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Supersedes GEH-6668

GE Industrial Systems

AV-300i™ 575V

User's Guide

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Safety Symbol Legend / Légende des Signes de Sécurité

WARNING!	Commands attention to an operating procedure, practice, condition, or statement which, if not strictly observed, could result in personal injury or death. *Attire l'attention sur les modes d'utilisation et les procédés et conditions d'exploitation qui, en cas d'inobservation, pourraient entraîner des blessures corporelles ou la mort.*
CAUTION!	Commands attention to an operating procedure, practice, condition, or statement which, if not strictly observed, could result in damage or destruction of equipment. The seriousness of the injuries and of the damages which could be caused by the non- observance of such indications, depends on the different conditions. Anyway, the instructions given below should always be followed with the highest attention. *Attire l'attention sur les modes d'utilization et les procédés et conditions d'exploitation qui, en cas d'inobservation, pourraient entraîner la détérioration ou la destruction des appareils.* *La gravité des blessures et des dommages matériels possibles dépendent de différent facteurs. Toutefois, les instructions mentionées ci-dessous devraient être toujours suivies avec la plus grande attention.*
NOTE!	Commands attention to an operating procedure, practice, condition, or statement that must be highlighted. *Attire l'attention sur les modes d'utilization et les procédés et conditions d'exploitation qui présentent un intéret particulier.*

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Chapter 0 - Safety Precautions / Precautions de Securité

NOTE! The terms “Inverter”, “Controller” and “Drive” are sometimes used interchangably throughout the industry. We will use the term “Drive” in this document

Les mots “Inverter”, “Controller” et “Drive” sont interchangeables dans le domaine industriel. Nous utiliserons dans ce manuel seulement le mot “Drive”.

WARNING! / ATTENTION!

- According to the EEC standards the AV300i and accessories must be used only after checking that the machine has been produced using those safety devices required by the 89/392/EEC set of rules.

  Drive systems cause mechanical motion. It is the responsibility of the user to insure that any such motion does not result in an unsafe condition. Factory provided interlocks and operating limits should not be bypassed or modified.
- Never open the device or covers while the AC Input power supply is switched on. Minimum time to wait before working on the terminals or internal devices is listed in section 5.11 of this instruction book.
- If the front plate has to be removed because the ambient temperature is higher than 40 degrees, the user has to ensure that no occasional contact with live parts will occur.
- Always connect the Drive to the protective ground (PE) via the marked connection terminals (PE2) and the housing (PE1). Adjustable Frequency Drives and AC Input filters have ground discharge currents greater than 3.5 mA. EN 50178 specifies that with discharge currents greater than 3.5 mA the protective conductor ground connection (PE1) must be fixed type and doubled for redundancy.
- The drive may cause accidental motion in the event of a failure, even if it is disabled, unless it has been disconnected from the AC input feeder.

- *Selon les normes EEC, les drives AV300i et leurs accessoires doivent être employés seulement après avoir verifié que la machine ait été produit avec les même dispositifs de sécurité demandés par la réglementation 89/392/EEC concernant le secteur de l’industrie.*

  Les systèmes provoquent des mouvements mécaniques. L’utilisateur est responsable de la sécurité concernant les mouvements mécaniques. Les dispositifs de sécurité prévues par l’usine et les limitations operationelles ne doivent être dépassés ou modifiés.
- *Ne jamais ouvrir l’appareil lorsqu’il est suns tension. Le temps minimum d’attente avant de pouvoir travailler sur les bornes ou bien à l’intérieur de l’appareil est indiqué dans la section 5.11 (this instruction book).*
- *Si la plaque frontale doit être enlevée pour un fonctionnement avec la température de l’environnement plus haute que 40°C, l’utilisateur doit s’assurer, par des moyens opportuns, qu’aucun contact occasionnel ne puisse arriver avec les parties sous tension.*
- *L’appaeil peut rédémarrer de façon accidentel en cas d’anomalie, sauf s’il a été déconnecté du reseau.*
- *Effectuer toujours des connexions de terre (PE) par le biais des bornes (PE2) et du chassis (PE1). Le courant de dispersion vers la terre est supérieur à 3,5 mA. Selon EN 50178 il faut prévoir dans ces cas une double connexion à terre.*

WARNING! - ELECTRICAL SHOCK AND BURN HAZARD / ATTENTION! – DÉCHARGE ÉLECTRIQUE ET RISQUE DE BRÚLURE :

When using instruments such as oscilloscopes to work on live equipment, the oscilloscope’s chassis should be grounded and a differential amplifier input should be used. Care should be used in the selection of probes and leads and in the adjustment of the oscilloscope so that accurate readings may be made. See instrument manufacturer’s instruction book for proper operation and adjustments to the instrument.

Lors de l'utilisation d'instruments (par example oscilloscope) sur des systémes en marche, le chassis de l'oscilloscope doit être relié à la terre et un amplificateur différentiel devrait être utilisé en entrée.

Les sondes et conducteurs doivent être choissis avec soin pour effectuer les meilleures mesures à l'aide d'un oscilloscope. Voir le manuel d'instruction pour une utilisation correcte des instruments.

WARNING! - FIRE AND EXPLOSION HAZARD / ATTENTION! – RISQUE D'INCENDIES ET D'EXPLOSIONS:

Fires or explosions might result from mounting Drives in hazardous areas such as locations where flammable or combustible vapors or dusts are present. Drives should be installed away from hazardous areas, even if used with motors suitable for use in these locations.

L'utilisation des drives dans des zônes à risques (présence de vapeurs ou de poussières inflammables), peut provoquer des incendies ou des explosions. Les drives doivent être installés loin des zônes dangeureuses, et équipés de moteurs appropriés.

WARNING! - STRAIN HAZARD / ATTENTION À L'ÉLÉVATION:

Improper lifting practices can cause serious or fatal injury. Lift only with adequate equipment and trained personnel.

Une élévation inappropriée peut causer des dommages sérieux ou fatals. Il doit être élevé seulement avec des moyens appropriés et par du personnel qualifié.

WARNING! - POWER SUPPLY AND GROUNDING / ATTENTION ! ALIMENTATION PUISSANCE ET MISE À LA TERRE

In case of a three phase supply not symmetrical to ground, an insulation loss of one of the devices connected to the same network can cause functional problem to the drive, if the use of a delta /star transformer is avoided.

1 The drives are designed to be powered from standard three phase lines that are electrically symmetrical with respect to ground (TN or TT network).

2 In case of supply with IT network, the use of wye/delta transformer is mandatory, with a secondary three phase wiring referred to ground.

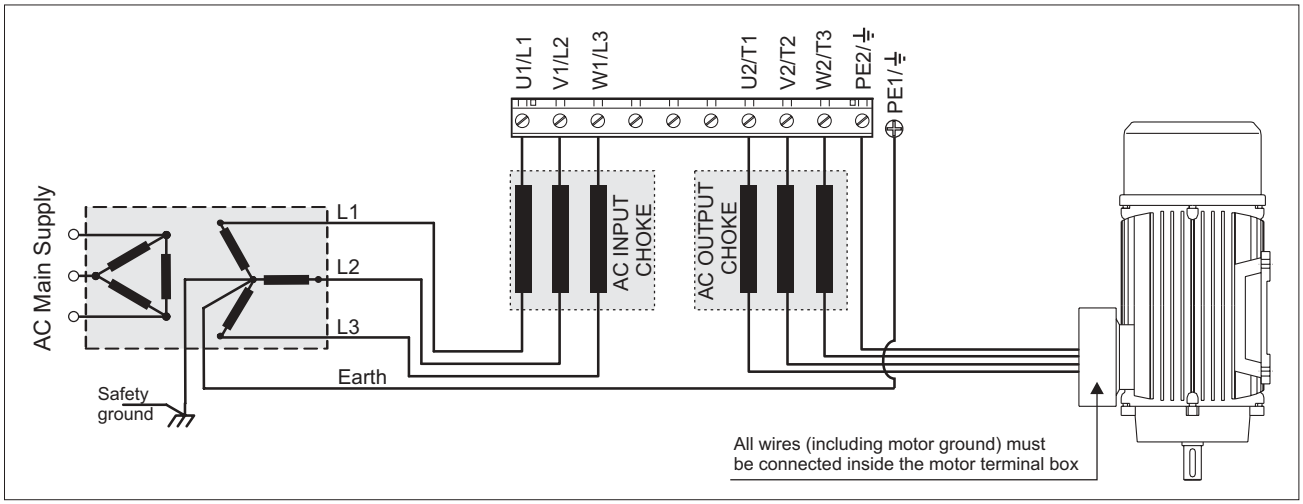
Please refer to the following connection sample.

Si le réseau n'est pas équilibré par rapport à la terre et qu'il n'y a pas de transformateur raingle/étoile, une mauvaise isolation d'un appareil électrique connecté au même réseau que le variateur peut lui causer des troubles de fonctionnement.

1 Les variateurs sont prévus pour être alimentés par un réseau triphasé équilibré avec un régime de neutre standard (TN ou TT).

2 Si le régime de neutre est IT, nous vous recommendons d'utiliser un tranformateur triangle/étoile avec point milieu ramené à la terre

Vous pouvez trouver ci-après des exemples de câblage.



WARNING! - ELECTRIC SHOCK HAZARD / ATTENTION! - CAS DE DECHARGE ELECTRIQUE:

- Drives and motors must be grounded according to NEC and local codes.
- Replace all covers before applying power to the Drive. Failure to do so may result in death or serious injury.
- Adjustable frequency drives are electrical apparatus for use in industrial installations. Parts of the Drives are at high voltage during operation. The electrical installation and the opening of the device should therefore only be carried out by qualified personnel. Improper installation of motors or Drives may therefore cause the failure of the device as well as serious injury to persons or material damage. Follow the instructions given in this manual and observe the local and national safety regulations applicable.

- *Tous les moteurs et les drives doivent être mis à la terre selon le Code Electrique National ou équivalent.*
- *Remettre tous les capots avant de mettre sous tension le drive. Des erreurs peuvent provoquer de sérieux accidents ou même la mort.*
- *Les drives à fréquence variable sont des dispositifs électriques utilisés dans des installations industriels. Une partie des drives sont sous tension pendant l'operation. L'installation électrique et l'ouverture des drives devrait être executé uniquement par du personel qualifié. De mauvaises installations de moteurs ou de drives peuvent provoquer des dommages materiels ou blesser des personnes.On doit suivir les instructions donneés dans ce manuel et observer les régles nationales de sécurité.*

CAUTION! / PRECAUTION!:

- Do not connect power supply voltage that exceeds the standard specification voltage fluctuation permissible. If excessive voltage is applied to the Drive, damage to the internal components will result.
- Do not operate the Drive without the ground wire connected. The motor chassis should be grounded to earth through a ground lead separate from all other equipment ground leads to prevent noise coupling.
- The grounding connector shall be sized in accordance with the NEC or Canadian Electrical Code. The connection shall be made by a UL listed or CSA certified closed-loop terminal connector sized for the wire gauge involved. The connector is to be fixed using the crimp tool specified by the connector manufacturer.
- Do not perform a megger test between the Drive terminals or on the control circuit terminals.
- Because the ambient temperature greatly affects Drive life and reliability, do not install the Drive in any location that exceeds the allowable temperature. Leave the ventilation cover attached for temperatures of 104° F (40° C) or below**.**
- If the Drive's Fault Alarm is activated, consult the TROUBLESHOOTING section of this instruction book, and after correcting the problem, resume operation. Do not reset the alarm automatically by external sequence, etc.
- Be sure to remove the desicant dryer packet(s) when unpacking the Drive. (If not removed these packets may become lodged in the fan or air passages and cause the Drive to overheat).
- The Drive must be mounted on a wall that is constructed of heat resistant material. While the Drive is operating, the temperature of the Drive's cooling fins can rise to a temperature of 194° F (90°C).
- Do not touch or damage any components when handling the device. Changing of isolation gaps or removing the isolation covers is not permissible.
- Protect the device from disallowed environmental conditions (temperature, humidity, shock etc.)
- No voltage should be connected to the output of the frequency inverter (terminals U2, V2 W2). The parallel connection of several frequency inverters via the outputs and the direct connection of the inputs and outputs (bypass) are not permissible.
- A capacitative load (e.g. Var compensation capacitors) should not be connected to the output of the frequency inverter (terminals U2, V2, W2).
- The electrical commissioning should only be carried out by qualified personnel, who are also responsible for the provision of a suitable ground connection and a protected power supply feeder in accordance with the local and national regulations. The motor must be protected against overloads.
- No dielectric tests should be carried out on parts of the frequency inverter. A suitable measuring instrument (internal resistance of at least 10 kΩ/V) should be used for measuring the signal voltages.

- *Ne pas raccorder de tension d'alimentation dépassant la fluctuation de tension permise par les normes. Dans le cas d' une alimentation en tension excessive, des composants internes peuvent être endommagés.*
- *Ne pas faire fonctionner le drive sans prise de terre. Le chassis du moteur doit être mis à la terre à l'aide d'un connecteur de terre separé des autres pour éviter le couplage des perturbations. Le connecteur de terre devrait être dimensionné selon la norme NEC ou le Canadian Electrical code. Le raccordement devrait être fait par un connecteur certifié et mentionné à boucle fermé par les normes CSA et UL et dimensionné pour l'épaisseur du cable correspondant. Le connecteur doit être fixé a l'aide d'un instrument de serrage specifié par le producteur du connecteur.*
- *Ne pas exécuter un test megger entre les bornes du drive ou entre les bornes du circuit de contrôle.*
- *Étant donné que la température ambiante influe sur la vie et la fiabilité du drive, on ne devrait pas installer le drive dans des places ou la temperature permise est dépassée. Laisser le capot de ventilation en place pour températures de 104°F (40°C) ou inférieures.*
- *Si la Fault Alarm du drive est activée, consulter la section du manuel concernant les défauts et après avoir corrigé l'erreur, reprendre l'opération. Ne pas réiniliatiser l'alarme automatiquement par une séquence externe, etc….*
- *Lors du déballage du drive, retirer le sachet déshydraté. (Si celui-ci n'est pas retiré, il empêche la ventilation et provoque une surchauffe du drive).*
- *Le drive doit être monté sur un mur construit avec des matériaux résistants à la chaleur. Pendant le fonctionnement du drive, la température des ailettes du dissipateur thermique peut arriver à 194°F (90°).*
- *Manipuler l'appareil de façon à ne pas toucher ou endommager des parties. Il n'est pas permis de changer les distances d'isolement ou bien d'enlever des matériaux isolants ou des capots.*
- *Protéger l'appareil contre des effets extérieurs non permis (température, humidité, chocs etc.).*
- *Aucune tension ne doit être appliquée sur la sortie du convertisseur (bornes U2, V2 et W2). Il n'est pas permis de raccorder la sortie de plusieurs convertisseurs en parallèle, ni d'effectuer une connexion directe de l'entrée avec la sortie du convertisseur (Bypass).*
- *Aucune charge capacitive ne doit être connectée à la sortie du convertisseur (bornes U2, V2 et W2) (par exemple des condensateurs de mise en phase).*
- *La mise en service électrique doit être effectuée par un personnel qualifié. Ce dernier est responsable de l'existence d'une connexion de terre adéquate et d'une protection des câbles d'alimentation selon les prescriptions locales et nationales. Le moteur doit être protégé contre la surcharge*
- *Il ne faut pas éxécuter de tests de rigidité diélectrique sur des parties du convertisseurs. Pour mesurer les tensions, des signaux, il faut utiliser des instruments de mesure appropriés (résistance interne minimale 10 kΩ/V).*

NOTE! If the Drives have been stored for longer than two years, the operation of the DC link capacitors may be impaired. Before commissioning devices that have been stored for long periods, connect them to a power supply for two hours with no load connected in order to regenerate the capacitors, (the input voltage has to be applied without enabling the inverter).

En cas de stockage des convertisseurs pendant plus de deux ans, il faut tenir compte du fait que les condensateurs du circuit intermédiaire gardent leurs caractéristiques d'origine seulement s'ils sont alimentés avant trois ans, à partir de leur date de fabrication. Avant la mise en service des appareils, qui sont restés stockés aussi longtemps, il est conseillé d'alimenter les convertisseurs pendant au moins deux heures, pour récupérer les caractéristiques d'origine des condensateurs: appliquer une tension d'entrée sans activer le convertisseur ***(Disable).***

Chapter 1 - Function and Features (Overview)

The AV-300i is a field-oriented vector Drive with excellent speed control properties and a high torque.
Available control modes are:

- Field oriented with speed sensor
- Field oriented without speed sensor (Sensorless vect mode)
- V/f control

Space vector modulation keeps the noise level to a minimum.

- Output voltage up to 98% of input voltage
- Self tuning procedure for current, flux and speed regulators

The Drives are fitted with IGBTs (insulated gate bipolar transistors).

The output is protected against ground fault and phase to phase output short.

Regulator power supply via switched-mode power supply unit from the DC Bus circuit. Power supply backup in the event of short-term voltage dips.

Galvanic isolation between control section and command terminals.

Analog inputs designed as differential inputs.

Simple operation of the drive

- via the terminal strip
- via the user-friendly keypad
- via the PC program supplied and the RS485 serial interface
- via a fieldbus connection (optional): PROFIBUS-DP or GENIUS.
- Toolbox configuration tool

Fault register storing the last ten fault alarms with the associated lifetime.

Overload control

Engaging a running motor

Three freely configurable analog inputs on the standard device

Expansion of the analog / digital outputs and analog / digital inputs via option cards

Reference value entry and actual value display as a percentage of a user-defined dimension

Speed and torque current regulation possible

Adaptive speed regulation

Speed-related alarms

Motor potentiometer function (Increase/Decrease speed by command)

Jog operation

8 internal speed reference values

4 internal ramps

PID control

Controlled stop in case of AC mains power loss.

Notes:

Chapter 2 - Inspection Procedure, Component Identification and Standard Specification

2.1. Upon Delivery Inspection Procedures

2.1.1. General

A high degree of care is taken in packing the AV-300i Drives and preparing them for delivery. They should only be transported with suitable transport equipment (see weight data). Observe the instructions printed on the packaging. This also applies when the device is unpacked and installed in the control cabinet.

Upon delivery, check the following:

- the packaging for any external damage
- whether the delivery note matches your order.

Open the packaging with suitable tools. Check whether:

- any parts were damaged during transport
- the device type corresponds to your order

In the event of any damage or of an incomplete or incorrect delivery please notify the responsible sales offfices immediately.

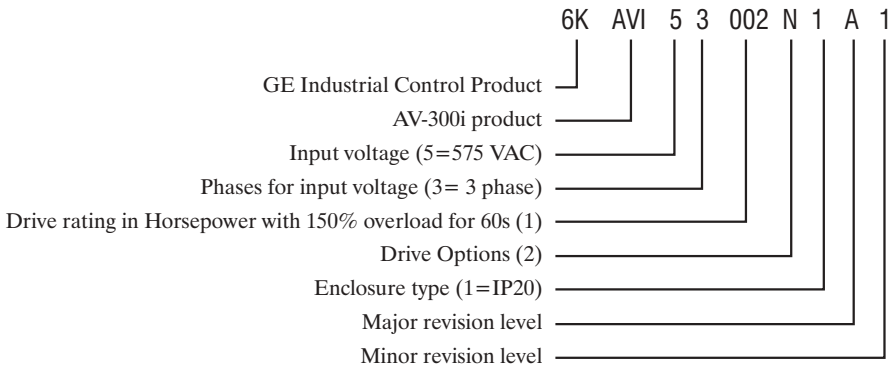
The devices should only be stored in dry rooms within the specified temperature ranges .

NOTE! A certain degree of moisture condensation is permissible if this arises from changes in temperature (see section 2.4.1, “Permissible Environmental Conditions”). This does not, however, apply when the devices are in operation. Always ensure that there is no moisture condensation in devices that are connected to the power supply!

2.1.2. Inverter Type Designation

The technical specification of the AV-300i Drive is stated in the type code. Example:

Figure 2.1.2.1: Inverter type designation



(1) Fractional HPs are denoted with the letter F (for example: ¾ HP=F75)

(2) X= with keypad, without internal brake transistor N= no keypad, use Led module with internal brake transistor (DB)

Y= with keypad, with internal brake transistor M= no keypad, use Led module without internal brake (DB) transistor

*AV300i with Full function Keypad is the Standard Stoked item

1 HP - 20 HP, internal brake (DB) transistor is always supplied, OPTION PICK= M and X are not available

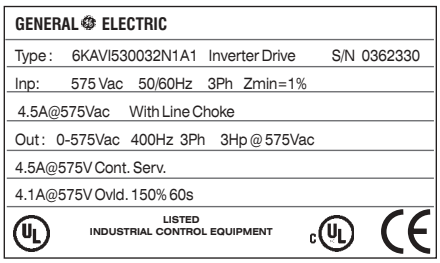
The AV-300i Drive selected depends on the rated current of the motor. The rated output current at the appropriate service conditions must be greater than or equal to the motor current required.

The speed of the three-phase motor is determined by the number of pole pairs and the frequency (nameplate, data sheet) of the motor concerned. Operation above the rated frequency and speed of the motor must take into account the specifications given by the manufacturer losses (bearings, unbalance etc.). This also applies to temperature specifications for continuous operation under 20 Hz (poor motor ventilation, not applicable to motors with external ventilation).

2.1.3. Nameplate

Check that all the data stated in the nameplate enclosed to the inverter correspond to what has been ordered.

Figure 2.1.3.1: Identification nameplate

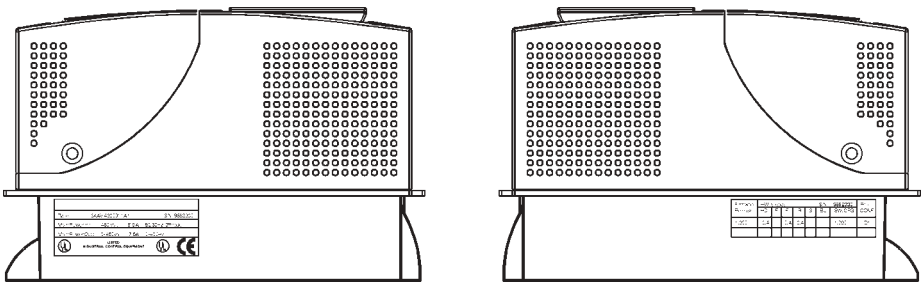


Type: Inverter model S/N: Serial number
Inp: Power supply voltage - Frequency - AC Input current
Out: Output voltage - Output frequency - Output power and current

Figure 2.1.3.2: Firmware & Card revision level nameplate

Firmware Release	HWrelease D	F	P	R	S	BU	S/N 0362330 SW. CFG	Prod. CONF
1.000	0.A		0.A	0.A				A1

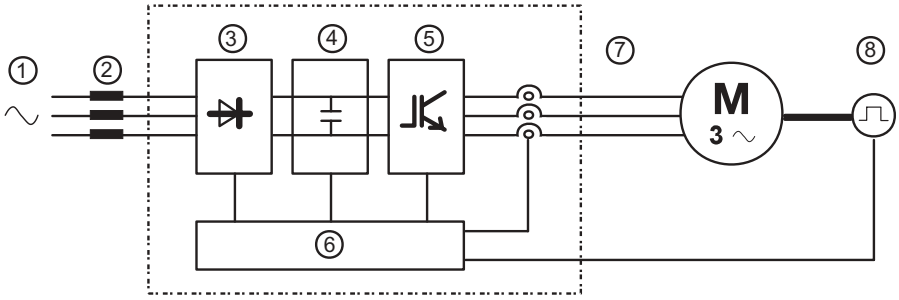
Figure 2.1.3.3: Nameplates position



2.2. Component Identification

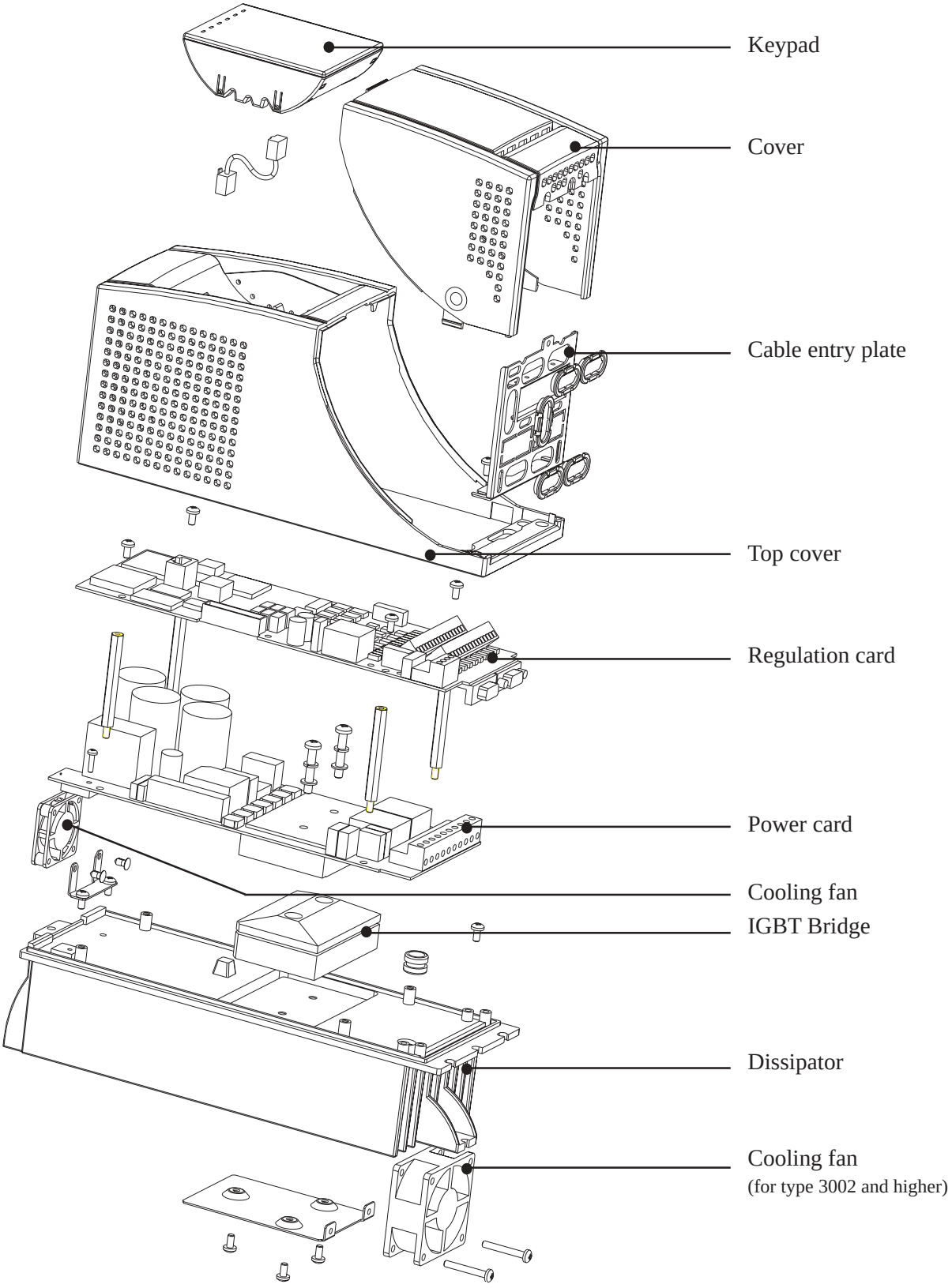
An AV-300i Drive converts the constant voltage and frequency of a three-phase power supply into a direct voltage and then converts this direct voltage into a new three-phase power supply with a variable voltage and frequency. This variable three-phase power supply can be used for the infinitely variable adjustment of the speed of three-phase asynchronous motors.

Figure 2.2.1: Basic Setup of Frequency Inverter



1 AC Input supply voltage	
2 AC Mains choke	(see section 4.7.1)
3 Three-phase rectifier bridge	Converts the alternating current into direct current using a three phase full wave bridge.
4 DC intermediate circuit	With charging resistor and smoothing capacitor. Direct voltage (U_{DC}) = $\sqrt{2}$ x Mains voltage (U_{LN})
5 IGBT inverter	Converts direct voltage to a variable three-phase alternating voltage with variable frequency.
6 Configurable control section	Modules for open-loop and closed-loop control of the power section. This is used for processing control commands, reference values and actual values.
7 Output voltage:	Three-phase, variable alternating voltage.
8 Encoder	For speed feedback (see section 3.4.2)

Figure 2.2.2: Drive view & components



2.3. Standard Specifications

2.3.1. Permissible Environmental Conditions

Table 2.3.1.1: Environmental specification

ENVIRONMENT	T_A Ambient temperature		[°C]	0 … +40; +40…+50 with derating
			[°F]	32 … +104; +104…+122 with derating
	Installation location			Pollution degree 2 or better (free from direct sunligth, vibration, dust, corrosive or inflammable gases, fog, vapour oil and dripped water, avoid saline environment)
	Degree of protection			IP20
				IP54 for the cabinet with externally mounted heatsink (size type 3002 to 3020)
	Installation altitude			Up to 1000 m above sea level; for higher altitudes a current reduction of 1.2% for every 100 m of additional height applies .
	Temperature:			
		operation [1]		0…40°C (32°…104°F)
		operation [2]		0…50°C (32°…122°F)
		storage		-25…+55°C (-13…+131°F), class 1K4 per EN50178
				-20…+55°C (-4…+131°F), for devices with keypad
		transport		-25…+70°C (-13…+158°F), class 2K3 per EN50178
				-20…+60°C (-4…+140°F), for devices with keypad
	Air humidity:			
		operation		5 % to 85 %, 1 g/m^3 to 25 g/m^3 without moisture condensation or icing (Class 3K3 as per EN50178)
		storage		5% to 95 %, 1 g/m^3 to 29 g/m^3 (Class 1K3 as per EN50178)
		transport		95 % [3] 60 g/m [4]
				A light condensation of moisture may occur for a short time occasionally if the device is not in operation (class 2K3 as per EN50178)
	Air pressure:			
		operation	[kPa]	86 to 106 (class 3K3 as per EN50178)
		storage	[kPa]	86 to 106 (class 1K4 as per EN50178)
		transport	[kPa]	70 to 106 (class 2K3 as per EN50178)
STANDARD	Climatic conditions			IEC 68-2 Part 2 and 3
	Clearance and creepage			EN 50178, UL508C, UL840 degree of pollution 2
	Vibration			IEC68-2 Part 6
	EMC compatibility			EN61800-3 (see “EMC Guidelines” instruction book)
	Approvals			CE, UL, cUL

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1) Parameter **Ambient temp** = 40°C (104°)
Ambient temp = 0 ... 40°C (32°...104°F)
Over 40°C: - current reduction of 2% of rated output current per K
- remove front plate (better than class 3K3 as per EN50178)

2) Parameter **Ambient temp** = 50°C (122°F)
Ambient temp = 0 ... 50°C (32°...122°F)
Current derated to 0.8 rated ouput current
Over 40°C (104°): removal of the top cover (better than class 3K3 as per EN50178)

3) Greatest relative air humidity occurs with the temperature @ 40°C (104°F) or if the temperature of the device is brought suddenly from -25 ...+30°C (-13°...+86°F).

4) Greatest absolute air humidity if the device is brought suddenly from 70...15°C (158°...59°F).

Disposal of the Device

The AV-300i Drive can be disposed as electronic scraps in accordance with the currently valid national regulations for the disposal of electronic parts.

The plastic covering of the Drives (up to sizes 6KAVi53020) are recyclable: the material used is >ABS+PC< .

2.3.2. AC Input/Output Connection

The AV300i Drive must be connected to an AC mains supply capable of delivering a symmetrical short circuit current (at 575V +10% Vmax) lower or equal to the values indicated on table above. Also the inserction of a Mains inductance should be take into account (see chapter 4.7.1).

No external connection of the regulator power supply to the existing AC Input supply is required since the power supply is taken from the DC Link circuit. When commissioning, set the **Mains voltage** parameter to the value of the AC Input voltage concerned. This automatically sets the threshold for the Undervoltage alarm at the appropriate level.

NOTE! In some cases AC Input chokes, and possibly noise suppression filters should be fitted on the AC Input side of the device in order to operate the AV-300i Drive. See chapter “Chokes/ Filters”.

Adjustable Frequency Drives and AC Input filters have ground discharge currents greater then 3.5 mA. EN 50178 specifies that with discharge currents greater than 3.5 mA the protective conductor ground connection (PE1) must be fixed type.

Table 2.3.2.1: AC Input/Output specifications

	Type		3002	3003	3005	3007	3010	3015	3020	3025	3030	3040	3050	3060	3075	3100	3125	3150	3200
	Mechanical dimension L x H x D	mm	151.5 x 306.5 x 199.5			208 x 323 x 240				350 x 569 x 268		350 x 569 x 320	418 x 605 x 320			509x 921x 297.5	509 x 1113 x 297.6		
		[inches]	[5.9x12.0x7.8]			[8.2x12.7x9.5]				[13.8x22.4x10.5]		[13.8x224x12.6]	[16.4x23.8x16.6]			[20x 36.2x 11.7]	[20x43.8x11.7]		
OUTPUT	Inverter Output (IEC 146 class1), Continuous service	[kVA]	3.8	4.5	7.0	10.8	13.7	18.6	24.1	30	36	46	58	69	86	109	136	157	210
	Inverter Output (IEC 146 class2), 150% overload for 60s	[kVA]	3.4	4.1	6.3	9.8	12.5	16.9	21.9	27	33	42	53	63	78	99	124	143	191
	P_N mot (recommended motor output):																		
	@ U_{LN}=575Vac; f_{SW}=default; IEC 146 class 1	[Hp]	2	3	5	7.5	10	15	20	25	30	40	50	60	75	100	125	150	200
	@ U_{LN}=575Vac; f_{SW}=default; IEC 146 class 2	[Hp]	2	3	5	7.5	10	15	20	25	30	40	50	60	75	100	125	150	200
	U_2 Max output voltage	[V]	0.98 x U_{LN} (AC Input voltage)																
	f_2 Max output frequency (*)	[Hz]	400							200									
	I_{2N} Rated output current :																		
	@ U_{LN}=575Vac; f_{SW}= default; IEC 146 class 1	[A]	3.8	4.5	7.0	10.8	13.8	18.7	24.2	30	36	46	58	69	86	109	137	158	211
	@ U_{LN}=575Vac; f_{SW}=default; IEC 146 class 2	[A]	3.5	4.1	6.4	9.8	12.6	17	22	27	33	42	53	63	78	99	125	144	192
	f_{SW} switching frequency (Default)	[kHz]	8							4								2	
	f_{SW} switching frequency (Higher)	[kHz]	16							8						4			2
	Iovld (short term overload current, 200% of I_{2N} for 0.5s on 60s)	[A]	7.0	8.2	12.8	19.6	25.2	34.0	44.0	54	66	84	106	126	156	198	249	288	384
	Derating factor:																		
	K_T for ambient temperature		0.8 @ 50°C (122°F)																
	K_F for switching frequency		0.7 for higher f_{SW}						0.87	0.8 for higher f_{SW}			0.64	t.b.d				0.87	t.b.d
INPUT	U_{LN} AC Input voltage	[V]	500V -10% / 575V +10%...- 10% , 3Ph																
	AC Input frequency	[Hz]	50/60 Hz ±5%																
	I_N AC Input current for continuous service :																		
	- Connection with 3-phase reactor																		
	@ 575Vac; IEC 146 class1	[A]	3.8	4.7	7.4	11.7	15	19.8	25.9	31	35	46	60	68	85	114	146	163	220
	- Connection without 3-phase reactor																		
	@ 575Vac; IEC 146 class1	[A]	5.3	6.1	9.9	17	20.7	27.6	33.9	For these types DC choke is inside									
	Max short circuit power without line reactor (Zmin=1%)	[kVA]	380	450	700	1080	1370	1860	100	3000	3600	4600	5800	6900	8600	10900	13600	15700	21000
	Overvoltage threshold	[V]	1000 V_{DC}																
	Undervoltage threshold	[V]	565 V_{DC} (for 575 V_{AC} mains)																
	Braking IGBT Unit (standard drive)		Standard internal (with external resistor); Braking torque 150%							Opt. intl (with extl res); Br. trq 150%						External braking unit (optional)			

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2.3.3. AC Input Current

NOTE! The Input current of the Drive depends on the operating state and the service conditions of the connected motor, and the use of input reactors. The table 2.3.4.1 shows the values corresponding to rated continuous service (IEC 146 class 1), keeping into account typical output power factor for each size

2.3.4. AC Output

The output of the AV-300i Drive is ground fault and phase to phase output short protected. The switching frequency is constant in the speed range and depends on the drive size.

NOTE! The connection of an external voltage to the output terminals of the Drive is not permissible! It is allowed to disconnect the motor from the Drive output, after the Drive has been disabled.

The value for the continuous output current rating (I_{CONT}) depends on AC Input voltage (K_V), Ambient temperature (K_T) and Switching frequency (K_F):

$I_{CONT} = I_{2N} \times K_V \times K_T \times K_F$ (Values of derating factor are the listed on table 2.3.2.1)

with an overload capacity $I_{MAX} = 1.36 \times I_{CONT}$ for 60 seconds

The applicable deratings are automatically set when selecting the appropriate values of AC Input voltage, Ambient temperature and Switching frequency.

Recommended motor outputs

The coordination of the motor rated powers with the Drive type presented in the table below refers to the use of standard 4 poles motors with a rated voltage equal to the rated voltage of the input supply. As for those motors with different voltages, the type of Drive to use is determined by the rated current of the motor.

Motor nominal current cannot be lower than $0,3 \times I_{2N}$. Magnetizing motor current must not be higher of I_{CONT}.

NOTE! For service conditions with overload higher than 150%, the nominal current must be derated.

Table 2.3.4.1 shows nominal current values for typical service profiles (Ambient temperature =40°C [104°F], standard switching frequency). For cycles with nominal current applied after the overload, the minimum duration is also specified.

For cycles shorter than the minimum duration specified, the current following the overload should be reduced to a level lower than the nominal, so that the RMS average over the cycle does not exceed the continuous current, I_{CONT}.

Similar criteria apply for operation with additional derating factors.

Tables 2.3.4.1: Nominal Drive Current

Type	3002	3003	3005	3007	3010	3015	3020	3025	3030	3040	3050	3060	3075	3100	3125	3150	3200
Continuous service, no overload (IEC 146 class 1)	3.8	4.5	7.0	10.8	13.8	18.7	24.2	30	36	46	58	69	86	109	137	158	211
Overload service 150% x 60s followed by In, min.cycle time 360s (IEC 146 class2)	3.5	4.1	6.4	9.8	12.6	17.0	22.0	27	33	42	53	63	78	99.2	124.7	144	192
Overload service 200% x 10s followed by In, min.cycle time 30s	2.6	3.1	4.8	7.4	9.5	12.8	16.5	20.3	24.8	31.5	39.8	47.3	58.5	74.1	93.2	107.4	143.5
Overload service 200% x 60s followed by In, min.cycle time 160s	2.6	3.1	4.8	7.4	9.5	12.8	16.5	20.3	24.8	31.5	39.8	47.3	58.5	74.1	93.2	107.4	143.5
Overload service 250% x 10s followed by In, min.cycle time 25s	2.1	2.5	3.8	5.9	7.6	10.2	13.2	16.2	19.8	25.2	31.8	37.8	46.8	59.3	74.6	85.9	114.8
Overload service 300% x 10s followed by In, min.cycle time 25s	1.8	2.1	3.2	4.9	6.3	8.5	11.0	13.5	16.5	21.0	26.5	31.5	39.0	49.4	62.1	71.6	95.6
Overload service 300% x 60s followed by In, min.cycle time 130s	1.8	2.1	3.2	4.9	6.3	8.5	11.0	13.5	16.5	21.0	26.5	31.5	39.0	49.4	62.1	71.6	95.6

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2.3.5. Open-Loop and Closed-Loop Control Section

Enable inputs		0 / 15...30 V	3.2...6.4 mA	(5 mA @ 24 V)
Analog inputs	Selectable	0... ± 10 V	0.25 mA max	
		0...20 mA	10 V max	
		4...20 mA	10 V max	
		Max common mode voltage: 0...± 10 V		
Analog outputs		0...± 10 V	5 mA max per output	
Digital inputs		0 / 15...30 V	3.2...6.4 mA	(5 mA @ 24 V)
Digital outputs	Supply	+ 15...35 V		
	Signals	+ 15...35 V	40 mA max per output	
Encoder inputs				
Sinusoidal	Voltage	1 V pp		
	Current	8.3 mA pp per channel (input resistance = 124 Ohms).		
	No. of pulses	min 600		
	per revolution	max 9999		
	max. frequency	80 kHz		
	Cable max.	500 feet (150 m), screened, 4 twisted pairs as shown in the table 3.4.2.1		
Digital	Voltage	5 V		
	Current	10 mA		
	No. of pulses	min 600		
	per revolution	max 9999		
	Type	standard and inverted signal		
	max. frequency	150 kHz		
Int. voltage supply				
	Load capacity	+ 5 V	160 mA	Plug connector
	+ 10 V	10 mA	Terminal 7	
		- 10 V	10 mA	Terminal 8
		+ 24 V	120 mA	Terminal 19
	Tolerance	+ 10 V	± 3 % [1)]	
		- 10 V	± 3 % [1)]	
		+ 24 V	+ 20 ... 30 V, not stabilized	
		XE for digital encoder, PIN 7/9		

[1)] The tolerance between positive and negative amplitudes is ± 0.5%

2.3.6. Accuracy

Output frequency:			
	temperature dependent stability error	[°C]	50 ppm/°C typical
	resolution	[Hz]	0.001 Hz at 50 Hz 0.005 Hz at 300 Hz
Internal reference value voltage:		[V]	± 10V, terminals 7 and 8
	- temperature dependent stability error	[°C]	100 ppm/°C typical
Reference values:			
	resolution via keypad / Interface bus		16 bit or 15 bit + sign
	resolution via terminals (1/2, 3/4, 5/6)		11 bit + sign
	linearity via terminals (1/2, 3/4, 5/6)		± 0.1 % of full scale
SPEED CONTROL	Speed limit / Absolute max speed	[rpm]	8000
	Digital reference resolution	[rpm]	0.25
	Field oriented (with sinusoidal Encoder):		
	speed feedback resolution	[rpm]	0.25 (for encoder pulses number 1900)
			> 0.25(for encoder pulses number <1900)
	accuracy	[%]	typical 0.01%
	control range	[rpm]	better than 1:10000
	max bandwidth	[rad/s]	300 rad/s [47 Hz] (1)
	Field oriented (with digital Encoder):		
	speed feedback resolution	[rpm]	0.5
	accuracy	[%]	typical 0.02%
	control range	[rpm]	better than 1:1000
	max bandwidth	[rad/s]	300 rad/s [47 Hz] (1)
	Sensorless vector control:		
	speed feedback resolution	[rpm]	0.002 x Nominal speed
	accuracy	[%]	0.3% @ Nominal speed
			1.3% @ 2% of Nominal speed
	control range	[rpm]	from 1:50 to 2.5 x Nominal speed
	max bandwidth	[rad/s]	100 rad /s [15,9Hz] (1)
	Constant V/f control:		
	accuracy	[rpm]	0.3 x nominal motor slip with automatic slip compensation
	control range	[%]	depending on motor nominal slip, typ. 1:50
TORQUE CONTROL	Field oriented - Sensorless:		
	resolution	[rpm]	typical 1:1.000
	accuracy	[%]	typical 5% (2)
	control range	[rpm]	1÷20
	min. response time (at load step)	[ms]	0.8
	max bandwidth		2.4 krad/s [380 Hz]

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(1) The response time and bandwidth are affected by the load and inertia. These represent limit values.
(2) This value does not include iron losses, mechanical losses and cogging torque. With Rr adaptation enabled.

Notes:

Chapter 3 - Installation Guidelines

3.1. Mechanical Specification

Figure 3.1.1: Drive dimensions (sizes 3002 up to 3020)

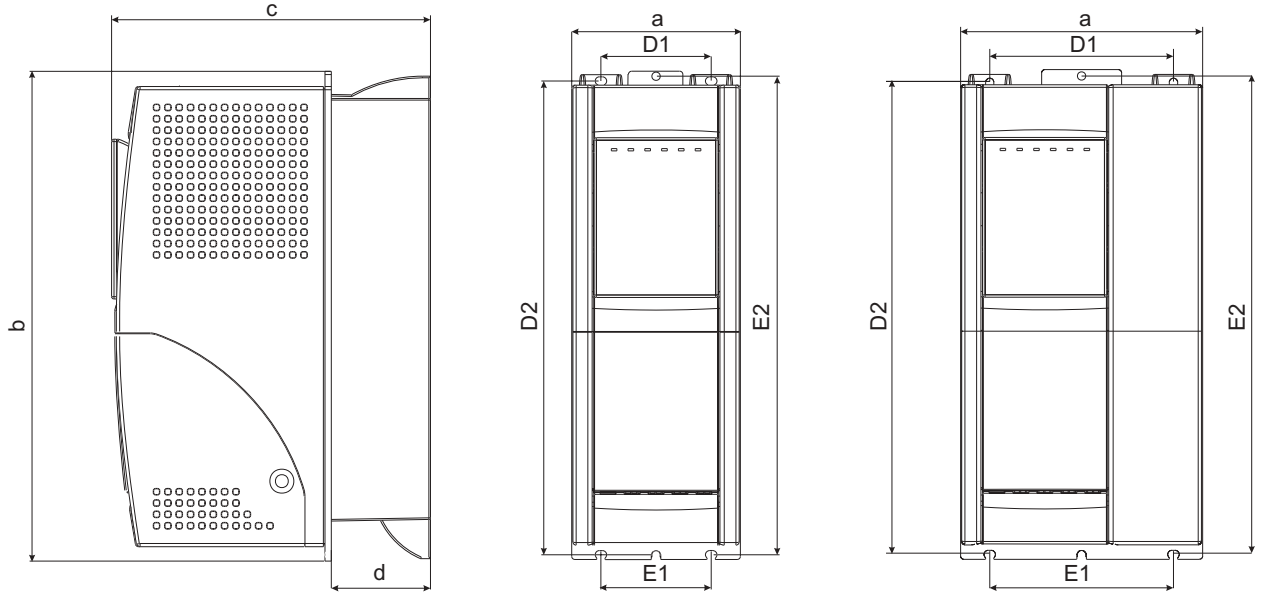
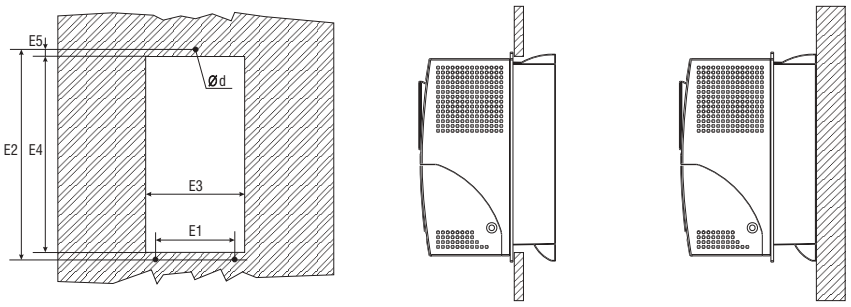


Figure 3.1.2: Mounting methods (sizes 3002 up to 3020)



Mounting with external dissipator (E)

Mounting wall (D)

Table 3.1.1: Drive dimensions and weights (sizes 3002 up to 3020)

Type		3002	3003	3005	3007	3010	3015	3020
Drive dimensions:								
a	mm (inch)	151.5 (5.9)			208 (8.2)			
b	mm (inch)	306.5 (12.0)			323 (12.7)			
c	mm (inch)	199.5 (7.8)			240 (9.5)			
d	mm (inch)	62 (2.4)			84 (3.3)			
D1	mm (inch)	115 (4.5)			168 (6.6)			
D2	mm (inch)	296.5 (11.6)			310.5 (12.2)			
E1	mm (inch)	115 (4.5)			164 (6.5)			
E2	mm (inch)	296.5 (11.6)			315 (12.4)			
E3	mm (inch)	145.5 (5.7)			199 (7.8)			
E4	mm (inch)	284 (11.2)			299.5 (11.8)			
E5	mm (inch)	9 (0.35)						
Ø d		M5						
Weight	kg (lbs)	4.6 (10.1)		4.8 (10.6)	8.2 (18)		8.8 (19.4)	

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Figure 3.1.3: Drive dimensions (sizes 3025 up to 3075)

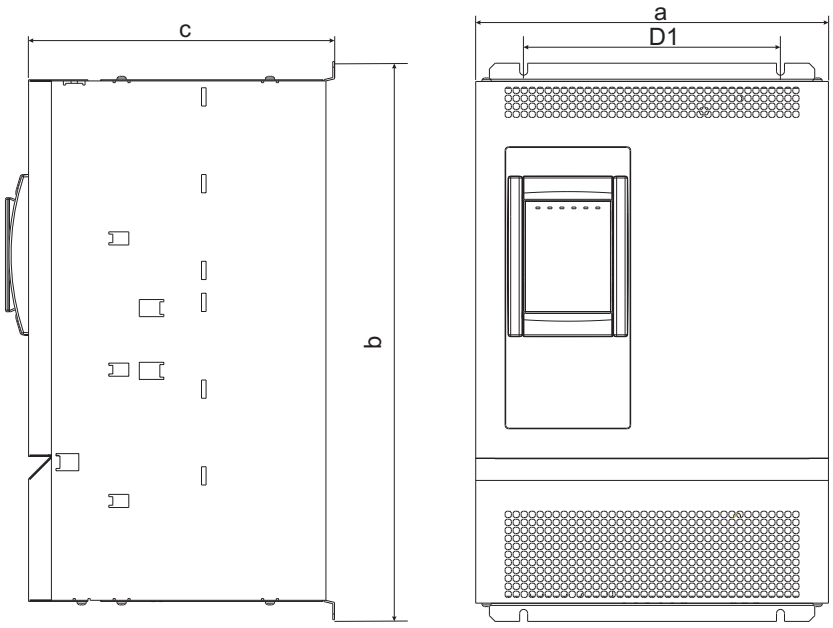

Figure 3.1.4: Mounting methods (sizes 3025 up to 3075)

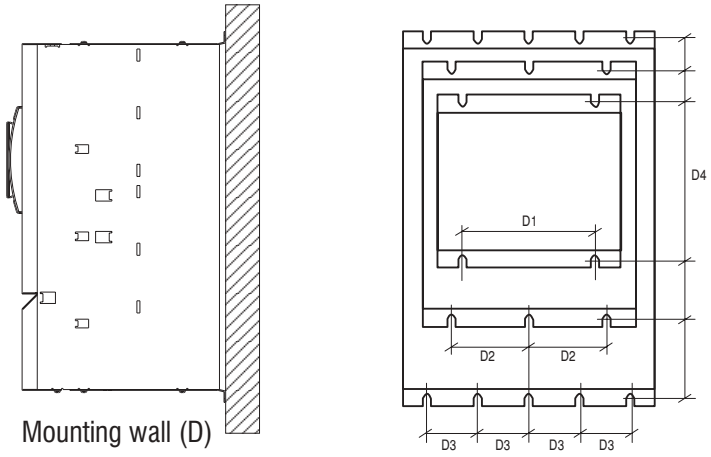

Table 3.1.2: Drive dimensions and weights (sizes 3025 up to 3075)

Type		3025	3030	3040	3050	3060	3075	3100	3125	3150	3200
Drive dimensions:											
a	mm (inch)	350 (13.8)			418 (16.46)			509 (20)			
b	mm (inch)	569 (22.4)			605 (23.82)			921 (36.2)	1113 (43.8)		1183 (46.6)
c	mm (inch)	268 (10.55)		320 (12.6)	320 (12.6)			297.5 (11.7)			
D1	mm (inch)										
D2	mm (inch)	150 (15.91)						-	-	-	-
D3	mm (inch)	-						100 (3.9)			
D4	mm (inch)	555 (21.85)			590 (23.23)			903 (35.5)	1095 (43.1)		1165 (45.9)
Ø		M6									
Weight	**kg**	28.6		31.6	47			83	118		
	lbs	63.1		69.7	103.6			183	260.1		

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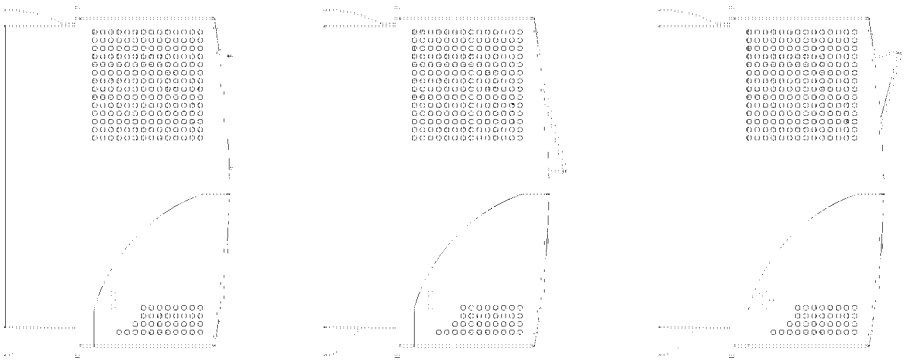
Figure 3.1.5: Keypad positioning



To allow a confortable viewing angle, the keypad can be oriented on three different position.

3.2. Watts Loss, Heat Dissipation, Internal Fans and Minimum Cabinet Opening Suggested for the Cooling

The heat dissipation of the Drives depends on the operating state of the connected motor. The table below shows values that refer to operation at default switching frequency (see section 2.4.4, "AC Output"), Tamb ≤ 40°C , typ. motor power factor and nominal continuous current.

Table 3.2.1: Heat dissipation and required air flow

Type		3002	3003	3005	3007	3010	3015	3020	3025	3030	3040	3050	3060	3075	3100	3125	3150	3200
P_V Heat dissipation:																		
@U_{LN}=575Vac [1]	[W]	75	80	128	215	266	338	453	515	620	810	1070	1155	1480	2150	2760	2760	3250
[1] f_{SW}=default; $I_2=I_{2N}$																		
Airflow of fan:																		
Internal fan	[m^3/h]	11	11	11	30	30	30	30										
Heatsink fans	[m^3/h]	30	30	2x30	2x79	2x79	2x79	2x79	2x80	2x80	170	340			650	975	975	975

ai3110ge

NOTE! All the Drives have internal fans.

Heat dissipation losses refer to default switching frequency

Table 3.2.2: Minimum cabinet opening suggested for the cooling

Type	3002-3005	3007-3020	3025	3030	3040	3050	3060	3075	3100	3125	3150	3200
Minimum cooling opening:												
Control section cm^2 (sq.inch)	31 (4.8)	36 (5.6)	2x150 (2x 23.5)	2x200 (2x31)		2x370 (2x57.35)			2x620 (2x96.1)			
Heatsink cm^2 (sq.inch)	72 (11.1)	128 (19.8)										

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3.2.1 Cooling Fans Power Supply

Sizes 3002 to 3060 — Power supply (+24VAC) for these fans is provided from the internal drive power supply unit.

Sizes 3100 to 3200 — Power supply for these fans are internally provided from the AC Input voltage:

- 3100: 0.8A@115V/60Hz, 0.45A@230V / 50Hz
- 3125... 3200 : 1.2A@115V/60Hz, 0.65A@230V/50Hz

Figure 3.2.1: UL type fans connections on 3125 to3200

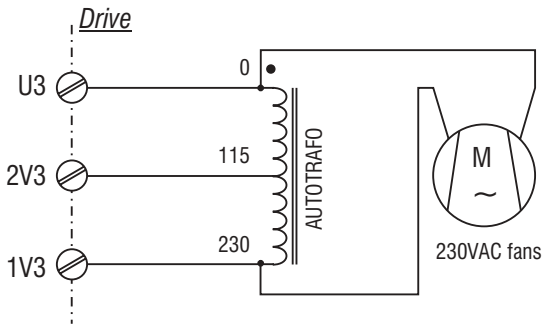


Figure 3.2.2: UL type fans connections on 3100

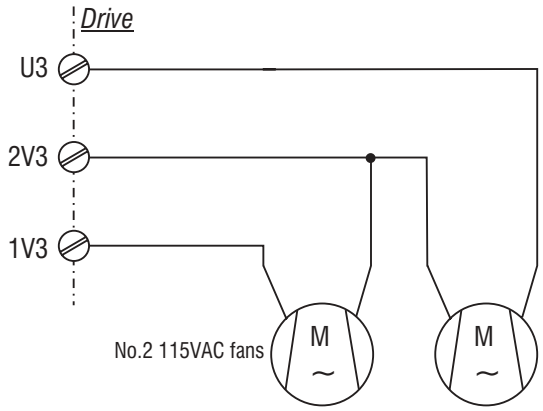
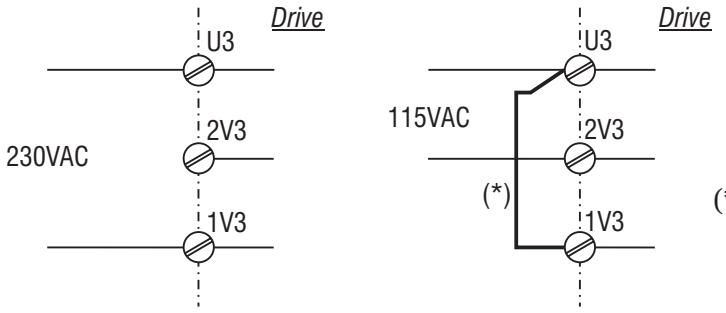


Figure 3.2.3: Example for external connection



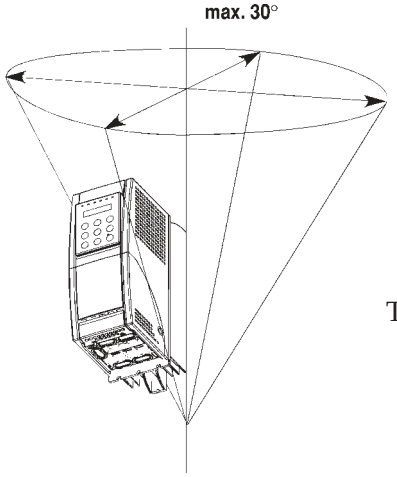
(*) Only for 3100 size

NOTE! - An internal fuse (2.5A 250VAC slo-blo) for3125 ... 3200 sizes is provided.

3.3. Installation Mounting Clearance

NOTE! The dimensions and weights specifed in this manual should be taken into consideration when the device is mounted. The technical equipment required (carriage or crane for large weights) should be used. Improper handling and the use of unsuitable tools may cause damage.

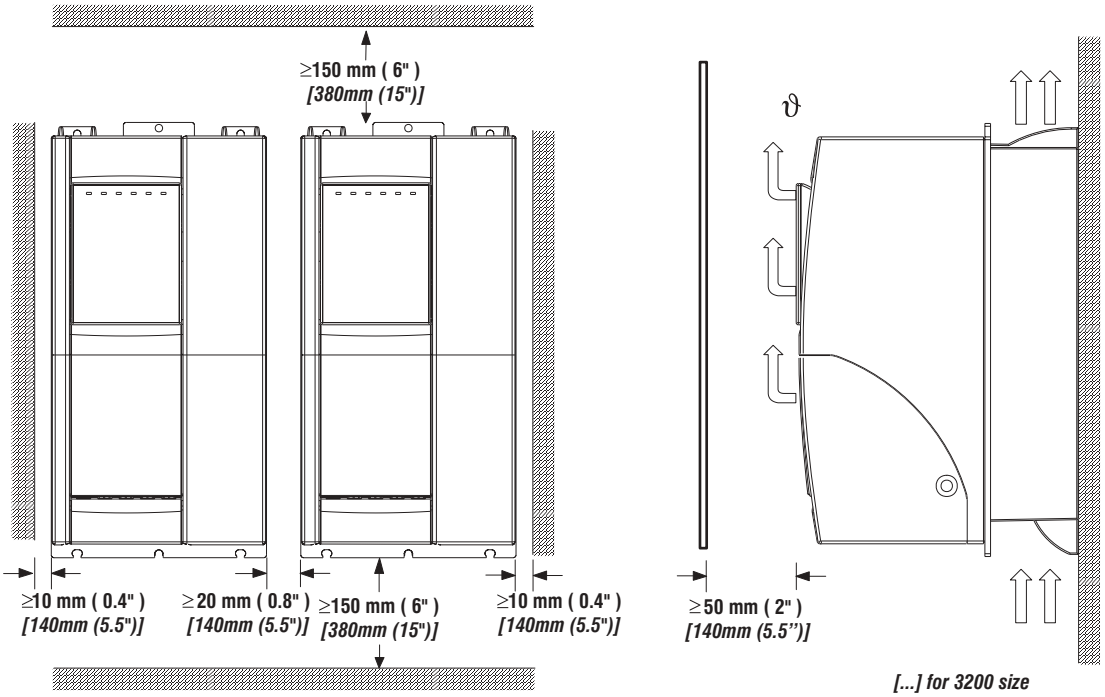
Figure 3.3.1: Max. angle of inclination



The maximum angle of inclination is 30°.

NOTE! The Drives must be mounted in such a way that the free flow of air is ensured. The clearance to the device must be at least 150 mm (6 inches). A space of at least 50 mm (2 inches) must be ensured at the front. On size 3200 the top and bottom clearance must be at least 380 mm (15 inches), on front and sides must be ensured a space of at least 140 mm (5.5 inches). Devices that generate a large amount of heat must not be mounted in the direct vicinity of the frequency inverter.

Figure 3.3.2: Mounting clearance



NOTE! Fastening screws should be re-tightened after a few days of operation.

3.4. Motors and Encoders

The AV-300i Drives designed for the field oriented regulation of standard three-phase induction AC motors. A sinusoidal encoder or digital encoder can be used for feedback in proportion to speed.

3.4.1. Motors

The electrical and mechanical data of standard three-phase motors refers to a particular operating range. The following points should be noted when these motors are connected to an AC Drive:

Is it possible to use standard induction motors?

With the AV-300i Drives it is possible to use standard induction motors. Some features of the motor have a great influence on the obtained performances. Notice also what is stated in section 2.4.2, "AC Output", about the voltages and the motor power.

Which properties of the asynchronous motors have an unfavorable result in operation with frequency inverters?

Motors with double squirrel-cage rotors or deep rotor bars should not be used.

Star or delta connection?

Motors can be connected in both star or delta connections. Experience has shown that star connected motors have better control properties, so star connections are preferred.

Cooling

The cooling of three-phase motors is normally implemented by means of a fan that is mounted on the motor shaft. Remember that the output of the fan is reduced when the motor is running at lower speeds, which in certain circumstances may mean that the cooling is insufficient for the motor. Check with the motor manufacturer whether an external fan is required and the motor speed range in the application concerned.

Operation above the rated speed

Due to the mechanical factors involved (bearings, unbalance of rotor) and due to the increased iron losses, consult the manufacturer of the motor if this is operated above the rated speed .

What motor data is required for connecting the frequency inverter?

Nameplate specifications

- Motor rated voltage
- Motor rated current
- Motor rated frequency
- Motor rated speed
- Power factor

The other data required for vector control is calculated inside the inverter. In order to optimize the drive operation it is also useful to know the values for :

- Magnetizing current
- Rotor resistance
- Stator resistance (Sensorless mode only)
- Leakage inductance (Field oriented mode with Rotor resistance adaptation enabled or Sensorless mode.).

Motor protection

Thermistors

PTC thermistors according to DIN 44081 or 44082 fitted in the motor can be connected directly to the frequency inverter via terminals 78 and 79. In this case the resistor (1Kohm) mounted between the terminals 78 and 79 has to be removed.

Temperature-dependent contacts in the motor winding

Temperature-dependent contacts “Klixon” type can disconnect the drive via the external control or can be reported as an external fault on the frequency inverter (terminal 15).They can also be connected to the terminals 78 and 79 in order to have a specific error signal. In this case connect the existing 1 Kohm resistor in series to the wiring, note that one side of it must be connected directly to terminal 79.

NOTE! The motor PTC interface circuit (or klixon) has to be considered and treated as a signal circuit. The connections cables to the motor PTC must be made of twisted pairs with a shield, the cable route should not be parallel to the motor cable or far away at least 20 cm.

Current limitation of the frequency inverter

The current limitation can protect the motor from impermissible overloads. For this the current limitation and the motor overload control function of the Drive (“Ovld mot ctrl”) must be set so that the current is kept within the permissible range for the motor concerned.

NOTE! Remember that the current limitation can control an overheating of the motor only due to overload, not due to insufficient ventilation. When the drive is operated at low speeds the additional use of PTC resistors or temperature-dependent contacts in the motor windings is recommended, unless separate forced ventilation is available.

Output chokes

When using general purpose standard motors, output chokes are recommended to protect winding isolation in some cases. See section 4.7.2, “ Output chokes”.

3.4.2. Encoders

One of four types of encoder may be connected to the XE connector (high density 15-pole socket, fitted on device), see the table 3.4.2.2 for the jumper settings

- **DE:** 5V digital incremental encoder with A / $\overline{A}$, B / $\overline{B}$, C / $\overline{C}$
- **SE**: 5V sinusoidal incremental encoder with A / $\overline{A}$, B / $\overline{B}$, C / $\overline{C}$
- **DEHS**: 5V digital incremental encoder with A / $\overline{A}$, B / $\overline{B}$, C / $\overline{C}$ and three Hall sensor digital position signals (for AC Brushless motors)
- **SESC**: 5V sinusoidal incremental encoder with A / $\overline{A}$, B / $\overline{B}$, C / $\overline{C}$ and and two sin/cos traces for absolute position (for AC Brushless motors or positioning)

Encoders are used to feed back a speed signal to the regulator. The encoder should be coupled to the motor shaft with a backlash free connection.

Optimal regulation results are ensured when using sinusoidal encoders. Digital encoders (rotary encoders) may also be used. See section 2.4.6, “Accuracy”.

The encoder cable can be made of twisted pairs with a global shield, which connect to ground on the Drive side. Avoid connecting the shield on the motor side. In particular cases where the cable length is more than 328 feet (100 meters), (high electromagnetic noise), it may useful to use a cable with a shield on each conductor pair, which can be connected to the common point (0V). The global shield must always be grounded. Some types of sinusoidal encoders may require installation with galvanic isolation from the motor frame and shaft.

Table 3.4.2.1: Recommended cable section and length for the connection of encoders

Cable section [mm^2]	0.22	0.5	0.75	1	1.5
Max Length feet [m]	88 [27]	203 [62]	305 [93]	410 [125]	492 [150]

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Table 3.4.2.2: Encoders setting via S11...S23 Jumpers

Encoder / Jumpers setting	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23
DE	OFF	OFF	OFF	OFF	OFF	OFF	ON (*)	-	-	-	-		
SE	ON	ON	ON	ON	ON	ON	-	-	-	-	-		
SESC	ON	ON	ON	ON	ON	ON	-	A	A	A	A	A	A
DEHS	OFF	OFF	OFF	OFF	OFF	OFF	ON (*)	B	B	B	B	B	B

ai3150

The jumper S17 selects the inhibition or the enabling of the channel C pulses reading. It has to be correctly selected in order to detect appropriately the encoder loss alarm.

S17 ON : channel C (index) reading=ON

S17 OFF: channel C (index) reading=OFF

(*) If the encoder is not provided of the zero channel : S17=OFF

Table 3.4.2.3: Encoders connections

Encoder type	Shielded cable	XE CONNECTOR PIN														
		1 **B-**	**2** **+8V**	**3** **C+**	**4** **C-**	**5** **A+**	**6** **A-**	**7** **0V**	**8** **B+**	**9** **+5V**	**10** **E+**	**11** **E-**	**12** **F+**	**13** **F-**	**14** **G+**	**15** **G-**
Internal +5V Encoder Power Supply																
DE	8 pole	●		●	●	●	●	●	●	●						
SE	8 pole	●		●	●	●	●	●	●	●						
SESC	12 pole	●		●	●	●	●	●	●	●	●	●	●	●		
DEHS	14 pole	●		●	●	●	●	●	●	●	●	●	●	●	●	●
SEHS	14 pole	●		●	●	●	●	●	●	●	●	●	●	●	●	●
Internal +8V Encoder Power Supply																
DE	8 pole	●	●	●	●	●	●	●	●							
SE	8 pole	●	●	●	●	●	●	●	●							
SESC	12 pole	●	●	●	●	●	●	●	●		●	●	●	●		
DEHS	14 pole	●	●	●	●	●	●	●	●		●	●	●	●	●	●
SEHS	14 pole	●	●	●	●	●	●	●	●		●	●	●	●	●	●

ai3160

Requirements:

Sinusoidal encoders (XE connector on Regulation card)

max. frequency	80 KHz (select the appropriate number of pulses depending on required max. speed)
Number of pulses per revolution	min 600, max 9999
Channels	two-channel, differential
Power supply	+ 5 V / +8 V (Internal supply) *
Load capacity	> 8.3 mA pp per channel

Digital encoders (XE connector on Regulation card)

max. frequency	150 KHz (select the appropriate number of pulses depending on required max. speed)
Number of pulses per revolution	min 600, max 9999
Channels	- two-channel, differential (A / $\overline{A}$, B / $\overline{B}$, C / $\overline{C}$). An encoder loss detection is possible via firmware setting. - two channel, (A,B). Encoder loss detection is not possible.
Power supply	+ 5 V / + 8 V (Internal supply) *
Load capacity	> 4.5 mA / 6.8 ... 10.9 mA per channel

* Via keypad ("CONFIGURATION/Motor spd fbk/ Enc 1 supply vlt" menu) it is possible to select 4 different values of internal encoder supply voltage to compensate the voltage reduction due to encoder cable length and load current encoder.

Selection available are:

- for + 5V encoder supply: 0=5.41V, 1=5.68V, 2=5.91V, 3=6.18V via **Enc 1 supply vlt** parameter.
- for + 8V encoder supply: leave standard default 0=5.41V.

Encoder power supply test (if the internal supply +5V is used)

During the start up of the drive:

- verify the encoder power supply to the encoders terminals with all the encoders channels connected
- via **Enc 1 supply vlt** parameter set the appropriate voltage if the encoder supply characteristic (example: +5V ± 5%) is out of range.

Terminals for external encoder connections

Male terminals type:	15 poles high density (VGA type)
Connector cover:	Standard 9 poles low profile (Example manufacturer code: AMP 0-748676-1, 3M 3357-6509)

Table 3.4.2.4: Assignment of the high density XE connector for a sinusoidal or a digital encoder

Designation	Function	I/O	max. voltage	max. current
PIN 1	Channel B- For B- digital or B- COS incremental signal	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 2	+8V Encoder supply voltage	O	+8 V	200 mA
PIN 3	Channel C+ For C+ digital or analog zero pulse or index	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 4	Channel C- For C- digital or analog zero pulse or index	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 5	Channel A+ For A+ digital or A+ SIN incremental signal	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 6	Channel A- For A+ digital or A+ SIN incremental signal	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 7	Reference point for +5V encoder supply voltage	O	–	–
PIN 8	Channel B+ For B+ digital or B+ COS incremental signal	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 9	+5V encoder supply voltage	O	+5 V	200 mA
PIN 10	Channel E+ For E+ digital commutation or SIN+ absolute position signal	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 11	Channel E- For E- digital commutation or SIN- absolute position signal	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 12	Channel F+ For F+ digital commutation or COS+ absolute position signal	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 13	Channel F- For F- digital commutation or COS- absolute position signal	I	5 V digital or 1 V pp analog	10 mA digital or 8.3 mA analog
PIN 14	Channel G+ For G+ digital commutation signal	I	5 V digital or 1 V pp analog	10 mA digital
PIN 15	Channel G- For G- digital commutation signal	I	5 V digital or 1 V pp analog	10 mA digital

ai3140

Chapter 4 - Wiring Procedure

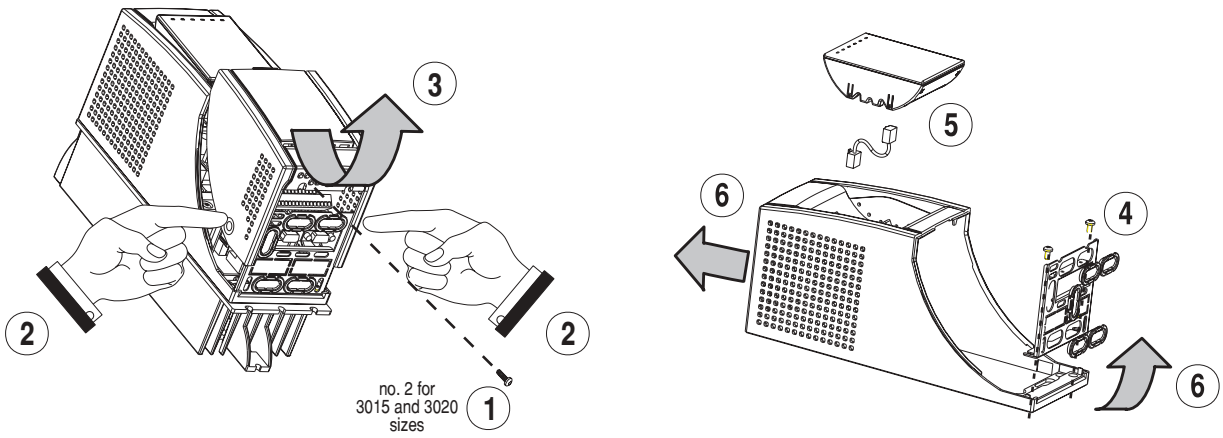
4.1. Accessing to the Connectors

4.1.1 Removing the Covers

NOTE! Observe the safety instructions and warnings given in this manual. The devices can be opened without the use of force. Only use the tools specified.

See figure 2.2.2 "Drive view & components" to identify the single part.

Figure 4.1.1: Removing the covers (sizes 3002 to 3020)



Sizes 3002 to 3005

The cover and cable entry plate of the device must be removed in order to fit the electrical connections:

- unscrew the screw (1), remove the cover of devices (2) by pressing on both sides as shown on the above figure (3).
- unscrew the two screws (4) to remove the cable entry plate.

The top cover must be removed in order to mount the option card and change the internal jumper settings:

- remove the keypad and disconnect the connector (5)
- lift the top cover on the bottom side (over the connector level) and then push it to the top (6).

Sizes 3007 to 3020

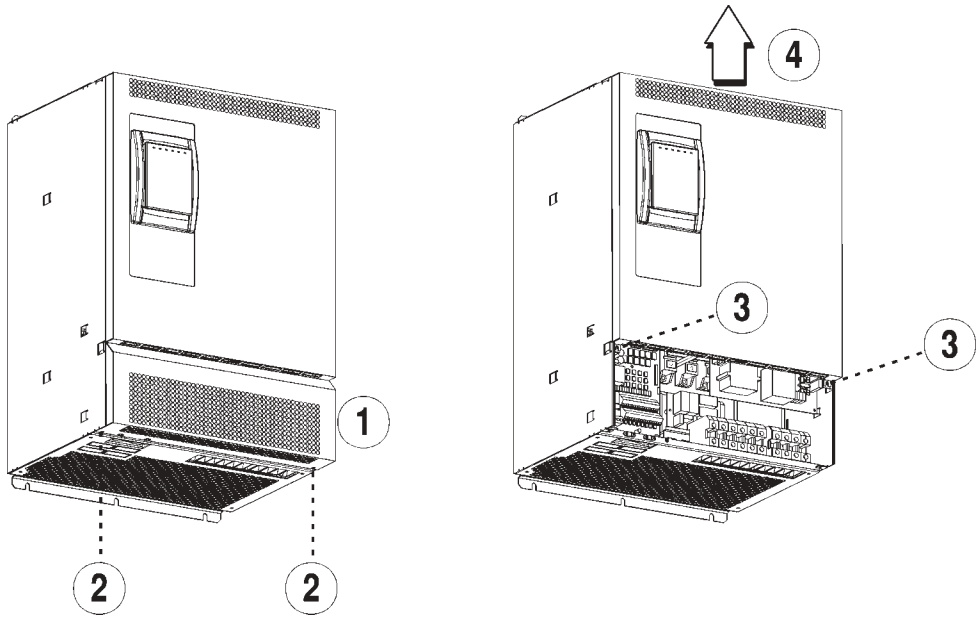
The cover and cable entry plate of the device must be removed in order to fit the electrical connections:

- unscrew the two screw (1) and remove the cover of devices
- unscrew the two screws (4) to remove the cable entry plate.

The top cover must be removed in order to mount the option card and change the internal jumper settings:

- remove the keypad and disconnect the connector (5)
- lift the top cover on the bottom side (over the connector level) and then push it to the top (6).

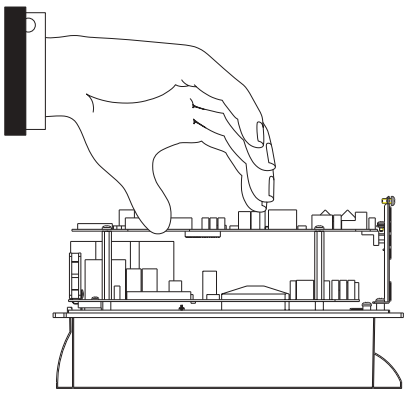
Figure 4.1.2: Removing the covers (sizes 3025 to 8200)



Sizes 3025 to 8200

The cover of the device must be removed in order to fit the electrical connections: unscrew the two screws (2) and remove the cover (1)

The top cover must be removed in order to mount the option card and change the internal jumper settings: unscrew the two screws (3) and remove the top cover by moving it as indicated on figure (4)



ATTENTION: In order to avoid damages of the device it is not allowed to transport it by handling on its cards!

4.2. Power Section

4.2.1. Terminal Assignment on Power Section / Cable Cross-Section

Table 4.2.1.1: Power section terminals from 2 Hp to 20 Hp

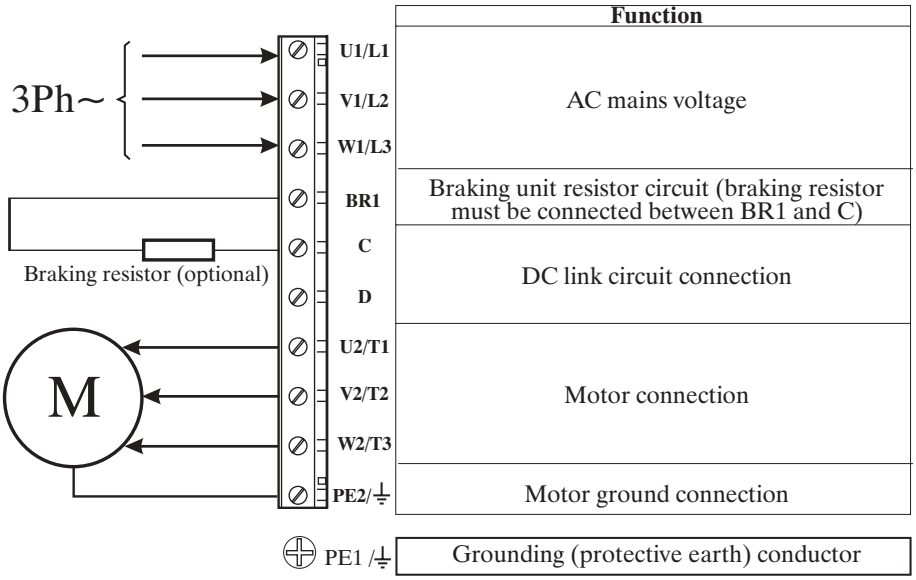
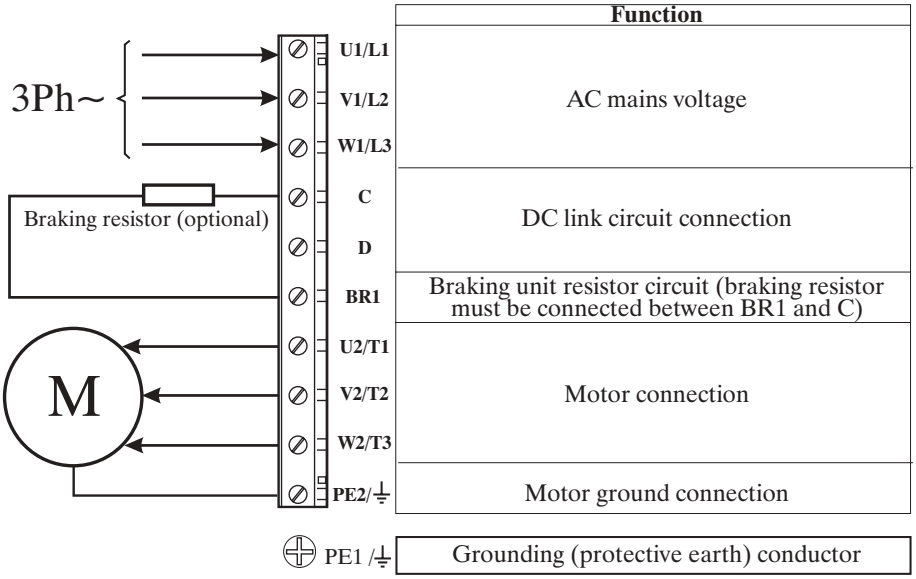


Table 4.2.1.2: Power section terminals from 25 Hp and higher



Power terminals lay-out

Sizes 3002 to 3020 The terminals of the devices are made accessible by removing the cover and the cable entry plate (see section 4.1, "Accessing to the connectors"), on some drive type it is also possible to extract the removable connector. All the power terminals are located on the power card PV33-.....

Sizes 3025 and higher: The terminals of the devices are made accessible by removing the cover (see section 4.1, "Accessing to the connectors").

Maximum Cable Sizes for power terminals U1, V1, W1, U2, V2, W2, C, D, PE

Table 4.2.1.3: Maximum cable cross section for power terminals

Type		3002	3003	3005	3007	3010	3015	3020	3025	3030
U1,V1,W1,U2,V2,W2,C,D terminals	AWG	14			10		8			
	[mm^2]	2			4		8			
Tightening torque	[Nm]	0.5 to 0.6			1.2 to 1.5				2	
BR1 terminals	AWG	14			10		8		10	
	[mm^2]	2			4		8		6	
Tightening torque	[Nm]	0.5 to 0.6			1.2 to 1.5				0.9	
PE1, PE2 terminals	AWG	14			10		8		6	
	[mm^2]	2			4		8		16	
Tightening torque	[Nm]	0.5 to 0.6			1.2 to 1.5				2	

Type		3040	3050	3060	3075	3100	3125	3150	3200
U1,V1,W1,U2,V2,W2,C,D terminals	AWG	6	4	2		1/0	2/0	4/0	350*
	[mm^2]	16	25	35		50	70	95	185
Tightening torque	[Nm]	2	4			4	12	12	10-30
BR1 terminals	AWG	10	6			6	terminals not available		
	[mm^2]	6	16			16			
Tightening torque	[Nm]	0.9	2			3			
PE1, PE2 terminals	AWG	6				2			
	[mm^2]	16				50			
Tightening torque	[Nm]	2				4			

*=kcmils

ai4040ge

CAUTION! The grounding conductor of the motor cable may conduct up to twice the value of the rated current if there is a ground fault at the output of the AV-300i Drive.

NOTE: Use 60°C / 75°C copper (CU) conductor only.

4.3 Regulation Section

4.3.1 RV33 Regulation Card

Figure 4.3.1.1: RV33-3 Regulation card switch & jumpers

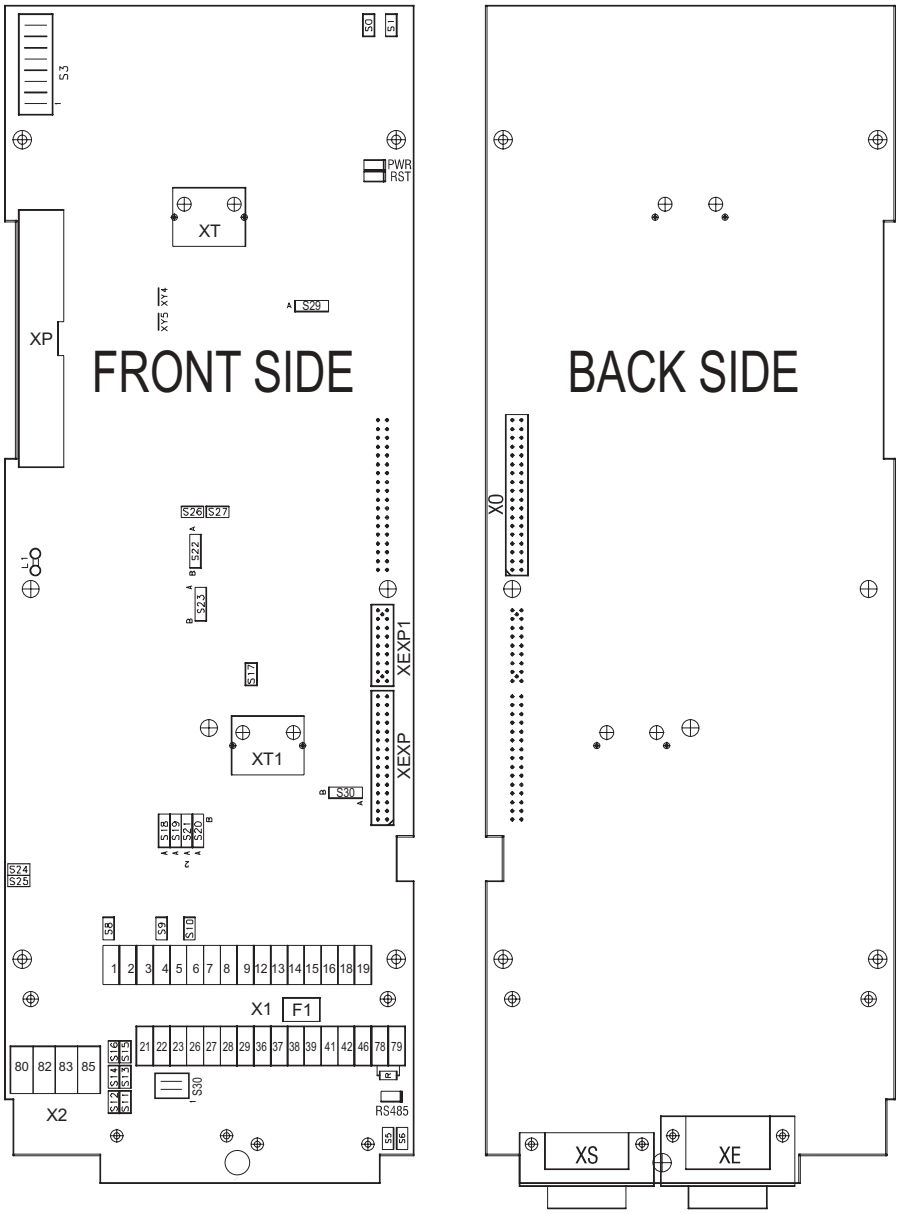


Table 4.3.1.1: LEDs on regulation card

Designation	Color	Function
RST	red	LED lit during the Hardware Reset
PWR	green	LED lit when the voltage +5V is present and at correct level
RS485	green	LED is lit when RS485 interface is supplied

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Table 4.3.1.2: Test points on regulation card

Designation	Function
XY4	Phase current signal (U) (see table 5.3.1.2.2)
XY5	Reference point

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Table 4.3.1.3: Jumpers on regulation card

Designation	Function	Factory setting
S0	The setting must not be changed	OFF
S1	The setting must not be changed	OFF
S5 - S6	Terminating resistor for the serial interface RS485 ON= Termination resistor IN OFF= No termination resistor	ON (*)
S8	Adaptation to the input signal of analog input 1 (terminals 1 and 2) ON=0...20 mA / 4...20 mA OFF=0...10V / -10...+10V	OFF
S9	Adaptation to the input signal of analog input 2 (terminals 3 and 4) ON=0...20 mA / 4...20 mA OFF=0...10V / -10...+10V	OFF
S10	Adaptation to the input signal of analog input 3 (terminals 5 and 6) ON=0...20 mA / 4...20 mA OFF=0...10V / -10...+10V	OFF
S11 - S12 - S13 S14 - S15 - S16	Encoder setting (jumpers on kit EAM_1618 supplied with the drive) ON=Sinusoidal SE or SESC encoder OFF=Digital DE or DEHS encoder	OFF
S17	Monitoring of the C-channel of the digital encoder ON=C-Channel monitored OFF=C-Channel not monitored (required for single-ended channels)	OFF
S18 - S19 S20 - S21	Encoder setting Pos. A=digital DEHS encoder Pos. B= sinusoidal SESC encoder	B
S22 - S23	Analog input 3 enabling (alternative with SESC encoder) Pos. A= if SESC encoder is used Pos. B=analog input 3 enabled	B
S24	Jumper to disconnect 0V (of 24V) from ground ON=0V connected to ground OFF=0V disconnected from ground	ON
S25	Jumper to disconnect 0V (regulation section) from ground ON=0V connected to ground OFF=0V disconnected from ground	ON
S26 - S27	Internal use	ON
S28	Encoder Internal power supply selection ON / ON = +5 V OFF / OFF = +8 V	ON/ON
S29	Internal use	A
S30	Second encoder qualifier input A=from EXP-… board B=from digital input "6" on RV33-3	B

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(*) on multidrop connection the jumper must be ON only for the last drop of a serial line

Table 4.3.1.4: Regulation Card Switch S3 Settings

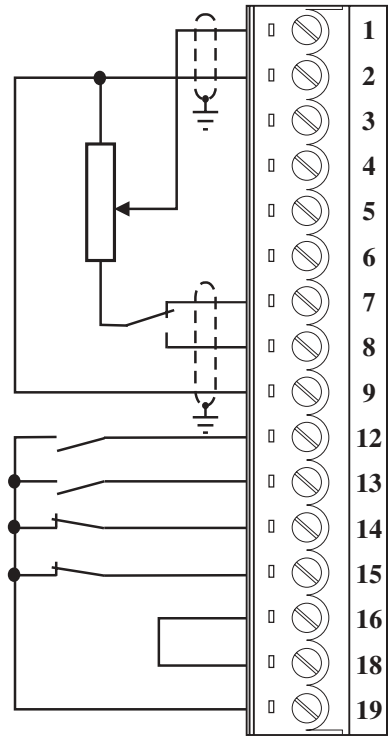
Type	3002	3003	3005	3007	3010	3015	3020	3025	3030	3040	3050	3060	3075	3100	3125	3150	3200
S1	ON	OFF	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	OFF	ON	
S2	ON	OFF	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF	ON	ON	OFF	OFF	
S3	OFF	OFF	ON	OFF	OFF	OFF	ON	ON	ON	ON	OFF	OFF	OFF	OFF	ON	ON	
S4	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	ON	ON	ON	ON	ON	ON	
S5	ON	OFF	ON	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
S6	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
S7	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	
S8	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	OFF	

ai4080-575

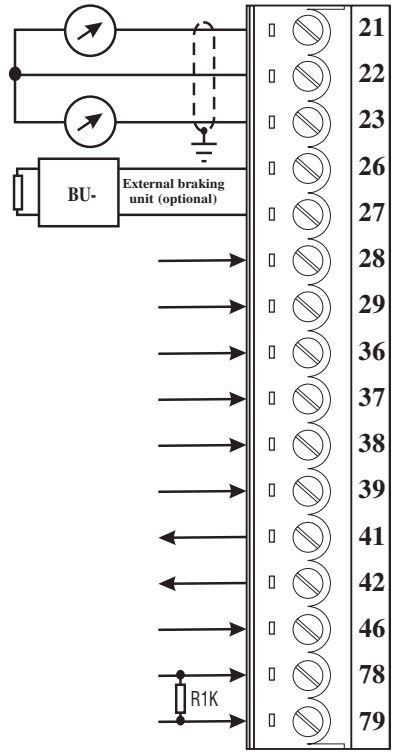
The devices are factory set accordingly.When fitting a regulation card as a spare, remember to set dip-switch S3 accordingly.

4.3.2. Terminal Assignments on Regulation Section

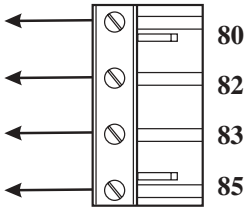
Table 4.3.2.1: Plug-in Terminal Strip Assignments



Strip X1	Function	max
Analog input 1	Programmable/configurable analog differential input. Signal: terminal 1. Reference point: terminal 2. Default setting: Ramp ref 1	±10V 0.25mA (20mA when current ref input)
Analog input 2	Programmable/configurable analog differential input. Signal: terminal 3. Reference point: terminal 4. Default setting: none	
Analog input 3	Programmable/configurable analog differential input. Signal: terminal 5. Reference point: terminal 6. Default setting: none.	
+10V	Reference voltage +10V; Reference point: terminal 9	+10V/10mA
-10V	Reference voltage -10V; Reference point: terminal 9	-10V/10mA
0V	Internal 0V and reference point for±10V	-
Enable drive	Drive enable; 0V or open: inverter disabled; +15…+30V: Drive enabled	+30V
Start	Drive start command; 0V or open: No start; +15…+30V: Start	3.2mA @ 15V
Fast stop	OV or open: Fast stop. +15…+30V: No Fast stop.	5mA @ 24V
External fault	OV or open: External fault. +15…+30V: No External fault	6.4mA @ 30V
COM D I/O	Reference point for digital inputs and outputs, term.12...15, 36...39, 41...42	-
0 V 24	Reference point for + 24V OUT supply, terminal 19	-
+24V OUT	+24V supply output. Reference point: terminal 18 or 27 or 28	+22…28V 120mA @ 24V



Analog output 1	Program.analog output; def.setting: Motor speed. Ref. point: term.22	±10V/5mA
0V	Internal 0V and reference point for terminals 21 and 23	-
Analog output 2	Program.analog output; def.setting: Motor current. Ref. point: term.22	±10V/5mA
BU comm. output	VeCon controlled BU-... braking units command. Ref. point: term.27.	+28V/15mA
0 V 24	Reference point for BU-... command, terminal 26	-
RESERVED		
RESERVED		
Digital input 1	Programmable digital input; default setting: none	+30V 3.2mA @ 15V 5mA @ 24V 6.4mA @ 30V
Digital input 2		
Digital input 3	Progr. digital input; def. setting: none. Configurable as 2nd encoder index qualifier (setting via S30 jumper, "Digital input 3" parameter must be set 0=OFF)	
Digital input 4	Programmable digital input; default setting: none. Configurable as 1st encoder index qualifier ("Digital input 4" parameter must be set 0=OFF).	
Digital output 1	Programmable digital output; default setting: none	+30V/40mA
Digital output 2		
Supply D O	Supply input for digital outputs on terminals 41/42. Ref. point: term.16.	+30V/80mA
Motor PTC	Motor PTC sensing for overtemperature (cutoff R1k if used)	1.5mA



Strip X2	Function	max curr.
OK relay contact	Potential- relay contact OK relay (closed=OK)	250V AC 1 A, AC11
Relay 2 contact	Potential-relay contact configurable (relay 2). Default: open 0 drive stopped	250V AC 1 A, AC11

Maximum Cable Sizes for control terminals

Table 4.3.2.2: Maximum permissible cable cross-section on the plug-in terminals of the regulator section

Terminals	Maximum Permissible Cable Cross-Section			Tightening torque [Nm]
	[mm^2]		AWG	
	flexible	multi-core		
1 ... 79	0.14 ... 1.5	0.14 ... 1.5	28 ... 16	0.4
80 ... 85	0.14 ... 1.5	0.14 ... 1.5	28 ... 16	0.4

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The use of a 75 x 2.5 x 0.4 mm (3 x 0.1 x 0.02 inch) flat screwdriver is recommended. Remove 6.5 mm (0.26 inch) of the insulation at the cable ends. Only one unprepared wire (without ferrule) should be connected to each terminal point.

Maximum Cable Length

Table 4.3.2.3: Maximum Control Cable Lengths

Cable section [mm^2]	0.22	0.5	0.75	1	1.5
Max Length feet [m]	88 [27]	203 [62]	305 [93]	410 [125]	492 [150]

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Potentials of the control section

The potentials of the regulation section (refer to 24V and ±10V) are isolated and can be disconnected via jumpers from ground. The connections between each potential are shown in Figure 4.3.1.2.

The digital inputs are designed as differential amplifiers.

The digital inputs are optocoupled with the control circuit. The digital inputs (terminals 12 to 15 and 36 to 39) and digital outputs have terminal 16 as a common reference point.

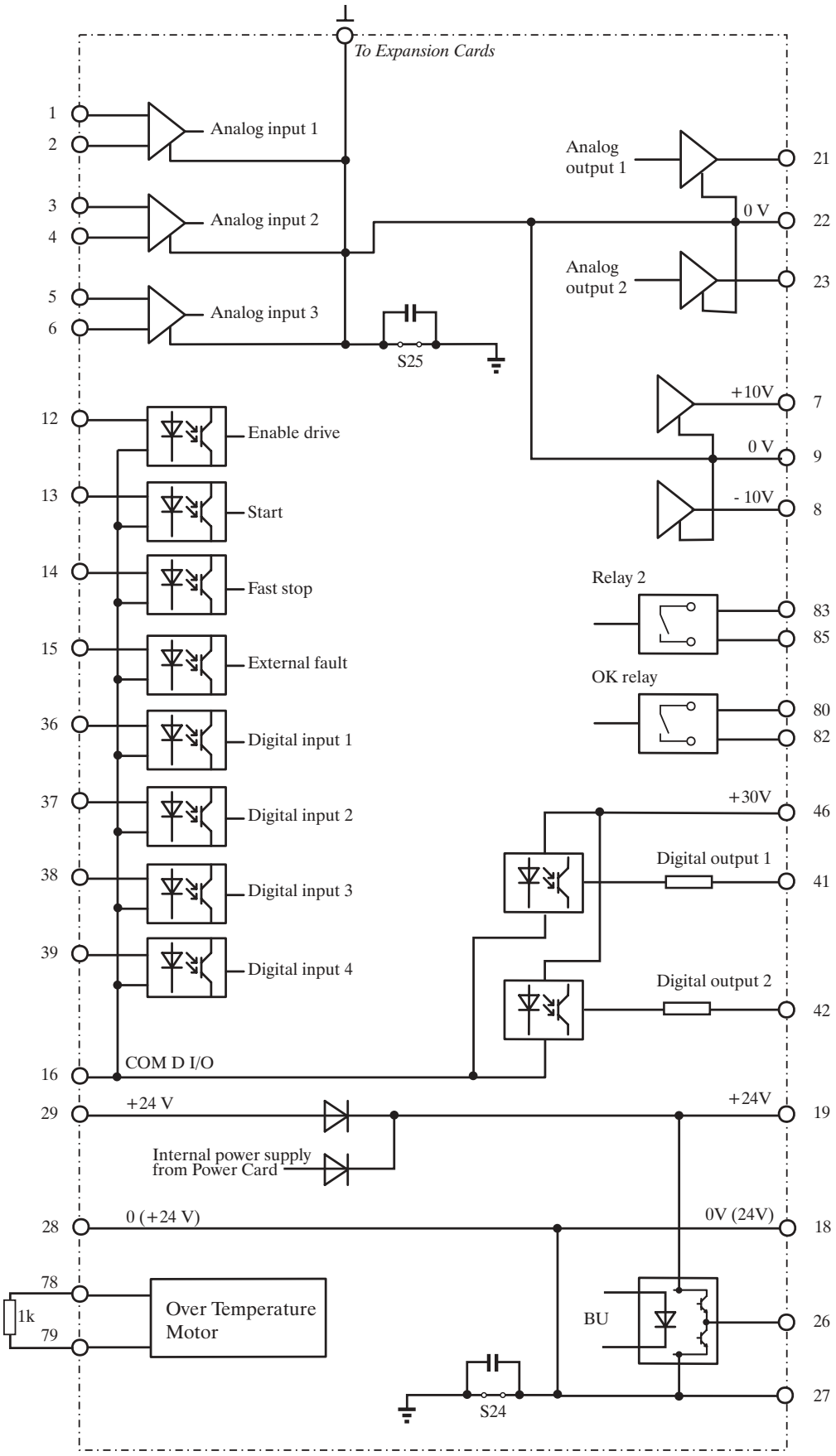
The analog outputs are designed as not differential amplifiers and have common reference point (terminal 22). The analog outputs and the ±10V reference point have same potential (terminal 22 and 9).

The digital outputs are optocoupled with the control circuit. The terminals 41 to 42 have terminal 16 as a common reference point and terminal 46 as common supply.

It is recommended, in order to reduce the interferences on the input/output signals, to not remove the jumpers ground connection S24 and S25.

The brake unit command has reference point (terminal 27) connected to reference point +24V (terminal 18).

Figure 4.3.1.2: Potentials of the control section



4.4. Serial Interface

4.4.1. Serial Interface Description

The RS 485 serial interface enables data transfer via a loop made of two symmetrical, twisted conductors with a common shield. The maximum transmission distance is 1200 m (3936 feet) with a transfer rate of 9.6 KBaud. The transmission is carried out via a differential signal. RS 485 interfaces are bus-compatible in half-duplex mode, i.e. sending and receiving take place in sequence. Up to 31 AV-300i devices (up to 128 address selectable) can be networked together via the RS 485 interface. Address setting is carried out via the **Device address** parameter. Further information concerning the parameters to be transfered, their type and value range is given in the table contained in section 10, “Parameter lists”.

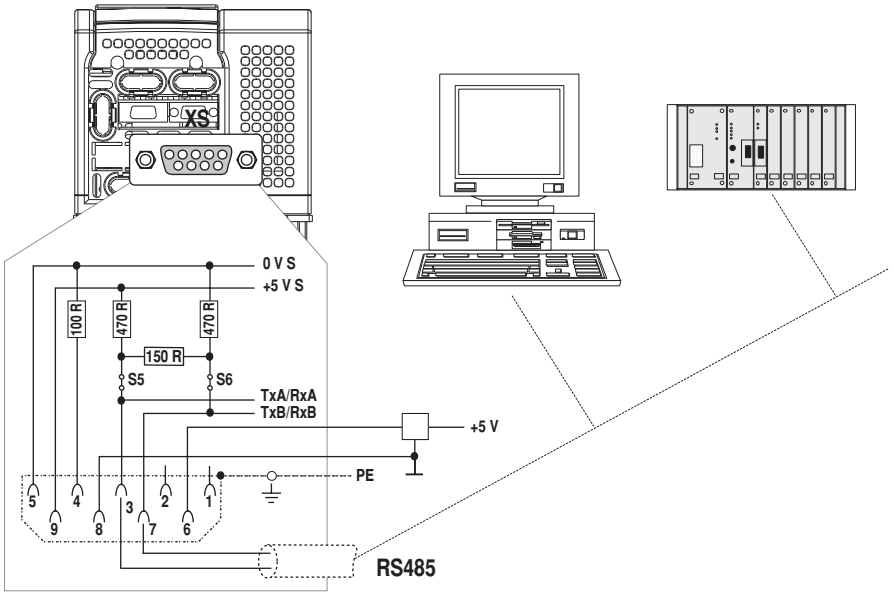


Figure 4.4.1.1: RS485 Serial Interface

The RS 485 on the AV-300i series devices is located on the Regulation card in the form of a 9-pole SUB-D socket connector (XS).The communication may be with or without galvanic isolation: by using galvanic isolation an external power supply is necessary (+5V). Communication without galvanic isolation are suggested only in case of temporary connection of one drive connected. The differential signal is transferred via PIN 3 (TxA/RxA) and PIN 7 (TxB/RxB). Bus terminating resistors must be connected at the physical beginning and end of an RS 485 bus in order to prevent signal reflexion. The bus terminating resistors on AV-300i series devices are connected via jumpers S5 and S6. This enables a direct point-to-point connection with a PLC or PC.

NOTE! Ensure that only the first and last drop of an RS 485 bus have a bus terminating resistor (S5 and S6 mounted). In all other cases (within the line) jumpers S5 and S6 must not be mounted.

A connection point to point can be done using “CTI” option interface , without jumper setting.

Multidrop connection (two or more drive) having an external power supply is necessary (pin 5 / 0V and pin 9 / +5V). Pins 6 and 8 are reserved for use with the “PCI-485” interface card.

When connecting the serial interface ensure that:

- only shielded cables are used
- power cables and control cables for contactors/relays are routed separately

NOTE! See the manual “SLINK3 Communication protocol” for more detail.

4.4.2. RS 485 Serial Interface Connector Description

Table 4.4.2.1: Assignment of the plug XS connector for the RS 485 serial interface

Designation	Function	I/O	Elec. Interface
PIN 1	Internal use	–	–
PIN 2	Internal use	–	–
PIN 3	RxA/TxA	I/O	RS485
PIN 4	Internal use	–	–
PIN 5	0V (Ground for 5 V)	–	Power supply
PIN 6	Internal use	–	–
PIN 7	RxB/TxB	I/O	RS 485
PIN 8	Internal use	–	–
PIN 9	+5 V	–	Power supply

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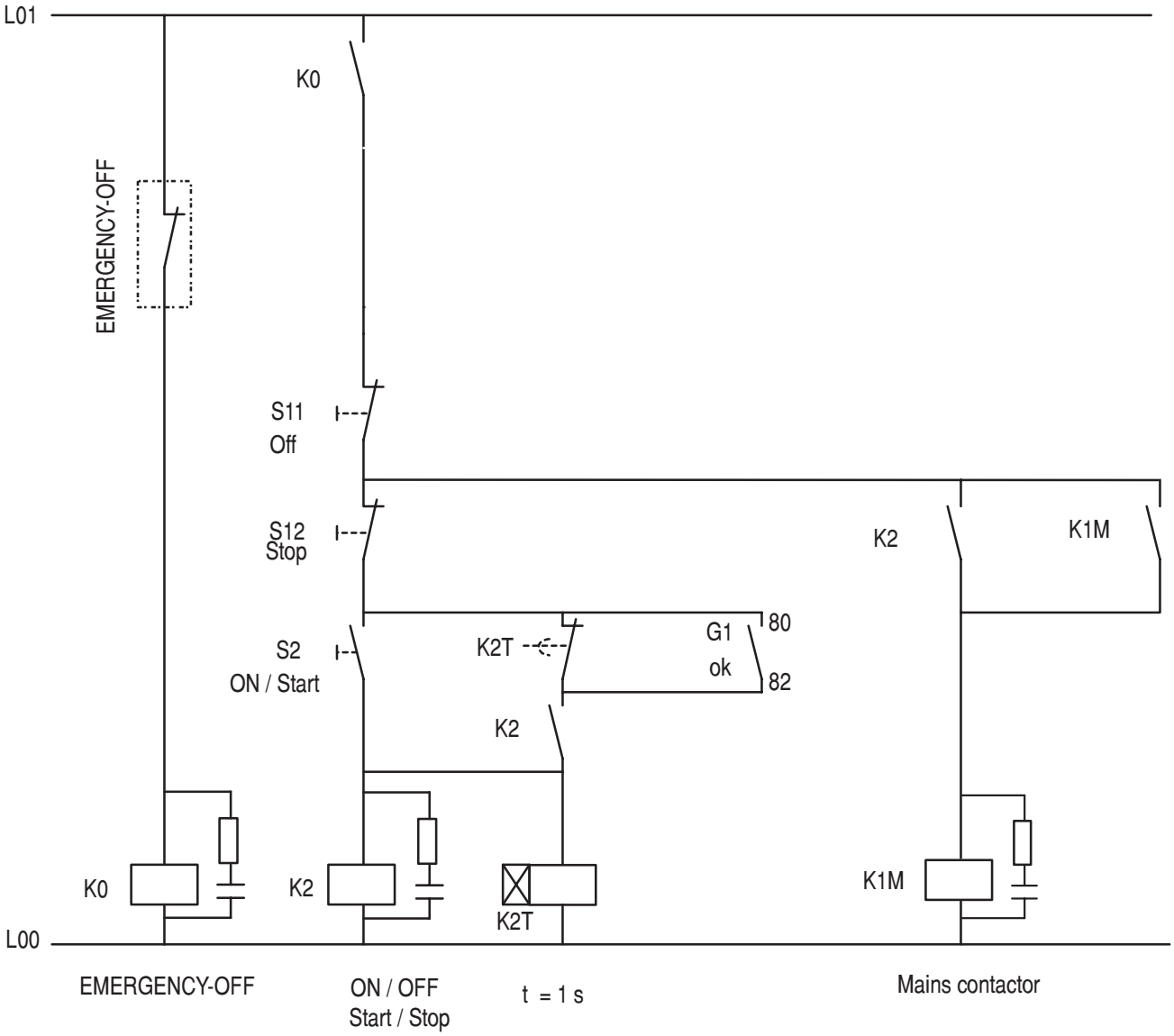
I = Input O = Output

4.5. Standard Connection Diagram

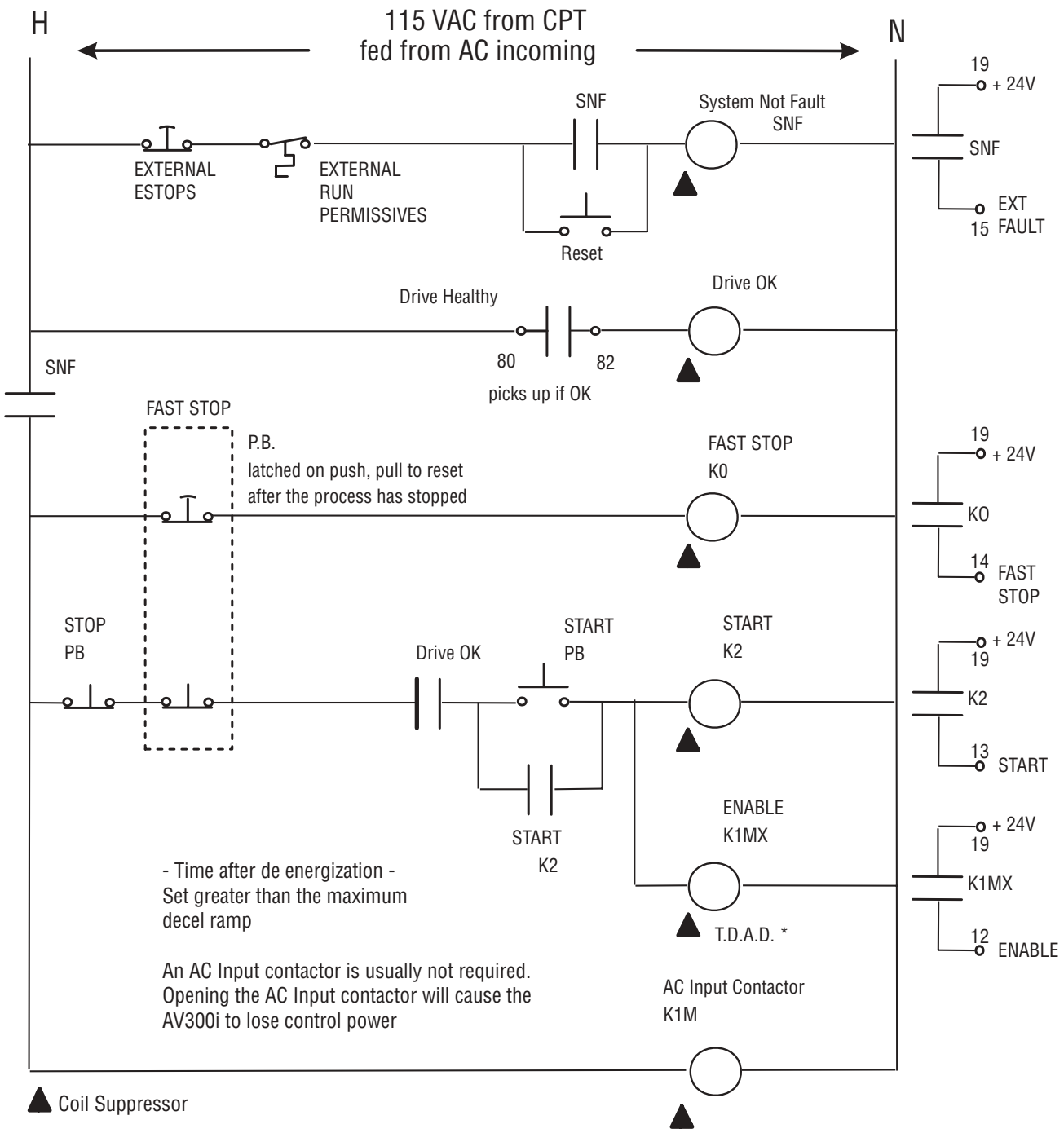
4.5.1. AV-300 Connections

Figure 4.5.1.1: Control sequencing



Note: OK relay must be configured as “Drive healty” for this circuit (Factory configuration)

Figure 4.5.1.2: Example for relay interface



NOTE!

1 - ENABLE must remained energized during a normal STOP or FAST STOP for the AV-300i to decel on a ramp.

ENABLE may be de energized after zero speed is achieved.

2 - ENABLE must be de energized to power up and to reset a fault or alarm.

3 - If the external fault input, or fast stop input, is unused, the unused input must be tied to +24V (terminal 19).

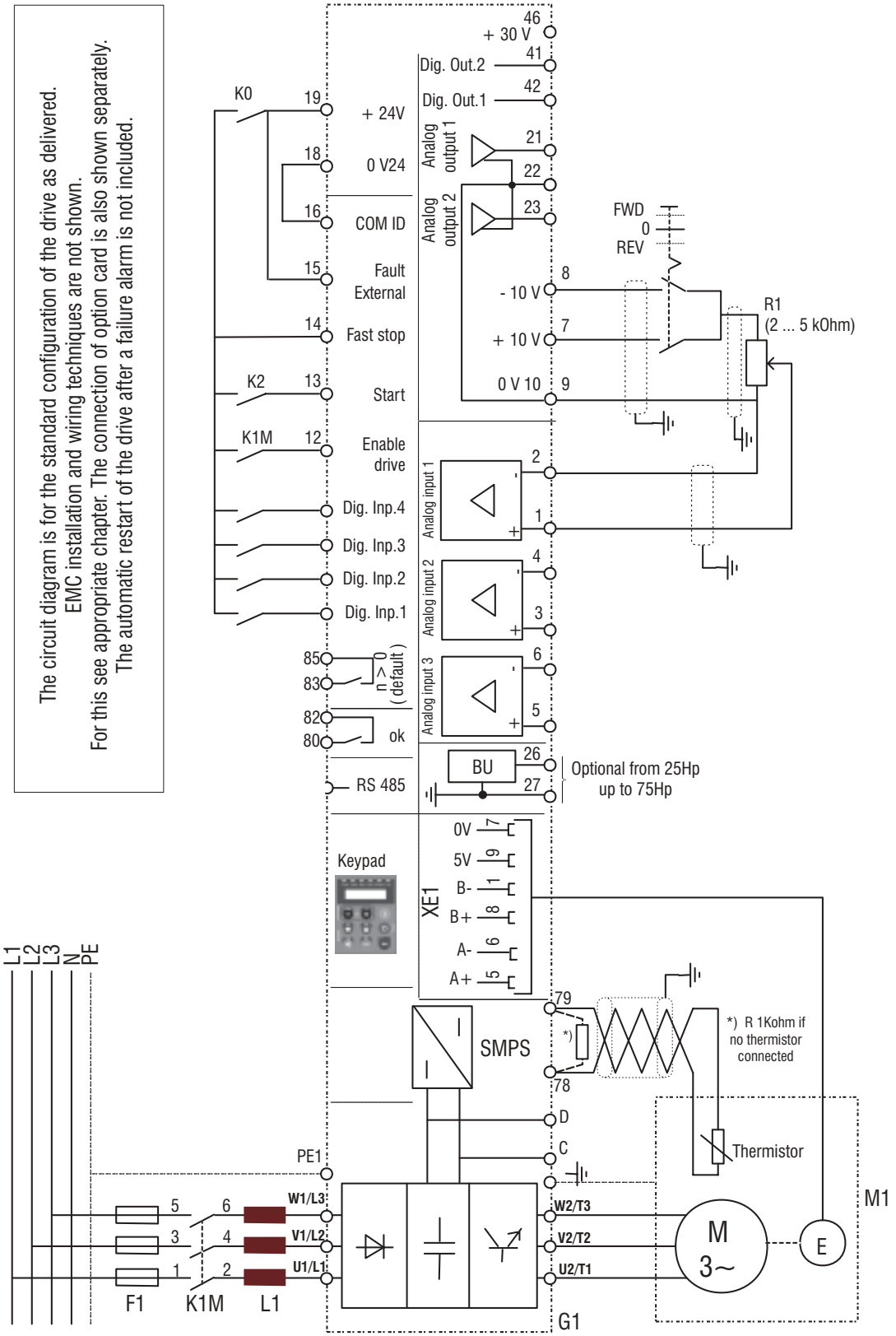
4 - EXTERNAL FAULT input, FAST STOP input, START input and ENABLE input need picked up during LAN operation.

Opening the input will cause labeled drive reaction.

* - T.D.A.D. = Time Delay After De energization

NOTE! The connection diagram reported in the picture 4.5.1.1 (Control sequencing) is valid only when the configuration of the sequency alarm **Enable seq err** is set as **Ignore**.

Figure 4.5.1.3: Typical connection



4.5.2. Parallel Connection on the AC (Input) and DC (Intermediate Circuit) Side of Several Inverters

Features and Limits:

1 The inverters used have to be all the same size.

2 AC line chokes (see chapter 4.7.1) have to be the same (provided by the same supplier).

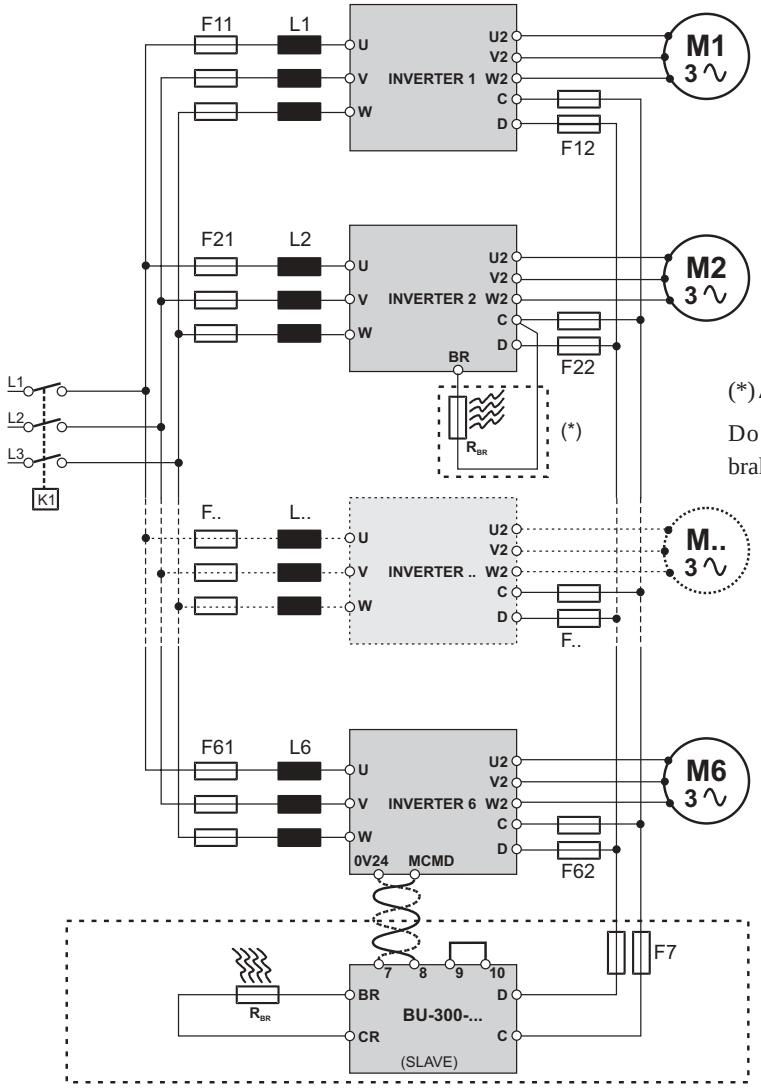
3 The mains power supply has to be simultaneous for all inverters, i.e. a single switch /line contactor has to be used.

4 Such connection is suitable for a maximum of 6 inverters.

5 If necessary dissipate braking energy; a single internal braking unit (with external resistor) has to be used **or** one (or several) external braking unit ("BU300-..") configured with the inverter or a BU as master (all the other connected BUs are configured as slaves).

6 Fast fuses (F12...F62) have to be fitted on the dc-link side (C and D terminals) of each inverters (see chapter 4.6.3).

Figure 4.5.2.1: Parallel Connection on the AC and DC Side of Several Inverters



(*) ***ATTENTION!***

Do not connect if external braking unit are used.

4.6. Circuit Protection

4.6.1. External fuses of the power section

The inverter must be fused on the AC Input side. Fuses, circuit breakers and slow protective switches can be used. Superfast semiconductor fuses provide a greater degree of protection.

NOTE! If the terminals of the DC Link circuit (C and D) are connected with external devices, semiconductor fuses must always be fitted on the input side. This, for example, is the case with:

- connected external braking units (BU...)
- coupled DC Link circuits of several inverters
- connected external capacitors

For sizes 3002 ... 3020, connections with three-phase inductance on AC input will improve the DC link capacitors life time. For sizes 3025 and higher, DC choke is mounted inside as standard

Table 4.6.1.1: External Fuse Types for AC input side

F1 - Fuses type (Connections with and/or without three-phase reactor on AC input)				
Drive type	**DC link capacitors life time [h]**	**Europe**	**USA**	
3002	25000 (*)	GRD2/10 or Z14GR10	A70P10	FWP10A14F
3003	25000 (*)			
3005	25000 (*)	GRD2-16	A70P15	FWP15
3007	25000 (*)	GRD2/25 or Z14GR25	A70P25	FWP25
3010	25000 (*)	Z14GR32	A70P30-1	FWP30A14F
3015	25000 (*)	GRD3/50 o Z22GR54	A70P40	FWP40
3020	25000 (*)	GRD3/50 or Z22GR50	A70P50	FWP50
3025	50000			
3030	50000			
3040	50000	Z22GR63	A70P60-4	FWP60B
3050	50000	S00C+üf1/80/80A/660V or Z22gR80	A70P80	FWP80
3060	50000	S00C+üf1/80/100A/660V or M00üf01/100A/660V	A70P100	FWP100
3075	50000	S00C+üf1/80/125A/660V or M00üf01/125A/660V	A70P125	FWP125
3100	50000	S00C+üf1/80/160A/660V or M00üf01/160A/660V	A70P150	
3125	50000	S1üf1/110/250A/660V or M1üf1/250A/660V	A70P200	FWP200
3150	50000	S1üf1/110/250A/660V or M1üf1/250A/660V	A70P250	FWP250
3200	50000	S2üf1/110/400A/660V or M2üf1/400A/660V	A70P400	FWP400

ai4120ge

(*) : 50000 h with external choke.

Fuse manufacturers:	Type GRD2... (E27), GRD3... (E33), Z14... 14 x 51 mm, Z22... 22 x 58 mm	Jean Müller, Eltville
	A70P...	Gould Shawmut
	FWP...	Bussmann

NOTE! The technical data of the fuses, e.g. dimensions, weights, heat dissipation, auxiliary contactors, are reported in the corresponding data sheets.

4.6.2. AC Input Contactors

Table 4.6.2.1: K1M - AC Input Contactors

AV-300i P/N	HP	Class 2 output current 575VAC input current (A)	AC contactor type*
3002	2	3.4	CL00A310TJ
3003	3	4.1	CL00A310TJ
3005	5	6.3	CL01A310TJ
3007	7	9.8	CL02A310TJ
3010	10	12.5	CL02A310TJ
3015	15	16.9	CL02A310TJ
3020	20	21.9	CL25A310TJ
3025	25	27	CL04A310MJ
3030	30	33	CL06A311MJ
3040	40	42	CL06A311MJ
3050	50	53	CL07A311MJ
3060	60	63	CL08A311MJ
3075	75	78	CL09A311MJ
3100	100	99	CL09A311MJ
3125	125	124	CL09A311MJ
3150	150	143	CK75CE311MJ
3200	200	191	CK08CE311MJ

Dai462ge

* GE C2000 series contactors. Contactors selected for use on the AC input side, AC1 duty, 200% for 1/2 sec, 150% for 1 minute, with 115 vac coil.

* P/Ns are listed for GE ED&C C2000 series mini contactors and IEC contactors with the following options: 3 N.O main poles, FVNR, 110/115 VAC 50/60 Hz coil, screw type terminals, and 1 N.O. auxilary contact, coil suppressor is recommended.

For alternate coil voltages, detailed ordering information, and other contactor options refer to GEP 1260, mini contactors: GEH 5475, GEH 5931, and GEH 5932 IEC contactors: GEH 6223.

Contactors picked using AC-1 rating @ 1 minute short time rating (10 min time recovery).

NOTE! The technical data of the contactors, e.g. dimensions, weights, heat dissipation, auxiliary contactors, are given in the appropriate data sheets.

4.6.3. External Fuses of the Power Section DC Input Side

Use the following fuses when a RS-300 Line Regen converter is used (see RS-300 instruction book for other details).

Table 4.6.3.1: External fuses type for DC input side

Drive type	Fuses type		
	Europe	USA	
3002		A100P15	
3003		A100P15	
3005		A100P20	
3007		A100P30	
3010		A100P35	FWJ35
3015		A100P50	FWJ50
3020		A100P60	FWJ60
3025		A100P60	FWJ60
3030		A100P70	FWJ70
3040		A100P80	FWJ80
3050		A100P100	FWJ100
3060		A100P125	FWJ125
3075		A100P150	FWJ150
3100		A100P200	FWJ200
3125		A100P250	FWJ250
3150		A100P250	FWJ250
3200		A100P400	FWJ400

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Fuse manufacturers: A100P...= Gould Shawmut
FW .. = Bussmann

NOTE! The technical data of the fuses, e.g. dimensions, weights, heat dissipation, auxiliary contactors, are reported in the corresponding data sheets.

4.6.4. Internal Fuses

Table 4.6.4.1: Internal fuses

Drive type	Designation	Protection of	Fuse (source)	Fitted on:
3025 to 3075	F1	+24V	2A fast 5 x 20 mm (Bussmann: SF523220 or Schurter: FSF0034.1519 or Littlefuse: 217002)	Power card PV33-4N
3002 to 8200	F1	+24V	Resettable fuse	Regulation card RV33-1 rev.C and higher
3125 to 3200	F3	Fans transformer	2.5A 6.3x32 (Bussmann: MDL 2.5, Gould Shawmut: GDL1-1/2, Siba: 70 059 76.2,5 , Schurter: 0034.5233)	Bottom cover (power terminals side)

ai4145ge

4.7. Chokes / Filters

NOTE! A three-phase inductance should be connected on the AC Input side in order to limit the input RMS current of AV-300i series Drives. The inductance can be provided by an AC Input choke or an AC Input transformer.

4.7.1. AC Input Chokes

Table 4.7.1.1: 3-Phase AC Input Chokes

Drive type	Three-phase Mains choke				
	Mains Inductance [mH]	Rated current [A]	Saturation current [A]	Frequency [Hz]	Model number *
3002	4.5	4.2	8.4	50/60	37G00403
3003	3.8	5.2	10.4	50/60	37G00403
3005	2.3	8.1	16.2	50/60	37G00803
3007	1.5	12.9	25.8	50/60	37G00802
3010	1.2	16.5	33.0	50/60	37G01202
3015	0.9	21.8	43.6	50/60	37G01802
3020	0.7	28.5	57	50/60	37G02502

ai4150

* GE Transmission, Distribution, & Industrial Systems

For all the sizes the input choke is strongly reccomended in order to:

- prolong the life time of the DC link capacitors and the reliability of the input rectifier.
- reduce the AC mains harmonic distortion
- reduce the problems due to a low impedence AC mains (≤ 1%).

NOTE! The current rating of these inductances (reactors) is based on nominal current of standard motors, listed in table 2.4.3.1 in section 2.4.4, “AC Output”. Model number are from TransCoil.Inc (TCI)

NOTE! The 3025 … 3200 sizes, integrate as standard the input choke on intermediate circuit (DC-Link). With this configuration the three phase input choke it is NOT required.

4.7.2. Output Chokes

The AV-300i Drive can be used with general purpose standard motors or with motors specially designed for Drive use. The latter usually have a higher isolation rating to better withstand PWM voltage.

Follow example of reference regulation

Low voltage general purpose standard motors

VDE 0530:	max peak voltage	1kV	max. dV/dt	500 V/us
NEMA MG1 part 30:	max. peak voltage	1 kV	min. rise time	2 us

Low voltage motors for use on inverters

NEMA MG1 part 31:	max. peak voltage	1.6 kV	min. rise time	0.1 us.

Motors designed for use with Adjustable Frequency Drives do not require any specific filtering of the voltage waveform from the Drive.

For general purpose motors, especially with long cable runs (typically over 328 feet [100 m]) an output choke is recommended to mantain the voltage waveform within the specified limits. Suggested choke ratings and part numbers are listed in table 4.7.2.1.

The rated current of the filters should be approx. 20% above the rated current of the frequency Drive in order to take into account additional losses due to PWM waveform.

Table 4.7.2.1: Recommended values for output chokes

Drive type (@575 VAC)	Three-phase output choke			
	Rated Inductance [mH]	Rated Current [A]	Saturation Current [A]	Model* number
3002	3	4.5	8.5	37G00404
3003	3	4.5	8.5	37G00404
3005	1.9	7	13	37G00804
3007	1	13.8	25.3	37G00803
3010	1	13.8	25.3	37G01203
3015	0.64	24.2	44.3	37G01803
3020	0.64	24.2	44.3	37G02503
3025	0.51	30	54.9	37G02503
3030	0.43	36	65.9	37G03503
3040	0.34	46	84.2	37G04503
3050	0.27	58	106.1	37G05503
3060	0.22	69	126.3	37G08003
3075	0.18	86	157.4	37G08003
3100	0.14	109	200	37G10003
3125	0.11	158	290	37G13003
3150	0.11	158	290	37G16003
3200	0.070	220	403	37G20003

ai4135

* GE Transmission, Distribution, & Industrial Systems

NOTE! When the Drive is operated at the rated current and at 50 Hz, the output chokes cause a voltage drop of approx. 2% of the output voltage. Model number are from TransCoil.Inc (TCI)

Chokes capable of 200% for 3 minutes.

4.7.3. Interference Suppression Filters

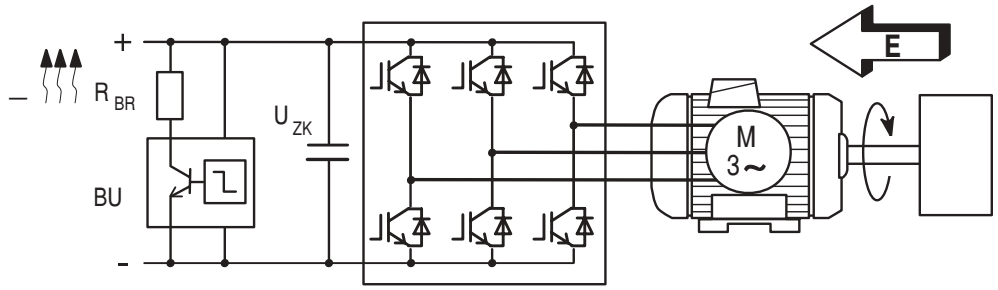
The inverters of AV-300i series must be equipped with an external EMI filter in order to reduce the radiofrequency emissions on the mains line. The filter selection is depending on the drive size and the installation environment. For this purpose see the “EMC Guidelines” instruction book.

In the Guide it is also indicated how to install the cabinet (connection of filter and mains reactors, cable shield, groundig, etc.) in order to make it EMC compliant according the EMC Directive 89/336/EEC.

4.8. Braking Units

In oversynchronous or regenerative operation, the frequency-controlled three-phase motor feeds energy back to the DC link circuit via the Drive. This leads to an increase in the intermediate circuit voltage. Braking units (BU) are therefore used in order to prevent the DC voltage rising to an impermissible value. When used, these activate a braking resistor that is connected in parallel to the capacitors of the intermediate circuit. The feedback energy is converted to heat via the braking resistor (R_{BR}), thus providing very short deceleration times and restricted four-quadrant operation.

Figure 4.8.1: Operation with Braking Unit (Principle)



Drive sizes 3002 to 3020 have an internal braking unit as standard (external resistor required).

Drive sizes 3025 to 3075 may have an optional internal braking unit (see section 2.1.2 “Inverter type designation”) factory mounted. The standard AV-300i... devices described here can be connected via terminals C and D with an external braking unit (BU-300...)**.**

NOTE! When the internal braking unit is present, or when circuit terminals C and D are connected to external devices, the AC Input must be protected with superfast semiconductor fuses! Observe the mounting instruction concerned.

For braking resistor connection (terminals BR1 and C) a twisted cable has to be used. In case the braking resistor is supplied with thermal protection (klixon), it may be connected to the "External fault" drive input.

WARNING! The braking resistors can be subject to unforeseen overloads due to possible failures. The resistors have to be protected using thermal protection devices.

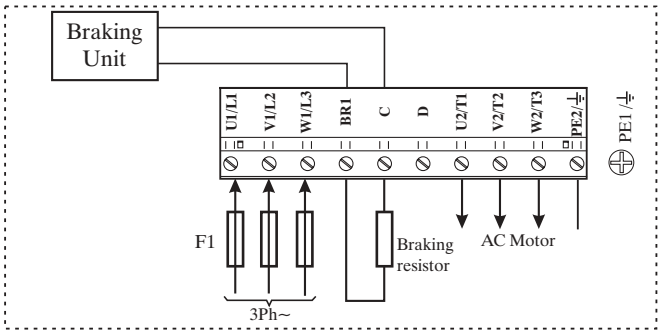
Such devices do not have to interrupt the circuit where the resistor is inserted but their auxiliary contact must interrupt the power supply of the drive power section.

In case the resistor foresees the precence of a protection contact, such contact has to be used together with the one belonging to the thermal protection device.

4.8.1. Internal Braking Unit

An external braking resistor is required (not included). The braking resistor is optional and has always to be mounted externally. For parameter setting refer to section 6.15.8 **Braking unit.** The figure below shows the configuration for internal brake unit operation.

Figure 4.8.1.1: Connection with internal Braking Unit and external braking resistor



4.8.2 External Braking Resistor

Table 4.8.2.1: Lists and technical data of the external standard resistors for inverters 3002 up to 3075

Inverter Type	Resistor Type	P_{NBR} [kW]	R_{BR} [Ohm]	E_{BR} [kJ]
3002	**MRI/T600 140R**	0.6	140	22
3003				
3005				
3007	**MRI/T900 100R**	0.9	100	33
3010				
3015	**MRI/T1300 74R**	1.3	74	48
3020	**MRI/T2200 42R**	2.2	42	82
3025	**MRI/T4000 23R**	4	23	150
3030	**MRI/T4000 23R**	4	23	150
3040	**MRI/T4000 18R**	4	18	150
3050	**MRI/T4000 18R**	4	18	150
3060	**MRI/T8000 11R6**	8	11.6	220
3075	**MRI/T8000 11R6**	8	11.6	220

ai4190

Parameters description:

P_{NBR} Nominal power of the braking resistor

R_{BR} Braking resistor value

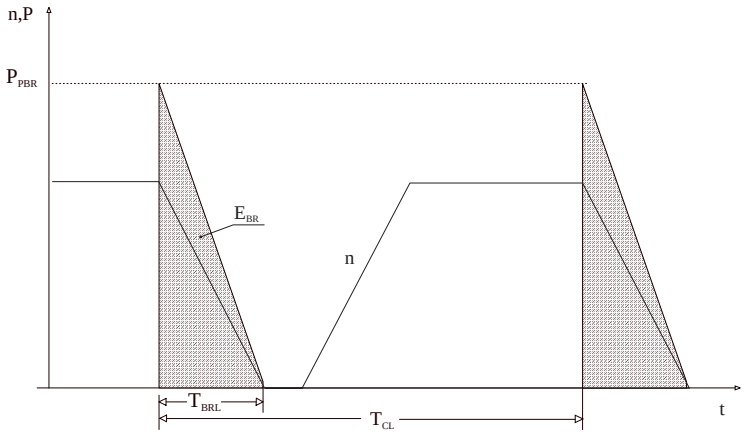
E_{BR} Max surge energy which can be dissipated by the resistor

P_{PBR} Peak power applied to the braking resistor

T_{BRL} Maximum braking time in condition of limit operating cycle (braking power = **P_{PBR}** with typical triangular profile)

$$T_{BRL} = 2 \frac{E_{BR}}{P_{PBR}} = [s]$$

Figure 4.8.2.1: Limit operating braking cycle with typical triangular power profile



T_{CL} Minimum cycle time in condition of limit operating cycle (braking power = **P_{PBR}** with typical triangular profile)

$$T_{CL} = \frac{1}{2} T_{BRL} \frac{P_{PBR}}{P_{NBR}} = [s]$$

The **BU overload** alarm occurs if the duty cycle exceeds the maximum data allowed in order to prevent possible damages to the resistor.

Resistor model: Standard resistor data

Example code: MRI/T900 100R

MRI = resistor type

900 = rated power (900 W)

T= with safety thermostat

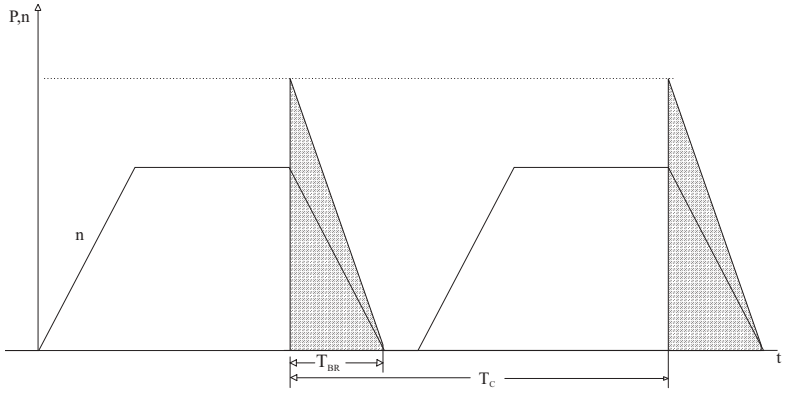
100R = resistor value (100 Ω)

NOTE! The suggested match of resistor-model and inverter-size, allows a braking stop at nominal torque with duty cycle $\mathbf{T_{BR}} / \mathbf{T_C} = 20\%$

Where: $\mathbf{T_{BR}}$ = Braking time

$\mathbf{T_C}$ = Cycle time

Figure 4.8.2.2: Braking cycle with $T_{BR} / T_C = 20\%$



The standard resistor can be used for couplings, different from the ones above reported. These resistors, whose technical data are reported in the table 4.8.2.1, have been dimensioned to tolerate an overload equal to 4 time their nominal power for 10 seconds.

In any event they can tolerate also an overload, whose energetic dissipation was the same of the maximum power level defined by:

$$\mathbf{P_{PBR}} = \frac{\mathbf{V_{BR}}^2 \ \mathbf{[V]}}{\mathbf{R_{BR}} \ \mathbf{[Ohm]}} = \mathbf{W}$$

Where: $\mathbf{V_{BR}}$ = braking unit threshold (see table 4.8.2.2)

With reference to the figure 4.8.2.4, where the power profile is the typical triangular one, the following example can be taken into consideration (see also table 4.8.2.1).

Resistor model: MRI/T600 140R

Rated power $\mathbf{P_{NBR}}$ = 600 [W]

Maximum energy $\mathbf{E_{BR}}$ = 22kJ

Inverter mains supply = 575V

From table 5.8.2.2: V_{BR}=965V

$$P_{PBR} = \frac{V_{BR}^2}{R_{BR}} = \frac{9652^2}{140} = 6650 \text{ [W]} \qquad T_{BRL} = 2\ \frac{E_{BR}}{P_{PBR}} = 2\ \frac{22000}{6650} = 6.6\text{[s]}$$

It is necessary to consider the following relation:

A) If $T_{BR} \leq E_{BR} / P_{NBR}$ verify:

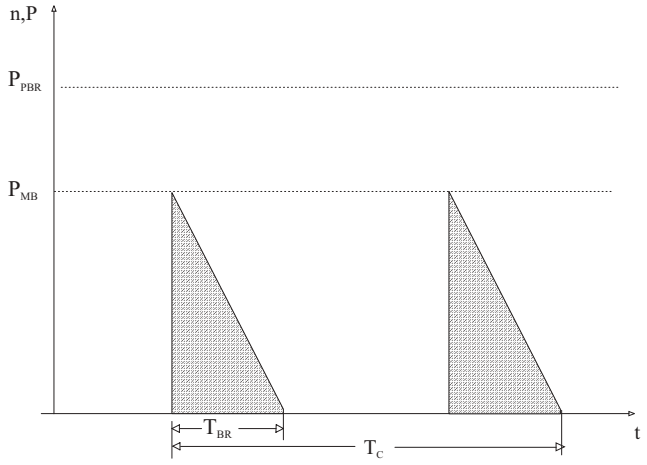
1) $P_{MB} \leq 2 . E_{BR} / T_{BR}$ Where: P_{MB} is the average power of the cycle (see.fig. 4.8.2.3)

2) $$\frac{P_{MB} \times T_{BR}}{2\ T_C} \leq P_{NBR}$$

The average power of the cycle must not be higher than the nominal power of the resistor.

B) If $T_{BR} > E_{BR} / P_{NBR}$ that is to say, in case of very long braking time, it must be dimensioned $P_{MB} \leq P_{NBR}$

Figure 4.8.2.3: Generic braking cycle with triangular profile



If one of the above mentioned rules is not respected, it is necessary, increase the nominal power of the resistor, respecting the limit of the internal braking unit (reported in table 4.8.2.4),

In order to protect these resistors from dangerous overload, the parameters **BU ovld time** and **BU duty cycle** (menu FUNCTIONS\Brake unit) manage maximum time and duty cycle at which the resistors can tollerate their peak power P_{PBR}.

The data must be related to the AC mains for which they are specified defined by the parameter **BU DC vlt** (menu FUNCTIONS\Brake unit).

The default parameters are calculated for a braking threshold that correspond to a Mains voltage = 575V.

The use of different braking resistors from those indicated on table 4.8.2.1, requires to take into consideration the meaning of following formulas:

BU ovld time [s] = E_{BR} / P_{PBR} (time of braking at limit condition for cycle with triangular profile)

BU duty cycle % = (P_{NBR} / P_{PBR}) x 100

Table 4.8.2.2: Braking thresholds for different Mains

Mains voltage	Braking threshold V_{BR} [V]
575 Vac	965

avy4200

The result of these calculations must be assigned to the corresponding parameters in menu FUNCTIONS\Brake unit. When the duty cycle exceeds the data entered, the alarm **BU overload** automatically occurs in order to prevent possible damages to the resistor.

