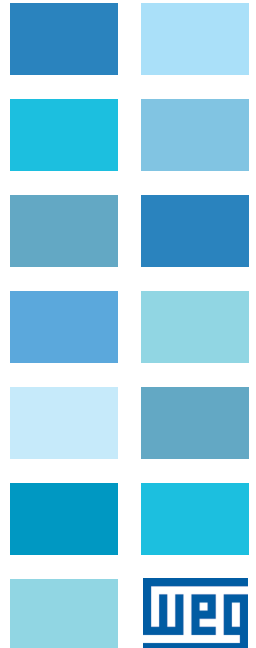


Fundamental Front End Regenerative Power Supply Unit

FFE200-4
FFE200-6

Instruction Manual

Language: English



Information about this manual

Software version

This manual is updated according the software version V 1.X.2.

The identification number of the software version is indicated on the identification plate of the FFE or can be checked with the **Firmware ver.rel** - PAR 490 parameter, menu 2.5

General information

Before using the product, read the safety instruction section carefully. Keep the manual in a safe place and available to engineering and installation personnel during the product functioning period.

WEG Automation Europe S.r.l. has the right to modify products, data and dimensions without notice. The data can only be used for the product description and they can not be understood as legally stated properties.

Thank you for choosing this WEG product.

We will be glad to receive any possible information which could help us improving this manual.

The e-mail address is the following: techdoc@weg.net.

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Table of contents

Information about this manual	2
1 - Safety Precautions	6
1.1 Symbols used in the manual	6
1.2 Safety precaution.....	7
1.3 General warnings	7
1.4 Disclaimer.....	8
2 - Introduction to the product.....	9
2.1 Product type designation	11
2.1.1 Parallel configurations	12
3 - Transport and storage.....	13
3.1 General.....	13
3.2 Permissible Environmental Conditions	14
3.3 Disposal: WEEE information	14
4 - Mechanical installation	15
4.1 Inclination and mounting clearance	15
4.2 Fastening positions.....	16
5 - Wiring Procedure.....	19
5.1 Power section	22
5.1.1 Cable Cross Section.....	22
5.1.2 EMC guide line	23
5.1.3 Block diagram power section	24
5.1.4 Power line connection	25
5.1.5 DC output connection.....	26
5.1.6 Connection of fans power supply	28
5.2 R-ADV Regulation card	29
5.2.1 Removing the terminal cover.....	29
5.2.2 Cable Cross Section.....	29
5.2.3 Regulation section connection	29
5.2.4 Switches, jumpers and LED	31
5.3 General description of power supply operation	34
5.4 R-PSM pre-charge card.....	35
5.4.1 I/O R-PSM Regulation card.....	35
5.4.2 Behavior of Precharge OK Relay- Digital Out 1, Digital Out 2 at "Power On" and "Power Off"	36
5.4.3 R-PSM card configuration switches	37
5.4.4 Jumpers.....	39
5.4.5 Led R-PSM card.....	39
5.5 Serial interface (XS connector).....	40
5.3.1 FFE / RS 485 Port (not insulated) point-to-point connection.....	40
5.5.2 FFE / RS485 port point-to-point connection (with insulation).....	42
5.5.3 RS 485 multi-drop connection	42
5.6 Typical connection diagrams.....	43
5.7 DC pre-charge unit, pre-charge inductor and contactors	45
5.7.1 LR3--FFE mains inductor	46
6 - Use of the keypad	48

6.1 Description.....	48
6.2 Navigation.....	49
6.2.1 Scanning of the first and second level menus.....	49
6.2.2 Display of a parameter.....	49
6.2.3 Scanning of the parameters.....	50
6.2.4 List of the last parameters modified.....	50
6.2.5 "Goto parameter" function.....	50
6.3 Parameter modification.....	51
6.4 How to save parameters.....	52
6.5 Configuration of the display.....	53
6.5.1 Language selection.....	53
6.5.2 Selection of Easy / Export mode.....	53
6.5.3 Startup display.....	53
6.5.4 Back-lighting of the display.....	53
6.6 Alarms.....	54
6.6.1 Alarm reset.....	54
6.7 Messages.....	54
6.8 Saving and recovery of new parameter settings.....	55
6.8.1 Selection of the keypad memory.....	55
6.8.2 Saving of parameters on the keypad.....	55
6.8.3 Load parameters from keypad.....	56
6.8.4 Transfer of parameters between FFE200.....	56
7 - Commissioning via keypad	57
7.1 Startup.....	60
7.2 Programming.....	61
7.2.1 Menu display modes.....	61
7.2.2 Programming of "function block" analog and digital input signals.....	61
7.2.3 Variable interconnections mode.....	61
8 - Description of parameters and functions (Expert list)....	63
Legend.....	63
8.1 Parameters on selection lists, but not displayed on keypad.....	128
8.2 Selection Lists.....	133
9 - Troubleshooting.....	137
9.1 Alarms.....	137
9.1.1 ExtIO fault" Alarm.....	139
9.1.2 "Fastlink" Alarm.....	140
9.2 Messages.....	141
10 - Specification	144
10.1 Environmental Conditions.....	144
10.2 Standards.....	144
10.3 Accuracy.....	144
10.3.1 Current control.....	144
10.3.2 Voltage control.....	144
10.3.3 Current rating.....	144
10.4 Overload.....	145
10.5 DC circuit.....	145
10.6 Electrical data.....	146
10.7 I2t protection.....	149
10.8 Overcurrent and Overtemperature thresholds.....	150
10.9 Voltage level of FFE200 for safe operations.....	151
10.10 Cooling.....	151

10.11 Weight and dimensions	152
11 - Options	157
11.1 Optional external fuses (mandatory).....	157
11.1.1 Fuses for connection mains side (F2)	157
11.1.2 Fuses for connection DC side	158
11.2 EMC filter	159
11.2.1 FFE200-4: filters for connection to TT and TN networks	159
11.2.2 FFE200-4: filters for IT network	159
11.2.3 FFE200-6, filters for connection to TT, TN and IT networks	159
11.3 Installation of optional cards	160
11.3.1 Shielding of optional card connections	161
Appendix 1 - Design	162
A.1.1 Single-motor applications	162
A.1.2 Multi-motor applications	163
A.1.3 Multi-motor applications where regenerated power is a small percentage of motor power.....	165
Appendix 2 - Parallel connection (400 ... 1650kW sizes)....	168
A 2.1 Introduction.....	168
A 2.2 Compatibility of IGBT modules	170
A 2.3 MS-SL interface cable wiring (2 parallel).....	171
A 2.4 MS-SL interface cable wiring (3 parallel).....	172
A 2.5 MS-SL interface cable wiring (4 parallel).....	173
A 2.6 MS-SL interface cable wiring (5 parallel).....	174
A 2.7 Jumpers and Switches	175
A 2.8 LEDs.....	175
Appendix 3 - Block Diagrams	178
System Diagrams Index	178
Commands	178
Digital inputs	179
Digital outputs.....	180
Analog inputs.....	181
Analog outputs.....	183
Active Curr Config	184
Functions	185

1 - Safety Precautions

1.1 Symbols used in the manual



Warning!

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

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



Caution

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

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



Indicates that the presence of electrostatic discharge could damage the appliance. When handling the boards, always wear a grounded bracelet.

Indique que la présence de décharges électrostatiques est susceptible d'endommager l'appareil. Toujours porter un bracelet de mise à la terre lors de la manipulation des cartes.



Attention

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

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

Note !

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

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

Qualified personnel

For the purpose of this Instruction Manual, a "Qualified person" is someone who is skilled to the installation, mounting, start-up and operation of the equipment and the hazards involved. This operator must have the following qualifications:

- trained in rendering first aid.
- trained in the proper care and use of protective equipment in accordance with established safety procedures.
- trained and authorized to energize, de-energize, clear, ground and tag circuits and equipment in accordance with established safety procedures.

Personne qualifiée

Aux fins de ce manuel d'instructions, le terme « personne qualifiée » désigne toute personne compétente en matière d'installation, de montage, de mise en service et de fonctionnement de l'appareil et au fait des dangers qui s'y rattachent. L'opérateur en question doit posséder les qualifications suivantes :

- formation lui permettant de dispenser les premiers soins
- formation liée à l'entretien et à l'utilisation des équipements de protection selon les consignes de sécurité en vigueur
- formation et habilitation aux manoeuvres suivantes : branchement, débranchement, vérification des isolations, mise à la terre et étiquetage des circuits et des appareils selon les consignes de sécurité en vigueur

Use for intended purpose only

The power drive system (electrical drive + application plant) may be used only for the application stated in the manual and only together with devices and components recommended and authorized by **WEG**.

En cas de panne et même désactivé, le drive peut provoquer des mouvements fortuits s'il n'a pas été débranché de l'alimentation secteur.



Electrical Shock

The DC link capacitors remain charged at a hazardous voltage even after cutting off the power supply.

Never open the device or covers while the AC Input power supply is switched on. Minimum time to wait before working on the terminals or inside the device is listed in section **"10.9 Voltage level of FFE200 for safe operations"** on page 151.

Risque de décharge électrique

Les condensateurs de la liaison à courant continu restent chargés à une tension dangereuse même après que la tension d'alimentation a été coupée.

Ne jamais ouvrir l'appareil lorsqu'il est sous tension. Le temps minimum d'attente avant de pouvoir travailler sur les bornes ou bien à l'intérieur de l'appareil est indiqué dans la section **"10.9 Voltage level of FFE200 for safe operations"** on page 151.

Electrical Shock and Burn Hazard:

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

Décharge Électrique et Risque de Brûlure : Lors de l'utilisation d'instruments (par exemple oscilloscope) sur des systèmes en marche, le châssis de l'oscilloscope doit être relié à la terre et une sonde différentiel devrait être utilisé en entrée. Les sondes et conducteurs doivent être choisis avec soin pour effectuer les meilleures mesures à l'aide d'un oscilloscope. Voir le manuel d'instruction pour une utilisation correcte des instruments.

Fire and Explosion Hazard:

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

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

1.4 Disclaimer

Any remote connection functions shall be used only under adequate security conditions, in compliance with current regulatory provisions and only by properly trained personnel. The evaluation of such conditions is up to the user.

2 - Introduction to the product

FFE200 is the Fundamental Front End family of six-pulse AC/DC regenerative power supplies.

During the supply phase, when power flows from the mains to the DC bus, operation is identical to that of a six-pulse diode rectifier, with the standard conversion ratio at full load ($V_{DC} = 1.35 V_{AC}$).

The rectifier bridge diodes are the same as the recirculation diodes used on the IGBT bridge.

When the motors act as brakes, generating energy toward the DC bus, the power flow is reversed and passes through the IGBTs of the FFE module to the AC mains.

The IGBT bridge pulses are synchronized with mains voltages and have a typical six-pulse scheme.

FFE200 was designed to power the **ADV200..-DC** series inverter family, whether with a single module or with several modules connected to the same DC bus.

It may also be used to supply ADV200-...-IT series powered from DC.

The FFE power supply has an integrated DC bus pre-charge system composed of a 3-phase semi-controlled thyristor bridge.



.....
About use with standard products (i.e. ADV200...-4 or -6) or other brand products.

AC fed inverters may utilize input filter capacitors that exist from the input diode bridge to ground. These capacitors are subject to failure if the product is powered via the DC bus input.

In this scenario, the input filter capacitors should be removed before powering up the unit from an FFE.

For **WEG** legacy or AC fed units, please consult the factory.

For Other Brand products, consult the manufacturer of that product.

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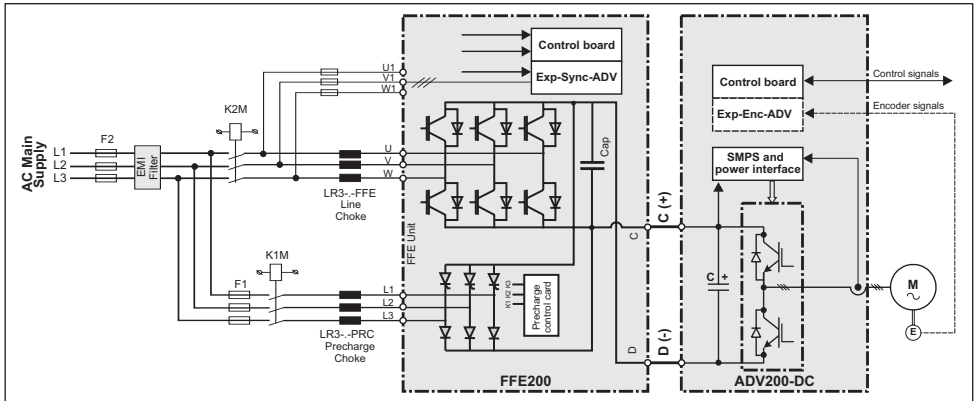
Note!

.....
For correct functioning, a 4% mains inductance must be used in order to limit current peaks during regeneration and to ensure an adequate current ripple value in the DC capacitor bank.

LCL filters must be chosen based on the overload required for the FFE: or Low Duty.

.....

Connection with Precharge (integrated) and EMI Filter



Reduced operating costs

The FFE200 achieves **considerable savings in terms of power consumption and the relative costs**. The kinetic energy of the inertia of the loads transformed into electric energy by the FFE200 is **sent back to the mains supply during braking**. In conventional resistor braking systems this power is dissipated in the form of heat. The excess energy can be used to supply other equipment.

Enhanced control dynamics

Used in single or multi-inverter solutions powered by a common DC bus the FFE200 also guarantees **high-level control dynamics** in FFE and energy regeneration conditions, which would be impossible with electric braking solutions.

Typical applications

The FFE200 is ideal for applications that require management of high-inertia loads or with high operating dynamics, such as: test benches, industrial lifting applications, centrifuges, mixers, ventilation systems, renewable energy systems, rolling systems, high-power servo systems, etc.

The economic benefits of using the FFE200 in applications such as these are not of secondary importance.

2.1 Product type designation

The main technical characteristic of the FFE200 are showed in the product code and in the nameplate.

FFE200 500-K X X -4 -XX YY

Parallel version only:

XX : MS = MASTER
SL = SLAVE with MS/SL cable 1m length
SL2 = SLAVE with MS/SL cable 2m length

YY : Total DC output current of parallel

FFE200-...-4	FFE200-...-6
10 = 900 A	09 = 910 A
13 = 1310 A	12 = 1240 A
16 = 1580 A	14 = 1360 A
20 = 1980 A	18 = 1860 A
23 = 2370 A	20 = 2040 A
26 = 2630 A	24 = 2480 A
31 = 3160 A	27 = 2720 A
33 = 3300 A	31 = 3100 A
40 = 3960 A	34 = 3400 A

Rated voltage (factory setting):

4 = 400 Vac, 50 Hz
6 = 500...690 Vac

Software:

X = standard

Braking unit:

X = not included

B = included

Keypad:

X = non included

K = included

DC output current

500 = 500 A

550 = 550 A

690 = 690 A



730 = 730 A

760 = 760 A

800 = 800 A

Fundamental Front End Regenerative Power Supply Unit

Identification Nameplate

Numero di serie	WEG WEG Automation Europe S.r.L. - Via G.Carducci, 24 I-21040-Gerenzano, VA
Modello	Type: FFE200-690-6 + PRC S/N: XXXXXXXX
Ingresso (tensione di alimentazione, corrente)	Main Power In 500Vac-10% ÷ 690 Vac +10% 582A 50/60Hz 3Ph
Uscita (tensione, potenza, corrente, sovraccarico SP e sovraccarico SL)	Main Power Out 575÷938 Vdc 691A Ovid 150% 60s 817A Ovid 110% 60s
Ingresso precarica (tensione, corrente)	Precharge Power Input 690Vac 70A 50/60Hz 3 Phase
Alim. ventilatori (tensione, corrente)	Fan Supply 380 Vac 430Vac 1,9A 50/60Hz 3 Phase
Approvazioni	Code 39FF04  
	Made in Italy

Firmware & cards revision level nameplate

	Firmware Release						S/N	X	Prod. CONF.
	HW release	D	PD	P	R	R-PS			
Revisione firmware	1.0.0	B	C	D	L	B	F	10.10.10	A1
Revisione schede		D-AD/V...	PD-AD/V...	Potenza	Regolazione	R-FSM	INT-F-AD/V...	Revisione software (configuratore)	Configurazione prodotto

The choice of FFE200 depends on the current rating of the inverters connected to the DC-link.

The rated output current of the FFE200 must be higher or equal to the sum of the current ratings of the FFE200 connected to the DC-link. For further information please see Appendix 1.

(*) The current rating in A shown on the product data plate refers to that of the equivalent ADV200-DC.

2.1.1 Parallel configurations

A parallel connection of several units basically consists of one MASTER unit and one or more SLAVE units.

When placing your order **please give the code number of the master and slave and number of these:**

DC Output Current (A)		Cod.	Description (Designation)
SP	SL		
1018	1221	S9FF01M	FFE200-550-4+PRC-MS 10
		S9FF01S	FFE200-550-4-SL
1356	1600	S9FF03M	FFE200-730-4+PRC-MS 13
		S9FF03S	FFE200-730-4-SL
1628	1967	S9FF05M	FFE200-880-4+PRC-MS 16
		S9FF05S	FFE200-880-4-SL
2034	2400	S9FF03M1	FFE200-730-4+PRC-MS 20
		S9FF03S	FFE200-730-4-SL
		S9FF03S	FFE200-730-4-SL
2442	2950	S9FF05M1	FFE200-880-4+PRC-MS 23
		S9FF05S	FFE200-880-4-SL
		S9FF05S	FFE200-880-4-SL
2712	3201	S9FF03M2	FFE200-730-4+PRC-MS 26
		S9FF03S	FFE200-730-4-SL
		S9FF03S	FFE200-730-4-SL
		S9FF03S1	FFE200-730-4-SL2
3256	3933	S9FF05M2	FFE200-880-4+PRC-MS 31
		S9FF05S	FFE200-880-4-SL
		S9FF05S	FFE200-880-4-SL
		S9FF05S1	FFE200-880-4-SL2
3390	4001	S9FF03M3	FFE200-730-4+PRC-MS 33
		S9FF03S	FFE200-730-4-SL
		S9FF03S	FFE200-730-4-SL
		S9FF03S1	FFE200-730-4-SL2
		S9FF03S1	FFE200-730-4-SL2
4070	4916	S9FF05M3	FFE200-880-4+PRC-MS 40
		S9FF05S	FFE200-880-4-SL
		S9FF05S	FFE200-880-4-SL
		S9FF05S1	FFE200-880-4-SL2
		S9FF05S1	FFE200-880-4-SL2

DC Output Current (A)		Cod.	Description (Designation)
SP	SL		
945	1090	S9FF02M	FFE200-500-6+PRC-MS 09
		S9FF02S	FFE200-500-6-SL
1278	1511	S9FF04M	FFE200-690-6+PRC-MS 12
		S9FF04S	FFE200-690-6-SL
1400	1647	S9FF06M	FFE200-760-6+PRC-MS 14
		S9FF06S	FFE200-760-6-SL
1918	2267	S9FF04M1	FFE200-690-6+PRC-MS 18
		S9FF04S	FFE200-690-6-SL
		S9FF04S	FFE200-690-6-SL
2101	2470	S9FF06M1	FFE200-760-6+PRC-MS 20
		S9FF06S	FFE200-760-6-SL
		S9FF06S	FFE200-760-6-SL
2557	3023	S9FF04M2	FFE200-690-6+PRC-MS 24
		S9FF04S	FFE200-690-6-SL
		S9FF04S	FFE200-690-6-SL
		S9FF04S1	FFE200-690-6-SL2
2801	3293	S9FF06M2	FFE200-760-6+PRC-MS 27
		S9FF06S	FFE200-760-6-SL
		S9FF06S	FFE200-760-6-SL
		S9FF06S1	FFE200-760-6-SL2
3196	3779	S9FF04M3	FFE200-690-6+PRC-MS 31
		S9FF04S	FFE200-690-6-SL
		S9FF04S	FFE200-690-6-SL
		S9FF04S1	FFE200-690-6-SL2
		S9FF04S1	FFE200-690-6-SL2
3501	4116	S9FF06M3	FFE200-760-6+PRC-MS 34
		S9FF06S	FFE200-760-6-SL
		S9FF06S	FFE200-760-6-SL
		S9FF06S1	FFE200-760-6-SL2
		S9FF06S1	FFE200-760-6-SL2

3 - Transport and storage



Correct transport, storage, erection and mounting, as well as careful operation and maintenance are essential for proper and safe operation of the equipment. Protect the FFE200 against physical shocks and vibration during transport and storage. Also be sure to protect it against water (rainfall) and excessive temperatures.

Le bon accomplissement des opérations de transport, de stockage, d'installation et de montage, ainsi que l'exploitation et l'entretien minutieux, sont essentiels pour garantir à l'appareil un fonctionnement adéquat et sûr.

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

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

3.1 General

A high degree of care is taken in packing the FFE200 product and preparing them for delivery. They should only be transported with suitable transport equipment (see weight data). Observe the instructions printed on the packaging. This also applies when the device is unpacked and installed in the control cabinet.

Upon delivery, check the following:

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

Open the packaging with suitable tools. Check whether:

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

In the event of any damage or of an incomplete or incorrect delivery please notify the responsible sales offices immediately. The devices should only be stored in dry rooms within the specified temperature ranges .

Note!

A certain degree of moisture condensation is permissible if this arises from changes in temperature. This does not, however, apply when the devices are in operation. Always ensure that there is no moisture condensation in devices that are connected to the power supply!

3.2 Permissible Environmental Conditions

Temperature

storage _____	-25...+55°C (-13...+131°F), class 1K4 per EN50178
	-20...+55°C (-4...+131°F), for devices with keypad
transport _____	-25...+70°C (-13...+158°F), class 2K3 per EN50178
	-20...+60°C (-4...+140°F), for devices with keypad

Air humidity

storage _____	5% to 95 %, 1 g/m ³ to 29 g/m ³ (class 1K3 as per EN50178)
transport _____	95 % (3), 60 g/m ³ (4)

A light condensation of moisture may occur for a short time occasionally if the device is not in operation (class 2K3 as per EN50178)

Air pressure:

storage _____	[kPa] 86 to 106 (class 1K4 as per EN50178)
transport _____	[kPa] 70 to 106 (class 2K3 as per EN50178)

- (3) Greatest relative air humidity occurs with the temperature @ 40°C (104°F) or if the temperature of the device is brought suddenly from -25...+30°C (-13°...+86°F).
- (4) Greatest absolute air humidity if the device is brought suddenly from 70...15°C (158°...59°F).

3.3 Disposal: WEEE information

Attention!

Please dispose of this unit with care as an industrial waste and according to your required local regulations.



Pursuant to Article 26 of Italian Legislative Decree no. 49 of 14 March 2014 “Implementation of Directive 2012/19/EU on waste electrical and electronic equipment (WEEE)”

The symbol showing a crossed-out wheeled bin on equipment or its packaging indicates that the product must be collected separately from other waste at the end of its useful life.

The manufacturer is responsible for organising and managing the separate collection of this piece of equipment at the end of its useful life.

Users wishing to dispose of the equipment must therefore contact the manufacturer to obtain instructions from the same on how to have the equipment collected separately at the end of its useful life.

By collecting the disused equipment separately, it can be recycled, treated or disposed of in an environmentally friendly manner, thus helping to prevent the environment and public health from being affected negatively and enabling reuse and/or recycling of the materials forming the same equipment.

4 - Mechanical installation

The FFE must be mounted on a wall that is constructed of heat resistant material. While the FFE is operating, the temperature of the FFE's cooling fins can rise to a temperature of 158° F (70°C).

Le FFE doit être monté sur un mur construit avec des matériaux résistants à la chaleur. Pendant le fonctionnement du FFE, la température des ailettes du dissipateur thermique peut arriver à 70°C (158° F).

Because the ambient temperature greatly affects FFE life and reliability, do not install the FFE in any location that exceeds the allowable temperature.

Étant donné que la température ambiante influe sur la vie et la fiabilité du FFE, on ne devrait pas installer le FFE dans des places où la température permise est dépassée.

Be sure to remove the desiccant dryer packet(s) when unpacking the FFE. (If not removed these packets may become lodged in the fan or air passages and cause the FFE to overheat).

Lors du déballage du FFE, retirer le sachet déshydraté. (Si celui-ci n'est pas retiré, il empêche la ventilation et provoque une surchauffe du FFE).

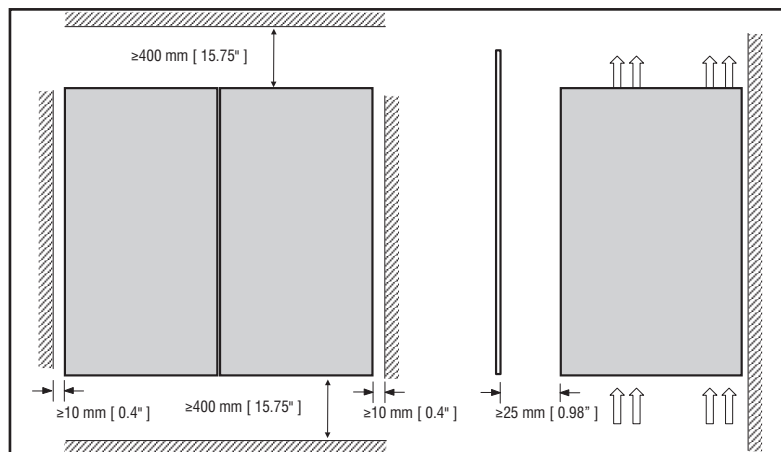
Protect the device from impermissible environmental conditions (temperature, humidity, shock etc.).

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

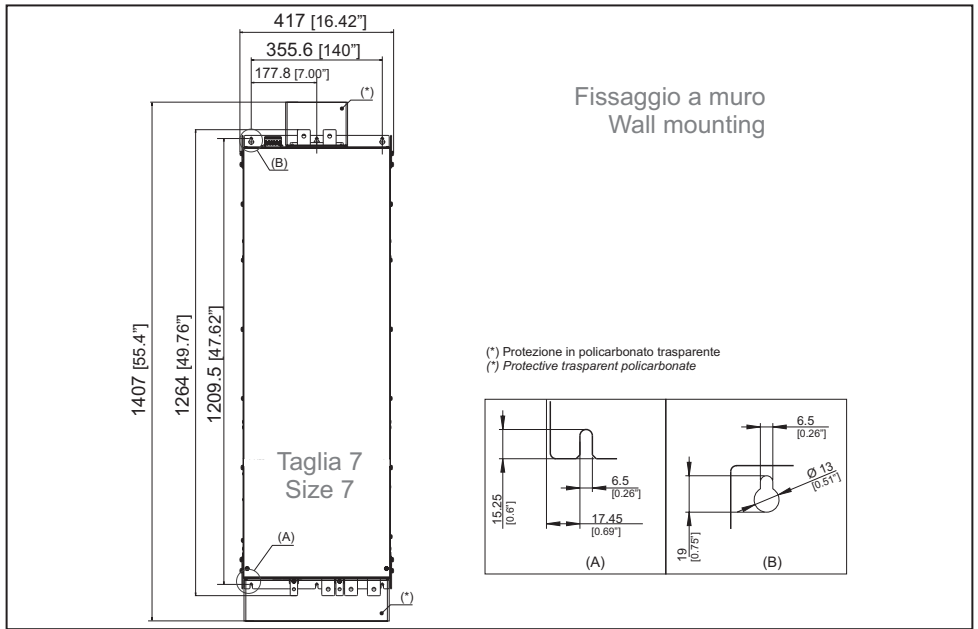
4.1 Inclination and mounting clearance

The FFE200 must be mounted in such a way that the free flow of air is ensured see [paragraph "10.10 Cooling" on page 151](#).

Maximum angle of inclination _____ 30° (referred to vertical position)
Minimum top and bottom distance _____ 400mm
Minimum free space to the front _____ 25 mm
Minimum distance between drives _____ none
Minimum distance to the side with the cabinet 10 mm



4.2 Fastening positions

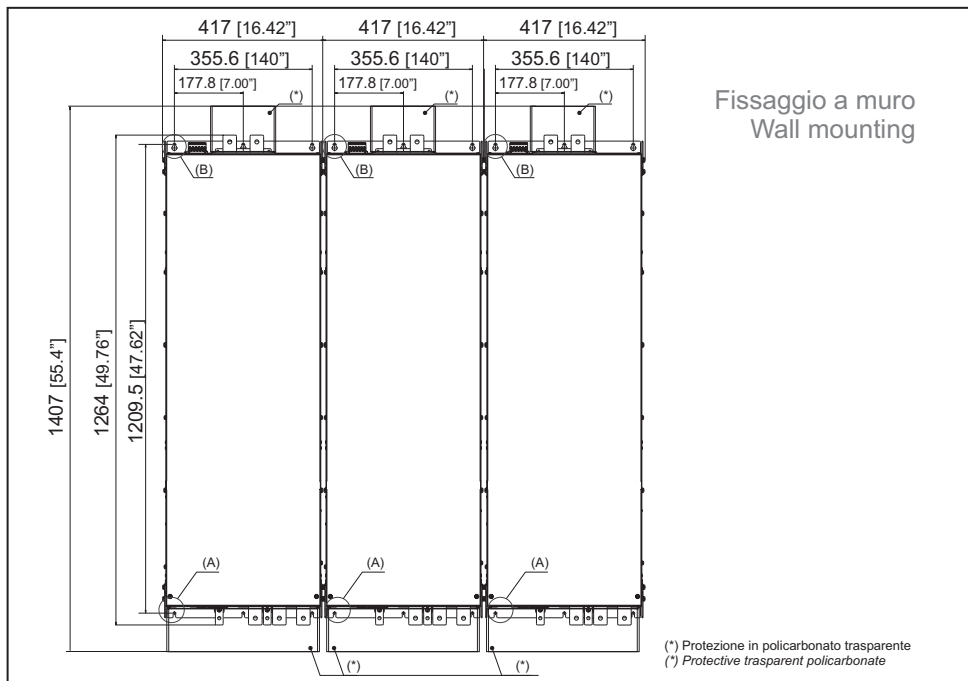
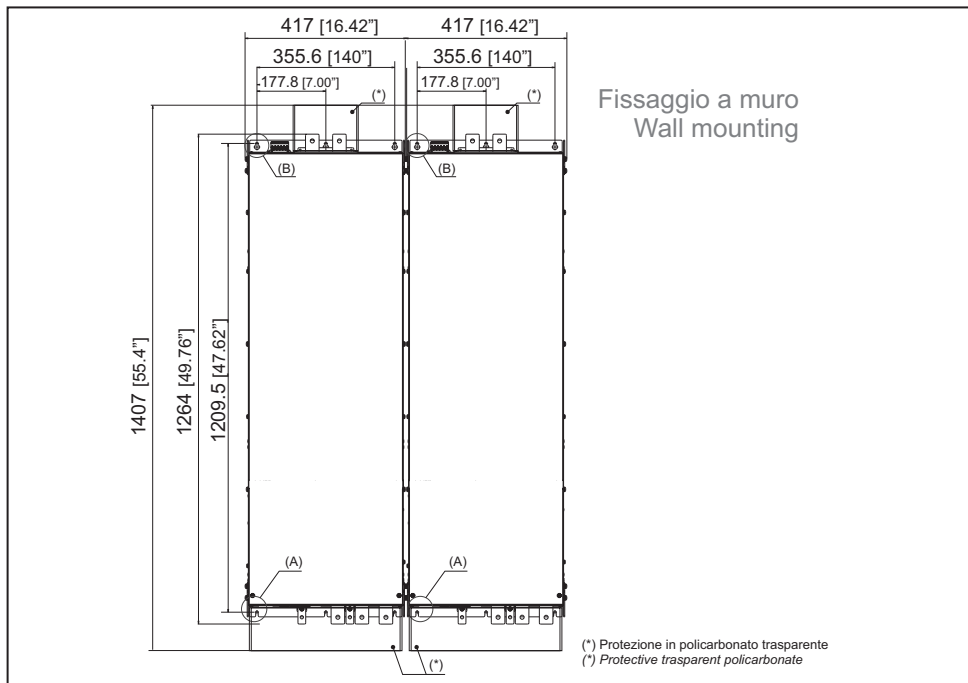


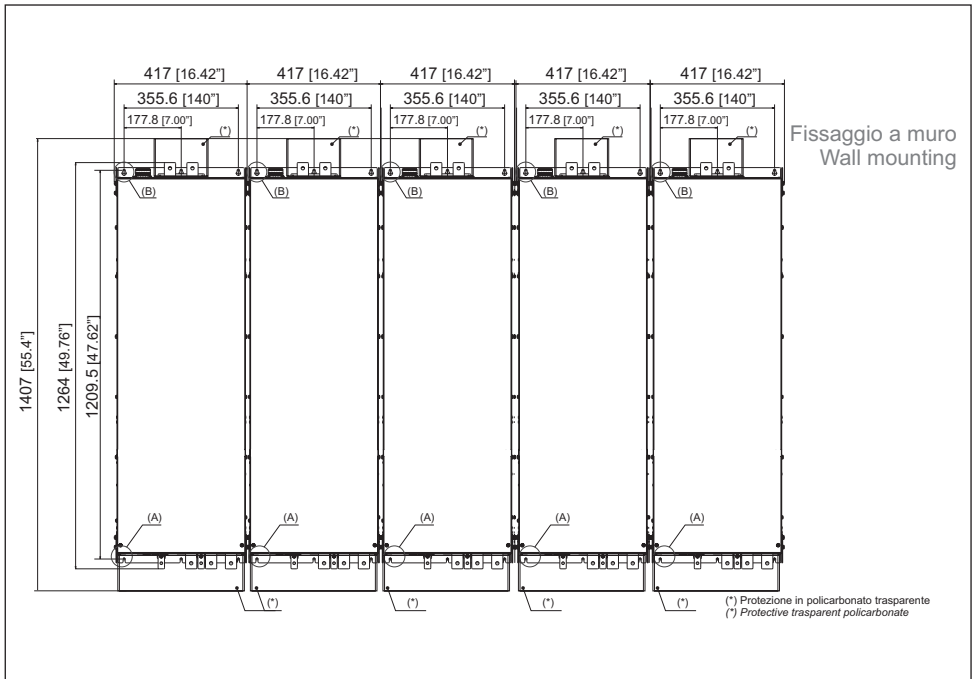
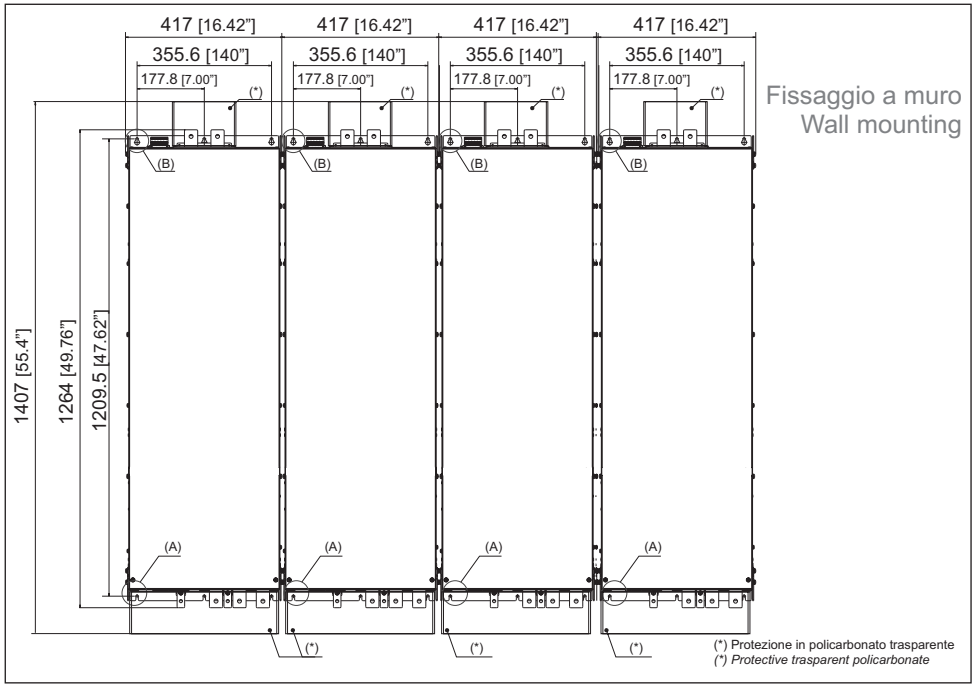
Recommended screws for fastening

6 x M6 x 16 mm screws + Grover (spring-lock) washer + Flat washer

Note!

Other dimensions [see chapter "10.11 Weight and dimensions" on page 152.](#)





5 - Wiring Procedure



FFE200 are electrical apparatus for use in industrial installations. Parts of the FFE200 are energized during operation. The electrical installation and the opening of the device should therefore only be carried out by qualified personnel. Improper installation of FFE200 may therefore cause the failure of the device as well as serious injury to persons or material damage. Drive is not equipped with motor overspeed protection logic other than that controlled by software. Follow the instructions given in this manual and observe the local and national safety regulations applicable.

Les FFE200 à fréquence variable sont des dispositifs électriques utilisés dans des installations industriels. Une partie des FFE200 sont sous tension pendant l'opération. L'installation électrique et l'ouverture des FFE200 devrait être exécuté uniquement par du personnel qualifié. De mauvaises installations de moteurs ou de FFE200 peuvent provoquer des dommages matériels ou blesser des personnes. On doit suivre les instructions données dans ce manuel et observer les règles nationales de sécurité.

Replace all covers before applying power to the FFE200. Failure to do so may result in death or serious injury.

Remettre tous les capots avant de mettre sous tension le FFE200. Des erreurs peuvent provoquer de sérieux accidents ou même la mort.



The FFE200 must always be grounded. If the FFE200 is not connected correctly to ground, extremely hazardous conditions may be generated that may result in death or serious injury.

Le FFE200 doit toujours être raccordé au système de mise à la terre. Un mauvais raccordement du FFE200 au système de mise à la terre peut se traduire par des conditions extrêmement dangereuses susceptibles d'entraîner le décès ou de graves lésions corporelles.

Never open the device or covers while the AC Input power supply is switched on. Minimum time to wait before working on the terminals or inside the device is listed in section "10.9 Voltage level of FFE200 for safe operations" on page 151.

Ne jamais ouvrir l'appareil lorsqu'il est sous tension. Le temps minimum d'attente avant de pouvoir travailler sur les bornes ou bien à l'intérieur de l'appareil est indiqué dans la section "10.9 Voltage level of FFE200 for safe operations" on page 151.

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

Manipuler l'appareil de façon à ne pas toucher ou endommager des parties. Il n'est pas permis de changer les distances d'isolement ou bien d'enlever des matériaux isolants ou des capots.



Do not connect power supply voltage that exceeds the standard specification voltage fluctuation permissible. If excessive voltage is applied to the Drive, damage to the internal components will result.

Ne pas raccorder de tension d'alimentation dépassant la fluctuation de tension permise par les normes. Dans le cas d'une alimentation en tension excessive, des composants internes peuvent être endommagés.

Operation with Residual Current Device

If an RCD (also referred to as ELCB or RCCB) is fitted, the FFE200 supplier will operate without nuisance tripping, provided that:

- a type B RCD is used.
- the trip limit of the RCD is 300mA.
- the neutral of the supply is grounded (TT or TN systems)

Type of networks

FFE200s were designed to be connected to standard TT, TN or IT three-phase networks.

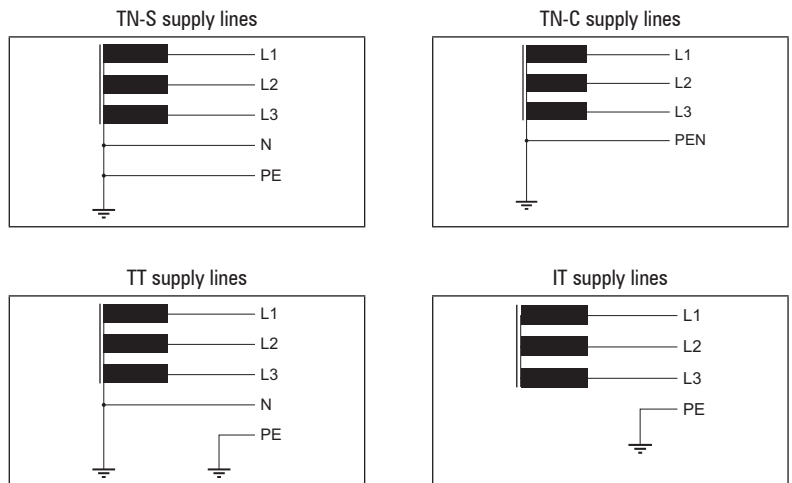
See the manual for the correct choice of the EMI filter in relation to the size of the power supply, the supply voltage and the type of network (TT, TN or IT).

Power supply networks

Based on the grounding method, the IEC 60634-1 describes three main types of grounding for power supply networks: TN, TT and IT systems.

In particular, the IT system has all the active parts insulated from earth or a point connected to ground through an impedance. The earths of the system are connected separately or collectively to the system ground.


The following figures show these different systems.



5.1 Power section


5.1.1 Cable Cross Section

Sizes	Bars: C - D - U - V - W				
	Maximum Cable Cross Section (mm ²)		Lock screw diameter (mm)	Recommended terminal	Tightening torque (min) (Nm)
FFE200-550-4	2 x 100	2 x AWG 4/0	M10	Eyelet	50
FFE200-730-4	2 x 150	2 x AWG 3/0	M10	Eyelet	50
FFE200-880-4	2 x 240	2 x AWG 500	M10	Eyelet	50

Sizes	Terminals:  on mechanical cabinet				
FFE200-550-4	100	AWG 4/0	M10	Eyelet	50
FFE200-730-4	2 X 85	2 X AWG 3/0	M10	Eyelet	50
FFE200-880-4	2 X 120	AWG 250	M10	Eyelet	50

Sizes	L1 - L2 - L3 (Pre-charge conductors)				
	Maximum Cable Cross Section (mm ²)		Lock screw diameter (mm)	Recommended terminal	Tightening torque (min) (Nm)
FFE200-...4	16	5	M10	Eyelet - Spade	50

Sizes	Bars: C - D - U - V - W				
	Maximum Cable Cross Section (mm ²)		Lock screw diameter (mm)	Recommended terminal	Tightening torque (min) (Nm)
FFE200-500-6	2 X 100	2 X AWG 4/0	M10	Eyelet	50
FFE200-690-6	2 X 150	2 X AWG 300	M10	Eyelet	50
FFE200-760-6	2 X 240	2 X AWG 500	M10	Eyelet	50

Sizes	Terminals:  on mechanical cabinet				
FFE200-500-6	100	AWG 4/0	M10	Eyelet	50
FFE200-690-6	2 X 85	2 X AWG 3/0	M10	Eyelet	50
FFE200-760-6	2 X 120	AWG 250	M10	Eyelet	50

Sizes	L1 - L2 - L3 (Pre-charge conductors)				
	Maximum Cable Cross Section (mm ²)		Lock screw diameter (mm)	Recommended terminal	Tightening torque (min) (Nm)
FFE200-...6	16	5	M10	Eyelet - Spade	50

Note!

.....
 For larger sizes (parallels), refer to the corresponding size.

5.1.2 EMC guide line



.....
In a domestic environment, this product may cause radio interference, in which case supplementary mitigation measures may be required.

Dans un environnement domestique, ce produit peut causer des interférences radio, auquel cas supplémentaire des mesures d'atténuation peuvent être nécessaires.
.....



.....
FFE are designed to operate in an industrial environment where a high level of electromagnetic interference are to be expected. Proper installation practices will ensure safe and trouble-free operation. If you encounter problems, follow the guidelines which follow.

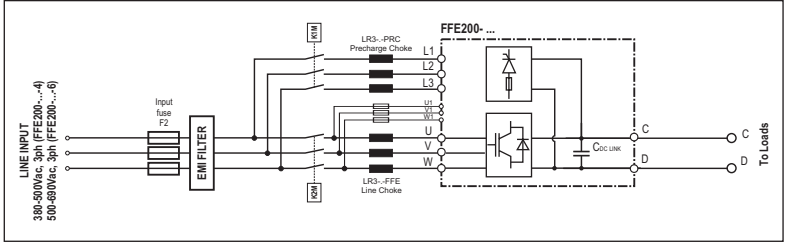
- Check for all equipment in the cabinet are well grounded using short, thick grounding cable connected to a common star point or busbar. Better solution is to use a conductive mounting plane and use that as EMC ground reference plane.
- Flat conductors, for EMC grounding, are better than other type because they have lower impedance at higher frequencies.
- Make sure that any control equipment (such as a PLC) connected to the FFE200 is connected to the same EMC ground or star point as the FFE200 via a short thick link.
- Separate the control cables from the power cables as much as possible, using separate trunking, if necessary at 90° to each other.
- Whenever possible, use screened leads for the connections to the control circuitry.
- Ensure that the contactors in the cubicle are suppressed, either with R-C suppressors for AC contactors or 'flywheel' diodes for DC contactors fitted to the coils. Varistor suppressors are also effective. This is important when the contactors are controlled from the FFE200 relay.
- Use the recommended EMI filters, which are listed in section 11.2 of this manual (conformity with EN61800-3, class C3 with 50 meters of motor cable with a single inverter supplied by the FFE200).
- Use shielded cables in motors to ensure the correct operation of the EMI filter.

Note!

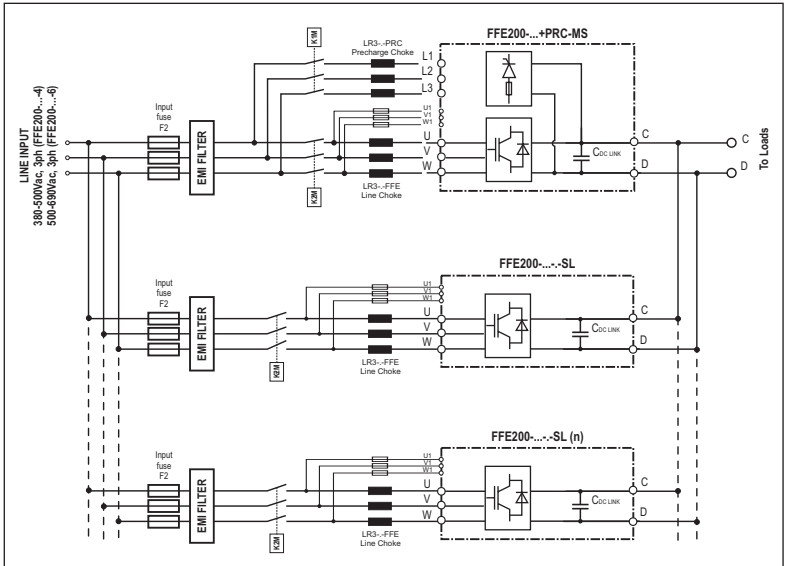
.....
For further information regarding electro-magnetic compatibility standards, according to Directive 2014/30/EU, conformity checks carried out on **WEG** appliances, connection of filters and mains inductors, shielding of cables, ground connections, etc., consult the "Electro-magnetic compatibility guide" (1S5E84) you can download from www.weg.net.
.....

5.1.3 Block diagram power section

FFE200-550-4, FFE200-730-4, FFE200-880-4
FFE200-500-6, FFE200-690-6, FFE200-760-6

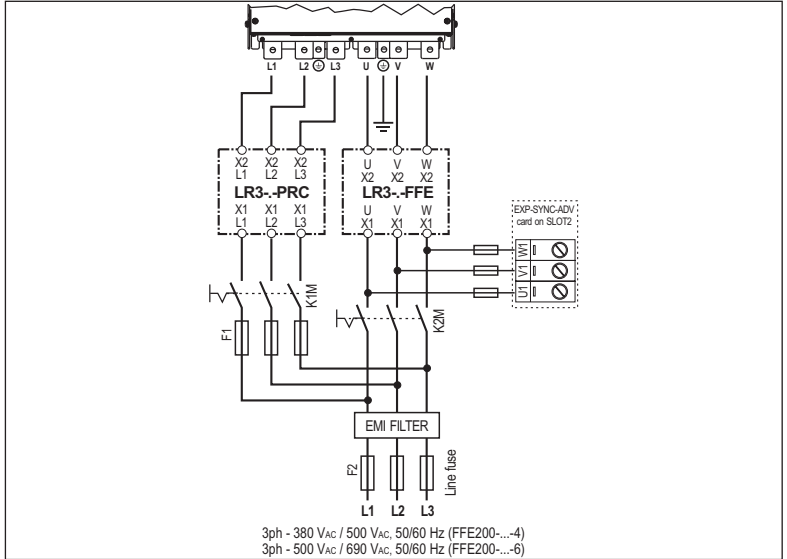


FFE200 on parallel: 1 Master + n Slave (max 4)



5.1.4 Power line connection

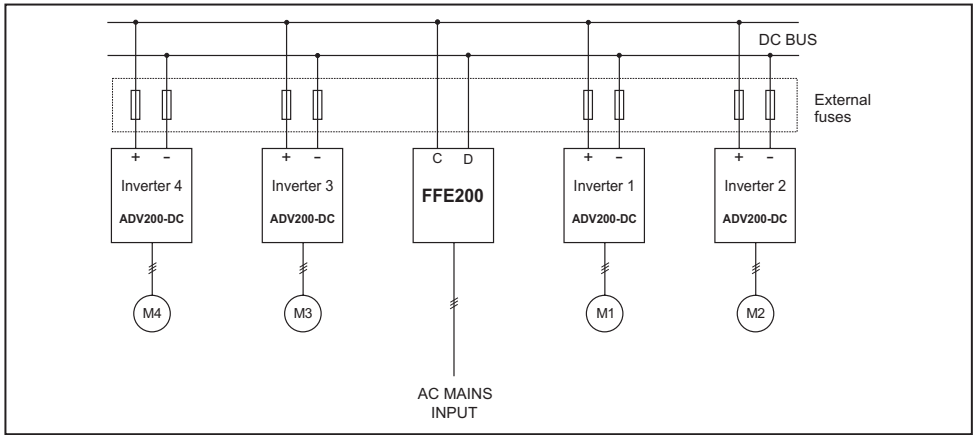
FFE200-550-4, FFE200-730-4, FFE200-880-4
 FFE200-500-6, FFE200-690-6, FFE200-760-6
 FFE200-...-MS-..



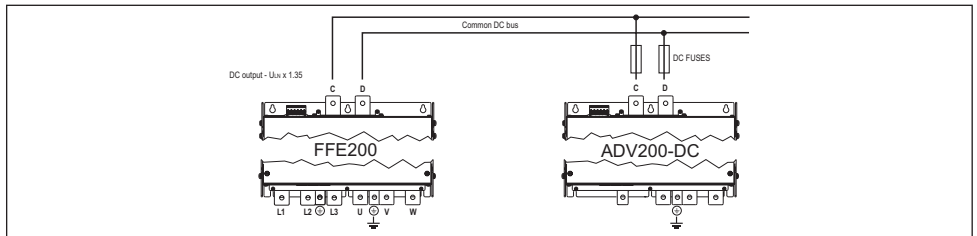
Note!

Recommended combination F1 fuses: see [paragraph 11.1](#).

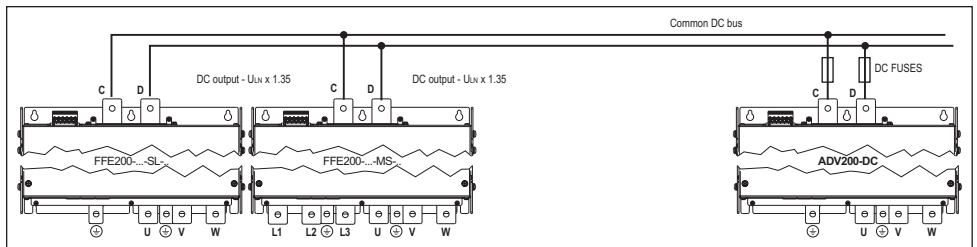
5.1.5 DC output connection



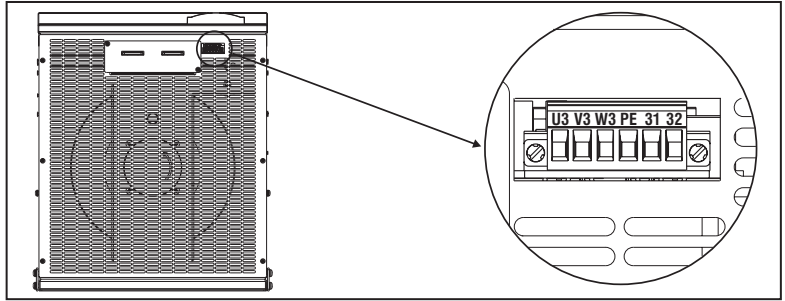
FFE200-550-4, FFE200-730-4, FFE200-880-4
 FFE200-500-6, FFE200-690-6, FFE200-760-6



FFE200 on parallel: 1 Master + 1 Slave



5.1.6 Connection of fans power supply



Sizes	Terminals : U3 - V3 - W3 - PE - 31 - 32			
	Maximum Cable Cross Section (mm ²)	AWG / kcmil	Recommended stripping (mm)	Tightening torque (min) (Nm)
FFE200-....	1,5	16	7	0,5 ...0,8

Sizes	Terminals					
	U3	V3	W3	PE	31	32
FFE200-550-4 FFE200-730-4 FFE200-500-6	3 x 400V / 50Hz, 1.15Arms ... 3 x 460V / 60Hz, 1.4Arms			Ground	250V/2A contact Motor over temperature contact management terminals 31-32: Closed: Internal fan in operation Open: Internal fan in over temperature alarm	
Power the internal fan (570W @400V, 930W @460V) with a three-phase voltage on terminals U3/V3/W3.						

Sizes	Terminals					
	U3	V3	W3	PE	31	32
FFE200-880-4 FFE200-690-6 FFE200-760-6	3 x 380V - 480 V 50/60Hz, 1.9A - 1.5A 1.15kW			Ground	250V/2A contact Motor alarm contact management terminals: 31-32: Closed: Internal fan in operation Open: Signalling of failure	
Power the internal fan (1150W) with a three-phase voltage on terminals U3/V3/W3.						

Note!

For larger sizes (parallels), refer to the corresponding size.



Make sure the sequence of the three-phase fan power supply phases is the same as that shown on the relative FFE200 supplier terminals, or check that the fan rotation direction is the same as the arrow on the fan frame (to see this, the upper chassis casing needs to be opened).

