

Brushless Servodrive



ARTDriveS-EV

XVy-EV

■ ■ ■ ■ Start up guide
Specification and installation

Thank you for choosing this Gefran-Siei product.

We will be glad to receive any possible information which could help us improving this manual. The e-mail address is the following: techdoc@siei.it.

Before using the product, read the safety instruction section carefully.)

Keep the manual in a safe place and available to engineering and installation personnel during the product functioning period. Gefran Spa has the right to modify products, data and dimensions without notice.

The data can only be used for the product description and they can not be understood as legally stated properties.

All rights reserved.

This manual is updated according to software version 4.0.

Note!

Refer to the "Drive programming with MDPlc" (inside the XVy tools cd-rom) to use the drive with the Plc function in the dedicated MDPlc development environment.

The identification number of the software version can be read on the inverter nameplate or on the label on the FLASH memories mounted on the regulation card.

Tables of Contents

Safety Symbol Legend - Precautions de sécurité	8
Chapter 0 - Safety Precautions	9
Chapter 1 - Functions and General Features	15
1.1 Motors and Encoders	17
1.1.1 Motors	17
Chapter 2 - Inspection Procedures, Components Identification and Standard Specifications	18
2.1 Delivery Inspection Procedures	18
2.1.1 General	18
2.1.2 Drive type designation	19
2.1.3 Nameplate	20
Figure 2.1.3.1: Identification nameplate	20
Figure 2.1.3.2: Firmware & Card revision level nameplate	20
Figure 2.1.3.3: Nameplates position	20
2.2 Component identification	21
Figure 2.2.1: Basic Setup of drive	21
Figure 2.2.2: Drive view & components	22
2.3 Standard specifications	23
2.3.1 Permissible environmental conditions	23
Disposal of the Device	24
2.3.2 AC Input/Output Connection	24
Table 2.3.2.1: Input / Output Specifications	25
2.3.3 Rated and overload currents	26
I x T Algorithm	27
Table 2.3.3.1: Rated and overload currents with I x T algorithm	27
I ² T Algorithm	30
Table 2.3.3.2: Rated and overload currents with I ² x T algorithm	30
Chapter 3 - Installation Guidelines	34
3.1 Mechanical Specification	34
Figure 3.1.1: Drive Dimensions, XVy-EV 10306 ... XVy-EV 32550 sizes	34
Figure 3.1.2: Drive dimensions, XVy-EV 43570 ... XVy-EV 8280400 sizes	35
Figure 3.1.3: Drive dimensions, C and CP sizes	36
Figure 3.1.4: Drive dimensions, C and CP -IP00 sizes	36
Figure 3.1.5: Drive dimensions, XVy-EV 9470670-DC-IP00 and XVy-EV 9560800-DC-IP00 sizes	37
3.2 Watts Loss, Heat Dissipation, Internal Fans and Minimum Cabinet Opening Suggested for the Cooling	38
Table 3.2.1: Heat dissipation and Required Air Flow	38
Table 3.2.2: Minimum cabinet opening suggested for the cooling	38
3.2.1 Cooling Fans Power Supply	39
Figure 3.2.1: UL type fans connections	39
Figure 3.2.2: Example for external connection	39
3.3 Installation Mounting Clearance	40
Figure 3.3.1: Max. Angle of Inclination	40
Figure 3.3.2: Mounting Clearance	40
Chapter 4 - Wiring Procedure	41
4.1 Accessing the Connectors (IP20 models)	41
4.1.1 Removing the Covers	41
Figure 4.1.1: Removing the covers (XVy-EV 10306 to XVy-EV 32550 sizes)	41
Figure 4.1.2: Removing the covers (XVy-EV 43570 to XVy-EV 9560650 sizes)	42
4.1.2. Wiring Suggestion	42
4.2 Power Section	43
4.2.1 Terminal Assignment on Power Section / Cable Cross-Section	43
Table 4.2.1.1: Power Section Terminals from XVy-EV 10306 to XVy-EV 32550	43
Table 4.2.1.2: Power Section Terminals from XVy-EV 43570 to XVy-EV 9560650	44

Table 4.2.1.3: Power Section Terminals XVy-EV ...-IP00 sizes	44
Table 4.2.1.4: Maximum cable cross section for power terminals	45
4.3 Regulation Section	46
4.3.1 R-XVy-EV Regulation Card	46
Figure 4.3.1: Connectors Location	47
Table 4.3.1.1: Jumpers on Regulation Card	47
4.3.2 Terminal Assignments on Regulation Section	48
Table 4.3.2.1: Plug-in Terminal Strip Assignments on Regulation Card	48
Table 4.3.2.2: Maximum permissible cable cross-section on the plug-in terminals of the regulator section	49
Table 4.3.2.3: Maximum Control Cable Lengths	49
Figure 4.3.2.1: Potentials of the control section	50
4.4 Feedback Devices	51
Table 4.4.1: Feedback devices	51
4.4.1 XE Connector Assignments	52
Table 4.4.1.1: XE Connector Assignments	52
4.4.2 XER Encoder Connector Assignments (for auxiliary encoders)	52
Table 4.4.2.1: XER Connector Assignments	52
4.4.3 Feedback /Drive Connections	53
Table 4.4.3.1: Resolver/Encoder jumpers settings	53
4.3.3.1 Resolver Connections (RES)	53
4.4.3.2 Sinusoidal Encoder SinCos Connections (SESC)	53
4.4.3.3 Digital Encoder with Hall Effect Sensors Connections (DEHS)	54
4.4.3.4 Absolute Encoder Connections (SSI / EnDat /Hiperface protocols)	55
4.4.3.5 Encoder /Resolver Specifications (XE connector)	55
4.4.3.6 Encoder Simulation / Repetition, Auxiliary Encoder Input (XER/EXP Connector)	56
4.4.4 Encoder Cable Length	57
4.4.5 Checking Encoder / Drive Connections	58
4.5 CANopen Connection	59
4.6 Fast Link Connections	60
Figure 4.6.1: XFL-OUT Connector (FAST LINK Output)	60
Figure 4.6.2: XFL-IN Connector (FAST LINK Input)	60
4.6.1 Fast Link Data	60
4.7 Serial Interface	61
4.7.1 Serial Interface Description	61
Figure 4.7.1: RS485 Serial Interface	61
4.7.2 RS 485 Serial Interface Connector Description	62
Table 4.7.2.1: Assignment of the plug XS connector for the RS 485 serial interface	62
4.8 Standard Connection Diagram	63
4.8.1 ARTDriveS Connections	63
Figure 4.8.1.1: Typical connection	63
Figure 4.8.1.2: Typical connection diagram for XVy-EV ...-DC versions.	64
4.8.2 Parallel Connection on the AC (Input) and DC (Intermediate Circuit) Side of Several Drives	65
Figure 4.8.2.1: Parallel Connection on the AC and DC Side of Several Drives	65
4.9 Circuit Protection	66
4.9.1 External Fuses for the Power Section	66
Table 4.9.1.1: External Fuse Types for AC input side	66
4.9.2 External Fuses for the Power Section DC Input Side	67
Table 4.9.2.1: External fuses type for DC input side	67
4.9.3 Internal Fuses	68
Table 4.9.3.1: Internal fuses	68
4.10 Chokes / Filters	68
Figure 4.10.1: Input/output choke dimensions	68
4.10.1 AC Input Chokes	69
Table 4.10.1.1: 3-Phase AC Input Chokes	69
4.10.2 Output Chokes	69
Table 4.10.2.1: Recommended values for output chokes	70
4.10.3 Interference Suppression Filters	71
Table 4.10.3.1: Recommended EMI filters	71
Figure 4.10.3.1: Filter dimension	72

4.11 Braking Units	73
<i>Figure 4.11.1: Operation with Braking Unit (Principle)</i>	73
4.11.1 Internal Braking Unit	73
<i>Table 4.11.1.1: Technical data of the internal braking units</i>	74
4.11.2 Internal and External Braking Resistors	74
<i>Figure 4.11.2.1: Connection with internal Braking Unit and external braking resistor</i>	74
<i>Table 4.11.2.1: Lists and technical data of the external standard resistors</i>	75
<i>Figure 4.11.2.2: External resistors</i>	75
<i>Figure 4.11.2.3: Limit operating braking cycle with typical triangular power profile</i>	76
<i>Figure 4.11.2.4: Braking cycle with TBR / TC = 20%</i>	76
<i>Figure 4.11.2.5: Generic braking cycle with triangular profile</i>	77
4.11.3 Control of the External Braking Power	78
4.11.4 External Resistance Interaction with the System Parameters	78
4.11.5 Choice of the Thermal Relay for Brake Resistor	78
4.12 Buffering the Regulator Supply	80
<i>Table 4.12.1: DC Link Buffer Time</i>	80
<i>Figure 4.12.1: Buffering the Regulator Supply by Means of Additional Intermediate Circuit Capacitors</i>	81
4.13 Discharge Time of the DC-Link	82
<i>Table 4.13.1: DC Link Discharge Time</i>	82
Chapter 5 - Sizing Criteria	83
5.1 Motor Check	84
5.2 Check of the Drive Size	85
5.3 Application Example: Flying Cut	86
Chapter 6 - Maintenance	88
6.1 Care	88
6.2 Service	88
6.3 Repairs	88
6.4 Customer Service	88
Chapter 7 - Settings and Commissioning	89
7.1 PC Configurator	89
7.2 Commissioning	89
7.2.1 Connection with the PC	89
7.2.2 Essential Parameters Set up	91
7.2.3 Speed Mode Configuration Example	92
7.2.4 Position Mode Configuration Example	93
7.2.5 Electrical Line Shaft Mode Configuration Example	94
7.3 Download Firmware	95
7.4 Automatic Electric Phasing Procedure for Encoder/Resolver	96
Chapter 8 - Keypad Operation	99
8.1 Keypad Description	99
8.1.1 LED	99
8.1.2 Function Keys	100
8.1.3 Display - Using keypad	101
<i>Figure 8.1.3.1: Navigation within the menus</i>	101
8.2 Keypad operations	102
8.2.1 Errors	104
<i>Table 8.2.1.1: Errors list</i>	104
8.3 Alarms and Errors Handling	105
8.3.1 Alarms (Failure register)	105
<i>Figure 8.3.1: Led Status and Keypad</i>	105
<i>Table 8.3.1.1: Alarms list</i>	105
8.3.2 Alarm description	106
Chapter 9 - Block Diagrams	109

Chapter 10 - Parameters and Functions	113
10.1 Parameters menu	113
10.2 Legend	115
10.3 Parameters Description and Functions	116
MONITOR	116
SAVE / LOAD PAR	117
DRIVE CONFIG	118
MOTOR DATA	120
ENCODER PARAM	121
RAMP	123
SPEED	124
SPD / POS GAIN	125
TORQUE	126
CURRENT GAINS	127
FLUX	128
DIGITAL INPUTS	128
DIGITAL OUTPUTS	136
ANALOG INPUTS	141
ANALOG OUTPUTS	143
ENC REPETITION	145
JOG FUNCTION	146
MULTISPEED	147
MULTIRAMP	148
SPEED DRAW	149
MOTOR POT	149
BRAKE CONTROL	151
POWERLOSS	152
POSITION	154
EL LINE SHAFT	176
BRAKING RES	180
ALARMS	180
FIELDBUS	183
TUNING	195
KEYPAD PSW	197
SERVICE	199
Chapter 11 - Parameters Index	206
IPA	206
Chapter 12 - Motor Cables	217
Figure 12.1: Cable SBM Motor Series / Sinusoidal Encoder	217
Figure 12.2: Cable SBM Motor Series / Digital Encoder + Hall Sensors	218
Figure 12.3: Cable SBM Motor Series / Absolute Encoder with SSi - EnDat Protocol	219
Figure 12.4: Cable SBM Motor Series / Resolver	220
Figure 12.5: Cable SHJ Motor Series / Sinusoidal Encoder	221
Figure 12.6: Cable SHJ Motor Series / Digital Encoder + Hall Sensors	222
Figure 12.7: Cable SHJ Motor Series / Resolver	223
Figure 12.8: SBM 5-7 Motor Series Power Cable	224
Figure 12.9: SBM 5-7 Motor Series Power + Brake Cable	225
Figure 12.10: SHJ Motor Series Power Cable	226
Figure 12.11: SHJ Motor Series Brake Cable	227

Chapter 13 - EMC Directive	228
Appendix - Field bus and serial interface	229
1.0 Integrated CANopen Interface	229
1.1 CANopen Functions	229
1.1.1 Pre-defined Master/Slave Connection	229
1.1.2 NMT Services (Network Management)	229
1.1.3 Initialization	230
1.1.4 Communication Object	230
<i>Table 1.4.1: Communication Objects</i>	<i>230</i>
1.1.5 Object Dictionary Elements	231
<i>Table 1.5.1: Objects used by the CANopen communication profile</i>	<i>231</i>
1.1.6 Rx PDO Entries	231
1.1.7 Tx PDO Entries	232
1.1.8 SDO Entries	232
1.1.9 COB-ID SYNC Entries	232
1.1.10 COB-ID Emergency	233
1.2 CANopen Management	233
1.3 Process Data Channel Control	234
1.3.1 PDC Input Configuration (FB XXX MS Parameter)	235
1.3.2 PDC Output Configuration (FB XXX SM Parameter)	236
1.3.3 Use of the PDC in MDPLc Applications	236
1.4 SDO Management	236
1.5 Alarms	238
2.0 Modbus	239
2.1 Modbus Functions	239
2.2 Error Management	239
2.2.1 Exception codes	239
2.3 System Configuration	240
2.4 Appendix - Register and Coil Modbus Tables	240
2.5 Modbus example	240
<i>03 Read Output register :</i>	<i>240</i>
<i>06 Preset single register :</i>	<i>241</i>
<i>16 Preset multiple registers :</i>	<i>242</i>
3.0 DeviceNet Interface (XVy-DN)	243
3.1 DeviceNet General Description	243
3.2 Connection	243
3.3 Leds	243
<i>Table 3.3.1: AL-OP leds status codification</i>	<i>243</i>
3.4 Interface	244
3.5 DeviceNet Function	244
3.6 Object description	244
3.6.1 Object Model	245
3.6.2 How Objects Affect Behavior	245
3.6.3 Defining Object Interface	245
3.7 Data transfert via Explicit Messaging	246
3.7.1 Drive Parameter Access	246
3.7.1.1 Class Code	246
3.7.1.2 Class attributes	246
3.7.1.3 Instance Attributes	246
3.7.1.4 Common Services	246
3.7.1.5 Object Specific Services	246

3.7.1.6 Behavior	246
3.7.2 Drive Parameter Access	247
3.7.2.1 Class Code	247
3.7.2.2 Class attributes	247
3.7.2.3 Instance Attributes	247
3.7.2.4 Common Services	247
3.7.2.5 Object Specific Services	248
3.7.2.6 Behavior	248
Table 3.7.1: Error codes for the parameter access	251
Table 3.7.2: Parameter format	251
3.8 Polling Function	252
3.9 XVy-DN Interface configuration	252
3.9.1 Fieldbus Menu	252
3.9.2 Error Codes	252
3.10 Alarms	253
3.10.1 XVy-DN Alarms	253
3.10.2 Drive alarm handling	253
3.10.3 Alarm reset	253
3.11 Process Data Channel Control	253
3.11.1 PDC Input Configuration (SYS_FB_XXX_MS parameter)	254
3.11.2 PDC Output Configuration (SYS_FB_XXX_SM Parameter)	254
3.11.3 Configuration of the Virtual Digital I/Os	254
3.11.4 Use of the PDC in MDPlc Applications	254

Safety Symbol Legend - Precautions de sécurité



Indicates a procedure, condition, or statement that, if not strictly observed, could result in personal injury or death.

Indique le mode d'utilisation, la procédure et la condition d'exploitation. Si ces consignes ne sont pas strictement respectées, il y a des risques de blessures corporelles ou de mort.



Indicates a procedure, condition, or statement that, if not strictly observed, could result in damage to or destruction of equipment.

Indique et le mode d'utilisation, la procédure et la condition d'exploitation. Si ces consignes ne sont pas strictement respectées, il y a des risques de détérioration ou de destruction des appareils



Indicates a procedure, condition, or statement that should be strictly followed in order to optimize these applications.

Indique le mode d'utilisation, la procédure et la condition d'exploitation. Ces consignes doivent être rigoureusement respectées pour optimiser ces applications..

NOTE!

Indicates an essential or important procedure, condition, or statement.

Indique un mode d'utilisation, de procédure et de condition d'exploitation essentiels ou importants

Chapter 0 - Safety Precautions

According to the EEC standards the ARTDriveS 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, as far as the machine industry is concerned. These standards do not apply in the Americas, but may need to be considered in equipment being shipped to Europe.

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.

Selon les normes EEC, les drives ARTDriveS et leurs accessoires doivent être employés seulement après avoir vérifié que la machine ait été produite avec les mêmes 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 opérationnelles ne doivent être dépassés ou modifiés.



Electrical Shock and Burn Hazard:

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.

Décharge Électrique et Risque de Brûlure :

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

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

Fire and Explosion Hazard:

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.

Risque d'incendies et d'explosions:

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



Warning

Strain Hazard:

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

Attention à l'Élévation:

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

Drives and motors must be ground connected according to the NEC.

Tous les moteurs et les drives doivent être mis à la terre selon le Code Electrique National ou équivalent.

Replace all covers before applying power to the Drive. Failure to do so may result in death or serious injury.

Remettre tous les capots avant de mettre sous tension le drive. Des erreurs peuvent provoquer de sérieux accidents ou même la mort.

Adjustable frequency drives are electrical apparatus for use in industrial installations. Parts of the Drives are energized 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.

Drive is not equipped with motor overspeed protection logic other than that controlled by software. Follow the instructions given in this manual and observe the local and national safety regulations applicable.

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 exécuté uniquement par du personel qualifié. De mauvaises installations de moteurs ou de drives peuvent provoquer des dommages materiels ou blesser des personnes. On doit suivre les instructions données dans ce manuel et observer les règles nationales de sécurité.

Always connect the Drive to the protective ground (PE) via the marked connection terminals (PE2) and the housing (PE1). Brushless 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.

Il faut toujours connecter le variateur à la terre (PE) par les des bornes (PE2) et le châssis (PE1). Le courant de dispersion vers la terre est supérieur à 3,5 mA sur les variateurs Brushless et sur les filtres à courant alterné (CA). Les normes EN 50178 spécifient qu'en cas de courant de dispersion vers la terre, supérieur à 3,5 ma, la mise à la terre (PE1) doit avoir une double connexion pour la redondance.

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.

En cas de panne, le variateur peut causer une mise en marche accidentelle, même s'il est désactivé, sauf s'il a été débranché de l'alimentateur à courant alterné.

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 inside the device is listed in section 4.10 on Instruction manual .

Ne jamais ouvrir l'appareil lorsqu'il est sous 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 4.10.

If the front plate has to be removed because of ambient temperature higher than 40 degrees, the user has to ensure that no occasional contact with live parts may occur.

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.



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.

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.

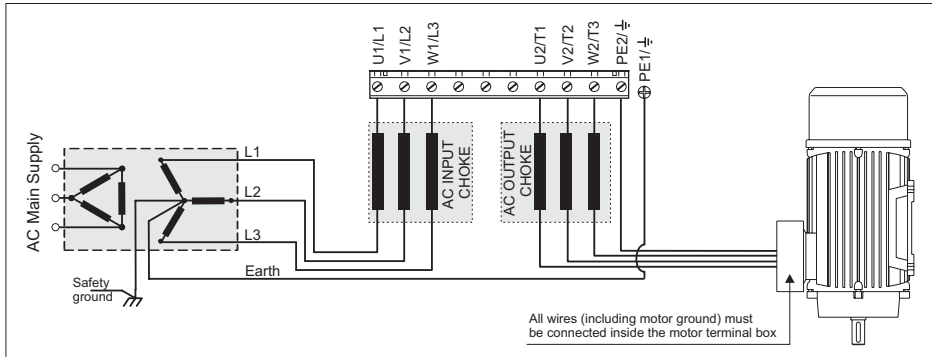
Power supply and grounding

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 wye / delta transformer is avoided.

- 1 Gefran-Siei 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.

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.



Ne pas faire fonctionner le drive sans prise de terre. Le châssis du moteur doit être mis à la terre à l'aide d'un connecteur de terre séparé des autres pour éviter le couplage des perturbations. Le connecteur de terre devrait être dimensionné selon la norme NEC ou le Canadian Electrical code.



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.

Le raccordement devrait être fait par un connecteur certifié et mentionné à boucle fermée par les normes CSA et UL et dimensionné pour l'épaisseur du câble correspondant. Le connecteur doit être fixé à l'aide d'un instrument de serrage spécifié par le producteur du connecteur.

Do not perform a megger test between the Drive terminals or on the control circuit terminals.

Ne pas exécuter un test megger entre les bornes du drive ou entre les bornes du circuit de contrôle.

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.

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 où la température permise est dépassée. Laisser le capot de ventilation en place pour températures de 104°F (40°C) ou inférieures.

If the Drive's Fault Alarm is activated, consult the TROUBLE-SHOOTING section of this instruction book, and after correcting the problem, resume operation. Do not reset the alarm automatically by external sequence, etc.

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 réinitialiser l'alarme automatiquement par une séquence externe, etc

Be sure to remove the desiccant 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).

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).

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).

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°).



Do not touch or damage any components when handling the device. The changing of the isolation gaps or the removing of the isolation and covers is not permissible.

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.

Protect the device from impermissible environmental conditions (temperature, humidity, shock etc.)

Protéger l'appareil contre des effets extérieurs non permis (température, humidité, chocs etc.).

No voltage should be connected to the output of the drive (terminals U2, V2 W2). The parallel connection of several drives via the outputs and the direct connection of the inputs and outputs (bypass) are not permissible.

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).

A capacitive load (e.g. Var compensation capacitors) should not be connected to the output of the drive (terminals U2, V2, W2).

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).



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.

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

No dielectric tests should be carried out on parts of the drive. A suitable measuring instrument (internal resistance of at least 10 k Ω /V) should be used for measuring the signal voltages.

Il ne faut pas exécuter 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 k Ω /V).

NOTE!

If the Drives have been stored for longer than two years, the operation of the DC link capacitors may be impaired and must be “reformed”. 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 drive).

En cas de stockage des variateurs pendant plus de trois ans, il est conseillé de contrôler l'état des condensateurs CC avant d'en effectuer le branchement. Avant la mise en service des appareils, ayant été stockés pendant longtemps, il faut alimenter variateurs à vide pendant deux heures, pour régénérer les condensateurs : appliquer une tension d'alimentation sans actionner le variateur .

NOTE!

The terms “Inverter”, “Controller” and “Drive” are sometimes used interchangeably 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”.

Chapter 1 - Functions and General Features

ARTDriveS represents a new concept in motion control technology; this very fast servodrive based on the DSP (digital signal processor) VECON™ is aimed at providing real-time control of servosystems and it is integrated with versatile and innovative power hardware.

ARTDriveS is an IGBT servodrive particularly suitable for high bandwidth applications with brushless servomotors. Thanks to the innovative software installed on the flash eprom, it can be considered as a combination of a digital drive and a PLC using a special software tool called E@syDrives.

ARTDriveS features full-digital regulation with a 16KHz cycle, a 5KHz current loop bandwidth, a position loop with zero tracking failure, an analog interface, some dedicated digital interface and I/O expansion.

The drive position loop, (PI type) is based on two symmetrical register circuits, which store the desired and the actual information. The PID speed loop (a position loop derivative) and the PID2 acceleration control (a second position loop derivative) are added to increase the accuracy of the controlled axes, both in a feedback and in a feedforward condition.

The drive has the following features:

- Torque control
- Speed control
- Position control
- Electrical line shaft
- PID function.
- Brake control.
- Flux reduction.
- Motor-driven potentiometer
- Sequential position control (multi-position controller)
- Power interrupt management
- Linear motor control
- Plc functions with MDPlc dedicated software environment; standard languages according to IEC 61131
- "E@syDrives" Windows® configurator via Slink3 protocol
- 1 configurable main encoder / resolver input
- 1 configurable auxiliary encoder input / encoder repetition / simulation output
- 2 analog differential inputs (11 bits + sign)
- 2 analog outputs (11 bits + sign)
- 7 programmable digital inputs
- 6 programmable digital outputs
- 1 digital relay output 1A 250V
- RS485 asynchronous opto-isolated multi-drop serial port
- 2 fast synchronous serial ports for a master-slave communications between drives (Fast Link connectors)
- Fiber optical communication adapters

- Standard Fieldbus communication: CANopen, Modbus and (only on XVy-PDP drive) Profibus-DP
- IP20 (NEMA 1) protection, book case, removable connectors, serial encoder interface brought out via 1/2 D-sub connectors, ground connection screws for shielded cables mounted on board.

Options (Maximum one expansion card per drive)

- **ENC-ADPT** card. Encoder connection adapter.
Terminals 1 to 15 with point-to-point connection to the VGA-type connector.
- **EXP-ABS-EV** card. Expansion card for absolute encoder with SSI / EnDat and Hyperface protocols.
- **EXP-FO** card. Expansion card for a digital encoder output + 5V.
- **EXP-E** card. Expansion card for a digital encoder output + 5V... +15V / +24V
- **EXP-D8R4** card. Expansion card for digital I/Os, 8 inputs + 4 outputs.
- **EXP-D8-120** card. Expansion card for digital I/Os: 12 digital inputs, opto-isolated, 120V, 8 digital outputs, opto-isolated, 15...30V.
- **EXP-D14-A4F** card. Expansion card for digital I/Os, 8 inputs + 6 outputs, 2 analogue inputs $\pm 10V$ or $0 \div 20mA$ or $4 \div 20mA$, 2 analogue outputs $\pm 10V$, 1 input in opto-isolated frequency for encoder, channels: A/A-, with +5V or 15..24V, 150kHz max; B/B-, with +5V or 15..24V, 150kHz max; 0/0-, with +5V or 15..24V, 150kHz max; zero reset input (C/C-) with 15...30V. (1) .
- **EXP-D16** card. Expansion card for digital I/Os: 8 digital outputs, opto-isolated, 15...30V, 8 digital inputs, opto-isolated, 15...30V.
- **EXP-D20-A6** card. Expansion card for digital I/Os: 12 digital inputs, opto-isolated, 15...30V, 8 digital outputs, opto-isolated, 15...30V, 2 analogue inputs, $\pm 10V$ / $0 \div 20mA$, 2 analogue outputs, $\pm 10V$, 2 analogue outputs, $0 \div 20mA$.
- **EXP-F2E** card. Expansion card for an opto-isolated encoder input, able to provide the repeat of the encoder data.
Channels: A/A-, with +5V or 15..24V, 150kHz max; B/B-, with +5V or 15..24V, 150kHz max; C/C-, with +5V or 15..24V, 150kHz max; zero reset input (QC+ / QC- denied) with 15...30V (1)
- **EXP-FI** card. Opto-isolated encoder input expansion card. Channels: A/A-, with +5V or 15..24V, 150kHz max; B/B-, with +5V or 15..24V, 150kHz max; 0/0-, with +5V or 15..24V, 150kHz max; zero reset input (C/C-) with 15...30V. (1) .
- **EXP-FIO** card. Expansion card for an opto-isolated encoder input, able to provide the repeat of the encoder data. Channels: A/A-, with +5V or 15..24V, 150kHz max; B/B-, with +5V or 15..24V, 150kHz max; 0/0-, with +5V or 15..24V, 150kHz max. (1) .
- **EXP-FIH** card. Opto-isolated encoder input expansion card. Channels: A/A-, with 15..24V, 150kHz max; B/B-, with 15..24V, 150kHz max. (1) .

NOTE!

- (1) If a supplementary type digital encoder is used (A, Anot, B, Bnot), the encoder missing signal is available.

1.1 Motors and Encoders

The ARTDriveS drives are designed for the field oriented regulation of brushless servomotors. A sinusoidal - digital - absolute encoder or resolver can be used to feedback a signal to the position / speed regulator (see chapter 4.4. for more details).

1.1.1 Motors

What motor data is required for connecting the drive?

Nameplate specifications

- Motor rated voltage
- Motor rated current
- Number of poles
- Motor rated speed
- Motor thermal protection type

Motor protection

Thermistors

PTC thermistors according to DIN 44081 or 44082 fitted in the motor can be connected directly to the drive via PIN 2 and PIN 7 of the XE connector. PTC type of sensor must be selected in the **MOTOR DATA** menu , IPA 20004 = [0] PTC.

Temperature-dependent contacts in the motor winding

Temperature-dependent contacts "Klixon" type can be connected directly to the drive via PIN2 and PIN 7 of the XE connectors. Klixon type of sensors must be selected in the **MOTOR DATA** menu.

Note!

The motor PTC interface circuit (or Klixon) has to be considered as treated as signal circuit. The connection cables to the motor PTC must be made of twisted pair shielded cable; the cable route should not be parallel to motor cables or it must be separated by at least 20 cm.

Chapter 2 - Inspection Procedures, Components Identification and Standard Specifications

2.1 Delivery Inspection Procedures

2.1.1 General

A high degree of care is taken in packing the ARTDriveS 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 offices 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 2.3.1, “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!

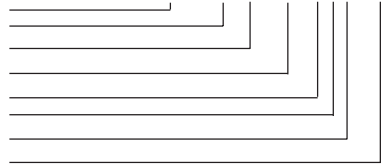
2.1.2 Drive type designation

The main technical characteristic of the drive are showed in the product code and in the nameplate. I.e. product code:

Standard sizes

Drive Series XVy Evolution
Enclosure dimension identification
Rated current (A rms)
Maximum output current (A rms, see table 2.3.3.1)
K=Keypad, X=without keypad
B=Internal Brake Unit, X= without brake unit
Software version
PDP = Includes Profibus DP interface card

XVy-EV X XX XX-XXX-PDP



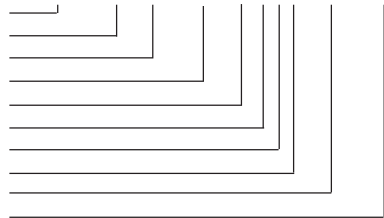
Example: XVy-EV10306-KBX

Drive type XVy-EV, size 1, rated current 3 A rms, max output current 6 A rms, with keypad, internal braking unit, standard software.

Compact sizes (C/CP)

Drive Series XVy Evolution
Enclosure dimension identification
Rated current (A rms)
Maximum output current (A rms, see table 2.3.3.1)
C/CP=compact version
K=Keypad, X=without keypad
B=Internal Brake Unit, X= without brake unit
Software version
PDP = Includes Profibus DP interface card
Open housing IP00

XVy-EV X XXX XXX-X-XXX-PDP-IP00



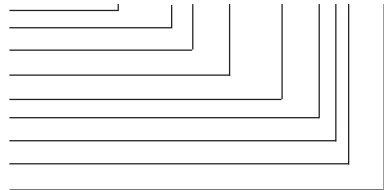
Example: XVy-EV9470650-C-KBX-IP00

Drive type XVy-EV, size 9, rated current 470 A rms, max output current 650 A rms, with keypad, internal braking unit, standard software, IP00 open housing.

Slim sizes

Drive Series XVy Evolution
Enclosure dimension identification
S= Slim version
Rated current (A rms)
Maximum output current (A rms, see table 2.3.3.1)
K=Keypad, X=without keypad
B=Internal Brake Unit, X= without brake unit
Software version
PDP = Includes Profibus DP interface card

XVy-EV X S XXX XXX-XXX-PDP



Example: XVy-EV5S100180-KBX-PDP

Drive type XVy-EV, size 5, rated current 100 A rms, max output current 180 A rms, with keypad, internal braking unit, standard software, with Profibus DP interface card.

2.1.3 Nameplate

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

Figure 2.1.3.1: Identification nameplate

GEFRAN #SIEI		
Type:	XVy-EV 10306-KBX	AC servo S/N 02006233
Inp:	230-480 Vac (Fctry Set=400)	50/60Hz 3Ph
2.9A@230Vac 2.9A@480Vac With line choke		
Out:	0-480Vac 0-450Hz 3Ph 1.5kW@480Vac	2Hp@480Vac
3A@230V Cont. Serv. 2.6A@480V		
LISTED INDUSTRIAL CONTROL EQUIPMENT		
UL US CE		

Type: Drive model

S/N: Serial number

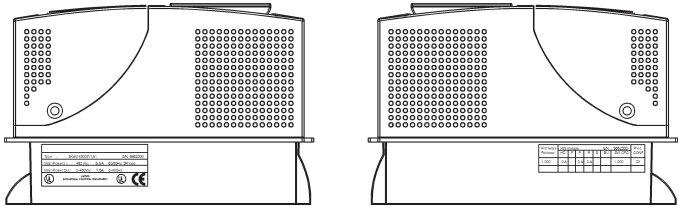
Main Power In: Power supply voltage, AC Input current, Frequency

Main Power Out: Output voltage, Output current, Output frequency

Figure 2.1.3.2: Firmware & Card revision level nameplate

Firmware Release	HW release					S/N 02006233		Prod. CONF
	D	F	P	R	S	BU	SW.CFG	
2.300	0.A		0.A	0.A			2.300	A1

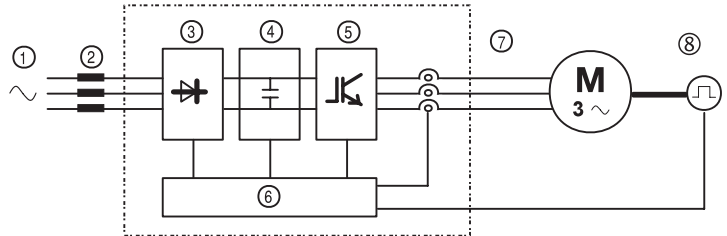
Figure 2.1.3.3: Nameplates position



2.2 Component identification

An ARTDriveS 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 infinitely variable adjustment of the speed of brushless servomotors. In the XVy-EV ...-DC versions the rectifier bridge is not included: the drives are powered by DC on the intermediate circuit.

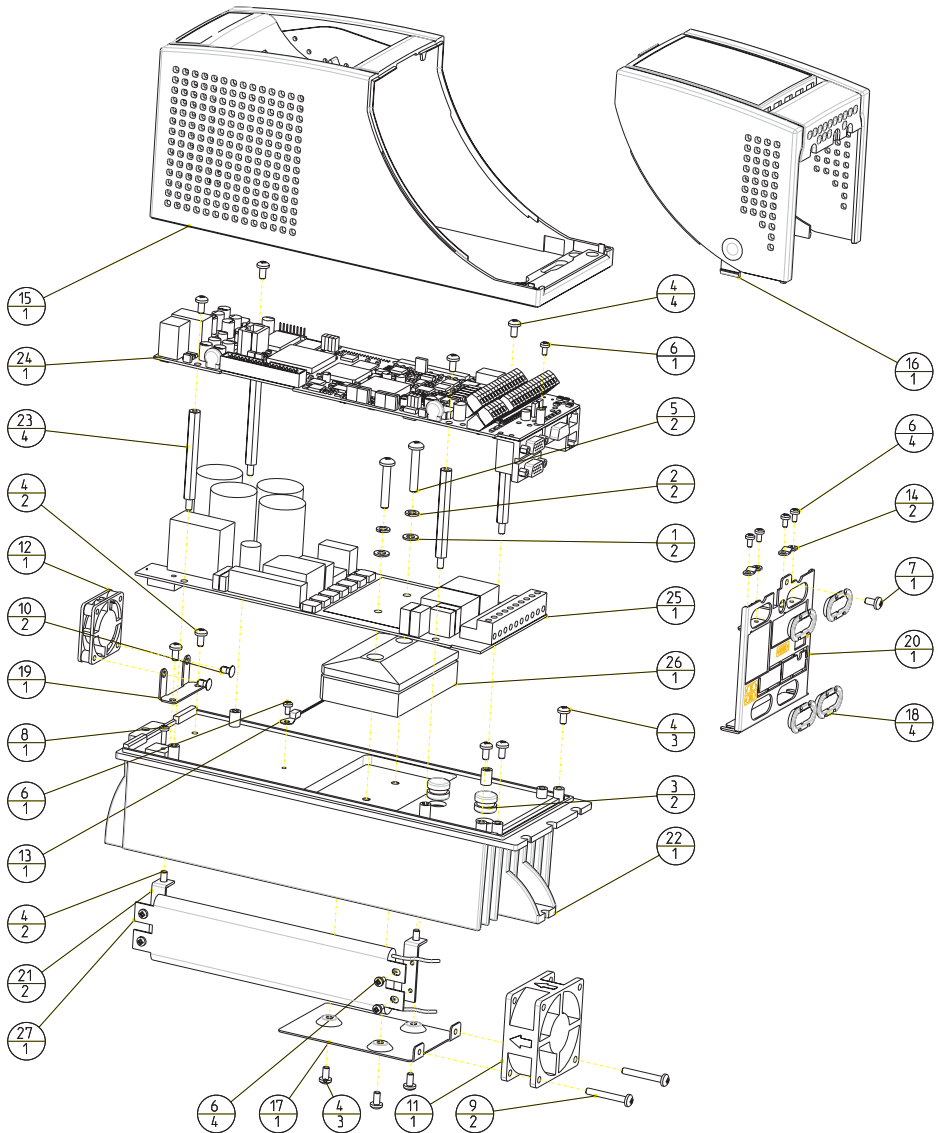
Figure 2.2.1: Basic Setup of drive



- 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})
In the XVy-EV ...-DC versions the DC voltage = 600 Vdc.
For speed and position feedback (see section 3.4.2).
- 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 Feedback**
For speed feedback (see section 3.4.2).

(*) not included in the XVy-EV ...-DC versions.

Figure 2.2.2: Drive view & components



<p> 6 — Ref. 4 — Q.ty </p>	<p> 6...9. Flamboyanted screw 10. Button 11. Cooling fun for type 3-6 and higher 12. Cooling fan IGBT Bridge 13. NTC thermal sensor 14. Bracket 15. Top cover </p>	<p> 16. Cover 17. Fan support 18. Plug 19. Fan support 20. Cable entry plate 21. Resistor square 22. Dissipator 23. Hexagonal bar </p>	<p> 24. RXVy Regulation card 25. PV33 Power card 26. IGBT Bridge 27. Internal brake resistor </p>
<p> 1. Piana M5 2. Grover M5 3. Fairlead 4. Flamboyanted screw 5. Screw </p>			

2.3 Standard specifications

2.3.1 Permissible environmental conditions

ENVIRONMENT

T_a Ambient temperature [°C] _____	0 ... +40; +40...+50 with derating
T_a Ambient temperature [°F] _____	32 ... +104; +104...+122 with derating
Installation location _____	Installation location Pollution degree 2 or better (free from direct sunlight, vibration, dust, corrosive or inflammable gases, fog, vapour oil and dripped water, avoid saline environment)
Degree of protection _____	IP20 (NEMA 1), IP00 (XVy-EV...-IP00 models) IP54 (NEMA 12) for the cabinet with externally mounted heatsink (size type XVy-EV 10306-... to XVy-EV 32550-...)
Installation altitude _____	Max 2000 m (6562 feet) above sea level; Above 1000 m (3281 feet) a current reduction of 1.2% for every 100 m (328 feet) 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 ³ ⁴⁾
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
Interference immunity _____	IEC801 Part 2,3 and 4
EMC compatibility _____	EN61800-3: 2004 (see "EMC Guidelines" instruction book)
Approvals _____	CE, UL, cUL

- 1) Environment Temp** parameter, IPA 20051 = 40°C (104°)
Ambient temp = 0 ... 40°C (32°...104°F)
Over 40°C: - 2% reduction of the output rated current for each exceeding C°.
- remove front plate (better than class 3K3 as per EN50178)
- 2) Environment Temp** parameter, IPA 20051 = 50°C (122°F)
Ambient temp = 0 ... 50°C (32°...122°F)
Current reduction to 80% of the output rated 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 drive can be disposed as electronic scrap in accordance with the currently valid national regulations for the disposal of electronic parts. The plastic covers of the Drives (up to size XVy-EV 32550-...) are recyclable: the material used is >ABS+PC< .

2.3.2 AC Input/Output Connection

The drive must be connected to an AC mains supply capable of delivering a symmetrical short circuit current (at 480V +10% Vmax) lower or equal to the values indicated on following table. For the use of an AC input choke 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. All drives are capable of operation at 480 Vac, therefore cannot be damaged by connection to lower voltages down to 208Vac. After connection, simply select in the menu the proper line voltage under "Drive Config"

NOTE!

In some cases AC Input chokes, and possibly noise suppression filters should be fitted on the AC Input side of the device. See chapter "Chokes/ Filters".

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.

XVy-EV ...-DC versions

In this version, the drive must be powered by a rectified DC supply of 600 Vdc.

The use of Gefran-Siei SM32 series power supplies is recommended for this, available with an output current from 185 to 2000A.

Table 2.3.2.1: Input / Output Specifications

Type - XYV-EV													
Inverter Output for continuous service, IEC 146 class 1: P _N Output power for continuous service (recommended motor output), IEC 146 class 1: @ U _N =230V _{ac} ; f _{sw} =default @ U _N =400V _{ac} ; f _{sw} =default @ U _N =460V _{ac} ; f _{sw} =default													
[kVA]	2.1	3.1	4.2	5.5	7.6	10.3	14.1	20.1	22.9	27	36.7	45	55.4
[kW]	0.75	1.1	1.5	2.2	3	4	5.5	7.5	9	11	18.5	22	22
[hp]	1.5	2.2	3	4	5.5	7.5	11	15	18.5	22	30	37	45
[Vrms]	2	3	3	5	7.5	10	15	20	25	30	40	50	60
[Hz]	450	450	450	450	450	450	450	450	450	450	450	450	450
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	65	80
[kHz]	2.6	3.9	5.2	7	10.5	12.9	16.9	26.1	28.7	33.9	46.1	56.5	69.6
[Arms]	3	4.5	6	8	10.9	14.8	20.3	29	33	39	53	6	

2.3.3 Rated and overload currents

The XVy-EV drive manages two different overload algorithms which can be selected by the user through the IPA 18778 Overload

Control parameter according to the application:

- **I xT** algorithm dedicated to high-dynamics solutions where the overload can reach up to 200% of the rated current (default setting).
- **I²xT** algorithm dedicated to applications where a limited overload is required for a longer period of time (limit = 136% In Class 1 for 60s every 300s).

The current rated and overload values change according to the type of selected algorithm as shown in tables 2.3.3.1 and 2.3.3.2 below.

I x T Algorithm

Table 2.3.3.1: Rated and overload currents with I x T algorithm

Type	Pot [kW]	fs<3Hz					3 Hz<fe<10 Hz (1)	fs>10Hz																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																				
		In	lolid duration	In duration	Recovery @ 90%In	In		lolid duration	lolid duration (2)	Recovery @ 90%In																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																		
											[Arms]	[Arms]	[s]	[s]																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																														
															@ 0 Hz	@ 3 Hz	[Arms]	[s]																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																																										

- (1) For frequencies between 3 to 10Hz all time duration values have to be calculated with a linear interpolation of values at 3 Hz and at 10 Hz.
- (2) Minimum granted overload. For temperatures lower than 20°C (T_{sink} < 45°C) the maximum overload time is automatically increased.

The **I x T** algorithm depends on the output frequency and also on the ambient temperature, as specified in table 2.3.3.1.

For output frequencies from 0 to 3 Hz the **I x T** algorithm does not depend from ambient temperature and the recovery from overload conditions will be asymmetrical (the IxT integral charge and discharge operations are different), while from output frequencies higher than 10 Hz the overload duration times will be dependent from ambient temperature and the recovery from overload conditions will be symmetrical. (The IxT integral will have the same charge and discharge). For output frequencies between 3 and 10 Hz the overload and the recovery times of the IxT algorithm can be obtained with a linear interpolation between the 3 Hz and the 10 Hz values.

Definitions

T_{ovld}	is the lasting period of an overload on the I_{ovld} current (as mentioned in the table 2.3.3.1, column 4,9 and 10).
I_{mot}	is the instantaneous motor output current
I_n	is the drive nominal current at the drive output frequency (as stated in table 2.3.3.1, column 2 and 7)

Here follows an example that shows how to perform the selection of the drives.

The overload stated in the **Drive Ovld Fact** parameter, IPA 19607 (MONITOR menu) is calculated by the drive firmware as follows:

$$\text{Drive Ovld Fact} = \text{ovld \%} = \frac{\int (I_{mot} - I_n) \cdot dt}{(I_{ovld} - I_n) \cdot T_{ovld}} * 100$$

Example: considering the XVy-EV 10612 drive, it is possible to see that the I_n rated current (with 400Vrms main supply) = $6 A_{rms}$, the I_{ovld} overload current = $12 A_{rms}$ and the T_{ovld} overload time = 2 seconds (if $f > 10$ Hz and the ambient temperature is 20°C).

See the table 2.3.3.1, column 2, 4, 13 line XVy-EV 10612.

Assuming that the I_{mot} output current = $10 A_{rms}$, the time used by ovld% to reach 100% is:

$$T = \frac{(I_{ovld} - I_n) * T_{ovld}}{(I_{mot} - I_n)} = 3 [\text{sec}]$$

Now the current limit is reduced to I_n and the drive is in an overload condition.

Another overload is possible if ovld% is brought to zero by reducing the I_{mot} current.

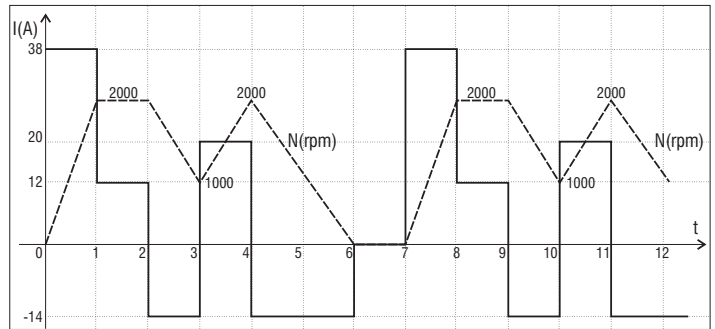
For example, if $I_{mot} = 5 A_{rms}$, the current limit returns to its maximum value after:

$$T = \frac{(I_{ovld} - I_n) * T_{ovld}}{(I_{mot} - I_n)} = 12 \text{ [sec]}$$

and therefore it will be possible to perform a new overload.

Let us consider now the following load cycle to select the proper drive to use:

Time (sec)	0	1	2	3	4	5	6
Speed (rpm)	0	2000	2000	1000	2000	1000	0
Motor current (A)	38	12	-14	20	-14	-14	0



This cycle will be repeated continuously.

The average motor current value will be $16 A_{rms}$.

The peak current is $38 A_{rms}$ and the peak duration is 1 second.

Assuming to use a XVy-EV 32040 with $I_n=20.3 A_{rms}$ and $I_{ovld}=40.6 A_{rms}$, it is possible to calculate that during the acceleration phase ovd% increases up to 43.6%.

During the following 6 seconds the current is lower than I_n , therefore it is possible to consider the average current = $12.33 A_{rms}$ and ovd% \cong 0%.

Looking these results we can say that the XVy-EV 32040 is suitable for this application.

PT Algorithm

Table 2.3.3.2: Rated and overload currents with $I^2 \times T$ algorithm

Type	Pot	f _{out} = 0 Hz			0 Hz < f _{out} < f ₁	f _{out} > f ₁			F1	T slow ovid	T fast ovid
		In	I slow ovid	I fast ovid		In	I slow ovid	I fast ovid			
	[kW]	[Arms]	[Arms]	[Arms]		[Arms]	[Arms]	[Arms]	[Hz]	[s]	[s]
XVy-EV 10306	1,5	3,0	4,1	5,5	For frequencies between 0 Hz to F1 all currents have to be calculated with a linear interpolation of values at 0 Hz and at F1.	4,0	5,4	7,3	3	60	0,5
XVy-EV 10408	2,2	4,5	6,1	8,2		5,6	7,6	10,2	3	60	0,5
XVy-EV 10612	3,0	6,0	8,2	11,0		7,5	10,2	13,7	3	60	0,5
XVy-EV 20816	4,0	8,0	10,9	14,6		9,6	13,1	17,6	3	60	0,5
XVy-EV 21020	5,5	8,8	12,0	16,1		12,6	17,1	23,1	3	60	0,5
XVy-EV 21530	7,5	12,4	16,9	22,7		17,7	24,1	32,4	3	60	0,5
XVy-EV 32040	11,0	17,4	23,6	31,8		24,8	33,7	45,4	3	60	0,5
XVy-EV 32550	15,0	23,1	31,4	42,3		33,0	44,9	60,4	3	60	0,5
XVy-EV 43366	18,5	27,3	37,1	50,0		39,0	53,0	71,4	3	60	0,5
XVy-EV 43570	22,0	32,9	44,7	60,2		47,0	63,9	86,0	7	60	0,5
XVy-EV 44590	30,0	44,1	60,0	80,7		63,0	85,7	115,3	7	60	0,5
XVy-EV 455110	37,0	55,3	75,2	101,2		79,0	107,4	144,6	7	60	0,5
XVy-EV 570140	45,0	65,1	88,5	119,1		93,0	126,5	170,2	3	60	0,5
XVy-EV 5100180	55,0	79,8	108,5	146,0		114,0	155,0	208,6	3	60	0,5
XVy-EV 55100180	55S	79,8	108,5	146,0		114,0	155,0	208,6	3	60	0,5
XVy-EV 6125230	75,0	99,4	135,2	181,9		142,0	193,1	259,9	3	60	0,5
XVy-EV 6S125230	75S	99,4	135,2	181,9		142,0	193,1	259,9	3	60	0,5
XVy-EV 7145290	90,0	129,5	176,1	237,0		185,0	251,6	338,6	3	60	0,5
XVy-EV 7190350	110,0	147,0	199,9	269,0		210,0	285,6	384,3	3	60	0,5
XVy-EV 7S190350	110S	147,0	199,9	269,0		210,0	285,6	384,3	3	60	0,5
XVy-EV 7230420	132,0	175,0	238,0	320,3		250,0	340,0	457,5	3	60	0,5
XVy-EV 7S230420	132S	175,0	238,0	320,3		250,0	340,0	457,5	3	60	0,5
XVy-EV 8280400	160,0	226,8	308,4	415,0		324,0	440,6	592,9	3	60	0,5
XVy-EV 8350460	200,0	280,0	380,8	512,4		400,0	544,0	732,0	3	60	0,5
XVy-EV 9470670	250-IP00	339,5	461,7	621,3		485,0	659,6	887,6	3	60	0,5
XVy-EV 9470650-C	250-C-IP20	339,5	461,7	621,3		485,0	659,6	887,6	3	60	0,5
XVy-EV 9560800	315-IP00	406,0	552,2	743,0		580,0	788,8	1061,4	3	60	0,5
XVy-EV 9560850-CP	315-C-IP20	406,0	471,0	743,0		580,0	672,8	1061,4	3	60	0,5

The $I^2 \times T$ algorithm depends on the output frequency.

At 0Hz frequency, the rated current reduction factor is 0.7 ... 0.9 according to sizes, as shown in table 2.3.3.2.

For output frequencies ranging from **0Hz** to **F1**, the overload times should be calculated using a linear interpolation of 0Hz and F1 values.

F1 is the frequency shown in the table for each drive size.

The rated and overload currents and the corresponding overload and recovery times do not depend on the room temperature.

The $I^2 \times T$ algorithm manages two drive overload levels:

1. **Slow overload** (136% I_n for 60s every 300s)
2. **Fast overload** (183% I_n for 0.5s every 60s)

The **slow overload** is calculated based on the following formula:

$$f_{sl-ov\%} = \frac{\int (I_{mot}^2 - I_n^2) dt}{(I_{sl-ov}^2 - I_n^2) T_{ovld}} \cdot 100$$

and appears in the IPA 19697 **Drive Ovld Fact** parameter (MONITOR menu).

The **fast overload** is calculated based on the formula:

$$f_{fs-ov\%} = \frac{\int (I_{mot}^2 - (1.36 I_n)^2) dt}{(I_{fs-ov}^2 - (1.36 I_n)^2) \cdot T_{ovld}} \cdot 100$$

Current limit management

When the drive delivers a current higher than the I_n value shown in table 2.3.3.2, **$f_{sl-ov\%}$** increases up to 100%.

At that point, the drive limits the maximum current which can be delivered to I_n value.

$f_{sl-ov\%}$ reaches 100% in 60s if the current delivered by the drive is 136% of I_n .

The drive can also deliver a maximum current of 183% of I_n . In this case, when the output current exceeds the 136% threshold, the **$f_{fs-ov\%}$** value is increased until 100% is reached in 0.5s; after that, the maximum current is limited to 136% of I_n .

- *Example of overload time calculation with slow overload:*

Refer to the XvY-EV10612 size for 400Vac mains operation.

Table 2.3.3.2 shows that, at frequencies higher than **F1**, the drive is able to deliver a rated current of 7.5Arms, with a maximum of 13.73Arms for 0.5s (fast overload) or 10.20Arms for 60s (slow overload).

Assuming that the drive delivers a current $I_m = 9A$ ($I_n < I_m < 136\%I_n$), only the **$f_{sl-ov\%}$** value is increased. .

The maximum overload time **T_{sl}** is:

$$T_{sl} = \frac{(I_{sl-ov}^2 - I_n^2) \cdot T_{sl-ov}}{(I_{mot}^2 - I_n^2)} = [s]$$

$$T_{sl} = \frac{(10.20^2 - 7.5^2) \cdot 60}{(9^2 - 7.5^2)} = 118.85 \text{ s}$$

When the **T_{ovl}** time has elapsed, the **Drive Ovd Fact** parameter has reached 100% and the maximum current is decreased to the rated one = 7.5Arms.

The drive will be able to deliver the maximum current of 183%I_n again only when **Drive Ovd Fact** returns to 0%.

The time required for **fsl-ov%** discharge depends on the current delivered by the drive (should be lower than I_n).

Assuming that I_{mot} = 3Arms, the recovery time will be:

$$T_{rec} = \frac{(I_{sl-ov}^2 - I_n^2) \cdot T_{sl-ov}}{(I_n^2 - I_{mot}^2)}$$

$$T_{rec} = \frac{(10.20^2 - 7.5^2) \cdot 60}{(7.5^2 - 3^2)} = 60.68 \text{ s}$$

- *Example of overload time calculation in case of fast overload:*

Refer to the XVy-EV10612 size for 400Vac mains operation.

Table 2.3.3.2 shows that, at frequencies higher than **F1**, the drive is able to deliver a rated current of 7.5Arms, with a maximum of 13.73Arms for 0.5s (fast overload) or 10.20Arms for 60s (slow overload).

Assuming that the drive delivers a current

$$I_m = 12A \text{ (} 136\%I_n < I_m < 183\%I_n \text{)}$$

the values of **fsl-ov%** and **ffs-ov%** are both increased.

The maximum overload time **T_{fs}** is:

$$T_{fs} = \frac{(I_{fs-ov}^2 - I_{sl-ov}^2) \cdot T_{fs-ov}}{(I_{mot}^2 - I_{sl-ov}^2)}$$

$$T_{fs} = \frac{(13.73^2 - 10.20^2) \cdot 0.5}{(12^2 - 10.20^2)} = 1.06 \text{ s}$$

At the same time, the **fsl-ov%** value is also increased to reach the value

$$fsl-ov\% = (I_{mot}^2 - I_n^2) \cdot T_{fs} = (12^2 - 7.5^2) \cdot 1.06 = 93 \text{ count} = 3.24\%$$

$$[\text{Max } f_{\text{sl-ov}}\% = (I_{\text{sl-ov}}^2 - I_n^2) \cdot T_{\text{sl-ov}} = (10.2^2 - 7.5^2) \cdot 60 = 2867.4 \text{ count} = 100\%]$$

Now, the current limit is lowered to 136% I_n .
This current value can be kept for:

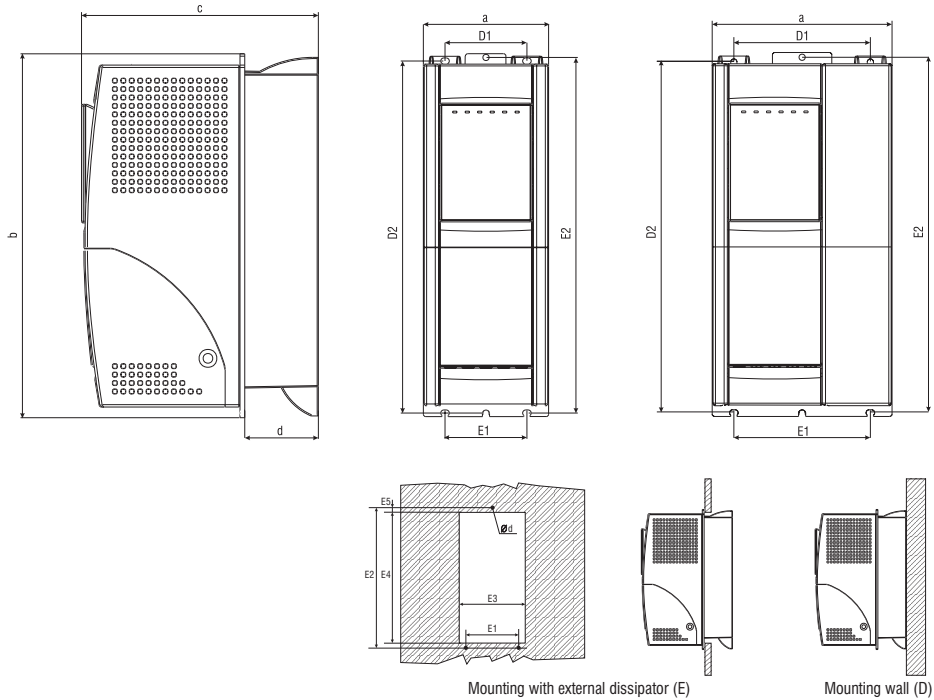
$$T_{\text{sl-ov}} = \frac{(I_{\text{sl-ov}}^2 - I_n^2) \cdot T_{\text{sl-ov}} - f_{\text{sl-ov}}}{(I_{\text{mot}}^2 - I_n^2)}$$

$$T_{\text{sl-ov}} = \frac{(10.20^2 - 7.5^2) \cdot 60 - 93}{(10.20^2 - 7.5^2)} = 52.98 \text{ s}$$

Chapter 3 - Installation Guidelines

3.1 Mechanical Specification

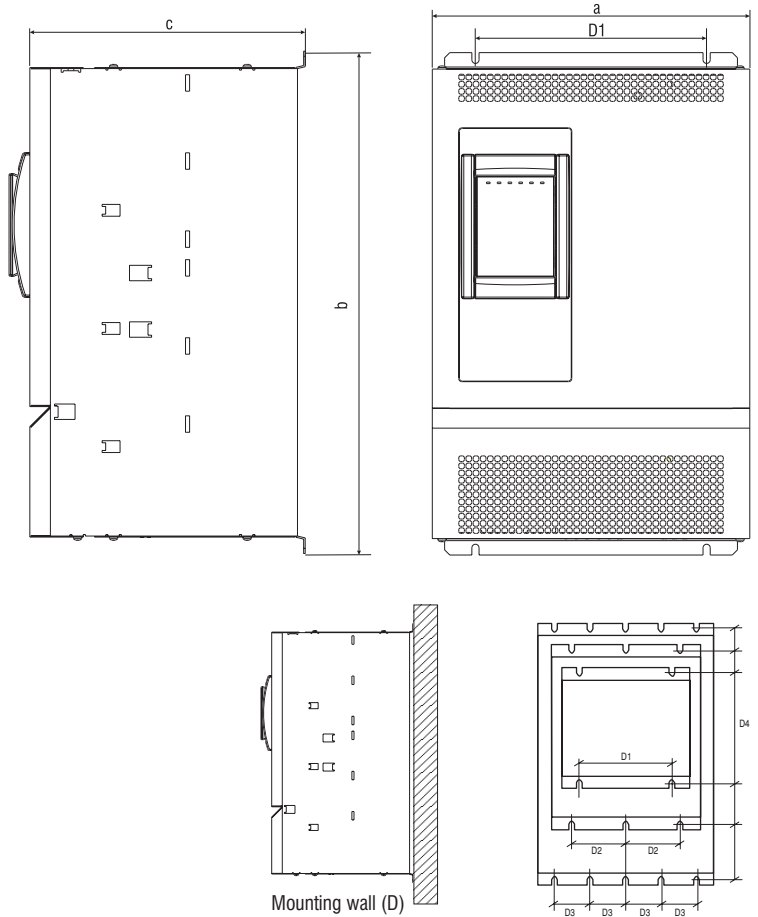
Figure 3.1.1: Drive Dimensions, XVy-EV 10306 ... XVy-EV 32550 sizes



XVy-EV Type		10306	10408	10612	20816	21020	21530	32040	32550
Drive dimensions:									
a	mm (inch)	105.5 (4.1)			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)	69 (2.7)			115 (4.5)			168 (6.6)	
D2	mm (inch)	296.5 (11.6)						310.5 (12.2)	
E1	mm (inch)	69 (2.7)			115 (4.5)			164 (6.5)	
E2	mm (inch)	299.5 (11.7)						315 (12.4)	
E3	mm (inch)	99.5 (3.9)			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)	3.6 (7.9)	3.7 (8.1)	4.95 (10.9)			8.6 (19)	

txv0020

Figure 3.1.2: Drive dimensions, XvY-EV 43570 ... XvY-EV 8280400 sizes



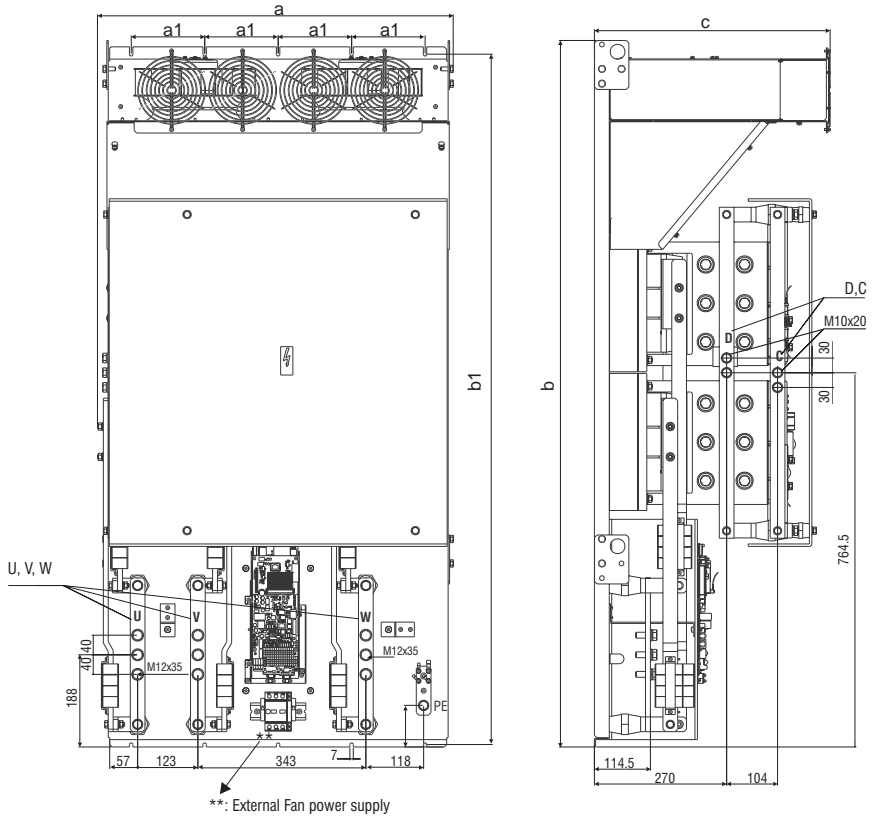
XvY-EV type		43366 43570	44590	455110	570140 5100180	5S100180	6125230	6S125231	7145290	7190350	7S190350	7230420	7S230420	8280400	8350460
Drive dimensions:															
a	mm (inch)	309 (12.1)		376 (14.7)		309 (12.1)	509 (20)	309 (12.1)	509 (20)	309 (12.1)	509 (20)	309 (12.1)	509 (20)	309 (12.1)	509 (20)
b	mm (inch)	489 (19.2)		564 (22.2)		639 (25.2)	741 (29.2)	789 (31)	909 (35.8)	789 (31)	909 (35.8)	789 (31)	909 (35.8)	789 (31)	965 (38)
c	mm (inch)	268 (10.5)	308 (12.1)		328 (12.9)		297.5 (11.7)	378 (14.9)	297.5 (11.7)	378 (14.9)	297.5 (11.7)	378 (14.9)	297.5 (11.7)	378 (14.9)	442 (17.4)
D1	mm (inch)	225 (8.8)				225 (8.8)				225 (8.8)				225 (8.8)	
D2	mm (inch)				150 (5.9)										
D3	mm (inch)						100 (3.9)		100 (3.9)		100 (3.9)				100 (3.9)
D4	mm (inch)	475 (18.7)		550 (21.6)		625 (24.6)	725 (28.5)		773 (30.4)	891 (35)		773 (30.4)	891 (35)	773 (30.4)	947 (37.3)
Ø		M6													
Weight	kg	18	22	22.2	34	31.4	59	36.2	75.4	80.2	42.2	86.5	--	--	109
	lbs	39.6	48.5	48.9	74.9	69.2	130	79.8	166.1	176.7	93	190.6	--	--	240.3

bxv0030

[illegible][illegible]

XVy-EV type		9470650-C	9560650-CP
Drive dimensions:			
a	mm (inch)	776 (30.6)	776 (30.6)
b	mm (inch)	1091 (43)	1091 (43)
c	mm (inch)	450 (17.7)	450 (17.7)
D2	mm (inch)	225 (8.9)	225 (8.9)
D4	mm (inch)	947 (37.3)	947 (37.3)
Ø		M8	M8
Weight	kg	155	155
	lbs	341.7	341.7

Figure 3.1.5: Drive dimensions, XVy-EV 9470670-DC-IP00 and XVy-EV 9560800-DC-IP00 sizes



Nota: inverter bridge only, power supplier not included.

XVy-EV type		9470670	9560800
Drive dimensions:			
a	mm (inch)	726.5 (28.55)	726.5 (28.55)
a1	mm (inch)	150 (5.9)	150 (5.9)
b	mm (inch)	1443 (56.71)	1443 (56.71)
b1	mm (inch)	1410 (55.41)	1410 (55.41)
c	mm (inch)	481 (18.9)	481 (18.9)
Weight	kg	193	193
	lbs	425.27	425.27
bxv0036			

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 2.3.2, "AC Input/Output Connection"), $T_{amb} \leq 40^{\circ}\text{C}$, typ. motor power factor and nominal continuous current.

Table 3.2.1: Heat dissipation and Required Air Flow

Type	Heat Dissipation [W]		Airflow of fan [m ³ /h]	
	@ $U_{LN}=400\text{Vac}$ ¹⁾	@ $U_{LN}=460\text{Vac}$ ¹⁾	Internal fan	Heatsink fans
XVy-EV 10306	77.5	72.0	11	30
XVy-EV 10408	104.0	96.3	11	30
XVy-EV 10612	138.3	126.7	11	30
XVy-EV 20816	179.6	164.1	11	2x30
XVy-EV 21020	230	215.6	11	2x30
XVy-EV 21530	330	300.8	11	2x30
XVy-EV 32040	380	340	30	2x79
XVy-EV 32550	512	468	30	2x79
XVy-EV 43366	546	490	-	80
XVy-EV 43570	658	582	-	80
XVy-EV 44590	864	780	-	170
XVy-EV 455110	1100	1000	-	170
XVy-EV 570140	1250	1100	-	340
XVy-EV 5100180	1580	1390	-	340
XVy-EV 5S100180	1185	1042	-	340
XVy-EV 6125230	1950	1750	-	650
XVy-EV 6S125230	1462	1312	-	730
XVy-EV 7145290	2440	2200	-	975
XVy-EV 7190350	2850	2560	-	975
XVy-EV 7S190350	1608	1320	-	730
XVy-EV 7230420	3400	3050	-	975
XVy-EV 7S230420	1878	1458	-	730
XVy-EV 8280400	4400	3950	-	1820
XVy-EV 8350460	5400	4700	-	2000
XVy-EV 9470670-DC-IP00	6300 max	5607 max	-	n. 4 x 1500
XVy-EV 9470650-C	6400	5700	-	1710
XVy-EV 9470650-C-IP00	6400 max	5700 max	-	-
XVy-EV 9560800-DC-IP00	8000 max	7900 max	-	-
XVy-EV 9560650-CP	8000	7900	-	1710
XVy-EV 9560650-CP-IP00	8000 max	7900 max	-	-

bxv0040

1) f_{sw} =default; $I_z=I_{2N}$

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

XVy-EV type	Minimum cooling opening [cm ²] (sq.inch)	
	Control section	Heatsink
10306 ... 10612	31 (4.8)	36 (5.6)
20816 ... 21530	31 (4.8)	72 (11.1)
32040 ... 32550	36 (5.6)	128 (19.8)
43366 ... 43570		2x150 (2x 23.5)
44590 ... 455110		2x200 (2x31)
570140 ... 5100180		2x370 (2x57.35)
6125230 ... 7230420		2x620 (2x96.1)
8280400 ... 9560650		2x1600 (2 x 248)

bxv0050

3.2.1 Cooling Fans Power Supply

Sizes XVy-EV 10306 to XVy-EV 5100180

Power supply (+24VAC) for these fans are provided from the internal drive power supply unit.

Sizes XVy-EV 6125230 to XVy-EV 9560650

Power supply for these fans is externally connected by the user. AC Input voltage is connected at the power terminal strip:

XVy-EV type	Drive fans	Fan power supply (values for 1 fan)
6125230		0,8A @115V/60Hz, 0,45A @230V/50Hz
7145290 ... 7230420		1,2A @115V/60Hz, 0,65A @230V/50Hz
8280400 ... 8350460		1,65A @115V/60Hz, 0,70A @230V/50Hz
9470670-DC-IP00	2	0.94A/190W @ 1x230Vac,50/60Hz
9470650-C	2	1.03A/215W @ 1x230Vac,50/60Hz
9470650-C-IP00	2	1.03A/215W @ 1x230Vac,50/60Hz
9560800-DC-IP00	2	0.94A/190W @ 1x230Vac,50/60Hz
9560650-CP	2	1.03A/215W @ 1x230Vac,50/60Hz
9560650-CP-IP00	2	1.03A/215W @ 1x230Vac,50/60Hz

txv0057

Figure 3.2.1: UL type fans connections

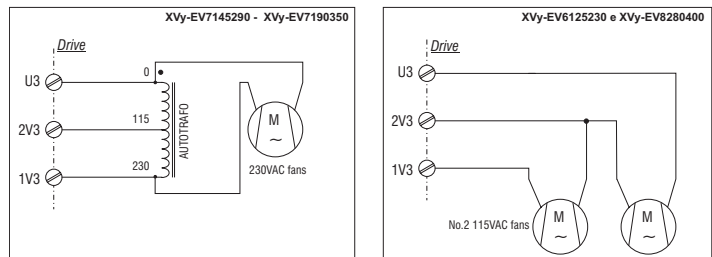
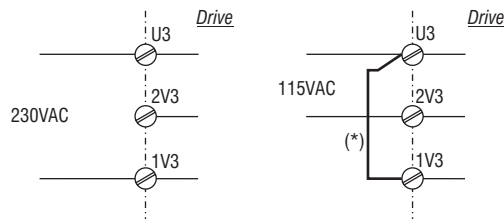


Figure 3.2.2: Example for external connection



*) Only for XVy-EV6125230 and XVy-EV8280400 sizes

Note!

An internal fuse (2.5A 250VAC slo-blo) for XVy-EV 7145290 and XVy-EV 7190350. sizes is provided.

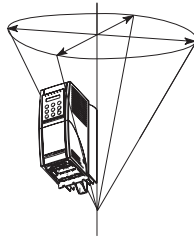
On XVy-EV 6125230 and XVy-EV 8280400 sizes the fuse must be mounted externally.

3.3 Installation Mounting Clearance

NOTE!

The dimensions and weights specified 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

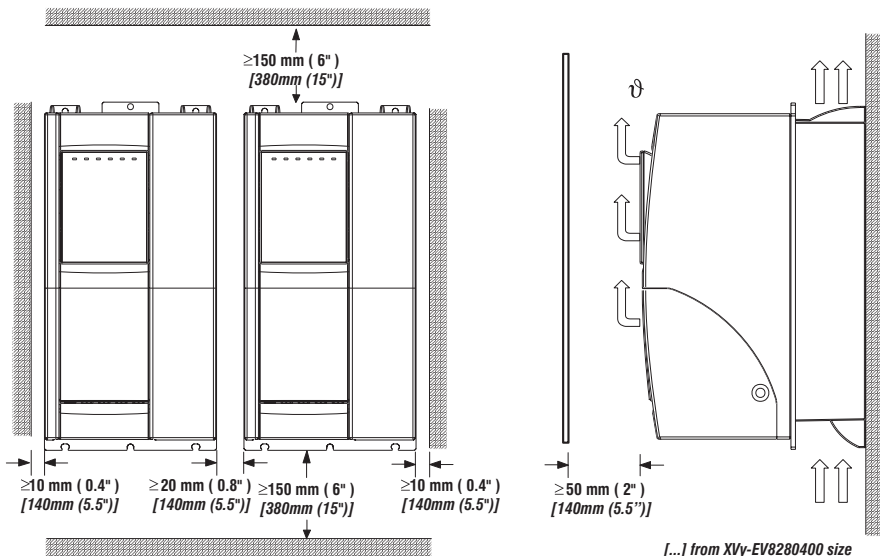


The maximum angle of inclination is 30°

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. From XVy-EV 8280400 size 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 drive.

Figure 3.3.2: Mounting Clearance



NOTE!

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

Chapter 4 - Wiring Procedure

4.1 Accessing the Connectors (IP20 models)

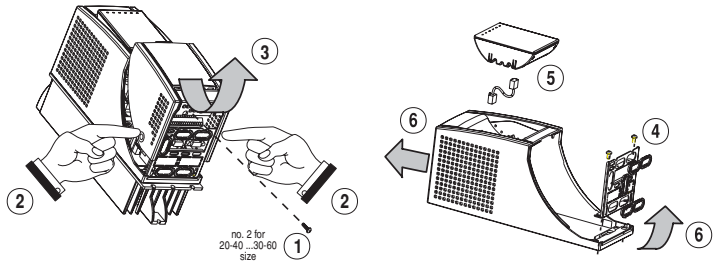
4.1.1 Removing the Covers

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 (XVy-EV 10306 to XVy-EV 32550 sizes)



XVy-EV 10306 to XVy-EV 21530 sizes :

The terminal 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 option cards 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).

XVy-EV 32040 to XVy-EV 32550 sizes :

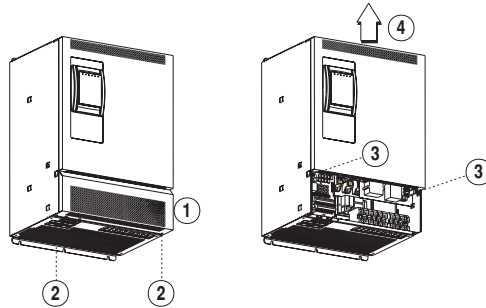
The terminal cover and cable entry plate of the device must be removed in order to fit the electrical connections:

- unscrew the two screws (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 (XVy-EV 43570 to XVy-EV 9560650 sizes)



XVy-EV 43570 to XVy-EV 9560650 sizes :

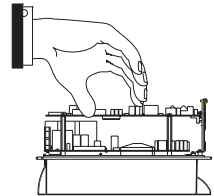
The terminal cover of the device must be removed in order to fit the electrical connections: unscrew the two screw (2) and remove the cover (1)

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

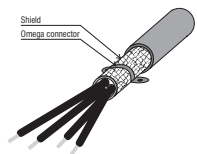
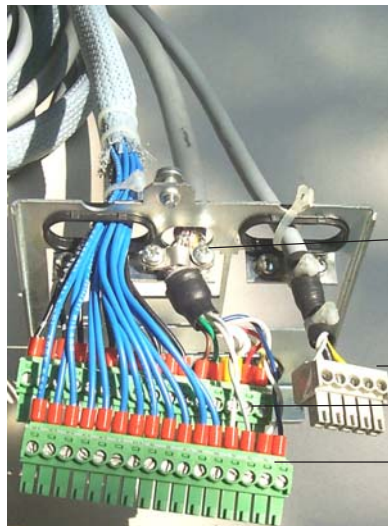


Caution

In order to avoid damage to the drive it is not allowed to transport it by holding the cards!



4.1.2. Wiring Suggestion



Grounding 360° of a shielded cable on Omega plug

CAN connector

Regulation section strip
(17 to 32 terminals)

Regulation section strip
(1 to 16 terminals)



4.2 Power Section

Please note that a wrong connection on motor phases can cause the motor to move without control and can destroy the drive.

Please check that motor phases are connected in the right sequence before enabling the drive.

4.2.1 Terminal Assignment on Power Section / Cable Cross-Section

Table 4.2.1.1: Power Section Terminals from XVy-EV 10306 to XVy-EV 32550

The terminals of the devices are made accessible by removing the cover and the cable entry plate (see section 4.1, "Accessing the connectors"). On XVy-EV 10306 up to XVy-EV 21530 sizes it is also possible to extract the removable connector.

All the power terminals are located on the power card PV33-...