The following table can be used to choose an external resistor, different from the standard series.

Table 4.8.2.3: Technical data of the internal braking units

Inverter type	I_{RMS} [A]	I_{PK} [A]	T [s]	Minimum R_{BR} [ohm]
3002	3.1	6.9	19	140
3003				
3005				
3007	4.4	9.7	16	100
3010				
3015	5.8	13	17	74
3020	10.3	23	16	42
3025	19	42	42	23
3030	19	42	23	23
3040	24	54	37	18
3050	24	54	37	18
3060	37	84	22	11.6
3075	37	84	22	11.6
3100 up to 3200	External braking unit (optional)			

ai4210

I_{RMS} : Nominal current of the braking unit

I_{PK} : Peak current deliverable for 60 seconds max.

T : Minimum cycle time for a working at **I_{PK}** for 10 seconds

Generally the following condition must be satisfed:

$$I_{RMS} \geq \sqrt{\frac{1}{2} \cdot \frac{P_{PBR}}{R_{BR}} \cdot \frac{T_{BR}}{T_C}}$$

Each drive is provided of the terminals 26 and 27 which allows control of one or more external braking units, parallel connected. The drive will act as Master and the external brake units 6KBU300 must be configured as Slave.

In this way it will be possible to utilize the internal I^2xt protection (see section 6.15.8 **Braking unit**).

In case it is used more external BU, each BU with a resistor (all the same) refers to the parameters calculation of a single unit.

4.9. Buffering the Regulator Supply

The power supply of the control section is provided by a switched mode power supply unit (SMPS) from the DC Link circuit. The Drive is disabled as soon as the voltage of the DC Link circuit is below the threshold value (U_{Buff}). The regulator supply is buffered by the energy of the DC Link circuit until the limit value (U_{min}) is reached. The buffer time is determined by the capacitance of the DC Link capacitors. The minimum values are shown in the table below. The buffer time (t_{Buff}) can be extended (only from 3007 drive and higher) by connecting external capacitors in parallel (on terminal C and D).

Table 4.9.1: DC Link Buffer Time

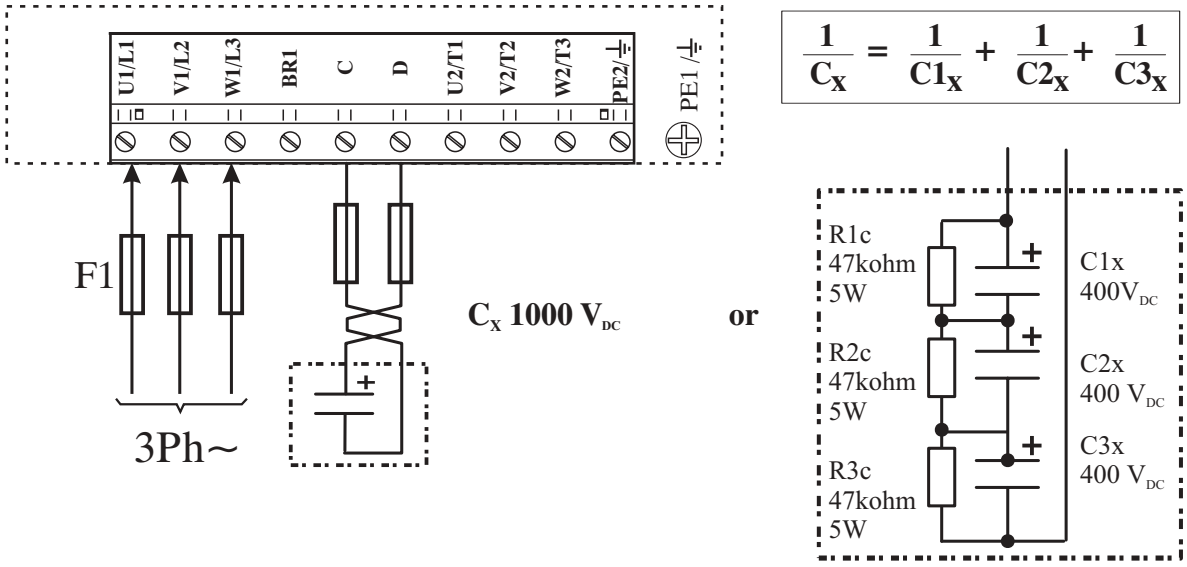
Inverter type	Internal capacitance C_{std} [μF]	Buffer time t_{Buff} (minimum value) with the internal capacitance at : AC Input voltage =575V [s]	Maximum permissible external capacitance C_{ext} [μF]	Maximum power required by switched mode power supply P_{SMPS} [W]
3002	157	0.31	0	65
3003	157	0.31	0	65
3005	313	0.62	0	65
3007	666	1.32	666	65
3010	666	1.32	666	65
3015	1000	1.97	1000	65
3020	1000	1.97	1000	65
3025	1100	2.02	1300	70
3030	1100	2.02	1300	70
3040	1566	2.87	1300	70
3050	2200	4.03	2500	70
3060	2200	4.03	2500	70
3075	3133	5.75	1500	70
3100	4700	8.62	0	70
3125	6267	11.5	0	70
3150	6267	11.5	0	70
3200	9066	16.6	0	70

ai4220

SMPS = Switched Mode Power Supply

NOTE! When connecting the intermediate circuit terminals C and D the AC Input side **must** be protected with superfast semiconductor fuses!

Figure 4.9.1: Buffering the Regulator Supply by Means of Additional Intermediate Circuit Capacitors



Formula for calculating the size of the external capacitors:

$$C_{ext} = \frac{2 \bullet P_{SMPS} \bullet t_{Buff} \bullet 10^{6}}{U^2_{Buff} - U^2_{min}} - C_{std}$$

fA018

C_{ext}, C_{std}	[µF]	
P_{SMPS}	[W]	U_{Buff} = 565 V at U_{LN} = 565 V
t_{Buff}	[s]	
U_{Buff}, U_{min}	[V]	U_{min} = 250 V

Calculation example

A 6KAVI53025 Drive is operated with an AC Input supply U_{LN} = 575 V. A voltage failure buffer is required for max. 3.0 s.

P_{SMPS}	70 W	t_{Buff}	3.0 s
U_{Buff}	565V	U_{min}	250 V
C_{std}	1100 µF		

$$C_{ext} = \frac{2 \,.\, 70\ W \,.\, 3.0\ s \,.\, 10^{6}\ \mu F / F}{(565\ V)^{2} - (250\ V)^{2}} - 1100 \mu F = 1636 \mu F - 1100 \mu F = 536 \mu F$$

4.10. AV-300i Power Dip Ride Through Data and Restart Setup

The AV-300i has a 3-phase full-wave rectifier feeding the DC link.

If the DC link reaches the Undervoltage threshold for its voltage input (see tables 4.10.1, 4.10.2 and 4.10.3), the AV-300i will disable the Drive, and generate an undervoltage alarm.

The undervoltage alarm can latch & trip the drive immediately, or be programmed to reset itself and restart. The undervoltage alarm settings define how many restarts are permitted (max=100). There is a 'restart time' parameter that sets how long the undervoltage condition can exist before the AV-300i gives up on the reset (max=65 secs).

The DC link feeds the AV-300i power supply. If the DC link goes below 250 VDC the electronics reset as if just powered up. The capacity of the DC link between the undervoltage shutdown of the Drivesection, the 250 VDC power supply threshold, and the power draw of the AV-300i electronics & cooling fan determine how long the drive stays up under power dips or power loss.

The DC link can have extra capacitance added externally to the DC link to add time to keep the DC link above 250 VDC as long as possible. The following tables calculate how long the Drive can keep the power above 250 VDC for control power if the maximum amount of capacitance is added externally. Remember, adding capacitance holds in the power supply longer, but also takes longer to recharge.

The survival of an input power dip without shutting down the Drive section depends on the relative load (energy) that the DC bus has to output, and the magnitude and duration of the power dip. A power dip needs to be below the DC undervoltage threshold before the drive would even see any trip condition from it.

Without external capacitors, as an estimate, a power dip of 1 cycle (16.6ms @ 60Hz) when the motor is at full load will cause an undervoltage trip.

The undervoltage trip time can be calculated by means of the following formula:

$$t = \frac{(U_{dc}^2 - U_{Buff}^2) \cdot (C_{Std} + C_{ext})}{2P_{am} \cdot 10^6} \quad \text{fA027}$$

where:

- t: undervoltage trip time [ms]
- U_{dc}: DC link voltage [V]
- U_{thr}: trip threshold voltage [V]
- C_{Std}: DC link capacitance [uF]
- C_{ext}: external capacitance [uF]
- P_{am}: motor power consumption [W]

P_{am} depends on the motor load conditions:

- at full load, it can be calculated as follows: $P_{am} = \frac{P_m}{\eta_m}$ fA028

  where:

  - P_m: motor rated power
  - η_m: motor rated efficiency
- at no load, it depends on the iron losses, on mechanical losses, and stator joule losses. The sum of these terms is about 50% of the full load losses.

Full load losses P_{lfl} are: $$P_{lfl} = P_m \frac{1 - \eta_m}{\eta_m}$$ fA029

Maximum power supply drop out time (Buffer time/voltage failure buffer) of AV-300i is achieved by adding the maximum recommended capacitance to the DC bus.

The following table show the maximum power supply drop out time for different Undervoltage thresholds and inverter sizes. The meaning of the symbols in the colums is as follows:

C_{std} = internal capacitance in uF,
C_{ext} max = external total capacitance in uF,
T_{buff} = max drop out time in sec.,
P_{SMPS} = power supply watts,
U_{buff} = volts threshold to disable drive operation,
U_{min} = min DC volts that will support the power supply

Where T_{buff} is defined by the formula $$T_{buff} = \frac{(C_{std} + C_{ext}\,max) \cdot (U_{buff}^2 - U_{min}^2)}{2 \cdot P_{SMPS} \cdot 10^6}$$

Table 4.10.1: Drive Trip Times, 575-V Threshold

Size	Psmps [W]	C_{std} [µF]	C_{ext} max [µF]	U_{buff} [V]	U_{min} [V]	T_{buff} [sec.]
3002	65	157	0	565	250	0.31
3003	65	157	0	565	250	0.31
3005	65	313	0	565	250	0.62
3007	65	666	666	565	250	1.32
3010	65	666	666	565	250	1.32
3015	65	1000	1000	565	250	1.97
3020	65	1000	1000	565	250	1.97
3025	70	1100	1300	565	250	2.02
3030	70	1100	1300	565	250	2.02
3040	70	1567	1300	565	250	2.87
3050	70	2200	2500	565	250	4.03
3060	70	2200	2500	565	250	4.03
3075	70	3130	1500	565	250	5.75
3100	70	4700	0	565	250	8,62
3125	70	6266	0	565	250	11,5
3150	70	6266	0	565	250	11,5
3200	70	9066	0	565	250	16,6

ai4230

4.11. Discharge Time of the DC-Link

Table 4.11.1: DC Link Discharge Times

Type	I_{2N}	Time (seconds)
3002	3.8	100
3003	4.5	
3005	7.0	200
3007	10.8	250
3010	13.8	
3015	18.7	
3020	24.2	
3025	30	230
3030	36	230
3040	46	230
3050	58	300
3060	69	300
3075	86	300
3100	109	300
3125	137	300
3150	158	300
3200	218	300

ai4250

This is the minimum time that must be elapsed since an AV-300i Drive is disconnected from the AC Input before an operator may service parts inside the Drive to avoid electric shock hazard.

CONDITION These values consider a turn off for a Drive supplied at 575Vac +10%, without any option, (the charge for the switching supply is the regulation card, the keypad and the 24Vdc fans “if mounted”).

The Drive is disabled. This represents the worst case condition.

Chapter 5 - Drive Operation

The figure 5.1. shows the parameters sets management in the Drive. The set of parameters which is used by the inverter during the operation, is called "Current set".

At each power up, the parameters contained in the not volatile memory, "Permanent set", are copied in the "Current set".

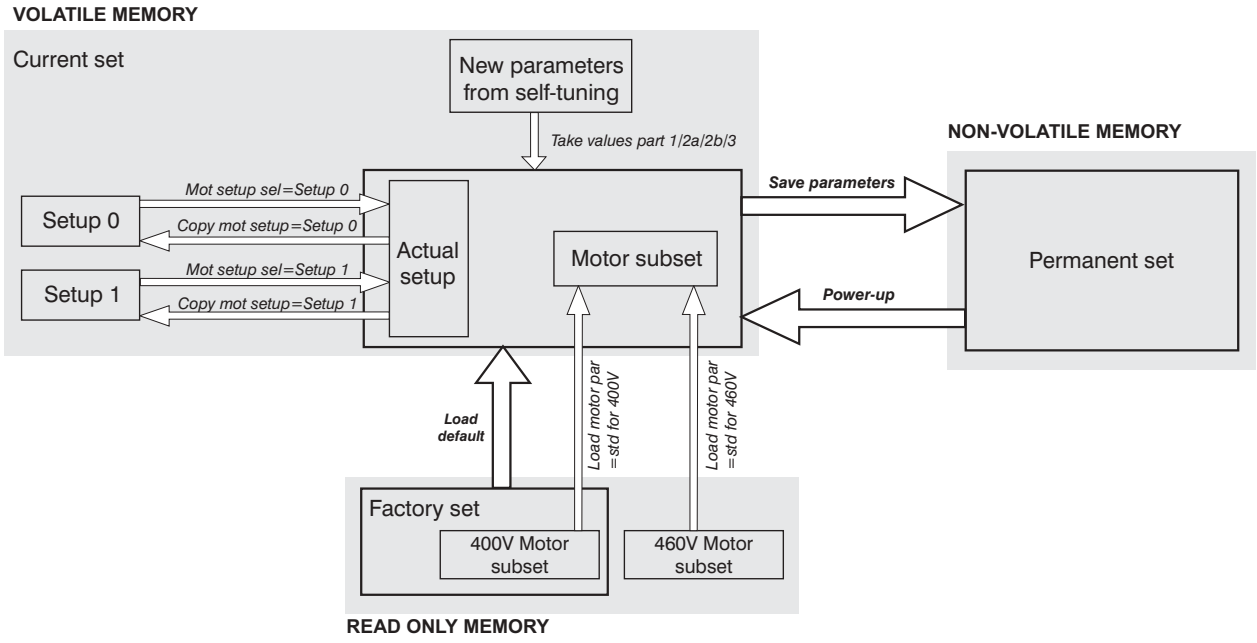
The device comes from the factory with the parameters of "Permanent set" preloaded with a set called "Factory set", whose values are indicated in the tables of section 10.1, column "Factory".

The user can change the parameter values of the "Current set" and subsequently store it in the "Permanent set" through the **Save parameters** command.

It is always possible to recall (in the "Current set") the factory parameters set "Factory set" by means of **Load default** command.

In addition the diagram shows some operations on subsets of parameters which are made possible by individual commands.

Figure 5.1: Parameters sets management

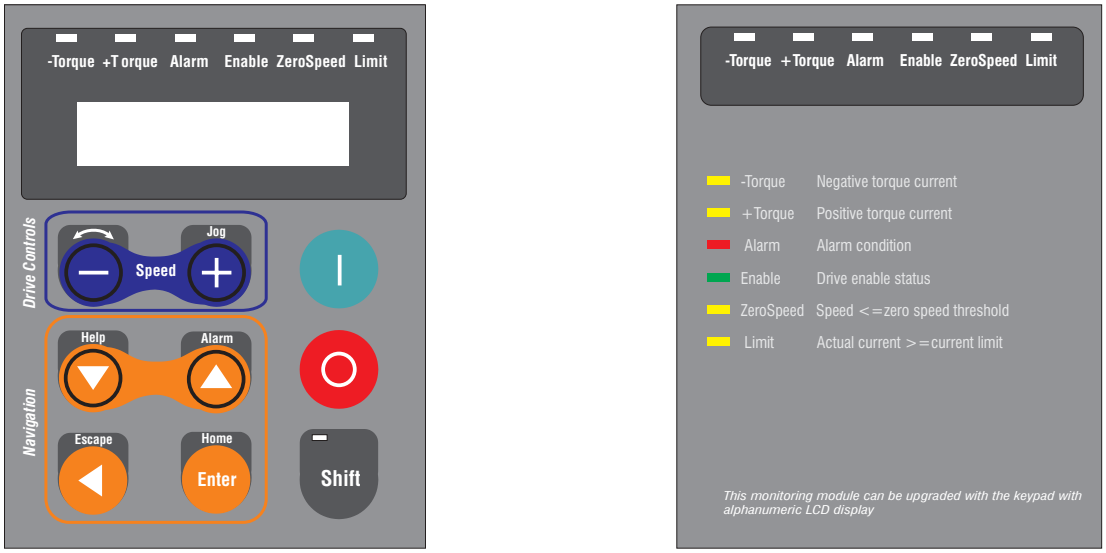


5.1. Keypad

The keypad is made of a LCD display with two 16-digit lines, seven LEDs and nine function keys. It is used

- to control the drive, when this kind of use has been programmed (Main commands=DIGITAL)
- to display the speed, voltage, diagnostics etc. during the operation
- to set the parameters

Figure 5.1.1: keypads (on right the optional Led module)



NOTE: keypad cable longer than 20 cm must be shielded.

5.1.1. LEDs & buttons

The LEDs present on the keypads are used to quickly diagnose the operating state of the drive.

Table 5.1.1.1: Keypad leds designation

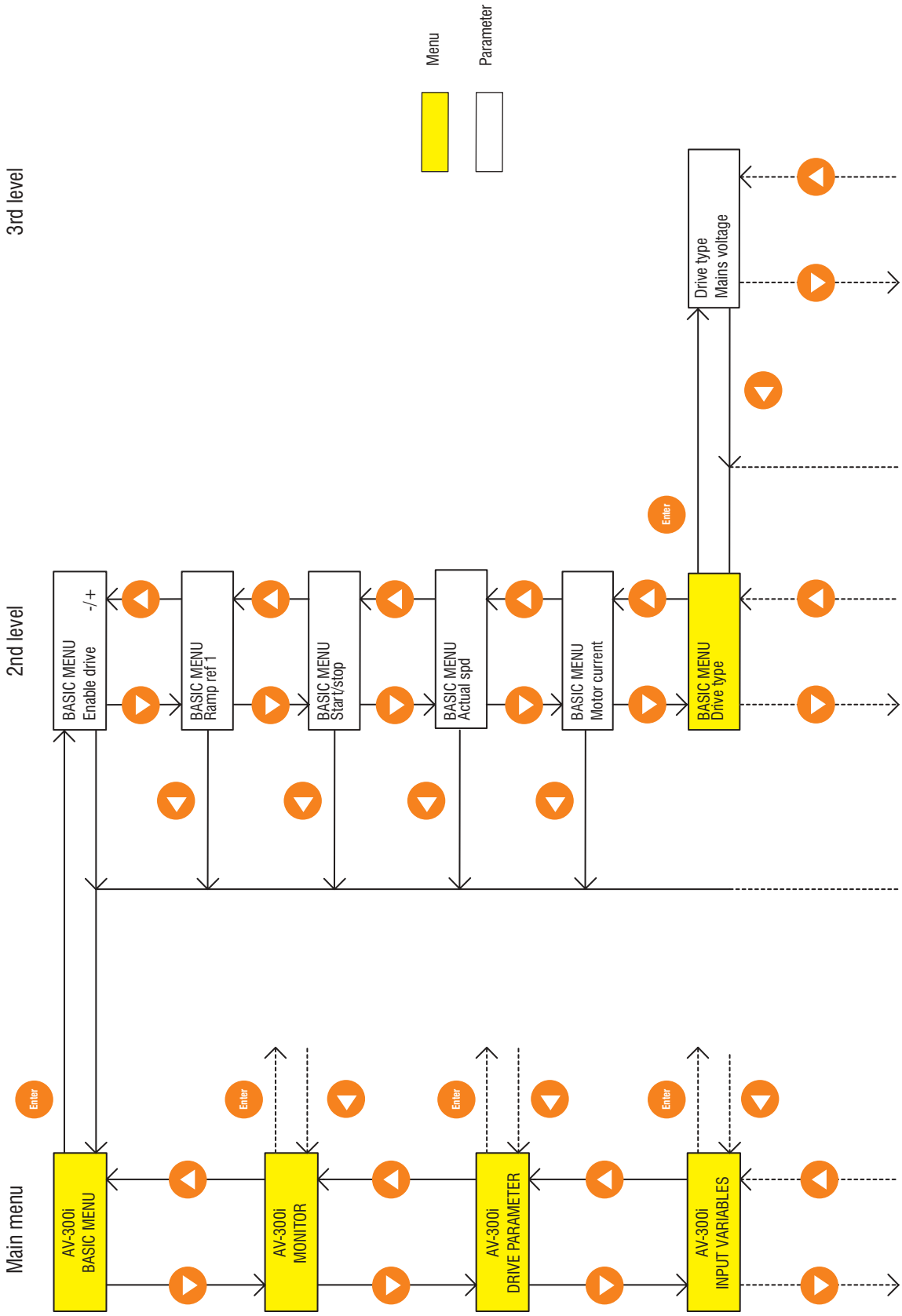
Designation	Color	Function
-Torque	yellow	the LED is lit, when the drive operates with a negative torque
+Torque	yellow	the LED is lit, when the drive operates with a positive torque
ALARM	red	the LED is lit; it signals a trip
ENABLE	green	the LED is lit, when the drive is enabled
Zero speed	yellow	the LED is lit; it signals zero speed
Limit	yellow	the LED is lit, when the drive operates at a current limit
Shift	yellow	the LED is lit, when the second keypad functions are enabled

ai5010

Control buttons	Text reference	Function
	[START]	START button commands the Drive to the Enable (Stop control function ON) and Run state (**Main commands** = DIGITAL) When **Main commands** is set as TERMINALS the button is not active
	[STOP]	STOP button commands to stop the Drive from the Run state when **Main commands** is set as DIGITAL (Pressing this button for 2 sec, the drive will be disabled). When **Main commands** is set as TERMINALS the button is not active.
	[Increase] / [Jog]	Plus button increases the speed reference for Motor pot function. JOG command, when shift button is selected.
	[Decrease] / [Rotation control]	Minus button decreases the speed reference for Motor pot function. Rotation control, it changes the rotation direction in Jog mode and Motor pot function when shift button is selected.
	[Down arrow] / [Help]	Down arrow - Used to change menu or parameter selection.In parameter and reference setting modes, it changes the value of the parameter or the reference. Help – Function Not available (“Help not found” displaying when pressed and when shift button is selected)
	[Up arrow] / [Alarm]	Up arrow - Used to change menu or parameter selection. In parameter and reference setting modes, it changes the value of the parameter or the reference. Alarm - Failure register displaying (shift selected). Use the UP/DOWN Arrows to scroll through the last 10 alarms.
	[Left arrow] / [Escape]	Left arrow, when editing numeric parameters it selects the digit of the parameter to modify. In the other cases it is used to exit from setting mode. Escape - Used to exit from setting mode and Alarm displaying mode (when shift button is selected)
	[Enter] / [Home]	[Enter] - Used to [Enter] a new value for a parameter in the parameter setting mode. Home - Used to go directly to BASIC MENU (when shift button is selected)
	[Shift]	Shift button enables the second keypad functions (Rotation control, Jog, Help, Alarm, Escape, Home)

5.1.2. Moving Inside a Menu

Figure 5.1.2.1: Moving Inside the Navigation Menu



The BASIC MENU always appears when the inverter is switched on.

Use the ∧ and ∨ keys to select the individual points within the same menu level.

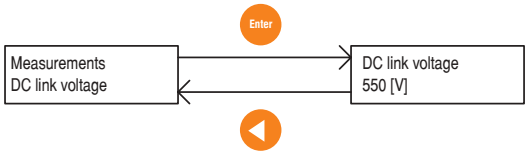
Press the **Enter** key to enter the next menu level.

Use the **<** key to return to the next higher menu level, irrespective of which menu point was selected. The appropriate menu of the next higher level will appear once the return has been made.

Press **Home** (**Shift** and **Enter**) to go directly to BASIC MENU.

5.1.3. Displaying Parameters

(MONITOR \ Measurement)



Select the parameters within the menu.

Press **Enter**. The parameter will appear with the corresponding value.

Press < key to return to the menu.

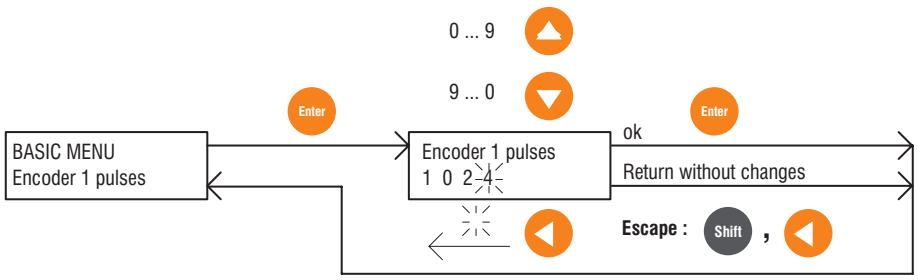
5.1.4. Changing / Saving Parameters / Password

The parameters with changeable values are divided into three groups:

- Parameters whose content is either selected as a number or as text within a defined range, e.g. ramp times and reference values
- Parameters whose contents are fixed values that can be selected, e.g. **Switching frequency** with the options 2, 4, 8 and 16 kHz.
- Parameters that are automatically scaled by the keypad, e.g. **Auto tune inp XX**

NOTE! Only those parameters that are not assigned to a digital or analog input/output can be changed with the keypad. The changed parameters must be saved otherwise the previous values will be loaded the next time the device is switched on.

Changing numerical values and text (i.e.: BASIC MENU \ Encoder 1 pulses)



Select the parameter to be changed in the menu.

Press **Enter**. The value of the parameter will appear and the last digit will flash. The value of the flashing digit is always the one that can be changed.

Increase the value with ∧. Reduce the value with ∨.

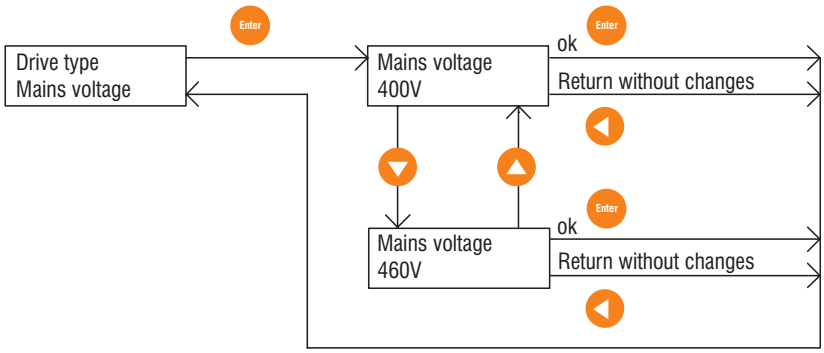
Select the next digit with <.

Confirm the new value and return to the previous display by pressing **Enter**.

Press **Escape** (**Shift** and <) to return without changes.

NOTE! When setting the **Dim factor text** parameter, the following characters are also available in addition to the numbers: / % & + , - . : < = > ? A...Z [ ] a...z

Selection from predefined values (i.e.: BASIC MENU \ Drive type \ Mains voltage)

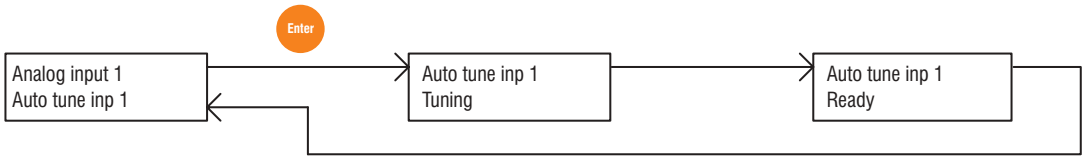


To change a value press **Enter**. The current value is shown in the display. This can be changed with the ∧ and ∨ keys.

Confirm the new value and return to the previous display by pressing **Enter**.

Press < key to return without changes.

Automatic Scaling (i.e.: I/O CONFIG \ Analog Inputs \ Analog input 1 \ Auto tune inp 1)



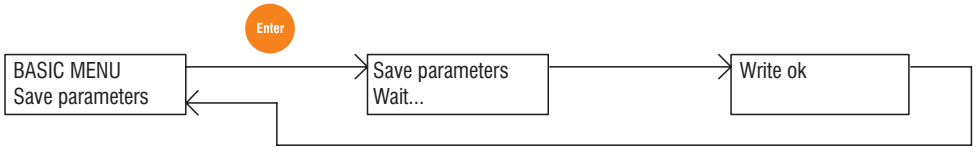
Select the appropriate **Auto tune input XX** parameter. Press **Enter.**

The scaling procedure will run automatically. The messages “Tuning” and “Ready” will appear in sequence before the original parameter is shown.

NOTE! The maximum signal possible must be present on the analog input concerned during the scaling procedure.

Saving (BASIC MENU \ Save parameters)

The parameters must be saved otherwise the previous values will be loaded the next time the device is switched on.

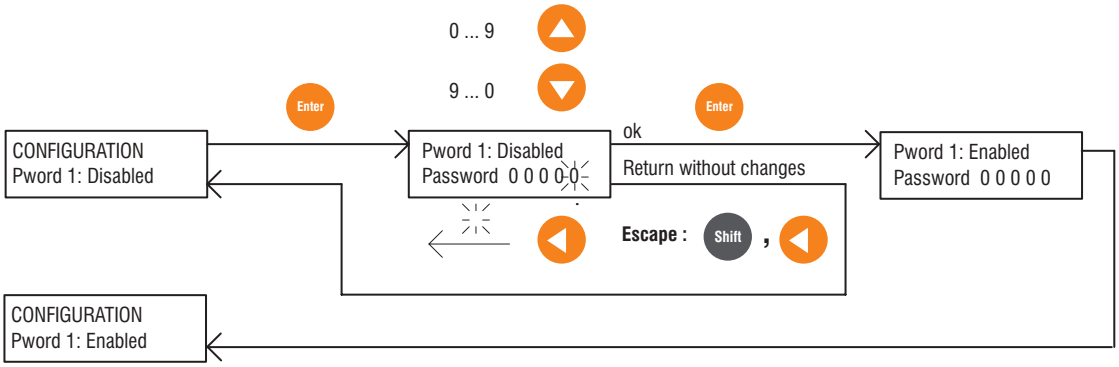


Select **Save parameters** in the BASIC MENU or in the SPEC FUNCTIONS menu. Press **Enter**.

The save operation is automatic. The messages “Wait ...” and “Write ok” will appear in sequence before the original parameter is shown.

Entering a password (CONFIGURATION \ Pword 1)

The operator can define a password consisting of a freely selectable five-digit number combination in order to protect the keypad from unauthorized access. This is carried out via the **Pword 1** parameter.



Select the **Pword1** (= Password 1) in the CONFIGURATION menu.

Press **Enter**. The value 00000 will appear with the last digit flashing. The value of the flashing digit is changed.

Increase the value with **^.** Reduce the value with **v.**

Select the next digit left with <.

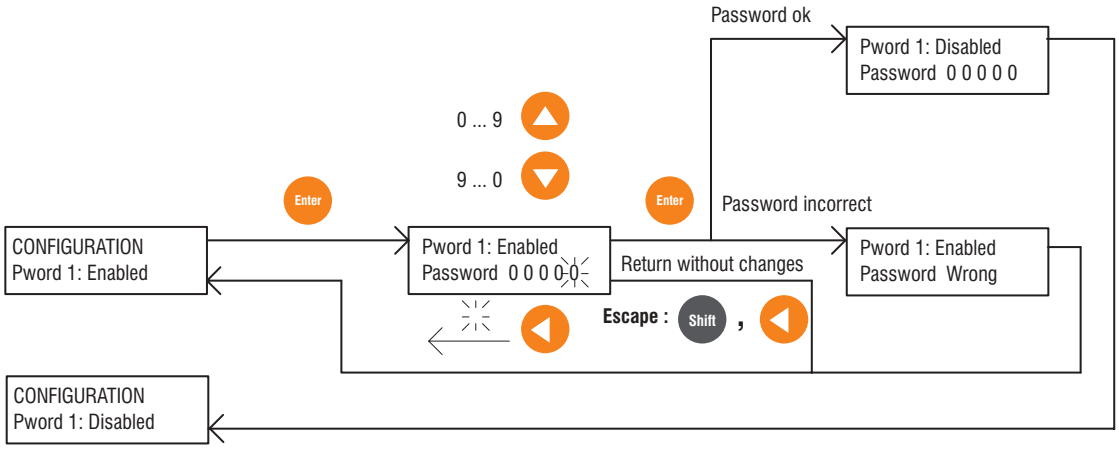
Confirm the password by pressing **Enter**. The message: “Pword1: Enabled” will then appear shortly with the currently valid password displayed.

The existing password is indicated in the CONFIGURATION menu via the “Pword 1: Enabled” message.

Press **Escape** (**Shift** and <) to return without changes.

NOTE! The password must be saved with **Save parameters** so that it is also active the next time the device is switched on.

General unlocking of the password (CONFIGURATION \ Pword 1)



Select the **Pword1** (= Password 1) parameter in the CONFIGURATION menu.

Press **Enter** to call up the value 00000 with the last digit flashing. Always the value of the flashing digit is changed. The valid password must be re-entered in order to unlock it.

Increase the value with **^.** Reduce the value with **v.**

Select the next digit left with <.

Confirm by pressing **Enter**. The message: “Pword1: Disabled” will then appear for a short time.

The existing password is indicated in the CONFIGURATION menu via the “Pword 1: Disabled”.

Press **Escape** (**Shift** and <) key to abort the entry of the password if required.

If the incorrect password is entered and then Enter pressed, the message “Password wrong” will appear and the keypad will return to the CONFIGURATION menu with the display “Pword1: Enabled”

NOTE! The **Save parameters** function must be used to save the password if the password itself must not only be disabled but completely unlocked.

5.1.5. Operating the Drive via the Keypad

In order to operate the drive via the keypad, the following settings must be made in the CONFIGURATION menu:

- **Main commands** = Digital
- **Control mode** = local

The hardware enable input on terminals 12 .. 15 are also active when the drive is operated via the keypad. This means, for example, that the signal at terminal 13 must also be present for starting the drive in addition to the command via the keypad.

If the drive is stopped via the keypad, it can be restarted simply by pressing the appropriate key.

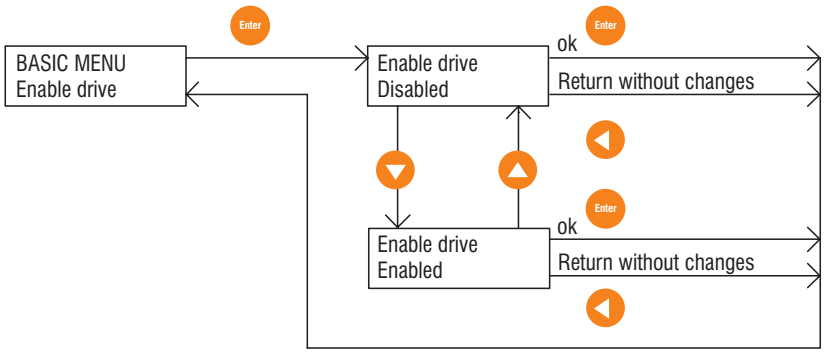
If the stop was caused by removing the voltage signal on terminal 13, both the signal at terminal 13 and the command via the keypad are necessary to restart the drive. The signal at the terminals must be present before giving the keypad command.

The same applies accordingly to the enabling of the drive via the **Enable drive** parameter.

5.1.5.1. Starting and Stopping the Drive with Keypad

NOTE: The keypad must be enabled (see section 6.12.1) before performing these actions.
(**MAIN COMMANDS** parameter **= DIGITAL)**

Enabling / Disabling the Drive (BASIC MENU \ Enable drive)



Select the **Enable drive** parameter in the BASIC MENU or MONITOR Menu.

Press **Enter**.

Use the ∧ and ∨ keys to move from “Disabled” to “Enabled”.

Press **Enter** to confirm your entry.

Press **Escape** (**Shift** and <) to return without changes.

Start / Stop

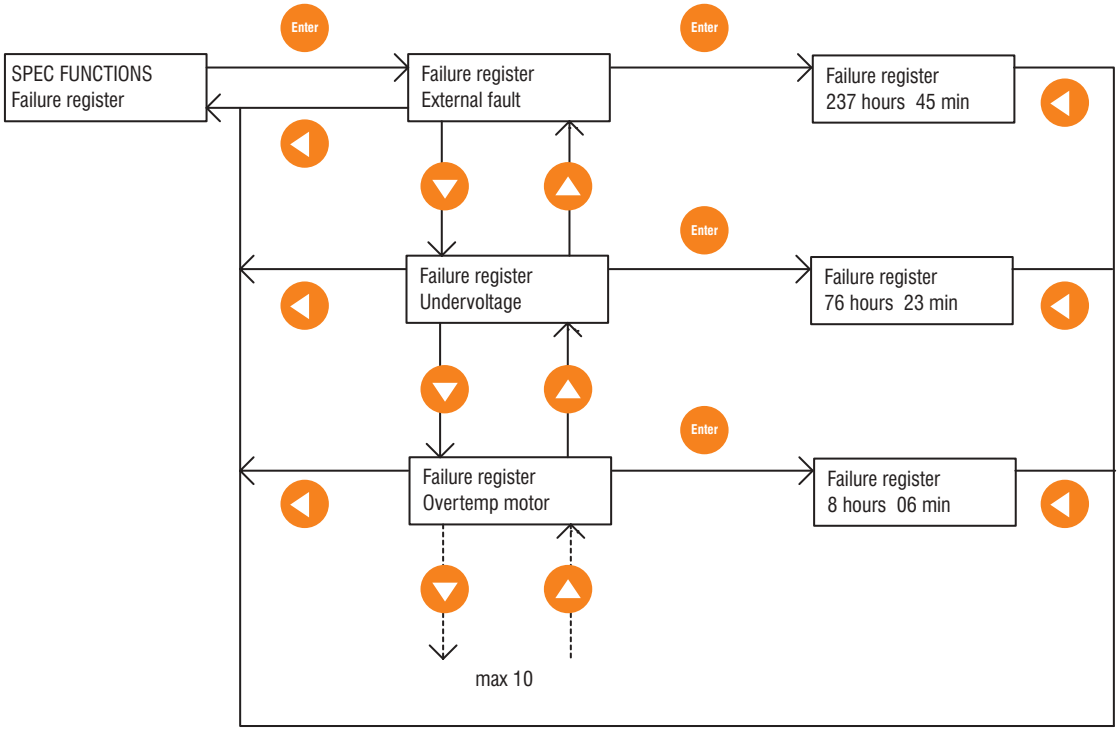
Start: Press the I key

Stop: Press the O key.

WARNING: **The Keypad STOP key can be used only when MAIN COMMANDS parameter is set to digital.**

5.1.5.2. Failure register / acknowledge alarms

Displaying the failure register



Press **Alarm** (**Shift** and ∧) key to select the **Failure register** parameter (or select it in the SPEC FUNCTIONS menu).

Press **Enter**: the last error that has occurred will be displayed.

Use ∨ key to display the previous error.

The failure register can take up to 10 values. If a new failure is reported, the oldest entry in the failure register is overwritten.

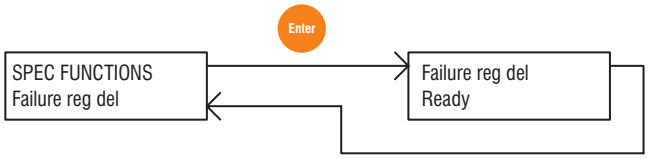
The entries in the failure register are retained until the register is cleared.

Press **Enter** to display the time at which the failure occurred. The time statement refers to the operating hours of the inverter (power supply unit connected to supply).

Press ∧ or ∨ to returns to the **Failure register** menu point.

If the < key is pressed when the failure is displayed, the display returns to the Failure register menu without showing the time.

Clearing the failure register



Select the **Failure reg del** parameter in the SPEC FUNCTIONS menu.

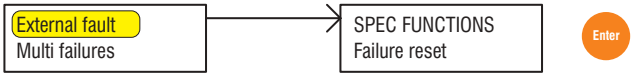
Press **Enter**. The failure register is deleted.

Acknowledging a failure alarm

If a failure occurs, the appropriate failure alarm will appear in the display and the display will flash, the failure message and the previous text alternately.

Acknowledge or reset the failure by pressing the < key. The Drive must be disabled for this and a Start command must not be present.

Acknowledging when several failure alarms occur at the same time



If several alarms occur at the same time, the blinking message “Multi failures” will be shown in the display.

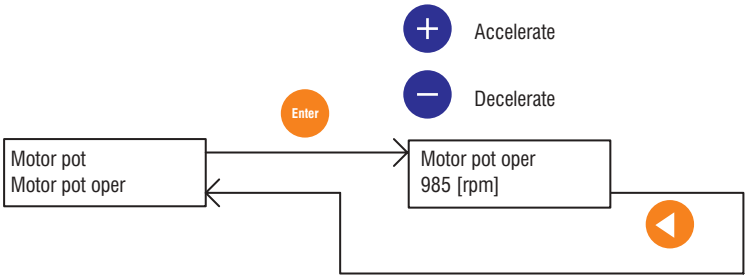
Select the **Failure reset** parameter in the SPEC FUNCTIONS menu.

Press the **Enter** key to acknowledge or reset the failure alarm. The Drive must be disabled for this and there should be no Start command present.

5.1.5.3. Motor Potentiometer Function

NOTE! To use the motor potentiometer function, this must be enabled with the **Enable motor pot** parameter!

Acceleration, Deceleration (FUNCTION \ Motor pot)

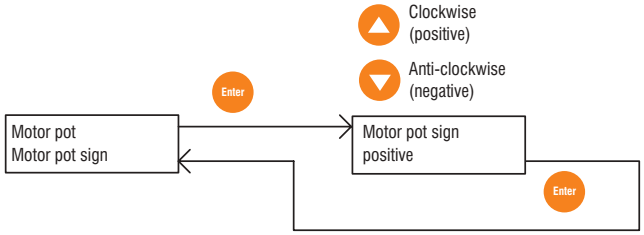


Select the **Motor pot oper** parameter in the “Motor pot” menu.

Press **Enter** to display the current reference value.

Press the + key to increase the reference value and accelerate the drive. Press the - key to decrease the reference value and decelerate the drive. This applies to both rotation directions.

Press **Escape** (**Shift** , <) to return to the “Motor pot” submenu.



Changing rotation direction

Select the **Motor pot sign** parameter in the “Motor pot” menu.

Press **Enter** to display the currently active rotation direction.

Press the ∧ key to select clockwise rotation and the ∨ key for counterclockwise rotation.

Confirm by pressing **Enter**.

Changing the **Motor pot sign** parameter during operation causes the drive to reverse rotation according to the ramp times set.

Resetting the speed reference value

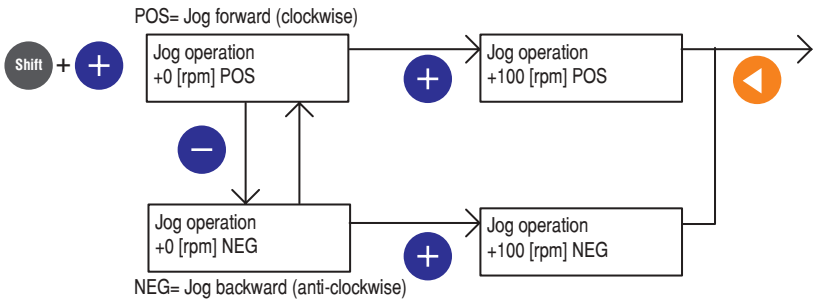
Select the **Motor pot reset** parameter in the “Motor pot” submenu.

Press **Enter**. The speed reference value will be set to zero.

NOTE! The speed reference value can only be reset when the drive is switched off.

5.1.5.4. Jog Function

NOTE! The **Enable jog** parameter is standard setting enabled with a speed reference value = 100 rpm.



Press **Shift** and + keys to select the **Jog operation** function.

Press the - key to select the motor shaft rotation (POS = clockwise rotation , NEG = counterclockwise rotation).

Press Jog to run the motor (the selected jog speed will be displayed).

Press **<** key to exit from jog operation.

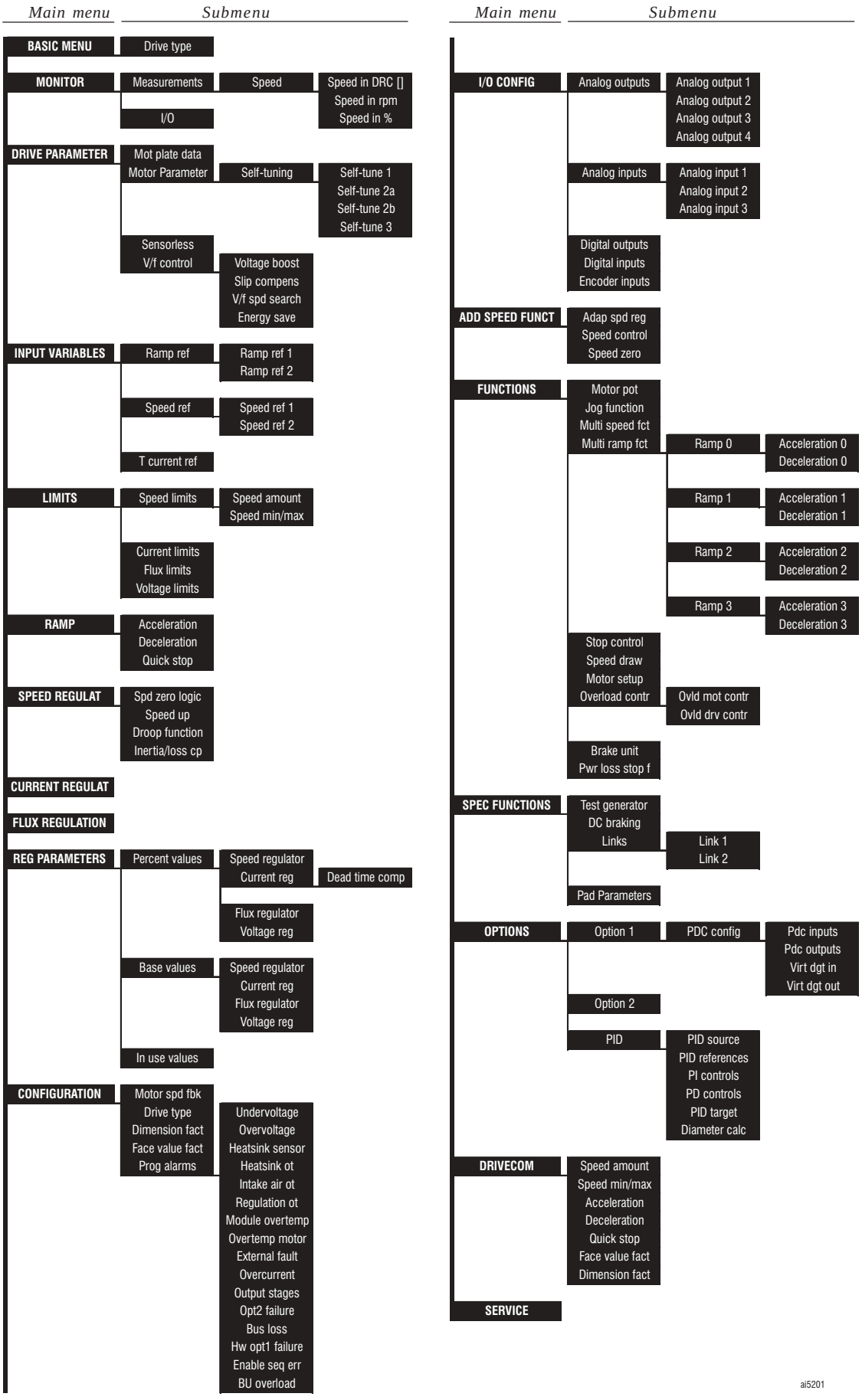
5.2. Menu Structure

The aim of this quick introductory guide is to introduce the user to the basic menu structure of the AV-300i Drive, how to operate the device and how to carry out an initial commissioning of the device via the BASIC MENU.

It is assumed that the device has the factory set default configuration and that the configuration has been carried out according to the diagrams in section 4.6, “Standard connection diagrams”.

Possible parameter values and information about write/read authorization by the operator are described in the “List of all parameters” provided in the manual.

5.2.1 Main Menu and Submenu



5.2.2 Main Menu, Submenu and Parameters

BASIC MENU

[314]	Enable drive
[44]	Ramp ref 1
[315]	Start/stop
[122]	Actual spd [rpm]
[231]	Motor current

Drive type

[333]	Mains voltage
[332]	Ambient temp
[802]	Continuous curr
[331]	Software version

[321]	Regulation mode
[21]	Acc delta speed
[22]	Acc delta time
[29]	Dec delta speed
[30]	Dec delta time
[8]	T current lim +
[9]	T current lim -
[415]	Encoder 1 type
[416]	Encoder 1 pulses
[45]	Speed base value
[256]	Save parameters

MONITOR

[314]	Enable drive
[315]	Start/stop

Measurements

Speed

Speed in DRC [ ]

[109]	Ramp ref (d)
[112]	Ramp output (d)
[115]	Speed ref (d)
[119]	Actual spd (d)
[925]	F act spd (d)
[923]	Act spd filter

Speed in rpm

[110]	Ramp ref (rpm)
[113]	Ramp outp (rpm)
[118]	Speed ref (rpm)
[122]	Actual spd (rpm)
[427]	Enc 1 speed (rpm)
[420]	Enc 2 speed (rpm)
[924]	F act spd (rpm)
[923]	Act spd filter

Speed in %

[111]	Ramp ref (%)
[114]	Ramp output (%)
[117]	Speed ref (%)
[121]	Actual spd (%)

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[227]	DC link voltage
[229]	Active power
[233]	Output voltage
[324]	Output frequency
[231]	Motor current
[230]	Torque
[41]	T current ref %
[927]	T curr (%)
[928]	F T curr (%)
[926]	T curr filter
[234]	Flux
[881]	Heatsink temp
[1147]	Regulation temp
[914]	Intake air temp

I/O

[-]	Digital I/Q
[582]	Virtual dig inp
[583]	Virtual dig out

DRIVE PARAMETER

Motor plate data

[161]	Nominal voltage
[162]	Nominal speed
[163]	Nom frequency
[164]	Nominal current
[371]	Cos phi
[167]	Base voltage
[168]	Base frequency
[694]	Take motor par

Motor parameter

[165]	Magnetizing curr
[726]	Magn working cur
[166]	Rotor resistance
[436]	Stator resist
[437]	Lkg inductance
[251]	Load motor par

Self-tuning

Self-tune 1

[676]	Start part 1
[436]	Stator resist
[683]	Stator resist Nw
[644]	Voltage comp lim
[685]	Volt comp lim Nw
[645]	Comp slope
[686]	Comp slope Nw
[437]	Lkg inductance
[684]	Lkg inductance Nw
[89]	Current P
[687]	Current P Nw

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[166]	Rotor resistance
[682]	Rotor resist Nw
[90]	Current I
[688]	Current I Nw
[677]	Take val part 1

Self-tune 2a

[678]	Start part 2a
[176]	P1 flux model
[689]	P1 flux model Nw
[692]	P2 flux model
[690]	P2 flux model Nw
[165]	Magnetizing curr
[691]	Magnetiz curr Nw
[91]	Flux P
[907]	Flux P Nw
[92]	Flux I
[908]	Flux I Nw
[1022]	Voltage P
[1024]	Voltage P Nw
[902]	Voltage I
[909]	Voltage I Nw
[679]	Take val part 2a

Self-tune 2b

[680]	Start part 2b
[176]	P1 flux model
[689]	P1 flux model Nw
[692]	P2 flux model
[690]	P2 flux model Nw
[165]	Magnetizing curr
[691]	Magnetiz curr Nw
[91]	Flux P
[907]	Flux P Nw
[92]	Flux I
[908]	Flux I Nw
[1022]	Voltage P
[1024]	Voltage P Nw
[902]	Voltage I
[909]	Voltage I Nw
[681]	Take val part 2b

Self-tune 3

[1029]	Fwd-Rev spd tune
[1048]	Test T curr lim
[1027]	Start part 3
[1014]	Inertia
[1030]	Inertia Nw
[1015]	Friction
[1031]	Friction Nw
[87]	Speed P
[1032]	Speed P Nw
[88]	Speed I
[1033]	Speed I Nw
[1028]	Take val part 3

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Sensorless

[646]	Low speed factor
[643]	Sls speed filter
[647]	Flux corr factor

V/f control

[712]	V/F shape

Voltage boost

[709]	Vlt boost type
[710]	Manual boost
[711]	Actual boost

Slip compensat

[722]	Slip comp type
[723]	Manual slip comp
[724]	Actual slip comp
[725]	Slip comp filt
[727]	Motor losses %

V/f spd search

[893]	Spd srch time
[894]	Flux srch time
[895]	Spd autocapture
[896]	Delay auto cap
[897]	Delay retrying

Energy save

[898]	Enable save eng
[899]	Lock save eng
[900]	V/f flux level
[901]	Flux var time

INPUTS VARIABLES

Ramp ref

Ramp ref 1

[44]	Ramp ref 1
[47]	Ramp ref 1(%)

Ramp ref 2

[48]	Ramp ref 2
[49]	Ramp ref 2 (%)

Speed ref

Speed ref 1

[42]	Speed ref 1
[378]	Speed ref 1(%)

Speed Ref 2

[43]	Speed ref 2
[379]	Speed ref 2(%)

T current ref

[39]	T current ref 1
[40]	T current ref 2

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LIMITS

Speed limits

Speed amount

[1]	Speed min amount
[2]	Speed max amount

Speed min/max

[5]	Speed min pos
[3]	Speed max pos
[6]	Speed min neg
[4]	Speed max neg

Current limits

[715]	T curr lim type
[7]	T current lim
[8]	T current lim +
[9]	T current lim -
[10]	In use Tcur lim+
[11]	In use Tcur lim-
[13]	Current lim red
[342]	Torque reduct

Flux limits

[467]	Flux level

Voltage limits

[889]	Dynam vlt margin

RAMP

Acceleration

[21]	Acc delta speed
[22]	Acc delta time

Deceleration

[29]	Dec delta speed
[30]	Dec delta time

Quick stop

[37]	QStp delta speed
[38]	QStp delta time

[18]	Ramp shape
[19]	S shape t const
[663]	S acc t const
[664]	S dec t const
[20]	Ramp +/- delay
[673]	Fwd-Rev
[245]	Enable ramp
[344]	Ramp out = 0
[345]	Ramp in = 0
[373]	Freeze ramp

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SPEED REGULAT.

[118]	Speed ref
[236]	Speed reg output
[322]	Lock speed reg
[242]	Enable spd reg
[348]	Lock speed I
[1016]	Aux spd fun sel
[444]	Prop. filter

Spd zero logic

[123]	Enable spd=0 I
[124]	Enable spd=0 R
[125]	Enable spd=0 P
[422]	Enable lck sls
[126]	Spd=0 P gain
[106]	Ref 0 level
[890]	Enable zero pos
[891]	Lock zero pos
[892]	Zero pos gain

Speed up

[445]	Speed up gain
[446]	Speed up base
[447]	Speed up filter

Droop function

[696]	Droop gain
[697]	Droop filter
[698]	Load comp
[700]	Droop limit
[699]	Enable droop

Inertia/loss cp

[1014]	Inertia
[1015]	Friction
[1013]	Torque const
[1012]	Inertia c filter

CURRENT REGULAT

[353]	Zero torque

FLUX REGULATION

[469]	Flux reg mode
[500]	Flux reference
[234]	Flux
[921]	Out vlt level

REG. PARAMETERS

Percent values

Speed regulator

[87]	Speed P
[88]	Speed I

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Current reg

[89]	Current P
[90]	Current I

Dead time comp

[644]	Voltage comp lim
[645]	Comp slope

Flux regulator

[91]	Flux P
[92]	Flux I

Voltage reg

[1022]	Voltage P
[902]	Voltage I

Base values

Speed regulator

[93]	Speed P base
[94]	Speed I base

Current reg

[95]	Current P base
[96]	Current I base

Flux regulator

[97]	Flux P base
[98]	Flux I base

Voltage reg

[1023]	Voltage P base
[903]	Voltage I base

In use values

[99]	Speed P in use
[100]	Speed I in use

CONFIGURATION

[252]	Main commands
[253]	Control mode
[45]	Speed base value
[321]	Regulation mode
[179]	Full load curr
[675]	Magn ramp time
[413]	Magn boost curr
[412]	Ok relay func
[240]	Switching freq
[713]	Qstp opt code

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Motor spd fbk

[414]	Speed fbk sel
[415]	Encoder 1 type
[416]	Encoder 1 pulses
[1146]	Enc 1 supply vlt
[169]	Encoder 2 pulses
[1054]	Encoder repeat
[649]	Refresh enc 1
[652]	Refresh enc 2
[911]	Enable ind store

Drive type

[333]	Mains voltage
[332]	Ambient temp
[802]	Continuous curr
[331]	Software version

Dimension fact

[50]	Dim factor num
[51]	Dim factor den
[52]	Dim factor text

Face value fact

[54]	Face value num
[53]	Face value den

Prog alarms

Undervoltage

[357]	Latch
[358]	OK relay open
[359]	Restart time
[360]	N of attempts

Overvoltage

[361]	Latch
[362]	OK relay Open

Heatsink sensor

[368]	Activity
[369]	Latch
[370]	OK relay open

Heatsink ot

[1152]	OK relay open

Intake air ot

[1140]	Activity
[1141]	Latch
[1152]	OK relay open

Regulation ot

[1148]	Activity
[1149]	Latch
[1150]	OK relay open

Module overtemp

[1151]	OK relay open

Overtemp motor

[365]	Activity
[366]	Latch
[367]	OK relay open

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External Fault

[354]	Activity
[355]	Latch
[356]	OK relay open

Overcurrent

[363]	Latch
[364]	OK relay open

Output stages

[210]	Latch
[211]	OK relay open

Opt2 failure

[639]	Activity
[640]	OK relay open

Bus loss

[634]	Activity
[633]	Latch
[635]	OK relay open
[636]	Hold off time
[637]	Restart time

Hw opt 1 failure

[386]	Activity
[387]	OK relay open

Enable seq err

[728]	Activity
[729]	Latch
[738]	OK relay open

BU overload

[737]	Activity
[730]	OK relay open

[319]	Device address
[408]	Ser answer delay
[85]	Pword1

I/O CONFIG.

Analog outputs

Analog output 1

[66]	Select output 1
[62]	Scale output 1

Analog output 2

[67]	Select output 2
[63]	Scale output 2

Analog output 3

[68]	Select output 3
[64]	Scale output 3

Analog output 4

[69]	Select output 4
[65]	Scale output 4

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Analog inputs

Analog input 1

[70]	Select input 1
[295]	An in 1 target
[71]	Input 1 type
[389]	Input 1 sign
[72]	Scale input 1
[73]	Tune value inp 1
[259]	Auto tune inp 1
[792]	Input 1 filter
[1042]	Input 1 compare
[1043]	Input 1 cp error
[1044]	Input 1 cp delay
[74]	Offset input 1

Analog input 2

[75]	Select input 2
[296]	An in 2 target
[76]	Input 2 type
[390]	Input 2 sign
[77]	Scale input 2
[78]	Tune value inp 2
[260]	Auto tune inp 2
[79]	Offset input 2

Analog input 3

[80]	Select input 3
[297]	An in 3 target
[81]	Input 3 type
[391]	Input 3 sign
[82]	Scale input 3
[83]	Tune value inp 3
[261]	Auto tune inp 3
[84]	Offset input 3

Digital outputs

[145]	Digital output 1
[146]	Digital output 2
[147]	Digital output 3
[148]	Digital output 4
[149]	Digital output 5
[150]	Digital output 6
[151]	Digital output 7
[152]	Digital output 8
[629]	Relay 2

Digital inputs

[137]	Digital input 1
[138]	Digital input 2
[139]	Digital input 3
[140]	Digital input 4
[141]	Digital input 5
[142]	Digital input 6
[143]	Digital input 7
[144]	Digital input 8

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Encoder inputs

[1020]	Select enc 1
[1021]	Select enc 2
[415]	Encoder 1 type
[416]	Encoder 1 pulses
[169]	Encoder 2 pulses
[649]	Refresh enc 1
[652]	Refresh enc 2

ADD SPEED FUNCT

[388]	Auto capture

Adap spd reg

[181]	Enable spd adap
[182]	Sel adap type
[183]	Adap reference
[184]	Adap speed 1
[185]	Adap speed 2
[186]	Adap joint 1
[187]	Adap joint 2
[188]	Adap P gain 1
[189]	Adap I gain 1
[190]	Adap P gain 2
[191]	Adap I gain 2
[192]	Adap P gain 3
[193]	Adap I gain 3

Speed control

[101]	Spd threshold +
[102]	Spd threshold -
[103]	Threshold delay
[104]	Set error
[105]	Set delay

Speed zero

[107]	Speed zero level
[108]	Speed zero delay

FUNCTIONS

Motor pot

[246]	Enab motor pot
[-]	Motor pot oper
[248]	Motor pot sign
[249]	Motor pot reset

Jog function

[244]	Enable jog
[-]	Jog operation
[375]	Jog selection
[266]	Jog reference

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Multi speed fct

[153]	Enab multi spd
[208]	Multi speed sel
[154]	Multi speed 1
[155]	Multi speed 2
[156]	Multi speed 3
[157]	Multi speed 4
[158]	Multi speed 5
[159]	Multi speed 6
[160]	Multi speed 7

Multi ramp fct

[243]	Enab multi rmp
[202]	Multi ramp sel

Ramp 0

Acceleration 0

[659]	Acc delta speed 0
[660]	Acc delta time 0
[665]	S acc t const 0

Deceleration 0

[661]	Dec delta speed 0
[662]	Dec delta time 0
[666]	S dec t const 0

Ramp 1

Acceleration 1

[23]	Acc delta speed 1
[24]	Acc delta time 1
[667]	S acc t const 1

Deceleration 1

[31]	Dec delta speed 1
[32]	Dec delta time 1
[668]	S dec t const 1

Ramp 2

Acceleration 2

[25]	Acc delta speed 2
[26]	Acc delta time 2
[669]	S acc t const 2

Deceleration 2

[33]	Dec delta speed 2
[34]	Dec delta time 2
[670]	S dec t const 2

Ramp 3

Acceleration 3

[27]	Acc delta speed 3
[28]	Acc delta time 3
[671]	S acc t const 3

Deceleration 3

[35]	Dec delta speed 3
[36]	Dec delta time 3
[672]	S dec t const 3

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Stop control

[626]	Stop mode
[627]	Spd 0 trip delay
[630]	Jog stop control

Speed draw

[1017]	Speed ratio
[1018]	Spd draw out (d)
[1019]	Spd draw out (%)

Motor setup

[943]	Mot setup sel
[941]	Copy mot setup
[942]	Actual mot setup

Overload contr

Ovld mot control

[656]	Motor cont curr
[657]	Trip time 50%

Ovld drv control

[655]	I_sqrt_t_accum

Brake unit

[736]	Enable BU
[740]	BU ovld time
[741]	BU duty cycle
[801]	BU DC vlt

Pwr loss stop f

[1083]	PL stop enable
[1082]	PL stop t limit
[1080]	PL stop acc
[1081]	PL stop dec
[1084]	PL stop vdc ref
[1087]	PL time-out
[1085]	PL stop I Gain
[1086]	PL stop P Gain
[1088]	PL stop active
[1089]	PL active limit
[1090]	PL next active
[1091]	PL next factor
[1093]	PL time-out sig
[1094]	PL time-out ack
[1092]	PL mains status

SPEC FUNCTION

Test generator

[58]	Gen access
[59]	Gen frequency
[60]	Gen amplitude
[61]	Gen offset

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[435]	Enable rr adap
[256]	Save parameters
[258]	Load default
[235]	Life time
[-]	Failure register
[262]	Failure reset
[263]	Failure reg del

DC braking

[904]	DC braking mode
[905]	Brk time @ stop
[717]	DC braking curr
[716]	DC braking delay

Links

Link 1

[484]	Source
[485]	Destination
[486]	Mul Gain
[487]	Div Gain
[488]	Input max.
[489]	Input min.
[490]	Input offset
[491]	Output offset
[492]	Input absolute

Link 2

[553]	Source
[554]	Destination
[555]	Mul Gain
[556]	Div Gain
[557]	Input max
[558]	Input min
[559]	Input offset
[560]	Output offset
[561]	Input absolute

Pad parameters

[503]	Pad 0
[504]	Pad 1
[505]	Pad 2
[506]	Pad 3
[507]	Pad 4
[508]	Pad 5
[509]	Pad 6
[510]	Pad 7
[511]	Pad 8
[512]	Pad 9
[513]	Pad 10
[514]	Pad 11
[515]	Pad 12
[516]	Pad 13
[517]	Pad 14
[518]	Pad 15
[519]	Bitword Pad A
[536]	Bitword Pad B

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OPTIONS

Option1

	Menu

PDC config

PDC inputs

[1095]	PDC in 0
[1096]	PDC in 1
[1097]	PDC in 2
[1098]	PDC in 3
[1099]	PDC in 4
[1100]	PDC in 5

PDC outputs

[1101]	PDC out 0
[1102]	PDC out 1
[1103]	PDC out 2
[1104]	PDC out 3
[1105]	PDC out 4
[1106]	PDC out 5

Virt dig in

[1107]	Virt dig in 0
[1108]	Virt dig in 1
[1109]	Virt dig in 2
[1110]	Virt dig in 3
[1111]	Virt dig in 4
[1112]	Virt dig in 5
[1113]	Virt dig in 6
[1114]	Virt dig in 7
[1115]	Virt dig in 8
[1116]	Virt dig in 9
[1117]	Virt dig in 10
[1118]	Virt dig in 11
[1119]	Virt dig in 12
[1120]	Virt dig in 13
[1121]	Virt dig in 14
[1122]	Virt dig in 15

Virt dig out

[1123]	Virt dig out 0
[1124]	Virt dig out 1
[1125]	Virt dig out 2
[1126]	Virt dig out 3
[1127]	Virt dig out 4
[1128]	Virt dig out 5
[1129]	Virt dig out 6
[1130]	Virt dig out 7
[1131]	Virt dig out 8
[1132]	Virt dig out 9
[1133]	Virt dig out 10
[1134]	Virt dig out 11
[1135]	Virt dig out 12
[1136]	Virt dig out 13
[1137]	Virt dig out 14
[1138]	Virt dig out 15

Option2

	Menu
[425]	Enable OPT2

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PID

[769]	Enable PI PID	
[770]	Enable PD PID	

PID source

	[786]	PID source
	[787]	PID source gain
[758]	Feed-fwd PID	

PID references

	[759]	PID error
	[763]	PID feed-back
	[762]	PID offs. sel
	[760]	PID offset 0
	[761]	PID offset 1
	[1046]	PID acc time
	[1047]	PID dec time
	[757]	PID clamp

PI controls

	[765]	PI P gain PID %
	[764]	PI I gain PID %
	[695]	PI steady thr
	[731]	PI steady delay
	[793]	P init gain PID %
	[734]	I init gain PID %
	[779]	PI central v sel
	[776]	PI central v 1
	[777]	PI central v 2
	[778]	PI central v 3
	[784]	PI top lim
	[785]	PI bottom lim
	[783]	PI integr freeze
[771]	PI output PID	
[418]	Real FF PID	

PD controls

	[768]	PD P gain 1 PID
	[766]	PD D gain 1 PID
	[788]	PD P gain 2 PID
	[789]	PD D gain 2 PID
	[790]	PD P gain 3 PID
	[791]	PD D gain 3 PID
	[767]	PD D filter PID
[421]	PID output PID	
[772]	PID out.sign PID	
[774]	PID output	

PID target

	[782]	PID target
	[773]	PID out scale

Diameter calc

	[794]	Diameter calc
	[795]	Positioning spd
	[796]	Max deviation
	[797]	Gear box ratio
	[798]	Dancer constant
	[799]	Minimum diameter

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DRIVECOM

[57]	Malfunction code
[55]	Control-Word
[56]	Status word
[44]	Speed input var
[115]	Speed ref var
[119]	Act speed value

Speed amount

[1]	Speed min amount
[2]	Speed max amount

Speed min/max

[5]	Speed min pos
[3]	Speed max pos
[6]	Speed min neg
[4]	Speed max neg

Acceleration

[21]	Acc delta speed
[22]	Acc delta time

Deceleration

[29]	Dec delta speed
[30]	Dec delta time

Quick stop

[713]	QStp opt code
[37]	QStp delta speed
[38]	QStp delta time

Face value fact

[54]	Face value num
[53]	Face value den

Dimension fact

[50]	Dim factor num
[51]	Dim factor den
[52]	Dim factor text

[45]	Speed base value
[46]	Speed input perc
[116]	Percent ref var
[120]	Act percentage

SERVICE

[86]	Password 2

ai5020-r

5.3. Start Up

WARNING! The safety instructions, danger warnings and technical data in the previous section of this manual must be observed!

CONVENTIONS Positive speed is clockwise rotation seen from the motor shaft end.

Negative speed is counterclockwise rotation seen from the motor shaft end.

Positive torque is torque in clockwise direction seen from the motor shaft end.

Negative torque is torque in counterclockwise direction seen from the motor shaft end.

These conventions are listed for reference. Actual rotation directions depend on mechanical configuration.

5.3.1 Pre Power Checks

5.3.1.1 Setting Jumpers and Switches

Review all jumper and switch positions on Power board and Regulation board of the Drive (see table 4.3.1.2 on chapter 4.3.1,).

- **Analog inputs 1,2,3**

Analog input (voltage type) 0...10V / -10...+10V	Jumper S8/S9/S10=OFF
Analog Input (current type) 0...20mA / 4...20mA	Jumper S8/S9/S10=ON

- **RS485 Termination resistors**

First and last drop of the net	Jumper S5/S6=ON
Other drive of the net	Jumper S5/S6=OFF

When using the 6KCV300CTI RS232/RS485 converter PC interface, refer to the “CTI” instruction book.

For initial tune up it is recommended to disconnect any DGF or SBI (LAN card).

5.3.1.2 Checking the Wiring and Auxiliary Voltages

The following should be checked before powering the drive:

- **Grounds/grounding** Verify an AC power ground wire from the incoming power / isolation transformer to the AV-300i input ground terminal.

  Verify the ground lead of the AV-300i output terminal is wired to the motor, or the motor is properly grounded .

  Verify the AC input leads, AC output leads, and control wiring to and from the drive terminals are not grounded.(Remember that the 0V terminal may be intentionally grounded).

- **Meggering** When meggering the power cables, they must be disconnected or isolated from the AV-300i drive to prevent drive damage.

- **Connections** Double check all connections to make sure they are tight. Verify each connection is wired per wiring diagrams, and are appropriate for the current and voltage levels specified.

Terminals	Description
U1, V1, W1, PE1 (ground)	3 phase AC input 575 VAC
U2, V2, W2, PE2 (ground)	3 phase AC output to motor, wire to the motor according to motor rotation.
C,D	internal DC power terminals, *DB units or external capacitors are wired to these terminals*
BR1	external braking resistor connection
26 & 27	command for external DB unit. (if used)
78 & 79	low voltage connection for motor thermistor (type DIN44081 or DIN 44082) when using a motor thermistor, remove the 1 K resistor *if motor klixon is used for this protective function, it must be wired in series with a 1 K resistor to these terminals*
80 & 82	OK relay, normally open dry contact, good for a maximum of 250 VAC, 1 A
83 & 85	relay 2, normally open dry contact, good for a maximum of 250 VAC, 1 A programmable functionality

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Table 5.3.1.2.1 : Terminals description

Regulation terminals

1,2 = analog input 1; 3,4 = analog input 2; 5,6 = analog input 3
7 = + 10 V; 8 = -10V; 9 = common;
12 = enable; 13 = start; 14 = fast stop;
15 = external fault; 18 = common for 24 V power supply; 19 = + 24 VDC (internal)

16 = common point for terminals 12 through 15, terminals 36 through 39, terminal 41 and terminal 42.
XS = 9 pin serial port for PC tools, use 6KCV300CTI (or equivalent) from PC to drive
XE (ENC1) 15 pin sinusoidal/digital encoder input

Amps/Volts ratio on Current Test point XY4 / XY5

Drive size	Hall CT ratio / (n. turns x burden resistor ohms x ampl.gain)				
3002	500 / (1 x 102 x 1)	= 4.90	**3040**	1000 / (1 x 15.8 x 1)	= 63.3
3003	500 / (1 x 86.6 x 1)	= 5.77	**3050**	1000 / (1 x 13.7 x 1)	= 73.0
3005	500 / (1 x 56.2 x 1)	= 8.9	**3060**	1000 / (1 x 11 x 1)	= 90.1
3007	1000 / (1 x 73.2 x 1)	= 13.7	**3075**	1000 / (1 x 9.5 x 1)	= 105.3
3010	1000 / (1 x 57.6 x 1)	= 17.4	**3100**	2000 / (1 x 14.3 x 1)	= 139.9
3015	2000 / (1 x 84.5 x 1)	= 23.7	**3125**	2000 / (1 x 11 x 1)	= 181.8
3020	2000 / (1 x 64.9 x 1)	= 30.8	**3150**	2000 / (1 x 10 x 1)	= 200.0
3025	2000 / (1 x 56.2 x 1)	= 35.6	**3200**	2000 / (1 x 7.15 x 1)	= 279.7
3030	2000 / (1 x 44.2 x 1)	= 45.3			

aI54122ge

Table 5.3.1.2.2: Amps/Volts ratio

Example: 3002 size, 1V = 4.90 A (peak current), Amps rms = Amps peak x 2^(1/2)

- Record motor nameplate data, encoder information, gearbox and mechanical data.

MOTOR DATA

HP (kW)		Cos phi (power factor)	
Amps		Tach type	
Volts		Tach PPR	
Hz		Motor rotation for machine fwd direction [CW/CCW]	
Rpm		Gearbox ratio	

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CAUTION! **The following is not permissible:**

- Operating a capacitive load on the Drive

- Connecting an external voltage source to the output side of the Drive

- Bridging the output side of the AV-300i directly to AC power (bypass). If the drive is to be bypassed, the motor must be disconnected from the Drive before the bypass contactor is closed.

5.3.2 Power Up Checks

- **Check drive power supplies from the appropriate terminals:**
  Terminal 7 = + 10 V (0V to terminal 9)
  Terminal 8 = - 10 V (0V to terminal 9)
  Terminal 19 = + 24 ... 30 V (0V to terminal 18)
- **Verify hardwired stop and enable controls are operational**
- **Check DC link voltage (DC link** parameter in **Monitor/Measurement** menu**):**
  The value should be: 730 to 890 VDC for 575 VAC input
  The DC link will read higher after the drive is enabled, and even higher if the drive is braking the motor.
  Refer to troubleshooting section for different voltage levels.

5.3.2.1 Basic Settings of the Drive for all the Regulation Modes

NOTE! These instructions assume the drive has the default configuration. The default setting can be loaded via the Load default command in the SPEC FUNCTIONS menu. Executing this command means that all modifications previously carried out by a user will be overwritten.

If the Save parameters command is executed after executing Load default command previous setting are lost. If Save parameters command is not entered, the original values stored by the user are loaded again after switching off and on the drive.

The defaults also assume that a four-pole motor with a rating that complies with the rated values of the AV-300i drive is used. Other motor can be used by entering their motor data via the “DRIVE PARAMETER / Motor plate data” menu. The rated values of the motor are entered here to ensure optimum regulation for the motor concerned.

- **Drive must be disabled to enter configuration data.**

See sections 5.1.1, “LEDs” and section 5.1.2, “Moving inside a menu” for information on operating the keypad.

- **Set AC Input voltage**
  This setting is carried out via the **Mains voltage** parameter in the “Drive type” submenu of the BASIC MENU. Select the AC Input voltage wired to the drive .

NOTE! If the “Undervoltage” alarm is activated when the device is switched on for the first time, this can be acknowledged by pressing the **Escape** key.

- **Regulation mode**

  This setting is carried out via the **Regulation mode** parameter in the BASIC MENU.

  Select “Field oriented”, “Sensorless vect” or “V/f control” mode.

- **Base for speed related values**

  Setting **Speed base value** in the BASIC MENU

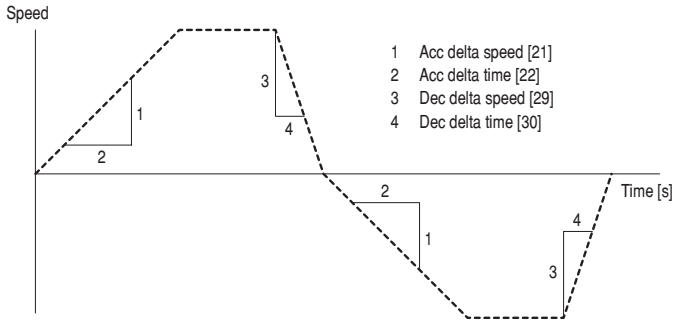
  This value determines the rpm speed ref with max. signal (e.g. 10 V) present at the analog input.

  This value also defines the basis for percentage values of speed related quantities (range is +/- 200%)

- **Ramp time**

  This setting is carried out via **Acc delta speed**, **Acc delta time**, **Dec delta speed** and **Dec delta time** parameters in the BASIC MENU.

  The interrelationship of these parameters is illustrated in the following diagram. If the maximum possible speed is entered for **Acc delta speed** and **Dec delta speed**, the times correspond to the ramp times from zero to maximum speed and vice versa.



- **Speed reference**

NOTE! In the standard drive configuration, **Ramp ref 1** reference value is set with an analog value via terminals 1 and 2. To set the reference value via the keypad or the PC software, **Ramp ref 1** is then setted from an analog input,

or:

Set parameter “**Select input 1** (2 or 3)” in OFF condition or in a different configuration of **Ramp ref 1**

Setting **Ramp ref 1** in the BASIC MENU

Select the reference value required. The sign determines the rotation direction of the drive. Entry via keypad: the reference value is not active until the entry is confirmed by pressing **Enter**.

- **Current limitation**

  Setting in the BASIC MENU with **T current lim +** and **T current lim -**

  T current lim + = positive limit (clockwise drive and counterclockwise braking)

  T current lim - = negative limit (counterclockwise drive and clockwise braking)

  The default maximum value corresponds to total current = 1.36 continuous current

- **Saving setting**

  Use **Save parameters** in BASIC MENU

  Parameters must be saved so that the entered values are read the next time the device is switched on.

  When using the keypad: press **Enter**

5.3.2.2. Setting Motor Parameters

The AV-300i drive is factory set for use with 4-pole standard motors, either for 400V or 460V, to be operated up to the nominal speed. Enter nameplate data recorded for the connected motor to ensure satisfactory performance.

Proper nameplate data is required for "**Field Oriented**" and "**Sensorless**" modes. For "**V/f control**" mode they are not. However, they are recommended for a better current limit control.

When using **V/f control** to operate multiple motors in parallel on the same drive, better result are obtained with motor similar or equal to each other.

• MOTOR NAMEPLATE SPECIFICATIONS (Mot plate data menu**)**

- Set the rated voltage of the motor via the **Nominal voltage** parameter. Ensure the voltage is specified according to the circuit connection (star or delta). (Location: **Drive parameters/Mot plate data/Nominal voltage**)
- Set the nominal speed (rated full load speed) in accordance with the nameplate specification via the **Nominal speed** parameter. (Location: **Drive parameters/Mot plate data/Nominal speed**)
- Set the nominal frequency of the motor in accordance with the nameplate specification of the motor via the **Nom frequency** parameter. (Location: **Drive parameters/Mot plate data/Nom frequency**)
- Set the nominal current (rated full load amps) of the motor via the **Nominal current** parameter. Ensure that the current is specificied according to the circuit connection (star or delta). (Location: **Drive parameters/ Mot plate data/Nominal current**)

  In case of "**V/f control**" mode with multiple motors enter a value equal to the sum of **Nominal current** of all the motors.
- Set Cos phi (power factor) as per motor nameplate via the **Cos phi** parameter. (Location: **Drive parameters/ Mot plate data/Cos phi**)

- VOLTAGE/FREQUENCY CHARACTERISTIC, "BASE" OPERATING POINT

The parameters **Base voltage** (location: **Drive parameters/Mot plate data/Base voltage**) and **Base frequency** (location: **Drive parameters/Mot plate data/Base frequency**) determine the degree of flux in the motor and the frequency where the field weakening range begins. The assignment of values to these parameters can be carried out according to the indications and the examples shown in the section "Motor plate data" .

NOTE! The operating level of the magnetic flux of the motor must not exceed the value corresponding to the nominal operating condition. This means that the ratio Base voltage to Base frequency must not exceed the ratio Nominal voltage to Nominal frequency.

When Base voltage is very close to or above to the Mains Voltage, in the field weakening range the dynamic behaviour of the drive is influenced by parameter "Dynamic vlt margin" (menu LIMITS\Voltage limits).

- Enter the basic frequency via the **Base frequency** parameter.
- Enter the base voltage via the **Base voltage** parameter.
- Finally enter **Take motor par** to enable computation of normalization factors and estimate values for parameters in the "Motor parameter" submenu.

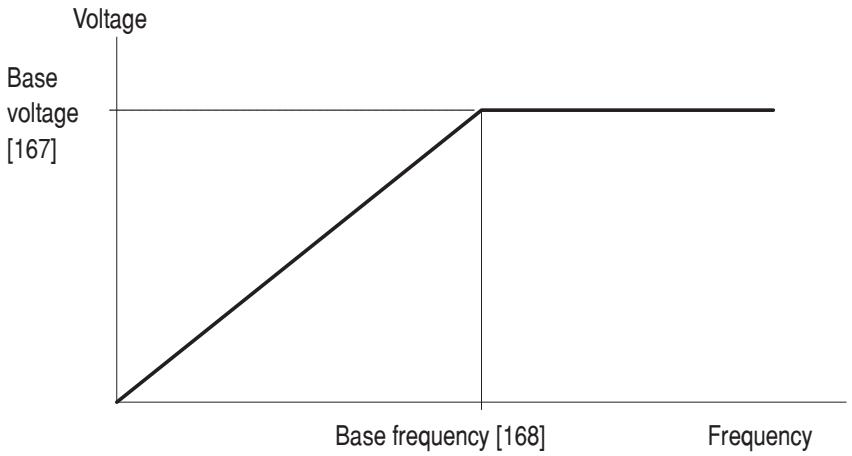


Figure 5.3.2.1.1: Voltage / frequency characteristics

In case of "**V/f control**", it is possible to select the shape of V/f characteristic:

Charateristics	Type of drive
Type 0 ($V = K * f^{1.0}$)	Constant torque requirement across the whole speed range
Type 1 ($V = K * f^{1.5}$)	Mixed load between types 0 and 3
Type 2 ($V = K * f^{1.7}$)	Mixed load between types 0 and 3
Type 3 ($V = K * f^{2.0}$)	Load where the torque is proportional to the speed squared, e.g. fans and certain types of pump

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- **MAGNETIZING CURRENT, ROTOR RESISTANCE, STATOR RESISTANCE AND LEAKAGE INDUCTANCE**

These values are not normally stated on the nameplate of the motor, although they are very important for the behavior of the drive. If you have obtained detailed specifications from the manufacturer, enter them in place of estimates computed from the nameplate motor data (**Take motor par** command).

NOTE! In case the command **Take motor par** is reentered, these parameters will be overwritten.

- Save the setting using **Save parameters** in BASIC MENU.

5.3.2.3. Verify Speed Feedback Setup and Encoder Polarity (Field Oriented Mode)

A tachometer is required to run the drive in field oriented (vector) regulation.

First, note the tachometer rotation direction (for example: A leads B when tach is turned CCW with respect to the motor shaft), and the direction of the desired motor rotation.

Verify the tach wiring to the drive is correct, and the tach is fed the appropriate voltage from the drive or separate power supply.

15 pin female connector XE (for a sinusoidal or digital encoder)

Encoder type	Shielded cable	XE CONNECTOR PIN														
		1 B-	2 +8V	3 C+	4 C-	5 A+	6 A-	7 0V	8 B+	9 +5V	10 E+	11 E-	12 F+	13 F-	14 G+	15 G-
Internal +5V Encoder Power Supply																
DE	8 pole	●		●	●	●	●	●	●	●						
SE	8 pole	●		●	●	●	●	●	●	●						
SESC	12 pole	●		●	●	●	●	●	●	●	●	●	●	●		
DEHS	14 pole	●		●	●	●	●	●	●	●	●	●	●	●	●	●
SEHS	14 pole	●		●	●	●	●	●	●	●	●	●	●	●	●	●
Internal +8V Encoder Power Supply																
DE	8 pole	●	●	●	●	●	●	●	●							
SE	8 pole	●	●	●	●	●	●	●	●							
SESC	12 pole	●	●	●	●	●	●	●	●		●	●	●	●		
DEHS	14 pole	●	●	●	●	●	●	●	●		●	●	●	●	●	●
SEHS	14 pole	●	●	●	●	●	●	●	●		●	●	●	●	●	●

ai3160

Jumpers setting

Encoder / Jumpers setting	S11	S12	S13	S14	S15	S16	S17	S18	S19	S20	S21	S22	S23
DE	OFF	OFF	OFF	OFF	OFF	OFF	ON (*)	-	-	-	-		
SE	ON	ON	ON	ON	ON	ON	-	-	-	-	-		
SESC	ON	ON	ON	ON	ON	ON	-	A	A	A	A	A	A
DEHS	OFF	OFF	OFF	OFF	OFF	OFF	ON (*)	B	B	B	B	B	B

ai3150

- **DE**: 5V digital incremental encoder with A / $\overline{A}$, B / $\overline{B}$, C / $\overline{C}$
- **SE**: 5V sinusoidal incremental encoder with A / $\overline{A}$, B / $\overline{B}$, C / $\overline{C}$
- **DEHS**: 5V digital incremental encoder with A / $\overline{A}$, B / $\overline{B}$, C / $\overline{C}$ and three Hall sensor digital position signals (for AC Brushless motors)
- **SESC**: 5V sinusoidal incremental encoder with A / $\overline{A}$, B / $\overline{B}$, C / $\overline{C}$ and and two sin/cos traces for absolute position (for AC Brushless motors or positioning)

(*) If the encoder is not provided with the zero channel S17=OFF

- The AV-300i must be disabled and not be in start.
- Enter parameters for tachometer setup:
  - CONFIGURATION\Motor speed feedback\Speed fbk sel\Encoder 1 or Encoder 2, **Enter**
  - CONFIGURATION\Motor speed feedback\Encoder 1 type\ sinusoidal or digital, **Enter**
  - CONFIGURATION\Motor speed feedback\Encoder 1 pulses\ PPR, **Enter**
- Set Regulation mode to **V/f control mode** (default).
- Enable and Run the Drive in forward direction with a positive speed reference.
- Select **Enc 1 speed parameter** (MONITOR/Measurement/Speed/Speed in rpm menu):
  - *Turn the motor shaft clockwise (view facing the shaft). The value indicated must be positive.*
  - *If the value does not change or if random values are shown, check the encoder power supply and the encoder connection.*
  - *If the displayed value is negative, reverse encoder terminals. Channel A+ and A- or B+ and B-*
- Set Regulation mode to **Field oriented** mode.
- Save the setting using Save parameters in BASIC MENU.

The drive is now setup and ready to continue with final commissioning and tune up.

5.3.3. Self Tuning

NOTE! In order to execute any of the self-tuning procedure (1, 2a or 2b, 3), Main commands must be set as Digital and ENABLE input (terminal 12) must be driven high (+24V).

If this setting is omitted you will be prompted by the message “Set main cmd = Dig”.

It is not necessary to set parameters Enable drive = Enable neither Regulation mode = Self-tuning, because they will be automatically set by the drive and reset at the end of the self-tuning execution.

- **Self tuning procedure is divided in three parts:**

The first part, “**Self-tune 1**”, identifies the voltage compensation parameters, stator and rotor resistances, and leakage inductance. Then it computes appropriate gains for current controllers, according to the “optimum module” algorithm.

“Self- tune 1” is executed without motor shaft rotation.

The second part identifies the magnetizing curve of the motor, that is parameters for the shape of saturation curve and the magnetizing current of the motor at nominal point.

The self tune computes appropriate gains for flux and voltage regulators. The second part is available in two versions, “**Self-tune 2a**” and “**Self-tune 2b**”.

- “Self-tune 2a” requires free shaft rotation at 50% rated motor speed (the shaft must be uncoupled from the load).
- If free shaft rotation is not possible, “Self-tune 2b” can be used because it is executed with the motor at standstill.

“Self-tune 2a” provide results with a better accuracy, therefore it should be used whenever possible.

The third part, speed regulator tuning, identifies the total Inertia value at the motor shaft ($Kg*m^2$), the friction value (or Loss compensation) in N*m and computes the Proportional and Integral gains of the speed regulator.

For the motor chosen, it is necessary to take into account the following limits:

- **Nominal current [164] parameter can not be set to a value lower or equal to 0.3 x I_{2N} (I_{2N} = drive nominal current-class 1 at 400V)**
- **Magnetizing current [165] parameter must not result higher than I_{CONT} (drive continuative current).**

TO EXECUTE PART 1, enter DRIVE PARAMETER\Motor parameter\Self-tuning\Self-tune 1.

Start execution by entering “Start part 1”, **Enter.**

The procedure takes a few minutes, and can be interrupted by either powering the AV-300i off or pressing the **Escape** button.

You may hear some buzzing noise from the motor during the execution.

The progress of the activity is reported with messages “Measuring xxx”

At the beginning of “Self-tune 1” a sudden, short rotation may occurr due to parasitic torque related to slot alignment between stator and rotor.

Results of the identification may be unreliable, or identification may fail with some “xxx range error” or “timeout” message. Repeat execution. Usually this problem disappears after the first trial. If shaft rotation is persistent, it is necessary to lock the rotor in order to get reliable results.

“ xxx range error” or “Timeout” messages may also occur in some extreme parameter ranges (see section 6.4.2.1, “Self-tuning”). Repeat execution in this case. If error messages are persistent, manual tuning procedures (following section) should be used.

After self tuning is done, new identified parameter values ("Nw" suffix) can be compared with values prior to the identification by browsing the subsequent menu entries. New parameters can be accepted all together by entering "**Take val part 1**". In this case prior values are overwritten. "Self-tune 1" can be repeated, whether values from the previous trial have been accepted or not.

NOTE! "Take val part 1" does not store values in non-volatile memory, so values are lost if inverter power is cycled off and on. You need to enter **Save parameters** in the BASIC MENU or SPEC FUNCTIONS menu to permanently store values.

TO EXECUTE "Self-tune 2a", enter menu DRIVE PARAMETER\Motor parameter\Self-tuning\Self-tune2a. Start execution by entering "Start part 2a", **Enter.**

The procedure takes a few minutes, and can be interrupted by either powering the AV300i off or pressing the **Escape** button.

Progress of activity is indicated by the message "Measuring sat2a".

WARNING! The motor shaft will rotate up to 50% rated speed in part 2a of the identification.

NOTE! The shaft must be free to rotate uncoupled from the load, otherwise results may be completely unreliable.

In case of extreme parameter ranges, a timeout message may occurr. Repeat execution in this case. If an error message is persistent, keep default values for parameters **P1 flux model** and **P2 flux model**, and use the manual tuning procedure for Magnetizing current (see section "Checking and manual tuning of Magnetizing current").

After self tuning is done, new values can be compared with the previous ones like in part 1. New parameters supersede the previous ones if "**Take val part 2a**" is entered.

NOTE! "Take val part 2a" does not store values in non-volatile memory, so values are lost if inverter power is cycled off and on. You need to enter Save parameters in the BASIC MENU or SPEC FUNCTIONS menu to permanently store values from the procedure.

"Self-tune 2a" can be repeated, whether values from the previous trial have been accepted or not.

If free shaft rotation is not possible, "**Self-tune 2b**" provides an alternative identification technique that does not require shaft rotation. The menu is DRIVE PARAMETER\Motor parameter\Self-tuning\Self-tune 2b.

Operation and meaning of parameters are the same as "Self-tune 2a", replacing "2b" suffix for "2a".

Magnetizing current [165] parameter must not result higher of the I_{CONT} (Drive continuative output current).

Self tune 3

WARNING! **This procedure requires free rotation of the motor shaft coupled to the load. Start/Stop command is disregarded, therefore it can not be used on drives with limited travel.**

- This procedure is not suitable for use with "hoist" or "elevator" drives.

- It is recommended that any hardwired stop control are operational.

CAUTION ! **The test is performed using the torque limit value set in Test T curr lim parameter. The torque is applied stepwise, with no ramp (profile), therefore the mechanical transmission must not have significant backlash, and it must be compatible with operation at the torque limit set in Test T curr lim parameter. The user can reduce the torque limit to a suitable value via theTest T curr lim parameter.**

NOTE ! **- Application where the system inertia coupled to the motor shaft is much higher than the motor inertia value , increase the Test T curr lim parameter to avoid "Time out" error.**

- Set **Regulation mode** parameter (BASIC MENU) to **Field oriented** or **Sensorless vect** mode (encoder feedback is required when Field oriented mode is selected).

- Set the current limit (BASIC MENU\ T Current lim +/-) to a value compatible with the motor size and load. (Example when motor is 1/3 of the Drive power, the limit should be reduced compared to the default value).

- Set the motor shaft direction: Forward or Reverse via the **Fwd-Rev spd tune** parameter

- Select the torque current value to be used during the test via the **Test T curr lim** parameter

TO EXECUTE PART 3, enter DRIVE PARAMETER\Motor parameter\Self tuning\Self tune 3.

Start execution by entering "**Start part 3**", **Enter.**

The procedure performs an acceleration test at torque limit value set in **Test T curr lim** parameter up to a speed threshold, then a deceleration test with no torque applied (coasting) down to zero speed.

The speed threshold is 33% of the lowest in the following:

- **Speed base value**
- **Motor nominal speed**
- **Base frequency** x 60 / pole pairs (crossover speed)
- **Speed max pos** or **Speed max neg** according to direction of rotation.

The procedure may take a few minutes, depending on inertia and friction values.

Based on inertia and friction values, the drive will calculate the speed loop gains (**Speed P** and **Speed I** parameters).

If self-tuning of speed regulator is not satisfactory, refer to manual tuning procedure in the next section.

After the completion of the **Speed self tune** by the drive, the new identified parameter values ("Nw" suffix) can be compared with values prior to the procedure, by browsing the subsequent menu entries. Parameters in this menu are read only. Editing of individual parameters must be done in their specific menus. New parameters can be accepted all togetheter by entering "**Take val part 3**" after disabling the drive. In this case, prior values are overwritten. "Self tune 3" can be repeated, whether values from the previous trial have been accepted or not.

NOTE! "Take val part 3" does not store values in non-volatile memory, so values are lost if drive power is cycled off and on. You need to enter **Save parameters** in the BASIC MENU or SPEC FUNCTIONS menu to permanently store values in non-volatile memory.

In case of extreme parameter ranges, error messages can occurr. Repeat execution in this case. If the error message is persistent, keep default values and use manual tuning of speed regulator in the following sections.

5.3.3.1 List of Self Tune Error Messages

Generic messages

Description	*Note*
"Drive disabled":	Provide enable input by setting terminal 12 high.
"Not ready":	"**Take values part 1**" or "**Take values part 2a**" or "**Take values part 2b**"or "**Take values part 3**" can not be executed because the measurement has not been completed correctly. Repeat self tune command.
"Time out":	Measurement has not been completed in the proper time.
"Start part…?":	Press **Enter** to confirm start of measurement.
"Tuning aborted":	Measurement aborted by user (**Escape** button has been pressed).
"Set Main cmd=Dig":	Go to CONFIGURATION menu and set **Main commands** = digital.
"Set Ctrl=Local":	Go to CONFIGURATION menu and set **Control mode** = Local.
"Reg mode NOK":	**Self tune part 3** can only be executed **Regulation mode = Field oriented** or **Regulation mode = Sensorless vect**. Go to BASIC MENU and set **Regulation mode** properly.

5.3.3.2 Measurement Error Messages

These messages may occour when extreme parameter values have to be identified. It can be useful to retry the self tune command when any of the following messages occours. If messages persist, alternative manual tuning procedures should be adopted.

Description	*Note*
"No break point"	**Self tune part1** failed. Check integrity of connections between inverter and motor prior to attempt repeating part 1.
"Over speed"	**Self tune part3** detected a a much higher speed than expected. Possible causes are: load causing a speed drift or bad tuning of inner loops when using Sensorless vector mode. Try repeating **Self tune 1** or the corresponding manual tune operations.
"Drive stalled":	Increase value of parameter **Test T curr lim** and repeat **Self tune 3**
"Load applied":	Nominal zero load torque at standstill was detected. **Self tune 3** is impossible for this type of load.
"T curr too high":	Reduce value of parameter **Test T curr lim** for **Self tune 3**
"Friction null":	Value of friction is zero or lower than the accuracy limit of the control system.

5.3.4 Manual Tuning

5.3.4.1 V/F Control Mode

5.3.4.1.1 Magnetizing Current in V/f Control

NOTE! **You may skip this section if Self-tune 2 executed successfully.**

For an accurate current limitation in "**V/f control**" mode it is useful to check the accuracy of magnetizing current by the following procedure:

- Operate the motor between ½ **Nominal speed** and **Nominal speed**, making sure electromechanical resonance areas have been avoided.
- **Magnetizing curr** parameter should be adjusted until **Magn working curr** equals the value read in **Motor current** (see Motor current in the Basic menu).

For "**V/f Control**" mode the following sections are relevant:

- Voltage boost (Sect 6.4.2.3.1)
- Slip Compensation (If Used) (Sect 6.4.2.3.2)
- Current Limit setting (Sect 6.6.2)
- DC Braking current (If Used) (Sect 6.15.9)

5.3.4.1.2 Tuning of Voltage Compensation Parameters

NOTE! **You may skip this section if Self-tune 1 executed successfully.**

The presence of current distortion is shown by an irregular rotation at low speeds (values lower than 2% of the motor rated speed).

- In order to compensate the distortion, monitor the "current U" variable on an analog output. Then operate the drive at a speed equal to 2% of the motor rated speed. The compensation is obtained through the two parameters **Voltage comp lim** and **Comp slope** in the "Dead time comp" menu.

The [Volt] value of **Voltage comp lim** represents the limit value of line voltage used for compensation. The [Volt/Ampere] value of **Comp slope** defines the relation between current and applied compensation voltage value.

5.3.4.2 Sensorless Vect Mode

5.3.4.2.1 Tuning of Voltage Compensation Parameters

NOTE! **You may skip this section if Self-tune 1 executed successfully.**

The presence of current distortion is shown by an irregular rotation at low speeds (values lower than 2% of the motor rated speed).

- In order to compensate the distortion, monitor the "current U" variable on an analog output set. Then operate the drive at a speed equal to 2% of the motor rated speed. The compensation is obtained through the two parameters **Voltage comp lim** and **Comp slope** in the "Dead time comp" menu.

The [Volt] value of **Voltage comp lim** represents the limit value of line voltage used for compensation. The [Volt/Ampere] value of **Comp slope** defines the relation between current and applied compensation voltage value.

5.3.4.2.2 Checking and Manual Tuning of Magnetizing Current

NOTE! **You may skip this section if Self-tune 1 executed successfully.**

- Operate the drive without load at 50% of Base frequency by setting:

$$\text{Ramp ref 1 [rpm]} = \frac{60 \bullet \text{Base frequency} \bullet 0.5}{\text{N. of pole pairs}}$$

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The **Output voltage** parameter in the MONITOR\Measurements menu should indicate a value approximately equal to 50% of Base voltage.

If this is not the case, you should adjust **Magnetizing current** in DRIVE PARAMETER\Motor parameter menu until you obtain the required voltage value.

5.3.4.2.3 Checking and Fine Tuning of Sensorless Parameters

In order to obtain the best setting, the measurement of the motor-shaft rpm is suggested using a hand held tachometer, so that a comparison between the real speed and the internal speed can be performed.

- **Calibration at no load**

- Set a speed reference equal to approx 2/3 of the rated motor speed.

- Check the accuracy of motor speed. This can be optimized by adjusting the value of **Leakage inductance**. If accuracy can not meet the specification, store the value of **Lkg inductance** that minimizes the error and then adjust **Flux curr factor**. With this parameter the error will be recovered.

- Set a speed value equal to approximately 3% of the rated speed. Then observe the error between real motor speed and reference set-point and adjust **Stator resistance** to minimize the error.

In “Stop” conditions, that is zero speed reference, the motor may tend to rotate or, given a “Start” command, the motor may not follow the reference. In either case the **Voltage comp lim** needs to be decreased.

- **Calibration with load applied**

During the normal operation of the drive with load applied, it is possible to calibrate the **Rotor resistance** value. The calibration of **Rotor resistance** will be carried out by observing the real motor speed with load applied. If **Rotor resistance** value is high, the real motor speed will be higher than the reference set-point, and vice-versa.

The **Low speed factor** parameter allows improving the torque to be obtained at a speed equal to approximately. 2% of the rated speed. By increasing the parameter value an increase of the available torque is obtained.

5.3.4.2.4 Manual Tuning of Regulator Loops

The AV-300i drive contains the following closed loop regulators:

- Current regulators for active (Torque) current and reactive (Flux) current. The value of gains are the same for both these regulators.
- Flux regulator (normally requires manual tuning only for applications with field weakening range.
- Speed regulator (Sensorless vect and Field oriented mode)
- Voltage regulator (does not require tuning).

Using the Test generator function

For the tuning of regulators, an internal test generator is used in order to evaluate the step responce of the regulators. This operation requires using a digital scope.

The test generator provides a square-wave signal with an adjustable frequency and amplitude, and an offset. The **Gen access** parameter determines which regulator input the signal is assigned to. Further information on this is provided in section 6.16.1, “Test generator” .

The menu structure to access the regulator gains is REG.PARAMETERS \ Percent value. Base values may be changed to extend the numerical ranges of the gains (REG.PARAMETERS \ Base value).

5.3.4.2.4.1 Manual Tuning of Current Regulator

NOTE! **You can skip this section if Self-tune 1 operated successfully.**

- **Drive disabled**
- Select the following settings for the test generator:
- **Gen access** = F current ref
- **Gen frequency** = 60 Hz
- **Gen amplitude** = 10 %
- **Gen offset** = 60 %
- Prepare current measuring as a direct measurement on regulation card (test point XY4 / XY5).
- Set **Current P** and **Current I** parameters in the REG PARAMETERS / .... menu to 0.00.

NOTE! Voltage saturation may occur during the optimization process (see Figure 5.3.4.1). In this case the value for Gen amplitude and also possibly for Generator offset should be reduced. Take extra care with this effect, especially with motors up to 7.5 kW.

- **Enable drive**
- Increase **Current P** until the reaction time is approximately 1 ms and the overshoot is less than 4 % of the applied step (see Figures 5.3.4.2 to 5.3.4.4)
- Increase **Current I** until the overshoot is greater than 4 %. Then reduce it until it is just smaller than 4% of the applied step (see Figure 5.3.4.5 and 5.3.4.6).
- Stop and disable drive.
- Set **Gen access** = Not connected
- Save setting via **Save parameters** command

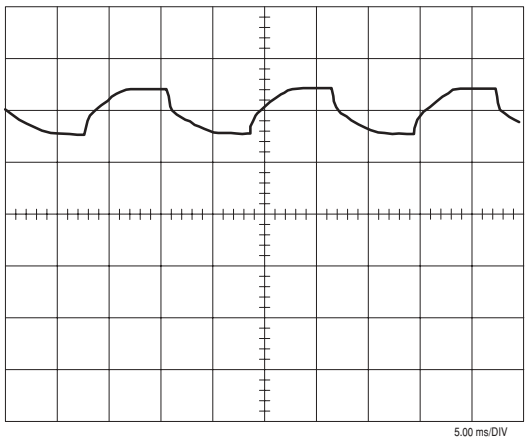


Figure 5.3.4.1: Current in phase U. Voltage reaches saturation: Gen amplitude and possibly Generator offset too high.

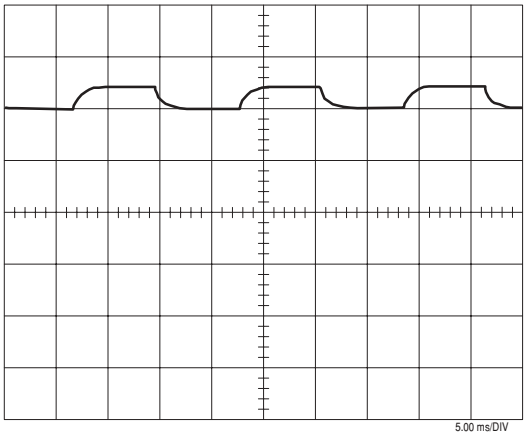


Figure 5.3.4.2: Current in phase U. Current P is too small.

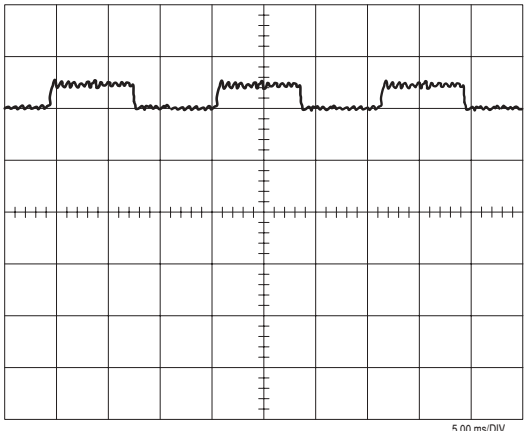


Figure 5.3.4.3: Current in phase U.Current P is too high.

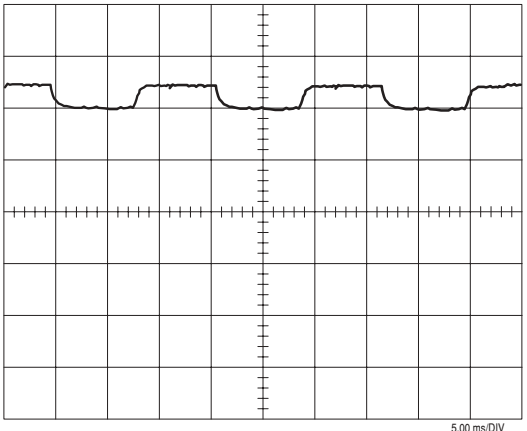


Figure 5.3.4.4: Current in phase U . Current P is set correctly.

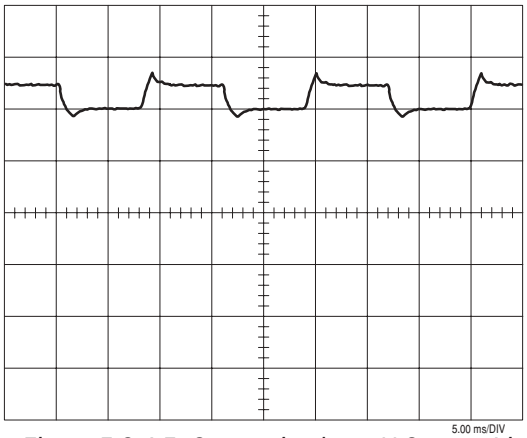


Figure 5.3.4.5: Current in phase U.Current I is too high.

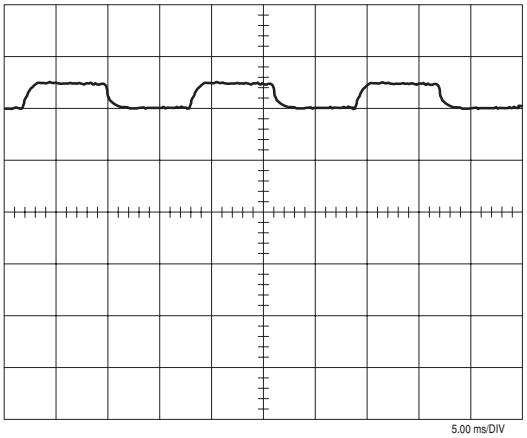


Figure 5.3.4.6: Current in phase U . Current P/I are set correctly.

5.3.4.2.4.2. Manual Tuning of Flux Regulator

NOTE! **This section can be skipped if Self-tune 2a or 2b have been performed successfully.**

If self-tuning has failed or had not been correctly carried out, the manual tuning can be applied.

This operation is usually required only for application with field weakening range.

- **Drive disabled**
- Select the following setting for the test generator:

- Gen access = Flux ref
- Gen frequency = 2 Hz
- Gen amplitude = 10 %
- Gen offset = 20 %

- Measure the actual value via an analog output. Set "**Flux**" to an analog output and "**F current ref**" to a second analog output. (see section 6.13, "I/O Configuration).
- Set **Flux P** and **Flux I** parameters in the REG PARAMETERS / .... to 0.00.
- **Enable the drive** and **start**

  Increase Flux P until the reaction time is approx. 40 ... 60 ms and the overshoot is less than 4 %. Ensure that saturation does not occur to the variable **F current ref** (see Figure 5.3.4.7). If saturation does occur,

- Reduce **Gen amplitude** and/or **Gen frequency**.
- Increase **Flux I** until the overshoot is greater than 4%. Then reduce it until it is just less than 4 % (see Figures 5.3.4.10 and 5.3.4.11).
- Stop the drive and disable.
- Set **Gen access** = Not connected
- Save setting via **Save parameters** command.

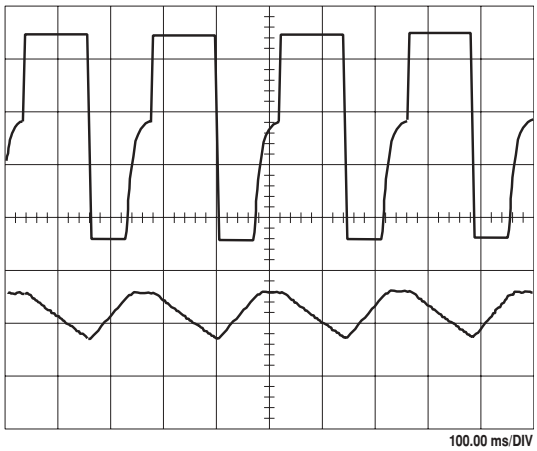


Figure 5.3.4.7: Above, F current ref; below, Flux. Too high amplitude and/or test generator frequency. Decrease both.

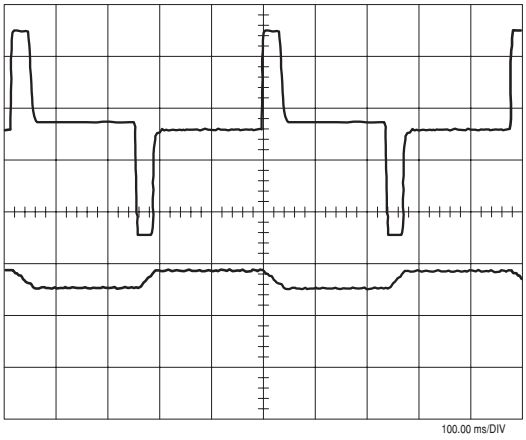


*Figure 5.3.4.8: Above, F current ref; below, Flux. **Flux P** is too high*

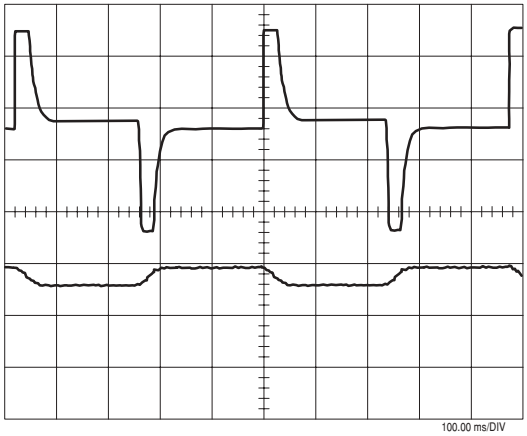


*Figure 5.3.4.9: Above; F current ref; below, Flux. **Flux P** set correctly.*

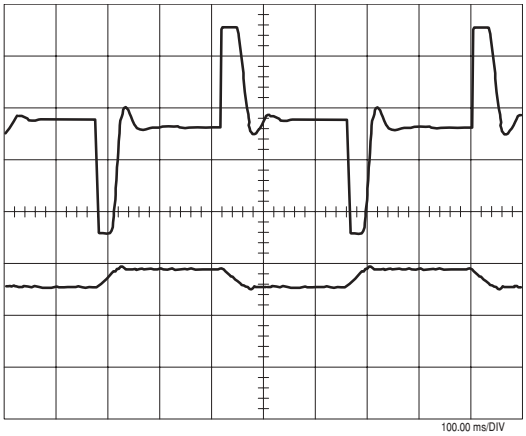


*Figure 5.3.4.10: Above, F current ref; below,Flux. **Flux I** is too high.*

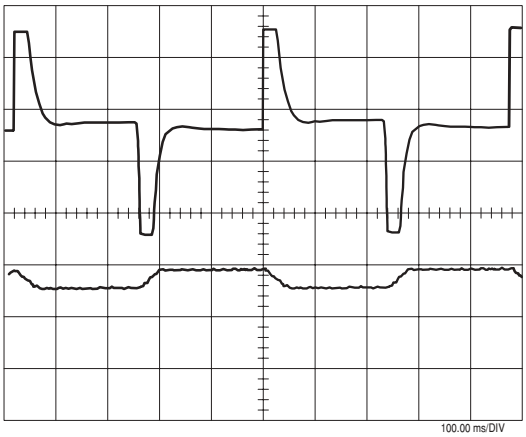


*Figure 5.3.4.11: Above, F current ref; below, Flux. **Flux P** are **Flux I** are set correctly.*

5.3.4.2.4.3. Manual Tuning the Speed Regulator

- **Drive disabled**
- Select the following settings for the test generator (high inertial loads may require different setting):

- **Gen access** = Ramp ref
- **Gen frequency** = 0.2 Hz
- **Gen amplitude** = 10 %
- **Gen offset** = 10 %

- Measure the actual value via an analog output. For this the **Actual speed** variable must be assigned to an analog output and the **Torque current** variable to a second analog output (see section 6.13, “I/O Configuration).
- Set the **Acc delta speed** parameter in the BASIC MENU to the highest possible value and the **Acc delta time** parameter to 1 s.
- If possible set the deceleration via **Dec delta speed** and **Dec delta time** in the same way. This is normally only possible with loads with a very low intertia or when using a braking unit. Otherwise the values should be set so that there is no overvoltage alarm when the motor is regenerating.
- Set the **Speed P** and **Speed I** parameters in the REG PARAMETERS / .... menu to 0.00.
- **Enable the drive** and **start**
- Increase **Speed P** until the overshoot is less than 4 % with a short reaction time of the drive.
- Increase the **Speed I** parameter until the overshoot is greater than 4 %.

  Then reduce it until it is less than 4 %.
- Stop and disable the drive.
- Set **Gen access** = Not connected
- Save setting via **Save parameters** command.

NOTE! If the ripple level on the estimated speed is significant, it is possible to attenuate it by increasing the value of **Sls speed filter**. This parameter represents the time constant of the low-pass filter applied on the estimated speed. Increasing the value of **Sls speed filter** reduces the available bandwidth of the speed regulator.

In some cases it is necessary to have variable gains of the speed regulator above the Base speed range. For this purpose of the AV-300i series are provided with an adaptive speed regulator. For further information on this function see section 6.14.2, “Adaptive spd reg”. See below for information on setting the auxiliary logic.

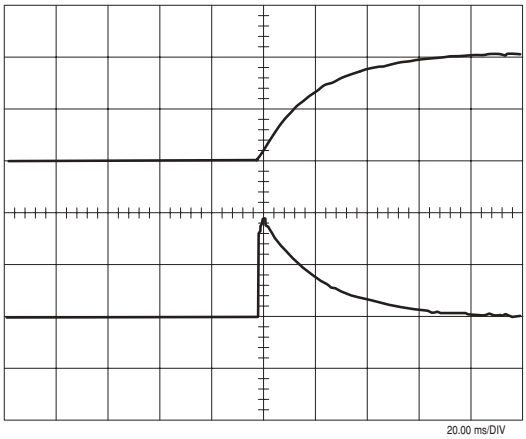


*Figure 5.3.4.12: Above, Motor speed; below, Torque current. **Speed P** is too small.*

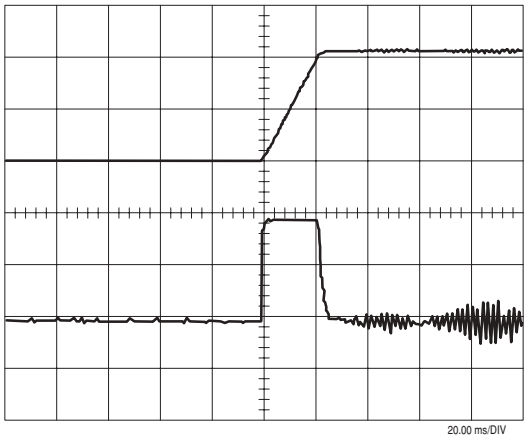


*Figure 5.3.4.13: Above, Motor speed; below, Torque current. **Speed P** is too high.*

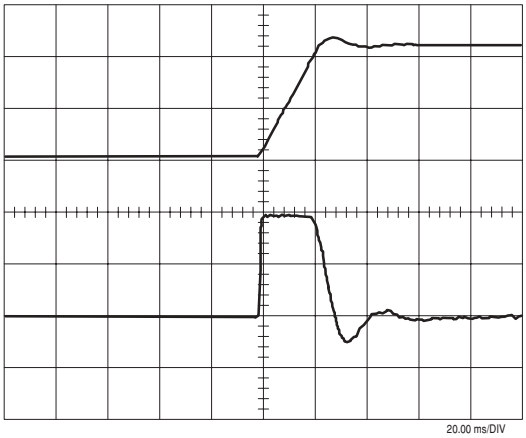


*Figure 5.3.4.14: Above, Motor speed; below, Torque current. **Speed I** is too high.*

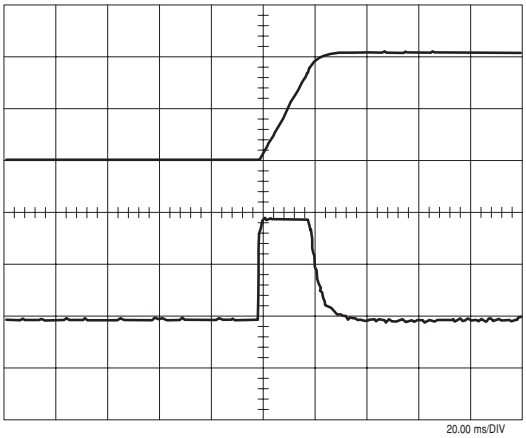


*Figure 5.3.4.15: Above, Motor speed; below, Torque current. **Speed P** and **Speed I** are set correctly.*

5.3.4.3 Field Oriented Mode

5.3.4.3.1 Checking and Manual Tuning of Magnetizing Current

NOTE! **You may skip this section if Self-tune 2 executed successfully.**

- Operate the drive without load at 50% of Base frequency by setting:

$$\text{Ramp ref 1 [rpm]} = \frac{60 \bullet \text{Base frequency} \bullet 0.5}{\text{N. of pole pairs}}$$

fA020

The **Output voltage** parameter in the MONITOR\Measurements menu should indicate a value approximately equal to 50% of Base voltage. If this is not the case, you should adjust **Magnetizing curt** in DRIVE PARAMETER\Motor parameter menu until you obtain the required voltage value.

5.3.4.3.2 Checking and Manual Tuning of Rotor Resistance

NOTE! **You may skip this section if Self-tune 1 executed successfully.**

There are three methods for this test:

The **first method** is based on steady-state load test. It offers the best accuracy and should be used, if compatible with the mechanical system coupled to the drive.

- Operate the drive at 50% of Base frequency, as in section 5.3.4.3.1, “Checking and manual tuning of magnetizing current”, but with load applied.
- Check that the drive is not at current limit.
- Compare **Output voltage** with the reading at no load. The value should be approximately the same, possibly 2-3% higher. If a strong voltage deviation appears when load is applied, tune the value of **Rotor resistance** until **Output voltage** reaches the correct value.You will have to increase Rotor resistance if **Output voltage** is too high, and vice-versa.

If load test cannot be used, other methods based on dynamic response are available. However, the current regulator must be properly tuned in order to use these methods (for manual tuning of the current regulator, see section 5.3.4.3.3.1, “Manual tuning of current regulator”).

As an alternative to the steady-state load tests, the following two methods are based on dynamic response tests.The **Rotor resistance** parameter in the DRIVE PARAMETER / Motor parameter menu can be adjusted in the two following ways:

Method 2: By means of a step change of the speed reference value and evaluation of the speed response

Method 3: By means of a step change of the torque reference value

Method 2

If the incorrect rotor resistance value is set, an unstable speed will occur on accelerations at the current limit. This effect can be used for calculating the correct value.

- **Drive disabled**
- Select the following settings for the test generator:

- **Gen access** = Ramp ref
- **Gen frequency** = 0.1 Hz
- **Gen amplitude** = 50 % of the required speed jump
- **Gen offset** = same value as for **Gen amplitude**

- Measure of the actual value via an analog output. For this the Actual spd variable must be assigned to an analog output and Torque current to a second analog output (see section 6.13, "I/O Configuration).
- Set the Acc delta speed and Acc delta time parameters in the BASIC menu so that the drive accelerates at the current limit (shortest possible acceleration time).
- Set the deceleration time via Dec delta speed and Dec delta time so that there is no overvoltage alarm when the drive decelerates.

NOTE! The current limit may not be reached with drives with low intertia, even with short acceleration times. In this case reduce the value for T current lim + in the BASIC MENU.

- **Enable drive and start**
- Ensure that the drive works at the current limit when accelerating. If not, shorten the acceleration time accordingly or reduce the current limit.
- Speed oscillations will occur if the **Rotor resistance** value is incorrect, as shown in Figure 5.3.4.12.
- Change the value until the behavior shown in Figure 5.3.4.13 is established.
- Stop and disable the drive.
- If the **T current lim +** parameter was reduced, this should be set to its original value.
- Set **Gen access** = Not connected
- Save settings via **Save parameters** command.

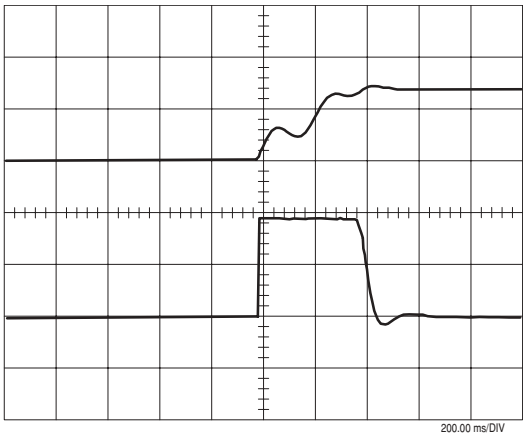


Figure 5.3.4.12: Above, Motor speed; below, Torque current. The rate for Rotor resistance is incorrect. Change this until the behavior corresponds to Figure 5.3.4.13.

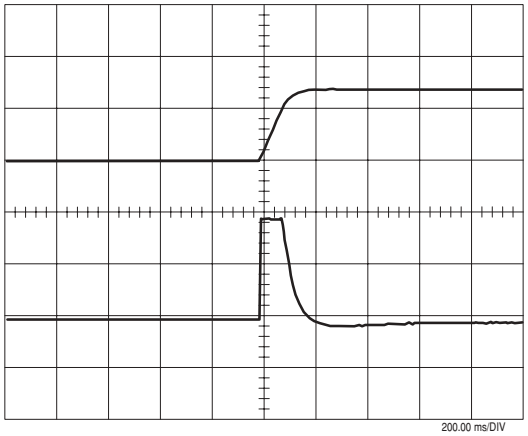


Figure 5.3.4.13: Above, Motor speed; below, Torque current. Correct setting for Rotor resistance.

Method 3

In order to check whether an incorrect value for Rotor resistance is present, a square wave torque reference value should be specified that has an average value of zero. Since the speed depends on the acceleration torque, it must have a sawtooth shape with sharp corners when the Rotor resistance has been set correctly. If the corners are rounded, the incorrect value has been entered.

NOTE! The motor must be operated without load applied with this method

- **Drive disabled**
- Preset the following settings for the test generator:

- **Gen access** = T current ref
- **Gen frequency** = 20 Hz
- **Gen amplitude** = 5 %
- **Gen offset** = 0 %

- Measure the actual values via an analog output. Set the Actual speed variable to an analog output and Torque current variable to a second analog output (see secton 6.13, “I/O Configuration).
- **Enable drive** and **start**

The motor shaft should turn alternately in both directions. If the measured speed is too low, the value for **Gen amplitude** should be increased and/or the value for **Gen frequency** should be reduced (only change the values minimally, in order to avoid uncontrolled behaviour).

- Change the **Rotor resistance** value until the speed signal measured is sawtooth-shaped and has sharp corners.
- Stop the drive and disable.
- Set **Gen access** = Not connected
- Save setting via **Save parameters** command.

NOTE! For motors rated 30 Kw and higher, thermal drift of the **Rotor resistance** due to operating temperature rise in the rotor may cause sensitive alteration of the performance. In this case the on-line adaption for Rotor resistance should be enabled via the parameter **Enable rr adap** in the SPEC FUNCTION menu (see section 6.16.2).

5.3.4.3.3 Manual Tuning of Regulator Loops

The AV-300i drive contains the following closed loop regulators:

- Current regulators for active (Torque) current and reactive (Flux) current. The value of gains are the same for both these regulators.
- Flux regulator (normally requires manual tuning only for applications with field weakening range.
- Speed regulator (Sensorless vect and Field oriented mode)
- Voltage regulator (does not require tuning).

Using the Test generator function

For the tuning of regulators, an internal test generator is used in order to evaluate the step responce of the regulators. This operation requires using a digital scope.

The test generator provides a square-wave signal with an adjustable frequency and amplitude, and an offset. The Gen access parameter determines which regulator input the signal is assigned to. Further information on this is provided in section 6.16.1, “Test generator” .

The menu structure to access the regulator gains is REG.PARAMETERS \ Percent value. Base values may be changed to extend the numerical ranges of the gains (REG.PARAMETERS \ Base value).

5.3.4.3.3.1 Manual Tuning of Current Regulator

NOTE! **You can skip this section if Self-tune 1 operated successfully.**

- **Drive disabled**
- Select the following settings for the test generator:
- **Gen access** = F current ref
- **Gen frequency** = 60 Hz
- **Gen amplitude** = 10 %
- **Gen offset** = 60 %
- Prepare current measuring as a direct measurement on regulation card (test point XY4 / XY5).
- Set **Current P** and **Current I** parameters in the REG PARAMETERS / .... menu to 0.00.

NOTE! Voltage saturation may occur during the optimization process (see Figure 5.3.4.1). In this case the value for Gen amplitude and also possibly for Generator offset should be reduced. Take extra care with this effect, especially with motors up to 7.5 kW.

- **Enable drive**
- Increase **Current P** until the reaction time is approximately 1 ms and the overshoot is less than 4 % of the applied step (see figures 5.3.4.2 to 5.3.4.4)
- Increase **Current I** until the overshoot is greater than 4 %. Then reduce it until it is just smaller than 4% of the applied step (see figure 5.3.4.5 and 5.3.4.6).
- Stop and disable drive.
- Set **Gen access** = Not connected
- Save setting via **Save parameters** command

5.3.4.3.3.2. Manual Tuning of Flux Regulator

NOTE! **This section can be skipped if Self-tune 2a or 2b have been performed successfully.**
If self-tuning has failed or had not been correctly carried out, the manual tuning can be applied.
This operation is usually required only for application with field weakening range.

- **Drive disabled**
- Select the following setting for the test generator:
- Gen access = Flux ref
- Gen frequency = 2 Hz
- Gen amplitude = 10 %
- Gen offset = 20 %

- Measure the actual value via an analog output. Set "**Flux**" to an analog output and "**F current ref**" to a second analog output. (see section 6.13, "I/O Configuration).
- Set **Flux P** and **Flux I** parameters in the REG PARAMETERS / .... to 0.00.
- **Enable the drive** and **start**

Increase Flux P until the reaction time is approx. 40 ... 60 ms and the overshoot is less than 4 %. Ensure that saturation does not occur to the variable **F current ref** (see Figure 5.3.4.7). If saturation does occur,

- Reduce **Gen amplitude** and/or **Gen frequency**.
- Increase **Flux I** until the overshoot is greater than 4%. Then reduce it until it is just less than 4 % (see Figures 5.3.4.10 and 5.3.4.11).
- Stop the drive and disable.
- Set **Gen access** = Not connected
- Save setting via **Save parameters** command.

5.3.4.3.3.3 Manual Tuning the Speed Regulator

- **Drive disabled**
- Select the following settings for the test generator (high inertial loads may require different setting):

- **Gen access** = Ramp ref
- **Gen frequency** = 0.2 Hz
- **Gen amplitude** = 10 %
- **Gen offset** = 10 %

- Measure the actual value via an analog output. For this the **Actual speed** variable must be assigned to an analog output and the **Torque current** variable to a second analog output (see section 6.13, “I/O Configuration).
- Set the **Acc delta speed** parameter in the BASIC MENU to the highest possible value and the **Acc delta time** parameter to 1 s.
- If possible set the deceleration via **Dec delta speed** and **Dec delta time** in the same way. This is normally only possible with loads with a very low intertia or when using a braking unit. Otherwise the values should be set so that there is no overvoltage alarm when the motor is regenerating.
- Set the **Speed P** and **Speed I** parameters in the REG PARAMETERS / .... menu to 0.00.
- **Enable the drive** and **start**
- Increase **Speed P** until the overshoot is less than 4 % with a short reaction time of the drive.
- Increase the **Speed I** parameter until the overshoot is greater than 4 %.

  Then reduce it until it is less than 4 %.
- Stop and disable the drive.
- Set **Gen access** = Not connected
- Save setting via **Save parameters** command.

NOTE! In some cases it is necessary to have variable gains of the speed regulator above the Base speed range. For this purpose the AV-300i series are provided with an adaptive speed regulator. For further information on this function see section 6.14.2, “Adaptive spd reg”. See below for information on setting the auxiliary logic

5.3.5 Enhanced Regulator Features

5.3.5.1. Setting the Speed Zero Logic

The Drive is factory set with the speed zero logic disabled. A detailed description of the drive settings is in section 6.8.2., “Spd zero logic”.

Speed zero logic enables separate tuning settings when zero speed is detected

Ref 0 level is used to define the switch threshold for the speed zero logic. References below this threshold are considered zero.

Selecting the proportional gain at zero speed, hence when reference value and **Actual speed** are respectively below **Ref 0 level** and **Speed zero level**:

Speed P gain corresponds **Spd=0 P gain** at zero speed	**Enable spd=0 P** = Enabled
Speed P gain corresponds to the normal P gain	**Enable spd=0 P** = Disabled

Deactivate the P gain specified with **Spd=0 P gain** :

Deactivate if the reference value is over **Ref 0 level**	**Enable spd=0 R** = Enabled
Deactivate if reference value or **Actual speed** are out of thresholds	**Enable spd=0 R** = Disabled

Enable spd=0 R is only effective if **Enable spd=0 P** has been enabled

Disable the I component of the speed regulator with speed=0:

Integral component disabled	**Enable spd=0 I** = Enabled
Integral component enabled	**Enable spd=0 I** = Disabled

When the motor is stopped, it is possible to avoid the position overshoots by the speed I. When the motor is switched off, it can not accept any load and therefore this function is not suitable for all applications!

In Sensorless mode enabling **Enable lck sls** disables speed control and field rotation when the speed reaches the threshold of zero speed, in order to avoid motor shaft drift.

Direct current equal to the magnetizing current is injected and no significant torque reaction is possible at standstill.

5.3.5.2 Anti Drift Function (Only for Field Oriented Control)

Enabling this function locks the rotor of the motor at zero speed without drift, using an internal position control.

It is activated via digital input or Bus, using the command **Lock zero pos**, and when the threshold of zero speed (**Speed zero level**) detection is reached.

Enable the Anti Drift function:

Anti Drift function enabled	**Enable zero pos** = Enabled
Anti Drift function disabled	**Enable zero pos** = Disabled

Lock zero pos	This command operates the Anti drift function the digital input, keypad or Bus
Zero pos gain [%]	Proportional gain of the position control

Also refer to parameters ADD SPEED FUNCT / Speed zero / Speed zero level and Speed zero delay

Anti Drift application example:

- Enable zero pos = Enabled

- Lock zero pos = Enabled
- Motor is running at 1000 rpm
- Speed zero level = 10 rpm
- Speed zero delay = 100 ms

When the STOP command is active and the motor reaches 10 rpm, the position control is automatically activated after 100 msec.

For restart, it is necessary to set the command Lock zero pos = Disabled before the START command.

5.3.5.3 Adaptive Speed

NOTE! The adaptive speed regulation is used if the gain of the speed regulator has to be changed above the speed range or dependant of another value. The details of the different parameters are described in section 6.14.2, "Adaptive spd reg".

Enable adaptive speed regulation with the drive disabled. **Enable spd adap** = Enabled. This makes the settings of **Speed P** and **Speed I** invalid.

Specify according to the controlling variable by which the speed regulator gain is to be changed. Normally this is based on the speed (**Select adap type** = Speed).

If the gain is to be changed on the basis of a different variable, set **Select adap type** = Adap reference. The other variable is connected to the device via an analog input. It is also possible to set **Adap reference** via the serial interface or a bus.

The setting of **Adap speed 1** and **Adap speed 2** produces three ranges that can have different gains. Enter the value as a percentage of the **Speed base value** and the maximum value of **Adap reference**.

For **Select adap type** = Speed: The optimization is carried out as previously described for Speed regulator. Note the following:

- **Gen offset** is assigned a value that is in the lower section of the range to be optimized, however outside of the transition range specified by **Adap joint XX**.
- Use **Gen amplitude** to define the jump so that the speed stays within the range to be optimized.
- The optimization is specified for each range separately and the regulator parameters by range via **Adap P gain XX** and **Adap I gain XX**.
- Run through the entire speed range after the ranges have beeen optimized.
- Instabilities within the transitions from one range to the next can be reduced by changing the values for **Adap joint XX**. Increase the values for more gradual transitions.

For **Select adap type** = Adap reference: the optimization depends on the system so that no general setting instructions can be given here.

The gains of the speed regulator set via **Adap P gain 1** and **Adap I gain 1** are active when the zero speed logic(as factory set) and the drive is disabled. When the zero speed logic is enabled, the values set when the motor is switched off are valid.

5.3.5.4 Speed-up Function

With loads having a high moment of inertia (large torque current to make a speed change) it is possible to “force” the speed regulator during speed changes using the function “Speed-up”. The figures 5.3.5.4.1 and 5.3.5.4.2 show the influence of this function.

Parameters used in the example:

Speed up base	14 rpm/ms
Speed up gain	50 %
Speed up filter	20 ms

- See section 6.8.4 for other parameter details.

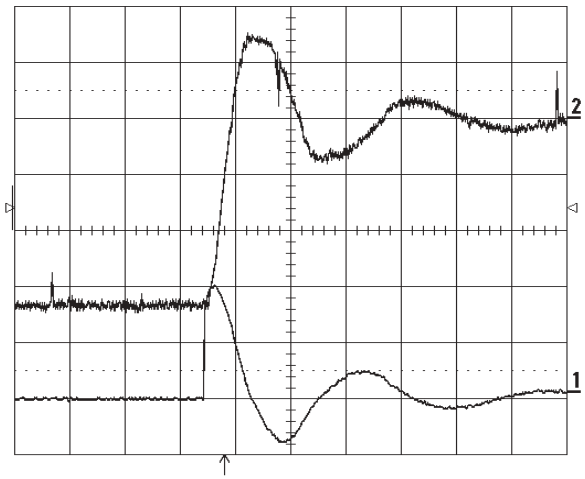


Figure 5.3.5.4.1: Above: Actual spd.Below: Motor current jumps with the speedchanges due to a high moment of inertia.The function Speed-up is not active.

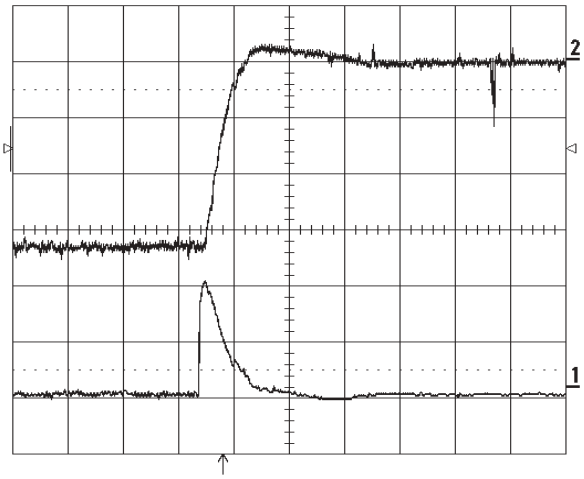


Figure 5.3.5.4.2: Above: Actual spd. Below: Motor current The same drive with Speed-up function active

5.3.6 Troubleshooting

See OVERFLOW LIST on chapter 6.4.1. and chapter 8.

Notes:

Chapter 6 - Function Description

Menu structure

BASIC MENU	Parameters required for the basic setup of the drive
MONITOR	Display of reference values, speed, voltage, current, frequency...
DRIVE PARAMETER	Entry of motor parameters, self-tuning, definition of the saturation curve for the field weakening range, sensorless parameters, V/f control parameters and functions
INPUT VARIABLES	Ramp reference value, speed reference value, torque reference value
LIMITS	Speed limitation, Current limitation, Flux limitation, Voltage limitation
RAMP	Acceleration, deceleration, quick stop, ramp shape
SPEED REGULAT	Configuration of the speed regulator, speed zero logic,Anti Drift, Speed up function, Droop function, Inertia Loss comp
CURRENT REGULAT	Configuration of the current regulator
FLUX REGULATION	Configuration of the flux regulator
REG PARAMETERS	Parameters for speed, current, flux regulation
CONFIGURATION	Operating mode, regulation mode, encoder type, factor function, programmable failure alarms, address, PWM frequency, password
I/O CONFIG	Configuration of programmable digital and analog inputs and outputs, Tach follower
ADD SPEED FUNCT	Auto capture, adaptive speed regulation, speed control, speed zero logic
FUNCTIONS	Motor potentiometer, jog function, internal multi-speed function, multi-ramps, overload control, Brake Unit control, Stop control, Power loss management
SPEC FUNCTION	Test generator, saving parameters, loading factory default settings, failure register, signal adjustments, PAD parameters, DC Braking functions
OPTIONS	Access to the Field Bus Card parameter (option 1), access to the DGF optional Card (option 2), PID function
DRIVECOM	Parameter settings for the DRIVECOM profile
SERVICE	Service menu, only accessible to service personnel of the manufacturer

GA4005ai

6.1. Enable Signals

The following hardware enable signals are always required, whether the device is to be controlled via the terminal strip, the keypad or the serial interface.

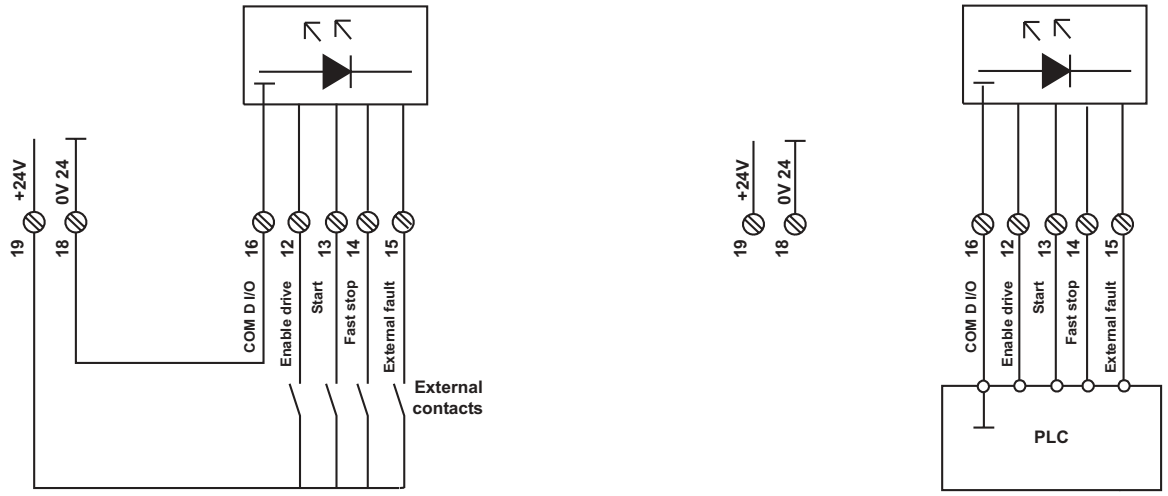


Figure 6.1.1: Enables via potential free contacts and PLC

Figure 6.1.1 show the connection principle

The enable signals are activated via a +15 ... 30 V voltage at the appropriate terminals.The inputs are protected against reverse polarity.

Negative voltage, 0 V and a missing signal are interpreted as disable signals.

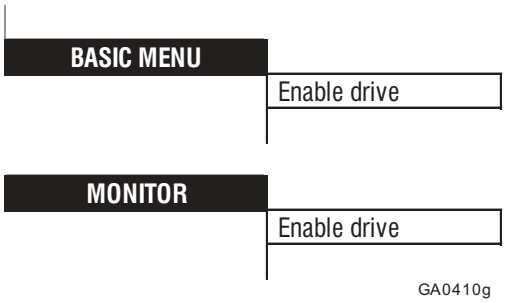
The reference point for the enable signals is terminal 16.

When using an operator keypad/serial interface, the signals on the appropriate terminals and the corresponding commands must be sent via the keypad/serial interface. If an enable is removed via a signal on the terminals, the appropriate command must be sent via the keypad/serial interface in addition to the signal on the terminal in order to restart the drive.

There are four types of enable signals that have a different effect on the behavior of the AV-300i Drive.

- **Enable drive** enables the inverter modulation
- **Start** enables the regulation
- **Fast stop** sets the speed reference value to zero with a fast ramp so that the drive is stopped as quickly as possible
- **External fault** incorporates external fault conditions into the enable logic

6.1.1. Enable Drive



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Enable drive	314	0	1	Disabled	Terminal 12
Enable					+ 15...30V
Disable				(0)	0V

GA6010g

The **Enable drive** command activates the AV-300i Drive.

An auxiliary contact on the AC Input contactor may be wired in the Drive enable (terminal 12).

