

FAGOR AUTOMATION S.COOP.

Brushless AC
servo drives
~ **MCS Innova series** ~

Ref.1504





FAGOR 



14460067

Original instructions

Title	Brushless AC Servo Drives. MCSi series.
Type of documentation	Description, installation and startup of small motors and digital drives.
Name	MAN REGUL MCSi (IN)
Manual reference	Ref.1504
Software	Version 01.0x
WinDDSSetup	Version 06.1x and later
Electronic document	man_mcsi.pdf
Headquarters	Fagor Automation S. Coop. B.º San Andrés 19, apdo. 144 20500 ARRASATE- MONDRAGÓN www.fagorautomation.com info@fagorautomation.es
	 34-943-719200
	 34-943-771118 (SAT)

DUAL-USE products. Products manufactured by Fagor Automation S. Coop. included on the list of dual-use products according to regulation (UE) Nr 1382/2014. Their product identification includes the text -MDU and require an export license depending on destination.

All rights reserved. No part of this documentation may be copied, transmitted, transcribed, stored in a backup device or translated into another language without Fagor Automation's permission.



Responsibility exemption

The information described in this manual may be subject to changes due to technical modifications. Fagor Automation S. Coop. reserves the right to change the contents of this manual without prior notice.

The content of this manual and its validity for the product described here has been verified. Nevertheless, the information, technical or otherwise, in these manuals or in any other type of documentation is not guaranteed to be integral, sufficient or up to date.

Involuntary errors are possible, hence the absolute match is guaranteed. However, the contents of manuals and documents are regularly checked and updated implementing the pertinent corrections in later editions.

Fagor Automation S. Coop. will not be held responsible for any losses or damage, direct, indirect or by chance that could result from that information and it will be the user's responsibility to use it.

Responsibility and warranty claims are excluded in case of shipping damage, wrong usage of the unit in wrong environments or when not used for the purpose for which it has been designed, ignoring the warnings and safety indications given in this document and/or legal ones that may be applied to the work place, software modifications and/or repairs made by unauthorized personnel, damage caused by the influence of other nearby equipment.

Warranty

The warranty terms may be requested from your Fagor Automation representative or through the usual commercial channels.

Registered trademarks

All registered trade marks, even those not indicated are also acknowledged. When some are not indicated, it does not mean that they are free.

April 2015 / Ref.1504

Warranty

Initial warranty

All products manufactured or marketed by FAGOR carry a 12-month warranty for the end user.

In order to prevent the possibility of having the time period from the time a product leaves our warehouse until the end user actually receives it run against this 12-month warranty, the OEM or distributor must communicate to FAGOR the destination, identification and installation date of the machine by filling out the Warranty Form that comes with each product.

The starting date of the warranty for the user will be the one appearing as the installation date of the machine on the Warranty Form.

This system ensures the 12-month warranty period for the user.

FAGOR offers a 12-month period for the OEM or distributor for selling and installing the product. This means that the warranty starting date may be up to one year after the product has left our warehouse so long as the warranty control sheet has been sent back to us. This translates into the extension of warranty period to two years since the product left our warehouse. If this sheet has not been sent to us, the warranty period ends 15 months from when the product left our warehouse.

FAGOR is committed to repairing or replacing its products from the time when the first such product was launched up to 8 years after such product has disappeared from the product catalog.

It is entirely up to FAGOR to determine whether a repair is to be considered under warranty.

Excluding clauses

The repair will take place at our facilities. Therefore, all shipping expenses as well as travelling expenses incurred by technical personnel are NOT under warranty even when the unit is under warranty.

The warranty will be applied so long as the equipment has been installed according to the instructions, it has not been mistreated or damaged by accident or negligence and has been handled by personnel authorized by FAGOR.

If once the service call or repair has been completed, the cause of the failure is not to be blamed on the FAGOR product, the customer must cover all generated expenses according to current fees.

No other implicit or explicit warranty is covered and FAGOR AUTOMATION shall not be held responsible, under any circumstances, of the damage which could be originated.

Service contracts

Service and Maintenance Contracts are available for the customer within the warranty period as well as outside of it.

Declaration of conformity

Manufacturer: Fagor Automation, S. Coop.

B.º San Andrés 19, C.P. 20500, Mondragón - Gipuzkoa - (SPAIN)

We hereby declare, under our responsibility that the product:

FAGOR AC Brushless Servo Drive System

consisting of the following modules and motors:

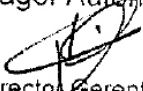
Drives MCS Innova. MCSi series

AC motors FS. FSA and FSP series.

mentioned on this declaration,

with the basic requirements of the European Directives 2006/95/CE on Low Voltage (Basic Safety Regulation; Machinery Electrical Equipment EN 60204-1:2006) and 2004/108/EC on Electromagnetic Compatibility (EN 61800-3:2004, Specific Regulation on electromagnetic compatibility for Servo Drive System).

Fagor Automation, S. Coop.


Director Gerente
Pedro Ruiz de Aguirre

In Mondragón, July 1st, 2009

Introduction

FAGOR offers a range of servo systems (AC brushless motor FS plus digital drive) for application between 0.318 and 2.39 N·m at a rated speed of 3,000 rev/min.

This manual describes the elements in detail and guides step by step through the installation and setup of the drive system.

When installed for the first time, it is a good idea to read the whole document.

Should you have any doubts or questions, please do not hesitate to contact our technicians at any of our subsidiaries worldwide.

Thank you for choosing FAGOR.

General index

BRUSHLESS AC MOTORS, FS	7
Introduction	7
General characteristics	7
Torque-speed curves	9
Dimensions	10
Base power connectors and encoder output	12
Holding brake	13
Sales model	14
MCSi DRIVE	15
Introduction	15
General characteristics	15
Dimensions	15
Technical data	16
Connectors	17
Indicators	21
Push-buttons and switches	21
Programming module	22
Front view	23
Top view	24
Pinout of the connectors	24
Sales model	26
INSTALLATION	27
General considerations	27
Electrical connections	28
Diagram of the electrical cabinet	38
Initialization and adjustment	41
PARAMETERS, VARIABLES AND COMMANDS	46
B group. Non-programmable inputs-outputs	48
C group. Current	48
D group. Diagnosis	52
E group. Encoder simulator	54
G group. General	54

H group. Hardware	56
I group. Inputs	57
K group. Monitoring	59
M group. Motor	60
O group. Analog and digital outputs	61
Q group. Communication	64
S group. Speed	66
T group. Torque and power	71
W group. Internal generator	72
ERROR MESSAGES	74
WARNINGS	79
LIST OF PARAMETERS, VARIABLES & COMMANDS.	
ModBus ID's	80

BRUSHLESS AC MOTORS, FS

Introduction

FS synchronous servo motors - FSA and FSP series - are AC Brushless with permanent magnets.

They are ideal for any application requiring great positioning accuracy.

They have a uniform output torque, high reliability and low maintenance.

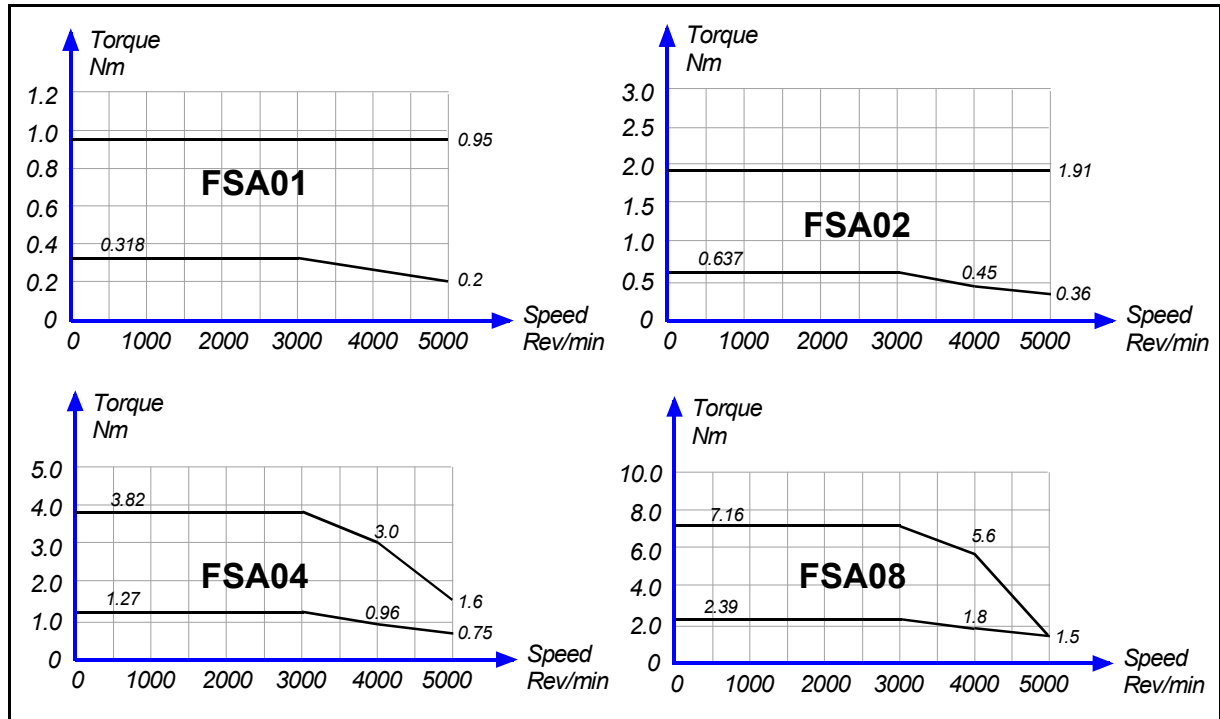


General characteristics

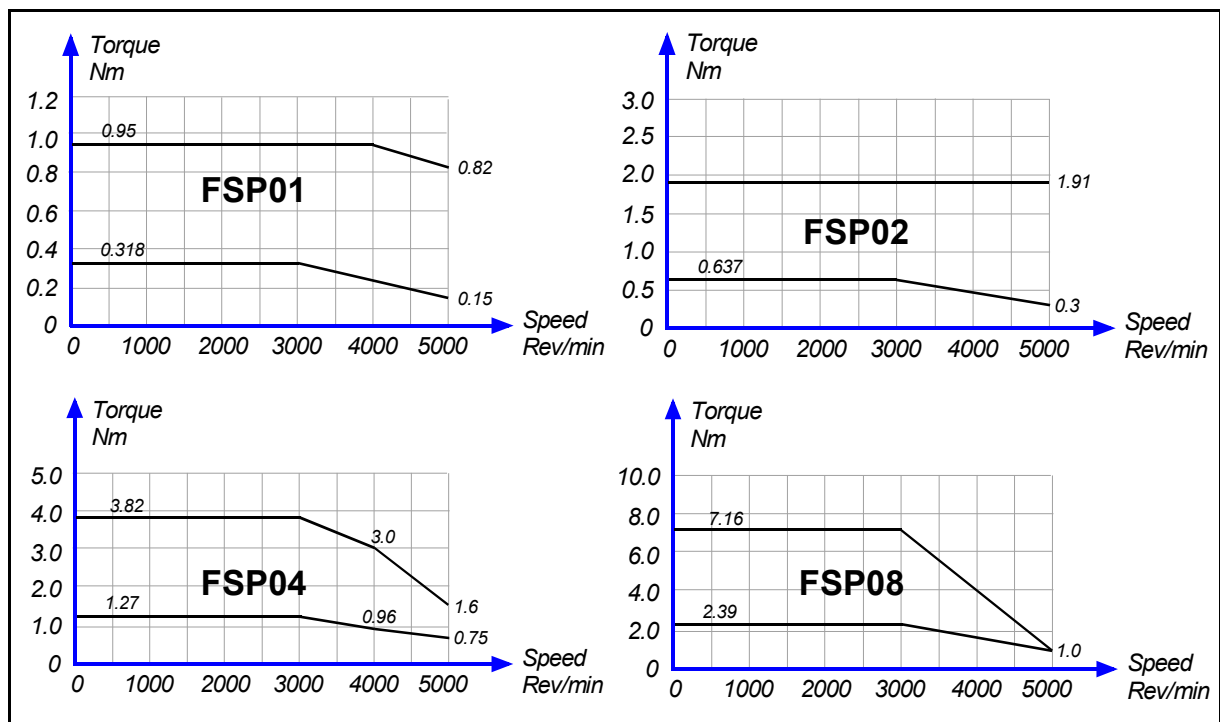
Excitation	Permanent magnets
Temperature sensor	Not available
Shaft end	Cylindrical with keyway (optional: without keyway)
Mounting	Face flange
Mounting method	IM B5, IM V1, IM V3 (as per IEC-34-3-72)
Mechanical tolerances	Eccentricity: 0.02 Concentricity: 0.04 Perpendicularity: 0.04
Roller bearings' life	20000 hours
Vibration resistance	Vibration acceleration: 49 m/s ²
Vibration class	15 µm or lower
Electrical insulation	Class B (130 °C / 266 °F)
Insulation resistance	500 V DC, 10 MΩ or greater
Dielectric rigidity	200 V motors: 1500 V AC, one minute
Body or housing	Totally enclosed and self-ventilated
Protection degree	General: standard IP 55 (shaft section excluded)
Storage temperature	From - 20 °C to 60 °C (from - 4 °F to 140 °F)
Ambient temperature allowed	From 0 °C to 40 °C (from 32 °F to 104 °F)
Working ambient humidity	From 20 % to 80 % (non condensing)
Voltage supply for the brake	24 V DC - the brake is optional -
Feedback	Standard. Incremental encoder 13 bits: 2028 ppt Optional. Absolute encoder 16 bits: 16384 ppt

Torque-speed curves

Synchronous AC servomotors FSA series

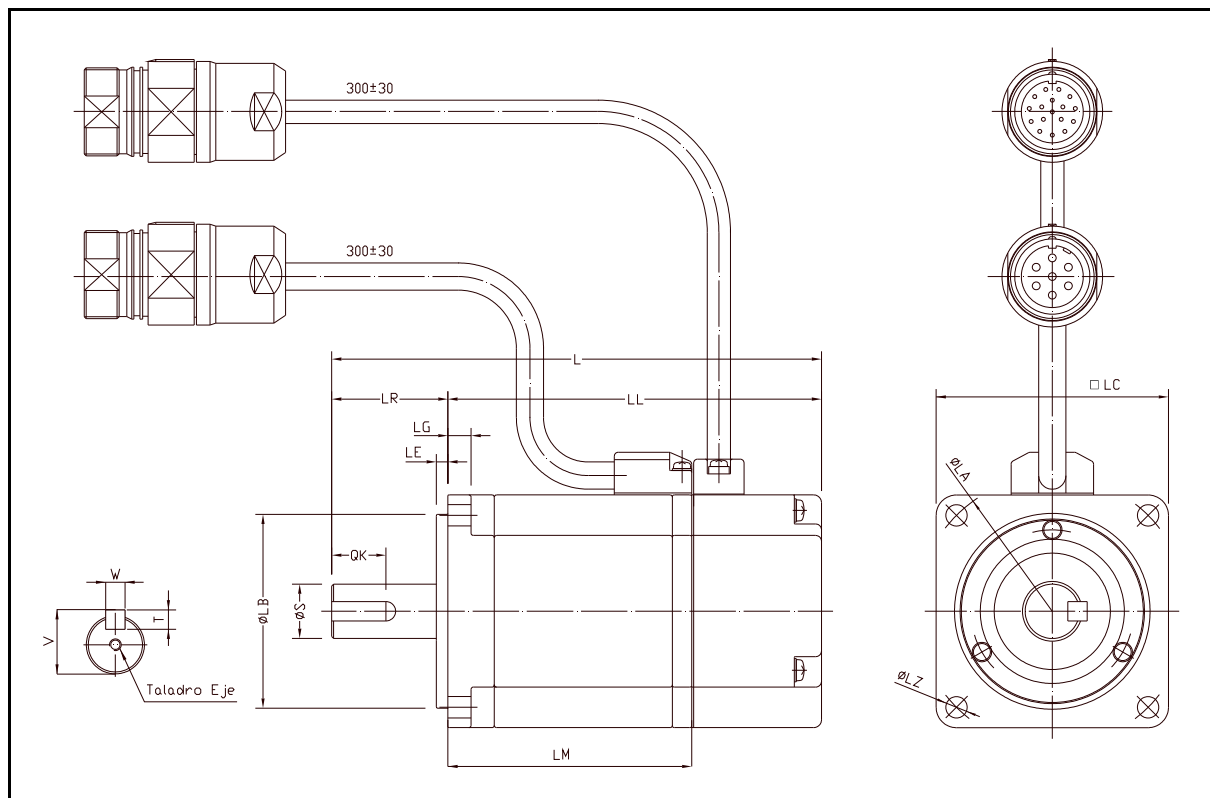


Synchronous AC servomotors FSP series



Dimensions

Synchronous AC servomotors. FSA series

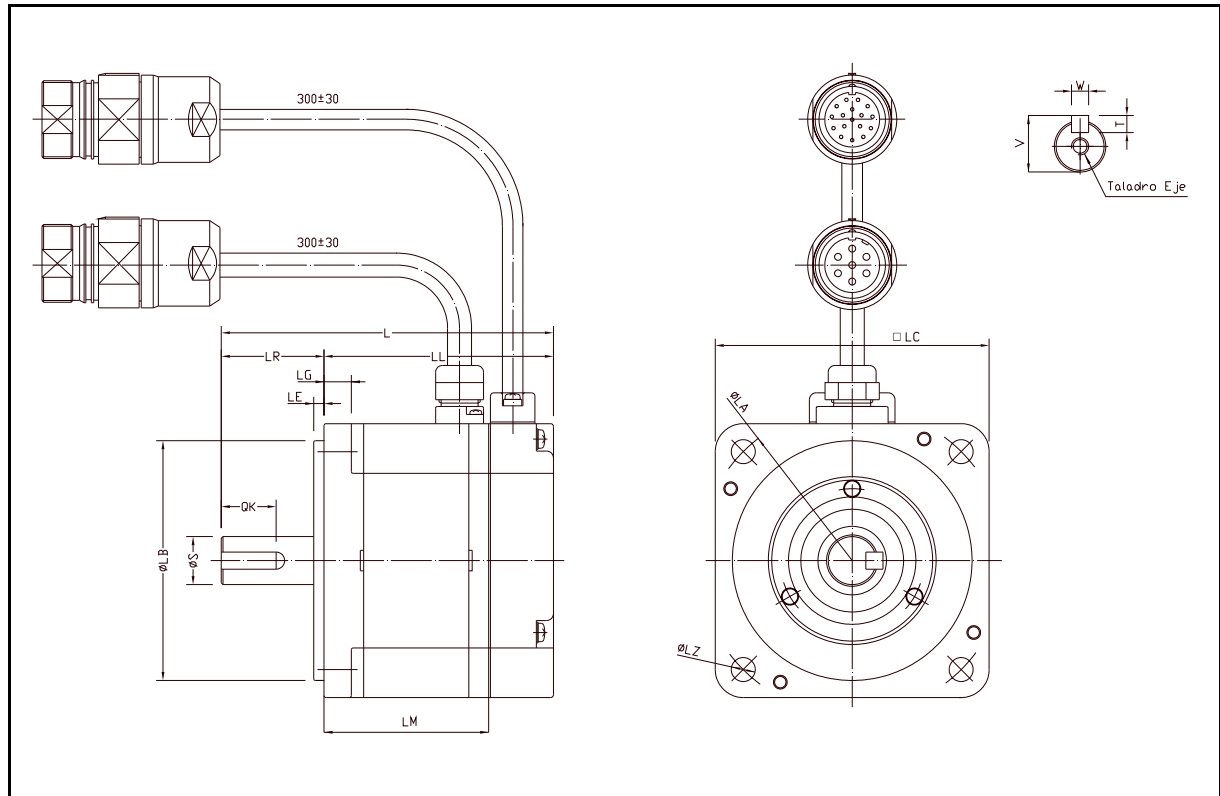


Dimensions	Motor length					Flange surface					
Motor type	LM	L	LL	Δ brake	LR	LA	LB	LC	LE	LG	LZ
FSA01	61.5	119.5	94.5	40.5	25	46	30h7	40	2.5	5	4.3
FSA02	63.0	126.5	96.5	39.5	30	70	50h7	60	3	6	5.5
FSA04	91.0	154.5	124.5	39.5	30	70	50h7	60	3	6	5.5
FSA08	111.5	185.0	145.0	44.5	40	90	70h7	80	3	8	7.0

The [Δ brake] column shows the length increment for the L and LL measurements when using a motor configuration “with brake”.

Dimensions	Shaft end					Shaft hole
Motor type	S	QK	W	T	V	
FSA01	8h6	14	3	3	9.2	M3 x 6
FSA02	14h6	20	5	5	16	M5 x 8
FSA04	14h6	20	5	5	16	M5 x 8
FSA08	16h6	30	5	5	18	M5 x 8

Synchronous AC servomotors. FSP series



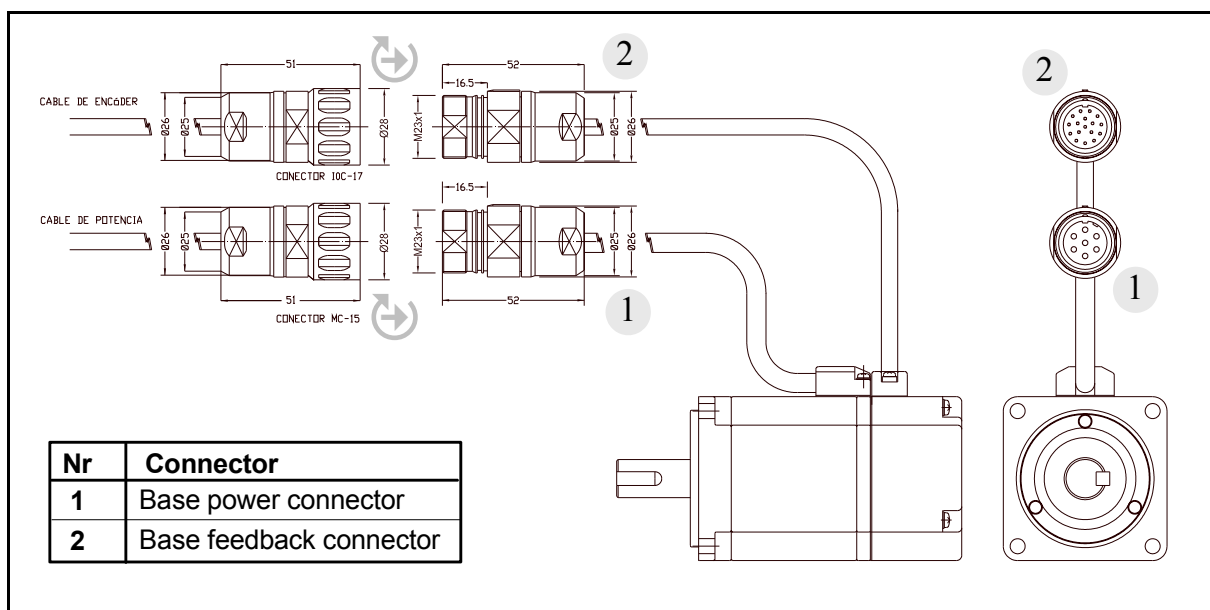
Dimensions	Motor length					Flange surface						
	LM	L	LL	Δ brake	LR	LA	LB	LC	LE	LG	LZ	
FSP01	42.5	87	62	29.0	25	70	50h7	60	3	6	5.5	
FSP02	48.1	97	67	31.5	30	90	70h7	80	3	8	7	
FSP04	68.1	117	87	31.5	30	90	70h7	80	3	8	7	
FSP08	66.7	126.5	86.5	33.5	40	145	110h7	120	3.5	10	10	

The [Δ brake] column shows the length increment for the L and LL measurements when using a motor configuration "with brake".

Dimensions	Shaft end					Shaft hole
	S	QK	W	T	V	
FSP01	8h6	14	3	3	9.2	M3 x 6
FSP02	14h6	16	5	5	16	M5 x 8
FSP04	14h6	16	5	5	16	M5 x 8
FSP08	16h6	22	5	5	18	M5 x 8

Base power connectors and encoder output

The following figure shows the identification of these connectors:

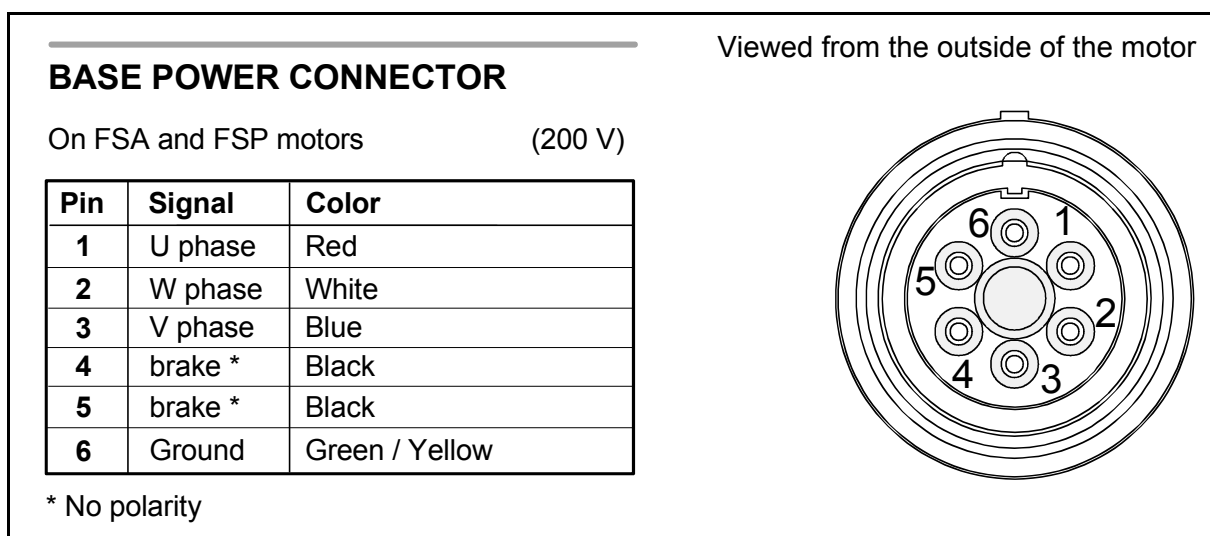


Note that although the figure shows the FSA series motor, the dimensions of all the connectors will be the same for the FSP series.

The base power connector includes pins 4 and 5 of the brake. Remember that it has no polarity and, therefore, the 24 V DC may be applied to either pin. A voltage between 22 and 26 V DC applied to the brake releases the shaft.

When installing the motor, verify that the brake releases the shaft completely before turning it for the first time.

Connecting the motor windings in the order indicated on the connector (U, V, W) of the figure below, the shaft will turn clockwise (CWR, **C**lock**W**ise **R**otation).



BASE FEEDBACK CONNECTOR

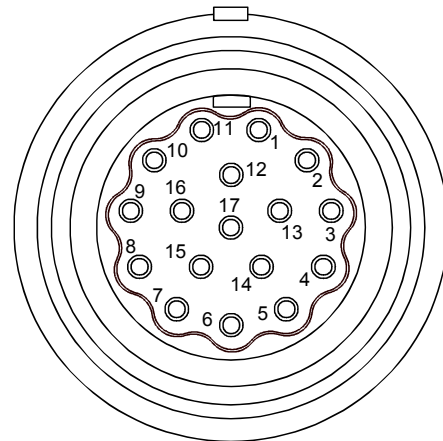
On FSA and FSP motors (200 V)

Pin	Signal	Color
1	0 V (16 bit absolute)	Pink
2	3.6 V (16 bit absolute)	Grey
3	+ RS485	Green
4	- RS485	Yellow
8	+ 5 V	White
9	0 V	Brown

Note 1. The rest of pins are not connected

Note 2. Connector housing connected to ground

Viewed from the outside of the motor



Holding brake

FSA and FSP series motors have an optional brake that applies friction to the shaft. Its purpose is to immobilize or lock vertical axes, not to brake a moving axis. Its main characteristics depending on the type of brake are:

Brake	Holding torque	Power consumption	Supply voltage	Mass	Inertia
Motor type	Nm (lbf·In)	W (hp)	V DC	kg (lbf)	kg·cm ²
FSA01	0.318 (2.814)	6.0 (0.008)	24	0.300 (0.66)	0.0085
FSA02	0.637 (5.637)	6.9 (0.009)	24	0.500 (1.10)	0.058
FSA04	1.270 (11.240)	6.9 (0.009)	24	0.500 (1.10)	0.058
FSA08	2.390 (21.153)	7.7 (0.010)	24	0.900 (1.98)	0.058
FSP01	0.318 (2.814)	8.1 (0.010)	24	0.200 (0.44)	0.029
FSP02	0.637 (5.637)	7.6 (0.010)	24	0.500 (1.10)	0.109
FSP04	1.270 (11.240)	7.6 (0.010)	24	0.500 (1.10)	0.109
FSP08	2.390 (21.153)	7.5 (0.010)	24	1.500 (33.1)	0.875

WARNING.