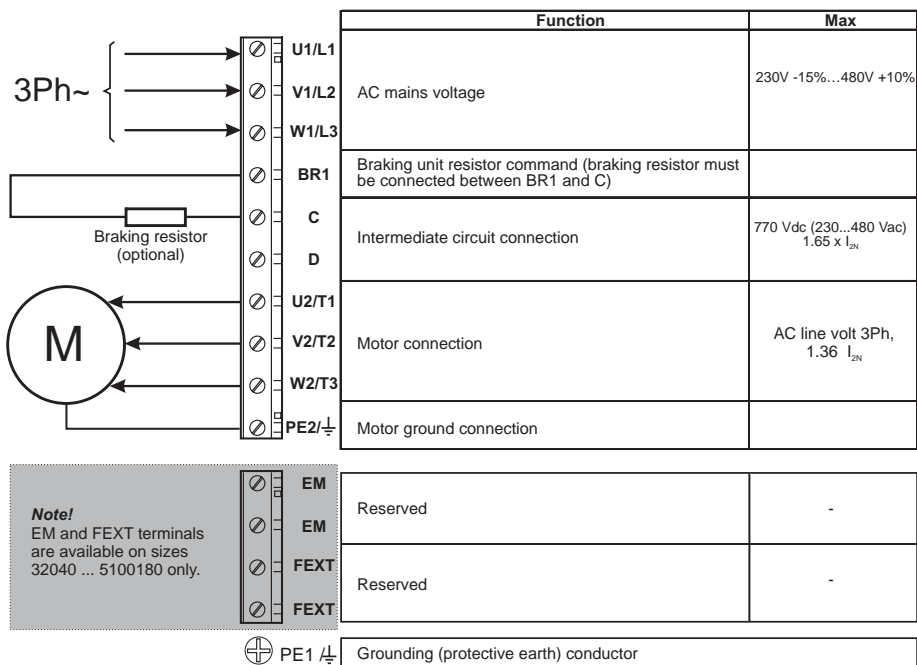


Table 4.2.1.2: Power Section Terminals from XVy-EV 43570 to XVy-EV 9560650



The terminals of the devices are made accessible by removing the cover (see section 4.1, “Accessing the connectors”).

Function		Max
U1/L1	AC mains voltage Terminations not included in the XVy-EV ...-DC versions.	230V -15%...480V +10%
V1/L2		
W1/L3		
C	Intermediate circuit connection	770 Vdc (230...480 Vac) 1.65 x I _{2N}
D		
BR1	Braking unit resistor command (braking resistor must be connected between BR1 and C) Available in XVy-EV 43570 ... 5100180 sizes, not including XVy-EV 5S100180.	
U2/T1	Motor connection	AC line volt 3Ph, 1.36 I _{2N}
V2/T2		
W2/T3		
PE2/⏏	Motor ground connection	
EM	Reserved	-
EM	Reserved	-
FEXT	Reserved	-
FEXT	Reserved	-

Note!
EM and FEXT terminals are available on sizes 32040 ... 5100180 only.

⏏ PE1 ⏏ Grounding (protective earth) conductor

Table 4.2.1.3: Power Section Terminals XVy-EV ...-IP00 sizes

		Function	Max
3Ph~	U1/L1	AC mains voltage	400V -15%...480V +10%
	V1/L2		
	W1/L3		
	C	Intermediate circuit connection	770 Vdc (400...480 Vac) 1.65 x I _{2N}
	D		
	U2/T1	Motor connection	AC line volt 3Ph, 1.36 I _{2N}
	V2/T2		
	W2/T3		
	PE / 	Grounding (protective earth) conductor, Motor ground connection	

Maximum cable sizes for power terminals U1, V1, W1, U2, V2, W2, C, D, PE

Table 4.2.1.4: Maximum cable cross section for power terminals

Type	U1,V1,W1, U2,V2,W2,C,D terminals			BR1 terminals			PE1, PE2 terminals		
	AWG	mm ²	Tightening torque Nm	AWG	mm ²	Tightening torque Nm	AWG	mm ²	Tightening torque Nm
XVy-EV									
10306	14	2	0.5 ... 0.6	14	2	0.5 ... 0.6	14	2	0.5 ... 0.6
10408	14	2	0.5 ... 0.6	14	2	0.5 ... 0.6	14	2	0.5 ... 0.6
10612	14	2	0.5 ... 0.6	14	2	0.5 ... 0.6	14	2	0.5 ... 0.6
20816	10	4	0.5 ... 0.6	10	4	0.5 ... 0.6	10	4	0.5 ... 0.6
21020	10	4	0.5 ... 0.6	10	4	0.5 ... 0.6	10	4	0.5 ... 0.6
21530	10	4	0.5 ... 0.6	10	4	0.5 ... 0.6	10	4	0.5 ... 0.6
32040	8	8	1.2 ... 1.5	8	8	1.2 ... 1.5	8	8	1.2 ... 1.5
32550	6	10	1.2 ... 1.5	6	10	1.2 ... 1.5	6	10	1.2 ... 1.5
43366	6	16	2	10	6	0.9	6	16	2
43570	6	16	2	10	6	0.9	6	16	2
44590	4	25	3	8	10	1.6	6	16	3
455110	2	35	4	8	10	1.6	6	16	3
570140	2	35	4	6	16	3	6	16	3
5100180	1/0	50	4	6	16	3	2	50	4
5S100180	1/0	50	10	nd	nd	nd	2	50	10
6125230	2/0	70	12	nd	nd	nd	2	50	4
6S125230	2/0	70	10	nd	nd	nd	2	50	10
7145290	4/0	95	12	nd	nd	nd	2	50	4
7190350	(300)	150	10 ... 30	nd	nd	nd	2	50	4
7S190350	(300)	150	10	nd	nd	nd	2	50	10
7230420	(350)	185	10 ... 30	nd	nd	nd	2	50	4
7S230420	(350)	185	10	nd	nd	nd	2	50	10
8280400	4xAWG2	4x35	10 ... 30	nd	nd	nd	2	50	4
8350460		150 *	10 ... 30	nd	nd	nd	2	50	4
9470670-DC-IP00	1/0 (500)	50...240	50	nd	nd	nd	1/0 (500)	50...240	50
9470650-C	1/0 (500)	50...240	50	nd	nd	nd	1/0 (500)	50...240	50
9470650-C-IP00	1/0 (500)	50...240	50	nd	nd	nd	1/0 (500)	50...240	50
9470650-C-DC-IP00	1/0 (500)	50...240	50	nd	nd	nd	1/0 (500)	50...240	50
9560800-DC-IP00	1/0 (500)	50...240	50	nd	nd	nd	1/0 (500)	50...240	50
Type	1/0 (500)	50...240	50	nd	nd	nd	1/0 (500)	50...240	50
9560650-CP-IP00	1/0 (500)	50...240	50	nd	nd	nd	1/0 (500)	50...240	50
9560650-CP-DC-IP00	1/0 (500)	50...240	50	nd	nd	nd	1/0 (500)	50...240	50

bv0060

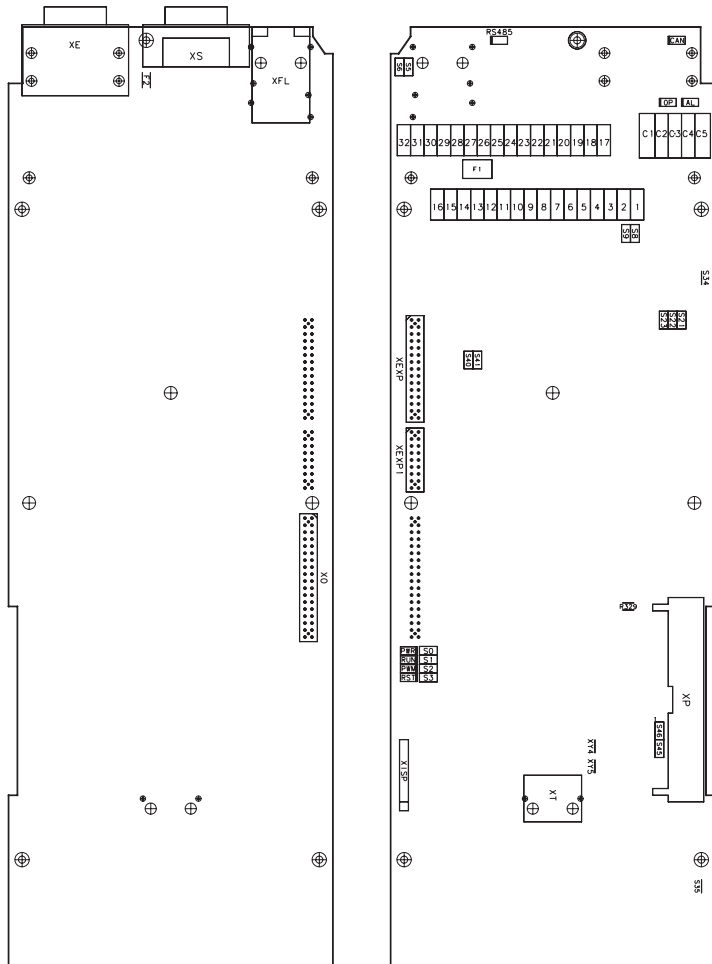
(...) = kcmils, * =copper bar

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 ARTDriveS drive.

Note!

Use 60/75°C copper conductor only.

4.3.1 R-XVy-EV Regulation Card



LEDs & Test points on Regulation Card

Designation	Color	Function
RST	red	LED lit during the Hardware Reset
PWM	green	LED lit during IGBT modulation
RUN	green	CPU status
PWR	green	LED lit when the voltage +5V is present and at correct level
RS485	green	LED is lit when RS485 interface is supplied
CAN	green	LED is lit when CAN interface is supplied
AL	red	LED is lit during the "Field bus failure" alarm or when the integrated CanOpen interface is not ready to communicate with the master
OP	green	LED is lit when the connection reaches the "Operational" phase
XY4	(test point)	Phase current signal (U)
XY5	(test point)	Reference point

Figure 4.3.1: Connectors Location

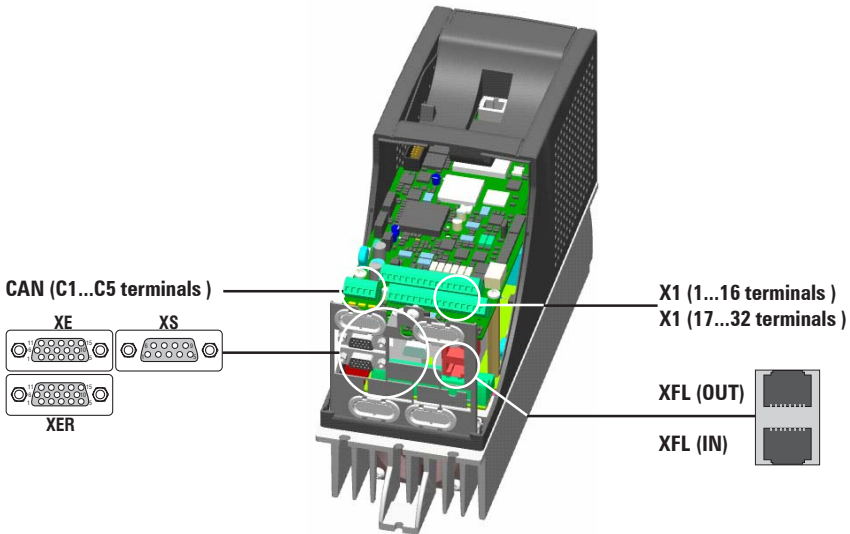


Table 4.3.1.1: Jumpers on Regulation Card

Designation	Function	Factory setting
S0	Service only ! (Test and software loading: bootstrap-loader)	OFF
S1	Service only ! (Test and software loading: monitor mode)	OFF
S2	Service only ! (Test and software loading: boot-sector protection)	OFF
S3	Service only ! (Test and software loading: manual reset)	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 0 (terminals 1 and 2) ON = 0..20 mA / 4..20 mA OFF = 0..10V / -10..+10 V	OFF
S9	Adaptation to the input signal of analog input 1 (terminals 3 and 4) ON = 0..20 mA / 4..20 mA OFF = 0..10V / -10..+10 V	OFF
S21-S22-S23	Hall sensor settings ON = Hall sensors OFF = No Hall sensors	OFF
S45-S46	INTERNAL USE - Do not modify factory setting	OFF

bxv0070

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

Note!

See chapter 4.4.3, Feedback drive connection for more details on S21 ... S23 jumper settings .



**The devices are factory set accordingly.
When fitting a regulation card as a spare, remember to set again
the encoders jumpers.**

4.3.2 Terminal Assignments on Regulation Section

Table 4.3.2.1: Plug-in Terminal Strip Assignments on Regulation Card

Strip X1	Function	max
1	Programmable/configurable analog differential input. Signal: terminal 1. Reference point: terminal 2. Default setting: "[3] Speed Ref 1".	±10V 0.20mA
2	Analog input 0	
3	Programmable/configurable analog differential input. Signal: terminal 3. Reference point: terminal 4. Default setting: none	
4	Analog input 1	
5	COM-DI	Reference point for Digital inputs, terminals 6, 7, 8, 9, 22, 23, 24 and 25.
6	Digital input 0	Drive enable; 0V or open: inverter disabled; +15...+30V: Drive enabled
7	Digital input 1	Programmable digital input, default setting: "[4] Start / Stop"
8	Digital input 2	Programmable digital input, default setting: "[8] Ramp In = 0"
9	Digital input 3	Programmable digital input, default setting: "[9] Reverse"
10	Supply-D0	Supply input for digital outputs, terminals 12, 13, 26, 27, 28, 29
11	COM-D0	Reference point for digital outputs, terminals: 12 and 13
12	Digital output 0	Programmable digital output, default setting: "[3] Speed Reached"
13	Digital output 1	Programmable digital output, default setting: "Speed 0 thr"
14	+24V OUT	+24V DC supply output. Reference point: terminal 16
15	+24V IN	+24V DC supply input
16	0 V (+24V)	Reference point for +24 V _{DC} I/O
17	Analog output 0	Programmable analog output, default setting: "[1] Actual speed"
18	Analog output 1	Programmable analog output, default setting: "[2] Motor current"
19	0V	Analog output reference point
20	+10V	Reference voltage +10V, reference point: terminal 19
21	-10V	Reference voltage -10V, reference point: terminal 19
22	Digital input 4	Programmable digital input, default setting: "[10] End Run Reverse"
23	Digital input 5	Programmable digital input, default setting: "[11] End Run Forward"
24	Digital input 6	Programmable digital input, default setting: "[3] External fault"
25	Digital input 7	Programmable digital input, default setting: "[2] Drive reset"
26	Digital output 2	Programmable digital output, default setting: none
27	Digital output 3	
28	Digital output 4	
29	Digital output 5	
30	Relay-NO	"Drive OK" N.O. contact
31	Relay-NC	"Drive OK" N.C. contact
32	Relay-COM	"Drive OK" common contact
C5	V+	CAN external positive supply (dedicated for supply of transceiver and optocouplers)
C4	H	CAN_H bus line (dominant high)
C3	SH	CAN_H shield
C2	L	CAN_L bus line (dominant low)
C1	V-	External supply reference



The + 24Vdc voltage used for external power for the control card must be stabilised, with a tolerance of $\pm 10\%$; maximum absorption 1A. Power supplies obtained from a single rectifier and capacitor filter are not sufficient.

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 ... 29	0.14 ... 1.5	0.14 ... 1.5	28 ... 16	0.4
30 ... 32	0.14 ... 1.5	0.14 ... 1.5	28 ... 16	0.4

bxv0065

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	m [feet]	27 [88]	62 [203]	93 [305]	125 [410]	150 [492]

bxv0055

Potentials of the control section

The potentials of the regulation section are isolated and can be disconnected via jumpers from ground. The connections between each potential are shown in Figure 4.3.2.1.

The analog inputs are designed as differential amplifiers.

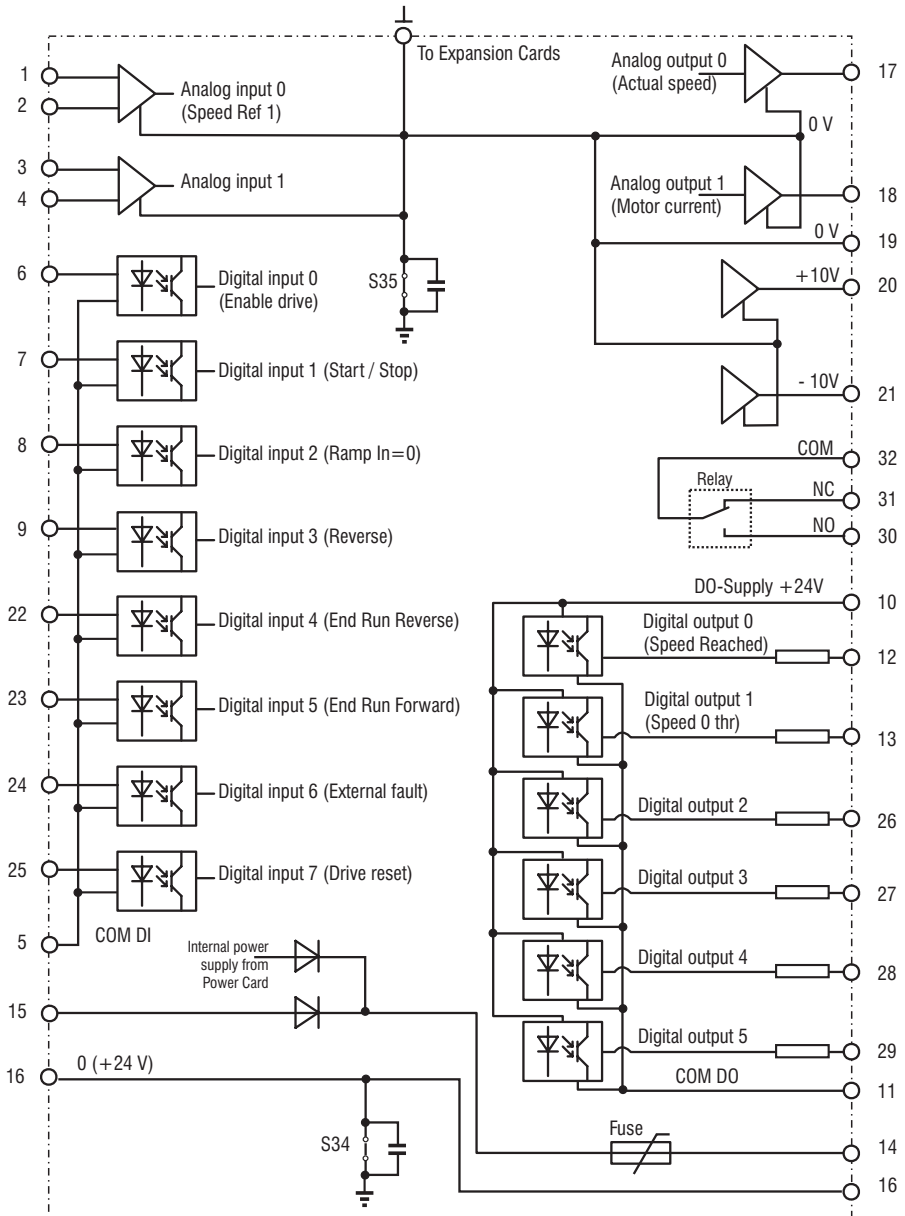
The digital inputs are optocoupled with the control circuit. The digital inputs have terminal 5 as reference point.

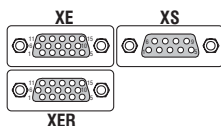
The analog outputs are not designed as differential amplifiers and have a common reference point (terminal 19).

The analog outputs and the $\pm 10V$ reference point have same potential (terminal 19).

The digital outputs are optocoupled with the control circuit. Terminals 12 to 13 and 26 to 29 have terminal 11 as a common reference point and terminal 10 as common supply.

Figure 4.3.2.1: Potentials of the control section





4.4 Feedback Devices

The ARTDriveS can control various feedback devices connector to the XE - XER terminals (15-pin high-density connectors fitted on drive) or to the expansion card EXP-ABS-XVy (optional), see table 4.4.1.

Can be used up to three feedback devices at the same time if the incremental signals of absolute encoders are not connected to XE.

In this last case can be used the DE , SSI / EnDat and Hiperface feedback devices only.

See chapter 4.4.3 for more details on connection.

Table 4.4.1: Feedback devices

Feedback devices		XE connector on XVy Drive	XER connector on expansion card EXP-ABS-EV	Note
DEHS	5V digital incremental encoder with A/Aneg,B/Bneg,C/Cneg and three Hall sensor digital position signals)	X		(1), (2)
SESC	Sinusoidal incremental encoder with A/Aneg,B/Bneg,C/Cneg and two sin/cos traces for absolute position (1Vpp).	X		(1), (3)
SEHS	Sinusoidal incremental encoder with A/Aneg,B/Bneg,C/Cneg and three Hall sensor digital position signals (1Vpp).	X		(1), (2)
RES	Resolver	X		(3)
HS	Three Hall effect sensors digital position signals single-ended	X		(2)
SC	Segnali assoluti SinCos due tracce.	X		(3)
SE	sinusoidal incremental encoder (1Vpp)	X		(1)
DE	5V digital incremental encoder.	X		(1)
SSI	absolute encoder with SSI protocol		X	(4), (1)
EnDat	absolute encoder with EnDat protocol		X	(4), (1)
Hiperface	absolute encoder with Hiperface protocol		X	(4), (1)

txv3420

- (1) Digital or sinusoid encoder plugged into the XE connector on the drive or XE1 on card EXP-ABS-XVy (see **SERVICE / ENCODER / XE ENC INC MEAS** menu)
- (2) Three Hall effect sensors connected to XE connectors (see **Service / Encoder / XE HALL TRACKS** menu)
- (3) Sin/cos signals, with resolver excitation (see **SERVICE / ENCODER / XE ENC ABS MEAS** menu)
- (4) Absolute encoder serial link plugged into the XE1 connector on the EXP-ABS-XVy card (see **SERVICE / ENCODER / EXP ENC ABS1** menu).

The encoder/resolver should be coupled to the motor shaft with a backlash free connection.

The encoder/resolver cable must be made of shielded twisted pairs with an overall shield, with all shields connected to ground on both sides. Some types of sinusoidal encoders may require installation with galvanic isolation from the motor frame and shaft.

4.4.1 XE Connector Assignments

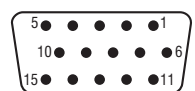
The connection with the drive is through a 15 pole high density sub-D connector (VGA type female). Please note that it is mandatory to use a shielded cable with at least 80 % coverage. The shield should be connected to ground on both sides of the connector, but not grounded at the motor end.

Please note that for resolver feedback it is mandatory to use a twisted pair cable with shields on each pair and an overall shield.

Table 4.4.1.1: XE Connector Assignments

Assignment	Function	I=Input O=Output
1 B-	Incremental Encoder B-	I
2 PTC	Motor temperature sensor	I
3 Z+	Zero channel Z (+)	I
4 Z-	Zero channel Z (-)	I
5 A+	Incremental Encoder A (+)	I
6 A-	Incremental Encoder A (-)	I
7 0VE	Encoder Supply 0V reference	O
8 B+	Incremental Encoder B(+)	I
9 +5VE	Encoder Supply	O
10 SIN+ / H1	Sin / resolver input (+) / Hall 1 input	I
11 SIN- / H2	Sin / resolver (-) / Hall 2 input	I
12 COS+ / H3	Cos / resolver (+) / Hall 3 input	I
13 COS-	Cos / resolver (-)	I
14 EXC+	Resolver excitation (+)	O
15 EXC-	Resolver excitation (-)	O

txv0090



Back View of VGA
D-sub connector (solder side)

4.4.2 XER Encoder Connector Assignments (for auxiliary encoders)

A +5V auxiliary incremental digital encoder can be plugged into the XER connector (controller card) or an expansion card (e.g. EXP-D14A4F, EXP-F2E, EXPFI, EXP-FO, EXP-FIH, etc.)

The connection with the drive is through a 15 pole high density sub-D connector (VGA type female).

Table 4.4.2.1: XER Connector Assignments

Assignment	Function	I=Input O=Output
1 B-	Digital incremental channel B (-) Input / Repetition	I / O
2		
3 Z+	Zero pulse (+) channel Input / Repetition	I / O
4 Z-	Zero pulse (-) channel Input / Repetition	I / O
5 A+	Digital incremental channel A (+) Input / Repetition	I / O
6 A-	Digital incremental channel A (-) Input / Repetition	I / O
7 0VR	Encoder Supply 0V reference	O
8 B+	Incremental channel B(+) Input / Repetition	I / O
9 +5VR	Encoder supply	O
10 ... 15		

txv0100

4.4.3 Feedback /Drive Connections

The ARTDriveS drive can handle several feedback devices (see paragraph 4.4) selectable through the setting of jumpers on the regulation board. The jumper setting will be as follows:

Table 4.4.3.1: Resolver/Encoder jumpers settings

Encoder	Jumpers settings		
	S21	S22	S23
DE / DEHS	ON	ON	ON
SE / SEHS	ON	ON	ON
SESC / SC	OFF	OFF	OFF
HS	ON	ON	ON
RES	OFF	OFF	OFF
SSI / ENDAT / Hiperface	OFF	OFF	OFF

trv0110

In the following paragraphs are specified the connections between ARTDriveS drives and the feedback sensors installed on standard motors.

4.3.3.1 Resolver Connections (RES)

The following table shows the connections between the ARTDriveS drives and the signal connector on servomotors by Gefran-Siei (see chapter 12 for more details on cable).

SBM Motors 19 Poles connector	SHJ Motors 10 Poles connector	Function	XVy drive 15 Pole XE connector	Cable section [mm ²]
A				
B (SHIELD)	F (SHIELD)	Cable shield	SHIELD to connector body	
C	B	Resolver Cos+	12	(2 x 0.25) + sfr
D	G	Resolver Cos-	13	
E	C	Resolver Sin-	11	
F	H	Resolver Sin+	10	
G				
H				
J				
K				
L				
M				
N				
P				
R				
S (PTC)	I (PTC)	Motor Temperature Sensor	7	(2 x 0.25) + sfr
T (PTC)	J (PTC)	Motor Temperature Sensor	2	
U	A	Resolver Excitation+	14	(2 x 0.25) + sfr
V	E	Resolver Excitation-	15	

trv0240

For resolver cable use twisted pair shielded cable; the pairs should be the signal wires cos+/cos-,sin+/sin-, exc+/ exc-, motor temperature sensor wires. All the shields must be connected together to cable shield pin of resolver connector on the motor side and to connector body on drive side.

4.4.3.2 Sinusoidal Encoder SinCos Connections (SESC)

The following table shows the connections between the ARTDriveS drives and the signal connector on servomotors by Gefran-Siei (see chapter 12 for more details on cable).

SBM Motors 19 Poles connector	SHJ Motors 19 Poles connector	Function	XVy drive 15 Pole XE connector	Cable section [mm ²]
A	12	Encoder supply 0VDC reference	7	0.5
B (SHIELD)	19 (SHIELD)	Cable shield	SHIELD to connector body	
C	15	Cos+ input	12	2 x 0.14
D	11	Cos- Input	13	
E	14	Sin- Input	11	2 x 0.14
F	10	Sin+ Input	10	
G				
H	4	Incremental Encoder B+	8	
J	8	Incremental Encoder B-	1	(2 x 0.14) + sfr
K	7	Incremental Encoder A-	6	
L	3	Incremental Encoder A+	5	(2 x 0.14) + sfr
M	5	Zero Channel Z+	3	
N	9	Zero Channel Z-	4	(2 x 0.14) + sfr
P	2	Encoder supply +5VDC	9	0.5
R				
S (PTC)	17 (PTC)	Motor Temperature Sensor	7	n.c.
T (PTC)	18 (PTC)	Motor Temperature Sensor	2	0.25
U				
V				

bxv0220

For encoder cable use twisted pair shielded cable; the pairs should be the signal wires A+/A-, B+/B-, Z+/Z-, cos+/cos-, sin+/sin-, motor temperature sensor wires, encoder supply wires. All the shields must be connected together to cable shield pin of encoder connector on the motor side and to connector body on drive side.

4.4.3.3 Digital Encoder with Hall Effect Sensors Connections (DEHS)

The following table shows the connections between the ARTDriveS drives and the signal connector on servomotors by Gefran-Siei (see chapter 12 for more details on cable).

SBM Motors 19 Poles connector	SHJ Motors 19 Poles connector	Function	XVy drive 15 Pole XE connector	Cable section [mm ²]
A	6	Encoder supply 0VDC reference	7	0.5
B (SHIELD)	7 (SHIELD)	Cable shield	SHIELD to connector body	
C	5	Hall 3 input	12	2 x 0.14
D				
E	4	Hall 2 Input	11	1 x 0.25
F				
G	3	Hall 1 Input	10	2 x 0.14
H	13	Incremental Encoder B+	8	
J	1	Incremental Encoder B-	1	(2 x 0.14) + sfr
K	11	Incremental Encoder A+	5	
L	10	Incremental Encoder A-	6	(2 x 0.14) + sfr
M	14	Zero Channel Z+	3	
N	9	Zero Channel Z-	4	(2 x 0.14) + sfr
P	12	Encoder supply +5VDC	9	0.5
R				
S (PTC)	15	Motor Temperature Sensor	7	n.c.
T (PTC)	16	Motor Temperature Sensor	2	0.25
U				
V				

bxv0230

For encoder cable use twisted pair shielded cable; the pairs should be the signal wires A+/A-, B+/B-, Z+/Z-, motor temperature sensor wires, encoder supply wires. All the shields must be connected together to cable shield

pin of encoder connector on the motor side and to connector body on drive side.

4.4.3.4 Absolute Encoder Connections (SSi / EnDat /Hiperface protocols)

EXP-ABS-EV expansion board has to be connected:

- to **XVy-EV drive** though the cable supplied with the board (**XE2** connector on EXP-ABS-EV, **XE** connector on XVy-EV drive).
- to the encoder signals connector (**XE1** connector on EXP-ABS-EV). Please refer to the following table:

Pin	Signal	Description
1	B- (Sine-)	Incremental encoder B- signal
2	PTC	Motor thermal protection signal (referred to GND)
3	Reserved	
4	Reserved	
5	A+ (Cosine+)	Incremental encoder A+ signal
6	A- (Cosine-)	Incremental encoder A- signal
7	GND	Ground of encoder supply voltage
8	B+ (Sine+)	Incremental encoder B+ signal
9	ALIM	Encoder supply voltage
10	EQP / SENSE-	Equipotential ⁽¹⁾ signal or SENSE- ⁽²⁾ signal (only for monitoring)
11	CLK+	Encoder CLOCK+ signal (ENDAT or SSI only)
12	CLK-	Encoder CLOCK- signal (ENDAT or SSI only)
13	DT+	Encoder DATA+ signal
14	DT-	Encoder DATA- signal
15	SENSE+	SENSE+ ⁽²⁾ signal (only for monitoring)

10010g

For encoder cable use twisted pair shielded cable; the pairs should be the signal wires A+/A-, B+/B-, clock+/clock-, data+/data-, motor temperature sensor wires, encoder supply wires. All the shields must be connected together to cable shield pin of encoder connector on the motor side and to connector body on drive side.

4.4.3.5 Encoder /Resolver Specifications (XE connector)

Sinusoidal encoders

max. frequency _____ 200 kHz (select the appropriate number of pulses depending on required max. speed)

Number of pulses per revolution _____ min 1, max 65535

Channels _____ three-channel, differential, TTL 5V compatible. An encoder loss detection is possible via firmware setting.

Power supply _____ + 5 V (Internal supply) *

Load capacity _____ > 8.3 mA pp per channel

Suggested cable _____ see chapter 12.

Digital encoders

max. frequency _____ 250 kHz (select the appropriate number of pulses depending on required max. speed)

Number of pulses per revolution _____ min 1, max 65535

Channels _____ three-channel, differential. An encoder loss detection is possible via firmware setting.

Power supply _____ + 5 V (Internal supply) *

Load capacity _____ > 4.5 mA / 6.8 ... 10 mA per channel

Suggested cable _____ see chapter 12

- * Via keypad (030 - **ENCODER PARAM** 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: 0=5.2V, 1=5.6V, 2=6.1V, 3=6.5V via **XE Enc Supply** (IPA 20012) or **XER Enc Supply** (IPA 20019). parameter.

Absolute Encoder

Absolute trace frequency _____ 500 kHz (on the EXP-ABS-EV expansion card)

Incremental trace max. frequency _____ 200 kHz

Max encoder resolution _____ 29 bit (17 bit/rev.* 12 bit rev.). Note: from the fw 2.41 version.

Interface electrical level _____ differential RS-485

Interface signals _____ clock and data (bidirectional)

Clock synchronous period _____ 2µs

Encoder supply _____ +5V(TTL) / +15V(HTL) +5V / +15V...+24V with external supply

max absorption of encoder supply _____ 250 mA max

Suggested cable _____ see chapter 12

Resolver interface

Resolver excitation _____ sinusoidal

Resolver excitation voltage _____ 6V rms

Resolver excitation current _____ 50mA rms max

Resolver excitation frequency _____ 8kHz

Resolver input _____ differential

Resolver input impedance _____ 4kΩ

Resolver transformation ratio _____ 1:1 - 1:2 - 1:3

Suggested cable _____ see chapter 12

4.4.3.6 Encoder Simulation / Repetition, Auxiliary Encoder Input (XER/EXP Connector)

Digital encoder input

max. frequency _____ 400 kHz (select the appropriate number of pulses depending on required max. speed)

Number of pulses per revolution _____ min 1, max 65535

Channels _____ three-channel, differential. Encoder loss detection is not possible.

Power supply _____ + 5 V (Internal supply) *

Load capacity _____ > 4.5 mA / 6.8 ... 10 mA per channel

Suggested cable _____ see chapter 12

- * Via keypad (030 - **ENCODER PARAM** 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: 0=5.2V, 1=5.6V, 2=6.1V, 3=6.5V via **XE Enc Supply** (IPA 20012) or **XER Enc Supply** (IPA 20019). parameter.

On the regulation board there is available an incremental encoder output, with TTL Line Driver levels, that can be used as simulation of the servo-motor feedback device.

This function is performed by the microprocessor and it is possible to simulate an encoder output with a programmable number of pulses/rev, or to repeat the signals of the motor encoder. The encoder output signals are available on the XER connector (see table 4.4.2.1):

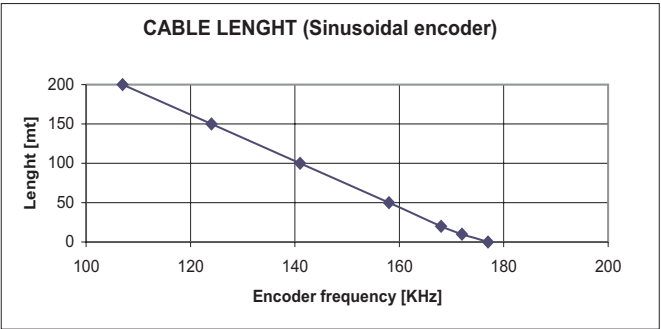
Digital encoder simulation (XER Port)

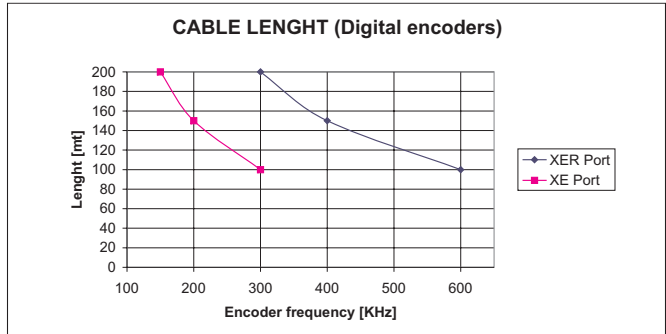
Interface	_____	opto-isolated
Simulation	_____	differential digital incremental
Standard outputs	_____	A+, A-, B+, B-,I+, I-
Outputs levels	_____	Standard TTL
Voltage limits on the TTL high-state outputs (on the pins)		
(Uhigh TTL)	_____	> 2.5V
Voltage limits on the TTL low-state outputs (on the pins)		
(Ulow TTL)	_____	< 0,5V
TTL load capacity	_____	20mA max. each
Parallel connection of standard ARTDriveS inputs		
with a TTL outputs	_____	3 inputs
Max. frequency	_____	400kHz (select the appropriate number of pulses depending on required max. speed)
Max absorption of the encoder simulation		
power supply	_____	150mA@5V
Mechanics	_____	Male high density 15-pole D-sub connector (type VGA) for standard inputs and extractable terminals to be connected to a 0.14..1.5 mm² power supply section

4.4.4 Encoder Cable Length

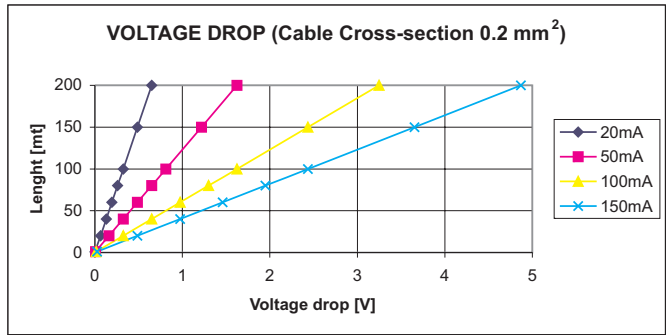
The following figures show the maximum encoder frequency as function of the encoder cable length. For this figures we have considered cables with the following specifications:

Distributed capacitance: 90pF/m





The following figure shows the voltage drop as function of the cable length and of the current absorption:



4.4.5 Checking Encoder / Drive Connections

It is strongly recommended to follow the next instructions (parameters to be check are only those for used feedback devices, see next table) :

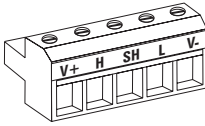
- rotate manually clockwise the motor shaft
- check "... pos" parameters values increasing up to "360" and than come back to "0"
- check "... rev" parameters values increasing on each turn.

	XE conn.			XER conn.
	SC (SinCos)	HS (Hall+Dig)	RES (resolver)	DE (Dig.Enc.)
menu: SERVICE / ENCODER / XE ENC INC MEAS				
Inc Data Pos (IPA 19002)	X	X		
Inc Data N Rev (IPA 19003)	X	X		
menu: SERVICE / ENCODER / XE ENC ABS MEAS				
Abs Turn Pos (IPA 19017)	X		X	
Abs Rev (IPA 19018)	X		X	
menu: SERVICE / ENCODER / XER/EXP Inc Enc				
XER/EXP Turn Pos (IPA 19011)				X
XER/EXP Rev (IPA 19012)				X
menu: SERVICE / ENCODER / XE HALL TRACKS				
XE Hall Pos (IPA 19022)		X		
XE Hall Rev (IPA 19026)		X		

txv0255

4.5 CANopen Connection

The ARTDriveS brushless drive can be connected in a CANopen network, the pins are:



Pin / Signal	Description
V-	External supply reference
L	CAN L bus line (dominant low)
SH	CAN H shield
H	CAN H bus line (dominant high)
V+	CAN external positive supply +24V (*), dedicated for supply of transceiver and optocouplers

txv0245

- (*) The supplier size have to be according to the used bus specification (CANopen or DeviceNet). Card absorption is 30 mA@24V.

The Bus connection is provided via a shielded loop to be placed far from the power cables, with a minimum distance of 20 cm. The cable shielding must be ground connected on both ends.

If the cable shieldings are ground connected on different points of the system, use the equipotential connection cables to reduce the current flow between the drives and the CAN bus master.



NOTE ON TERMINATING RESISTOR:

The first and last network components must have a 120 ohm resistance between pins C2 and C4.

4.6 Fast Link Connections

On the XFL connectors a fast serial connection is available, that is optimized to exchange I/O and regulation parameters between different drives. This synchronous serial interface is named FAST LINK. This interface can have two different connection architectures :

- Multi Point : one drive is configured as master (transmitting) and the others as slaves (receiving).
- Peer-to-Peer: This software is not yet released, but is supported by the existing hardware.

Figure 4.6.1: XFL-OUT Connector (FAST LINK Output)

Pin	Function	Description
1	-	
2	-	
3	DT_OUT+	Data output Fast-Link (+)
4	DT_OUT-	Data output Fast-Link (-)
5	CLK_OUT+	Clock output Fast-Link (+)
6	CLK_OUT-	Clock output Fast-Link (-)
7	-	
8	-	

txv0200

Figure 4.6.2: XFL-IN Connector (FAST LINK Input)

Pin	Function	Description
1	-	
2	-	
3	DT_IN+	Data input Fast-Link (+)
4	DT_IN-	Data input Fast-Link (-)
5	CLK_IN+	Clock input Fast-Link (+)
6	CLK_IN-	Clock input Fast-Link (-)
7	-	
8	-	

txv0210

4.6.1 Fast Link Data

Max number of drops _____ 8 (1 Master + 7 Slaves)

Max length _____ 1.5 meters (with conductor shielded cables), 40 meters (with plastic optical fiber)

Baud rate _____ 3 Mbit

Max Data Exchanged _____ 15 words + 1 CRC / Info every 250 μ S in synchronous way from master to slave

PWM _____ Drive Synchronization

8 conductors shielded cable (*) _____ L= 65 cm (code S7QK7), L=115 cm (code S7QK8)

Plastic optical fiber cable _____ L=5 m (code 8S895B), L=10 m (code 8S896B), L=20 m (code 8S897B), L=30 m (code 8S899B)

Optical fiber interface kit _____ Transmitter and receiver (code S370E)

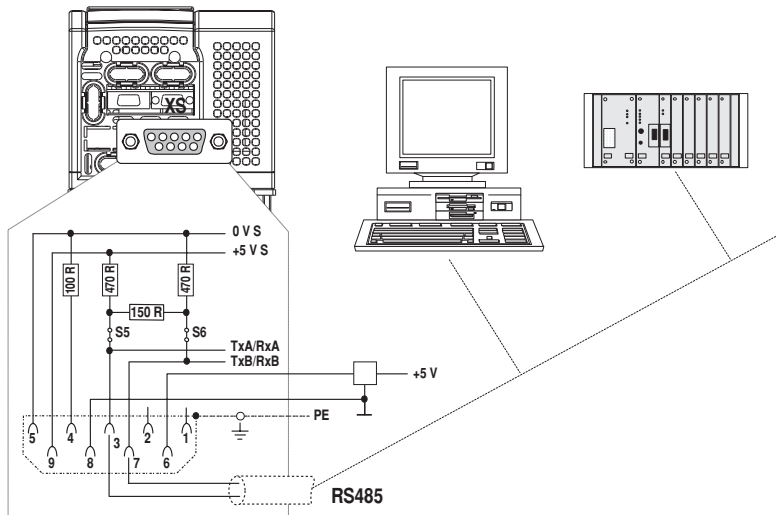
(*) Ferrite on Slave side

4.7 Serial Interface

4.7.1 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 up to 38,400 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 ARTDriveS devices (up to 128 address selectable) can be networked together via the RS 485 interface. Address setting is carried out via the **Drive Serial Add** (IPA 18031) parameter, **DRIVE CONFIG / COMM CONFIG** menu. Further information concerning the parameters to be transferred, their type and value range is given in the table contained in section 10, "Parameter lists".

Figure 4.7.1: RS485 Serial Interface



The RS 485 on the ARTDriveS 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: when using galvanic isolation an external power supply is necessary (+5V). Communication without galvanic isolation is suggested only in case of temporary connections for setup with 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 reflection. The bus terminating resistors on ARTDriveS drives 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 "PCI-COM" option interface, without jumper setting.
 For multidrop connection (two or more drive), an external power supply is necessary (pin 5 / 0V and pin 9 / +5V).
 Pins 6 and 8 are reserved for use with the "PCI-COM" 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.

4.7.2 RS 485 Serial Interface Connector Description

Table 4.7.2.1: 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

ai4110

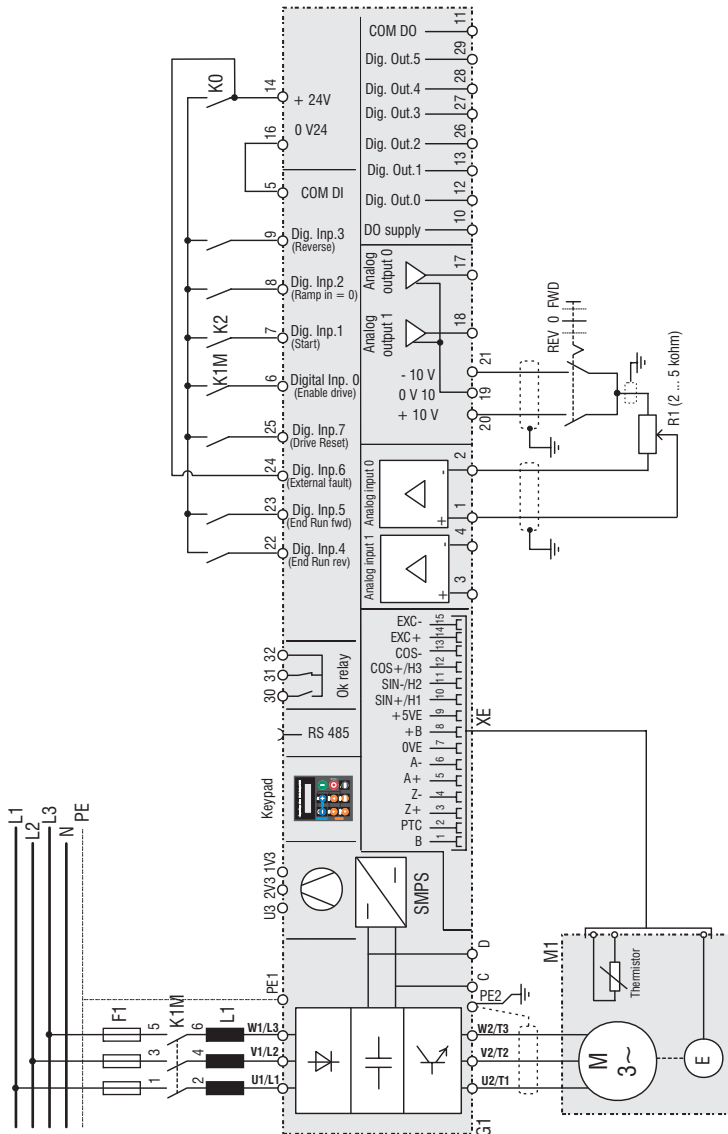
I = Input

O = Output

4.8 Standard Connection Diagram

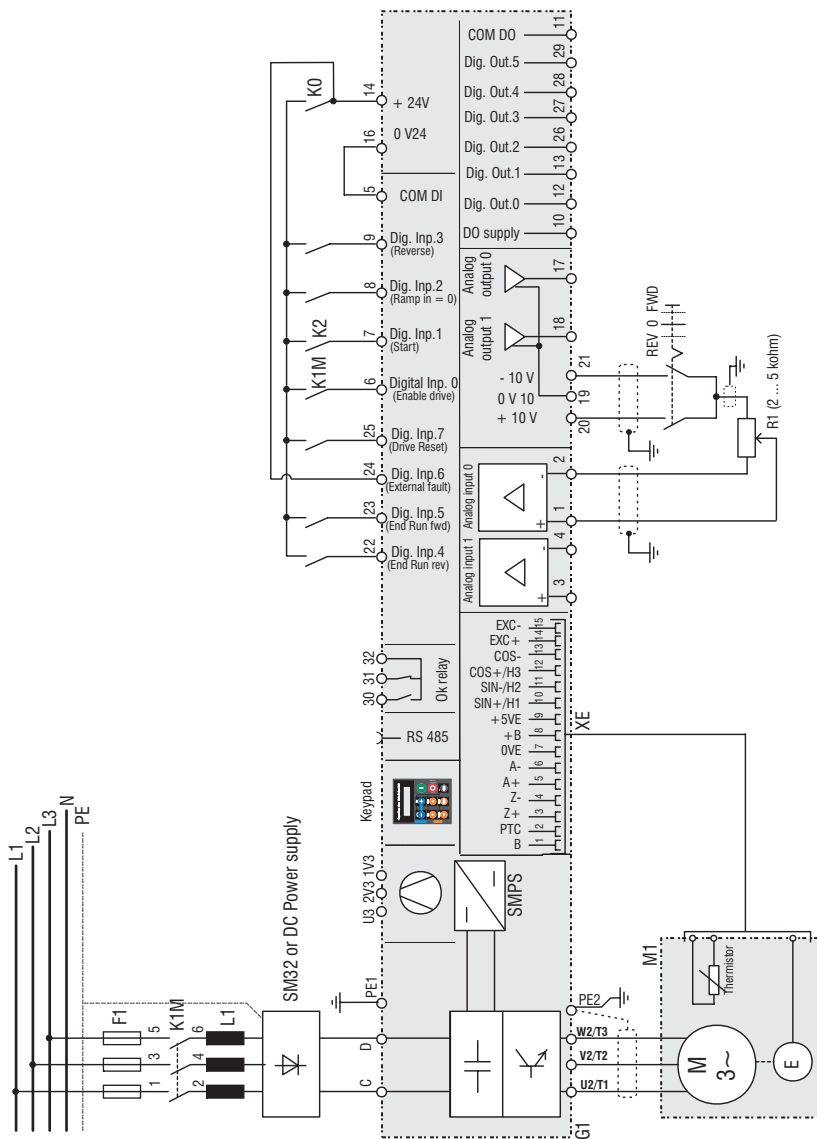
4.8.1 ARTDriveS Connections

Figure 4.8.1.1: Typical connection



The circuit diagram is for the standard configuration of the drive as delivered.
 EMC installation and wiring techniques are not shown.
 For this see appropriate chapter. The connection of option card is also shown separately.
 The automatic restart of the drive after a failure alarm is not included.
 Note! U3/2V3 and 1V3 only from sizes 75kW. For more details see chapter 4.2.1

Figure 4.8.1.2: Typical connection diagram for XVy-EV ...-DC versions.



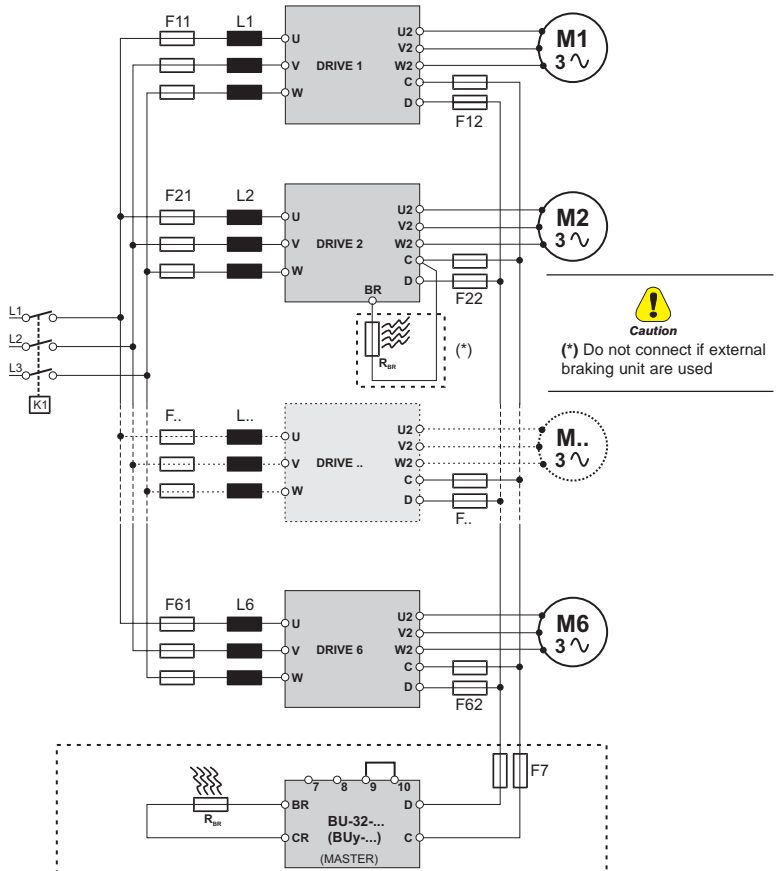
The circuit diagram is for the standard configuration of the drive as delivered. EMC installation and wiring techniques are not shown. For this see appropriate chapter. The connection of option card is also shown separately. The automatic restart of the drive after a failure alarm is not included.

4.8.2 Parallel Connection on the AC (Input) and DC (Intermediate Circuit) Side of Several Drives

Features and Limits:

- 1 The inverters used have to be all the same size.
- 2 AC line chokes (see chapter 4.10.1) 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 required, dissipate the braking power; it is necessary to use one internal "BU" braking unit (with external resistance) or one (or more) external braking units ("BU32-...", BUy...") of which one has to be configured as master and the others as slave.
- 6 Fast fuses (F12...F62) have to be fitted on the dc-link side (C and D terminals) of each inverters (see chapter 4.9.2).

Figure 4.8.2.1: Parallel Connection on the AC and DC Side of Several Drives



4.9 Circuit Protection

4.9.1 External Fuses for the Power Section

The drive must be fused on the AC Input side. Use fast fuses only. Connections with three-phase inductance on AC input are not essential but will improve the DC link capacitors lifetime and drive reliability in unusual power events.

Table 4.9.1.1: External Fuse Types for AC input side

Drive type XVy-EV	DC link capacitors life time [h]	F1 - Fuses type (Code)		
		Europe		America
		Connections without three-phase reactor		
10306	25000	GRD2/10 (F4D13) or Z14GR10 (F4M03)	A70P10	FWP10 (S7G49)
10408	25000	GRD2/16 (F4D14) or Z14GR16 (F4M05)	A70P20	FWP20 (S7G48)
10612	10000			
20816	25000	GRD2/20 (F4D15) or Z14GR20 (F4M07)	A70P20	FWP20 (S7G48)
21020	25000	GRD2/25 (F4D16) or Z14GR25 (F4M09)	A70P25	FWP25 (S7G51)
21530	10000	GRD3/35 (F4D20) or Z22GR40	A70P35	FWP35 (S7G86)
32040	25000	GRD3/50 (F4D21) or Z22GR40	A70P40	FWP40 (S7G52)
32550	10000	GRD3/50 (F4D21) or Z22GR50 (F4M15)	A70P40	FWP40 (S7G52)
43366 ... 8350460	10000	For these types an external reactor is mandatory if the AC input impedance is equal or less than 1%		
		Connections without three-phase reactor		
10306	50000	GRD2/10 (F4D13) or Z14GR10 (F4M03)	A70P10	FWP10 (S7G49)
10408	50000		A70P10	FWP10 (S7G49)
10612	50000	GRD2/16 (F4D14) or Z14GR16 (F4M05)	A70P20	FWP20 (S7G48)
20816	50000			
21020	50000	GRD2/20 (F4D15) or Z14GR20 (F4M07)	A70P20	FWP20 (S7G48)
21530	50000	GRD2/25 (F4D16) or Z14GR25 (F4M09)	A70P25	FWP25 (S7G51)
32040	50000	GRD3/50 (F4D21) or Z22GR40	A70P35	FWP35 (S7G86)
32550	50000	GRD3/50 (F4D21) or Z22GR50 (F4M15)	A70P40	FWP40 (S7G52)
43366	30000	GRD3/50 (F4D21) or Z22GR50	A70P50	FWP50 (S7G53)
43570	25000			
44590	25000	S00C+üf1/80/80A/660V or Z22gR80	A70P80	FWP80 (S7G54)
455110	25000	S00C+üf1/80/100A/660V or M00üf01/100A/660V (F4G18)	A70P100	FWP100 (S7G55)
570140	25000			
5100180	25000	S00C+üf1/80/160A/660V or M00üf01/160A/660V (F4E15)	A70P175	FWP175 (S7G57)
5S100180	25000			
6125230	25000			
6S125230	25000	S1üf1/110/250A/660V or M1üf1/250A/660V (F4G28)	A70P300	FWP300 (S7G60)
7145290	25000			
7190350	25000			
7S190350	25000			
7230420	25000	S2üf1/110/400A/660V or M2üf1/400A/660V (F4G34)	A70P400	FWP400 (S7G62)
7S230420	25000			
8280400	25000			
8350460	25000	S2üf1/110/500A/660V or M2üf1/500A/660V (F4G30)	A70P500	FWP500 (S7G63)
9470650-C	25000	S2üf1/110/630A/660V (F4E31)	A70P600	FWP600 (S7G65)
9470650-C-IP00	25000	S2üf1/110/630A/660V (F4E31)	A70P600	FWP600 (S7G65)
9560650-CP	25000	S2üf1/110/630A/660V (F4E31)	A70P600	FWP600 (S7G65)
9560650-CP-IP00	25000	S2üf1/110/630A/660V (F4E31)	A70P600	FWP600 (S7G65)

bv0150

Fuse manufacturers:

Type GRD2... (E27), GRD3... (E33), M... (blade fuses),	Jean Müller, Eltville
Z14... 14 x 51 mm, Z22... 22 x 58 mm, S...	Gould Shawmut
A70P...	Bussmann
FWP...	

NOTE!

The technical data of the fuses, e.g. dimensions, weights, heat dissipation, auxiliary contactors, are found in the manufacturers data sheets.

4.9.2 External Fuses for the Power Section DC Input Side

Use the following fuses when an external bus supply is used.

Table 4.9.2.1: External fuses type for DC input side

Drive type XVy-EV	Europe		America		
	Fuses type	Code	Fuses type		Code
10306	Z14GR10	F4M03	A70P10	FWP10A14F	S7G49
10408					
10612	Z14GR16	F4M05	A70P20-1	FWP20A14F	S7G48
20816					
21020	Z14GR20	F4M07	A70P20-1	FWP20A14F	S7G48
21530	Z14GR32	F4M11	A70P30-1	FWP30A14F	S7I50
32040	Z14GR40	F4M13	A70P40-4	FWP40B	S7G52
32550	Z22GR63	F4M17	A70P60-4	FWP60B	S7I34
43366	S00C+/üf1/80/80A/660V	F4EAF	A70P80	FWP80	S7G54
43570					
44590	S00C+/üf1/80/100A/660V	F4EAG	A70P100	FWP100	S7G55
455110	S00C+/üf1/80/125A/660V	F4EAJ	A70P150	FWP150	S7G56
570140	S00C+/üf1/80/160A/660V	F4EAL	A70P175	FWP175	S7G57
5100180	S00üF1/80/200A/660V	F4G23	A70P200	FWP200	S7G58
5S100180					
6125230	S1üF1/110/250A/660V	F4G28	A70P250	FWP250	S7G59
6S125230					
7145290	S1üF1/110/315A/660V	F4G30	A70P350	FWP350	S7G61
7190350	S1üF1/110/400A/660V	F4G34	A70P400	FWP400	S7G62
7S190350					
7230420	S1üF1/110/500A/660V	F4E30	A70P500	FWP500	S7G63
7S230420					
8280400					
8350460	S2üf1/110/630A/660V	F4E31	A70P600	FWP600	S7G65
9470670-DC-IP00	S3üF1/110/800A/660V	F4H02	A70P800	FWP800	S7813
9470650-C					
9470650-C-IP00					
9470650-C-DC-IP00					
9560800-DC-IP00					
9560650-CP					
9560650-CP-IP00					
9560650-CP-DC-IP00					

bxv0160

Fuse manufacturers:

Type Z14..., Z22, S00 ..., S1..., S2...
A70P...
FWP...

Jean Müller, Eltville
Gould Shawmut
Bussmann

Note!

The technical data of the fuses, e.g. dimensions, weights, heat dissipation, auxiliary contactors, are found in the manufacturers data sheets.

4.9.3 Internal Fuses

Table 4.9.3.1: Internal fuses

Drive type	Designation	Protection of	Fuse (source)	Fitted on:
43366 ... 9560800	F1	+24V	2A fast 5 x 20 mm (Bussmann: SF523220 or Schurter: FSF0034.1519 or Littlefuse: 217002)	Power card PV33-4 and higher
				Power card PV33-5 and higher
10306 ... 9560800	F1	+24V	Resettable fuse	Regulation card R-XVv and higher
7145290 ... 8350460	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)

tw0170

4.10 Chokes / Filters

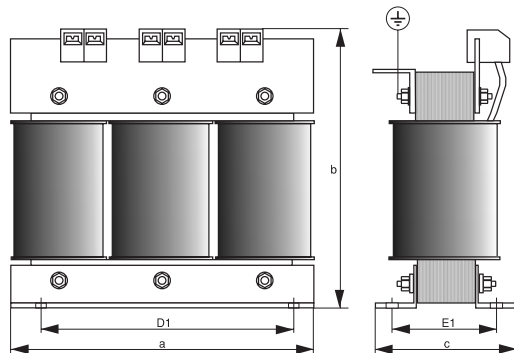
NOTE!

A three-phase inductance should be connected on the AC Input side in order to limit the input RMS current of ARTDriveS series drives. The inductance can be provided by an AC Input choke or an AC Input transformer. While the drive will work without the inductance, capacitor life will be shortened and general reliability will be less.

NOTE!

For the use of output sinusoidal filters, please contact the factory.

Figure 4.10.1: Input/output choke dimensions



4.10.1 AC Input Chokes

Table 4.10.1.1: 3-Phase AC Input Chokes

Drive type XVy-EV	Three-phases main chokes											
	Mains inductance [mH]	Rated current [A]	Saturat. current [A]	Freq. [Hz]	Model	Cod.	Weight kg (lbs)	Dimensions : mm (inch)				
								a	b	c	D1	E1
10306	3.69	3.7	7.4	50/60	LR3y-1015	S7AAE	1.8 (4.0)	120 (4.7)	125 (4.9)	65 (2.6)	100 (3.9)	45 (1.8)
10408	2.71	5.5	11	50/60	LR3y-1022	S7AAF	1.9 (4.2)					
10612	2.3	6.7	14	50/60	LR3y-1030	S7AB3						
20816	1.63	8.7	18	50/60	LR3y-2040	S7AAG	2 (4.4)					
21020	1.29	11.8	24.5	50/60	LR3y-2055	S7AB5	2.2 (4.4)	120 (4.7)	125 (4.9)	75 (2.6)	100 (3.9)	55 (2.2)
21530	0.89	17.4	36.5	50/60	LR3y-2075	S7AB6	4.9 (10.8)	150 (5.9)	155 (6.1)	79 (3.1)	90 (3.5)	54 (2.1)
32040	0.68	22.4	46.5	50/60	LR3y-3110	S7AB7	5 (11)	150 (5.9)	155 (6.1)	79 (3.1)	90 (3.5)	54 (2.1)
32550	0.51	30	61	50/60	LR3y-3150	S7AB8	6.2 (13.7)	150 (5.9)	168 (6.6)	100 (3.9)	90 (3.5)	69 (2.7)
43366	0.35	41	83	50/60	LR3-022	S7FF4	7.8 (17.2)	180 (7.1)	182 (7.2)	130 (5.1)	150 (5.9)	70 (2.8)
43570												
44590	0.24	58	120	50/60	LR3-030	S7FF3	9.5 (20.9)	180 (7.1)	160 (6.3)	170 (6.7)	150 (5.9)	80 (3.1)
455110	0.18	71	145	50/60	LR3-037	S7FF2	9.5 (20.9)	180 (7.1)	160 (6.3)	180 (7.1)	150 (5.9)	80 (3.1)
570140	0.13	102	212	50/60	LR3-055	S7FF1	12.5 (27.6)	240 (9.4)	215 (8.5)	180 (7.1)	150 (5.9)	80 (3.1)
5100180												
5S100180												
6125230												
6S125230	0.148	173	350	50/60	LR3-090	S7D19	55 (121.3)	300 (11.8)	265 (10.4)	210 (8.3)	250 (9.8)	85 (3.3)
7145290												
7190350												
7S190350												
7230420	0.085	297	600	50/60	LR3-160	S7D40	44 (97.0)	300 (11.8)	270 (10.6)	260 (10.2)	250 (9.8)	120 (4.7)
7S230420												
8280400												
8350460												
8350460	0.085	380	710	50/60	LR3-200	S7AE9	54 (119)	300 (11.8)	270 (10.6)	355 (13.9)	250 (9.8)	130 (5.1)
9470670	0.06	550	1050	50/60	LR3-315	S7D28	110 (242.5)	375 (14.8)	545 (21.5)	255 (10)	250 (9.8)	133 (5.2)
9470650-C												
9560800												
9560650-CP												

inv0180

For all the sizes an input choke is strongly recommended 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 impedance AC mains ($\leq 1\%$).

Note!

The current rating of these inductors (reactors) is based on the nominal current of standard motors, listed in table 2.3.2.1 in section 2.3.2, "AC Input/Output Connection".

4.10.2 Output Chokes

For motors with long cable runs (typically over 30 m [98.5 feet]) an output choke is recommended to maintain the voltage waveform within the specified limits. Suggested choke ratings and part numbers are listed in table 4.10.2.1.

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 4.10.2.1: Recommended values for output chokes

Drive type XVy-EV	Three-phases output choke										
	Mains inductance	Rated current	Saturat. current	Model	Cod.	Weight kg (lbs)	Dimensions : mm (inch)				
	[mH]	[A]	[A]				a	b	c	D1	E1
10306	1.4	9.5	20	LU3-001	S7FG1	2.7 (6.0)	120 (4.7)	128 (5.0)	71 (2.9)	100 (3.9)	54 (2.1)
10408	1.4	9.5	20	LU3-003	S7FG2	5.2 (11.5)	180 (7.1)	170 (6.7)	110 (4.3)	150 (5.9)	60 (2.4)
10612											
20816	0.87	16	34	LU3-005	S7FG3	5.8 (12.8)	180 (7.1)	170 (6.7)	110 (4.3)	150 (5.9)	60 (2.4)
21020											
21530	0.51	27	57	LU3-011	S7FG4	8 (17.6)	180 (7.1)	180 (7.1)	130 (5.1)	150 (5.9)	70 (2.8)
32040											
32550	0.43	32	68	LU3-015	S7FM2	7.5 (16.5)	180 (7.1)	160 (6.3)	170 (6.7)	150 (5.9)	70 (2.8)
43366	0.33	42	72	LU3-022	S7FH3	8 (17.6)	180 (7.1)	160 (6.3)	170 (6.3)	150 (5.9)	70 (2.8)
43570											
44590	0.24	58	100	LU3-030	S7FH4	9.5 (20.9)	180 (7.1)	160 (6.3)	180 (7.1)	150 (5.9)	80 (3.1)
455110	0.18	76	130	LU3-037	S7FH5	9.7 (21.4)	180 (7.1)	160 (6.3)	180 (7.1)	150 (5.9)	80 (3.1)
570140	0.12	110	192	LU3-055	S7FH6	14 (30.9)	240 (9.4)	210 (8.3)	180 (7.1)	200 (7.9)	80 (3.1)
5100180											
5S100180											
6125230	0.07	180	310	LU3-090	S7FH7	18.5 (40.8)	240 (9.4)	210 (8.3)	200 (7.9)	200 (7.9)	80 (3.1)
6S125230											
7145290											
7190350	0.041	310	540	LU3-160	S7FH8	27.5 (60.6)	300 (11.8)	260 (10.2)	240 (9.4)	250 (9.8)	90 (3.5)
7S190350											
7230420											
7S230420											
8280400											
8350460				LU3-200	S7AF0	Please contact the nearest Gefran-Siei office					
9470670	0.022	580	1100	LU3-315	S7FH9	95 [209.4]	380 [15.0]	500 [10.7]	310 [12.2]	250 [9.8]	134 [5.3]
9470650-C											
9560800											
9560650-CP											

bxv0190

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. Slightly less drop will occur at 60Hz.

4.10.3 Interference Suppression Filters

ARTDriveS drives must be equipped with an external EMI filter in order to reduce the radiofrequency emissions on the mains line as required for operation in Europe.

The filter selection is depending on the drive size and the installation environment.

For more information, see the “EMC guide” on the cd-rom included.

In the Guide it is also indicated how to install the drive in an enclosure (connection of filter and mains reactors, cable shield, ground, etc.) in order to make it EMC compliant according the EMC Directive 89/336/EEC. The document describes the present situation concerning the EMC standards and the compliance tests made on the drives as required by CE.

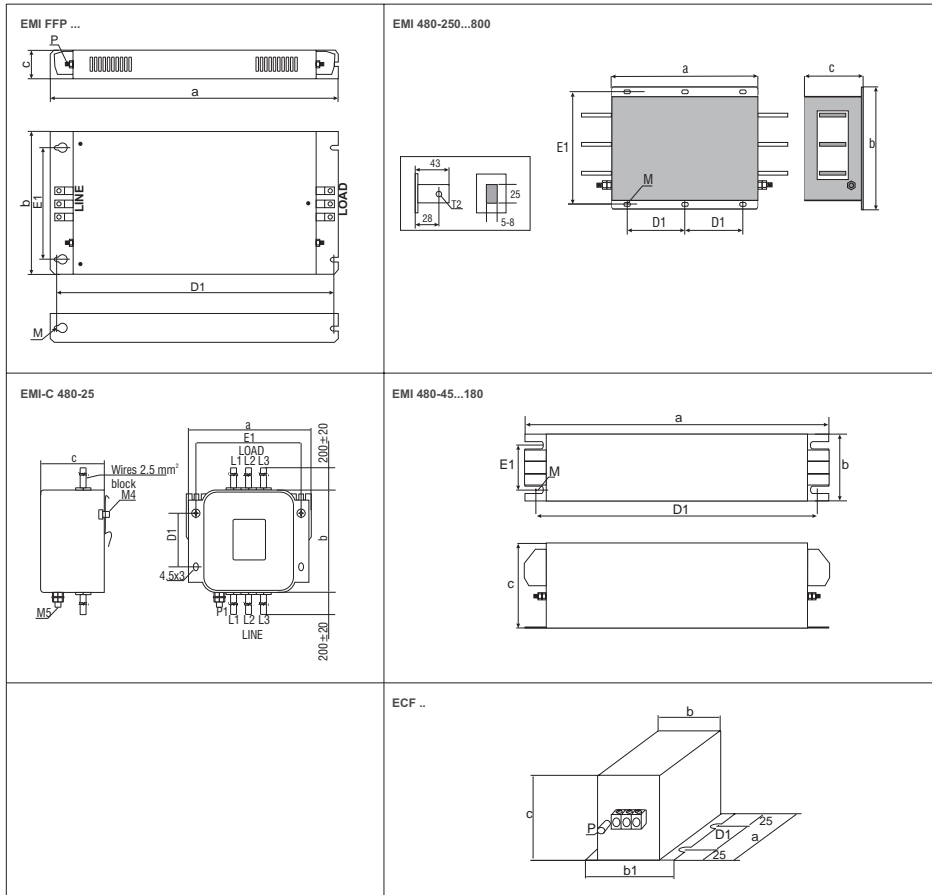
Table 4.10.3.1: Recommended EMI filters

Drive type XVy-EV	Class	Model	Cod.	Weight kg (lbs)	Dimensions : mm (inch)									
					a	b	c	d	D1	E1	R	P	M	
					Mains supply : 230 - 400V ±15%									
10306 ... 10612	(2)	EMI FFP 480-9	S7DEQ	1.1 (2.4)	375 (14.8)	104 (4.1)	45 (1.8)	-	360 (14.2)	59 (2.3)	-	M5	Ø6	
20816 ... 21530	(2)	EMI FFP 480-24	S7DER	1.4 (3.1)	375 (14.8)	150 (5.9)	45 (1.8)	-	360 (14.2)	105 (4.1)	-	M5	Ø6	
32040	(2)	EMI FFP 480-30	S7DES	1.6 (3.5)	390 (15.4)	200 (7.9)	45 (1.8)	-	375 (14.8)	155 (6.1)	-	M5	Ø6	
32550	(2)	EMI FFP 480-40	S7DET	2.3 (5.1)	390 (15.4)	200 (7.9)	45 (1.8)	-	375 (14.8)	155 (6.1)	-	M5	Ø6	
43366 ... 43570	(3)	EMI 480-45	S7DFU	1.3 (2.9)	250 (9.8)	85 (3.3)	90 (3.5)	-	235 (9.3)	60 (2.4)	-	-	M6	
44590 ... 455110	(3)	EMI 480-70	S7DFZ	2.6 (5.7)	270 (10.6)	90 (3.5)	150 (5.9)	-	255 (10.0)	65 (2.6)	-	-	M6	
570140 ... 5S100180	(3)	EMI 480-100	S7DGA	2.6 (5.7)	270 (10.6)	90 (3.5)	150 (5.9)	-	255 (10.0)	65 (2.6)	-	-	M6	
6125230 - 6S125230	(3)	EMI 480-150	S7DGB	4.4 (9.7)	400 (15.7)	120 (4.7)	170 (6.7)	-	365 (14.4)	102 (4.0)	-	-	M6	
7145290	(3)	EMI 480-180	S7DGC	4.4 (9.7)	400 (15.7)	120 (4.7)	170 (6.7)	-	365 (14.4)	102 (4.0)	-	-	M6	
7190350 - 7S190350	(3)	EMI 480-250	S7DGG	13 (28.7)	300 (11.8)	260 (10.2)	135 (5.31)	-	120 (4.72)	235 (9.25)	-	-	M10	
7230420 - 7S230420	(3)	EMI 480-250	S7DGG	13 (28.7)	300 (11.8)	260 (10.2)	135 (5.31)	-	120 (4.72)	235 (9.25)	-	-	M10	
8280400	(3)	EMI 480-320	S7DGH	13.2 (29.1)	300 (11.8)	260 (10.2)	135 (5.31)	-	120 (4.72)	235 (9.25)	-	-	M10	
8350460	(3)	EMI 480-400	S7DGI	13.4 (29.5)	300 (11.8)	260 (10.2)	135 (5.31)	-	120 (4.72)	235 (9.25)	-	-	M10	
9470650-C	(3)	EMI-480-600	S7DGL	40 (88.2)	300 (11.8)	260 (10.2)	135 (5.31)	-	120 (4.72)	235 (9.25)	-	-	M10	
9560800	(3)	EMI-480-800	S7DGM	40 (88.2)	350 (13.8)	280 (11.0)	150 (5.9)	-	145 (5.7)	255 (10.0)	-	-	M10	
9560650-CP	(3)	EMI-480-800	S7DGM	40 (88.2)	350 (13.8)	280 (11.0)	150 (5.9)	-	145 (5.7)	255 (10.0)	-	-	M10	
Mains supply : 460 - 480 +10%														
10306 ... 10612	(2)	EMI FFP 480-9	S7DEQ	1.1 (2.4)	375 (14.8)	104 (4.1)	45 (1.8)	-	360 (14.2)	59 (2.3)	-	M5	Ø6	
20816 ... 21530	(2)	EMI FFP 480-24	S7DER	1.4 (3.1)	375 (14.8)	150 (5.9)	45 (1.8)	-	360 (14.2)	105 (4.1)	-	M5	Ø6	
32040	(2)	EMI FFP 480-30	S7DES	1.6 (3.5)	390 (15.4)	200 (7.9)	45 (1.8)	-	375 (14.8)	155 (6.1)	-	M5	Ø6	
32550	(2)	EMI FFP 480-40	S7DET	2.3 (5.1)	390 (15.4)	200 (7.9)	45 (1.8)	-	375 (14.8)	155 (6.1)	-	M5	Ø6	
43366 ... 43570	(3)	EMI 480-45	S7DFU	1.3 (2.9)	250 (9.8)	85 (3.3)	90 (3.5)	-	235 (9.3)	60 (2.4)	-	-	M6	
44590	(3)	EMI 480-55	S7DFV	2 (4.4)	250 (9.8)	85 (3.3)	90 (3.5)	-	235 (9.3)	60 (2.4)	-	-	M6	
455110	(3)	EMI 480-70	S7DFZ	2.6 (5.7)	270 (10.6)	90 (3.5)	150 (5.9)	-	255 (10.0)	65 (2.6)	-	-	M6	
570140 ... 5S100180	(3)	EMI 480-100	S7DGA	2.6 (5.7)	270 (10.6)	90 (3.5)	150 (5.9)	-	255 (10.0)	65 (2.6)	-	-	M6	
6125230 ... 7145290	(3)	EMI 480-150	S7DGB	4.4 (9.7)	400 (15.7)	120 (4.7)	170 (6.7)	-	365 (14.4)	102 (4.0)	-	-	M6	
7190350 - 7S190350	(3)	EMI 480-180	S7DGC	4.4 (9.7)	400 (15.7)	120 (4.7)	170 (6.7)	-	365 (14.4)	102 (4.0)	-	-	M6	
7230420 - 7S230420	(3)	EMI 480-250	S7DGG	13 (28.7)	300 (11.8)	260 (10.2)	135 (5.31)	-	120 (4.72)	235 (9.25)	-	-	M10	
8280400	(3)	EMI 480-250	S7DGG	13 (28.7)	300 (11.8)	260 (10.2)	135 (5.31)	-	120 (4.72)	235 (9.25)	-	-	M10	
8350460	(3)	EMI 480-400	S7DGI	13.4 (29.5)	300 (11.8)	260 (10.2)	135 (5.31)	-	120 (4.72)	235 (9.25)	-	-	M10	
9470650-C	(3)	EMI-480-600	S7DGL	40 (88.2)	300 (11.8)	260 (10.2)	135 (5.31)	-	120 (4.72)	235 (9.25)	-	-	M10	
9560800	(3)	EMI-480-600	S7DGL	40 (88.2)	300 (11.8)	260 (10.2)	135 (5.31)	-	120 (4.72)	235 (9.25)	-	-	M10	
9560650-CP	(3)	EMI-480-600	S7DGL	40 (88.2)	300 (11.8)	260 (10.2)	135 (5.31)	-	120 (4.72)	235 (9.25)	-	-	M10	
Mains supply : 230 - 400V ±15%, 460 - 480 +10%														
10306 ... 32040	(1), (2)	EMI-C 480-25	S7DFA	0.96 (2.1)	105 (4.1)	100 (3.9)	57 (2.2)	-	57 (2.2)	95 (3.7)	-	M5	4.5x3	
Mains supply : 400V ±10%														
10306 ... 9560650-CP	(4)	ECF1	F4ZZ1		150 (5.9)	70 (2.76)	55 (2.17)	-	100 (3.94)	-	-	M5	-	
Mains supply : 500V ±10%														
10306 ... 9560650-CP	(4)	ECF3	F4ZZ2		150 (5.9)	85 (3.3)	120 (4.72)	-	100 (3.94)	-	-	M6	-	

bv0195

- (1): Drive/motor cable lengths max 5 metres.
- (2): EN61800-3, 1st environment restricted distribution, conducted emission.
- (3): EN61800-3, 2nd environment unrestricted distribution, conducted emission.
- (4): EN61800-3, 2nd environment restricted distribution, conducted emission.