When the **Enable drive**=disable and terminal 12=0 V, no other control commands (e.g. **Jog +**, **Jog -** or **Start**) are accepted.

Removal of the **Enable drive** command (**Enable drive**=disable) while the drive is running causes the motor coasting to stop. Neither electrical braking nor controlled stopping of the motor within a prescribed time during the run down are possible. The actuation of the Drive is disabled.

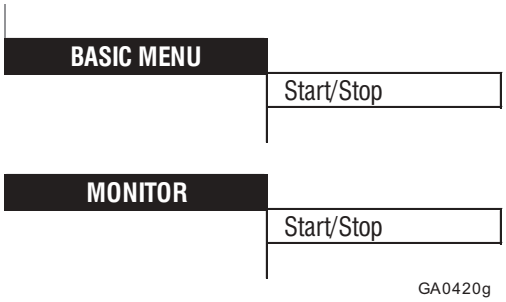
When operated via the keypad the **Enable drive** command is provided in the BASIC MENU and in the MONITOR menu.

Using **Enable drive** command from keypad (**mains command**=Digital), active voltage level is also required on terminal 12.

Using **Enable drive** command from terminal 12 set "**Main command**=terminals".

Enable drive in the menu is read only parameter.

6.1.2. Start/Stop



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Start/Stop	315	0	1	Stop	Terminal 13
Start					+ 15...30V
Stop				(0)	0V

GA6015g

When "**Main commands**"is set to "Digital", **Start/Stop** parameters is used for starting the drive and the STOP button on the keypad is able to stop the drive (active voltage level is also required on terminal 13).

When "**Main commands**" is set to "Terminals", **Start/Stop** is read only parameters.

NOTE: The following signals (at High level) are required for operating the drive in addition to the **Start** command:

- **Enable drive**
- **Fast stop**
- **External fault**

The behavior of the drive after the **Start** command depends on the parameter setting at hand:

- When using the ramp (**Enable ramp** = Enabled and **Enable spd reg** = Enabled) the drive accelerates to the required speed according to the ramp specified. If the Start command is removed, the drive decelerates to zero according to the ramp defined. If the Start command is reapplied once more during the deceleration time, the drive accelerates once more to the required speed.
- If the **Speed ref 1** value reaches the input of the speed regulator directly without a ramp (**Enable ramp** = Disabled and **Enable spd reg** = Enabled), the drive accelerates to the required speed in the shortest possible time once the Start command has been applied. When the Start command is removed, the **Speed ref 1** value is set to zero immediately. The command has no effect on the correction value (**Speed ref 2**).
- When using torque current regulation (**Enable spd reg** = Disabled) the **Start** command enables the torque current reference value (**T current ref 1**) or disables it after the **Start** command is removed. The command has no effect on the correction value (**T current ref 2**).

The **Start** command is not required for Jog function mode.

If the **Start** command and **Jog +** or **Jog -** are applied at the same time, the **Start** command is given priority.

If the **Start** command is applied during Jog operation, the Jog operation is aborted.

6.1.3. Fast Stop

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Fast stop	316	0	1	No fast stop	Terminal 14
No fast stop				(1)	
Fast stop					

GA6020g

Terminal 14: + 15 ... 30 V = no Fast stop, 0 V = Fast stop.

NOTE: **This function cannot be actuated via the keypad!**

Application: **Fast stop** is actuated in emergencies and hazardous situations, to stop the drive in the shortest possible time. This method of stopping employs the intermediate circuit and braking unit which absorb energy and thus bring the drive to a stop in a shorter time than when the drive coasts down.

The **Fast stop** input signal is always required to be high for operation of the Drive. A removal of the command when the drive is running initiates braking with the ramp specified by the parameters **Qstp delta speed** and **Qstp delta time**.

When the drive is brought to a stop, it is still enabled and has torque. The **Enable drive** command must be removed for it to be disconnected.

The drive behavior after the **Fast stop** command has been given depends on the type of operating mode selected:

1) Operation via the terminal strip (**Main commands** = Terminals):

- The drive keeps braking as long as there is low voltage on terminal 14. When voltage is restored, the drive automatically accelerates to the required reference value (provided the other enable commands are still active).

2) Operation via the terminal strip with the additional possibility of digital parameter entry (**Main commands** = Digital):

- The drive executes braking until it has come to a stop. When voltage is restored on terminal 14, there is no automatic start. This requires the entry of the **Start** command.
- If the **Fast stop** command is actuated via the serial interface while there is voltage present on terminal 14, the fast stop is executed until the drive is at a stop. The **Start** command must be entered for the drive to be restarted.

6.1.4. Quick Stop

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Quick stop	343	0	1	No Quick stop	
Quick stop					
No Quick stop				(1)	

GA6025g

NOTE: **This function cannot be actuated via the keypad!**

Application: **Quick stop** is actuated in emergencies or hazardous situations to bring the drive to a stop in the shortest possible time. This method of stopping empoys the intermediate circuit and braking unit (when fitted) which can absorb energy and bring the drive to a stop in a shorter time than when the drive coasts to a stop.

- Quick stop function can be assigned to a programmable digital input.
- If select Qstp Opt code = Ramp stop, the drive is stopped with the ramp defined by Qstp delta speed and Qstp delta time.
- If select Qstp Opt code = DC braking curr, the drive is stopped by injection of DC current (section 6.16.7)
- **When the drive is at a stop, it is disabled and thus has no torque.** The **Start** command must be given again for the drive to re-enable and start.

6.1.5. External Fault

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
External fault	-	-	-	-	Terminal 15

GA6030g

Terminal 15: + 15...30 V = No ext. fault, 0 V = ext. fault

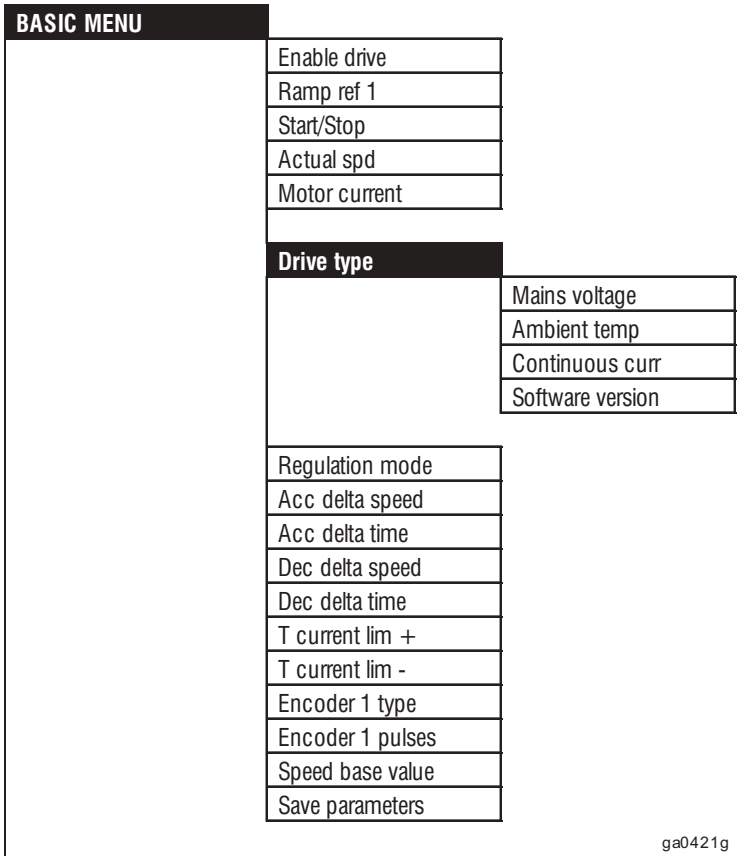
The **External fault** command enables an external signal to be incorporated in the failure alarms of the frequency inverter.

Application example

The Drive is being used for closed-loop control of a single drive without contactors. A temperature-dependent contact, which opens under excessive temperature is located within the motor. Connect this contact between +24 V and terminal 15. When the contact opens (= overtemperature) the Drive will be disabled.

- During operation a signal is always required on terminal 15, whether the commands are transmitted via the terminal strip or not.
- In the event of an external fault, the drive will behave according to the configuration set in the “Programmable alarms”.

6.2. Basic Menu



The BASIC MENU provides the parameters required for the initial commissioning of the drive. The data that is factory set for the default motor concerned refers to a four-pole machine for either 400V or 460V). The motor data in the DRIVE PARAMETER menu should be changed accordingly if different motors are used.

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Enable drive Enable Disable	314	0	1	Disabled (0)	Terminal 12
Start/Stop Start Stop	315	0	1	Stop (0)	Terminal 13
Actual Spd [rpm]	122	-8192	+8192	—	Analog output 1*
Motor Current [A]	231	0.00	S		Analog output 4**
Mains voltage 575V	333	3	3	575 V (3)	
Ambient temp 50°C 40°C	332	0	1	40°C (1)	—
Software version	331				
Continuous curr	802	S	S	S	
Regulation mode Sensorless Field oriented V/f control Self-tuning	321	0	3	V/f control (3)	
Acc delta speed [FF]	21	0	2^{32}-1	100	
Acc delta time [s]	22	0	65535	1	
Dec delta speed [FF]	29	0	2^{32}-1	100	
Dec delta time [s]	30	0	65535	1	
Ramp ref 1 [FF]	44	-2*P45	-2*P45	0	Terminals 1/2
T current lim + [%]	8	0	F	S	*
T current lim - [%]	9	0	F	S	*
Encoder 1 type Sinusoidal Digital	415	0	1	Digital (1)	
Encoder 1 pulses	416	600	9999	1024	
Speed base value [FF]	45	0	16383	1500	
Save parameters	256	0	65535		

GA6035ai

* This function can be assigned to a programmable analog input

** This function is assigned to programmable analog outputs (optional card required)

See index for further information on the individual parameters.

Enable drive When controlling the Drive via the keypad, the Drive is activated via the **Enable drive** parameter. Voltage is also required on terminal 12. The Start command is required for starting the drive.

Enable Drive enabled

Disable Drive disabled

Start/Stop If the menu point **Start** is selected via the keypad, the Start/Stop status is displayed. (dedicated keys are available to execute Start/stop, voltage is required on terminal 13).

Actual spd Display of speed actual value in rpm (revolutions per minute)

Motor current Display of motor line current in A_{RMS}

Mains voltage Rated value for the mains voltage present. This value is used as a reference for the undervoltage monitoring.

Ambient temp Adaption to Ambient temperature.Temperature characteristics specified on the name-plate of the inverter.

40°C (104°F)	The Drive is able to take the current continously at an ambient temperature of up to 40°C (104°F).
50°C (122°F)	The Drive is able to take the current continously at an ambient temperature of up to 50°C (122°F). (See section, 3.1, “Permissable environmental conditions”).

Software version Display of version number of the Drive operating system

Continuous current Indicates the continuous current of the drive in relation to different derating values.

E.g. Mains voltage (K_V) - PWM frequency (K_T) - Ambient temperature (K_T).

This parameter is automatically set according to the formula: $\mathbf{I_{CONT}} = \mathbf{I_{2N}} \times \mathbf{K_V} \times \mathbf{K_T} \times \mathbf{K_F}$

For the derating factor values see section 2.3.4 **.**

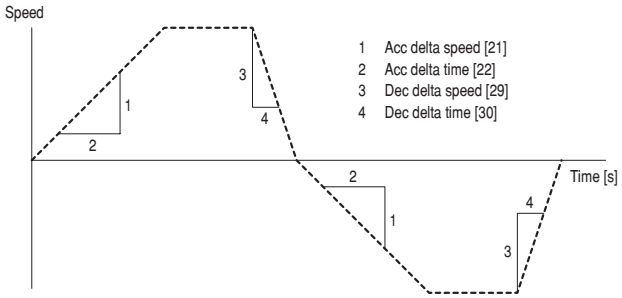
Regulation Mode This parameter determines the type of regulation of the Drive

Sensorless	The drive operates with a sensorless control mode. An encoder is not necessary to feedback the motor speed. In this case the speed and position of motor shaft are estimated by a control algorithm.
Self-tuning	Automatic commissioning (see section 5.3.3, “Self-tuning”).
Field oriented	The drive operates with a field-oriented vector control. Either a sinusoidal encoder or a digital encoder is needed in order to feed back the motor speed to the Drive. This setting provides the best regulation performance.
V/f control	The motor is not vector controlled but according to a specified voltage/frequency characteristic curve. (See section 6.4.2.3, “Voltage/ Frequency control”).

The acceleration of the drive is specified as a ratio of the parameters **Acc delta speed** and **Acc delta time**, the deceleration as a ratio of the parameters **Dec delta speed** and **Dec delta time** (see Figure below). They are the same for both rotation directions of the motor.

Acc delta speed Has the same dimension as the ramp reference value and depends on the factor function.

Acc delta time Is specified in seconds. When “0 s” is entered, the ramp output follows the reference value directly.



Dec delta speed Has the same dimension as the ramp reference value and depends on the factor function.

Dec delta time Is specified in seconds. Entering “0 s” causes the ramp output to follow the reference value directly.

Ramp ref 1 1st reference value for the ramp. The value to be entered depends on the factor function.

T current lim + Setting for the current limitation of the drive for the positive current direction (clock-wise drive or counter-clockwise brake).

T current lim - Setting for the current limitation of the drive for the negative current direction (counter-clockwise drive or clockwise brake).

These values are specified as a percentage of Full load torque curr (see section 6.9, “Current regulation”).

Encoder 1 type Specifying the encoder type on the XE connector (standard connection)
Sinusoidal Encoder with sinusoidal outputs

Digital Encoder with digital outputs

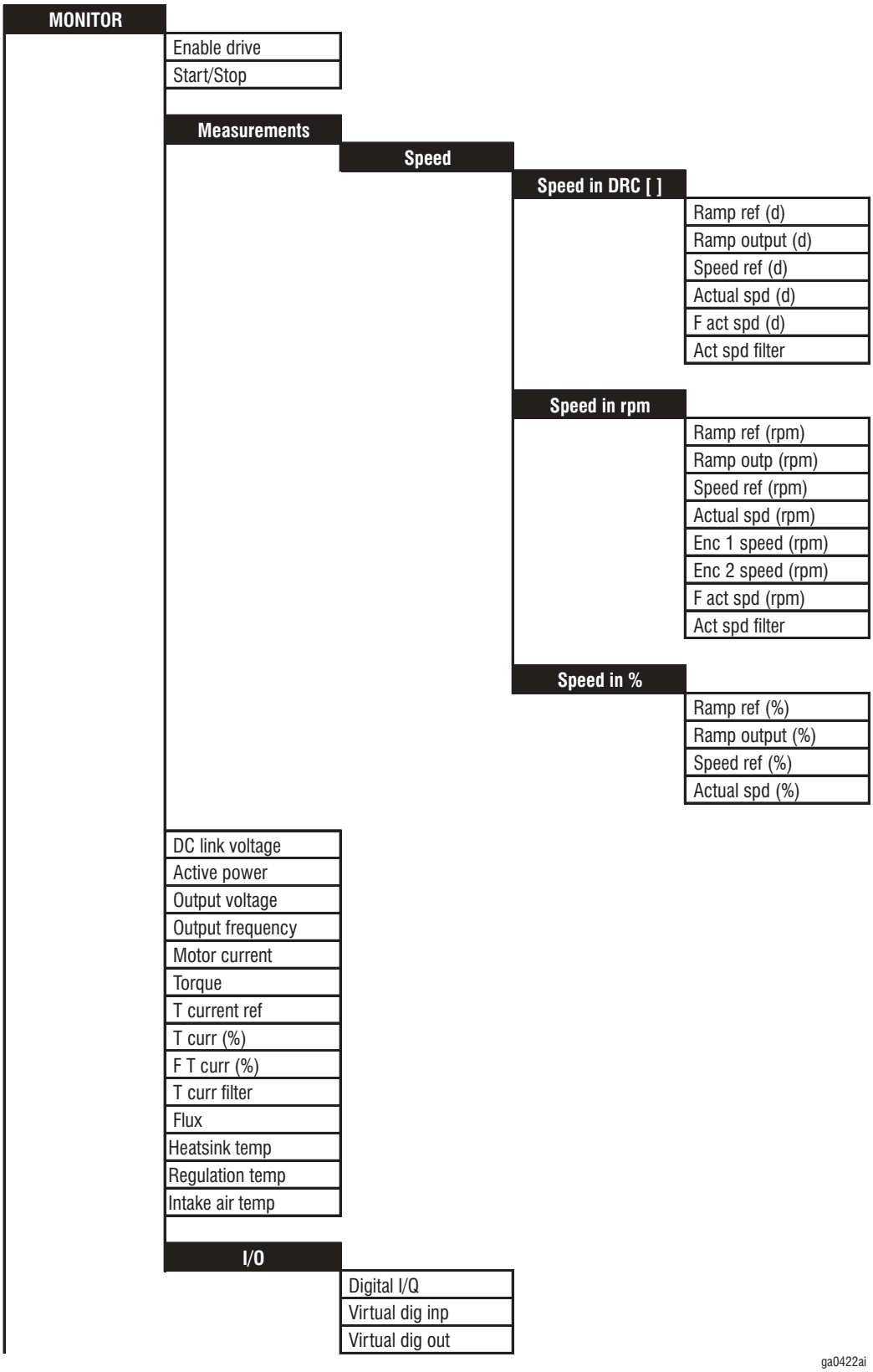
Encoder 1 pulses Number of pulses per revolution

Speed base value The **Speed base value** is defined in the unit specified by the factor function. It is the base value for all speed values (reference values, adaptive speed regulation..) given as a percentage, and corresponds to 100% of the speed. Changing this parameter is only possible whe the drive is disabled (**Enable drive** = Disabled). The **Speed base value** does not define the maximum possible speed. However, the maximum range for speed percentage is ±200% of **Speed base value**.

Save parameters Saving of customer-related parameters.

When the drive is switched on, the last saved parameters are read in. It is absolutely necessary to save parameters once they have been modified otherwise any changes made will be cancelled when power to the drive is applied.

6.3. Monitor



The MONITOR menu shows all current reference and actual values. The values related to the speed are given in rpm (revolutions per minute), as a percentage (related to the **Speed base value**) and in the dimension specified by the factor function.

Parameter	No.	Value			Standard configuration
		min	max	Factory	
Enable drive Enable Disable	314	0	1	Disabled (0)	Terminal 12
Start/Stop Start Stop	315	0	1	Stop (0)	Terminal 13
Ramp ref (d) [FF]	109	-32768	+32767	–	
Ramp ref (rpm)	110	-32768	+32767		*
Ramp ref (%)	111	-200.0	+200.0		
Ramp output (d) [FF]	112	-32768	+32767	–	
Ramp output (rpm)	113	-32768	+32767		*
Ramp output (%)	114	-200.0	+200.0		
Speed ref (d) [FF]	115	-32768	+32767	–	
Speed ref (rpm)	118	-32768	+32767		*
Speed ref (%)	117	-200.0	+200.0		
Actual spd (d) [FF]	119	-32768	+32767	–	
Actual spd (rpm)	122	-8192	+8192		Analog out. 1*
Actual spd (%)	121	-200.0	+200.0		
Act spd filter [s]	923	0.001	0.100	0.001	
F act spd (rpm)	924	-32768	32767	-	**
F act spd (d) [FF]	925	-32768	32767	-	
Enc1 speed (rpm)	427	-8192	+8192	-	*
Enc2 speed (rpm)	420	-8192	+8192	-	*
DC link voltage [V]	227	0	999	–	*
Active power [%]	229	-500	+500	–	*
Output voltage [V]	233	0	500	–	*
Output frequency [Hz}	324	0.0	500.0	–	–
Motor current [A]	231	0.00	S	–	Analog out. 4*
Torque [%]	230	-500	+500	–	*
T current ref [%]	41	-500	+500	–	*
T curr filter [s]	926	0.001	0.250	0.100	
T curr (%)	927	-500	500	-	**
F T curr (%)	928	-500	500	-	**
Flux [%]	234	0.00	100.00	–	*
Heatsink temp [°C]	881	-	-	-	–
Regulation temp [°C]	1147	-	-	-	–
Intake air temp [°C]	914	-	-	-	–
Dig input term	564	0	65535	–	–
Dig input term 1	565	0	1	–	–
Dig input term 2	566	0	1	–	–
Dig input term 3	567	0	1	–	–
Dig input term 4	568	0	1	–	–
Dig input term 5	569	0	1	–	–
Dig input term 6	570	0	1	–	–
Dig input term 7	571	0	1	–	–
Dig input term 8	572	0	1	–	–
Dig input term 9	573	0	1	–	–
Dig input term 10	574	0	1	–	–
Dig input term 11	575	0	1	–	–
Dig input term 12	576	0	1	–	–
Dig input term 13	577	0	1	–	–
Dig input term 14	578	0	1	–	–
Dig input term 15	579	0	1	–	–
Dig input term 16	580	0	1	–	–
Dig output term	581	0	65535	–	–
Virtual dig inp	582	0	65535	–	–
Virtual dig out	583	0	65535	–	–

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* This function can be assigned to a programmable analog output.

Enable drive When operating the Drive via the keypad, it is activated via the **Enable drive** parameter. A voltage is also required on terminal 12. The **Start** command is required for starting the drive.

Enable Drive enabled

Disabled Drive disabled

Start/Stop If the menu point **Start** is selected via the keypad, the Start/Stop status is displayed.

Ramp ref (d) Total reference value for the ramp using the unit specified by the factor function.

Ramp ref (rpm) Total reference value for the ramp in rpm (revolutions per minute).

Ramp ref (%) Total reference value for the ramp as a percentage of the **Speed base value**.

Ramp output (d) Ramp output in the dimension specified by the factor function.

Ramp outp (rpm) Ramp output in rpm (revolutions per minute)

Ramp output (%) Ramp output as a percentage of the **Speed base value**

Speed ref (d) Total speed reference value using the unit specified by the factor function.

Speed ref (rpm) Total speed reference value in rpm (revolutions per minute).

Speed ref (%) Total speed reference value as a percentage of the **Speed base value**

Actual spd (d) Actual speed using the unit specified by the factor function.

Actual spd (rpm) Actual speed in rpm (revolutions per minute).

Actual spd (%) Actual speed as a percentage of the **Speed base value**

Act spd filter 1st order Low pass filter time constant on Actual speed.

F act spd (rpm) Filtered value of Actual speed in rpm.

F act spd (d) Filtered value of Actual speed in the unit specified by the factor function.

Enc1 speed [rpm] This parameter provides the value of speed measured from Encoder 1, regardless of the value of **Speed fbk sel**

Enc2 speed [rpm] This parameter provides the value of speed measured from Encoder 2, regardless of the value of **Speed fbk sel**

DC link voltage Intermediate circuit voltage in Volt

Active Power [%]Active power of the drive as a percentage of the rated active power, if the **Full load curr** parameter corresponds to the rated motor current and the motor is operating with rated flux.

Using RS-300 “Line regen converter” this parameter is also accessible via:

- PDC (for BUS card) with full range:

32767 (7FFFH) = √3 x **Mains voltage** x **Full load current**

- programmable analog output (code selection = 78) with full range = 10V:

√3 x **Mains voltage** x **Full load current**

These selection are possible only with **Regulation mode** = **Sensorless** or **Field oriented mode**

Output voltage Line to line output voltage of the inverter in V_{RMS}

Output frequency Output frequency in Hz

Motor current Motor current in A_{RMS}

Torque Torque of the drive as a percentage of the rated motor torque if the **Full load curr** parameter corresponds to the rated motor current and the motor is operating with rated flux.

T current ref Total current reference value as a percentage of Full load torque curr (see section 6.9, “Current regulation”).

T curr filter 1st order Low pass filter time constant on **Torque current**.

T curr (%) **Torque current** value in percentage. It can be associated to an analog output (Select: **Torque [29]**)

F T curr (%) Filtered value of **Torque current** in percentage.

Flux Calculated flux in the motor as a percentage of the rated flux

Heatsink temp Reading of the heatsink temperature in °C

Regulation temp Reading of the regulation temperature in °C

Heatsink air temp Reading of the cooling air temperature in °C

Digital I/O Status of the digital input and output of the base device and the optional digital input card.

Display: I 1 2 3 4 5 6 7 8 E S F

Q 1 2 3 4 5 6 7 8

A I/O is displayed only if a voltage is present on the corresponding terminal. E.g., if the inputs 1 and 4 are displayed, that means that the digital inputs 1 and 4 on the Regulation card are at High level (Digital inputs 5 to 8 will be displayed only if an Expansion card is connected).
E = Enable drive (terminal 12)
S = Start (terminal 13)
F = Fast stop (terminal 14)
When a serial line or a Bus is used, the status of the digital I/O can be read by means of the **Dig input term** and **Dig output term** parameters.

Dig input term Status of the digital inputs on the drive and optional digital input card to be read by serial line or field bus. Format: decimal. The information is contained in a word, where each bit is 1 if voltage is present on the corresponding input terminal.

Bit n.	Input	Bit n.	Input
0	I/O, Terminal 36 (Digital Input 1)	6	I/O, Terminal 33 (Digital Input 7)
1	I/O, Terminal 37 (Digital Input 2)	7	I/O, Terminal 34 (Digital Input 8)
2	I/O, Terminal 38 (Digital Input 3)	8	AV-300i, Terminal 12 (Enable drive)
3	I/O, Terminal 39 (Digital Input 4)	9	AV-300i, Terminal 13 (Start/Stop)
4	I/O, Terminal 31 (Digital Input 5)	10	AV-300i, Terminal 14 (Fast stop)
5	I/O, Terminal 32 (Digital Input 6)		

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Dig input term 1* Status of the digital input 1 (terminal 36, on optional digital input card)

Dig input term 2* Status of the digital input 2 (terminal 37, on optional digital input card)

Dig input term 3* Status of the digital input 3 (terminal 38, on optional digital input card)

Dig input term 4* Status of the digital input 4 (terminal 39, on optional digital input card)

Dig input term 5* Status of the digital input 5 (terminal 31, on optional digital input card)

Dig input term 6* Status of the digital input 6 (terminal 32, on optional digital input card)

Dig input term 7* Status of the digital input 7 (terminal 33, on optional digital input card)

Dig input term 8* Status of the digital input 8 (terminal 34, on optional digital input card)

Dig input term 9* Status of the digital input on terminal 12 (Enable Drive)

Dig input term 10* Status of the digital input on terminal 13 (Start)

Dig input term 11* Status of the digital input on terminal 14 (Fast stop)

Dig input term 12*up to 16* Not used

Dig output term Status of the digital outputs on the device and optional digital input card to be accessed

by serial line or field bus. Format: decimal. The information is contained in a word, where each bit is 1 if voltage is present on the corresponding input terminal.

Bit n.	Output	Bit n.	Output
0	Terminal 41, on Regulation card (Digital output 1)	4	Terminal 53, on Option card (Digital output 5)
1	Terminal 42, on Regulation card (Digital output 2)	5	Terminal 54, on Option card (Digital output 6)
2	Terminal 51, on Option card (Digital output 3)	6	Terminal 56, on Option card (Digital output 7)
3	Terminal 52, on Option card (Digital output 4)	7	Terminal 57, on Option card (Digital output 8)

ai6050

Virtual dig inp Status of the virtual digital inputs**

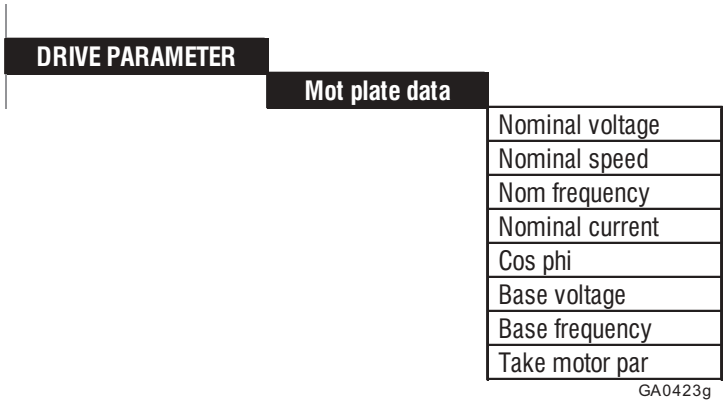
Virtual dig out Status of the virtual digital outputs**

* Available only via RS 485 interface line or via Field Bus.

** The virtual inputs and outputs are used only in connection with a Bus provide fast communication. For further details see the manual of the Bus.

6.4. Drive Parameter

6.4.1. Motor Plate Data



GA0423g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Nominal voltage [V]	161	1	999	575	
Nominal speed [rpm]	162	1	99999	S	
Nom frequency [Hz]	163	1	999	60	
Nominal current [A]	164	0.1	999.0	S	
Cos phi	371	0.1	0.99	S	
Base voltage [V]	167	1	999	575	
Base frequency [Hz]	168	1	999	60	
Take motor par	694	0	1	-	

GA6055-575

S = depending on device type

In the "Mot plate data" submenu, data from the motor nameplate and information on the desired "base" operating point must be entered. These are required in order to:

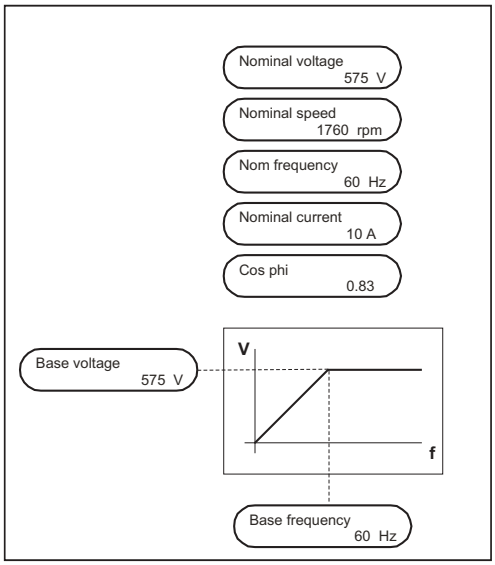
a) Compute appropriate normalization factors for the regulation

b) Compute estimated values for the motor parameters required by the regulation (see section "Motor parameter").

Nominal voltage	Nominal voltage of the motor (given on nameplate). Enter here the voltage that the inverter should supply at the nominal frequency of the motor.
Nominal speed	Nominal full load speed of the motor in rpm (revolutions per minute)
Nom frequency	Nominal frequency of the motor in Hz
Nominal current	Nominal current of the motor according to the given nominal voltage. In case of **"V/f control"** with multiple motors enter a value equal to the sum of Nominal current of all the motors.
Cos phi	Motor power factor.
Base voltage	Max. working voltage in field weakening condition.
Base frequency	Frequency at which the field weakening range begins.
Take motor par	This command must be entered after entering appropriate values for all parameters listed above. It causes computation of normalization factors (a) and motor parameter estimates (b).

Nominal voltage, Nominal speed, Nom frequency, Nominal current, Cos phi, Base voltage and **Base frequency** must be entered (default value of **Cos phi** can be used if value not available from the nameplate). After setting these parameters, **Take motor par** must be entered in order to compute items (a) and (b) above. The drive can not be operated until **Take motor par** is entered. If some values are inconsistent, or motor size is far too small compared to the inverter size, an error message indicating numerical overflow is given, and the previous set of parameters in the "Mot plate data" submenu is restored.

Figure 6.4.1.1: Motor plate data



OVERFLOW LIST

CODE	CAUSES
10 ; 54	The ratio between the Encoder 1 pulses[416] and the number of motor poles pair must be higher than 128
3 ; 4	The Stator resistance [436] value is too high. The motor is not compatible with the drive size used.
5 ; 8 ; 9 ; 15	The Leakage inductance [437] value is too high. The motor is not compatible with the drive size used.
16 ; 24	The Rotor resistance [166] value is too high. The motor is not compatible with the drive size used.
17	The Nominal voltage [161] and Nom frequency [163] values produce motor nominal flux (out of range) that is too high. - Verify these values: the Nominal voltage value is too high and/or the Nom Frequency value is too small.
18	The Base voltage [167] and Base frequency [168] values produce motor nominal flux (out of range) that is too high. - Verify these values: the Base voltage value is too high and/or the Base frequency value is too small
23	The ratio between nominal flux (Nominal voltage, Nom frequency) and working flux (Base voltage , base frequency) is too high. - Verify the above parameters value. The Magnetizing current [165] value is too high. - Verify that this value is lower than Full load curr.
27	The Base voltage value is too high. The maximum value is 625V.
28	The Base frequency value is too high. This value must be lower than 500Hz
59	The Magnetizing working curr [726] is too high. - Verify that the nominal flux value (Nominal voltage and Nom frequency) is lower than the working flux value (Base voltage and Base frequency). Check the parameters value. The Magnetizing current value is too high. - Verify that this value is lower than Full load curr.
64	The Motor cont curr [656] value, of the motor thermal protection function (menu Ovld mot contr), produces continuative current that is too low in comparison to the used inverter size. This error can also be due to a too low setting of the Nominal current [164] parameter ($\leq 0.3 \times I_{2N}$).
66	The Nominal speed [162] value is wrong. The set value produces too small (or too high) slip value.

- Parameters computed in (b) are an estimate, they can be overwritten if values are available from the motor manufacturer (see section "Motor parameter"). Alternatively, these values can be overwritten by the values identified by the Self-tuning procedure (see section "Self-tuning").
- Manual assignment of values in the "Motor parameter" submenu, or Self-tuning procedure, must be executed only after entering **Take motor par** command. In case **Take motor par** is entered after manual assignment or Self-tuning procedure, values will be overwritten again.

SETTING OF THE BASE SETPOINT

The coordinated setting of **Base voltage** and **Base frequency** determines the working flux and the starting threshold of the flux weakening.

Setting them equal to the nominal value of the motor yields operation at nominal flux in the costant torque region and weakened flux at frequencies higher than **Base frequency**.

Different setting allows the working at a lower flux (Base Voltage/Base frequency < Nominal voltage/Nominal Frequency).

The operation with a flux higher of the nominal one is not allowed.

The **Base voltage** and **Base frequency** setting at values higher than Nominal Voltage and Nominal Frequency will be prompted by an error message "Overflow", when the **"Take motor par"** command is entered.

VOLTAGE AVAILABLE ON THE DRIVE OUTPUT

The **Base voltage** value is also the value of the output voltage in flux weakening condition.

The maximum available value is determined by the actual value of the main voltage reduced by the **dynamic regulation margin** (LIMITS\Voltage Limits\Dynam Vlt Margin).

Then the Base voltage setting must be done according to the application.

If the request of the application is the maximum static performances of the motor (torque and power) without any particular dynamic requirements or torque smoothness versus main voltage dips, the Base voltage must be set equal to the nominal value of the motor.

On the contrary, if the application can not tollerate any torque fluctuation when a main dip occurs, Base voltage must be set to a value lower than the fluctuation range of the main voltage.

Here below are presented some examples with different V/f settings:

Example 1

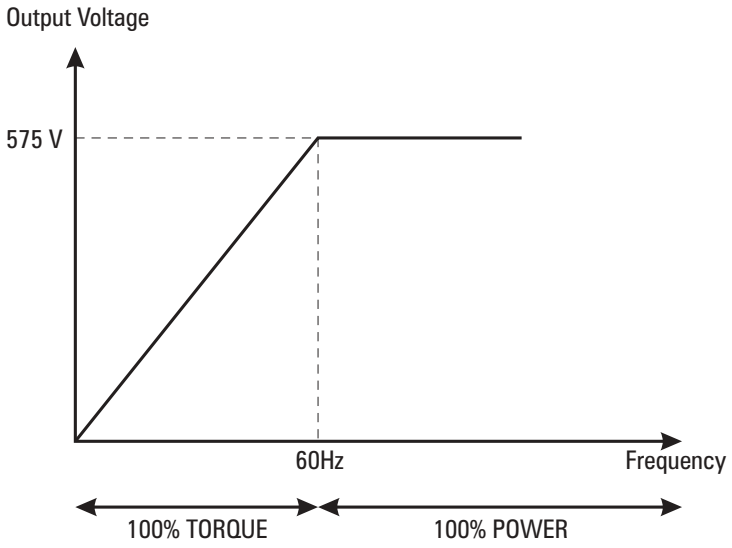
Use of a standard motor 575 V / 60 Hz

Base voltage 575 V

Base frequency 50 Hz (standard)

The motor works with nominal flux until around 60Hz, at full torque.

Over this frequency the voltage is regulated constant, the flux is weakened and the motor supplies a constant power equal to the nominal (rated) power.



Example 2

Use of a standard motor 575 V / 60Hz

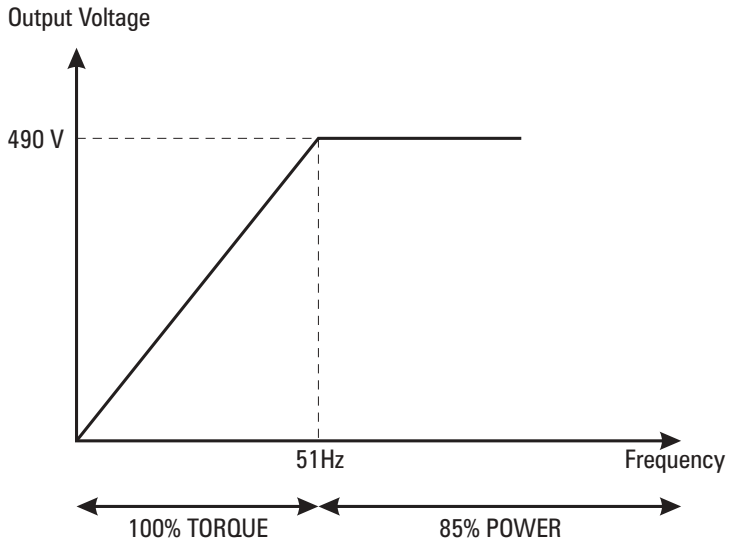
Application requiring total immunity from torque disturbances due to main voltage fluctuation.

Base voltage 575 V -15% = 490 V

Base frequency 60 Hz -15% = 51 Hz

The motor works at nominal flux until 51Hz (85% of the nominal speed), supplying full torque.

Over this frequency the voltage is regulated constant regulated, the flux is weakened and the motor supplies constant power equal to 85% of the nominal (rated) power.



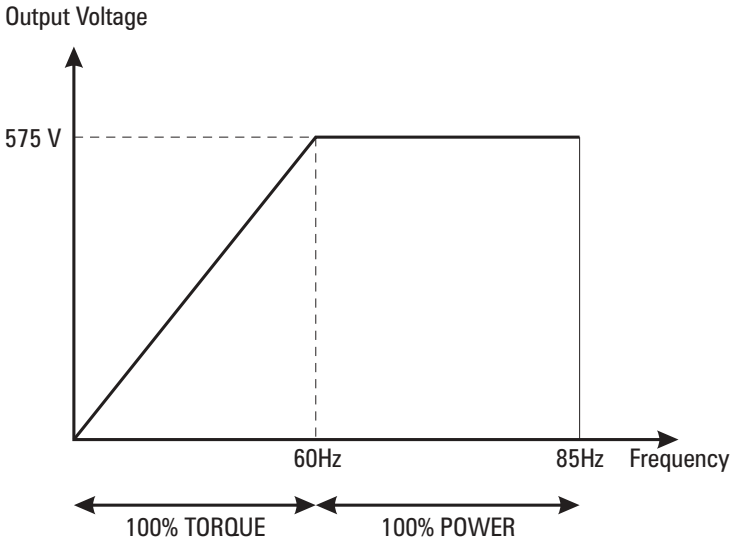
Example 3

Application with constant torque until 1760 rpm and constant power until 2500 rpm.
Set the motor as star connection and select a 10 Hp drive (nominal current 13.8 A).

Set the drive as follow:

Nominal voltage	575 V (star)
Nominal current	10 A (star)
Nominal frequency	60 Hz
Cos phi	0.87
Nominal speed	1760 rpm
Base voltage	570 V
Base frequency	60 Hz

The motor supplies full torque up to nominal speed and full power (10 HP) up to the maximum speed.



6.4.2. Motor Parameter

DRIVE PARAMETER

Motor parameter

Magnetizing cur
Magn working cur
Rotor resistance
Stator resist
Lkg inductance
Load motor par

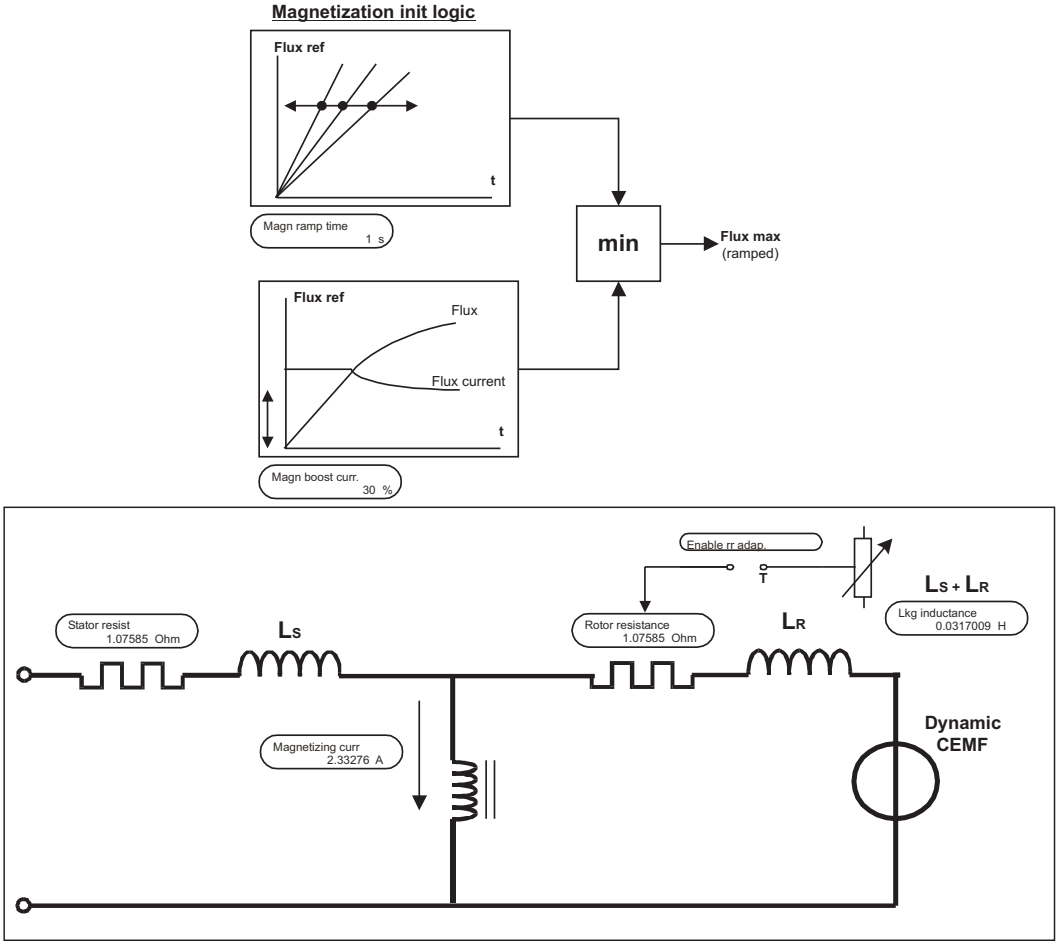
GA0424g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Magnetizing cur [A]	165	0.1	999.0	S	
Magn working cur [A]	726	0.1	999	S	
Rotor resistance [Ohm]	166	0.0001	S	S	
Stator resist [Ohm]	436	0.0001	S	S	
Lkg inductance [H]	437	0.00001	9.00000	S	
Load motor par	251	0	1	Set 1	
Set 1				(0)	
Set 2				(1)	

GA6060-575

S = depending on device type

Figure 6.4.2.1 : Motor parameter



The "Motor parameter" submenu contains parameters used inside the regulation (Flux model). These parameters can be either:

- Estimated from plate data values using the **Take motor par** command (see section 5.3.2.2 "Setting Motor Parameters").
- Manually assigned, if values are available
- Identified by the Self-tuning procedure (see section 5.3.3 "Self-tuning").

Magnetizing curr Value of magnetizing current (approx. equal to no load current) at nominal voltage and frequency. The magnetizing transient when drive is enabled can be modified by making an appropriate setting of the Magn curr boost and Magn ramp time parameters in the CONFIGURATION menu.

Magn working curr Value of magnetizing current corresponding to the actual setting of **Base voltage** and **Base frequency.**

Rotor resistance Rotor resistance of the motor in Ohm.

Stator resistance Stator resistance of motor in Ohm.

Lkg inductance Leakage inductance in Henry

.

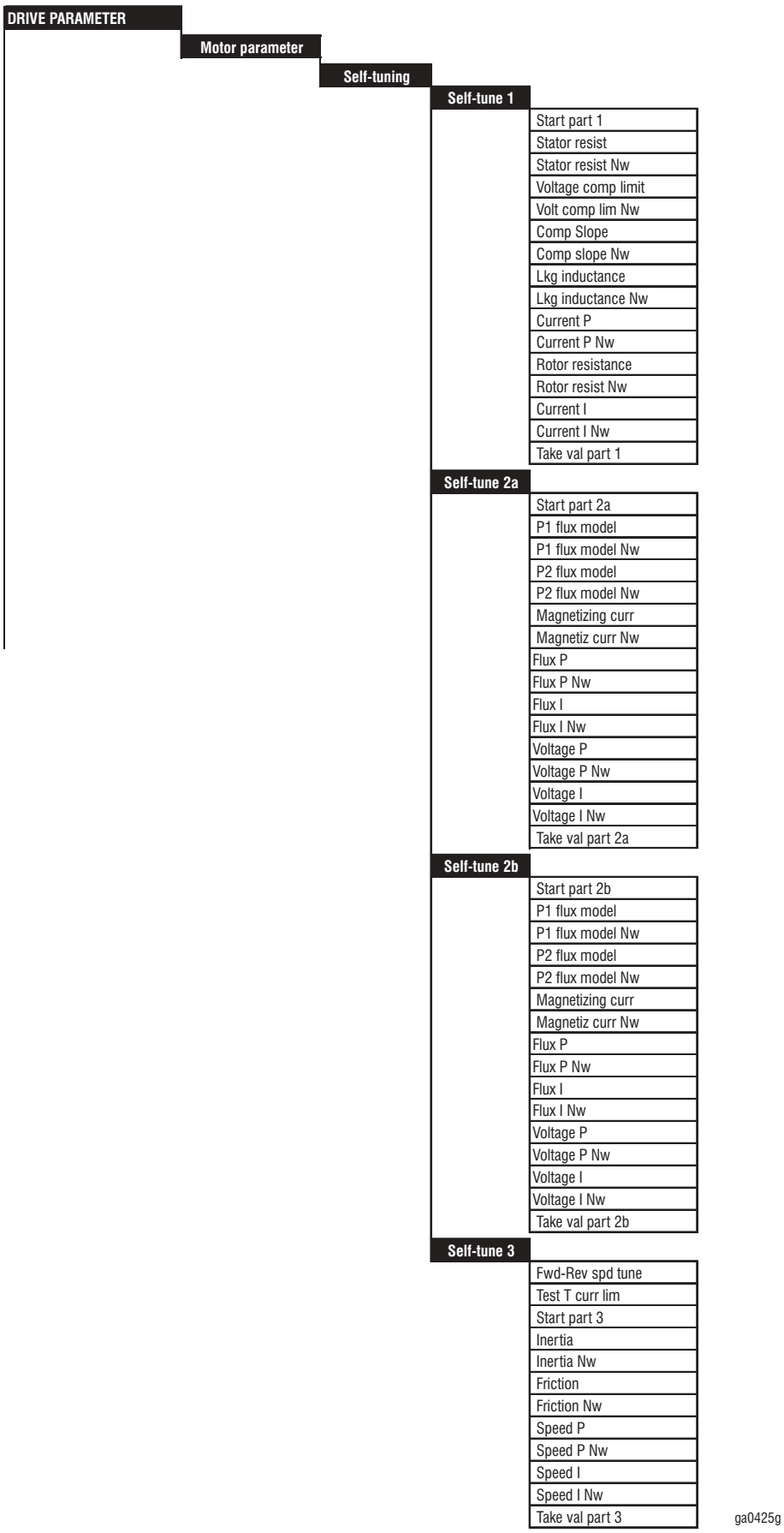
Load motor par It allows to automatically set motor plate data and parameters and regulator gains corresponding to the standard recommended motor, either for Set1 or Set2.

If the value for **Magnetizing curr** is too low, the motor does not provide the nominal torque.

If the values for the **Rotor resistance** are incorrect, the motor may show speed instability, or it may be unable to deliver the nominal torque (Field oriented mode). The speed accuracy may get worse (Sensorless mode).

The procedures required for the fine adjustment are described in section 5.3, "Start up".

6.4.2.1. Self Tuning



Parameter	No.	Value			Standard configuration
		min	max	Factory	
Start part 1	676	0	65535	-	
Take val part 1	677	0	65535	-	
Stator resist [Ohm]	436	0.0001	9.0000	S	
Stator resist Nw [Ohm]	683	S	S	-	
Voltage comp lim [V]	644	0.1	30.0	6.0	
Volt comp lim Nw [V]	685	0.1	30.0	-	
Comp slope [V/A]	645	0.1	50.0	13.0	
Comp slope Nw [V/A]	686	0.1	50.0	-	
Lkg inductance [H]	437	0.00001	9.00000	S	
Lkg inductance Nw [H]	684	S	S	-	
Current P [%]	89	0.00	100.00	S	
Current P Nw [%]	687	S	S	-	
Rotor resistance [Ohm]	166	0.0001	9.0000	S	
Rotor resist Nw [Ohm]	682	S	S	-	
Current I [%]	90	0.00	100.00	S	
Current I Nw [%]	688	S	S	-	
Flux P [%]	91	0.00	100.00	S	
Flux P Nw [%]	907	0.00	100.00	S	
Flux I [%]	92	0.00	100.00	S	
Flux I Nw [%]	908	0.00	100.00	S	
Voltage P [%]	1022	0.00	100.00	15.00	
Voltage P Nw [%]	1024	0.00	100.00	S	
Voltage I [%]	902	0.00	100.00	4.00	
Voltage I Nw [%]	909	0.00	100.00	S	
Start part 2a	678	0	65535	-	
Take val part 2a	679	0	65535	-	
Start part 2b	680	0	65535	-	
Take val part 2b	681	0	65535	-	
P1 flux model	176	0.00	1.00	S	
P1 flux model Nw	689	S	S	S	
P2 flux model	692	1	20	S	
P2 flux model Nw	690	S	S	S	
Magnetizing curr [A]	165	0.1	999.0	S	
Magnetiz curr Nw [A]	690	S	S	S	
Fwd-Rev spd tune **Fwd direction** **Rev direction**	1029	1	2	Fwd direct. (1)	
Test T curr lim	1048	0	S	20	
Start part 3	1027	0	65535	-	
Inertia [Kg*m*m)	1014	0.001	999.999	S	
Inertia Nw [Kg*m*m)	1030	0.001	999.999	-	
Friction [N*m]	1015	0.000	99.999	S	
Friction Nw [N*m]	1031	0.000	99.999	-	
Speed P [%]	87	0.00	100.00	S	
Speed P Nw [%]	1032	0.00	100.00	-	
Speed I [%]	88	0.00	100.00	S	
Speed I Nw [%]	1033	0.00	100.00	-	
Take val part 3	1028	0	65535	-	

Ga6065g

S = Depending on the size of the device

Self-tuning	Automatic commissioning (See section 5.3.3, “Self-tuning”)
Start part 1	Start-up first step of self commissioning
Take val part 1	Acquire the parameters after first step
Start part 2a	Start-up second step of self commissioning (with rotating motor)
Take val part 2a	Acquire the parameters after second step
Start part 2b	Start-up second step of self commissioning (with the motor at stand-still)
Take val part 2b	Acquire the parameters after second step
Start part 3	Start speed self tune.
Stator resistance	Stator resistance of motor in ohm.
Stator resistance Nw	New value of stator resistance of motor in ohm identified by Self-tuning.
Voltage comp lim	Value of the voltage compensation
Volt comp lim Nw	New value of the voltage compensation identified by Self-tuning
Comp slope	Compensation gradient value
Comp slope Nw	New value of Compensation gradient identified by Self-tuning
Lkg inductance	Leakage inductance in Henry
Lkg inductance Nw	New value of Leakage inductance in Henry identified by Self-tuning
Current P	Proportional coefficient of the current regulator in percentage
Current P Nw	New value of proportional coefficient of the current regulator in percentage identified by Self-tuning
Rotor resistance	Rotor resistance of the motor in ohm
Rotor resist Nw	New value of Rotor resistance of thes motor in ohms identified by Self-tuning
Current I	Integral coefficient of the current regulator in percentage
Current I Nw	New value of integral coefficient of the current regulator in percentage identified by Self-tuning
P1 flux model	First parameter to define the value of motor magnetizing curve
P1 flux model Nw	New value identified by self-tuning
P2 flux model	Second parameter to define the value of motor magnetizing curve
P2 flux model Nw	New value identified by self-tuning
Magnetizing curr	Magnetizing current value of the motor
Magnetiz curr Nw	New magnetizing current value of the motor identified by Self-tuning
Flux P	Proportional coefficient of the flux regulator in percent
Flux P Nw	New value of proportional coefficient of the flux regulator in percent identified by the Self tuning
Flux I	Integral coefficient of the flux regulator in percent
Flux I Nw	New value of integral coefficient of the flux regulator in percent identified by the Self tuning
Voltage I	Integral coefficient of the voltage regulator in percent
Voltage I Nw	New value of integral coefficient of the voltage regulator in percent identified by the Self tuning
Voltage P	Proportional coefficient of the voltage regulator in percentage
Voltage P Nw	New value of Proportional coefficient of the voltage regulator in percentage identified by the Self tuning
Fwd-Rev spd tune	Direction of rotation for the speed self tune test (Forward or Reverse; Forward is clock-wise as seen from shaft drive end).

Test T curr lim Torque current lim applied during **Speed Self tune** tests

Inertia Inertia value in Kg*m^2. (**1 Kg*m^2 = 23.76 lb*ft^2**)

Inertia Nw New Inertia value in Kg*m^2 identified during the Speed self tune procedure.

Friction Friction value or Loss compensation in N*m. (**1 N*m = 0.738 lb*ft**)

Friction Nw New Friction value or Loss compensation in N*m identified during the speed self tune procedure.

Speed P Proportional gain of the speed regulator in percentage.

Speed P Nw New value of Proportional gain of the speed regulator in percentage computed during the speed self tune procedure.

Speed I Integral gain of the speed regulator in percentage.

Speed I Nw New value of Integral gain of the speed regulator in percentage computed during the speed self tune procedure.

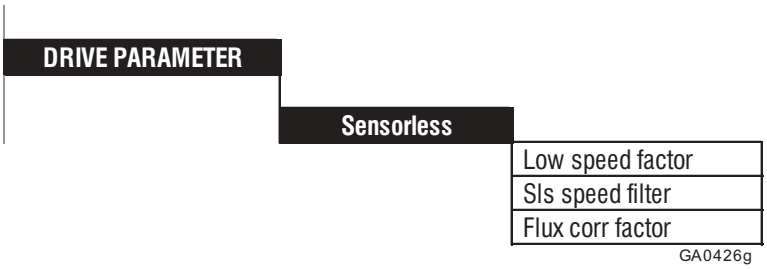
Take val part 3 Acquire the parameters after the self tune procedure (overwrite current values).

NOTE! This is not a permanent save. Go to "Save Parameters" in BASIC MENU or SPEC FUNCTIONS to save to non-volatile memory.

NOTE! A range control exists over the parameters identified by the self-tuning procedure in case of out of range occuring an error message like "parameter_name range error" is displayed. As follows the parameter list: Rs (stator resistance), DTL (Voltage comp lim), DTS (Comp slope), Ls (stator inductance), U (Voltage used during Rr tuning process), Rr (rotor resistance), PIS (stator current regulator proportional gain) and IIS (stator current regulator integralgain).

For commissioning and more informations on procedure in case of error message "parameter_name range error"see chapter 5.3.3 "Self tuning".

6.4.2.2. Sensorless



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Low speed factor	646	0	32000	5000	
Sls speed filter [s]	643	0.01	0.50	0.01	
Flux corr factor	647	0.50	1.00	0.90	

GA6070g

Low speed factor This parameter influences the performance of low speed control (2% of nominal speed). If the drive cannot provide the required torque value at low speed, the parameter will have to be increased. Too high values of this parameter can produce instability.

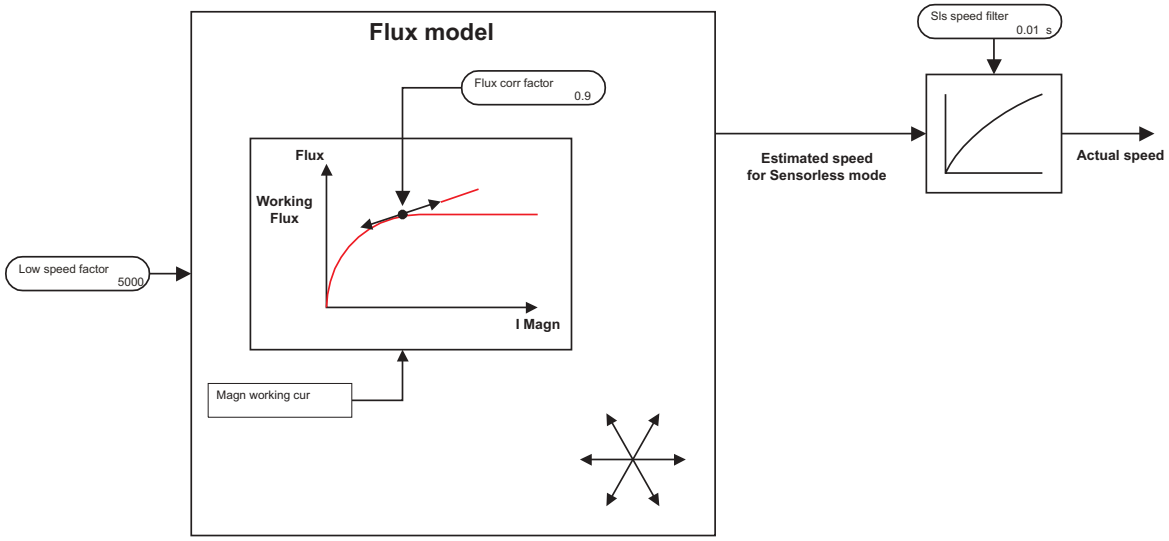
Sls speed filter This parameter represents the time constant of the low-pass filter on the estimated speed.

By increasing this parameter it is possible to reduce the noise level of the estimated speed; consequently lowering the speed control dynamics too.

Flux corr factor This parameter is a correction factor on estimated rotor flux.

In case of high inertia load or in regenerative operation, a speed instability might occur that can be avoided decreasing this factor.

Figure 6.4.2.2.1: Sensorless



6.4.2.3. V/f Control

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
V/f shape	712	0	3	$V = K \bullet f^{1.0}$	
$V = K \bullet f^{1.0}$				(0)	
$V = K \bullet f^{1.5}$					
$V = K \bullet f^{1.7}$					
$V = K \bullet f^{2.0}$					

GA6075g

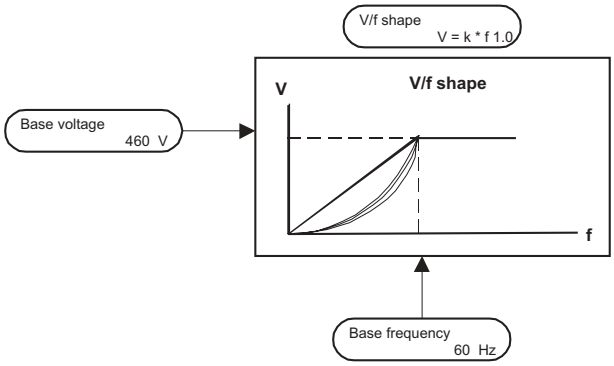
V/f shape There are essentially four different types of V/f characteristics, which are specified by this parameter. This parameter specifies the characteristics between zero and the knee of the characteristic curve.

Type 0 $V = K \cdot f^{1.0}$ (use this selection for constant torque loads)

Type 1 $V = K \cdot f^{1.5}$

Type 2 $V = K \cdot f^{1.7}$

Type 3 $V = K \cdot f^{2.0}$

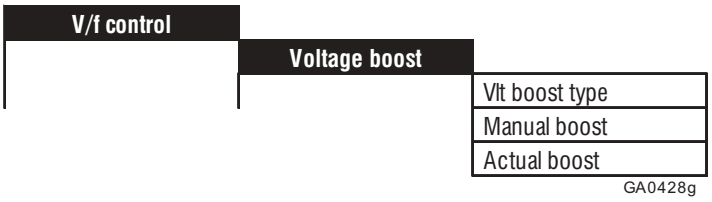


The basic selection criteria for the V/f characteristics (V/f shape) available can be taken from the next table.

Characteristics	Type of load
0	Constant torque requirement across the whole speed range
1	Mixed load between types 0 and 3
2	Mixed load between types 0 and 3
3	Load where the torque is proportional to the speed squared, e.g. fans and certain types of pump

GA6080g

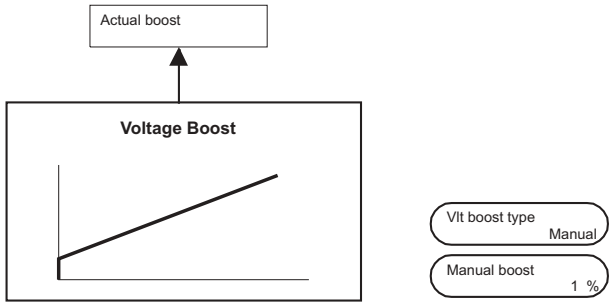
6.4.2.3.1. Voltage Boost



GA0428g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Vlt boost type Manual Automatic	709	0	1	Manual (0)	
Manual boost [%]	710	0.0	10.0	0.0	
Actual boost [%]	711	0.0	100.0	—	

GA6085g



The resistive impedance of the stator windings causes a voltage drop within the motor, which results in a reduction in torque in the lower speed range. Compensation can be made for this effect by boosting the voltage. Compensation is carried out continuously across the whole speed range and according to the amount of Output current.

Vlt boost type Selection of the Boost type:

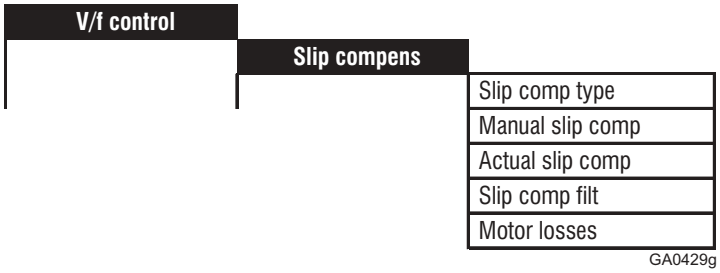
Manual Boost value can be set manually via **Manual boost**

Automatic Boost value is derived from Motor parameters

Manual boost Value in percentage of the **Nominal voltage** [161], the voltage boost specified is independent of the V/f characteristic selected (parameter 712).

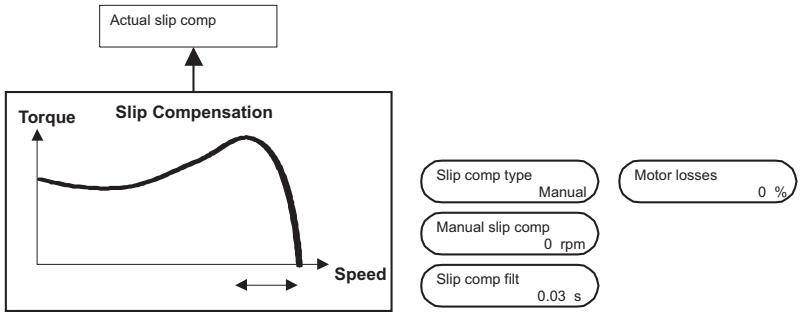
Actual boost Actual boost as a percentage of the **Nominal voltage**

6.4.2.3.2. Slip Compens



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Slip comp type Manual Automatic	722	0	1	Manual (0)	
Manual slip comp [rpm]	723	0	200	0.0	
Actual slip comp [rpm]	724	-400	+400	0	
Slip comp filter [s]	725	0.003	0.300	0.030	
Motor losses %	727	0.0	20.0	0.0	

GA6090g



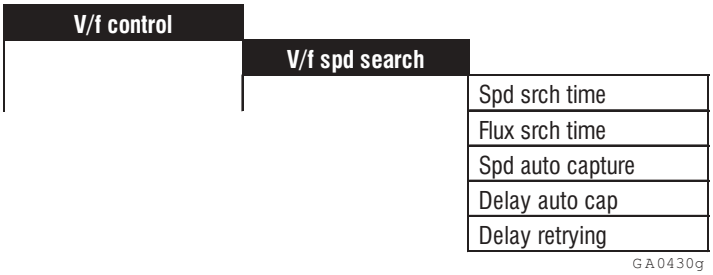
If the asynchronous motor is being loaded, due to the slip compensation, the mechanical speed will vary as long as the load varies. In order to adjust this speed error the slip compensation function can be used.

During the “Slip comp” calibration make sure that the drive is not in the Current limit condition; in that case it is not possible to make calibration. Too high compensation values can cause instability because of over slip compensation.

Losses in the motor may cause **Actual slip comp** to be different from zero even if the Drive is not loaded. **Motor losses** parameter can be used to adjust compensation to zero at no load.

Slip comp type	**Selection of the Slip compensation type:** Manual Manual compensation Automatic Automatic compensation value in base of Motor parameters
Manual slip comp	Compensation value to be applied when the motor supplies the nominal torque
Actual slip comp	Actual slip compensation in rpm
Slip comp filt	Time constant of 1st order lowpass filter of the slip compensation. The value is specified in seconds. Increasing this value helps damping oscillations that may arise with load steps (especially negative ones).
Motor losses %	Total losses of the motor, as a percentage of rated output power this value is used to adjust slip compensation at no load.

6.4.2.3.3. V/f Spd Search



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Spd srch time [s]	893	0.01	10.00	10.00	
Flux srch time [s]	894	0.01	20.00	1.00	
Spd auto capture [FF]	895	-32768	32767	1500	
Delay auto cap	896	0	10000	1000	
Delay retrying	897	0	10000	1000	

GA6091g

Enabling this function allows an automatic restart in case of momentary alarm (retrying).

The same parameters can also be used to engage a spinning motor (auto capture).

Retrying: the alarm which causes the momentary stop of the drive (for example Undervoltage), must be set as Latch = OFF (CONFIGURATION/Prog Alarms menu).

Autocapture: the engage of a spinning motor, for example in case of motor by-pass between the AC mains and the drive, is activated setting Autocapture = OFF (ADD SPD FUNCT menu)

Spd srch time	This parameter determines the speed variation of the drive output frequency. It represents the time within which is executed a frequency variation from 0 to the motor nominal one, if the output current would be equal to the nominal of the motor.
Flux srch time	This parameter determines the speed variation of the drive flux. It represents the time within which is executed a flux variation from 0 to the motor nominal flux, if the output current would be equal to the nominal of the motor.
Delay retrying	Delay time for motor demagnetization (with retrying function).

Spd auto capture It represents the starting speed of the synchronism research.

Delay auto cap Delay time for motor demagnetization (in case of Autocapture function).

Autorestart after a momentary alarm: Retrying

Before to start the autocapture procedure, it is necessary to consider the motor demagnetization, to avoid high current transient due to the e.m.f. (electromotive force) which cause Overcurrent alarm.

The demagnetization time can be set in milliseconds through the **Delay retrying** parameter. Generally as bigger is the motor power as higher must be the setting of this time; lower values of this parameter can cause high insertion current (Overcurrent alarm).Elapsed the demagnetization time, the autocapture procedure starts. This function is related to **Spd srch time** and **Flux srch time** parameters.

The procedure begins providing to the motor a frequency equal to the one at which the drive was working before the alarm. Then the motor flux will be increased towards the value corresponding to the one related at the output frequency (V/f ratio).

If during this procedure the output current is kept high respect to the nominal one of the motor, the output frequency is reduced and the speed of the flux insertion decreased.

Generally as faster is the motor deceleration at the switching off, as bigger must be the value of **Spd srch time**.

If during the syncronization procedure the Overcurrent alarm occurrs, it is necessary to increase the value of **Flux srch time**.

At the end of the autocapture process, the drive restarts in normal working condition.

Engage of a spinning motor: Autorestart

The procedure is similar to the one above mentioned. The demagnetization time is here set by mean of **Delay auto cap** parameter and the starting search speed of the syncronism by mean of **Spd auto capture**.

Example: 4 poles motor by-pass from the AC mains (60Hz) to inverter.

- Enable the **Autocapture** function (ADD SPD FUNCT)
- Set **Spd auto capture** = 1800
- Drive in STOP condition
- Disconnect the motor from the mains and by-pass it to the inverter

WARNING ! Never apply voltage to the inverter output (terminals U2, V2, W2). Pay particular attention to the commutation sequence contacts between AC mains and inverter.

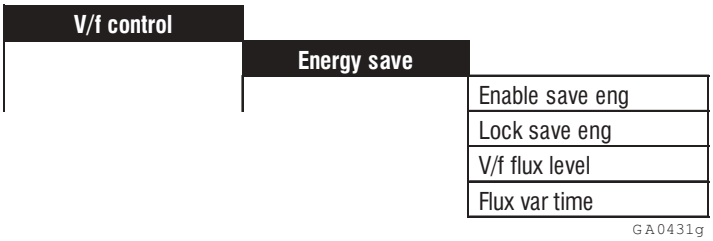
- Give the START command to the inverter

If necessary modify as above described the parameters **Spd srch time** and **Flux srch time**

WARNING ! When this function is selected, the drive will automatically restart once power is reconnected to the unit**.**

This function should only be used on applications where there is no danger to persons or machines during automatic restart. Anyway the valid safety regulations are to be considered.

6.4.2.3.4. Energy Save Function



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Enable save eng Disable Enable	898	0	1	Disabled (0)	
Lock save eng OFF ON	899	0	1	OFF (0)	
V/f flux level [%]	900	0	100	100	
Flux var time [s]	901	1	100	10	

GA6092g

* This parameter can be assigned to one of the programmable digital input

** This parameter can be assigned to one of the programmable analog input

When a motor is found to use only partial levels during normal running conditions, enabling this function reduces the motor flux current to save energy costs.

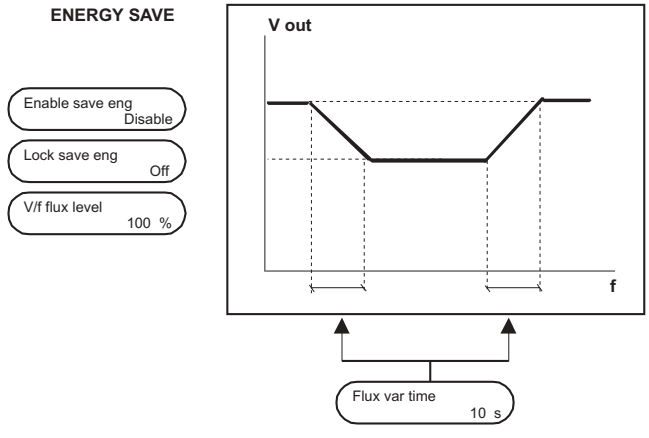
Enable save eng Enable Energy save function enabled

Disable Energy save function not enabled

Lock save eng This command enables (ON) the Energy save function through the digital input, Keypad or Bus.

V/f flux level Percentage value of the motor flux

Flux var time Time to obtain the flux variation



This function can be activated via **"Enable save eng"** by using the serial interface or via keypad.

Using **V/f Flux level** parameter you can change the percentage value of the motor flux which is required. With **Flux var time** you can set the time to obtain the variation flux, from the rated value to the reduced one and back again.

6.5. Input Variables

The AV-300i Drives enable reference values for the ramp and the speed regulator to be specified in different units:

- as a percentage of the **Speed base value**
- in a unit that the user can define himself with the factor function, e.g. as a speed in m/s. The default factory setting is rpm (revolutions per minute).

When entering a value on one of the two parameters, the other is updated with the equivalent value.

Example:

A motor has a maximum speed of 1450 rpm. This corresponds to 100 % and at the same time the user-defined value for this speed is 10,000 bottles per hour.
Changing the reference value to 50 % will automatically result in a change of the other value to 5,000 bottles per hour.

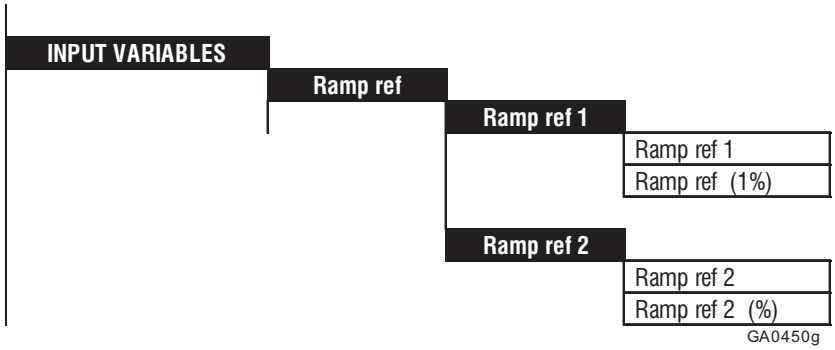
The table below shows the relationship among reference values. In the event of a change, the other parameters are overwritten automatically.

Parameters of the same value	No.	Dimension
Ramp ref 1	44	acc. factor function
Ramp ref 1 (%)	47	%
Speed input var*	44	acc. factor function
Speed input perc*	46	%
Ramp ref 2	48	acc. factor function
Ramp ref 2 (%)	49	%
Speed ref 1	42	acc. factor function
Speed ref 1 (%)	378	%
Speed ref var*	115	acc. factor function
Percent ref var*	116	%
Speed ref 2	43	acc. factor function
Speed ref 2 (%)	379	%

GA6095g

* Defined in the DRIVECOM menu

6.5.1. Ramp Ref



The ramp reference value specifies the speed the drive should reach once the acceleration phase has been completed. Modifications to the ramp reference value are therefore transferred to the ramp accordingly. The amplitude of the ramp reference value determines the motor speed while the plus/minus sign determines the direction of rotation.

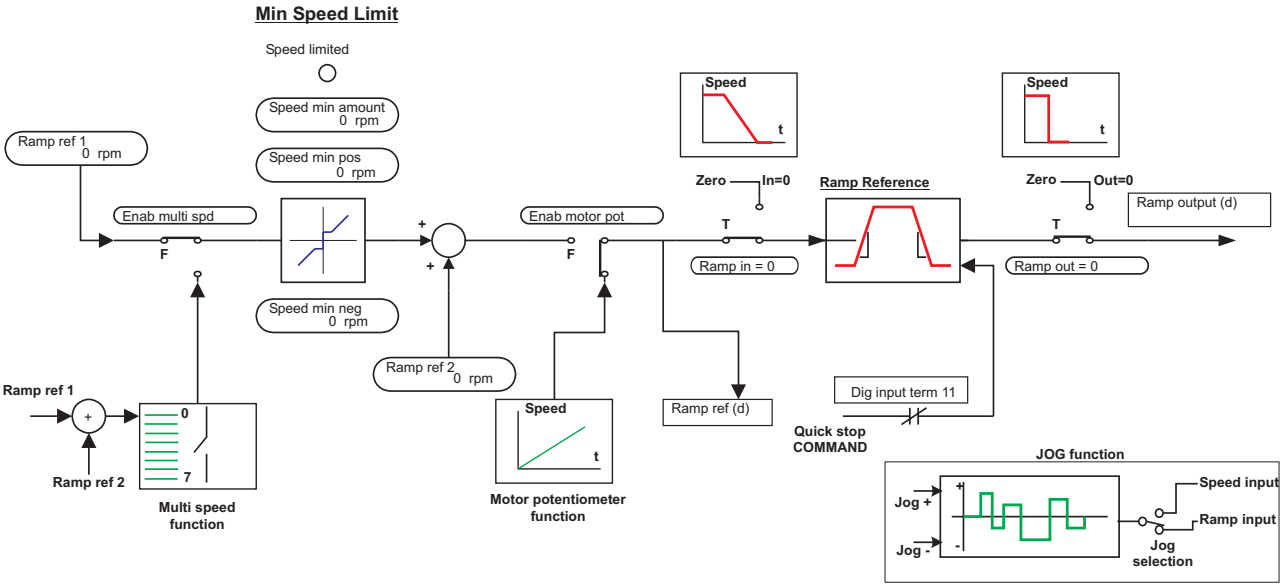


Figure 6.5.1.1: Ramp references

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Ramp ref 1 [FF]	44	-2*P45	+2*P45	0	Analog input 1 (Terminals 1 + 2)*
Ramp ref 1 (%)	47	-200.0	+200.0	0.0	
Ramp ref 2 [FF]	48	-2*P45	+2*P45	0	*
Ramp ref 2 (%)	49	-200.0	+200.0	0.0	
Ramp ref (rpm)	110	-32768	+32767	-	**
Ramp ref (d) [FF]	109	-32768	+32767	-	
Ramp ref (%)	111	-200.0	+200.0	-	

GA6100g

* This parameter can be assigned to one of the programmable digital input. Terminals factory configuration can be changed for differente use.

** This parameter can be assigned to one of the programmable analog input

Ramp ref 1 1st reference value for the ramp. The value to be entered depends on the factor function.

Ramp ref 1 (%) 1st reference value as a percentage of the **Speed base value**

Ramp ref 2 2nd reference value for the ramp. The value to be entered depends on the factor function.

Ramp ref 2 (%) 2nd reference value as a percentage of the **Speed base value**

Ramp ref (rpm) Total reference value for the ramp in rpm (revolutions per minute)

Ramp ref (d) Total reference value for the ramp in the unit is specified by the factor function.

Ramp ref (%) Total reference value of the ramp as a percentage of the **Speed base value**

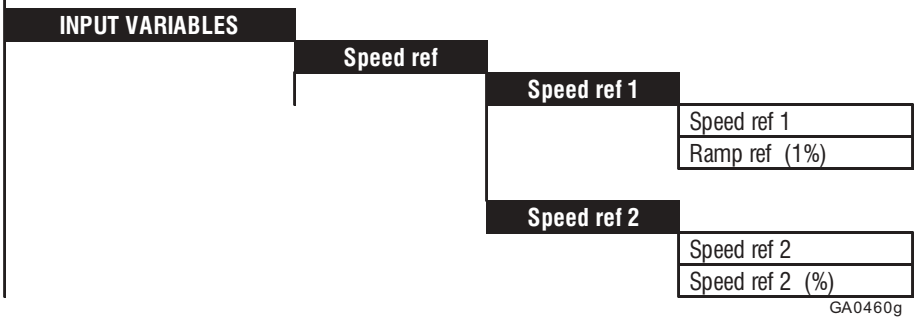
The entire Ramp reference value **Ramp ref** consists of the signed addition of **Ramp ref 1** and **Ramp ref 2** (see Figure 6.5.1.1).

Example 1: **Ramp ref 1** = + 50 % **Ramp ref 2** = + 30 %
Ramp ref = 50 % + 30 % = 80 %

Example 2: **Ramp ref 1** = + 40 % **Ramp ref 2** = - 60 %
Ramp ref = 40 % - 60 %= - 20 %

0 ... 10 V, 0 ... 20 mA and 4 ... 20 mA signals can be used when setting the reference value via terminals. For the **Ramp ref (rpm)**, **Ramp ref (d)** and **Ramp ref (%)** parameters a minimum limit can be specified. When the “Motopotentiometer” or “Multi speed” functions are set, its references will be used.

6.5.2. Speed Ref



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Speed ref 1 [FF]	42	-2*P45	+2*P45	0	Ramp output *
Speed ref 1 (%)	378	-200.0	+200.0	0.0	
Speed ref 2 [FF]	43	-2*P45	+2*P45	0	*
Speed ref 2 (%)	379	-200.0	+200.0	0.0	
Speed ref (rpm)	118	-32768	+32767		
Speed ref (d) [FF]	115	-32768	+32767		**
Speed ref (%)	117	-200.0	+200.0		

GA6105g

* This parameter can be assigned to one of the programmable digital input

** This parameter can be assigned to one of the programmable analog input

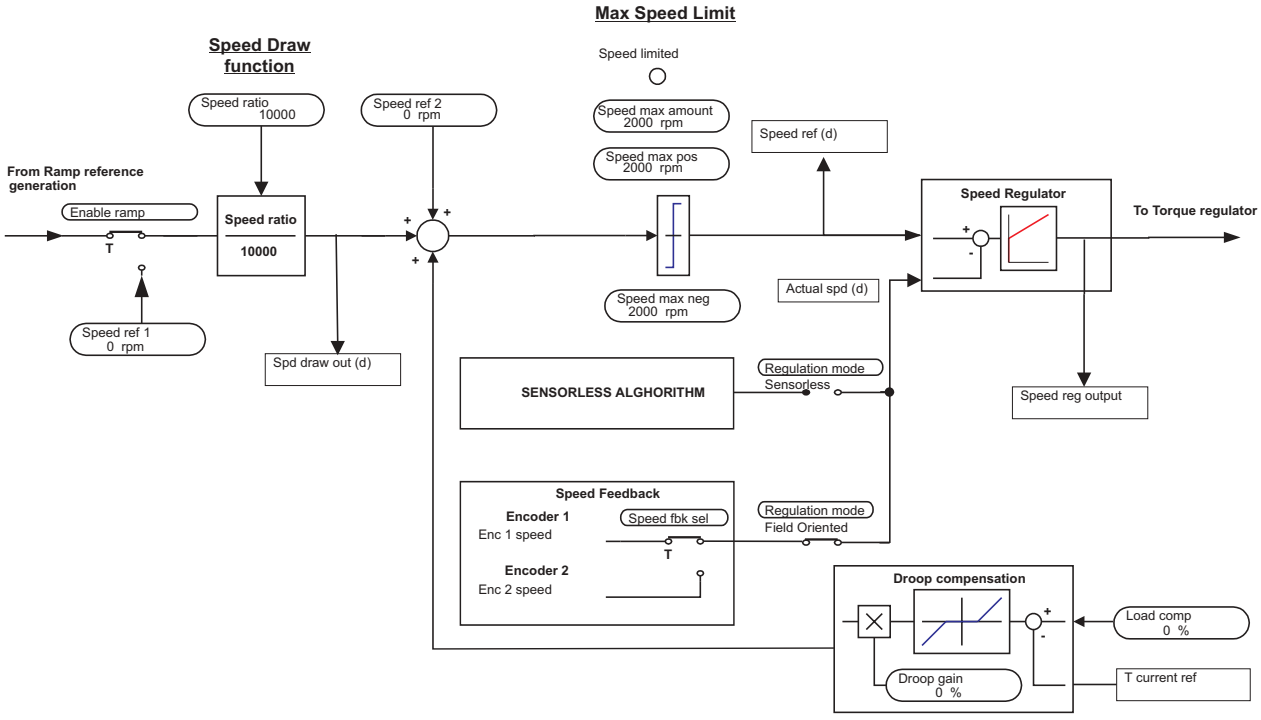


Figure 6.5.2.1: Speed references

The speed reference value specifies the required speed of the drive. The drive responds to the reference value progression directly, except in cases where the torque available is insufficient for this purpose. In this case, the drive operates at the current limit until the selected speed has been reached. The speed reference value determines the speed of the motor, while the plus/minus sign determines the directíon of rotation.

Speed ref 1	1st reference value for the speed. The value to be entered depends on the factor function.
Speed ref 1 (%)	1st speed reference value as a percentage of the **Speed base value**
Speed ref 2	2nd reference value for the speed. The value to be entered depends on the factor function.
Speed ref 2 (%)	2nd speed reference value as a percentage of the **Speed base value**
Speed ref (rpm)	Total speed reference value in rpm (revolutions per minute).
Speed ref (d)	Total speed reference value in the unit specified by the factor function.
Speed ref (%)	Total speed reference value as a percentage of the **Speed base value**

The total speed reference value consists of the signed addition of **Speed ref 1** and **Speed ref 2.**

Example 1: **Speed ref 1** = + 50 % **Speed ref 2** = + 30 %
Speed ref = 50 % + 30 % = 80 %

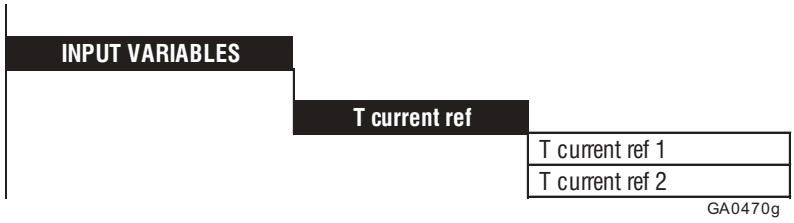
Example 2: **Speed ref 1** = + 40 % **Speed ref 2** = - 60 %
Speed ref = 40 % - 60 % = - 20 %

0 ... 10 V, 0 ... 20 mA and 4 ... 20 mA signals can be used when setting the reference value via terminals.

The speed reference value has an upper and a lower limit.

If the ramp is selected, (**Enable ramp** parameter= Enabled), the reference value input **Speed ref 1** is automatically linked with the ramp output.

6.5.3. Torque Current Reference Value (T Current Ref)



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
T current ref 1 [%]	39	***	***	0	Speed reg output *
T current ref 2 [%]	40	***	***	0	*
T current ref [%]	41	-500	+500	-	**

GA6110g

* This parameter can be assigned to one of the programmable digital input

** This parameter can be assigned to one of the programmable analog input

*** This value depends on Full load torque current **Flt 100mf** (see section 6.9).

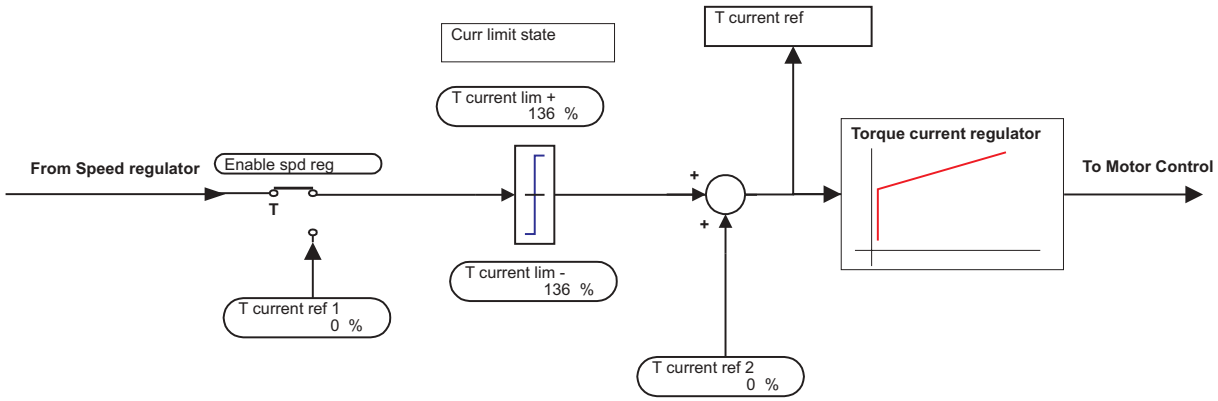


Figure 6.5.3.1: Torque references

The torque current reference value is proportional to the active current of the motor and determines the torque, the sign of the torque determines the direction. For most applications **T current Ref 1** comes from the speed regulator output. **T current ref 2** can also be used as a correction value.

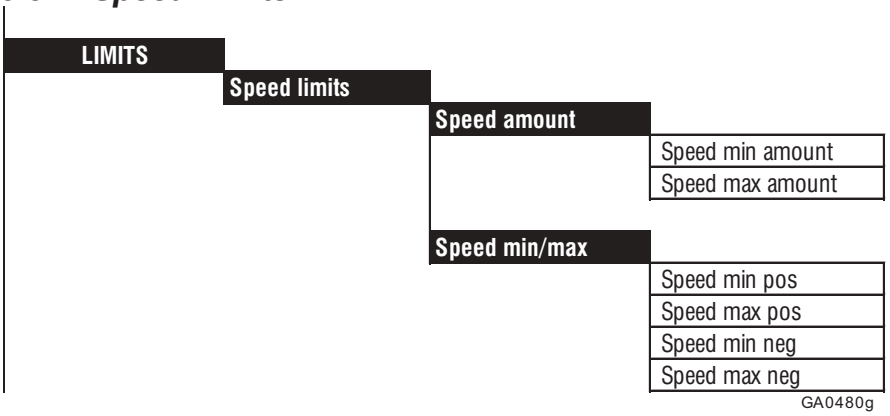
T current ref 1 First current reference value.
T current ref 2 Second current reference value.
T current ref Total current reference value.

T current ref, **T current ref 1**, **T current ref 2** are specified as a percentage of:
Full load torque current Flt 100mf (see section 6.9, "Current regulation")

The total current reference value consists of the signed addition of **T current ref 1** and **T current ref 2.**
Example 1: **T current ref 1** = + 50 % **T current ref 2** = + 30 %
T current ref = 50 % + 30 % = 80 %
Example 2: **T current ref 1** = + 40 % **T current ref 2** = - 60 %
T current ref = 40 % - 60 % = - 20 %
0 ... 10 V, 0 ... 20 mA and 4 ... 20 mA signals can be used when setting the reference value via terminals.
The torque current reference value has an upper limit.

6.6. Limits

6.6.1. Speed Limits



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Speed min amount [FF]	1	0	2^{32} -1	0	
Speed max amount [FF]	2	0	2^{32} -1	2000	
Speed min pos [FF]	5	0	2^{32} -1	0	
Speed max pos [FF]	3	0	2^{32} -1	2000	
Speed min neg [FF]	6	0	2^{32} -1	0	
Speed max neg [FF]	4	0	2^{32} -1	2000	
Speed limited	372	0	1		*

GA6115ai

* This function can be assigned to a programmable digital output.

Speed min amount It defines the minimum speed for both directions. A value below the minimum value is not possible, regardless of the reference value selected. This parameter affects the ramp input. If the **Speed min amount** parameter is changed, the parameters **Speed min pos** and **Speed min neg** are set to the same value. If either of these parameters is subsequently changed, the last change is valid. The value to be entered is based on the factor function.

Speed max amount It defines the maximum speed for both directions. This parameter affects the input of the speed regulator and therefore it takes into account both the reference values that come from the ramp as well as the direction of rotation (see Figure 6.5.2.1). If the **Speed max amount** parameter is changed, the **Speed max pos** and **Speed max neg** parameters are set to the same value. If either of these values is subsequently changed, the last change is valid. The value to be entered is based on the factor function.

Speed min pos It defines the minimum speed for the clockwise rotation of the motor. A value below the minimum is not possible, regardless of the reference value selected. This function effects the ramp input (see Figure 6.5.1.1). The value of the parameter to be entered is based on the factor function.

Speed max pos It defines the maximum speed for the clockwise rotation of the motor. This function affects the input of the speed regulator and therefore takes into account both the reference values that come from the ramp as well as the directly entered values (see Figure 6.5.1.1). The value of the parameter entered is based on the factor function.

Speed min neg It defines the minimum speed for the counter clockwise rotation of the motor. A value below the minimum is not possible, regardless of the reference value selected. This parameter affects the ramp input (see Figure 6.5.1.1). The value of the parameter entered is based on the factor function.

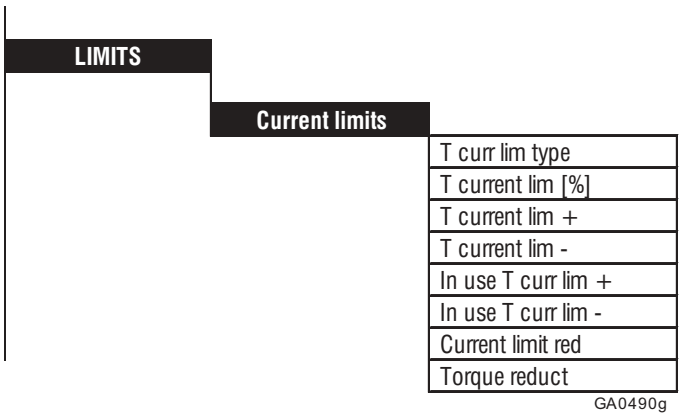
Speed max neg It defines the maximum speed for the counter clockwise rotation of the motor. This parameter affects the input of the speed regulator and therefore it takes into account both the reference values that come from the ramp as well as the directly entered value (see Figure 6.5.1.1). The value of the parameter entered is based on the factor function.

Speed limited Message that indicates that the reference value limited by the entered minimum and maximum limit values.

Speed limited	Reference value limited since the value selected is out of range of the limit values defined.
Speed not limited	Reference value within the defined limit values.

NOTE! The **Speed min amount**, **Speed min pos** and **Speed min neg** parameters have an effect on the **Ramp ref 1** reference value, the motor potentiometer function and the multi-speed function. They do not, however, have an effect on the **Ramp ref 2** parameter!

6.6.2. Current Limits



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
T curr lim type T lim +/- T lim mot gen	715	0	1	T lim +/- (0)	
T current lim [%]	7	0	****	S	**
T current lim + [%]	8	0	****	S	**
T current lim - [%]	9	0	****	S	**
Curr limit state	349	0	1		Digital output 5 ***
In use T cur lim + [%]	10	0	****		
In use T cur lim - [%]	11	0	****		
Current lim red [%]	13	0	****	100	
Torque reduct Torque red. not active Torque red. active	342	0	1	Not active (0)	*

GA6120g

* This function can be assigned to one of the programmable digital inputs.

** This parameter can be assigned to a programmable analog input.

*** This function can be assigned to one of the programmable digital outputs.

**** This value depends on Full load torque curr Flt 100 mf (see chapter 6.9.)

The current limit parameters affect the input of the current regulator and only take into account the active current of the drive.

T curr lim type This parameter determines the behaviour of the drive in current limit condition.

T lim +/-	The active positive torque limit is T current lim + and the active negative torque limit is T current lim -.

T lim mot gen With this selection 3 conditions are possible:

1 - If the motor speed > +1% of Motor nom speed the active positive torque limit is **T current lim+** and the active negative torque limit is **T current lim-**

2 - If the motor speed < -1% of Motor nom speed the active positive torque limit is **T current lim-** and the active negative torque limit is **T current lim+**.

3 - If -1% of Motor nom speed < motor speed < +1% of Motor nom speed both the active positive torque limit and the active negative torque limit are **T current lim+**.

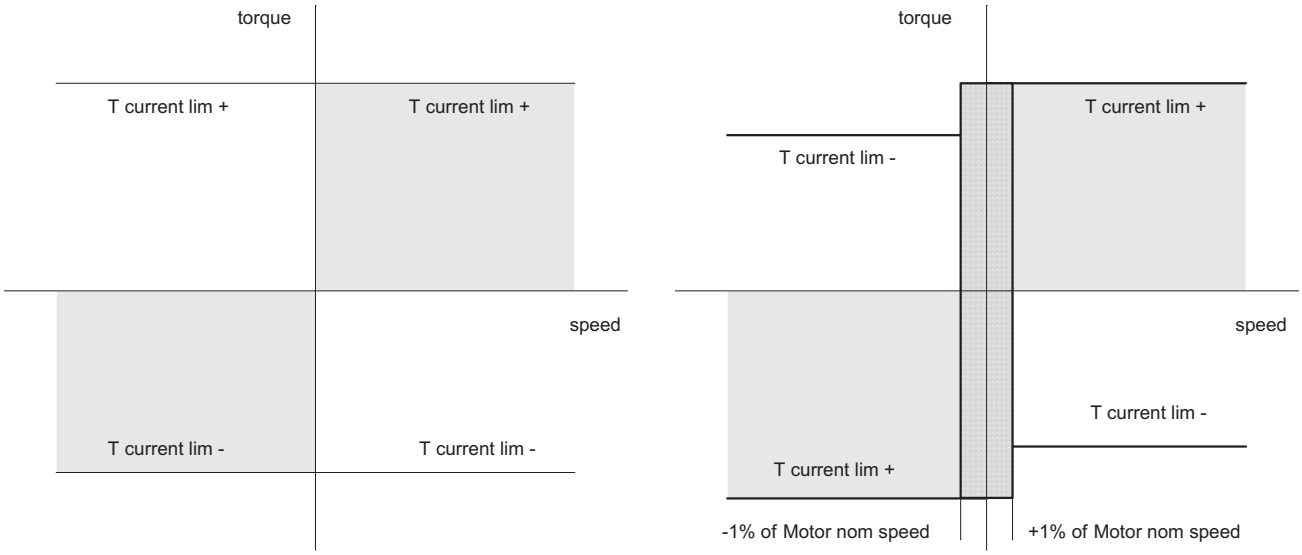


Figure 6.6.2.1: Tlim +/- , T lim not gen

In **Sensorless** mode there is also the following internal limitation :

NOTE! Parameter **Full load curr [179]** must be set equal to **Nominal Current [164]** of the motor.

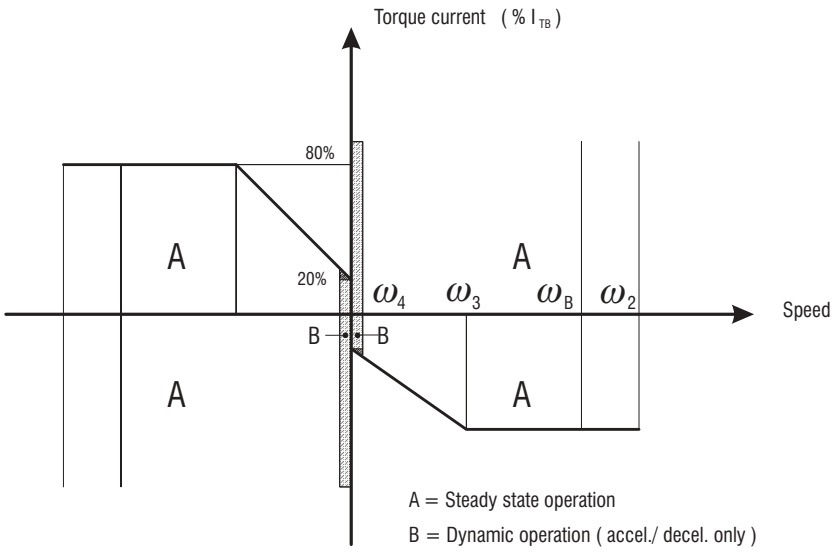


Figure 6.6.2.3: Current limits in sensorless mode

ω_B = Speed @ Base frequency

ω_2 = 2.5 x ω_B

ω_3 = 0.2 x ω_B

ω_4 = 0.02 x ω_B

$$I_{TB} = \sqrt{(I_N)^2 - (I\mu_{work})^2}$$

$\mathbf{I_{TB}}$ = Torque current at **Base voltage [167], Base frequency [168]**

Where: I_N = **Nominal current** [164], $I\mu_{WORK}$ = **Magn working curr** [726]

T current lim	Symmetrical current limit for both current directions. If the **T current limit** parameter is changed, the Parameter **T current lim +** and **T current lim -** parameters are set to the same value. If any of these parameters is subsequently changed, the last change is valid.
T current lim +	Setting of the drive current limit for the positive current direction (clockwise drive and counter-clockwise brake).
T current lim -	Setting of the drive current limit for the negative current direction (counter-clockwise drive and clockwise brake).
	T current lim, **T current lim+**,**T current lim -** are specified as a percentage of:
	Full load torque curr Flt 100 mf (see section 6.9 “Current regulation”).
Curr limit state	It indicates whether the drive is working at current limit or not.
	Current limit reached — Drive working at the current limit. “I limit” LED lights up.
	Current limit not reached — Drive not working at the current limit.
In use Tcur lim +	Positive Current limit value in use
In use Tcur lim -	Negative Current limit value in use
Current lim red	Selection of **T current lim +/-** value, for use with **Torque reduct** (torque reduction) function.
Torque reduct	Selection for torque reduction. This function can be assigned to a programmable digital input. When the torque reduction function is active, the current limit is reduced to the percentage defined with the **Current lim red** parameter.
	Low — Torque reduction not active
	High — Torque reduction active

Example of the function of the **Current lim red** and **Torque reduct** parameters.

T current limit (or **T current lim +/-**) = 80 %

Current lim red = 70 %

Torque reduct = Low(not active) Current limit = 80 %

Torque reduct = High (active) Current limit = 70 %

The value for **T current lim** can be set in the BASIC MENU.

6.6.3. Flux Limit

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Flux level	467	10	100	100	**

** This parameter can be assigned to one of the programmable Analog output and Analog Input

GA6121g

Flux Level Percentage limit of the working flux.

Working flux is internally computed according to choice of **Base Voltage** and **Base frequency** parameter.

See also chapter 6.10 Flux regulation

6.6.4. Voltage Limits

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Dynamic vlt margin [%]	889	01.00	10.00	01.00	

GA6122g

Dynamic vlt margin It corresponds to the voltage regulation margin with respect to the nominal one available.

In case of a **Base voltage** setting close to or equal to the actual value of the main, **Dynamic vlt margin** represent the margin allowable by the voltage regulation to perform current variations when load steps are suddenly applied.

A 5% value allows a very fast response to load steps but at a loss of voltage (and maximum power).

The minimum value (1%) allows to obtain a maximum output voltage around the 98% of the main voltage but at a loss of quality of dynamic response.

6.7. Ramp

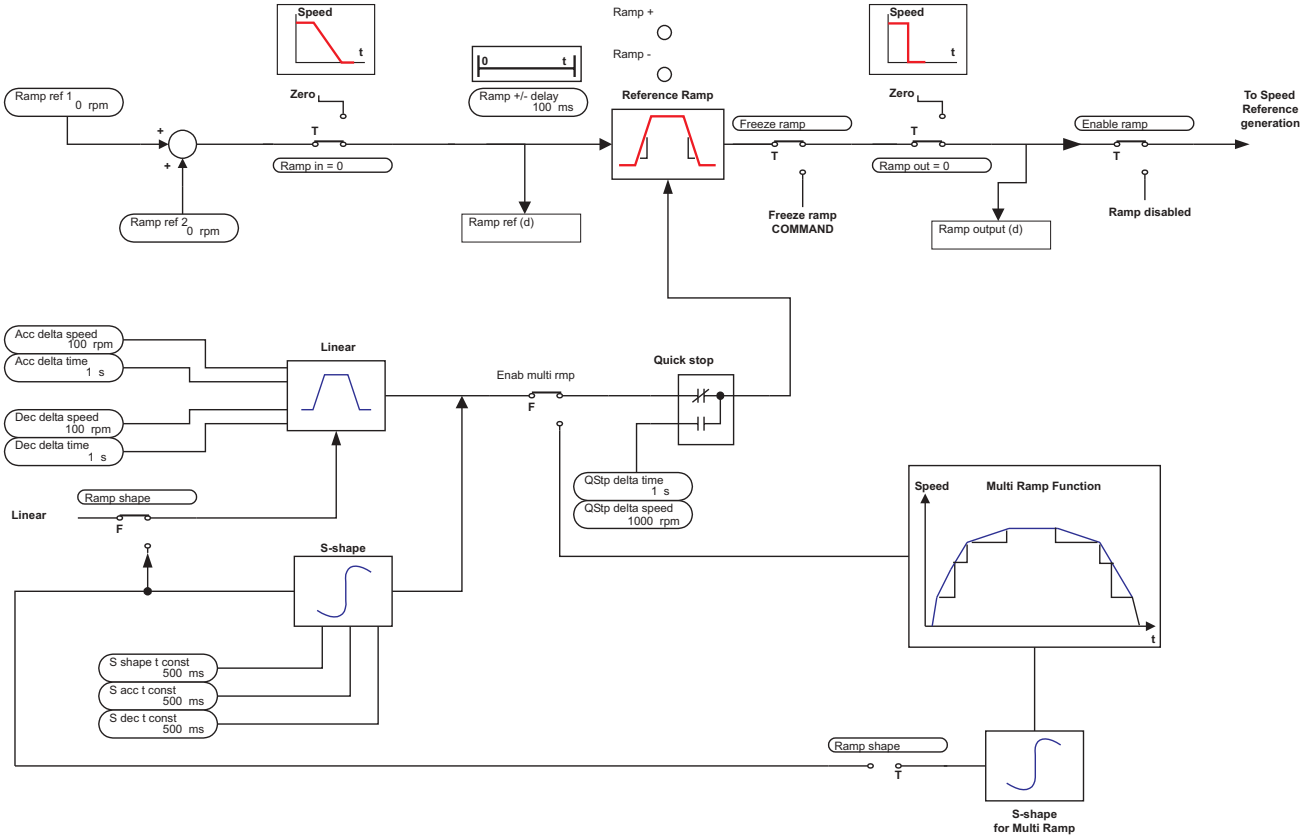


Figure 6.7.1: Ramp

The ramp (reference value integrator) determines the acceleration and deceleration times of the drive. These times can be set independently of each other. An additional ramp is provided for fast stop. This ramp can be activated via the serial interface or a bus or via terminal strip (Fast Stop).

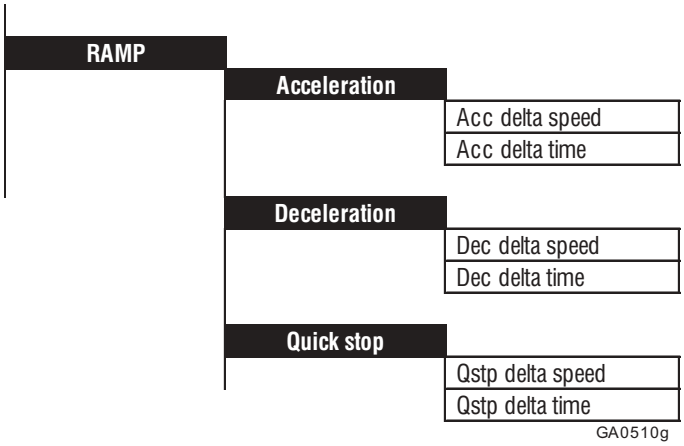
The ramp can either be linear or S-shaped.

The reference values can be defined in three ways

- with the **Ramp ref 1** and/or **Ramp ref 2** reference values
- with the multi-speed function
- with the motor potentiometer function

The Ramp generator can be used in a stand alone configuration. When the Ramp generator is disabled (**Enable Ramp** = disabled), the Enable drive, Start/Stop and Fast stop commands have no more influence on Ramp generator. In such a condition it is free to run and can be used separately.

6.7.1. Acceleration, Deceleration, Quick Stop



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Acc delta speed [FF]	21	0	2^{32} -1	100	
Acc delta time [s]	22	0	65535	1	
Dec delta speed [FF]	29	0	2^{32} -1	100	
Dec delta time [s]	30	0	65535	1	
Qstp delta speed [FF]	37	0	2^{32} -1	1000	
Qstp delta time [s]	38	0	65535	1	

GA6125g

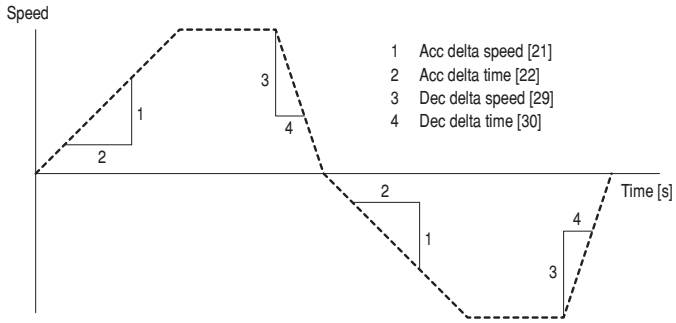


Figure 6.7.1.1: Accel, Decel, and Quick stop

Acc delta speed Has the same unit as the ramp reference value and is based on the factor function.

Acc delta time Is defined in seconds. If “0 s” is entered,the ramp output directly follows the reference value.

Dec delta speed Has the same unit as the ramp reference value and is based on the factor function.

Dec delta time Is defined in seconds. If “0s” is entered, the ramp output directly follows the reference value.

Qstp delta speed Has the same unit as the ramp reference value and is based on the factor function.

Qstp delta time Is defined in seconds. If “0 s” is entered,the ramp output directly follows the reference value.

Quick stop Activates the Quick stop ramp and disables the Drive when halted

Fast stop Activates the Quick stop ramp and holds the motor at zero speed under control

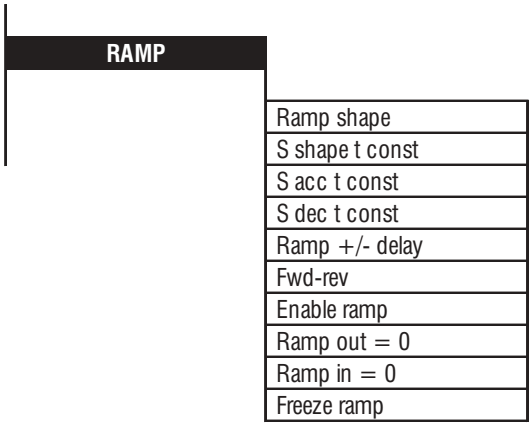
The acceleration of the drive is defined as a ratio of the **Acc delta speed** and **Acc delta time** parameters (see Figure 6.7.1.1). It is the same for both directions of rotation.

The deceleration of the drive is defined as a quotient of the parameters **Dec delta speed** and **Dec delta time** (see Figure 6.7.1.1). It is the same for both directions of rotation.

The Quick Stop and Fast stop functions provide the possibility of an indipendent deceleration ramp for the emergency braking of the drive. The ramp output in this case is not set to zero immediately but after a set time. The deceleration of the drive via the Quick Stop function is defined as the ratio of the **Qstp delta speed** and

Qstp delta time parameters. It is the same for both directions of rotation. If the parameter **Qstp Opt code** = DC Braking curr, the Drive is stopped by injection of DC current.

6.7.2. Ramp Shape and Control Commands



GA0520g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Ramp shape Linear S shaped	18	0	1	Linear (0)	
S shape t const [ms]	19	100	3000	500	
S acc t const [ms]	663	100	3000	500	
S dec t const [ms]	664	100	3000	500	
R amp+	346	0	1		Digital output 1 **
R amp-	347	0	1		Digital output 2 **
Ramp +/- Delay [ms]	20	0	65535	100	
Fwd-Rev No direction Fwd direction Rev direction No direction	673	0	3	Fwd (1)	
Forward sign	293	0	1	0	
Reverse sign	294	0	1	0	
Enable ramp (Enabled/Disabled)	245	0	1	Enabled (1)	
Ramp in = 0 Active Not Active	345	0	1	Not active (1)	*
Ramp out = 0 Active Not Active	344	0	1	Not active (1)	*
Freeze ramp Active Not Active	373	0	1	Not active (1)	*
Ramp outp (rpm)	113	-32768	+32767		
Ramp output (d)	112	-32768	+32767		***
Ramp output (%)	114	-200.0	+200.0		

GA6130g

* This function can be assigned to one of the programmable digital inputs.

** This parameter can be assigned to a programmable digital output.

*** This parameter can be assigned to a programmable analog output.

The shape of the ramp is determined by the **Ramp shape** and **S shape t const** parameters.

Ramp shape	Linear	Linear ramp
	S shaped	S-shaped ramp

S shape t cons Determines the curve for S-shaped ramps (see Figure 6.7.2.1).

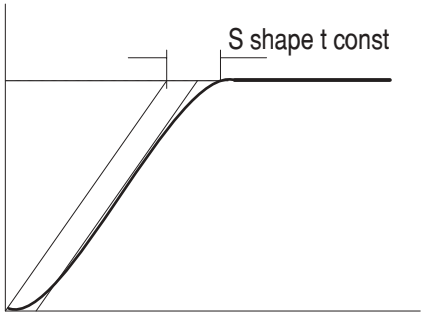


Figure 6.7.2.1: Ramp shape

The value of **S shape t const** is added to the ramp time of linear ramps. The ramp time is thus lengthened by the value defined by the **S shape t const** parameter. This is done regardless of the speed change involved!

S acc t const Determines the curve for S-shaped acceleration ramps

S dec t const Determines the curve for S-shaped deceleration ramps

Using very different **S acc t const** and **S dec t const** values it is possible to have a discontinuous behaviour during the changing of the motor direction.

Speed changes (= Ramp active) are indicated by the **Ramp + and Ramp - parameters.**

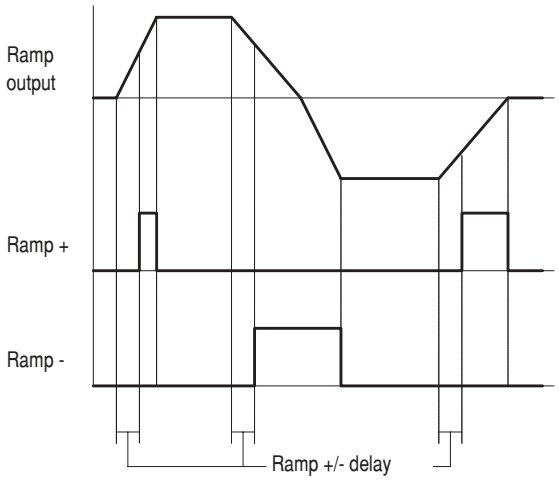


Figure 6.7.2.2: Ramp delay

Ramp + Active, if the drive has a positive torque (clockwise drive and counter clockwise brake)

Ramp - Active if the drive has a negative torque (counter clockwise drive and clockwise brake).

Ramp +/- delay It defines a delay time for Ramp+ and Ramp- commutations.

Fwd-Rev Changes the sign of the Ramp reference. When Fwd direction is selected the Ramp reference is multiplied by +1. When Rev direction is selected the Ramp reference is multiplied by -1.

Forward sign Sets the Fwd direction of the Ramp reference. It can be programmed on a digital input.

Reverse sign Sets the Rev direction of the Ramp reference. It can be programmed on a digital input.

When both Fwd and Rev are 0 or 1, or Fwd-Rev is 0 or 1 the multiplier is 0.

The behavior of the ramp is defined by the **Enable Ramp**, **Ramp In = 0**, **Ramp Out = 0** and **Freeze ramp** parameters.

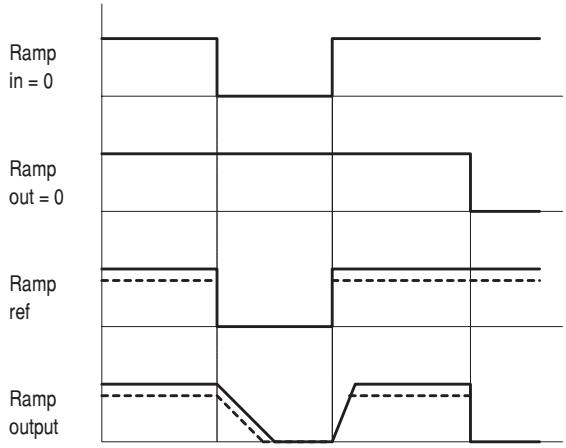


Figure 6.7.2.3: Ramp control

This parameter can be used only with a disabled drive.

Enable Ramp	Enabled Disabled	Ramp function enabled. Ramp function disabled.
Ramp in = 0	Not active	Ramp input is enabled. The **Ramp Ref** parameter corresponds to the reference value set.
	Active	The ramp input is disabled. **Ramp Ref** = 0
Ramp out = 0	Not active Active	The ramp output is enabled. The ramp output is set to zero immediately.
Freeze ramp	Not active	- The value at the ramp output is kept, regardless of any possible reference value changes at the ramp input
	Active	- The ramp output follows the reference value changes at the ramp input according to the times set.
Ramp outp (rpm)	Ramp output in rpm (revolutions per minute)	
Ramp output (d)	Ramp output in the dimension defined by the factor function	
Ramp output (%)	Ramp output as a percentage of the **Speed base value**	

Drive operation is only possible with the ramp function enabled. **Enable ramp** = Enabled.

When the ramp input is enabled via **Ramp in = 0,** the acceleration time of the drive starts. If the input is disabled, the drive slows down according to the deceleration time set till a zero speed.

When the ramp output is set to zero via **Ramp out=0,** the drive brakes at current limit (maximum available torque). The ramp function (also **Quick Stop**) has no effect.

6.8. Speed Regulation

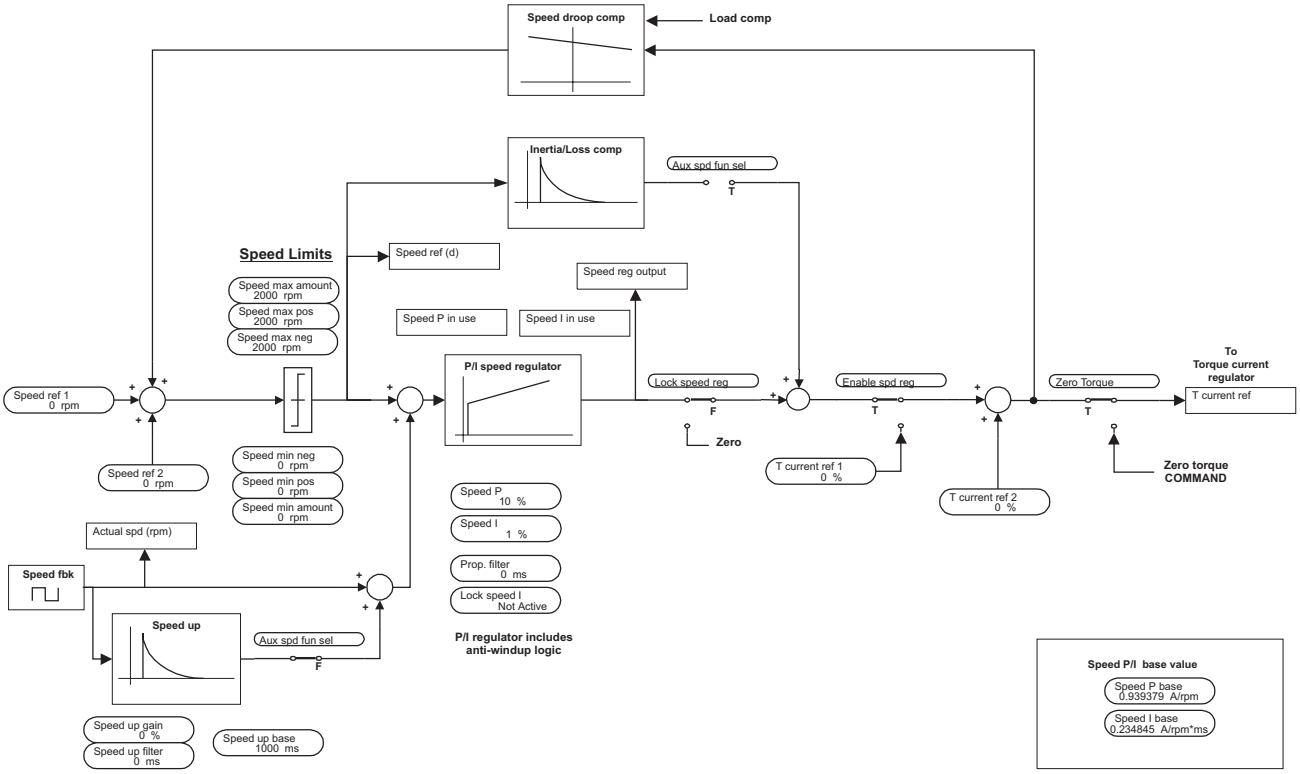


Figure 6.8.1: Speed regulator

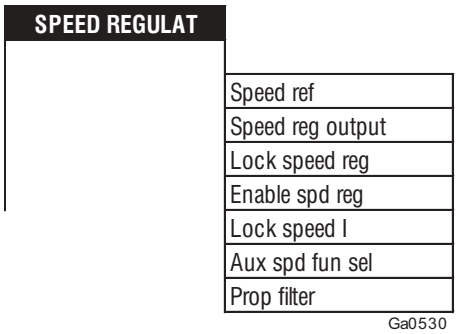
The AV-300i Drives are provided with a speed regulator circuit that can be adapted to the requirements of various applications. The device is factory set for PI behaviour with constant P and I gains.

The following functions are also provided:

- “Speed up” function in order to avoid oscillations in presence of loads with a high moment of inertia.
- Speed zero logic for regulator behaviour when the motor is stopped.
- Speed regulator adaption for optimizing the regulator according to the current speed or to an external reference (Adap Reference).
- Motor captive function for engaging the running motor
- Speed control logic
- Speed signals
- Droop function for current balancing

The internal structure of the speed regulator is shown on chapter 9 (“Speed regulator PI part” block diagram).

6.8.1. Speed Regulator



Parameter	No.	Value			Standard configuration
		min	max	Factory	
Speed ref [rpm]	118	-32768	+32767	-	**
Speed reg output	236	-	-	-	T current ref 1**
Lock speed reg ON OFF	322	0	1	OFF (0)	*
Enable spd reg Enabled Disabled	242	0	1	Enabled (1)	
Lock speed I Active Not active	348	0	1	Not active (1)	*
Aux spd fun sel Speed up Inertia/loss cp	1016	0	1	Speed up (0)	
Prop filter [ms]	444	0	1000	0	

Ga6135

* This function can be assigned to one of the programmable digital inputs.

** This parameters can be assigned to a programmable analog output.

Speed ref Total speed reference value in rpm (revolutions per minute)

Speed reg output Output value of the speed regulator, used as the reference value for the torque current regulator

NOTE! **Speed reg output [%]** contains valid information even if the speed regulator is disabled (Enable speed reg = Disabled). If Speed reg output is enabled, it contains the sum of actual speed regulator output and **T current ref 2.**

Lock speed reg This parameter is used in order to separate the speed regulator output from the torque current regulator during operation. When this happens, the torque current reference value is set to zero and the drive coasts to a halt. This coasting time then depends on the rotating mass and the friction within the system concerned. If the connection between the speed regulator and the current regulator is restored, the drive will restart in the shortest possible time.

ON Speed regulator / torque current regulator connection separated (= when using a digital input).

OFF Speed regulator / torque current regulator connection present (= 15...30 V when using a digital input).

Enable spd reg This parameter can only be changed when the drive is switched off.

Enabled	The speed regulator is enabled. The regulator output is connected to the input of the torque current regulator. **Speed reg output** = **T current ref 1**
Disabled	The speed regulator is disabled.

Lock speed I

Not active	I component of the speed regulator is active
Active	I component of the speed regulator is set to zero

Aux spd fun sel Selection of the Speed up or Inertia/loss comp function (see chapter 5.3.5.4 & 6.8.4 for other details).

Prop filter Time constant of the filter belonging to the circuit of the speed feedback. Filtering og the high frequency components of speed feedback signal is useful in case of elastic coupling between motor and load (joint or belts)

NOTE! The speed regulator must be enabled with the **Enable spd reg** parameter in order to use it.

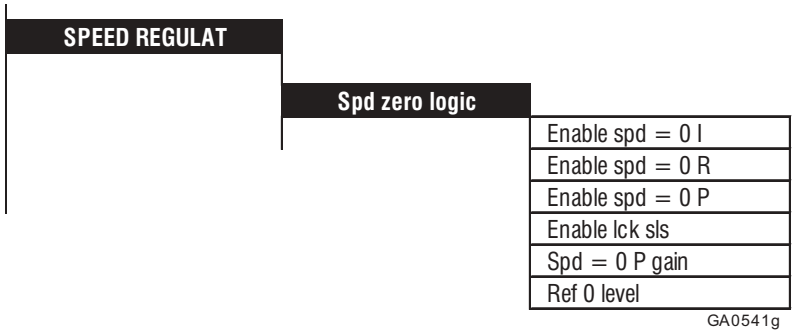
The reference value for the speed regulator consists of the signed addition of **Speed ref 1** and **Speed ref 2.**

For Field oriented mode the actual value is supplied by an encoder that is mounted to the motor shaft. The higher the resolution of the encoder, the better the control accuracy of the regulator. for Sensorless mode, the actual value is computed by the flux model block in the regulation scheme.

The regulator parameters can be set separately.

For the speed PI regulator diagram block, please refer to diagram on chapter 9.

6.8.2. Spd Zero Logic



GA0541g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Enable spd=0I Enable Disable	123	0	1	Disabled (0)	
Enable spd=0R Enable Disable	124	0	1	Disabled (0)	
Enable sped=0P Enable Disable	125	0	1	Disabled (0)	
Spd=0P gain [%]	126	0.00	100.00	10.00	
Enable lck sls Enable Disable	422	0	1	Disabled (0)	
Ref 0 level [FF]	106	1	32767	10	

GA6140g

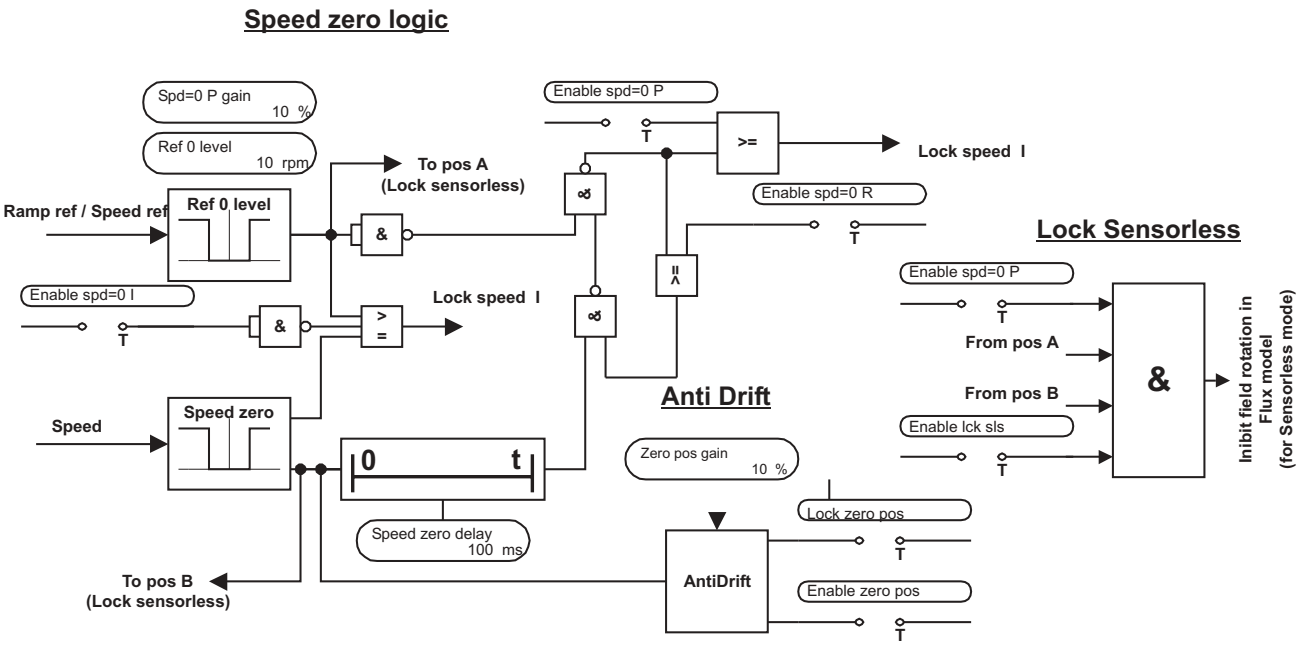


Figure 6.8.2.1: Speed adaptive and Speed zero logic

The speed zero logic defines the behavior of the drive when the motor is at a stop.

Enable spd=0 I

Enabled — The I component of the speed regulator is set to zero when the reference value and the actual value = 0. The drive control is then only proportional. The I component is enabled when a reference value is entered to restart acceleration.

Disabled — The I component of the speed regulator is effective also when the motor is at a stop.

Enable spd=0 R — Only effective if **Enable spd=0 P** is enabled.

Enabled — The proportional **Spd=0 P gain** used when the drive is at a halt is suspended when the speed reference value is above the value defined by **Ref 0 level**.

Disabled — The proportional **Spd=0 P gain** used when the drive is at a halt is suspended when the speed reference value or the speed actual value is above the value defined by **Ref 0 level**.

Enable spd=0 P

Enabled — When reference value and Actual speed are respectively below **Ref 0 level** and **Speed zero level** ("ADD SPEED FUNCT\Speed zero" menu), after the time delay defined by **Speed zero delay**, the proportional and integral gains of the speed regulator are set respectively to **Spd=0 P gain** and to zero. **Spd=0 P gain** deactivation is based on **Enable spd=0 R** parameter.

Disabled — The speed regulator keeps its normal proportional gain when the drive is at a halt.

For **Speed zero level** and **Speed zero** delay parameter, see section 6.14.4.

Spd=0 P gain — Proportional gain of the speed regulator, that is only active when the **Enable spd=0 P** function has been enabled.

Enable lck sls — This parameter is used for **Sensorless** control. This function (Enabled lck sls=Enabled) disables speed control and field rotation when the speed reaches the threshold of zero speed detection. This avoids the drift of the motor shaft. Direct current equal to magnetizing current is injected. No significant torque reaction is possible at standstill with this function enabled. This function is active when **Enable Spd = 0P** is enabled.

Ref 0 level Switch threshold for speed zero logic for zero reference detection. Defined in the unit specified in the factor function. References below this threshold are defined as zero.

6.8.3. Anti Drift Function

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Enable zero pos Disable Enable	890	0	1	Disabled (0)	
Lock zero pos OFF ON	891	0	1	OFF (0)	*
Zero pos gain [%]	892	0	100	10	

GA6123g

* This parameter can be assigned to one of the programmable digital input

Enabling this function locks the rotor of the motor at zero speed without drift, using an internal position control.

It is activated via digital input or Bus, using the command **Lock zero pos**, and when the threshold of zero speed (**speed zero level**) detection is reached.

Enable zero pos Enable Anti drift function enabled

Disable Anti drift function not enabled

Lock zero pos This command enables (ON) the Anti drift function through the digital input, keypad or Bus

Zero pos gain [%] Proportional gain of the position control

Also refer to parameters ADD SPEED FUNCT / Speed zero / **Speed zero level** and **Speed zero delay**

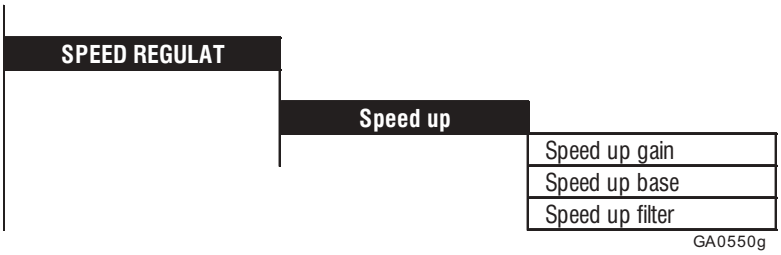
Application example:

- Enable zero pos = Enabled
- Lock zero pos = Enabled
- Motor is running at 1000 rpm
- Speed zero level = 10 rpm
- Speed zero delay = 100 ms

When the STOP command is active and the motor reaches 10 rpm, the position control is automatically activated after 100 msec.

For restart the motor, it is necessary to set the command **Lock zero pos** = Disabled before to give the START command.

6.8.4. Speed Up



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Speed up gain [%]	445	0.00	100.00	0.00	
Speed up base [ms]	446	0	16000	1000	
Speed up filter [%]	447	0	1000	0	

GA6150g

The Speed-up function is used in order to avoid oscillations in presence of loads with a high moment of inertia. It is made up of a D derivative part in the speed feedback circuit, which increases the integral gain of the speed regulator and limits the overshoot. It is also useful in case of cyclical non constant loads on the motor (ex. cams). The feedback applied to the speed regulator is made of two components:

- the motor speed
- the output signal from the Speed up function

This function is mutually exclusive to the **Inertia/loss comp** function, This selection must be done via the **Aux spd fun sel** [1016] parameter. (SPEED REGULAT menu). See section 6.8.1 Speed regulator.

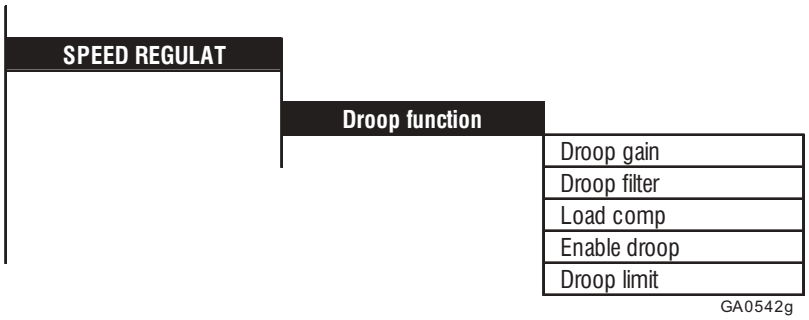
Speed up gain Speed up function gain as a percentage of **Speed up base**

Speed up base Speed up function max. gain. The defined value corresponds to 100% of the **Speed up gain** parameter.

Speed up filter Time constant of the filter belonging to the Derivative part of the Speed up function.

(see example figure 5.3.5.4.1 and 5.3.5.4.2)

6.8.5. Droop Function



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Droop gain [%]	696	0.00	100.00	0.00	
Droop filter [ms]	697	0	1000	0	
Load comp [%]	698	F	F	0	*
Enable droop (Enable / Disable)	699	0	1	Disabled (0)	**
Droop limit [FF]	700	0	2*P45	1500	

GA6145ai

* This parameter can be assigned to one of the programmable digital inputs.

** This parameter can be assigned to a programmable analog outputs.

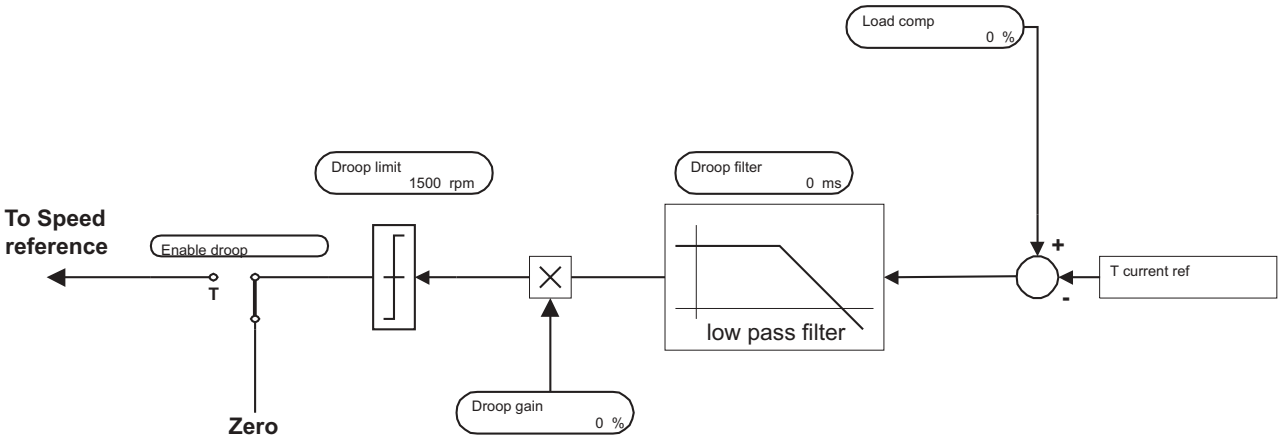


Figure 6.8.5.1: Droop compensation

The Droop function is used when current balancing between two drives is required. A typical situation is when two motors are mechanically coupled and have to run at the same speed. If, because of a different characteristic of the two speed regulators, one motor is driven to run at a higher speed, it will be overloaded and the second motor will work as a brake. The Droop function avoids this by adding a component in the speed reference of a drive, which is proportional to the actual load difference of the drives. The effect is the balacing of the two motor current.

Droop gain Droop function gain. It is defined as a percentage of the ratio between **Speed base value** and the difference **Load comp - T current ref.** That means that when the difference **Load comp - T current ref** is 100% and **Droop gain** = 100%, the speed reference correction signal is equal to **Speed base value**.

Droop filter Filter time constant.

Load comp Load compensation signal. It is typically equal to the “master” drive current, but it can also be provided by an external control (PLC, etc). The parameter can be assigned to a programmable analog input. It is defined as a percentage of Idn.

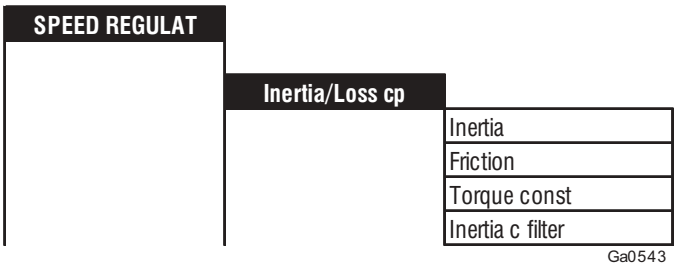
Enable droop Enabled Droop function enabled.

Disabled Droop function disabled.

Droop limit It defines the speed range in which the droop function is active. The value to be entered is based on the factor function.

(For more detail see figure 6.8.1 Speed regulator)

6.8.6. Inertia/Loss Comp



Parameter	No.	Value			Standard configuration
		min	max	Factory	
Inertia [Kg*m*m]	1014	0.001	999.999	S	
Friction [N*m]	1015	0.000	99.999	S	
Torque const [N*m/A]	1013	0.01	99.99	S	
Inertia c filter [ms]	1012	0	1000	0	

Ga6146

S = depending on the Drive size

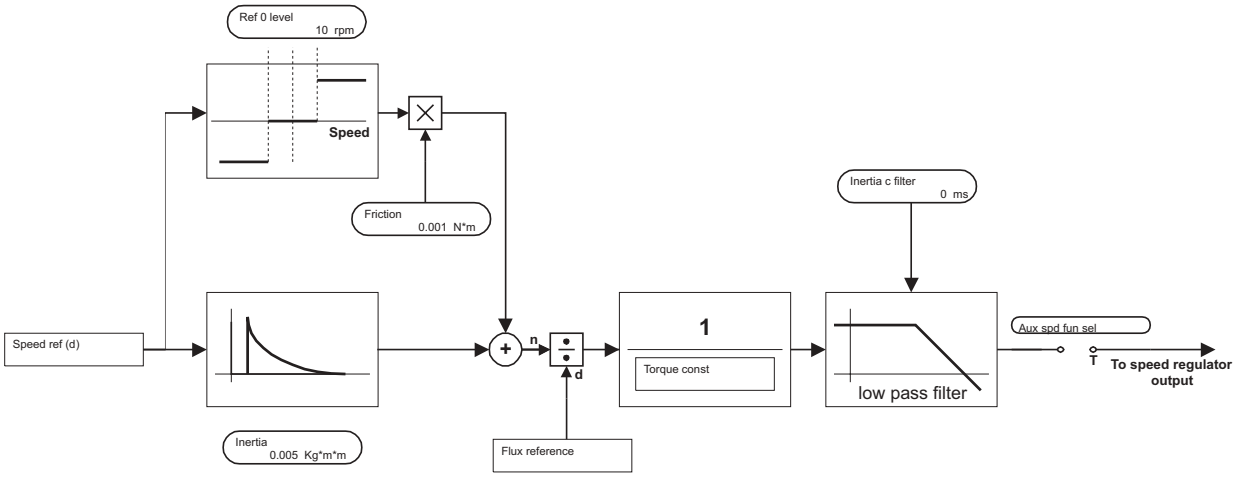


Figure 6.8.6.1: Inertia/Loss compensation

Speed regulator feedforward term that allows to increase the dynamic response to a speed reference variation. These parameters are identified from the Speed self tune function (DRIVE PARAMETER\Motor parameter\Self tuning\Self-tune 3) but they can also be set from the user.

This function is mutually exclusive to the Speed up function, This selection must be done via the **Aux spd fun sel [1016]** parameter. (SPEED REGULAT menu). See section 6.8.1, Speed regulator.

This function does not apply to “V/f control” regulation mode.

Inertia Total Inertia value at the motor shaft in Kg*m^2 identified during the speed self tune procedure. (**1 Kg*m^2 = 23.73 lb*ft^2**)

Friction Friction value (or Loss compensation) in N*m identified during the speed self tune procedure. (**1 N*m = 0.738 lb*ft**)

Torque const Total torque constant value internally computed that allows to obtain the Nm – Amps conversion when the motor operates within the specified **Base voltage** and **Base frequency** range. In order to take field weakening into account, this value must be scaled using the value of **Flux reference [500]**.

Inertia c filter 1st order low pass filter time constant. The filter reduces the noise value owed to the operation of the speed differentiation in the Inertia compensation block.

Inertia/Friction: default value

Drive size	Inertia [Kg*m*m]	Friction [N*m]
6KAVI53002	0.0048	0.001
6KAVI53003	0.005	
6KAVI53005	0.011	
6KAVI53007	0.023	
6KAVI53010	0.028	
6KAVI53015	0.05	
6KAVI53020	0.07	
6KAVI53025	0.15	
6KAVI53030	0.24	
6KAVI53040	0.44	
6KAVI53050	0.52	
6KAVI53060	0.79	
6KAVI53075	1.4	
6KAVI53100	1.6	
6KAVI53125	2.2	
6KAVI53150	2.7	
6KAVI53200		

ga6147-575

[1013] **Torque const** is an internal value which is computed as a function of motor plate data when **Take motor par** is asserted.