- ❑ The brake must not be used to stop the axis while it is moving.
- ❑ The brake must never exceed its maximum turning speed.
- ❑ A voltage between 22 V DC and 26 V DC releases the shaft. Make sure that no voltage over 26 V DC is applied that prevent the shaft from turning.
- ❑ When installing the motor, make sure that the brake fully releases the shaft before making it turn for the first time.

Sales model

FSA04.50F.J5.000 - S99

MOTOR SERIES

MOTOR LENGTH

LONG MOTORS
SHORT MOTORS

A
P

SIZE/POWER

HEIGHT	FSA		FSP	
	200 V	kW	200 V	kW
40	01	0.1		
60			01	0.1
			02	0.2
			04	0.4
80			02	0.2
			04	0.4
			08	0.75
120			08	0.75

MAXIMUM SPEED

50 5000 rev/min

Note that the rated speed is 3000 rev/min

VOLTAGE

200 V

F

FEEDBACK

13 bit incremental
16 bit absolute

J5
J7

FLANGE & SHAFT

Cylindrical shaft with keyway and tapped hole
Cylindrical keyless shaft and tapped hole

0
1

BRAKE/SEAL OPTION

Without brake or seal (no considered)
With brake (24 V DC), without seal
With brake (24 V DC), with seal
Without brake, with seal

0
1
2
3

CONNECTION

Interconnectron connector

0

SPECIAL CONFIGURATION

S

ESPECIFICATION

only when having the special "S" configuration !

01 → ZZ

MCSi DRIVE

Introduction

The **MCS Innova** servodrive (MCSi) family is a compact speed servo drive family for controlling small synchronous AC brushless motors.

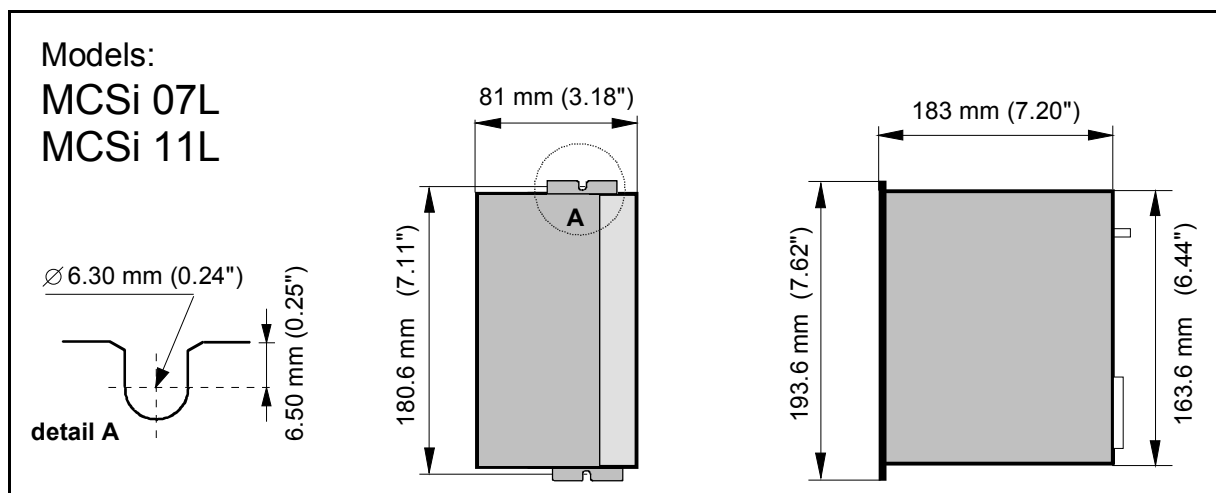
There are three modules of different power offering peak currents of 6.5, 10.5 and 15.0 Arms for single-phase 220 V AC.

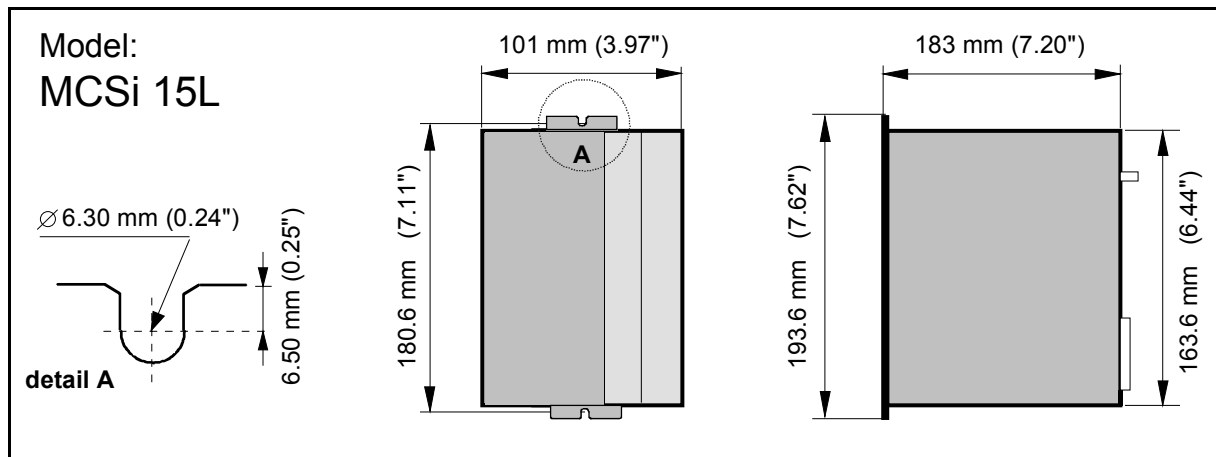
General characteristics

Their main characteristics are:

- 220 V AC single-phase voltage supply.
- Dynamic braking in case of mains failure.
- PWM IGBTs
- Serial encoder feedback.
- Programmable encoder simulator output.
- USB service communication line.
- Two logic inputs for motor control. Speed Enable and Drive Enable.
- Integrated functions.
- On-line parameter editing.
- Integrated programming module.
- RS-485 communications interface.
- Possible communication protocol: ModBus.

Dimensions





Technical data

	MODELS		
	MCSi 07L	MCSi 11L	MCSi 15L
Rated output current	2.1 Arms	3.5 Arms	5.0 Arms
Peak current (3 s)	6.5 Arms	10.5 Arms	15.0 Arms
Power supply	Single phase 50/60 Hz. Voltage range between 220-10 % and 230+10 % V AC		
Consumption	12.5 Arms	20.0 Arms	29.0 Arms
Over-voltage protection	390 V DC		
Frequency	Lower than 600 Hz		
Internal Ballast resistor	-	-	45 Ω
Internal Ballast power	-	-	15 W
Ballast trigger	380 V DC		
Thermal protection of the heatsink	90 °C (194 °F)		
Operating temperature	5 °C / 45 °C (41 °F / 113 °F)		
Storage temperature	- 4 °F / 60 °C (- 4 °F / 140 °F)		
Protection degree *	IP 20	IP 20	IP 20
Module dimensions	81x163.6x183 mm (3.18x6.44x7.20 ")		101x163.6x183 mm (3.97x6.44x7.20 ")
Module mass	1.9 kg (4.18 lb)		2.1 kg (4.62 lb)

* **IP 20** means that it is protected against objects of a diameter larger than 12.5 mm, but not against water splashes. Therefore, the unit must be mounted inside an electrical cabinet.

Connectors

Power terminals

Connector X4

- ▶ **POWER INPUTS (L1, L2):** Mains input terminals.
- ▶ **POWER OUTPUTS (U, V, W):** Output terminals for the voltage applied to the motor. Current control with PWM on a carrier frequency of 8 kHz. When connecting to the motor, watch the matching of phases U-U, V-V and W-W.

Connector X9

- ▶ **L+, Ri, Re:** Terminals to configure and connect the external ballast resistor.

Connector X5

- ▶ **CONTROL POWER INPUTS (L1, L2, GROUND):** Input terminals for the voltage supply of the drive's control circuits from mains. The maximum cable section at these power terminals is **2.5 mm²**.
- ▶ **ACTIVATION OF THE INTERNAL FAN:** The internal fan that cools the drive's power elements starts when enabling the Drive_Enable signal (only on models with integrated fan). It will stop when the heatsink temperature is lower 70 °C since the Drive_Enable signal is turned off. This system decreases the fan's operating time, thus increasing its useful life.

Control signals

Conector X3

► ANALOG INPUTS AND OUTPUTS

Velocity command, pins 1 and 2: Velocity command input for the motor. It admits a range of ± 10 V.

PIN 1	Input -
PIN 2	Input +

Programmable analog input, pins 17 and 18: Input for analog command used for some integrated functions.

PIN 17	Input -
PIN 18	Input +

± 12 V, pins 33, 34 and 19: Output of an internal power supply so the user can easily generate a command signal. It offers a maximum current of 20 mA limited internally.

PIN 34	+12 V
PIN 33	-12 V
PIN 19	GND

Programmable analog output 1, pins 31 and 16 with a voltage range of ± 10 V and **programmable output 2, pins 32 and 16** with a voltage range of ± 10 V.

PIN 31	Output 1
PIN 32	Output 2
PIN 16	Common

► ENCODER SIMULATOR

Encóder Simulator Output , pins 22, 7, 24, 8, 37, 38 and 23: Outputs of the encoder signals divided by the preset factor, for closing the position loop at the CNC.

PIN 22	A+
PIN 7	A -
PIN 24	B+
PIN 8	B -
PIN 37	Z+
PIN 38	Z -
PIN 23	GND

► DIRECT FEEDBACK

Auxiliary Feedback Input , **pins 5, 6, 36, 21, 35, 20, 4 and 3**: Input to connect a second feedback device with TTL signals. The connector provides an auxiliary + 5 V DC (0.5 A max) for the feedback device (see pin 4).

PIN 6	A+
PIN 5	A -
PIN 21	B+
PIN 36	B -
PIN 20	Z+
PIN 35	Z -
PIN 3	GND
PIN 4	+ 5 V DC (0.5 A max.)

► ENABLES

Drive Enable input, pin 13: No current circulates through the motor stator winding at 0 V DC, thus it no longer supplies torque. It is activated with +24 V DC.

Speed Enable input, pin 15: At 0 V DC, it forces an internal zero velocity command. It is activated with +24 V DC.

Common to inputs Drive Enable and Speed Enable pin 14: Reference point for inputs Drive Enable and Speed Enable.

+24 V DC and 0 V DC, pins 43 and 44: Output of the internal 24 V DC power supply that may be used for the control of inputs Drive Enable and Speed Enable as well as the programmable digital input. It offers a maximum current of 50 mA limited internally.

PIN 13	DRIVE ENABLE
PIN 15	SPEED ENABLE
PIN 14	Pin common to inputs DRIVE ENABLE and SPEED ENABLE
PIN 43	+24 V DC of the auxiliary power supply (max. 50 mA)
PIN 44	GND of the auxiliary 24 V DC power supply

► DIGITAL INPUTS AND OUTPUTS

Programmable digital input, pins 11 and 12: Digital input (servo drive at +24 V DC and 0 V DC) used as input for some integrated functions.

Programmable digital output, pins 27 and 28: Optocoupled open collector output that reflects the output of some integrated functions.

► DRIVE OK

Drive Ok, pins 29 and 30: Relay contact that closes when the internal status of the drive control is OK.

Note that this relay contact must be necessarily included in the electrical maneuver.

► RELAY FOR SAFETY DISABLE

Safe-disable relay, pins 41 and 42: Second, normally closed contact (N.C.) used as an external acknowledgement of the status of the integrated-safety relay.

Note that this relay contact must be necessarily included in the electrical maneuver.

► CHASSIS

Metal housing of the connector: Drive chassis connection point.

Connector X1

► COMMUNICATIONS

USB - type A **double parallel** connector for fast interconnection between various units (ModBus protocol) via RS-485 serial line. It has a line terminating resistor selector whose status is set as follows:

ON	Resistor connected
OFF	Resistor not connected

Connector X2

► MOTOR FEEDBACK INPUT

Standard IEEE 1394 type connector for input of the serial encoder signals, installed on the motor itself for position + speed feedback.

Connector X6

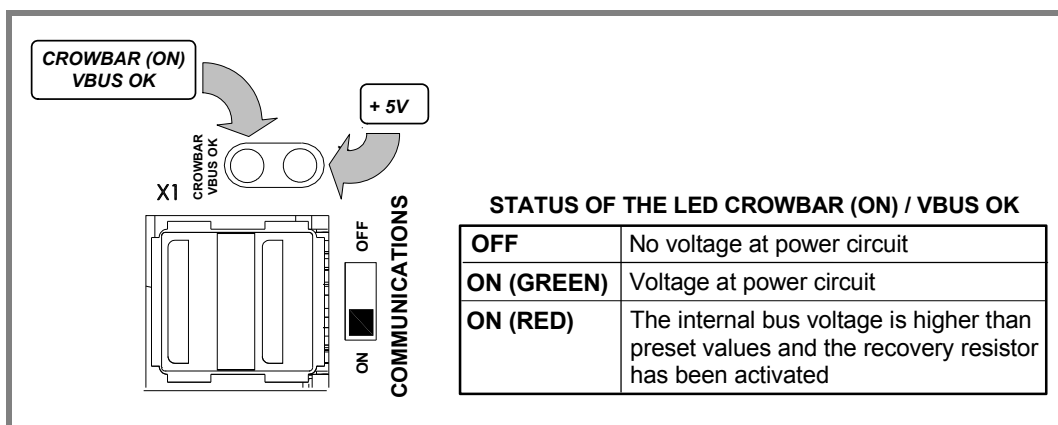
► SERVICE

Standard USB mini AB type connector to connect a PC for setting parameters, monitoring system variables and updating the firmware of the unit using the WinDDSSetup application for PC. Any standard USB cable with a miniA or miniB connector may be connected at the drive side.

Indicators

+5 V: LED located on top of connector X1. When lit, it indicates that the internal +5 V are being applied.

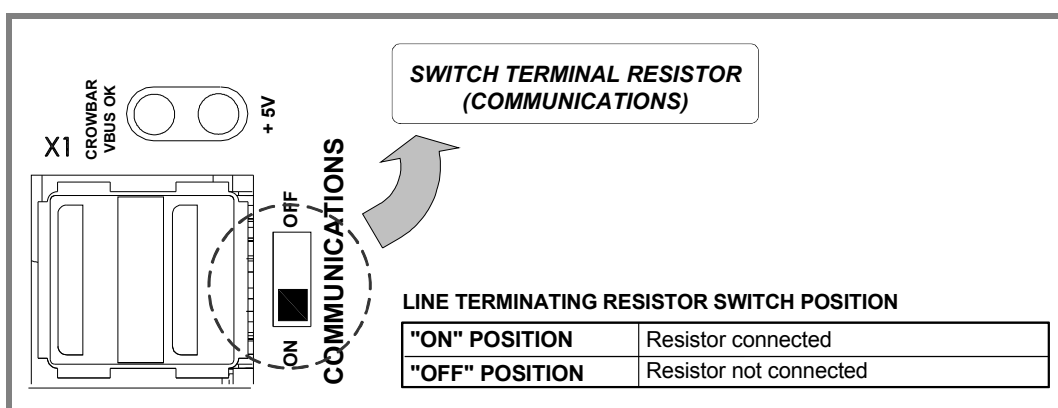
CROWBAR (ON) / VBUS OK: Two-color (green/red) light indicator located next to the + 5 V LED. It indicates its status according to the following table:



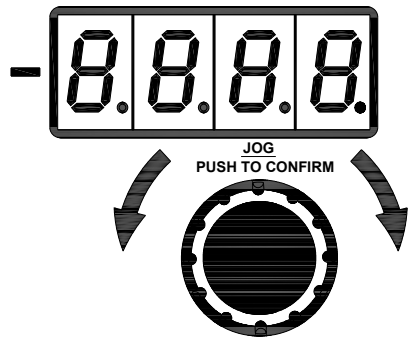
Push-buttons and switches

RESET: Push-button for resetting the system.

TERMINATING RESISTOR (COMMUNICATIONS): This switch located next to the connector X1 (front of the module) may be used to connect or disconnect the line terminating resistor in RS-485 communications.



Programming module



The programming module (present on MCS model) has four numeric displays of 7 segments, a sign indicator and a rotary decoder with a push button for confirmation incorporated on the knob itself.

The rotating direction may be:

► **Clockwise** being possible to:

- To scroll through the list of parameters, variables and commands and display a particular one.

- To increase its value (if parameters).

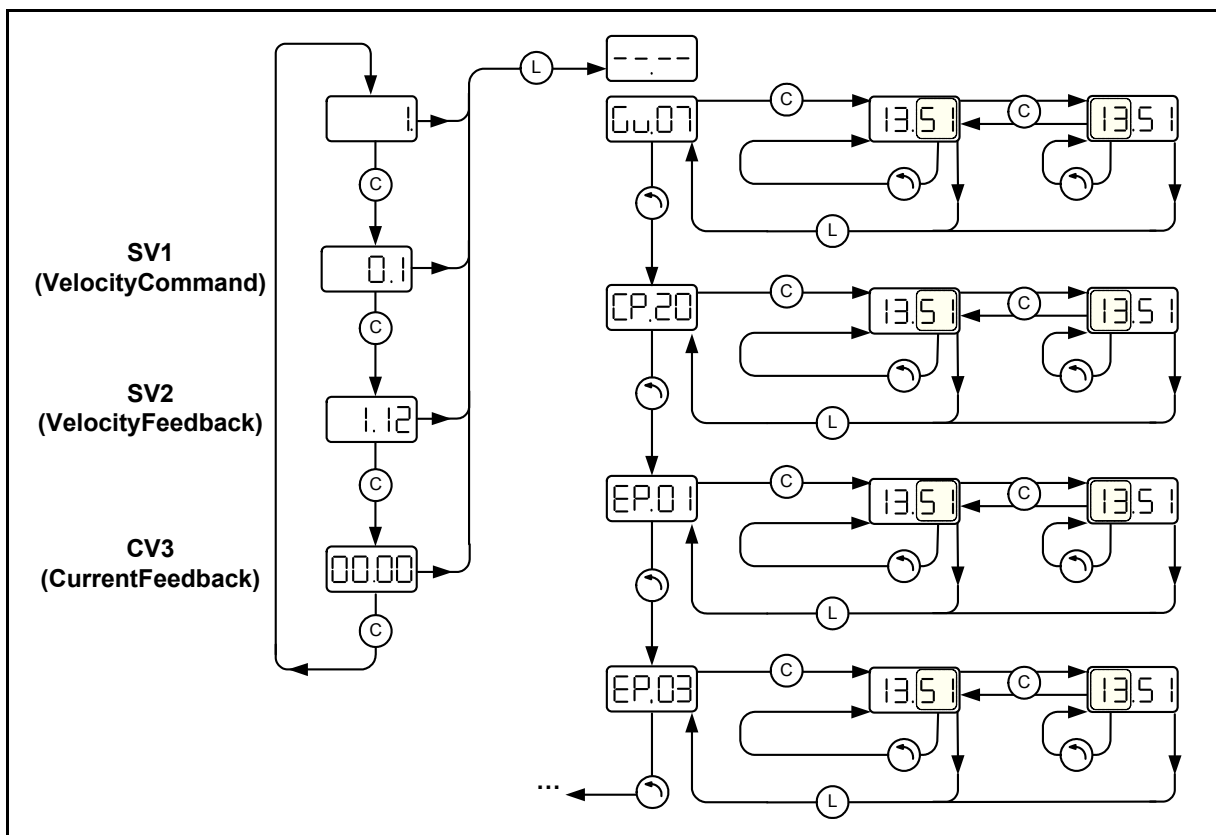
► **Counterclockwise** being possible to:

- To decrease its value.

The push-button may be pressed in two ways :

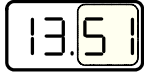
- Short push.
- Long push.

The following diagram shows the sequence to follow to display parameters, variables, commands; modify the value of a parameter, confirm its new value, ...

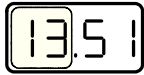


There are also a set of variables and certain commands of special characteristics whose meaning and sequences to follow are described in section “initialization and setup” in this manual.

Interpretation of the symbols used in some diagrams of this manual.



Blinking status of the two rightmost digits of the display.



Blinking status of the two leftmost digits of the display.



Long push on the programming module.

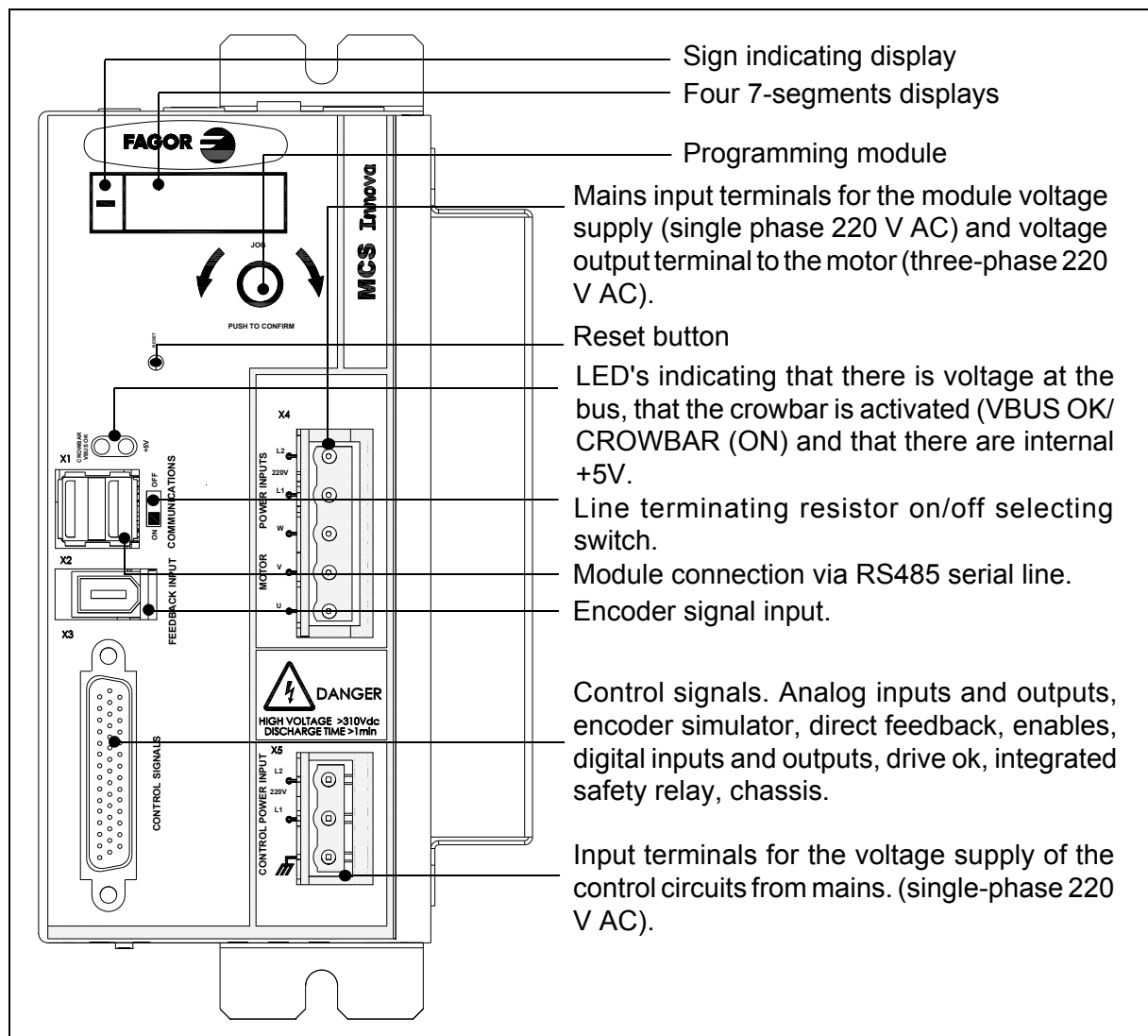


Short push on the programming module.

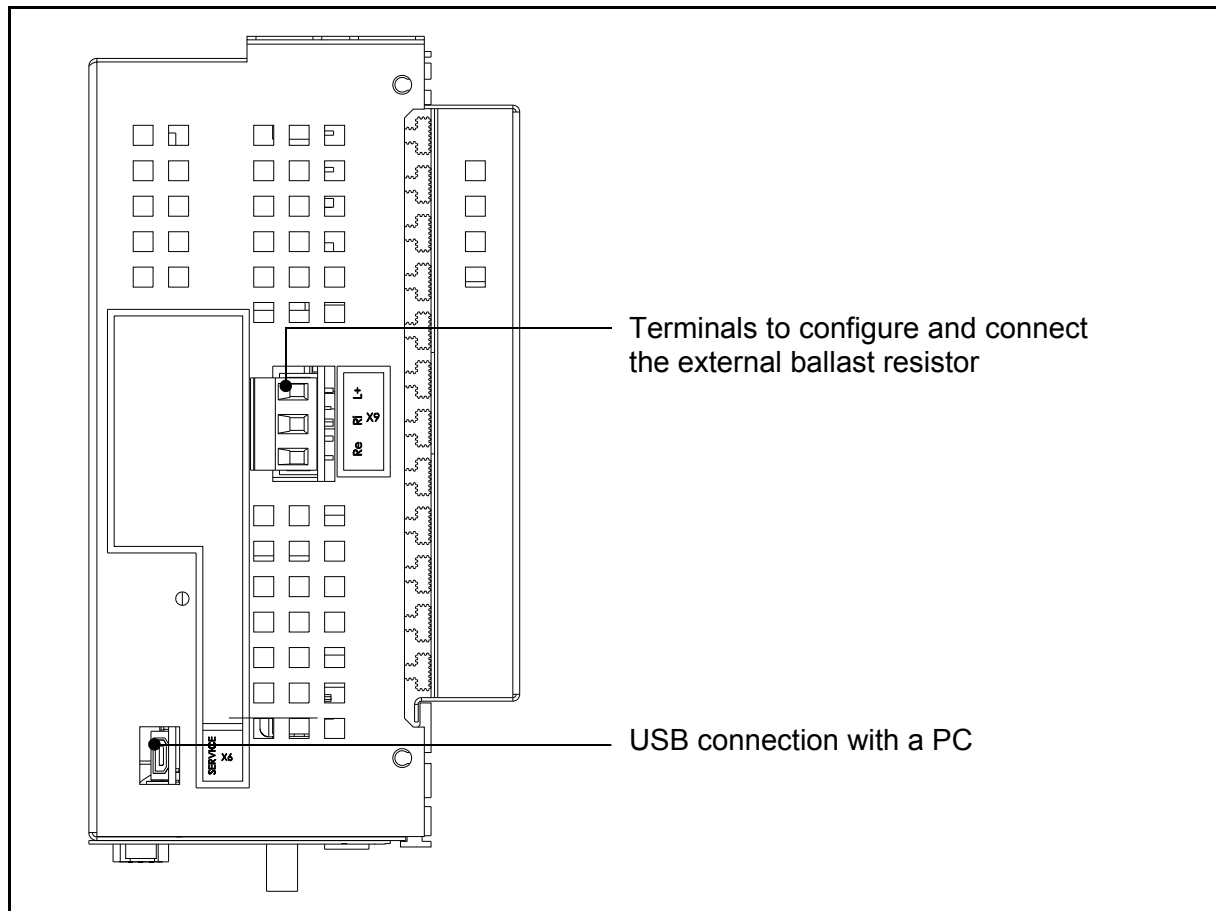


Rotary decoder on the programming module.