If not, the air flow will be inadequate to ensure correct cooling.

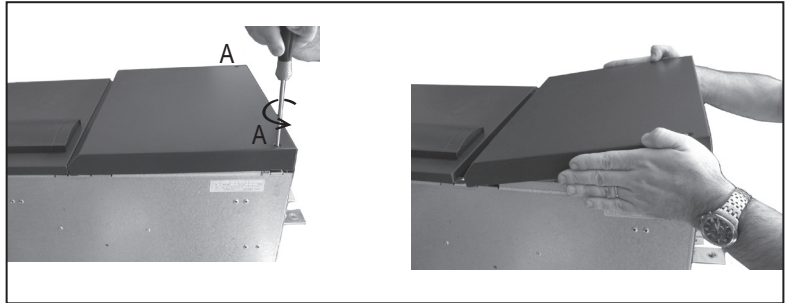
Verification is NOT required for sizes: FFE200-880-4, FFE200-690-6 and FFE200-760-6.

5.2 R-ADV Regulation card

5.2.1 Removing the terminal cover



When removing the covers be careful to lateral metal sheet enclosure. Presence of sharp edge are possible.

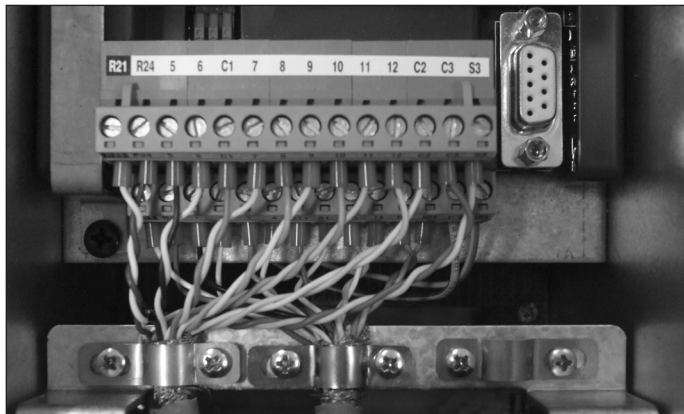


5.2.2 Cable Cross Section

Terminal strips (Regulation card)	Maximum Cable Cross Section		Recommended stripping (mm)	Tightening torque (min) (min) (Nm)
	(mm ²)	(AWG)		
	0.2 ... 2.5	24 ... 12	7	0.5

5.2.3 Regulation section connection

Figure 5.2.3.1: Regulation shielding



For shielding of the regulation section (recommended), fasten the shield of the cables to the omega sections (see figure above).

Table 5.2.3.1: Regulation terminals

Strip T2 (top)			
Terminal	Designation	Function	Max
R21	COM Digital output 2	Common reference for digital output 2 (Relay 2)	-
R24	Digital output 2	Programmable digital relay output 2 (NO). Default = Drive ready (PAR 1064)	250 Vac - 30 Voc / 2A
5	Analog output 1	Analog output 1. Default = Null (PAR 6000)	±12,5 V (typical ±10 V / 5 mA)
6	Analog output 2	Analog output 2. Default = Null (PAR 6000)	- voltage (default): ±12,5 V (typical ±10V/5mA) - current (set by S3 switch): 0...20mA or 4...20mA (setting by PAR 1848, 15 - ANALOG OUPUTS menu)
C1	COM Analog output	Common reference for analog outputs and ±10V potential voltage reference	-
7	Digital input E	Digital input E. Default = Digital input E mon, PAR 1110 (Enable)	5mA @ +24V (+30V max)
8	Digital input 1	Digital input 1. Default = Precharge fbk src (PAR 4498)	5mA @ +24V (+30V max)
9	Digital input 2	Digital input 2. Default . Default = Null (PAR 6000)	5mA @ +24V (+30V max)
10	Digital input 3	Digital input 3. Default . Default = Null (PAR 6000)	5mA @ +24V (+30V max)
11	Digital input 4	Digital input 4. Default . Default = Null (PAR 6000)	5mA @ +24V (+30V max)
12	Digital input 5	Digital input 5. Default = Fault reset src (PAR 4500)	5mA @ +24V (+30V max)
C2	COM Digital inputs	Common reference for digital inputs	-
C3	0V 24 OUT	+24V supply for IO	150 mA (Resettable fuse), ±10 %
S3	+ 24V OUT	Reference point for +24V OUT	-

Strip T1 (bottom)			
Terminal	Designation	Function	Max
R11	COM Digital output 1	Common reference for digital output 1 (Relay 1)	-
R14	Digital output 1	Programmable digital relay output 1 (NO). Default = Precharge Command (PAR 1122)	250 Vac - 30 Voc / 2A
1	Analog input 1	Programmable / configurable analog differential input. Signal: terminal 1. Reference: terminal 2. Default = Multi ref 0 src	- voltage (default): ±12,5 V (typical ±10V/1mA) - current (set by switches S1-S2): 0...20mA or 4...20mA (set by PAR 1502 or 1552, 14 - ANALOG INPUTS menu)
2			
3	Analog input 2	Programmable / configurable analog differential input. Signal: terminal 3. Reference: terminal 4. Default = Not used	
4			
S1+	+10 V	Voltage reference +10V; reference point: C1 terminal	+10 V ±1% / 10 mA
S1-	-10V	Analog output -10V; reference point: C1 terminal	-10 V ±1% / 10 mA
13	Digital output 3	Digital output 3. Default = Drive OK (PAR 1062)	+24 V / 20 mA (typ), 40 mA (max)
14	Digital output 4	Digital output 4. Default = Enable Ready mon (PAR 1068)	+24 V / 20 mA (typ), 40 mA (max)
IS1	PS Digital output	Digital outputs 3 / 4 power supply	-
IC1	COM Digital output	Common reference for digital outputs 3 / 4	-
IC2	0V 24 EXT	Reference for regulation card 24V external supply	-
IS2	+ 24V EXT	External supply of regulation card	+24V ±10% / 1A



|||||

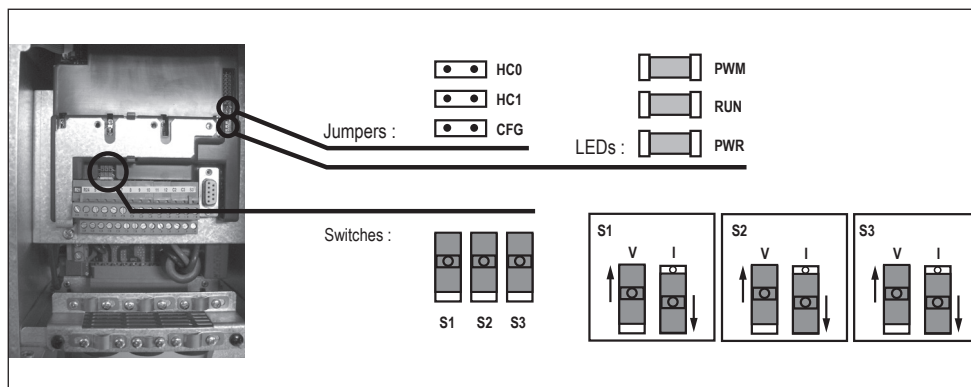
+24Vdc voltage, which is used to externally supply the regulation card has to be stabilized and with a maximum ±10% tolerance. The maximum absorption is 1A.

It is not suitable to power supply the regulation card only through a unique rectifier and capacitive filter.

La tension de +24Vdc utilisée pour alimenter extérieurement la carte de régulation doit être stabilisée avec une tolérance de ±10% ; absorption maximum de 1A. Les alimentations obtenues avec les seules redresseur e filtre capacitive ne sont pas appropriées.

|||||

5.2.4 Switches, jumpers and LED



Switch	V/I settings on inputs and analog output
S1	Analog input 1 Default = voltage (± 10 V)
S2	Analog input 2 Default = voltage (± 10 V)
S3	Analog output 2 Default = voltage (± 10 V)

LEDs	Function
PWM (green)	LED lit during IGBT modulation
RUN (green)	Flashes (freq. 1 sec) if no errors or faults have occurred. If ON or OFF, indicates an error conditions (software hangup)
PWR (green)	ON when the regulation card is correctly powered

Jumpers	Function
HC0 HC1	Reserved. Default = Open
CFG	Open = 400 Vac rated voltage (default) Closed = 460 Vac rated voltage

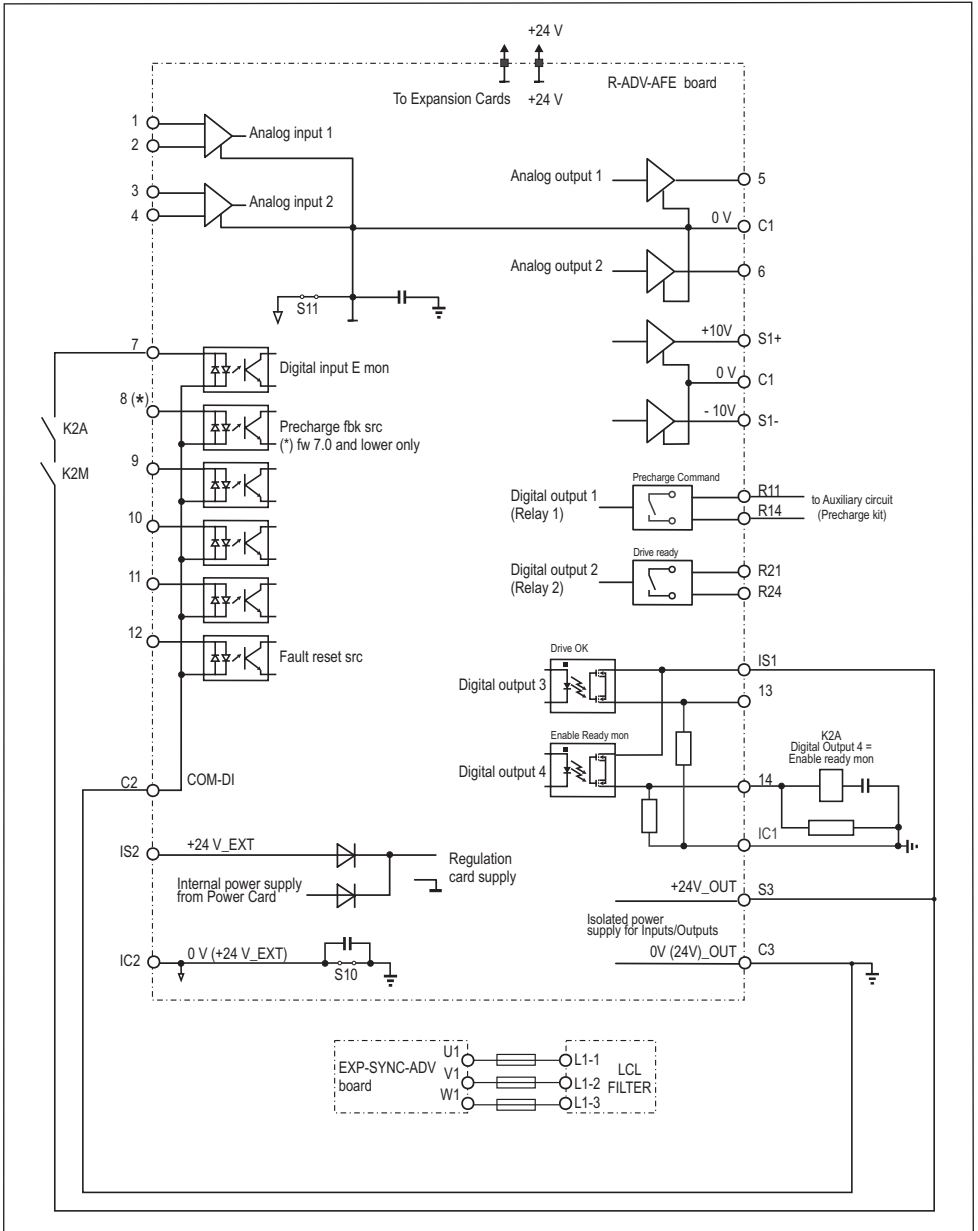
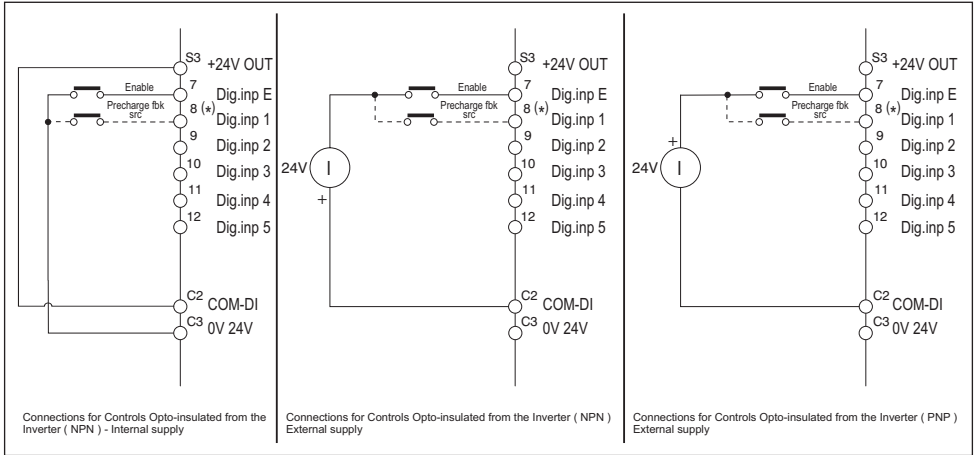


Figure 5.2.4.1: Potentials of the control section. Digital I/O PNP connection



(*) : fw 7.0 and lower only.

Figure 5.2.4.2: Other inputs connections (NPN-PNP)

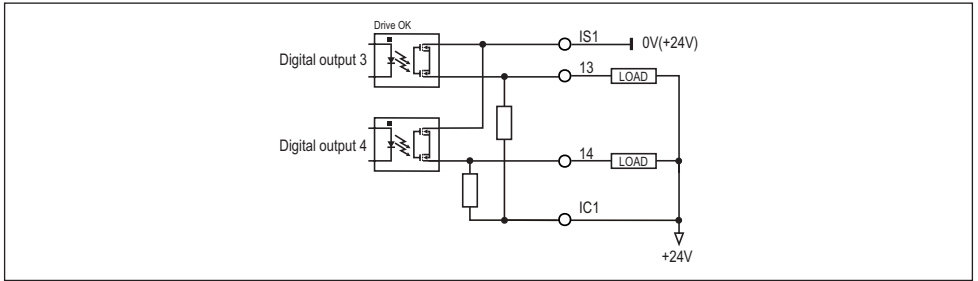


Figure 5.2.4.3: NPN outputs connection

5.3 General description of power supply operation

General description of power supply operation

The power supply is managed with FPGA logic, on which a state machine has been implemented to manage inputs/outputs and to control bridge thyristors.

When the line is on, a switching power supply on the R-PSM card generates the internal supplies needed for card operation.

When the card is powered, control of the semi-controlled power supply is entirely internal.

When the SCR bridge is in full conduction the OK relay is closed.

If an UNDERVOLTAGE alarm is detected when the SCR bridge is enabled, the precharge ramp can be repeated only after 300ms, the time needed for the phase loss circuit to signal an alarm condition.

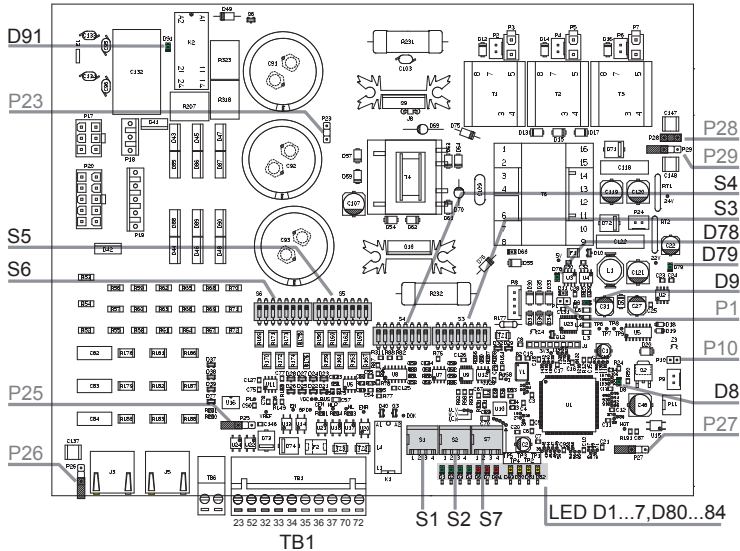
5.4 R-PSM pre-charge card

The R-PSM card is used to control the precharge circuit on the power supply module.

When the pre-charge circuit is connected to the mains (terminals L1 – L2 – L3), the R-PSM regulation card generates the internal power supplies needed for operation. Therefore, additional external power supplies are unnecessary.

If an UNDERVOLTAGE alarm is detected when the SCR bridge is enabled, the precharge ramp can be repeated only after 300ms, the time needed for the phase loss circuit to confirm that normal mains conditions have been restored.

Figure 5.4.1: Position of Switches, LEDs and Jumpers on R-PSM card



5.4.1 I/O R-PSM Regulation card

The switches and jumpers on the R-PSM card are factory-set. If the module is used according to its standard power supply characteristics:

- FFE200-...-4 = 400VAC / 50Hz
 - FFE200-...-6 = 690VAC / 50Hz
- the settings should not be changed.

In case of non-standard power supply, see the configuration tables shown further below.

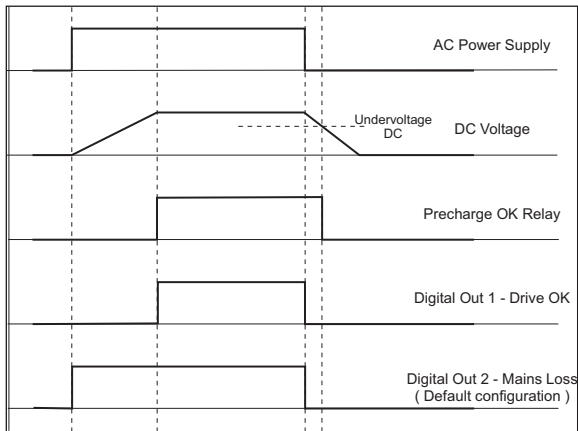
Table 5.4.1: R-PSM card terminal box

TB1 terminal strip			
Terminal	Designation	Function	Electrical specifications
23	ENABLE	ENABLE digital input	5mA @ +24Vdc (+20% max, -20% min)
52	ENABLE in COM	ENABLE common digital input	
32	Digital Out 1	Drive OK	24V / 20mA typ (40mA max)
33	Dig Out Com	Common Digital Out 1 and Digital Out 2	

34	0V24 Out	I/O power reference	
35	+24V Out	I/O power	150mA resettable fuse
36	Digital Out 2	Factory preset as Mains Loss	24V / 20mA typ (40mA max)
37	Dig Out Supply	Power input digital outputs	
70 - 72	Relay 1	Factory preset as Precharge OK	250Vac - 30Vdc - 0.5A

Terminal strip TB1	Cable Cross Section (flexible conductor)		Recommended stripping	Tightening torque (min) (min)
	(mm ²)	(AWG)	(mm)	(Nm)
	0.2 ... 2.5	24 ... 12	7	0.5

5.4.2 Behavior of Precharge OK Relay- Digital Out 1, Digital Out 2 at “Power On” and “Power Off”



Relay 1 – Precharge OK (factory setting)

The relay between terminals 70 – 72 closes at the end of the precharge phase and opens when DC voltage drops below the DC Undervoltage threshold.

Digital Out 1 – Drive OK

Digital output 1 connected to terminal 32 goes high at the end of the precharge phase and goes low under one of the following conditions:

- Power failure
- Lack of a power supply phase
- Mains frequency out of range ($> \pm 5\%$). This condition occurs only during the power-on phase.
- Presence of Enable command at terminal 23

Digital Out 2 – Mains Loss (factory setting)

Digital output 2 connected to terminal 36 goes high at Power On and goes low under one of the following conditions.

- Power failure
- Lack of a power supply phase

5.4.3 R-PSM card configuration switches

The jumpers and switches on these cards are factory-set. **If the module is used according to its standard power supply characteristics the settings should not be changed.**

The R-PSM card has three 4-position configuration switches. The following tables show all of the permitted combinations.

Legend:

0 OPEN

1 CLOSE

(*) Default setting for models FFE200-...-4,

(**) Default setting for models FFE200-...-6

S1 - Mains voltage configuration switches						
Mains voltage [Vac]	DC undervoltage trip threshold [Vdc]	DC undervoltage return threshold [Vdc]	S1-1	S1-2	S1-3	S1-4
230	225	255	0	0	0	0
380	372	402	1	0	0	0
400 (*)	392	422	0	1	0	0
415	407	437	1	1	0	0
440	431	461	0	0	1	0
460	451	481	1	0	1	0
480	470	500	0	1	1	0
500	490	520	1	1	1	0
575	563	593	0	0	0	1
690 (**)	676	706	1	0	0	1

The correct selection of mains voltage is very important for correct setting of UNDERVOLTAGE limits.

S2 - Mains frequency configuration switch	
Mains frequency [Hz]	S2-1
50 (*)	0
60 (**)	1

An incorrect mains frequency setting will block the control card: the mains frequency tolerance is $\pm 5\%$.

S2 - Precharge time configuration switches				
Selection of precharge time for 50Hz line [s]	Selection of precharge time for 60Hz line [s]	S2-2	S2-3	S2-4
17.4	24.1	0	0	0
11.6 (*)(**)	12.1	1	0	0
8.7	8	0	1	0
6.9	6	1	1	0
5.0	4.8	0	0	1
3.5	3.4	1	0	1
2.7	2.7	0	1	1
1.9	2	1	1	1

Switch S2-2...4 lets you set the precharge time for the capacitors connected to the DC link.

The default configuration calls for a time of 11.6[s] for a 50[Hz] line and 12.1[s] for a 60[Hz] line.

Remember that with equal levels of energy to be transferred to the condenser bank, decreasing the precharge time increases the current draw.

The rectifier bridge and precharge inductance are sized for maximum peak current of 400[Apk] (unified value for all sizes of FFE200).

Considering that with decreased precharge time the increased current is not linear, and that the larger the capacitors bank connected to the DC Link the greater the energy to be transferred, if you need a precharge time shorter than the default configuration you have to run the following check procedure:

- 1) Keep the default configuration of switches S2-2...4 and connect an current probe to output C or D of the FFE200 module. The probe must be able to measure a peak current ≤ 10 [ms].
- 2) Power and enable the precharge bridge by measuring the value of the peak current absorbed.
- 3) Cut power to the precharge bridge and wait for the DC Link to discharge completely (discharge time depends on the total capacitance installed on the DC Link).
- 4) Set the switches to have a precharge time of 8.7[s] (8[s] for 60[Hz] line).
- 5) Repeat point 2). If the peak current measured is below 400[Apk] you can further reduce the precharge time. In this case, run the entire procedure again until you reach the required precharge time.

S7-1...3 – Dig Out 2 configuration switch	S7-1	S7-2	S7-3
No Mains Loss or Phase Loss (*) (**)	0	0	0
Mains Loss alarm	1	0	0
Phase Loss alarm	0	1	0
Drive OK (excluded UV alarm)	1	1	0
Heatsink OT alarm	0	0	1
SCRs pulses enabled	1	0	1
Precharge ramp finished	0	1	1
Undervoltage alarm	1	1	1

The configurable output goes high when the condition indicated in the table occurs.

S7-4 -Function exchange between Relay 1 and Digital Out 2	
Function	S7-4
Factory preset	0 (*) (**)
Function exchange between Relay 1 and Digital Out 2	1

5.4.4 Jumpers

The configuration of the configuration Jumpers can be changed ONLY by WEG personnel. Unauthorized changes will invalidate the warranty.

Jumper	Function	Default
P1	FPGA manual reset	OPEN
P10	Disables heatsink overtemperature monitor	OPEN
P23	Enables function of 230VAC line power supply	OPEN
P25	Internal use	OPEN
P26	Connects J3 shield with ground	OPEN
P27	Connects 0V control with 0V_24 I/O	OPEN
P28	Grounds 0V control	CLOSE
P29	Grounds 0V_24 I/O	CLOSE

Note!

For the position of the Jumpers, see "Figure 5.4.1: Position of Switches, LEDs and Jumpers on R-PSM card" on page 34.

5.4.5 Led R-PSM card

LED	"MONITOR" function	Color
D9	+3V3 logic power	GREEN
D78	+5V logic power	GREEN
D79	+22V driver power	GREEN
D91	Presence of DC-Link voltage	BLUE

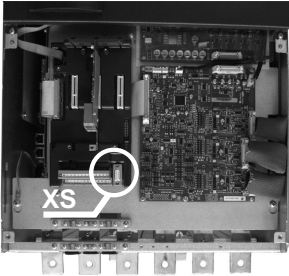
LED	"SIGNAL" function	Color
D1	DC-Link voltage above UNDERVOLTAGE limit	GREEN
D2	Power supply enabled	GREEN
D3	Not used	GREEN
D4	Power supply OK (no alarms – excluding UV)	GREEN
D6	Phase loss or Main loss alarm	RED
D7	Heatsink overtemperature alarm	RED
D8	FPGA configuration in progress	GREEN
D84	Wrong line frequency alarm	RED

LED	"POWER SUPPLY STATE" functions	Color
D83	Bit S0: codes STATE of power supply (LSB)	YELLOW
D80	Bit S1: codes STATE of power supply	YELLOW
D81	Bit S2: codes STATE of power supply (MSB)	YELLOW
D82	SCR bridge enabled	YELLOW

Note!

For the position of the Jumpers, see "Figure 5.4.1: Position of Switches, LEDs and Jumpers on R-PSM card" on page 34.

5.5 Serial interface (XS connector)



	Funzione	I/O	Interfaccia electr.
PIN 1	Uso interno	-	-
PIN 2	Uso interno	-	-
PIN 3	RxA/TxA	I/O	RS485
PIN 4	Equipotenzialità (opzionale)	-	-
PIN 5	0V (Ground for 5 V)	-	Alimentazione
PIN 6	+5 V	-	Alimentazione
PIN 7	RxB/TxB	I/O	RS 485
PIN 8	Uso interno	-	-
PIN 9	Uso interno	-	-

I = Ingresso
O = Uscita

The FFE200 is equipped as standard with a port (9-pin D-SUB connector: **XS**) for connection of the RS485 serial line used for FFE/PC point-to-point communication (through the **WEG_eXpress** configuration software) or for multi-drop connection.

To access the connector, remove the lower cover as illustrated in shown in [paragraph 5.2.1](#).

5.3.1 FFE / RS 485 Port (not insulated) point-to-point connection



The connection indicated is without galvanic insulation !

Le raccordement indiqué n'a pas d'isolation galvanique !

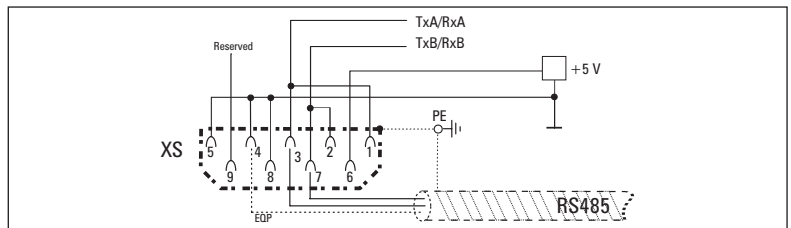


Figura 5.4.1.1: Serial connection (not insulated)

A twin-pair consisting of two symmetrical conductors, spiral wound with a common shield plus the bonding connection cable, connected as shown in the figure, must be used for connection. The transmission speed is 38.4 kBaud.

For connection of the RS485 serial line to the PC, see the figure below.

The **Modbus** or **Jbus** serial protocol can be selected in the Serial protocol parameter PAR 3804. For more details see the "1S9H63_Modbus_it-en.pdf" instruction manual available on **WEG** web site.

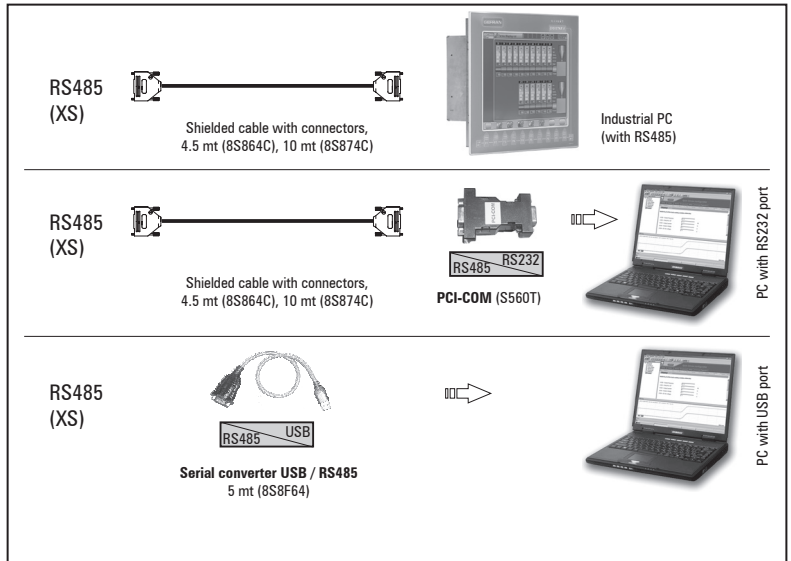


Figure 5.5.1.2: Collegamento RS485 al PC

Connection of an industrial PC with RS485

The following are required for connection:

- shielded cable for the **XS / RS485** connection (see figure 5.5.1.2), code 8S864C (L=4.5 mt) or 8S874C (L=10 mt).

Connection to a PC with RS232 port

The following are required for connection:

- an optional **PCI-COM** (or PCI-485) adapter, code S560T.
- shielded cable for **XS / PCI-COM** (or PCI-485) connection, code 8S864C (L=4.5 mt) or 8S874C (L=10 mt), see figure 5.5.1.2 .

Connection to a PC with USB port

The following is required for connection: optional adapter USB/ RS485, code 8S8F64, see figure 5.5.1.2 .

5.5.2 FFE / RS485 port point-to-point connection (with insulation)

To make the connection with galvanic isolation, the **OPT-RS485-ADV** optional card is required.

The card is equipped with a 9-pin D-SUB male connector which must be inserted in the **XS** connector of the FFE200.

Connect terminals 1, 2 and 4 to the serial line as shown in the figure below; for the connection from the serial line to the PC, the adapters indicated in paragraph 5.5.1 must be used.

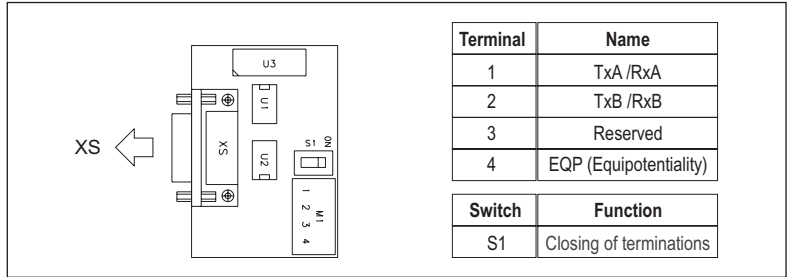
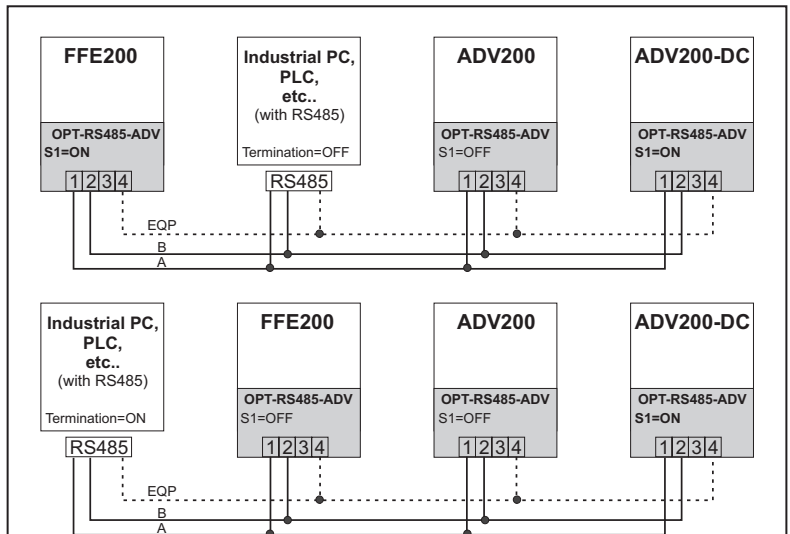


Figure 5.3.2.1: OPT-RS485-ADV card

5.5.3 RS 485 multi-drop connection

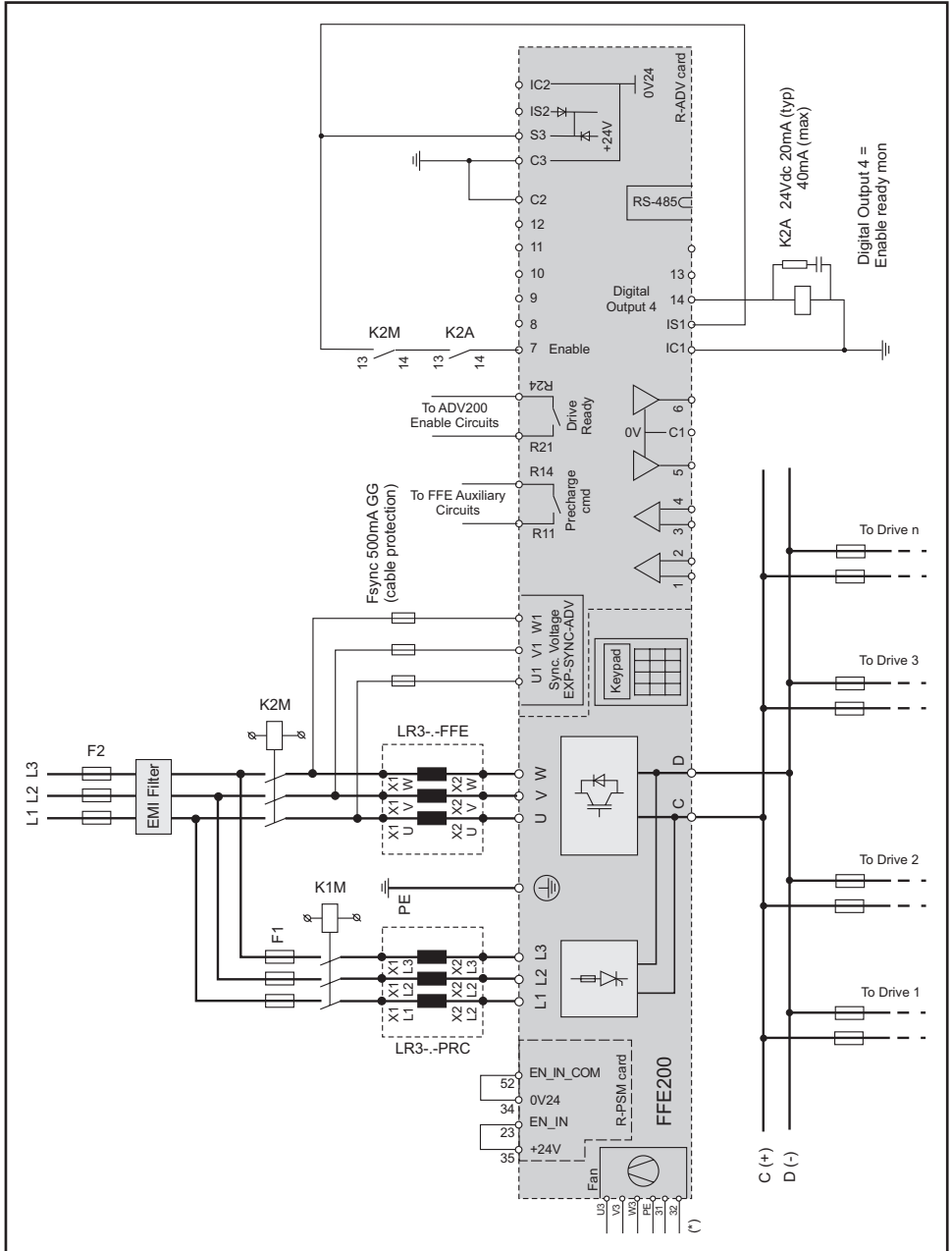
For the multi-drop connection, the **OPT-RS485-ADV** optional card must be installed on each drive; the ends of the connection must have **S1** termination switch set to ON. The multi-drop connection is always galvanically insulated.

Up to 20 drives can be connected; the maximum length of the connection is 200 meters.



5.6 Typical connection diagrams

Figure 5.6.1: Typical connection diagram (with Pre-charge Kit)

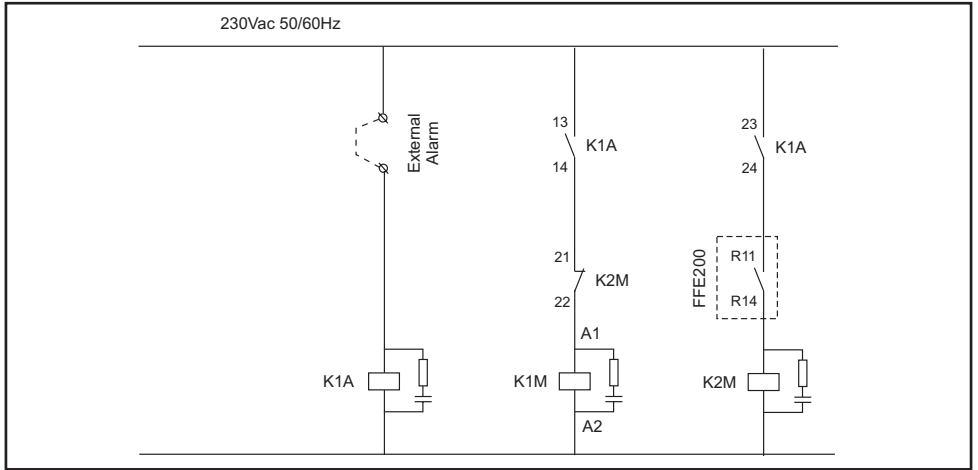


(*) See section "5.1.6 Connection of fans power supply" on page 28

Note!

Pre-charge inductance LR3--PRC can be omitted if there are all of the conditions specified in paragraph "5.7 DC pre-charge unit, pre-charge inductor and contactors" on page 45

Figure 5.6.2: Auxiliary control circuit



5.7 DC pre-charge unit, pre-charge inductor and contactors

Each FFE module contains a pre-charge unit (in models composed of multiple units in parallel, only the Master FFE200 has its own pre-charge circuit). The precharge unit is essentially a three-phase thyristor-diode bridge plus R-PSM (Regulation - Power Supply Module) control card. The DC capacity must be charged by partializing the conduction of the thyristors of all three phases by means of time-programmable ramp. To limit the peak current value during the pre-charge transient, a dedicated mains inductor (LR3-.-PRC) must be used (see below for specifications).

The inductors are sized in order to ensure a brief pre-charge current of:
 RMS current < 100A
 Peak current < 400A

The pre-charge card is factory-set to charge the DC capacitance in 11 seconds. Maximum chargeable capacitance is 300mF for the 400 VAC version and 250mF for the 690VAC version (these capacitance values include the capacitance value of the FFE itself).

For higher capacitance values, you can select pre-charge times longer than 11 seconds, but you must always check that peak current during the pre-charge phase does not exceed 400A.

The standard inductors and the pre-charge circuit integrated in the FFE module are sized in order to charge a total capacitance on the DC-link that is greater than the one on a system where the total power of the ADV200 drives linked to the DC-link matches the maximum power deliverable by the FFE modules in parallel. Therefore, these systems do not generally require a check of correct pre-charge circuit size.

When the DC-link is powered by an SMB AC/DC power supply and the FFE module is sized only for regenerating power (i.e., for a percentage of total installed power), it is appropriate to check that the pre-charge circuit is correctly sized. In this regard, see "Appendix 1 - Design" on page 162.

The following table shows the coupling of devices that must be connected between the FFE200 and the power mains.

Sizes	LR3-.-PRC pre-charge inductor					
	Type	Code	L [mH]	Thermal current [Aac]	Saturation current [Aac]	Dimensions (LxHxp, mm) and weight
FFE200-...-4	LR3-4-PRC	S7ALF10	100	70	400	180 x 165 x 140; 8 kg
FFE200-...-6	LR3-6-PRC	S7ALF11	200	70	400	180 x 165 x 170; 15 kg



Attention

=====

FFE200-...-4 : with 3-phase 480VAC mains and over 400mF of total capacitance on the DC Bus, use the LR-PRC-6 pre-charge inductance.

=====

Type	Code	FFE200-...-4 - K2M mains contactor, Coupling and quantity																							
		550		730		880		550 x 2		730 x 2		880 x 2		730 x 3		880 x 3		730 x 4		880 x 4		730 x 5		880 x 5	
		SP	SL	SP	SL	SP	SL	SP	SL	SP	SL	SP	SL	SP	SL	SP	SL	SP	SL	SP	SL	SP	SL	SP	SL
DILM400	6S7072	1	1					2	2					3	3			4	4			5	5		

		FFE200-...-4 - K2M mains contactor, Coupling and quantity																									
Type	Code	550		730		880		550 x 2		730 x 2		880 x 2		730 x 3		880 x 3		730 x 4		880 x 4		730 x 5		880 x 5			
		SP	SL	SP	SL	SP	SL	SP	SL	SP	SL	SP	SL	SP	SL	SP	SL	SP	SL	SP	SL	SP	SL	SP	SL	SP	SL
DILM500	2S283			1	1	1				2	2	2				3				4						5	
DILM580	6S7082					1							2			3				4						5	

		FFE200-...-6 - K2M mains contactor, Coupling and quantity																									
Type	Code	500		690		760		500 x 2		690 x 2		760 x 2		690 x 3		760 x 3		690 x 4		760 x 4		690 x 5		760 x 5			
		SP	SL	SP	SL	SP	SL	SP	SL	SP	SL	SP	SL	SP	SL	SP	SL	SP	SL	SP	SL	SP	SL	SP	SL	SP	SL
DILM300	370495	1						2																			
DILM400	6S7072		1	1					2	2				3				4				5	5				
DILM500	2S283				1	1	1			2	2	2		3	3	3		4	4	4					5	5	

		K1M, pre-charge contactor, Coupling and quantity															
Type	Code	FFE200-...-4 (SP-SL)								FFE200-...-6 (SP-SL)							
DILM65	277902	1								1							

In general, the pre-charge inductance can be omitted if the conditions described below are satisfied.

U _{LN}	DC capacitance	Trafo output inductance	Pre-charge inductor
380V _{AC} ... 415V _{AC}	< 150mF	> 20μH	Not needed
440V _{AC} ... 500V _{AC}	< 150mF	> 30μH	Not needed
575V _{AC}	< 115mF	> 30μH	Not needed
690V _{AC}	< 115mF	> 50μH	Not needed

5.7.1 LR3-.-FFE mains inductor

It is mandatory to use mains inductors with a 3-4% drop, as shown in the following table.

		FFE200-4 (380 ... 480 V, 50/60Hz) - Coupling and quantity																								
Type	Code	550		730		880		550 x 2		730 x 2		880 x 2		730 x 3		880 x 3		730 x 4		880 x 4		730 x 5		880 x 5		
		LR3-4-FFE-550	S7ALF04	1						2						3										
LR3-4-FFE-730	S7ALF05			1						2					3								5			
LR3-4-FFE-880	S7ALF06					1						2						4	4						5	

		FFE200-6 (690 V, 50Hz) - Coupling and quantity																								
Type	Code	500		690		760		500 x 2		690 x 2		760 x 2		690 x 3		760 x 3		690 x 4		760 x 4		690 x 5		760 x 5		
		LR3-6-FFE-500	S7ALF01	1						2																
LR3-6-FFE-690	S7ALF02			1						2				3				4					5			
LR3-6-FFE-760	S7ALF03					1						2			3			4							5	

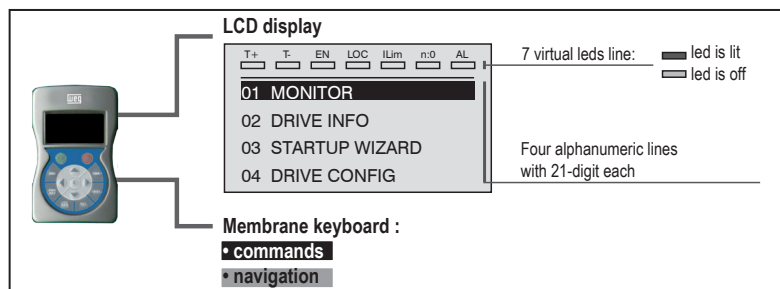
FFE200-6 (500-575 V, 50Hz) - Coupling and quantity													
Type	Code	500	690	760	500 x 2	690 x 2	760 x 2	690 x 3	760 x 3	690 x 4	760 x 4	690 x 5	760 x 5
LR3-5-FFE-500	S7ALF07	1			2								
LR3-5-FFE-690	S7ALF08		1			2		3		4		5	
LR3-5-FFE-760	S7ALF09			1			2		3		4		5

LR3--FFE mains inductor					
Type	Code	L [μH]	Rated current [Aac]	Saturation current [Aac]	Dimensions (LxHxp, mm) and weight
LR3-4-FFE-550	S7ALF04	57	560	1300	380 x 430 x 270; 120 kg
LR3-4-FFE-730	S7ALF05	44	730	1750	385 x 490 x 285; 130 kg
LR3-4-FFE-880	S7ALF06	35	895	1900	480 x 520 x 330; 165 kg
LR3-5-FFE-500	S7ALF07	79	500	1160	385 x 480 x 290; 130 kg
LR3-5-FFE-690	S7ALF08	57	685	1590	385 x 480 x 305; 151 kg
LR3-5-FFE-760	S7ALF09	52	750	1750	480 x 575 x 380; 165 kg
LR3-6-FFE-500	S7ALF01	110	500	1160	480 x 520 x 320; 160 kg
LR3-6-FFE-690	S7ALF02	80	685	1590	480 x 575 x 340; 186 kg
LR3-6-FFE-760	S7ALF03	73	750	1750	480 x 575 x 380; 225 kg

6 - Use of the keypad

This chapter describes the keypad and methods of use for display and programming of FFE200 parameters.

6.1 Description



Membrane keyboard

FFE200 control programming menu navigation keys.

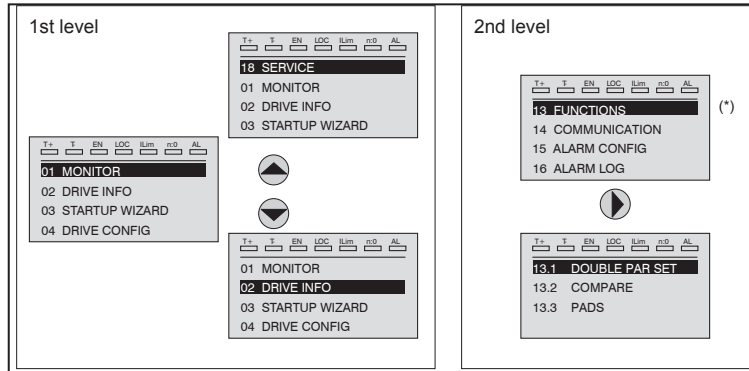
Symbol	Reference	Description
	Start	Activates the FFE
	Stop	Quick stop and generation of the Emg stop alarm [21] if programmed in the Stop key mode parameter, PAR 1008
ESC	Escape	Returns to the higher level menu or submenu. Exit from a parameter, a list of parameters, from the list of the last 10 parameters and from the Goto parameter function (see CUST). Can be used to exit from a message that requires use of this.
FWD REV	Forward/Reverse	Not used
LOC REM	Local/Remote	Changes the method of use from local to remote and vice versa. Is active only if the FFE is not enabled.
RST	Reset	Resets alarms only if the causes have been eliminated.
CUST	Custom	The first time it is pressed, displays the list of the last 10 parameters modified. Pressing this key a second time activates the Goto parameter function for access to a parameter through its number. To exit these functions, press the ◀ key.
DISP	Display	Displays a list of FFE functioning parameters.
E	Enter	Accesses the submenu or parameter selected or selects an operation, Is used during parameter modification to confirm the new value set.
▲	Up	Moves selection in a menu or a list of parameters up. During modification of a parameter, increases the value of the digit under the cursor.
▼	Down	Moves the selection in a menu or a list of parameters down. During modification of a parameter, decreases the value of the digit under the cursor.
◀	Left	Returns to the higher level menu. During modification of a parameter, moves the cursor to the left.
▶	Right	Accesses the submenu or parameter selected. During modification of a parameter, moves the cursor to the right.

LED's meaning:

- T+** the LED is lit, when the FFE operates with a positive torque
- T-** the LED is lit, when the FFE operates with a negative torque
- EN** the LED is lit, when the FFE is enabled
- LOC** The led is lit when the FFE is in local mode and OFF when in remote mode.
- lLim** the LED is lit, when the FFE operates at a current limit. During normal functioning, this led is OFF.
- n=0** The LED stays on.
- AL** the LED is lit; it signals a trip.

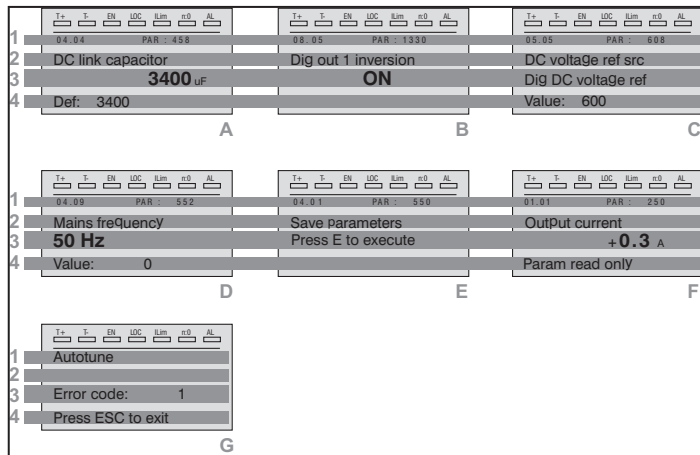
6.2 Navigation

6.2.1 Scanning of the first and second level menus



(*) This example is visible only in **Export mode** (see [paragraph 6.5.2](#)).

6.2.2 Display of a parameter

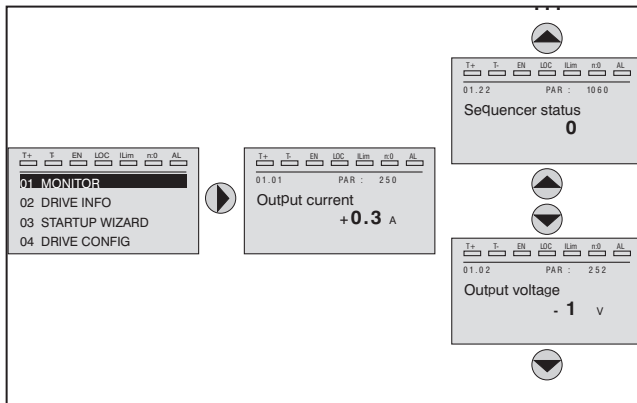


- 1 Position of the parameter in the menu structure (in figure A, 16.01); number of the parameter (in figure A, PAR: 458).
- 2 Description of the parameter.

- 3 Depends on the type of parameter:
 - **Numeric parameter:** displays the numeric value of the parameter, in the format required, and unit of measurement (figure A).
 - **Binary selection:** the parameter may assume only 2 states, indicated as OFF-ON or 0 - 1 (figure B).
 - **LINK type parameter:** displays the description of the parameter set from the selection list (figure C).
 - **ENUM type parameter:** displays the description of the selection (figure D)
 - **Command:** displays the method of execution of the command (figure E)
- 4 In this position, the following may be displayed:
 - **Numeric parameter:** displays the default, minimum and maximum values of the parameter. These values are displayed in sequence pressing the ► key (figure A).
 - **LINK type parameter:** displays the number (PAR) of the parameter set (figure C) .
 - **ENUM type parameter:** displays the numeric value corresponding to the current selection (figure D).
 - **Command:** in the case of an error in the command, indicates that ESC must be pressed to terminate the command (figure G).
 - **Messages and error conditions (figure F):**

Param read only	attempt to modify a read-only parameter
Password active	the parameter protection password is active
Drive enabled	attempt to modify a non-modifiable parameter with the FFE enabled
Input value too high	the value entered too high
Input value too low	the value entered too low
Out of range	attempt to insert a value outside the min. and max. limits

6.2.3 Scanning of the parameters



6.2.4 List of the last parameters modified

Pressing the **CUST** key, a list containing the last 10 parameters modified is accessed. One parameter at a time is displayed and the list can be scrolled using the ▲ and ▼ keys.

To exit this list, press the ► key.

6.2.5 “Goto parameter” function

Pressing the **CUST** key twice, or once if already in the “List of modified parameters”, the “Goto parameter” is activated.

This function permits access to any parameter entering only the software number

of the parameter (PAR).

When the parameter reached by the “Goto” command is displayed, it is possible to navigate all the parameters forming part of the same group using the ▲ and ▼ keys.

Pressing the ► key returns to the “Goto” function.

To exit the “Goto” function, press the ► key.

6.3 Parameter modification

To enter parameter modification mode, press the **E** key when the parameter to be modified is displayed.

To save the value of the parameter, following modification, press the **E** key again.

Note !

To save permanently, see [paragraph 6.4](#).

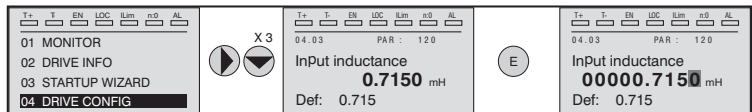
To exit from modification mode without saving the value, press the **ESC** key.

The operations to be carried out to modify the value depend on the type of the parameter, as described below.

Note !

For further information about the type of parameters displayed, see [chapter 8](#).

- **Numeric parameters**



When **E** is pressed to access modification mode, the cursor is activated on the digit corresponding to the unit.