6.9. Current Regulation

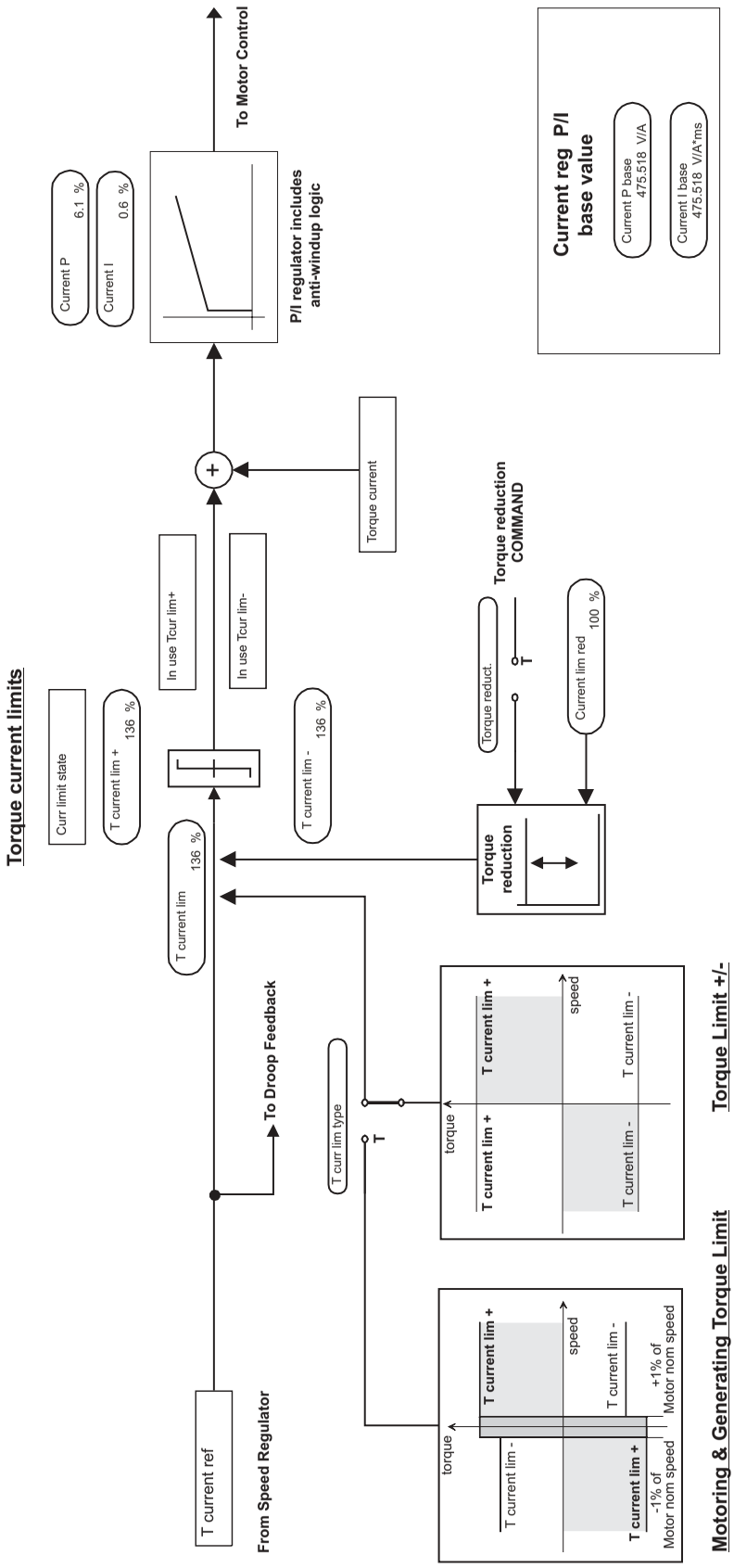
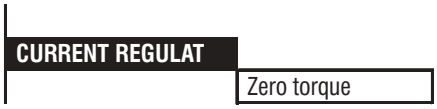


Figure 6.9.1: Torque current regulator



Parameter	No.	Value			Standard
		min	max	Factory	Configuration
Torque current	350	S	S		**
Flux current	351	S	S		**
F current ref	352	S	S		**
Zero torque	353	0	1	Not Active	*
Active					
Not Active				(1)	

GA6155g

* This function can be assigned to one of the programmable digital inputs.

** This parameters can be assigned to a programmable analog output.

The user defines the full load current of the motor via the **Full load curr** (FLC) parameter in the CONFIGURATION menu. This is at the same time the output current of the drive when **T current ref** = 100 %. The drive calculates the value $I\mu_{WORK}$ of magnetizing current required according to **Base voltage** and **Base frequency** and the defined motor data for operation in the base speed range. **F current ref**, during steady state operation in the base speed range, approximately equals $I\mu_{WORK}$. The active motor current in this operating condition is called "Full load torque current" and it is computed as:

$$Flt\ 100mF = \sqrt{(FLC)^2 - (I\mu_{WORK})^2}$$

Foav021u

The **Torque current reference** and **Torque current limit** percentage values are based on **Flt 100mF**. Note that Flt 100mF is an external parameter and not accessible to the user.

Therefore, percentage quantities based on **Flt 100mF** represent torque quantities in the base speed range (scaling by the flux percentage is required in the field weakening range).

Percentage quantities based on FLC refer to total inverter output current. Overload control typically deals with these quantities.

The current regulator consists of two control loops:

- a control loop for the active current "Torque current" (Abbr.: T current)
- a control loop for the reactive current "Flux current" (Abbr.: F current)

They use the same P and I gains. See the regulation block diagram in section 9, "Block Diagrams".

Torque Current Active current of the motor (actual value). This value can be assigned to a programmable analog output.

Flux Current Reactive current of the motor (actual value). This value is only available via the serial interface.

F current ref Reference value for the flux current (generated internally). This value can be assigned to a programmable analog output.

Zero torque This parameter can be used to set the reference value for the reactive current **T current ref** to zero so that the drive has no torque.
Not Active (H) - **T current ref** not set to zero
Active (L) - **T current ref** set to zero. The drive has no torque.

6.10. Flux Regulation

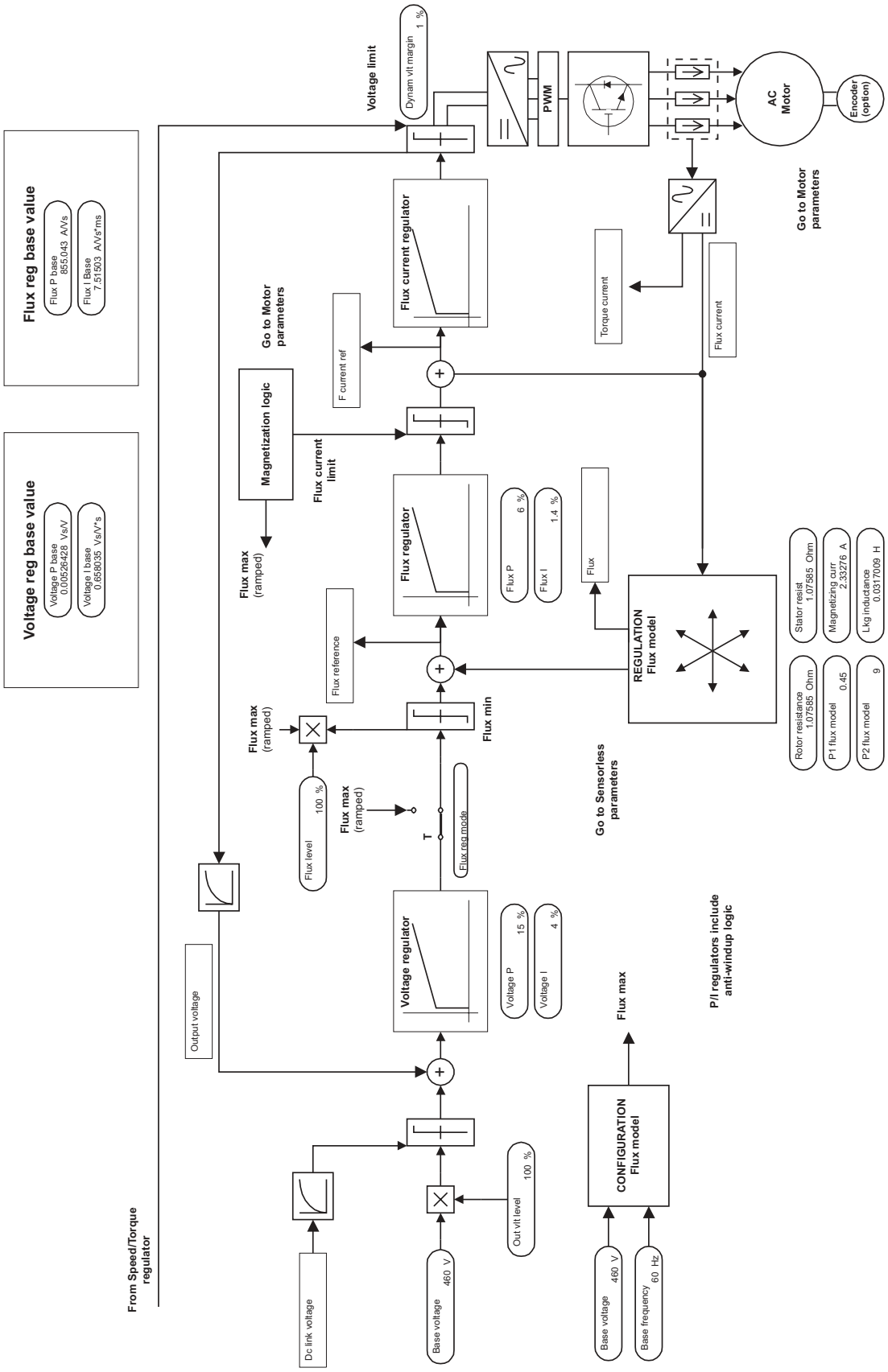


Figure 6.10.1: Motor control

FLUX REGULATION

- Flux reg mode
- Flux reference
- Flux
- Out vlt level

GA0551g

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Flux reg mode	469	0	1	Volt. control	
Constant current					
Voltage control				(1)	
Flux reference	500	0.0	100.0	-	*
Flux	234	0.00	100.00	-	*
Out vlt level	921	0.0	100.0	100.0	**

GA6151g

* This parameter can be assigned to one of the programmable Analog output

** This parameter can be assigned to one of the programmable Analog output and Analog Input

The AV-300i Drive contains the "flux control" regulator (working flux) and the "Voltage control" regulator. The magnetization curve (P1 flux model [176] and P2 flux model [692] parameters) is automatically defined through the Self tuning procedure.

Via the **Flux level** [467] parameter (Limit\Flux Limit) it is possible to set the working flux value and via the Out vlt level [921] it is possible to set the motor output voltage.

Flux reg mode Operating mode selection of the Flux regulator

Constant current By this selection, the motor flux is automatically set and controlled according to the setting of **Base voltage** and **Base frequency**, by the voltage really available on the DC link and by the output frequency of the inverter.

This functionality must be used when it is necessary to perform an external control of the motor flux (for example through the DGF card or through an analog input).

Voltage control By this selection the regulator tends to mantain the flux value constant, for all the working range of the motor, independently from the value of the output frequency and from the voltage available on the DC link.

Flux reference Flux reference, indicated as a percentage of the working flux (defined by **Base voltage** [167] and **Base frequency** [168] values).

Flux Flux feedback, indicated as a percentage of the working flux (defined by **Base voltage** [167] and **Base frequency** [168] values).

Out vlt level By this selection, it is possible to modify the voltage value corresponding to the defluxing setpoint of the motor.

Out vlt level is defined as percentage of **Base voltage**.

Out vlt level is operative only in condition of **Flux reg mode** = **Voltage control**

Working on parameters **Out vlt level** and **Flux level** (LIMIT/Flux limit) it is possible to modify the flux characteristic, as described in the following examples:

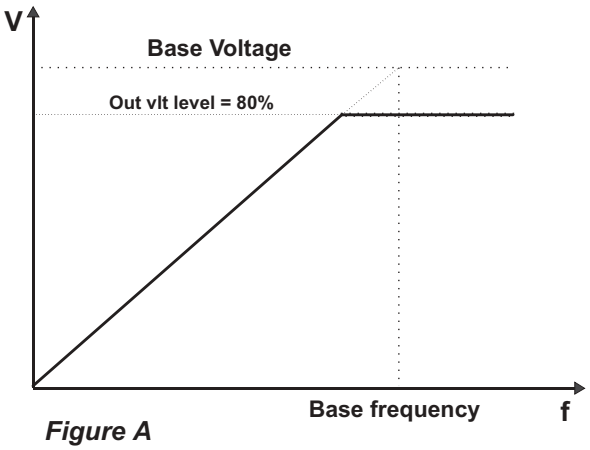


Figure A

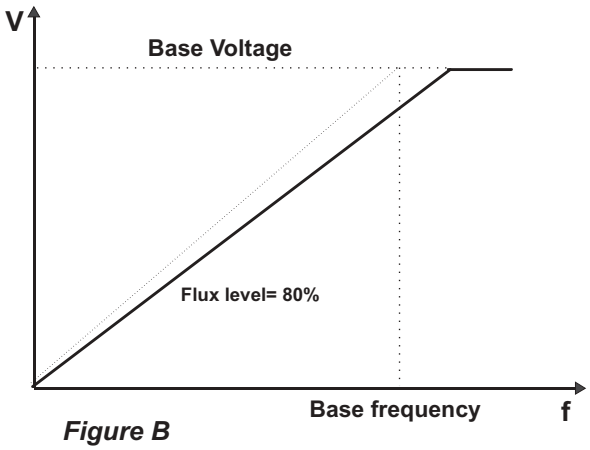


Figure B

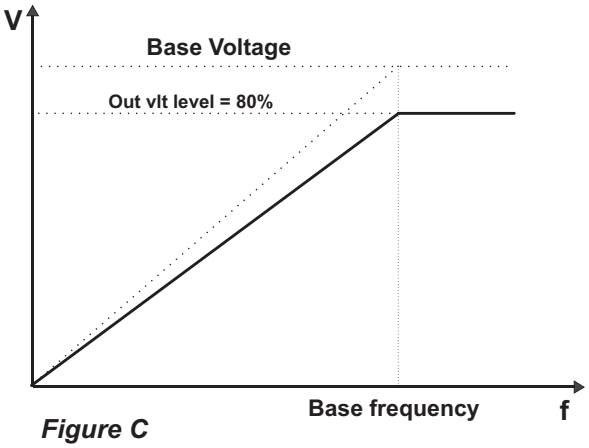


Figure C

Figure A: Out vlt level = 80%

The motor flux value follows the characteristic defined by **Base voltage** and **Base frequency** up to the 80% of the **Base voltage**, operating in costant flux. Over this setpoint the motor will be defluxed.

Figure B: Flux level = 80%

The motor voltage value is reduced at the 80% respect to the ratio defined by **Base voltage** and **Base frequency**. In this way the voltage value corresponding to the **Base voltage** setting, is reached at a frequency value higher than **Base frequency**.

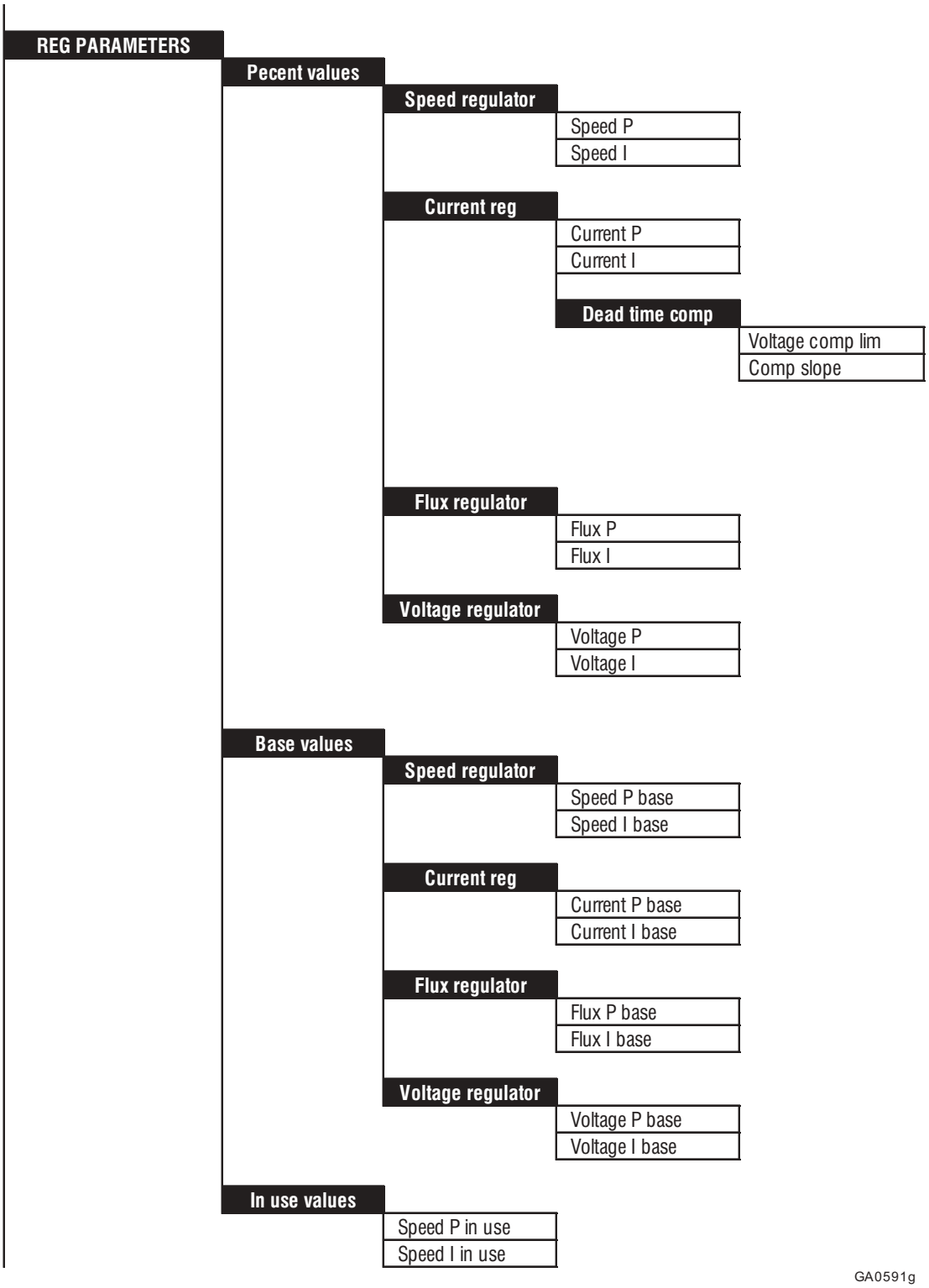
Figure C:

The motor voltage value follows the characteristic defined by the 80% of **Base voltage** and **Base frequency**.

The motor flux value will be constant but reduced at the 80% of the flux value, defined by the **Base voltage** and **Base frequency** ratio. It will be up to the frequency value identified by the intersection of the stright lines shown as **Out vlt level** = 80% and **Flux level** = 80%

Over this setpoint the flux will decrease in a way inversely proportional to the output frequency of the drive.

6.11. Reg Parameters



Parameter	No.	Value			Standard configuration
		min	max	Factory	
Speed P [%]	87	0.00	100.00	S	
Speed I [%]	88	0.00	100.00	S	
Current P [%]	89	0.00	100.00	S	
Current I [%]	90	0.00	100.00	S	
Flux P [%]	91	0.00	100.00	S	
Flux I [%]	92	0.00	100.00	S	
Voltage P [%]	1022	0.00	100.00	15.00	
Voltage I [%]	902	0.00	100.00	4.00	
Speed P base [A/rpm]	93	0.001	99.999	S	
Speed I base [A/rpm•ms]	94	0.001	99.999	S	
Current P base [V/A]	95	0.1	99999.9	S	
Current I base [V/A•ms]	96	0.1	9999.9	S	
Flux P base [A/Vs]	97	0.1	9999.9	S	
Flux I base [A/Vs•ms]	98	0.01	999.99	S	
Voltage P base [Vs/V]	1023	0.00001	9.99999	S	
Voltage I base [Vs/V•s]	903	0.00001	9.99999	S	
Speed P in use [%]	99	0.00	100.00	S	
Speed I in use [%]	100	0.00	100.00	S	
Voltage comp lim [V]	644	0.1	30.0	6.0	
Comp slope [V/A]	645	0.1	50.0	13.0	

Ga6160

S = Depending on the size of the device

Speed P Proportional gain K_p* of the speed regulator expressed as a percentage of **Speed P base**.

Speed I Integral gain K_I* of the speed regulator expressed as a percentage of **Speed I base**.

Current P Proportional gain K_p* of the current regulator, expressed as a percentage of **Current P base**.

Current I Integral gain K_I* of the current regulator, expressed as a percentage of **Current I base**.

Flux P Proportional gain K_p* of the flux regulator expressed as percentage of **Flux P base**.

Flux I Integral gain K_I* of the flux regulator expressed as a percentage of **Flux I base**.

Voltage P Proportional gain K_p of the voltage regulator exspressed as a percentage Voltage P base

Voltage I Integral gain K_I of the voltage regulator exspressed as a percentage Voltage I base

Speed P base Base value for Proportional gain K_{P0} of the speed regulator in A/rpm (base value).

Speed I base Base value for Integral gain K_{I0} of the speed regulator in A/rpm·ms

Current P base Base value for Proportional gain K_{P0} of the current regulator in V/A

Current I base Base value for Integral gain K_{I0} of the current regulator in V/A·ms

Flux P base Base value for Proportional gain K_{P0} of the flux regulator in A/Vs

Flux I base Base value for Integral gain K_{I0} of the flux regulator in A/Vs·ms

Voltage P base Base value for Proportional gain K_{PO} of the voltage regulator in Vs / s

Voltage I base Base value for Integral gain K_{IO} of the voltage regulator in Vs / V x s

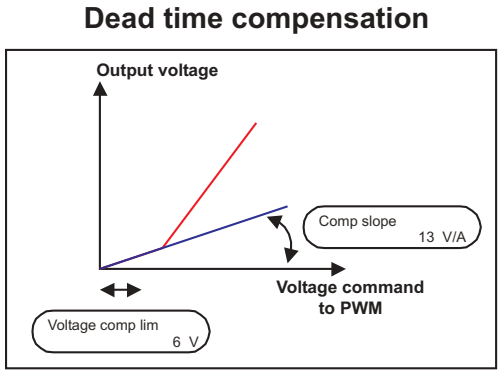
Speed P in use Indication of the current proportional gain of the speed regulator as a percentage of **Speed P base**

Speed I in use Indication of the current integral gain as a percentage of **Speed I base**

*These parameters are used for **Sensorless** control)**:***

Dead time comp	Distortion compensation of output voltage due to lock times
Voltage comp lim	Value of the voltage compensation
Comp slope	Compensation gradient value

Figure 6.11.1: Reg parameters for sensorless



NOTE! Current, flux and voltage regulators can be tuned by the self tuning procedure (see section 5.3.3 Self tuning). If this fails, manual tuning procedures are possible for current and flux regulators (not for the voltage regulator, no changes by the user should be performed).

The speed regulator has to be manually tuned.

The maximum value for the regulator parameters is defined by the base values. The settings possible depend on the size of the device.

The user can optimize the function of the regulator by changing the percentage values (values marked with *).

The resulting gains for the regulator are calculated as follows:

$$\mathbf{K_P = K_{P0} \cdot K_P^* / 100\ \%} \qquad \mathbf{K_I = K_{I0} \cdot K_I^* / 100\ \%}$$

Example of the speed regulator gains:

Speed P base = 12 A/rpm (= K_{P0}) **Speed P** = 70 % (= K_P*)

Proportional gain K_P = 12 · 70 % / 100 % = 8,4 A/rpm

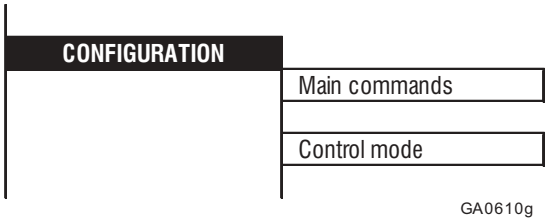
The base values **... base** are also the basis for setting the adaptive speed regulator.

When the adaptive speed regulator is enabled (**Enable spd adap** = Enabled), the **Speed P** and **Speed I** parameters have no effect. They still retain their value, however, and are effective again when the speed regulator adaption is disabled.

The **Speed P in use** and **Speed I in use** parameters indicate the current gains for the speed regulator. This also applies when the speed regulator adaption is active.

6.12 Configuration

6.12.1. Operating Mode Selection



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Main commands Terminals Digital	252	0	1	Digital (1)	
Control mode Local Bus	253	0	1	Local (0)	

GA6165ai

Main commands Defines the modality of use of **Enable drive** and **Start** drive commands.

Terminals These commands are exclusively assigned by Terminal via terminals 12 (Enable) and 13 (Start), active voltage level is required.

Digital With this configuration **Enable drive** and **Start/stop** drive commands are active through **Enable drive** and **Start/stop** parameters (BASIC MENU).

If the motor is stopped by removing the **Start** signal from terminal 13, to get again the **Start** is necessary to restore the active voltage level on terminal 13 and give the command using "Start" button (keypad) or through the **Start** parameter.

To restart a motor when active level is present on terminal 13, is enough to use "Start" button (keypad) or use the **Start/stop** parameter. This is also valid when drive enabled/disabled (**Enable drive** command) is used.

Changing the mode selection from Digital to Terminals with these terminals supplied, you will be prompted by the message **"Change input"**, indicating the wrong operation.

NOTE! In case of Main commands=Digital, the described commands can be assigned through:

- Terminal or RS485, when **Control mode** parameter = Local
- field Bus, when **Control mode** parameter = Bus

Control mode Defines whether the digital channel is the keypad/RS485 or a bus system (Option).

Local The digital channel is the keypad or the RS485 serial interface

Bus The digital channel is a bus system (Option)

The following tables show the operating modes possible.

Parameter		Actuation of: Enable drive Start Fast stop	Control mode selection	Failure reset	Save parameters
Input commands	Control mode				
Terminals	Local	Terminals	Keypad*/ RS485* or Bus	Terminals or Keypad	Keypad/ RS485
Digital	Local	Terminals and Keypad/RS485	Keypad*/ RS485* or Bus	Terminals or Keypad	Keypad/ RS485
Terminals	Bus	Terminals	Keypad*/ RS485* or Bus	Terminals or Keypad/RS485 or Bus	Keypad/ RS485 or Bus
Digital	Bus	Terminals and Bus	Keypad*/ RS485* or Bus	Terminals or Keypad/RS485 or Bus	Keypad/ RS485 or Bus

GA6170g

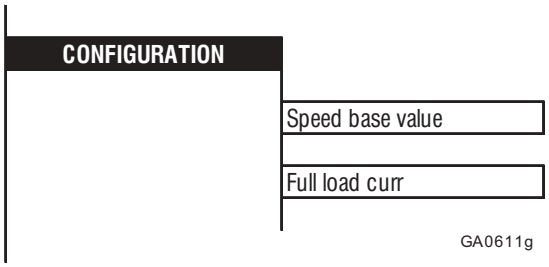
Parameter		Write Access Restrictions		
Input commands	Control mode	Terminals	Keypad/RS485	Bus
Terminals	Local	Access to everything assigned to programmable I/Os	Access to all parameters not assigned to programmable I/Os	Select control mode *
Digital	Local	Access to everything assigned to programmmable I/Os	Access to all parameters not assigned to programmable I/Os	Select control mode *
Terminals	Bus	Access to everything assigned to programmable I/Os	Access to all parameters not assigned to programmable I/Os	Access to all parameters not assigned to programmable I/Os
Digital	Bus	Access to everything assigned to programmable I/Os	Access to all parameters not assigned to programmable I/Os	Access to all parameters not assigned to programmable I/Os

GA6175g

* Access via the keypad or the RS485 serial interface is protected in this configuration by password level 1

Write access from Bus through process data channel is not affected by control mode description.

6.12.2. Speed Base Value, Full Load Current



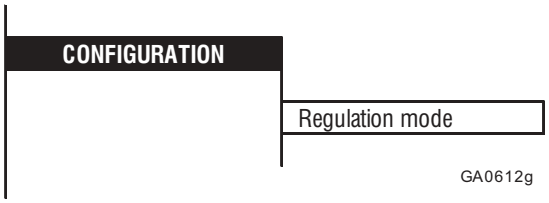
Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Speed base value [FF]	45	1	16383	1500	
Full load curr [A]	179	0.1	999.0	S	

GA6180g

Speed base value The **Speed base value** is defined in the unit specified by the factor function. It is the base value for all speed values (reference values, adaptive speed regulation) given as a percentage, and corresponds to 100% of the speed. Changing this parameter is only possible whe the drive is disabled (**Enable drive** = Disabled). The **Speed base value** does not define the maximum possible speed. However, the maximum range for speed percentage is ±200% of speed base value.

Full load curr The **Full load curr** (FLC) parameter is defined in A_{RMS} and by default it is equal to I_{CONT}. It depends on Derating factor (see section 2.4.1, "Permissable environmental conditions"). The FLC is used to calculate the corresponding active current (see section 6.9, " Current regulation"), taking into account the motor parameters entered. 100mF corresponds to 100 % of the current limit. The settings for the current limit and the overload function are based on **Flt 100mF**.

6.12.3. Regulation Mode



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Regulation mode (Sensorless\Self-tuning\ Field oriented\V/f control)	321	0	3	V/f control (3)	

GA6185ai

Regulation Mode This parameter defines the regulation mode of the Drive.

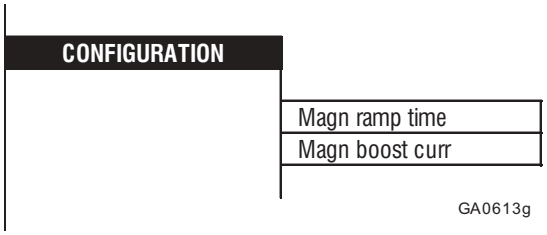
Sensorless The drive operates with a sensorless control mode. An encoder is not necessary to feedback the motor speed. In this case the speed and position of motor shaft are estimated by a control algorithm.

Self-tuning Automatic commissioning (see section 5.3.3, "Self-tuning")

Field oriented The drive operates with a field oriented vector regulation. Either a sinusoidal encoder or a digital encoder are required to feedback the motor speed to the drive.

V/f control The drive operates without vector control. A predefined voltage/ frequency characteristic curve is used instead.

6.12.4. Magnetizing Boost Current, Magnetizing Ramp Time



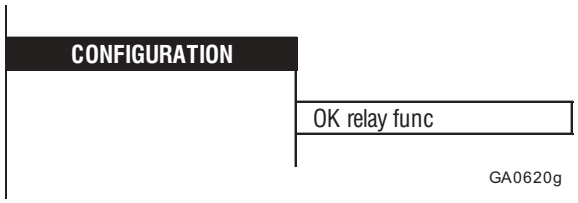
Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Magn ramp time [s]	675	0.01	5.00	1.00	
Magn boost curr [%]	413	10	136	30	

GA6190g

Magn ramp time Ramp time for the F current ref at initial magnetization. It may be used to slow down the magnetization transient and avoid shaft rotation due to torque parasitic related to stator and rotor slot alignment.

Magn boost curr At the opposite to the purpose of **Magn ramp time**, in some applications it may be necessary to speed up the magnetizing of the motor. This option is provided by the **Magn boost curr** parameter. Higher values will thus lead to short magnetization times. The parameter is defined as a percentage of the **Full load curr** and represents a temporary value of the flux current limit for the initial magnetization. After magnetization the nominal limit $\pm 1.2 \cdot I_{\mu}$ is restored.

6.12.5. Configuration of the OK Relay *(Terminals 80,82)*



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Ok relay func	412	0	1	Drive Healthy	
Drive Healthy				(0)	
Ready to start					

GA6195g

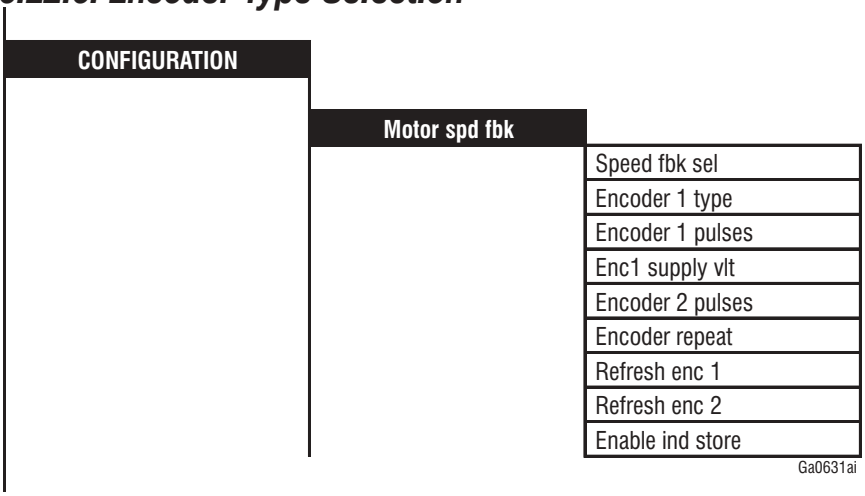
Ok relay func This parameter defines the condition in which the relay contact will close.

Drive Healthy — The contact closes when the drive is supplied with voltage and when there are no failure alarms.

Ready to start — The contact closes when the following conditions are fulfilled:

The drive has a voltage supply
There are no failure alarms present
The drive is enabled with **Enable drive**
The magnetizing procedure has been completed.(Drive is ready to deliver torque)

6.12.6. Encoder Type Selection



Parameter	N.	Value			Standard configuration
		min	max	Factory	
Speed fbk sel Encoder 1 Encoder 2	414	0	1	Encoder 1 (1)	*
Encoder 1 type Sinusoidal Digital	415	0	1	Digital (1)	
Encoder 1 pulses	416	600	9999	1024	
Enc 1 supply vlt 5.41V 5.68V 5.91V 6.18V	1146	0	3	5.41V	
Encoder 2 pulses	169	600	9999	1024	
Encoder repeat	1054	0	1	Encoder 1 (1)	
Refresh enc 1 Enabled Disabled	649	0	1	Disabled (0)	
Refresh enc 2 Enabled Disabled	652	0	1	Disabled (0)	
Encoder 1 state Encoder 1 OK Encoder 1 NOT OK	648	0	1	-	**
Encoder 2 state Encoder 2 OK Encoder 2 NOT OK	651	0	1	-	**
Enable ind store Disabled Enabled	911	0	1	Disabled (0)	
Ind store ctrl	912	0	65535	0	
Index storing	913	0	2^{32} -1	-	

Ga6200ai

* This function can be assigned to one of the programmable digital inputs.

** This function can be assigned to one of the programmable digital outputs.

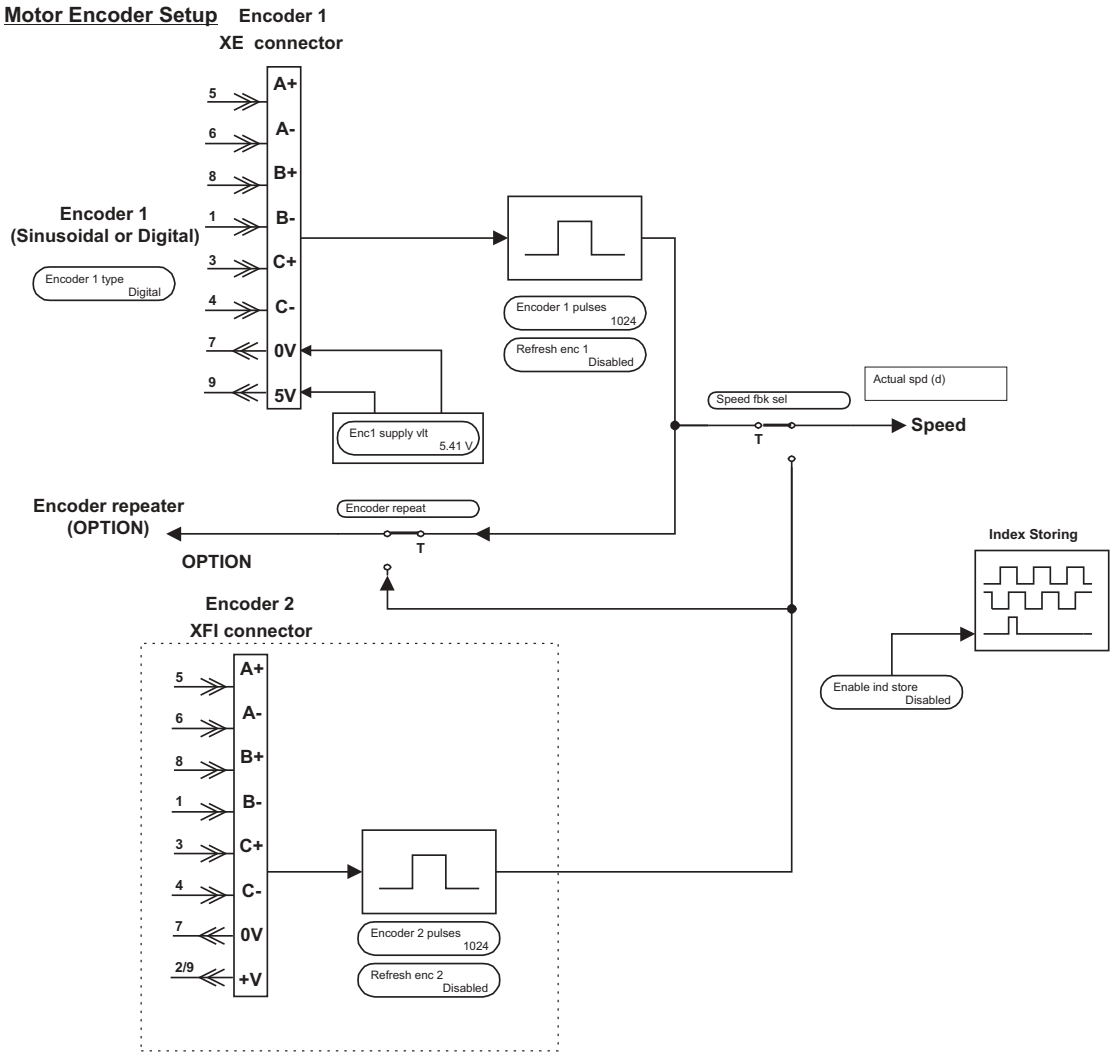


Figure 6.12.6.1: Speed Feedback

NOTE! Encoders are required in the "Field oriented" regulation mode , both for speed and torque current. The required encoder specifications are defined in section 3.4.2, "Encoders".

Speed fbk sel Selects which encoder input is to be used for feeding back the actual speed value.

Encoder 1	The encoder on connector XE is used (Default)
Encoder 2	The digital encoder on optional card EXP-F2E is used

Encoder 1 type Defines the encoder type on connector XE

Sinusoidal	Sinusoidal encoder
Digital	Digital encoder

Encoder 1 pulses Number of pulses per revolution for the encoder on connector XE

Encoder 2 pulses Number of pulses per revolution for the digital encoder on optional card EXP-F2E

Refresh enc 1 Enable the monitoring of the encoder 1 connection status, in order to detect a speed feedback loss alarm.

Encoder 1 state Provides the indication of encoder 1 connection status. The parameter can be programmed on a digital output

Refresh enc 2 Enable the monitoring of the digital encoder 2 connection status, in order to detect a speed feedback loss alarm.

Encoder 2 state Provides the indication of digital encoder 2 connection status. The parameter can be programmed on a digital output

Enc1 supply vlt This parameter allows to supply the encoder 1 at different voltage levels, in order to avoid a possible voltage drop, due to the encoder wires resistance.

Four available range of supply are selectable by means of the parameter Enc1 supply vlt and these are automatically generated by the internal supplier.

The four range are: V0 = 5,41V, V1 = 5,68V, V2 = 5,91V, V3 = 6,18V

Encoder repeat The external processing of the encoder data, can be carried out by using the optional card 6KCV301ENC. The selection of which encoder data have to be elaborated, is possible through the parameter Encoder repeat.

Encoder 1	Repetition of the encoder 1 pulses
Encoder 2	Repetition of the encoder 2 pulses

NOTE: Encoder 1: standard hardware

Encoder 2: optional hardware

For further information about the encoder signals management, please refer to the instruction manual of the optional card 6KCV301ENC.

Following parameters allows to determine the machine absolute zero and perform a positioning control:

Enable ind store This parameter enables the reading of the encoder index and qualifying signal that could be used in a system for implementation of position control.

Enabled	This setting enables the reading of the encoder index.
Disabled	This setting disables the reading of the encoder index

Ind store ctrl Control register for the encoder index and qualifying signal (*).

Index storing Status register and function data.

NOTE: **Programmable digital input 4 (terminal 39) can be used as an encoder index qualifier (in this case the corresponding configuration parameter must be set to "OFF").**

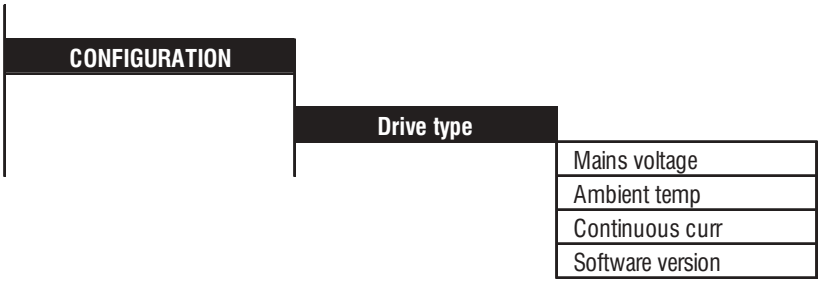
Ind store ctrl parameter [912]

No. bit	Name	Description	Access (Read/Write)	Default
0-1	-	Not used	-	-
2	**POLNLT**	It indicates the encoder index edge polarity: · 0=rising edge · 1=falling edgec	R/W	0
3	-	Not used	-	-
4-5	**ENNQUAL**	It indicates the qualifier level that activates the encoder index reading: · =0=Switched off · =1=Switched off · =2=Through signal = 0 · =3=Through signal = 1	W	0
6	**Target Enc Num**	It points out for which encoder the values of this parameter are reported. · =0, operations requested on the Encoder 1 · =1, operations requested on the Encoder 2	R/W	0
7	-	Not used	-	-
8-9	**ENNLT**	Control function of the encoder index reading · =0=Switched off, function disabled · =1=Once, enables the reading of the first index signal edge only. · =2=Continuous, enables the reading of the index signal.	R/W	0

Index storing parameter [913]

No. bit	Name	Description	Access (Read/Write)	Default
0	**Source Enc Num**	It indicates to which encoder the values in this register are referred to: · =0, register data are referred to the encoder 1 · =1, register data are referred to the encoder 2	R	0
1	**MP_IN**	Actual Qualifier level value: · =0, qualifier input level is low · =1, qualifier input level is high	R	0
2 3	**STATNLT**	Status of the acquisition function: · =0=Switched off · =1=Once, storing is not executed yet · =2=Once, storing is already executed · =3=Continuous	R	0
16-31	**CNTNLT**	Position counter value corresponding to the index. Value is only valid when STANLT is equal to 2 or 3	R	0

6.12.7. Mains Voltage, Ambient Temp, Continuous Current, Software Version



Parameter	No.	Value			Standard configuration
		min	max	Factory	
Mains voltage (575V)	333	3	3	575V (3)	
Ambient temp 104°-122°F (40°C/50°C)	332	0	1	104°F (40°C) (1)	
Continuous curr	802	S	S	S	
Software version	331				

Ga6205-575

Mains voltage Rated value of the line voltage . The undervoltage monitoring function is based on this value (see section 2.4.2, "AC Input/Output Connections" for detail on value of Derating factor).

Ambient temp Adaption to Ambient temperature. Possible currents are specified on the nameplate of the inverter. See example.

40°C The drive is able to take the current continously at an ambient temperature of up to 40°C.

50°C The drive is able to take the current continously at an ambient temperature of up to 50°C.

(See section 2.4.1, "Permissable environmental conditions" for detail of derating factor).

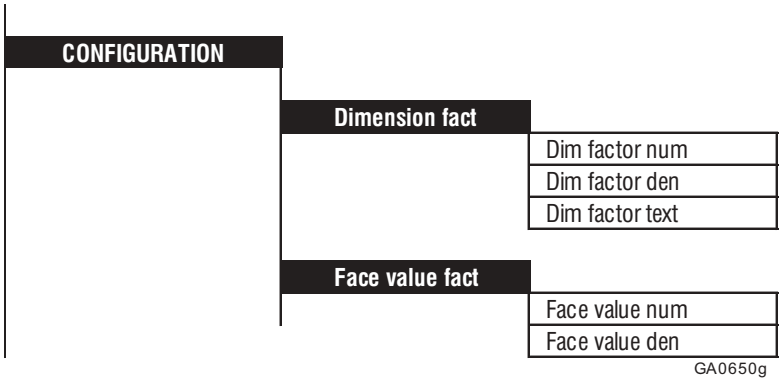
Continuous curr Drive continuative output current value considering the derating factor due to mains voltage, switching frequency and ambient temperature setting.

This parameter is automatically overwritten by the control system as $\mathbf{I_{CONT}} = \mathbf{I_{2N}} \times \mathbf{K_V} \times \mathbf{K_T} \times \mathbf{K_F}$

The "**K**" derating factors are shown on section 2.4.2. **Full load Current** parameter (CONFIGURATION menu) is automatically set by the system to the same **Continuous curr** value.

Software version Display of the version number of the drive operating system.

6.12.8. Dimension Factor, Face Value Factor



Parameter	No.	Value			Standard configuration
		min	max	Factory	
Dim factor num	50	1	65535	1	
Dim factor den	51	1	$+2^{31-1}$	1	
Dim factor text	52			rpm	
Face value num	54	1	+32767	1	
Face value den	53	1	+32767	1	

Ga6210

The factor function consists of two functions: the dimension factor and the face value factor. Both factors are defined as fractions.

The dimension factor is used to specify the drive speed in a unit related to the machine concerned, e.g. kg/h or m/min.

The face value factor is used to increase the resolution.

See the calculation examples given below.

Dim factor num Numerator of the dimension factor

Dim factor den Denominator of the dimension factor

Dim factor text Unit of the dimension factor (5 characters). This text is shown in the keypad display for reference value entry.

Possible characters: / % & + , - . 0...9 : < = > ? A...Z [ ] a...z

Face value num Numerator of the face value factor

Face value den Denominator of the face value factor

The reference value given multiplied with the dimension factor and the face value factor defines the motor speed in rpm.

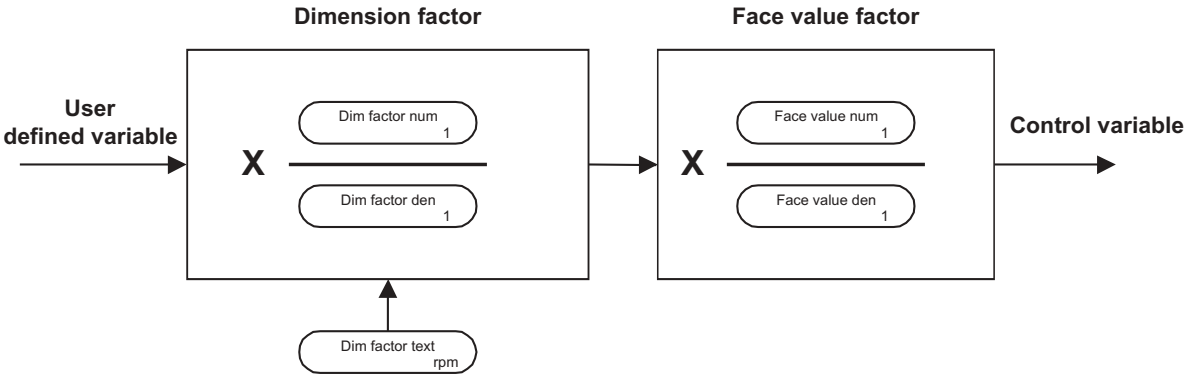


Figure 6.12.8.1: Calculation using dimension and face value factors

Example 1 of the calculation of the dimension factor

The drive speed is given in m/s. The conversion ratio is 0.01 m per revolution of the motor (Note: face value factor = 1)

The dimension factor is calculated from

$$\text{Dimension factor} = \frac{\text{Output (rpm)}}{\text{Entry (here: m/s)}} \quad \text{f022}$$

0.01 m corresponds to 1 revolution of the motor shaft

0.01 m/min corresponds to 1/min

0.01 m / 60 s corresponds to 1/min

$$\text{Dimension factor} = \frac{1}{\text{min}} \bullet \frac{60\text{s}}{0.01\text{m}} \bullet \frac{6000}{1} \bullet \frac{1}{\text{min}} \bullet \frac{\text{s}}{\text{m}} \quad \text{f023}$$

Dim factor num 6000

Dim factor den 1

Dim factor text ”m/s” (meters per second)

Example 2 of the calculation of the dimension factor

The reference values for a bottling plant are given in bottles per minute. One revolution of the drive corresponds to the filling of 0.75 bottles. This corresponds to a dimension factor of 4/3. The speed limitation and the ramp function are also given in bottles per minute.

$$\text{Dimension factor} = \frac{\text{Output (rpm)}}{\text{Entry (here: Bottles / min)}} \quad \text{f024}$$

3/4 bottles correspond to 1 revolution of the motor shaft

3/4 bottles / minute = 1/min

$$\text{Dimension factor} = \frac{1}{\text{min}} \bullet \frac{4\ \text{min}}{3\ \text{Bottles}} = \frac{4}{3} \bullet \frac{1}{\text{min}} \bullet \frac{\text{min}}{\text{Bottles}} \quad \text{f025}$$

Dim factor dum 4

Dim factor den 3

Dim factor text ”B/min”(Bottles per minute)

Example of the face value factor

Normally the reference value has a resolution of 1 rpm. In order to fully exploit the available resolution, the face value factor is used. The maximum internal resolution is 0.25 rpm

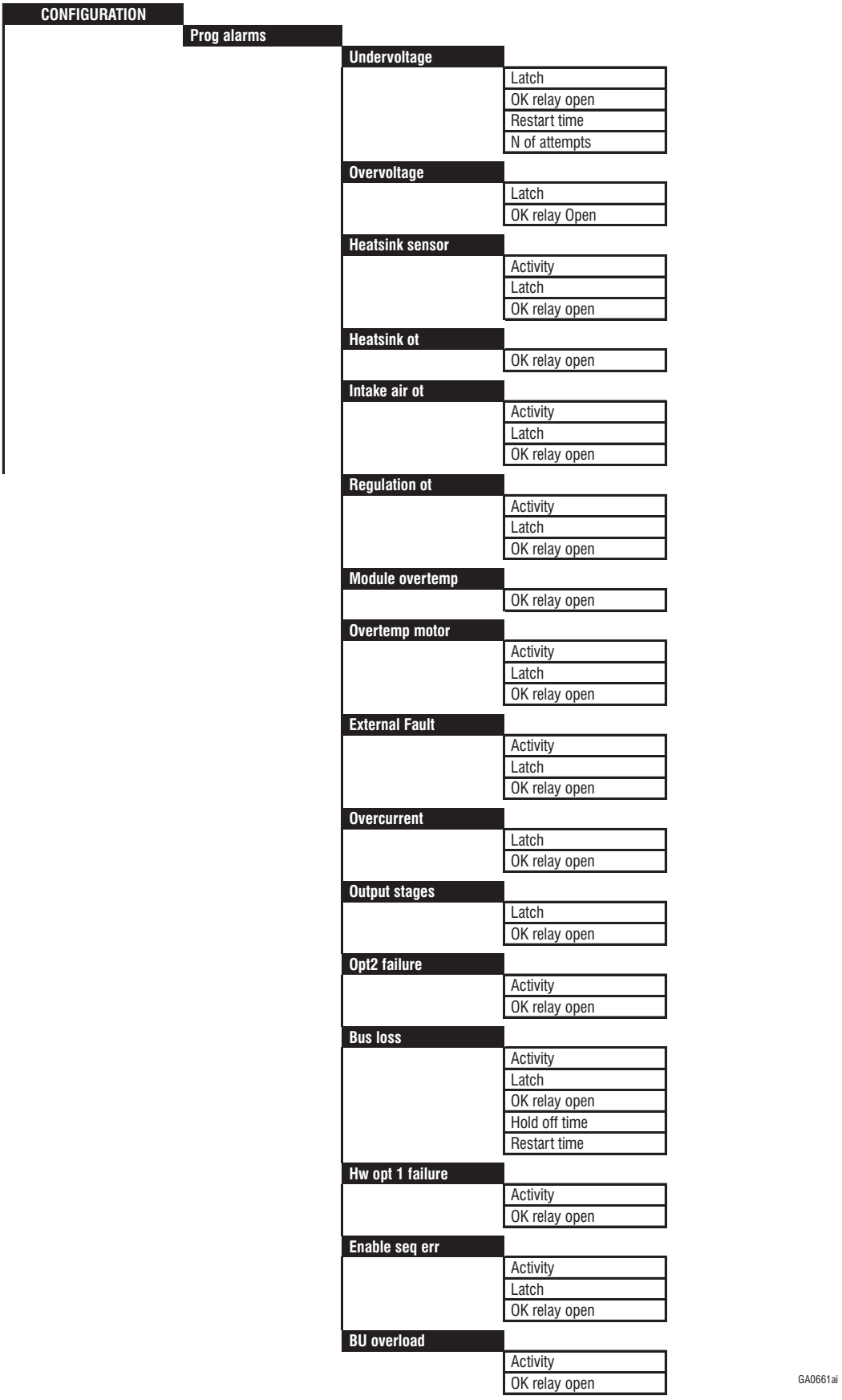
The motor speed range required is, for example, 0 ... 1500 rpm. A more accurate resolution (i.e. 1/4 revolution) can be obtained by setting the face value factor to 1/4.

The value 4 000 is entered, for example, in order to select 1000 rpm This is then multiplied with the face value factor to give the value 1000 rpm.

Face value num 1

Face value den 4

6.12.9. Programmable Alarms



Alarm	No.	Factory			Restart time, No. of attempts	Standard
		Activity	Latch	Open ok relay		
Overcurrent	2300h	Disable drive	ON	ON		Dig. outp. 8*
Overvoltage	3210h	Disable drive	ON	ON		Dig. outp. 6*
Undervoltage	3220h	Disable drive	ON	ON	1000 ms, 0	Dig. outp.7*
Heatsink sensor	4210h	Disable drive	ON	ON		*
Heatsink ot	4211h	Disable drive	ON	ON		*
Regulation ot	4212h	Disable drive	ON	ON		*
Module overtemp	4213h	Disable drive	ON	ON		*
Intake air ot	4214h	Disable drive	ON	ON		*
Overtemp motor	4310h	Disable drive	ON	ON		*
Failure supply**	5100h	Disable drive	ON	ON		
Curr Fbk Loss	5210h	Disable drive	ON	ON		*
Output stages	5410h	Disable drive	ON	ON		*
DSP error**	6110h	Disable drive	ON	ON		
Interrupt error**	6120h	Disable drive	ON	ON		
BU Overload	7110h	Disable drive	ON	ON		*
Speed fbk loss***	7301h	Disable drive	ON	ON		*
Opt2	7400h	Disable drive	ON	ON	8 ms	*
Hw Opt 1 failure	7510h	Disable drive	ON	ON		*
Bus loss	8110h	Disable drive	ON	ON		*
External fault	9000h	Disable drive	ON	ON		*
Enable seq err	9009h	Disable drive	ON	ON		*

GA6215ai

* This function can be assigned to one of the programmable digital outputs.

** The behavior of the drive cannot be configured for these alarms. The assignment of an alarm to a digital output is not possible.

*** This alarm can be disabled, but the behavior of the Drive can not be configured.

If the serial interface or bus system is used, the alarms can be evaluated via the **Malfunction Code** parameter.

The AV-300i Drives contain extensive monitoring functions. The effect of possible alarms (Drive faults) on the behaviour of the drive are defined in the PROG ALARMS submenu:

- Saving of alarm status
- How the drive is to react to the alarm
- Indication via the relay between terminal 80 and 82. The switch conditions for the relay can be defined with the Ok relay func parameter in the CONFIGURATION menu.
- Automatic restart
- Failure reset

For some alarms, the behavior of the drive can be configured separately. All alarms can also be assigned to a programmable digital output present as standard configuration.

Activity

Warning — The alarm does not cause the disconnection of the drive. A warning message can be output via a digital output. If LATCH = ON, the drive locks to the "stop" condition as soon as speed = zero is reached. To start the drive again the alarm must be reset.

Disable drive — The alarm causes the immediate disabling of the Drive. The motor coasts to an uncontrolled stop.

Quick stop — When the alarm occurs, the drive runs to a halt according to the ramp set in the RAMP / QUICK STOP menu. The Drive is then disabled.

Normal stop — When the alarm occurs, the drive runs to a stop according to

		the ramp set. The Drives then disabled.
	Curr lim stop	When the alarm occurs, the Drive brakes with the maximum possible current, until stopped, the Drive is then disabled when stopped.
	Ignore	The alarm message is indicated on the keypad. No other reaction is present. Acknowledgment of the situation via RESET.

Not all alarms can initiate a controlled stop of the drive. The possibility of setting the particular "Activity" for individual alarms is described in the table below.

Allarme	Warning	Disable drive	Quick stop	Normal stop	Curr lim stop	Ignore
Overcurrent	-	X	-	-	-	-
Overvoltage	-	X	-	-	-	-
Undervoltage	-	X	-	-	-	-
Heatsink sensor	X	X	X	X	X	-
Heatsink ot	–	X	–	–	–	–
Regulation ot	X	-	-	-	-	X
Module overtemp	–	X	–	–	–	–
Intake air ot	X	X	X	X	X	-
Overtemp motor	X	X	X	X	X	-
Failure supply	-	X	-	-	-	-
Curr fbk Loss	-	X	-	-	-	-
Output stages	-	X	-	-	-	-
DSP error	-	X	-	-	-	-
Interrupt error	-	X	-	-	-	-
BU Overload	X	X	X	X	X	-
Speed fbk loss	-	X	-	-	-	-
Opt2	-	X	X	X	X	-
Hw Opt 1 failure	X	X	X	X	X	-
Bus loss	X	X	X	X	X	-
External fault	X	X	X	X	X	-
Enable seq err	-	X	-	-	-	X

ga6220ai

Latch	ON	The alarm is stored. The programmed actions (e.g. opening the OK relay) are enabled. This status is retained even if the fault condition is restored. A Reset command is required before a restart.
	OFF	In case of alarm, the drive is disabled and the programmed functions are enabled. The alarm is not saved. When the failure is restored, the alarm is automatically reset and the Drive tries a restart
OK relay open	ON	An alarm causes the opening of the isolated potential contact between terminals 80 and 82.
	OFF	In case of alarm, the contact between the terminals 80 and 82 does not open.
Hold off time	Delay time between the alarm condition detection and the alarm activation. If an alarm condition occurs the alarm keeps OFF for the Hold off time. When this time is elapsed, if the alarm is still present, it becomes ON.	
Restart time	If Latch=OFF and the alarm condition persists even after the time defined via Restart time, the alarm is stored and no restart is possible. In case the alarm condition is still present after the time setted on **Restart time**, the alarm condition is saved and cannot happen any restart.	
No of attempts	Number of start attempts after an alarm. The number of start attempts are counted. When the defined number has been reached, the "No more attempts" message is displayed. The failure must then be reset and the drive restarted. If the number of attempts required for a restart is below the defined value, the counter for the start attempts is set to zero after 5 minutes and will start counting from the beginning if another alarms occurs.	

NOTE! The occurrence of a failure is indicated in the display of the keypad. If "Latch" = ON is selected, a Reset command is necessary. This can be also done by pressing the CANCEL key on the keypad. If a second error occurs before the first one was reset, the text "Multiple failures" will appear in the display. In this case, a reset is possible via Failure reset parameter in the SPEC FUNCTIONS menu by pressing the Enter key with a disabled inverter, or through a digital input programmed as “Failure reset”.

LIST OF PROGRAMMABLE ALARMS

Undervoltage Undervoltage in the intermediate circuit (DC Link).

The Undervoltage alarm occurs in case of an undervoltage in the intermediate circuit if the Drive is enabled (Enable drive = Enabled). The power section is disabled immediately in order to prevent the intermediate circuit discharge.

If the alarm is not saved (Latch = OFF), the drive will try to restart automatically as soon as the voltage rises up to the undervoltage threshold. If this does not happen within the restart time, the alarm is latched anyway. The number of restart attempts is limited.

If the ramp is used, when the voltage is restored, if the function Auto capture is active, the ramp output is set to the value corresponding to the curent motor speed. This avoids speed steps.

In case of undervoltage the Drive is disabled and the precharge resistor is inserted so that the charging of the DC link can be controlled when voltage is restored.

Bypass of the precharge resistor occurs if conditions for restart are met.

Overvoltage Overvoltage in the intermediate circuit

If the failure is not saved (Latch = OFF), the drive will try a restart automatically once the overvoltage has been removed.

If the ramp is used, when the voltage is restored, if the function Auto capture is active, the ramp output is set to the value corresponding to the curent motor speed. This avoids speed steps.

Heatsink sensor Heatsink temperature of the Drive too high. This alarm always initiates the disconnection of the Drive 10 seconds after the failure has been detected.

If the alarm is assigned to a programmable digital output, the alarm will be output there immediately after being detected. It is possible to initiate a controlled stop of the drive within the 10 seconds described.

Heatsink ot (For sizes from 30 Hp ... and higher).Heatsink temperature of the Drive too high (possible heatsink sensor malfunctioning). This always initiates the disabling of the Drive 1s after the failure has been detected (Activity=Disable drive). If the alarm is assigned to a programmable digital output, the alarm will be output there immediately after being detected.

Regulation ot Temperature of the regulation card of the Drive too high. This always initiates the disabling of the Drive 10s after the failure has been detected. If the alarm is assigned to a programmable digital output, the alarm will be output there immediately after being detected.

Module overtemp (For drives size up to 20 Hp) Temperature of the IGBT module too high

This always initiates the disabling of the Drive immediately after the failure has been detected. If the alarm is assigned to a programmable digital output, the alarm will be output there immediately after being detected.

Intake air ot (For sizes 30 Hp and higher) Temperature of the cooling air too high. This always initiates the disabling of the Drive 10s after the failure has been detected.

If the alarm is assigned to a programmable digital output, the alarm will be output there immediately after being detected.

Overtemp motor Motor temperature (connection for thermistor: terminals 78/79)

External Fault External fault (no voltage on terminal 15)

Overcurrent Overcurrent (short-circuit / ground fault)

The Drive is always disconnected (Activity = Disable drive) when an overcurrent is detected in order to protect the power section.

If the fault is not saved, the drive will automatically try to restart if no other overcurrent alarms occured within the last 30 seconds. If this, however, is the case, the alarm is saved and no automatic restarts are possible.

Output stages Alarm caused by a short-circuit on the inverter output bridge or on the brake unit (if enabled).

Opt2 failure Failure on the card "Option 2" (Optional)

Bus loss Failure in the connection on the field bus (only with an option bus interface card).

Hw opt 1 failure Failure on the card "Option 1" (Not included in the default equipment)

Enable seq err Wrong drive enabling sequence. The correct sequence is as follows:

Case a: **Main commands** = Terminal

1 - Regulation board power-up: Enable terminal (term.12) in any state.

2 - Drive initialization. Max duration time: 5 s.

3 - End of drive initialization. The Enable drive terminal (12) is L (0V).

4 - Delay time during which the Enable drive terminal must be L (0V): 1s.

5 - Drive enabling. Terminal 12 is H (+24V).

If at the end of the drive initialization (step 3) or during the 1s delay time the Enable drive terminal (term. 12) is High (+24V) a fault is detected.

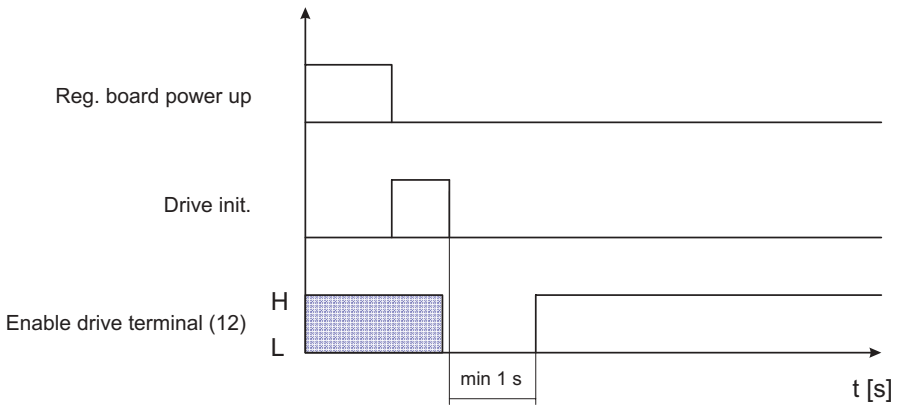


Figure 6.12.9.1 : Drive enabling sequence: ***Main commands*** *= Terminals*

Case b: **Main command** = Digital

1 - Regulation board power-up: Enable terminal (term.12) in any state.

2 - Drive initialization. Max duration time: 5 s.

3 - End of drive initialization.

4 - Delay time during which the Enable drive terminal must be L (0V) and Enable drive [314] = Disable (0): 1s. During this time the Process data channels setup initialization occurs.

5 - Drive enabling. Terminal 12 is H (+24V) and **Enable drive** [314] = Enable (1).

If at the end of the drive initialization (step 3) or during the 1s delay time the Enable drive terminal (term. 12) is High (+24V) and **Enable drive** [314] = Disable (0) a fault is detected.

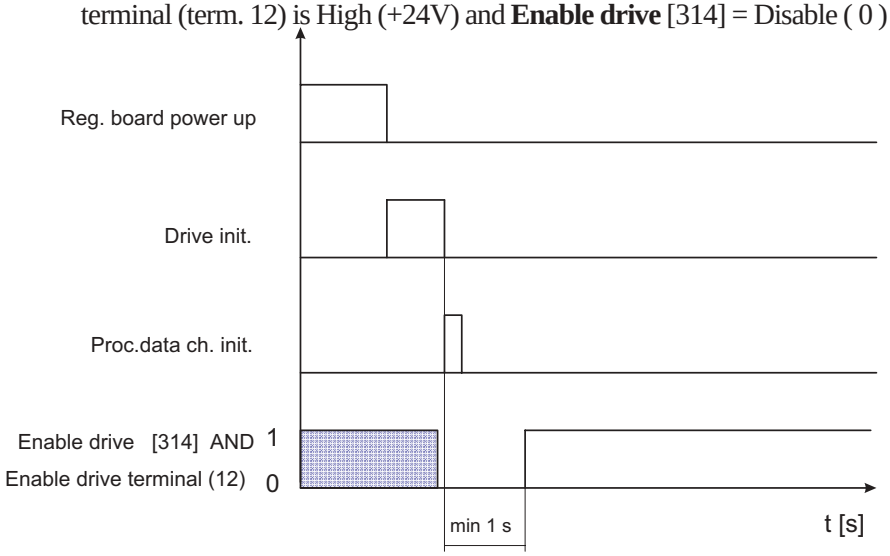


Figure 6.12.9.2 : Drive enabling sequence: ***Main command*** *= Digital*

In case of fault the reset sequence is as follows:

Case a: **Latch** = ON

1 - Set Enable drive terminal (term. 12) = L (0V)

2 - Set **Enable drive** [314] = Disable (0)

3 - If **Main commands** = Terminals set Start/Stop terminal (term. 13) = L (0V)

4 - Failure reset command. The failure is reset and the drive can work normally.

Case b: **Latch** = OFF

1 - Set Enable drive terminal (term. 12) = L (0V) and **Enable drive** [314] = Disable (0) for at least 30 ms. The failure is automatically reset.

NOTE! In case of alarm, the behavior of OK Relay can be affected only if **OK relay funct** = Drive Healthy. If Config OK relay funct = Ready to start, the contact will be open anyway.

NOTE! The connection diagram reported in the manual AV300i 1st part, picture 4.5.1.1 (Control sequencing) is valid only when the configuration of the sequency alarm **Enable seq err** is set as **Ignore**.

BU overload Protection for the internal or external braking resistance. The duty cycle exceeds the limits specified (internal - user defined)

LIST OF NON-PROGRAMMABLE ALARMS

The operation of the Drive upon a non-programmable alarm is Disable drive, Latch the alarm condition, open Ok relay, N. restart

Failure supply Failure in the power supply.

DSP error Program error of the processor

Interrupt error Unused interrupt error has occurred

Speed fbk loss Failure on speed feedback:

In order to detect an alarm of the encoder 1 (connector XE) set **Refresh encoder 1** parameter (MENU CONFIGURATION\Drive type) to ENABLED.

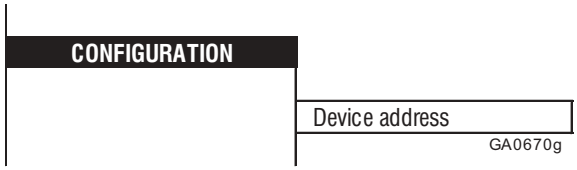
The jumper S17 selects the inhibition or the enabling of the channel C pulses reading. It has to be correctly selected in order to detect appropriately the encoder loss alarm.

S17 ON : channel C (index) reading=ON

S17 OFF: channel C (index) reading=OFF

Curr fbk loss Failure in the connection between regulation card and TA transformer (XTA Connector)

6.12.10. Address for Bus Operation

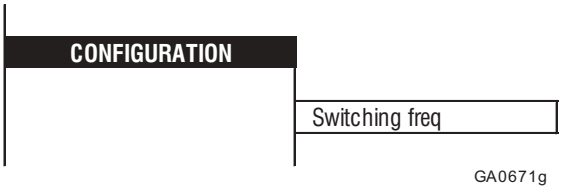


Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Device address	319	0	127	0	

GA6225g

Device address Address under which the Drive can be accessed if it is networked via the RS485 interface. (For connection see section 4.4, “Serial interface”)

6.12.11. Switching Frequency

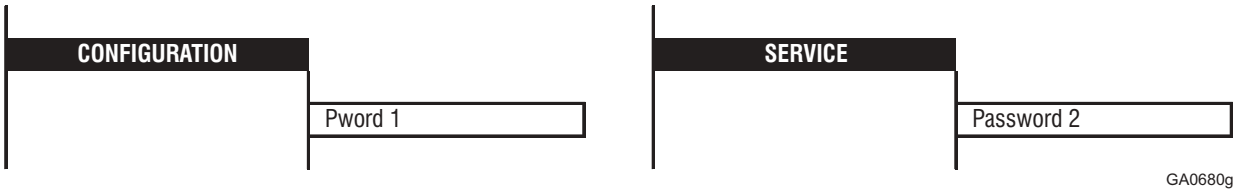


Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Switching freq (4-8-16 KHz)	240	S	S	S	

GA6230g

The switching frequency is constant in the speed set range and depends on the Drive size. (See section 2.4.2, “AC Input/Output Connection” for details of derating factor).

6.12.12. Password



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Pword 1	85	00000	99999		
Password 2	86	-	-		

GA6235g

Passwords are used by the operator to protect the parameters from unauthorized access. The following two levels are available.

Pword 1 Protects the parameters entered by the user from unauthorized changes. The password can be freely defined by the user in the form of a 5-digit combination.

Proceed as follows to activate **Pword 1**:

Select **Pword 1** in the CONFIGURATION menu

This indicates whether the Password is active (Enabled) or not (Disabled)

If not, press ENTER and enter the password (see section 5.1.4, “Changing/Saving Parameters/Password”).

Press ENTER once more. The keypad indicates that the, Password is active (Enabled).

The password must be saved so that it is valid when the power supply is switched off and on again. —> Saving parameters

Proceed as follows to unlock the **Pword 1**:

Select **Pword 1** in the CONFIGURATION menu

The display indicates whether the password is active (Enabled) or not (Disabled)

If enabled, press ENTER and enter the password (see Commissioning)

Press ENTER again. The display now indicates that the password is not active (Disabled).

This configuration must be saved In order to keep the password Disabled even after the power supply is turned off and switched back on again. —> Saving parameters

The message **Wrong password** appears if an incorrect password is entered.

If the drive shows the message “**EEPROM Error**” the password is deactivated. This takes place the first time the drive is switched on and after a possible upgrade of the Firmware.

In case personal password has been forgotten, it is possible to deactivate it through the setting of the universal password.

The code of this password is: 51034.

The setting mode of this one remains unchanged compared to the personal password.

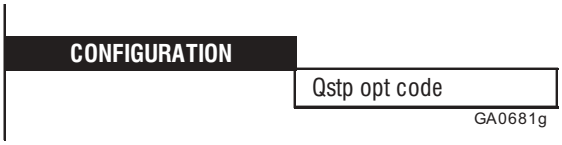
Password 2 Enables access to the Service menu. The password set by the manufacturer and consists of a 5-figure combination.

On delivery the Service menu of the drive is protected by **Password 2**. No **Pword 1** has been entered. The user has free access to all parameters except for those in the SERVICE menu which is reserved for manufacture's service personnel.

Password 2 cannot be deactivated.

Password 2 allows access to the Service menu until a different menu is selected.

6.12.13. Qstp Opt Code



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Qstp opt code Ramp stop DC braking curr	713	-2	-1	Ramp stop (-1)	

GA6240g

Qstp opt code Selection control for Operation of **Quick stop** command

Ramp stop = -1 Drive is stopped with the ramp defined by **Qstp delta speed, Ostp delta time**

DC braking curr = -2 Drive is stopped by an injection of DC current

6.12.14. Serial Answer Delay

Parameter	No.	Value			Standard configuration
		min	max	factory	
Ser answer delay	408	0	900	0	

GA6231

Setting of min. delay of drive between the reception of last byte and the start of its answer.

This delay avoid conflict on the serial line when the used RS485 interface is not presetted for an automatic Tx/Rx commutation.

The **Ser answer delay** parameter is specific for the standard serial line RS485.

E.g. : if on master the Tx/Rx delay commutation is 20ms max., the setting of **Ser answer delay** parameter have to be higher than 20ms: 22ms.

6.13. I/O Config

Apart from the terminals which have fixed functions (e.g. for Enables), the AV-300i Drives provide the possibility of assigning programmable inputs/outputs to particular functions. This can either be carried out via the keypad, the serial interface or any bus connection present.

The freely programmable inputs/outputs are factory set for assignment to the most frequently required functions. However, these can be modified by the user to meet the requirements of the application at hand.

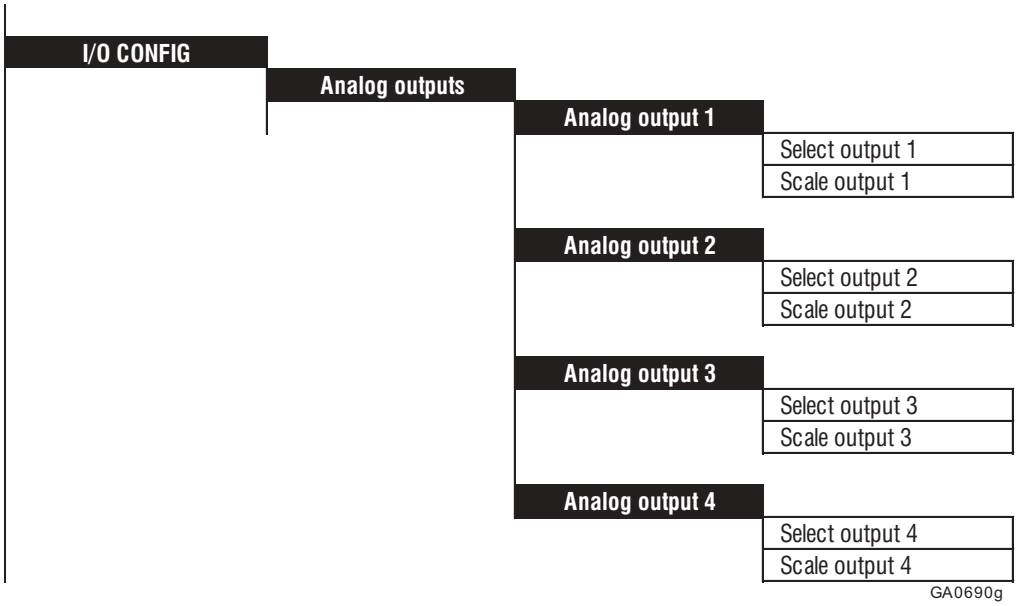
The basic device is provided with three analog inputs, that are designed as differential inputs. If more digital inputs/outputs and/or analog outputs are required, the I/O expansion cards are necessary. For more details about I/O expansion cards refer to relative instruction manual.

The following inputs / outputs are provided as standard configuration:

Basic device:	3	Analog differential inputs (1...3)
	2	Analog outputs (1 and 2) with common reference point
	2	Digital outputs (1...2) with common reference point, common voltage supply, galvanic isolation
	4	Digital inputs (1...4) with common reference point, galvanic isolation

NOTE! If parameters are assigned to particular terminals, the parameter value (e.g. speed reference value) can only be entered via this terminal and not via the keypad or bus.

6.13.1. Analog Outputs



Parameter	No.	Value			Standard configuration
		min	max	Factory	
Select output 1	66	0	84	Actual speed	
Scale output 1	62	-10.000	10.000	1.000	
Select output 2	67	0	84	T current	
Scale output 2	63	-10.000	10.000	1.000	
Select output 3	68	0	84	Current U	*
Scale output 3	64	-10.000	10.000	1.000	
Select output 4	69	0	84	Motor current	*
Scale output 4	65	-10.000	10.000	1.000	

Ga6245ai

* These outputs can be used only when optional expansion cards are mounted

Select output XX Selection of the parameter assigned as a variable to the corresponding analog output. The following assignments are possible (the value in square brackets are selection codes for RS485 or BUS):

OFF [0]
Speed ref 1 [1] [1]
Speed ref 2 [1] [2]
Ramp ref 1 [1] [3]
Ramp ref 2 [1] [4]
Ramp ref [1] [5]
Speed ref [1] [6]
Ramp output [1] [7]
Actual spd [1] [8]
T current ref 1 [2] [9]
T current ref 2 [2] [10]
T current ref [2] [11]
F current ref [8] [12]
Flux current [8] [13]
Torque current [2] [14]
Speed reg out [2] [15]
Motor current [12] [16]
Current U [3] [17]
Current V [3] [18]
Current W [3] [19]
Output voltage [4] [20]
Voltage U [5] [21]
Voltage V [5] [22]
DC link voltage [6] [23]
Analog input 1 [7] [24]
Analog input 2 [7] [25]
Analog input 3 [7] [26]
Flux [9] [27]
Active power [11] [28]
Torque [10] [29]
Rr adap output [13] [30]
Pad 0 [14] [31]
Pad 1 [14] [32]
Pad 4 [14] [33]
Pad 5 [14] [34]
Flux reference [9] [35]
Pad 6 [14] [38]
PID output [15] [39]
Feed fwd power [16] [78]
Out vlt level [19] [79]
Flux level [20] [80]
F act spd (rpm) [1] [81]
F T curr (%) [2] [82]
Spd draw out (d) [17] [84]
PL next factor [18] [87]
PL active limit [2] [88]

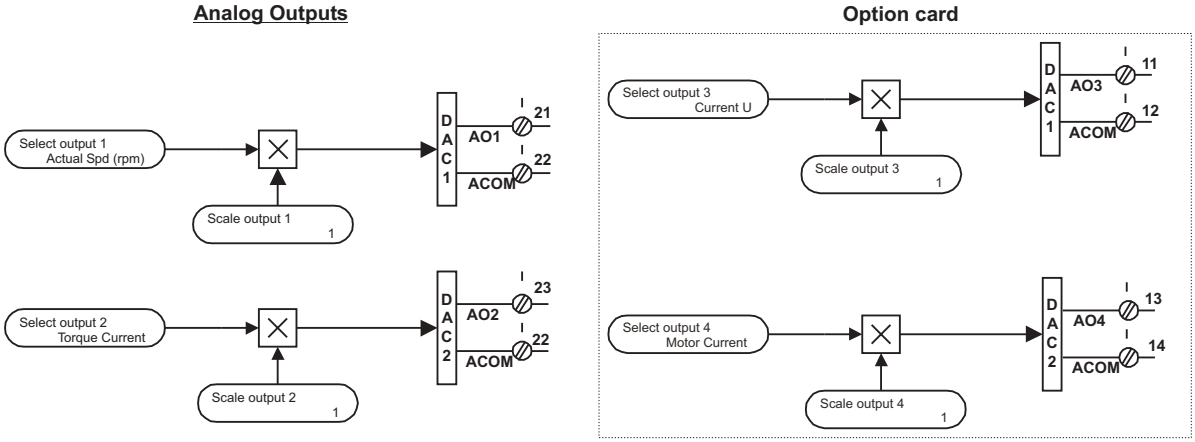


Figure 6.13.1.1: Standard Analog output and Option card blocks

Scale output XX Scaling of the analog output concerned

1) With a scaling factor of 1 the output is 10 V when the reference value or speed equals to the value defined by **Speed base value.**
2) With a scaling factor of 1 the output is 10 V when the quantity equals to Full load torque current **Flt 100mF**.
3) With a scaling factor of 1 the output is 10 V when the current in A equals to √2 times **Full load curr.**
4) With a scaling factor of 1 the output is 10 V when the RMS value of fondamental voltage (1st harmonic component) equals to **Mains voltage**
5) With a scaling factor of 1 the output is 10 V when the voltage is 500 V. The output shows the voltage waveform over time. Sample time <1 ms.
6) With a scaling factor of 1 the output is 10 V when the voltage is 1000 V.
7) With a scaling factor of 1 the output is 10 V when the voltage at the corresponding analog input is 10 V (when scaling factor and Tune value of the equals input =1). See Figure 6.13.1.1.
8) With a scaling factor of 1 the output is 10 V when the reference value equals to the **Magnetizing curr**
9) With a scaling factor of 1 the output is 10 V when the flux is 2 Vs
10) With a scaling factor of 1 the output is 10 V when the torque equals to the rated torque of the motor.
11) With a scaling factor of 1 the output is 10 V when the active power equals to the rated power of the motor.
12) With a scaling factor of 1 the output is 10 V when the current in ARMS equals to the **Full load curr.**
13) With a scaling factor of 1 the output is 10 V when Rotor resistance correction corresponds to the original parameter value
14) With a scaling factor of 1 the output is 10V when a Pad value equals to 2047.
15) The range values are described in chapter 6.17.3 **PID Function**
16) With a scaling factor of 1 the output is 10V, when **Active power** = √3 x **Mains voltage** x **Full load current**.

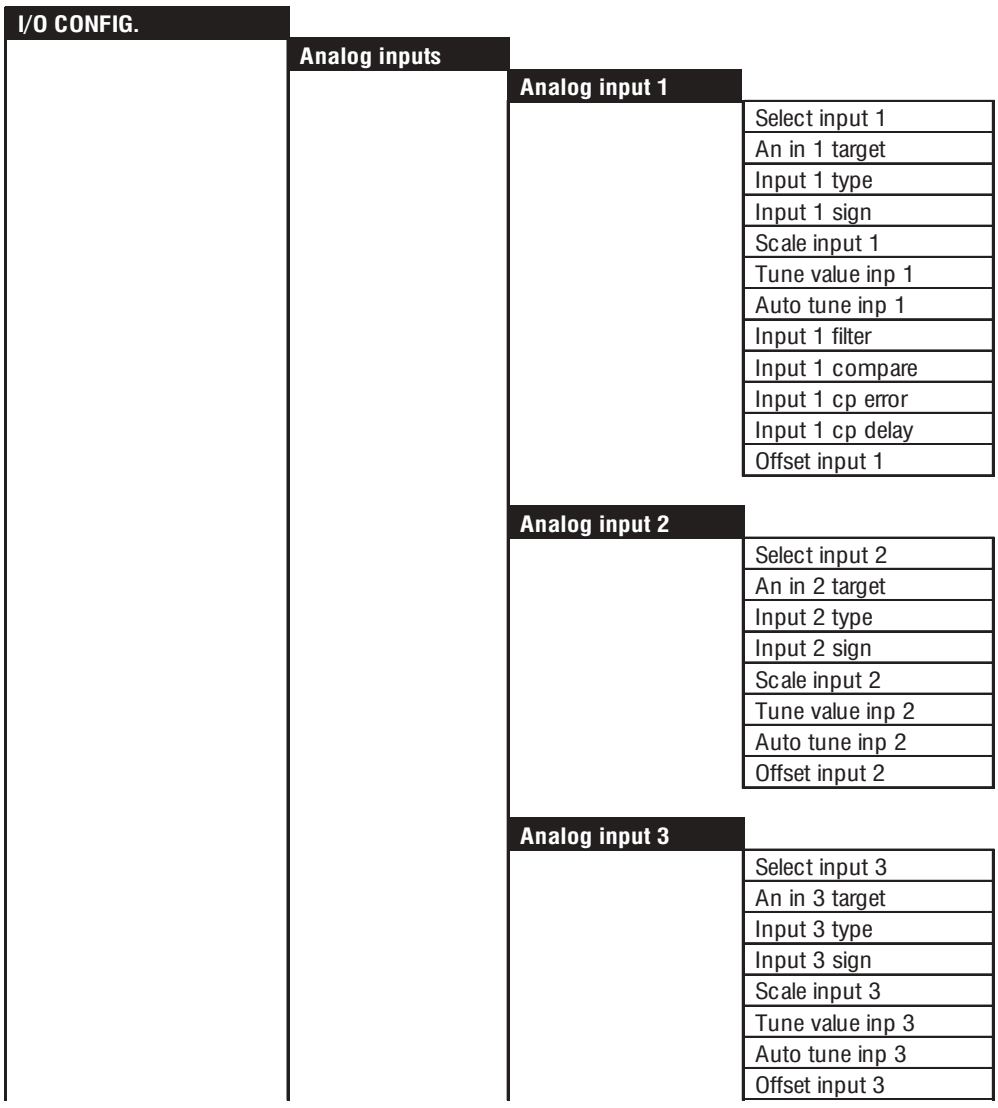
    Using the drive with a RS300 line regenerative converter, either the PDC and the analog output are used only when **Regulation mode** = **Sensorless** or **Regulation mode** = **Field oriented**
17) With a scaling factor of 1 the output is 10V when the speed ratio = 20000
18) With a scaling factor of 1 the output is 10V when **PL next factor** = 10000 (ratio = 1)
19) With a scaling factor of 1, the output is 10V, when **Out Vlt level** (100%) is equals to **Base voltage** parameter**.**
20) With a scaling factor of 1, the output is 10V, when **Flux level** (100%) is equals to the nominal flux level**.**

Calculation example for calculating the scaling factor **Scale output xx**

Consider an analog display device to indicate the speed of the drive. The instrument has a measuring range of 0 ... 2 V.

This means that at maximum speed 2 V is required at the analog output of the frequency inverter. A scaling factor of 1 would supply 10 V. (Scaling factor = 2 V / 10 V = 0.200).

6.13.2. Analog Inputs



GA0700

Parameter	No.	Value			Standard configuration
		min	max	Factory	
Select input 1	70	0	28	Ramp ref 1	Terminals1/2
An in 1 target	295	0	1	Assigned (0)	
Input 1 type -10V...+10V 0-20 mA, 0-10 V 4-20 mA	71	0	2	-10V...+10V (0)	
Input 1 sign Positive Negative	389	0	1	Positive (1)	
Input 1 sign+	-				*
Input 1 sign-	-				*
Scale input 1	72	-10.000	10.000	1.000	
Tune value inp 1	73	0.1	10.000	1.000	
Auto tune inp 1	259	0	65535		
Input 1 filter	792	0	1000	0	

Ga6250a

Parameter	No.	Value			Standard configuration
		min	max	Factory	
Input 1 compare	1042	-10000	10000	0	
Input 1 cp error	1043	0	10000	0	
Input 1 cp delay [ms]	1044	0	65000	0	
Offset input 1	74	-32768	+32767	0	
Select input 2	75	0	28	OFF	Terminals 3/4
An in 2 target	296	0	1	Assigned (0)	
Input 2 type -10V...+10V 0-20 mA, 0-10 V 4-20 mA	76	0	2	-10V...+10V (0)	
Input 2 sign Positive Negative	390	0	1	Positive (1)	
Input 2 sign+	-			-	*
Input 2 sign-	-			-	*
Scale input 2	77	-10.000	10.000	1.000	
Tune value inp 2	78	0.1	10.000	1.000	
Auto tune inp 2	260	0	65535		
Offset input 2	79	-32768	+32767	0	
Select input 3	80	0	28	OFF	Terminals 5/6
An in 3 target	297	0	1	Assigned (0)	
Input 3 type -10V...+10V 0-20 mA, 0-10 V 4-20 mA	81	0	2	-10V...+10V (0)	
Input 3 sign Positive Negative	391	0	1	Positive (1)	
Input 3 sign+	-				*
Input 3 sign-	-				*
Scale input 3	82	-10.000	10.000	1.000	
Tune value inp 3	83	0.1	10.000	1.000	
Auto tune inp 3	261	0	65535		
Offset input 3	84	-32768	+32767	0	

Ga6250b

* These parameters can be assigned to programmable digital inputs. Both ...sign+ and ...sign- must be used for each channel, with a XOR logic.

Select input XX Selection of the parameter to be assigned its value via an analog input. The following assignments are possible:

OFF [0]
Jog reference[1)][1]
Speed ref 1[1)][2]
Speed ref 2[1)][3]
Ramp ref 1[1)][4]
Ramp ref 2[1)][5]
T current ref 1[2)][6]
T current ref 2[2)][7]
Adap reference [8]
T current lim [2)][9]
T current lim+[2)][10]
T current lim-[2)][11]
Pad 0[3)] [12]
Pad 1[3)] [13]
Pad 2[3)] [14]
Pad 3[3)] [15]
Load comp [19]
PID offset 0 [4)] [21]
PI central V3 [4)] [22]
PID feed-back [4)] [23]
V/f flux level [24]
Flux level [25]
Out vlt level [26]
Speed ratio [5)] [28]

Input XX type Selection of input type (voltage or current input)

Jumpers on the regulator card of the AV-300i should be fitted or removed according to the input signal used. The inputs of the device are factory set for voltage signals.

Analog input	Input signal	
	-10V...+10V 0-10 V	0-20 mA 4-20 mA
Analog input 1	S8 = OFF	S8 = ON
Analog input 2	S9 = OFF	S9 = ON
Analog input 3	S10 = OFF	S10 = ON

GA6255ai

ON Jumper fitted OFF Jumper not fitted

-10 V...+10 V — A voltage of max +10 V is connected to the analog input concerned. If the signal is used as a speed reference value, a polarity reversal can be used to reverse the rotation direction of the drive.

0-10V, 0-20mA — A voltage of max. +10 V or a current signal of 0...20 mA is connected to the analog input concerned. The signal must be positive. If the signal is used as a speed reference value, the drive rotation direction can be reversed via the **Input XX sign +** and **Input XX sign -** parameters.

4-20 mA — A current signal of 4...20 mA is connected to the analog input concerned. The signal must be positive. If the signal is used as a speed reference value, the drive rotation direction can be reversed via the **Input XX sign +** and **Input XX sign -** parameters.

An in XX target Assign the analog input xx sampling. If **assigned**, the sampled value is copied into the parameter programmed on the analog input.

If **not assigned**, the programmed parameter takes the value preset via keypad or RS485 or BUS, before to assign an analog input. Exception are the "PAD" parameters, where the last value on the analog input is stored when An in XX target = not assigned is executed.

Input XX sign Selection of rotation direction when operated via the serial interface or bus.

Input XX sign + Selection of "Clockwise"rotation when operated via the terminal strip, when the reference value is only given with one polarity.

High — Clockwise selected

Low — Clockwise not selected

Input XX sign - Selection of "Counter-clockwise" rotation when operated via the terminal strip, when the reference value is only given with one polarity.

High — Counter-clockwise selected

Low — Counter-clockwise not selected

Both Input xx sign+ and Input xx sign- should be used for each channel, with a XOR logic.

Scale input XX Scaling of the corresponding analog input

1) With a scaling factor of 1 and a **Tune value inp XX** = 1, 10 V or 20 mA on the input correspond to the **Speed base value.**

2) With a scaling factor of 1 and a **Tune value inp XX** = 1, 10 V or 20 mA on the input correspond to max possible Flt 100mF current.

3) With a scaling factor of 1, 10 V or 20 mA in the input correspond to the Pad value of 2047.

4) The range values are described in chapter: 6.17.3 **PID Function**

5) With a scaling factor of 1.0 and Tune value inp XX=1, 10V or 20 mA correspond to Speed ratio = 20000

Tune value inp XX Fine tuning of the input when the max. signal does not exactly match the full scale rated value. See below example.

Auto tune inp XX Automatic fine tuning of the input. If this command is given. **Tune value inp XX** is automatically selected so that the input signal present provides the full scale value, such as the **Speed base value**. Two conditions are necessary for automatic fine tuning:

- Input voltage greater than 1V or input current greater than 2 mA Positive polarity. The value found is used for both polarities.

NOTE! The automatically calculated value can, if necessary, be modified manually via **Tune value inp XX.**

Offset inp XX If the analog signal has an offset or if the variable assigned to the input shows a non-zero value although there is no input signal present, this can be compensated via the **Offset inp XX.**

The AV-300i Drive is factory set so that analog values defined as 0-10 V, 0-20 mA and 4-20 mA signals are always interpreted as positive values. In order to reverse the polarity, the parameters **Input XX sign +** and **Input XX sign -** must be configured on digital inputs. Both these inputs are used with a XOR logic. With field bus operation (Option), the Input XX sign parameter specifies the sign for the polarity of an analog input.

If a parameter is already internally assigned (e.g. if Speed ref 1 is automatically connected with the ramp output when the ramp is enabled), it will no longer appear in the list of parameters that can be assigned to an analog input. The **Input XX sign +** and **Input sign -** parameters cannot be addressed via the serial interface.

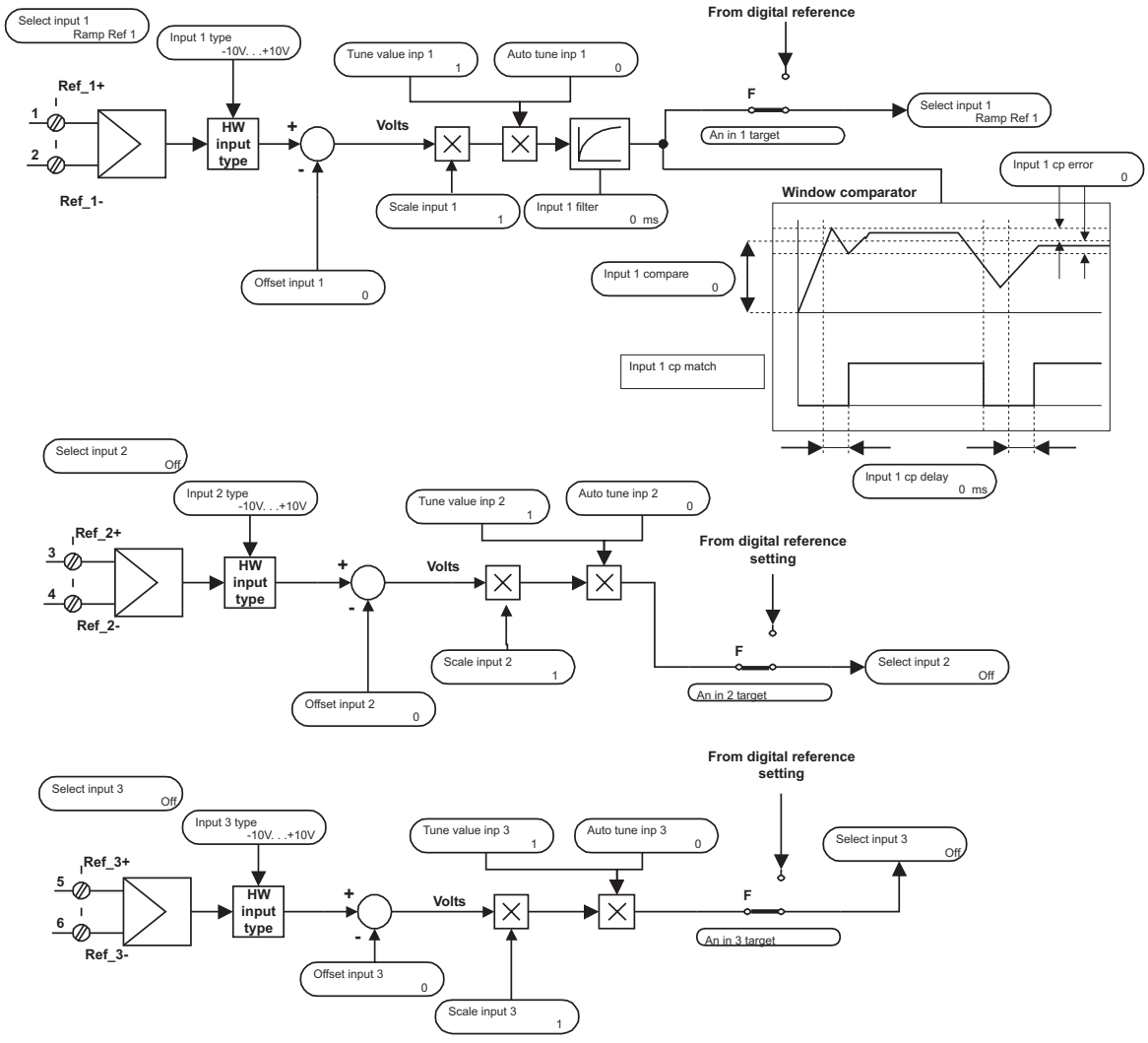


Figure 6.13.2.1: Analog input

Example 1:

The speed reference value of a drive is defined with an external voltage of max. 5 V. The value corresponds to the maximum possible speed of the drive (defined with Speed base value).

Scaling factor 2 is entered as the Scale input XX parameter (10V : 5V)

Example 2:

An external analog reference value is only max. 9.8 V instead of 10 V.

Set the Tune value inp XX parameter to 1.020 (10 V : 9.8 V).

The same result would have been obtained via the **Auto tune inp XX** function. The appropriate parameters would have to be entered in the menu of the keypad. The maximum possible analog value (in this case 9.8 V) would have to be present at the terminal with a positive polarity. The keypad will adjust the "Tune value" automatically if the ENTER key is pressed.

Analog Input 1 window comparator

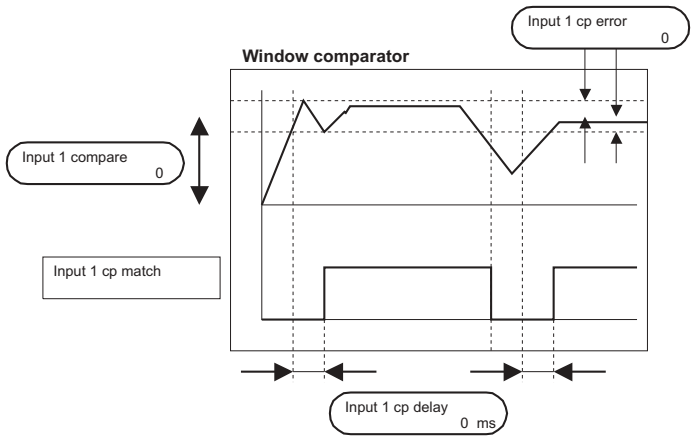


Figure 6.13.2.2: Window comparator

This function allows to signal the match of a programmable value on analog input 1.

Input 1 compare	Sets the level for the comparator.	
Input 1 cp error	Defines a tolerance window around **Input 1 compare**.	
Input 1 cp delay	Delay time setting in milliseconds for the transition of **Input 1 cp match** from low to high.	
Input 1 cp match	Signalling output of the video comparator.	
	It can be read through a Field Bus LAN or digital output.	
	High	**Analog input 1** value is within the comparation window.
	Low	**Analog input 1** value is out the comparation window.

NOTE! How to calculate **Input 1 compare** and **Input 1 cp error** parameters:

Input 1 compare = (Compare value) * 10000 / (Full range value)

Input 1 error = (Tolerance half window) 10000 / (Full range value)

Example 1:
Select analog input 1 to **Ramp ref 1**
Speed base value equal to 1500 [RPM]
10Volt or 20 mA on analog input 1 (Ramp ref 1=Speed base value).
The application requires a signaling at 700 [RPM] via a digital output, with a tolerance window equal to 100 [RPM]
Input 1 cp match assigned to a programmable digital output.
Input 1 compare = 700 * 10000 / 1500 = 4667
Input 1 cp error = 100 * 10000 / 1500 = 666

Example 2:
Select analog input 1 to **Ramp ref 1**
Speed base value equal to 1500 [RPM]
10Volt or 20 mA on **Analog input 1** (**Ramp ref 1**=**Speed base value**).
The application requires a signaling at –700 [RPM] via LAN, with a tolerance window equal to ±100 [RPM]
Input 1 compare = -700 * 10000 / 1500 = -4667
Input 1 cp error = 100 * 10000 / 1500 = 666

Example 3:
Select analog input 1 to **Pad 0**
10Volt or 20 mA on **Analog input 1** corresponds to Pad 0=2047.
The application requires a signaling at 700 [count] via a digital output, with a tolerance window equal to ±50 [count]
Input 1 cp match assigned to a programmable digital output
Input 1 compare = 700 * 10000 / 2047 = 3420
Input 1 cp error = 50 * 10000 / 2047 = 244

Example 4:
Select analog input 1 to **PID feedback**
10Volt or 20 mA on **Analog input 1** corresponds to **PID feedback**=10000.
The application requires a signaling at 4000 [count] via a digital output, with a tolerance band equal to ±1000 [count]
Input 1 set thr assigned to a programmable digital output
Input 1 thr = 4000 * 10000 / 10000 = 4000
Input 1 cp error = 1000 * 10000 / 10000 = 1000

Example 5:
Select input 1 to **T current lim**
10Volt or 20 mA on **Analog input 1** corresponds to **T current lim** = 100 [%]
The application requires a signaling at 50 [%] via a digital output, with a tolerance band equal to ±2 [%]
Input 1 cp match assigned to a programmable digital output
Input 1 compare = 50 * 10000 / 100 = 5000
Input 1 cp error = 2 * 10000 / 100 = 200

6.13.3. Digital Outputs

I/O CONFIG

Digital outputs

- Digital output 1
- Digital output 2
- Digital output 3
- Digital output 4
- Digital output 5
- Digital output 6
- Digital output 7
- Digital output 8
- Relay 2

GA0710g

Parameter	No.	Value			Standard configuration
		min	max	Factory	
Digital output 1	145	0	49	Ramp+	
Digital output 2	146	0	49	Ramp-	
Digital output 3	147	0	49	Spd threshold	
Digital output 4	148	0	49	Overld available	
Digital output 5	149	0	49	Curr limit state	
Digital output 6	150	0	49	Overvoltage	
Digital output 7	151	0	49	Undervoltage	
Digital output 8	152	0	49	Overcurrent	
Relay 2	629	0	49	Speed zero thr	

Ga6260

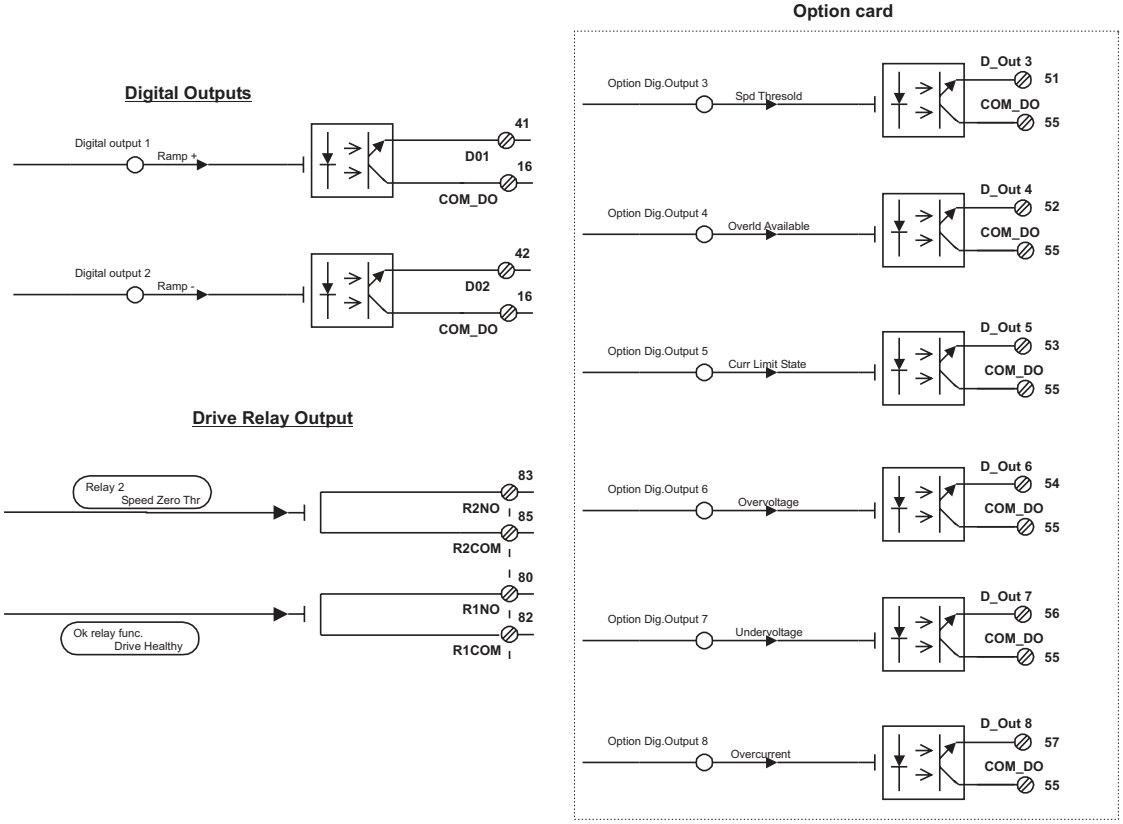


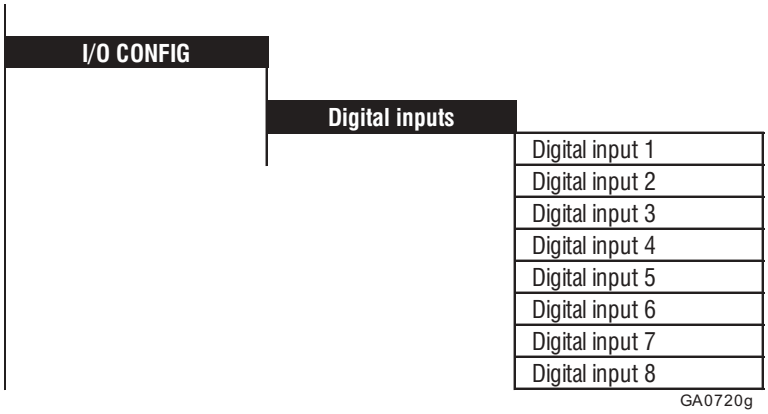
Figure 6.13.3.1: Digital Outputs and Option card

Digital output XX Selection of the parameter that is assigned to the digital output concerned. The following assignments are possible:

OFF [0]
Speed zero thr [1]
Spd threshold [2]
Set speed [3]
Curr limit state [4]
Drive ready [5]
Overld available [6]
Reserved [7]
Ramp +[8]
Ramp -[9]
Speed limited [10]
Undervoltage [11]
Overvoltage [12]
Heatsink sensor [13]
Overcurrent [14]
Overtemp mot [15]
External fault [16]
Failure supply [17]
Pad A bit [18]
Pad B bit [19]
Virt dig input [20]
Speed fbk loss [25]
Bus loss [26]
Output stages [27]
Hw opt1 failure [28]
Opt2 failure [29]
Encoder1 state [30]
Encoder2 state [31]
Ovld mot state [32]
Enable seq err [35]
BU overload [36]
Diameter calc st [38]
Mot setup state [46]
Input 1 cp match [49]
Overload 200% [51]
PL stop active [52]
PL next active [53]
PL time-out sig [54]
Regulation ot [55]
Module overtemp [56]
Heatsink ot [57]
Intake air ot [62]

Relay 2 Selection of the parameters, that is assigned to the relay contact 83 and 85 has to trip (Open relay contact = Alarm, closed relay contact = No alarm).

6.13.4. Digital Inputs



Parameter	No.	Value			Standard configuration
		min	max	Factory	
Digital input 1	137	0	62	OFF	
Digital input 2	138	0	62	OFF	
Digital input 3	139	0	62	OFF	
Digital input 4	140	0	62	OFF	
Digital input 5	141	0	62	OFF	
Digital input 6	142	0	62	OFF	
Digital input 7	143	0	62	OFF	
Digital input 8	144	0	62	OFF	

Ga6265

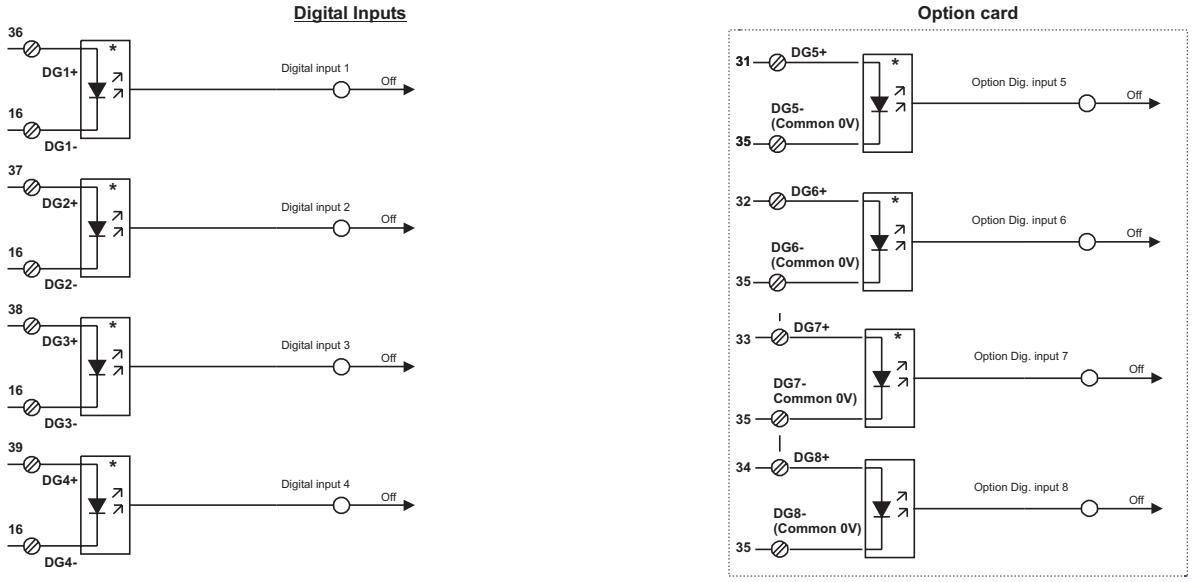


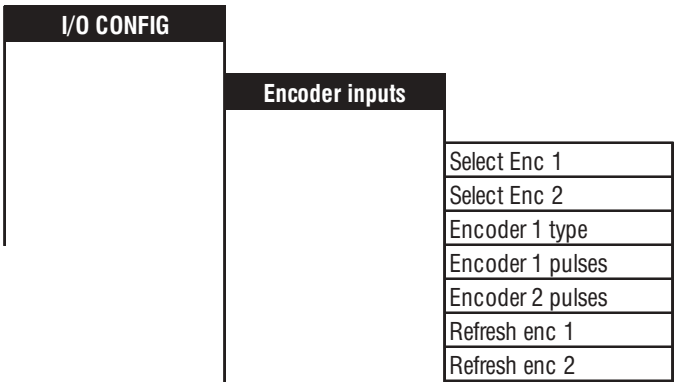
Figure 6.13.4.1: Digital Input and Option card

Digital input XX Selection of the parameter that is addressed by the digital input concerned. The following assignments are possible:

OFF [0]
Motor pot reset [1]
Motor pot up [2]
Motor pot down [3]
Motor pot sign +[4]
Motor pot sign -[5]
Jog +[6]
Jog -[7]
Failure reset [8]
Torque reduct [9]
Ramp out = 0 [10]
Ramp in = 0 [11]
Freeze ramp [12]
Lock speed reg [13]
Lock speed I [14]
Auto capture [15]
Input 1 sign +[1)][16]
Input 1 sign -[1)][17]
Input 2 sign +[1)][18]
Input 2 sign -[1)][19]
Input 3 sign +[1)][20]
Input 3 sign -[1)][21]
Zero torque [22]
Speed sel 0[2)][23]
Speed sel 1[2)][24]
Speed sel 2[2)][25]
Ramp sel 0[3)][26]
Ramp sel 1[3)][27]
Speed fbk sel [28]
PAD A bit 0 [32]
PAD A bit 1 [33]
PAD A bit 2 [34]
PAD A bit 3 [35]
PAD A bit 4 [36]
PAD A bit 5 [37]
PAD A bit 6 [38]
PAD A bit 7 [39]
Fwd sign [44]
Rev sign [45]
An in 1 target [46]
An in 2 target [47]
An in 3 target [48]
Enable droop [49]
Forward sign [44]
Quick Stop [51]
Enable PI PID [4)] [52]
Enable PD PID [4)] [53]
PI int freeze [4)] [54]
PID offs. sel [4)] [55]
PI central vs0 [4)] [56]
PI central vs1 [4)] [57]
Diameter calc [4)] [58]
Lock zero pos [59]
Lock save eng [60]
Mot setup sel 0 [5)] [62]
PL mains status [66]
PL time-out ack [67]

1) The **Input xx sign +** and **Input XX sign -** parameters can only be used in conjunction with each other.
2) The **Speed sel 0**, **Speed sel 1** and **Speed sel 2** parameters can only be used together.
3) The **Ramp sel 0** and **Ramp sel 1** parameters can only be used together.
4) See **PID Function** (chapter 6.17.3)
5) See **Motor setup function** (chapter 6.15.6)

6.13.5. Speed Reference from Encoder Input (Tach Follower Function)



Ga0725

Parameter	No.	Value			Standard configuration
		min	max	Factory	
Select enc 1	1020	0	5	OFF	
Select enc 2	1021	0.00	5	OFF	
Encoder 1 type Sinusoidal Digital	415	0	1	Digital (1)	
Encoder 1 pulses	416	600	9999	1024	
Encoder 2 pulses	169	600	9999	1024	
Refresh enc 1 Enabled Disabled	649	0	1	Disable (0)	
Refresh enc 2 Enabled Disabled	652	0	1	Disable (0)	

Ga6266ai

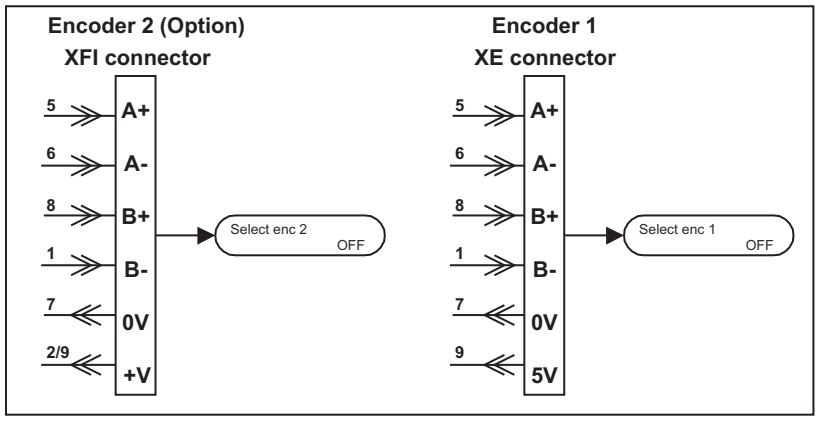


Figure 6.13.5.1: Tach follower

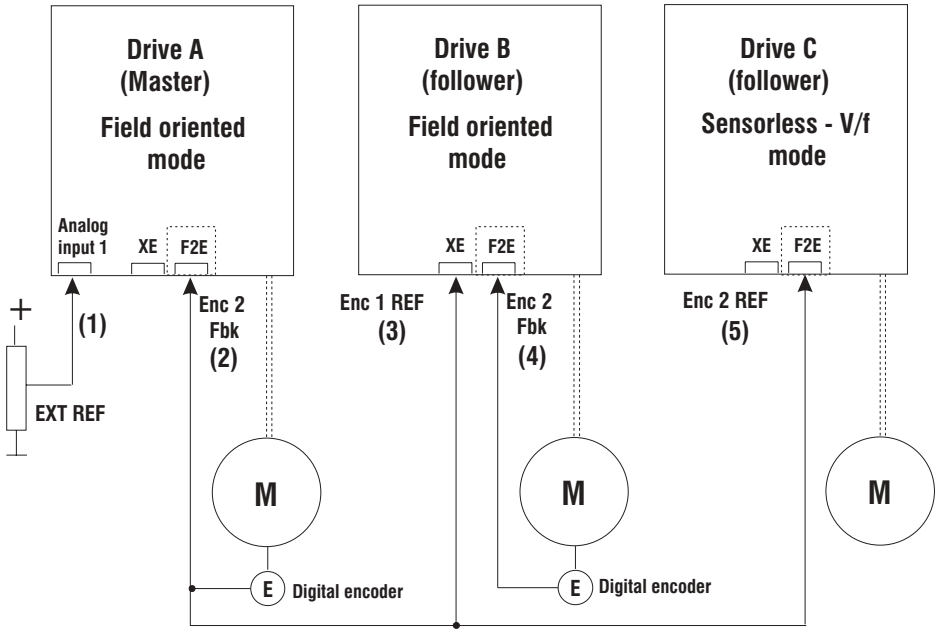
This configuration allows the use of the encoder inputs, as a speed reference. Compared to an analog input, these inputs have higher resolution and higher noise immunity.

Using for this purpouse the encoder input (XE connector), it is necessary to define the destination, selecting properly the type of speed reference on which it has to interact (**Ramp ref 1**, **Speed ref 1**, etc.)

When the encoder input is used as a speed reference source, using the same encoder input as speed feedback is disallowed. It is impossible to configure the same speed reference to the encoder input and an analog input.

Select enc 1	These parameters define which speed reference the encoder signal will reference to.
Select enc 2	The OFF condition indicates that the encoder connector is not used as speed reference and then it could be used as speed feedback. (CONFIGURATION/Speed fbk sel menu). The speed reference destination choice must be done according to the speed regulator configuration (e.g. can not use **Speed ref 1** with the ramp active).
Encoder 1 type	It defines the encoder type to the XE connector connected. Sinusoidal — Sinusoidal encoder Digital — Digital encoder
Encoder 1 pulses	Pulse number of the encoder to the XE connector connected.
Encoder 2 pulses	Pulse number of the encoder to the optional card EXP-F2E connector connected.
Refresh enc 1	Enables the monitoring of the encoder 1 connection status, in order to detect a speed feedback loss alarm
Refresh enc 2	Enables the monitoring of the digital encoder 2 connection status, in order to detect a speed feedback loss alarm

The figure 6.13.5.2 describe a typical use of this function.



(1) Analog inputs/ Select input 1 = Ramp ref 1

(2) Speed fbk sel = Encoder 2

(3) Select enc 1 = Ramp ref 1
Enc 1 Type = digital

(4) Speed fbk sel = Encoder 2

(5) Select enc 2 = Ramp ref 1

Figure 6.13.5.1: Example of application of the encoder reference

The Drive A speed reference is provided in this case by an external analog signal but it could be set from internal digital sources (e.g. DGF optional card or field bus).

A configuration using the encoder signal as the line speed reference, is only possible when the speed reference source is provided by an additional encoder, independent from the motor shaft.

Use with different regulation mode setting:

The function “Tach follower” with **Regulation mode** = **Field oriented** can be used in accordance with the table below, if the “Motor setup” function (the parameters **Select enc 1** and **Select enc 2** must be set OFF) is used.

In the table below are reported the possible configurations of the Drive for the simultaneous use of the functions “Tach follower” and “Motor setup”.

Regulation mode	Motor setup		Tach follower	
	Setup 0 Speed fbk sel	Setup 1 Speed fbk sel	Select enc 1	Select enc 2
Field oriented mode	Encoder 1	Encoder 2	OFF	OFF
	Encoder 2	Encoder 1	OFF	OFF
	Encoder 1 (1)	Encoder 1 (1)	OFF	Reference assigned
	Encoder 2 (1)	Encoder 2 (1)	Reference assigned	OFF
Sensorless mode or V/f control (2)	Encoder 1	Encoder 2	OFF	OFF
	Encoder 2	Encoder 1	OFF	OFF
	Encoder 1	Encoder 1	OFF	Reference assigned
	Encoder 2	Encoder 2	Reference assigned	OFF

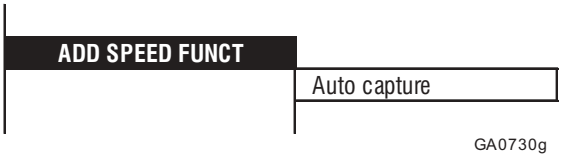
Ga6267

(1) It requires the electromechanical commutation of the encoder signals. It is not suggested for the correct continuity of the shieldings and low noise immunity.

(2) Encoder feedback is not used in these cases. The **Spd fbk sel** parameter is logically interblocked with **Select enc 1** and **Select enc 2** parameters and in both the setups it is necessary to assign it both channels.

6.14. Additional Speed Functions

6.14.1. Auto Capture



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Auto capture	388	0	1	OFF	*
ON					
OFF				(0)	

GA6270g

* This function can be assigned to one of the programmable digital inputs.

Auto capture

ON When the Drive is switched on, the speed of the motor is determined and the field orientation is initialized accordingly. The drive then runs to the set reference value.

OFF When the Drive is switched on, it starts at zero frequency.

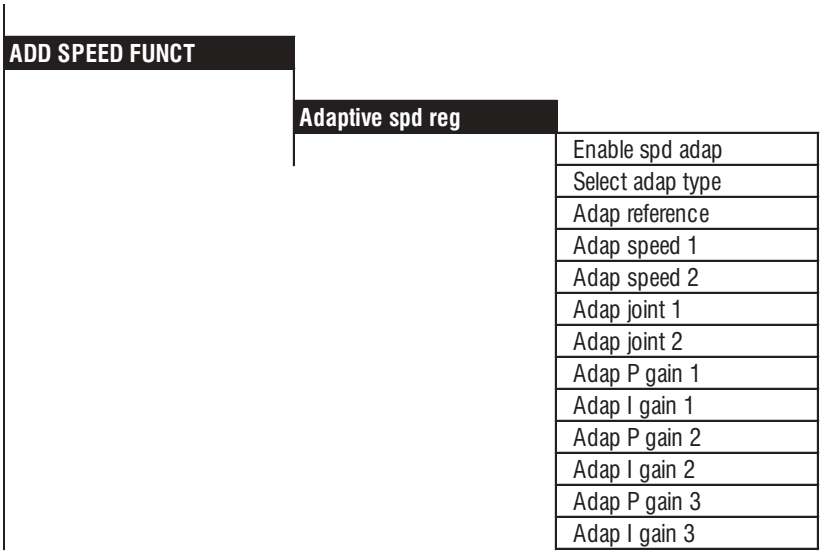
This function can be used only with REGULATION MODE = Field oriented or REGULATION MODE= V/f control (see chapter 6.4.2.3.3).

Main uses:

- Start of a motor that is already running due to its load (e.g. in the case of pumps, the flowing medium).
- Restart after a fault alarm.
- If the speed reference value is defined via the ramp, with **Auto capture** = ON this starts at a reference value corresponding to the motor speed.

NOTE! If the Auto capture function is switched off, ensure that the motor is not turning when the Drive is switched on. If this is not the case, this may cause the Drive to be switched off due to overvoltage or overcurrent.

6.14.2. Adaptive Spd Reg



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Enable spd adap Enable Disable	181	0	1	Disabled (0)	
Select adap type Speed Adap reference	182	0	1	Speed (0)	
Adap reference [FF]	183	-32768	+32767	1000	*
Adap speed 1 [%]	184	0.0	200.0	20.3	
Adap speed 2 [%]	185	0.0	200.0	40.7	
Adap joint 1 [%]	186	0.0	200.0	6.1	
Adap joint 2 [%]	187	0.0	200.0	6.1	
Adap P gain 1 [%]	188	0.00	100.00	10.00	
Adap I gain 1 [%]	189	0.00	100.00	1.00	
Adap P gain 2 [%]	190	0.00	100.00	10.00	
Adap I gain 2 [%]	191	0.00	100.00	1.00	
Adap P gain 3 [%]	192	0.00	100.00	10.00	
Adap I gain 3 [%]	193	0.00	100.00	1.00	

GA6275g

*This function can be assigned to one of the programmable analog inputs.

The adaptive speed regulator function enables different gains of the speed regulator depending on the speed or another variable (Adaptive Reference). This allows optimum adaption of the speed regulator to the application at hand.

Enable spd adap	Enabled	Adaptive speed regulation enabled.
	Disabled	Adaptive speed regulation is not enabled. The regulator operates with the parameters set in the REG PARAMETERS menu.
Select adap type	Speed	The regulator parameters are modified according to the speed.
	Adap reference	The regulator parameters are modified according to the **Adap reference** parameter.
Adap reference	The variable according to which the speed regulator parameters are to be modified (only with **Select adap type** = Adap reference)	

Adap speed 1	Parameter set 1 is valid below this point, and parameter set 2 above it. The transition behavior between the values is defined by the **Adap joint 1** parameter. The definition is a percentage of the **Speed base value**
Adap speed 2	Parameter set 2 is valid below this point, and parameter set 3 above it. The transition behaviour between the values is defined by **Adap joint 2**. The definition is a percentage of the **Speed base value**
Adap joint 1	Defines a range around **Adap speed 1** in which there is a linear change in gain from parameter set 1 to parameter set 2 in order to prevent jumps in the behavior of the regulator. The definition is a percentage of the **Speed base value**
Adap joint 2	Defines a range around **Adap Speed 2** in which there is a linear change in gain from parameter set 2 to parameter set 3 in order to prevent jumps in the behavior of the regulator. The definition is a percentage of the **Speed base value**
Adap P gain 1	Proportional gain for the range from zero to **Adap speed 1**. Defined as a percentage of **Speed P base**.
Adap I gain 1	Integral gain for the range from zero to Adap speed 1. Defined as a percentage of **Speed I base**.
Adap P gain 2	Proportional gain for the range from **Adap speed 1** to **Adap speed 2**. Defined as a percentage of **Speed P base**.
Adap I gain 2	Integral gain for the range from **Adap speed 1** to **Adap speed 2**. Defined as a percentage of **Speed I base**.
Adap P gain 3	Proportional gain for the range above **Adap speed 2**. Defined as a percentage of **Speed P base**.
Adap I gain 3	Integral gain for the range above **Adap speed 2**. Defined as a percentage of **Speed I base**.

In order to activate Adaptive speed regulation, the function must be enabled with the **Enable spd adap** parameter.

Normally the gain depends on the speed of the drive. It can, however, also vary according to another variable, defined by the **Adap reference** parameter. This must be selected with the **Select adap type** parameter.

The **Adap speed 1** and **Adap speed 2** parameters are used to define the three ranges that may have different gains.

A parameter set can be defined for each of these ranges, with each set containing an individually definable P and I component. The **Adap joint 1** and **Adap joint 2** parameters ensure a smooth transition between the different parameter sets. The ranges must be defined in such a way that **Adap joint 1** and **Adap joint 2** do not overlap.

When the Adaptive speed regulation is enabled (**Enable spd adap** = Enabled), the **Speed P** and **Speed I** parameters have no effect. They still retain, however, their value and are effective after disabling the Adaptive speed regulation.

When the drive is not enabled, the gain of the speed regulator is determined by the speed zero logic. See section 6.14.4, “Speed zero logic”.

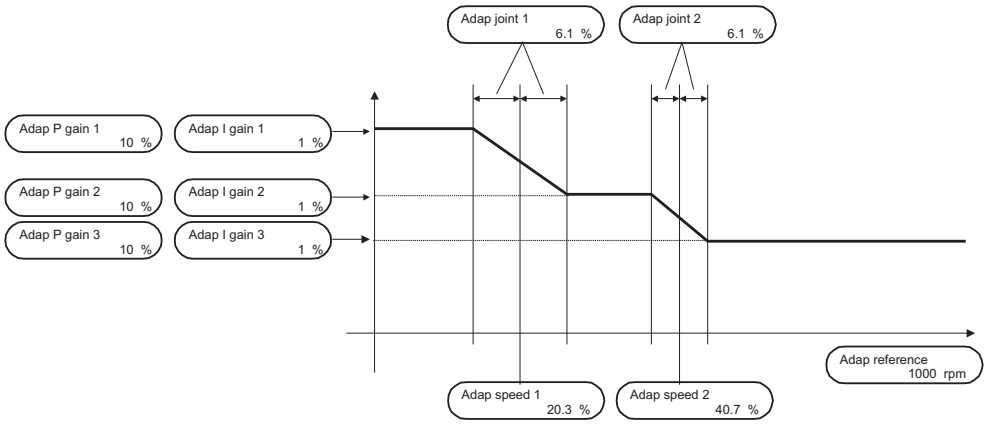
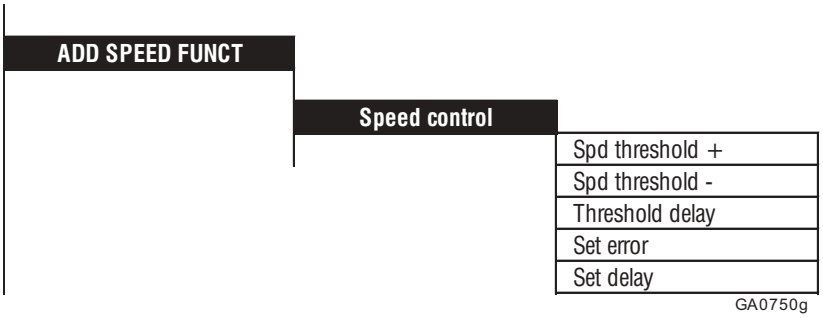


Figure 6.14.2.1: Adaptive speed regulation

6.14.3. Speed Control



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Spd threshold + [FF]	101	1	32767	1000	
Spd threshold - [FF]	102	1	32767	1000	
Threshold delay [ms]	103	1	65535	100	
Spd threshold	393	0	1	-	Digital output 3 *
Set error [FF]	104	1	32767	100	
Set delay [ms]	105	0	65535	100	
Set speed	394	0	1	-	*

GA6280g

*This function can be assigned to a programmable digital output.

Two speed control messages are provided:
- when an adjustable speed threshold is exceeded
- when the speed equals the set reference value

Spd threshold + Switch point for “Spd threshold” for clockwise rotation of the drive in the unit defined by the factor function.

Spd threshold - Switch point for the “Spd threshold” for counter clockwise rotation of the drive in the unit defined by the factor function.

Threshold delay Setting of a delay time in milliseconds for the transition of **Spd threshold**

Spd threshold Message “Speed exceeded” (via a programmable digital output or RS485 or BUS)

High	Speed not exceeded
Low	Speed exceeded

Set error Defines a tolerance band around the speed reference in the unit specified by the factor function.

Set delay Setting of a delay time in milliseconds for the transition of set speed from low to high.

Set speed Message “The speed corresponds to the reference value” (via a programmable digital output or RS485 or BUS).

High	Speed is in the range:reference ± Set error
Low	Speed is outside the range said above

The message “Speed corresponds to the reference value” refers to the total reference value **Speed ref** or **Ramp Ref** ramp reference value when the ramp is selected.

With reference values below ± 1 % the signal is always Low!

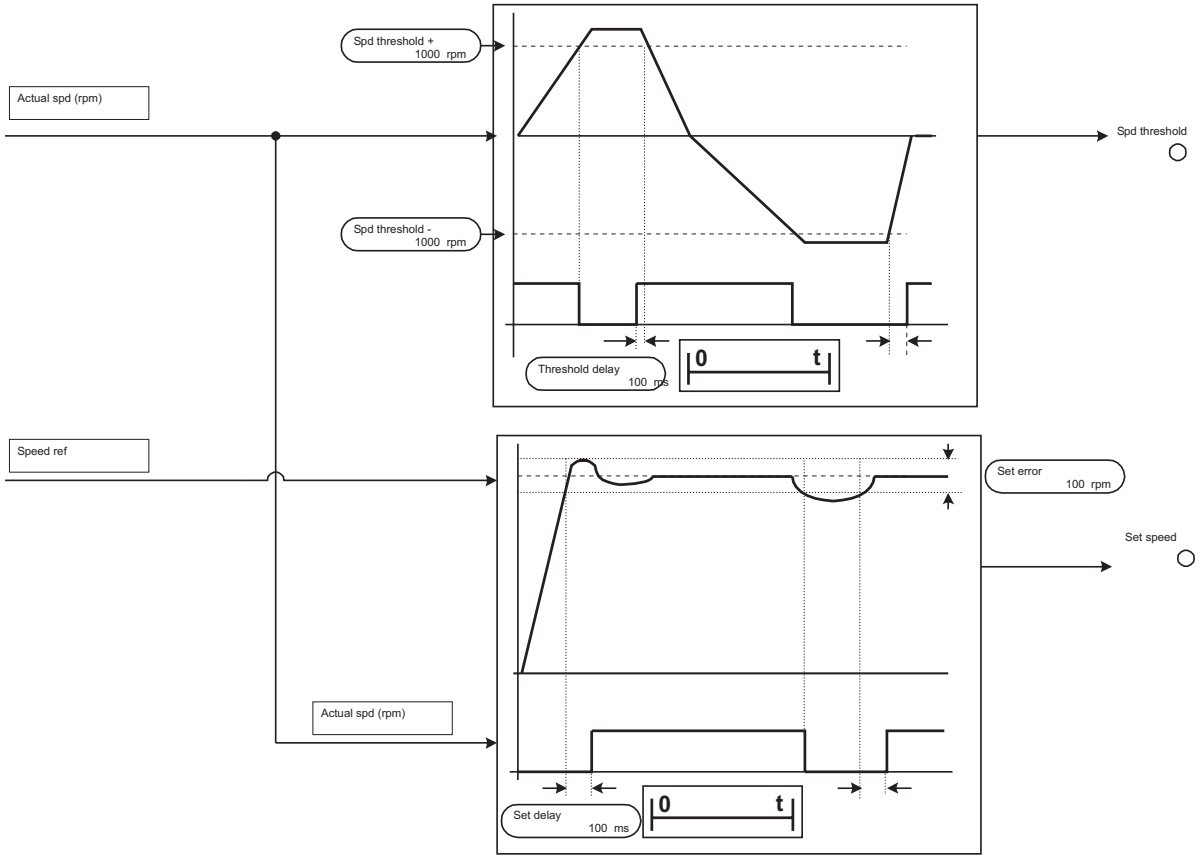


Figure 6.14.3.1: "Speed threshold" (up) and "Set speed" (down) messages

6.14.4. Speed Zero

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Speed zero level [FF]	107	1	32767	10	-
Speed zero delay [ms]	108	0	65535	100	-
Speed zero thr	395	0	1	-	* Relay terminals 83/85

GA6285g

* This function can be assigned to a programmable digital output.

Speed zero level Switch threshold for Speed zero level. The value applies to both rotation directions. Defined in the unit specified by the factor function.

Speed zero delay Definition of a delay time in milliseconds, for the transition of speed zero thr from High to low

Speed zero thr	Message “Drive running” (via a programmable digital output or RS485 or BUS)	
	High	Drive running
	Low	Drive not running

The LED “Zero speed” is lit when the motor is not running.

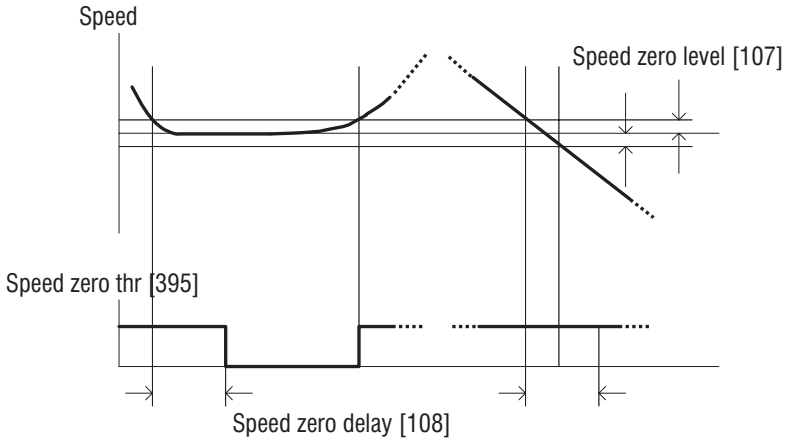
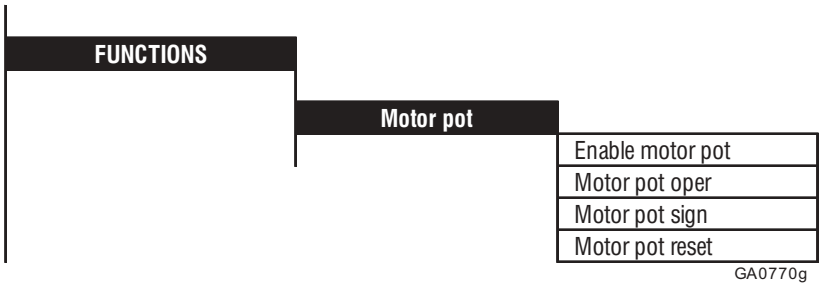


Figure 6.14.4.1: Speed zero

6.15. Functions

6.15.1. Motor Potentiometer



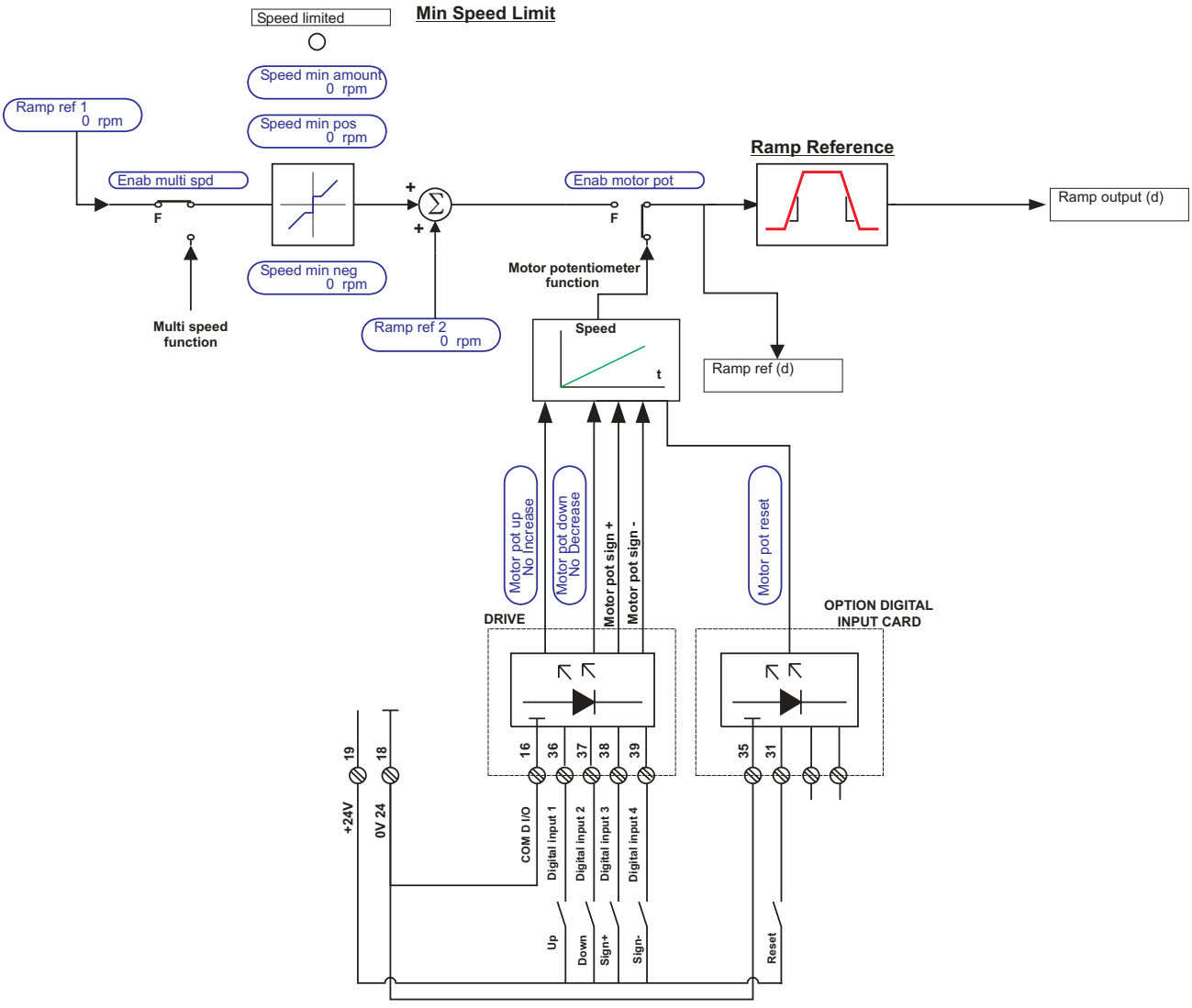


Figure 6.15.1.1: Example of the external activation of the motor potentiometer function.

The + and - sign signals can be omitted if only one rotation direction required.

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Enable motor pot Enabled Disabled	246	0	1	Enabled (1)	
Motor pot oper	-				
Motor pot sign **- / +**	248	0	1	Positive (1)	
Motor pot sign +	-				**
Motor pot sign -	-				**
Motor pot reset	249	0	65535	-	*
Motor pot up	396	0	1	No acceleration (0)	
Motor pot down	397	0	1	No deceleration (0)	

GA6290ai

* This function can be assigned to one of the programmable digital inputs.

** These parameters can only be accessed via a programmable digital input.

The motor potentiometer function allows the speed of the drive to be adjusted by pressing a key. The speed is then adjusted according to the defined ramp time.

Enable motor pot

Enabled — The motor potentiometer function is enabled. The ramp receives its reference value from the motor potentiometer function.

Disabled — The motor potentiometer function is disabled.

Motor pot oper

After entering this menu item on the keypad pressing the "+" and "-" keys of the keypad the drive can be accelerated or decelerated.

\+ — Accelerate

\- — Decelerate

Motor pot sign

This parameter is only accessible via the keypad and via the serial interface or bus. (When the drive is operated via the terminal strip, the parameters **Motor pot sign +** and **Motor pot sign -** must be used).

Positive — "Clockwise" rotation selected

Negative — "Counter-clockwise" rotation selected

Motor pot sign +

Selection of the the "Clockwise" rotation direction when the selection is carried out via the terminal strip. The **Motor pot sign +** parameter is linked with the **Motor pot sign -** parameter via an XOR function. This means that the command (+24V) must be given only to one of the two terminals.

High — "Clockwise" rotation direction selected

Low — "Clockwise" rotation direction not selected

Motor pot sign -

Selection of the "Counter-clockwise" rotation direction when the changeover is carried out via the terminal strip. The **Motor pot sign -** parameter is linked with the **Motor pot sign +** parameter via an XOR function: this means that the command (+24V) must be given only to one of the two terminals.

High — "Counter-clockwise" rotation direction selected.

Low — "Counter-clockwise" rotation direction not selected.

Motor pot reset

After the Reset command is executed, if drive is switched off and on, and restarted,the reference is set at zero. The Motor pot up command is required in order to accelerate the drive. If the Reset command is not executed, the drive after being started will accelerate

to the speed last selected (before being switched off).

The command is only possible with the drive disabled

Motor pot up The drive is accelerated with the preselected ramp. The setting is either carried out via the terminal, serial interface or bus.

Motor pot down The drive is decelerated with the preselected ramp. The setting is either carried out via the terminal, serial interface or bus.

When the motor potentiometer function is active (**Enable motor pot**), the current speed reference value is shown in the **Motor pot** submenu of the keypad.