Front view



Top view



Pinout of the connectors

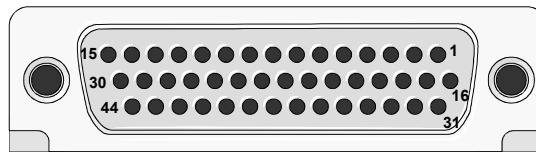
► **COMMUNICATIONS (X1)**

Pin	Signal	Description
A1, B1	N.C.	Not connected
A2, B2	TxD/RxD - (RS485)	TxD/RxD signal - (RS485)
A3, B3	TxD/RxD + (RS485)	TxD/RxD signal + (RS485)
A4, B4	N.C.	Not connected
	Chassis	Housing

► **FEEDBACK INPUT (X2)**

Pin	Signal	Description
1	+ 5 V	Voltage supply for the encoder
2	GND	Encoder voltage supply GND
3	+ BAT	+ Battery (with absolute encoder)
4	- BAT	- Battery (with absolute encoder)
5	+ 485	Encoder communication
6	- 485	Encoder communication
	Chassis	Connector housing

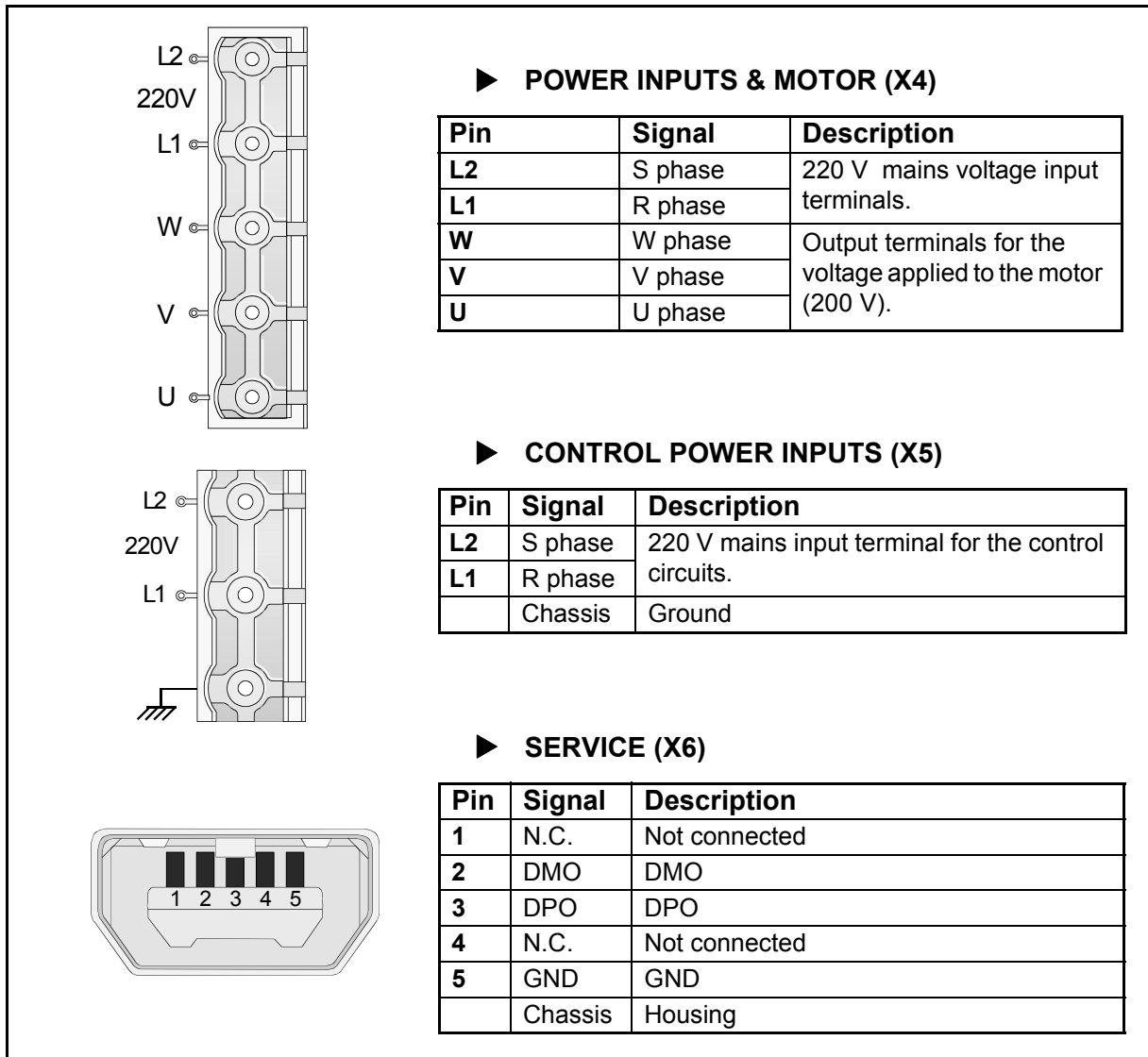
► CONTROL SIGNALS (X3)



Pin	Signal	I/O	Description	
2	ANALOG VELOCITY COMMAND INPUT	I	Input +	Range ± 10 V, impedance 56 k Ω
1			Input -	
18	PROG. ANALOG INPUT	I	Input +	Range ± 10 V, impedance 56 k Ω
17			Input -	
31	PROG. ANALOG OUTPUT	O	Programmable analog output 1	Range ± 10 V
32			Programmable analog output 2	
16			GND	
34	AUX. ± 12 V	O	+12 V (20 mA max) output	
33			-12 V (20 mA max) output	
19			GND	
43	AUX 24 V DC	O	+24 V DC (50 mA max) output	
44			GND AUX 24 V DC	
13	DRIVE ENABLE	I	DRIVE ENABLE input (range from 0 to 24V DC)	
15	SPEED ENABLE	I	SPEED ENABLE input (range from 0 to 24V DC)	
14	COMMON DRIVE	-	Common to inputs DRIVE ENABLE and SPEED ENABLE	
11	PROG. DIGIT. INPUT	I	Programmable digital input +	Range from 0 to 24 V DC
12			Common of the digital input -	
27	PROG. DIGIT. OUTPUT	O	Programmable digital output (collector)	100 mA max, 50 V DC
28			Programmable digital output (emitter)	
29	DRIVE OK	O	Open contact of the DRIVE OK signal	
30			(0.6 A - 125 V DC, 0,5 A - 110 V DC, 2 A - 30 V DC)	
22	ENCODER SIMUL. OUT	O	A + signal	Encoder simulator outputs. (range from 0 to 5 V)
7			A - signal	
24			B + signal	
8			B - signal	
37			Z + signal	
38			Z - signal	
23			GND	
6	AUXILIARY	I	A + signal	
5			A - signal	
21			B + signal	
36			B - signal	
20			Z + signal	
35			Z - signal	
4		O	+ 5 V. Supply for the direct feedback device (0.5 A max)	
3	Supply GND for the direct feedback device			
41	SAFETY RELAY	O	Second contact (N.C. normally closed) used as external acknowledgment	
42			of the status of the safety relay.	

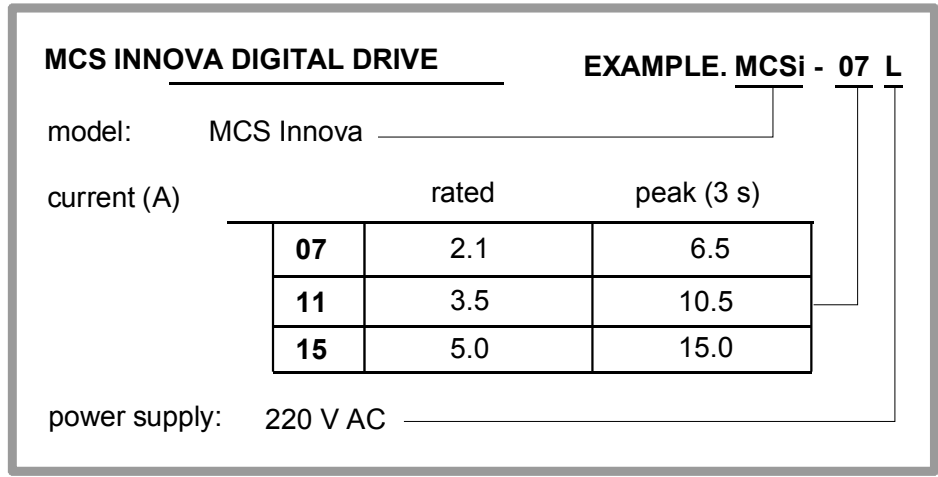
Pins 9, 10, 25, 26, 39 and 40 are N.C. (not connected).

The < I/O > column indicates whether it is an input signal (Input) or an output signal (Output) through the relevant pin at connector X3.



Sales model

Codes of the sales model of FAGOR MCS Innova drives.



INSTALLATION

General considerations

At the motor

Remove the anti-corrosion paint of the shaft before mounting them on to the machine.
The motor will admit flange mounts: IM B5 and IM V1.

Watch for the ambient conditions mentioned in the section on general characteristics and also:

- Mount it somewhere that is dry, clean and accesible for maintenance.

Note. Remember that the degree of protection is IP 55 (standard), shaft section excluded.

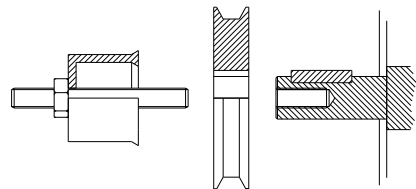
- It must be easily cooled.
- Avoid corrosive or flammable environments.
- Guard the motor with a cover if it is exposed to splashes.
- Use flexible coupling for direct transmission.
- Avoid radial and axial loads on the motor shaft.



MANDATORY.

DO NOT hit the shaft when installing transmission pulleys or gears!

Use some tool that is supported in the threaded hole on the shaft to insert the pulley or the gear.

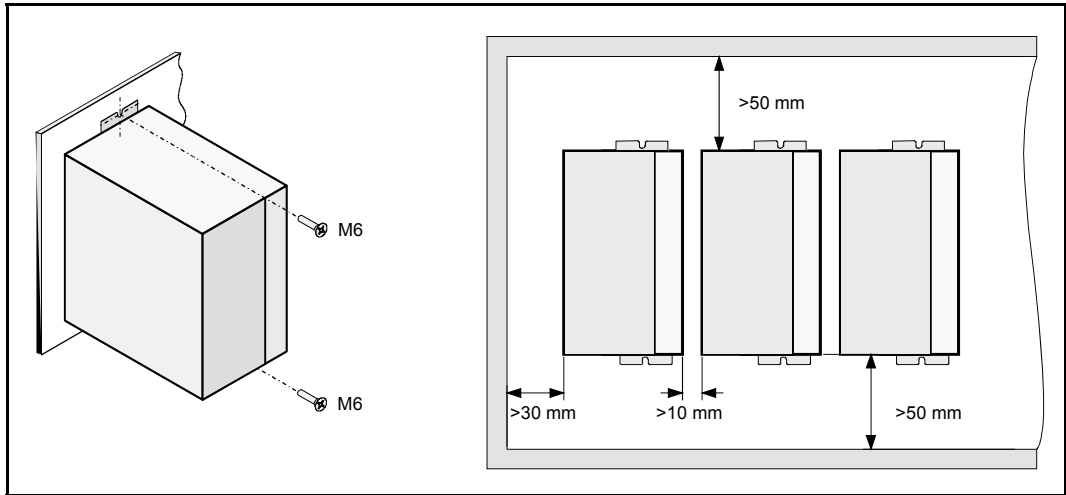


At the drive

The module must be installed in an electrical cabinet that is clean, dry, free of dust, oil and other pollutants.

Note. Remember that the degree of protection is IP 20.

Never install it exposing it to flammable gases. Avoid excessive heat and humidity. The ambient temperature must never exceed 45 °C (113 °F). Install the modules vertically, avoid vibrations and respect the gaps to allow air flow. See figure.



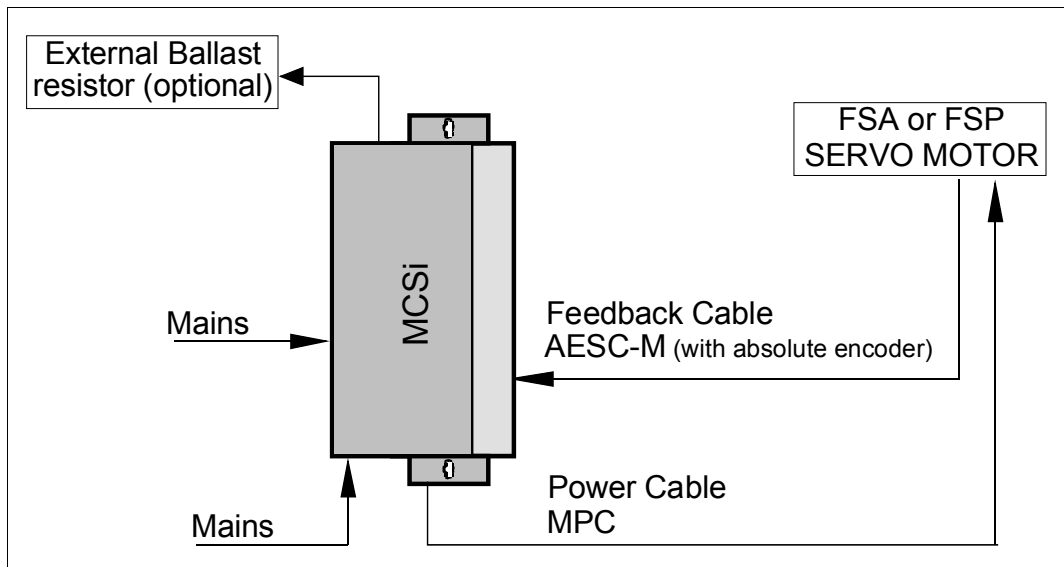
About the connection

All the cables must be shielded, to reduce the interference on the control of the motor due to the commutation of the PWM. The shield of the motor power cable must be connected to the chassis screw at the bottom of the module and it, in turn, taken to mains ground. The command signal lines must be shielded twisted pairs. The shield must be connected to the housing of connector X3.

Note. Keep the signal cables away from the power cables.

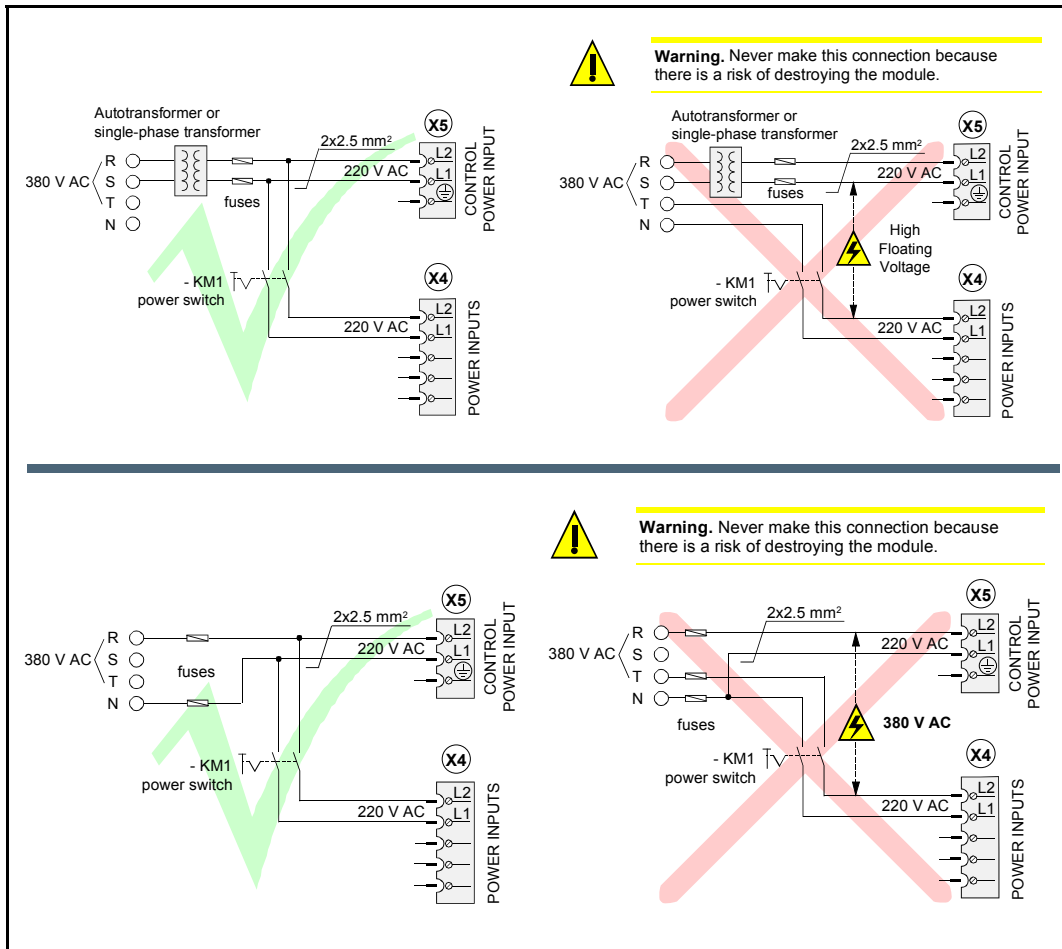
Electrical connections

Basic interconnection diagram



Power connection. Mains/drive

The drive voltage supply is single phase and does not require a transformer.



The table below shows the values recommended for the fuses shown in the previous figure. They are slow general purpose fuses. If they are installed on the Mains input lines, their maximum currents will depend on the value of the Mains voltage.

Model	Peak current (Arms)	Fuse (A)
MCSi 07L	6.5	16
MCSi 11L	10.5	16
MCSi 15L	15.0	25

Note. A thermal switch may optionally replace the fuses.

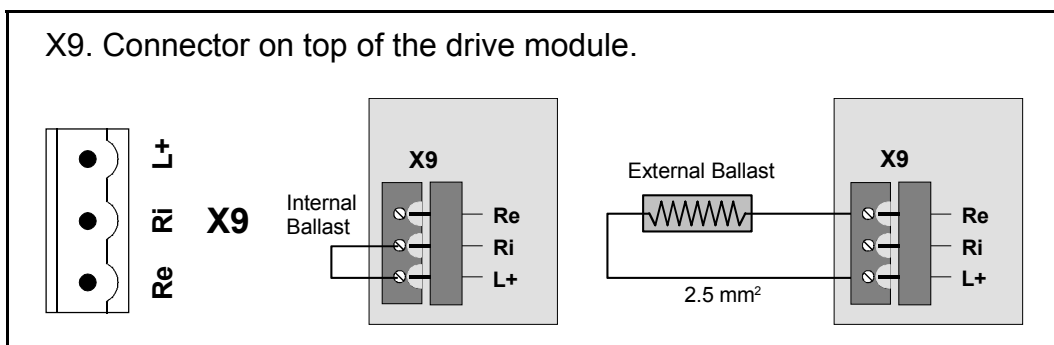
Power connection. External Ballast resistor

If the application requires a Ballast resistor with a power greater than the one indicated in this table according to model:

Model	Internal resistor Ri		Maximum power that may be	External resistor
MCSi 07L	-	-	-	Max. value 65 Ω Min. value 45 Ω
MCSi 11L	-	-	-	
MCSi 15L	45 Ω	60 W	15 W	

therefore:

- Remove the cable joining the terminals **Ri** and **L+**.
- Install the external resistor between the terminals **Re** and **L+**.
- Make sure that the resistance (Ohms) of the external ballast resistor is exactly the same as that of the internal resistor of that module. See the general characteristics table.
- Use KV41 to indicate to the drive that an external ballast resistor has been connected.



Inductance for reducing high frequency harmonics

It is recommended to connect an inductance at the input of one of the power phases **L1** or **L2** of the drive (connector X4) to reduce high frequency harmonics coming from mains with a value of 5 mH and and rms current of 6 Arms. This inductance reduces the disturbances in mains, but it does not ensure compliance with CE regulations. **Connect the inductance as shown in the figure.**

Mains filter to suppress electromagnetic interference

In order for the FAGOR DDS servo drive system to meet the European Directive on Electromagnetic Compatibility 2004/108/EC, the mains filter FAGOR FEHV-XXX must be inserted (see the table in the next section "connection") at the input of the MCSi (power phases **L1** and **L2** of connector X4) against electromagnetic interference.

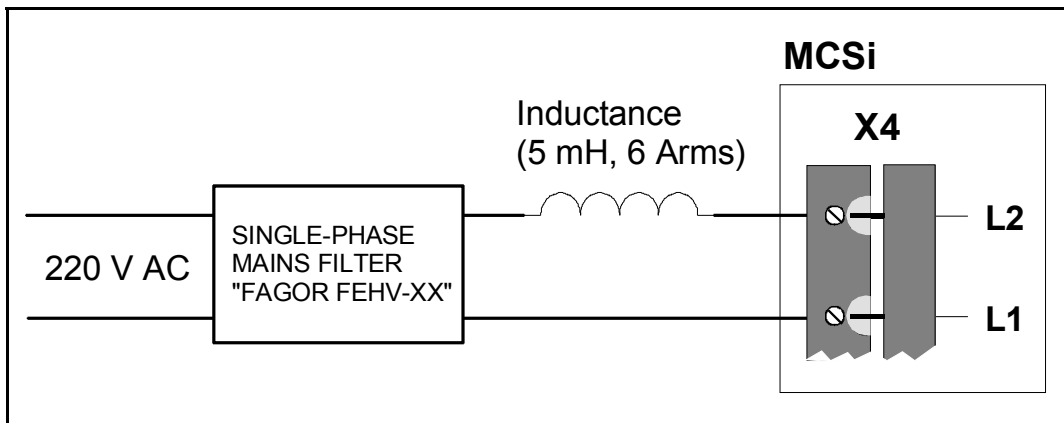
Connection

Install the proper filter that can handle the sum of the rated Arms currents of the MCSi drives installed in the system.

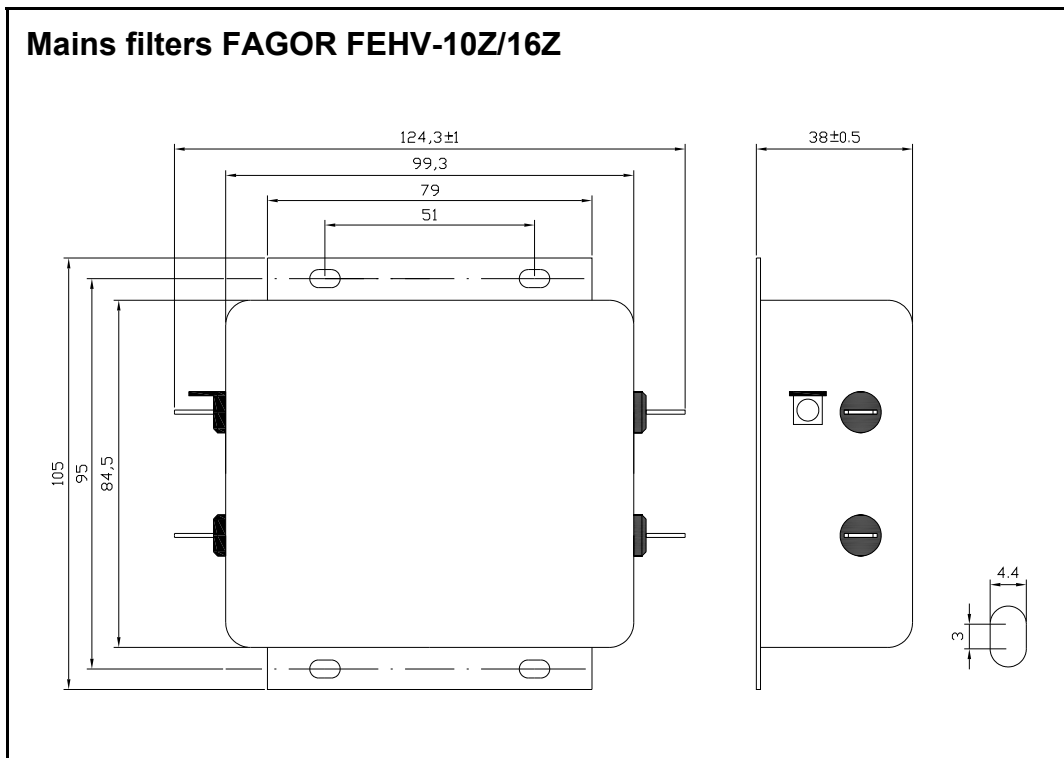
Mains filters	I _{max} (A)
FEHV-10Z	10
FEHV-16Z	16
FEHV-30B	30

Remember that the rated currents of the drives are 2.1 A for the MCSi 07L; 3.5 A for the MCSi 11L and 5 A for the MCSi 15L.

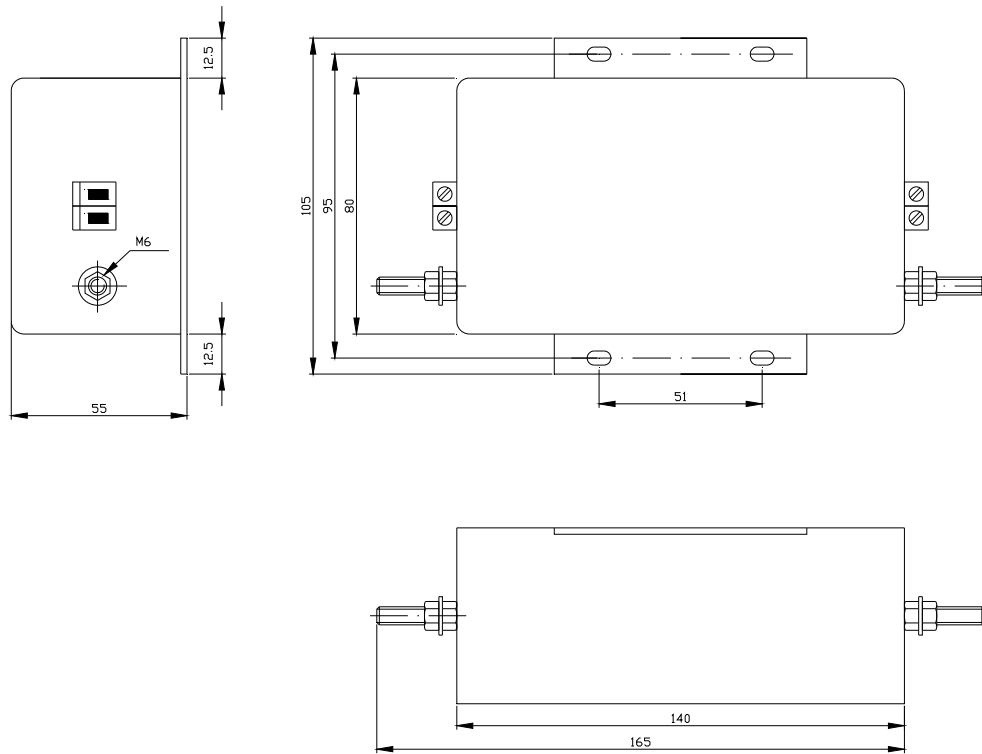
Connect the filter using 6.3 mm Faston terminals as shown in the figure.



