Products Tde Macno

Installation

Power Stack

Cod. MP00600E00 V_1.3

INDEX

1 FOREWORD

OPDE POWERSTACK is the new brand of TDEMACNO power converters designed for industrial plants and renewable energy power station.

OPDE POWERSTACK inverter offers technical solutions for all drive tasks such as:

- Pump and fan applications in the industry processes
- Drives in more complex applications such as extruders, elevators, conveyors etc
- High dynamic drives for machine tools such as packaging and printing
- High efficiency power conversion in the renewable energy field

OPDE POWERSTACK inverter new brand has been developed in two different mechanical arrangements:

- Withdrawable power stack with a IP20 protection degree
- Fixed power stack with a IP00 protection degree

Depending on the application, OPDE POWERSTACK range offers the most suitable version for any drive task: its modular system solves many complex drive tasks and users can choose a wide range of possibilities to arrange a solution that meets their requirements.

OPDE POWERSTACK inverter new brand conforms with the most important quality requirements: development and production processes ensure an high quality level. OPDE POWERSTACK inverter fulfills many relevant International Standard such as EN European and IEC Standard.
TDEMACNO quality assurance system is certified to DIN EN ISO 9001.

2 SYSTEM OVERVIEW

OPDE POWERSTACK drives are designed to be installed in cabinets and in order to fulfill all the requirements in terms of power components the following elements are available:

- Line-side power components such as main input fuses , reactors , filters
- Line Modules to feed the DC link and in addition they can also feed regenerative energy back into the power system
- DC link component such as capacitor banks to stabilize the DC link
- Motor Modules as inverters with their integrated motor reactors and DC bus protection fuses receive power from the DC link to supply the connected motors

All the components have similar characteristics such as:

- Removable cabinets by wheels for a easy handle
- Simple input – output bars connections
- Same overall dimensions for a simpler cabinet configuration and standardization
- Internal fans
- Integrated protection fuses
- Integrated reactors (30μH) for a simple parallel configuration

2.1 TECHNICAL SPECIFICATIONS

The following technical specifications are valid for all the OPDE POWERSTACK components unless differently specified

Main Technical Specifications

Electrical data	
Main input line	380 3AC –10% to 440 3AC + 10% 660 3AC –10 % to 690 3AC + 10%
Input Frequency range	46 Hz to 64 Hz
Output voltage	Depending on the infeed type
Output Frequency range	0 Hz to 300 Hz
Auxiliary Power Supply	24 V DC (21 V ÷ 27 V) – 5A
Auxiliary Power Supply	400 3AC 1250W 50 Hz, 3.0A for the internal fan 440 3AC 1350W 60 Hz, 3.5A for the internal fan
Mechanical data	
Vibration and shock load	In accordance with EN 60721-3-2 In accordance with EN 60068-2-6
Protection degree EN60529	IP20 for the Removable type IP00 for the Open frame type
Cooling system	Internal fan
Ambient conditions	
Ambient temperature	0°C to +40°C without derating > 40°C to 55°C (referring to derating curves)
Storage	Class 1K3 to EN 60721-3-1 and temperature range –40°C to + 70°C
Transportation	Class 2K4 to EN 60721-3-2 and temperature range –40°C to + 70°C
Operation	Class 3K3 to EN 60721-3-3
Installation altitude	< 2000 m above sea level without any derating > 2000 m above sea level (referring to derating curves)

Conformity	CE (Low voltage and EMC Directives)
Certification	Safety integrity Level SIL 2 to IEC 61508 and SIL 3 to EN 954-1

2.2 DERATING FACTOR

When a OPDE POWERSTACK inverter has to operate in ambient temperatures higher than 40°C and at installation altitude over 2000 m, the derating characteristics must be taken into account. In any case inverter with a voltage rating of 690 V 3 AC cannot be used over 3500m.

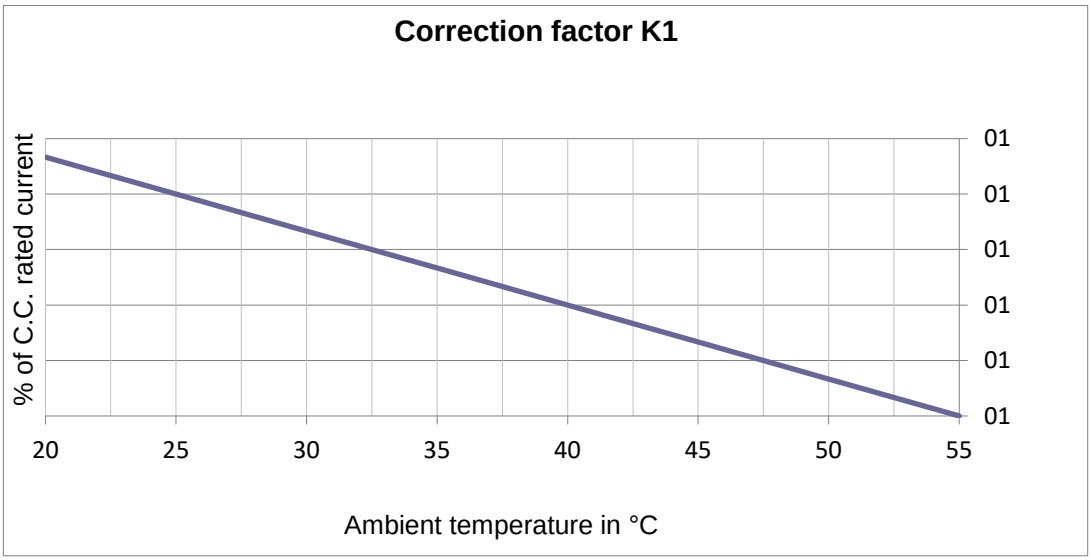


Fig. 1 – Derating factor K1

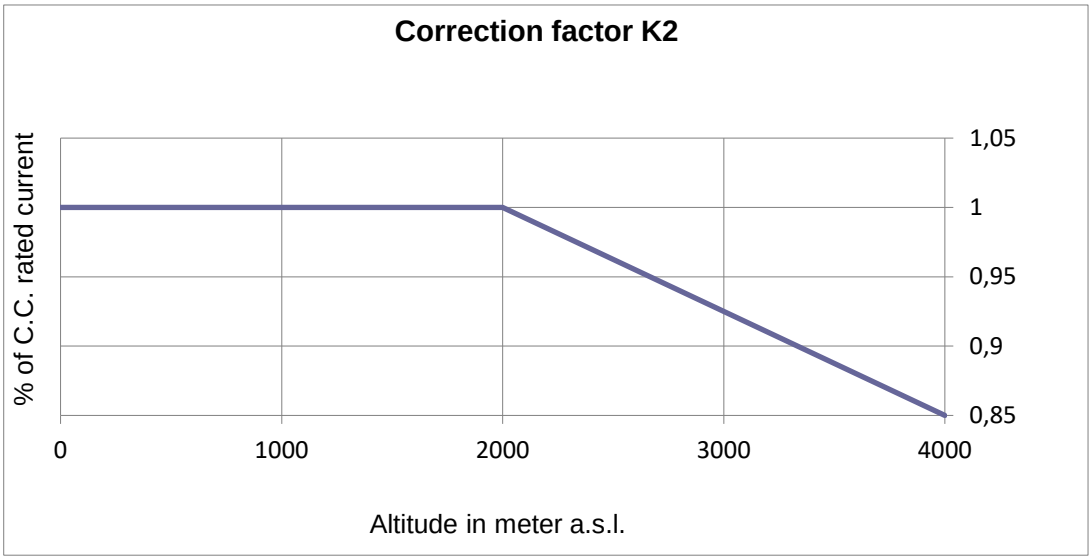


Fig. 2 – Derating factor K2

The following formula has to be used to determine the permissible continuous current when temperature and altitude exceed the standard values:

$$I < I_N \times K_1 \times K_2$$

- I_N = rated current
- K_1 = ambient temperature correction factor
- K_2 = altitude above sea correction factor

2.2.1 ELECTRICAL DATA AFE-INVERTER AND FFE

AFE-INVERTER Nominal values

A_N: Apparent continuous power at I_N

I_N: Maximum continuous current at 40°C without any overload

P_N: Maximum continuous active power

$I_{110\%}$: Maximum continuous current at 40°C to allow a 110% overload with a 10% of duty cycle

$P_{110\%}$: Maximum continuous active power at 40°C to allow a 110% overload with a 10% of duty cycle

$I_{150\%}$: Maximum continuous current at 40°C to allow a 150% overload with a 10% of duty cycle

$P_{150\%}$: Maximum continuous active power at 40°C to allow a 150% overload with a 10% of duty cycle

2.3 AFE UNIT

An AFE unit is an incoming regenerative unit and supplies the connected inverter module and can feed back energy into the main input line.

The rectifier operates as an intelligent converter and is controlled and filtered to draw an undistorted sine-shaped current from the mains.
The power factor is normally kept equal to one. However, the Active Front End rectifier may be used as a phase compensator thus allowing generators to be run at a power factor near to one even with a high degree of inductive/capacitive loads connected.

Main characteristics of the inverter module

- 660 V DC÷1035 V DC version from 460 A_{ac} to 2760 A_{ac}

The main components inside each inverter module are:

- Power IGBT bridge
- DC Protection fuses (option)
- Electrolitic capacitor bank
- Resistor divider
- Output current transducers
- Internal air cooling fan
- Driver cards with integrated power supply
- DC/DC power supply
- Integrated signal interface
- Input LCL filter (Option – externally mounted)

2.3.1 INTERFACE TERMINAL BOARDS

Referring to Fig. 3 the following interface signals and connectors are available.

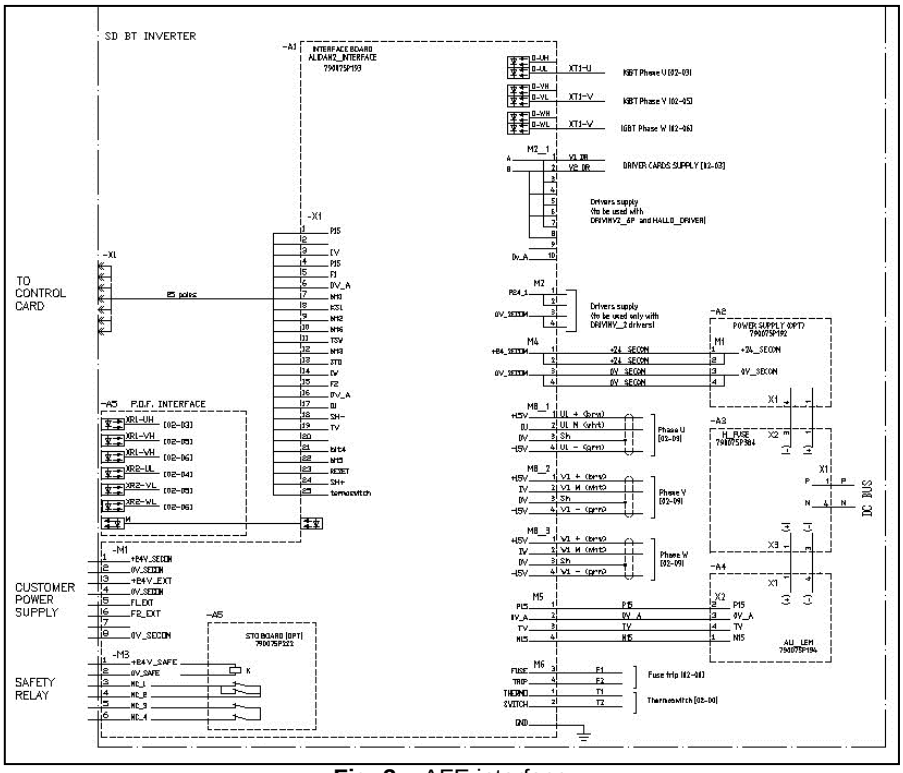


Fig. 3 – AFE interface

a) Control Interface X1 – 25 pin female connector D-SUB Type

X1	Name	Meaning
X1-1	P15	+ 15V for internal use
X1-2	N15	- 15V for internal use
X1-3	I_V	Analog signal from the burden resistor phase V
X1-4	N.U.	Not used
X1-5	F1_CONTROL	1° Contact of the internal microswitch: normally closed
X1-6	0V_A	0V reference voltage
X1-7	BIT1	Not used
X1-8	N.U.	Not used
X1-9	BIT2	Not used
X1-10	MV1	HW Overvoltage signal for redundancy: OPEN = ALARM
X1-11	TSW-	1° Contact of the internal thermal switch: normally closed
X1-12	BIT3	Not used
X1-13		
X1-14	I_W	Analog signal from the burden resistor phase W
X1-15	F2_CONTROL	2° Contact of the internal microswitch: normally closed
X1-16	0V_A	0V reference voltage
X1-17	I_U	Analog signal from the burden resistor phase U

X1-18	SH-	1° Contact of the Stack Healthy alarm relè : normally closed when +24V is present and ALIDAN2 Power Supply is properly working
X1-19	TV	Analog signal from the LEM voltage transducer :
X1-20	N.U.	Not used
X1-21	BIT4	1° BIT for stack size
X1-22	BIT5	2° BIT for stack size
X1-23	RESET	Reset signal operating when connected to 0V- for driver card – N.U.
X1-24	SH+	2° Contact of the Stack Healthy alarm relè : normally closed when +24V is present and ALIDAN2 Power Supply is properly working
X1-25	TSW+	2° Contact of the internal thermal switch: normally closed

Tab.1 – X1 signals

b) Power Supply Interface M1 – 8 poles connector, Phoenix MSTB2.5 Type

M1	Name	Meaning
M1-1	+24V	+ 24V power supply from ALIDAN2
M1-2	0V	0V reference of the +24V
M1-3	+24V_EXT	+ 24V power supply from the Client
M1-4	0V	0V reference of the +24V
M1-5	F1_EXT	1° Contact of the internal fuses : normally closed
M1-6	F2_EXT	2° Contact of the internal fuses : normally closed
M1-7	+24V	Common power supply between +24V and +24V_EXT
M1-8	0V	0V reference of the +24V

Tab.2 – M1 power supply interface

c) Optical fibers for firing and monitor

Nome	Significato
M	*Monitor: luce assente significa condizione di de-saturazione dalla scheda driver o dall'interfaccia alla scheda di controllo*
U_H	*Impulsi di accensione per l'IGBT "High" fase U*
U_L	*Impulsi di accensione per l'IGBT "Low" fase U*
V_H	*Impulsi di accensione per l'IGBT "High" fase V*
V_L	*Impulsi di accensione per l'IGBT "Low" fase V*
W_H	*Impulsi di accensione per l'IGBT "High" fase W*
W_L	*Impulsi di accensione per l'IGBT "Low" fase W*

Tab.3 – Optical fibers identification labels

2.3.2 SAFETY INFORMATION

Warning

After disconnecting all the main power supply, a dangerous and hazardous voltage is present for at least another 6 minutes.
Work inside the frame is forbidden until this time has elapsed
Cable shields and unused conductors must be connected to the PE potential avoiding any capacitive charges

Caution

DC link discharge voltage hazard warning have to be clearly displayed in the electrical cabinets

Important

All the distances specified in the manual drawings in terms of clearances above, below and in front of the inverter module must be observed.