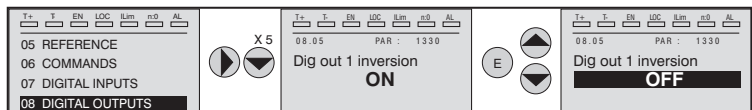
Using the ◀ and ▶ keys, the cursor can be moved to all the digits, including trailing zeros that are normally not displayed.

With the ▲ and ▼ keys, the digit under the cursor is increased or decreased.

Press **E** to confirm the modification or **ESC** to cancel.

- **Binary parameters (BIT type)**

The parameter may assume only two states which are indicated as OFF-ON or 0-1.



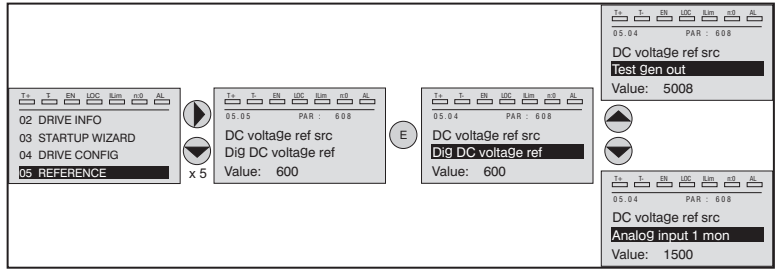
Pressing **E**, modification mode is activated. The entire line is displayed in reverse.

Use the ▲ and ▼ keys to move from one state to another.

Press **E** to confirm the modification or **ESC** to cancel.

- **LINK type parameter**

The parameter may assume the number of another parameter as value.

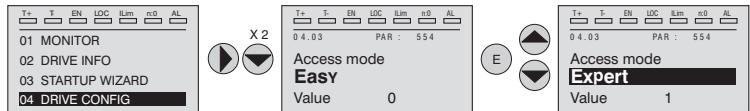


Pressing **E**, modification mode is activated. The entire line is displayed in reverse. The elements of the list of parameters associated to this parameter can be scrolled using the **▲** and **▼** keys.

Press **E** to confirm the modification or **ESC** to cancel.

- **ENUM type parameter**

The parameter may assume only the values contained in a selection list.



Pressing **E**, modification mode is activated. The entire line is displayed in reverse. The elements of the selection list can be scrolled using the **▲** and **▼** keys.

Press **E** to confirm the modification or **ESC** to cancel.

- **Execution of commands**

A parameter can be used to carry out a number of operations on the FFE.

For an example, see [paragraph 6.4](#): in this case, the “Press E to execute” request is displayed instead of the value.

To perform the command, press **E**.

During execution of the command, the “In progress” caption is displayed to indicate that the operation is in course.

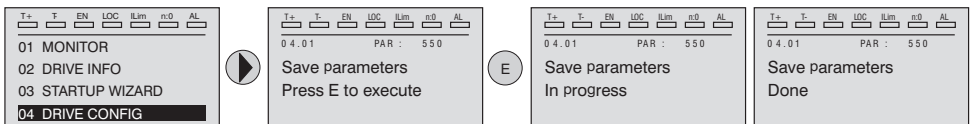
At the end of execution, if the result is positive, the “Done” caption is displayed for few seconds.

If execution has failed, an error message is displayed.

6.4 How to save parameters

Menu 04 DRIVE CONFIG, parameter 04.01 **Save parameters**, PAR : 550.

Used to save changes to parameter settings so that they are maintained also at the power-off.



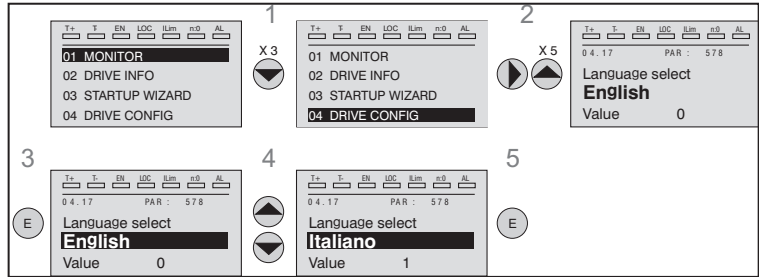
To exit, press the **◀** key.

6.5 Configuration of the display

6.5.1 Language selection

Menu 04 DRIVE CONFIG, parameter 04.17 **Language select**, PAR: 578, default=English.

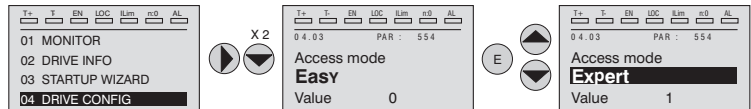
Used to set one of the languages available : English, Italian, Francais, Deutsch, Polish, Romanian, Russian, Turkish and Portuguese.



Note !

To access the Cyrillic font : 1) press the E key and hold it down while you switch the FFE on, 2) select the required font using the ▲ and ▼ keys, 3) press E to confirm and return to normal operating mode.

6.5.2 Selection of Easy / Export mode



Menu 04 DRIVE CONFIG, parameter 04.03 **Access mode** , PAR: 570.

Makes it possible to configure two methods of access :

Easy (default) only the main parameters are displayed

Expert for advanced users, all the parameters are displayed, see [paragraph 8.1](#) List of Expert parameters.

6.5.3 Startup display

Note !

This parameter is visible only in **Expert** mode (see [paragraph 6.5.2](#))

Menu 04 DRIVE CONFIG, parameter 04.15 **Startup display**, PAR : 574.

Used to set the parameter that will be displayed automatically at FFE power-on.

Entering the value -1 (default), the function is disabled and the main menu is displayed at power-on.

6.5.4 Back-lighting of the display

Note !

This parameter is visible only in **Expert** mode (see [paragraph 6.5.2](#)).

Menu 04 DRIVE CONFIG, parameter 04.16 **Display backlight**, PAR : 576.

Sets lighting of the display

ON the light of the display remains always on.

OFF (default) the light switches off after approx. 3 minutes from pressing of the last key.

6.6 Alarms

The alarms page is displayed automatically when an alarm occurs.

	T1	T2	EN	LOC	Lim	sd	AL
1	Alarm ->RTN: 1/2						
2	Power down						
3	Code: 0000H-0						
4	Time: 28:04						

- 1 Alarm:** identifies the alarm page.
RTN : indicates that the alarm has been reset; if the alarm is still active, nothing is displayed.
x/y : x indicates the position of this alarm in the list of alarms and y the number of alarms (the alarm with lowest x is the most recent)
- 2** Description of the alarm
- 3** Sub-code of the alarm, provides other information in addition to the description
- 4** Moment of occurrence of the alarm in machine time.

The list of alarms is scrolled using the ▲ and ▼ keys.

6.6.1 Alarm reset

- If the alarm page is displayed:

Pressing the **RST** key, the alarms are reset and all alarms reset are eliminated from the list.

If, after this operation, the list of alarms is empty, the alarm page is closed.

If the list is not empty, press the ► key to exit from the alarms page.

- If the alarms page is not displayed:

Pressing the **RST** key, the alarms are reset.

If active alarms are still present following reset, the alarm page is opened.

Note

For further information, see [chapter 9](#).

6.7 Messages

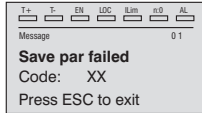
Operator messages are displayed with this page.

The messages are of two types:

- *timed* (closed automatically after a certain number of seconds),
- *fixed* (remain displayed until the operator presses the **ESC** key).

Several concurrent messages are enqueued and presented to the operator in sequence, starting from the most recent.

If an error occurs during transfer, the following message is displayed:



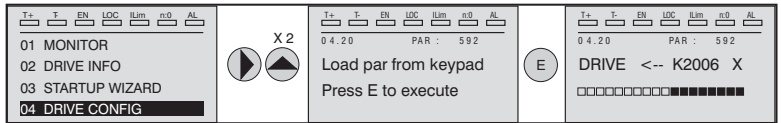
The code XX indicates the type of error, see [paragraph 9.2](#).

To exit from the error message, press the **ESC** key.

6.8.3 Load parameters from keypad

Menu 04 DRIVE CONFIG, parameter 04.20 **Load par from keypad**, PAR : 592.

Is used to transfer the parameters from the selected memory of the keypad to the FFE.

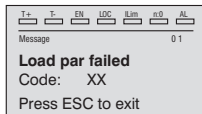


To start the operation, press the **E** key. During transfer, a bar is displayed which indicates progress of the operation.

Instead of the letter **X**, the number of the currently selected keypad memory is displayed.

At the end of transfer, if this has been completed successfully, the “Done” caption is displayed for a few seconds with subsequent return to the initial page.

If an error occurs during transfer, the following message is displayed:



The code XX indicates the type of error, see [paragraph 9.2](#).

To exit from the error message, press the **ESC** key.

6.8.4 Transfer of parameters between FFE200

Transfer the parameters of the source FFE to the keypad memory as indicated in [paragraph 6.8.2](#), then connect the keypad to the FFE on which the new setting is to be saved and proceed as indicated in paragraph 6.8.3.



To prevent possible damage to equipment, it is advisable to disconnect and connect the keypad with the FFE OFF.

Pour éviter tout endommagement possible des appareils, il est conseillé de débrancher et de brancher le pavé de commande une fois le FFE éteint.

7 - Commissioning via keypad



FFE200 are electrical apparatus for use in industrial installations. Parts of the FFE200 are energized during operation. The electrical installation and the opening of the equipment should therefore only be carried out by qualified personnel. Improper installation of FFE200 may therefore cause the failure of the device as well as serious injury to persons or material damage.

Les FFE200 à fréquence variable sont des dispositifs électriques utilisés dans des installations industriels. Une partie des FFE200 sont sous tension pendant l'opération. L'installation électrique et l'ouverture des FFE200 devrait être exécuté uniquement par du personnel qualifié. De mauvaises installations de FFE200 peuvent provoquer des dommages matériels ou blesser des personnes.

Always connect the FFE200 to the protective ground (PE) via the marked connection \perp . FFE200 product and AC Input filters have ground leakage currents greater than 3.5 mA. EN61800-5-1 specifies that with leakage currents greater than 3.5 mA the protective conductor ground connection (\perp) must be fixed type and doubled for redundancy if its section is lower than 10mm² CU or 16mm² AL.

Il faut toujours connecter les variateurs et les FFE à la terre \perp (PE). Le courant de dispersion vers la terre est supérieur à 3,5 mA sur les variateurs et sur les filtres à courant alternatif. Les normes EN61800-5-1 spécifient qu'en cas de courant de dispersion vers la terre, supérieur à 3,5 ma, la mise à la terre (\perp) doit avoir une double connexion pour la redondance si sa section est inférieure à 10mm² CU ou 16mm² AL.

Only permanently-wired input power connections are allowed. This equipment must be grounded (EN 50178, EN 61800-5-1).

If a Residual Current-operated protective Device (RCD) is to be used, it must be an RCD type B. Machines with a three phase power supply, fitted with EMC filters, must not be connected to a supply via an ELCB (Earth Leakage Circuit-Breaker - see DIN VDE 0160, section 5.5.2 and EN 61800-5-1 section 4.3.10).

The following terminals can carry dangerous voltages even if the FFE200 is inoperative:
- output terminals C, D.
- line terminals U, V, W.

This equipment must not be used as an 'emergency stop mechanism' (see EN 60204, 9.2.5.4).

Seuls des branchements électriques permanents par câble en entrée sont admis. Mettre l'appareil à la masse (IEC 536 Classe 1, NEC et autres normes applicables).

S'il s'avère nécessaire d'utiliser un dispositif protecteur de courant résiduel (RCD), il convient de choisir un RCD de type B. Les machines à alimentation triphasée et dotées de filtres EMC ne doivent pas être raccordées au bloc d'alimentation par le biais d'un disjoncteur ELCB (Earth Leakage Circuit-Breaker – cf. DIN VDE 0160, paragraphe 5.5.2 et EN 61800-5-1 section 4.3.10.)

Les bornes suivantes peuvent recevoir des tensions dangereuses, même si l'onduleur est désactivé :

- bornes d'e sortie C, D.
- bornes d'alimentation U, V, W.

Ne pas utiliser cet appareil en tant que « dispositif d'arrêt d'urgence » (cf. EN 60204, 9.2.5.4).

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

Manipuler l'appareil de façon à ne pas toucher ou endommager des parties. Il n'est pas permis de changer les distances d'isolement ou bien d'enlever des matériaux isolants ou des capots.

According to the EU directives the FFE200 and accessories must be used only after checking that the machine has been produced using those safety devices required by the 2006/42/EC set of rules, as far as the machine industry is concerned. These standards do not apply in the Americas, but may need to be considered in equipment being



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

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

The electrical commissioning should only be carried out by qualified personnel, who are also responsible for the provision of a suitable ground connection and a protected power supply feeder in accordance with the local and national regulations. The motor must be protected against overloads.

La mise en service électrique doit être effectuée par un personnel qualifié. Ce dernier est responsable de l'existence d'une connexion de terre adéquate et d'une protection des câbles d'alimentation selon les prescriptions locales et nationales. Le moteur doit être protégé contre la surcharge.

Do not connect power supply voltage that exceeds the standard specification voltage fluctuation permissible. If excessive voltage is applied to the FFE, damage to the internal components will result.

Ne pas raccorder de tension d'alimentation dépassant la fluctuation de tension permise par les normes. Dans le cas d'une alimentation en tension excessive, des composants internes peuvent être endommagés.

Do not operate the FFE without the ground wire connected.

Ne pas faire fonctionner le FFE sans prise de terre.

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

Il ne faut pas exécuter de tests de rigidité diélectrique sur des parties du FFE. Pour mesurer les tensions, des signaux, il faut utiliser des instruments de mesure appropriés (résistance interne minimale 10k Ω /V).

7.1 Startup

Connections

Connect the power supply line and enabling contacts as shown in the diagram in chapter "5.6 Typical connection diagrams" on page 43.

Checks to be performed before powering the FFE

- Check that the supply voltage is correct and that the output terminals on the FFE (C, D) are connected correctly.
- Check that all the FFE control circuit terminals are connected correctly. Check that all control inputs are open.

Powering the FFE

- After completing all the checks described above, power the FFE.

7.2 Programming

7.2.1 Menu display modes

The programming menu can be displayed in two modes, which can be selected using the **Access mode** parameter (04 - DRIVE CONFIG menu), see [chapter 6.5.2](#):

- **Easy** (default) only the main parameters are displayed.
- **Expert** all the parameters are displayed.

7.2.2 Programming of “function block” analog and digital input signals

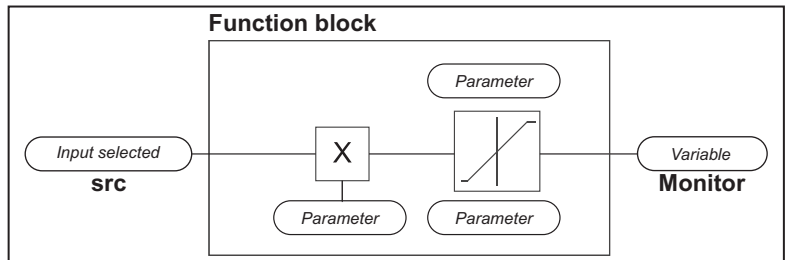
The signals, variables and parameters of each single “function block” of the FFE are interconnected in order to achieve the configurations and controls inside the control system.

These can be managed and modified using the keypad, PC configurator or fieldbus programming.

The programming mode is based on the following logic:

src (source; i.e.: **DC voltage ref src**, PAR: 608)
This term defines **the source of the function block input**, i.e. the signal to be processed in the function block.
The different configurations are defined in the relative **selection lists**.

mon (display; i.e.: **Analog input 1 mon** PAR: 1500)
This term refers to the **variable output from the function block, which is the result of the calculations performed on the actual block**.



7.2.3 Variable interconnections mode

The **source (src)** allows the desired control signal to be assigned to the function block input.

This operation is performed by using specific selection lists.

Possible control signal sources:

1 – Physical terminal

The analog and digital signals come from the terminal strip of the regulation card and/or from those of the expansion cards.

2 – Drive internal variables

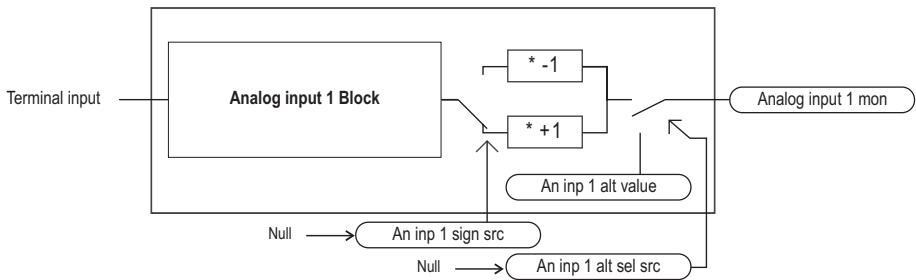
Internal FFE control system variables, from “function block” calculations, sent via keypad, PC configurator or fieldbus.

Practical example

The following examples illustrate the philosophies and methods with which more or less complex operations are performed in the single "function blocks", the results of which represent the output of the block.

• Example: Inverting the analog reference signal

To invert the "Analog input 1 Block" output signal, the value of the **An inp 1 sign src** parameter (PAR: 1526), which has a default setting of **Null** (no operation), must be changed by selecting the source of the command signal from among those listed in the L_DIGSEL 2 selection list, for example **Digital input X mon**, **One** (function always enabled), etc.



Note

.....
This section contains a brief description of the functions of the other parameters in the function blocks not included for the changes in the example.
.....

The **An inp 1 alt sel src** parameter (PAR: 1528) can be used to select an alternative reference for the **Analog input 1 mon** (PAR: 1500) output.

The **An inp 1 alt value** parameter (PAR: 1524) determines the alternative reference value for the **Analog input 1 mon** (PAR: 1500) output.

8 - Description of parameters and functions (Expert list)

Legend

0	1	2	3	4	5	6	7	8	9
Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
1 - MONITOR					<i>(Level 1 menu)</i>				
1.1	250	Output current	A	FLOAT	16/32	0.0	0.0	0.0	R
1.2	276	DC link current	A	FLOAT		0.0	0.0	0.0	R
13.2 - FUNCTIONS/DOUBLE PAR SET					<i>(Level 2 menu)</i>				
13.2.1	3300	Par set enable		ENUM		Disable	0	1	ERW
13.2.2	3302	Par set select src		LINK	16	6000	0	16384	ERWZ
				L DIGSEL2		<i>(Selection list) [*]</i>			

0	Indexing of the menu and parameter
1	Parameter identifier
2	Parameter description
3	UM: unit of measure
4	Type of parameter BIT Boolean, from modbus seen as 16 bits ENUM Selection list, from modbus seen as 16 bits FLOAT Real, from modbus seen as 32 bits FBM2SIPA 16-bit unsigned integer. Only PAR of existing parameters accepted. FBS2MIPA 16-bit unsigned integer. Only PAR of existing parameters accepted. INT16 Integer with sign 16 bits, from modbus seen as 16 bits INT32 Integer with sign 32 bits, from modbus seen as 32 bits ILINK Selection list, from modbus seen as 32 bits LINK Selection list, from modbus seen as 16 bits UINT16 Integer without sign 16 bits, from modbus seen as 16 bits UINT32 Integer without sign 32 bits, from modbus seen as 32 bits
5	Format of data exchanged on Fieldbus (16BIT, 32BIT)

6	Default value
7	Minimum value
8	Maximum value
9	Accessibility : E Expert R Read S Size (set value depending on the size of the device) W Write Z parameters that can be modified ONLY with the FFE disabled
[*]	Selection lists: The "... src" format parameters are linked to a selection list. The source of the signal that will control the parameter can be selected from the list indicated. The lists are indicated in paragraph 8.5 of this manual.

1 - MONITOR

The monitor menu displays the measured values of the sizes and of the FFE operating parameters.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
1.1	250	Output current	A	FLOAT	16/32	0.0	0.0	0.0	R

The current value absorbed by AC mains supply is displayed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
1.2	276	DC link current	A	FLOAT		0.0	0.0	0.0	R

The DC link current value is displayed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
1.3	254	Output frequency	Hz	FLOAT	16/32	0.0	0.0	0.0	R

The FFE output voltage is displayed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
1.4	270	DC link voltage	V	FLOAT	16/32	0.0	0.0	0.0	ER

The direct voltage of the intermediate circuit capacitors is displayed (DC-Bus).

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
1.5	272	Heatsink temperature	degC	INT16	16	0	0	0	ER

The temperature measured is displayed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
1.6	256	Phase U voltage	V	FLOAT	16/32	0.0	0.0	0.0	R

The phase U voltage is displayed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
1.7	258	Phase V voltage	V	FLOAT	16/32	0.0	0.0	0.0	R

The phase V voltage is displayed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
1.8	260	Phase W voltage	V	FLOAT	16/32	0.0	0.0	0.0	R

The phase W voltage is displayed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
1.9	248	Power factor		FLOAT		0.0	0.0	0.0	ER

The power factor value ($\cos\phi$) is displayed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
1.10	262	Output power	kW	FLOAT	16/32	0.0	0.0	0.0	ER

The value of the power generated into the mains is displayed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
1.11	368	Drive overload accum	perc	UINT16	16/32	0	0	100	ER

The FFE overload level is displayed. An instantaneous overload of 180% of the FFE rated current

is allowed for 0.5s. The thermal image I²t adjusts the FFE output current thresholds. During normal operation, the instantaneous output current value can reach 180% of the FFE rated current. After 0.5s at 180%, the output current threshold is reduced to 150%. When the overload level **PAR 368 Drive overload accum** reaches 100%, the output current threshold is reduced to 100% of the rated current, and stays at that value until the I²t integrator cycle is complete. At this point the 180% instantaneous overload is re-enabled.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
1.12	1066	Enable state mon		BIT	16	0	0	1	R

The FFE Enable command status is displayed. Voltage must be present on terminal 7. The FR Forwardstart command is needed to start the FFE200.

- 0 Disabled FFE disabled
- 1 Enabled FFE enabled

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
1.13	1100	Digital input mon		UINT16	16	0	0	0	R

The status of the digital inputs on the FFE is displayed. It can also be read via a serial line or fieldbus. The data are contained in a word, where each bit is 1 if voltage is supplied to the corresponding input terminal.

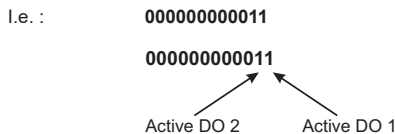
- 0 Input disabled
- 1 Input enabled



Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
1.14	1300	Digital output mon		UINT16		0	0	0	R

The status of the digital outputs on the FFE is displayed. It can also be read via a serial line or fieldbus. The data are contained in a word, where each bit is 1 if voltage is supplied to the corresponding input terminal.

- 0 Output disabled
- 1 Output enabled

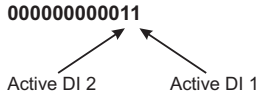


Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
1.15	1200	Digital input X mon		UINT16	16	0	0	0	R

The status of the digital inputs of the expansion card is displayed. It can also be read via a serial line or fieldbus. The data are contained in a word, where each bit is 1 if voltage is supplied to the corresponding input terminal.

- 0 Input disabled
- 1 Input enabled

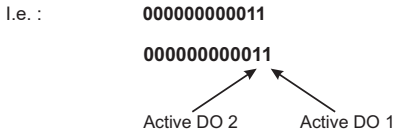
I.e. : **000000000011**



Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
1.16	1400	Digital output X mon		UINT16		0	0	0	R

The status of the digital outputs of the expansion card is displayed. It can also be read via a serial line or fieldbus. The data are contained in a word, where each bit is 1 if voltage is supplied to the corresponding input terminal.

- 0** Output disabled
- 1** Output enabled



Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
1.17	5400	Dig inp 0Ext mon		UINT32	32	0	0	4294967295	ER

This parameter displays the state of external inputs from 0 to 31.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
1.18	5402	Dig inp 1Ext mon		UINT32	32	0	0	4294967295	ER

This parameter displays the state of external inputs from 32 to 63.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
1.19	5450	Digital out 0Ext mon		UINT32	32	0	0	0	ER

This parameter is used to read the state of external outputs from 0 to 31.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
1.20	5452	Digital out 1Ext mon		UINT32	32	0	0	0	ER

This parameter is used to read the state of external outputs from 32 to 63.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
1.21	1060	Sequencer status		ENUM	16	Inizio	0	0	ER

Drive state parameter. Provides the FFE's operating and activation state and is responsible for protection and alarm conditions, the command sequence and reset condition.

- 0** Init
- 1** Wait Vdc Ok
- 2** Delay
- 3** Offset Calc
- 4** Ready
- 5** Run
- 6** Alarm Disabled
- 7** Alm End Action
- 8** Alm return
- 9** Alm no restart

2 - DRIVE INFO

This menu displays the information for identifying and configuring the FFE.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
2.1	482	Drive size		UINT16		0	0	0	RS

The FFE size identification code is displayed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
2.2	484	Drive family		ENUM		No Power	0	0	RS

The available mains voltage is displayed (e.g. 400V). The undervoltage alarm refers to this voltage value.

The condition **No power** occurs when the regulation board has just left from production and has never been configured for any power. The configuration adjustment for a given power is achieved by linking it to a power board and running a **Save parameters**.

- 0 No Power
- 1 380V..480V
- 2 500V..575V
- 3 690V
- 4 230V
- 5 270V

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
2.3	486	Drive region		ENUM		EU	0	1	R

Setting of the geographical area in which the FFE is to be used (Europe or USA). This setting determines the factory voltage and power supply frequency values (e.g. when set to 0 the default voltage is 400V and frequency 50Hz).

- 0 EU
- 1 USA

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
2.4	488	Drive cont current	A	FLOAT		CALCF	0.0	0.0	RZS

The current that the FFE can deliver continuously according to size and supply voltage.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
2.5	490	Firmware ver.rel		UINT16		0	0	0	R

The version number and release number of the FFE firmware are displayed. On the keypad these are displayed in the version.release format. The parameter reading from the serial communication device or fieldbus returns the version in the high byte and the release in the low byte.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
2.6	496	Firmware type		UINT16		0	0	0	R

The type of firmware installed in the FFE is displayed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
2.7	504	Application ver.rel		UINT16		0	0	0	ER

The version number and release number of the application are displayed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
2.8	506	Application type		UINT16		0	0	0	ER

The type of application currently used by the FFE is displayed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
2.9	508	Actual date time		UINT32		0	0	0	ER

The current date and time are displayed in dd/mm/yyyy hh/min format.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
2.10	510	Time drive power on	h.min	UINT32		0	0	0	ER

The total time for which the FFE has been powered is displayed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
2.11	512	Time drive enable	h.min	UINT32		0	0	0	ER

The time for which the enable hardware contact on the FFE has been connected is displayed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
2.12	514	Number power up		UINT16		0	0	0	ER

The number of times the FFE has been powered on is displayed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
2.13	516	Time fan on	h.min	UINT32		0	0	0	ER

The total operating time of the FFE fan is displayed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
2.14	520	Product S/N		UINT32		0	0	0	R

The FFE serial number is displayed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
2.15	522	Regulation S/N		UINT32		0	0	0	R

The FFE regulation card serial number is displayed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
2.16	524	Power S/N		UINT32		0	0	0	R

The FFE power card serial number is displayed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
2.17	526	Power file ver.rel		UINT16		0	0	0	ER

The version number and release number of the FFE power card are displayed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
2.18	530	Slot1 card type		ENUM		None	0	0	R
2.19	532	Slot2 card type		ENUM		None	0	0	R
2.20	534	Slot3 card type		ENUM		None	0	0	R

The type of expansion card installed in the relative slot of the FFE is displayed.

- 0 None
- 769 I/O 1
- 1793 I/O 2
- 2305 I/O 3

3329	I/O 4	
4	Can/Dnet	
260	Profibus	
516	RTE	(EXP-ETH-...-ADV200)
32	Fast IO	
288	Exp sync 1	(EXP-SYNC-ADV)
255	Unknown	
320	I/O Ext	
832	I/O FastLink	(EXP-FL-XCAN-ADV)

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
2.21	536	S/N scheda slot 1		UINT32		0	0	0	R
2.22	538	S/N scheda slot 2		UINT32		0	0	0	R
2.23	540	S/N scheda slot 3		UINT32		0	0	0	R

The serial number of the expansion card installed in the relative slot of the FFE is displayed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
2.24	5724	Fw FastLink ver.rel		UINT16		0	0	0	ER

The version and release number of the FastLink card firmware installed in the drive are displayed. When the parameter is read via serial line or fieldbus the version is returned in the high byte and the release in the low byte.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
2.25	5726	Fw FastLink type		UINT16		0	0	0	ER

The type of FastLink card firmware installed in the drive is displayed.

4 - CONFIG DRIVE

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
4.1	550	Save parameters		BIT		0	0	1	RW

Any changes to parameter values immediately affect FFE operations, but are not automatically saved in the permanent memory.

The "Save Parameters" command is used to save current parameter values in the permanent memory.

Any changes that are not saved will be lost when the FFE is switched off.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
4.2	554	Access mode		ENUM		Facile	0	1	RW

With this parameter you can restrict access to advanced configuration.

0 Easy

1 Expert

The **Easy** mode gives access to a list of parameters that can be used for rapid FFE commissioning. This type of configuration is suitable for the majority of applications.

Setting the parameter to **Expert** gives access to all the parameters in the firmware. This mode allows an extremely high level of customization to be achieved in order to exploit the potential of the FFE200 to the full.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
4.3	558	Application select		ENUM		None	0	2	ERWZ

Selection of which IEC 61131-3-compliant application to make operational.

0 None

1 Application 1

2 Application 2

Note!

.....
 The Load Default command (par. 580) does not modify this parameter

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
4.4	560	Mains voltage		ENUM		400 V	SIZE	SIZE	ERWZS

Setting of the available mains voltage value in Volts. Detection of the undervoltage alarm refers to this value.

0 320 V

1 270 V

2 290 V

3 230 V

4 380V

5 400 V

6 415 V

7 440 V

8 460 V

9 480 V

10 500 V

11 575 V

12 690 V

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
4.5	552	Mains frequency		ENUM		50 Hz	0	1	ERWZS
		Setting of the value of the available mains frequency in Hz.							
		0	50 Hz						
		1	60 Hz						

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
4.6	564	Ambient temperature		ENUM		40 degC	0	1	ERWZ
		Setting of the ambient temperature value. This parameter is used to set the output current derating factor (1% for every °C above 40°C).							
		0	40 degC						
		1	50 degC						
		40 degC The FFE200 is capable of delivering direct current continuously with ambient temperatures of up to 40°C.							
		50 degC The FFE200 is capable of delivering direct current continuously with ambient temperatures of up to 50°C.							
		If the value is set to 1 the FFE output current will be 10% less than the rated current at 40°C.							

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
4.7	566	Drive overload mode		ENUM		Heavy duty	1	2	ERWZ
		Setting of the overload that can be supplied by the FFE, depending on the application.							
		1	Heavy duty						
		2	Light duty						
		Set Heavy duty when a large overload is requested: the FFE can supply 180% of the rated current for 0.5 seconds and 150% for 1 minute every 5 minutes.							
		Select Light duty to enable the FFE to deliver a current of 110% of the rated current for 1 minute every 5 minutes.							
		LCL must be ordered indicating the use of the FFE overload: Heavy Duty or Light Duty. Changing the default value may impact on the LCL input filter operation.							

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
4.8	570	Password		UINT32		0	0	99999	ERW
		You can enter a password to protect the parameters from unauthorized tampering: the password can consist of a combination of a maximum of any 5 figures that can be selected by the user. All parameters are locked, except this one and Save parameters .							
		After entering the password, press the E key once to enter it into the memory and again to enable it (= Enabled is displayed to indicate that the password is enabled).							
		So that the password remains valid even after switching the unit off and then switching it back on, save it using the Save parameters command.							
		When the password is enabled any attempts to modify a parameter are blocked and the Password enabled message is displayed.							
		To disable the password, enter the Password parameter (572) in the DRIVE CONFIG menu.							
		Check that the password is enabled (Enabled), press E and enter the combination of figures that make up the password.							
		Press E again. A message is displayed telling you the password is no longer enabled (Disabled).							
		To make sure the password continues to be disabled even after switching the unit off and then switching it back on, save this configuration using the Save parameters command.							
		When an incorrect password is entered, the Password wrong message is displayed.							

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
4.9	574	Startup display		INT16		-1	-1	20000	ERW
		It is possible to set the parameter that will automatically be displayed when the FFE is switched							

on. If set to -1 the FFE moves to the display menu.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
4.10	576	Display backlight		BIT		0	0	1	ERW

Enabling of the backlight on the FFE display.
 If set to **0** the display backlight will go off when the FFE has been on for three minutes.
 If set to **1** the backlight will stay on for as long as the FFE is powered.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
4.11	578	Language select		ENUM		English	0	9	RWZ

Setting of the FFE programming language.

- 0 English
- 1 Italiano
- 2 Francais
- 3 Deutsch
- 4 Espanol
- 5 Polish
- 6 Romanian
- 7 Russian
- 8 Turkish
- 9 Portuguese

Note!

%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%
 The Load Default command (par. 580) does not modify this parameter.
 %%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%%

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
4.12	580	Load default		BIT		0	0	1	RWZ

Transfers the standard factory settings to the FFE memory ("Def" column in the parameters table).

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
4.13	590	Save par to keypad		BIT		0	0	1	RW

Transfers the parameters currently stored in the FFE and saves them in the keypad memory.

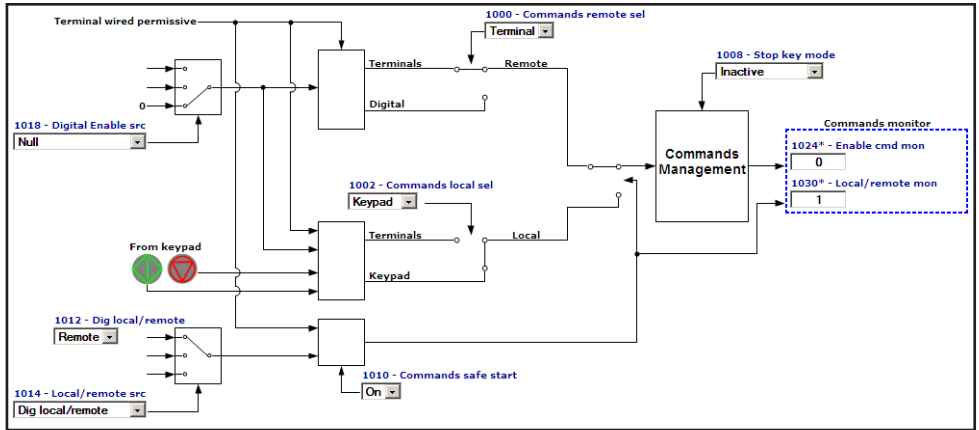
Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
4.14	592	Load par from keypad		BIT		0	0	1	RWZ

Transfers the parameters from the keypad memory to the FFE.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
4.15	594	Keypad memory select		UINT16		1	1	5	ERW

Selection of the area of the keypad memory to which to transfer and save the parameters stored in the FFE.

6 - COMMANDS



It is possible to work in **Local** or **Remote** mode.

When switching between **Remote** and **Local** modes the origin of the **Enable** and **Start** commands is switched.

In **Remote** mode the “**Commands remote sel**” parameter is used to configure the source of the **Enable** and **Start** commands which can be **Terminal** (standard digital input, expansion digital input) or **Digital** (Modbus, Fieldbus).

In **Local** mode the PAR1002 “**Commands local sel**” parameter is used to configure the source of the **Enable** and **Start** commands, which can be **Terminal** (standard digital input, expansion digital input) or **Keypad** (Start key, Stop key).

In **Remote -> Digital** mode the **PAR 1018 Digital Enable src** must be used to configure the source.

Normally the sources are the **Pad** parameters. Modbus or Fieldbus must therefore write the desired value on the **Pad** parameters. Alternatively, the value of 6000 can be written directly on the **Digital Enable src** parameter for a source of **Null** (0) or the value of 6002 for a source of **One** (1).

Another alternative is to configure the **Digital Enable src** source on the **PAR 4454 ... 4484 BitX decomp mon** parameters, so that the Modbus or Fieldbus can then write the desired value on the **PAR 4450 Dig word decomp** parameter.

Local <> Remote switching is performed with the variable value configured as **Loc/Remote src**, i.e. it can be a standard digital input, expansion digital input, Modbus, Fieldbus, Dig Local/Remote.

In the default condition, the associated variable is **Dig Local/Remote**, which is written by the **LOC** key from the keypad: switching is thus performed by pressing the **LOC** key.

For safety reasons, **Local <> Remote** switching is only performed with Terminal Enable = 0.

Example 1

With the machine in automatic operating mode, the FFE works in Remote -> Digital -> Fieldbus mode. With the machine in manual operating mode, the FFE works in Local -> Terminal -> Standard digital input mode.

If switching from automatic to manual machine operation, the FFE must switch between Remote and Local mode. The switch command must be sent via standard digital input or fieldbus.

Example 2

With the machine controlled from console A, the FFE operates in Local -> Terminal -> Standard digital input mode.

With the machine controlled from console B, the FFE operates in Remote -> Digital -> Expansion digital input mode.

When switching the control console, the FFE must switch between Remote and Local mode. The switch command must be sent via Standard digital input or Expansion digital input.

This configuration is allowed because the Terminal variables are available in the digital command selection lists.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
6.1	1000	Commands remote sel		ENUM		Terminal	0	1	RWZ

This parameter defines the source of the command signals when the FFE is used in the **Remote** mode.

The **Enable** command can only be set via hardware, connecting a positive voltage (+24VDC) to terminal 7.

- 0 Terminal
- 1 Digital

When the parameter is set to **Terminals** the source of the **Enable cmd mon** command is the **Enable** terminal (7)

When the parameter is set to **Digital** the origin of the **Enable cmd mon** command is configured using the **PAR 1018 Digital Enable src** parameter.

If **Digital** is set to generate the **Enable cmd mon** command, as well as the variable associated with **Digital Enable src**, the enable hardware command must also be sent to the **Enable** terminal.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
6.2	1002	Commands local sel		ENUM		Keypad	0	1	ERWZ

This parameter defines the source of the command signals when the FFE is used in the **Local** mode.

- 0 Terminal
- 2 Keypad

When the parameter is set to **Terminal** the source of the **Enable cmd mon** command is the **Enable** terminal (7) and the origin of the **Start cmd mon** command is configured using the **Terminal Start src** parameter.

When the parameter is set to **Keypad** the origin of the **Enable cmd mon** is the Start key. When Keypad is set to generate the **Enable cmd mon** command, as well as the **Start** key the enable hardware command must also be sent to the **Enable** terminal (7)

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
6.3	1008	Stop key mode		ENUM		Inactive	0	1	ERW

Setting of the **Stop** key functioning on the keypad. In Local with command from Keypad, this configuration is ineffective.

Active in remote control mode (PAR 1012=1) both by using "Terminals" command or **"Digital"** commands and, in local control mode (PAR 1012=0) by using "Terminals" command

- 0 Inactive
- 1 EmgStop&Alarm

If the command is set to Inactive, pressing the **Stop** key on the keypad is ineffective.

If the command is set to **EmgStop&Alarm**, when the **Stop** key is pressed the motor stops in **FastStop mode** and the **Emg stop alarm** is generated. When the motor reaches the speed=0, the drive is automatically disabled and waits for the **Fault reset** command. The **Fault reset** command must be sent twice to reset the drive.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
6.4	1010	Commands safe start		BIT		1	0	1	ERW
		This parameter is used to define whether the safe start command is disabled or enabled at FFE power-on							
		0 Off							
		1 On							

If set to **Off** the safe start function is disabled. Therefore, if the FFE is powered with the hardware signal present on terminal 7 the FFE could start.

If set to **On** the safe start function is enabled. Therefore, if the FFE is powered with the hardware enabling signal on terminal 7 it will not start. Open the hardware enabling contact on terminal 7 and then close it again to enable the FFE to accept subsequent commands.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
6.5	1012	Dig local/remote		ENUM	16	Remote	0	1	ERW
		Setting Local or Remote operating mode.							
		0 Local							
		1 Remote							

Writing this parameter is only effective if it is associated with **Local/Remote src** and if performed without the hardware enabled on the terminal 7. Press **LOC** to modify the value of this parameter 0 <> 1.

To disable the **LOC** key, set **Local/Remote src** to a value other than **Dig local/remote**.

In **Remote** mode use the **Commands remote sel** parameter, PAR 1000 to configure the source of the enable and run commands, which can be **Terminal** board (Standard digital input, Expansion card digital input), or Digital (Modbus, Fieldbus).

In **Local** mode use the **Commands local sel** parameter, PAR 1002 to configure the source of the enable commands, which can be **Terminal** board (Standard digital input, Expansion card digital input), or Keypad (**Start** key, **Stop** key).

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
6.6	1014	Local/remote src		LINK	16	1012	0	16384	ERW
		L_DIGSEL3							

Selection of the origin (source) of the signal that switches between **Remote** and **Local**.

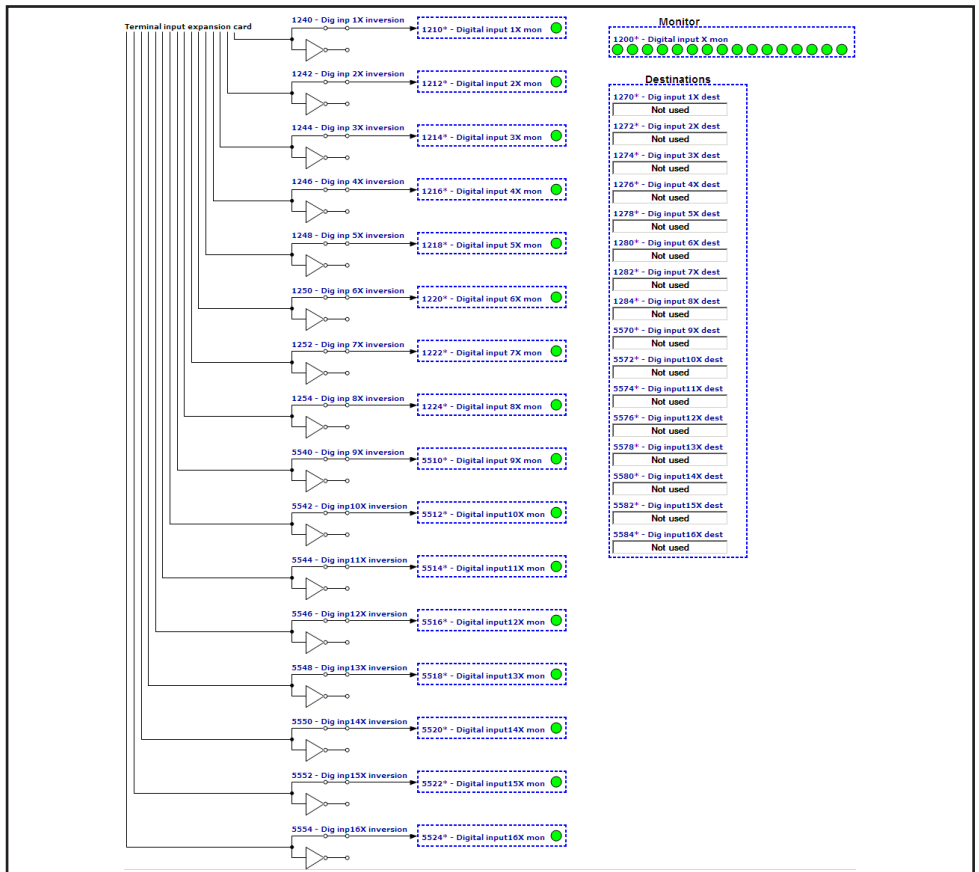
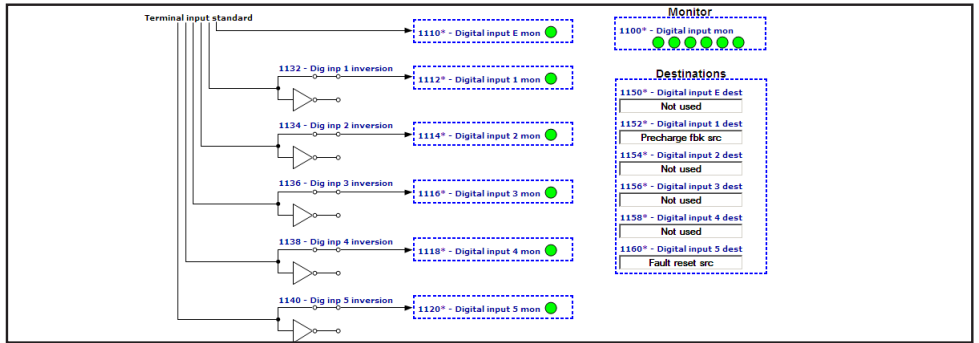
The signal to be associated with this function can be selected from the "L_DIGSEL3" selection list.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
6.7	1018	Digital Enable src		LINK	16	6000	0	16384	ERW
		L_DIGSEL2							

Selection of the origin (source) for the Digital Enable signal. The signal to be associated with this function can be selected from the "L_DIGSEL2" selection list.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
6.8	1024	Enable cmd mon		BIT	16	0	0	1	R
		The status of the enable command is displayed.							

7 - DIGITAL INPUTS



Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
7.1	1132	Dig inp 1 inversion		BIT		0	0	1	RW
7.2	1134	Dig inp 2 inversion		BIT		0	0	1	RW

7.3	1136	Dig inp 3 inversion		BIT	0	0	1	RW
7.4	1138	Dig inp 4 inversion		BIT	0	0	1	RW
7.5	1140	Dig inp 5 inversion		BIT	0	0	1	RW

Reversal of the logic status of the function associated with the digital input (e.g. from enabled with +24V signal to enabled with low signal).

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
7.6	1150	Digital input E dest		ILINK		0	0	0	ER
7.7	1152	Digital input 1 dest		ILINK		0	0	0	ER
7.8	1154	Digital input 2 dest		ILINK		0	0	0	ER
7.9	1156	Digital input 3 dest		ILINK		0	0	0	ER
7.10	1158	Digital input 4 dest		ILINK		0	0	0	ER
7.11	1160	Digital input 5 dest		ILINK		0	0	0	ER

The function to which the associated digital input refers is displayed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
7.12	1240	Dig inp 1X inversion		BIT		0	0	1	RW
7.13	1242	Dig inp 2X inversion		BIT		0	0	1	RW
7.14	1244	Dig inp 3X inversion		BIT		0	0	1	RW
7.15	1246	Dig inp 4X inversion		BIT		0	0	1	RW
7.16	1248	Dig inp 5X inversion		BIT		0	0	1	RW
7.17	1250	Dig inp 6X inversion		BIT		0	0	1	RW
7.18	1252	Dig inp 7X inversion		BIT		0	0	1	RW
7.19	1254	Dig inp 8X inversion		BIT		0	0	1	RW
7.20	5540	Dig inp 9X inversion		BIT		0	0	1	ERW
7.21	5542	Dig inp 10X inversion		BIT		0	0	1	ERW
7.22	5544	Dig inp 11X inversion		BIT		0	0	1	ERW
7.23	5546	Dig inp 12X inversion		BIT		0	0	1	ERW
7.24	5548	Dig inp 13X inversion		BIT		0	0	1	ERW
7.25	5550	Dig inp 14X inversion		BIT		0	0	1	ERW
7.26	5552	Dig inp 15X inversion		BIT		0	0	1	ERW
7.27	5554	Dig inp 16X inversion		BIT		0	0	1	ERW

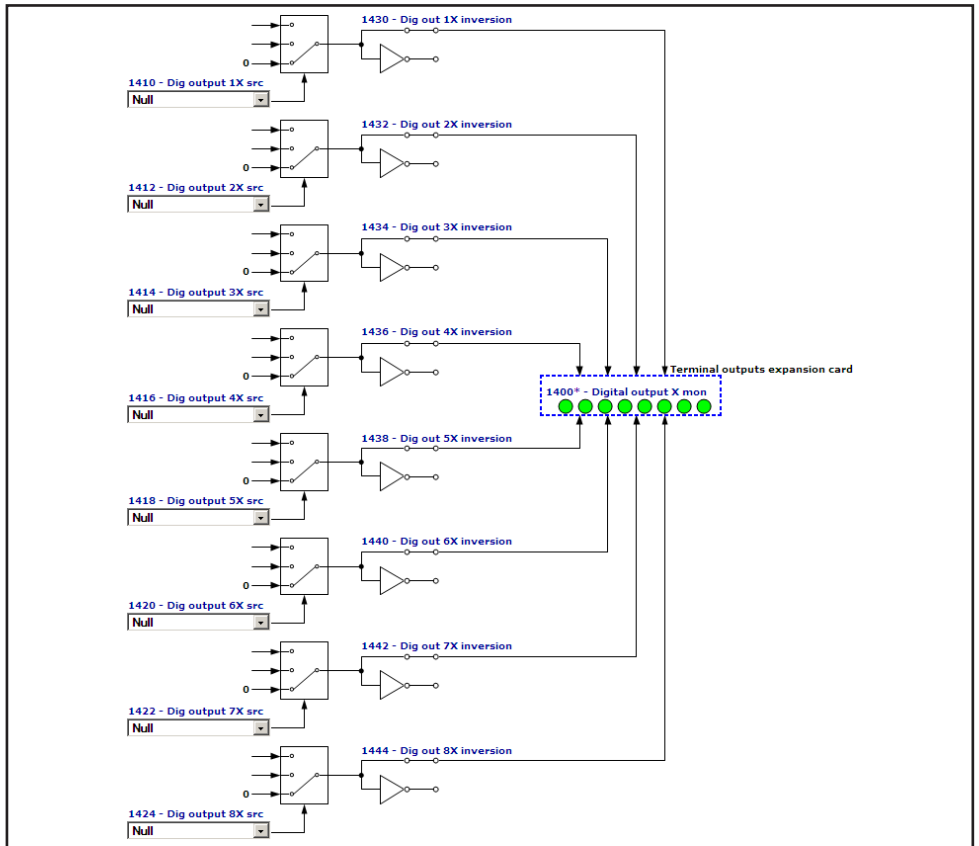
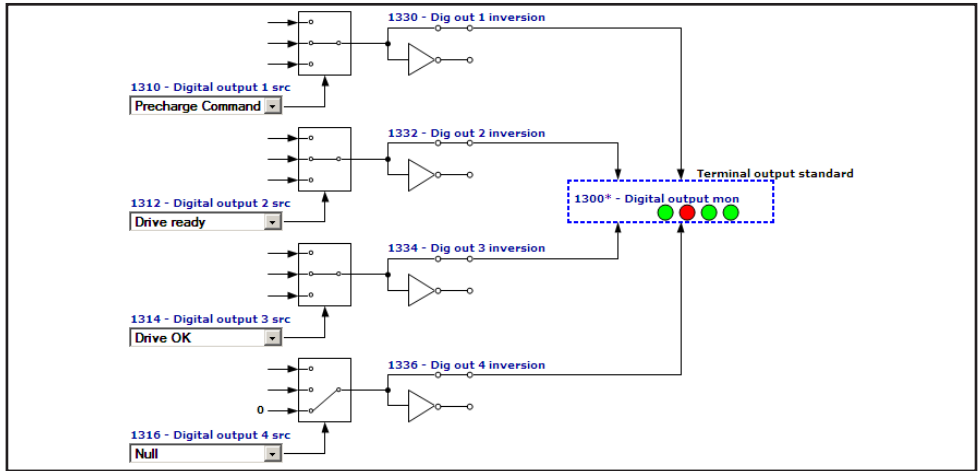
Reversal of the logic status of the function associated with the digital input of the expansion card.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
7.28	1270	Dig input 1X dest		ILINK		0	0	0	ER
7.29	1272	Dig input 2X dest		ILINK		0	0	0	ER
7.30	1274	Dig input 3X dest		ILINK		0	0	0	ER
7.31	1276	Dig input 4X dest		ILINK		0	0	0	ER
7.32	1278	Dig input 5X dest		ILINK		0	0	0	ER
7.33	1280	Dig input 6X dest		ILINK		0	0	0	ER
7.34	1282	Dig input 7X dest		ILINK		0	0	0	ER
7.35	1284	Dig input 8X dest		ILINK		0	0	0	ER
7.36	5570	Dig input 9X dest		ILINK		0	0	0	ER

7.37	5572	Dig input 10X dest	ILINK	0	0	0	ER
7.38	5574	Dig input 11X dest	ILINK	0	0	0	ER
7.39	5576	Dig input 12X dest	ILINK	0	0	0	ER
7.40	5578	Dig input 13X dest	ILINK	0	0	0	ER
7.41	5580	Dig input 14X dest	ILINK	0	0	0	ER
7.42	5582	Dig input 15X dest	ILINK	0	0	0	ER
7.43	5584	Dig input 16X dest	ILINK	0	0	0	ER

Selection of the destination of the associated digital input of the expansion card.