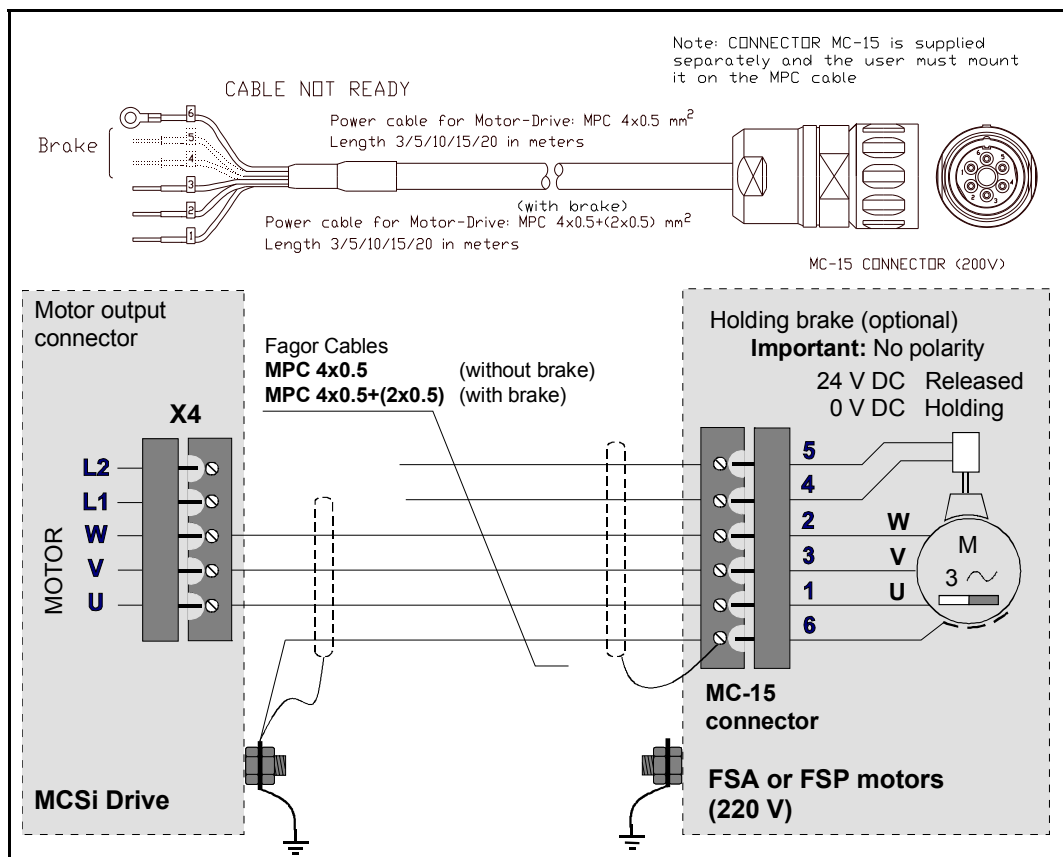
Dimensions



Mains filters FAGOR FEHV- 30B



Power connection. Drive/motor

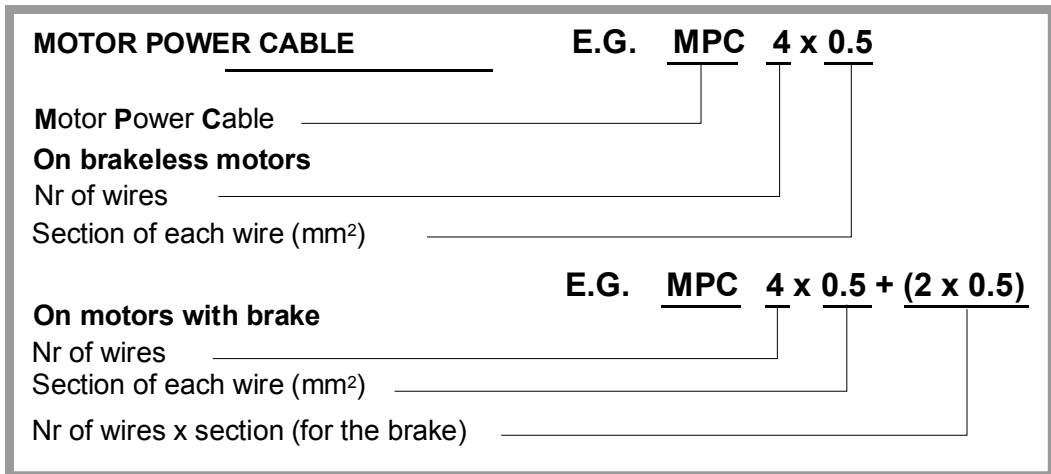


Power cables

If the motor does not have a brake	If the motor has a brake
MPC-4x0.5	MPC-4x0.5+(2x0.5)

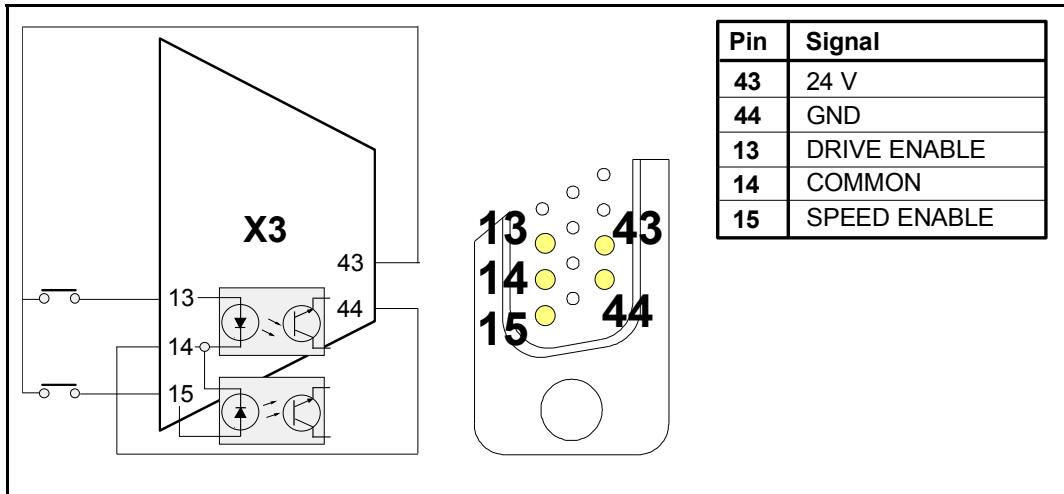
Note. The length of the MPC power cable must be specifically ordered (in meters).

Codes of the sales model of FAGOR power cables.

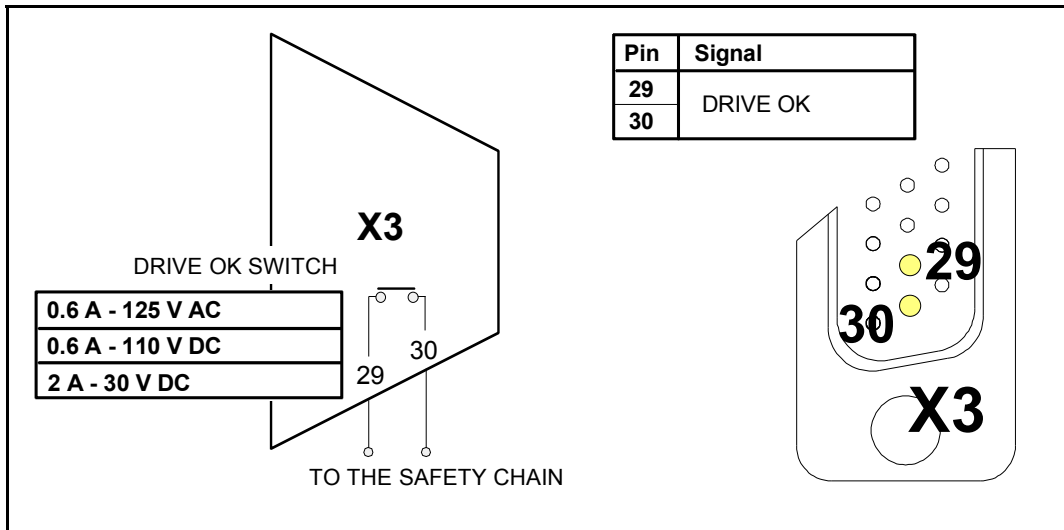


Connection of the monitoring and control signals

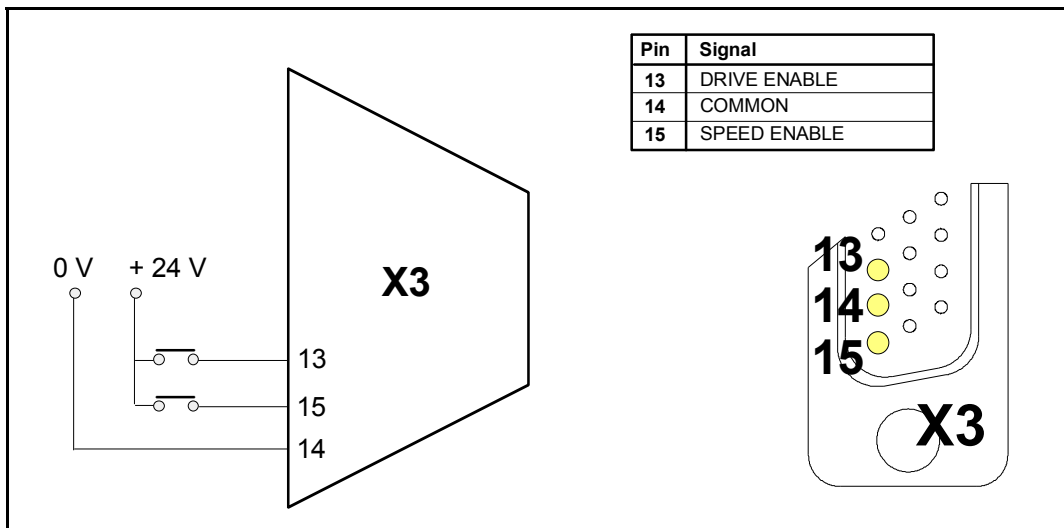
► Enable signals using 24 V



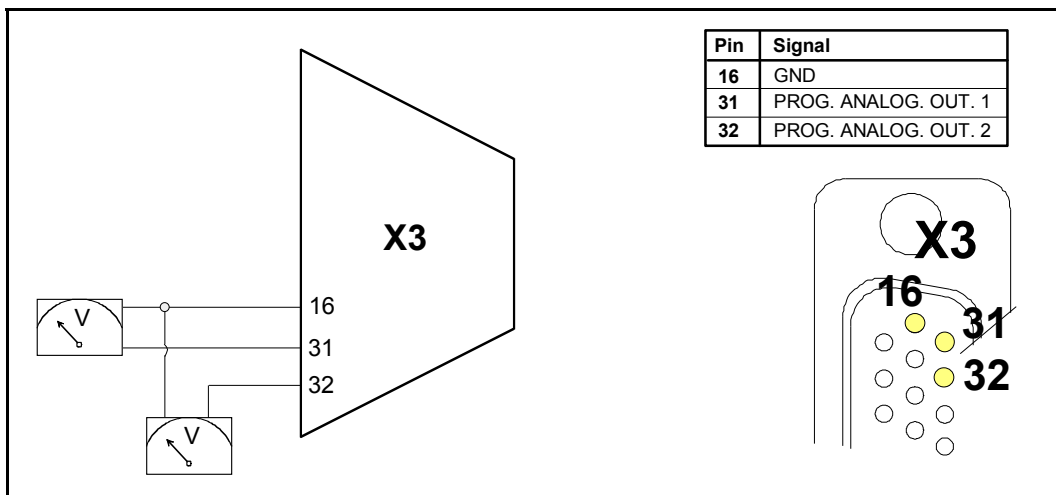
► Signal indicating that the Servodrive is running properly



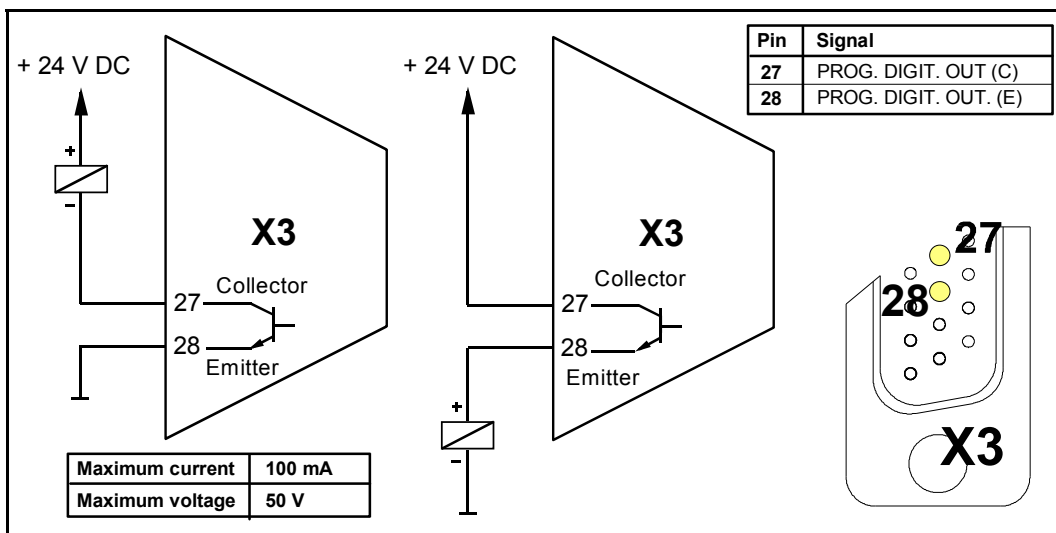
► Enable signals



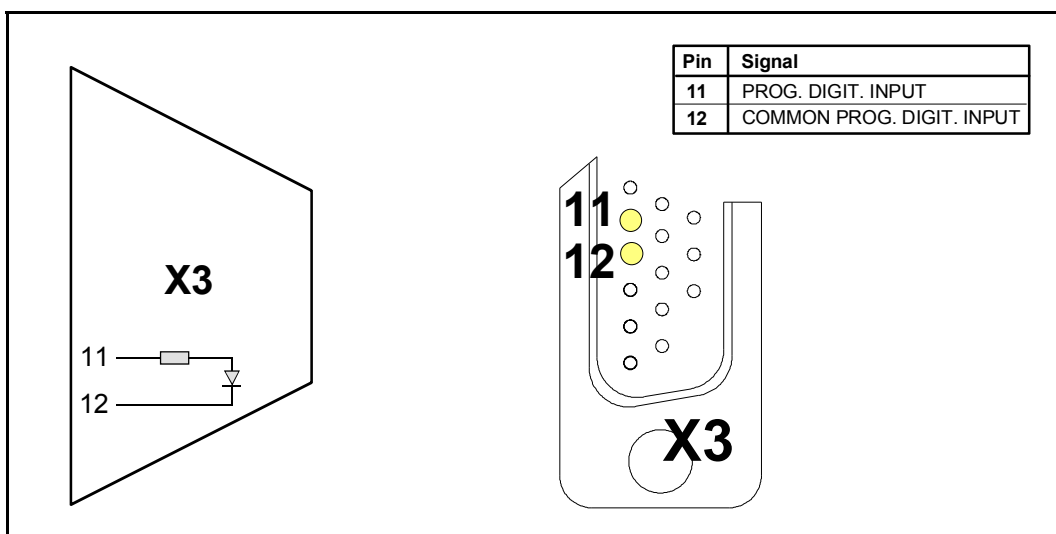
► Monitoring signals



► Programmable digital outputs



► Programmable digital input

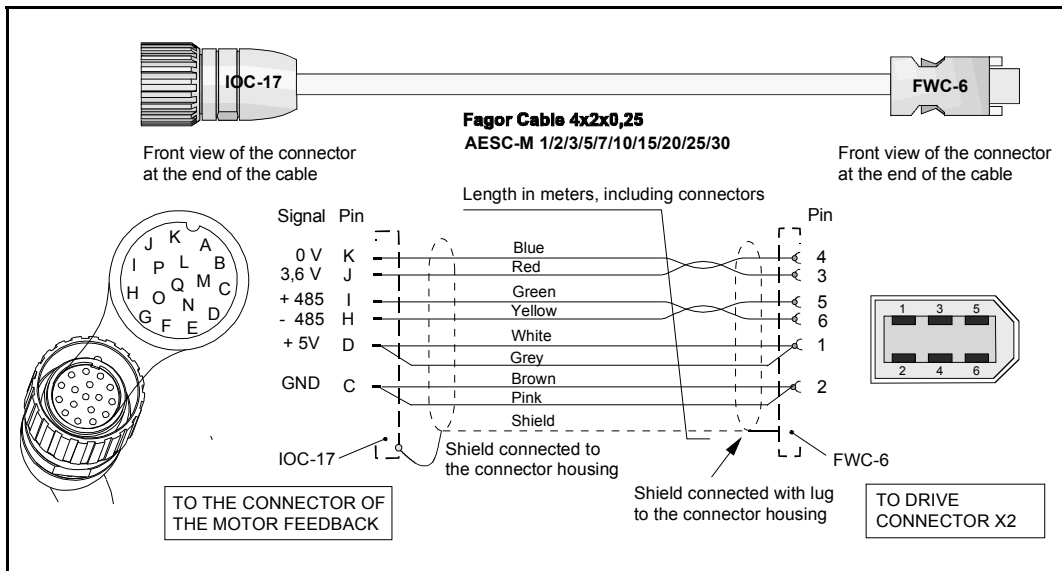


Encoder feedback connection

The signals generated by the encoder are taken to connector (X2) FEEDBACK INPUT of the MCSi drive. The MCS amplifies these signals and may divide their frequency. The division factor is given by the values of parameter EP1 and the sequence between A and B by parameter EP3. The MCPi drive outputs these signals through (X3) CONTROL SIGNALS. The encoder must be mounted on to the motor shaft and cannot be installed anywhere else in the transmission chain.

The motors may have use an incremental encoder J5 (13 bit) or an absolute encoder J7 (16 bit). But, when choosing an absolute encoder to use this characteristic, you must also obtain a battery with a mounting clip "Battery for Absolute Encoders in FS motor". The battery will not be necessary if you only wish to increase the resolution.

The connection cable is:



Sales model of the FAGOR feedback cable

The sales model of the feedback cable is AESC-M-□□ where the last two digits shown as "□□" indicate its length in meters. For example the AESC-M-3 is a 3 meter encoder cable. The available lengths are: 1, 2, 3, 5, 7, 10, 15, 20, 25 and 30 meters.

Remember that this encoder cable may be used both under static and dynamic work conditions.

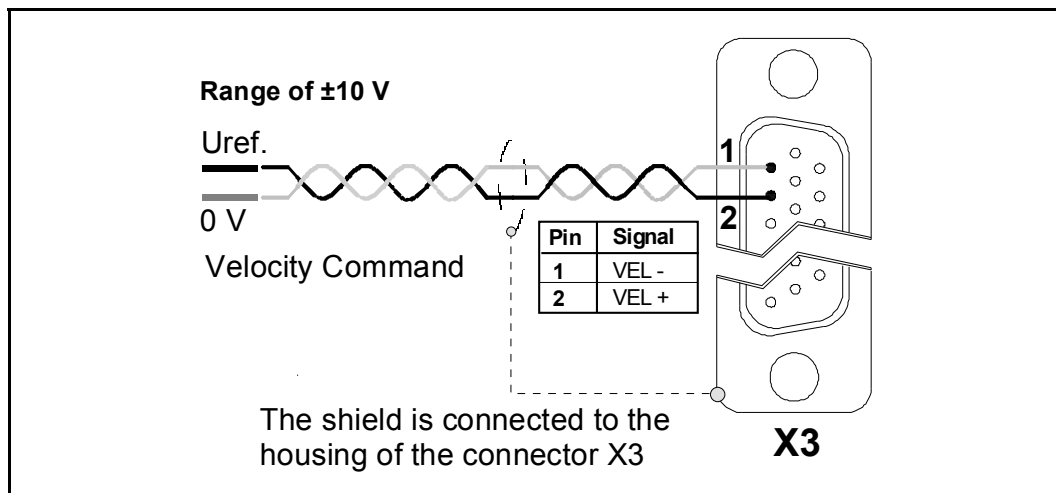
Sales model of FAGOR feedback extension cables

FAGOR also provides, upon request and in meters, the feedback cable (without connectors) with sales model **FSA/FSP encoder cable** up to 30 meters in case the user wants to make his own cable.

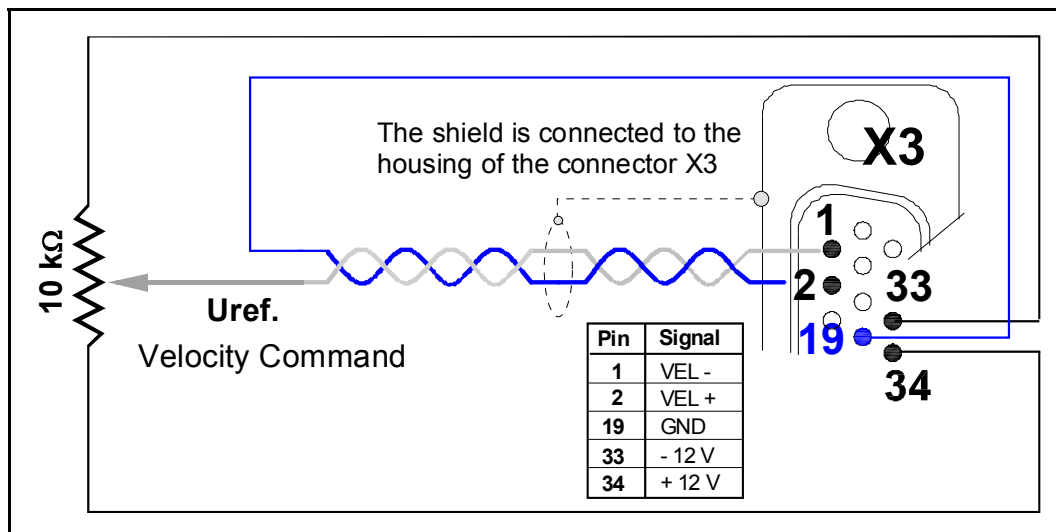
Analog command signal connection

The command governing the motor may be a velocity or current command. All the command signal lines must be shielded twisted pairs. The shield must be connected to the housing of the 44-pin connector X3 (control signals). The input impedance of the velocity command is 56 k Ω (a range ± 10 V).

► Differential velocity command input



► Generation of the inverted velocity command and application to the drive



Service port. USB line

Connecting a PC compatible computer with an MCS Innova drive via USB (Universal Serial Bus) makes it possible to set and monitor system variables facilitating its adjustment. The motor table may be updated through this line. The connection cable is a standard USB cable with a mini A or mini B type male connector at the drive side. The maximum length of the cable should not exceed 3 meters.

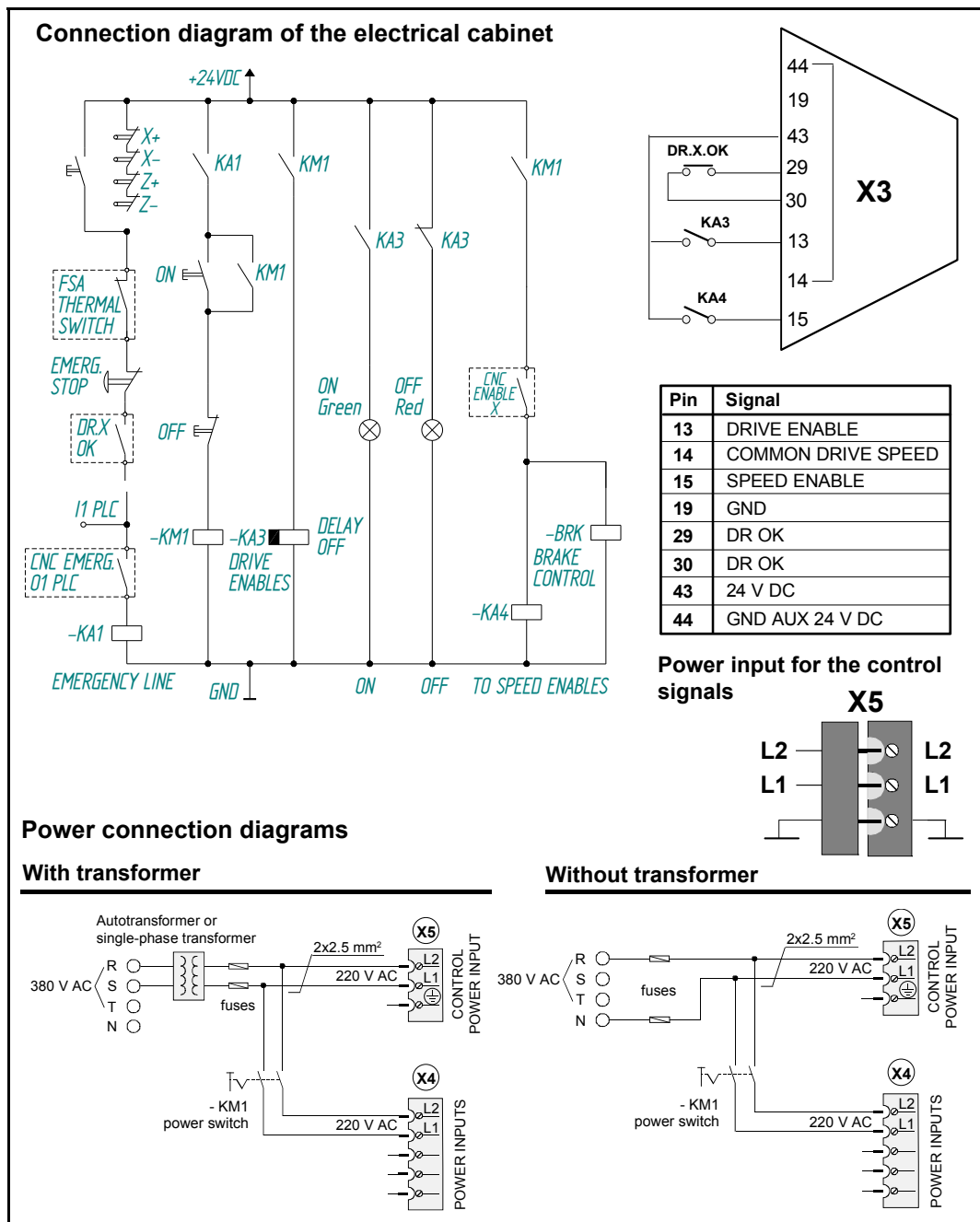
Diagram of the electrical cabinet

This is an orientative diagram for the installation of the electrical cabinet. This diagram may be modified according to the requirements of each application. It includes a simple circuit for the voltage supply of the brake of the servo motors. The use of fuses is a must.

Mains connection and maneuver diagram

The delayed disconnection of KA3 contacts is useful so:

- The Drive Enable stays active while the motor brakes at max. torque.
- the brake holds the motor after it has stopped.

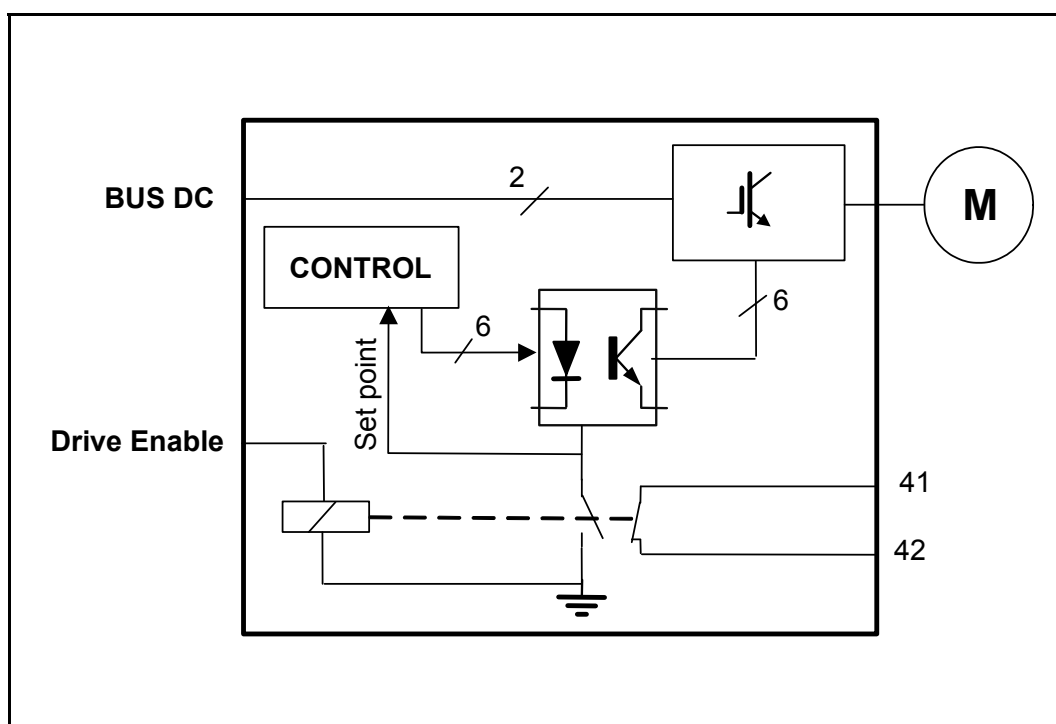


Safety Disable function

The **Safe Disable** function (**SD**) offered by FAGOR MCS Innova drives permits disabling the power output of the drive making sure that the motor torque is eliminated as a safe situation.

This function is available through the "Drive Enable" section so called in standard Fagor servo drive systems. Techniques and elements approved to be used in safety systems have been considered for its design and internal operation.

Thus, with a conventional drive (without SD), a contactor would have to be installed to assure a safe disable of the motor. However, using the safety techniques (implemented in FAGOR MCS Innova drives) guarantees the same or greater safety without having to use external contactors, thus saving material and room in the electrical cabinet.