Figure 4.10.3.1: Filter dimension

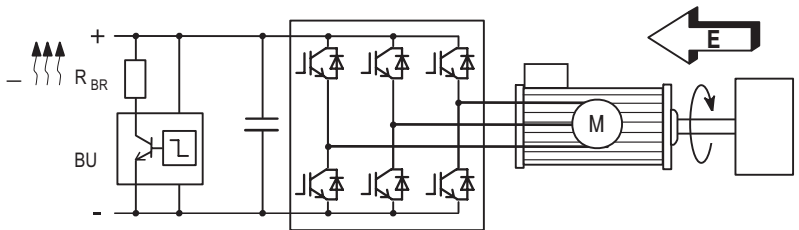


4.11 Braking Units

In regenerative operation, the frequency-controlled three-phase motor feeds energy back to the DC link circuit via the drive. This creates an increase in the intermediate circuit voltage.

Braking units (BU) are therefore used in order to prevent the DC voltage rising to a value causing the drive to trip. When used, these activate a braking resistor that is modulated across 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 four-quadrant operation.

Figure 4.11.1: Operation with Braking Unit (Principle)



All ARTDriveS drives can be equipped with an external braking unit (BU-32.xx... or BUy-....) connected to terminals C (+Bus) and D (-Bus).

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.



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 presence of a protection contact, such contact has to be used together with the one belonging to the thermal protection device.

4.11.1 Internal Braking Unit

Drive sizes XVy-EV 10306 up to XVy-EV 32550 have, as standard configuration, an internal braking unit.

Drive sizes XVy-EV 43366 up to XVy-EV 5100180 can have an optional internal braking unit factory mounted.

Table 4.11.1.1: Technical data of the internal braking units

Drive type XVy-EV	I_{RMS} [A]	I_{PK} [A]	T [s]	Minimum R_{BR} [ohm]
10306 ...20816	4.1	7.8	19	100
21020 ... 21530	6.6	12	16	67
32040	12	22	17	36
32550	17	31	16	26
43366 - 43570	18	52	42	15
44590	37	78	23	10
455110	29	78	37	10
570140 ... 5S100180	50	104	22	7.5
6125230 ... 9560650	External braking unit (optional)			

txv0260

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

4.11.2 Internal and External Braking Resistors

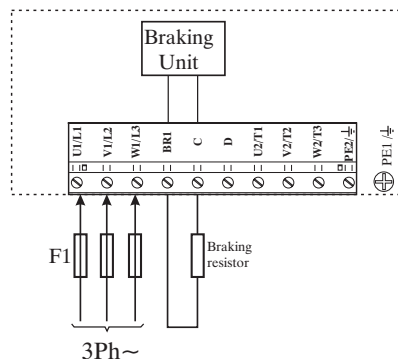
The ARTDriveS drives, up to size XVy-EV 32550, are equipped with an Internal Braking Resistor according to the following table:

Drive Type	Resistor Type	P_{NBR} [W]	R_{BR} [Ohm]	E_{BR} [kJ]
10306 ...10612	CBR-100R	100	100	11
21020 ... 21530	CBR-67R	150	67	11
32040	RF11300-36R	200	36	16
32550	RF11300-26R	200	26	16

txv0225

For bigger sizes, the braking resistor is optional and has always to be mounted externally. For parameter settings refer to the section 10, **BRAKING RES** menu. The figure below shows the configuration for internal brake unit operation.

Figure 4.11.2.1: Connection with internal Braking Unit and external braking resistor



If the application requires to use an External Braking Resistor, it is necessary to follow the recommended external resistors to be used with drives internal braking units:

Table 4.11.2.1: Lists and technical data of the external standard resistors

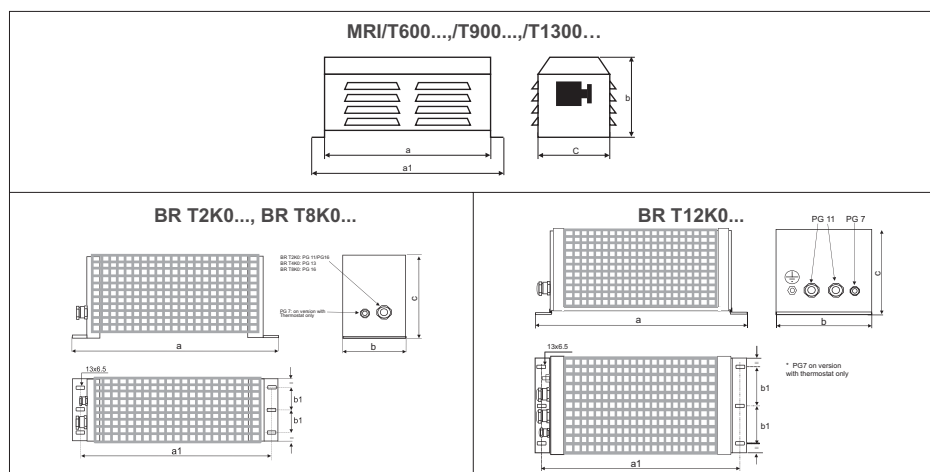
XVy-EV	P _{NBR} [kW]	R _{BR} [Ohm]	E _{BR} [kJ]	Resistor Type	Cod.	Weight kg (lbs)	Dimensions : mm (inch)				
							a	b	c	a1	b1
10306 ... 20816	0.6	100	22 (1)	MRI/T600 100R	S8SS3	1.5 (3.3)	320 (12.6)	120 (4.7)	100 (3.9)	360 (14.2)	
21020 ... 21530	0.9	68	33 (1)	MRI/T900 68R	S8SS2	2.7 (6.0)	320 (12.6)	160 (6.3)	120 (4.7)	380 (15.0)	
32040	1.3	49	48 (1)	MRI/T1300 49R	S8ST4	3.7 (8.2)	320 (12.6)	320 (12.6)	120 (4.7)	380 (15.0)	
32550	2.1	28	20 (2)	BR T2K0-28R	S8T00F	6.2 (13.7)	625 (24.6)	100 (3.9)	250 (9.8)	605 (23.8)	40 (1.6)
43366 ... 43570	4	15.4	40 (2)	BR T4K0-15R4	S8T00G	7.0 (15.4)	625 (24.6)	100 (3.9)	250 (9.8)	605 (23.8)	40 (1.6)
44590 ... 455110	4	11.6	40 (2)	BR T4K0-11R6	S8T00H	7.0 (15.4)	625 (24.6)	100 (3.9)	250 (9.8)	605 (23.8)	40 (1.6)
570140 ... 5100180	8	7.7	40 (2)	BR T8K0-7R7	S8T00I	11.5 (25.)	625 (24.6)	160 (6.3)	250 (9.8)	605 (23.8)	60 (2.4)

trv0250

(1): Max overload, 30"-duty 25%,

(2): 10 * P_n * 1" each 10" or 5 * P_n * 10" each 120"

Figure 4.11.2.2: External resistors



Warning

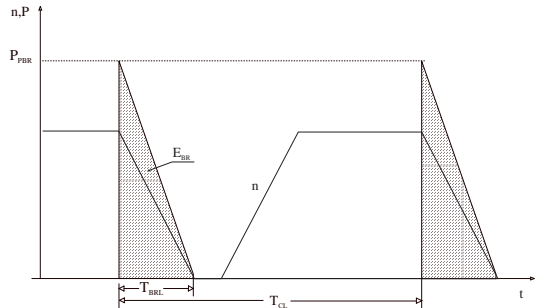
When using an external resistor, remove the connections of the internal braking resistor from terminals BR1 and C and connect the two wires together using the proper faston.

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 4.11.2.3: 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 Overpower** alarm occurs if the duty cycle exceeds the maximum data allowed in order to prevent possible damage to the resistor.

Resistor model: Standard resistor data

Example code: MRI/T900 68R

MRI = resistor type

900 = nominal power (900 W)

T= with safety thermostat

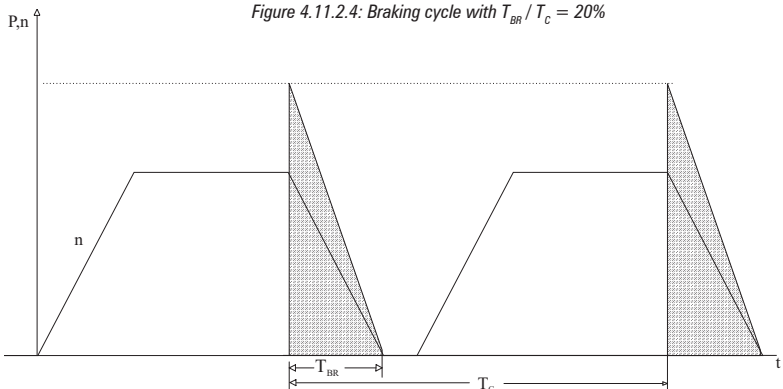
68R = resistor value (68 ohm)

NOTE!

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

Where: T_{BR} = Braking time
 T_c = Cycle time

Figure 4.11.2.4: Braking cycle with $T_{BR} / T_c = 20\%$



These resistors, whose technical data are reported in the table 4.11.2.1, have been sized to tolerate an overload equal to 4 times their nominal power for 10 seconds.

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

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

Where: V_{BR} = braking unit threshold

With reference to the figure 4.11.2.3, where the power profile is the typical triangular one, the following example can be taken into consideration (see also table 4.11.2.1).

Resistor model: MRI/T600 100R

Nominal power $P_{NBR} = 600 [W]$

Maximum energy $E_{BR} = 4 \times 600[W] \times 10[s] = 24000[J]$

Inverter mains supply = 460V

Voltage threshold: $V_{BR} = 780V$

$$P_{PBR} = \frac{V_{BR}^2}{R_{BR}} = \frac{780^2}{100} = 6084 [W] \quad T_{BRL} = 2 \frac{E_{BR}}{P_{PBR}} = 2 \frac{24000}{6084} = 7.8[s]$$

It is necessary to consider the following relation:

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

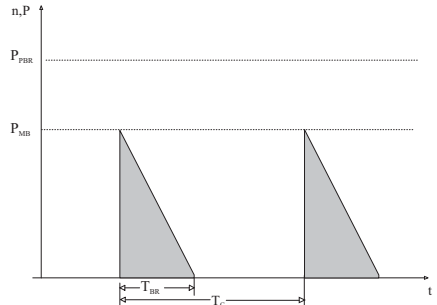
1) $P_{MB} < 2 * E_{BR} / T_{BR}$ Where: P_{MB} is the maximum cycle power (see figure 4.11.2.5)

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

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 $P_{MB} < P_{NBR}$

Figure 4.11.2.5: Generic braking cycle with triangular profile



If one of the above mentioned rules is not respected, it is necessary to increase the nominal power of the resistor, respecting the limit of the internal braking unit as stated in the table 4.11.1.

Generally the following condition must be satisfied

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

4.11.3 Control of the External Braking Power

The braking resistance average power is defined by the following formula:

$$P = 0.2 \cdot J_{tot} \cdot \omega^2 \cdot f$$

where: P = Dissipated power
 J_{tot} = Total inertia (Kg m^2)
 ω = Max speed (rad/sec)
 f = Cycle frequency in Herz (number of cycles per second).
 $f = 1/T_{BR}$ (sec)

4.11.4 External Resistance Interaction with the System Parameters

When the external braking resistance is installed it is always necessary to carry out some modifications in the parameters.
 See chapter 10, BRAKING RES menu for further details.

4.11.5 Choice of the Thermal Relay for Brake Resistor

Here is a procedure aimed at stating the coordination of a thermal relay for the protection of the resistor bank in case of a sudden component failure (not detected), when the DC bus power supply is continuously connected to the braking resistance.

It is important to remember that the drives are supplied with a I^2t function for the resistor bank protection; such a function is in a position to avoid any possible overload but it cannot protect against component failure that might render impossible the logical control of the braking resistor current.

As stated in the dimensioning procedure for the bus braking system, the resistor bank has, with a given ambient condition, a possible instantaneous overload defined as

$$\begin{matrix} E_{max_BR} & \text{in [Joule]} & \text{or as a product given by} \\ P_{max_BR} & \times T_{max_BR} & \text{[Joule]} \end{matrix}$$

supplied by the producer of the resistor. Such parameters are able to define the resistor overload possibility in case of continuous maximum power peaks.

According to E_{max_BR} and to the peak power value, which the resistor bank is subject to, $P_{PBR} = V_{BR}^2 / R_{BR}$ (V_{BR} = 780 V, default) the maximum time for the peak power application is calculated as

$$T_{\max BR} = E_{\max BR} / P_{PBR}$$

Furthermore, the peak current on the resistors is

$$I_{PK} = V_{BR} / R_{BR}$$

Therefore, the time/current curves of the thermal relays must have an overload ratio requiring a thermal relay intervention time lower than $T_{\max BR}^*$

Given that K , the overload ratio obtained from the curves, the current value to which the thermal relay has to be set is:

$$I_{term} = I_{PK} / K$$

Now it is necessary to check that the product $V_{BR} \times I_{term}$ is higher than the average power, which can be dissipated on the resistor bank; such value is stated during the dimensioning procedure of the braking system. In case the above-mentioned conditions are not satisfied, it is necessary to use a thermal relay with a time/current feature able to obtain a K factor lower than the one stated above.

The thermal relays to be used are those coordinated for the protection of three-phase motors. In this case it is advisable to use all the three contacts which have to be connected in series to be able to break the substantial DC voltage involved.

4.12 Buffering the Regulator Supply

When no external power supply is available on the terminals 15 and 16 of the regulation card, the power supply of the control section is derived from a switching power supplier (SMPS) of 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 on 11 kW drive and higher) by connecting external capacitors in parallel (on terminal C (+ bus) and D(- bus)).

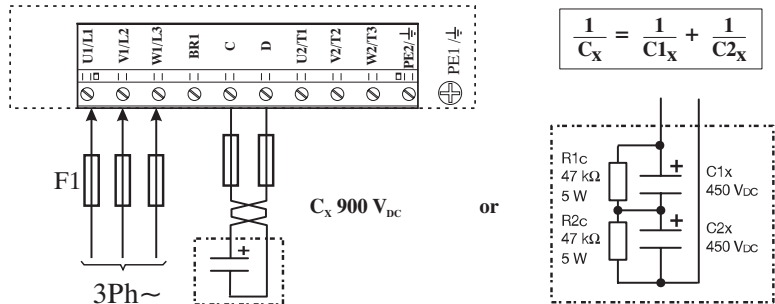
Table 4.12.1: DC Link Buffer Time

XVy-EV	Internal capacitance C_{std} [μF]	Buffer time t_{Buff} (minimum value) with the internal capacitance at :		Maximum permissible external capacitance C_{ext} [μF]	Maximum power required by switched mode power supply P_{SMPS} [W]
		AC Input voltage =400V [s]	AC Input voltage =460V [s]		
10306	220	0.165	0.25	0	65
10408	330	0.24	0.37	0	65
10612	330	0.24	0.37	0	65
20816	830	0.62	0.95	0	65
21020	830	0.62	0.95	0	65
21530	830	0.62	0.95	0	65
32040	1500	1.12	1.72	1500	65
32550	1500	1.12	1.72	1500	65
43366	1800	1.54	2.3	4500	70
43570	1800	1.54	2.3	4500	70
44590	2200	1.88	2.8	4500	70
455110	3300	2.83	4.2	4500	70
570140	4950	4.24	6.3	4500	70
5100180	4950	4.24	6.3	4500	70
6125230	6600	5.6	8.1	0	70
7145290	6600	5.6	8.1	0	70
7190350	9900	8.4	12.1	0	70
7230420	14100	12.8	17.2	0	70
8280400	14100	12.8	17.2	0	70
8350460	14100	12.8	17.2	0	70
9470670	29700	12.1	36.4	0	140
9470650	29700	12.1	36.4	0	140
9560800	56400	12.1	36.4	0	140
9560650	56400	12.1	36.4	0	140

SMPS = Switched Mode Power Supply

bxv0270

Figure 4.12.1: Buffering the Regulator Supply by Means of Additional Intermediate Circuit Capacitors



Note!

When connecting the intermediate circuit terminals C and D the AC Input side **must** be protected with superfast semiconductor fuses! Formula for calculating the size of the external capacitors:

$$C_{\text{ext}} = \frac{2 \cdot P_{\text{SMPS}} \cdot t_{\text{Buff}} \cdot 10^6}{U_{\text{Buff}}^2 - U_{\text{min}}^2} - C_{\text{std}} \quad \text{fA018}$$

C_{ext}	C_{std}	[μF]	
P_{SMPS}		[W]	$U_{\text{Buff}} = 400 \text{ V}$ at $U_{\text{LN}} = 400 \text{ V}$
t_{Buff}		[s]	$U_{\text{Buff}} = 460 \text{ V}$ at $U_{\text{LN}} = 460 \text{ V}$
U_{Buff}	U_{min}	[V]	$U_{\text{min}} = 250 \text{ V}$

Calculation example

A XVy-EV 43570 drive is operated with an AC Input supply $U_{\text{LN}} = 400 \text{ V}$. A voltage failure buffer is required for max. 1.5 s.

P_{SMPS}	70 W	t_{Buff}	1.5 s
U_{Buff}	400 V	U_{min}	250 V
C_{std}	1800 μF		

$$C_{\text{ext}} = \frac{2 \cdot 70 \text{ W} \cdot 1.5 \text{ s} \cdot 10^6 \mu\text{F} / \text{F}}{(400 \text{ V})^2 - (250 \text{ V})^2} - 1800 \mu\text{F} = 2154 \mu\text{F} - 1800 \mu\text{F} = 354 \mu\text{F}$$

4.13 Discharge Time of the DC-Link

Table 4.13.1: DC Link Discharge Time

XVy-EV	I _{2N}	Time (seconds)
10306	3.5	90
10408	4.9	150
10612	6.5	
20816	8.3	
21020	12.1	205
21530	15.4	
32040	23.1	220
32550	29.7	
43366	34	60
43570	41	
44590	55	
455110	69	90
570140	81	120
5100180	110	
6125230	124	
7145290	161	
7190350	183	
7230420	218	
8280400	282	
8350460	348	
9330660	485	300
9470650	485	
9560800	580	
9560650	580	

bxv0280

This is the minimum time that must be elapsed when a ARTDriveS drive is disconnected from the AC Input before an operator may service parts inside the drive to avoid electric shock hazard.

CONDITION

The value consider the time to turn-off for a drive supplied at 480Vac +10%, without any options, (the loads on the switching supply are the regulation card, the keypad and the 24Vdc fans "if mounted"). The drive is disconnected from the line. This represents the worst case condition.

Chapter 5 - Sizing Criteria

Because of the high performance obtained by the drive/brushless motor set, the dynamic performance of the entire system is strongly influenced by the mechanics of the system itself.

In particular, the following considerations are important:

- the degree of precision depends on the sensor and not on the motor
- the response speed depends on the transmission rigidity (mechanical passband)
- the system audible noise, sometimes very strong, does not depend on the motor and/or on the electronics, but on a mechanical design which is not suitable for the required performance.
- the motor noise is due to continuous acceleration and braking. In such conditions, motor overheating may occur, which may not be due to a too-small motor.
- the passband controlling the drive depends on the mechanics, as it is not possible to stabilize the electronics to a period less than 3 times the ring time of the system mechanical oscillations.

The choice of the mechanical transmission must be carried out, therefore, according to the application. In mandrel applications, with significant transmitted power and marginal dynamic performance, common reducer transmissions are used. In this case, that is the optimum economical choice.

In case of axis applications, where the system dynamic performance is fundamental, the required torque is often equal to the sum of the motor and load inertial torques. The use of a reduction ratio in the transmission reduces, on one side, the load inertia influence, but, on the other, it increases the motor side. In such applications, therefore, direct coupling is normally used.

With direct coupling, the system dynamics are influenced by the shaft torsional rigidity and by the relative resonance frequency. The drive and motor are capable of much higher bandwidth than the mechanics. After choosing the motor and the transmission, it is necessary to check the application.

In case of applications whose speed and load are constant or variable for periods longer than the motor time constant, it is sufficient to check that the maximum load is within the capacity limits stated for the motor and the drive.

On the contrary, in applications where the load changes according to a faster cycle, do the following:

- Trace a cycle speed/time diagram, remembering that the reaching of a precise position or speed value requires, apart from the time set by the system limit accelerations, a settling period equal to 3 times the period of the system passband.
- Refer the system inertia and loads back to the motor axis.
- Calculate the acceleration cycle and the cycle of the relative inertial

torques.

- State the cycle torque/time diagram by adding the inertial torques to the loads.
- Calculate from the torque/time diagram the cycle effective torque. If the cycle is made up of n duration segments t_1, t_2, \dots, t_n , and of their corresponding torques C_1, C_2, \dots, C_n , the cycle effective torque is given by:

$$C_{eff} = \sqrt{\frac{C_1^2 t_1 + C_2^2 t_2 + \dots + C_n^2 t_n}{t_1 + t_2 + \dots + t_n}}$$

- Calculate, with the same formula, the average quadratic speed.
- Calculate the cycle average torque.
- Calculate the maximum duration period of the cycle maximum torque.
- Calculate the torque required with the cycle maximum speed.
- Calculate the cycle maximum torque.

The motor and the electronic have to be checked on the basis of the obtained data.

5.1 Motor Check

The motor check phases are:

- check of the peak torque
- thermal Sizing
- electrical Sizing

Check of the demagnetization current

Such control is performed by comparing directly the maximum value of the peak current, which is obtained using the following formula, and the motor demagnetization current.

$$I_{pk} = \sqrt{2} \frac{C_{pk}}{K_t}$$

where:

$$\begin{aligned} C_{pk} &= \text{cycle peak torque} \\ K_t &= \text{motor torque constant} \end{aligned}$$

Check of the thermal sizing

Check first that the point C_{eff}, ω_{eff} is within the area of the motor continuous operating range.

In particular, calculate the motor temperature increase, given by the relation:

$$\Delta T_{max} = \frac{65}{L_n} \left[\left(\frac{C_{eff}}{T_n} \right)^2 L_n + \left(\frac{\omega_{eff}}{\omega_n} \right)^2 L_0 \right]$$

where:

$$\begin{aligned} L_n &= \text{motor rated losses} \\ T_n &= \text{motor rated torque} \\ \omega_n &= \text{motor rated speed} \end{aligned}$$

L_o = motor rated losses in ω_n

If the maximum temperature is higher than the motor maximum, a bigger motor is needed.

Check of the electric sizing

In this case, it is necessary to check that at maximum speed, the voltage required by the motor is lower or equal to that supplied by the drive with the minimum expected power supply voltage. The following relation must be satisfied:

$$V_{max} = \sqrt{\left(K_e \omega_{pk} + R_w \frac{C_{pk}}{K_t}\right)^2 + \left(\frac{C_{pk}}{K_t} \frac{P_N}{2} \omega_{pk} L_w\right)^2} \leq E_{min}$$

where:

E_{min} = minimum voltage supplied by the drive
 K_e = motor voltage constant
 ω_{pk} = cycle maximum speed
 R_w = motor terminal to terminal resistance
 C_{pk} = cycle maximum torque
 K_t = motor torque constant
 P_N = motor pole number
 L_w = motor terminal to terminal inductance

If such condition is not satisfied, it is necessary to choose a motor with a winding suitable for a higher speed; in this case a higher current will be needed.

5.2 Check of the Drive Size

The drive size is chosen according to the torque to be supplied to the motor with a specific winding, from where the needed energy is derived. The peak and average currents required by the drive are provided by:

$$I_{max} = \frac{C_{pk}}{K_t} \quad I_{ave} = \frac{C_{ave}}{K_t}$$

where:

C_{pk} = cycle maximum torque
 C_{ave} = cycle average torque
 K_t = motor torque constant

The drive must be in a position to develop continuous and peak currents higher than the calculated values; remember that the drive maximum current must be compared to I_{max} only if the relative time is lower than 2 seconds; if not, the drive must have a rated current higher than I_{max} .

5.3 Application Example: Flying Cut

Consider a continuous belt moving cutter.

The cutter is mounted on a carriage. The belt speed is 5 m/s.

The cutter must, with a command, increase its speed till reaching the belt, get synchronized with the belt speed, keep such speed for 300 ms (cutting time T_t), brake and return to the rest position.

The total stroke of the cutter carriage is 5 m. The cutter weighs 80 kilos plus the motor weight.

As the mechanical transmission system is rather complex, it is necessary to provide a speed stabilization time T_{st} with transients to about 150 ms.

The cutting space with a constant speed is given by:

$$S_t = V_t \times (T_t + T_{st}) = 5 \times (300 \times 10^{-3} + 150 \times 10^{-3}) = 2.25 \text{ m}$$

The carriage will run across the remaining space during its acceleration and deceleration phase. If these two spaces are equal:

$$S_{acc} = S_{dec} = (S_{tot} - S_t) / 2 = (5 - 2.25) / 2 = 1.375 \text{ m}$$

The average speed during the acceleration is:

$$V_{med} = V_{max} / 2 = 5 / 2 = 2.5 \text{ m/s}$$

The acceleration and deceleration times are:

$$T_{acc} = S_{acc} / V_{med} = 1.375 / 2.5 = 550 \text{ ms}$$

The acceleration (and deceleration) is:

$$a = V_{max} / T_{acc} = 5 / 0.55 = 9.091 \text{ m/s}^2$$

Assuming that the motor weight is about 20 kilos, the required inertial power is:

$$F = a \times (M_{carr} + M_{mol}) = 9.091 \times (80 + 20) = 909.091 \text{ N}$$

The total semi-cycle time is:

$$T_{sc} = 2 \times T_{acc} + T_{st} + T_t = 2 \times 0.550 + 0.150 + 0.300 = 1.55 \text{ s}$$

The transmission is carried out via a pinion and a rack. The pinion dimensions are:

diameter	Dp = 40 mm
length	hp = 30 mm

The speed, acceleration and inertia brought to the motor axis are:

Speed: $\omega_{max} = V_{max} / (Dp/2) = 5 / (0.04/2) = 250 \text{ rad/s}$

Acceleration: $m_a = a / (Dp/2) = 9.091 / (0.04/2) = 454.545 \text{ rad/s}^2$

Inertia: $J = M_{tot} \times (Dp/2)^2 = 100 \times (0.04/2)^2 = 0.04 \text{ kgm}^2$

The pinion inertia is given by:

$$Jp = (Dp/2)^4 \times h_p \times \pi \times \delta = 5.806 \times 10^{-5} \text{ Kgm}^2$$

where δ is the density of the material forming the pinion (steel).

Check now a SBM75.30.3 motor with an inertia of 0.0017 kgm².

The total inertia is:

$$J_{tot} = J + J_p + 0.0017 = 0.04 + 5.806 \times 10^{-5} + 0.0017 = 0.0417 \text{ kgm}^2$$

Assuming a pinion efficiency equal to 0.95, the maximum torque (overload) required to the motor is:

$$C_{max} = m_a \times J_{tot} / 0.95 = 454.545 \times 0.0417 / 0.95 = 19.98 \text{ Nm}$$

The average (continuative) and effective torques are therefore, supposing null the torque at constant speed:

$$C_{med} = C_{max} \times T_{acc} \times 2 / T_{sc} = 14.179 \text{ Nm}$$

$$C_{eff} = C_{max} \times (2 \times T_{acc} / T_{sc})^{1/2} = 16.832 \text{ Nm}$$

As the cycle effective torque is higher than the motor rated torque at nominal speed, a motor of a bigger size must be chosen.

Repeating the operations for a SBM77.30.3 motor with an inertia of 0.0023 kgm², the obtained average torque is 14.383 Nm while the effective torque is 17.073 Nm. The motor is therefore suitable for the application with a high margin, considering that its nominal torque at nominal speed is 18.8 Nm.

Given the torque constant $K_t = 1.50$, the average and maximum current absorbed by the motor are:

$$I_{max} = C_{max} / K_t = 12.8 \text{ A}_{rms}$$

$$I_{med} = C_{med} / K_t = 9.09 \text{ A}_{rms}$$

The drive size to be used with the present application is therefore XVy-EV 21020.

Chapter 6 - Maintenance

6.1 Care

The drives of the XVy series 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.

6.2 Service

The screws of all terminals on the drive 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 drives, it is advisable to supply power to the drives for at least two hours in order to regain the capacitor original ratings.

To this purpose apply an input voltage **without applying any load on the output**.

After these steps, the drive is ready to be installed without limits.

6.3 Repairs

Repairs of the drive should only be carried out by qualified personnel (suggested 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 drive type but also the drive serial number. It is also useful to state the type of the regulation card and the system software version.
- When changing the cards ensure that the positions of switches and jumpers are observed!

6.4 Customer Service

For customer service, please refer to your Gefran-Siei office.

Chapter 7 - Settings and Commissioning

7.1 PC Configurator

The configurator E@syDrives is a program supplied together with the product.

Its installation requires a PC with MS Windows ® 95/98/ME/XP or Windows NT®4/2000 system, with minimum 8 Mb RAM.

The configurator communicates with the drive using the Slink-3 protocol.

Together with the drive parameterization, the configurator allows downloading the firmware in order to create some personalized applications using the MDPIc development environment.

7.2 Commissioning

Before powering up the drive, carry out the following verifications:

- Check the connections with the line L1, L2, L3
- Check the connections with the motor U, V, W
- Check the breaking resistance connection (if present)
- Check the connections between the encoder and XE connector
- Check the input connection 24Vdc (if present)
- Check the I/O connections
- Check all the drive and motor ground connections

After having checked as shown above, it's possible now to power the drive; then check:

- Line voltage (max permissible voltage 480Vac + 10%)
- Voltage of the intermediate circuit DC bus (270-350 for input voltage 230Vac, 480-650Vdc for input voltage 400Vac, 432-528 for input voltage 480Vac; if the measured voltage is not in the indicated range, check the line voltage)

7.2.1 Connection with the PC

The drive is delivered from the factory with a standard configuration in the speed mode. The input and output state is already programmed as in the following example; therefore user is able to start up the drive control and run the motor immediately (when used a motor series SBM with encoder sin.cos at 2048 p/r).

To perform the correct parameter settings, it's necessary to use the configurator E@syDrives. Connect the drive to your PC using the serial communication as suggested in the manual; check that the termination resistance switch is on the 120 ohm position.

E@syDrives configurator

- 1) Install the E@syDrives application from the attached CD-rom (setup.exe, in E@syDrives folder).
- 2) Install the XVyBasic application from the attached CD-rom (setup.exe, in XVyBasic folder).
- 3) From Windows Start / Programs / SIEI PC Tools menu run the E@syDrives command to start the configurator.

4) Select ARTDriveS - XVy



5) Select XVy Brushless Servodrive



If the PC is connected to the drive via the serial link, the programme recognises the size of the drive and the firmware version. Otherwise, a window is displayed to modify the connection settings. Alternatively, it is possible to continue by selecting “OFFLINE”, when the parameter file (the Basic firmware versions installed will be displayed, e.g. “V.4.12 Basic”) and the size of the drive must be selected manually.



6) At this point there are 2 options:

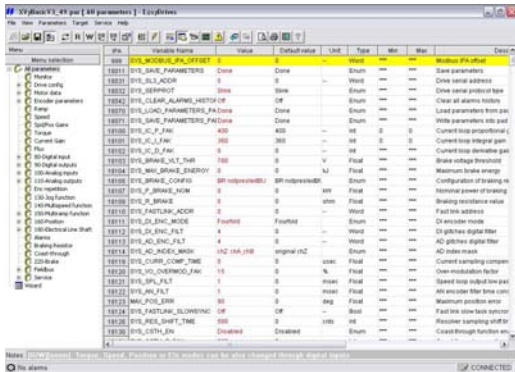
Setup XVy using Wizard:

A guided procedure for easy setup of the drive: windows will open from which the basic setup of the drive, the motor, the loop current, the control method and feedback.



Edit the XvY parameter list

For expert users, a list is displayed of all parameters resident in the drive: the data are subdivided into several windows and into Windows-type tree-structure menus.



7.2.2 Essential Parameters Set up

The essential parameters to check before starting the motor are:

MENU

MONITOR
DRIVE CONFIG
MOTOR DATA
ENCODER PARAM

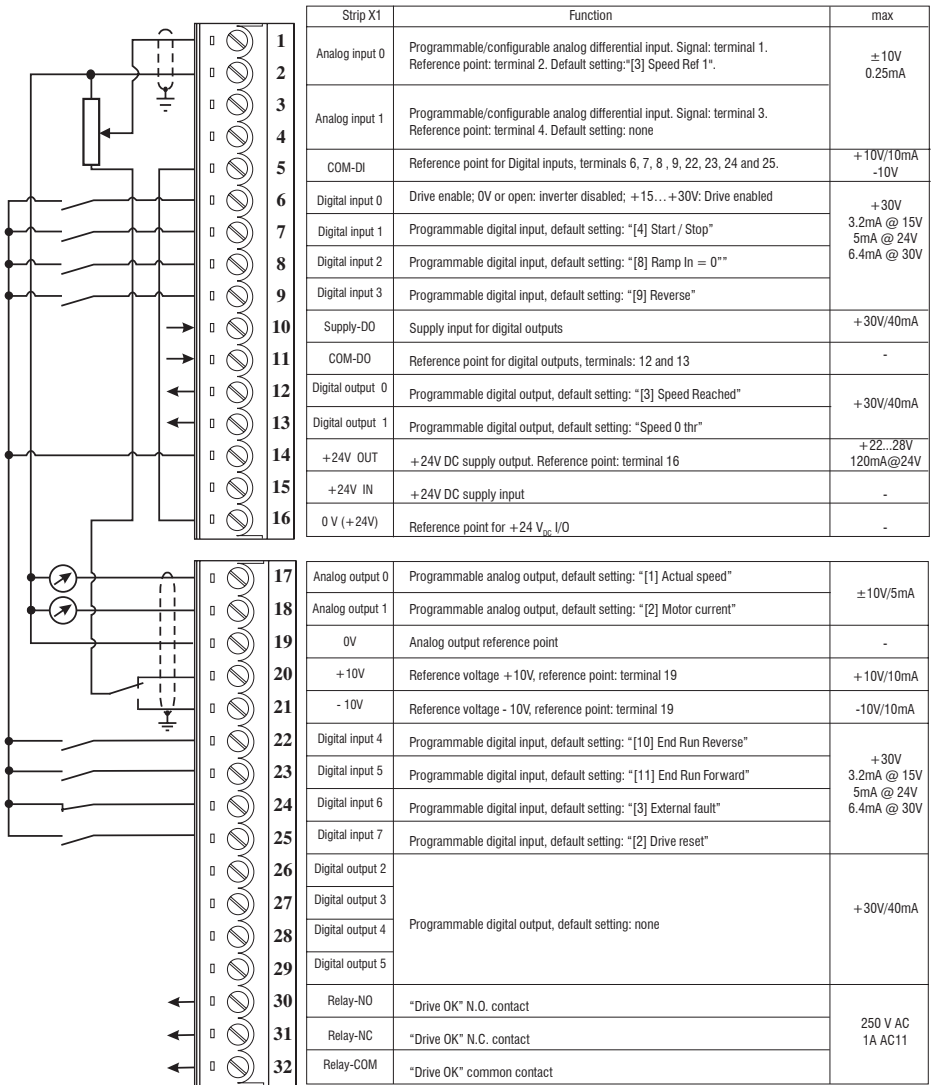
SPEED

PARAMETER

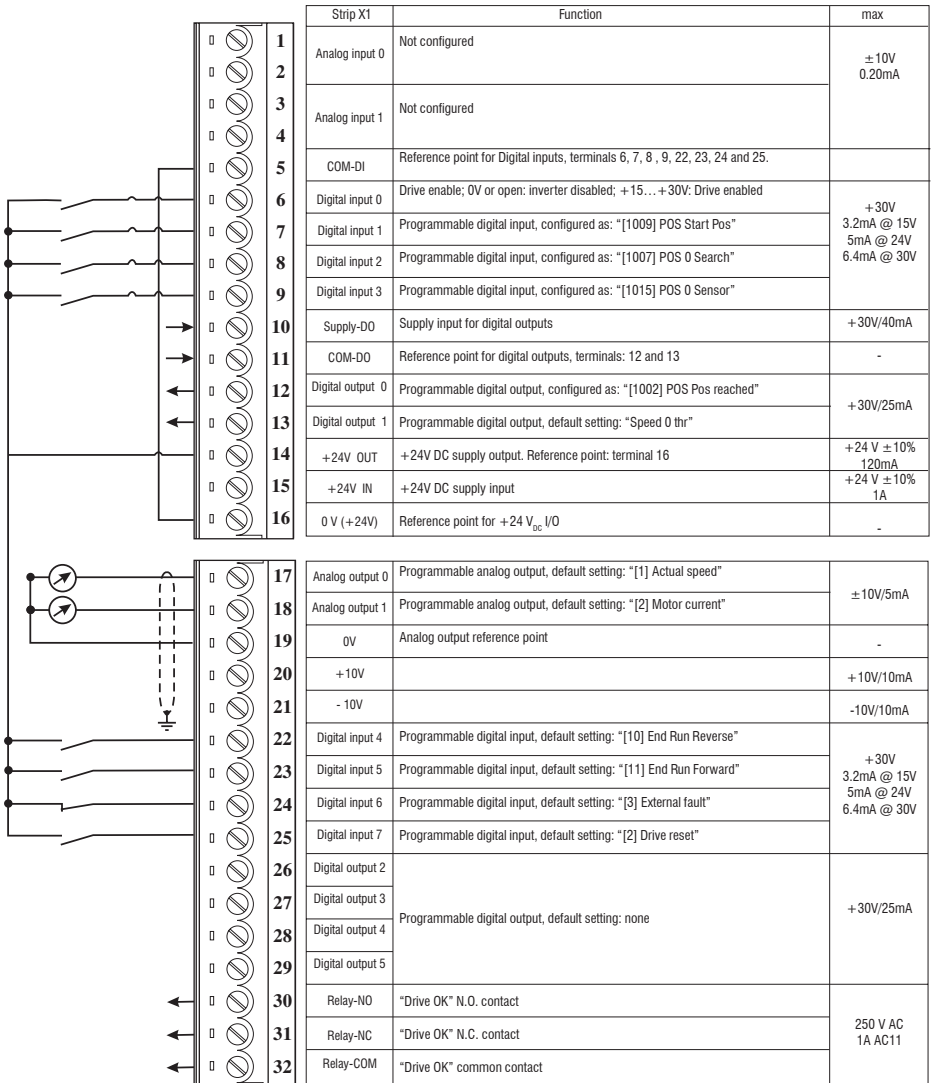
IPA 20003, **Drive size**
IPA 20000, **Drive Max Curr**
IPA 20002, **Motor poles**
IPA 20010, **XE Enc Type**
IPA 20011, **XE Enc ppr**
IPA 20012, **XE Enc Supply**
IPA 20003, **Full Scale Speed**

It's now possible to enable the drive and rotate the motor in the function of the inputs configuration and setup. As an example three types of configurations are described.

7.2.3 Speed Mode Configuration Example



7.2.4 Position Mode Configuration Example



7.2.5 Electrical Line Shaft Mode Configuration Example

Strip X1		Function	max
1	Analog input 0	Not configured	±10V 0.20mA
2			
3	Analog input 1	Not configured	
4			
5	COM-DI	Reference point for Digital inputs, terminals 6, 7, 8, 9, 22, 23, 24 and 25.	
6	Digital input 0	Drive enable; 0V or open: inverter disabled; +15...+30V: Drive enabled	+30V 3.2mA @ 15V 5mA @ 24V 6.4mA @ 30V
7	Digital input 1	Programmable digital input, configured as: "[4] Start / Stop"	
8	Digital input 2	Programmable digital input, configured as: "[2001] ELS Ratio Sel B0"	
9	Digital input 3	Programmable digital input, configured as: "[2002] ELS Ratio Sel B1"	
10	Supply-DO	Supply input for digital outputs	+30V/40mA
11	COM-DO	Reference point for digital outputs, terminals: 12 and 13	-
12	Digital output 0	Programmable digital output, configured as: "Speed 0 thr"	+30V/25mA
13	Digital output 1	Programmable digital output, not configured	
14	+24V OUT	+24V DC supply output. Reference point: terminal 16	+24 V ±10% 120mA
15	+24V IN	+24V DC supply input	+24 V ±10% 1A
16	0 V (+24V)	Reference point for +24 V _{DC} I/O	-
17	Analog output 0	Programmable analog output, default setting: "[1] Actual speed"	±10V/5mA
18	Analog output 1	Programmable analog output, default setting: "[2] Motor current"	
19	0V	Analog output reference point	-
20	+10V		+10V/10mA
21	-10V		-10V/10mA
22	Digital input 4	Programmable digital input, configured as: "[2003] ELS Inc Ratio"	+30V 3.2mA @ 15V 5mA @ 24V 6.4mA @ 30V
23	Digital input 5	Programmable digital input, configured as: "[2004] ELS Dec Ratio"	
24	Digital input 6	Programmable digital input, default setting: "[3] External fault"	
25	Digital input 7	Programmable digital input, default setting: "[2] Drive reset"	
26	Digital output 2	Programmable digital output, default setting: none	+30V/25mA
27	Digital output 3		
28	Digital output 4		
29	Digital output 5		
30	Relay-NO	"Drive OK" N.O. contact	250 V AC 1A AC11
31	Relay-NC	"Drive OK" N.C. contact	
32	Relay-COM	"Drive OK" common contact	

7.3 Download Firmware

The standard firmware loaded at the factory is an application called Basic.

The Basic Application Firmware consists of 2 files:

- the firmware (XVyBasicVX_XX.sre)
- the parameter file, the user's tool for the drive tuning (XVyBasicVX_XX.par).

The firmware upgrade can be performed making reference to the following points.

1. Open the E@syDrives configurator.
2. Select the used drive in the displayed window and enable the communication with the drive via the "Target/connect" menu.
3. Open the parameter file of the old firmware version
4. Read all parameters through the "Read All" command in the "Parameter" menu
5. Perform the Browse command via the "Service / Load firmware" menu.
6. The XVyBasicVX_XX.sre file of the last version is default (*) stated; choose this file and perform the Load command.

() In case it is not found, search the .sre file with the Browser button (the file is default located in the path \Programs\SIE\PC Tools\E@syDrives\XVyBasic\Vx.xx\Service).*

7. Now the firmware download is active; the display shows the quantity of data (Byte number) which are being transferred.
8. Reset the drive with the configurator reset command or disable and afterwards enable again the 24 VDC voltage.
9. Perform the "Load default drives values" command via the "Parameters" menu and answer yes to the question "Save them into target?".
10. Reset the drive using the configurator "reset" command or switch the device off and then on again.
11. The firmware update is now over; the user can reload the parameters via the "Write All" command in the "Parameter" menu or he can tune the drive

Upgrade from version 3.XX to version 4.XX

The XVy-EV drive is not compatible with 3.X versions.

It is therefore not possible to load firmware earlier than version 4.X onto this drive.

7.4 Automatic Electric Phasing Procedure for Encoder/Resolver

The knowledge of the right phase relation between the current and the motor magnetic angle is fundamental for the drive performances.

The simple electric and automatic phasing sequence of the XVy drive allows to store the phasing angle in a drive parameter (electric phasing) in order to constantly supply precise information about the phase of the position/speed motor feedback (encoder/resolver).

Such procedure has to be performed every time the XVy drive is used with NON-Gefran-Siei motors. All Gefran-Siei motors, on the contrary, are factory-phased (mechanical phasing).

Before performing the automatic electric phasing, it is advisable to check the encoder/resolver connections (as described in the paragraph "Encoder Control/Drive Connections") and the power/U-V-W phase sequence connections.

Note! The following procedure must be performed using incremental encoders with zero pulse.

If using an encoder without zero pulse the procedure cannot be completed and will be aborted as unsuccessful.

Procedure

If this procedure is performed using the software of the E@syDrives configurator, the following sequence has to be respected:

1. Start the software of the E@syDrives configurator (from the Windows Start menu)
2. Enable the "MONITOR Window" function
3. Display in MONITOR Window the **Enc Mech Offset** (IPA 20058) parameter and the **Enc Offset** (IPA 20057) parameter (from the Service->Phasing menu)
4. Remove any mechanical coupling from the motor shaft, so that it can move freely
5. Set the **Mot Nominal Curr** (IPA 20001) parameter, with the value referring to the motor rated current (from the TUNING / PHASING menu)
6. Set the **Application Sel** (IPA 18140) parameter as "Phasing" (from the TUNING menu)
7. Save the parameters (Command "Save parameters" (*)).
8. Perform the command "Drive Reset" or switch the drive off and on again
9. Enable the drive using the Digital 0 Input
10. Check that the drive performs a current ramp till the limit set in the **Mot Nominal Curr** (IPA 20001) parameter while the motor rotor carries out a small movement
11. After a few seconds the motor starts rotating and stops in a fixed position after performing a revolution. If the motor is SIEI-marked, make sure that it rotates in a clockwise direction (from the motor shaft side); with NON- Gefran-Siei, motors, check the wiring on the power cables between the drive and the motor.

The counting of the encoder/revolver must increase (see 4.4.5

"Encoder Control/Drive Connections" paragraph) during the motor rotation.

12. Check the value of the **Enc Mech Offset** (IPA 20058) parameter keeping the drive enabled. If the motor has been supplied by Gefran-Siei, the parameter value has to be near the zero (values in the range of ± 4 degrees are allowed) because Gefran-Siei motors are factory phased (mechanically) with the XVy-EV Gefran-Siei drives.
13. Perform the command "Save parameters" (*) by keeping the drive enabled. The current value of the phasing angle is stored in the **Enc Mech Offset** (IPA 20058) parameter
14. Disable the drive
15. Set the **Application Sel** (IPA 18140) parameter (from the SERVICE menu) with the original selection "Basic" (factory default) or "Plc"
16. Save the parameters (command "Save parameters" (*))
17. Use the command "Drive Reset" or switch the drive off and on again

At the end of this electric and automatic phasing procedure, it is suggested to configure the XVy drive with a speed mode and to check the motor functioning procedure.

(*) it is possible to run "Save parameters" in the following ways:

- Ctrl+Alt+S
- from the Parameters menu
- "Save parameters into target" key

Chapter 8 - Keypad Operation

8.1 Keypad Description



The keypad consists of an LCD display with two lines of 16 characters each, seven LEDs and nine function keys.

It is used to:

- control operation, when this user option is selected (DRIVE CONFIG / KEYPAD, **Enable I-O Keys** IPA20022 = Keys Enabled)
- display speed, voltage, diagnostics, etc., during operation
- set parameters








8.1.1 LED

The LEDs meaning can be summarized as follows:

- | | |
|---------------------------|-------------------------------------------------------------------------------------------------------------------|
| - Torque (yellow) | This LED is ON when the drive is running with negative torque. |
| + Torque (yellow) | This LED is ON when the drive is running with positive torque. |
| Alarm (red) | This LED starts to blink in case of a fault condition of the drive. During normal operation this LED will be OFF. |
| • Enable (green) | This LED is ON when the drive is power supplied and enabled. |
| ZeroSpeed (yellow) | This LED is ON when the motor speed is zero. |
| LIMIT (yellow) | This LED is ON if the drive reaches its torque limit. During normal operation this LED will be OFF. |

8.1.2 Function Keys

The keypad has nine function keys with different modes defined by the state of the keypad itself.

Control Keys	Text reference	Function
	START	START key commands the drive to Enable and Start The Enable I-O Keys parameter must be enabled (DRIVE CONFIG / KEYPAD menu)
	STOP	STOP key commands to Stop and disable; holding it for 2 seconds disables the drive. The Enable I-O Keys parameter must be enabled (DRIVE CONFIG / KEYPAD menu).
	+ [Jog] (*)	The "plus" key increases the reference velocity for the Motor pot. function [Jog, when the Shift key is pressed first]. See paragraph 8.2
	- [Rotation control] (*)	The "minus" key reduces the reference velocity for the Motor pot. function [Control of direction of rotation. When the Shift key is pressed, it changes the motor direction of rotation (in Jog mode and in Motor pot function)]. See paragraph 8.2
	Down [Help]	Used to scroll down menu items in menu navigation, picklists in selectors, or digit values in numeric editing. [After pressing Shift key, an item-specific information menu is entered when applicable]
	Up [Alarm]	Used to scroll up menu items in menu navigation, picklists in selectors, or digit values in numeric editing. [After pressing Shift key, the Alarm list display mode is entered. Active alarms and Alarms pending for acknowledge can be browsed with Up / Down arrows keys. Left arrow key returns to normal mode.
	Left [Escape]	Used to go down one level in menu navigation; to scroll digits in numeric edit mode, to return to normal mode from alarm list or Help modes. [After pressing Shift key, it is used to Escape out of numeric edit or selection with no change].
	Enter [Home]	Used to go up one level in menu navigation; to enter Selections or numeric values after editing, to issue commands, to acknowledge alarms in the Alarm list mode. [Home second function, return to Monitor menu from any main menu level].
	Shift	Shift button enables the keypad second functions (Rotation control, Jog, Help, Alarm, Escape, Home)

[...] Secondary function. Press **Shift** to activate these functions.

(*) The Jog and + / - keys (Motor potentiometer) can be activated only when the speed and current are displayed (press Left in the Monitor menu)

8.1.3 Display - Using keypad

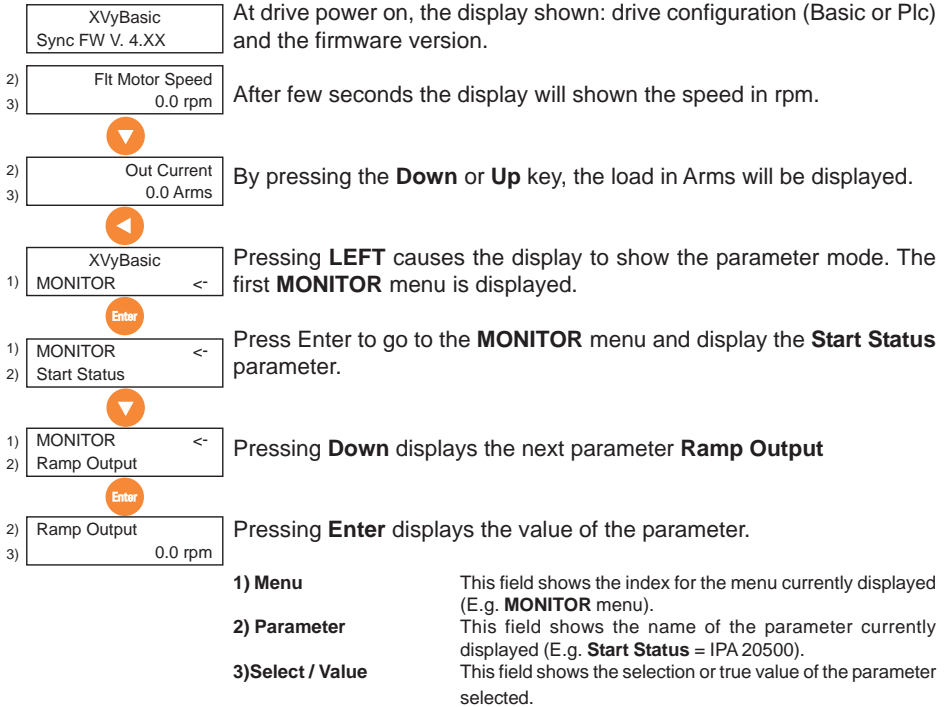
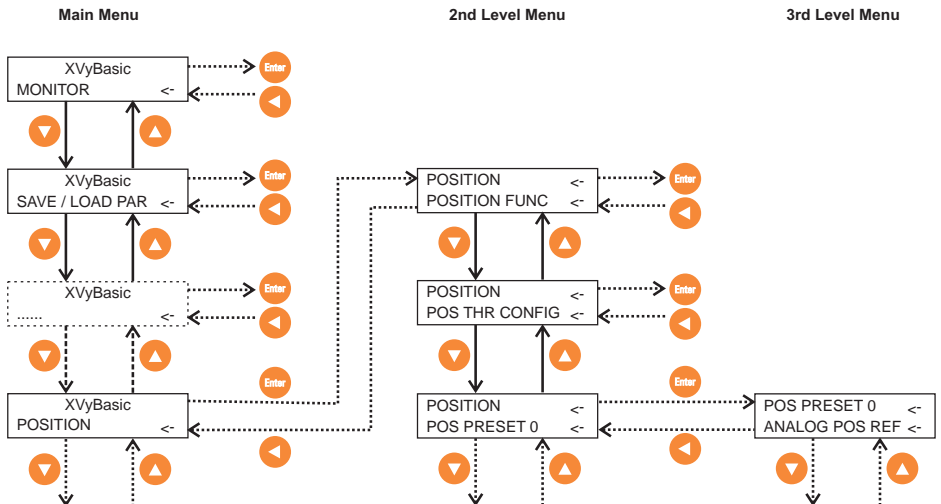


Figure 8.1.3.1: Navigation within the menus



Full list of menus and parameters in chapter 10.

8.2 Keypad operations

Changing parameters

- XVyBasic
DRIVE CONFIG <-

Enter

1 From the DRIVE CONFIG menu, press **Enter**.
- Drive config <-
KEYPAD <-

Enter

2 Press **Down** three times to select the **Mains Voltage** parameter.
- Drive config <-
Mains Voltage

▼ X 3

3 Press **Enter**
- Mains Voltage
460/480 Vrms

Enter

4 Press **Enter**, the cursor will start blinking.
- Mains Voltage
460/480 Vrms █

Enter

5 Set the voltage values using the **Up** or **Down** keys.
- MAIN VOLTAGE
380 Vrms

▼ ▲

6 Press **Enter**
- MAIN VOLTAGE
380 Vrms

Enter

Saving parameters

- XVyBasic
SAVE / LOAD PAR <-

Enter

1 From the SAVE / LOAD PAR menu, press **Enter**.
- SAVE / LOAD PAR <-
Save parameters

Enter

2 Press **Enter** again to save the settings.
- SAVE / LOAD PAR
Save now

Enter

3 The display will show the confirmation messages "Save now" and "Save done."
- SAVE / LOAD PAR
Save done.

Enter

4 When the operation is complete, the display will show **Save Parameters** again.
- SAVE / LOAD PAR <-
Save Parameters

Enter

Loading default parameters

The default parameters relate to the size of the drive, which is not modified by this operation.

- | | | |
|------------------------------------------------------------------------|---|----------------------------------------------------------------------------------------------------|
| <div>XVyBasic
SAVE / LOAD PAR <-</div> <div>Enter</div> | 1 | From the SAVE / LOAD PAR menu, press Enter . |
| <div>SAVE / LOAD PAR <-
Save parameters</div> <div>▼</div> | 2 | Press the Down key to select the Load Default Par parameter. |
| <div>SAVE / LOAD PAR <-
Load Default Par</div> <div>Enter</div> | 3 | Press Enter |
| <div>SAVE / LOAD PAR
Load now</div> | 4 | The display will show the confirmation messages "Load now" and "Load done." |
| <div>SAVE / LOAD PAR
Load done.</div> | | |
| <div>SAVE / LOAD PAR <-
Load Default Par</div> | 5 | When the operation is complete, the display will show the Load Default Par parameter again. |

Reset alarms and drives

See section 8.3.1.

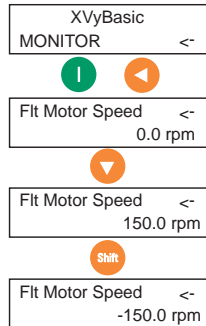
Jog function

The drive should be enabled: + 24Vdc at terminal 6.

- | | | |
|-----------------------------------------------------------------|---|-----------------------------------------------------------------------------------------------------------|
| <div>XVyBasic
MONITOR <-</div> <div>⏮ ⏭</div> | 1 | From the MONITOR menu, press Start to activate, then press Left |
| <div>Flt Motor Speed <-
0.0 rpm</div> <div>▼</div> | 2 | The speed display is enabled (or press Down or Up , to enable current display). |
| <div>Flt Motor Speed <-
150.0 rpm</div> <div>Shift</div> | 3 | Press Shift to enable the secondary functions, then press + to increase the reference speed |
| <div>Flt Motor Speed <-
-150.0 rpm</div> | 4 | Press - to revert the rotation direction and press + to decrease the reference speed |

Motor potentiometer function

The drive should be enabled: + 24Vdc at terminal 6.



- 1 From the MONITOR menu, press **Start** to activate, then press **Left**
- 2 The speed display is enabled (or press **Down** or **Up**, to enable current display)
- 3 Press **+** to increase the reference speed.
- 4 Press **Shift** to enable the secondary functions, then press **-** to revert the direction rotation and press **+** to decrease the reference speed

8.2.1 Errors

If the operator will try to give to a parameter a wrong value (e.g. outside the Min/Max permitted values), the display will show an "E" followed by the numeric code of the error (e.g. **E 04**); to move back to Status Index 2 "Parameter Display" press any function key of the keypad.

Table 8.2.1.1: Errors list

Code E 01	Error code 1	Parameter does not exist
Code E 02	Error code 2	System error
Code E 03	Error code 3	Type does not exist
Code E 04	Error code 4	Read-only parameter
Code E 05	Error code 5	Write enabled only when drive is enabled
Code E 06	Error code 6	Value outside min value
Code E 07	Error code 7	Value outside max value
Code E 08	Error code 8	System error
Code E 09	Error code 9	Value exceed limit

8.3 Alarms and Errors Handling

8.3.1 Alarms (Failure register)

In the event of an alarm, the “**Alarm**” LED flashes red, while the keypad displays an alarm code and description.

Figure 8.3.1: Led Status and Keypad



- RA (Reset Alarm) To reset the alarm, enable the drive and press **Enter**, then select RA with the **Up** or **Down** keys and press **Enter**.
- RD (Reset Drive) To reset the drive, enable the drive and press **Enter**, then select RD with the **Up** or **Down** keys and press **Enter**.

Table 8.3.1.1: Alarms list

Code A 01	Alarme Code 1	(*)	IGBT desaturat
Code A 02	Alarme Code 2	(*)	Overcurrent
Code A 03	Alarme Code 3	(*)	Overvoltage
Code A 04	Alarme Code 4	(*)	Heatsink Ot
Code A 05	Alarme Code 5		Parameter Error
Code A 06	Alarme Code 6	(*)	Current Fbk Loss
Code A 07	Alarme Code 7	(*)	Motor Overtemp
Code A 08	Alarme Code 8		CPU error
Code A 09	Alarme Code 9		Enable key error
Code A 11	Alarme Code 11		Bad Flash Par
Code A 12	Alarme Code 12		Bad Flash Device
Code A 13	Alarme Code 13	(*)	Brake Overpower
Code A 14	Alarme Code 14	(*)	Reg Pwr Failure
Code A 16	Alarme Code 16	(*)	Main Loss
Code A 18	Alarme Code 18	(*)	Encoder Fbk Loss
Code A 19	Alarme Code 19	(*)	Encoder Simulat
Code A 20	Alarme Code 20	(*)	Undervoltage
Code A 21	Alarme Code 21	(*)	Intake Air Ot
Code A 22	Alarme Code 22	(*)	Regulation Ot
Code A 23	Alarme Code 23	(*)	Module Overtemp
Code A 25	Alarme Code 25		Reset Required
Code A 26	Alarme Code 26	(*)	FieldBus Failure
Code A 27	Alarme Code 27	(*)	Enable Seq Error
Code A 28	Alarme Code 28	(*)	Fast Link Error
Code A 29	Alarme Code 29	(*)	Position Error
Code A 30	Alarme Code 30	(*)	Drive Overload
Code A 31	Alarme Code 31	(*)	External Fault
Code A 32	Alarme Code 32		PLC Application

(*) alarms resettable with an ALARM RESET command

8.3.2 Alarm description

(A 01) IGBT desaturat

Short circuit on the motor winding or on the power bridge.

(A 02) Overcurrent

Overcurrent protection intervention.

The cause could be an incorrect setting of the current regulator gains as compared

(A 03) Overvoltage

Overvoltage on the intermediate circuit.

The braking resistance is not connected in the right way or it is open.

The threshold is 950V.

(A 04) Heatsink Ot

Drive thermal protection.

The working cycle is too high for the drive size.

(A 05) Parameter Error

Parameters setting error.

The IPAs are showed on **IPA 1 Par Set** (IPA 24110) and **IPA 2 Par Set** (IPA 24111)

(A 06) Current Fbk Loss

Current feedback sensor failure.

(A 07) Motor Overtemp

Intervention of the motor thermal protection.

Overtemperature on the motor winding or PTC sensor not connected to the drive.

(A 08) CPU error

On **CPU Err Al Cause** (IPA 18143) the cause is specified.

(A 09) Enable key error

Wrong enabling key for Plc and/or DeviceNet.

(A 11) Bad Flash Par

The parameter value is not recognized.

Do the Parameter Saving and Drive Reset commands with the correct parameters.

(A 12) Bad Flash Device

Alarm on a non preset flash. Firmware error.

(A 13) Brake Overpower

The internal braking resistance is too warm because of a too high working cycle. Wait 30 seconds and give the Drive Reset command. The resistance temperature is calculated by an algorithm of the drive.

(A 14) Reg Pwr Failure

±15V internal power supply of regulation board R-XV_y is not working.

(A 16) Main Loss

Power supply failure

The **Powerloss** function is activated.

(A 18) Encoder Fbk Loss

Error detected in encoder feedback. Failure cause is specified in parameter **Enc Warning Case** (IPA 20016, **ALARMS** menu)

(A 19) Encoder Simulat

Encoder simulation alarm.

Check the encoder simulation parameters..

(A 20) Undervoltage

Always active when the drive is enabled.

The threshold level depends on the power supply level selected in parameter **Mains Voltage** (IPA 20050), according to the following table.

Main supply	DC-bus threshold undervoltage
230 VAC	225.4 VAC
380 VAC	372.3 VAC
400 VAC	391.9 VAC
415 VAC	406.6 VAC
440 VAC	431.1 VAC
460 VAC	450.7 VAC

(A 21) Intake Air Ot

Temperature of intake air too high; detected by TAC sensor.

(A 22) Regulation Ot

Overtemperature of regulation board; detected by sensor on reg board.

(A 23) Module Overtemp

IGBT module Overtemperature; detected by sensors on Power stage.

(A 25) Reset Required

There has been a modification of one or more parameters that requires a DRIVE RESET to be active.

(A 26) FieldBus Failure

Bus communication not present

(A 27) Enable Seq Error

Sequence error alarm

When the drive is power supplied (after the drive reset), it is active if the digital input 0 is high.

(A 28) Fast Link Error

Fast Link communication alarm.

It occurs in slave drives when the fast link serial communication is physically interrupted.

(A 29) Position Error

Position error alarm.

It happens in the position slaves and with the electric shaft mode when the error is higher than the **Max Pos Error** (IPA 18123) parameter.

(A 30) Drive Overload

Drive overload alarm.

Drive overload duration is too high. Check drive sizing using the overload table specified in section 2.3.3 IxT Algorithm

(A 31) External Fault

External alarm present.

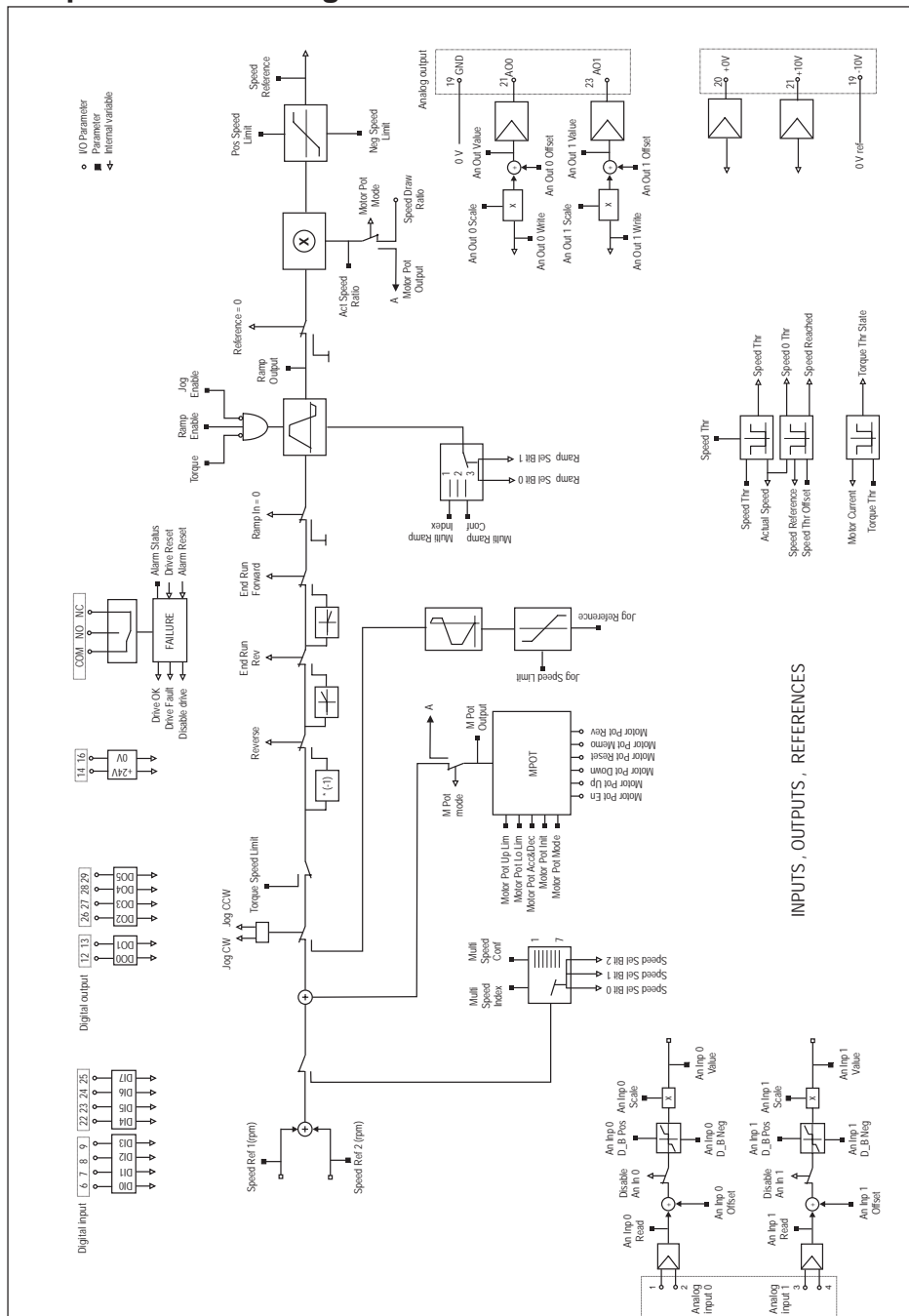
A digital input has been programmed as an external alarm, but +24V is not available on this terminal.

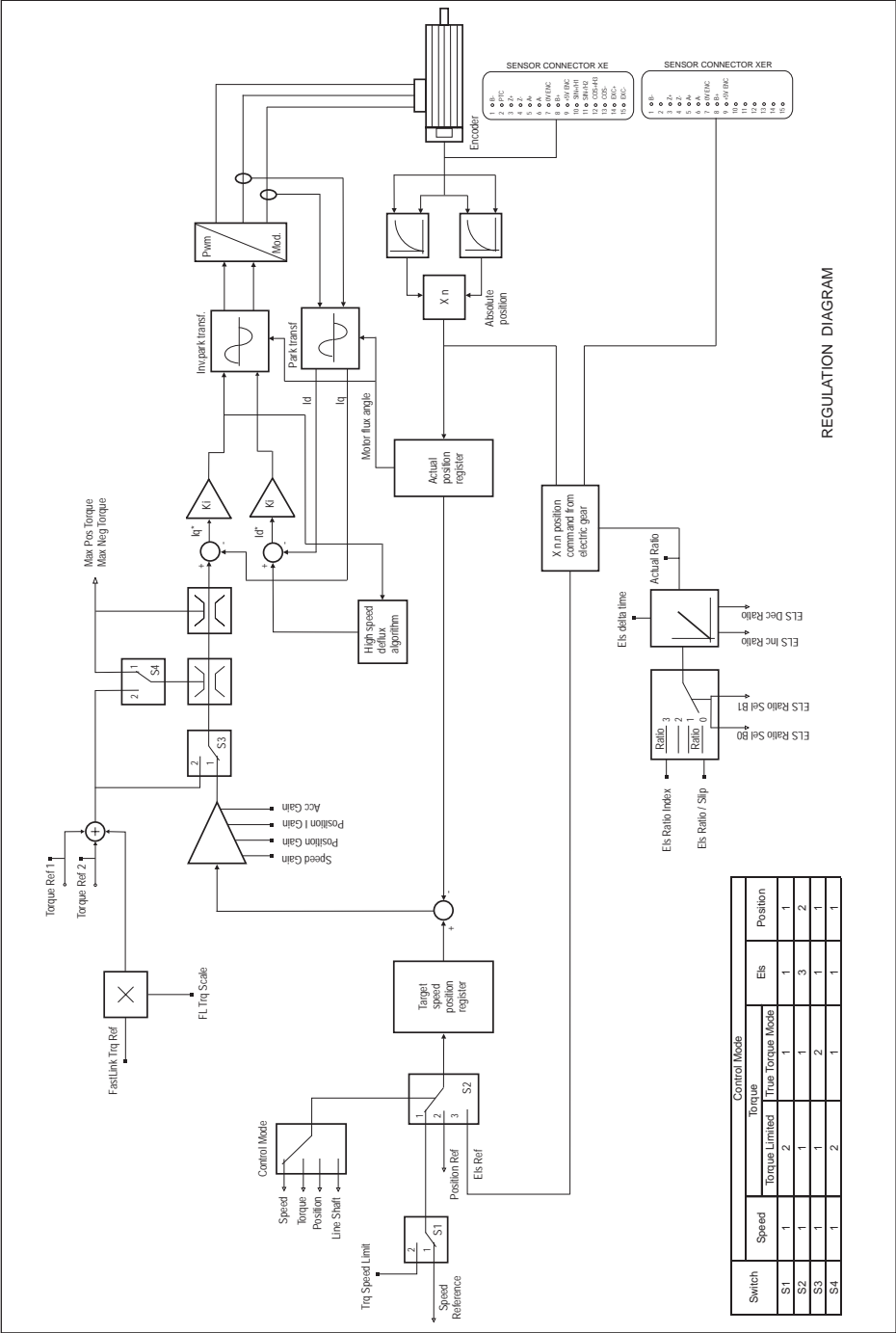
(A 32) PLC Application

MDPIc application not loaded.

Active only if the application selected is MDPIc.

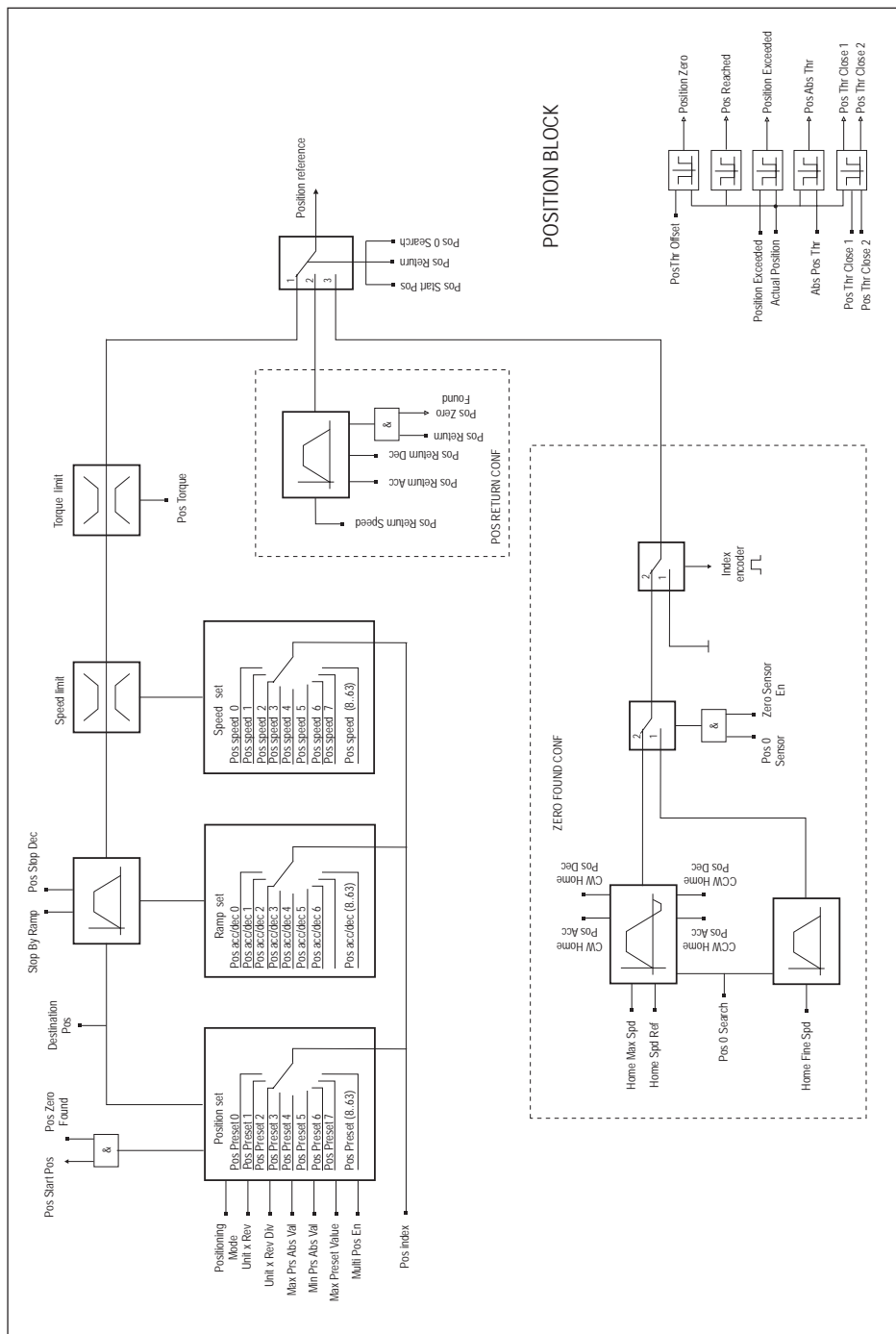
Chapter 9 - Block Diagrams





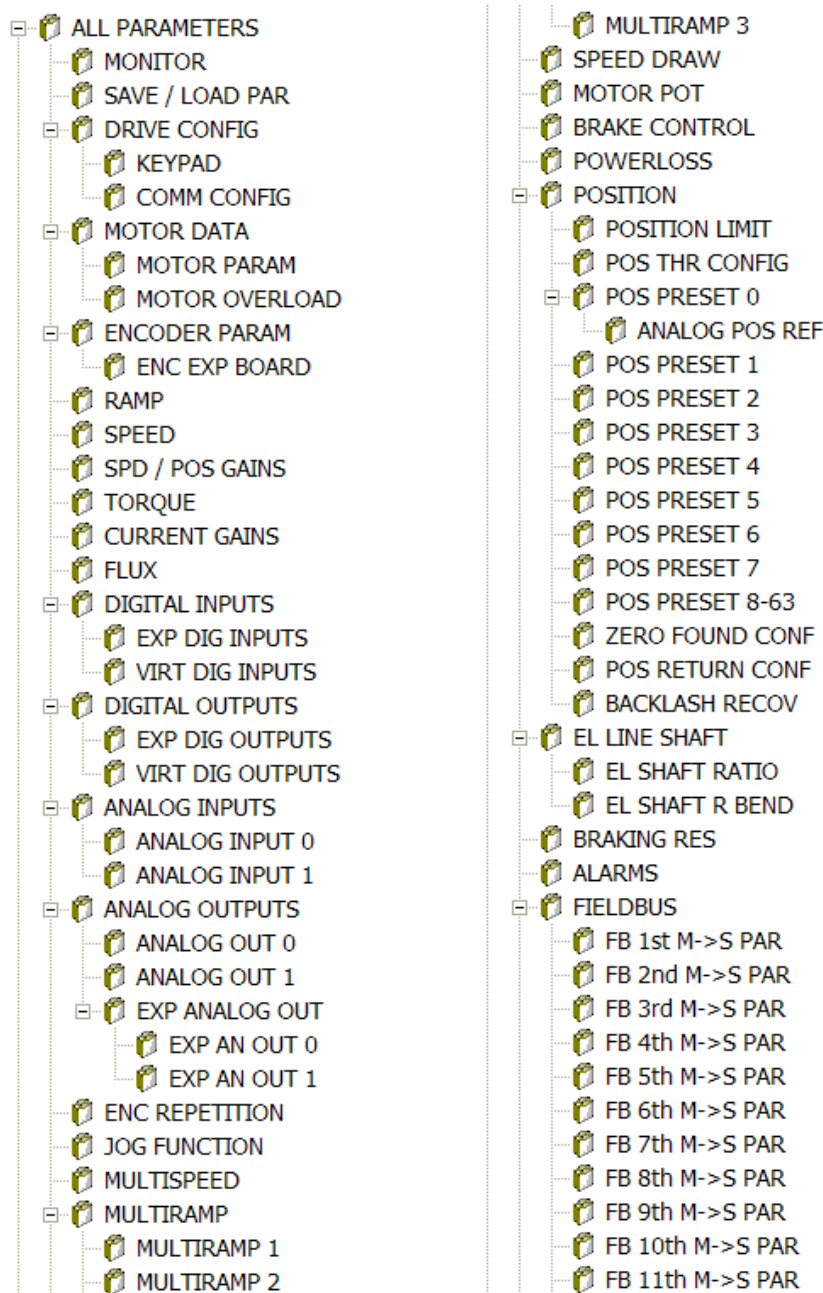
REGULATION DIAGRAM

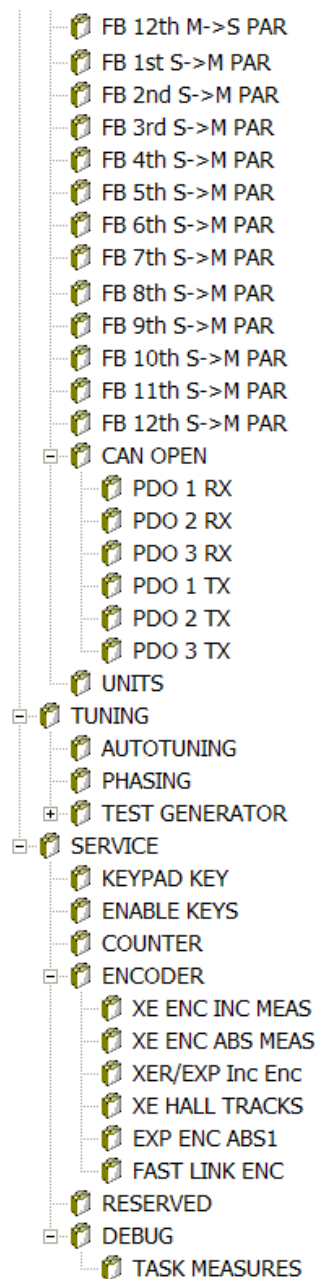
Switch	Control Mode			
	Speed	Torque	Position	ELS
S1	1	2	1	1
S2	1	1	1	3
S3	1	1	2	1
S4	1	2	1	1



Chapter 10 - Parameters and Functions

10.1 Parameters menu





10.2 Legend

Access: mode parameter R = read only W = write Z = write only when drive disabled * = the enabling function, related to the parameter, is active only after the drive reset command							
Format : parameter format Int = integer signed 16 bits Enum = integer signed 16 bits Word = integer unsigned 16 bits Long = integer signed 32 bits Dword = integer unsigned 32 bits Float = floating point Bool = 1 bit							
Parameter default value S = function datum of the drive size							
Parameter minimum value S = function datum of the drive size							
Parameter maximum value S = function datum of the drive size							
Parameter number	Parameter name	Parameter unit of measure (u.u. = user unit)					
IPA	Description	[Unit]	Format	Access	Default	Min	Max
ENCODER PARAM						Main menu	
ENC EXP BOARD						2nd level	
20038	ABS1 Enc Div Rev	[--]	Dword	R/Z/*	8192	1	8192
Number of division per rev of the abs tracks of the abs enc. n.1							

Nota!

