Solutions in *motion*

BDPOW

Intelligence Production Movement

Ed. 1.5 - English

User Guide

BDPOW

Doc. MS061201
Ed. 1.5 - English - 09 May 2019

IMPORTANT

CMZ SISTEMI ELETTRONICI S.r.l. reserves the right to make changes to the products described in this document at any time without notice.

This document has been prepared by CMZ SISTEMI ELETTRONICI S.r.l. solely for use by its customers, guaranteeing that at the date of issue it is the most up-to-date documentation on the products.

Users use the document under their own responsibility and certain functions described in this document should be used with due caution to avoid danger for personnel and damage to the machines.

No other guarantee is therefore provided by CMZ SISTEMI ELETTRONICI S.r.l., in particular for any imperfections, incompleteness or operating difficulties.

Table of Contents

Chapter 1

General informations about this manual

1.1. Aim

This manual is a complete guide to the installation, commissioning, functioning and use of the BDPOW power supply. There are general purpose informations about the functionalities and about the power supply structure, notices related to the safety for people and for the product; furthermore, for the technicians in-charge to installation, all the data and specifications to be observed for the wiring and the installation are described.

Caution

What is written in this manual refers to the version of firmware 15, except from any other different instructions.

Previous firmware versions may not implement all the functionalities described in this manual.

Tip

Per una miglior comprensione di questo manuale, è opportuno avere le nozioni base di gestione del Modbus.

1.2. Recipients

Only specialized staff can modify the BDPOW power supplies and use them, who previously read the manual and all the documents related to the product. Specialized staff must have been adequately trained about safety in order to prevent any possible risks. The technical training, foreground and experience of the specialized staff must help them preventing from any possible risk occurring during the product use, from the settings modification to the functioning of the mechanical, electrical and electronic equipment of the device. The specialized staff must know all the current regulations and safe working practices in case of any intervention on the product.

In particular, the following operations must be executed by specialized personnel:

- Transport: for personnel expert in handling sensitive parts of electrostatic charges.
- Unpacking: for qualified electricians.
- Installation: for qualified electricians.
- Use: for qualified staff expert in electro-technology.

The qualified staff must know and follow these rules:

- EN 12100, EN 60364 and EN 60664;
- national safe working practices.

This manual is addressed to all users of the BDPOW power supply.

Tip

During the power supply functioning beware of danger of death, serious injuries or material damage. For a safe functioning, follow all the safety instructions in this manual. The security officer must check that the staff working with the power supply read and understood this manual before using it.

1.3. Responsibilities

CMZ SISTEMI ELETTRONICI S.r.l. can modify the described products in this manual in any time and without any notice.

This manual was written by CMZ SISTEMI ELETTRONICI S.r.l. only for their customers' use providing the most updated version of the products.

The responsibility to use this manual belongs to every user and the use of some functions must be under strict care to avoid any danger for the staff and the equipment.

No other warranty is provided by CMZ SISTEMI ELETTRONICI S.r.l., in particular for possible imperfections, incompleteness, and/or any other difficulties.

1.4. Abbreviations

Abbreviation	Meaning
0x	Number in hexadecimal notation
HVDC	DC bus voltage, supply voltage of the power section
ac	Alternating current
CE	Communité Européenne Every time that in this document this abbreviation is present, it is intended to specify that the described characteristic is valid for the product with CE certification.
CH1, CH2	HVDC output channels (see *X7 e X8 Power Output*).
COM	Serial communication interface for personal computer
CRC	Cyclic redundancy control

Abbreviation	Meaning
dc	Direct current
DVC	Decisive Voltage Class
EEPROM	Electrically erasable programmable memory (permanent memory)
EMC	Electromagnetic compatibility
FW	Firmware
GND	Ground
HW	Hardware
I	Input, generally digital
I^2T	Passing specific over energy
L1, L2, L3	Line charge
LED	Light-emitting diode
LSB	Byte (or bit) less important
MB	Mega Byte
MSB	Byte (or bit) more important
neg	Negative
NC	Not connected
O	Output, generally digital
OSC	Integrated oscilloscope
PC	Personal computer
PE	Protective Earth
pos	Positive
RAM	Random access memory (non permanent memory)
Rbrake	Brake resistor
RBext	External brake resistor
RBint	Internal brake resistor
RMS	root-mean-square value of the current signals
RTO	Ready To Operate
RX	Reception
s.l.m.	Above sea level
SW	Software
Temp	Temperature
TX	Transmission
UL	Underwriters Laboratory Inc. Every time that in this document this abbreviation is present, it is intended to specify that the described characteristic is valid for the product with UL certification.

1.5. Symbols

Danger

It shows a dangerous situation that, in case of failure to comply with safety rules, can lead to a serious or fatal accident or damage to the equipment.

Warning

It shows a potentially dangerous situation, in case of failure to comply with safety rules it can lead to a serious accident or damage to the equipment.

Caution

It shows a potentially dangerous situation. In case of failure to comply with the reported informations and to the safety rules it can lead to a minor or moderate accident.

Note

It shows some important information on the text about the mentioned topic.

Tip

It shows some useful information on the mentioned topic.

Symbol	Description
	It shows the presence of dangerous voltages that can cause electric shocks.
	It shows the presence of surfaces and/or heat sources that can cause burns.

Table 1.1. Complementary symbols.

1.6. Definitions

Modbus is a registered trade mark of Schneider Automation Inc.

WINDOWS is a registered trade mark of Microsoft Corporation.

POWER SUPPLY
The name POWER SUPPLY used in this manual has to be intended as an AC/DC rectifier not isolated.

BDM Base drive module
Activation module made up by a conversion section and a section used to check the speed, the torque, the power or the voltage, etc.

CDM Complete drive module
Activation without motor and sensors mechanically coupled to the drive shaft, made up by a BDM, but not limited to it, and other devices, such as the charge section and the auxiliaries. The BDPOW is defined as part of a CDM, with BDM excluded, so a power supply with power section and auxiliaries.

Node (Modbus)
Hardware device (drive, sensors, actuators) connected to the communication bus which can communicate with the other devices.

Network protocol
All rules, mechanisms and formalities that two or more electronic devices connected one another must respect to start a communication.

Modbus register
Memory area of 1 Word = 16 bit = 2 byte that contains a numeric value, accessible both in reading and in writing. It's identified by a number that represents its memory position and it's used to exchange data in the Modbus protocol.

Transition
Intermediate phase that allows the transition between the system logical states (see *Chapter 8, Power supply logical states*).

1.7. Reviews

Revision History		
Revision 1.0	21/01/2015	Author: CMZ SISTEMI ELETTRONICI S.r.l.
• First revision of the manual.		
Revision 1.1	01/07/2015	Author: CMZ SISTEMI ELETTRONICI S.r.l.
• Updated and/or corrected the informations in the *Section 10.1, Errors description*. • Updated and/or corrected the informations in the *Chapter 6, Technical features*. • Regulations texts corrected. • Charge resistor parameters added (*Chapter 6, Technical features*). • *X1 Brake Resistor* connector description integrated and corrected.		
Revision 1.2	21/07/2016	Author: CMZ SISTEMI ELETTRONICI S.r.l.
• Front cover image updated. • *Chapter 5, Default configuration* updated; • *Chapter 10, Fault and warning*: corrected; • *Section 3.2, Installation*and *Section 11.3, Updating the Configuration File*: Update of installation procedure of SDSetup and consequent update of the Configuration File.		
Revision 1.3	05/03/2018	Author: CMZ SISTEMI ELETTRONICI S.r.l.
• *Section 1.5, Symbols*: legend of notes and symbols updated; • *Chapter 6, Technical features*: informations added in the *Protection against short-circuit of the output section*.		
Revision 1.4	08/11/2018	Author: CMZ SISTEMI ELETTRONICI S.r.l.
• Information and data related to the UL certificated version added; • *Chapter 2, Informations about the BDPOW power supply*: *Section 2.7, Precautions for the product handling* added. • *Chapter 10, Fault and warning*: *IGBT feedback error on braking circuit* error added. • Some contents reorganized in order to improve the information order.		
Revision 1.5	22/02/2019	Author: CMZ SISTEMI ELETTRONICI S.r.l.
• minor modifications (admonitions and typos);		

Chapter 2

Informations about the BDPOW power supply

2.1. CE compliance

The BDPOW power supply respects the following european regulations:

- 2014/30/UE relating to electromagnetic compatibility;
- 2014/35/UE relating to electrical equipment designed for use within certain voltage limits;

in conditions in which the instructions in the user manual are respected and there are not particular work environment or installation needs.

CMZ SISTEMI ELETTRONICI S.r.l. guarantees the conformity of the power supply to the following harmonized standards:

EN 61800-5-1:2007	Adjustable speed electrical power drive systems Part 5-1: Safety requirements - Electrical, thermal and energy
EN 61800-3:2004 EN 61800-3/A1:2012	Adjustable speed electrical power drive systems Part 3 : EMC Requirements and specific test methods
EN 61000-6-2:2005	Electromagnetic Compatibility (EMC) Part 6-2: Generic Standards - Immunity for industrial environments
EN 55011:2009 EN 55011/A1:2010	Limits and methods of measurement of radio disturbance characteristics of industrial, scientific and medical (ISM) radio frequency equipment

The BDPOW power supplies are commercialized as components of a Power Drive System, belong to the restricted distribution category and are intended to the installation in industrial environment.

The installation of these devices is intended to specialized personnel that has an in-depth knowledge about the safety requirements and the electromagnetic compatibility (EMC).

The planner has the responsibility to guarantee that the product or the final system comply to the pertinent regulations that are in force in the country in which the product (or the entire system) is used.

If the entire system is connected to a low voltage distribution public network it will be necessary to pay attention to the network harmonic and flicker inclusion effects to guarantee the concern of the overall certifications.

Danger

The machine user that uses the BDPOW power supply must analyse the risk for the device and implement the necessary measures to safeguard the device itself and the surrounding people.

2.2. UL certification

The BDPOW power supply[1]is an UL certified product (file E245547) and complies to the following regulations for the US and Canadian markets.

ANSI/UL 61800-5-1:2007	Adjustable speed electrical power drive systems Part 5-1: Safety requirements - Electrical, thermal and energy
CAN/CSA C22.2 No. 274-17	Adjustable speed electrical power drive systems

The requirements of the UL certified version are marked in the user documentation with the "UL" writing, if they correct or are supplementary to the CE requirements.

2.3. General features of the BDPOW

This power supply must be part of a fixed installation or a fixed plant. In particular, the BDPOW power supply is made by a power module, a control section, internal brake resistor.
The power supply must be kept in an environment with pollution degree 2 or inserted in an adequate container (e.g. electric panel).
All the versions of this power supply are provided with digital I/Os, leds and switches. It is furthermore present a permanent memory and a debug serial port.

[1]The product is UL certified if the value of *"Certification"* = 1 (see *Section 14.1, OrderCode*). Check this condition on the label applied on the product.

> **Note**
>
> For further details on the features and options of the available versions, see *Chapter 6, Technical features* and *Chapter 14, Order codes*.

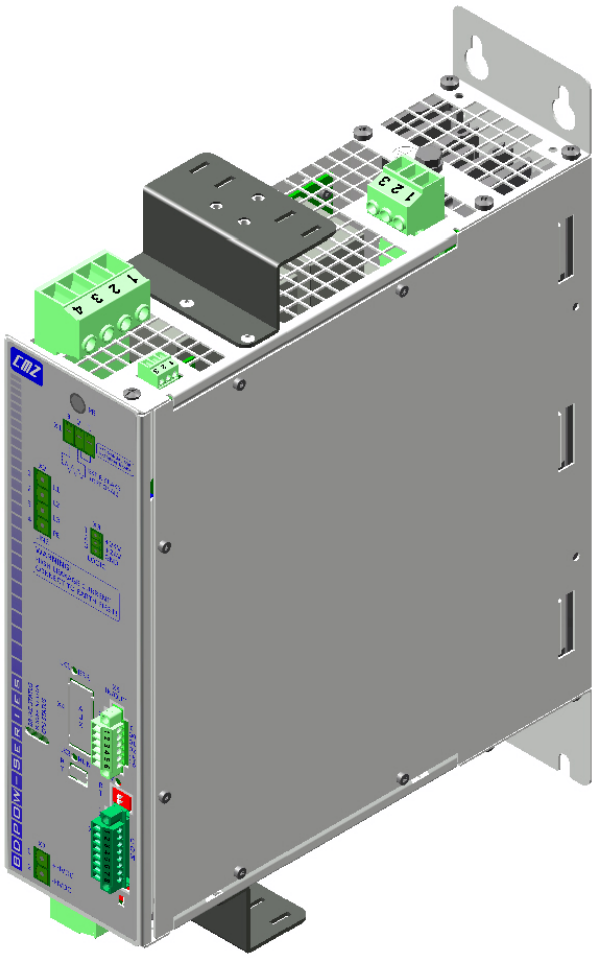


Figure 2.1. The BDPOW power supply.

Features	BDPOW
Dimensions	See *Section 6.1, "Dimensions and sizes"*
Range of supply of the power section	See *Table 6.1* and *Table 6.2*
RBrake (Brake resistor)	1 (eventually even if external) see *Section 7.2.5, "Braking resistor connection"*
Range of supply of the control section	See *Table 6.3*
Debug communication port	Modbus on RS232

Features	BDPOW
Leds	Information and local diagnostics (see *Section 7.3, "Leds"*)
Power outputs number	2 (see *Section 6.4, "Output section"*)
Number of digital inputs	1 (see *Section 6.8, "Digital inputs and outputs"*)
Number of digital outputs	3 (see *Section 6.8, "Digital inputs and outputs"*)
RTO contact (Ready To Operate)	1 (see *Section 6.7, "RTO contact: Ready To Operate"*)

Table 2.1. General features of the BDPOW.

The software on the BDPOW power supply is divided in two typology:

- *Boot firmware*: it boots the power supply by enabling some basic services and, after an initial phase of identification and diagnostics of the system, it runs the firmware
- *Firmware*: it manages all the power supply operating functions

2.4. System Block Diagram

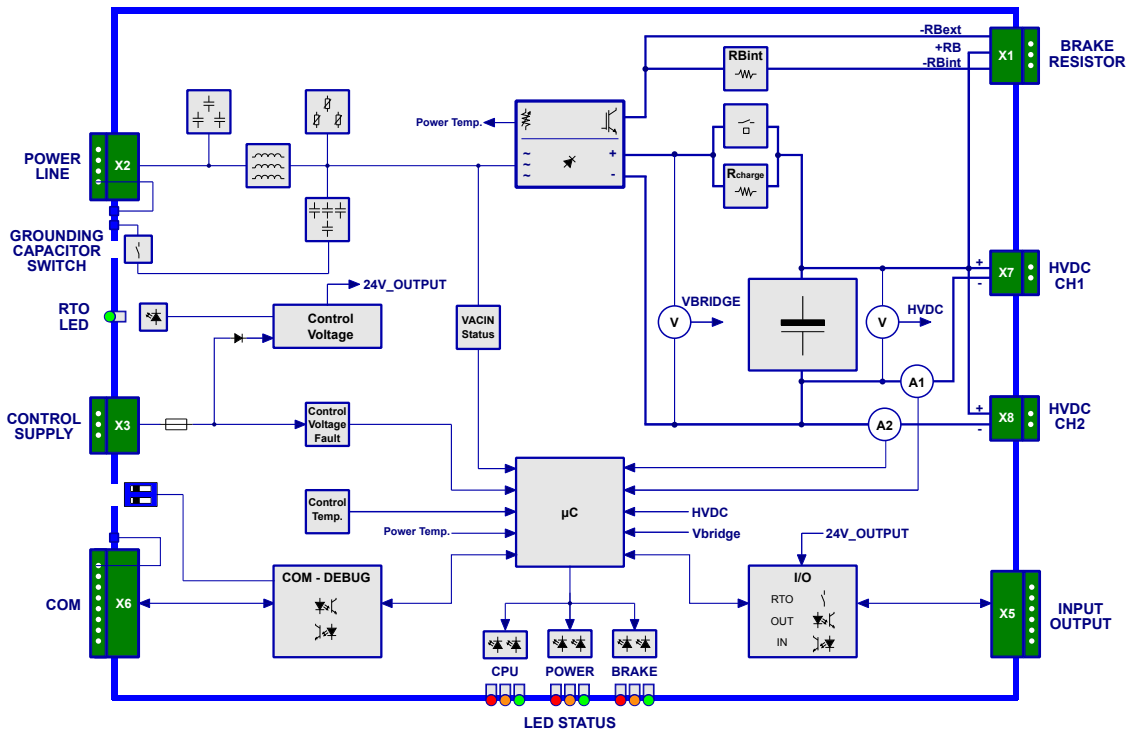


Figure 2.2. System Block Diagram

2.5. BDPOW use

The BDPOW are power supplies for drives that need exclusively a DC source (refer to *Chapter 6, Technical features* to check the compatibility).

2.6. Packaging

The package includes:

- The BDPOW power supply
- The X1, X2, X3, X5, X6, X7, X8 connectors
- illustrative sheet

> **Note**
>
> No cable is included in the package, unless it is required by the customer.

For further accessories please contact the CMZ sales office.

Before to begin to work with the power supply, verify that there are not visible damages. Be sure that the BDPOW power supply you have taken from the package is the correct model for the application, that corresponds to what has been ordered and that can be provided a proper voltage and supply system according to the specifications written in this document.

> **Warning**
>
> In order to avoid damages in case of long storage periods, follow the instructions that are reposted in *Chapter 13, Maintenance*.

2.7. Precautions for the product handling

Do not keep the product in the warehouse without the original package. Open the package only immediately before the installation. Do not stack the packages and comply with the indication that are written in this document.

Pay attention to comply with the environmental condition that are required for the transport/storage as temperature, humidity and shock limits (see *Chapter 6, Technical features*).

> **Warning**
>
> The package content includes ESD-sensitive parts that may be damaged by ESD. Use proper ESD-safe protections before touching the equipment and avoid any contact with non ESD-safe material (such as insulating materials or conductive unearthed parts).

> **Warning**
>
> While handling the product, pay attention to the risk of drop, impact and cutting. Do not lift the product unless proper protection measures are taken. Depending on the actual content, the package may be heavy and require additional tools to be moved.

2.8. Methods of product disposal at the end of life

The device must be disposed as electrical or electronic waste. At the end of its life, the BDPOW power supplies can be easily disassembled and their main component can be separated in order to facilitate an efficient recycling. Many parts of this device are fixed through normal screws. The packaging of the product is of good quality and can be re-used For the recycling or the disposal of a product or of a packaging, the CMZ calls to respect the current regulations and the more appropriate procedures.

2.9. Identificative plate (CE)

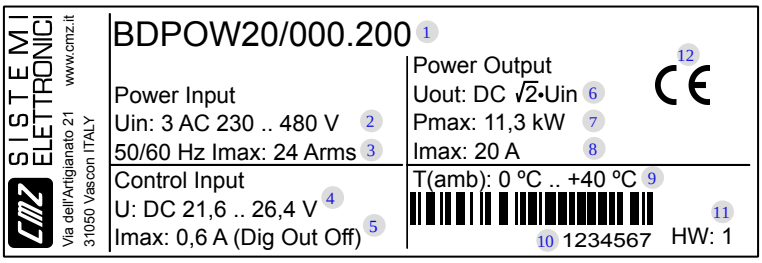


Figure 2.3. Product plate example (CE).

Reference	Meaning
1	Product name
2	Input voltage range of the power section
3	Maximum input current of the power section
4	Voltage range of the control section
5	Maximum current of the control section
6	Output voltage range of the power section
7	Maximum output power of the power section

Reference	Meaning
8	Maximum output current of the power section
9	Environment temperature for the correct functioning, according to the technical data
10	Serial number
11	Hardware revision
12	CE mark

Table 2.2. Plate fields (CE)

2.10. Identificative plate (UL)

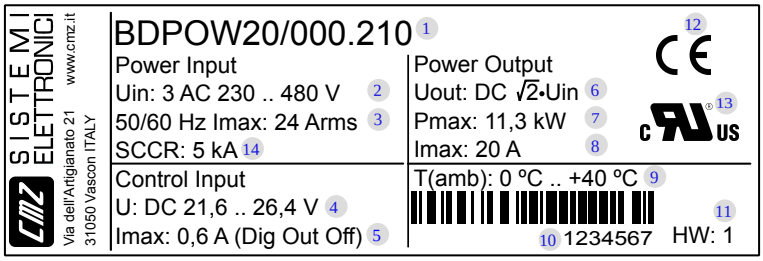


Figure 2.4. Product plate example (UL).

Reference	Meaning
1	Product name
2	Input voltage range of the power section
3	Maximum input current of the power section
4	Voltage range of the control section
5	Maximum current of the control section
6	Output voltage range of the power section
7	Maximum output power of the power section
8	Maximum output current of the power section
9	Environment temperature for the correct functioning, according to the technical data
10	Serial number
11	Hardware revision
12	CE mark
13	UL mark
14	Short-Circuit Rated Current

Table 2.3. Plate fields (UL)

2.11. Safety precautions and limits

Danger

The precautions described in this paragraph are suitable to avoid any dangerous situation by suggesting the right use of the product.

Danger

The power supply must not be used in an explosive or corrosive environment, in the presence of inflammables, water or fuels. There can be risk of fire, electric shock or injuries.

In case of failures because of accidental circumstances or wiring errors the power section can even provoke electric arcs. The power supply must be installed in an environment without any inflammables. This product is intended to be exclusively used in machines and systems in industrial environment, by respecting the described application, environmental and functioning conditions. It is recommended not to use the product for any further purpose than those specified.

Danger

Do not transport, install or make any connections or inspections and don't touch the output connectors when the voltage is greater than 50Vdc. In such cases always switch the power off and wait at least 10 minutes and be sure that the residual voltage on the power connectors between +HVDC and -HVDC is fallen below 50Vdc. The power supply must be installed in a enclosure that satisfies the regulations related to the specific application, so that the parts with dangerous voltage are not accessible.

Danger: hot surfaces

- Do not touch the power supply during the functioning or immediately after its disabling: the surface temperature can be higher than 90°C.
- To prevent any risks of damaging, do not obstruct or limit its ventilation. Keep any object away from the ventilation apertures of the power supply.
- Depending on the functioning conditions, the braking resistor may reach temperature higher than 250°C.
- Avoid any contact with the brake resistor.
- Do not put near any flammable or sensitive to the heat components near the brake resistor.
- Provide an adequate heat dissipation.
- In the most critical cases, check the brake resistor temperature with a test working cycle.

The non-compliance with these precautions may provoke grave injuries or material damages.

Danger

Do not open and do not modify the power supply: for any internal checks please contact CMZ SISTEMI ELETTRONICI S.r.l.. In case of forcing the power supply the warranty expires.

Danger

The magnetic and electromagnetic fields, that are generated by the conductors in which the current flows or by permanent magnets inside the electric motors, represent a serious danger for the people with the pacemaker, metallic prostheses and hearing aids. Be sure that these people have no access to the areas in which these systems are presents (both during functioning and in storage). Eventually, if these persons have to enter in the described areas, consult a doctor.

Danger

Electric shock and isolation damage risk in case of foreign elements intrusion or device breaking.

Warning

Carefully insulate the wires and the cables connected to the terminal blocks of the power input and output (DVC C) and of the braking resistor from any other wire, cable or other conductive parts of other DVC (e.g. fan cable, control wiring). Keep a proper insulation between the terminals or the wires with voltage higher than ELV and othe conductive parts.

Warning

When some fault is found, the power supply automatically disables and a led signal shows the possible cause.

Chapter 3

General information about SDSetup

SDSetup is an application for *personal computer* used to control, configure and programme in a simple, quick and perceptive way the BDPOW power supply.

From the tab Main of SDSetup it is possible to know the whole power supply status. For example: the detailed description of the found errors, the status of the outputs and the digital inputs, operative status, connection status, etc...

Caution

What is written in this manual refers to the version SDSetup 2.0.13.214. Previous versions of SDSetup could not implement all the functionalities described here.

3.1. Requirements and compatibility

Minimum PC requirements:

- System with compatible processor Pentium 133 MHz or higher.
- Sufficient memory for the operating system, minimum 128 MB, recommended 512.
- Hard disk with minimum available space to install the application, at least 35MB.
- Display adapter and monitor Super VGA, minimum resolution 800 x 600 px, better 1024x768 px or higher.

Compatibility with the following operating systems:

- Microsoft Windows XP
- Microsoft Windows Vista, 7, 8 or latest versions, 32bit and 64bit.

3.2. Installation

Check if all the system prerequisites are respected (*Section 3.1, Requirements and compatibility*).

Installation from the CMZ website

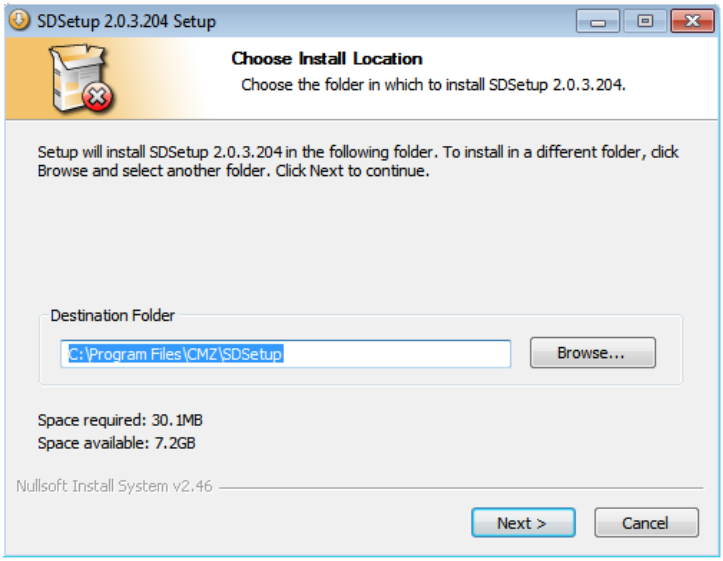
- Go to the website *http://www.cmz.it*
- Go to the *AREA DOWNLOAD* through the menu on the left. If you are not a registered user, please register.
- Choose the folder *Stepper and stepless series* > *Tools* and download the file *SDSetupInstall.exe* by clicking on the *SDSetup link.*
- Run the downloaded file by following the proposed procedure.

