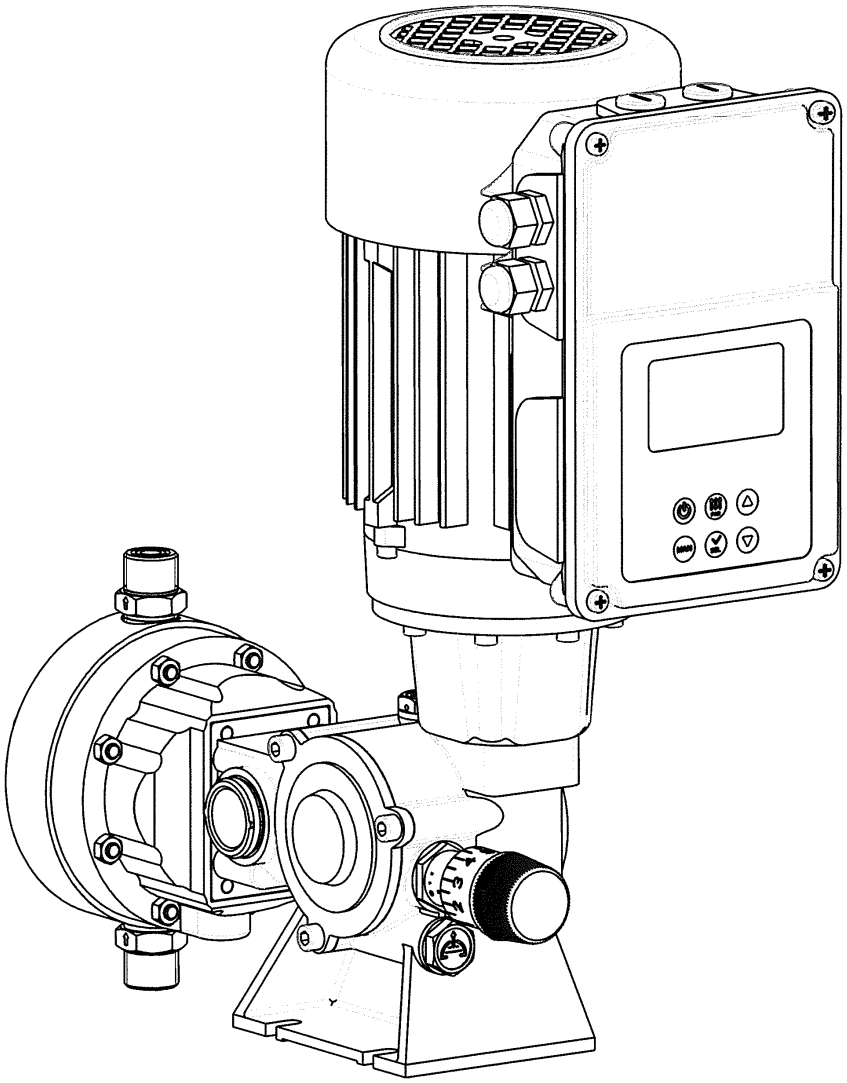
Doseuro
METERING PUMP SOLUTIONS

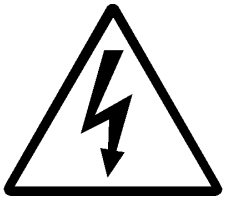
ATTENTION:
Industrial machinery for professional use.
These instructions are for qualified personnel

TRANSLATION OF ORIGINAL INSTRUCTIONS



User's manual for inverter motor Rapida 2.0

Manual Display Version Rapida 2.0



ATTENTION!

Any installation, de-installation or maintenance operation described in this manual must be carried out in strict compliance with the laws in force regarding "safety at work": the indications given here are of a general nature and cannot take into account the specific nature of each installation. It is therefore recommended that the safety requirements applicable to the context in which operations take place are strictly observed.

IF THERE IS A CONFLICT BETWEEN THE POSSIBILITY OF CARRYING OUT ANY OF THE OPERATIONS DESCRIBED IN THIS MANUAL AND THE WORK SAFETY REQUIREMENTS (LAID DOWN BY LAW OR BY THE PERSON IN CHARGE OF THE PREMISES WHERE THE OPERATIONS ARE CARRIED OUT), COMPLIANCE WITH THE SAFETY REQUIREMENTS MUST UNDOUBTEDLY PREVAIL.