When controlled via the keypad, the drive can be accelerated by pressing the "+" key and decelerated by pressing the "-" key. This corresponds to the commands **Motor pot u**p and **Motor pot down**. Select the menu point **Motor pot oper** for this purpose.

The speed of the drive can be adjusted between 0 and 100 % by setting the command **Motor pot up**.

The drive reduces the speed between 100 and 0 % by setting the command **Motor pot down**. If the command is given when the drive is already at a stop, this will not cause the drive to run reverse.

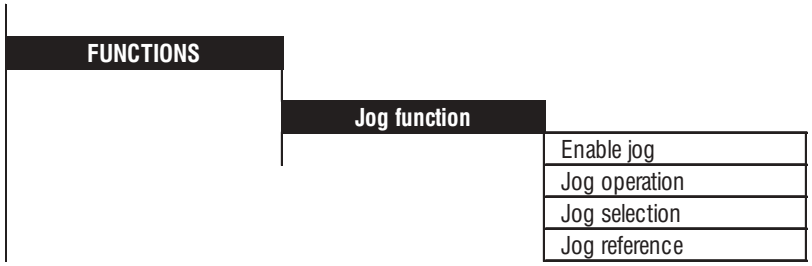
If the **Motor pot up** and **Motor pot down** commands are given at the same time, the speed reference value will not change. The last speed reference value is saved when the drive is disabled or if there is a fault. When the drive is restarted, it accelerates to this speed according to the ramp set.

If the command **Motor pot reset** is given with the drive switched off, the speed reference value is deleted, and the drive starts at zero speed.

If the status of the **Motor pot sign** command is changed while the drive is running, the drive will reverse according to the ramp times specified.

When using the motor potentiometer function, the ramp must be enabled and the **Start** command must be present.

6.15.2. Jog Function



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Enable jog (Enable/disable)	244	0	1	Enabled (1)	-
Jog operation	-				
Jog selection (Speed input/Ramp input)	375	0	1	Speed input (0)	
Jog reference [FF]	266	0	32767	100	**
Jog+	398	0	1	No jog+	*
Jog-	399	0	1	No jog-	*

GA6295ai

* This function can be assigned toone of the programmable digital inputs.

** This parameter can be assigned to a programmable analog input.

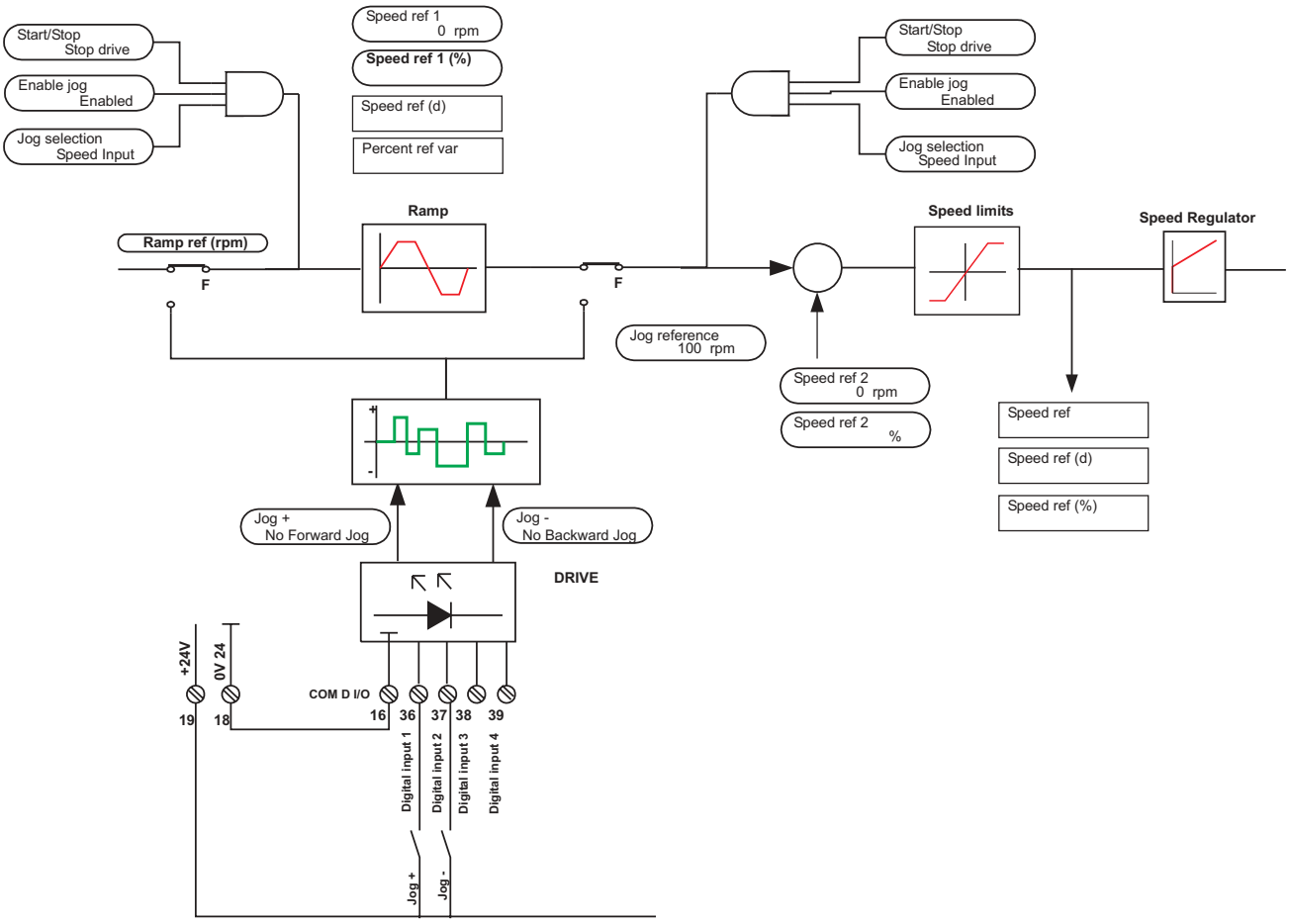


Figure 6.15.2.1: Example of external activation in Jog function

Enable jog	Enabled	Jog mode is enabled (selection only possible if the drive is disabled).
	Disabled	Jog mode is disabled
Jog operation	Pressing the “+” and “-” keys and backward.	(on keypad) enables the drive to be moved forward
	+	Jog clockwise rotation
	-	Jog counter-clockwise rotation
Jog selection	This parameter determines if the jog function reference must go through the ramp or if it has to reach directly the speed regulator.	
	Speed input	The jog reference is directly fed to the speed regulator. The ramp is not active.
	Ramp input	The jog reference is fed to the ramp input block.
Jog reference	Reference value for jog mode. Defined by the dimension specified in the factor function.	
Jog +	High	Jog with clockwise motion of the drive when Jog mode enabled and no **Start** command present.
	Low	Disabled
Jog -	High	Jog with counter-clockwise rotation of the drive when Jog mode enabled and no **Start** command present.
	Low	Disabled

NOTE: The following signals are required to be high for Jog mode in addition to the commands

- **Jog +** and **Jog -**
- **Enable drive**
- **Fast Stop**
- **External fault**

The jog speed corresponds to the value defined with the **Jog reference** parameter.

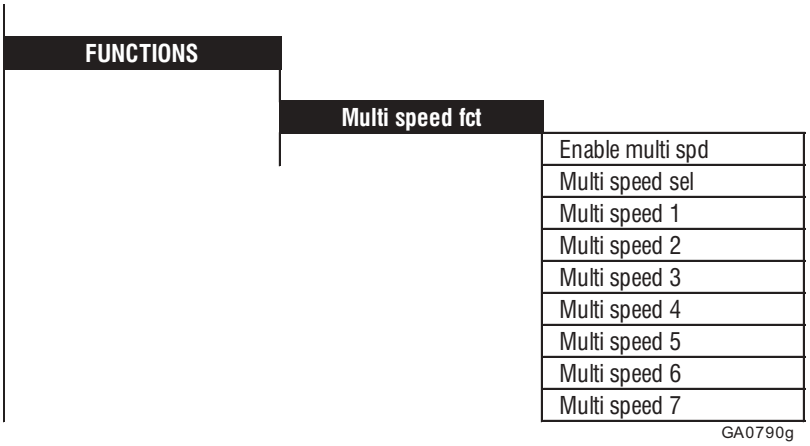
The jog reference value can only be activated by the **Jog +** or **Jog -** command if there is no **Start** command active and the actual speed of the drive is zero.

If the **Start** command is given in addition to the **Jog +** or **Jog -** command, Jog mode will be aborted and the drive will react according to the **Start** command.

When controlled via the keypad the "+" and "-" keys can be used in the **Jog function** menu. For this select the **Jog operation** menu point.

The correction value **Speed ref 2** for the speed regulator is still active during jog operation.

6.15.3. Multi Speed Fct



The Multi speed function allows up to seven internally preset reference values to be called up via a set of three digital signals

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Enable multi spd (Enable/Disable)	153	0	1	Disabled (0)	
Multi speed sel	208	0	7	0	
Multi speed 1	154	-32768	+32767	0	
Multi speed 2	155	-32768	+32767	0	
Multi speed 3	156	-32768	+32767	0	
Multi speed 4	157	-32768	+32767	0	
Multi speed 5	158	-32768	+32767	0	
Multi speed 6	159	-32768	+32767	0	
Multi speed 7	160	-32768	+32767	0	
Speed sel 0	400	0	1	Low	Digital input 5 *
Speed sel 1	401	0	1	Low	Digital input 6 *
Speed sel 2	402	0	1	Low	Digital input 7 *

GA6300g

* This function can be assigned to one of the programmable digital inputs.

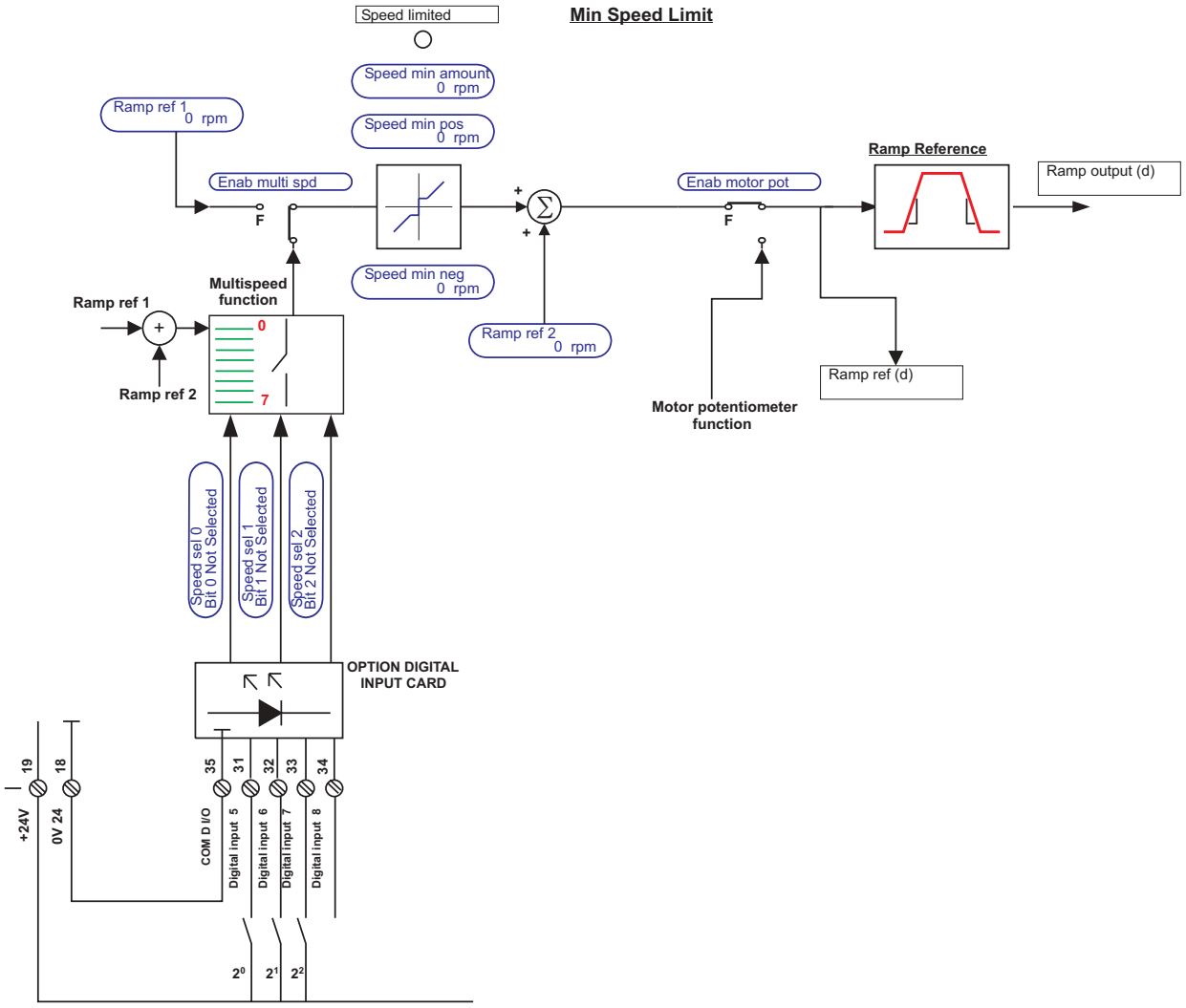


Figure 6.15.3.1: Selection of different reference values via terminal strip

Enab multi spd Enabled - Multi speed function is enabled

Disabled - Multi speed function is disabled

Multi speed 1 Reference value 1 for Multi speed function.Defined in the unit specified by the factor function.

Multi speed 2 Reference value 2 for Multi speed function.Defined in the unit specified by the factor function.

Multi speed 3 Reference value 3 for Multi speed function.Defined in the unit specified by the factor function.

Multi speed 4 Reference value 4 for Multi speed function.Defined in the unit specified by the factor function.

Multi speed 5 Reference value 5 for Multi speed function.Defined in the unit specified by the factor function.

Multi speed 6 Reference value 6 for Multi speed function.Defined in the unit specified by the factor function.

Multi speed 7 Reference value 7 for Multi speed function. Defined in the unit specified by the factor function.

Speed sel 0 Reference value selection with the significance 2^0 (=1) (bit 0). Parameter can only be used in conjunction with **Speed sel 1** and **Speed sel 2**

High Significance 2^0 selected

Low Significance 2^0 not selected

Speed sel 1 Reference value selection with the significance 2^1 (=2)(bit 1). Parameter can only be used in conjunction with **Speed sel 0** and **Speed sel 2**

High Significance 2^1 selected

Low Significance 2^1 not selected

Speed sel 2 Reference value selection with the significance 2^2 (=4) (bit 2). Parameter can only be used in conjunction with **Speed sel 0** and **Speed sel 1**.

High	Significance 2^2 selected
Low	Significance 2^2 not selected

Multi speed sel It is the word representation of the three parameters **Speed sel1** (bit 0), **Speed sel2** (bit1) and **Speed sel 2** (bit2). Used to change the speed selection by changing only one parameter instead of three. This allows to select different speeds via serial line or Bus instantaneously.

The table and graph below shows the interaction between the selection and the corresponding reference value.

Speed sel 0 bit 0 not selected	Speed sel 1 bit 1 not selected	Speed sel 2 bit 2 not selected	REFERENCE
0	0	0	Ramp ref 1 0 rpm + Ramp ref 2 0 rpm
1	0	0	Multi speed 1 0 rpm
0	1	0	Multi speed 2 0 rpm
1	1	0	Multi speed 3 0 rpm
0	0	1	Multi speed 4 0 rpm
1	0	1	Multi speed 5 0 rpm
0	1	1	Multi speed 6 0 rpm
1	1	1	Multi speed 7 0 rpm

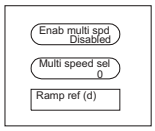


Table 6.15.3.1: Multispeed selection

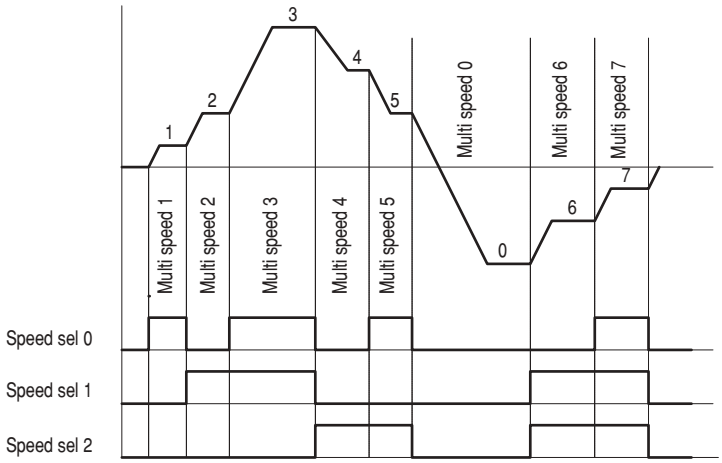


Figure 6.15.3.2: Multi speed function

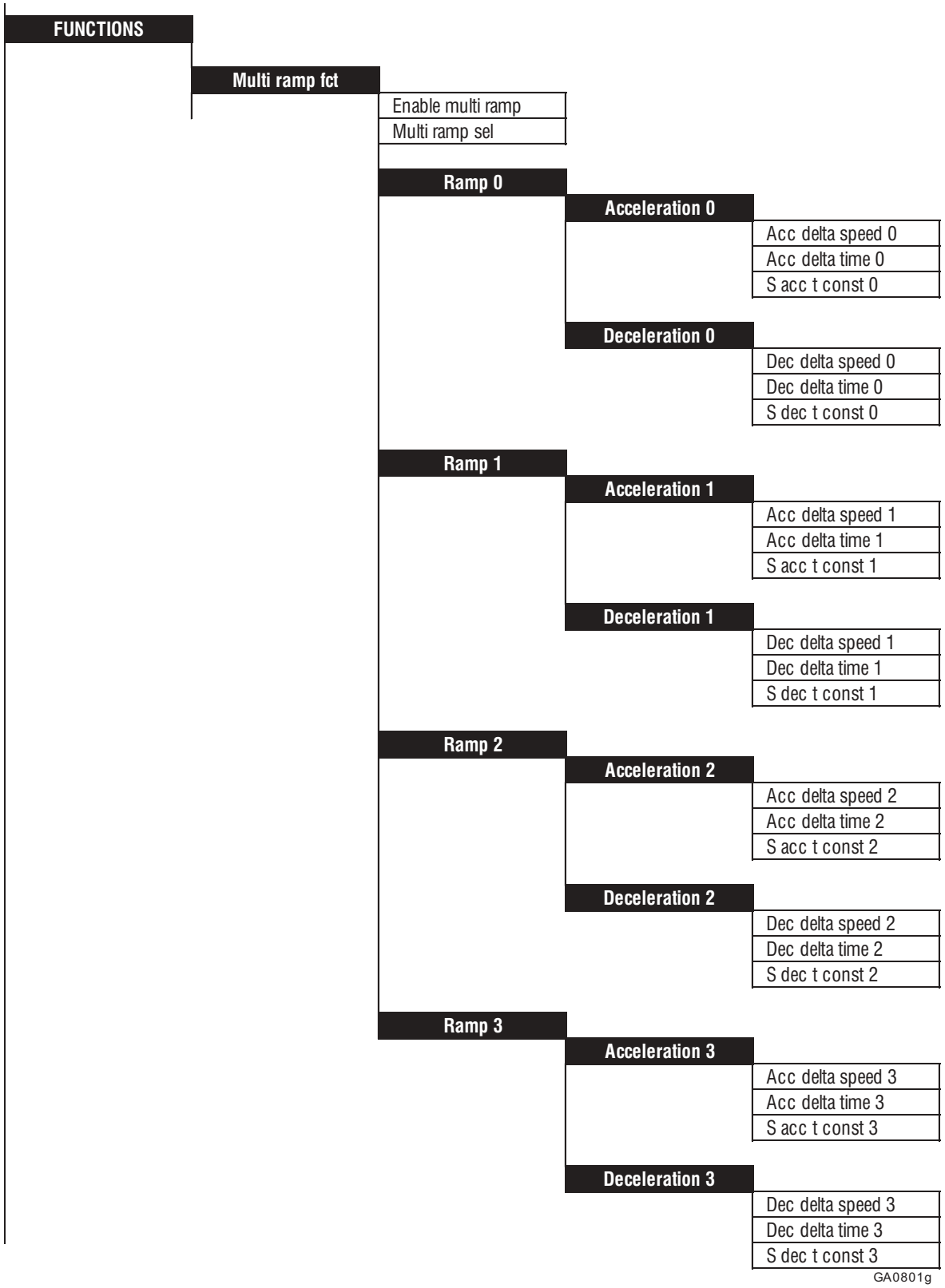
In order to operate the Multi speed function this must be enabled with the **Enab multi spd** parameter.

The reference value required is selected with the **Speed sel 0**, **Speed sel 1** and **Speed sel 2** signals. When the selection is carried out via the terminal strip, all three signals must always be assigned to digital input and also when, for example, only reference values 1 and 2 are required. The selection of the reference values is carried out via the keypad or the serial interface or digital input or RS485 or BUS.

The ref. values are signed so that they can be defined for either rotation direction of the drive.

When the Multi speed function is enabled, **Multi speed 0** is defined by the addition of the reference values **Ramp ref 1** and **Ramp ref 2.**

6.15.4. Multi Ramp Fct



The Multi ramp function enables up to four different ramps to be called up. The acceleration and deceleration times can also be defined here separately. The ramps are called up via digital signals.

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Enab multi rmp (Enable/Disable)	243	0	1	Disabled (0)	—
Multi ramp sel	202	0	3	0	—
Acc delta speed 0 [FF]	659	0	2^{32} -1	100	—
Acc delta time 0 [s]	660	0	65535	1	—
S acc t const 0 [ms]	665	100	3000	500	—
Dec delta speed 0 [FF]	661	0	2^{32} -1	100	—
Dec delta time 0 [s]	662	0	65535	1	—
S dec t const 0 [ms]	666	100	3000	500	—
Acc delta speed1 [FF]	23	0	2^{32} -1	100	—
Acc delta time 1 [s]	24	0	65535	1	—
S acc t const 1 [ms]	667	100	3000	500	—
Dec delta speed 1 [FF]	31	0	2^{32} -1	100	—
Dec delta time 1 [s]	32	0	65535	1	—
S dec t const 1 [ms]	668	100	3000	500	—
Acc delta speed 2 [FF]	25	0	2^{32} -1	100	—
Acc delta time 2 [s]	26	0	65535	1	—
S acc t const 2 [ms]	669	100	3000	500	—
Dec delta speed 2 [FF]	33	0	2^{32} -1	100	—
Dec delta time 2 [s]	34	0	65535	1	—
S dec t const 2 [ms]	670	100	3000	500	—
Acc delta speed 3 [FF]	27	0	2^{32} -1	100	—
Acc delta time 3 [s]	28	0	65535	1	—
S acc t const 3 [ms]	671	100	3000	500	—
Dec delta speed 3 [FF]	35	0	2^{32} -1	100	—
Dec delta time 3 [s]	36	0	65535	1	—
S dec t const 3 [ms]	672	100	3000	500	—
Ramp sel 0	403	—	—	Low	*
Ramp sel 1	404	—	—	Low	*

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* This function can be assigned to one of the programmable digital inputs.

Enab multi rmp Enabled The Multi ramp function is enabled

Disabled The Multi ramp function is disabled

Multi ramp sel It is the word representaton of the two parameters Ramp sel 0 (bit0) and Ramp sel (bit1). Used to change the ramp selection by changing only one parameter instead of two. This allows to select different ramps via serial line or Bus instantaneously.

Acc delta speed 0 It defines together with **Acc delta time 0** the acceleration ramp 0. Defined by the units specified in the factor function.

Acc delta time 0 It defines together with **Acc delta speed 0** the acceleration ramp 0. Defined in seconds.

S acc t const 0 Defines the acceleration curve for S-shape ramp 0. Defined in ms.

Dec delta speed 0 It defines together with **Dec delta time 0** the deceleration ramp 0. Defined by the units specified in the factor function.

Dec delta time 0 It defines together with **Acc delta speed 0** the acceleration ramp 0. Defined in seconds.

S dec t const 0 Defines the deceleration curve for S-shape ramp 0. Defined in ms.

Acc delta speed1 It defines together with **Acc delta time 1** the acceleration ramp 1. Defined by the units specified in the factor function.

Acc delta time 1 It defines together with **Acc delta speed 1** the acceleration ramp 1. Defined in seconds.

S acc t const 1 Defines the acceleration curve for S-shape ramp 1. Defined in ms.

Dec delta speed1 It defines together with **Dec delta time 1** the deceleration ramp 1. Defined by the units specified in the factor function.

Dec delta time 1 It defines together with **Dec delta speed 1** the deceleration ramp 1. Defined in seconds.

S dec t const 1 Defines the deceleration curve for S-shape ramp 1. Defined in ms.

Acc delta speed2 It defines together with **Acc delta time 2** the acceleration ramp 2. Defined by the units specified in the factor function.

Acc delta time 2 It defines together with **Acc delta speed 2** the acceleration ramp 2. Defined in seconds.

S acc t const 2 Defines the acceleration curve for S-shape ramp 2. Defined in ms.

Dec delta speed2 It defines together with **Dec delta time 2** the deceleration ramp 2. Defined by the units specified in the factor function.

Dec delta time 2 It defines together with **Dec delta speed 2** the deceleration ramp 2. Defined in seconds.

S dec t const 2 Defines the deceleration curve for S-shape ramp 2. Defined in ms.

Acc delta speed3 It defines together with **Acc delta time 3** the acceleration ramp 3. Defined by the units specified in the factor function.

Acc delta time 3 It defines together with **Acc delta speed 3** the acceleration ramp 3. Defined in seconds.

S acc t const 3 Defines the acceleration curve for S-shape ramp 3. Defined in ms.Dec delta speed3It defines together with **Dec delta time 3** the deceleration ramp 3. Defined by the units specified in the factor function.

Dec delta time 3 It defines together with **Dec delta speed 3** the deceleration ramp 3. Defined in seconds.

S dec t const 3 Defines the deceleration curve for S-shape ramp 3. Defined in ms.

Ramp sel 0 Ramp selection with the significance 2^0 (bit 0). Parameter can only be used in conjunction with Ramp sel 1.

High Significance 2^0 selected

Low Significance 2^0 not selected

Ramp sel 1 Ramp selection with the significance 2^1 (bit 1). Parameter can only be used in conjunction with Ramp sel 0.

High Significance 2^1 selected

Low Significance 2^1 not selected

The table and graph below shows the interaction between the selection and the corresponding reference value.

	Ramp sel 0	Ramp sel 1
Ramp 0	Low	Low
Ramp 1	High	Low
Ramp 2	Low	High
Ramp 3	High	High

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Table 6.15.4.1: Ramp selection

In order to activate the **Multiramp function**, it must be enabled with the **Enab multi rmp** parameter.

The ramp required is selected via the **Ramp sel 0** and **Ramp sel 1** signals. When the selection is made via the terminal strip, it is possible to select only one digital input. This configuration enables only the ramp time selected.

Another ramp can be selected at any time. If this happens during an acceleration or deceleration phase, the reference value will then follow the new ramp.

The ramp parameters are defined via the keypad or the serial interface.

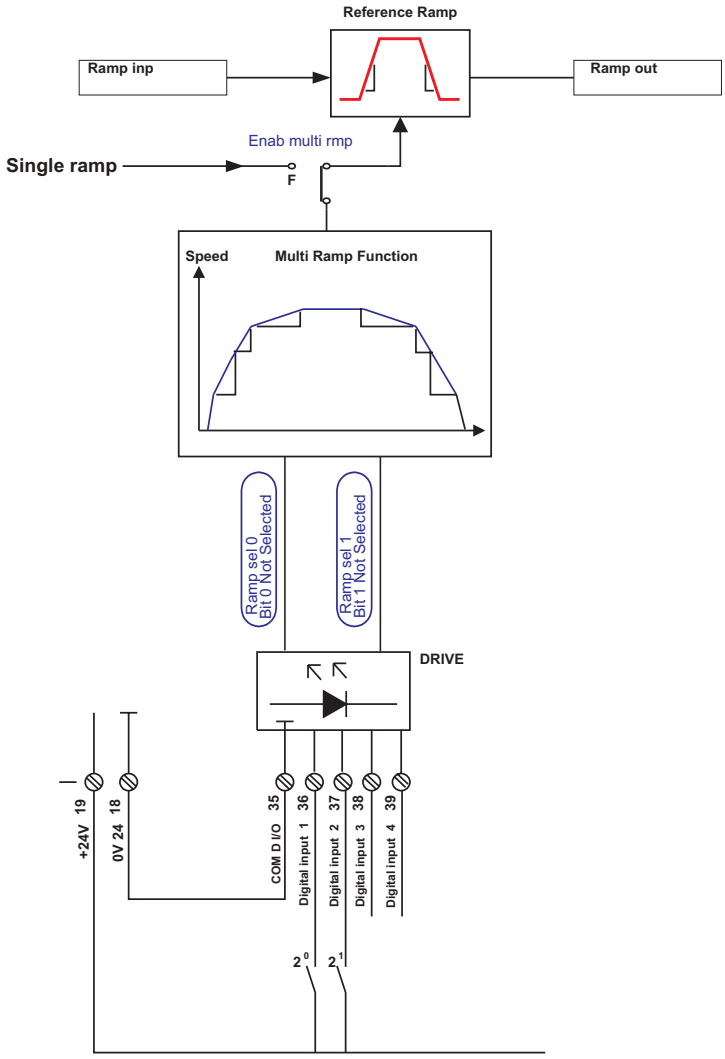


Figure 6.15.4.1: Selection of different ramps via the terminal strip

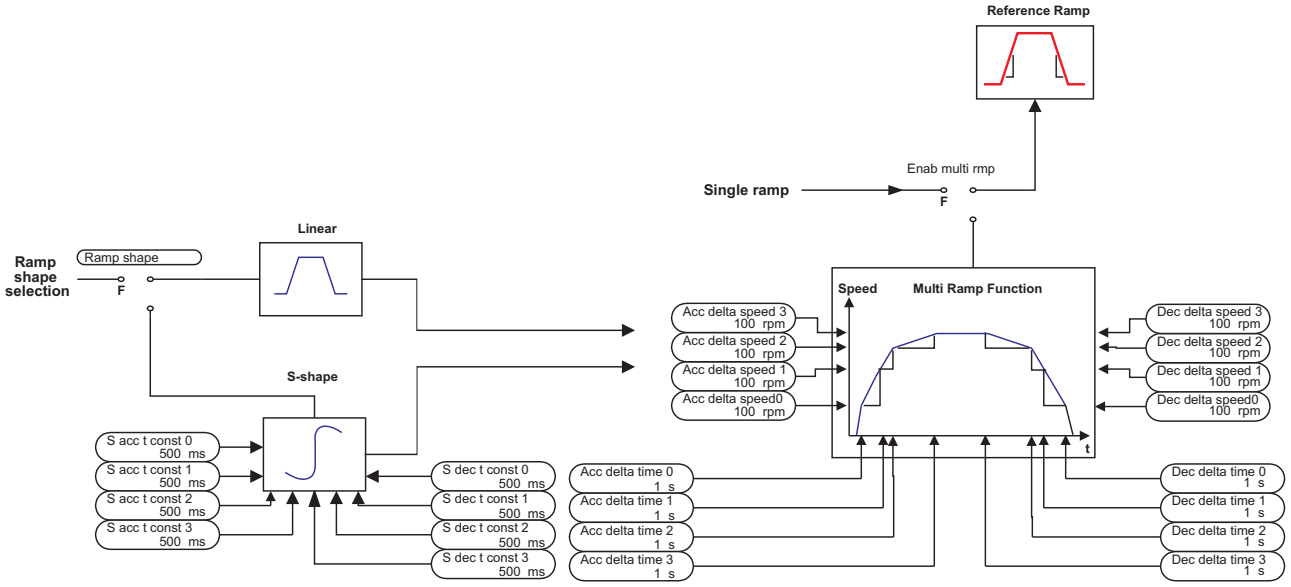
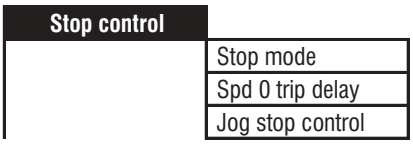


Figure 6.15.4.2: Multi ramp selection via signals

6.15.5. Stop Control



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Stop mode	626	0	3	1	
OFF					
Stop & speed					
Fast stp & spd					
Fs/stp & spd					
Spd 0 trip delay [ms]	627	0	40000	0	
Jog stop control	630	0	1	OFF (0)	
ON					
OFF					

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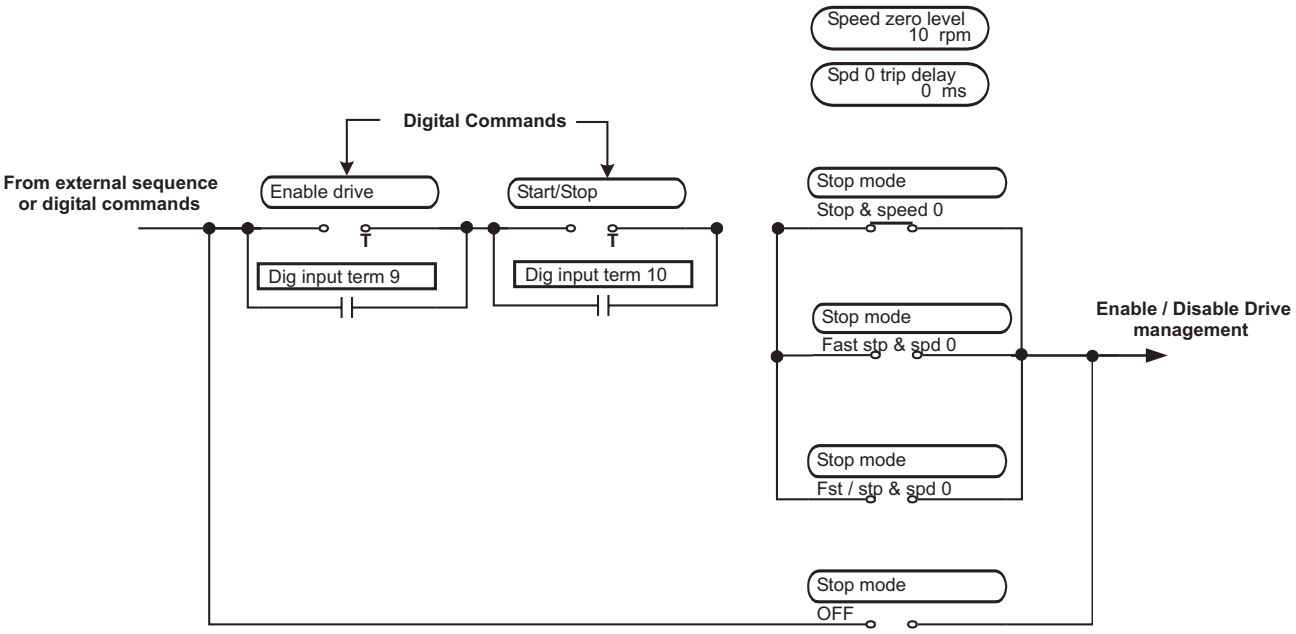


Figure 6.15.5.1 Start and stop management

This function is intended to help the system engineer to coordinate the output voltage of the inverter with the reference, in according to the management of the Start and Stop command.

Basically the Stop or Fast Stop command mode (**Stop mode** setting) define in which way the drive will stop and disables/enables the regulation and the reference.

In default condition (Main commands = Digital), when the drive receives the start command by pressing the START button (terminals 12 –13 HIGH) it runs the motor.

When the STOP button is pressed, the motor decelerates towards zero speed. When the zero speed is reached the drive is completely disabled once the **Spd 0 trip** delay is elapsed.

Different ways to manage the motor Stop are possible by the selection of the parameter **Stop mode**.

Stop mode

OFF The function is disabled

With Digital commands (terminals 12-13 HIGH):

Press START button: Enables and Starts the drive and the motor runs

Press STOP button: Stops the motor but the drive is enabled

With Terminal commands: Enable/Disable and Start/Stop commands indipendent

Stop&Speed

The Start command determines the behaviour. If the Start command is not present (digital or via terminal strip) the inverter is blocked and stopped.

When the Start command is given the drive is enabled and ready to run.

Disabling the Start command and once reached zero speed (Speed 0 level), the drive is is blocked after a timespan set by **Spd 0 trip delay**.

Fast stp&Spd 0

The Fast Stop command determines the behaviour. If the Fast Stop command is present (digital or via terminal strip: i.e. with 0V on terminal 14) the inverter is blocked and stopped.

When the Fast Stop command is disabled (i.e. with +24V on terminal 14) the drive is enabled and ready to run.

Entering the Fast Stop command, when the zero speed (Speed 0 level) has been reached, the drive is is blocked after a timespan set by **Spd 0 trip delay**.

Fst / stp & Spd 0

The Fast Stop and Start commands determine the behaviour. When the Stop or Fast Stop command are present (digital or via terminal strip) the inverter is blocked and stopped.

When the Start command is given or the Fast Stop command is disabled (i.e. with +24V on terminal 14) the drive is enabled and ready to run.

When the Start command is disabled or when the Fast Stop command is entered, once reached the zero speed (Speed 0 level), the drive is blocked after a timespan set by **Spd 0 trip delay**.

Spd 0 trip delay

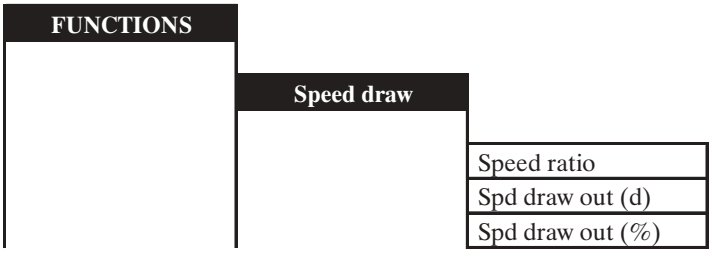
Delay time in ms between the reaching of the zero speed (Speed 0 level) and the disabling of the drive.

Jog stop control

OFF The behaviour selected by **Stop mode** has no influence on the Jog function

ON The behaviour selected by **Stop mode** is active also on the Jog function

6.15.6. Speed Draw Function



Parameter	No.	Value			Standard configuration
		min	max	Factory	
Speed ratio	1017	0	32767	10000	*
Spd draw out (d)	1018	-32768	32767	-	**
Spd draw out (%)	1019	-200	200	-	

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* This parameter can be assigned to a programmable Analog Input

** This parameter can be assigned to a programmable Analog Output

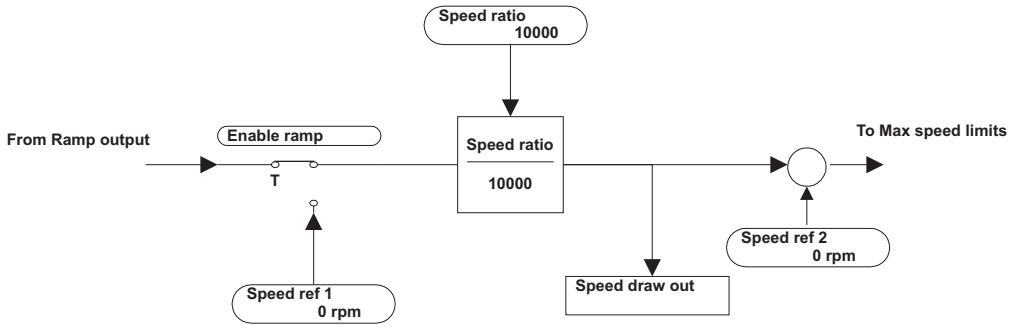


Figure 6.15.6.1 Speed draw block diagram

This function allows a configurable **Speed ratio** to be applied to the main reference **Speed ref 1**.

The Speed ratio range can be set between 0 and 32767 if written in digital form. It can be set from 0 to 20000 (0 to +10V) if assigned via an analog input.

This function is useful in a multidrive system where between the motors is required (see example in figure 6.15.6.2). The speed resulting value can be read through the **Spd draw out** parameter via an analog output.

Speed ratio This parameter determines the speed ratio value.This setting can be done in digital form, via LAN or through an analog input.

Spd draw out (d) Speed value in the unit specified by the factor function.

Spd draw out (%) Speed value as a percentage of **Speed base value**.

EXAMPLE (RUBBER CALENDER)

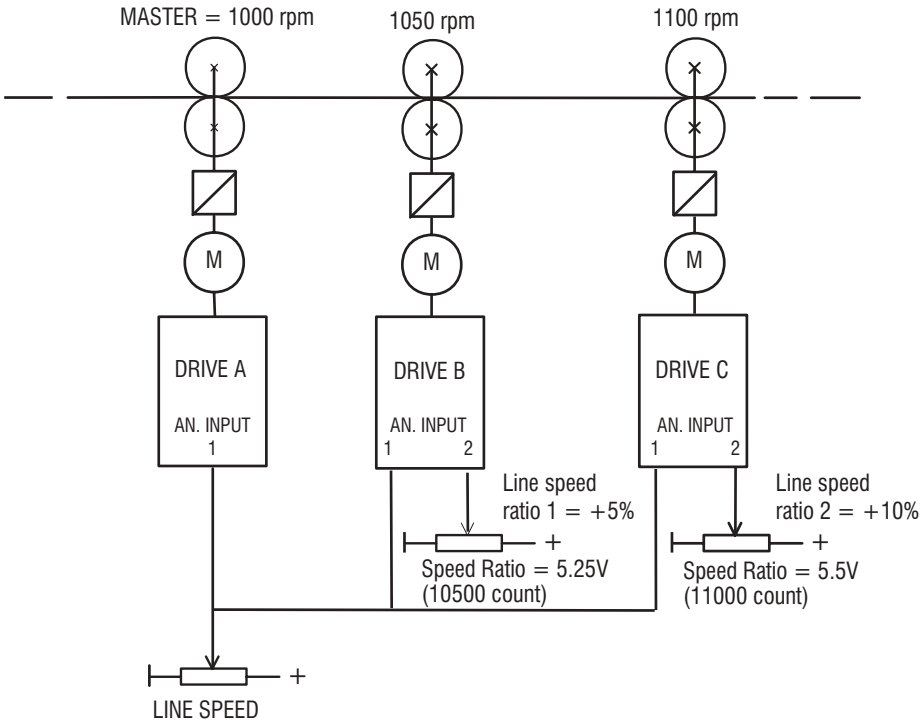


Figure 6.15.6.2 Rubber calender example

Example Setting:

DRIVE A (master)
Set **Analog input 1** = **Ramp ref 1**

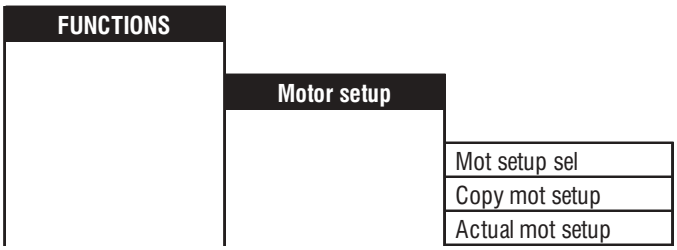
DRIVE B
Line speed ratio 1 = Line speed + 5%

Set **Analog input 1** = **Ramp ref 1**
Set **Analog input 2** = **Speed ratio**
Set **Speed ratio** parameter = **10500**

DRIVE C
Line speed ratio 2 = **Line speed + 10%**

Set **Analog input 1** = **Ramp ref 1**
Set **Analog input 2** = **Speed ratio**
Set **Speed ratio** parameter = **11000**

6.15.7. Motor Setup Function



Parameter	No.	Value			Standard configuration
		min	max	Factory	
Mot setup sel Setup 0 / Setup 1	943	0	1	0 (Setup 0)	
Copy mot setup Setup 0 / Setup 1	941	0	1	0 (Setup 0)	
Actual mot setup Setup 0 / Setup 1	942	0	1	0 (Setup 0)	

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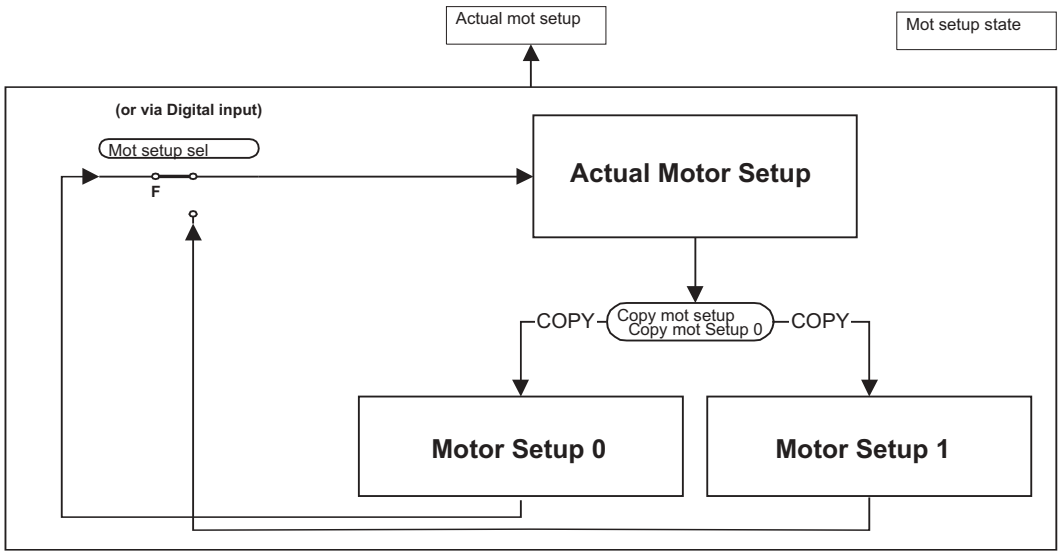

Figure 6.15.7.1: Dual motor setup

This configuration allows the selection of two motor parameter sets as listed in table 6.15.7.1 for using the Drive with two different motors.

For this purpose it is necessary to perform the parametrization of both the motors (motor parameters, self tune, speed regulation setting), determining in this way two "groups of parameters" (**Setup 0** and **Setup 1**) relative to each motor.

Selection of the parameter group concerning the motor which has to be used, is performed by the **Mot setup sel** parameter, or through a digital input configured as **Mot setup sel 0**.

The operation can be performed only with the Drive disabled (**Enable drive** parameter = Disable) and following the procedure described below.

Mot setup sel It selects the parameter group (**Setup 0** or **Setup 1**) concerning the motor which has to be used.

Mot setup sel 0 (Not shown on the keypad)

Selection through digital input, of the "group of parameters" (**Setup 0** or **Setup 1**) concerning the motor to be used.

LOW Selection **Setup 0**

HIGH Selection **Setup 1**

Copy mot setup This parameter defines in which "group of parameters", the first motor (setup 0) or the second motor (setup 1) the data will be stored.

Mot setup state (Not shown on the keypad)

It indicates the data computing status of the function. This parameter can be assigned to a programmable digital output.

LOW Computing ended

HIGH Computing in progress

Actual mot setup It indicates which parameter group is actually in use(**Setup 0** or **Setup 1**)

- The "parameter set" loading and the commutation of the two AC motors, can be performed only with the drive disabled (**Enable drive** = Disable).
- The "parameter set" loading needs a data computing time whose duration is around 200 ms.

  The Enable command is not active until the end of this computing time.
- It is also necessary that the Enable command be supplied with a minimum delay of 24 ms, from the rising edge of the commutation input (Mot setupsel 0).
- The motor will be started with a minimum delay, which is the sum of the time intervals said above, plus magnetization time.
- The loading operation of the "parameter set" in **Setup 0** or **Setup 1** does not store them in permanent memory. It is necessary to execute a saving procedure via **Save parameters** (BASIC MENU or SPECIAL FUNCTION menu).
- At the Drive initialization, the "parameter set" corresponding to the value of Mot setup sel, will be loaded.

  If selection is defined via digital input (**Mot setup sel 0**), the active "parameter set" will be the one associated to the digital input status.

NOTE! This function can be performed independently by the regulation mode configuration (V/f – Sensorless vect –Field oriented mode).

Example of "parameters set" procedure

a) Motor 1 plate data setting
   - Nominal voltage
   - Nominal speed
   - Nom frequency
   - Nominal current
   - Cos phi
   - Base voltage
   - Base frequency
   - Take motor par

b) Speed feedback selection (if **Regulation mode** = Field oriented mode)

c) Self tuning (Self tune 1, 2a or 2b, 3) with motor 1

d) Speed regulator setting for motor 1 (if **Self tune 3** not performed)

e) Disable the drive (**Enable drive** = Disable)

f) Using **Copy mot setup** parameter, store the "parameter set" in **Setup 0**

g) Repeat steps a), b), c), d), e) for motor 2

h) Using **Copy mot setup** parameter, store the "parameter set" in **Setup 1**

i) Permanent storing via the **Save parameters** (BASIC MENU)

To execute the selection from **Setup 0** to **Setup 1** with:

- Manual sequence:

a) Disable the drive (**Enable drive** = Disable)

b) Set the **Mot setup sel** parameter = **Setup 0** or (**Setup 1**)

c) Enable the drive (**Enable drive** = Enable)

*- Selection from **Setup 0** to **Setup 1** through digital input:*

a) Disable the drive mantaining the terminal 12 = LOW (0V)

b) Set digital input **Mot setup sel 0 =** HIGH (+24V)

c) Wait at least 24 ms

d) Enable the drive supplying the terminal 12= HIGH (+24V)

NOTE! Whatever modification of parameters relative to a "parameters set", performed when it is active, it will be lost at the next commutation unless a **Copy mot setup** command is applied. For the permanent storing (with drive switched off), it is also necessary to execute **Save parameters** (BASIC MENU).

Below is a list of the parameters included in the "setup" of each motor.

Par. number	Parameter	Par. number	Parameter
161	Nominal voltage	645	Comp slope
162	Nominal speed	91	Flux P
163	Nom freq	92	Flux I
164	Nominal current	1022	Voltage P
748	Polepairs	902	Voltage I
371	Cos phi	646	Low speed factor
167	Base voltage	643	Sls speed filter
168	Base frequency	647	Flux corr factor
165	Magnetiz curr	712	V/f shape
166	Rotor resistance	709	Vlt boost type
436	Stator resist	710	Manual boost
437	Lkg inductance	722	Slip comp type
87	Speed P	723	Manual slip comp
88	Speed I	725	Slip comp filter
89	Current P	727	Motor losses
90	Current I	321	Regulation mode
644	Voltage comp lim	414	Speed fbk sel

Table 6.15.7.1 : Motor setup parameters list

NOTE: If after storing the "parameter sets" other parameters are assigned that do not belong to them, the compatibility of the new parameters must be verified with each of the two sets.

For setup, it is suggested that the following sequence be followed to allow individual motor setup to be done last:

1. The drive parametrization
2. Motor setup1 parametrization
3. Motor setup 2 parametrization

If **Speed reference** from encoder input (**Tach follower**) is used with **Motor setup** function, restrictions apply. See table below.

Regulation mode	Motor setup		Tach follower	
	Setup 0 Speed fbk sel	Setup 1 Speed fbk sel	Select enc 1	Select enc 2
Field oriented mode	Encoder 1	Encoder 2	OFF	OFF
	Encoder 2	Encoder 1	OFF	OFF
	Encoder 1 (1)	Encoder 1 (1)	OFF	Reference assigned
	Encoder 2 (1)	Encoder 2 (1)	Reference assigned	OFF
Sensorless mode or V/f control (2)	Encoder 1	Encoder 2	OFF	OFF
	Encoder 2	Encoder 1	OFF	OFF
	Encoder 1	Encoder 1	OFF	Reference assigned
	Encoder 2	Encoder 2	Reference assigned	OFF

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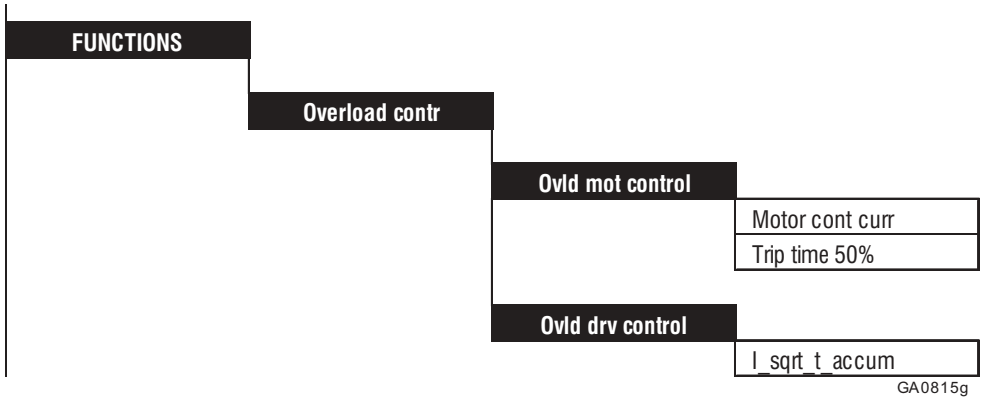
(1) It requires the electromechanical commutation of the encoder signals. It is not suggested for continuity of the shieldings and low noise immunity.

(2) Encoder feedback is not used in these cases. The **Spd fbk** sel parameter is logically interlocked with **Select enc 1** and **Select enc 2** parameters and in both the setups it is necessary to assign it to both channels.

6.15.8. Overload Control



The Overload control function provides integrator logic to protect the drive and the motor independently against thermal overload.

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Motor cont curr [%]	656	50	100	100	
Trip time 50% [s]	657	0	120	60	
Ovld mot state Overload Not Overload	658	0	1		*
I_sqrt_t_accum	655	0	65535	0	
Overld available	406	0	1	-	Digital output 4 *
Overload 200%	1139	0	1	-	*

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* This parameter can be assigned to a programmable digital output.

FUNCTIONS

I²t protection on the drive overload

The I2t protection on the drive is calibrated in order to allow the IEC 146 class 2 service (see section 2.3.4, "AC Output").

The integrator builds according to the following formula:

I_sqrt_t_accum = ¾ $(I^2-I_{CONT}{}^2)$ dt

Where I_{CONT} = continuous current to be delivered to the drive (considering derating factors).

A restriction applies for frequency range 0...3 Hz (see Note below) The threshold protection of the drive reduces the Torque current limit at I_{CONT} value when the integrator exceeds the safety threshold. It is possible to set the warning signal on a digital output (**Overld available**). The warning signal is activated 10s before the current limit reduction is activated. Current limit is automatically restored when the accumulator is reset to zero.

I_sqrt_t_accum gives a percentage definition of the integration of the Rms current.

100 % = trip level I²t (Value in internal units is 4000hex)

Overld available Indicates whether an overload is possible at the moment.

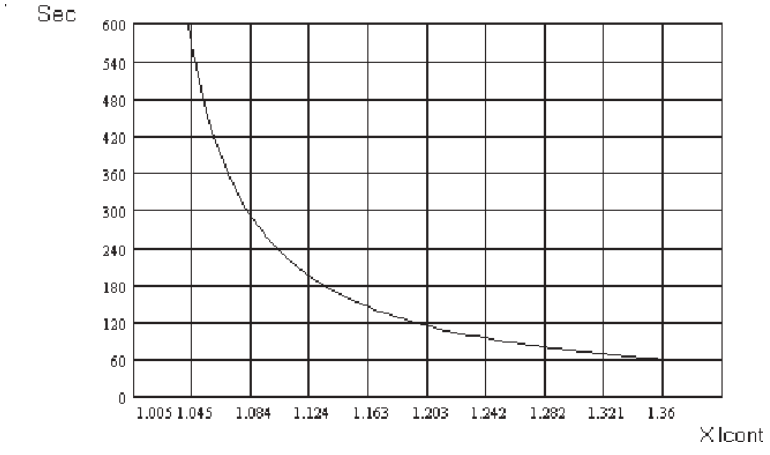
High Overload possible

Low Overload not possible (current limit reduction active)

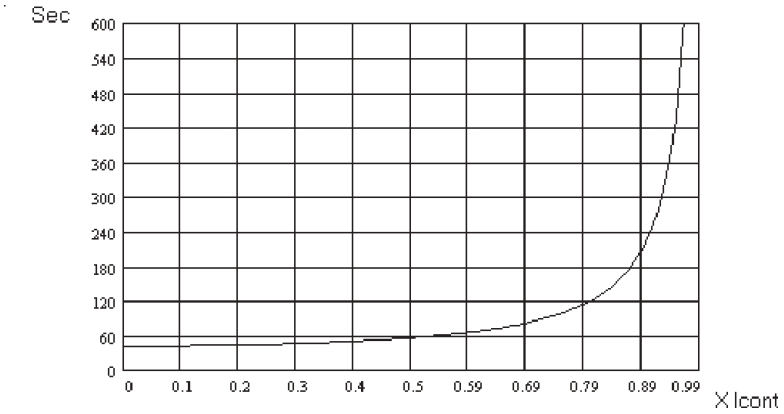
Oveload 200% A short term overload of 200% (I2N Rated output current as for IEC 146 Class 2) is available for 0,5s each 60s.

The 200% overload status can be monitored on a digital output.

Overload time



Pause time



NOTE! In the output frequency ranges 0...3 Hz a faster I^2t function operates. This is calibrated to reduce the Torque current limit to I_{CONT} if $1.36 \cdot I_{CONT}$ overload is applied for more than 2 seconds.

Current limit is restored either when the faster accumulator is reset to zero, or when the output frequency exceeds 3 Hz.

The activation of the protection will be reported by a keypad message, registered in the failure register and monitored on a digital output (**Overld available** parameter).

The current limits depend on the value I_{CONT} ($I_{2N} \cdot$ Derating factor) that it is automatically selected depending on Ambient temperature, Switching frequency and input voltage.

The ability of the drive to provide an overload is indicated by the status of the **Overld available** parameter.

Motor thermal protection

This function is an emulation of the protection thermal relay of the motor controlled by AV-300i drives. This protection presents the characteristic I^2t behavior.

For this purpose it is necessary to set the following characteristic parameters of the function:

Cont motor curr value in percentage of "Nominal current" (motor rated current). It represents the current that can be delivered to the motor for continuous service.

Trip time 50% Value in seconds. It represents the time at which the protection ("Motor overload") operates, if the motor current value is 50% more than "**Cont motor curr**". It is possible to assign this alarm to a programmable digital output (**Ovld mot state**, low = Alarm)

$$\text{Trip time [s]} = \frac{\text{Trip time 50\%} \bullet 1.25}{(\text{Motor current \%})^2 \quad (\text{Cont motor curr \%})^2 - 1}$$

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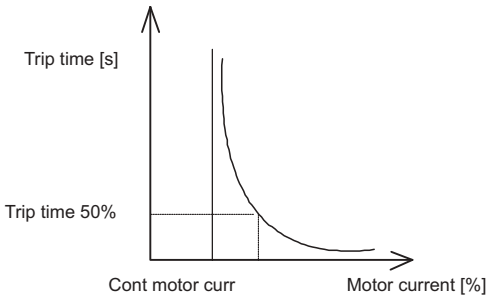
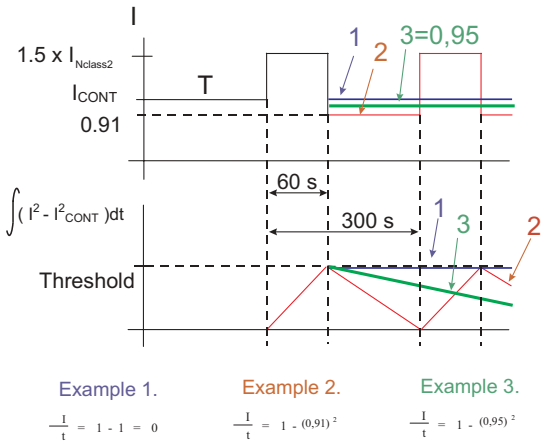
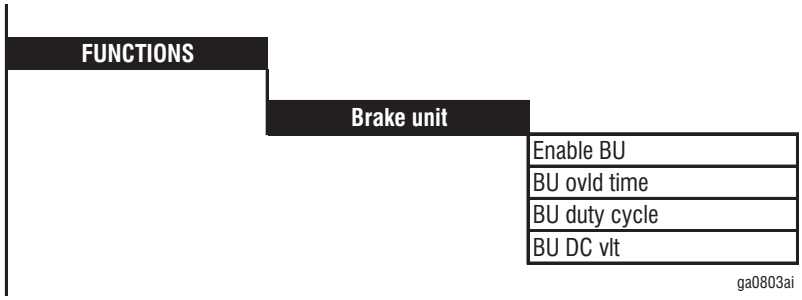
According to the above definition, the tripping time as a function of current value to the motor will be the following (the mentioned values in percentage are referred to the motor rated current):



Examples



6.15.9. Braking Unit Function



Parameter	No.	Value			Standard configuration
		min	max	Factory	
Enable Bu Enable (0) Disable (1)	736	0	1	Disabled (1)	
BU ovld time [s]	740	0.10	50.00	S	
BU duty cycle [%]	741	1	75	S	
BU DC vlt [V] 0 (230V) 1 (400V) 2 (460V) 3 (575V)	801	0	3	3	

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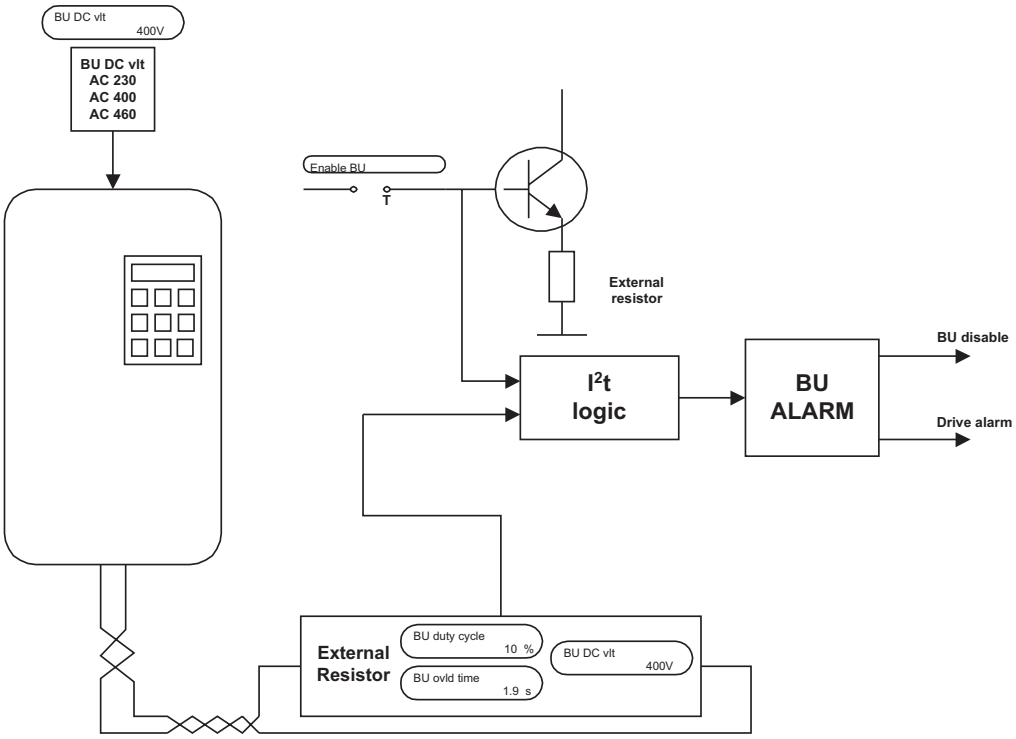


Figure 6.15.9.1: Brake unit function

Enable BU It enables the command for the internal brake unit and the protection for the braking resistance (internal or external). This parameter enables also the digital output MCMD for the command of the external braking units and the protection for the relative resistor.

NOTE! The command for both internal and external BU depends on drive enable status (terminal 12 and **Enable drive [314]** parameters). For multi drive applications with common DC BUS the drive that controls the BU must always be enabled when BU operations is required (net power regeneration flow).

BU ovld time Maximum time for which can be applied to the braking resistor the peak power $\mathbf{P_{PBR}}$.

Bu ovld time = $\mathbf{E_{BR}}$ / $\mathbf{P_{PBR}}$ (see section 4.8.1)

BU duty cycle Maximum chopping duty cycle of the resistor, defined as:

BU duty cycle = **($\mathbf{P_{NBR}}$ / $\mathbf{P_{PBR}}$) . 100**

BU DC vlt Value of the mains voltage at which "**BU ovld time**" and "**BU duty cycle**" must be referred.

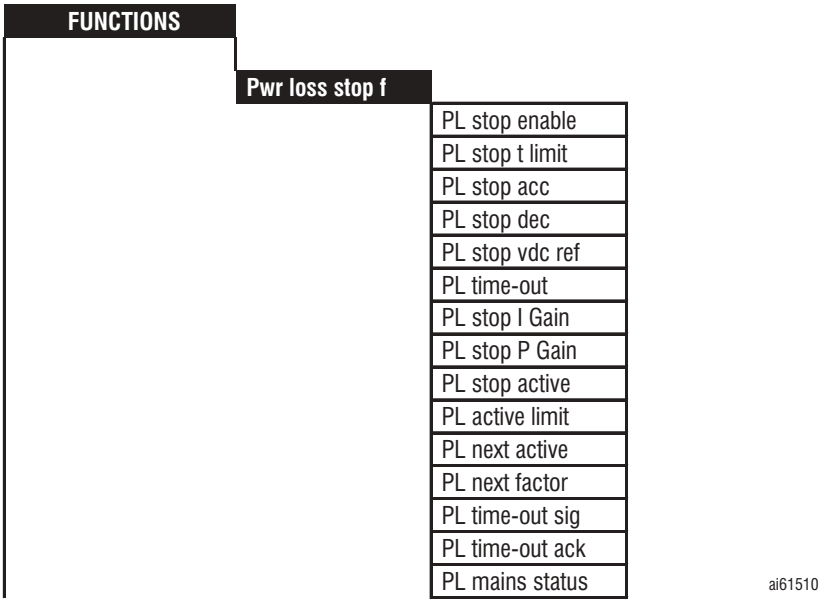
Once defined the values of **Bu duty cycle** and **BU ovld time** according to the resistor type chosen and to the **BU DC vlt** , in case the inverter is connected to a different mains voltage, it is not necessary to modify the three above mentioned parameters, because the software adapts automatically these values according to the mains voltage.

Besides **BU duty cycle** is automatically modified according to the istantaneous values of the DC link voltage.

The values recalculated are not displayed by the keypad or by the PC configurator.

For all the sizes it is possible the management of an external braking unit (through MCMD digital output on the power card) and of the I^2t protection.

6.15.10. Powerloss Stop Function



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
PL stop enable Disabled Enabled as Mst Enabled as Slv	1083	0	2	0	
PL stop t limit [%]	1082	0	F	100	
PL stop acc [rpm/s]	1080	0	99999999	100	
PL stop dec [rpm/s]	1081	0	99999999	10000	
PL stop vdc ref [V]	1084	0	980	917	
PL time-out [s]	1087	0	65535	10	
PL stop P Gain [%]	1086	0.00	100.00	5.00	
PL stop I Gain [%]	1085	0.00	100.00	0.30	
PL stop active Not active Active	1088	0	1	Not active (0)	
PL active limit [%]	1089	-	-	-	
PL next active Not active Active	1090	0	1	Not active (0)	
PL next factor	1091	0	32767	10000	
PL time-out sig Not active Active	1093	0	1	Not active (0)	
PL time-out ack Not acknowledged Acknowledged	1094	0	1	Not acknowledged (0)	
PL mains status Not ok Ok	1092	0	1	Not ok (0)	

ai61511

This function allows the controlled stop of a single or multiple drive / motor configuration, in case of a.c. mains power loss.

Enabling the function, the DC link voltage is permanently monitored.

The function can be enabled as a master (**Pwr loss stop f** = **Enable as Mst**) or as a slave (**Pwr loss stop f** = **Enable as Slv**) in function of the application setup.

In single drive / motor application the function must be enabled always as a master.

In multiple drive / motor applications, only one of the drives must be enabled as master, normally it is the main motor of the line and all the other drives have to be enabled as slaves.

When the DC link voltage drops under the power loss detection threshold, the power loss stop function is actived. The power loss detection threshold is internally selected to be higher than the undervoltage level.

The drive then will automatically lead the motor to zero speed with a ramp defined by the parameter **PL stop dec**.

In this phase, the torque of the system is controlled by a dedicated PI regulator and with the limit set in the parameter **PL stop t limit** . The control action of the PI regulator can be adjusted through the parameters **PL stop P gain** and **PL stop I gain**.

The DC link voltage is regulated at the value set by the parameter **PL stop vdc ref**. Its default setting is a 5% less than the intervention threshold of the braking unit.

In applications where the braking unit is used, the parameter **PL stop vdc ref** can be manually changed to a level higher than the braking threshold.

The device will take the advantages of the braking unit intervention and in this way a stop in a specified time can be achieved. Of course, also the current limit defined by the parameter **PL stop t limit** must be properly set so that the stopping time specifications are met.

It is possible to monitor the power loss stop function activity on a digital output programmed as PL stop active.

If the a.c.mains is restored within the time set by the parameter **PL time out**, the motor after having reached the zero speed, will be automatically lead back by the drive to run at its original speed, with an acceleration ramp time defined by **PL stop acc**. In case the a.c.mains is restored but, the **PL time out** elapses before than the motor is arrived at zero speed, it is necessary to provide the drive with the digital command **PL time-out ack**, in order to restart and return to the original speed.

The elapsing of **PL time out** can be monitored on a digital output set as **PL time-out sig**.

During the power loss, it is possible to restart even before that the motor reached the zero speed, when the drive is provided with a signal indicating that the a.c.mains is restored. This signal must be programmed on a digital input as **PL mains status**.

Such signal can be provided for example from a RS-300 or CS-300 line converters.

In a multiple drive / motor configuration where a co-ordinated stop is required, in addition to the **Enable Mst** and **Enable Slv** programming, a master drive must have an analog output set as **PL next factor**.

The **PL next factor** range can be set between 0 and 32767 if written in digital form. It can be set from 0 to 20000 (0 to +10V) if assigned via analog output.

This analog output has to be connected to an analog input of each slave drive (**PL stop enable** = **Enable as Slv**) programmed as **Speed ratio** (see chapter 6.15.6 Speed Draw Function). When the power loss is detected, the speed of the master decreases according to a computed ratio between **Speed ref** and the **Actual speed**.

This ratio determines the reference for the slaves, to decrease linearly the speed in accordance to the master drive speed. The fact that the motor is running at the speed controlled by the master can be monitored on a digital output of master drive programmed as **PL next active**.

The performance of this function in case of a multiple motor configuration, can be achieved only with drives connected on common DC bus.

PL stop enable	Enable as Mst	Setting of the drive as a master. This configuration is for single drive / motor or multiple drive / motor applications.
	Enable as Slv	Setting of the drive as a slave. This configuration is for multiple drive / motor applications.
PL stop acc	Acceleration and deceleration time when power loss stop function is active.	
PL stop dec	The smooth deceleration allows to avoid sudden variation of the torque when the power loss stop function is activated . However the ramp must be fast enough to allow the proper intervention of the function itself.	
PL stop vdc ref	Set point of the DC link voltage during the power loss stop activity. If the braking unit is used in order to achieve shorter stopping times, then the parameter has to be set higher than the value of the braking unit ON threshold. The value has not to be set higher than the Overvoltage alarm threshold.	
PL time-out	Time after which it is not possible to restart automatically.	
PL stop P gain	Proportional gain of the power loss stop function PI regulator.	
PL stop I gain	Integral gain of the power loss stop function PI regulator.	
PL stop active	Signalling of the power loss stop function activity. The parameter can be monitored on a programmable digital output.	
PL active limit	Reading of the drive torque current, during the Power loss stop function activity. This parameter can be monitored on a programmable analog output.	
PL next active	It indicates that the slave motor speed is the same of the master motor speed. The parameter can be monitored on a programmable digital output.	
PL next factor	Ratio between Ramp ref / Speed ref and Actual speed.It is the reference for the slaves, to decrease linearly the speed in accordance with the master drive speed.The parameter can be set on a programmable analog output.	
PL time-out sig	It indicates that **PL time-out** is elapsed. The parameter can be monitored on a programmable digital output.	
PL stop t limit	Setting of the torque current limit in use, during the power loss stop function activity. The parameter has the priority on the T curr lim when the function is active.	
PL time-out ack	Command of the motor restart, in case the a.c. mains is restored after the time set in **PL time-out**. The command can be provided via keypad, programmable digital input, serial line or Bus.	
PL mains status	Indication for the drive of the a.c. mains restoring, in order to restart the motor before it reached the zero speed. The command can be provided via keypad, programmable digital input, serial line or Bus.	

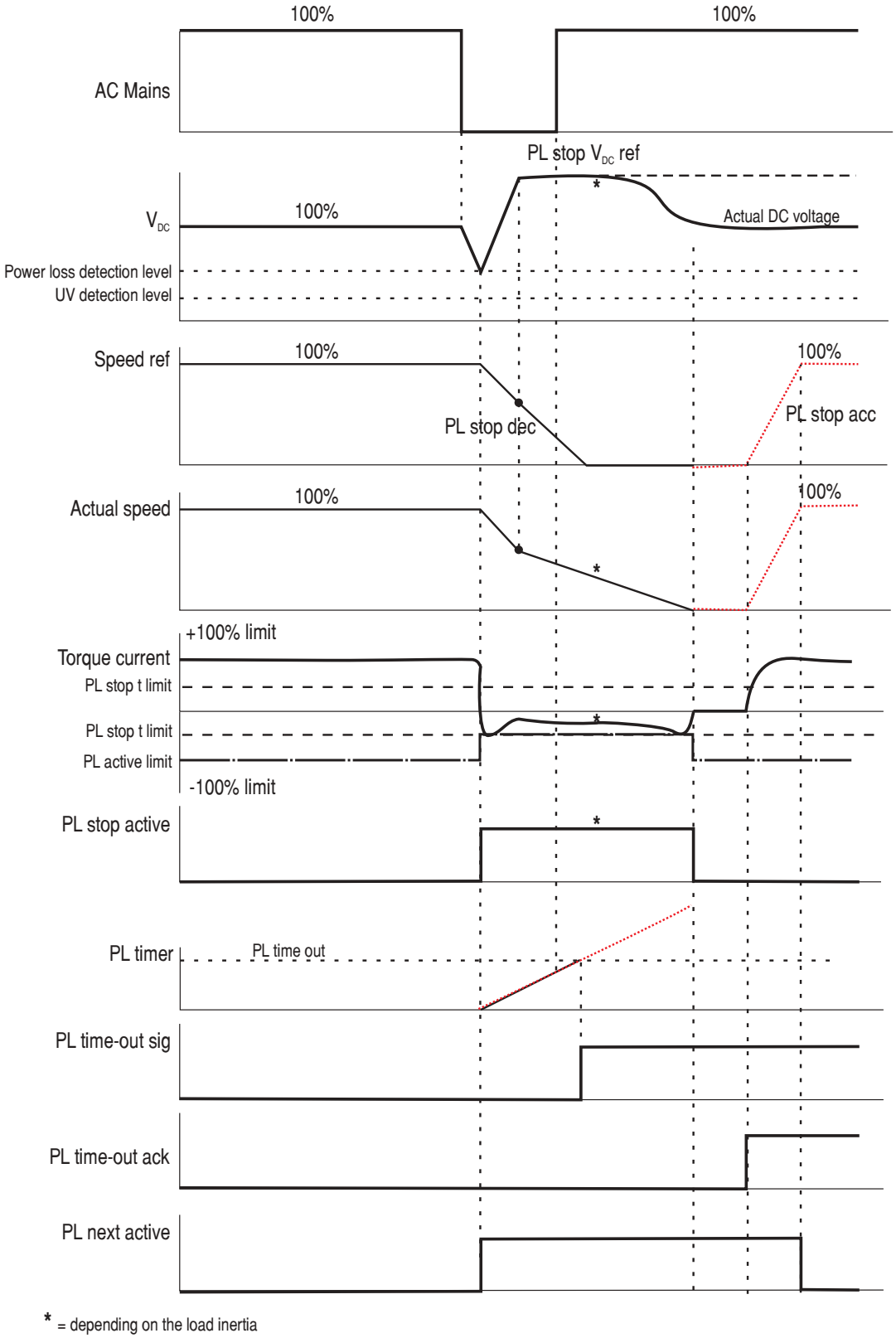


*Figure 6.15.10.1: Power loss stop function. Drive stopped after **PL time-out***

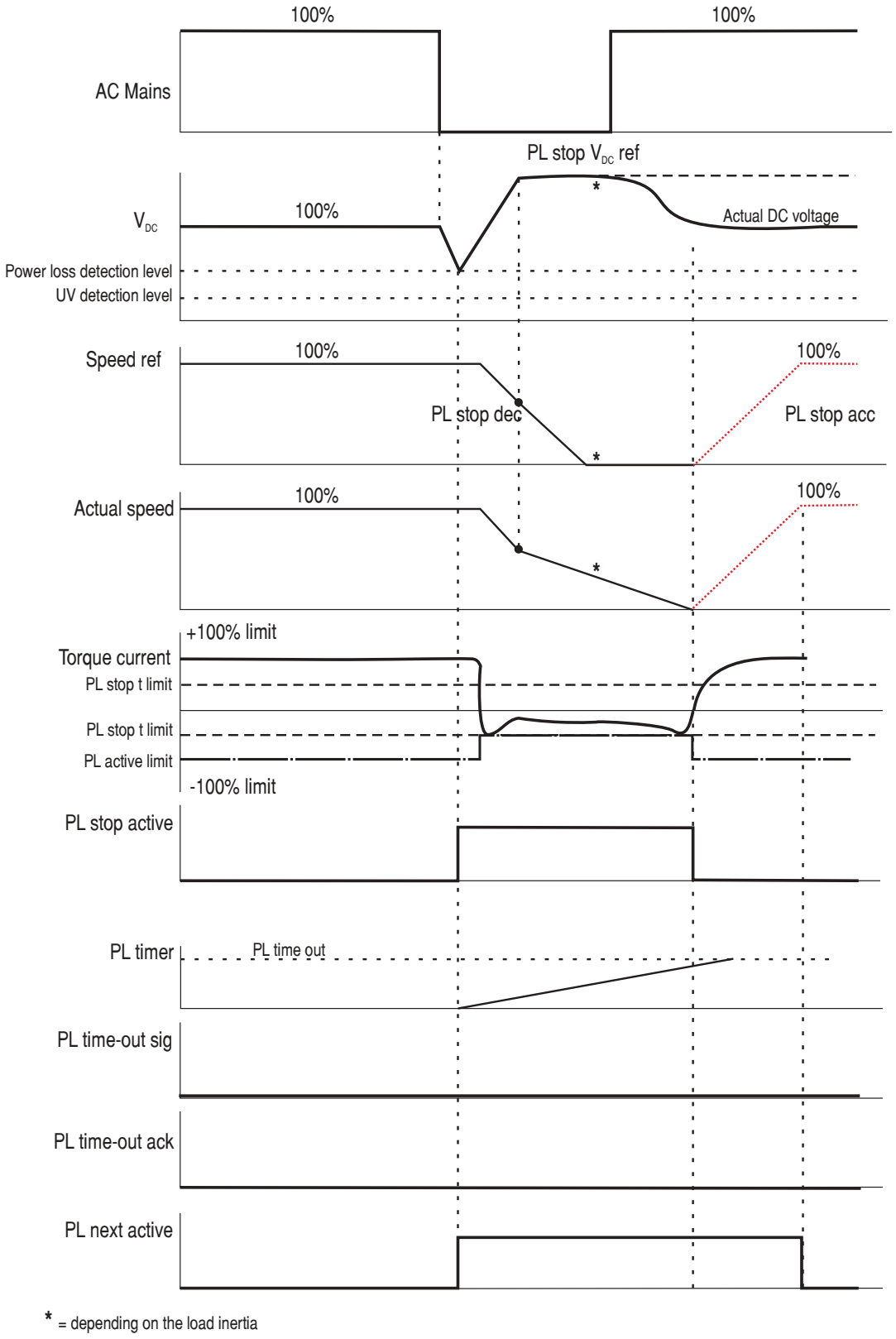


Figure 6.15.10.2: Power loss stop function. AC mains restored and drive stopped before ***PL time-out***

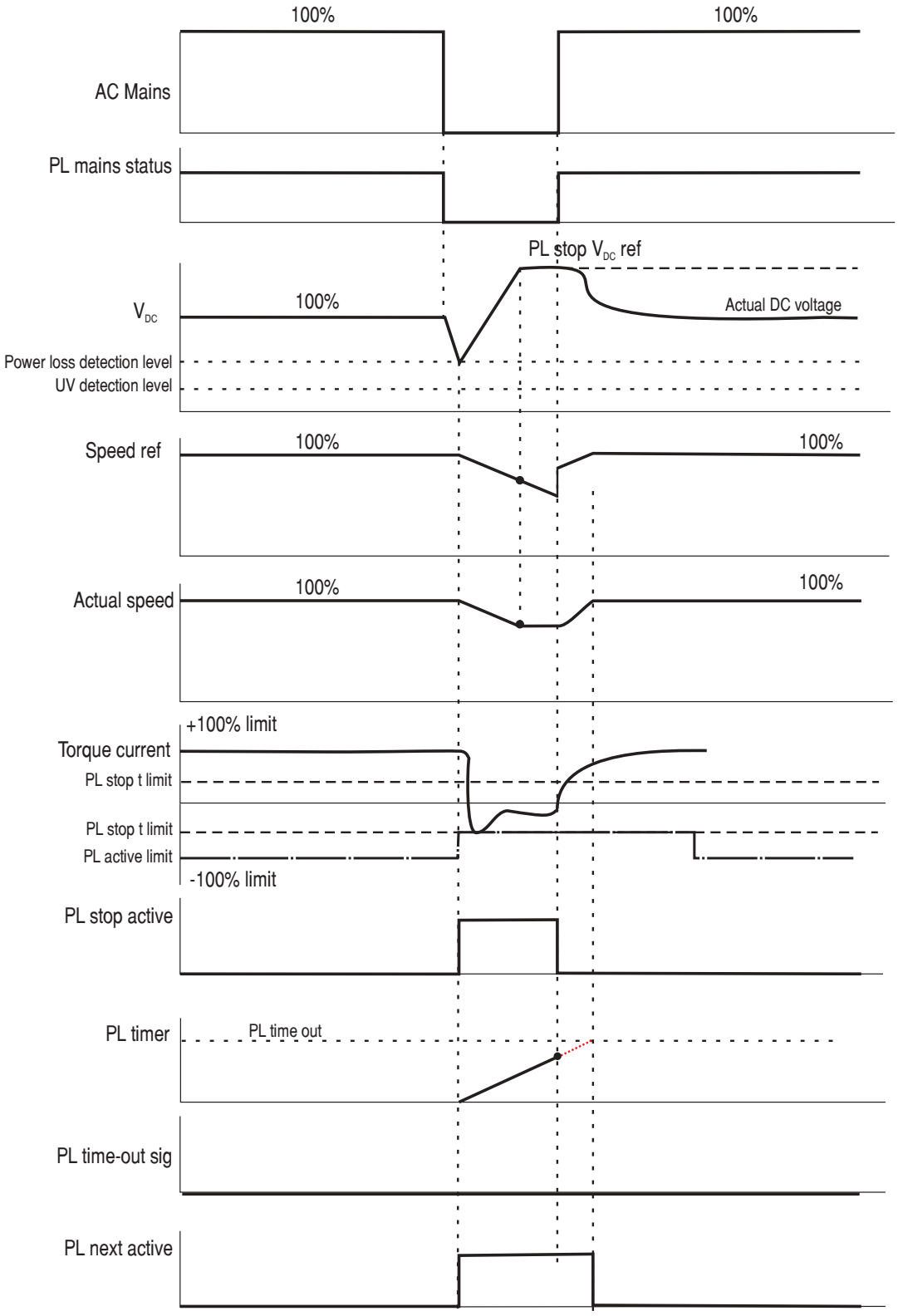
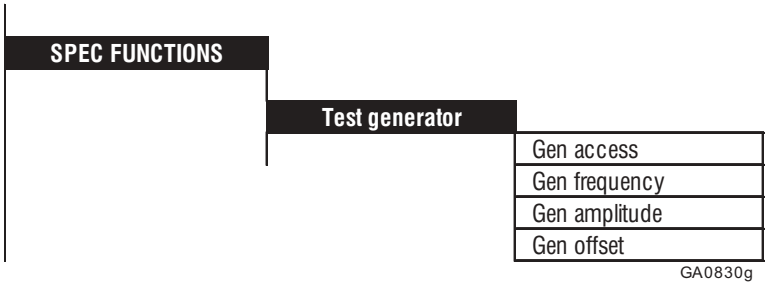


Figure 6.15.10.3: Power loss stop function. Operation with RS-300 / CS300 sources

6.16. Special Functions

6.16.1. Test Generator



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Gen access	58	0	4	Not connected	*
Not connected				(0)	
F current ref					
T current ref					
Flux ref					
Ramp ref					
Gen frequency [Hz]	59	0.1	62.5	1.0	
Gen amplitude [%]	60	0.00	200.00	0.00	
Gen offset [%]	61	-200.00	+200.00	0.00	

GA6325g

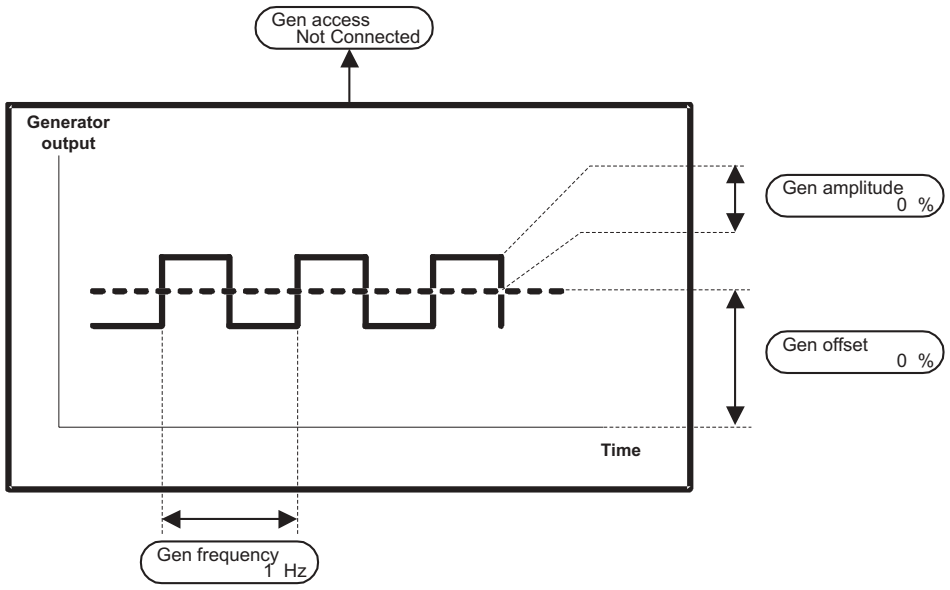


Figure 6.16.1.1: Test generator output

The test generator of the AV-300i Drive is used to manually tune the regulators. It consists of a square wave generator whose frequency, offset and amplitude can be set.

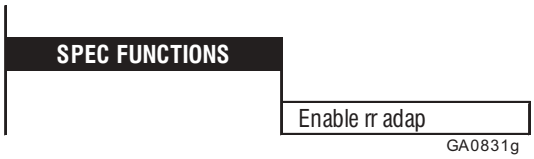
Gen access Different parameters can be simulated by the test generator. The parameter concerned then has the value of the generator output.

	Not connected	No internal parameters defined by the generator
	F current ref	The generator output defines the reference value of the flux current. 100 % corresponds to the **Magnetizing current** parameter.
	T current ref	The output of the generator defines the reference value of torque current. 100 % corresponds to Flt 100mF current (see section 6.9, “Current Regulation”).
	Flux ref	The output of the generator defines the flux reference value. 100 % corresponds to the rated flux based on the motor parameters.
	Ramp ref	The output of the generator defines the ramp reference value. 100 % corresponds to the **Speed base value**.
Gen frequency	Output frequency of the generator in Hz.	
Gen amplitude	Amplitude of the square-wave signal produced by the generator in percent.	
Generator offset	Offset of the generator in percent.	

The generator output consists of the addition of **Gen amplitude** and **Generator offset**. The signal is limited internally to the maximum possible values.

Current:	limited to the max. permissible current for the drive
Speed:	limited to the value set with **Speed max amount**

6.16.2. Temperature Compensation of the Rotor Resistance



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Enable rr adap	435	0	1	Disabled	
Enable					
Disable				(0)	

GA6330g

Enable rr adap	Enabled	The temperature compensation is enabled
	Disabled	The temperature compensation is disabled

The motor temperature changes in time, because of the motor losses.

This condition causes a variation of the rotor resistance from cold to warm.

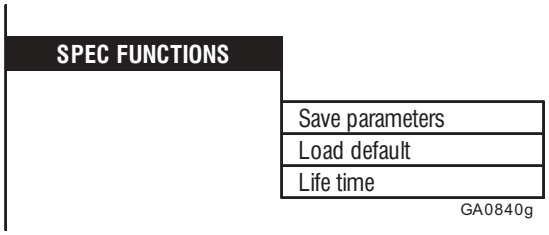
A torque or motor power reduction can be caused by the deviation of rotor resistance from the value set in the “Motor parameter” menu. This effect is more sensitive for high power, high efficency motors.

An automatic adaptation function for the rotor resistance value is available via the **Enable rr adap** parameter. If necessary, this parameter must be enabled.

On the basis of tests, the time constant and the limit value for the compensation are factory set. If these values are not suitable for your particular case, refer to your customer service center.

For calibration purpose, the compensation internal value can be set on an analog output by selecting the “Rr adap output” code. See section 5.3, “ Start up”.

6.16.3 Saving Parameters. Loading Default Factory Settings, Life Time



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Save parameters	256	0	65535		
Load default	258	0	65535		
Life time [h.min]	235	0.00	65535.00		

GA6335g

Save parameters Saving of parameters that are currently set.

Load default Loading of the default settings (“Factory” column in the parameter lists, section 10).

Life time Shows the operating time of the drive. This parameter counts the time in which the drive is powered on (even if disabled).

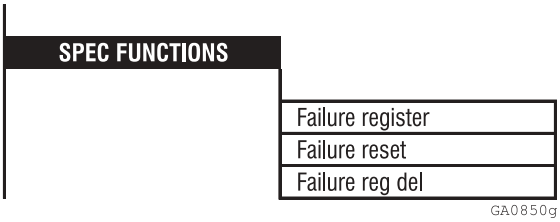
Default values for individual parameters are factory set in the device. These values are shown in the “Factory” column of the individual parameter tables. (Motor parameter and regulator defaults, that depend on drive size, are listed in section 10, “Parameter lists”).

In order to retrieve the values specific to your application when the device is switched on, they must be saved via the **Save parameters** command after being set.

The factory default values can be re-loaded by selecting **Load default**. If these are not saved, the application specific drive settings will still be available the next time the drive is switched on .

When the device is switched on the saved parameter set is loaded.

6.16.4. Failure Register



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Failure register	320	-	-	-	-
Failure reset	262	0	65535	-	*
Failure reg del	263	0	65535	-	-

GA6340g

* This function can be assigned to one of the programmable digital inputs.

Failure register The Failure register contains the last 10 failures that have occurred. It also contains information about the time the failure occurred, based on the operating hours (Life time), as well as information on the type of failure. This information can be accessed by pressing the Enter key on the keypad when a failure is indicated. If several failures occur in sequence, all the failures are stored in the failure register until a failure occurs that causes the disconnection of the drive (Latch = ON, see Programmable alarms).The content of the failure register can also be read out via the bus or the serial interface.

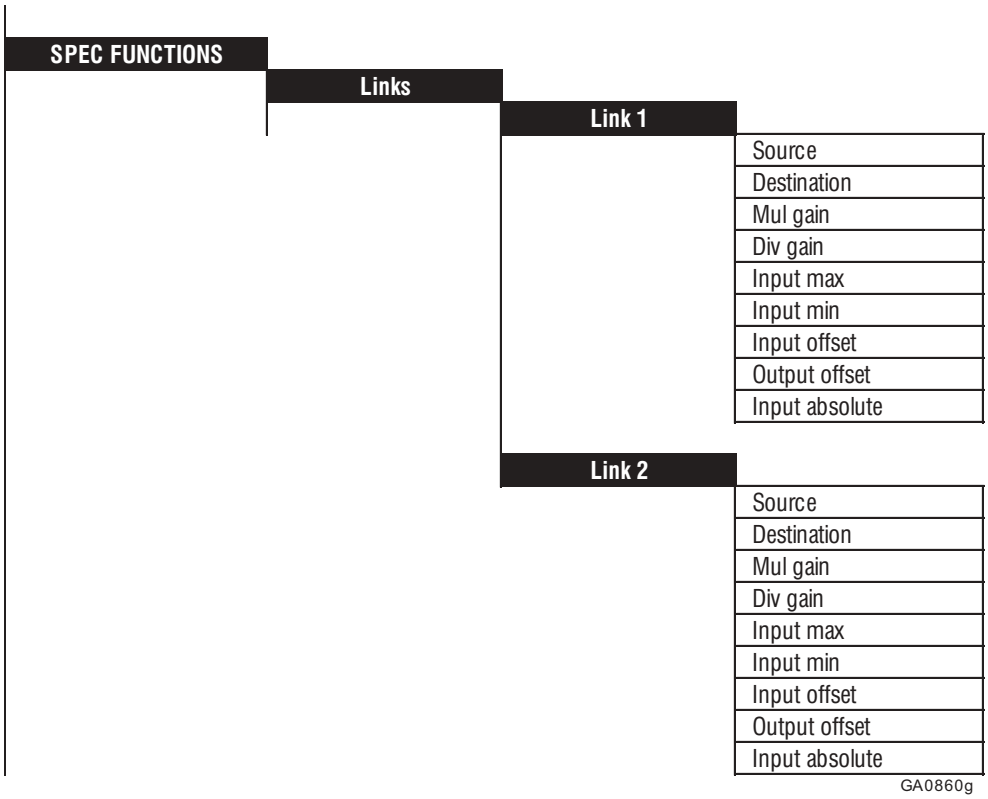
Failure reset Acknowledgement of a failure. The failure reset can be initiated by pressing the Escape key when the failure is shown in the display of the keypad. If, however, several failures occur in sequence, these can only be reset by selecting **Failure reset** command through the Enter key.

Failure reg del Clearing the failure register.

6.16.5. Signal Adaptation (Links Function)

The Link1 and Link 2 functions are two control sections operating independently from each other for the signal adaptation. With the Links, parameters can be:

- rectified
- limited
- multiplied by a factor
- divided by a factor
- provided with an offset.



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Source *link 1*	484	0	65535	0	—
Destination *link 1*	485	0	65535	0	—
Mul gain *link 1*	486	-10000	+10000	1	—
Div gain *link 1*	487	-10000	+10000	1	—
Input max *link 1*	488	-2^{31}	$+2^{31}-1$	0	—
Input min *link 1*	489	-2^{31}	$+2^{31}-1$	0	—
Input offset *link 1*	490	-2^{31}	$+2^{31}-1$	0	—
Output offset *link 1*	491	-2^{31}	$+2^{31}-1$	0	—
Inp absolute *link 1* **(ON/OFF)**	492	0	1	OFF	—
Source *link 2*	553	0	65535	0	—
Destination *link 2*	554	0	65535	0	—
Mul gain *link 2*	555	-10000	+10000	1	—
Div gain *link 2*	556	-10000	+10000	1	—
Input max *link 2*	557	-2^{31}	$+2^{31}-1$	0	—
Input min *link 2*	558	-2^{31}	$+2^{31}-1$	0	—
Input offset *link 2*	559	-2^{31}	$+2^{31}-1$	0	—
Output offset *link 2*	560	-2^{31}	$+2^{31}-1$	0	—
Inp absolute *link 2* **(ON/OFF)**	561	0	1	OFF	—

GA6345g

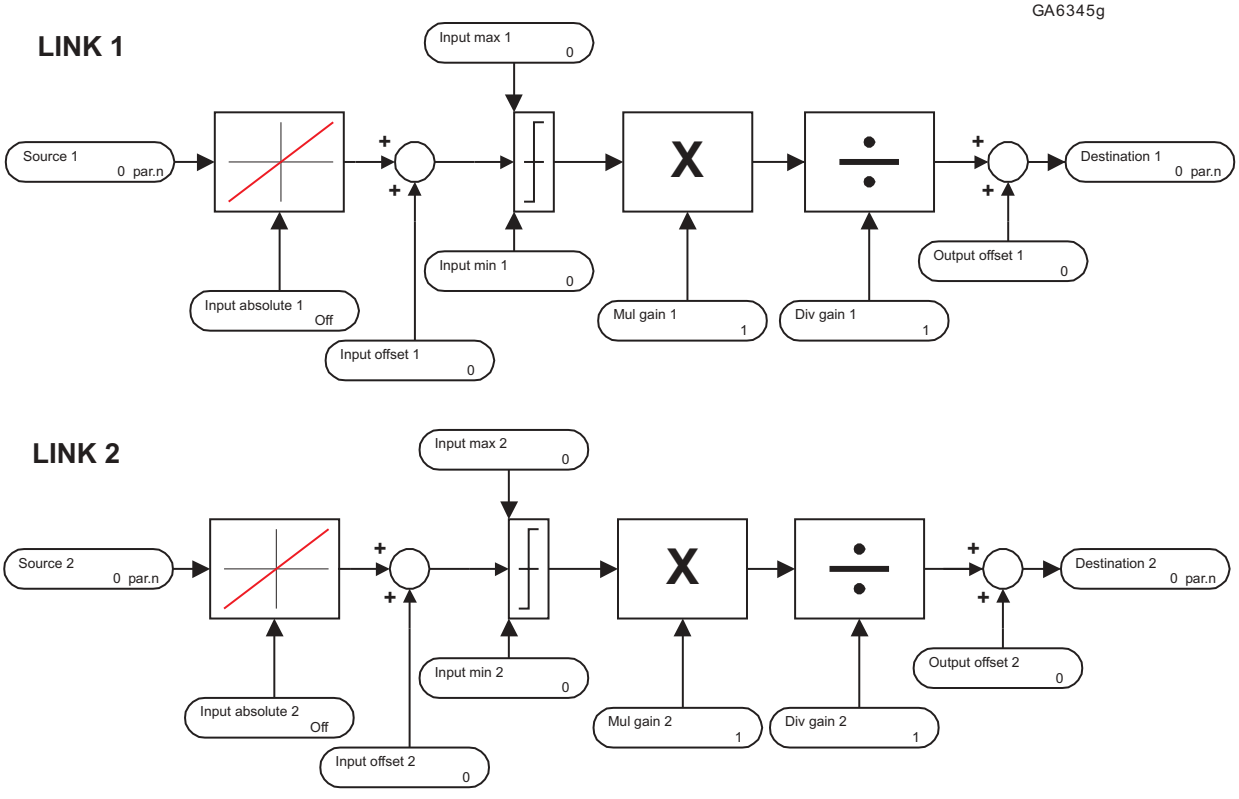


Figure 6.16.5.1: Structure of the signal adaptation

Source Parameter number used as an input quantity. For example “8236” for the **Ramp ref 1** parameter (44+8192 offset). Select the parameter number in the individual descriptions or in the list of all parameters in section 10, “Parameter list”.

Destination Parameter number, which determines the output quantity. Select the parameter number (+8192 offset) in the individual description column or in the list of all parameters in section 10, “Parameter lists”.

Mul gain Multiplicative factor of the input quantity (after a possible limitation). Resolution: 5 digits.

Div gain Divisor, through which it is possible to divide the input quantity already multiplied and limited. Resolution: 5 digits.

Input max Max. limit of the input quantity. Resolution: 5 digits.

Input min Min. limit of the input quantity. Resolution: 5 digits.

Input offset Offset to be added to the input quantity. Resolution: 5 digits.

Output offset Offset to be added to the output quantity. Resolution: 5 digits.

Inp absolute The input behavior can be determined with this parameter.

OFF The input quantity is processed with its sign.

ON The input quantity is processed with a positive sign (absolute value). It is possible to have a polarity change with the signs of **Mul gain** or **Div gain**.

In order to write SOURCE LINK (1/2) parameter or DESTINATION LINK (1/2) parameter it is necessary to add to the parameter number the offset "8192"

Eg. RAMP REF 1 "44"

SOURCE LINK (1/2) = 44+8192 = 8236

NOTE! The links are executed with an approximate cycle time of 20 ms. They are not mainly intended to be used for regulation but to access or connect parameters otherwise not accessible. The use of Links according to the parameter as a destination involves a CPU overhead that can slow down the keypad/display operation. Check that the functionality corresponds to the needs before plant-wide implementation.

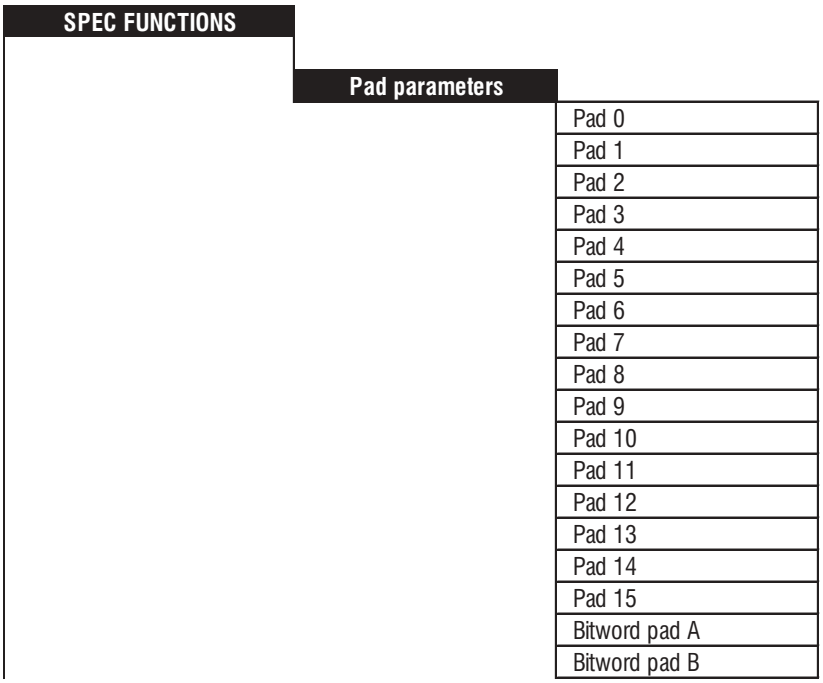
NOTE! The following parameters cannot be used as a destination of a Link:

- All parameters with only "R" access code
- All parameters with "Z" access code
- All parameters with "C" access code
- All the following:

19	S shape t const	553	Link2 Source	726	Motor losses %
55	Control-Word	554	Link2 Destination	776	PI central v1
72	Scale input 1	636	Bus loss - Hold off time	777	PI central v2
73	Tune value inp 1	637	Bus loss - Restart time	778	PI central v3
77	Scale input 2	644	Voltage comp lim	784	PI bottom lim
78	Tune value inp 2	645	Comp slope	785	PI bottom lim85
85	Pword1	647	Flux corr factor	786	PID source
83	Tune value inp 3	649	Refresh enc 1	792	Input 1 filter [mS]
86	Pword2	652	Refresh enc 2	889	Dynamic vlt margin
165	Magnetizing curr	656	Motor cont curr	891	Lock zero pos
166	Rotor resistance	657	Trip time 50%	892	Zero pos gain
167	Base voltage	663	S acc t const	893	Spd src time
168	Base frequency	664	S dec t const	1012	Inertia c filter
176	P1 flux model	665	S acc t const 0	1013	Torque const
359	Undervoltage - Restart time	665	S dec t const 0	1014	Inertia
360	Undervoltage - N of attempts	666	S acc t const 1	1015	Friction
408	Ser answer del	668	S dec t const 1	1042	Input 1 compare
425	Enable OPT2	669	S acc t const 2	1043	Input 1 cp error
436	Stator resist	670	S dec t const 2	1044	Input 1 cp delay
437	Lkg inductance	672	S dec t const 3	1095 up to 1100	PDC in xx
444	Prop. filter	692	P2 flux model	1101 up to 1106	PDC out xx
467	Flux level	710	Manual boost	1107 up to 1122	Virt dig in xx
484	Link1 Source	717	DC braking curr	1123 up to 1138	Virt dig out xx
485	Link1 Destination	725	Slip comp filt		

6.16.6. Pads

The pads are used for the data exchange among the several components of a Bus system. They can be compared to the variables of a PLC. The figure 6.16.6.1 shows the overall structure of the system. With the help of pads it is possible for example to send information from a field Bus to an option card. All the pads can be written and read. See the several access possibilities in section 10, “Parameter lists”.



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Pad 0	503	-32768	+32767	0	*,**
Pad 1	504	-32768	+32767	0	*,**
Pad 2	505	-32768	+32767	0	*
Pad 3	506	-32768	+32767	0	*
Pad 4	507	-32768	+32767	0	**
Pad 5	508	-32768	+32767	0	**
Pad 6	509	-32768	+32767	0	**
Pad 7	510	-32768	+32767	0	-
Pad 8	511	-32768	+32767	0	-
Pad 9	512	-32768	+32767	0	-
Pad 10	513	-32768	+32767	0	-
Pad 11	514	-32768	+32767	0	-
Pad 12	515	-32768	+32767	0	-
Pad 13	516	-32768	+32767	0	-
Pad 14	517	-32768	+32767	0	-
Pad 15	518	-32768	+32767	0	-

GA6350a+F55

Parameter	No.	Value			Standard
		min	max	Factory	Configuration
Bitword pad A	519	0	65535	0	***,****
Pad A bit 0	520	0	1	0	***,****
Pad A bit 1	521	0	1	0	***,****
Pad A bit 2	522	0	1	0	***,****
Pad A bit 3	523	0	1	0	***,****
Pad A bit 4	524	0	1	0	***,****
Pad A bit 5	525	0	1	0	***,****
Pad A bit 6	526	0	1	0	***,****
Pad A bit 7	527	0	1	0	***,****
Pad A bit 8	528	0	1	0	****
Pad A bit 9	529	0	1	0	****
Pad A bit 10	530	0	1	0	****
Pad A bit 11	531	0	1	0	****
Pad A bit 12	532	0	1	0	****
Pad A bit 13	533	0	1	0	****
Pad A bit 14	534	0	1	0	****
Pad A bit 15	535	0	1	0	****
Bitword pad B	536	0	65535	0	****
Pad B bit 0	537	0	1	0	****
Pad B bit 1	538	0	1	0	****
Pad B bit 2	539	0	1	0	****
Pad B bit 3	540	0	1	0	****
Pad B bit 4	541	0	1	0	****
Pad B bit 5	542	0	1	0	****
Pad B bit 6	543	0	1	0	****
Pad B bit 7	544	0	1	0	****
Pad B bit 8	545	0	1	0	****
Pad B bit 9	546	0	1	0	****
Pad B bit 10	547	0	1	0	****
Pad B bit 11	548	0	1	0	****
Pad B bit 12	549	0	1	0	****
Pad B bit 13	550	0	1	0	****
Pad B bit 14	551	0	1	0	****
Pad B bit 15	552	0	1	0	****

GA6350b

* These parameters can be set on a programmable analog input.

** These parameters can be set on a programmable analog output.

*** These parameters can be set on a programmable digital input.

**** These parameters can be set on a programmable digital output.

Pad 0...15 General variables, 16 Bit. The Pads 0...3 can be set via analog inputs. The values of the Pads 0, 1, 4 , 5 and 6 can be set on analog outputs.

Bitword pad A (B) Bitmap of the parameters Pad A (B) bit 0 up to Pad A (B) bit 15. With a parameter it is possible to read or write all the Bits inside a Word.

Example:

Pad A bit 0	0		
Pad A bit 1	1	$= 2^1$	=2
Pad A bit 2	0		
Pad A bit 3	0		
Pad A bit 4	0		

Pad A bit 5	1	$= 2^5 = 32$
Pad A bit 6	1	$= 2^6 = 64$
Pad A bit 7	0	
Pad A bit 8	0	
Pad A bit 9	0	
Pad A bit 10	1	$= 2^{10} = 1024$
Pad A bit 11	0	
Pad A bit 12	1	$= 2^{12} = 4096$
Pad A bit 13	0	
Pad A bit 14	0	
Pad A bit 15	0	

Bitword pad A = 2 + 32 + 64 + 1024 + 4096 = 5218

Pad A (B) bit 0...15 Bit variables. The single Bits can be read or written. With the **Bitword pad A (B)** it is possible to process a Word. See the example. From the Pad A it is possible to read the Bits 0.....7 of a digital input. On a digital output it is possible to write all the Bits.

NOTE! When setting the PADs bit to digital I/O, the following rules apply:

1- Assigning PAD A/B bit to Digital Output will cause the state of the digital output (n) coming from PAD A/B bit (n-1)

2- Relay 2 (terminals 83,85) can be driven by means of PAD A/B bit 14

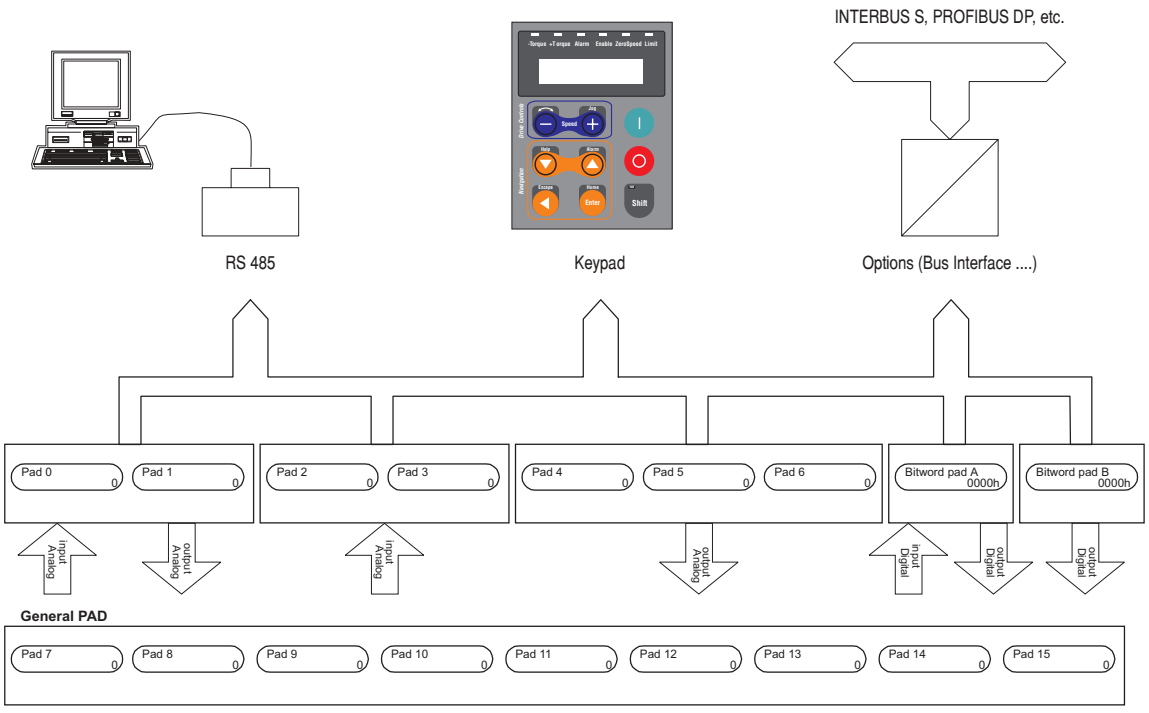
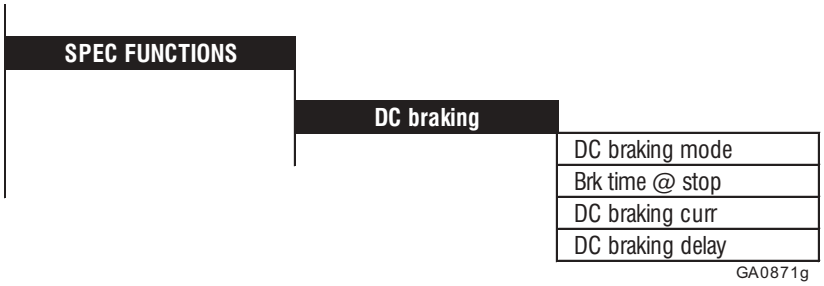


Figure 6.16.6.1: Bus pads

6.16.7. DC Braking



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
DC Braking mode (Disabled) 0 (Enabled) 1	904	0	1	0 (OFF)	
Brk time @ stop [ms]	905	0	30000	1000	
DC braking curr [%]	717	0	100	50	
DC braking delay [ms]	716	0	65535	500	

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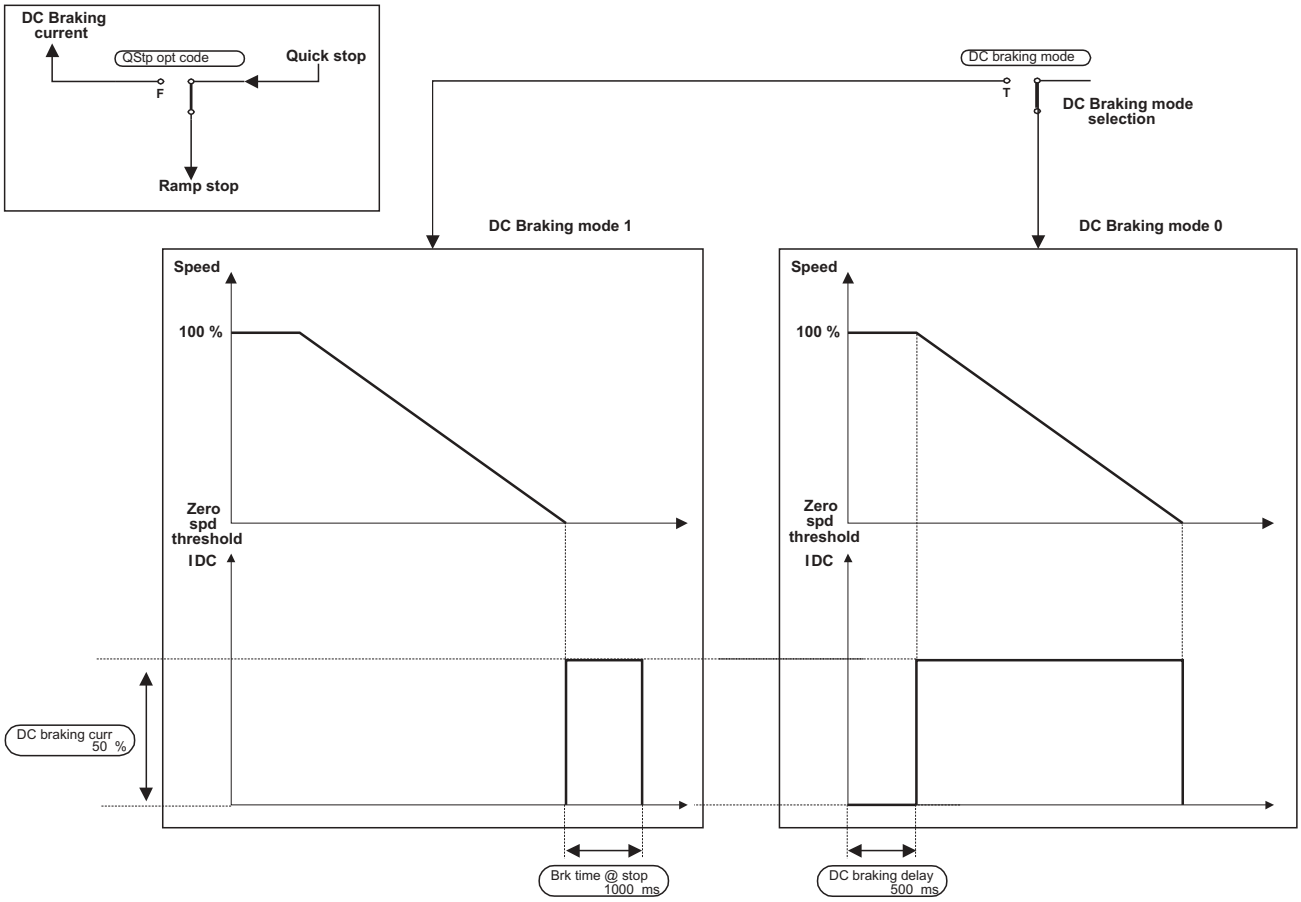


Figure 6.16.7.1: DC Braking function

The Drive offers the facility of D.C. braking as a standard. With this operation, the Inverter injects D.C. current into motor phases, thereby generating braking torque. The level of braking current (=braking torque) can be set between 0 and 100% of the **Full load curr** .

The kinetic energy of the machine is dissipated as heat in the motor.

To enable this function it is necessary select the parameter **Qstp Option code** = DC braking curr (in the Configuration menu).

To activate DC braking curr set "**Quick stop**" on a Digital input

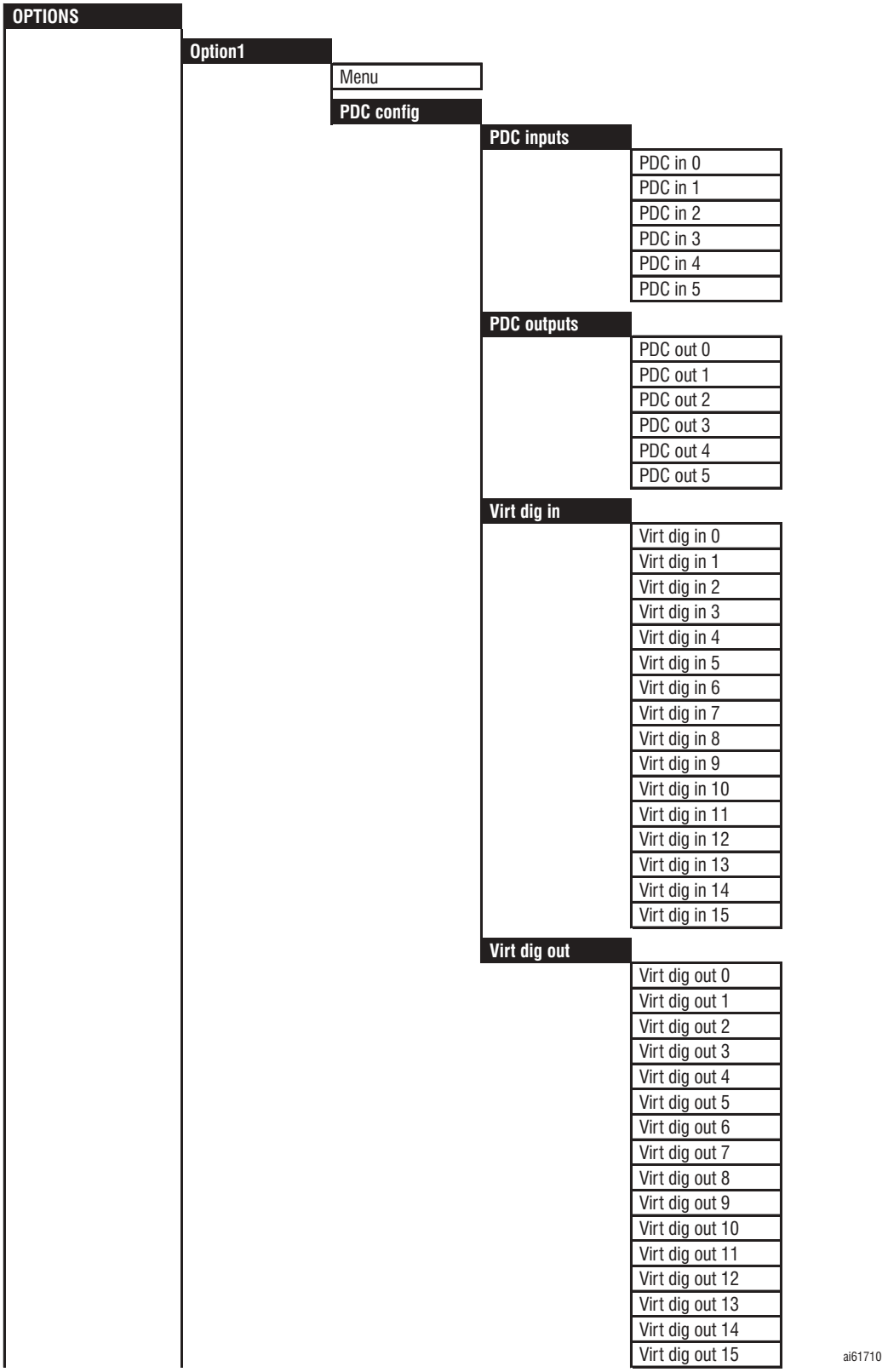
DC braking mode = **0**	DC Braking function is activated for braking the drive in the shortest possible time using the "**Quick stop**" command.
DC braking mode = **1**	When the "**Stop**" command is activated the motor decelerates with the ramp time selected. When the threshold of zero speed (**speed zero level**) detection is reached, D.C. braking is activated and the motor is braked to a standstill. The level of the current is determined by **DC braking curr** parameter and the braking time is determined by **Brk time @ stop** parameter.

Brk time @ stop	Braking time of the DC braking (msec).
DC braking curr	Level of current for DC operation. It is specified as a percentage of **Full load curr**.
DC braking delay	Delay from the assertion of the command to the actuation of the DC braking. This delay allow the motor to demagnetize, thus avoiding Overcurrent trip due to electro motive force (e.m.f.) In the motor.

NOTE: The Enable command is required during braking. If this command is not present or is removed during the braking process, the drive coasts to a halt without braking. Once braking has been initiated, the drive ignores a Start or Jog command.

6.17 Options

6.17.1 Option 1



Through this Menu, the setting of Drive parameters to the virtual digital I/O (menu MONITOR\Virtual digital Inp-Out) and the data channels (PDC) of the field Bus can be carried out.

If the OPT1 board is not present you will be prompted (inside the menu) by the message **OPT1 not present**.

If the used OPT1 card does not support the configuration from this menu you will be prompted (inside the menu) by the message **OPT1 old version**. For further and detailed information see the instruction book of the optional board.

6.17.1.1 Process Data Channel

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Pdc in 0	1095	0	65535	0	
Pdc in 1	1096	0	65535	0	
Pdc in 2	1097	0	65535	0	
Pdc in 3	1098	0	65535	0	
Pdc in 4	1099	0	65535	0	
Pdc in 5	1100	0	65535	0	
Pdc out 0	1101	0	65535	0	
Pdc out 1	1102	0	65535	0	
Pdc out 2	1103	0	65535	0	
Pdc out 3	1104	0	65535	0	
Pdc out 4	1105	0	65535	0	
Pdc out 5	1106	0	65535	0	
Virt dig in 0	1107	0	65535	0	
Virt dig in 1	1108	0	65535	0	
Virt dig in 2	1109	0	65535	0	
Virt dig in 3	1110	0	65535	0	
Virt dig in 4	1111	0	65535	0	
Virt dig in 5	1112	0	65535	0	
Virt dig in 6	1113	0	65535	0	
Virt dig in 7	1114	0	65535	0	
Virt dig in 8	1115	0	65535	0	
Virt dig in 9	1116	0	65535	0	
Virt dig in 10	1117	0	65535	0	
Virt dig in 11	1118	0	65535	0	
Virt dig in 12	1119	0	65535	0	
Virt dig in 13	1120	0	65535	0	
Virt dig in 14	1121	0	65535	0	
Virt dig in 15	1122	0	65535	0	
Virt dig out 0	1123	0	65535	0	
Virt dig out 1	1124	0	65535	0	
Virt dig out 2	1125	0	65535	0	
Virt dig out 3	1126	0	65535	0	
Virt dig out 4	1127	0	65535	0	
Virt dig out 5	1128	0	65535	0	
Virt dig out 6	1129	0	65535	0	
Virt dig out 7	1130	0	65535	0	
Virt dig out 8	1131	0	65535	0	
Virt dig out 9	1132	0	65535	0	
Virt dig out 10	1133	0	65535	0	
Virt dig out 11	1134	0	65535	0	
Virt dig out 12	1135	0	65535	0	
Virt dig out 13	1136	0	65535	0	
Virt dig out 14	1137	0	65535	0	
Virt dig out 15	1138	0	65535	0	

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Through the parameters of this menu, it is possible to manage the process data channel coming from a field bus interface card. The exchange of high priority parameters (see list at chapter 10.4) with the bus interface, can be performed by programming the **Pdc input** and **Pdc output**. The exchange of the high priority parameters is executed in automatic synchronous communication with the task of the speed regulation.

For this purpose, the regulation card of the drive, provides 6 dedicated word, while the number of the word used by the bus interface cards, is dependant on the type of the bus connected (for further information see the instruction manual of the relative interface cards).

Pdc input is referred to the data transfer from master to slave (Input for the drive). **Pdc output** is referred to the data transfer from slave to master (Output for the drive)

Assigning a drive parameter to a Pdc I/O, it necessary to add at the number of the parameter itself an offset equal to decimal number 8192.

E.g.: Reading of **Actual speed** on **Pdc out 2** [1103]

Actual speed [122]

Pdc out 2 = 122+8192 = 8314

Writing of **Ramp ref 1** on **Pdc in 1** [1096]

Ramp ref 1 [44]

Pdc in 1 = 44+8192 = 8236

A virtual terminal is available as 16 bits format for input and output. The bit terminal functionality is programmable by assigning drive parameter number to the **Virt dig in** and **Virt dig out** parameters.

Virt dig in is referred to the data transfer from master to slave (Input for the drive)

Virt dig out is referred to the data transfer from slave to master (Output for the drive)

Assigning a parameter to a Virtual I/O, it necessary to add at the number of the parameter itself an offset equal to 8192.

E.g.: Setting of **Enable/Disable** on **Virt dig in 1** [1108]

Enable/Disable [314]

Virt dig in 1 = 314+8192 = 8506

Setting of **Drive ready** status on **Virt dig out 2** [1125]

Drive ready [380]

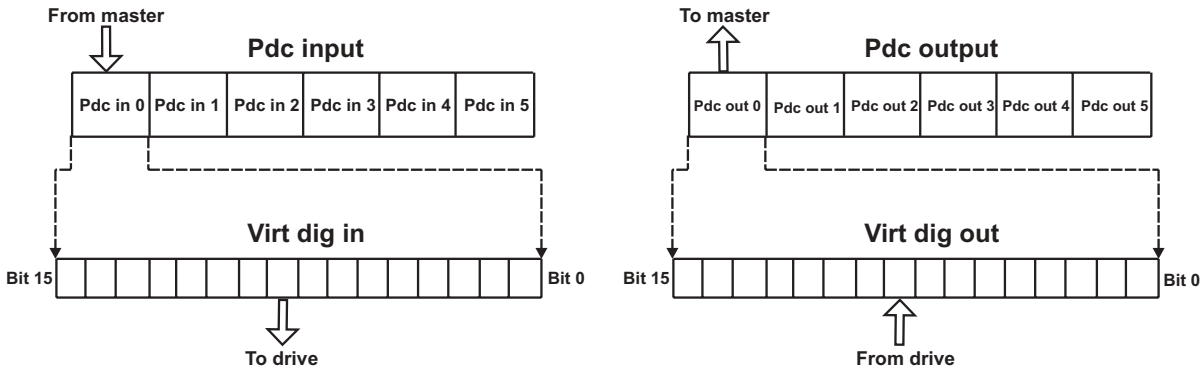
Virt dig out 2 = 380+8192 = 8572

To connect the **Pdc Input** to the **Virt dig in**, the parameter index 582 is involved.

This index must be assigned to the configuration parameter of the selected **Pdc input** word.

Eg: **Virt dig in** has to be assigned to the **Pdc in** word no. 0.

This can be performed by assigning parameter number [582+8192] to the configuration parameter 1095 of the **Pdc input.**



To connect the **Pdc Output** to the **Virt dig out**, the parameter index 583 is involved.

This index must be assigned to the configuration parameter of the selected **Pdc output** word.

Eg: Virt dig out has to be assigned to the Pdc out word no.1.

This can be performed by assigning parameter number (583+8192) to the configuration parameter 1102 of the **Pdc output**.

The following table shows the different error codes that may occur during the execution of a service.

RESULT	VALUE	RESULT	VALUE
OK no error	0000H	Reserved	0017H
Parameter not exist	0001H	Unknown Command	0018H
Reserved	0002H	Read only Parameter	0019H
Control Access denied	0003H	Write not allowed	001AH
Reserved	0004H	Value out of constant limits	001BH
Attribute Access denied	0005H	State not correct	001CH
Type value error	0006H	Password	001DH
Reserved	0007H-000FH	Type Unknown	001EH
Destination option not exist	0010H	Hardware Fail	0030H
Parameter Access Conflict	0011H	Checksum Fail	0031H
Value out of the maximun range	0012H	Reserved	001FH-007CH
Value out of the minimun range	0013H	Reserved	0082H-00FCH
Value not supported	0014H	NOK generic	00FFH
Parameter Configuration Conflict	0015H	User defined	0100H-FFFFH
Command Submitted	0016H		

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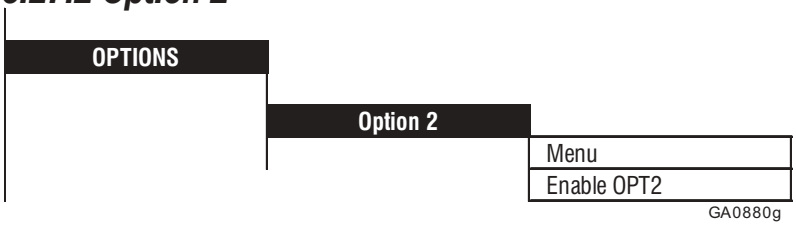
Explanation:

Parameter not exist	The specified parameter does not exist
Control Access denied	The access is denied because of the control status
Attribute Access denied	The parameter attributes do not allow the access
Type value error	The specified type value is incorrect
Destination option not exist	The destination option does not exist at node
Parameter Access Conflict	The addressed parameter can not be accessed (for example if the command is write and parameter is connected to an external input)
Value out of the max range	Value is out of the maximum range
Value out of the min range	Value is out of the minimum range
Value not supported	Value is in range but not allowed
Parameter Configuration Conflict	The addressed parameter can not be accessed for sistem configuration conflict (for example try to connect an input source to a parameter that is already connected to an input source)
Command Submitted	Command has been submitted but is not possible to know if it has been executed
Unknown Command	The command is not known
Read only Parameter	The parameter has read only attribute
Write not allowed	Write operation is not allowed for the slave conditions
Value out of constant limits	Value is out of constant fixed limits
State not correct	The control state doesn't allow the command execution
Password	The command is not executed because the password is active
Type Unknown	The parameter type is not known
Hardware Fail	The access is denied because of an hardware failure
Checksum Fail	The access is aborted because of an error in cheksum control
NOK generic	The access is aborted because of an indeterminated error

6.17.2 Option 2



This menu allows the user access to the parameter set of the OPT2 option card.

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Menu					
Enable OPT2	425	0	1	Disabled	

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Menu The menu is active only if the OPT2 card is present (e.g. a DGF card). If the user tries to enter in the Option 2 menu and the card is not mounted on the device the message "Not present" is displayed.

For further and detailed information see the instruction book of the optional board.

Enable OPT2 Default configuration = Disabled.

To change the configuration:

1 - set the new value of **Enable OPT2** parameter

2 - store via the **Save parameters** (BASIC MENU)

3 - switch-off and switch-on the drive

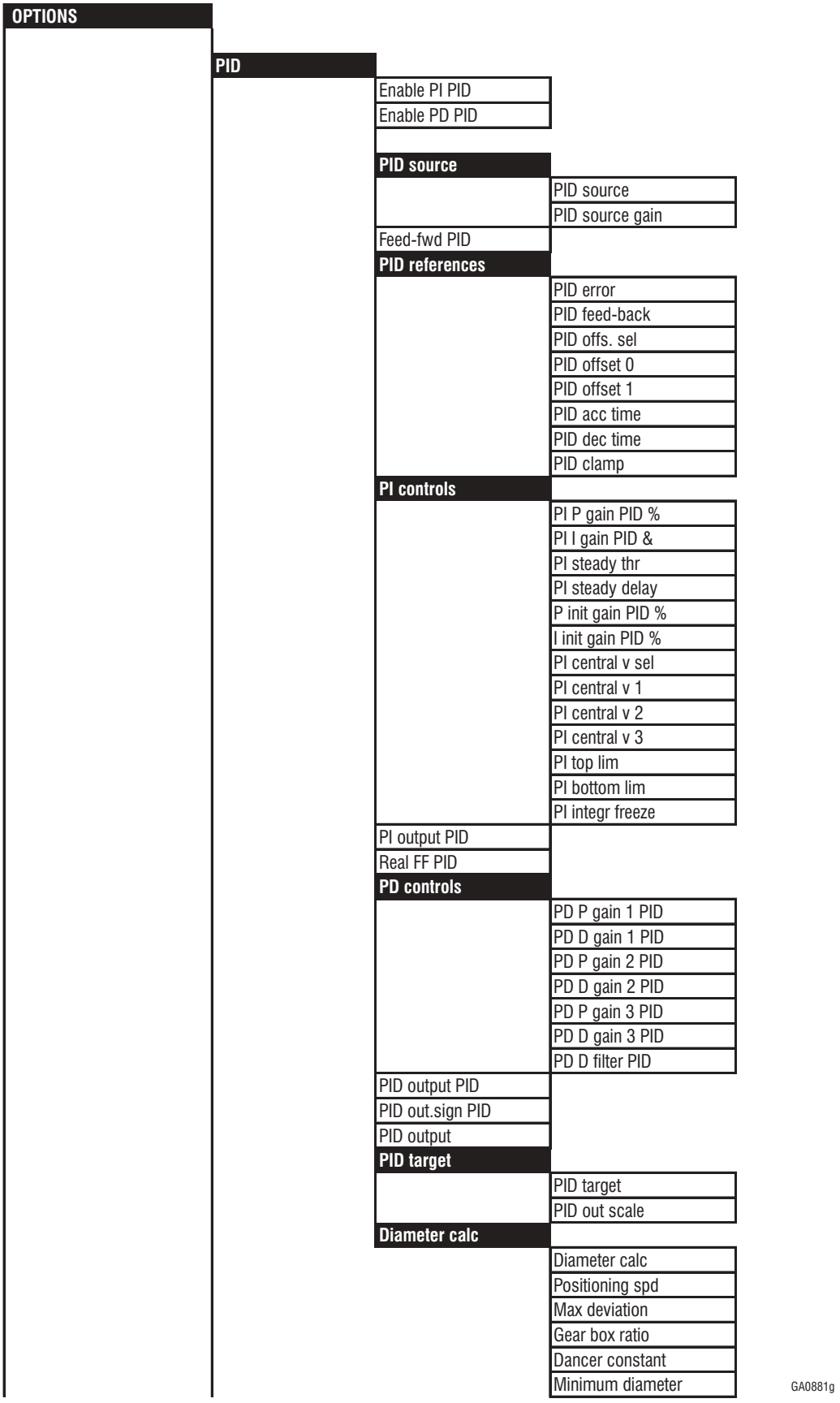
If Enabled and the DGF card is not present, will be generated the error:

OPT2 failure code 100-98 or OPT2 failure code 100-96.

NOTE When using the DGF card (Option 2), all parameters listed in the "Opt2-A/PDC" column of Parameter List (section 10.1 and 10.2) can be accessed through the automatic asynchronous communication. Parameters listed in the High Priority Parameter List (section 10.4) can be accessed by means of the automatic synchronous communication. (See DGF manual for more details.)

If the software has detected the presence of the DGF the parameter set of the optional card is accessible. In this case see the DGF user manual for detailed information.

6.17.3. PID Function



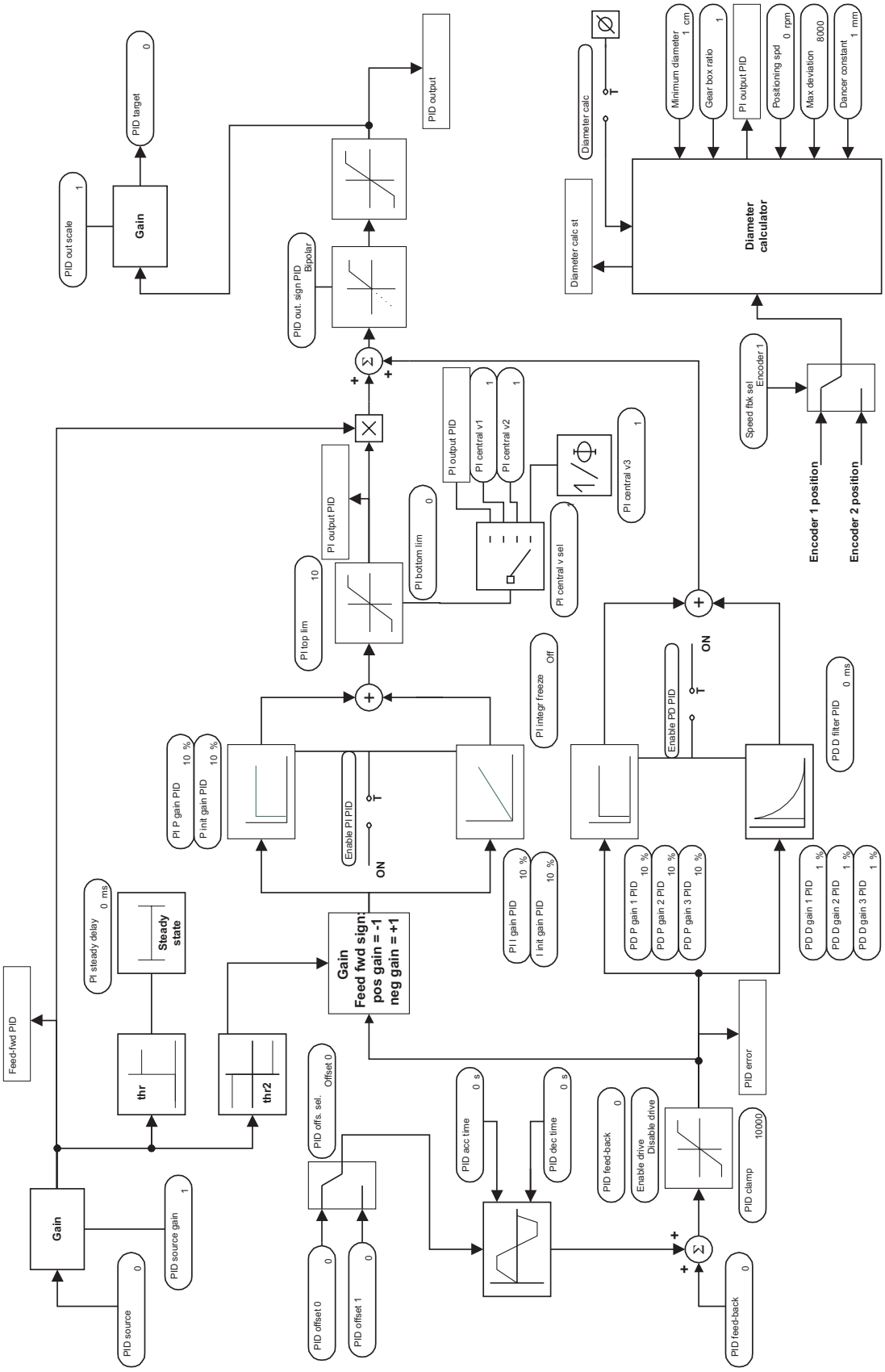


Figure 6.17.3.1: PID function

6.17.3.1. General

The PID function has been developed for general uses which can include nip-roll, winders, unwinders, pressure control of pumps and extruders.

A dancer or a load cell can be used as position/tension transducer.

The inputs (with the exception of those concerning the transducers) and the outputs can be configured. They can be associated to various converter parameters, E.g. the PID output can be sent to the speed or to current regulator.

The analog inputs/outputs will be sampled/updated to 2ms.

The digital inputs/outputs will be sampled/updated to 8ms.

NOTE! PID function in the firmware and the DGF card are mutually exclusive.

6.17.3.2. Inputs / Outputs

Regulation Inputs/outputs

PID source	Sample parameter of Feed-forward normally programmed on analog input.
PID feed-back	Analog input of position / tension transducer (dancer/load cell). PID feed-back must be programmed on the analog input 1 (terminals 1-2) because of the input filter provided.
PID offset 0	Offset analog input added to **PID feed-back.** Used for the adjustement of the dancer position.
PID target	Parameter associated with the regulator output. Normally, it will be programmed on the speed reference of the drive.
PID output	Analog output of the regulator. Used to carry on a reference cascade in multidrives systems.
PI central v3 PID	Initial value setting of the integral component of the regulator (correspondent to initial diameter). It can be programmed on an analog input. E.g. to an ultrasonic transducer used for the diameter measure of a winder/unwinder.

Input Command (programmable on digital inputs)

Enable PI PID	Enable of the PI (proportional - integral) of the regulator.
Enable PD PID	Enable of the PD (proportional - derivative) of the regulator.
PI integral freeze	Freezing of the actual value of the integral component of the regulator.
PID offset sel	Offset selection, in addition to **PID feed-back**: L = **PID offset 0**, H = **PID offset 1**.
PI central v S0	Output selector of initial block PI. With **PI central v S1** determined, through binary selection, 4 possible settings of the integral initial level (correspondent to initial diameter) can be used.
PI central v S1	Output selector of initial block PI. With **PI central v S0** determined, through binary selection, 4 possible settings of the integral initial level (correspondent to initial diameter) can be used.
Diameter calc	Enable of the calculation.
Diameter calc st	Calculation of the ended initial diameter (digital output).

6.17.3.3. Feed - Forward

PID source	
	PID source
	PID source gain
Feed-fwd PID	

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Parameter	N.	Value			Standard configuration
		min	max	default	
PID source	786	0	65535	0	
PID source gain	787	-100.000	100.000	0	
Feed-fw PID	758	-10000	+10000	0	*

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* This parameter can be set on an analog programmable input.

When used , the feed-forward signal represents the main reference of the regulator. Inside the regulator it will be attenuated or amplified by the PID function and sent to the output as reference signal for the drive.