- FLT_M = 3.40282347³⁸

- In order to perform the **Save Parameters**, the **Reset Drive** command, or **Load Default Par (*)** via the serial line, the number of the parameter index to be brought to a high logic level

Save Parameters	=	18011
Reset Drive	=	18010
Load Default Par	=	18017

(*) the default command does not change the parameters:

- **Mains Voltage**, IPA 20050
- **Application Sel**, IPA 18140

10.3 Parameters Description and Functions

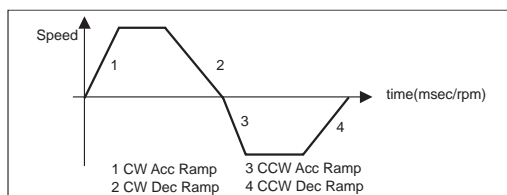
The standard factory-loaded XVy-EV configuration (IPA 18140=0=Basic in SERVICE menu) allows torque, speed, position and electric shaft regulation. The drive is supplied defaulted to run as a speed regulator. The four regulation modes are correlated one with the other and are enabled via a suitable bit parameter which can be addressed as a digital input.

The parameter list sorted as shown on the keyboard and E@syDrives (default setting) is given below.

IPA	Description	[Unit]	Format	Access	Default	Min	Max
-----	-------------	--------	--------	--------	---------	-----	-----

MONITOR

20500	Start Status Condition of the drive start command.	[--]	Word	R			
21212	Ramp Output Parameter reading the speed reference on the output of the ramp block.	[rpm]	Float	R			



18735	Out Current Motor present current (filtered).	[Arms]	Float	R			
18805	Torque Current Present value of the quadrature axis current (filtered).	[Arms]	Float	R			
18806	Flux Current Present value of the direct axis current (filtered).	[Arms]	Float	R			
18807	Act Out Curr Lim Present value of the maximum current to be supplied by the drive.	[Arms]	Float	R			
18732	Act Pos Trq Lim Present torque upper limit. 100% equal to the motor rated torque.	[%]	Float	R			
18746	Act Neg Trq Lim Present torque lower limit. 100% equal to the motor rated torque.	[%]	Float	R			
18739	Act Torque Torque applied to motor (filtered). 100% is the rated torque of the IPA 18800 motor, Base Torque	[%]	Float	R			
18776	Act Torque Nm Torque applied to motor in Nm.	[Nm]	Float	R			
18800	Base Torque Motor rated torque.	[Nm]	Float	R			
18748	Ramp Reference Ramp reference.	[rpm]	Float	R			
18749	Speed Reference Speed reference.	[rpm]	Float	R			
18777	Motor Speed Speed of motor.	[rpm]	Float	R			

IPA	Description	[Unit]	Format	Access	Default	Min	Max
18782	Act Out Power Value of the motor Output Power. This parameter is the resulting of the value between Torque and speed.	[kW]	Float	R			
18754	Act Pos Spd Lim Positive speed limit.	[rpm]	Float	R			
18755	Act Neg Spd Lim Negative speed limit.	[rpm]	Float	R			
18756	Enc Postition Speed/pos feedback position.	[mech. deg]	Float	R			
18757	Enc Revolution Revolutions number for speed/pos feedback.	[--]	Float	R			
18742	Out Frequency Output frequency	[Hz]	Float	R			
18736	DC Link Voltage DC link voltage (filtered).	[V]	Float	R			
18772	Output Voltage Output voltage	[Vrms]	Float	R			
18710	Heatsink Temp Drive heatsink temperature	[°C]	Int	R			
18711	Intake Air Temp Input air temperature. If the temperature probe is not present, the parameter always shows an invalid value.	[°C]	Int	R			
18712	Reg Card Temp Regulation card temperature	[°C]	Int	R			
20022	FW Version Firmware version	[--]	Float	R			
19607	Drive Ovid Fact Drive overload factor: when it reaches 100%, the drive automatically limits the output current to the drive rated current. The maximum peak current can be supplied again by reducing the drive supplied current to a value lower than the rated one till the I2T integral value returns to zero.	[%]	Word	R			

SAVE / LOAD PAR

18011	Save Parameters Any changes to the value of the parameters have an immediate effect on the running of the drive, but are not automatically stored in memory. The Save Parameters instruction is used to store the value of the current parameters to the permanent store. All unsaved modifications will be lost when the drive is powered down. 0 = Save Now 1 = Save Done	[--]	Bool	R/W	0	0	1
18017	Load Default Par The factory setting parameters will be restored. 0 = Load Now 1 = Load Done	[--]	Bool	R/W	0	0	1
18070	Load Param PAD Loading values of parameters on the keypad to the drive memory. 0 = Load Now 1 = Load Done	[--]	Bool	R/W	0	0	1
18071	Save Param PAD The values of the drive parameters are saved in the keypad memory. 0 = Save Now 1 = Save Done	[--]	Bool	R/W	0	0	1

IPA	Description	[Unit]	Format	Access	Default	Min	Max
18010	Reset Drive Resets the drive 0 = Reset Now 1 = Drive Working	[-]	Bool	R/W	0	0	1

DRIVE CONFIG

20023	Control Mode Configuration of the drive working mode. It is possible to select four different modes: torque, speed, electric axis and position control (as for the selection see the next table). The drive is factory programmed for speed control. 1=Torque 2=Speed 4=Position 8=Els	[-]	Enum	R/W*	2	1	8
-------	-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	-----	------	------	---	---	---

Function configuration	Bit0	Bit1	Bit2	Bit3	Bit4	Bit5...15 (*)
Drive disabled	0	0	0	0	0	0
Torque control	1	0	0	0	0	0
Speed control	0	1	0	0	0	0
Position control	0	0	1	0	0	0
Electric line shaft control	0	0	0	1	0	0

bxv9030

(*) These bits have to be set at 0 to be compatible with future versions.

The different working modes can be selected also via a suitably programmed digital input.
See **Digital inputs** for further details.

20050	Mains Voltage Main voltage supply 0=230 Vrms 1=400 Vrms 2=460/480 Vrms 3=380 Vrms 4=415 Vrms 5=440 Vrms	[-]	Enum	R/Z*	1	0	5
20051	Environment Temp Environment temperature 0=0..40°C (32°..104°F) 1=0..50°C (32°..122°F)	[-]	Enum	R/Z*	0	0	1
20052	PWM Frequency Switching frequency: 0=Default (see table 2.3.2.1) 2= 2 kHz 4= 4 kHz 8= 8 kHz	[-]	Enum	R/W*	0	6	3
20000	Drive Max Curr Setting the drive maximum current output to the motor.	[Arms]	Float	R/Z	IP18701	0	IPA18703
18778	Overload Control Choice of algorithm to calculate drive overload: 0 = I _x T 1 = I ² xT	[-]	Enum	R/Z*	0	0	1

IPA	Description	[Unit]	Format	Access	Default	Min	Max
29004	Act Ctrl Mode It states the selected functioning method, see IPA 20023 1=Torque 2=Speed 4=Position 8=Els Note! When the IPA 18104 Application Sel parameter = "Autotuning" or "Phasing" or "Test generator", the Act Ctrl Mode parameter is displayed as " * * * "	[--]	Enum	R			
20053	Drive size Display size of drive. Example: : 10306 = XVy-EV 10306	[--]	Enum	R			
18701	Drive Nom Curr Drive nominal current (see I_{2N} table 2.3.2.1)	[Arms]	Float	R			
18704	Drv Nom Curr 0Hz Nominal current of drive at 0Hz (see table 2.3.3.1).	[Arms]	Float	R			
18703	Max Ovd Curr Maximum overload current.	[Arms]	Float	R			
KEYPAD							
20021	Enable I-O Keys Enables Start (I) and Stop (O) keys on keypad. 0= Disabled 1 = Enabled	[--]	Bool		0	0	1
COMM CONFIG							
18031	Drive Serial Add Drive address when it is connected via the RS485 serial line.	[--]	Word	R/W/*	0	0	127
18032	Serial Prot Type Configuration of the communication protocol of the drive 485 serial line: 0=Slink 1= Modbus	[--]	Word	R/Z/*	0	0	1
20024	Serial Baud Rate Configuration of the communication speed (baudrate) of the drive serial line. It is possible to select one of the following values: 1200, 2400, 4800, 9600, 19200, 38400. If this value is modified, it is advisable to mark the drive with a label if you change the default to highlight the different serial line configuration; in this way, possible communication problems between the drive and the E@syDrives configurator, whose default setting is 38400, will be avoided. E@syDrives window, see IPA 20025.	[--]	Enum	R/W/*	38400	1200	38400
20025	Serial Line Conf Configuration of the drive RS485 serial port. It is possible to select one of the following values: N,8,1=32785 (NO parity, 8 data bit, 1 stop bit) O,8,1=36919 (Odd parity, 8 data bit, 1 stop bit) E,8,1=32823 (Even parity, 8 data bit, 1 stop bit) N,8,2=32793 (No parity, 8 data bit, 2 stop bit) O,8,2=36927 (Odd parity, 8 data bit, 2 stop bit) E,8,2=32831 (Even parity, 8 data bit, 2 stop bit) The factory configuration is 32785 (N,8,1). In this case too, as for the previous parameter, it is advisable to mark the drive with a label. Attention ! The change of the serial port configuration becomes active only after the drive Reset has been performed. The E@syDrives configurator has to be configured as the drive in the Communication Settings menu.	[--]	Enum	R/W/*	32785	32785	32927

IPA	Description	[Unit]	Format	Access	Default	Min	Max
20026	Serial Del Time Setting of the minimum delay between the drive reception of the last byte and the beginning of its response. Such delay avoids any conflict on the serial line when the RS485 interface is not set for an automatic TX / RX switching.	[msec]	Word	R/W	0	0	800
18110	Fast Link Addr Enable of fast link on the XT-IN and XT-OUT connectors. Using fast link in electrical line shaft configuration, it is necessary to configure this parameter. 0 The fast link is disabled 1 Fast link enable (the drive is the master) > 1 Fast link enable (the drive is the slave).	[-]	Word	R/Z/*	0	0	8
18124	FstLnk Slow Sync Enabling synchronisation of slow task 0=OFF 1=ON	[-]	Bool	R/Z/*	0	0	1

MOTOR DATA

20002	Motor Poles Settings of motor poles. <i>Note:</i> the motor pole number has to be lower than the pulse number/revolution of the motor mounted encoder.	[-]	Word	R/Z/*	8	2	8
20001	Mot Nominal Curr Motor nominal current	[Arms]	Float	R/Z/*	IPA18701	0.0	IPA18703
18360	Mot Nom K Torque Motor torque constant.	[Nm/Arms]	Float	R/Z	1.5	0.1	100
20004	Mot Thermal Prot Thermal protection type of servomotors. 0=PTC 1=NC Contact	[-]	Enum	R/Z/*	1	0	1

MOTOR PARAM

18313	LKG Inductance Motor inductance.	[H]	Float	R/Z/*	0.005	10 ⁻⁶	20
-------	--------------------------------------------	-----	-------	-------	-------	------------------	----

MOTOR OVERLOAD

20080	Mot Ovld Control Enabled the motor protection to excessive overload.	[-]	Enum	R/Z/*	0	0	1
20081	Mot Ovld Curr Motor overload current. 0 = Disabled 1 = Enabled	[A]	Float	R/Z	IPA18701	0	IPA18703

When this is selected the **Mot Ovld Time** and **Mot Ovld Factor** parameters must be set.

Note: The **Mot Ovld Time** and **Mot Ovld Factor** parameters are only used to calculate the I2t motor limit.

20082	Mot Ovld Time Motor overload time.	[sec]	Float	R/Z	5	0,1	2097
20083	Mot Ovld Factor Motor overload factor. When 100% has been reached, the current limit is reduced to the value Mot Nominal Curr (IPA 20001) till when Mot Ovld Factor goes back to zero. It is calculated with the following formula:	[%]	Int	R			

IPA	Description	[Unit]	Format	Access	Default	Min	Max
$\text{Mot Ovid Factor (\%)} = \frac{\int (I_{\text{mot}}^2 - \text{Mot Nominal Curr}^2) \cdot dt}{(\text{Mot Ovid Curr}^2 - \text{Mot Nominal Curr}^2) \cdot \text{Mot Ovid Time}} \cdot 100$							

ENCODER PARAM

The signals coming from the position sensors are mainly used in two points of the brushless motor control system: First is to modulate the three stator currents in order to obtain an equivalent field presenting a 90 electric degree phase shift as compared to the field of the permanent magnets. They are also used for feedback of the speed/space loop. These two functions are usually performed by two different position sensors, which are usually integrated into one single encoder. The features of the two sensors are, in fact, different. One determines commutation, the other, speed and sinewave accuracy. In order to keep the stator field in the desired position, it is necessary to know, also at power-on, the absolute position in the electrical revolution; for this purpose resolvers are normally used, but digital encoders with hall channels are also supported.

The feedback of the speed/space loop requires the maximum possible resolution; the loop quality defines the limit of the control loop. We recommend for best accuracy and smoothness, the resolver, or a Sin-Cos type encoder.

The ARTDriveS drive digitizes the data of the sinewave in a resolver or SinCos encoder to a resolution of 212 (16,384 pulses equivalent), thus obtaining a high precision level and very good behaviour in conditions of low speed and locked shaft.

In the ARTDriveS drives (as default configuration), after the initialization phasing procedure (executed at power on and alarm reset), the field modulation is based on the reading of the sensor with the highest resolution, which becomes absolute since the sensor mechanical position is known.

The above working mode can be changed through the parameters on **SERVICE / ENCODER** menu.

20007	Mot Enc Source	[--]	Enum	R/Z/*	1	1	4
	Motor encoder source						
	1=XE Main Encoder						
	2=Riservato						
	3=EXP ABS1 Encoder						
	4=Reserved						
20008	Spd-Pos Enc Sour	[--]	Enum	R/Z/*	0	0	4
	Speed/pos encoder source						
	0=Same as motor						
	1=XE Main Encode						
	2=XER/EXP Aux Enc						
	3=EXP ABS1 Encoder						
	4=Reserved						
20010	XE Enc Type	[--]	Enum	R/Z/*	1	0	10
	Software setting of the encoder type used for the feedback, to be connected to the XE connector (standard connection). To select the encoder type the ARTDriveS drives needs a software parameter setting and also a hardware setting through jumpers. This is necessary to allow so many kinds with so few connectors.						
	0=Off						
	1=Sincos 5 tracks	Absolute sine and cosine once per revolution, incremental and sinusoidal A and B, I zero slot or index					
	2=Dig + Hall	Hall sensors, incremental digital A-B channel, I zero marker or index					
	3=Abs1 encoder	ABS1.					
	4=Hall	Hall sensors					
	5=Sincos 2 tracks	Absolute sine and cosine once per revolution.					
	6=Ana + Hall						
	8=Resolver	Two pole resolver					
	9=Only Ana Inc Tracks	Incremental encoder with analog tracks (*)					
	10=Only Dig Inc Trk	Incremental encoder with digital tracks (*)					
	(*) When using these encoders, each time the drive is reset and the enable command is performed, the drive						

IPA	Description	[Unit]	Format	Access	Default	Min	Max
	executes an internal phasing procedure for approx. 5 sec. Warning! During this procedure the motor shaft performs a limited number of rotations.						
20011	XE Enc ppr Number of pulses per revolution of the encoder.	[--]	Word	R/Z/*	2048	1	65535
20012	XE Enc Supply It is possible to program the encoder supply level between the minimum 5.2V and the maximum 6.5V value, in order to balance possible voltage drops on a long encoder cable, so that the level of the motor feedback signals is suitable to be read by the drive. 0=5.2V 1=5.6V 2=6.1V 3=6.5V	[V]	Enum	R/Z	0	0	3
20020	Resolver Poles Number of poles on resolver.	[--]	Word	R/Z/*	0	0	1
20036	Aux Enc Type Auxiliary encoder type: XER connector 0=OFF XER port disabled 1=XER/EXP rip/sim out XER used for secondary encoder input and encoder output on expansion card. 2=XER in and EXP rip out XER and output on expansion used for repeat/simulation of motor encoder. 3=XER rip out and EXP in XER used as encoder repeat output and encoder input on expansion card.	[--]	Enum	R/Z/*	1	0	2
20037	XER/EXP Enc ppr Auxiliary encoder pulses per revolution.	[--]	Word	R/Z/*	2048	1	65535
20019	XER Enc Supply Auxiliary encoder supply. See XE Enc Supply , IPA 20012. 0=5.2V 1=5.6V 2=6.1V 3=6.5V	[V]	Enum	R/W	0	0	3
ENC EXP BOARD							
20040	ABS1 Enc Type First absolute enc. type: ABS1 connector. 0 = Off 1 = EnDat + 2 ana inc 2 = SSI 3 = EnDat 4 = SSI + 2 ana inc 5 = Hiperface	[--]	Enum	R/Z	0	0	4
20039	ABS1 Enc Revol Number of rev of the abs tracks of the abs enc. n.1.	[--]	Word	R/Z/*	4096	1	4096
20038	ABS1 Enc Div Rev Number of division per rev of the abs tracks of the abs enc. n.1.	[--]	Dword	R/Z/*	8192	1	131072
20042	ABS1 Enc ppr Number of pulses per rev of the inc tracks (if present) of the abs enc. n.1	[--]	Word	R/Z/*	512	1	65535
20041	ABS1 Enc Supply Absolute encoder n.1 encoder supply. 0 = 5.2V 1 = 5.6V 2 = 6.1V 3 = 6.5V	[--]	Enum	R/W	0	0	3

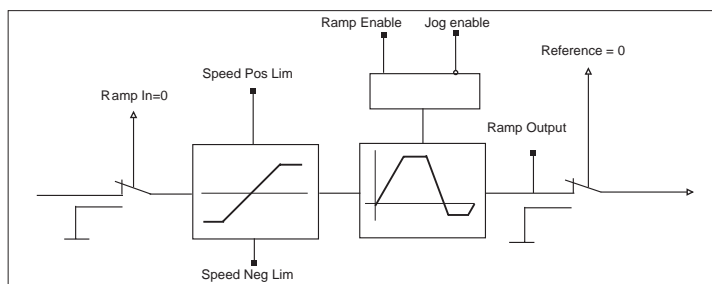
IPA	Description	[Unit]	Format	Access	Default	Min	Max
20043	EnDat Del Comp Signal propagation delay compensation on EnDat cable: 0 = No delay comp 1 = 1 us delay comp 2 = 2 us delay comp	[--]	Enum	R/W	0	0	2

RAMP

The acceleration and deceleration of the speed reference is set by the **CW Acc Ramp / CW Dec Ramp** parameters for clockwise rotation direction and by **CCW Acc Ramp / CCW Dec Ramp** for counterclockwise rotation direction.

The Fast stop function allows stopping the motor in the shortest possible time in case of emergency regardless of the normal ramps set. Set a digital input as Fast/stop.

These parameters are active in the only in the speed control configuration; for a position control application see the specific paragraph..



The drive behaviour after the Start command depends on the parameter settings:

- If the ramp circuit is used (**Ramp Enable** = enable) the motor reaches the desired speed at set ramp rate. If commanded to stop, the drive stops with the deceleration ramp time. If during the deceleration time a new start command is given, the drive regains the set speed.
- If the ramp circuit is not used (**Ramp Enable** = disable) the motor reaches the desired speed in the shortest possible time limited only by current.

When the motor is stopped, the drive is torque-enabled. The drive can be disabled by opening the Enable drive command. The Jog function does not require the Start command, but requires the enable.

In case the Start and Jog+ or Jog- commands are given simultaneously, the start command has the priority.

21115	Fast Stop Dec Setting of the Fast Stop deceleration time	[ms/krpm]	Float	R/W	100	0	IPA21111
21116	End Run Dec Setting of the End Run deceleration time	[ms/krpm]	Float	R/W	100	0	IPA21111
21210	Ramp Enable Ramp enabling command : 0=Disabled 1=Enabled	[--]	Enum	R/W	1	0	1
21102	CW Acc Ramp Setting of the clockwise acceleration time.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
21103	CCW Acc Ramp Setting of the counterclockwise acceleration time.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
21104	CW Dec Ramp Setting of the clockwise deceleration time.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
21105	CCW Dec Ramp Setting of the counterclockwise deceleration time.	[ms/krpm]	Float	R/W	336.1	0	IPA21111

IPA	Description	[Unit]	Format	Access	Default	Min	Max																		
21110	Ramp Exp Factor	[-]	Int	R/W	1	1	1000																		
Ramp expansion factor, used to increase the maximum value allowed for the ramp parameters. The cycle time of the speed control loop is 125 μ s and if the parameter Ramp Exp Factor is set to 1, the ramp generator updates the ramp output every 125 μ s; this means that the slowest ramp will increase the speed by 1count/125 μ s every 125 μ s and this will limit the maximum value of the ramp parameters to 8738 msec/krpm (with a 2048 ppr encoder); if this parameter is set to a value N higher than 1 this means that the ramp output will be updated every N x 125 μ s and this will mean that the maximum value of the ramp parameters will be limited to N x 8738 msec/krpm. In the following table there are some examples about the influence of the Ramp Exp Factor parameter on all the ramp parameters settings:																									
<table><tr><th>Encoder pulses/rev</th><th>Ramp Exp Factor</th><th>Max Ramp Rate</th></tr><tr><td>2048</td><td>1</td><td>8738 msec/krpm</td></tr><tr><td>2048</td><td>4</td><td>34952 msec/krpm</td></tr><tr><td>2048</td><td>10</td><td>87355 msec/krpm</td></tr><tr><td>1024</td><td>1</td><td>4369 msec/krpm</td></tr><tr><td>512</td><td>2</td><td>4369 msec/krpm</td></tr></table>								Encoder pulses/rev	Ramp Exp Factor	Max Ramp Rate	2048	1	8738 msec/krpm	2048	4	34952 msec/krpm	2048	10	87355 msec/krpm	1024	1	4369 msec/krpm	512	2	4369 msec/krpm
Encoder pulses/rev	Ramp Exp Factor	Max Ramp Rate																							
2048	1	8738 msec/krpm																							
2048	4	34952 msec/krpm																							
2048	10	87355 msec/krpm																							
1024	1	4369 msec/krpm																							
512	2	4369 msec/krpm																							

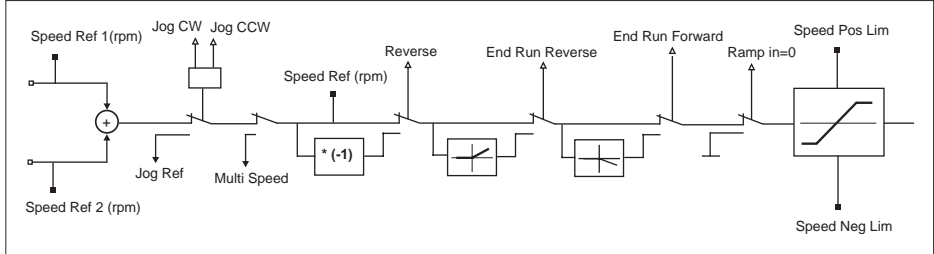
txv9065

21111	Max Ramp Rate	[ms/krpm]	Float	R
Max ramp time				

SPEED

The value of the speed reference determines the value of the motor speed, while the sign defines the rotation direction. When the ramp is enabled (parameter **Ramp Enable** = enable), the speed reference (**Speed Ref**) follows the time set in the acc and dec parameters (CW - CCW).

The **Speed Ref 1**, **Speed Ref 2**, **Pos Speed Lim** and **Neg Speed Lim** parameters are active only in the Speed loop configuration. See the specific paragraph for the Position loop configuration



20003	Full Scale Speed	[rpm]	Float	R/Z/*	3000	0	100000
Setting of the motor maximum speed. The drive maximum speed is limited according to the value set in this parameter.							
21200	Speed Ref 1	[rpm]	Float	R/W	0	-IPA20003	IPA20003
Speed reference 1. Setting of the speed reference if no analog input has been set as [3] Speed Ref 1 . In case an analog input is set as [3] Speed Ref 1 , the parameter is read-only.							
21201	Speed Ref 2	[rpm]	Float	R/W	0	-IPA20003	IPA20003
Speed reference 2. Setting of the speed reference 2 if no analog input has been set as [4] Speed Ref 2 . In case an analog input is set as [4] Speed Ref 2 , the Speed Ref 2 parameter is read-only. The total reference is the result of the sum of the values of Speed Ref 1 and Speed Ref 2 .							

Example 1:

Speed Ref 1 = 1500 rpm

Speed Ref 2 = 500 rpm

Speed Ref = 1500 + 500 = 2000 rpm

IPA	Description	[Unit]	Format	Access	Default	Min	Max
	Example 2:	Speed Ref 1 = 1500 Rpm Speed Ref 2 = -500 rpm Speed Ref = 1500 - 500 = 1000 rpm					
21206	Speed Thr Setting of the threshold value for overspeed. Such threshold is stated as an absolute value. When the speed is higher than the value set in this parameter, the digital output set as [4] = Speed 0 Thr goes to +24V.	[rpm]	Float	R/W	10	0	IPA20003
21207	Speed Reach Wnd Offset setting of the zero speed threshold. It states how much the speed can oscillate around zero before the digital output programmed as [4] = Speed 0 Thr will be considered as active.	[rpm]	Float	R/W	10	0	IPA20003
21208	Speed Zero Thr Zero speed threshold (the test is performed according to the speed filtered at 100ms)	[rpm]	Float	R/W	10	0	1000
21209	Speed Zero Delay Delay on zero speed signalling	[sec]	Float	R/W	0.1	0	1000
21213	Speed Thr Delay Setting of the delay time signalling that the motor has reached a speed. When the motor speed is higher than the value set in Speed Thr + Speed Thr Wnd for a time higher than the value of this parameter, a digital output set with [15] Speed Thr de is brought to +24V. If the speed falls under the Speed Thr - Speed Thr Wnd value, the digital output programmed as [15] Speed Thr de is set to 0V.	[sec]	Float	R/W	10	0	1000
21211	Speed Thr Wnd Window applied to Speed Thr IPA 21206 parameter to signal that speed threshold has been reached. See parameter Speed Thr Delay IPA 21213.	[sec]	Float	R/W	10	0	100000
21204	Pos Speed Limit Setting of the maximum speed for motor clockwise rotation direction.	[rpm]	Float	R/W	3000.0	0	100000
21205	Neg Speed Limit Setting of the maximum speed for motor counterclockwise rotation direction	[rpm]	Float	R/W	3000.0	0	100000
SPD / POS GAIN							
18150	Inertia Motor inertia used for inertial compensation.	[kg*m²]	Float	R/W	0	0	
18151	Inertia Filter Filter time constant on inertial compensation.	[msec]	Float	R/W	1	0	200
23000	Speed Gain Speed proportional gain.	[--]	Int	R/W	100	0	32767
23001	Position Gain Position proportional gain.	[--]	Int	R/W	50	0	32767
23002	Position I Gain Position integral gain. These are conservative, relatively low performance settings, suitable for most general purpose applications, they can be set much higher if machine construction allows it and the application requires it.	[--]	Int	R/W	0	0	32767
23003	Acc Gain Acceleration proportional gain (speed regulator).	[--]	Int	R/Z/*	3000.0	0	100000
23010	Gain Mult Fct Multiplier factor speed and position gains. 1= x 1 16= x 16	[--]	Enum	R/W	1	1	16

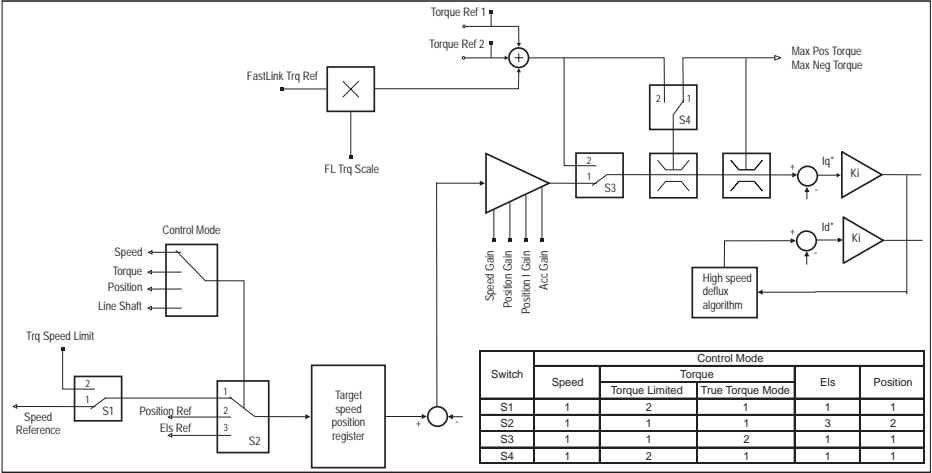
TORQUE

The current loop is the fastest control section and has a sampling frequency of 16 kHz.

There are two current loops working simultaneously. The components of the forward and quadrature current are calculated directly from the phase currents read by the AD converters; both components are controlled in order to obtain the desired behaviour. The quadrature component contributes to the rotating torque while the forward component is (usually) set at zero.

The torque control functioning mode is active if the **Control Mode** parameter (IPA 20023) is set as "Torque". In this case the motor supplies a torque equal to the sum of **Torque Ref 1** (IPA 22000) and **Torque Ref 2** (IPA 22001)..

All torque values (references, limits and thresholds) are stated as a percentage. 100% is equal to the motor rated torque, **Base Torque** parameter (IPA 18800).



22000	Torque Ref 1	[%]	Float	R/W	0	-IPA22012	IPA22012	<p>Setting of the torque reference if no analog input has been programmed as [1] Torque Ref 1. If an analog input has been programmed as [1] Torque Ref 1, the parameter is read-only.</p>
22001	Torque Ref 2	[%]	Float	R/W	0	-IPA22012	IPA22012	<p>Setting of the torque reference if no analog input has been programmed as [2] Torque Ref 2. If an analog input has been programmed as [2] Torque Ref 2, the parameter is read-only.</p> <p>The Torque Ref 1 and Torque Ref 2 parameters are active if the Torque loop functioning mode is selected.</p> <p>The total reference is the sum of the values of Torque Ref 1 and Torque Ref 2.</p>
22002	Torque Mode	[-]	Enum	R/W	0	0	1	<p>0 = Torque Limited</p> <p>The speed reference can be ignored. To allow the motor to run, the torque reference must be set to Torque Ref 1, Torque Ref 2 or through FastLink Trq Ref. If the torque reference is high enough, the motor will reach the maximum speed set in 22009 Trq Speed Limit.</p> <p>The torque limits (22004 Max Pos Torque and 22005 Max Neg Torque) are operative as well.</p> <p>1 = True Torque Mode</p> <p>The speed regulator is disabled, therefore no control is carried out. To allow the motor to run, the torque reference must be set to Torque Ref 1, Torque Ref 2 or through FastLink Trq Ref. If the torque reference is high enough, the motor can reach a speed higher than the rated one.</p>

IPA	Description	[Unit]	Format	Access	Default	Min	Max
	The torque limits (22004 Max Pos Torque and 22005 Max Neg Torque) are operative as well.						
22003	Trq Lim Config 0 = Torque lim symm 1=Torque lim +/- 2 = Torque lim motor/brake	[--]	Enum	R/W	0	0	2
	Symmetric torque limits. The limit is considered equal to the value of the Max Pos Torque parameter (IPA 22004). Asymmetric torque limits. Max Pos Torque = positive torque limit, Max Neg Torque = negative torque limit. Different torque limits for the functioning of the drive as a motor (Max Pos Torque) and as a brake (Max Neg Torque)						
22004	Max Pos Torque Setting of the positive torque limit.	[%]	Float	R/W	100	0	IPA22012
22005	Max Neg Torque Setting of the negative torque limit.	[%]	Float	R/W	100	0	IPA22012
22007	Torque Thr Setting of the torque threshold defined with an absolute value. When the torque is higher than the value set in this parameter, the digital output set as [6] Torque Thr is brought to +24V.	[Arms]	Float	R/W	0	0	IPA20000
22009	Trq Speed Limit Speed limit during the torque control. When Torque Mode is selected as Torque Limited.	[rpm]	Float	R/W	3000	0	10000
22010	Torque Thr Delay Setting of the delay time signaling that the level of the torque supplied by the motor has been reached. When the motor supplied torque is higher than that set in Torque Thr for a period longer than the value of this parameter, the digital output programmed as [16] Torque Thr Del is brought to +24V.	[sec]	Float	R/W	10	0	10
22011	Torque Reduction Active torque limit when the digital input set as Torque reduction is brought to +24V.	[%]	Float	R/W	50	0	IPA22012
22013	FastLink Trq En If this function is enabled, the torque reference coming from a drive master through Fast Link is added to Torque Ref 1 and Torque ref 2 . This function is normally used to perform a Helper configuration between two motors.	[--]	Bool	R/W/Z	0	0	1
22515	FL Trq Scale Torque reference scale coming from the drive master. If the scale which has been set is negative, the torque direction is inverted compared to the master.	[--]	Float	R/W	1	-10	+10
22012	Max Torque Maximum torque value supplied by the drive-motor system equal to Mot Nom K Torque * Drive Max Curr , stated as a percentage of the motor rated torque.	[%]	Float	R			
22014	FastLink Trq Ref Torque reference reading from Fast Link (after the scaling).	[%]	Float	R			
18800	Base Torque Rated torque of motor matching rated current of motor.	[Nm]	Float	R			

CURRENT GAINS

The current loop is controlled by a PID regulator; the maximum control bandwidth is 5 kHz. The gains of this loop are factory set with appropriate values for the motors and specifically for the motor purchased if this drive was bought with a motor. For advanced applications such values have to be optimized according to the motor used.

18100	Curr Prop Gain Current loop proportional gain.	[--]	Int	R/W	S	0	32767
18101	Curr Integr Gain Current loop integral gain.	[--]	Int	R/W	S	0	32767

IPA	Description	[Unit]	Format	Access	Default	Min	Max
18102	Curr Deriv Gain Current loop derivative gain.	[--]	Int	R/W	0	0	32767
18345	Curr Gain Calc 0=Off : no calculation 1=Calc from motor parameter the current gains are recalculated according to the motor parameters (LKG Inductance , IPA 18313).	[--]	Enum	R/W	0	0	1

FLUX

Flux reduction function

In the brushless motor, the flux is constant, generated by the permanent magnets.

It is possible to implement the flux reduction function by passing a negative current through the stator windings with vectors oriented to reduce overall flow.

Caution ! If the drive is disabled when the motor is running above nominal speed, the voltage on the motor could reach values that might damage the drive.

Normally it is possible to run the motor up to 150% of nominal speed, without taking special precautions.

In order to reach higher speeds, and avoid damage to the drive, an independent braking unit must be used, to brake the load at least up to the motor's nominal speed.

For information on how to reach speeds greater than 150% of nominal, contact the Gefran-Siei technical support centre.

18320	Max Deflux Curr Maximum flux reduction current of motor (only negative values are permitted).	[Arms]	Float	R/Z*	0	IPA20000	0
18321	User Vlt Max Lim Setting flux reduction starting voltage. Only values below mains voltage have an effect. It is used to reduce the maximum working voltage of the motor.	[Vrms]	Int	R/W	400	10	612
18322	Out Volt Filter Filter time constant on output voltage.	[msec]	Float	R/W	10	1	500
18325	Volt Prop Gain Proportional gain on voltage loop	[--]	Int	R/W	500	0	32767
18326	Volt Int Gain Integral gain on voltage loop	[--]	Int	R/W	500	0	32767
18328	Out Vlt Max Lim Monitor flux reduction starting voltage.	[Vrms]	Int	R			

DIGITAL INPUTS

The regulation board of the ARTDriveS drive has 8 digital inputs. Seven digital inputs can be programmed to different functions and they are located on the I/O terminal block on R-XVy regulation board.

Refreshing time = 8ms.

The changes in the digital input setting can be enabled by resetting the drive.

This rule can be applied also to the virtual inputs.

20101	Digital Input 1 Choice of the parameters to be set on Digital Input 1 . The possibilities listed as "Choices for the digital input association" are available. Default = Start/stop	[--]	Enum	R/W	4	0	2007
-------	------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------	------	-----	---	---	------

Choices for the digital input association:

0 = OFF Unconfigured input.

2 = Drive reset Alarm Reset command.

Momentary input active on the edge. The drive must be disabled for a reset to occur.

IPA	Description	[Unit]	Format	Access	Default	Min	Max
	3 = External fault External alarm signal. It is active on the leading edge.						
	4 = Start/stop Start /stop command. It is active on the leading edge. In the current and speed configuration this command must be programmed on a digital input. If its value is high, it starts the drive operation; if its value is low, the drive will stop. When this command is active, if a speed reference is present, the motor goes to the set speed.						
	5 = Fast/stop Emergency stop command. Active on the drop wire leading edge. It is active on the leading edge, it stops the speed command instantly, braking the motor with no decel ramp in the shortest possible time till zero speed has been reached. The Fast/stop command is used in emergency and dangerous situations in order to stop the drive in the shortest possible time. If a digital input is set as Fast/stop , this input must be high to run in any mode. The Fast/stop command must be present before the drive enabling command (Enable command). By disabling the voltage on this input while the drive is active, it is possible to cause a braking stop with the shortest possible time. With a start following a Fast/stop command it is necessary to set the Enable digital input with a low logic status and the Fast/stop digital input with a high logic status; before a jog function can be performed.						
	6 = Jog CW Jog forward function command. It is active only in the speed and position configurations. When this input is active, the speed reference and the ramp times are those set in the Jog parameter menu.						
	7 = Jog CCW Jog reverse function command. It is active only in the speed and position configurations. When this input is active, the speed reference and the ramp times are those set in the Jog parameter menu.						
	8 = Ramp in = 0 Ramp In = 0 command. It is active only in the speed and position configurations. When this input is active (high logic status), it replaces the present reference with a zero reference and uses the set ramp. This digital zero keeps the motor rotor stopped in a torque condition, without any offset drift typical for A/D (analog/digital) converters.						
	9 = Reverse Inverse command. When the command is active, it changes the motor rotation direction by following the set ramp.						
	10 = End Run Reverse Clockwise end run command. It is active only in the speed and position configuration. It only allows, regardless of reference, motor x rotation in a clockwise (CW) direction.						
	11 = End Run Forward Counterclockwise end run command. It is active only in the speed and position configuration. It only allows, regardless of reference, motor rotation in a counterclockwise (CCW) direction.						
	12 = Reference = 0 Speed reference = 0. It has the same function as Ramp In = 0 but it does not perform the decel ramp, it stops immediately.						
	14 = Torque loop It selects the Torque Regulation mode.						
	15 = Speed loop Select the mode to Speed regulation.						
	16 = Position loop Select the mode to Position regulation.						
	17 = Line Shaft loop It selects the Electric Axis mode.						
	18 = Disable An Inp 0 Command Disabling analog input 0 (both the value and the offset are disabled). With a high logic level analog input 0 is disabled.						
	19 = Disable An Inp 1 Command Disabling analog input 1 (both the value and the offset are disabled). With a high logic level the analog input 1 is disabled.						
	Speed sel bit 0...2 The number given by the binary combination of these digital inputs selects a digital speed reference set in the parameters of the Multispeed function.						
	21 = Speed sel Bit 0 Multi-speed function, Bit 0 selection.						
	22 = Speed sel Bit 1 Multi-speed function, Bit 1 selection.						
	23 = Speed sel Bit 2 Multi-speed function, Bit 1 selection.						

IPA	Description	[Unit]	Format	Access	Default	Min	Max
-----	-------------	--------	--------	--------	---------	-----	-----

Ramp sel bit 0...1

The number given by the binary combinations of these digital inputs selects the ramp times set in the parameters of the Multiramp function.

24 = Ramp sel Bit 0 Multi-ramp function, Bit 0 selection.

25 = Ramp sel Bit 1 Multi-ramp function, Bit 1 selection.

26 = Virtual DI OK When the virtual digital input 14 (only this one) is set with VIRTUAL DI OK, all the set Virtual digital inputs are active only if this input is equal to 1 (high logic level). In other words, this enables virtual digital input to be used.

27 = Alarm reset When this digital input is active, it is possible to reset all the active alarm (high logic level). The reset is executed only if the alarm cause is no more present.

28 = Virtual Enable Virtual Enable, it functions in parallel with the physical one (Digital Input 0).

29 = Torque Reduct It enables the torque reduction. When it is active, the torque limits are set by the Torque Reduction parameter, IPA 22011.

Motor potentiometer selection

30 = Motor Pot Up Increases speed reference according to the ramp time set in **Motor Pot Acc.**

31 = Motor Pot Down Reduces speed reference according to the ramp time set in **Motor Pot Dec.**

32 = Motor Pot Enable Enables motor potentiometer function

33 = Motor Pot Reset Reset memory

34 = Motor Pot Mode Operational mode of the motor potentiometer:

Low state = speed reference is added to Ramp Reference

High state = the motor potentiometer acts as a Ramp Reference multiplier

35 = Motor Pot Memo Storage of reference setting in memory

High state = storage of last speed setting in memory. After Start, the motor accelerates automatically up to the speed setting.

Low state = After Start, the motor stops, waiting for the **Motor Pot Up** command

36 = Motor Pot Rev Speed reference polarity

Low state = positive reference, High state = negative reference

Sequential position control selection

Inputs active only in Sequential position control configuration. The number given of the binary combination of the digital inputs set as **POS Event Bit 0...7**, forms the parameter value IPA 30800 **Pos Actual Event** which is the event that causes the multiposition controller to go to "Event Match" or "Dwell + Event".

37 = POS Event Bit 0

38 = POS Event Bit 1

39 = POS Event Bit 2

40 = POS Event Bit 3

41 = POS Event Bit 4

42 = POS Event Bit 5

43 = POS Event Bit 6

44 = POS Event Bit 7

45 = Multi Pos Enable Enabling multi-position controller

46 = Multi Pos Abort Ends position sequence.

Powerloss

47 = PL Mains status It signals the mains voltage reset to the drive

Pos-preset 0...5

These inputs are only active with the position configuration. The number given by the binary combination of the digital inputs set as **Pos Preset (0...5)** selects the number of the active position preset.

Example: with a three-position positioner, all **Pos Preset** parameters must have a default value (=0) with the

IPA	Description	[Unit]	Format	Access	Default	Min	Max
	exception of Pos Preset 0 and Pos Preset 1, whose task is the identification of the active position preset (binary combination).						
	1001 = POS Preset 0	Bit 0 position preset.					
	1002 = POS Preset 1	Bit 1 position preset.					
	1003 = POS Preset 2	Bit 2 position preset.					
	1004 = POS Preset 3	Bit 3 position preset.					
	1005 = POS Preset 4	Bit 4 position preset.					
	1006 = POS Preset 5	Bit 5 position preset.					
	1007 = POS 0 Search	Command to Search for the zero position. It is active only in the position configuration. Momentary input active on the rising leading edge. When this command is active, the motor performs a homing (see the POSITION menu).					
	1009 = POS Start Pos	Positioning start command. Initiates the start of a move to new position.					
	1010 = POS Memo 0	Command Storing the 0 position.					
	Momentary input active on the rising leading edge, it allows storage of the present position as a zero position. Such function is normally used in point-to-point self-acquisition positioning procedures.						
	1011 = POS Memo Pos	Position storing command.					
	Momentary input active on the rising leading edge; it allows storage of the present position as a destination position. Such function is normally used in point-to-point self-acquisition positioning procedures.						
	1012 = POS Return	Command returning to a set position. Active pulse input on the climbing leading edge. Movement starting towards an absolute predefined position.					
	1015 = POS 0 sensor	Zero sensor. Used for the zero search.					
	1016 = Save parameters						

Els ratio sel 0...1

The number given by the binary combinations of these digital inputs selects the active speed ratio.

2001 = ELS Ratio Sel B0 Electric Line Shaft function: Preset selection of the bit 0 ratio.

2002 = ELS Ratio Sel B1 Electric Line Shaft function: Preset selection of the bit 1 ratio.

2003 = ELS Inc Ratio Ratio increasing command.

When this command is active, the selected ratio between master and slave is increased with a time constant defined by the **Els Delta Time** and **Els Delta Ratio** parameters.

2004 = ELS Dec Ratio Ratio decreasing command.

When this command is active, the selected ratio between master and slave is decreased with a time constant defined by the **Els Delta Time** and **Els Delta Ratio** parameters.

2005 = ELS RampRatioDis Ramp disabling command during a ratio switching phase.

When this command is active, the ramp time set via the **Els Delta Ratio** parameter (ramp for ratio switching) is ignored and the change will be made immediately. Be careful when using this since new ratios will change as fast as current limit allows.

2006 = ELS Bend Rec CW Command to activate the correction reference (slave drive), bend recover, in CW rotation.

2007 = ELS Bend Rec CCW Command to activate the correction reference (slave drive), bend recover, in CCW rotation.

20102	Digital Input 2	[--]	Enum	R/W/*	8	0	2007
	Choice of the parameters to be set on Digital Input 2 . The possibilities listed as "Choices for the digital input association" are available, see IPA 20100. Default = [8] Ramp in = 0						
20103	Digital Input 3	[--]	Enum	R/W/*	9	0	2007
	Choice of the parameters to be set on Digital Input 3 . The possibilities listed as "Choices for the digital input association" are available, see IPA 20100. Default = [9] Inverse						
20104	Digital Input 4	[--]	Enum	R/W/*	10	0	2007
	Choice of the parameters to be set on Digital Input 4 . The possibilities listed as "Choices for the digital input association" are available, see IPA 20100. Default = [10] End Run Reverse						

IPA	Description	[Unit]	Format	Access	Default	Min	Max
20105	Digital Input 5 Choice of the parameters to be set on Digital Input 5 . The possibilities listed as “Choices for the digital input association” are available, see IPA 20100. Default = [11] End Run Forward	[--]	Enum	R/W/*	11	0	2007
20106	Digital Input 6 Choice of the parameters to be set on Digital Input 6 . The possibilities listed as “Choices for the digital input association” are available, see IPA 20100. Default = [3] External fault	[--]	Enum	R/W/*	3	0	2007
20107	Digital Input 7 Choice of the parameters to be set on Digital Input 7 . The possibilities listed as “Choices for the digital input association” are available, see IPA 20100. Default = [2] Drive reset	[--]	Enum	R/W/*	2	0	2007
20162	Dig Inp Rev Mask This parameter allows changing the logic level of the set digital inputs. Normally digital inputs become active when switching from a low to a high logic level occurs. Through this bit-set parameter it is possible to decide whether to change the logic condition, i.e. active low logic level, inactive high logic level. This parameter cannot modify the logic level of digital input 0.	[--]	DWord	R/W	0H	0H	0FFFFFFH

Example: The intervention of two limit switches (End Run Forward and End Run Reverse) has to be set on two digital inputs, digital input 3 and digital input 4; the limit switch intervention has to be active with a low logic level.

DIGITAL INPUT	7	6	5	4	3	2	1	0
Dig Inp Rev Mask	0	0	0	1	1	0	0	0

1 8

bv9110

It is necessary to set **Dig Inp Rev Mask** = 18H

20100	Dig Inp 0 Status Drive enabled.	[--]	Enum	R
20163	Dig Inp Status Read-only parameter stating the present condition (high logic level 1 and low logic level 0) of the digital inputs. It is an hexadecimal parameter. <i>Example:</i> The digital inputs are: DIG IN 0 = 1 DIG IN 1 = 1 DIG IN 6 = 1	[--]	Word	R

DIGITAL INPUT	7	6	5	4	3	2	1	0
DIG IN STATUS	0	1	0	0	0	0	1	1

4 3

bv9111

The value displayed by the **Dig Inps Status** parameter is 43H .

EXP DIG INPUTS

Inside the ARTDriveS drive it is possible to install an option expansion card of the digital inputs and outputs. It is possible to add up to 8 programmable digital inputs through the following parameters. The programming procedure is the same as the one for the digital inputs.

20150	Exp Dig Inp 0 Choice of the programmable parameters on a digital input. The same possibilities stated for the digital inputs are available. See “Choices for the digital input association” list on IPA 20101.	[--]	Enum	R/W/*	0	0	2007
20151	Exp Dig Inp 1 Scelta dei parametri programmabili su un ingresso digitale. Sono disponibili le stesse possibilità degli ingressi digitali. Vedere la lista “Codifica per l’associazione degli ingressi” IPA 20101.	[--]	Enum	R/W/*	0	0	2007
20152	Exp Dig Inp 2 Choice of the programmable parameters on a digital input. The same possibilities stated for the digital inputs are available. See “Choices for the digital input association” list on IPA 20101.	[--]	Enum	R/W/*	0	0	2007

IPA	Description	[Unit]	Format	Access	Default	Min	Max
20153	Exp Dig Inp 3 Choice of the programmable parameters on a digital input. The same possibilities stated for the digital inputs are available. See “Choices for the digital input association” list on IPA 20101.	[--]	Enum	R/W/*	0	0	2007
20154	Exp Dig Inp 4 Choice of the programmable parameters on a digital input. The same possibilities stated for the digital inputs are available. See “Choices for the digital input association” list on IPA 20101.	[--]	Enum	R/W/*	0	0	2007
20155	Exp Dig Inp 5 Choice of the programmable parameters on a digital input. The same possibilities stated for the digital inputs are available. See “Choices for the digital input association” list on IPA 20101.	[--]	Enum	R/W/*	0	0	2007
20156	Exp Dig Inp 6 Choice of the programmable parameters on a digital input. The same possibilities stated for the digital inputs are available. See “Choices for the digital input association” list on IPA 20101.	[--]	Enum	R/W/*	0	0	2007
20157	Exp Dig Inp 7 Choice of the programmable parameters on a digital input. The same possibilities stated for the digital inputs are available. See “Choices for the digital input association” list on IPA 20101.	[--]	Enum	R/W/*	0	0	2007

20164	Exp Dig Inp Stat Only-reading parameter stating the present condition (high logic level 1 and low logic level 0) of the digital inputs on the EXP-D14A4F expansion card. It is an hexadecimal parameter.	[--]	Word	R			
-------	--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------	------	------	---	--	--	--

Example: The digital inputs are:

Exp Dig Inp 0 = 1

Exp Dig Inp 5 = 1

Exp Dig Inp 7 = 1

EXP DIGIT INPUT	7	6	5	4	3	2	1	0
EXP DIG IN STATUS	1	0	1	0	0	0	0	1

A

1

bx9112

The value displayed by the **Exp Dig Inp Stat** parameter is A1 H.

VIRT DIG INPUTS

Digital virtual inputs which are not physically present on the terminals but which are available to program possible commands, configured through the serial interface or field bus. When an external application needs to use some drive programmable functions through digital input, it is always necessary :

- Set the desired functionality see list “Choices for the digital input association” IPA 20101
- Write the status of the virtual digital inputs (see IPA 20186).

20170	Virt Dig Inp 0 Choice of the programmable parameters on Virt Dig Inp 0 . The same possibilities stated for the digital inputs are available. See “Choices for the digital input association” list on IPA 20101.	[--]	Enum	R/W/*	0	0	2007
20171	Virt Dig Inp 1 Choice of the programmable parameters on Virt Dig Inp 1 . The same possibilities stated for the digital inputs are available. See “Choices for the digital input association” list on IPA 20101.	[--]	Enum	R/W/*	0	0	2007
20172	Virt Dig Inp 2 Choice of the programmable parameters on Virt Dig Inp 2 . The same possibilities stated for the digital inputs are available. See “Choices for the digital input association” list on IPA 20101.	[--]	Enum	R/W/*	0	0	2007
20173	Virt Dig Inp 3 Choice of the programmable parameters on Virt Dig Inp 3 . The same possibilities stated for the digital inputs are available. See “Choices for the digital input association” list on IPA 20101.	[--]	Enum	R/W/*	0	0	2007
20174	Virt Dig Inp 4 Choice of the programmable parameters on Virt Dig Inp 4 . The same possibilities stated for the digital inputs are available. See “Choices for the digital input association” list on IPA 20101.	[--]	Enum	R/W/*	0	0	2007

IPA	Description	[Unit]	Format	Access	Default	Min	Max
20175	Virt Dig Inp 5 Choice of the programmable parameters on Virt Dig Inp 5 . The same possibilities stated for the digital inputs are available. See “ Choices for the digital input association ” list on IPA 20101.	[--]	Enum	R/W/*	0	0	2007
20176	Virt Dig Inp 6 Choice of the programmable parameters on Virt Dig Inp 6 . The same possibilities stated for the digital inputs are available. See “ Choices for the digital input association ” list on IPA 20101.	[--]	Enum	R/W/*	0	0	2007
20177	Virt Dig Inp 7 Choice of the programmable parameters on Virt Dig Inp 7 . The same possibilities stated for the digital inputs are available. See “ Choices for the digital input association ” list on IPA 20101.	[--]	Enum	R/W/*	0	0	2007
20178	Virt Dig Inp 8 Choice of the programmable parameters on Virt Dig Inp 8 . The same possibilities stated for the digital inputs are available. See “ Choices for the digital input association ” list on IPA 20101.	[--]	Enum	R/W/*	0	0	2007
20179	Virt Dig Inp 9 Choice of the programmable parameters on Virt Dig Inp 9 . The same possibilities stated for the digital inputs are available. See “ Choices for the digital input association ” list on IPA 20101.	[--]	Enum	R/W/*	0	0	2007
20180	Virt Dig Inp 10 Choice of the programmable parameters on Virt Dig Inp 10 . The same possibilities stated for the digital inputs are available. See “ Choices for the digital input association ” list on IPA 20101.	[--]	Enum	R/W/*	0	0	2007
20181	Virt Dig Inp 11 Choice of the programmable parameters on Virt Dig Inp 11 . The same possibilities stated for the digital inputs are available. See “ Choices for the digital input association ” list on IPA 20101.	[--]	Enum	R/W/*	0	0	2007
20182	Virt Dig Inp 12 Choice of the programmable parameters on Virt Dig Inp 12 . The same possibilities stated for the digital inputs are available. See “ Choices for the digital input association ” list on IPA 20101.	[--]	Enum	R/W/*	0	0	2007
20183	Virt Dig Inp 13 Choice of the programmable parameters on Virt Dig Inp 13 . The same possibilities stated for the digital inputs are available. See “ Choices for the digital input association ” list on IPA 20101.	[--]	Enum	R/W/*	0	0	2007
20184	Virt Dig Inp 14 Choice of the programmable parameters on Virt Dig Inp 14 . The same possibilities stated for the digital inputs are available. See “ Choices for the digital input association ” list on IPA 20101.	[--]	Enum	R/W/*	0	0	2007
20185	Virt Dig Inp 15 Choice of the programmable parameters on Virt Dig Inp 15 . The same possibilities stated for the digital inputs are available. See “ Choices for the digital input association ” list on IPA 20101.	[--]	Enum	R/W/*	0	0	2007
20186	Virt DI Status It displays and sets the status of the virtual digital inputs. Hexadecimal setting.	[--]	Word	R/W	0000H	0000H	FFFFH

Programming example

If the virtual digital inputs have to be enabled via the serial input:

Virt Dig Inp 0 Programmed as POS Preset 0

Virt Dig Inp 1 Programmed as POS Preset 1

Virt Dig Inp 2 Programmed as POS Preset 2

Virt Dig Inp 3 Programmed as POS Preset 3

If we set to high logic level :

- the bit 0 referring to Virt Dig Inp 0 = 1
- the bit 1 referring to Virt Dig Inp 1 = 1
- the bit 2 referring to Virt Dig Inp 2 = 1
- the bit 3 referring to Virt Dig Inp 3 = 1

IPA	Description	[Unit]	Format	Access	Default	Min	Max
-----	-------------	--------	--------	--------	---------	-----	-----

VIRT DIG IN	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Virt DI Status	0	0	0	0	0	0	0	0	0	0	0	0	1	1	1	1

bv9113

The drive will write in the **Virt DI Status** parameter the value obtained by adding

$$1 \text{ (bit 0)} + 2 \text{ (bit 1)} + 4 \text{ (bit 2)} + 8 \text{ (bit 3)} = 15 = \text{F}$$

$$\text{Virt DI Status} = 000\text{FH}$$

20187	Virt DI at Start	[--]	Word	R/W	FFFFH	0000H	FFFFH
-------	-------------------------	------	------	-----	-------	-------	-------

Setting of the status of the virtual digital inputs when the drive is started.
Through this parameter it is possible to state if each configured input will be reset or not at the power-on.
This is a Hexadecimal setting.
1 = The parameter is not reset at each drive starting.
0 = The parameter is reset at each drive starting.

Application example

If the virtual digital inputs 0 and 2 must be reset at the power-on, it is necessary to:

- (reset) **Virt Dig Inp 0**

Programmed as Pos Preset 0

- (do not reset) **Virt Dig Inp 1**

Programmed as Pos Preset 1

- (reset) **Virt Dig Inp 2**

Programmed as Pos Preset 2

- (do not reset) **Virt Dig Inp 3**

Programmed as Pos Preset 3

It is necessary to set with a high logic level (not reset):

- bit 1 referring to **Virt Dig Inp 1** = 1

- bit 3 referring to **Virt Dig Inp 3** = 1

It is necessary to set with a low logic level (reset):

- bit 0 referring to **Virt Dig Inp 0** = 0

- bit 2 referring to **Virt Dig Inp 2** = 0

VIRT DIG IN	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
VIRT DI STATUS	0	0	0	0	0	0	0	0	0	0	0	0	1	0	1	0

bv9114

it is therefore necessary to write in the **Virtual DI at start** parameter the value obtained by adding

$$0 \text{ (bit 0)} + 2 \text{ (bit 1)} + 0 \text{ (bit 2)} + 8 \text{ (bit 3)} = 10 = \text{A}$$

$$\text{Virt DI at Start} = \text{A}$$

20188	Virt DI at Dis	[--]	Word	R/W	FFFFH	0000H	FFFFH
-------	-----------------------	------	------	-----	-------	-------	-------

Setting of the status of the virtual digital inputs when the drive is disabled.
Through this parameter it is possible to state if each configured input will be reset or not when the drive is disabled. Hexadecimal setting.
1 = The parameter is not reset at each drive starting.
0 = The parameter is reset at each drive starting.

20189	Virt DI at Reset	[--]	Word	R/W	0000H	0000H	FFFFH
-------	-------------------------	------	------	-----	-------	-------	-------

Setting of the virtual digital input condition when a drive alarm gets active.
Through this parameter it is possible to state if each configured input has to be reset or not when an alarm intervenes. Hexadecimal setting.
1 = The parameter is reset when the drive is in an alarm condition

IPA	Description	[Unit]	Format	Access	Default	Min	Max
	0 = The parameter is not reset when the drive is in an alarm condition.						
	The procedure to be followed is the same as the one used for the Virt DI at Start parameter.						

DIGITAL OUTPUTS

In the regulation board of the ARTDriveS drives there is one slow Relay Output and six fast Digital Outputs. The relay output has one N.O. and one N.C. contact, and it is used as “**Drive OK**”. Refreshing time = 8ms.

The changes in the digital output setting can be enabled by resetting the drive.

The same rule can be applied also to the virtual outputs.

NOTE! It is possible to set all the drive alarms on a digital output. The logic status is normally low and it becomes high when the drive is in an alarm condition.

20005	DO Reset at Fail	[-]	Long	R/W	0H	0H	FFFFH
	Setting of the digital output state when a drive alarm gets active: only for alarm code 1...6, 8...12, 18...32, which disable PWM. This parameter allows to state, when an alarm condition intervenes, which digital output, corresponding to the set bit, is brought to a 0 logic level. Hexadecimal setting. The bits 0 ... 5 refer to the digital outputs, the bits 8 ... 13 refer to the digital outputs of the expansion card. 0 = The output does not change its logic level 1 = The output is reset and set with 0.						
20006	DO Set at Fail	[-]	Long	R/W	0H	0H	FFFFH
	Setting of the digital output state when a drive alarm gets active: only for alarm code 1...6, 8...12, 18...32, which disable PWM. This parameter allows to state, when a drive alarm intervenes, which digital output, corresponding to the set bit, is brought to a high logic level. Hexadecimal setting. The bits 0 ... 5 refer to the digital outputs, the bits 8 ... 13 refer to the digital outputs of the expansion card. 0 = The output does not change its logic level 1 = The output is set to an high logic level.						
20200	Digital Output 0	[-]	Enum	R/W*	3	0	1010
	Choice of the programmable parameters on Digital Output 0 . The possibilities listed as “ Choices for Digital output association ” are available. Default = Speed Reached						

Choices for digital output association:

0 = OFF Output not configured.

1 = Drive Enable The digital output reaches high logic status when the drive is power supplied, enabled (enable command active) and no alarm is present.

2 = Drive OK The digital output acquires the high logic status when the drive is power supplied and no alarm is present.

3 = Speed Reached Reached speed.

The digital output reaches high logic status when the motor present speed is equal to the reference within a window defined by the **Speed Thr Wnd** parameter.

4 = Speed 0 Thr Speed = 0.

The digital output reaches high logic status when the motor speed is zero with an dead band (positive and negative) defined by the **Speed Zero Delay** parameter

5 = Torque Limit Torque limit.

The digital output acquires the high logic status with a torque limit functioning condition.

6 = Torque Thr Overcome torque.

The digital output acquires the high logic status when the motor supplied torque, with an absolute value, is higher than the one set in the **Torque Thr** parameter.

7 = Speed Thr Overcome current.

The digital output acquires the high logic status if the speed, with an absolute value, is higher than the value set in the **Speed Thr** parameter.

8 = AD Index (XE) Repetition of incremental encoder index connected on XE connector. The signal

IPA	Description	[Unit]	Format	Access	Default	Min	Max
	remains active for 8 ms.						
9 = DI Index (XER)	Repetition of incremental encoder index connected on XER connector. The signal remains active for 8 ms.						
10 = Position Error	The drive is in Position error (exceeded the threshold of Max Pos Error set in the SERVICE menu).						
11 = Fast Link Rx	On slave drive active during reception of Fast link. This output can be used only on a slave drive.						
12 = UV Active	The drive is in undervoltage alarm (power supply voltage is lower than the undervoltage threshold).						
13 = Cost Through Act	When there is a Mains loss condition, it activates the energy recovery, braking to a stop; in this way the motor can brake in controlled mode.						
14 = Speed Thr > 0	Speed \neq 0.						
	Same meaning of Speed 0 Thr but with an inverted logic level.						
15 = Speed Thr del	Delayed speed threshold reached. The digital output reaches a high logic level if the speed, either positive or negative, is higher than the value set in the Speed Thr parameter for a time higher than the value set in the Speed Thr Delay parameter.						
16 = Torque thr del	Reached delayed torque threshold. The digital output reaches the high logic status if the torque, with an absolute value, is higher than the value set in the Torque Thr parameter for a period longer than Torque Thr Delay .						
17 = Alarm Warning	Active alarm.						
	When a previously masked alarm goes active (see IPA 24100), the digital output set as Alarm warning reaches the high logic level.						
18 = Alarm Coming	Delayed alarm.						
	When a previously delayed alarm gets active (see IPA 24102), the digital output set as Alarm coming reaches the high logic level.						
19 = 80% Overload Thr	The IxT integral has reached 80% of the maximum value						
20 = Brake Command	Command for the motor emergency brake.						
21 = Fast Stop	It states that the drive is in a Fast Stop condition.						
22 = PL Stop active	It indicates that the drive is in an Emergency stop condition.						
100 = Drive fault	Drive in an alarm condition.						
101 = IGBT Desaturat	Short circuit alarm of the power module.						
102 = Overcurrent	Overcurrent alarm.						
103 = Overvoltage	Overcurrent alarm on the DC LINK intermediate circuit.						
104 = Heatsink Ot	Heatsink overtemperature alarm.						
105 = Drive Overload	Drive IxT integral has reached maximum value						
106 = Current Fbk Loss	Loss of Power Supply TA.						
107 = Motor overtemp	Motor overtemperature alarm.						
108 = Motor Overload	Motor Overload						
109 = CPU Overtime	CPU alarm						
111 = Inval Flash Par	Invalid flash parameter alarm.						
112 = Flash Fault	Flash error alarm.						
113 = Brake Overpower	Brake overpower alarm.						
118 = Enc Fbk Loss	Main encoder count alarm.						
119 = Enc Sim Fault	Encoder simulation alarm.						
120 = Undervoltage	Undervoltage alarm.						
121 = Intake Air Ot	Temperature of intake air too high; detected by TAC sensor.						
122 = Regulation Ot	Overtemperature of regulation board; detected by TAR sensor on regulation board.						
123 = Module Overtemp	IGBT module Overtemperature; detected by OTS sensors on Power stage.						
127 = Enable Seq Error	Alarm for a wrong sequence in the drive power supply. This alarm gets active when, at the start up, the drive shows a high Digital input 0.						

IPA	Description	[Unit]	Format	Access	Default	Min	Max
	128 = Fast Link Error	Fast link communication error.					
	129 = Position Fault	The drive is in Position error (A 29) alarm.					
	131 = Sequence Fault	External alarm for the drive.					
	1001 = Position Zero	Position 0 reached.					
	The digital output reaches high logic status when the motor present position is equal to the zero position with an dead band defined by the Pos 0 Thr Offset parameter.						
	1002 = Pos Reached	The digital output acquires the high logic status when the control finishes the positioning procedure and the position is equal to the destination position +- Pos Window for a period equal to Pos Window Time .					
	1003 = Position Exceeded	Position threshold.					
	The digital output acquires the high logic status when the difference between the present position and the starting position is higher than the value set in the Position Thr parameter.						
	1004 = Pos Abs Thr	Absolute position threshold.					
	The digital output reaches high logic status if the position is higher than the value set in the Pos Abs Thr parameter.						
	1005 = Pos Zero Found	Found zero position.					
	The digital output reaches high logic status at the end of the zero searching phase.						
	1006 = Pos Thr Close 1	Reached position threshold 1.					
	The digital output acquires the high logic status when the difference between the motor present position and the destination position is lower or equal to the Pos Thr Close 1 parameter.						
	1007 = Pos Thr Close 2	Reached position threshold 2.					
	The digital output acquires the high logic status when the difference between the motor present position and the destination position is lower or equal to the Pos Thr Close 2 parameter.						
	1008 = Pos Out Of Lim	A value has been set up out of range Min Preset Value/Max Preset Value . If a value required is out of range, it is not executed and the digital output programmed as Pos Out Of Lim changes to high logic status.					
	1009 = Pos Loop Active	It states that the drive present functioning mode is Position					
	1010 = Pos Not Reached	The digital output has a logic state high when position control has ended, and the position is not entered in the +- Pos Window for a period at least equal to Pos Window Time . Takes the low logic state when a new POS Start Pos command is issued.					
	1011 = Mpos end cycle	The output becomes high when the multi-positioning sequence is complete					
20201	Digital Output 1	[-]	Enum	R/W/*	4	0	1010
	Choice of the programmable parameters on Digital Output 1 The possibilities listed as "Choices for Digital output association" are available, see IPA 20200. Default = Speed 0 thr						
20202	Digital Output 2	[-]	Enum	R/W/*	5	0	1010
	Choice of the programmable parameters on Digital Output 2 The possibilities listed as "Choices for Digital output association" are available, see IPA 20200. Default = Torque Limit						
20203	Digital Output 3	[-]	Enum	R/W/*	100	0	1010
	Choice of the programmable parameters on Digital Output 3 The possibilities listed as "Choices for Digital output association" are available, see IPA 20200. Default = Drive Fault						
20204	Digital Output 4	[-]	Enum	R/W/*	131	0	1010
	Choice of the programmable parameters on Digital Output 4 The possibilities listed as "Choices for Digital output association" are available, see IPA 20200. Default = External Fault						
20205	Digital Output 5	[-]	Enum	R/W/*	1	0	1010
	Choice of the programmable parameters on Digital Output 5 The possibilities listed as "Choices for Digital output association" are available, see IPA 20200. Default = Drive Enable						
20254	Dig Out Reverse	[-]	Dword	R/W	00H	0H	FFFFFFFFH
	This parameter allows to change the logic level of the programmed digital outputs. The digital outputs usually have a 0 logic level when they are inactive and they switch to a high logic level when they become active. Via						

IPA	Description	[Unit]	Format	Access	Default	Min	Max
	this bit-mapped parameter it is possible to choose which output the normal logic level has to be switched to. Hexadecimal setting.						

Example: the digital outputs 1, 4 and 5 have to be programmed with an inverted condition:

DIGITAL OUTPUT	5	4	3	2	1	0
Dig Out Reverse	1	1	0	0	1	0
	3		2			

bx9115

It is necessary to set **Dig Out Reverse** = 32H

20255	Dig Out Status	[--]	Word	R			
	Only-reading parameter stating the present condition (high logic level 1 and low logic level 0) of the digital outputs. It is an hexadecimal parameter.						

Example: the digital outputs are:

DIGITAL OUTPUT	5	4	3	2	1	0
Dig Out Status	0	0	1	0	0	0
	0		8			

bx9116

DIG OUT 3 = 1

The value displayed by the **Dig Out Status** parameter is 8H

EXP DIG OUTPUTS

It is possible to install inside the drive a card for the digital inputs and outputs expansion. Up to six Digital Outputs can be expanded and programmed through the below parameters. The programming procedure for the expanded digital outputs is the same as for the digital outputs. Refreshing time = 8ms.

20250	Exp Dig Out 0	[--]	Enum	R/W*	0	0	1010
	Choice of the programmable parameters on Exp Dig Out 0 . The same possibilities stated for the digital outputs are available. See "Choices for the digital output association" list on IPA 20200..						
20251	Exp Dig Out 1	[--]	Enum	R/W*	0	0	1010
	Choice of the programmable parameters on Exp Dig Out 1 . The same possibilities stated for the digital outputs are available. See "Choices for the digital output association" list on IPA 20200..						
20252	Exp Dig Out 2	[--]	Enum	R/W*	0	0	1010
	Choice of the programmable parameters on Exp Dig Out 2 . The same possibilities stated for the digital outputs are available. See "Choices for the digital output association" list on IPA 20200..						
20253	Exp Dig Out 3	[--]	Enum	R/W*	0	0	1010
	Choice of the programmable parameters on Exp Dig Out 3 . The same possibilities stated for the digital outputs are available. See "Choices for the digital output association" list on IPA 20200..						
20257	Exp Dig Out 4	[--]	Enum	R/W*	0	0	1010
	Choice of the programmable parameters on Exp Dig Out 4 . The same possibilities stated for the digital outputs are available. See "Choices for the digital output association" list on IPA 20200..						
20258	Exp Dig Out 5	[--]	Enum	R/W*	0	0	1010
	Choice of the programmable parameters on Exp Dig Out 5 . The same possibilities stated for the digital outputs are available. See "Choices for the digital output association" list on IPA 20200..						
20259	Exp Dig Out 6	[--]	Enum	R/W*	1	0	1010
	Choice of the programmable parameters on Exp Dig Out 6 . The same possibilities stated for the digital outputs are available. See "Choices for the digital output association" list on IPA 20200..						
20260	Exp Dig Out 7	[--]	Enum	R/W*	1	0	1010
	Choice of the programmable parameters on Exp Dig Out 7 . The same possibilities stated for the digital outputs are available. See "Choices for the digital output association" list on IPA 20200..						

IPA	Description	[Unit]	Format	Access	Default	Min	Max
20256	Exp Dig Out Stat	[--]	Word	R			
	Only-reading parameter stating the present condition (high logic level 1 and low logic level 0) of the digital outputs set on the EB-DIO expansion card.						

VIRT DIG OUTPUTS

Virtual digital outputs, which are not physically present on the terminals but which are available to set possible Digital outputs to be read via the serial line or the field bus.

By setting the Virtual digital outputs, the Digital outputs on the terminal strip are still available. The function performed by a digital output programmed on a Digital output or on a Virtual digital output is the same.

The programming procedure is the same as the one stated for the digital outputs.

20270	Virt Dig Out 0	[--]	Enum	R/W*	0	0	1010
	Choice of the programmable parameters on Virt Dig Out 0 . The same possibilities stated for the digital outputs are available. See “ Choices for the digital output association ” list on IPA 20200.						
20271	Virt Dig Out 1	[--]	Enum	R/W*	0	0	1010
	Choice of the programmable parameters on Virt Dig Out 1 . The same possibilities stated for the digital outputs are available. See “ Choices for the digital output association ” list on IPA 20200.						
20272	Virt Dig Out 2	[--]	Enum	R/W*	0	0	1010
	Choice of the programmable parameters on Virt Dig Out 2 . The same possibilities stated for the digital outputs are available. See “ Choices for the digital output association ” list on IPA 20200.						
20273	Virt Dig Out 3	[--]	Enum	R/W*	0	0	1010
	Choice of the programmable parameters on Virt Dig Out 3 . The same possibilities stated for the digital outputs are available. See “ Choices for the digital output association ” list on IPA 20200.						
20274	Virt Dig Out 4	[--]	Enum	R/W*	0	0	1010
	Choice of the programmable parameters on Virt Dig Out 4 . The same possibilities stated for the digital outputs are available. See “ Choices for the digital output association ” list on IPA 20200.						
20275	Virt Dig Out 5	[--]	Enum	R/W*	0	0	1010
	Choice of the programmable parameters on Virt Dig Out 5 . The same possibilities stated for the digital outputs are available. See “ Choices for the digital output association ” list on IPA 20200.						
20276	Virt Dig Out 6	[--]	Enum	R/W*	0	0	1010
	Choice of the programmable parameters on Virt Dig Out 6 . The same possibilities stated for the digital outputs are available. See “ Choices for the digital output association ” list on IPA 20200.						
20277	Virt Dig Out 7	[--]	Enum	R/W*	0	0	1010
	Choice of the programmable parameters on Virt Dig Out 7 . The same possibilities stated for the digital outputs are available. See “ Choices for the digital output association ” list on IPA 20200.						
20278	Virt Dig Out 8	[--]	Enum	R/W*	0	0	1010
	Choice of the programmable parameters on Virt Dig Out 8 . The same possibilities stated for the digital outputs are available. See “ Choices for the digital output association ” list on IPA 20200.						
20279	Virt Dig Out 9	[--]	Enum	R/W*	0	0	1010
	Choice of the programmable parameters on Virt Dig Out 9 . The same possibilities stated for the digital outputs are available. See “ Choices for the digital output association ” list on IPA 20200.						
20280	Virt Dig Out 10	[--]	Enum	R/W*	0	0	1010
	Choice of the programmable parameters on Virt Dig Out 10 . The same possibilities stated for the digital outputs are available. See “ Choices for the digital output association ” list on IPA 20200.						
20281	Virt Dig Out 11	[--]	Enum	R/W*	0	0	1010
	Choice of the programmable parameters on Virt Dig Out 11 . The same possibilities stated for the digital outputs are available. See “ Choices for the digital output association ” list on IPA 20200.						
20282	Virt Dig Out 12	[--]	Enum	R/W*	0	0	1010
	Choice of the programmable parameters on Virt Dig Out 12 . The same possibilities stated for the digital outputs are available. See “ Choices for the digital output association ” list on IPA 20200.						