DOC. NO.:	XMPI0MTIRPD2ST021	Rev. 01	LANGUAGE: EN	Date:	04/06/2020
Drawn up by:	Luca FUMAGALLI	Checked by:	Luca FUMAGALLI	Repl. On:	-

Rev.	Description	Checked by	Date
00	New Doseuro format issue	L. FUMAGALLI	23/04/2021
01	Correction Ch.3, tA up to 45°C	L. FUMAGALLI	11/05/2021

This manual refers to the following products:

Inverter motor “Rapida 2.0 02”
Inverter motor “Rapida 2.0 03”
Inverter motor “Rapida 2.0 05”
Inverter motor “Rapida 2.0 07”

INSTALLATION AND OPERATING MANUAL DISPLAY VERSION

DOCUMENTATION CODE:	Dosing machine graphic display panel manual (**XMPI0MTIRPD2ST021)**
EDITION DATE:	04/06/2020
SOFTWARE VERSION:	rev.25.1

Table of contents

1. INTRODUCTION

1.1 REMINDER OF SAFETY INSTRUCTIONS

THE FOLLOWING SYMBOLS, USED IN THIS MANUAL, HIGHLIGHT INFORMATION THAT MUST BE READ WITH PARTICULAR CARE TO SAFEGUARD INDIVIDUAL SAFETY.

The symbol:

indicates information about the presence of a dangerous voltage that could cause serious injury or death.

The symbol:

indicates warnings about general hazards, or information that is particularly important for the proper operation of the inverter.

The symbol:

highlights a section that it is important to read for easier use of the information in this manual.

1.2 PRODUCT DESCRIPTION

The RAPIDA 2.0 inverter motor is an assembly of a three-phase asynchronous electric motor and an inverter board, designed to allow the speed of the motor to be varied.
It is specifically fitted to the entire range of Doseuro "SR" series pumps.

Mechanical and electrical installation and commissioning of the inverter must only be carried out by professional assemblers and installers who must have the general technical knowledge to install the product correctly.

This documentation is a specific guide for:
– Assemblers or Installers who must electrically install the inverter motor in an installation or incorporate the inverter motor into equipment or systems;
– Installers or technicians who must perform functional commissioning and calibration of the motor-inverter already installed in the system.

This manual is also made available to the assembler to enable him to achieve the protection requirements of Directive 2014/30/EC on ELECTROMAGNETIC COMPATIBILITY (EMC Directive) and to perform an installation in accordance with CEI EN 60204-1:2018.

However, the manufacturer of the equipment, system or installation is responsible for the overall result of electromagnetic compatibility according to the harmonised standards applicable to his product.
This information applies only to RAPIDA 2.0 inverter motors with single-phase voltage supply.

1.3 GENERAL CHARACTERISTICS

Inverter power supply:
from single-phase mains **230V/50-60 Hz**. (on request from 110V/50-60 Hz. with appropriate power derating).

Power input:
on PG11 cable gland (PG11 cable gland is designed for cables with an outer diameter of 7 to 10 mm).

In order to comply with the IP degree of protection declared for the inverter, it is essential that the cables passing through the cable glands have a circular cross-section.

Inverter operating limits:
from 155 V[(1)] to 264 V - frequency from 42 Hz to 60 Hz.

Inverter output:
three-phase for asynchronous motors with 230/400V windings (on request from 110V/50 Hz with appropriate power derating).

Inverter output frequency:
6 to 60 Hz in standard Rapida 2.0 configuration[(2)]
0 to 160 Hz[(3)] nominal inverter.

Type of operation:
V/F SVM ("Space Vector Modulation").

Adjustment type:
PWM (Pulse Width Modulation) at a maximum frequency of 15 kHz.

Ambient temperature:
0°C to 45°C in operation (without derating)

Protection rating:
Up to IP55.

Ambient altitude:
max 1000 m above sea level.

Derating:
-3% for each °C above 40°C and up to 60°C max.
-5% above 1000 m for every additional 1000 m a.s.l.

SPECIFIC PRODUCT FEATURES	
Characteristics:	RAPIDA 2.0 (size 02-03-05-07)
Rated motor power	from 0.25 kW up to 0.75 kW
Rated motor current at 230Vac	up to 3.5 A
Guaranteed overload capacity in continuous service	150%
A.C. side current consumption at motor $P_{nominal}$	4.3 A (Rms)

[1] The lower voltage limit ensures that the electronics do not switch off in the event of a low supply voltage. However, under conditions of reduced supply voltage, the motor-inverter supplies less torque to its axis than the rated torque, so the power output at rated speed may be reduced compared to the motor's rated speed. Under certain conditions of high mechanical load and low supply voltage, the overcurrent protection may trip.
[2] For severe and continuous use (more than 30 minutes) of the inverter at frequencies <=20 Hz, the use of servo-assisted ventilation motors is absolutely recommended
[3] The minimum operating frequency at which the motor reaches its rated torque depends on the characteristics of the motor used in combination.