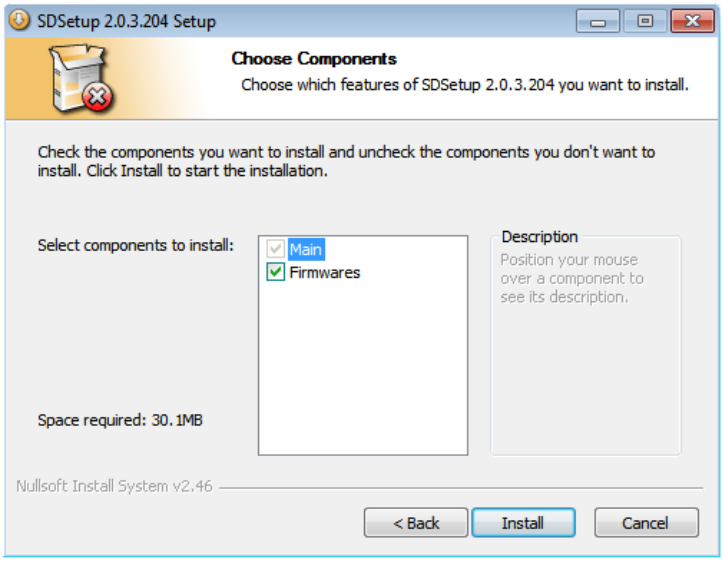
Installation from file

- If the *SDSetupInstall.exe* file is already present in the PC, run the file and follow the proposed procedure.
- Every SDSetup version is released with the firmware pack that's most updated in relation to the release date; it's however possible, during the installation procedure, to deselect the firmwares installation procedure.

Tip

Please accept all the configurations proposed during the installation.





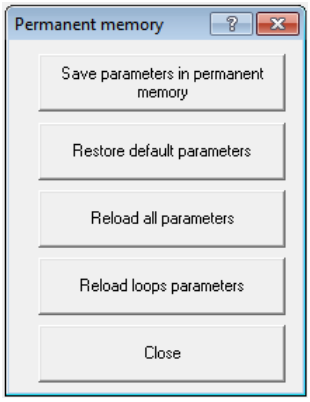
3.3. Update

To update SDSetup you only need to install the updated version of the application by choosing one of the procedures proposed in *Section 3.2, Installation*.

To update the Configuration files of SDSetup look at what is reported in *Chapter 11, Software updating*.

3.4. Configuration restoring

To restore the default configuration, it's sufficient to click the Restore default parameters button in the *Permanent memory* window (**Main menu** > **Supply** > **Permanent memory...**)



3.5. SDSetup overview

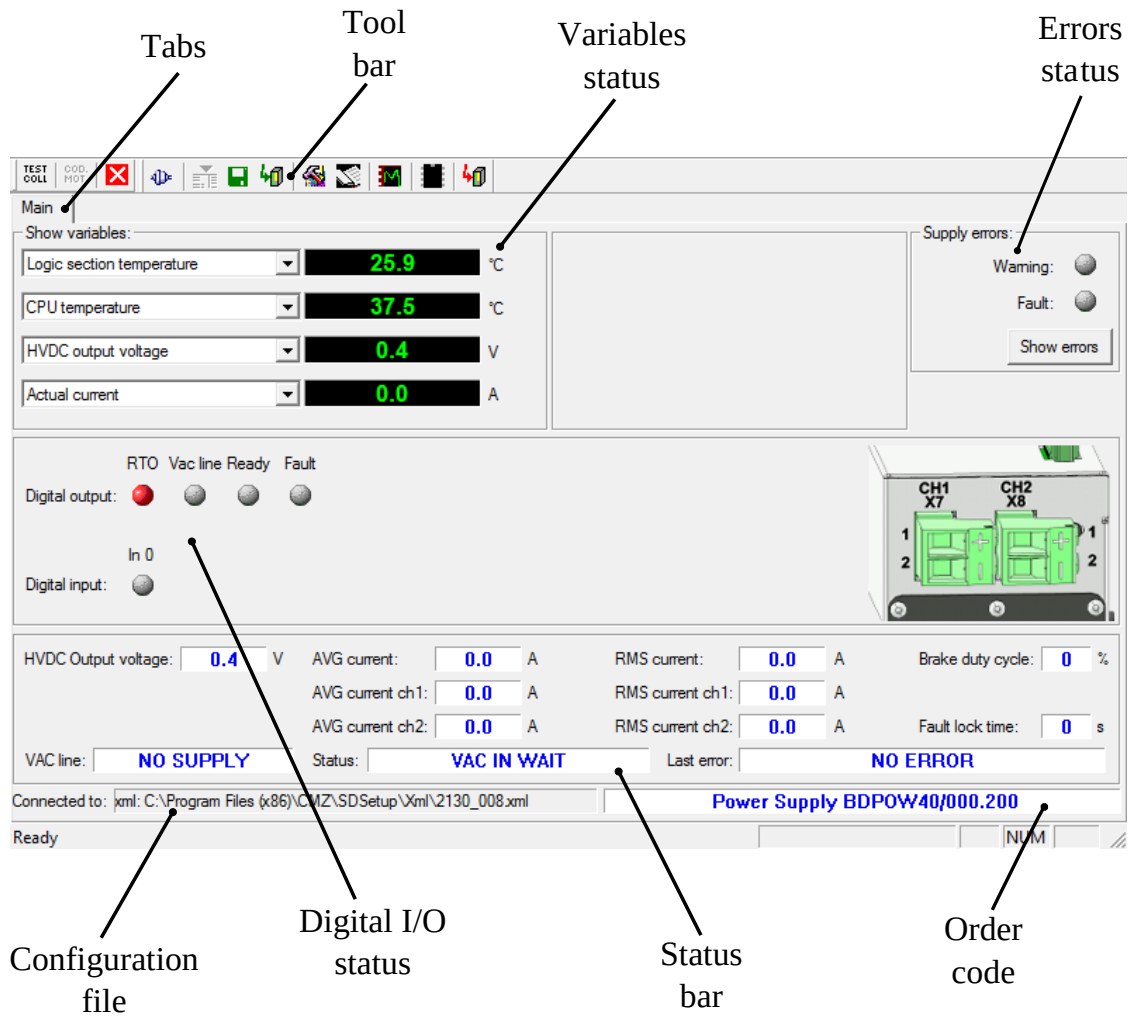


Figure 3.1. Tab Main of SDSetup

Tab Main	
Functionalities	**Link**
Variables status	Monitoring in real time of the most interesting variables
Errors status	*Chapter 10, Fault and warning*
Configuration File	*Chapter 11, Software updating*
Digital I/O status	*Section 6.8, Digital inputs and outputs*
OrderCode	*Section 14.1, OrderCode*

Table 3.1. Functionalities of the Tab Main

3.6. Show errors

This is the visualization page of the faults and warnings that are detected by the power supply in relation to the list described in *Table 10.2*. The informations are divided in two groups (warning

and fault), each group report the anomaly in dynamic and retentive way, to reset the retentive data the Reset errors button is provided. For further details on this argument see *Chapter 10, Fault and warning*.

3.7. Supply Setup

The Supply Setup window allows to immediate access to the main configuration parameters of the power supply (for the details of these parameters refer to *Chapter 9, Parametrization*).

3.7.1. Supply Setup - Parameters

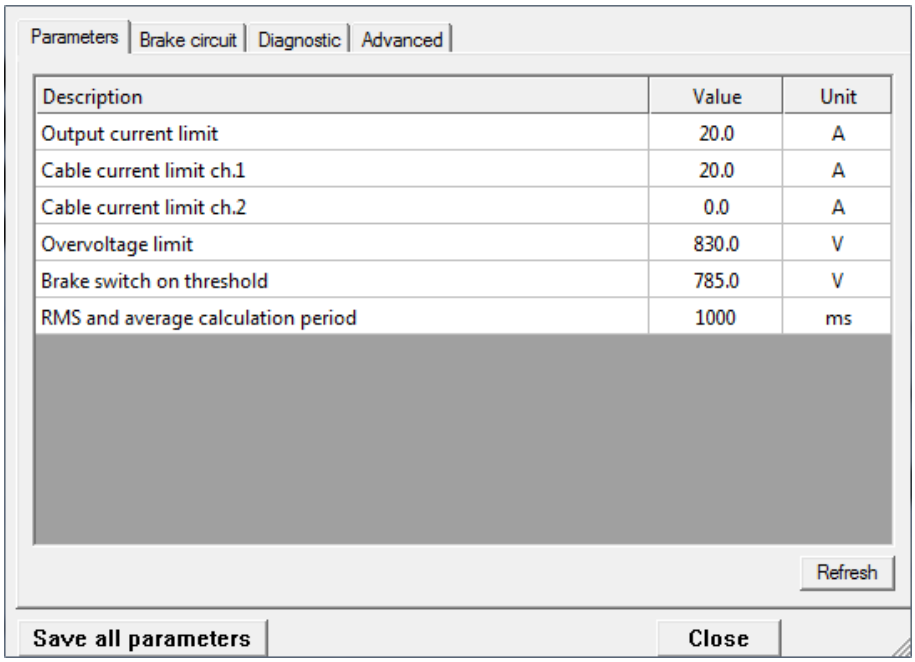


Figure 3.2. Tab Parameters of Supply Setup

The parameters contained in this page can be modified by the user. By clicking on the numeric value the inserted data can be modified; when the new value is confirmed (ENTER button) the WRITE and CANCEL buttons became active; by clicking WRITE the data is written in a non retentive mode, so if the power supply is turned off and on again, the previous values are restored.

To save in retentive mode the new parameters set, after the WRITE button has been clicked it's even necessary to click the SAVE ALL PARAMETERS button.

Access with SDSetup:

Main menu > Supply > Supply setup ... > Parameters

Toolbar >  **> Parameters**

The parameters that can be set are:

- *OutputCurrentLimit*
- *CableCurrentLimit(CH1)*
- *CableCurrentLimit(CH2)*
- *OvervoltageLimit*
- *BrakingCircuitActivationVoltage*
- *RMS_Average_CalculationPeriod*

3.7.2. Supply Setup - Brake Circuit

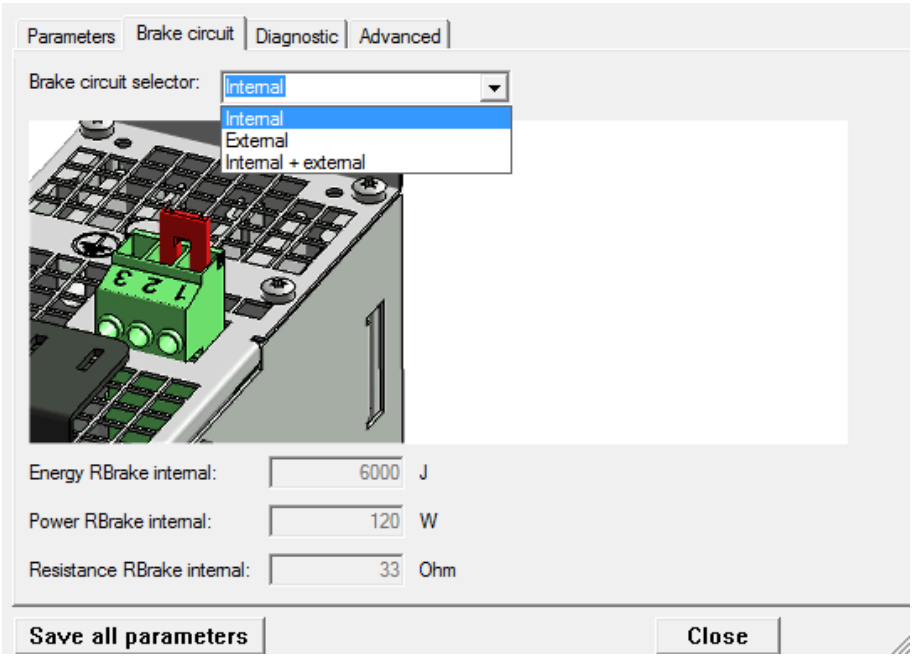


Figure 3.3. Tab Brake Circuit of Supply Setup

This is a configuration page of the brake resistor. Through the drop-down menu on the top (that directly works on the *BrakeCircuitSelector* parameter value) it's possible to select the brake circuit type, that can be connected to an internal or external (or both) resistor. The external resistor, if different than the default type, can be configured by setting the resistor power and energy values of the desired model. If the external resistor use is enabled, the resistance, power and energy values becomes writable and, by clicking on the numeric value, the inserted data can be modified; when the new value is confirmed (ENTER button) the WRITE and CANCEL buttons became active; by clicking WRITE the data is written in a non retentive mode, so if the power supply is turned off and on again, the previous values are restored.

To save in retentive mode the new parameters set, after the WRITE button has been clicked it's even necessary to click the SAVE ALL PARAMETERS button.

Access with SDSetup:

Main menu > Supply > Supply setup ... > Brake Circuit

Toolbar >  **> Brake Circuit**

The read only parameters (related to the internal resistor) are:

- *IntBrakeResistorNominalEnergy*
- *IntBrakeResistorNominalPower*
- *IntBrakeResistorValue*

The parameters that can be set (related to the external resistor) are:

- *ExtBrakeResistorNominalEnergy*
- *ExtBrakeResistorNominalPower*
- *ExtBrakeResistorValue*

3.7.3. Supply Setup - Diagnostic

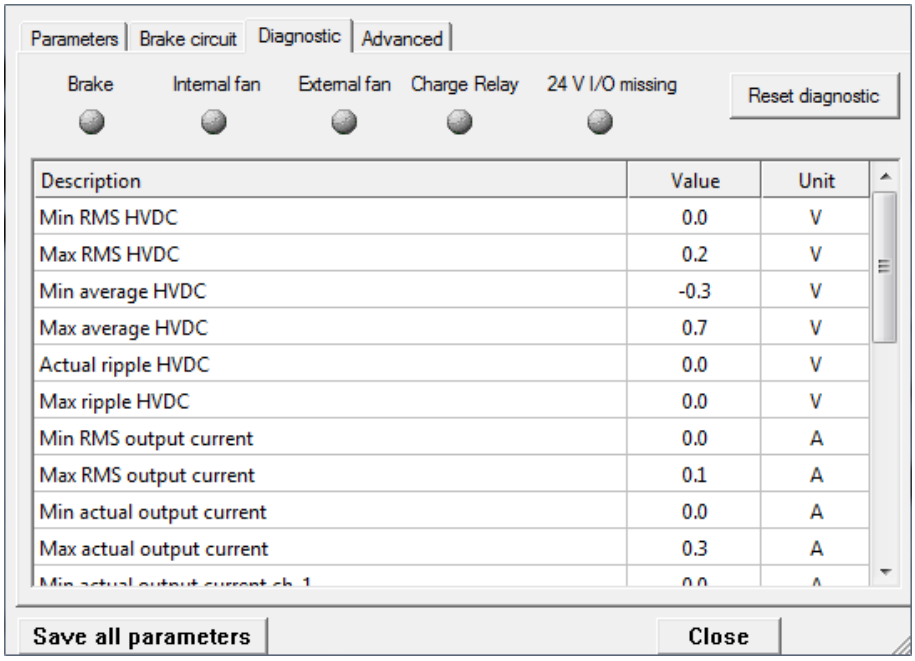


Figure 3.4. Tab Diagnostic of Supply Setup

This is a diagnostic informations page about the power supply. There are not settable parameters, the only allowed operation is the activation of the Reset Diagnostic button that resets the retentive variables of the minimum and maximum visualized values (for example *MinHVDC_OutputVoltage* and *MaxHVDC_OutputVoltage*).

Access with SDSetup:

Main menu > Supply > Supply setup ... > Diagnostic

Toolbar >  **> Diagnostic**

The visualized parameters that can be only read are:

- *MinHVDC_OutputVoltage*

- *MaxHVDC_OutputVoltage*
- *MinRMS_Current*
- *MaxRMS_Current*
- *MinActualCurrent*
- *MaxActualCurrent*
- *MinActualCurrentCH1*
- *MaxActualCurrentCH1*
- *MinActualCurrentCH2*
- *MaxActualCurrentCH2*
- *MaxActualDeviceEnergyOverload*
- *MaxDeviceEnergyOverloadPercentage*
- *MaxBrakeEnergy*
- *MaxChargeCircuitEnergy*
- *MaxAveragePower*
- *BackfeedEnergy*
- *MaxBackfeedEnergy*
- *MinControlSectionTemperature*
- *MaxControlSectionTemperature*
- *MinPowerSectionTemperature*
- *MaxPowerSectionTemperature*

3.7.4. Supply Setup - CMZ Reserved

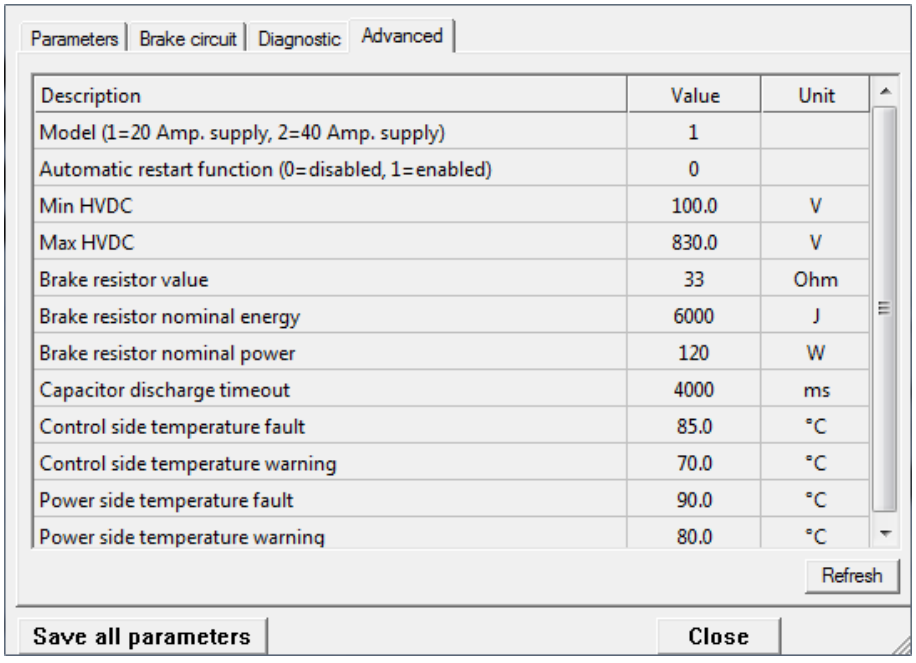


Figure 3.5. Tab Reserved of Supply Setup

This is a reserved parameters setting page, the write access to this parameter is reserved to the CMZ technicians, the user can see but not modify them.

Access with SDSetup:

Main menu > Supply > Supply setup ... > Reserved

Toolbar >  **> Reserved**

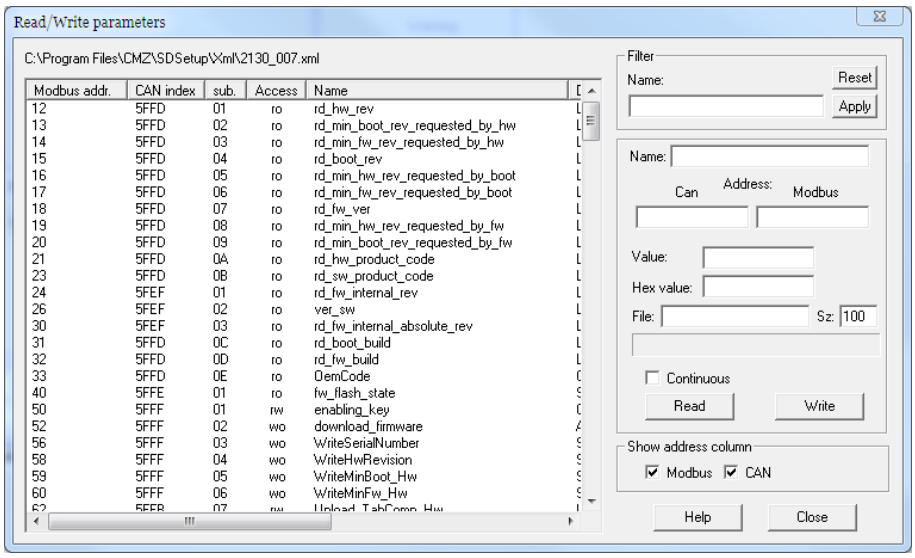
3.8. Object dictionary

In this page it's possible to access to all the implemented parameters (power supply dictionary), through Modbus protocol. The configuration parameters writing is protected by a password and is reserved to the CMZ technicians. The dictionary, divided in parameters groups, is described in*Chapter 12, Object dictionary*

Access with SDSetup:

Main menu > Supply > Object dictionary ...

Toolbar > 



To select the parameter to be read or written in the Object dictionary window, you can click on the proposed list, write the name and the address or use the search by name functions in the box Filter.

Tip

To interpret any error messages please see *Section 10.4, Errors in parameters reading / writing*.

Besides a series of internal parameters, even some configuration and diagnostic parameters are present. Some of them can only be read, some others can even be written. The following tables list the most useful parameters between the provided ones.

MONITOR AND DIAGNOSTIC PARAMETERS (read only)	
Modbus address	**Parameter link**
12	*HardwareRevision*
15	*BootRevision*
18	*FirmwareRevision*
126	*SerialNumber*
2001	*HVDC_OutputVoltage*
2002	*PowerSupplyType*
2010	*CPU_Temperature*
2011	*ControlSectionTemperature*
2012	*PowerSectionTemperature*
2013	*ActualCurrent*
2014	*ActualCurrentLimit*
2024	*DeviceStatus*
2025	*LastFaultCause*
2030	*DeviceEnergyOverloadPercentage*
2031	*BrakeEnergyOverloadPercentage*
2032	*ChargeCircuitEnergyOverloadPercentage*
2048	*RMS_Current*
2052	*RMS_OutputCurrent*
2054	*RMS_BackfeedingCurrent*
2056	*AveragePower*
2058	*BackfeedEnergy*
2060	*ControlSideFaultTemperature*
2061	*ControlSideWarningTemperature*
2064	*PowerSideFaultTemperature*
2065	*PowerSideWarningTemperature*
2068	*FaultLockTime*
2400	*RetentiveWarning*
2402	*DynamicWarning*
2404	*RetentiveFault*
2406	*DynamicFault*

CONFIGURATION PARAMETERS (read only)	
Modbus address	**Parameter link**
2100	*DeviceModel*
2101	*AutomaticRestartFunction*
2102	*MinVoutFaultThreshold*
2103	*MaxVoutFaultThreshold*
2107	*IntBrakeResistorValue*
2108	*IntBrakeResistorNominalEnergy*

CONFIGURATION PARAMETERS (read only)	
Modbus address	**Parameter link**
2110	*IntBrakeResistorNominalPower*
2114	*CapacitorDischargeTimeout*

CONFIGURATION PARAMETERS (settable by the user)	
Modbus address	**Parameter link**
2112	*RMS_Average_CalculationPeriod*
2134	*OutputCurrentLimit*
2135	*OvervoltageLimit*
2136	*BrakingCircuitActivationVoltage*
2137	*BrakeCircuitSelector*
2138	*ExtBrakeResistorNominalEnergy*
2140	*ExtBrakeResistorNominalPower*
2141	*ExtBrakeResistorValue*
2142	*CableCurrentLimit(CH1)*
2145	*CableCurrentLimit(CH2)*

Chapter 4

Communicating with SDSetup

The power supplies of the BDPOW series provide a debug communication port where the protocol Modbus is implemented. Through the *X6 COM port* connector it's possible to connect to the port, which purpose is the configuration and the commissioning of the power supply through SDSetup (see *Chapter 3, General information about SDSetup*).

> **Note**
>
> The Modbus protocol that's implemented in the power supplies respects the regulations of the *Modbus organization*: in this section are only reported the implemented functionalities indications.
>
> In the protocol only the transmission mode of RTU type has been implemented.

Modbus frame

The Modbus protocol uses a frame that's made of some fields, in *Figure 4.1* their scheme is indicated.

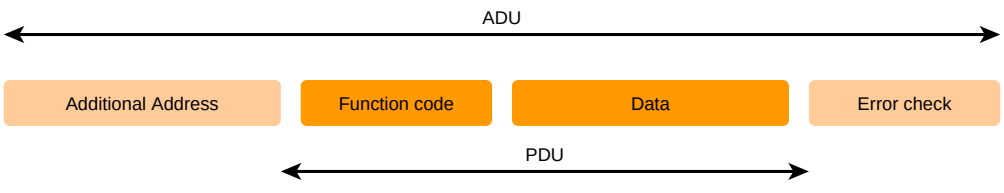


Figure 4.1. Modbus frame

The *Function code* field shows which operation the power supply must run, once received and checked the whole frame, while checking it's not damaged. This information occupies 1 byte

and has a range of valid values from 1 to 127; the codes between 128 and 255 are used for the *Exceptions* but the value 0 is not accepted. In *Table 4.1* the admitted codes are listed.

Funct. Code	Name	Description
3	Read Holding Register	Reading one or more parameters (at 16/32 bits) starting from the Modbus address shown in the frame (such as *Read Input Register*).
4	Read Input Register	Reading one or more parameters (at 16/32 bits) starting from the Modbus address shown in the frame (such as *Read Holding Register*).
6	Write Single Register	Writing a parameter at 16 bits near the Modbus address shown in the frame. If the Modbus address refers to a parameter greater than 16 bits, the operation is not run and the power supply returns an exception.
7	Diagnostics	The diagnostics is only simulated and it has been implemented only to be compatible with the terminals requesting it.
16	Write Multiple Register	Writing one or more parameters (at 16/32 bits) starting from the Modbus address shown in the frame.

Table 4.1. Function Codes supported by the power supplies.

The *Function codes* (3, 4, 6 and 16), described in the previous chart, give full access to all power supply parameters through the object dictionary in *Chapter 12, Object dictionary*.

Exceptions

If the power supply receives a message without communication errors, but it cannot run the requested operation or there is an error in the protocol, the power supply answers to the request with an exception frame. In *Table 4.2* you can find the implemented exception codes.

Funct. Code	Name	Description
1	Illegal function	Function code not supported.
2	Illegal data address	Modbus address not accepted. More precisely, the combination of the Modbus address and of the number of data to write / read is not valid (all addresses included in the requested range must be in the vocabulary).
3	Illegal data value	Data quantity not accepted (too high or equal to 0).
4	Slave device failure	Error in the running of the requested action.

Table 4.2. Exception codes implemented in the power supply.

4.1. SDSetup via RS232 (debug communication port)

Connect the PC serial port to *X6 COM port*. For further information see *Section 7.2, Electrical connections*.