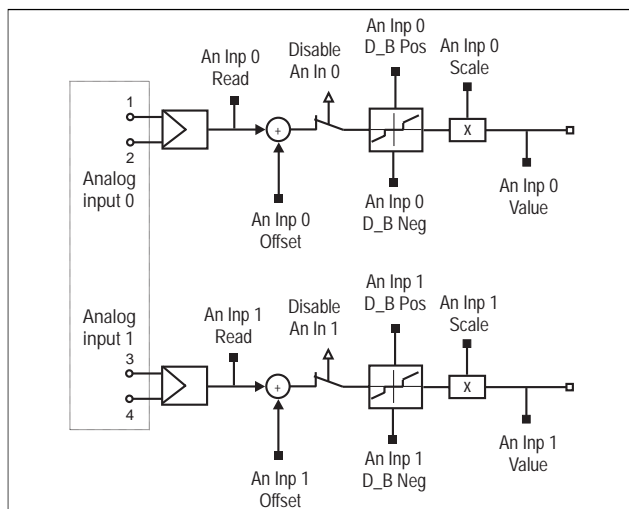
IPA	Description	[Unit]	Format	Access	Default	Min	Max
20283	Virt Dig Out 13 Choice of the programmable parameters on Virt Dig Out 13 . The same possibilities stated for the digital outputs are available. See “ Choices for the digital output association ” list on IPA 20200.	[--]	Enum	R/W*	0	0	1010
20284	Virt Dig Out 14 Choice of the programmable parameters on Virt Dig Out 14 . The same possibilities stated for the digital outputs are available. See “ Choices for the digital output association ” list on IPA 20200.	[--]	Enum	R/W*	0	0	1010
20285	Virt Dig Out 15 Choice of the programmable parameters on Virt Dig Out 15 . The same possibilities stated for the digital outputs are available. See “ Choices for the digital output association ” list on IPA 20200.	[--]	Enum	R/W*	0	0	1010
20289	Virt DO at Reset Setting of the virtual digital output state when a drive alarm gets active: only for alarm code 1...6, 8...12, 18...32, which disable PWM. This parameter allows to state, when an alarm condition intervenes, which virtual output, corresponding to the set bit, is brought to a 0 logic level. Hexadecimal setting. 0 = The output does not change its logic level 1 = The output is reset and set with 0.	[--]	Word	R/W	0000H	0000H	FFFFH
20290	Virt DO at Fail Setting of the virtual digital output state when a drive alarm gets active: only for alarm code 1...6, 8...12, 18...32, which disable PWM. This parameter allows to state, when a drive alarm intervenes, which virtual digital output, corresponding to the set bit, is brought to a high logic level. Hexadecimal setting. 0 = The output does not change its logic level 1 = The output is set to an high logic level.	[--]	Word	R/W	0000H	0000H	FFFFH
20286	Virt DO Status Only-reading parameter stating the present condition of the virtual digital outputs (high logic level 1 and low logic level 0). Hexadecimal setting.	[--]	Word	R			

ANALOG INPUTS

The regulation board of the ARTDriveS drive has two programmable analog inputs.

The Analog Input channels are available on the I/O Terminal Block.

Note! Input maximum value: 10.81 V.
Resolution = 12 bit (11 bit + sign).
Bandwidth = 1,5 kHz.



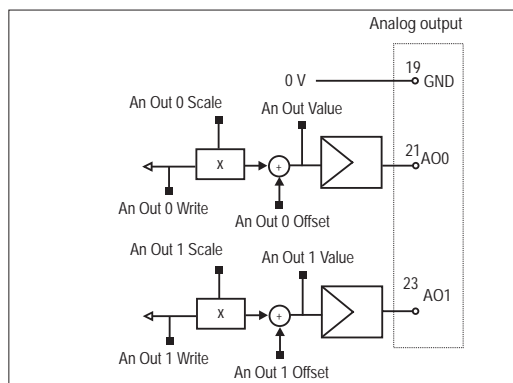
IPA	Description	[Unit]	Format	Access	Default	Min	Max
20300	Analog Inp 0 Sel	[--]	Enum	R/W	3	0	24
	Choice of the parameter to be programmed on analog_input_0. The possibilities listed as "Choices for Analog Input association" are available. Default = Speed Ref 1.						
	Choices for Analog Input association						
	0 = OFF						
	1 = Torque Ref 1 (500 us)						
	2 = Torque Ref 2 (500 us)						
	3 = Speed Ref 1 (500 us)						
	4 = Speed Ref 2 (500 us)						
	5 = Speed Pos Lim (8 ms)						
	6 = Speed Neg Lim (8 ms)						
	7 = Speed limit (8 ms)						
	8 = Jog Ref (8 ms)						
	9 = Torque Limit + (8 ms)						
	10 = Torque Limit - (8 ms)						
	11 = Torque Limit (8 ms)						
	12 = Max Spd Trq Lim (8 ms)						
	13 = Pos Speed (8 ms)						
	14 = Pos Speed Ref 0 (8 ms)						
	15 = Speed Threshold (8 ms)						
	16 = Torque Thr (8 ms)						
	17 = Multi Speed 1 (8 ms)						
	18 = Multi Speed 2 (8 ms)						
	19 = Multi Speed 4 (8 ms)						
	20 = Els Rb Spd Ref (8 ms)						
	21 = Els Ratio [0] (8 ms)						
	22 = Els Ratio [1] (8 ms)						
	23 = Els Ratio [2] (8 ms)						
	24 = Els Ratio [3] (8 ms)						
	25 = Pos Preset 0 (8 ms)						
	26 = Speed Ratio (8 ms)						
	(1):	10V = 2 * Base Torque parameter, TORQUE menu					
	(2):	10V = Full Scale Speed parameter, SPEED menu					
	(3):	10V = Els Max RB Speed parameter, EL SHAFT R BEND menu					
	(4):	10V = Max Prs Abs Val parameter, POSITION FUNC menu					
		0V = Min Prs Abs Val parameter, POSITION FUNC menu					
	(5):	10V = multiplication factor 2.00					
20301	Analog Inp 1 Sel	[--]	Enum	R/W	1	0	65535
	Choice of the parameter to be programmed on Analog Inp 1 Sel. The possibilities listed as "Choices for Analog Input association" are available, see IPA 20300. Default = Torque Ref 1						

IPA	Description	[Unit]	Format	Access	Default	Min	Max
ANALOG INPUT 0							
20320	An Inp 0 Offset	[V]	Float	R/W	0	-10	10
	Writing parameter for the offset setting to be algebraically added to the analog signal.						
20330	An Inp 0 D_B Pos	[V]	Float	R/W	0	0	10
	Writing parameter for the setting of a positive reference threshold, under which the analog value is set to 0.						
20340	An Inp 0 D_B Neg	[V]	Float	R/W	0	-10	0
	Writing parameter for the setting of a negative reference threshold, under which the analog value is set to 0.						
20350	An Inp 0 Scale	[--]	Float	R/W	1	-3.0	3
	Writing parameter for the setting of a multiplication factor of the analog signal.						
20310	An Inp 0 Read	[V]	Float	R			
	Parameter reading the voltage value of the analog input						
20360	An Inp 0 Value	[V]	Float	R			
	Read-only parameter of the analog input after the offset, the scaling and the dead band.						
ANALOG INPUT 1							
20321	An Inp 1 Offset	[V]	Float	R/W	0	-10	10
	Writing parameter for the offset to be algebraically added to the analog signal.						
20331	An Inp 1 D_B Pos	[V]	Float	R/W	0	-10	10
	Writing parameter for the setting of a positive reference threshold under which the analog value is set to 0.						
20341	An Inp 1 D_B Neg	[V]	Float	R/W	0	-10	10
	Writing parameter for the setting of a negative reference threshold under which the analog value is set to 0.						
20351	An Inp 1 Scale	[--]	Float	R/W	1	-3.0	3
	Writing parameter for the setting of a multiplication factor of the analog signal.						
20311	An Inp 1 Read	[V]	Float	R			
	Parameter reading the analog input.						
20361	An Inp 1 Value	[V]	Float	R			
	Read-only parameter of the analog input after the offset, the scaling and the dead band.						

ANALOG OUTPUTS

The drives of the ARTDriveS series are equipped with 2 $\pm 10V$ differential analog outputs and a 12-bit (11 bit + sign) A/D converter. Basic Software allows to program up to two Analog Outputs.

Bandwidth = 280 Hz



20400	Analog Out 0 Sel	[--]	Enum	R/W	1	0	12
	Choice of the parameter to be programmed on Analog Out 0 Sel. The possibilities listed as "Choices for						

IPA	Description	[Unit]	Format	Access	Default	Min	Max
Analog Output association* are available. Deafult =Actual speed (8 ms)							
Choices for Analog Output association:							
0=Off	The analog output is not configured.						
1=Actual Speed (8 ms)	Analog signal proportional to the actual motor speed. With a scale factor equal to 1, the analog output supplies 10V when the speed is equal to the Full Scale Speed parameter.						
2=MotorCurrent (8 ms)	Analog signal proportional to the actual current supplied by the drive. With a scale factor equal to 1, the analog output supplies 10V when the current is equal to the Drive Max Curr parameter.						
3=Motor Torque (8 ms)	Analog signal proportional to the torque supplied by the motor. With a scale equal to 1, the analog output supplies 10V when the torque is equal to 200% of the Base Torque parameter (IPA 18800, 001 - MONITOR or TORQUE menu).						
4=DC Link Voltage (8 ms)	Analog signal proportional to the Voltage of the DC+/ DC- drive intermediate circuit (DC Bus). With a scale factor equal to 1, the analog output supplies 10V when the voltage is equal to 1000 V.						
5=Drive Temp (8 ms)	Analog signal proportional to the drive internal temperature. With a scale factor equal to 1, the analog output supplies 10V when the temperature is equal to 100°C (212°F).						
Note!	The drive internal fan is normally stopped. It becomes active when the temperature exceeds 55°C (131°F).						
6=Ramp Output (8 ms)	Analog signal proportional to the output of the ramp circuit. With a scale factor equal to 1, the analog output supplies 10V when the output voltage of the ramp circuit is equal to the Full Scale Speed parameter.						
7=+10V (8 ms)	+10V Analog signal. Signal available for possible potentiometer connections for the drive references. Unit of measure : Volt.						
8= -10V (8 ms)	-10V Analog signal. Signal available for possible potentiometer connections for the drive references. Unit of measure : Volt.						
9=Position Error (8 ms)	Analog signal proportional to the position error. The analog output reaches 10V when the position error is equal to the AnOut MaxPosErr parameter (IPA 32200).						
10=Flt Act Speed (8 ms)	Actual speed value with low pass filter (400 msec)						
11=Flt Motor Curr (8 ms)	Motor current value with low pass filter (400 msec)						
12=Flt Motor Torque	Value of the motor torque with low-pass filter (400 msec)						
13 = PL Next Factor	Speed reference multiplication factor.						
20401	Analog Out 1 Sel	[--]	Enum	R/W	2	0	12
Choice of the parameter to be programmed on Analog Out 1 Sel . The possibilities listed as "Choices for Analog Output association" are available. Default = [2] Motor current (1 ms) .							
32200	AnOut MaxPosErr	[deg]	Float	R/W	90	0	2880
Position error to scale the Analog Output.							
ANALOG OUT 0							
20420	An Out 0 Scale	[--]	Float	R/W	1	-3.0	3
Parameter for the setting of a multiplication factor of the analog signal.							
20430	An Out 0 Offset	[V]	Float	R/W	0	-10	10
Parameter for the offset setting to be algebraically added to the analog signal.							
20410	An Out 0 Write	[V]	Float	R			
Parameter reading the analog output.							
20440	An Out 0 Value	[V]	Float	R			
Parameter reading the actual voltage of the analog output 0.							

IPA	Description	[Unit]	Format	Access	Default	Min	Max
ANALOG OUT 1							
20421	An Out 1 Scale	[--]	Float	R/W	1	-3.0	3
	Parameter for the setting of a multiplication factor of the analog signal.						
20431	An Out 1 Offset	[V]	Float	R/W	0	-10	10
	Parameter for the offset setting to be algebraically added to the analog signal.						
20411	An Out 1 Write	[V]	Float	R			
	Parameter reading the analog output.						
20441	An Out 1 Value	[V]	Float	R			
	Parameter reading the real value of the analog output 1.						

EXP ANALOG OUT

It is possible to install inside the drive a card for the analog outputs expansion. Up to two Analog Outputs can be expanded and programmed through the below parameters.

The programming procedure for the expanded analog outputs is the same as for the digital inputs.

Refreshing time = 8ms.

20402	Exp Analog Out 0	[--]	Enum	R/W	0	0	12
	Choice of the parameter to be programmed on Exp Analog Out 0 . The possibilities listed as "Choices for Analog Output association" are available, see IPA 20400.						
20403	Exp Analog Out 1	[--]	Enum	R/W	0	0	12
	Choice of the parameter to be programmed on Exp Analog Out 1 . The possibilities listed as "Choices for Analog Output association" are available, see IPA 20400.						

EXP AN OUT 0

20422	ExAn Out 0 Scale	[--]	Float	R/W	1	-3.0	3
	Writing parameter for the setting of a multiplication factor of the analog signal.						
20432	ExAn Out 0 Offse	[V]	Float	R/W	0	-10	10
	Writing parameter for the offset setting to be algebraically added to the analog signal.						
20412	ExAn Out 0 Write	[V]	Float	R			
	Parameter reading the analog output.						
20442	ExAn Out 0 Value	[V]	Float	R			
	Parameter reading the actual voltage of the analog output.						

EXP AN OUT 1

20423	ExAn Out 1 Scale	[--]	Float	R/W	1	-3.0	3
	Writing parameter for the setting of a multiplication factor of the analog signal.						
20433	ExAn Out 1 Offse	[V]	Float	R/W	0	-10	10
	Writing parameter for the offset setting to be algebraically added to the analog signal.						
20413	ExAn Out 1 Write	[V]	Float	R			
	Parameter reading the analog output.						
20443	ExAn Out 1 Value	[V]	Float	R			
	Parameter of the actual voltage of the analog output 1.						

ENC REPETITION

The signal coming from the encoder/resolver and used as a feedback for the speed/space loop can be repeated/ simulated (as a digital encoder) on the XER port with a desired ratio. This port can be configured both as an input (frequency reference, coming from the master encoder, for the electric axis) or as an output.

The repetition can be enabled/disabled via the software (in order to avoid possible failures the XER connector is default configured as an input).

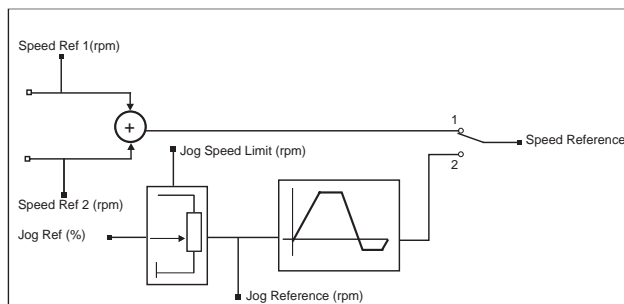
The maximum repetition frequency is 500 kHz; if such frequency is exceeded, a drive alarm occurs as the counting

IPA	Description	[Unit]	Format	Access	Default	Min	Max
	storage can not be assured.						
	The index can be repeated up to a total accumulated limit of 131070 pulses.						
	It is possible to set the position of the first repeated index pulse as compared to the first master index after the index repetition has been enabled.						
	The following indexes will be repeated with a frequency set independently of the master index.						
20035	Enc Rep Sim Cfg	[--]	Enum	R/Z/*	0	0	1
	The following possibilities are available:						
	0=Main Enc Repet	Hw repetition of motor encoder (not available on motor with resolver)					
	1=Spd Pos Enc Sim	Simulation of motor encoder.					
	2=Aux Enc Repeater	Hw repetition of the auxiliary encoder (XER).					
20030	PPR Simulation	[--]	Dword	R/Z/*	1024	1	131071
	Parameter setting the pulse/revolution number for the encoder simulation signal.						
20032	Index Puls Simul	[--]	Dword	R/Z/*	1024	1	536871000
	Parameter setting the gain for the simulation of the zero slot. It states the pulse frequency with which the encoder index is repeated. For example, 100 means that a zero index is obtained every 100 repeated pulses.						
20033	Index Offset Sim	[--]	Long	R/Z/*	0	1	536871000
	Parameter setting the offset for the simulation of the index signal. With this parameter it is possible to program the position of the first repeated index pulse as compared to the first master index, after the index repetition has been enabled. Following indexes will be repeated with the set frequency (Index Puls Simul parameter) independently of the master index.						
19040	Enc Err Simul	[mech.deg.]	Float	R			
	Encoder simulation error.						

JOG FUNCTION

The JOG function can be used both with a speed control and with a position control. By programming specific digital inputs, "Jog CW" and/or "Jog CCW", it is possible to replace the Speed ref speed reference (position 1 for the switch) with the jog one (position 2 for the switch). Speed ref (speed reference) is active when is present the START command while the jog reference is active when is present Jog CW or Jog CCW.

In case both the START and the JOG command are present, the START command has the priority.



21000	Jog Speed Limit	[rpm]	Float	R/W	1500.0	0	IPA2003
	Parameter setting the maximum reference limit for the jog function.						
21001	Jog Reference	[%]	Float	R/W	10	0	100
	Jog function reference, which can be set also via an analog input. Its percentage value states the jog						
21003	CW Jog Acc	[ms/krpm]	Float	R/W	336.1	0	IPA2111
	Setting of the clockwise acceleration time (active on the Jog CW reference).						
21004	CCW Jog Acc	[ms/krpm]	Float	R/W	336.1	0	IPA2111
	Setting of the counterclockwise acceleration time (active on the Jog CCW reference).						

IPA	Description	[Unit]	Format	Access	Default	Min	Max
21005	CW Jog Dec	[ms/krpm]	Float	R/W	336.1	0	IPA2111
Setting of the clockwise deceleration time (active on the Jog CW reference).							
21006	CCW Jog Dec	[ms/krpm]	Float	R/W	336.1	0	IPA2111
Setting of the counterclockwise deceleration time (active on the Jog CCW reference).							

MULTISPEED

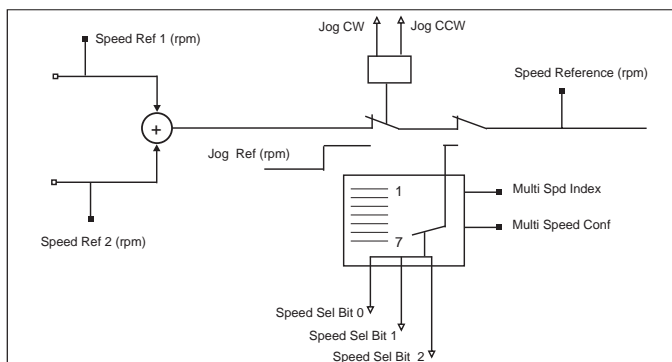
As an alternative to the Speed ref analog reference (in the speed control configuration), it is possible to enable the Multispeed function. Enabling some digital inputs configured as Speed sel bit X (see IPA 20101). it is possible to recall up to seven fixed speeds set in the **Multi Speed XX**. parameters.

The references can be supplied with signs, so that their definition sets the desired rotation direction.

In case the digital inputs programmed as **Speed Sel Bit** are all at 0, the reference **Speed Ref 1/2** remains active

	Speed sel bit 0	Speed sel bit 1	Speed sel bit 2
Multi speed 1	high	low	low
Multi speed 2	low	high	low
Multi speed 3	high	high	low
Multi speed 4	low	low	high
Multi speed 5	high	low	high
Multi speed 6	low	high	high
Multi speed 7	high	high	high

txv9201



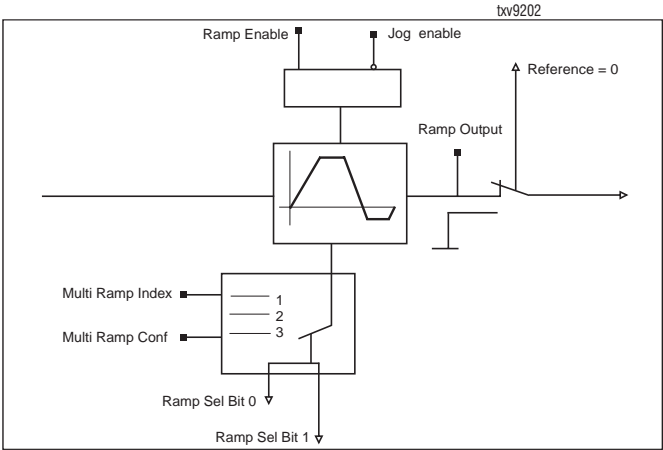
21301	Multi Speed 1	[rpm]	Float	R/W	0	-IPA2003	IPA2003
Setting of the multispeed 1 speed reference							
21302	Multi Speed 2	[rpm]	Float	R/W	0	-IPA2003	IPA2003
Setting of the multispeed 2 speed reference							
21303	Multi Speed 3	[rpm]	Float	R/W	0	-IPA2003	IPA2003
Setting of the multispeed 3 speed reference							
21304	Multi Speed 4	[rpm]	Float	R/W	0	-IPA2003	IPA2003
Setting of the multispeed 4 speed reference							
21305	Multi Speed 5	[rpm]	Float	R/W	0	-IPA2003	IPA2003
Setting of the multispeed 5 speed reference							
21306	Multi Speed 6	[rpm]	Float	R/W	0	-IPA2003	IPA2003
Setting of the multispeed 6 speed reference							
21307	Multi Speed 7	[rpm]	Float	R/W	0	-IPA2003	IPA2003
Setting of the multispeed 7 speed reference							

IPA	Description	[Unit]	Format	Access	Default	Min	Max
21310	Multi Spd Index Read parameter, if Multi Speed Conf = <i>Digital input</i> . It states the currently used speed reference. Read/write parameter if Multi Speed Conf = <i>Parameter</i> . Setting of the multi speed reference.	[--]	Word	R/W	0	0	7
21311	Multi Speed Conf Parameter for the selection of the commands enabling the multi speed references. 0 = Digital input Reference selection via digital input 1 = Parameter Reference selection via the Multi Spd Index parameter It is also possible to select up to 3 analog references as Multispeed (see IPA 20300), which can be recalled via the selection of three digital inputs.	[--]	Enum	R/W	0	0	1

MULTIRAMP

The Multiramp function allows to recall up to three different ramps (in addition to the main ramp). The acceleration and deceleration times can be set in an independent way. The recall of the desired ramp is carried out via a / two digital signals programmed as Ramp sel bit 0 and ramp sel bit 1 (see IPA 20201). The selection of each different ramp allows the reference to follow the new ramp during the acceleration and deceleration phase.

	Ramp sel bit 0	Ramp sel bit 1
Ramp 1	high	low
Ramp 2	low	high
Ramp 3	high	high



21440	Multi Ramp Index Read parameter if Multi Ramp Conf = Digital input. It states the ramp being used. Read/write parameter if Multi Ramp Conf = Parameter. Setting of the multi-ramp selection.	[--]	Word	R/W	0	0	3
21441	Multi Ramp Conf Parameter for the selection of the multi-ramp enabling commands 0 = Digital input Ramp selection via digital input 1 = Parameter Ramp selection via the Multi Ramp Index	[--]	Enum	R/W	1	0	1

MULTIRAMP 1

21401	M Ramp 1 CW Acc Rate 1 setting of the clockwise acceleration	[ms/krpm]	Float	R/W	336.1	0	IPA21111
-------	------------------------------------------------------------------------	-----------	-------	-----	-------	---	----------

IPA	Description	[Unit]	Format	Access	Default	Min	Max
21411	M Ramp 1 CCW Acc Rate 1 setting of the counterclockwise acceleration	[ms/krpm]	Float	R/W	336.1	0	IPA21111
21421	M Ramp 1 CW Dec Rate 1 setting of the clockwise deceleration	[ms/krpm]	Float	R/W	336.1	0	IPA21111
21431	M Ramp 1 CCW Dec Rate 1 setting of the counterclockwise deceleration	[ms/krpm]	Float	R/W	336.1	0	IPA21111
MULTIRAMP 2							
21402	M Ramp 2 CW Acc Rate 2 setting of the clockwise acceleration	[ms/krpm]	Float	R/W	336.1	0	IPA21111
21412	M Ramp 2 CCW Acc Rate 2 setting of the counterclockwise acceleration	[ms/krpm]	Float	R/W	336.1	0	IPA21111
21422	M Ramp 2 CW Dec Rate 2 setting of the clockwise deceleration	[ms/krpm]	Float	R/W	336.1	0	IPA21111
21432	M Ramp 2 CCW Dec Rate 2 setting of the counterclockwise deceleration	[ms/krpm]	Float	R/W	336.1	0	IPA21111
MULTIRAMP 3							
21403	M Ramp 3 CW Acc Rate 3 setting of the clockwise acceleration	[ms/krpm]	Float	R/W	336.1	0	IPA21111
21413	M Ramp 3 CCW Acc Rate 3 setting of the counterclockwise acceleration	[ms/krpm]	Float	R/W	336.1	0	IPA21111
21423	M Ramp 3 CW Dec Rate 3 setting of the clockwise deceleration	[ms/krpm]	Float	R/W	336.1	0	IPA21111
21433	M Ramp 3 CCW Dec Rate 3 setting of the counterclockwise deceleration	[ms/krpm]	Float	R/W	336.1	0	IPA21111

SPEED DRAW

The Speed Draw functional enables the speed reference from the ramp unit to be multiplied by a value between 0 and 2 (0-200%). This value can be entered manually via the configurator, bus or entered from an external analogue reference.

The SPEED DRAW function is working only if parameter 20023 **Control Mode** is set as **Speed**; in all other modes, this function is bypassed (ratio = 1). The function is bypassed in case of Jog run as well.

20085	Speed Draw Ratio Multiplication factor	[--]	Float	R/W	1	0	2
20086	Speed Draw Out Resulting reference speed.	[rpm]	Float	R			
20089	Speed Draw In Speed reference input at SPEED DRAW function.	[rpm]	Float	R			
20092	Act SpdDrw Ratio Speed ratio currently used.	[%]	Float	R			

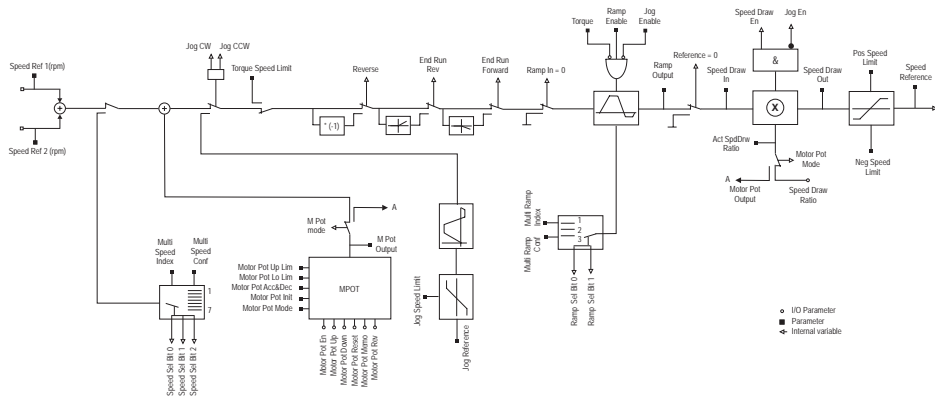
MOTOR POT

The Motor potentiometer function allows the speed of the drive to be varied, with the command entered from the keypad, from digital inputs, from the serial link or the field bus.

Changes are made by setting a ramp time. The Motor-potentiometer reference can be added or multiplied with the output from the ramp.

The Jog function is separate from the Motor potentiometer function.

IPA	Description	[Unit]	Format	Access	Default	Min	Max
-----	-------------	--------	--------	--------	---------	-----	-----



22502	Motor Pot Up Lim	[%]	Float	R/W	100	0	200
Upper limit of the motor potentiometer output reference. 0 ... 200% Referred to Full scale speed if Motor Pot Mode = Add To Ramp Ref . Considered as maximum percentage of main speed reference multiplication if Motor Pot Mode = Speed ref Multip . The parameter can be set through keyboard, serial line or bus.							
22503	Motor Pot Lo Lim	[%]	Float	R/W	100	0	200
Lower limit of the motor potentiometer output reference. 0 ... 200% Referred to Full scale speed if Motor Pot Mode = Add To Ramp Ref . Considered as minimum percentage of main speed reference multiplication if Motor Pot Mode = Speed ref Multip . The parameter can be set through keyboard, serial line or bus.							
22504	Motor Pot Acc	[msec]	Long	R/W	4000	0	IPA20003
Speed reference acceleration time. [s] 0 ... 6553,5 (Referred to Full Scale Speed). If Motor Pot Mode = Add To Ramp Ref : the drive main ramp (RAMP menu) is overwritten by Motor Pot Acc . If Motor Pot Mode = Speed Ref Multip : the drive main ramp (RAMP menu) is completely independent from Motor Pot Acc . The command can be sent through keyboard, terminals, serial line or bus.							
22505	Motor Pot Dec	[msec]	Long	R/W	4000	0	IPA20003
Speed reference deceleration time. [s] 0 ... 6553,5 (Referred to Full Scale Speed). If Motor Pot Mode = Add To Ramp Ref : the drive main ramp (RAMP menu) is overwritten by Motor Pot Dec . If Motor Pot Mode = Speed Ref Multip : the drive main ramp (RAMP menu) is completely independent from Motor Pot Dec . The parameter can be set through keyboard, serial line or bus.							
22506	Motor Pot Init	[%]	Float	R/W	0	0	100
Initialisation of the motor potentiometer output reference. 0 ... 200% Referred to Full scale speed if Motor Pot Mode = Add To Ramp Ref . Considered as percentage of main speed reference multiplication if Motor Pot Mode = Speed ref Multip . The parameter can be set through keyboard, serial line or bus.							
22507	Motor Pot En	[-]	Enum	R/W	0	0	1
Enabling of motor potentiometer function. The command can be sent through keyboard, terminals, serial line or bus.							

IPA	Description	[Unit]	Format	Access	Default	Min	Max
	0 = Disabled 1 = Enabled						
22508	Motor Pot Reset Reset memory and initialisation of Motor Pot Output to a value set in Motor Pot Init . 0 = Disabled 1 = Enabled Reset The command can be sent through keyboard, terminals, serial line or bus.	[--]	Float	R/W	0	0	1
22509	Motor Pot Mode Operational mode of the motor potentiometer: 0 = Add to Ramp Ref Speed reference is added to Speed Ref 1 = Ramp Ref Multip The motor potentiometer acts as a Speed Ref multiplier. In this case, the drive Speed Draw function is used. <i>Note:</i> if the Speed Ratio parameter is set to analog input, this takes the priority over the motor-potentiometer function. The command can be sent through keyboard, terminals, serial line or bus.	[--]	Enum	R/W	0	0	1
22510	Motor Pot Memo Storage of reference setting in memory 0 = Disabled Restart from default configuration If Motor Pot Mode = Add To Ramp Ref : the speed reference is set to the value shown in Motor Pot Lo Lim . If Motor Pot Mode = Speed Ref Multip : the speed ratio is set to 100%. The command can be sent through keyboard, terminals, serial line or bus. Storage of last speed or speed ratio set. If Motor Pot Mode = Add To Ramp Ref : after Start, the motor accelerates automatically up to the preset speed. If Motor Pot Mode = Speed Ref Multip : after Start, the motor follows the speed reference multiplied by the preset ratio. 1 = Enabled	[--]	Float	R/W	0	0	1
22511	Motor Pot Dir Polarity inversion of speed reference. 0=Forward direct 1=Reverse reversed reference The command can be sent through keyboard, terminals, serial line or bus.	[--]	Bool	R/W	0	0	1
22501	Motor Pot Output Monitor for motor potentiometer setting 0 ... 200%. The command can be sent through keyboard, serial line or bus.	[%]	Float	R			

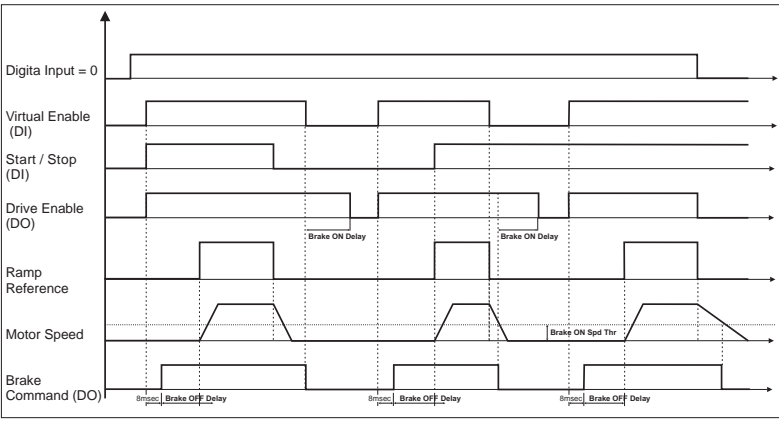
BRAKE CONTROL

The brake function allows to control in a suitable way the motor emergency brake with a drive digital output programmed as [20] **Brake Command**.

The drive enabling and disabling requires the use of a digital input programmed as [28] **Virtual Enable**.

In case an alarm occurs or the digital input 0 drops out during the functioning procedure, the output controlling the brake drops out when the motor speed is lower than the programmable threshold.

IPA	Description	[Unit]	Format	Access	Default	Min	Max
-----	-------------	--------	--------	--------	---------	-----	-----



Note! In case an alarm occurs, the behavior is the same as the one used for the Digital Input 0 drop.

20600	Brake Enable	[--]	Enum	R/W	0	0	1
	0 = Disabled						
	1 = Enabled						
	Disabled brake function.						
	Enabled brake function						
20601	Brake OFF Delay	[sec]	Float	R/W	0	0	10
	Delay stated in seconds from the brake opening command to the reference enabling.						
20602	Brake ON Delay	[sec]	Float	R/W	0	0	10
	Delay stated in seconds from the brake closing command to the drive disabling (non-torque motor).						
20603	Brake ON Spd Thr	[rpm]	Float	R/W	100	0	20000
	Speed threshold closing the brake in case an alarm occurs or the digital input 0 drops out.						

POWERLOSS

The Powerloss function controls the loss of power whether transient or long term. When running in Powerloss mode, the system is controlled so as to use the motor's kinetic energy, keeping the DC link voltage value high. The function is activated automatically for a cut-in threshold of around 78% of normal operating voltage of the DC Link (e.g.: for a 400 V AC supply, the threshold is 440 V DC). The function's activation can be detected by the programmable **PL Stop Active** parameter on the digital output.

There are two operating modes implemented: **Coast through** and **Emergency Stop**. The choice is made from the **Powerloss Config.** parameter.

Coast-through mode

This mode is designed to allow the controlled motor to pass through a mains dip with as little loss of speed as possible. When the function activation threshold is detected, the motor speed is controlled by a PI regulator, in order to maintain the DC Link voltage constant at a predefined value of 12% above the voltage drop threshold. The gains on the PI regulator are set via **P Loss Prop Gain** and **P Loss Int Gain**. The function is automatically deactivated when the mains power returns, restoring the motor to the operating conditions prior to the break. If the power loss is permanent, or the motor speed drops too low to allow kinetic energy to be recovered, the drive stops in the **Main Power Loss (A16)** alarm conditions.

Emergency Stop mode

This mode is designed for use in applications where the motor or motors installed in a machine have to be stopped in a

IPA	Description	[Unit]	Format	Access	Default	Min	Max
controlled and synchronised way, including where mains power is lost.							
When the function activation threshold is detected, the drive reduces the output frequency according to the P Loss Ramp setting, causing the motor to operate as a generator, recharging the DC Link to the value specified in the P Loss Volt Ref parameter. The motor speed is then controlled via a PI regulator and regulated to keep the DC Link voltage constant. The gains on the PI regulator are set via P Loss Prop Gain and P Loss Int Gain .							
While operating in Powerloss the drive current limit is set with P Loss Trq Limit .							
When the motor speed drops below the threshold set in P Loss Spd 0 Thr , the drive stops in Main Power Loss (A16) alarm conditions.							
The PL Next Factor parameter, that can be set on the analogue output, provides the speed reference (Motor Speed / Speed Reference). It can be used as a speed reference multiplier for the other motors installed on the machine, to permit synchronised stop.							
The drive can be notified that the mains voltage is restored via the PL Mains Status parameter or via a digital input.							
When the parameter value returns to the high state, and if the motor speed is above the threshold set in P Loss NoRes Thr , the system accelerates the motor again to the operating conditions prior to the break, with the standard system ramp (RAMP menu).							
18138	PL Mains status It signals the mains voltage reset to the drive. The command can be sent through keyboard, programmable digital input, serial line or bus. 0 = Off 1 = On	[--]	Bool	R/W	0	0	1
18130	Powerloss Config Configuration of Powerloss function. 0 = Disabled 1 = Coast - Through 2 = Emergency Stop	[--]	Enum	R/W/*	0	0	2
18131	P Loss Prop Gain Proportional gain of Powerloss function regulation algorithm.	[--]	Int	R/W	500	0	32767
18132	P Loss Int Gain Integral gain of Powerloss function regulation algorithm.	[--]	Int	R/W	500	0	32767
18133	P Loss Volt Ref Reference value for Emergency stop function algorithm.	[V]	Float	R/W	790	100	820
18134	P Loss Ramp Ramp value used for activation of Emergency stop function algorithm.	[ms/krpm]	Float	R/W	336.1	0	FLT_MAX
18135	P Loss Trq Lim Maximum value of braking torque in Emergency Stop phase.	[%]	Float	R/W	100	0	FLT_MAX
18136	P Loss Spd 0 Thr Main Loss alarm (A 16) activation threshold..	[rpm]	Float	R/W	10	0	FLT_MAX
20088	P Loss NoRes Thr Speed threshold below which operation can no longer be restored to the state prior to a break in power, when the power returns.	[rpm]	Float	R/W	10	0	100000
18137	PL Next Factor Provides the speed reference (Motor Speed / Speed Reference). It can be used as a speed reference multiplier for the other motors installed on the machine, to permit synchronised stop. The parameter can be set to a programmable analog output.	[--]	Float	R			
20087	Loss Active Power loss function activity state. 0 = Not Active 1 = Active	[--]	ENUM	R	0	0	1

IPA	Description	[Unit]	Format	Access	Default	Min	Max
-----	-------------	--------	--------	--------	---------	-----	-----

POSITION

The drives can be configured in Position Control; the default mode is however Speed Control.

DRIVE CONFIG / Control Mode -> Position

Caution! In order to perform a right positioning, the drive has to reach the position 0 (or homing position) at least once. When the home position has been found, it is maintained till the drive is switched off or reset. It is possible to perform a new 0 search (or homing) at any moment by rising the digital input programmed as Pos zero search.

There are 8 point-point conditions available, with constant acceleration profile, configurable in absolute or relative mode, and with options of various speed and acceleration settings for each position.

Absolute mode:

- **Position Mode** parameter= [0] Absolute : used to vary distances between stations, by modifying the position of each individual station, and in the event of an unwanted stop, allowing easier return to the zero position (home).
 - **Position Mode** parameter= [1] IncAbs : movements are incremental, in absolute steps.
- Example:* if the preset position is 2000 u.u., the destination settings are 2000, 4000, 6000,

Relative mode:

- **Position Mode** parameter = [2] Incremental : movements are incremental with respect to the starting position
- Example:* if the selected position preset is 2000 u.u. (user unit), with each Pos start pos command the position increases by 2000 u.u.

For each movement, the parameters can be set:

Pos Preset X	Setting initial sector
Pos Speed X	Setting speed
Pos Acc X	Setting acceleration
Pos Dec X	Setting deceleration

The parameters for managing functions are in the **Position** menu:

- Find Zero
- Position start
- Position reference from analogue input
- Self-learning measurements
- Sequential position control (multi-position controller)

Zero search (Pos 0 search)

The zero search phase can be performed following different procedures:

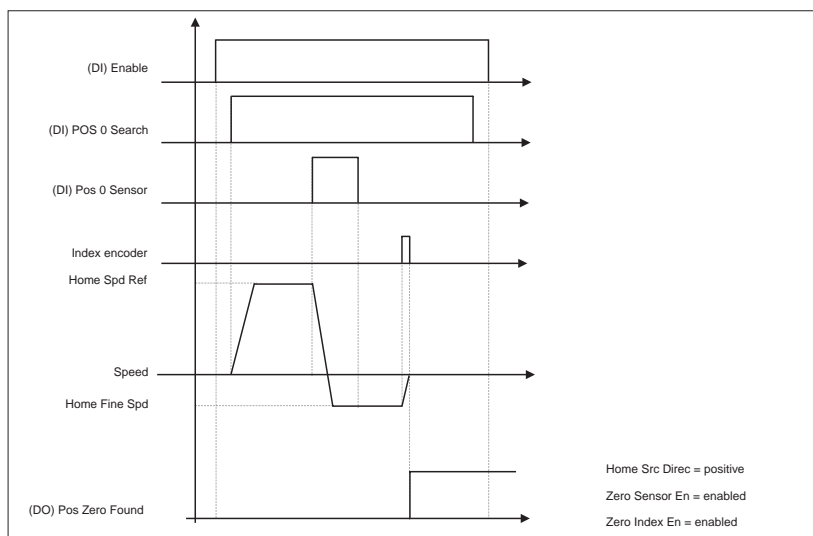
- A - Using the zero sensor and the encoder slot (default mode)
- B - Using only the zero sensor
- C - Using the encoder slot
- D - With parameter IPA 30045, 0 Pos at Startup (ZERO FOUND CONF menu)

IPA	Description	[Unit]	Format	Access	Default	Min	Max
-----	-------------	--------	--------	--------	---------	-----	-----

A - Using the zero sensor and the encoder slot (default mode):

Zero Sensor En = Enabled;

Zero Index En = Enabled.



- 1) Abilitare il drive: ingresso digitale "Enable" a stato logico alto.
- 2) Abilitare (stato logico alto) l'ingresso digitale programmato come **POS 0 Search**.
- 3) When the motor receives the **POS 0 Search** command, it starts moving in the direction stated by the **Home Src Direc** parameter (positive = motor clockwise rotation direction) with the **Home Spd Ref** reference. When the sensor is used (high **POS 0 Sensor**), the motor changes its rotation direction and the active speed reference becomes **Home Fine Spd**. The motor stops at the first encoder slot after freeing the sensor (low **POS 0 Sensor**) The position of the encoder slot is acquired as position 0.

If the sensor is used at the motor start up (high **POS 0 Sensor**) the motor starts rotating in an opposite direction as compared to the one stated by the **Home Src Direc** parameter (positive = the motor rotates in an anti-clockwise direction) with the **Home Fine Spd** reference. The motor stops at the first encoder slot after freeing the sensor (low **POS 0 Sensor**). The position of the encoder slot is acquired as position 0.

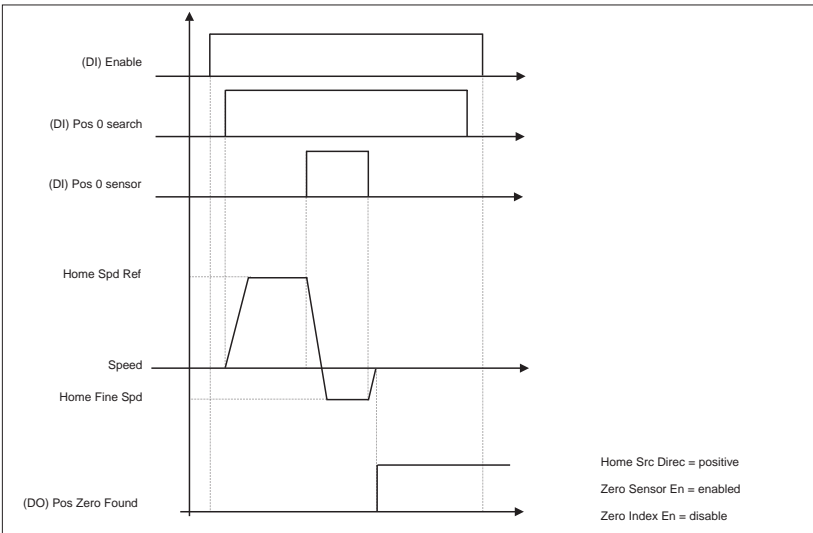
The **Inside Index Src** parameter allows to define if the encoder index corresponding to zero is internal or external to the sensor.

The **Zero Sensor Edge** parameter allows to choose the active edge of the zero sensor. For further information see the **ZERO FOUND CONFIG** menu.

B - Using only the zero sensor

Zero Sensor En = Enabled;

Zero Index En = Disabled.



- 1) Enable the drive: **"Enable"** digital input with a high logic status.
- 2) Enable (high logic status) the digital input programmed as **POS 0 Search**.
- 3) When the motor receives the **POS 0 Search** command, it starts moving in the direction stated by the **Home Src Direc** parameter (positive = motor clockwise rotation direction) with the **Home Spd Ref** reference. When the sensor is used (high **POS 0 Sensor**), the motor changes its rotation direction and the active speed reference becomes **Home Fine Spd**.
The motor stops after the sensor has been freed (low **POS 0 Sensor**). This position is acquired as position 0.

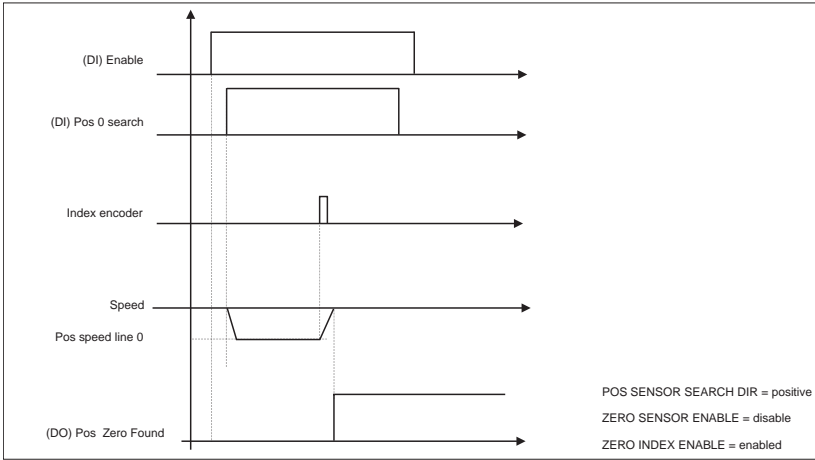
If the sensor is used at the motor start up (high **POS 0 Sensor**) the motor starts rotating in an opposite direction as compared to the one stated by the **Home Src Direc** parameter (positive = the motor rotates in an anti-clockwise direction) with the **Home Fine Spd** reference. The motor stops after the sensor has been freed (low **POS 0 Sensor**). This position is acquired as position 0.

The **Zero Sensor Edge** parameter allows to choose the active edge of the zero sensor. For further information see the **ZERO FOUND CONF** menu.

C - Using the encoder slot

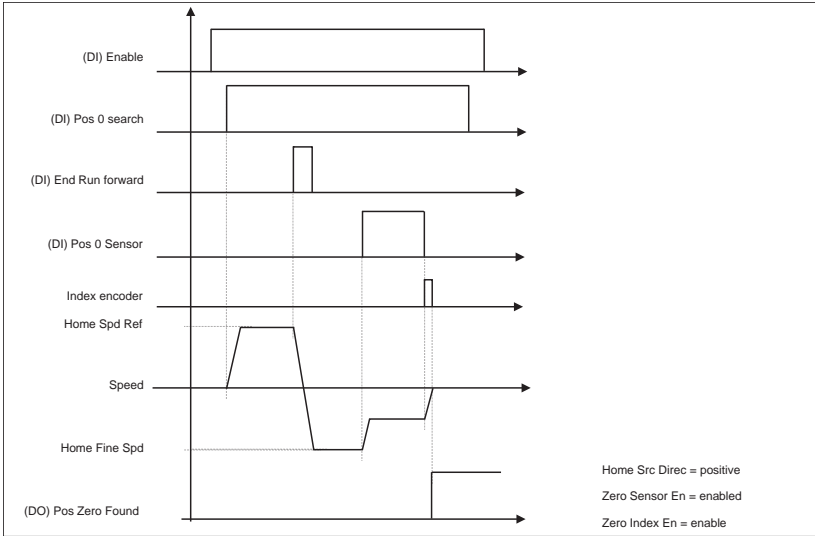
Zero Sensor En = Disabled;
Zero Index En = Enabled

- 1) Enable the drive: **"Enable"** digital input with a high logic status.
- 2) Enable (high logic status) the digital input programmed as **POS 0 Search**.
- 3) When the motor receives **POS 0 Search** command, the motor starts rotating in a direction opposite to the one stated by the **Home Src Direc** parameter (positive = the motor rotates in an anti-clockwise direction) with the **Home Fine Spd** reference. The motor stops at the first encoder slot and acquires this position as 0.



NOTE! If Zero Sensor En = Disabled and Zero Index En = Disabled by rising POS 0 Search the motor stands still and the home search is not performed.

If in the A and B condition the limit switch is found (**End Run Forward** if the speed is positive and **End Run Reverse** if the speed is negative) before using the sensor, the motor changes its rotation direction maintaining the **Home Spd Ref** reference speed. When the sensor is used (**high POS 0 Sensor**), the active speed reference is **Home Fine Spd**, but the motor does not change its rotation direction. The motor stops when the sensor is freed (**low POS 0 Sensor**). This position is acquired as position 0. This is useful when the 0 sensor is not placed at one of the stroke ends.



If an offset is set for the zero position (**Home Pos Offset** different from 0), during the zero search the motor behaves as previously described. The only difference is that in the home point the position is equal to **-Home Pos Offset**. Through the **Home Pos Offs En** parameter it is possible to stop the motor at 0 user units, i.e. a movement of **-Home Pos Offset** as compared to the encoder slot.

IPA	Description	[Unit]	Format	Access	Default	Min	Max
-----	-------------	--------	--------	--------	---------	-----	-----

D - With parameter IPA 30045, 0 Pos at Startup (ZERO FOUND CONF menu)

- 1) Enable parameter IPA 30045, 0 Pos at Startup (ZERO FOUND CONF menu)
- 2) Next time the drive is turned on it will sample the position of the encoder which will be acquired as Zero position (Home).

Note: If a further zero search is made with one of the above methods, the initial zero position will be overwritten.

Position Start

At the end of the zero search phase it is possible to carry out the position start. The motor, when the drive (enabled) receives the **POS Start Pos** command, starts rotating with the reference **Pos Speed** and reaches the set value. There are 64 registers where it is possible to store the desired values and to recall them via digital inputs programmed as **Pos Preset 0,1,2,3,4,5**. (They are used to state in a binary way the positioning value. It is not necessary to use them all. If they have not been programmed, the bits are set at 0).

For each value of the first 8 registers it is possible to set a maximum speed and a personalized acceleration and deceleration ramp. As for the other registers, the speed, the acceleration and deceleration ramp is the same for them all.

Position reference from analogue input

For absolute positioning (IPA 30091, **Position Mode** = 1) with continuous sampling enabled (IPA 30099, **Pos An Mode** = 1) an analogue input can be sampled to set the position reference **Pos Preset 0**.

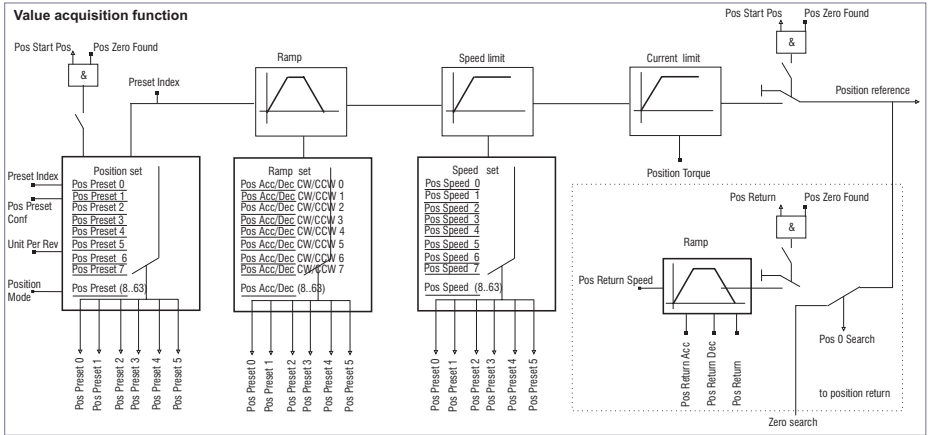
The sampled reference will go from **Min Prs Abs Val** to **Max Prs Abs Val**

Example: 0V = Min Prs Abs Val, 10V = Max Prs Abs Val

The analogue reference is followed as long as the **POS-Start Pos** remains active, and when it is deactivated the value is frozen as the final position.

Other parameters dedicated to the function: IPA 30098, **Pos An Filter**; IPA 30097, **Pos An Stdy Wind**; IPA 30096, **Pos An Wind Del** .

Value Self-acquisition



POS Memo 0: (see IPA 20101) it stores the present position as a zero position. If the zero position is stored, the value is considered to have been found (a further zero search is not necessary to perform the positioning procedure).

POS Memo Pos: (see IPA 20101) it stores the present position as a value xx. The register where the value has to be stored is stated by the **Preset Index** parameters if the **Pos Preset Conf** parameter has been set as Parameter, or by the digital input if **Pos Preset Conf** has been set as Digital Input.

Sequential position control (multi-position controller)

When a position is completed (within the first eight) it is possible to continue to follow it with any subsequent movement, as long as certain conditions are fulfilled. This allows a composite movement to be executed.

The following parameters control the sequence

Pos X Progress	At the end of each position setting, this parameter enables or prevents movement to the next position.
Pos Dwell X	Sets the delay time for forward movement
Pos Event X	Setting the forward movement following an event from digital or field bus inputs
M Pos X Next Pos	Setting of next positioning step.

The forward movement may take place:

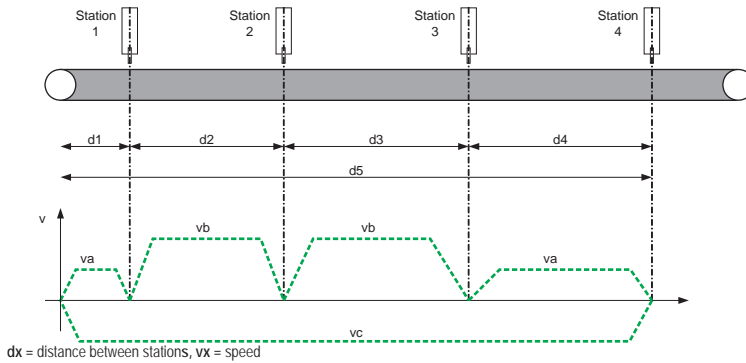
- with a delay, set in **Pos Dwell X**
- following an event. The event is a value given by the digital or field bus inputs which equals **Pos Event X**
- Combination of both the above: after a period waiting for an event to be performed.

The command **POS Start Pos** selects the initial sector as a function of **POS Preset**

The following parameters are available to enable, display and interrupt the sequence:

IPA	Description	[Unit]	Format	Access	Default	Min	Max
Menu	Parameter		Function				
POSITION FUNC	Multi Pos Enable [46] MultiPos Abort		Enabling multi-position controller Command from digital or field bus input: Interrupts position sequence. Interruption possible with POS Start Pos disabled or with drive disabled. At next POS Start Pos command, the sector will be chosen according to POS Preset.				
POSITION	Multi Pos Index Actual Event Start on Edge Start on Edge		Sector in execution Value of variable Event., is compared to Pos Event X Enabled: with Multi Pos Enable = ON, Start on Edge is always Disabled. Disabled: with the POS Start Pos command it advances, as the command is cut, it stops. As the next command is given, it moves on from the stop point.				

Example of use of Multi-position controller: Repeated movement of a conveyor belt



Movement to the next station takes place when the micro-switches are in position, and in each case after a minimum preset time.

- *Setting parameters in absolute mode - POSITION | POSITION FUNC Menu*

Position Mode = Absolute

The positions shown are absolute with respect to zero (home)

Multi Pos Enable = On

- *Event definition: with three digital inputs, Pos Actual Event can be set from 0 to 7*

Digital Input 4 = POS Event Bit 0

Digital Input 5 = POS Event Bit 1

Digital Input 6 = POS Event Bit 2

- *Setting five presets for the position (Pos Preset 0, 1, 2, 3 and 4)*

> Menu POSITION|Pos Preset 0

Parameter	setting	note
Pos Preset 0	d1	
Pos Speed 0	va	
Pos Acc 0	xxx	will not be relayed to the other settings
Pos Dec 0	xxx	will not be relayed to the other settings
MPos 0 Progress	Dwell+Event	advance to the next position setting

IPA	Description	[Unit]	Format	Access	Default	Min	Max
MPos 0 Dwell	100	arrived at station 1, waits 100 msec					
MPos 0 Event	3	waits until Pos Actual Event word equals 3, so that the digital inputs 4 and 5 are high.					
MPos 0 Next Pos	1	advancement to Pos Preset 1					

> Menu POSITIONI**Pos Preset 1**

Parameter	setting	note	
Pos Preset 1	d1+d2		
Pos Speed 1	vb		
MPos 1 Progress	Dwell+Event	advance to the next position setting	
MPos 1 Dwell	100	arrived at station 2, waits 100 msec	
MPos 1 Event	7	waits until Pos Actual Event word equals 7, so that the digital inputs 4, 5 and 6 are high.	
MPos 1 Next Pos	2	advancement to Pos Preset 2	

> Menu POSITIONI**Pos Preset 2**

Parameter	setting	note	
Pos Preset 2	d1+d2+d3		
Pos Speed 2	vb		
MPos 2 Progress	= Dwell+Event	advance to the next position setting	
MPos 2 Dwell	= 100	arrived at station 3, waits 100 msec	
MPos 2 Event	= 1	waits until Pos Actual Event word equals 1, so that the digital input 4 is high.	
MPos 2 Next Pos	3	advancement to Pos Preset 3	

> Menu POSITIONI**Pos Preset 3**

Parameter	setting	note	
Pos Preset 3	d1+d2+d3+d4		
Pos Speed 3	va		
MPos 3 Progress	Dwell+Event	advance to the next position setting	
MPos 3 Dwell	100	arrived at station 4, waits 100 msec	
MPos 3 Event	2	waits until Pos Actual Event word equals 2, so that the digital input 2 is high.	
MPos 3 Next Pos	4	advancement to Pos Preset 4	

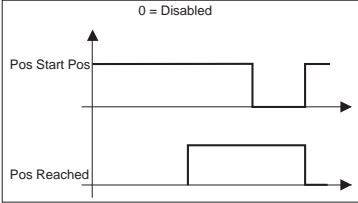
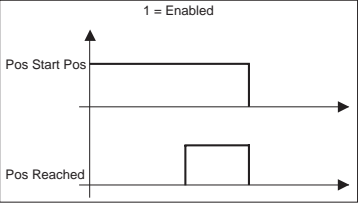
> Menu POSITIONI**Pos Preset 4**

Parameter	setting	note	
Pos Preset 4	0	Home	
Pos Speed 4	vc		
MPos 4 Progress	Dwell+Event	advance to the next position setting	
MPos 4 Dwell	100	arrived at home waits 100 msec	
MPos 4 Event	5	waits until Pos Actual Event word equals 5, so that the digital inputs 4 and 5 are high.	
MPos 4 Next Pos	0	advancement to Pos Preset 0	

> Menu POSITIONI**Pos Preset 5 ... 8**

Parameter	setting	note	
MPos 5 Progress ... MPos 8 Progress	None	default	

30000	Unit Per Rev	[--]	Float	R/Z/*	1000	-10000	100000
	Setting of distance (in u.u.) covered by one motor revolution. Parameter used for the conversion of the position into engineering units; by setting a negative value it is possible to combine positive positioning procedures with motor anti-clockwise rotations.						
30001	Unit Per Div	[--]	Float	R/Z/*	1	1	10000.0
	This parameter is used as divider to calculate the number of motor pulses per user unit, and to avoid rounding errors introduced by mechanical ratios. As example let's consider a mechanical system made with a 10 mm pitch ballscrew and a 1:3 gear ratio. If we want to express the distances in millimeters we can set the parameters as follows: Unit Per Rev (IPA 30000) = 10 Unit Per Div (IPA 30001) = 3						
30002	Multi Pos Enable	[--]	Bool	R/W	0	0	1
	Enabling multi-position controller 0 = Disabled 1 = Enabled						

IPA	Description	[Unit]	Format	Access	Default	Min	Max
30010	Pos CW Acc Setting of the clockwise acceleration rate during the positioning procedures (ramp rate active for the positions set by the registers 8 to 63)..	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30011	Pos CCW Acc Setting of the counterclockwise acceleration rate during the positioning procedures (ramp rate active for the positions set by the registers 8 to 63).	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30012	Pos CW Dec Setting of the clockwise deceleration rate during the positioning procedures (ramp rate active for the positions set by the registers 8 to 63).	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30013	Pos CCW Dec Setting of the counterclockwise deceleration rate during the positioning procedures (ramp rate active for the positions set by the registers 8 to 63)	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30014	Position Speed It is active if the Pos_speed analog input is not programmed. Setting of the speed reference during the positioning procedures (active for the positions set by the registers 8 to 63).	[rpm]	Float	R/W	3000.0	0	IPA20003
30042	Start on Edge 0 = Disabled 1 = Enable The change of this parameter is active only after a homing phase. The change to this parameter is active only after the drive is reset.	[-]	Enum	R/W	0	0	1
30043	Stop by Ramp 0 = Disabled 1 = Enable The change to this parameter is active only after the drive is reset.	[-]	Enum	R/W	0	0	1
30044	Pos Reach Behav 0 = Disabled 1 = Enable	[-]	Enum	R/W	0	0	1
<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>0 = Disabled</p>  </div> <div style="text-align: center;"> <p>1 = Enabled</p>  </div> </div>							
30057	Back Lash Window This parameter sets the width of the position window where it is possible to correct the positioning errors caused by some mechanical clearance. During the positioning process if the input defined as [1010] POS Memo 0 becomes active the drive will complete the move, but it will be consider that the starting point of the next move command will be the position where POS Memo 0 input become active. If the input defined as POS Memo 0 becomes active outside the position window defined in Back Lash Window, the drive will not start the next position command until new zero search will be completed. This function is active only in "Inc Abs"	[u.u.]	Float	R/W	2000.0	0	IPA30018

IPA	Description	[Unit]	Format	Access	Default	Min	Max
30090	Preset Index Read parameter if Pos Preset Conf = Digital input. Read/write parameter if Pos Preset Conf = Parameter. It states which position preset is currently used.	[--]	Word	R/W	0	0	63
30091	Position Mode This parameter states if the positioning values make reference to the zero position or to the actual position. (Relative or absolute moves).	[--]	Enum	R/W	0	0	1
<p>0 = Inc Abs It states that the value of the position register is incremental for absolute pitches. <i>Example:</i> if the position preset is 2000 u.u., the destination values are 2000, 4000, 6000, ... If the positioning procedure is stopped, the new POS Start Pos command ends the previous positioning procedure.</p>							
<p>1 = Absolute It states that the value of the position register is absolute as compared to the zero position. <i>Example:</i> If the currently selected position preset is 2000 u.u., with the first command of POS Start Pos the destination position is 2000 u.u. (referred to the zero position); with the following commands (if the register is not modified) the position will not change.</p>							
<p>2=Incremental It indicates that the position register setting is incremental compared to the current position. <i>Example:</i> if the preset position presently selected is at 2000 u.u. (user unit), each POS Start Pos command will increase the position by 2000 u.u. If the seeking is interrupted, the next POS Start Pos command will increase the position by 2000 u.u. from the point where the motor stopped.</p>							
30094	Pos Stop Dec Setting of the active clockwise/anti-clockwise deceleration time when the POS Start Pos command is disabled before the in process positioning procedure is completed.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30004	Multi Pos Index Displays the sector of Pos Preset in execution during execution of the Multiposition function.	[--]	Int	R			
30016	Actual Position Read-only parameter. It states the motor present position as compared to the zero position.	[u.u.]	Float	R			
30081	Destination Pos Read-only parameter stating the destination position in user units.	[u.u.]	Float	R			
30093	Position Config Bit-configured parameter with hexadecimal setting. Bit 0: Mapping the IPA 30044 parameter Bit 1: Mapping the IPA 30042 parameter Bit 2: Mapping the IPA 30043 parameter Bit 9: Using the absolute encoder to close the position loop Bit 11: Using the revolver to close the position loop. Bit 12: Using the external encoder to close the position loop. Bit 16: Mapping the IPA 30037 parameter Bit 17: Mapping the IPA 30038 parameter Bit 18: Mapping the IPA 30036 parameter Bit 19: Mapping the IPA 30039 parameter Bit 20: Mapping the IPA 30040 parameter Bit 21: Mapping the IPA 30041 parameter	[--]	Dword	R			
30800	Pos Actual Event Displays the present state of the events from the digital or bus inputs active in the function Multi position controller to advance from one position to the next.	[--]	Word	R			

IPA	Description	[Unit]	Format	Access	Default	Min	Max
POSITION LIMIT							
30015	Position Torque Setting of the maximum torque during the positioning procedures (active for all positions set in the records from 0 to 63).	[%]	Float	R/W	100	0	IPA22012
30017	Min Preset Value Parameter stating the minimum value to be set in the different position registers. In case the setting of a position is lower than this value, such setting is not accepted.	[u.u.]	Float	R/Z/*	-4194304	-2 ²³	2 ²³ -1
30018	Max Preset Value Parameter stating the maximum value to be set in the different position registers. In case the setting of a position is higher than this value, such setting is not accepted.	[u.u.]	Float	R/Z/*	4194303	-2 ²³	2 ²³ -1
30056	Max Prs Abs Val Software limit switch: maximum absolute value. When it is equal to Min Prs Abs Val , it is not enabled. If the destination value is higher than this value, the command is not performed and the drive enables the digital output [1008] Pos Out Of Lim .	[u.u.]	Float	R/W	0	-2 ²³	2 ²³ -1
30055	Min Prs Abs Val Software limit switch: minimum absolute value. When it is equal to Max Prs Abs Val , it is not enabled. If the destination value is lower than this value, the command is not performed and the drive enables the digital output [1008] Pos Out Of Lim .	[u.u.]	Float	R/W	0	-2 ²³	2 ²³ -1
POS THR CONFIG							
30050	Pos Abs Thr Setting of the threshold indicating the machine has passed the position referred to the zero position. When the position is higher than the value set in this parameter, the digital output programmed as [1004] Pos Abs Thr goes to +24V.	[u.u.]	Float	R/W	0	-2 ²³	2 ²³ -1
30051	Pos Exceeded Setting of the threshold signaling the "overcome position" referred to the last positioning procedure: present position - starting position > Positon Thr, the "Position Exceeded" output is set.	[u.u.]	Float	R/W	0	0	IPA30018
30052	Pos 0 Thr Offset Setting the offset of the position threshold. When the absolute value position is lower than the value set in this parameter, the digital output programmed as [1001] Position Zero is active.	[u.u.]	Float	R/W	0	0	IPA30018
30053	Pos Thr Close 1 Reached position threshold 1. The digital output reaches high logic status when the motor present position is equal to the destination position minus the Pos Thr Close 1 parameter	[u.u.]	Float	R/W	0	0	IPA30018
30054	Pos Thr Close 2 Reached position threshold 2. The digital output reaches high logic status when the motor present position is equal to the destination position minus the Pos Thr Close 2 parameter	[u.u.]	Float	R/W	0	0	IPA30018
30058	Pos Window This parameter, together with Pos Window Time , defines the behavior of the [1002] Pos Reached digital output. The output is set when, after terminating the positioning procedure, the present position is equal to the destination position +- Pos Window for a period equal to Pos Window Time .	[u.u.]	Float	R/W	0	0	IPA30018
30059	Pos Window Time This parameter sets the time delay for the correct positioning inside Pos Window , IPA 30058). Used with digital output set to [1002] Pos Reached .	[sec]	Float	R/W	0	0	30
30060	Pos Window Tout This parameter defines the period of time within which the position is considered as not reached. Used with digital output set to [1010] Pos Not Reached (see IPA 30058).	[sec]	Float	R/W	0	0	0

IPA	Description	[Unit]	Format	Access	Default	Min	Max
POS PRESET 0							
30100	Pos Preset 0 Setting of the position value in the register 0.	[u.u.]	Float	R/W	0	IPA30017	IPA30018
30200	Pos Speed 0 Maximum speed setting during the positioning phase of preset 0. If this value is set with 0 (rpm) the Pos Speed parameter in the POSITION menu becomes active.	[rpm]	Float	R/W	0	0	IPA20003
30300	Pos CW Acc 0 Setting of the clockwise acceleration rate during the positioning phase of preset 0.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30400	Pos CW Dec 0 Setting of the clockwise acceleration rate during the positioning phase of preset 0.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30380	Pos CCW Acc 0 Setting of the counterclockwise acceleration rate during the positioning phase of preset 0.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30490	Pos CCW Dec 0 Setting of the counterclockwise acceleration rate during the positioning phase of preset 0.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30500	Pos 0 Progress Setting performance of the Multi-position controller function to reach the required setting 0 = None 1 = Dwell 2 = Event match 3 = Dwell+Event	[-]	Enum	R/W	0	0	3
	The position control sequence is interrupted When the position is reached before going to the next phase, waits for the period set with MPos 0 Dwell When the position is reached before going to the next phase, waits until the Pos Actual Event parameter equals MPos 0 Event When the position is reached before going to the next phase, waits for the time set in MPos 0 Dwell and then until the Pos Actual Event parameter equals MPos 0 Event						
30600	Pos Dwell 0 Delay in reaching the specified value and moving onto the next station.	[msec]	Long	R/W	0	0	32000
30700	Pos Event 0 Value of Pos Actual Event variable, from which to move on to the next value.	[-]	Word	R/W	0	0	65535
30710	MPos 0 Next Pos Setting of next positioning step. 0= Pos Preset 0 ... 7=Pos Preset 7	[-]	Word	R/W	1	0	7
ANALOG POS REF							
30096	Pos An Wind Del Delay time after entering the Pos An Stdy Wind window to ensure that the position reference is stable. Usually, Pos An Wind Del should be increased according to the Pos An Stdy Wind increase.	[msec]	Word	R/W	20	0	65
30097	Pos An Stdy Wind Windows expressed in u.u., within which the position analog reference can oscillate without changing Pos Preset 0 . The window is controlled according to the last stable position. An increase of the Pos An Stdy Wind value as regards the default value will result in a stability increase, but also in a delay in following the required position. Pos An Stdy should however be set to a value higher than the max. position resolution defined by the analog input.	[u.u.]	Float	R/W	0.5	0	-
<i>Example:</i> Min Prs Abs Val = 0 [u.u.], Max Prs Abs Val = 10000 [u.u.], 10000 / 2047 = 4.88, set Pos An Stdy Wind = 2 * 4.88 = 10[u.u.]							
30098	Pos An Filter Filter on sampling of Position 0 from analogue input.	[msec]	Float	R/W	0.2	0	10

IPA	Description	[Unit]	Format	Access	Default	Min	Max
30099	Pos An Mode Enables continuous sampling of the Position reference 0 (typically where it is assigned to an analogue input); this function is active only when the Position Mode parameter is set to Absolute. 0 = Step 1 = Continuous	[--]	Bool	R/W	0	0	1
POS PRESET 1							
30101	Pos Preset 1 Setting of the position value in the register 1.	[u.u.]	Float	R/W	0	IPA30017	IPA30018
30201	Pos Speed 1 Maximum speed setting during the positioning phase of preset 1. If this value is set with 0 (rpm) the Pos Speed parameter in the POSITION menu becomes active.	[rpm]	Float	R/W	0	0	IPA20003
30301	Pos CW Acc 1 Setting of the clockwise acceleration rate during the positioning phase of preset 1.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30401	Pos CW Dec 1 Setting of the clockwise acceleration rate during the positioning phase of preset 1.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30481	Pos CCW Acc 1 Setting of the counterclockwise acceleration rate during the positioning phase of preset 1.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30491	Pos CCW Dec 1 Setting of the counterclockwise acceleration rate during the positioning phase of preset 1.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30501	Pos 1 Progress Setting performance of the Multi-position controller function to reach the required setting 0 = None 1 = Dwell 2 = Event match 3 = Dwell+Event	[--]	Enum	R/W	0	0	3
	The position control sequence is interrupted When the position is reached before going to the next phase, waits for the period set with MPos 1 Dwell When the position is reached before going to the next phase, waits until the Pos Actual Event parameter equals MPos 1 Event When the position is reached before going to the next phase, waits for the time set in MPos 1 Dwell and then until the Pos Actual Event parameter equals MPos 1 Event						
30601	Pos Dwell 1 Delay in reaching the specified value and moving onto the next station.	[msec]	Long	R/W	0	0	32000
30701	Pos Event 1 Value of Pos Actual Event variable, from which to move on to the next value.	[--]	Word	R/W	0	0	65535
30711	MPos 1 Next Pos Setting of next positioning step. 0= Pos Preset 0 ... 7=Pos Preset 7	[--]	Word	R/W	2	0	7
POS PRESET 2							
30102	Pos Preset 2 Setting of the position value in the register 2.	[u.u.]	Float	R/W	0	IPA30017	IPA30018
30202	Pos Speed 2 Maximum speed setting during the positioning phase of preset 2. If this value is set with 0 (rpm) the Pos Speed parameter in the POSITION menu becomes active.	[rpm]	Float	R/W	0	0	IPA20003
30302	Pos CW Acc 2 Setting of the clockwise acceleration rate during the positioning phase of preset 2.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30402	Pos CW Dec 2 Setting of the clockwise acceleration rate during the positioning phase of preset 2.	[ms/krpm]	Float	R/W	336.1	0	IPA21111

IPA	Description	[Unit]	Format	Access	Default	Min	Max
30482	Pos CCW Acc 2 Setting of the counterclockwise acceleration rate during the positioning phase of preset 2.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30492	Pos CCW Dec 2 Setting of the counterclockwise acceleration rate during the positioning phase of preset 2.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30502	Pos 2 Progress Setting performance of the Multi-position controller function to reach the required setting 0 = None 1 = Dwell 2 = Event match 3 = Dwell+Event	[--]	Enum	R/W	0	0	3
	The position control sequence is interrupted When the position is reached before going to the next phase, waits for the period set with MPos 2 Dwell When the position is reached before going to the next phase, waits until the Pos Actual Event parameter equals MPos 2 Event When the position is reached before going to the next phase, waits for the time set in MPos 2 Dwell and then until the Pos Actual Event parameter equals MPos 2 Event						
30602	Pos Dwell 2 Delay in reaching the specified value and moving onto the next station.	[msec]	Long	R/W	0	0	32000
30702	Pos Event 2 Value of Pos Actual Event variable, from which to move on to the next value.	[--]	Word	R/W	0	0	65535
30712	MPos 2 Next Pos Setting of next positioning step. 0= Pos Preset 0 ... 7=Pos Preset 7	[--]	Word	R/W	3	0	7
POS PRESET 3							
30103	Pos Preset 3 Setting of the position value in the register 3.	[u.u.]	Float	R/W	0	IPA30017	IPA30018
30203	Pos Speed 3 Maximum speed setting during the positioning phase of preset 3. If this value is set with 0 (rpm) the Pos Speed parameter in the POSITION menu becomes active.	[rpm]	Float	R/W	0	0	IPA20003
30303	Pos CW Acc 3 Setting of the clockwise acceleration rate during the positioning phase of preset 3.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30403	Pos CW Dec 3 Setting of the clockwise acceleration rate during the positioning phase of preset 3.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30483	Pos CCW Acc 3 Setting of the counterclockwise acceleration rate during the positioning phase of preset 3.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30493	Pos CCW Dec 3 Setting of the counterclockwise acceleration rate during the positioning phase of preset 3.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30503	Pos 3 Progress Setting performance of the Multi-position controller function to reach the required setting 0 = None 1 = Dwell 2 = Event match 3 = Dwell+Event	[--]	Enum	R/W	0	0	3
	The position control sequence is interrupted When the position is reached before going to the next phase, waits for the period set with MPos 3 Dwell When the position is reached before going to the next phase, waits until the Pos Actual Event parameter equals MPos 3 Event When the position is reached before going to the next phase, waits for the time set in MPos 3 Dwell and then until the Pos Actual Event parameter equals MPos 3 Event						
30603	Pos Dwell 3 Delay in reaching the specified value and moving onto the next station.	[msec]	Long	R/W	0	0	32000

IPA	Description	[Unit]	Format	Access	Default	Min	Max
30703	Pos Event 3 Value of Pos Actual Event variable, from which to move on to the next value.	[--]	Word	R/W	0	0	65535
30713	MPos 3 Next Pos Setting of next positioning step. 0= Pos Preset 0 ... 7=Pos Preset 7	[--]	Word	R/W	4	0	7
POS PRESET 4							
30104	Pos Preset 4 Setting of the position value in the register 4	[u.u.]	Float	R/W	0	IPA30017	IPA30018
30204	Pos Speed 4 Maximum speed setting during the positioning phase of preset 4. If this value is set with 0 (rpm) the Pos Speed parameter in the POSITION menu becomes active.	[rpm]	Float	R/W	0	0	IPA20003
30304	Pos CW Acc 4 Setting of the clockwise acceleration rate during the positioning phase of preset 4.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30404	Pos CW Dec 4 Setting of the clockwise acceleration rate during the positioning phase of preset 4.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30484	Pos CCW Acc 4 Setting of the counterclockwise acceleration rate during the positioning phase of preset 4.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30494	Pos CCW Dec 4 Setting of the counterclockwise acceleration rate during the positioning phase of preset 4.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30504	Pos 4 Progress Setting performance of the Multi-position controller function to reach the required setting 0 = None The position control sequence is interrupted 1 = Dwell When the position is reached before going to the next phase, waits for the period set with MPos 4 Dwell 2 = Event match When the position is reached before going to the next phase, waits until the Pos Actual Event parameter equals MPos 4 Event 3 = Dwell+Event When the position is reached before going to the next phase, waits for the time set in MPos 4 Dwell and then until the Pos Actual Event parameter equals MPos 4 Event	[--]	Enum	R/W	0	0	3
30604	Pos Dwell 4 Delay in reaching the specified value and moving onto the next station.	[msec]	Long	R/W	0	0	32000
30704	Pos Event 4 Value of Pos Actual Event variable, from which to move on to the next value.	[--]	Word	R/W	0	0	65535
30714	MPos 4 Next Pos Setting of next positioning step. 0= Pos Preset 0 ... 7=Pos Preset 7	[--]	Word	R/W	5	0	7
POS PRESET 5							
30105	Pos Preset 5 Setting of the position value in the register 5.	[u.u.]	Float	R/W	0	IPA30017	IPA30018
30205	Pos Speed 5 Maximum speed setting during the positioning phase of preset 5. If this value is set with 0 (rpm) the Pos Speed parameter in the POSITION menu becomes active.	[rpm]	Float	R/W	0	0	IPA20003
30305	Pos CW Acc 5 Setting of the clockwise acceleration rate during the positioning phase of preset 5.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30405	Pos CW Dec 5 Setting of the clockwise acceleration rate during the positioning phase of preset 5.	[ms/krpm]	Float	R/W	336.1	0	IPA21111

