INVERTER SIEMENS S120

for

HI POWER UNITS

Index

1 INTRODUCTION

SIEMENS S120 is an inverter with special software for hydraulic systems, that controls the phase of travel in upward direction and, with prearranged hydraulic power units, also the travel in downward direction. This inverter is able to work both with old and new hydraulic power units.

The advantages are:

- **No starting current peaks. The maximum starting current is the rated current.**
- **Power factor correction of absorbed current. Cosφ≥0.98.**
- **Energy saving.**
- **Run comfort optimization.**
- **Adjustable inspection speed.**
- **Possibility of setting a maximum limit for the absorbed power from the mains, to limit the installed power.**

NOTES:

For further insights regarding the functions of the Siemens S120, refer to the corresponding manuals Siemens, available on the website of the company.

All information, product manuals and details, could be found at the internet address: http://support.automation.siemens.com

2 SAFETY INSTRUCTIONS AND PRECAUTIONS

Read all of this manual before powering the equipment, following step by step the procedures.

2.1 SAFETY INSTRUCTIONS

Carefully follow the procedures given below, to prevent the risk of serious accidents.

1- **The leakage current from the inverter to earth is greater than 30mA**, therefore a differential switch with **Id of at least 300mA, type B or type A**, must be provided. Regulations require the use of a cable with a section of at least 10 mm² for the earth connection. **If the differential switch trips when the main power switch is closed, do not repeat the operation in succession, because the inverter could become permanently damaged.**

2- If the parameters are incorrect, the inverter can cause the motor to rotate at a speed higher than synchronous speed. Do not run the motor beyond its electrical and mechanical limits. The installer is responsible for ensuring that movements occur in safe conditions, without exceeding the specified operating limits.

3- Risk of electrocution. Power on the inverter only with the front cover fitted. **NEVER** remove the cover during operation. Before carrying out any operation on the equipment, disconnect the power supply and wait a few minutes for the internal capacitors to discharge.

4- The external braking resistor heats up during operation. Do not install it near or in contact with inflammable materials. To improve heat dissipation it is advisable to fix it to a metal plate. Make sure it is suitably protected and cannot be touched.

5- The inverter must always be connected to the mains. In case of an interruption, wait at least 1 minute before reconnecting. **RECONNECTING WITHOUT WAITING LONG ENOUGH WILL DAMAGE THE INVERTER.**

6- Do not use an oscilloscope or similar instruments to test the internal circuits of the inverter. This type of operation must be performed only by specialized personnel.

2.2 PRECAUTIONS

Carefully follow the procedures given in the manual to avoid the risk of damaging the inverter.

1- Do not connect the equipment to a voltage higher than that permissible. An excessive voltage can cause permanent damage to the internal components.

2- **To avoid damaging the inverter in case of prolonged stoppages with no power supply, before restarting proceed as follows:**
- **If the inverter has been idle for several months, connect it to the power supply for at least 1 hour in order to regenerate the bus capacitors.**
- **If the inverter has been idle for more than one year, power it for 1 hour at 50% less than the nominal voltage, and then for 1 hour at nominal voltage.**

3- Do not connect capacitors to the inverter outputs.

4- Before resetting an inverter fault, carefully check what caused activation of the protection.

5- Use an inverter with rated current equal to or higher than the motor rated current.

3 POWER MODULE

3.1 POWER MODULE BLOCKSIZE (PM340)

3.1.1 Description

The Power Module in the Blocksize format are the inverter power modules and theirs size are identified with letters, from FSA to reach FSF.
They consist of the following components:

- Line-side diode rectifier
- DC link electrolytic capacitors with pre-charging circuit
- Output inverter
- Braking chopper for (external) braking resistor
- 24 V DC / 1 A power supply
- Gating unit, actual value acquisition
- Fan to cool the power semiconductors

The Power Modules cover the power range to 90.0 kW (178A) and are supplied in versions with line filter with reference to the standard EN 61800-3

Table 1 Overview, Power Modules PM340 (selection)

	
Power Module frame size FSB, with and without integrated line filter	Power Module frame size FSC, with and without integrated line filter

		
Power Module frame size FSD, with and without integrated line filter	Power Module frame size FSE, with and without integrated line filter	Power Module frame size FSF, with and without integrated line filter

3.1.2 Safety instructions

WARNING

Danger of fire through overheating caused by insufficient ventilation and installation Clearances
Insufficient ventilation and installation clearances result in overheating with danger to persons as a result of smoke and fire.

- Always mount the Power Module in a vertical position.
- Maintain the following clearances between the components when mounting (*):
  - Frame size FSA: 30 mm (1.18 inches)
  - Frame size FSB: 40 mm (1.57 inches)
  - Frame size FSC: 50 mm (1.96 inches)
- Maintain the following ventilation clearances above and below the component:
  - Frame sizes FSA and FSB: 100 mm (3.93 inches)
  - Frame size FSC: 125 mm (4.92 inches)
  - Frame sizes FSD and FSE: 300 mm (11.81 inches)
  - Frame size FSF: 350 mm (13.77 inches).
- Maintain the following ventilation clearances in front of the component:
  - Frame sizes FSB to FSF: 30 mm (1.18 inches)
- Ensure that the cooling air flow of the Power Modules can flow unrestricted.

(*)The Power Modules can be mounted side by side without base components up to an ambient temperature of 40° C.
In combination with base components and at ambient temperatures of 40° C to 55° C, the specified lateral minimum clearances must be observed. Where combinations of different frame sizes are concerned, the longer of the two clearances shall apply.

3.1.4 Interface description

Overview

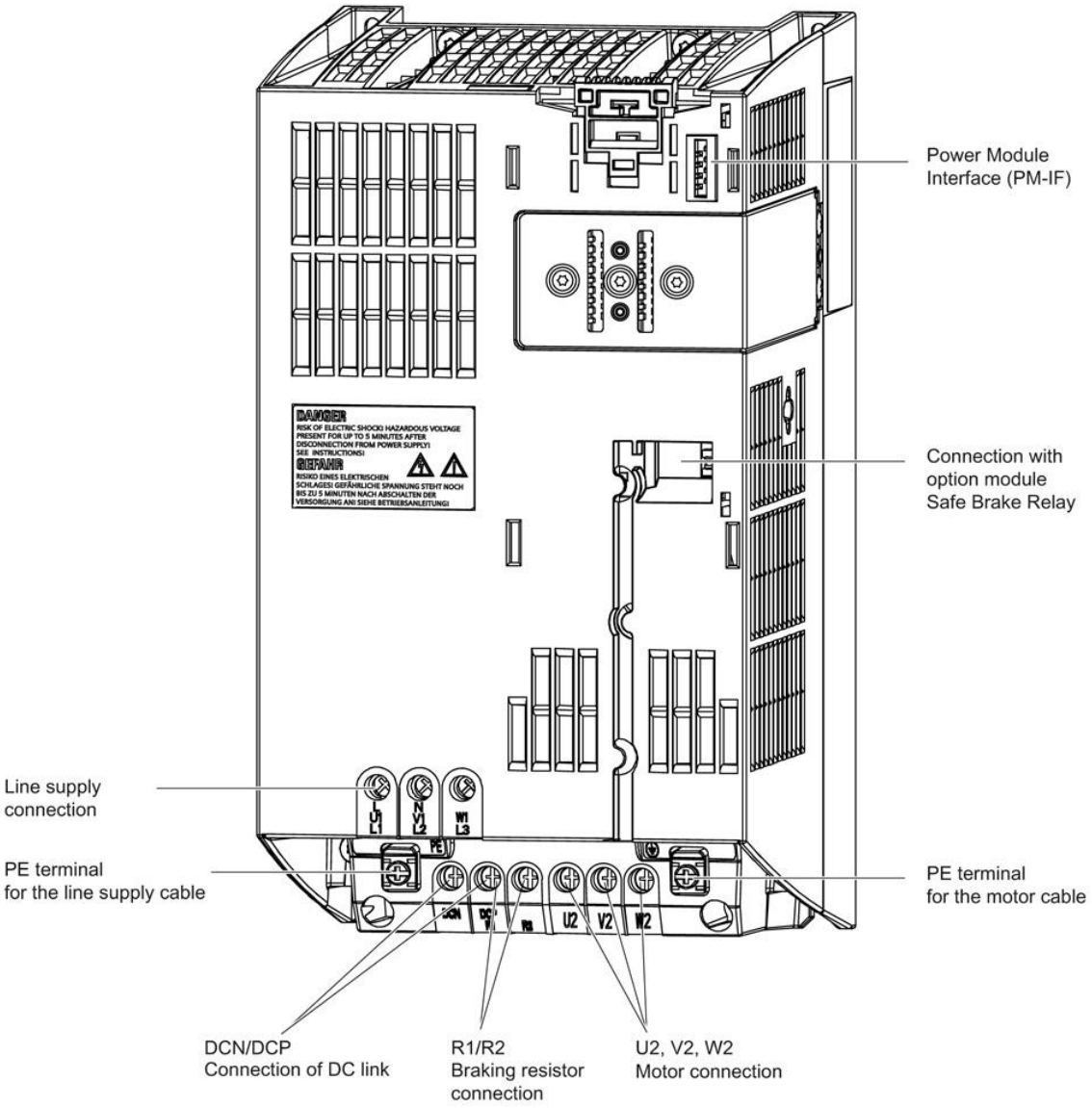


Figure 1 PM340, frame size FSB

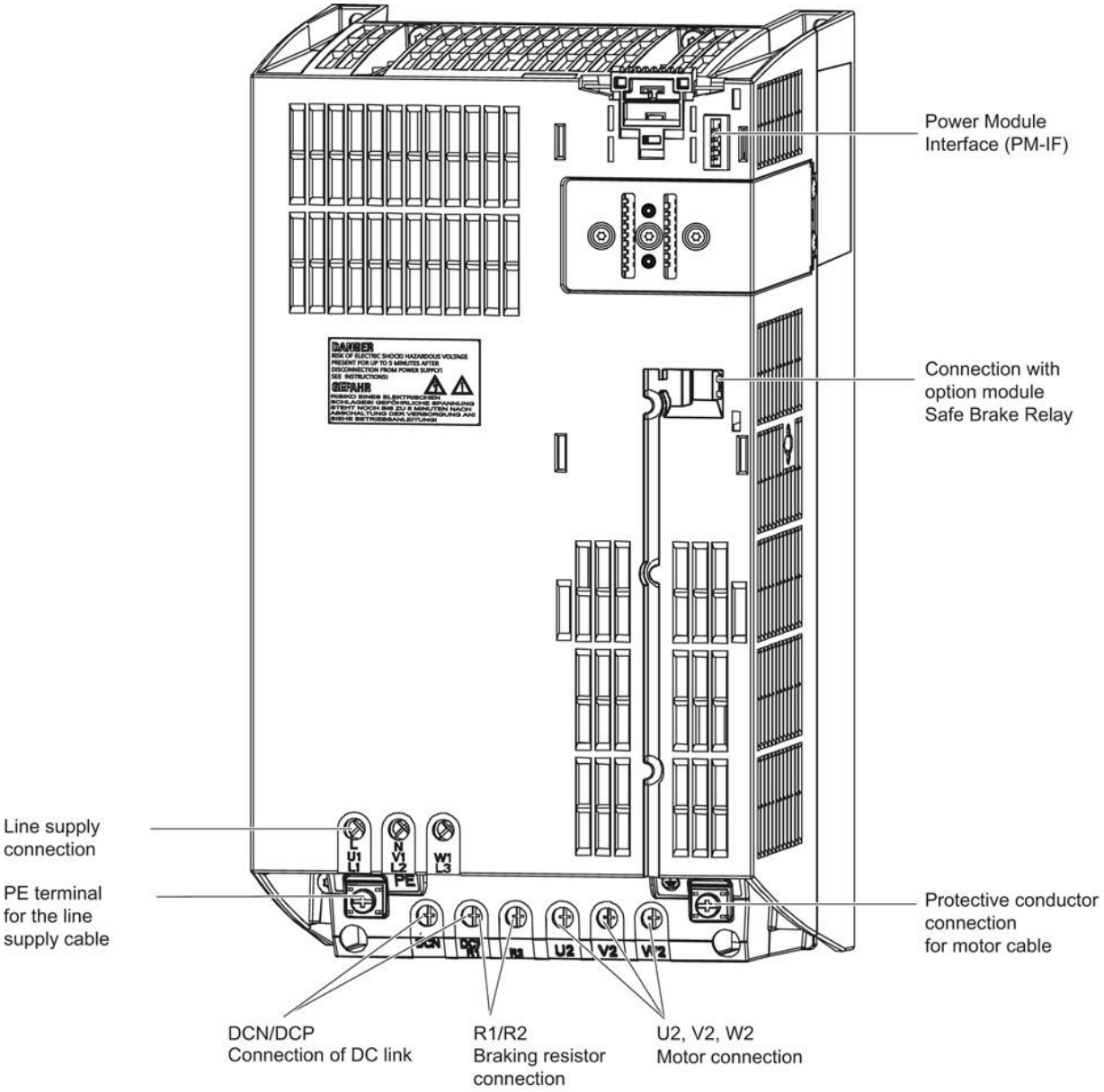


Figure 2 PM340, frame size FSC

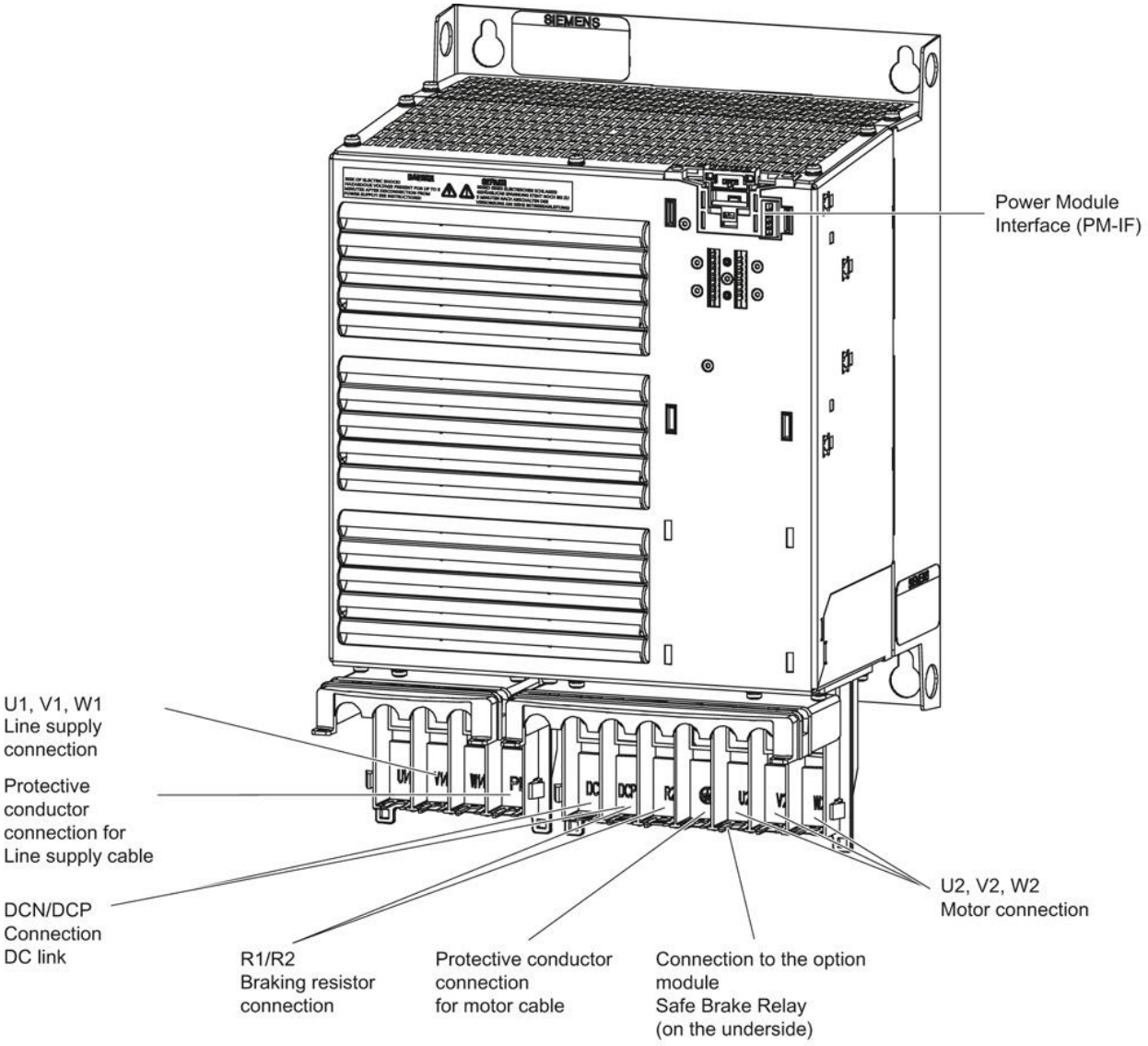


Figure 3 PM340, frame size FSD

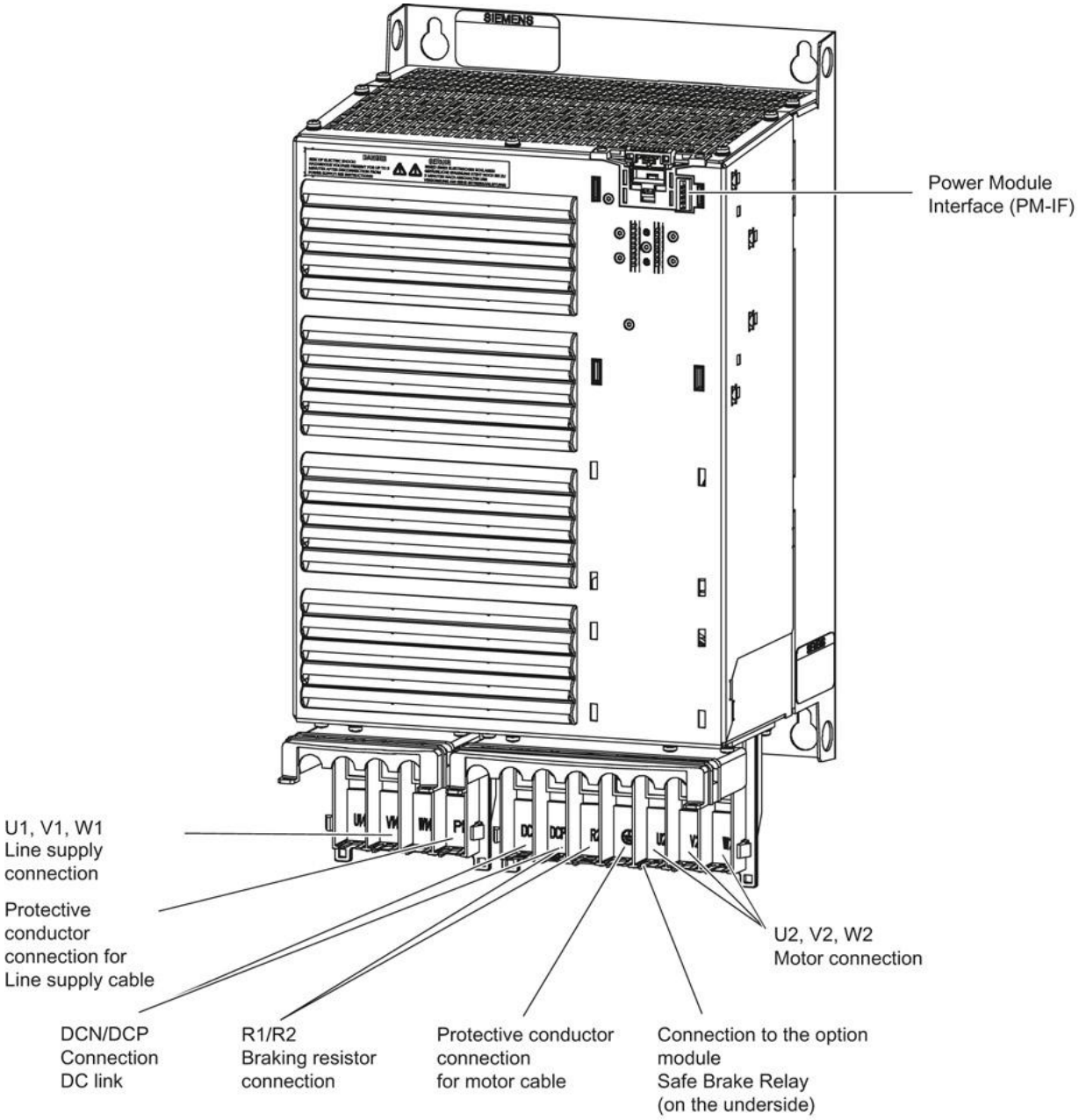


Figure 4 PM340, frame size FSE

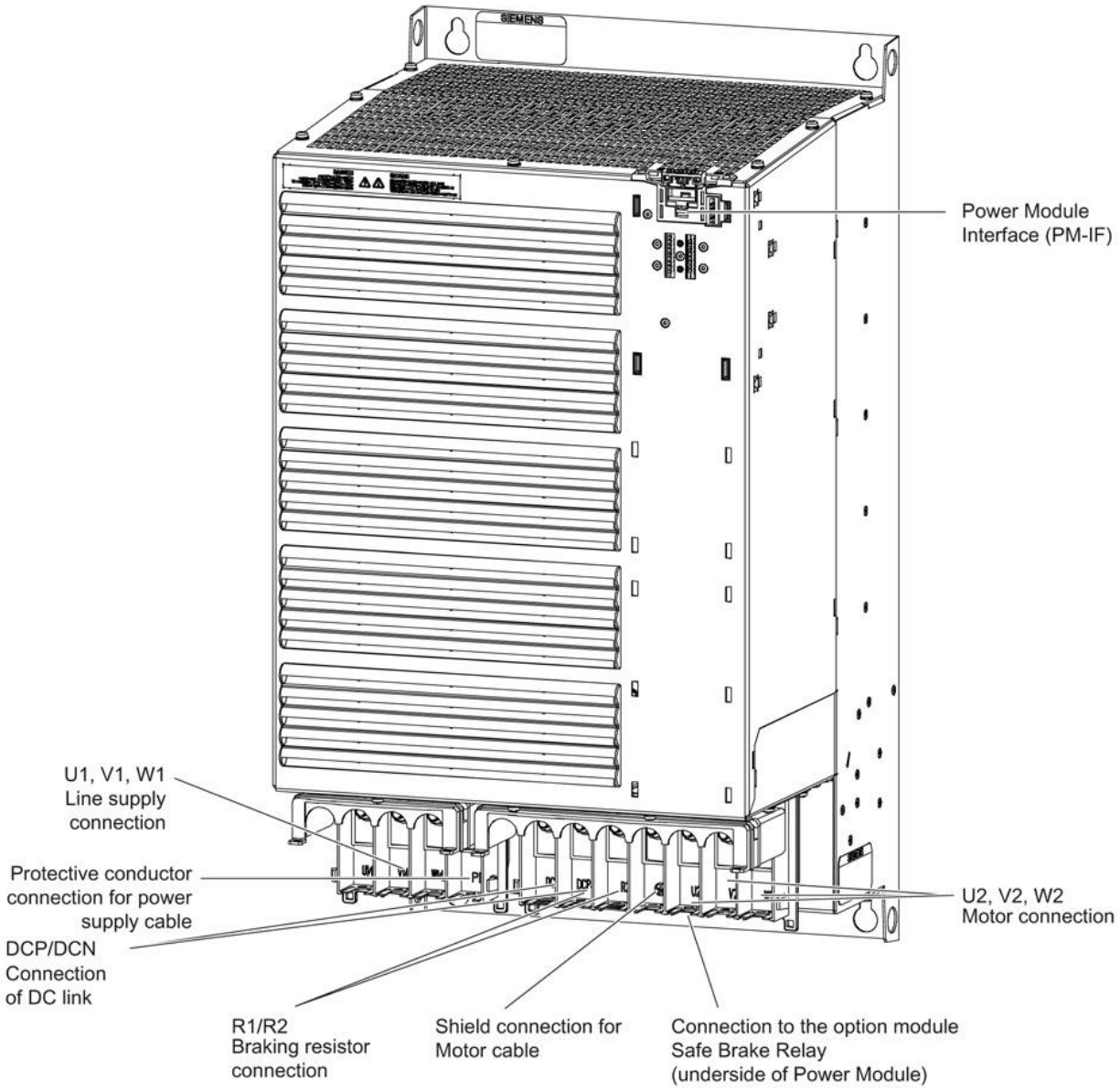


Figure 5 - PM340, frame size FSF

For more details on:

- Arrangement of the line and motor terminals,
- Technical details
- Fixing modes

refer to the SIEMENS product manual *S120-GH6*

3.1.5 Dimension drawings

Frame sizes FSB/FSC

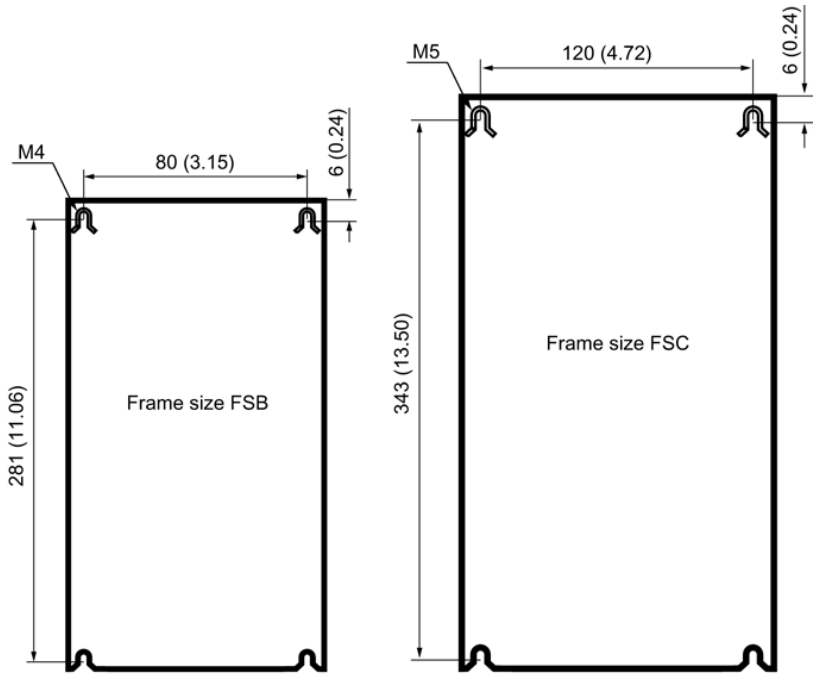
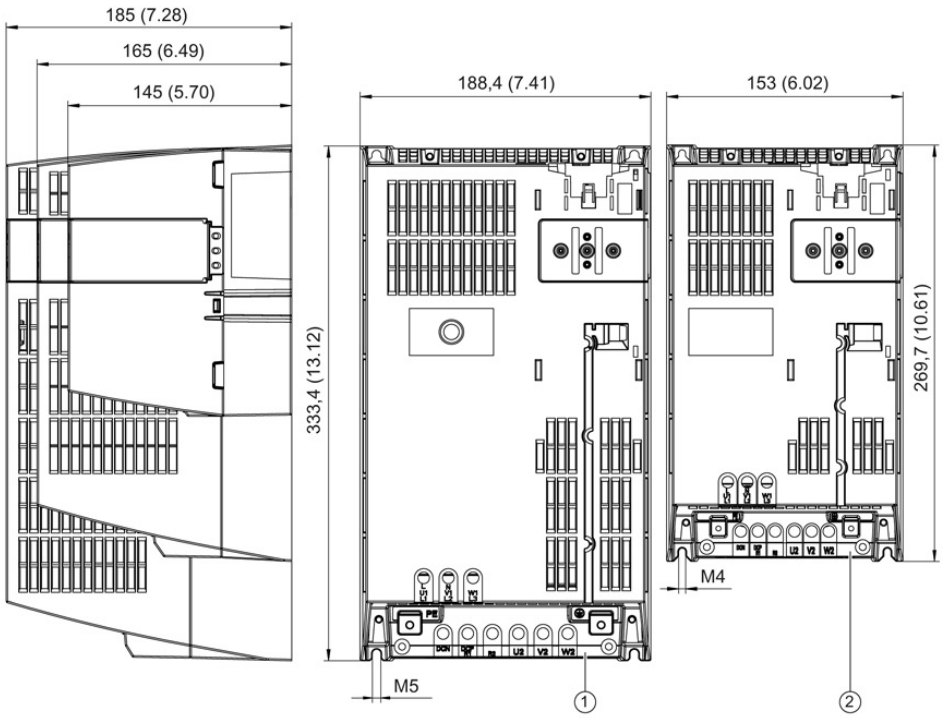


Figure 6 - Drilling pattern, PM340 Power Modules, frame sizes, FSB, FSC; all data in mm and (inches)



1- Frame size FSC
2- Frame size FSB

Figure 7 Dimension drawing, PM340 Power Modules, frame sizes FSB, FSC; all data in mm and (inches)

Frame size FSD

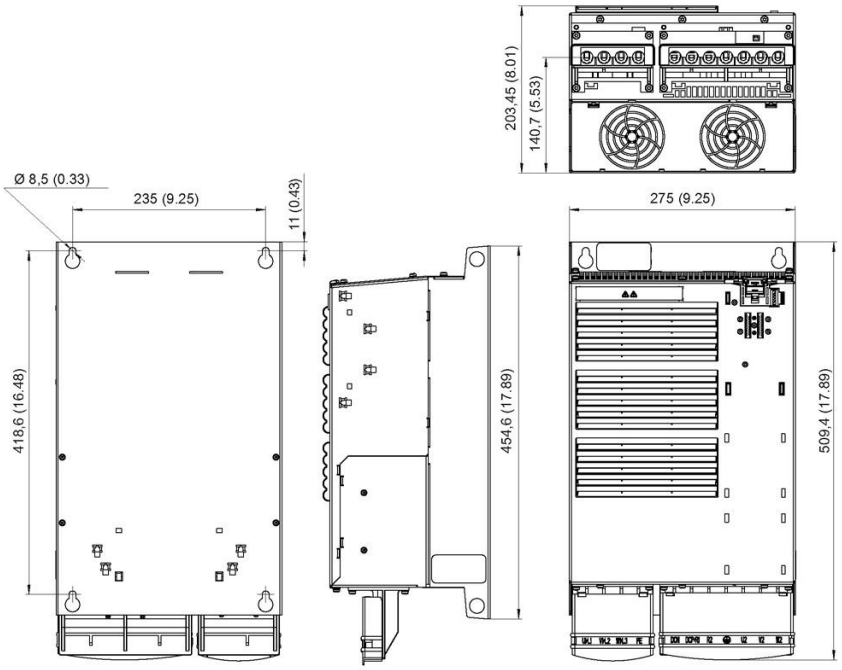


Figure 8 - Dimension drawing, PM340 Power Module, frame size FSD (with integrated line filter); all dimensions in mm and (inches)