8 - DIGITAL OUTPUTS



Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
8.1	1310	Digital output 1 src		LINK	16	1122	0	16384	RW
8.2	1312	Digital output 2 src		LINK	16	1064	0	16384	RW
8.3	1314	Digital output 3 src		LINK	16	1062	0	16384	RW
8.4	1316	Digital output 4 src		LINK	16	1068	0	16384	RW

L_DIGSEL1

Selection of the origin (source) of the signal to be assigned to the relative digital output. The functions that can be associated with the digital outputs are listed in the "L_DIGSEL1" selection list.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
8.5	1330	Dig out 1 inversion		BIT		0	0	1	RW
8.6	1332	Dig out 2 inversion		BIT		0	0	1	RW
8.7	1334	Dig out 3 inversion		BIT		0	0	1	RW
8.8	1336	Dig out 4 inversion		BIT		0	0	1	RW

Reversal of the logic status of the function associated with the digital output.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
8.9	1410	Dig output 1X src		LINK	16	6000	0	16384	RW
8.10	1412	Dig output 2X src		LINK	16	6000	0	16384	RW
8.11	1414	Dig output 3X src		LINK	16	6000	0	16384	RW
8.12	1416	Dig output 4X src		LINK	16	6000	0	16384	RW
8.13	1418	Dig output 5X src		LINK	16	6000	0	16384	RW
8.14	1420	Dig output 6X src		LINK	16	6000	0	16384	RW
8.15	1422	Dig output 7X src		LINK	16	6000	0	16384	RW
8.16	1424	Dig output 8X src		LINK	16	6000	0	16384	RW

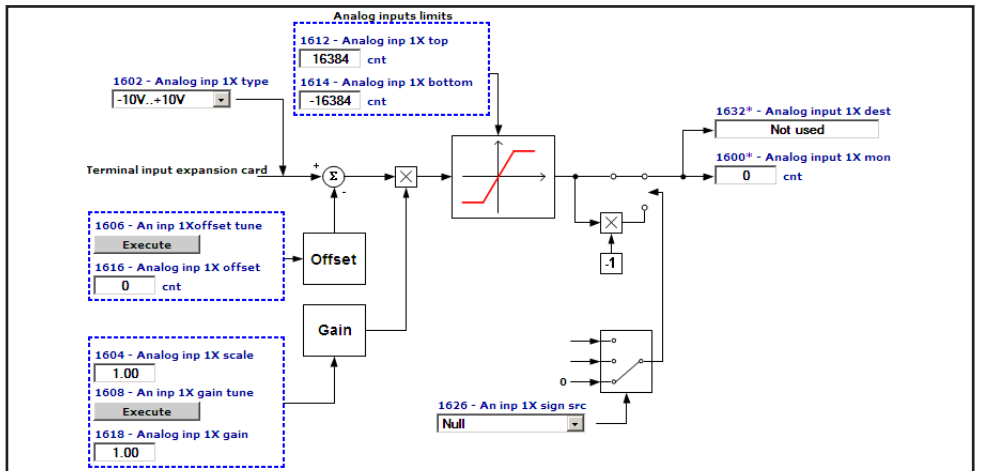
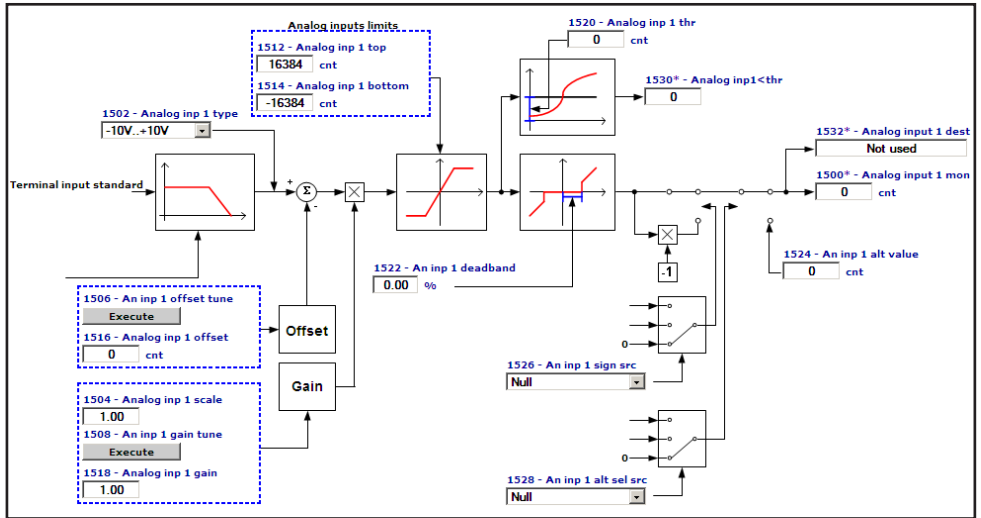
L_DIGSEL1

Selection of the origin (source) of the signal to be assigned to the relative digital output of the expansion card. The functions that can be associated with the digital outputs are listed in the "L_DIGSEL1" selection list.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
8.17	1430	Dig out 1X inversion		BIT		0	0	1	RW
8.18	1432	Dig out 2X inversion		BIT		0	0	1	RW
8.19	1434	Dig out 3X inversion		BIT		0	0	1	RW
8.20	1436	Dig out 4X inversion		BIT		0	0	1	RW
8.21	1438	Dig out 5X inversion		BIT		0	0	1	RW
8.22	1440	Dig out 6X inversion		BIT		0	0	1	RW
8.23	1442	Dig out 7X inversion		BIT		0	0	1	RW
8.24	1444	Dig out 8X inversion		BIT		0	0	1	RW

Reversal of the logic status of the function associated with the digital output of the expansion card.

9 - ANALOG INPUTS



Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
9.1	1500	Analog input 1 mon	cnt	INT16	16/32	0	0	0	R
9.16	1550	Analog input 2 mon	cnt	INT16	16/32	0	0	0	R

The value of the voltage on the output of the function block of the relative analog input is displayed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
9.2	1502	Analog inp 1 type		ENUM		-10V..+10V	0	2	RW
9.17	1552	Analog inp 2 type		ENUM		-10V..+10V	0	2	RW

Selection of the type of input (voltage or current). Depending on the input signal, move the switches on the regulation card. The factory parameter is inputs set for differential voltage signals ($\pm 10V$).

- 0 -10V..+10V
- 1 0.20mA ... 0.10V
- 2 4..20mA

Select option **0** in order to connect a maximum voltage of $\pm 12.5V$ (typically $\pm 10V/5mA$) to the analog input concerned. If the signal is used as a reference, reverse the direction of rotation by inverting the voltage polarity.

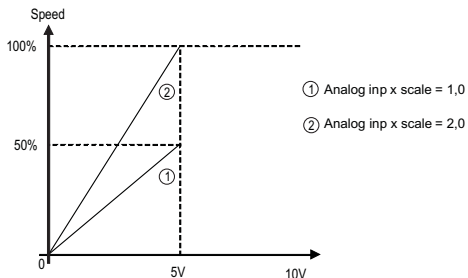
Select option **1** to connect a max voltage of 12.5V (typically 10V/5mA) or a signal in current from 0 ... 20 mA to the analog input concerned. The signal must be positive.

Select option **2** to connect a current signal of 4...20 mA to the analog input concerned. The signal must be positive.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
9.3	1504	Analog inp 1 scale		FLOAT		1.0	-10.0	10.0	RW
9.18	1554	Analog inp 2 scale		FLOAT		1.0	-10.0	10.0	RW

Setting of a multiplier factor to apply to the relative analog input.

Example :



The speed reference of a FFE is assigned with a max external voltage of 5V. As the **Analog inp x scale** parameter a scale factor of 2 is entered (10V : 5V).

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
9.4	1506	An inp 1 offset tune		BIT		0	0	1	ERW
9.19	1556	An inp 2 offset tune		BIT		0	0	1	ERW

Self-tuning command for the relative analog input offset. Automatic fine tuning of the input. To perform self-tuning, set the input signal to its minimum value and execute the command. The conditions containing an offset can be compensated. When this command is sent, An inp x offset tune is automatically selected so that the available input signal corresponds to the zero value of the variable. Offset tuning can also be performed with the FFE enabled. Automatic tuning can only be performed if the following condition is present:

Automatic tuning can only be performed if the following condition is present:
 - Input voltage less than 1V or input current less than 2 mA

Note!

.....
 The value that is obtained automatically can be changed manually if necessary, using **Analog inp x offset**.

If the voltage setting on the analog input is higher than 1V, the **Value too low** alarm is generated.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
9.5	1508	An inp 1 gain tune		BIT		0	0	1	RWZ
9.20	1558	An inp 2 gain tune		BIT		0	0	1	RWZ

Self-tuning command for the relative analog input gain. Automatic fine tuning of the input. When this command is sent, Analog inp 1 gain x is automatically selected so that the available input signal corresponds to the maximum value of the variable. Offset tuning can also be performed with the FFE enabled.

Two conditions are necessary in order to perform automatic tuning:

- Input voltage greater than 1V or input current greater than 2 mA
- Positive polarity. The value found is automatically accepted even for negative polarity.

Note!

=====

If necessary, the value obtained automatically can be changed manually via **Analog inp x gain**.

=====

To perform self-tuning, set the input signal to its maximum value and execute the command. A multiplier factor is calculated to apply to the input signal value (not considering the Analog inp scale parameter) to reach the **full scale value**.

If the voltage setting on the analog input is less than 1V, the **Value too low** alarm is generated.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
9.6	1510	Analog inp 1 filter	ms	FLOAT		10.0	1.0	100.0	ERW
9.22	1560	Analog inp 2 filter	ms	FLOAT		10.0	1.0	100.0	ERW

Filter on the measurement of the corresponding analog input. This parameter can be used to control the response of the analog input and reduce any possible noise and interference.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
9.7	1512	Analog inp 1 top	cnt	INT16		16384	-32768	+32767	ERW
9.23	1562	Analog inp 2 top	cnt	INT16		16384	-32768	+32767	ERW

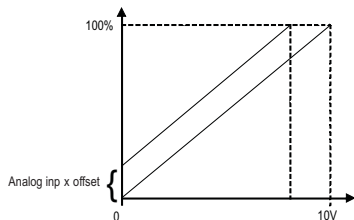
Setting of the upper speed reference limit as a function of the voltage (or current) of the relative analog reference.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
9.8	1514	Analog inp 1 bottom	cnt	INT16		-16384	-32768	+32767	ERW
9.24	1564	Analog inp 2 bottom	cnt	INT16		-16384	-32768	+32767	ERW

Setting of the lower speed reference limit as a function of the voltage (or current) of the relative analog reference..

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
9.9	1516	Analog inp 1 offset	cnt	INT16		0	-32768	+32767	ERW
9.25	1566	Analog inp 2 offset	cnt	INT16		0	-32768	+32767	ERW

Setting of a value to compensate the condition in which the analog signal contains an offset, or when the variable assigned to the input already has a value even though no signal is connected.



Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
9.10	1518	Analog inp 1 gain		FLOAT		1.0	-10.0	10.0	ERW
9.26	1568	Analog inp 2 gain		FLOAT		1.0	-10.0	10.0	ERW

This parameter contains the value of the multiplier factor to apply to the analog reference calculated using the **Analog inp gain tune** function.

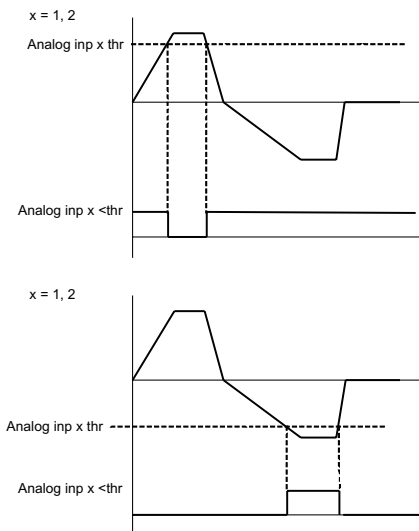
Example :

An external analog reference only reaches a maximum of 9.8V instead of 10V. 1.020 (10V : 9.8V) is entered as the **Analog inp x gain** parameter.

The same result can be achieved using the **An inp x gain tune** function. This parameter can be selected from the keypad menu. The maximum analog value available (in this case 9.8V) must be present on the terminal, with positive polarity. Press the **Enter** key on the keypad to start analog reference self-tuning.

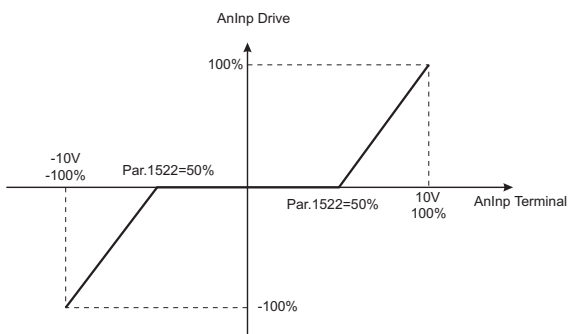
Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
9.11	1520	Analog inp 1 thr		INT16		0	-16384	+16383	ERW
9.25	1570	Analog inp 2 thr		INT16		0	-16384	+16383	ERW

Setting of the analog input threshold for the speed not exceeded signal, which allows enabling of the digital outputs **Analog inp1<thr** (PAR 1530) and **Analog inp2<thr** (PAR 1580).



Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
9.12	1522	An inp 1 deadband	perc	FLOAT		0.0	0.0	100.0	ERW
9.28	1572	An inp 2 deadband	perc	FLOAT		0.0	0.0	100.0	ERW

Deadband referring to the analog input signal. When the value on the input terminal is below the threshold defined by the parameter, the output signal of the analog input block is forced to zero. Outside the deadband, the block output varies linearly from zero to 100%.



Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
9.13	1524	An inp 1 alt value	cnt	INT16	16/32	0	-16384	16384	ERW
9.29	1574	An inp 2 alt value	cnt	INT16	16/32	0	-16384	16384	ERW

Setting of a fixed alternative value for the relative analog input, which can be selected via a command enabled by a digital input programmed with the **An inp alt sel src** parameter.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
9.14	1526	An inp 1 sign src		LINK	16	6000	0	16384	ERW
9.30	1576	An inp 2 sign src		LINK	16	6000	0	16384	ERW

L_DIGSEL2

Selection of the origin (source) of the signal to be assigned to the relative digital input for selecting the direction of rotation of the motor. The functions that can be associated with the digital outputs are listed in the "L_DIGSEL2" selection list.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
9.15	1528	An inp 1 alt sel src		LINK	16	6000	0	16384	ERW
9.30	1578	An inp 2 alt sel src		LINK	16	6000	0	16384	ERW

L_DIGSEL2

Selection of the origin (source) of the signal to be assigned to the relative digital input for selecting the alternative analog reference. The functions that can be associated with the digital outputs are listed in the "L_DIGSEL2" selection list.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
9.16	1532	Analog input 1 dest		ILINK		0	0	0	ER
9.32	1582	Analog input 2 dest		ILINK		0	0	0	ER

The function for which the relative analog input has been programmed and on which it acts is displayed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
9.33	1600	Analog input 1X mon	cnt	INT16	16/32	0	0	0	R
9.44	1650	Analog input 2X mon	cnt	INT16	16/32	0	0	0	R

The value of the voltage output of the function block of the relative analog input is displayed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
9.34	1602	Analog inp 1X type		ENUM		-10V..+10V	0	2	RW
9.45	1652	Analog inp 2X type		ENUM		-10V..+10V	0	2	RW

Selection of the type of expansion card input (voltage or current input). Depending on the input signal, move the switches on the regulation card. Standard inputs are coded for voltage signals.

- 0 -10V..+10V
- 1 0.20mA ... 0.10V
- 2 4..20mA

Select option **0** in order to connect a maximum voltage of $\pm 12.5V$ (typically $\pm 10V/5mA$) to the analog input concerned. If the signal is used as a reference, reverse the direction of rotation of the drive by inverting the voltage polarity.

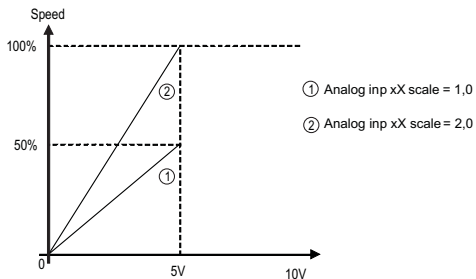
Select option **1** to connect a max voltage of 12.5V (typically 10V/5mA) or a signal in current from 0 ... 20 mA to the analog input concerned. The signal must be positive.

Select option **2** to connect a current signal of 4...20 mA to the analog input concerned. The signal must be positive.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
9.35	1604	Analog inp 1X scale		FLOAT		1.0	-10.0	10.0	RW
9.46	1654	Analog inp 2X scale		FLOAT		1.0	-10.0	10.0	RW

Setting of a multiplier factor to apply to the relative analog input of the expansion card.

Example :



The speed reference of a drive is assigned with a max external voltage of 5V. As the Analog inp X scale parameter the scale factor of 2 is entered (10V : 5V).

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
9.36	1606	An inp 1Xoffset tune		BIT		0	0	1	RWZ
9.47	1656	An inp 2Xoffset tune		BIT		0	0	1	RWZ

Self-tuning command for the offset of the relative analog input of the expansion card. Automatic fine tuning of the input. To perform self-tuning, set the input signal to its minimum value and execute the command.

The conditions containing an offset can be compensated. When this command is sent, **An inp**

xx offset tune is automatically selected so that the available input signal corresponds to the zero value of the variable.

Automatic tuning can only be performed if the following condition is present:

- Input voltage less than 1V or input current less than 2 mA

Note!

=====

The value that is obtained automatically can be changed manually, if necessary, using **An inp offset xX**.

=====

If the voltage setting on the analog input is higher than 1V, the **Value too low** alarm is generated.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
9.37	1608	An inp 1X gain tune		BIT		0	0	1	RWZ
9.48	1658	An inp 2X gain tune		BIT		0	0	1	RWZ

Self-tuning command for the relative analog input gain. Automatic fine tuning of the input. When this command is sent, **Analog inp 1 gain x** is automatically selected so that the available input signal corresponds to the maximum value of the variable.

Two conditions are necessary in order to perform automatic tuning:

- Input voltage greater than 1V or input current greater than 2 mA
- Positive polarity. The value found is automatically accepted even for negative polarity.

Note!

=====

If necessary, the value obtained automatically can be changed manually via **Analog inp xX gain**.

=====

To perform self-tuning, set the input signal to its maximum value and execute the command. A multiplier factor is calculated to apply to the input signal value (not considering the Analog inp scale parameter) to reach the full scale value.

If the voltage setting on the analog input is less than 1V, the **Value too low** alarm is generated.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
9.38	1612	Analog inp 1X top	cnt	INT16		16384	-32768	+32767	ERW
9.49	1662	Analog inp 2X top	cnt	INT16		16384	-32768	+32767	ERW

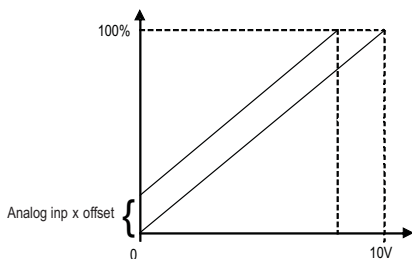
Setting of the upper speed reference limit as a function of the voltage (or current) of the relative analog reference of the expansion card.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
9.39	1614	Analog inp 1X bottom	cnt	INT16		-16384	-32768	+32767	ERW
9.51	1664	Analog inp 2X bottom	cnt	INT16		-16384	-32768	+32767	ERW

Setting of an offset value to algebraically add to the relative analog input of the expansion card.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
9.40	1616	Analog inp 1X offset	cnt	INT16		0	-32768	+32767	ERW
9.51	1666	Analog inp 2X offset	cnt	INT16		0	-32768	+32767	ERW

Setting of an offset value to algebraically add to the relative analog input of the expansion card.



Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
9.41	1618	Analog inp 1X gain		FLOAT		1.0	-10.0	10.0	ERW
9.52	1668	Analog inp 2X gain		FLOAT		1.0	-10.0	10.0	ERW

This parameter contains the value of the multiplier factor to apply to the analog reference of the expansion card calculated using the **Analog inp gain tune** function.

Example :

An external analog reference only reaches a maximum of 9.8V instead of 10V. 1.020 (10V : 9.8V) is entered as the **Analog inp x gain** parameter.

The same result can be achieved using the **Analog inp x gain** tune function. This parameter can be selected from the keypad menu. The maximum analog value available (in this case 9.8V) must be present on the terminal, with positive polarity. Press the **Enter** key on the keypad to start analog reference self-tuning.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
9.42	1626	An inp 1X sign src		LINK	16	6000	0	16384	ERW
9.53	1676	An inp 2X sign src		LINK	16	6000	0	16384	ERW

L_DIGSEL2

Selection of the origin (source) for the signal to be assigned to the relative digital input for selecting the sign of the relative analog reference signal. The functions that can be associated with the digital outputs are listed in the "L_DIGSEL2" selection list.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
9.43	1632	Analog inp 1X dest		ILINK		0	0	0	ER
9.54	1682	Analog inp 2X dest		ILINK		0	0	0	ER

The function for which the relative analog input of the expansion card has been programmed and on which it acts is displayed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
9.55	5410	Analog inp 0Ext mon		INT16	16	0	-32768	+32767	ER
9.56	5412	Analog inp 1Ext mon		INT16	16	0	-32768	+32767	ER
9.57	5414	Analog inp 2Ext mon		INT16	16	0	-32768	+32767	ER
9.58	5416	Analog inp 3Ext mon		INT16	16	0	-32768	+32767	ER
9.59	5418	Analog inp 4Ext mon		INT16	16	0	-32768	+32767	ER
9.60	5420	Analog inp 5Ext mon		INT16	16	0	-32768	+32767	ER
9.61	5422	Analog inp 6Ext mon		INT16	16	0	-32768	+32767	ER
9.62	5424	Analog inp 7Ext mon		INT16	16	0	-32768	+32767	ER

These parameters show the value of the analog input.

Analog input modules can have a resolution of 12 to 16 bits and scaling may vary from manufacturer to manufacturer.

E.g.:

12-bit module

Signal connected Module configuration	Variant 1	Variant 2	Variant 3	Variant 4
-10V..+10V	-2048..+2047	-32768..+32767	-16384..+16383	
0V..+10V	0..+4095	0..+2047	0..+32767	0..+65535
4..20mA	0..+32767	+6553..+32767	+3276..+16383	

16-bit module

Signal connected Module configuration	Variant 1	Variant 2	Variant 3	
-10V..+10V	-32768..+32767			
0V..+10V	0..+65535	0..+32767		
4..20mA				

There is no single Unit suitable for all models of analog input module. Check the scaling provided by the model being used and use the system variables accordingly. Analog input 0 and analog input 1 can also be managed by the drive parameters. To ensure correction operation, the scaling provided by the external module must be compatible with the scaling requested by the drive.

The drive needs I/O modules that supply datum scaled as follows

Tip ing analogicoX	Range
-10V..+10V	-32768..+32767
0V..+10V	0..+65535
4..20mA	+13107..+65535

When the **An inp X gain tune** (PAR 1508, PAR 1558) command is sent with analog input set to the maximum value, the gain needed to adjust the full scale value is calculated.

For modules with scaling other than that requested by the drive, the **An inp X gain tune** command attempts to adjust the scaling. For that reason the maximum value is increased for **An inp X gain tune** parameters.

The tables below show the output of the analog input block according to the signal connected and the configuration of the **Analog inp X type** parameter (PAR 1502, PAR 1552).

Signal connected: -10V..+10V

An input type	-10V	0V	+10V
-10V..+10V	Bottom	Obtained from straight line	Top
0V..+10V	Less than 0V saturation at Bottom	Bottom	Top
4..20 mA	Less than 2V saturation at Bottom	Bottom	Top

Signal connected: 0V..+10V

An input type		0V	+10V
-10V..+10V		Obtained from straight line	Top
0V..+10V		Bottom	Top
4..20 mA		Less than 2V saturation at Bottom	Top

Signal connected: 4..20mA

An input type		4mA	20mA
-10V..+10V			Top
0V..+10V		Less than 4 mA saturation at Bottom	Top
4..20 mA		Bottom	Top

The Analog inputs voltage or current inputs must be configured on the external module using a

dedicated switch or tool. For analog input 0 and analog input 1 the An input type parameter must be set according to the type of external device.

10 - ANALOG OUTPUTS

On the FFE200 regulation card there are two programmable analog outputs.

Analog output 1 supplies a two-pole +/-10VDC voltage signal, while analog output 2 can be programmed to obtain a 0-20mA or 4-20mA output signal in current or a signal in two-pole +/-10VDC voltage, depending on the parameter assigned.

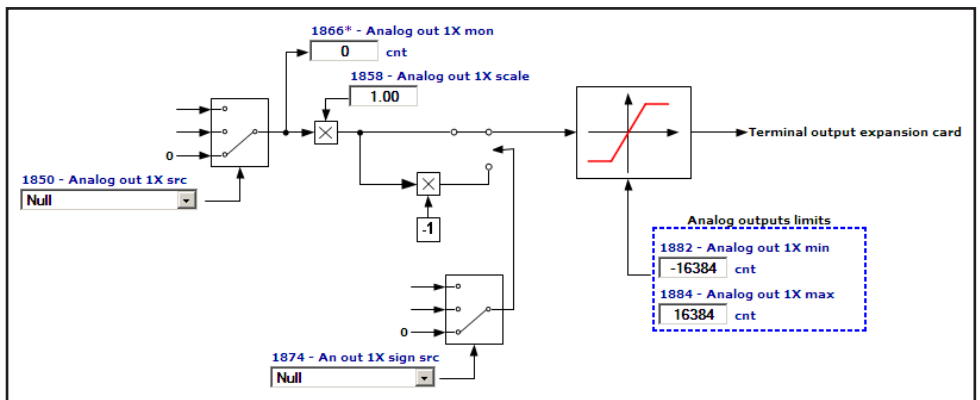
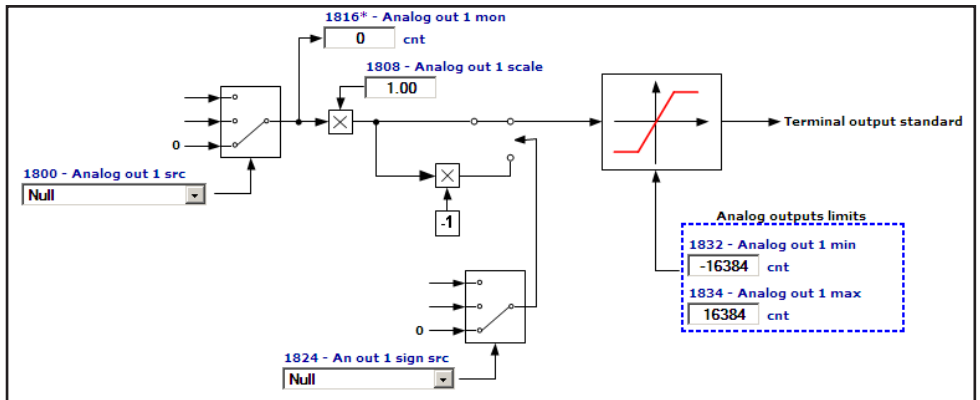


Table: value of the signal of the analog outputs according to the measurement used

PAR	Description	Full scale output
250	Output current	10V = 200% Heavy Duty FFE rated current (this value can be found in the manual and is defined @400Vac, default switching frequency and 40°C)
284	Active current	
286	Reactive current	
2388	Active curr nofft	
252	Output voltage	10V = 200% Mains voltage (PAR 560)
254	Output frequency	10V = 1000Hz
270	DC link voltage	10V = 7000V
1500	Analog input 1 mon	10V = 10V Analog input
1550	Analog input 2 mon	
1600	Analog input 1X mon	
1650	Analog input 2X mon	
368	Drive overload accum	5V = 100% Accumulator

4024 ... 4174	Fieldbus M->SX mon	10V = 16384 * 2 ¹⁶
3700 ... 3730	Pad X	

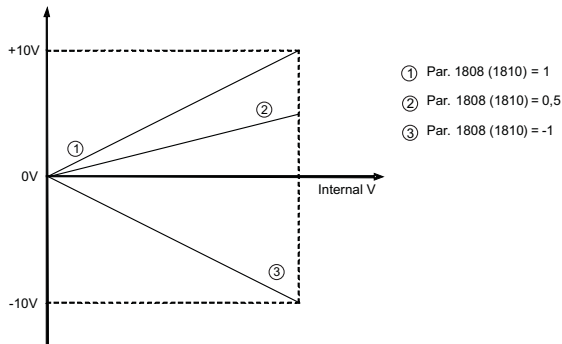
Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
10.1	1800	Analog out 1 src		LINK	16/32	6000	0	16384	RW
10.2	1802	Analog out 2 src		LINK	16/32	6000	0	16384	RW

L_ANOUT

Selection of the origin (source) of the signals that can be placed as variables on the analog outputs. The functions that can be assigned to the analog outputs are listed in the "L_ANOUT" selection list.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
10.3	1808	Analog out 1 scale		FLOAT		1.0	-10.0	10.0	RW
10.4	1810	Analog out 2 scale		FLOAT		1.0	-10.0	10.0	RW

Parameter for setting a multiplier factor of the signal of the relative analog output. It can be used to amplify or reduce the input value of the relative analog output block.



$$V_{out} = 10 \times \left(\frac{\text{Stp Var} \times \text{par. 1808 (1810)}}{\text{FS Var}} \right)$$

where:

Vout output voltage on the card terminals.
Stp Var actual value of the variable (variable unit)
FS Var full scale of the variable (variable unit)

Example of calculation of scale factor **Analog out x scale** :

To display the FFE speed, use an analog instrument with field of measurement from 0...2V. This means that, to display the speed of the FFE, a voltage of 2V on the analog output of the FFE must correspond to the maximum speed. With a scale factor of 1 this would be 10V (Scale factor = 2V / 10 V = 0.200).

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
10.5	1816	Analog out 1 mon	cnt	INT16		0	0	0	ER

The value of the actual voltage present on analog output 1 is displayed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
10.6	1818	Analog out 2 mon	cnt	INT16		0	0	0	ER

The value of the actual voltage or current present on analog output 2 is displayed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
10.7	1824	An out 1 sign src		LINK	16	6000	0	16384	ERW
10.8	1826	An out 2 sign src		LINK	16	6000	0	16384	ERW

L_DIGSEL2

Selection of the origin (source) for the signal that determines the sign of the relative analog output. The terminal to be associated with this function can be selected from the "L_DIGSEL2" selection list.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
10.9	1832	Analog out 1 min	cnt	INT16		-16384	-32768	+32767	ERW
10.10	1834	Analog out 1 max	cnt	INT16		16384	-32768	+32767	ERW

Setting of the minimum and maximum values for the analog output for the voltage present on analog output 1.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
10.11	1840	Analog out 2 min	cnt	INT16		-16384	-32768	+32767	ERW
10.12	1842	Analog out 2 max	cnt	INT16		16384	-32768	+32767	ERW

Setting of the minimum and maximum values for the analog output for the voltage present on analog output 2.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
10.13	1848	Analog out 2 type		ENUM		-10V..+10V	0	2	ERW

Selection of the type of output (in voltage or current). Depending on the output signal, move the switch on the regulation card. The standard output is coded for the signal in voltage.

- 0 0..20mA
- 1 4..20mA
- 2 -10V..+10V

Select option **0** in order to apply a maximum voltage of $\pm 12.5V$ (typically $\pm 10V/5mA$) to analog output 2.

Select option **1** in order to apply a maximum voltage of +10V or a signal in current of 0 ... 20 mA to analog output 2. The signal must be positive.

Select option **2** to apply a signal in current of 4...20 mA to analog output 2.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
10.14	1850	Analog out 1X src		LINK	16/32	6000	0	16384	RW
10.15	1852	Analog out 2X src		LINK	16/32	6000	0	16384	RW

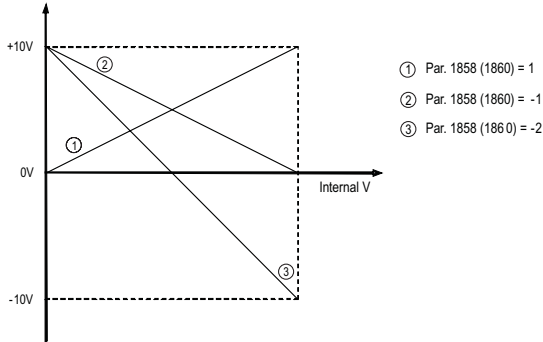
L_ANOUT

Selection of the origin (source) of the signals that can be placed as variables on the analog outputs of the expansion card. The functions that can be assigned to the analog outputs are listed in the

"L_ANOUT" selection list.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
10.16	1858	Analog out 1X scale		FLOAT		1.0	-10.0	10.0	RW
10.17	1860	Analog out 2X scale		FLOAT		1.0	-10.0	10.0	RW

Parameter for setting a multiplier factor of the signal of the relative analog output of the expansion card. It can be used to amplify or reduce the input value of the relative analog output block.



$$V_{out} = 10 \times \left(\frac{\text{Stp Var} \times \text{par. 1858 (1860)}}{\text{FS Var}} \right)$$

where:

V_{out} output voltage on the card terminals.
Stp Var actual value of the variable (variable unit)
FS Var full scale of the variable (variable unit)

Example of calculation of the Analog out Xx scale factor

To display the FFE speed, use an analog instrument with field of measurement from 0 ... 2V. This means that, to display the speed of the FFE, a voltage of 2V on the analog output of the FFE must correspond to the maximum speed. With a scale factor of 1 this would be 10V (Scale factor = 2V / 10 V = 0.200).

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
10.18	1866	Analog out 1X mon	cnt	INT16		0	0	0	ER

The actual value of the voltage present on analog output 1 of the expansion card is displayed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
10.19	1868	Analog out 2X mon	cnt	INT16		0	0	0	ER

The actual value of the voltage or current present on analog output 2 of the expansion card is displayed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
10.20	1874	An out 1X sign src		LINK	16	6000	0	16384	ERW
10.21	1876	An out 2X sign src		LINK	16	6000	0	16384	ERW

L_DIGSEL2

Selection of the origin (source) for the signal that determines the polarity of the relative analog

output of the expansion card. The terminal to be associated with this function can be selected from the "L_DIGSEL2" selection list.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
10.22	1882	Analog out 1X min	cnt	INT16		-16384	-32768	+32767	ERW
10.23	1884	Analog out 1X max	cnt	INT16		16384	-32768	+32767	ERW

Setting of the minimum and maximum values for the analog output for the voltage present on analog output 1 of the expansion card.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
10.24	1890	Analog out 2X min	cnt	INT16		-16384	-32768	+32767	ERW
10.25	1892	Analog out 2X max	cnt	INT16		16384	-32768	+32767	ERW

Setting of the minimum and maximum values for the analog output in current or voltage present on analog output 2 of the expansion card.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
10.26	1898	Analog out 2X type		ENUM		-10V..+10V	0	2	ERW

Selection of the programmed signal on analog output 2 of the expansion card. Depending on the output signal, move the switch on the regulation card. The standard output is coded for the signal in voltage.

- 0 0..20mA
- 1 4..20mA
- 2 -10V..+10V

Select option **0** in order to apply a maximum voltage of $\pm 12.5V$ (typically $\pm 10V/5mA$) to analog output 2.

Select option **1** in order to apply a maximum voltage of +10V or a signal in current of 0 ... 20 mA to analog output 2. The signal must be positive.

Select option **2** to apply a signal in current of 4...20 mA to analog output 2.11 - REGULATOR PARAM.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
10.27	5460	Dig Analog out 0 ext		INT16	16	0	-32768	+32767	ERW
10.28	5462	Dig Analog out 1 ext		INT16	16	0	-32768	+32767	ERW
10.29	5464	Dig Analog out 2 ext		INT16	16	0	-32768	+32767	ERW
10.30	5466	Dig Analog out 3 ext		INT16	16	0	-32768	+32767	ERW
10.31	5468	Dig Analog out 4 ext		INT16	16	0	-32768	+32767	ERW
10.32	5470	Dig Analog out 5 ext		INT16	16	0	-32768	+32767	ERW
10.33	5472	Dig Analog out 6 ext		INT16	16	0	-32768	+32767	ERW
10.34	5474	Dig Analog out 7 ext		INT16	16	0	-32768	+32767	ERW

Analog output modules can have a resolution of 12 to 16 bits and scaling may vary from manufacturer to manufacturer..

E.g.:

12-bit module

Signal connected Module configuration	Variant 1	Variant 2	Variant 3	Variant 4
-10V..+10V	-2048..+2047	-32768..+32767	-16384..+16383	
0V..+10V	0..+4095	0..+2047	0..+16383	0..+32767
4..20mA	0..+32767	+6553..+32767	+3276..+16383	

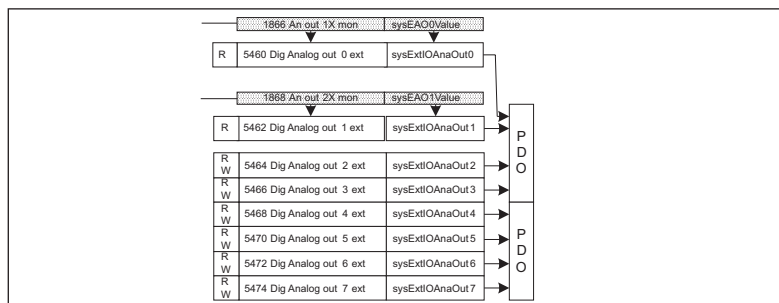
16-bit module

Signal connected Module configuration	Variant 1	Variant 2	Variant 3
-10V..+10V	-32768..+32767		
0V..+10V	0..+65535	0..+32767	
4..20mA			

There is no single unit that is suitable for all models of analog output module. Check the scaling provided by the model being used and use the system variables accordingly. Analog output 0 and analog output 1 can also be managed by the drive parameters. To ensure correction operation, the scaling provided by the external module must be compatible with the scaling provided by the drive. The drive supplies a datum for the I/O modules scaled as follows

Analog input type	Range
-10V..+10V	-32768..+32767
0V..+10V	0..+65535
4..20mA	+13107..+65535

Analog outputs 0..1 are managed via drive parameters and the value produced by the drive overwrites that written by the MDPLC or serial communication or fieldbus.



13 - FUNCTIONS

13.1 - RTC SET

Menu	PAR	Descrizione	UM	Tipo	FB BIT	Def	Min	Max	Acc
13.1.1	700	Rtc year		UUINT16		2000	2000	2069	ERW
		Setting/modification of the current year.							

Menu	PAR	Descrizione	UM	Tipo	FB BIT	Def	Min	Max	Acc
13.1.2	702	Rtc month		UUINT16		1	1	12	ERW
		Setting/modification of the current month.							

Menu	PAR	Descrizione	UM	Tipo	FB BIT	Def	Min	Max	Acc
13.1.3	704	Rtc day		UUINT16		1	1	31	ERW
		Setting/modification of the current day.							

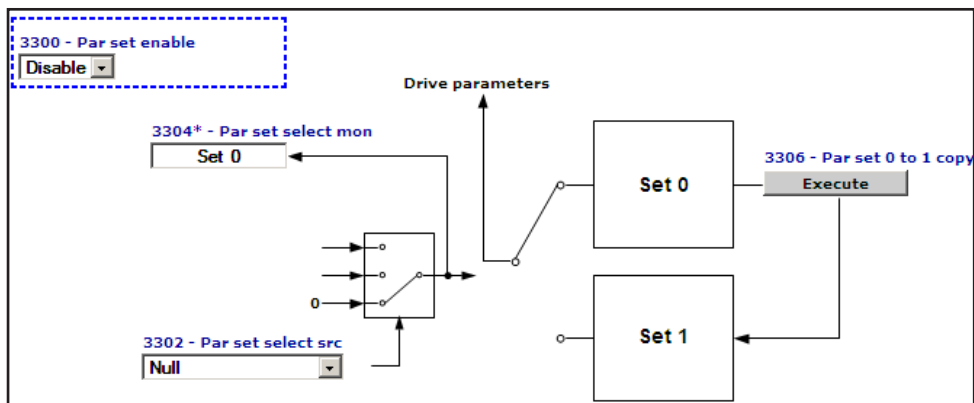
Menu	PAR	Descrizione	UM	Tipo	FB BIT	Def	Min	Max	Acc
13.1.4	706	Rtc hour		UUINT16		0	0	23	ERW
		Setting/modification of the current hour.							

Menu	PAR	Descrizione	UM	Tipo	FB BIT	Def	Min	Max	Acc
13.1.5	708	Rtc minute		UUINT16		0	0	59	ERW
		Setting/modification of the current minute.							

Menu	PAR	Descrizione	UM	Tipo	FB BIT	Def	Min	Max	Acc
13.1.6	710	Rtc second		UUINT16		0	0	59	ERW
		Setting/modification of the current second.							

Menu	PAR	Descrizione	UM	Tipo	FB BIT	Def	Min	Max	Acc
13.1.7	712	Rtc calibration		UUINT16		1	-31	31	ERW
		This parameter is used to gauge the real-time clock counting speed, if the clock is not accurate enough.							

13.2 - FUNCTIONS/DOUBLE PAR SET



Two independent sets of parameters can be stored in the FFE200. These can be selected via the keypad or by using an external command. This makes it possible to change all the FFE parameters quickly and automatically according to the various operating requirements.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
13.2.1	3300	Par set enable		ENUM		Disable	0	1	ERW
		Enabling of management of two parameter sets							
		0	Disable						
		1	Enable						

When set to **0** only one parameter set is managed (the one used as the default set).

If set to **1** two separate parameter sets can be configured. These can be selected using a command signal on a digital input of the terminal strip.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
13.2.2	3302	Par set select src		LINK	16	6000	0	16384	ERWZ
		L_DIGSEL2							
		Selection of the origin (source) of the signal to be used to select the parameter set to be used. The terminal or digital command that can be associated with this function can be selected from among those available in the "L_DIGSEL2" selection list.							

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
13.2.3	3304	Par set select mon		ENUM	16	Set 0	0	0	ER
		The parameter set currently in use is displayed.							
		0	Set 0						
		1	Set 1						

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
13.2.4	3306	Par set 0 to 1 copy		BIT		0	0	1	ERW

Procedures for setting up and managing the double parameter set

Creating the second set:

This function copies parameter set 0 onto set 1. Before enabling management of the double parameter set, the first set should be programmed with the correct values.

When the first set is ready, the second can be activated as follows:

1. Activate management of the double parameter set by enabling parameter **3300 Par set enable**.
2. Copy set 0 onto set 1 using command **3306 Par set 0 to 1 copy**.
This creates an initial parameter base in set 1 to which changes can be made.
Save the parameters.
3. Activate set 1 using parameter **3302 Par set select src**.
To select set 1 manually, set this parameter to "One".
Otherwise select the desired source.
4. Modify the parameters in set 1 as necessary.
5. Save the parameters.

You can change the set being used by changing the source selected in parameter **3302 Par set select src**. This can only be changed with the FFE disabled.

When the double parameter set is active, the number of the set being used is shown next to the number of each parameter on the keypad.

Modifying and saving parameters:

When the double parameter set is active, any parameters that need to be the same in the two sets must be modified in each set separately.

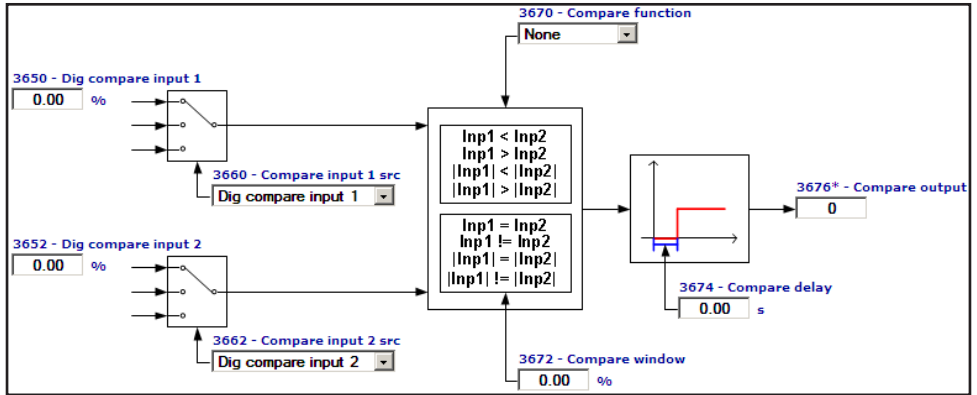
Parameters are only saved in the set that is active at the time. To save both sets, you must first save one and then select and save the other.

Note!

Any changes to the parameters regarding the "parameter sets", performed when enabled, will be lost at the next switching unless a **Par set 0 to 1 copy** command is sent.

To save data permanently (even when the FFE is switched off), send the **Save parameters** command (DRIVE CONFIG menu).

13.3 - FUNCTIONS/COMPARE



This function allows the comparison among two signals or values.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
13.3.1	3650	Dig compare input 1	perc	FLOAT	32	0.0	-100.0	100.0	ERW

Setting of the digital value of the first element of comparison.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
13.3.2	3652	Dig compare input 2	perc	FLOAT	32	0.0	-100.0	100.0	ERW

Setting of the digital value of the second element of comparison.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
13.3.3	3660	Compare input 1 src		LINK	32	3650	0	16384	ERW

L_CMP

Selection of the origin (source) of the signal to be used as the first term of comparison. The values that can be selected in the compare function are listed in the "L_CMP" selection list.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
13.3.4	3662	Compare input 2 src		LINK	32	3652	0	16384	ERW

L_CMP

Selection of the origin (source) of the signal to be used as the second term of comparison. The values that can be selected in the compare function are listed in the "L_CMP" selection list.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
13.3.5	3670	Compare function		ENUM		None	0	8	ERW

Setting of the compare function between **Compare input 2** and **Compare input 1** to enable **Cmp output**.

- 0 None
- 1 Ingr1=Ingr2
- 2 Ingr1!=Ingr2
- 3 Ingr1<Ingr2

- 4 |Ingr1>Ingr2
- 5 |Ingr1|=|Ingr2|
- 6 |Ingr1|!=|Ingr2|
- 7 |Ingr1|<|Ingr2|
- 8 |Ingr1|>|Ingr2|

If set to **0** the comparator is not enabled

If set to **1** the comparator output is enabled when the value of **Dig compare input 1** is inside the window resulting from the value of **Dig compare input 2** ± the tolerance set via the **Comparator Window**.

If set to **2** the comparator output is enabled when the value of **Dig compare input 1** is not inside the window resulting from the value of **Dig compare input 2** ± the tolerance set via the **Comparator Window**.

If set to **3** the comparator output is enabled when **Compare input 1** is less than **Compare input 2**.

If set to **4** the comparator output is enabled when **Compare input 1** is greater than **Compare input 2**.

If set to **5** the comparator output is enabled when the value of **Dig compare input 1** is inside the window resulting from the absolute value of **Dig compare input 2** ± the tolerance set via the **Comparator Window**.

If set to **6** the comparator output is enabled when the absolute value of **Dig compare input 1** is not inside the window resulting from the absolute value of **Dig compare input 2** ± the tolerance set via the **Comparator Window**.

If set to **7** the comparator output is enabled when the absolute value of **Dig compare input 1** is less than the absolute value of **Dig compare input 2**.

If set to **8** the comparator output is enabled when the absolute value of **Dig compare input 1** is more than the absolute value of **Dig compare input 2**.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
13.3.6	3672	Compare window	perc	FLOAT		0.0	0.0	100.0	ERW
Setting of the tolerance window for comparing the Dig compare input 1 and Dig compare input 2 signals.									

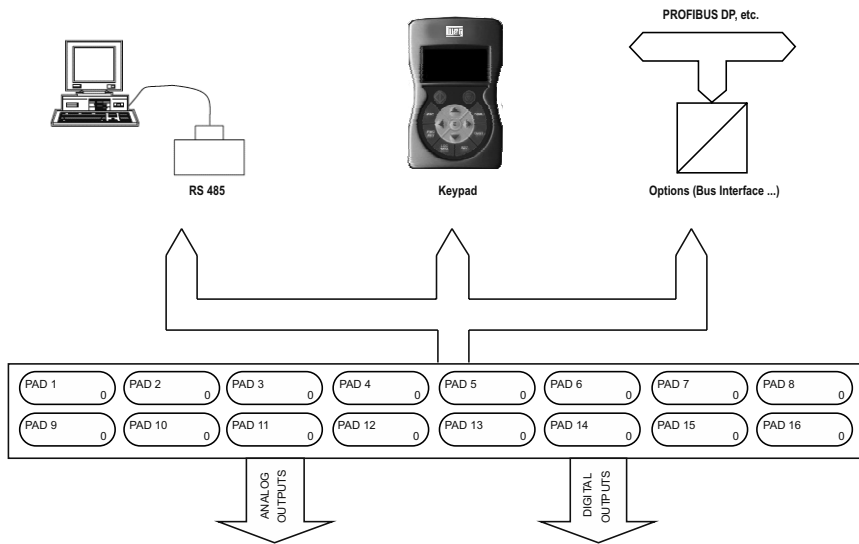
Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
13.3.7	3674	Compare delay	s	FLOAT		0.0	0.0	30.0	ERW
Setting of the delay for signalling the result of the comparison.									

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
13.3.8	3676	Compare output		BIT	16	0	0	1	ER
The status of the comparator output is displayed:									

- 0** The result of the set comparison is negative
- 1** The result of the set comparison is positive.

13.4 - FUNCTIONS/PADS

The general variables are used to exchange data between the various components of a Bus system. They are similar to the variables of a PLC. The basic structure of the system is illustrated below. Pads can be used, for example, to send information from a fieldbus to an optional card. All Pads can be read and written.



Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
13.4.1	3700	Pad 1		INT32	32	0	0	0	ERW
13.4.2	3702	Pad 2		INT32	32	0	0	0	ERW
13.4.3	3704	Pad 3		INT32	32	0	0	0	ERW
13.4.4	3706	Pad 4		INT32	32	0	0	0	ERW
13.4.5	3708	Pad 5		INT32	32	0	0	0	ERW
13.4.6	3710	Pad 6		INT32	32	0	0	0	ERW
13.4.7	3712	Pad 7		INT32	32	0	0	0	ERW
13.4.8	3714	Pad 8		INT32	32	0	0	0	ERW
13.4.9	3716	Pad 9		INT32	32	0	0	0	ERW
13.4.10	3718	Pad 10		INT32	32	0	0	0	ERW
13.4.11	3720	Pad 11		INT32	32	0	0	0	ERW
13.4.12	3722	Pad 12		INT32	32	0	0	0	ERW
13.4.13	3724	Pad 13		INT32	32	0	0	0	ERW
13.4.14	3726	Pad 14		INT32	32	0	0	0	ERW
13.4.15	3728	Pad 15		INT32	32	0	0	0	ERW
13.4.16	3730	Pad 16		INT32	32	0	0	0	ERW

Setting of general, 32 Bit variables. PAD parameters can be used as supporting parameters to send values written by the fieldbus, serial line, etc. to analog or digital outputs.

14 - COMMUNICATION

The FFE200 is provided with a standard port (9 pole sub-D connector: XS) for connecting the RS485 serial line used for FFE-PC point-to-point communication (via the **WEG_eXpress** configuration software) or for the multidrop connection.

The RS485 serial line format is: 8 data bits, no parity and one stop bit.

14.1 - COMMUNICATION/RS485

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.1.1	3800	Drive address		UINT16		1	1	255	ERW
		Setting of the address to which the FFE responds when connected to the RS485 serial line.							

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.1.2	3802	Serial baudrate		ENUM		38400	0	2	ERW
		Setting of the RS485 serial communication speed (Baud Rate).							
		0	9600						
		1	19200						
		2	38400						

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.1.3	3810	Serial parameter		ENUM		None,8,1	0	3	ERW
		Setting of the format of the RS485 serial communication data.							
		0	None,8,1						
		1	None,8,2						
		2	Even,8,1						
		3	Odd,8,1						

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.1.4	3804	Serial protocol		ENUM		Modbus	0	1	ERW
		Setting of the serial communication protocol:							
		0	Modbus						
		1	Jbus						

Setting to **0** selects the Modbus RTU (Remote Terminal Unit) serial communication protocol.

Setting to **1** selects the Jbus serial communication protocol. The Jbus protocol is functionally identical to the Modbus, except for the different numbering of addresses: in the Modbus these start from zero (0000 = 1st address) while in the JBUS they start from one (0001 = 1st address) and maintain this difference throughout numbering.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.1.5	3806	Serial delay	ms	UINT16		0	0	1000	ERW
		Setting of the minimum delay between the FFE receiving the last byte and starting its response. This delay avoids conflicts on the serial line when the RS485 interface that is used has not been pre-set for automatic Tx/Rx switching. The parameter only concerns the use of the standard RS485 serial line.							

Example: if the delay in Tx/Rx switching on the master is a maximum of 20ms, the **Ser answer delay** parameter must be set to at least 20ms: 22ms

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.1.6	3808	Serial swap data		BIT		0	0	1	ERW
This parameter enables the exchange of the reading of the High and Low parts of the words for FLOAT type parameters when using the Modbus protocol.									

14.2 - COMMUNICATION/FIELDBUS CONFIG

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.2.1	4000	Fieldbus type		ENUM		Off	0	5	RW
Setting of the type of fieldbus to be used..									
0 Off 1 CANopen 2 DeviceNet 3 Profibus 40 Cansync master 41 Cansync slave 42 RTE									

If set to **0** no fieldbus is selected.

If set to **1** the CANopen fieldbus profile is selected.

If set to **2** the Profibus-DP fieldbus profile is selected.

If set to **3** the DeviceNet fieldbus profile is selected.

If set to **40** the FFE is selected as the master device (*).

If set to **41** the FFE is selected as the slave device (*).

Set **42** to select the Real Time Ethernet card.

(* Only one FFE can be the master device, all the others must be slave devices. When the slave device is synchronised the SPD0 LED on the keypad lights up; the LED on the master FFE is always off.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.2.2	4004	Fieldbus baudrate		ENUM		500k	0	12	RW
Setting of the communication network speed (Baud Rate).									
0 Auto 1 125k 2 250k 3 500k 4 1M 5 9600 6 19200 7 93750 8 187,5k 9 1,5M 10 3M 11 6M 12 12M									

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.2.3	4006	Fieldbus address		INT16		3	0	255	RW
Setting of the node address of the FFE when connected to the network.									

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.2.4	4010	Fieldbus M->S enable		ENUM		Enable	0	1	ERWZ
Setting of fieldbus data updating.									
0 Disable 1 Enable									

If set to **0**, the possibility of sending commands and references from the FFE PLC via the fieldbus is disabled.

If set to **1** the possibility of sending commands and references from the FFE PLC via the fieldbus is enabled.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.2.5	4012	Fieldbus alarm mode		INT32		0	0	1	ERWZ

Setting of the **Opt Bus Fault** alarm generation mode.

- 0** Off
- 1** On

If set to **0** the alarm is only generated if the FFE is enabled.

If set to **1** the alarm is generated even with the FFE disabled.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.2.6	4014	Fieldbus state		ENUM		Stop	0	7	R

The logic status of the fieldbus connection is displayed. The value depends on the type of bus that is used.

These logic states are displayed if the selected fieldbus is CANopen or RTE:

- 0** Stop
- 1** PreOperational
- 2** Operational

These logic states are displayed if the selected fieldbus is Profibus:

- 3** Error
- 4** WaitPRM
- 5** WaitCFG
- 6** DataExchange
- 7** DPErrror

The following logic states are displayed if the RTE field bus is selected:

- 8** SAFE OP
- 9** INIT

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.2.7	4398	RTE protocol		ENUM		None	0	6	ER

The Real Time Ethernet protocol implemented on the expansion card is displayed.