1.4 AVAILABLE INPUTS/OUTPUTS

The RAPIDA 2.0 series inverter motors have the following I/O resources for control and interfacing:

- **No. 4** low safety voltage **digital inputs** with programmable functions. Type of control contacts:
  - free of potential;
  - with n. 1 common terminal.
- **N. 2 digital HSI (High Speed Inputs)** low voltage safety inputs with programmable functions, also usable for Encoder inputs.
  - **Attention:these inputs are not voltage protected. The maximum applicable voltage is 15 V.**
- **N. 1 signalling output (relay 5 A)** with programmable functions. Output contact: N.O. with maximum driveable voltage 230V AC/DC - 5 A resistive.
- **No. 1 analogue input** for proportional speed reference 0-10V (with input impedance 1 kOhm) or 0-20mA or 4-20mA operation.
- **No. 1 RS485 serial port** for programming and interfacing in ModBus/RTU protocol (with 9600/19200 bit/s speed).

2. ELECTRICAL INSTALLATION OF THE INVERTER MOTOR IN THE SYSTEM

It is essential to read this chapter before proceeding with the electrical installation of the new or replacement inverter or with re-installation following maintenance in the existing system.

Installation of the motor-inverter in the system may only be carried out by electrical installers, manufacturers and professional operators in possession of the technical and professional qualifications required by the laws in force. Installation is not permitted for private individuals or end users.

With the exception of action with appropriate tools (3 mm blade screwdriver) on the connection terminals (when the inverter is powered down), no operation is required or permitted on any part of the inverter. In particular, it is not permitted to separate the electronic board from the base and it is not permitted to tamper with, modify, replace or eliminate any of the electronic components mounted on the inverter, **failure to do so will invalidate the warranty.**

After completing the wiring operations described in this chapter and before switching on the power supply, it is essential to close the cover of the inverter to ensure the electrical safety of the installation.