Overall dimensions and main connections

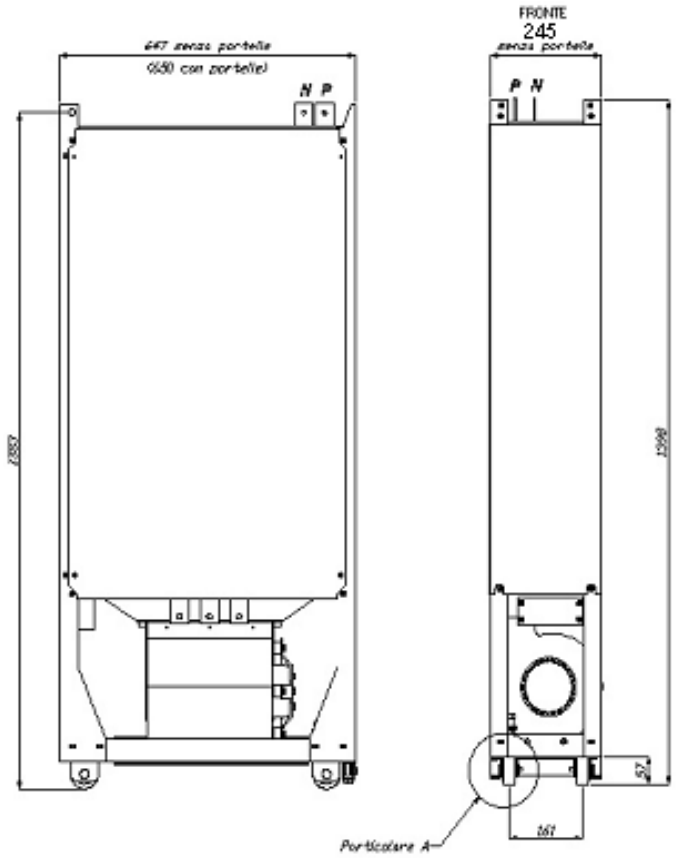


Fig. 4 – AFE dimensional drawing

2.4 INVERTER UNIT

An INVERTER unit is a DC/AC Power Converter . Power is supplied by means of the DC link of the Input AC/DC Converter.
In case of a stand alone solution the input AC/DC rectifier is included in the same frame and its input terminals are located in on the right side bottom.

Main characteristics of the inverter module

- 500 V DC ÷ 740 V DC version from 420 A to 4960 A
- 660 V DC ÷ 1035 V DC version from 410 A to 4080 A

Current features are valid only at nominal input line : 400 V and 690 V
For higher input voltage line or with an Active Front End input converter a suitable derating has to be considered.
The inverter can be equipped with integrated internal inductances of 30μH, for each phase.

The main components inside each inverter module are :

- Power IGBT bridge
- DC Protection fuses (option)
- Electrolitic capacitor bank
- Resistor divider
- Output current transducers
- Internal air cooling fan
- Driver cards with integrated power supply
- DC/DC power supply
- Integrated signal interface
- Internal integrated inductances (30μH each phase - Option)
- Output inductances (Option)

2.4.1 INTERFACE TERMINAL BOARDS

For the INVERTER solution it is necessary to distinguish between two possible configurations :

- INVERTER with a single power stack
- INVERTER with several stack in parallel

2.4.2 INVERTER WITH A SINGLE POWER STACK

Referring to Fig. 5 the following interface signals and connectors are available

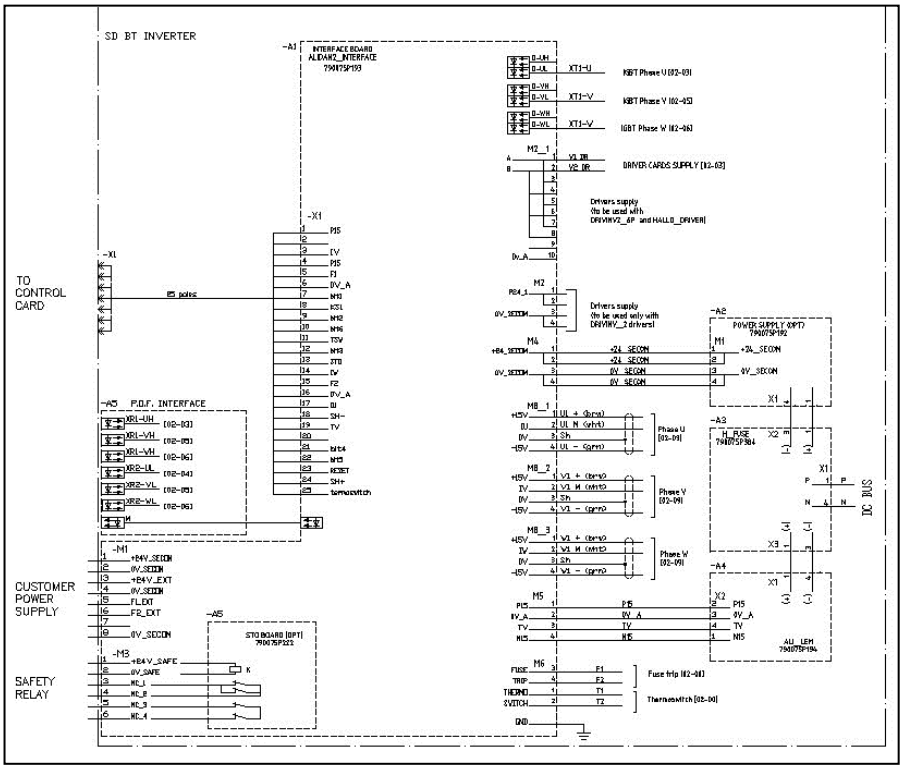


Fig. 5 – INVERTER single stack interface

d) Control Interface X1 – 25 pin female connector D-SUB Type

X1	Name	Meaning
X1-1	P15	+ 15V for internal use
X1-2	N15	- 15V for internal use
X1-3	I_V	Analog signal from the burden resistor phase V
X1-4	N.U.	Not used
X1-5	F1_CONTROL	1° Contact of the internal microswitch: normally closed
X1-6	0V_A	0V reference voltage
X1-7	BIT1	Not used
X1-8	N.U.	Not used
X1-9	BIT2	Not used
X1-10	MV1	HW Overvoltage signal for redundancy: OPEN = ALARM
X1-11	TSW-	1° Contact of the internal thermal switch: normally closed
X1-12	BIT3	Not used
X1-13		
X1-14	I_W	Analog signal from the burden resistor phase W
X1-15	F2_CONTROL	2° Contact of the internal microswitch: normally closed
X1-16	0V_A	0V reference voltage
X1-17	I_U	Analog signal from the burden resistor phase U
X1-18	SH-	1° Contact of the Stack Healthy alarm relè : normally closed when +24V is present

		and ALIDAN2 Power Supply is properly working
X1-19	TV	Analog signal from the LEM voltage transducer :
X1-20	N.U.	Not used
X1-21	BIT4	1° BIT for stack size
X1-22	BIT5	2° BIT for stack size
X1-23	RESET	Reset signal operating when connected to 0V- for driver card – N.U.
X1-24	SH+	2° Contact of the Stack Healthy alarm relè : normally closed when +24V is present and ALIDAN2 Power Supply is properly working
X1-25	TSW+	2° Contact of the internal thermal switch: normally closed

Tab.4 – X1 signals

e) Power Supply Interface M1 – 8 poles connector, Phoenix MSTB2.5 Type

M1	Name	Meaning
M1-1	+24V	+ 24V power supply from ALIDAN2
M1-2	0V	0V reference of the +24V
M1-3	+24V_EXT	+ 24V power supply from the Client
M1-4	0V	0V reference of the +24V
M1-5	F1_EXT	1° Contact of the internal fuses : normally closed
M1-6	F2_EXT	2° Contact of the internal fuses : normally closed
M1-7	+24V	Common power supply between +24V and +24V_EXT
M1-8	0V	0V reference of the +24V

Tab.5 – M1 power supply interface

f) Safety Relè Interface M3 (Option) – 4 poles connector, Phoenix MSTB2.5 Type

M3	Nome	Significato
M3-1	+24V_SAFE	+24V del relè di sicurezza
M3-2	0V_SAFE	0V del relè di sicurezza
M3-3	NC_1	Auxiliary contact of the safety relè
M3-4	NC_2	Auxiliary contact of the safety relè
M3-5	NC_3	Auxiliary contact of the safety relè
M3-6	NC_4	Auxiliary contact of the safety relè

Tab.6 – M3 safety relè interface

g) Optical fibers for firing and monitor

Name	Meaning
M	*Monitor : missing light means de-saturation condition from the driver card or from the interface to the control card*
U_H	*Firing pulses for the "High" IGBT phase U*
U_L	*Firing pulses for the "Low" IGBT phase U*
V_H	*Firing pulses for the "High" IGBT phase V*
V_L	*Firing pulses for the "Low" IGBT phase V*
W_H	*Firing pulses for the "High" IGBT phase W*
W_L	*Firing pulses for the "Low" IGBT phase W*

Tab.7 – Optical fibers identification labels

2.4.3 SAFETY INFORMATION

Warning

After disconnecting all the main power supply, a dangerous and hazardous voltage is present for at least another 6 minutes.
Work inside the frame is forbidden until this time has elapsed
Cable shields and unused conductors must be connected to the PE potential avoiding any capacitive charges

Caution

DC link discharge voltage hazard warning have to be clearly displayed in the electrical cabinets

Important

All the distances specified in the manual drawings in terms of clearances above, below and in front of the inverter module must be observed .

Overall dimensions and main connections

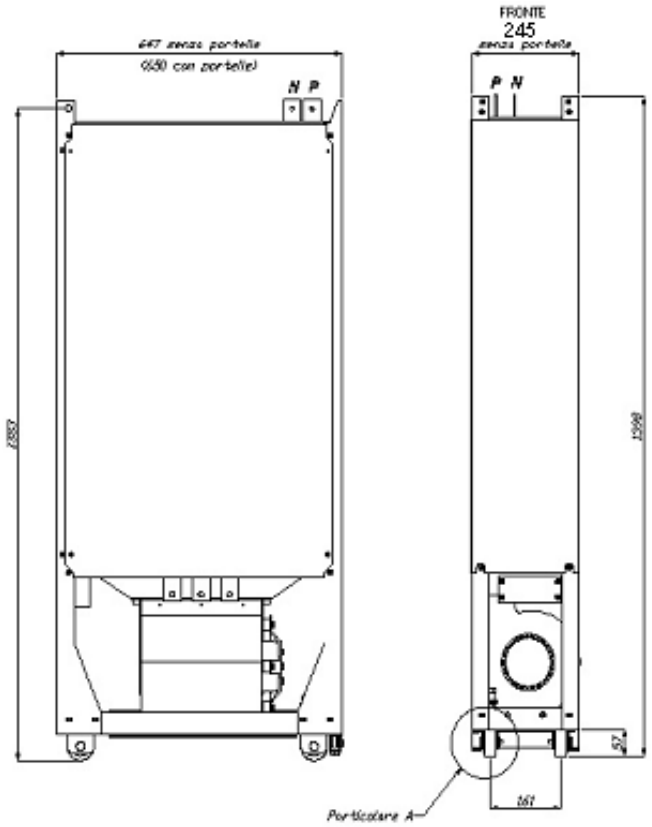


Fig. 6 – Inverter dimensional drawing

2.5 BRAKING UNIT

A braking unit converts the kinetic energy of the motor into thermal energy. It consists of a braking resistor, a chopper unit and a control electronic. When the voltage on DC-BUS exceeds a predetermined maximum value the chopper connects the braking resistor to the DC-BUS.

A braking unit is needed whenever:

- A rapid or accurate deceleration of the motor
- Emergency deceleration of the motor
- There isn't a regenerative unit on main line input

The braking unit is selected according to the required braking power, not according to the power of the inverter.

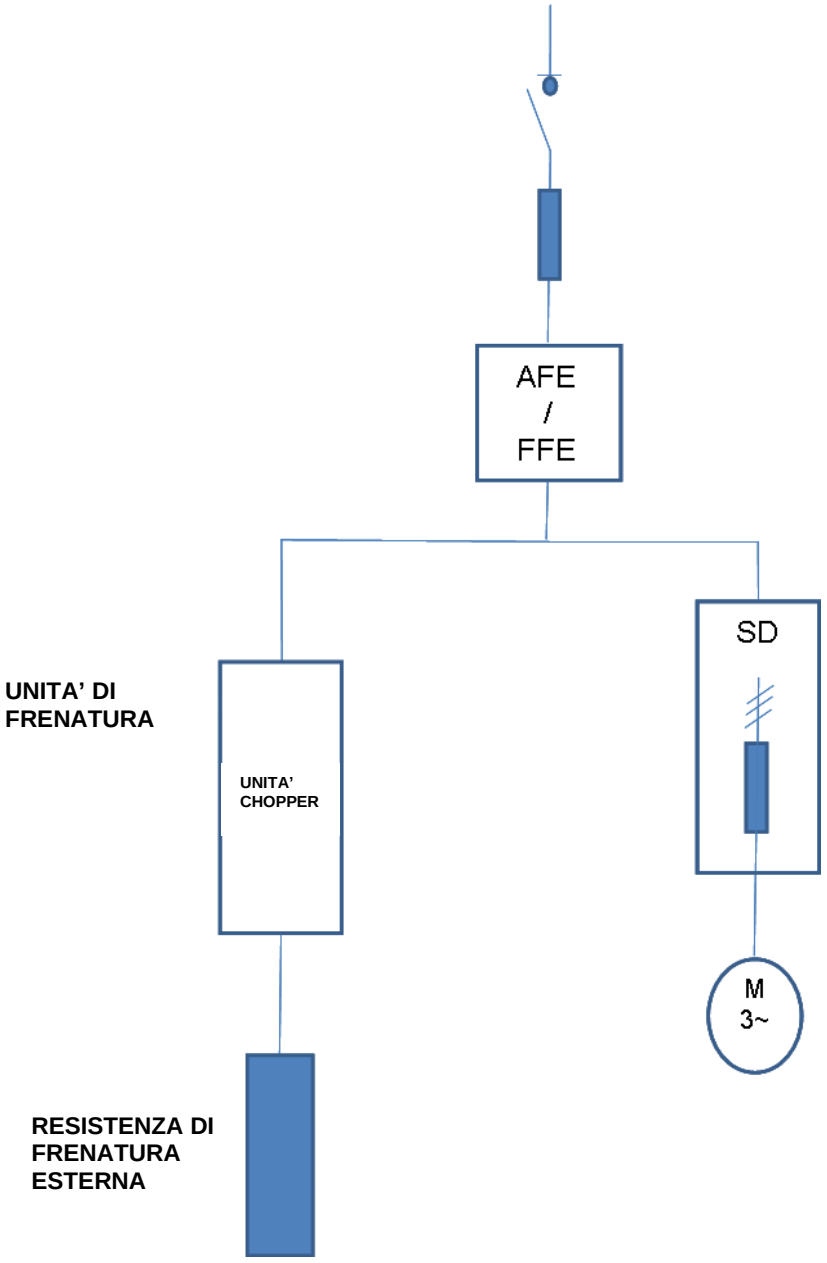


Fig. 7 – Braking unit

3 TECHNICAL DATA

3.1 AFE TECHNICAL DATA

3.1.1 400V AFE

400Vac AFE with a switching frequency of **1.5 kHz** and **2.5 kHz** are shown in the following tables.

MODEL	A_N kVA	I_N A	P_N kW	$I_{110\%}$ A	$P_{110\%}$ kW	$I_{150\%}$ A	$P_{150\%}$ kW	Losses @ I_N W	Air flow m^3/h
U_N = 400V @ 1,5 kHz (Range 380÷440V)									
SD290V04.AFE	290	420	240	410	234	330	189	4.770	> 1.400
SD350V04.AFE	350	510	291	500	286	410	234	5,590	> 1,600
SD430V04.AFE	430	620	354	600	343	500	286	6,340	> 1,800
SD580V04.AFE	580	840	480	820	468	660	377	9,540	> 2,800
SD710V04.AFE	710	1,020	583	1,000	571	820	468	11,180	> 3,200
SD860V04.AFE	860	1,240	708	1,200	685	1,000	571	12,680	> 3,600
SD1060V04.AFE	1,060	1,530	874	1,500	857	1,230	703	16,770	> 4,200
SD1290V04.AFE	1,290	1,860	1,062	1,800	1,028	1,500	857	19,020	> 5,400
SD1720V04.AFE	1,720	2480	1,417	2,400	1,371	2,000	1,142	25,360	> 7,200
SD2150V04.AFE	2,150	3,100	1,770	3,000	1,715	2,500	1,430	31,700	> 9,000
SD2580V04.AFE	2,580	3,720	2,124	3,600	2,058	3,000	1,716	38,040	> 10,800
SD3010V04.AFE	3,010	4,340	2,478	4,200	2,401	3,500	2,002	44,380	> 12,600
SD3440V04.AFE	3,440	4,960	2,832	4,800	2,744	4,000	2,288	50,720	> 14,400

Tab.8

MODEL	A_N kVA	I_N A	P_N kW	$I_{110\%}$ A	$P_{110\%}$ kW	$I_{150\%}$ A	$P_{150\%}$ kW	Losses @ I_N W	Air flow m^3/h
U_N = 400V @ 2,5 kHz (Range 380÷440V)									
SD290V04.AFE	240	340	194	330	189	270	154	4,500	> 1,400
SD350V04.AFE	290	420	240	410	234	330	189	5,220	> 1,600
SD430V04.AFE	360	520	297	510	291	410	234	5,840	> 1,800
SD580V04.AFE	470	680	388	660	377	540	308	9,000	> 2,800
SD710V04.AFE	580	840	480	820	468	660	377	10,440	> 3,200
SD860V04.AFE	720	1,040	594	1,020	583	820	468	11,680	> 3,600
SD1060V04.AFE	870	1,260	720	1,230	703	990	566	15,660	> 4,200
SD1290V04.AFE	1,080	1,560	891	1,530	874	1,230	703	17,520	> 5,400
SD1720V04.AFE	1,440	2,080	1,188	2,040	1,165	1,640	937	23,360	> 7,200
SD2150V04.AFE	1,800	2,600	1,485	2,550	1,455	2,050	1,170	29,200	> 9,000
SD2580V04.AFE	2,160	3,120	1,782	3,060	1,746	2,460	1,404	35,040	> 10,800
SD3010V04.AFE	2,520	3,640	2,079	3,570	2,037	2,870	1,638	40,880	> 12,600
SD3440V04.AFE	2,880	4,160	2,376	4,080	2,328	3,280	1,872	46,720	> 14,400

Tab.9

3.1.2 690V AFE

690Vac AFE with a switching frequency of **1.5 kHz** and **2.5 kHz** are shown in the following tables.