- 0** None
- 1** Ethercat
- 2** EthernetIP
- 3** GdNet
- 4** Profinet
- 5** ModbusTCP
- 6** Powerlink

14.3 - COMMUNICATION/FIELDBUS M2S

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.3.1	4020	Fieldbus M->S1 ipa		FBM2SIPA		0	0	0	R
14.3.5	4030	Fieldbus M->S2 ipa		FBM2SIPA		0	0	0	R
14.3.9	4040	Fieldbus M->S3 ipa		FBM2SIPA		0	0	0	R
14.3.13	4050	Fieldbus M->S4 ipa		FBM2SIPA		0	0	0	R

14.3.17	4060	Fieldbus M->S5 ipa	FBM2SIPA	0	0	0	R
14.3.21	4070	Fieldbus M->S6 ipa	FBM2SIPA	0	0	0	R
14.3.25	4080	Fieldbus M->S7 ipa	FBM2SIPA	0	0	0	R
14.3.29	4090	Fieldbus M->S8 ipa	FBM2SIPA	0	0	0	R
14.3.33	4100	Fieldbus M->S9 ipa	FBM2SIPA	0	0	0	R
14.3.37	4110	Fieldbus M->S10 ipa	FBM2SIPA	0	0	0	R
14.3.41	4120	Fieldbus M->S11 ipa	FBM2SIPA	0	0	0	R
14.3.45	4130	Fieldbus M->S12 ipa	FBM2SIPA	0	0	0	R
14.3.49	4140	Fieldbus M->S13 ipa	FBM2SIPA	0	0	0	R
14.3.53	4150	Fieldbus M->S14 ipa	FBM2SIPA	0	0	0	R
14.3.57	4160	Fieldbus M->S15 ipa	FBM2SIPA	0	0	0	R
14.3.61	4170	Fieldbus M->S16 ipa	FBM2SIPA	0	0	0	R

Setting of the parameter to associate with the bus channel. The default setting is **0**, which means channel not active.

If the parameter to be connected is a **sorg** (source), the channel and parameter can also be associated by modifying the **sorg** parameter in its menu.

When setting a parameter, the format is also automatically set in the sys parameter.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.3.2	4022	Fieldbus M->S1 sys		ENUM		Not assigned	0	10	RW
14.3.6	4032	Fieldbus M->S2 sys		ENUM		Not assigned	0	10	RW
14.3.10	4042	Fieldbus M->S3 sys		ENUM		Not assigned	0	10	RW
14.3.14	4052	Fieldbus M->S4 sys		ENUM		Not assigned	0	10	RW
14.3.18	4062	Fieldbus M->S5 sys		ENUM		Not assigned	0	10	RW
14.3.22	4072	Fieldbus M->S6 sys		ENUM		Not assigned	0	10	RW
14.3.26	4082	Fieldbus M->S7 sys		ENUM		Not assigned	0	10	RW
14.3.30	4092	Fieldbus M->S8 sys		ENUM		Not assigned	0	10	RW
14.3.34	4102	Fieldbus M->S9 sys		ENUM		Not assigned	0	10	RW
14.3.38	4112	Fieldbus M->S10 sys		ENUM		Not assigned	0	10	RW
14.3.42	4122	Fieldbus M->S11 sys		ENUM		Not assigned	0	10	RW
14.3.46	4132	Fieldbus M->S12 sys		ENUM		Not assigned	0	10	RW
14.3.50	4142	Fieldbus M->S13 sys		ENUM		Not assigned	0	10	RW
14.3.54	4152	Fieldbus M->S14 sys		ENUM		Not assigned	0	10	RW
14.3.58	4162	Fieldbus M->S15 sys		ENUM		Not assigned	0	10	RW
14.3.62	4172	Fieldbus M->S16 sys		ENUM		Not assigned	0	10	RW

Setting of the format of the datum received on the channel. When the **src** parameter is programmed, the format is automatically programmed on the relative **sys** . If the **src** parameter is reset to **null** , the format does not change. The value of the format can be selected from the following list, according to the parameter selected as the source:

- 0** Not assigned
- 1** Count 16
- 2** Count 32
- 3** Fill 16
- 4** Fill 32
- 5** Mdpic 16
- 6** Mdpic 32

- 7 EU
- 8 Eu float
- 9 Par 16
- 10 Par 32

If set to **0** the channel is not assigned.
 If set to **1** the datum is assigned a 16-bit count.
 If set to **2** the datum is assigned a 32-bit count.
 If set to **3** 16 bits on the channel are reserved for the datum, not used.
 If set to **4** 32 bits on the channel are reserved for the datum, not used.
 If set to **5** the datum is assigned a 16-bit count used by MDPLC.
 If set to **6** the datum is assigned a 32-bit count used by MDPLC.
 If set to **7** the datum is assigned engineering units on a 16-bit integer.
 If set to **8** the datum is assigned engineering units on a 32-bit integer.
 If set to **9**, the datum is assigned a 16-bit integer engineering unit format not in real time (5-10ms)
 If set to **10** the datum is assigned a 32-bit integer engineering unit format or float format if the associated parameter is a float-type parameter not in real time (5-10ms)

Note!

If the **sys** parameter is not assigned, none of the subsequent fieldbus channels are read, even if programmed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.3.3	4024	Fieldbus M->S1 mon		INT32	32	0	0	0	ER
14.3.7	4034	Fieldbus M->S2 mon		INT32	32	0	0	0	ER
14.3.11	4044	Fieldbus M->S3 mon		INT32	32	0	0	0	ER
14.3.15	4054	Fieldbus M->S4 mon		INT32	32	0	0	0	ER
14.3.19	4064	Fieldbus M->S5 mon		INT32	32	0	0	0	ER
14.3.23	4074	Fieldbus M->S6 mon		INT32	32	0	0	0	ER
14.3.27	4084	Fieldbus M->S7 mon		INT32	32	0	0	0	ER
14.3.31	4094	Fieldbus M->S8 mon		INT32	32	0	0	0	ER
14.3.35	4104	Fieldbus M->S9 mon		INT32	32	0	0	0	ER
14.3.39	4114	Fieldbus M->S10 mon		INT32	32	0	0	0	ER
14.3.43	4124	Fieldbus M->S11 mon		INT32	32	0	0	0	ER
14.3.47	4134	Fieldbus M->S12 mon		INT32	32	0	0	0	ER
14.3.51	4144	Fieldbus M->S13 mon		INT32	32	0	0	0	ER
14.3.55	4154	Fieldbus M->S14 mon		INT32	32	0	0	0	ER
14.3.59	4164	Fieldbus M->S15 mon		INT32	32	0	0	0	ER
14.3.63	4174	Fieldbus M->S16 mon		INT32	32	0	0	0	ER

The value received from the bus is displayed. This parameter must be associated with the src parameter to enable the **M->S** channel.

The user may modify the **M->S** and by **S->M sys** parameters. The consistency of the sys with the parameter assigned to the channel is checked.

Check for channels M->S:

Sys parameter	FB type	result
Count 32	32 bit	Receives 32 bits from FB and copies to 32 bits of monitor. OK
	32_H	Receives 32 bits from FB and copies to 32 bits of monitor. OK
	32_L	Receives 32 bits from FB and copies to 32 bits of monitor. OK
Count 16 monitor. Error	16 bit	Receives 16 bits from FB and doesn't know whether to copy to 16H or 16L of
	16_H	Receives 16 bits from FB and copies to 16H bit of monitor. OK
	16_L	Receives 16 bits from FB and copies to 16L bit of monitor. OK

A **Fieldbus M->S X Mon** parameter can only be assigned to a single "src". If assigned to more than one **src**, an error signal is generated during fieldbus initialization.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.3.4	4026	Fieldbus M->S1 div		FLOAT		1.0	1.0	1000.0	ERW
14.3.8	4036	Fieldbus M->S2 div		FLOAT		1.0	1.0	1000.0	ERW
14.3.12	4046	Fieldbus M->S3 div		FLOAT		1.0	1.0	1000.0	ERW
14.3.16	4056	Fieldbus M->S4 div		FLOAT		1.0	1.0	1000.0	ERW
14.3.20	4066	Fieldbus M->S5 div		FLOAT		1.0	1.0	1000.0	ERW
14.3.24	4076	Fieldbus M->S6 div		FLOAT		1.0	1.0	1000.0	ERW
14.3.28	4086	Fieldbus M->S7 div		FLOAT		1.0	1.0	1000.0	ERW
14.3.32	4096	Fieldbus M->S8 div		FLOAT		1.0	1.0	1000.0	ERW
14.3.36	4106	Fieldbus M->S9 div		FLOAT		1.0	1.0	1000.0	ERW
14.3.40	4116	Fieldbus M->S10 div		FLOAT		1.0	1.0	1000.0	ERW
14.3.44	4126	Fieldbus M->S11 div		FLOAT		1.0	1.0	1000.0	ERW
14.3.48	4136	Fieldbus M->S12 div		FLOAT		1.0	1.0	1000.0	ERW
14.3.52	4146	Fieldbus M->S13 div		FLOAT		1.0	1.0	1000.0	ERW
14.3.56	4156	Fieldbus M->S14 div		FLOAT		1.0	1.0	1000.0	ERW
14.3.60	4166	Fieldbus M->S15 div		FLOAT		1.0	1.0	1000.0	ERW
14.3.64	4176	Fieldbus M->S16 div		FLOAT		1.0	1.0	1000.0	ERW

The **Div M->Sx fieldbus** parameters can be used to increase the resolution of the datum sent on the bus to the FFE in the corresponding channel in EU and EU_float exchange mode. The parameter value is used by the FFE as the divider of the incoming datum, so that a number with decimal digits can be transferred.

Note!

~~~~~  
 You must check the size in bits of the datum that is sent to make sure that the maximum value in bits fits in a 16-bit integer. For example, if specifying the divider as "**Fieldbus M->S<sub>n</sub> div**" = 1000, the maximum value that can be used for the exchanged datum is 32.768 (32768/1000).  
 ~~~~~

I.e. : **Fieldbus M->S1 div** = 10, **Fieldbus S->M1 ipa** = **Ramp ref src 1**, **Fieldbus M->S1 sys** = Eu. If the PLC sends the decimal value 1000 on the first word the value of **DC voltage ref src** on the FFE is 1000/10 = 100.

14.4 - COMMUNICATION/FIELDBUS S2M

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.4.1	4180	Fieldbus S->M1 ipa		FBM2SIPA		0	0	20000	RW
14.4.5	4190	Fieldbus S->M2 ipa		FBM2SIPA		0	0	20000	RW
14.4.9	4200	Fieldbus S->M3 ipa		FBM2SIPA		0	0	20000	RW
14.4.13	4210	Fieldbus S->M4 ipa		FBM2SIPA		0	0	20000	RW
14.4.17	4220	Fieldbus S->M5 ipa		FBM2SIPA		0	0	20000	RW
14.4.21	4230	Fieldbus S->M6 ipa		FBM2SIPA		0	0	20000	RW
14.4.25	4240	Fieldbus S->M7 ipa		FBM2SIPA		0	0	20000	RW
14.4.29	4250	Fieldbus S->M8 ipa		FBM2SIPA		0	0	20000	RW
14.4.33	4260	Fieldbus S->M9 ipa		FBM2SIPA		0	0	20000	RW

14.4.37	4270	Fieldbus S->M10 ipa	FBM2SIPA	0	0	20000	RW
14.4.41	4280	Fieldbus S->M11 ipa	FBM2SIPA	0	0	20000	RW
14.4.45	4290	Fieldbus S->M12 ipa	FBM2SIPA	0	0	20000	RW
14.4.49	4300	Fieldbus S->M13 ipa	FBM2SIPA	0	0	20000	RW
14.4.53	4310	Fieldbus S->M14 ipa	FBM2SIPA	0	0	20000	RW
14.4.57	4320	Fieldbus S->M15 ipa	FBM2SIPA	0	0	20000	RW
14.4.61	4330	Fieldbus S->M16 ipa	FBM2SIPA	0	0	20000	RW

Setting of the parameter to associate with the bus channel. The default setting is **0**, which means channel not active.

When setting a parameter, the format is also automatically set in the **sys** parameter

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.4.2	4182	Fieldbus S->M1 sys		ENUM		Not assigned	0	10	RW
14.4.6	4192	Fieldbus S->M2 sys		ENUM		Not assigned	0	10	RW
14.4.10	4202	Fieldbus S->M3 sys		ENUM		Not assigned	0	10	RW
14.4.14	4212	Fieldbus S->M4 sys		ENUM		Not assigned	0	10	RW
14.4.18	4222	Fieldbus S->M5 sys		ENUM		Not assigned	0	10	RW
14.4.22	4232	Fieldbus S->M6 sys		ENUM		Not assigned	0	10	RW
14.4.26	4242	Fieldbus S->M7 sys		ENUM		Not assigned	0	10	RW
14.4.30	4252	Fieldbus S->M8 sys		ENUM		Not assigned	0	10	RW
14.4.34	4262	Fieldbus S->M9 sys		ENUM		Not assigned	0	10	RW
14.4.38	4272	Fieldbus S->M10 sys		ENUM		Not assigned	0	10	RW
14.4.42	4282	Fieldbus S->M11 sys		ENUM		Not assigned	0	10	RW
14.4.46	4292	Fieldbus S->M12 sys		ENUM		Not assigned	0	10	RW
14.4.50	4302	Fieldbus S->M13 sys		ENUM		Not assigned	0	10	RW
14.4.54	4312	Fieldbus S->M14 sys		ENUM		Not assigned	0	10	RW
14.4.58	4322	Fieldbus S->M15 sys		ENUM		Not assigned	0	10	RW
14.4.62	4332	Fieldbus S->M16 sys		ENUM		Not assigned	0	10	RW

When setting the sorg parameter the format is automatically set on the relative **sys**. If sorg is set to **null**, the data format does not change. The value of the format can be selected from the following list, according to the parameter selected as the source:

- 0** Not assigned
- 1** Count 16
- 2** Count 32
- 3** Fill 16
- 4** Fill 32
- 5** Mdplc 16
- 6** Mdplc 32
- 7** EU
- 8** Eu float
- 9** Par 16
- 10** Par 32

If set to **0** the channel is not assigned.

If set to **1** the datum is assigned a 16-bit count.

If set to **2** the datum is assigned a 32-bit count.

If set to **3** 16 bits on the channel are reserved for the datum, not used.

If set to **4** 32 bits on the channel are reserved for the datum, not used.

If set to **5** the datum is assigned a 16-bit count used by MDPLC.

If set to **6** the datum is assigned a 32-bit count used by MDPLC.
 If set to **7** the datum is assigned engineering units on a 16-bit integer.
 If set to **8** the datum is assigned engineering units on a 32-bit integer.
 If set to **9**, the datum is assigned a 16-bit integer engineering unit format not in real time (5-10ms)
 If set to **10** the datum is assigned a 32-bit integer engineering unit format or float format if the associated parameter is a float-type parameter not in real time (5-10ms)

Note!

If the **sys** parameter is not assigned, none of the subsequent channels are transferred to the fieldbus, even if programmed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.4.3	4184	Dig Fieldbus S->M1		INT32	32	0	0	0	ERW
14.4.7	4194	Dig Fieldbus S->M2		INT32	32	0	0	0	ERW
14.4.11	4204	Dig Fieldbus S->M3		INT32	32	0	0	0	ERW
14.4.15	4214	Dig Fieldbus S->M4		INT32	32	0	0	0	ERW
14.4.19	4224	Dig Fieldbus S->M5		INT32	32	0	0	0	ERW
14.4.23	4234	Dig Fieldbus S->M6		INT32	32	0	0	0	ERW
14.4.27	4244	Dig Fieldbus S->M7		INT32	32	0	0	0	ERW
14.4.31	4254	Dig Fieldbus S->M8		INT32	32	0	0	0	ERW
14.4.35	4264	Dig Fieldbus S->M9		INT32	32	0	0	0	ERW
14.4.39	4274	Dig Fieldbus S->M10		INT32	32	0	0	0	ERW
14.4.43	4284	Dig Fieldbus S->M11		INT32	32	0	0	0	ERW
14.4.47	4294	Dig Fieldbus S->M12		INT32	32	0	0	0	ERW
14.4.51	4304	Dig Fieldbus S->M13		INT32	32	0	0	0	ERW
14.4.55	4314	Dig Fieldbus S->M14		INT32	32	0	0	0	ERW
14.4.59	4324	Dig Fieldbus S->M15		INT32	32	0	0	0	ERW
14.4.63	4334	Dig Fieldbus S->M16		INT32	32	0	0	0	ERW

If associated with the relative **src**, the value of this parameter is sent to the bus.

The user may modify the **M->S** and by **S->M sys** parameters. The consistency of the sys with the parameter assigned to the channel is checked.

Check for channels S->M:

Sys parameter	FB type	result
Count 32	32 bit	Sends all 32 bits of input to fieldbus. OK
	16_H	Sends all 32 bits of input to fieldbus. OK
	16_L	Sends all 32 bits of input to fieldbus. OK
Count 16	32 bit	Doesn't know whether to send 16H or 16L. Error
	16_H	Sends all 16H bits of input to fieldbus. OK
	16_L	Sends all 16L bits of input to fieldbus. OK

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.4.4	4186	Fieldbus S->M1 mul		FLOAT		1.0	1.0	1000.0	ERW
14.4.8	4196	Fieldbus S->M2 mul		FLOAT		1.0	1.0	1000.0	ERW
14.4.12	4206	Fieldbus S->M3 mul		FLOAT		1.0	1.0	1000.0	ERW
14.4.16	4216	Fieldbus S->M4 mul		FLOAT		1.0	1.0	1000.0	ERW
14.4.20	4226	Fieldbus S->M5 mul		FLOAT		1.0	1.0	1000.0	ERW
14.4.24	4236	Fieldbus S->M6 mul		FLOAT		1.0	1.0	1000.0	ERW

14.4.28	4246	Fieldbus S->M7 mul	FLOAT	1.0	1.0	1000.0	ERW
14.4.32	4256	Fieldbus S->M8 mul	FLOAT	1.0	1.0	1000.0	ERW
14.4.36	4266	Fieldbus S->M9 mul	FLOAT	1.0	1.0	1000.0	ERW
14.4.40	4276	Fieldbus S->M10 mul	FLOAT	1.0	1.0	1000.0	ERW
14.4.44	4286	Fieldbus S->M11 mul	FLOAT	1.0	1.0	1000.0	ERW
14.4.48	4296	Fieldbus S->M12 mul	FLOAT	1.0	1.0	1000.0	ERW
14.4.52	4306	Fieldbus S->M13 mul	FLOAT	1.0	1.0	1000.0	ERW
14.4.56	4316	Fieldbus S->M14 mul	FLOAT	1.0	1.0	1000.0	ERW
14.4.60	4326	Fieldbus S->M15 mul	FLOAT	1.0	1.0	1000.0	ERW
14.4.64	4336	Fieldbus S->M16 mul	FLOAT	1.0	1.0	1000.0	ERW

The **Fieldbus S->Mx mul** parameters are multipliers that the FFE applies to the datum before sending it to the bus. It is therefore possible to increase the resolution of some values read in EU and EU_float mode, also using decimal digits.

Note!

.....
 The FFE does not check that the multiplied parameter expressed in bits fits in a 16-bit integer. You must make sure that the multiplier is compatible with the maximum value of the exchanged parameter and that it does not exceed the maximum size of 32768.

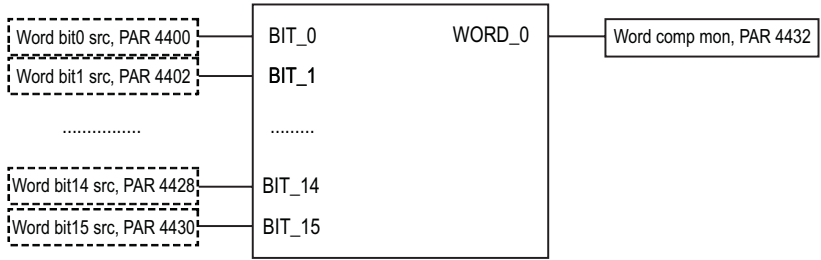
I.e.: **Fieldbus S->Mx mul** = 10, **Fieldbus S->M1 ipa** = Output voltage, **Fieldbus S->M1 sys** = Eu. If the voltage is 400V, the PLC reads the value $400 * 10 = 4000$ on the first word exchanged.

14.5 - COMMUNICATION/WORD COMP

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.5.1	4400	Word bit0 src		LINK	16	6000	0	16384	ERW
14.5.2	4402	Word bit1 src		LINK	16	6000	0	16384	ERW
14.5.3	4404	Word bit2 src		LINK	16	6000	0	16384	ERW
14.5.4	4406	Word bit3 src		LINK	16	6000	0	16384	ERW
14.5.5	4408	Word bit4 src		LINK	16	6000	0	16384	ERW
14.5.6	4410	Word bit5 src		LINK	16	6000	0	16384	ERW
14.5.7	4412	Word bit6 src		LINK	16	6000	0	16384	ERW
14.5.8	4414	Word bit7 src		LINK	16	6000	0	16384	ERW
14.5.9	4416	Word bit8 src		LINK	16	6000	0	16384	ERW
14.5.10	4418	Word bit9 src		LINK	16	6000	0	16384	ERW
14.5.11	4420	Word bit10 src		LINK	16	6000	0	16384	ERW
14.5.12	4422	Word bit11 src		LINK	16	6000	0	16384	ERW
14.5.13	4424	Word bit12 src		LINK	16	6000	0	16384	ERW
14.5.14	4426	Word bit13 src		LINK	16	6000	0	16384	ERW
14.5.15	4428	Word bit14 src		LINK	16	6000	0	16384	ERW
14.5.16	4430	Word bit15 src		LINK	16	6000	0	16384	ERW

L_DIGSEL1

Selection of the origin (source) of the signal to be used for coding in **Word comp**. This function allows the user to compose a single word composed of 16 signals, each of which can be selected from among those listed in the "L_DIGSEL1" selection list. The values of the sectioned sizes are converted into a single word.



Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.5.17	4432	Monitor word comp		UINT32	16	0	0	0	ER

The hexadecimal value of the **Word comp** output is displayed.

14.6 - COMMUNICATION/WORD DECOMP

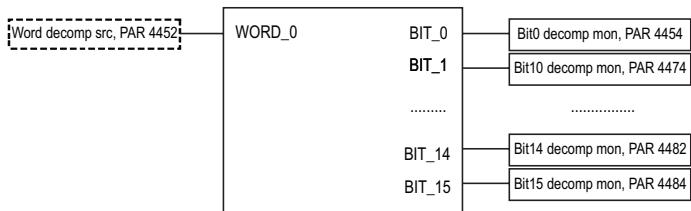
Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.6.1	4450	Dig word decomp		UINT32	16	0	0	0	ERW

Setting of the digital input decoded by the “Word decomp” block.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.6.2	4452	Word decomp src		LINK	16	4450	0	16384	ERW

L_WDECOMP

Selection of the origin (source) of the word to be decoded by the “**Word decomp**” block. Each bit that is part of the word to be decoded is associated with the output channel of the “**Word decomp**” block. The variables that can be used for this function can be selected from among those listed in the “L_WDECOMP” selection list.



Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.6.3	4454	Bit0 decomp mon		BIT	16	0	0	1	ER
14.6.4	4456	Bit1 decomp mon		BIT	16	0	0	1	ER
14.6.5	4458	Bit2 decomp mon		BIT	16	0	0	1	ER
14.6.6	4460	Bit3 decomp mon		BIT	16	0	0	1	ER
14.6.7	4462	Bit4 decomp mon		BIT	16	0	0	1	ER
14.6.8	4464	Bit5 decomp mon		BIT	16	0	0	1	ER
14.6.9	4466	Bit6 decomp mon		BIT	16	0	0	1	ER
14.6.10	4468	Bit7 decomp mon		BIT	16	0	0	1	ER

14.6.11	4470	Bit8 decomp mon	BIT	16	0	0	1	ER
14.6.12	4472	Bit9 decomp mon	BIT	16	0	0	1	ER
14.6.13	4474	Bit10 decomp mon	BIT	16	0	0	1	ER
14.6.14	4476	Bit11 decomp mon	BIT	16	0	0	1	ER
14.6.15	4478	Bit12 decomp mon	BIT	16	0	0	1	ER
14.6.16	4480	Bit13 decomp mon	BIT	16	0	0	1	ER
14.6.17	4482	Bit14 decomp mon	BIT	16	0	0	1	ER
14.6.18	4484	Bit15 decomp mon	BIT	16	0	0	1	ER

The single bits that make up the selected word are displayed.

14.7 - COMMUNICATION/EXTERNAL IO

The optional EXP-FL-XCAN-ADV card (generally inserted in slot 1) allows the number of I/Os managed by the drive to be increased, using an external device. Communication with the external device is performed via CAN using the "DS401 Device profile for generic IO modules".

For more details see manual 1S5F32_EXP-FL-XCAN-ADV.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.7.1	5480	External IO enable		ENUM		Disable	0	1	ERW

This parameter is used to enable or disable communication between the EXP-FL-XCAN-ADV card and the external device.

0 Disable

1 Enable

Communication is disabled in the default configuration. Communication can be enabled by setting Enable and saving the parameters. When the drive is re-started the EXP-FL-XCAN-ADV card, if installed, is recognised. The communication is started and the external I/Os are managed. With the "External IO enable" set to **Disable** the EXP-D6A4R1-ADV can be managed, if installed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.7.2	5482	External IO info		UINT32		0	0	4294967295	ER

This parameter displays the number of I/O resources read by the module.

It is a 32-bit parameter made up as follows:

Uint32			
Uint16 High		Uint16 Low	
Uint8 High	Uint8 Low	Uint8 High	Uint8 Low
N. of AO	N. of AI	N. of DO	N. of DI

The parameter is displayed in HEX format.

E.g.:

PAR 5482	N. of AO	N. of AI	N. of DO	N. of DI
0x02041020 33820704	0x02 2	0x04 4	0x10 16	0x20 32
0x00000810 2064	0x00 0	0x00 0	0x08 8	0x10 16

If the configuration that is read has changed (compared to the last configuration saved or read) the drive displays and message requires the intervention of the operator in order to proceed.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.7.3	5484	External IO state		BIT	16	0	0	1	ER

This parameter displays the communication state.

- 0 Off
- 1 On

This parameter is set to 1 (on) if the communication state is operational.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.7.4	5486	External I/O failcode		UINT32		0	0	4294967295	ER

If an "Ext I/O fault" occurs due to the Emergency slave subcode 255..65535 alarm message, this parameter displays 4 of the 5 InfoBytes of the "Emergency" message. See the slave manual for information about the meaning of the InfoBytes in the Emergency message (CAN slave communication module). See "Ext I/O fault" [27] alarm, Chapter "9.1 Alarms" on page 137.

14.8 - COMMUNICATION/FAST LINK

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.8.1	5702	FL address		UINT16		0	0	16	ERWZ

This parameter is used to enable the FastLink function and select whether the drive is to be the master or slave. If used as a slave device, the address can be selected.

- 0 = Disabled
- 1 = Master
- 2 = Slave 1
- X = Slave X-1
- 16 = Slave 16

For the Pwm synchronisation to function properly, the address of the slave drive must be configured in the same order as the physical connection.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.8.2	5818	FL bidirectional		ENUM		Enable	0	1	ERWZ

Enables/disables bi-directional Fast Link mode.

- 0 Disable
- 1 Enable

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.8.3	5820	FL N of slave		UINT16		0	0	32767	ERWZ

It is a parameter related only to the master drive and it indicates which slave drives need to be interrogated.

The encoding data used is an integer having set to 1 the bit corresponding to the slaves that need to be interrogated:

- bit 0 (least significant bit) is related to slave with address 2
- bit 1 is related to the slave with address 3
- ...

- ...until to the slave with address 16.

For example, if need to be interrogated slaves with address 2 and address 5, the value will be 9 (1001 binary). If one or more slaves are not connected to the drops giving no answer, it will produce a fast link alarm on the master drive. Fast link alarm on the master will produce communication error to all the slaves connected.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.8.4	5710	FL sync slave type		ENUM		Off	0	2	ERWZ

This parameter is ineffective on the master drive.

On the slave drive this parameter is used to enable the function for generating Pwm signals that are synchronised with the Pwm signals of the master. It is also possible to enable the function for

executing control tasks synchronised with execution of control tasks of the master.

- 0 Off Fastlink transfers information between the drives.
- 1 Pwm The Fastlink transfers information between the drives and the function for synchronising the generation of Pwm signals with the Pwm signals of the master is enabled.
- 2 Pwm&Ctrl The Fastlink transfers information between the drives, the function for synchronising the generation of Pwm signals with the Pwm signals of the master is enabled and the function for synchronising control tasks with the control tasks of the master is enabled. The variables and the MDPLC tasks are also synchronised to 1 ms and 8 ms.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.8.5	5712	FL N Fwd slave chg		UINT16		0	0	4	ERWZ

There are two possible operation modes.

In the first, the master sends the data frame to the first slave. The first slave takes all the data in the frame and sends the same frame to the next slave without making any changes. The same sequence is repeated by all the slave drives.

In the second, the master sends the data frame to the first slave. The first slave takes all the data in the frame, replaces part of the data and then sends the frame to the next slave drive. The same sequence is repeated by all the slave drives.

This parameter is ineffective on the master drive.

On the slave drive this parameter is used to configure the amount of data to be replaced in the data frame.

FL N Fw slave change	Information replaced
0	None
1	FL Fw 1
2	FL Fw 1, FL Fw 2
3	FL Fw 1, FL Fw 2, FL Fw 3
4	FL Fw 1, FL Fw 2, FL Fw 3, FL Fw 4

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.8.6	5714	FL fault enable src		LINK	16	6002	0	16384	ERW

This parameter is used to select the origin (source) of the **FL fault enable** signal.

The signal to be associated with this function can be selected from the "**L_DIGSEL1**" selection list.

0 **FL fault enable** not active (No FastLink alarm signal)

1 **FL fault enable** active (FastLink alarm signal)

When the drive detects a FastLink fault, it prepares to trigger a "FastLink fault" alarm.

This command is used to select whether an alarm is generated when a fault is detected.

Alarm generation is enabled in the default configuration.

The configuration of the "**FL fault enable src**" parameter can be changed to control the phases in which alarm generation is enabled.

For example, by connecting the "**FL fault enable src**" parameter to "Enable state mon" you can enable generation of the "**FastLink fault**" alarm in the phase when the drive is enabled.

In systems where drive the drives are not powered-off simultaneously, some drives detect a FastLink fault and generate a FastLink alarm.

This parameter is used to disable the alarm at power-off by connecting the "**FL fault enable src**" parameter to "**Enable state mon**".

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.8.7	5730	FL Fwd 1 src		LINK	16/32BIT	6000	0	16384	ERW
14.8.8	5732	FL Fwd 2 src		LINK	16/32BIT	6000	0	16384	ERW
14.8.9	5734	FL Fwd 3 src		LINK	16/32BIT	6000	0	16384	ERW

14.8.10 5736 FL Fwd 4 src LINK 16/32BIT 6000 0 16384 ERW

This parameter is used to select the origin (source) of the **FL Fw 1 src** signal.

The signal to be associated with this function can be selected from the "**L_FLWORD**" selection list. On the drive configured as the master, these parameters are used to select the data to be sent to the first slave.

On drives configured as slaves, these paramters are used to select the data that the slave must include in the data frame to replace the data received from the previous drive.

Replacement is disabled in the default configuration. It can be enabled with the PAR 5712 **FL N Fwd slave chg** parameter.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.8.11	5830	FL Rev 1 src		LINK	16/32BIT	6000	0	16384	ERW
14.8.12	5832	FL Rev 2 src		LINK	16/32BIT	6000	0	16384	ERW

Parameter significant only for Slave drive, indicates what data to insert in first word to be sent to Master drive when Slave is interrogated. Selectable values are shown on the **L_FLWORD** list.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.8.13	5750	FL Fwd 1 mon		INT32	32BIT	0	0	2 ^ 32	ER
14.8.14	5752	FL Fwd 2 mon		INT32	32BIT	0	0	2 ^ 32	ER
14.8.15	5754	FL Fwd 3 mon		INT32	32BIT	0	0	2 ^ 32	ER
14.8.16	5756	FL Fwd 4 mon		INT32	32BIT	0	0	2 ^ 32	ER
14.8.17	5758	FL Fwd 5 mon		INT32	32BIT	0	0	2 ^ 32	ER
14.8.18	5760	FL Fwd 6 mon		INT32	32BIT	0	0	2 ^ 32	ER
14.8.19	5762	FL Fwd 7 mon		INT32	32BIT	0	0	2 ^ 32	ER
14.8.20	5764	FL Fwd 8 mon		INT32	32BIT	0	0	2 ^ 32	ER

These parameters are not used on the master drive.

On the slave drive these parameters show the value received from the previous drive. The "Inv" parameters enable the value received to be used with the opposite sign, without changing any of the data sent to subsequent slaves.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.8.21	5850	FL Rev 1 mon		INT32	32BIT	0	0	0	ER
14.8.22	5852	FL Rev 2 mon		INT32	32BIT	0	0	0	ER
14.8.23	5854	FL Rev 1 mon		INT32	32BIT	0	0	0	ER
14.8.24	5856	FL Rev 4 mon		INT32	32BIT	0	0	0	ER

Display of data selected via parameters **FL Rev X Slave sel** corresponding (PAR 5822 ... 5828).

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.8.25	5822	FL Rev 1 slave sel		UINT16		0	0	31	ERWZ
14.8.26	5824	FL Rev 2 slave sel		UINT16		0	0	31	ERWZ
14.8.27	5826	FL Rev 3 slave sel		UINT16		0	0	31	ERWZ
14.8.28	5828	FL Rev 4 slave sel		UINT16		0	0	31	ERWZ

Parameter significant only for Master drive, indicates what data of which Slave drive to display in parameter **Mon rev X FL** (you can choose to display word 1 or 2 of a Slave with address from 2 to 16). The code used assigns the significance of the first word of the Slave at address 2 to value 0, value 1 for the first word of the Slave at address 3 14 first word of the Slave at address 16, 15 has no significance, 16 second word of Slave at address 2 ... 30 second word of Slave at address 16.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.8.29	5720	Mon sinc slave		BIT	16	0	0	1	ER

This parameter is not significant on the master drive.

On the slave drives this parameter indicates the state of the function that enables Pwm signals to be synchronised with the Pwm signals of the master and execution of control tasks to be synchronised with execution of control tasks of the master.

0 Slave not synchronised

1 Slave synchronised

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
14.8.30	5722	FL fault code		UINT32		0	0	0	ER

This parameter is used to display the cause of the FastLink fault alarm.

See Chapter "9.1 Alarms" on page 137.

15 - ALARM CONFIG

In the ALARM CONFIG menu the type of effect any alarm signals have on the FFE product is determined:

- The alarm status is saved
- How must the FFE product react to the alarm signal?
- Auto restart
- Alarm reset

For some alarms, behaviour can be configured separately for each signal, while for the others the Disable FFE product is executed. Individual signals can also be sent to a programmable digital output.

Activity	Ignore	The alarm is not included in the list of alarms, it is not included in the alarm log, it is not signalled on the digital outputs, no FFE product commands are modified.
	Warning	The alarm is included in the list of alarms, it is included in the alarm log, it is signalled on the digital outputs, the First alarm information is updated, the Alarm enabled information is updated, no FFE product commands are modified.
	Disable drive	The alarm is inserted in the alarm list, it is inserted in the alarm log, it is signalled on the digital outputs, the First alarm data is updated, the Alarm active data is updated, the FFE product is disabled.

n alarms with Activity = Ignore or Warning can be enabled at the same time.

If an alarm with Activity = Stop or Fast Stop is enabled and another alarm with an Activity other than Ignore or Warning is enabled, the FFE product stops and is disabled

Not all alarms allow the controlled stopping of the FFE product. The following table shows the possibility of setting the Activities for the individual alarm signals.

Alarm	PAR	Ignore	Warning	Disable drive
ExtFlt activity	4504	√	√	√
ExtFlt restart	4506	-	-	√
UndervoltAC activity	4534	√	√	√
UndervoltAC restart	4536	-	-	√
Overvolt AC activity	4554	√	√	√
Overvolt AC restart	4556	-	-	√
Drive ovoid activity	4570	√	√	√
HTsens restart	4582	-	-	√
InAir activity	4600	√	√	√
InAir restart	4602	-	-	√
Desat restart	4610	-	-	√
IOverC restart	4620	-	-	√
OverV restart	4630	-	-	√
UnderV restart	4640	-	-	√
Optionbus activity	4670	√	√	√

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.1	4500	Fault reset src		LINK	16BIT	1120	0	16384	RW

DIGSEL2

Selection of the origin (source) of the signal to be used for the command to reset the FFE product after an alarm. The terminal that can be used for this function can be selected from among those listed in the “L_DIGSEL2” selection list.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.2	4502	ExtFlt src		LINK	16BIT	6000	0	16384	RW

DIGSEL2

Selection of the origin (source) of the signal to be used as the input for the FFE product **External Fault [20]** alarm. The terminal that can be used for this function can be selected from among those listed in the “L_DIGSEL2” selection list.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.3	4498	Precharge fbk src		LINK	16BIT	1112	0	16384	RW

L_DIGSEL1

Setting of the origin for the signal to confirm the pre-load contactor. If no confirmation is received after a 100ms hold-off time the **Prc fbk loss** [23] alarm is generated (Pre-load not confirmed). If this parameter is set to **Precharge Command** (PAR 1122) the command and confirmation always correspond and the alarm signal is never activated.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.4	4504	ExtFlt activity		ENUM		Disable	0	2	RW

Setting of the behaviour of the FFE product in the event of an external fault alarm **External Fault [20]**. This alarm indicates the intervention of a FFE product external protection.

- 0 Ignore
- 1 Warning
- 2 Disable

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.5	4506	ExtFlt restart		ENUM		Disabilita	0	1	RW

Enabling of automatic restart after the external fault alarm **External Fault [20]**

- 0 Disable
- 1 Enable

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.6	4508	ExtFlt restart time	ms	UINT16		1000	120	30000	RW

Setting of the time within which the **External Fault [20]** alarm must be reset in order to perform automatic restart.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.7	4510	ExtFlt holdoff	ms	UINT16		0	0	10000	RW

Setting of the delay between the signalling of the **External Fault [20]** alarm and enabling of the alarm. If an alarm condition occurs, the FFE product will wait for the set time to activate the alarm. If the alarm is removed within the set time, the FFE product will not indicate any alarm condition.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.8	4534	UndervoltAC activity		ENUM		Disable	0	2	RW
		Setting of the behaviour of the FFE product if the Undervolt AC [9] alarm is present. This alarm indicates a mains undervoltage condition.							
		<ul style="list-style-type: none"> 0 Ignore 1 Warning 2 Disable 							
Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.9	4536	UndervoltAC restart		ENUM		Disable	0	1	RW
		Setting of the behaviour of the FFE product if the Undervolt AC [9] alarm is present. This alarm indicates a mains undervoltage condition.							
		<ul style="list-style-type: none"> 0 Disable 1 Enable 							
Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.10	4538	UnderVAC restarttime	ms	UINT16		1000	0	30000	RW
		Setting of the time within which the Undervolt AC [9] alarm must be removed in order to execute automatic restart.							
Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.11	4554	Overvolt AC activity		ENUM		Disable	0	2	RW
		Setting of the behaviour of the FFE product if the Overvoltage AC [10] alarm is present. This alarm indicates a mains voltage overvoltage condition.							
		<ul style="list-style-type: none"> 0 Ignore 1 Warning 2 Disable 							
Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.12	4556	Overvolt AC restart		ENUM		Disable	0	1	RW
		Enabling of automatic restart after the Overvoltage AC [10] alarm.							
		<ul style="list-style-type: none"> 0 Disable 1 Enable 							
Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.13	4558	OverVAC restart time	ms	UINT16		1000	0	30000	RW
		Setting of the time within which the Undervolt AC [9] alarm must be removed in order to execute automatic restart.							
Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.14	4570	Drive ovlld activity		ENUM		Ignore	0	2	ERW
		Setting of the behaviour of the FFE product in case of a Drive overload [14] alarm. This alarm indicates that the FFE product overload threshold has been reached.							
		<ul style="list-style-type: none"> 0 Ignore 1 Warning 2 Disable 							

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.15	4582	HTsens restart		ENUM		Disable	0	1	ERW
		Enabling of automatic restart after the FFE product heatsink overtemperature alarm HeatsinkS OTUT [12] .							
		<ul style="list-style-type: none"> 0 Disable 1 Enable 							

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.16	4584	HTsens restart time	ms	UINT16		20000	120	60000	ERW
		Setting of the time within which the HeatsinkS OTUT [12] alarm must be reset in order to perform automatic restart.							

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.17	4600	InAir activity		ENUM		Disable	0	2	ERW
		Setting of the behaviour of the FFE product in case of an intake air overtemperature alarm InAir [13] . This alarm indicates that the temperature of the intake cooling air is too high.							
		<ul style="list-style-type: none"> 0 Ignore 1 Warning 2 Disable 							

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.18	4602	InAir restart		ENUM		Disable	0	1	ERW
		Enabling of automatic restart after the Intakeair OT [13] overtemperature alarm.							
		<ul style="list-style-type: none"> 0 Disable 1 Enable 							

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.19	4604	InAir restart time	ms	UINT16		1000	120	30000	ERW
		Setting of the time within which the Intakeair OT [13] alarm must be reset in order to perform automatic restart.							

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.20	4606	Air holdoff	ms	UINT16		10000	0	30000	ERW
		Setting of the delay between the signalling of the Intakeair OT [13] overtemperature alarm and enabling of the alarm. If an alarm condition occurs, the FFE product will wait for the set time before enabling the alarm. If the alarm is removed within the set time, the FFE product will not indicate any alarm condition.							

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.21	4610	Desat restart		ENUM		Disable	0	1	ERW
		Enabling of automatic restart after the desaturation alarm Desaturation [5] . This alarm indicates a short circuit between the phases of the power bridge.							
		<ul style="list-style-type: none"> 0 Disable 1 Enable 							

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.22	4612	Desat restart time	ms	UINT16		2000	1000	10000	ERW
		Setting of the time within which the Desaturation [5] alarm must be reset in order to perform							

automatic restart. (Time with alarm signal active + 1000 msec).

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.23	4620	IOverC restart		ENUM		Disable	0	1	ERW
Enabling of automatic restart after the FFE product Overcurrent [4] alarm. This alarm indicates an overcurrent (or short circuit between phases or towards the ground).									
0 Disable									
1 Enable									

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.24	4622	IOverC restart time	ms	UINT16		2000	1000	10000	ERW
Setting of the time within which the Overcurrent [4] alarm must be reset in order to perform automatic restart. (Time with alarm signal active + 1000 msec).									

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.25	4630	OverV restart		ENUM		Disable	0	1	ERW
Enabling of automatic restart after the Overvoltage [1] alarm. This alarm indicates an overvoltage on the intermediate circuit (DC link)									
0 Disable									
1 Enable									

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.26	4632	OverV restart time	ms	UINT16		2000	1000	10000	ERW
Setting of the time within which the Overvoltage [1] alarm must be reset in order to perform automatic restart. (Time with alarm signal active + 1000 msec).									

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.27	4640	UnderV restart		ENUM		Enable	0	1	ERW
Enabling of automatic restart after the Undervoltage [2] alarm. This alarm indicates an undervoltage on the intermediate circuit (DC link)									
0 Disable									
1 Enable									

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.28	4642	UnderV restart time	ms	UINT16		1000	120	10000	ERW
Setting of the time within which the Undervoltage [2] alarm must be reset in order to perform automatic restart. (Time with alarm signal active + 100 msec).									

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.29	4650	UVRep attempts		UINT16		5	0	1000	ERW
Setting of the maximum number of attempts at automatic restart after the Undervoltage [2] alarm before a Mult Undervoltage [6] alarm is generated. If this parameter is set to 1000 an infinite number of attempts are available.									

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.30	4652	UVRep delay	s	UINT16		240	0	300	ERW
Setting of the time within which, if no automatic restarts are executed after the Undervoltage [2] alarm, the attempts counter is reset. In this way the number of attempts set in UVRep attempt are still available.									

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.31	4670	Optionbus activity		ENUM		Disable	0	2	ERW
Setting of the behaviour of the FFE product in case of an Opt Bus Fault [16] alarm.									
<ul style="list-style-type: none"> 0 Ignore 1 Warning 2 Disable 									

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.32	4690	ExtIO activity		ENUM		Disable	0	4	ERW
This parameter is used to configure the behaviour of the drive if the "Ext I/O fault" [27] alarm occurs when the EXP-FL-XCAN-ADV card is installed.									
See "Ext I/O fault" [27] alarm, Chapter "9.1 Alarms" on page 137.									
When the alarm is activated due to a communication error, the last value that was received is maintained.									
The following activities are programmable:									
<ul style="list-style-type: none"> 0 Ignore 1 Warning 2 Disable 									

You can check whether a card that supports XCAN External IO functions is installed from the DRIVE INFO menu for parameters 530, 532, 534 **SlotX card type**:

Value	Description	Expansion	
832	IO FastLink	EXP-FL-XCAN-ADV	XCAN External IO supported

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.33	4940	FL fault activity		ENUM		Disable	0	4	ERW
This parameter is used to configure the behaviour of the drive when the "FastLink fault" [28] alarm occurs.									
If the EXP-FL-XCAN-ADV card is installed in the drive, all the FastLink communication fault signals are enabled and managed via generation of a "FastLink fault" [28] alarm, with different subcodes to indicate the cause of the error.									
See "FastLink Fault" [28] alarm, Chapter "9.1 Alarms" on page 137.									
The following activities are programmable:									
<ul style="list-style-type: none"> 0 Ignore 1 Warning 2 Disable 									

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.34	4680	GroundFault thr	perc	FLOAT		10.0	0.0	150.0	ERWS
Setting of the threshold for the ground short circuit alarm Ground Fault [3] .									

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.35	4700	Alarm dig sel 1		ENUM		No alarm	0	60	ERW
15.36	4702	Alarm dig sel 2		ENUM		No alarm	0	60	ERW
15.37	4704	Alarm dig sel 3		ENUM		No alarm	0	60	ERW
15.38	4706	Alarm dig sel 4		ENUM		No alarm	0	60	ERW
Setting of the alarm signal to enable on a digital output. The digital output is selected using parameters Alm dig out mon 1÷4 , which can be enabled in the L_DIGSEL1 selection list.									
<ul style="list-style-type: none"> 0 No alarm 1 Overvoltage 									

2	Undervoltage	
3	Ground fault	
4	Overcurrent	
5	Desaturation	
6	MultiUndervolt	
7	MultiOvercurr	
8	MultiDesat	
9	Undervolt AC	
10	Overvoltage AC	
11	Heatsink OT	
12	HeatsinkS OTUT	
13	Intakeair OT	
14	Drive overload	
15	Bres overload	
16	Opt Bus fault	
17	Opt 1 IO fault	
18	Opt 2 IO fault	
19	Opt Enc fault	(Opt sync fault)
20	External fault	
21	Emg stop alarm	
22	Power down	
23	Prc fbk loss	
24	Wrong synchro	
25	Not Used2	
26	Not Used3	
27	ExtIO fault	
28	FastLink fault	
29	Not Used6	
30	Not Used7	
31	Not Used8	
32	Not Used9	
33	Plc1 fault	
34	Plc2 fault	
35	Plc3 fault	
36	Plc4 fault	
37	Plc5 fault	
38	Plc6 fault	
39	Plc7 fault	
40	Plc8 fault	
41	Watchdog	
42	Trap error	
43	System error	
44	User error	
45	Param error	
46	Load def par	
47	Plc cfg error	
48	Load def plc	
49	Gener PV alarm	
50	Encoder error	
51	Opt cfg change	
52	Not Used10	
53	Plc9 fault	
54	Plc10 fault	
55	Plc11 fault	
56	Plc12 fault	
57	Plc13 fault	
58	Plc14 fault	
59	Plc15 fault	
60	Plc16 fault	

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.39	4720	Alm autoreset time	s	FLOAT		0.0	0.0	60.0	ERW
<p>Setting of the time interval that must pass before executing an automatic reset. If no alarms are enabled the FFE product is set to restart. If some alarms are still enabled the FFE product is set to execute a new attempt at automatic reset. At each attempted reset a counter increases. If the limit set in the PAR 4722 Alm autoreset number parameter is reached the FFE product is set to make no more attempts at reset and waits for a user reset. The counter is set to zero when an automatic reset or user reset is performed and no alarms are enabled. If the parameter is 0 the function is disabled.</p>									

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
15.40	4722	Alm autoreset number		UINT16		20	0	100	ERW
<p>Setting of the maximum number of attempted automatic resets.</p>									

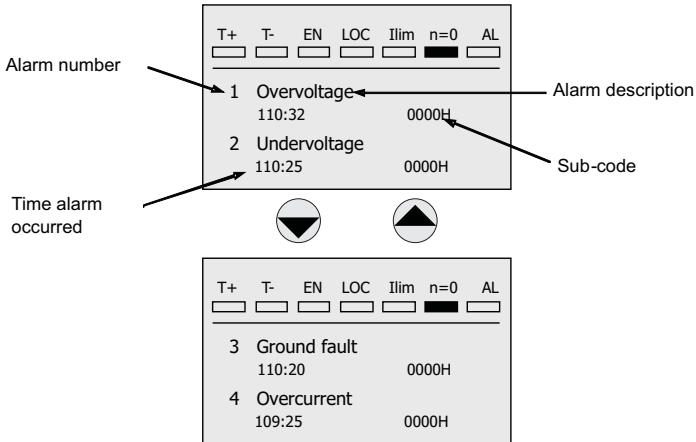
16 - ALARM LOG

This is the menu in which the log of previous alarms is saved, with the time the alarm occurred (in relation to the **Time drive power on** parameter).

The alarms are displayed starting from the most recent (No. 1) up to the furthest back in time (No. 30).

Up to 30 alarm signals can be displayed. The sub-code is used by service technicians to identify the specific type of alarm.

Press the ▲ and ▼ keys to scroll the screen pages of the alarm log. The alarm log cannot be deleted.



18 - APPLICATION

This menu is designed to host two customized applications using the MDPIc program, currently in progress. It will not be possible to use both applications simultaneously. PAR 558 **Application select** parameter in the DRIVE CONFIG menu must be used to select between the two possible applications.

8.1 Parameters on selection lists, but not displayed on keypad

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
-	362	Drive overload trip		BIT	16BIT	0	0	1	ER

This signal indicates that the FFE product is in the overload alarm condition.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
-	366	Drive overload 80%		BIT	16BIT	0	0	1	ER

This signal indicates that the FFE product has reached 80% of the thermal image accumulator (Drive overload).

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
-	1030	Local/remote mon		BIT	16BIT	0	0	1	ER

This signal is active when the FFE product is in the Remote operating mode.

0 Local
1 Remote

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
-	1062	Drive OK		BIT	16BIT	0	0	1	ER

This signal is active when the FFE product is in the "OK" condition and no alarms are present.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
-	1064	Drive ready		BIT	16BIT	0	0	1	ER

This signal is active when the FFE is in the operational condition (Enabled)

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
-	1068	Enable ready mon		BIT	16BIT	0	0	1	ER

This signal is active when the FFE can accept the enable command. If the enable command is sent before PAR 1068 **Enable ready mon** is active, it is not accepted.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
-	1110	Digital input E mon		BIT	16BIT	0	0	1	ER
-	1112	Digital input 1 mon		BIT	16BIT	0	0	1	ER
-	1114	Digital input 2 mon		BIT	16BIT	0	0	1	ER
-	1116	Digital input 3 mon		BIT	16BIT	0	0	1	ER
-	1118	Digital input 4 mon		BIT	16BIT	0	0	1	ER
-	1120	Digital input 5 mon		BIT	16BIT	0	0	1	ER

These signals represent the state of the corresponding digital input.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
-	1122	Precharge Command		BIT	16BIT	0	0	1	ER

This signal is enabled when the voltage on the DC-link exceeds the set value and indicates the end of pre-loading. It is used to close the main contactor and open the pre-load resistor contactor.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
-	1210	Digital input 1X mon		BIT	16BIT	0	0	1	ER

-	1212	Digital input 2X mon	BIT	16BIT	0	0	1	ER
-	1214	Digital input 3X mon	BIT	16BIT	0	0	1	ER
-	1216	Digital input 4X mon	BIT	16BIT	0	0	1	ER
-	1218	Digital input 5X mon	BIT	16BIT	0	0	1	ER
-	1220	Digital input 6X mon	BIT	16BIT	0	0	1	ER
-	1222	Digital input 7X mon	BIT	16BIT	0	0	1	ER
-	1224	Digital input 8X mon	BIT	16BIT	0	0	1	ER

These signals represent the state of the corresponding digital input on the expansion card.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
-	1530	Analog inp1		BIT	16BIT	0	0	1	ER

This signal is active when the value of the analog input is below the threshold set in parameter **1520 Analog inp 1 thr**

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
-	1580	Analog inp2		BIT	16BIT	0	0	1	ER

This signal is active when the value of the analog input is below the threshold set in parameter **1570 Analog inp 2 thr**.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
-	2360	Active climPos Inuse	A	FLOAT	16/32	0.0	0.0	0.0	ER

The positive torque limit value currently being used is displayed. When parameter 2354 is set to [3] T lim sym or [4] T lim pos/neg, the unit of measure of parameter 2360 is Nm.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
-	2362	Active climNeg Inuse	A	FLOAT	16/32	0.0	0.0	0.0	ER

The negative torque limit value currently being used is displayed. When parameter 2354 is set to [3] T lim sym or [4] T lim pos/neg, the unit of measure of parameter 2362 is Nm.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
-	3260	Bres overload accum	perc	UINT16	16BIT	0	0	100	ER

The braking resistor overload limit is displayed (100% = alarm threshold). This parameter is not available for the standard version of the FFE200.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
-	4708	Alm dig out mon 1		BIT	16BIT	0	0	1	ER

This signal is activated when the alarm configured in parameter **4700 Alarm dig sel 1** is active.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
-	4710	Alm dig out mon 2		BIT	16BIT	0	0	1	ER

This signal is activated when the alarm configured in parameter **4702 Alarm dig sel 2** is active.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
-	4712	Alm dig out mon 3		BIT	16BIT	0	0	1	ER

This signal is activated when the alarm configured in parameter **4704 Alarm dig sel 3** is active.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
-	4714	Alm dig out mon 4		BIT	16BIT	0	0	1	ER

This signal is activated when the alarm configured in parameter **4706 alarm dig sel 4** is active.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
-	4770	First alarm		UINT32	16BIT	0	0	0	ERW

This parameter displays the first alarm to be activated.
See alarm list of PAR 4700 .. 4706, menu 15 - ALARM CONFIG.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
-	4780	Alarm PLC		UINT16		0	0	0	ER

This parameter displays the state of the alarms generated by the application written with the internal PLC

Bit	Description
0	1 = Overvoltage active
1	1 = Undervoltage active
2	1 = Ground fault active
3	1 = Overcurrent active
4	1 = Desaturation active
5	1 = MultiUndervolt active
6	1 = MultiOvercurr Mult active
7	1 = MultiDesat active
8	1 = Undervolt AC active
9	1 = Overvoltage AC active
10	1 = Heatsink OT active
11	1 = HeatsinkS OTUT active
12	1 = Intakeair OT active
13	1 = Drive overload active
14	1 = Bres overload active
15	1 = Opt Bus fault active
16	1 = Opt 1 IO fault active
17	1 = Opt 2 IO fault active
18	1 = Opt Enc fault active (Opt sync fault)
19	1 = External fault active
20	1 = Emg stop alarm active
21	1 = Power down active
22	1 = Prc fbk loss active
23	1 = Wrong synchro active
24	1 = Not Used 2 active
25	1 = Not Used 3 active
26	1 = ExtIO fault active
27	1 = FastLink fault active
28	1 = Not Used 6 active
29	1 = Not Used 7 active
30	1 = Not Used 8 active
31	1 = Not Used 9 active

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
-	4840	Alarm lo state		UINT32	32BIT	0	0	0	ER

This parameter displays the state of alarms 1..32 of the FFE product.