Frame size FSE (with integrated line filter)

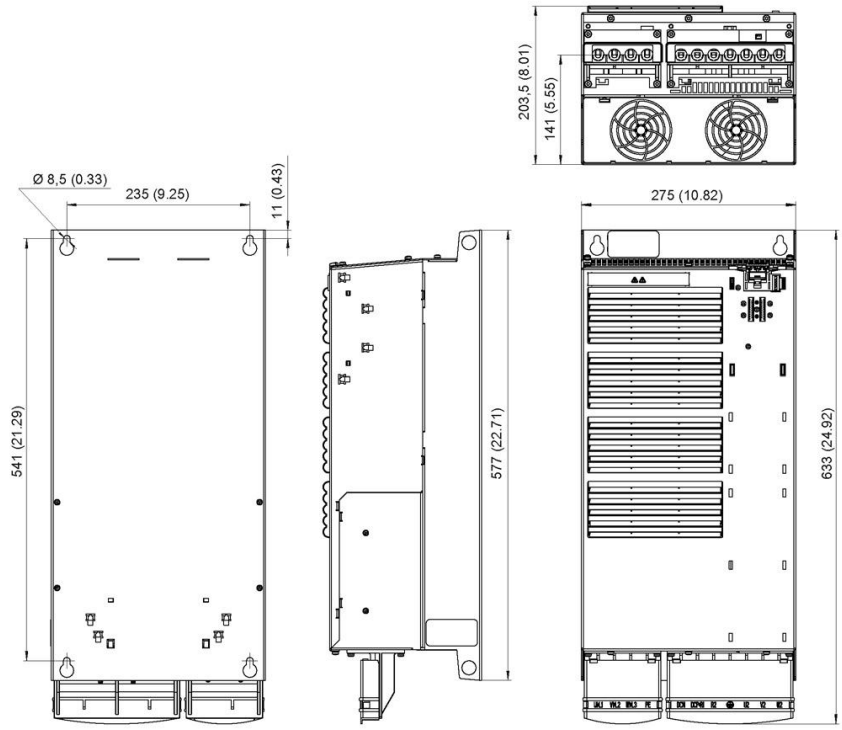


Figure 9 - Dimension drawing, PM340 Power Module, frame size FSE (with integrated line filter); all dimensions in mm and (inches)

Frame size FSF (with integrated line filter)

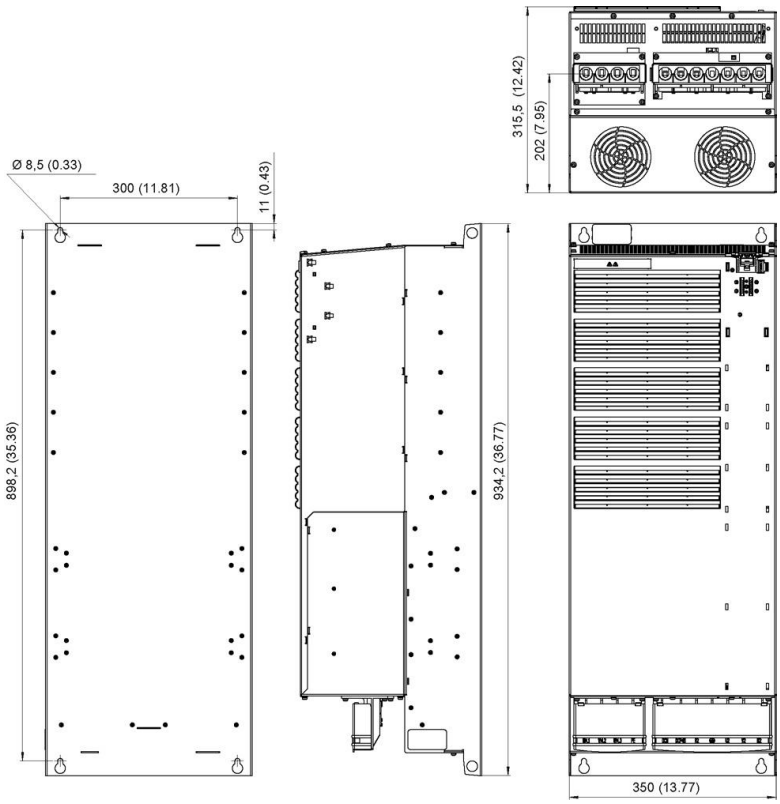
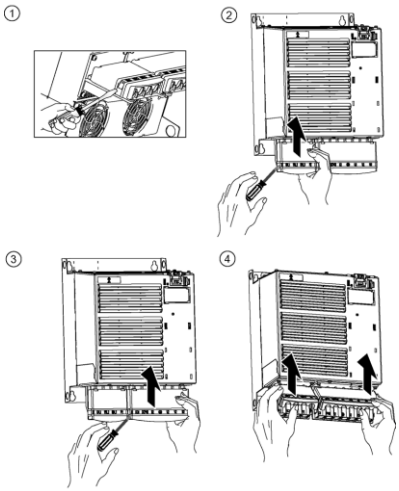


Figure 10 Dimension drawing, PM340 Power Module, frame size FSF (with integrated line filter); all dimensions in mm and (inches)

3.1.6 Wire assembly

Access to the power supply terminals and motor terminals

The line and motor terminals are accessed by releasing the tab on the side of the terminal covers using a suitable screwdriver. The cover can then be pushed upwards and snapped into this position as shown in the following diagram.



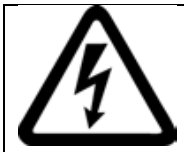
	⚠ DANGER **Danger to life due to electric shock due to exposed terminals** Touching live components results in death or severe injury. • • Only operate the Power Module with the terminal cover closed

Figure 11 Access to the line and motor terminals for PM340 Power Modules

3.1.7 Technical data

Table 2 Technical data of the PM340, FSB (380 V ... 480 V 3 AC ±10 %)

PM340	**6SL3210-**	**1SE21-0UA0**
PM340 with integrated line filter	**6SL3210-**	**1SE21-0AA0**
Output current Rated current In Base-load current IH for S6 operation (40 %) Is6 Peak current Imax	 A A A A	 10.2 9.1 10.8 20.4
Type rating[1]) on basis of In on basis of IH	 kW kW	 4 4
Rated pulse frequency	kHz	4
Power loss	kW	0.18
Cooling air requirement	m³/s	0.009
Sound pressure level LpA (1m)	dB	<50
24 V DC supply for the Control Unit	 A	 1.0
Rated input current[2]) with/without integrated line reactor	 A	 9.8/12.4
Class J UL fuses Rated current Short-circuit current rating SCCR	 A kA	 15 65
NH fuses IEC 60947 Rated current	 A	3NA3803 16
Circuit breaker type designation IEC 60947 Rated current	 A	3RV2021-4BA10 14 … 20
Resistance value ext. braking resistor	Ω	> 160
Max. cable length to braking resistor	m	15
Line supply connection L1, L2, L3		Screw terminals for cable cross-sections 1.0 … 6 mm²
Motor connection U2, V2, W2		
DC link connection, connection for braking resistor DCP/R1, DCN, R2		
PE connection		On housing with M5 screw
Max. motor cable length [3]) shielded/unshielded	 m	 50/75
Degree of protection		IP20 or IPXXB
Weight	kg	4.0

[1]) Rated power of a typical standard induction motor at 400 V 3 AC

[2]) The input current depends on the motor load and line impedance. The input currents apply for a load with the type rating (based on I_{rated}) for a line impedance corresponding to uk = 1%.

[3]) Max. motor cable length 25 m (shielded) for PM340 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2.

Table 3 Technical data of the PM340, FSC (380 V ... 480 V 3 AC ±10 %)

PM340	**6SL3210-**	**1SE21-8UA0**	**1SE22-5UA0**	**1SE23-2UA0**
PM340 with integrated line filter	**6SL3210-**	**1SE21-8AA0**	**1SE22-5AA0**	**1SE23-2AA0**
Output current Rated current In Base-load current IH for S6 operation (40 %) Is6 Peak current Imax	 A A A A	 18 14 19.6 26.4	 25 21 27.8 38	 32 27 37.1 52
Type rating[1]) on basis of In on basis of IH	 kW kW	 7.5 5.5	 11 7.5	 15 11
Rated pulse frequency	kHz	4	4	4
Power loss	kW	0.24	0.30	0.40
Cooling air requirement	m³/s	0.038	0.038	0.038
Sound pressure level LpA (1m)	dB	<60	<60	<60
24 V DC supply for the Control Unit	 A	 1.0	 1.0	 1.0
Rated input current**[2])** with/without integrated line reactor	 A	 17.1/23.1	 24.6/32.6	 33/39
Class J UL fuses Rated current Short-circuit current rating SCCR	 A kA	 25 65	 35 65	 45 65
NH fuses IEC 60947 Rated current	 A	3NA3810 25	3NA3814 35	3NA3817 40
Circuit breaker type designation IEC 60947 Rated current	 A	3RV1031-4EA10 22 … 32	3RV1031-4FA10 28 … 40	3RV1031-4HA10 40 … 50
Resistance value ext. braking resistor	Ω	> 56	> 56	> 56
Max. cable length to braking resistor	m	15	15	15
Line supply connection L1, L2, L3		Screw terminals for cable cross-sections 2.5 … 10 mm²		
Motor connection U2, V2, W2				
DC link connection, connection for braking resistor DCP/R1, DCN, R2				
PE connection		On housing with M5 screw		
Max. motor cable length [3]) shielded/unshielded	 m	 50/75		
Degree of protection		IP20 or IPXXB		
Weight	kg	6.5	6.5	6.5

[1]) Rated power of a typical standard induction motor at 400 V 3 AC

[2]) The input current depends on the motor load and line impedance. The input currents apply for a load with the type rating (based on I_{rated}) for a line impedance corresponding to uk = 1%.

[3]) Max. motor cable length 25 m (shielded) for PM340 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2.

Table 4 Technical data PM340, FSD (3 AC 380 V to 480 V ±10 %)

PM340	**6SL3210-**	**1SE23-8UA0**	**1SE24-5UA0**	**1SE26-0UA0**
PM340 with integrated line filter	**6SL3210-**	**1SE23-8AA0**	**1SE24-5AA0**	**1SE26-0AA0**
Output current Rated current In Base-load current IH for S6 operation (40 %) Is6 Peak current Imax	 A A A A	 38 33 49 64	 45 40 58 76	 60 48 78 90
Type rating[1]) on basis of In on basis of IH	 kW kW	 18.5 15	 22 18.5	 30 22
Rated pulse frequency	kHz	4	4	4
Power loss	kW	0.38	0.51	0.69
Cooling air requirement	m³/s	0.022	0.022	0.039
Sound pressure level LpA (1m)	dB	<60	<60	<60
24 V DC supply for the Control Unit	 A	 1.0	 1.0	 1.0
Rated input current[2]) with/without integrated line reactor	 A	 40/46	 47/53	 63/72
Class J UL fuses Rated current Short-circuit current rating SCCR	 A kA	3NE1817-0 50 65	3NE1818-0 60 65	3NE1820-0 90 65
NH fuses IEC 60947 Rated current	 A	3NA3820 50	3NA3822 63	3NA3824 80
Circuit breaker type designation IEC 60947 Rated current	 A	3RV1042-1JA10 45 … 63	3RV1042-4KA10 57 … 75	3RV1042-4MA10 80 … 100
Resistance value ext. braking resistor	Ω	> 27	> 27	> 27
Max. cable length to braking resistor	m	15	15	15
Line supply connection L1, L2, L3		Screw terminals for cable cross-sections 10 … 50 mm²		
Motor connection U2, V2, W2				
DC link connection, connection for braking resistor DCP/R1, DCN, R2				
PE connection		On housing with M6 screw		
Max. motor cable length [3]) shielded/unshielded	 m	 70/100		
Degree of protection		IP20 or IPXXB		
Height PM340 with/without integrated line filter	mm (pollici)	418.3 (16.47)/ 511 (20.11)	418.3 (16.47)/ 511 (20.11)	418.3 (16.47)/ 511 (20.11)
Weight with/without integrated line filter	kg	15.9/19.3	15.9/19.3	15.9/19.3

[1]) Rated power of a typical standard induction motor at 400 V 3 AC

[2]) The input current depends on the motor load and line impedance. The input currents apply for a load with the type rating (based on I_{rated}) for a line impedance corresponding to uk = 1%.

[3]) Max. motor cable length 25 m (shielded) for PM340 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2.

Table 5 Technical data PM340, FSE and FSF (3 AC 380 V to 480 V ±10 %)

PM340	**6SL3210-**	**1SE27-5UA0**	**1SE31-0UA0**	**1SE31-1UA0**	**1SE31-5UA0**	**1SE31-8UA0**
PM340 with integrated line filter	**6SL3210-**	**1SE27-5AA0**	**1SE31-0AA0**	**1SE31-1AA0**	**1SE31-5AA0**	**1SE31-8AA0**
Frame size		FSE	FSE	FSF	FSF	FSF
Output current Rated current In Base-load current IH for S6 operation (40 %) Is6 Peak current Imax	 A A A A	 75 65 98 124	 90 80 117 150	 110 95 143 180	 145 115 188 220	 178 155 231 290
Type rating[1]) on basis of In on basis of IH	 kW kW	 37 30	 45 37	 55 45	 75 55	 90 75
Rated pulse frequency	kHz	4	4	4	4	4
Power loss	kW	0.99	1.21	1.42	1.93	2.31
Cooling air requirement	m³/s	0.022	0.039	0.094	0.094	0.117
Sound pressure level LpA (1m)	dB	<60	62	<60	<60	65
24 V DC supply for the Control Unit	 A	1.0	1.0	1.0	1.0	1.0
Rated input current[2]) with/without integrated line reactor	A	78/88	94/105	115/129	151/168	186/204
Class J UL fuses Rated current Short-circuit current rating SCCR	 A kA	3NE1021-0 100 65	3NE1022-0 125 65	3NE1224-0 150 65	3NE1225-0 200 65	3NE1227-0 250 65
NH fuses IEC 60947 Rated current	 A	3NA3830 100	3NA3832 125	3NA3836 160	3NA3140 200	3NA3144 250
Circuit breaker type designation IEC 60947 Rated current	 A	3VL1712-1DD33-0AA0 100 …125	3VL1716-1DD33-0AA0 125 … 160	3VL3720-1DC36-0AA0 160 … 200	3VL3720-1DC36-0AA0 160 … 200	3VL3725-1DC36-0AA0 200 … 250
Resistance value ext. braking resistor	Ω	>15		>8.2		
Max. cable length to braking resistor	m	15				
Line supply connection L1, L2, L3		Screw terminals for cable cross-sections 10 … 50mm²		Screw terminals for cable cross-sections 120mm²		
Motor connection U2, V2, W2						
DC link connection, connection for braking resistor DCP/R1, DCN, R2						
PE connection		On housing with M6 screw		On housing with M8 screw		
Max. motor cable length [3]) shielded/unshielded	 m	70 / 100				
Degree of protection		IP20 or IPXXB				
Height PM340 with/without integrated line filter	mm (in)	498.3 (19.62) / 633 (24.92)		634 (24.96) / 934 (36.77)		
Weight with/without integrated line filter	kg	19.8 / 27.1		50.7 / 667		

[1]) Rated power of a typical standard induction motor at 400 V 3 AC

[2]) The input current depends on the motor load and line impedance. The input currents apply for a load with the type rating (based on Irated) for a line impedance corresponding to uk = 1%.

[3]) Max. motor cable length 25 m (shielded) for PM340 Power Modules with integrated line filter to maintain the limit values of EN 61800-3 Category C2.

3.2 POWER MODULE CHASSIS (≥ 210A)

3.2.1 Interface description

Applications with ≥ 210A inverter are running under CHASSIS format

Overview

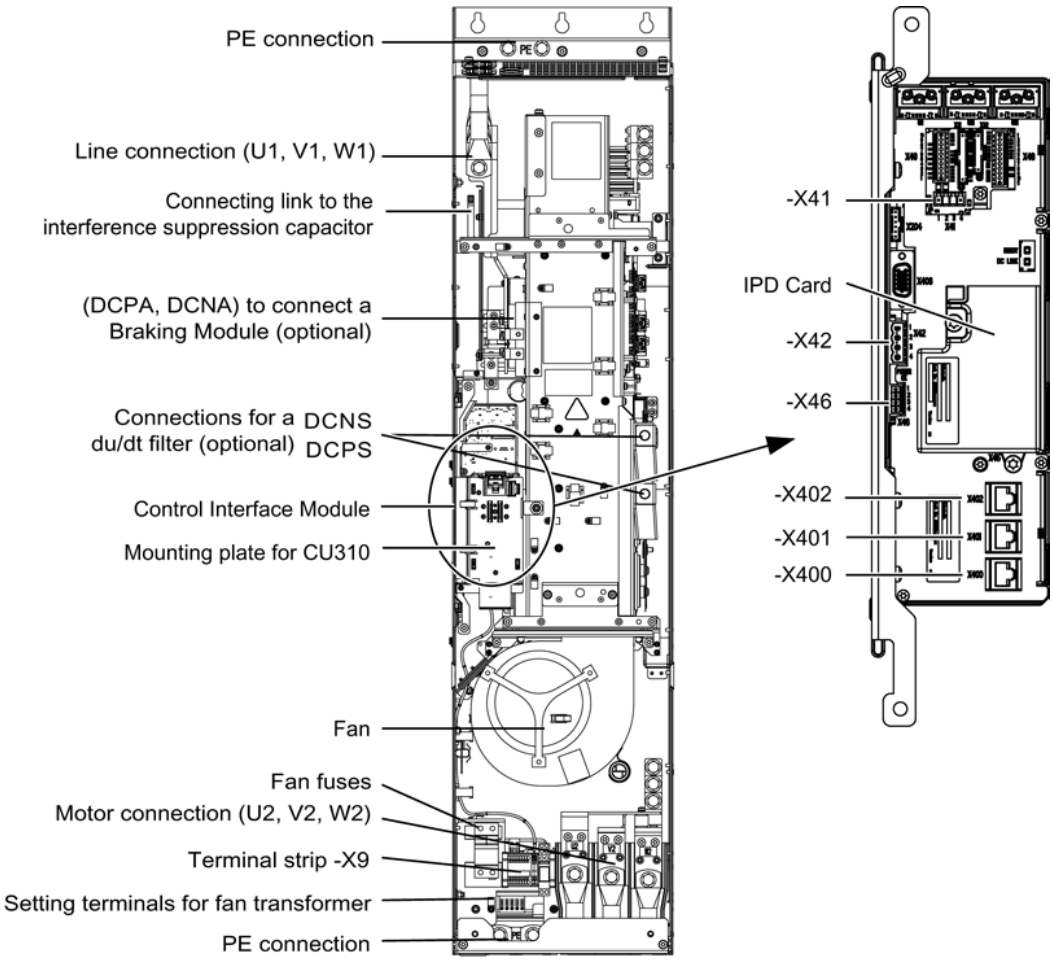


Figura 12 Power Module, frame size FX

Connection example

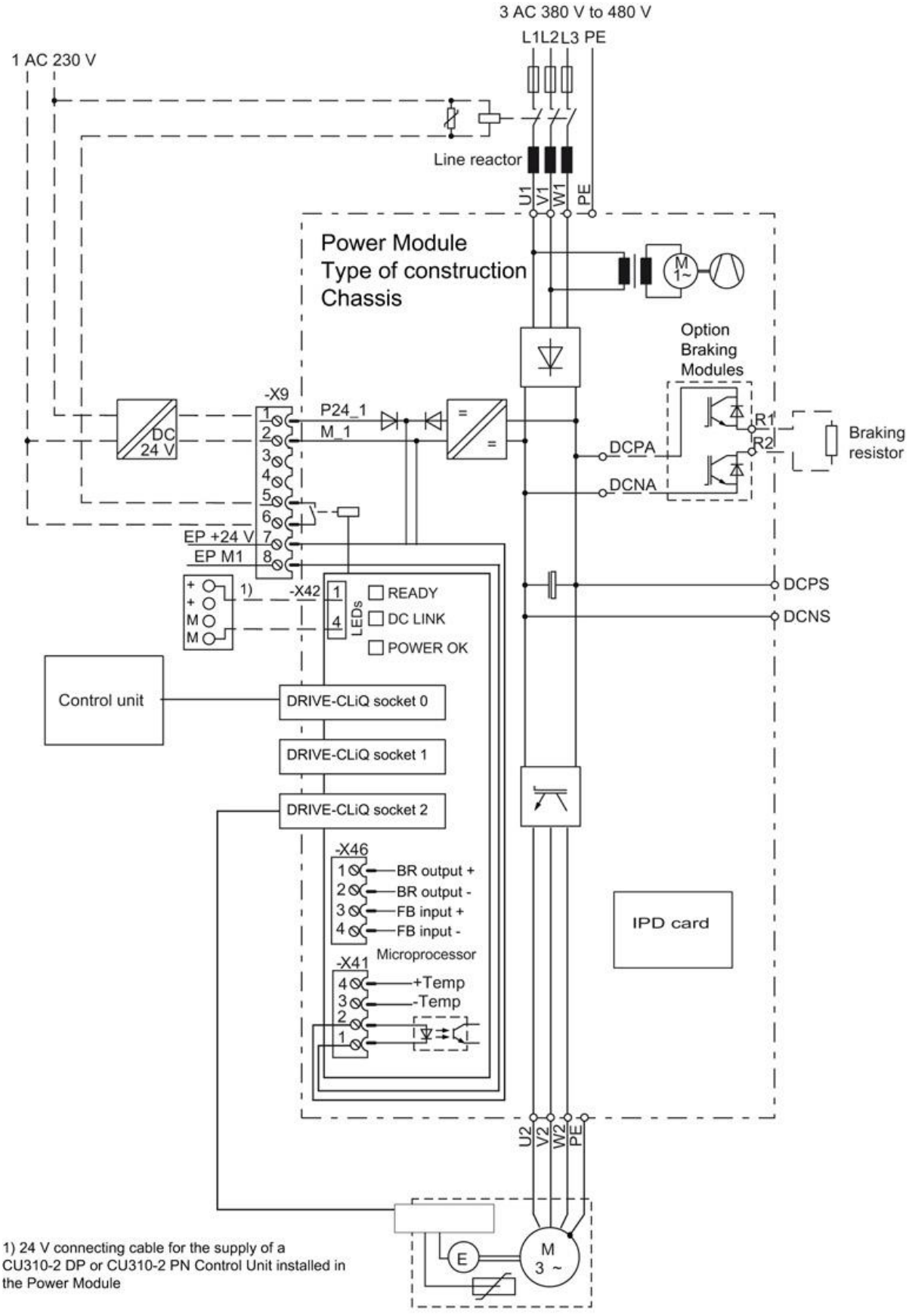


Figure 13 Connection example: Power Module chassis

3.2.2 Dimension drawings

Dimension drawing frame size FX

The cooling clearances to be maintained are indicated by the dotted line.

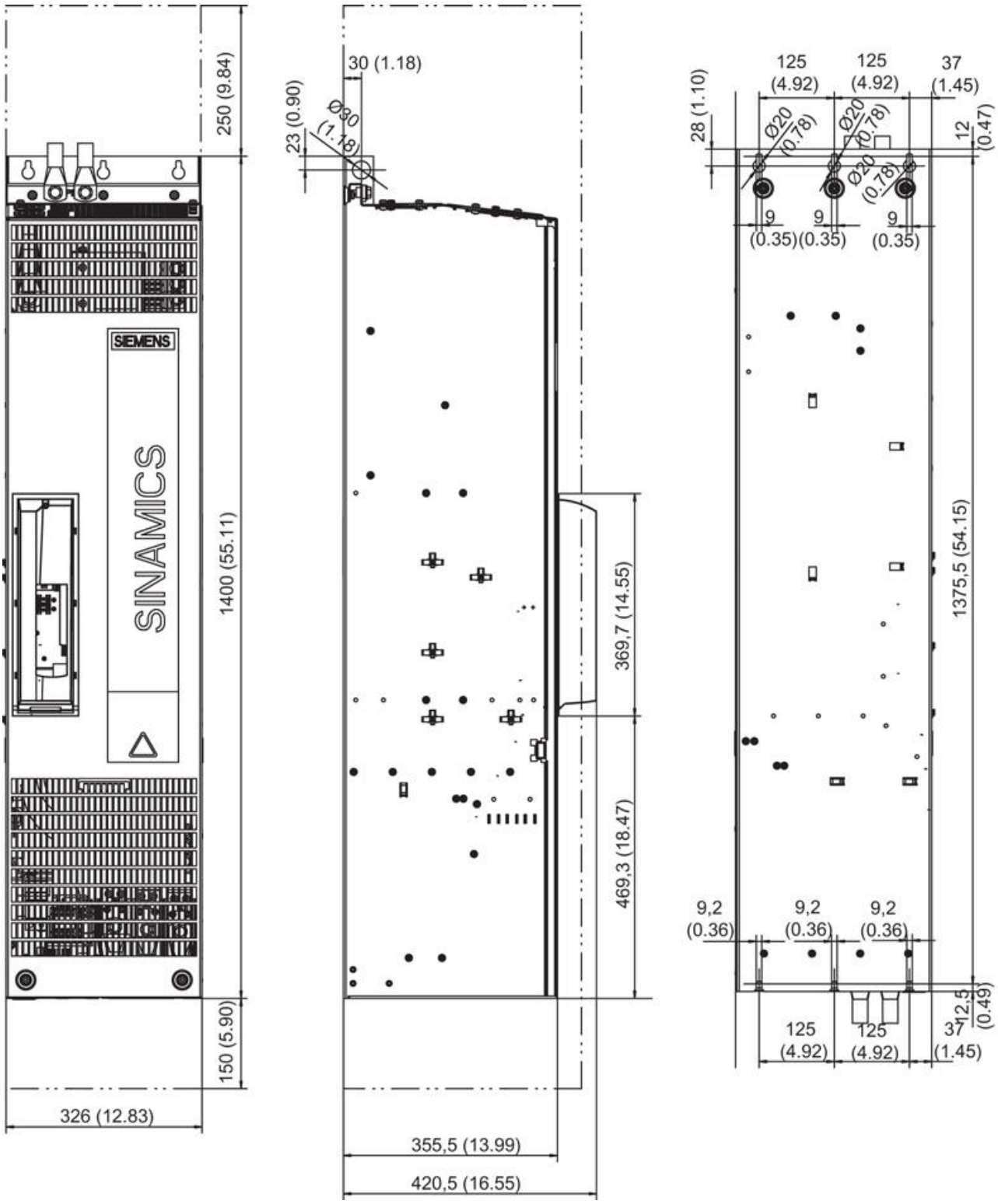


Figure 14 Dimension drawing Power Module, frame size FX

3.2.3 Electrical connection

Adjusting the fan voltage (-T10)

The power supply for the device fans (1-phase 230 VAC) in the Power Module (-T10) is taken from the line supply using a transformer. The mounting position of the transformer is shown in the interface descriptions.

The transformers are fitted with primary taps so that they can be fine-tuned to the line voltage. When delivered, the taps are always set to the highest level. With a low supply voltage, the appropriate transformer tap must be activated.

The connections at the setting terminals must be connected to "0" and the line voltage.

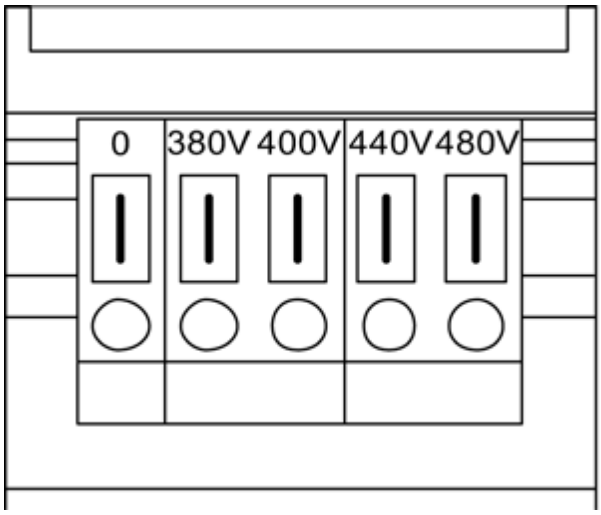


Figure 15 Setting terminals for the fan transformers

The supply voltage assignments for making the appropriate setting on the fan transformer are indicated in the following table (factory presetting: 480 V/0 V).

⚠ **WARNING**
Danger of fire due to overheating resulting from insufficient equipment fan voltage If the terminals are not reconnected to the actual line voltage, overheating and human danger.

Table 6 Assignment of the existing line voltage for setting at the fan transformer

Line voltage	**Tap at the fan transformer (-T10)**
380 V ±10 %	380 V
400 V ±10 %	400 V
440 V ±10 %	440 V
480 V ±10 %	480 V

3.2.4 Technical data

Table 7 Technical data, Power Modules Chassis

Line voltage 3-ph. 380 V to 480 V AC ±10% (-15% < 1 min)		
Order number	**6SL3310-**	**1TE32-1AA3**
Frame size		**FX**
Output current rated current In base load current IL base load current IH for S6 duty (40 %) IS6 peak current Imax	 A A A A A	 210 205 178 230 307
Supply voltages Electronics power supply Overvoltage trip Undervoltage trip	 VDC VDC VDC	 24 (20.4 … 28.8) 820 ± 2 % 424
Type rating[1]) on basis of In on basis of IH	 kW kW	 110 90
Rated pulse frequency without derating with derating	 kHz kHz	 2 8
Power loss	kW	2.46
Cooling air requirement	m³/s	0.17
Sound pressure level at 50/60 Hz	dB(A)	66/67
Rated input current	A	229
Current requirement [2]) at 24 V DC, max.	A	0.8
NH fuses Rated current	 A	3NA3144 250
Fuses UL Class J Rated current Short-circuit current rating SCCR	 A kA	3NE1227 250 65
Circuit-breaker type designation IEC 60947 rated current	 A	3VL4725-1DC36-0AA0 200…250
Circuit breaker type designation **UL489 / CSA C22.2 No. 5-02** Rated current Short-circuit current rating SCCR	 A kA	3VL3125-3KN30-0AA0 250 65
Line supply connection U1, V1, W1		Flat connector for M10 cable lug, max. connection crosssection 2x185mm²
Motor connection U2, V2, W2		Flat connector for M10 cable lug, max. connection cross-section x185mm²
DC link connections DCPA, DCNA, (option, Braking Module)		Flat connector for M6 cable lug, connection cross-section 1x35 mm²
DC link connections DCPS, DCNS (option, dV/dt filter)		Flat connector for M8 cable lug, connection cross-section 1 x 35 mm²
PE connection		Flat connector for M10 cable lug, max. connection cross-section 2 x 185 mm2
Max. motor cable length[3])	m	300 (shielded) / 450 (unshielded)
Max. ambient temperature without derating with derating	 °C °C	 40 55
Degree of protection		IP20 or IPXXB
Width	mm	326
Height	mm	1400
Depth	mm	356 [4])
Weight	kg	104

[1]) Rated power of a typical standard induction motor at 400 V 3 AC

[2]) Current consumption of Power Module only. If a Control Unit is supplied with 24 V DC from the Power Module, its current consumption must be added.