MODEL	A_N kVA	I_N A	P_N kW	$I_{110\%}$ A	$P_{110\%}$ kW	$I_{150\%}$ A	$P_{150\%}$ kW	Losses @ I_N W	Air flow m^3/h
U_N = 690V @ 1,5 kHz (Range 525÷690V) (STANDARD)									
SD490V06.AFE	490	410	404	400	394	320	315	6,460	> 1,400
SD540V06.AFE	540	450	443	440	434	350	345	7,130	> 1,600
SD610V06.AFE	610	510	503	500	493	430	424	7,970	> 1,800
SD980V06.AFE	980	820	808	800	788	640	631	12,920	> 2,800
SD1080V06.AFE	1,080	900	887	880	867	700	690	14,260	> 3,200
SD1220V06.AFE	1,220	1,020	1,005	1,000	985	860	847	15,940	> 3,600
SD1610V06.AFE	1,620	1,350	1,330	1,320	1,301	1,050	1,035	21,390	> 4,200
SD1830V06.AFE	1,830	1,530	1,508	1,500	1,478	1,290	1,271	23,910	> 5,400
SD2440V06.AFE	2,440	2,040	2,010	2,000	1,971	1,720	1,695	31,880	> 7,200
SD3050V06.AFE	3,050	2,550	2,515	2,500	2,465	2,150	2,120	39,850	> 9,000
SD3660V06.AFE	3,660	3,060	3,018	3,000	2,958	2,580	2,544	47,820	> 10,800
SD4270V06.AFE	4,270	3,570	3,521	3,500	3,451	3,010	2,968	55,790	> 12,600
SD4880V06.AFE	4,880	4,080	4,024	4,000	3,944	3,440	3,392	63,760	> 14,400

Tab.10

MODEL	A_N kVA	I_N A	P_N kW	$I_{110\%}$ A	$P_{110\%}$ kW	$I_{150\%}$ A	$P_{150\%}$ kW	Losses @ I_N W	Air flow m^3/h
U_N = 690V @ 2,5 kHz (Range 525÷690V) (ON REQUEST)									
SD490V06.AFE	380	320	315	310	310	250	246	5,810	> 1,400
SD540V06.AFE	440	370	365	340	355	290	286	6,480	> 1,600
SD610V06.AFE	480	400	394	390	384	320	315	6,980	> 1,800
SD980V06.AFE	760	640	631	620	611	500	493	11620	> 2,800
SD1080V06.AFE	880	740	729	720	709	580	572	12,960	> 3,200
SD1220V06.AFE	960	800	788	780	769	640	631	13,960	> 3,600
SD1610V06.AFE	1,330	1,110	1,094	1,080	1,064	870	857	19,440	> 4,200
SD1830V06.AFE	1,430	1,200	1,182	1,170	1,153	960	946	20,940	> 5,400
SD2440V06.AFE	1,910	1,600	1,577	1,560	1,537	1,280	1,261	27,920	> 7,200
SD3050V06.AFE	2,500	2,100	2,070	2,050	2,020	1,650	1,625	34,900	> 9,000
SD3660V06.AFE	3,000	2,520	2,484	2,460	2,424	1,980	1,950	41,880	> 10,800
SD4270V06.AFE	3,500	2,940	2,898	2,870	2,828	2,310	2,275	48,860	> 12,600
SD4880V06.AFE	4,000	3,360	3,312	3,280	3,232	2,640	2,600	55,840	> 14,400

Tab.11

3.1.3 VALUES OF STANDARD INPUT LCL FILTER

Suggested values of input line inductance are listed in next tables.

MODEL	L uH	I_N A
U_N = 400V		
SD290V04.AFE	550	420
SD350V04.AFE	450	510
SD430V04.AFE	370	620
SD580V04.AFE	270	840
SD710V04.AFE	220	1,020
SD860V04.AFE	180	1,240
SD1060V04.AFE	150	1,530
SD1290V04.AFE	120	1,860
SD1720V04.AFE	92	2480
SD2150V04.AFE	74	3,100
SD2580V04.AFE	62	3,720
SD3010V04.AFE	53	4,340
SD3440V04.AFE	42	4,960

Tab.12

MODEL	L uH	I_N A
U_N = 690V		
SD490V06.AFE	960	410
SD540V06.AFE	880	450
SD610V06.AFE	770	510
SD980V06.AFE	480	820
SD1080V06.AFE	440	900
SD1220V06.AFE	390	1,020
SD1610V06.AFE	290	1,350
SD1830V06.AFE	260	1,530
SD2440V06.AFE	190	2,040
SD3050V06.AFE	150	2,550
SD3660V06.AFE	130	3,060
SD4270V06.AFE	110	3,570
SD4880V06.AFE	97	4,080

Tab.13

Capacitor values on request.

3.2 INVERTER TECHNICAL DATA

3.2.1 400V INVERTER

400Vac inverter with a switching frequency of **1.5kHz** and **2.5 kHz** are shown in the following tables.

MODEL	A_N kVA	I_N A	P_N kW	$I_{110\%}$ A	$P_{110\%}$ kW	$I_{150\%}$ A	$P_{150\%}$ kW	Losses @ I_N W	Air flow m^3/h
U_N = 400V @ 1,5 kHz (Range 380÷440V) (STANDARD)									
SD290V04	290	420	240	410	234	330	189	4,770	> 1,400
SD350V04	350	510	291	500	286	410	234	5,590	> 1,600
SD430V04	430	620	354	600	343	500	286	6,340	> 1,800
SD580V04	580	840	480	820	468	660	377	9,540	> 2,800
SD710V04	710	1,020	583	1,000	571	820	468	11,180	> 3,200
SD860V04	860	1,240	708	1,200	685	1,000	571	12,680	> 3,600
SD1060V04	1,060	1,530	874	1,500	857	1,230	703	16,770	> 4,200
SD1290V04	1,290	1,860	1,062	1,800	1,028	1,500	857	19,020	> 5,400
SD1720V04	1,720	2,480	1,417	2,400	1,371	2,000	1,142	25,360	> 7,200
SD2150V04	2,150	3,100	1,770	3,000	1,715	2,500	1,430	31,700	> 9,000
SD2580V04	2,580	3,720	2,124	3,600	2,058	3,000	1,716	38,040	> 10,800
SD3010V04	3,010	4,340	2,478	4,200	2,401	3,500	2,002	44,380	> 12,600
SD3440V04	3,440	4,960	2,832	4,800	2,744	4,000	2,288	50,720	> 14,400

Tab.14

MODEL	A_N kVA	I_N A	P_N kW	$I_{110\%}$ A	$P_{110\%}$ kW	$I_{150\%}$ A	$P_{150\%}$ kW	Losses @ I_N W	Air flow m^3/h
U_N = 400V @ 2,5 kHz (Range 380÷440V) (ON REQUEST)									
SD290V04	240	340	194	330	189	270	154	4,500	> 1,400
SD350V04	290	420	240	410	234	330	189	5,220	> 1,600
SD430V04	360	520	297	510	291	410	234	5,840	> 1,800
SD580V04	470	680	388	660	377	540	308	9,000	> 2,800
SD710V04	580	840	480	820	468	660	377	10,440	> 3,200
SD860V04	720	1,040	594	1,020	583	820	468	11,680	> 3,600
SD1060V04	870	1,260	720	1,230	703	990	566	15,660	> 4,200
SD1290V04	1,080	1,560	891	1,530	874	1,230	703	17,520	> 5,400
SD1720V04	1,440	2,080	1,188	2,040	1165	1,640	937	23,360	> 7,200
SD2150V04	1,800	2,600	1,485	2,550	1,455	2,050	1,170	29,200	> 9,000
SD2580V04	2,160	3,120	1,782	3,060	1,746	2,460	1,404	35,040	> 10,800
SD3010V04	2,520	3,640	2,079	3,570	2,037	2,870	1,638	40,880	> 12,600
SD3440V04	2,880	4,160	2,376	4,080	2,328	3,280	1,872	46,720	> 14,400

Tab.15

3.2.2 690V INVERTER

690Vac inverter with a switching frequency of **1.5 kHz** and **2.5 kHz** are shown in the following tables.

MODEL	A_N kVA	I_N A	P_N kW	$I_{110\%}$ A	$P_{110\%}$ kW	$I_{150\%}$ A	$P_{150\%}$ kW	Losses @ I_N W	Air flow m^3/h
U_N = 690V @ 1,5 kHz (Range 525÷690V) (STANDARD)									
SD490V06	490	410	404	400	394	320	315	6,460	> 1,400
SD540V06	540	450	443	440	434	350	345	7,130	> 1,600
SD610V06	610	510	503	500	493	430	424	7,970	> 1,800
SD980V06	980	820	808	800	788	640	631	12,920	> 2,800
SD1080V06	1,080	900	887	880	867	700	690	14,260	> 3,200
SD1220V06	1,220	1,020	1,005	1,000	985	860	847	15,940	> 3,600
SD1610V06	1,620	1,350	1,330	1,320	1,301	1,050	1,035	21,390	> 4,200
SD1830V06	1,830	1,530	1,508	1,500	1,478	1,290	1,271	23,910	> 5,400
SD2440V06	2,440	2,040	2,010	2,000	1,971	1,720	1,695	31,880	> 7,200
SD3050V06	3,050	2,550	2,515	2,500	2,465	2,150	2,120	39,850	> 9,000
SD3660V06	3,660	3,060	3,018	3,000	2,958	2,580	2,544	47,820	> 10,800
SD4270V06	4,270	3,570	3,521	3,500	3,451	3,010	2,968	55,790	> 12,600
SD4880V06	4,880	4,080	4,024	4,000	3,944	3,440	3,392	63,760	> 14,400

Tab.16

MODEL	A_N kVA	I_N A	P_N kW	$I_{110\%}$ A	$P_{110\%}$ kW	$I_{150\%}$ A	$P_{150\%}$ kW	Losses @ I_N W	Air flow m^3/h
U_N = 690V @ 2,5 kHz (Range 525÷690V) (ON REQUEST)									
SD490V06	380	320	315	310	310	250	246	5,810	> 1,400
SD540V06	440	370	365	340	355	290	286	6,480	> 1,600
SD610V06	480	400	394	390	384	320	315	6,980	> 1,800
SD980V06	760	640	631	620	611	500	493	11620	> 2,800
SD1080V06	880	740	729	720	709	580	572	12,960	> 3,200
SD1220V06	960	800	788	780	769	640	631	13,960	> 3,600
SD1610V06	1,330	1,110	1,094	1,080	1,064	870	857	19,440	> 4,200
SD1830V06	1,430	1,200	1,182	1,170	1,153	960	946	20,940	> 5,400
SD2440V06	1,910	1,600	1,577	1,560	1,537	1,280	1,261	27,920	> 7,200
SD3050V06	2,500	2,100	2,070	2,050	2,020	1,650	1,625	34,900	> 9,000
SD3660V06	3,000	2,520	2,484	2,460	2,424	1,980	1,950	41,880	> 10,800
SD4270V06	3,500	2,940	2,898	2,870	2,828	2,310	2,275	48,860	> 12,600
SD4880V06	4,000	3,360	3,312	3,280	3,232	2,640	2,600	55,840	> 14,400

Tab.17

3.3 DIMENSION AND WEIGHT

3.3.1 AFE

Dimensions and weights are shown in the following table and figures.

MODEL	Height (mm)	Width (mm)	Depth (mm)	Weight (kg)	Number of Units
SD290V04.AFE	1398	245	650	120	1
SD350V04.AFE	1398	245	650	135	1
SD430V04.AFE	1398	245	650	165	1
SD580V04.AFE	1398	2 x 245	650	120 x 2	2
SD710V04.AFE	1398	2 x 245	650	135 x 2	2
SD860V04.AFE	1398	2 x 245	650	165 x 2	2
SD1060V04.AFE	1398	3 x 245	650	135 x 3	3
SD1290V04.AFE	1398	3 x 245	650	165 x 3	3
SD1720V04.AFE	1398	4 x 245	650	165 x 4	4
SD2150V04.AFE	1398	5 x 245	650	165 x 5	5
SD2580V04.AFE	1398	6 x 245	650	165 x 6	6
SD3010V04.AFE	1398	7 x 245	650	165 x 7	7
SD3440V04.AFE	1398	8 x 245	650	165 x 8	8

Tab.18 – Dimensions and weights – 400V AFE

MODEL	Height (mm)	Width (mm)	Depth (mm)	Weight (kg)	Number of Units
SD490V06.AFE	1398	245	650	130	1
SD540V06.AFE	1398	245	650	145	1
SD610V06.AFE	1398	245	650	175	1
SD980V06.AFE	1398	2 x 245	650	130 x 2	2
SD1080V06.AFE	1398	2 x 245	650	145 x 2	2
SD1220V06.AFE	1398	2 x 245	650	175 x 2	2
SD1610V06.AFE	1398	3 x 245	650	145 x 3	3
SD1830V06.AFE	1398	3 x 245	650	175 x 3	3
SD2440V06.AFE	1398	4 x 245	650	175 x 4	4
SD3050V06.AFE	1398	5 x 245	650	175 x 5	5
SD3660V06.AFE	1398	6 x 245	650	175 x 6	6
SD4270V06.AFE	1398	7 x 245	650	175 x 7	7
SD4880V06.AFE	1398	8 x 245	650	175 x 8	8