Bit	Description
0	1 = Overvoltage active
1	1 = Undervoltage active
2	1 = Ground fault active
3	1 = Overcurrent active
4	1 = Desaturation active
5	1 = MultiUndervolt active
6	1 = MultiOvercurr active
7	1 = MultiDesat active
8	1 = Heatsink OT active
9	1 = Heatsink lin OT active
10	1 = Air OT active

Bit	Description
11	1 = Motor OT active
12	1 = Drive overload active
13	1 = Motor overload active
14	1 = Bres overload active
15	1 = Phase loss active
16	1 = Opt bus fault active
17	1 = Opt 1 I/O fault active
18	1 = Opt 2 I/O fault active
19	1 = Opt enc fault active
20	1 = External fault active
21	1 = Fbk loss active
22	1 = Overspeed active
23	1 = Ref loss active
24	1 = Emg stop alarm active
25	1 = Power down active
26	1 = not used
27	1 = not used
28	1 = not used
29	1 = not used
30	1 = not used
31	1 = not used

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
-	4842	Alarm hi state		UINT32	32BIT	0	0	0	ER

This parameter displays the state of alarms 33...64 of the FFE product.

Bit	Description
0	1 = PLC 1 fault active
1	1 = PLC 2 fault active
2	1 = PLC 3 fault active
3	1 = PLC 4 fault active
4	1 = PLC 5 fault active
5	1 = PLC 6 fault active
6	1 = PLC 7 fault active
7	1 = PLC 8 fault active

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
-	5510	Digital input 9X mon		BIT	16	0	0	1	ER
-	5512	Digital input 10X mon		BIT	16	0	0	1	ER
-	5514	Digital input 11X mon		BIT	16	0	0	1	ER
-	5516	Digital input 12X mon		BIT	16	0	0	1	ER
-	5518	Digital input 13X mon		BIT	16	0	0	1	ER
-	5520	Digital input 14X mon		BIT	16	0	0	1	ER
-	5522	Digital input 15X mon		BIT	16	0	0	1	ER
-	5524	Digital input 16X mon		BIT	16	0	0	1	ER

These signals represent the state of the corresponding digital input on the expansion card.

Menu	PAR	Descrizione	UM	Tipo	FB BIT	Def	Min	Max	Acc
-	5800	FL Fwd 1 inv mon		INT32	32BIT	0	0	0	ER
-	5802	FL Fwd 2 inv mon		INT32	32BIT	0	0	0	ER
-	5804	FL Fwd 3 inv mon		INT32	32BIT	0	0	0	ER
-	5806	FL Fwd 4 inv mon		INT32	32BIT	0	0	0	ER

-	5808	FL Fwd 5 inv mon	INT32	32BIT	0	0	0	ER
-	5810	FL Fwd 6 inv mon	INT32	32BIT	0	0	0	ER
-	5812	FL Fwd 7 inv mon	INT32	32BIT	0	0	0	ER
-	5814	FL Fwd 8 inv mon	INT32	32BIT	0	0	0	ER

These parameters are not used on the master drive.

On the slave drive these parameters show the value received from the previous drive. The “ Inv” parameters enable the value received to be used with the opposite sign, without changing any of the data sent to subsequent slaves.

These parameters are available in the “src” analog parameter selection lists.

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
-	6000	Null		UINT32	32BIT	0	0	0	ER
This signal forces the variable to the zero level (always disabled).									

Menu	PAR	Description	UM	Type	FB BIT	Def	Min	Max	Acc
-	6002	One		UINT32	32BIT	1	1	1	ER
This signal forces the variable to level one (always active).									

8.2 Selection Lists

PAR	Description	Menu	PAR	Description	Menu	PAR	Description	Menu		
L ANOUT										
6000	Null	(*)	1600	Analog input 1X mon	9.33	1116	Digital input 3 mon	(*)		
250	Line current	1.1	1650	Analog input 2X mon	9.44	1118	Digital input 4 mon	(*)		
254	Line frequency	1.3	368	Drive overload accum	1.11	1120	Digital input 5 mon	(*)		
270	DC link voltage	1.4	3260	Bres overload accum	(*)	1210	Digital input 1X mon	(*)		
1500	Analog input 1 mon	9.1	4024	Fieldbus M->S1 mon	14.3.3	1212	Digital input 2X mon	(*)		
1550	Analog input 2 mon	9.17	4034	Fieldbus M->S2 mon	14.3.7	1214	Digital input 3X mon	(*)		
1600	Analog input 1X mon	9.33	4044	Fieldbus M->S3 mon	14.3.11	1216	Digital input 4X mon	(*)		
1650	Analog input 2X mon	9.44	4054	Fieldbus M->S4 mon	14.3.15	1218	Digital input 5X mon	(*)		
368	Drive overload accum	1.11	4064	Fieldbus M->S5 mon	14.3.19	1220	Digital input 6X mon	(*)		
4024	Fieldbus M->S1 mon	14.3.3	4074	Fieldbus M->S6 mon	14.3.23	1222	Digital input 7X mon	(*)		
4034	Fieldbus M->S2 mon	14.3.7	4084	Fieldbus M->S7 mon	14.3.27	1224	Digital input 8X mon	(*)		
4044	Fieldbus M->S3 mon	14.3.11	4094	Fieldbus M->S8 mon	14.3.31	5510	Digital input 9X mon	(*)		
4054	Fieldbus M->S4 mon	14.3.15	4104	Fieldbus M->S9 mon	14.3.35	5512	Digital input10X mon	(*)		
4064	Fieldbus M->S5 mon	14.3.19	4114	Fieldbus M->S10 mon	14.3.39	5514	Digital input11X mon	(*)		
4074	Fieldbus M->S6 mon	14.3.23	4124	Fieldbus M->S11 mon	14.3.43	5516	Digital input12X mon	(*)		
4084	Fieldbus M->S7 mon	14.3.27	4134	Fieldbus M->S12 mon	14.3.47	5518	Digital input13X mon	(*)		
4094	Fieldbus M->S8 mon	14.3.31	4144	Fieldbus M->S13 mon	14.3.51	5520	Digital input14X mon	(*)		
4104	Fieldbus M->S9 mon	14.3.35	4154	Fieldbus M->S14 mon	14.3.55	5522	Digital input15X mon	(*)		
4114	Fieldbus M->S10 mon	14.3.39	4164	Fieldbus M->S15 mon	14.3.59	5524	Digital input16X mon	(*)		
4124	Fieldbus M->S11 mon	14.3.43	4174	Fieldbus M->S16 mon	14.3.63	1062	Drive OK	(*)		
4134	Fieldbus M->S12 mon	14.3.47	3700	Pad 1	13.4.1	1064	Drive ready	(*)		
4144	Fieldbus M->S13 mon	14.3.51	3702	Pad 2	13.4.2	1066	Enable state mon	1.12		
4154	Fieldbus M->S14 mon	14.3.55	3704	Pad 3	13.4.3	1068	Enable ready mon	(*)		
4164	Fieldbus M->S15 mon	14.3.59	3706	Pad 4	13.4.4	1024	Enable cmd mon	6.8		
4174	Fieldbus M->S16 mon	14.3.63	3708	Pad 5	13.4.5	4708	Alm dig out mon 1	(*)		
3700	Pad 1	13.4.1	3710	Pad 6	13.4.6	4710	Alm dig out mon 2	(*)		
3702	Pad 2	13.4.2	3712	Pad 7	13.4.7	4712	Alm dig out mon 3	(*)		
3704	Pad 3	13.4.3	3714	Pad 8	13.4.8	4714	Alm dig out mon 4	(*)		
3706	Pad 4	13.4.4	3716	Pad 9	13.4.9	1530	Analog inp1<thr	(*)		
3708	Pad 5	13.4.5	3718	Pad 10	13.4.10	1580	Analog inp2<thr	(*)		
3710	Pad 6	13.4.6	3720	Pad 11	13.4.11	362	Drive overload trip	(*)		
3712	Pad 7	13.4.7	3722	Pad 12	13.4.12	366	Drive overload 80%	(*)		
3714	Pad 8	13.4.8	3724	Pad 13	13.4.13	4454	Bit0 decomp mon	14.6.3		
3716	Pad 9	13.4.9	3726	Pad 14	13.4.14	4456	Bit1 decomp mon	14.6.4		
3718	Pad 10	13.4.10	3728	Pad 15	13.4.15	4458	Bit2 decomp mon	14.6.5		
3720	Pad 11	13.4.11	3730	Pad 16	13.4.16	4460	Bit3 decomp mon	14.6.6		
3722	Pad 12	13.4.12	5750	FL Fwd 1 mon	14.8.13	4462	Bit4 decomp mon	14.6.7		
3724	Pad 13	13.4.13	5752	FL Fwd 2 mon	14.8.14	4464	Bit5 decomp mon	14.6.8		
3726	Pad 14	13.4.14	5754	FL Fwd 3 mon	14.8.15	4466	Bit6 decomp mon	14.6.9		
3728	Pad 15	13.4.15	5756	FL Fwd 4 mon	14.8.16	4468	Bit7 decomp mon	14.6.10		
3730	Pad 16	13.4.16	5758	FL Fwd 5 mon	14.8.17	4470	Bit8 decomp mon	14.6.11		
5008	Test gen out	19.1.5	5760	FL Fwd 6 mon	14.8.18	4472	Bit9 decomp mon	14.6.12		
5750	FL Fwd 1 mon	14.8.13	5762	FL Fwd 7 mon	14.8.19	4474	Bit10 decomp mon	14.6.13		
5752	FL Fwd 2 mon	14.8.14	5764	FL Fwd 8 mon	14.8.20	4476	Bit11 decomp mon	14.6.14		
5754	FL Fwd 3 mon	14.8.15	5800	FL Fwd 1 inv mon	(*)	4478	Bit12 decomp mon	14.6.15		
5756	FL Fwd 4 mon	14.8.16	5802	FL Fwd 2 inv mon	(*)	4480	Bit13 decomp mon	14.6.16		
5758	FL Fwd 5 mon	14.8.17	5804	FL Fwd 3 inv mon	(*)	4482	Bit14 decomp mon	14.6.17		
5760	FL Fwd 6 mon	14.8.18	5806	FL Fwd 4 inv mon	(*)	4484	Bit15 decomp mon	14.6.18		
5762	FL Fwd 7 mon	14.8.19	5808	FL Fwd 5 inv mon	(*)	3700	Pad 1	13.4.1		
5764	FL Fwd 8 mon	14.8.20	5810	FL Fwd 6 inv mon	(*)	3702	Pad 2	13.4.2		
5800	FL Fwd 1 inv mon	(*)	5812	FL Fwd 7 inv mon	(*)	3704	Pad 3	13.4.3		
5802	FL Fwd 2 inv mon	(*)	5814	FL Fwd 8 inv mon	(*)	3706	Pad 4	13.4.4		
5804	FL Fwd 3 inv mon	(*)	<i>(1) the XXXX parameter changes according to the src parameter used:</i>					3708	Pad 5	13.4.5
5806	FL Fwd 4 inv mon	(*)						3710	Pad 6	13.4.6
5808	FL Fwd 5 inv mon	(*)	3712	Pad 7	13.4.7					
5810	FL Fwd 6 inv mon	(*)	3714	Pad 8	13.4.8					
5812	FL Fwd 7 inv mon	(*)	3716	Pad 9	13.4.9					
5814	FL Fwd 8 inv mon	(*)	3718	Pad 10	13.4.10					
L CMP										
XXXX	(1)		3660 Compare input 1 src							
250	Line current	1.1	(1) = 3650 Dig compare input 1	13.3.1						
254	Line frequency	1.3	3662 Compare input 2 src							
270	DC link voltage	1.4	(1) = 3652 Dig compare input 2	13.3.2						
1500	Analog input 1 mon	9.1	L DIGSEL1							
1550	Analog input 2 mon	9.17	6000	Null	(*)	3720	Pad 11	13.4.11		
L DIGSEL1										
6000	Null	(*)	1110	Digital input E mon	(*)	3722	Pad 12	13.4.12		
6002	One	(*)	1112	Digital input 1 mon	(*)	3724	Pad 13	13.4.13		
1110	Digital input E mon	(*)	1114	Digital input 2 mon	(*)	3726	Pad 14	13.4.14		
1112	Digital input 1 mon	(*)								
1114	Digital input 2 mon	(*)								
L DIGSEL1										
1030	Local/remote mon	(*)								
4780	Alarm PLC	(*)								
3676	Compare output	13.3.8								
1122	Precharge Command	(*)								

PAR	Descrizione	Menu	PAR	Description	Menu	PAR	Description	Menu
5720	Sync slave mon	14.8.29	1110	Digital input E mon	(*)	3676	Compare output	13.3.8
L DIGSEL2			1112	Digital input 1 mon	(*)	5720	Sync slave mon	14.8.29
6000	Null	(*)	1114	Digital input 2 mon	(*)	<i>(2) the XXXX parameter changes according to the src parameter used:</i>		
6002	One	(*)	1116	Digital input 3 mon	(*)	<i>1014 Local/remote src</i>		
1110	Digital input E mon	(*)	1118	Digital input 4 mon	(*)	<i>(2) = 1012 Dig local/remote</i> 6.5		
1112	Digital input 1 mon	(*)	1120	Digital input 5 mon	(*)	L FBS2M		
1114	Digital input 2 mon	(*)	1210	Digital input 1X mon	(*)	6000	Null	(*)
1116	Digital input 3 mon	(*)	1212	Digital input 2X mon	(*)	6002	One	(*)
1118	Digital input 4 mon	(*)	1214	Digital input 3X mon	(*)	250	Line current	1.1
1120	Digital input 5 mon	(*)	1216	Digital input 4X mon	(*)	254	Line frequency	1.3
1210	Digital input 1X mon	(*)	1218	Digital input 5X mon	(*)	284	Active current	10.20.30
1212	Digital input 2X mon	(*)	1220	Digital input 6X mon	(*)	286	Reactive current	19.8.3
1214	Digital input 3X mon	(*)	1222	Digital input 7X mon	(*)	270	DC link voltage	1.4
1216	Digital input 4X mon	(*)	1224	Digital input 8X mon	(*)	1500	Analog input 1 mon	9.1
1218	Digital input 5X mon	(*)	5510	Digital input 9X mon	(*)	1550	Analog input 2 mon	9.17
1220	Digital input 6X mon	(*)	5512	Digital input10X mon	(*)	1600	Analog input 1X mon	9.33
1222	Digital input 7X mon	(*)	5514	Digital input11X mon	(*)	1650	Analog input 2X mon	9.44
1224	Digital input 8X mon	(*)	5516	Digital input12X mon	(*)	368	Drive overload accum	1.11
5510	Digital input 9X mon	(*)	5518	Digital input13X mon	(*)	272	Heatsink temperature	1.5
5512	Digital input10X mon	(*)	5520	Digital input14X mon	(*)	1060	Sequencer status	1.21
5514	Digital input11X mon	(*)	5522	Digital input15X mon	(*)	1068	Enable ready mon	(*)
5516	Digital input12X mon	(*)	5524	Digital input16X mon	(*)	4432	Word comp mon	14.5.17
5518	Digital input13X mon	(*)	1062	Drive OK	(*)	4024	Fieldbus M->S1 mon	14.3.31
5520	Digital input14X mon	(*)	1064	Drive ready	(*)	4034	Fieldbus M->S2 mon	14.3.7
5522	Digital input15X mon	(*)	1066	Enable state mon	1.12	4044	Fieldbus M->S3 mon	14.3.11
5524	Digital input16X mon	(*)	1068	Enable ready mon	(*)	4054	Fieldbus M->S4 mon	14.3.15
1024	Enable cmd mon	6.8	1024	Enable cmd mon	6.8	4064	Fieldbus M->S5 mon	14.3.19
4708	Alm dig out mon 1	(*)	4708	Alm dig out mon 1	(*)	4074	Fieldbus M->S6 mon	14.3.23
4710	Alm dig out mon 2	(*)	4710	Alm dig out mon 2	(*)	4084	Fieldbus M->S7 mon	14.3.27
4712	Alm dig out mon 3	(*)	4712	Alm dig out mon 3	(*)	4094	Fieldbus M->S8 mon	14.3.31
4714	Alm dig out mon 4	(*)	4714	Alm dig out mon 4	(*)	4104	Fieldbus M->S9 mon	14.3.35
1530	Analog inp1<thr	(*)	1530	Analog inp1<thr	(*)	4114	Fieldbus M->S10 mon	14.3.39
1580	Analog inp2<thr	(*)	1580	Analog inp2<thr	(*)	4124	Fieldbus M->S11 mon	14.3.43
362	Drive overload trip	(*)	362	Drive overload trip	(*)	4134	Fieldbus M->S12 mon	14.3.47
366	Drive overload 80%	(*)	366	Drive overload 80%	(*)	4144	Fieldbus M->S13 mon	14.3.51
4454	Bit0 decomp mon	14.6.3	4454	Bit0 decomp mon	14.6.3	4154	Fieldbus M->S14 mon	14.3.55
4456	Bit1 decomp mon	14.6.4	4456	Bit1 decomp mon	14.6.4	4164	Fieldbus M->S15 mon	14.3.59
4458	Bit2 decomp mon	14.6.5	4458	Bit2 decomp mon	14.6.5	4174	Fieldbus M->S16 mon	14.3.63
4460	Bit3 decomp mon	14.6.6	4460	Bit3 decomp mon	14.6.6	3700	Pad 1	13.4.1
4462	Bit4 decomp mon	14.6.7	4462	Bit4 decomp mon	14.6.7	3702	Pad 2	13.4.2
4464	Bit5 decomp mon	14.6.8	4464	Bit5 decomp mon	14.6.8	3704	Pad 3	13.4.3
4466	Bit6 decomp mon	14.6.9	4466	Bit6 decomp mon	14.6.9	3706	Pad 4	13.4.4
4468	Bit7 decomp mon	14.6.10	4468	Bit7 decomp mon	14.6.10	3708	Pad 5	13.4.5
4470	Bit8 decomp mon	14.6.11	4470	Bit8 decomp mon	14.6.11	3710	Pad 6	13.4.6
4472	Bit9 decomp mon	14.6.12	4472	Bit9 decomp mon	14.6.12	3712	Pad 7	13.4.7
4474	Bit10 decomp mon	14.6.13	4474	Bit10 decomp mon	14.6.13	3714	Pad 8	13.4.8
4476	Bit11 decomp mon	14.6.14	4476	Bit11 decomp mon	14.6.14	3716	Pad 9	13.4.9
4478	Bit12 decomp mon	14.6.15	4478	Bit12 decomp mon	14.6.15	3718	Pad 10	13.4.10
4480	Bit13 decomp mon	14.6.16	4480	Bit13 decomp mon	14.6.16	3720	Pad 11	13.4.11
4482	Bit14 decomp mon	14.6.17	4482	Bit14 decomp mon	14.6.17	3722	Pad 12	13.4.12
4484	Bit15 decomp mon	14.6.18	4484	Bit15 decomp mon	14.6.18	3724	Pad 13	13.4.13
3700	Pad 1	13.4.1	3700	Pad 1	13.4.1	3726	Pad 14	13.4.14
3702	Pad 2	13.4.2	3702	Pad 2	13.4.2	3728	Pad 15	13.4.15
3704	Pad 3	13.4.3	3704	Pad 3	13.4.3	3730	Pad 16	13.4.16
3706	Pad 4	13.4.4	3706	Pad 4	13.4.4	4770	First alarm	(*)
3708	Pad 5	13.4.5	3708	Pad 5	13.4.5	4840	Alarm lo state	(*)
3710	Pad 6	13.4.6	3710	Pad 6	13.4.6	4842	Alarm hi state	(*)
3712	Pad 7	13.4.7	3712	Pad 7	13.4.7	1100	Digital input mon	1.13
3714	Pad 8	13.4.8	3714	Pad 8	13.4.8	1200	Digital input X mon	1.15
3716	Pad 9	13.4.9	3716	Pad 9	13.4.9	5008	Test gen out	19.1.5
3718	Pad 10	13.4.10	3718	Pad 10	13.4.10	5750	FL Fwd 1 mon	14.8.13
3720	Pad 11	13.4.11	3720	Pad 11	13.4.11			
3722	Pad 12	13.4.12	3722	Pad 12	13.4.12			
3724	Pad 13	13.4.13	3724	Pad 13	13.4.13			
3726	Pad 14	13.4.14	3726	Pad 14	13.4.14			
3728	Pad 15	13.4.15	3728	Pad 15	13.4.15			
3730	Pad 16	13.4.16	3730	Pad 16	13.4.16			
1530	Analog inp1<thr	(*)	3718	Pad 10	13.4.10			
1580	Analog inp2<thr	(*)	3720	Pad 11	13.4.11			
3676	Compare output	13.3.8	3722	Pad 12	13.4.12			
L DIGSEL3			3724	Pad 13	13.4.13			
XXXX	(2)		3726	Pad 14	13.4.14			
6000	Null	(*)	3728	Pad 15	13.4.15			
6002	One	(*)	3730	Pad 16	13.4.16			
			4780	Alarm PLC	(*)			

PAR	Descrizione	Menu	PAR	Description	Menu	PAR	Description	Menu
4034	Fieldbus M->S2 mon	14.3.7	4114	Fieldbus M->S10 mon	14.3.39	4134	Fieldbus M->S12 mon	14.3.47
4044	Fieldbus M->S3 mon	14.3.11	4124	Fieldbus M->S11 mon	14.3.43	4144	Fieldbus M->S13 mon	14.3.51
4054	Fieldbus M->S4 mon	14.3.15	4134	Fieldbus M->S12 mon	14.3.47	4154	Fieldbus M->S14 mon	14.3.55
4064	Fieldbus M->S5 mon	14.3.19	4144	Fieldbus M->S13 mon	14.3.51	4164	Fieldbus M->S15 mon	14.3.59
4074	Fieldbus M->S6 mon	14.3.23	4154	Fieldbus M->S14 mon	14.3.55	4174	Fieldbus M->S16 mon	14.3.63
4084	Fieldbus M->S7 mon	14.3.27	4164	Fieldbus M->S15 mon	14.3.59	3700	Pad 1	13.4.1
4094	Fieldbus M->S8 mon	14.3.31	4174	Fieldbus M->S16 mon	14.3.63	3702	Pad 2	13.4.2
4104	Fieldbus M->S9 mon	14.3.35	3700	Pad 1	13.4.1	3704	Pad 3	13.4.3
4114	Fieldbus M->S10 mon	14.3.39	3702	Pad 2	13.4.2	3706	Pad 4	13.4.4
4124	Fieldbus M->S11 mon	14.3.43	3704	Pad 3	13.4.3	3708	Pad 5	13.4.5
4134	Fieldbus M->S12 mon	14.3.47	3706	Pad 4	13.4.4	3710	Pad 6	13.4.6
4144	Fieldbus M->S13 mon	14.3.51	3708	Pad 5	13.4.5	3712	Pad 7	13.4.7
4154	Fieldbus M->S14 mon	14.3.55	3710	Pad 6	13.4.6	3714	Pad 8	13.4.8
4164	Fieldbus M->S15 mon	14.3.59	3712	Pad 7	13.4.7	3716	Pad 9	13.4.9
4174	Fieldbus M->S16 mon	14.3.63	3714	Pad 8	13.4.8	3718	Pad 10	13.4.10
3700	Pad 1	13.4.1	3716	Pad 9	13.4.9	3720	Pad 11	13.4.11
3702	Pad 2	13.4.2	3718	Pad 10	13.4.10	3722	Pad 12	13.4.12
3704	Pad 3	13.4.3	3720	Pad 11	13.4.11	3724	Pad 13	13.4.13
3706	Pad 4	13.4.4	3722	Pad 12	13.4.12	3726	Pad 14	13.4.14
3708	Pad 5	13.4.5	3724	Pad 13	13.4.13	3728	Pad 15	13.4.15
3710	Pad 6	13.4.6	3726	Pad 14	13.4.14	3730	Pad 16	13.4.16
3712	Pad 7	13.4.7	3728	Pad 15	13.4.15	5750	FL Fwd 1 mon	14.8.13
3714	Pad 8	13.4.8	3730	Pad 16	13.4.16	5752	FL Fwd 2 mon	14.8.14
3716	Pad 9	13.4.9	6000	Null	(*)	5754	FL Fwd 3 mon	14.8.15
3718	Pad 10	13.4.10	5008	Test gen out	19.1.5	5756	FL Fwd 4 mon	14.8.16
3720	Pad 11	13.4.11	5750	FL Fwd 1 mon	14.8.13	5758	FL Fwd 5 mon	14.8.17
3722	Pad 12	13.4.12	5752	FL Fwd 2 mon	14.8.14	5760	FL Fwd 6 mon	14.8.18
3724	Pad 13	13.4.13	5754	FL Fwd 3 mon	14.8.15	5762	FL Fwd 7 mon	14.8.19
3726	Pad 14	13.4.14	5756	FL Fwd 4 mon	14.8.16	5764	FL Fwd 8 mon	14.8.20
3728	Pad 15	13.4.15	5758	FL Fwd 5 mon	14.8.17	5800	FL Fwd 1 inv mon	(*)
3730	Pad 16	13.4.16	5760	FL Fwd 6 mon	14.8.18	5802	FL Fwd 2 inv mon	(*)
5008	Test gen out	19.1.5	5762	FL Fwd 7 mon	14.8.19	5804	FL Fwd 3 inv mon	(*)
5750	FL Fwd 1 mon	14.8.13	5764	FL Fwd 8 mon	14.8.20	5806	FL Fwd 4 inv mon	(*)
5752	FL Fwd 2 mon	14.8.14	5800	FL Fwd 1 inv mon	(*)	5808	FL Fwd 5 inv mon	(*)
5754	FL Fwd 3 mon	14.8.15	5802	FL Fwd 2 inv mon	(*)	5810	FL Fwd 6 inv mon	(*)
5756	FL Fwd 4 mon	14.8.16	5804	FL Fwd 3 inv mon	(*)	5812	FL Fwd 7 inv mon	(*)
5758	FL Fwd 5 mon	14.8.17	5806	FL Fwd 4 inv mon	(*)	5814	FL Fwd 8 inv mon	(*)
5760	FL Fwd 6 mon	14.8.18	5808	FL Fwd 5 inv mon	(*)			
5762	FL Fwd 7 mon	14.8.19	5810	FL Fwd 6 inv mon	(*)			
5764	FL Fwd 8 mon	14.8.20	5812	FL Fwd 7 inv mon	(*)			
5800	FL Fwd 1 inv mon	(*)	5814	FL Fwd 8 inv mon	(*)			
5802	FL Fwd 2 inv mon	(*)						
5804	FL Fwd 3 inv mon	(*)						
5806	FL Fwd 4 inv mon	(*)						
5808	FL Fwd 5 inv mon	(*)						
5810	FL Fwd 6 inv mon	(*)						
5812	FL Fwd 7 inv mon	(*)						
5814	FL Fwd 8 inv mon	(*)						

(4) the XXXX parameter changes according to the src parameter used:

(3) the XXXX parameter changes according to the src parameter used:

(3) = DC voltage ref src
Dig DC voltage ref (*)

(3) = 610 Vdc reference src
606 Ramp DC link out (*)

4452 Word decomp src
(4) = 4450 Dig word decomp 14.6.1

(*) Parameter not shown on the keypad. For information see the "PARAMETERS INCLUDED IN SELECTION LISTS BUT NOT SHOWN ON THE KEYPAD" section.

L SCOPE

6000 Null -

L VREF

XXXX (3)	
1500	Analog input 1 mon 9.1
1550	Analog input 2 mon 9.17
1600	Analog input 1X mon 9.33
1650	Analog input 2X mon 9.44
4024	Fieldbus M->S1 mon 14.3.3
4034	Fieldbus M->S2 mon 14.3.7
4044	Fieldbus M->S3 mon 14.3.11
4054	Fieldbus M->S4 mon 14.3.15
4064	Fieldbus M->S5 mon 14.3.19
4074	Fieldbus M->S6 mon 14.3.23
4084	Fieldbus M->S7 mon 14.3.27
4094	Fieldbus M->S8 mon 14.3.31
4104	Fieldbus M->S9 mon 14.3.35

L WDECOMP

XXXX (4)	
6000	Null (*)
6002	One (*)
4432	Word comp mon 14.5.17
4024	Fieldbus M->S1 mon 14.3.3
4034	Fieldbus M->S2 mon 14.3.7
4044	Fieldbus M->S3 mon 14.3.11
4054	Fieldbus M->S4 mon 14.3.15
4064	Fieldbus M->S5 mon 14.3.19
4074	Fieldbus M->S6 mon 14.3.23
4084	Fieldbus M->S7 mon 14.3.27
4094	Fieldbus M->S8 mon 14.3.31
4104	Fieldbus M->S9 mon 14.3.35
4114	Fieldbus M->S10 mon 14.3.39
4124	Fieldbus M->S11 mon 14.3.43

9 - Troubleshooting

9.1 Alarms

Note !

To reset alarms, see Quick start guide, [paragraph 6.6.1](#).

In the following table, the Code is visible only from serial line.

Code	Error message shown on the display	Sub-code	Description
0	No alarm	Condition: No alarm present	
1	Overvoltage	Condition: DC link overvoltage alarm due to energy recovered from the motor. The voltage supplied to the FFE power section is too high with respect to the maximum limit.	
		Solution: - Increase the bandwidth of the voltage regulator (if the problem occurs under dynamic conditions) - Use a larger FFE.	
2	Undervoltage	Condition: DC link undervoltage alarm. The voltage arriving at the FFE power section is too low compared to the minimum threshold relating to the 560 Mains voltage parameter setting due to: - the mains voltage being too low or overextended voltage drops. - poor cable connections (e.g. loose contactor terminals, inductance, filter, etc.).	
		Solution: Check the connections and measure the mains voltage.	
3	Ground fault	Condition: Ground short circuit alarm	
		Solution: - Check the FFE and pre-load circuit wiring.	
4	Overcurrent	Condition: Instantaneous overcurrent protection intervention alarm. This may be due to the incorrect setting of current regulator parameters or a short circuit between phases or ground fault on the FFE output.	
		Solution: - Check the current regulator parameters - Check the wiring to the mains and make sure the mains phases match those of the synchronisation card.	
5	Desaturation	Condition: Instantaneous overcurrent in the IGBT bridge alarm.	
		Solution: Switch the FFE off and then switch it on again. If the alarm persists, contact the technical service centre.	
6	MultiUndervolt	Condition: The number of attempted automatic restarts after the Undervoltage alarm has exceeded the set PAR 4650 Underv res attempt value in the PAR 4652 Underv res delay time.	
		Solution: Too many Undervoltage alarms. Adopt the proposed solutions for the Undervoltage alarm.	
7	MultiOvercurr	Condition: 2 attempted automatic restarts after the Overcurrent alarm within 30 seconds. If more than 30 seconds pass after the Overcurrent alarm was generated, the attempt counter is reset.	
		Solution: Too many Overcurrent alarms. Adopt the proposed solutions for the Overcurrent alarm	
8	MultiDesat	Condition: 2 attempted at automatic restarts after the Desaturation alarm within 30 seconds. If more than 30 seconds pass after the Desaturation alarm was generated, the attempt counter is reset.	
		Solution: Too many Desaturation alarms. Adopt the proposed solutions for the Desaturation alarm.	
9	Undervolt AC	Condition: The measured mains voltage is too low	
		Solution: Check the cables connected to the mains voltage measurement card. - Check for the presence of the mains voltage	
10	Overvoltage AC	The measured mains voltage is too high	
		Solution: Check the cables connected to the mains voltage measurement card. - Check the readings of parameters PAR 256 Phase U voltage, PAR 258 Phase V voltage, PAR 260 Phase W voltage	
11	Heatsink OT	Condition: Heatsink temperature too high alarm	

Code	Error message shown on the display	Sub-code	Description
			Solution: - Verify the correct operation of the cooling fan. - Check that the heatsinks are not clogged - Check that the openings for the cabinet cooling air are not blocked.
12	Heatsinks OTUT		Condition: IGBT modules temperature too high or too low alarm
			Solution: - Verify the correct operation of the cooling fan. - Check that the heatsinks are not clogged - Check that the openings for the cabinet cooling air are not blocked.
13	Intakeair OT		Solution: - Check correct fan operation - Check that the heatsinks are not clogged - Check temperature in electrical panel.
			Solution: Check correct fan operation
14	Drive overload		Condition: Drive overload alarm. The overload threshold of the accumulator of the I ² t FFE thermal image has been exceeded.
			Solution: Check that the size of the FFE is suitable for the application.
15	-	-	
16	Opt Bus fault		Condition: Error in the configuration stage or communication error.
		XXX0H-X	If the first digit to the left of "H" in the alarm sub-code is 0, the error regards a communication problem.
		XXXXH-X	If the first digit to the left of "H" in the alarm sub-code is other than 0, the error regards a configuration problem.
			Solution: For configuration errors, check the configuration of the Bus communication, Bus type, Baudrate, address, parameter settings. For communication errors verify wiring, resistance of terminations, interference immunity, timeout settings. For further details, please refer to the user guide for the specific bus.
17	Opt 1 IO fault		Condition: Error in the communication between Regulation and I/O expansion card in slot 1.
			Solution: Check that it has been inserted correctly, see chapter 11.5
18	Opt 2 IO fault		Condition: Error in the communication between Regulation and I/O expansion card in slot 2.
			Solution: Check that it has been inserted correctly, see chapter 11.5
19	Opt Enc fault (Opt sync fault)		Condition: Error in communications between the regulation board and voltage synchronisation card in slot 2
			Solution: Check that they are inserted correctly
20	External fault		Condition: External alarm present. A digital input has been programmed as an external alarm, but the +24V voltage is not available on the terminal.
			Solution: Check that the terminal screws are tight
21	Emg stop alarm		Condition: Emergency stop alarm. The Stop key on the keypad was pressed with the PAR 1008 Stop key mode parameter set to EmgStop&Alarm. Active in remote control mode (PAR 1012=1) both by using "Terminals" command or "Digital" commands and, in local control mode (PAR 1012=0) by using "Terminals" command.
			Solution: Eliminate the reason for which the Stop key on the keypad was pressed and reset the FFE.
22	Power down		Condition: The FFE was enabled with no supply voltage at the power section.
			Solution: Check the FFE power supply
23	Prc fbk loss		Condition: No confirmation of pre-load contactor alarm
			Solution: Check the condition of the pre-load contactor
24 ... 26	Not Used1.. 3		
27	ExtIO fault		Condition: Communication fault with the external module.
			Solution: See paragraph "9.1.1 ExtIO fault" Alarm" on page 139.

Code	Error message shown on the display	Sub-code	Description
28	FastLink fault	Condition: FastLink communication fault	
		Solution: See paragraph "9.1.2 "Fastlink" Alarm" on page 140.	
29 ... 32	Not Used 6.. 9		
33 ... 40	Plc1 fault ... Plc8 fault	Condition: Enabled application developed in the IEC 61131-3 environment has found the conditions for generating this specific alarm to be true. The meaning of the alarm depends on the type of application. For more information, refer to the documentation concerning the specific application.	
		XXXXH-X	The XXXXH-X code indicates the reason for the error: make a note of this to discuss it with the service centre.
		Solution: Refer to the documentation concerning the enabled application.	

9.1.1 ExtIO fault" Alarm

The drive may generate an "ExtIO fault [27]" alarm for a series of reasons. At drive startup there may be problems with configuration, associated with the EXP-FL-XCAN-ADV card or parameter settings. During the Config phase the alarm might depend on an SDO communication error. During the Control phase the HeartBeat or NodeGuarding protocol might fail due to an interruption in the communication with the slave. An Emergency message sent by the slave could generate the "ExtIO fault [27]" alarm.

Each reason for the alarm can be identified by to the associated subcode. The table below shows information about the subcodes and how to associate these with the cause of the alarm, to enable troubleshooting and proper use of the system.

Subcode		Description	Remarks
0	0	BusLoss	Loss of communication in the Operational state
1..51	1h..35h	SDO error	Error sending the SDO. See the SDO Configuration Table on appendix to identify the object with the problem
200	0xC8	CAN error	Internal hardware fault; if the problem cannot be solved, replace the regulation card
202	0xCA	Config error	The number or I/Os in the slave module has changed. Check parameter 5482 External IO info. Save the parameters to store the current configuraiton.
203	0xCB	Lost Messages	TPDOs coming from the slave too frequently. Check that the slave meets CANopen specifications for TPDO sending times
204	0xCC	Opt IO installed	An optional internal I/O expansion card has been installed. The EXP-XCAN-ADV card functions are not available.
255..65535	0xFF..0xFFFF	Slave Emergency	Emergency message sent by the slave.

If the alarm is due to an Emergency message sent by the slave, the subcode contains the error code (Error code low and Error code Hi) of the message, while 4 of the 5 additional bytes in the message are shown by parameter 5486 External IO Failcode.

Emergency message content:

Byte0	Byte1	Byte2	Byte3	Byte4	Byte5	Byte6	Byte7
Error code Low	Error code Hi	Error register	Info 0	Info 1	Info 2	Info3	Info4
Subcode		PAR 5486 External IO Failcode					

See the slave manual for information about the meaning of the Emergency message.

9.1.2 “Fastlink” Alarm

Reasons why the FastLink alarm is generated:

Bit					Name	Description
	D3	D2	D1	D0		
0				0x1	Cks	<p>Cause: The drive has detected a checksum error</p> <p>Solution: Take all the necessary precautions to increase the resistance of the drive to disturbance</p>
1				0x2	Not used	<p>Cause:</p> <p>Solution:</p>
2				0x4	Not used	<p>Cause:</p> <p>Solution:</p>
3				0x8	Not used	<p>Cause:</p> <p>Solution:</p>
4			0x1		Not used	<p>Cause:</p> <p>Solution:</p>
5			0x2		RX Timeout	<p>Cause: The slave drive has not received a new data frame for 2 consecutive cycles.</p> <p>Solution: Take all the necessary precautions to increase the resistance of the drive to disturbance</p>
6			0x4		Pwm sync slave	<p>Cause: On the slave drives there is a problem with the function that enables the generation of Pwm signals to be synchronised with the Pwm signals of the master and with the function that enables the execution of control tasks to be synchronised with execution of control tasks by the master. An error exceeding the maximum error allowed has been detected for 4 consecutive cycles.</p> <p>Solution: Take all the necessary precautions to increase the resistance of the drive to disturbance</p>
7			0x8		Cable open	<p>Cause: No optical fibre.</p> <p>Solution: Check connection with optical fibre.</p>
8		0x1			Setup error	<p>Cause: An error occurred during setup; the information received from the FastLink is not reliable.</p> <p>Solution: Check setting of FastLink parameters.</p>
9		0x2			Compatibility error	<p>Cause: The firmware on the optional FastLink card is incompatible with that on the regulation card.</p> <p>Solution: Contact WEG in order to update the firmware on the optional fastlink card.</p>
10		0x4			Slave answer NOK	<p>Cause: situation in which an interrogated Slave does not reply</p> <p>Solution: check FastLink connection</p>

9.2 Messages

Note

For more information see [chapter 6.7](#).

Error message shown on the display	Sub-code	Description
Fast IO error	Condition: may occur at FFE start-up, during card recognition	
	0000H-0	Fast IO error (Bus synchronisation)
	Solution: contact the WEG technical support centre.	
Key expiring	Condition: this may occur at FFE power-on if the incorrect enabling key was inserted for a given firmware function. At this stage the firmware function can still be used freely, but this time limit is about to expire.	
	xxxxH-x	Number of hours for which the function can still be used freely.
	Solution: Ask WEG for the correct key to enable the desired firmware function.	
Load default	Condition: may occur during loading of the parameter database saved in flash normally appears in the following conditions: at initial power-on when a new firmware version is downloaded, when the regulation is installed on a new size, when the region is changed. If this message is displayed when the FFE is already operating, this means that a problem has occurred in the parameter database saved in Flash. If this message is displayed, the FFE automatically performs the Load default command.	
	0001H-1	The database saved is not valid
	0002H-2	The database saved is not compatible
	0003H-3	The database saved refers to a different size from the current size
	0004H-4	The database saved refers to a different region from the current region
	Solution: Set the parameters to the value required and perform Save parameter	
Load def plc	Condition: may occur during loading of the parameter database saved in the Flash of the Mdplc application Normally appears at initial power-on after downloading a new application. If this message is displayed when the FFE is already operating, this means that a problem has occurred in the parameter database saved in Flash. If this message appears the FFE restores the default database, i.e. the one that was downloaded.	
	0001H-1	The database saved is not valid
	Solution: Set the parameters to the value required and perform Save parameter	
Load par failed	Condition: during transfer of the parameters from the memory of the keypad to the FFE	
	0H-0	Communication error
	0025H-37	The data saved on the keypad are not valid. No parameter is transferred from the keypad to the FFE
	0026H-38	Incompatible FFE series. No parameter is transferred from the keypad to the FFE
	0027H-39	Incompatible software version. All the parameters present in the memory of the keypad have been transferred to the FFE. The set of parameters transferred refers to a FFE with a different firmware version; therefore, certain parameters may not be updated.
	0028H-40	Incompatible FFE size. All the parameters present in the memory of the keypad (excluding those that depend on the size of the FFE), have been transferred to the FFE. The parameters that depend on size maintain their original value.
	0029H-41	Error during saving of parameters on the FFE. All the parameters present in the memory of the keypad have been transferred to the FFE. The transfer of one or more parameters has caused an "out of range" error, or one or more parameters does not exist. At the end of transfer, one or more parameters may not have been updated.
	002AH-42	PLC application release and version not compatible. All parameters in the keypad memory have been transferred to the FFE. The transferred set of parameters relates to a FFE with a PLC application in which the version and release of the application are different. As a result some of the PLC application parameters may not be updated.

Error message shown on the display	Sub-code	Description	
	002BH-43	PLC application not compatible. All the parameters in the keypad memory except those relating to the PLC application have been transferred to the FFE. The transferred set of parameters relates to a FFE with a different PLC application. As a result none of the PLC application parameters are updated. Solution: Recover a set of parameters from a compatible FFE (model and size)	
Options config error	Condition: may occur at FFE start-up, during recognition of the optional cards installed		
	0001H-1	Non-permissible optional card in slot 1	
	0002H-2	Non-permissible optional card in slot 2	
	0004H-4	Non-permissible optional card in slot 3	
	0010H-16	Conflict slot 1 with slot 2	
	0020H-32	Conflict slot 1 with slot 3	
	0040H-64	Conflict slot 2 with slot 3	
	Solution: Remove the optional cards from the incorrect slots and insert them in the correct slots		
Option detect slot 1 Option detect slot 2 Option detect slot 3	Condition: at power-on, the FFE recognizes the presence of an optional card in one of the three expansion slots. One of the three messages is shown on the display		
	0H-0	None	
	0001H-1	I_0_1	
	0004H-4	Can_Dnet	
	00FFH-255	Unknown	
	0101H-257	I_0_2	
	0104H-260	Profibus	
	0020H-32	Fast IO (Sync-ON card)	
	0201H-513	I_0_3	
	0204H-516	Gdnet	
	0301H-769	I_0_4	
	Solution:		
	Plc cfg error	Condition: may occur during loading of the Mdplc application The Mdplc application present on the FFE is not run.	
		0004H-4	The application downloaded has a different Crc on DataBlock and Function table
0065H-101		The application downloaded has an invalid identifier (Info)	
0066H-102		The application downloaded has an incorrect task number (Info)	
0067H-103		The application downloaded has an incorrect software configuration	
0068H-104		The application downloaded has a different Crc on DataBlock and Function table	
0069H-105		A Trap error or System error has occurred. The FFE automatically performs a Power-up operation. The application is not run. See in Alarm List for further information regarding the error occurred	
006AH-106		The application downloaded has an incorrect identifier (Task)	
006BH-107		The application downloaded has an incorrect task number (Task)	
006CH-108		The application downloaded has an incorrect Crc (Tables + Code)	
Solution: Remove the Mdplc application or download a correct Mdplc application			
Power config	Condition: may occur during recognition of power cards. The FFE cannot be enabled when this message is shown.		
	0020H-32	The power card is configured for a FFE that is incompatible with the regulation card	
	0021H-33	The configuration of the power card is not compatible with the regulation card	
	0017H-23	The configuration required is not available on the power card	
Solution: Download the correct configuration on the power card			
Save par failed	Condition: during transfer of the parameters from the FFE to the memory of the keypad		
	0H-0	Communication error	
	0025H-37	The data saved on the keypad are not valid	
	0026H-38	Incompatible FFE series	

Error message shown on the display	Sub-code	Description
	0027H-39	Incompatible software version
	0028H-40	Incompatible FFE size
	0029H-41	Error during saving of parameters on the FFE
	Solution:	


10 - Specification

10.1 Environmental Conditions

Installation location _____	Pollution degree 2 or lower (free from direct sunlight, vibration, dust, corrosive or inflammable gases, fog, vapour oil and dripped water, avoid saline environment)
Installation altitude _____	Up to 2000m (6562 feet) above sea level; Up to 2000 meters above sea level; for higher altitudes apply a reduction of 1% of rated current for each 100 meters. Maximum installation altitude 4000 meters above sea level (3500 meters for FFE200-6)
Mechanical conditions for installation _____	Vibrational stress: EN 60721-3-3 Class 3M1
Operating temperature _____	-10...+40°C (32°...104°F)
Operating temperature (1) _____	+40 ... +50°C with derating, (+104 ... +122°F with 1% derating of IdN current for each additional °C).
Air humidity (operating) _____	5 % to 85 % and 1 g/m ³ to 25 g/m ³ without moisture condensation or icing (class 3K3 as per EN50178)
Air pressure (operating) [kPa] _____	86 to 106 (class 3K3 as per EN50178)

- (1) In menu 4 - DRIVE CONFIG set the Ambient temperature parameter, PAR 564, to 1 (50°C).
10 % derating of output current.

10.2 Standards

Climatic conditions _____	EN 60721-3-3
Electrical safety _____	EN 50178, EN 61800-5-1, UL508C, UL840
Air and surface isolation distance _____	EN 50178. Overvoltage category for mains connected circuits: III; degree of pollution 2
Vibration _____	EN 60068-2-6, test Fc.
EMC compatibility _____	EN61800-3
Protection degree _____	IP00 (with protection against accidental contact)
EC Directives _____	LVD 2014/35/EU, EMC 2014/30/EU
Approvals _____	

10.3 Accuracy

10.3.1 Current control

Loop sampling time _____	62,5μs
Response time _____	800 - 1000μs

10.3.2 Voltage control

Loop sampling time _____	62,5μs
Response time _____	10 - 15ms

10.3.3 Current rating

Heavy duty (HD) _____	150% 60 sec, 180% 0.5 sec.
Light duty (LD) _____	110% 60 sec.

10.4 Overload

Heavy duty (HD)
Light duty (LD)

150% 60 sec every 300 sec, 180% 0,5 sec.
110% 60 sec every 300 sec.

10.5 DC circuit

DC overvoltage threshold _____ 820 V_{dc} (FFE-...-4), 1192 V_{dc} (FFE-...-6);
DC undervoltage threshold _____ Mains voltage $\times \sqrt{2} \times (\sqrt{3}/2) \times 0,8$

Sizes FFE200-	DC-link capacity
	Total (μ F)
FFE200-550-4	16800
FFE200-730-4	20400
FFE200-880-4	25200
x 2 FFE200-550-4	2 x 16800
x 2 FFE200-730-4	2 x 20400
x 2 FFE200-880-4	2 x 25200
x 3 FFE200-730-4	3 x 20400
x 3 FFE200-880-4	3 x 25200
x 4 FFE200-730-4	4 x 20400
x 4 FFE200-880-4	4 x 25200
x 5 FFE200-730-4	5 x 20400
x 5 FFE200-880-4	5 x 25200
FFE200-500-6	11200
FFE200-690-6	13600
FFE200-760-6	13600
x 2 FFE200-500-6	2 x 11200
x 2 FFE200-690-6	2 x 13600
x 2 FFE200-760-6	2 x 13600
x 3 FFE200-690-6	3 x 13600
x 3 FFE200-760-6	3 x 13600
x 4 FFE200-690-6	4 x 13600
x 4 FFE200-760-6	4 x 13600
x 5 FFE200-690-6	5 x 13600
x 5 FFE200-760-6	5 x 13600

10.6 Electrical data

Input voltage (FFE200-...-4)	380 - 15% ... 500 + 5% V _{AC}
Input voltage (FFE200-...-6)	500 - 10% ... 690 + 10% V _{AC}
Input frequency	50/60 Hz ± 5%
Maximum line voltage unbalance	3 %
THD Input current	< 45%
Cosphi	≥ 0.99
Connection to TT and TN Networks	FFE200-...-4 and FFE200-...-6: = Suitable
Connection to IT Networks:	FFE200-...-4 and FFE200-...-6 = Suitable (with EMI-FN3359HV- filter, see "11.2 EMC filter" on page 159).
Rated voltage DC link	U _{LN} x 1,35

It may be necessary to apply some derating factors to rated DC output current. The user is responsible for the application of these factors, which are not automatically implemented by the drive: $IDRIVE = I_n \times K_{ALT} \times K_T$.

Sizes FFE200-...-4	AC input current @ 380...500 V _{CA}		DC output current @ 380 ... 500 V _{CA}		Derating factor		
	Heavy duty	Light duty	Heavy duty	Light duty	K _v	K _t	K _{ALT}
	(A)	(A)	(A)	(A)	(1)	(2)	(3)
FFE200-550-4	465	552	550	660	See figure 10.6.1	1.2	1
FFE200-730-4	619	724	733	865		1.2	1
FFE200-880-4	746	890	880	1063		1.2	1
x 2 FFE200-550-4	860	1021	1018	1221		1.2	1
x 2 FFE200-730-4	1145	1339	1356	1600		1.2	1
x 2 FFE200-880-4	1379	1647	1628	1967		1.2	1
x 3 FFE200-730-4	1717	2008	2034	2400		1.2	1
x 3 FFE200-880-4	2069	2470	2442	2950		1.2	1
x 4 FFE200-730-4	2290	2677	2712	3201		1.2	1
x 4 FFE200-880-4	2758	3294	3256	3933		1.2	1
x 5 FFE200-730-4	2862	3347	3390	4001		1.2	1
x 5 FFE200-880-4	3448	4117	4070	4916		1.2	1

Sizes FFE200-...-6	AC input current @ 500...690 V _{CA}		DC output current @ 500 ... 690 V _{CA}		Derating factor		
	Heavy duty	Light duty	Heavy duty	Light duty	K _v	K _t	K _{ALT}
	(A)	(A)	(A)	(A)	(1)	(2)	(3)
FFE200-500-6	430	492	511	589	See figure 10.6.1	1.2	1
FFE200-690-6	582	682	691	817		1.2	1
FFE200-760-6	639	744	757	890		1.2	1
x 2 FFE200-500-6	795	910	945	1090		1.2	1
x 2 FFE200-690-6	1077	1262	1278	1511		1.2	1
x 2 FFE200-760-6	1182	1377	1400	1647		1.2	1
x 3 FFE200-690-6	1616	1894	1918	2267		1.2	1
x 3 FFE200-760-6	1772	2065	2101	2470		1.2	1
x 4 FFE200-690-6	2155	2525	2557	3023		1.2	1
x 4 FFE200-760-6	2363	2754	2801	3293		1.2	1
x 5 FFE200-690-6	2693	3156	3196	3779		1.2	1
x 5 FFE200-760-6	2954	3442	3501	4116		1.2	1

- (1) K_v : Derating factor for mains voltage. Voltage derating must be considered for installations higher than 2000 meters above sea level (to ensure isolation). See next figure.
- (2) K_t : Derating factor for room temperature > 40°C up to 50°C (1.2% each °C higher than 40°C). You can also set parameter IPA564 (default=40) to 50 to obtain automatic derating of 0.9.
- (3) K_F : Derating factor for higher switching frequency
- (4) K_{ALT} : Derating factor for installation at altitudes above 1000 meters a.s.l.. Value to be applied = 1 % at each 100 m increase above

1000 m (up to a maximum of 4000 m).