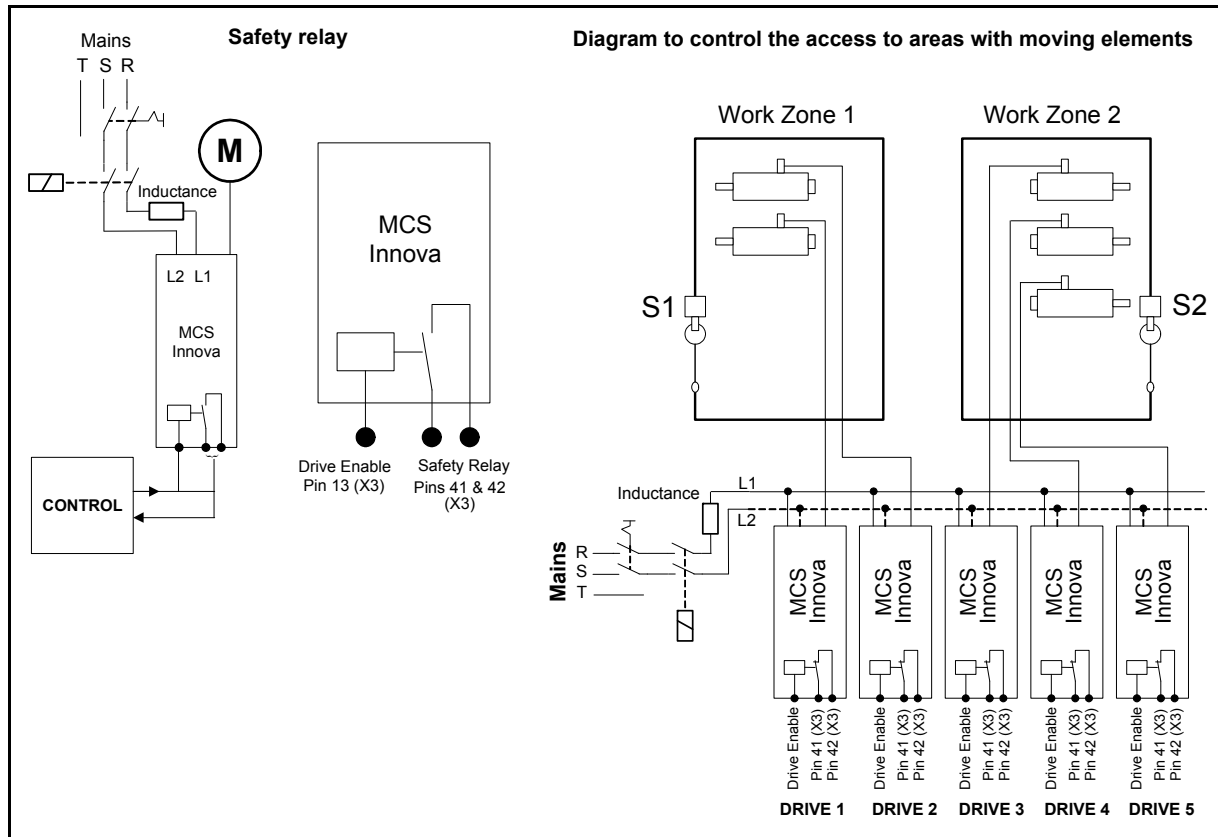


The "Drive Enable" pin already available on conventional FAGOR drives works the same way on drives with **Safe Disable** although it has been implemented keeping the safety principles and protocols in mind.

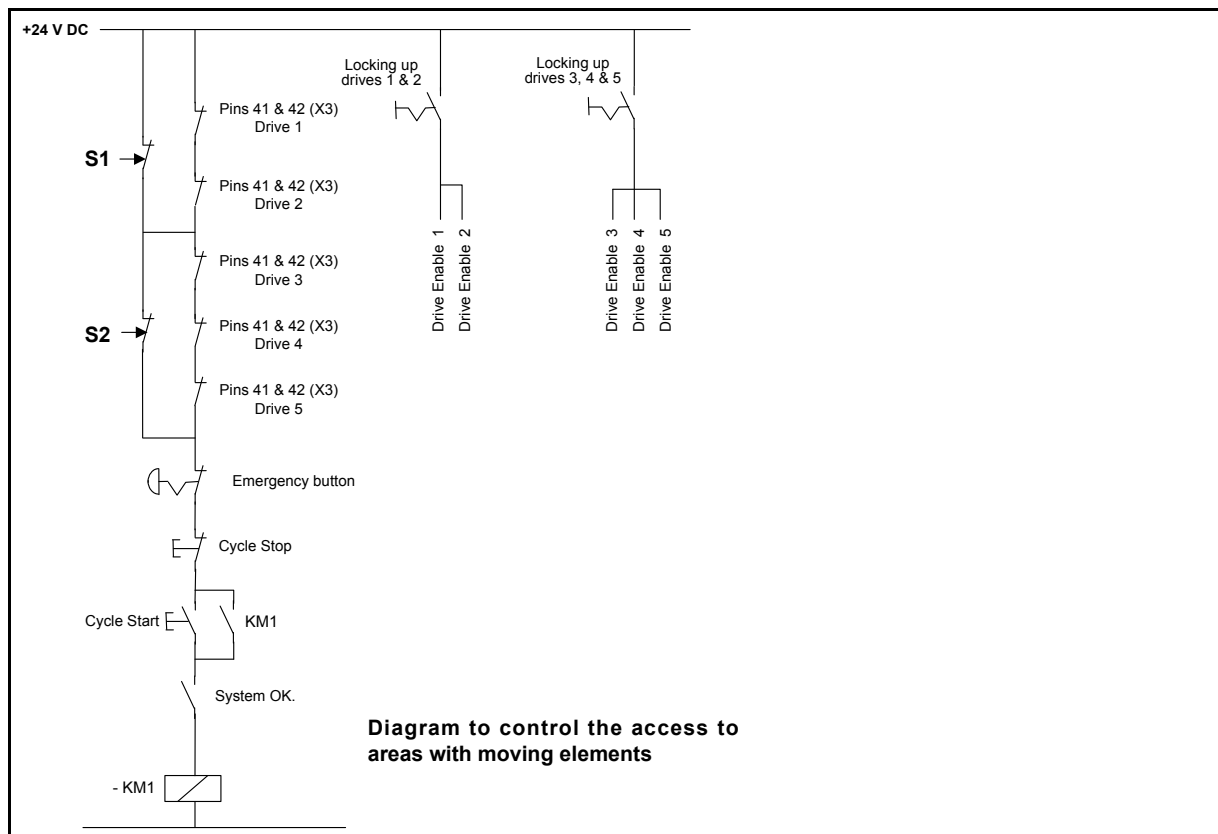
For that, a safety relay with guided contacts has been considered so:

- The first contact (N.O.) enables the power inverter and sets the control part to rest assuring a redundancy when locking up.
- The second contact (N.C.) is used as an external acknowledgement of the status of the safety relay. This contact is available between pins 41 and 42 of connector X3 located on the face of the module.

The following figure shows the diagram of the safe disable (**SD**) of an MCS Innova and as an example of application, a diagram to control the access to areas with moving elements:



The diagram to control the access to areas with moving elements is:



Initialization and adjustment

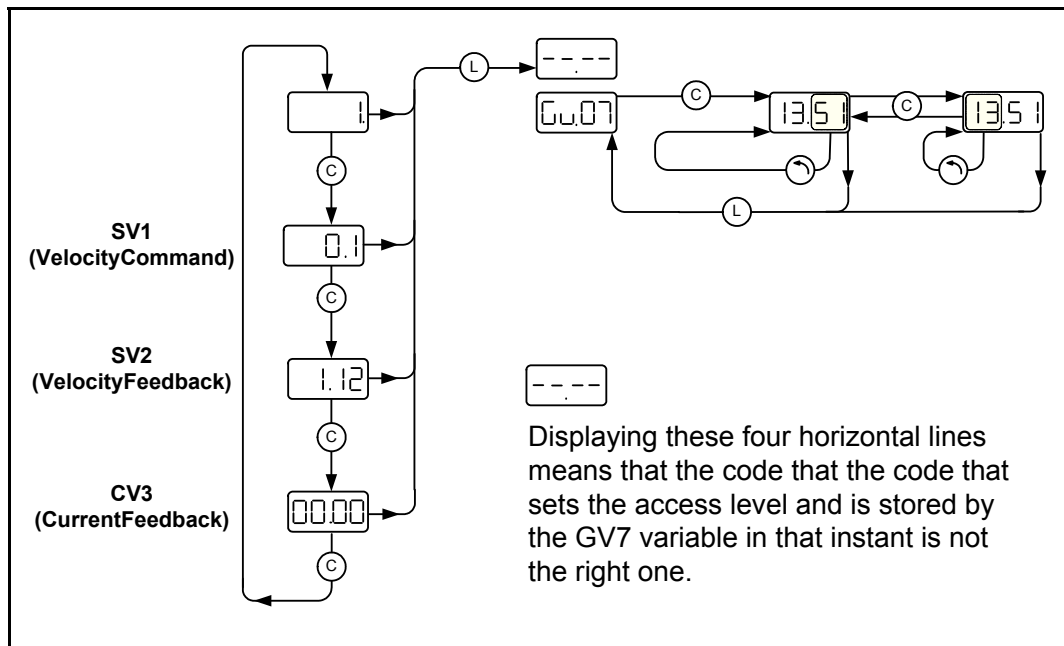
After starting the motor-drive system, the way the parameters, variables and commands will be displayed and edited will be determined by the access level: FAGOR level, user level or basic level restricting, depending on the level, the access to some or all of them.

This access level is determined by entering its corresponding code in the GV7 variable.

This way, with no access level, the following variables may be displayed in this order:

- SV1: VelocityCommand
- SV2: VelocityFeedback
- CV3: CurrentFeedback

To access the rest, access GV7 and browse through as shown below:

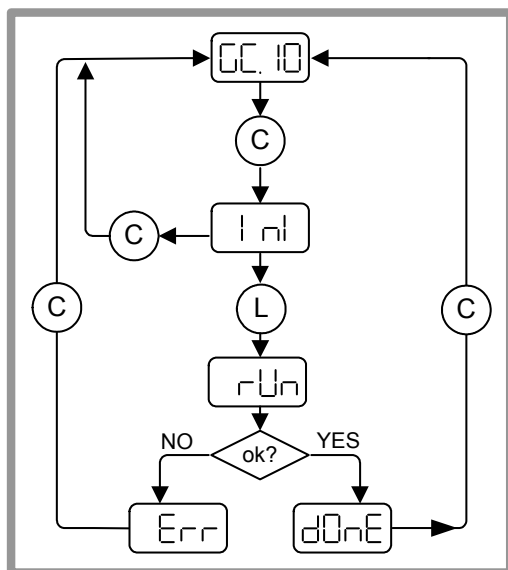


If the code is correct, all the parameters, variables and commands permitted by that level may be accessed by turning the rotary decoder. If it is not correct, it will display 4 horizontal lines and then the variable GV7 where the level code must be edited again.

On startup, the drive will look, in the memory of the digital feedback device integrated into the motor, for the information on the type of motor connected. If the motor recognized by the drive is different from the one it was governing up to that moment, it will automatically adjust the critical parameters related to the motor type.

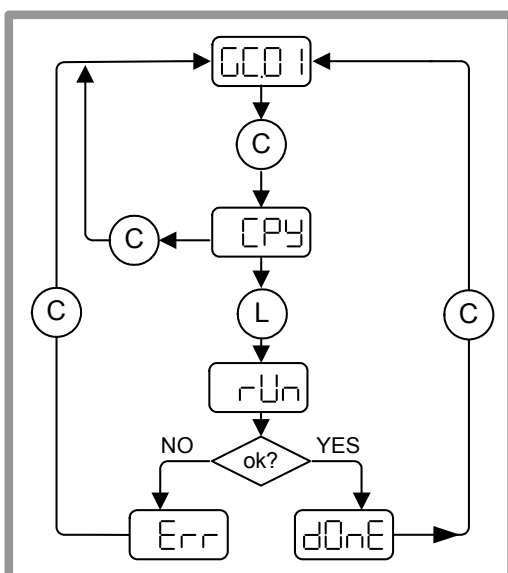
However, it is recommended to initialize it using the GC10 command every time a motor is changed in order to set the initial values (by default) of all the parameters of the drive verifying them with the selected motor.

Once the GC10 has been found (by turning the decoder until appears on the display) the sequence to follow is shown in the figure:



All that has been done so far is saved in the RAM memory of the drive, but not permanently.

When doing a reset, all these modifications will be ignored because on startup the drive restores the configuration stored in its E²PROM memory.



Therefore, to store all these modifications permanently, the information stored in RAM memory must be transferred into the E²PROM memory using the GC1 command.

Found by turning the switch until it appears on the display, the sequence to follow is the one indicated in this figure.

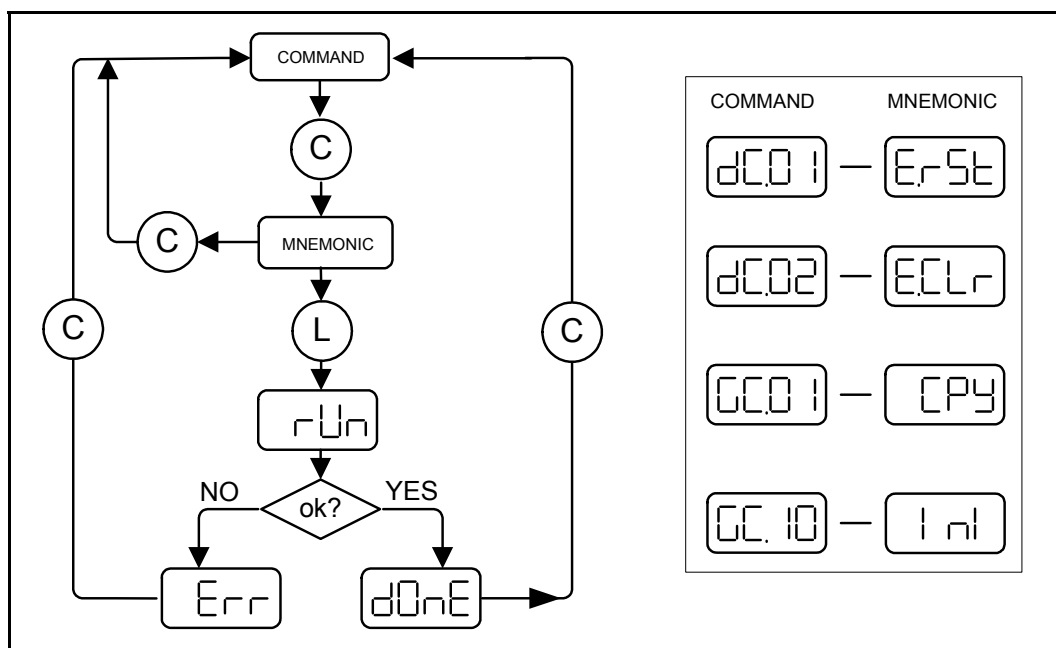
Besides these two commands whose sequences have been shown in the previous two figures, there are others that follow the same sequences but with the mnemonic of the functionality of the command itself; they may be displayed as shown in the figure later on:

After finding the command, use a short push to display its function mnemonic. A long push confirms its execution whereas a short push returns it to its initial state.

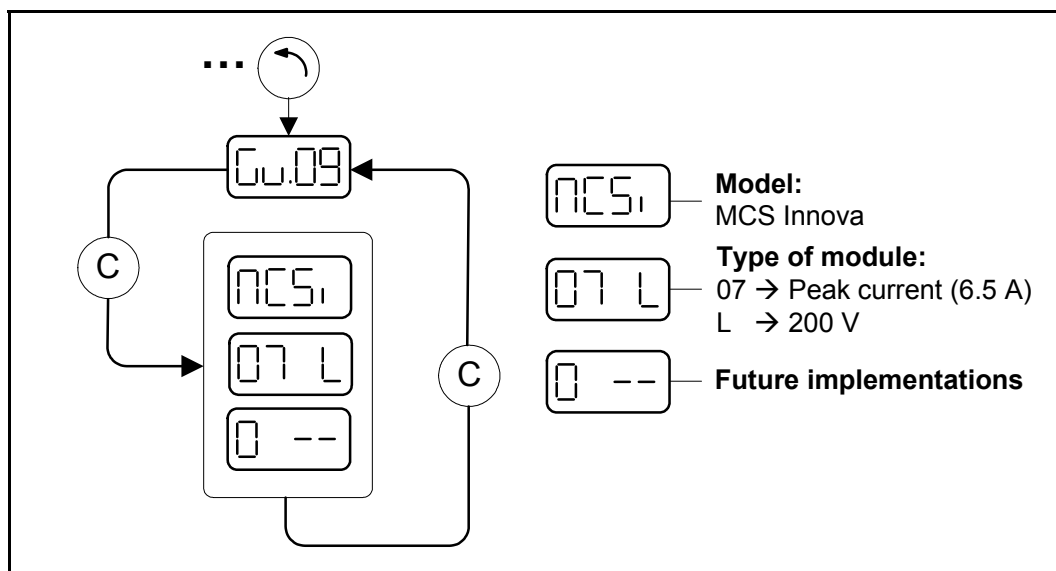
While executing the command, the display shows the word: **rUn** (it is not displayed in commands that are executed very fast).

If the command has been executed properly, the displays shows the word: **dOnE**. Otherwise, in case of an error, it displays the word: **Err**.

In any of these instances, a short push returns it to its initial state.



To obtain information on the type of drive (it can be read but not edited) find the GV9 variable and follow the indication of the figure below to display the different fields that show their characteristics:



If for any reason, the access level must be changed, display the GV7 variable and write the new code. Then, find GC1 until it appears on the display and execute the command as described earlier. Finish the procedure with a reset.

On the other hand, when adjusting it, proceed as follows:

- Verify that desired velocity or current command is selected. To do this, make sure that all the parameters involved (such as SP45, etc.) are properly set.
- When using external analog command, verify that it is output to the proper pins.

Note. When using an analog command, set parameters SP20 and SP21 properly to obtain the desired response to the velocity command entered.

- Use parameter CP20 to set the maximum peak current value of the drive to obtain the best dynamic response.
- Set the velocity PI gain using parameter SP1 (proportional gain K) and SP2 (integral K) until the desired system performance is obtained.
- Adjust the velocity offset using parameter SP30.
- Send a 0 V velocity command to the drive (jumping pins 1, 2 and 19 of connector X3).
- Measure the motor speed and adjust the offset using parameter SP30 until the motor stops. Be careful because this method only eliminates the offset of the drive. The CNC may have an offset of its own which must be adjusted at the CNC.

In order to adjust the offset for the whole control loop:

- Set the CNC in DRO mode keeping the Drive_Enable and Speed_Enable signals active.
- Change parameter SP30 until the motor stops.

Note. Another method would consist in setting an axis position with the CNC and adjusting parameter SP30 until the following error (axis lag) is symmetrical.

WinDDSSetup

It is a FAGOR application for PC. The operator can use the application's interface to read, modify, save to a PC file and download from a PC file all the parameters and variables of the drive and check the status of the motor-drive combination; thus making the final adjustment of the servo drive system easier, faster and more comfortable. This also makes it easier to manufacture many machines that have MCS Innova units.

When installing the WinDDSSetup, the USB drives are also installed. These drivers generate an additional virtual COM port to those already used by the PC and it will only be present when the unit is connected and is applied control or power voltage. This is why, the unit should be connected first and then run WinDDSSetup.

The first time the unit is connected to the PC, the operating system will show two messages indicating that “new hardware has been detected”.

Do the <default> installation, recommended by the system and ignore the message regarding the incompatibility tests of the software with the operating system Windows® XP that comes up during the installation process. Go on by pressing the <Continue> button. This message refers to the drives that have not been certified yet. However, they are fully functional.

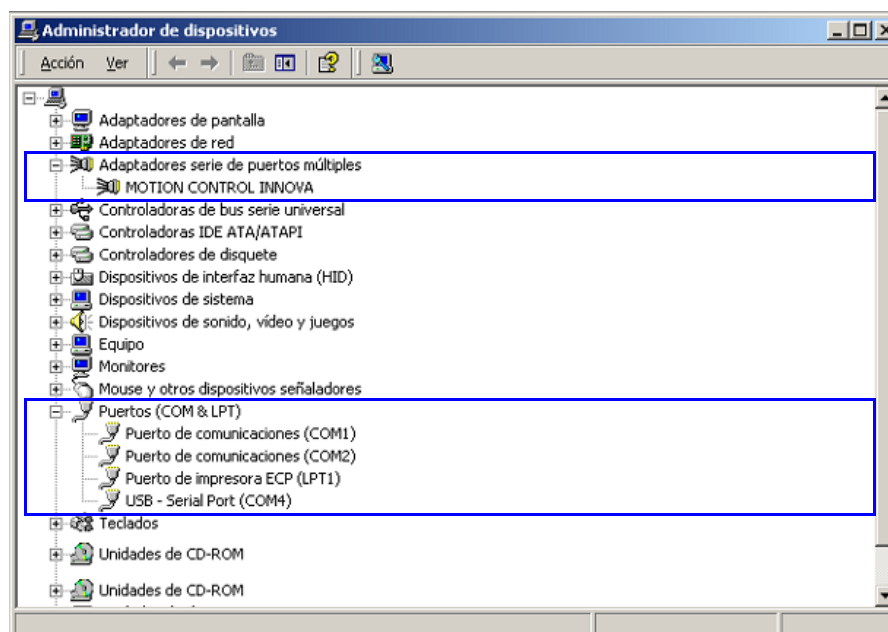
When starting the WinDDSSetup application, you must select the virtual COM port in order establish communication with the unit.

To obtain information on the generated COM port, proceed as follows:

- Click the right button of the mouse on the icon <My PC>.
- Select the <Properties> option and the <Hardware> label in the next popup window
- Select <Device administrator>.

The window will show them as:

- Multiple serial port adapters**, the reference MOTION CONTROL INNOVA
- Ports (COM & LPT)**, reference USB-Serial Port (COMx). The digit appearing in the x position refers to the new virtual COM port for the PC.



PARAMETERS, VARIABLES AND COMMANDS

NOTATION USED

[Group] [Type] [Index] where:

Group: Identifying character of the logic group to which the parameter or variable belongs.

There are the following groups of parameters:

GROUPS OF PARAMETERS, VARIABLES & COMMANDS			
Nr	FUNCTION	GROUP	LETTER
1	Control signals	Terminal box	B
2	Current control loop	Current.	C
3	Error diagnosis	Diagnosis	D
4	Encoder simulator	Encoder	E
5	General of the system	General	G
6	System hardware	Hardware	H
7	Analog and digital inputs	Inputs	I
8	Temperatures and voltages	Monitoring	K
9	Motor properties	Motor	M
10	Linear configuration	Linear axis	N
11	Analog and digital outputs	Outputs	O
12	System communication	Communication	Q
13	Velocity control loop	Speed:	S
14	Torque and power parameters	Torque	T
15	Internal function generator	Internal generator	W

Type: Character identifying the type of data which the information corresponds to. May be:

- A parameter** defining the system operation (P)
- A variable** that can be read and modified dynamically (V) or
- A command** that carries out a specific action (C).

Index: Character identifying the parameter or the variable within the group to which it belongs.

Definition examples

SP10	S group	(P) parameter	nr (10)
CV11	C group	(V) variable	nr (11)
GC1	G group	(C) command	nr (1)

Access level:

The access level is defined by the number following the ID: Thus:

- Fagor level
- User level
- Basic level

Examples of access levels

SP10 basic	▶	S group	(P) parameter	nr (10)	(basic) access level
CV11 Fagor, RO	▶	C group	(V) variable	nr (11)	(Fagor) access level (RO) read-only variable.

Modifiable variable:

Any modifiable variable, in other words, that can be read and written, will carry the (RW) label to identify it as such next to its access level. The (RO) label means that the variable is Read Only.

Examples of a modifiable variable

DV32 Fagor, RW	▶	D Group	(V) variable	nr (32)	(Fagor) access level (RW) read-write (modifiable) variable.
-----------------------	---	----------------	---------------------	----------------	--

B group. Non-programmable inputs-outputs

BV14 FAGOR, RO NotProgrammableIOs

bu.14

Function: Indicates the logic values of the electrical control signals of the drive. 24 V at the electrical input mean a logic 1 at the bits of this variable.

bit	function
15, ..., 4	Reserved
3	Programmable input Pins 11-12 of terminal strip X3 Default value (IP14=4), error reset
2	Drive_OK output Pins 29 -30 of terminal strip X3
1	Speed_Enable input Pin 15 of terminal strip X3
0	Drive_Enable input Pin 13 of terminal strip X3

C group. Current

CP1 FAGOR, RW CurrentProportionalGain

CP.01

Function: Value of the proportional action of the current PI.

Valid values: 0, ..., 999.

Default value: Depends on the motor-drive combination.

CP2 FAGOR, RW CurrentIntegralTime

CP.02

Function: Value of the integral action of the current PI.

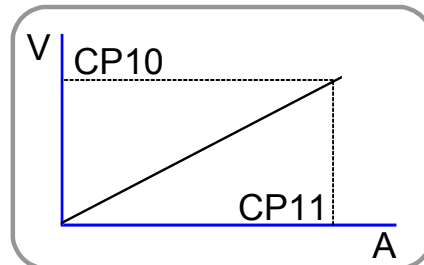
Valid values: 0, ..., 999.

Default value: Depends on the motor-drive combination.

CP10 USER, RW VoltageAmpVolt

CP.10

Function: Parameters CP10 and CP11 define the relationship between the voltage of the analog input IV2 and the current that this input generates in IV3.



Valid values: 1.000, ..., 9.999 V.

Default value: 9.500 V.

CP11 USER, RW AmpAmpVolt

CP.11

Function: See parameter CP10.

Valid values: 1.00, ..., 50.00 A. Depends on the connected drive.

Default value: MP3. Rated motor current (in amperes).

CP20 BASIC, RW CurrentLimit

CP.20

Function: Limit of the current command that reaches the system's current loop.

Valid values: 0.00, ..., 50.00 Arms. CP20 must never exceed the smallest value given by the peak current of the motor (5 x MP3) and of the drive.

Default value: CP20 takes the lowest value of the ones given by the motor and drive peak currents.

CP30 FAGOR, RW CurrentCommandFilter1Type

CP.30

Function: Parameter in charge of enabling / disabling the current filter.

Valid values:

value	function
1	It enables the filter (by default)
0	Disables the filter

CP31 FAGOR, RW CurrentCommandFilter1Frequency**CP31**

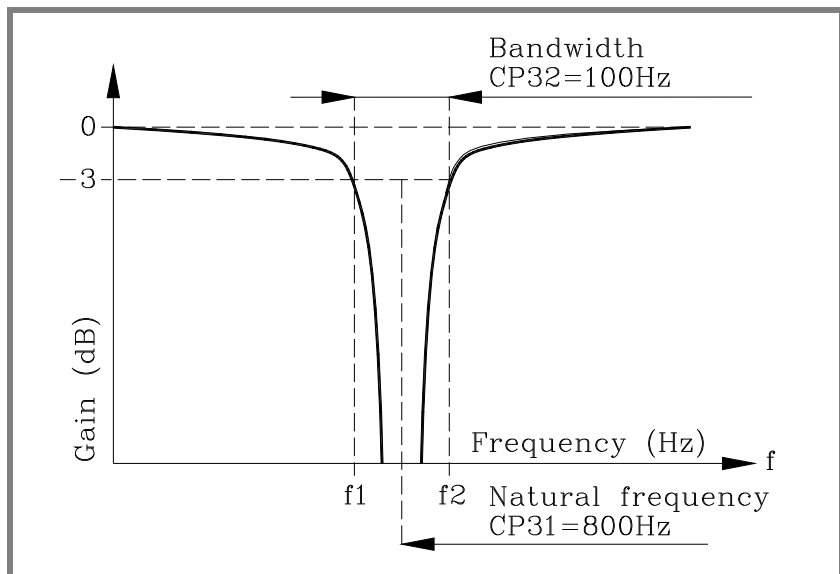
Function: Sets the natural frequency in Hz of a notch filter that acts upon the current command.

Valid values: 0, ..., 4 000.

Default value: 0.