[3]) Max. motor cable length 100 m (shielded) in conjunction with a line filter to comply with the EMC limit values of EN 61800-3 Category C2.

[4]) Depth = 421 mm including front cover when a Control Unit is installed

3.2.5 Line filter (PM Chassis only)

The PM CHASSIS must be combined with an external mains filter.

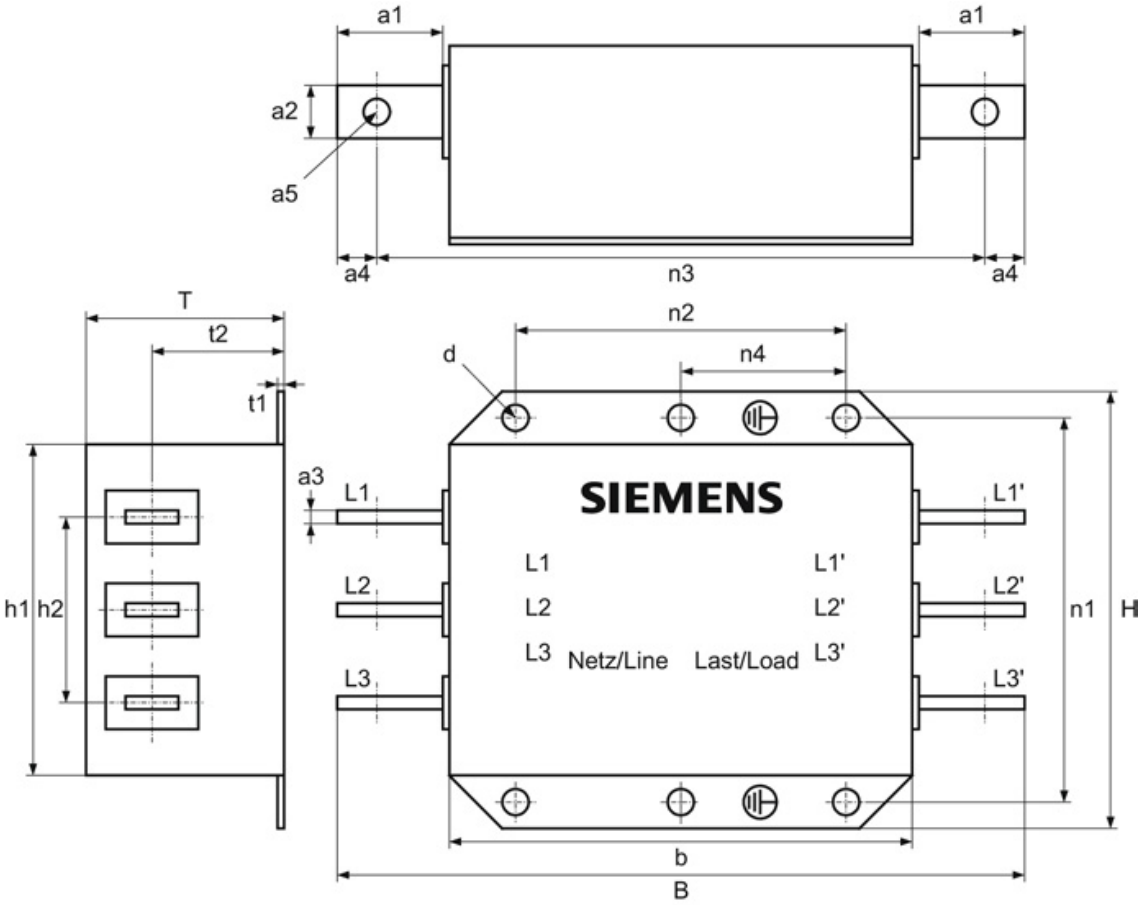


Figure 16 Dimension drawing, line filter

Table 8 Dimensions of the line filter, all data in mm and (inches)

6SL3000-	**0BE32-5AA0**
B	360 (14.17)
H	240 (9.44)
T	116 (4.56)
a1	40 (1.57)
a2	25 (0.98)
a3	5 (0.19)
a4	15 (0.59)
a5	11 (0.43)
b	270 (10.62)
h1	200 (7.87)
h2	100 (3.93)
t1	2 (0.07)
t2	78.2 (3.07)
n1 [1])	220 (8.66)
n2 [1])	210 (8.26)
n3	330 (12.99)
n4	-
d	9 (0.35)

[1]) Lengths n1 and n2 correspond to the distance between holes.

4 ELECTROMAGNETIC COMPATIBILITY

Together with a system configuration in conformity with EMC standards (see norms EN 61000-6-2, EN61000-6-4, EN60204-1), the line filters limit the conducted interference emitted by the Power Modules to limit values according to standard EN61800-3, which defines the installation Ambient and the Category of Drive Systems from C1 (best) to C4 (worst).

All POWER MODULES (PM) delivered are provided with line filter, and they are in conformity with category C3 (industrial) in accordance with the standard EN 61800-3.

For PM Block Size (<180A), this is obtained by mains integrals filters, while for the PM chassis must be coupled to a line filter.

The PM with a suitable line filter shall correspond to the category C2 for domestic installations, provided that:

1. they are installed and put into service by a specialist (according to the definition given by the normative), in compliance with the limit values for electromagnetic compatibility
2. the below shown additional requisites are respected:

- Connection by use of a shielded cable at reduced capacity
- Motor cable shorter than 25 m in PM Blocksize (100m in PM Chassis)
- Pulse frequency ≤ 4 kHz in the PM Blocksize (≤ 2 kHz in the AM Chassis)
- Current ≤ nominal input current in the technical data

WARNING
For the PM chassis is required an additional impedance coil to reach the C2 class

5 BRAKING RESISTORS

5.1 PM BLOCKSIZE

5.1.1 Description braking resistors

The PM340 Power Modules cannot regenerate into the line supply. For regenerative operation, e.g. the braking of a rotating mass, a braking resistor must be connected to convert the resulting energy into heat.

A thermostatic switch monitors the braking resistor for overtemperature and issues a signal on an isolated contact if the limit value is exceeded.

5.1.2 Safety instructions

⚠ WARNING

Risk of fire and device damage as a result of ground fault / short-circuit
The cables to the braking resistor must be routed so that a ground fault or short circuit can be ruled out. A ground fault can result in fire.
• Comply with local installation regulations, which allow this fault to be ruled out.
• Protect the cables from mechanical damage.
• In addition, apply one of the following measures:
- Using cables with double insulation.
- Observe adequate clearances, e.g. through the use of spacers.
- Route the cables in separate cable ducts or pipes.

⚠ CAUTION

Risk of burns or damage resulting from high surface temperature of the braking resistor
The braking resistor can become very hot. You can be severely burnt when touching the surface. Neighboring components can become damaged.

- Mount the braking resistor so that it cannot be touched. If this is not possible, at the dangerous locations, attach an appropriate warning note that is clearly visible and easy to understand.
- To avoid temperature-related damage to adjacent components, follow these rules:
  For PM340 Power Modules:
  - Ensure a cooling clearance of 100 mm on all sides of the braking resistor

5.1.3 Dimension drawings

Braking resistors for PM340

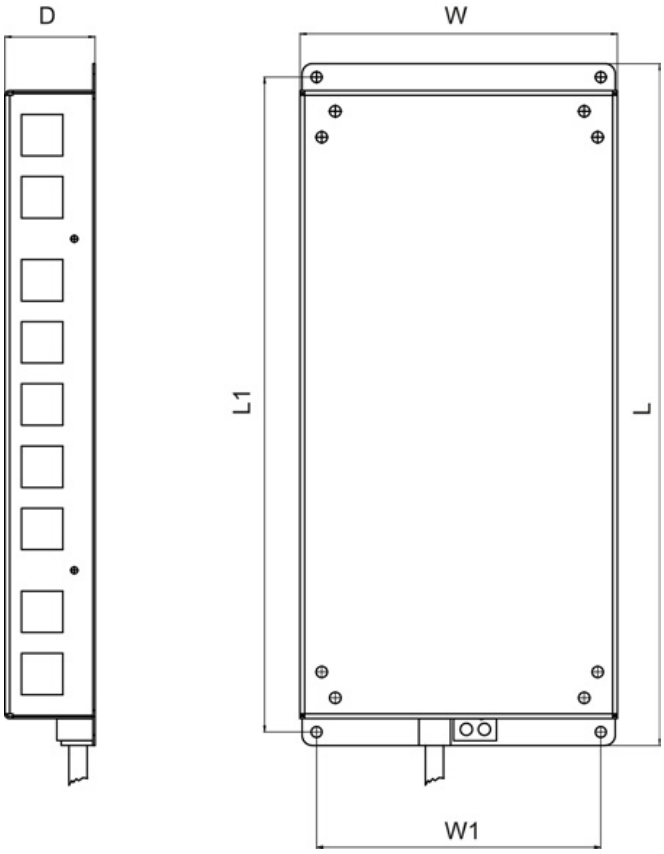


Figure 17 Dimension drawing of braking resistor for PM340, frame sizes FSA / FSB

Table 9 Dimension drawing in mm (inches)

Order number	**6SL3201-0BE12-0AA0**
Frame size	**FSB**
L	239 (9.40)
L1	226 (8.89)
L2	-
L3	-
D	43.5 (1.71)
D1	-
D2	-
W	149 (5.86)
W1	133 (5.24)

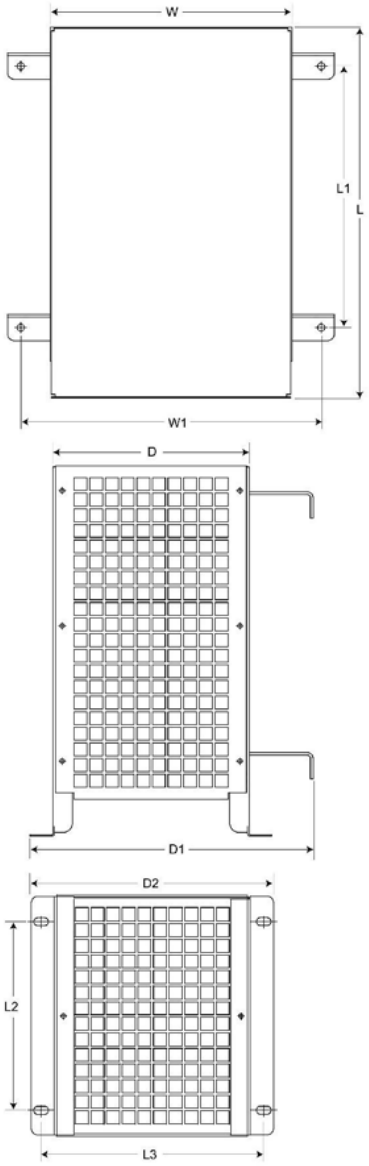


Figure 18 Dimension drawing of braking resistor for PM340, frame sizes FSC / FSD / FSE / FSF

Table 10 Dimension drawing in mm (inches)

Order number	**6SE6400-4BD16-5CA0**	**6SE6400-4BD21-2DA0**	**6SE6400-4BD22-2EA1**	**6SE6400-4BD24-0FA0**
Frame size	**FSC**	**FSD**	**FSE**	**FSF**
L	285 (11.22)	515 (20.27)	645 (25.39)	650 (25.59)
L1	200 (7.87)	350 (13.77)	480 (18.89)	510 (20.07)
L2	145 (5.70)	205 (8.07)	205 (8.07)	270 (10.62)
L3	170 (6.69)	195 (7.67)	195 (7.67)	335 (13.18)
D	150 (5.90)	175 (6.88)	175 (6.88)	315 (12.40)
D1	217 (8.54)	242 (9.52)	242 (9.52)	382 (15.03)
D2	185 (7.28)	210 (8.26)	210 (8.26)	382 (15.03)
W	185 (7.28)	270 (10.62)	270 (10.62)	400 (15.74)
W1	230 (9.05)	315 (12.40)	315 (12.40)	435 (17.12)

5.1.4 Mounting

The braking resistor for all modules is connected at terminals DCP/R1 and R2. Since it generates heat, it should be mounted to the side of the Power Modules.
The braking resistors for the PM340 Power Modules in frame sizes FSA and FSB are designed as base components. If the PM340 Power Modules of the FSA or FSB frame size are operated without a line reactor, the braking resistors can also be installed under the Power Modules.
The braking resistors for the PM340 Power Modules of the FSC to FSF frame sizes should be placed outside the control cabinet or the switchgear room to lead the resulting heat loss away from the Power Modules. This reduces the level of air conditioning required.
The braking resistors can be installed horizontally or vertically. The power connections on vertically installed resistors, must be at the bottom.

5.1.5 Technical data

Table 11 Technical data of braking resistors for PM340 Power Modules, frame sizes FSB, FSC

Order number		**6SL3201-0BE12-0AA0**	**6SE6400-4BD16-5CA0**
Suitable for Power Modules of frame size		FSB ²)	FSC ²)
Resistance	Ω	160	56
Unit rating PDB	kW	0.2	0.65
Peak power Pmax	kW	4.0	13
Load duration for peak power Ta	s	12.6	13.1
Period duration of braking duty cycle T	s	252	262
Degree of protection		IP20 or IPXXB	IP20 or IPXXB
Power connections (including PE)		Pigtail 3 x 1.5 mm2 shielded, length 0.5 m	Pigtail 3 x 1.5 mm2 shielded, length 0.9 m
Thermostatic switch (NC contact) Maximum contact load connecting cable		250 VAC / 2.5 A	250 VAC / 2.5 A
Weight	kg	1.6	3.8

For information about order numbers, refer to SIEMENS manual
¹) Power Modules Blocksize, 1-phase AC
²) Power Modules Blocksize, 3-phase AC

Table 12 Technical data of braking resistors for PM340 Power Modules, frame sizes FSD to FSF

Order number		**6SE6400-4BD21-2DA0**	**6SE6400-4BD22-2EA1**	**6SE6400-4BD24-0FA0**
Suitable for Power Modules of frame size		FSD [1])	FSE [1])	FSF [1])
Resistance	Ω	27	15	8.2
Unit rating PDB	kW	1.2	2.2	4.0
Peak power Pmax	kW	24	44	80
Load duration for peak power Ta	s	13.6	14.5	13.1
Period duration of braking duty cycle T	s	271	290	252
Degree of protection		IP20 or IPXXB	IP20 or IPXXB	IP20 or IPXXB
Power connections (including PE)		M6 studs	M6 studs	M6 studs
Thermostatic switch (NC contact) Maximum contact load connecting cable		250 VAC / 2.5 A	250 VAC / 2.5 A	250 VAC / 2.5 A
Weight	kg	7.4	10.6	16.7

[1]) Power Modules Blocksize, 3-phase AC

Duty cycles

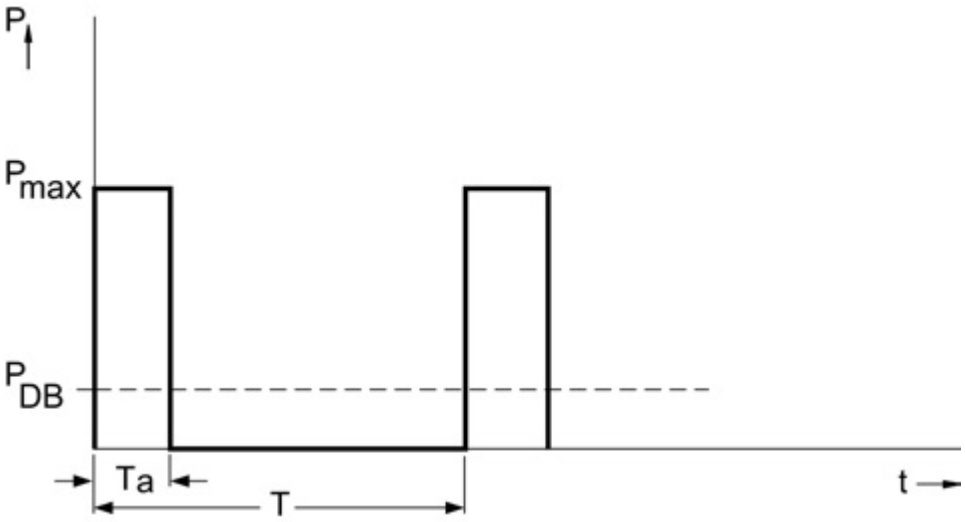


Figure 19 Load diagram for the braking resistor, in Blocksize format

T [s] period duration of braking duty cycle
T_a [s] load duration for peak power
P_{DB} [W] unit rating of the braking resistor
P_{max} [W] peak braking power of the braking resistor

5.2 PM CHASSIS (≥ 210A)

5.2.1 Braking Module

5.2.1.1 Description

A Braking Module (and an external braking resistor) is required in certain cases when the drive is to be braked or brought to a standstill (e.g. EMERGENCY SWITCHING-OFF Category 1). The Braking Module contains the power electronics and the associated control.
The supply voltage for the electronics is taken from the DC link.
During operation, the DC link energy is converted to heat loss in an external braking resistor.
A mounting slot is provided in the Power Module.

Design

The Braking Module in chassis format is installed in a slot within the Power Module and force-cooled by its fan. The Braking Module is connected to the DC link by means of flexible cables, which are supplied as standard.

5.2.1.2 Braking Module for frame size FX

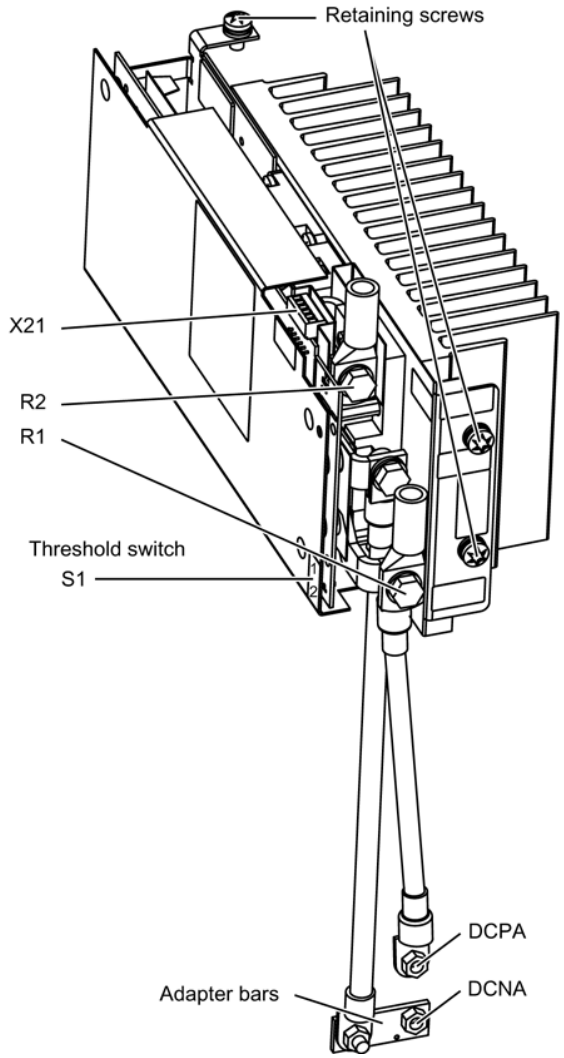


Figure 20 Braking Module for Power Module, frame size FX

Note:
With this Braking Module, the R1 and DCPA interfaces use the same connection.

5.2.1.3 Connection example

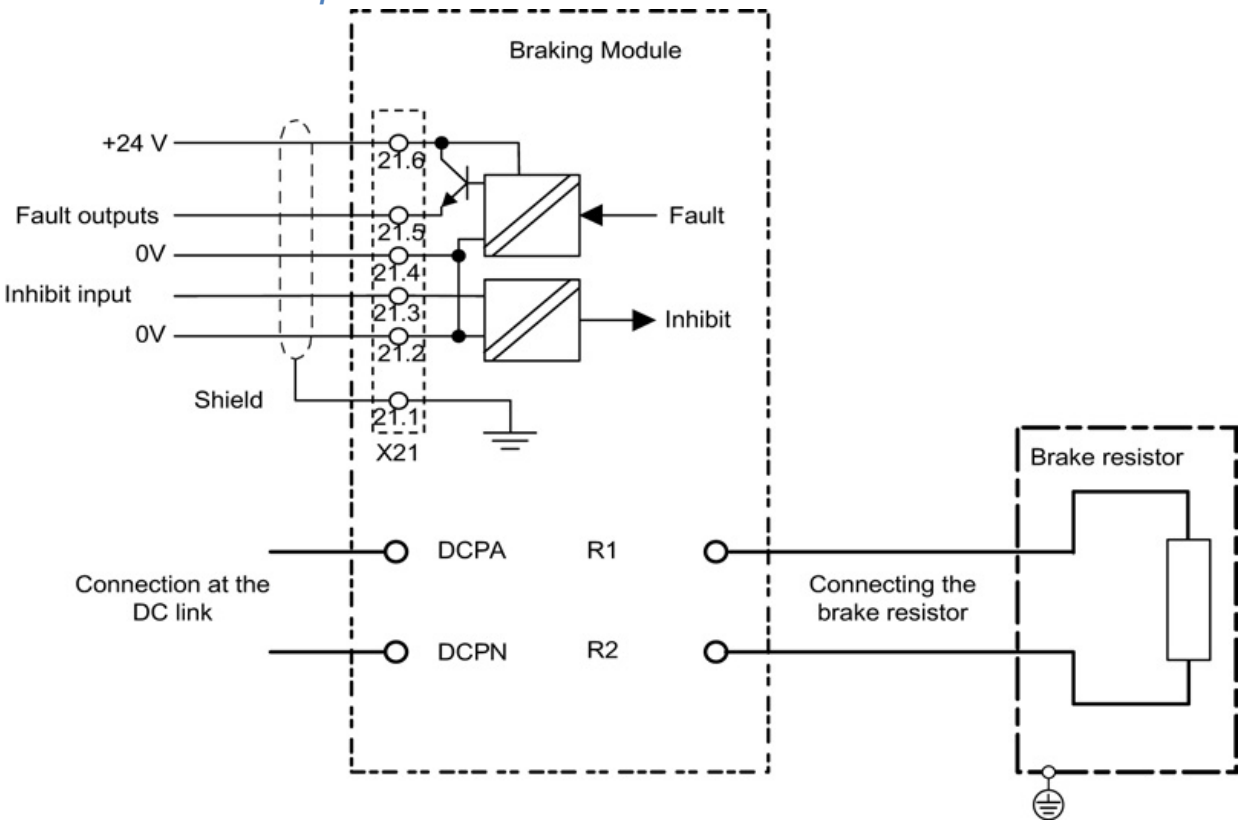
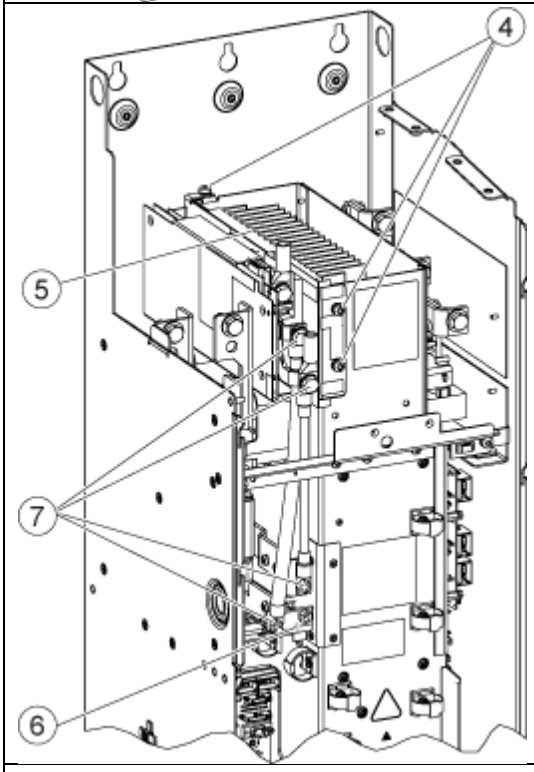


Figure 21 Example connection of Braking Module

5.2.1.4 Installing a Braking Module in a Power Module, frame size FX

1	Loosen the two M6 screws. Remove the front cover to the top.
2	Loosen the two screws from the cover plate at the top and the M6 nut on the left-hand side. Remove the cover plate at the left.
3	Loosen the four screws from the cover plate at the top and the three securing screws at the rear. Remove the cover plate at the top.



4	Remove the three screws on the blanking cover. Remove the blanking cover.
5	Install the Braking Module instead of the blanking cover and secure it with the blanking cover screws that were previously removed.
6	Secure the adapter bars at the DCNA connection using a nut, so that the bar cannot be twisted. For this purpose, a small bolt is attached to the adapter bar, which must be located on the lower side of the DCNA connection.
7	Secure the connecting cable to the DC link with two screws (Braking Module connection) and with two nuts (DC-link connection).
	Attach the - cover plate, top - step 3 - cover plate, left - step 2 - the front cover - step 1

An opening above the connections for the braking resistor (R1, R2) is provided in the cover for connecting the cable to the braking resistor

NOTE:
You must carefully observe the specified tightening torques.

5.2.1.5 Technical data

Table 13 Technical data, Braking Modules

Order number	**6SL3300-1AE31-3AA0**
Suitable for installation in Power Modules, frame size	FX
PDB power (unit rating)	25 kW
P15 power (peak power)	125 kW
P20 power	100 kW
P40 power	50 kW
Variable response thresholds	774 V (673V)
Digital input	
Rated voltage	-3 … 30V
Low signal level (an open digital input is interpreted as "low")	-3 … 5V
High level	15 … 30 V
Current drain (typical at 24 VDC)	10 mA
Max. cross-section that can be connected	1.5 mm²
Digital output (continued-short-circuit-proof)	
Rated voltage	24 VDC
Max. load current of the digital output	500 mA
Max. cross-section that can be connected	1.5 mm²
R1/R2 connection	M8 screw
Max. connection cross-section R1/R2	35 mm²
Weight	3.6 Kg

5.2.2 Description Braking Resistors

The braking resistor is used to reduce the excess DC link energy in regenerative operation.
The braking resistor is connected to the Braking Module. The braking resistor is mounted outside the cabinet or switchgear room. This means that the resulting heat loss around the Power Module can be dissipated - and cooling costs/equipment reduced.
Resistors with unit ratings of 25 kW and 50 kW are available.
Braking resistors can be used on Power Modules with a voltage range. This is the reason that the voltage can be changed by setting the response thresholds at the Braking Module to reduce the voltage stress on the motor and Power Module.
A temperature protection switch monitors the braking resistor for overtemperature and issues a signal on a floating contact if the limit value is exceeded.

5.2.3 Safety instructions for braking resistors chassis format

DANGER

Danger to life due to electric shock caused by applied voltage and residual charge of the DC-link capacitors on the braking module

Contact with live connections on the Braking Module can result in death or serious injury.

- Only connect the Braking Module when the Power Module is disconnected.
- Only connect the Braking Module after five minutes has elapsed. Measure the voltage before starting work on the DCP and DCN DC-link terminals

WARNING

Danger of fire through overheating for insufficient ventilation clearances

Insufficient ventilation clearances can result in overheating with danger to persons.

- It is essential that you maintain a cooling clearance of 200 mm on all sides of the component (with ventilation grills).

WARNING

Risk of fire and device damage as a result of ground fault / short-circuit

The cables to the braking resistor must be routed so that a ground fault or short-circuit can

be ruled out.

CAUTION

Risk of burns resulting from high surface temperature of the braking resistor
The braking resistor can become very hot. You can be severely burnt when touching the surface.

- Mount the braking resistor so that it cannot be touched. If this is not possible, at the dangerous locations, attach an appropriate warning note that is clearly visible and easy to understand.

WARNING

Fire hazard due to heat dissipation from a braking resistor
An incorrectly installed braking resistor can cause overheating of components with resulting fire and smoke.

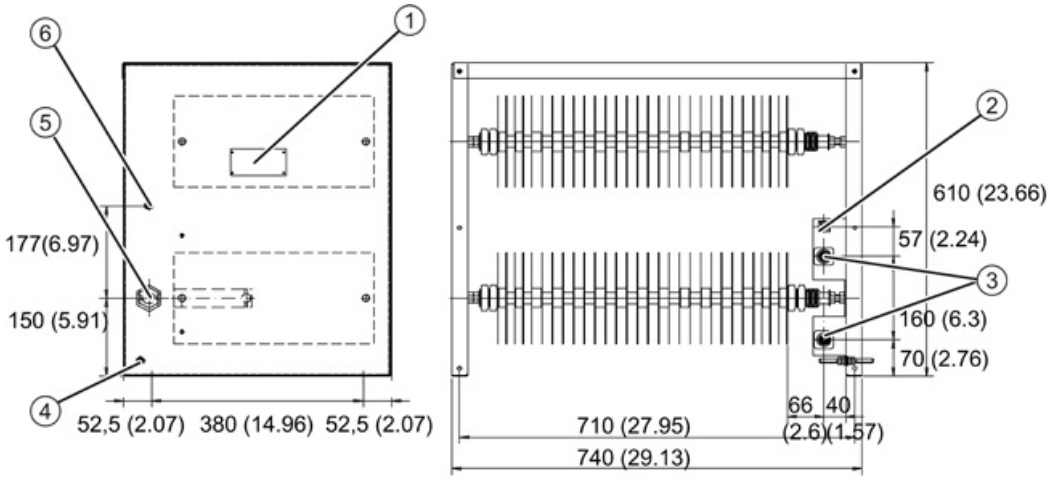
- Only mount braking resistors on the floor.
- Mount the braking resistors so that they are in the vertical position and freestanding. Sufficient space must be available for dissipating the energy converted by the braking resistor.
- Maintain sufficient clearance to objects that can burn.
- Do not place any objects on or above the braking resistor.