2.1. CONNECTION DIAGRAMS

Layout of the inverter board

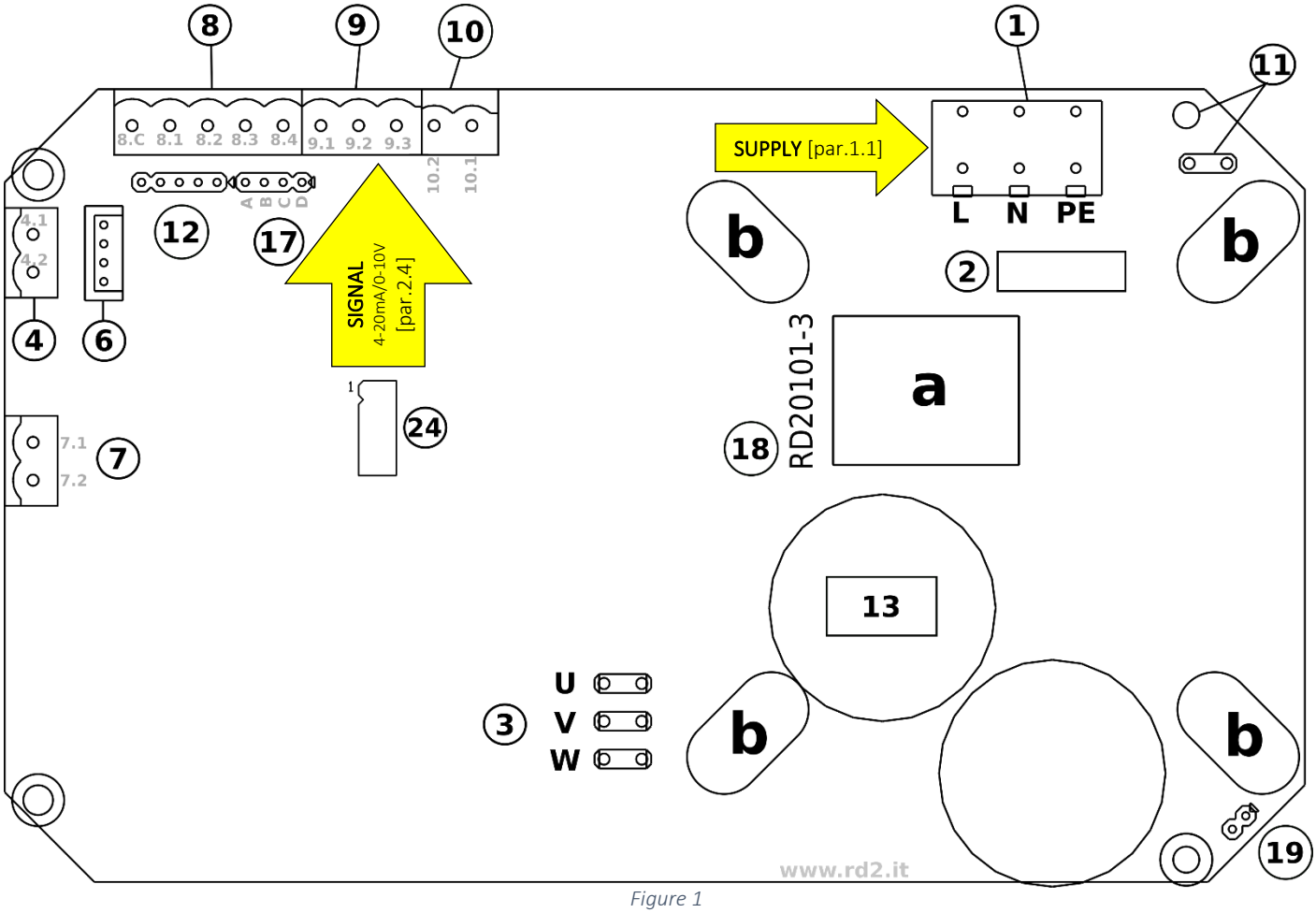


Figure 1

Pay particular attention to the power supply: in standard configuration it is **230V/1ph. 50-60 Hz** but may be a special product [par. 1.1], in which case refer to the correct feeding in the technical specification.

Key:

1	Power supply terminal block
2	Power fuse
3	Motor connection faston
4	RS485 serial connection terminal
6	ALS-1 terminal connector and RS485 serial connector
7	Programmable output connector
8	Control input connector
9	Potentiometer/analogue reference connector

10	HSI/Encoder control input connector
11	Earth connection faston
12	Input connector reserved for 4-key keyboard
13	Inverter registration label
17	Analog input mode selector (Volt/mA)
18	Hardware version reference
19	Filter stage closure jumper on PE
24	Pin Header 5x2 Display

2.2. INVERTER MOTOR POWER SUPPLY

The power cable must be fed into the inverter through the PG11 cable gland on the side of the inverter box.

Use 2-pole sheathed cable plus earth, of suitable cross-section.

g of the power cable is not required. However, for reasons of electrical safety and EMC protection, correct earthing is absolutely essential. For this purpose, the PE terminal must be connected to the protective conductor in the power supply cabinet.

For the power supply, the inverter is equipped with a spring-loaded terminal block (1) which guarantees maximum mechanical tightness of the connection. The cable must have a circular cross-section and a diameter suitable for the cable gland.

Press the orange terminals perpendicularly to the surface of the printed circuit board with a screwdriver with a 2.5÷3 mm blade and insert the stripped wire for about 5 mm until resistance is encountered, then release the terminal and check, with a slight pull on the wire, the tightness of the connection.

The protection fuse (2) is type 5x20 mm / 250 V - T10A (0.75 kW).

2.3. DETAILS OF THE CONTROL TERMINAL SECTION

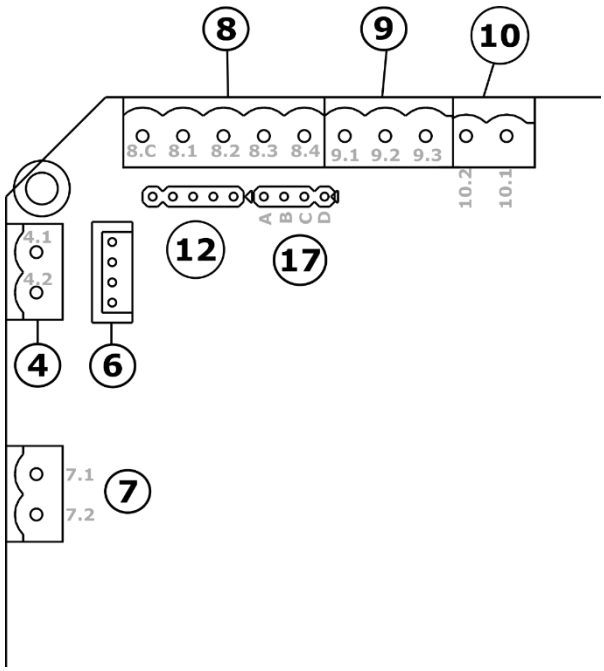
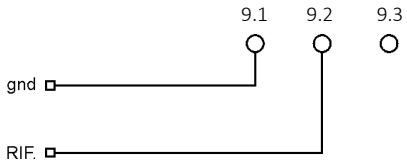
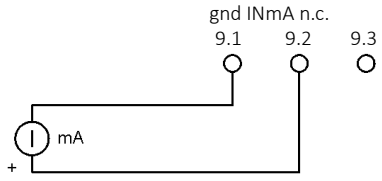