Tab.19 – Dimensions and weights – 690V AFE

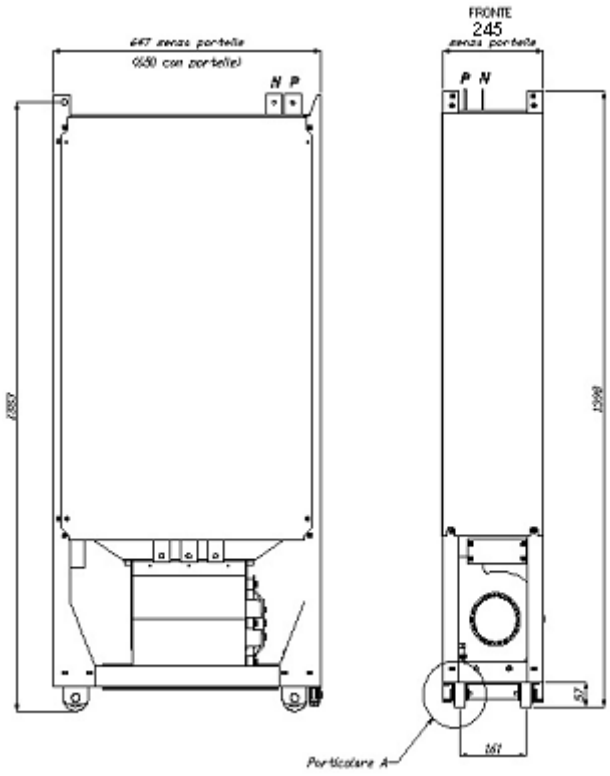


Fig. 8 – AFE dimensional drawing

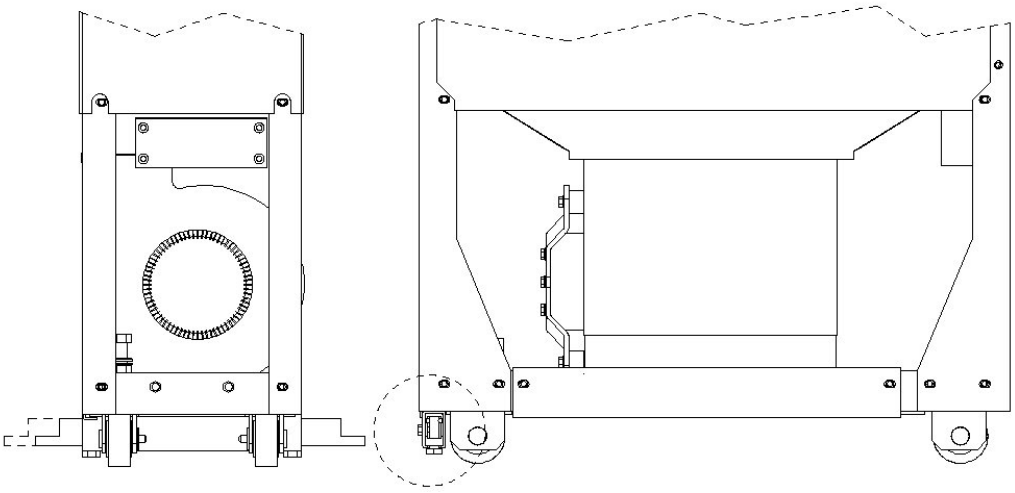


Fig. 9 – AFE drawing particular

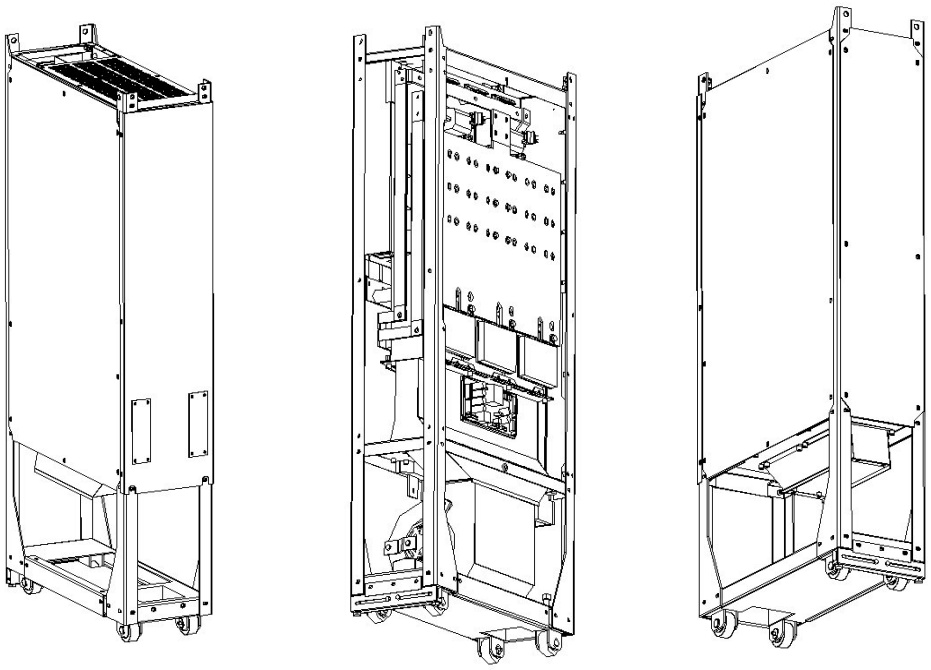


Fig. 10 – AFE 3D drawings

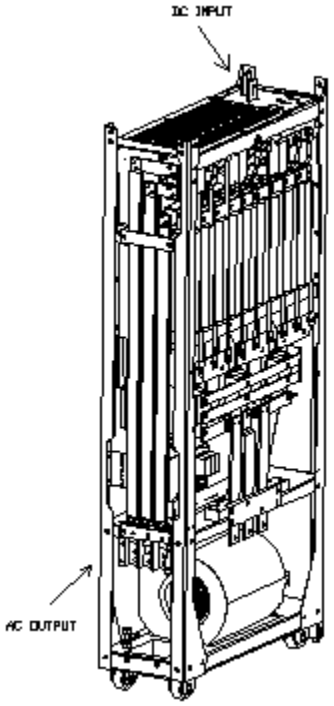


Fig. 11 – AFE 3D drawings – Front AC OUTPUT

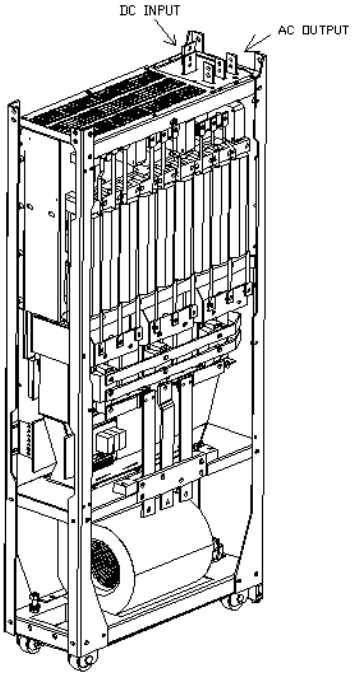


Fig. 12 – AFE 3D drawings – Upside AC OUTPUT

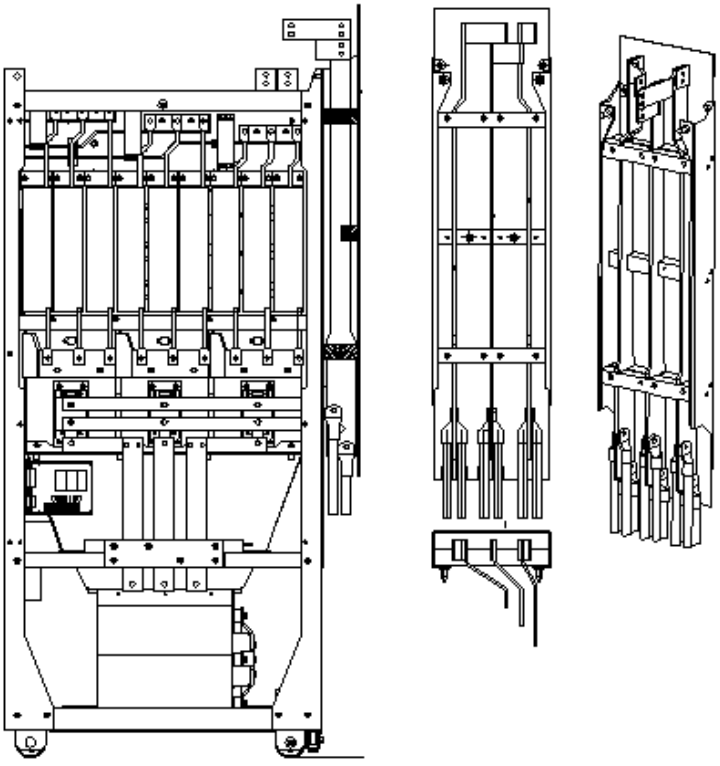
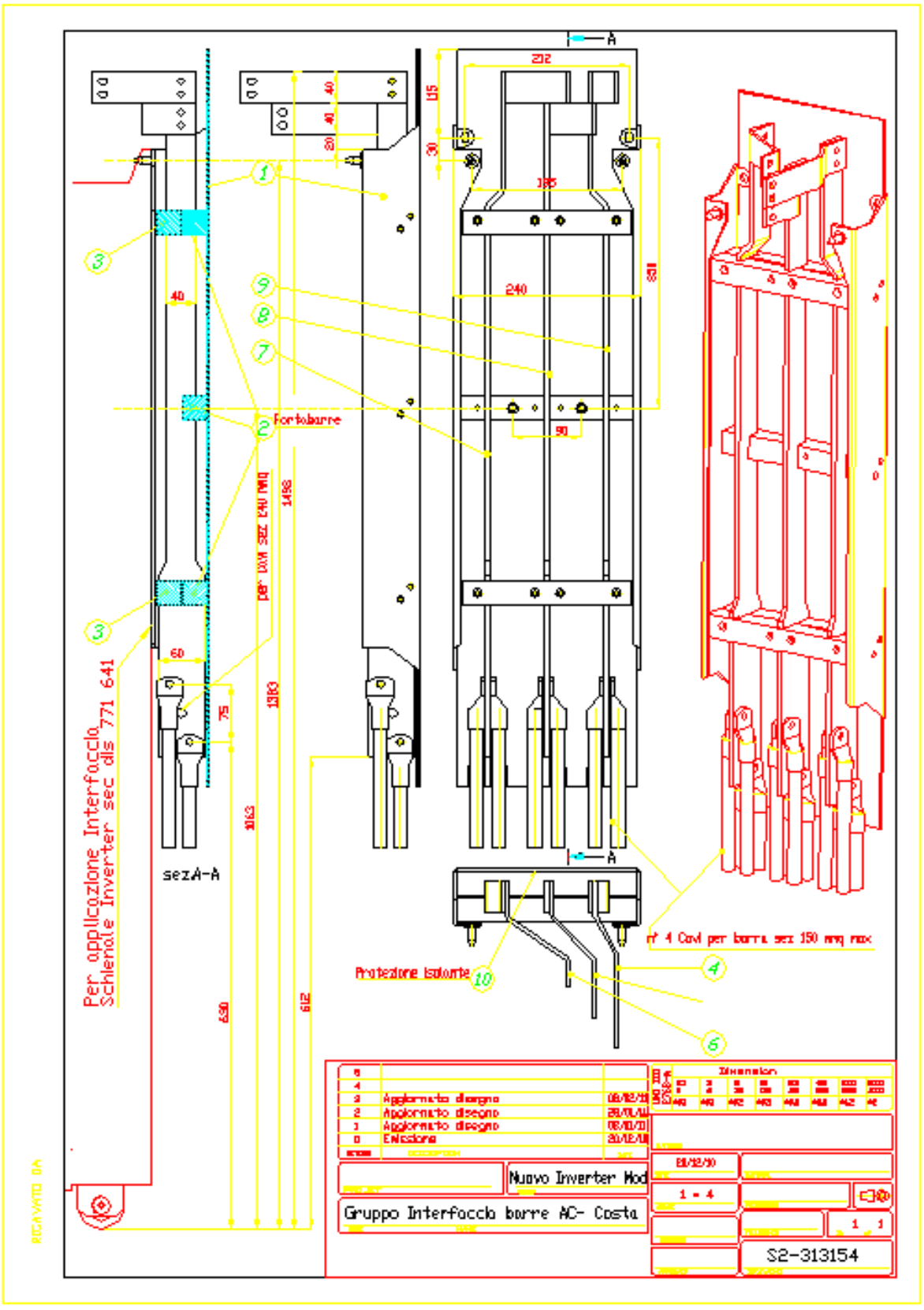


Fig. 13 – AFE 3D drawings – Rear kit bar AC OUTPUT


Per applicazione Interfaccio
Schienole Inverter sec dis 771 641
sezA-A
Portabarre
Protezione Isolante
nr 4 Cavi per barra sez 150 mmq max
Nuovo Inverter Mod
Gruppo Interfaccio barre AC- Costa
S2-313154

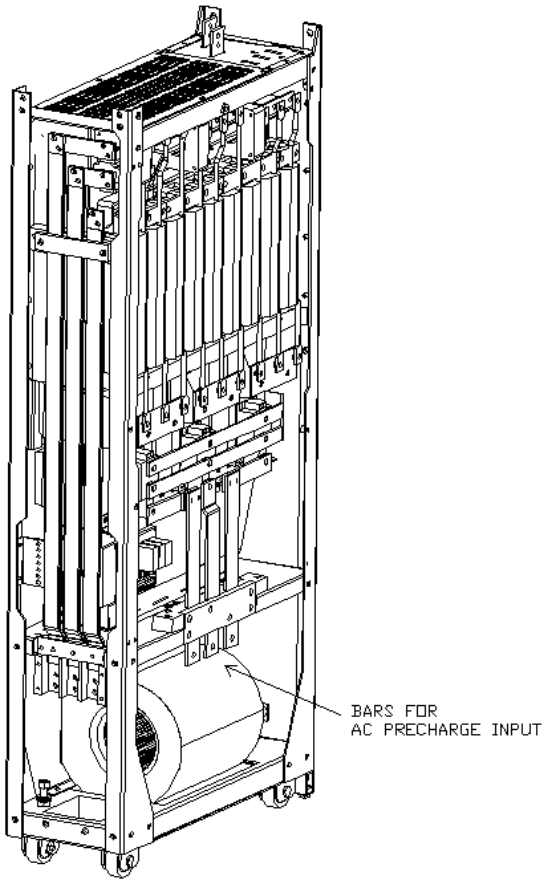


Fig. 14 – AFE 3D drawings – Precharge AC INPUT

3.3.2 INVERTER

Dimensions and weights are shown in the following tables and figures.

MODEL	Height (mm)	Width (mm)	Depth (mm)	Weight (kg)	Number of Units
SD290V04	1398	245	650	120	1
SD350V04	1398	245	650	135	1
SD430V04	1398	245	650	165	1
SD580V04	1398	2 x 245	650	120 x 2	2
SD710V04	1398	2 x 245	650	135 x 2	2
SD860V04	1398	2 x 245	650	165 x 2	2
SD1060V04	1398	3 x 245	650	135 x 3	3
SD1290V04	1398	3 x 245	650	165 x 3	3
SD1720V04	1398	4 x 245	650	165 x 4	4
SD2150V04	1398	5 x 245	650	165 x 5	5
SD2580V04	1398	6 x 245	650	165 x 6	6
SD3010V04	1398	7 x 245	650	165 x 7	7
SD3440V04	1398	8 x 245	650	165 x 8	8

Tab.20 – Dimensions and weights – 400V Inverter

MODEL	Height (mm)	Width (mm)	Depth (mm)	Weight (kg)	Number of Units
SD490V06	1398	245	650	130	1
SD540V06	1398	245	650	145	1
SD610V06	1398	245	650	175	1
SD980V06	1398	2 x 245	650	130 x 2	2
SD1080V06	1398	2 x 245	650	145 x 2	2
SD1220V06	1398	2 x 245	650	175 x 2	2
SD1610V06	1398	3 x 245	650	145 x 3	3
SD1830V06	1398	3 x 245	650	175 x 3	3
SD2440V06	1398	4 x 245	650	175 x 4	4
SD3050V06	1398	5 x 245	650	175 x 5	5
SD3660V06	1398	6 x 245	650	175 x 6	6
SD4270V06	1398	7 x 245	650	175 x 7	7
SD4880V06	1398	8 x 245	650	175 x 8	8