IPA	Description	[Unit]	Format	Access	Default	Min	Max
30485	Pos CCW Acc 5 Setting of the counterclockwise acceleration rate during the positioning phase of preset 5.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30495	Pos CCW Dec 5 Setting of the counterclockwise acceleration rate during the positioning phase of preset 5.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30505	Pos 5 Progress Setting performance of the Multi-position controller function to reach the required setting 0 = None 1 = Dwell 2 = Event match 3 = Dwell+Event	[--]	Enum	R/W	0	0	3
							The position control sequence is interrupted When the position is reached before going to the next phase, waits for the period set with MPos 5 Dwell When the position is reached before going to the next phase, waits until the Pos Actual Event parameter equals MPos 5 Event When the position is reached before going to the next phase, waits for the time set in MPos Dwell and then until the Pos Actual Event parameter equals MPos 5 Event
30605	Pos Dwell 5 Delay in reaching the specified value and moving onto the next station.	[msec]	Long	R/W	0	0	32000
30705	Pos Event 5 Value of Pos Actual Event variable, from which to move on to the next value.	[--]	Word	R/W	0	0	65535
30715	MPos 5 Next Pos Setting of next positioning step. 0= Pos Preset 0 ... 7=Pos Preset 7	[--]	Word	R/W	6	0	7

POS PRESET 6

30106	Pos Preset 6 Setting of the position value in the register 6.	[u.u.]	Float	R/W	0	IPA30017	IPA30018
30206	Pos Speed 6 Maximum speed setting during the positioning phase of preset 6. If this value is set with 0 (rpm) the Pos Speed parameter in the POSITION menu becomes active.	[rpm]	Float	R/W	0	0	IPA20003
30306	Pos CW Acc 6 Setting of the clockwise acceleration rate during the positioning phase of preset 6.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30406	Pos CW Dec 6 Setting of the clockwise acceleration rate during the positioning phase of preset 6.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30486	Pos CCW Acc 6 Setting of the counterclockwise acceleration rate during the positioning phase of preset 6.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30496	Pos CCW Dec 6 Setting of the counterclockwise acceleration rate during the positioning phase of preset 6.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30506	Pos 6 Progress Setting performance of the Multi-position controller function to reach the required setting 0 = None 1 = Dwell 2 = Event match 3 = Dwell+Event	[--]	Enum	R/W	0	0	3
							The position control sequence is interrupted When the position is reached before going to the next phase, waits for the period set with MPos 6 Dwell When the position is reached before going to the next phase, waits until the Pos Actual Event parameter equals MPos 6 Event When the position is reached before going to the next phase, waits for the time set in MPos 6 Dwell and then until the Pos Actual Event parameter equals MPos 6 Event
30606	Pos Dwell 6 Delay in reaching the specified value and moving onto the next station.	[msec]	Long	R/W	0	0	32000

IPA	Description	[Unit]	Format	Access	Default	Min	Max
30706	Pos Event 6 Value of Pos Actual Event variable, from which to move on to the next value.	[--]	Word	R/W	0	0	65535
30716	MPos 6 Next Pos Setting of next positioning step. 0= Pos Preset 0 ... 7=Pos Preset 7	[--]	Word	R/W	7	0	7
POS PRESET 7							
30107	Pos Preset 7 Setting of the position value in the register 7.	[u.u.]	Float	R/W	0	IPA30017	IPA30018
30207	Pos Speed 7 Maximum speed setting during the positioning phase of preset 7. If this value is set with 0 (rpm) the Pos Speed parameter in the POSITION menu becomes active.	[rpm]	Float	R/W	0	0	IPA20003
30307	Pos CW Acc 7 Setting of the clockwise acceleration rate during the positioning phase of preset 7.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30407	Pos CW Dec 7 Setting of the clockwise acceleration rate during the positioning phase of preset 7.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30487	Pos CCW Acc 7 Setting of the counterclockwise acceleration rate during the positioning phase of preset 7.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30497	Pos CCW Dec 7 Setting of the counterclockwise acceleration rate during the positioning phase of preset 7.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30507	Pos 7 Progress Setting performance of the Multi-position controller function to reach the required setting 0 = None The position control sequence is interrupted 1 = Dwell When the position is reached before going to the next phase, waits for the period set with MPos 7 Dwell 2 = Event match When the position is reached before going to the next phase, waits until the Pos Actual Event parameter equals MPos 7 Event 3 = Dwell+Event When the position is reached before going to the next phase, waits for the time set in MPos 7 Dwell 7 and then until the Pos Actual Event parameter equals MPos 7 Event	[--]	Enum	R/W	0	0	3
30607	Pos Dwell 7 Delay in reaching the specified value and moving onto the next station.	[msec]	Long	R/W	0	0	32000
30707	Pos Event 7 Value of Pos Actual Event variable, from which to move on to the next value.	[--]	Word	R/W	0	0	65535
30717	MPos 7 Next Pos Setting of next positioning step. 0= Pos Preset 0 ... 7=Pos Preset 7	[--]	Word	R/W	0	0	7
POS PRESET (8-63)							
30108	Pos Preset 8 Setting of the position value in the register 8.	[u.u.]	Float	R/W	0	IPA30017	IPA30018
.....							
30163	Pos Preset 63 Setting of the position value in the register 63.	[u.u.]	Float	R/W	0	IPA30017	IPA30018

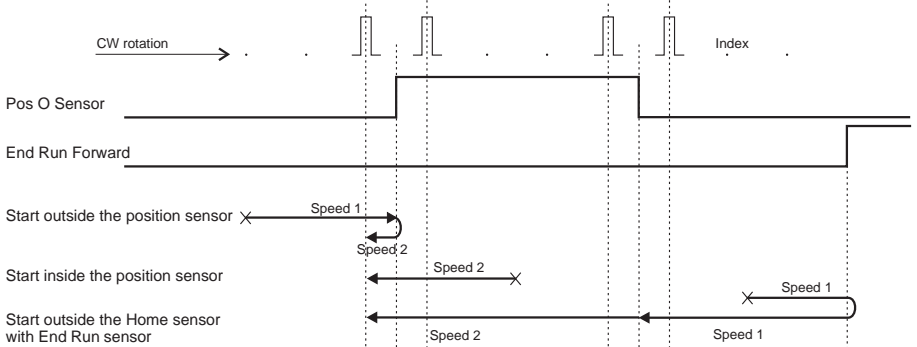
IPA	Description	[Unit]	Format	Access	Default	Min	Max
ZERO FOUND CONF (Zero Configuration)							

**Search with Zero Sensor En (IPA 30037) = Enabled, Zero Index En (IPA 30038) = Enabled
Home Src Direc (IPA 30036) = Positive**

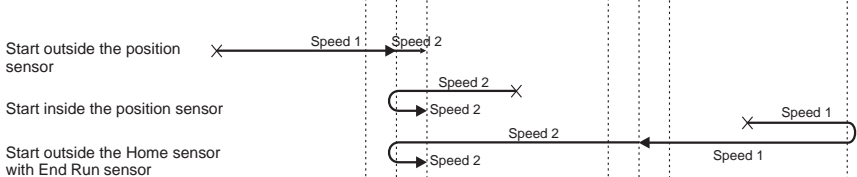
$$\text{Speed 1} = \text{Home Spd Ref} * \frac{\text{Home Max Spd (IPA 30024)}}{100}$$

Speed 2 = Home Fine Spd (IPA 30027)

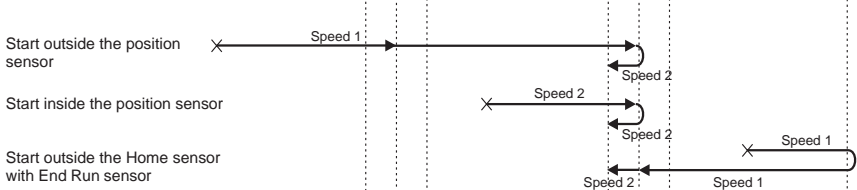
Inside Index Src (IPA 30039) = Disabled, Zero Sensor Edge (IPA 30040) = Rising



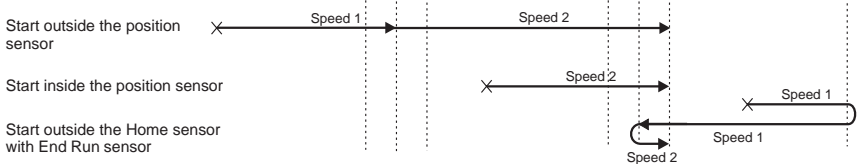
Inside Index Src (IPA 30039) = Enabled, Zero Sensor Edge (IPA 30040) = Rising



Inside Index Src (IPA 30039) = Enabled, Zero Sensor Edge (IPA 30040) = Falling



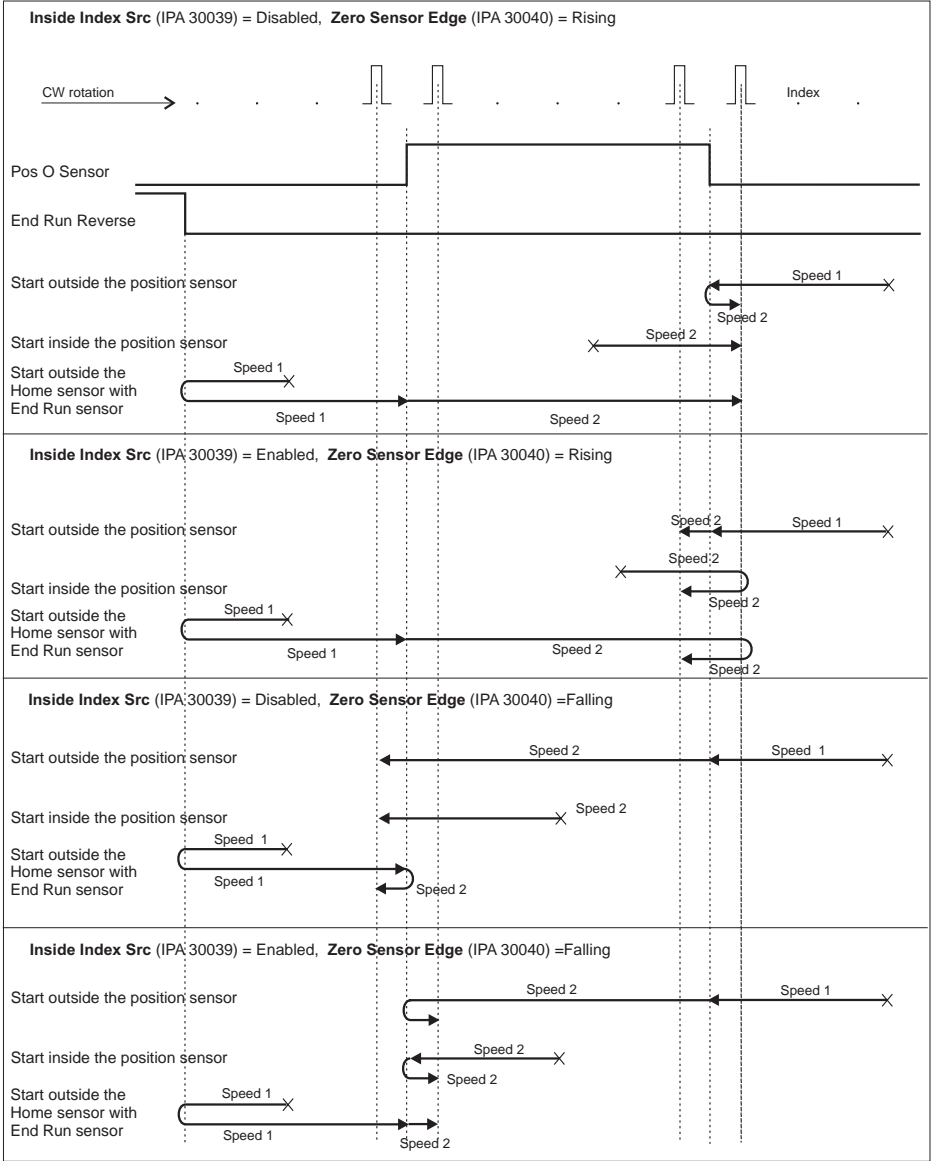
Inside Index Src (IPA 30039) = Disabled, Zero Sensor Edge (IPA 30040) = Falling



**Search with Zero Sensor En (IPA 30037) = Enabled, Zero Index En (IPA 30038) = Enabled
Home Src Direc (IPA 30036) = Negative**

$$\text{Speed 1} = \text{Home Spd Ref} * \frac{\text{Home Max Spd (IPA 30024)}}{100}$$

$$\text{Speed 2} = \text{Home Fine Spd (IPA 30027)}$$

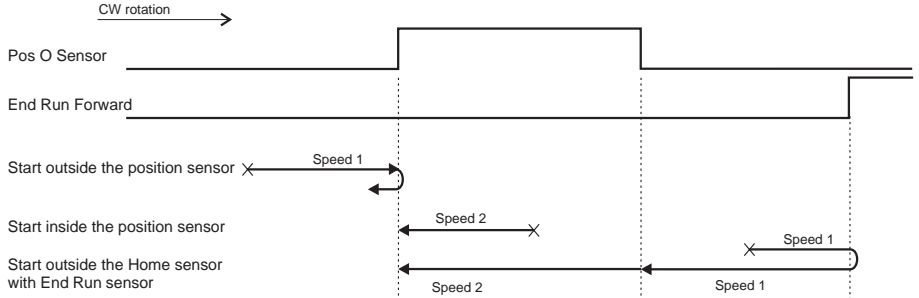


Search with Zero Sensor En (IPA 30037) = Enabled , Zero Index En (IPA 30038) = Disabled

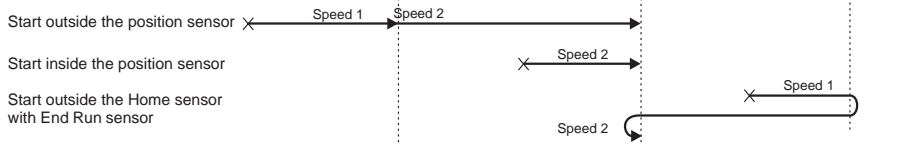
$$\text{Speed 1} = \text{Home Spd Ref} * \frac{\text{Home Max Spd (IPA 30024)}}{100}$$

$$\text{Speed 2} = \text{Home Fine Spd (IPA 30027)}$$

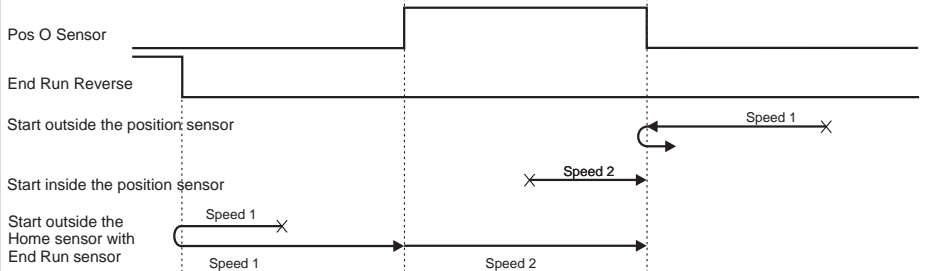
Home Src Direc (IPA 30036) = Positive, Inside Index Src (IPA 30039) = Indifferente, Zero Sensor Edge (IPA 30040) = Rising



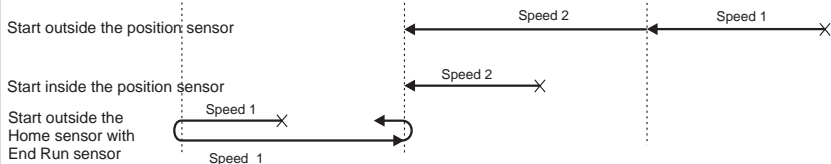
Home Src Direc (IPA 30036) = Positive, Inside Index Src (IPA 30039) = Indifferente, Zero Sensor Edge (IPA 30040) = Falling



Home Src Direc (IPA 30036) = Negative, Inside Index Src (IPA 30039) = Indifferente, Zero Sensor Edge (IPA 30040) = Rising



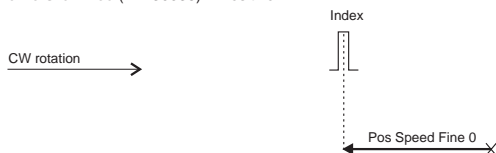
Home Src Direc (IPA 30036) = Negative, Inside Index Src (IPA 30039) = Indifferente, Zero Sensor Edge (IPA 30040) = Falling



IPA	Description	[Unit]	Format	Access	Default	Min	Max
-----	-------------	--------	--------	--------	---------	-----	-----

Search with **Inside Index Src** (IPA 30039) = Indifferent, **Zero Sensor Edge** (IPA 30040) = Indifferent
Zero Sensor En (IPA 30037) = Disabled, **Zero Index En** (IPA 30038) = Enabled

Home Src Direc (IPA 30036) = Positive



Home Src Direc (IPA 30036) = Negative



30020	CW Home Pos Acc Clockwise acceleration during the home search.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30021	CCW Home Pos Acc Counterclockwise acceleration during the home search.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30022	CW Home Pos Dec Clockwise deceleration during the home search.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30023	CCW Home Pos Dec Counterclockwise deceleration during the home search.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30024	Home Max Spd Maximum speed during the home search.	[rpm]	Float	R/W	1500.0	0	100000
30025	Home Spd Ref Speed reference during the home search, stated as a percentage of Home Max Spd	[%]	Float	R/W	10	-100.0	100
30027	Home Fine Spd Speed reference while searching the home absolute position.	[rpm]	Float	R/W	50.0	0	100000
30028	Home Pos Offset Offset della posizione di home. Vedere IPA 30041.	[u.u.]	Float	R/W	0	IPA 30017	IPA30018
30036	Home Src Direc Position indicator of the found home. 0 = Positive The motor rotates clockwise 1 = Negative The motor rotates counterclockwise.	[-]	Enum	R/W	0	0	1
30037	Zero Sensor En 0 = Disabled The [1015] POS 0 sensor input is not used during the searching of home 1 = Enabled The [1015] POS 0 sensor input is used during the searching of home.	[-]	Enum	R/W	1	0	1
30038	Zero Index En 0 = Disabled The 0 index of the encoder is not used during the searching of home 1 = Enabled The 0 index of the encoder is used during the searching of home	[-]	Enum	R/W	1	0	1
30039	Inside Index Src If both index and sensor are used, the home position corresponds to the first code 0 = Disabled placed outside the sensor. 1 = Enabled placed inside the sensor.	[-]	Enum	R/W	0	0	1

IPA	Description	[Unit]	Format	Access	Default	Min	Max
30040	Zero Sensor Edge The zero sensor is active on the 0 = Rising climbing leading edge 1 = Falling drop wire leading edge	[--]	Enum	R/W	0	1	0
30041	Home Pos Offs En 0 = Disable 1 = Enable At the end of the zero search procedure, the motor stops on the slot/sensor and the position of the slot/sensor is equal to - Home Pos Offset u.u. At the end of the zero search procedure, after finding the slot/sensor, the motor movement corresponds to + Home Pos Offset u.u. and its position is 0 u.u.	[--]	Enum	R/W	0	0	1
30045	Startup Zero Pos 0 = Disable 1 = Enable If authorised, next time the drive is turned on it will sample the position of the encoder which will be acquired as Zero position (Home).	[--]	Bool	R/W	0	0	1

POS RETURN CONF

When the digital input programmed as [1012] **Pos Return** becomes high, the motor reaches the **Pos Return** position with the speed and acceleration stated in this menu.

The start for the return phase is the climbing leading edge of the **Pos Return** input. After the start, it can be stopped with a **Fast Stop** or by disabling the drive.

Example: Forward and return movement: connect the digital output programmed as [1002] **Pos Reached** to the digital input programmed as [1012] **Pos Return**. When the positioning procedure is over, the position reached output is risen thus causing the return to the starting position.

30164	Pos Return Final value of the return movement in user units.	[u.u.]	Float	R/W	0	IPA30017	IPA30018
30264	Pos Return Speed Maximum speed during the return movement.	[rpm]	Float	R/W	1000	0	IPA20003
30364	Pos Return Acc Acceleration ramp during the return movement.	[ms/krpm]	Float	R/W	336.1	0	IPA21111
30464	Pos Return Dec Deceleration ramp during the return movement.	[ms/krpm]	Float	R/W	336.1	0	IPA21111

BACKLASH RECOV

It allows to compensate possible mechanical clearances by performing the positioning procedures in the same direction.

Example: **Back Lash En** = Enable, **Back Lash Dir** = Positive, **Delta Pos** = 100 u.u.,
Speed Comp = 10 rpm, **Actual Position** = 10000 u.u., **Destination Pos** = 15000 u.u.

As the movement is positive, the drive performs the first positioning procedure at 15100 u.u. (without increasing the reached position output) and a new positioning procedure at 15000 u.u. with a 10 rpm maximum speed. The reached position output is increased at the end of this positioning procedure.

Let's assume to perform a new positioning procedure:

Actual Position = 15000 u.u.

Destination Pos = 8000 u.u.

The movement is negative and the recovery function is not active.

31000	Back Lash En It enables the compensation function of the mechanical allowance:	[--]	Enum	R/W	0	0	1
-------	------------------------------------------------------------------------------------------	------	------	-----	---	---	---

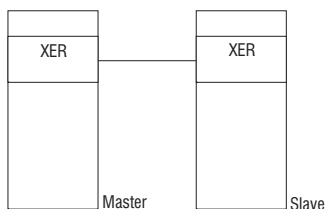
IPA	Description	[Unit]	Format	Access	Default	Min	Max
	0 = Disable 1 = Enable						
31001	Back Lash Dir It detects the movement direction: 0 = Positive 1 = Negative <i>NOTE!</i> A positive direction is able to generate a positive position delta.	[--]	Enum	R/W	0	0	1
31002	Delta Pos u.u. position added or taken away from the destination position.	[u.u.]	Float	R/W	10	0	IPA30018
31003	Speed Comp Maximum speed of the return "positioning" procedure.	[rpm]	Float	R/W	100	0	IPA20003

EL LINE SHAFT

In the configuration Electrical line shaft it is possible to provide synchronism between 2 or more motors. The master encoder can be connected to XER or it is possible to use the fast link.

Moreover, it is possible to save into the drive up to 4 ratios selectable through 2 programmed digital input as [2001] ELS Ratio Sel B0, [2002] ELS Ratio Sel B1. Whatever ratio is actually selected, it is possible to increase/decrease by two programmed digital inputs as [2003] ELS Inc Ratio ed [2004] ELS Dec Ratio.

Connection of a digital encoder using repetition



Master ARTDriveS: The connector XER give the encoder repetition / simulation to the connector XER of the slave drive. Set up the parameters as follows:

- IPA 20036: **Aux Enc Type** = XER/EXP Rep/Sim
- IPA 20035: **Enc Rep Sim Cfg** = Select encoder repetition or simulation

If you select encoder simulation then you must program the correct number of pulses with the parameter **PPR Simulation** (IPA 20030).

Slave ARTDriveS: The connector XER receives the encoder repetition / simulation from the connector XER of the master drive. Set up the parameters as follows:

- IPA 20036: **Aux Enc Type** = XER In_EXP Out
- IPA 32009: **Els Master Sel** = XER/EXP Aux Enc

Fast link connection instead of encoder connection

Master ARTDriveS: XT-OUT connector (master), connected to the XT-IN connector (slave)

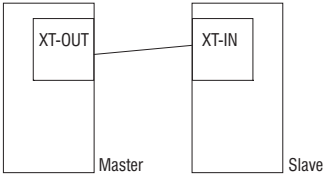
Set up: enable the fast link, parameter **Fast Link Addr** (IPA 18110) set as 1 (Master)

Slave ARTDriveS: Connector XT-IN (slave).

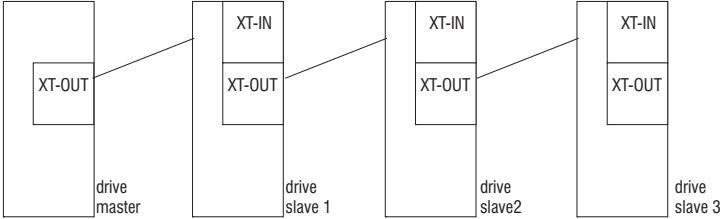
Set up: enable the fast link, parameter **Fast Link Addr** (IPA 18110) set as >1 (Slave).

The fast link is active only after a reset drive command.

IPA	Description	[Unit]	Format	Access	Default	Min	Max
-----	-------------	--------	--------	--------	---------	-----	-----

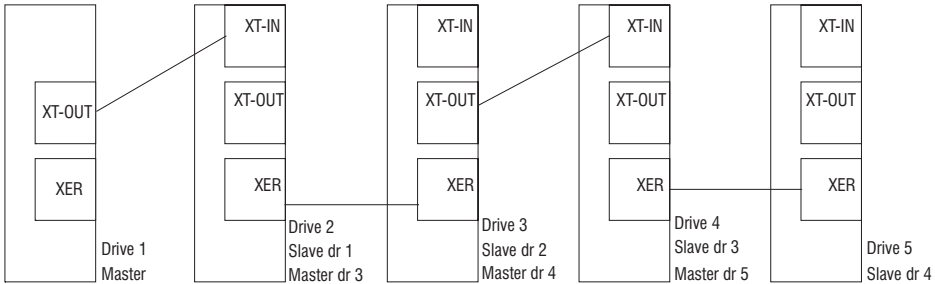


In applications with a drive master and drive slave it is possible to make a connection with fast link XT-OUT (master) - XT-IN (slave) because from the master encoder frequency is always available at connector XT-OUT.



The drive slave 1,2,3 are all synchronized with the drive master.

In applications where it is necessary to synchronize the drive in cascade, master –slave, where the previous is always the master of the next it is necessary to use both the encoder repetition and the fast link.



32000	Els PPR Master	[--]	Word	R/Z/*	2048	16	65535
Set the number pulses per turn of the master encoder present on the connector XER or on the fast-link.							
32008	Els Delta Time	[sec]	Float	R/W	1	0	10
This parameter is used together with the programmed digital input as [2003] ELS Inc Ratio and [2004] ELS Dec Ratio. It defines the rate of change from a ratio to a new ratio. This parameter is used together with the parameter Els Delta Ratio.							
<i>Example:</i> when the Els Inc/Dec ratio inputs are active, the ratio changes according to the value set by Els Delta Ratio (ex. 0.002) in the time set in the Els Delta Time parameter (ex 0.1 sec).							
32009	Els Master Sel	[--]	Enum	R/W	0	0	2
Setting the master encoder reference source.							
0 = XER/EXP Aux Enc		Master encoder port XER or expansion encoder input					
1 = Fast link		Connectors XFL-IN, XFL-OUT					
2 = XE Main Encoder		Master encoder main port XE					

IPA	Description	[Unit]	Format	Access	Default	Min	Max
32010	Els Mec Ratio Setting this parameter equal to : Master mechanical ratio / Slave mechanical ratio The Els Ratio X parameters show directly the ratio/slip between the speed of the slow shafts.	[-]	Float	R/W	1	1e-007	20
32011	Els FL Source 0 = Spd Pos Enc Mst The slave follows the Master encoder which closes the speed/position loop (IPA 20008 Master). 2 = XER Master The slave follows the motor auxiliary encoder.	[-]	Enum	R/W	0	0	2
32012	ElsMec Ratio Mul Multiplication factor in the mechanical ratio for electrical shaft.	[-]	Float	R/W	1	1	-
32013	ElsMec Ratio Div Divisor factor in the mechanical ratio for electrical shaft.	[-]	Float	R/W	1	1	-
32014	Els Delta Ratio Define how much the ratio should increment (or decrement) every cycle of slow task (8msec).	[-]	Float	R/W	1	IPA32090	IPA32090
<p><i>Example:</i> if through the digital input a new ratio is selected changing from 1.000 up to 2.000 the change is not immediate but follows a ramp profile with a set increase in this parameter.</p> <p>If Els Delta Ratio is set 1.000 means an increment of 1.000 every 8msec, therefore it changes to the new ratio in 8msec.</p> <p>If Els Delta Ratio is set 0.010 means a change of 0.01 every 8msec, therefore it changes to the new ratio (2.000) in 800msec.</p> <p>Through a programmed digital input, [2005] ELS RampRatioDis it's possible to disable this time to ramp.</p>							
32016	Els Control Mode Selects the speed control method 0 = Speed The drive is set to speed control 1 = Position The drive is set to position control	[-]	Enum	R/W	0	0	1
32020	Els Ratio / Slip 0 = Slip The parameters Els Ratio 0, 1, 2, 3 are not set as ratio but as % of slipping from the Master. For instance 10 % slip correspond to 110% of the speed master, or ratio of 1.1: Els Ratio = 1 + Els Slip / 100 By default, when the ratio is sampled from the analog input, 10V correspond to what is set in parameter 32021 Els Slip Limit . 1 = Ratio If set up to Ratio the ratio is activated. By default, when the ratio is sampled from the analog input, 10V correspond to what is set in parameter 32090 Els Ratio Range .	[-]	Enum	R/W	0	0	1
When changing the setting from "Slip" to "Ratio", check parameters 32014, 32001, 32002, 32003 and 32004.							
32021	Els Slip Limit Limit of slippage sampled from analogue input. At default conditions, with 10V on the analog input, the set slippage is Els Slip Limit . The Els Ratio ratio corresponds to 1 + (Slip sampled by analog input / 100).	[-]	Int	R/W	100	0	
32090	Els Ratio Range Value of max. ratio for ELS. A high value can reduce the ELS accuracy level. Available range: 4, 8, 16, 32 e 64.	[-]	Word	R/W	8	4	64
<p>NOTE! This parameter shows the limits for the ratio between the speed of the motor shafts, therefore for the product Els Mec Ratio * Els Ratio.</p>							

IPA	Description	[Unit]	Format	Access	Default	Min	Max
EL SHAFT RATIO							
It is possible to load into the drive up to 4 ratios selectable through 2 programmed digital input as Els ratio sel bit 0,1 or from parameter. It is also possible to set the 4 ratios via the analog input. The set ratio is calculated as: $R = \text{slave speed} / \text{master speed}$. <i>Example:</i> if the master speed is 1000 rpm and the slave must rotate at 2000 rpm it is necessary to set a ratio: $\text{Ratio} = 2000 \text{ rpm} / 1000 \text{ rpm} = 2.000$.							
32001	Els Ratio 0 Set up speed ratio 0 for electric axis.	[--]	Float	R/W	1	-IPA32090	IPA32090
32002	Els Ratio 1 Set up speed ratio 1 for electric axis.	[--]	Float	R/W	1	-IPA32090	IPA32090
32003	Els Ratio 2 Set up speed ratio 2 for electric axis.	[--]	Float	R/W	1	IPA32090	IPA32090
32004	Els Ratio 3 Set up speed ratio 3 for electric axis.	[--]	Float	R/W	1	-IPA32090	IPA32090
32006	Els Ratio Index Set up of the ratio selection (ratio 0, 1, 2, 3). Can also be programmed by digital inputs with [2001] Els Ratio Sel B0 and [2002] Els Ratio Sel B1.	[--]	Word	R/W	0	0	3
32005	Actual Ratio Read-only parameter, it shows the value of the active ratio.	[--]	Float	R			

EL SHAFT R BEND

Through an external command it is possible to increase/decrease the motor slave speed momentarily to create a phase offset or "bend" in the shaft. To do this, for a fixed time the motor slave is not in synchronism with the master, because its reference is modified to be either faster or slower. At the end of the fixed time by parameter or when the digital input is not longer present, the slave gets back in synchronism with the master.

The modified speed can be set on an analog input or fixed by parameter.

The digital inputs activating this function ([2006] ELS Bend Rec CW, [2007] ELS Bend Rec CCW) are active even if the Start / Stop input is disabled.

32100	Els Max RB Speed Parameter to set up the max limit of speed reference for the bend recover function.	[rpm]	Float	R/W	1000	-IPA20003	IPA20003
32101	Els RB Time Time setting for the correction reference to be active. The digital input that enables this function ([2006] ELS Bend Rec CW, [2007] ELS Bend Rec CCW) must be kept activated during the recovery. At the end of the acceleration phase of the bend recover function, the timing starts. When the time is equal to that set in this parameter the bend recover reference becomes zero. The remaining bend will remain. If the digital input that enables this function ([2006] ELS Bend Rec CW, [2007] ELS Bend Rec CCW) goes low before the time expires (0V) the bend recover reference becomes zero. In other words, if time is not sufficient to recover, the bend that is left after time runs out will remain.	[sec]	Float	R/W	500.0	0	500.0
32102	Els RB Acc Acceleration ramp during the speed change. Increase the speed of the set revolutions number in the parameter every 8 msec	[rpm]	Float	R/W	0.97	0	100000
32103	Els RB Dec Deceleration ramp during the speed change. Decrease the speed of the set revolutions number in the parameter every 8 msec	[rpm]	Float	R/W	0.97	0	100000
32104	Els RB Speed Ref Reference for bend recover function, setting available also from an analog input ([20] Els Rb Spd Ref). At default conditions, 10V on the analog input correspond to 100% of Els Max RB Speed, IPA 32100.	[%]	Float	R/W	0.97	0	100

IPA	Description	[Unit]	Format	Access	Default	Min	Max
32105	Els RB Speed Sel	[%]	Bool	R/W	0	0	1
	Selection of the percentage value of the maximum speed reference limit or Master speed value						
	0 = Els Max RB Speed						
	1= Master Speed						

BRAKING RES

Parameters required for the optimization of the internal or external braking resistance system (see paragraph 4.8, Braking unit). The parameters are described in the paragraph 4.8.4.

The ARTDriveS drives up to size XVy-EV 32550-KBX have an internal braking resistor according to the following table:

Drive size	Resistor value [ohm]	Braking Resistor [W]
XVy-EV 10306 ... XVy-EV 10612	100	100
XVy-EV 21020 ... XVy-EV 21530	67	150
XVy-EV 32040	36	200
XVy-EV 32550	26	200

btv9340

CAUTION!

Please not that if you use an external braking resistor on drives up to size XVy-EV 32550, you must disconnect internal resistor and connect its two wires together using the proper faston.

18105	Brake Config	[--]	Enum	R/Z/*	0	0	2
	Configuration of braking resistance						
	0=No BU or Ext BU	Braking resistor not present or external braking unit					
	1=Ext BR & Int BU	External Braking resistor and internal braking unit					
	2=Int BR & Int BU	Internal Braking resistor and internal braking unit					
	If you select "Int BR & Int BU" then all the other parameters are ignored. This happens also if any of the parameters Brake Res Power , Max Brake Energy or Brake Res Value is set to zero.						
18109	Brake Res Value	[ohm]	Float	R/Z/*	0	0	FLT_M
	Braking resistance value.						
18107	Brake Res Power	[kW]	Float	R/Z/*	0	0	FLT_M
	Nominal power of braking resistance.						
18104	Max Brake Energy	[kJ]	Float	R/Z/*	0	0	FLT_M
	Maximum brake energy.						
18412	BR Ovd Factor	[%]	Word	R			
	Brake resistor overload factor. When 100% has been reached, the Brake Overpower (A 13) alarm gets active.						

ALARMS

24101	Alarm Delay Mask	[--]	Dword	R/Z/*	0H	0H	FFFFFFFFH
	Delayed alarms mask. List of possible alarms on IPA 24100.						
24102	Alarm Delay	[sec]	Float	R/W	10	0.001	10
	Delayed alarms delay.						
24100	Alarm Dis Mask	[--]	Dword	R/Z/*	20000000H	0H	FFFFFFFFH
	This parameter allows masking the intervention of some alarms thus making them inactive. It is an hexadecimal alarm. When the masked alarm gets active, the drive goes on functioning properly (the OK relay does not change its state) and Enc W->A Mask parameter with the digital output programmed as [17] Alarm Warnings changes its logic level.						

IPA	Description	[Unit]	Format	Access	Default	Min	Max
<i>List of possible excluded alarms:</i>							
	Motor Overtemp	(error code 7)					
	Encoder Fbk Loss	(error code 18)					
	Encoder Simulat	(error code 19)					
	Undervoltage	(error code 20)					
	Field Bus failure	(error code 26)					
	Enable Seq Error	(error code 27)					
	Fast link	(error code 28)					
	Position Error	(error code 29)					
	Drive Overload	(error code 30)					
	External Fault	(error code 31)					

Example for a parameter setting :

32	31	30	29	28	27	26	25	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1
0	0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1				8				0				0				0				0				0				0			

bv9118

Alarm Dis Mask = 18000000h (disabled Position error and Fast link alarms)

Note: The Position Error alarm is disabled as default.

1° row: Alarm code

2° row: Setting of the alarm functions : 0 = active, 1 = masked

3° row: Parameter hexadecimal setting

18042	Alarm List Clear	[--]	Enum	R/W	0	0	1
It cancels the whole alarm history. It can be made permanent by saving the parameters: 0=Off 1=Clear AI History							
24000	Alarm Status	[--]	Dword	R			
Alarm status. See the alarm list, table 8.3.1.1.							
24120	Warning Status	[--]	Dword	R			
Warnings state. See the alarm list, table 8.3.1.1.							
20016	Enc Warning Cause	[--]	Enum	R			

N. bit IPA 20018=Meaning Cause

0 = None

Encoder is OK

1=Low Enc AD Level

Check encoder supply.

2=Low Enc AN level

Check encoder supply.

3=Hall Sens Error

The sequence of the Hall effect sensors is not correct. Check encoder wiring.

4=Aux DI Enc Loss

No encoder on expansion input.

9=Abs 1 Ini Res Er

EN DAT reset failure. Check encoder parameters setting (**ENC EXP BOARD** menu) and encoder connections.

10=Abs 1 Ini RX Er

Reception problem at power on (EN DAT, SSI). Check encoder parameters setting (**ENC EXP BOARD** menu) and encoder connections.

11=Abs 1 RX Error

Checksum error in the serial communication of the absolute data. Check noise on the encoder signals.

12=Abs 1 Alarm bit

The error bit on the absolute encoder (EN DAT) is active.

13=Abs 1 RX Tout Er

Time-out error of absolute data serial communication.

17=Phasing Loss

The incremental channel and the absolute channel of the encoder shows a misalignment.

IPA	Description	[Unit]	Format	Access	Default	Min	Max
	18=Enc Pulses Loss		The number of incremental pulses detected between two index signals is not correct. Check noise on encoder signals.				
	25= Idx Out Of Site		Index signal in the incremental encoder channel is not in the correct place. Check noise on encoder signal.				
	26= Idx Not Presen		Index signal in the incremental encoder channel is not detected. Check encoder connections.				
20018	Enc W->A Mask	[-]	Dword	R			
	This mask shows active encoder warnings. If encoder alarms are not disabled warnings becomes immediately alarms. If encoder alarms are disabled, Alarm Dis Mask signals a problem on the encoder even if there are no alarm active. The meaning of each bit is listed in the table 8.3.1.1.						
24109	Par Set Cause AI	[-]	Enum	R			
	It shows the cause of the Error alarm in the parameter setting:						
	0 = None						
	1 = HW Unavailable						
	2 = Resource Unavail						
	3 = Mot Fbk Not Supp						
	4 = Mot Fbk Undefin						
	5 = Spd/Pos Fbk Und						
	6 = Enc Par Range						
	7 = Enc Not Pow of 2						
	8 = Motor Res Poles						
	20 = Magn Induc Range						
	21 = Rotor Res Range						
	22 = Flux Fact Range						
	23 = Slip Fact Range						
	24 = Slip Value Range						
	30 = Size Code Err						
	31 = Brake Volt Thr						
	40 = Value Not Supp						
24110	IPA 1 Par Set	[-]	Word	R			
	IPA of the first parameter that causes Parameter Error (A 05) alarm						
24111	IPA 2 Par Set	[-]	Word	R			
	IPA of the second parameter that causes Parameter Error (A 05) alarm.						
24112	IPA 3 Par Set	[-]	Word	R			
	IPA of the third parameter that causes Parameter Error (A 05) alarm.						
18143	CPU Err AI Cause	[-]	Enum	R			
	CPU overtime alarm cause :						
	0 = None						
	1 = Ph In Fst Tsk OT		(Phase In Fast Task Overtime)				
	2 = PhExe Fst Tsk OT		(Phase Execution Fast Task Overtime)				
	3 = PhOut Fst Tsk OT		(Phase Out Fast Task Overtime)				
	4 = PhAux Fst Tsk OT		(Phase Auxiliary Fast Task Overtime)				
	5= Slow Tsk OT						
	6 = System Tsk OT						
	7 = DSP Tsk OT						
	8 = Backgnd Tsk OT						
	20 = CPU Fault						
	21 = Watchdog Alarm						

IPA	Description	[Unit]	Format	Access	Default	Min	Max
18391	PLC Err Cause	[--]	Word	R			
	Cause of the "PLC not running" alarm:						
	0 = None						
	1 = Wrong PLC ID						
	2 = Wrong PLC Tsk N	(Wrong PLC Task Number)					
	3 = Wrong PLC Tgt ID						
	4 = Wrong Build N						
	6 = Wrong PLC Tsk ID						
	7 = Missing Tsk info						
	8 = PLC Code Chckerr						
	9 = DB Code Chk Err						
	20 = Wrong Enable Key						
	In the cases from 1 to 8 it is necessary to reload the fw; in case 20 it is necessary to enter the right activation key in the PLC Enable Key , IPA 41001 parameter.						
18751	Load Def Err IPA	[--]	Word	R			
	Par IPA that caused load default error.						

FIELDBUS

Using Process Data Channel (PDC), it is possible to exchange up to 8 words on the input and 8 words on the output. For each PDC it is possible to choose, via the **FB Assign XXX X** parameters, one of the following modes for the data exchange according to the following table:

- Parameter:

The parameters are entered into engineering units and are exchanged in an asynchronous way.

The **FB Format M->S 1** parameter sets the parameter writing format. The format can be different from the parameter original one.

The **FB Exp M->S 1** parameter defines the 10th power which the parameter is multiplied by before being transferred to the drive.

- Direct Access:

The parameters are entered into internal counts and are exchanged in an asynchronous way (one every 8 msec). The writing format identified by the **FB Format M->S 1** parameter (see the following table) must coincide with the drive internal format.

As for parameters with a float internal format, it is possible to choose "32 bit integer" and the conversion into a float format between the received datum and the internal datum is performed automatically.

Before establishing the Profibus communication between the Master and the drive, it is necessary to assign the drive parameters to the Process Channel. These parameters can be activated by resetting the drive.

Dimension	Format	Conversion
Speed	INT 32	$\text{cnts} = \frac{\text{Speed (rpm)}}{\text{Rpm Conv Fact}}$
Ramp	INT 16	$\text{cnts} = \frac{\text{Max Ramp Rate}}{\text{Ramp [ms / krpm]}}$
Position	FLOAT	User unit
Torque	INT 16	$\text{cnts} = \frac{\text{Torque [\%]} * \text{Base Torque}}{100 * \text{Torque Conv Fact}}$
Current	INT 16	$\text{cnts} = \frac{\text{Current [Arms]}}{\text{Arms Conv Fact}}$

IPA	Description	[Unit]	Format	Access	Default	Min	Max
Attention: The conversion parameters (ex. Rpm Conv Fact) are in the FIELDBUS / UNITS menu and are a function of the motor data, of the drive size and of the encoder. It is therefore necessary to read them after configuring the drive.							
40000	Field Bus Type Type of expansion board if installed 0 = Not Used 1 = Profibus 2 = CanOpen 3 = DeviceNet	[--]	Enum	R/Z/*	0	0	3
40001	Bus Baud Rate Baud rate of expansion board installed, if any	[kbits/s]	Dword]	R/Z/*	50	0	2 ³² .1
40100	Bus Address Address of expansion board installed	[--]	Word	R/Z/*	0	0	65535
40110	CC Enabling Enables or disables the CC 0 = OFF 1 = ON	[--]	Enum	R/Z/*	0	0	65535
40111	PDC Enabling Enables or disables the PDC channel 0 = OFF 1 = ON	[--]	Enum	R/Z/*	0	0	65535
40115	FB Alarm Watch Field bus communication alarm control when drive disabled. 0 = OFF control inactive 1 = ON control active	[--]	Enum	R/Z/*	0	0	65535
40116	Float Word Order Identical configuration of words for Direct Access and Parameter modes	[--]	Word	R/W	0	0	65535
40113	Field Bus Status Status of FB device	[--]	Enum	R			
40114	FB Fail Cause Failure cause of FB card	[--]	Dword	R			
FB 1st M->S PAR							
40190	FB Assign M->S 1 Exchange data mode. 0 = Not assigned 1 = Parameter 3 = Direct Acc Par Direct access parameter (8ms) 4 = Filling 5 = Fast Access Par Fast access parameter (250uS)	[--]	Enum	R/Z/*	0	0	5
40200	FB IPA M->S 1 Parameter index (IPA) to write into XvY-EV with PDC channel	[--]	Word	R/Z/*	0	0	65535
40210	FB Format M->S 1 Format of the parameter to write into XvY-EV 1 = 16 Bit Integer 2 = 16 Bit Uns Int 3 = 32 Bit Integer	[--]	Enum	R/Z/*	1	0	65535

IPA	Description	[Unit]	Format	Access	Default	Min	Max
	4 = 32 Bit Uns Int 6 = Floating Point						
40220	FB Exp M->S 1 Power of 10 used to multiply the parameter value to write into XVy-EV.	[--]	Int	R/Z/*	0	-9	9
FB 2ndM->S PAR							
40191	FB Assign M->S 2 Exchange data mode. 0 = Not assigned 1 = Parameter 3 = Direct Acc Par Direct access parameter (8ms) 4 = Filling 5 = Fast Access Par Fast access parameter (250uS)	[--]	Enum	R/Z/*	0	0	5
40201	FB IPA M->S 2 Parameter index (IPA) to write into XVy-EV with PDC channel	[--]	Word	R/Z/*	0	0	65535
40211	FB Format M->S 2 Format of the parameter to write into XVy-EV 1 = 16 Bit Integer 2 = 16 Bit Uns Int 3 = 32 Bit Integer 4 = 32 Bit Uns Int 6 = Floating Point	[--]	Word	R/Z/*	1	0	65535
40221	FB Exp M->S 2 Power of 10 used to multiply the parameter value to write into XVy-EV.	[--]	Enum	R/Z/*	0	-9	9
FB 3rd M->S PAR							
40192	FB Assign M->S 3 Exchange data mode. 0 = Not assigned 1 = Parameter 3 = Direct Acc Par Direct access parameter (8ms) 4 = Filling 5 = Fast Access Par Fast access parameter (250uS)	[--]	Enum	R/Z/*	0	0	5
40202	FB IPA M->S 3 Parameter index (IPA) to write into XVy-EV with PDC channel	[--]	Word	R/Z/*	0	0	65535
40212	FB Format M->S 3 Format of the parameter to write into XVy-EV 1 = 16 Bit Integer 2 = 16 Bit Uns Int 3 = 32 Bit Integer 4 = 32 Bit Uns Int 6 = Floating Point	[--]	Enum	R/Z/*	1	0	65535
40222	FB Exp M->S 3 Power of 10 used to multiply the parameter value to write into XVy-EV.	[--]	Int	R/Z/*	0	-9	9
FB 4th M->S PAR							
40193	FB Assign M->S 4 Exchange data mode. 0 = Not assigned 1 = Parameter	[--]	Enum	R/Z/*	0	0	5

IPA	Description	[Unit]	Format	Access	Default	Min	Max
	3 = Direct Acc Par	Direct access parameter (8ms)					
	4 = Filling						
	5 = Fast Access Par	Fast access parameter (250uS)					
40203	FB IPA M->S 4	[--]	Word	R/Z/*	0	0	65535
	Parameter index (IPA) to write into XVy-EV with PDC channel						
40213	FB Format M->S 4	[--]	Enum	R/Z/*	1	0	65535
	Format of the parameter to write into XVy-EV						
	1 = 16 Bit Integer						
	2 = 16 Bit Uns Int						
	3 = 32 Bit Integer						
	4 = 32 Bit Uns Int						
	6 = Floating Point						
40223	FB Exp M->S 4	[--]	Int	R/Z/*	0	-9	9
	Power of 10 used to multiply the parameter value to write into XVy-EV.						
FB 5th M->S PAR							
40194	FB Assign M->S 5	[--]	Int	R/Z/*	0	0	5
	Exchange data mode.						
	0 = Not assigned						
	1 = Parameter						
	3 = Direct Acc Par	Direct access parameter (8ms)					
	4 = Filling						
	5 = Fast Access Par	Fast access parameter (250uS)					
40204	FB IPA M->S 5	[--]	Word	R/Z/*	0	0	65535
	Parameter index (IPA) to write into XVy-EV with PDC channel						
40214	FB Format M->S 5	[--]	Enum	R/Z/*	1	0	65535
	Format of the parameter to write into XVy-EV						
	1 = 16 Bit Integer						
	2 = 16 Bit Uns Int						
	3 = 32 Bit Integer						
	4 = 32 Bit Uns Int						
	6 = Floating Point						
40224	FB Exp M->S 5	[--]	Int	R/Z/*	0	-9	9
	Power of 10 used to multiply the parameter value to write into XVy-EV.						
FB 6th M->S PAR							
40195	FB Assign M->S 6	[--]	Enum	R/Z/*	0	0	5
	Exchange data mode.						
	0 = Not assigned						
	1 = Parameter						
	3 = Direct Acc Par	Direct access parameter (8ms)					
	4 = Filling						
	5 = Fast Access Par	Fast access parameter (250uS)					
40205	FB IPA M->S 6	[--]	Word	R/Z/*	0	0	65535
	Parameter index (IPA) to write into XVy-EV with PDC channel						
40215	FB Format M->S 6	[--]	Enum	R/Z/*	1	0	65535
	Format of the parameter to write into XVy-EV						
	1 = 16 Bit Integer						
	2 = 16 Bit Uns Int						
	3 = 32 Bit Integer						

IPA	Description	[Unit]	Format	Access	Default	Min	Max
	4 = 32 Bit Uns Int 6 = Floating Point						
40225	FB Exp M->S 6 Power of 10 used to multiply the parameter value to write into XVy-EV.	[--]	Int	R/Z/*	0	-9	9
FB 7th M->S PAR							
40196	FB Assign M->S 7 Exchange data mode. 0 = Not assigned 1 = Parameter 3 = Direct Acc Par Direct access parameter (8ms) 4 = Filling 5 = Fast Access Par Fast access parameter (250uS)	[--]	Enum	R/Z/*	0	0	5
40206	FB IPA M->S 7 Parameter index (IPA) to write into XVy-EV with PDC channel	[--]	Word	R/Z/*	0	0	65535
40216	FB Format M->S 7 Format of the parameter to write into XVy-EV 1 = 16 Bit Integer 2 = 16 Bit Uns Int 3 = 32 Bit Integer 4 = 32 Bit Uns Int 6 = Floating Point	[--]	Enum	R/Z/*	1	0	65535
40226	FB Exp M->S 7 Power of 10 used to multiply the parameter value to write into XVy-EV.	[--]	Int	R/Z/*	0	-9	9
FB 8th M->S PAR							
40197	FB Assign M->S 8 Exchange data mode. 0 = Not assigned 1 = Parameter 3 = Direct Acc Par Direct access parameter (8ms) 4 = Filling 5 = Fast Access Par Fast access parameter (250uS)	[--]	Enum	R/Z/*	0	0	5
40207	FB IPA M->S 8 Parameter index (IPA) to write into XVy-EV with PDC channel	[--]	Word	R/Z/*	0	0	65535
40217	FB Format M->S 8 Format of the parameter to write into XVy-EV 1 = 16 Bit Integer 2 = 16 Bit Uns Int 3 = 32 Bit Integer 4 = 32 Bit Uns Int 6 = Floating Point	[--]	Enum	R/Z/*	1	0	65535
40227	FB Exp M->S 8 Power of 10 used to multiply the parameter value to write into XVy-EV.	[--]	Int	R/Z/*	0	-9	9
FB 9th M->S PAR							
41198	FB Assign M->S 9 Exchange data mode. 0 = Not assigned 1 = Parameter	[--]	Enum	R/Z/*	0	0	5

IPA	Description	[Unit]	Format	Access	Default	Min	Max
	3 = Direct Acc Par	Direct access parameter (8ms)					
	4 = Filling						
	5 = Fast Access Par	Fast access parameter (250uS)					
41208	FB IPA M->S 9	[-]	Word	R/Z/*	0	0	65535
	Parameter index (IPA) to write into XVy-EV with PDC channel						
41218	FB Format M->S 9	[-]	Enum	R/Z/*	1	0	65535
	Format of the parameter to write into XVy-EV						
	1 = 16 Bit Integer						
	2 = 16 Bit Uns Int						
	3 = 32 Bit Integer						
	4 = 32 Bit Uns Int						
	6 = Floating Point						
41228	FB Exp M->S 9	[-]	Int	R/Z/*	0	-9	9
	Power of 10 used to multiply the parameter value to write into XVy-EV.						
FB 10th M->S PAR							
41199	FB Assign M->S 10	[-]	Enum	R/Z/*	0	0	5
	Exchange data mode.						
	0 = Not assigned						
	1 = Parameter						
	3 = Direct Acc Par	Direct access parameter (8ms)					
	4 = Filling						
	5 = Fast Access Par	Fast access parameter (250uS)					
41209	FB IPA M->S 10	[-]	Word	R/Z/*	0	0	65535
	Parameter index (IPA) to write into XVy-EV with PDC channel						
41219	FB Format M->S 10	[-]	Enum	R/Z/*	1	0	65535
	Format of the parameter to write into XVy-EV						
	1 = 16 Bit Integer						
	2 = 16 Bit Uns Int						
	3 = 32 Bit Integer						
	4 = 32 Bit Uns Int						
	6 = Floating Point						
41229	FB Exp M->S 10	[-]	Int	R/Z/*	0	-9	9
	Power of 10 used to multiply the parameter value to write into XVy-EV.						
FB 11th M->S PAR							
41200	FB Assign M->S 11	[-]	Enum	R/Z/*	0	0	5
	Exchange data mode.						
	0 = Not assigned						
	1 = Parameter						
	3 = Direct Acc Par	Direct access parameter (8ms)					
	4 = Filling						
	5 = Fast Access Par	Fast access parameter (250uS)					
41210	FB IPA M->S 11	[-]	Word	R/Z/*	0	0	65535
	Parameter index (IPA) to write into XVy-EV with PDC channel						
41220	FB Format M->S 11	[-]	Enum	R/Z/*	1	0	65535
	Format of the parameter to write into XVy-EV						
	1 = 16 Bit Integer						
	2 = 16 Bit Uns Int						
	3 = 32 Bit Integer						

IPA	Description	[Unit]	Format	Access	Default	Min	Max
	4 = 32 Bit Uns Int 6 = Floating Point						
41230	FB Exp M->S 11 Power of 10 used to multiply the parameter value to write into XVy-EV.	[--]	Int	R/Z/*	0	-9	9
FB 12th M->S PAR							
41201	FB Assign M->S 12 Exchange data mode. 0 = Not assigned 1 = Parameter 3 = Direct Acc Par Direct access parameter (8ms) 4 = Filling 5 = Fast Access Par Fast access parameter (250uS)	[--]	Enum	R/Z/*	0	0	5
41201	FB IPA M->S 12 Parameter index (IPA) to write into XVy-EV with PDC channel	[--]	Word	R/Z/*	0	0	65535
41221	FB Format M->S 12 Format of the parameter to write into XVy-EV 1 = 16 Bit Integer 2 = 16 Bit Uns Int 3 = 32 Bit Integer 4 = 32 Bit Uns Int 6 = Floating Point	[--]	Enum	R/Z/*	1	0	65535
41231	FB Exp M->S 12 Power of 10 used to multiply the parameter value to write into XVy-EV.	[--]	Int	R/Z/*	0	-9	9
FB 1st S->M PAR							
40290	FB Assign S->M 1 Exchange data mode. 0 = Not assigned 1 = Parameter 3 = Direct Acc Par Direct access parameter (8ms) 4 = Filling 5 = Fast Access Par Fast access parameter (250uS)	[--]	Enum	R/Z/*	0	0	5
40300	FB IPA S->M 1 Parameter index (IPA) to read from XVy-EV with PDC channel	[--]	Word	R/Z/*	0	0	65535
40310	FB Format S->M 1 Format of the parameter to read into XVy-EV 1 = 16 Bit Integer 2 = 16 Bit Uns Int 3 = 32 Bit Integer 4 = 32 Bit Uns Int 6 = Floating Point	[--]	Enum	R/Z/*	1	0	65535
40320	FB Exp S->M 1 Power of 10 used to multiply the parameter value to read into XVy-EV.	[--]	Int	R/Z/*	0	-9	9
FB 2nd S->M PAR							
40291	FB Assign S->M 2 Exchange data mode. 0 = Not assigned 1 = Parameter	[--]	Enum	R/Z/*	0	0	5

IPA	Description	[Unit]	Format	Access	Default	Min	Max
	3 = Direct Acc Par	Direct access parameter (8ms)					
	4 = Filling						
	5 = Fast Access Par	Fast access parameter (250uS)					
40301	FB IPA S->M 2	[--]	Word	R/Z/*	0	0	65535
	Parameter index (IPA) to read from XvY-EV with PDC channel						
40311	FB Format S->M 2	[--]	Enum	R/Z/*	1	0	65535
	Format of the parameter to read into XvY-EV						
	1 = 16 Bit Integer						
	2 = 16 Bit Uns Int						
	3 = 32 Bit Integer						
	4 = 32 Bit Uns Int						
	6 = Floating Point						
40321	FB Exp S->M 2	[--]	Int	R/Z/*	0	-9	9
	Power of 10 used to multiply the parameter value to read into XvY-EV.						
FB 3rd S->M PAR							
40292	FB Assign S->M 3	[--]	Enum	R/Z/*	0	0	5
	Exchange data mode.						
	0 = Not assigned						
	1 = Parameter						
	3 = Direct Acc Par	Direct access parameter (8ms)					
	4 = Filling						
	5 = Fast Access Par	Fast access parameter (250uS)					
40302	FB IPA S->M 3	[--]	Word	R/Z/*	0	0	65535
	Parameter index (IPA) to read from XvY-EV with PDC channel						
40312	FB Format S->M 3	[--]	Enum	R/Z/*	1	0	65535
	Format of the parameter to read into XvY-EV						
	1 = 16 Bit Integer						
	2 = 16 Bit Uns Int						
	3 = 32 Bit Integer						
	4 = 32 Bit Uns Int						
	6 = Floating Point						
40322	FB Exp S->M 3	[--]	Int	R/Z/*	0	-9	9
	Power of 10 used to multiply the parameter value to read into XvY-EV.						
FB 4th S->M PAR							
40293	FB Assign S->M 4	[--]	Enum	R/Z/*	0	0	5
	Exchange data mode.						
	0 = Not assigned						
	1 = Parameter						
	3 = Direct Acc Par	Direct access parameter (8ms)					
	4 = Filling						
	5 = Fast Access Par	Fast access parameter (250uS)					
40303	FB IPA S->M 4	[--]	Word	R/Z/*	0	0	65535
	Parameter index (IPA) to read from XvY-EV with PDC channel						
40313	FB Format S->M 4	[--]	Enum	R/Z/*	1	0	65535
	Format of the parameter to read into XvY-EV						
	1 = 16 Bit Integer						
	2 = 16 Bit Uns Int						
	3 = 32 Bit Integer						

IPA	Description	[Unit]	Format	Access	Default	Min	Max
	4 = 32 Bit Uns Int 6 = Floating Point						
40323	FB Exp S->M 4 Power of 10 used to multiply the parameter value to read into XVy-EV.	[--]	Int	R/Z/*	0	-9	9
FB 5th S->M PAR							
40294	FB Assign S->M 5 Exchange data mode. 0 = Not assigned 1 = Parameter 3 = Direct Acc Par Direct access parameter (8ms) 4 = Filling 5 = Fast Access Par Fast access parameter (250uS)	[--]	Enum	R/Z/*	0	0	5
40304	FB IPA S->M 5 Parameter index (IPA) to read from XVy-EV with PDC channel	[--]	Word	R/Z/*	0	0	65535
40314	FB Format S->M 5 Format of the parameter to read into XVy-EV 1 = 16 Bit Integer 2 = 16 Bit Uns Int 3 = 32 Bit Integer 4 = 32 Bit Uns Int 6 = Floating Point	[--]	Enum	R/Z/*	1	0	65535
40324	FB Exp S->M 5 Power of 10 used to multiply the parameter value to read into XVy-EV.	[--]	Int	R/Z/*	0	-9	9
FB 6th S->M PAR							
40295	FB Assign S->M 6 Exchange data mode. 0 = Not assigned 1 = Parameter 3 = Direct Acc Par Direct access parameter (8ms) 4 = Filling 5 = Fast Access Par Fast access parameter (250uS)	[--]	Enum	R/Z/*	0	0	5
40305	FB IPA S->M 6 Parameter index (IPA) to read from XVy-EV with PDC channel	[--]	Word	R/Z/*	0	0	65535
40315	FB Format S->M 6 Format of the parameter to read into XVy-EV 1 = 16 Bit Integer 2 = 16 Bit Uns Int 3 = 32 Bit Integer 4 = 32 Bit Uns Int 6 = Floating Point	[--]	Enum	R/Z/*	1	0	65535
40325	FB Exp S->M 6 Power of 10 used to multiply the parameter value to read into XVy-EV.	[--]	Int	R/Z/*	0	-9	9
FB 7th S->M PAR							
40296	FB Assign S->M 7 Exchange data mode. 0 = Not assigned 1 = Parameter	[--]	Enum	R/Z/*	0	0	5

IPA	Description	[Unit]	Format	Access	Default	Min	Max
	3 = Direct Acc Par	Direct access parameter (8ms)					
	4 = Filling						
	5 = Fast Access Par	Fast access parameter (250uS)					
40306	FB IPA S->M 7	[-]	Word	R/Z/*	0	0	65535
	Parameter index (IPA) to read from XVy-EV with PDC channel						
40316	FB Format S->M 7	[-]	Enum	R/Z/*	1	0	65535
	Format of the parameter to read into XVy-EV						
	1 = 16 Bit Integer						
	2 = 16 Bit Uns Int						
	3 = 32 Bit Integer						
	4 = 32 Bit Uns Int						
	6 = Floating Point						
40326	FB Exp S->M 7	[-]	Int	R/Z/*	0	-9	9
	Power of 10 used to multiply the parameter value to read into XVy-EV.						
FB 8th S->M PAR							
40297	FB Assign S->M 8	[-]	Enum	R/Z/*	0	0	5
	Exchange data mode.						
	0 = Not assigned						
	1 = Parameter						
	3 = Direct Acc Par	Direct access parameter (8ms)					
	4 = Filling						
	5 = Fast Access Par	Fast access parameter (250uS)					
40307	FB IPA S->M 8	[-]	Word	R/Z/*	0	0	65535
	Parameter index (IPA) to read from XVy-EV with PDC channel						
40317	FB Format S->M 8	[-]	Enum	R/Z/*	1	0	65535
	Format of the parameter to read into XVy-EV						
	1 = 16 Bit Integer						
	2 = 16 Bit Uns Int						
	3 = 32 Bit Integer						
	4 = 32 Bit Uns Int						
	6 = Floating Point						
40327	FB Exp S->M 8	[-]	Int	R/Z/*	0	-9	9
	Power of 10 used to multiply the parameter value to read into XVy-EV.						
FB 9th S->M PAR							
41298	FB Assign S->M 9	[-]	Enum	R/Z/*	0	0	5
	Exchange data mode.						
	0 = Not assigned						
	1 = Parameter						
	3 = Direct Acc Par	Direct access parameter (8ms)					
	4 = Filling						
	5 = Fast Access Par	Fast access parameter (250uS)					
41308	FB IPA S->M 9	[-]	Word	R/Z/*	0	0	65535
	Parameter index (IPA) to read from XVy-EV with PDC channel						
41318	FB Format S->M 9	[-]	Enum	R/Z/*	1	0	65535
	Format of the parameter to read into XVy-EV						
	1 = 16 Bit Integer						
	2 = 16 Bit Uns Int						
	3 = 32 Bit Integer						

IPA	Description	[Unit]	Format	Access	Default	Min	Max
	4 = 32 Bit Uns Int 6 = Floating Point						
41328	FB Exp S->M 9 Power of 10 used to multiply the parameter value to read into XVy-EV.	[--]	Int	R/Z/*	0	-9	9
FB 10th S->M PAR							
41299	FB Assign S->M 10 Exchange data mode. 0 = Not assigned 1 = Parameter 3 = Direct Acc Par Direct access parameter (8ms) 4 = Filling 5 = Fast Access Par Fast access parameter (250uS)	[--]	Enum	R/Z/*	0	0	5
41309	FB IPA S->M 10 Parameter index (IPA) to read from XVy-EV with PDC channel	[--]	Word	R/Z/*	0	0	65535
41319	FB Format S->M 10 Format of the parameter to read into XVy-EV 1 = 16 Bit Integer 2 = 16 Bit Uns Int 3 = 32 Bit Integer 4 = 32 Bit Uns Int 6 = Floating Point	[--]	Enum	R/Z/*	1	0	65535
41329	FB Exp S->M 10 Power of 10 used to multiply the parameter value to read into XVy-EV.	[--]	Int	R/Z/*	0	-9	9
FB 11th S->M PAR							
41300	FB Assign S->M 11 Exchange data mode. 0 = Not assigned 1 = Parameter 3 = Direct Acc Par Direct access parameter (8ms) 4 = Filling 5 = Fast Access Par Fast access parameter (250uS)	[--]	Enum	R/Z/*	0	0	5
41310	FB IPA S->M 11 Parameter index (IPA) to read from XVy-EV with PDC channel	[--]	Word	R/Z/*	0	0	65535
41320	FB Format S->M 11 Format of the parameter to read into XVy-EV [1] 16 Bit Integer [2] 16 Bit Uns Int [3] 32 Bit Integer [4] 32 Bit Uns Int [6] Floating Point	[--]	Enum	R/Z/*	1	0	65535
41331	FB Exp S->M 11 Power of 10 used to multiply the parameter value to read into XVy-EV.	[--]	Int	R/Z/*	0	-9	9
FB 12th S->M PAR							
41301	FB Assign S->M 12 Exchange data mode. 0 = Not assigned 1 = Parameter	[--]	Enum	R/Z/*	0	0	5

IPA	Description	[Unit]	Format	Access	Default	Min	Max
	3 = Direct Acc Par	Direct access parameter (8ms)					
	4 = Filling						
	5 = Fast Access Par	Fast access parameter (250uS)					
41311	FB IPA S->M 12	[--]	Word	R/Z*	0	0	65535
	Parameter index (IPA) to read from XVy-EV with PDC channel						
41321	FB Format S->M 12	[--]	Enum	R/Z*	1	0	65535
	Format of the parameter to read into XVy-EV						
	1 = 16 Bit Integer						
	2 = 16 Bit Uns Int						
	3 = 32 Bit Integer						
	4 = 32 Bit Uns Int						
	6 = Floating Point						
41331	FB Exp S->M 12	[--]	Int	R/Z*	0	-9	9
	Power of 10 used to multiply the parameter value to read into XVy-EV.						
CANOPEN							
40902	Sync Period	[usec]	dword	RZ*	0	0	100000
	This parameter defines the SYNC interval (communication cycle, Object 1006h). Used to synchronise execution of the task within the inverter in SYNC message. If set to 0, the bus loss timeouts on SYNC are disabled						
40903	Guard Time	[msec]	word	RZ*	20	0	65535
	This parameter defines the Node Guarding interval (Object 100Ch). If set to 0, the bus loss timeouts on Node Guarding are disabled.						
40904	Life Time Factor	[--]	Word	RZ*	3	0	65535
	Life time factor (Object 100Dh) multiplied by Node Guarding period or SYNC period is the timeout for bus loss errors.						
40905	COBID Em Obj	[--]	Dword	RZ*	0x80000081	0x00000080	0x800000FF
	COB-ID of Emergency object (Object 1014h).						
40906	Cus OBJ Idx Mode	[--]	Enum	RZ*	Mod100	0	65536
	Sets the address method for parameters in SDO requests.						
	0 = Offset						
	1 = Mod 100						
PDO 1 RX							
40910	PDO 1 RX COBID	[--]	Dword	RZ*	0x40000201	0x00000200	0x4000027F
	COB ID for 1° PDO receiver (Object 1400h , Subindex 1)						
40915	PDO 1 RX TYPE	[--]	word	RZ*	1	1	255
	1° PDO in reception (Object 1400h , Subindex 2)						
PDO 2 RX							
40911	PDO 2 RX COBID	[--]	Dword	RZ*	0x40000301	0x00000300	0x4000037F
	COB ID for 2° PDO receiver (Object 1401h , Subindex 1).						
40916	PDO 2 RX TYPE	[--]	word	RZ*	1	1	255
	2° PDO in reception (Object 1401h , Subindex 2)						
PDO 3 RX							
40912	PDO 3 RX COBID	[--]	Dword	RZ*	0x40000401	0x00000400	0x4000047F
	COB ID for 3° PDO receiver (Object 1404h , Subindex 1).						
40917	PDO 3 RX TYPE	[--]	word	RZ*	1	1	255
	3° PDO in reception (Object 1402h , Subindex 2)						

IPA	Description	[Unit]	Format	Access	Default	Min	Max
PDO 1 TX							
40920	PDO 1 TX COBID COB ID of 1° PDO in transmission (Object 1800h , Subindex 1).	[--]	Dword	RZ*	0x40000181	0x00000181	0x400001FF
40925	PDO 1 TX TYPE 1° PDO in transmission (Object 1800h , Subindex 2).	[--]	word	RZ*	1	1	255
40930	PDO 1 TX INH Inhibition time of 1° PDO in transmission (Object 1800h , Subindex 3).	[100us]	word	RZ*	40	0	65535
PDO 2 TX							
40921	PDO 2 TX COBID COB ID of 2° PDO in transmission (Object 1801h , Subindex 1).	[--]	Dword	RZ*	0x40000281	0x00000281	0x400002FF
40926	PDO 2 TX TYPE 2° PDO in transmission (Object 1801h , Subindex 2).	[--]	word	RZ*	1	1	255
40931	PDO 2 TX INH Inhibition time of 2° PDO in transmission (Object 1801h , Subindex 3)	[100us]	word	RZ*	40	0	65535
PDO 3 TX							
40922	PDO 3 TX COBID COB ID of 3° PDO in transmission (Object 1802h , Subindex 1).	[--]	Dword	RZ*	0x40000381	0x00000381	0x400003FF
40927	PDO 3 TX TYPE 3° PDO in transmission (Object 1802h , Subindex 2).	[--]	word	RZ*	1	1	255
40932	PDO 3 TX INH Inhibition time of 3° PDO in transmission (Object 1802h , Subindex 3)	[100us]	word	RZ*	40	0	65535
UNITS							
18700	Arms Conv Fact Current conversion factor.	[Arms/cnts]	Float	R			
18752	Rpm Conv Fact Speed conversion factor.	[rpm/cnts]	Float	R			
18753	Pos Conv Fact Position conversion factor.	[deg/cnts]	Float	R			
18790	Torque Conv Fact Torque conversion factor.	[Nm/cnts]	Float	R			
TUNING							
18140	Application Sel Application selection parameter. It is possible to select different applications: 0=Basic 2=Phasing 3=Test Generator 4=Autotuning	[--]	Enum	R/Z/*	0	0	65535
AUTOTUNING							
18330	Tuning Status Tuning developing process 0 = Off 1 = Lsigma Tuning... 2 = Rs Tuning... 3 = Magn Tuning... 4 = Rr Tuning...	[--]	Enum	R			

IPA	Description	[Unit]	Format	Access	Default	Min	Max
	90 = Done						
	100 = Err Drive Dis						
	110 = Err Lsigma TOut						
	111 = Err Lsigma Range						
	130 = Err Rs Range						
	150 = Err Lm Range						
	151 = Err Lm Neg Value						
	160 = Err Imagn Range						
	170 = Err Rr Range						
18313	LKG Inductance	[H]	Float	R			
	Motor inductance						
PHASING							
20058	Enc Mech Offset	[el.deg.]	Float	R/Z/*	0	-180	180
	Offset between electrical angle zero of motor phases and encoder feedback device.						
20057	Enc Offset	[mech deg]	Float	R/Z/*	0	-180	180
	Offset between absolute and incremental tracks on encoder feedback device.						
20059	Phasing Speed	[rpm]	Float		5	0	100
	Motor speed during Phasing procedure						
TEST GENERATOR							
20060	Test Gen Ref	[--]	Enum	R/Z	0	0	1
	Used to select current or speed loop adjusting procedure :						
	0 = Current Ref: current loop adjust						
	1 = Pos \ Spd Ref speed loop adjust						
CURR TEST GEN							
20061	Period Test Gen	[ms]	Int	R/W	16	0	32767
	In current generator mode (current loop adjustment), this is the period of the generated square wave.						
20062	Hig Curr Ref Gen	[Apk]	Float	R/W	IPA18703	S	S
	Maximum value of the current reference as compared to the motor U phase.						
20063	Low Curr Ref Gen	[Apk]	Float	R/W	0		S
	Minimum value of the current reference as compared to the motor U phase.						
SPD/POS TESTGEN							
20070	CW Rev Test Gen	[rev]	Float	R/W	5		
	Number of clockwise revolutions performed by the motor during the speed generator Test as compared to the starting position.						
20071	CCW Rev Test Gen	[rev]	Float	R/W	5		
	Number of anti-clockwise revolutions performed by the motor during the speed generator Test as compared to the starting position.						
20072	Speed Test Gen	[rpm]	Float	R/W	100	0	100000
	Motor speed during speed generator test						

IPA	Description	[Unit]	Format	Access	Default	Min	Max
KEYPAD PSW							
18145	Keypad PSWD	[--]	Dword	R/W	00000000H		

The drive manages two password access levels:

- level 1 "user" access to prevent any unauthorised modification of drive configuration parameters. See

Entering the user Password.

- level 2 to access the Service menu (reserved for use by GEFRAN-SIEL technicians).

Both Passwords are entered from the keypad in the **Keypad PSWD (*)** parameter.

The default value for the **Keypad PSWD** parameter is 00000000H. If it is not changed, access is always allowed to the complete list of menus and parameters (except the SERVICE menu).

If a user password has been configured, access is only allowed to the MONITOR menu.

Access to the complete list of menus and parameters (except the Service menu) is only allowed if the correct password is entered in the Keypad PSWD parameter

Entering the user Password.

1) When the drive is turned on the motor speed is shown on the display. Press **Escape (Shift + ◀)** to access the menus.

2) Press **Escape** to display the MONITOR menu, then **Enter** to show all the measurements.

3) In the MONITOR menu, press **▼** to display all the drive menus in sequence until the **Keypad PSWD** parameter appears. Press **Enter** to display the value 00000000H.

4) Enter a value from 1 up to a maximum of 8 digits.

5) Press **Enter** to confirm

Press **▲** to return to the menu list.

6) To make the password operational, store it using the **Save Parameter** command.

The protection will be enabled the next time the inverter is turned off and then on again.

Temporarily disabling the Password

1) Select the **Keypad PSWD** parameter (see points 1 to 3 in the previous section).

2) Press **Enter** to display the value 00000000H.

3) Enter the correct password value.

4) Press **Enter** to confirm

5) Press **▲** to exit the password parameter and return to the MONITOR menu.

In this menu, press **▼** to display all the drive menus in sequence.

The password is automatically re-enabled the next time the inverter is turned off and then on again.

Removing the Password

1) After temporarily disabling the password as described in the previous point, return to the **Keypad PSWD** parameter.

2) Press **Enter** to display the value 00000000H.

3) Press **Enter** to confirm

4) Press **▲** to exit the password parameter

5) Store using the **Save Parameter** command.

You can now access the complete list of menus and parameters again (except the SERVICE menu) even after turning the inverter off and then on again.

Repeat the "**Entering the user Password**" procedure to enter a new password.

(*) The **Keypad PSWD** parameter is not visible via the E@syDrives tool.

IPA	Description	[Unit]	Format	Access	Default	Min	Max
	Using the E@syDrives tool the password (only required to enable the SERVICE menu) can be entered in the <u>F</u> ile / Password pull-down menu.						
<i>NOTA !</i>	<p>The KEYPAD PSWD menu is shown on the keypad:</p> <ul style="list-style-type: none"> - with the user password enabled after the MONITOR menu - without a password (or password disabled) after the TUNING menu - with the Service password enabled after the SERVICE menu 						
<i>NOTA !</i>	<p>With the E@syDrives tool you can always display all the menus except the SERVICE menu:</p> <ul style="list-style-type: none"> 0 - Basic Level only the MONITOR menu is displayed 1 - User Menu (default) all the menus are displayed except the SERVICE menu 3 - Service Menu all the menus are displayed (reserved for use by GEFRAN-SIEL technicians) 						

IPA	Description	[Unit]	Format	Access	Default	Min	Max
-----	-------------	--------	--------	--------	---------	-----	-----

SERVICE

This menu is reserved for use by Gefran-Siei technicians.

To access the SERVICE menu simply enter the level 2) password:

- using the E@syDrives tool, from the File / Password pull-down menu, select "3 - Service menu" and enter the password.

- using the keypad, via the **Keypad PSWD** parameter (from the MONITOR menu, keep pressing ▼ until the **Keypad PSWD** parameter is displayed).

Please refer to the **Keypad PSWD** parameter for more details about how to enter the Password.

Temporarily disabling the Service Password

This password, which is reserved for use by GEFRAN-SIEI technicians, allows access to the SERVICE menu. The password is fixed with a hexadecimal valueH

1) When the drive is turned on the motor speed is shown on the display. Press **Escape (Shift + ◀)** to access the menus.

2) Press **Escape** to display the MONITOR menu

3) In the MONITOR menu, press ▼ to display all the drive menus in sequence until the Keypad PSWD parameter appears. Press **Enter** to display the value 00000000H.

4) Enter the Service password value.