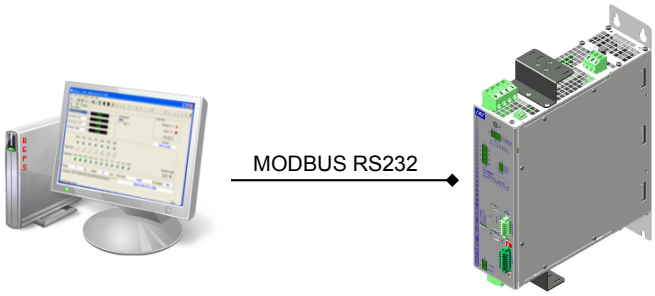
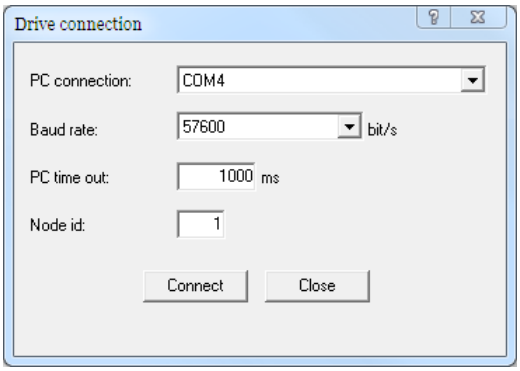


Figure 4.2. Point-point communication scheme with SDSetup.

Start SDSetup from: **Start menu** > **Programs** > **CMZ SISTEMI ELETTRONICI S.r.l.** > **SDSetup.**

Set the connection parameters in the window *Supply connection.*



If the application has already been started, run a new connection. Access:

Main menu > **File** > **New connection ...**

Toolbar > 

Connection parameters

1. *PC connection*: choosing the connection physical port (COM1, COM2...)
2. *Baud rate*: choosing the communication speed (the power supply default value is 57600bit/s).
3. *PC time out*: if the power supply does not answer during a longer time period than this value, the communication is interrupted and it is necessary to reconnect (the default value is 500 ms).
4. *Node id*: set the value 1.

Tip

In case of more connection interruptions it may be necessary to increase the PC time out. It is advisable not to increase the timeout more than 5 seconds.

4.2. Offline mode

Through the Offline mode it is possible to connect to a virtual power supply through SDSetup. To enable this mode, start SDSetup or request a new connection by pressing  .

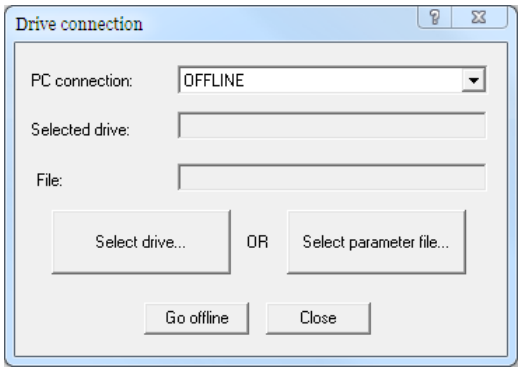
In the window *Supply connection:*

1. Choose *OFFLINE* in the pull-down menu *PC connection*
2. Select the power supply type by pressing 

or a parameters file previously saved by pressing 

.
3. Start the Offline mode by pressing 

.

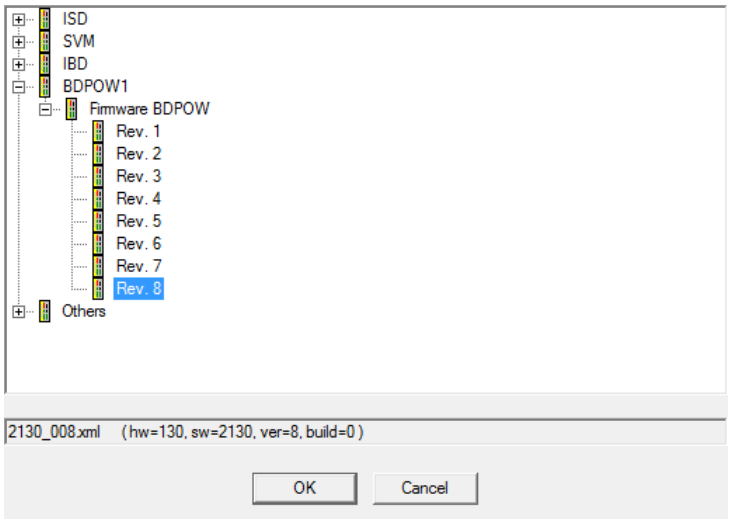


> **Note**
>
> The Offline mode is the best way to debug the system remotely by analysing the parameters file containing the problem.

How to select the power supply

Choose in the window *Select configuration file* the firmware Configuration file and the related version you are going to work with by exploring the stem-and-leaf diagram.

> **Tip**
>
> Always choose the latest available firmware version. After having selected the file, check that the power supply data shown in the field below are the wanted ones.



What cannot be done in the Offline mode

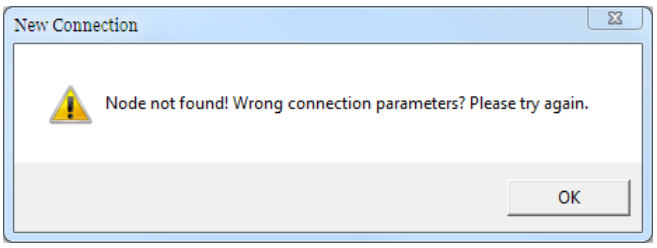
In the Offline mode you can run all the operations foreseen by SDSetup, except from:

- Tab Main
  - download the firmware
  - download a parameters file ().
  - monitor of the variables in this page
- Supply setup
  - Diagnostic functionality
- Oscilloscope
  - enabling a data capture

4.3. Communication errors with SDSetup

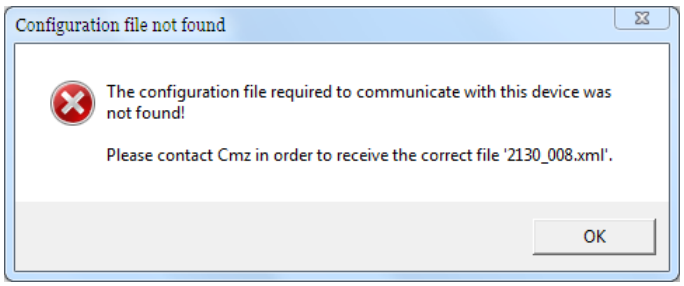
New connection

If during the connection the following window appears check carefully the electrical connections, the correctness of the *Connection parameters* and if the power supply is correctly supplied; then try again.



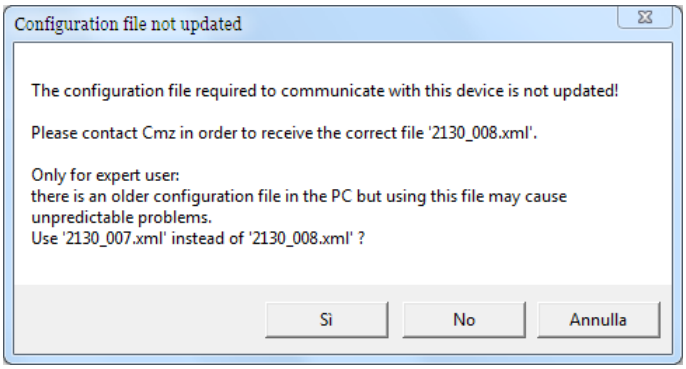
Configuration file not found

If the following window appears, it is necessary to update the SDSetup Configuration files according to what is reported in *Section 11.3, Updating the Configuration File*.



Configuration file not update

If the following window appears it is advisable to update the SDSetup Configuration files according to what is reported in *Section 11.3, Updating the Configuration File*.

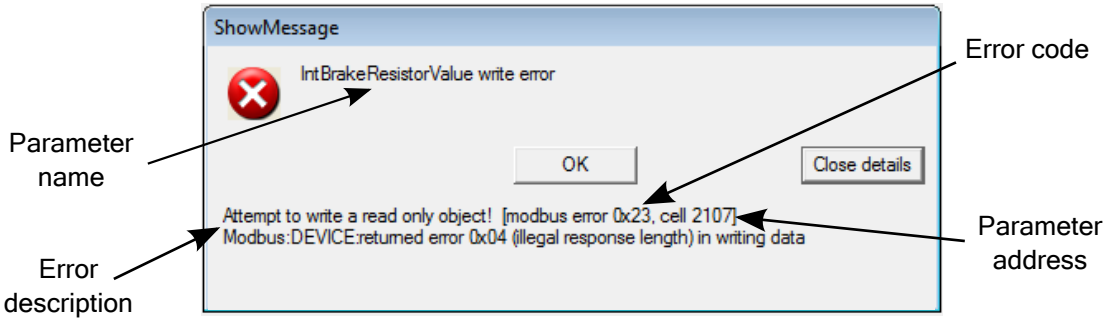


Caution

In case of urgency and if it is not possible to update the Configuration files, you can connect to the power supply by using the Configuration file proposed only to expert users. By using not updated Configuration files, CMZ SISTEMI ELETTRONICI S.r.l. does not guarantee the correct working of SDSetup.

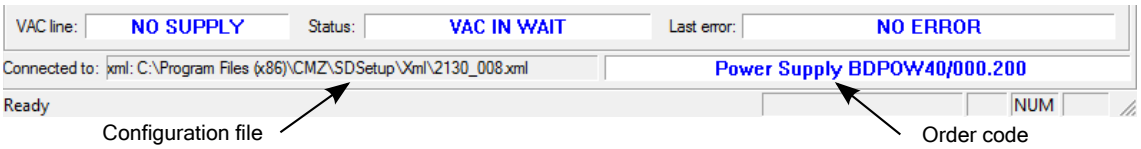
Generic errors

When you have communication errors, SDSetup shows some specific messages. To understand the information in the error generic message see the following picture and the *Table 10.3*.



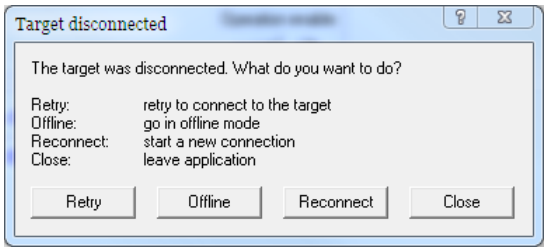
4.4. Connection status with SDSetup

The connection status is made up by the Configuration File and by the Order code, which can be found in the last line below in the tab Main. For further information see *Section 11.3, Updating the Configuration File* and *Section 14.1, OrderCode*.



4.5. Disconnection of SDSetup

When the connection between SDSetup and the power supply is interrupted you will see the following window.



Retry try to connect again with the last *Connection parameters* used.

Offline go to mode *Offline*.

Reconnect open a new connection.

Close close the application.

4.6. SDSetup options

The SDSetup options refer to the program working mode, particularly with its messages transmission. Access:

Main menu > **View** > **Options** > **General options**.

The choices done by the user by interacting with the SDSetup message service are saved in this page and can be modified in any moment.

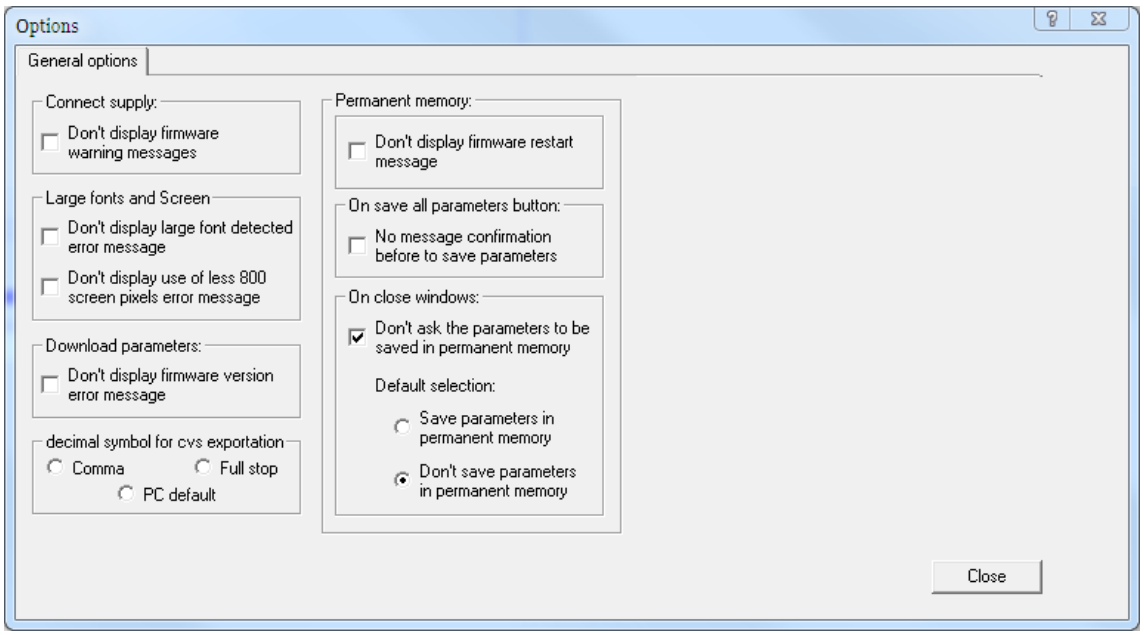


Figure 4.3. Default configuration of SDSetup options

- *Connect supply:* notice of obsolete firmware while connecting (only for some firmwares)
- *Large fonts and Screen:* notice at the start-up in case some screen graphical options are not compatible with SDSetup
- *Download parameters:* error notice during the download of the parameters file (only for some firmwares)
- *Decimal symbol for cvs exportation:* choice of the separating character to export the oscilloscope data to a file
- *Permanent memory:* notice of firmware reboot when the default parameters in the permanent memory are restored (only for some firmwares)
- *On save all parameters button:* saving confirmation in the permanent memory of the modifications to the parameters
- *On close window:* automatic saving of the modifications to the parameters in the permanent memory at the Supply setup closure.

Chapter 5

Default configuration

For a quick test installation of the BDPOW power supply, follow what is reported in this chapter.

5.1. Before starting

> **Danger**
>
> Before installing the power supply, read the paragraph on safety *Section 2.11, Safety precautions and limits*. If you do not follow the safety instructions you may damage the equipment or be hurt.

Required instruments, materials and equipment

Considering to have correctly choosen the system input voltages (see *Table 6.1* and *Table 6.2*) even the following apsects must be considered.
For the proper functioning of the power supply, protection included, the installation of the following components is required:

- **Short circuit protection device** (fuses on each phase of the input line): it has to promptly protect the internal power electronic of the BDPOW when a short circuit happens on HVDC (see the fuse characteristics in *Table 6.1* and *Table 6.2*).
- **Power contactor** commanded by the RTO contact (Ready To Operate)[1]: the RTO contact allows to activate/deactivate the power contactor upstream the power section input (see *Section 7.2.1, Complete connection scheme*). If a FAULT is detected or there are not the right conditions, the RTO contact opens, cuts the command to the contactor and the power supply input power is cut off. The information related to the contactor power are reported in *Table 6.1* and *Table 6.2*.
- **Brake Resistor connection:** check that the *X1 Brake Resistor* connector is correctly configured and inserted in the system. For details see *Section 6.6, Brake resistor*.

[1]If the power contactor and the RTO contact are not used, the internal protections fail. The power supply can be permanently damaged.

- **RCD / RCM device**: it may be necessary to install a type B Residual Current Device (RCD) or Residual Current Monitor (RCM) upstream the input power line. For further information see*Section 5.2.1, Installation precautions*.
- **Line inductance**: it may be necessary to install an adequate three-phase inductance upstream the power input. For further details see *Section 6.3.2, Line inductances*.

There are other aspects to be considered that, unlike the previous ones, don't cause any damage to the power supply, but may cause a fault:

- **Hold Up 24V time check (*X3 Control supply*):** in absence of the control section voltage some of the internal circuits of the power supply don't work. In particular, when the control section voltage decreases under the *Input voltage missing on control section* threshold the RTO contact is opened. In particular it must be guaranteed the voltage to the control section for at least 10 seconds after the interruption of the power line.
- **HVDC Ready status check:** waiting for the operative state before the enabling of the output load (e.g. servomotors) in order to avoid undervoltage faults or an eccessive HVDC ripple. A way to verify this status is to refer to the OUT0 digital output logical state (for details of this output see *HVDC Ready*).

5.2. Hardware installation

5.2.1. Installation precautions

Danger

The power supply must not be used in an explosive or corrosive environment, in the presence of inflammables, water or fuels. There can be risk of fire, electric shock or injuries.

In case of failures because of accidental circumstances or wiring errors the power section can even provoke electric arcs. The power supply must be installed in an environment without any inflammables. This product is intended to be exclusively used in machines and systems in industrial environment, by respecting the described application, environmental and functioning conditions. It is recommended not to use the product for any further purpose than those specified.

Danger

Do not transport, install or make any connections or inspections and don't touch the output connectors when the voltage is greater than 50Vdc. In such cases always switch the power off and wait at least 10 minutes and be sure that the residual voltage on the power connectors between +HVDC and -HVDC is fallen below 50Vdc. The power supply must be installed in a enclosure that satisfies the regulations related to the specific application, so that the parts with dangerous voltage are not accessible.

Danger: hot surfaces

- Do not touch the power supply during the functioning or immediately after its disabling: the surface temperature can be higher than 90°C.
- To prevent any risks of damaging, do not obstruct or limit its ventilation. Keep any object away from the ventilation apertures of the power supply.
- Depending on the functioning conditions, the braking resistor may reach temperature higher than 250°C.
- Avoid any contact with the brake resistor.
- Do not put near any flammable or sensitive to the heat components near the brake resistor.
- Provide an adequate heat dissipation.
- In the most critical cases, check the brake resistor temperature with a test working cycle.

The non-compliance with these precautions may provoke grave injuries or material damages.

Danger

Electric shock and isolation damage risk in case of foreign elements intrusion or device breaking.

Danger

Danger of electric shock in case of inadequate connection of the protective earth conductors. Always connect with 2 separated wires the protection earth screw (see *Grounding screw connection*) and the pin 4 of the *X2 Power Line* connector to the protection earth circuit (star connection).

Danger

BEFORE TO ACTIVATE THE POWER SUPPLY BE SURE THAT THE *X1 Brake Resistor* CONNECTOR (BRAKE RESISTOR) IS INSERTED AND CORRECTLY CONFIGURED. In case the braking resistor is not correctly sized or even not present, the overvoltage may not be discharged. THE NON-COMPLIANCE WITH THESE PRECAUTIONS CAN CAUSE MORTAL ACCIDENT, GRAVE INJURIES OR MATERIAL DAMAGES.

Warning

The BDPOW systems must be installed by specialized personnel only that must have an in-depth knowledge about the safety requirements and the electromagnetic compatibility (EMC).

The planner has the responsibility to guarantee that the product or the final system comply to the pertinent regulations that are in force in the country in which the product (or the entire system) is used.

It's recommended to carefully select the conductors section, the fuses or other protection devices and the protective grounding connections.

Warning

The product does not provide Motor Overload protection. External Motor Overload protection shall be provided in the end-use applications.

Caution

Pay particular attention on the input circuit wiring. The signals L1, L2 and L3 (*X2 Power Line*) must be wired as described in *Section 5.2.3, "Electrical supply line"*.

Caution

Correctly connect the proper protection devices (e.g. fuses, contactors, RCM/RCD type B, protective earth connections) according to the *Chapter 6, Technical features* and the local regulations.

- The introduction of conductive foreign elements inside the product, as chippings, screws or pieces of metallic wire, may put the implemented protections out of order.

High leakage on the protection earth

This power supplier may cause the presence of leakage currents > 3,5mA on the protection earth. Use a protection earth conductor with minimum section according to what's reported in *Section 7.2.1, "Complete connection scheme"*. This power supplier may cause the presence of leakage currents > 3,5mA on the protection earth. Use a protection earth conductor with minimum section according to what's reported in *Section 7.2.1, "Complete connection scheme"*.

For the grounding connection, respect the local regulations. The non-compliance with this precautions may provoke grave injuries or death.

- An inadequate earthing connection exposes to electric shock risk.
- Connect the system to the protective earth BEFORE to apply voltage.

- Don't use the cable holder pipes as protection conductors; instead of it use a protection conductor inside the pipe.
- The protection conductor section must comply with the regulations in force.
- Connect the cables shields to the protective ground as reported in the diagram of *Figure 7.1*.

Danger: high leakage current

If it is allowed by the local regulations, use a type B RCD or RCM upstream the input power line. If some line phases are interrupted, the leakage current may considerably increase (7÷8 times).

- Do not put near any flammable or sensitive to the heat components near the product. Observe the precautions about the heat dissipation.
- The ventilation system in the electrical cabinet must be able to dissipate the heat that's produced by all the devices and components that are inside installed.

5.2.2. Mechanical installation

The details of the mechanical installation are reported in *Section 6.1, Dimensions and sizes*. Be sure that the ventilation is free (see *Section 6.2, Power supply arrangement and heat dissipation*), respecting however the maximum admitted environment temperature (see *Chapter 6, Technical features*).

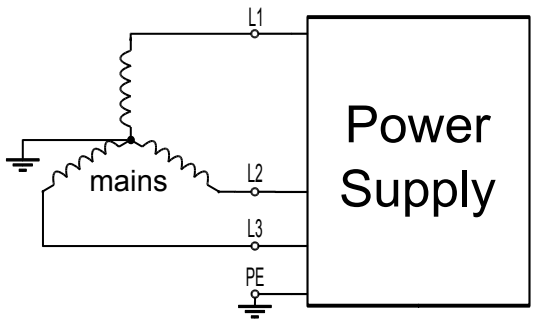
5.2.3. Electrical supply line

Check that the supply source is appropriate, according to the specifications in *Chapter 6, Technical features*. Further information are reported in *Section 6.3, Input section*.

This power supply is designed for a fixed connection on a TT and TN three-phase electrical supply line.

The short circuit nominal current of the electric line must be ≤ 5kA.

Be sure that the input protection devices upstream the BD-POW power supply have an adequate interruption capacity.



Warning

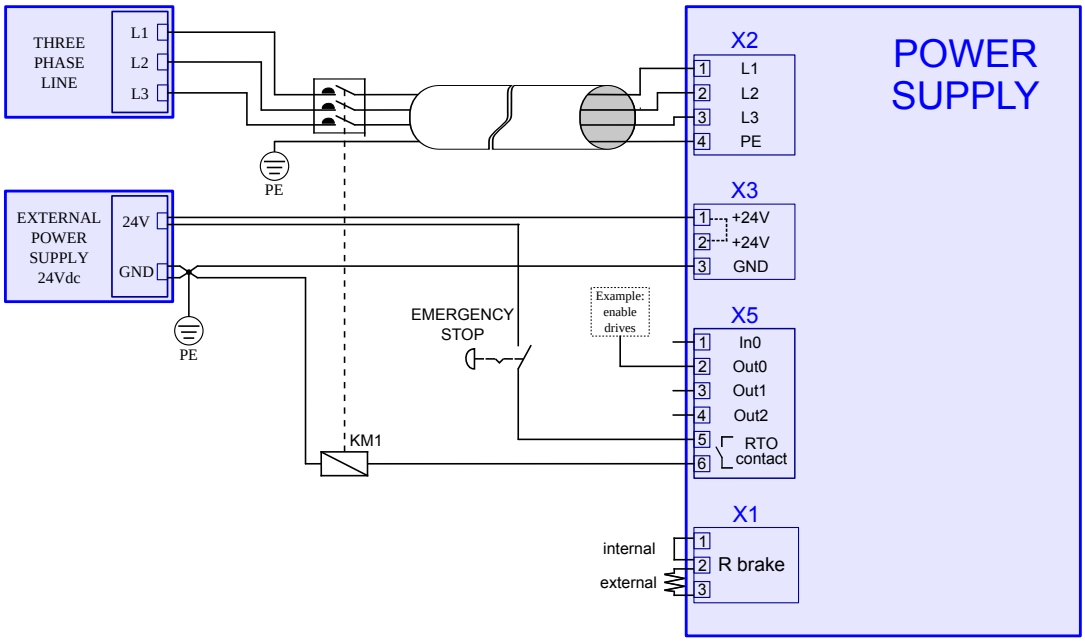
The phase-ground voltage (named "system voltage") must not be greater than 300VAC.

5.2.4. Connection of the protective earthing conductors

Two protective earthing connections are necessary: one through the *X2 Power Line* connector (functional earth), the other through *Grounding screw connection* (protection earth).

5.2.5. Connection of the supplies and RTO contact

Connect the supplies and the RTO contact to the power supplies as shown in the following scheme.



To connect the pins of *X2 Power Line*, *X3 Control supply* and *X5 Input/Output*, please pay attention to what is reported in *Section 7.2.6, Connectors*:

The RTO function allows to deactivate the power voltage in case there is a fault.

> **Caution**
>
> If a Fault is detected the RTO contact opens the contactor upstream the BDPOW.

5.2.6. Connection of the serial port

For a detailed control of all the provided functionalities of the BDPOW, connect the RS232 serial port to the *X6 COM port* connector of the power supply.

> **Warning**
>
> Connect and disconnect the communication connector only when the power supply is switched off. Check if the pin 5 (Ground Control supply) of *X6 COM port*, the power supply and the PC are correctly connected to the protection conductor.

To connect the pins of *X6 COM port*, please pay attention to what is reported in *Section 7.2.6, Connectors*:

5.2.7. Connections check-up

After having completed the connections, check if they are correct and switch on the power supply of the control section (24Vdc) and of the power section. The leds on the BDPOW front, should have the following configuration.

- LED "RTO" GREEN ON; Closed contact;
- LED "CPU STATUS" GREEN ON; CPU working in firmware mode;
- LED "POWER STATUS" GREEN ON; power section correctly supplied;
- LED "BRAKE STATUS" OFF; Brake not active;

If the leds status is not one of the above described, see *Section 7.3, Leds*.

Chapter 6

Technical features

Danger

The power supply must not be used in an explosive or corrosive environment, in the presence of inflammables, water or fuels. There can be risk of fire, electric shock or injuries.

In case of failures because of accidental circumstances or wiring errors the power section can even provoke electric arcs. The power supply must be installed in an environment without any inflammables. This product is intended to be exclusively used in machines and systems in industrial environment, by respecting the described application, environmental and functioning conditions. It is recommended not to use the product for any further purpose than those specified.

Caution

The power supplier has 2 power outputs CH1 and CH2, respectively on *X7 e X8 Power Output*. Unless not expressly indicated, the maximum air temperature is 40°C and the output current has its nominal value.