Figure 2

FUNCTION OF TERMINALS	
Digital outputs:	
7.1 - 7.2	ALS-1 PROGRAMMABLE RELAY OUTPUT
Digital inputs:	
8.1	ENTRANCE 1
8.2	ENTRANCE 2
8.3	ENTRANCE 3
8.4	ENTRANCE 4
8.C	MUNICIPALITY ENTRANCES
10.1	HSI INPUT 1/INPUT ENCODER A
10.2	HSI 2 INPUT/INPUT ENCODER B
Analogue speed reference:	
17	ANALOGUE INPUT MODE SELECTION.
9.1	GND ANALOGUE INPUT
9.2	PROPORTIONAL SPEED REFERENCE
9.3	+10V
RS485 connection:	
4.1	RB-
4.2	RA+

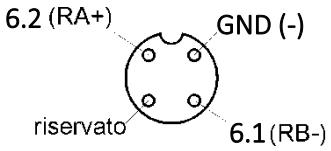
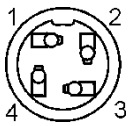
2.4. CONNECTION OF THE ANALOGUE SPEED REFERENCE

REFERENCE TYPE	CONNECTION ON CONNECTOR 9	HARDWARE SETTINGS ON CONNECTOR 17	
Analogue voltage signal		0 ÷ 10 V A = OFF B = OFF C = OFF D = OFF	0 ÷ 5 V A = OFF B = OFF C - D = jumper
Analogue current signal		0 ÷ 20 mA 4 ÷ 20 mA A - B = jumper C - D = jumper	

2.5. SERIAL CONNECTIONS FOR ModBus/RTU PROTOCOL OPERATIONS

For the ModBus register map, please refer to the "ModBus manual".

Connection mapping via 4-pin connector

Female connector on box (seen from the front)	Flying male connector (view screw terminal side)	Terminal number and function
		1 (6.2) = RA + 2 GND (-) 3 (6.1) = RB - 4 (reserved) = reserved ALS-1 terminal

3. PROTECTION

The inverter is equipped as standard with a passive filtering stage, which allows it to be installed in accordance with the requirements of EN61000-6-3 (Class A, industrial environment).

ATTENTION: The presence of the EMC filter on the inverter board may however cause the tripping of incorrectly sized differential electrical protections when the inverter is powered up.
It is recommended to use earth leakage circuit breakers suitable for supplying loads equipped with EMC filters.
Under no circumstances must the possible problem of tripping of the system's differential protection be circumvented by removing the earth conductor connected to the PE terminal on the inverter board, otherwise the installation will not be compliant from the point of view of electrical safety and EMC protection.

4. UNINSTALLATION AND OPEN ENCLOSURE OPERATIONS

After switching off the motor-inverter, the upper cover of the inverter can be opened by unscrewing the four screws. After that, the necessary uninstallation or maintenance operations are possible.

WARNING - RISK OF ELECTRIC SHOCK: Do not perform any type of direct operation on internal parts or open the cover of the inverter unless it is powered down. If in doubt, disconnect the power supply to the motor-inverter using the control devices in the electrical panel and wait at least 60 seconds before opening the cover.

All installation, de-installation or maintenance operations must be carried out in strict compliance with the current laws on "safety at work": the indications given here are of a general nature and cannot take into account the specific nature of each installation.

It is therefore recommended that the safety requirements applicable to the context in which operations take place are strictly observed. If there is a conflict between the possibility of carrying out any of the operations described herein and the work safety requirements (laid down by law or by the person in charge of the premises where the operations take place), compliance with the safety requirements must undoubtedly prevail.