NOTICE

Damage to braking resistor due to ingress of water
The ingress of water can damage the braking resistor.

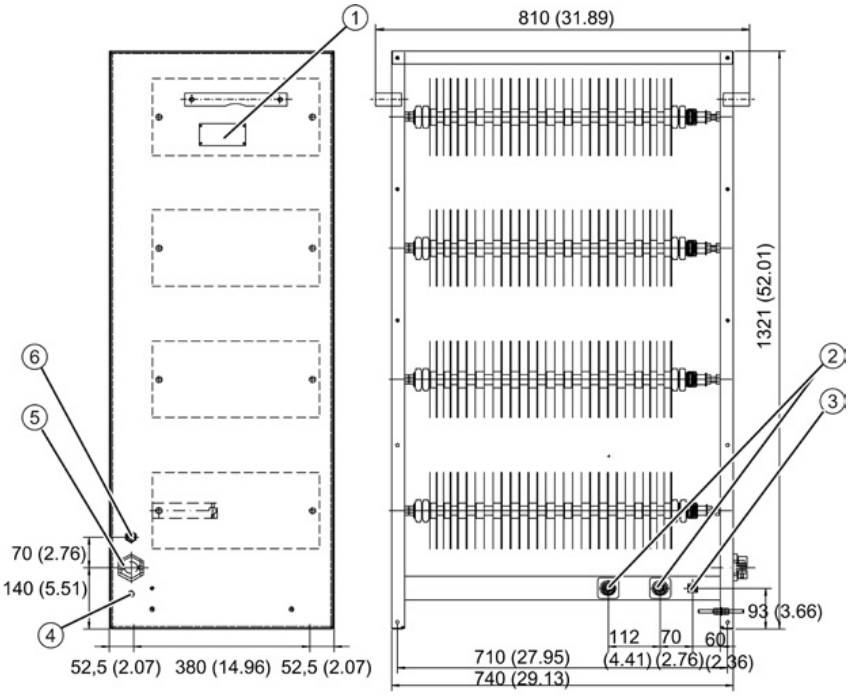
- To maintain degree of protection IP20, provide a canopy to protect against rain when mounting outside.

5.2.4 Dimension drawing



1- Rating plate
2- T1/T2 screw terminal (2.5 mm2)
3- Threaded bolt (M8)
4- Ground connection (M8)
5- M50
6- M12

Figure 22 Dimension drawing, 25 kW/125 kW resistor



1- Rating plate
2- Threaded bolt (M10)
3- T1/T2 screw terminal (2.5 mm2)
4- Ground connection (M10)
5- M50
6- M12

Figure 23 Dimension drawing, 50 kW/250 kW resistor

5.2.5 Electrical connection

Recommended cable cross-sections:

- For 25 kW: 35 mm²
- For 50 kW: 50 mm²

5.2.6 Technical data

Table 14 What is the technical data of the braking resistors

Order number	**Unit**	**6SL3000-1BE31-3AA0**	**6SL3000-1BE32-5AA0**
PDB power (unit rating)	kW	25	50
P15 power (peak power)	kW	125	250
Max. current	A	189	378
Cable entry		Via cable gland M50	Via cable gland M50
Line connection		Via stud M10	Via stud M10
Max. cross-section that can be connected	mm²	50	70
Degree of protection		IP20	IP20
Width x height x depth	mm	740 x 605 x 485	810 x 1325 x 485
Thermostatic switch (NC contact) maximum contact load connecting cable		240 VAC / 10 A	240 VAC / 10 A
Weight	kg	50	120

6 CONTROL UNIT CU310-2 PN (PROFINET)

6.1 DESCRIPTION

The CU310-2 Controller Units are designed for operation connected to a Power Module, in the blocksize or chassis formats.

The Control Unit CU310-2 PN (PROFINET) is a control module for single drives in which the open-loop and closed-loop control functions of the drive are implemented.
It controls the Power Modules in the blocksize format via the PM-IF interface and is mounted directly on the Power Module.
The table shows an overview of the available interfaces on the CU310-2 PN.

Table 15 Overview of the CU310-2 PN interfaces

Type	**Quantity**
Isolated digital inputs	11
Non-isolated digital inputs/outputs	8
Isolated digital output	1
Non-isolated analog input	1
DRIVE-CLiQ interface	1
PROFINET interfaces	2
Serial interface (RS232)	1
Encoder interface (HTL/TTL/SSI)	1
LAN (Ethernet)	1
Temperature sensor input	1
EP terminal	1
Measuring sockets	3

NOTE:
For the characteristics of interfaces and inputs / outputs refer to the manual SIEMENS S120-GH6

6.2 SAFETY INSTRUCTIONS

⚠ **WARNING**
Danger of fire through overheating for insufficient ventilation clearances: • It is essential that you maintain 50 mm ventilation clearances above and below the Control Unit and

Control Unit Adapter.

- Ensure that the air openings are not blocked by connecting cables.

⚠ WARNING

As a result of incorrect parameterization, machines can malfunction, which in turn can lead to injuries or death.

6.3 INTERFACE DESCRIPTION

Overview

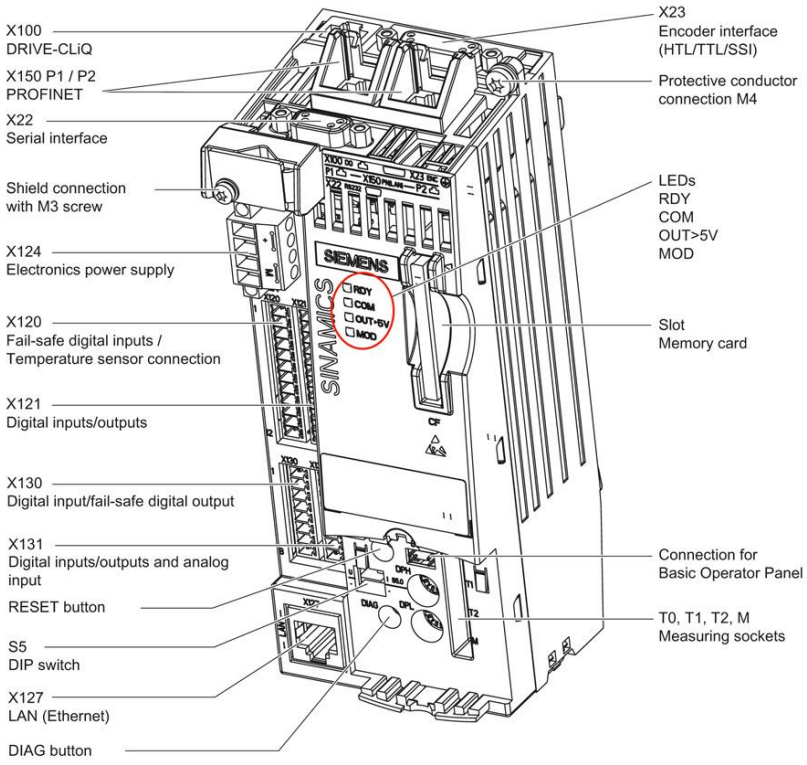


Figure 24 CU310-2 PN overview of interfaces

Note:
The PROFIBUS address switch on the CU310-2 PN has no function.

Memory card

Use only memory cards manufactured by Siemens to run the CU310-2 PN. These cards will be pre-loaded by the factory with the adequate management software.

⚠	DO NOT REMOVE FOR ANY REASON THE COMPACT-FLASH. RISK OF DAMAGE / LOSS OF SOFTWARE

6.4 MEANING OF THE LEDS

Function of the LEDs

There are four LEDs on the front panel of the CU310-2 PN's housing (see CU310-2 PN Interface Overview (Figure 24)).

Table 16 LEDs

RDY	Ready
COM	Status of the fieldbus communication
OUT>5V	Encoder current supply > 5 V (TTL/HTL)
MOD	Operating mode (reserved)

The various LEDs are switched on and off as the control unit is powered up (depending on the phase the system is currently in). When switched on, the color of the LEDs shows the status of the corresponding power-up phase (see Behavior of the LEDs during booting).
In the event of a fault, power up will be ended in the corresponding phase. The LEDs that are switched on, retain their color at this particular instant in time, so that the fault can be determined based on the combination of LEDs that are switched on (bright) and switched off (dark).
All the LEDs go out briefly if the CU310-2 PN has powered up without error. The system is ready for operation when the LED "RDY" is permanently green.
All the LEDs are controlled by the software loaded during operation (see Behavior of the LEDs in the operating state).

Behavior of the LEDs during booting
For information about the start-up phase with verification software / firmware, refer to the manual SIEMENS S120 - GH6

Behavior of the LEDs in the operating state

Table 17 Description of the LEDs during operation of the CU310-2 PN

LED	Color	Stat	Description / cause	Remedy
RDY (READY)	-	OFF	The electronics power supply is missing or outside the permissible tolerance range.	Check the power supply
	Green	Continuous light	The unit is ready for operation. Cyclic DRIVE-CLiQ communication is in progress.	-
		Flashing light 1x2 sec	Commissioning/reset	-
		Flashing light 2x1 sec.	Writing to the memory card.	-
	Red	Flashing light 2x1 sec.	General fault	Check parameter assignment/ configuration
	Red/ Green	Flashing light 1x2 sec	The control unit is ready for operation, but there are no software licenses.	Install the missing licenses.
	Orange	Flashing light 1x2 sec	Updating the firmware of the DRIVE-CLiQ components.	-
		Flashing light 2x1 sec.	DRIVE-CLiQ component firmware update completed. Waiting for POWER ON of the corresponding components.	Switch on the component.
	Green/ Orange or Red/ Orange	Flashing light 2x1 sec.	Recognition of the component via LED is activated (see SINAMICS S120/S150 List Manual.) **Note**: Both options depend on the LED status when component recognition is activated.	-

6.5 DIMENSION DRAWING

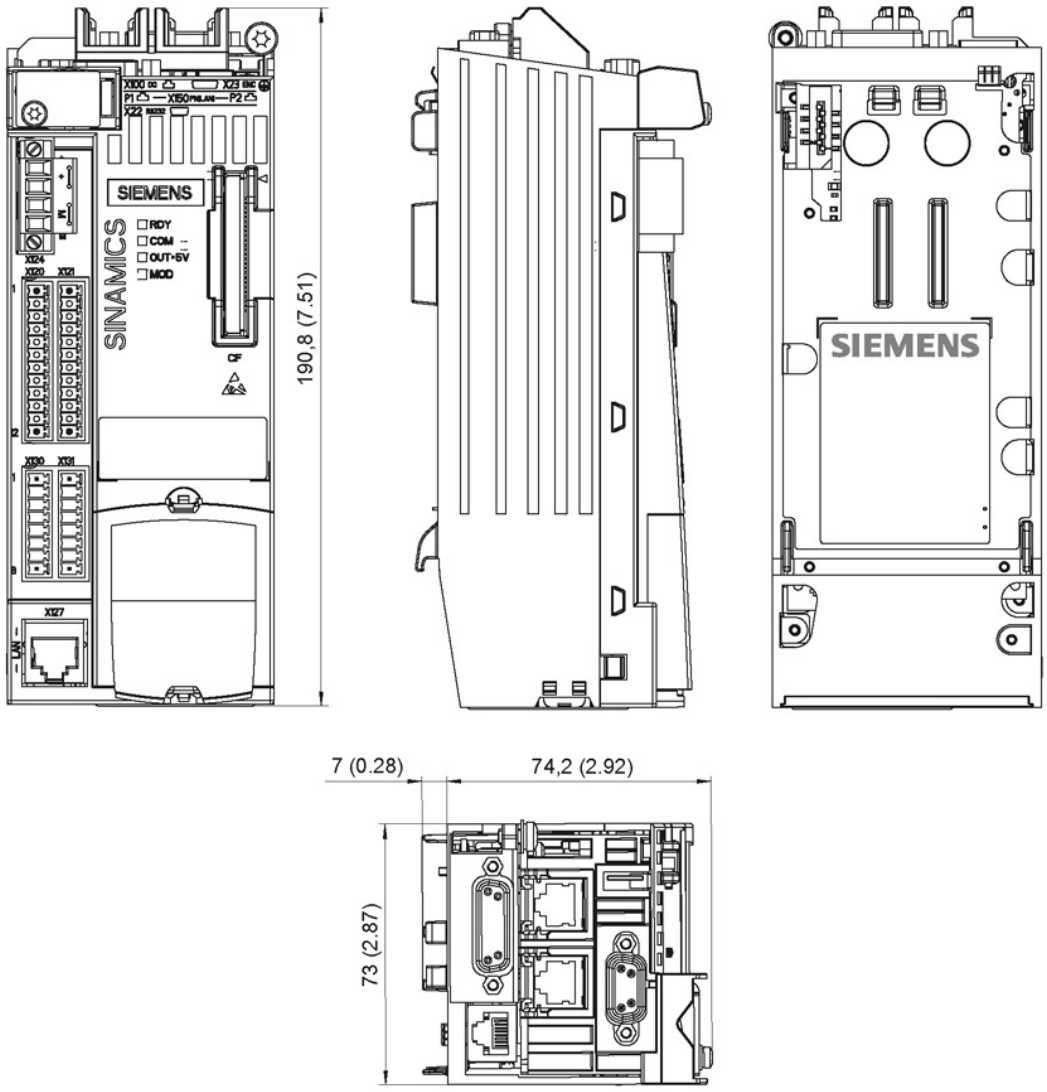


Figure 25 Dimension drawing, Control Unit CU310-2 PN, all data in mm (inches)

6.6 TECHNICAL DATA

Table 18 Technical data for CU310-2 PN

6SL3040-1LA01-0AA0	**Unit**	**Value**
Electronics power supply Voltage Current (without DRIVE-CLiQ and digital outputs) Power loss Maximum DRIVE-CLiQ cable length	 VDC ADC W m	 DC 24 (20.4 … 28.8) 0.8 <20 100
PE/ground connection	At the housing with M4/3 Nm screw	
Response time	The response time of digital inputs/outputs depends on the evaluation (1)	
INPUT: - Absorption Current (at 24V) - Signal level (including ripple) - High - Low	VDC mA V V	-3…30 6 15…30 -3…5
OUTPUT: - Max. current	VDC mA	24 500
Weight	Kg	0.95

(1)You will find information on this topic in the SINAMICS S120/S150 List Manual, Chapter "Function block diagrams."

6.7 MOUNTING

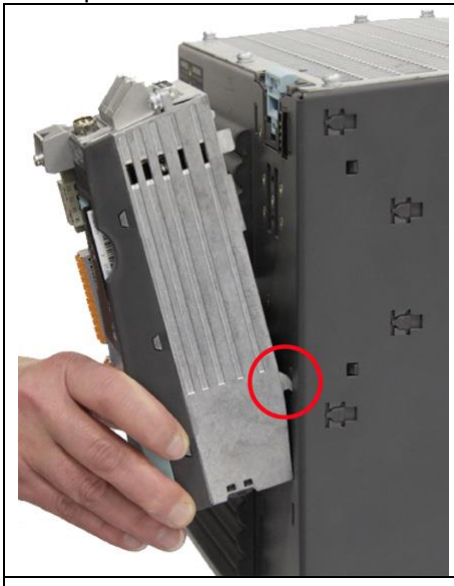
Power Module Blocksize

The Control Unit (CU310-2 PN) can be mounted onto Power Modules Blocksize of any size and the communication between the devices is realized via the PM-IF interface.

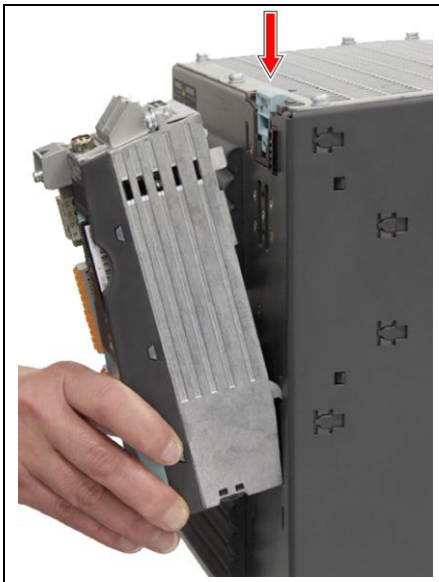
Mounting

1. Mount the Control Unit on the PM.
2. Press the Control Unit back until it latches into the blue interlocking lug.

The diagrams show the Control Unit mounted on the PM340 (frame size FSD), using the CU310-2 PN as an example.

	
Placing the CU310-2 PN on the PM340	PM340 with CU310-2 PN fitted

Removal

 *Figure 26 Removing the CU310-2 PN from the PM340*	1. Press the blue locking latch downwards (see arrow). 2. Remove the Control Unit towards the front.

Power Module Chassis

1. Connect the DRIVE-CLiQ interfaces of Power Module Chassis and the Control Unit. The DRIVE-CLiQ interface of the Power Module Chassis is located behind the mounting plate.
2. Mount the Control Unit on the mounting plate.

7 POWER WIRING

7.1 POWER CIRCUIT CONNECTION

All electrical wirings have to be done, respecting the rules shown in the table below:

U1,V1,W1	Mains power supply input	Connect the mains power supply input phases in any order.
U2;V2;W2	Inverter output	Connect the three output phases to the contactors, then to the motor.
R1;R2	External braking resistor	Connect the external braking resistor
⏚	Earth	Connect to the building's earth system.

7.2 SAFETY INSTRUCTIONS

1- Do not power the inverter without first making the earth connection.
2- To increase inverter protection (especially against overvoltage due to electrical storms), three extrafast-blow fuses (one for each phase) can be installed in series with the supply mains input terminals. The fuses must be rated according to the various sizes. The set of fuses, complete with protection box, can be supplied on request (not indispensable!).
3- To avoid permanently damaging the inverter, **do not connect braking resistors with resistance or power ratings lower than those given in the table (see) .**
4- The inverter drive must be connected “upstream” of the power contactors.
5- The external braking resistor heats up during operation. Do not install it near or in contact with inflammable materials; protect it to prevent direct contact.
6- Wire earth connections and masses correctly to avoid problems of EMC interference.
7- ⚠ Pay particular attention to the power connection; **if the input and output are inverted, the inverter will inevitably be damaged.**

7.3 RULES FOR EMC COMPLIANT MOTOR - INVERTER WIRING

For a correct wiring of the group INVERTER - ENGINE, in addition to the procedure described in Chapter 4, about electromagnetic compatibility, follow the steps below:

1- The inverter and motor must be connected directly to the building's earth system.
2- The power cables for the inverter/contactors and contactors/motor connection must be as short as possible, shielded four-core (three phases plus yellow/green earth wire), or four unshielded cables bound together and inserted in a raceway or a metal pipe connected to earth. In other words, there must be an earth wire as close as possible to the power wires in the same cable or in the same pipe.
If shielded cable is used, continuity of the earth braid between the inverter/contactors and contactors/motor section must be ensured.
It is advisable to connect the shielding to earth at both ends by means of a U-clip or with special terminals.
If the shield cannot be connected with a U clip inside the motor terminal block, it must be earthed on the frame before entering the terminal block.
3- Even if it is not essential, a good engineering way provides to have a shielded cable also in the power line in input, in order to prevent that irradiated noises are brought out, by means this cable.
4- The inverter power cables (input and output) and control cables must be kept as far apart as possible and must not run parallel, even if shielded; if the cables cross, they must be arranged at an angle of 90°.
5- Irrespective of the connection to the building's earth system, the motor frame MUST be connected to the cable shield and to the yellow/green earth wire inside the shielded cable.
6- The inverter emits radiated interference, which can therefore be picked up and carried outside the panel by the cables, especially by flexible cables which radiate the interference into the lift shaft. If this problem is to be avoided, the connections between the panel and the inverter must be made using shielded wires with shield connected to earth at both ends. Shielded cables must not be used without the shield connected to earth, as in this case any interference will be greater than with an unshielded cable.

⚠ **Any free or unused wires in a multicore cable must be connected to earth at both ends.**

7- Any cable, for control or external connections for the shaft and lift car, must never run near and parallel to the power cable, even if shielded; if parallel routing cannot be avoided, they must be in separate metal raceways.
8- All earth connections must be as short and wide as possible.

9- To avoid unwanted tripping of the differential switch:
    - Make the power connection as short as possible
    - Use suitable differential switches (type A or B 300mA)
    - When possible, reduce the inverter carrier frequency: in fact, as lower is the frequency, is greater the motor noise, but with less current leakage to earth and less EMC interference; so the motor windings are less stressed.

7.4 SIEMENS S120 ELECTRICAL WIRING

Below is a diagram for the execution of inverter wiring with all electrical connections.
All supplies at 24V are in continuous current (DC) rectified.
Highlighted in red, the wirings you have to perform.

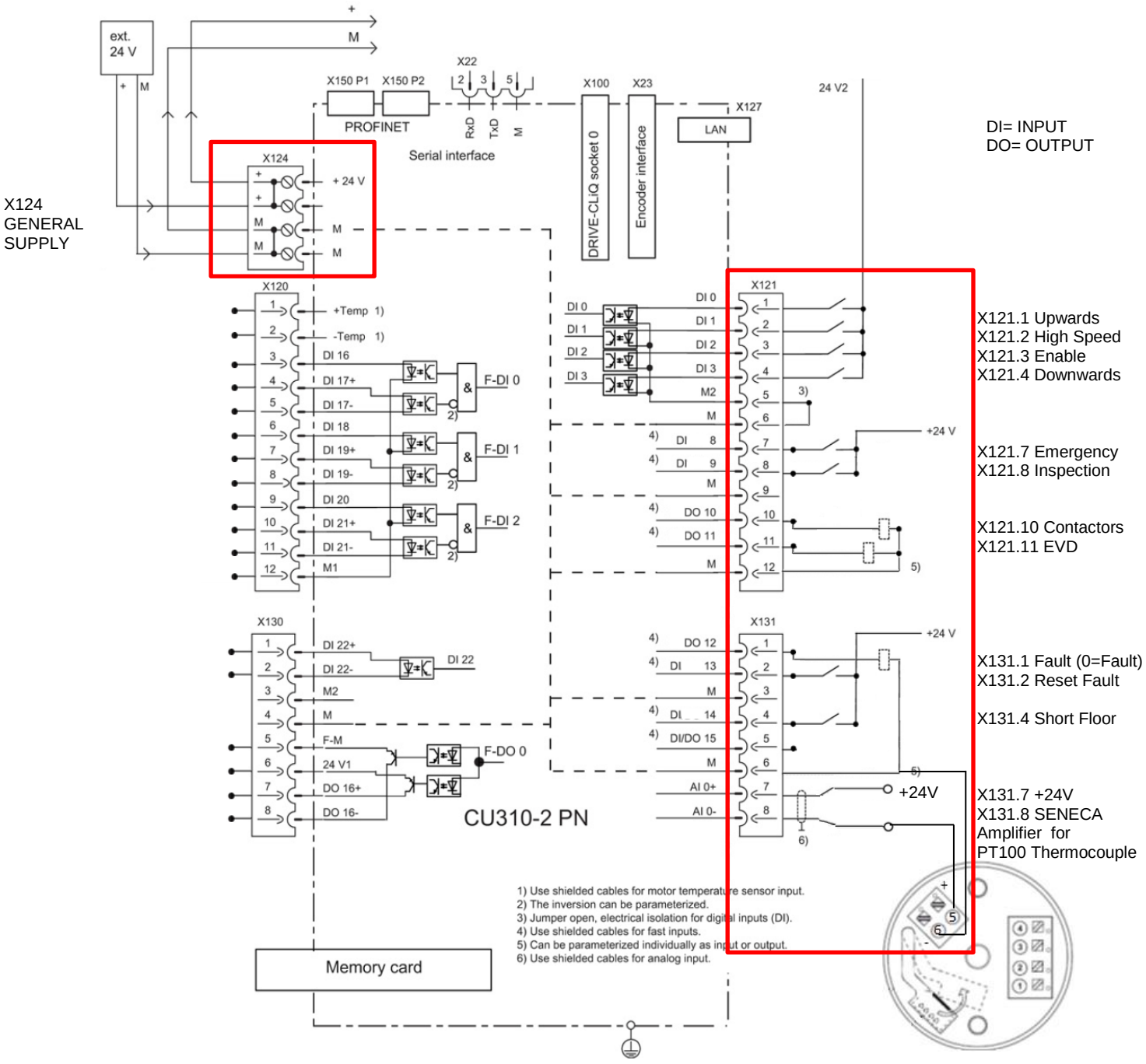


Figure 27 Connection example CU310-2 PN without safety function

⚠ The Input port X131.2could be used for reset automatically some system faults by the main switch board, on the base of its evaluation.

X121.7-Emergency and X131.4-Short Floor, allow to set specific reduced high speed that will be used in place of the standard value of high speed.

X121.7 has to be used as a +24V command to reduce the power used in condition of UPS feeding (for example in emergency conditions activated by the fire fighters). See paragraph 10.4.4.

⚠ X121.7 isn't the command for emergency downward travel in the event of a power failure! It cannot be used to open the valve in case of lack of power.

The outputs (DO) are signals +24V that guarantee maximum 0,5A and can't be able to directly feed the coils!

7.5 THERMOCOUPLE

For a proper operation of the inverter and in order to ensure the temperature compensation, must be connected a thermocouple PT100 and its transmitter amplifier to the terminals X131.7 and X131.8 of the CU.

OmarLift deliver as standard a thermocouple and an amplifier from SENECA company.

Amplifier technical data:

T120
2 WIRE - LOOP POWERED TRANSMITTER FOR PT100 AND NI100 PROBES

General Description

The T120 instrument converts a temperature signal read by a PT100 (EN 60751) or NI100 probe with connection by 2, 3 or 4 wires into a signal normalised in current for 4 - 20 mA loop (2 wires technology).
The module's main features are:

- %High precision
- %16 bit resolution
- %Compact size
- %Configuration by PC with KT120 dedicated software downloadable at www.seneca.it

Technical Features

PT100 Input - EN 60751/A2 (ITS-90)

Measurement Range :	-200 - +650 °C
Resistance Range :	18,5 Ω - 330 Ω
Minimum span :	20 °C
Current on sensor :	750 µA rated
Cable resistance :	Max 25 Ω per wire
Connection :	2, 3 or 4 wires
Resolution:	~ 6 mΩ

NI100 Input

Measurement Range :	-60 - +250 °C
Resistance Range :	69 Ω - 290 Ω
Minimum span :	20 °C
Current on sensor :	750 µA rated
Cable resistance :	Max 25 Ω per wire
Connection :	2, 3 or 4 wires
Resolution :	~ 6 mΩ

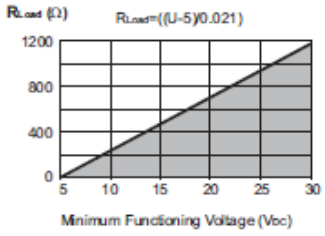
Output/Power Supply

Operating Voltage :	5 - 30 Vdc
Current output :	4 - 20 mA, 20 - 4 mA (2 wires technology)
Load resistance :	1 kΩ @ 26 Vdc, 21 mA (see on page 2, **Load Resistance vs Minimum Functioning Voltage** diagram)
Resolution :	1 µA (>14 bits)
Output in case of over-range :	102,5% of full scale value (see Table on Page 3)
Output in case of fault :	105% of full scale value (see Table on Page 3)
Current output protection :	approximately 30 mA

Other Features

Network freq. Rejection :	50 Hz and 60 Hz (settable)
Transmission error :	Max of 0,1% (of measurement range) or 0,1 °C
Error caused by EMI (*)	< 0,5 %
Influence of cable resistance :	0,005 Ω / Ω
Temperature Coefficient :	< 100 ppm, Typical : 30 ppm
Sampling Time:	100 ms (without 50/60 Hz Rejection) 300 ms (with 50/60 Hz Rejection)
Response time (10..90 %) :	< 220 ms (without 50/60 Hz Rejection) < 620 ms (with 50/60 Hz Rejection)
Protection Index :	IP20
Operating Conditions :	Temperature -40 - +85 °C Humidity 30 - 90 % at 40°C (non-condensing) Altitude: up to 2000 m a.s.l
Storage Temperature:	-40 - +105 °C
Connections :	Spring terminals
Conductor Section :	0,2..2,5 mm²
Wire stripping :	8 mm
Box:	Nylon / glass, (black colour)
Dimensions :	20.0 mm x ϕ 40.0 mm
Standards : CE	EN 61000-6-4/2002-10 (electromagnetic emission, industrial surroundings) EN 61000-6-2/2006-10 (electromagnetic immunity, industrial surroundings)

Diagram: Load Resistance vs Minimum Functioning Voltage



(*) EMI: electromagnetic interferences.

Factory setting

The instrument leaves the factory with the following configuration (except for other indications on the box):

RTD wiring	→	3 wires
Input filter	→	Enable
Reversed Output	→	NO
RTD Type	→	PT100
Measurement Range Start	→	0 °C
Measurement Full-Scale	→	100 °C
Output signal in case of fault	→	Towards the top of the output range YES: a 2.5% over-range value is acceptable;
Over-Range	→	a 5% over-range value is considered a fault.

Custumized Setting by PC and accessories

The configuration by PC use (see the drawing below) is possible with the following accessories:
S117P: USB to RS232/TTL
PM002411: connection cable between S117P and T120
KT120: Dedicated programming software.
The module may be programmed even if it is not supplied by the 4..20 mA loop, since the power supply is provided through the programming connector.

Once the user has at his disposal the above listed accessories, the following parameters may be setStart and Full scale values.

- %RTD Connection: 2 wires, 3 wires o 4 wires.
- %50 / 60 Hz Rejection (*): Disable or enable.
- %Measurement filter: Disable o renable (1, 2, 5 , 10, 30, 60 seconds).
- %Output: Normal (4 - 20 mA) o Reversed (20 - 4 mA).
- %RTD Type: PT100 or NI100.
- %Cable Resistance Compensation for 2 wires measurement.
- %Output signal in case of fault: towards the bottom of the output range or towards the top of the output range.

It is besides possible the calibration of the output scale.

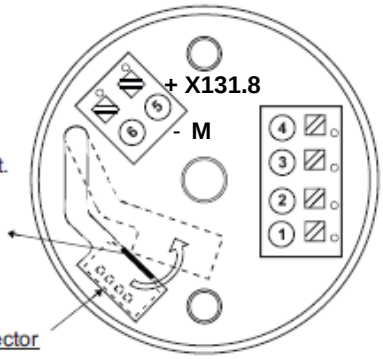
(*) The input filter slows down the response time to around 620 ms and guarantees the repeating of the disturbance signal at 50 / 60 Hz overlapping the measurement signal.