BDPOW20			
Power section	**Minimum rated voltage**	**Rated voltage**	**Maximum rated voltage**
Three-phase rated voltage[a]	230Vac	400Vac	480Vac
System voltage (nominal voltage between a phase and ground)	MAX 300Vac [overvoltage category III]		
Input voltage range	180 ÷ 520Vac (50/60Hz)		
Line voltage unbalance	<3% of the input line voltage		
Short-circuit rated current (SCCR) of the line	5kA max		
Line filter	Integrated		
Line fuses: (user provided)[b]	SIBA 50 124 06.32 Alternative fuses (CE): Bussmann cod. FWP-32A14F or ITALWEBER AQS-F14x51 cod.1480032 or other fuses 32A quick-acting with $I^2T \leq 700A^2s$.		
Power contactor (user provided)[c]	3 power poles normally open + 24Vdc coil[d];		

BDPOW20			
Power section	**Minimum rated voltage**	**Rated voltage**	**Maximum rated voltage**
	compliant with IEC 60947 (CE) or with Schneider LC1D40 series (UL);		
Input current[e]	22Arms	24Arms	21Arms
Input current with line inductance (user provided)[f]	-	17Arms	-
Output nominal voltage	324VDC	564VDC	677VDC
Output nominal current (CH1 + CH2)[g]	20A	20A	16,7A
Output maximum current (≤ 5s)	40A	40A	33,4A
Output nominal power	6,5kW	11,3kW	11,3kW
Output power pulse (≤ 5s)	13kW	22,6kW	22,6kW
Current of each single output channel[h]	20A		
Internal capacitance	1000µF		
Heat dissipation (brake dissipation excluded)	100W		

[a]See *Section 5.2.3, "Electrical supply line"*

[b]The fuses shall be integrated in the same electrical panel of the BDPOW

[c]For example contactor Schneider mod. LC1D32BL (suppressor module included)

[d]For the coil ratings refer to *Section 6.7, "RTO contact: Ready To Operate"*

[e]without line inductance and with output nominal current

[f]Value with line inductance of 1mH

[g]Default limit value 20 A. Configurable by the user within the 1-20 A range according to the value of *OutputCurrentLimit*

[h]Value with the other channel without load. Default limit value 10 A. Limits that are configurable by the user for CH1 and CH2, within the value range 1-25 A according to the values of *CableCurrentLimit(CH1)* and *CableCurrentLimit(CH2)*.

Table 6.1. Electrical features of the BDPOW20.

BDPOW40			
Power section	**Minimum rated voltage**	**Rated voltage**	**Maximum rated voltage**
Three-phase rated voltage[a]	230Vac	400Vac	480Vac
System voltage (nominal voltage between a phase and ground)	MAX 300Vac [overvoltage category III]		
Input voltage range	180 ÷ 520Vac (50/60Hz)		
Line voltage unbalance	<3% of the input line voltage		
Short-circuit rated current (SCCR) of the line	5kA max		
Line filter	Integrated		
Line fuses: (user provided)[b]	SIBA 50 124 06.50 Alternative fuses (CE): Bussmann cod. FWP-50A14F or ITALWEBER AQS-F14x51 cod.1482050 or other fuses 50A quick-acting with $I^2T \leq 1300A^2s$.		
Power contactor (user provided)[c]	3 power poles normally open + 24Vdc coil[d]; compliant with IEC 60947 (CE)		

BDPOW40			
Power section	**Minimum rated voltage**	**Rated voltage**	**Maximum rated voltage**
	or with Schneider LC1D40 series (UL);		
Input current[e]	41Arms	44Arms	39Arms
Input current with additilnal line inductance (user provided)[f]	-	34Arms	-
Output nominal voltage (CH1 + CH2)[g]	324VDC	564VDC	677VDC
Output nominal current	40A	40A	33A
Output maximum current (≤ 5s)	80A	80A	66A
Output nominal power	13kW	22,5kW	22,5kW
Output power pulse (≤ 5s)	26kW	46kW	46kW
Current of each single output channel[h]	25A		
Internal capacitance	1500µF		
Heat dissipation (brake dissipation excluded)	200W		

[a]Line obtained from a TT or TN three-phase electric line. No other kinds of wiring are allowed. See *Section 5.2.3, "Electrical supply line"*

[b]The fuses shall be integrated in the same electrical panel of the BDPOW

[c]For example contactor Schneider mod. LC1D40ABD (suppressor module included)

[d]For the coil ratings refer to *Section 6.7, RTO contact: Ready To Operate*

[e]without line inductance and with output nominal current

[f]Value with line inductance of 0,5mH

[g]Default limit value 40 A. Configurable by the user within the 1-40 A range according to the value of *OutputCurrentLimit*

[h]Value with the other channel without load. Default limit value 20 A. Limits that are configurable by the user for CH1 and CH2, within the value range 1-25 A according to the values of *CableCurrentLimit(CH1)* and *CableCurrentLimit(CH2)*.

Table 6.2. Electrical features of the BDPOW40.

Control section	BDPOW20 & BDPOW40
Rated voltage	24Vdc +/- 10%
Internal protections	Fuse: 4AT Polarity reverse
Absorbed current @ 24Vdc (only control section)	0,6A (Digital output OFF)[a]
ADDITIONAL absorbed current @ 24Vdc (with turned on outputs)	See *Table 6.11*
Digital outputs	Output voltage: 24 Vdc Type: PNP output Output current= 0,9A (0.3A for each output)[b]
RTO contact	Maximum voltage: 30 Vac/Vdc Maximum current: 1 A (for further details see *Section 6.7, RTO contact: Ready To Operate*)

[a]it can reach 1,4A for 100ms when the (AC) line voltage is applied to the BDPOW and there is the transition from the *HVDC CHECK* to the *Operational* status (see *Chapter 8, Power supply logical states*)

[b]The voltage that's supplied to the outputs depends on the voltage that's supplied to the control section through the *X3 Control supply* connector.

Table 6.3. Control section electrical features.

Other data	BDPOW20 & BDPOW40	
Braking circuit	Maximum current pulse	50A
	Maximum activation threshold[a]	785VDC
	Hysteresis value	20VDC
Internal brake resistor	Resistor	33Ω
	Power	120W (CE) / 25W (UL)
	Maximum energy	6kJ
External brake resistor	Resistor	16 ÷ 1000Ω
	Power	100 ÷ 30000W
	Maximum energy	0,1 ÷ 2000kJ
Internal charge resistor	Number of restart per hour	450 (CE) / 150 (UL)
Power and control sections protection	Overload of the output current	Yes
	Short-circuit of the output section	Yes[b]
	CH1 cable current overload	Yes
	CH2 cable current overload	Yes
	Brake circuit short-circuit	Yes
	Braking energy overload	Yes
	Charging energy overload	Yes
	HVDC undervoltage	<100Vdc
	HVDC overvoltage[c]	>830Vdc
	Excessive ripple on HVDC	Yes
	Over temperature	Power(>90°C) ; control (>85°C)
	Control section under voltage	<18,3Vdc
Mechanical Shock according to the IEC 60068-2-27 standard 3 shocks per direction, on 3 axes. Pulse duration of 11ms.	20g	
Sinusoidal vibration according to the IEC 60068-2-6 standard from 5 to 500 Hz, on 3 axes.	2g	
Surrounding air temperature	0 ÷ +40 °C	
Storage ambient temperature	-20 ÷ +50 °C (for long storage time) -20 ° +70 °C (for short storage time)	
Humidity related to storage and working (without condensation)	+5 ÷ +95 %	
Weight	About 5,8 Kg	
Maximum altitude	4000m [a.s.l.] (CE) 2000m [a.s.l.] (UL)	

Other data	BDPOW20 & BDPOW40
Ventilation	Forced ventilation (external fan)
Pollution degree	2
Protection degree	IP20

[a]Default limit value 785Vdc. Limits that are configurable by the user, within the value range 100-785 Vdc according to the value of *BrakingCircuitActivationVoltage*.

[b](see *Protection against short-circuit of the output section*)

[c]Default limit value 830Vdc. Limits that are configurable by the user, within the value range 100-830Vdc according to the value of*OvervoltageLimit*

Table 6.4. Generic features

6.1. Dimensions and sizes

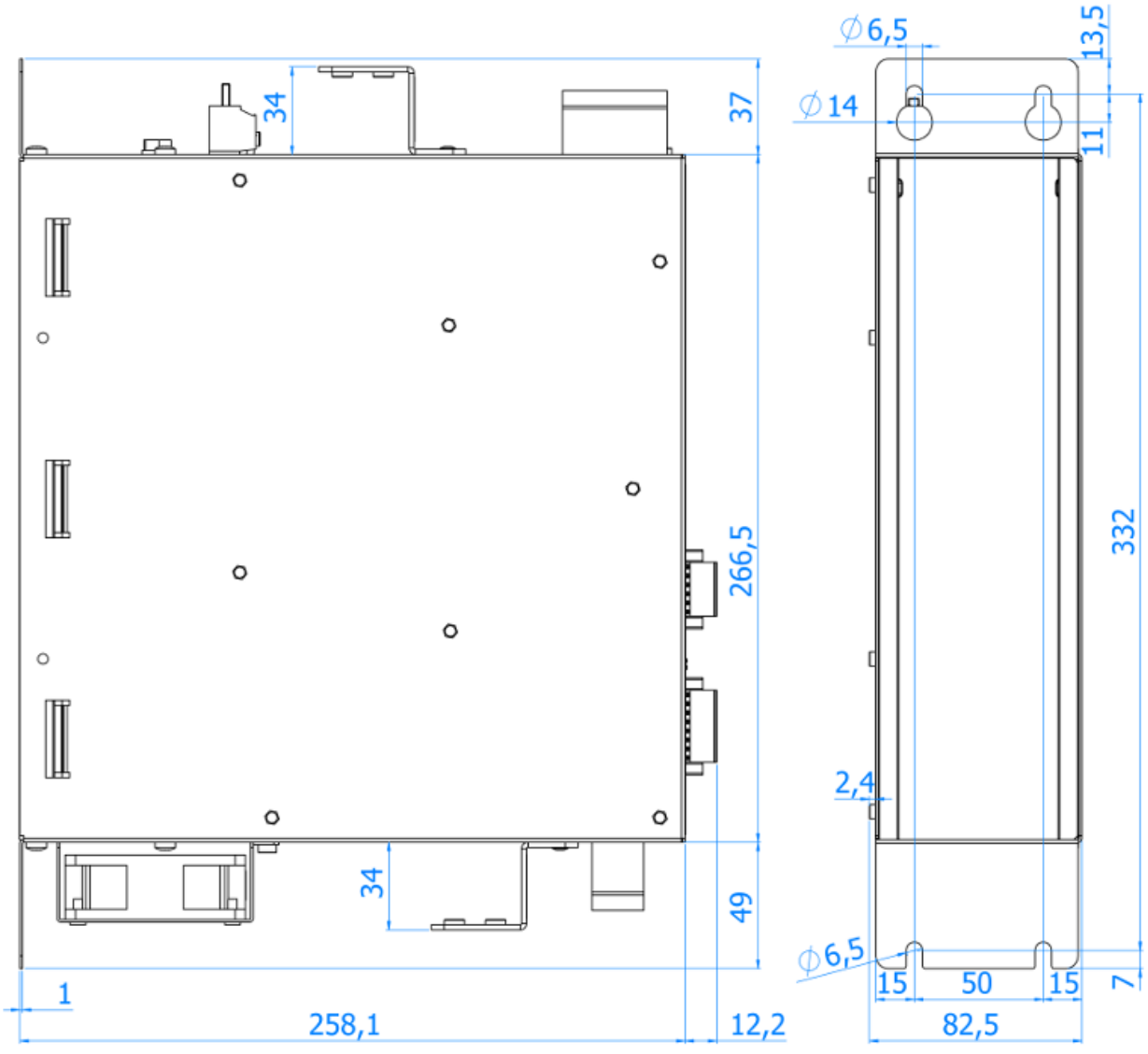


Figure 6.1. BDPOW dimensions [mm].

- Fixing mode: use 4 screw M6 on the back of the flange for the fixing on the background plate of the electrical panel;
- Indicative weight: about 5,8Kg.

6.2. Power supply arrangement and heat dissipation

Danger: hot surfaces

- Do not touch the power supply during the functioning or immediately after its disabling: the surface temperature can be higher than 90°C.
- To prevent any risks of damaging, do not obstruct or limit its ventilation. Keep any object away from the ventilation apertures of the power supply.
- Depending on the functioning conditions, the braking resistor may reach temperature higher than 250°C.
- Avoid any contact with the brake resistor.
- Do not put near any flammable or sensitive to the heat components near the brake resistor.
- Provide an adequate heat dissipation.
- In the most critical cases, check the brake resistor temperature with a test working cycle.

The non-compliance with these precautions may provoke grave injuries or material damages.

The power supply correct installation requires that it is installed in vertical position and strongly fixed to the electrical cabinet background plate. Keep at least 10cm air clearance on the upper and lower sides and 5cm on the lateral sides, and avoid hot zones of the electrical cabinet.
The installation surface should be made of metal, with a rigidity adequate for the BDPOW weight.

Warning

Pay attention to provide an airspace around the external fan and the upper/lower fencing grid in order to avoid an inadequate ventilation of the system and a temperature Fault.

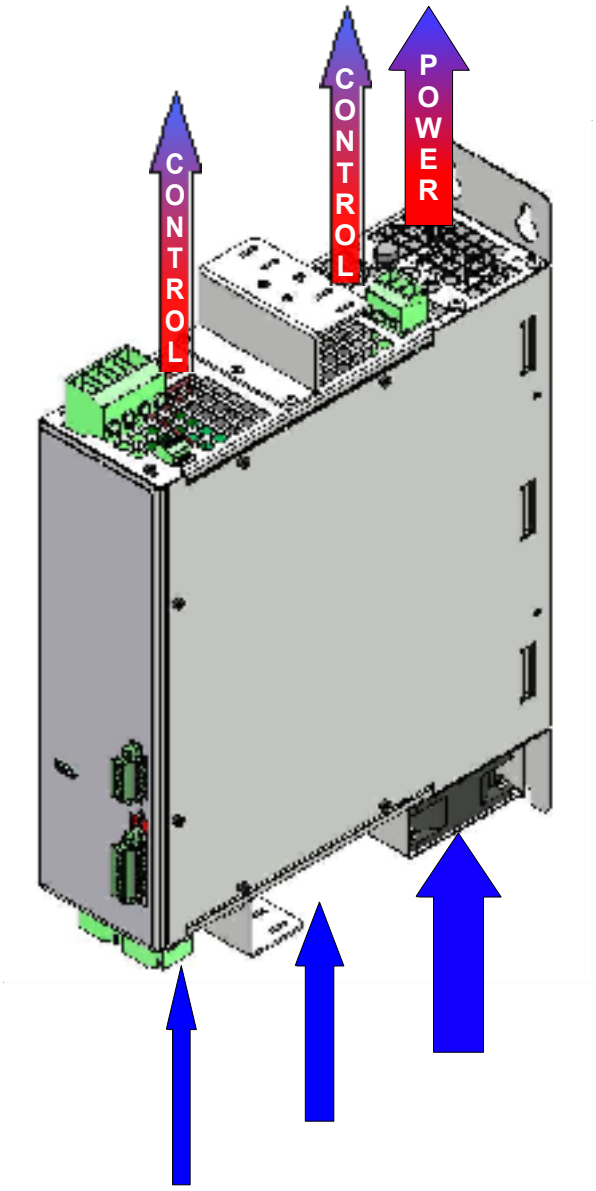


Figure 6.2. BDPOW arrangement and heat dissipation.

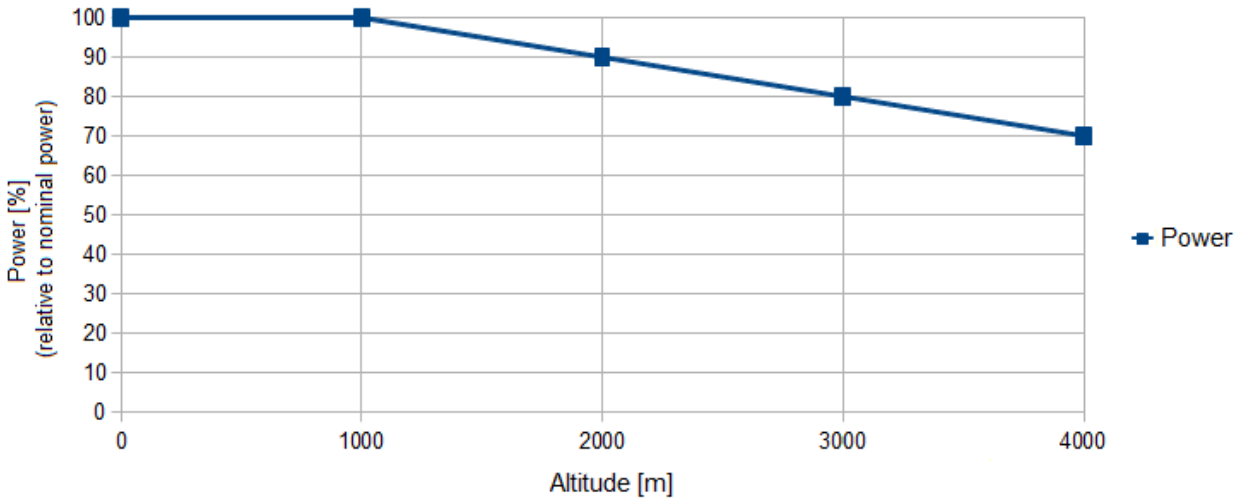


Figure 6.3. Output power derate in relation to the altitude.

The output power depends on the dissipation degree of the power supply with the external environment ; in case the dissipation is not sufficient, then the *Overtemperature of power section* alarm intervenes.

The thermal protection of the power section intervenes when the heat sink exceeds the temperature of 90°C.

The thermal protection doesn't activate with the output current at the nominal value if the environment temperature doesn't exceeds the 40°C and if the brake resistor doesn't generate an excessive heat.

6.3. Input section

For the system functioning two supplies are required:

- for the control section: a DC voltage (continue voltage)
- for the power section: an AC three-phase voltage (alternate voltage)

> **Caution**
>
> The contactor upstream the power section is commanded by the control section through the RTO contact. For further details see *Section 6.7, RTO contact: Ready To Operate*.

There are no restrictions about the supply sequence: it can be supplied first the control voltage supply and then the power one, or vice versa. But without the control section voltage the system doesn't turn on, therefore in this situation the leds don't light and it's not possible any commu-

nication (even if the power voltage is present). In *Table 6.1*, *Table 6.2* and *Table 6.3* there are the limits of the control and power sections voltage.

6.3.1. Fuses

Control section

The control section is provided with a NON REPLACEABLE (and non resettable) fuse. The fuse breaking probably implies a damage of the electronics: in this case please contact CMZ SISTEMI ELETTRONICI S.r.l.

Power section

Internally to the power section there are no fuses. It must be the user that externally provides a fuse upstream each input line, according to the tables of the technical data (see *Chapter 6, Technical features*).

6.3.2. Line inductances

they may be necessary additional input phase inductances:

- to reduce the occurring of the *Voltage ripple exceeds the limit on power section* fault in case of unbalanced line voltage or excessive noise;
- to increase the efficiency of the input power section, by reducing the input RMS current.

Reactance values within 2-4% are recommended. If necessary, higher values may be chosen, but they may imply a reduction of the performance on the connected systems (torque reduction at high speeds), due to the voltage drop.

For example, high noises can be caused by the following factors:

- Devices for the power factor adjustment, connected near the converter.
- Big converters in d.c. without line inductances or with inadequate components connected to the supply.
- Start-up phase of the motors connected to the line.

> **Warning**
>
> These noises may provoke excessive peak currents in the power supply power input circuit, causing unexpected alarms.

Inductances current

For the line inductances current dimensioning, the following rules must be respected:

- Continuous nominal current: not lower than the *Input current* nominal continuous
- Repetitive peak current: not lower than twice the *Input current* nominal continuous

> **Tip**
>
> Refer to the "Input current" reported in *Table 6.1* and *Table 6.2*.

6.4. Output section

The power supply provides the output HVDC voltage through the *X7 e X8 Power Output* connectors (CH1 and CH2). This voltage is contemporary present in both channels. If one of them goes in error, then the entire system switches in fault status and, on consequence, the voltage will not be present neither on the other one.

> **Danger**
>
> The CH1 and CH2 channels are not electrically isolated, so the voltage is always present on both. If, for example, only one channel is used, the voltage is anyway present even on the other one that's not used.

This output total current is divided in the CH1 and CH2 outputs, that respectively measure their values through two amperometers A1 and A2, as showed in the following diagram.

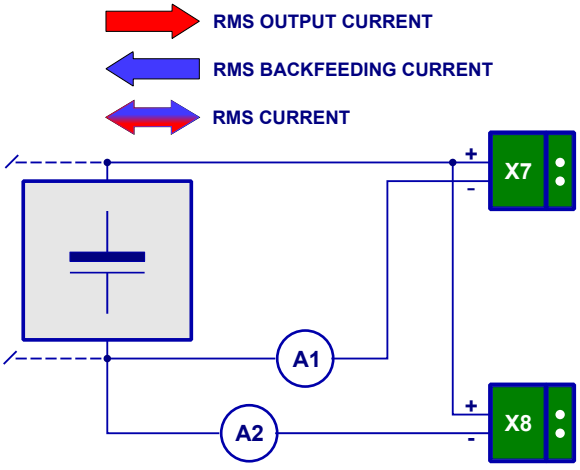


Figure 6.4. Output section electrical scheme.

The *RMS_OutputCurrent*, *RMS_BackfeedingCurrent* and *RMS_Current* currents can be distinguished for each output or overall (calculated from the values that are detected by the 2 amperometers A1 and A2).

- *RMS_OutputCurrent*: it is the supplied current (positive component only)
- *RMS_BackfeedingCurrent*: it is the return current (negative component only)
- *RMS_Current*: it is the total current (supplied and return) that includes both the current values (positive and negative)

That means that, for each current measurement, we will have a value that's related to the single output and a total one, as reported in the following table:

Channel 1	Channel 2	Total
RMS_OutputCurrentCH1	*RMS_OutputCurrentCH2*	*RMS_OutputCurrent*
RMS_BackfeedingCurrentCH1	*RMS_BackfeedingCurrentCH2*	*RMS_BackfeedingCurrent*
RMS_CurrentCH1	*RMS_CurrentCH2*	*RMS_Current*

Table 6.5. Detected current values.

Protection against short-circuit of the output section
The protection cases are

- short-circuit at the start-up: the protection is made by the start-up circuit that limits the current, see *Power section* in the *Section 6.5, Charge circuit and start-up phase*
- short-circuit in *Operational*: the protection is made through the external fuses, see *Section 6.3.1, Fuses*.

6.5. Charge circuit and start-up phase

The charge circuit limits the capacitor charging current at the start-up of the power supply.

In the circuit an over energy and a voltage level control have been implemented against the over heating or the breaking of the circuit itself.

The protection parameters of the start-up circuit are described in *Chapter 6, Technical features*.

Warning

Repetitive start-up may cause to the charge circuit a fault situation due to an excessive transferred energy. It's advisable to respect the turn off - turn on cycles frequency of the power supply (see *Chapter 6, Technical features*).

In general, the dissipated energy at the start-up depends on the VAC Line voltage on the system input and on the output current. The worst cases will be with the maximum voltage on VAC Line and a high output current.

Connect only loads with negligible start-up current (e.g. servo driver)

- During the start-up the output load must mainly be capacitive.
- The power supply start-up time isabout from 2 s to 4 s.

6.5.1. Charge circuit functioning

> **Note**
>
> In order to understand the meaning of the signals that are analyzed in the following graphs, refer to *Figure 2.2*.

Normal Start-up in the start-up phase, the provided charging time is about 2 s. In this time the HVDC output voltage must increase until to be within 50V from the VBRIDGE adjusted voltage, in other words ΔV1 (difference between VBRIDGE and HVDC) must be lower or equal to 50V. If this situation, represented in the following chart, verifies, then the start-up phase finishes and the power supply switches to the next phase (OPERATIONAL logic status).

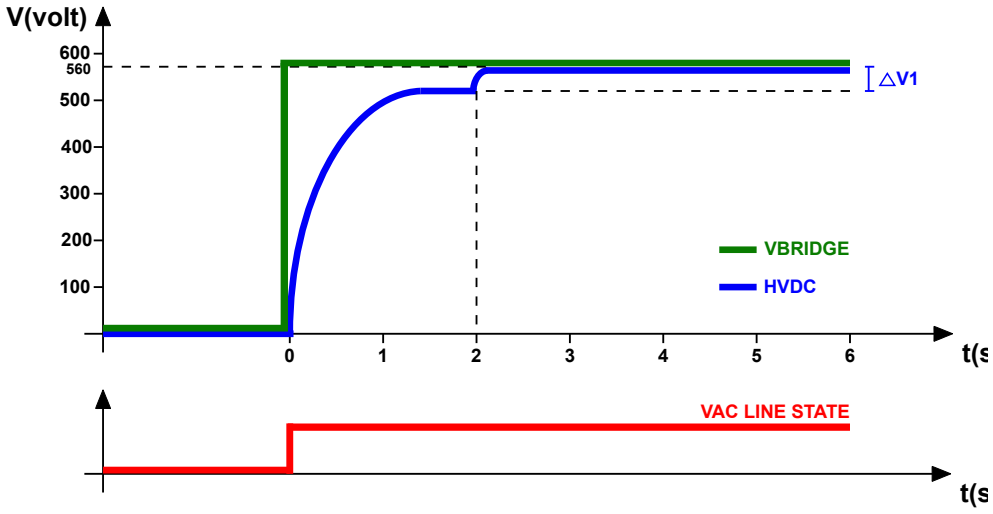


Figure 6.5. Example of normal start-up with input voltage VACLine = 400Vac.

Prolonged start-up: in this case the HVDC voltage increasing is very slowed due to a big capacitive load connected to the output, and that determines a considerable increasing of the charging time. In fact it happens that, unlike the previous case, the input voltage value is not sufficient

to obtain a ΔV1 lower than 50V within 2 sec, and so the charging time is prolonged to 4 sec and a new control is done (ΔV2). As in the previous phase, if the difference between VBRIDGE and HVDC reaches a value that's lower than 50V, that charging phase successfully ends and the power supply switches to the next phase (OPERATIONAL logic status) and no fault condition is reported. This second case is reported in the following chart.