CP32 FAGOR, RW CurrentCommandFilter1Damping**CP32**

Function: Sets the bandwidth in Hz of a notch filter that acts upon the current command.



Valid values: 0, ..., 1 000.

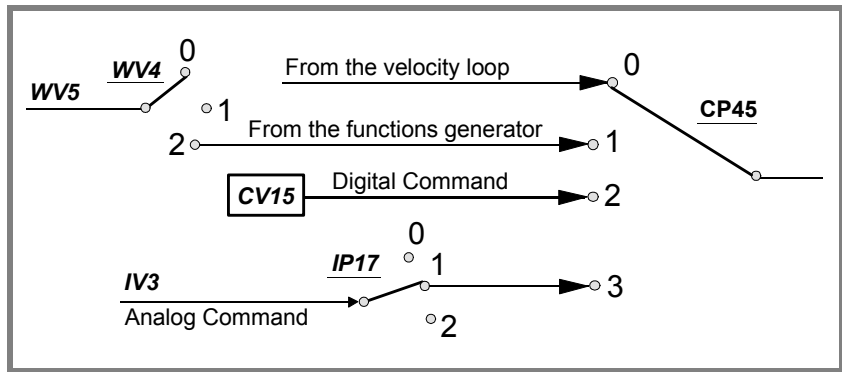
Default value: 0.

CP45 USER, RW CurrentCommandSelector**CP45**

Function: This parameter is used to determine the command source of the current loop.

Valid values: 0, 1, 2 and 3.

value	function
0	Normal operation. The current command comes from the velocity loop.
1	Reserved.
2	Digital. Value of CV15 that can be modified through the serial line.
3	External analog. It applies the value of the external auxiliary input (pins 17 and 18 of connector X3) after being treated, IV3, if IP17 has the right value (IP17 = 1).



Default value: 0.

CV1	USER, RO	Current1Feedback	
------------	-----------------	-------------------------	--

Function: Display the value of the feedback of the current going through phase V.

Valid values: - 50, ...+ 50 A (instant values).

Default value: 0.

CV2	USER, RO	Current2Feedback	
------------	-----------------	-------------------------	--

Function: Display the value of the feedback of the current going through phase W.

Valid values: - 50, ...+ 50 A (instant values).

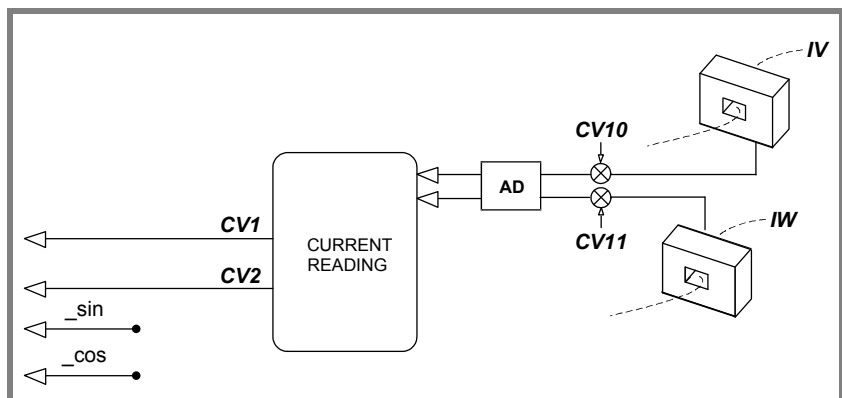
Default value: 0.

CV3	USER, RO	CurrentFeedback	
------------	-----------------	------------------------	--

Function: Display the rms current circulating through the motor.

Valid values: 0, ..., 50 Arms (rms values).

Default value: 0.



CV10 FAGOR, RO Current1Offset

CU.10

Function: Value of the automatic compensation of the current feedback offset of phase V.

Valid values: - 2 000, ..., + 2 000 mA (depends on the connected drive).

Default value: 0.

CV11 FAGOR, RO Current2Offset

CU.11

Function: Value of the automatic compensation of the current feedback offset of phase W.

Valid values: - 2 000, ..., + 2 000 mA (depends on the connected drive).

Default value: 0.

CV15 USER, RW DigitalCurrentCommand

CU.15

Function: This variable registers the value of the digital current command.

Valid values: - 50.00, ..., + 50.00 Arms.

Default value: 0.00 Arms.

D group. Diagnosis

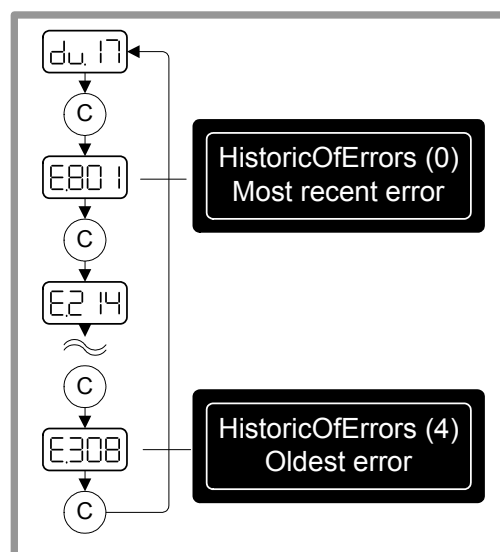
DV17 USER, RO HistoricOfErrors

du.17

Function:

5-word register containing the numbers of the last 5 errors occurred in the drive module.

The programming module can display each one of these 5 errors one by one using short pushes from the most recent to the oldest.



DV31 FAGOR, RO DriveStatusWord

Function:

The DV31 variable contains a numerical data coded into 16 binary bits and represents the system status as shown by the attached table. Bits (from the most to the least significant).

bit	function
15, 14	Power & Torque Status. (0,0) DoingInternalTest (DRVSTS_INITIALIZATING) (0,1) ReadyForPower (DRVSTS_LBUS) (1,0) PowerOn (DRSTS_POWER_ON) (1,1) TorqueOn (DRSTS_TORQUE_ON).
13	Error bit
12	Warning
11	OperationStatusChangeBit
10...7	Reserved
6	ReferenceMarkerPulseRegistered
5	ChangeCommandsBit
4...1	Reserved
0	DriveStatusWordToggleBit

DV32 FAGOR, RW MasterControlWord

Function:

The DV32 variable contains a numerical data coded into 16 binary bits and represents the control signals that act upon the drive through the serial line.

bit	function
15	Speed Enable
14	Drive Enable
13...7	Reserved
6	Homing Enable
5...1	Reserved
0	MasterControlWordToggleBit

DC1 USER, RW ResetClassDiagnostics

Function:

Reset of the unit's errors. When an error occurs, this command may be used to reset it and restart the unit by first updating the error bit of DV31, DriveStatusWord, and then setting the drive in the ReadyForPower state. Note its difference with the unit's reset because the action carried out by this command **keeps the RAM memory intact** and therefore the parameter settings of the unit.

DC2 **USER, RW** **ResetHistoricOfErrors**



Function: Reset of the DV17 variable HistoricOfErrors (array). This command sets it to 0.

E group. Encoder simulator

EP1 **BASIC, RW** **EncoderSimulatorPulsesPerTurn**



Function: Number of pulses generated by the encoder simulator per rotor revolution.

Valid values: 1, ..., Number of pulses of the selected feedback.

Default value: Number of pulses of the selected feedback device.

EP3 **BASIC, RW** **EncoderSimulatorDirection**



Function: Selection of the turning direction of the simulated encoder.

Valid values: 0/1, clockwise (by default) / counterclockwise.

G group. General

GP3 **BASIC, RW** **StoppingTimeout**



Function: After deactivating the Speed_Enable and after the GP3 time has elapsed, if the motor has not stopped, it cancels the torque automatically and issues error E.004. If the motor stops within the GP3 time, it also cancels the torque but does not issue an error. To make this time infinite (never generating error E.004), set this parameter to "0".

Valid values: 1, ..., 9 999 ms, 0 (infinite).

Default value: 500 ms.

GP5 **BASIC, RO** **ParameterVersion**



Function: This parameter represents the version of the parameter table that has been loaded at the drive.

GP9	BASIC, RW	DriveOffDelayTime	
------------	------------------	--------------------------	---

Function: After the motor has stopped because the Speed_Enable function has been disabled, the cancellation of the the Drive_Enable function (that implies PWM-OFF) is delayed by a time period indicated by GP9. It is useful on axes not compensated with a holding brake. To make this time period infinite, set it to 0 and to remove it, set it to 1.

Valid values: 1, ..., 9 999 ms, 0 (infinite).

Default value: 50 ms.

GP11	USER, RW	IOFunctionsTime	
-------------	-----------------	------------------------	---

Function: Value of the time used in functions OutFunc1 & OutFunc2.

Valid values: 0, ..., 9 999 ms.

Default value: 2 000 ms.

GV2	BASIC, RO	ManufacturerVersion	
------------	------------------	----------------------------	--

Function: Displays the software version in use.

GV5	BASIC, RO	CodeChecksum	
------------	------------------	---------------------	---

Function: It registers the checksum value of the software version loaded at the drive.

Valid values: - 32 768, ..., 32 767 (although the programming module can only display the 4 least significant digits).
Ej: If GV5 = 27 234, the display of the programming module shows 7 234.

GV7	BASIC, RW	Password	
------------	------------------	-----------------	---

Function: Variable where the password is entered to change the access level. The system will change the access level corresponding to the password entered.

Valid values: 0, ..., 9 999.

Default value: 0.

GV9	BASIC, RO	DriveType	
------------	------------------	------------------	---

Function: This variable informs of the drive's sales models. See section **initialization and adjustment** in this manual.

GV11 BASIC, RW SoftReset

GV.11

Function: Variable that resets the unit by software.
Valid values: 0 and 1 (with 1, it resets the unit).
Default value: 0.

GV16 USER, RO MotorTableVersion

GV.16

Function: Version of the motor table.

GV75 FAGOR, RO ErrorList

GV.75

Function: List of the error numbers active in the unit.
Valid values: 0, ..., 999.
Default value: 0.

GC1 BASIC, RW BackupWorkingMemoryCommand

GC.01

Function: Command to execute the parameter transfer from RAM to E²PROM.

GC10 BASIC, RW LoadDefaultsCommand

GC.10

Function: Command to initialize parameters. This command loads the default parameters of the drive for the motor whose ID is stored in parameter MP1.

See section “**initialization and adjustment**” in this manual.

H group. Hardware

HV5 BASIC, RO PLDVersion

HV.05

Function: Software version installed in the unit's PLD's.

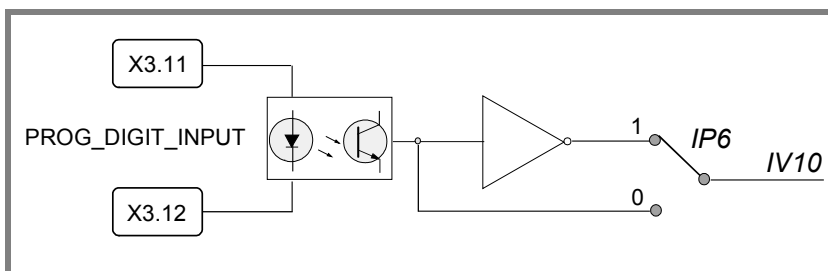
I group. Inputs

IP6	USER, RW	DigitalInputPolarity	P.06
------------	-----------------	-----------------------------	-------------

Function: Sets the polarity (inverted or not inverted) of the programmable input (pins 11 and 12 of X3).

Valid values: **0** Not inverted.
1 Inverted.

Default value: **0** Not inverted.



IP14	USER, RW	DigitalInputFunctionSelector	P.14
-------------	-----------------	-------------------------------------	-------------

Function: Determines the function assigned to the digital input of the unit. The programmable digital input (pins 11 and 12 of X3) is configured as remote input for resetting errors (IP14 = 04).

Valid values: 0, ..., 4.

value	function	description
0	missing	
1	InFunc1	Reset of the integral action of the velocity loop
2	InFunc2	Invert the velocity command
3	InFunc3	Halt function (drive management)
4	InFunc4	Error reset (ResetClassDiagnostics, DC1=3)

Default value: **4**. Error reset.

IP17	USER, RW	AnalogFunctionSelector	IP.17
-------------	-----------------	-------------------------------	--------------

Function: Determines the analog function assigned to the programmable analog input.

Valid values: 0, ..., 2.

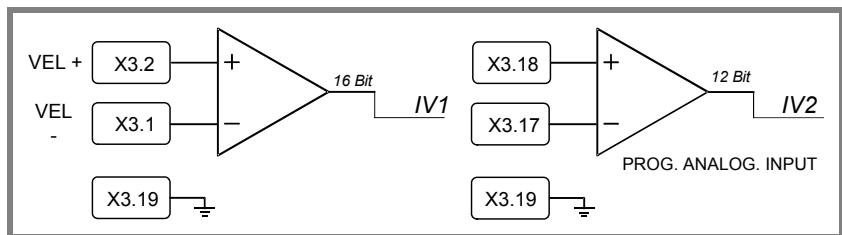
Default value: 0.

IV3 as input
to function Nr ▶▶▶

IP17	Function
00	-
01	Func1
02	Func2

IV1	BASIC, RO	AnalogInput1	IV.01
------------	------------------	---------------------	--------------

Function: Monitors the voltage through the analog input ANALOG VELOCITY COMMAND INPUT (VEL+ and VEL-) (pins 2-1 of X3). It's display is in volts.



IV2	USER, RO	AnalogInput2	IV.02
------------	-----------------	---------------------	--------------

Function: Monitors the input voltage through analog input 2 (pins 18 - 17 of X3). It's display is in volts.

IV3	USER, RO	CurrentCommandAfterScaling	IV.03
------------	-----------------	-----------------------------------	--------------

Function: Contains the value of the auxiliary analog command (pins 17 and 18 of X3; usually current command) after being affected by CP10 and CP11. It must never exceed the value of the maximum current of the unit.

Valid values: - 50.00, ..., + 50.00 Arms.

Default value: 0.00.

IV10 **USER, RO** **DigitalInputs**

IV.10

Function: This variable reflects the status of the programmable digital input at pins 11 and 12 of connector X3. The status of this variable is affected by IP6.

Valid values: 0 and 1.

Default value: 0.

K group. Monitoring

KP3 **USER, RW** **ExtBallastPower**

HP.03

Function: Contains the value of power of the external ballast resistor.

Valid values: 200, ..., 2 000 W.

Default value: 200 W.

KP4 **USER, RW** **ExtBallastEnergyPulse**

HP.04

Function: Contains the value of the energy pulse that can be dissipated by the external ballast resistor.

Valid values: 200, ..., 2 000 J.

Default value: 200 J.

KV10 **USER, RO** **CoolingTemperature**

HV.10

Function: It displays the temperature of the heatsink of the power stage.

Valid values: 0, ..., 200 °C.

KV32 **USER, RO** **I²tDrive**

HV.32

Function: Variable internally useful to the system. It measures the internal load level of the calculation of the i^2t at the drive in percentage used over the maximum.

Valid values: 0, ..., 100 %.

Default value: 0 %.

KV36	USER, RO	I²tMotor	h_v.36
-------------	-----------------	----------------------------	-------------------------

Function: Variable internally useful to the system. It measures the internal load level of the calculation of the i²t at the motor in percentage used over the maximum.

Valid values: 0, ..., 100 %.

Default value: 0 %.

KV40	USER, RO	IntBallastOverload	h_v.40
-------------	-----------------	---------------------------	-------------------------

Function: Shows the load percentage on the ballast resistor in a drive. Useful for the i²t protection of the resistor. A value greater than 100 % in this variable causes error E.314.

Valid values: 0, ..., 100 %.

Default value: 0 %.

KV41	USER, RW	BallastSelect	h_v.41
-------------	-----------------	----------------------	-------------------------

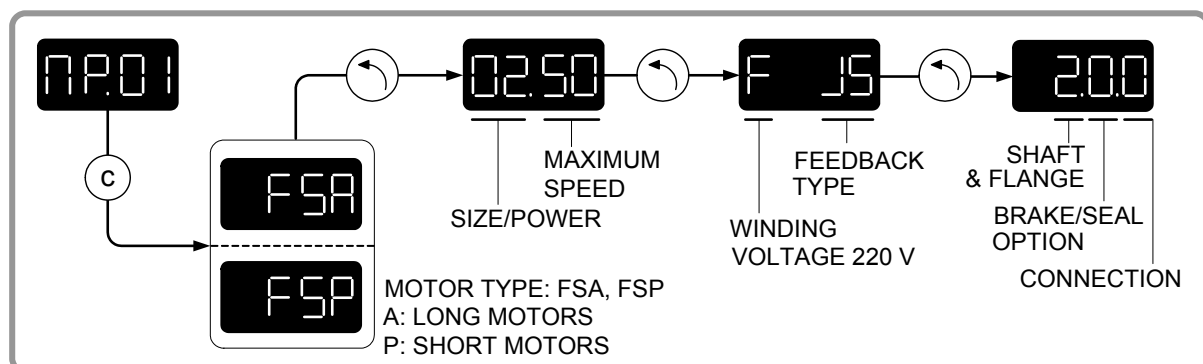
Function: Selector that determines whether the ballast resistor is external or internal.

Valid values: 0/1 external / internal (by default).

M group. Motor

MP1	BASIC, RW	MotorType	MP.01
------------	------------------	------------------	--------------

Function: Motor identification. The limits of certain parameters depend on the value of MP1 (e.g. The upper limit of SP10 is 110 % of the motor rated speed) like its default parameter initialization through GC10. See command GC10.



MP2 **FAGOR, RW** **MotorTorqueConstant**

MP.02

Function: Contains the torque constant of the synchronous motor, (motor torque according to the rms current)

Valid values: 0.0, ..., 10.0 Nm/Arms.

Default value: It depends on the motor connected.

MP3 **FAGOR, RW** **MotorContinuousStallCurrent**

MP.03

Function: Contains the motor rated current. Manipulating MP3 may affect parameter CP20 directly. See parameter CP20.

Valid values: 0.00, ..., 50.00 Arms. Depends on the motor connected.

Default value: It depends on the motor connected.

MP4 **FAGOR, RO** **MotorPeakCurrent**

MP.04

Function: Peak current of the motor. This current value must NEVER be exceeded in the motor. See parameter CP20.

Valid values: 0.00, ..., 50.00 Arms. Depends on the motor connected.

Default value: It depends on the motor connected.

O group. Analog and digital outputs

OP1 **USER, RW** **DA1IDN**

OP.01

OP2 **USER, RW** **DA2IDN**

OP.02

Function: They identify the internal analog variables of the drive that will be reflected at the electrical outputs and will be affected by the OP3 and OP4 gains respectively. Channel 1 (pin 31 of X3) and channel 2 (pin 32 of X3).

Valid values: Name of any parameter or variable of the table.

Default value: 04 for OP1 and 07 for OP2.

OP1	VARIABLE	NAME	OP2	VARIABLE	UNITS
00	SV15	DigitalVelocityCommand	00	SV15	rev/min
01	SV1	VelocityCommand	01	SV1	
02	SV6	VelocityCommandAfterFilters	02	SV6	
03	SV7	VelocityCommandFinal	03	SV7	
04	SV2	VelocityFeedback	04	SV2	
05	TV1	TorqueCommand	05	TV1	dN·m
06	TV2	TorqueFeedback	06	TV2	
07	CV3	CurrentFeedback	07	CV3	cA
08	WV5	GeneratorOutput	08	WV5	-
09	IV1	AnalogInput1	09	IV1	mV
10	IV2	AnalogInput2	10	IV2	
11	Reserved	Reserved	11	Reserved	-

OP3	USER, RW	DA1ValuePer10Volt	
------------	-----------------	--------------------------	---

OP4	USER, RW	DA2ValuePer10Volt	
------------	-----------------	--------------------------	---

Function: They define the gain of channel 1 (pin 31 of X3) and channel 2 (pin 32 of X3). There are 10 V at these outputs when the selected variable reaches this value.

Units: The units of the variable being displayed.

Valid values: 0, ..., 9 999.

Default value: 4 000 and 3 000 respectively.

Example

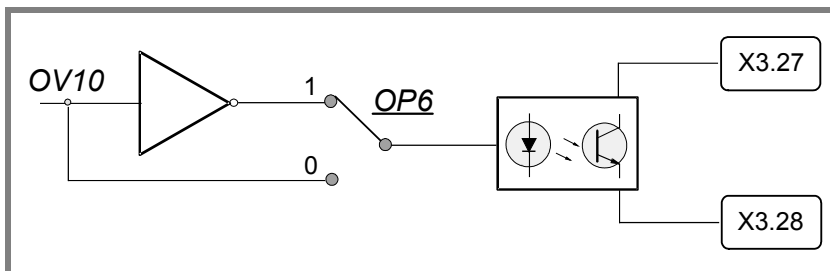
OP1=04 [SV2] (VelocityFeedback), in rpm and OP3=3000.
It means that when the value of SV2 is 3000 rev/min the analog output will be 10 V and it maintains this (rev/min)/V ratio throughout its full range ± 10 V.

OP6	USER, RW	DigitalOutputPolarity	
------------	-----------------	------------------------------	---

Function: Sets the polarity (inverted or not inverted) of the programmable digital input (pins 27 and 28 of X3).

Valid values: **0/1** Not inverted / inverted

Default value: **0** Not inverted.



OP14 USER, RW

DigitalOutputFunctionSelector

OP. 14

Function:

They determine the activation of the various outputs of the digital functions available.

OP14	function
00	OutFunc0
01	OutFunc1
02	OutFunc2
03	OutFunc3
04	OutFunc4
05	OutFunc5
06	OutFunc6
07	OutFunc7

◀◀◀ **OV10** as
output of
function Nr

OP15 USER, RW

DigitalOutputWarningSelector

OP. 15

Function:

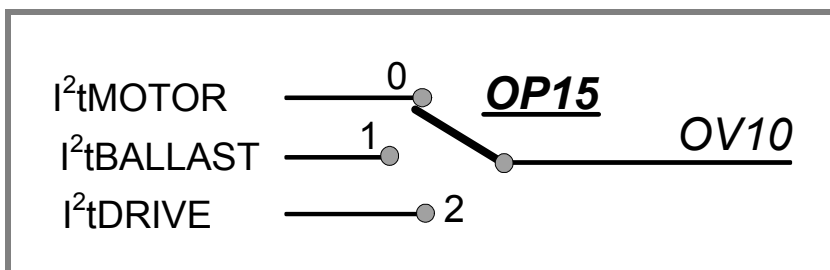
Selector of the warning that will be displayed by the programmable output when function OutFunc7 is selected.

Valid values:

- 0 I²tMotor
- 1 I²tBallast
- 2 I²tDriver

Default value:

0.



OV10 **USER, RO** **DigitalOutputs**



Function: The OV10 variable contains the value of the output status of the various functions that may be selected with OP14.

Valid values: 0 and 1.

Default value: 0.

Q group. Communication

QP16 **USER, RW** **SerialSettings**



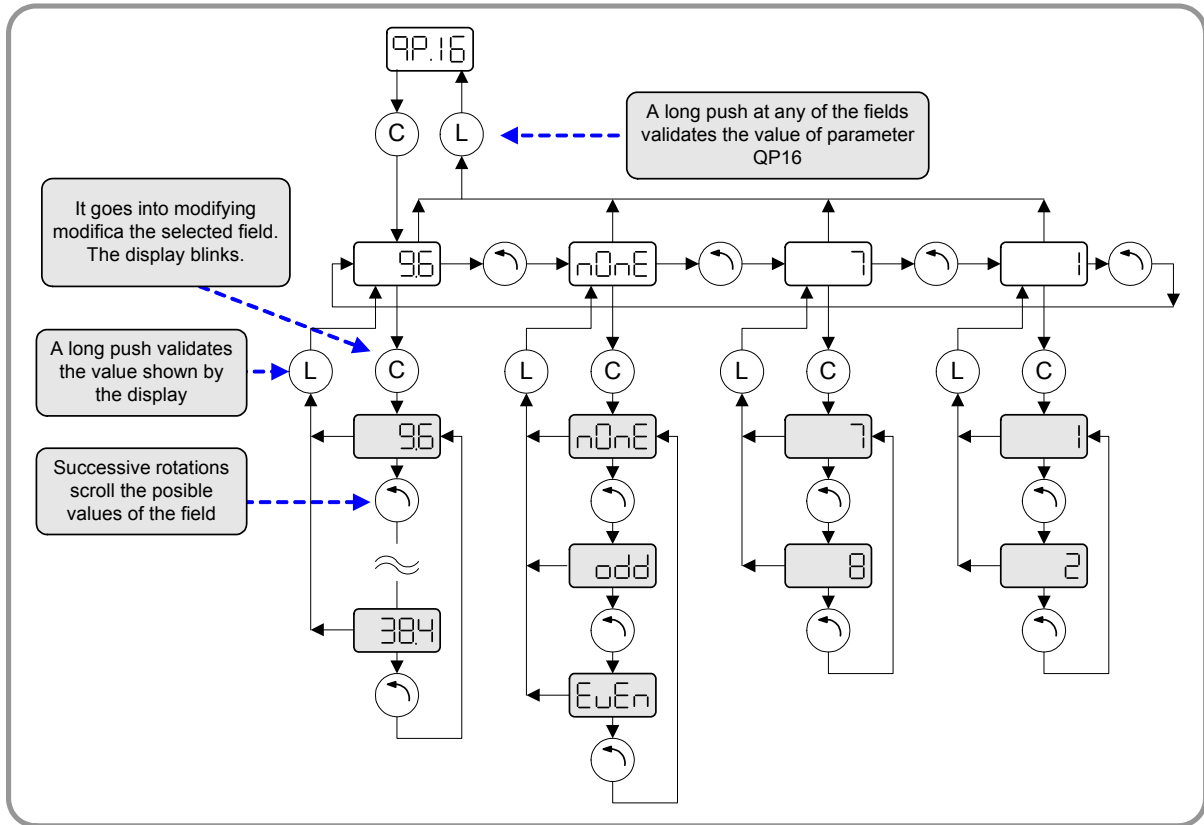
Function: Determines the communications parameters of the UART (Universal Asynchronous Receiver/Transmitter) of the 485 serial line of connector X1.

For the service line USB-COM, it is always configured as (9600, no parity, 8 data bits, 1 stop bit).

bit	function
15 ... 12	Reserved
11, 10	Stop bits 1 Stop bits 2 Stop bits
9 ... 6	Data bits 7 Data bits 8 Data bits
5, 4	Parity bits 0 No parity 1 Even parity 2 Odd parity
3 ... 0	Communication speed (baudrate) 0 2400 Bd 4 9600 Bd 1 3600 Bd 5 19200 Bd 2 4800 Bd 6 38400 Bd 3 7200 Bd

Default value: 1540 (9600, no parity, 8 data bits, 1 stop bit).

To edit this parameter, the programming module has a sub-menu like the one in the figure on the next page.



QV22 FAGOR, RO IDNListOfInvalidOperationData 9u.22

Function: Variable containing the parameters that are readjusted by the drive when it issues the error E.502 (incompatible parameters). The parameters are listed by their bus identifier (the WinDDSSetup shows the parameter names directly).

Valid values: Any parameter bus identifier.

Default value: 0.

QV96 USER, RW SlaveArrangement 9u.96

Function: This variable contains the number of the node assigned to the drive for communication.

Valid values: 0, ..., 127.

value	ModBus protocol
0	Number Nr 0 (not commonly used)
1 ... 127	Node Nr assigned to the unit in a bus type communication.

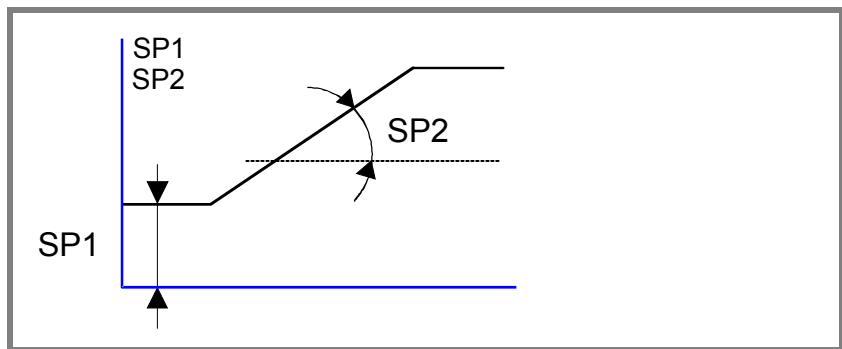
Default value: 0.