Tab.21 – Dimensions and weights – 690V Inverter

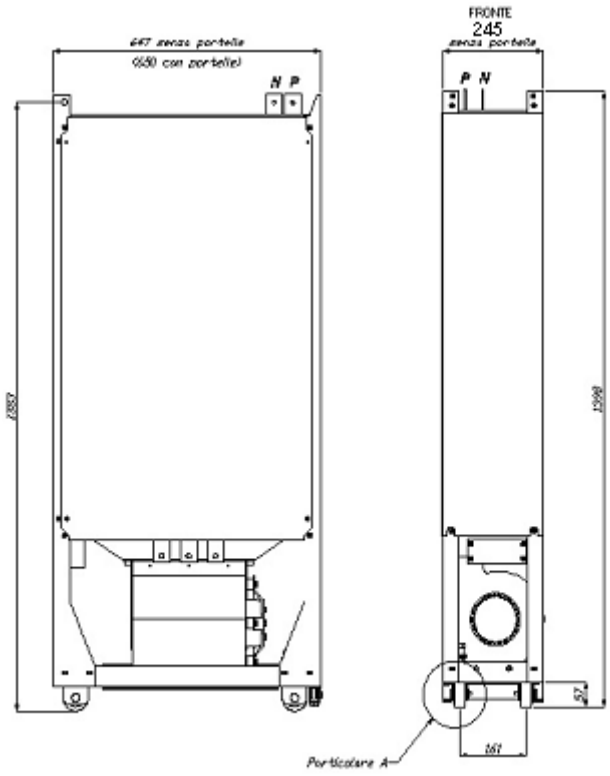


Fig. 15 – Inverter dimensional drawing

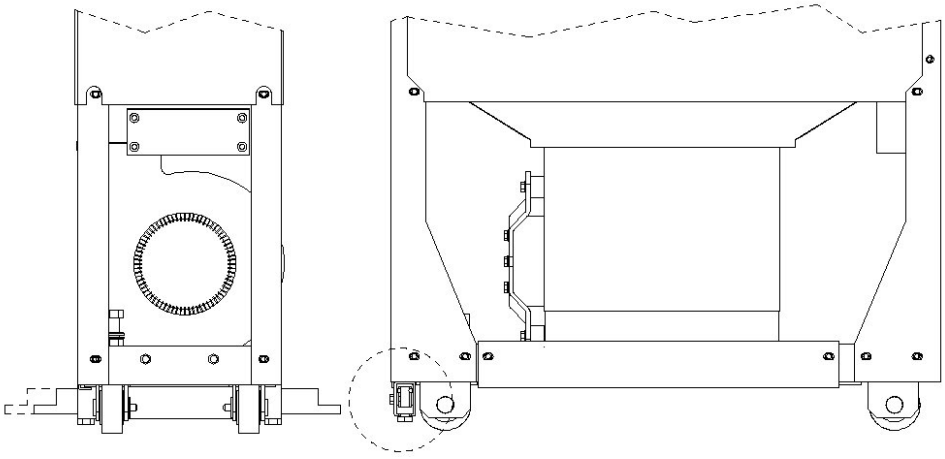


Fig. 16 – Inverter drawing particular

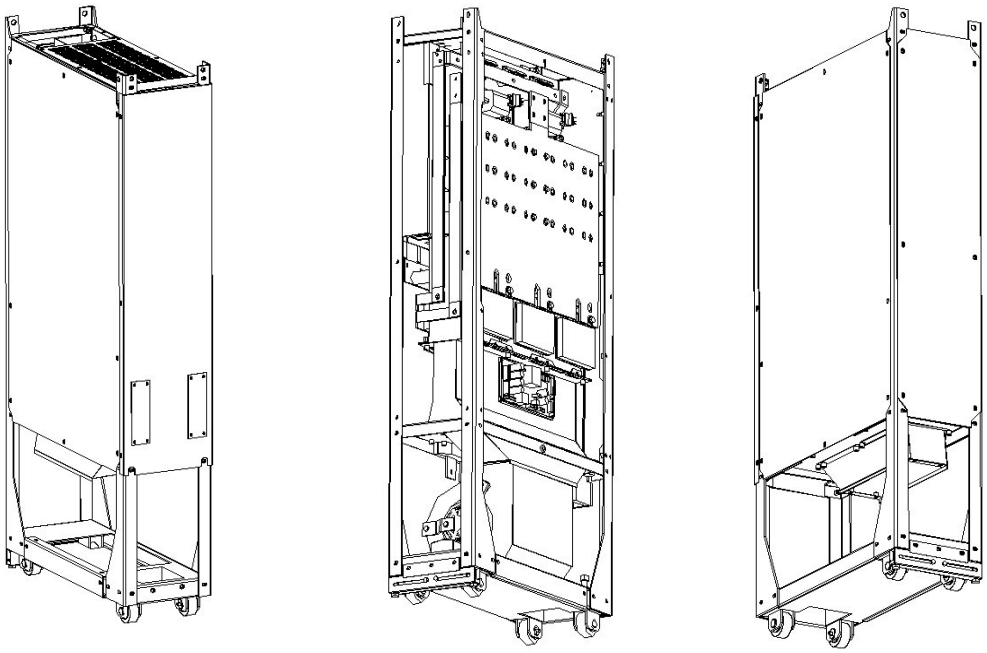


Fig. 17 – Inverter 3D drawings

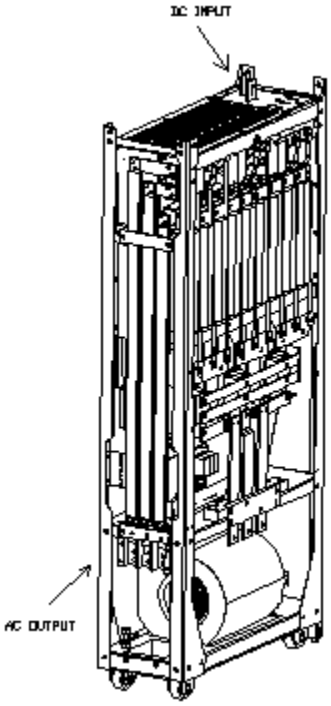


Fig. 18 – Inverter 3D drawings - Front AC OUTPUT

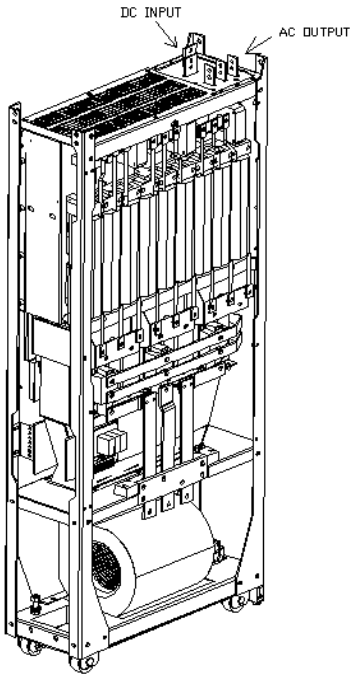


Fig. 19 – Inverter 3D drawings - Upside AC OUTPUT

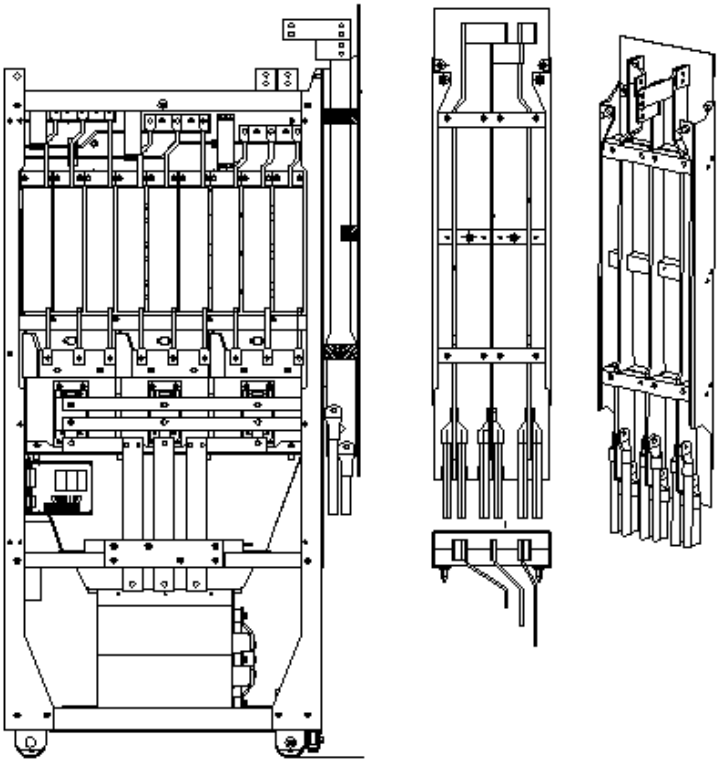
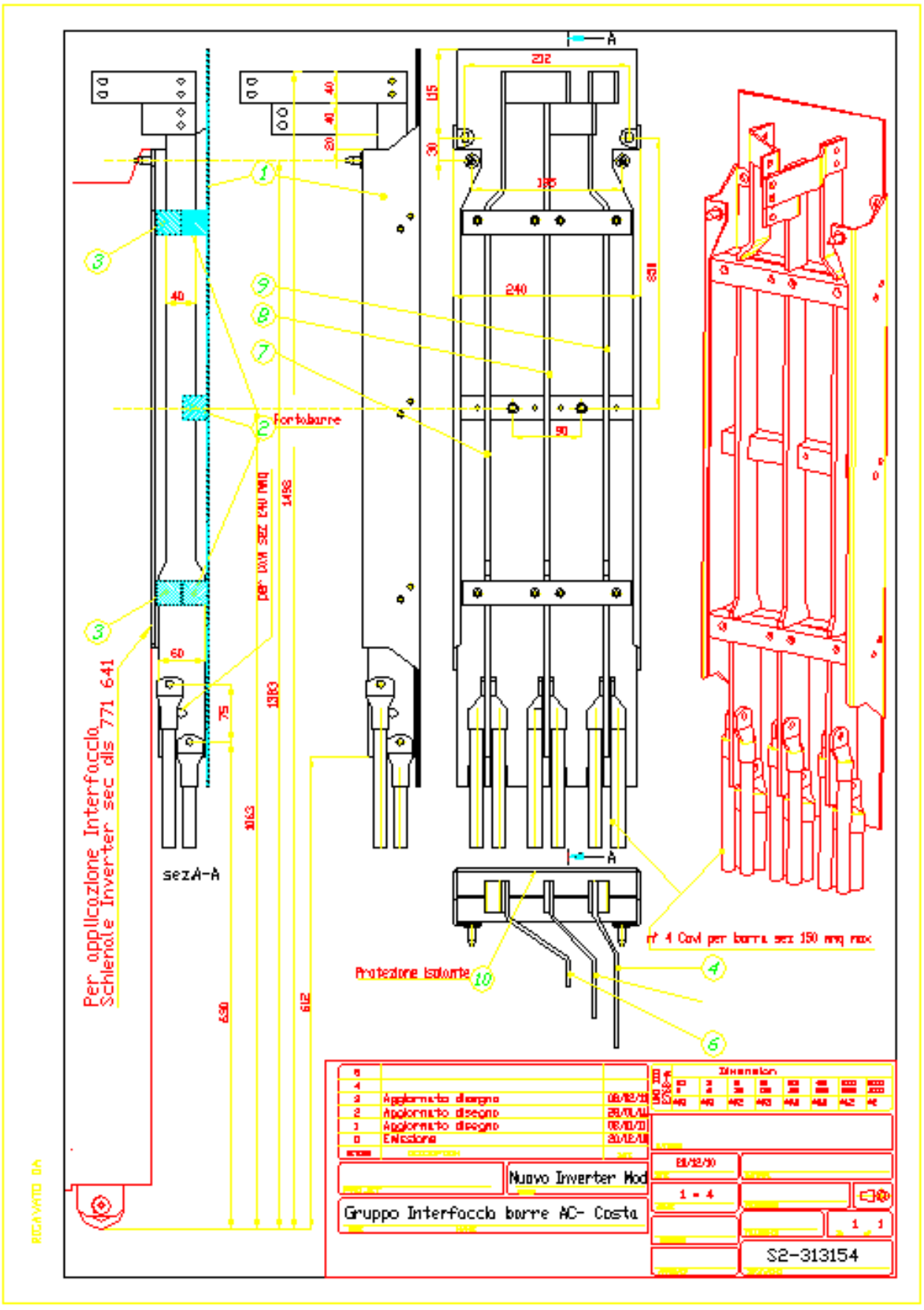


Fig. 20 – Inverter 3D drawings - Rear kit bar AC OUTPUT


Per applicazione Interfaccia
Schienole Inverter sec dis 771 641
sezA-A
Portabarre
Protezione Isolante
nr 4 Cavi per barra sez 150 mmq max
Gruppo Interfaccia barre AC- Costa
Nuovo Inverter Mod
S2-313154

3.4 INTERNAL INVERTER CAPACITOR BANKS

The table is valid for all the inverter type.

MODEL	CAPACITANCE VALUE µF
400V	
SD290V04	11,750
SD350V04	11,750
SD430V04	14,100
SD580V04	11,750 x 2
SD710V04	11,750 x 2
SD860V04	14,100 x 2
SD1060V04	11,750 x 3
SD1290V04	14,000 x 3
SD1720V04	14,000 x 4
SD2150V04	14,000 x 5
SD2580V04	14,000 x 6
SD3010V04	14,000 x 7
SD3440V04	14,000 x 8

Tab.22 – Capacitance values

MODELLO	CAPACITANCE VALUE µF
690V	
SD490V06	7,833
SD540V06	7,833
SD610V06	9,400
SD980V06	7,833 x 2
SD1080V06	7,833 x 2
SD1220V06	9,400 x 2
SD1610V06	7,833 x 3
SD1830V06	9,400 x 3
SD2440V06	9,400 x 4
SD3050V06	9,400 x 5
SD3660V06	9,400 x 6
SD4270V06	9,400 x 7
SD4880V06	9,400 x 8