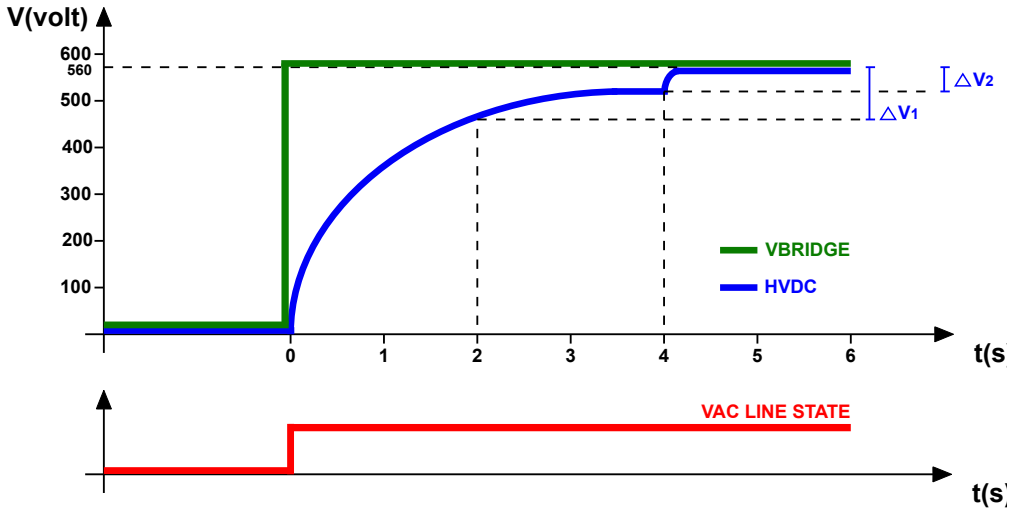


Figure 6.6. Example of prolonged start-up with input voltage VACLine = 400Vac.

Prolonged start-up with fault: if neither after 4 sec the HVDC voltage value has reached the [VBRIDGE - 50V] threshold because of the excessive load on the output, the power supply switches to the Fault status (*Internal circuit ripple exceeds the limit on power section*). This failed start-up case is reported in the following chart.

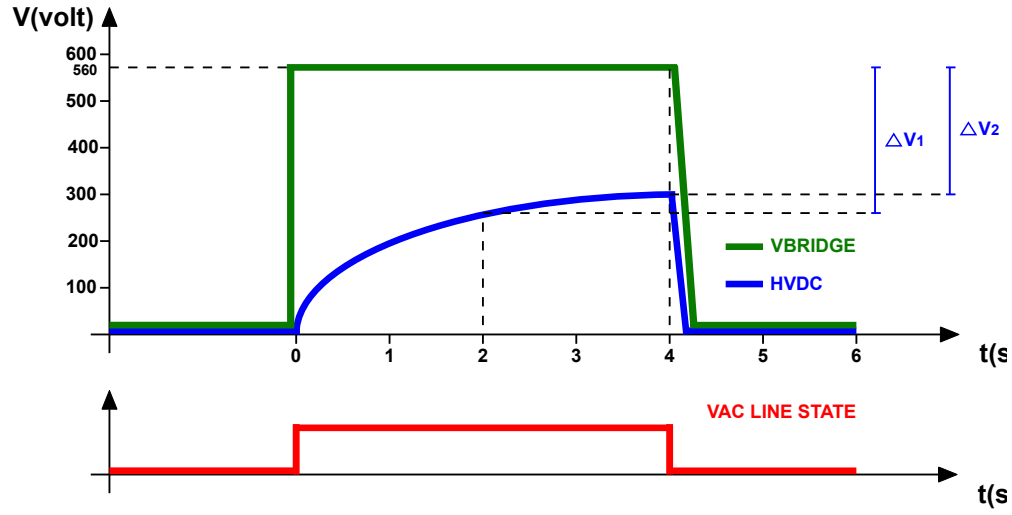


Figure 6.7. Example of prolonged start-up with fault with input voltage VACLine = 400Vac.

During the charging phase some other fault types may happen, and the most probable one is *Charge circuit energy overload*.

6.6. Brake resistor

This device limits the voltage on HVDC during the regeneration operations by the servomotors, for example during the braking phase. If the voltage exceeds the threshold value (*BrakingCircuitActivationVoltage*) the brake resistor is activated. In this case the exchanged energy between servomotors and power supply turns into heat.

If the energy that's regenerated by the motors is higher that the expected one (see *IntBrakeResistorNominalEnergy* if internal resistor and *ExtBrakeResistorNominalEnergy* if external resistor) the *Overvoltage of HVDC output during braking* warning or the *Braking circuit energy overload exceeds the limit* fault may appear. It's required the use of an external resistor that has higher electrical features, compared to the internal resistor ones (the *Section 7.2.5, Braking resistor connection* reports the internal or external brake resistor connection notes).

Value of *BrakeCircuitSelector*	Parameters	Dimensioning
0 (internal)	*IntBrakeResistorValue*, *IntBrakeResistorNominalEnergy*, *IntBrakeResistorNominalPower*	Not necessary
1 (external)	*ExtBrakeResistorNominalEnergy*, *ExtBrakeResistorNominalPower*, *ExtBrakeResistorValue*	See *Section 6.6.1, "External brake resistor value calculation"*
2 (internal + external)	The parameters in this configuration are the same that are used when only the internal resistor is used.	For the external resistor use the same values used for the internal one (see *Table 6.4*).

Table 6.6. Parameter that depends on the selected RBrake

Danger

In case the *Braking circuit energy overload exceeds the limit* fault condition occurs, some residual currents will be present (because, due to the fault condition, the brake circuit is deactivated before the voltage is increased up to the correct level). Before to execute any inspection operation on the BDPOW wait at least 10 minutes.

Warning

The brake resistor use assure HVDC voltages within the range. A wrong dimensioning (OVERLOAD) may break the resistor or the electric circuit and damage the machine/system. Furthermore it can cause grave injuries, for example in lifting up operations.

In particular, in the configuration 2 with "internal + external" RBrake, the external resistor parameters MUST be the same of the internal one (see *Table 6.4*).

Tip

In case the internal resistor is not sufficient to dissipate the braking energy, the most useful solution is the one with "internal + external" Rbrake, because the doubling of the brake energy, power and current is obtained, without change any default parameter.

In this configuration, due to the presence of the external resistor connected in parallel, the *BrakeEnergy*, *BrakeEnergyOverloadPercentage*, *MaxBrakeEnergy* real values will be the double of the measured ones, that are related to the internal resistor only.

During the test and the calculations keep in mind that the more the line voltage is high, the more energy is dissipated by the braking resistor.

To evaluate the usage level of the circuit that commands the braking resistor, it's possible to control the status and the colour of the BRAKE STATUS led (for details see *Table 7.5*). This shows the brake resistor activation (On=active, Off=not active). If it activates and the led colour is green, it means that the braking circuit energy is lower than the 50%, if instead the led becomes red it means that the energy is higher or equal to the 50%; if the energy of the circuit of the braking resistor exceeds the limit value (*Braking circuit energy overload exceeds the limit*) the RTO contact is opened and the functioning status switches from OPERATIONAL to FAULT (BRAKE STATUS led is off).

For further details about the RTO see *Section 6.7, RTO contact: Ready To Operate*.

6.6.1. External brake resistor value calculation

The external brake resistor value must not decrease under a certain value in order to avoid a too high current. If only the external resistor is connected, the formula that has to be used is the following one:

$$R = V_B / I_{Pmax} \quad (6.1)$$

Where:

- R = Value of the external brake resistor
- V_B = *BrakingCircuitActivationVoltage*
- I_{Pmax} = Maximum current pulse

Caution

The values of the external resistor must respect the ranges that are reported in *Table 6.4*.

6.7. RTO contact: Ready To Operate

The RTO contact is used to activate/deactivate the contactor upstream the LINE input (L1, L2 and L3 *X2 Power Line* connector) to the BDPOW. If there is a fault, the RTO contact opens and the upstream contact is opened. On consequence, the HVDC output voltage will decrease according to the applied load.

The RTO contact is optoisolated from the other internal circuits.

> **Danger**
>
> If the RTO contact is opened, the contactor is turned off and the power section is disabled.

The following table summarizes the RTO contact electrical features:

RTO contact	
Type	**NO (Normally Open) solid-state contact**[a]
RTO contact terminations maximum voltage (OFF state).	30 Vac / Vdc
RTO contact terminations maximum current (ON state).	1A
Protection from short-circuit	No
Maximum allowed voltage between RTO (pin 5 or 6 of the *X5 Input/Output* connector) and GND (pin 3 of the *X3 Control supply* connector)	50V[b]

[a]This contact state depends on the internally implemented logical states. When the power supply is off the contact is opened (NO).

[b]The voltage limit must be obtained through a suppressor applied on the terminations of the contactor coil, as showed in*Figure 6.8*

Table 6.7. RTO contact electrical features

Electrical features needed by the contactor

In order to guarantee the correct power supply functioning, the contactor must be chosen according to the electrical features that are summarized in the following table[1]:

Features	Values
Contacts opening time	< 150ms
Peak voltage generated by the coil	≤ 50V (limited by the suppressor)
Rated current/voltage of the power terminations	see *Table 6.1* and*Table 6.2*

Table 6.8. Contactor electrical features

[1]A contactor example is reported in *Chapter 6, Technical features*.

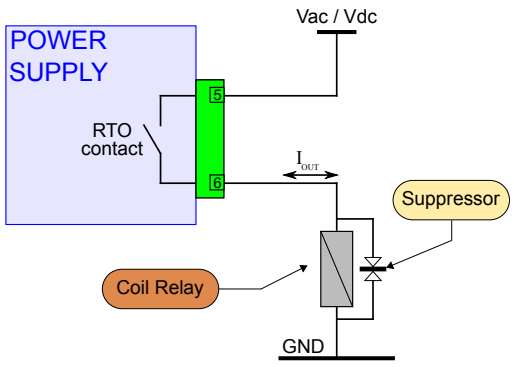


Figure 6.8. RTO contact wiring example.

Caution

The contactor must respect the Opening time (that is the contacts opening time from the moment in which the coil supply is cut off). The Opening time increases about 10 times if snubber diodes are inserted on the inductance terminations. Therefore, use a suppressor.

Caution

If the suppressor is not already present in the contactor, add it externally.

6.8. Digital inputs and outputs

On the *X5 Input/Output* connector the following optoisolated digital inputs and outputs are provided:

- 1 PNP digital input (24Vdc)
- 3 PNP digital outputs (24Vdc; max 300mA)

Digital I/Os

Name	Type of resource / logic	Details
In 0	Input, PNP, 24V	*Reset Fault*, connection: pin 1 of*X5 Input/Output*
Out 0	Output, PNP, 24V	*HVDC Ready*, connection: pin 2 of*X5 Input/Output*
Out 1	Output, PNP, 24V	*Vac Line state*, connection: pin 3 of*X5 Input/Output*
Out 2	Output, PNP, 24V	*Fault*, connection: pin 4 of*X5 Input/Output*

Table 6.9. BDPOW digital I/Os description

Electrical features of inputs (*Table 6.10*) and outputs (*Table 6.11*).

DIGITAL INPUT FEATURES	
Inputs n°	1
Galvanic isolation	YES, through optoisolators
Protection	Polarity reversal
Input voltage	• Nominal : +24Vdc • For LOW signal (logical state 0) : -30 ÷ +5Vdc • For HIGH signal (logical state 1) : +15 ÷ +30Vdc
Input current (typical) with Vin = 24Vdc	• 4,8 mA

Table 6.10. Digital input electrical characteristics

DIGITAL OUTPUTS CHARACTERISTICS	
Output type	PNP
Outputs n°	3
Galvanic isolation	YES, through optoisolators
Protection	Polarity reversal, overcurrent, short circuit
Supply voltage	24V (internally obtained from the 24V that are presents on *X3 Control supply*)
Maximum output current (for each output)	300mA

Table 6.11. Digital outputs electrical characteristics

Note

In relation to what's reported on *Table 6.11*, on the 24V the absorption may increase until 900mA if the 3 outputs are all on and with the maximum load connected.

RTO CONTACT FEATURES	
RTO contact	See *Table 6.7*

Table 6.12. RTO contact electrical features

6.8.1. Functionalities

In the *Table 6.9* the functionalities related to the I/O resources of the BDPOW are described.

Reset Fault

The IN0 digital input function is Reset Fault, that tries to restore the power supply to the normal functioning, in case no Faul condition is present.

For details about the Fault status restoring, refer to *Chapter 10, Fault and warning*.

To force a Reset function it's necessary to apply a positive pulse of at least 100ms.

> **Warning**
>
> When the Reset Fault is forced, a new restore attempt is started, with the generation of the HVDC voltage from the *X7 e X8 Power Output* connector (Power Output).

HVDC Ready

The OUT0 output is active (ON state, transistor on) when the power supply is in the operative status and without faults.
If a fault is reported, with the consequent RTO contact deactivation, the output becomes inactive (OFF status, transistor off).
This output can be used as command for the enabling of the motors that are supplied by the BDPOW HVDC voltage.

Vac Line state

The OUT1 output indicates the alternate voltage status on the *X2 Power Line* connector (Power Line).
This output is active (ON state, transistor on) when on the system input an alternate three-phase or two-phases voltage is present and it's higher than the minimum expected value (see "Absolute range voltage" in *Chapter 6, Technical features*).
The delay time since when the alternate current is missing is about 20ms.

Fault

The OUT2 output indicates the power supply Fault status, when it is on it indicates that a Fault has been detected (see *Chapter 10, Fault and warning*).

Chapter 7

Electrical connections, leds and switches

7.1. Installation notes

Danger

The precautions described in this paragraph are suitable to avoid any dangerous situation by suggesting the right use of the product.

Danger

Do not transport, install or make any connections or inspections and don't touch the output connectors when the voltage is greater than 50Vdc. In such cases always switch the power off and wait at least 10 minutes and be sure that the residual voltage on the power connectors between +HVDC and -HVDC is fallen below 50Vdc. The power supply must be installed in a enclosure that satisfies the regulations related to the specific application, so that the parts with dangerous voltage are not accessible.

Danger: high leakage current

If it is allowed by the local regulations, use a type B RCD or RCM upstream the input power line. If some line phases are interrupted, the leakage current may considerably increase (7÷8 times).

Danger

Danger of electric shock in case of inadequate connection of the protective earth conductors. Always connect with 2 separated wires the protection earth screw (see *Grounding screw connection*) and the pin 4 of the *X2 Power Line* connector to the protection earth circuit (star connection).

Warning

Carefully insulate the wires and the cables connected to the terminal blocks of the power input and output (DVC C) and of the braking resistor from any other wire, cable or other conductive parts of other DVC (e.g. fan cable, control wiring). Keep a proper insulation between the terminals or the wires with voltage higher than ELV and othe conductive parts.

Warning

The cables characteristics must be adequate to the electrical and thermal ratings.

Warning

The BDPOW systems must be installed by specialized personnel only that must have an in-depth knowledge about the safety requirements and the electromagnetic compatibility (EMC).

The planner has the responsibility to guarantee that the product or the final system comply to the pertinent regulations that are in force in the country in which the product (or the entire system) is used.

It's recommended to carefully select the conductors section, the fuses or other protection devices and the protective grounding connections.

Warning

The BDPOW system must be installed in an environment that guarantees the conditions that this manual prescribes (see *Section 2.11, Safety precautions and limits*), in particular it must be protected from excessive humidity and/or condensation. Furthermore it must be respected every environment condition (see *Chapter 6, Technical features*), by considering that the heat that's produced by the system must be adequately dissipated in order to not exceed the maximum working temperature (see *Section 6.2, Power supply arrangement and heat dissipation*). To ensure the maximum reliability of the system and of the related installation, the regular controls must be done.

Caution

Pay particular attention on the input circuit wiring. The signals L1, L2 and L3 (*X2 Power Line*) must be wired as described in *Section 5.2.3, "Electrical supply line"*.

Caution

Correctly connect the proper protection devices (e.g. fuses, contactors, RCM/RCD type B, protective earth connections) according to the *Chapter 6, Technical features* and the local regulations.

For the braking resistor wiring description see *Section 6.2, Power supply arrangement and heat dissipation*.

For the complete connection scheme see *Section 7.2.1, Complete connection scheme*.

For the complete connection scheme of the RTO contact see *Section 6.7, RTO contact: Ready To Operate*.

7.2. Electrical connections

The section about the electrical connection includes both the connectors pins and the characteristics and the description of the different parts which the system is made of; in particular the supply section, with the related limits, and the interface section (digital inputs and outputs, debug serial port).

Warning

A correct cable, protective earth and shield wiring is essential for the power supply safety, immunity and correct functioning. It's better if the cables are not interrupted; if it is not possible, be sure that the interruptions are reduced to the shortest possible length. It's recommended to always wire the cables without voltage presence.

Warning

The grounding conductor connection must be done so that this one is the last conductor to be interrupted.

7.2.1. Complete connection scheme

Tip

Fix the input and output cables with cable ties, referring to the metal flange that are above or under the power supply.

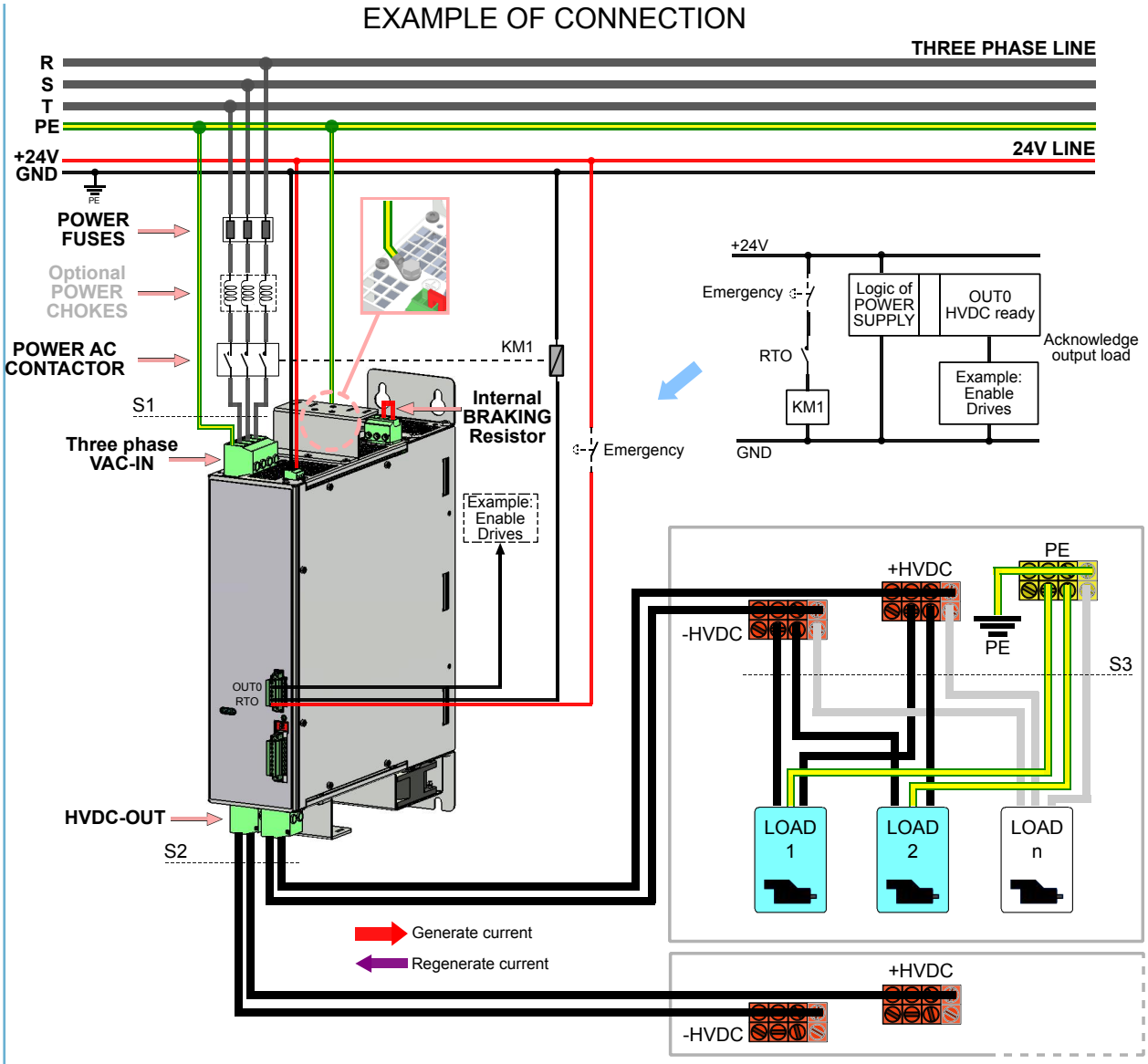


Figure 7.1. Connection scheme from line to load.

Conductors sections

For (CE): the sections of the conductors in the following tables refer to PVC insulated copper conductors according with the C installation method, with a surrounding air temperature of 40°C:

- With the default current values (for default current values of *OutputCurrentLimit*, *CableCurrentLimit(CH1)* and *CableCurrentLimit(CH2)* parameters see *Chapter 6, Technical features*).

Stranded copper conductor section		
Reference *Figure 7.1*	**BDPOW20 [mm^2]**	**BDPOW40 [mm^2]**
S1 - Input line	4	10

Stranded copper conductor section		
Reference *Figure 7.1*	**BDPOW20 [mm²]**	**BDPOW40 [mm²]**
S1 - PE	10[a]	10
S2	1,5	2,5
S3	1,5	2,5

[a]If an additional protection conductor is present, the PE conductor section can be equal to the section of the input line wire.

Table 7.1. Minumum conductors section with default current values (CE), referring to*Figure 7.1*

- With the maximum current values (for maximum current values of *OutputCurrentLimit*, *CableCurrentLimit(CH1)* and *CableCurrentLimit(CH2)* parameters see *Chapter 6, Technical features*).

Stranded copper conductor section		
Reference *Figure 7.1*	**BDPOW20 [mm²]**	**BDPOW40 [mm²]**
S1 - Input line	4	10
S1 - PE	10[a]	10
S2	2,5	4
S3	2,5	4

[a]If an additional protection conductor is present, the PE conductor section can be equal to the section of the input line wire.

Table 7.2. Conductors minimum section with maximum current values (CE), referring to*Figure 7.1*

- With other operative conditions or parameters values refer to IEC 60204-1, IEC 60364-5-52 or other relevant standards.

For (UL): the conductor section requirements are listed in the following table:

Stranded copper conductor section		
Reference *Figure 7.1*	**BDPOW20 [mm²]**	**BDPOW40 [mm²]**
S1 - Input line	6 (10AWG)	16 (6AWG)
S1 - PE	10 (6AWG)	10 (6AWG)
S2	2,5 (12AWG)	4 (10AWG)
S3	2,5 (12AWG)	4 (10AWG)

Table 7.3. Minumum conductors section with default current values (UL), referring to*Figure 7.1*

7.2.2. Input section connection

The connector for the control section is *X3 Control supply*, the one for the power section supply is *X2 Power Line*.

In order to guarantee the safety and a well functioning of the product and the limitation of the noises, it's necessary to make the protective ground connection through a low impedance conductor (see *Grounding screw connection*). This conductor must be connected to the protective earth conductor of the machine.

Connection notes

To connect the voltage supply use a cable with an adequate section (refer to *Conductors sections*). The cable must be fixed through a cable tie, applied on the power supply superior bracket.

Warning

NEVER apply an alternate or a DC voltage out of the provided range or with an inverted polarity: this may cause damage on the power and/or control section and the risk of fire or electric arc.

Caution

Refer the GND potential of the control supply to the protective earth (PE).

Caution

The power section is activated/deactivated by the contactor through the RTO contact. Check its correct connection. For further details see *Section 6.7, RTO contact: Ready To Operate*.

Note

Fusibili alternativiCheck that the value of the supply voltage on the control section connector is adequate. Be sure that this range is respected in particular if a long cable is used (eventually compensate the voltage drop in the cable by supplying a higher voltage upstream).

7.2.3. Output section connection

The configuration of the output channels can be distinguished in:

- Connection to 1 output channel (with the other channel load free)

- Separated connection of the 2 output channels
- Parallel connection of the 2 output channels (for a proper parallel conneciton refer to the following figure)

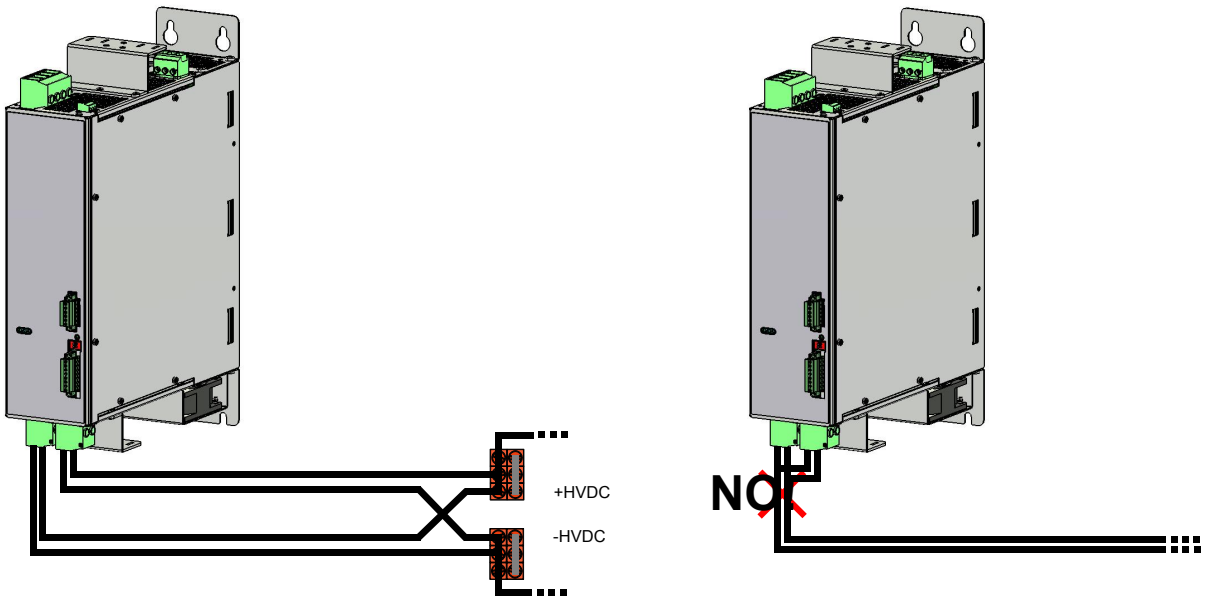


Figure 7.2. Output channels parallel connection

In particular, for both the connection type, even the following cases can be considered:

- Connection with not shielded cable: when the cable length is within the range 0.5m ÷ 1m.
- Connection with shielded cable: when the cable length is within the range 1 ÷ 30m. In this case connect the cable shield to the chassis with a conductive cable clamp fixed to the lower support.[1]

Connection notes

To connect the power outputs use a cable with an adequate section (refer to *Conductors sections*).