S group. Speed

SP1	BASIC, RW	VelocityProportionalGain	SP.01
------------	------------------	---------------------------------	--------------

SP2	BASIC, RW	VelocityIntegralGain	SP.02
------------	------------------	-----------------------------	--------------

Function: Value of the proportional / integral action of the velocity PI.
 Valid values: SP1: 0, ..., 999.9 mArms/rpm.
 SP2: 0.1, ..., 999.9 ms.
 Default value: Depends on the motor-drive combination.

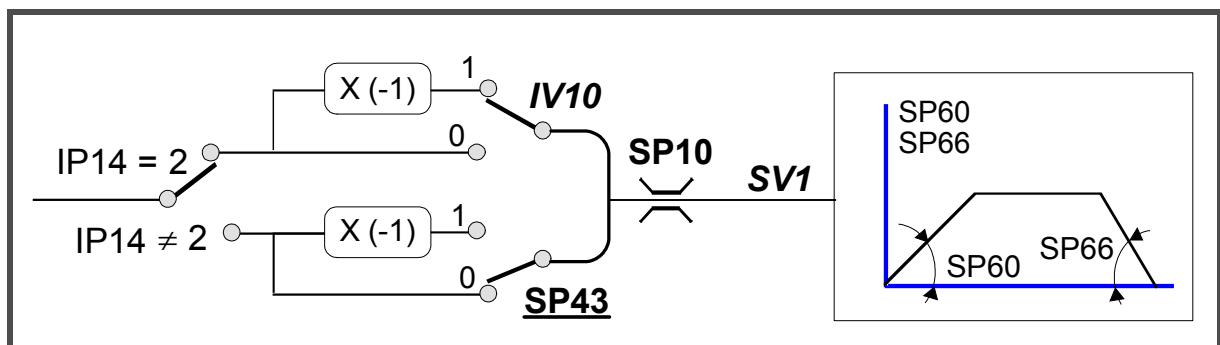


SP3	BASIC, RW	VelocityDerivativeGain	SP.03
------------	------------------	-------------------------------	--------------

Function: Value of the derivative action of the velocity PI.
 Valid values: SP3: 0, ..., 9 999.
 Default value: SP1: 0.

SP10	BASIC, RW	VelocityLimit	SP.10
-------------	------------------	----------------------	--------------

Function: Maximum velocity limit for the SV7 variable (Velocity CommandFinal).
 Valid values: 0 ... 110 % of the motor rated speed in rev/min.
 Default value: 1000 rev/min.

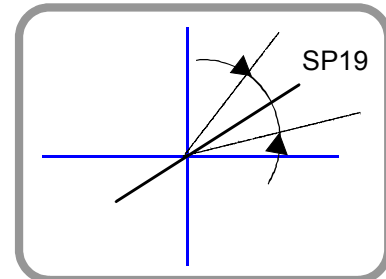


SP19 BASIC, RW SymmetryCorrection**SP.19**

Function: Its purpose is to correct the possible difference in analog command generated to obtain exactly the same speed in both turning directions.

Valid values: - 500, ..., + 500 mV

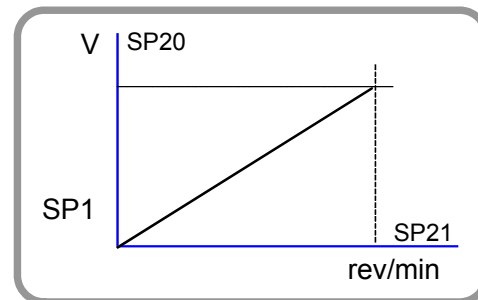
Default value: 0 mV.

**SP20 BASIC, RW VoltageRpmVolt****SP.20**

Function: Parameter SP20 and SP21 set the necessary ratio between the analog command and the motor speed. They correspond to the reference of the CNC concept G00 Feed.

Valid values: 1.00, ..., 10.00 V.

Default value: 9.50 V.

**SP21 BASIC, RW RpmRpmVolt****SP.21**

Function: See parameter SP20.

Valid values: 10, ..., Motor rated speed (rev/min).

Default value: Motor rated speed (rev/min).

SP30 BASIC, RW VelocityOffset**SP.30**

Function: Correction of the analog velocity command offset It is applied after the analog input is treated by SP19, SP20 and SP21.

Valid values: - 2 000, ..., + 2 000 (rev/min) x10⁻²

Default value: 0 (rev/min)x10⁻².

SP40 **USER, RW** **VelocityThresholdNx**

SP.40

Function: Velocity level over which the OV10 variable is activated when function OutFunc3 (MotorSpeed > SP40) is active.

Valid values: 0, ..., Motor rated speed (rev/min).

Default value: 1 000 rev/min.

SP41 **USER, RW** **VelocityWindow**

SP.41

Function: Velocity window assigned to the "reached speed" function. It is used to know when the speed of a motor (SV2) has reached the supplied command (SV7) within the margins of this window SP41.

Valid values: 0, ..., 12 % of parameter SP10 (speed limit) in rev/min.

Default value: 20 rev/min.

SP42 **USER, RW** **StandStillWindow**

SP.42

Function: Determines the value of the velocity window around zero that will be considered to be zero speed.

Valid values: 0 ... Motor rated speed (rev/min).

Default value: 20 rev/min.

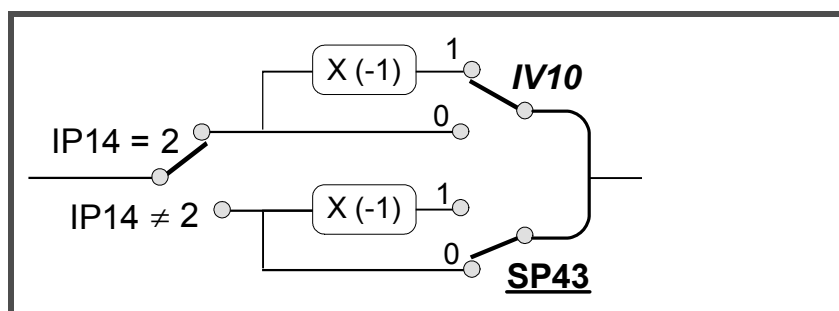
SP43 **BASIC, RW** **VelocityPolarityParameter**

SP.43

Function: This parameter is used to change the sign of the velocity command in specific applications. This parameter cannot be used to solve a positive feedback problem (axis run-away).

Valid values: **0/1** Not inverted / inverted.

Default value: **0** Not inverted.



SP45 BASIC, RW VelocityCommandSelector

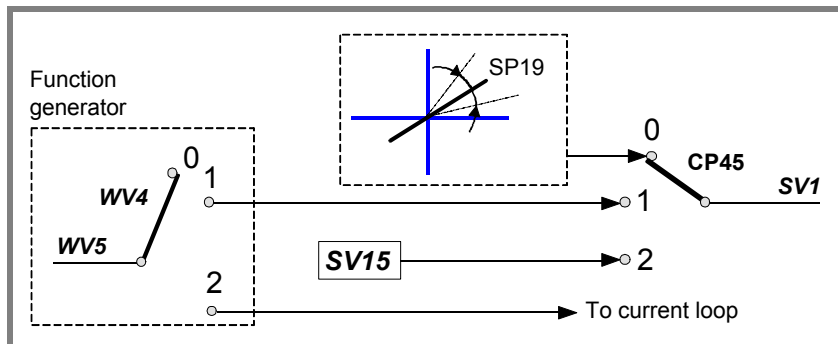
SP45

Function: This parameter is used to determine the velocity command source.

Valid values: 0, ..., 2.

value	function
0	Analog. Input through pins 1 and 2 of connector X3 after being adapted by SP19, SP20 and SP21.
1	Function generator. Value of WV5 if the output of the function generator is applied to the velocity loop (WV4=1).
2	Digital. Value of SV15.

Default value: 0.



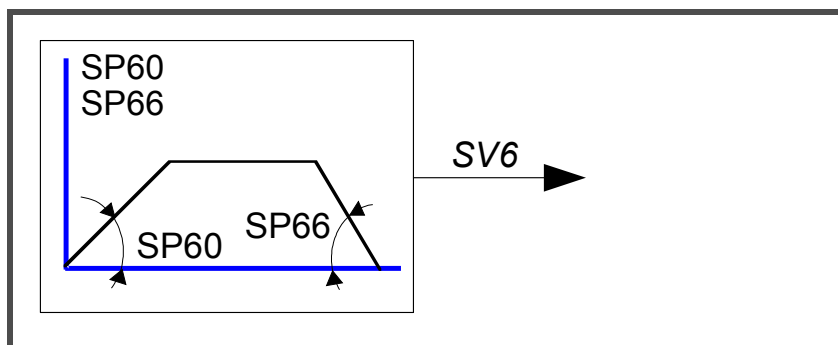
SP60 BASIC, RW VelocityAccelerationTime

SP60

Function: Determine the value of the acceleration ramp applied to the velocity command. Setting this parameter with a 0 value means that no ramps will be applied.

Valid values: 0.0, ..., 400.0 (rpm)/ms.

Default value: 0.0.

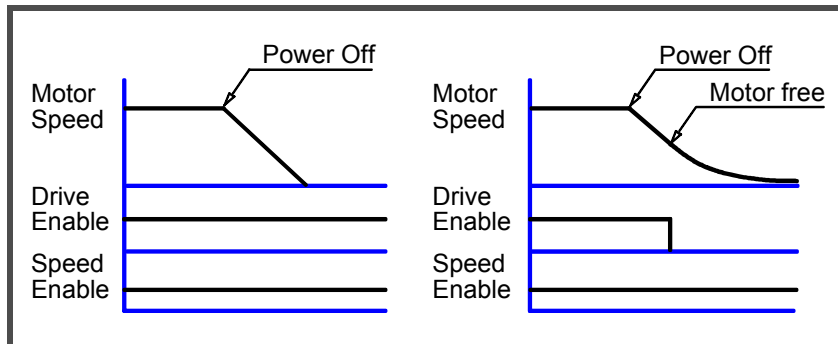


SP65 BASIC, RW EmergencyAcceleration

SP.65

Function:

In emergency stop. If the bus voltage drops or there is a power outage for the unit in the acceleration, deceleration or constant power mode, the drive will get into the dynamic braking sequence. It stops with the emergency ramp until its speed is zero as long as the mechanical energy stored in the motor allows it. Therefore, it limits the command acceleration for stopping the motor. If anytime during the sequence, the Drive Enable is interrupted, the motor will turn by inertia. SP65=0 cancels this limiting effect.



Valid values: 0.0, ..., 400.0 (rpm)/ms.

Default value: 0.0.

SP66 BASIC, RW VelocityDecelerationTime

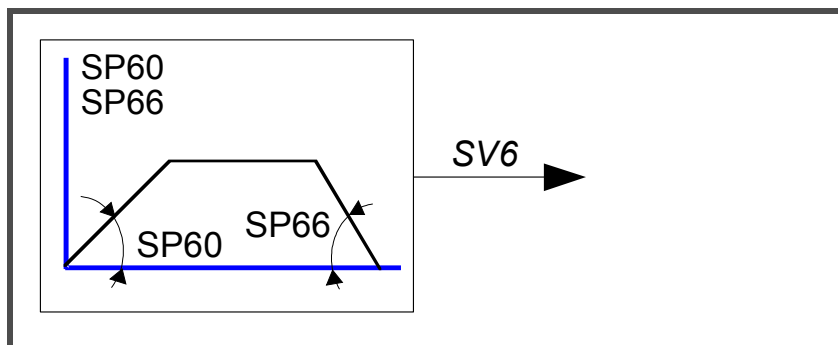
SP.66

Function:

Determine the value of the deceleration ramp applied to the velocity command. Setting this parameter with a 0 value means that no ramps will be applied.


Valid values: 0.0, ..., 400.0 (rpm)/ms.

Default value: 0.0.



SV1	BASIC, RW	VelocityCommand	
------------	------------------	------------------------	---

Function: Velocity command after the SP45 selector.
Valid values: - 6 000, ..., + 6 000 rev/min.
Default value: 0.

SV2	BASIC, RO	VelocityFeedback	
------------	------------------	-------------------------	---

Function: Velocity feedback.
Valid values: - 9 999, ..., + 9 999 rev/min.

SV6	BASIC, RO	VelocityCommandAfterFilters	
------------	------------------	------------------------------------	---

Function: Velocity command after applying limits, ramps, etc.
Valid values: - 9 999, ..., + 9 999 rev/min.

SV7	BASIC, RO	VelocityCommandFinal	
------------	------------------	-----------------------------	--

Function: Final velocity command applied to the loop.
Valid values: - 9 999, ..., + 9 999 rev/min.

SV15	USER, RW	DigitalVelocityCommand	
-------------	-----------------	-------------------------------	---

Function: Digital velocity command.
Valid values: - 6 000, ..., + 6 000 rev/min.
Default value: 0.

T group. Torque and power

TP1	USER, RW	TorqueThresholdTx	
------------	-----------------	--------------------------	---

Function: Parameter that determines the threshold for the activation of OV10 when function OutFunc2 (TorqueLimitModeZero Search) is activated.
Units: Fraction of the rated value of the motor torque.
Valid values: 0, ..., 100 %.
Default value: 5 %.

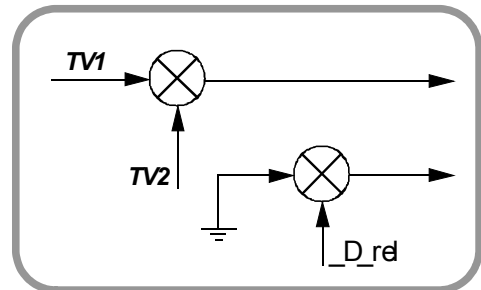
TV1	USER, RO	TorqueCommand	
------------	-----------------	----------------------	---

TV2	USER, RO	TorqueFeedback	
------------	-----------------	-----------------------	---

Function: Displays the values of the command and torque feedback.

Valid values: - 99.9..., + 99.9 N·m

Default value: 0.0 N·m.



W group. Internal generator

WV1	USER, RW	GeneratorShape	
------------	-----------------	-----------------------	--

Function: It indicates the waveform of the internal command generator.

Valid values:

value	waveform
0	sinusoidal
1	square
2	triangular

Default value: 1.

WV2	USER, RW	GeneratorPeriod	
------------	-----------------	------------------------	---

Function: It indicates the signal period of the internal command generator.

Valid values: 2, ..., 9 999 ms.

Default value: 200 ms.

WV3	USER, RW	GeneratorAmplitude	
------------	-----------------	---------------------------	---

Function: It indicates the signal amplitude of the internal command generator.

Valid values: 0, ..., 9 999 rev/min if it is a velocity command.

0, ..., 9 999 Arms $\times 10^{-2}$ if it is a current command.

Default value: 0.

WV4	USER, RW	GeneratorType	04
------------	-----------------	----------------------	-----------

Function: It specifies on which magnitude the internal command is applied.

Valid values:

value	waveform
0	generated disconnected (by default)
1	generated connected. Velocity command
2	generated connected. Current command

Default value: 0.

WV5	USER, RO	GeneratorOutput	05
------------	-----------------	------------------------	-----------

Function: Variable that reflects the value of the signal generated by the internal function generator.

Valid values: - 9 999, ..., + 9 999.

Default value: 0.

WV6	USER, RW	GeneratorDutyCycle	06
------------	-----------------	---------------------------	-----------

Function: For generating square signals (WV1=1), this variable specifies the ratio of the duty cycle.
For example: to simulate an S6-40 % cycle, WV6=40.

Valid values: 1, ..., 99 %.

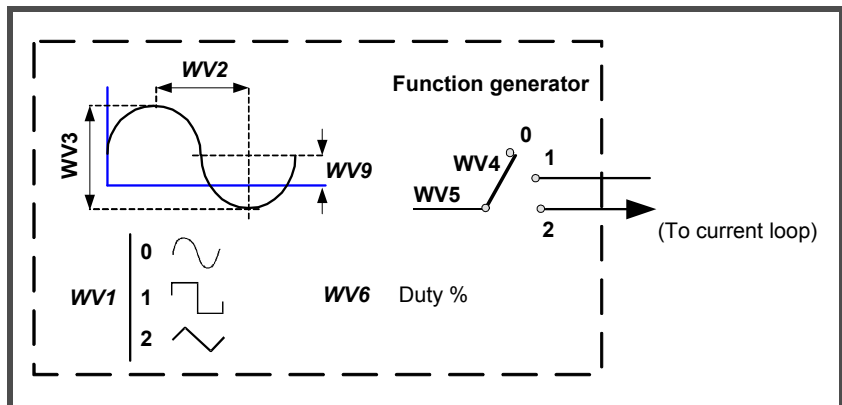
Default value: 50 %.

WV9	USER, RW	GeneratorOffset	09
------------	-----------------	------------------------	-----------

Function: It allows entering an offset in the signal of the internal command generator.

Valid values: - 9 999, ..., + 9 999 rev/min. Velocity.

- 9 999, ..., + 9 999 Arms x10⁻². Current.



ERROR MESSAGES

E.001	Internal	
--------------	-----------------	---

Contact Fagor Automation.

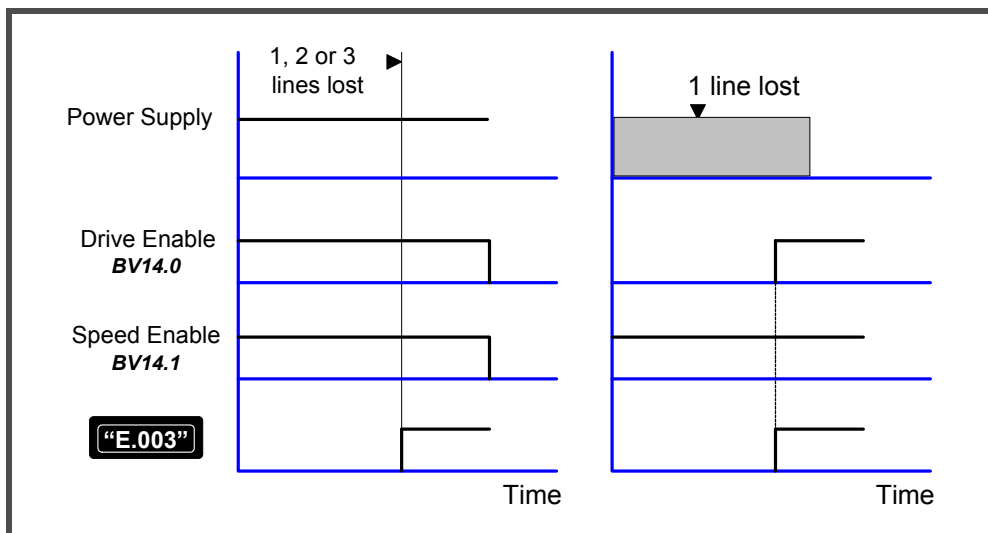
E.003	Error at the power bus voltage	
--------------	---------------------------------------	---

Error When having torque, one of the phases of the line may have dropped.

Warning: When starting the unit up, maybe:

- The connector of the Ballast resistor has not been installed.
- The Ballast resistor is open.

Check that the line phases and the drives are OK in the direction indicated earlier and start the system back up.



E.004	Emergency stop exceeding time limit GP3	
--------------	--	---

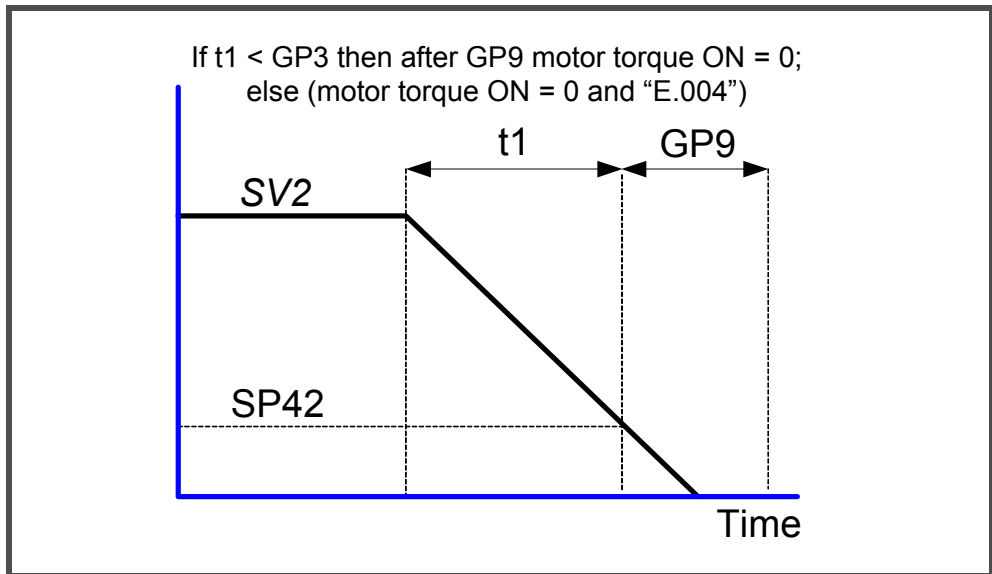
An attempt has been made to stop the motor by canceling **Speed Enable**. The system has tried to stop the motor at full torque, but it has not been able to stop it in the time frame set by parameter GP3 (**StoppingTimeout** = maximum time allowed for braking, before considering the error for being unable to stop it in the set time) or the parameter that determines when the motor is considered to be stopped (SP42) **Minimum velocity threshold**, is too small. Bear in mind that zero speed (total lack of velocity) does not exist, there is always a minimum amount of speed noise due to feedback.

Solutions

The load that must stop the motor is too large to stop it in the time frame set by GP3 and the value given to this parameter must be increased.

The threshold or velocity window considered zero (SP42) is too small; thus, increase the value of this parameter.

The module is performing poorly and is unable to stop the motor. The module may be defective.



E.106

Extreme temperature at the heatsink (of the IGBT's)

E. 106

The drive is carrying out a task that overheats the power devices.

Stop the system for several minutes and decrease the effort demanded from the drive.

E.108

Motor overheated

E. 108

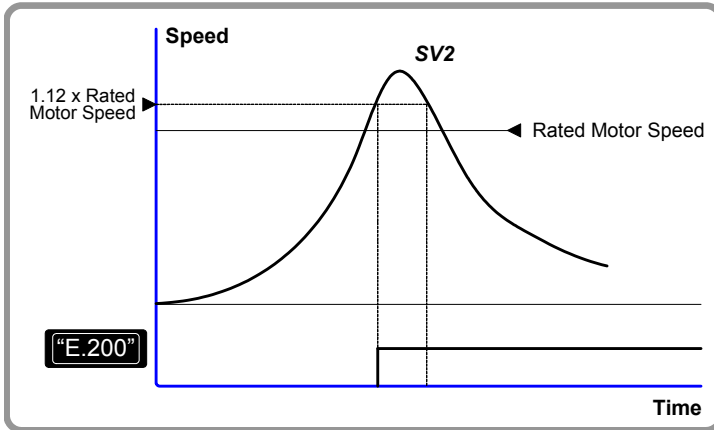
The motor has overheated. The motor temperature measuring cables (position sensor cable) or the temperature sensor itself are defective. The application may be demanding high current peaks.

Stop the system for several minutes and decrease the effort demanded from the drive. Cool the motor.

E.200

Overspeed

E.200



The motor speed has exceeded the value of SP10 in a 12%.
Bad cabling of the position sensor or of the motor power.
The velocity loop is adjusted wrong.
Decrease the speed overshoot in the system response.

E.201

Motor overload

E.201

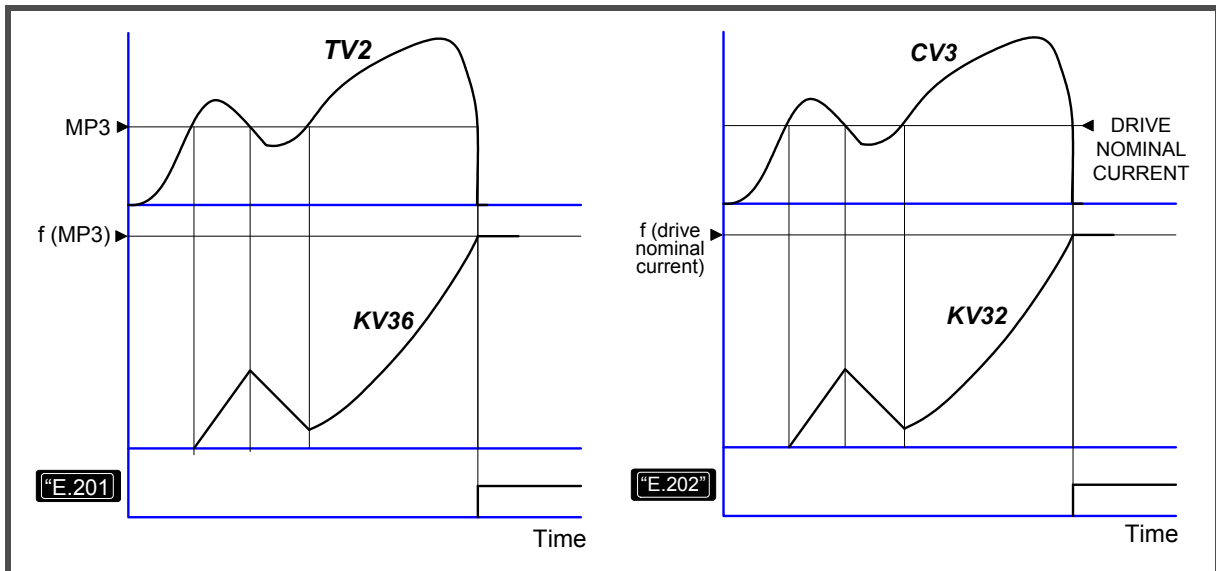
E.202

Drive overload

E.202

The I²t protection of the drive went off. The duty cycle is greater than the system can provide.

Decrease the speed overshoot in the system response.



E.214**Short-circuit**

There is short-circuit at the drive module.

Reset the error.

If it persists, may be because:

- An erroneous sequence when connecting the power cables or a short-circuit between them.
- The parameters may be wrong or there is a fault at the drive.

Contact Fagor Automation.

After displaying E.214, it will display some of the codes that describe the type of short-circuit that has taken place.

ABS	over the absolute value of the output current
IGBT	at the IGBT's
OUT	in the output

E.304**Power bus voltage too high**

The hardware of the drive module has detected that the voltage at the power bus is too high.

When using an external Ballast, it is not connected properly. The Ballast resistor is burned.

Disconnect the power supply and ckeck the proper connection of the Ballast circuit.

E.307**Power bus voltage too low**

The mains voltage is too low.

Disconnect the power supply and check the proper condition of the lines.

E.314**Ballast overload**

Due to the duty cycle, the Ballast resistor is overloaded.

Resize the Ballast resistor.

Decrease the duty cycle.

Smooth the duty cycle by applying acceleration ramps.

E.502 Incompatible parameters

Parameter incompatibility.

Example.

A drive controls a motor that admits a peak current of 20 A (e.g.: being the current limit CP20=20 A).

If now, a 16 A peak motor is connected, the current limit will be beyond the value allowed for this new motor. It will readjust in RAM memory certain parameters related to speed and current issuing E502 and describing the erroneous parameters in the QV22 variable. Resetting the unit without saving the parameters causes the error to come up again. The error will go away when executing the GC1 command because the parameters readjusted to the right values by the drive in RAM memory are saved in E²PROM memory.

E.506 Motor table missing

Contact Fagor Automation.

E.510 Incoherent combination of motor and feedback

Motor not accepted by the drive.

Motor's power voltage is different from that of the drive.

E.801 Encoder not detected

The drive has not detected the sensor.

Check the cabling and the motor connection regarding connector X2. Then do a reset.

If it doesn't fix it, contact Fagor Automation.

E.802 Defective encoder

Communication error. After an initial connection, communication errors keep coming up.

Check the cabling and the motor connection regarding connector X2. Then do a reset.

If it doesn't fix it, contact Fagor Automation.

WARNINGS

The warnings indicate that the drive is approaching an error limit. Thus:

- ❑ Before the drive display shows errors E.201, E.202 and E.314, it will issue a warning with fast flashing (0.5 s) of the **BUS ACTIVITY** indicator. If this behavior continues for longer than 5 s, the display will show one of the errors mentioned earlier.
- ❑ **Warning W.003.** Warning due to a drive power-up failure. It will appear in the following circumstances. When a unit is powered up and:
 - ❑ The connector of the crowbar resistor has not been installed.
 - ❑ The crowbar resistor is open.