Tab.23 – Capacitance values

3.5 ELECTRICAL AND SIGNAL CONNECTIONS

3.5.1 INVERTER

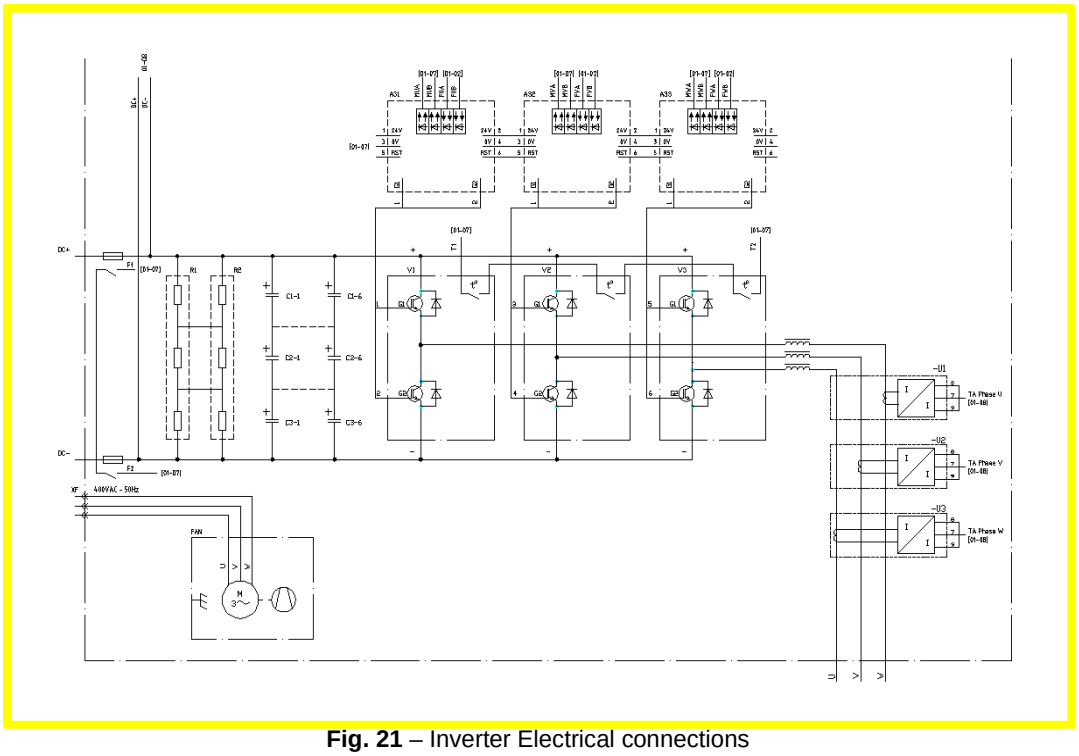


Fig. 21 – Inverter Electrical connections

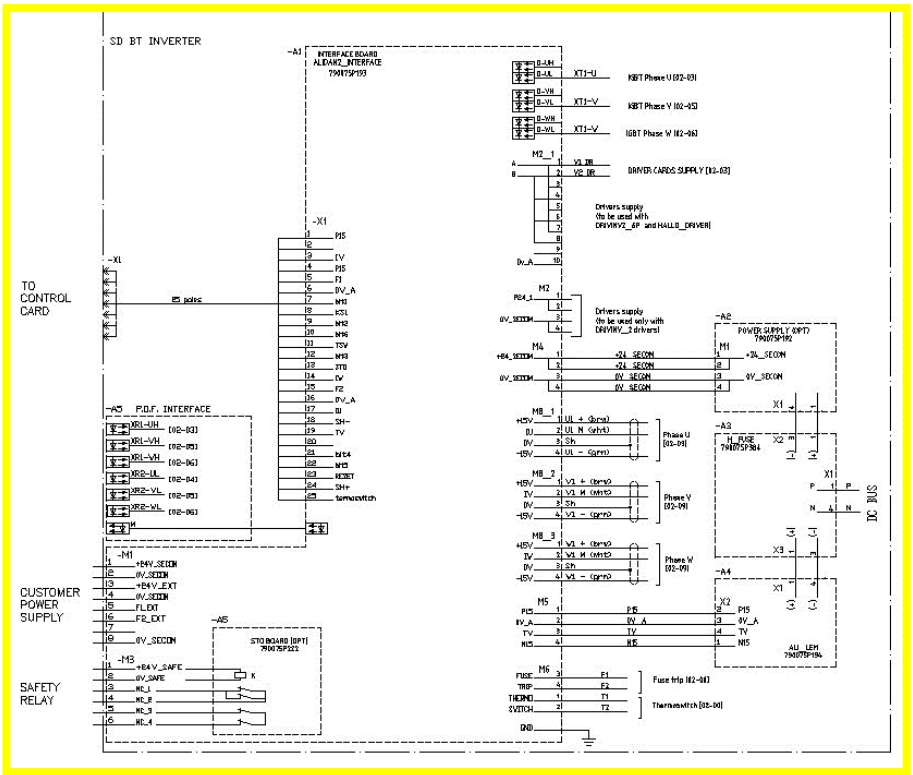


Fig. 22 – Inverter Electrical connections

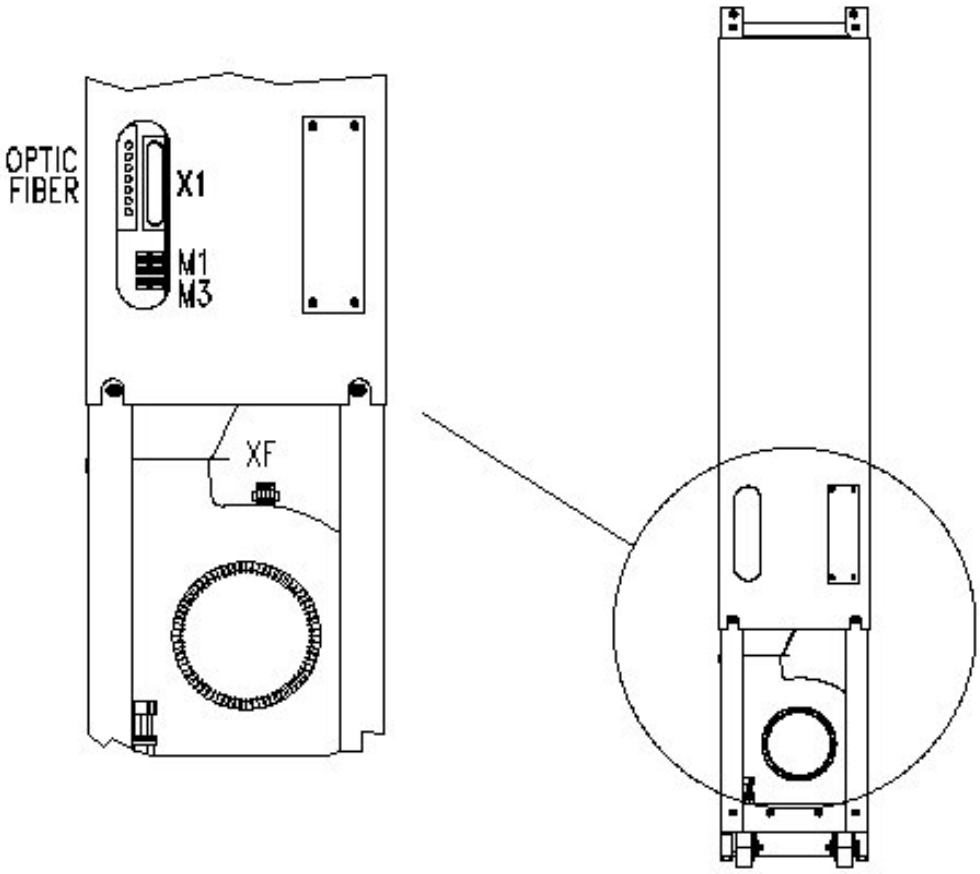
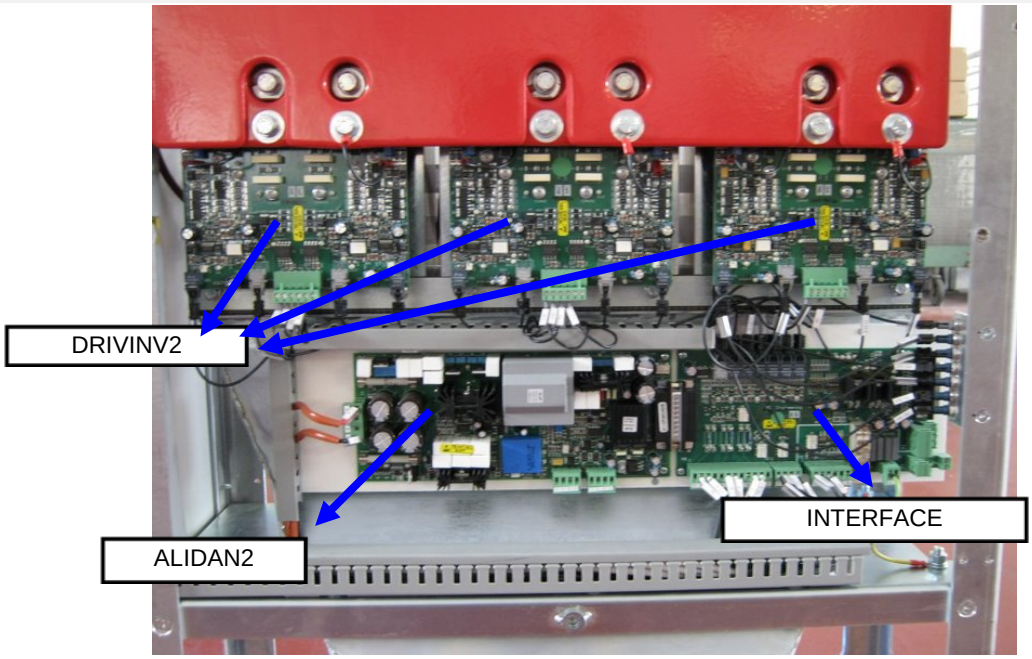
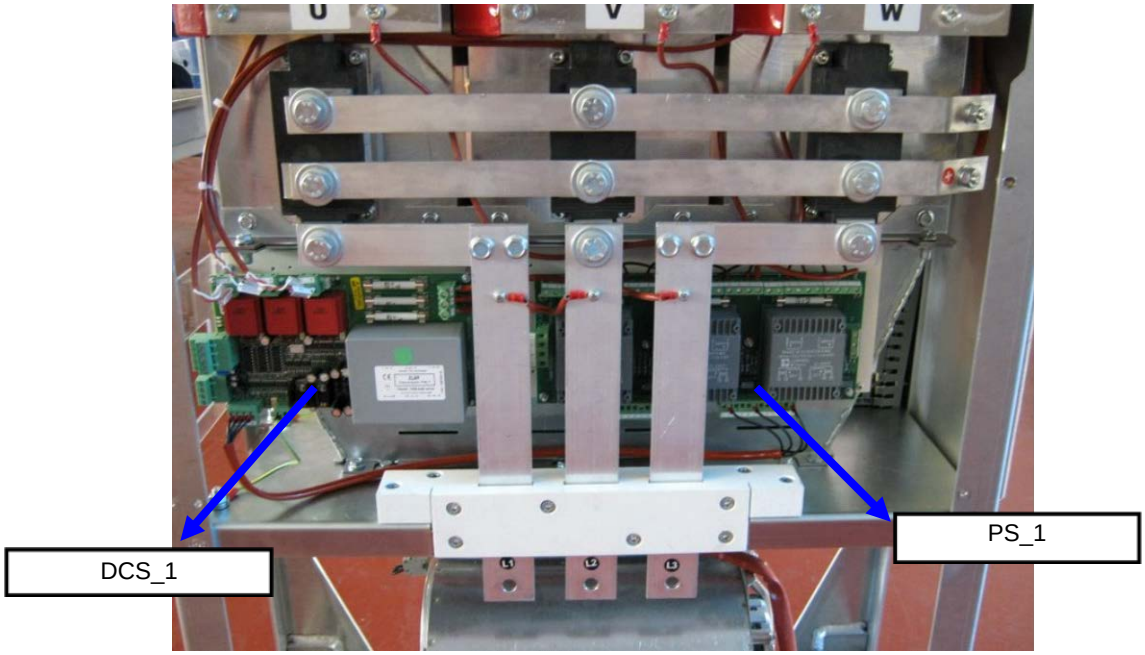


Fig. 23 – Inverter Electrical clamps

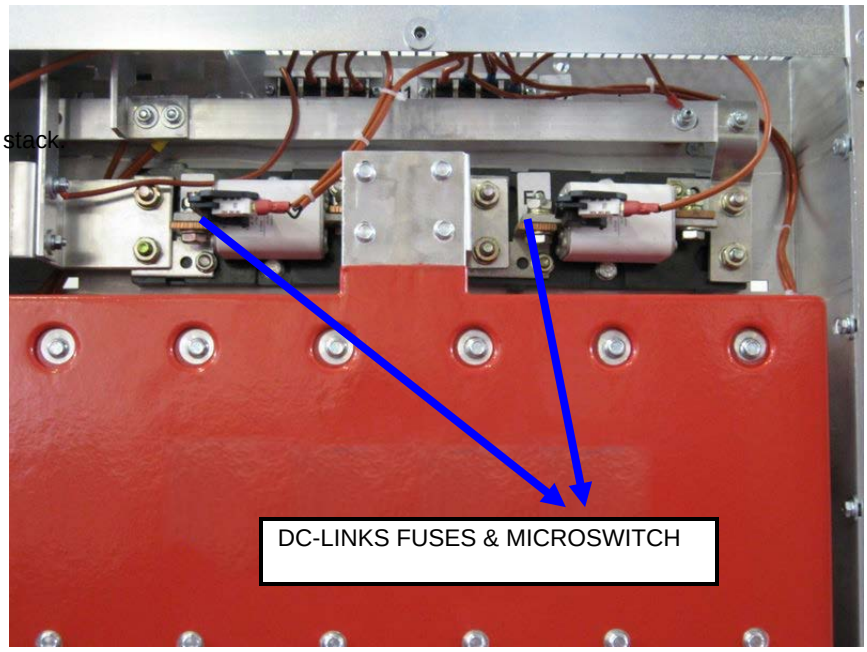
3.6 SPARE PARTS

3.6.1 ELECTRICAL BOARDS





3.6.2 DC-LINK FUSE



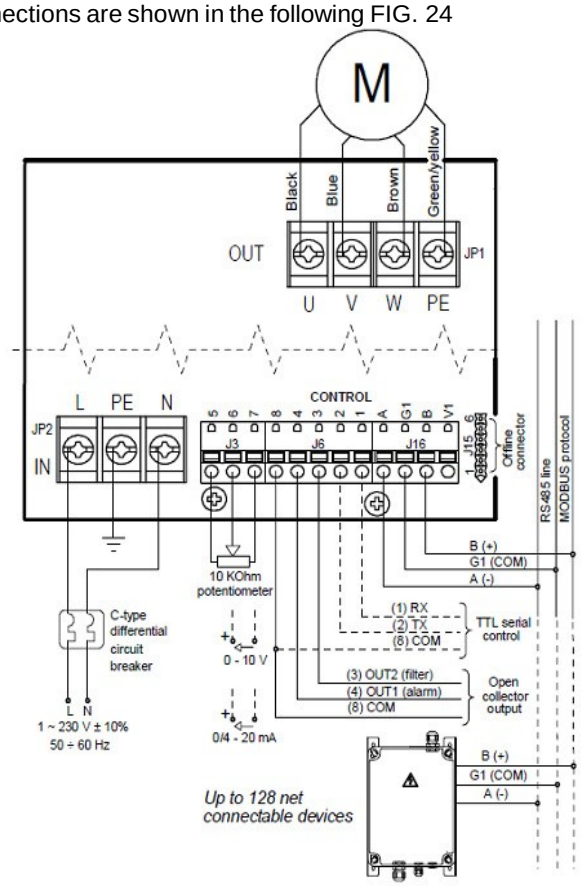
3.7 INVERTER FAN

The frames 0-1-2 can be equipped with a special optional inverter when a speed-frequency control is requested.

INVERTER FAN CODES			
FRAME	**Rated Voltage (Vac)**	**Rated Input Current (A)**	**Code**
0 – 1 - 2	230 / 440	4.5 / 2.5	594031
Inverter	230 – 1Ph	2.5 ÷ 10	790075P026

Tab.24 – Inverter fan codes

Circuit diagram and connections are shown in the following FIG. 24



JP1 = motor terminal block
JP2 = power supply terminal block
J3 + J6 +J16 + J15 = signal/control terminal block

Fig. 24 – Diagram and connections

In the following FIG. 25 a simple correlation between output current and fan speed (Hz) is shown. It is necessary to consider:

1. Temperature ambient 40 °C
2. Output nominal current is the actual current considering any switching frequency and output frequency
3. In is the current of the inverter power stage updated at the nominal value considering all the necessary derating parameter such as switching frequency

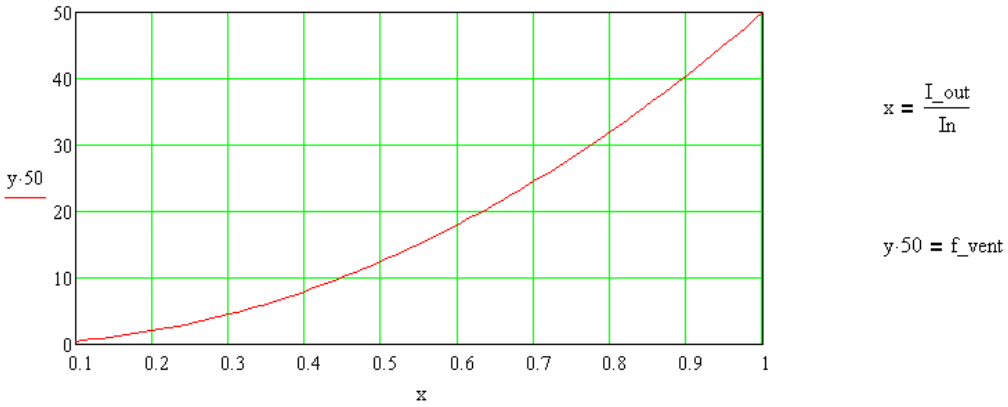


Fig. 25 – Diagram and connections

A suitable minimum fan speed has to be valuated: 20 Hz should be the lowest suggested minimum value.

3.7.1 CONNECTIONS & TERMINALS BLOCK

In the following tables and figures all the connections with and without inverter option are shown.