> **Caution**
>
> NEVER apply an external voltage to the output connectors: this may cause damage on the power section and the risk of fire or electric arcs.

[1]For length that are greater than 30 m, please contact CMZ SISTEMI ELETTRONICI S.r.l.

7.2.4. Wrong connections

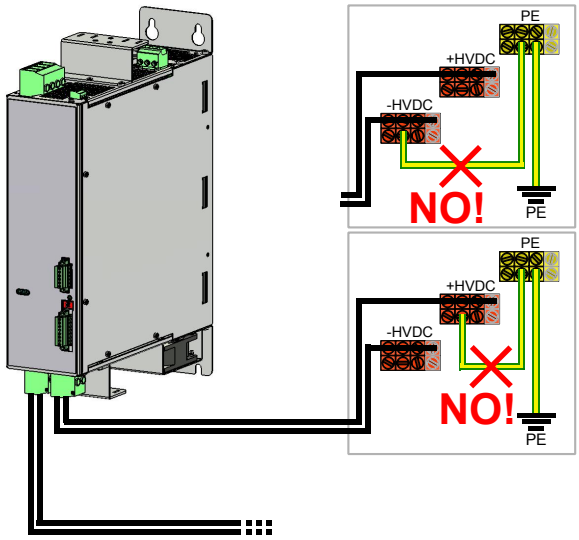
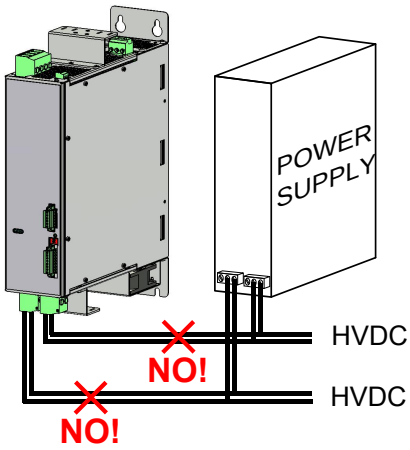
Description	Scheme
The network supply (TT or TL) is not isolated to PE ! (therefore it must be maintained an adequate electric isolation). The HVDC voltage supplied on the BDPOW output is obtained from the network voltage through three-phase rectifier. (The + and - HVDC signals must not be connected to PE, or a short circuit may happen, and the diode bridge will be damaged).	
IT IS NOT ALLOWED THE PARALLEL CONNECTION OF ANY POWER SUPPLY. The beckfed currents may, in unfavourable cases, be unbalanced and lead to the overload of the power outputs or cause damages.	

Table 7.4. Wrong connections schemes

7.2.5. Braking resistor connection

Danger

Do not transport, install or make any connections or inspections and don't touch the output connectors when the voltage is greater than 50Vdc. In such cases always switch the power off and wait at least 10 minutes and be sure that the residual voltage on the power connectors between +HVDC and -HVDC is fallen below 50Vdc. The power supply must be installed in a enclosure that satisfies the regulations related to the specific application, so that the parts with dangerous voltage are not accessible.

Danger: hot surfaces

- Do not touch the power supply during the functioning or immediately after its disabling: the surface temperature can be higher than 90°C.
- To prevent any risks of damaging, do not obstruct or limit its ventilation. Keep any object away from the ventilation apertures of the power supply.
- Depending on the functioning conditions, the braking resistor may reach temperature higher than 250°C.
- Avoid any contact with the brake resistor.
- Do not put near any flammable or sensitive to the heat components near the brake resistor.
- Provide an adequate heat dissipation.
- In the most critical cases, check the brake resistor temperature with a test working cycle.

The non-compliance with these precautions may provoke grave injuries or material damages.

Danger

BEFORE TO ACTIVATE THE POWER SUPPLY BE SURE THAT THE *X1 Brake Resistor* CONNECTOR (BRAKE RESISTOR) IS INSERTED AND CORRECTLY CONFIGURED. In case the braking resistor is not correctly sized or even not present, the overvoltage may not be discharged. THE NON-COMPLIANCE WITH THESE PRECAUTIONS CAN CAUSE MORTAL ACCIDENT, GRAVE INJURIES OR MATERIAL DAMAGES.

The default configuration provides the internal Brake Resistor set-up. Do not remove the plug connector!

In general, it's possible to make the following configurations:

- Internal resistor (normal applications)
- Internal + external resistor (intermittent applications with high inertial loads)
- External resistor (continual applications with high inertial loads)

the *Figure 7.3* reports the braking resistor connection

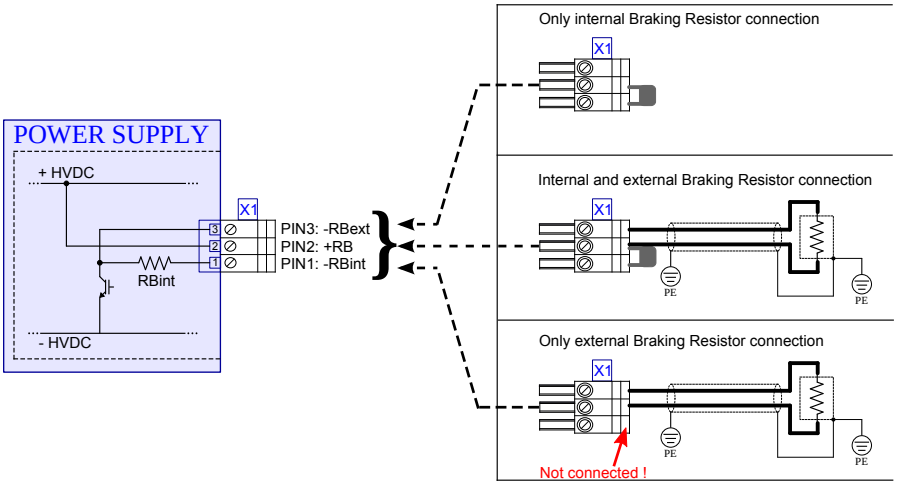


Figure 7.3. Braking resistor connection.

7.2.6. Connectors

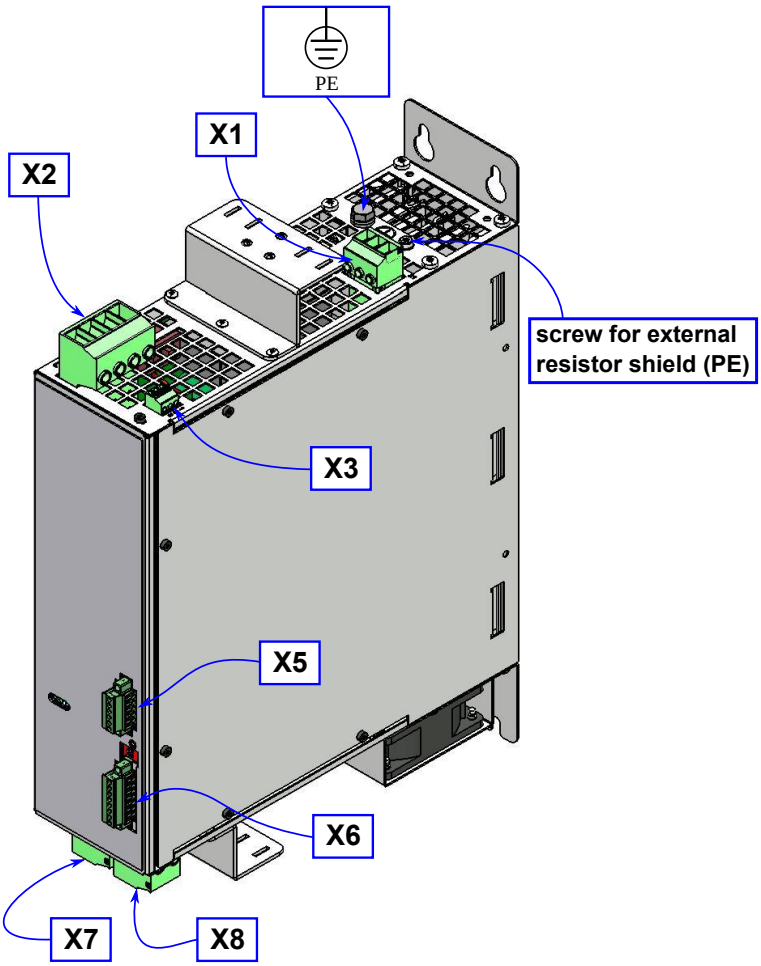


Figure 7.4. Connectors arrangement.

Warning

Check the integrity of the connectors and that the terminals are correctly installed and insulated.

Note

The connectors are prescribed for fixed conductors. Comply with the maximum connection section. Carefully insert the conductors to obtain the maximum amperage and the maximum vibration resistance.

Note

Use 60/75°C rated copper conductor only.

Protection grounding screw connection

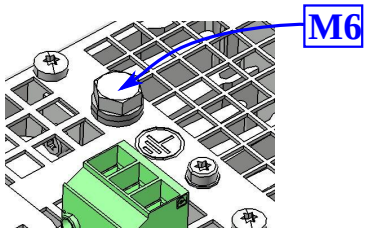
High leakage on the protection earth

This power supplier may cause the presence of leakage currents > 3,5mA on the protection earth. Use a protection earth conductor with minimum section according to what's reported in *Section 7.2.1, "Complete connection scheme"*. This power supplier may cause the presence of leakage currents > 3,5mA on the protection earth. Use a protection earth conductor with minimum section according to what's reported in *Section 7.2.1, "Complete connection scheme"*.

For the grounding connection, respect the local regulations. The non-compliance with this precautions may provoke grave injuries or death.

Screw for the connection with the common reference PE.

Screw M6		
Tightening torque	[Nm]	6

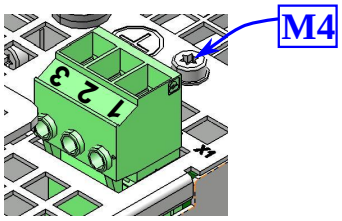


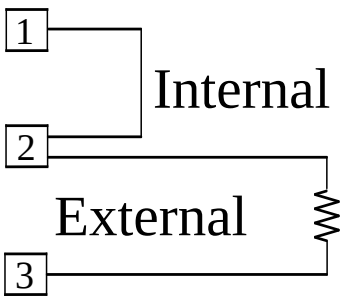
PIN	Diagram	Description
	PE	Protection Earth.

X1 Brake Resistor

Connector for the brake resistor and screw M4 for the grounding of the shield of the external resistor cable.

Phoenix PC 5/ 3-ST1-7,62 (1777736)		
Connector type	-	female extractable
Poles number	-	3
Stranded copper conductor section	[mm^2] (CE) [AWG] (UL)	0,2 ÷ 6 (CE) 24 ÷ 8 (UL)
Tightening torque	[Nm] [lb in]	0,8 7
Rated voltage	[V]	1000 (CE) 600 (UL)
Rated current	[A]	41



PIN	Diagram	Description	V_{pin} > ELV
1		In order to use the internal brake resistor, short circuit the pins 1 and 2.	YES
2			YES
3		In order to use the external brake resistor, connect it between the pins 2 and 3.	YES

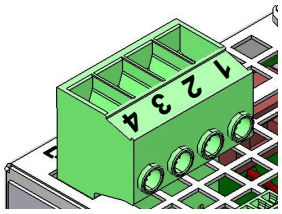
If an external resistor is connected, then connect the brake resistor cable shield to the screw M4, near the connector X1.

Screw M4		
Tightening torque	[Nm]	2

X2 Power Line

Connector for the three-phase supply.

Phoenix PC 16/ 4-ST-10,16 (1967391)		
Connector type	-	female extractable
Poles number	-	4
Stranded copper conductor section	[mm^2] (CE) [AWG] (UL)	0,75 ÷ 16 (CE) 20 ÷ 6 (UL)
Tightening torque	[Nm] [lb in]	1,7 ÷ 1,8 15
Rated voltage	[V]	1000 (CE) 600 (UL)
Rated current	[A]	76 (CE) 55 (UL)

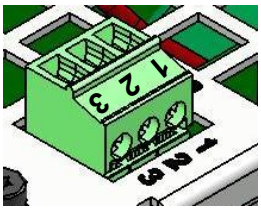


PIN	Signal	Description	V_{pin} > ELV
1	L1	Line 1 of Three-phase source	YES
2	L2	Line 2 of Three-phase source	YES
3	L3	Line 3 of Three-phase source	YES
4	PE	Protection earth	NO

X3 Control supply

Connector for the 24V control section supply.

Phoenix MC 1,5/ 3-ST-3,81 (1803581)		
Connector type	-	female extractable
Poles number	-	3
Stranded copper conductor section	[mm^2] (CE) [AWG] (UL)	0,14 ÷ 1,5 (CE) 30 ÷ 14 (UL)
Tightening torque	[Nm] [lb in]	0,22 ÷ 0,25 2 ÷ 4
Rated voltage	[V]	160 (CE) 300 (UL)
Rated current	[A]	8



PIN	Signal	Description	V_{pin} > ELV
1	+24V	+24Vdc Control Supply[a]	NO
2	+24V	+24Vdc Control Supply[a]	NO
3	GND	Ground Control Supply	NO

[a]The pin 1 and 2 are internally connected, it's then sufficient to provide the 24V to one of them only.

X5 Input/Output

Connector for the digital inputs and outputs.

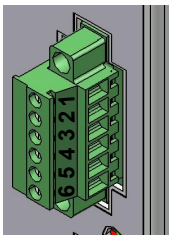
Caution

Be sure that the wiring, the cables and the connected interface comply with the PELV requirements.

Phoenix MCVR 1,5/ 6-STF-3,5 (1863343)		
Connector type	-	female extractable
Poles number	-	6
Stranded copper conductor section	[mm^2] (CE) [AWG] (UL)	0,13 ÷ 1,5 (CE) 30 ÷ 14 (UL)
Tightening torque	[Nm] [lb in]	0,22 ÷ 0,25 2 ÷ 4
Rated voltage	[V]	160 (CE) 300 (UL)
Rated current	[A]	8

Note

The IN0 PNP digital input (24V) has the common ground connected to the 24V supply ground that's present on *X3 Control supply*-pin 3. For this reason it's advisable to connect each input signal to this ground.



PIN	Signal	Description	V_{pin} > ELV
1	IN0	Reset Fault	NO
2	OUT0	HVDC Ready	NO
3	OUT1	Vac Line State	NO
4	OUT2	Fault	NO
5	RTO Contact	*Section 6.7, RTO contact: Ready To Operate*	NO
6			NO

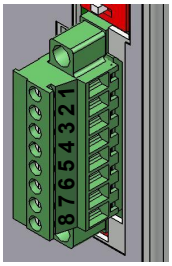
X6 COM port

Connector for the communication with Modbus protocol on RS485.

Phoenix MCVR 1,5/8-STF-3,5 (1863369)		
Connector type	-	female extractable
Poles number	-	8
Stranded copper conductor section	[mm^2] (CE) [AWG] (UL)	0,13 ÷ 1,5 (CE) 30 ÷ 14 (UL)
Tightening torque	[Nm] [lb in]	0,22 ÷ 0,25 2 ÷ 4
Rated voltage	[V]	160 (CE) 300 (UL)
Rated current	[A]	8

Caution

This serial port is isolated. The cable shield must be connected to the earth on the host side (PC) and to the pin 8 on the power supply side.

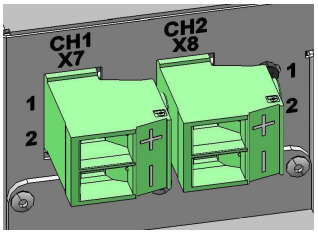


PIN	Signal	Description	V_{pin} > ELV
1	-	Not connected	NO
2	-	Not connected	NO
3	COM SELECTION 3 — RS232 — 4 3 — NC 4 — NC Reserved	short circuit = RS232, open circuit = Not implemented	NO
4			NO
5	GND_COM	Ground RS232	NO
6	TX232	Transmit Data RS232	NO
7	RX232	Receive Data RS232	NO
8	SHIELD	Shield	NO

X7 and X8 Power Output

Connectors relative to the HVDC output channels. The channels CH1 and CH2 are respectively related to X7 and X8 connectors.

Phoenix IPC16/2-ST-10,16 (1969373)		
Connector type	-	female extractable
Poles number	-	2
Stranded copper conductor section	[mm^2] (CE) [AWG] (UL)	0,75 ÷ 16 (CE) 20 ÷ 6 (UL)
Tightening torque	[Nm] [lb in]	1,7 ÷ 1,8 15
Rated voltage	[V]	1000 (CE) 600 (UL)
Rated current	[A]	76 (CE) 55 (UL)



PIN	Signal	Description	V_{pin} > ELV
1	+HVDC	+HVDC Power Output	YES
2	-HVDC	-HVDC Power Output	YES

7.3. Leds

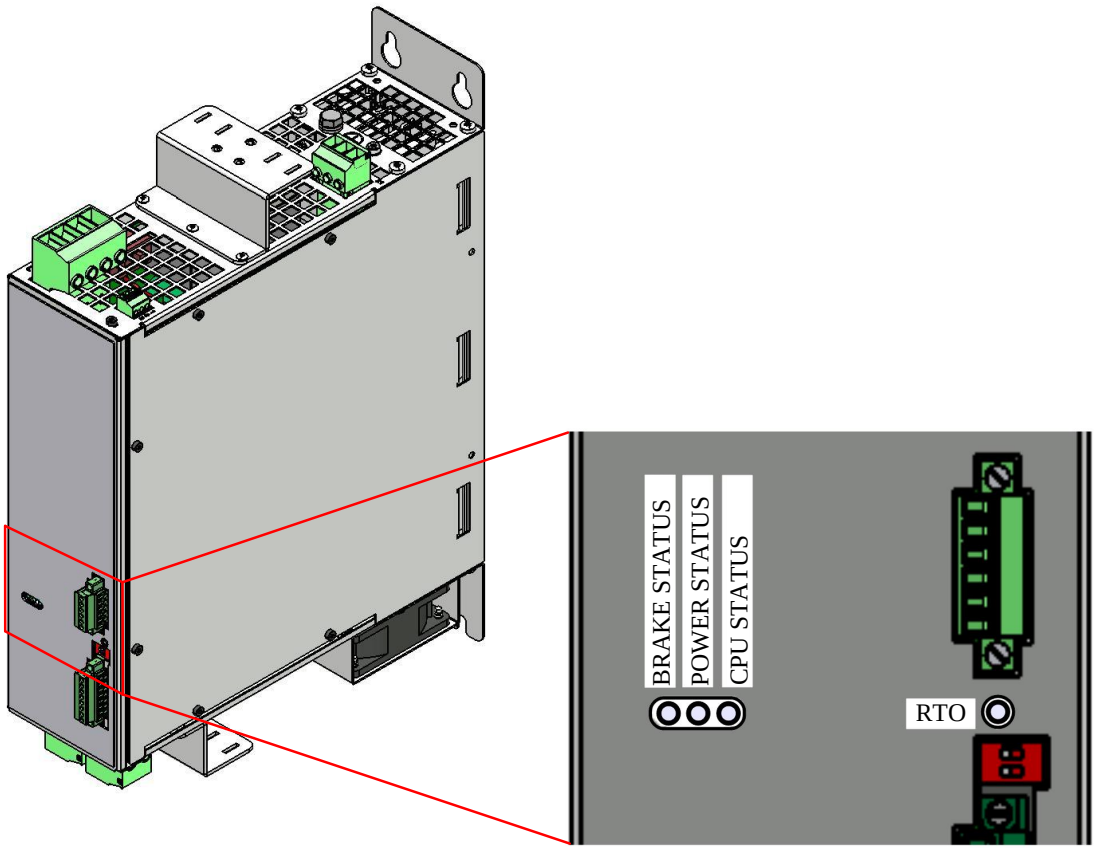


Figure 7.5. Leds and switches arrangement.

The leds can have the following statuses:

- *OFF*: led switched off;
- *ON*: fixed led switched on;
- *BLK* (blinking): led 200 ms on, 200 ms off;

The leds notifications meaning can be found in the following table:

Leds	Colour	Status	Meaning
RTO CONTACT STATUS	-	OFF	Open contact
	GREEN	ON	Closed contact
CPU STATUS	-	OFF	CPU not working (check Control Voltage)

Leds	Colour	Status	Meaning
	GREEN	ON	CPU working in firmware mode
	ORANGE	ON	CPU working in boot mode
	RED	ON	CPU in reset
POWER STATUS	-	OFF	Power supply off or in boot
	GREEN	BLK	Start-up sequence (voltage/current monitor)
	GREEN	ON	Power supply operative, output current <70% Inom. (no warning and fault)
	GREEN and ORANGE	BLK	Power supply operative, output current ≥70% Inom (no warning and fault)
	ORANGE	ON	Power supply in warning, power section is working (one or more active warning)
	RED	ON	Power supply in fault, power section is not working (one or more active fault)
BRAKE STATUS	-	OFF	Brake not active
	ORANGE	ON	Brake active (energy < 50% of the maximum tolerable)
	RED	ON	Brake active (energy ≥ 50% of the maximum tolerable)

Table 7.5. Description of the leds for BDPOW.

7.4. Switch

Earth Capacitor Switch

This power supply contains a filter that decreases the noises and is connected to the ground through a capacitor. The slide switch SW1 allows to disconnect the capacitor and then to reduce the current leakage to earth and the load on the same capacitor.

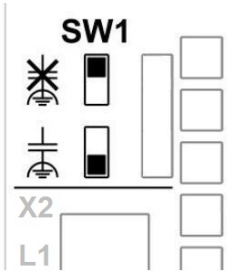


Figure 7.6. Switch SW1 arrangement.

Caution

The capacitor disconnection implies a non-compliance to the EMC standards. In any case always cut the input line before to operate on SW1.

Note

The default position of SW1 is with the capacitor connected to the earth.

Chapter 8

Power supply logical states

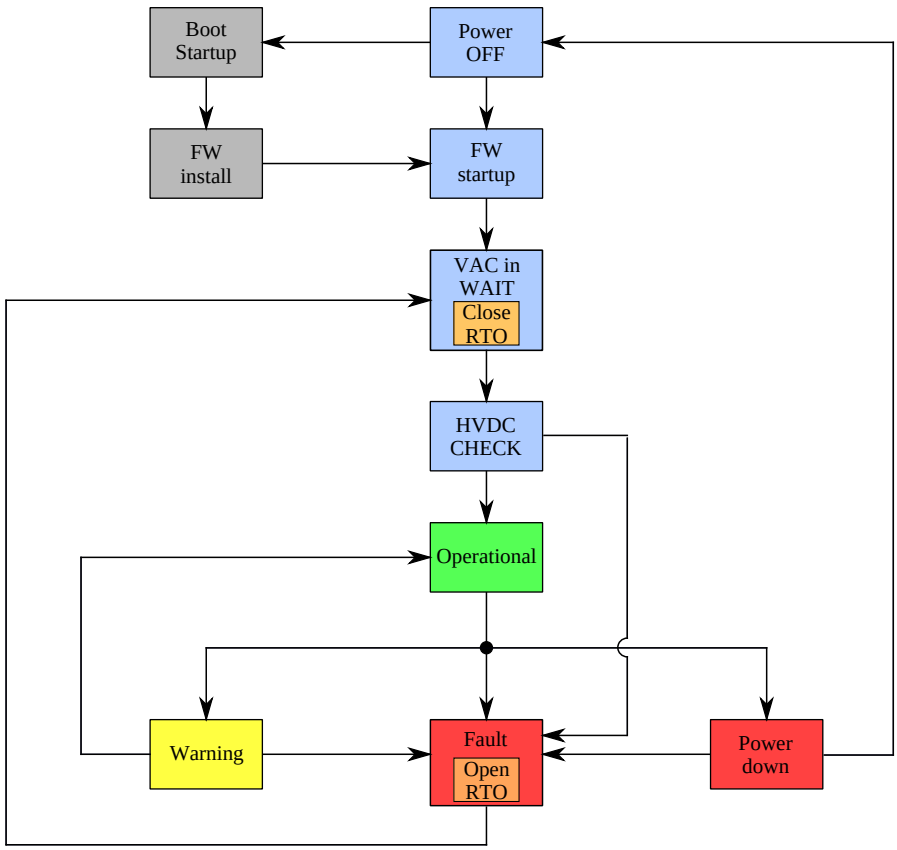


Figure 8.1. Logical states diagram.

Status	Value *DeviceStatus*	Description
Power OFF	-	Control section 24Volt supply missing, through the hardware circuit the RTO contact is kept disabled
Boot Start-up	-	24V supply present, boot start-up to cover a firmware anomaly (corrupted firmware or hardware and boot incompatibility)
FW Install	-	Updating the firmware through the debug serial port

Status	Value *DeviceStatus*	Description
FW Start-up	0	24 Volt supply present, firmware start-up
	1	24 Volt supply present, system auto-test, capacitor discharge
	2	24 Volt supply present, measurement circuit calibration
VAC in WAIT	3	The RTO contact is closed and the VAC input voltage is controlled, the next status is reached only if an input voltage included in the functioning limits is detected, otherwise the VAC in WAIT status remains
HVDC CHECK	4	The output voltage trend is analyzed: within the capacitors charging time the voltage must grow until a value within VOUT_MIN and VOUT_MAX.
	5	The output voltage trend is analyzed: ripple must be lower than a safety threshold. At the end of this phase, if all the parameters are within the limits, the system is in normal functioning conditions and the device switches to the Operative Status, otherwise it switches to the Fault Status
Operational	6	The power supply works normally, no warnings or faults are detected, the input voltage is present
	7	The power supply works normally, no warnings or faults are detected, the input voltage is not present
Warning	8	The power supply works normally, but some parameter has exceeded the warning threshold (voltage/current/temperature)
Fault	9	The power supply is in this status when one of the type of the monitored faults happens, so the RTO contact is opened and the timer of Fault restore waiting starts. When the restore waiting time is elapsed it is verified if the fault is solved, and in this case the power supply returns in the VAC in WAIT status, according to the available restore sources (IN0 input, automatic restore, restore via software with SDSetup); otherwise the Fault status remains.
Power down	10	The power supply is in this status when the control voltage fall below the undervoltage threshold, in this case the RTO contact is opened. If the voltage supply restores, the power supply switches to the "NO 24V IN" status and returns the *Input voltage missing on control section* fault.