(**) See the table below for the corresponding values.

Output signal Limit	Over-range / Fault ± 2,5 %	Fault ± 5 %
20 mA	20,4 mA	21 mA
4 mA	3,6 mA	< 3,4 mA

Frontal Side: Terminals Position and Enumeration

1. Raising the plastic protection using the appropriate slot.
2. Move the plastic protective as in the drawing.



Electrical Connections

Input

The module accepts input from a PT100 (EN 60 751) or NI100 temperature probe with connection by 2, 3 or 4 wires.

The use of shield cables is recommended for the electronic connections.

2-wire connection

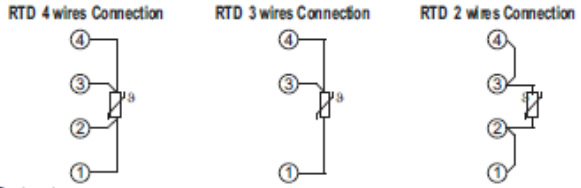
This is the connection to be used for short distances (< 10 m) between module and probe, bearing in mind that it adds an error (which may be removed by sofware programming) equivalent to the resistance contributed by the connection cables to the measurement.
The module has to be programmed by PC for 2 wires connection.

3-wire connection

This is the connection to be used for media-long distances (> 10 m) between module and probe. The instrument performs compensation for the resistance of the connection cables. In order for compensation to be correct, it is necessary that the resistance values of each conductors be the same because in order to perform compensation the instrument measures the resistance of only one conductor and assumes the resistance of the others conductors to be exactly the same.
The module has to be programmed by PC for 3 wires connection.

4-wire connection

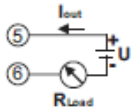
This connection to be used for media-long distances (> 10 m) between module and probe. Provides the maximum precision because the instrument measure the resistance of the sensor independently of the resistance of the connection cables.
The module has to be programmed by PC for 4 wires connection.



Output

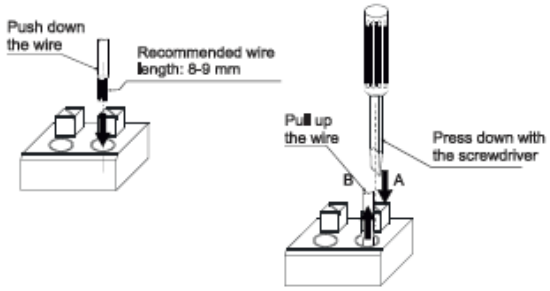
Current Loop connection (regolated current).

The use of shield cables is recommended for the electronic connections.

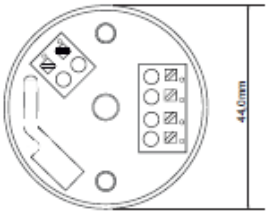


Note: in order to reduce the instrument's dissipation, we recommend guaranteeing a load of > 250 Ω to the current output.

Pattern of connecting terminal with push-wire connection



Size and dimensions



Smaltimento dei rifiuti elettrici ed elettronici (applicabile nell'Unione Europea e negli altri paesi con servizio di raccolta differenziata).
Il simbolo presente sul prodotto o sulla sua confezione indica che il prodotto non verrà trattato come rifiuto domestico. Sarà invece consegnato al centro di raccolta autorizzato per il riciclo dei rifiuti elettrici ed elettronici. Assicurandovi che il prodotto venga smaltito in modo adeguato, eviterete un potenziale impatto negativo sull'ambiente e la salute umana, che potrebbe essere causato da una gestione non conforme dello smaltimento del prodotto. Il riciclaggio dei materiali contribuirà alla conservazione delle risorse naturali.

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8 COMPUTER PROGRAMMING (preferable, if available)

⚠	The Computer programming is not available in all type of installations in dependence of SIEMENS availability (required CFC v4.8 or higher)

8.1 COMMISSIONING

⚠	It is preferable and easier to perform the commissioning by PC using the software STARTER, instead of set up the parameters from the operator panel. The STARTER software is available for download for free from SIEMENS website (www.siemens.com) selecting AUTOMATION SERVICE and SUPPORT.
⚠	You could register some problems during the access to functions or parameters below described, caused by know-how protection activated

8.2 STARTER COMMISSIONING TOOL

The STARTER commissioning tool is used to parameterize and commission drive units from the SINAMICS product family.

The STARTER commissioning tool can be used for the following activities:

- Commissioning
- Testing (via the control panel)
- Drive optimization
- Diagnostics
- Setting up and activating the safety functions

System prerequisites

You can find the system requirements for the STARTER commissioning tool in the "readme" file in the STARTER installation directory.

8.2.1 General information on STARTER

Calling STARTER

1. In the Windows starting menu, call the menu command "Start > STARTER > STARTER or by clicking the icon.
2. The STARTER's main screen is structured in the following areas:

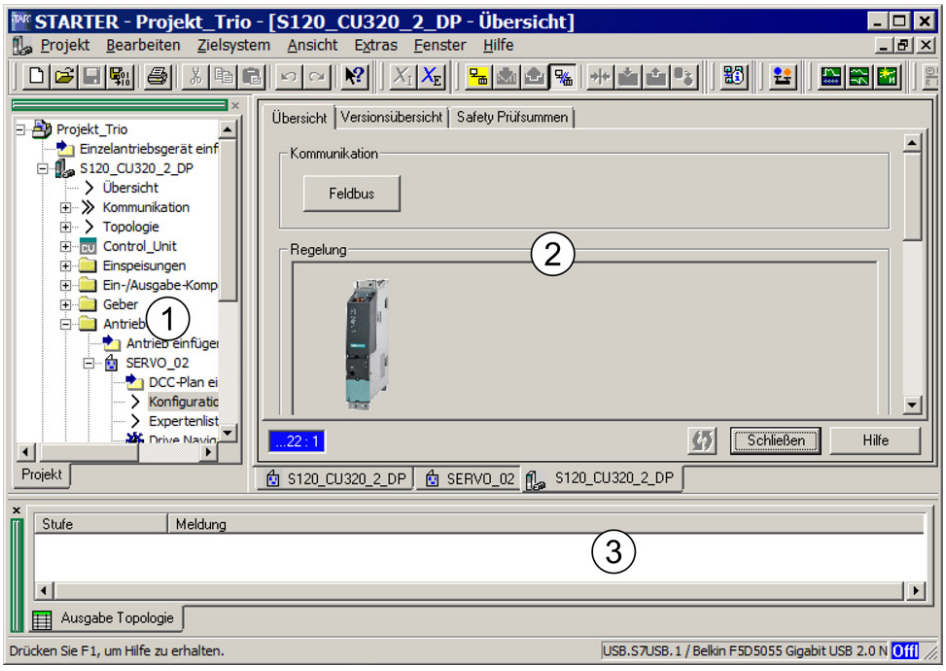


Figure 28 - STARTER: Structure screen

No.	Operating area	Description
1	Project navigator	This area displays the elements and objects that can be added to your project.

2	Work area	In this area you perform the tasks to create the project: • When you are configuring the drive, this area contains the Wizards that help you configure the drive objects. • When you call up the expert list, the system displays a list of all the parameters that you can view or change.
3	Detail view	This area provides detailed information on faults and alarms, for example.

8.2.2 Important functions in the STARTER commissioning tool

The STARTER commissioning tool offers the following functions to support the project handling:

- Configuring and parameterizing drives
- Run trace functions for controller optimization of the drives
- Creation, comparison and copy data records
- Load the project from the programming device to the target device
- Copy volatile data from RAM to ROM
- Load the project from the target device to the programming device

The programming device is called "PG/PC" in the subsequent text. The Control Unit of the SINAMICS drive system is called the "Target device".

8.2.3 Activating online operation: STARTER via Ethernet

The Control Unit can be commissioned with the PG/PC via the integrated Ethernet interface.

Connecting with a special cable it be used as an interface PROFIBUS (see SIEMENS manual)

STARTER via Ethernet (example)

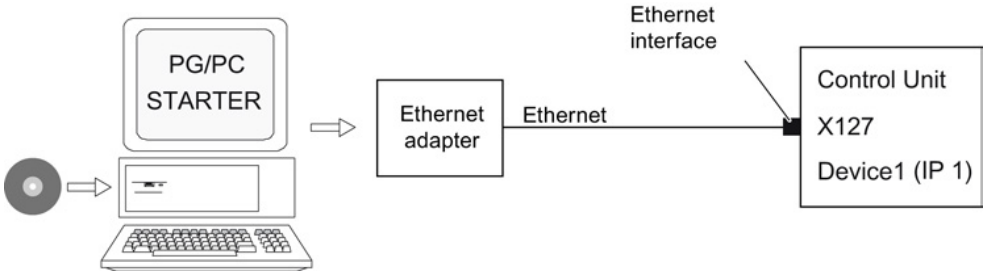


Figure 29 Ethernet connection of the programming device to the target device (example)

8.2.4 Settings Language STARTER

Open STARTER and configure, if necessary, the language via the *Tools / Settings* menu selecting the *Language* screen and then selecting the language of interest and confirming.

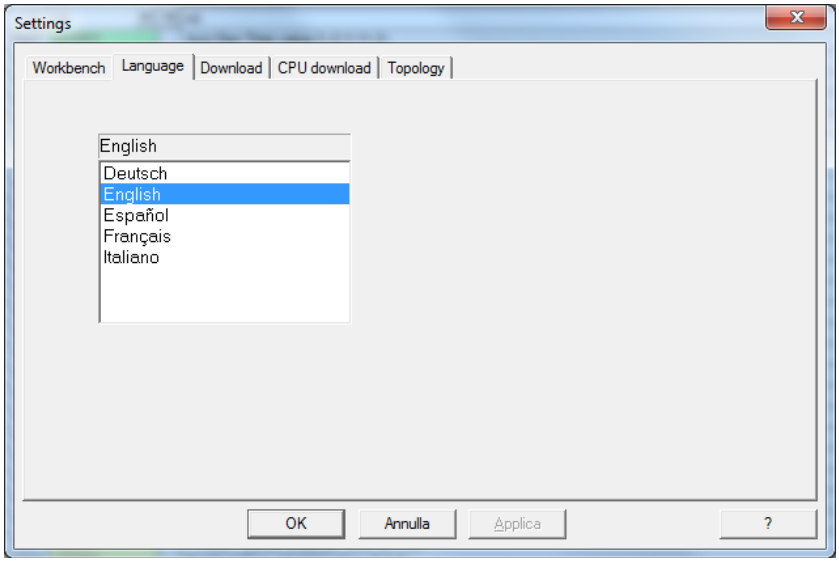


Figure 30 - STARTER language Selection

⚠ In order for the choice becomes operational, you must restart STARTER.

8.3 CONFIGURATION of PC CONNECTION

The instructions below are for Windows 7; for other versions of Windows, the concepts to be applied are the same, although the screens and / or sequence may differ slightly.

1. Open *Network and Sharing Center*, and click *Change adapter settings*

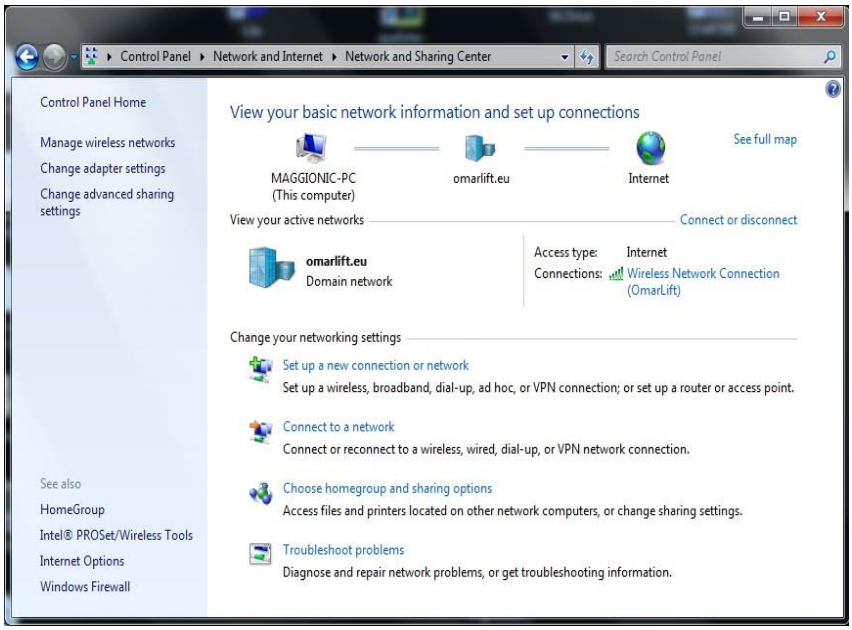


Figure 31 - Change Windows settings tab

2. Select the door to which you connected the Ethernet cable to the inverter (in this case P1 - Intel(R) 82579LM) and then press the right button *Properties*.

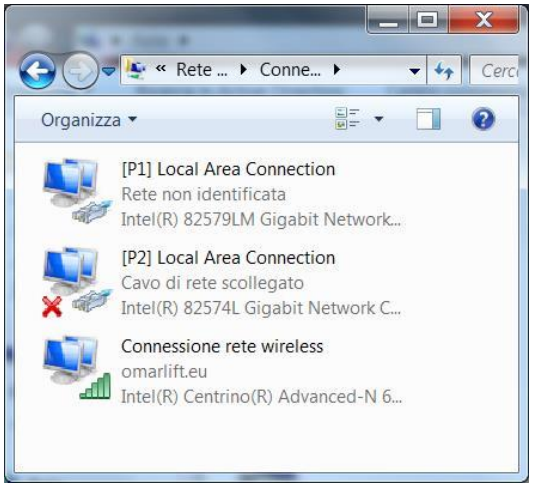


Figure 32- Windows Network

3. Select Network screen in the Internet Protocol Version 4 (TCP / IPv4), and then press *Properties*.

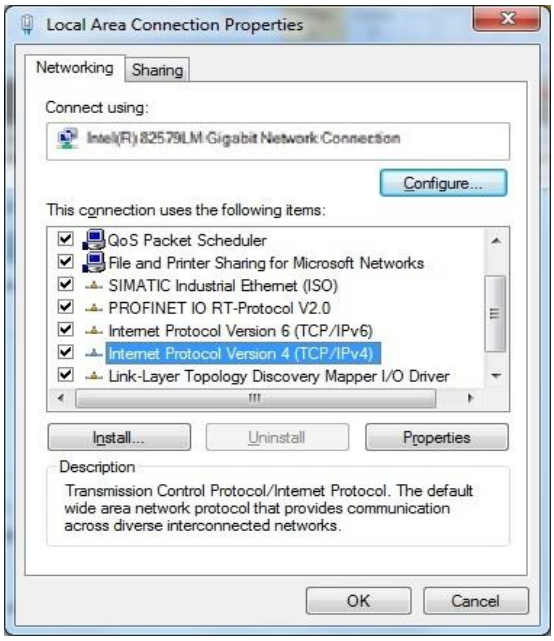


Figure 33 - Windows: Connection Properties

4. Enter the IP address and subnet mask as shown below in the configuration mask shown in Figure 34, then confirm and close screens.

⚠ SIEMENS address for the inverter are:

IP: 169.254.11.22

Subnet mask: 255.255.0.0

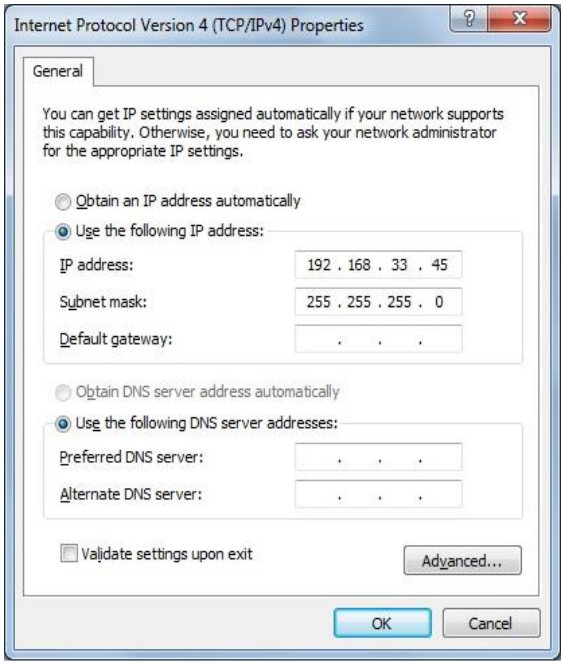


Figure 34 – Windows: TCP / IP connection network card

⚠ Remember that, in order to do not have a reference duplicate IP, the last two digits identifying two communication systems, must be different! So, the values for the inverter and the network card of the PC, cannot be the same!

⚠ If in the supply the **remote assistance pack (optional)** is included, the values corresponding to the **configuration established by Omarlift for the inverter** are different, and they assume a configuration of this type:

IP: 192.168.33.xx (Network card for the last two digits must be set different,)

Subnet mask: 255.255.255.0

The definitive value will be supplied by Omarlift, jointly with the optional pack

⚠ In the case of a full reset of the system, the address could be automatically set to the SIEMENS values

5. Start the SIEMENS STARTER program, then proceed as follows:

a. **If the Software and parameters on the inverter has already been loaded and saved on your PC,** bring up the saved copy via *Project> Open*, choose the location where it was saved and go to step described in the paragraph 8.4.1; otherwise

b. If the parameters on software and have never been loaded and saved on the PC (first time): create a new project by choosing *Project> New*, and giving it a name that allows to recognize (eg: plant name + date). Then select *Tools> PG / PC interface* to select the parameter setting interface and choose the ID number of the TCP / IP where is connected the Ethernet cable, which was previously configured in *Network resources* (in our example the Intel (R) 82759LM Gigabit Network Connection TCP / IP).

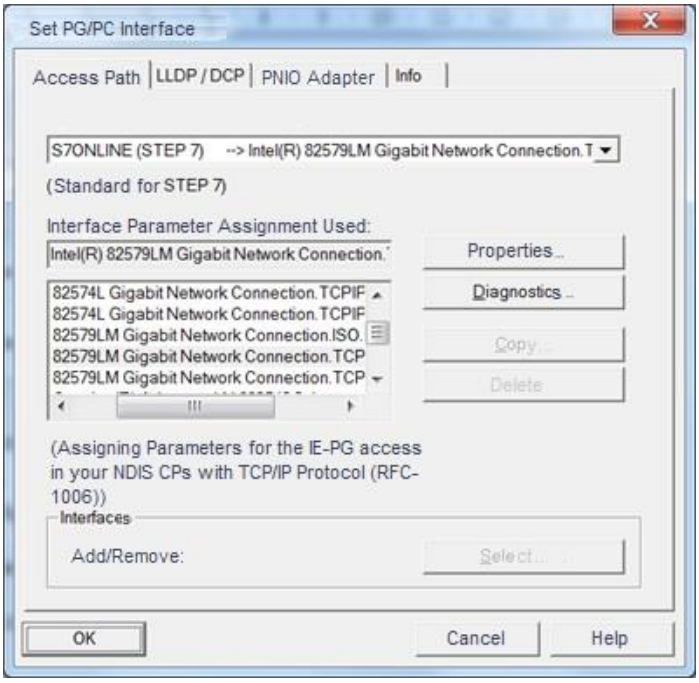


Figure 35 - Configuration STARTER PG / PC interface

At this point, you can connect the PC to the inverter to perform the following configuration tasks and the development of the elevator.

8.4 CONNECTION PC-INVERTER

8.4.1 Connecting ONLINE

If the PC and the inverter has already been linked above, you can simply connect to target devices using the yellow button to switch ONLINE (**the inverter must be powered on**).
If you are **the first connection**, follow these steps:

1. Connect to the target devices using the yellow button to switch ONLINE and press YES to search for accessible nodes.

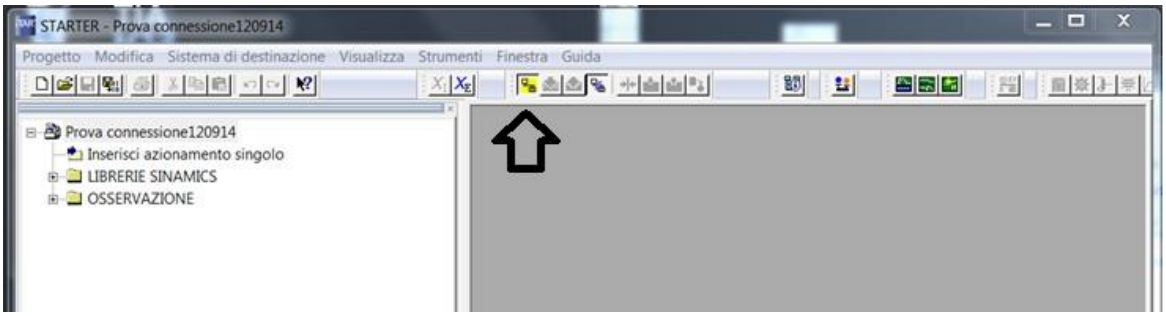


Figure 36 - STARTER connection ONLINE

2. Add the addresses corresponding to the configuration of the inverter (or to the original SIEMENS) to enable dialogue with the PC by pressing YES, if a dedicated screen like that shown in the next image, appears.

Figure 37 - STARTER Adding IP addresses

3. Then select the drive and press *Accept* at the bottom left to turn on the inverter on the project and then *Close* the same screen:

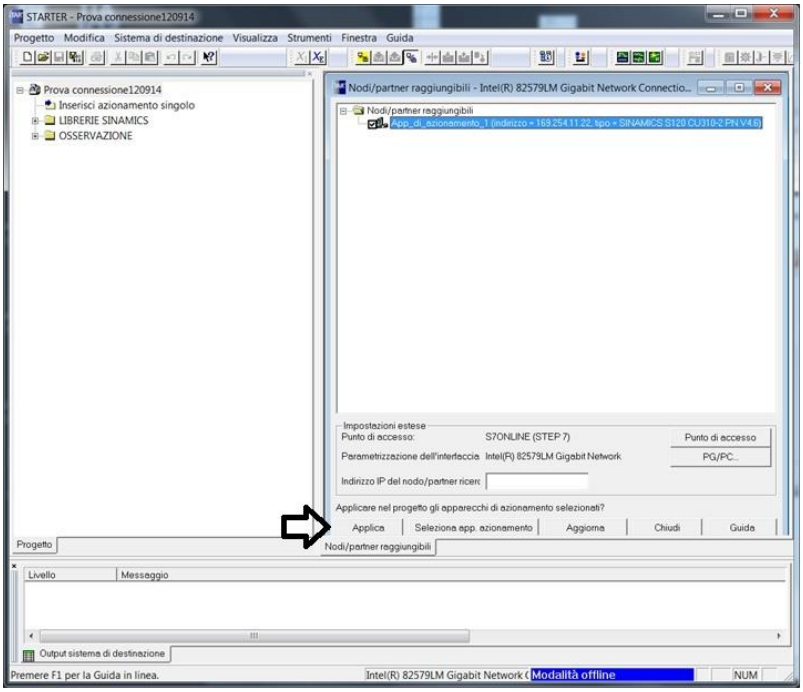


Figure 38 - Nodes STARTER / partners within

4. Press the yellow button again to connect *ONLINE*.

⚠ You may see a screen like shown in Figure 39, which highlights the inconsistencies between the configuration software on the PC and the inverter.
To resolve these inconsistencies press the "Upload to PG →" and confirm subsequent screens, so that the configuration on the PC is conformed to what is available on the machine.

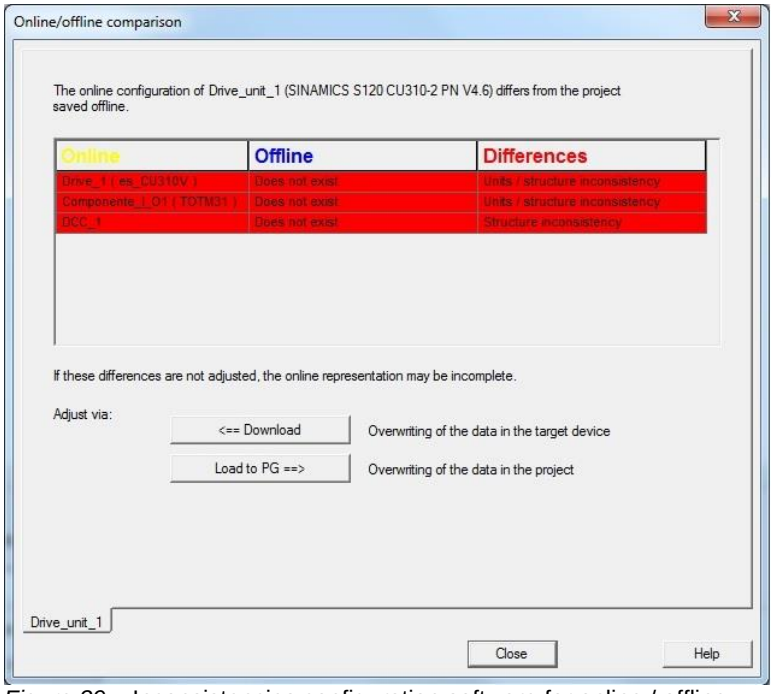


Figure 39 – Inconsistencies configuration software for online / offline

After that, press *Close* to close the screen.

5. In case of the know how protection is activated, the screen will highlight the differences and that the know-how protection is activated. Therefore, press on the *CLOSE* button.

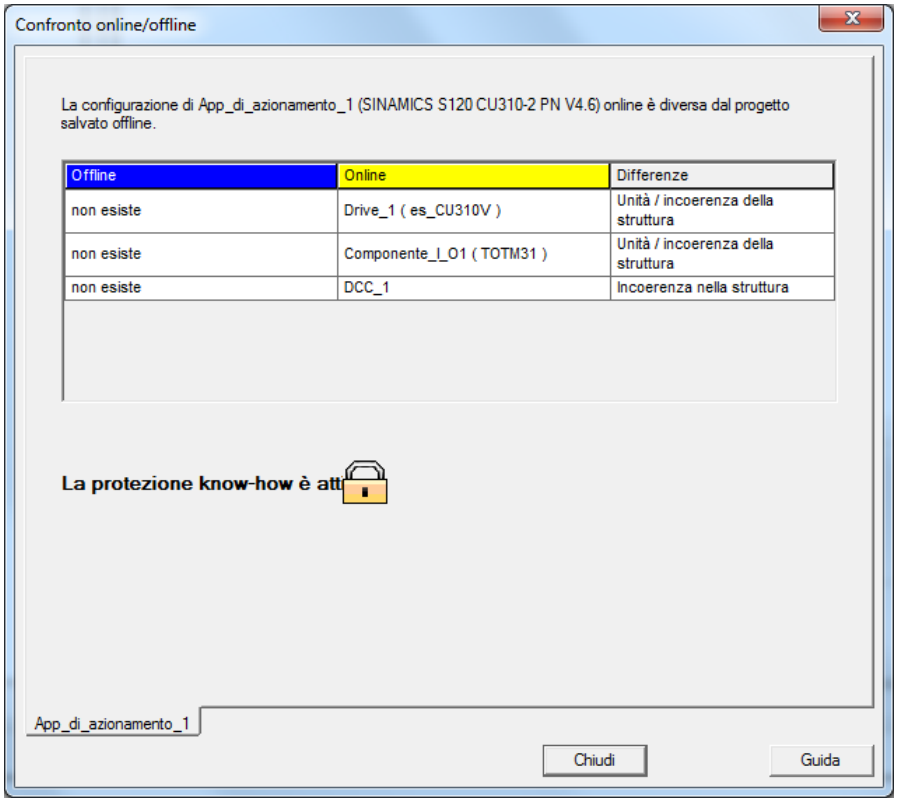


Figure 40 – Inconsistencies software configuration online/offline with signaling know how protection activated

6. Select the drive from the left screen and then press the button "*Upload to CPU→PC"* to transfer the configuration and the program from the inverter to programming PC.