LIST OF PARAMETERS, VARIABLES & COMMANDS. ModBus ID's

Mnem.	Name	Level	IdBus	Ac	Min.	Max.	Def.	Units	Page
BV14	NotProgrammableIOs	fagor	08601	ro	0	65535	-	-	48
CP1	CurrentProportionalGain	fagor	00213	rw	0	999	-	-	48
CP2	CurrentIntegralTime	fagor	00215	rw	0	999	-	-	48
CP10	VoltageAmpVolt	user	08823	rw	1000	9999	9500	mV	49
CP11	AmpAmpVolt	user	08825	rw	100	5000	5000	cA	49
CP20	CurrentLimit	basic	08807	rw	0	5000	0	cA	49
CP30	CurrentCommandFilter1Type	fagor	08809	rw	0	1	0	-	49
CP31	CurrentCommandFilter1Frequency	fagor	08817	rw	0	4000	0	Hz	50
CP32	CurrentCommandFilter1Damping	fagor	08819	rw	0	1000	0	Hz	50
CP45	CurrentCommandSelector	user	08821	rw	0	3	0	-	50
CV1	Current1Feedback	user	08811	ro	- 5000	5000	-	cA	51
CV2	Current2Feedback	user	08813	ro	- 5000	5000	-	cA	51
CV3	CurrentFeedback	user	08815	ro	- 5000	5000	-	cA	51
CV10	Current1Offset	fagor	08803	ro	- 2000	2000	-	mA	52
CV11	Current2Offset	fagor	08805	ro	- 2000	2000	-	mA	52
CV15	DigitalCurrentCommand	user	08827	rw	- 5000	5000	0	cA	52
DC1	ResetClass1Diagnostics	user	00199	rw	0	15	0	-	53
DC2	ClearHistoricOfErrorsCommand	user	08997	rw	0	15	0	-	54
DV17	HistoricOfErrors	user	09012	ro	-	-	-	-	52
DV31	DriverStatusWord	fagor	00271	ro	0	65535	-	-	53
DV32	MasterControlWord	fagor	00269	rw	0	65535	0	-	53
EP1	EncoderSimulatorPulsesPerTurn	basic	09193	rw	1	pulses	-	-	54
EP3	EncoderSimulatorDirection	basic	09197	rw	0	1	0	-	54
GC1	BackupWorkingMemoryCommand	basic	00529	rw	0	15	0	-	56
GC10	LoadDefaultsCommand	basic	00525	rw	0	15	0	-	56
GP3	StoppingTimeout	basic	09597	rw	0	9999	500	ms	54
GP5	ParameterVersion	basic	09601	ro	-	-	-	-	54
GP9	DriveOffDelayTime	basic	00415	rw	0	9999	50	ms	55
GP11	IOFunctionsTime	user	09645	rw	0	9999	2000	ms	55
GV2	ManufacturerVersion	basic	00060	ro	-	-	-	-	55
GV5	CodeChecksum	basic	09605	ro	-	-	-	-	55
GV7	Password	basic	00535	rw	0	9999	0	-	55
GV9	DriveType	basic	00280	ro	-	-	-	-	55
GV11	SoftReset	basic	09609	rw	0	16	0	-	56
GV16	MotorTableVersion	basic	09625	ro	-	-	-	-	56
GV75	ErrorList	fagor	00750	ro	-	-	-	-	56
HV5	PLDVersion	basic	08783	ro	-	-	-	-	56
IP6	DigitalInputPolarity	user	10013	rw	0	1	0	-	57
IP14	DigitalInputFunctionSelector	user	10015	rw	0	4	4	-	57
IP17	AnalogFunctionSelector	user	10017	rw	0	2	0	-	58
IV1	AnalogInput1	basic	10003	ro	-12000	12000	-	mV	58
IV2	AnalogInput2	user	10005	ro	- 1200	1200	-	cV	58
IV3	CurrentCommandAfterScaling	user	10019	ro	-9999	9999	-	cA	58
IV10	DigitalInputs	user	10007	ro	0	1	-	-	59
KP3	ExtBallastPower	user	10421	rw	200	2000	200	W	59
KP4	ExtBallastEnergyPulse	user	10425	rw	200	2000	200	J	59
KV10	CoolingTemperature	user	10397	ro	- 20	200	-	° C	59

Mnem.	Name	Level	IdBus	Ac	Min.	Max.	Def.	Units	Page
KV32	I2tDrive	user	10410	ro	0	100	-	%	59
KV36	I2tMotor	user	10415	ro	0	100	-	%	60
KV40	I2tCrowbar	user	10423	ro	0	100	-	%	60
KV41	BallastSelect	user	10427	rw	0	1	1	-	60
MP1	MotorType	basic	00282	rw	-	-	-	-	60
MP2	MotorTorqueConstant	fagor	10593	rw	0	100	-	dNm/A	61
MP3	MotorContinuousStallCurrent	fagor	00223	rw	0	5000	-	cA	61
MP4	MotorPeakCurrent	fagor	00219	ro	0	50	-	A	61
OP1	DA1IDN	user	10993	rw	0	11	4	-	61
OP2	DA2IDN	user	10995	rw	0	11	7	-	61
OP3	DA1ValuePer10Volt	user	10997	rw	0	9999	4000	-	62
OP4	DA2ValuePer10Volt	user	10999	rw	0	9999	3000	-	62
OP6	DigitalOutputPolarity	user	11025	rw	0	1	0	-	62
OP15	DigitalOutputWarningSelector	user	11023	rw	0	2	0	-	63
OP14	DigitalOutputFunctionSelector	user	11021	rw	0	7	0	-	63
OV10	DigitalOutputs	user	11013	ro	0	1	0	-	64
QP16	SerialSettings	user	12217	rw	0	65535	1540	-	64
QV22	IDNListOffInvalidOperationData	fagor	00044	ro	-	-	-	-	65
QV96	SlaveArrangement	user	00193	rw	0	127	1	-	65
SP1	VelocityProportionalGain	basic	00201	rw	0	9999	-	dmArms/rpm	66
SP2	VelocityIntegralTime	basic	00203	rw	0	9999	-	dms	66
SP3	VelocityDerivativeGain	basic	00205	rw	0	9999	0	-	66
SP10	VelocityLimit	basic	00183	rw	0	9999	1000	rpm	66
SP19	SymmetryCorrection	basic	11431	rw	- 500	500	0	mV	67
SP20	VoltageRpmVolt	basic	11433	rw	1000	9999	9500	mV	67
SP21	RpmRpmVolt	basic	11435	rw	10	9999	4000	rpm	67
SP30	VelocityOffset	basic	11399	rw	- 2000	2000	0	crpm	67
SP40	VelocityThresholdNx	user	00251	rw	0	9999	1000	rpm	68
SP41	VelocityWindow	user	00315	rw	0	9999	20	rpm	68
SP42	StandStillWindow	user	00249	rw	0	9999	20	rpm	68
SP43	VelocityPolarityParameters	basic	00087	rw	0	1	0	-	68
SP45	VelocityCommandSelector	basic	11427	rw	0	2	0	-	69
SP60	AccelerationLimit	basic	00277	rw	0	4000	0	drpm/ms	69
SP65	EmergencyAcceleration	basic	11411	rw	0	4000	0	drpm/ms	70
SP66	VelocityDecelerationTime	basic	11429	rw	0	4000	0	drpm/ms	70
SV1	VelocityCommand	basic	00072	rw	- 6E7	6E7	0	dmrpm	71
SV2	VelocityFeedback	basic	00080	ro	- 6E7	6E7	-	dmrpm	71
SV6	VelocityCommandAfterFilters	basic	11436	ro	- 6E7	6E7	-	dmrpm	71
SV7	VelocityCommandFinal	basic	11416	ro	- 6E7	6E7	-	dmrpm	71
SV15	DigitalVelocityCommand	user	11438	rw	- 6E7	6E7	0	dmrpm	71
TP1	TorqueThresholdTx	user	00253	rw	0	100	5	%	71
TV1	TorqueCommand	user	00161	ro	-9999	9999	0	dN·m	72
TV2	TorqueFeedback	user	00169	ro	-9999	9999	-	dN·m	72
WV1	GeneratorShape	user	11793	rw	0	2	1	-	72
WV2	GeneratorPeriod	user	11795	rw	2	9999	200	ms	72
WV3	GeneratorAmplitude	user	11797	rw	0	9999	0	-	72
WV4	GeneratorType	user	11799	rw	0	2	0	-	73
WV5	GeneratorOutput	user	11801	ro	-9999	9999	0	-	73
WV6	GeneratorDutyCycle	user	11803	rw	1	99	50	%	73
WV9	GeneratorOffset	user	11809	rw	- 9999	9999	0	-	73

User notes



User notes

FAGOR AUTOMATION S. COOP.

B.º San Andrés Nº 19

Apdo de correos 144

20500 Arrasate-Mondragón

- Spain -

Web: www.fagorautomation.com

Email: info@fagorautomation.es

Tel.: (34) 943 719200

Fax: (34) 943 791712



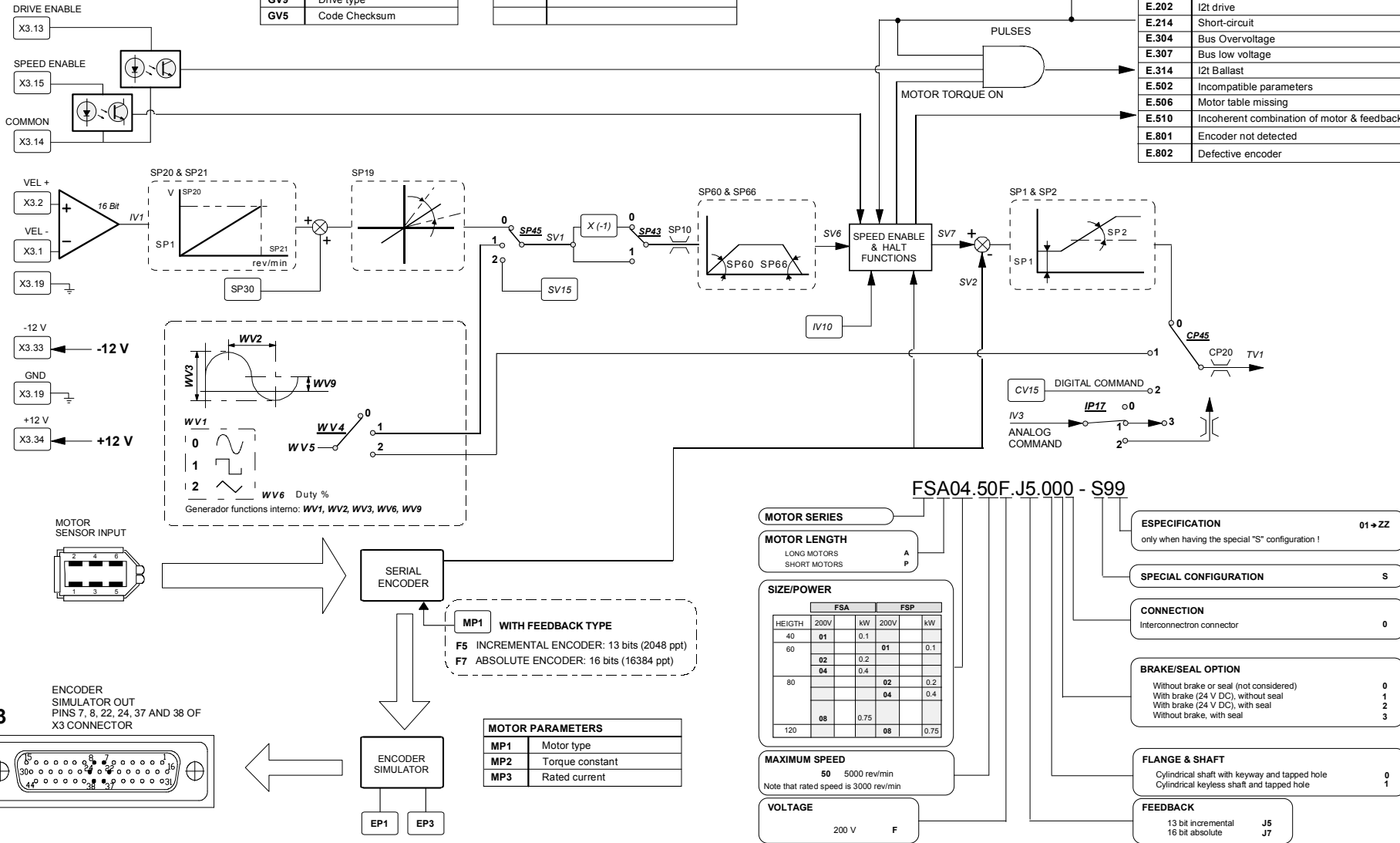
Fagor Automation S. Coop.

VELOCITY CONTROL BLOCK DIAGRAM

GENERAL PARAMETERS	
GV2	Software version
GV7	Password
GC10	Default parameters
GC11	Reset
GC1	Store parameters
GV9	Drive type
GV5	Code Checksum

DISPLAY	DRIVE STATUS
L. buS	Waiting P. Supply
[.]	Drive ready
[rdy1]	Motor running
[rdy0]	Motor running speed = 0
[rdy-]	Drive Enable (on) and no pulses

ERROR	DESCRIPTION
E.001	Watch dog
E.003	Power Supply fault / warning
E.004	Stop time > GP3
E.106	Drive Overtemp
E.108	Motor Overtemp
E.200	OverSpeed
E.201	I2t motor
E.202	I2t drive
E.214	Short-circuit
E.304	Bus Overvoltage
E.307	Bus low voltage
E.314	I2t Ballast
E.502	Incompatible parameters
E.506	Motor table missing
E.510	Incoherent combination of motor & feedback
E.801	Encoder not detected
E.802	Defective encoder



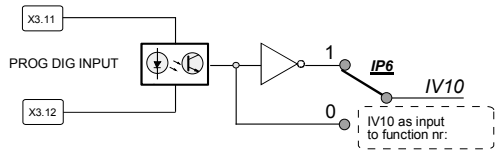
MOTOR PARAMETERS	
MP1	Motor type
MP2	Torque constant
MP3	Rated current

FSA04.50F.J5.000 - S99

MOTOR SERIES	LONG MOTORS A SHORT MOTORS P																																									
MOTOR LENGTH																																										
SIZE/POWER	<table border="1"> <thead> <tr> <th rowspan="2">HEIGHT</th> <th colspan="2">FSA</th> <th colspan="2">FSP</th> </tr> <tr> <th>200V</th> <th>kW</th> <th>200V</th> <th>kW</th> </tr> </thead> <tbody> <tr> <td>40</td> <td>01</td> <td>0.1</td> <td></td> <td></td> </tr> <tr> <td rowspan="2">60</td> <td></td> <td></td> <td>01</td> <td>0.1</td> </tr> <tr> <td>02</td> <td>0.2</td> <td></td> <td></td> </tr> <tr> <td rowspan="2">80</td> <td>04</td> <td>0.4</td> <td></td> <td></td> </tr> <tr> <td></td> <td></td> <td>02</td> <td>0.2</td> </tr> <tr> <td rowspan="2">120</td> <td></td> <td></td> <td>04</td> <td>0.4</td> </tr> <tr> <td>08</td> <td>0.75</td> <td>08</td> <td>0.75</td> </tr> </tbody> </table>	HEIGHT	FSA		FSP		200V	kW	200V	kW	40	01	0.1			60			01	0.1	02	0.2			80	04	0.4					02	0.2	120			04	0.4	08	0.75	08	0.75
HEIGHT	FSA		FSP																																							
	200V	kW	200V	kW																																						
40	01	0.1																																								
60			01	0.1																																						
	02	0.2																																								
80	04	0.4																																								
			02	0.2																																						
120			04	0.4																																						
	08	0.75	08	0.75																																						
MAXIMUM SPEED	50 5000 rev/min Note that rated speed is 3000 rev/min																																									
VOLTAGE	200 V F																																									

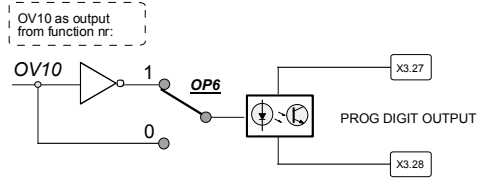
ESPECIFICATION	01 → ZZ only when having the special "S" configuration 1
SPECIAL CONFIGURATION	S
CONNECTION	Interconnection connector 0
BRAKE/SEAL OPTION	Without brake or seal (not considered) 0 With brake (24 V DC), without seal 1 With brake (24 V DC), with seal 2 Without brake, with seal 3
FLANGE & SHAFT	Cylindrical shaft with keyway and tapped hole 0 Cylindrical keyless shaft and tapped hole 1
FEEDBACK	13 bit incremental J5 16 bit absolute J7

I/O FUNCTIONS



IP14	FUNCTION
00	INFUNC0
01	INFUNC1
02	INFUNC2
03	INFUNC3
04	INFUNC4

FUNCTION	OP14
NO FUNC.	00
OUTFUNC1	01
OUTFUNC2	02
OUTFUNC3	03
OUTFUNC4	04
OUTFUNC5	05
OUTFUNC6	06
OUTFUNC7	07



IP14 01 REMOTE P. / P.I. CONTROL

IP14 02 SERVOMOTOR ROTATION DIRECTION

IP14 03 HALT

IP14 04 ERROR RESET

OP14 01 MOTOR BRAKE CONTROL

OP14 02 TORQUE LIMIT

OP14 03 MOTOR SPEED > SP40

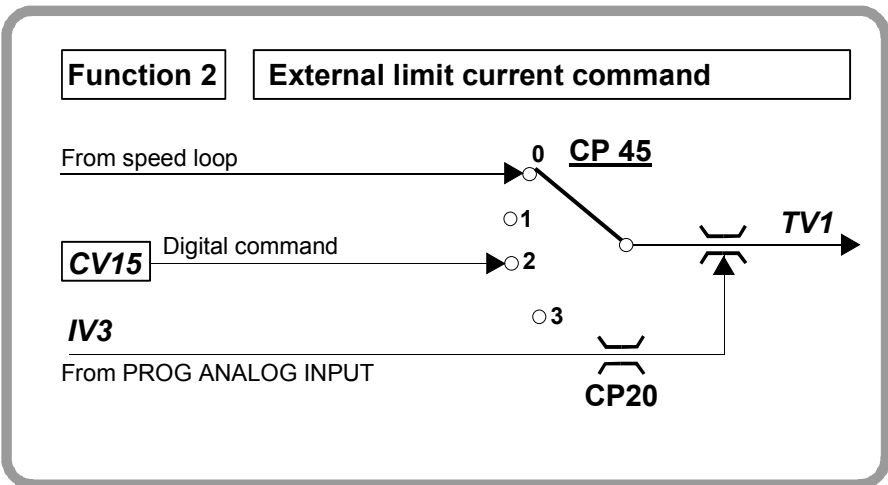
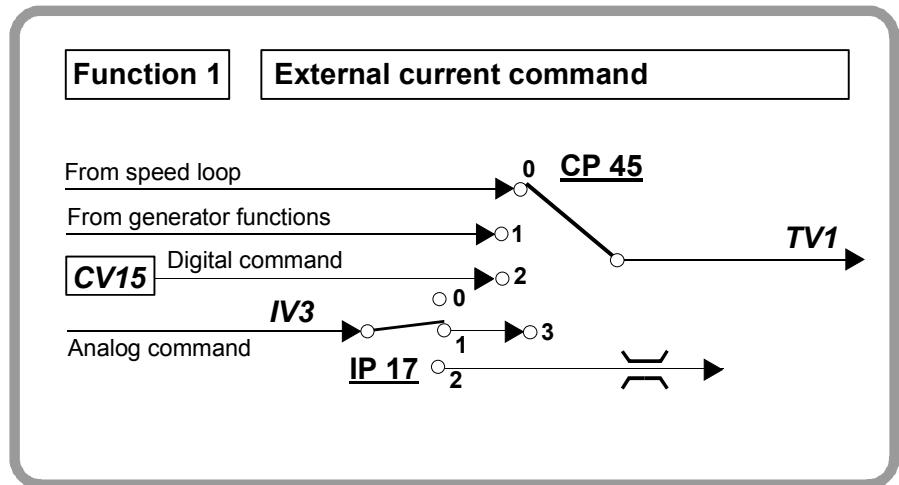
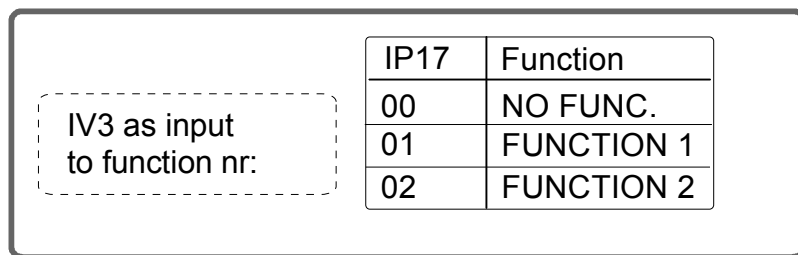
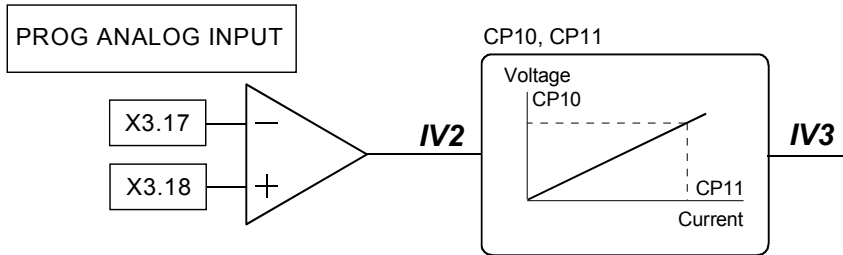
OP14 04 TARGET SPEED

OP14 05 0 REV/MIN > TARGET SPEED

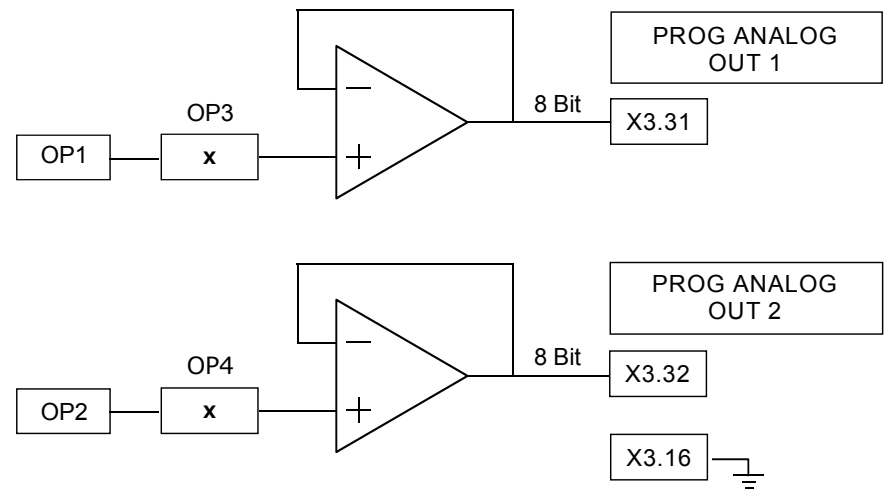
OP14 06 SECOND D.R. OK

OP14 07 WARNINGS

ANALOG FUNCTIONS



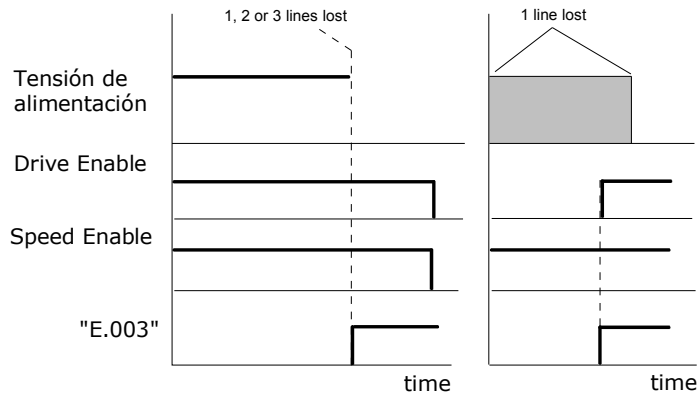
OP1	VARIABLE	OP2	VARIABLE	UNITS
00	SV15	00	SV15	rev/min
01	SV1	01	SV1	rev/min
02	SV6	02	SV6	rev/min
03	SV7	03	SV7	rev/min
04	SV2	04	SV2	rev/min
05	TV1	05	TV1	dNm
06	TV2	06	TV2	dNm
07	CV3	07	CV3	cA
08	WV5	08	WV5	---
09	IV1	09	IV1	mV
10	IV2	10	IV2	mV
11	Reserved	11	Reserved	---



ERROR FUNCTIONS

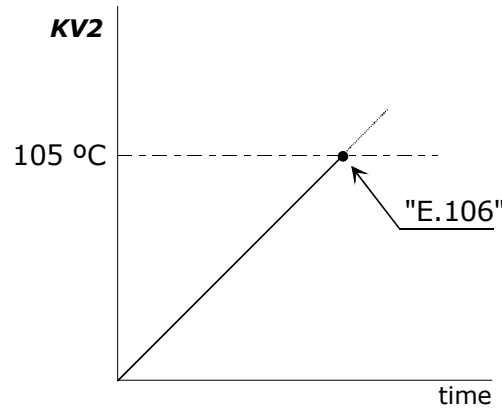
Function "E.003"

Power Supply fault



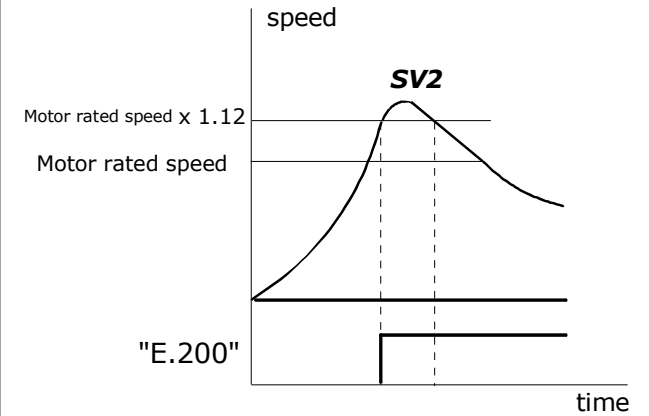
Function "E.106"

Drive Overtemperature



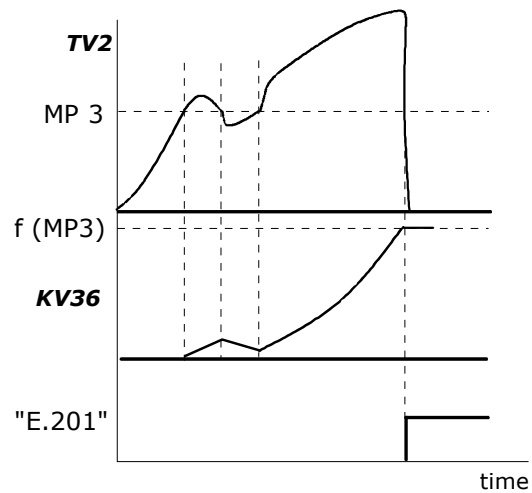
Function "E.200"

OverSpeed



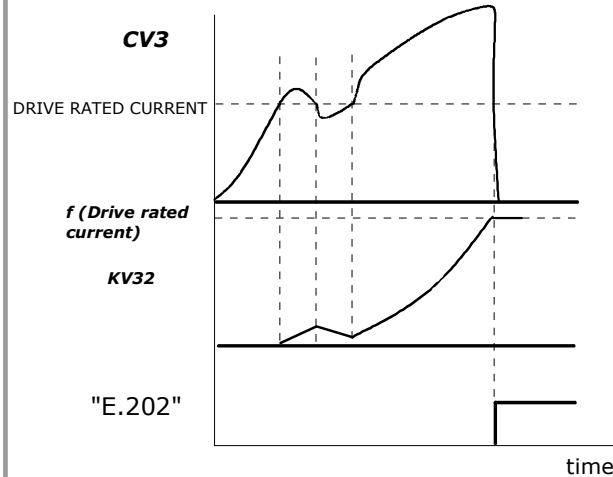
Function "E.201"

Motor Overload



Function " E.202 "

Drive Overload



Function " E.314 "

Ballast overload