Table 8.1. Power supply logical states description.

Chapter 9

Parametrization

9.1. Limits that can be set by the user

The following table summarizes the user parameters description.
When the value of *Reference variable* or of the *Increment variable* (if it exists) exceeds the set limit value (*User parameter*) the system enters in the related *Fault* status.

Reference variable	Increment variable	User parameter	Fault
RMS_OutputCurrent	*DeviceEnergyOverloadPercentage*	*OutputCurrentLimit*	*Device energy overload exceeds the limit*
RMS_CurrentCH1	*CableEnergyOverloadPercentageCH1*	*CableCurrentLimit(CH1)*	*Cable energy overload exceeds the limit on channel 1*
RMS_CurrentCH2	*CableEnergyOverloadPercentageCH2*	*CableCurrentLimit(CH2)*	*Cable energy overload exceeds the limit on channel 2*
HVDC_OutputVoltage	-	*OvervoltageLimit*	*Overvoltage of power section*
HVDC_OutputVoltage	*BrakeEnergyOverloadPercentage*	*BrakingCircuitActivationVoltage*	*Braking circuit energy overload exceeds the limit*
-	-	*RMS_Average_CalculationPeriod*	-

The *CableCurrentLimit(CH1)* and *CableCurrentLimit(CH2)* parameters are independent each other, and their value must be adequate to the section of the cables that are connected to the outputs. The *OutputCurrentLimit* parameter determines the maximum value of the total output current, but it doesn't affect the current limit values that can be set on each single output.

OutputCurrentLimit

This parameter refers to the *RMS_OutputCurrent*.
When *RMS_OutputCurrent* > *OutputCurrentLimit* the *DeviceEnergyOverloadPercentage* variable increases and when it reaches the 100% the fault intervenes : *Device energy overload exceeds the limit*.

The intervention time is obtained from the I^2T internal calculation, in particular it takes the value of 5sec when the following conditions occur: line 400Vac, *RMS_OutputCurrent* equal to 2**OutputCurrentLimit*.

CableCurrentLimit(CH1)

This parameter refers to the *RMS_CurrentCH1*.
When *RMS_CurrentCH1* > 1,3**CableCurrentLimit(CH1)* the *CableEnergyOverloadPercentageCH1* variable increases and when it reaches the 100% the fault intervenes : *Cable energy overload exceeds the limit on channel 1*.
The intervention time is obtained from the I^2T internal calculation, in particular it takes the value of 3600sec (1 hour) when the following conditions occur: line 400Vac, *RMS_CurrentCH1* equal to 1,3**CableCurrentLimit(CH1)*.

CableCurrentLimit(CH2)

This parameter refers to the *RMS_CurrentCH2*.
When *RMS_CurrentCH2* > 1,3**CableCurrentLimit(CH2)* the *CableEnergyOverloadPercentageCH2* variable increases and when it reaches the 100% the fault intervenes : *Cable energy overload exceeds the limit on channel 2*.
The intervention time is obtained from the I^2T internal calculation, in particular it takes the value of 3600sec (1 hour) when the following conditions occur: line 400Vac, *RMS_CurrentCH2* equal to 1,3**CableCurrentLimit(CH2)*.

OvervoltageLimit

This parameter refers to the *HVDC_OutputVoltage*.
When *HVDC_OutputVoltage* > *OvervoltageLimit* the fault status activates: *Overvoltage of power section*.

BrakingCircuitActivationVoltage

This parameter refers to the *HVDC_OutputVoltage*.
When *HVDC_OutputVoltage* > *BrakingCircuitActivationVoltage* the Brake Circuit activates to limit the *HVDC_OutputVoltage*. Consequently, if the power that is absorbed by the Brake Circuit is greater than the *IntBrakeResistorNominalPower* or the *ExtBrakeResistorNominalPower*, the *BrakeEnergyOverloadPercentage* variable increases and when it reaches the 100% the fault status activates: *Braking circuit energy overload exceeds the limit*.

RMS_Average_CalculationPeriod

It is applied to all the RMS, AVG variables of CH1, CH2 and total current. An example of RMS and AVG variables is the following: RMS current, RMS output current, RMS back-feeding current, AVG current, AVG power referred to both CH1 and CH2.

Chapter 10

Fault and warning

The BDPOW power supply provides some monitor functions of its physical quantities (voltage, current, temperature, etc.) in order to check the correct functioning and to protect the electronic devices that are connected to it. The Fault status signal is indicated by the POWER STATUS red led (see *Section 7.3, "Leds"*), through SDSetup it's possible to know the Fault that is occurred.

10.1. Errors description

The errors are divided in two categories, depending on their severity level:

- **Warning**: error that indicates a non grave condition of the power supply
- **Fault**: error that prevents and interrupts the power supply on the power section through the RTO contact opening (except for *Input voltage missing on power section*);

In general, when the power supply is in the Operative or Warning status, all the physical quantities are monitored (voltage, current, temperature, etc.) and if one of them exceeds the functioning limits, it switches to the Fault status.

Furthermore, the errors can be:

- **Dynamic**: the error condition is present if and as long as the error cause is present;
- **Retentive**: the error is active until the next reset command (even if the error cause has been removed).

Tip

For the details and the solutions of the faults please see*Section 10.3, "Errors description"*

10.2. Errors reset

> **Caution**
>
> The only Faul condition that's exclusively Dynamic is *Undervoltage of power section* with *Input voltage missing on power section*. In this case an automatic restart is done and the Fault state is reset.
>
> If *Undervoltage of power section* intervenes when the input alternate current (VAC_IN) is present, it is not automatically restorable and the Fault status remains.

The restore of the power supply from the Fault status can be made in different ways, if the condition listed in *Necessary requirements to execute the faults reset* are respected.

The modes are:

- Turn on - turn off cycle of the control voltage: if the control supply is off and then turned on, the power supply returns in the VAC_IN_WAIT state;
- automatic restart: if the *AutomaticRestartFunction* parameter is set to 1, the power supply starts an automatic restore procedure of the errors. This procedure is repeated at every expire of the *FaultLockTime* until the cause that has triggered the fault is not removed. When the reset procedure succeeds, the power supply returns in the VAC_IN_WAIT state;
- restore through IN0: if a positive transition is detected on the IN0 input, the power supply returns in the VAC IN WAIT state;
- restore from SDSetup: by pushing the Reset Errors button, the power supply returns in the VAC_IN_WAIT state.

Necessary requirements to execute the faults reset

In order to reset the faults, the following conditions must be verified:

- it must not be present any Dynamic Fault;
- Accumulated over energy discharge waiting (only for the faults that are reported in *Table 10.1*)
- waiting the expire of the restoring time *FaultLockTime*: in order to avoid damages to the power supply, it is necessary to wait a minimum time before to execute a Fault Reset command. At every single Fault is related a different instance of the waiting time (for details see *Table 10.2*).

Caution

After the turn off of the control supply the *FaultLockTime* is lost. The value of the collected energy is memorized after the turn off of the control supply only for the Faults which values are saved in the retentive memory (see *Table 10.1*).
DO NOT REMOVE THE CONTROL SUPPLY IN ORDER TO AVOID INTERNAL DAMAGES.

Fault	1% discharge time	100% discharge time	Retentive memorization of the Faults after the turn off of the control voltage
Braking circuit energy overload exceeds the limit	0,5s (CE) / 2,4s (UL)	50s (CE) / 240s (UL)	*YES*
Charge circuit energy overload	0,5s (CE) / 1s (UL)	50s (CE) / 100s (UL)	*YES*
Cable energy overload exceeds the limit on channel 1	24,8s	2480s	*YES*
Cable energy overload exceeds the limit on channel 2	24,8s	2480s	*YES*
Device energy overload exceeds the limit	0,15s	15s	-
Device energy overload exceeds the limit on channel 1	0,17s	17s	-
Device energy overload exceeds the limit on channel 2	0,17s	17s	-

Table 10.1. Accumulated energy discharge maximum time estimation.

10.3. Errors description

In the following table every single Fault and Warning is listed.

- WD: dynamic warnings
- WR: retentive warnings
- FD: dynamic faults
- FR: retentive faults

Error type	*FaultLockTime* (s)	Error Code	WD	WR	FD	FR
Undervoltage of power section	5	1	-	-	*YES*	*YES*
Overvoltage of power section	5	2	-	-	*YES*	*YES*
Voltage ripple exceeds the limit on power section	10	3	-	-	*YES*	*YES*
Overtemperature of control section	10	4	*YES*	*YES*	*YES*	*YES*
Overtemperature of power section	10	5	*YES*	*YES*	*YES*	*YES*
Overcurrent of power section	10	6	-	-	*YES*	*YES*
Device energy overload exceeds the limit	10	7	*YES*	*YES*	*YES*	*YES*
Braking circuit energy overload exceeds the limit	10	8	*YES*	*YES*	*YES*	*YES*

Error type	*FaultLock-Time* (s)	Error Code	WD	WR	FD	FR
Overvoltage of HVDC output during braking	-	-	*YES*	*YES*	-	-
Input voltage missing on power section	9	-	-	*YES*	*YES*	
Short circuit on braking circuit	10	10	-	-	*YES*	*YES*
Input voltage missing on control section	0.1	11	-	-	*YES*	*YES*
Charge circuit energy overload	100	12	-	-	*YES*	*YES*
Configuration parameters missing	-	13	-	-	*YES*	*YES*
Device energy overload exceeds the limit on channel 1	10	16	*YES*	*YES*	*YES*	*YES*
Device energy overload exceeds the limit on channel 2	10	17	*YES*	*YES*	*YES*	*YES*
Internal circuit ripple exceeds the limit on power section	10	18	-	-	*YES*	*YES*
Input voltage falling on power section	5	19	-	-	*YES*	*YES*
Cable energy overload exceeds the limit on channel 1	100	21	*YES*	*YES*	*YES*	*YES*
Cable energy overload exceeds the limit on channel 2	100	22	*YES*	*YES*	*YES*	*YES*
Hardware configuration not valid	10	20	-	-	*YES*	*YES*
IGBT feedback error on braking circuit	10	24	-	-	*YES*	*YES*

Table 10.2. Errors list: related codes and restoring times.

Here follows the list of the faults that are managed (see *Table 10.2*) and the corrective action to perform.

Note

About the data related to the functioning ranges, temperature, etc. refer to *Chapter 6, Technical features*.

Undervoltage of power section

HVDC effective voltage lower than the minimum limit.
Check that the input voltage (VAC_IN) is within the expected functioning range, that there is no phase voltage difference and tthat here are no voltage dips.

Overvoltage of power section

HVDC effective voltage higher than the minimum limit.
Check that the input voltage (VAC_IN) is within the expected functioning range, and check if the overvoltage is due to the regeneration current of the connected drives.

Voltage ripple exceeds the limit on power section

Voltage ripple higher than the 25 % of the nominal voltage for 700 ms.

Check that the input voltage (VAC_IN) is three-phase and within the expected functioning range and there are no voltage dips (if one of the three phases is missing and a load is present on the output a higher ripple effects on HVDC are produced, and they may activate this fault); check if there are overload conditions on the output line (HVDC).

Overtemperature of control section

Temperature of the control section higher than the maximum limit.
Check the power supply environment temperature and its correct positioning and ventilation inside the electrical panel.

Overtemperature of power section

Temperature of the power section higher than the maximum limit.
Check the power supply environment temperature and its correct positioning and ventilation inside the electrical panel. Furthermore, check the BRAKE circuit intervention frequency if it has been configured the internal brake resistor use (Internal brake circuit) (see *Section 6.6, Brake resistor*).

Overcurrent of power section

Instantaneous output current higher than the maximum limit.
Check the output current and the eventual peaks.

Device energy overload exceeds the limit

Energy supplied by the power supply higher than the maximum value.
Check that the *RMS_OutputCurrent* is not higher than the *OutputCurrentLimit*.

Braking circuit energy overload exceeds the limit

Energy absorbed by the overvoltage protection circuit higher than the maximum value.
Check the BRAKE circuit intervention frequency (see *Section 6.6, Brake resistor*), check if the Brake switch on threshold parameter has been set with a too low value (*BrakingCircuitActivationVoltage*).

Overvoltage of HVDC output during braking

The output voltage exceeds by 15V the *Maximum activation threshold* of the Braking Circuit.
Check the braking resistor value or decrease the motors braking dynamic (deceleration ramps).

Input voltage missing on power section

Power section input voltage missing.
Check the RTO contact (*Section 6.7, RTO contact: Ready To Operate*) and the power relay activation, check the upstream supply of the power relay and the status of eventual fuses, disconnecting switches.

Short circuit on braking circuit

Short circuit detected in the Brake protection section.
Check the connector *X1 Brake Resistor* (connection of the external resistor, check even its value).

Input voltage missing on control section

Control section voltage supply missing (< 18 Vdc).
Check if the 24V supply on *X3 Control supply* is within the correct range and that there are no voltage dips during the functioning.

Charge circuit energy overload

The energy absorbed by the capacitor charging current limitation circuit is higher than the maximum value (see *Chapter 6, Technical features*).
Check that at the start-up there are no loads on the output connectors *X7 e X8 Power Output* (the output load during this operation must mainly be capacitive).

Configuration parameters missing

Missing or corrupted configuration parameters, it's not possible to use the power supply because the set of the parameters that characterize it is not valid and can't be restored by the user.
Send back to repair, please contact CMZ SISTEMI ELETTRONICI S.r.l.

Device energy overload exceeds the limit on channel 1

Energy supplied in the CH1 channel higher than the maximum value.
Check that the *RMS_CurrentCH1* is within the range.

Device energy overload exceeds the limit on channel 2

Energy supplied in the CH2 channel higher than the maximum value.
Check that the *RMS_CurrentCH2* is within the range.

Internal circuit ripple exceeds the limit on power section

During the start-up, the output voltage difference (ripple) between VBRIDGE (HVDC nominal value) and the actual value of HVDC is higher than 50V (see *Section 6.5.1, "Charge circuit functioning"*).
Check that at the start-up there are no excessive loads on the output connectors *X7 e X8 Power Output*.

Input voltage falling on power section

Input voltage dip for more than 20 ms and HVDC output voltage value lower than the 65% of the nominal voltage.
Check the VAC_IN input alternate voltage, the wiring and the protection upstream of the power supply.

Cable energy overload exceeds the limit on channel 1

Protection energy of the cable connected to X7 (CH1) higher than the maximum value (see *X7 e X8 Power Output*).
Check that *RMS_CurrentCH1* is within the limit *CableCurrentLimit(CH1)*. Check that the value that is set on *CableCurrentLimit(CH1)* and/or *CableCurrentLimit(CH2)* is not too low. If it will be necessary to increase its value, check the dimensioning of the cable (section, length, ...) to avoid the overheating.

Cable energy overload exceeds the limit on channel 2

Protection energy of the cable connected to X8 (CH2) higher than the maximum value (see *X7 e X8 Power Output*).
Check that *RMS_CurrentCH2* is within the limit *CableCurrentLimit(CH2)*. Check that the value that is set on *CableCurrentLimit(CH1)* and/or *CableCurrentLimit(CH2)* is not too low. If it will be necessary to increase its value, check the dimensioning of the cable (section, length, ...) to avoid the overheating.

Hardware configuration not valid

Hardware configuration not valid.
Send back to repair, please contact CMZ SISTEMI ELETTRONICI S.r.l.

IGBT feedback error on braking circuit

short-circuit Fault detected on the IGBT braking circuit. Check the connections of *X1 Brake Resistor* or contact CMZ Srl

10.4. Errors in parameters reading / writing

When a parameter reading / writing error occurs, to understand the problem it's necessary to get the error code.

- auxiliary communication port: the error code of the last failed access is reported in *AuxiliaryPortErrorCode*;

AuxiliaryPortErrorCode	Error	Description
0x00	No error	No error.
0x01	Modbus protocol error: illegal function	Modbus function code not supported. In *Table 4.1* the admitted codes are listed.
0x02	Modbus protocol error: address not existent	Address not existent: the combination of the Modbus address and the number of data to be read / write is not valid; the addresses that are included in the required range must be present in the object dictionary.
0x03	Modbus protocol error: data dimension too large	Quantity of data not admitted: it's too high or equal to 0.
0x10	Modbus protocol error: illegal upload/download code	Upload/download code not valid.
0x11	Modbus protocol error: unexpected upload/download state	Upload/download status not expected.
0x12	Modbus protocol error initializing upload/download	Upload/download wrong initialization.
0x13	Modbus protocol error during upload/download	Error during the data upload/download.
0x14	Modbus protocol error closing upload/download	Error during the upload/download closing.
0x15	Modbus protocol error: memory overflow during upload/download	Insufficient memory to complete the upload/download.
0x16	Unexpected toggle bit	Toggle bit not alternated during the upload/download.
-	Client / server command specifier not valid or unknown	Command specifier of the SDO frame not valid.
0x20	Memory not available	Insufficient memory to execute the required operation.
0x21	Access denied	Access denied to the parameter.
0x22	Attempt to read a write only object	Reading failed, the parameter can only be written.
0x23	Attempt to write a read only object	Writing failed, the parameter can only be readed.
0x24	General parameter incompatibility	Generic data incompatibility.
0x25	General internal incompatibility	Generic incompatibility, internal of the power supply.
0x26	Hardware error	Access failed due to a hardware error.
-	Data type does not match	Wrong data dimension.
0x27	SubIndex not exist	Sub-index CANopen or EtherCAT not existent.
0x28	Parameter out of range	Parameter value out of the admitted range.
0x29	Generic error	Generic error.

Auxiliary-PortErrorCode	Error	Description
0x2A	Internal control refuse data	Access denied because of a local control.
0x2B	Internal state refuse data	Access denied because of the actual power supply status.
0x2C	Object does not exist	Index CANopen or EtherCAT not existent.
0x2D	Object not mappable on PDO	Parameter not mappable in the PDOs.
0x2E	Length of object mapped exceed PDO length	The dimension of the data that are mapped in the PDOs is too big.

Table 10.3. Coding of the parameters reading / writing error codes.

Chapter 11

Software updating

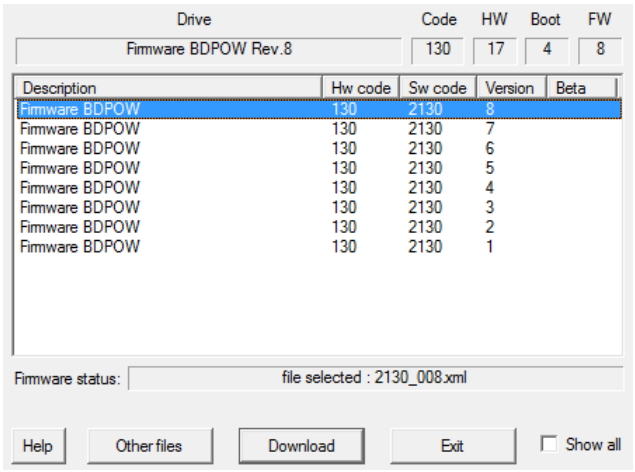
11.1. Firmware updating

> **Caution**
>
> The firmware updating does not delete any data saved in the permanent memory.

To update the firmware, connect the power supply with SDSetup and open the Download firmware window. Access with SDSetup:

Main menu > Supply > Download firmware ...

Toolbar > 



In the Download firmware window, choose the desired firmware and press Download. If the firmware does not appear in the proposed list, update the Configuration files.

> **Tip**
>
> If at the end of the download, the firmware does not start up, check what reported in the window and in the parameter in *FirmwareStatus*.

11.2. Updating the boot

> **Caution**
>
> If during the boot updating the control section runs out of power, the power supply cannot be used anymore and must be sent back to CMZ SISTEMI ELETTRONICI S.r.l.. During the updating, supply power to the BDPOW with an uninterruptible power supply (UPS).

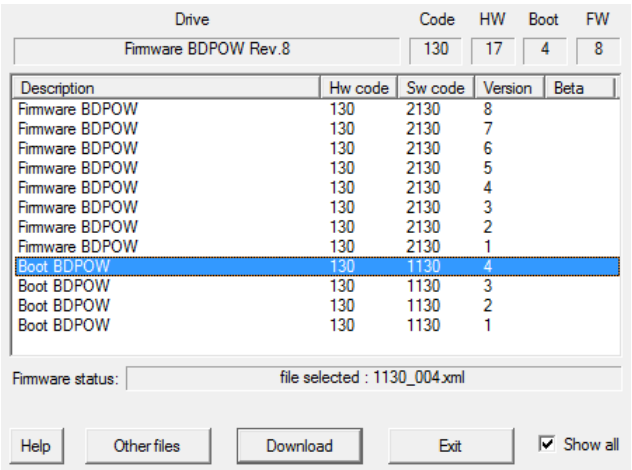
To update the boot, connect the power supply with SDSetup and open the Download firmware window.

> **Caution**
>
> Update the boot software only if really necessary.

Access with SDSetup:

Main menu > Supply > Download firmware ...

Toolbar > 



Activate the Show all option in the download firmware window, select the desired boot and push Download. If the boot does not appear in the proposed list, update the Configuration files.

> **Note**
>
> After downloading the boot it is necessary to download the firmware again. The data saved in the permanent memory are not cancelled.

11.3. Updating the Configuration File

The Configuration files are files xml used by SDSetup to communicate with the power supply.

Updating the Configuration files from the CMZ website

- Connect to the *http://www.cmz.it* website and enter the *DOWNLOAD AREA* through the menu on the left. If you are not a registered user, please register.
- Select the *Stepper and stepless series* folder > *Tools* and download the *SDFirmwareSetup.exe* file by clicking on the *SDFirmwareSetup* link.
- Run the downloaded file by following the proposed procedure.

Installation from file

- If the *SDFirmwareSetup.exe* file is already present in the PC, launch the file execution and follow the proposed procedure.

Chapter 12

Object dictionary

> **Caution**
>
> The parameters that are described in this chapter refers to the version of firmware and hardware as reported at the beginning of the *Chapter 1, General informations about this manual*.

The exchange of data with the power supply takes place through a list of parameters, called *Object dictionary*. The parameters define and control each single function of the power supply.

12.1. Agreements on the parameters description

Every power supply parameter is described in this chapter by the fields in the following table:

Field	Description
All	The written "*Desc*", in whatever box is inserted, means that the field information can be found in the following description.
Modbus	Parameter address which is accessible through protocol Modbus. The number is expressed on a decimal basis.
CANopen	Parameter address which is accessible through protocol CANopen[a].
Range	Range of values accepted for the parameter. If it is not specified it means that all values represented by the type of datum associated to the parameter are considered as valid.
Default	Parameter default value.
Type	Type of datum associated to the parameter: • U8: 8 bits without sign • U16: 16 bits without sign; • U32: 32 bits without sign; • S8: 8 bits with sign; • S16: 16 bits with sign; • S32: 32 bits with sign; • STR: string; • IQN: notation at fixed point at 32 bits with sign and N bits after the point; • FLT: floating point single precision.

Field	Description
Units	Units of measurement of the parameter.
Acc	Type of access to the parameter: • RW (read/write): reading and writing; • WO (write only): only writing; • RO (read only): only reading; • CST (constant): only reading (constant parameter).
PDO	This voice is related only to the CANopen protocol, that is actually not implemented.
Mem	Type of parameter saving in the permanent memory: • -: parameters non savable in the permanent memory • ES: parameters savable in the permanent memory that cannot be restored on command with the default values; • EM: parameters savable in the permanent memory that are not restored on command with default values.

[a] The CANopen protocol is actually not implemented.

Table 12.1. Fields describing the parameters

12.2. Reading and writing a parameter

The dimension of every *Modbus register* is 1 Word (2 byte). Therefore each parameter takes a minimum of 2 bytes of memory. For example:

- if a parameter is 8 bit long (1 byte = 1/2 Word) it takes 1 word anyway, therefore if it is on 4100 Modbus address, the next parameter is on 4101;

- if a parameter is 16 bit long (2 byte = 1 Word) it takes 1 word, therefore if it is on 1201 Modbus address, the next parameter is on 1202;

- if a parameter is 32 bit long (4 byte = 2 Word) it takes 2 words, therefore if it is on 4110 Modbus address, the contained data take even the 4111 register and, in consequence, the next parameter is on 4112;

Note

To read and write a parameter via Modbus, send a frame by using the function codes written in *Table 4.1*.

To select the parameter to read or write in the window Object dictionary, you can click on the proposed list, write the name and the address or use the search by name functions in the box Filter (for details about the dictionary interface use, refer to *Section 3.8, Object dictionary*).

Tip

To interpret any error messages please see *Section 10.4, Errors in parameters reading / writing*.

12.3. Initial configuration, update and board identity (0-599)

DeviceInformation

Informations related to the device.

Number of entries

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
-	-	6	6	U8	-	CST	-	-

Number of parameters in this group.

HardwareRevision

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
12	-	-	-	S16	-	RO	-	-

Device hardware revision.

BootRevision

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
15	-	-	-	S16	-	RO	-	-

Boot firmware revision.

FirmwareRevision

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
18	-	-	-	S16	-	RO	-	-

Firmware revision. If the value is -1, only the boot firmware is present.

HardwareProductCode

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
21	-	-	-	U32	-	RO	-	-

Device hardware code.

OemCode

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
33	---	6868	6868	U16	-	CST	-	-

Code that identifies the manufacturer.

SoftwareProductCode

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
34	-	-	-	U16	-	RO	-	-

Device software code.

FirmwareStatus

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
40	-	-	-	U8	-	RO	-	-

Firmware status.

FirmwareStatus	Message	Solution
0	CRC has not been checked yet	Wait the end of the download procedure.
1	Do not launch firmware	
10	Run	Firmware is executing.
11	Permanent memory error	Error in the permanent memory, turn off and on again the device. If the problem persists, please contact CMZ Srl.
12	Reserved	-
13	CRC error	The firmware is corrupted, try again the download procedure. If the problem persists, please contact CMZ Srl.
14	Hardware is not compatible with firmware	The hardware is not compatible with firmware. Try a new download procedure with a compatible firmware or substitute the device with one that has a compatible hardware. In the "Download Firmware" window, choose the desired firmware and press
15	Boot is not compatible with firmware	The Boot is not compatible with the firmware. Try a new download procedure with a compatible firmware or update the boot. The “Download Firmware” window automatically shows the firmwares and the boots that are compatible.
16	Firmware is not compatible with hardware	The firmware is not compatible with the hardware. Try a new download procedure with a compatible firmware or substitute the device with one that has a compatible hardware. In the "Download Firmware" window, choose the desired firmware and press
17	Firmware is not compatible with boot	The firmware is not compatible with the boot. Try a new download procedure with a compatible firmware or update the boot.