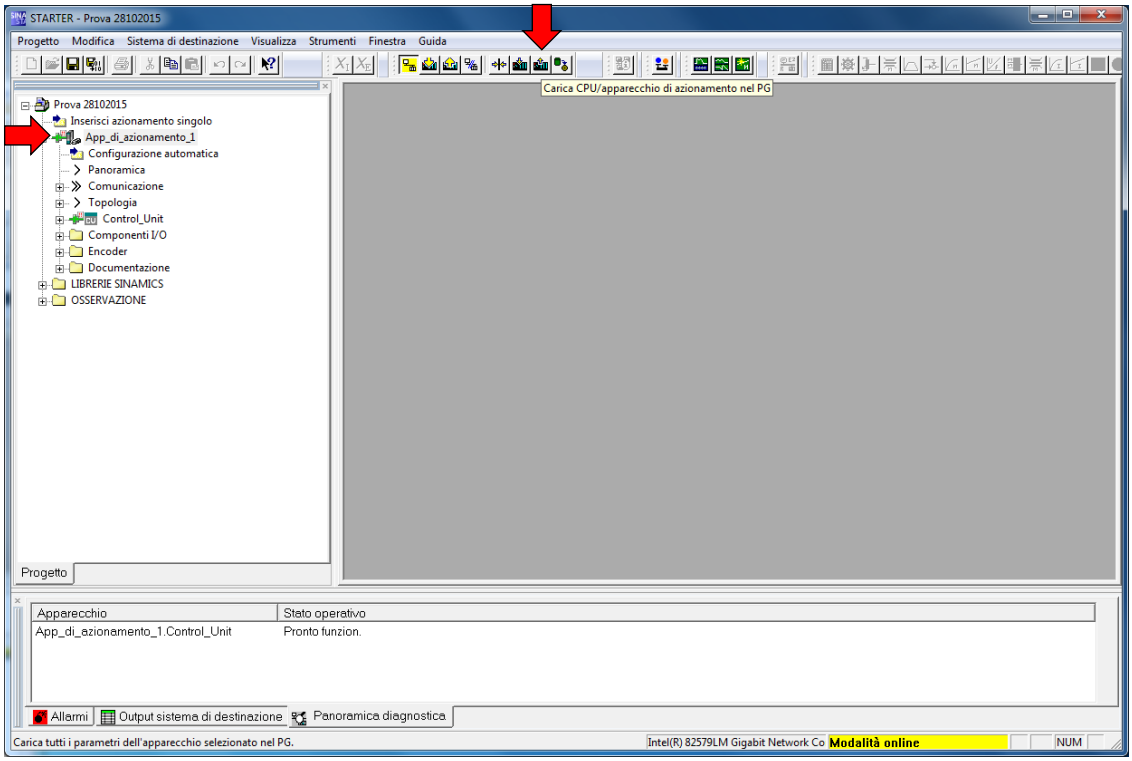


Figure 41 – STARTER transferring inverter configuration into PC

7. Confirm the screen *know how protection activated*, so that the loading happens to the PC.

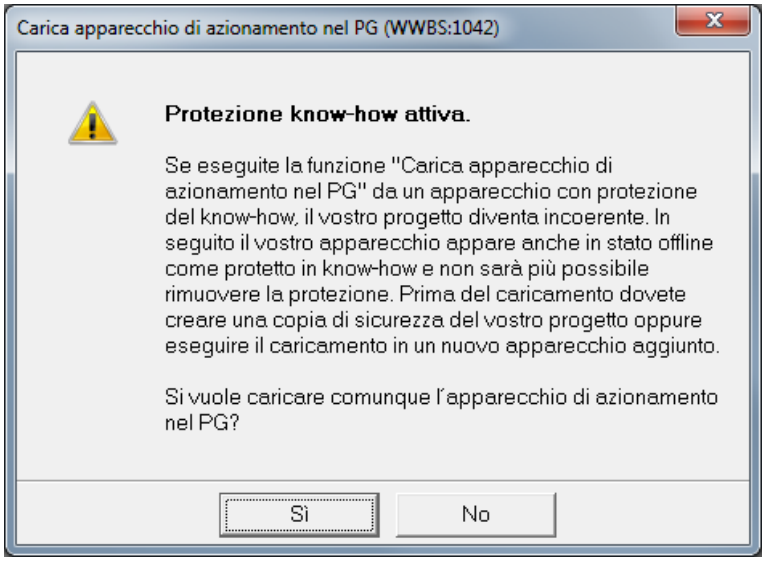


Figure 42 – transferring confirmation with know how protection activated

8. At the end of the loading on the left side of the screen, the drive will be named **S120**..and will appear numerous other items including *DRIVE.*

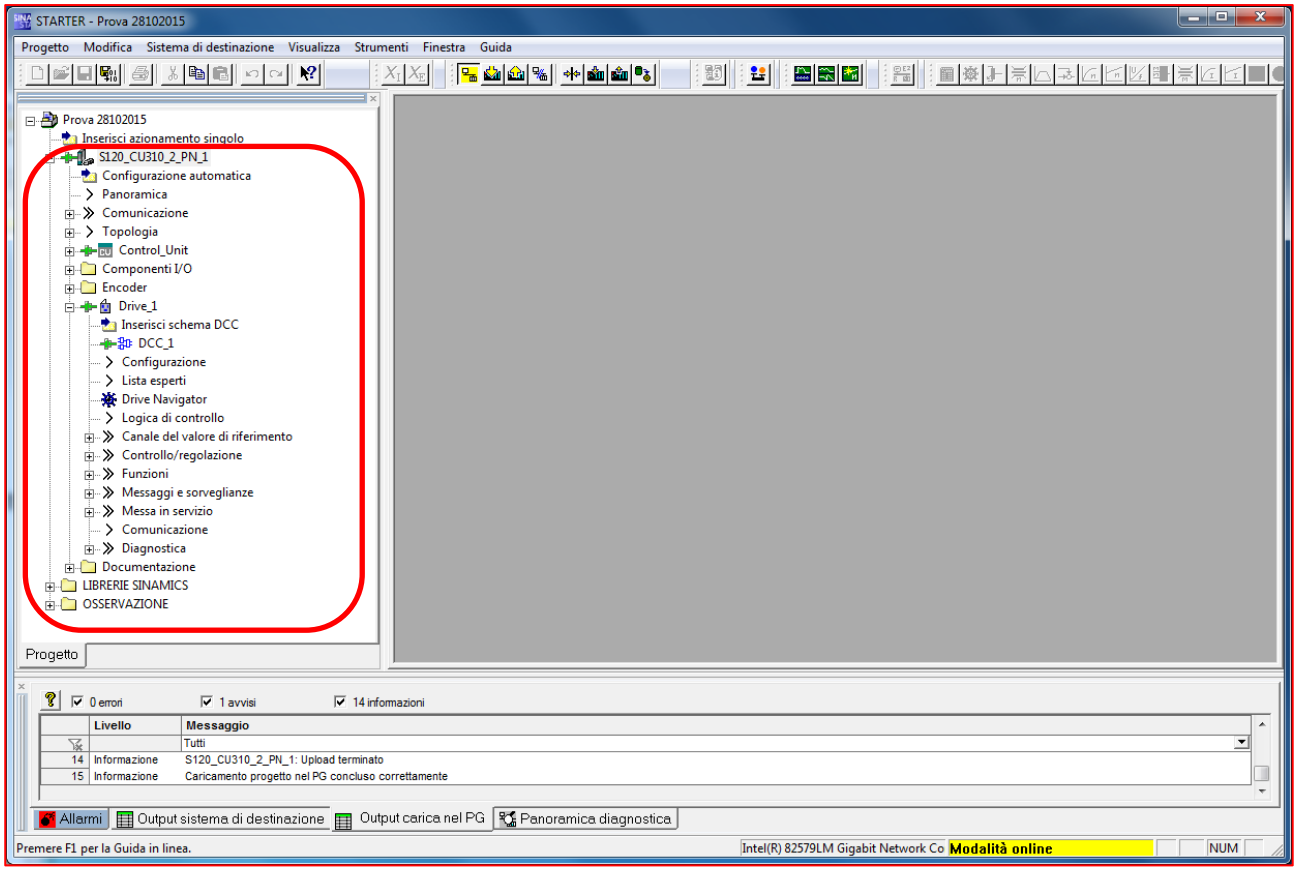


Figure 43 – STARTER screen after transferring of the configuration

9. At this point on the PC is visible the program loaded in the inverter.

In the STARTER screen on the left will be available the **drive S120**, in which are shown the **Drive** and the **Control Unit**.

Pressing the + sign next to each entry, you expand the available menus and you can select the expert list, with all the configurable parameters of the system (see example image).

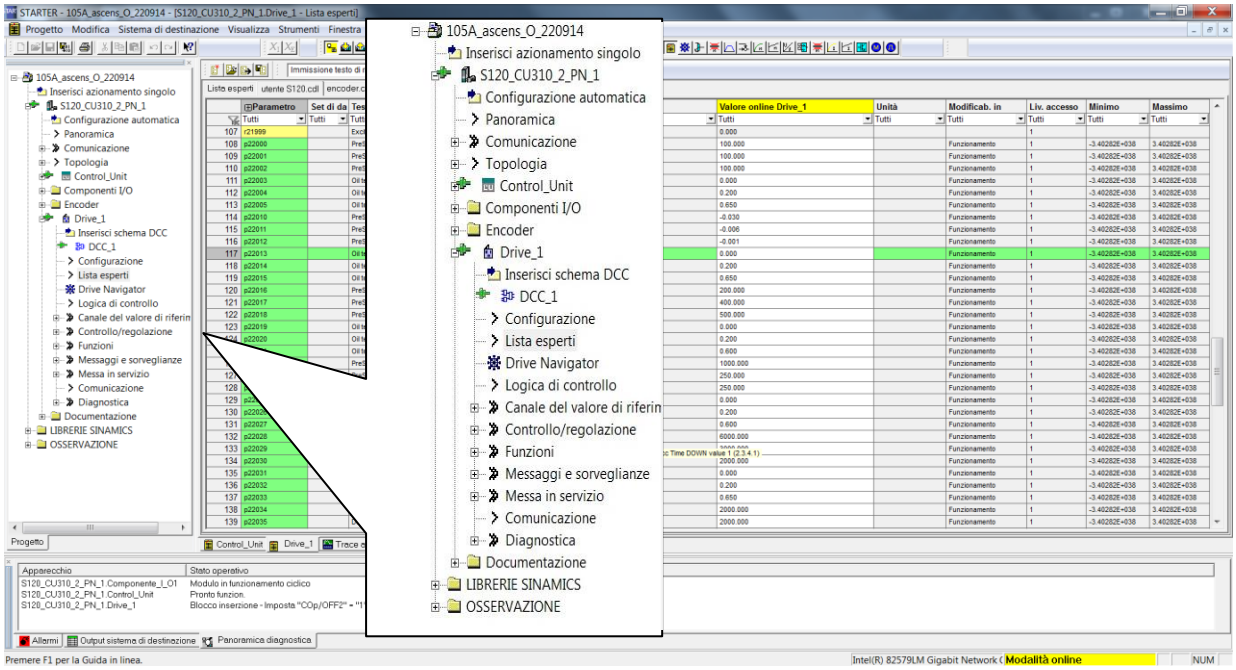


Figure 44 - STARTER structure overview screen

10. After that, on the left screen click on sign + to left of DRIVE and then on *expert list.* In this way you will display all the parameters both reading and writing of the inverter.

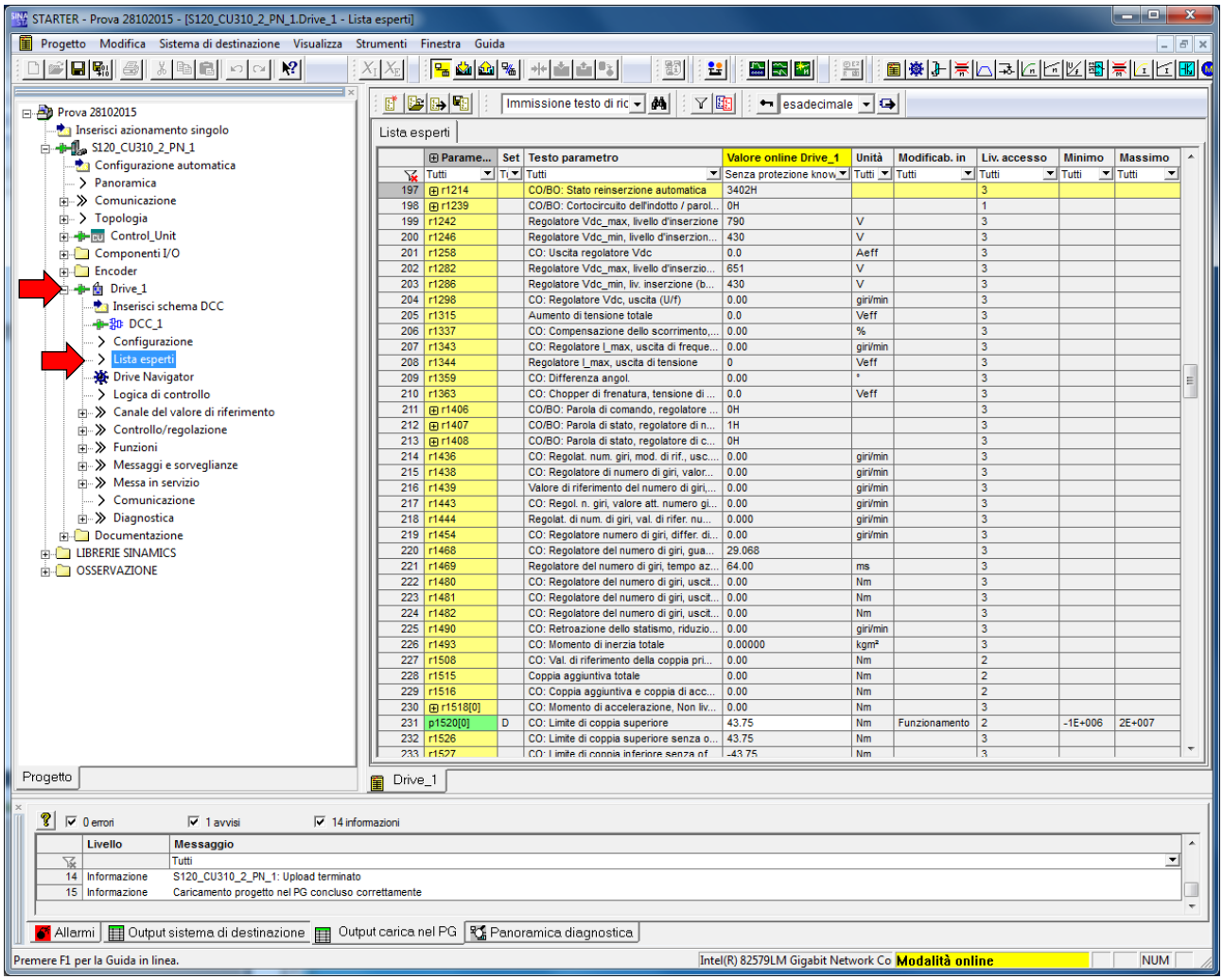


Figure 45 – STARTER visualization of all parameters both reading (yellow) and writing (green)

11. To display only the parameters of interest for the setting of the inverter, apply one of the available filters. For more details, see also chapter 10.1.

⚠ if the lists are not available, you can copy them from the same folder of another project (…\u7\cdldate t) , or ask directly to OMARLIFT.

12. The modification of the parameters of interest (only those in green field, by the letter P) takes places by disconnecting from inverter (OFFLINE mode), clicking -always in OFFLINE mode- on the value of interest, typing the new number and pressing ENTER. At the end of the parameters change, press the *Save project* button to save the new configuration.

⚠ **at this point, the modified program is saved only on the PC and is NOT operating on the INVERTER yet.**

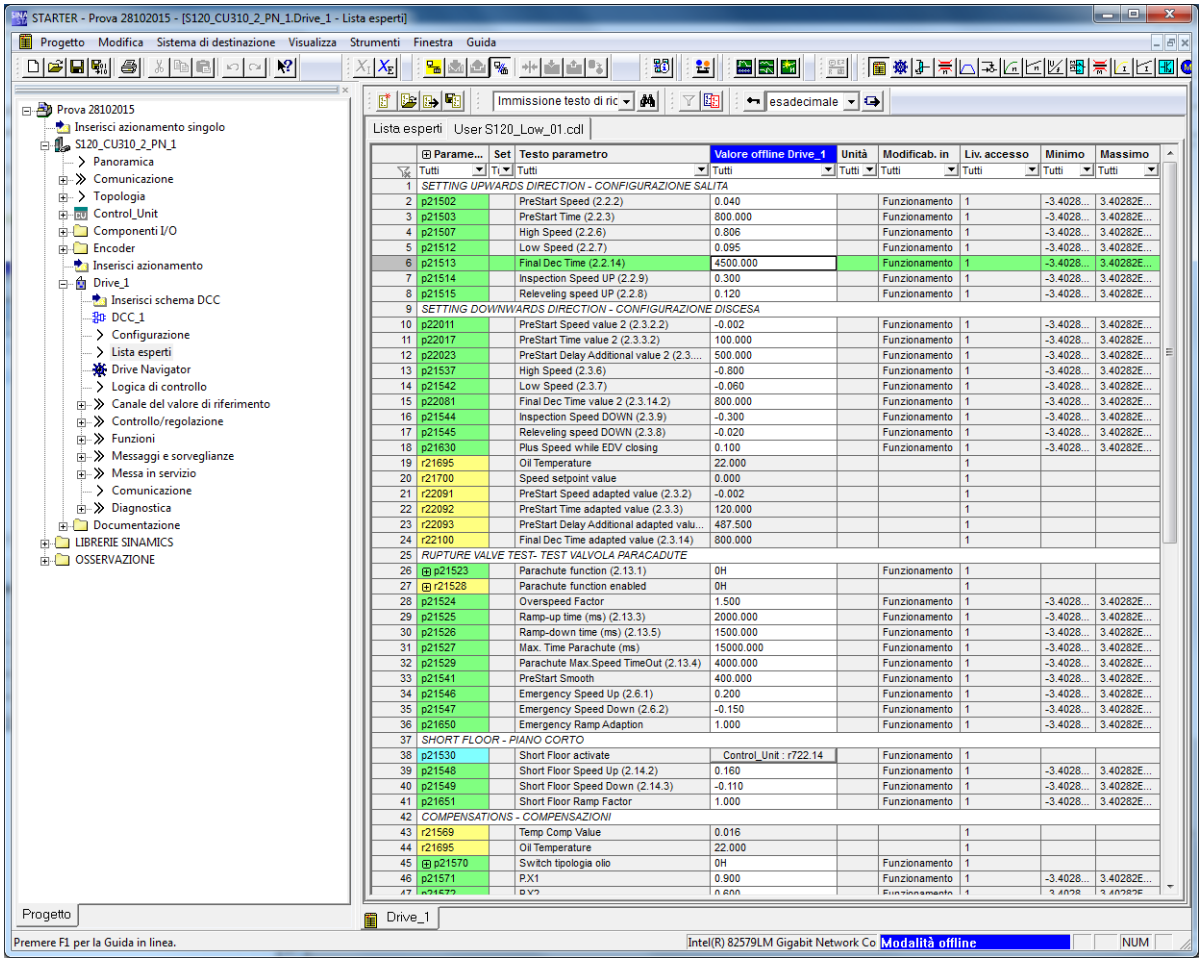
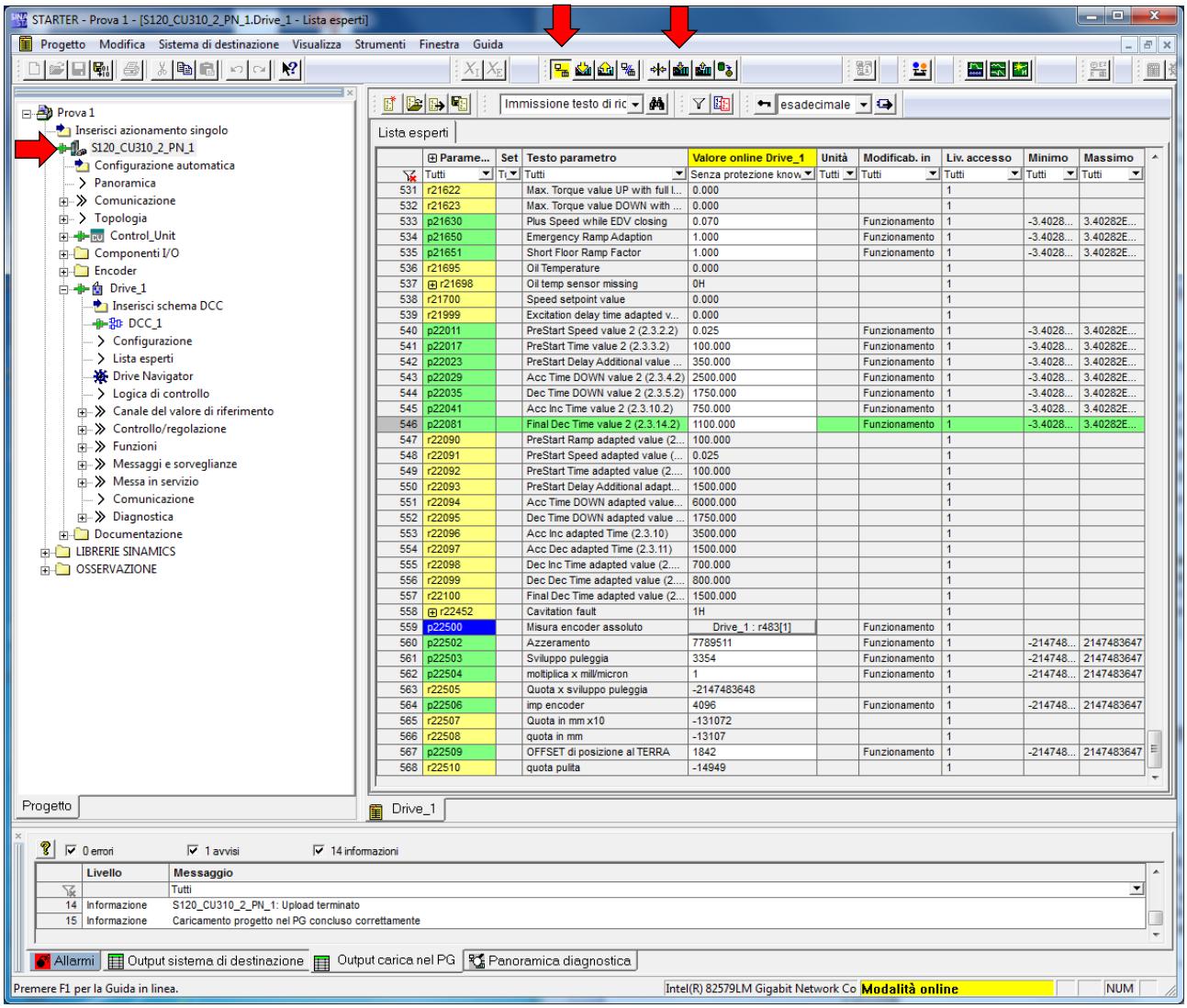


Figure 46 – STARTER change parameter of interest (example P21513)

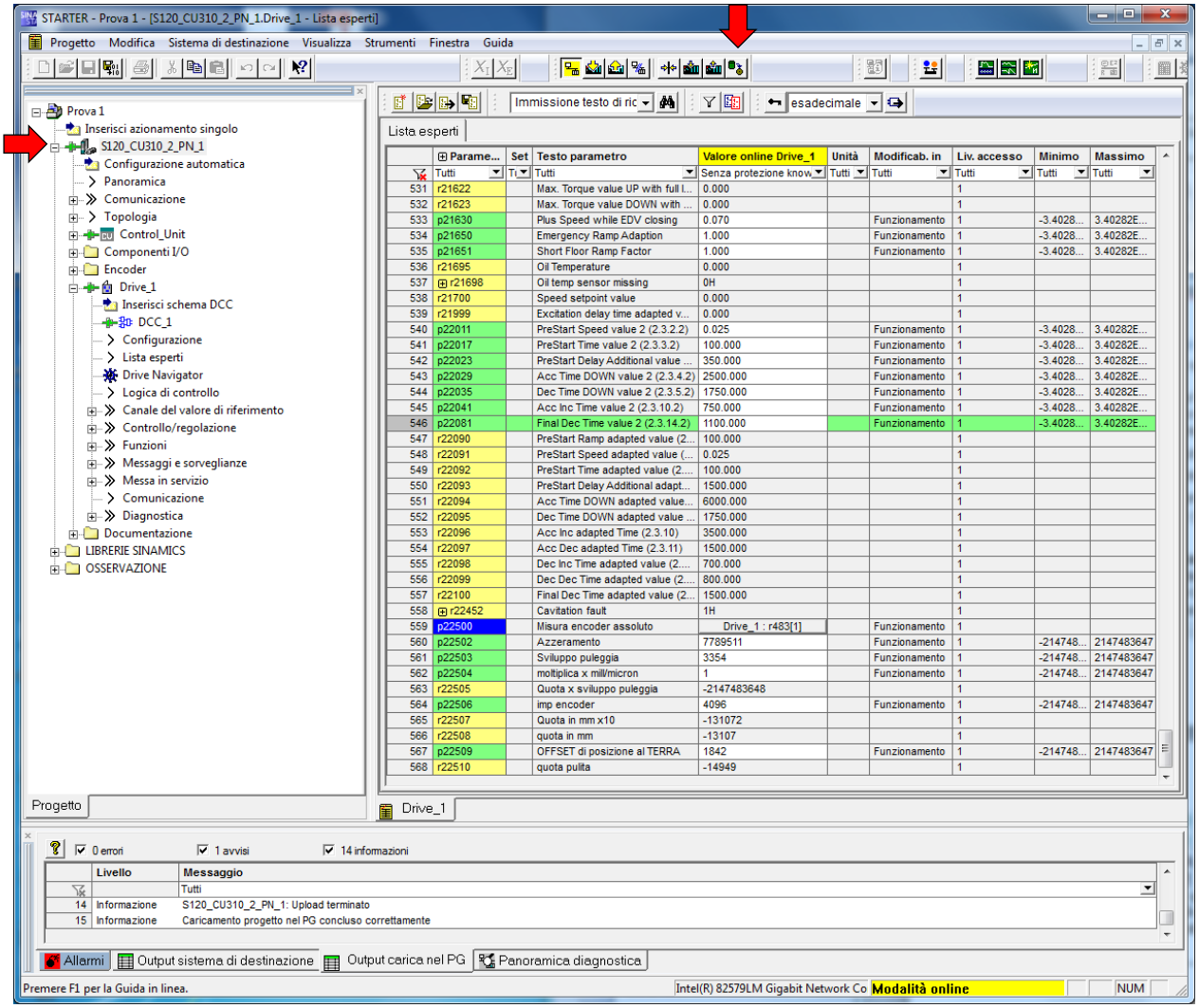
13. It's necessary to transfer the new configuration on the inverter, going in ONLINE mode, selecting the drive S120 from the left screen and pressing the button  *Transfer from PC to inverter*.



	Parame...	Set	Testo parametro	Valore online Drive_1	Unità	Modificab. in	Liv. accesso	Minimo	Massimo
531	r21622		Max. Torque value UP with full l...	0.000			1		
532	r21623		Max. Torque value DOWN with ...	0.000			1		
533	p21630		Plus Speed while EDV closing	0.070		Funzionamento	1	-3.4028...	3.40282E...
534	p21650		Emergency Ramp Adaption	1.000		Funzionamento	1	-3.4028...	3.40282E...
535	p21651		Short Floor Ramp Factor	1.000		Funzionamento	1	-3.4028...	3.40282E...
536	r21695		Oil Temperature	0.000			1		
537	r21698		Oil temp sensor missing	0H			1		
538	r21700		Speed setpoint value	0.000			1		
539	r21999		Excitation delay time adapted v...	0.000			1		
540	p22011		PreStart Speed value 2 (2.3.2.2)	0.025		Funzionamento	1	-3.4028...	3.40282E...
541	p22017		PreStart Time value 2 (2.3.3.2)	100.000		Funzionamento	1	-3.4028...	3.40282E...
542	p22023		PreStart Delay Additional value ...	350.000		Funzionamento	1	-3.4028...	3.40282E...
543	p22029		Acc Time DOWN value 2 (2.3.4.2)	2500.000		Funzionamento	1	-3.4028...	3.40282E...
544	p22035		Dec Time DOWN value 2 (2.3.5.2)	1750.000		Funzionamento	1	-3.4028...	3.40282E...
545	p22041		Acc Inc Time value 2 (2.3.10.2)	750.000		Funzionamento	1	-3.4028...	3.40282E...
546	p22081		Final Dec Time value 2 (2.3.14.2)	1100.000		Funzionamento	1	-3.4028...	3.40282E...
547	r22090		PreStart Ramp adapted value (2...	100.000			1		
548	r22091		PreStart Speed adapted value (...	0.025			1		
549	r22092		PreStart Time adapted value (2....	100.000			1		
550	r22093		PreStart Delay Additional adapt...	1500.000			1		
551	r22094		Acc Time DOWN adapted value...	6000.000			1		
552	r22095		Dec Time DOWN adapted value ...	1750.000			1		
553	r22096		Acc Inc adapted Time (2.3.10)	3500.000			1		
554	r22097		Acc Dec adapted Time (2.3.11)	1500.000			1		
555	r22098		Dec Inc Time adapted value (2....	700.000			1		
556	r22099		Dec Dec Time adapted value (2....	800.000			1		
557	r22100		Final Dec Time adapted value (2...	1500.000			1		
558	r22452		Cavitation fault	1H			1		
559	p22500		Misura encoder assoluto	Drive_1 : r483[1]		Funzionamento	1		
560	p22502		Azzeramento	7789511		Funzionamento	1	-214748...	2147483647
561	p22503		Sviluppo puleggia	3354		Funzionamento	1	-214748...	2147483647
562	p22504		moltiplica x mill/micron	1		Funzionamento	1	-214748...	2147483647
563	r22505		Quota x sviluppo puleggia	-2147483648			1		
564	p22506		imp encoder	4096		Funzionamento	1	-214748...	2147483647
565	r22507		Quota in mm x10	-131072			1		
566	r22508		quota in mm	-13107			1		
567	p22509		OFFSET di posizione al TERRA	1842		Funzionamento	1	-214748...	2147483647
568	r22510		quota pulita	-14949			1		

Figure 47 – STARTER transferring new parameters from PC to inverter

14. At the end of parameters change, select S 120 drive in the left screen and then press *Copy from RAM to ROM* button  to make definitive the modification, as shown in Figure 48.



	Parame...	Set	Testo parametro	Valore online Drive_1	Unità	Modificab. in	Liv. accesso	Minimo	Massimo
	Tutti		Tutti	Senza protezione know	Tutti	Tutti	Tutti	Tutti	Tutti
531	r21622		Max. Torque value UP with full l...	0.000			1		
532	r21623		Max. Torque value DOWN with ...	0.000			1		
533	p21630		Plus Speed while EDV closing	0.070		Funzionamento	1	-3.4028...	3.40282E...
534	p21650		Emergency Ramp Adaption	1.000		Funzionamento	1	-3.4028...	3.40282E...
535	p21651		Short Floor Ramp Factor	1.000		Funzionamento	1	-3.4028...	3.40282E...
536	r21695		Oil Temperature	0.000			1		
537	r21698		Oil temp sensor missing	0H			1		
538	r21700		Speed setpoint value	0.000			1		
539	r21999		Excitation delay time adapted v...	0.000			1		
540	p22011		PreStart Speed value 2 (2.3.2.2)	0.025		Funzionamento	1	-3.4028...	3.40282E...
541	p22017		PreStart Time value 2 (2.3.3.2)	100.000		Funzionamento	1	-3.4028...	3.40282E...
542	p22023		PreStart Delay Additional value ...	350.000		Funzionamento	1	-3.4028...	3.40282E...
543	p22029		Acc Time DOWN value 2 (2.3.4.2)	2500.000		Funzionamento	1	-3.4028...	3.40282E...
544	p22035		Dec Time DOWN value 2 (2.3.5.2)	1750.000		Funzionamento	1	-3.4028...	3.40282E...
545	p22041		Acc Inc Time value 2 (2.3.10.2)	750.000		Funzionamento	1	-3.4028...	3.40282E...
546	p22081		Final Dec Time value 2 (2.3.14.2)	1100.000		Funzionamento	1	-3.4028...	3.40282E...
547	r22090		PreStart Ramp adapted value (2...	100.000			1		
548	r22091		PreStart Speed adapted value (...	0.025			1		
549	r22092		PreStart Time adapted value (2....	100.000			1		
550	r22093		PreStart Delay Additional adapt...	1500.000			1		
551	r22094		Acc Time DOWN adapted value...	6000.000			1		
552	r22095		Dec Time DOWN adapted value ...	1750.000			1		
553	r22096		Acc Inc adapted Time (2.3.10)	3500.000			1		
554	r22097		Acc Dec adapted Time (2.3.11)	1500.000			1		
555	r22098		Dec Inc Time adapted value (2....	700.000			1		
556	r22099		Dec Dec Time adapted value (2....	800.000			1		
557	r22100		Final Dec Time adapted value (2...	1500.000			1		
558	r22452		Cavitation fault	1H			1		
559	p22500		Misura encoder assoluto	Drive_1 : r483[1]		Funzionamento	1		
560	p22502		Azzeramento	7789511		Funzionamento	1	-214748...	2147483647
561	p22503		Sviluppo puleggia	3354		Funzionamento	1	-214748...	2147483647
562	p22504		moltiplica x mill/micron	1		Funzionamento	1	-214748...	2147483647
563	r22505		Quota x sviluppo puleggia	-2147483648			1		
564	p22506		imp encoder	4096		Funzionamento	1	-214748...	2147483647
565	r22507		Quota in mm x10	-131072			1		
566	r22508		quota in mm	-13107			1		
567	p22509		OFFSET di posizione al TERRA	1842		Funzionamento	1	-214748...	2147483647
568	r22510		quota pulita	-14949			1		

Figure 48 – STARTER permanent saving of the changes on the software parameters

8.4.2 Alignment software versions PC-inverter

Should be observe the following notes:

- If in the screen to the left side of the drive S120, referring to the Drive, or to the Control Unit some red marks appear, it means that there are inconsistencies between the PC and the inverter. In particular:
  - "!!"(red) = minor inconsistencies in terms of parameters
  - "", ""(red) = serious inconsistencies at the level of parameters or software configuration

  It's possible to align the two systems by pressing one of two buttons next to the yellow button *"ONLINE"* to load on the inverter the software version on your PC (), or to transfer to the PC the version in this inverter (),depending on of what is believed to be the more correct version of the settings.
- If you want to **change the parameters** before introducing any changes, save a copy with the current situation, which is useful for restoring. In order to create this safety copy, at first you have to go OFFLINE via the blue button, and then you have to click *Project>Save and create a copy* , giving an appropriate name to the saved copy
- On the right screen, on the expert list or user list, the values highlighted in green are the only **adjustable parameters**, while those in yellow are only the current values and cannot be changed.
- At the bottom of the screen are displayed details and further information. In particular, it is possible to **reset ALARM or WARNINGS**, by pressing the appropriate button, once you select the tab of the item ALARMS among those available at the bottom and after clicking on the description of interest.