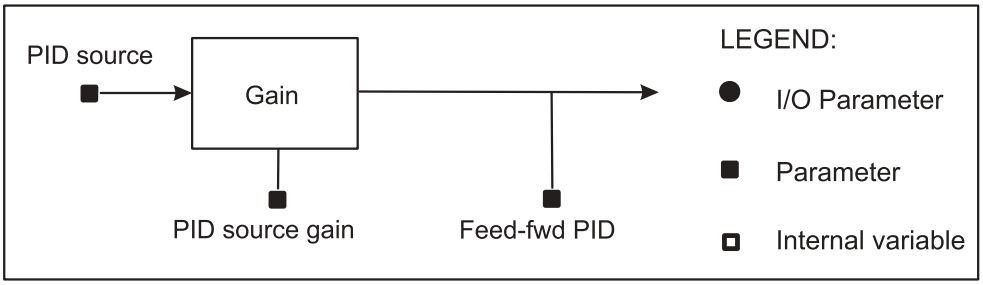

Figure 6.17.3.1: Feed-forward block description

PID source Address of the parameter (Feed-forward value) containing the value which will be used as PID source.

Number +2000H (8192 decimal) must be added to the parameter.

PID source gain Multiplier factor of the input value to PID source.

Feed-fwd PID Value of feed-forward

Through the parameter **PID source,** it is possible to select which point in the drive the feed-forward signal may be sent. The selectable parameters are those indicated in the paragraph 10.4. “List of the high-priority parameters”. The measure units are those indicated in the notes at the end of this paragraph.

1. Programming example of the ramp output block (Parameter Ramp out) on PID source:

Menu’ OPTION

————> PID

————> PID source

————> PID source = 8305

The **PID source** must be set to the parameter number to which it will be associated, choosing it from paragraph 10.4. “List of high-priority parameters’ (**Ramp out** has the decimal number 113).

To obtain the value, it must be added to the decimal value 8192 (fixed offset):

8192 + 113 = 8305.

If you need to set the feed-forward on analog input, given that they are not directly inserted in the 'high-priority parameters', it is necessary to pass through a **PAD 0.....PAD 15** parameters.

2. Programming example of the analog input 2 on PID source:

a) Input programming on a PAD parameter

Menu' I/O CONFIG

————> Analog input

————> Analog input 2

————> Select input 2 = PAD 0

b) Setting of the **PAD 0** as feed-forward input:

Menu' OPTION

————> PID

————> PID source

————> PID source = 8695

The **PID source** must be set to the parameter number to which it will be associated, choosing it from paragraph 10.4 "List of high-priority parameters' (**PAD 0** has the decimal number 503).

To obtain the value must be added the decimal value 8192 (fixed offset):

8192 + 503 = 8695.

The full-scale of the feed-forward is limited to the value +/- 10000, which depends on the parameter set on **PID source**. It will be necessary the calibration through the **PID gain source**.

The measure units are those indicated in the notes at the end of the paragraph 10.4. "List of the high-priority parameters'.

The feed-forward value can be read through the parameter **Feed-fwd PID** via keypad or serial line.

Referring to the above examples:

1. Programming example of the ramp output block (**Parameter Ramp out**) on **PID source**:
   Speeds will be converted inside the drive into RPM x 4.
   The ramp input references take as maximum set value what set in **Speed base value**.
   Feed - fwd PID = Speed base value x 4 x PID source gain

   If, with max. ramp reference and **Speed base value** = 3000rpm, to have
   Feed - fwd PID = 10000, it is necessary to set:
   PID source gain = 10000 / (3000 x 4) = 0.833

2. Programming for example analog input 2 on **PID source**:
   When an analog input will be set on a **PAD** parameter, this will have a max. value of + / - 2047.
   With max. analog reference, for having **Feed - fwd PID** = 10000, it is necessary to set:
   PID source gain = 10000 / 2047 = 4.885.

NOTE! Using the regulator as "generic PID" without the feed -forward function, **Feed - fwd PID** must be at its max. value.
To do this, it is necessary to set **PID source** on a **PAD** parameter and program it = 10000

6.17.3.4. PID Function

The PID function is divided in three blocks:

- Feed-back input "**PID reference**"
- Proportional-integral control block "**PI controls**"
- Proportional-derivative control block "**PD controls**"

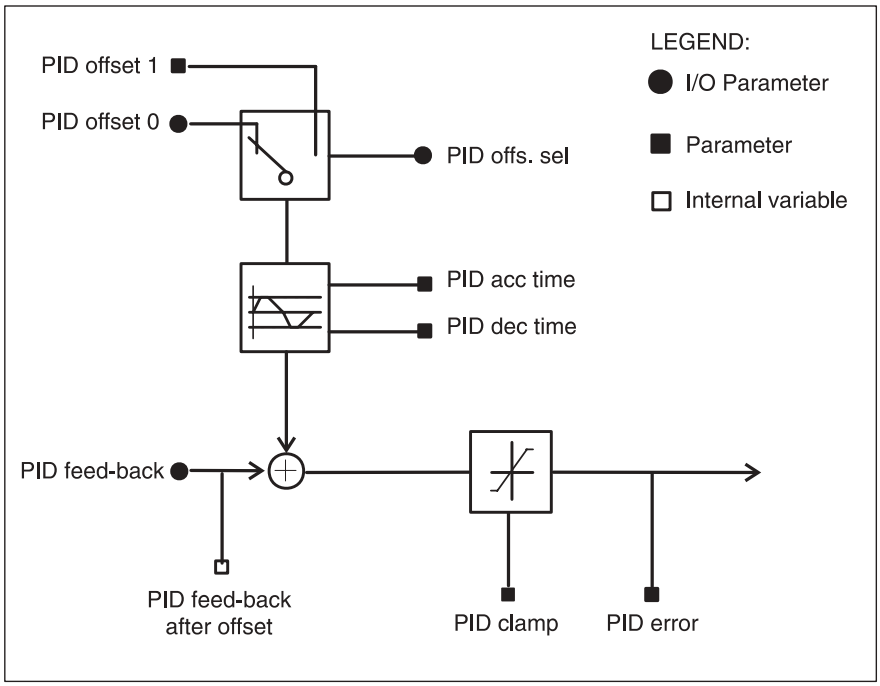

Figure 6.17.3.2: Feedback block description

PID reference

- PID error
- PID feed-back
- PID offs. Sel
- PID offset 0
- PID offset 1
- PID acc time
- PID dec time
- PID clamp

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Parameter	N.	Value			Standard configuration
		min	max	default	
PID error	759	-10000	+10000	0	
PID feed back	763	-10000	+10000	0	**
PID offs. Sel	762	0	1	0	*
PID offset 0	760	-10000	+10000	0	**
PID offset 1	761	-10000	+10000	0	
PID acc time [s]	1046	0.0	900.0	0.0	
PID dec time [s]	1047	0.0	900.0	0.0	
PID clamp	757	0	+10000	10000	

GA6391g

* This function can be set on a digital programmable input

** This parameter can be set on an analog programmable input

PID error	Error reading the input of the function PID (**PID clamp** block output).
PID feed-back	Reading of feed-back value from the transducer position (dancer) or tension (load cell).
PID offs. sel	Offset selector added to **PID feed-back**. This parameter can be set on a digital programmable input. 0 = **PID offset 0** 1 = **PID offset 1**
PID offset 0	Offset 0 added to **PID feed-back**. This parameter can be set on analog input , E.g. for the tension setting when a load cell has to be used as feed-back.
PID offset 1	Offset 1 added to **PID feed-back**.
PID acc time	Acceleration ramp time value in seconds after the PID offset block.
PID dec time	Deceleration ramp time value in seconds after the PID offset block.
PID clamp	The clamper allows a smooth tension setting of a controlled system winder/unwinder, when cannot be used the "Function for the calculation of the initial diameter". When enabling the drive, the dancer is at its lower full scale, being **PID error** at its maximum value, the motor could have a too fast acceleration for setting the dancer in its central position of work. Setting **PID clamp** at a value sufficiently low e.g = 1000, enabling the drive and at the enabling the **Enable PD PID**, the value of **PID error** is limited at 1000 till when the signal coming from the dancer (**PID feed-back**) does not go down this value. Now **PID clamp** is automatically take back at its maximum value corresponding to 10000. The clamper is kept at 10000 till the next disabling of the drive or of **Enable PD PID**.

The feed - back input is provided for the analog transducers connection like dancer, with relative potentiometer or load cell. Nevertheless, it is possible to use this input block as comparison point between two different analog signals + / - 10V.

Connection to a dancer with potentiometer connected between - 10 and + 10V.

The cursor of the potentiometer can be connected to one of the analog inputs of the drive. Normally it should be used the analog input 1 (terminals 1 and 2) because it is provided with filter.

The input choosen for that connection must be programmed in the menu I/O CONFIG as **PID feed - back.** Its value can be read in the **PID feed - back** parameter in the **PID REFERENCE** submenu.

Through **PID offset 1** (or PID offset 0), it is possible to carry on the adjustement of the dancer position.

Connection to a load cell with full range + 10V.

The output of the load cell can be connected to one of the drive analog inputs. Normally the analog input 1 (terminals 1 and 2) should be used because its provided with filter.

The input chosen for the connection must be programmed in the menu I/O CONFIG as **PID feed - back.** Its value can be read in the **PID feed - back** parameter of the **PID REFERENCE** submenu.

The tension setting can be sent, with value 0...-10V, to one of the remaining programmable analog inputs in the **I/O CONFIG** menu as **PID offset 0**.

6.17.3.5. Proportional - Integral Block

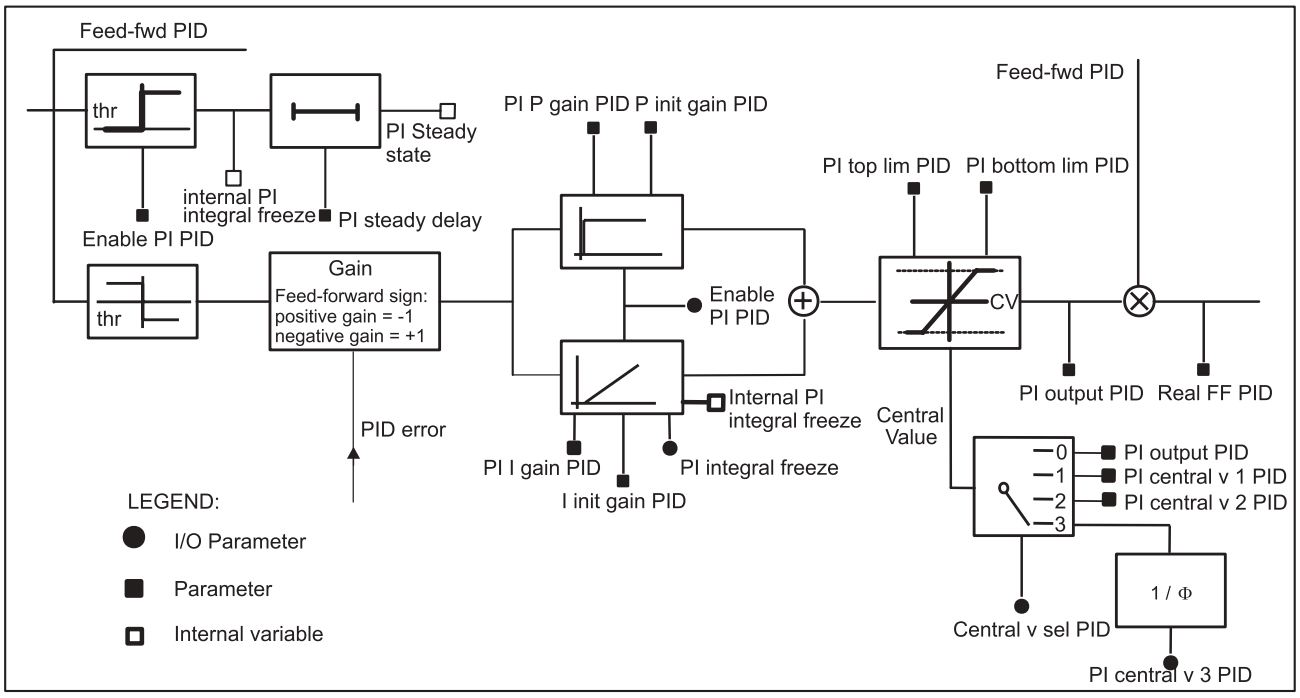

Figure 6.17.3.3: PI block description

The PI block receives its input from the **PID error** parameter, which represents the error that must be corrected by the regulator. The PI block carries on a proportional-integral regulation. Its output, **PI output PID,** after having been appropriately adapted, according to the system which has to control, will be used as multiplier factor of the feed-forward (**Feed-fwd PID**) obtaining the correct value of the speed reference for the drive (**Real FF PID**).

The PI block will be enabled by setting **Enable PI PID** = Enable. If **Enable PI PID** has been programmed on a digital input, this must be set to a high logic level (+24V).

Parameter	N.	Value			Standard
		min	max	default	configuration
Menu					
Enable PI PID	769	0	1	Disabled	*

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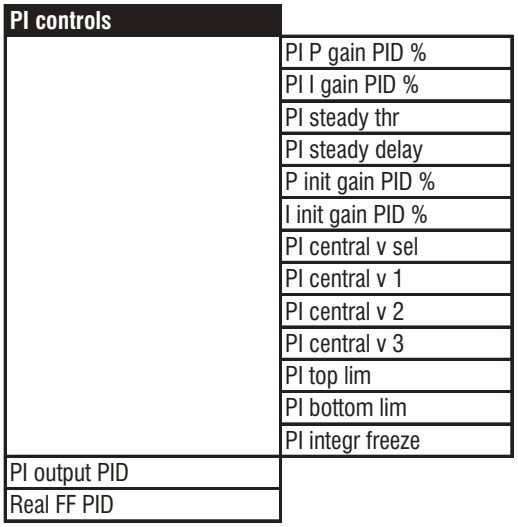
* This function can be set on a digital programmable input

Enable PI PID	Enabled	Enable of the proportional-integral block
	Disabled	Disabling of the proportional-integral block.



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Parameter	N.	Value			Standard configuration
		min	max	default	
PI P gain PID	765	0.00	100.00	10.00	
PI I gain PID	764	0.00	100.00	10.00	
PI steady thr	695	0	10000	0	
PI steady delay	731	0	60000	0	
P init gain PID	793	0.00	100.00	10.00	
I init gain PID	734	0.00	100.00	10.00	
PI central v sel	779	0	3	1	*
PI central v 1	776	PI bottom lim	PI top lim	1.00	
PI central v 2	777	PI bottom lim	PI top lim	1.00	
PI central v 3	778	PI bottom lim	PI top lim	1.00	**
PI top limit	784	PI bottom lim	10.00	10.00	
PI bottom limit	785	-10.00	PI top lim	0.00	
PI integral freeze	783	0	1	0	*
PI output PID	771	0	1000 x PI top lim	1000	
Real FF PID	418	-10000	+10000	0	

GA6393g

* This function can be set on a digital programmable input

** This parameter can be set on an analog programmable input

PI P gain PID Proportional gain of PI block

PI I gain PID Integral gain of PI block

PI steady thr Threshold feed-forward survey. If **Feed-fwd PID** is less than **PI steady thr** the integral regulation will be frozen, the proportional gain assumes the value set in **P init gain PID**.

When **Feed-fwd PID** overcomes the threshold, the integral regulation with the gain set in **I init gain PID** will be enabled. The PI block will mantain the gains **P init gain PID** and **I init gain PID** for the time preset through **PI steady delay**. Once this delay is over, they will be brought automatically to **PI P gain PID** and **PI I gain PID**.

PI steady delay Time for which the gains **P init gain PID** and **I init gain PID** have been kept operative after overcoming the feed-forward **PI steady thr** threshold.

The delay time **PI steady delay** and the resulting function of initial gains changing also, operate on the transition L to H of the **Enable PI PID** parameter.

P init gain PID Initial proportional gain. **P init gain PID** operates when feed-forward is less than **PI steady thr** and at its overcoming, for the time set in **PI steady delay** or on the transition L to H of **Enable PI PID** for the same time.

I init gain PID Initial integral gain. **I init gain PID** operates after the threshold **PI steady thr** has been overcome or on the transition L to H of **Enable PI PID** for the time set in **PI steady delay**.

PI central v sel Output selector of the starting PI block. **PI central v sel** (0...3) selects between the 4 possible settings of the initial value of the regulator integral component (corresponding to initial diameter).

PI central v sel can be set directly from keypad, serial line or through two digital inputs set respectively as **PI central v S0** and **PI central v S1**.

Selecting **PI central v sel = 0**, when PI block is disabled (**Enable PI PID** = Disable), the last value of the integral component calculated (corresponding to roll diameter) is stored. This value is displayed in **PI output PID**. When enabled again, the regulation restarts again from that value. The same functionality is used when switching off the drive. This kind of operation can be used when controlling a winder and it is necessary to stop the machine and disable the drives or even remove AC incoming power from the electrical cabinet.

Selecting **PI central v sel** = 1-2-3, when PI block has been disabled, the value of **PI output PID** will be set at what is programmed in the correspondent parameter (x1000). When the drive is restarted after a power off, the precalculated value will be automatically set only if, when powering up the drive, the digital input programmed as **Enable PI PID** is already set at a high level.

PI central v 1 Setting of the first initial value of the regulator's integral component (corresponding to initial diameter 1). The **PI central v 1** value must be included in the limits set in **PI top lim PID** and **PI bottom lim PID**.

PI central v 1 will be selected by setting **PI central v sel** = 1.

PI central v 2 Setting of the second initial value of the regulator's integral component (corresponding to initial diameter 2). The **PI central v 2** value must be included in the limits set in

PI top lim PID and **PI bottom lim PID**.

PI central v 2 will be selected by setting **PI central v sel** = 2.

PI central v 3 Setting of the third initial value of the regulator's integral component (correspondent to initial diameter 3). The **PI central v 1** value must be included in the limits given by **PI top lim PID** and **PI bottom lim PID**.

PI central v 3 will be selected by setting **PI central v sel** = 3.

PI top lim It defines the higher limit of the adapting block of the PI correction.

PI bottom lim It defines the lower limit of the adapting block of the PI correction.

The output of the PI block represents the multiplier factor of feed-forward, whose value must be adapted from the regulator in the max. limits included between +10000 and -10000 and defined by **PI top lim** and **PI bottom lim**. The value of these parameters will be defined according to the system that has to be controlled. For a better understanding, please refer to the paragraph "Examples of application".

PI output PID Output of PI block, adapted to the values included between **PI top limit** and **PI bottom limit**. At the power up of the drive, **PI output PID** acquires automatically the selected value with **PI central v sel** multiplied by 1000.

Example: If **PI central v 2** = 0.5 is selected, at the start **PI output PID** acquires value = 500.

When **Enable PI PID** has been enabled, the output **PI output PID** is, dependent on the input error able to

integrate its value up to the limits set with **PI top limit** or **PI bottom limit** multiplied by 1000.

Example: **PI top limit** = 2, **PI output PID** max = 2000.

The PI block output will be further limited from the parameter saturation **Real FF PID** (see corresponding parameter).

As previously described, **PI output PID** is used as a multiplier factor of the feed-forward in order to obtain the angular speed reference of the motor. If the PID function is used to control a winder/ unwinder system, its value is inversely proportional to the roll diameter. When winding with a constant peripheral speed, the following is valid:

$$\omega_0 \Phi_1 = \omega_1 \Phi_1$$

where:

ω_0 = angular speed at minimum diameter

Φ_0 = minimum diameter

ω_1 = angular speed at actual diameter

Φ_0 = actual diameter

$\omega_1 = \omega_0 \times (\Phi_0/\Phi_1)$

If the drive is set correctly, and $\omega 0$ is equivalent to the maximum value of the feed-forward, then **PI output PID** depends on (Φ_0/Φ_1).

Taking into consideration the internal coefficients of the firmware, it can be written:

PI output PID = $(\Phi_0/\Phi_1) \times 1000$

This formula can be used to verify the accuracy of the setting when the system is on working or during the procedure for the calculation of the initial diameter.

Real FF PID — Represents the feed-forward value which has been recalculated according to the PI correction. It will be calculated with the following formula:

Real FF PID = (**Feed-fwd PID** / 1000) x **PI output PID**

The max. value of **Real FF PID** is +/- 10.000.If this limit had been reached during operation, in order to avoid dangerous levels of regulator saturation, further increases of **PI output PID** will be blocked.

Example: Feed-fwd = + 8000, the positive limit of PI output PID will be automatically set at

10000 / (8000 / 1000) = 1250.

6.17.3.6. Proportional - Derivative Control Block

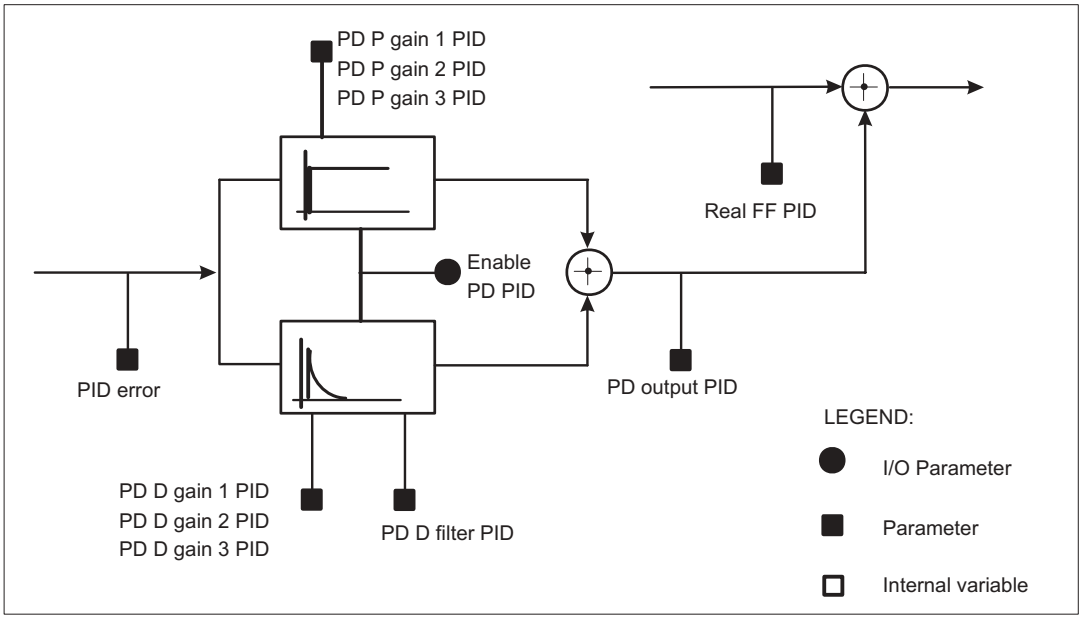


Figure 6.17.3.4: PD block description

The PD block receives the values **PID error** at its input, which represents the error that must be corrected by the regulator. The PD block carries out proportional-derivative regulation and its output **PD output PID** will be added to **Real FF PID**.

The PD block is enabled by setting **Enable PD PID** = Enable. If **Enable PD PID** has been programmed on a digital input, this must be set to a high logic level.

PID

Enable PD PID

GA0932g

Parameter	N.	Value			Standard
		min	max	default	configuration
Menu					
Enable PD PID	770	0	1	Disabled	*

GA6394g

Enable PD PID	Enabled	Enabling of the block proportional-derivative
	Disabled	Disabling of the block proportional-derivative

PD controls	
	PD P gain 1 PID
	PD D gain 1 PID
	PD P gain 2 PID
	PD D gain 2 PID
	PD P gain 3 PID
	PD D gain 3 PID
	PD D filter PID
PD output PID	

GA0885g

Parameter	N.	Value			Standard configuration
		min	max	default	
PD P gain 1 PID	768	0.00	100.00	10.00	
PD D gain 1 PID	766	0.00	100.00	1.00	
PD P gain 2 PID	788	0.00	100.00	10.00	
PD D gain 2 PID	789	0.00	100.00	1.00	
PD P gain 3 PID	790	0.00	100.00	10.00	
PD D gain 3 PID	791	0.00	100.00	1.00	
PD D filter PID	767	0	1000	0	
PD output PID	421	-10000	+10000	0	

GA6395g

The gains of the block can remain fixed and programmed in this case through the parameters **PD P gain 1 PID** and **PD I gain 1 PID**, or changed depending on machine parameters, through the function **Adap spd reg**. In this case the gains come from **PD P gain 1-2-3 PID** and **PD I gain 1-2-3 PID**.

For example, it is possible to modify, dynamically, the gains of PD block according to the speed, to a regulation parameter internal to the drive, or to an analog input proportional to the unit related to the machine. The behaviour of the regulator can be so configured to meet the needs of the machine.

NOTE: When **Adap Spd reg** has been enabled (paragraph 6.14.2. of the manual), it operates both on the PID function and on the gains of the speed regulator. So it is necessary to appropriately program all relative parameters. If one wishes to modify only the gains of the speed regulator and keep fixed the gains of the PID function, it is necessary set the three proportional gains and integral gains of the PD block at the same value. The same is valid in case the PID gains have to be modified and the speed regulator gains must remain fixed.

PD P gain 1 Proportional gain 1 of the block PD (its selection depends on the eventual enabling of the function **Adap Spd reg** and its configuration).

PD D gain 1 Derivative gain 1 of block PD (its selection depends on the eventual enabling of the function **Adap Spd reg** and its configuration).

PD P gain 2 Proportional gain 2 of the block PD (its selection depends on the eventual enabling of the function **Adap Spd reg** and its configuration).

PD D gain 2 Derivative gain 2 of block PD (its selection depends on the eventual enabling of the function **Adap Spd reg** and its configuration).

PD P gain 3 Proportional gain 3 of the block PD (its selection depends on the eventual enabling of the function **Adap Spd reg** and its configuration).

PD D gain 3 Derivative gain 3 of block PD (its selection depends on the eventual enabling of the function **Adap Spd reg** and its configuration).

PD D filter PID Time constant of the filter from the derivative side.

PD output PID PD block output.

6.17.3.7. Output Reference

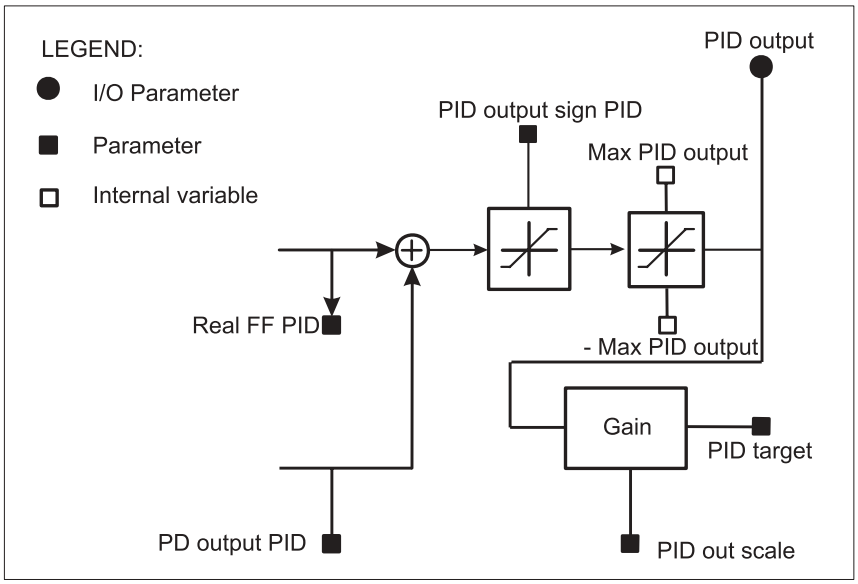


Figure 6.17.3.5: Output reference block description

PID

PID out. sign PID
PID output

GA0886g

Parameter	N.	Value			Standard configuration
		min	max	default	
PID output sign PID	772	0	1	1	
PID output	774	-10000	+10000	0	*

GA6396g

* This parameter can be set on an analog programmable output.

PID out. sign PID Through this parameter it is possible to set the output of the regulator to be either bipolar or simply positive (clamp of negative side).

PID output Display of regulator output. It is possible to program this parameter to an analog output in order to perform a reference cascade in multidrive systems.

PID target

PID target
PID out scale

GA0887g

Parameter	N.	Value			Standard
		min	max	default	configuration
PID target	782	0	65535	1	
PID out scale	773	-100.00	+100.00	1.000	

GA6397g

PID target Address of the parameter which contains the value to be used as PID target. To obtain the real settable value, it is necessary to add +2000H (8192 decimal) to the parameter number.

PID out scale Matching factor of **PID output**. Its value depends on the parameter to which the regulator output is addressed.

Through the parameter **PID target** it is possible to select which point of the drive will be addressed as the output signal of the regulation. The selectable parameters are those assigned as writing parameters (W or R/W) indicated in the paraghraph 10.4. "*List of high-priority parameters*'". The units are those indicated in the notes at the end of the paragraph.

Programming example of the speed reference 1 (parameter **Speed ref 1**) on **PID target**:

Menu' OPTION

————> PID

————> PID target

————> PID target = 8234

PID target must be set according to the number of the parameter to which it will be associated, choosing it from the paragraph 10.4. "List of high-priority parameters'" (**Speed ref 1** has the decimal number 42). To obtain the value it must be added the decimal number 8192 (fixed offset):

8192 + 42 = 8234.

NOTE: When the ramp function has been enabled, **Speed ref 1** will be automatically programmed on its output. To have it available it is necessary to set parameter **Enable ramp** = disable.

Speed ref 1 will be set in RPM x 4, considering that **PID output** assumes values included between 0....10000, it is necessary to set appropriately the calibration through **PID out scale**.

Calculation of PID out scale

If it is necessary that **PID output**, at its max. value = 10000, corresponds at speed reference = 2000rpm it is necessary to set:

PID out scale = (2000 x 4) / 10000 = 0.8

It is possible to read the set value of **Speed ref 1** in the appropriate parameter of the menu **INPUT VARIABLES / Speed ref**.

NOTE: The value of **PID out scale** will be defined according to the system which is being controlled. For a better understanding, please refer to the paragraph "Application examples".

6.17.3.8. Function of Calculation for Initial Diameter

This function performs a preliminary calculation of the diameter of an unwinder/winder before starting the line. This allows better control of the system avoiding unwanted balancing of the dancer.

The calculation is based on the measure of the movement of the dancer from the position of lower fullrange to its central position of work, and on the measure of angular movement of the roll during the initial phase.

NOTE: The function of initial diameter calculation can be carried out only when the winder/unwinder are controlled through dancer (no load cell) and the speed feed-back is carried out through encoder.

The result of the calculation is assigned to the parameter **PI output PID**, and so it represents the multiplier factor of the feed-forward, in order to obtain the angular speed reference of the motor.

Its value is universely proportional to the roll diameter.

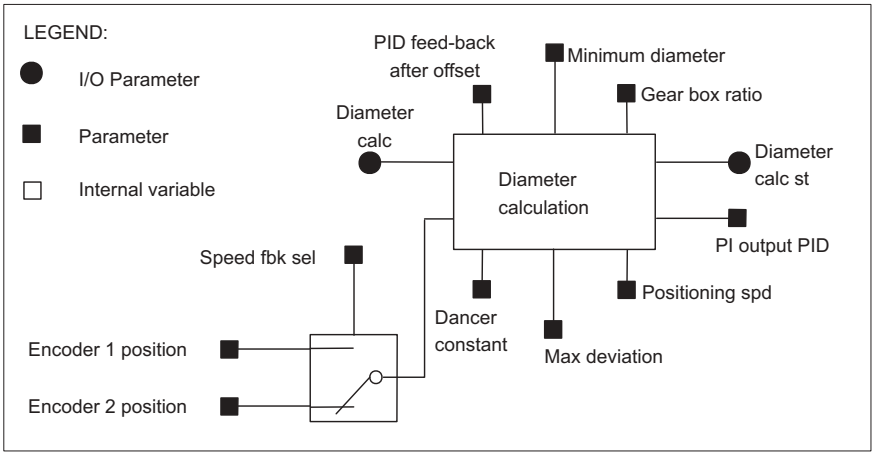


Figure 6.17.3.6: Diameter calculation block description

Diameter calc
Diameter calc
Positioning spd
Max deviation
Gear box ratio
Dancer constant
Minimum diameter

GA0888g

Parameter	N.	Value			Standard configuration
		min	max	default	
Diameter calc	794	0	1	0	*
Positioning spd	795	-100	+100	0	
Max deviation	796	-10000	+10000	8000	
Gear box ratio	797	0.001	1.000	1.000	
Dancer constant	798	1	10000	1	
Minimum diameter	799	1	2000	1	

GA6398g

* This function can be set on a digital programmable input.

Diameter calc Enabling of the initial function of diameter calculation.

The calculation will be enabled by setting **Diameter calc** = Enable.

If **Diameter calc** has been programmed on a digital input, this must be brought to a high logic level.

Positioning spd Motor speed at which the dancer is at its central working position, during the calculation phase of the initial diameter.

Max deviation Value expressed in count of D/A which corresponds to the maximum shift allowed by the dancer. This value will be associated with the starting measurement of the dancer movement during the calculation of the initial diameter.

During the preliminary phase of the commissioning, it is necessary to carry out the self-calibration of the analog inputs, so at the fullrange position of the dancer they will correspond, whatever was the value of the analog input, at 10000 counts. The parameter **Max deviation**, in order to guarantee a precise calculation of the movement , must be set at a value slightly lower. (standard **Max deviation** = 8000).

Gear box ratio Ratio reduction between the motor and the winder (< = 1).

Dancer constant It expresses the measure in mm, the total bunching of material in the dancer.

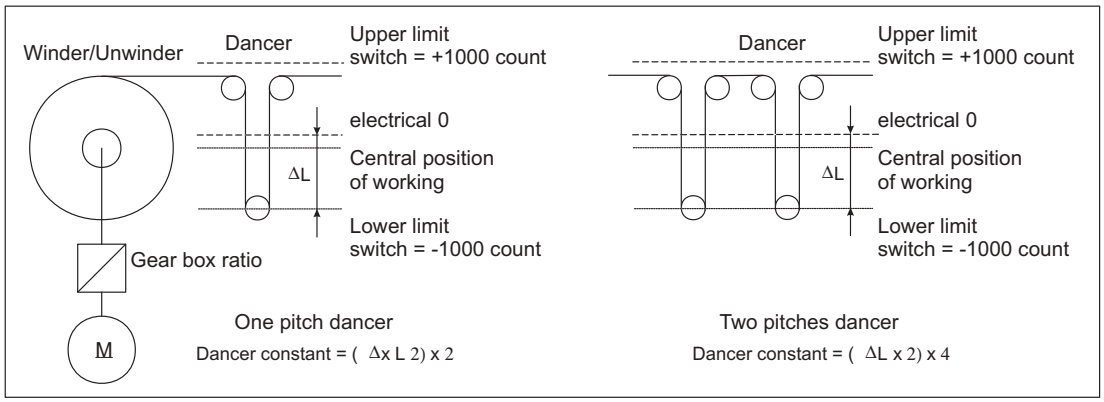


Figure 6.17.3.7: Diameter calculation

Measurement of Dancer constant

With dancer in lower fullrange position, perform the self-calibration of the analog input programmed as **PID feed-back**.

Set the keypad of the drive on the parameter **PID feed-back**.

Measure and multiply by 2, the distance in mm between the lower mechanical fullrange and the position of the dancer that, on the parameter **PID feed-back,** will display 0 (position of electrical 0).

Multiply the above calculated value by 2 if the dancer has only one pitch, by 4 if the dancer has two pitches and so on, as per the figure above.

Minimum diameter Min. value of core diameter expressed in cm.

6.17.3.9. Procedure of Calculation for Initial Diameter

The calculation is based on the measurement of the dancer movement from the lower fullrange position to its central working position, and on the measurent of the angular movement of the swift during the drawing phase. For that reason, during this period, make sure that the gear mantaining the material blocked. For this reason it is necessary to enable the regulation of the nip-roll drive with speed reference = 0.

If line nip-rolls are controlled by dancers or load cells, it is necessary to carry out the diameter calculation of the winders/unwinders first, then the gear.

The parameter **PI central v sel** must be set at 0 to avoid **PI output PID** being set automatically at a predefined value.

Bringing the digital input programmed as **Diameter calc** to a high logic level (+24V) , if the drive is enabled, will start the procedures. During this phase, the parameters **Enable PI PID** and **Enable PD PID** are automatically disabled.

The regulation verifies the signal coming from the dancer potentiometer. If this is higher than what is already set in **Max deviation**, the motor begins following the speed reference set in **Positioning speed** in order to wind the material and bring the dancer to its central position of working.

The polarity of the reference assigned to **Positioning speed** will be winder / unwinder equal to the one working as a winder.

If the initial regulation verifies that the signal coming from the potentiometer of the dancer is lower than what already set in **Max deviation**, the motor starts running with speed reference set in **Positioning speed** in order to unwind the material and bring the dancer on the point identified by **Max deviation**, at this point the reference will be inverted to bring the dancer to its central position.

When the dancer has reached the central position, the parameter **PI output PID** will be set at a value inversely proportional to the diameter and the digital output **Diameter calc st**, that indicates the end of diameter calculation, will be brought to high logical level .

At this point, if **Enable PI PID** and/or **Enable PD PID** are enabled, the system passes automatically in regulation. For this reason generally the digital inputs programmed as **Diameter calc** and **Enable PI PID** and/or **Enable PD PID** will be brought to high logic level at the same time.

The output signal **Diameter calc st** can be used to reset the command **Diameter calc** (this command will be activated on the sliding edge of the digital input). For that reason, it must be brought to high logical level after the supply of the regulation part of the drive and reset once the initial calculation phase has finished.

The value of **PI output PID** will be calculated with the following formula:

PI output PID = (**Min diameter x PI top lim**) / Value of the calculated diameter

The parameters **PI top limit** and **PI bottom limit** in the menu **PI controls** have to be set according to the max. and min. diameter of the roll. For better explanation, please refer to paragraph 6.17.3.10 “Application examples”.

6.17.3.10. Examples of Application

Nip-roll control with dancer

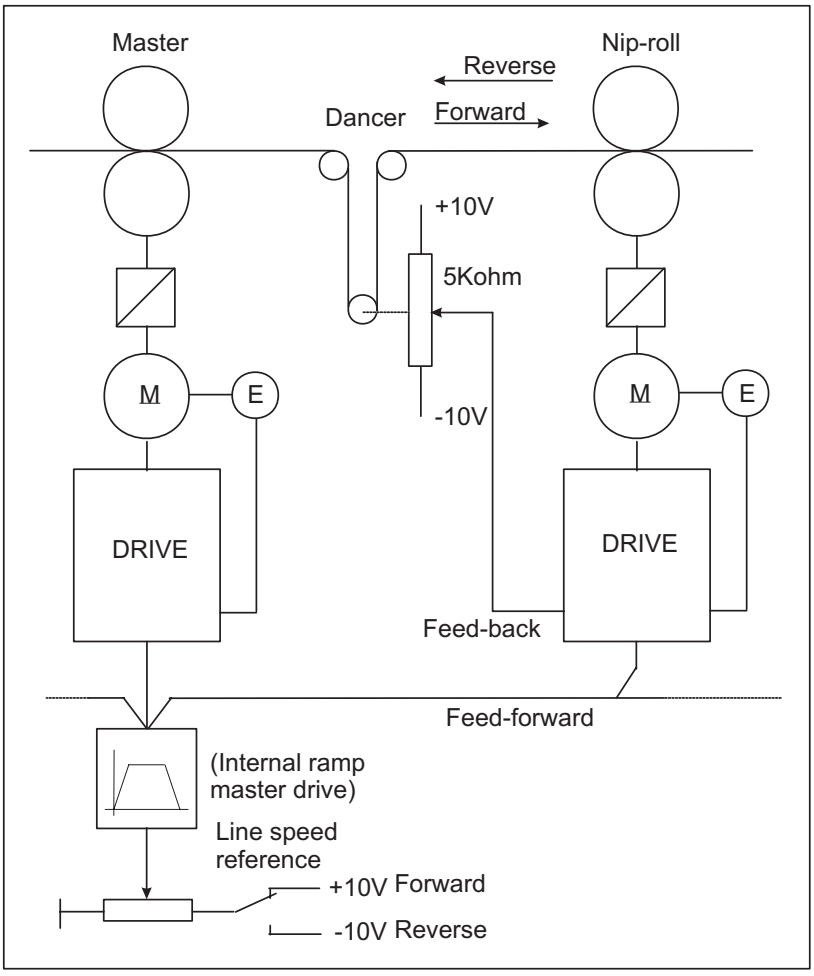


Figure 6.17.3.8: Nip-roll control with dancer

Machine data:

Rated speed of slave motor Vn = 3000rpm

Slave motors speed correspondent to the max. line speed = 85% Vn = 2550rpm

Max. correction of the dancer = +/- 15% of the line speed = +/- 382.5rpm

The slave drive must be sent the analog signals regarding line speed and the position of the dancer (whose potentiometer will be supplied between terminals -10V... +10V) and the digital commands regarding the enabling of the PID control.

The regulator output will be sent to speed reference 1.

Drive setting: (below parameters regarding only the PID function)

Input/output.

Set **Analog input 1** as input for the cursor of the dancer.

Analog input 1 / Select input 1= PID Feed-back

Set **Analog input 2** as line speed input (feed- forward).

To set the feed-forward on analog input, seeing that this one is not directly accessible in the list of high-priority parameters, it is necessary to pass through a supporting parameter **PAD 0.....PAD 15**.

Analog input 2 / Select input 2 = PAD 0

Set **Digital input 1** as enabling input of PI block of the PID

Digital input 1 = Enable PI PID

Set **Digital input 2** as enabling input of PD block of the PID

Digital input 2 = Enable PD PID

Parameters.

Set **Speed base value** equal to the rated speed of the motor.

Speed base value = 3000rpm

Set **PID source** as **PAD 0**.

(**PAD 0** has been used as supporting parameter for the feed-forward reading on **Analog input 2**)

For **PID source**, set the parameter number to which it will be associated, choosing it from the list of paragraph 10.4. "*List of high-priority parameters*' (**PAD 0** has the decimal number 503).

To obtain the correct value it must be added to the decimal number 8192 (fixed offset):

PID source = (8192 + 503) = 8695

Set **PID source Gain** so that **Feed-fwd PID** reaches, along with the max. analog value on Analog input 2, 85% of its max. value = 10000 x 85%.

When an analog input is set on a PAD parameter, this will have a max. value +/- 2047.

So: **PID source Gain** = (max **Feed-fwd PID** x 85%) / max **PAD 0** = (10000 x 0.85) / 2047 = 4.153

Set **PID target** as **Speed ref 1**.

NOTE: When the ramp function is enabled, **Speed ref 1** is not available. In order to keep it available, it is necessary to set the parameter **Enable ramp** = Disable.

PID target must be set to the parameter number to which it will be associated, choosing it from the list of paragraph 10.4, "*List of high-priority parameters*" (**Speed ref 1** has the decimal number 42).

To obtain the correct value it must be added the decimal number 8192 (fixed offset)

PID target = 8192 + 42 = 8234

Set **PID out scale** so that , the max. analog value on **Analog input 2** (**Feed-fwd PID** = 8500) and **Enable PI PID** and **Enable PD PID** = Disable, **Speed ref 1** is the same at 2550rpm.

The parameter **Speed ref 1** will set in RPM x 4, so:

PID out scale = (2550 x 4) / 8500 = 1.2

Set **PI central v sel** = 1.

Set **PI central v 1** = 1

In absence of a correction performed by the PI block of the regulator, the line speed reference (Feed-forward) must be multiplied by 1 and sent directly to the speed regulator of the drive.

In this application, the regulator carries out a mono type proportional control. The correction will be indicated in percentage, according to the line speed, from 0 to the maximum.

Set **PI top limit** and **PI bottom limit** so that, with max. of the dancer (max.value of the analog input 1 = **PID Feed-back**) and setting the proportional gain of the PI block at 15%, it will correspond to an equal proportional correction of feed-forward. For this reason set:

PI top limit = 10

PI bottom limit = 0.1

Set **PI P gain PID** = 15%

Set **PI I gain PID** = 0%

With this configuration, having a correction proportional to the line speed, the PI block is not able to position the dancer at speed = 0. In order to do the drawing in stop conditions, it is necessary to use the PD block.

Set **PD P gain PID** to a value that allows positioning of the dancer without large dynamic variations.

For example:

PD P gain PID = 1%

If necessary, use the derivative component as damping component of the system, setting for example:

PD D gain PID = 5%

PD D filter PID = 20ms

If not necessary, keep these parameters = 0.

If it is necessary to carry out a reference cascade for another drive, set **PID output** on an analog output, for example:

Analog output 1 / Select output 1= PID output

(with **Real FF PID** = 10000 count, **Analog output 1** = 10V).

Nip-rolls control with load cell

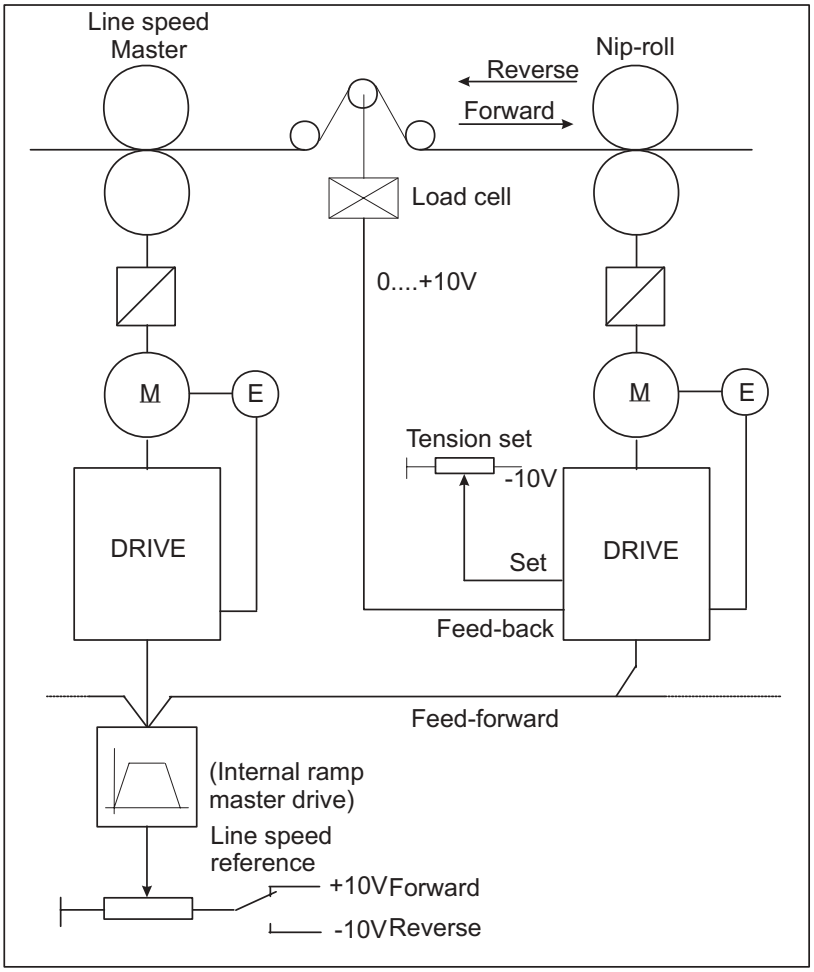


Figure 6.17.3.9: Nip-rolls control with load cell

Machine data:

Rated speed of slave motor Vn = 3000rpm

Slave motors speed corresponding to the max. line speed = 85% Vn = 2550rpm

Max. correction of the dancer = +/- 20% of the line speed = +/-510rpm

To the slave drive must be sent the analog signals regarding the line speed and the position of the load cell signal (0... +10V) and the tension set (0... +10V), and the digital commands regarding the enabling of the PID control.

The regulator output will be sent to the speed reference 1.

Drive setting: (below are parameters regarding only the PID function)

Input/output.

Set **Analog input 1** as input for the load cell signal.

Analog input 1 / Select input 1= PID Feed-back

Set **Analog input 2** as line speed input (feed- forward).

Setting the feed-forward on analog input, seeing that it is not directly inserted in the list of high-priority parameters, it is necessary to pass through a supporting parameter **PAD 0.....PAD 15**.

Analog input 2 / Select input 2 = PAD 0

Set **Analog input 3** as input for the tension set (**PID offset 0**).

Analog input 3 / Select input 3 / PID offset 0

Set **Digital input 1** as enabling input of the PI block of the PID

Digital input 1 = Enable PI PID

Set **Digital input 2** as enabling input of the PD block of the PID

Digital input 2 = Enable PD PID

Parameters

Program **Speed base value** equal to the rated speed of the motor.

Speed base value = 3000rpm

Program **PID source** as **PAD 0**.

(**PAD 0** has been used as supporting parameter of the feed-forward reading on **Analog input 2**)

For **PID source** set the parameter number to which it will be associated, choosing it from the list of paragraph 10.4. "*List of high-priority parameters*' (**PAD 0** has the decimal number 503).

To obtain the correct value it must be added the decimal number 8192 (fixed offset):

PID source = (8192 + 503) = 8695

Set **PID source Gain** so that **Feed-fwd PID** reaches, along with the max. analog value on **Analog input 2**, 85% of its max. value = 10000 x 85%.

When an analog input is set on a PAD parameter , this will have a max. value +/- 2047.

So:

PID source Gain = (max **Feed-fwd PID** x 85%) / max **PAD 0** = (10000 x 0.85) / 2047 = 4.153

Set **PID target** as **Speed ref 1**.

NOTE: When the ramp function is enabled, **Speed ref 1** is not available. In order to have it available, it is necessary to set the parameter **Enable ramp** = Disable.

For **PID target** set the parameter number to which it will be associated, choosing it from the list of paragraph 10.4 *"List of high-priority parameters'* (**Speed ref 1** has the decimal number 42).

To obtain the correct value it must be added the decimal number 8192 (fixed offset)

PID target = 8192 + 42 = 8234

Set **PID out scale** so that, along with the max. analog value on **Analog input 2** (**Feed-fwd PID** = 8500) and with **Enable PI PID** e **Enable PD PID** = disable, **Speed ref 1** is the same at 2550rpm.

Speed ref 1 will be set in *RPM* x 4, so:

PID out scale = (2550 x 4) / 8500 = 1.2

Set **PI central v sel** = 1.

Set **PI central v 1** = 1

In the absence of a correction carried out from the PI block of the regulator, the line speed reference (Feed-forward) must be multiplied by 1 and sent directly to the speed regulator of the drive.

This application operates by using proportional control. The correction will be indicated in percentage according to the line speed, from 0 to the maximum.

Set **PI top limit** and **PI bottom limit** so that the max. correction of PI block corresponds at 20% of line speed.

PI top limit and **PI bottom limit** parameters are the maximum and minimum multiplier factor of Feed forward value.

At the max. line speed it will correspond 2550rpm of the motor (max. feed-forward).

Max. correction = 2550 x 20% = 510rpm

2550 + 510 = 3060rpm ——> **PI top limit** = 3060 / 2550 = 1.2

2550 - 510 = 2040rpm ——> **PI bottom limit** = 2040 / 2550 = 0.80

which will multiply the setting of **PI central v 1** (= 1) by + 20% (1.2) and - 20% (0.80).

With this configuration, having a correction proportional to the line speed, the PI block is not able to apply tension at speed = 0. In order to apply tension in stop conditions, it is necessary to use on the PD block.

The gains of the single components have to be set with loaded machine; it is possible to start tests with values below indicated (default values):

Set **PI P gain PID** = 10%

Set **PI I gain PID** = 10%

Set **PD P gain PID** = 10%

In case use the derivative component for forcing the regulator output during velocity changes of the system, programming for example:

PD D gain PID = 5%

PD D filter PID = 20ms

If not necessary, keep these parameters = 0.

In case it is necessary to carry out a references cascade for another drive, set **PID output** on an analog output, for example:

Analog output 1 / Select output 1= PID output

(with **Real FF PID** = 10000 count, **Analog output 1** = 10V).

NOTE: If it is necessary, a system with the integral regulation enabled, with feed-forward = 0, and the need to apply tension of the system with null error also when the machine is stopped, please refer to the paragraph “Generic PID”.

Winder/Unwinder control with dancer

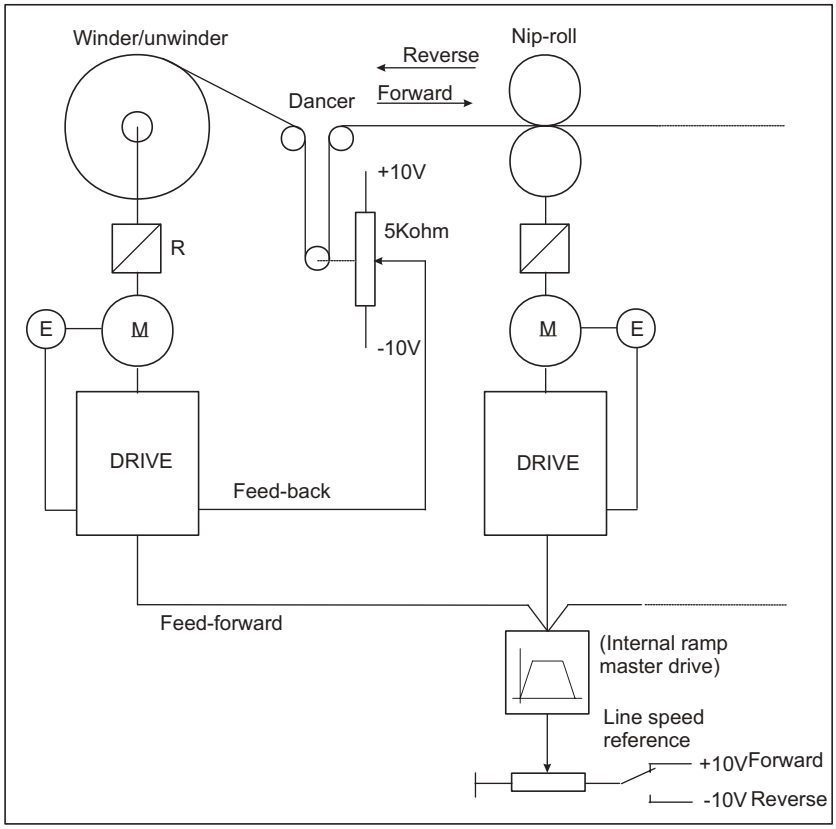


Figure 6.17.3.10 Winder/Unwinder control with dancer

Machine data:

Max. line speed =400m/min

Rated speed of the motor winder/unwinder Vn = 3000rpm

Max. diameter of the winder/unwinder = 700mm

Min. diameter of the winder/unwinder = 100mm

Reduction ratio motor-swift = 0.5

One pitch dancer

Dancer stroke from the lower limit switch to the position of electric 0 = 160mm

The drive of the winder/unwinder must be sent the analog signals regarding line speed and the position of the dancer (whose potentiometer will be supplied between the terminals -10V... +10V) and the digital commands regarding the enabling of the PID control.

The regulator output will be sent to the speed reference 1.

Drive setting: (below are only the parameters regarding the PID function)

Input/output.

Set **Analog input 1** as input for the cursor of the dancer.

Analog input 1 / Select input 1= PID Feed-back

Set **Analog input 2** as line speed input (feed- forward).

To set the feed-forward on an analog input, seeing that this one is not directly accesible in the list of high-priority parameters, it is necessary to pass through a supporting parameter **PAD 0.....PAD 15**.

Analog input 2 / Select input 2 = PAD 0

Set **Digital input 1** as enabling input of the PI block of the PID

Digital input 1 = Enable PI PID

Set **Digital input 2** as enabling input of the PI block of the PID

Digital input 2 = Enable PD PID

Set **Digital input 3** as enabling input of the calculation function of initial diameter.

Digital input 3 = Diameter calc

Set **Digital output 1** as signalling " phase of calculation of starting diameter ".

Digital output 1 = Diameter calc st

Parameters

Set **Speed base value** equal to the rated speed of the motor.

Speed base value = 3000rpm

Set **PID source** as **PAD 0**.

(**PAD 0** has been used as supporting parameter of the feed-forward reading on **Analog input 2**)

For **PID source** set the parameter number to which it will be associated, choosing it from the list of the paragraph 10.4. "*List of high-priority parameters*' (**PAD 0** had the decimal number 503). To obtain the correct value it must be added the decimal number 8192 (fixed offset):

PID source = (8192 + 503) = 8695

Set **Gain source** and **PID out scale** so that, the max. analog value on **Analog input 2** and without the PID correction (**Enable PI PID** e **Enable PD PID** = Disable), the peripheral speed of the swift in conditions of minimum diameter (soul) is the same of the max. line speed.

Calculation of the motor speed in the condition above mentionned:

$Vp = \pi \times \Phi min \times \omega \times R$

where:

Vp = peripheral speed of the swift = line speed

Φmin = min. diameter of the swift [m]

ω = angular speed of the motor [rpm]

R = reduction ratio motor-swift

ω = Vp / π x Φmin x R = 400 / (π x 0.1 x 0.5) = 2546rpm = about 2550rpm

Mantaining a 15% margin as to the saturation limit of the regulator (10000 count), it is necessary to set **PID source Gain** so that **Feed-fwd PID** reaches, along with the max. analog value on **Analog input 2**, 85% of its max. value.

When an analog input is set on a PAD parameter , this will have a max. value +/- 2047.

So:

PID source Gain = (max **Feed-fwd PID** x 85%) / max **PAD 0** = (10000 x 0.85) / 2047 = 4.153

The speed reference of the motor is set in *RPM* x 4, so program as follows:

PID out scale = (2550 x 4) / (10000 x 0.85) = 1.2

Set **PID target** as 1 **Speed ref 1**.

NOTE: When the ramp function has been enabled, **Speed ref 1** is not available. To keep it available it is necessary to set the parameter **Enable ramp** = Disable.

For **PID target** set the parameter number to which it will be associated, choosing it from the list of paragraph 10.4. "*List of high-priority parameters*' (**Speed ref 1** has the decimal number 42).

To obtain the correct value it must be added the decimal number 8192 (fixed offset):

PID source = (8192 + 42) = 8234

Set **PI central v sel** = 0.

Using this procedure it is possible to calculate the initial diameter and store in memory its value automatically in case of drive switch off.

As previously stated, the procedure determines the theorical multiplier factor (**PI output PID**) of feed-forward as relation of the diameter calculated. In order to send to the drive the correct speed angular value.

NOTE: When **PI central v sel** = 0 has been selected and the the PI block has been disabled, the system keeps in memory, or reset automatically in case of switching off, the last value calculated for **PI output PID**. If it would be necessary to set the value in order to have at the output an incorrect reference and so equal to the feed-forward, it is possible to configure a digital input as correction reset.

So configure:

Digital input 4 = PI central v S0

PI central v 1 = 1.00

Bringing the digital input to logical high level, the **PI output PID** will be reset.

Set **PI top lim** and **PI bottom lim** according to the ratio diameters swift.

Parameters **PI top lim** and **PI bottom lim** can be considered as multiplier factors, respectively max. and min. of the feed-forward.

Considering that the angular speed of the motor and the corresponding reference, change inversely to the unwinder/ winder diameter;

Set:

PI top lim = 1

PI bottom lim = Φmin / Φmax = 100 / 700 = 0.14

Below is an explanation of above settings.

Calculation of the angular speed of the motor:

ω max. = Vl / (π x Φmin x R)

and

ω min = Vl / (π x Φmax. x R)

where:

ω max. = angular speed of the motor in conditions of min. diameter [rpm]

ω min = angular speed of the motor in conditions of max. diameter [rpm]

Vl = line speed

Φmin = min. diameter of the core[m]

Φmax. = max. diameter of the core[m]

R = gear reduction ratio motor-winder/unwinder

So: ω max. / ω min = Φmax. / Φmin

from which

ω min = (Φmin / Φmax) x ω max.

Considering that the **PI top lim** and **PI bottom lim** parameters can be considered as multiplier factors max. and min. of the feed-forward.

Multiplying the feed-forward by **PI top lim** = 1, gives the max. speed reference concerning the minimum diameter.

Multiplying the feed-forward by **PI bottom lim** = 0.14, gives the min. speed reference concerning the max. diameter.

This application operates by using the proportional-integral regulation.

The gains of a single component will be experimentally set with a loaded machine. It is possible to begin the tests with the values below:

Set **PI P gain PID** = 15%

Set **PI I gain PID** = 8%

Set **PD P gain PID** = 5%

In this case, use the derivative component for forcing the regulator output during velocity changes of the system. Programming for example:

PD D gain PID = 20%

PD D filter PID = 20ms

In case it is necessaryto carry out a reference cascade for another drive, program **PID output** on an analog output, for example:

Analog output 1 / Select output 1= PID output

(with **Real FF PID** = 10000 count, **Analog output 1** = 10V).

Parameters regarding the calculation function of the initial diameter

This function is always necessary when one has to control an unwinder or when the starting diameter is unknown.

Set **Positioning spd** at the value, in rpm, with which the initial positioning of the dancer has to be done. For example:

Positioning spd = 15rpm

The polarity of the reference assigned to **Positioning speed** will be (winder/unwinder) equal to the one functioning as a winder.

If for example one has to control an unwinder and the speed reference in standard functioning is positive, assign to **Positioning spd** a negative value.

Set **Max deviation** at a value slightly lower than the one correspondent to the position of max. mechanical sealing allowed by the dancer.

During commissioning, it is always necessary to carry out the self calibration of the analog inputs of the drive. In particular the one regarding analog input 1, with dancer in its position of lower fullrange, This position is automatically assigned to the value 10000. So in order to guarantee a precise calculation it might be assigned:

Max deviation = 8000 (Default value)

Set **Gear box ratio** equal to the reduction ratio between the motor and the winder/unwinder:

Gear box ratio = 0.5

Set **Dancer constant** to the value in mm correspondent to the total accumulation of material in the dancer:

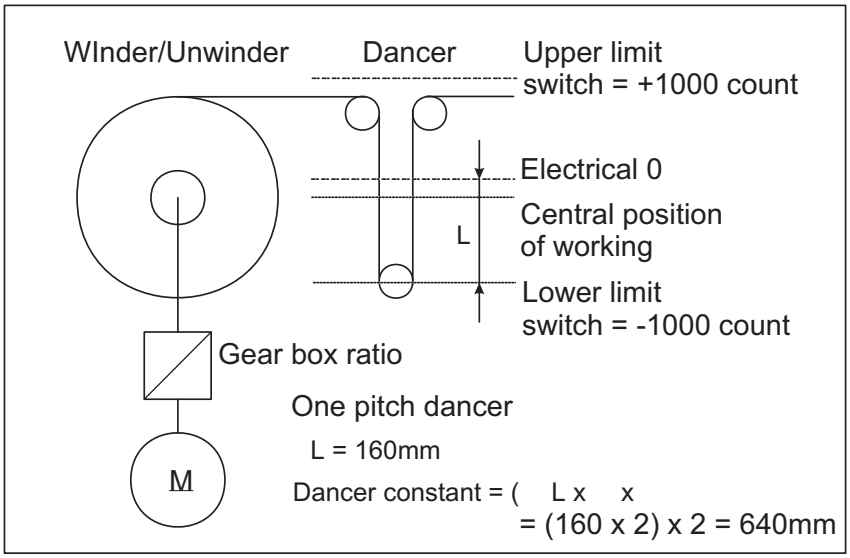


Figure 6.17.3.11: Diameter calculation

Measure of **Dancer constant**:

Set the keypad of the drive on the parameter **PID feed-back**.

Measure and multiply by 2, the distance between the lower mechanical fullrange and the position of the dancer so that in the parameter **PID feed-back** will display 0 (position of 0 electric).

As the dancer has only one pitch, multiply the above calculated value by 2.

In this case set:

Dancer constant = 640mm

Programm **Minimum diameter** equal to the minimum value of the core diameter [cm]:

Minimum diameter = 10cm

Use of the diameter sensor

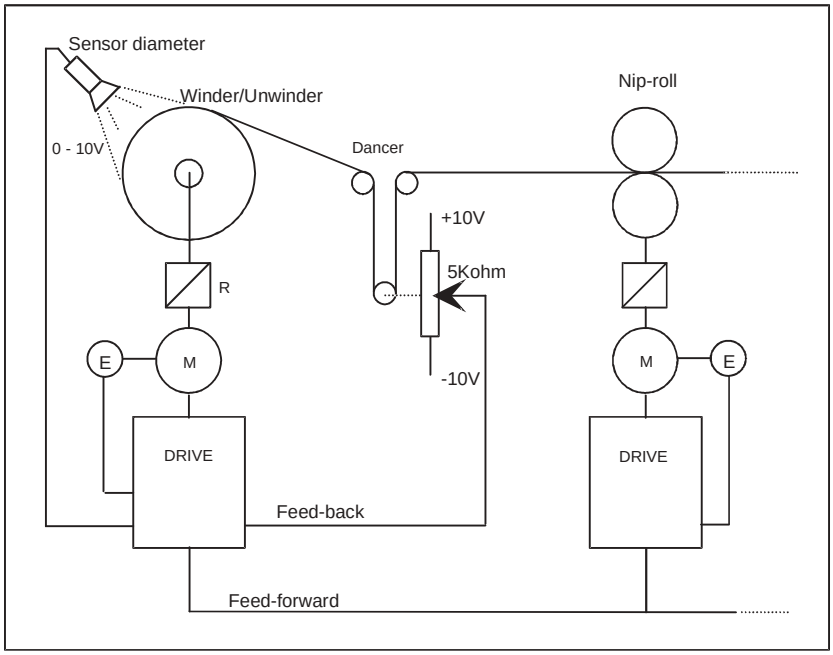


Figure 6.17.3.12 Winder/unwinder control with diameter sensor

The diameter sensor can be used in case of unwinder system with automatic gear.

In these cases, it is necessary to know the value of the starting diameter, in order to calculate the reference of the angular speed of the motor, before the insertion of the new core.

The transducer must set in order to supply a voltage signal proportional to the roll diameter.

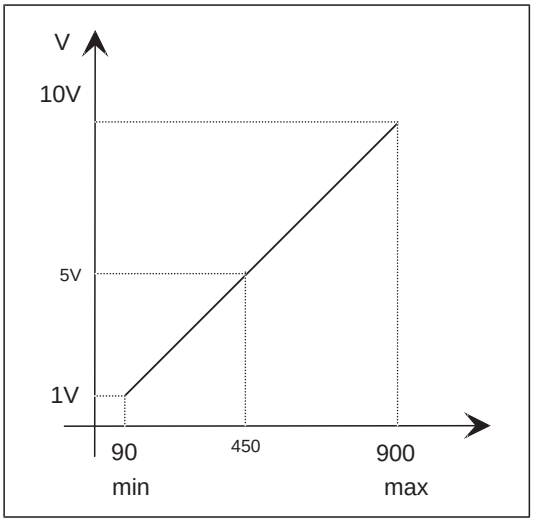


Figure 6.17.3.13: Relation between transducer signal and winder/unwinder diameter

Example:

Φmin	= 90 mm	transducer output = 1V
Φmax	= 900 mm	transducer output = 10V
Φ	= 450 mm	transducer output = 5V

The analog input to which the sensor is connected, must be programmed as **PI central V3**.

The parameter **PI central v sel**, must be set = 3.

When **Enable PI PID** = disable, the value of **PI central V3** is written in **PI output PID** and used as multiplier factor of the feed-forward.

As previously described in the instruction book, the setting of PI output PID depends on the diameters ratio, so the voltage signal proportional to the diameter will be automatically recalculated with the formula:

PI central V3 = (Φ_0 / Φ_1)

Where: Φ_0 = minimum winder diameter

Φ_1 = actual diameter

Setting resolution = 3 digits after the comma (also if in **PI central V3** are displayed only 2 digits after the comma).

NOTE ! During commissioning, it is necessary to verify that the signal coming from the sensor as proportional to the diameter and that its maximum value is corresponding to 10V (carry out the autotune of the analog input).

It is necessary to verify that **PI top lim** and **PI bottom lim** had been programmed

Pressure control for pumps and extruders

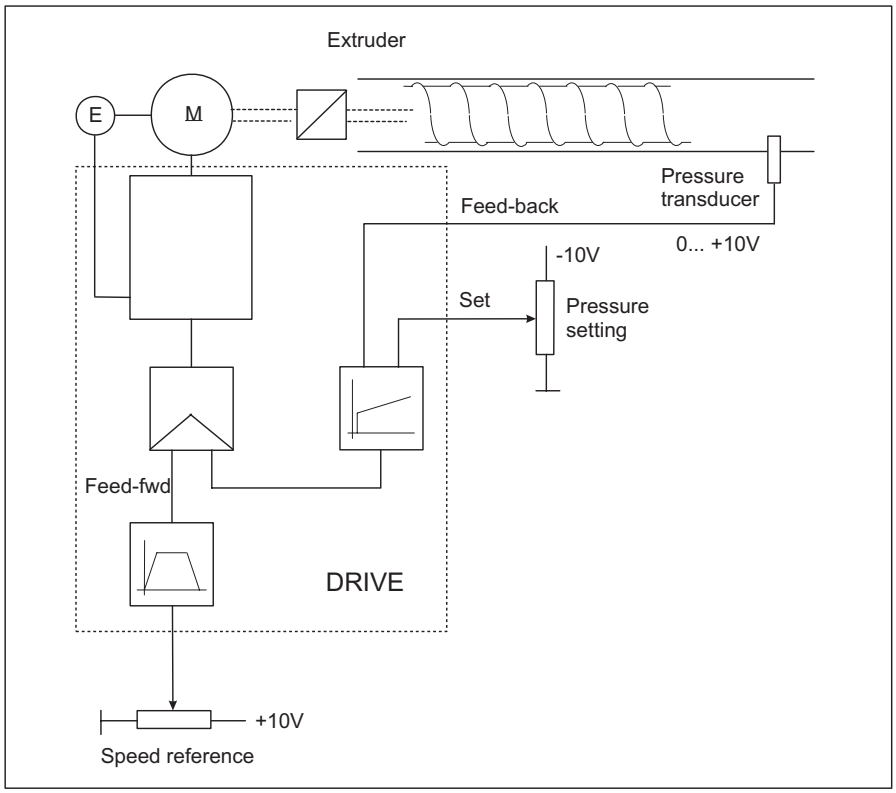


Figure 6.17.3.14: Pressure control for pumps and extruder

Machine Data:

Nominal speed of the extruder motor Vn = 3000rpm

Pressure transducer 0... +10V

The extruder slave drive must be sent analog signals concerning speed reference, the pressure transducer, the setting of potentiometer for pressure (supplied between 0V... -10V) and the digital commands concerning the enabling of the PID control.

The regulator output must be sent to the speed reference 1.

Setting of the drive: (below are only the parameters regarding the PID function)

Input/output.

Set **Analog input 1** as input for the pressure transducer.

Analog input 1 / Select input 1= PID Feed-back

Set **Analog input 2** as input for the ramp block. The output of the ramp block must be used as speed reference. (feed- forward).

Analog input 2 / Select input 2 = Ramp ref 1

Set **Analog input 3** as input for the pressure setting (**PID offset 0**).

Analog input 3 / Select input 3 / PID offset 0

Set **Digital input 1** as enabling input for the PI block of the PID

Digital input 1 = Enable PI PID

Set **Digital input 2** as enabling input for the PD block of the PID

Digital input 2 = Enable PD PID

Parameters.

Set **Speed base value** equal to the motor nominal speed .

Speed base value = 3000rpm

Set **PID source** as **Ramp output**.

For **PID source** set the parameter number to which it will be associated, choosing it from the list of section 10.4. "*List of high priority parameters*' (**Ramp output** has the decimal number 113).

To obtain the correct value it must be added the decimal value 8192 (fixed offset):

PID source = (8192 + 113) = 8305

Set **PID source Gain** so that **Feed-fwd PID,** along with the maximum value of **Ramp output** (corresponding to the maximum value of the analog input 2), reaches 100% of its value = 10000.

The ramp reference and its output automatically acquire their maximum value from the setting of **Speed base value**. Therefore it must be taken into consideration that each writing or reading of any parameter concerning the speed is defined as *RPM* x 4.

So:

PID source Gain = max **Feed-fwd PID** / (**Speed base value** x 4) = 10000 / (3000 x 4) = 0.833

Set **PID target** as **Speed ref 1**.

NOTE: When the ramp function is enabled, **Speed ref 1** is not available. In order to make it available it is necessary to set the parameter **Enable ramp** = Disable. (This setting allows the working of the ramp block, but disconnects its output from the speed reference 1).

For **PID target,** set the parameter number to which it will be associated, choosing it from the list of the section 10.4. "*List of high priority parameters*'" (**Speed ref 1** has the decimal number 42). To obtain the correct value it must be added the decimal value 8192 (fixed offset):

PID target = 8192 + 42 = 8234

Set **PID out scale** so that the maximum analog value on **Analog input 2** (**Feed-fwd PID** = 10000) and with **Enable PI PID** and **Enable PD PID** = Disable, **Speed ref 1** were equal to 3000rpm.

The **Speed ref 1** must be set as RPM x 4, then:

PID out scale = (3000 x 4) / 10000 = 1.2

Set **PI central v sel** = 1.

Set **PI central v 1** = 1

In absence of correction performed by the PI block of the regulator, the line reference speed (Feed-forward) must be multiplied x 1 and sent directly to the speed regulator of the drive.

In this application, the regulator makes a proportional-integral control.

Set **PI top limit** and **PI bottom limit** in order to obtain maximum correction of the PI block equal to the 100% of the speed reference.

The parameters, **PI top limit** and **PI bottom limit** could be considered as the multiplier factor respectively maximum and minimum of the feed-forward.

PI top limit = 1

PI bottom limit = 0

In this application the regulator uses a proportional-integral type of control.

The gains of the various components must be set with the load on the machine. A reference, it is possible to start the test with the values below (default values):

Set **PI P gain PID** = 10%

Set **PI I gain PID** = 20%

Set **PD P gain PID** = 10%

If necessary, use the derivative component for forcing the regulator output during velocity changes of the system, setting for example:

PD D gain PID = 5%

PD D filter PID = 20ms

If not necessary, keep these parameters = 0.

6.17.3.11. Generic PID

Drive settings: (below are parameters regarding only the PID function)

Input/output.

Set **Analog input 1** as input of the variable which has to be regulated (Feed-back).
Analog input 1 / Select input 1= PID Feed-back

Set **Analog input 2** as input of the offset signal (**PID offset 0**).
Analog input 2 / Select input 2 / PID offset 0

Set **Digital input 1** as input for the enabling of the PI block of the PID
Digital input 1 = Enable PI PID
Set **Digital input 2** as input for the enabling of the PD block of the PID
Digital input 2 = Enable PD PID

Parameters

If it necessary to use the regulator as a "Generic PID", independent from the feed-forward function, the parameter **Feed-fwd PID** must be set at its maximum value. In order to do this it is necessary to go through a PAD parameter.

Set **PID source** to **PAD 0**.
For **PID source** set the parameter number to which it will be associated, choosing it from the list of the section 10.4. "*List of high priority parameters*" (**PAD 0** has the decimal number 503).
To obtain the correct value, it must be added the decimal value 8192 (fixed offset):
PID source = (8192 + 503) = 8695

Set **PAD 0** = 10000 (The parameter **PAD 0** is found in the "Special Function" menu').

NOTE: Setting PAD 0 = -10000, the output regulator polarity will be overwritten.

Set **PID source Gain** = 1

Set **PID target** with the parameter number that will be addressed to the output regulator.

To obtain the correct value it must be added to the decimal value 8192.
The parameters that can be addressed are described in "List of high priority parameters" in section 10.4.

Set **PID out scale** according to the parameter on which the regulator output has been addressed..
From the section 10.4. "List of high priority parameters ":
The parameters concerning the speed are expressed as [*SPD*].
The parameters concerning the current are expressed as [*CURR*].

Calculation of **PID out scale** when **PID target** is addressed on a parameter relative to the speed:

[*SPD*] = *RPM x 4*, so:

PID out scale = (max. speed x 4) / max. output PID = (max. speed x 4) / 10000

Calculation of **PID out scale** when **PID target** is addressed on a parameter relative to the current (active current):

1[CURR] = [**Current norm** / (2^{15} x $\sqrt{2}$)] A_{RMS}

Current norm depends on the inverter size, it can be choosen from the following table:

Drive Size	Rated drive curr [334]	Curr norm AMPS [267]
3002	3.8	16.3
3003	4.5	19.2
3005	7.0	29.7
3007	10.8	45.5
3010	13.8	57.9
3015	18.7	78.9
3020	24.2	102.7
3025	30.0	118.6
3030	36.0	150.8
3040	46.0	211.0
3050	58.0	243.0
3060	69.0	303.0
3075	86.0	350.8
3100	109.0	466.20
3125	137.0	606.06
3150	158.0	666.66
3200		

ga9349-575

Through the parameter **Full load curr** (FLC) in the menu CONFIGURATION the user must define the motor current at full load.

The inverter calculates the magnetizing current value **Magn working curr** based on parameters **Base voltage**, **Base frequency** and on the motor plate data.

The active current of the motor is defined by the internal parameter (not accessible via keypad) “Full load torque current” (Flt 100mf), and calculated through the formula:

$$Flt\ 100mf = \sqrt{FLC^2 - I\mu_{work}{}^2}$$

The percentage values of **Torque current ref** and **Torque current limit** are based on **Flt 100mf**.

The maximum value of the torque current can be defined as “Full load torque current”and it is calculated as:

$$Full\ scale\ torque\ current = \sqrt{FLC^2 - I\mu_{work}{}^2}\ \ / CURR\ [count]$$

PID out scale = Full scale torque current / max. output PID = Full scale torque current / 10000

Example:

Mains voltage	=	575V	Ambient temperature	=	40°C (104°F)
Motor:					
Nominal Voltage	=	575V	Nominal frequency	=	60Hz
Nominal current	=	3.2A	Nominal speed	=	1760rpm

Inverter type: 6KAVI53003

Switching frequency = standard

The output of the PID function is sent to the parametr **T current ref 2**.

After having carried out the base setting and the selftuning of the drive, from menu MOTOR PARAMETER comes out that **Magn working curr** = 1.6A.

(With an approximation it is possible to refer also to **Magnetizing current**).

Set in the menu CONFIGURATION:

Full load current = 3.2A

From the table above reported for 6KAVI53003 **Current norm** = 19.2A

CURR = [**Current norm** / (2^{15} x √2)] = 19.2 / 46340.95 = 0.00041432 = 4.143^{e-4} A_{rms}

$$\textit{Full scale torque current} = \sqrt{FLC^2 - I\mu_{work}^2} / CURR = \sqrt{3.2^2 - 1.6^2} / 4.143^{e-4} = 6680\ [count]$$

PID out scale = Full scale torque current / max. output PID = 6680 / 10000 = 0.668

With this configuration, when the PID output reaches its maximum value, the reference of the active current **T current ref 2** receives a value equal to the active nominal current of the motor.

It must be said that, in this way, the drive is not driven at its maximum. Increasing the value of **PID out scale** it is possible to control the motor in overload condition.

If the application requires working in these conditions, it is necessary to calculate the maximum admissible overload of the drive

Inverter continuative current I_{cont} = 4.5A

$$\textit{Full scale inverter torque current} = \sqrt{(Icont \times 1.36)^2 - I\mu_{work}^2} / CURR =$$
$$= \sqrt{(4.5 \times 1.36)^2 - 3.2^2} / 4.143^{e-4} = 12590\ [count]$$

PID out scale = Full scale inverter torque current / max. uscita PID = 12590 / 10000 = 1.259

With this configuration, when the PID output receives its maximum value, the active current reference

T current ref 2 gets the value corresponding to the 161% of the active current of the motor (1.259 / 0.668 = 1.88)

Furthermore it is necessary to set **T current lim+** and **T current lim-** = 188%

NOTE! The firmware of the drive does not perform a control on the polarity of the value sent. For this reason, if it is not necessary to address the regulator output on parameters “Unsigned”, then set the PID output so that it can only be positive.

PID out. sign PID = Only positive

The parameters “Unsigned”, for example the current limits **T current lim +** and **T current lim -**, are indicated in the “List of high priority parameters “ with the symbol “U16”.

Set **PI central v sel** = 1.

Set **PI central v 1** = 0

In this configuration, when the transition Off / On of the parameters for the enabling of the PID function, is executed the regulator output starts from 0.

If it is necessary to retain the last value calculated when the machine is disabled, it necassary to use a digital input programmed as:

Digital input xx = PI central v S0

PI central v 1 = 0

When the digital input is at a low logic level (L), the last value calculated is stored. Applying a high logic level (H) will reset the value.

Set **PI top lim** and **PI bottom lim** in order to obtain a correction of the PID block equal to 100% of its maximum value.

PI top lim = 1

PI bottom lim = -1

In this configuration the PID block output will be either positive and negative.

Setting **PI top lim** = 0, the positive part is blocked.

Setting **PI bottom lim** = 0, the negative part is blocked.

The gains of the various components must be set experimentally with the machine loaded.

It is possible to start the test with the following values:

Set **PI P gain PID** = 10%

Set **PI I gain PID** = 4%

Set **PD P gain PID** = 10%

In necessary, use the derivative component for forcing the regulator output during velocity changes of the system, setting for example:

PD D gain PID = 5%

PD D filter PID = 20ms

If not necessary, keep these parameters = 0.

6.17.3.12. Application Note

Dynamic modification of the integral gain of the PI block

In standard dancer applications, where there is not a build up of material, the PI gains are set to a constant value. Where dancers are used in conjuction with material winding, the gains are compromise between low gain setting at large diameter, and high gain settings at a small diameter. Using the drawing as an example, it can be seen that with a large diameter roll, the amount of material to move the dancer requires only a fraction of a turn. At a small diameter, or empty roll, the center of the roll must rotate a whole turn to move the same amount of material. Since the PI regulator is used to provide the correction in rpm to maintain the dancer position, having the gain set by a single value is inadequate when used with a winder

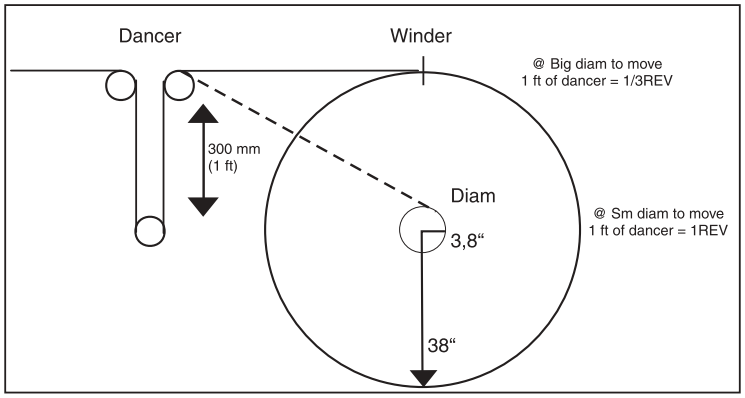


Figure 6.17.3.15 Example with small and large diameter

Better dancer control is realized if the gain of the PI is modified dynamically based on diameter.

This can be accomplished using LINKS function.

In case of higher ratio diameters, **PI I gain PID** could be dynamically changed according to the actual diameter. At the moment this functionality has not been implemented as specific function.

For example to control a winder having a diameters ratio of 1/10. The function LINK 1 is used to get a connection between the diameter and the value of the integral component of the PI block.

The integral component of the regulator must have a behavior inversely proportional to the diameter.

The value of the parameter **PI output PID** already follows this behavior, infact it changes according to the relation Φ_0 / Φ_{act}.

Where: Φ_0 = minimum swift diameter

Φ_{act} = actual swift diameter

The operation to carry out through the LINK parameter is:

PI output PID x KI **= PI I gain PID**

Where KI corresponds to the value of the integral component on minimum diameter condition.

Supposing that by functioning tests comes out that the system, on condition of minimum diameter is able to work till the maximum speed with steady dancer in electric zero position with **PI I gain PID** = 40%.

The LINK source must be associated to **PI output PID** [n^0 771]:

Source *link 1* = 8192 + 771 = 8963

The LINK destination must be associated to the value of the integral component= parameter PI I gain PID [n^0 764]:

Destination *link 1* = 8192 + 764 = 8956

The multiplier factor must be set to the value defined by the functioning tests above mentioned.

Mul gain *link 1* = 40

It will be necessary to set:

Div gain *link 1* = 1000 *

Input max *link 1* = 1000 *

Input min *link 1* = 100 **

Input offset *link 1* = 0

Output offset *link 1* = 0

Input absolute *link 1* = OFF

* The value 1000 is defined by **PI top lim** which will be in this case = 1 (correspondent to a maximum value of **PI output PID** = 1000).

** The value 100 is defined by **PI bottom lim** which will be in this case = 0.1 (correspondent to a minimum value of **PI output PID** = 100).

With this configuration at minimum diameter it will correspond an integral gain = 40% and at maximum diameter it will correspond an integral gain = 4%, between the two setpoints the gain will change with a hyperbolic characteristic.

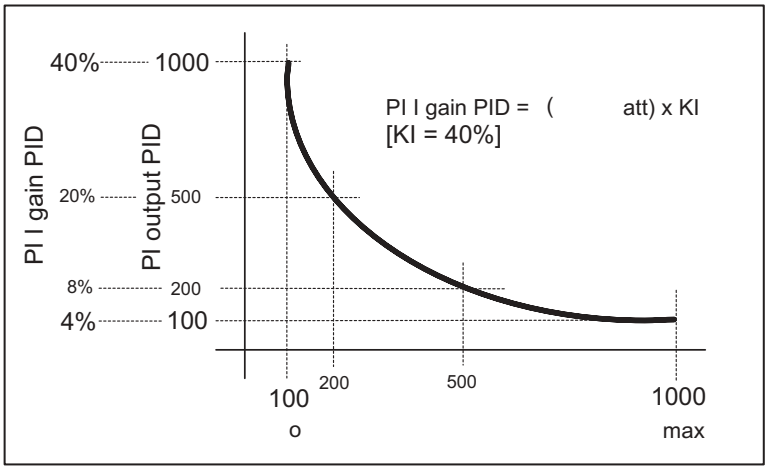


Figure 6.17.3.16: Relation between PI I gain PID and PI I output PID

The value of **PI I gain PID** will be displayed in the relative parameter of the submenu **PI controls**.

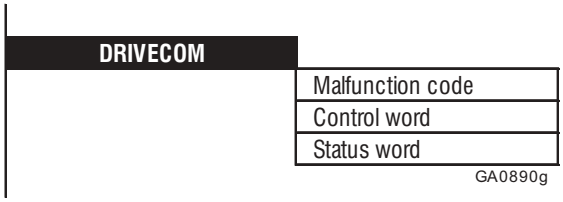
If necessary, using the LINK 2, it is possible to modify dynamically also the proportional gain **P gain PID.**

6.18. Drivecom

The DRIVECOM profile #21, “Power transission” defines the behavior of the drive if this is operated via the INTERBUS-S field bus. The DRIVECOM menu of the AV-300i Drive provides functions that were defined in the above standard and which are required to operate a motor with the drive.

The AV-300i Drives, however, have a considerably greater range of functions than is defined here. Apart from a few exceptions the parameters provided in this menu are described elsewhere in more detail. We will therefore restrict this description to the Parameters function. See section 10, “ Parameter lists”, for further information on the parameters concerned. When operating from a Bus, the parameters in the Drivecom group can also be accessed using the format and index specified in the above standard.

6.18.1. Control Word, Status Word, Malfunction Code



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Malfunction code	57	0	65535		
Control word	55	0	65535	0	
Status word	56	0	65535		

GA6360g

Malfunction code Malfunction code according to DRIVECOM specification (Mandatory functions)

The code displayed indicates a particular failure. The meaning of the individual failures concerned is described in section 6.12.9, “Programmable Alarms”.

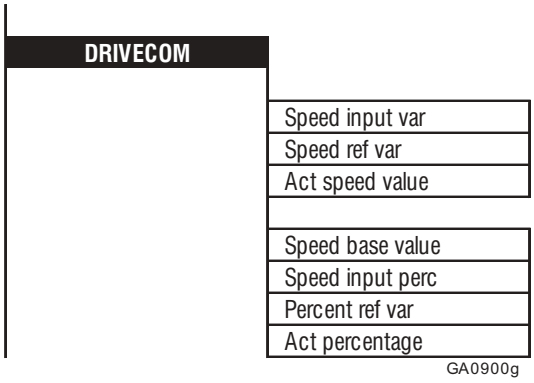
0000h **No failure**	4313h **Module overtemp**	7301h **Speed fbk loss**
2300h **Overcurrent**	4314h **Intake air ot**	7400h **Opt2**
3210h **Overvoltage**	5100h **Failure supply**	7510h **Hw Opt 1 failure**
3220h **Undervoltage**	5210h **Curr fbk loss**	8110h **Bus loss**
4210h **Heatsink sensor**	5410h **Output strages**	9000h **External fault**
4211h **Heatsink ot**	6110h **DSP error**	9009h **Enable seq err**
4212h **Regulation ot**	6120h **Interrupt error**	
4310h **Overtemp motor**	7110h **BU overload**	

The code and the alarm are displayed in plain text in the event of a failure. The code is given in hexadecimal format.

Control word Control word according to DRIVECOM specification (Mandatory functions)

Status word Status word according to DRIVECOM specification (Mandatory functions).

6.18.2. Speed



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Speed input var [FF]	44	-2*P45	+2*P45	0	*
Speed ref var [FF]	115	-32768	+32767		**
Act speed value [FF]	119	-32768	+32767		***
Speed base value [FF]	45	1	16383	1500	
Speed input perc [%]	46	-32768	+32767	0	*
Percent ref var [%]	116	-32768	+32767		**
Act percentage [%]	120	-32768	+32767		***

GA6365g

* Factory set as Ramp ref 1 and connected to analog input 1 (terminal 1 and 2). See reference values

** Factory set as Speed ref 1 and connected to the ramp output. See reference values.

*** Factory set as Motor Speed and connected to analog output 1. See BASIC MENU

Speed input var 1st ramp reference value. The value to be entered is based on the factor function

Speed ref var 1st speed reference value. The value to be entered is based on the factor function

Act speed value Speed actual value in the unit specified in the factor function.

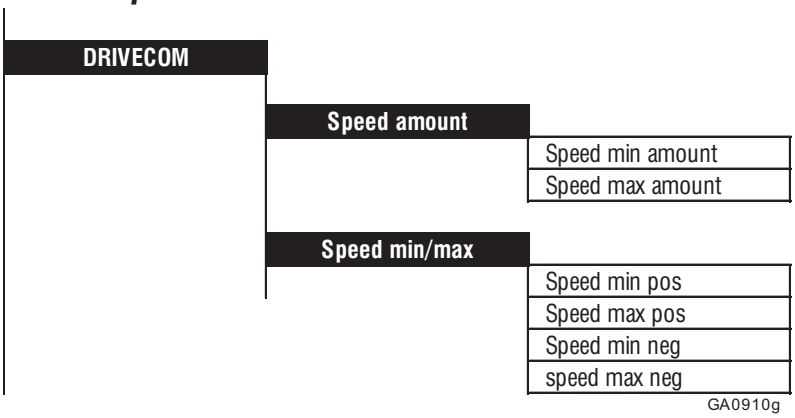
Speed base value The Speed base value is given in the unit specified in the factor function. It is the base value for all speed values given as a percentage (reference values, adaptive speed regulation ...). It is possible to modify the parameter drive only when the drive is disabled. (Enable drive = Disabled).

Speed input perc 1st ramp reference value. Defined as a percentage of the Speed base value

Percent ref var 1st speed reference value. Defined as a percentage of the Speed base value

Act percentage Speed actual value as a percentage of the Speed base value.

6.18.3. Speed Limitation



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Speed min amount [FF]	1	0	2^{32} -1	0	
Speed max amount [FF]	2	0	2^{32} -1	2000	
Speed min pos [FF]	5	0	2^{32} -1	0	
Speed max pos [FF]	3	0	2^{32} -1	2000	
Speed min neg [FF]	6	0	2^{32} -1	0	
Speed max neg [FF]	4	0	2^{32} -1	2000	

GA6370ai

Speed min amount Defines the minimum speed for both rotation directions. A lower value than the defined value is not possible, regardless of the reference value set. It has an effect on the input of the ramp. If the Speed min amount parameter is changed, the Speed min pos and Speed min neg parameters are set to the same value. If one of these two parameters is changed later, the last change is valid. The current value for positive rotation (clockwise) is shown in the display of the keypad. The value to be entered is based on the factor function.

Speed max amount Defines the maximum speed for both rotation directions. The function has an effect on the input of the speed regulator and therefore takes into account the reference value that comes from the ramp as well as the directly defined values (see Figure 6.5.2.1). If the Speed max amount is changed, the Speed max pos and Speed max neg parameters are set to the same value. If one of these two parameters is changed later, the last change is valid. The current value for positive rotation (clockwise) is shown in the display of the keypad. The value to be entered is based on the factor function.

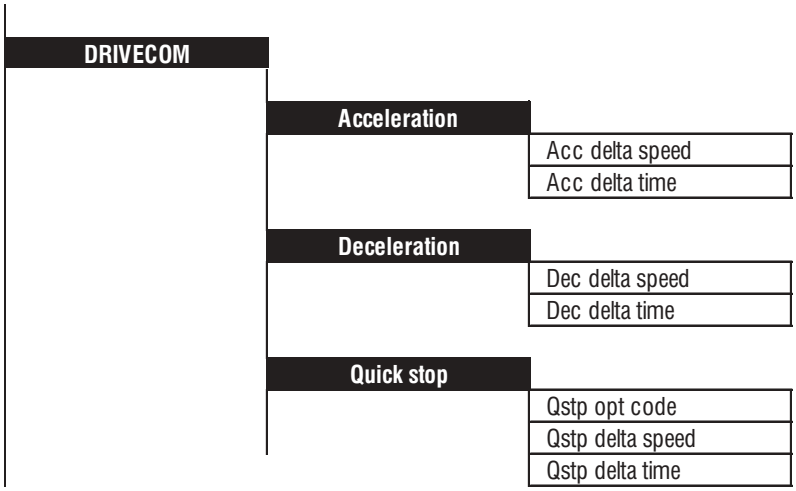
Speed min pos Defines the minimum speed for the clockwise rotation of the motor. A lower value than the defined value is not possible, regardless of the reference value. The function has an effect on the input of the ramp (see Figure 6.5.1.1). The value to be entered is based on the factor function.

Speed max pos Defines the maximum speed for the clockwise rotation of the motor. The function has an effect on the input of the speed regulator, and therefore takes intoconsideration the reference value that comes from the ramp as well as those that are entered directly (see Figure 6.5.2.1). The value to be entered is based on the factor function.

Speed min neg Defines the minimum speed for the counter clockwise rotation of the motor. A lower value than the defined value is not possible, regardless of the reference value. The function has an effect on the input of the ramp (see Figure 6.5.1.1). The value to be entered is based on the factor function.

Speed max neg Defines the maximum speed for the counter clockwise rotation of the motor. The function has an effect on the input of the speed regulator, and therefore takes into consideration the reference value that comes from the ramp as well as the those that are entered directly (see Figure 6.5.2.1). The value to be entered is based on the factor function.

6.18.4. Acceleration / Deceleration



Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Acc delta speed [FF]	21	0	2^{32} -1	100	
Acc delta time [s]	22	0	65535	1	
Dec delta speed [FF]	29	0	2^{32} -1	100	
Dec delta time [s]	30	0	65535	1	
Qstp delta speed [FF]	37	0	2^{32} -1	100	
Qstp delta time [s]	38	0	65535	1	
Quick stop Quick stop No Quick stop	343	0	1	No Quick stop (1)	
Quick opt code Ramp stop DC Braking curr	713	-2	-1	Ramp stop (-1)	

GA6375g

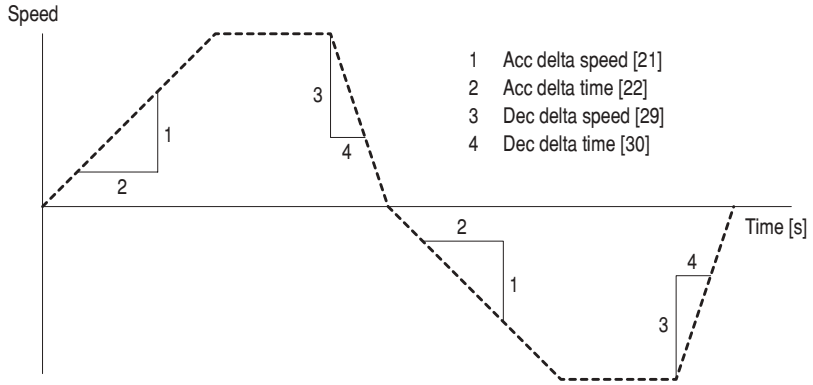


Figure 6.18.4.1: Accel and Decel

Acc delta speed Has the same unit as the ramp reference value and is based on the factor function.

Acc delta time Is defined in seconds. The ramp output follows the reference value directly if "0 s" is entered.

Dec delta speed Has the same unit as the ramp reference value and is based on the factor function.

Dec delta time Is defined in seconds. If "0 s" is entered, the ramp output follows the reference value directly.

Qstp delta speed Has the same unit as the ramp reference value and is based on the factor function.

Qstp delta time is defined in seconds. If "0 s" is entered, the ramp output follows the reference value directly.

Quick stop Activates the Quick stop ramp to stop the Drive.

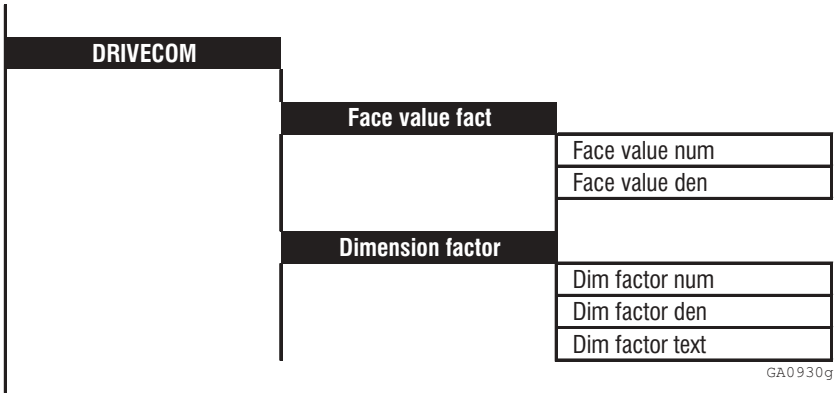
If SELECT Qstp Opt code = Ramp stop, the drive is stopped with the ramp defined by

Qstp Delta speed and Qstp delta time.

If SELECT Qstp Opt Code = DC braking curr, the drive is stopped by injection of DC current (section 6.16.7)

The acceleration of the drive is defined as a quotient of the **Acc delta speed** and **Acc delta time** parameters. It is the same for both rotation directions of the motor. The deceleration of the drive is defined as a quotient of the **Dec delta speed** and **Dec delta time** parameters. It is the same for both rotation directions of the motor.

6.18.5. Factor Function



The factor function contains two functions, the Dimension factor and Face value factor. They are both expressed as fraction numbers.

The dimension factor enables the drive speed to be defined in a machine-related dimension, e.g. kg/h or m/min.

Further information and examples are given in section 6.12, " Configuration".

Parameter	No.	Value			Standard Configuration
		min	max	Factory	
Dim factor num	50	1	65535	1	
Dim factor den	51	1	$+2^{31}$ -1	1	
Dim factor text	52			rpm	
Face value num	54	1	+32767	1	
Face value den	53	1	+32767	1	

GA6380g

Dim factor num Numerator of the dimension factor

Dim factor den Denominator of the dimension factor

Dim factor text Unit of the dimension factor. This text is shown in the display of the keypad when the reference value is shown.

Possible characters: / % & + , - . 0...9 : < = > ? A...Z [ ] a...z

Face value num Numerator of the reference value factor.

Face value den Denominator of the reference value factor.

See example in section 6.12.8, "Dimension Factor, Face Value Factor on how to make the calculation.

6.19. Service

The SERVICE menu is reserved for the manufacturer’s service personnel.

Chapter 7 - Maintenance

7.1. Care

The AV-300i Drives must be installed according to the relevant installation regulations. They do not require any particular maintenance. They should not be cleaned with a wet or moist cloth. The power supply must be switched off before cleaning.

7.2. Service

The screws of all terminals on the device should be re-tightened two weeks after initial commissioning. This should be repeated each year.

If the drives have been stored for more than three years, the capacitance of the intermediate circuit capacitors may have been impaired. Before commissioning these devices, it is advisable to regenerate the capacitors by connecting them to the voltage for two hours with the inverter disabled. After these operations the device is ready to be installed without limitations.

7.3. Repairs

Repairs of the device should only be carried out by the specialist personnel (qualified by the manufacturer)

If you carry out a repair on your own, observe the following points:

- When ordering spare parts do not only state the device type but also the device serial number (nameplate). It is also useful to state the type of regulator card and the version of the operating system (on Firmware & Card revision level nameplate, see figure 2.1.3.2).
- When exchanging cards ensure that the positions of switches and jumpers are observed! This particularly applies to switch S3 on the regulation card.

NOTE! The manufacturer does not accept any liability for any device parts that are destroyed due to the incorrect switch position of "switch S3".

7.4. Customer Service

For customer service please contact your sales office or General Electric Company at (540) 387-7595, 8a.m. to 5p.m. (EDT) weekdays. For emergency weekend service, call (540) 387-8080.

Notes:

Chapter 8 - Troubleshooting

The following describes possible drive faults and their causes. Use the Table of Contents to find information on a particular keyword.

Failure alarms in the keypad display

FAILURE ALARM	POSSIBLE CAUSES
BU overload	The braking duty cycle is out of the allowed range
Bus loss	Failure in the Bus connection (only with interface Bus option card) Check the Bus connection EMC compatibility problem, check wiring.
Curr fbk loss	Failure in the connection between regulation card and TA transformer. Check the connection cable on XTA connector.
DSP error	Processor program error Switch off device and restart If you are unsuccessful: probably an internal fault. Contact your service office.
Enable seqerr	Drive is powered up or RESET* with ENABLE input connected to 24V (picked up) and the Drive is configured to run from the terminals. Refer to CONFIGURATION/ Main Commands.
External fault	External failure, reported on terminal 15 If the "External fault" message is not used: connection missing between terminals 16 and 18 (reference point) and/or 15 and 19. If the "External fault" message is used: - The signal on terminal 15 is missing (15 ... 30 V to terminal 16). With external voltage supply: reference points must be connected with each other!
Failure supply	Fault in voltage supply = the voltages are below the permitted value CAUTION: switch off voltage before removing terminal strips. In most cases the cause is in the external wiring. Pull out the plug-in terminal strips of the regulator card and enter the Reset command. If no other failures are reported, check your wiring for a short-circuit, in some cases with the cable shielding. If this has not corrected the fault, try to RESET* once more. If you are still unsuccessful: probably an internal fault. Contact your service office.

Heatsink ot

(For sizes from 30Hp ... and higher). Temperature of the heatsink drive too high.
Failure of device fan.
Failure in the IGBT module on power section.
Fast overload current duty cycle.

Heatsink sensor

Ambient temperature too high
Failure of device fan
Dirty heatsink

Intake air ot

(For sizes from 30Hp ... and higher). Temperature of the cooling air too high.
Failure of device fan(s).
Cooling opening obstructed.

Interrupt error

An unused interrupt has occurred
Switch off device and restart
If you are unsuccessful: probably an internal fault. Contact your service office.

Module overtemp

(For sizes up to 20Hp). Temperature of the IGBT module too high.
Failure of device fan.
Failure in the IGBT module on power section.
Fast overload current duty cycle.

Output stages

Internal Overcurrent failure of IGBT power section
Switch off device and restart
If you are unsuccessful, contact your service office.

Overcurrent

Overcurrent in the motor circuit
Short-circuit or ground fault at the output of the drive
Current regulator optimized incorrectly
Message appears when switching on the device: drive is engaging a motor that is running. Auto capture function must be activated.
Switch off device and restart
If you are unsuccessful, contact your service office.

Overvoltage

Overvoltage in intermediate circuit due to energy feedback from motor
Lengthen deceleration ramp. If not possible:
Use a BU... braking unit to reduce the feed

Overtemp Motor

Overtemperature of the motor (indicated via thermistor on terminals 78/79)
Cable between thermistor connection on motor and terminals 78 and 79 interrupted.
Overheating of motor:

- Load cycle too extreme

- Ambient temperature at site of motor too high
- Motor has an external fan: fan failed
- Motor does not have an external fan: too large a load at low speeds. The cooling effect of the fan on the motor shaft is too low for this load cycle. Change cycle or fit external fan.

Regulation ot Temperature of the Regulation card of the Drive too High.

Ambient temperature too high.

Speed fbk loss Speed feedback loss

Encoder not connected, or incorrectly connected or not supplied:

Select the **Enc 1 speed** parameter in the MONITOR\ Measurement \ Speed \ Speed in rpm menu.

- With the Drive disabled turn the motor clockwise (viewed from the front of the shaft). The value indicated must be positive.
- If the indicated value does not change or random values are shown, check the power supply and the cabling of the encoder.
- If the indicated value is negative, reverse the encoder connections. Exchange channel A+ and A- or B+ and B-

Undervoltage The incoming voltage to the power section of the device is too low due to:

- too low an AC input voltage or long voltage dips
- poor cable connections (e.g. terminals on contactor, choke, filter ... not properly fixed). Remedy: check connections.

* To RESET the alarms press **[Escape]** ([Shift] + [Left arrow]). If **Enable** and **Start** commands are configured from teminals (CONFIGURATION / Main.=Terminal), to RESET remove from these terminals the +24V potential.

NOTE: The RESET alarm operation can be also configured on a digital input (properly configured).

FAILURE **POSSIBLE CAUSES**

Other faults

Motor not turning

Failure alarm is displayed: see above

Once the error has been corrected enter the failure Reset command

Keypad display is dark: AC voltage supply to terminals U1/V1/W1 missing or internal fuse faulty

Enable and/or start command missing (Check configuration of the reg. terminals)

Drive not accepting commands: incorrect or wrongly selected operating mode

Protective device of the power supply has tripped: protective device incorrectly sized or input jumper faulty.

The analog input used for the reference value was not assigned or assigned differently.

Motor turning in the wrong direction

Polarity of the reference value signal incorrect

Motor incorrectly connected. CAUTION: if the motor lets itself be controlled in the wrong direction the two encoder cables (A+ and A- or B+ and B-) have to be changed around in addition to the two lines of the motor cable

Motor not reaching nominal speed

Drive is within speed limitation. Remedy: check **Speed max amount**, **Speed max pos** and **Speed max neg** parameters

Drive working at current limit (LED Ilimit) Possible causes:

- Motor overloaded
- Inverter sized too small
- Incorrect V/f characteristics set
- T current lim reduction selected via Torque reduct

The entered value for the number of encoder pulses is too high. Remedy: check the parameters concerned (encoder 1 pulses) and set correct value.

A correction value reduces the main reference value. Remedy: check the configuration

With operation via the terminal strip: Speed base value parameter too low

Motor accelerates immediately to maximum speed

Reference value set via terminals: Check whether the value varies from min. to max. value. Potentiometer used for reference value setting: is there a 0V connection present?

Encoder not connected, or incorrectly connected or not supplied:

Select the **Enc 1 speed** parameter in the MONITOR \ Measurement \ Speed \ Speed in rpm menu.

- With the regulator disabled turn the motor clockwise (viewed from the front of the shaft). The value indicated must be positive.
- If the indicated value does not change or if random values are shown, check the power supply and the cabling of the encoder.
- If the indicated value is negative, reverse the encoder connections. Exchange channel A+ and A- or B+ and B-.

Motor accelerates too slowly

Ramp value incorrectly set

Motor running at max. current

- Motor overloaded
- Drive sized too small
- Incorrect V/f characteristics set

Motor decelerates too slowly

Ramp value incorrectly set

Motor turns slowly, although reference value = Zero

Minimum speed parameter selected

Interference due to unused analog input. Remedy: set unused analog inputs to OFF

Disconnect reference value on used analog input

- If drive now stands still, the effect is due to the cable resistance of the 0V cable.
- If the drive is still turning: carry out offset compensation of the analog input. Set **Offset input xx** parameter so that the drive stands still.

Output voltage deviates strongly under load

The value for **Rotor resistance** is not correct. See section “Checking and maunual tuning of rotor resistance for field oriented mode” .

Motor not supplying the maximum torque or maximum output power

The value for **Magnetizing curr** is less than required for the connected motor.

- The ratio **Output voltage** / **Output frequency** in the MONITOR / Measurements menu should be approx equal to the ratio of **Base voltage** / **Base frequency**
- Drive working at current limit
- Check whether the value for **Full load curr** in the CONFIGURATION menu is correctly set
- Check the value for the current limitation
- The value for **Magnetizing curr** and/or **Rotor resistance** parameters is not correct. Optimize the tuning as described in the instruction book.

The speed during acceleration with maximum current is not linear

Reduce the **Speed I** and **Speed P** proportionally. If this does not lead to an improvement, optimize the regulator.

Speed oscillating

Check **Speed P** and **Speed I** parameter

If the operating point is in the field weak range, check the **Flux P** and **Flux I** parameters

Incorrect value for Rotor resistance

Remedy: Optimize the tuning.

Drive not reacting to adaptive speed regulation

Adaptive speed regulation not enabled. **Enable spd adap** = Enabled

Adap reference not assigned to an analog input if using Adap reference

Motor potentiometer function not executed

Function not enabled. **Enable motor pot** = Enabled

With operation via the terminal strip: **Motor pot up** and/or **Motor pot down** and **Motor pot sign** were not assigned to a digital inputs

Jog operation not possible

A start command is still present

Function not enabled. **Enable jog** = Enabled

With operation via terminal strip: **Jog +** and/or **Jog -** were not assigned to a digital inputs.

Internal speed reference values not actuated

Function not enabled. **Enab multi spd** = Enabled

With operation via terminal strip: **Speed sel 0, Speed sel 1** and **Speed sel 2** were not assigned to a digital inputs.

Multi-Ramp function not reacting

Function not enabled. **Enab multi rmp** = Enabled

With operation via terminal strip: **Ramp sel 0** and **Ramp sel 1** were not assigned to a digital inputs

AV-300i Inverter Overview

NAVIGATION

Go To Index

AVi_Contents

BASIC CONFIGURATION

Continuos curr 19 A	Speed base value 1765 rpm
Mains Voltage 575V	Full load current 24.2 A
Ambient temp 40 ° C	Main commands Digital
Regulation mode V/f Control	Control mode Local
Switching freq 8kHz	Device address 0

AV-300i Drive Feedbacks & Status

Ramp ref (%)	Speed ref (%)	Dc link voltage	Output voltage	Regulation temp
Ramp output (%)	Actual spd (%)	Active power	Output frequency	Heatsink temp

Drive ready ○	Ramp + ○	Encoder 1 state ○	Motor current	Overload 200% ○
Speed limited ○	Ramp - ○	Encoder 2 state ○	Torque	OvId Available ○
Curr limit state ○	Spd threshold ○	Spd zero thr ○		

Input / Output Mapping — AVi_HWIO

ALARM mapping — AVi_Alarm_mp

FUNCTIONS — AVi_Funct

Speed Reference Select / Ramp

Start & Stop Management — AVi_STSP_pro

Ramp ref (d) → AVi_Ramp → Ramp output (d)

AVi_Ovr_RfSel

Speed / Torque regulator

Speed ref (d), Actual spd (d) → Speed Regulator — AVi_SReg

Speed Feedback — AVi_Spd_Fbk

T current ref → Torque curr Reg — AVi_Tcurr_reg

T curr (%), Flux → Motor control — Motor Control — AVi_motctrl

AVi_Ovr_SpTq

Digital inputs Status

DRIVE	DRIVE	EXPANSION CARD
Dig input term 1	Enable: Dig input term 9	Dig input term 5
Dig input term 2	Start: Dig input term 10	Dig input term 6
Dig input term 3	Fast stop: Dig input term 11	Dig input term 7
Dig input term 4		Dig input term 8

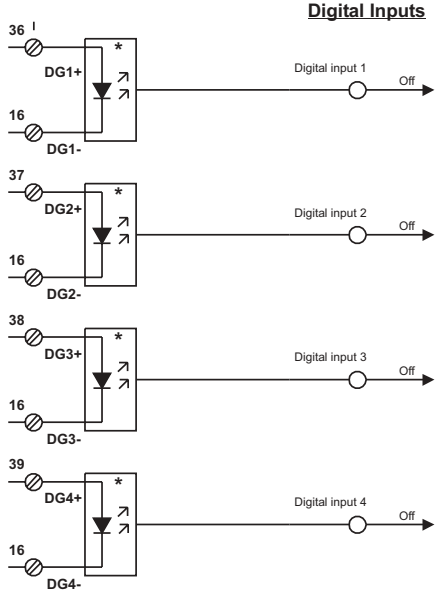
GE Motors and Industrial Systems Salem, Va. USA	PRODUCT: AV-300i AC Flux vector Drive	File name: AVi_Ovw.vsd
	Firmware Revision: 01.00	Issued Date --- Initials: 03/10/97 -- GE User
Proprietary Information Do Not Copy	This is a verified copy of controlled documentation printed on 07/02/98. The master is located on vasald03/[vss]$/InnovCtl.	Revision Date -- Initials: 09/02/98 -- GE User

Digital Inputs/Outputs & Mapping Standard and Option cards

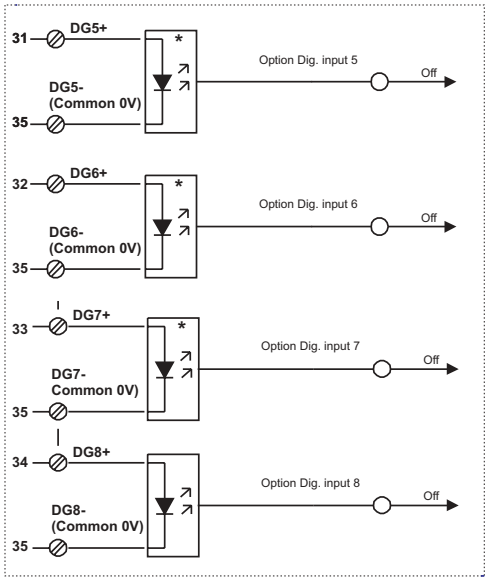
NAVIGATION

Overview: AVi_Ovw | Analog I/O: AVi_HWIOAN

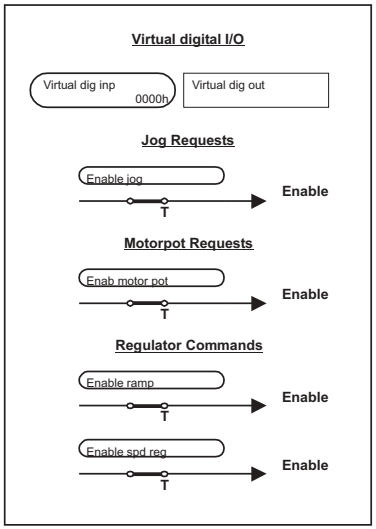
Digital Inputs



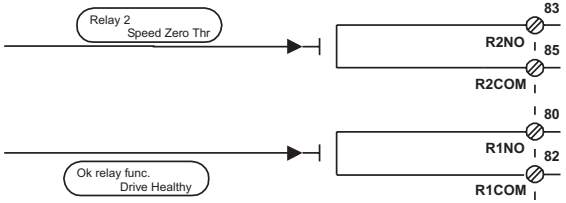
Option card



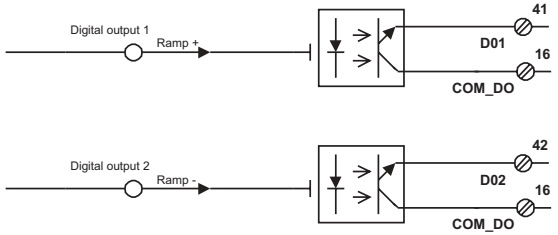
Virtual digital I/O



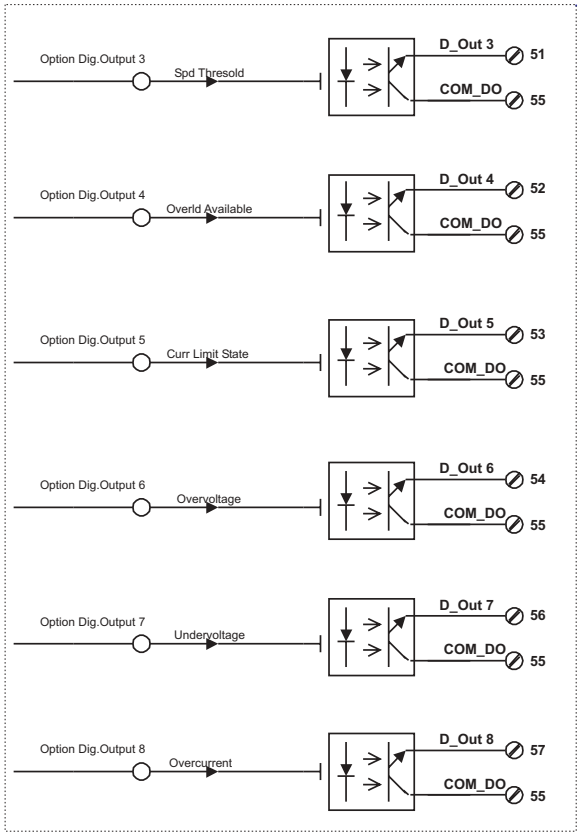
Drive Relay Output



Digital Outputs



Option card



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	Firmware Revision: 01.00	Issued Date --- Initials: 03/10/97 -- GE User
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Analog Inputs/Outputs & Mapping

NAVIGATION
Overview: AVi_Ovw | Digital I/O: AVi_HWIO

Select input 1: Ramp Ref 1
Input 1 type: -10V. . .+10V
Ref_1+ (1), Ref_1- (2)
HW input type
Volts
Tune value inp 1: 1
Auto tune inp 1: 0
From digital reference setting
F
An in 1 target
Select input 1: Ramp Ref 1
Scale input 1: 1
Input 1 filter: 0 ms
Offset input 1: 0
Input 1 cp error: 0
Window comparator
Input 1 compare: 0
Input 1 cp match
Input 1 cp delay: 0 ms

Select input 2: Off
Input 2 type: -10V. . .+10V
Ref_2+ (3), Ref_2- (4)
HW input type
Volts
Tune value inp 2: 1
Auto tune inp 2: 0
From digital reference setting
F
An in 2 target
Select input 2: Off
Scale input 2: 1
Offset input 2: 0

Select input 3: Off
Input 3 type: -10V. . .+10V
Ref_3+ (5), Ref_3- (6)
HW input type
Volts
Tune value inp 3: 1
Auto tune inp 3: 0
From digital reference setting
F
An in 3 target
Select input 3: Off
Scale input 3: 1
Offset input 3: 0

Analog Outputs

Select output 1: Actual Spd (rpm)
Scale output 1: 1
DAC1: AO1 (21), ACOM (22)

Select output 2: Torque Current
Scale output 2: 1
DAC2: AO2 (23), ACOM (22)

Option card

Select output 3: Current U
Scale output 3: 1
DAC1: AO3 (11), ACOM (12)

Select output 4: Motor Current
Scale output 4: 1
DAC2: AO4 (13), ACOM (14)

Tach follower

Encoder 2 (Option) XFI connector
5 A+, 6 A-, 8 B+, 1 B-, 7 0V, 2/9 +V
Select enc 2: OFF

Encoder 1 XE connector
5 A+, 6 A-, 8 B+, 1 B-, 7 0V, 9 5V
Select enc 1: OFF

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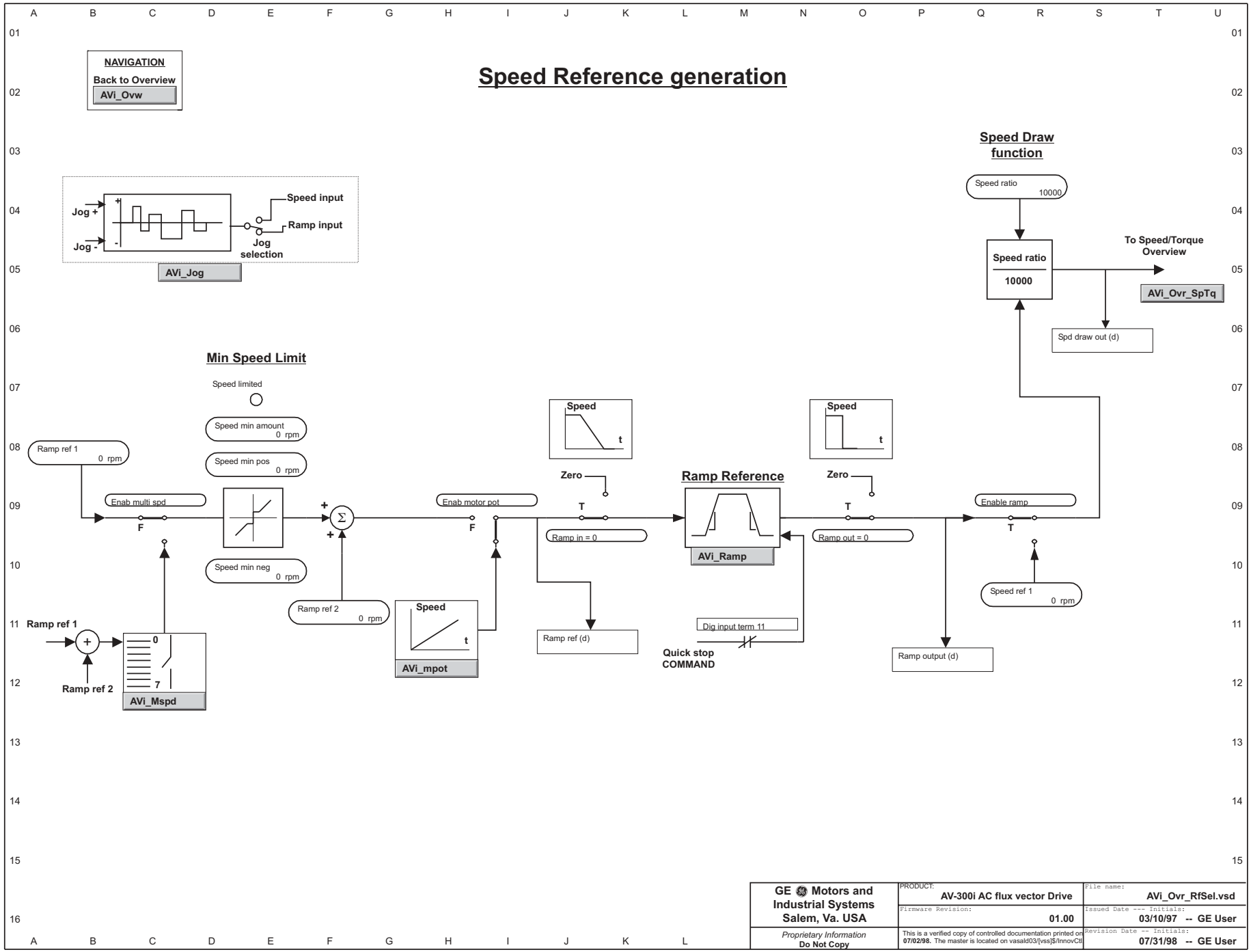
NAVIGATION
Back to Overview
AVi_Ovw
Speed Reference generation
Speed Draw function
Speed ratio
10000
Speed ratio
10000
To Speed/Torque Overview
AVi_Ovr_SpTq
Spd draw out (d)
Jog +
Jog -
Speed input
Ramp input
Jog selection
AVi_Jog
Min Speed Limit
Speed limited
Speed min amount
0 rpm
Speed min pos
0 rpm
Speed min neg
0 rpm
Ramp ref 1
0 rpm
Enab multi spd
F
Ramp ref 2
0 rpm
Speed
t
Enab motor pot
F
Zero
T
Ramp in = 0
Ramp ref (d)
Ramp Reference
AVi_Ramp
Speed
t
Zero
T
Ramp out = 0
Enable ramp
T
Speed ref 1
0 rpm
Ramp output (d)
Dig input term 11
Quick stop COMMAND
Ramp ref 1
Ramp ref 2
0
7
AVi_Mspd
AVi_mpot
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AVi_Ovr_RfSel.vsd
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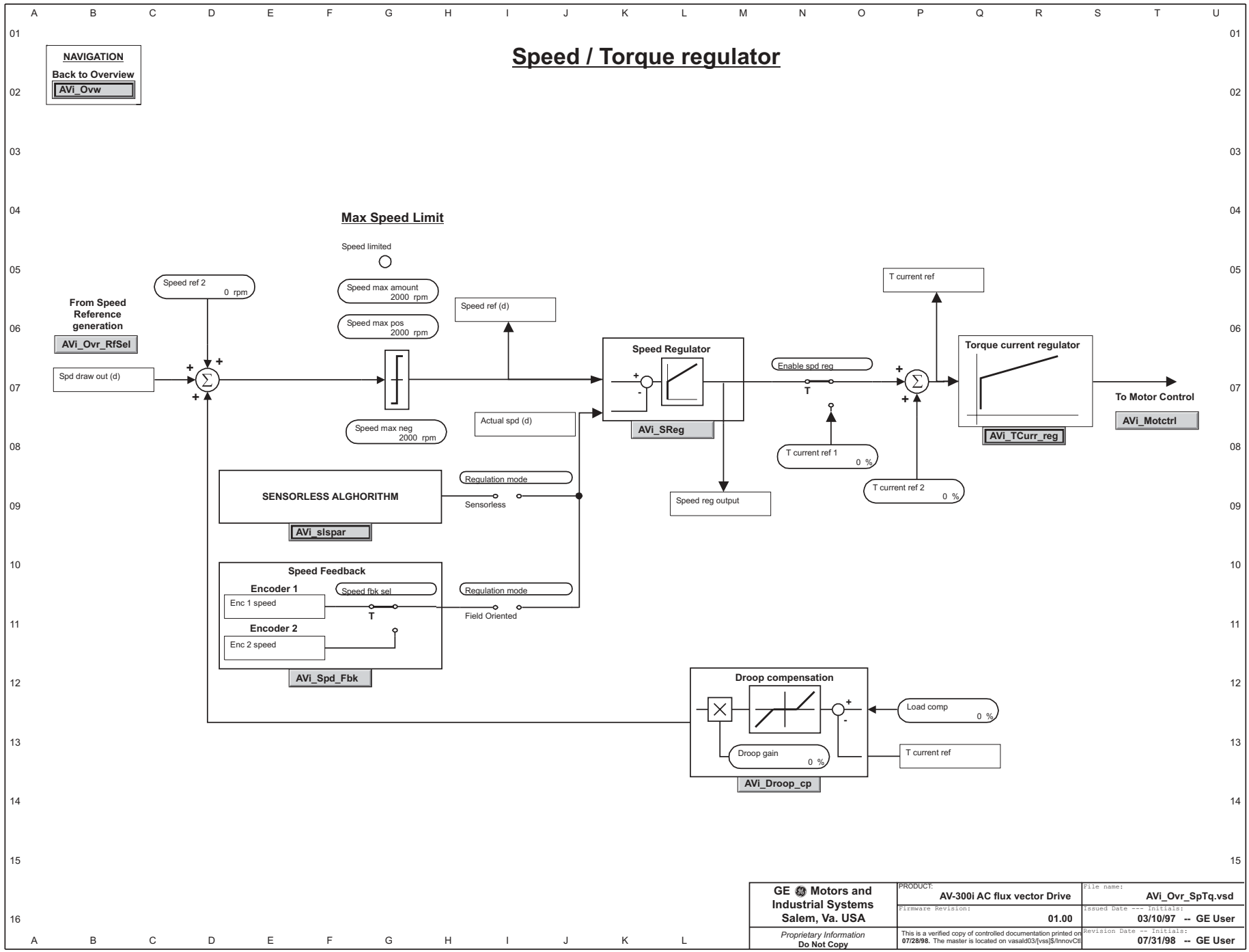
NAVIGATION
Back to Overview
AVi_Ovw
Speed / Torque regulator
Max Speed Limit
Speed limited
Speed ref 2
0 rpm
Speed max amount
2000 rpm
Speed max pos
2000 rpm
Speed max neg
2000 rpm
Speed ref (d)
From Speed Reference generation
AVi_Ovr_RfSel
Spd draw out (d)
Actual spd (d)
Speed Regulator
AVi_SReg
Enable spd reg
T
T current ref
T current ref 1
0 %
T current ref 2
0 %
Torque current regulator
AVi_TCurr_reg
To Motor Control
AVi_Motctrl
SENSORLESS ALGHORITHM
AVi_slspar
Regulation mode
Sensorless
Speed reg output
Speed Feedback
Encoder 1
Enc 1 speed
Speed fbk sel
T
Encoder 2
Enc 2 speed
Regulation mode
Field Oriented
AVi_Spd_Fbk
Droop compensation
Load comp
0 %
Droop gain
0 %
T current ref
AVi_Droop_cp
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File name:
AVi_Ovr_SpTq.vsd
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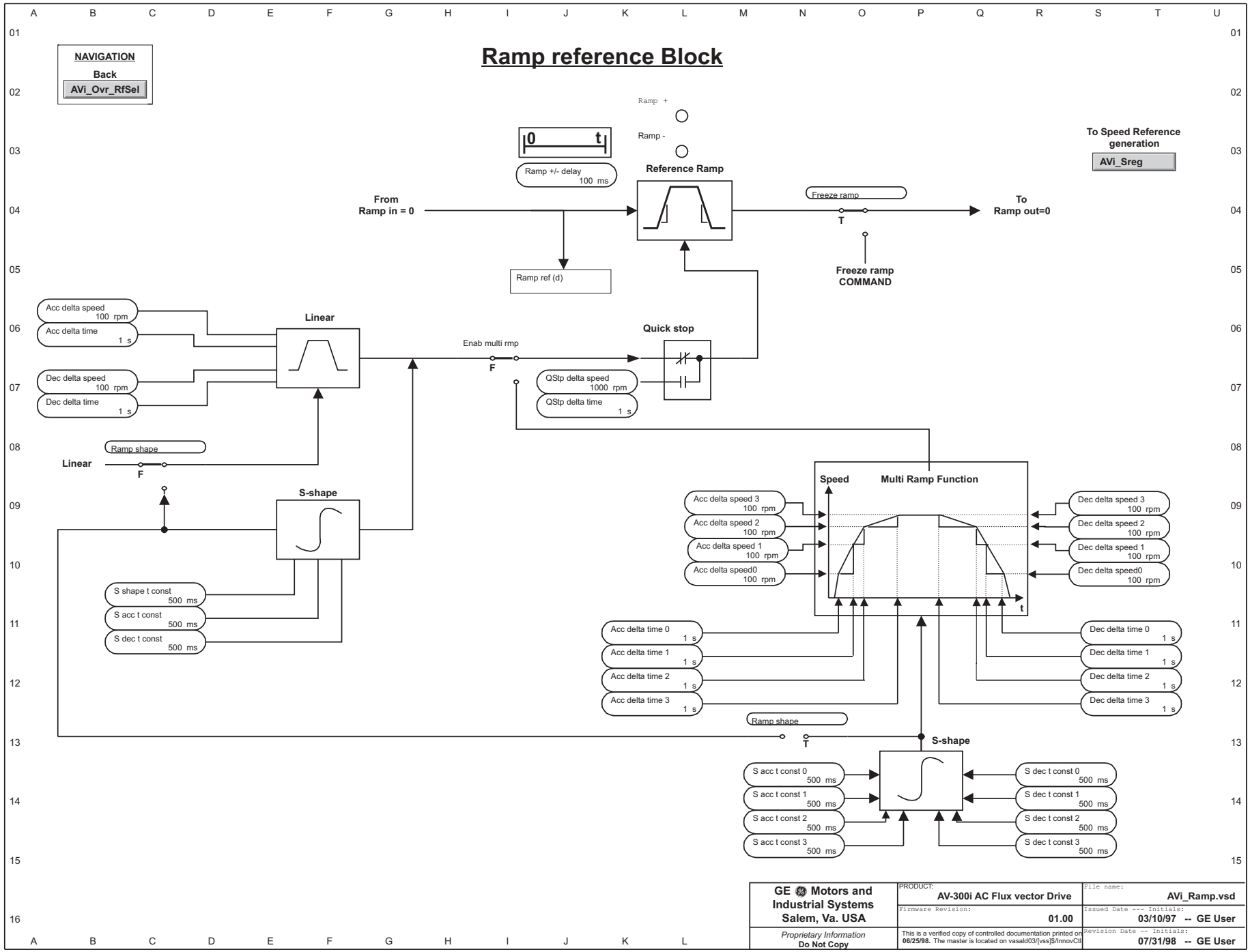
Ramp reference Block
NAVIGATION
Back
AVi_Ovr_RfSel
Ramp +
Ramp -
0
t
Ramp +/- delay
100 ms
Reference Ramp
To Speed Reference generation
AVi_Sreg
From
Ramp in = 0
Freeze ramp
T
To
Ramp out=0
Freeze ramp
COMMAND
Ramp ref (d)
Acc delta speed
100 rpm
Acc delta time
1 s
Linear
Dec delta speed
100 rpm
Dec delta time
1 s
Enab multi rmp
F
Quick stop
QStp delta speed
1000 rpm
QStp delta time
1 s
Ramp shape
Linear
F
S-shape
S shape t const
500 ms
S acc t const
500 ms
S dec t const
500 ms
Speed
Multi Ramp Function
Acc delta speed 3
100 rpm
Acc delta speed 2
100 rpm
Acc delta speed 1
100 rpm
Acc delta speed0
100 rpm
Dec delta speed 3
100 rpm
Dec delta speed 2
100 rpm
Dec delta speed 1
100 rpm
Dec delta speed0
100 rpm
t
Acc delta time 0
1 s
Acc delta time 1
1 s
Acc delta time 2
1 s
Acc delta time 3
1 s
Dec delta time 0
1 s
Dec delta time 1
1 s
Dec delta time 2
1 s
Dec delta time 3
1 s
Ramp shape
T
S-shape
S acc t const 0
500 ms
S acc t const 1
500 ms
S acc t const 2
500 ms
S acc t const 3
500 ms
S dec t const 0
500 ms
S dec t const 1
500 ms
S dec t const 2
500 ms
S dec t const 3
500 ms
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File name:
AVi_Ramp.vsd
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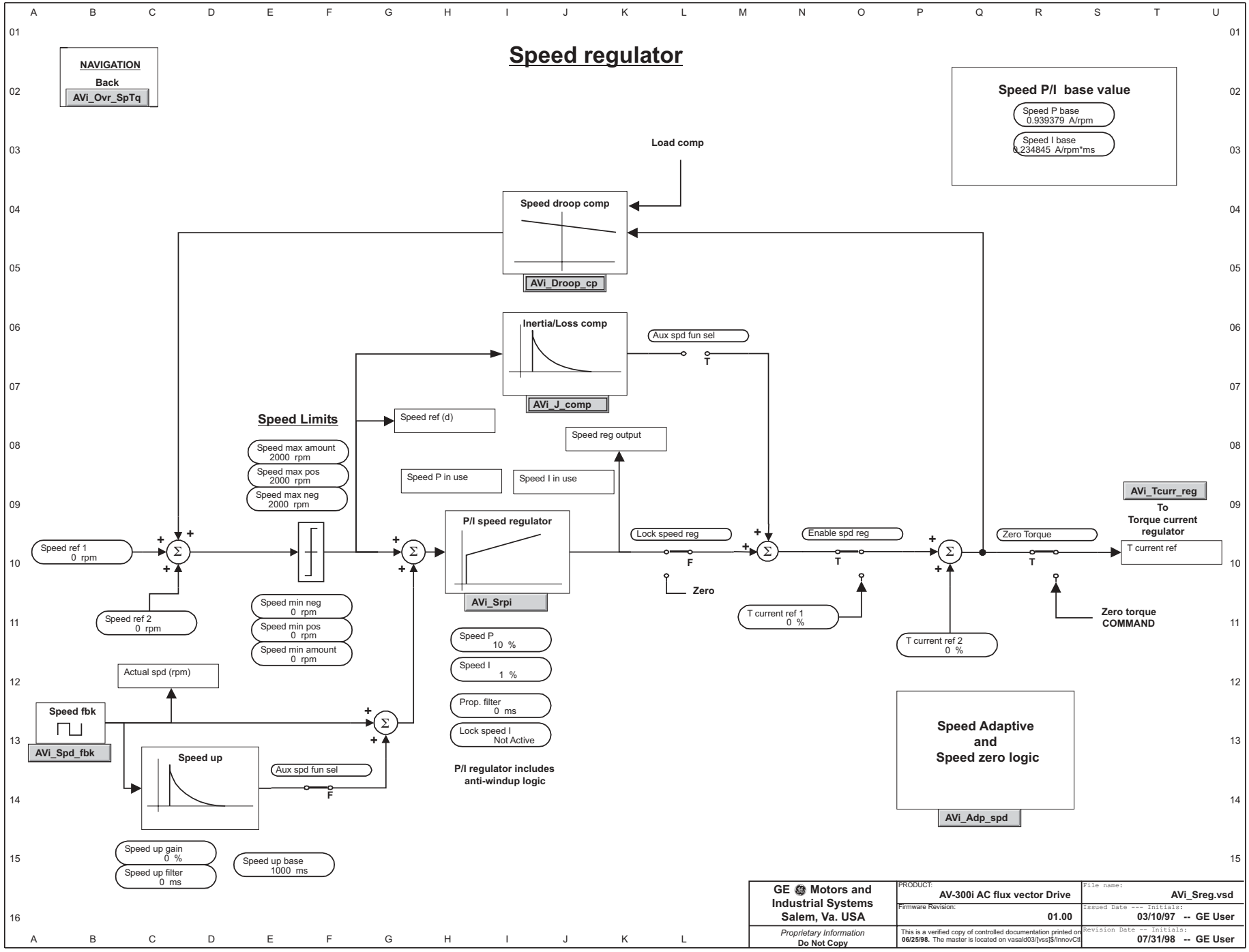
Speed regulator
NAVIGATION
Back
AVi_Ovr_SpTq
Speed P/I base value
Speed P base
0.939379 A/rpm
Speed I base
0.234845 A/rpm*ms
Load comp
Speed droop comp
AVi_Droop_cp
Inertia/Loss comp
AVi_J_comp
Aux spd fun sel
T
Speed Limits
Speed ref (d)
Speed reg output
Speed max amount
2000 rpm
Speed max pos
2000 rpm
Speed max neg
2000 rpm
Speed P in use
Speed I in use
AVi_Tcurr_reg
To
Torque current
regulator
T current ref
Speed ref 1
0 rpm
P/I speed regulator
AVi_Srpi
Lock speed reg
F
Zero
Enable spd reg
T
Zero Torque
T
Zero torque
COMMAND
Speed ref 2
0 rpm
Speed min neg
0 rpm
Speed min pos
0 rpm
Speed min amount
0 rpm
T current ref 1
0 %
T current ref 2
0 %
Actual spd (rpm)
Speed P
10 %
Speed I
1 %
Prop. filter
0 ms
Lock speed I
Not Active
Speed fbk
AVi_Spd_fbk
Speed up
Aux spd fun sel
F
P/I regulator includes
anti-windup logic
Speed Adaptive
and
Speed zero logic
AVi_Adp_spd
Speed up gain
0 %
Speed up filter
0 ms
Speed up base
1000 ms
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AVi_Sreg.vsd
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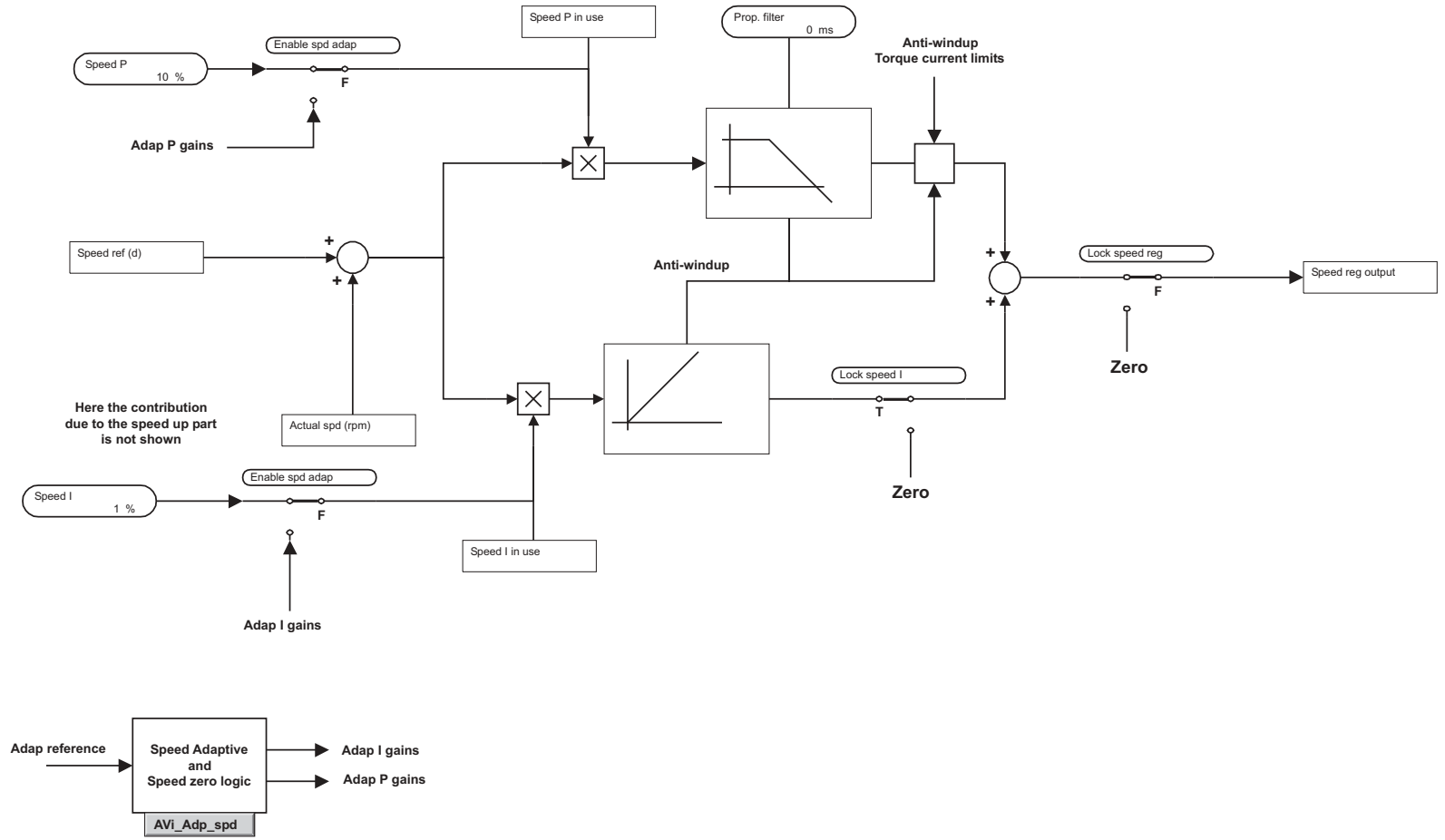
Speed regulator PI part