I.e.: Altitude 2000 m, Kalt = 1% *10 = 10% di derating; In derated = 100 - ((10*100)/100) = 90 % In

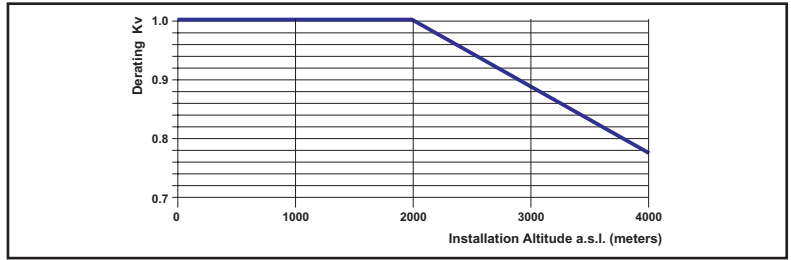


Figure 10.6.1: Kv Derating factor

Installation altitude	FFE200-...-4					
	Mains voltage [V]					
	380 Vac	400 Vac	415 Vac	440 Vac	460 Vac	480 Vac
m (s.l.m.)						
≤ 2000	100%	100%	100%	100%	100%	100%
≤ 2250	100%	100%	100%	100%	100%	97%
≤ 2500	100%	100%	100%	100%	98%	94%
≤ 2750	100%	100%	100%	100%	96%	92%
≤ 3000	100%	100%	100%	97%	93%	89%
≤ 3250	100%	100%	99%	94%	90%	86%
≤ 3500	100%	100%	96%	91%	87%	83%
≤ 3750	100%	96%	93%	88%	84%	80%
≤ 4000	98%	93%	90%	85%	81%	78%

Installation altitude	FFE200-...-6		
	Mains voltage [V]		
	500 Vac	575 Vac	690 Vac
m (s.l.m.)			
≤ 2000	100%	100%	100%
≤ 2250	100%	100%	97%
≤ 2500	100%	100%	94%
≤ 2750	100%	100%	92%
≤ 3000	100%	100%	89%
≤ 3250	100%	100%	86%
≤ 3500	100%	100%	83%
≤ 3750	100%	96%	-
≤ 4000	100%	93%	-

Table 10.6.1: Voltage derating based on altitude

Sizes FFE200-...-4	AC Power		Sizes FFE200-...-6	AC Power	
	FFE200-...-4 Output (@ 400Vac)			FFE200-...-6 Output (@ 690Vac)	
	Heavy duty (kVA)	Light duty (kVA)		Heavy duty (kVA)	Light duty (kVA)
FFE200-550-4	322	382	FFE200-500-6	514	588
FFE200-730-4	429	501	FFE200-690-6	696	816
FFE200-880-4	516	617	FFE200-760-6	763	889
x 2 FFE200-550-4	596	708	x 2 FFE200-500-6	950	1087
x 2 FFE200-730-4	793	927	x 2 FFE200-690-6	1287	1509
x 2 FFE200-880-4	956	1141	x 2 FFE200-760-6	1412	1645
x 3 FFE200-730-4	1190	1391	x 3 FFE200-690-6	1931	2263
x 3 FFE200-880-4	1433	1711	x 3 FFE200-760-6	2118	2468
x 4 FFE200-730-4	1587	1855	x 4 FFE200-690-6	2575	3018
x 4 FFE200-880-4	1911	2282	x 4 FFE200-760-6	2824	3291
x 5 FFE200-730-4	1983	2319	x 5 FFE200-690-6	3219	3772

Sizes FFE200-...-4	AC Power		Sizes FFE200-...-6	AC Power	
	FFE200-...-4 Output (@ 400VAc)			FFE200-...-6 Output (@ 690VAc)	
	Heavy duty (kVA)	Light duty (kVA)		Heavy duty (kVA)	Light duty (kVA)
x 5 FFE200-880-4	2389	2852	x 5 FFE200-760-6	3530	4113

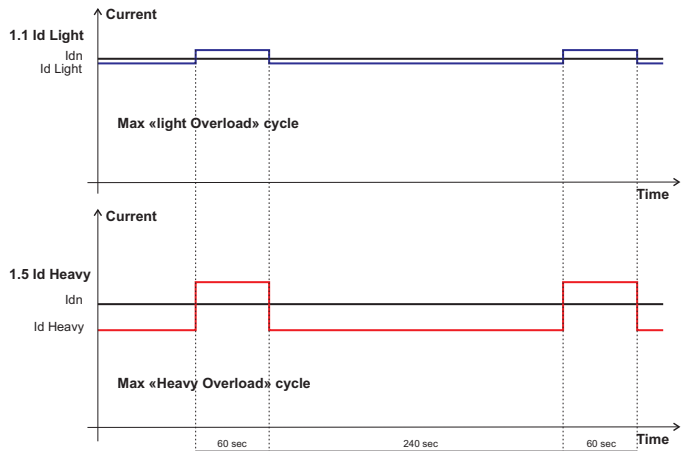
Taglie FFE200-...-4	Overload			
	AC input current		DC output current	
	Heavy duty 150% for 60s each 300s	Light duty 110% for 60s each 300s	Heavy duty 150% for 60s each 300s	Light duty 110% for 60s each 300s
	(A)	(A)	(A)	(A)
FFE200-550-4	684	605	825	726
FFE200-730-4	911	793	1100	952
FFE200-880-4	1096	975	1320	1169
x 2 FFE200-550-4	1265	1119	1526	1832
x 2 FFE200-730-4	1686	1466	2034	2400
x 2 FFE200-880-4	2028	1804	2442	2950
x 3 FFE200-730-4	2529	2199	3051	3601
x 3 FFE200-880-4	3041	2706	3663	4425
x 4 FFE200-730-4	3371	2933	4068	4801
x 4 FFE200-880-4	4055	3608	4884	5900
x 5 FFE200-730-4	4214	3666	5085	6001
x 5 FFE200-880-4	5069	4509	6105	7375

Sizes FFE200-...-6	Overload			
	AC input current		DC output current	
	Heavy duty 150% for 60s each 300s	Light duty 110% for 60s each 300s	Heavy duty 150% for 60s each 300s	Light duty 110% for 60s each 300s
	(A)	(A)	(A)	(A)
FFE200-500-6	634	539	767	648
FFE200-690-6	858	748	1037	899
FFE200-760-6	941	815	1136	979
x 2 FFE200-500-6	1173	997	1418	1634
x 2 FFE200-690-6	1588	1383	1918	2267
x 2 FFE200-760-6	1740	1508	2101	2470
x 3 FFE200-690-6	2382	2075	2876	3401
x 3 FFE200-760-6	2610	2262	3151	3705
x 4 FFE200-690-6	3175	2766	3835	4534
x 4 FFE200-760-6	3481	3016	4201	4940
x 5 FFE200-690-6	3969	3458	4794	5668
x 5 FFE200-760-6	4351	3770	5252	6174

10.7 I2t protection

An I2t protection algorithm is applied to mains current:

- In HD mode the drive can deliver 150% of rated current for 60 seconds (every 300 seconds).
- In LD mode the drive can deliver 110% of rated current for 60 seconds (every 300 seconds).



- If the I2t accumulator is loaded, the drive goes into "DRIVE OVERLOAD" alarm.
- At 20% over the overload current, a HARDWARE CLAMP trips to make the converter more immune to brief power interruptions.

10.8 Overcurrent and Overtemperature thresholds

Size FFE200-	SP [A _{dc}]	SL [A _{dc}]	Overcurrent OC [A _{pk}]	Clamp SP 170 % [A _{pk}]	Clamp SL 130 % [A _{pk}]	OT SP/SL [°C]
FFE200-550-4	550	660	1508	1247	1126	90
FFE200-730-4	733	865	2010	1661	1478	100
FFE200-880-4	880	1063	2321	2018	1827	100
1020 A	1018	1221	3015	2492	2250	90
1350 A	1356	1600	4018	3320	2954	100
1630 A	1628	1967	4639	4034	3653	100
2030 A	2034	2400	6025	4980	4430	100
2440 A	2442	2950	6958	6050	5479	100
2710 A	2712	3201	8033	6639	5907	100
3250 A	3256	3933	9277	8067	7304	100
3390 A	3390	4001	10041	8298	7383	100
4070 A	4070	4916	11595	10083	9130	100
FFE200-500-6	511	589	1338	1143	998	90
FFE200-690-6	691	817	1826	1547	1383	100
FFE200-760-6	757	890	2010	1703	1523	100
x 2 FFE200-500-6	945	1090	2673	2285	1995	90
x 2 FFE200-690-6	1278	1511	3649	3093	2765	100
x 2 FFE200-760-6	1400	1647	4018	3405	3044	100
x 3 FFE200-690-6	1918	2267	5473	4638	4146	100
x 3 FFE200-760-6	2101	2470	6025	5106	4565	100
x 4 FFE200-690-6	2557	3023	7297	6184	5528	100
x 4 FFE200-760-6	2801	3293	8033	6808	6086	100
x 5 FFE200-690-6	3196	3779	9121	7729	6910	100
x 5 FFE200-760-6	3501	4116	10041	8509	7607	100

10.9 Voltage level of FFE200 for safe operations

The **minimum time** between the moment in which an FFE200 is disabled from the mains and that in which an operator can operate on internal parts of the product, without the danger of electric shock, **is 5 minutes**.



.....
 The value consider the time to turn-off for an FFE200 without any options (time indicated for disabled FFE200 condition).

10.10 Cooling

All the FFE200 have internal fans.

Sizes FFE200-...-4	Dissipated power		Airflow of fan	Sizes FFE200-...-6	Dissipated power		Airflow of fan
	HD [W]	LD [W]	Heatsink [m ³ /h]		HD [W]	LD [W]	Heatsink [m ³ /h]
FFE200-550-4	2400	3100	1500	FFE200-500-6	2400	3100	1500
FFE200-730-4	2570	3160	1500	FFE200-690-6	2570	3160	2500
FFE200-880-4	3170	3980	2500	FFE200-760-6	3170	3980	2500
x 2 FFE200-550-4	4800	6200	2 x 1500	x 2 FFE200-500-6	4800	6200	2 x 1500
x 2 FFE200-730-4	5140	6320	2 x 1500	x 2 FFE200-690-6	5140	6320	2 x 2500
x 2 FFE200-880-4	6340	7960	2 x 2500	x 2 FFE200-760-6	6340	7960	2 x 2500
x 3 FFE200-730-4	7710	9480	3 x 1500	x 3 FFE200-690-6	7710	9480	3 x 2500
x 3 FFE200-880-4	9510	11940	3 x 2500	x 3 FFE200-760-6	9510	11940	3 x 2500
x 4 FFE200-730-4	10280	12640	4 x 1500	x 4 FFE200-690-6	10280	12640	4 x 2500
x 4 FFE200-880-4	12680	15920	4 x 2500	x 4 FFE200-760-6	12680	15920	4 x 2500
x 5 FFE200-730-4	12850	15800	5 x 1500	x 5 FFE200-690-6	12850	15800	5 x 2500
x 5 FFE200-880-4	15850	19900	5 x 2500	x 5 FFE200-760-6	15850	19900	5 x 2500

10.11 Weight and dimensions

Taglie FFE200-...-	Dimensions: Width x Height x Depth		Bar thickness (mm)		Weight		
	[mm]	[inches]	C-D	L1-L2-L3-U-V-W	(kg)	(lbs)	
FFE200-550-4 FFE200-500-6	417 x 1407 x 485	16,42 x 55,4 x 19,1	4	4	130	287	
FFE200-730-4 FFE200-690-6			5	4	135	298	
FFE200-880-4 FFE200-760-6			6	5	140	309	
2 parallele	837 x 1407 x 485	33,0 x 55,4 x 19,1	See the individual MS / SL size.			260 ... 280	573 ... 617
3 parallele	1257 x 1407 x 485	49,5 x 55,4 x 19,1				405 ... 420	893 ... 926
4 parallele	1677 x 1407 x 485	66.02 x 55,4 x 19,1				540 ... 560	1190 ... 1236
5 parallele	2097 x 1407 x 485	82.56 x 55,4 x 19,1				675 ... 700	1488 ... 1543

Note !

Weights referred to standard FFE with keypad, without options, packaging not included.

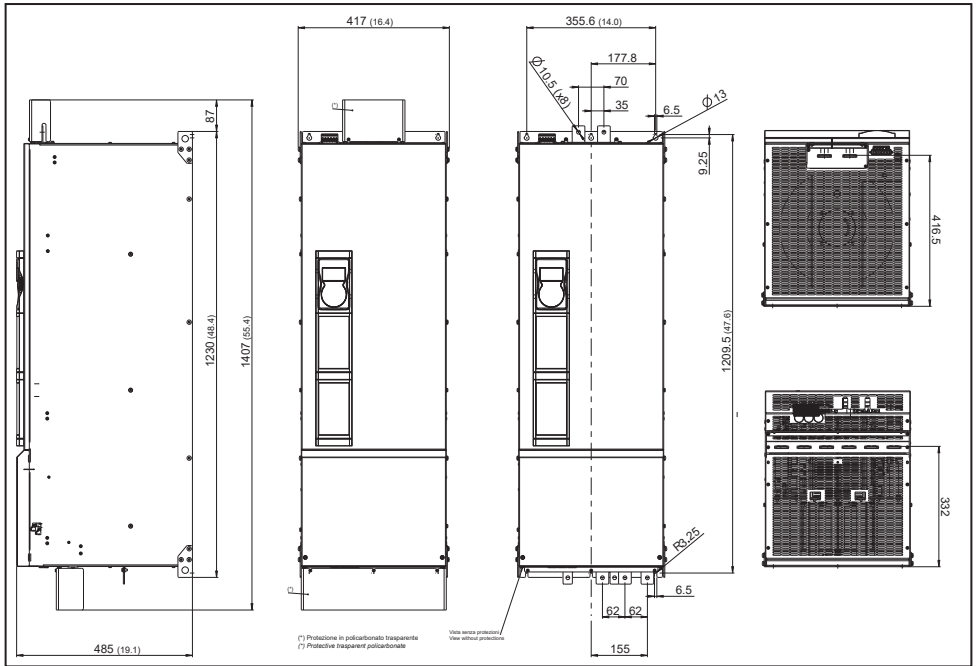


Figure 10.11.1: Dimensions FFE200-550...880-4 and FFE200-500...760-6

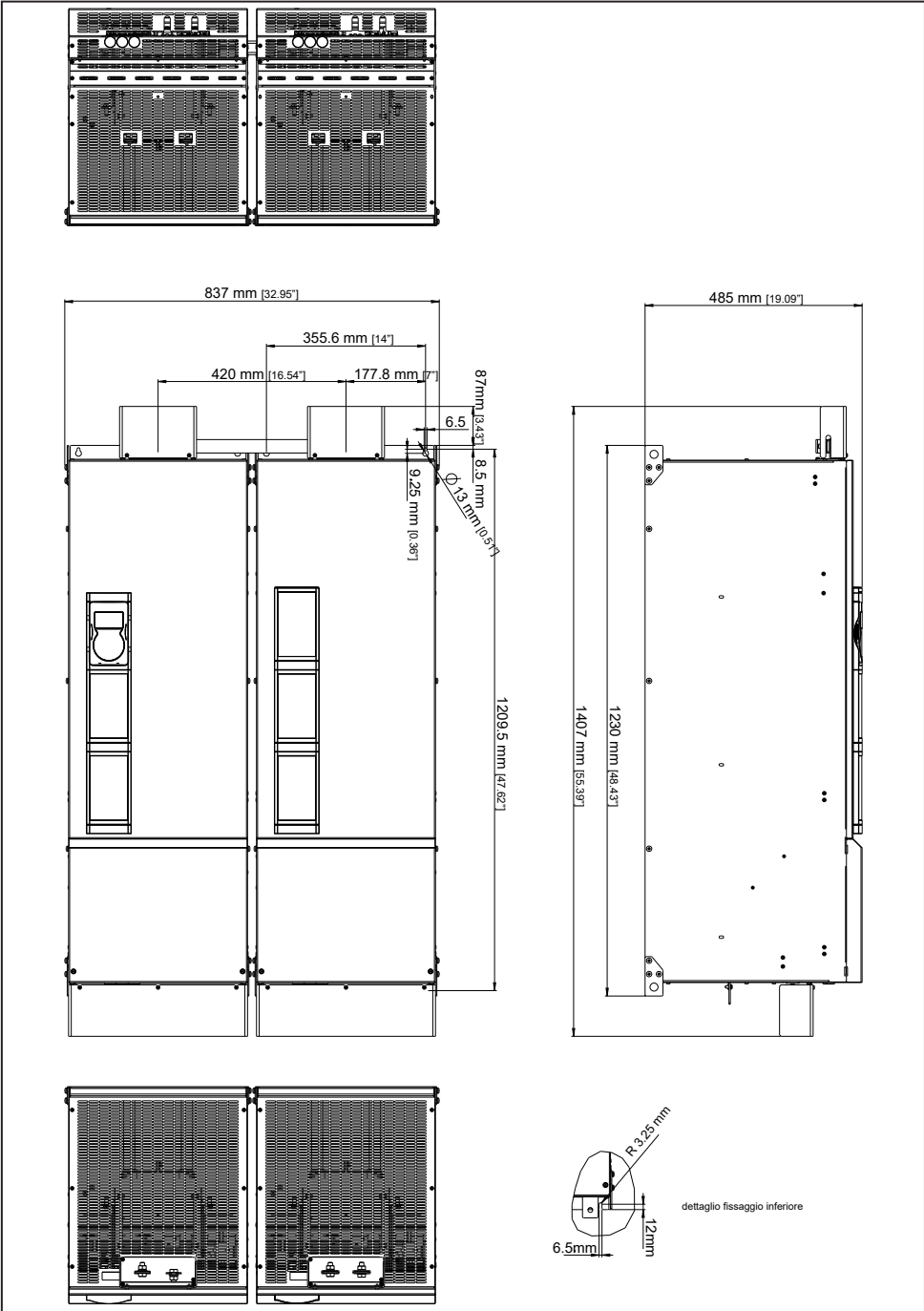


Figure 10.11.2: no.2 parallels dimensions

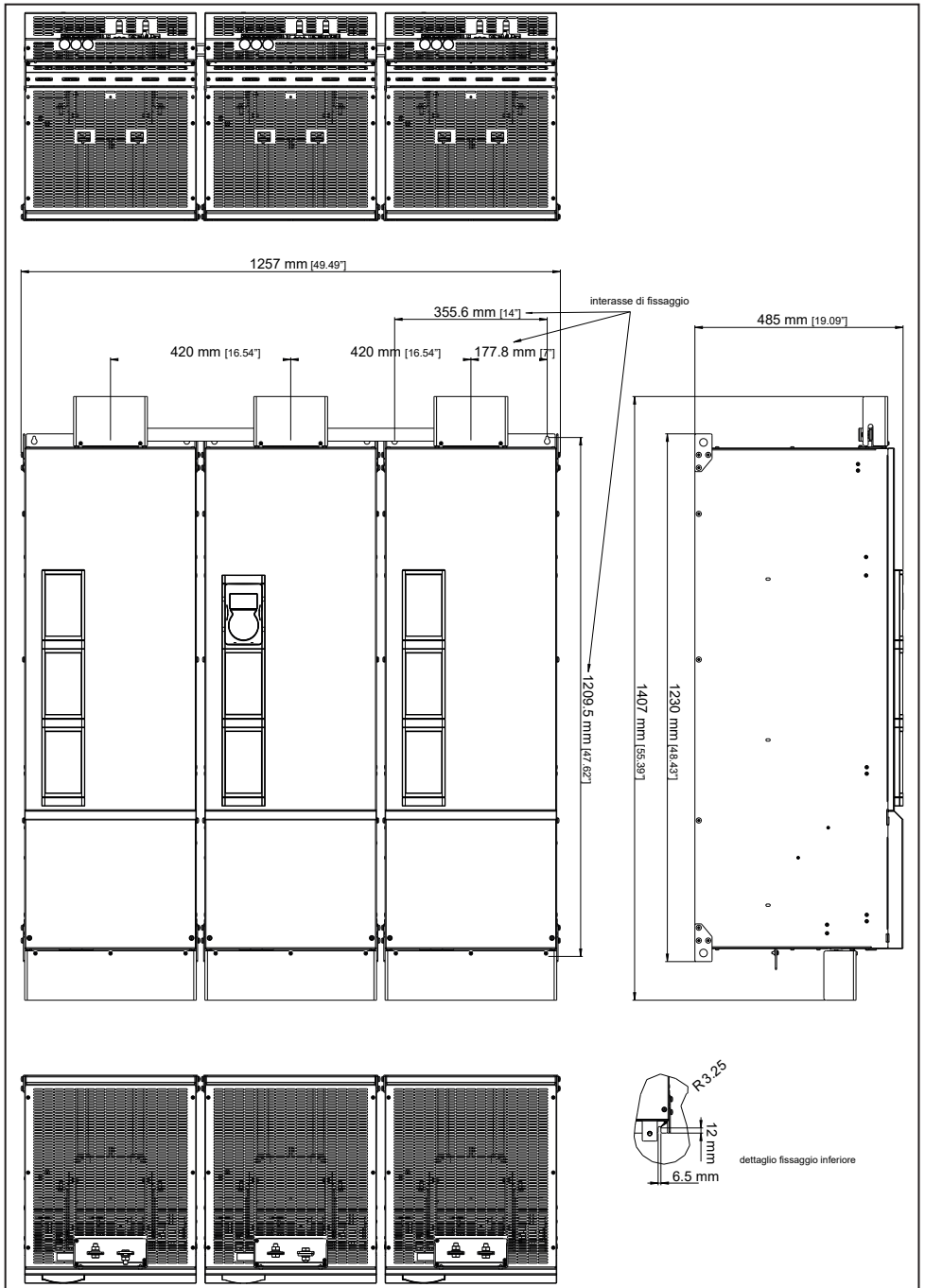


Figure 10.11.3: no.3 parallels dimensions

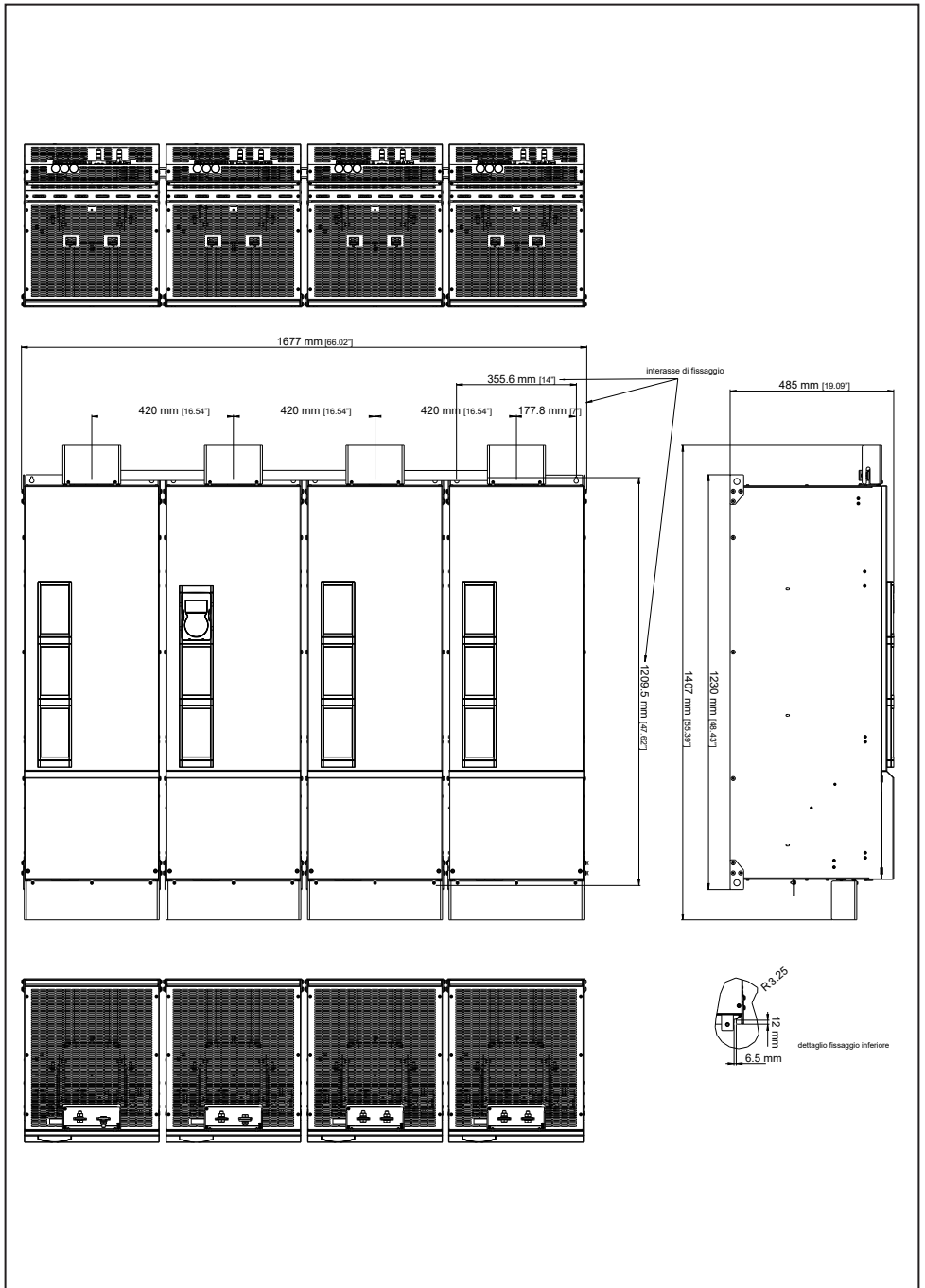


Figure 10.11.4: no.4 parallels dimensions

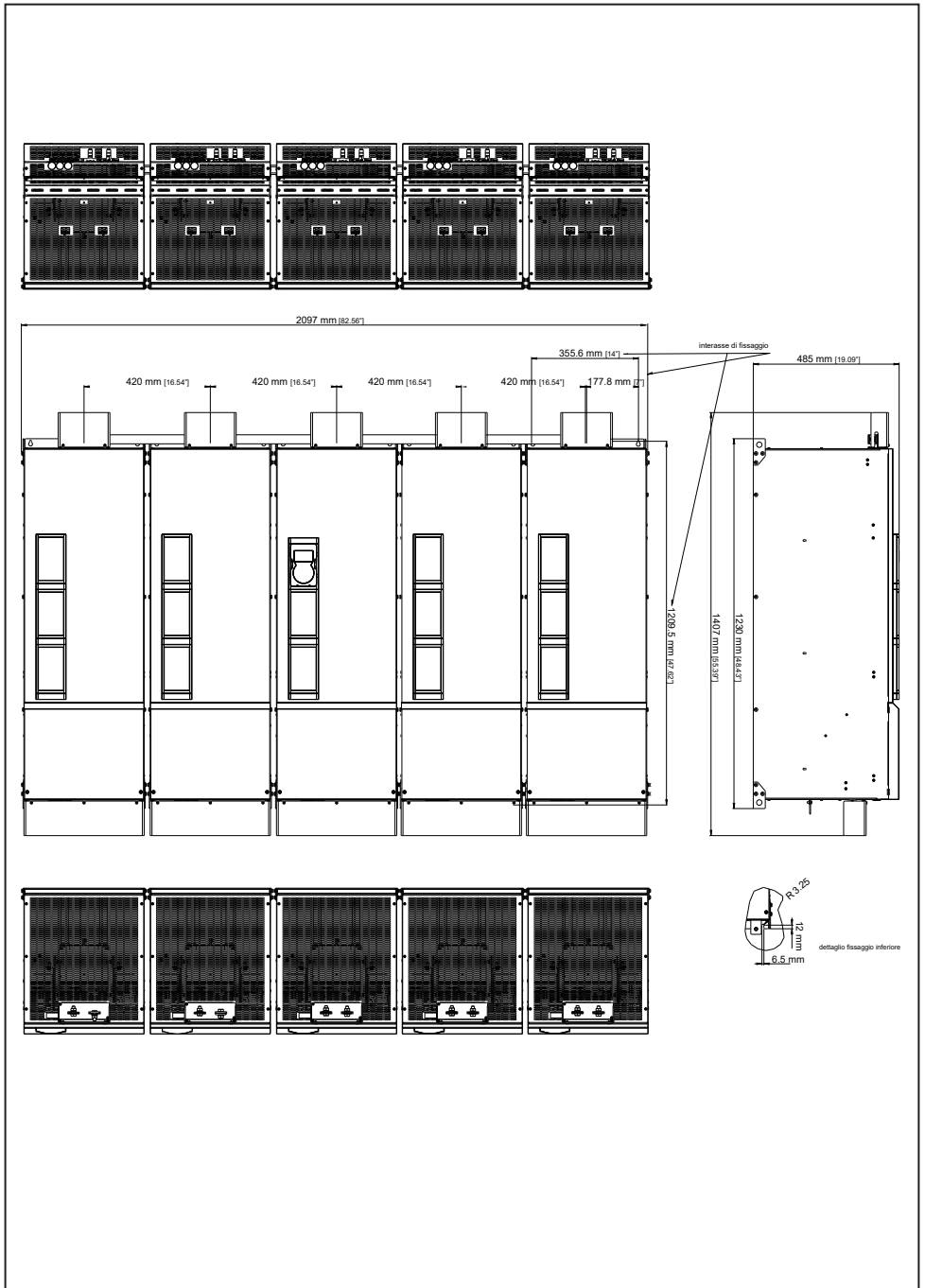


Figure 10.11.5: no.5 parallels dimensions

11 - Options

11.1 Optional external fuses (mandatory)

11.1.1 Fuses for connection mains side (F2)

Sizes FFE200-...-4		F2 - External fuses for AC connection			
		Q.ty	EUROPE / AMERICA		
			Type	Type	Code
FFE200-550-4		3	20 623 32.800	170M5164	S8B23BF
FFE200-730-4		3	20 623 32.1000	170M5166	S8B24BF
FFE200-880-4		3	20 635 32.1250	170M6266	S86C3
2x550	FFE200-550-4+PRC-MS 10	3	20 623 32.800	170M5164	S8B23BF
	FFE200-550-4-SL	3	20 623 32.800	170M5164	S8B23BF
2x730	FFE200-730-4+PRC-MS 13	3	20 623 32.1000	170M5166	S8B24BF
	FFE200-730-4-SL	3	20 623 32.1000	170M5166	S8B24BF
2x880	FFE200-880-4+PRC-MS 16	3	20 635 32.1250	170M6266	S86C3
	FFE200-880-4-SL	3	20 635 32.1250	170M6266	S86C3
3x730	FFE200-730-4+PRC-MS 20	3	20 623 32.1000	170M5166	S8B24BF
	FFE200-730-4-SL	3	20 623 32.1000	170M5166	S8B24BF
	FFE200-730-4-SL2	3	20 623 32.1000	170M5166	S8B24BF
3x880	FFE200-880-4+PRC-MS 23	3	20 635 32.1250	170M6266	S86C3
	FFE200-880-4-SL	3	20 635 32.1250	170M6266	S86C3
	FFE200-880-4-SL2	3	20 635 32.1250	170M6266	S86C3
4x730	FFE200-730-4+PRC-MS 26	3	20 623 32.1000	170M5166	S8B24BF
	FFE200-730-4-SL	3	20 623 32.1000	170M5166	S8B24BF
	FFE200-730-4-SL2	3	20 623 32.1000	170M5166	S8B24BF
	FFE200-730-4-SL2	3	20 623 32.1000	170M5166	S8B24BF
4x880	FFE200-880-4+PRC-MS 31	3	20 635 32.1250	170M6266	S86C3
	FFE200-880-4-SL	3	20 635 32.1250	170M6266	S86C3
	FFE200-880-4-SL2	3	20 635 32.1250	170M6266	S86C3
	FFE200-880-4-SL2	3	20 635 32.1250	170M6266	S86C3
5x730	FFE200-730-4+PRC-MS 33	3	20 623 32.1000	170M5166	S8B24BF
	FFE200-730-4-SL	3	20 623 32.1000	170M5166	S8B24BF
	FFE200-730-4-SL2	3	20 623 32.1000	170M5166	S8B24BF
	FFE200-730-4-SL2	3	20 623 32.1000	170M5166	S8B24BF
	FFE200-730-4-SL2	3	20 623 32.1000	170M5166	S8B24BF
5x880	FFE200-880-4+PRC-MS 40	3	20 635 32.1250	170M6266	S86C3
	FFE200-880-4-SL	3	20 635 32.1250	170M6266	S86C3
	FFE200-880-4-SL2	3	20 635 32.1250	170M6266	S86C3
	FFE200-880-4-SL2	3	20 635 32.1250	170M6266	S86C3
	FFE200-880-4-SL2	3	20 635 32.1250	170M6266	S86C3

The technical data of the fuses, e.g. dimensions, weights, heat dissipation, auxiliary contactors, are reported in the corresponding manufacturer data sheets: 20... (Siba), 170... (Bussmann).

Sizes FFE200-...-6		F2 - External fuses for AC connection			
		Q.ty	EUROPE / AMERICA		
			Type	Type	Code
FFE200-500-6		3	20 623 32.630	170M5162	S8B22BF
FFE200-690-6		3	20 623 32.1000	170M5166	S8B24BF
FFE200-760-6		3	20 623 32.1000	170M5166	S8B24BF
2x500	FFE200-500-6+PRC-MS 09	3	20 623 32.630	170M5162	S8B22BF
	FFE200-500-6-SL	3	20 623 32.630	170M5162	S8B22BF
2x690	FFE200-690-6+PRC-MS 12	3	20 623 32.1000	170M5166	S8B24BF
	FFE200-690-6-SL	3	20 623 32.1000	170M5166	S8B24BF
2x760	FFE200-760-6+PRC-MS 14	3	20 623 32.1000	170M5166	S8B24BF
	FFE200-760-6-SL	3	20 623 32.1000	170M5166	S8B24BF
3x690	FFE200-690-6+PRC-MS 18	3	20 623 32.1000	170M5166	S8B24BF
	FFE200-690-6-SL	3	20 623 32.1000	170M5166	S8B24BF
	FFE200-690-6-SL	3	20 623 32.1000	170M5166	S8B24BF
3x760	FFE200-760-6+PRC-MS 20	3	20 623 32.1000	170M5166	S8B24BF
	FFE200-760-6-SL	3	20 623 32.1000	170M5166	S8B24BF
	FFE200-760-6-SL	3	20 623 32.1000	170M5166	S8B24BF
4x690	FFE200-690-6+PRC-MS 24	3	20 623 32.1000	170M5166	S8B24BF
	FFE200-690-6-SL	3	20 623 32.1000	170M5166	S8B24BF
	FFE200-690-6-SL	3	20 623 32.1000	170M5166	S8B24BF
	FFE200-690-6-SL2	3	20 623 32.1000	170M5166	S8B24BF
4x760	FFE200-760-6+PRC-MS 27	3	20 623 32.1000	170M5166	S8B24BF
	FFE200-760-6-SL	3	20 623 32.1000	170M5166	S8B24BF
	FFE200-760-6-SL	3	20 623 32.1000	170M5166	S8B24BF
	FFE200-760-6-SL2	3	20 623 32.1000	170M5166	S8B24BF
5x690	FFE200-690-6+PRC-MS 31	3	20 623 32.1000	170M5166	S8B24BF
	FFE200-690-6-SL	3	20 623 32.1000	170M5166	S8B24BF
	FFE200-690-6-SL	3	20 623 32.1000	170M5166	S8B24BF
	FFE200-690-6-SL2	3	20 623 32.1000	170M5166	S8B24BF
5x760	FFE200-760-6+PRC-MS 34	3	20 623 32.1000	170M5166	S8B24BF
	FFE200-760-6-SL	3	20 623 32.1000	170M5166	S8B24BF
	FFE200-760-6-SL	3	20 623 32.1000	170M5166	S8B24BF
	FFE200-760-6-SL2	3	20 623 32.1000	170M5166	S8B24BF

The technical data of the fuses, e.g. dimensions, weights, heat dissipation, auxiliary contactors, are reported in the corresponding manufacturer data sheets: 20... (Siba), 170... (Bussmann).

11.1.2 Fuses for connection DC side

Sizes FFE200-...-4+PRC	F1 - External fuses for DC connection			
	EUROPE		AMERICA	
	Type	Code	Type	Code
FFE200-... +PRC	1441050	S85C27	AJT60	S85C28

The technical data of the fuses, e.g. dimensions, weights, heat dissipation, auxiliary contactors, are reported in the corresponding manufacturer data sheets:
 144... Itälweber, 22-58 cylindrical fuse
 AJT... Mersen , 27-60 cylindrical fuse

11.2 EMC filter

The FFE200 power supply MUST be used with an external EMI filter.
Reference standard for conducted immunity:
EN 61800-3 : Category C3, 2nd Environment / 50 m Motor cable length.

11.2.1 FFE200-4: filters for connection to TT and TN networks

Filter type	Code	Dimensions : WxHxd (mm)	Weight (kg)	FFE200-4 - Heavy Duty Filter q.ty													
				550	730	880	550 x 2	730 x 2	880 x 2	730 x 3	880 x 3	730 x 4	880 x 4	730 x 5	880 x 5		
EMI-FN3359-480-600	S7GHW	510 x 177 x 280	18,0	1			2										
EMI-FN3359-480-800	S7EMI19	510 x 177 x 280	18,0		1	1		2	2	3	3	4	4	5	5		

Filter type	Code	Dimensions : WxHxd (mm)	Weight (kg)	FFE200-4 - Low Duty Filter q.ty													
				550	730	880	550 x 2	730 x 2	880 x 2	730 x 3	880 x 3	730 x 4	880 x 4	730 x 5	880 x 5		
EMI-FN3359-480-600	S7GHW	510 x 177 x 280	18,0	1			2										
EMI-FN3359-480-800	S7EMI19	510 x 177 x 280	18,0		1			2		3		4		5			
EMI-FN3359-480-1000	S7EMI20	510 x 177 x 280	18,0			1			2		3		4		5		

11.2.2 FFE200-4: filters for IT network

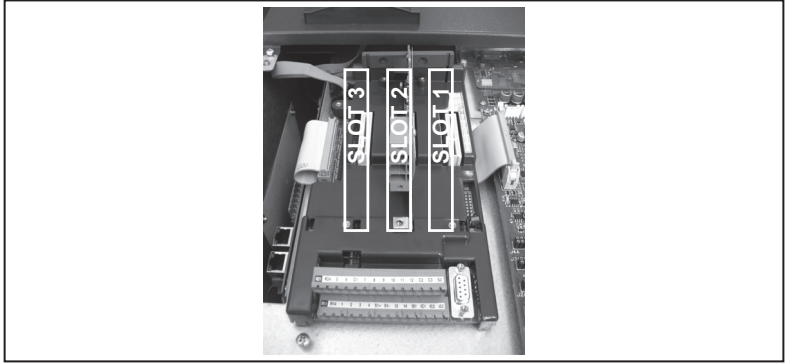
Filter type	Code	Dimensions : WxHxd (mm)	Weight (kg)	FFE200-4 - Heavy Duty anmd Low Duty Filter q.ty													
				550	730	880	550 x 2	730 x 2	880 x 2	730 x 3	880 x 3	730 x 4	880 x 4	730 x 5	880 x 5		
EMI-FN3359HV-690-600	S7EMI22	221 x 142 x 260	18,0	1			2										
EMI-FN3359HV-690-800	2S393	510 x 177 x 280	18,0		1			2		3		4		5			
EMI-FN3359HV-690-1000	S7EMI23	510 x 177 x 280	18,0			1			2		3		4		5		

11.2.3 FFE200-6, filters for connection to TT, TN and IT networks

Filter type	Code	Dimensions : WxHxd (mm)	Weight (kg)	FFE200-6 - Heavy Duty Filter q.ty													
				500	690	760	500 x 2	690 x 2	760 x 2	690 x 3	760 x 3	690 x 4	760 x 4	690 x 5	760 x 5		
EMI-FN3359HV-690-600	S7EMI22	221 x 142 x 260	18,0	1	1		2	2		3		4		5			
EMI-FN3359HV-690-800	2S393	510 x 177 x 280	18,0			1			2		3		4		5		

Filter type	Code	Dimensions : WxHxd (mm)	Weight (kg)	FFE200-6 - Low Duty Filter q.ty													
				500	690	760	500 x 2	690 x 2	760 x 2	690 x 3	760 x 3	690 x 4	760 x 4	690 x 5	760 x 5		
EMI-FN3359HV-690-600	S7EMI22	221 x 142 x 260	18,0	1			2										
EMI-FN3359HV-690-800	2S393	510 x 177 x 280	18,0		1	1		2	2	3	3	4	4	5	5		

11.3 Installation of optional cards



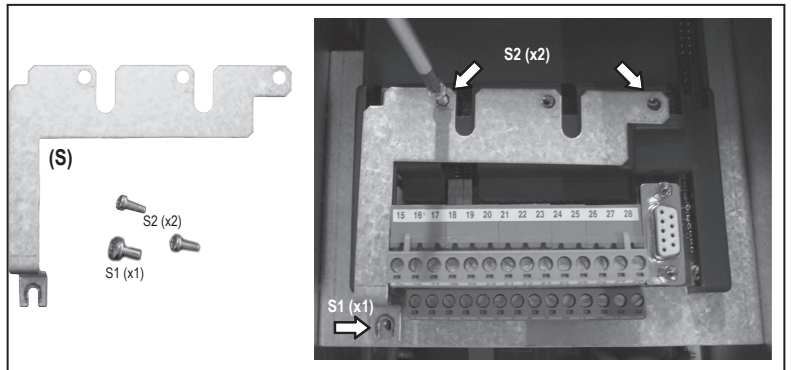
Up to three optional cards can be inserted in the three slots under the top cover:

- **Slot 1:** dedicated to IO cards IO (EXP-IO-...-ADV)
- **Slot 2:** Reserved for the EXP-SYNC-ADV card
- **Slot 3:** dedicated to field Bus cards (EXP-PDP-ADV, EXP-CAN-ADV, ecc)

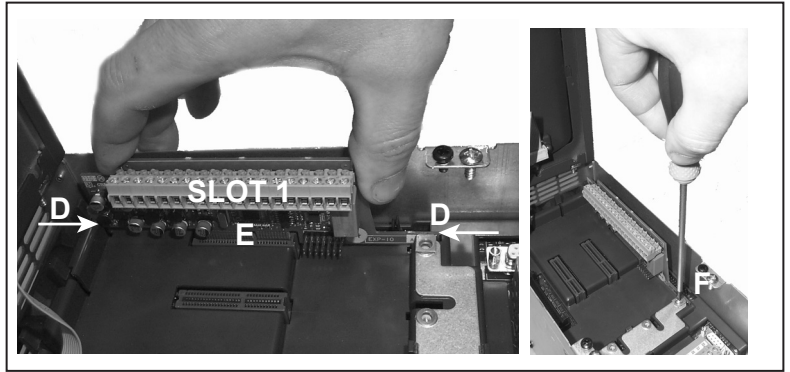


.....
If an optional card is inserted in an incorrect Slot, the FFE will send an error message.
.....

1. Remove the bottom cover as indicated in [paragraph 5.2.1](#).

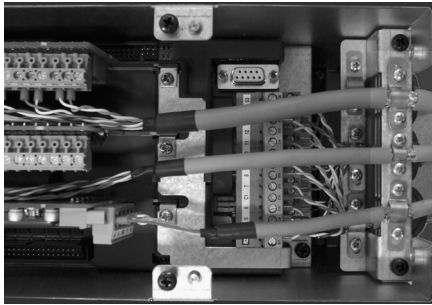


2. Position and fasten the metallic shield (S), provided with the optional card, with the screws S1 and S2 (x1) as shown in the figure.

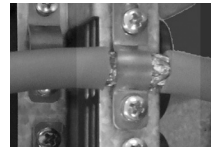


3. Position the optional card in the dedicated Slot (in the example, the EXP-IO card is inserted in Slot 1). Align the ends of the card (D) in the slots and then fully insert the connector of the card in the connectors of the FFE (E).
4. Fasten the card with the screw + washer (provided with the optional card) in housing (F) as shown in the figure

11.3.1 Shielding of optional card connections



Fasten the shield of the cables to the omega sections as showed on figure.



Appendix 1 - Design

FFE200 drives are used in applications that require the re-introduction of power into the mains.

This section provides some examples of design:

1. Single-motor applications
2. Multi-motor applications
3. Multi-motor applications where regenerated power is a small percentage of motor power.

Key to symbols:

Vmains = AC mains supply voltage rating

Poutm = Motor output power (continuous operation)

Voutm = Motor voltage rating

η_m = Typical motor efficiency

η_d = Typical drive efficiency (0.97)

Pdc = Power requested by the DC-link

Vdc = DC-link rated voltage

Idc = Current requested by the DC-link

DC-link voltage depends on mains voltage, and under nominal load conditions is about 1.3 times the AC supply voltage.

Therefore, for a 400VAC three-phase mains under nominal load conditions, the DC-link voltage is about $400\text{VAC} * 1.35 = 540\text{VDC}$.

The same calculation must be used for a 690VAC mains or other supply.

Note!

For special applications please contact technohelp@weg.net.

A.1.1 Single-motor applications

The application requires 100% of motor and regenerating power of a single asynchronous motor with 150% overload for 60s every 300s.

Vmains = three-phase 400[V]

Poutm = 250[kW]

Voutm = 400[V]

$\eta_m = 0.95$

> Calculation of the current required on the DC-link:

Vdc = Vmains [V] * 1.35 = 400 * 1.35 = 540 [V]

$$P_{dc} [\text{W}] = P_{outm} [\text{kW}] * \frac{1000}{(\mu m * \mu d)} = 250 * \frac{1000}{0.95 * 0.97} = 271300 [\text{W}]$$

$$I_{dc} [\text{A}] = \frac{P_{dc} [\text{W}]}{V_{dc} [\text{V}]} = \frac{271300}{540} = 502 [\text{A}]$$

> Choosing the power supply unit and accessories:

The chosen FFE200 power supply must be able to deliver current $\geq 502[\text{A}]$ with 150% overload.

Choose the size with the appropriate voltage and current characteristics from

section "10.6 Electrical data" on page 146 (see column DC output current @ 380...500VAC – Heavy Duty):

n°1 FFE200-550-4+PRC

The added code +PRC indicates that the power supply has a precharge circuit for the condenser bank on the DC-link.

Choose the mains inductance and the FFE precharge inductance from sections "5.7 DC pre-charge unit, pre-charge inductor and contactors" on page 45 and "5.7.1 LR3-.-FFE mains inductor" on page 46:

n°1 LR3-4-FFE-550

n°1 LR3-4-PRC

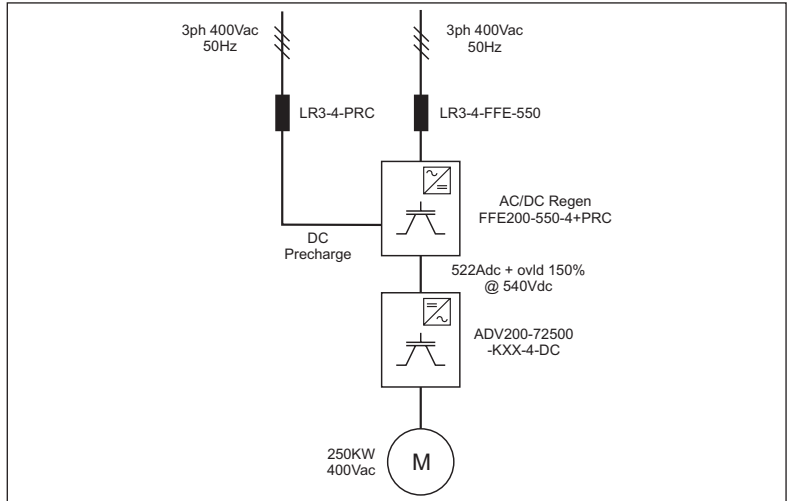


Figure A.1: Single-motor applications

A.1.2 Multi-motor applications

The application consists of 4 asynchronous motors, each controlled by a separate inverter.

The inverters are connected to a common DC-link.

The DC-link is powered by an FFE regenerative system.

The application requires 100% of motor and regenerating power of each asynchronous motor with 150% overload.

V_{mains} = three-phase 690[V]

P_{outm1} = 500 [KW] @ V_{outm1} = 690 [V]

P_{outm2} = 355 [KW] @ V_{outm2} = 690 [V]

P_{outm3} = 500 [KW] @ V_{outm3} = 690 [V]

P_{outm4} = 355 [KW] @ V_{outm4} = 690 [V]

η_m = 0.95

> Calculation of the current required on the DC-link:

$$V_{dc} = V_{mains} [V] * 1,35 = 690 * 1.35 = 930 [V]$$

$$P_{dc} [W] = (P_{out1} [kW] + P_{out2} [kW] + P_{out3} [kW] + P_{nm4} [kW]) * \frac{1000}{(\mu m^* \mu d)} =$$

$$P_{dc} [W] = (500+355+500+355) * \frac{1000}{(0.95*0.97)} = 1855670 [W]$$

$$I_{dc} [A] = \frac{P_{dc} [W]}{V_{dc} [V]} = \frac{1855670}{930} = 1995 [A]$$

> Choosing the power supply unit and accessories:

The chosen FFE200 power supply must be able to deliver current $\geq 1995[A]$ with 150% overload.

Choose the size with the appropriate voltage and current characteristics from section "10.6 Electrical data" on page 146 (see column DC output current @ 500...690VAC – Heavy Duty)

x 3 FFE200-760-6

This power supply consists of 3 modules in parallel. Only one of them (MS - master) is equipped with the precharge circuit for the total condenser bank on the DC-link.

n°1 FFE200-760-6+PRC-MS 20

n°1 FFE200-760-6-SL

n°1 FFE200-760-6-SL

Choose the mains inductance (one for each FFE module) and the precharge inductance from sections 5.7 and 5.7.1:

n°3 LR3-6-FFE-760

n°1 LR3-6-PRC

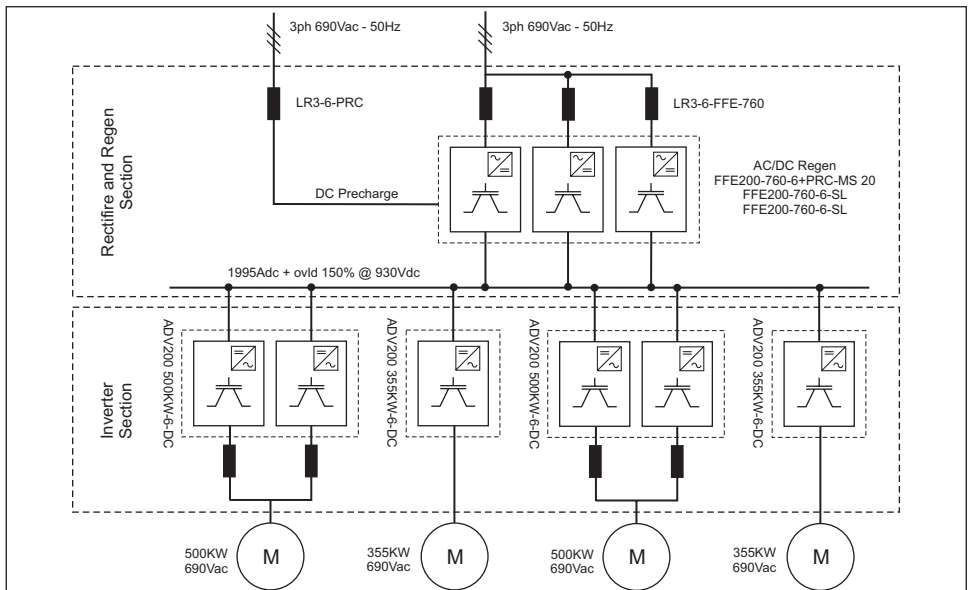


Figure A.2: Multi-motor applications

> Checking the precharge circuit

Precharge inductors LR3-...-PRC are needed to limit the current for charging the condenser bank on the DC-link.

The standard inductors and the precharge circuit integrated in the FFE module are sized in order to charge a total capacitance on the DC Link that is greater than the one on a system where the total power of the ADV200 drives linked to the DC Link corresponds to the maximum power deliverable by the FFE modules in parallel. Therefore, these systems do not generally require a check of correct precharge circuit size.

A.1.3 Multi-motor applications where regenerated power is a small percentage of motor power

This application is similar to the one described above, but in this case it requires 100% of motor power of each asynchronous motor with 150% overload, whereas regenerating power is 60% of total installed power.

In this case, the use of an FFE regenerative power supply calculated for 100% of installed power is not economical.

The best solution calls for the use of an SMB AC/DC power supply (see SMB200 manual) sized for 100% of motor power and an FFE regenerative power supply for regenerating power, connected in parallel to the SMB.

Vmains= three-phase 690[V]
Poutm1 = 500[KW] @ Voutm1 = 690[V]
Poutm2 = 355[KW] @ Voutm2 = 690[V]
Poutm3 = 500[KW] @ Voutm3 = 690[V]
Poutm4 = 355[KW] @ Voutm4 = 690[V]
 $\eta_m = 0.95$

> Calculation of the current required on the DC-link:

$$V_{dc} = V_{mains} [V] * 1,35 = 690 * 1,35 = 930 [V]$$

$$P_{dc} [W] = (P_{outm1} [kW] + P_{outm2} [kW] + P_{outm3} [kW] + P_{outm4} [kW]) * \frac{1000}{(\eta_m * \mu_d)} =$$

$$P_{dc} [W] = (500+355+500+355) * \frac{1000}{(0.95*0.97)} = 1855670 [W]$$

$$I_{dc} [A] = \frac{P_{dc} [W]}{V_{dc} [V]} = \frac{1855670}{930} = 1995 [A]$$

The chosen SMB200 power supply must be able to deliver current $\geq 1995[A]$ with 150% overload.

Choose the size with the appropriate voltage and current characteristics from sections "6.3 Electrical data" and "5.1.1 Connecting the SMB200 in parallel" of the SMB200 manual (see section DC output current 500VAC < ULN \leq 690VAC HEAVY DUTY column).

A single-module power supply is available:

SMB200-D-2500-6 is able to deliver direct current of 1920A with 150% overload for 60s every 300s.

Considering that normally the motors on the same line never absorb 100% of rat-

ed power and 150% of overload simultaneously, the SMB200-D-2500-6 could be considered suitable even if the direct current is slightly below the level calculated.