9 PROGRAMMING WITH KEYBOARD AND MENU

⚠	For simplicity it is preferable to perform the commissioning via PC using the STARTER software, rather than setting the parameters from the operator panel. See Chapter 8.

9.1 BASIC OPERATOR PANEL BOP20

9.1.1 Description

The Basic Operator Panel BOP20 is an operator panel with six keys and a backlit display unit. The BOP20 can be inserted on the CU310-2 PN SINAMICS Control Units and operated.

The BOP20 supports the following functions:

- Input of parameters and activation of functions
- Display of operating modes, parameters, alarms and faults

9.1.2 Interface description

Figure 49 - Basic Operator Panel BOP20

Overview of displays and keys

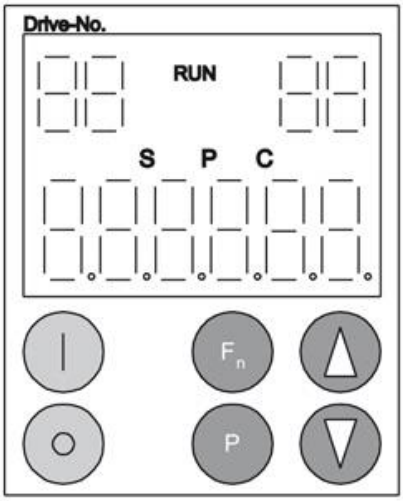


Figure 50 - Overview of displays and keys

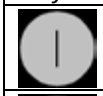
Table 19 Views

Display	Meaning
Top left 2 positions	The active drive object of the BOP is displayed here. The displays and key operations always refer to this drive object.
RUN	Is lit (bright) if the displayed drive is in the RUN state (in operation).

Top right 2 positions	The following is displayed in this field: • More than 6 digits: Characters that are present but cannot be seen (e.g. "r2" → 2 characters to the right are invisible, "L1" → 1 character to the left is invisible) • Faults: Selects/displays other drives with faults • Designation of BICO inputs (bi, ci) • Designation of BICO outputs (bo, co) Source object of a BICO interconnection to a drive object other than the active one.
S	Is (bright) if at least one parameter was changed and the value was not transferred into the non-volatile memory.
P	Is lit (bright) if, for a parameter, the value only becomes effective after pressing the P key.
C	Is light (bright) if at least one parameter was changed and the calculation for consistent data management has still not been initiated.
Below, 6 position	Displays, e.g. parameters, indices, faults and alarms.

Tastiera del BOP20

Table 20 Keyboard layout BOP20

Key	Name	Meaning
	ON	Powering-up the drives for which the command "ON/OFF1","OFF2" or "OFF3" should come from the BOP.
	OFF	Power-down the drives for which the "ON/OFF1," "OFF2," or "OFF3" commands should come from the BOP. **Note:** The effectiveness of these keys can be defined using the appropriate BICO parameterization (e.g. using these keys, it is possible to simultaneously control all of the axes that have been configured.) The structure of the BOP control word corresponds to the structure of the PROFIBUS control word.
	Functions	The meaning of these keys depends on the actual display. **Note:** The effectiveness of this key to acknowledge faults can be defined using the appropriate BICO parameterization.
	Parameter	The meaning of these keys depends on the actual display. **If you press "P" key for 3sec, the command "Copy from RAM to ROM" is performed, and the "S" key disappear from the BOP.**
	Raise	The keys are dependent on the actual display and are used to raise or lower values.
	Lower	

	**Press the "FN" key to reset errors**

9.1.3 Displays and using the BOP20

With the BOP these operation are possible:

- **Changing the active drive object**
  - Press key "FN" and "Arrow up" → the drive object number at the top left flashes
  - Select the required drive object using the arrow keys
  - Acknowledge using the "P" key
- **Parameter display**

- Press the "P" key.
- The required parameters can be selected using the arrow keys.
- Press the "FN" key → "r00000" is displayed
- Press the "P" key → changes back to the operating display

Parameter display

The parameters are selected in the BOP20 using the respective identification number (Pxxxxx).
The parameter display is reached from the operating display by pressing the "P" key.
Parameters can be searched for using the arrow keys.
The parameter value is displayed by pressing the "P" key again.
You can toggle between the drive objects by simultaneously pressing the "FN" key and an arrow key.
You can toggle between "r00000" and the parameter that was last displayed by pressing the "FN" key in the parameter display.

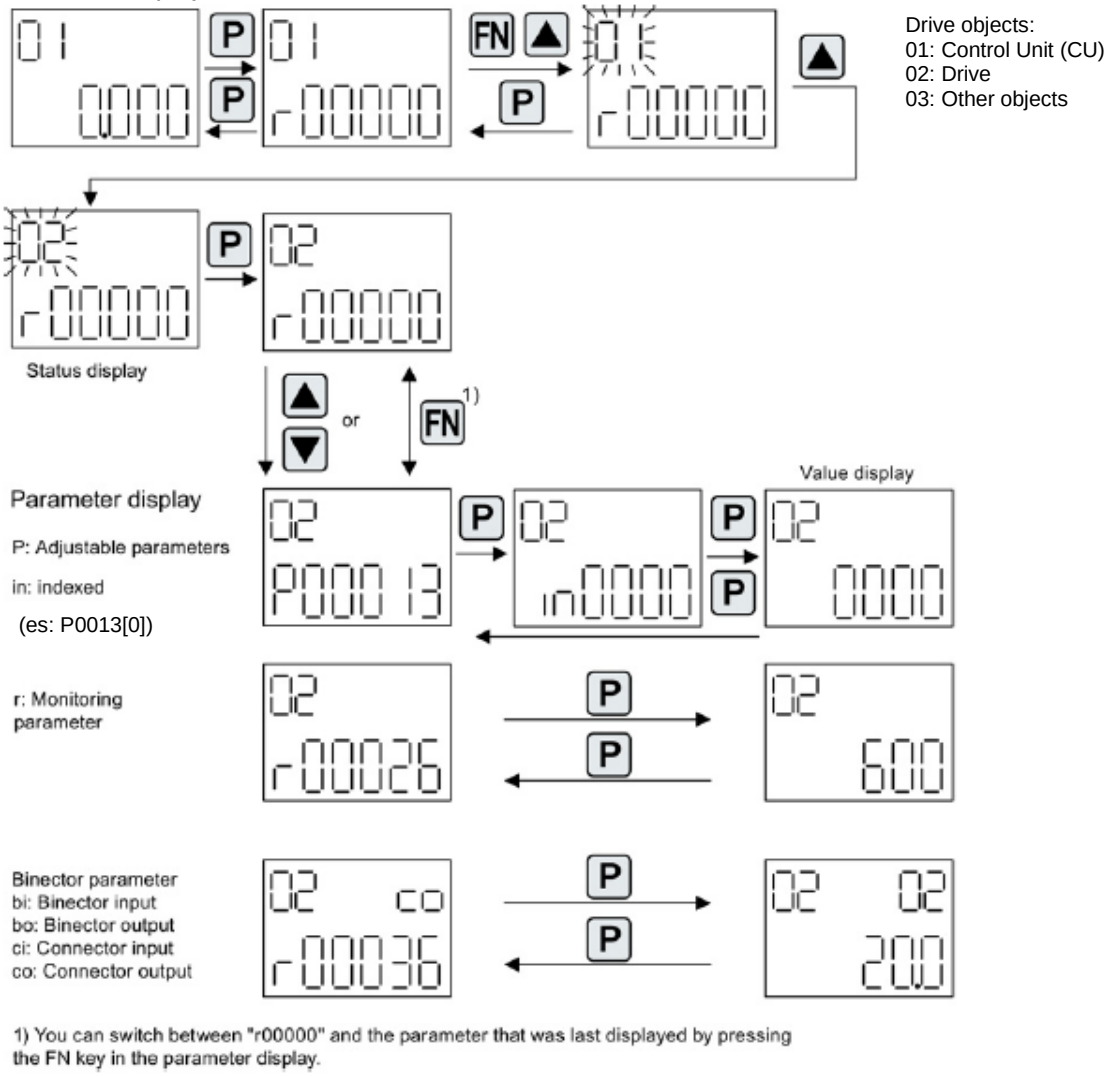


Figure 51 Parameter display

Value display

Displaying the presence of additional digits to the right/left of the six displayed

Decimal number
e.g. r1084

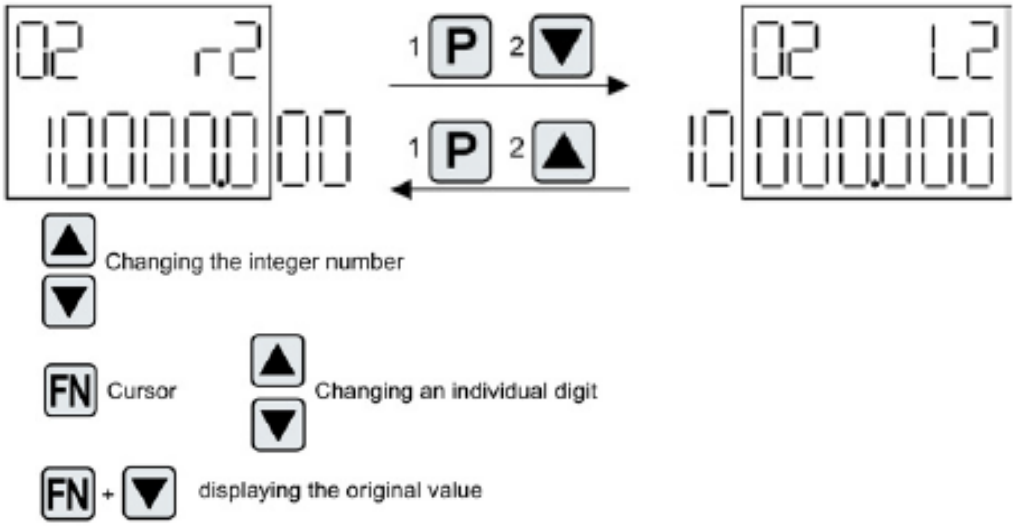


Figure 52 Value display

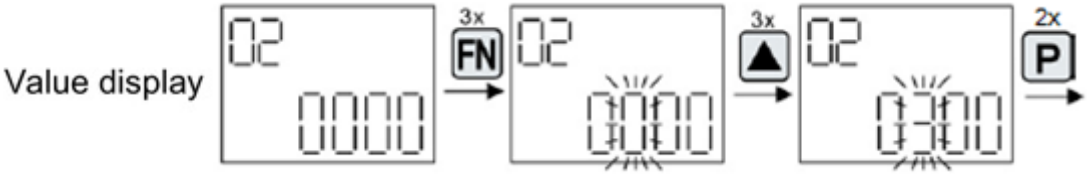
9.1.4 Example: Changing a parameter

Modify the parameter of the drive P21507 High speed (2.2.6) from 0 to 300.

1- From the current display switch to parameter display by setting the drive 02 on the display

2- Select the parameter of the drive you want to modify (eg: p21507 - high speed (2.2.6)) by scrolling with the arrow keys keeping them pressed or pulse dialing

3- Move the cursor with "FN" and change the values with the arrow keys



4- Confirm the entered value by pressing “P”. (2x), it will appear the number of the modified parameter
5- To proceed to the setting of another parameter, press "FN" while it is displayed the ID of the last modified parameter and repeat from the point 2-
6- To end the setting while viewing the ID of the last parameter changed, press "FN" and confirm with “P”: starting screen will be displayed.

⚠ **After the modify of the parameters of interest, it is always necessary to save the new values on the hard memory of the Control Unit, in order to prevent a loss of data at the first shut down (voluntary or accidental).** You can proceed in 2 ways:

a) Press “P” key for 3 sec long: the actual value on the display will flash and when it becomes fixed, the saving process on the ROM memory is terminated

b) After setting all parameters, select P0971 (if enabled) and set it to 1 (default=0): This activate the data transfer RAM-ROM and the permanent saving.

9.1.5 Fault and alarm displays

Fault and alarm displays

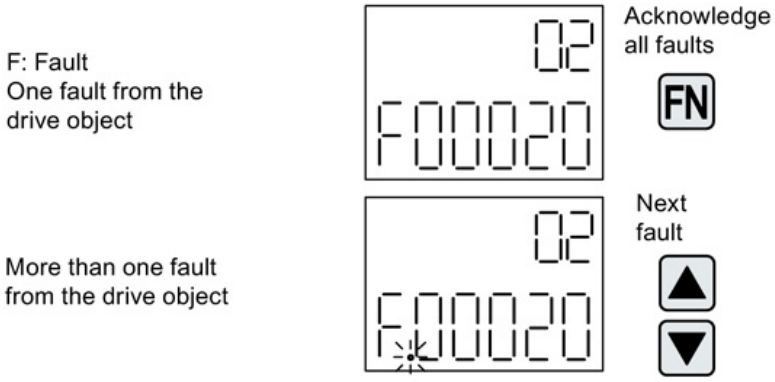


Figure 53 Faults

Displaying alarms

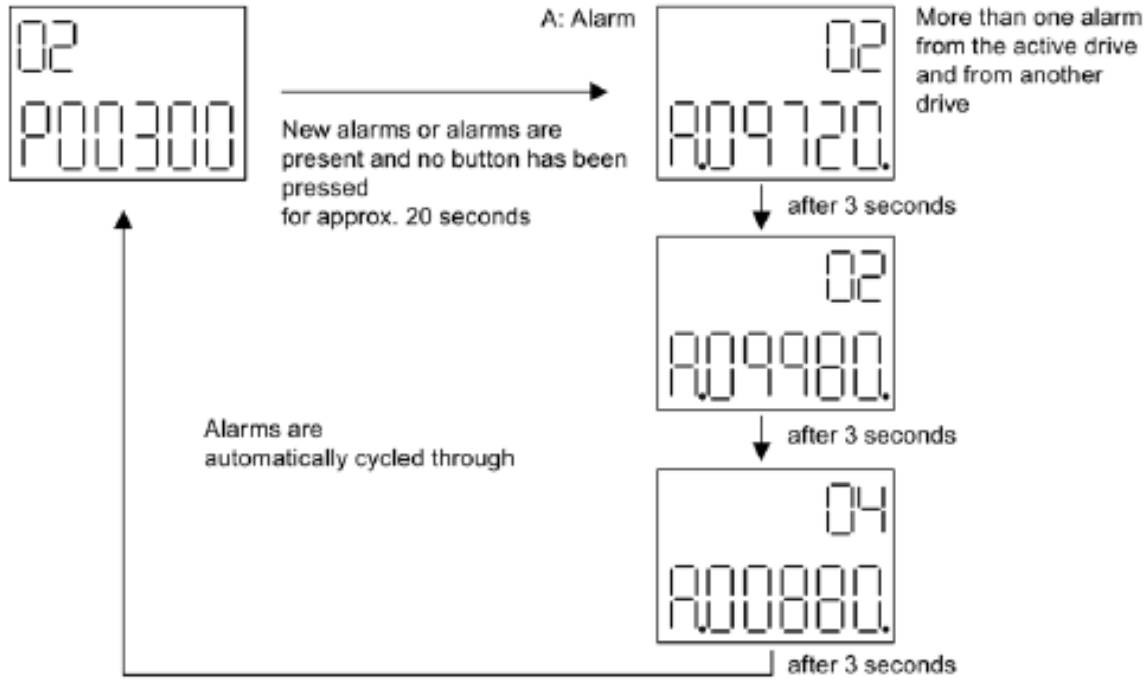


Figure 54 Alarms

For more functions or information about the BOP20, refer to the SIEMENS *S120 Commissioning manual* (IH1)

9.1.6 Mounting

ATTENTION
Damage when using the BOP The interface for the BOP20 on the CU310-2 may be damaged when the BOP20 is used. • Make sure that you insert and withdraw the BOP20 straight into/out of the CU310-2 and that it is not tilted up or down.

Mounting

The diagrams show how to mount the Basic Operator Panel BOP20 on a CU310-2

		
1. Remove the blind cover by pressing on the tabs to snap and pull the front.	2. Squeeze the tabs on the joint BOP20 and insert it directly into the housing of the CU310-2 until it clicks into place.	CU310-2 with BOP installed.
NOTE: The BOP20 may be inserted or withdrawn while the Control Unit is operational.		

Removal

1. Simultaneously press the latching cams on the BOP20.
2. Keep the latching cams pressed together and pull the BOP20 straight out.
3. Insert the blanking cover.

Display and operator controls of the BOP20

For information about display and operator controls of the BOP20, refer the SINAMICS *S120 Commissioning Manual (IH1)*.

10 PARAMETERS

10.1 DISPLAY PARAMETERS

To perform a configuration / modification of parameters that control the elevator, follow these steps:

1. Once you open STARTER, click in the menu on the "+" sign to the left side of the **S120** device (pos. 1), and then the "+" sign on the side of **Drive_1** (pos. 2) to expand the tree. Then select the expert list (pos. 3).
2. If the top center of the screen displays only a single sheet with written **expert list** (pos. 4), then click on the button  (pos.5) and open the list "User S120 Low" which will allow you to view a list of simple parameters (recommended), useful for **setup and quick commissioning of the inverter.**

   ⚠ If *S120 User* files are not present, you can copy them from another project (typically saved to the path: *S7Proj\projectname\u7\cdldata,* where projectname is the name of a previously saved project), or pick them up from the initial configuration that was provided by Omarlift with the drive, or even request them to Omarlift.

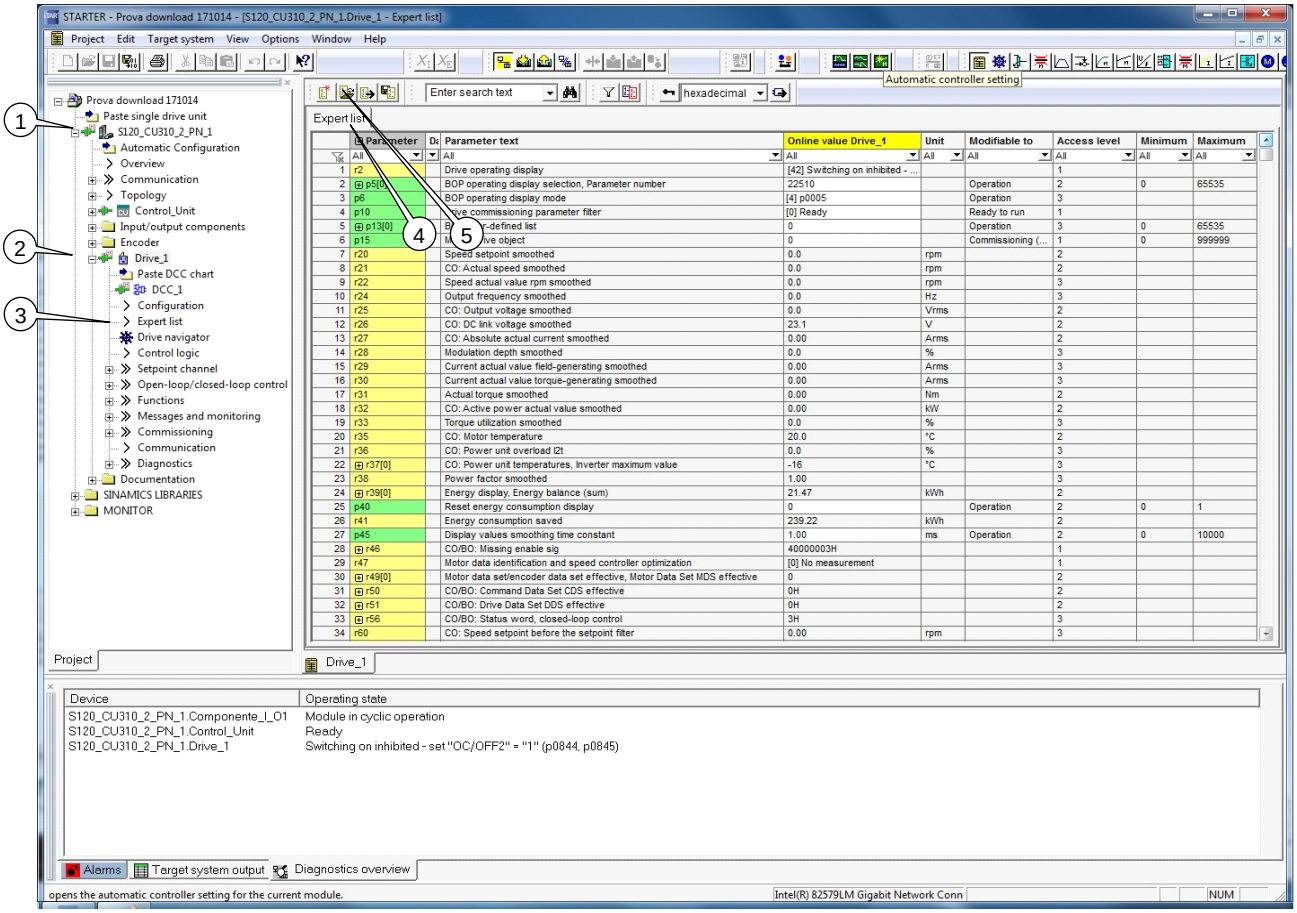


Figure 55- STARTER screen parameter list

Otherwise, if the list "User S120 Low" is available now from those at the top center of the screen (pos. 4), select it.

The list of "User S120 HIGH", instead, provides tools for **advanced configuring and commissioning the inverter**, and is recommended only for experienced users with an indication of Omarlift.

In the list, **the parameters are grouped into families** based on the range of intervention and for each parameter, as well as a numeric identifier, there is a description of the function performed.

The parameters highlighted in green are the only user-modifiable.

The parameters highlighted in yellow are a display of the current value of the parameter indicated.

The blank lines identify and separate families of parameters

⚠ DO NOT CHANGE PARAMETERS FOR WHICH YOU DO NOT KNOWN EFFECT: possibility of unintended consequences and / or serious physical injury to people and to the system.

10.2 INVERTER COMMISSIONING

All activities below described can be performed alternatively with the BOP or by PC

⚠**ATTENTION: You must do self-learning inverter before performing any calibration, in order to adapt its behavior to the installation characteristics.**

To run the self-learning inverter correctly, do the following:

1. Install and set up the system completely (electrical connections, piping, oil filling the tank,...)
2. make sure you have the weight that can be loaded to reach the maximum working pressure of the system (Pmax)
3. Only if you use PC commissioning, Start the STARTER program, connect the PC ONLINE to the device via the yellow button
4. Only if you use PC commissioning, Navigate to the parameter list *User S120 Low*
5. Make sure the oil temperature (see parameter r21695 Drive) is within the range Tmin = 20 ° C and Tmax = 30 ° C. In case Toil<20 ° C, run a few cycles of movement up and down to increase the T oil. If Toil>30 ° C, let the oil cool with the system is shut down. If you use PC commissioning, the parameter is inside the parameters family AUTOTUNING,
6. Run **the self-learning without load** (by PC, *User S120 Low*, family parameters AUTOTUNING):
   - Remove any load from the cab
   - Set the parameter P21600=1 and then press ENTER
   - Perform a normal cycle of ascent and descent of the lift
   - Set the parameter P21600 = 0 and press ENTER

   In this way, the new torque values detected at empty conditions, that are visible to the parameters r21620 and r21621, are copied and saved in the parameters of the inverter use P21590 and P21595.
7. Run **the self-learning at full load** (by PC, *User S120 Low*, family parameters AUTOTUNING):
   - load the cab with weights to reach Pmax
   - Set the parameter P21601=1 and then press ENTER
   - Perform a normal cycle of ascent and descent of the lift
   - Set the parameter P21601 = 0 and press ENTER
   - In this way, the new torque values measured at full-load conditions, that are visible to the parameters visible to r21622 and r21623, are copied and saved in the parameters of the inverter use P21591 and P21596.

⚠ ATTENTION: If the Toil is outside of the range Tmin / Tmax values of auto-tuning will not be captured and torque values may be setup to 0!

⚠ ATTENTION: If you do not set the parameter to 0 at the end of the test, the system will remain under self-learning conditions and the system does not work properly.

⚠ ATTENTION: If during the procedure is missing voltage, the torque values remain set to 0! Repeat the tuning after restoring power.

⚠ ATTENTION: If you calibrate under conditions other than empty / full load, the torque values recorded may not ensure proper operation of the system under all conditions.

At this point the system is ready to be used and configured.
Any additional tune-up can be done by acting directly on the values of the parameters of the drive available in the list "User S120".