5) Press **Enter** to confirm

5) Press ▲ to exit the password parameter and return to the MONITOR menu.

In this menu, press ▼ to display all the drive menus in sequence, including the SERVICE MENU.

The password is automatically re-enabled the next time the inverter is turned off and then on again.

The SERVICE menu only displays the **Keypad Key Word** parameter, which can be used to display the user password that is enabled. If 00000000H appears in the parameter no password has been enabled.

18123	Max Pos Error	[deg]	Float	R/W	90	0	2880
Maximum position error which, if overcome, causes the intervention of the "(A 29) Position error" alarm in the "Els" or "Position" condition.							
00999	Modbus IPA Ofst	[--]	Word	R/W			
Offset used to address all drive parameter with a modbus connected PLC having limited addressing capacity.							
19113	Actual Pos Error	[deg]	Float	R			
Position error used with the "Els" or "Position" condition.							
18792	FW Build Number	[--]	Dword	R			
It is a number which identifies univocally a version of the FW. The higher numbers identify more recent FW versions.							

KEYPAD KEY

18144	Keypad Key Word	[--]	Dword	R	00000000H
Displays the user password. If the value shown is 00000000H the password has not been entered.					

ENABLE KEYS

The communications via the DeviceNet communication protocol and the applications developed via the MDPlc environment are protected by a software key customized for each single drive. The code of the activation key can be purchased through the Gefran-Siei commercial department.

In order to allow the function check and while waiting for the personal key, each drive is enabled to function without the key protection for 100 hours. The functioning period is given adding the values read in the IPA 20045 and IPA 20046 parameters (COUNTER menu).

IPA	Description	[Unit]	Format	Access	Default	Min	Max
41000	DeviceNet Enable DeviceNet activation code.	[--]	Dword	R/W*			
41001	PLC Enable Key Key disabling the Plc functions.	[--]	Dword	R/W*			
41050	DNet En Key Stat Status of the DeviceNet enabling key: 0 = Disabled 1 = Enabled 60 = 200 Hours Free 200h free for valuation.	[--]	Word	R			
41051	PLC En Key Stat Status of the Plc enabling key 0 = Disabled 1 = Enabled 60 = 200 Hours Free 200h free for valuation.	[--]	Word	R			
41020	En Keys Mask Enabled key mask.	[--]	Word	R			
18504	Ser Num En Keys Serial number used to enable the key codes.	[--]	Word	R			
COUNTER							
20044	Load Def Counter Counter for the number of performed loading procedures for the factory-set parameters.	[--]	Dwor	R			
20045	Tot Life Hours Life hours at last power on.	[Hour]	Float	R			
20046	Act Life Hours Hours from last power on.	[Hour]	Float	R			
20047	Power Fail Count Counter listing the number of times the drive has been switched off.	[--]	Dwor	R			
20048	Save Param Count Save parameters counter.	[--]	Dwor	R			
20049	SW Reset Count Software reset counter.	[--]	Dwor	R			
ENCODER							
20017	Enc Inc Tracks Incremental encoder enabling for current regulation 0=Disabled 1=Enabled	[--]	Enum	R/Z/*	1	0	1
20031	Enc Inc Index Indicates if index on incremental encoder is present. 0=Not Present 1= Present	[--]	Enum	R/Z/*	1	0	1
20028	Enc No Idx Range Maximum number of revolutions to be performed without reading the zero slot. 0...65535. If 0, the control is disabled.	[--]	Word	R/W	2	0	65535
20029	Enc M Lost Puls Maximum number of lost incremental pulses for each revolution.	[--]	Word	R/W	2	0	65535
20034	Max Loss Pos Maximum allowed position loss.	[mech deg]	Float	R/Z/*	90.0	0	180

IPA	Description	[Unit]	Format	Access	Default	Min	Max
20013	Phasing Err Actual phasing error	[el deg]	Float	R			
20014	Act Enc Pos Loss Actual position loss	[mech deg]	Float	R			
20015	Act Mot El Angle Motor electrical angle.	[el deg]	Float	R			
XE ENC INC MEAS							
18744	Inc Data Min Mod AD minimum allowed module.	[cnts]	Int	R/W	11000	0	32767
18741	Inc Data Act Mod AD measured module.	[cnts]	Int	R			
19002	Inc Data Pos AD incremental position, main fbk.	[mech deg]	Float	R			
19003	Inc Data N Rev AD incremental revolution, main fbk.	[--]	long	R			
19096	Index Position AD index position, main fbk.	[mech deg]	Float	R			
19004	Inc Pulses / Rev AD incremental pulses/revolution, main fbk.	[--]	Dword	R			
19006	Inc B Data Count AD incremental B channel, main fbk (XE pin 8-1)	[cnts]	Int	R			
19005	Inc A Data Count AD incremental A channel, main fbk (XE pin 5-6)	[cnts]	Int	R			
XE ENC ABS MEAS							
18747	Resolver Gain Resolver input gain 0 = 5 times 1 = 2 times 2 = 1.25 times 3 = 1 times	[times]	Enum	R/Z/*	1	0	3
18126	Res Shift Time Resolver sampling shift time. 1cnts=33.3 ns.	[cnts]	Int	R/W	580	-4000	4000
18745	Abs Data Min Mod AN minimum allowed module.	[cnts]	Int	R/W	17000	0	32767
18760	Abs Comp En Enable offset compensation and amplitudes difference of AN channel. 0 = Disabled 1 = Enabled	[--]	Enum	R/W	1	0	1
18761	Abs Comp TAU AN comp time constant.	[--]	Int	R/W	100	1	32767
18767	Abs Max Noise Maximum value of electrical noise on AN transducer.	[count]	INT		0	0	65535
18740	Abs Act Module AN measured module.	[cnts]	Int	R			
19017	Abs Turn Pos AN position, main fbk.	[mech deg]	Float	R			

IPA	Description	[Unit]	Format	Access	Default	Min	Max
19018	Abs Rev AN revolution, main fbk.	[--]	Long	R			
18762	Abs Sin Offset AN SIN ch. compensated offset, main fbk (XE pin 10-11).	[cnts]	Int	R			
18763	Abs Cos Offset AN COS ch. compensated offset, main fbk (XE pin 12-13).	[cnts]	Int	R			
18764	Abs Gain Err AN SIN/COS ch. compensated gain error	[%]	Float	R			
18766	Abs Meas Noise Momentary value of electrical noise on AN transducer.	[count]	INT		0	0	65535
19019	Abs Sin Meas AN SIN ch., main fbk (XE pin 10-11)	[--]	Int	R			
19020	Abs Cos Meas AN COS ch., main fbk (XE pin 12-13)	[--]	Int	R			
XER/EXP Inc Enc							
19011	XER/EXP Turn Pos DI incremental position, aux encoder (XER connector)	[mech deg]	Float	R			
19012	XER/EXP Rev DI incremental revolution, aux encoder (XER connector)	[--]	Long	R			
19013	XER/EXP Puls Rev DI incremental pulses/revolution, aux encoder (XER connector)	[--]	Dword	R			
19095	XER/EXP Ind Pos DI index position, aux encoder (XER connector)	[el deg]	Float	R			
XE HALL TRACKS							
19022	XE Hall Pos HA position, main fbk (XE connector).	[el deg]	Float	R			
19026	XE Hall Rev HA electrical revolution, main fbk (XE connector).	[--]	Long	R			
19027	XE Hall Meas HA inputs pins H1, H2, H3, main fbk (XE connector).	[--]	Word	R			
19028	XE Hall N Error Number of times when the 000 or 111 wrong configuration has appeared during the probe reading.	[--]	Int	R			
EXP ENC ABS1							
19030	ABS1 AI Bit En ABS1 alarm bit check enable (EnDat only). 0=Disabled 1=Enabled	[--]	Enum	R/W	1	0	1
19031	EXP ABS1 Pos ABS1 absolute position, main fbk.	[mech deg]	Float	R			
19032	EXP ABS1 Sw Rev Number of calculated absolute turns. This parameter can be greater than max number of revolutions set by encoders hardware limit.	[--]	Long	R			
19033	EXP ABS1 Hw Rev Number of absolute revolutions. This number has a maximum value, the maximum number of revolutions that encoder can measure. After maximum value, count starts from zero.	[--]	Int	R			

IPA	Description	[Unit]	Format	Access	Default	Min	Max
19034	ABS1 Rx N Err ABS1 total communication error.	[--]	Int	R			
19035	ABS1 Alarm Bit ABS1 alarm bit value (EnDat only).	[--]	Enum	R			
FAST LINK ENC							
29103	RX Rev Number of incremental revolutions of the speed/position loop encoder, fast link receiver.	[--]	Long	R			
29104	RX Pos Incremental position of the speed/position loop encoder, fast link receiver.	[--]	Long	R			
29106	TX Rev Number of incremental revolutions of the speed/position loop encoder, fast link transmitter.	[--]	Long	R			
29107	TX Pos Incremental position of the speed/position loop encoder, fast link transmitter.	[--]	Long	R			
29108	RX Rev Aux Number of incremental revolutions of the auxiliary encoder, fast link receiver.	[--]	Long	R			
29109	RX Pos Aux Incremental position of the auxiliary encoder, fast link receiver.	[--]	Long	R			
29110	TX Rev Aux Number of incremental revolutions of the auxiliary encoder, fast link transmitter.	[--]	Long	R			
29111	TX Pos Aux Incremental position of the auxiliary encoder, fast link transmitter.	[--]	Long	R			
32015	FL Error Incremental number of the fast link reception errors. It is active only on the FL slaves configured with the functioning of the electric shaft. A drive reset takes it back to zero.	[--]	INT16	R			
RESERVED							
18111	XER/EXP Enc Mod 0 = Fourfold 1 = A=UpB=Dir 2 = A=UpB=Down	[--]	Enum	R/Z/*	0	0	2
18112	XER/EXP Enc Flt DI glitches digital filter	[--]	Word	R/Z/*	4	0	7
18113	XE Inc Enc Flt AD glitches digital filter	[--]	Word	R/Z/*	4	0	7
18114	XE Index Mask 0=original ChZ 1=ChZ & ChA & ChB	[--]	Enum	R/Z/*	1	0	1
18121	Spd Loop Filter Speed loop output LP filter time constant.	[msec]	Float	R/W	1	0	50
18122	XE Enc Abs Flt AN filter time constant.	[msec]	Float	R/W	1	0	50
18119	Curr Comp Time Current sampling compensation time.	[msec]	Float	R/W	0	-1000	1000
18120	Over Mod Factor Overmodulation factor.	[%]	Float	R/W	15	0	50
18103	Brake Volt Thr BU intervention threshold.	[V]	Float	R/Z/*	780	(*)	820

IPA	Description	[Unit]	Format	Access	Default	Min	Max
	(*): function of IPA 20050						
40901	FBCFG Not to be modified, reserved for internal use.						
DEBUG							
18146	Debug Mode Enabling the "Debug mode" 0 = Disabilitato 1 = Abilitato.	[--]	Enum	R/W	0	0	1
18392	PLC Correct ChkS Restricted	[--]	DWord	R	0	0	65535
18390	PLC Saved ChkS Restricted	[--]	DWord	R	0	0	65535
18773	Quadrature Volt Quadrature output voltage.	[Vrms]	Float	R			
18774	Direct Volt Direct output voltage.	[Vrms]	Float	R			
18765	Measured Speed Speed measurement deriving from feedback devices.	[rpm]	Float	R			
TASK MEASURES							
18726	MaxIn Ph Exe T Maximum task INPUT phase execution time.	[us]	Word	R/W	0	0	62
18727	MaxFst Tsk Exe T Maximum task EXECUTE phase execution time.	[us]	Word	R/W	0	0	62
18728	MaxOut Ph Exe T Maximum task OUTPUT phase execution time.	[us]	Word	R/W	0	0	62
18729	MaxAux Ph Exe T Maximum task AUXILIARY phase execution time.	[us]	Word	R/W	0	0	62
18721	MaxSl Tsk Exe T Maximum slow task execution task time.	[us]	Long	R/W	0	0	8000
18709	MaxSys Tsk Exe T Maximum system task execution task time.	[us]	Long	R/W	0	0	64000
18781	MaxBkg Tsk Exe T Maximum execution time of the "Background Task".	[msec]	Long	R/W	0	0	8000
18771	MaxDSP Exe T Maximum DSP execution time. DSP. 1 cnts=33.3 nsec.	[cnts]	Word	R/W	0	0	1875
18722	Inp Phase Exe T Present execution time of the fast task "INPUT phase".	[us]	Word	R			
18723	Fst Tsk Exe T Actual fast task EXECUTE phase execution time.	[us]	Word	R			
18724	Out Phase Tsk T Actual task OUTPUT phase execution time.	[us]	Word	R			
18725	Aux Phase Exe T Actual task AUXILIARY phase execution time.	[us]	Word	R			
18720	Slow Tsk Exe T Actual slow task execution time.	[us]	Long	R			

IPA	Description	[Unit]	Format	Access	Default	Min	Max
18708	Sys Tsk Exe T Actual system task execution time.	[us]	Long	R			
18780	Bkg Tsk Exe T Present execution time of the "Background Task".	[msec]	Long		R		
18770	DSP Exe Time Actual DSP execution time 1 cnts=33.3 nsec.	[cnts]	Word	R			

Chapter 11 - Parameters Index

In UPPERCASE = Menu

In lowercase = Parameter description

IPA

00999, pg.199	18322, pg.128	18756, pg.117
18010, pg.118	18325, pg.128	18757, pg.117
18011, pg.117	18326, pg.128	18760, pg.201
18017, pg.117	18328, pg.128	18761, pg.201
18031, pg.119	18330, pg.195	18762, pg.202
18032, pg.119	18360, pg.120	18763, pg.202
18042, pg.181	18390, pg.204	18764, pg.202
18070, pg.117	18391, pg.183	18765, pg.204
18071, pg.117	18392, pg.204	18766, pg.202
18100, pg.127	18412, pg.180	18767, pg.201
18101, pg.127	18504, pg.200	18770, pg.205
18102, pg.128	18700, pg.195	18771, pg.204
18103, pg.203	18701, pg.119	18772, pg.117
18104, pg.180	18703, pg.119	18774, pg.204
18105, pg.180	18704, pg.119	18776, pg.116
18107, pg.180	18708, pg.205	18777, pg.116
18109, pg.180	18709, pg.204	18778, pg.118
18110, pg.120	18710, pg.117	18780, pg.205
18111, pg.203	18711, pg.117	18781, pg.204
18112, pg.203	18720, pg.204	18782, pg.117
18113, pg.203	18721, pg.204	18790, pg.195
18114, pg.203	18722, pg.204	18792, pg.199
18119, pg.203	18723, pg.204	18800, pg.116, 127
18120, pg.203	18724, pg.204	18805, pg.116
18121, pg.203	18725, pg.204	18806, pg.116
18122, pg.203	18726, pg.204	18807, pg.116
18123, pg.199	18727, pg.204	19002, pg.201
18124, pg.120	18728, pg.204	19003, pg.201
18126, pg.201	18729, pg.204	19004, pg.201
18130, pg.153	18732, pg.116	19005, pg.201
18131, pg.153	18735, pg.116	19006, pg.201
18132, pg.153	18736, pg.117	19011, pg.202
18133, pg.153	18739, pg.116	19012, pg.202
18134, pg.153	18740, pg.201	19013, pg.202
18135, pg.153	18741, pg.201	19017, pg.201
18136, pg.153	18742, pg.117	19018, pg.202
18138, pg.153	18744, pg.201	19019, pg.202
18140, pg.195	18745, pg.201	19020, pg.202
18143, pg.182	18746, pg.116	19022, pg.202
18144, pg.199	18747, pg.201	19026, pg.202
18145, pg.197	18748, pg.116	19027, pg.202
18146, pg.204	18749, pg.116	19028, pg.202
18150, pg.125	18751, pg.183	19030, pg.202
18151, pg.125	18752, pg.195	19031, pg.202
18313, pg.120, 196	18753, pg.195	19032, pg.202
18320, pg.128	18754, pg.117	19033, pg.202
18321, pg.128	18755, pg.117	19034, pg.203

19035, pg.203
19040, pg.146
19095, pg.202
19096, pg.201
19113, pg.199
19607, pg.117
20000, pg.118
20001, pg.120
20002, pg.120
20003, pg.124
20004, pg.120
20005, pg.136
20006, pg.136
20007, pg.121
20008, pg.121
20010, pg.121
20011, pg.122
20012, pg.122
20013, pg.201
20014, pg.201
20015, pg.201
20016, pg.181
20017, pg.200
20018, pg.182
20019, pg.122
20020, pg.122
20021, pg.119
20022, pg.117
20023, pg.118
20024, pg.119
20025, pg.119
20026, pg.120
20028, pg.200
20029, pg.200
20030, pg.146
20031, pg.200
20032, pg.146
20033, pg.146
20034, pg.200
20035, pg.146
20036, pg.122
20037, pg.122
20038, pg.122
20039, pg.122
20040, pg.122
20041, pg.122
20042, pg.122
20043, pg.123
20044, pg.200
20045, pg.200
20046, pg.200
20047, pg.200
20048, pg.200
20049, pg.200

20050, pg.118
20051, pg.118
20052, pg.118
20053, pg.119
20057, pg.196
20058, pg.196
20059, pg.196
20060, pg.196
20061, pg.196
20062, pg.196
20063, pg.196
20070, pg.196
20071, pg.196
20072, pg.196
20080, pg.120
20081, pg.120
20082, pg.120
20083, pg.120
20085, pg.149
20086, pg.149
20087, pg.153
20088, pg.153
20089, pg.149
20092, pg.149
20100, pg.132
20101, pg.128
20102, pg.131
20103, pg.131
20104, pg.131
20105, pg.132
20106, pg.132
20107, pg.132
20150, pg.132
20151, pg.132
20152, pg.132
20153, pg.133
20154, pg.133
20155, pg.133
20156, pg.133
20157, pg.133
20162, pg.132
20163, pg.132
20164, pg.133
20170, pg.133
20171, pg.133
20172, pg.133
20173, pg.133
20174, pg.133
20175, pg.134
20176, pg.134
20177, pg.134
20178, pg.134
20179, pg.134
20180, pg.134

20181, pg.134
20182, pg.134
20183, pg.134
20184, pg.134
20185, pg.134
20186, pg.134
20187, pg.135
20188, pg.135
20189, pg.135
20200, pg.136
20201, pg.138
20202, pg.138
20203, pg.138
20204, pg.138
20205, pg.138
20250, pg.139
20251, pg.139
20252, pg.139
20253, pg.139
20254, pg.138
20255, pg.139
20256, pg.140
20257, pg.139
20258, pg.139
20259, pg.139
20260, pg.139
20270, pg.140
20271, pg.140
20272, pg.140
20273, pg.140
20274, pg.140
20275, pg.140
20276, pg.140
20277, pg.140
20278, pg.140
20279, pg.140
20280, pg.140
20281, pg.140
20282, pg.140
20283, pg.141
20284, pg.141
20285, pg.141
20286, pg.141
20289, pg.141
20290, pg.141
20300, pg.142
20301, pg.142
20310, pg.143
20311, pg.143
20320, pg.143
20321, pg.143
20330, pg.143
20331, pg.143
20340, pg.143

20341, pg.143	21301, pg.147	24101, pg.180
20350, pg.143	21302, pg.147	24102, pg.180
20351, pg.143	21303, pg.147	24109, pg.182
20360, pg.143	21304, pg.147	24110, pg.182
20361, pg.143	21305, pg.147	24111, pg.182
20400, pg.143	21306, pg.147	24112, pg.182
20401, pg.144	21307, pg.147	24120, pg.181
20402, pg.145	21310, pg.148	29004, pg.119
20403, pg.145	21311, pg.148	29103, pg.203
20410, pg.144	21401, pg.148	29104, pg.203
20411, pg.145	21402, pg.149	29106, pg.203
20412, pg.145	21403, pg.149	29107, pg.203
20413, pg.145	21411, pg.149	29108, pg.203
20420, pg.144	21412, pg.149	29109, pg.203
20421, pg.145	21413, pg.149	29110, pg.203
20422, pg.145	21421, pg.149	29111, pg.203
20423, pg.145	21422, pg.149	30000, pg.161
20430, pg.144	21423, pg.149	30001, pg.161
20431, pg.145	21431, pg.149	30002, pg.161
20432, pg.145	21432, pg.149	30004, pg.163
20433, pg.145	21433, pg.149	30010, pg.162
20440, pg.144	21440, pg.148	30011, pg.162
20441, pg.145	21441, pg.148	30012, pg.162
20442, pg.145	22000, pg.126	30013, pg.162
20443, pg.145	22001, pg.126	30014, pg.162
20500, pg.116	22002, pg.126	30015, pg.164
20600, pg.152	22003, pg.127	30016, pg.163
20601, pg.152	22004, pg.127	30017, pg.164
20602, pg.152	22005, pg.127	30018, pg.164
20603, pg.152	22007, pg.127	30020, pg.174
21000, pg.146	22009, pg.127	30021, pg.174
21001, pg.146	22010, pg.127	30022, pg.174
21003, pg.146	22011, pg.127	30023, pg.174
21004, pg.146	22012, pg.127	30024, pg.174
21005, pg.147	22013, pg.127	30025, pg.174
21006, pg.147	22014, pg.127	30027, pg.174
21102, pg.123	22501, pg.151	30028, pg.174
21103, pg.123	22502, pg.150	30036, pg.174
21104, pg.123	22503, pg.150	30037, pg.174
21105, pg.123	22504, pg.150	30038, pg.174
21110, pg.124	22505, pg.150	30039, pg.174
21111, pg.124	22506, pg.150	30040, pg.175
21115, pg.123	22507, pg.150	30041, pg.175
21116, pg.123	22508, pg.151	30042, pg.162
21200, pg.124	22509, pg.151	30043, pg.162
21201, pg.124	22510, pg.151	30044, pg.162
21204, pg.125	22515, pg.127	30050, pg.164
21205, pg.125	23000, pg.125	30051, pg.164
21206, pg.125	23001, pg.125	30052, pg.164
21207, pg.125	23002, pg.125	30053, pg.164
21210, pg.123	23003, pg.125	30054, pg.164
21211, pg.125	23010, pg.125	30055, pg.164
21212, pg.116	24000, pg.181	30056, pg.164
21213, pg.125	24100, pg.180	30057, pg.162

30058, pg.164
30059, pg.164
30060, pg.164
30081, pg.163
30090, pg.163
30091, pg.163
30093, pg.163, 175
30094, pg.163
30096, pg.165
30097, pg.165
30098, pg.165
30099, pg.166
30100, pg.165
30101, pg.166
30102, pg.166
30103, pg.167
30104, pg.168
30105, pg.168
30106, pg.169
30107, pg.170
30108, pg.170
30163, pg.170
30164, pg.175
30200, pg.165
30201, pg.166
30202, pg.166
30203, pg.167
30204, pg.168
30205, pg.168
30206, pg.169
30207, pg.170
30264, pg.175
30300, pg.165
30301, pg.166
30302, pg.166
30303, pg.167
30304, pg.168
30305, pg.168
30306, pg.169
30307, pg.170
30364, pg.175
30380, pg.165
30400, pg.165
30401, pg.166
30402, pg.166
30403, pg.167
30404, pg.168
30405, pg.168
30406, pg.169
30407, pg.170
30464, pg.175
30481, pg.166
30482, pg.167
30483, pg.167

30484, pg.168
30485, pg.169
30486, pg.169
30487, pg.170
30490, pg.165
30491, pg.166
30492, pg.167
30493, pg.167
30494, pg.168
30495, pg.169
30496, pg.169
30497, pg.170
30500, pg.165
30501, pg.166
30502, pg.167
30503, pg.167
30504, pg.168
30505, pg.169
30506, pg.169
30507, pg.170
30600, pg.165
30601, pg.166
30602, pg.167
30603, pg.167
30604, pg.168
30605, pg.169
30606, pg.169
30607, pg.170
30700, pg.165
30701, pg.166
30702, pg.167
30703, pg.168
30704, pg.168
30705, pg.169
30706, pg.170
30707, pg.170
30710, pg.165
30711, pg.166
30712, pg.167
30713, pg.168
30714, pg.168
30715, pg.169
30716, pg.170
30717, pg.170
30800, pg.163
31000, pg.175
31001, pg.176
31002, pg.176
31003, pg.176
32000, pg.177
32001, pg.179
32002, pg.179
32003, pg.179
32004, pg.179

32005, pg.179
32006, pg.179
32008, pg.177
32009, pg.177
32010, pg.178
32011, pg.178
32012, pg.178
32013, pg.178
32014, pg.178
32015, pg.203
32016, pg.178
32020, pg.178
32021, pg.178
32090, pg.178
32100, pg.179
32101, pg.179
32102, pg.179
32103, pg.179
32104, pg.179
32200, pg.144
40000, pg.184
40001, pg.184
40100, pg.184
40110, pg.184
40111, pg.184
40113, pg.184
40114, pg.184
40115, pg.184
40116, pg.184
40190, pg.184
40191, pg.185
40192, pg.185
40193, pg.185
40194, pg.186
40195, pg.186
40196, pg.187
40197, pg.187
40200, pg.184
40201, pg.185
40202, pg.185
40203, pg.186
40204, pg.186
40205, pg.186
40206, pg.187
40207, pg.187
40210, pg.184
40211, pg.185
40212, pg.185
40213, pg.186
40214, pg.186
40215, pg.186
40216, pg.187
40217, pg.187
40220, pg.185

40221, pg.185	40926, pg.195	ABS1 Alarm Bit, pg.203
40222, pg.185	40930, pg.195	ABS1 Enc Div Rev, pg.122
40223, pg.186	40931, pg.195	ABS1 Enc ppr, pg.122
40224, pg.186	41000, pg.200	ABS1 Enc Revol, pg.122
40225, pg.187	41001, pg.200	ABS1 Enc Supply, pg.122
40226, pg.187	41020, pg.200	ABS1 Enc Type, pg.122
40227, pg.187	41050, pg.200	ABS1 Rx N Err, pg.203
40290, pg.189	41051, pg.200	Acc Gain, pg.125
40291, pg.189	41198, pg.187	Act Ctrl Mode, pg.119
40292, pg.190	41199, pg.188	Act Enc Pos Loss, pg.201
40293, pg.190	41200, pg.188	Act Life Hours, pg.200
40294, pg.191	41201, pg.189	Act Mot El Angle, pg.201
40295, pg.191	41208, pg.188	Act Neg Spd Lim, pg.117
40296, pg.191	41209, pg.188	Act Neg Trq Lim, pg.116
40297, pg.192	41210, pg.188	Act Out Curr Lim, pg.116
40300, pg.189	41218, pg.188	Act Out Power, pg.117
40301, pg.190	41219, pg.188	Act Pos Spd Lim, pg.117
40302, pg.190	41220, pg.188	Act Pos Trq Lim, pg.116
40303, pg.190	41221, pg.189	Act SpdDrw Ratio, pg.149
40304, pg.191	41228, pg.188	Act Torque, pg.116
40305, pg.191	41229, pg.188	Act Torque Nm, pg.116
40306, pg.192	41230, pg.189	Actual Pos Error, pg.199
40307, pg.192	41231, pg.189	Actual Position, pg.163
40310, pg.189	41298, pg.192	Actual Ratio, pg.179
40311, pg.190	41299, pg.193	Alarm Delay, pg.180
40312, pg.190	41300, pg.193	Alarm Delay Mask, pg.180
40313, pg.190	41301, pg.193	Alarm Dis Mask, pg.180
40314, pg.191	41308, pg.192	Alarm List Clear, pg.181
40315, pg.191	41309, pg.193	Alarm Status, pg.181
40316, pg.192	41310, pg.193	ALARMS, pg.180
40317, pg.192	41311, pg.194	An Inp 0 D_B Neg, pg.143
40320, pg.189	41318, pg.192	An Inp 0 D_B Pos, pg.143
40321, pg.190	41319, pg.193	An Inp 0 Offset, pg.143
40322, pg.190	41320, pg.193	An Inp 0 Read, pg.143
40323, pg.191	41321, pg.194	An Inp 0 Scale, pg.143
40324, pg.191	41328, pg.193	An Inp 0 Value, pg.143
40325, pg.191	41329, pg.193	An Inp 1 D_B Neg, pg.143
40326, pg.192	41331, pg.193, 194	An Inp 1 D_B Pos, pg.143
40327, pg.192		An Inp 1 Offset, pg.143
40901, pg.204	A	An Inp 1 Read, pg.143
40902, pg.194	Abs Act Module, pg.201	An Inp 1 Scale, pg.143
40903, pg.194	Abs Comp En, pg.201	An Inp 1 Value, pg.143
40904, pg.194	Abs Comp TAU, pg.201	An Out 0 Offset, pg.144
40905, pg.194	Abs Cos Meas, pg.202	An Out 0 Scale, pg.144
40906, pg.194	Abs Cos Offset, pg.202	An Out 0 Value, pg.144
40910, pg.194	Abs Data Min Mod, pg.201	An Out 0 Write, pg.144
40911, pg.194	Abs Gain Err, pg.202	An Out 1 Offset, pg.145
40912, pg.194	Abs Max Noise, pg.201	An Out 1 Scale, pg.145
40915, pg.194	Abs Meas Noise, pg.202	An Out 1 Value, pg.145
40916, pg.194	Abs Rev, pg.202	An Out 1 Write, pg.145
40917, pg.194	Abs Sin Meas, pg.202	Analog Inp 0 Sel, pg.142
40920, pg.195	Abs Sin Offset, pg.202	Analog Inp 1 Sel, pg.142
40921, pg.195	Abs Turn Pos, pg.201	ANALOG INPUT 0, pg.143
40925, pg.195	ABS1 Al Bit En, pg.202	ANALOG INPUT 1, pg.143

ANALOG INPUTS, pg.141
 ANALOG OUT 0, pg.144
 Analog Out 0 Sel, pg.143
 ANALOG OUT 1, pg.145
 Analog Out 1 Sel, pg.144
 ANALOG OUTPUTS, pg.143
 ANALOG POS REF, pg.165
 AnOut MaxPosErr, pg.144
 Application Sel, pg.195
 Arms Conv Fact, pg.195
 AUTOTUNING, pg.195
 Aux Enc Type, pg.122
 Aux Phase Exe T, pg.204

B

Back Lash Dir, pg.176
 Back Lash En, pg.175
 BACKLASH RECOV, pg.175
 Base Torque, pg.116, 127
 Bkg Tsk Exe T, pg.205
 BR Ovd Factor, pg.180
 Brake Config, pg.180
 BRAKE CONTROL, pg.151
 Brake Enable, pg.152
 Brake ON Delay, pg.152
 Brake ON Spd Thr, pg.152
 Brake Res Power, pg.180
 Brake Res Value, pg.180
 Brake Volt Thr, pg.203
 BRAKING RES, pg.180
 Bus Address, pg.184
 Bus Baude Rate, pg.184

C

CANOPEN, pg.194
 CC Enabling, pg.184
 CCW Acc Ramp, pg.123
 CCW Dec Ramp, pg.123
 CCW Home Pos Acc, pg.174
 CCW Home Pos Dec, pg.174
 CCW Jog Acc, pg.146
 CCW Jog Dec, pg.147
 CCW Rev Test Gen, pg.196
 COBID Em Obj, pg.194
 COMM CONFIG, pg.119
 Control Mode, pg.118
 COUNTER, pg.200
 CPU Err AI Cause, pg.182
 Curr Comp Time, pg.203
 Curr Deriv Gain, pg.128
 Curr Gain Calc, pg.128
 Curr Integr Gain, pg.127
 Curr Prop Gain, pg.127

CURR TEST GEN, pg.196
 CURRENT GAINS, pg.127
 Cus OBJ Idx Mode, pg.194
 CW Acc Ramp, pg.123
 CW Dec Ramp, pg.123
 CW Home Pos Acc, pg.174
 CW Home Pos Dec, pg.174
 CW Jog Acc, pg.146
 CW Jog Dec, pg.147
 CW Rev Test Gen, pg.196

D

DC Link Voltage, pg.117
 DEBUG, pg.204
 Debug Mode, pg.204
 Delta Pos, pg.176
 Destination Pos, pg.163
 DeviceNet Enable, pg.200
 Dig Inp 0 Status, pg.132
 Dig Inp Rev Mask, pg.132
 Dig Inp Status, pg.132
 Dig Out Reverse, pg.138
 Dig Out Status, pg.139
 Digital Input 1, pg.128
 Digital Input 2, pg.131
 Digital Input 3, pg.131
 Digital Input 4, pg.131
 Digital Input 5, pg.132
 Digital Input 6, pg.132
 Digital Input 7, pg.132
 DIGITAL INPUTS, pg.128
 Digital Output 0, pg.136
 Digital Output 1, pg.138
 Digital Output 2, pg.138
 Digital Output 3, pg.138
 Digital Output 4, pg.138
 Digital Output 5, pg.138
 DIGITAL OUTPUTS, pg.136
 Direct Volt, pg.204
 DNet En Key Stat, pg.200
 DO Reset at Fail, pg.136
 DO Set at Fail, pg.136
 DRIVE CONFIG, pg.118
 Drive Max Curr, pg.118
 Drive Nom Curr, pg.119
 Drive Ovd Fact, pg.117
 Drive Serial Add, pg.119
 Drive size, pg.119
 Drv Nom Curr 0Hz, pg.119
 DSP Exe Time, pg.205

E

EL LINE SHAFT, pg.176

EL SHAFT R BEND, pg.179
 EL SHAFT RATIO, pg.179
 Els Control Mode, pg.178
 Els Delta Ratio, pg.178
 Els Delta Time, pg.177
 Els FL Source, pg.178
 Els Master Sel, pg.177
 Els Max RB Speed, pg.179
 Els Mec Ratio, pg.178
 Els PPR Master, pg.177
 Els Ratio / Slip, pg.178
 Els Ratio 0, pg.179
 Els Ratio 1, pg.179
 Els Ratio 2, pg.179
 Els Ratio 3, pg.179
 Els Ratio Index, pg.179
 Els Ratio Range, pg.178
 Els RB Acc, pg.179
 Els RB Dec, pg.179
 Els RB Speed Ref, pg.179
 Els RB Time, pg.179
 Els Slip Limit, pg.178
 ElsMec Ratio Div, pg.178
 ElsMec Ratio Mul, pg.178
 En Keys Mask, pg.200
 Enable I-O Keys, pg.119
 ENABLE KEYS, pg.199
 Enc Err Simul, pg.146
 ENC EXP BOARD, pg.122
 Enc Inc Index, pg.200
 Enc Inc Tracks, pg.200
 Enc M Lost Puls, pg.200
 Enc Mech Offset, pg.196
 Enc No Idx Range, pg.200
 Enc Offset, pg.196
 Enc Position, pg.117
 Enc Rep Sim Cfg, pg.146
 ENC REPETITION, pg.145
 Enc Revolution, pg.117
 Enc W->A Mask, pg.182
 Enc Warning Cause, pg.181
 ENCODER, pg.200
 ENCODER PARAM, pg.121
 End Run Dec, pg.123
 EnDat Del Comp, pg.123
 Environment Temp, pg.118
 ExAn Out 0 Offse, pg.145
 ExAn Out 0 Scale, pg.145
 ExAn Out 0 Value, pg.145
 ExAn Out 0 Write, pg.145
 ExAn Out 1 Offse, pg.145
 ExAn Out 1 Scale, pg.145
 ExAn Out 1 Value, pg.145
 ExAn Out 1 Write, pg.145

EXP ABS1 Hw Rev, pg.202
 EXP ABS1 Pos, pg.202
 EXP ABS1 Sw Rev, pg.202
 EXP AN OUT 0, pg.145
 EXP AN OUT 1, pg.145
 EXP ANALOG OUT, pg.145
 Exp Analog Out 0, pg.145
 Exp Analog Out 1, pg.145
 Exp Dig Inp 0, pg.132
 Exp Dig Inp 1, pg.132
 Exp Dig Inp 2, pg.132
 Exp Dig Inp 3, pg.133
 Exp Dig Inp 4, pg.133
 Exp Dig Inp 5, pg.133
 Exp Dig Inp 6, pg.133
 Exp Dig Inp 7, pg.133
 Exp Dig Inp Stat, pg.133
 EXP DIG INPUTS, pg.132
 Exp Dig Out 1, pg.139
 Exp Dig Out 2, pg.139
 Exp Dig Out 3, pg.139
 Exp Dig Out 4, pg.139
 Exp Dig Out 5, pg.139
 Exp Dig Out 6, pg.139
 Exp Dig Out 7, pg.139
 Exp Dig Out Stat, pg.140
 EXP DIG OUTPUTS, pg.139
 EXP ENC ABS1, pg.202

F

Fast Link Addr, pg.120
 FAST LINK ENC, pg.203
 Fast Stop Dec, pg.123
 FastLink Trq En, pg.127
 FastLink Trq Ref, pg.127
 FB 10th M->S PAR, pg.188
 FB 10th S->M PAR, pg.193
 FB 11th M->S PAR, pg.188
 FB 11th S->M PAR, pg.193
 FB 12th M->S PAR, pg.189
 FB 12th S->M PAR, pg.193
 FB 1st M->S PAR, pg.184
 FB 1st S->M PAR, pg.189
 FB 2nd S->M PAR, pg.189
 FB 2ndM->S PAR, pg.185
 FB 3rd M->S PAR, pg.185
 FB 3rd S->M PAR, pg.190
 FB 4th M->S PAR, pg.185
 FB 4th S->M PAR, pg.190
 FB 5th M->S PAR, pg.186
 FB 5th S->M PAR, pg.191
 FB 6th M->S PAR, pg.186
 FB 6th S->M PAR, pg.191

FB 7th M->S PAR, pg.187
 FB 7th S->M PAR, pg.191
 FB 8th M->S PAR, pg.187
 FB 8th S->M PAR, pg.192
 FB 9th M->S PAR, pg.187
 FB 9th S->M PAR, pg.192
 FB Alarm Watch, pg.184
 FB Assign M->S 10, pg.188
 FB Assign M->S 11, pg.188
 FB Assign M->S 12, pg.189
 FB Assign M->S 2, pg.185
 FB Assign M->S 3, pg.185
 FB Assign M->S 4, pg.185
 FB Assign M->S 5, pg.186
 FB Assign M->S 6, pg.186
 FB Assign M->S 7, pg.187
 FB Assign M->S 8, pg.187
 FB Assign M->S 9, pg.187
 FB Assign S->M 1, pg.189
 FB Assign S->M 10, pg.193
 FB Assign S->M 11, pg.193
 FB Assign S->M 12, pg.193
 FB Assign S->M 2, pg.189
 FB Assign S->M 3, pg.190
 FB Assign S->M 4, pg.190
 FB Assign S->M 5, pg.191
 FB Assign S->M 6, pg.191
 FB Assign S->M 7, pg.191
 FB Assign S->M 8, pg.192
 FB Assign S->M 9, pg.192
 FB Exp M->S 1, pg.185
 FB Exp M->S 10, pg.188
 FB Exp M->S 11, pg.189
 FB Exp M->S 12, pg.189
 FB Exp M->S 2, pg.185
 FB Exp M->S 3, pg.185
 FB Exp M->S 4, pg.186
 FB Exp M->S 5, pg.186
 FB Exp M->S 6, pg.187
 FB Exp M->S 7, pg.187
 FB Exp M->S 8, pg.187
 FB Exp M->S 9, pg.188
 FB Exp S->M 1, pg.189
 FB Exp S->M 10, pg.193
 FB Exp S->M 11, pg.193
 FB Exp S->M 12, pg.194
 FB Exp S->M 2, pg.190
 FB Exp S->M 3, pg.190
 FB Exp S->M 4, pg.191
 FB Exp S->M 5, pg.191
 FB Exp S->M 6, pg.191
 FB Exp S->M 7, pg.192
 FB Exp S->M 8, pg.192
 FB Exp S->M 9, pg.193

FB Fail Cause, pg.184
 FB Format M->S, pg.185
 FB Format M->S 1, pg.184
 FB Format M->S 10, pg.188
 FB Format M->S 11, pg.188
 FB Format M->S 12, pg.189
 FB Format M->S 3, pg.185
 FB Format M->S 4, pg.186
 FB Format M->S 5, pg.186
 FB Format M->S 6, pg.186
 FB Format M->S 7, pg.187
 FB Format M->S 8, pg.187
 FB Format M->S 9, pg.188
 FB Format S->M 1, pg.189
 FB Format S->M 10, pg.193
 FB Format S->M 11, pg.193
 FB Format S->M 12, pg.194
 FB Format S->M 2, pg.190
 FB Format S->M 3, pg.190
 FB Format S->M 4, pg.190
 FB Format S->M 5, pg.191
 FB Format S->M 6, pg.191
 FB Format S->M 7, pg.192
 FB Format S->M 8, pg.192
 FB Format S->M 9, pg.192
 FB IPA M->S 1, pg.184
 FB IPA M->S 10, pg.188
 FB IPA M->S 11, pg.188
 FB IPA M->S 12, pg.189
 FB IPA M->S 2, pg.185
 FB IPA M->S 3, pg.185
 FB IPA M->S 4, pg.186
 FB IPA M->S 5, pg.186
 FB IPA M->S 6, pg.186
 FB IPA M->S 7, pg.187
 FB IPA M->S 8, pg.187
 FB IPA M->S 9, pg.188
 FB IPA S->M 1, pg.189
 FB IPA S->M 10, pg.193
 FB IPA S->M 11, pg.193
 FB IPA S->M 12, pg.194
 FB IPA S->M 2, pg.190
 FB IPA S->M 3, pg.190
 FB IPA S->M 4, pg.190
 FB IPA S->M 5, pg.191
 FB IPA S->M 6, pg.191
 FB IPA S->M 7, pg.192
 FB IPA S->M 8, pg.192
 FB IPA S->M 9, pg.192
 FBCFG, pg.204
 Field Bus Status, pg.184
 FIELDBUS, pg.183
 FL Trq Scale, pg.127
 Float Word Order, pg.184

FLUX, pg.128
 Flux Current, pg.116
 Fst Tsk Exe T, pg.204
 FstLnk Slow Sync, pg.120
 Full Scale Speed, pg.124
 FW Build Number, pg.199
 FW Version, pg.117

G

Guard Time, pg.194

H

Heatsink Temp, pg.117
 Hig Curr Ref Gen, pg.196
 Home Fine Spd, pg.174
 Home Max Spd, pg.174
 Home Pos Offs En, pg.175
 Home Pos Offset, pg.174
 Home Spd Ref, pg.174
 Home Src Direc, pg.174

I

Inc A Data Count, pg.201
 Inc B Data Count, pg.201
 Inc Data Act Mod, pg.201
 Inc Data Min Mod, pg.201
 Inc Data N Rev, pg.201
 Inc Data Pos, pg.201
 Inc Pulses / Rev, pg.201
 Index Offset Sim, pg.146
 Index Position, pg.201
 Index Puls Simul, pg.146
 Inertia, pg.125
 Inertia Filter, pg.125
 Inp Phase Exe T, pg.204
 Inside Index Src, pg.174
 Intake Air Temp, pg.117
 IPA 1 Par Set, pg.182
 IPA 2 Par Set, pg.182

J

JOG FUNCTION, pg.146
 Jog Reference, pg.146
 Jog Speed Limit, pg.146

K

KEYPAD, pg.119
 KEYPAD KEY, pg.199
 Keypad Key Word, pg.199
 KEYPAD PSW, pg.197
 Keypad PSWD, pg.197

L

Life Time Factor, pg.194
 LKG Inductance, pg.120, 196
 Load Def Counter, pg.200
 Load Def Err IPA, pg.183
 Load Default Par, pg.117
 Load Param PAD, pg.117
 Loss Active, pg.153
 Low Curr Ref Gen, pg.196

M

M Ramp 1 CCW Acc, pg.149
 M Ramp 1 CCW Dec, pg.149
 M Ramp 1 CW Acc, pg.148
 M Ramp 1 CW Dec, pg.149
 M Ramp 2 CCW Acc, pg.149
 M Ramp 2 CCW Dec, pg.149
 M Ramp 2 CW Acc, pg.149
 M Ramp 2 CW Dec, pg.149
 M Ramp 3 CCW Acc, pg.149
 M Ramp 3 CCW Dec, pg.149
 M Ramp 3 CW Acc, pg.149
 M Ramp 3 CW Dec, pg.149
 Mains Voltage, pg.118
 Max Brake Energy, pg.180
 Max Deflux Curr, pg.128
 Max Loss Pos, pg.200
 Max Neg Torque, pg.127
 Max Ovld Curr, pg.119
 Max Pos Error, pg.199
 Max Pos Torque, pg.127
 Max Preset Value, pg.164
 Max Prs Abs Val, pg.164
 Max Ramp Rate, pg.124
 Max Torque, pg.127
 MaxAux Ph Exe T, pg.204
 MaxBkg Tsk Exe T, pg.204
 MaxDSP Exe T, pg.204
 MaxFst Tsk Exe T, pg.204
 MaxIn Ph Exe T, pg.204
 MaxOut Ph Exe T, pg.204
 MaxSI Tsk Exe T, pg.204
 MaxSys Tsk Exe T, pg.204
 Measured Speed, pg.204
 Min Preset Value, pg.164
 Min Prs Abs Val, pg.164
 Modbus IPA Ofst, pg.199
 Mot Enc Source, pg.121
 Mot Nom K Torque, pg.120
 Mot Nominal Curr, pg.120
 Mot Ovld Control, pg.120
 Mot Ovld Factor, pg.120
 Mot Ovld Time, pg.120

Mot Thermal Prot, pg.120
 MOTOR DATA, pg.120
 MOTOR OVERLOAD, pg.120
 MOTOR PARAM, pg.120
 Motor Poles, pg.120
 MOTOR POT, pg.149
 Motor Pot Acc, pg.150
 Motor Pot Dec, pg.150
 Motor Pot Dir, pg.151
 Motor Pot En, pg.150
 Motor Pot Init, pg.150
 Motor Pot Lo Lim, pg.150
 Motor Pot Memo, pg.151
 Motor Pot Mode, pg.151
 Motor Pot Output, pg.151
 Motor Pot Reset, pg.151
 Motor Pot Up Lim, pg.150
 Motor Speed, pg.116
 MPos 0 Next Pos, pg.165
 MPos 1 Next Pos, pg.166
 MPos 2 Next Pos, pg.167
 MPos 3 Next Pos, pg.168
 MPos 4 Next Pos, pg.168
 MPos 5 Next Pos, pg.169
 MPos 6 Next Pos, pg.170
 MPos 7 Next Pos, pg.170
 Multi Pos Enable, pg.161
 Multi Pos Index, pg.163
 Multi Ramp Conf, pg.148
 Multi Ramp Index, pg.148
 Multi Spd Index, pg.148
 Multi Speed 1, pg.147
 Multi Speed 2, pg.147
 Multi Speed 3, pg.147
 Multi Speed 4, pg.147
 Multi Speed 5, pg.147
 Multi Speed 6, pg.147
 Multi Speed 7, pg.147
 Multi Speed Conf, pg.148
 MULTIRAMP, pg.148
 MULTIRAMP 1, pg.148
 MULTIRAMP 2, pg.149
 MULTIRAMP 3, pg.149
 MULTISPEED, pg.147

N

Neg Speed Limit, pg.125

O

Out Current, pg.116
 Out Frequency, pg.117
 Out Phase Tsk T, pg.204
 Out Vlt Max Lim, pg.128

Out Volt Filter, pg.128
 Output Voltage, pg.117
 Over Mod Factor, pg.203
 Overload Control, pg.118

P

P Loss Int Gain, pg.153
 P Loss NoRes Thr, pg.153
 P Loss Prop Gain, pg.153
 P Loss Ramp, pg.153
 P Loss Spd 0 Thr, pg.153
 P Loss Trq Lim, pg.153
 P Loss Volt Ref, pg.153
 Par Set Cause Al, pg.182
 PDC Enabling, pg.184
 PDO 1 RX, pg.194
 PDO 1 RX COBID, pg.194
 PDO 1 RX TYPE, pg.194
 PDO 1 TX, pg.195
 PDO 1 TX COBID, pg.195
 PDO 1 TX INH, pg.195
 PDO 1 TX TYPE, pg.195
 PDO 2 RX, pg.194
 PDO 2 RX COBID, pg.194
 PDO 2 RX TYPE, pg.194
 PDO 2 TX, pg.195
 PDO 2 TX INH, pg.195
 PDO 2 TX TYPE, pg.195
 PDO 3 RX, pg.194
 PDO 3 RX COBID, pg.194
 PDO 3 RX TYPE, pg.194
 PDO 3 TX, pg.195
 PDO 3 TX COBID, pg.195
 PDO 3 TX INH, pg.195
 PDO 3 TX TYPE, pg.195
 Period Test Gen, pg.196
 PHASING, pg.196
 Phasing Speed, pg.196
 PL Mains status, pg.153
 PLC Correct ChkS, pg.204
 PLC En Key Stat, pg.200
 PLC Enable Key, pg.200
 PLC Err Cause, pg.183
 PLC Saved ChkS, pg.204
 Pos 0 Progress, pg.165
 Pos 0 Thr Offset, pg.164
 Pos 1 Progress, pg.166
 Pos 2 Progress, pg.167
 Pos 3 Progress, pg.167
 Pos 4 Progress, pg.168
 Pos 5 Progress, pg.169
 Pos 6 Progress, pg.169
 Pos 7 Progress, pg.170

Pos Abs Thr, pg.164
 Pos Actual Event, pg.163
 Pos An Filter, pg.165
 Pos An Mode, pg.166
 Pos An Stdy Wind, pg.165
 Pos An Wind Del, pg.165
 Pos CCW Acc, pg.162
 Pos CCW Acc 0, pg.165
 Pos CCW Acc 1, pg.166
 Pos CCW Acc 3, pg.167
 Pos CCW Acc 4, pg.168
 Pos CCW Acc 5, pg.169
 Pos CCW Acc 6, pg.169
 Pos CCW Acc 7, pg.170
 Pos CCW Dec, pg.162
 Pos CCW Dec 0, pg.165
 Pos CCW Dec 1, pg.166
 Pos CCW Dec 2, pg.167
 Pos CCW Dec 3, pg.167
 Pos CCW Dec 4, pg.168
 Pos CCW Dec 5, pg.169
 Pos CCW Dec 6, pg.169
 Pos CCW Dec 7, pg.170
 Pos Conv Fact, pg.195
 Pos CW Acc, pg.162
 Pos CW Acc 0, pg.165
 Pos CW Acc 1, pg.166
 Pos CW Acc 2, pg.166
 Pos CW Acc 3, pg.167
 Pos CW Acc 4, pg.168
 Pos CW Acc 5, pg.168
 Pos CW Acc 6, pg.169
 Pos CW Acc 7, pg.170
 Pos CW Dec, pg.162
 Pos CW Dec 0, pg.165
 Pos CW Dec 1, pg.166
 Pos CW Dec 2, pg.166
 Pos CW Dec 3, pg.167
 Pos CW Dec 4, pg.168
 Pos CW Dec 5, pg.168
 Pos CW Dec 6, pg.169
 Pos CW Dec 7, pg.170
 Pos Dwell 0, pg.165
 Pos Dwell 1, pg.166
 Pos Dwell 2, pg.167
 Pos Dwell 3, pg.167
 Pos Dwell 4, pg.168
 Pos Dwell 5, pg.169
 Pos Dwell 6, pg.169
 Pos Dwell 7, pg.170
 Pos Event 0, pg.165
 Pos Event 1, pg.166
 Pos Event 2, pg.167
 Pos Event 3, pg.168

Pos Event 4, pg.168
 Pos Event 5, pg.169
 Pos Event 6, pg.170
 Pos Event 7, pg.170
 Pos Exceeded, pg.164
 POS PRESET 6, pg.169
 POS PRESET 7, pg.170
 POS PRESET (8-63), pg.170
 POS PRESET 0, pg.165
 Pos Preset 0, pg.165
 POS PRESET 1, pg.166
 Pos Preset 1, pg.166
 POS PRESET 2, pg.166
 Pos Preset 2, pg.166
 POS PRESET 3, pg.167
 Pos Preset 3, pg.167
 POS PRESET 4, pg.168
 Pos Preset 4, pg.168
 POS PRESET 5, pg.168
 Pos Preset 5, pg.168
 Pos Preset 6, pg.169
 Pos Preset 63, pg.170
 Pos Preset 7, pg.170
 Pos Preset 8, pg.170
 Pos Reach Behav, pg.162
 Pos Return, pg.175
 Pos Return Acc, pg.175
 POS RETURN CONF, pg.175
 Pos Return Dec, pg.175
 Pos Return Speed, pg.175
 Pos Speed 0, pg.165
 Pos Speed 1, pg.166
 Pos Speed 2, pg.166
 Pos Speed 3, pg.167
 Pos Speed 4, pg.168
 Pos Speed 5, pg.168
 Pos Speed 6, pg.169
 Pos Speed 7, pg.170
 Pos Speed Limit, pg.125
 Pos Stop Dec, pg.163
 Pos Thr Close 1, pg.164
 Pos Thr Close 2, pg.164
 POS THR CONFIG, pg.164
 Pos Window, pg.164
 Pos Window Time, pg.164
 Pos Window Tout, pg.164
 POSITION, pg.154
 Position Config, pg.163
 Position Gain, pg.125
 Position I Gain, pg.125
 POSITION LIMIT, pg.164
 Position Mode, pg.163
 Position Speed, pg.162
 Position Torque, pg.164

Power Fail Count, pg.200
POWERLOSS, pg.152
Powerloss Config, pg.153
PPR Simulation, pg.146
Preset Index, pg.163
PWM Frequency, pg.118

Q

Quadrature Volt, pg.204

R

RAMP, pg.123
Ramp Enable, pg.123
Ramp Exp Factor, pg.124
Ramp Output, pg.116
Ramp Reference, pg.116
Reg Card Temp, pg.117
Res Shift Time, pg.201
RESERVED, pg.203
Resolver Gain, pg.201
Resolver Poles, pg.122
Rpm Conv Fact, pg.195
RX Pos, pg.203
RX Pos Aux, pg.203
RX Rev, pg.203
RX Rev Aux, pg.203

S

SAVE / LOAD PAR, pg.117
Save Param Count, pg.200
Save Param PAD, pg.117
Save Parameters, pg.117
Ser Num En Keys, pg.200
Serial Baud Rate, pg.119
Serial Del Time, pg.120
Serial Line Conf, pg.119
Serial Prot Type, pg.119
SERVICE, pg.199
Slow Tsk Exe T, pg.204
SPD / POS GAIN, pg.125
Spd Loop Filter, pg.203
Spd-Pos Enc Sour, pg.121
SPD/POS TESTGEN, pg.196
SPEED, pg.124
Speed Comp, pg.176
SPEED DRAW, pg.149
Speed Draw In, pg.149
Speed Draw Out, pg.149
Speed Draw Ratio, pg.149
Speed Gain, pg.125
Speed Reach Wnd, pg.125
Speed Ref 1, pg.124
Speed Reference, pg.116

Speed Test Gen, pg.196
Speed Thr, pg.125
Speed Thr Delay, pg.125
Speed Thr Wnd, pg.125
Speed Zero Delay, pg.125
Speed Zero Thr, pg.125
Start on Edge, pg.162
Start Status, pg.116
Startup Zero Pos, pg.175
Stop by Ramp, pg.162
SW Reset Count, pg.200
Sync Period, pg.194
Sys Tsk Exe T, pg.205

T

TASK MEASURES, pg.204
Test Gen Ref, pg.196
TEST GENERATOR, pg.196
TORQUE, pg.126
Torque Conv Fact, pg.195
Torque Current, pg.116
Torque Mode, pg.126
Torque Reduction, pg.127
Torque Ref 1, pg.126
Torque Ref 2, pg.126
Torque Thr, pg.127
Torque Thr Delay, pg.127
Tot Life Hours, pg.200
Trq Lim Config, pg.127
Trq Speed Limit, pg.127
TUNING, pg.195
Tuning Status, pg.195
TX Pos, pg.203
TX Rev, pg.203

U

Unit Per Div, pg.161
Unit Per Rev, pg.161
UNITS, pg.195
User Vlt Max Lim, pg.128

V

Virt DI at Dis, pg.135
Virt DI at Reset, pg.135
Virt DI at Start, pg.135
Virt DI Status, pg.134
Virt Dig Inp 0, pg.133
Virt Dig Inp 1, pg.133
Virt Dig Inp 10, pg.134
Virt Dig Inp 11, pg.134
Virt Dig Inp 12, pg.134
Virt Dig Inp 13, pg.134
Virt Dig Inp 14, pg.134

Virt Dig Inp 15, pg.134
Virt Dig Inp 2, pg.133
Virt Dig Inp 3, pg.133
Virt Dig Inp 4, pg.133
Virt Dig Inp 5, pg.134
Virt Dig Inp 6, pg.134
Virt Dig Inp 7, pg.134
Virt Dig Inp 8, pg.134
Virt Dig Inp 9, pg.134
VIRT DIG INPUTS, pg.133
Virt Dig Out 0, pg.140
Virt Dig Out 1, pg.140
Virt Dig Out 10, pg.140
Virt Dig Out 11, pg.140
Virt Dig Out 12, pg.140
Virt Dig Out 13, pg.141
Virt Dig Out 14, pg.141
Virt Dig Out 15, pg.141
Virt Dig Out 2, pg.140
Virt Dig Out 3, pg.140
Virt Dig Out 4, pg.140
Virt Dig Out 5, pg.140
Virt Dig Out 6, pg.140
Virt Dig Out 7, pg.140
Virt Dig Out 8, pg.140
Virt Dig Out 9, pg.140
VIRT DIG OUTPUTS, pg.140
Virt DO at Fail, pg.141
Virt DO at Reset, pg.141
Virt DO Status, pg.141
Volt Int Gain, pg.128
Volt Prop Gain, pg.128

W

Warning Status, pg.181

X

XE Enc Abs Flt, pg.203
XE ENC ABS MEAS, pg.201
XE ENC INC MEAS, pg.201
XE Enc ppr, pg.122
XE Enc Supply, pg.122
XE Enc Type, pg.121
XE Hall Meas, pg.202
XE Hall N Error, pg.202
XE Hall Pos, pg.202
XE Hall Rev, pg.202
XE HALL TRACKS, pg.202
XE Inc Enc Flt, pg.203
XE Index Mask, pg.203
XER Enc Supply, pg.122
XER/EXP Enc Flt, pg.203
XER/EXP Enc Mod, pg.203

XER/EXP Enc ppr, pg.122
XER/EXP Ind Pos, pg.202
XER/EXP Puls Rev, pg.202
XER/EXP Rev, pg.202
XER/EXP Turn Pos, pg.202

Z

ZERO FOUND CONF, pg.171
Zero Index En, pg.174
Zero Sensor Edge, pg.175
Zero Sensor En, pg.174