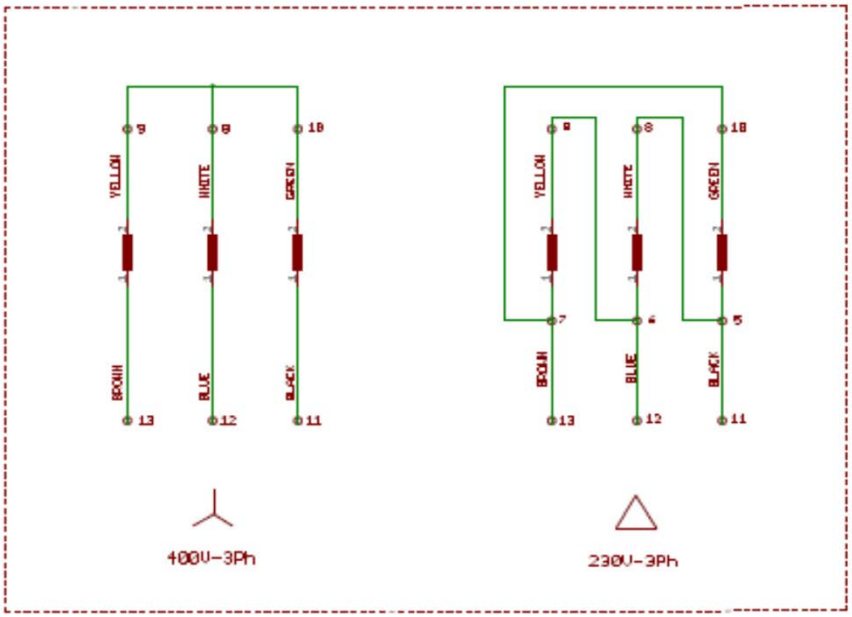


Fig. 26 – 230/400V electrical connections for Motor Fan

X1	Name	Meaning
X1-1	INV_1	Inverter output phase 1
X1-2	INV_2	Inverter output phase 2
X1-3	INV_3	Inverter output phase 3
X1-4	GND	
X1-5	INV_1_ Δ	Inverter output phase 1 to Δ winding_1
X1-6	INV_2_ Δ	Inverter output phase 2 to Δ winding_1
X1-7	INV_3_ Δ	Inverter output phase 3 to Δ winding_1
X1-8	INV_1_ Δ	Inverter output phase 1 to Δ winding_2
X1-9	INV_2_ Δ	Inverter output phase 2 to Δ winding_2

X1-10	INV_3_ Δ	Inverter output phase 3 to Δ winding_2
X1-11	FAN_1	Input FAN phase 1
X1-12	FAN_2	Input FAN phase 2
X1-13	FAN_3	Input FAN phase 3
X1-14	GND	
X1-15	NTC_1	Connection_1 to heatsink NTC
X1-16	NTC_2	Connection_1 to heatsink NTC
X1-17	L	230vac 1 Ph to inverter input (L)
X1-18	GND	
X1-19	N	230vac 1 Ph to inverter input (N)

Tab.25 – X1 signals

X2	Name	Meaning
X2-1	Rx	TTL receiver
X2-2	Tx	TTL transmitter
X2-3	OUT2	Programmable open collector output for alarm (+24V-10mA)
X2-4	OUT1	Programmable open collector output for alarm, tacho out, load% (+24V-10mA)
X2-5	+	+5V (max 1mA) for external potentiometer
X2-6	IN	Input set: 0÷5V-Rin=100kΩ; 0÷10V-Rin=67kΩ; 0/4÷20mA- Rin=250kΩ
X2-7	GND	0V reference for analog signals
X2-8	COM	Tx/Rx and alarms reference
X2-9	A(-)	RS485
X2-10	G1	Reference for RS485
X2-11	B(+)	RS485
X2-12	V1	+5V, max 80mA

Tab.26 – X2 signals

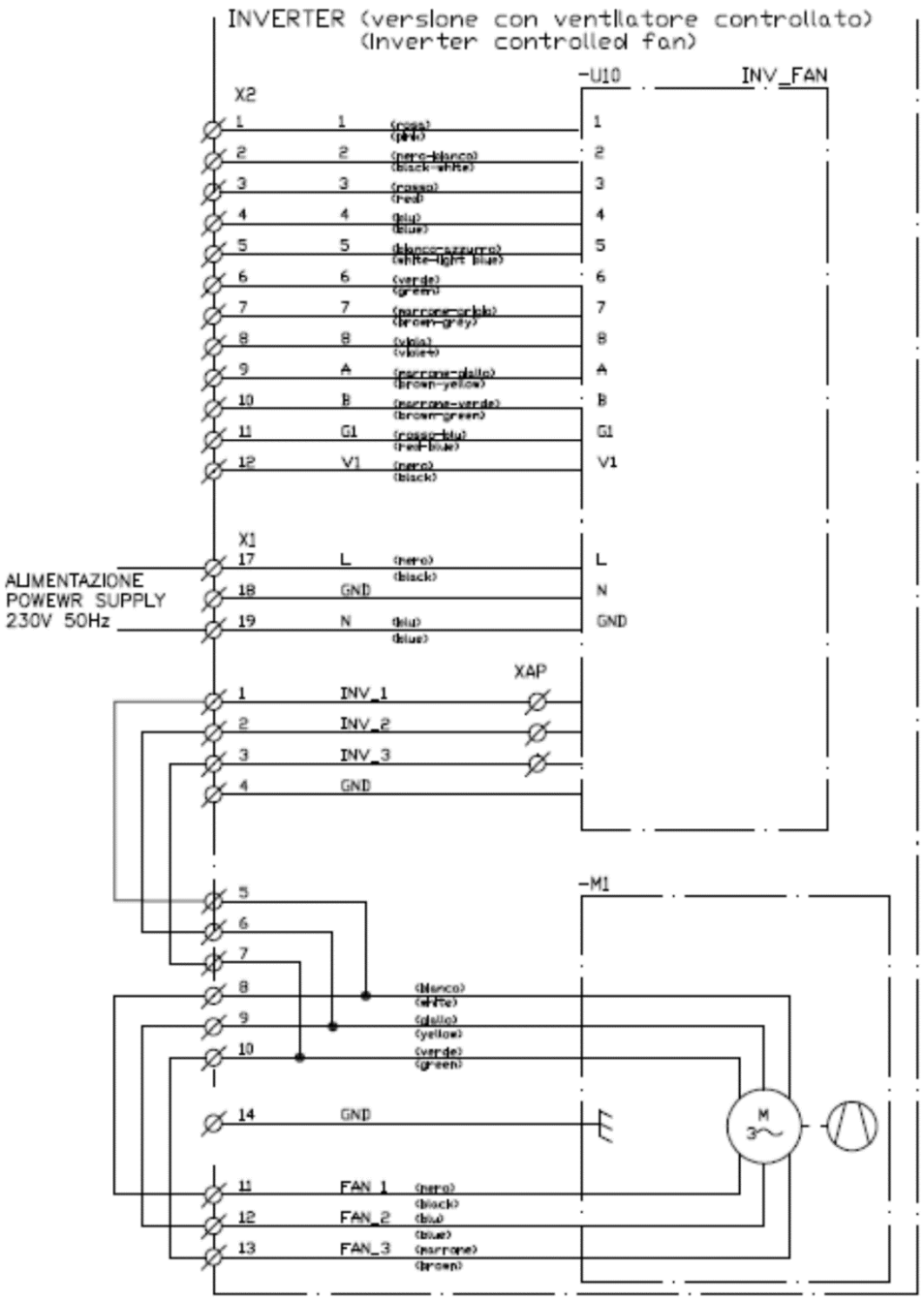


Fig. 27 – Electrical connections for Inverter Fan option

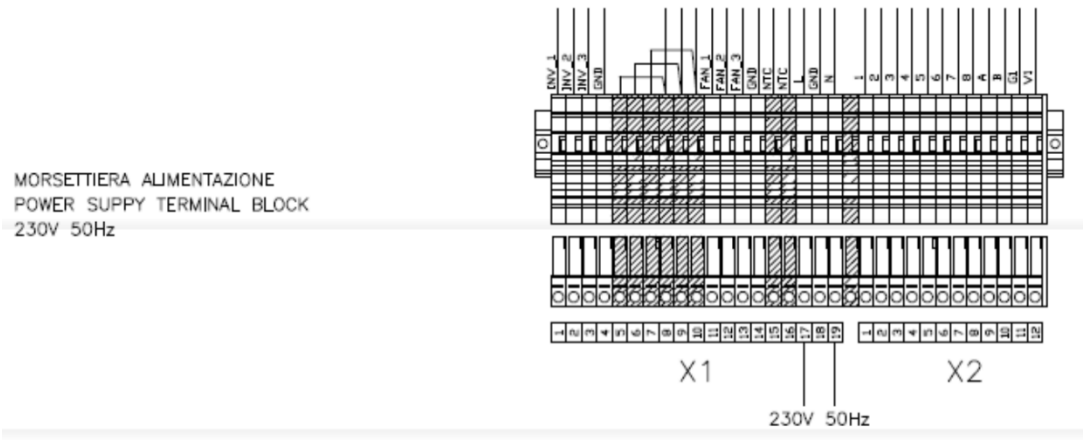


Fig. 28 – Terminal block connections for Inverter Fan option

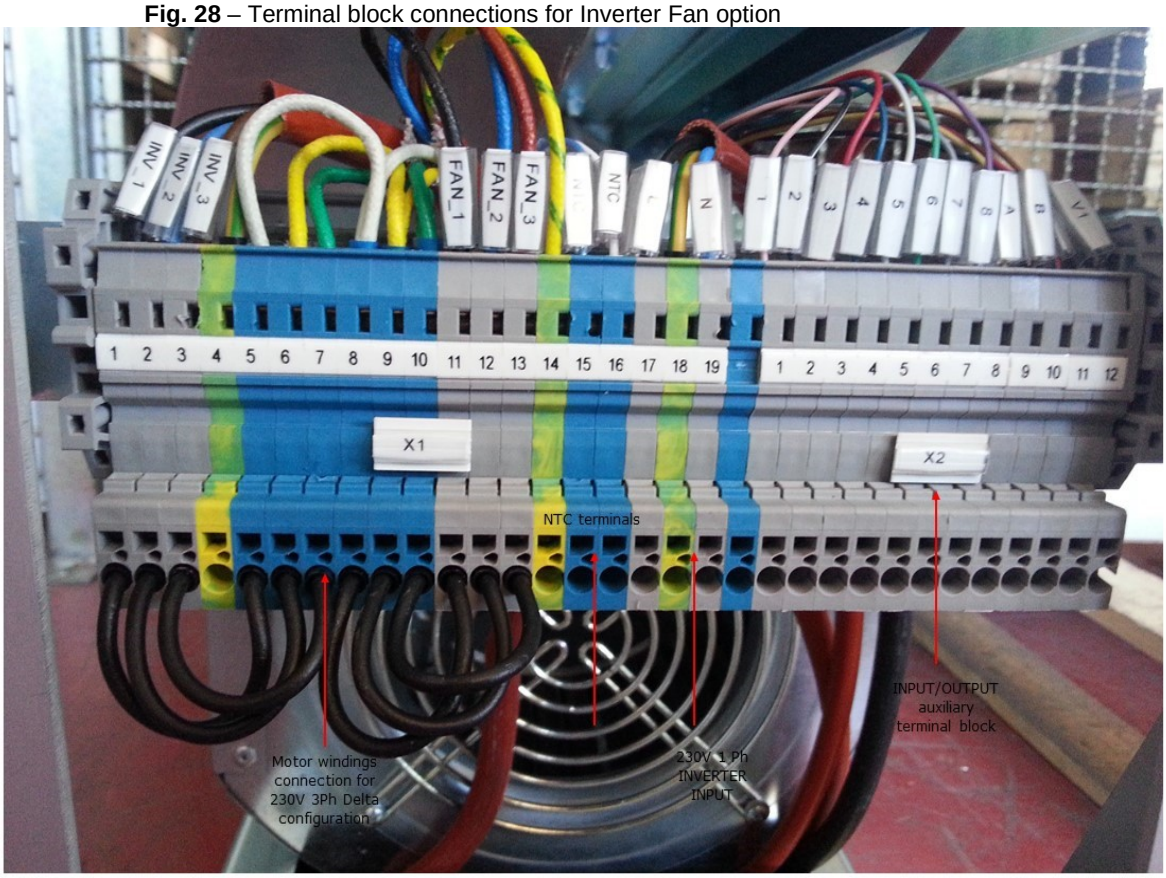


Fig. 29 – Terminal block connections for Inverter Fan option

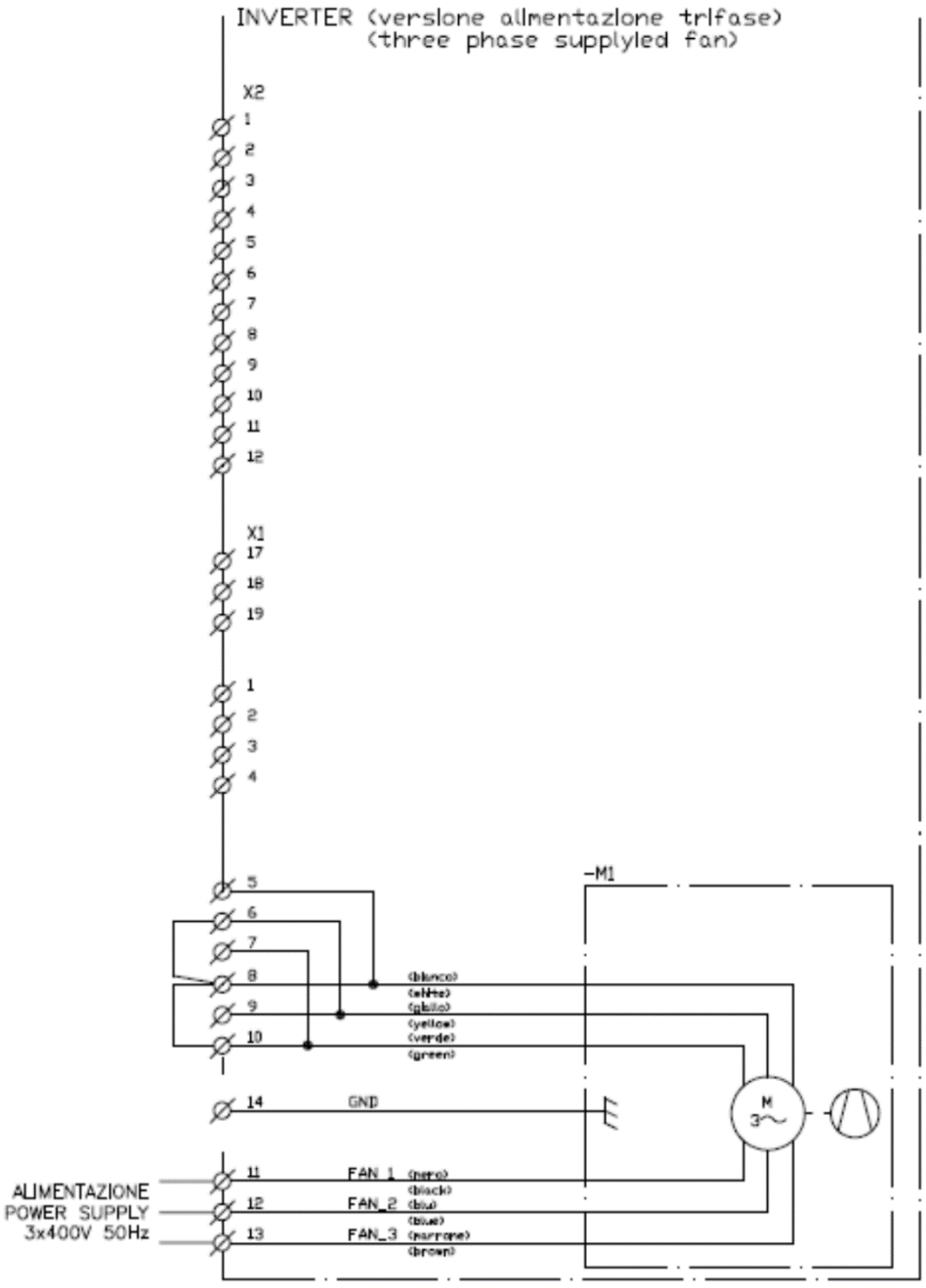


Fig. 30 – Electrical connections for Standard Fan (without inverter)