⚠**ATTENTION: Only in case of change of the inverter or of the electric motor, you must do motor recognition by P1910, before performing any calibration. Please contact Omarlift Service, for the procedure.**

10.3 PARAMETERS LIST

Below are listed the parameters of the list "User S120 Low" and their default values:

After the modify of the parameters of interest, it is always necessary to save the new values on the hard memory of the Control Unit *(Copy from RAM to ROM)***, in order to prevent a loss of data at the first shut down (voluntary or accidental).** Using STARTER software, you have to switch ONLINE, then press the push button *Copy from RAM to ROM*  . Alternatively, see the procedure described to the chapter 9 for the setup by BOP

Table 21 - List of parameters

ID	Description	Valore Value	Unità Unit
SETTING UPWARDS DIRECTION - CONFIGURAZIONE SALITA			
p21502	PreStart Speed (2.2.2)	0.040	%
p21503	PreStart Time (2.2.3)	800.000	ms
p21507	High Speed (2.2.6)	0.750	%
p21512	Low Speed (2.2.7)	0.095	%
p21513	Final Dec Time (2.2.14)	4.500.000	ms
p21514	Inspection Speed UP (2.2.9)	0.300	%
p21515	Releveling speed UP (2.2.8)	0.120	%
SETTING DOWNWARDS DIRECTION - CONFIGURAZIONE DISCESA			
p22011	PreStart Speed value 2 (2.3.2.2)	-0.002	%
p22017	PreStart Time value 2 (2.3.3.2)	100.000	ms
p22023	PreStart Delay Additional value 2 (2.3.3D.2)	500.000	ms
p21537	High Speed (2.3.6)	-0.750	%
p21542	Low Speed (2.3.7)	-0.090	%
p22081	Final Dec Time value 2 (2.3.14.2)	800.000	ms
p21544	Inspection Speed DOWN (2.3.9)	-0.300	%
p21545	Releveling speed DOWN (2.3.8)	-0.020	%
p21630	Plus Speed while EDV closing	0.080	%
RUPTURE VALVE TEST- TEST VALVOLA PARACADUTE			
p21523	Parachute function (2.13.1)	0H	
p21524	Overspeed Factor	1.500	
p21525	Ramp-up time (ms) (2.13.3)	2.000.000	ms
p21526	Ramp-down time (ms) (2.13.5)	1.500.000	ms
p21527	Max. Time Parachute (ms)	15.000.000	ms
p21529	Parachute Max.Speed TimeOut (2.13.4)	4.000.000	ms
p21541	PreStart Smooth	400.000	ms
p21546	Emergency Speed Up (2.6.1)	0.200	%
p21547	Emergency Speed Down (2.6.2)	-0.150	%
p21650	Emergency Ramp Adaption	1.000	
SHORT FLOOR - PIANO CORTO			
p21530	Short Floor activate	0	
p21548	Short Floor Speed Up (2.14.2)	0.160	%
p21549	Short Floor Speed Down (2.14.3)	-0.110	%
p21651	Short Floor Ramp Factor	1.000	

COMPENSATIONS – COMPENSAZIONI			
p21570	Switch tipologia olio	0H	
p21571	P.X1	0.900	
p21572	P.X2	0.800	
p21573	P.X3	0.200	
p21574	P.X4	0.300	
p21575	P.X5	0.250	
p21576	P.X6	0.200	
p21577	P.X7	1.000	
p21578	P.X8	1.600	
p21579	P.X9	1.000	
p21580	P.X10	0.200	
p21581	P.X11	2.900	
p21582	P.X12	1.000	
AUTOTUNING - AUTO REGOLAZIONE			
p21600	Torque Measure without load	0H	
p21601	Torque Measure with full load	0H	
TORQUE VALUES - VALORI COPPIA			
p21590	Ascending Torque Min Value	29.731	Nm
p21591	Ascending Torque Max Value	51.892	Nm
p21592	Ascending Comp Value	0.030	%
p21595	Descending Torque Min Value	-8.194	Nm
p21596	Descending Torque Max Value	9.558	Nm
p21597	Descending Comp Value	0.035	%
ENCODER – ENCODER			
p22502	Azzeramento	7789511	
p22503	Sviluppo puleggia	3354	
p22504	moltiplica x mill/micron	1	
p22506	imp encoder	4096	
p22509	OFFSET di posizione al TERRA	1880	

⚠ NOTE: (*) all speeds are expressed in rpm% compared to the rated motor speed (usually 3000r / min)

10.4 CONFIGURATION PARAMETERS

For both directions, it is necessary to adjust some values to your system:

- **Set the desired value for the high-speed P21507 (2.2.6) (P21537 (2.3.6) for downward).**
- **Set the desired value for the low speed P21512 (2.2.7) (P21542 (2.3.7) for the downward).**
- **Set the desired value for the inspection speed P21514 (2.2.9) (P21544 (2.3.9) for the downward).**

⚠ **After the modify of the parameters of interest, it is always necessary to save the new values on the hard memory of the Control Unit** *(Copy from RAM to ROM)***, in order to prevent a loss of data at the first shut down (voluntary or accidental).** Using STARTER software, you have to switch ONLINE, then press the push button *Copy from RAM to ROM*  . Alternatively, see the procedure described to the chapter 9 for the setup by BOP

10.4.1 UPWARDS

After the modify of the parameters of interest, it is always necessary to save the new values on the hard memory of the Control Unit *(Copy from RAM to ROM)***, in order to prevent a loss of data at the first shut down (voluntary or accidental).** Using STARTER software, you have to switch ONLINE, then press the push button *Copy from RAM to ROM* . Alternatively, see the procedure described to the chapter 9 for the setup by BOP

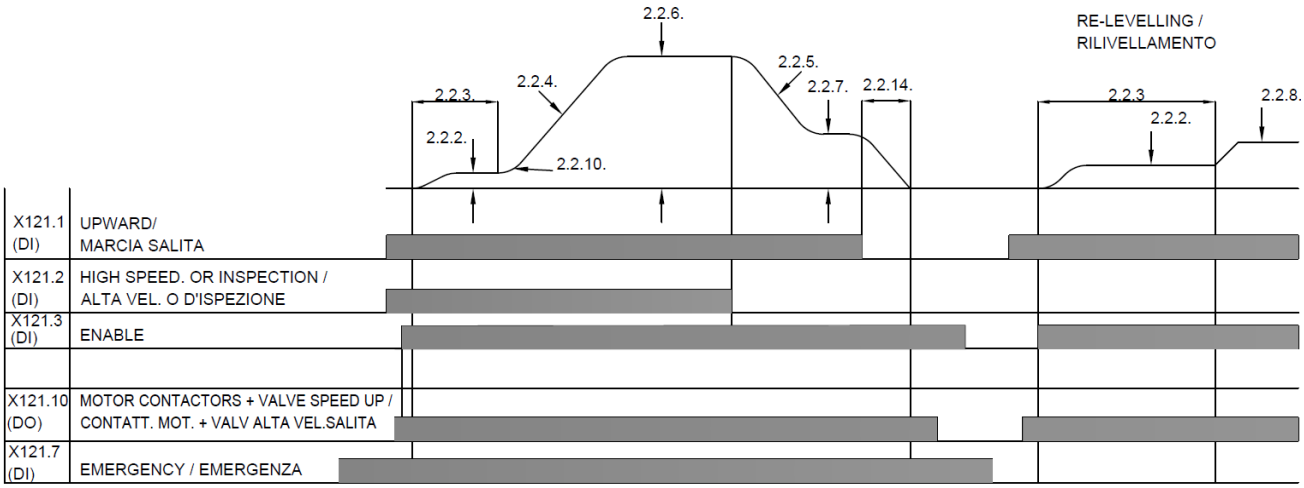


Figura 56 - Upwards diagram DI=INPUT DO=OUTPUT

Sequence controls Upward

1. Insertion of the UPWARD command then, when the contactors are closed, a signal has to arrive to the ENABLE input: this will enable the starting of the motor. If you enable the High speed or INSPECTION, the motor runs at a speed "high" or "inspection" (P21507 (2.2.6) or P21514 (2.2.9)). If you do not enable any speed level (eg. During the re-leveling at floor), the motor will run at the speed of re-leveling (P21515 (2.2.8)).
2. During normal running, when the elevator reach the command of slowdown, it should be taken off the signal HIGH SPEED: in this way, the inverter automatically switches to "low" speed (P21512 (2.2.7))
3. Once on the floor, you have to open the UPWARD command, so the inverter reduce the speed of the motor till to stop it, dropping the contactor command. As result of this operation, the command ENABLE will be removed.

- **Setting the START UPWARD**

  Preferably adjust only the parameters visible in the list *User S120_Low.* Some of parameters mentioned are available only in the list *User S120_High*

  To have a good start, make sure that it is completely managed by the inverter. In this sense a good way is to adjust the hydraulic valve to the maximum opening (it is the same operation done, in installations without inverter, in order to have an instantaneous and rapid departure)**.**

  For "sweet" and without tearing departures it is necessary that the cabin moves slightly before the acceleration begins. This could be done with the parameters P21502 (2.2.2), P21503 (2.2.3), by tuning them properly. The subsequent acceleration phase is already set at the factory. If necessary, you can make a different setting with parameters P21504 (2.2.4) and P21505 (2.2.10) visible in the list *User S120 High*.

PARAMETER	CABIN DEPARTURE WITH TEARING	CABIN STARTING LATE	CABIN SPEEDS UP TOO FAST
P21502 (2.2.2)	↑	↑	=
P21503 (2.2.3)	↑	↑	=
P21504 (2.2.4)	=	=	↑
P21505 (2.2.10)	↑	=	↑

↑ increase the value of the parameter
↓ decrease the value of the parameter
= parameter has no effect

- **Setting the STOP UPWARD**

⚠ Preferably adjust only the parameters visible in the list *User S120_Low.* Some of parameters mentioned are available only in the list *User S120_High.*

The slowdown starts when you remove the command HIGH SPEED, and the UPWARDS command remains activated; once the elevator get on the floor, you will take off the UP command and the engine is automatically set to zero speed.

To achieve the desired accuracy of the stop, adjust the parameters P21512 (2.2.7) (Low Speed) and P21513 (2.2.14) (Deceleration Final).

PARAMETER	EXCESSIVE LENGTH OF LOW-SPEED	ARRIVAL AT THE FLOOR WITHOUT LOW SPEED	PRESENCE OF LOW SPEED, BUT STOP BEYOND THE FLOOR	PRESENCE OF LOW SPEED, BUT STOP BEFORE THE FLOOR
P21508 (2.2.5)	↑	↓		=
P21512 (2.2.7)	=	=	↓	↑
P21513 (2.2.14)	=	=	↓	↑

The stopping accuracy should not be affected too much by the load in the cabin or oil temperature, as have been calculated with the appropriate automatic compensation.

If the situation on the arrival on the floor isn't satisfactory modifying the load or temperature, proceed as follows:

- Adjust the stop with cold oil and empty car, acting on the parameters P21512 (2.2.7) and P21513 (2.2.14).
- Repeat the test at the same temperature, but at full load and if necessary to adjust the accuracy of the correct destination, this time to act on the parameter **PX8** (DO NOT CHANGE the parameters P21512 (2.2.7) and P21513 (2.2.14)!)
- **Make several trips to heat the oil,** oil heat control the stopping accuracy**. If the car stops before the floor, modify the parameter PX2 until you have the desired accuracy**.
- Finally, check with cold oil and empty car that stopping accuracy remained the one obtained with the initial tests, otherwise repeat the procedure.

10.4.2 DOWNWARDS

After the modify of the parameters of interest, it is always necessary to save the new values on the hard memory of the Control Unit *(Copy from RAM to ROM)***, in order to prevent a loss of data at the first shut down (voluntary or accidental).** Using STARTER software, you have to switch ONLINE, then press the push button *Copy from RAM to ROM* . Alternatively, see the procedure described to the chapter 9 for the setup by BOP.

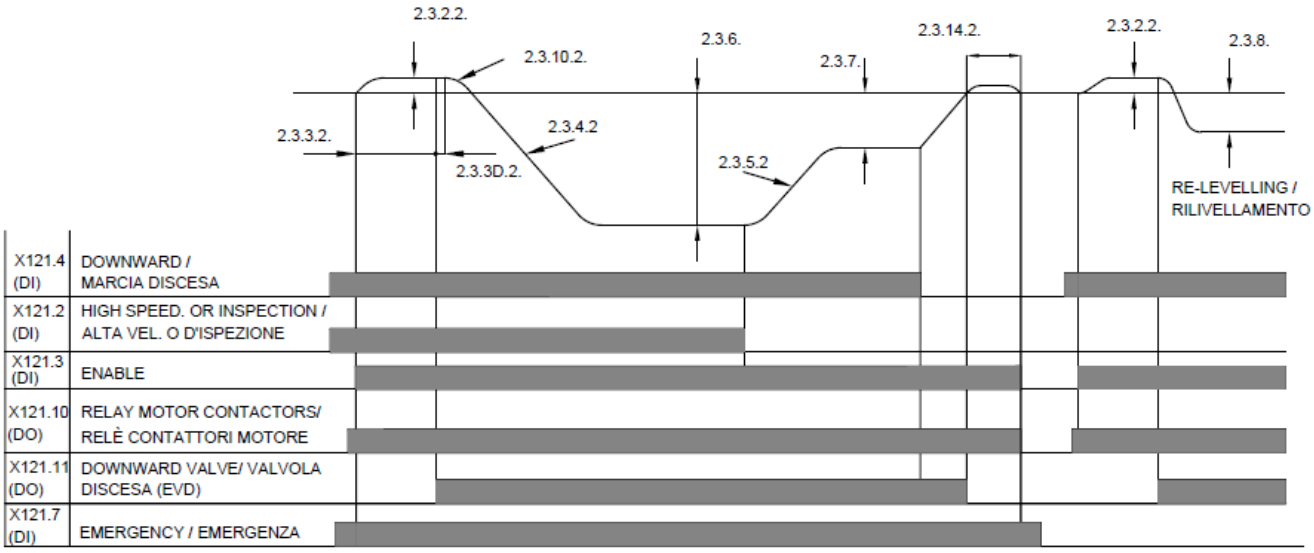


Figura 57 - Downwards diagram DI=INPUT DO=OUTPUT

- **Setting the START DOWNWARD**

  Preferably adjust only the parameters visible in the list *User S120_Low.* Some of parameters mentioned are available only in the list *User S120_High.*

  For departures "sweet" and without tearing it is necessary that the cabin moves slightly before acceleration begins. This is obtained with the parameters:

PARAMETER	THE CABIN AT THE FIRST MOVE UP THEN DOWN	SUDDEN ACCELERATION AT START	CABIN ACCELERATION TOO FAST
P22011 (2.3.2.2)	↓	↑	=
P22017 (2.3.3.2)	↓	↑	=
P22029 (2.3.4.2)	=	=	↑
P22041 (2.3.10.2)	=	=	↑

  ↑ increase the value of the parameter
  ↓ decrease the value of the parameter
  = parameter has no effect

- **Setting the STOP DOWNWARD**

  Preferably adjust only the parameters visible in the list *User S120_Low.* Some of parameters mentioned are available only in the list *User S120_High.*

  To get an accurate and "sweet" stop, with minor variations in load, it is necessary to adjust some parameters:

PARAMETER	ARRIVAL TO FLOOR STILL IN DECELERATION (NOT AT CONSTANT SPEED)	OVER TIME AT LOW SPEED	STOPPING AFTER THE FLOOR	STOPPING BEFORE THE FLOOR	SUDDEN STOP	UPWARD JUMP AFTER STOP
P22035 (2.3.5.2)	↓	↑	=	=	=	=
P21542 (2.3.7)	=	=	↓	↑	=	=

⚠	**ALWAYS CHANGE ONLY ONE PARAMETER AT A TIME.**

10.4.3 RE-LEVELING

- **Setting the re-leveling**

  Test the re-leveling at empty conditions, moving the elevator downwards/upwards in respect to the floor, by press the Emergency button for descent direction, and with the hand pump for upwards direction.

  If the restoration of the position of the plan is not satisfactory, adjust the parameter P21515 (2.2.8) until you get the desired stop.

  You can change the re-leveling at full load using the parameter PX9.

  You can change the re-leveling at maximum oil temperature, using the parameter PX3.

10.4.4 EMERGENCY

- **Parameters for EMERGENCY operation (input X121.7)**

  The inverter SIEMENS allows the dedicated management of a state of emergency power supply by installing a UPS AC 400 V (not supplied), whose installation and dimensioning are the responsibility of the customer.

  The operation via UPS unit guarantees a limited number of runs both uphill and downhill, dependent on the dimensioning of the same.

  The Emergency function is controlled via input X121.7

  You can adjust the speed of movement in the direction up or down through the parameters:

  P21546 (2.6.1) Emergency Speed Upward
  P21547 (2.6.2) Emergency Speed Downward

10.4.5 GENERAL CONSIDERATIONS

- **General rules for proper adjustment**
  - If the high-speed cabin speed is not constant, check the motor data. In particular, the motor data must match the "real" situation. Also verify that the mechanical devices (cabin / piston) have uniform friction during movement.
  - To have a stop with constant precision is necessary that the cabin tread a small space (5 ÷ 10cm) in low constant speed (adjust the parameters as indicated in the table).
  - Set the low speed to the desired value, bearing in mind that a very low value increases the time of arrival at the floor.
  - Do not adjust the switching frequency at too high values, otherwise the engine and the inverter will overheat unnecessarily.

10.5 RUPTURE VALVE TEST

The rupture valve test, verify the functionality of the safety device, that normally is installed on the cylinder or in it neighborhood. This safety device, should stop the elevator in case of speed exceeding for 30% the rated speed of the elevator.

SIEMENS inverter supplied by Omarlift, allows to test the functionality by a specific function, that you can use only to perform the test and verify the rupture valve intervention.

If you need to perform a rupture valve test, see the following steps:

- Make sure that the system is on safety conditions (travel shaft free, functionality of all safety and control devices of elevator, etc..)
- Load the elevator to the nominal weight, and climb to the top floor
- Activate the test function, by setting the inverter parameter *P21523 Parachute function (2.13.1)* to the value 1
- Perform a downward travel from the top floor to the ground floor

- The elevator's cabin will increase the speed, exceeding the rated value
- When the speed exceed of 30% the rated speed, the safety valve start to trip reducing the oil flow and stop the cabin.

⚠ **If after some meters at speed higher than the nominal value, the safety valve doesn't trip, manually stop the elevator, by pressing the command STOP, without waiting the intervention of any other safety device**.

⚠ The *Parachute function,* deactivate itself after each test (0H). For a new test, after the valve regulation, re-activate the function.

⚠ For rupture valve adjusting, refer to the relative manufacturer's instruction manual.

10.6 ACQUISITION OF OPERATION DATA AND TRACKS ON PC

The STARTER software, allows you to view and save data tracks related to parameters used, which are indicative of the operation of the lift.

If you want to acquire data on the operation of the inverter (Charts), proceed as follows:

- click the button  in the top menu bar, or click on the + sign at the side of the *Drive*, then click on the + sign on the side of *Commissioning* and finally *Trace device*,
- Select on the top menu screen that appears, the item *Measures,* which contains the list of current measurements that you can select for displaying
- Select on the top menu screen, the voice *Time chart* and you can see the graph of the selected track or the real-time track during acquisitions, as in the illustration.

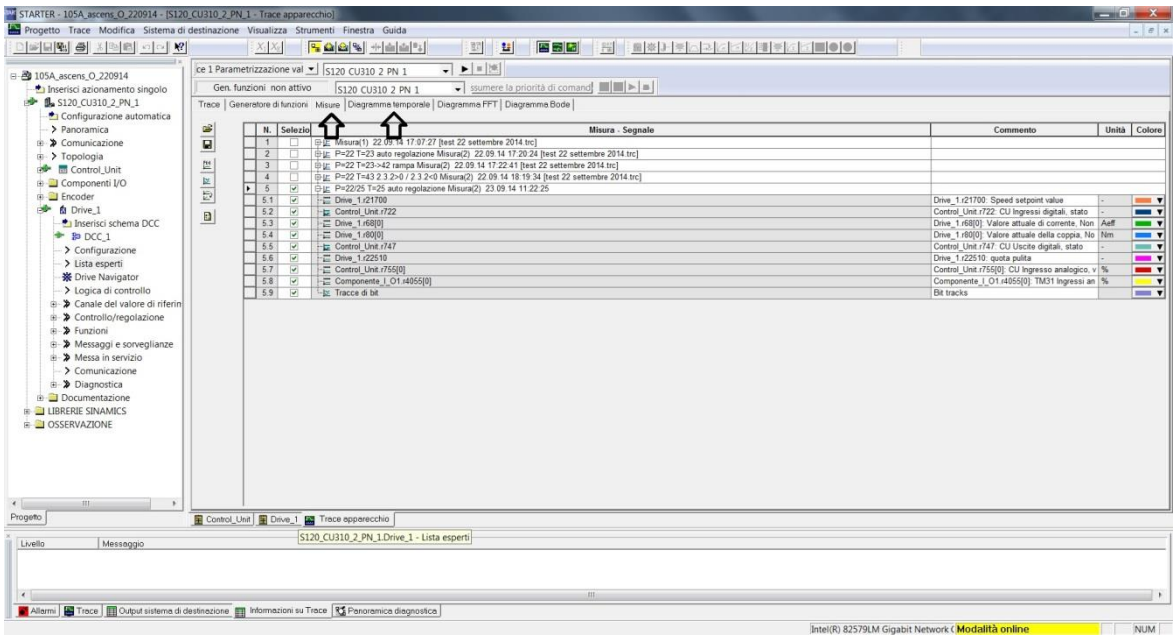


Figure 58 - Measurements and Charts

The **recording new tracks** can only happen if you are ONLINE:

- Click on the triangle symbol "▶"to start a recording;
- Click on the square symbol "■"to end a record. The graphic traces acquired and available can be retrieved by clicking on *Measures.*

⚠ WARNING: for the acquisition of the tracks you need to configure the inputs. To quickly do this, you can recall the curves previously acquired, or take the configuration from the initial configuration that was provided by Omarlift with the drive, or even require the configuration file from Omarlift.

To **assign a name to a track**:

- Select on the top menu screen, the item *Measures*
- Click on the measure to which you want to change the name and type the new name. Normally, the

default name is automatically assigned in the format "Measurement (Program number) + date + time"

To **save graphs**:

- Activate the screen *Measures,*
- Press on the button with the Save File symbol,
- Define a name for the saved file
- Apply the tick all the boxes for the measurement of interest in the screen that appears (eg: “Misura(1)…” in the example),
- To select all the items in the list of measurements, you can click the check mark in the header of the same list

⚠ If you do not select all the boxes belonging to the measure of interest, you will not get a save of the curves, useful for later viewing (eg: track “P=22 T=23…” in the example, will be not displayable).

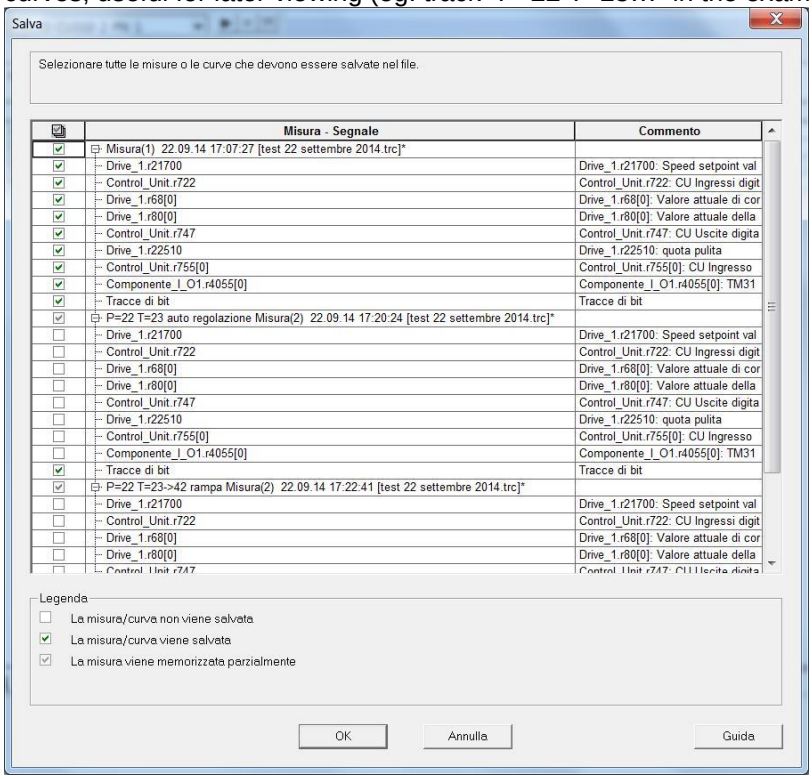


Figure 59- Saving tracks

To **open a graphics file previously saved**:

- Activate the *Measures* sheet in the top menu, press the button with the symbol File Open,
- Select the location you want (generally the data files in the *.trc format, are saved to the address *..\projectname\u7\cdldata,* where *projectname* is the name by which you saved the program on the inverter PC)
- Fully tick the measures that you want to load.
- The tracks of the selected measure are visible on the screen by clicking *Sequence Diagram*

⚠ For a more detailed analysis of the graph data, in the work area of the graph are also available some useful features:

- **ZOOM** by selecting the area of interest, or using scroll bars bottom and side,
- **Measurement of the point values:** select the color of the trend of interest in the legenda at the top right, then click with right mouse button on the workspace and choose *Measurement Cursor*. The measurement lines that appear are mobile and can be dragged with the left button of the mouse on the area of interest. The corresponding values are shown in the boxes at the foot of the graph.

An example of the graph that could be obtained with STARTER, acquiring a number of trace signals (speed, current, torque, temperature, etc.), is displayed in the image below:

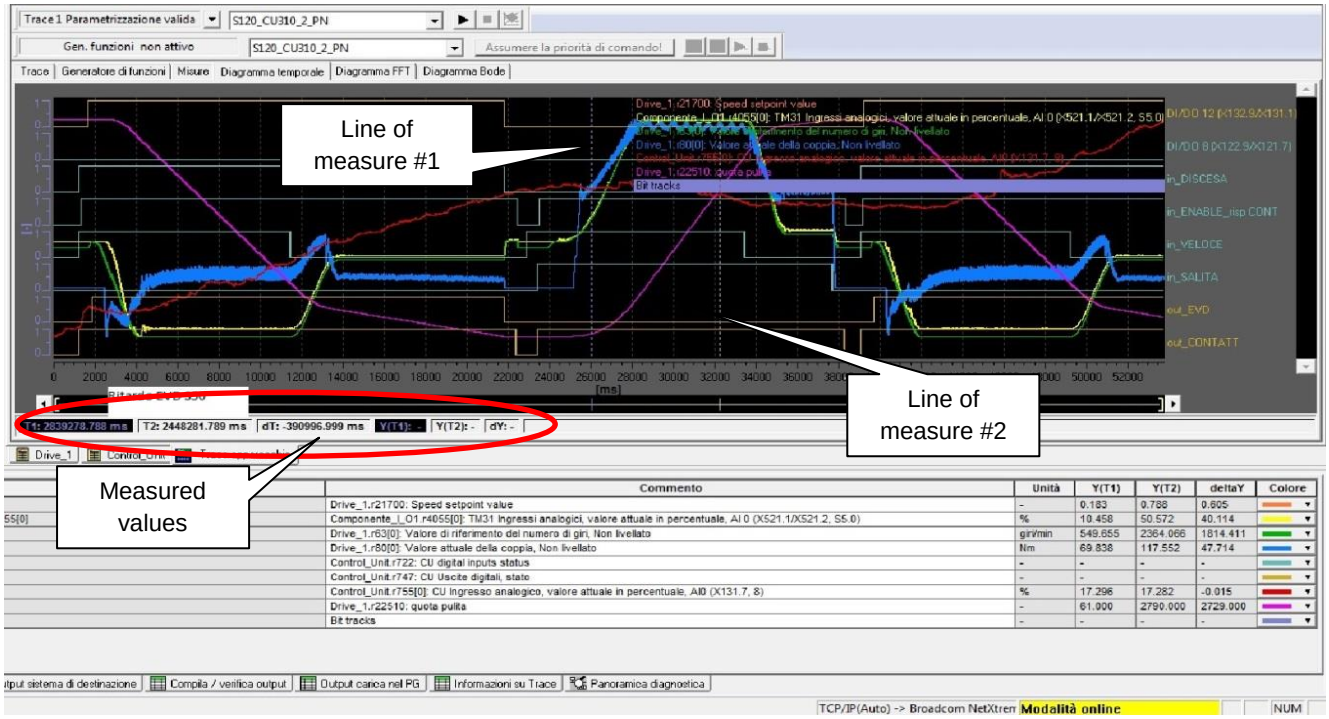


Figure 60- Example graph traces

11 ACTIVE FAULTS

SIEMENS inverters emit warnings FAULT type A or F.
Errors are identified by the letter of the type (A/F), followed by a 5-digit code that allows you to trace the causes that have generated and their possible solutions.
The errors are displayed on both: on the BOP operator panel, and in a special STARTER screen, clicking the bookmark *Alarms* in the lower left (see illustration)

⚠ Bookmark *Alarms* and messages are only available ONLINE

A description of the error, the possible causes and solutions, you can get by clicking 2 times on the alarm code; this will automatically open the help guide (where available)
The list of all possible errors and their solutions can be found in the standard manual SIEMENS S120, "LH1 List Manual", which we refer.

To **reset an error**, select the error and press the *Confirm* button, or act through the BOP (see).

Some type of errors could be reset automatically by the main control board, by using the input port X131.2 (see the application diagram to the paragraph 7.4 SIEMENS S120 ELECTRICAL WIRING).

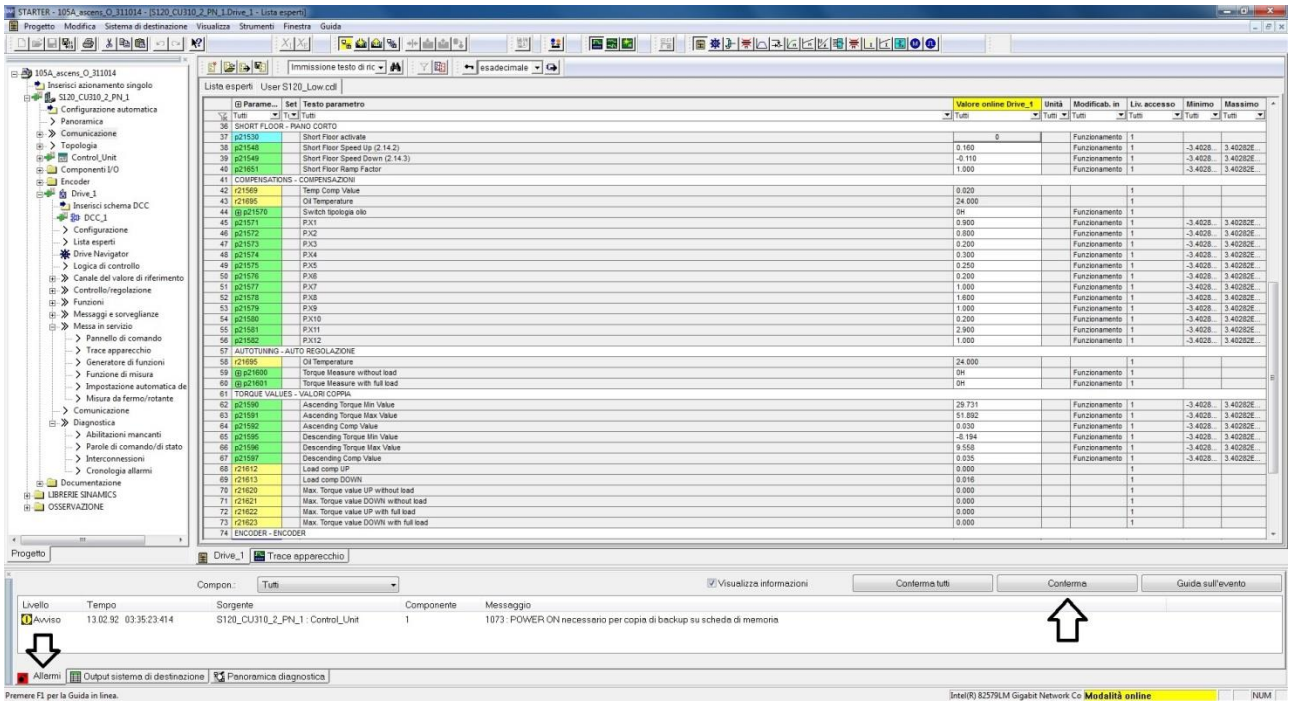


Figure 61- Displaying and acknowledging alarms

In general, facing to a non-compliance detected, the inverter behaves as follows:

- errors Type A (Alarm) are minor errors that, in principle, have no influence on the behavior of the inverter / LIFT.

⚠ The error in the cause still remains active until it has determined, then is reset.

- Errors TYPE F (Fault) are serious flaws that lead to the immediate arrest of the inverter and the lift that is placed safely via simultaneous closing of the solenoid downward (EVD).

⚠ The error F remains active even after the disappearance of the cause that determines it and has to be reset manually (via PC or PO) or via the microphone input from the framework (X131.2).

12 CHECKS AND MAINTENANCE

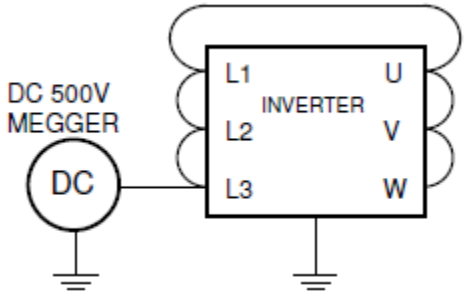
To ensure long service life and optimum operation of the inverter, carry out the following checks at regular intervals.

⚠ Operate on the inverter only after disconnecting the power and making sure the keypad is off.

1- Remove the dust collected on the cooling fins and on the control circuit board, if possible by blowing with compressed air or using a vacuum cleaner.
2- Make sure no screws are loose in the power or control terminal blocks.
3- Make sure inverter operation is “normal” and that there are no signs of anomalous overheating.

12.1 MEGGER TEST

When doing insulation tests using a Megger tester on the input/output cables or on the motor, remove all the connections from all the inverter terminals and perform the test only on the power circuit, according to the diagram opposite. Do not test the control circuits.



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