On the other hand, the FFE regenerative power supply must be sized for 60% of total installed power. Therefore:

$$P_{dc} [W] = (P_{out1} [kW] + P_{out2} [kW] + P_{out3} [kW] + P_{out4} [kW]) * \left(\frac{60}{100}\right) * \frac{1000}{(\mu m * \mu d)} =$$

$$P_{dc} [W] = (500+355+500+355) * \left(\frac{60}{100}\right) * \frac{1000}{(0.95*0.97)} = 1113402 [W]$$

$$I_{dc} [A] = \frac{P_{dc} [W]}{V_{dc} [V]} = \frac{1113402}{930} = 1197 [A]$$

The chosen FFE200 power supply must be able to deliver current $\geq 1197[A]$ with 150% overload.

Choose the size with the appropriate voltage and current characteristics from section "10.6 Electrical data" on page 146 (see column DC output current @ 500...690VAC – Heavy Duty)

2 x FFE200-690

This power supply consists of 2 modules in parallel.

n°1 FFE200-690+PRC-MS 12

n°1 FFE200-690-6-SL

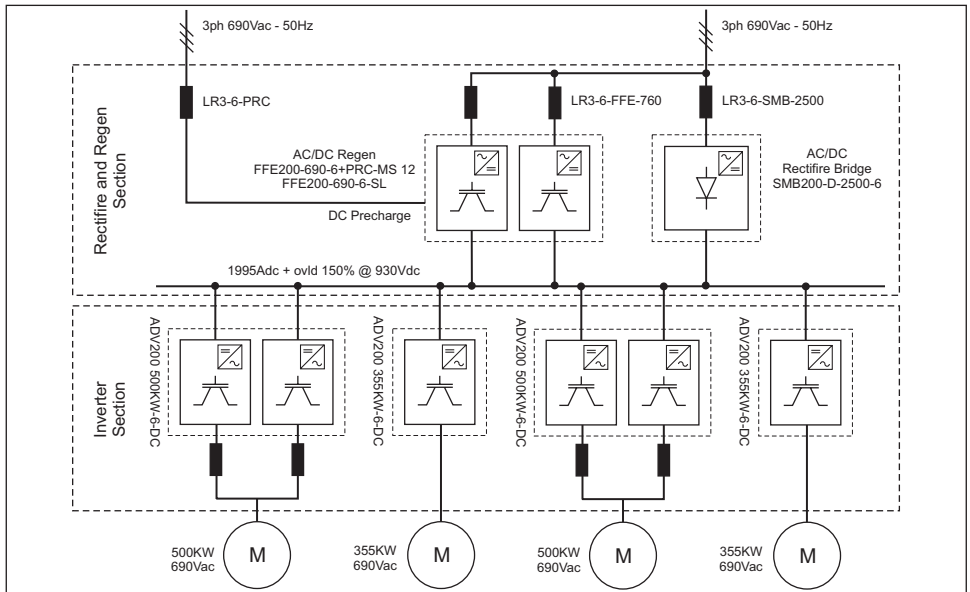


Figure A.3: Multi-motor applications with FFE200 and SMB200

> Checking the precharge circuit

Precharge inductors LR3-...-PRC are needed to limit the current for charging the condenser bank on the DC-link.

The standard inductors and the precharge circuit integrated in the FFE module are sized in order to charge a total capacitance on the DC Link that is greater than the one on a system where the total power of the ADV200 drives linked to the DC Link corresponds to the maximum power deliverable by the FFE modules in parallel.

When the DC-link is powered by an SMB AC/DC power supply and the FFE module is sized only for regenerating power, it is appropriate to check that the pre-charge circuit is correctly sized.

As specified in section "5.7 DC pre-charge unit, pre-charge inductor and contactors" on page 45 the maximum chargeable capacitance is:

- 500mF = 500000 µF for 400Vac mains
- 300mF = 300000 µF for 690Vac mains

The specified maximum capacitance includes the capacitance of the ADV200 inverters connected to the DC-link and the capacitance integrated in the FFE module/s.

The SMB module does not have integrated capacitance.

ADV200 inverter capacitance is shown for each size in the related manual.

FFE regenerative module capacitance is shown in section "10.5 DC circuit" on page 145.

For the application in question, the ADV200 inverters were sized as shown in the table.

> Check of total capacitance:

Module	Type	Capacitance [µF]
FFE Master Module	FFE200-690-6+PRC-MS 12	13600
FFE Slave Module	FFE200-690-6-SL	13600
Inverter 1	ADV200 500KW-6-DC	22400
Inverter 2	ADV200 355KW-6-DC	11200
Inverter 3	ADV200 500KW-6-DC	22400
Inverter 4	ADV200 355KW-6-DC	11200
Total		94400

Total capacity value, calculated as the sum of the capacity of each single module, is below maximum value. Therefore, the precharge circuit is suitable.

Appendix 2 - Parallel connection (400 ... 1650kW sizes)

A 2.1 Introduction

To obtain an FFE200-4 of more than FFE200-880-4 connect a number of single units of between FFE200-550-4 and FFE200-880-4 in parallel.

To obtain an FFE200-6 of more than FFE200-500-6 connect a number of single units of between FFE200-500-6 and FFE200-760-6 in parallel.

A parallel connection of several units basically consists of one MASTER unit and one or more SLAVE units.

DC Output Current (A)		Cod.	Description (Designation)	DC Output Current (A)		Cod.	Description (Designation)
SP	SL			SP	SL		
1018	1221	S9FF01M	FFE200-550-4+PRC-MS 10	945	1090	S9FF02M	FFE200-500-6+PRC-MS 09
		S9FF01S	FFE200-550-4-SL			S9FF02S	FFE200-500-6-SL
1356	1600	S9FF03M	FFE200-730-4+PRC-MS 13	1278	1511	S9FF04M	FFE200-690-6+PRC-MS 12
		S9FF03S	FFE200-730-4-SL			S9FF04S	FFE200-690-6-SL
1628	1967	S9FF05M	FFE200-880-4+PRC-MS 16	1400	1647	S9FF06M	FFE200-760-6+PRC-MS 14
		S9FF05S	FFE200-880-4-SL			S9FF06S	FFE200-760-6-SL
2034	2400	S9FF03M1	FFE200-730-4+PRC-MS 20	1918	2267	S9FF04M1	FFE200-690-6+PRC-MS 18
		S9FF03S	FFE200-730-4-SL			S9FF04S	FFE200-690-6-SL
		S9FF03S	FFE200-730-4-SL			S9FF04S	FFE200-690-6-SL
2442	2950	S9FF05M1	FFE200-880-4+PRC-MS 23	2101	2470	S9FF06M1	FFE200-760-6+PRC-MS 20
		S9FF05S	FFE200-880-4-SL			S9FF06S	FFE200-760-6-SL
		S9FF05S	FFE200-880-4-SL			S9FF06S	FFE200-760-6-SL
2712	3201	S9FF03M2	FFE200-730-4+PRC-MS 26	2557	3023	S9FF04M2	FFE200-690-6+PRC-MS 24
		S9FF03S	FFE200-730-4-SL			S9FF04S	FFE200-690-6-SL
		S9FF03S	FFE200-730-4-SL			S9FF04S	FFE200-690-6-SL
		S9FF03S1	FFE200-730-4-SL2			S9FF04S1	FFE200-690-6-SL2
3256	3933	S9FF05M2	FFE200-880-4+PRC-MS 31	2801	3293	S9FF06M2	FFE200-760-6+PRC-MS 27
		S9FF05S	FFE200-880-4-SL			S9FF06S	FFE200-760-6-SL
		S9FF05S	FFE200-880-4-SL			S9FF06S	FFE200-760-6-SL
		S9FF05S1	FFE200-880-4-SL2			S9FF06S1	FFE200-760-6-SL2
3390	4001	S9FF03M3	FFE200-730-4+PRC-MS 33	3196	3779	S9FF04M3	FFE200-690-6+PRC-MS 31
		S9FF03S	FFE200-730-4-SL			S9FF04S	FFE200-690-6-SL
		S9FF03S	FFE200-730-4-SL			S9FF04S	FFE200-690-6-SL
		S9FF03S1	FFE200-730-4-SL2			S9FF04S1	FFE200-690-6-SL2
		S9FF03S1	FFE200-730-4-SL2			S9FF04S1	FFE200-690-6-SL2
4070	4916	S9FF05M3	FFE200-880-4+PRC-MS 40	3501	4116	S9FF06M3	FFE200-760-6+PRC-MS 34
		S9FF05S	FFE200-880-4-SL			S9FF06S	FFE200-760-6-SL
		S9FF05S	FFE200-880-4-SL			S9FF06S	FFE200-760-6-SL
		S9FF05S1	FFE200-880-4-SL2			S9FF06S1	FFE200-760-6-SL2
		S9FF05S1	FFE200-880-4-SL2			S9FF06S1	FFE200-760-6-SL2

Master unit

this is the only one to have the regulation card and keypad. It differs from the standard single unit in that the power section control card (INT-P-ADV) is reconfigured to function as MASTER and includes one or more MASTER - SLAVE (INT-SLAVE) interface cards, one card for each slave that is connected.

The MASTER - SLAVE interface is achieved via a specific signal cable included in the SLAVE FFE packaging.

Slave unit

It differs from the standard single unit in that it has a dedicated power section control card (INT-P-ADV) and there is no regulation card or keypad.

INT-P-ADV-FFE-MASTER card

The INT-P-ADV-FFE-MASTER card provided with one or more INT-SLAVE cards, acts as the interface between the R-ADV regulation card and the power section of the master unit and all the slave units. It also performs the following functions:

- current signal scaling (via dip switch, factory-set)
- hardware dead time compensation
- alarm signal management (including local diagnostics via LED)
- temperature signal management.

INT-P-ADV-FFE-SLAVE card

The INT-P-ADV-FFE-SLAVE card interfaces between the power section of the slave unit and the master unit. It also performs the following functions:

- alarm signal management (including local diagnostics via LED)
- temperature signal management.

INT-SLAVE card

The INT-SLAVE interface card manages communication between a master unit and a slave unit.

The INT-SLAVE cards are mounted on the master unit, their number corresponding to that of the slaves that are connected (max. 4 slaves).

The INT-SLAVE card is factory-set.

A 2.2 Compatibility of IGBT modules

Starting from July 2015, the following 690V products based on power stack 315kW and 355kW, which use IGBT modules "INFINEON" branded, will be manufactured with power modules "FUJI" branded too. Both types have same mechanical dimensions but they cannot be combined together.

MODEL	Code	Type
INFINEON	S8HRS20	MODULE-IGBT6-1K7V 450A
FUJI	S8HRS44	MODULE-IGBT6-1K7V 450A

Code	Type	Product configuration with Module INFINEON	Product configuration with Module FUJI
S9FF04	FFE200-690-6+PRC	A1	A2
S9FF04M	FFE200-690-6+PRC-MS 12		
S9FF04S	FFE200-690-6-SL		
S9FF04X	FFE200-690-6+PRC		
S9FF10	FFE200-690-6		

.....



When replacing the IGBT modules on an existing product, it must be checked the "Prod Configuration" on the label for the correct replacement. IGBT module installed in the drive must be all the same type. See "Firmware & cards revision" in chapter **"2.1 Product type designation" on page 11**.

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The following rules must be strictly followed:

- IGBT modules installed in the drive must be all same type / typology.
- Master / Slave products configuration must necessarily be made with the same IGBT type. It will be not possible to use drive with different product configuration between master and slave.
- For repair in field, the replacement of an IGBT module may be carry out with same type. It will be not possible to use drive Master with Infineon power module and drive Slave with Fuji power module and vice versa.

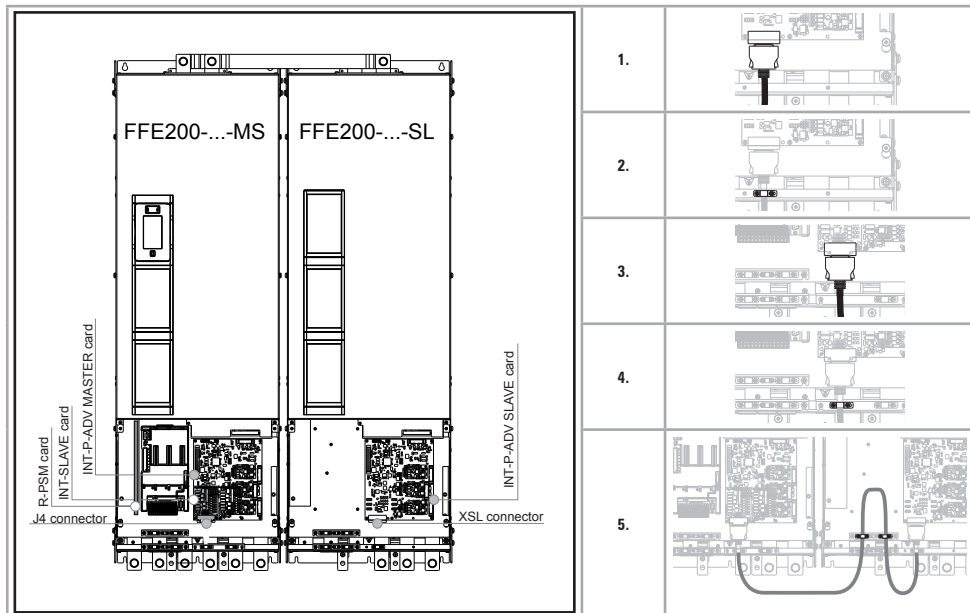
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A 2.3 MS-SL interface cable wiring (2 parallel)

Fit the FFE200 MASTER and SLAVE power supplier units inside the electrical panel. Connect all the power section cables and connect the signal cable for interfacing between the 2 FFE200.



The cable (code 8S860B) for connecting 2 FFE200 is one meter long and has two quick coupling male MDR connectors at the ends.



Wiring instructions:

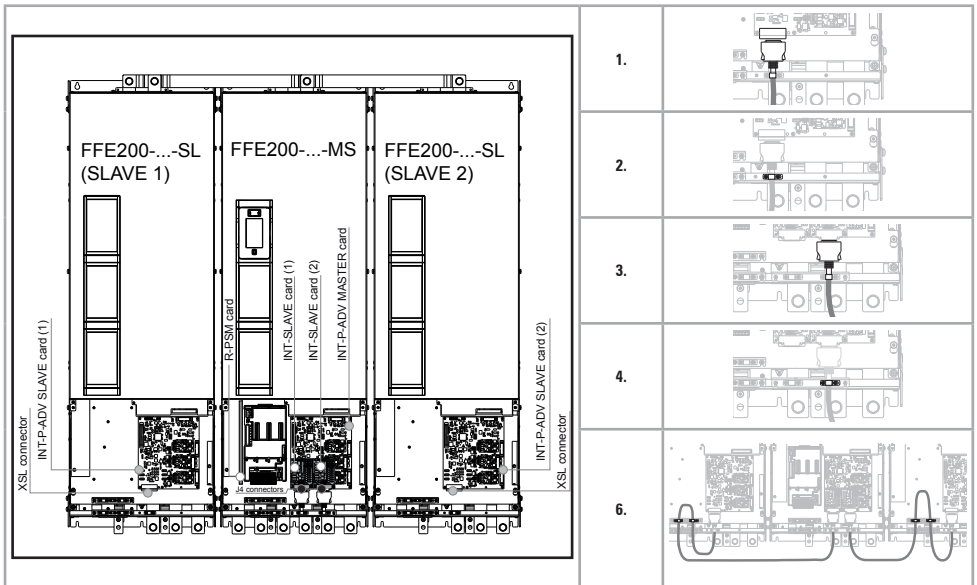
4. Connect one of the 2 ends of the interface cable to the XSL connector of the INT-P-ADV-FFE-SLAVE card.
5. Secure the cable using the specific clamp.
6. Connect the other end of the cable to connector J4 of the INT-SLAVE card mounted on the INT-P-ADV-FFE-MASTER card of the MASTER FFE.
7. Secure the cable in the relative clamp
8. To prevent the interface cable from coming into contact with the power terminals, fold the excess length of cable inside the SLAVE FFE as shown in the figure and secure it using the specific cable clamps.

A 2.4 MS-SL interface cable wiring (3 parallel)

Fit the FFE200 MASTER and SLAVE power supplier inside the electrical panel.
Connect all the power section cables and connect the 2 signal cables for interfacing between the 3 FFE200.



The cable (code 8S860B, x 2) for connecting the FFE200 is one meter long and has two quick coupling male MDR connectors at the ends.

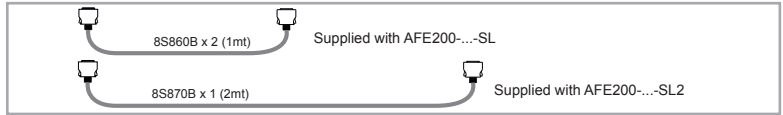


Wiring instructions:

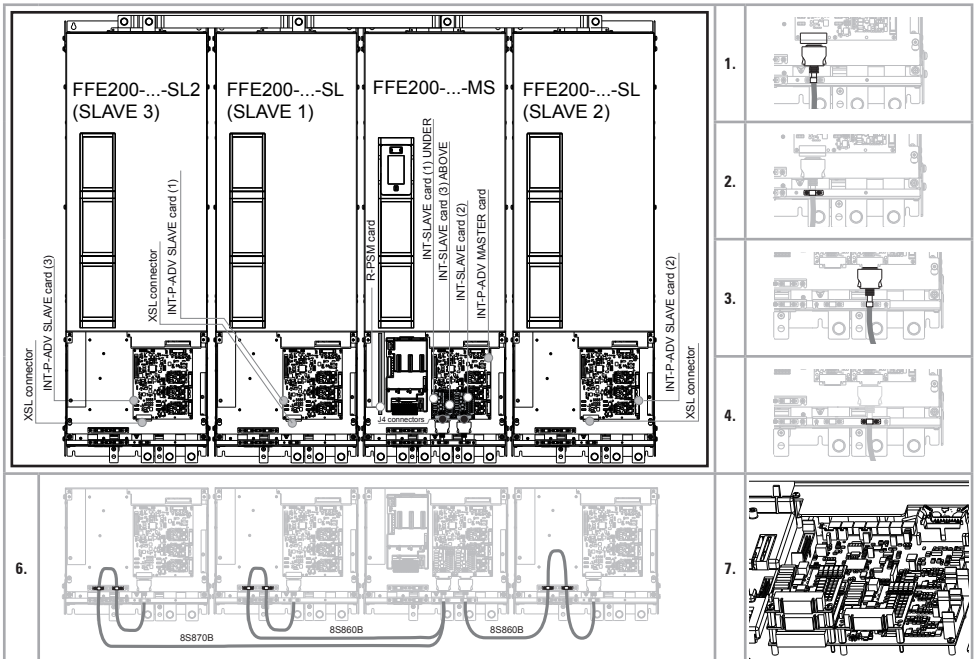
1. Connect one of the 2 ends of the interface cable to the XSL connector of the INT-P-ADV-FFE-SLAVE (SLAVE 2) card.
2. Secure the cable using the specific clamp.
3. Connect the other end of the cable to connector J4 of the INT-SLAVE (2) card mounted on the INT-P-ADV-FFE-MASTER card of the MASTER FFE.
4. Secure the cable in the relative clamp
5. Repeat steps 1-2-3-4 for SLAVE 1.
6. To prevent the interface cables from coming into contact with the power terminals, fold the excess length of cable inside the SLAVE FFE as shown in the figure and secure it using the specific cable clamps.

A 2.5 MS-SL interface cable wiring (4 parallel)

Fit the FFE200 MASTER and SLAVE power supplier inside the electrical panel.
Connect all the power section cables and connect the 3 signal cables for interfacing between the 4 FFE200.



The cables (code 8S860B x 2 + code 8S870B x 1) for connecting the FFE200-...-SL and FFE200-...-SL2 are respectively one and two meters long and have two quick coupling male MDR connectors at the ends.

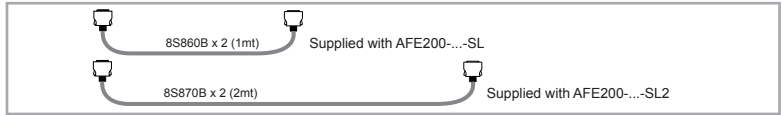


Wiring instructions:

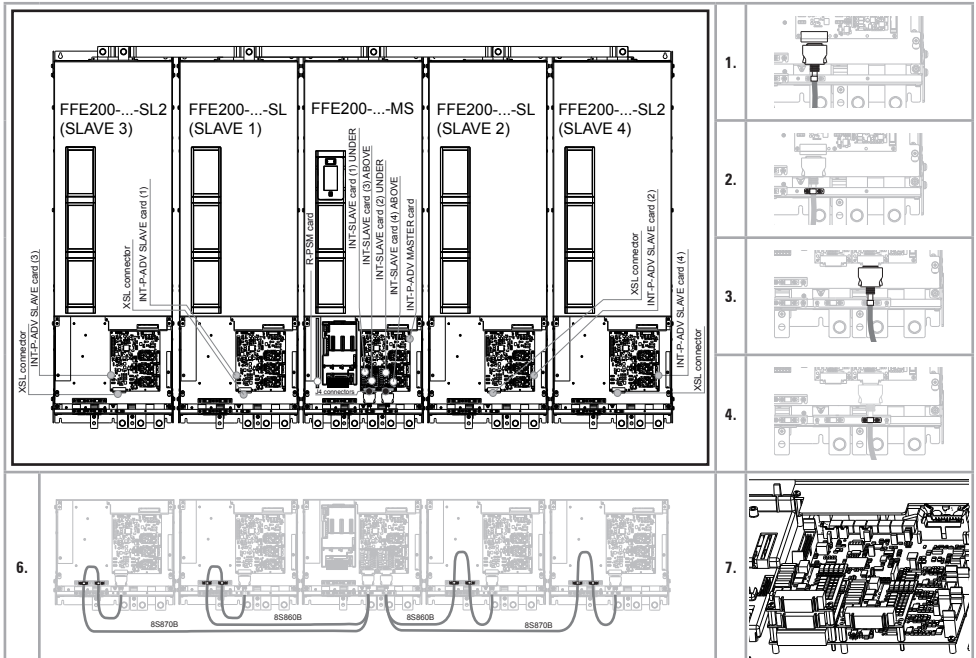
1. Connect one of the 2 ends of the interface cable to the XSL connector of the INT-P-ADV-FFE-SLAVE (SLAVE 2) card.
2. Secure the cable using the specific clamp.
3. Connect the other end of the cable to connector J4 of the INT-SLAVE (2) card mounted on the INT-P-ADV-FFE-MASTER card of the MASTER FFE.
4. Secure the cable in the relative clamp
5. Repeat steps 1-2-3-4 for SLAVE 1 and SLAVE 3 (see figures 6-7 for INT-SLAVE position on the INT-P-ADV-FFE-MASTER and wiring)
6. To prevent the interface cables from coming into contact with the power terminals, fold the excess length of cable inside the SLAVE FFE as shown in the figure and secure it using the specific cable clamps.

A 2.6 MS-SL interface cable wiring (5 parallel)

Fit the FFE200 MASTER and SLAVE power supplier inside the electrical panel.
Connect all the power section cables and connect the 4 signal cables for interfacing between the 5 FFE200.



The cables (code 8S860B x 2 + code 8S870B x 2) for connecting the FFE200-...-SL and FFE200-...-SL2 are respectively one and two meters long and have two quick coupling male MDR connectors at the ends.



Wiring instructions:

1. Connect one of the 2 ends of the interface cable to the XSL connector of the INT-P-ADV-FFE-SLAVE (SLAVE 2) card.
2. Secure the cable using the specific clamp.
3. Connect the other end of the cable to connector J4 of the INT-SLAVE (2) card mounted on the INT-P-ADV-FFE-MASTER card of the MASTER FFE.
4. Secure the cable in the relative clamp
5. Repeat steps 1-2-3-4 for SLAVE 1, SLAVE 3 and SLAVE 4 (see figures 6-7 for INT-SLAVE position on the INT-P-ADV-FFE-MASTER and wiring)
6. To prevent the interface cables from coming into contact with the power terminals, fold the excess length of cable inside the SLAVE FFE as shown in the figure and secure it using the specific cable clamps.

A 2.7 Jumpers and Switches

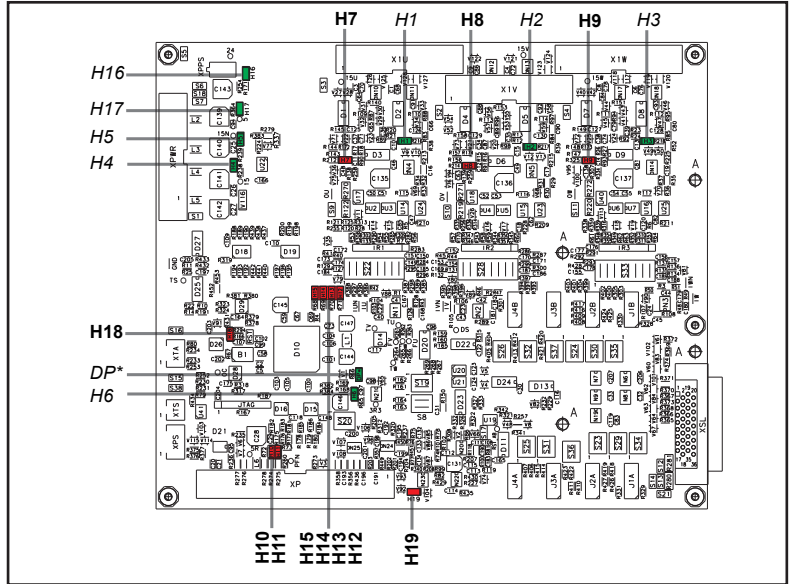
INT-P-ADV (MASTER and SLAVE) cards

The jumpers and switches on these cards are factory-set. DO NOT change these settings.

A 2.8 LEDs

The cards incorporate a LED diagnostics system for rapid analysis of everything happening on a multi-unit FFE.

INT-P-ADV-FFE (MASTER and SLAVE) cards

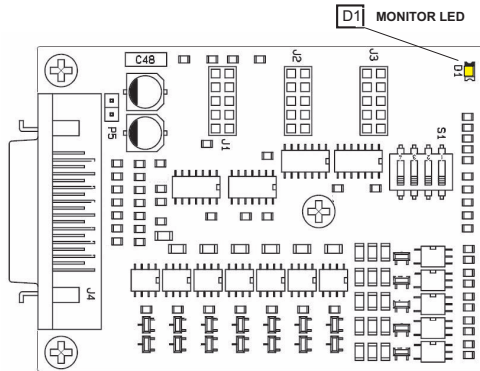


LEDS	Colour	FUNCTION	Normal functioning
MONITOR			
H1	Green	+15V_PWR_U monitor	On
H2	Green	+15V_PWR_V monitor	On
H3	Green	+15V_PWR_W monitor	On
H4	Green	+15V monitor	On
H5	Green	-15V monitor	On
H6	Green	+3,3V monitor	On
H16	Green	+24V monitor	On
H17	Green	+5V monitor	On
DP*	Green	It switches on after power supply start-up when the FPGA configuration sequence is complete	On

LEDS	Colour	FUNCTION		Normal functioning
ALARM				
H7	Red	PHASE U	They light up to indicate a short circuit between the output phases	Off
H8	Red	PHASE V		Off
H9	Red	PHASE W		Off
H10	Red	It lights up to indicate a power rectifier heat sink overtemperature		Off
H11	Red	It lights up to indicate overtemperature of the air inside the FFE		Off
H12	Red	IGBT U	They light up to indicate loss of the feedback signal relating to the moment the IGBT devices are switched on. The signal is used for hardware dead time compensation	Off
H13	Red	IGBT V		Off
H14	Red	IGBT W		Off
H15	Red	<p>It lights up in case of overtemperature of one of the IGBT devices. The signal temperature relating to the hotter of the master and slave IGBT devices is sent to the regulation card.</p> <p>A temperature signal is also sent automatically to the regulation card in case of minimum temperature, which could occur in the event of a fault in one of the temperature reading circuits.</p> <p>The loss of one of the temperature signals is indicated by LED H15, with the code indicated by the number of flashes (*): the sequence of flashes to indicate the faulty PHASE or SLAVE has a 3Hz frequency and is repeated cyclically every 5 seconds.</p>		Off
H18	Red	<p>It lights up on the INT-P-ADV MASTER card to indicate that the FFE's total current (master + slave) has exceeded the overcurrent value for the size of FFE, whereas it lights up on the INT-P-ADV SLAVE card to indicate that the SLAVE current has only exceeded the overcurrent value of the SLAVE.</p>		Off
H19	Red	It lights up to indicate a fault on the DC-BUS power supply regulation card		Off

(*) Led H15 code indicated by number of flashes	NO. FLASHES
PHASE U	1
PHASE V	2
PHASE W	3
SLAVE 1	4
SLAVE 2	5
SLAVE 3	6
SLAVE 4	7

INT-SLAVE cards



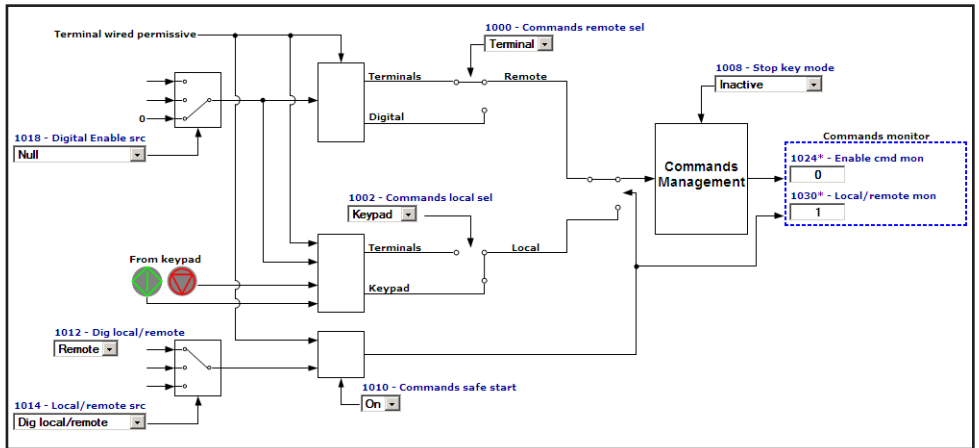
LEDS	Colour	FUNCTION	Normal functioning
MONITOR			
D1	Yellow	It flashes to indicate the presence of the temperature signal of the slave FFE that is connected	Flashes

System Diagrams Index

DRIVE OVERVIEW	DrvOverview
REFERENCE	Reference
COMMANDS	Commands
DIGITAL INPUTS	DigInps
DIGITAL OUTUTS	DigOuts

AnalInps	ANALOG INPUTS
AnalOuts	ANALOG OUTPUTS
CurrCtrl	CURRENT CONTROL
ActCurrConf	ACTIVE CURR CONFIG
Functions	FUNCTIONS

Commands



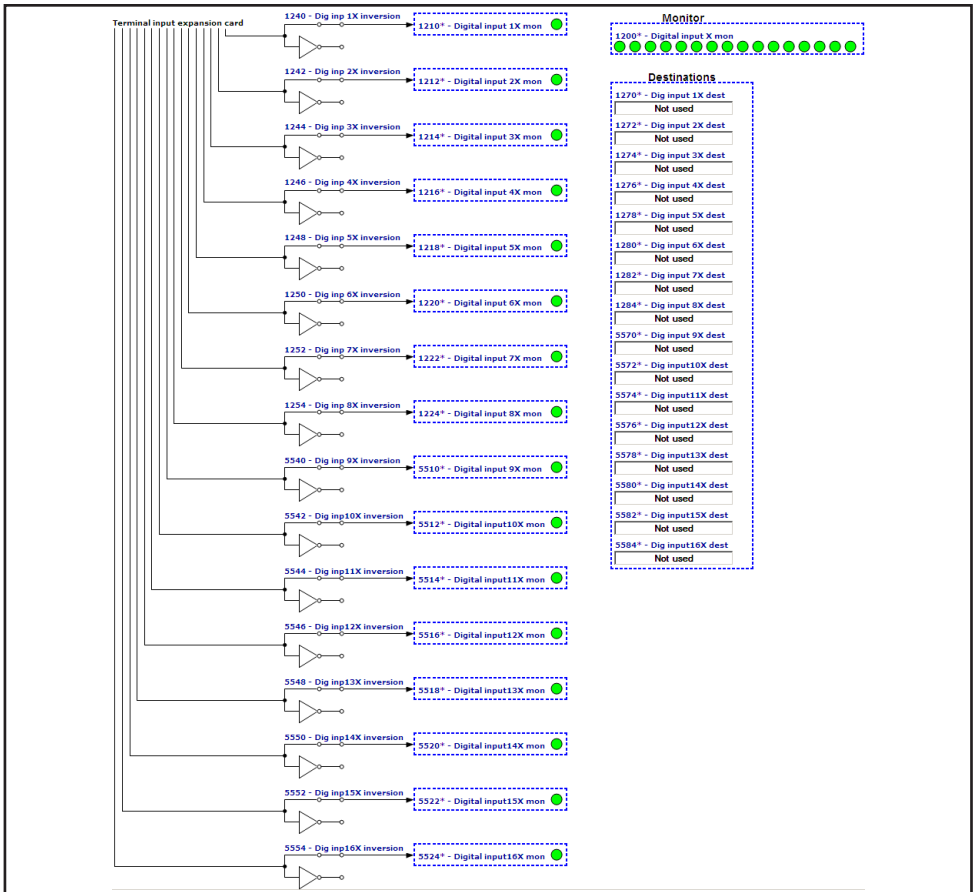
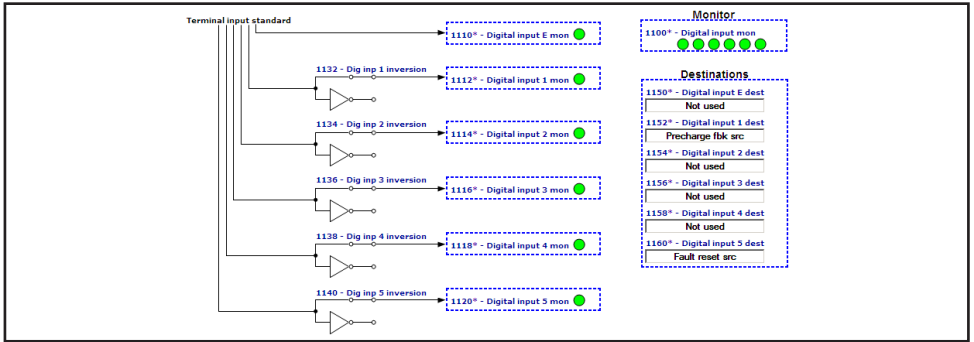
Digital inputs

DIGITAL INPUTS STANDARD

DigInpStd

DIGITAL INPUTS EXPANSION CARD

DigInpExp



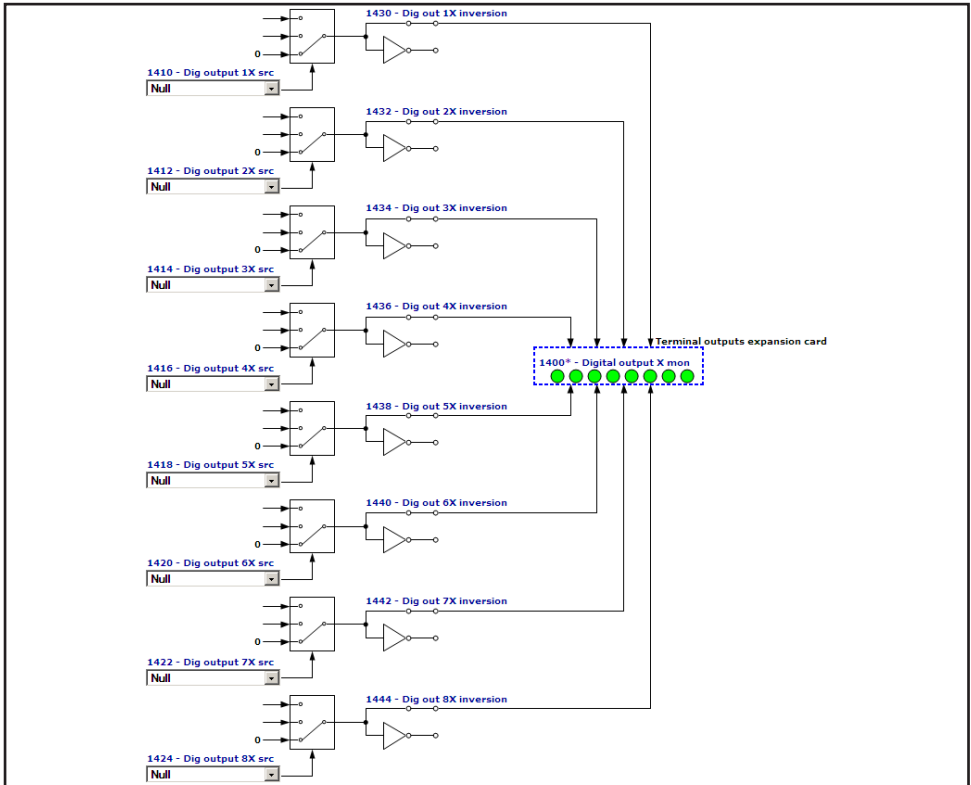
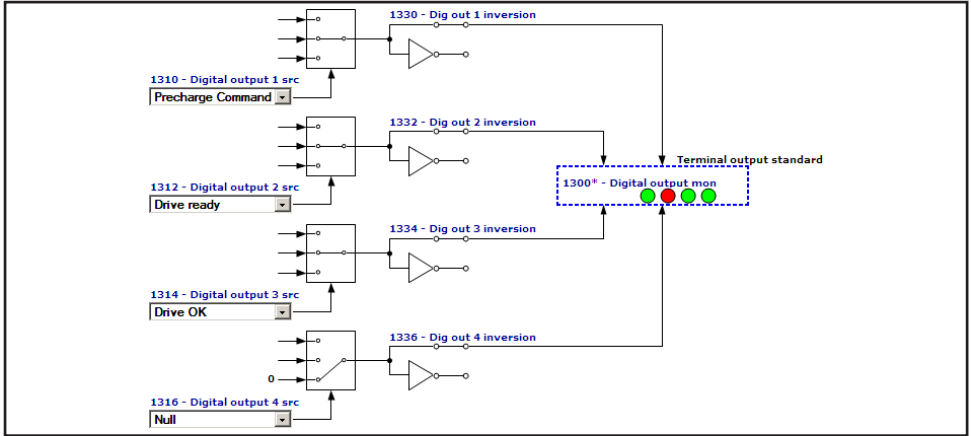
Digital outputs

DIGITAL OUTPUTS STANDARD

DigOutStd

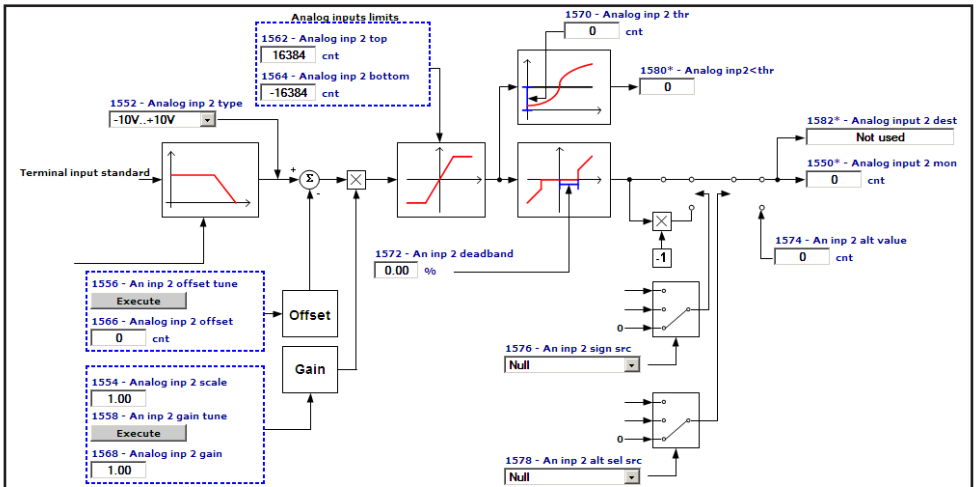
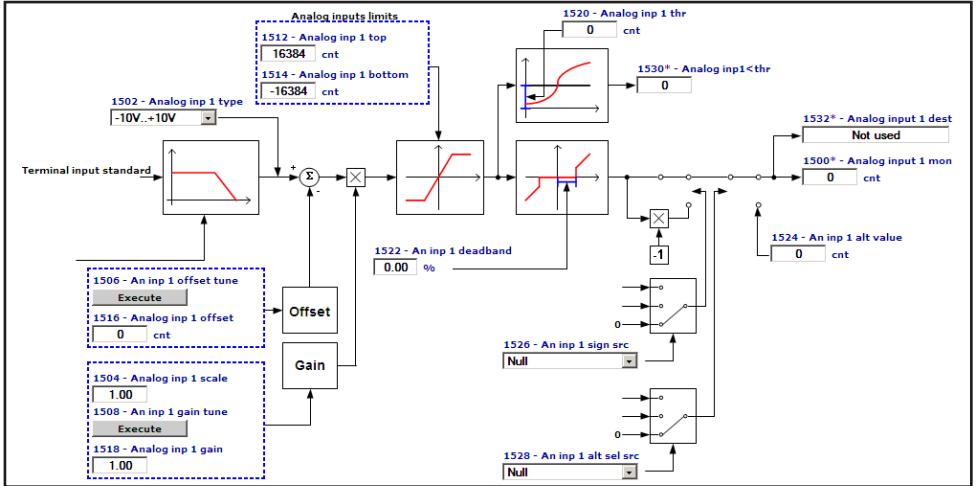
DIGITAL OUTPUTS EXPANSION CARD

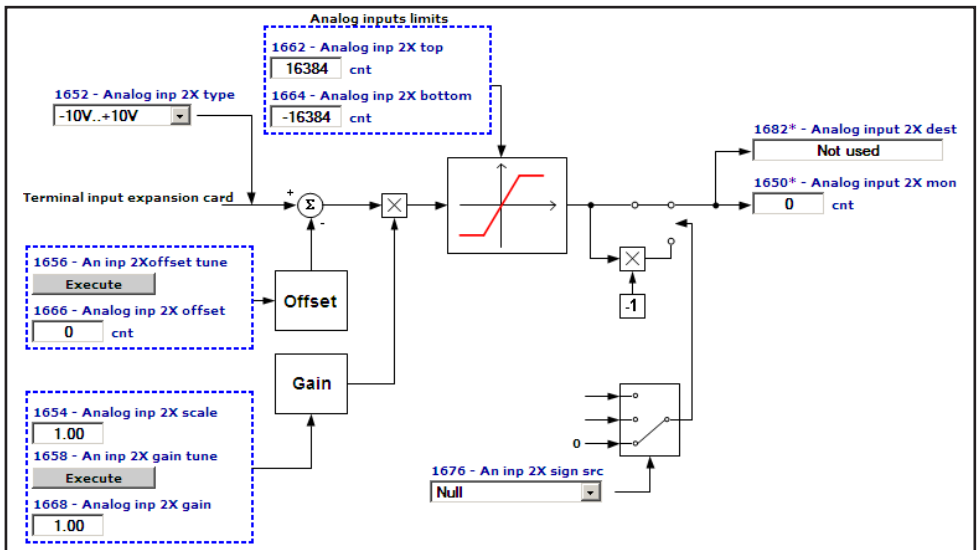
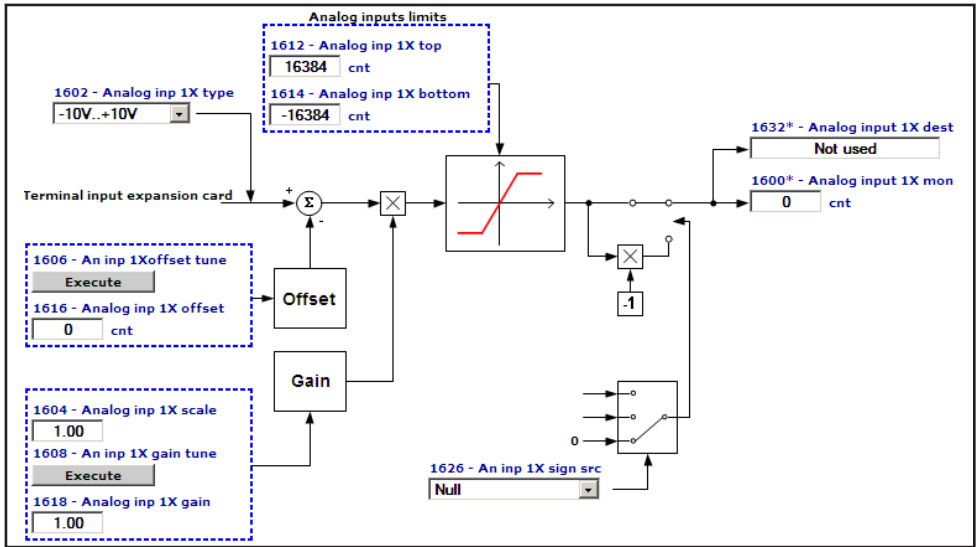
DigOutExp



Analog inputs

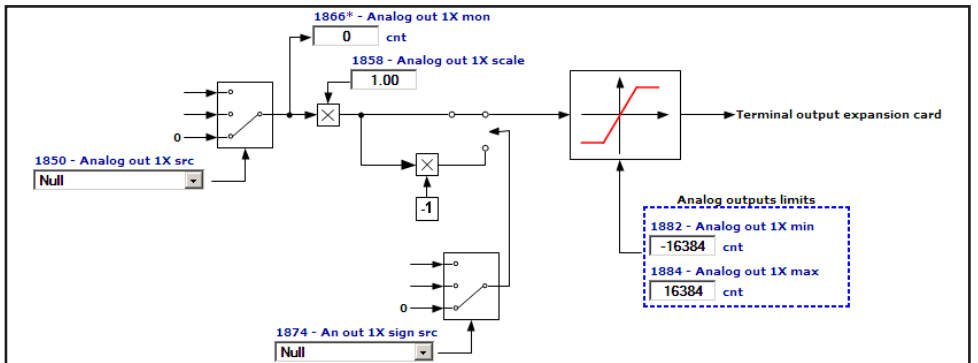
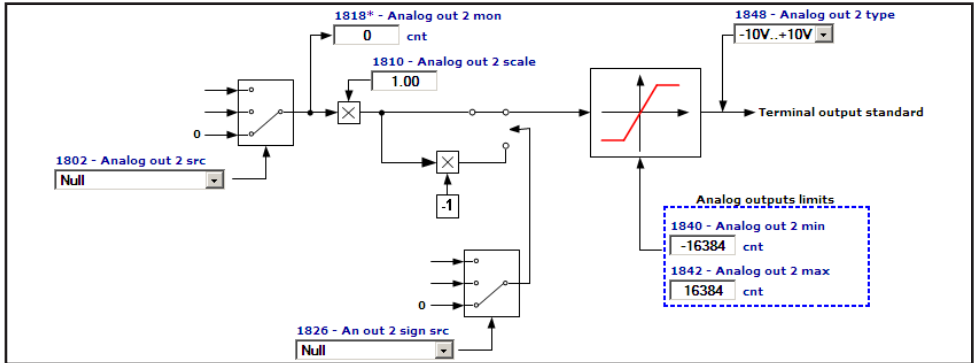
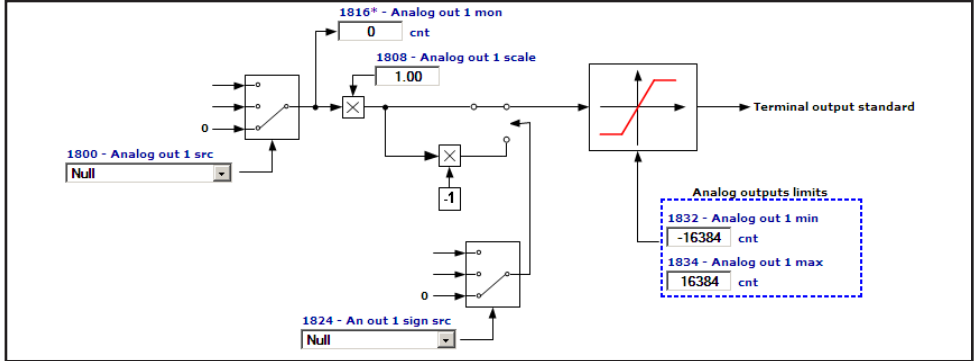
- ANALOG INPUT 1 STANDARD
- ANALOG INPUT 2 STANDARD
- ANALOG INPUT 1 EXPANSION CARD
- ANALOG INPUT 2 EXPANSION CARD

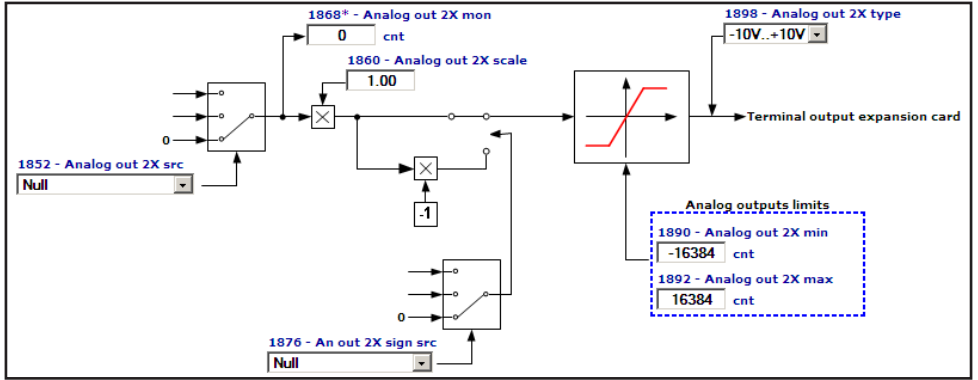




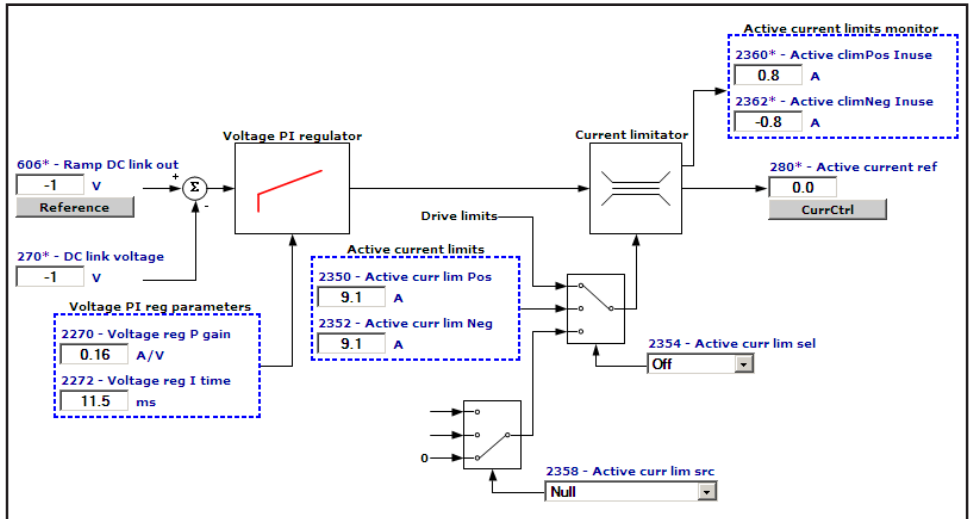
Analog outputs

ANALOG OUTPUT 1 STANDARD	AnOut1Std
ANALOG OUTPUT 2 STANDARD	AnOut2Std
ANALOG OUTPUT 1 EXPANSION CARD	AnOut1Exp
ANALOG OUTPUT 2 EXPANSION CARD	AnOut2Exp





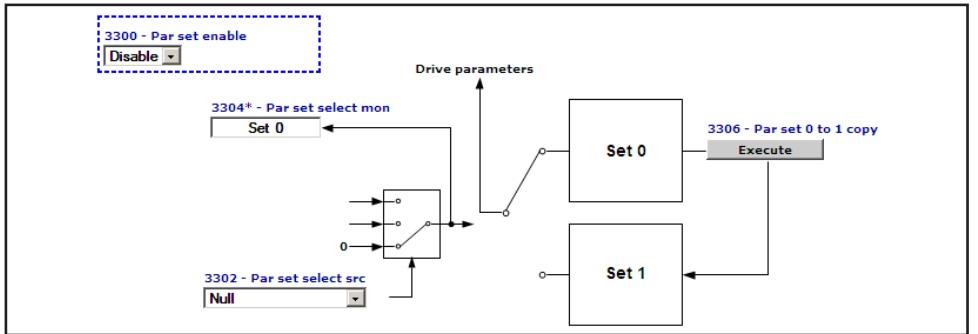
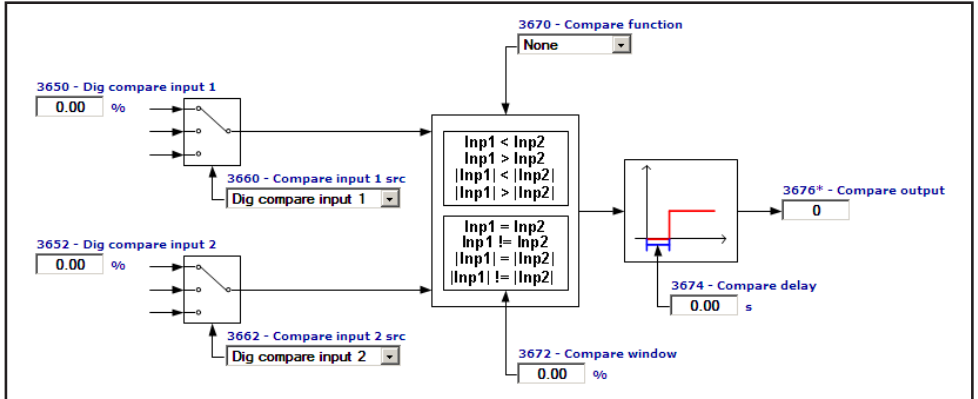
Active Curr Config



Functions

DOUBLE PAR SET

COMPARE



Instruction Manual

Series: FFE200

Revision: 1.1

Date: 25-11-2022

Code: 1S9FFEN

WEG Automation Europe S.r.l.

Via Giosuè Carducci, 24

21040 Gerenzano (VA) · Italy

Technical Assistance: technohelp@weg.net

Customer Service: salesmotion@weg.net