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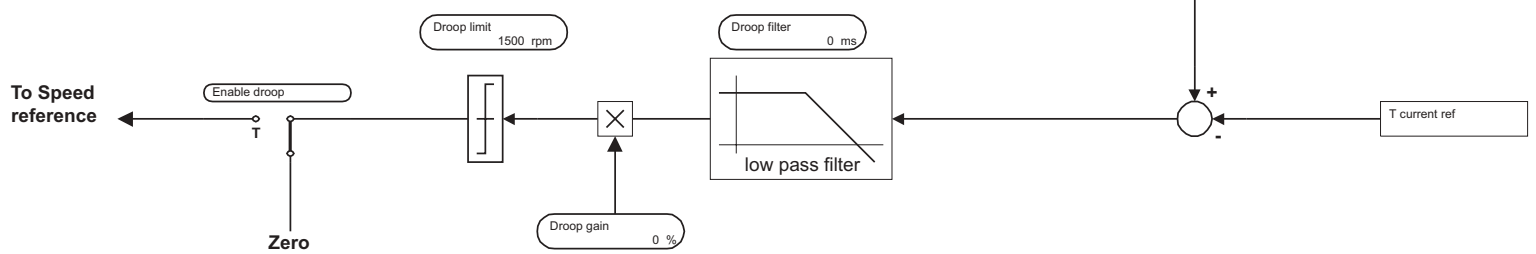
Droop compensation

NAVIGATION
Back
AVi_Sreg



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	Firmware Revision: 01.00	Issued Date --- Initials: 03/10/97 -- GE User
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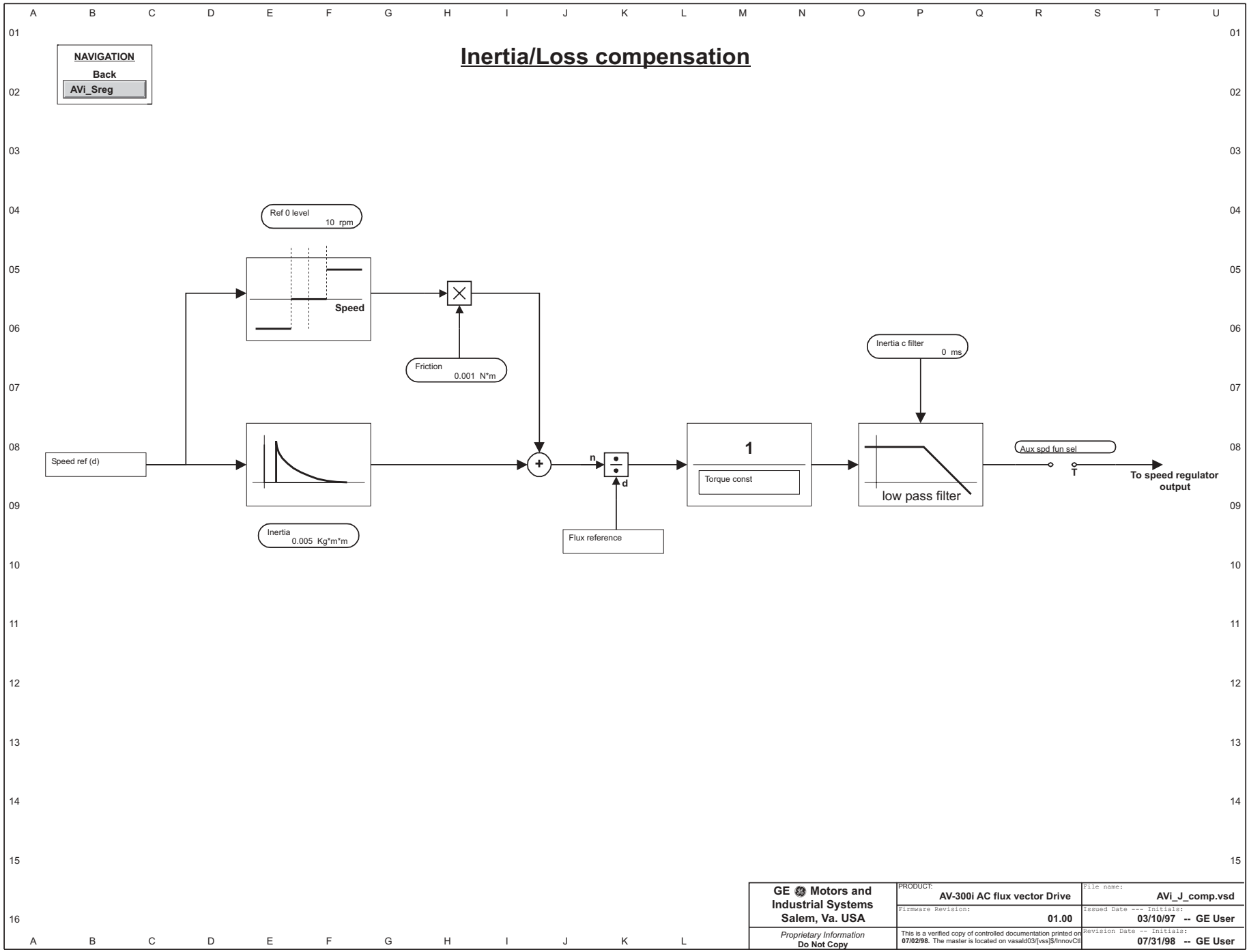
NAVIGATION
Back
AVi_Sreg
Inertia/Loss compensation
Ref 0 level
10 rpm
Speed
Friction
0.001 N*m
Inertia c filter
0 ms
Speed ref (d)
Inertia
0.005 Kg*m*m
n
d
Flux reference
1
Torque const
low pass filter
Aux spd fun sel
T
To speed regulator output
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File name:
AVi_J_comp.vsd
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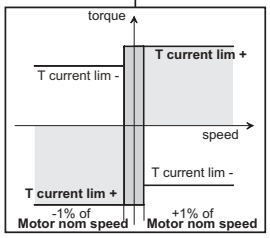
Torque current regulator

NAVIGATION
Back to Overview
AVi_Ovr_SpTq

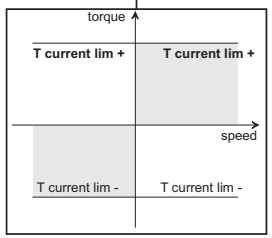
Current reg P/I base value
Current P base 475.518 V/A
Current I base 475.518 V/A*ms

Torque current limits

Curr limit state
T current lim + 136 %
T current lim 136 %
T current lim - 136 %
In use Tcur lim+
In use Tcur lim-
T current ref
From Speed Regulator
AVi_SReg
To Droop Feedback
AVi_Droop_cp
T curr lim type
T
Torque current
Current P 6.1 %
Current I 0.6 %
P/I regulator includes anti-windup logic
To Motor Control
AVi_motctrl
Torque reduction
Torque reduct.
Torque reduction COMMAND
Current lim red 100 %



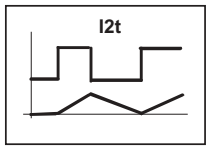
Motoring & Generating Torque Limit



Torque Limit +/-

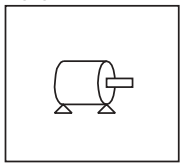
OVERLOAD Control

DRIVE



Ovld Available
I_sqrt_t_accum
Overload 200%

MOTOR



Ovld mot state
Motor cont curr 100 %
Trip time 50% 60 s

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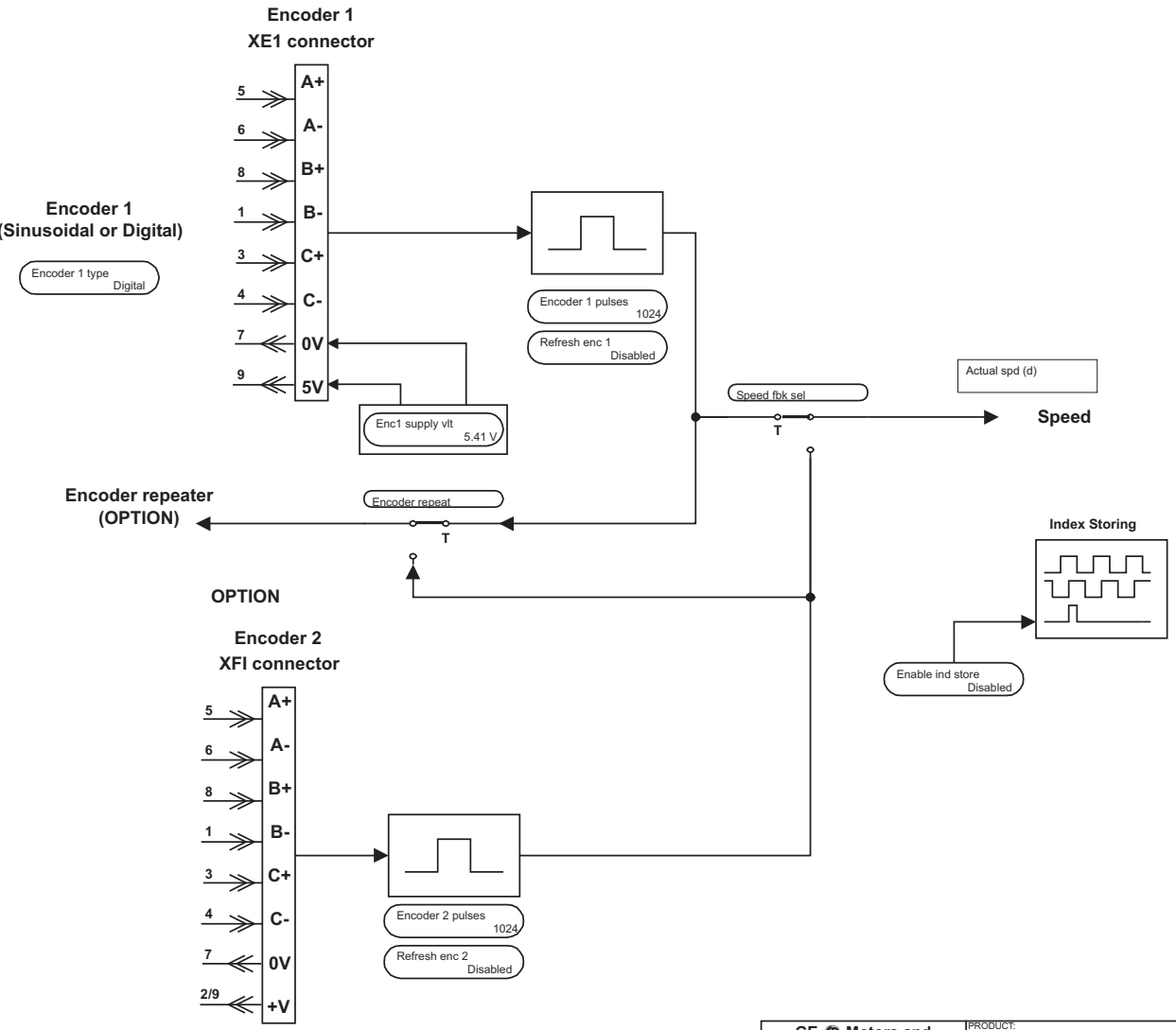
Speed Feedback

NAVIGATION

Back to Overview: AVi_Ovr_SpTq | Go to motor control: AVi_motctrl

Motor Encoder Setup



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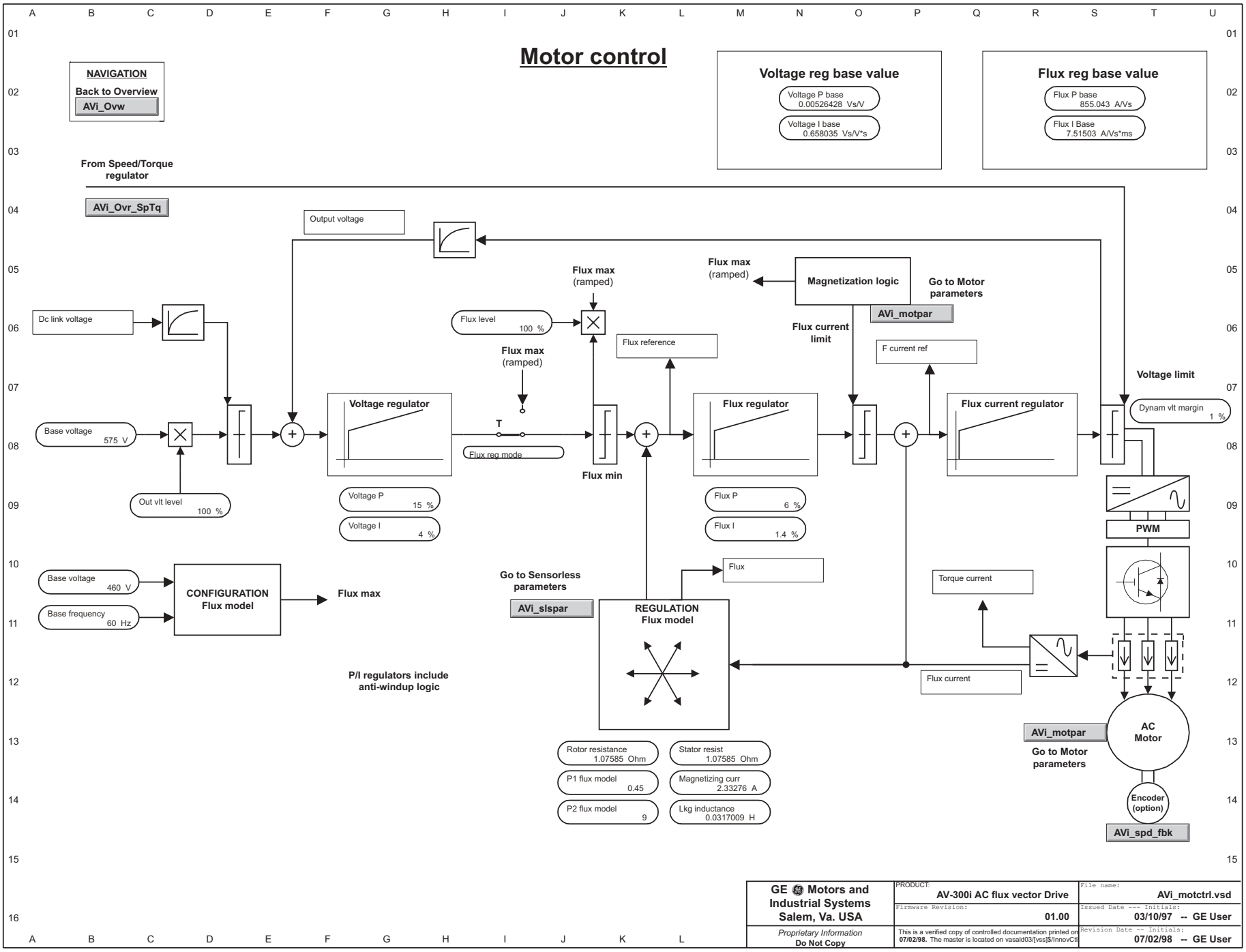
Motor control
NAVIGATION
Back to Overview
AVi_Ovw
Voltage reg base value
Voltage P base
0.00526428 Vs/V
Voltage I base
0.658035 Vs/V*s
Flux reg base value
Flux P base
855.043 A/Vs
Flux I Base
7.51503 A/Vs*ms
From Speed/Torque regulator
AVi_Ovr_SpTq
Output voltage
Dc link voltage
Base voltage
575 V
Out vlt level
100 %
Voltage regulator
Voltage P
15 %
Voltage I
4 %
Flux max
(ramped)
Flux level
100 %
Flux max
(ramped)
T
Flux reg mode
Flux min
Flux reference
Flux max
(ramped)
Magnetization logic
Go to Motor parameters
AVi_motpar
Flux current limit
F current ref
Flux regulator
Flux P
6 %
Flux I
1.4 %
Flux current regulator
Voltage limit
Dynam vlt margin
1 %
PWM
Base voltage
460 V
Base frequency
60 Hz
CONFIGURATION
Flux model
Flux max
Go to Sensorless parameters
AVi_slspar
REGULATION
Flux model
Flux
Torque current
Flux current
P/I regulators include anti-windup logic
Rotor resistance
1.07585 Ohm
Stator resist
1.07585 Ohm
P1 flux model
0.45
Magnetizing curr
2.33276 A
P2 flux model
9
Lkg inductance
0.0317009 H
AVi_motpar
Go to Motor parameters
AC Motor
Encoder (option)
AVi_spd_fbk
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File name:
AVi_motctrl.vsd
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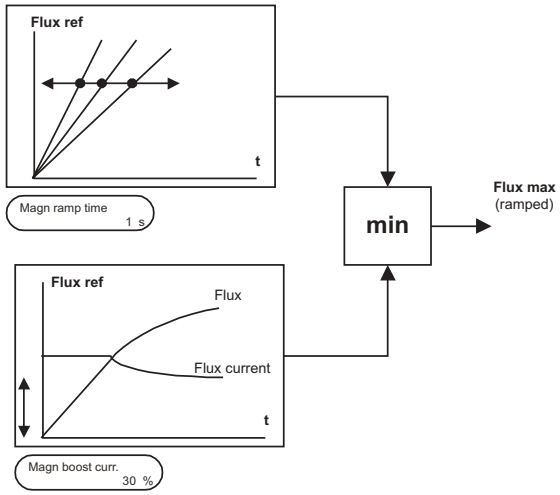
NAVIGATION

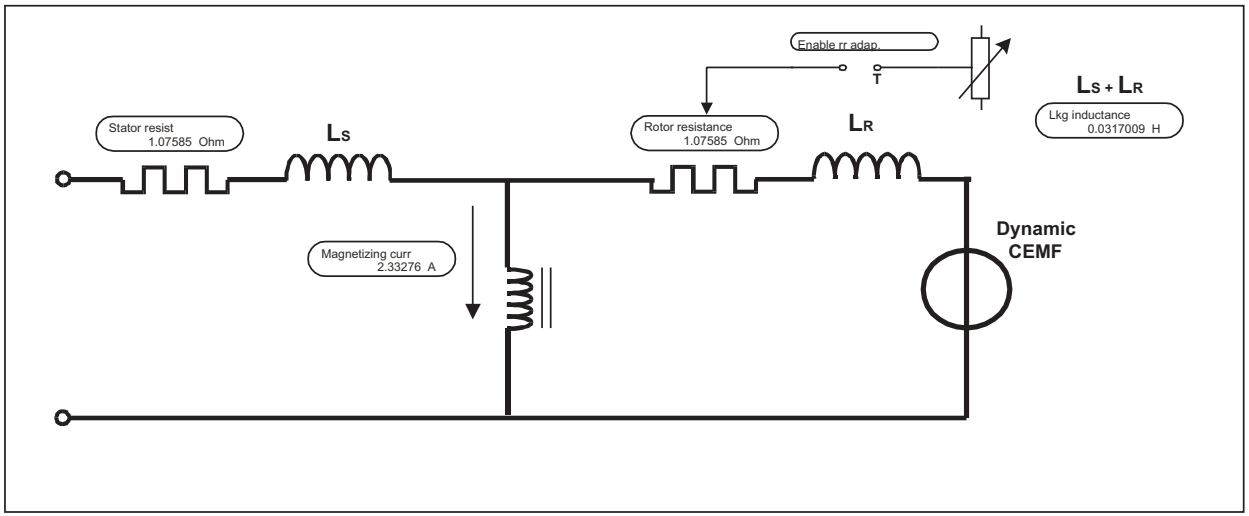
Back to Overview: AVi_Ovw | Back to mot ctrl: AVi_motctrl

Motor parameters

Nominal voltage 575 V
Nominal speed 1760 rpm
Nom frequency 60 Hz
Nominal current 10 A
Cos phi 0.83
Base voltage 575 V
Base frequency 60 Hz

Magnetization init logic





GE Motors and Industrial Systems Salem, Va. USA	PRODUCT: AV-300i AC flux vector Drive	File name: AVi_motpar.vsd
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NAVIGATION

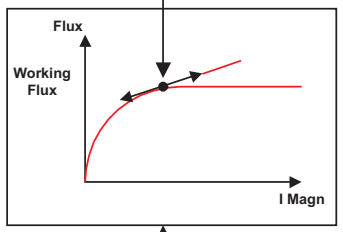
Overview: AVi_Ovw | Back to Mot control: AVi_motctrl

SENSORLESS Parameters

Regulation mode: V/f Control

Flux model

Flux corr factor: 0.9



Magn working cur

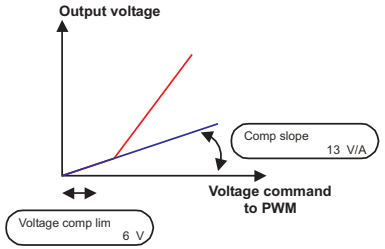
Low speed factor: 5000

Sls speed filter: 0.01 s

Estimated speed for Sensorless mode

Actual speed

Dead time compensation



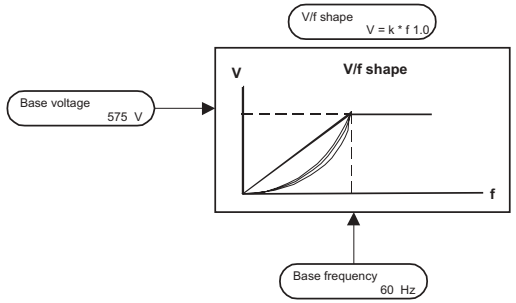
GE Motors and Industrial Systems Salem, Va. USA	PRODUCT: AV-300i AC flux vector Drive	File name: AVi_slspar.vsd
	Firmware Revision: 01.00	Issued Date --- Initials: 03/10/97 -- GE User
Proprietary Information Do Not Copy	This is a verified copy of controlled documentation printed on 07/02/98. The master is located on vasald03/[vss]$/InnovCtl	Revision Date -- Initials: 07/02/98 -- GE User

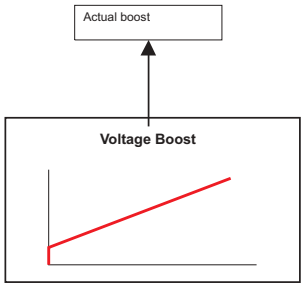
V/Hz functions

NAVIGATION

Overview	Go to functions
AVi_Ovw	AVi_Funct

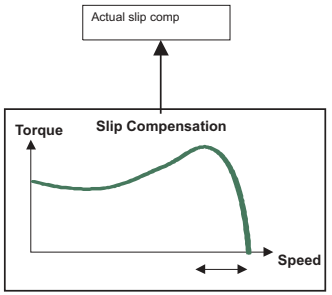
Regulation mode
V/f Control





Vlt boost type
Manual

Manual boost
1 %



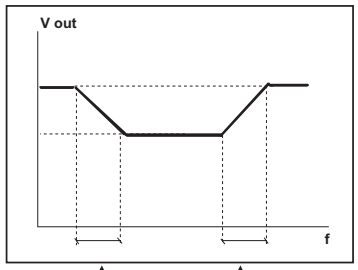
Slip comp type
Manual

Motor losses
0 %

Manual slip comp
0 rpm

Slip comp filt
0.03 s

ENERGY SAVE



Enable save eng
Disable

Lock save eng
Off

V/f flux level
100 %

Flux var time
10 s

Auto capture

Enable

Spd srch time
10 s

Flux srch time
1 s

Spd auto capture
1500 rpm

Delay auto cap
1000 ms

Delay retrying
1000 ms

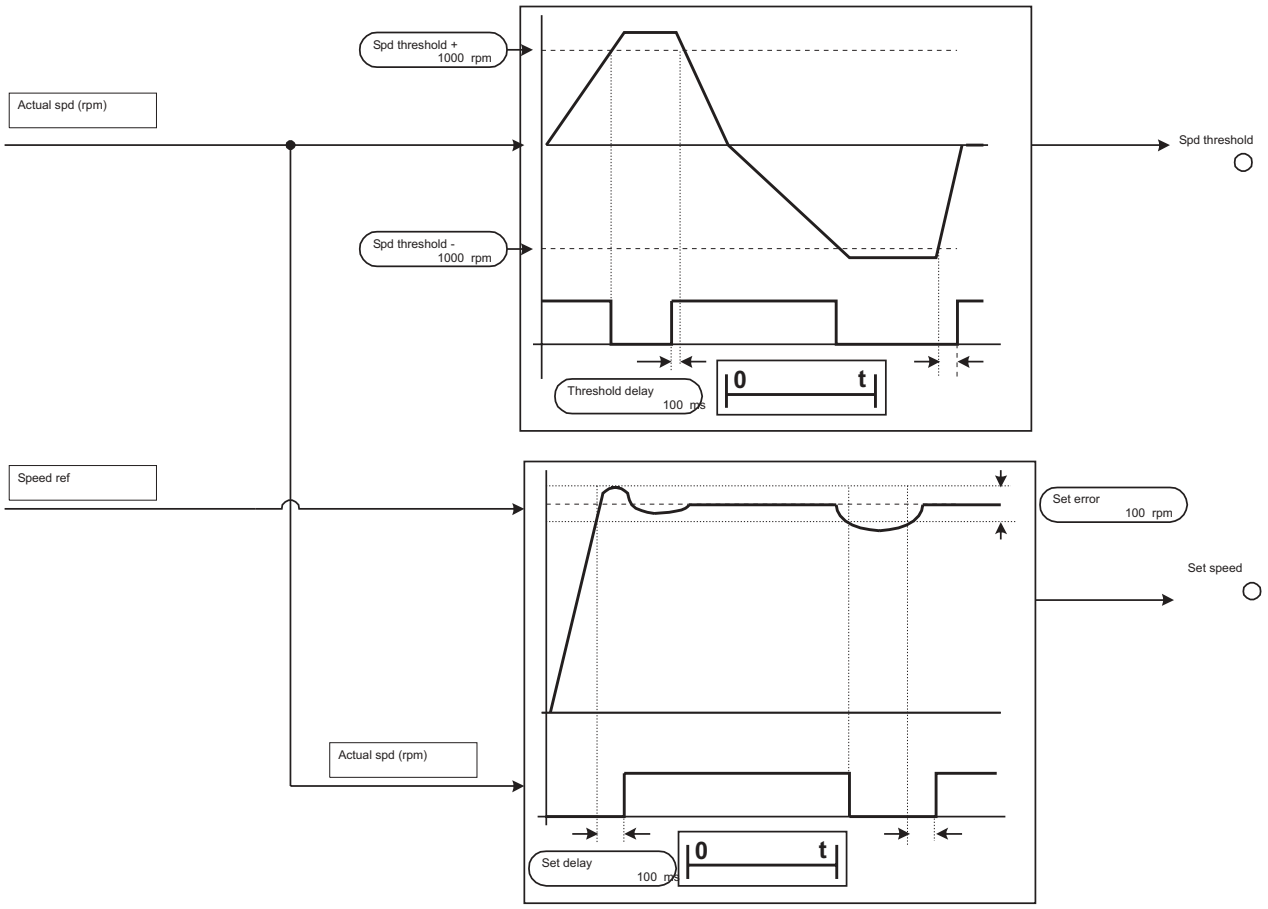
V/f speed search

GE Motors and Industrial Systems Salem, Va. USA	PRODUCT: AV-300i AC flux vector Drive	File name: AVi_vf.vsd
	Firmware Revision: 01.00	Issued Date --- Initials: 03/10/97 -- GE User
Proprietary Information Do Not Copy	This is a verified copy of controlled documentation printed on 07/02/98. The master is located on vasald03/[vss]$/InnovCtl	Revision Date -- Initials: 07/31/98 -- GE User

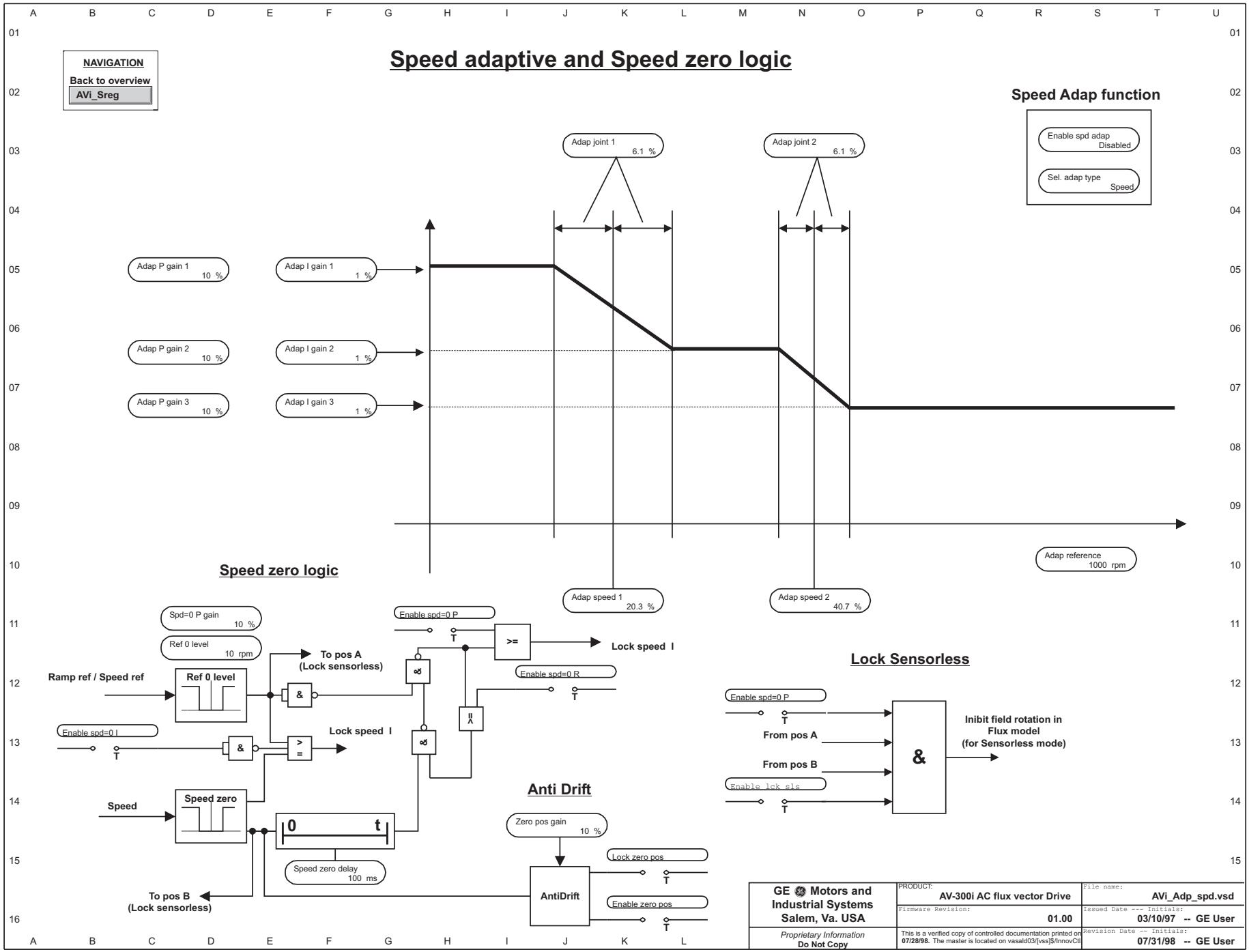
NAVIGATION

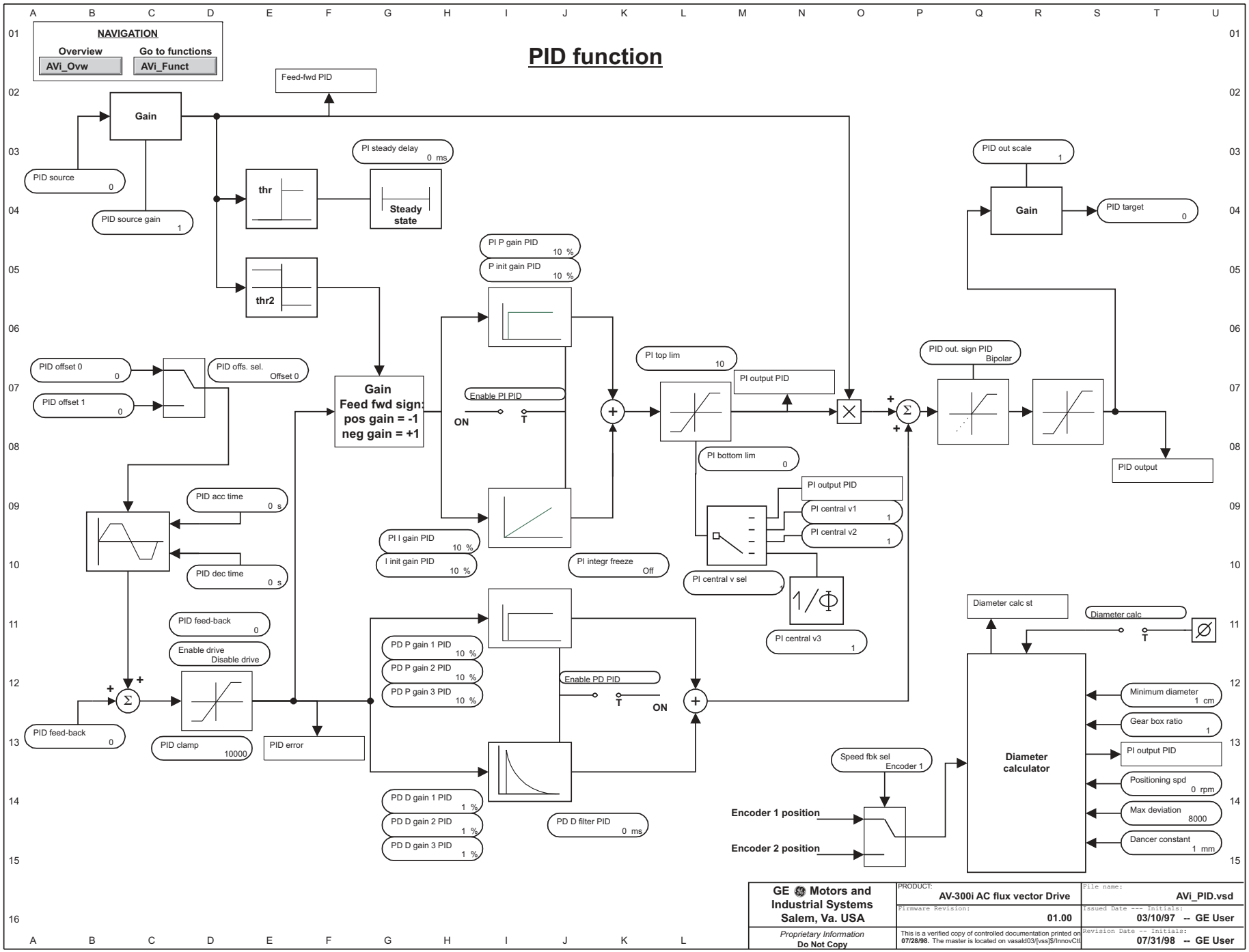
Overview	Go to functions
AVi_Ovw	AVi_Funct

Speed Threshold / Speed control



GE Motors and Industrial Systems Salem, Va. USA	PRODUCT: AV-300i AC Flux vector Drive	File name: AVi_SPD_THR.vsd
	Firmware Revision: 01.00	Issued Date --- Initials: 03/10/97 -- GE User
Proprietary Information Do Not Copy	This is a verified copy of controlled documentation printed on 07/02/98. The master is located on vasald03/[vss]$/InnovCtl	Revision Date -- Initials: 07/31/98 -- GE User


NAVIGATION
Back to overview
AVi_Sreg
Speed adaptive and Speed zero logic
Speed Adap function
Enable spd adap
Disabled
Sel. adap type
Speed
Adap joint 1
6.1 %
Adap joint 2
6.1 %
Adap P gain 1
10 %
Adap I gain 1
1 %
Adap P gain 2
10 %
Adap I gain 2
1 %
Adap P gain 3
10 %
Adap I gain 3
1 %
Adap reference
1000 rpm
Adap speed 1
20.3 %
Adap speed 2
40.7 %
Speed zero logic
Spd=0 P gain
10 %
Ref 0 level
10 rpm
Ramp ref / Speed ref
Ref 0 level
To pos A
(Lock sensorless)
Enable spd=0 P
Lock speed I
Enable spd=0 R
Enable spd=0 I
Lock speed I
Speed
Speed zero
0
t
Speed zero delay
100 ms
To pos B
(Lock sensorless)
Anti Drift
Zero pos gain
10 %
Lock zero pos
Enable zero pos
AntiDrift
Lock Sensorless
Enable spd=0 P
From pos A
From pos B
Enable lck sls
Inibit field rotation in
Flux model
(for Sensorless mode)
GE Motors and
Industrial Systems
Salem, Va. USA
Proprietary Information
Do Not Copy
PRODUCT:
AV-300i AC flux vector Drive
Firmware Revision:
01.00
This is a verified copy of controlled documentation printed on 07/28/98. The master is located on vasald03/[vss]$/InnovCtl
File name:
AVi_Adp_spd.vsd
Issued Date --- Initials:
03/10/97 -- GE User
Revision Date -- Initials:
07/31/98 -- GE User


NAVIGATION
Overview
AVi_Ovw
Go to functions
AVi_Funct
PID function
Feed-fwd PID
Gain
PID source
0
PID source gain
1
thr
PI steady delay
0 ms
Steady state
thr2
PI P gain PID
10 %
P init gain PID
10 %
PID offset 0
0
PID offset 1
0
PID offs. sel.
Offset 0
Gain
Feed fwd sign:
pos gain = -1
neg gain = +1
Enable PI PID
ON
T
PI top lim
10
PI output PID
PI bottom lim
0
PID out. sign PID
Bipolar
PID out scale
1
Gain
PID target
0
PID output
PID acc time
0 s
PID dec time
0 s
PI I gain PID
10 %
I init gain PID
10 %
PI integr freeze
Off
PI output PID
PI central v1
1
PI central v2
1
PI central v sel
1/Φ
PI central v3
1
PID feed-back
0
Enable drive
Disable drive
PID feed-back
0
PID clamp
10000
PID error
PD P gain 1 PID
10 %
PD P gain 2 PID
10 %
PD P gain 3 PID
10 %
Enable PD PID
T
ON
PD D gain 1 PID
1 %
PD D gain 2 PID
1 %
PD D gain 3 PID
1 %
PD D filter PID
0 ms
Diameter calc st
Diameter calc
T
Speed fbk sel
Encoder 1
Encoder 1 position
Encoder 2 position
Diameter calculator
Minimum diameter
1 cm
Gear box ratio
1
PI output PID
Positioning spd
0 rpm
Max deviation
8000
Dancer constant
1 mm
GE Motors and Industrial Systems
Salem, Va. USA
Proprietary Information
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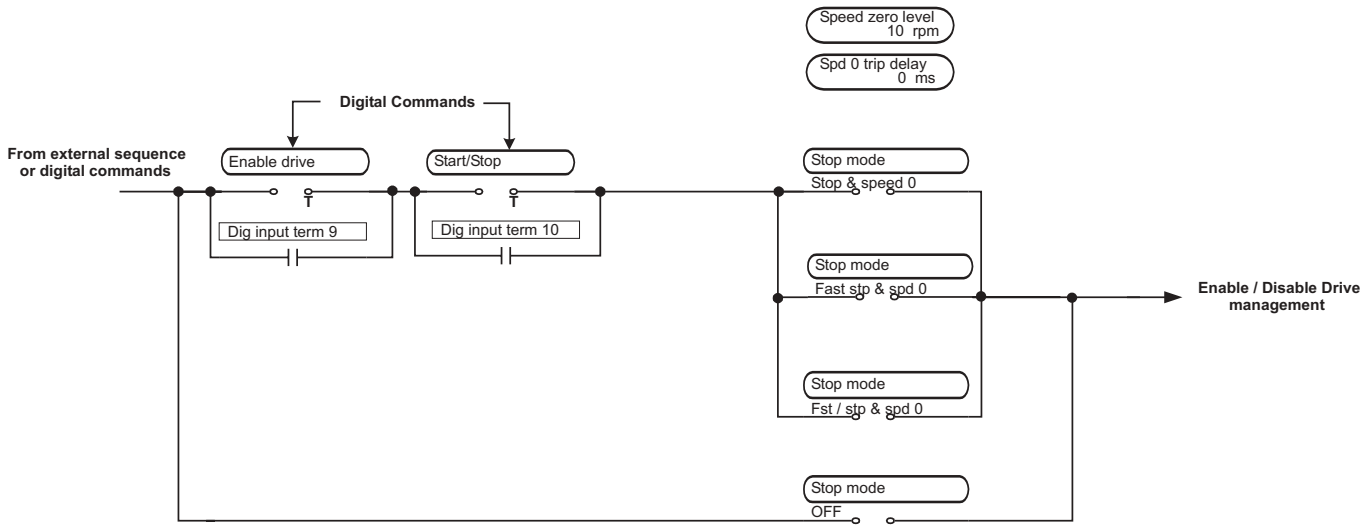
PRODUCT:
AV-300i AC flux vector Drive
Firmware Revision:
01.00
This is a verified copy of controlled documentation printed on 07/28/98. The master is located on vasald03/[vss]$/InnovCtl
File name:
AVi_PID.vsd
Issued Date --- Initials:
03/10/97 -- GE User
Revision Date -- Initials:
07/31/98 -- GE User

Start and Stop management

NAVIGATION

Overview: AVi_Ovw

Go to functions: AVi_Funct

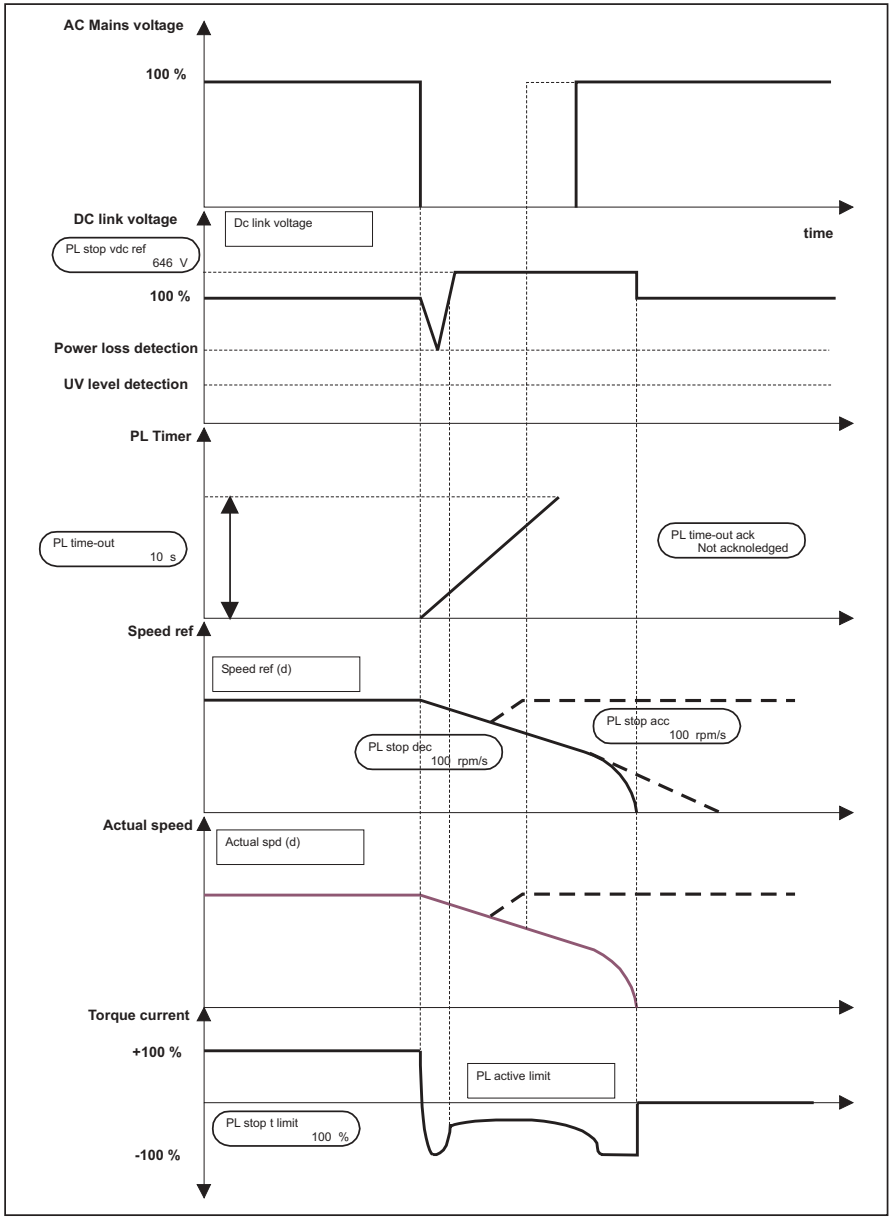


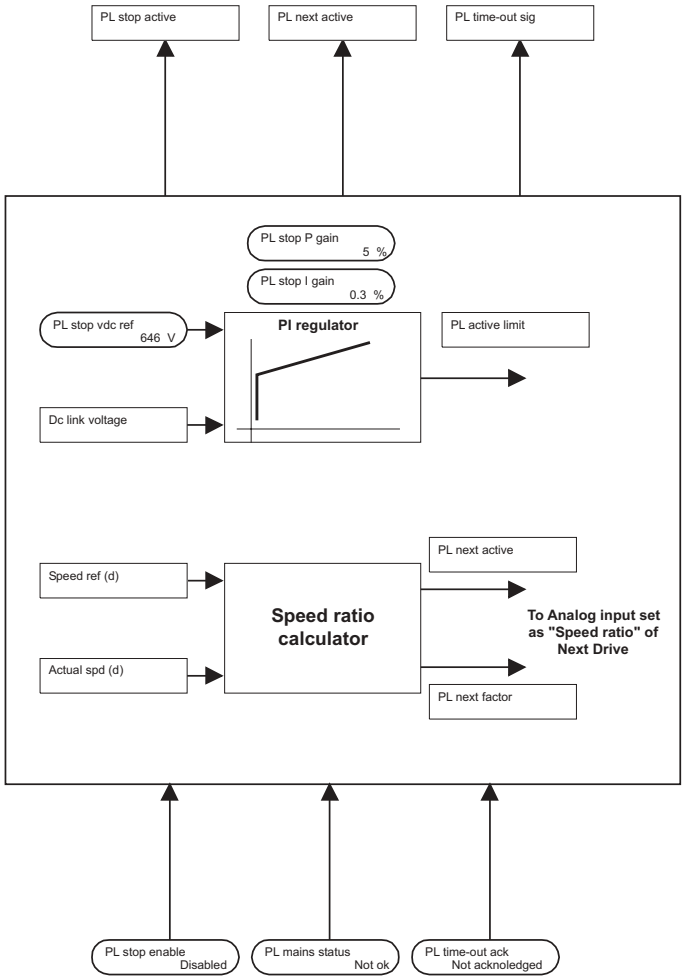
GE Motors and Industrial Systems Salem, Va. USA	PRODUCT: AV-300i AC Flux vector Drive	File name: AVi_STSP_pro.vsd
	Firmware Revision: 01.00	Issued Date --- Initials: 03/10/97 -- GE User
Proprietary Information Do Not Copy	This is a verified copy of controlled documentation printed on 07/29/98. The master is located on vasald03/[vss]$/InnovCtl.	Revision Date -- Initials: 09/02/98 -- GE User

NAVIGATION

Overview: AVi_Ovw | Go to functions: AVi_Funct

Power loss stop control



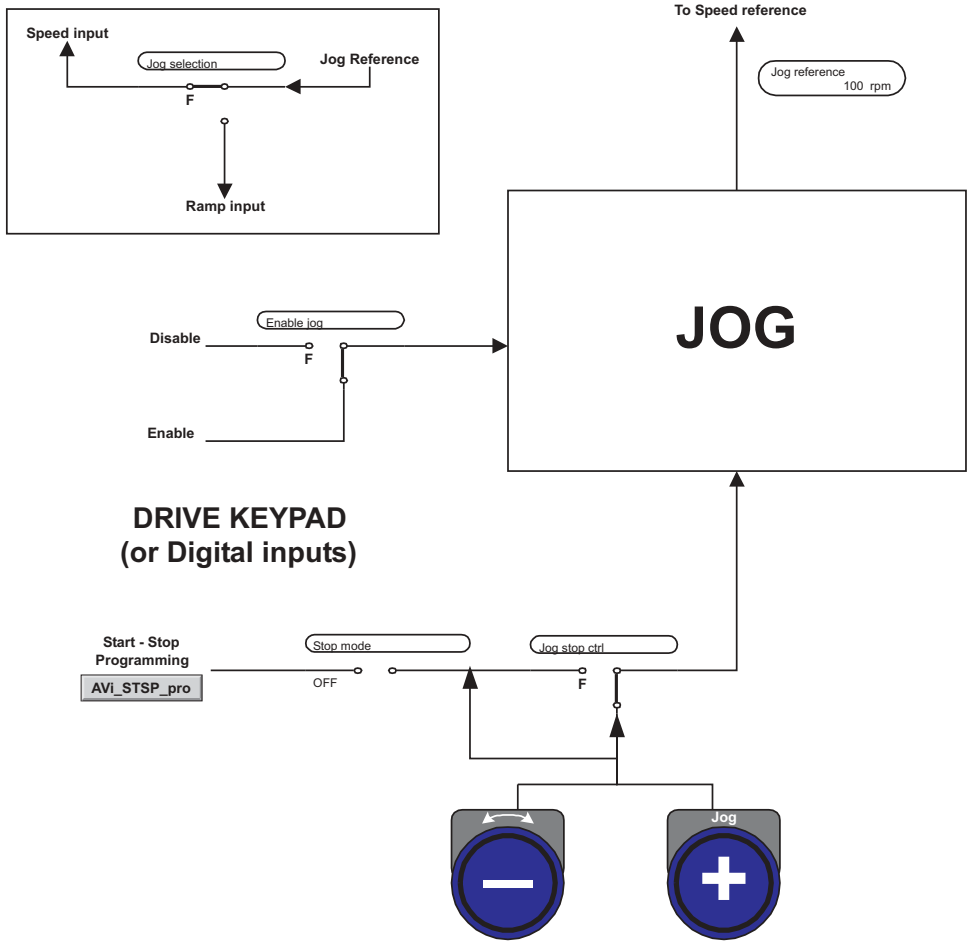


GE Motors and Industrial Systems Salem, Va. USA	PRODUCT: AV-300i AC flux vector Drive	File name: AVi_pwrlss_ctrl.vsd
	Firmware Revision: 01.00	Issued Date --- Initials: 03/10/97 -- GE User
Proprietary Information Do Not Copy	This is a verified copy of controlled documentation printed on **08/03/98.** The master is located on vasald03/[vss]$/InnovCtl.	Revision Date -- Initials: 08/03/98 -- GE User

JOG function

NAVIGATION

Overview	Go to functions
AVi_Ovw	AVi_Funct



GE Motors and Industrial Systems Salem, Va. USA	PRODUCT: AV-300i AC flux vector Drive	File name: AVi_jog.vsd
	Firmware Revision: 01.00	Issued Date --- Initials: 03/10/97 -- GE User
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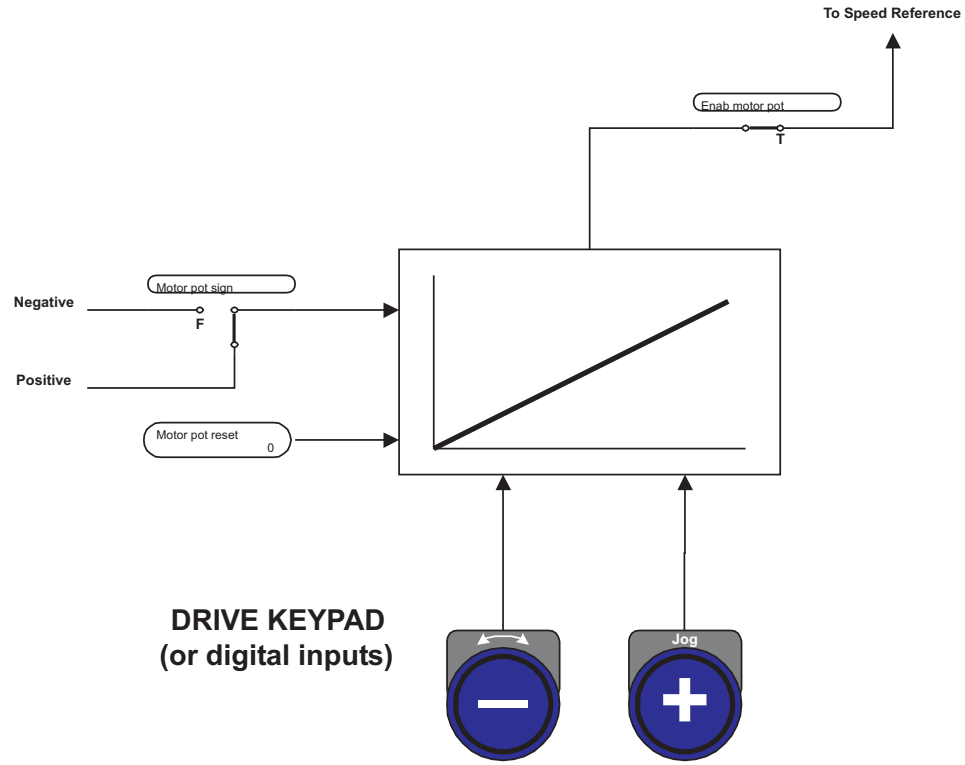
NAVIGATION

Overview	Go to functions
AVi_Ovw	AVi_Funct

Motor potentiometer



GE Motors and Industrial Systems Salem, Va. USA	PRODUCT: AV-300i AC flux vector Drive	File name: AVi_mpot.vsd
	Firmware Revision: 01.00	Issued Date --- Initials: 03/10/97 -- GE User
Proprietary Information Do Not Copy	This is a verified copy of controlled documentation printed on 07/20/98. The master is located on vasald03/[vss]$/InnovCtl	Revision Date -- Initials: 07/31/98 -- GE User

NAVIGATION

Overview: AVi_Ovw | Go to functions: AVi_Funct

Multi speed

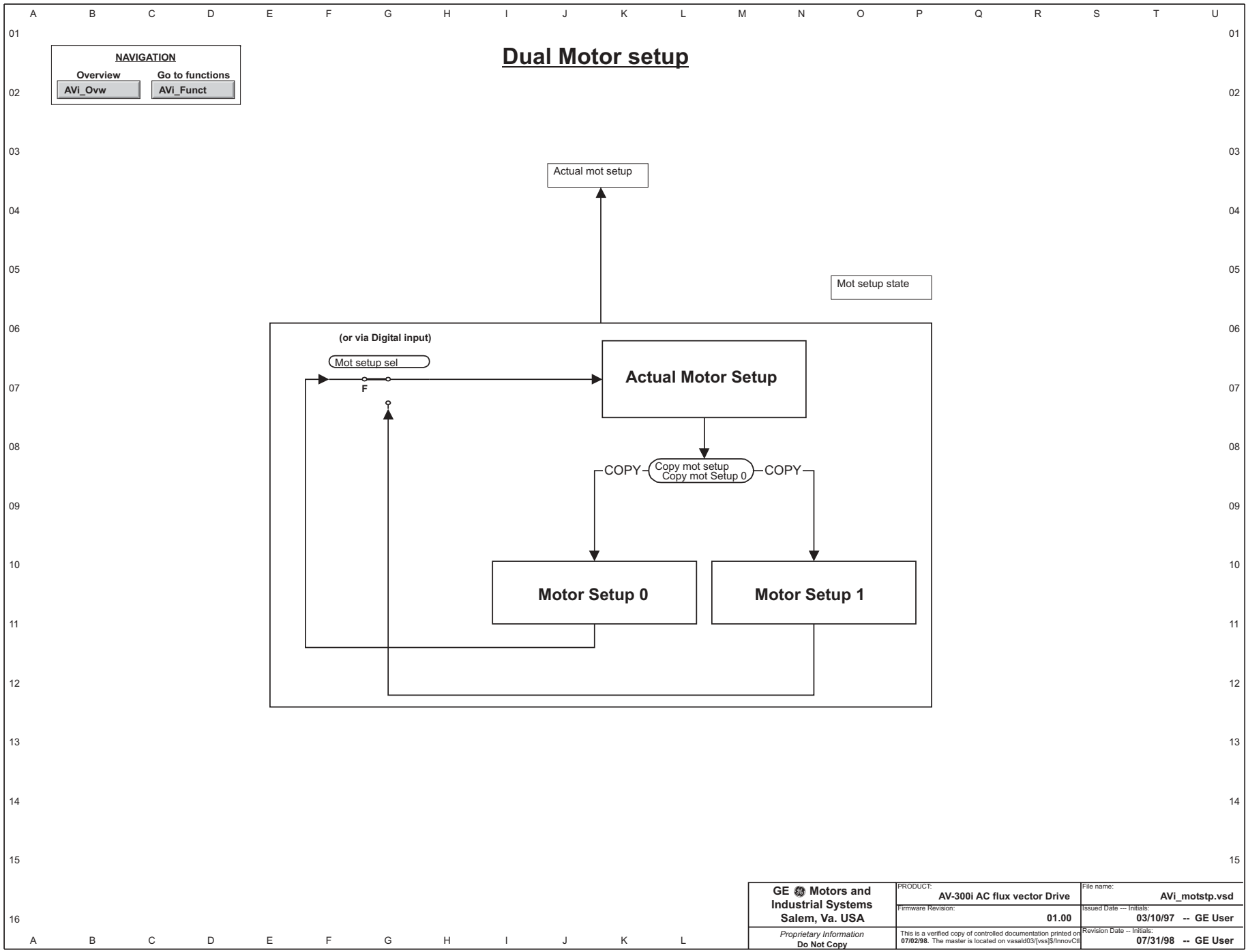
Enab multi spd: Disabled

Multi speed sel: 0

Ramp ref (d)

Speed sel 0 Bit 0 Not Selected	Speed sel 1 Bit 1 Not Selected	Speed sel 2 Bit 2 Not Selected	REFERENCE
0	0	0	Ramp ref 1: 0 rpm + Ramp ref 2: 0 rpm
1	0	0	Multi speed 1: 0 rpm
0	1	0	Multi speed 2: 0 rpm
1	1	0	Multi speed 3: 0 rpm
0	0	1	Multi speed 4: 0 rpm
1	0	1	Multi speed 5: 0 rpm
0	1	1	Multi speed 6: 0 rpm
1	1	1	Multi speed 7: 0 rpm

GE Motors and Industrial Systems Salem, Va. USA	PRODUCT: AV-300i AC flux vector Drive	File name: AVi_mspd.vsd
	Firmware Revision: 01.00	Issued Date --- Initials: 03/10/97 -- GE User
Proprietary Information Do Not Copy	This is a verified copy of controlled documentation printed on 07/07/98. The master is located on vasald03/[vss]$/InnovCtl	Revision Date -- Initials: 07/31/98 -- GE User


NAVIGATION
Overview
Go to functions
AVi_Ovw
AVi_Funct
Dual Motor setup
Actual mot setup
Mot setup state
(or via Digital input)
Mot setup sel
F
Actual Motor Setup
COPY
Copy mot setup
Copy mot Setup 0
COPY
Motor Setup 0
Motor Setup 1
GE Motors and Industrial Systems
Salem, Va. USA
Proprietary Information
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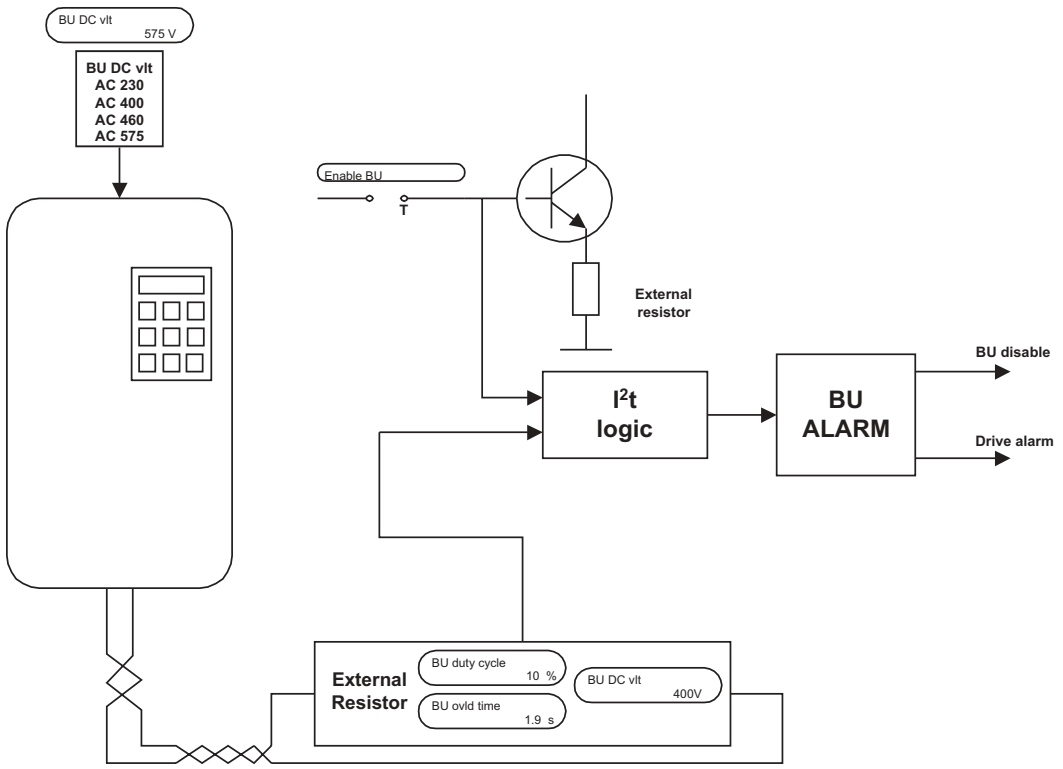
PRODUCT:
AV-300i AC flux vector Drive
Firmware Revision:
01.00
This is a verified copy of controlled documentation printed on 07/02/98. The master is located on vasald03/[vss]$/InnovCtl
File name:
AVi_motstp.vsd
Issued Date --- Initials:
03/10/97 -- GE User
Revision Date -- Initials:
07/31/98 -- GE User

NAVIGATION

Overview: AVi_Ovw | Go to functions: AVi_Funct

Brake unit function



GE Motors and Industrial Systems Salem, Va. USA	PRODUCT: AV-300i AC Flux vector Drive	File name: AVi_BRU.vsd
	Firmware Revision: 01.00	Issued Date --- Initials: 03/10/97 -- GE User
Proprietary Information Do Not Copy	This is a verified copy of controlled documentation printed on 07/02/98. The master is located on vasald03/[vss]$/InnovCtl	Revision Date -- Initials: 07/31/98 -- GE User

DC Braking function

NAVIGATION

Overview	Go to functions
AVi_Ovw	AVi_Funct

DC braking mode

T

DC Braking mode selection

DC Braking current

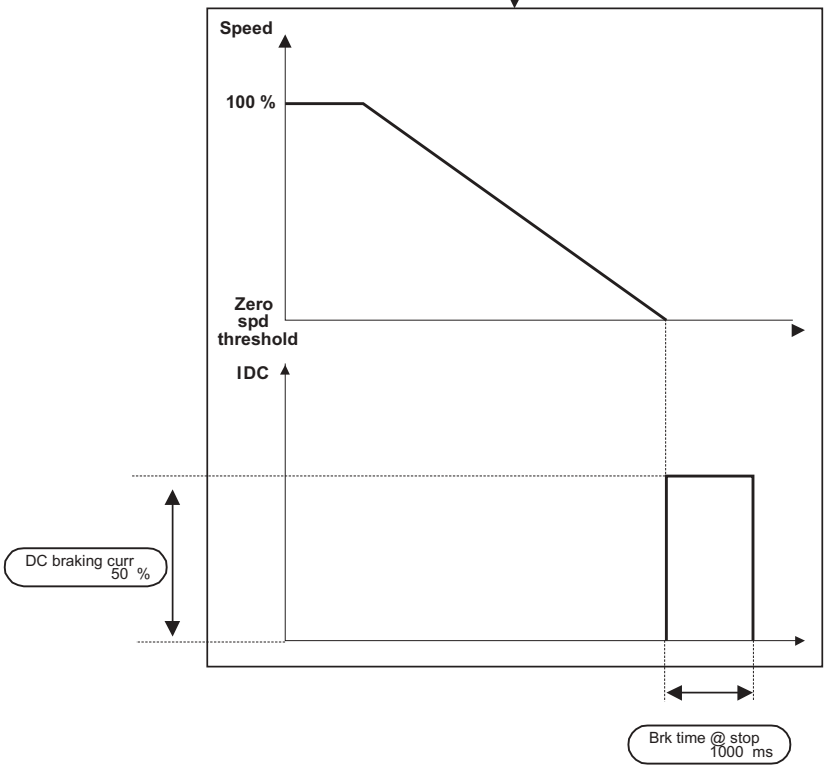
QStp opt code

Quick stop

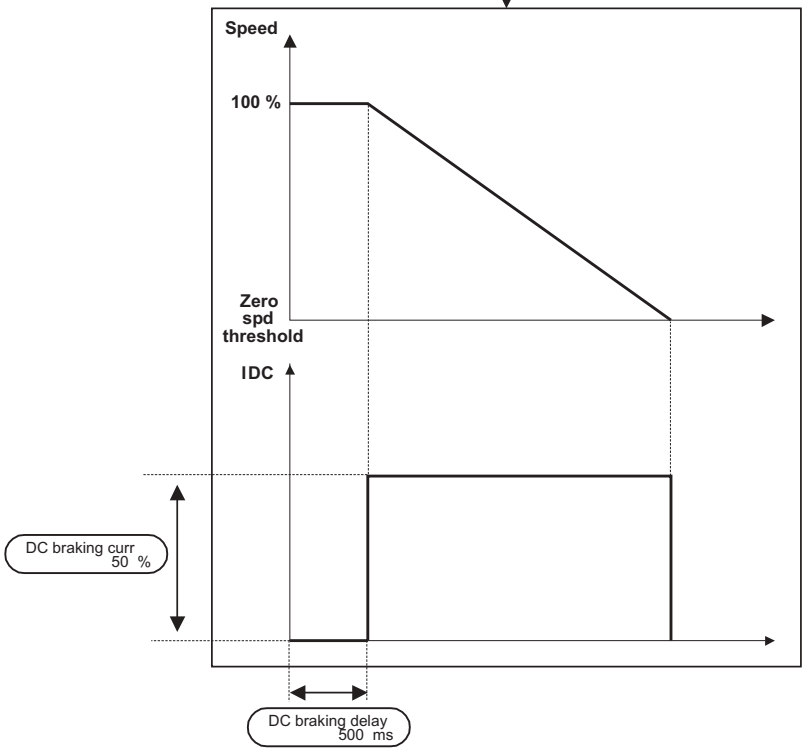
F

Ramp stop

DC Braking mode 1



DC Braking mode 0



GE Motors and Industrial Systems Salem, Va. USA	PRODUCT: AV-300i AC flux vector Drive	File name: AVi_DCBR.vsd
	Firmware Revision: 01.00	Issued Date --- Initials: 03/10/97 -- GE User
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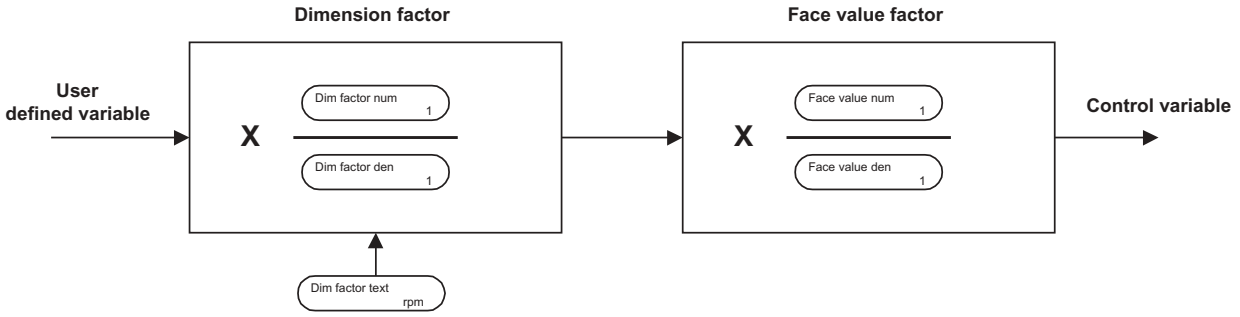
NAVIGATION

Overview: AVi_Ovw

Go to functions: AVi_Funct

Dimension factor
Face value factor

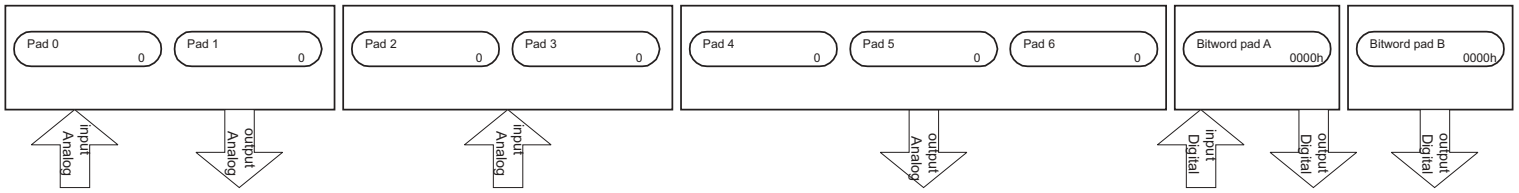


GE Motors and Industrial Systems Salem, Va. USA	PRODUCT: AV-300i AC flux vector Drive	File name: AVi_fctfct.vsd
	Firmware Revision: 01.00	Issued Date --- Initials: 03/10/97 -- GE User
Proprietary Information Do Not Copy	This is a verified copy of controlled documentation printed on 07/02/98. The master is located on vasald03/[vss]$/InnovCtl	Revision Date -- Initials: 07/31/98 -- GE User

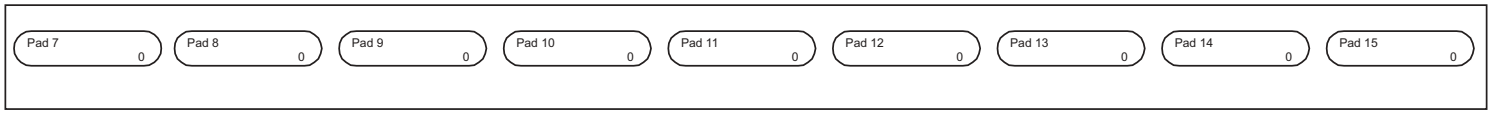
PAD parameters

NAVIGATION

Overview	Go to functions
AVi_Ovw	AVi_Funct



General PAD

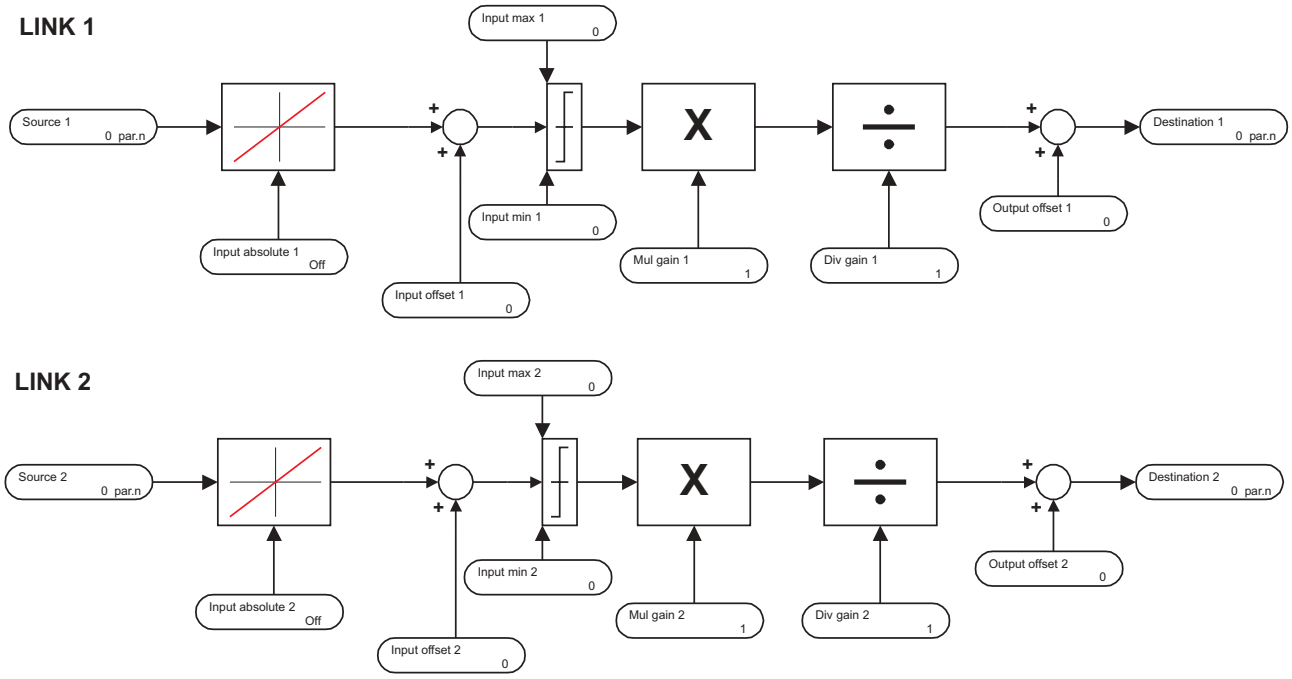


GE Motors and Industrial Systems Salem, Va. USA	PRODUCT: AV-300i AC flux vector Drive	File name: AVi_PAD.vsd
	Firmware Revision: 01.00	Issued Date --- Initials: 03/10/97 -- GE User
Proprietary Information Do Not Copy	This is a verified copy of controlled documentation printed on 07/02/98. The master is located on vasald03/[vss]$/InnovCtl	Revision Date -- Initials: 07/31/98 -- GE User

NAVIGATION

Overview: AVi_Ovw | Go to functions: AVi_Funct

LINKS Function

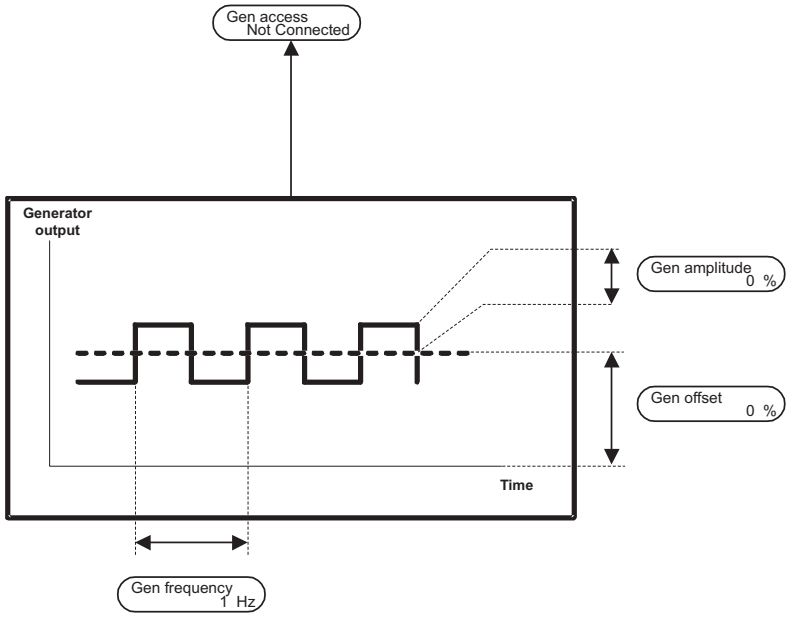


GE Motors and Industrial Systems Salem, Va. USA	PRODUCT: AV-300i AC flux vector Drive	File name: AVi_Links.vsd
	Firmware Revision: 01.00	Issued Date --- Initials: 03/10/97 -- GE User
Proprietary Information Do Not Copy	This is a verified copy of controlled documentation printed on 07/02/98. The master is located on vasald03/[vss]$/InnovCtl	Revision Date -- Initials: 07/02/98 -- GE User

Test Generator

NAVIGATION

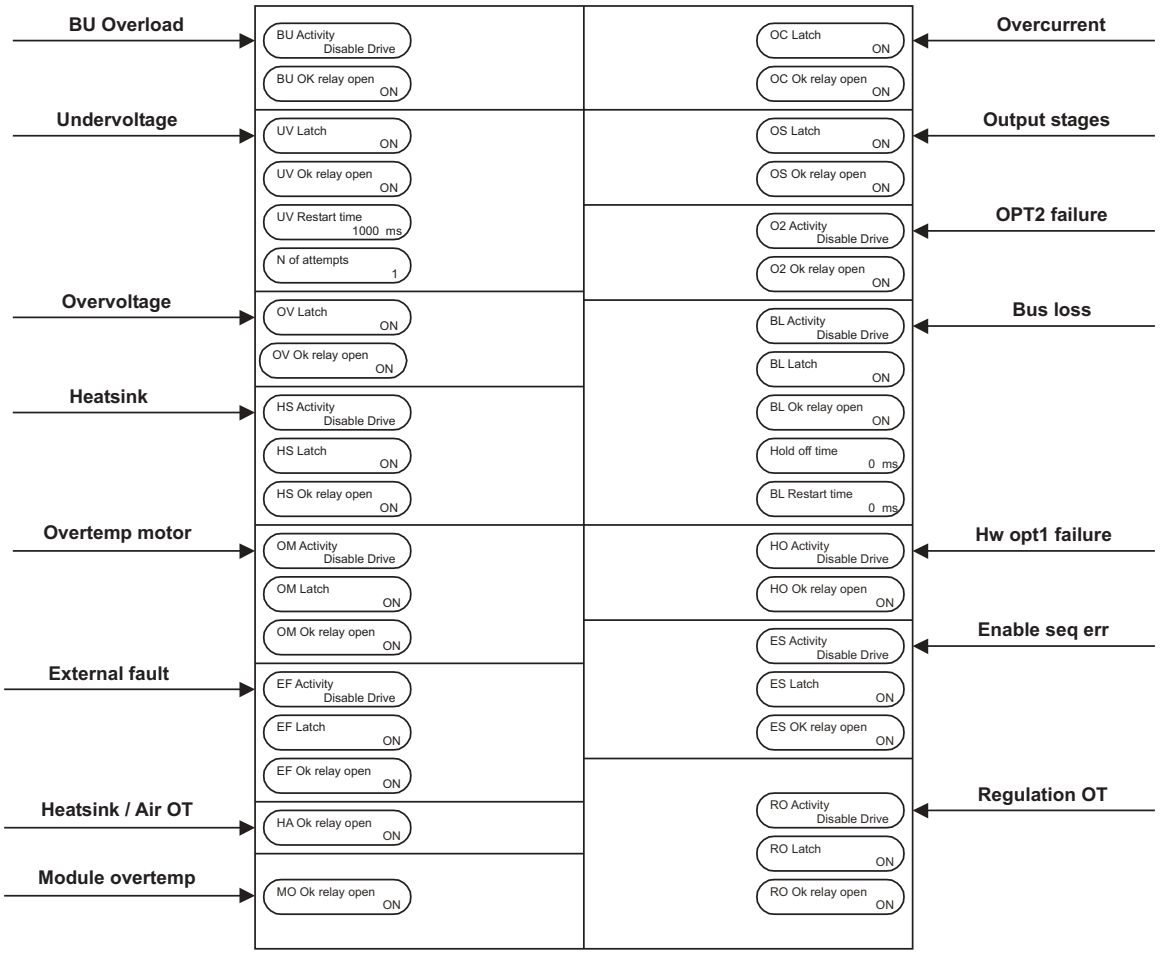
Overview	Go to functions
AVi_Ovw	AVi_Funct



GE Motors and Industrial Systems Salem, Va. USA	PRODUCT: AV-300i AC flux vector Drive	File name: AVi_Test_gen.vsd
	Firmware Revision: 01.00	Issued Date --- Initials: 03/10/97 -- GE User
Proprietary Information Do Not Copy	This is a verified copy of controlled documentation printed on 07/02/98. The master is located on vasald03/[vss]$/InnovCtl	Revision Date -- Initials: 07/31/98 -- GE User

NAVIGATION
Overview
AVi_Ovw

Alarm mapping



Pointer 10

Failure code

Failure text 0

Failure hour

GE Motors and Industrial Systems Salem, Va. USA	PRODUCT: AV-300i AC flux vector Drive	File name: AVi_Alarm_mp.vsd
	Firmware Revision: 01.00	Issued Date --- Initials: 03/10/97 -- GE User
Proprietary Information Do Not Copy	This is a verified copy of controlled documentation printed on 07/02/98. The master is located on vasald03/[vss]$/InnovCtl	Revision Date -- Initials: 07/31/98 -- GE User

Chapter 10 - Parameters Lists

10.1. List of all Parameters

Explanation of tables:

White text on black background	Menu/submenu
White text on black background in brackets	Menu does not exist in the keypad
Fields with gray background	Function not accessible via keypad. The status of the corresponding parameter is only displayed.
[FF] in the Parameter column	Dimension based on the factor function
"No." column	**Parameter number (decimal). The value 2000H (= decimal 8192) must be added to the number given in the "No." column in order to obtain the index to access the parameter via Bus , serial line or Opt2 (DGF card). The parameters in the Drivecom group can be accessed using the format and index specified in the DRIVECOM power transmission profile (#21).**
"Format" column	Internal parameter format: I= Integer (Example: I16 = Integer 16 bit) U = Unsigned (Example: U32 = unsigned 32 bit) Float = Floating point
"Value" column	Minimum, maximum and factory parameter values. S = set value depending on the size of the device. F = set value depending on the **Flt 100 mF** [303] parameter
"Keypad" column	√ = Parameter available via keypad
"RS485/BUS/Opt2-M" column (Low priority)	Parameter available via RS485, field Bus or via the DGF Card manual communication (see the DGF Card user manual) The numbers indicate what has to be sent via interface line in order to set the single parameters.
"Term." column	Parameter addressable to one of the analog or digital input/output terminals.

"Opt2-A" (Low Priority)

"PDC" (High Priority)

Parameter available via the DGF Card asynchronous communication (see the DGF Card user manual) and/or the Process Data Channel (PDC) of the Field bus.

NOTE: When field Bus interface parameters whose range is [min=0; max=1] can be assigned to either virtual digital inputs (if "w" access code exists) and/or virtual digital outputs (if "R" access code exists).

IA, QA, ID, QD in the "Term." column

The function can be accessed via a freely programmable analog or digital input or output.

IA = analog input

QA = analog output

ID = digital input

QD = digital output.

The possibly present number is the one by which the terminal is identified.

H, L in the "Term." column

Level of the terminal signals (H=high, L=low) which enables the single function.

R/W/Z/C

Access possibilities via the serial interface, Bus or Opt2 manual or asynchronous communication :

R = Read, W = Write, Z = Write only when drive disabled, C=Command parameter (the writing of any value causes the execution of a command).

X · Pyy

The value of this parameter can correspond to min/max X times the value of the yy parameter.

NOTE !

The parameter number shown in the following table is a base number. The value 2000H (=8192 decimal) must be added to the number given in the "No." column in order to obtain the index to access the parametr via Bus, serial line or Opt2 (DGF card). The parameters in the Drivecom group can be accessed using the format and index specified in the DRIVECOM power transmission profile (#21).

* When the parameter is accessed by Opt2-A/PDC the format is U16

** When the parameter is accessed by Opt2-A/PDC the format is I16

*** When the parameter is accessed by Opt2-A/PDC the lower word of the parameter is considered

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Drive ready	380	U16	0	1	-	-	R	QD	R
Drive ready							1	H	
Drive not ready							0	L	
Quick stop	343	U16	0	1	No quick stop (1)	-	R/W	ID	R/W
Quick stop							0	L	
No Quick stop							1	H	
Fast stop	316	U16	0	1	No fast stop (1)	-	R/W	14	R/W
Fast Stop							0	L	
No Fast Stop							1	H	
BASIC MENU									
Enable drive	314	U16	0	1	Disabled (0)		R/W	12	R/W
Enabled							1	H	
Disabled							0	L	
Ramp ref 1 [FF]	44	I16	-2 x P45	+2 x P45	0		R/W	IA, QA	R/W
(Speed input var)									
Start/Stop	315	U16	0	1	Stop (0)		R/W	13	R/W
Start							1	H	
Stop							0	L	
Actual spd (rpm)	122	I16	-8192	8192	-		R	QA	R
Motor current [A]	231	Float	0	S	-		R	QA	-
BASIC MENU \ Drive type									
Mains voltage	333	U16	0	2	460 V (2)		R/Z	-	-
575 V							3		
Ambient temp [°C]	332	U16	0	1	40°C (1)		R/Z	-	-
50°C (122°F)							0		
40°C (104°F)							1		
Rated drive curr	334	U16	0	16	S	-	R	-	R
3							0		
7.5							1		
10							2		
15							3		
20							4		
25							5		
30							6		
40							7		
50							8		
60							9		
75							10		
100							11		
125							12		
150							13		
2							19		
5							20		
Continuous curr [A]	802	Float	S	S	S		R	-	-
Software version	331	Text	-	-	-		R	-	-
Drive type (AV-300i)	300	U16	-	-	274	-	R	-	R
BASIC MENU									
Regulation mode	321	U16	0	3	V/f control (3)		R/Z	-	-
Sensorless vect							0		
Self-tuning							1		
Field oriented							2		
V/f control							3		
Acc delta speed [FF]	21	U32	0	2^{32}-1	100		R/W	-	-
Acc delta time [s]	22	U16	0	65535	1		R/W	-	-
Dec delta speed [FF]	29	U32	0	2^{32}-1	100		R/W	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Dec delta time [s]	30	U16	0	65535	1	√	R/W	-	-
T current lim + [%]	8	U16	0	F	S	√	R/W	IA	R/W
T current lim - [%]	9	U16	0	F	S	√	R/W	IA	R/W
Encoder 1 type Sinusoidal Digital	415	I16	0	1	Digital (1)	√	R/Z 0 1	-	-
Encoder 1 pulses	416	Float*	600	9999	1024	√	R/Z	-	R
Speed base value [FF]	45	U32***	1	16383	1500	√	R/Z	-	R
Save parameters	256	U16	0	65535	-	√	C	-	-
MONITOR									
Enable drive Enabled Disabled	314	U16	0	1	Disabled (0)	√	R/W 1 0	12 H L	R/W
Start/Stop Start Stop	315	U16	0	1	Stop (0)	√	R/W 1 0	13 H L	R/W
MONITOR \ Measurements \ Speed \ Speed in DRC []									
Ramp ref (d) [FF]	109	I16	-32768	32767	-	√	R	-	R
Ramp output (d) [FF]	112	I16	-32768	32767	-	√	R	-	R
Speed ref (d) [FF] (Speed ref var)	115	I16	-32768	32767	-	√	R	-	R
Actual spd (d) [FF] (Act spd value)	119	I16	-32768	32767	-	√	R	-	R
F act spd (d) [FF]	925	I16	-32768	32767	-	√	R	-	R
Act spd filter [s]	923	Float	0.001	0.100	0.001	√	R/W	-	-
MONITOR \ Measurements \ Speed \ Speed in rpm									
Ramp ref (rpm)	110	I16	-32768	32767	-	√	R	QA	R
Ramp outp (rpm)	113	I16	-32768	32767	-	√	R	QA	R
Speed ref (rpm)	118	I16	-32768	32767	-	√	R	QA	R
Actual spd (rpm)	122	I16	-8192	8192	-	√	R	QA	R
Enc1 speed [rpm]	427	I16	-8192	8192	-	√	R	-	R
Enc2 speed [rpm]	420	I16	-8192	8192	-	√	R	-	R
F act spd (rpm)	924	I16	-32768	32767	-	√	R	QA	R
Act spd filter [rpm]	923	Float	0.001	0.100	0.001	√	R/W	-	-
MONITOR \ Measurements \ Speed \ Speed in %									
Ramp ref (%)	111	Float	-200.0	+ 200.0	-	√	R	-	-
Ramp output (%)	114	Float	-200.0	+ 200.0	-	√	R	-	-
Speed ref (%)	117	Float	-200.0	+ 200.0	-	√	R	-	-
Actual spd (%)	121	Float	-200.0	+ 200.0	-	√	R	-	-
MONITOR \ Measurements									
DC link voltage [V]	227	U16	0	999	-	√	R	QA	-
Active power [%]	229	Float**	-500	500	-	√	R	QA	R
Output voltage [V]	233	Float**	0	500	-	√	R	QA	R
Output frequency [Hz]	324	Float	0.0	500.0	-	√	R	-	-
Motor current [A]	231	Float	0.00	S	-	√	R	QA	-
Torque [%]	230	Float	-500	500	-	√	R	QA	-
T current ref [%]	41	I16	-500	500	-	√	R	QA	R
T curr (%)	927	I16	-500	500	-	√	R	QA	R
F T curr (%)	928	I16	-500	500	-	√	R	QA	R
T curr filter [s]	926	Float	0.001	0.250	0.100	√	R/W	-	-
Flux [%]	234	Float*	0.00	100.00	-	√	R	QA	R
Heatsink temp [°C]	881	I16	-	-	-	√	R	-	-
Regulation temp [°C]	1147	I16	-	-	-	√	R	-	-
Intake air temp [°C]	914	U16	-	-	-	√	R	QA	-
MONITOR \ I/O									
Digital I/Q	-				-	√	R	-	-
Dig input term	564	U16	0	65535	-	-	R	-	R
Dig input term 1	565	U16	0	1	-	-	R	-	R
Dig input term 2	566	U16	0	1	-	-	R	-	R
Dig input term 3	567	U16	0	1	-	-	R	-	R
Dig input term 4	568	U16	0	1	-	-	R	-	R
Dig input term 5	569	U16	0	1	-	-	R	-	R
Dig input term 6	570	U16	0	1	-	-	R	-	R
Dig input term 7	571	U16	0	1	-	-	R	-	R

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Dig input term 8	572	U16	0	1	-	-	R	-	R
Dig input term 9	573	U16	0	1	-	-	R	-	R
Dig input term 10	574	U16	0	1	-	-	R	-	R
Dig input term 11	575	U16	0	1	-	-	R	-	R
Dig input term 12	576	U16	0	1	-	-	R	-	R
Dig input term 13	577	U16	0	1	-	-	R	-	R
Dig input term 14	578	U16	0	1	-	-	R	-	R
Dig input term 15	579	U16	0	1	-	-	R	-	R
Dig input term 16	580	U16	0	1	-	-	R	-	R
Dig output term	581	U16	0	65535	-	-	R	-	R
Virtual dig inp	582	U16	0	65535	-		R/W	-	R/W
Virtual dig out	583	U16	0	65535	-		R	-	R
DRIVE PARAMETER \ Mot plate data									
Nominal voltage [V]	161	Float	1	999	575		R/Z	-	-
Nominal speed [rpm]	162	Float**	1	99999	S		R/Z	-	-
Nom frequency [Hz]	163	Float	1	999	60		R/Z	-	-
Nominal current [A]	164	Float	0.10	999.00	S		R/Z	-	-
Cos phi	371	Float	0.1	0.99	S		R/Z	-	-
Base voltage [V]	167	Float	1	999	575		R/Z	-	-
Base frequency [Hz]	168	Float	1	999	60		R/Z	-	-
Take motor par	694	U16	0	1	-		C	-	-
DRIVE PARAMETER \ Motor Parameter									
Magnetizing cur [A]	165	Float	0.10	999.00	S		R/W	-	-
Magn working cur [A]	726	Float	0.10	999.00	S		R	-	-
Rotor resistance [Ohm]	166	Float	0.0001	S	S		R/W	-	-
Stator resist [Ohm]	436	Float	0.0001	S	S		R/W	-	-
Lkg inductance [H]	437	Float	0.00001	9.00000	S		R/W	-	-
Load motor par Set 1 Set 2	251	U16	0	1	Set 1 (0)		Z 0 1	-	-
DRIVE PARAMETER \ Motor Parameter \ Self-tuning									
Self tune state	705	U16	0	65535	-	-	R	-	-
DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1									
Start part 1	676	U16	0	65535	-		C	-	-
Stator resist [Ohm]	436	Float	0.0001	S	S		R/W	-	-
Stator resist Nw [Ohm]	683	Float	S	S	-		R	-	-
Voltage comp lim [V]	644	Float	0.1	30.0	6.0		R/W	-	-
Volt comp lim Nw [V]	685	Float	0.1	30.0	-		R	-	-
Comp slope [V/A]	645	Float	0.1	50.0	13.0		R/W	-	-
Comp slope Nw [V/A]	686	Float	0.1	50.0	-		R	-	-
Lkg inductance [H]	437	Float	0.00001	9.00000	S		R/W	-	-
Lkg indutance Nw [H]	684	Float	S	S	-		R	-	-
Current P [%]	89	Float	0.00	100.00	S		R/W	-	-
Current P Nw [%]	687	Float	S	S	-		R	-	-
Rotor resistance [Ohm]	166	Float	0.0001	S	S		R/W	-	-
Rotor resist Nw [Ohm]	682	Float	S	S	-		R	-	-
Current I [%]	90	Float	0.00	100.00	S		R/W	-	-
Current I Nw [%]	688	Float	S	S	-		R	-	-
Take val part 1	677	U16	0	65535	-		Z/C	-	-
DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a									
Start part 2a	678	U16	0	65535	-		C	-	-
P1 flux model	176	Float	0.00	1.00	S		R/W	-	-
P1 flux model Nw	689	Float	S	S	S		R	-	-
P2 flux model	692	U16	1	20	S		R/W	-	-
P2 flux model Nw	690	U16	S	S	S		R	-	-
Magnetizing curr [A]	165	Float	0.1	999.0	S		R/W	-	-
Magnetiz curr Nw [A]	691	Float	S	S	S		R	-	-
Flux P [%]	91	Float	0.00	100.00	S		R/W	-	-
Flux P Nw [%]	907	Float	0.00	100.00	S		R	-	-
Flux I [%]	92	Float	0.00	100.00	S		R/W	-	-
Flux I Nw [%]	908	Float	0.00	100.00	S		R	-	-
Voltage P [%]	1022	Float	0	100.00	15.00		RW	RW	-
Voltage P Nw [%]	1024	Float	100.00	0.00	S		R	R	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Voltage I [%]	902	Float	0.00	100.00	4.00	√	R/W	-	-
Voltage I Nw [%]	909	Float	0.00	100.00	S	√	R	-	-
Take val part 2a	679	U16	0	65535	-	√	Z/C	-	-
DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b									
Start part 2b	680	U16	0	65535	-	√	C	-	-
P1 flux model	176	Float	0.00	1.00	S	√	R/W	-	-
P1 flux model Nw	689	Float	S	S	S	√	R	-	-
P2 flux model	692	U16	1	20	S	√	R/W	-	-
P2 flux model Nw	690	U16	S	S	S	√	R	-	-
Magnetizing curr [A]	165	Float	0.1	999.0	S	√	R/W	-	-
Magnetiz curr Nw [A]	691	Float	S	S	S	√	R	-	-
Flux P [%]	91	Float	0.00	100.00	S	√	R/W	-	-
Flux P Nw [%]	907	Float	0.00	100.00	S	√	R	-	-
Flux I [%]	92	Float	0.00	100.00	S	√	R/W	-	-
Flux I Nw [%]	908	Float	0.00	100.00	S	√	R	-	-
Voltage P [%]	1022	Float	0.00	100.00	15.00	√	RW	RW	-
Voltage P Nw [%]	1024	Float	100.00	0.00	S	√	R	R	-
Voltage I [%]	902	Float	0.00	100.00	4.00	√	R/W	-	-
Voltage I Nw [%]	909	Float	0.00	100.00	S	√	R	-	-
Take val part 2b	681	U16	0	65535	-	√	Z/C	-	-
DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3									
Fwd-Rev spd tune Fwd direction Rev direction	1029	U16	1	2	Fwd direction (1)	√	R/Z 1 2	-	-
Test T curr lim [%]	1048	U16	0	S	20	√	R/Z	-	-
Start part 3	1027	U16	0	65535	-	√	C	-	-
Inertia [kg*m*m*]	1014	Float	0.0010	999.9990	S	√	R/W	-	-
Inertia Nw [kg*m*m*]	1030	Float	0.0010	999.9990	-	√	R	-	-
Friction [N*m]	1015	Float	0.000	99.99	S	√	R/W	-	-
Friction Nw [N*m]	1031	Float	0.000	99.99	-	√	R	-	-
Speed P [%]	87	Float	0.00	100.00	S	√	R/W	-	-
Speed P Nw [%]	1032	Float	0.00	100.00	-	√	R	-	-
Speed I [%]	88	Float	0.00	100.00	S	√	R/W	-	-
Speed I Nw [%]	1033	Float	0.00	100.00	-	√	R	-	-
Take val part 3	1028	U16	0	65535	-	√	Z/C	-	-
DRIVE PARAMETER \ Sensorless									
Low speed factor	646	I16	0	32000	5000	√	R/W	-	-
Sls speed filter [s]	643	Float	0.01	0.50	0.01	√	R/W	-	-
Flux corr factor	647	Float	0.50	1.0	0.90	√	R/W	-	-
DRIVE PARAMETER \ V/f control									
V/f shape $V = k \cdot f^{1.0}$ $V = k \cdot f^{1.5}$ $V = k \cdot f^{1.7}$ $V = k \cdot f^{2.0}$	712	U16	0	3	$V = k \cdot f^{1.0}$ (0)	√	R/Z 0 1 2 3	-	-
DRIVE PARAMETER \ V/f control \ Voltage boost									
Vlt boost type Manual Automatic	709	U16	0	1	Manual (0)	√	R/Z 0 1	-	-
Manual boost [%]	710	Float	0.0	10.0	1.0	√	R/W	-	-
Actual boost [%]	711	Float	0.0	100.0	-	√	R	-	-
DRIVE PARAMETER \ V/f control \ Slip compens									
Slip comp type Manual Automatic	722	U16	0	1	Manual (0)	√	R/Z 0 1	-	-
Manual slip comp [rpm]	723	I16	0	200	0	√	R/W	-	-
Actual slip comp [rpm]	724	I16	-400	400	0	√	R	-	-
Slip comp filt [s]	725	Float	0.003	0.300	0.030	√	R/W	-	-
Motor losses %	727	Float	0.0	20.0	0	√	R/W	-	-
DRIVE PARAMETER \ V/f control \ V/f spd search									
Spd srch time [s]	893	Float	0.01	10.00	10.00	√	R/W	-	-
Flux srch time [s]	894	Float	0.01	20.00	1.00	√	R/W	-	-
Spd autocapture [FF]	895	I16	-32768	32767	1500	√	R/W	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Delay auto cap [ms]	896	U16	0	10000	1000	√	R/W	-	-
Delay retrying [ms]	897	U16	0	10000	1000	√	R/W	-	-
DRIVE PARAMETER \ V/f control \ Energy save									
Enable save eng Enabled Disabled	898	U16	0	1	Disabled (0)	√	R/Z 1 0	-	-
Lock save eng OFF ON	899	U16	0	1	OFF (0)	√	R/W 0 1	ID L H	R/W
V/f flux level [%]	900	U16	0	100	100	√	R/W	IA	R/W
Flux var time [s]	901	U16	1	100	10	√	R/W	-	-
INPUT VARIABLES \ Ramp ref \ Ramp ref 1									
Ramp ref 1 [FF] (Speed input var)	44	I16	-2 × P45	+2 × P45	0	√	R/W	IA, QA	R/W
Ramp ref 1 (%)	47	Float	-200.0	+200.0	0.0	√	R/W	-	-
INPUT VARIABLES \ Ramp ref \ Ramp ref 2									
Ramp ref 2 [FF]	48	I16	-2 × P45	+2 × P45	0	√	R/W	IA, QA	R/W
Ramp ref 2 (%)	49	Float	-200.0	+200.0	0.0	√	R/W	-	-
INPUT VARIABLES \ Speed ref \ Speed ref 1									
Speed ref 1 [FF]	42	I16	-2 × P45	+2 × P45	0	√	R/W	IA, QA	R/W
Speed ref 1 (%)	378	Float	-200.0	+200.0	0.0	√	R/W	-	-
INPUT VARIABLES \ Speed ref \ Speed ref 2									
Speed ref 2 [FF]	43	I16	-2 × P45	+2 × P45	0	√	R/W	IA, QA	R/W
Speed Ref 2 (%)	379	Float	-200.0	+200.0	0.0	√	R/W	-	-
INPUT VARIABLES \ T current ref									
T current ref 1 [%]	39	I16	F	F	0	√	R/W	IA, QA	R/W
T current ref 2 [%]	40	I16	F	F	0	√	R/W	IA, QA	R/W
LIMITS \ Speed limits \ Speed amount									
Speed min amount [FF]	1	U32	0	2^{32}-1	0	√	R/Z	-	-
Speed max amount [FF]	2	U32	0	2^{32}-1	2000	√	R/Z	-	-
LIMITS \ Speed limits \ Speed min/max									
Speed min pos [FF]	5	U32	0	2^{32}-1	0	√	R/Z	-	-
Speed max pos [FF]	3	U32	0	2^{32}-1	2000	√	R/Z	-	-
Speed min neg [FF]	6	U32	0	2^{32}-1	0	√	R/Z	-	-
Speed max neg [FF]	4	U32	0	2^{32}-1	2000	√	R/Z	-	-
Speed limited Speed not limited Speed limited	372	U16	0	1		-	R 0 1	QD L H	R
LIMITS \ Current limits									
T curr lim type T lim + / - T lim mot gen	715	U16	0	1	T lim +/- (0)	√	R/Z 0 1	-	-
T current lim [%]	7	U16	0	F	S	√	R/W	IA	R/W
T current lim + [%]	8	U16	0	F	S	√	R/W	IA	R/W
T current lim - [%]	9	U16	0	F	S	√	R/W	IA	R/W
Curr limit state Curr. limit not reached Curr. limit reached	349	U16	0	1		-	R 0 1	QD L H	R
In use Tcur lim+ [%]	10	U16	0	F		√	R	-	R
In use Tcur lim- [%]	11	U16	0	F		√	R	-	R
Current lim red [%]	13	U16	0	F	100	√	R/W	-	R/W
Torque reduct Not actived actived	342	U16	0	1	Not act. (0)	√	R/W 0 1	ID L H	R/W
LIMITS \ Flux limits									
Flux level [%]	467	U16	10	100	100	√	R/W	IA QA	R/W
LIMITS \ Voltage limits									
Dynam vlt margin [%]	889	Float	10.00	10.00	1.00	√	R/W	-	-
RAMP \ Acceleration									
Acc delta speed [FF]	21	U32	0	2^{32}-1	100	√	R/W	-	-
Acc delta time [s]	22	U16	0	65535	1	√	R/W	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
RAMP \ Deceleration									
Dec delta speed [FF]	29	U32	0	2^{32}-1	100	√	R/W	-	-
Dec delta time [s]	30	U16	0	65535	1	√	R/W	-	-
RAMP \ Quick stop									
QStp delta speed [FF]	37	U32	0	2^{32}-1	1000	Ö	R/W	-	-
QStp delta time [s]	38	U16	0	65535	1	Ö	R/W	-	-
RAMP									
Ramp shape Linear S-Shaped	18	U16	0	1	Linear (0)	√	R/Z 0 1	-	-
S shape t const [ms]	19	Float	100	3000	500	√	R/W	-	-
S acc t const [ms]	663	Float	100	3000	500	√	R/W	-	-
S dec t const [ms]	664	Float	100	3000	500	√	R/W	-	-
Ramp +/- delay [ms]	20	U16	0	65535	100	√	R/W		-
Fwd-Rev No direction Fwd direction Rev direction No direction	673	U16	0	3	Fwd (1)	√	R/W 0 1 2 3	-	R/W
Forward sign FWD selected FWD not selected	293	U16	0	1	not sel (0)	-	R/W 1 0	ID H L	R/W
Reverse sign REV selected REV not selected	294	U16	0	1	not sel (0)	-	R/W 1 0	ID H L	R/W
Enable ramp Enabled Disabled	245	I16	0	1	Enabled (1)	√	R/Z 1 0	-	-
Ramp out = 0 Actived Not Actived	344	U16	0	1	Not act. (1)	√	R/W 0 1	ID L H	R/W
Ramp in = 0 Actived Not Actived	345	U16	0	1	Not act. (1)	√	R/W 0 1	ID L H	R/W
Freeze ramp Actived Not Actived	373	U16	0	1	Not act. (1)	√	R/W 0 1	ID L H	R/W
Ramp + Acc. clockwise + Dec. counter-clockwise Other states	346	U16	0	1	-	-	R 1 0	QD H L	R
Ramp - Acc. counter-clockwise + Dec. clockwise Other states	347	U16	0	1	-	-	R 1 0	QD H L	R
SPEED REGULAT.									
Speed ref [rpm]	118	I16	-32768	32767	-	√	R	QA	R
Speed reg output [%]	236	I16	-	-	-	√	R	QA	R
Lock speed reg ON OFF	322	U16	0	1	OFF (0)	√	R/W 1 0	ID L H	R/W
Enable spd reg Enabled Disabled	242	I16	0	1	Enabled (1)	√	R/Z 1 0	-	-
Lock speed I Actived Not Actived	348	U16	0	1	Not act. (1)	√	R/W 0 1	ID L H	R/W
Aux spd fun sel Speed up Inertia-loss cp	1016	U16	0	1	Speed up (0)	√	R/Z 0 1	-	-
Prop. filter [ms]	444	U16	0	1000	0	√	R/W	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
SPEED REGULAT \ Spd zero logic									
Enable spd=0 I Enabled Disabled	123	U16	0	1	Disabled (0)	√	R/Z 1 0	-	-
Enable spd=0 R Enabled Disabled	124	U16	0	1	Disabled (0)	√	R/Z 1 0	-	-
Enable spd=0 P Enabled Disabled	125	U16	0	1	Disabled (0)	√	R/Z 1 0	-	-
Enable lck sls Enabled Disabled	422	U16	0	1	Disabled (0)	√	R/Z 1 0	-	-
Spd=0 P gain [%]	126	Float	0.00	100.00	10.00	√	R/W	-	-
Ref 0 level [FF]	106	U16	1	32767	10	√	R/W	-	-
Enable zero pos Enabled Disabled	890	U16	0	1	Disabled (0)	√	R/Z 1 0	-	-
Lock zero pos ON OFF	891	U16	0	1	OFF (0)	√	R/W 1 0	ID L H	R/W
Zero pos gain [%]	892	U16	0	100	10	√	R/W	-	-
SPEED REGULAT \ Speed up									
Speed up gain [%]	445	Float	0.00	100.00	0.00	√	R/W	-	-
Speed up base [ms]	446	Float	0	16000	1000	√	R/W	-	-
Speed up filter [ms]	447	U16	0	1000	0	√	R/W	-	-
SPEED REGULAT \ Droop function									
Droop gain [%]	696	Float	0.00	100.00	0.00	√	R/W	-	-
Droop filter [ms]	697	U16	0	1000	0	√	R/W	-	-
Load comp [%]	698	I16	F	F	0	√	R/W	IA	R/W
Droop limit [FF]	700	U16	0	2 × P45	1500	√	R/W	-	-
Enable droop Enabled Disabled	699	U16	0	1	Disabled (0)	√	R/W 1 0	ID H L	R/W
SPEED REGULAT \ Inertia/loss cp									
Inertia [kg*m*m]	1014	Float	0.001	999.999	S	√	R/W	-	-
Friction [N*m]	1015	Float	0.000	99.999	S	√	R/W	-	-
Torque const [N*m/A]	1013	Float	0.01	99.99	S	√	R	-	-
Inertia c filter [ms]	1012	U16	0	1000	0	√	R/W	-	-
CURRENT REGULAT									
Current norm	267	Float	0.00	9999.99	S	-	R	-	-
Torque current	350	Float	S	S		-	R	QA	-
Flux current	351	Float	S	S		-	R	QA	-
F current ref	352	Float	S	S		-	R	QA	-
Zero torque Actived Not Actived	353	U16	0	1	Not Act. (1)	√	R/W 0 1	ID L H	R/W
FLUX REGULATION									
Flux reg mode Constant current Voltage control	469	U16	0	1	Volt.control (1)	√	R/Z 0 1	-	-
Flux reference	500	Float*	0.0	100.0	-	√	R	QA	R
Flux	234	Float*	0.00	100.00	-	√	R	QA	R
Out vlt level [%]	921	Float*	0.0	100.0	100.0	√	R/W	IA,QA	R/W
REG PARAMETERS \ Percent values \ Speed regulator									
Speed P [%]	87	Float	0.00	100.00	S	√	R/W	-	-
Speed I [%]	88	Float	0.00	100.00	S	√	R/W	-	-
REG PARAMETERS \ Percent values \ Current reg									
Current P [%]	89	Float	0.00	100.00	S	√	R/W	-	-
Current I [%]	90	Float	0.00	100.00	S	√	R/W	-	-
REG PARAMETERS \ Percent values \ Current reg\Dead time comp									
Voltage comp lim [V]	644	Float	0.1	30.0	6.0	√	R/W	-	-
Comp slope [V/A]	645	Float	0.1	50.0	13.0	√	R/W	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
REG PARAMETERS \ Percent values \ Flux regulator									
Flux P [%]	91	Float	0.00	100.00	S	√	R/W	-	-
Flux I [%]	92	Float	0.00	100.00	S	√	R/W	-	-
REG PARAMETERS \ Percent values \ Voltage reg									
Voltage P [%]	1022	Float	0.00	100.00	15.00	√	R/W	-	-
Voltage I [%]	902	Float	0.00	100.00	4.00	√	R/W	-	-
REG PARAMETERS \ Base values \ Speed regulator									
Speed P base [A/rpm]	93	Float	0.001	99.999	S	√	R/Z	-	-
Speed I base[A/rpm×ms]	94	Float	0.001	99.999	S	√	R/Z	-	-
REG PARAMETERS \ Base values \ Current reg									
Current P base [V/A]	95	Float	0.1	99999.9	S	√	R/Z	-	-
Current I base [V/A×ms]	96	Float	0.1	9999.9	S	√	R/Z	-	-
REG PARAMETERS \ Base values \ Flux regulator									
Flux P base [A/Vs]	97	Float	0.1	9999.9	S	√	R/Z	-	-
Flux I base [A/Vs×ms]	98	Float	0.01	999.99	S	√	R/Z	-	-
REG PARAMETERS \ Base values \ Voltage reg									
Voltage P base [Vs/V]	1023	Float	0.00001	9.99999	S	√	R/W	-	-
Voltage I base [Vs/V x s]	903	Float	0.00001	9.99999	S	√	R/W	-	-
REG PARAMETERS \ In use values									
Speed P in use [%]	99	Float	0.00	100.00	S	√	R	-	-
Speed I in use [%]	100	Float	0.00	100.00	S	√	R	-	-
CONFIGURATION									
Main commands	252	U16	0	1	Digitals (1)	√	R/Z	-	-
Terminals							0		
Digital							1		
Control mode	253	U16	0	1	Local (0)	√	R/Z	-	-
Local							0		
Bus							1		
Speed base value [FF]	45	U32***	1	16383	1500	√	R/Z	-	R
Regulation mode	321	U16	0	3	V/f control (3)	√	R/Z	-	-
Sensorless vect							0		
Self-tuning							1		
Field oriented							2		
V/f control							3		
Full load curr [A]	179	Float	0.10	999.00	S	√	R/Z	-	-
Flt_100_mf	303	I16	0	32767	S	-	R	-	R
Magn ramp time [s]	675	Float	0.01	5.00	1.00	√	R/Z	-	-
Magn boost curr [%]	413	U16	10	136	30	√	R/Z	-	-
Ok relay funct	412	I16	0	1	Drive healthy (0)	√	R/Z	-	-
Drive healthy							0		
Ready to start							1		
Switching freq	240	U16	S	S	S	√	R/Z	-	-
4 KHz							0		
8 KHz							1		
16 KHz							2		
2 KHz							3		
Qstp opt code	713	I16	-2	-1	Ramp stop (1)	√	R/Z	-	-
Ramp stop							1		
DC braking							2		
CONFIGURATION \ Motor spd fbk									
Speed fbk sel	414	U16	0	1	Enc.1 (1)	√	R/Z	ID	R/W
Encoder 1							1	H	
Encoder 2							0	L	
Encoder 1 type	415	I16	0	1	Digital (1)	√	R/Z	-	-
Sinusoidal							0		
Digital							1		
Encoder 1 pulses	416	Float*	600	9999	1024	√	R/Z	-	R
Enc1 supply vlt	1146	U16	0	3	5.41 V (0)	√	R/Z		
5.41 V							0		
5.68 V							1		
5.91 V							2		
6.18 V							3		
Encoder 2 pulses	169	Float*	600	9999	1024	√	R/Z	-	R

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Encoder repeat Encoder 2 Encoder 1	1054	U16	0	1	Encoder 1 (1)		R/Z 0 1	-	-
Encoder 1 state Encoder 1 OK Encoder 1 NOT OK	648	U16	0	1	-	-	R 1 0	QD H L	R
Encoder 2 state Encoder 2 OK Encoder 2 NOT OK	651	U16	0	1	-	-	R 1 0	QD H L	R
Refresh enc 1 Enabled Disabled	649	U16	0	1	Disabled (0)		R/W 1 0	-	-
Refresh enc 2 Enabled Disabled	652	U16	0	1	Disabled (0)		R/W 1 0	-	-
Enable ind store Enabled Disabled	911	U16	0	1	Disabled (0)		R/W 1 0	-	R/W
Ind store ctrl	912	U16	0	65535	0	-	R/W	-	R/W
Index storing	913	U32	0	2^{32}-1	-	-	R	-	R
CONFIGURATION \ Drive type									
Mains voltage 230 V 400 V 460 V	333	U16	S	2	460 V (2)		R/Z 0 1 2	-	-
Ambient temp [°C] 50°C (122°F) 40°C (104°F)	332	U16	0	1	40°C (1)		R/Z 0 1	-	-
Rated drive curr 3 7.5 10 15 20 25 30 40 50 60 75 100 125 150 2 5	334	U16	0	16	S	-	R 0 1 2 3 4 5 6 7 8 9 10 11 12 13 19 20	-	R
Continuous curr [A]	802	Float	S	S	S		R	-	-
Software version	331	Text					R	-	-
Drive type (AV-300i)	300	U16	-	-	274	-	R	-	R
CONFIGURATION \ Dimension fact									
Dim factor num	50	I32***	1	65535	1		R/Z	-	R
Dim factor den	51	I32***	1	2^{32}-1	1		R/Z	-	R
Dim factor text	52	Text			rpm		R/Z	-	-
CONFIGURATION \ Face value fact									
Face value num	54	I16	1	32767	1		R/Z	-	R
Face value den	53	I16	1	32767	1		R/Z	-	R
CONFIGURATION \ Prog alarms \ Undervoltage									
Latch ON OFF	357	U16	0	1	ON (1)		R/Z 1 0	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
OK relay open	358	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
Restart time [ms]	359	U16	0	65535	1000	√	R/W	-	-
N of attempts	360	U16	0	100	1	√	R/W	-	-
CONFIGURATION \ Prog alarms \ Overvoltage									
Latch	361	U16	0	1	ON (1)	√	R/Z	-	-
ON							1		
OFF							0		
Ok relay open	362	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
CONFIGURATION \ Prog alarms \ Heatsink sensor									
Activity	368	U16	1	5	Disable drive (2)	√	R/Z	-	-
Warning							1		
Disable drive							2		
Quick stop							3		
Normal stop							4		
Curr lim stop							5		
Latch	369	U16	0	1	ON (1)	√	R/Z	-	-
ON							1		
OFF							0		
Ok relay open	370	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
CONFIGURATION \ Prog alarms \ Heatsink ot									
Ok relay open	1152	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
CONFIGURATION \ Prog alarms \ Intake air ot									
Activity	1140	U16	1	5	Disable drive (2)	√	R/Z	-	-
Warning							1		
Disable drive							2		
Quick stop							3		
Normal stop							4		
Curr lim stop							5		
Latch	1141	U16	0	1	ON (1)	√	R/Z	-	-
ON							1		
OFF							0		
Ok relay open	1142	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
CONFIGURATION \ Prog alarms \ Regulation ot									
Activity	1148	U16	0	1	Warning (1)	√	R/Z	-	-
Ignore							0		
Warning							1		
Latch	1149	U16	0	1	ON (1)	√	R/Z	-	-
ON							1		
OFF							0		
Ok relay open	1150	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
CONFIGURATION \ Prog alarms \ Module overtemp									
Ok relay open	1151	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
CONFIGURATION \ Prog alarms \ Overtemp motor									
Activity	365	U16	1	5	Disable drive (2)	√	R/Z	-	-
Warning							1		
Disable drive							2		
Quick stop							3		
Normal stop							4		
Curr lim stop							5		
Latch	366	U16	0	1	ON (1)	√	R/Z	-	-
ON							1		
OFF							0		
Ok relay open	367	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
CONFIGURATION \ Prog alarms \ External fault									
Activity	354	U16	1	5	Disable drive (2)	√	R/Z	-	-
Warning							1		
Disable drive							2		
Quick stop							3		
Normal stop							4		
Curr lim stop							5		
Latch	355	U16	0	1	ON (1)	√	R/Z	-	-
ON							1		
OFF							0		
OK relay open	356	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
CONFIGURATION \ Prog alarms \ Overcurrent									
Latch	363	U16	0	1	ON (1)	√	R/Z	-	-
ON							1		
OFF							0		
OK relay open	364	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
CONFIGURATION \ Prog alarms \ Output stages									
Latch	210	U16	0	1	ON (1)	√	R/Z	-	-
ON							1		
OFF							0		
OK relay open	211	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
CONFIGURATION \ Prog alarms \ Opt2 failure									
Activity	639	U16	2	5	Disabled drive (2)	√	R/Z	-	-
Disable drive							2		
Quick stop							3		
Normal stop							4		
Curr lim stop							5		
OK relay open	640	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
CONFIGURATION \ Prog alarms \ Bus loss									
Activity	634	U16	1	5	Disabled drive (2)	√	R/Z	-	-
Warning							1		
Disable drive							2		
Quick stop							3		
Normal stop							4		
Curr lim stop							5		
Latch	633	U16	0	1	ON (1)	√	R/Z	-	-
ON							1		
OFF							0		
OK relay open	635	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Hold off time [ms]	636	U16	0	10000	0	√	R/W	-	-
Restart time [ms]	637	U16	0	10000	0	√	R/W	-	-
CONFIGURATION \ Prog alarms \ Hw opt1 failure									
Activity	386	U16	1	5	Disabled drive (2)	√	R/Z	-	-
Warning							1		
Disable drive							2		
Quick stop							3		
Normal stop							4		
Curr lim stop							5		
OK relay open	387	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
CONFIGURATION \ Prog alarms \ Enable seq err									
Activity	728	U16	0	2	Disabled drive (2)	√	R/Z	-	-
Ignore							0		
Disable drive							2		
Latch	729	U16	0	1	ON (1)	√	R/Z	-	-
ON							1		
OFF							0		
OK relay open	730	I16	0	1	ON	√	R/W	-	-
ON					(1)		1		
OFF							0		
CONFIGURATION \ Prog alarms \ BU overload									
Activity	737	U16	1	5	Disabled drive (2)	√	R/Z	-	-
Warning							1		
Disable drive							2		
Quick stop							3		
Normal stop							4		
Curr lim stop							5		
OK relay open	738	I16	0	1	ON (1)	√	R/W	-	-
ON							1		
OFF							0		
CONFIGURATION									
Device address	319	U16	0	127	0	√	R/Z	-	-
Ser answer delay [ms]	408	U16	0	900	0	√	R/W	-	-
Pword 1 :	85	I32	00000	99999	Disabled (0)	√	W	-	-
Enabled							1		
Disabled							0		
I/O CONFIG \ Analog outputs \ Analog output 1									
Select output 1	66	U16	0	84	Actual speed (8)	√	R/Z	-	-
OFF							0		
Speed ref 1							1		
Speed ref 2							2		
Ramp ref 1							3		
Ramp ref 2							4		
Ramp ref							5		
Speed ref							6		
Ramp output							7		
Actual spd (rpm)							8		
T current ref 1							9		
T current ref 2							10		
T current ref							11		
F current ref							12		
Flux current							13		
Torque current							14		
Speed reg out							15		
Motor current							16		
Current U							17		
Current V							18		
Current W							19		
Output voltage							20		
Voltage U							21		

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Voltage V							22		
DC link voltage							23		
Analog input 1							24		
Analog input 2							25		
Analog input 3							26		
Flux							27		
Active power							28		
Torque							29		
Rr adap output							30		
Pad 0							31		
Pad 1							32		
Pad 4							33		
Pad 5							34		
Flux reference							35		
Pad 6							38		
PID output							39		
Feed fwd power							78		
Out vlt level							79		
Flux level							80		
F act spd (rpm)							81		
F T curr (%)							82		
Spd draw out							84		
PL next factor							87		
PL active limit							88		
Scale output 1	62	Float	-10.000	10.000	1.000	√	R/W	-	-
I/O CONFIG \ Analog outputs \ Analog output 2									
Select output 2 (Select like output 1)	67	U16	0	84	T current (14)	√	R/Z	-	-
Scale output 2	63	Float	-10.000	10.000	1.000	√	R/W	-	-
I/O CONFIG \ Analog outputs \ Analog output 3									
Select output 3 (Select like output 1)	68	U16	0	84	Current U (17)	√	R/Z	-	-
Scale output 3	64	Float	-10.000	10.000	1.000	√	R/W	-	-
I/O CONFIG \ Analog outputs \ Analog output 4									
Select output 4 (Select like output 1)	69	U16	0	84	Motor current (16)	√	R/Z	-	-
Scale output 4	65	Float	-10.000	10.000	1.000	√	R/W	-	-
I/O CONFIG \ Analog inputs \ Analog input 1									
Select input 1	70	U16	0	28	Ramp ref 1 (4)	√	R/Z	-	-
OFF							0		
Jog reference							1		
Speed ref 1							2		
Speed ref 2							3		
Ramp ref 1							4		
Ramp ref 2							5		
T current ref 1							6		
T current ref 2							7		
Adap reference							8		
T current lim							9		
T current lim +							10		
T current lim -							11		
Pad 0							12		
Pad 1							13		
Pad 2							14		
Pad 3							15		
Load comp							19		
PID offset 0							21		
PI central v3							22		
PID feed-back							23		
V/f flux level							24		
Flux level							25		
Out vlt level							26		
Speed ratio							28		

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
An in 1 target Assigned Not assigned	295	U16	0	1	Assign. (0)	√	R/W 0 1	ID L H	R/W
Input 1 type -10V ... + 10 V 0...20 mA, 0...10 V 4...20 mA	71	U16	0	2	± 10 V (0)	√	R/Z 0 1 2	-	-
Input 1 sign Positive Negative	389	U16	0	1	Positive (1)	√	R/W 1 0	-	R/W
Scale input 1	72	Float	-10000	10.000	1.000	√	R/W	-	-
Tune value inp 1	73	Float	0.1	10.000	1.000	√	R/W	-	-
Auto tune inp 1 Auto tune	259	U16	0	65535	-	√	C 1	-	-
Input 1 filter [ms]	792	U16	0	1000	0	√	R/W	-	-
Input 1 compare	1042	I16	-10000	10000	0	√	R/W	-	-
Input 1 cp error	1043	U16	0	10000	0	√	R/W	-	-
Input 1 cp delay	1044	U16	0	65000	0	√	R/W	-	-
Input 1 cp match Input 1 not thr.val. Input 1=thr.val	1045	U16	0	1	-	-	R 0 1	QD L H	R
Offset input 1	74	I16	-32768	32767	0	√	R/W	-	-
I/O CONFIG \ Analog inputs \ Analog input 2									
Select input 2 (Select like Input 1)	75	U16	0	28	OFF (0)	√	R/Z	-	-
An in 2 target Assigned Not assigned	296	U16	0	1	Assign.(0)	√	R/W 0 1	ID L H	R/W
Input 2 type -10V ... + 10 V 0...20 mA, 0...10 V 4...20 mA	76	U16	0	2	± 10 V (0)	√	R/Z 0 1 2	-	-
Input 2 sign Positive Negative	390	U16	0	1	Positive (1)	√	R/W 1 0	-	R/W
Scale input 2	77	Float	-10000	10.000	1.000	√	R/W	-	-
Tune value inp 2	78	Float	0.1	10.000	1.000	√	R/W	-	-
Auto tune inp 2 Auto tune	260	U16	0	65535	-	√	C 1	-	-
Offset input 2	79	I16	-32768	32767	0	√	R/W	-	-
I/O CONFIG \ Analog inputs \ Analog input 3									
Select input 3 (Select like Input 1)	80	U16	0	28	OFF (0)	√	R/Z	-	-
An in 3 target Assigned Not assigned	297	U16	0	1	Assign. (0)	√	R/W 0 1	ID L H	R/W
Input 3 type -10V ... + 10 V 0...20 mA, 0...10 V 4...20 mA	81	U16	0	2	± 10 V (0)	√	R/Z 0 1 2	-	-
Input 3 sign Positive Negative	391	U16	0	1	Positive (1)	√	R/W 1 0	-	R/W
Scale input 3	82	Float	-10000	10.000	1.000	√	R/W	-	-
Tune value inp 3	83	Float	0.1	10.000	1.000	√	R/W	-	-
Auto tune inp 3 Auto tune	261	U16	0	65535	-	√	C 1	-	-
Offset input 3	84	I16	-32768	32767	0	√	R/W	-	-
I/O CONFIG \ Digital outputs									
Digital output 1 OFF Speed zero thr Spd threshold	145	U16	0	49	Ramp + (8)	√	R/Z 0 1 2	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Set speed							3		
Curr limit state							4		
Drive ready							5		
Overld available							6		
Ramp +							8		
Ramp -							9		
Speed limited							10		
Undervoltage							11		
Overvoltage							12		
Heatsink sensor							13		
Overcurrent							14		
Overtemp motor							15		
External fault							16		
Failure supply							17		
Pad A bit							18		
Pad B bit							19		
Virt dig input							20		
Speed fbk loss							25		
Bus loss							26		
Output stages							27		
Hw opt 1 failure							28		
Opt 2 failure							29		
Encoder 1 state							30		
Encoder 2 state							31		
Ovld mot state							32		
Enable seq err							35		
BU overload							36		
Diameter calc st							38		
Mot setup state							46		
Input 1 cp match							49		
Overload 200%							51		
PL stop active							52		
PL next active							53		
PL time-out sig							54		
Regulation ot							55		
Module overtemp.							56		
Heatsink ot							57		
Intake air ot							62		
Digital output 2 (Select like output 1)	146	U16	0	49	Ramp - (9)	√	R/Z	-	
Digital output 3 (Select like output 1)	147	U16	0	49	Spd threshold (2)	√	R/Z	-	
Digital output 4 (Select like output 1)	148	U16	0	49	Overld available (6)	√	R/Z	-	-
Digital output 5 (Select like output 1)	149	U16	0	49	Curr limit state (4)	√	R/Z	-	-
Digital output 6 (Select like output 1)	150	U16	0	49	Over-voltage (12)	√	R/Z	-	-
Digital output 7 (Select like output 1)	151	U16	0	49	Under-voltage (11)	√	R/Z	-	-
Digital output 8 (Select like output 1)	152	U16	0	49	Over-current (14)	√	R/Z	-	-
Relay 2 (Select like output 1)	629	U16	0	49	Speed zero thr (1)	√	R/Z	83-85	-
I/O CONFIG \ Digital inputs									
Digital input 1	137	U16	0	62	OFF (0)	√	R/Z	-	-
OFF							0		
Motor pot reset							1		
Motor pot up							2		
Motor pot down							3		
Motor pot sign +							4		
Motor pot sign -							5		
Jog +							6		

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Jog -							7		
Failure reset							8		
Torque reduct							9		
Ramp out = 0							10		
Ramp in = 0							11		
Freeze ramp							12		
Lock speed reg							13		
Lock speed I							14		
Auto capture							15		
Input 1 sign +							16		
Input 1 sign -							17		
Input 2 sign +							18		
Input 2 sign -							19		
Input 3 sign +							20		
Input 3 sign –							21		
Zero torque							22		
Speed sel 0							23		
Speed sel 1							24		
Speed sel 2							25		
Ramp sel 0							26		
Ramp sel 1							27		
Speed fbk sel							28		
PAD A bit 0							32		
PAD A bit 1							33		
PAD A bit 2							34		
PAD A bit 3							35		
PAD A bit 4							36		
PAD A bit 5							37		
PAD A bit 6							38		
PAD A bit 7							39		
Fwd sign							44		
Rev sign							45		
An in 1 target							46		
An in 2 target							47		
An in 3 target							48		
Enable droop							49		
Quick stop							51		
Enable PI PID							52		
Enable PD PID							53		
PI int freeze PID							54		
PID offs. sel							55		
PI central v s0							56		
PI central v s1							57		
Diameter calc							58		
Lock zero pos							59		
Lock save eng							60		
Mot setup sel 0							62		
PL mains status							66		
PL time-out ack							67		
Digital input 2 (Select like input 1)	138	U16	0	62	OFF (0)	√	R/Z	-	-
Digital input 3 (Select like input 1)	139	U16	0	62	OFF (0)	√	R/Z	-	-
Digital input 4 (Select like input 1)	140	U16	0	62	OFF (0)	√	R/Z	-	-
Digital input 5 (Select like input 1)	141	U16	0	62	OFF (0)	√	R/Z	-	-
Digital input 6 (Select like input 1)	142	U16	0	62	OFF (0)	√	R/Z	-	-
Digital input 7 (Select like input 1)	143	U16	0	62	OFF (0)	√	R/Z	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Digital input 8 (Select like input 1)	144	U16	0	62	OFF (0)	√	R/Z	-	-
I/O CONFIG \ Encoder inputs									
Select enc 1 OFF Speed ref 1 Speed ref 2 Ramp ref 1 Ramp ref 2	1020	U16	0	5	OFF (0)	√	R/Z 0 2 3 4 5	-	-
Select enc 2 OFF Speed ref 1 Speed ref 2 Ramp ref 1 Ramp ref 2	1021	U16	0	5	OFF (0)	√	R/Z 0 2 3 4 5	-	-
Encoder 1 type Sinusoidal Digital	415	I16	0	1	Digital (1)	√	R/Z 0 1	-	-
Encoder 1 pulses	416	Float*	600	9999	1024	√	R/Z	-	R
Encoder 2 pulses	169	Float*	600	9999	1024	√	R/Z	-	R
Refresh enc 1 Enabled Disabled	649	U16	0	1	Disabled (0)	√	R/W 1 0	-	-
Refresh enc 2 Enabled Disabled	652	U16	0	1	Disabled (0)	√	R/W 1 0	-	-
ADD SPEED FUNCT									
Auto capture ON OFF	388	U16	0	1	OFF (0)	√	R/W 1 0	ID H L	-
ADD SPEED FUNCT \ Adap spd reg									
Enable spd adap Enabled Disabled	181	U16	0	1	Disabled (0)	√	R/Z 1 0	-	-
Sel adap type Speed Adap reference	182	U16	0	1	Speed (0)	√	R/Z 0 1	-	-
Adap reference [FF]	183	I16	-32768	32767	1000	√	R/W	IA	R/W
Adap speed 1 [%]	184	Float	0.0	200.0	20.3	√	R/W	-	-
Adap speed 2 [%]	185	Float	0.0	200.0	40.7	√	R/W	-	-
Adap joint 1 [%]	186	Float	0.0	200.0	6.1	√	R/W	-	-
Adap joint 2 [%]	187	Float	0.0	200.0	6.1	√	R/W	-	-
Adap P gain 1 [%]	188	Float	0.00	100.00	10.00	√	R/W	-	-
Adap I gain 1 [%]	189	Float	0.00	100.00	1.00	√	R/W	-	-
Adap P gain 2 [%]	190	Float	0.00	100.00	10.00	√	R/W	-	-
Adap I gain 2 [%]	191	Float	0.00	100.00	1.00	√	R/W	-	-
Adap P gain 3 [%]	192	Float	0.00	100.00	10.00	√	R/W	-	-
Adap I gain 3 [%]	193	Float	0.00	100.00	1.00	√	R/W	-	-
ADD SPEED FUNCT \ Speed control									
Spd threshold + [FF]	101	U16	1	32767	1000	√	R/W	-	-
Spd threshold - [FF]	102	U16	1	32767	1000	√	R/W	-	-
Threshold delay [ms]	103	U16	0	65535	100	√	R/W	-	-
Spd threshold Speed exceeded Speed not exceeded	393	U16	0	1		-	R 0 1	QD L H	R
Set error [FF]	104	U16	1	32767	100	√	R/W	-	-
Set delay [ms]	105	U16	0	65535	100	√	R/W	-	-
Set speed Speed not ref. val. Speed = ref. val.	394	U16	0	1		-	R 0 1	QD L H	R
ADD SPEED FUNCT \ Speed zero									
Speed zero level [FF]	107	U16	1	32767	10	√	R/W	-	-
Speed zero delay [ms]	108	U16	0	65535	100	√	R/W	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Spd zero thr	395	U16	0	1		-	R	QD	R
Drive not rotating							0	L	
Drive rotating							1	H	
FUNCTIONS \ Motor pot									
Enab motor pot	246	I16	0	1	Enabled (1)	√	R/Z	-	-
Enabled							1		
Disabled							0		
Motor pot oper	-					√	-	-	-
Motor pot sign	248	I16	0	1	Positive (1)		R/W	ID	-
Positive							1		
Negative							0		
Motor pot reset	249	U16	0	65535		√	Z/C	ID H=reset	-
Motor pot up	396	U16	0	1	No acc. (0)	-	R/W	ID	R/W
No acceleration							0	L	
Acceleration							1	H	
Motor pot down	397	U16	0	1	No dec. (0)	-	R/W	ID	R/W
No deceleration							0	L	
Deceleration							1	H	
FUNCTIONS \ Jog function									
Enable jog	244	I16	0	1	Enabled (1)	√	R/Z	-	-
Enabled							1		
Disabled							0		
Jog operation	-					√	-	-	-
Jog selection	375	U16	0	1	Spd inp. (0)	√	R/Z	-	-
Speed input							0		
Ramp input							1		
Jog reference [FF]	266	I16	0	32767	100	√	R/W	IA	-
Jog +	398	U16	0	1	No jog+ (0)	-	R/W	ID	R/W
No jog forward							0	L	
Forward jog							1	H	
Jog -	399	U16	0	1	No jog- (0)	-	R/W	ID	R/W
No backward jog							0	L	
Backward jog							1	H	
FUNCTIONS \ Multi speed fct									
Enab multi spd	153	I16	0	1	Disabled (0)	√	R/Z	-	-
Enabled							1		
Disabled							0		
Multi speed sel	208	U16	0	7	0	√	R/W	-	R/W
Multi speed 1 [FF]	154	I16	-32768	32767	0	√	R/W	-	-
Multi speed 2 [FF]	155	I16	-32768	32767	0	√	R/W	-	-
Multi speed 3 [FF]	156	I16	-32768	32767	0	√	R/W	-	-
Multi speed 4 [FF]	157	I16	-32768	32767	0	√	R/W	-	-
Multi speed 5 [FF]	158	I16	-32768	32767	0	√	R/W	-	-
Multi speed 6 [FF]	159	I16	-32768	32767	0	√	R/W	-	-
Multi speed 7 [FF]	160	I16	-32768	32767	0	√	R/W	-	-
Speed sel 0	400	U16	0	1	Not sel. (0)	-	R/W	ID	R/W
Value 2^0 not selected							0	L	
Value 2^0 selected							1	H	
Speed sel 1	401	U16	0	1	Not sel. (0)	-	R/W	ID	R/W
Value 2^1 not selected							0	L	
Value 2^1 selected							1	H	
Speed sel 2	402	U16	0	1	Not sel. (0)	-	R/W	ID	R/W
Value 2^2 not selected							0	L	
Value 2^2 selected							1	H	
FUNCTIONS \ Multi ramp fct									
Enab multi rmp	243	I16	0	1	Disabled (0)	√	R/Z	-	-
Enabled							1		
Disabled							0		
Multi ramp sel	202	U16	0	3	0	√	R/W	-	R/W
FUNCTIONS \ Multi ramp fct \ Ramp 0 \ Acceleration 0									
Acc delta speed0 [FF]	659	U32	0	2^{32}-1	100	√	R/W	-	-
Acc delta time 0 [s]	660	U16	0	65535	1	√	R/W	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
S acc t const 0 [ms]	665	Float	100	3000	500	√	R/W	-	-
FUNCTIONS \ Multi ramp fct \ Ramp 0 \ Deceleration 0									
Dec delta speed0 [FF]	661	U32	0	2^{32} -1	100	√	R/W	-	-
Dec delta time 0 [s]	662	U16	0	65535	1	√	R/W	-	-
S dec t const 0 [ms]	666	Float	100	3000	500	√	R/W	-	-
FUNCTIONS \ Multi ramp fct \ Ramp 1 \ Acceleration 1									
Acc delta speed1 [FF]	23	U32	0	2^{32} -1	100	√	R/W	-	-
Acc delta time 1 [s]	24	U16	0	65535	1	√	R/W	-	-
S acc t const 1 [ms]	667	Float	100	3000	500	√	R/W	-	-
FUNCTIONS \ Multi ramp fct \ Ramp 1 \ Deceleration 1									
Dec delta speed1 [FF]	31	U32	0	2^{32} -1	100	√	R/W	-	-
Dec delta time 1 [s]	32	U16	0	65535	1	√	R/W	-	-
S dec t const 1 [ms]	668	Float	100	3000	500	√	R/W	-	-
FUNCTIONS \ Multi ramp fct \ Ramp 2 \ Acceleration 2									
Acc delta speed2 [FF]	25	U32	0	2^{32} -1	100	√	R/W	-	-
Acc delta time 2 [s]	26	U16	0	65535	1	√	R/W	-	-
S acc t const 2 [ms]	669	Float	100	3000	500	√	R/W	-	-
FUNCTIONS \ Multi ramp fct \ Ramp 2 \ Deceleration 2									
Dec delta speed2 [FF]	33	U32	0	2^{32} -1	100	√	R/W	-	-
Dec delta time 2 [s]	34	U16	0	65535	1	√	R/W	-	-
S dec t const 2 [ms]	670	Float	100	3000	500	√	R/W	-	-
FUNCTIONS \ Multi ramp fct \ Ramp 3 \ Acceleration 3									
Acc delta speed3 [FF]	27	U32	0	2^{32} -1	100	√	R/W	-	-
Acc delta time 3 [s]	28	U16	0	65535	1	√	R/W	-	-
S acc t const 3 [ms]	671	Float	100	3000	500	√	R/W	-	-
FUNCTIONS \ Multi ramp fct \ Ramp 3 \ Deceleration 3									
Dec delta speed3 [FF]	35	U32	0	2^{32} -1	100	√	R/W	-	-
Dec delta time 3 [s]	36	U16	0	65535	1	√	R/W	-	-
S dec t const 3 [ms]	672	Float	100	3000	500	√	R/W	-	-
Ramp sel 0	403	U16	0	1	Not sel. (0)	-	R/W	ID	R/W
Value 2^0 not selected							0	L	
Value 2^0 selected							1	H	
Ramp sel 1	404	U16	0	1	Not sel. (0)	-	R/W	ID	R/W
Value 2^1 not selected							0	L	
Value 2^1 selected							1	H	
FUNCTIONS \ Stop control									
Stop mode	626	U16	0	3	1	√	R/Z	-	-
OFF							0		
Stop & Speed 0							1		
Fast stp & Spd 0							2		
Fst / stp & spd 0							3		
Spd 0 trip delay [ms]	627	U16	0	40000	0	√	R/W	-	-
Jog stop control	630	U16	0	1	OFF (0)	√	R/Z	-	-
ON							1		
OFF							0		
FUNCTIONS \ Speed draw									
Speed ratio	1017	I16	0	32767	10000	√	R/W	IA	R/W
Spd draw out (d)	1018	I16	-32767	32767	-	√	R	QA	R
Spd draw out (%)	1019	Float	-200.0	+200.0	-	√	R	-	-
FUNCTIONS \ Motor setup									
Mot setup sel	943	U16	0	1	Setup 0 (0)	√	R/Z	-	R/W
Setup 0							0		
Setup 1							1		
Mot setup sel 0	940	U16	0	1	Not sel (0)	-	R/Z	ID	R/W
Value 2° not sel							0	L	
Value 2° sel							1	H	
Copy mot setup	941	U16	0	1	Setup 0 (0)	√	R/Z	-	-
Setup 0							0		
Setup 1							1		
Mot setup state	944	U16	0	1	0	-	R	QD	R
Not running							0	L	
Running							1	H	