FirmwareStatus	Message	Solution
		The “Download Firmware” window automatically shows the firmwares and the boots that are compatible.

ManufacturerDeviceName

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
80	-	-	-	STR	-	CST	-	-

String in ASCII characters showing the name of the device. For further information see *Section 14.1, OrderCode*.

ManufacturerHwVersion

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
110	-	-	-	STR	-	CST	-	-

String in ASCII characters showing the hardware version of the device.

ManufacturerSwVersion

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
114	-	-	-	STR	-	CST	-	-

String in ASCII characters showing the software version of the drive.

Identity

Device Identity.

Number of entries

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
-	-	4	4	U8	-	CST	-	-

Number of parameter in this group.

ProductCode

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
122	-	-	-	U32	-	RO	-	-

Identification code of the device.

RevisionNumber

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
124	-	-	-	U32	-	RO	-	-

Device revision.

SerialNumber

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
126	-	-	-	U32	-	RO	-	-

Device serial number.

CpuInfo

Information on the CPU.

Number of entries

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
-	-	2	2	U8	-	CST	-	-

Number of parameter in this group.

CPUSiliconRevision

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
580	-	-	-	U16	-	RO	-	-

CPU revision.

ResetCause

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
581	-	1 ÷ 4	2	U32	-	RW	-	-

Codice della causa che ha provocato il reset del firmware.

ResetCause	Description
1	Generic reset (cause not found)
2	Reset from power-up (device turn-on)
3	Reset from line of hardware reset
4	Reset from watchdog

12.4. Auxiliary communication port (1100-1199)

AuxiliaryPortSetup

Parameters used to configure the auxiliary communication port.

Number of entries

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
-	-	4	4	U8	-	CST	-	-

Number of parameters in this group.

AuxiliaryPortSetupWordOrder

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
1100	-	0 - 1	0	U16	-	RW	-	EM

Order of the words used by the device, through the auxiliary port, to receive or send the parameters of 32 bits (the byte order of the words is big-endian, as defined by the specification of the Modbus protocol, implemented in the auxiliary port).

Auxiliary Port Set-up Word Order	Description	Example
0	Word sent in little-endian format.	The value 0x12345678 is sent in the order 0x5678 0x1234.
1	Word sent in big-endian format.	The value 0x12345678 is sent in the order 0x1234 0x5678.

AuxiliaryPortSetupTimeout

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
1101	-	20 - 65000	50	U16	ms	RW	-	EM

Timeout of the auxiliary port. If the time between two consecutive characters overcomes this value, the interface cancels the ongoing receiving of the whole frame and it prepares to receive a new frame.

AuxiliaryPortSetupBaudRateImmediate

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
1110	-	19200 , 57600	57600	U32	bit/s	RW	-	-

Parameters used for the immediate exchange of the baud rate of the auxiliary port. Once received the request to change the baud rate, the device sends the answer with the precedent baud rate and only after it configures the communication interface with the new baud rate.

AuxiliaryPortSetupBaudRate

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
1112	-	19200 or 57600	57600	U32	bit/s	RW	-	EM

Auxiliary port baud rate. This parameter, once written and saved in the permanent memory, take effect only after the device switching off and on again.

AuxiliaryPortError

Parameters to read the last error condition in writing or reading carried out with the auxiliary communication port.

Number of entries

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
-	-	2	2	U8	-	CST	-	-

Number of parameters in this group.

AuxiliaryPortErrorParam

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
1120	-	-	0	U16	-	RW	-	-

Modbus address of the parameter that generated the last error condition during the writing/reading phase with the auxiliary communication port. An access in writing provokes the resetting of this parameter and of the *AuxiliaryPortErrorCode* parameter.

AuxiliaryPortErrorCode

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
1121	-	Desc	0	U16	-	RW	-	-

Code of the last error condition found during the writing/reading phase with the auxiliary communication port. An access in writing provokes the resetting of this parameter and of the *AuxiliaryPortErrorParam* parameter. The meaning of the codes can be found in *Table 10.3*.

12.5. Monitor and diagnostic of the power supply (2000-2099)

HVDC_OutputVoltage

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2001	-	-	0	U16	0.1 V	RO	-	-

RMS value of the HVDC output voltage.

PowerSupplyType

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2002	-	0 ÷ 2	0	U16	-	RO	-	-

Power supply type (alternate voltage) on input section (0=not supplied, 1=single-phase, 2=three-phase).

Value	Description
0	Not powered
1	Single-phase
2	Three-phase

CPU_Temperature

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2010	-	-250 ÷ 1200	-	S16	0.1°C	RO	-	-

Instantaneous CPU temperature.

ControlSectionTemperature

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2011	-	-250 ÷ 1200	-	S16	0.1°C	RO	-	-

Control section instantaneous temperature.

PowerSectionTemperature

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2012	-	-250 ÷ 1200	-	S16	0.1°C	RO	-	-

Power section instantaneous temperature.

ActualCurrent

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2013	-	-	0	S16	0.1 A	RO	-	-

Power supply output instantaneous current. This parameter represents the sum of the currents of the two channels (see *ActualCurrentCH1* and *ActualCurrentCH2*).

ActualCurrentLimit

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2014	-	-	-	U16	0.1 A	RO	-	-

Power supply output current limit, conditioned by *HVDC_OutputVoltage*.

AverageCurrent

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2015	-	-	-	S16	0.1 A	RO	-	-

Power supply average current. This parameter represents the sum of the average currents of the two channels (see *AverageCurrentCH1* and *AverageCurrentCH2*).

ActualPower

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2016	-	-	-	S32	0,01 W	RO	-	-

Power supply output actual power. This parameter represents the sum of the powers of the two channels (see *ActualPowerCH1* and *ActualPowerCH2*).

Energy values

Values of the energy that's absorbed and supplied by the power supply.

Number of entries

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
-	-	8	8	U8	-	CST	-	-

Number of parameters in this group.

ActualDeviceEnergyOverload

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2020	-	-	-	U32	A^2s	RO	-	-

Actual value of overload energy supplied by the power supply (I^2T).

BrakeEnergy

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2026	-	-	0	U32	0,001 J	RO	-	EM

Energy absorbed by the braking circuit. This circuit intervenes in case of overvoltage, caused for example by the energy that's regenerated by the motors.

ChargeCircuitEnergy

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2028	-	-	-	U32	0,01 J	RO	-	EM

Energy absorbed by the capacitors charging circuit at the power supply start-up (see *Section 6.5, Charge circuit and start-up phase*).

DeviceEnergyOverloadPercentage

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2030	-	0 ÷ 32767	0	U16	%	RO	-	-

Percentage value of the overload energy supplied to the power supply (related to *ActualDeviceEnergyOverload*).

BrakeEnergyOverloadPercentage

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2031	-	0 ÷ 32767	0	U16	%	RO	-	-

Percentage value of the braking circuit overload (see *BrakeEnergy*).

ChargeCircuitEnergyOverloadPercentage

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2032	-	0 ÷ 32767	0	U16	%	RO	-	-

Percentage value of the overload energy absorbed by the capacitors charging circuit (see *Section 6.5, Charge circuit and start-up phase*).

CableEnergyOverloadPercentage

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2034	-	0 ÷ 32767	0	U16	%	RO	-	EM

Percentage value of the overload energy absorbed by the cables that are connected to the outputs, referred to the *CableCurrentLimit(CH1)* and *CableCurrentLimit(CH2)* current limits.

BackfeedEnergy

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2058	-	-	0	S32	J	RO	-	-

Energy poured from the loads that are connected on the outputs (drives, motors, etc.) to the power supply.

DeviceStatus

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2024	-	-	-	U16	-	RO	-	-

Power supply actual logic status (see *Chapter 8, Power supply logical states*).

Value	Message on SDSetup
0	STARTUP
1	CAP. DISCHARGE
2	OFFSET CAL.
3	VAC IN WAIT
4	VOUT CHECK
5	VOUT RIPPLE CHECK
6	OPERATIONAL
7	VOUT HOLD UP
8	WARNING
9	FAULT
10	POWER DOWN

LastFaultCause

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2025	-	-	0	U16	-	RO	-	-

Last detected fault code (see *Table 10.2*).

BrakeDutyCycle

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2033	-	-	0	U16	‰	RO	-	-

Duty cycle of the braking circuit, expressed in ‰.

Current RMS values

RMS current values.

Number of entries

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
-	-	4	4	U8	-	CST	-	-

Number of parameters in this group.

> **Note**
>
> The calculation period of the RMS value can be set through the *RMS_Average_Calculation-Period* parameter.

RMS_Current

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2048	-	-	0	S32	0.1 A	RO	-	-

Total root-mean-square value calculated with the contribution of *RMS_OutputCurrent* and *RMS_BackfeedingCurrent*.

RMS_OutputCurrent

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2052	-	-	0	S32	0.1 A	RO	-	-

Root-mean-square current supplied by the power supply.

RMS_BackfeedingCurrent

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2054	-	-	0	S32	0.1 A	RO	-	-

Root-mean-square current absorbed by the power supply.

AveragePower

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2056	-	-	0	S32	0.01 W	RO	-	-

Average power supplied by the power supply.

Temperature Limits

Temperature Limit.

Number of entries

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
-	-	4	4	U8	-	CST	-	-

Number of parameters in this group.

ControlSideFaultTemperature

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2060	-	-	85,0°	S16	0.1°C	RO	-	ES

Temperature Fault threshold of the control section.

ControlSideWarningTemperature

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2061	-	-	700	S16	0.1°C	RO	-	ES

Temperature Warning threshold of the control section.

PowerSideFaultTemperature

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2064	-	-	900	S16	0.1°C	RO	-	ES

Temperature Fault threshold of the power section.

PowerSideWarningTemperature

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2065	-	-	800	S16	0.1°C	RO	-	ES

Temperature Warning threshold of the power section.

FaultLockTime

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2068	-	-	Desc	S32	ms	RO	-	-

Waiting time for the Faults Reset (for details see *Necessary requirements to execute the faults reset*).

12.6. Power supply configuration (2100-2199)

DeviceModel

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2100	-	1 ÷ 2	Desc	U16	-	RO	-	ES

BDPOW model: 1 = BDPOW20; 2 = BDPOW40.

AutomaticRestartFunction

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2101	-	0 ÷ 1	0	U16	-	RO	-	ES

Automatic restart function: 0 = disabled; 1 = enabled (fot details see *Section 10.2, Errors reset*).

Voltage values

Voltage values

Number of entries

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
-	-	2	2	U8	-	CST	-	-

Number of parameters in this group.

MinVoutFaultThreshold

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2102	-	-	1000	U16	0.1 V	RO	-	ES

Minimum output voltage value, under which the power supply enters in fault status.

MaxVoutFaultThreshold

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2103	-	-	8300	U16	0.1 V	RO	-	ES

Maximum output voltage value, over which the power supply enters in fault status.

Brake Circuit Parameters

Values related to the internal braking circuit resistor

Number of entries

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
-	-	3	3	U8	-	CST	-	-

Number of parameters in this group.

IntBrakeResistorValue

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2107	-	-	33	U16	Ω	RO	-	ES

Internal brake resistor value.

IntBrakeResistorNominalEnergy

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2108	-	-	6000	U32	J	RO	-	ES

Nominal energy that can be absorbed by the brake resistor.

IntBrakeResistorNominalPower

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2110	-	-	120 (CE) / 25 (UL)	U16	W	RO	-	ES

Nominal power that can be absorbed by the brake resistor.

CapacitorDischargeTimeout

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2114	-	-	4000	U16	ms	RO	-	ES

Waiting time, in case of fault, before to start the capacitors discharge and to reset the output voltage.

User Parameters

Parameters that can be set by the user

Number of entries

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
-	-	6	6	U8	-	CST	-	-

Number of parameters in this group.

RMS_Average_CalculationPeriod

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2112	-	-	1000	U16	ms	RW	-	ES

RMS and average current signals values and power signal average value calculation period.

OutputCurrentLimit

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2134	-	Desc	Desc	U16	0.1 A	RW	-	ES

Output current limit (t's the sum of the CH1 + CH2 currents)

BDPOW20		BDPOW40	
Range	Default	Range	Default
10 ÷ 200	200	10 ÷ 400	400

OvervoltageLimit

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2135	-	1000 ÷ 8300	8300	U16	0.1 V	RW	-	ES

Output voltage limit.

BrakingCircuitActivationVoltage

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2136	-	1000 ÷ 7850	7850	U16	0.1 V	RW	-	ES

Braking circuit activation voltage.

CableCurrentLimit(CH1)

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2142	-	Desc	Desc	U16	0.1 A	RW	-	ES

Output current limit on channel 1.

BDPOW20		BDPOW40	
Range	Default	Range	Default
10 ÷ 250	100	10 ÷ 250	200

CableCurrentLimit(CH2)

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2145	-	Desc	Desc	U16	0.1 A	RW	-	ES

Output current limit on channel 2.

BDPOW20		BDPOW40	
Range	Default	Range	Default
10 ÷ 250	100	10 ÷ 250	200

External Brake Settings

Braking circuit configuration parameters

Number of entries

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
-	-	4	4	U8	-	CST	-	-

Number of parameters in this group.

BrakeCircuitSelector

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2137	-	0 ÷ 2	0	U16	-	RW	-	ES

Configuration of the active braking circuit: 0 = internal; 1 = external; 2 = internal + external.

ExtBrakeResistorNominalEnergy

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2138	-	100 ÷ 2000000	6000	U32	J	RW	-	ES

Nominal energy that can be absorbed by the brake resistor.

ExtBrakeResistorNominalPower

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2140	-	100 ÷ 30000	120 (CE) / 25 (UL)	U16	W	RW	-	ES

Nominal power that can be absorbed by the brake resistor.

ExtBrakeResistorValue

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2141	-	16 ÷ 1000	33	U16	Ω	RW	-	ES

External brake resistor value.

12.7. Fault and Warning (2400-2499)

RetentiveWarning

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2400	-	-	0	U32	-	RW	-	-

Retentive Warnings mask. By writing 0 in this parameter, all the active warnings reset.

DynamicWarning

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2402	-	-	0	U32	-	RO	-	-

Dynamic Warnings mask.

RetentiveFault

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2404	-	-	0	U32	-	RW	-	-

Retentive Fault mask. By writing 0 in this parameter, all the active faults reset.

DynamicFault

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2406	-	-	0	U32	-	RO	-	-

Dynamic Fault mask.

12.8. Output channels monitor (2500-2699)

Channel 1 current values

Channel 1 current value.

Number of entries

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
-	-	5	5	U8	-	CST	-	-

Number of parameters in this group.

> **Note**
>
> The calculation period of the RMS value can be set through the *RMS_Average_Calculation-Period* parameter.

RMS_CurrentCH1

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2548	-	-	0	S32	0.1 A	RO	-	-

Total root-mean-square value calculated with the contribution of *RMS_OutputCurrentCH1* and *RMS_BackfeedingCurrentCH1*.

RMS_OutputCurrentCH1

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2552	-	-	0	S32	0.1 A	RO	-	-

Root-mean-square current supplied by the power supply on the channel 1.

RMS_BackfeedingCurrentCH1

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2554	-	-	0	S32	0.1 A	RO	-	-

Root-mean-square current absorbed by the power supply on channel 1.

ActualCurrentCH1

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2513	-	-	0	S16	0.1 A	RO	-	-

Power supply output instantaneous current for channel 1 (in the version with 1 channel this value coincides with the *ActualCurrent* parameter).

AverageCurrentCH1

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2515	-	-	0	S16	0.1 A	RO	-	-

Power supply output average current on channel 1.

Channel 1 power values

Power values of channel 1.

Number of entries

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
-	-	2	2	U8	-	CST	-	-

Number of parameters in this group.

ActualPowerCH1

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2516	-	-	0	S32	0,01 W	RO	-	-

Power supply output actual power on channel 1.

AveragePowerCH1

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2556	-	-	0	S32	0.01 W	RO	-	-

Average power supplied by the power supply to the channel 1.

Channel 1 energy values

Values of the energy that's absorbed and supplied by the power supply from the channel 1.

Number of entries

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
-	-	3	3	U8	-	CST	-	-

Number of parameters in this group.

ActualDeviceEnergyOverloadCH1

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2520	-	-	-	U32	A^2s	RO	-	-

Actual value of overload energy supplied by the power supply (I^2T) on the channel 1.

DeviceEnergyOverloadPercentageCH1

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2530	-	-	0	U16	%	RO	-	-

Percentage value of the overload energy supplied to the power supply on the channel 1 (related to *ActualDeviceEnergyOverloadCH1*).

CableEnergyOverloadPercentageCH1

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2534	-	-	0	U16	%	RO	-	EM

Percentage value of the overload energy absorbed by the cables that are connected to the channel 1.

Channel 2 current values

Channel 2 current value.

Number of entries

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
-	-	5	5	U8	-	CST	-	-

Number of parameters in this group.

Note

The calculation period of the RMS value can be set through the *RMS_Average_Calculation-Period* parameter.

RMS_CurrentCH2

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2648	-	-	0	S32	0.1 A	RO	-	-

Total root-mean-square value calculated with the contribution of *RMS_OutputCurrentCH2* and *RMS_BackfeedingCurrentCH2*.

RMS_OutputCurrentCH2

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2652	-	-	0	S32	0.1 A	RO	-	-

Root-mean-square current supplied by the power supply on the channel 2.

RMS_BackfeedingCurrentCH2

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2654	-	-	0	S32	0.1 A	RO	-	-

Root-mean-square current absorbed by the power supply on channel 2.

ActualCurrentCH2

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2613	-	-	0	S16	0.1 A	RO	-	-

Power supply output instantaneous current on channel 1.

AverageCurrentCH2

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2615	-	-	0	S16	0.1 A	RO	-	-

Power supply output average current on channel 2.

Channel 2 power values

Power values of channel 2.

Number of entries

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
-	-	2	2	U8	-	CST	-	-

Number of parameters in this group.

ActualPowerCH2

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2616	-	-	0	S32	0,01 W	RO	-	-

Power supply output actual power on channel 2.

AveragePowerCH2

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2656	-	-	0	S32	0.01 W	RO	-	-

Average power supplied by the power supply to the channel 2.

Channel 2 energy values

Values of the energy that's absorbed and supplied by the power supply from the channel 2.

Number of entries

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
-	-	3	3	U8	-	CST	-	-

Number of parameters in this group.

ActualDeviceEnergyOverloadCH2

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2620	-	-	-	U32	A^2s	RO	-	-

Actual value of overload energy supplied by the power supply (I^2T) on the channel 2.

DeviceEnergyOverloadPercentageCH2

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2630	-	-	0	U16	%	RO	-	-

Percentage value of the overload energy supplied to the power supply on the channel 2 (related to *ActualDeviceEnergyOverloadCH2*).

CableEnergyOverloadPercentageCH2

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2634	-	-	0	U16	%	RO	-	EM

Percentage value of the overload energy absorbed by the cables that are connected to the channel 2.

12.9. Internal diagnostic (2800-2999)

RectifierBridgeVoltageSignal

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2824	-	-	-	S16	0.1Vdc	RO	-	-

Measured voltage signal of the diode-rectifier bridge.

> **Note**
>
> The following parameters report the minimum and maximum values that have been reached by the physical quantities which they refer to. The measurements start at the conclusion of the start-up (power supply on the OPERATIONAL status).

Voltage Min/Max Values

Minimum and maximum HVDC voltage values.

Number of entries

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
-	-	2	2	U8	-	CST	-	-

Number of parameters in this group.

MinHVDC_OutputVoltage

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2900	-	-	0	U16	0.1V	RO	-	-

Minimum value reached by *HVDC_OutputVoltage*.

MaxHVDC_OutputVoltage

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2901	-	-	0	U16	0.1V	RO	-	-

Maximum value reached by *HVDC_OutputVoltage*.

Current Min/Max Values

Minimum and maximum current values.

Number of entries

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
-	-	8	8	U8	-	CST	-	-

Number of parameters in this group.

MinRMS_Current

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2905	-	-	0	S16	0.1A	RO	-	-

Minimum value reached by *RMS_Current*.

MaxRMS_Current

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2906	-	-	0	S16	0.1A	RO	-	-

Maximum value reached by *RMS_Current*.

MinActualCurrent

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2911	-	-	0	S16	0.1A	RO	-	-

Minimum value reached by *ActualCurrent*.

MaxActualCurrent

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2912	-	-	0	S16	0.1A	RO	-	-

Maximum value reached by *ActualCurrent*.

MinActualCurrentCH1

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2926	-	-	0	S16	0.1A	RO	-	-

Minimum value reached by *ActualCurrentCH1*.

MaxActualCurrentCH1

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2927	-	-	0	S16	0.1A	RO	-	-

Maximum value reached by *ActualCurrentCH1*.

MinActualCurrentCH2

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2928	-	-	0	S16	0.1A	RO	-	-

Minimum value reached by *ActualCurrentCH2*.

MaxActualCurrentCH2

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2929	-	-	0	S16	0.1A	RO	-	-

Maximum value reached by *ActualCurrentCH2*.

Power Max Values

Power maximum values.

Number of entries

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
-	-	1	1	U8	-	CST	-	-

Number of parameters in this group.

MaxAveragePower

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2920	-	-	0	S32	0.01 W	RO	-	-

Maximum value reached by *AveragePower*.

Energy Max Values

Energy maximum values.

Number of entries

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
-	-	5	5	U8	-	CST	-	-

Number of parameters in this group.

MaxDeviceEnergyOverloadPercentage

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2913	-	-	0	U16	%	RO	-	-

Maximum value reached by *DeviceEnergyOverloadPercentage*.

MaxActualDeviceEnergyOverload

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2914	-	-	0	U32	0.001 J	RO	-	-

Maximum value reached by *ActualDeviceEnergyOverload*.

MaxBrakeEnergy

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2916	-	-	0	U32	0.01 J	RO	-	-

Maximum value reached by *BrakeEnergy*.

MaxChargeCircuitEnergy

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2918	-	-	0	U32	0.01 J	RO	-	-

Maximum value reached by *ChargeCircuitEnergy*.

MaxBackfeedEnergy

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2922	-	-	0	U32	0.01 J	RO	-	-

Maximum value reached by *BackfeedEnergy*.

Temperature Min/Max Values

Minimum and maximum temperature values.

Number of entries

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
-	-	4	4	U8	-	CST	-	-

Number of parameters in this group.

MinControlSectionTemperature

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2907	-	-	0	S16	0.1°C	RO	-	-

Minimum value reached by *ControlSectionTemperature*.

MaxControlSectionTemperature

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2908	-	-	0	S16	0.1°C	RO	-	-

Maximum value reached by *ControlSectionTemperature*.

MinPowerSectionTemperature

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2909	-	-	0	S16	0.1°C	RO	-	-

Minimum value reached by *PowerSectionTemperature*.

MaxPowerSectionTemperature

Modbus	CANopen	Range	Default	Type	Units	Acc	PDO	Mem
2910	-	-	0	S16	0.1°C	RO	-	-

Maximum value reached by *PowerSectionTemperature*.

Chapter 13

Maintenance

Important

Before starting the maintenance, read the *Section 2.11, Safety precautions and limits*. If you do not follow the safety instructions you can cause injury or death.

13.1. Maintenance interval

If the power supply is installed in a correct environment, it requires a minimal maintenance.

The following table shows the component lifetime and the maintenance intervals that are recommended by CMZ.

Maintenance	Interval
Heat sink: Temperature control and cleaning	It depends on the dust that's present in the environment (every 6-12 months)
Capacitor regeneration	Every year when stored[a]

[a]Please send the product back to CMZ Srl in order to let the capacitors regeneration be executed.

Table 13.1. Maintenance interval of the BDPOW.

Typical lifetime		
Capacitors of the HVDC power section	without line inductor	20000 hours @ 40°C
	with line inductor (user provided)	30000 hours @ 40°C BDPOW20 = inductance 1,2 mH 25Arms BDPOW40 = inductance 0,58 mH 50Arms
Cooling fans	Internal (only BDPOW40)	MTTF (confidence level 90%) = 90000h
	External	MTTF (confidence level 90%) > 200000h

Table 13.2. Components lifetime BDPOW.

Chapter 14

Order codes

14.1. OrderCode

The BDPOW power supplies differ from one another by the output nominal current value and the CE or UL compliance. The order code is the following:

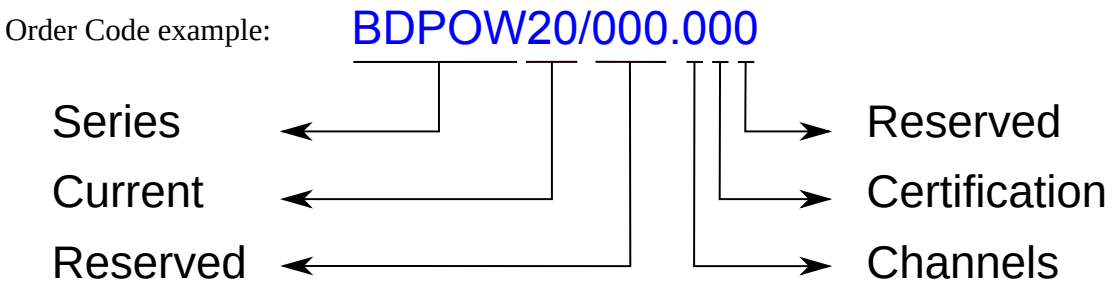


Figure 14.1. Position of the fields in the order code.

Order code							
Field	**Description**	**XXXXX**	**XX**	**/ XXX**	**.X**	**X**	**X**
Series	Three-phase power supply (rectifier)	BDPOW					
Current	Nominal current that can be supplied to the 20A output		20				
	Nominal current that can be supplied to the 40A output		40				
-	Reserved			000			
Channels	Version with 1 output channel				1		
	Version with 2 output channels				2		
Certification	CE compliance (only)[a].					0	
	UL certification and CL compliance[b].					1	
-	Reserved						0

[a]With internal brake resistor of 120 W

[b]With internal brake resistor of 25 W

Table 14.1. Fields that make up the order code.

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HEADQUARTERS

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