Chapter 12 - Motor Cables

Figure 12.1: Cable SBM Motor Series / Sinusoidal Encoder

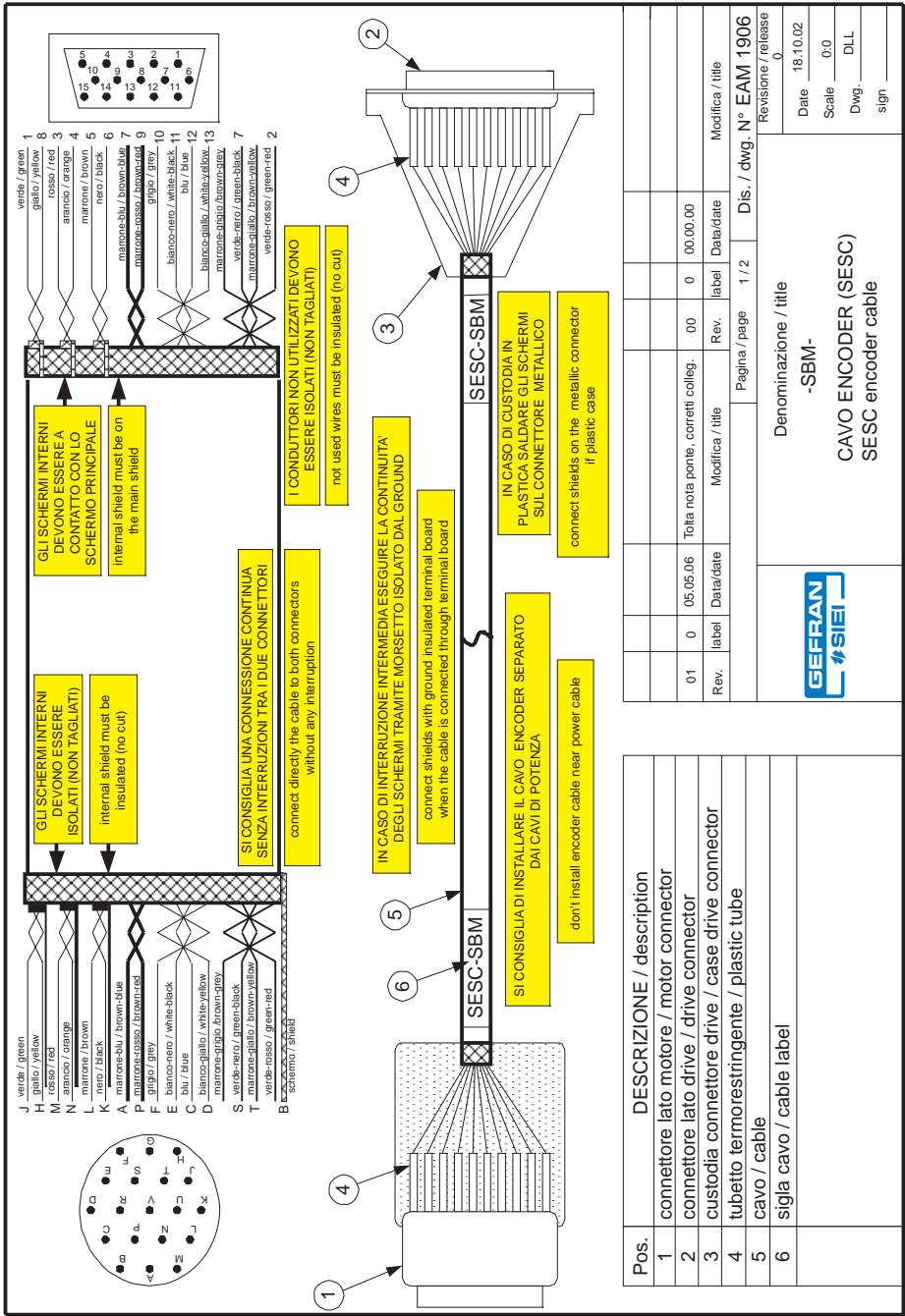


Figure 12.2: Cable SBM Motor Series / Digital Encoder + Hall Sensors

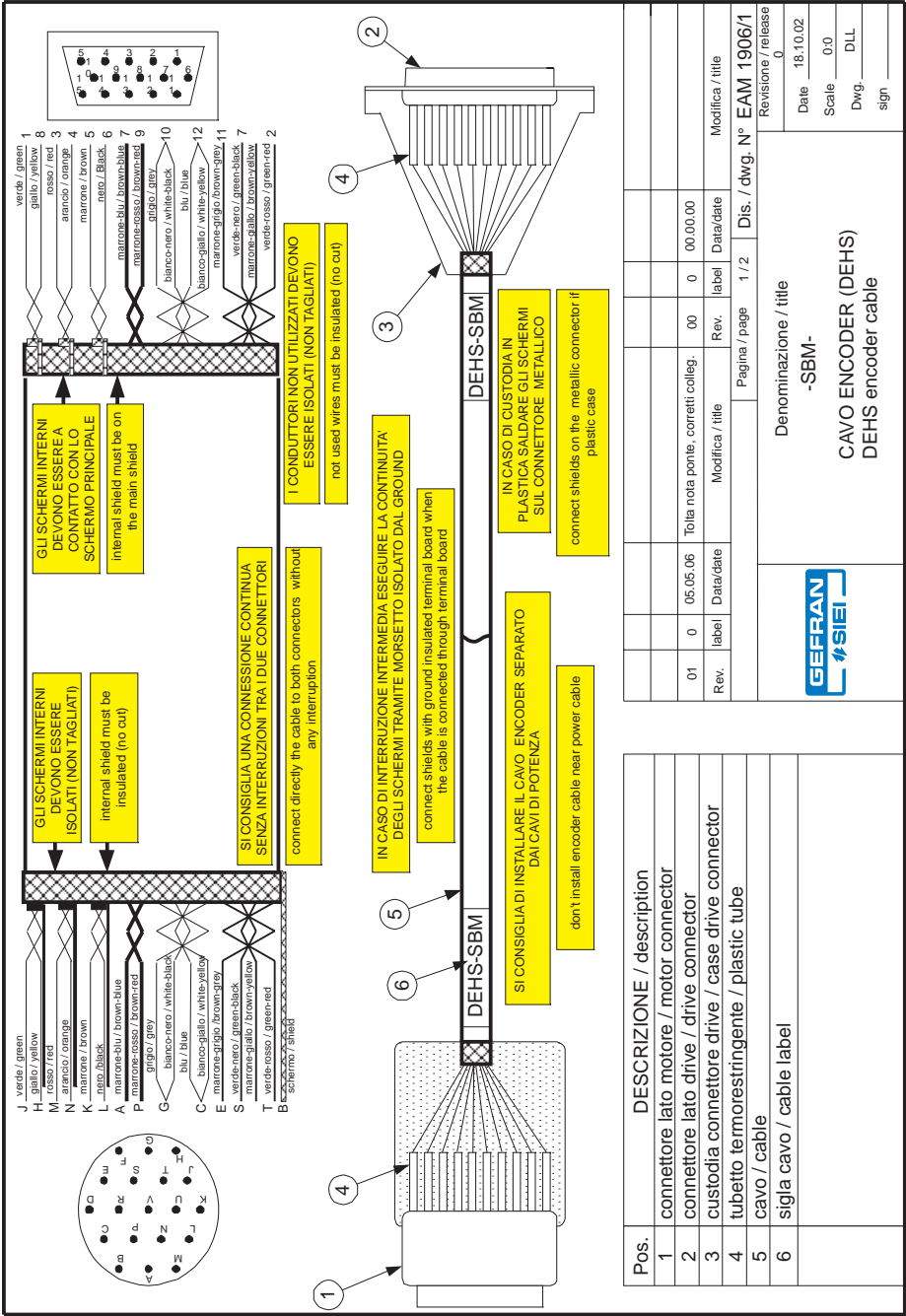


Figure 12.3: Cable SBM Motor Series /Absolute Encoder with SSI - EnDat Protocol

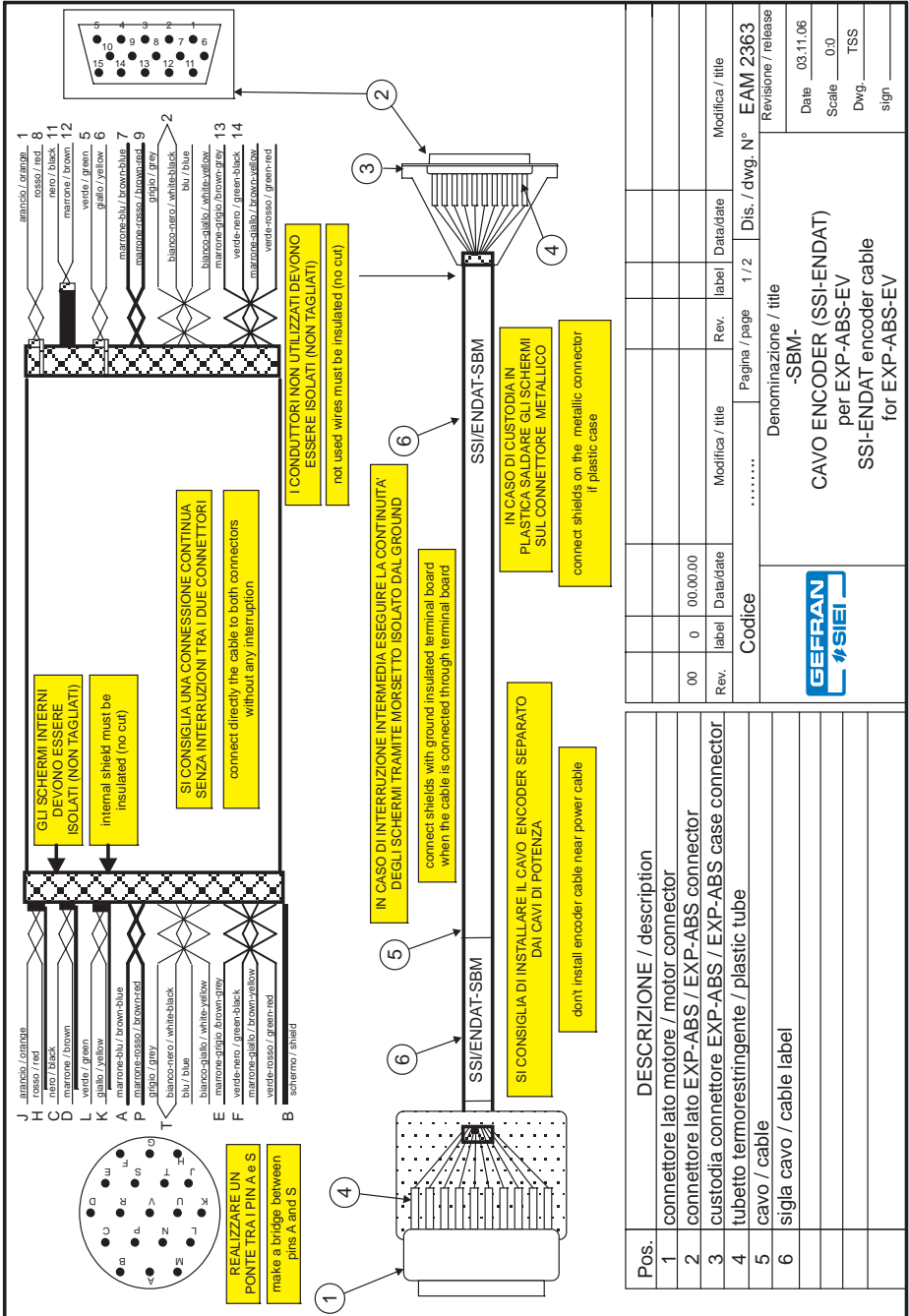


Figure 12.4: Cable SBM Motor Series / Resolver

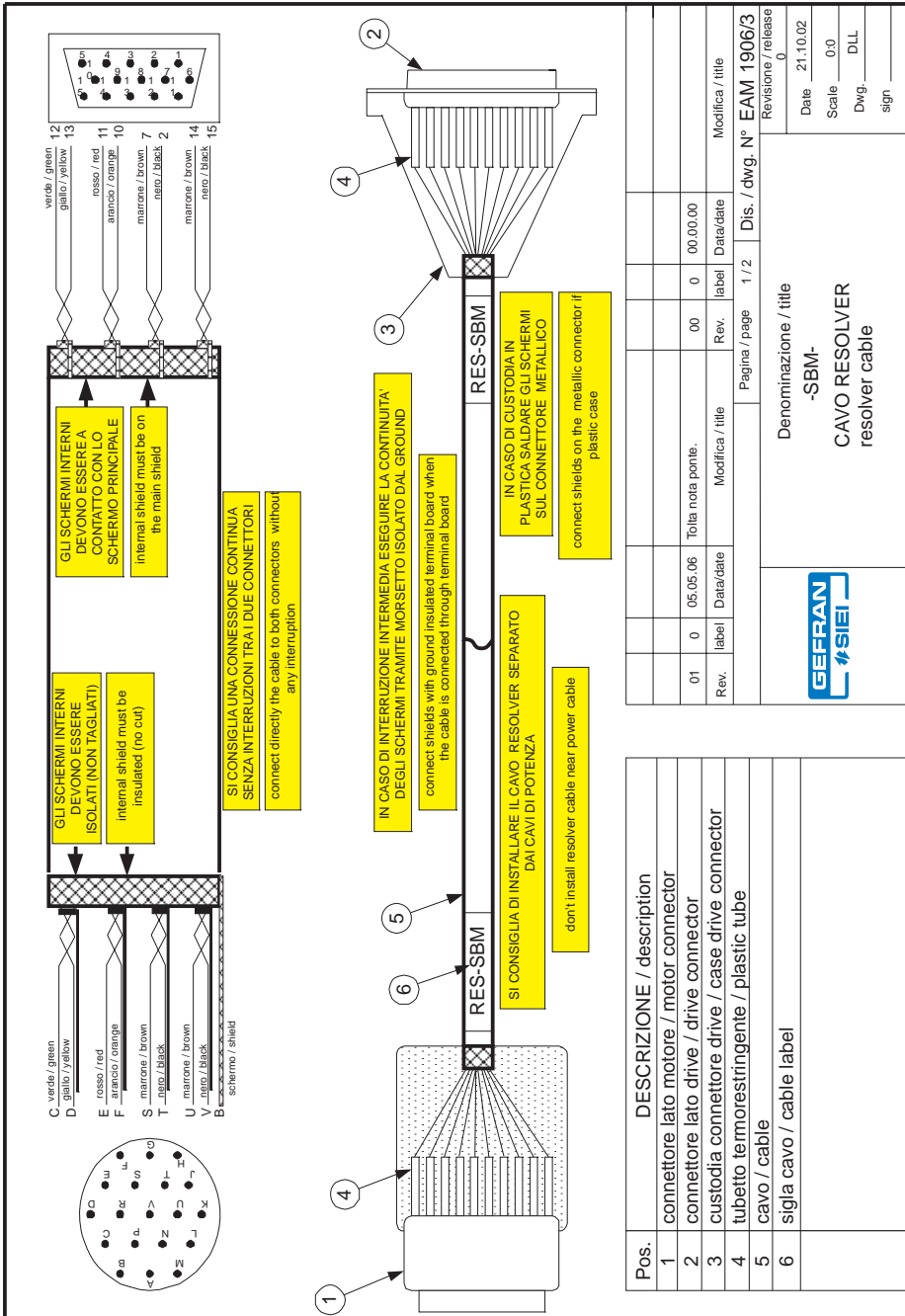


Figure 12.5: Cable SHJ Motor Series / Sinusoidal Encoder

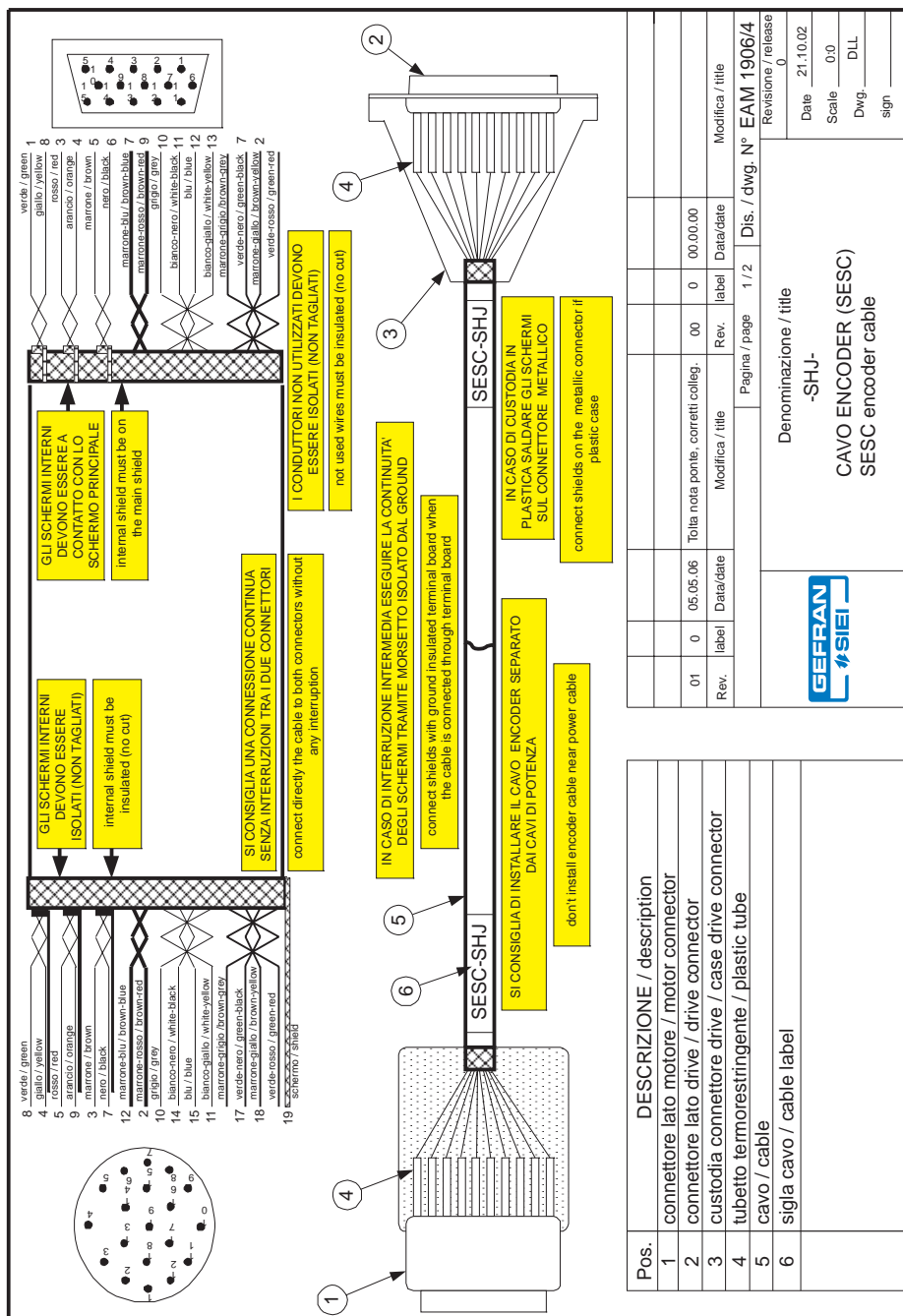


Figure 12.6: Cable SHJ Motor Series / Digital Encoder + Hall Sensors

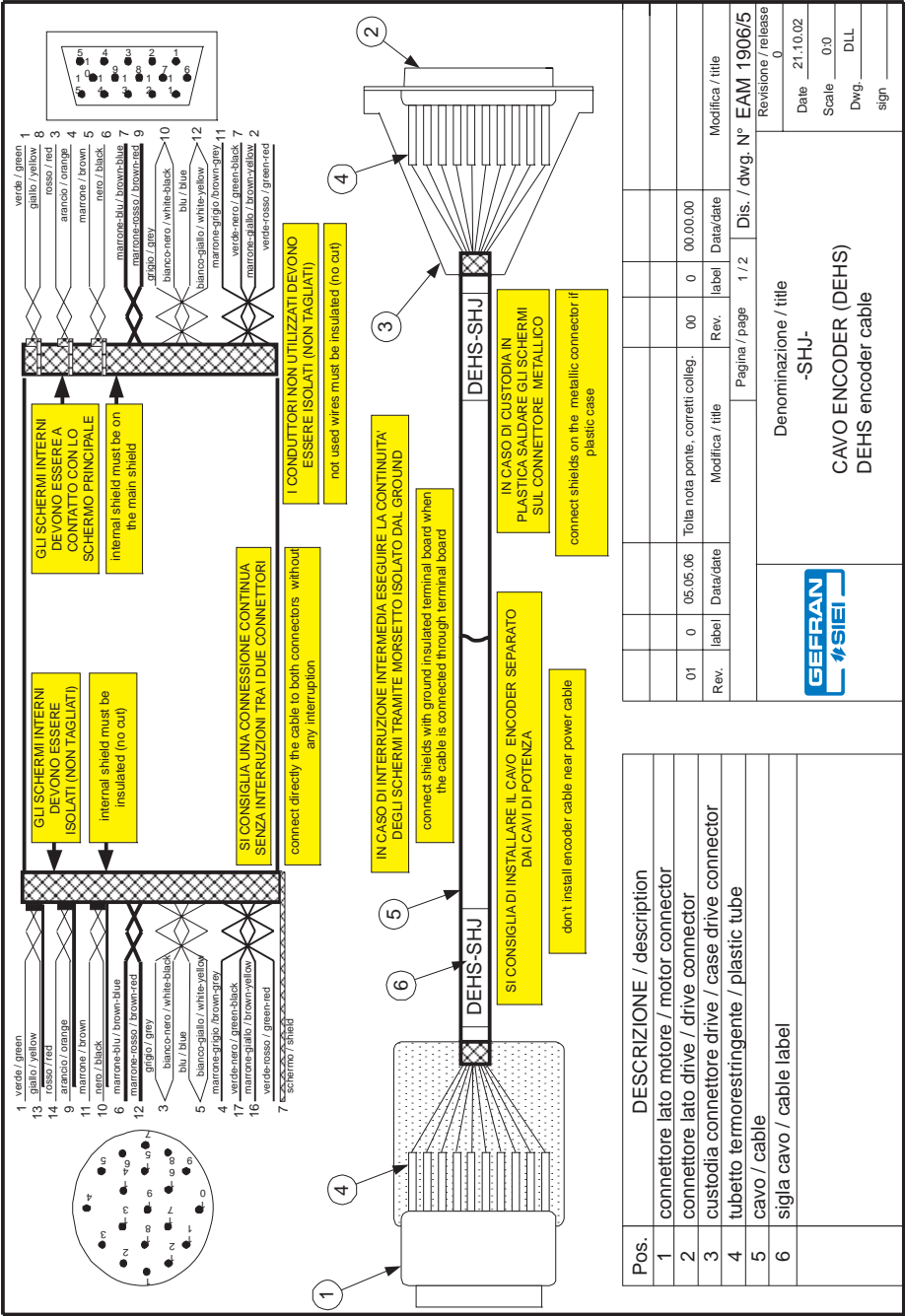


Figure 12.7: Cable SHJ Motor Series / Resolver

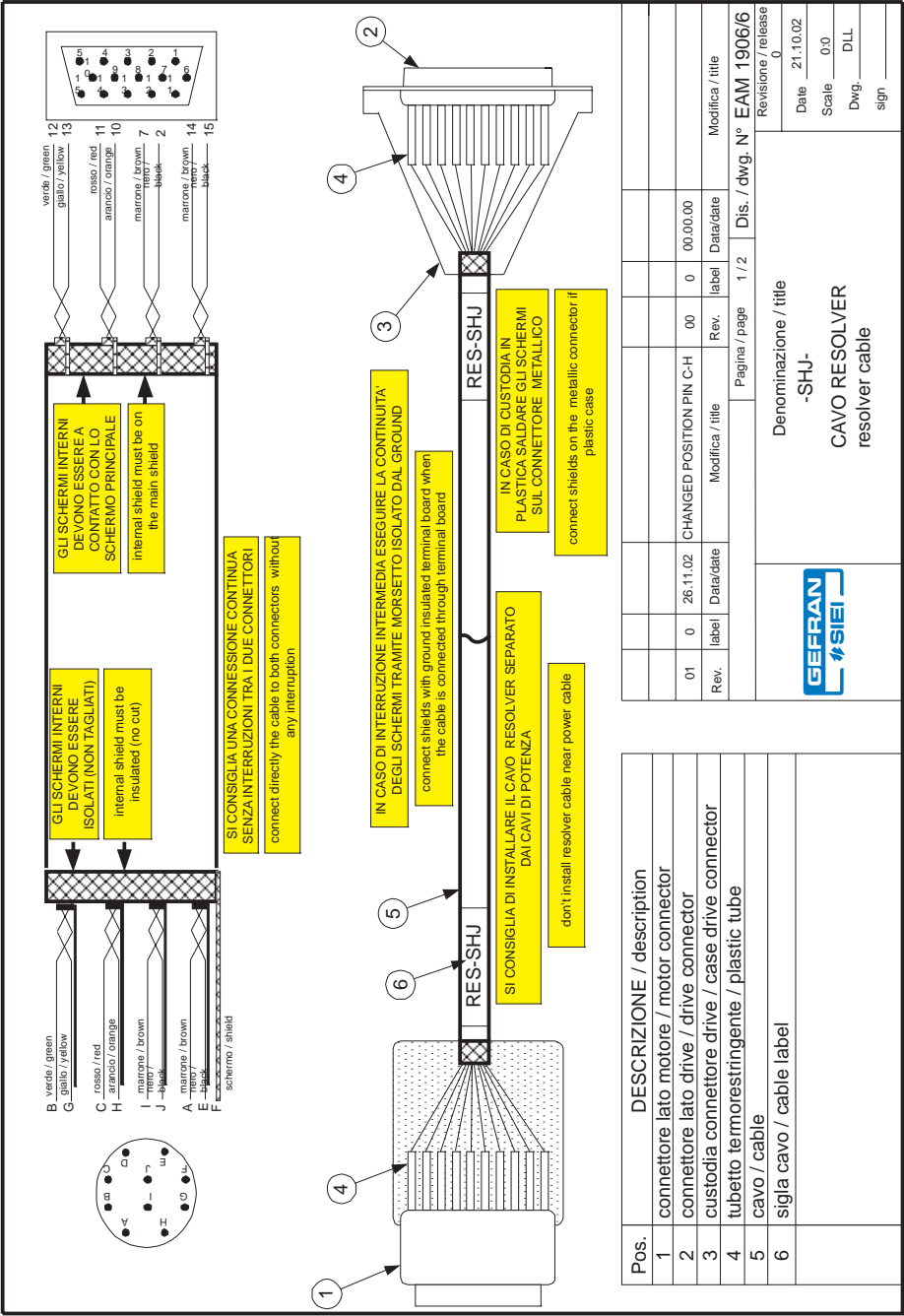


Figure 12.8: SBM 5-7 Motor Series Power Cable

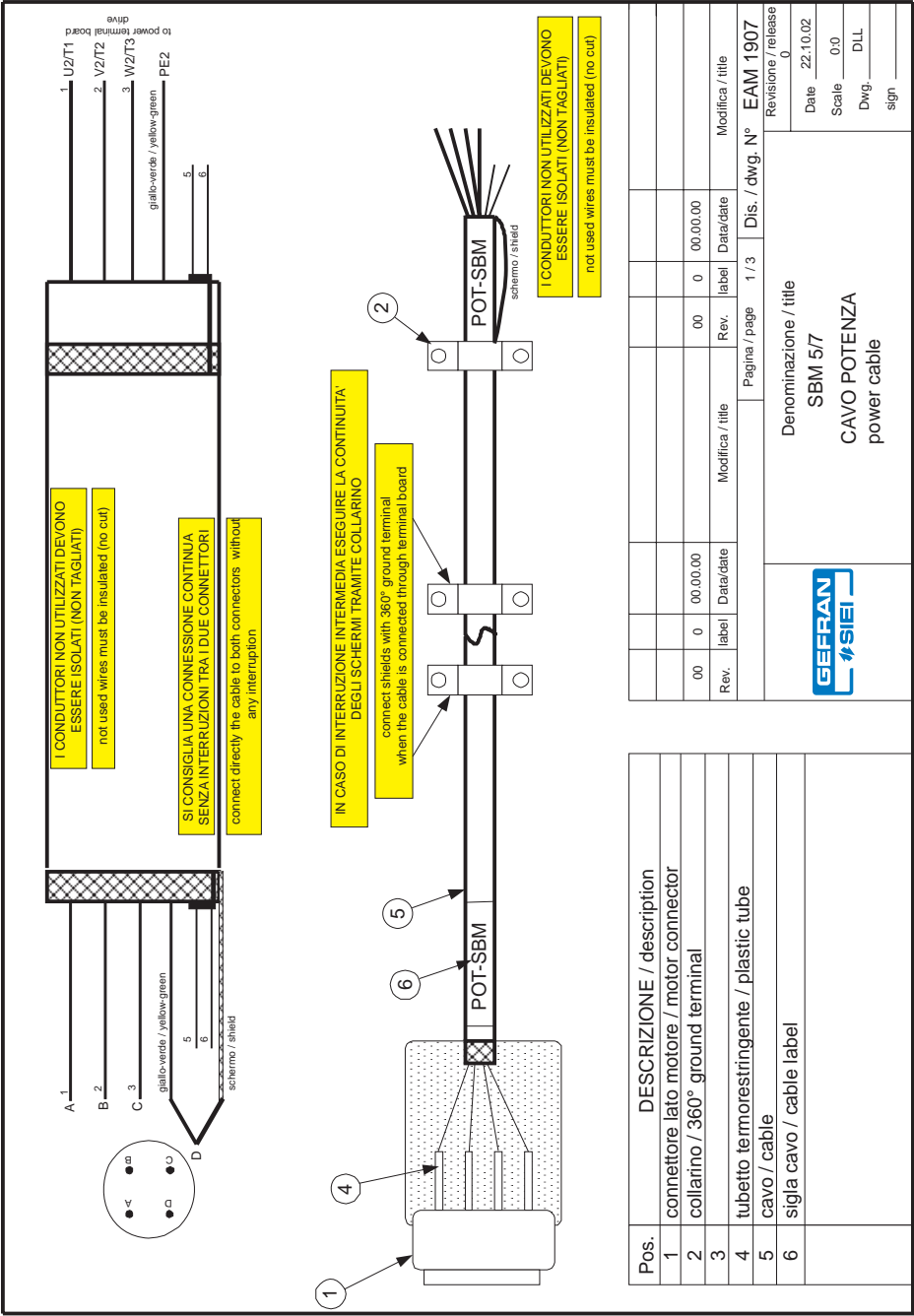


Figure 12.10: SHJ Motor Series Power Cable

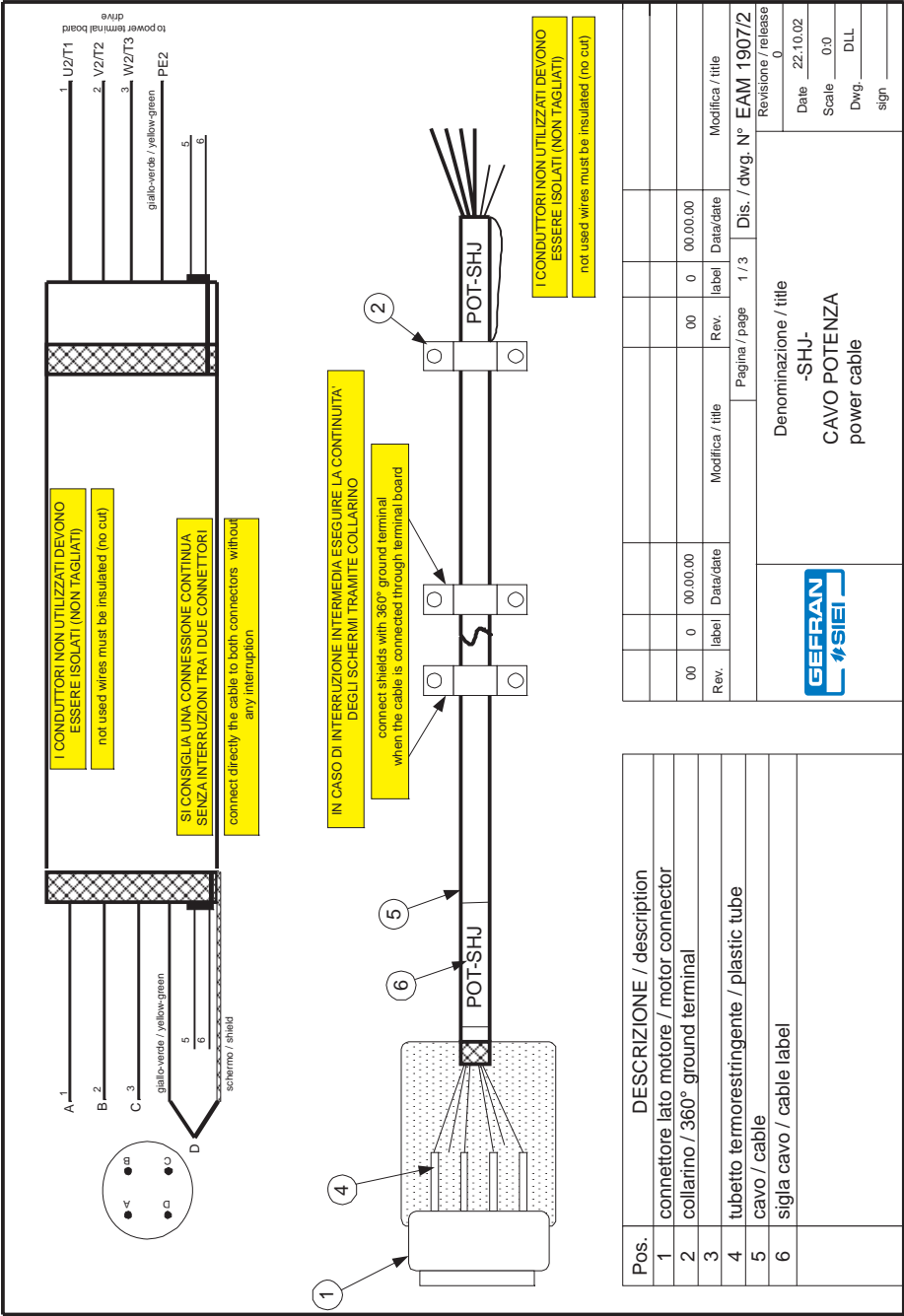
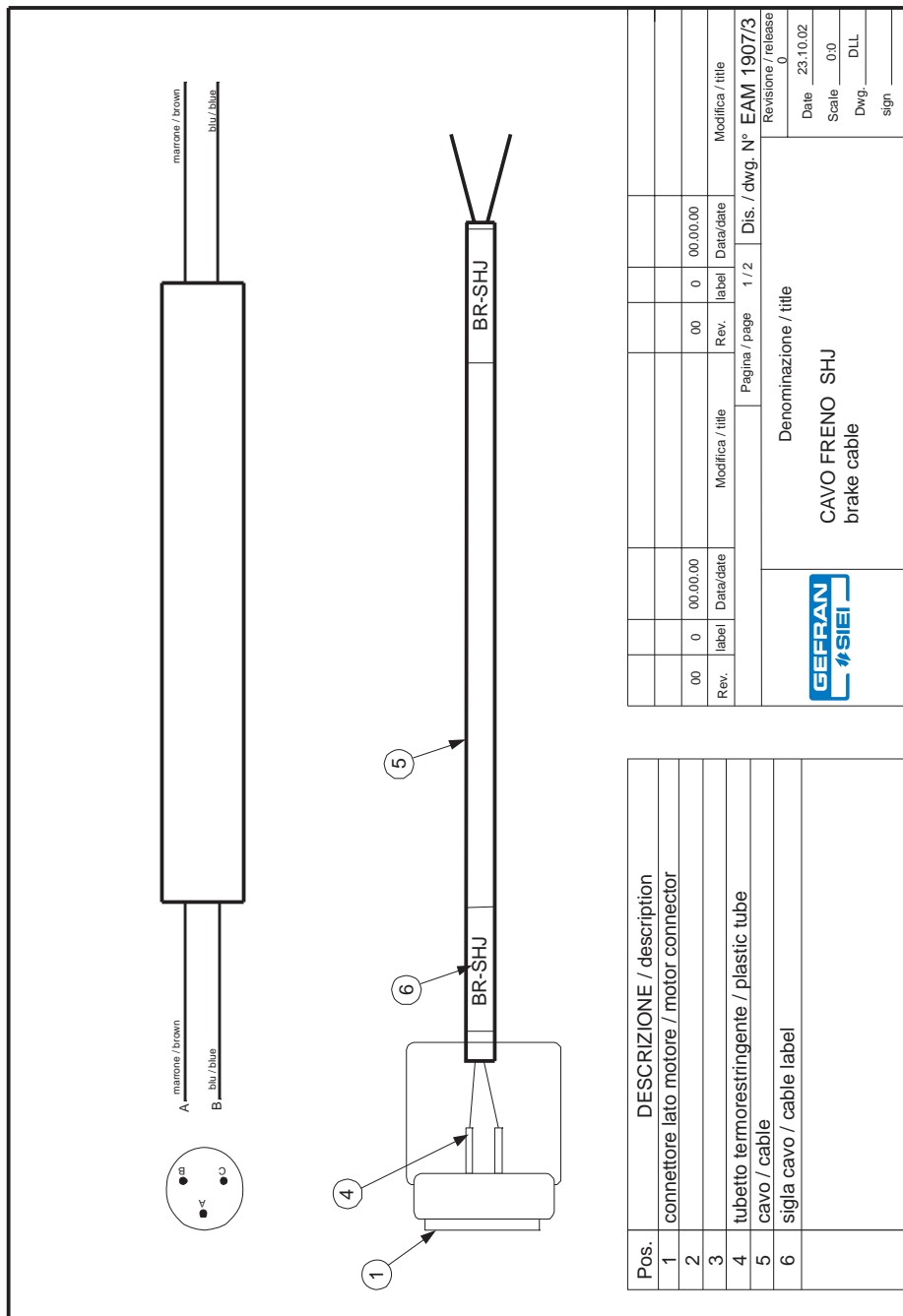


Figure 12.11: SHJ Motor Series Brake Cable



Chapter 13 - EMC Directive

EMC Directive

The possible Validity Fields of the EMC Directive (89/336) applied to PDS “CE marking” summarises the presumption of compliance with the Essential Requirements of the EMC Directive, which is formulated in the EC Declaration of Conformity Clauses numbers [.] refer to European Commission document “Guide to the Application of Directive 89/336/EEC” 1997 edition. ISBN 92-828-0762-2

	Validity Field	Description
Relates to PDS or CDM or BDM directly	<p>-1- Finished Product/ Complex component available to general public [Clauses: 3.7, 6.2.1, 6.2.3.1 & 6.3.1]</p> <p>A PDS (or CDM/BDM) of the Unrestricted Distribution class</p>	<p>Placed on the market as a single commercial unit for distribution and final use. Free movement based on compliance with the EMC Directive</p> <p>- EC Declaration of conformity required - CE marking required</p> <p>- PDS or CDM/BDM should comply with IEC 1800-3/EN 61800-3</p> <p>The manufacturer of the PDS (or CDM/BDM) is responsible for the EMC behaviour of the PDS (or CDM/BDM), under specified conditions. EMC measures outside the item are described in an easy to understand fashion and could actually be implemented by a layman in the field of EMC.</p> <p>The EMC responsibility of the assembler of the final product is to follow the manufacturer's recommendations and guidelines.</p> <p>Note: The manufacturer of the PDS (or CDM/BDM) is not responsible for the resulting behaviour of any system or installation which includes the PDS, see Validity Fields 3 or 4.</p>
	<p>-2- Finished Product/Complex component only for professional assemblers [Clauses: 3.7, 6.2.1, 6.2.3.2 & 6.3.2]</p> <p>A PDS (or CDM/BDM) of the Restricted Distribution class sold to be included as part of a system or installation</p>	<p>Not placed on the market as a single commercial unit for distribution and final use. Intended only for professional assemblers who have a level of technical competence to correctly install.</p> <p>- No EC Declaration of conformity - No CE marking</p> <p>- PDS or CDM/BDM should comply with IEC 1800-3/EN 61800-3</p> <p>The manufacturer of the PDS (or CDM/BDM) is responsible for the provision of installation guidelines that will assist the manufacturer of the apparatus, system or installation to achieve compliance.</p> <p>The resulting EMC behaviour is the responsibility of the manufacturer of the apparatus, system, or installation, for which its own standards may apply.</p>
Relates to application of PDS or CDM or BDM	<p>-3- Installation [Clause: 6.5]</p> <p>Several combined items of system, finished product or other components brought together at a given place. May include PDSs (CDM or BDM), possibly of different classes -Restricted or Unrestricted</p>	<p>Not intended to be placed on the market as a single functional unit (no free movement). Each system included is subject to the provisions of the EMC Directive.</p> <p>- No EC Declaration of conformity - No CE marking</p> <p>- For the PDSs or CDM/BDMs themselves see Validity Fields 1 or 2</p> <p>- Responsibility of the manufacturer of the PDS may include commissioning</p> <p>The resulting EMC behaviour is the responsibility of the manufacturer of the installation in co-operation with the user (e.g. by following an appropriate EMC plan). Essential protection requirements of EMC Directive apply regarding the neighbourhood of the installation.</p>
	<p>-4- System [Clause: 6.4]</p> <p>Ready to use finished item(s). May include PDSs (CDM or BDM), possibly of different classes - Restricted or Unrestricted</p>	<p>Has a direct function for the final user. Placed on the market for distribution as a single functional unit, or as units intended to be easily connected together.</p> <p>- EC Declaration of conformity required - CE marking required for the system</p> <p>- For the PDSs or CDM/BDMs themselves see Validity Fields 1 or 2</p> <p>The resulting EMC behaviour, under specified conditions is the responsibility of the manufacturer of the system by using a modular or system approach as appropriate.</p> <p>Note: The manufacturer of the system is not responsible for the resulting behaviour of any installation which includes the PDS, see Validity Field 3.</p>

Examples of application in the different Validity Fields:

- BDM to be used anywhere:** (example in domestic premises, or BDM available from commercial distributors), sold without any knowledge of the purchaser or the application. The manufacture is responsible that sufficient EMC can be achieved even by any unknown customer or layman (snap-in, switch-on).
- CDM/BDM or PDS for general purpose:** to be incorporated in a machine or for industrial application This is sold as a subassembly to a professional assembler who incorporates it in a machine, system or installation. Conditions of use are specified in the manufacturer's documentation. Exchange of technical data allows optimization of the EMC solution.. (See restricted distribution definition).
- Installation:** It can consist of different commercial units (PDS, mechanics, process control etc.). The conditions of incorporation for the PDS (CDM or BDM) are specified at the time of the order, consequently an exchange of technical data between supplier and client is possible. The combination of the various items in the installation should be considered in order to ensure EMC. Harmonic compensation is an evident example of this, for both technical and economical reasons. (E.g. rolling mill, paper machine, crane, etc.)
- System:** Ready to use finished item which includes one or more PDSs (or CDMs/BDMs); e.g. household equipment, air conditioners, standard machine tools, standard pumping systems, etc.

Appendix - Field bus and serial interface

1.0 Integrated CANopen Interface

CiA : CAN in Automation, user international group.

CAN : Controller Area Network.

CANopen is a communication profile for CAL-based industrial systems. The reference document is the CANopen CAL-Base COMMUNICATION PROFILE for Industrial Systems; CiA Draft Standard 301 Version 3.0. Issue October 1996 by CAN in Automation e. V.

The CAN protocol (ISO 11898) is CAN2.0A with an 11-bit identifier. The integrated CANopen interface is developed as a "Minimum Capability Device".

The data exchange is cyclic; the Master unit reads the Slave input data and writes the Slave output data; the Baud Rates for the interface are those foreseen by the CANopen specification.

1.1 CANopen Functions

This chapter describes the controlled functions of the CANopen communication profile. The main features are:

- 1) The "Minimum Boot-up" is managed; the "Extended Boot-up (CAL)" is not managed.
- 2) The SYNC function is implemented.
- 3) The PDO asynchronous assignment and RTR are managed.
- 4) The Node Guarding is managed.
- 5) The emergency message is managed ("EMERGENCY").
- 6) The Dynamic ID distribution function (DBT slave) is not managed.
- 7) A "Pre-Defined Master/Slave connection" is implemented to simplify the Master tasks during the initialization phase. "Inhibit-Times" (in units of 100 uS) can be modified up to a value of 1 min.
- 8) The high-resolution synchronization is not supported.
- 9) "TIME STAMP" is not managed.
- 10) On the access of the structured parameters, the OFFhex option subindex (access to the whole object) is not managed.
- 11) In order to obtain a higher efficiency level, only the "Expedited" data transfer (max. 4 Bytes) of the SDO services is managed.

PDO: Process Data Object, service messages without confirmation used for the real time data transfer from/to the device.

DBT: Distributor. It is a service element of the CAN Application Layer in the CAN Reference Model; the DBT has the task to assign COB-ID to the COBs used by the CMS.

SDO: Service Data Object, service messages with confirmation used for the acyclic data transfer from/to the device.

1.1.1 Pre-defined Master/Slave Connection

The "Pre-defined Master/Slave connection" allows a peer-to-peer communication between one Master and 127 Slaves; the Broadcast address is zero.

1.1.2 NMT Services (Network Management)

The NMT "mandatory" services are:

- Enter_Pre-Operational_State CS = 128
- Reset_Node CS = 129
- Reset_Communication CS = 130

Being that the "Minimum Boot-up" is used, also the following NMT services are managed:

- Start_Remote_Mode CS = 1

NMT: Network Management. It is a service element of the CAN Application Layer in the CAN Reference Model; it initializes, configures and controls the errors of a CAN network.

CS: Command Specifier; it defines the NMT service.

COB = Communication Object (CAN Message). It is a transport unit inside a CAN network. The data must be sent in network inside a COB.

COB-ID = COB-Identifier. It identifies a COB inside the network. It also states the COB priority.

- Stop_Remote_Mode CS = 2

The COB-ID * of an initialization NMT service is always at 0; CS is the Command Specifier defining the NMT service.

1.1.3 Initialization

The XVy drive supports the Node Guarding mechanism. The Node Guarding configuration can be performed through the master via the standard Object Dictionary elements (1006h, 100Ch, 100Dh). The drive checks the master functioning conditions through the Life Guarding. If the check fails, the drive enables the "Buss Loss" alarm. The Life Guarding threshold can be calculated as follows:

Value/Condition
60ms
Default. No parameterization of the Node Guarding.
SYNC_PERIOD (*)
LIFE_TIME_FACTOR
Use of the synchronous mode. If not stated by the master, the LIFE_TIME_FACTOR default value is equal to 3.
NODE_GUARDING_PERIOD (*)
LIFE_TIME_FACTOR
NODE_GUARDING_PERIOD set by the master
If not otherwise stated, the LIFE_TIME_FACTOR value is equal to 3

1.1.4 Communication Object

This chapter describes the communication objects of the CANopen protocol; they are managed by the interface card. The managed communication objects are:

- 1) 1 SDO reception Server.
- 2) 1 SDO transmission Server.
- 3) 2 reception PDOs.
- 4) 2 transmission PDOs.
- 5) 1 Emergency Object.
- 6) 1 Node Guarding - Life Guarding.
- 7) 1 SYNC object.

The following table lists the used communication objects with their priority level and the Message Identifier; the "Resulting COB-ID" is obtained by adding the Node-ID (card address) to the number.

OBJECT	PRIORITY	MESSAGE ID
1st SDO rx	6	1536
1st SDO tx	6	1408
1st PDO rx	2	512
1st PDO tx	2	384
2nd PDO rx	2	768
2nd PDO tx	2	640
EMERGENCY	1	220
NODE GUARDING	not used	1792
SYNC	0	128

Table 1.4.1: Communication Objects

Node Guarding has no priority because it is a special NMT service; it has the Message-ID because it is not a Broadcast service.

1.1.5 Object Dictionary Elements

The Object Dictionary is accessible from a master CANopen and from the keypad configurator.

The following table shows the communication objects used and accessibility with master CANopen, keypad configurator.

Index (hex)	IPA Parameter	Name
1000		Device Type
1001		Error Register
1002		Manufacturer status register
1005		COB-ID SYNC Message
1006	40902	Communication cycle period
1008		Manufacturer Device Name
1010		Store parameter
1009		Manufacturer Hardware Version
100A		Manufacturer Software Version
100C	40903	Guard Time
100D	40904	Life Time Factor
100F		Number of PDOs supported
1014	40905	COB-ID Emergency
1018		Identity object
1400	40910, 40915	1st Receive PDO
1401	40911, 40916	2nd Receive PDO
1402	40912, 40917	3rd Receive PDO
1600		Receive PDO1 mapping parameter
1601		Receive PDO2 mapping parameter
1602		Receive PDO3 mapping parameter
1A00		Transmit PDO1 mapping parameter
1A01		Transmit PDO2 mapping parameter
1A02		Transmit PDO3 mapping parameter
1800	40920, 40925, 40930	1st Transmit PDO
1801	40921, 40926, 40931	2nd Transmit PDO
1802	40922, 40927, 40932	3rd Transmit PDO

Table 1.5.1: Objects used by the CANopen communication profile

The objects shown in bold in the table allow writing of the parameters assigned with the exchange of data in the PDO. The allocation criterion is variable, and depends on the size (in bytes) of the parameter exchanged.

Note!

It is possible to save the objects permanently to the drive flash memory:

- 1) via configurator, only for objects with parameter reference (e.g.: index 1000 -> IPA 40902)
- 2) with the SAVE function from CANopen (object index 1010).

1.1.6 Rx PDO Entries

The structure of the PDO Communication Parameter (index 1400h, 1401h) is:

- 1) Subindex 0 (Number of supported entries) = 2
- 2) The structure of Subindex 1 (COB-ID used by the PDO) is:

- Bit 31 (valid/invalid PDO) can be set via SDO.
 - Bit 30 (RTR Remote Transmission Request) = 0 because this function is not supported.
 - Bit 29 = 0 because the 11-bit ID is used (CAN 2.0A).
 - Bits 11-28 are not used.
 - Bit 0-10 COB-ID (see table 1.4.1).
- 3) Cyclic-synchronous Subindex 2 (Transmission Type), or synchronous according to the master performed setting (1 if SYNC has been foreseen, 254...255 if asynchronous). If not stated, the synchronous mode is active.

1.1.7 Tx PDO Entries

The structure of the PDO Communication Parameter (index 1800h, 1801h) is:

- 1) Subindex 0 (Number of supported entries) = 3
- 2) The structure of Subindex 1 (COB-ID used by the PDO) is:
 - Bit 31 (valid/invalid PDO) can be set via SDO.
 - Bit 30 (RTR Remote Transmission Request) = 0 because this function is not supported.
 - Bit 29 = 0 because the 11-bit ID is used (CAN 2.0A).
 - Bits 11-28 are not used.
 - Bit 0-10 COB-ID (see table 1.4.1).
- 3) Cyclic-synchronous Subindex 2 (Transmission Type), or synchronous according to the master performed setting (1 if SYNC has been foreseen, 254...255 if asynchronous). If not stated, the synchronous mode is active.
- 4) Inhibit time

1.1.8 SDO Entries

Only the "Expedited" data transfer mode (max. 4 Bytes) is used.

The structure of the SDO Communication Parameter is:

- 1) Subindex 0 (Number of supported entries) = 3 because the device is a Server of the SDO service.
- 2) The structure of the Subindex 1 and 2 (COB-ID used by the SDO) is:
 - Bit 31 (valid/invalid SDO); it is equal to 1 because just the Default SDOs are used.
 - Bit 30 reserved = 0.
 - Bit 29 = 0 because the 11-bit ID is used (CAN 2.0A).
 - Bits 11-28 are not used.
 - Bit 0-10 COB-ID (see table 1.4.1).

The element "node ID of SDO's client resp. server" is not supported because just the Default SDOs are used.

1.1.9 COB-ID SYNC Entries

The structure of the 32 bits contained in the COB-ID SYNC communication parameter is:

- Bit 31 = 1 because the CANopen interface card is a "consumer" of SYNC messages.
- Bit 30 = 0 because the interface card does not create SYNC mes-

sages.

- Bit 29 = 0 because the 11-bit ID is used (CAN 2.0A).
- Bits 11-28 are not used.
- Bit 0-10 COB-ID (see table 1.4.1).

1.1.10 COB-ID Emergency

The structure of the 32 bits contained in the COB-ID Emergency Message communication parameter is:

- Bit 31 = 0 because the CANopen interface card is not a “consumer” of Emergency messages.
- Bit 30 = 0 because the interface card creates Emergency messages.
- Bit 29 = 0 because the 11-bit ID is used (CAN 2.0A).
- Bits 11-28 are not used.
- Bit 0-10 COB-ID (see table 1.4.1).

1.2 CANopen Management

The user interface of the CANopen protocol is performed via the drive parameters. The parameters are controlled via hierarchical menus. All the writing parameters referring to the field bus are active only after the drive reset. Here following is a list of drive parameters useful to control the CANopen protocol.

Fieldbus menu

The CANopen protocol can be enabled by setting the IPA 40000 **Field Bus Type** parameter as "Can Open". The other parameters of this menu are:

IPA	Par. Name	Type	Default value	Attr.
40100	Bus Address	1 byte unsigned	0	Write
40001	Bus Baud Rate	4 bytes unsigned	0	Write
40110	CC Enabling	Enum	Enabled	Write
40111	PDC Enabling	Enum	Enabled	Write
40114	FB Fail Cause	4 bytes unsigned	0	Read only

- **Bus Address** = address of the node;
- **Bus Baud Rate** = network baud rate. The baudrate is stated directly in baud (ex. 125kb = 125000);
- **PDC Enabling** and **CC Enabling** = allow the user to enable/disable the corresponding channels. With the PDC channel it is possible to exchange up to 8 parameters

The **FB Fail Cause** parameter defines the error cause. Presently the following causes are provided:

Cod.	Meaning
1	Protocol incorrect
18..24	Configuration error on M2S reception channel
25..31	Configuration error on S2M transmission channel
32	Too many bytes on M2S reception channel
33	Too many bytes on S2M transmission channel
34-35	errored IPA for PLC allocation

36	More than 4 words allocated as Fast250 us on M2S
37	More than 4 words allocated as Fast250 us on S2M
100	Baud rate not correct
101	Node address not correct
103	Non expedited SDO type not supported
104	SDO length not correct
105	Error on NMT messages
106	NMT code not supported
107	Can line on "Bus-off" status
108	Impossible to be operational (can never happen)
111	RPDO dimension exceeded
112	TPDO dimension exceeded

1.3 Process Data Channel Control

This function allows to allocate the drive parameters or application variables to the Process Data Channel data.

As for the CANopen protocol, the PDC is performed via the PDO messages ((Process data Object).

The CANopen protocol uses a number of words for the Process Data Channel (abbr. PDC Process Data Channel), which can always be set. The fieldbus Process Data Channel configuration is the following:

Data 0 Data... Data n

The drive can both read and write the Process Data Channel data.

A datum can be made both of 2 and 4 bytes. The word "data" refers to any quantity of bytes included between 0 and 8, if the byte total number required is not higher than 16.

Example

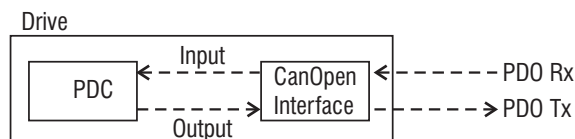
It is possible to have:

- from 0 to 12 data with 2 bytes
- 1 datum with 4 bytes + from 0 to 10 data with 2 bytes
- 2 data with 4 bytes + from 0 to 8 data with 2 bytes
- 3 data with 4 bytes + from 0 to 6 data with 2 bytes
- 4 data with 4 bytes + from 0 to 4 data with 2 bytes
- 5 data with 4 bytes + from 0 to 2 data with 2 bytes
- 6 data with 4 bytes

The data exchanged via the PDC can be of two types: drive parameters and variables of an MDPIc application. The use of the MDPIc variables is described in par. 7.5.3.3

The composition of the PDC input and output data is defined via suitable parameters as described in the paragraphs 1.3.1 and 1.3.2.

The master writes the data defined as PDC input and reads the data defined as PDC output.



1.3.1 PDC Input Configuration (FB XXX MS Parameter)

The configuration of the PDC input channel can be performed via 12 menus with the same structure.

IPA	Par. Name	Typo	Default value	Attr.	Unit
40190	FB Assign M->S 1	Enum	Not assign	Writing	
40200	FB IPA M->S 1	2 bytes unsigned	0	Writing	--
40210	FB Format M->S 1	Enum	16 bit int	Writing	--
40220	FB Exp M->S 1	2 bytes unsigned	16 bit integer	Writing	

This structure refers to the first input parameter. The structure is repeated 12 times for the 12 possible input parameters. The following parameter indexes are 40201..40221, 40202..40222 etc.

The **FB Assign M->S 1** parameter can be selected as follows:

- **Parameter:** the PDC corresponding datum is combined to a parameter identified by **FB IPA M->S 1**. The parameters are entered into engineering units and are exchanged in an asynchronous way. The **FB Format M->S 1** parameter sets the parameter writing format. The format can be different from the parameter original one. The **FB Exp M->S 1** parameter defines the 10th power which the parameter is multiplied by before being transferred to the drive.

A practical example for the parameter use:

The **Els Ratio 0 - IPA 32001**, parameter, with a float format is written by the master. It must be written with an integer format, signed and three decimal digits. Set the parameters as follows:

40200 **FB IPA M->S 1** @ 32001

40210 **FB Format M->S 1** @ "16 bit integer"

40220 **FB Exp M->S 1** @ 3

In this way the master must write:

1000 to set the value 1.000

-1234 to set the value -1.234.

- **Direct Access:** the PDC corresponding datum is combined to a parameter identified by **FB IPA M->S 1.1**. The parameters are entered into internal counts and are exchanged in an asynchronous way (one every 8 msec). The writing format identified by the **FB Format M->S 1** parameter (see the table in the **FIELD BUS** menu) must coincide with the drive internal format. As for parameters with a float internal format, it is possible to choose "32 bit integer" and the conversion into a float format between the received datum and the internal datum is performed automatically.
- **Filling:** the corresponding PDC datum is not associated with any parameter, but a number of bytes is inserted equal to 0 corresponding to the parameter **FB Format M->S 1**.
- **Fast Access parameter (250 us):** the corresponding PDC datum is associated with a parameter identified by **FB IPA M->S 1**. The parameters are emitted in internal counts and exchanged synchronously (every 250 usec). The write format identified by

parameter **FB Format M->S 1** (see **FIELDBUS** menu table) must match that within the drive.
 With this data exchange mode, up to 4 words from the 12 available can be assigned.

Before establishing the Profibus communication between the Master and the drive, it is necessary to assign the drive parameters to the Process Channel. These parameters can be activated by resetting the drive.

1.3.2 PDC Output Configuration (FB XXX SM Parameter)

The output configuration of the PDC channel can be performed via 12 menus with the same structure.

IPA	Par. Name	Type	Default value	Attr.	Unit
40290	FB Assign S->M 1	Enum	Not assign	Writing	--
40300	FB IPA S->M 1	2 bytes unsigned	0	Writing	--
40310	FB Format S->M 1	Enum	16 bit int	Writing	--
40320	FB Exp S->M 1	2 bytes unsigned	16 bit integer	Writing	--

This is the structure for the first output parameter. The structure is repeated 12 times for the 12 possible output parameters. The indexes of the following parameters are 40301..40321, 40302..40322 etc.

The **FB Assign S->M 1**, **FB IPA S->M 1** and **FB Format S->M 1** and **FB IPA S->M 1** parameters have the same meaning as those described in point 1.3.1.

1.3.3 Use of the PDC in MDPIc Applications

It is possible to configure both the PDC input and output data in order to allow the data direct access via the MDPIc application code.
 For more details see the manual "Drive programming with MDPIc" on "XVy tools" cd-rom.

1.4 SDO Management

The SDO service is available only if the 40110 **CC Enabling** parameter is ON.

The drive parameters can be accessed via the "MSPA" Manufacturer Specific Profile Area (2000hex< index <5FFFhex).

As the drive parameter indexes (IPA) normally exceed the CANopen MSPA, the XVy drive is supplied with an offset value allowing the access to the drive parameters.

The index to be shown in the SDO command to access a drive parameter is obtained via the following rules:

- Offset mode

SDO index = 2000 hex + IPA-OFFSET

The OFFSET value can also be accessed (and modified) via the 5FFF hex index of the CANopen Object Dictionary. The default value is 1000. The Subindex field has always to be set with 0, if not, an error message is displayed.

- Mode Mod. 100
SDO index = IPA/100 + 2000 hex (if parameters)
SDO index = IPA/100 + 4000 hex (direct access)
SDO subindex = IPA%100 (parameters and direct access)

The Data field must contain the value of the drive parameter.

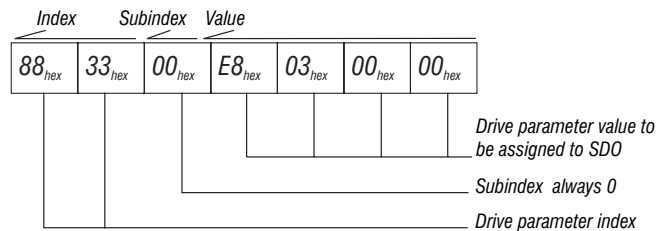
Example (mod Offset):

Writing the value 1000 in the 23000 (**Speed Gain**) parameter.

Set, for example, the OFFSET value (5FFF hex index of the CANopen Object Dictionary) at 18000.

The required information is:

- 1) The SDO index resulting from the formula is
2000 hex + 23000dec - 18000 dec = 13192 dec (3388 hex)
- 2) The value to be written is 1000, corresponding to 03E8 hex.



Example (mod 100):

Value 1000 written to parameter 23001 (**Position Gain**).

First of all set 40906 (**Cus OBJ Idx Mode**) to Mod.100

The following information is required:

- 1) The SDO index is
2000 hex + 23001 dec /100 = 8422 dec (20E6 hex)
- 2) Sub-index: 23001 Mod. 100 = 1 dec (1 hex)
- 3) Value to be written 1000, corresponding to 03E8 hex.

In case an error occurs during the parameter reading or setting, the CANopen interface sends an Abort domain transfer message; the value of Application-error-codes has the following meanings:

Error class	Error code	Additional code (hex)	Meaning
6	0	0	Parameter doesn't exist
8	0	22	Access failed because of present device state
6	1	2	Read/Write only error
8	0	0	Generic error
6	9	32	Minimum value
6	9	31	Maximum value
5	4	0	SDO time_out
5	4	1	Invalid command
3	9	30	Invalid value

1.5 Alarms

Fieldbus alarms

The bus failure is signaled via the 26-"Field bus failure" alarm. As for CANopen, the possible failure causes are:

- "Bus-off" condition of the CAN line;
- the drive has not been enabled in the "Operational" mode;
- the "Life Guarding" threshold has been overcome.

This alarm becomes active only when the drive is enabled.

If ON, the 40115 **FB Alarm Watch** parameter enables the generation of the "Field bus failure" alarm also when the drive is disabled.

Drive alarm handling

Considering that the fieldbus must function with different firmware application systems, the "drive alarm status" is not foreseen.

The "drive alarm status" is not therefore given any special treatment.

The XVy firmware provides a series of parameters capable of detecting the drive status.

Alarm reset

The alarm reset is one of the drive standard functions, i.e. each application provides the same parameter for this function. It is therefore possible to reset the alarms via the configuration channel on the firmware of all the different drives. The alarm reset can be performed by sending the value 1 to the parameter 18012.

The XVy firmware provides the "Virtual Digital Input" function, through which it is possible effect a bit-controlled alarm reset.

2.0 Modbus

Refer to “MODBUS RTU Protocol, chapters 1 and 2” Instruction manual (SIEI code 1S5E68).

Note! Do not use address 0 in the Modbus protocol (**Drive Serial Add**, IPA 18031) since it is reserved for broadcast command.
Set **Serial Prot Type** (IPA 18032) as "Modbus".

2.1 Modbus Functions

The following functions are implemented on the drive:

Code	Function	Description
01 (*)	Read coil status	This function allows to require the ON or OFF condition of the Drive discrete parameters (Coil). The broadcast mode is not allowed.
02 (*)	Read input status	This function allows to require the ON or OFF condition of the Drive discrete parameters (input). The broadcast mode is not allowed.
03 (*)	Read holding registers	This function allows to require the value of 16-bit (word) registers containing Drive parameters. The broadcast mode is not allowed.
06	Preset single register	This function allows to set the value of a single 16-bit register. The broadcast mode is allowed.
16 (*)	Preset multiple registers	This function allows to set the value of a consecutive block made of 16-bit registers. The broadcast mode is allowed.

Note: For a detailed function description refer to “MODBUS RTU Protocol, chapter 3” Instruction manual
(*) Multiple request cannot be executed. Only one parameter can be accessed at the time.

Note! The 16-bit Drive parameter (word or integer type) is referred to as 16-bit Modbus register; a 32-bit Drive parameter (Dword, long or float type) covers therefore two Modbus registers.
For the float format, the first word is the most significative part of the 32-bit data. For the Dword or long format, the first word is the less significative part of the 32-bit data. Each word is the register. The registers require two bytes where the first one contains the most significative section.

2.2 Error Management

Refer to “MODBUS RTU Protocol, chapter 4” Instruction manual (SIEI code 1S5E68).

2.2.1 Exception codes

The protocol implemented on the drive foresees the following exception codes.

Code	Name	Meaning
00	ILLEGAL ADDRESS	Address is not valid.
01	ILLEGAL FUNCTION	The received function code does not correspond to a function allowed on the addressed slave.

02	ILLEGAL DATA ADDRESS	The address number, which the data field refers to, is not a register allowed on the addressed slave.
03	ILLEGAL DATA VALUE	The value to be allocated, which the data field refers to, is not allowed for this register.
04	SLAVE FAIL	The Slave cannot execute the requested command
05	SLAVE ACK	The Slave has accept and is executing the requested command
06	SLAVE BUSY	The Slave is busy
07	NAK - NEGATIVE ACKNOWLEDGEMENT	The function can not be performed with the present operating conditions or attempt to write an only-reading parameter.

IMPORTANT!

The settings of **Serial Baud Rate** (IPA 20024) is enabled with the drive start-up; it is therefore required to store it and to switch the drive off.

2.3 System Configuration

To use the Modbus protocol within the drive, the user must configure the **Serial Prot type** (IPA 18032) = [1] Modbus protocol and the address **DriveSerial Add** (IPA 18031) which cannot be = 0 (DRIVE CONFIG/ COMM CONFIG menu).

The serial port configuration is managed by the DRIVE CONFIG / Comm Config menu (parameters: **Drive Serial Add** (IPA 18031), **Serial Baud Rate** (IPA 20024), **Serial Line Conf** (IPA 20025), **Serial Del Time** (IPA 20026) and **Serial Prot Type** (IPA 18032).

In order to communicate with the drive through the E@syDrives configurator in Modbus Protocol, it is necessary to set "Modbus" in the "Communication setup" on Target windows.

2.4 Appendix - Register and Coil Modbus Tables

In the drive the **register number** and **parameter index** (IPA) are the same.

2.5 Modbus example

The following functions are implemented :

03 Read Output register :

This function is used to read the parameters . It is possible to read 16-bits parameters (word & int) and 32bit parameters (dword & float) . Only one parameter can be accessed on each request :

16 bit parameters are read by reading the register corresponding to the IPA, while 32 bits parameters are accessed by reading 2 registers starting from the one corresponding to the IPA of the drive . It is not possible to read more than two registers .

Example with int (word is the same) :
reading 18710 **Heatsink Temp** .

The following bytes should be sent through the RS-485 line :

01,03,49,15,00,01,83,92

With this meaning :

- 01** is the address of the drive (as in 18031 **Drive Serial Add**). Each drive must have a unique address, starting from 1, because 0 is reserved.
- 03** is the function number Read Output register
- 49 , 15** is the register number corresponding to IPA 18710 . This is 0x4915 in hex, MSB first .

Modbus addresses start from 1 , so this is 18710-1 in hex .

- 00 , 01** is the number of 16 bit registers to read .
- 83 , 92** is the calculated CRC16 of the message

The drive should answer in a similar way (temperature may be different):

01, 03, 02, 00, 1D, 78, 4D

If the heatsink temperature is 29°C.

If the answer looks different or there is no answer at all , see the section "Errors" below .

Example with dword :

If we want to read the status of the alarms, IPA 24000 **Alarm Status** , this is the message to send :

01, 03, 5D, BF, 00, 02 , E6 , 43

This is the answer of the drive (no active alarms) :

01, 03, 04, 00, 00, 00, 00, FA, 33

Dwords are exchanged in this order : LSW MSW . In each word : MSB , LSB .

Example with float :

Let's try to read 18735 **Out Current**:

01, 03, 49, 3E, 00, 02, B3 , 9B

This is the answer (drive is not running) :

01, 03, 04, 00, 00, 00, 00, FA, 33

If for instance the current is 40:

01, 03, 04, 87, D7, 42, 1F, 13, D7

The binary format of the floating point numbers is beyond the scope of this document.

06 Preset single register :

This function sets single 16 bit parameter . Please do not use on a 32 bit parameter .

To set for example 23000 **Speed Gain** to 100, send the following string

01, 06, 59, D7 , 00, 64 , 2A , 85

The drive will answer :

01, 06, 59, D7, 00, 64, 2A, 85

If everything is ok .

Please note that this function can be used in broadcast mode (address 0):

00, 06, 59, D7 , 00, 64 ,2B,54

In this case the drive does not answer , but will apply the value anyway .

16 Preset multiple registers :

This function is used to set parameters . Only one parameter can be set on each request . It is not possible to set multiple parameters .

Example with int :

writing to 23000 **Speed Gain** , value is 100

01, 10, 59, D7 , 00, 01, 2,00,64 ,7C , 99

It is necessary to write the register address , the number of registers (1 for 16 bit parameters) , the number of data bytes (2 for 16 bit parameters) and then the data .

The drive answers in this way :

01, 10, 59, D7, 00, 01, A3, 6D

Example with dword:

writing to 20162 DIG_IN_NEG

01, 10, 4E, C1 , 00, 02, 4,00,00,00,00,43,90

For 32 bits parameters , number of registers is 2 and number of data bytes is 4 .

Answer :

01, 10, 4E, C1, 00, 02, 07, 1C

The byte order is the same as in function 03 .

Example with float:

writing to 21200 **Speed Ref 1**

01, 10, 52, CF , 00, 02, 4,00,00,00,00,5A,DC

Sets speed ref 1 to 0 .

The answer is :

01, 10, 52, CF, 00, 02, 61, 4F

3.0 DeviceNet Interface (XVy-DN)

This chapter describes the software for connecting of XVy drives to DeviceNet networks.

It is intended for design engineers and technicians responsible for the maintenance, commissioning and operation of DeviceNet systems.

A basic knowledge of DeviceNet is assumed and may be found in the following manuals:

- DeviceNet Specifications. Volume 1 - DeviceNet Communication Model and Protocol (Issued by ODVA).
- DeviceNet Specifications. Volume 2 - DeviceNet Device Profiles and Object Library (Issued by ODVA)

3.1 DeviceNet General Description

DeviceNet is a profile of communication for industrial systems based on CAN.

As protocol CAN (ISO 11898) is used CAN2.0A with the 11 bit identifier. The XVy-DN driver is developed as "Slave UCMM Capable Device" for operating only in "Predefined Master/Slave Connection Set".

The data transfer is carried out cyclically; the Master unit reads the data supplied by the Slaves and writes the Slave reference data; the Baud Rate supported by the SBI card are:

- 125 kbit
- 250 kbit
- 500 kbit .

The physical support is given by the RS485 serial line; a maximum of 64 Slaves can be connected to the Bus.

3.2 Connection

The CAN terminals allows to connect the XVy drive to DeviceNet network. Refer to chapter 4.3.6 of this manual for more details.

3.3 Leds

The DeviceNet connection leds are behind the CAN connector.

Name	Colour	Function
CAN	Green	The led is ON when the connection is powered (pin C1, C5)
AL	Red	DeviceNet connection status see next table
OP	Green	DeviceNet connection status see next table

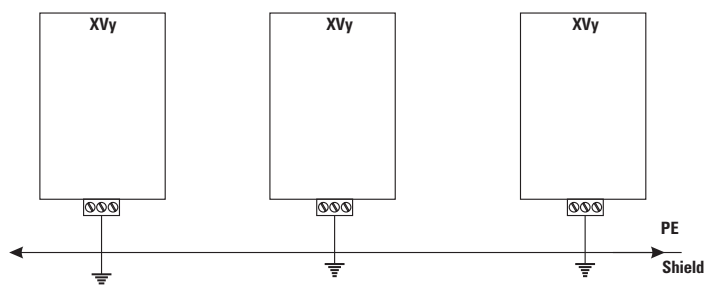
Table 3.3.1: AL-OP leds status codification

OP	AL	Meaning
ON	ON	Card power-up
BLINK	BLINK	Self test and Duplicate MAC-ID check is running
BLINK	OFF	Master configuration and/or I/O Polling wait not active
ON	OFF	I/O Polling active, operative status
OFF	BLINK	Minor fault (DUP MAC-ID fail, bus-off, bus-loss)
OFF	ON	Major fault (configuration error, internal error)
OFF	OFF	DeviceNet not configured

3.4 Interface

For the connection to the Bus please use a shielded twisted cable recommended by DeviceNet specification.

The connection among the single cards is accomplished by a shielded cable as shown in the following figure:



3.5 DeviceNet Function

In this chapter are described the functions of DeviceNet managed by the driver. The main characteristics of the card are:

1. XVy-DN operates only as Slave in "Predifined Master/Slave Connection Set".
2. Within the "Predefined Master/Slave Connection Set" the driver is a "UCMM Capable Device".
3. The "Explicit Messaging" is managed.
4. The "Polling" for the fast cyclical data exchange Master/Slave is managed.
5. The detection mechanism of the "Duplicate MAC ID" is implemented.

Regarding the "Explicit Messaging" the fragmentation of the data frame, with a total of max. 32 byte, is managed.

Connection sizes

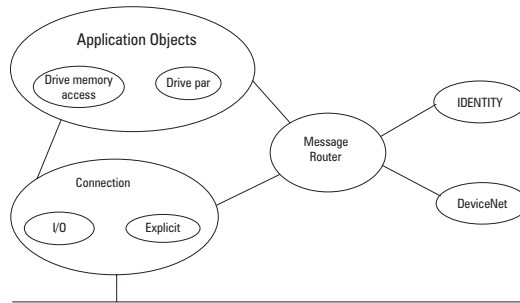
CONNECTION INSTANCE	PRODUCED	CONSUMED
Polled I/O	Depending on frame setting	
Explicit messaging	32	32

3.6 Object description

Hereafter you find the description of the objects managed by the XVy-DN driver.

3.6.1 Object Model

The following figure shows the XVy-DN “Object Model”.



The following table shows:

1. The object classes of XVy-DN driver.
 2. If the class is mandatory.
 3. The number of instances included in every class.
- See “DeviceNet Specifications” for the Standard classes.

Object	Optional/Required	# of Instances
Identity	Required	1
Message Router	Required	1
DeviceNet	Required	1
Connection	Required	1 I/O, 3 Explicit
Parameter	Optional	many
Drive Parameter Access	Optional	many
Drive memory Access	Optional	many

3.6.2 How Objects Affect Behavior

The “Affect Behaviour” of the objects is reported in the following table:

Object	Effect on Behavior
Identity	Supports “Reset Service”
Message Router	No effect
DeviceNet	Port attributes configuration
Connection	Contains the number of logical ports
Parameter	Drive parameters read/write
Drive Parameter Access	Drive parameters read/write
Drive Memory Access	Drive parameters read/write

3.6.3 Defining Object Interface

The object interface of the XVy-DN driver is the following:

Object	Interface
Identity	Message router
Message Router	Explicit Messaging Connection Instance
DeviceNet	Message router
Connection	Message router
Parameter	Message router
Drive Parameter Access	Message router
Drive memory Access	Message router

3.7 Data transfert via Explicit Messaging

The data transfer via Explicit Messaging is made through two new objects: one for accessing the Drive parameters, the other to direct access the drive memory.

3.7.1 Drive Parameter Access

For read/write of Drive parameters, the Drive Parameter Access object is defined with the following properties:

- Class ID: Fh.
- Class Attribute: Revision
- Instance Attribute: This instance does not have attributes.

3.7.1.1 Class Code

Class code: F hex

3.7.1.2 Class attributes

Number	Need in implementation	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of values
1	Optional	Get	Revision	UINT	Revision of this object	

dn345

3.7.1.3 Instance Attributes

Number	Need in implementation	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of values
This instance does not provide attributes						

dn350

3.7.1.4 Common Services

This object has no common services.

3.7.1.5 Object Specific Services

Service Code	Need in implementation		Service Name	Description of Service
	Class	Instance		
0 _{hex}	n/a	Required	Get_Attribute_Single	Read drive parameter value
10 _{hex}	n/a	Required	Set_Attribute_Single	Writes drive parameter value

dn356

3.7.1.6 Behavior

This object is the interface between the DeviceNet and all drive parameters.

The Drive parameter is accessed via the parameter index itself.

For example, reading a parameter (IPA 24000:

- Run a Get_Attribute_Single from class Fh,
- instance = 24000 (5DC0 hex)
- class 1 attribute
- the drive responds with 4 bytes (Dword format).

For example, writing a parameter (IPA 23000):

- Run a Set_Attribute_Single from class Fh,
- instance = 23000 (53D8 hex)
- class 1 attribute
- to set value 20, select "Word 2 byte" (parameter format is INT, 16 bit)
- the drive does not respond if there is an error (timeout).

byte	VALUE	XX	Low byte - Low word drive parameter drive
			High byte - Low word drive parameter drive
			Low byte - High word drive parameter drive
			High byte - High word drive parameter drive

dn357

The number of bytes in the "Value" field depends on the length of drive parameter;

Example:

if the type of drive parameter is "Integer" the length of VALUE is 2 bytes.

3.7.2 Drive Parameter Access

For read/write of Drive parameters, the Drive Parameter Access object is defined with the following properties:

- Class ID: 66h.
- Class Attribute: Revision
- Instance Attribute: This instance does not have attributes.

3.7.2.1 Class Code

Class code: 66 hex

3.7.2.2 Class attributes

Number	Need in implementation	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of values
1	Optional	Get	Revision	UINT	Revision of this object	

dn345

3.7.2.3 Instance Attributes

Number	Need in implementation	Access Rule	Name	DeviceNet Data Type	Description of Attribute	Semantics of values
This instance does not provide attributes						

dn350

3.7.2.4 Common Services

This object has no common services.

3.7.2.5 Object Specific Services

Service Code	Need in implementation		Service Name	Description of Service
	Class	Instance		
32 _{hex}	n/a	Required	Get_Drive_Value	Read drive parameter value
33 _{hex}	n/a	Required	Set_Drive_Value	Writes drive parameter value
34 _{hex}	n/a	Required	Get_Typed_Drive_Value	Read drive parameter value indicating the data type
35 _{hex}	n/a	Required	Set_Typed_Drive_Value	Writes drive parameter value indicating the data type

dn355

3.7.2.6 Behavior

This object is the interface between the DeviceNet network and all Drive parameters. The access to the Drive parameter is carried out by the parameter index; if the parameter does not exist or may not be accessed for any reason (for example: try to write a read only parameter) an error code will be returned. Drive parameters in text format cannot be accessed.

In the following are repeated patterns of how the data frame of data has to be composed for reading/writing Drive parameters.

A) Write Drive Parameter

In this example the writing of a Drive parameter is shown; the cases of positive or wrong writing are distinguished.

A-1) Write Drive Parameter Request

The data frame for writing a drive parameter is composed as follows:

DATA TYPE	FIELD	VALUE	MEANING
Byte	Service Code	33hex	Set Drive Parameter - Object Specific Service
See Note ¹⁾	Class ID	66hex	Drive Parameter Access Class Object
	Instance ID	XXXX	Drive Parameter Index in format Low byte-High byte
Byte ²⁾	VALUE	XX	Low byte-Low word drive parameter value
		XX	High byte-Low word drive parameter value
		XX	Low byte-High word drive parameter value
		XX	High byte-High word drive parameter value

dn360

- 1) Byte or Word depending on the type of allocation executed by the Master.
- 2) The number of bytes of the "Value"-field depends on the length of the Drive parameter; i.e.: if the Drive parameter type is "Integer" the length of VALUE is 2 bytes.

A-2) Write drive parameter - Reply OK

If the Drive parameter is written correctly, the response is:

DATA TYPE	FIELD	VALUE	MEANING
Byte	Service Code	33hex OR 80hex	Set Drive Parameter Reply code- Object Specific Service.
Word	Result	0000	Result field equal to zero means writing correctly executed.

dn365

A-3) Write drive parameter - Reply Error

If the writing of the drive parameter has been rejected, the response is

the following:

DATA TYPE	FIELD	VALUE	MEANING
Byte	Service Code	33hex OR 80hex	Set Drive Parameter Reply code- Object Specific Service.
Word	Result	XXXX ¹	Drive specific error code.

dn370

- 1) For error codes see table 3.7.1. .

B) Read Drive Parameter

In this example is shown the reading of a Drive parameter; the cases of positive or wrong reading are distinguished.

B-1) Read Drive Parameter Request

The data frame for the Drive parameter reading is composed as follows:

DATA TYPE	FIELD	VALUE	MEANING
Byte	Service Code	32hex	Get Drive Parameter - Object Specific Service.
See Note ¹⁾	Class ID	66hex	Drive Parameter Access Class Object.
See Note ¹⁾	Instance ID	XXXX	Drive Parameter Index in format Lowbyte-High byte.

dn375

- 1) Byte or Word depending on the type of allocation executed by the Master.

B-2) Read drive parameter - Reply OK

If the Drive parameter is read correctly, the response is:

DATA TYPE	FIELD	VALUE	MEANING
Byte	Service Code	32hex	Get Drive Parameter Reply code- Object Specific Service.
Word	Result	0	Result field equal to zero means reading correctly executed.
Byte ¹⁾	VALUE	XX	Low byte-Low word drive parameter value.
			High byte-Low word drive parameter value.
			Low byte-High word drive parameter value.
			High byte-High word drive parameter value.

dn380

- 1) The number of bytes of the Value-field depends on the length of the Drive parameter; i.e. if the Drive parameter type is "Integer" the length of VALUE is 2 bytes.

B-3) Read drive parameter - Reply Error

If Drive parameter reading is rejected, the response is the following:

DATA TYPE	FIELD	VALUE	MEANING
Byte	Service Code	32hex	Get Drive Parameter Reply code- Object Specific Service.
Word	Result	XXXX ¹	Drive specific error code.

dn385

- 1) For error codes see table 3.7.1. .

C) Write Typed Drive Parameter

In this example the writing of a Drive parameter is shown; the cases of positive or wrong writing are distinguished.

In this case, it is shown the parameter IPA number, the value and the data type used in the data transmission.

The optional data type conversion is automatically executed by the firmware.

C-1) Write Drive Parameter Request

The data frame for writing a drive parameter is composed as follows:

DATA TYPE	FIELD	VALUE	MEANING
Byte	Service Code	35hex	Set Drive Parameter - Object Specific Service
See Note ¹⁾	Class ID	66hex	Drive Parameter Access Class Object
	Instance ID	XXXX	Drive Parameter Index in format Low byte-High byte
Byte ²⁾	DATA TYPE	XX	Value data type
Byte ³⁾	VALUE	XX	Low byte-Low word drive parameter value
		XX	High byte-Low word drive parameter value
		XX	Low byte-High word drive parameter value
		XX	High byte-High word drive parameter value

dn390

- 1) Byte or Word depending on the type of allocation executed by the Master.
- 2) The coding of the possible data type is listed in table 3.7.2.
- 3) The number of bytes of the "Value"-field depends on the length of the Drive parameter; i.e.: if the Drive parameter type is "Integer" the length of VALUE is 2 bytes.

C-2) Write drive parameter - Reply OK

If the Drive parameter is written correctly, the response is:

DATA TYPE	FIELD	VALUE	MEANING
Byte	Service Code	33hex	Set Drive Parameter Reply code- Object Specific Service.
Word	Result	0000	Result field equal to zero means writing correctly executed.

dn395

C-3) Write drive parameter - Reply Error

If the writing of the drive parameter has been rejected, the response is the following:

DATA TYPE	FIELD	VALUE	MEANING
Byte	Service Code	33hex	Set Drive Parameter Reply code- Object Specific Service.
Word	Result	XXXX ¹⁾	Drive specific error code.

dn400

- 1) For error codes see table 3.7.1. .

D) Read Drive Parameter

In this example is shown the reading of a Drive parameter; the cases of positive or wrong reading are distinguished.

In this case, it is shown the parameter IPA number, the value and the data type used in the data transmission.

The optional data type conversion is automatically executed by the firmware.

D-1) Read Drive Parameter Request

The data frame for the Drive parameter reading is composed as follows:

DATA TYPE	FIELD	VALUE	MEANING
Byte	Service Code	36hex	Get Drive Parameter - Object Specific Service.
See Note ¹⁾	Class ID	66hex	Drive Parameter Access Class Object.
See Note ¹⁾	Instance ID	XXXX	Drive Parameter Index in format Lowbyte-High byte.
Byte ²⁾	DATA TYPE	XX	Value data type

dn405

For parameter format see table 3.7.2.

- 1) Byte or Word depending on the type of allocation executed by the Master.
- 2) The coding of the possible data type is listed in table 3.7.2.

D-2) Read drive parameter - Reply OK

If the Drive parameter is read correctly, the response is:

DATA TYPE	FIELD	VALUE	MEANING
Byte	Service Code	32hex	Get Drive Parameter Reply code- Object Specific Service.
Word	Result	0	Result field equal to zero means reading correctly executed.
Byte ¹⁾	VALUE	XX	Low byte-Low word drive parameter value.
			High byte-Low word drive parameter value.
			Low byte-High word drive parameter value.
			High byte-High word drive parameter value.

dn380

- 1) The number of bytes of the Value-field depends on the length of the Drive parameter; i.e. if the Drive parameter type is "Integer" the length of VALUE is 2 bytes.

D-3) Read drive parameter - Reply Error

If Drive parameter reading is rejected, the response is the following:

DATA TYPE	FIELD	VALUE	MEANING
Byte	Service Code	32hex	Get Drive Parameter Reply code- Object Specific Service.
Word	Result	XXXX ¹	Drive specific error code.

dn385

- 1) For error codes see table 3.7.1. .

Table 3.7.1: Error codes for the parameter access

RESULT	VALUE	MEANING
DB_E_OK	0	No error
DB_E_NO_IPA	-1	Parameter not exist
DB_E_SYSERR	-2	Generic error
DB_E_TYPE	-3	Type not supported
DB_E_READONLY	-4	Attempt to write a read only parameter
DB_E_NOTWRITENOW	-5	Attempt to write a parameter when not allowed
DB_E_MINVAL	-6	Value exceed minimum value
DB_E_MAXVAL	-7	Value exceed maximum value
DB_E_CNFCONFLICT	-8	Attempt to assign a currently invalid value
DB_E_CONSTANTLIMITS	-9	Attempt to access a parameter using currently invalid type

Table 3.7.2: Parameter format

FORMAT	VALUE	MEANING
DB_T_VOID	0	Return the value in the original format
DB_T_INT	1	16 bit signed
DB_T_WORD	2	16 bit unsigned
DB_T_LONG	3	32 bit signed
DB_T_DWORD	4	32 bit unsigned
DB_T_FLOAT	6	Float in IEEE 744 format

3.8 Polling Function

This type of DeviceNet-function is used for a fast cyclic exchange of Drive-parameters between Master and XVy drive.

The characteristics of the Polling-function are:

1. The data frame length is configurable through specific drive parameter (see chapter 10, FIELDDBUS menu) and can vary from 1 to 10 word for both directions (Slave->Master and Master->Slave).
2. The card, as it is a Slave, during the Polling consumes Output data and produces Input data as response.

The configuration of the Drive parameters transferred via Polling is set by using configuration parameter allocated in the drive (see chapter 10, FIELDDBUS menu).

3.9 XVy-DN Interface configuration

The DeviceNet interface configuration is performed via the drive parameters. The parameters are controlled via hierarchical menus. All the writing parameters referring to the DeviceNet interface are active only after the drive reset. Here following is a list of drive parameters useful to control the DeviceNet interface

3.9.1 Fieldbus Menu

The XVy-DN communication card can be enabled by setting the IPA 40000 **Field Bus Type** parameter as "Devicenet". The other parameters of this menu are:

IPA	Par. Name	Type	Default val.	Attr.
40100	Bus Address	1 byte unsigned	0	writing
40001	Bus Baud Rate	4 bytes unsigned	0	writing
40110	CC Enabling	Enum	Enabled	writing
40111	PDC Enabling	Enum	Enabled	writing
40114	FB Fail Casue	4 bytes unsigned	0	read only

- **Bus Address** (IPA 40100) = address of the node; admitted values 1 ... 63.
- **Bus Baud Rate** (IPA 40001) = network baud rate. The baudrate is stated directly in kbaud (ex. 125kb = 125); admitted values 125, 250, 500.
- **PDC Enabling** (IPA 40111) and **CC Enabling** (IPA 40110) = allow the user to enable/disable the corresponding channels. With the PDC channel it is possible to exchange up to 8 parameters.
- **FB Fail Casue** (IPA 40114) = error cause. See the following table

3.9.2 Error Codes

Cod.	Meaning
1	Protocol incorrect
18..24	Configuration error on M2S reception channel
25..31	Configuration error on S2M reception channel
32	Too many bytes on M2S reception channel
33	Too many bytes on S2M transmission channel
34-35	Errored IPA for PLC allocation
36	More than 4 words allocated as Fast250 us on M2S

37	More than 4 words allocated as Fast250 us on S2M
100	Baud-rate value not correct
101	Node address not correct
107	CAN line in "Bus-off" state
108	Dnet internal error
109	MAC-ID duplicated (there is already a node with the same address)
110	Software key for authorisation invalid or expired

3.10 Alarms

3.10.1 XVy-DN Alarms

The XVy-DN interface provides two possible alarms:

Alarm (A 26) **FieldBus Failure**, is automatically enabled if there is no communication on the bus at a PDC level (polling I/O). This alarm becomes active only when the drive is enabled.

If ON, the **FB Alarm Watch** parameter (IPA 40115) enables the generation of the "Field bus failure" alarm also when the drive is disabled.

3.10.2 Drive alarm handling

Considering that the card must function on different firmware application systems, the "drive alarm status" is not foreseen.

The "drive alarm status" is not therefore given any special treatment.

The XVy-EV firmware, provides a series of parameters capable of detecting the drive status. Refer to chapter 10, Alarms and Fieldbus menu for more information.

3.10.3 Alarm reset

The alarm reset is one of the drive standard functions, i.e. each application provides the same parameter for this function. It is therefore possible to reset the alarms via the configuration channel on the firmware of all the different drives. The alarms can be reset by sending the value 1 to the 18012 parameter.

The reset of the bit-controlled alarms can be performed also via the "Virtual Digital Input" function.

3.11 Process Data Channel Control

This function allows to allocate the drive parameters or application variables to the Process Data Channel data.

The XVy-DN interface uses a number of words for the Process Data Channel (abbr. PDC Process Data Channel), which can always be set. The Process Data Channel configuration for the XVy-DN interface is the following:

DATUM 0 DATUM... DATUMn

The Slave can both read and write the Process Data Channel data.

The DeviceNet data read by the Slave are defined as input data; the data written in DeviceNet by the Slave are defined as output data.

A datum can be made both of 2 and 4 bytes. The word "data" refers to any quantity of bytes included between 0 and 10, if the byte total number required is not higher than 20.

Example

It is possible to have:

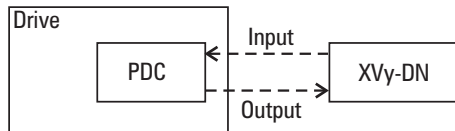
- from 0 to 10 data items of 2 byte
- 1 datum of 4 bytes + from 0 to 8 data items of 2 bytes
- 2 data items of 4 bytes + from 0 to 6 data items of 2 bytes
- 3 data items of 4 bytes + from 0 to 4 data items of 2 bytes
- 4 data items of 4 bytes + from 0 to 2 data items of 2 bytes
- 5 data items of 4 bytes

The data exchanged via the PDC can be of two types:

- drive parameters
- variables of an MDPIc application

The composition of the PDC input and output data is defined via suitable parameters as described in the paragraphs 3.11.1 and 3.11.2.

The master cyclically writes the data defined as PDC input and cyclically reads the data defined as PDC output.



3.11.1 PDC Input Configuration (SYS_FB_XXX_MS parameter)

See section 1.3.1, Appendix.

3.11.2 PDC Output Configuration (SYS_FB_XXX_SM Parameter)

See section 1.3.1, Appendix.

3.11.3 Configuration of the Virtual Digital I/Os

The XVy-EV firmware, provides the "Virtual Digital I/O" function, which allows to exchange discrete signals between the master and the slave and vice versa. See the chapter 10 (DIGITAL INPUTS / VIRT DIG INPUTS e DIGITAL OUTPUTS / VIRT DIG OUTPUTS.menu) for a detailed description of these parameters.

Other application firmware, for example MDPIc, does not provide the "Virtual Digital I/O" function.

3.11.4 Use of the PDC in MDPIc Applications

It is possible to configure both the PDC input and output data in order to allow the data direct access via the MDPIc application code.

For more details see the manual "Drive programming with MDPIc" on "XVy tools" cd-rom.

GEFRAN SENSORI

via Cave, 11
25050 PROVAGLIO D'ISEO (BS)
ITALY
Ph. +39 030 9291411
Fax. +39 030 9823201
info@gefran.com

GEFRAN BENELUX

Lammerdries, 14A
B-2250 OLEN
Ph. +32 (0) 14248181
Fax. +32 (0) 14248180
info@gefran.be

GEFRAN BRASIL ELETRÔELETRÔNICA

Avenida Dr. Altino Arantes,
377/379 Vila Clementino
04042-032 SÃO PAULO - SP
Ph. +55 (0) 1155851133
Fax +55 (0) 1155851425
gefran@gefran.com.br

GEFRAN DEUTSCHLAND

Philipp-Reis-Straße 9a
63500 SELIGENSTADT
Ph. +49 (0) 61828090
Fax +49 (0) 6182809222
vertrieb@gefran.de

GEFRAN SUISSE

Rue Fritz Courvoisier, 40
2302 LA CHAUX-DE-FONDS
Ph. +41 (0) 329684955
Fax +41 (0) 329683574
office@acome.ch

GEFRAN SIEI - FRANCE

4, rue Jean Desparmet - BP
8237
69355 LYON Cedex 08
Ph. +33 (0) 478770300
Fax +33 (0) 478770320
commercial@gefran.fr
contact@sieifrance.fr

GEFRAN ISI

8 Lowell Avenue
WINCHESTER - MA 01890
Toll Free 1-888-888-4474
Ph. +1 (781) 7295249
Fax +1 (781) 7291468
info@gefranisi.com

SIEI AREG - GERMANY

Zachersweg, 17
D 74376 - Gemmrigheim
Ph. +49 7143 9730
Fax +49 7143 97397
info@sieiareg.de

GEFRAN SIEI - UK

7 Pearson Road, Central Park
TELFORD, TF2 9TX
Ph. +44 (0) 8452 604555
Fax +44 (0) 8452 604556
sales@gefran.co.uk
sales@sieiuuk.co.uk

GEFRAN SIEI - ASIA

No.160 Paya Lebar Road
05-07 Orion Industrial Building
409022 Singapore
Ph. +65 6 8418300
Fax +65 6 7428300
info@sieiasia.com.sg

GEFRAN SIEI Electric Pte Ltd

Block B, Gr.Fir, No.155,
Fu Te Xi Yi Road,
Wai Gao Giao Trade Zone
200131 Shanghai
Ph. +86 21 5866 7816
Ph. +86 21 5866 1555
Ph. +86 21 5866 7688
gefransh@online.sh.cn

SIEI DRIVES TECHNOLOGY

No.1265, B1, Hong De Road,
Jia Ding District
201821 Shanghai
Ph. +86 21 69169898
Fax +86 21 69169333
info@sieiasia.com.cn

SIEI AMERICA - USA

14201 D South Lakes Drive
NC 28273 - Charlotte
Ph. +1 704 3290200
Fax +1 704 3290217
salescontact@sieiamerica.com

GEFRAN



GEFRAN S.p.A.

Via Sebina 74
25050 Provaglio d'Iseo (BS)
ITALY
Ph. +39 030 98881
Fax +39 030 9839063
info@gefran.com
www.gefran.com

Motion Control

Via Carducci 24
21040 Garenzano (VA)
ITALY
Ph. +39 02 967601
Fax +39 02 9682653
info@siei.it
www.gefransiei.com

Technical Assistance :
technohelp@siei.it

Customer Service :
customer@siei.it
Ph. +39 02 96760500
Fax +39 02 96760278

Manuale XvY-EV - EN
Rev. 0.1 - 25.1.2007



1S3A43