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Actual mot setup	942	U16	0	1	Setup 0 (0)		R	-	R
Setup 0							0		
Setup 1							1		
FUNCTIONS \ Overload contr \ Ovld mot contr									
Motor cont curr [%]	656	U16	50	100	100		R/W	-	-
Trip time 50% [s]	657	U16	0	120	60		R/W	-	-
Ovld mot state	658	U16	0	1	Not ovrl (1)	-	R	QD	R
Overload							0	L	
Not overload							1	H	
FUNCTIONS \ Overload contr \ Ovld drv contr									
I_sqrt_t_accum [%]	655	U16	0	100	0		R	-	R
Ovld Available	406	U16	0	1	-	-	R	QD	R
Overload not possible							0	L	
Overload possible							1	H	
Overload 200%	1139	U16	0	1	-	-	R	QD	R
Overload not possible							0	L	
Overload possible							1	H	
FUNCTIONS \ Brake unit									
Enable BU	736	U16	0	1	Disabled (0)		R/W	-	-
Enabled							1		
Disabled							0		
BU ovld time [s]	740	Float	0.10	50.00	S		R/W		
BU duty cycle [%]	741	U16	1	75	S		R/W	-	-
BU DC vlt [V]	801	U16	0	3	3		R/W	-	-
230 V							0		
400 V							1		
460 V							2		
575 V							3		
FUNCTIONS \ Pwr loss stop f									
PL stop enable	1083	U16	0	2	0		R/W	-	-
Disabled							0		
Enabled as Mst							1		
Enabled as Slv							2		
PL stop t limit [%]	1082	U16	0	F	100		R/W	-	-
PL stop acc [rpm/s]	1080	U32	0	99999999	100		R/W	-	-
PL stop dec [rpm/s]	1081	U32	0	10000	10000		R/W	-	-
PL stop vdc ref [V]	1084	U16	0	980	917		R/W	-	-
PL time-out [s]	1087	U16	0	65535	10		R/W	-	-
PL stop P Gain [%]	1086	Float	0.00	100.00	5.00		R/W	-	-
PL stop I Gain [%]	1085	Float	0.00	100.00	0.30		R/W	-	-
PL stop active	1088	U16	0	1	Not active (0)		R	-	R
Not active							0		
Active							1		
PL active limit [%]	1089	U16	-	-	-		R	-	-
PL next active	1090	U16	0	1	Not active (0)		R	-	R
Not active							0		
Active							1		
PL next factor	1091	I16	0	32767	10000		R	-	R
PL time-out sig	1093	U16	0	1	Not active (0)		R	-	R
Not active							0		
Active							1		
PL time-out ack	1094	U16	0	1	Not acknowledged		R/W	-	R/W
Not acknowledged					(0)		0		
Acknowledged							1		
PL mains status	1092	U16	0	1	Not ok (0)		R/W	-	R/W
Not ok							0		
Ok							1		
SPEC FUNCTIONS \ Test generator									
Gen access	58	U16	0	4	Not conn. (0)		R/Z	-	-
Not connected							0		
F current ref							1		
T current ref							2		
Flux ref							3		
Ramp ref							4		

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Gen frequency [Hz]	59	Float	0.1	62.5	1.0	√	R/W	-	-
Gen amplitude [%]	60	Float	0.00	200.00	0.00	√	R/W	-	-
Gen offset [%]	61	Float	-200.00	200.00	0.00		R/W	-	-
SPEC FUNCTIONS									
Enable rr adap Enabled Disabled	435	U16	0	1	Disabled (0)	√	R/W 1 0	-	-
Save parameters	256	U16	0	65535		√	C	-	-
Load default	258	U16	0	65535		√	Z/C	-	-
Life time [h.min]	235	Float	0.00	65535.00		√	R	-	-
Failure register	-					√	R	-	-
Failure text	327	Text				-	R	-	-
Failure hour	328	U16	0	65535		-	R	-	-
Failure min	329	U16	0	59		-	R	-	-
Failure code No failure Overcurrent Overvoltage Undervoltage Heatsink sensor Heatsink ot Regulation ot Module overtemp Intake air ot Overtemp motor Failure supply Curr fbk loss Output stages DSP error Interrupt error BU overload Speed fbk loss Opt2 Hw Opt 1failure Bus loss External fault Enable seq err	417	U16	0	65535		-	R 0000h 2300h 3210h 3220h 4210h 4211h 4212h 4213h 4214h 4310h 5100h 5210h 5410h 6110h 6120h 7110h 7301h 7400h 7510h 8110h 9000h 9009h	-	-
Pointer	330	U16	1	10	10	-	R/W	-	-
Failure reset	262	U16	0	65535		√	Z/C	ID H=reset	-
Failure reg del	263	U16	0	65535		√	C	-	-
SPEC FUNCTIONS \ DC braking									
DC braking mode Enabled Disabled	904	U16	0	1	0	√	R/Z 1 0	-	-
Brk time @ stop [ms]	905	U16	0	30000	1000	√	R/W	-	-
DC braking curr [%]	717	U16	0	100	50	√	R/W	-	-
DC braking delay [ms]	716	U16	0	65535	500	√	R/W	-	-
SPEC FUNCTIONS \ Links \ Link 1									
Source	484	U16	0	65535	0	√	R/W	-	-
Destination	485	U16	0	65535	0	√	R/W	-	-
Mul.Gain	486	Float	-10000	10000	1	√	R/W	-	-
Div.Gain	487	Float	-10000	10000	1	√	R/W	-	-
Input max	488	Float	-2^{31}	$2^{31}-1$	0	√	R/W	-	-
Input min	489	Float	-2^{31}	$2^{31}-1$	0	√	R/W	-	-
Input offset	490	Float	-2^{31}	$2^{31}-1$	0	√	R/W	-	-
Output offset	491	Float	-2^{31}	$2^{31}-1$	0	√	R/W	-	-
Input absolute ON OFF	492	U16	0	1	OFF (0)	√	R/W 1 0	-	-
SPEC FUNCTIONS \ Links \ Link 2									
Source	553	U16	0	65535	0	√	R/W	-	-
Destination	554	U16	0	65535	0	√	R/W	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Mul.Gain	555	Float	-10000	10000	1	√	R/W	-	-
Div.Gain	556	Float	-10000	10000	1	√	R/W	-	-
Input max	557	Float	-2^{31}	$2^{31}-1$	0	√	R/W	-	-
Input min	558	Float	-2^{31}	$2^{31}-1$	0	√	R/W	-	-
Input offset	559	Float	-2^{31}	$2^{31}-1$	0	√	R/W	-	-
Output offset	560	Float	-2^{31}	$2^{31}-1$	0	√	R/W	-	-
Input absolute ON OFF	561	U16	0	1	OFF (0)	√	R/W 1 0	-	-
SPEC FUNCTIONS \ Pad Parameters									
Pad 0	503	I16	-32768	32767	0	√	R/W	IA, QA	R/W
Pad 1	504	I16	-32768	32767	0	√	R/W	IA, QA	R/W
Pad 2	505	I16	-32768	32767	0	√	R/W	IA	R/W
Pad 3	506	I16	-32768	32767	0	√	R/W	IA	R/W
Pad 4	507	I16	-32768	32767	0	√	R/W	QA	R/W
Pad 5	508	I16	-32768	32767	0	√	R/W	QA	R/W
Pad 6	509	I16	-32768	32767	0	√	R/W	QA	R/W
Pad 7	510	I16	-32768	32767	0	√	R/W	-	R/W
Pad 8	511	I16	-32768	32767	0	√	R/W	-	R/W
Pad 9	512	I16	-32768	32767	0	√	R/W	-	R/W
Pad 10	513	I16	-32768	32767	0	√	R/W	-	R/W
Pad 11	514	I16	-32768	32767	0	√	R/W	-	R/W
Pad 12	515	I16	-32768	32767	0	√	R/W	-	R/W
Pad 13	516	I16	-32768	32767	0	√	R/W	-	R/W
Pad 14	517	I16	-32768	32767	0	√	R/W	-	R/W
Pad 15	518	I16	-32768	32767	0	√	R/W	-	R/W
Bitword Pad A	519	U16	0	65535	0	√	R/W	ID*, QD*	R/W
Pad A Bit 0	520	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 1	521	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 2	522	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 3	523	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 4	524	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 5	525	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 6	526	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 7	527	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 8	528	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 9	529	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 10	530	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 11	531	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 12	532	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 13	533	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 14	534	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 15	535	U16	0	1	0	-	R/W	QD*	-
Bitword Pad B	536	U16	0	65535	0	√	R/W	QD*	R/W
Pad B Bit 0	537	U16	0	1	0	-	R/W	QD	R
Pad B Bit 1	538	U16	0	1	0	-	R/W	QD	R
Pad B Bit 2	539	U16	0	1	0	-	R/W	QD	R
Pad B Bit 3	540	U16	0	1	0	-	R/W	QD	R
Pad B Bit 4	541	U16	0	1	0	-	R/W	QD	R
Pad B Bit 5	542	U16	0	1	0	-	R/W	QD	R
Pad B Bit 6	543	U16	0	1	0	-	R/W	QD	R
Pad B Bit 7	544	U16	0	1	0	-	R/W	QD	R
Pad B Bit 8	545	U16	0	1	0	-	R/W	QD*	-
Pad B Bit 9	546	U16	0	1	0	-	R/W	QD*	-
Pad B Bit 10	547	U16	0	1	0	-	R/W	QD*	-
Pad B Bit 11	548	U16	0	1	0	-	R/W	QD*	-
Pad B Bit 12	549	U16	0	1	0	-	R/W	QD*	-
Pad B Bit 13	550	U16	0	1	0	-	R/W	QD*	-
Pad B Bit 14	551	U16	0	1	0	-	R/W	QD*	-
Pad B Bit 15	552	U16	0	1	0	-	R/W	QD*	-
OPTIONS \ Option 1									
Menu	Accessible only with optional Field bus card								

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
OPTIONS \ Option 1\ PDC config \ PDC inputs									
Pdc in 0	1095	U16	0	65535	0	√	R/W	-	-
Pdc in 1	1096	U16	0	65535	0	√	R/W	-	-
Pdc in 2	1097	U16	0	65535	0	√	R/W	-	-
Pdc in 3	1098	U16	0	65535	0	√	R/W	-	-
Pdc in 4	1099	U16	0	65535	0	√	R/W	-	-
Pdc in 5	1100	U16	0	65535	0	√	R/W	-	-
OPTIONS \ Option 1\ PDC config \ PDC outputs									
Pdc out 0	1101	U16	0	65535	0	√	R/W	-	-
Pdc out 1	1102	U16	0	65535	0	√	R/W	-	-
Pdc out 2	1103	U16	0	65535	0	√	R/W	-	-
Pdc out 3	1104	U16	0	65535	0	√	R/W	-	-
Pdc out 4	1105	U16	0	65535	0	√	R/W	-	-
Pdc out 5	1106	U16	0	65535	0	√	R/W	-	-
OPTIONS \ Option 1\ PDC config \ Virt dig in									
Virt dig in 0	1107	U16	0	65535	0	√	R/W	-	-
Virt dig in 1	1108	U16	0	65535	0	√	R/W	-	-
Virt dig in 2	1109	U16	0	65535	0	√	R/W	-	-
Virt dig in 3	1110	U16	0	65535	0	√	R/W	-	-
Virt dig in 4	1111	U16	0	65535	0	√	R/W	-	-
Virt dig in 5	1112	U16	0	65535	0	√	R/W	-	-
Virt dig in 6	1113	U16	0	65535	0	√	R/W	-	-
Virt dig in 7	1114	U16	0	65535	0	√	R/W	-	-
Virt dig in 8	1115	U16	0	65535	0	√	R/W	-	-
Virt dig in 9	1116	U16	0	65535	0	√	R/W	-	-
Virt dig in 10	1117	U16	0	65535	0	√	R/W	-	-
Virt dig in 11	1118	U16	0	65535	0	√	R/W	-	-
Virt dig in 12	1119	U16	0	65535	0	√	R/W	-	-
Virt dig in 13	1120	U16	0	65535	0	√	R/W	-	-
Virt dig in 14	1121	U16	0	65535	0	√	R/W	-	-
Virt dig in 15	1122	U16	0	65535	0	√	R/W	-	-
OPTIONS \ Option 1\ PDC config \ Virt dig out									
Virt dig out 0	1123	U16	0	65535	0	√	R/W	-	-
Virt dig out 1	1124	U16	0	65535	0	√	R/W	-	-
Virt dig out 2	1125	U16	0	65535	0	√	R/W	-	-
Virt dig out 3	1126	U16	0	65535	0	√	R/W	-	-
Virt dig out 4	1127	U16	0	65535	0	√	R/W	-	-
Virt dig out 5	1128	U16	0	65535	0	√	R/W	-	-
Virt dig out 6	1129	U16	0	65535	0	√	R/W	-	-
Virt dig out 7	1130	U16	0	65535	0	√	R/W	-	-
Virt dig out 8	1131	U16	0	65535	0	√	R/W	-	-
Virt dig out 9	1132	U16	0	65535	0	√	R/W	-	-
Virt dig out 10	1133	U16	0	65535	0	√	R/W	-	-
Virt dig out 11	1134	U16	0	65535	0	√	R/W	-	-
Virt dig out 12	1135	U16	0	65535	0	√	R/W	-	-
Virt dig out 13	1136	U16	0	65535	0	√	R/W	-	-
Virt dig out 14	1137	U16	0	65535	0	√	R/W	-	-
Virt dig out 15	1138	U16	0	65535	0	√	R/W	-	-
OPTIONS \ Option 2									
Menu	Accessible only with optional DGF card (See DGF card user manual)								
Enable OPT2 Enabled Disabled	425	U16	0	1	Disabled (0)	√	R/Z 1 0		
OPTIONS \ PID									
Enable PI PID Enabled Disabled	769	U16	0	1	Disabled (0)	√	R/W 1 0	ID	R/W
Enable PD PID Enabled Disabled	770	U16	0	1	Disabled (0)	√	R/W 1 0	ID	R/W
OPTIONS \ PID \ PID source									
PID source	786	U16	0	65535	0	√	R/W	-	-
PID source gain	787	Float	-100.000	100.000	1.000	√	R/W	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
OPTIONS \ PID									
Feed-fwd PID	758	I16	-10000	10000	0	√	R	IA	R
OPTIONS \ PID \ PID references									
PID error	759	I16	-10000	10000	0	√	R	-	R
PID feed-back	763	I16	-10000	10000	0	√	R/W	IA	R/W
PID offs. Sel Offest 0 Offset 1	762	U16	0	1	Offset 0 (0)	√	R/W 0 1	ID	R/W
PID offset 0	760	I16	-10000	10000	0	√	R/W	IA	R/W
PID offset 1	761	I16	-10000	10000	0	√	R/W	-	-
PID acc time [s]	1046	Float	0.0	900.0	0.0	√	R/W	-	-
PID dec time [s]	1047	Float	0.0	900.0	0.0	√	R/W	-	-
PID clamp	757	I16	0	10000	10000	√	R/W	-	-
OPTIONS \ PID \ PI controls									
PI P gain PID %	765	Float	0.00	100.00	10.00	√	R/W	-	-
PI I gain PID %	764	Float	0.00	100.00	10.00	√	R/W	-	-
PI steady thr	695	I16	0	10000	0	√	R/W	-	-
PI steady delay [ms]	731	U16	0	60000	0	√	R/W	-	-
P init gain PID %	793	Float	0.00	100.00	10.00	√	R/W	-	-
I init gain PID %	734	Float	0.00	100.00	10.00	√	R/W	-	-
PI central v sel	779	U16	0	3	1	√	R/W	ID	R/W
PI central v1	776	Float	P785	P784	1.00	√	R/W	-	-
PI central v2	777	Float	P785	P784	1.00	√	R/W	-	-
PI central v3	778	Float	P785	P784	1.00	√	R/W	IA	-
PI top lim	784	Float	P785	10.00	10.00	√	R/W	-	-
PI bottom lim	785	Float	-10.00	P784	0	√	R/W	-	-
PI integr freeze ON OFF	783	U16	0	1	0	√	R/W 1 0	ID	R/W
OPTIONS \ PID									
PI output PID	771	I16	0	1000 x P784	1000	√	R	-	R
Real FF PID	418	I16	-10000	10000	0	√	R	-	R
OPTIONS \ PID \ PD controls									
PD P gain 1 PID [%]	768	Float	0.00	100.00	10.00	√	R/W	-	-
PD D gain 1 PID [%]	766	Float	0.00	100.00	1.00	√	R/W	-	-
PD P gain 2 PID [%]	788	Float	0.00	100.00	10.00	√	R/W	-	-
PD D gain 2 PID [%]	789	Float	0.00	100.00	1.00	√	R/W	-	-
PD P gain 3 PID [%]	790	Float	0.00	100.00	10.00	√	R/W	-	-
PD D gain 3 PID[%]	791	Float	0.00	100.00	1.00	√	R/W	-	-
PD D filter PID [ms]	767	U16	0	1000	0	√	R/W	-	-
OPTIONS \ PID									
PD output PID	421	I16	-10000	10000	0	√	R	-	R
PID out sign PID Positive Bipolar	772	U16	0	1	1	√	R/W 0 1	-	-
PID output	774	I16	-10000	10000	0	√	R	QA	R
OPTIONS \ PID \ PID target									
PID target	782	U16	0	65535	0	√	R/W	-	-
PID out scale	773	Float	-100.000	100.000	1.000	√	R/W	-	-
OPTIONS \ PID \ Diameter calc									
Diameter calc Enabled Disabled	794	U16	0	1	0	√	Z/R 1 0	ID	R/W
Positioning spd [rpm]	795	I16	-100	100	0	√	R/W	-	-
Max deviation	796	I16	-10000	10000	8000	√	R/W	-	-
Gear box ratio	797	Float	0.001	1.000	1.000	√	R/W	-	-
Dancer constant [mm]	798	U16	1	10000	1	√	R/W	-	-
Minimum diameter [cm]	799	U16	1	2000	1	√	R/W	-	-
OPTIONS \ PID									
PI central vs0	780	U16	0	1	1	-	R/W	ID	R/W
PI central vs1	781	U16	0	1	0	-	R/W	ID	R/W
Diameter calc st	800	U16	0	1	0	-	R	QD	R

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
DRIVECOM									
Malfunction code	57	U16	0	65535		√	R	-	-
No failure							0000h		
Overcurrent							2300h		
Overvoltage							3210h		
Undervoltage							3220h		
Heatsink sensor							4210h		
Heatsink ot							4211h		
Regulation ot							4212h		
Module overtemp							4213h		
Intake air ot							4214h		
Overtemp motor							4310h		
Failure supply							5100h		
Curr fbk loss							5210h		
Output stages							5410h		
DSP error							6110h		
Interrupt error							6120h		
BU overload							7110h		
Speed fbk loss							7301h		
Opt2							7400h		
Hw opt 1 failure							7510h		
Bus loss							8110h		
External fault							9000h		
Enable seq err							9009h		
Control Word	55	U16	0	65535	S	√	R/W	-	R/W
Status word	56	U16	0	65535	-	√	R	-	R
Speed input var [FF] (Ramp ref 1)	44	I16	-2 × P45	+2 × P45	0	√	R/W	IA, QA	
Speed ref var [FF] (Speed ref)	115	I16	-32768	32767		√	R	-	R
Act speed value [FF] (Actual spd)	119	I16	-32768	32767		√	R	-	R
DRIVECOM \ Speed amount									
Speed min amount [FF]	1	U32	0	2^{32} -1	0	√	R/Z	-	
Speed max amount [FF]	2	U32	0	2^{32} -1	2000	√	R/Z	-	-
DRIVECOM \ Speed min/max									
Speed min pos [FF]	5	U32	0	2^{32} -1	0	√	R/Z	-	-
Speed max pos [FF]	3	U32	0	2^{32} -1	2000	√	R/Z	-	-
Speed min neg [FF]	6	U32	0	2^{32} -1	0	√	R/Z	-	-
Speed max neg [FF]	4	U32	0	2^{32} -1	2000	√	R/Z	-	-
DRIVECOM \ Acceleration									
Acc delta speed [FF]	21	U32	0	2^{32} -1	100	√	R/W	-	-
Acc delta time [s]	22	U16	0	65535	1	√	R/W	-	-
DRIVECOM \ Deceleration									
Dec delta speed [FF]	29	U32	0	2^{32} -1	100	√	R/W	-	-
Dec delta time [s]	30	U16	0	65535	1	√	R/W	-	-
DRIVECOM \ Quick stop									
QStp opt code	713	I16	-2	-1	Ramp stop (1)	√	R/Z		-
Ramp stop							1		
DC braking curr							2		
QStp delta speed [FF]	37	U32	0	2^{32} -1	1000	√	R/W	-	-
QStp delta time [s]	38	U16	0	65535	1	√	R/W	-	-
DRIVECOM \ Face value fact									
Face value num	54	I16	1	32767	1	√	R/Z	-	R
Face value den	53	I16	1	32767	1	√	R/Z	-	R
DRIVECOM \ Dimension fact									
Dim factor num	50	I32***	1	65535	1	√	R/Z	-	R
Dim factor den	51	I32***	1	2^{32} -1	1	√	R/Z	-	R
Dim factor text	52	Text			rpm	√	R/Z	-	-
DRIVECOM									
Speed base value [FF]	45	U32***	1	16383	1500	√	R/Z	-	R
Speed input perc [%]	46	I16	-32768	32767	0	√	R/W	-	R/W
Percent ref var [%]	116	I16	-32768	32767	0	√	R	-	R
Act percentage [%]	120	I16	-32768	32767	0	√	R	-	R
SERVICE									
Password 2	86	Service				√	W	-	-

10.2. List of all Parameters in Numeric Order

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Digital I/Q	-				-	√	R	-	-
Motor pot oper	-					√	-	-	-
Jog operation	-					√	-	-	-
Failure register	-					√	R	-	-
Speed min amount [FF]	1	U32	0	2^{32}-1	0	√	R/Z	-	
Speed max amount [FF]	2	U32	0	2^{32}-1	2000	√	R/Z	-	-
Speed max pos [FF]	3	U32	0	2^{32}-1	2000	√	R/Z	-	-
Speed max neg [FF]	4	U32	0	2^{32}-1	2000	√	R/Z	-	-
Speed min pos [FF]	5	U32	0	2^{32}-1	0	√	R/Z	-	-
Speed min neg [FF]	6	U32	0	2^{32}-1	0	√	R/Z	-	-
T current lim [%]	7	U16	0	F	S	√	R/W	IA	R/W
T current lim + [%]	8	U16	0	F	S	√	R/W	IA	R/W
T current lim - [%]	9	U16	0	F	S	√	R/W	IA	R/W
In use Tcur lim+ [%]	10	U16	0	F		√	R	-	R
In use Tcur lim- [%]	11	U16	0	F		√	R	-	R
Current lim red [%]	13	U16	0	F	100	√	R/W	-	R/W
Ramp shape Linear S-Shaped	18	U16	0	1	Linear (0)	√	R/Z 0 1	-	-
S shape t const [ms]	19	Float	100	3000	500	√	R/W	-	-
Ramp +/- delay [ms]	20	U16	0	65535	100	√	R/W		-
Acc delta speed [FF]	21	U32	0	2^{32}-1	100	√	R/W	-	-
Acc delta time [s]	22	U16	0	65535	1	√	R/W	-	-
Acc delta speed1 [FF]	23	U32	0	2^{32}-1	100	√	R/W	-	-
Acc delta time 1 [s]	24	U16	0	65535	1	√	R/W	-	-
Acc delta speed2 [FF]	25	U32	0	2^{32}-1	100	√	R/W	-	-
Acc delta time 2 [s]	26	U16	0	65535	1	√	R/W	-	-
Acc delta speed3 [FF]	27	U32	0	2^{32}-1	100	√	R/W	-	-
Acc delta time 3 [s]	28	U16	0	65535	1	√	R/W	-	-
Dec delta speed [FF]	29	U32	0	2^{32}-1	100	√	R/W	-	-
Dec delta time [s]	30	U16	0	65535	1	√	R/W	-	-
Dec delta speed1 [FF]	31	U32	0	2^{32}-1	100	√	R/W	-	-
Dec delta time 1 [s]	32	U16	0	65535	1	√	R/W	-	-
Dec delta speed2 [FF]	33	U32	0	2^{32}-1	100	√	R/W	-	-
Dec delta time 2 [s]	34	U16	0	65535	1	√	R/W	-	-
Dec delta speed3 [FF]	35	U32	0	2^{32}-1	100	√	R/W	-	-
Dec delta time 3 [s]	36	U16	0	65535	1	√	R/W	-	-
QStp delta speed [FF]	37	U32	0	2^{32}-1	1000	√	R/W	-	-
QStp delta time [s]	38	U16	0	65535	1	√	R/W	-	-
T current ref 1 [%]	39	I16	F	F	0	√	R/W	IA, QA	R/W
T current ref 2 [%]	40	I16	F	F	0	√	R/W	IA, QA	R/W
T current ref [%]	41	I16	-500	500	-	√	R	QA	R
Speed ref 1 [FF]	42	I16	-2 × P45	+2 × P45	0	√	R/W	IA, QA	R/W
Speed ref 2 [FF]	43	I16	-2 × P45	+2 × P45	0	√	R/W	IA, QA	R/W
Ramp ref 1 [FF] (Speed input var)	44	I16	-2 × P45	+2 × P45	0	√	R/W	IA, QA	R/W
Speed base value [FF]	45	U32***	1	16383	1500	√	R/Z	-	R
Speed input perc [%]	46	I16	-32768	32767	0	√	R/W	-	R/W
Ramp ref 1 (%)	47	Float	-200.0	+200.0	0.0	√	R/W	-	-
Ramp ref 2 [FF]	48	I16	-2 × P45	+2 × P45	0	√	R/W	IA, QA	R/W
Ramp ref 2 (%)	49	Float	-200.0	+200.0	0.0	√	R/W	-	-
Dim factor num	50	I32***	1	65535	1	√	R/Z	-	R
Dim factor den	51	I32***	1	2^{32}-1	1	√	R/Z	-	R
Dim factor text	52	Text			rpm	√	R/Z	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Face value den	53	I16	1	32767	1		R/Z	-	R
Face value num	54	I16	1	32767	1		R/Z	-	R
Control Word	55	U16	0	65535	S		R/W	-	R/W
Status word	56	U16	0	65535	-		R	-	R
Malfunction code	57	U16	0	65535			R	-	-
No failure							0000h		
Overcurrent							2300h		
Overvoltage							3210h		
Undervoltage							3220h		
Heatsink sensor							4210h		
Heatsink ot							4211h		
Regulation ot							4212h		
Module overtemp							4213h		
Intake air ot							4214h		
Overtemp motor							4310h		
Failure supply							5100h		
Curr fbk loss							5210h		
Output stages							5410h		
DSP error							6110h		
Interrupt error							6120h		
BU overload							7110h		
Speed fbk loss							7301h		
Opt2							7400h		
Hw opt 1 failure							7510h		
External fault							9000h		
Enable seq err							9009h		
Gen access	58	U16	0	4	Not conn. (0)		R/Z	-	-
Not connected							0		
F current ref							1		
T current ref							2		
Flux ref							3		
Ramp ref							4		
Gen frequency [Hz]	59	Float	0.1	62.5	1.0		R/W	-	-
Gen amplitude [%]	60	Float	0.00	200.00	0.00		R/W	-	-
Gen offset [%]	61	Float	-200.00	200.00	0.00		R/W	-	-
Scale output 1	62	Float	-10.000	10.000	1.000		R/W	-	-
Scale output 2	63	Float	-10.000	10.000	1.000		R/W	-	-
Scale output 3	64	Float	-10.000	10.000	1.000		R/W	-	-
Scale output 4	65	Float	-10.000	10.000	1.000		R/W	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Select output 1	66	U16	0	84	Actual speed (8)	√	R/Z	-	-
OFF							0		
Speed ref 1							1		
Speed ref 2							2		
Ramp ref 1							3		
Ramp ref 2							4		
Ramp ref							5		
Speed ref							6		
Ramp output							7		
Actual spd (rpm)							8		
T current ref 1							9		
T current ref 2							10		
T current ref							11		
F current ref							12		
Flux current							13		
Torque current							14		
Speed reg out							15		
Motor current							16		
Current U							17		
Current V							18		
Current W							19		
Output voltage							20		
Voltage U							21		
Voltage V							22		
DC link voltage							23		
Analog input 1							24		
Analog input 2							25		
Analog input 3							26		
Flux							27		
Active power							28		
Torque							29		
Rr adap output							30		
Pad 0							31		
Pad 1							32		
Pad 4							33		
Pad 5							34		
Flux reference							35		
Pad 6							38		
PID output							39		
Feed fwd power							78		
Out vlt level							79		
Flux level							80		
F act spd (rpm)							81		
F T curr (%)							82		
Spd draw out							84		
PL next factor							87		
PL active limit							88		
Select output 2 (Select like output 1)	67	U16	0	84	T current (14)	√	R/Z	-	-
Select output 3 (Select like output 1)	68	U16	0	84	Current U (17)	√	R/Z	-	-
Select output 4 (Select like output 1)	69	U16	0	84	Motor current (16)	√	R/Z	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Select input 1 OFF Jog reference Speed ref 1 Speed ref 2 Ramp ref 1 Ramp ref 2 T current ref 1 T current ref 2 Adap reference T current lim T current lim + T current lim - Pad 0 Pad 1 Pad 2 Pad 3 Load comp PID offset 0 PI central v3 PID feed-back V/f flux level Flux level Out vlt level Speed ratio	70	U16	0	28	Ramp ref 1 (4)	√	R/Z 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 19 21 22 23 24 25 26 28	-	-
Input 1 type -10V ... + 10 V 0...20 mA, 0...10 V 4...20 mA	71	U16	0	2	± 10 V (0)	√	R/Z 0 1 2	-	-
Scale input 1	72	Float	-10000	10.000	1.000	√	R/W	-	-
Tune value inp 1	73	Float	0.1	10.000	1.000	√	R/W	-	-
Offset input 1	74	I16	-32768	32767	0	√	R/W	-	-
Select input 2 (Select like Input 1)	75	U16	0	28	OFF (0)	√	R/Z	-	-
Input 2 type -10V ... + 10 V 0...20 mA, 0...10 V 4...20 mA	76	U16	0	2	± 10 V (0)	√	R/Z 0 1 2	-	-
Scale input 2	77	Float	-10000	10.000	1.000	√	R/W	-	-
Tune value inp 2	78	Float	0.1	10.000	1.000	√	R/W	-	-
Offset input 2	79	I16	-32768	32767	0	√	R/W	-	-
Select input 3 (Select like Input 1)	80	U16	0	28	OFF (0)	√	R/Z	-	-
Input 3 type -10V ... + 10 V 0...20 mA, 0...10 V 4...20 mA	81	U16	0	2	± 10 V (0)	√	R/Z 0 1 2	-	-
Scale input 3	82	Float	-10000	10.000	1.000	√	R/W	-	-
Tune value inp 3	83	Float	0.1	10.000	1.000	√	R/W	-	-
Offset input 3	84	I16	-32768	32767	0	√	R/W	-	-
Pword 1 : Enabled Disabled	85	I32	00000	99999	Disabled (0)	√	W 1 0	-	-
Password 2	86	Service				√	W	-	-
Speed P [%]	87	Float	0.00	100.00	S	√	R/W	-	-
Speed I [%]	88	Float	0.00	100.00	S	√	R/W	-	-
Current P [%]	89	Float	0.00	100.00	S	√	R/W	-	-
Current I [%]	90	Float	0.00	100.00	S	√	R/W	-	-
Flux P [%]	91	Float	0.00	100.00	S	√	R/W	-	-
Flux I [%]	92	Float	0.00	100.00	S	√	R/W	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Speed P base [A/rpm]	93	Float	0.001	99.999	S		R/Z	-	-
Speed I base[A/rpm×ms]	94	Float	0.001	99.999	S		R/Z	-	-
Current P base [V/A]	95	Float	0.1	99999.9	S		R/Z	-	-
Current I base [V/A×ms]	96	Float	0.1	9999.9	S		R/Z	-	-
Flux P base [A/Vs]	97	Float	0.1	9999.9	S		R/Z	-	-
Flux I base [A/Vs×ms]	98	Float	0.01	999.99	S		R/Z	-	-
Speed P in use [%]	99	Float	0.00	100.00	S		R	-	-
Speed I in use [%]	100	Float	0.00	100.00	S		R	-	-
Spd threshold + [FF]	101	U16	1	32767	1000		R/W	-	-
Spd threshold - [FF]	102	U16	1	32767	1000		R/W	-	-
Threshold delay [ms]	103	U16	0	65535	100		R/W	-	-
Set error [FF]	104	U16	1	32767	100		R/W	-	-
Set delay [ms]	105	U16	0	65535	100		R/W	-	-
Ref 0 level [FF]	106	U16	1	32767	10		R/W	-	-
Speed zero level [FF]	107	U16	1	32767	10		R/W	-	-
Speed zero delay [ms]	108	U16	0	65535	100		R/W	-	-
Ramp ref (d) [FF]	109	I16	-32768	32767	-		R	-	R
Ramp ref (rpm)	110	I16	-32768	32767	-		R	QA	R
Ramp ref (%)	111	Float	-200.0	+ 200.0	-		R	-	-
Ramp output (d) [FF]	112	I16	-32768	32767	-		R	-	R
Ramp outp (rpm)	113	I16	-32768	32767	-		R	QA	R
Ramp output (%)	114	Float	-200.0	+ 200.0	-		R	-	-
Speed ref var [FF] (Speed ref)	115	I16	-32768	32767			R	-	R
Percent ref var [%]	116	I16	-32768	32767	0		R	-	R
Speed ref (%)	117	Float	-200.0	+ 200.0	-		R	-	-
Speed ref [rpm]	118	I16	-32768	32767	-		R	QA	R
Act speed value [FF] (Actual spd)	119	I16	-32768	32767			R	-	R
Act percentage [%]	120	I16	-32768	32767	0		R	-	R
Actual spd (%)	121	Float	-200.0	+ 200.0	-		R	-	-
Actual spd (rpm)	122	I16	-8192	8192	-		R	QA	R
Enable spd=0 I Enabled Disabled	123	U16	0	1	Disabled (0)		R/Z 1 0	-	-
Enable spd=0 R Enabled Disabled	124	U16	0	1	Disabled (0)		R/Z 1 0	-	-
Enable spd=0 P Enabled Disabled	125	U16	0	1	Disabled (0)		R/Z 1 0	-	-
Spd=0 P gain [%]	126	Float	0.00	100.00	10.00		R/W	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Digital input 1	137	U16	0	62	OFF (0)	√	R/Z	-	-
OFF							0		
Motor pot reset							1		
Motor pot up							2		
Motor pot down							3		
Motor pot sign +							4		
Motor pot sign -							5		
Jog +							6		
Jog -							7		
Failure reset							8		
Torque reduct							9		
Ramp out = 0							10		
Ramp in = 0							11		
Freeze ramp							12		
Lock speed reg							13		
Lock speed I							14		
Auto capture							15		
Input 1 sign +							16		
Input 1 sign -							17		
Input 2 sign +							18		
Input 2 sign -							19		
Input 3 sign +							20		
Input 3 sign –							21		
Zero torque							22		
Speed sel 0							23		
Speed sel 1							24		
Speed sel 2							25		
Ramp sel 0							26		
Ramp sel 1							27		
Speed fbk sel							28		
PAD A bit 0							32		
PAD A bit 1							33		
PAD A bit 2							34		
PAD A bit 3							35		
PAD A bit 4							36		
PAD A bit 5							37		
PAD A bit 6							38		
PAD A bit 7							39		
Fwd sign							44		
Rev sign							45		
An in 1 target							46		
An in 2 target							47		
An in 3 target							48		
Enable droop							49		
Quick stop							51		
Enable PI PID							52		
Enable PD PID							53		
PI int freeze PID							54		
PID offs. sel							55		
PI central v s0							56		
PI central v s1							57		
Diameter calc							58		
Lock zero pos							59		
Lock save eng							60		
Mot setup sel 0							62		
PL mains status							66		
PL time-out ac							67		
Digital input 2 (Select like input 1)	138	U16	0	62	OFF (0)	√	R/Z	-	-
Digital input 3 (Select like input 1)	139	U16	0	62	OFF (0)	√	R/Z	-	-
Digital input 4 (Select like input 1)	140	U16	0	62	OFF (0)	√	R/Z	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Digital input 5 (Select like input 1)	141	U16	0	62	OFF (0)		R/Z	-	-
Digital input 6 (Select like input 1)	142	U16	0	62	OFF (0)		R/Z	-	-
Digital input 7 (Select like input 1)	143	U16	0	62	OFF (0)		R/Z	-	-
Digital input 8 (Select like input 1)	144	U16	0	62	OFF (0)		R/Z	-	-
Digital output 1 OFF Speed zero thr Spd threshold Set speed Curr limit state Drive ready Overld available Ramp + Ramp - Speed limited Undervoltage Overvoltage Heatsink sensor Overcurrent Overtemp motor External fault Failure supply Pad A bit Pad B bit Virt dig input Speed fbk loss Bus loss Output stages Hw opt 1 failure Opt 2 failure Encoder 1 state Encoder 2 state Ovld mot state Enable seq err BU overload Diameter calc st Mot setup state Input 1 cp match Overload 200% PL stop active PL next active PL time-out sig Regulation ot Module overtemp. Heatsink ot Intake air ot	145	U16	0	49	Ramp + (8)		R/Z 0 1 2 3 4 5 6 8 9 10 11 12 13 14 15 16 17 18 19 20 25 26 27 28 29 30 31 32 35 36 38 46 49 51 52 53 54 55 56 57 62	-	-
Digital output 2 (Select like output 1)	146	U16	0	49	Ramp - (9)		R/Z	-	
Digital output 3 (Select like output 1)	147	U16	0	49	Spd threshold (2)		R/Z	-	
Digital output 4 (Select like output 1)	148	U16	0	49	Overld available (6)		R/Z	-	-
Digital output 5 (Select like output 1)	149	U16	0	49	Curr limit state (4)		R/Z	-	-
Digital output 6 (Select like output 1)	150	U16	0	49	Over-voltage (12)		R/Z	-	-
Digital output 7 (Select like output 1)	151	U16	0	49	Under-voltage (11)		R/Z	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Digital output 8 (Select like output 1)	152	U16	0	49	Over-current (14)		R/Z	-	-
Enab multi spd Enabled Disabled	153	I16	0	1	Disabled (0)		R/Z 1 0	-	-
Multi speed 1 [FF]	154	I16	-32768	32767	0		R/W	-	-
Multi speed 2 [FF]	155	I16	-32768	32767	0		R/W	-	-
Multi speed 3 [FF]	156	I16	-32768	32767	0		R/W	-	-
Multi speed 4 [FF]	157	I16	-32768	32767	0		R/W	-	-
Multi speed 5 [FF]	158	I16	-32768	32767	0		R/W	-	-
Multi speed 6 [FF]	159	I16	-32768	32767	0		R/W	-	-
Multi speed 7 [FF]	160	I16	-32768	32767	0		R/W	-	-
Nominal voltage [V]	161	Float	1	999	575		R/Z	-	-
Nominal speed [rpm]	162	Float**	1	99999	S		R/Z	-	-
Nom frequency [Hz]	163	Float	1	999.	60		R/Z	-	-
Nominal current [A]	164	Float	0.1	999.0	S		R/Z	-	-
Magnetizing curr [A]	165	Float	0.1	999.0	S		R/W	-	-
Rotor resistance [Ohm]	166	Float	0.0001	S	S		R/W	-	-
Base voltage [V]	167	Float	1	999	575		R/Z	-	-
Base frequency [Hz]	168	Float	1	999	60		R/Z	-	-
Encoder 2 pulses	169	Float*	600	9999	1024		R/Z	-	R
P1 flux model	176	Float	0.00	1.00	S		R/W	-	-
Full load curr [A]	179	Float	0.1	999.0	S		R/Z	-	-
Enable spd adap Enabled Disabled	181	U16	0	1	Disabled (0)		R/Z 1 0	-	-
Sel adap type Speed Adap reference	182	U16	0	1	Speed (0)		R/Z 0 1	-	-
Adap reference [FF]	183	I16	-32768	32767	1000		R/W	IA	R/W
Adap speed 1 [%]	184	Float	0.0	200.0	20.3		R/W	-	-
Adap speed 2 [%]	185	Float	0.0	200.0	40.7		R/W	-	-
Adap joint 1 [%]	186	Float	0.0	200.0	6.1		R/W	-	-
Adap joint 2 [%]	187	Float	0.0	200.0	6.1		R/W	-	-
Adap P gain 1 [%]	188	Float	0.00	100.00	10.00		R/W	-	-
Adap I gain 1 [%]	189	Float	0.00	100.00	1.00		R/W	-	-
Adap P gain 2 [%]	190	Float	0.00	100.00	10.00		R/W	-	-
Adap I gain 2 [%]	191	Float	0.00	100.00	1.00		R/W	-	-
Adap P gain 3 [%]	192	Float	0.00	100.00	10.00		R/W	-	-
Adap I gain 3 [%]	193	Float	0.00	100.00	1.00		R/W	-	-
Multi ramp sel	202	U16	0	3	0		R/W	-	R/W
Multi speed sel	208	U16	0	7	0		R/W	-	R/W
Latch ON OFF	210	U16	0	1	ON (1)		R/Z 1 0	-	-
OK relay open ON OFF	211	I16	0	1	ON (1)		R/W 1 0	-	-
DC link voltage [V]	227	U16	0	999	-		R	QA	-
Active power [%]	229	Float**	-500	500	-		R	QA	R
Torque [%]	230	Float	-500	500	-		R	QA	-
Motor current [A]	231	Float	0.00	S	-		R	QA	-
Output voltage [V]	233	Float**	0	500	-		R	QA	R
Flux [%]	234	Float*	0.00	100.00	-		R	QA	R
Life time [h.min]	235	Float	0.00	65535.00			R	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Speed reg output [%]	236	I16	-	-	-		R	QA	R
Switching freq 4 KHz 8 KHz 16 KHz 2 KHz	240	U16	S	S	S		R/Z 0 1 2 3	-	-
Enable spd reg Enabled Disabled	242	I16	0	1	Enabled (1)		R/Z 1 0	-	-
Enab multi rmp Enabled Disabled	243	I16	0	1	Disabled (0)		R/Z 1 0	-	-
Enable jog Enabled Disabled	244	I16	0	1	Enabled (1)		R/Z 1 0	-	-
Enable ramp Enabled Disabled	245	I16	0	1	Enabled (1)		R/Z 1 0	-	-
Enab motor pot Enabled Disabled	246	I16	0	1	Enabled (1)		R/Z 1 0	-	-
Motor pot sign Positive Negative	248	I16	0	1	Positive (1)		R/W 1 0	ID	-
Motor pot reset	249	U16	0	65535			Z/C	ID H=reset	-
Load motor par Set 1 Set 2	251	U16	0	1	Set 1 (0)		Z 0 1	-	-
Main commands Terminals Digital	252	U16	0	1	Digital (1)		R/Z 0 1	-	-
Control mode Local Bus	253	U16	0	1	Local (0)		R/Z 0 1	-	-
Save parameters	256	U16	0	65535	-		C	-	-
Load default	258	U16	0	65535			Z/C	-	-
Auto tune inp 1 Auto tune	259	U16	0	65535	-		C 1	-	-
Auto tune inp 2 Auto tune	260	U16	0	65535	-		C 1	-	-
Auto tune inp 3 Auto tune	261	U16	0	65535	-		C 1	-	-
Failure reset	262	U16	0	65535			Z/C	ID H=reset	-
Failure reg del	263	U16	0	65535			C	-	-
Jog reference [FF]	266	I16	0	32767	100		R/W	IA	-
Current norm	267	Float	0.00	9999.99	S	-	R	-	-
Forward sign FWD selected FWD not selected	293	U16	0	1	not sel (0)	-	R/W 1 0	ID H L	R/W
Reverse sign REV selected REV not selected	294	U16	0	1	not sel (0)	-	R/W 1 0	ID H L	R/W
An in 1 target Assigned Not assigned	295	U16	0	1	Assign. (0)		R/W 0 1	ID L H	R/W

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
An in 2 target Assigned Not assigned	296	U16	0	1	Assign.(0)		R/W 0 1	ID L H	R/W
An in 3 target Assigned Not assigned	297	U16	0	1	Assign. (0)		R/W 0 1	ID L H	R/W
Drive type (AV-300i)	300	U16	-	-	274	-	R	-	R
Flt_100_mf	303	I16	0	32767	S	-	R	-	R
Enable drive Enabled Disabled	314	U16	0	1	Disabled (0)		R/W 1 0	12 H L	R/W
Start/Stop Start Stop	315	U16	0	1	Stop (0)		R/W 1 0	13 H L	R/W
Fast stop Fast Stop No Fast Stop	316	U16	0	1	No fast stop (1)	-	R/W 0 1	14 L H	R/W
Device address	319	U16	0	127	0		R/Z	-	-
Regulation mode Sensorless vect Self-tuning Field oriented V/f control	321	U16	0	3	Field oriented (2)		R/Z 0 1 2 3	-	-
Lock speed reg ON OFF	322	U16	0	1	OFF (0)		R/W 1 0	ID L H	R/W
Output frequency [Hz]	324	Float	0.0	500.0	-		R	-	-
Failure text	327	Text				-	R	-	-
Failure hour	328	U16	0	65535		-	R	-	-
Failure min	329	U16	0	59		-	R	-	-
Pointer	330	U16	1	10	10	-	R/W	-	-
Software version	331	Text					R	-	-
Ambient temp [°C] 50°C (122°F) 40°C (104°F)	332	U16	0	1	40°C (1)		R/Z 0 1	-	-
Mains voltage 575 V	333	U16	S	3	575 V (3)		R/Z 3	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Rated drive curr 3 7.5 10 15 20 25 30 40 50 60 75 100 125 150 2 5	334	U16	0	16	S	-	R 0 1 2 3 4 5 6 7 8 9 10 11 12 13 19 20	-	R
Torque reduct Not actived actived	342	U16	0	1	Not act. (0)		R/W 0 1	ID L H	R/W
Quick stop Quick stop No Quick stop	343	U16	0	1	No quick stop (1)	-	R/W 0 1	ID L H	R/W
Ramp out = 0 Actived Not Actived	344	U16	0	1	Not act. (1)		R/W 0 1	ID L H	R/W
Ramp in = 0 Actived Not Actived	345	U16	0	1	Not act. (1)		R/W 0 1	ID L H	R/W
Ramp + Acc. clockwise + Dec. counter-clockwise Other states	346	U16	0	1	-	-	R 1 0	QD H L	R
Ramp - Acc. counter-clockwise + Dec. Clockwise Other states	347	U16	0	1	-	-	R 1 0	QD H L	R
Lock speed I Actived Not Actived	348	U16	0	1	Not act. (1)		R/W 0 1	ID L H	R/W
Curr limit state Curr. limit not reached Curr. limit reached	349	U16	0	1		-	R 0 1	QD L H	R
Torque current	350	Float	S	S		-	R	QA	-
Flux current	351	Float	S	S		-	R	QA	-
F current ref	352	Float	S	S		-	R	QA	R/W
Zero torque Actived Not Actived	353	U16	0	1	Not Act. (1)		R/W 0 1	ID L H	

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Activity Warning Disable drive Quick stop Normal stop Curr lim stop	354	U16	1	5	Disable drive (2)	√	R/Z 1 2 3 4 5	-	-
Latch ON OFF	355	U16	0	1	ON (1)	√	R/Z 1 0	-	-
OK relay open ON OFF	356	I16	0	1	ON (1)	√	R/W 1 0	-	-
Latch ON OFF	357	U16	0	1	ON (1)	√	R/Z 1 0	-	-
OK relay open ON OFF	358	I16	0	1	ON (1)	√	R/W 1 0	-	-
Restart time [ms]	359	U16	0	65535	1000	√	R/W	-	-
N of attempts	360	U16	0	100	1	√	R/W	-	-
Latch ON OFF	361	U16	0	1	ON (1)	√	R/Z 1 0	-	-
Ok relay open ON OFF	362	I16	0	1	ON (1)	√	R/W 1 0	-	-
Latch ON OFF	363	U16	0	1	ON (1)	√	R/Z 1 0	-	-
OK relay open ON OFF	364	I16	0	1	ON (1)	√	R/W 1 0	-	-
Activity Warning Disable drive Quick stop Normal stop Curr lim stop	365	U16	1	5	Disable drive (2)	√	R/Z 1 2 3 4 5	-	-
Latch ON OFF	366	U16	0	1	ON (1)	√	R/Z 1 0	-	-
Ok relay open ON OFF	367	I16	0	1	ON (1)	√	R/W 1 0	-	-
Activity Warning Disable drive Quick stop Normal stop Curr lim stop	368	U16	1	5	Disable drive (2)	√	R/Z 1 2 3 4 5	-	-
Latch ON OFF	369	U16	0	1	ON (1)	√	R/Z 1 0	-	-
Ok relay open ON OFF	370	I16	0	1	ON (1)	√	R/W 1 0	-	-
Cos phi	371	Float	0.1	0.99	S	√	R/Z	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Speed limited Speed not limited Speed limited	372	U16	0	1		-	R 0 1	QD L H	R
Freeze ramp Actived Not Actived	373	U16	0	1	Not act. (1)	√	R/W 0 1	ID L H	R/W
Jog selection Speed input Ramp input	375	U16	0	1	Spd inp. (0)	√	R/Z 0 1	-	-
Speed ref 1 (%)	378	Float	-200.0	+200.0	0.0	√	R/W	-	-
Speed Ref 2 (%)	379	Float	-200.0	+200.0	0.0	√	R/W	-	-
Drive ready Drive ready Drive not ready	380	U16	0	1	-	-	R 1 0	QD H L	R
Activity Warning Disable drive Quick stop Normal stop Curr lim stop	386	U16	1	5	Disabled drive (2)	√	R/Z 1 2 3 4 5	-	-
OK relay open ON OFF	387	I16	0	1	ON (1)	√	R/W 1 0	-	-
Auto capture ON OFF	388	U16	0	1	OFF (0)	√	R/W 1 0	ID H L	-
Input 1 sign Positive Negative	389	U16	0	1	Positive (1)	√	R/W 1 0	-	R/W
Input 2 sign Positive Negative	390	U16	0	1	Positive (1)	√	R/W 1 0	-	R/W
Input 3 sign Positive Negative	391	U16	0	1	Positive (1)	√	R/W 1 0	-	R/W
Spd threshold Speed exceeded Speed not exceeded	393	U16	0	1		-	R 0 1	QD L H	R
Set speed Speed not ref. val. Speed = ref. val.	394	U16	0	1		-	R 0 1	QD L H	R
Spd zero thr Drive not rotating Drive rotating	395	U16	0	1		-	R 0 1	QD L H	R
Motor pot up No acceleration Acceleration	396	U16	0	1	No acc. (0)	-	R/W 0 1	ID L H	R/W
Motor pot down No deceleration Deceleration	397	U16	0	1	No dec. (0)	-	R/W 0 1	ID L H	R/W
Jog + No jog forward Forward jog	398	U16	0	1	No jog+ (0)	-	R/W 0 1	ID L H	R/W
Jog - No backward jog Backward jog	399	U16	0	1	No jog- (0)	-	R/W 0 1	ID L H	R/W

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Speed sel 0 Value 2^0 not selected Value 2^0 selected	400	U16	0	1	Not sel. (0)	-	R/W 0 1	ID L H	R/W
Speed sel 1 Value 2^1 not selected Value 2^1 selected	401	U16	0	1	Not sel. (0)	-	R/W 0 1	ID L H	R/W
Speed sel 2 Value 2^2 not selected Value 2^2 selected	402	U16	0	1	Not sel. (0)	-	R/W 0 1	ID L H	R/W
Ramp sel 0 Value 2^0 not selected Value 2^0 selected	403	U16	0	1	Not sel. (0)	-	R/W 0 1	ID L H	R/W
Ramp sel 1 Value 2^1 not selected Value 2^1 selected	404	U16	0	1	Not sel. (0)	-	R/W 0 1	ID L H	R/W
Ovld Available Overload not possible Overload possible	406	U16	0	1	-	-	R 0 1	QD L H	R
Ser answer delay [ms]	408	U16	0	900	0		R/W	-	-
Ok relay funct Drive healthy Ready to start	412	I16	0	1	Drive healthy (0)		R/Z 0 1	-	-
Magn boost curr [%]	413	U16	10	136	30		R/Z	-	-
Speed fbk sel Encoder 1 Encoder 2	414	U16	0	1	Enc.1 (1)		R/Z 1 0	ID H L	R/W
Encoder 1 type Sinusoidal Digital	415	I16	0	1	Sinus. (0)		R/Z 0 1	-	-
Encoder 1 pulses	416	Float*	600	9999	1024		R/Z	-	R
Failure code No failure Overcurrent Overvoltage Undervoltage Heatsink sensor Heatsink ot Regulation ot Module overtemp Intake air ot Overtemp motor Failure supply Curr fbk loss Output stages DSP error Interrupt error BU overload Speed fbk loss Opt2 Hw Opt 1failure Bus loss External fault Enable seq err	417	U16	0	65535		-	R 0000h 2300h 3210h 3220h 4210h 4211h 4212h 4213h 4214h 4310h 5100h 5210h 5410h 6110h 6120h 7110h 7301h 7400h 7510h 8110h 9000h 9009h	-	-
Real FF PID	418	I16	-10000	10000	0		R	-	R
Enc2 speed [rpm]	420	I16	-8192	8192	-		R	-	R

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
PD output PID	421	I16	-10000	10000	0		R	-	R
Enable lck sls Enabled Disabled	422	U16	0	1	Disabled (0)		R/Z 1 0	-	-
Enable OPT2 Enabled Disabled	425	U16	0	1	Disabled (0)		R/Z 1 0		
Enc1 speed [rpm]	427	I16	-8192	8192	-		R	-	R
Enable rr adap Enabled Disabled	435	U16	0	1	Disabled (0)		R/W 1 0	-	-
Stator resist [Ohm]	436	Float	0.0001	S	S		R/W	-	-
Lkg inductance [H]	437	Float	0.00001	9.00000	S		R/W	-	-
Prop. filter [ms]	444	U16	0	1000	0		R/W	-	-
Speed up gain [%]	445	Float	0.00	100.00	0.00		R/W	-	-
Speed up base [ms]	446	Float	0	16000	1000		R/W	-	-
Speed up filter [ms]	447	U16	0	1000	0		R/W	-	-
Flux level [%]	467	U16	10	100	100		R/W	IA QA	R/W
Flux reg mode Constant current Voltage control	469	U16	0	1	Volt.control (1)		R/Z 0 1	-	-
Source *link 1*	484	U16	0	65535	0		R/W	-	-
Destination *link 1*	485	U16	0	65535	0		R/W	-	-
Mul.Gain *link 1*	486	Float	-10000	10000	1		R/W	-	-
Div.Gain *link 1*	487	Float	-10000	10000	1		R/W	-	-
Input max *link 1*	488	Float	-2^{31}	$2^{31}-1$	0		R/W	-	-
Input min *link 1*	489	Float	-2^{31}	$2^{31}-1$	0		R/W	-	-
Input offset *link 1*	490	Float	-2^{31}	$2^{31}-1$	0		R/W	-	-
Output offset *link 1*	491	Float	-2^{31}	$2^{31}-1$	0		R/W	-	-
Input absolute *link 1* ON OFF	492	U16	0	1	OFF (0)		R/W 1 0	-	-
Flux reference	500	Float*	0.0	100.0	-		R	QA	R
Pad 0	503	I16	-32768	32767	0		R/W	IA, QA	R/W
Pad 1	504	I16	-32768	32767	0		R/W	IA, QA	R/W
Pad 2	505	I16	-32768	32767	0		R/W	IA	R/W
Pad 3	506	I16	-32768	32767	0		R/W	IA	R/W
Pad 4	507	I16	-32768	32767	0		R/W	QA	R/W
Pad 5	508	I16	-32768	32767	0		R/W	QA	R/W
Pad 6	509	I16	-32768	32767	0		R/W	QA	R/W
Pad 7	510	I16	-32768	32767	0		R/W	-	R/W
Pad 8	511	I16	-32768	32767	0		R/W	-	R/W
Pad 9	512	I16	-32768	32767	0		R/W	-	R/W
Pad 10	513	I16	-32768	32767	0		R/W	-	R/W
Pad 11	514	I16	-32768	32767	0		R/W	-	R/W
Pad 12	515	I16	-32768	32767	0		R/W	-	R/W
Pad 13	516	I16	-32768	32767	0		R/W	-	R/W
Pad 14	517	I16	-32768	32767	0		R/W	-	R/W
Pad 15	518	I16	-32768	32767	0		R/W	-	R/W
Bitword Pad A	519	U16	0	65535	0		R/W	ID*, QD*	R/W
Pad A Bit 0	520	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 1	521	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 2	522	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 3	523	U16	0	1	0	-	R/W	ID, QD	R/W

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Pad A Bit 4	524	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 5	525	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 6	526	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 7	527	U16	0	1	0	-	R/W	ID, QD	R/W
Pad A Bit 8	528	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 9	529	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 10	530	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 11	531	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 12	532	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 13	533	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 14	534	U16	0	1	0	-	R/W	QD*	-
Pad A Bit 15	535	U16	0	1	0	-	R/W	QD*	-
Bitword Pad B	536	U16	0	65535	0		R/W	QD*	R/W
Pad B Bit 0	537	U16	0	1	0	-	R/W	QD	R
Pad B Bit 1	538	U16	0	1	0	-	R/W	QD	R
Pad B Bit 2	539	U16	0	1	0	-	R/W	QD	R
Pad B Bit 3	540	U16	0	1	0	-	R/W	QD	R
Pad B Bit 4	541	U16	0	1	0	-	R/W	QD	R
Pad B Bit 5	542	U16	0	1	0	-	R/W	QD	R
Pad B Bit 6	543	U16	0	1	0	-	R/W	QD	R
Pad B Bit 7	544	U16	0	1	0	-	R/W	QD	R
Pad B Bit 8	545	U16	0	1	0	-	R/W	QD*	-
Pad B Bit 9	546	U16	0	1	0	-	R/W	QD*	-
Pad B Bit 10	547	U16	0	1	0	-	R/W	QD*	-
Pad B Bit 11	548	U16	0	1	0	-	R/W	QD*	-
Pad B Bit 12	549	U16	0	1	0	-	R/W	QD*	-
Pad B Bit 13	550	U16	0	1	0	-	R/W	QD*	-
Pad B Bit 14	551	U16	0	1	0	-	R/W	QD*	-
Pad B Bit 15	552	U16	0	1	0	-	R/W	QD*	-
Source *link 2*	553	U16	0	65535	0		R/W	-	-
Destination *link 2*	554	U16	0	65535	0		R/W	-	-
Mul.Gain *link 2*	555	Float	-10000	10000	1		R/W	-	-
Div.Gain *link 2*	556	Float	-10000	10000	1		R/W	-	-
Input max *link 2*	557	Float	-2^{31}	$2^{31}-1$	0		R/W	-	-
Input min *link 2*	558	Float	-2^{31}	$2^{31}-1$	0		R/W	-	-
Input offset *link 2*	559	Float	-2^{31}	$2^{31}-1$	0		R/W	-	-
Output offset *link 2*	560	Float	-2^{31}	$2^{31}-1$	0		R/W	-	-
Input absolute *link 2* ON OFF	561	U16	0	1	OFF (0)		R/W 1 0	-	-
Dig input term	564	U16	0	65535	-	-	R	-	R
Dig input term 1	565	U16	0	1	-	-	R	-	R
Dig input term 2	566	U16	0	1	-	-	R	-	R
Dig input term 3	567	U16	0	1	-	-	R	-	R
Dig input term 4	568	U16	0	1	-	-	R	-	R
Dig input term 5	569	U16	0	1	-	-	R	-	R
Dig input term 6	570	U16	0	1	-	-	R	-	R
Dig input term 7	571	U16	0	1	-	-	R	-	R
Dig input term 8	572	U16	0	1	-	-	R	-	R
Dig input term 9	573	U16	0	1	-	-	R	-	R
Dig input term 10	574	U16	0	1	-	-	R	-	R
Dig input term 11	575	U16	0	1	-	-	R	-	R
Dig input term 12	576	U16	0	1	-	-	R	-	R
Dig input term 13	577	U16	0	1	-	-	R	-	R

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Dig input term 14	578	U16	0	1	-	-	R	-	R
Dig input term 15	579	U16	0	1	-	-	R	-	R
Dig input term 16	580	U16	0	1	-	-	R	-	R
Dig output term	581	U16	0	65535	-	-	R	-	R
Virtual dig inp	582	U16	0	65535	-	√	R/W	-	R/W
Virtual dig out	583	U16	0	65535	-	√	R	-	R
Stop mode OFF Stop & Speed 0 Fast stp & Spd 0 Fst / stp & spd 0	626	U16	0	3	1	√	R/Z 0 1 2 3	-	-
Spd 0 trip delay [ms]	627	U16	0	40000	0	√	R/W	-	-
Relay 2 (Select like output 1)	629	U16	0	49	Speed zero thr (1)	√	R/Z	83-85	-
Jog stop control ON OFF	630	U16	0	1	OFF (0)	√	R/Z 1 0	-	-
Latch ON OFF	633	U16	0	1	ON (1)	√	R/Z 1 0	-	-
Activity Warning Disable drive Quick stop Normal stop Curr lim stop	634	U16	1	5	Disabled drive (2)	√	R/Z 1 2 3 4 5	-	-
OK relay open ON OFF	635	I16	0	1	ON (1)	√	R/W 1 0	-	-
Hold off time [ms]	636	U16	0	10000	0	√	R/W	-	-
Restart time [ms]	637	U16	0	10000	0	√	R/W	-	-
Activity Disable drive Quick stop Normal stop Curr lim stop	639	U16	2	5	Disabled drive (2)	√	R/Z 2 3 4 5	-	-
OK relay open ON OFF	640	I16	0	1	ON (1)	√	R/W 1 0	-	-
Sls speed filter [s]	643	Float	0.01	0.50	0.01	√	R/W	-	-
Voltage comp lim [V]	644	Float	0.1	30.0	6.0	√	R/W	-	-
Comp slope [V/A]	645	Float	0.1	50.0	13.0	√	R/W	-	-
Low speed factor	646	I16	0	32000	5000	√	R/W	-	-
Flux corr factor	647	Float	0.50	1.0	0.90	√	R/W	-	-
Encoder 1 state Encoder 1 OK Encoder 1 NOT OK	648	U16	0	1	-	-	R 1 0	QD H L	R
Refresh enc 1 Enabled Disabled	649	U16	0	1	Disabled (0)	√	R/W 1 0	-	-
Encoder 2 state Encoder 2 OK Encoder 2 NOT OK	651	U16	0	1	-	-	R 1 0	QD H L	R
Refresh enc 2 Enabled Disabled	652	U16	0	1	Disabled (0)	√	R/W 1 0	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
I_sqrt_t_accum [%]	655	U16	0	100	0	√	R	-	R
Motor cont curr [%]	656	U16	50	100	100	√	R/W	-	-
Trip time 50% [s]	657	U16	0	120	60	√	R/W	-	-
Ovld mot state Overload Not overload	658	U16	0	1	Not ovrl (1)	-	R 0 1	QD L H	R
Acc delta speed0 [FF]	659	U32	0	2^{32}-1	100	√	R/W	-	-
Acc delta time 0 [s]	660	U16	0	65535	1	√	R/W	-	-
Dec delta speed0 [FF]	661	U32	0	2^{32}-1	100	√	R/W	-	-
Dec delta time 0 [s]	662	U16	0	65535	1	√	R/W	-	-
S acc t const [ms]	663	Float	100	3000	500	√	R/W	-	-
S dec t const [ms]	664	Float	100	3000	500	√	R/W	-	-
S acc t const 0 [ms]	665	Float	100	3000	500	√	R/W	-	-
S dec t const 0 [ms]	666	Float	100	3000	500	√	R/W	-	-
S acc t const 1 [ms]	667	Float	100	3000	500	√	R/W	-	-
S dec t const 1 [ms]	668	Float	100	3000	500	√	R/W	-	-
S acc t const 2 [ms]	669	Float	100	3000	500	√	R/W	-	-
S dec t const 2 [ms]	670	Float	100	3000	500	√	R/W	-	-
S acc t const 3 [ms]	671	Float	100	3000	500	√	R/W	-	-
S dec t const 3 [ms]	672	Float	100	3000	500	√	R/W	-	-
Fwd-Rev No direction Fwd direction Rev direction No direction	673	U16	0	3	Fwd (1)	√	R/W 0 1 2 3	-	R/W
Magn ramp time [s]	675	Float	0.01	5.00	1.00	√	R/Z	-	-
Start part 1	676	U16	0	65535	-	√	C	-	-
Take val part 1	677	U16	0	65535	-	√	Z/C	-	-
Start part 2a	678	U16	0	65535	-	√	C	-	-
Take val part 2a	679	U16	0	65535	-	√	Z/C	-	-
Start part 2b	680	U16	0	65535	-	√	C	-	-
Take val part 2b	681	U16	0	65535	-	√	Z/C	-	-
Rotor resist Nw [Ohm]	682	Float	S	S	-	√	R	-	-
Stator resist Nw [Ohm]	683	Float	S	S	-	√	R	-	-
Lkg indutance Nw [H]	684	Float	S	S	-	√	R	-	-
Volt comp lim Nw [V]	685	Float	0.1	30.0	-	√	R	-	-
Comp slope Nw [V/A]	686	Float	0.1	50.0	-	√	R	-	-
Current P Nw [%]	687	Float	S	S	-	√	R	-	-
Current I Nw [%]	688	Float	S	S	-	√	R	-	-
P1 flux model Nw	689	Float	S	S	S	√	R	-	-
P2 flux model Nw	690	U16	S	S	S	√	R	-	-
Magnetiz curr Nw [A]	691	Float	S	S	S	√	R	-	-
P2 flux model	692	U16	1	20	S	√	R/W	-	-
Take motor par	694	U16	0	1	-	√	C	-	-
PI steady thr	695	I16	0	10000	0	√	R/W	-	-
Droop gain [%]	696	Float	0.00	100.00	0.00	√	R/W	-	-
Droop filter [ms]	697	U16	0	1000	0	√	R/W	-	-
Load comp [%]	698	I16	F	F	0	√	R/W	IA	R/W
Enable droop Enabled Disabled	699	U16	0	1	Disabled (0)	√	R/W 1 0	ID H L	R/W
Droop limit [FF]	700	U16	0	2 × P45	1500	√	R/W	-	-
Self tune state	705	U16	0	65535	-	-	R	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
PID offset 1	761	I16	-10000	10000	0		R/W	-	-
PID offs. Sel Offest 0 Offset 1	762	U16	0	1	Offset 0 (0)		R/W 0 1	ID	R/W
PID feed-back	763	I16	-10000	10000	0		R/W	IA	R/W
PI I gain PID %	764	Float	0.00	100.00	10.00		R/W	-	-
PI P gain PID %	765	Float	0.00	100.00	10.00		R/W	-	-
PD D gain 1 PID [%]	766	Float	0.00	100.00	1.00		R/W	-	-
PD D filter PID [ms]	767	U16	0	1000	0		R/W	-	-
PD P gain 1 PID [%]	768	Float	0.00	100.00	10.00		R/W	-	-
Enable PI PID Enabled Disabled	769	U16	0	1	Disabled (0)		R/W 1 0	ID	R/W
Enable PD PID Enabled Disabled	770	U16	0	1	Disabled (0)		R/W 1 0	ID	R/W
PI output PID	771	I16	0	1000 x P784	1000		R	-	R
PID out sign PID Positive Bipolar	772	U16	0	1	1		R/W 0 1	-	-
PID out scale	773	Float	-100.000	100.000	1.000		R/W	-	-
PID output	774	I16	-10000	10000	0		R	QA	R
PI central v1	776	Float	P785	P784	1.00		R/W	-	-
PI central v2	777	Float	P785	P784	1.00		R/W	-	-
PI central v3	778	Float	P785	P784	1.00		R/W	IA	-
PI central v sel	779	U16	0	3	1		R/W	ID	R/W
PI central vs0	780	U16	0	1	1	-	R/W	ID	R/W
PI central vs1	781	U16	0	1	0	-	R/W	ID	R/W
PID target	782	U16	0	65535	0		R/W	-	-
PI integr freeze ON OFF	783	U16	0	1	0		R/W 1 0	ID	R/W
PI top lim	784	Float	P785	10.00	10.00		R/W	-	-
PI bottom lim	785	Float	-10.00	P784	0		R/W	-	-
PID source	786	U16	0	65535	0		R/W	-	-
PID source gain	787	Float	-100.000	100.000	1.000		R/W	-	-
PD P gain 2 PID [%]	788	Float	0.00	100.00	10.00		R/W	-	-
PD D gain 2 PID [%]	789	Float	0.00	100.00	1.00		R/W	-	-
PD P gain 3 PID [%]	790	Float	0.00	100.00	10.00		R/W	-	-
PD D gain 3 PID[%]	791	Float	0.00	100.00	1.00		R/W	-	-
Input 1 filter [ms]	792	U16	0	1000	0		R/W	-	-
P init gain PID %	793	Float	0.00	100.00	10.00		R/W	-	-
Diameter calc Enabled Disabled	794	U16	0	1	0		Z/R 1 0	ID	R/W
Positioning spd [rpm]	795	I16	-100	100	0		R/W	-	-
Max deviation	796	I16	-10000	10000	8000		R/W	-	-
Gear box ratio	797	Float	0.001	1.000	1.000		R/W	-	-
Dancer constant [mm]	798	U16	1	10000	1		R/W	-	-
Minimum diameter [cm]	799	U16	1	2000	1		R/W	-	-
Diameter calc st	800	U16	0	1	0	-	R	QD	R
BU DC vlt [V] 230 V 400 V 460 V 575 V	801	U16	0	3	3		R/W 3	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
PID offset 1	761	I16	-10000	10000	0		R/W	-	-
PID offs. Sel Offest 0 Offset 1	762	U16	0	1	Offset 0 (0)		R/W 0 1	ID	R/W
PID feed-back	763	I16	-10000	10000	0		R/W	IA	R/W
PI I gain PID %	764	Float	0.00	100.00	10.00		R/W	-	-
PI P gain PID %	765	Float	0.00	100.00	10.00		R/W	-	-
PD D gain 1 PID [%]	766	Float	0.00	100.00	1.00		R/W	-	-
PD D filter PID [ms]	767	U16	0	1000	0		R/W	-	-
PD P gain 1 PID [%]	768	Float	0.00	100.00	10.00		R/W	-	-
Enable PI PID Enabled Disabled	769	U16	0	1	Disabled (0)		R/W 1 0	ID	R/W
Enable PD PID Enabled Disabled	770	U16	0	1	Disabled (0)		R/W 1 0	ID	R/W
PI output PID	771	I16	0	1000 x P784	1000		R	-	R
PID out sign PID Positive Bipolar	772	U16	0	1	1		R/W 0 1	-	-
PID out scale	773	Float	-100.000	100.000	1.000		R/W	-	-
PID output	774	I16	-10000	10000	0		R	QA	R
PI central v1	776	Float	P785	P784	1.00		R/W	-	-
PI central v2	777	Float	P785	P784	1.00		R/W	-	-
PI central v3	778	Float	P785	P784	1.00		R/W	IA	-
PI central v sel	779	U16	0	3	1		R/W	ID	R/W
PI central vs0	780	U16	0	1	1	-	R/W	ID	R/W
PI central vs1	781	U16	0	1	0	-	R/W	ID	R/W
PID target	782	U16	0	65535	0		R/W	-	-
PI integr freeze ON OFF	783	U16	0	1	0		R/W 1 0	ID	R/W
PI top lim	784	Float	P785	10.00	10.00		R/W	-	-
PI bottom lim	785	Float	-10.00	P784	0		R/W	-	-
PID source	786	U16	0	65535	0		R/W	-	-
PID source gain	787	Float	-100.000	100.000	1.000		R/W	-	-
PD P gain 2 PID [%]	788	Float	0.00	100.00	10.00		R/W	-	-
PD D gain 2 PID [%]	789	Float	0.00	100.00	1.00		R/W	-	-
PD P gain 3 PID [%]	790	Float	0.00	100.00	10.00		R/W	-	-
PD D gain 3 PID[%]	791	Float	0.00	100.00	1.00		R/W	-	-
Input 1 filter [ms]	792	U16	0	1000	0		R/W	-	-
P init gain PID %	793	Float	0.00	100.00	10.00		R/W	-	-
Diameter calc Enabled Disabled	794	U16	0	1	0		Z/R 1 0	ID	R/W
Positioning spd [rpm]	795	I16	-100	100	0		R/W	-	-
Max deviation	796	I16	-10000	10000	8000		R/W	-	-
Gear box ratio	797	Float	0.001	1.000	1.000		R/W	-	-
Dancer constant [mm]	798	U16	1	10000	1		R/W	-	-
Minimum diameter [cm]	799	U16	1	2000	1		R/W	-	-
Diameter calc st	800	U16	0	1	0	-	R	QD	R
BU DC vlt [V] 230 V 400 V 460 V 575 V	801	U16	0	3	3		R/W 3	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Continuous curr [A]	802	Float	S	S	S	√	R	-	-
Heatsink temp [°C]	881	I16	-	-	-	√	R	-	-
Dynam vlt margin [%]	889	Float	10.00	10.00	1.00	√	R/W	-	-
Enable zero pos Enabled Disabled	890	U16	0	1	Disabled (0)	√	R/Z 1 0	-	-
Lock zero pos ON OFF	891	U16	0	1	OFF (0)	√	R/W 1 0	ID L H	R/W
Zero pos gain [%]	892	U16	0	100	10	√	R/W	-	-
Spd srch time [s]	893	Float	0.01	10.00	10.00	√	R/W	-	-
Flux srch time [s]	894	Float	0.01	20.00	1.00	√	R/W	-	-
Spd autocapture [FF]	895	I16	-32768	32767	1500	√	R/W	-	-
Delay auto cap [ms]	896	U16	0	10000	1000	√	R/W	-	-
Delay retrying [ms]	897	U16	0	10000	1000	√	R/W	-	-
Enable save eng Enabled Disabled	898	U16	0	1	Disabled (0)	√	R/Z 1 0	-	-
Lock save eng OFF ON	899	U16	0	1	OFF (0)	√	R/W 0 1	ID L H	R/W
V/f flux level [%]	900	U16	0	100	100	√	R/W	IA	R/W
Flux var time [s]	901	U16	1	100	10	√	R/W	-	-
Voltage I [%]	902	Float	0.00	100.00	4.00	√	R/W	-	-
Voltage I base [Vs/V x s]	903	Float	0.00001	9.99999	S	√	R/W	-	-
DC braking mode Enabled Disabled	904	U16	0	1	0	√	R/Z 1 0	-	-
Brk time @ stop [ms]	905	U16	0	30000	1000	√	R/W	-	-
Flux P Nw [%]	907	Float	0.00	100.00	S	√	R	-	-
Flux I Nw [%]	908	Float	0.00	100.00	S	√	R	-	-
Voltage I Nw [%]	909	Float	0.00	100.00	S	√	R	-	-
Enable ind store Enabled Disabled	911	U16	0	1	Disabled (0)	√	R/W 1 0	-	R/W
Ind store ctrl	912	U16	0	65535	0	-	R/W	-	R/W
Index storing	913	U32	0	2^{32}-1	-	-	R	-	R
Intake air temp [°C]	914	U16	-	-	-	√	R	QA	-
Out vlt level [%]	921	Float*	0.0	100.0	100.0	√	R/W	IA,QA	R/W
Act spd filter [s]	923	Float	1.000	0.100	0.100	√	R/W	-	-
F act spd (rpm)	924	I16	-32768	32767	-	√	R	QA	R
F act spd (d) [FF]	925	I16	-32768	32767	-	√	R	-	R
T curr filter [s]	926	Float	0.001	0.250	0.100	√	R/W	-	-
T curr (%)	927	I16	-500	500	-	√	R	QA	R
F T curr (%)	928	I16	-500	500	-	√	R	QA	R
Mot setup sel 0 Value 2° not sel Value 2° sel	940	U16	0	1	Not sel (0)	-	R/Z 0 1	ID L H	R/W
Copy mot setup Setup 0 Setup 1	941	U16	0	1	Setup 0 (0)	√	R/Z 0 1	-	-
Actual mot setup Setup 0 Setup 1	942	U16	0	1	Setup 0 (0)	√	R 0 1	-	R
Mot setup sel Setup 0 Setup 1	943	U16	0	1	Setup 0 (0)	√	R/Z 0 1	-	R/W

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Mot setup state Not running Running	944	U16	0	1	0	-	R 0 1	QD L H	R
Inertia c filter [ms]	1012	U16	0	1000	0		R/W	-	-
Torque const [N*m/A]	1013	Float	0.01	99.99	S		R	-	-
Inertia [kg*m*m*]	1014	Float	0.001	999.999	S		R/W	-	-
Friction [N*m]	1015	Float	0.000	99.999	S		R/W	-	-
Aux spd fun sel Speed up Inertia-loss cp	1016	U16	0	1	Speed up (0)		R/Z 0 1	-	-
Speed ratio	1017	I16	0	32767	10000		R/W	IA	R/W
Spd draw out (d)	1018	I16	-32767	32767	-		R	QA	R
Spd draw out (%)	1019	Float	-200.0	+200.0	-		R	-	-
Select enc 1 OFF Speed ref 1 Speed ref 2 Ramp ref 1 Ramp ref 2	1020	U16	0	5	OFF (0)		R/Z 0 2 3 4 5	-	-
Select enc 2 OFF Speed ref 1 Speed ref 2 Ramp ref 1 Ramp ref 2	1021	U16	0	5	OFF (0)		R/Z 0 2 3 4 5	-	-
Voltage P [%]	1022	Float	0	100.00	15.00		RW	RW	-
Voltage P base [Vs/V]	1023	Float	0.00001	9.99999	S		R/W	-	-
Voltage P Nw [%]	1024	Float	100.00	0.00	S		R	R	-
Start part 3	1027	U16	0	65535	-		C	-	-
Take val part 3	1028	U16	0	65535	-		Z/C	-	-
Fwd-Rev spd tune Fwd direction Rev direction	1029	U16	1	2	Fwd direction (1)		R/Z 1 2	-	-
Inertia Nw [kg*m*m*]	1030	Float	0.001	999.999	-		R	-	-
Friction Nw [N*m]	1031	Float	0.000	99.99	-		R	-	-
Speed P Nw [%]	1032	Float	0.00	100.00	-		R	-	-
Speed I Nw [%]	1033	Float	0.00	100.00	-		R	-	-
Input 1 compare	1042	I16	-10000	10000	0		R/W	-	-
Input 1 cp error	1043	U16	0	10000	0		R/W	-	-
Input 1 cp delay	1044	U16	0	65000	0		R/W	-	-
Input 1 cp match Input 1 not thr.val. Input 1=thr.val	1045	U16	0	1	-	-	R 0 1	QD L H	R
PID acc time [s]	1046	Float	0.0	900.0	0.0		R/W	-	-
PID dec time [s]	1047	Float	0.0	900.0	0.0		R/W	-	-
Test T curr lim [%]	1048	U16	0	S	20		R/Z	-	-
Encoder repeat Encoder 2 Encoder 1	1054	U16	0	1	Encoder 1 (1)		R/Z 0 1	-	-
PL stop acc [rpm/s]	1080	U32	0	99999999	100		R/W	-	-
PL stop dec [rpm/s]	1081	U32	0	99999999	10000		R/W	-	-
PL stop t limit [%]	1082	U16	0	F	100		R/W	-	-
PL stop enable Disabled Enabled as Mst Enabled as Slv	1083	U16	0	2	0		R/W 0 1 2	-	-
PL stop vdc ref [V]	1084	U16	0	980	917		R/W	-	-
PL stop I Gain [%]	1085	Float	0.00	100.00	0.30		R/W	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
PL stop P Gain [%]	1086	Float	0.00	100.00	5.00		R/W	-	-
PL time-out [s]	1087	U16	0	65535	10		R/W	-	-
PL stop active Not active Active	1088	U16	0	1	Not active (0)		R 0 1	-	R
PL active limit [%]	1089	U16	-	-	-		R	-	-
PL next active Not active Active	1090	U16	0	1	Not active (0)		R 0 1	-	R
PL next factor	1091	I16	0	32767	10000		R	-	R
PL mains status Not ok Ok	1092	U16	0	1	Not ok (0)		R/W 0 1	-	R/W
PL time-out sig Not active Active	1093	U16	0	1	Not active (0)		R 0 1	-	R
PL time-out ack Not acknowledged Acknowledged	1094	U16	0	1	Not acknowledged (0)		R/W 0 1	-	R/W
Pdc in 0	1095	U16	0	65535	0		R/W	-	-
Pdc in 1	1096	U16	0	65535	0		R/W	-	-
Pdc in 2	1097	U16	0	65535	0		R/W	-	-
Pdc in 3	1098	U16	0	65535	0		R/W	-	-
Pdc in 4	1099	U16	0	65535	0		R/W	-	-
Pdc in 5	1100	U16	0	65535	0		R/W	-	-
Pdc out 0	1101	U16	0	65535	0		R/W	-	-
Pdc out 1	1102	U16	0	65535	0		R/W	-	-
Pdc out 2	1103	U16	0	65535	0		R/W	-	-
Pdc out 3	1104	U16	0	65535	0		R/W	-	-
Pdc out 4	1105	U16	0	65535	0		R/W	-	-
Pdc out 5	1106	U16	0	65535	0		R/W	-	-
Virt dig in 0	1107	U16	0	65535	0		R/W	-	-
Virt dig in 1	1108	U16	0	65535	0		R/W	-	-
Virt dig in 2	1109	U16	0	65535	0		R/W	-	-
Virt dig in 3	1110	U16	0	65535	0		R/W	-	-
Virt dig in 4	1111	U16	0	65535	0		R/W	-	-
Virt dig in 5	1112	U16	0	65535	0		R/W	-	-
Virt dig in 6	1113	U16	0	65535	0		R/W	-	-
Virt dig in 7	1114	U16	0	65535	0		R/W	-	-
Virt dig in 8	1115	U16	0	65535	0		R/W	-	-
Virt dig in 9	1116	U16	0	65535	0		R/W	-	-
Virt dig in 10	1117	U16	0	65535	0		R/W	-	-
Virt dig in 11	1118	U16	0	65535	0		R/W	-	-
Virt dig in 12	1119	U16	0	65535	0		R/W	-	-
Virt dig in 13	1120	U16	0	65535	0		R/W	-	-
Virt dig in 14	1121	U16	0	65535	0		R/W	-	-
Virt dig in 15	1122	U16	0	65535	0		R/W	-	-
Virt dig out 0	1123	U16	0	65535	0		R/W	-	-
Virt dig out 1	1124	U16	0	65535	0		R/W	-	-
Virt dig out 2	1125	U16	0	65535	0		R/W	-	-
Virt dig out 3	1126	U16	0	65535	0		R/W	-	-
Virt dig out 4	1127	U16	0	65535	0		R/W	-	-
Virt dig out 5	1128	U16	0	65535	0		R/W	-	-
Virt dig out 6	1129	U16	0	65535	0		R/W	-	-
Virt dig out 7	1130	U16	0	65535	0		R/W	-	-
Virt dig out 8	1131	U16	0	65535	0		R/W	-	-

Parameter	No	Format	Value			Access via			
			min	max	Factory	Keyp.	RS485/ BUS/ Opt2-M	Terminal	Opt2-A /PDC
Virt dig out 9	1132	U16	0	65535	0	√	R/W	-	-
Virt dig out 10	1133	U16	0	65535	0	√	R/W	-	-
Virt dig out 11	1134	U16	0	65535	0	√	R/W	-	-
Virt dig out 12	1135	U16	0	65535	0	√	R/W	-	-
Virt dig out 13	1136	U16	0	65535	0	√	R/W	-	-
Virt dig out 14	1137	U16	0	65535	0	√	R/W	-	-
Virt dig out 15	1138	U16	0	65535	0	√	R/W	-	-
Overload 200% Overload not possible Overload possible	1139	U16	0	1	-	-	R 0 1	QD L H	R
Activity Warning Disable drive Quick stop Normal stop Curr lim stop	1140	U16	1	5	Disable drive (2)	√	R/Z 1 2 3 4 5	-	-
Latch ON OFF	1141	U16	0	1	ON (1)	√	R/Z 1 0	-	-
Ok relay open ON OFF	1142	I16	0	1	ON (1)	√	R/Z 1 0	-	-
Enc1 supply vlt 5.41 V 5.68 V 5.91 V 6.18 V	1146	U16	0	3	5.41 V (0)	√	R/Z 0 1 2 3		
Regulation temp [°C]	1147	I16	-	-	-	√	R	-	-
Activity Ignore Warning	1148	U16	1	5	Warning (1)	√	R/Z 0 1	-	-
Latch ON OFF	1149	U16	0	1	ON (1)	√	R/Z 1 0	-	-
Ok relay open ON OFF	1150	I16	0	1	ON (1)	√	R/Z 1 0	-	-
Ok relay open ON OFF	1151	I16	0	1	ON (1)	√	R/Z 1 0	-	-
Ok relay open ON OFF	1152	I16	0	1	ON (1)	√	R/Z 1 0	-	-

* When the parameter is accessed by Opt2-A/PDC the format is U16

** When the parameter is accessed by Opt2-A/PDC the format is I16

*** When the parameter is accessed by Opt2-A/PDC the lower word of the parameter is considered

10.3. Parameters in Alphabetical Order

Parameter	N.	Position
Acc delta speed [FF]	21	BASIC MENU
Acc delta speed [FF]	21	RAMP \ Acceleration
Acc delta speed [FF]	21	DRIVECOM \ Acceleration
Acc delta speed0 [FF]	659	FUNCTIONS \ Multi ramp fct \ Ramp 0 \ Acceleration 0
Acc delta speed1 [FF]	23	FUNCTIONS \ Multi ramp fct \ Ramp 1 \ Acceleration 1
Acc delta speed2 [FF]	25	FUNCTIONS \ Multi ramp fct \ Ramp 2 \ Acceleration 2
Acc delta speed3 [FF]	27	FUNCTIONS \ Multi ramp fct \ Ramp 3 \ Acceleration 3
Acc delta time [s]	22	BASIC MENU
Acc delta time [s]	22	RAMP \ Acceleration
Acc delta time [s]	22	DRIVECOM \ Acceleration
Acc delta time 0 [s]	660	FUNCTIONS \ Multi ramp fct \ Ramp 0 \ Acceleration 0
Acc delta time 1 [s]	24	FUNCTIONS \ Multi ramp fct \ Ramp 1 \ Acceleration 1
Acc delta time 2 [s]	26	FUNCTIONS \ Multi ramp fct \ Ramp 2 \ Acceleration 2
Acc delta time 3 [s]	28	FUNCTIONS \ Multi ramp fct \ Ramp 3 \ Acceleration 3
Act percentage [%]	120	DRIVECOM
Act spd filter [rpm]	923	MONITOR \ Measurements \ Speed \ Speed in rpm
Act spd filter [s]	923	MONITOR \ Measurements \ Speed \ Speed in DRC []
Act speed value [FF]	119	DRIVECOM
Active power [%]	229	MONITOR \ Measurements
Activity	368	CONFIGURATION \ Prog alarms \ Heatsink sensor
Activity	1140	CONFIGURATION \ Prog alarms \ Intake air ot
Activity	1148	CONFIGURATION \ Prog alarms \ Regulation ot
Activity	365	CONFIGURATION \ Prog alarms \ Overtemp motor
Activity	354	CONFIGURATION \ Prog alarms \ External fault
Activity	639	CONFIGURATION \ Prog alarms \ Opt2 failure
Activity	634	CONFIGURATION \ Prog alarms \ Bus loss
Activity	386	CONFIGURATION \ Prog alarms \ Hw opt1 failure
Activity	728	CONFIGURATION \ Prog alarms \ Enable seq err
Activity	737	CONFIGURATION \ Prog alarms \ BU overload
Actual boost [%]	711	DRIVE PARAMETER \ V/f control \ Voltage boost
Actual mot setup	942	FUNCTIONS \ Motor setup
Actual slip comp [rpm]	724	DRIVE PARAMETER \ V/f control \ Slip compens
Actual spd (%)	121	
Actual spd (d) [FF]	119	MONITOR \ Measurements \ Speed \ Speed in DRC []
Actual spd (rpm)	122	BASIC MENU
Actual spd (rpm)	122	MONITOR \ Measurements \ Speed \ Speed in rpm
Adap I gain 1 [%]	189	ADD SPEED FUNCT \ Adap spd reg
Adap I gain 2 [%]	191	ADD SPEED FUNCT \ Adap spd reg
Adap I gain 3 [%]	193	ADD SPEED FUNCT \ Adap spd reg
Adap joint 1 [%]	186	ADD SPEED FUNCT \ Adap spd reg
Adap joint 2 [%]	187	ADD SPEED FUNCT \ Adap spd reg
Adap P gain 1 [%]	188	ADD SPEED FUNCT \ Adap spd reg
Adap P gain 2 [%]	190	ADD SPEED FUNCT \ Adap spd reg
Adap P gain 3 [%]	192	ADD SPEED FUNCT \ Adap spd reg
Adap reference [FF]	183	ADD SPEED FUNCT \ Adap spd reg
Adap speed 1 [%]	184	ADD SPEED FUNCT \ Adap spd reg
Adap speed 2 [%]	185	ADD SPEED FUNCT \ Adap spd reg
Ambient temp [°C]	332	BASIC MENU \ Drive type
Ambient temp [°C]	332	CONFIGURATION \ Drive type
An in 1 target	295	I/O CONFIG \ Analog inputs \ Analog input 1
An in 2 target	296	I/O CONFIG \ Analog inputs \ Analog input 2
An in 3 target	297	I/O CONFIG \ Analog inputs \ Analog input 3
Auto capture	388	ADD SPEED FUNCT
Auto tune inp 1	259	I/O CONFIG \ Analog inputs \ Analog input 1
Auto tune inp 2	260	I/O CONFIG \ Analog inputs \ Analog input 2
Auto tune inp 3	261	I/O CONFIG \ Analog inputs \ Analog input 3
Aux spd fun sel	1016	SPEED REGULAT.
Base frequency [Hz]	168	DRIVE PARAMETER \ Mot plate data
Base voltage [V]	167	DRIVE PARAMETER \ Mot plate data
Bitword Pad A	519	SPEC FUNCTIONS \ Pad Parameters
Bitword Pad B	536	SPEC FUNCTIONS \ Pad Parameters
Brk time @ stop [ms]	905	SPEC FUNCTIONS \ DC braking
BU DC vlt [V]	801	FUNCTIONS \ Brake unit
BU duty cycle [%]	741	FUNCTIONS \ Brake unit
BU ovld time [s]	740	FUNCTIONS \ Brake unit
Comp slope [V/A]	645	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1

Parameter	N.	Position
Comp slope [V/A]	645	REG PARAMETERS \ Percent values \ Current reg\Dead time comp
Comp slope Nw [V/A]	686	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Continuous curr [A]	802	BASIC MENU \ Drive type
Continuous curr [A]	802	CONFIGURATION \ Drive type
Control mode	253	CONFIGURATION
Control Word	55	DRIVECOM
Copy mot setup	941	FUNCTIONS \ Motor setup
Cos phi	371	DRIVE PARAMETER \ Mot plate data
Curr limit state	349	LIMITS \ Current limits
Current I [%]	90	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Current I [%]	90	REG PARAMETERS \ Percent values \ Current reg
Current I base [V/A×ms]	96	REG PARAMETERS \ Base values \ Current reg
Current I Nw [%]	688	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Current lim red [%]	13	LIMITS \ Current limits
Current norm	267	CURRENT REGULAT
Current P [%]	89	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Current P [%]	89	REG PARAMETERS \ Percent values \ Current reg
Current P base [V/A]	95	REG PARAMETERS \ Base values \ Current reg
Current P Nw [%]	687	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Dancer constant [mm]	798	OPTIONS \ PID \ Diameter calc
DC braking curr [%]	717	SPEC FUNCTIONS \ DC braking
DC braking delay [ms]	716	
DC braking mode	904	SPEC FUNCTIONS \ DC braking
DC link voltage [V]	227	MONITOR \ Measurements
Dec delta speed [FF]	29	BASIC MENU
Dec delta speed [FF]	29	RAMP \ Deceleration
Dec delta speed [FF]	29	DRIVECOM \ Deceleration
Dec delta speed0 [FF]	661	FUNCTIONS \ Multi ramp fct \ Ramp 0 \ Deceleration 0
Dec delta speed1 [FF]	31	FUNCTIONS \ Multi ramp fct \ Ramp 1 \ Deceleration 1
Dec delta speed2 [FF]	33	FUNCTIONS \ Multi ramp fct \ Ramp 2 \ Deceleration 2
Dec delta speed3 [FF]	35	FUNCTIONS \ Multi ramp fct \ Ramp 3 \ Deceleration 3
Dec delta time [s]	30	BASIC MENU
Dec delta time [s]	30	RAMP \ Deceleration
Dec delta time [s]	30	DRIVECOM \ Deceleration
Dec delta time 0 [s]	662	FUNCTIONS \ Multi ramp fct \ Ramp 0 \ Deceleration 0
Dec delta time 1 [s]	32	FUNCTIONS \ Multi ramp fct \ Ramp 1 \ Deceleration 1
Dec delta time 2 [s]	34	FUNCTIONS \ Multi ramp fct \ Ramp 2 \ Deceleration 2
Dec delta time 3 [s]	36	FUNCTIONS \ Multi ramp fct \ Ramp 3 \ Deceleration 3
Delay auto cap [ms]	896	DRIVE PARAMETER \ V/f control \ V/f spd search
Delay retrying [ms]	897	DRIVE PARAMETER \ V/f control \ V/f spd search
Destination	485	SPEC FUNCTIONS \ Links \ Link 1
Destination	554	SPEC FUNCTIONS \ Links \ Link 2
Device address	319	CONFIGURATION
Diameter calc	794	OPTIONS \ PID \ Diameter calc
Diameter calc st	800	OPTIONS \ PID
Dig input term	564	MONITOR \ I/O
Dig input term 1	565	MONITOR \ I/O
Dig input term 10	574	MONITOR \ I/O
Dig input term 11	575	MONITOR \ I/O
Dig input term 12	576	MONITOR \ I/O
Dig input term 13	577	MONITOR \ I/O
Dig input term 14	578	MONITOR \ I/O
Dig input term 15	579	MONITOR \ I/O
Dig input term 16	580	MONITOR \ I/O
Dig input term 2	566	MONITOR \ I/O
Dig input term 3	567	MONITOR \ I/O
Dig input term 4	568	MONITOR \ I/O
Dig input term 5	569	MONITOR \ I/O
Dig input term 6	570	MONITOR \ I/O
Dig input term 7	571	MONITOR \ I/O
Dig input term 8	572	MONITOR \ I/O
Dig input term 9	573	MONITOR \ I/O
Dig output term	581	MONITOR \ I/O
Digital I/Q	-	MONITOR \ I/O
Digital input 1	137	I/O CONFIG \ Digital inputs
Digital input 2	138	I/O CONFIG \ Digital inputs

Parameter	N.	Position
Digital input 4	140	I/O CONFIG \ Digital inputs
Digital input 5	141	I/O CONFIG \ Digital inputs
Digital input 6	142	I/O CONFIG \ Digital inputs
Digital input 7	143	I/O CONFIG \ Digital inputs
Digital input 8	144	I/O CONFIG \ Digital inputs
Digital output 1	145	I/O CONFIG \ Digital outputs
Digital output 2	146	I/O CONFIG \ Digital outputs
Digital output 3	147	I/O CONFIG \ Digital outputs
Digital output 4	148	I/O CONFIG \ Digital outputs
Digital output 5	149	I/O CONFIG \ Digital outputs
Digital output 6	150	I/O CONFIG \ Digital outputs
Digital output 7	151	I/O CONFIG \ Digital outputs
Digital output 8	152	I/O CONFIG \ Digital outputs
Dim factor den	51	CONFIGURATION \ Dimension fact
Dim factor den	51	DRIVECOM \ Dimension fact
Dim factor num	50	CONFIGURATION \ Dimension fact
Dim factor num	50	DRIVECOM \ Dimension fact
Dim factor text	52	CONFIGURATION \ Dimension fact
Dim factor text	52	DRIVECOM \ Dimension fact
Div.Gain	487	SPEC FUNCTIONS \ Links \ Link 1
Div.Gain	556	SPEC FUNCTIONS \ Links \ Link 2
Drive ready	380	
Drive type (AV-300i)	300	BASIC MENU \ Drive type
Drive type (AV-300i)	300	CONFIGURATION \ Drive type
Droop filter [ms]	697	SPEED REGULAT \ Droop function
Droop gain [%]	696	SPEED REGULAT \ Droop function
Droop limit [FF]	700	SPEED REGULAT \ Droop function
Dynam vlt margin [%]	889	LIMITS \ Voltage limits
Enab motor pot	246	FUNCTIONS \ Motor pot
Enab multi rmp	243	FUNCTIONS \ Multi ramp fct
Enab multi spd	153	FUNCTIONS \ Multi speed fct
Enable BU	736	FUNCTIONS \ Brake unit
Enable drive	314	BASIC MENU
Enable drive	314	MONITOR
Enable droop	699	SPEED REGULAT \ Droop function
Enable ind store	911	CONFIGURATION \ Motor spd fbk
Enable jog	244	FUNCTIONS \ Jog function
Enable lck sls	422	SPEED REGULAT \ Spd zero logic
Enable OPT2	425	OPTIONS \ Option 2
Enable PD PID	770	OPTIONS \ PID
Enable PI PID	769	OPTIONS \ PID
Enable ramp	245	RAMP
Enable rr adap	435	SPEC FUNCTIONS
Enable save eng	898	DRIVE PARAMETER \ V/f control \ Energy save
Enable spd adap	181	ADD SPEED FUNCT \ Adap spd reg
Enable spd reg	242	SPEED REGULAT.
Enable spd=0 I	123	SPEED REGULAT \ Spd zero logic
Enable spd=0 P	125	SPEED REGULAT \ Spd zero logic
Enable spd=0 R	124	SPEED REGULAT \ Spd zero logic
Enable zero pos	890	SPEED REGULAT \ Spd zero logic
Enc1 speed [rpm]	427	MONITOR \ Measurements \ Speed \ Speed in rpm
Enc1 supply vlt	1146	CONFIGURATION \ Motor spd fbk
Enc2 speed [rpm]	420	MONITOR \ Measurements \ Speed \ Speed in rpm
Encoder 1 pulses	416	BASIC MENU
Encoder 1 pulses	416	CONFIGURATION \ Motor spd fbk
Encoder 1 pulses	416	I/O CONFIG \ Encoder inputs
Encoder 1 state	648	CONFIGURATION \ Motor spd fbk
Encoder 1 type	415	BASIC MENU
Encoder 1 type	415	CONFIGURATION \ Motor spd fbk
Encoder 1 type	415	I/O CONFIG \ Encoder inputs
Encoder 2 pulses	169	CONFIGURATION \ Motor spd fbk
Encoder 2 pulses	169	I/O CONFIG \ Encoder inputs
Encoder 2 state	651	CONFIGURATION \ Motor spd fbk
Encoder repeat	1054	CONFIGURATION \ Motor spd fbk
F act spd (d) [FF]	925	MONITOR \ Measurements \ Speed \ Speed in DRC []
F act spd (rpm)	924	MONITOR \ Measurements \ Speed \ Speed in rpm

Parameter	N.	Position
F act spd (rpm)	924	MONITOR \ Measurements \ Speed \ Speed in rpm
F current ref	352	CURRENT REGULAT
F T curr (%)	928	MONITOR \ Measurements
Face value den	53	CONFIGURATION \ Face value fact
Face value den	53	DRIVECOM \ Face value fact
Face value num	54	CONFIGURATION \ Face value fact
Face value num	54	DRIVECOM \ Face value fact
Failure code	417	SPEC FUNCTIONS
Failure hour	328	SPEC FUNCTIONS
Failure min	329	SPEC FUNCTIONS
Failure reg del	263	SPEC FUNCTIONS
Failure register	-	SPEC FUNCTIONS
Failure reset	262	SPEC FUNCTIONS
Failure text	327	SPEC FUNCTIONS
Fast stop	316	
Feed-fwd PID	758	OPTIONS \ PID
Flt_100_mf	303	CONFIGURATION
Flux	234	FLUX REGULATION
Flux [%]	234	MONITOR \ Measurements
Flux corr factor	647	DRIVE PARAMETER \ Sensorless
Flux current	351	CURRENT REGULAT
Flux I [%]	92	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Flux I [%]	92	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
Flux I [%]	92	REG PARAMETERS \ Percent values \ Flux regulator
Flux I base [A/Vs×ms]	98	REG PARAMETERS \ Base values \ Flux regulator
Flux I Nw [%]	908	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Flux I Nw [%]	908	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
Flux level [%]	467	LIMITS \ Flux limits
Flux P [%]	91	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Flux P [%]	91	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
Flux P [%]	91	REG PARAMETERS \ Percent values \ Flux regulator
Flux P base [A/Vs]	97	REG PARAMETERS \ Base values \ Flux regulator
Flux P Nw [%]	907	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Flux P Nw [%]	907	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
Flux reference	500	FLUX REGULATION
Flux reg mode	469	FLUX REGULATION
Flux srch time [s]	894	DRIVE PARAMETER \ V/f control \ V/f spd search
Flux var time [s]	901	DRIVE PARAMETER \ V/f control \ Energy save
Forward sign	293	RAMP
Freeze ramp	373	RAMP
Friction [N*m]	1015	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3
Friction [N*m]	1015	SPEED REGULAT \ Inertia/loss cp
Friction Nw [N*m]	1031	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3
Full load curr [A]	179	CONFIGURATION
Fwd-Rev	673	RAMP
Fwd-Rev spd tune	1029	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3
Gear box ratio	797	OPTIONS \ PID \ Diameter calc
Gen access	58	SPEC FUNCTIONS \ Test generator
Gen amplitude [%]	60	SPEC FUNCTIONS \ Test generator
Gen frequency [Hz]	59	SPEC FUNCTIONS \ Test generator
Gen offset [%]	61	SPEC FUNCTIONS \ Test generator
Heatsink temp [°C]	881	MONITOR \ Measurements
Hold off time [ms]	636	CONFIGURATION \ Prog alarms \ Bus loss
I init gain PID %	734	OPTIONS \ PID \ PI controls
I_sqrt_t_accum [%]	655	FUNCTIONS \ Overload contr \ Ovld drv contr
In use Tcur lim- [%]	11	LIMITS \ Current limits
In use Tcur lim+ [%]	10	LIMITS \ Current limits
Ind store ctrl	912	CONFIGURATION \ Motor spd fbk
Index storing	913	CONFIGURATION \ Motor spd fbk
Inertia [kg*m*m*]	1014	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3
Inertia [kg*m*m]	1014	SPEED REGULAT \ Inertia/loss cp
Inertia c filter [ms]	1012	SPEED REGULAT \ Inertia/loss cp
Inertia Nw [kg*m*m*]	1030	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3
Input 1 compare	1042	I/O CONFIG \ Analog inputs \ Analog input 1
Input 1 cp delay	1044	I/O CONFIG \ Analog inputs \ Analog input 1
Input 1 cp error	1043	I/O CONFIG \ Analog inputs \ Analog input 1
Input 1 cp match	1045	I/O CONFIG \ Analog inputs \ Analog input 1

Parameter	N.	Position
Input 1 filter [ms]	792	I/O CONFIG \ Analog inputs \ Analog input 1
Input 1 sign	389	I/O CONFIG \ Analog inputs \ Analog input 1
Input 1 type	71	I/O CONFIG \ Analog inputs \ Analog input 1
Input 2 sign	390	I/O CONFIG \ Analog inputs \ Analog input 2
Input 2 type	76	I/O CONFIG \ Analog inputs \ Analog input 2
Input 3 sign	391	I/O CONFIG \ Analog inputs \ Analog input 3
Input 3 type	81	I/O CONFIG \ Analog inputs \ Analog input 3
Input absolute	492	SPEC FUNCTIONS \ Links \ Link 1
Input absolute	561	SPEC FUNCTIONS \ Links \ Link 2
Input max	488	SPEC FUNCTIONS \ Links \ Link 1
Input max	557	SPEC FUNCTIONS \ Links \ Link 2
Input min	489	SPEC FUNCTIONS \ Links \ Link 1
Input min	558	SPEC FUNCTIONS \ Links \ Link 2
Input offset	490	SPEC FUNCTIONS \ Links \ Link 1
Input offset	559	SPEC FUNCTIONS \ Links \ Link 2
Intake air temp	914	MONITOR \ Measurements
Jog -	399	FUNCTIONS \ Jog function
Jog +	398	FUNCTIONS \ Jog function
Jog operation	-	FUNCTIONS \ Jog function
Jog reference [FF]	266	FUNCTIONS \ Jog function
Jog selection	375	FUNCTIONS \ Jog function
Jog stop control	630	FUNCTIONS \ Stop control
Latch	357	CONFIGURATION \ Prog alarms \ Undervoltage
Latch	361	CONFIGURATION \ Prog alarms \ Overvoltage
Latch	369	CONFIGURATION \ Prog alarms \ Heatsink sensor
Latch	1141	CONFIGURATION \ Prog alarms \ Intake air ot
Latch	1149	CONFIGURATION \ Prog alarms \ Regulation ot
Latch	366	CONFIGURATION \ Prog alarms \ Overtemp motor
Latch	355	CONFIGURATION \ Prog alarms \ External fault
Latch	363	CONFIGURATION \ Prog alarms \ Overcurrent
Latch	210	CONFIGURATION \ Prog alarms \ Output stages
Latch	633	CONFIGURATION \ Prog alarms \ Bus loss
Latch	729	CONFIGURATION \ Prog alarms \ Enable seq err
Life time [h.min]	235	SPEC FUNCTIONS
Lkg inductance [H]	437	DRIVE PARAMETER \ Motor Parameter
Lkg inductance [H]	437	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Lkg indutance Nw [H]	684	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Load comp [%]	698	SPEED REGULAT \ Droop function
Load default	258	SPEC FUNCTIONS
Load motor par	251	DRIVE PARAMETER \ Motor Parameter
Lock save eng	899	DRIVE PARAMETER \ V/f control \ Energy save
Lock speed I	348	SPEED REGULAT.
Lock speed reg	322	SPEED REGULAT.
Lock zero pos	891	SPEED REGULAT \ Spd zero logic
Low speed factor	646	DRIVE PARAMETER \ Sensorless
Magn boost curr [%]	413	CONFIGURATION
Magn ramp time [s]	675	CONFIGURATION
Magn working cur [A]	726	DRIVE PARAMETER \ Motor Parameter
Magnetiz curr Nw [A]	691	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Magnetiz curr Nw [A]	691	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
Magnetizing cur [A]	165	DRIVE PARAMETER \ Motor Parameter
Magnetizing curr [A]	165	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Magnetizing curr [A]	165	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
Main commands	252	CONFIGURATION
Mains voltage	333	BASIC MENU \ Drive type
Mains voltage	333	CONFIGURATION \ Drive type
Malfunction code	57	DRIVECOM
Manual boost [%]	710	DRIVE PARAMETER \ V/f control \ Voltage boost
Manual slip comp [rpm]	723	DRIVE PARAMETER \ V/f control \ Slip compens
Max deviation	796	OPTIONS \ PID \ Diameter calc
Menu		OPTIONS \ Option 1
Menu		OPTIONS \ Option 2
Minimum diameter [cm]	799	OPTIONS \ PID \ Diameter calc
Mot setup sel	943	FUNCTIONS \ Motor setup
Mot setup sel 0	940	FUNCTIONS \ Motor setup
Mot setup state	944	FUNCTIONS \ Motor setup
Motor cont curr [%]	656	FUNCTIONS \ Overload contr \ Ovld mot contr

Parameter	N.	Position
Motor current [A]	231	BASIC MENU
Motor current [A]	231	MONITOR \ Measurements
Motor losses %	727	DRIVE PARAMETER \ V/f control \ Slip compens
Motor pot down	397	FUNCTIONS \ Motor pot
Motor pot oper	-	FUNCTIONS \ Motor pot
Motor pot reset	249	FUNCTIONS \ Motor pot
Motor pot sign	248	FUNCTIONS \ Motor pot
Motor pot up	396	FUNCTIONS \ Motor pot
Mul.Gain	486	SPEC FUNCTIONS \ Links \ Link 1
Mul.Gain	555	SPEC FUNCTIONS \ Links \ Link 2
Multi ramp sel	202	FUNCTIONS \ Multi ramp fct
Multi speed 1 [FF]	154	FUNCTIONS \ Multi speed fct
Multi speed 2 [FF]	155	FUNCTIONS \ Multi speed fct
Multi speed 3 [FF]	156	FUNCTIONS \ Multi speed fct
Multi speed 4 [FF]	157	FUNCTIONS \ Multi speed fct
Multi speed 5 [FF]	158	FUNCTIONS \ Multi speed fct
Multi speed 6 [FF]	159	FUNCTIONS \ Multi speed fct
Multi speed 7 [FF]	160	FUNCTIONS \ Multi speed fct
Multi speed sel	208	FUNCTIONS \ Multi speed fct
N of attempts	360	CONFIGURATION \ Prog alarms \ Undervoltage
Nom frequency [Hz]	163	DRIVE PARAMETER \ Mot plate data
Nominal current [A]	164	DRIVE PARAMETER \ Mot plate data
Nominal speed [rpm]	162	DRIVE PARAMETER \ Mot plate data
Nominal voltage [V]	161	DRIVE PARAMETER \ Mot plate data
Offset input 1	74	I/O CONFIG \ Analog inputs \ Analog input 1
Offset input 2	79	I/O CONFIG \ Analog inputs \ Analog input 2
Offset input 3	84	I/O CONFIG \ Analog inputs \ Analog input 3
Ok relay funct	412	CONFIGURATION
OK relay open	358	CONFIGURATION \ Prog alarms \ Undervoltage
Ok relay open	362	CONFIGURATION \ Prog alarms \ Overvoltage
Ok relay open	370	CONFIGURATION \ Prog alarms \ Heatsink sensor
Ok relay open	1142	CONFIGURATION \ Prog alarms \ Heatsink ot
Ok relay open	1152	CONFIGURATION \ Prog alarms \ Heatsink ot
Ok relay open	1150	CONFIGURATION \ Prog alarms \ Regulation ot
Ok relay open	1151	CONFIGURATION \ Prog alarms \ Module overtemp
Ok relay open	367	CONFIGURATION \ Prog alarms \ Overtemp motor
OK relay open	356	CONFIGURATION \ Prog alarms \ External fault
OK relay open	364	CONFIGURATION \ Prog alarms \ Overcurrent
OK relay open	211	CONFIGURATION \ Prog alarms \ Output stages
OK relay open	640	CONFIGURATION \ Prog alarms \ Opt2 failure
OK relay open	635	CONFIGURATION \ Prog alarms \ Bus loss
OK relay open	387	CONFIGURATION \ Prog alarms \ Hw opt1 failure
OK relay open	730	CONFIGURATION \ Prog alarms \ Enable seq err
OK relay open	738	CONFIGURATION \ Prog alarms \ BU overload
Out vlt level [%]	921	FLUX REGULATION
Output frequency [Hz]	324	MONITOR \ Measurements
Output offset	491	SPEC FUNCTIONS \ Links \ Link 1
Output offset	560	SPEC FUNCTIONS \ Links \ Link 2
Output voltage [V]	233	MONITOR \ Measurements
Overload 200%	1139	FUNCTIONS \ Overload contr \ Ovld drv contr
Ovld Available	406	FUNCTIONS \ Overload contr \ Ovld drv contr
Ovld mot state	658	FUNCTIONS \ Overload contr \ Ovld mot contr
P init gain PID %	793	OPTIONS \ PID \ PI controls
P1 flux model	176	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
P1 flux model	176	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
P1 flux model Nw	689	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
P1 flux model Nw	689	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
P2 flux model	692	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
P2 flux model	692	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
P2 flux model Nw	690	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
P2 flux model Nw	690	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
Pad 0	503	SPEC FUNCTIONS \ Pad Parameters
Pad 1	504	SPEC FUNCTIONS \ Pad Parameters
Pad 10	513	SPEC FUNCTIONS \ Pad Parameters
Pad 11	514	SPEC FUNCTIONS \ Pad Parameters
Pad 12	515	SPEC FUNCTIONS \ Pad Parameters
Pad 13	516	SPEC FUNCTIONS \ Pad Parameters
Pad 14	517	SPEC FUNCTIONS \ Pad Parameters

Parameter	N.	Position
Pad 15	518	SPEC FUNCTIONS \ Pad Parameters
Pad 2	505	SPEC FUNCTIONS \ Pad Parameters
Pad 3	506	SPEC FUNCTIONS \ Pad Parameters
Pad 4	507	SPEC FUNCTIONS \ Pad Parameters
Pad 5	508	SPEC FUNCTIONS \ Pad Parameters
Pad 6	509	SPEC FUNCTIONS \ Pad Parameters
Pad 7	510	SPEC FUNCTIONS \ Pad Parameters
Pad 8	511	SPEC FUNCTIONS \ Pad Parameters
Pad 9	512	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 0	520	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 1	521	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 10	530	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 11	531	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 12	532	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 13	533	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 14	534	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 15	535	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 2	522	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 3	523	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 4	524	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 5	525	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 6	526	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 7	527	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 8	528	SPEC FUNCTIONS \ Pad Parameters
Pad A Bit 9	529	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 0	537	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 1	538	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 10	547	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 11	548	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 12	549	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 13	550	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 14	551	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 15	552	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 2	539	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 3	540	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 4	541	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 5	542	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 6	543	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 7	544	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 8	545	SPEC FUNCTIONS \ Pad Parameters
Pad B Bit 9	546	SPEC FUNCTIONS \ Pad Parameters
Password 2	86	SERVICE
PD D filter PID [ms]	767	OPTIONS \ PID \ PD controls
PD D gain 1 PID [%]	766	OPTIONS \ PID \ PD controls
PD D gain 2 PID [%]	789	OPTIONS \ PID \ PD controls
PD D gain 3 PID[%]	791	OPTIONS \ PID \ PD controls
PD output PID	421	OPTIONS \ PID
PD P gain 1 PID [%]	768	OPTIONS \ PID \ PD controls
PD P gain 2 PID [%]	788	OPTIONS \ PID \ PD controls
PD P gain 3 PID [%]	790	OPTIONS \ PID \ PD controls
Pdc in 0	1095	OPTIONS \ Option 1\ PDC config \ PDC inputs
Pdc in 1	1096	OPTIONS \ Option 1\ PDC config \ PDC inputs
Pdc in 2	1097	OPTIONS \ Option 1\ PDC config \ PDC inputs
Pdc in 3	1098	OPTIONS \ Option 1\ PDC config \ PDC inputs
Pdc in 4	1099	OPTIONS \ Option 1\ PDC config \ PDC inputs
Pdc in 5	1100	OPTIONS \ Option 1\ PDC config \ PDC inputs
Pdc out 0	1101	OPTIONS \ Option 1\ PDC config \ PDC outputs
Pdc out 1	1102	OPTIONS \ Option 1\ PDC config \ PDC outputs
Pdc out 2	1103	OPTIONS \ Option 1\ PDC config \ PDC outputs
Pdc out 3	1104	OPTIONS \ Option 1\ PDC config \ PDC outputs
Pdc out 4	1105	OPTIONS \ Option 1\ PDC config \ PDC outputs
Pdc out 5	1106	OPTIONS \ Option 1\ PDC config \ PDC outputs
Percent ref var [%]	116	DRIVECOM
PI bottom lim	785	OPTIONS \ PID \ PI controls
PI central v sel	779	OPTIONS \ PID \ PI controls
PI central v1	776	OPTIONS \ PID \ PI controls
PI central v2	777	OPTIONS \ PID \ PI controls

Parameter	N.	Position
PI central v3	778	OPTIONS \ PID \ PI controls
PI central vs0	780	OPTIONS \ PID
PI central vs1	781	OPTIONS \ PID
PI I gain PID %	764	OPTIONS \ PID \ PI controls
PI integr freeze	783	OPTIONS \ PID \ PI controls
PI output PID	771	OPTIONS \ PID
PI P gain PID %	765	OPTIONS \ PID \ PI controls
PI steady delay [ms]	731	OPTIONS \ PID \ PI controls
PI steady thr	695	OPTIONS \ PID \ PI controls
PI top lim	784	OPTIONS \ PID \ PI controls
PID acc time [s]	1046	OPTIONS \ PID \ PID references
PID clamp	757	OPTIONS \ PID \ PID references
PID dec time [s]	1047	OPTIONS \ PID \ PID references
PID error	759	OPTIONS \ PID \ PID references
PID feed-back	763	OPTIONS \ PID \ PID references
PID offs. Sel	762	OPTIONS \ PID \ PID references
PID offset 0	760	OPTIONS \ PID \ PID references
PID offset 1	761	OPTIONS \ PID \ PID references
PID out scale	773	OPTIONS \ PID \ PID target
PID out sign PID	772	OPTIONS \ PID
PID output	774	OPTIONS \ PID
PID source	786	OPTIONS \ PID \ PID source
PID source gain	787	OPTIONS \ PID \ PID source
PID target	782	OPTIONS \ PID \ PID target
PL active limit [%]	1089	FUNCTIONS \ Pwr loss stop f
PL mains status	1092	FUNCTIONS \ Pwr loss stop f
PL next active	1090	FUNCTIONS \ Pwr loss stop f
PL next factor	1091	FUNCTIONS \ Pwr loss stop f
PL stop acc [rpm/s]	1080	FUNCTIONS \ Pwr loss stop f
PL stop active	1088	FUNCTIONS \ Pwr loss stop f
PL stop dec [rpm/s]	1081	FUNCTIONS \ Pwr loss stop f
PL stop enable	1083	FUNCTIONS \ Pwr loss stop f
PL stop I Gain [%]	1085	FUNCTIONS \ Pwr loss stop f
PL stop P Gain [%]	1086	FUNCTIONS \ Pwr loss stop f
PL stop t limit [%]	1082	FUNCTIONS \ Pwr loss stop f
PL stop vdc ref [V]	1084	FUNCTIONS \ Pwr loss stop f
PL time-out [s]	1087	FUNCTIONS \ Pwr loss stop f
PL time-out ack	1094	FUNCTIONS \ Pwr loss stop f
PL time-out sig	1093	FUNCTIONS \ Pwr loss stop f
Pointer	330	SPEC FUNCTIONS
Positioning spd [rpm]	795	OPTIONS \ PID \ Diameter calc
Prop. filter [ms]	444	SPEED REGULAT.
Pword 1 :	85	CONFIGURATION
QStp delta speed [FF]	37	RAMP \ Quick stop
QStp delta speed [FF]	37	DRIVECOM \ Quick stop
QStp delta time [s]	38	RAMP \ Quick stop
QStp delta time [s]	38	DRIVECOM \ Quick stop
Qstp opt code	713	CONFIGURATION
QStp opt code	713	DRIVECOM \ Quick stop
Quick stop	343	
Ramp -	347	RAMP
Ramp +	346	RAMP
Ramp +/- delay [ms]	20	RAMP
Ramp in = 0	345	RAMP
Ramp out = 0	344	RAMP
Ramp outp (rpm)	113	MONITOR \ Measurements \ Speed \ Speed in rpm
Ramp output (%)	114	MONITOR \ Measurements \ Speed \ Speed in %
Ramp output (d) [FF]	112	MONITOR \ Measurements \ Speed \ Speed in DRC []
Ramp ref (%)	111	MONITOR \ Measurements \ Speed \ Speed in %
Ramp ref (d) [FF]	109	MONITOR \ Measurements \ Speed \ Speed in DRC []
Ramp ref (rpm)	110	MONITOR \ Measurements \ Speed \ Speed in rpm
Ramp ref 1 (%)	47	INPUT VARIABLES \ Ramp ref \ Ramp ref 1
Ramp ref 1 [FF]	44	BASIC MENU
Ramp ref 1 [FF]	44	INPUT VARIABLES \ Ramp ref \ Ramp ref 1
Ramp ref 2 (%)	49	INPUT VARIABLES \ Ramp ref \ Ramp ref 2
Ramp ref 2 [FF]	48	INPUT VARIABLES \ Ramp ref \ Ramp ref 2

Parameter	N.	Position
Ramp sel 0	403	FUNCTIONS \ Multi ramp fct \ Ramp 3 \ Deceleration 3
Ramp sel 1	404	FUNCTIONS \ Multi ramp fct \ Ramp 3 \ Deceleration 3
Ramp shape	18	RAMP
Rated drive curr	334	BASIC MENU \ Drive type
Rated drive curr	334	CONFIGURATION \ Drive type
Real FF PID	418	OPTIONS \ PID
Ref 0 level [FF]	106	SPEED REGULAT \ Spd zero logic
Refresh enc 1	649	CONFIGURATION \ Motor spd fbk
Refresh enc 1	649	I/O CONFIG \ Encoder inputs
Refresh enc 2	652	CONFIGURATION \ Motor spd fbk
Refresh enc 2	652	I/O CONFIG \ Encoder inputs
Regulation mode	321	BASIC MENU
Regulation mode	321	CONFIGURATION
Regulation temp [°C]	1147	MONITOR \ Measurements
Relay 2	629	I/O CONFIG \ Digital outputs
Restart time [ms]	359	CONFIGURATION \ Prog alarms \ Undervoltage
Restart time [ms]	637	CONFIGURATION \ Prog alarms \ Bus loss
Reverse sign	294	RAMP
Rotor resist Nw [Ohm]	682	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Rotor resistance [Ohm]	166	DRIVE PARAMETER \ Motor Parameter
Rotor resistance [Ohm]	166	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
S acc t const [ms]	663	RAMP
S acc t const 0 [ms]	665	FUNCTIONS \ Multi ramp fct \ Ramp 0 \ Acceleration 0
S acc t const 1 [ms]	667	FUNCTIONS \ Multi ramp fct \ Ramp 1 \ Acceleration 1
S acc t const 2 [ms]	669	FUNCTIONS \ Multi ramp fct \ Ramp 2 \ Acceleration 2
S acc t const 3 [ms]	671	FUNCTIONS \ Multi ramp fct \ Ramp 3 \ Acceleration 3
S dec t const [ms]	664	RAMP
S dec t const 0 [ms]	666	FUNCTIONS \ Multi ramp fct \ Ramp 0 \ Deceleration 0
S dec t const 1 [ms]	668	FUNCTIONS \ Multi ramp fct \ Ramp 1 \ Deceleration 1
S dec t const 2 [ms]	670	FUNCTIONS \ Multi ramp fct \ Ramp 2 \ Deceleration 2
S dec t const 3 [ms]	672	FUNCTIONS \ Multi ramp fct \ Ramp 3 \ Deceleration 3
S shape t const [ms]	19	RAMP
Save parameters	256	BASIC MENU
Save parameters	256	SPEC FUNCTIONS
Scale input 1	72	I/O CONFIG \ Analog inputs \ Analog input 1
Scale input 2	77	I/O CONFIG \ Analog inputs \ Analog input 2
Scale input 3	82	I/O CONFIG \ Analog inputs \ Analog input 3
Scale output 1	62	I/O CONFIG \ Analog outputs \ Analog output 1
Scale output 2	63	I/O CONFIG \ Analog outputs \ Analog output 2
Scale output 3	64	I/O CONFIG \ Analog outputs \ Analog output 3
Scale output 4	65	I/O CONFIG \ Analog outputs \ Analog output 4
Sel adap type	182	ADD SPEED FUNCT \ Adap spd reg
Select enc 1	1020	I/O CONFIG \ Encoder inputs
Select enc 2	1021	I/O CONFIG \ Encoder inputs
Select input 1	70	I/O CONFIG \ Analog inputs \ Analog input 1
Select input 2	75	I/O CONFIG \ Analog inputs \ Analog input 2
Select input 3	80	I/O CONFIG \ Analog inputs \ Analog input 3
Select output 1	66	I/O CONFIG \ Analog outputs \ Analog output 1
Select output 2	67	I/O CONFIG \ Analog outputs \ Analog output 2
Select output 3	68	I/O CONFIG \ Analog outputs \ Analog output 3
Select output 4	69	I/O CONFIG \ Analog outputs \ Analog output 4
Self tune state	705	DRIVE PARAMETER \ Motor Parameter \ Self-tuning
Ser answer delay [ms]	408	CONFIGURATION
Set delay [ms]	105	ADD SPEED FUNCT \ Speed control
Set error [FF]	104	ADD SPEED FUNCT \ Speed control
Set speed	394	ADD SPEED FUNCT \ Speed control
Slip comp filt [s]	725	DRIVE PARAMETER \ V/f control \ Slip compens
Slip comp type	722	DRIVE PARAMETER \ V/f control \ Slip compens
Sls speed filter [s]	643	DRIVE PARAMETER \ Sensorless
Software version	331	BASIC MENU \ Drive type
Software version	331	CONFIGURATION \ Drive type
Source	484	SPEC FUNCTIONS \ Links \ Link 1
Source	553	SPEC FUNCTIONS \ Links \ Link 2
Spd 0 trip delay [ms]	627	FUNCTIONS \ Stop control
Spd autocapture [FF]	895	DRIVE PARAMETER \ V/f control \ V/f spd search
Spd draw out (%)	1019	FUNCTIONS \ Speed draw
Spd draw out (d)	1018	FUNCTIONS \ Speed draw

Parameter	N.	Position
Spd srch time [s]	893	DRIVE PARAMETER \ V/f control \ V/f spd search
Spd threshold	393	ADD SPEED FUNCT \ Speed control
Spd threshold - [FF]	102	ADD SPEED FUNCT \ Speed control
Spd threshold + [FF]	101	ADD SPEED FUNCT \ Speed control
Spd=0 P gain [%]	126	SPEED REGULAT \ Spd zero logic
Spd zero thr	395	ADD SPEED FUNCT \ Speed zero
Speed base value [FF]	45	BASIC MENU
Speed base value [FF]	45	CONFIGURATION
Speed base value [FF]	45	DRIVECOM
Speed fbk sel	414	CONFIGURATION \ Motor spd fbk
Speed I [%]	88	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3
Speed I [%]	88	REG PARAMETERS \ Percent values \ Speed regulator
Speed I base[A/rpm×ms]	94	REG PARAMETERS \ Base values \ Speed regulator
Speed I in use [%]	100	REG PARAMETERS \ In use values
Speed I Nw [%]	1033	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3
Speed input perc [%]	46	DRIVECOM
Speed input var [FF]	44	DRIVECOM
Speed limited	372	LIMITS \ Speed limits \ Speed min/max
Speed max amount [FF]	2	LIMITS \ Speed limits \ Speed amount
Speed max amount [FF]	2	DRIVECOM \ Speed amount
Speed max neg [FF]	4	LIMITS \ Speed limits \ Speed min/max
Speed max neg [FF]	4	DRIVECOM \ Speed min/max
Speed max pos [FF]	3	LIMITS \ Speed limits \ Speed min/max
Speed max pos [FF]	3	DRIVECOM \ Speed min/max
Speed min amount [FF]	1	LIMITS \ Speed limits \ Speed amount
Speed min amount [FF]	1	DRIVECOM \ Speed amount
Speed min neg [FF]	6	LIMITS \ Speed limits \ Speed min/max
Speed min neg [FF]	6	DRIVECOM \ Speed min/max
Speed min pos [FF]	5	LIMITS \ Speed limits \ Speed min/max
Speed min pos [FF]	5	DRIVECOM \ Speed min/max
Speed P [%]	87	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3
Speed P [%]	87	REG PARAMETERS \ Percent values \ Speed regulator
Speed P base [A/rpm]	93	REG PARAMETERS \ Base values \ Speed regulator
Speed P in use [%]	99	REG PARAMETERS \ In use values
Speed P Nw [%]	1032	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3
Speed ratio	1017	FUNCTIONS \ Speed draw
Speed ref (%)	117	MONITOR \ Measurements \ Speed \ Speed in %
Speed ref (d) [FF]	115	MONITOR \ Measurements \ Speed \ Speed in DRC []
Speed ref (rpm)	118	MONITOR \ Measurements \ Speed \ Speed in rpm
Speed ref [rpm]	118	SPEED REGULAT.
Speed ref 1 (%)	378	INPUT VARIABLES \ Speed ref \ Speed ref 1
Speed ref 1 [FF]	42	INPUT VARIABLES \ Speed ref \ Speed ref 1
Speed Ref 2 (%)	379	INPUT VARIABLES \ Speed ref \ Speed ref 2
Speed ref 2 [FF]	43	INPUT VARIABLES \ Speed ref \ Speed ref 2
Speed ref var [FF]	115	DRIVECOM
Speed reg output [%]	236	SPEED REGULAT.
Speed sel 0	400	FUNCTIONS \ Multi speed fct
Speed sel 1	401	FUNCTIONS \ Multi speed fct
Speed sel 2	402	FUNCTIONS \ Multi speed fct
Speed up base [ms]	446	SPEED REGULAT \ Speed up
Speed up filter [ms]	447	SPEED REGULAT \ Speed up
Speed up gain [%]	445	SPEED REGULAT \ Speed up
Speed zero delay [ms]	108	ADD SPEED FUNCT \ Speed zero
Speed zero level [FF]	107	ADD SPEED FUNCT \ Speed zero
Start part 1	676	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Start part 2a	678	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Start part 2b	680	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
Start part 3	1027	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3
Start/Stop	315	BASIC MENU
Start/Stop	315	MONITOR
Stator resist [Ohm]	436	DRIVE PARAMETER \ Motor Parameter
Stator resist [Ohm]	436	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Stator resist Nw [Ohm]	683	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Status word	56	DRIVECOM
Stop mode	626	FUNCTIONS \ Stop control
Switching freq	240	CONFIGURATION

Parameter	N.	Position
T curr (%)	927	MONITOR \ Measurements
T curr filter [s]	926	MONITOR \ Measurements
T curr lim type	715	LIMITS \ Current limits
T current lim - [%]	9	BASIC MENU
T current lim - [%]	9	LIMITS \ Current limits
T current lim [%]	7	LIMITS \ Current limits
T current lim + [%]	8	BASIC MENU
T current lim + [%]	8	LIMITS \ Current limits
T current ref [%]	41	MONITOR \ Measurements
T current ref 1 [%]	39	INPUT VARIABLES \ T current ref
T current ref 2 [%]	40	INPUT VARIABLES \ T current ref
Take motor par	694	DRIVE PARAMETER \ Mot plate data
Take val part 1	677	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Take val part 2a	679	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Take val part 2b	681	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
Take val part 3	1028	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3
Test T curr lim [%]	1048	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 3
Threshold delay [ms]	103	ADD SPEED FUNCT \ Speed control
Torque [%]	230	MONITOR \ Measurements
Torque const [N*m/A]	1013	SPEED REGULAT \ Inertia/loss cp
Torque current	350	CURRENT REGULAT
Torque reduct	342	LIMITS \ Current limits
Trip time 50% [s]	657	FUNCTIONS \ Overload contr \ Ovld mot contr
Tune value inp 1	73	I/O CONFIG \ Analog inputs \ Analog input 1
Tune value inp 2	78	I/O CONFIG \ Analog inputs \ Analog input 2
Tune value inp 3	83	I/O CONFIG \ Analog inputs \ Analog input 3
V/f flux level [%]	900	DRIVE PARAMETER \ V/f control \ Energy save
V/f shape	712	DRIVE PARAMETER \ V/f control
Virt dig in 0	1107	OPTIONS \ Option 1\ PDC config \ Virt dig in
Virt dig in 1	1108	OPTIONS \ Option 1\ PDC config \ Virt dig in
Virt dig in 10	1117	OPTIONS \ Option 1\ PDC config \ Virt dig in
Virt dig in 11	1118	OPTIONS \ Option 1\ PDC config \ Virt dig in
Virt dig in 12	1119	OPTIONS \ Option 1\ PDC config \ Virt dig in
Virt dig in 13	1120	OPTIONS \ Option 1\ PDC config \ Virt dig in
Virt dig in 14	1121	OPTIONS \ Option 1\ PDC config \ Virt dig in
Virt dig in 15	1122	OPTIONS \ Option 1\ PDC config \ Virt dig in
Virt dig in 2	1109	OPTIONS \ Option 1\ PDC config \ Virt dig in
Virt dig in 3	1110	OPTIONS \ Option 1\ PDC config \ Virt dig in
Virt dig in 4	1111	OPTIONS \ Option 1\ PDC config \ Virt dig in
Virt dig in 5	1112	OPTIONS \ Option 1\ PDC config \ Virt dig in
Virt dig in 6	1113	OPTIONS \ Option 1\ PDC config \ Virt dig in
Virt dig in 7	1114	OPTIONS \ Option 1\ PDC config \ Virt dig in
Virt dig in 8	1115	OPTIONS \ Option 1\ PDC config \ Virt dig in
Virt dig in 9	1116	OPTIONS \ Option 1\ PDC config \ Virt dig in
Virt dig out 0	1123	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virt dig out 1	1124	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virt dig out 10	1133	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virt dig out 11	1134	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virt dig out 12	1135	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virt dig out 13	1136	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virt dig out 14	1137	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virt dig out 15	1138	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virt dig out 2	1125	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virt dig out 3	1126	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virt dig out 4	1127	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virt dig out 5	1128	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virt dig out 6	1129	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virt dig out 7	1130	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virt dig out 8	1131	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virt dig out 9	1132	OPTIONS \ Option 1\ PDC config \ Virt dig out
Virtual dig inp	582	MONITOR \ I/O
Virtual dig out	583	MONITOR \ I/O
Vlt boost type	709	DRIVE PARAMETER \ V/f control \ Voltage boost
Volt comp lim Nw [V]	685	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Voltage comp lim [V]	644	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 1
Voltage comp lim [V]	644	REG PARAMETERS \ Percent values \ Current reg\Dead time comp

Parameter	N.	Position
Voltage I [%]	902	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Voltage I [%]	902	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
Voltage I [%]	902	REG PARAMETERS \ Percent values \ Voltage reg
Voltage I base [Vs/V x s]	903	REG PARAMETERS \ Base values \ Voltage reg
Voltage I Nw [%]	909	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Voltage I Nw [%]	909	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
Voltage P [%]	1022	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Voltage P [%]	1022	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
Voltage P [%]	1022	REG PARAMETERS \ Percent values \ Voltage reg
Voltage P base [Vs/V]	1023	REG PARAMETERS \ Base values \ Voltage reg
Voltage P Nw [%]	1024	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Self-tune 2a
Voltage P Nw [%]	1024	DRIVE PARAMETER \ Motor Parameter \ Self-tuning \ Sel-tune 2b
Zero pos gain [%]	892	SPEED REGULAT \ Spd zero logic
Zero torque	353	CURRENT REGULAT

10.4. List of High Priority Parameters

When a 6KCV300DGF is used a subset of the AV-300i parameters can be exchanged with the optional card through the automatic synchronous communication. For more details see the 6KCV300DGF Technical documentation.

Parameter	N.	Format	Value			Read/ Write
			min	max	Default	
T current lim + [CURR]	8	U16	0	F	S	R/W
T current lim - [CURR]	9	U16	0	F	S	R/W
In use Tcur lim+ [CURR]	10	U16	0	F	-	R
In use Tcur lim- [CURR]	11	U16	0	F	-	R
current lim red [CURR]	13	U16	0	F	F	R/W
T current ref 1 [CURR]	39	I16	F	F	0	R/W
T current ref 2 [CURR]	40	I16	F	F	0	R/W
T current ref [CUR+A11R]	41	I16	F	F	-	R
Speed ref 1 [spd]	42	I16	-32768	32767	0	R/W
Speed ref 2 [spd]	43	I16	-32768	32767	0	R/W
Ramp ref 1 [spd]	44	I16	-32768	32767	0	R/W
Ramp ref 2 [spd]	48	I16	-32768	32767	0	R/W
Control word	55	U16	0	65535	0	R/W
Status word	56	U16	0	65535	-	R
Ramp ref [spd]	110	I16	-32768	32767	-	R
Ramp outp [spd]	113	I16	-32768	32767	-	R
Speed ref [spd]	118	I16	-32768	32767	-	R
Actual spd [[spd]	122	I16	-8192	8192	-	R
Adap reference [spd]	183	I16	-32768	32767	4000	R/W
Enc 1 position [enc_pls]	197	I16	-32768	32767	-	R
Enc 2 position [enc_pls]	198	I16	-32768	32767	-	R
Enc 1 last time [enc_tim]	204	U32	0	232-1	-	R
Enc 1 last time high [enc_tim]	205	U16	0	65535	-	R
Enc 2 last time [enc_tim]	206	U32	0	232-1	-	R
Enc 2 last time high [enc_tim]	207	U16	0	65535	-	R
Speed reg output	236	I16	—	—	-	R
Lock speed reg	322	U16	0	1	0	R/W
Enc 2 speed [spd]	420	I16	-32768	32767	-	R
Enc 1 speed [spd]	427	I16	-32768	32767	-	R
Flux level	467	U16	1638	16384	16384	R/W
Flux reference	500	Float	0	16384	16384	R
Pad 0	503	I16	-32768	32767	0	R/W
Pad 1	504	I16	-32768	32767	0	R/W
Pad 2	505	I16	-32768	32767	0	R/W
Pad 3	506	I16	-32768	32767	0	R/W
Pad 4	507	I16	-32768	32767	0	R/W
Pad 5	508	I16	-32768	32767	0	R/W
Pad 6	509	I16	-32768	32767	0	R/W
Pad 7	510	I16	-32768	32767	0	R/W
Pad 8	511	I16	-32768	32767	0	R/W
Pad 9	512	I16	-32768	32767	0	R/W
Pad 10	513	I16	-32768	32767	0	R/W

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Parameter	N.	Format	Value			Read/ Write
			min	max	Default	
Pad 11	514	I16	-32768	32767	0	R/W
Pad 12	515	I16	-32768	32767	0	R/W
Pad 13	516	I16	-32768	32767	0	R/W
Pad 14	517	I16	-32768	32767	0	R/W
Pad 15	518	I16	-32768	32767	0	R/W
Bitword pad A	519	U16	0	65535	0	R/W
Bitword pad B	536	U16	0	65535	0	R/W
Dig input term	564	U16	0	65535	-	R
Dig output term	581	U16	0	65535	-	R
Load comp [CURR]	698	I16	F	F	-	R
V/f flux level	900	U16	0	16384	16384	R/W
Ind store ctrl	912	U16	0	65535	0	R/W
Index storing	913	U16	0	$+2^{32}-1$	-	R
Out vlt level	921	Float	0	16384	16384	R/W
F act speed (rpm) [spd]	924	I16	-32768	32767	-	R
F act speed (d) [spd]	925	I16	-32768	32767	-	R
T curr % [CURR]	927	I16	F	F	-	R
F T curr % [CURR]	928	I16	F	F	-	R
Speed ratio	1017	I16	0	+32767	10000	R/W
Spd draw out (d)	1018	I16	-32767	+32767	-	R
PL next factor	1091	I16	0	+32768	10000	R

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Notes!

1) Speed settings are expressed in **[SPD]**: 1 SPD = 0.25 rpm
2) Current settings are expressed in **[CURR]** : 1 CURR = **[Current norm** / $(2^{15}\cdot\sqrt{2})$] ARMS

   - **Current norm**: (parameter no 267, format: floating, access code R (read only), not available via key pad), depends on drive sizes

   - **Flt 100 mf** (parameter no. 303, format: integer 16 bits, access code R (read only), not available via keypad): expressed in [CURR]. Setting **T current lim...** [CURR] equal to **Flt 100mf** implies the setting **Motor current** [ARMS] =FLC
3) Encoder positions are expressed in **[ENC_PLS]**: 1 ENC_PLS = 0.25 pulses
4) Encoders last time[s] are expressed in 50 ns units (1 = 50 ns) **[ENC_TIM]**.
5) Speed reg Output [%] contains valid information even if the speed regulator is disabled **(Enable Speed reg** = Disabled). If Speed Output is enabled, it contains the sum of actual speed regulator output and **T current ref 2**.

Drive Size	Rated drive curr [334]	Curr norm AMPS [267]
3002	3.8	16.3
3003	4.5	19.2
3005	7.0	29.7
3007	10.8	45.5
3010	13.8	57.9
3015	18.7	78.9
3020	24.2	102.7
3025	30.0	118.6
3030	36.0	150.8
3040	46.0	211.0
3050	58.0	243.0
3060	69.0	303.0
3075	86.0	350.8
3100	109.0	466.20
3125	137.0	606.06
3150	158.0	666.66
3200		

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10.5. Load Motor Parameter

Standard for 575V										
Description	**No.**	**3002**	**3003**	**3005**	**3007**	**3010**	**3015**	**3020**	**3025**	**3030**
Nominal Voltage	**161**	575	575	575	575	575	575	575	575	575
Nominal speed	**162**	1750	1760	1750	1760	1760	1765	1765	1770	1780
Nom. frequency	**163**	60	60	60	60	60	60	60	60	60
Nominal current	**164**	2	3.2	5.2	7.8	10	14.8	19	23.9	29
Magn. current	**165**	0.91	1.6	2.6	3.9	4.57	6.98	8.12	6.81	7.96
Rotor resistance	**166**	4.6108	2.3054	1.7734	0.9458	0.7377	0.4362	0.3397	0.2315	0.1272
Cos phi	**371**	0.83	0.8	0.8	0.8	0.83	0.82	0.85	0.84	0.84
Stator resist	**436**	4.6108	2.3054	1.7734	0.9458	0.7377	0.4362	0.3397	0.2315	0.1272
Lkg inductance	**437**	0.08947	0.06115	0.03763	0.02509	0.01789	0.01247	0.00879	0.01048	0.00833
Speed P	**87**	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00	10.00
Speed I	**88**	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00	1.00
Current P	**89**	4.94	5.19	5.00	4.44	4.70	7.07	6.83	6.83	5.93
Current I	**90**	1.26	1.28	0.92	0.74	0.78	0.60	0.60	0.68	0.48
Flux P	**91**	3.44	3.38	4.71	5.89	5.57	7.18	7.18	6.38	9.11
Flux I	**92**	2.12	2.15	2.37	1.92	2.13	1.52	1.36	1.46	1.56
Base voltage	**167**	575	575	575	575	575	575	575	575	575
Base frequency	**168**	60	60	60	60	60	60	60	60	60
Description	**No.**	**3040**	**3050**	**3060**	**3075**	**3100**	**3125**	**3150**	**3200**	
Nominal Voltage	**161**	575	575	575	575	575	575	575		
Nominal speed	**162**	1775	1775	1780	1780	1780	1780	1780		
Nom. frequency	**163**	60	60	60	60	60	60	60		
Nominal current	**164**	37	46	55	67.4	87.0	113.0	134.0		
Magn. current	**165**	10.15	12.13	15.09	17.77	23.87	29.79	33.85		
Rotor resistance	**166**	0.1246	0.1002	0.0671	0.0547	0.0424	0.0326	0.0275		
Cos phi	**371**	0.85	0.87	0.86	0.87	0.86	0.87	0.88		
Stator resist	**436**	0.1246	0.1002	0.0671	0.0547	0.0424	0.0326	0.0275		
Lkg inductance	**437**	0.00653	0.00505	0.00439	0.00344	0.00278	0.00205	0.00166		
Speed P	**87**	10.00	10.00	10.00	10.00	10.00	10.00	10.00		
Speed I	**88**	1.00	1.00	1.00	1.00	1.00	1.00	1.00		
Current P	**89**	6.30	6.40	7.07	5.81	6.00	6.00	5.00		
Current I	**90**	0.43	0.46	0.42	0.27	0.3	0.2	0.2		
Flux P	**91**	10.01	9.46	10.28	16.28	17.00	23.00	24.00		
Flux I	**92**	1.47	1.23	1.12	1.48	1.4	1.4	1.4		
Base voltage	**167**	575	575	575	575	575	575	575		
Base frequency	**168**	60	60	60	60	60	60	60		

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