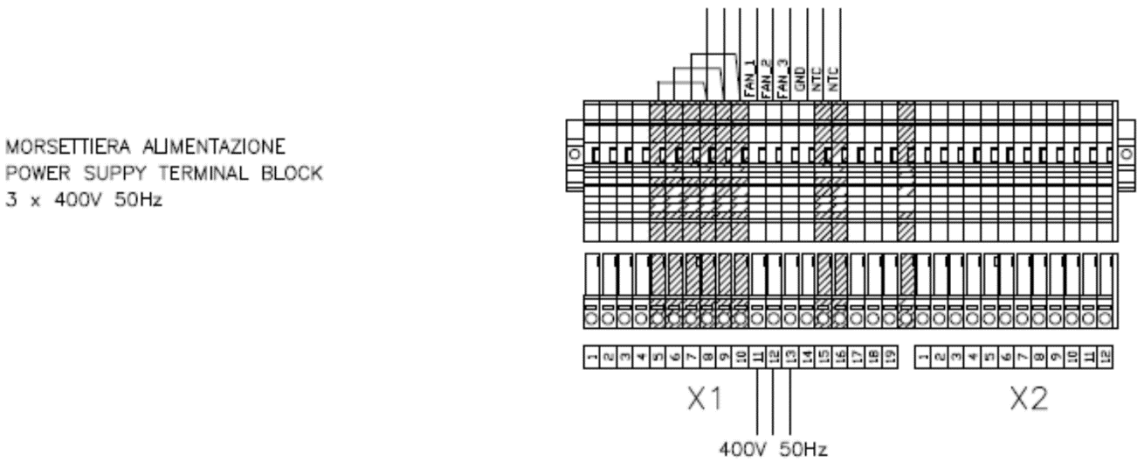


Fig. 31 – Terminal block connections for Standard Fan

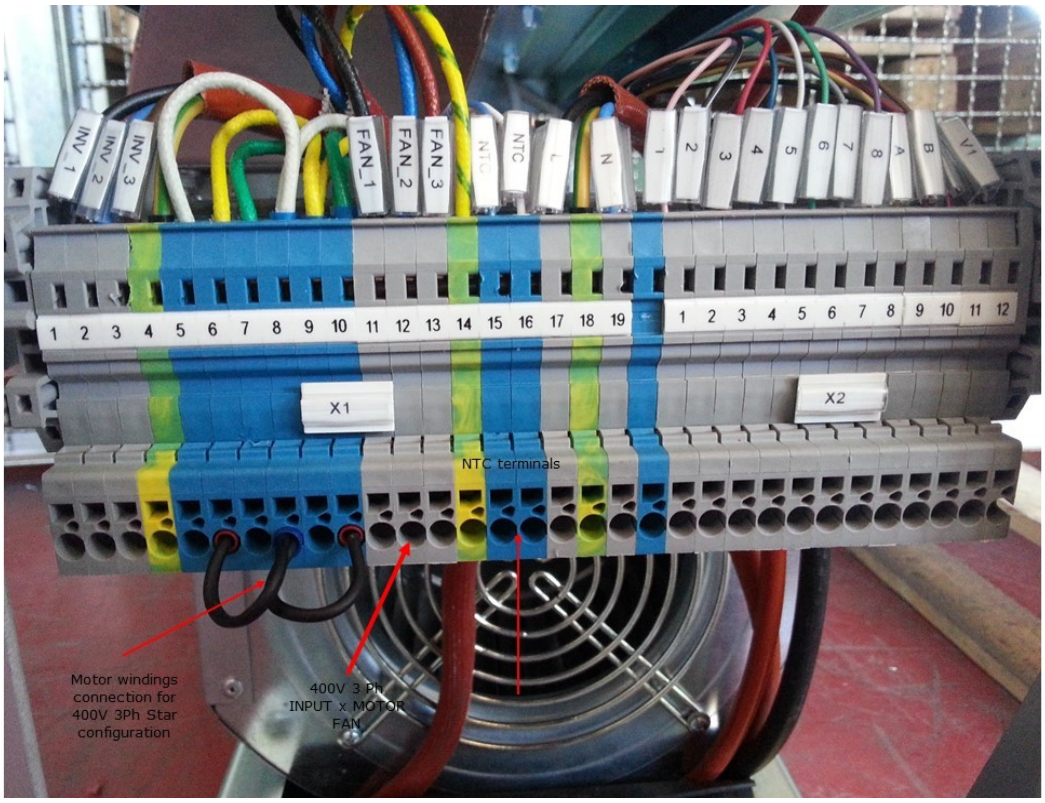


Fig. 32 – Terminal block connections for Standard Fan

3.8 OPTIONAL DIFFERENTIAL PRESSURE SWITCH

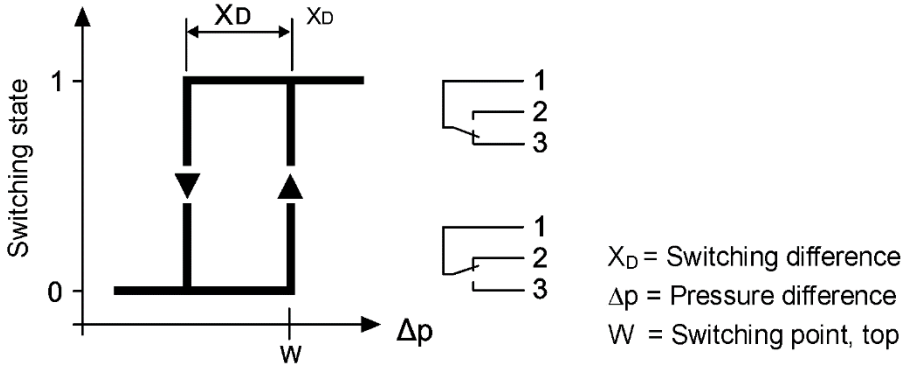
3.8.1 GENERAL DESCRIPTION

The Differential Pressure Switch installed in the Power Stack is a Siemens QBM81-5 type, for air and nonaggressive gases.

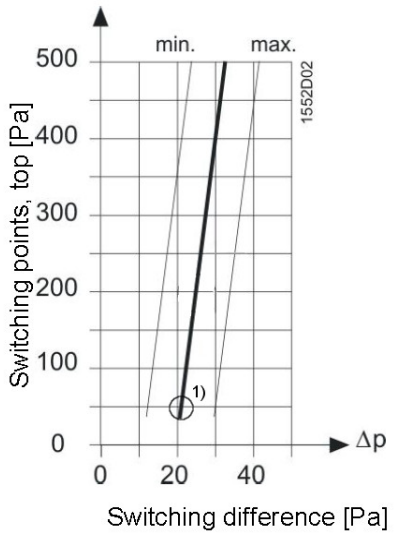
This pressure sensor monitors air differential pressure between the fan's input air flow and the Power Stack's output air flow, as a feedback signal for PLC of a fan's status (running or stopping state).
Pressure range:

Type	mbar	Pa	in H_2O
QBM81-5	0.2 ÷ 5	50 ÷ 500	0.2 ÷ 2

The differential pressure between the two pressure connections deflects a springloaded diaphragm. This special diaphragm ensures the long-term stability of switching points. Every pressure switch is engraved with individual scales for very precise adjustment. The adjustment options is illustrated in the diagram below.
Function diagram:



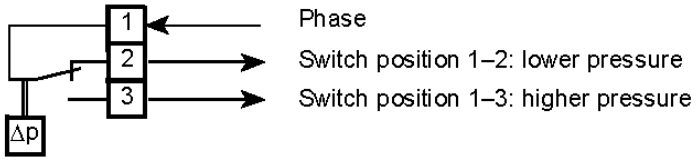
Switching points:



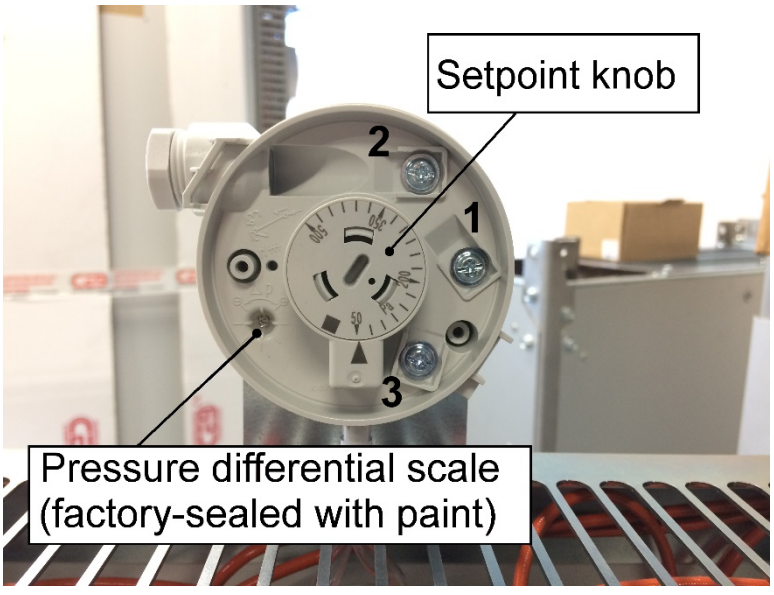
1) Factory setting

Factory setting of switching point is about 50 Pa.

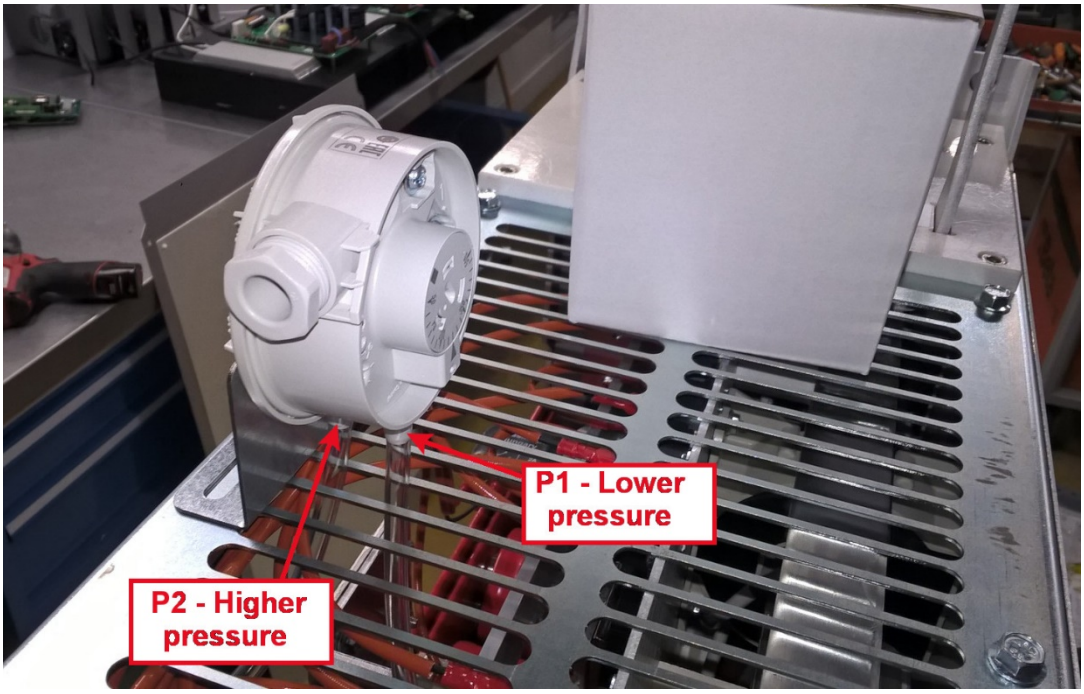
3.8.2 CONNECTION TERMINALS

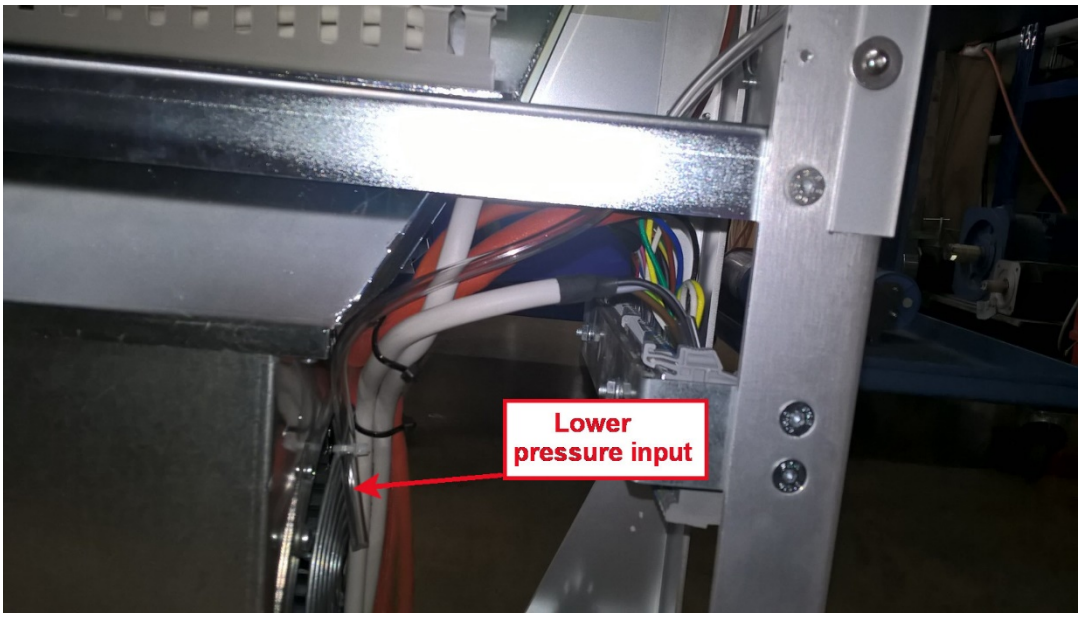


- When fan is activate (all is OK) the pressure difference is higher than 50 Pa, so the switch position is: **1-3 Closed (1-2 Opened)**.
- When fan is deactivate (Fan Problem) the pressure difference is lower than 50 Pa, so the switch position is: **1-2 Closed (1-3 Opened)**.



3.8.3 DIFFERENTIAL PRESSURE SWITCH POSITION





3.8.4 TECHNICAL DATA

Electrical interface	Type of switch	Single-pole change-over, multi-layer contact
	Contact rating	AC/DC 24 V, ≥ 0.01 A AC 250 V, max. 5 A res. max. 3 A ind., cos φ > 0.6 (0.8 A starting current sixfold, cos φ > 0.6)
	Voltage against earth	Max. AC 250 V
⚠ Warning	No internal fuse	
	External preliminary protection required in all cases	
	External supply line protection (EU)	Fuse slow max. 10 A or Circuit breaker max. 13 A Characteristic B, C, D according to EN 60898
	Switching differential	Factory set
	Reset	Automatic
	Service life	>1 000 000 switching cycles
Functional data	Measuring range	See "Type summary"
	Max. unilateral overload	
	-30…75 °C	7500 Pa
	-30…85 °C	5000 Pa
	Permitted media	Air, non-corrosive gases
	Reproducibility for range	
	20…300 Pa	<±2.5 Pa
	50…2000 Pa	<±5 Pa
	1000…5000 Pa	<±15 Pa
Degree of protection	Protection class	III according to EN 60730-1
	Protection degree of housing	IP54 according to EN 60529
Materials	Housing	Fiber-glass reinforced polycarbonate
	Cover	Polycarbonate
	Diaphragm	Silicone. low-swell rubber, emission-free
	Mounting bracket	Sheet-steel (galvanized)
	Duct adaptors	ABS
	Tubing	PVC, soft
Mounting	Orientation	Any; See "Commissioning notes"
Connections	Electrical connection	3 screw terminals
	Cable entry	PG11 cable gland
	Pressure connections	Male, dia. 6.2 mm
Ambient conditions	Ambient temperature:	
	Operation	–30… +85 °C
	Storage	–40… +85 °C
	Ambient humidity	<90 % r.h. (non-condensing)
Directives and Standards	Product standard	EN 61326-x Electrical equipment involved in measurement, control, and laboratory use; EMV requirements; general requirements
	Electromagnetic compatibility (application)	For residential, commercial, and industrial environments.
	EU Conformity (CE)	CA1T1552xx *)
	EAC Conformity	Eurasia Conformity
	DVGW approval	to DIN 1854
Combustion class		According to UL94
	Pressure casing and housing	V-0
	Cover	HB
	Plastic tubing	V-2
	Duct adaptors	HB
Environmental compatibility	The product environmental declaration CA1E1552*) contains data on environmentally compatible product design and assessments (RoHS compliance, materials composition, packaging, environmental benefit, disposal).	
Weight	Weight (including packaging)	0.19 kg with mounting bracket

3.9 APPLICABLE STANDARDS

IEC 60204-1	Safety of machinery. Electrical equipment of machines
IEC 60529	Degrees of protection (IP code)
IEC 60664-1	Insulation coordination for equipment within low-voltage system
IEC 50178	Electronic equipment for use in power installations
IEC 60146	Semiconductor convertors
IEC 60204-1	Safety of machinery- Electrical of machines
IEC 60721-3	Classification of environmental conditions
EN 61800-3	Adjustable speed electrical power drive system – Part 3 – General requirements – EMC Product Standard including specific test method
EN 61800-5	Adjustable speed electrical power drive system – Part 5 – General requirements – Safety requirements – Electrical, Thermal & Energy

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