5. COMMISSIONING AND CALIBRATION

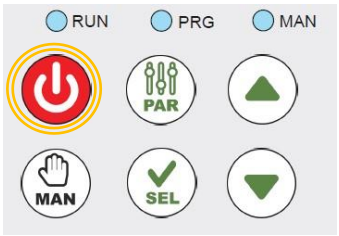
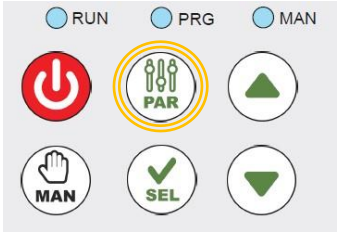
Powering up is only permitted after closing the inverter cover and tightening the four fastening screws.
Pay particular attention to the correct positioning of the gasket between the cover and the base of the box before tightening the screws.

Commissioning operations may only be carried out by adequately trained personnel or personnel with the necessary professional skills and/or qualifications to work on live systems and mechanical moving parts.

The instructions in this paragraph lead to the rotation of the motor shaft and the corresponding operation of the pump. It is therefore essential to check that the motor-inverter is connected to the mechanical transmission (lantern pump connection) and is able to turn without causing damage to the transmission components or creating situations of danger to people or animals.

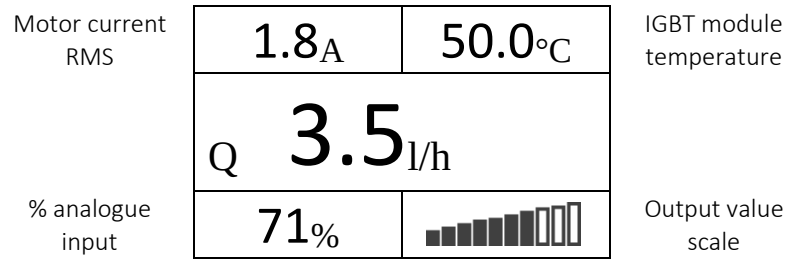
6. GRAPHIC DISPLAY

The graphic display panel mounted on the inverter allows the display of parameters and the management of the dosing pump.

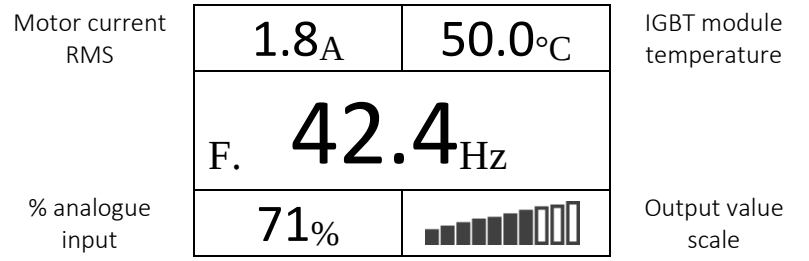
<table>
<tr><th colspan="3">GRAPHIC DISPLAY PANEL</th></tr>
<tr><td>  </td><td>The version of the Rapida with graphic display panel looks like the picture opposite, with the display already connected to the inverter via the two cables (pictures in the right-hand box). The inverter is already programmed for start-up and speed adjustment directly from the panel.
The keypad is used to navigate the parameter menu as follows:</td><td> 
5x2 FLAT CABLE FOR COMMUNICATION BETWEEN INVERTER AND DISPLAY.
 
POWER CABLE FOR THE DISPLAY.</td></tr>
<tr><td>  </td><td colspan="2">Press RUN to start up/shut down the device: start-up and adjustment is handled by remote 4-20mA signal where:
4mA → STOP;
20mA → max. flow rate.
When restarting after each shutdown, the device will be in the last state it was left in (manual or automatic mode, RUN or STOP). Instead of pressing RUN, functions can also be operated via an external button. See chapter 12 for its connection</td></tr>
<tr><td>  </td><td colspan="2">Pressing the MAN button switches to manual control, which allows you to set the l/h [Hz. or % adjustment] using the two arrows.</td></tr>
<tr><td>  </td><td colspan="2">Press SEL to access the timer menu: here you can set the two timers for timed mode and delayed start. Use the arrows to change the minutes and hours. Confirm the setting by pressing SEL. Press PAR again to return to the main menu.
If a timer has been set, after returning to the main menu, press MAN to start the timer mode: the device will run (or wait to start) for the set minutes. If no timer has been set, the device will run continuously.
However, if the RUN button is pressed in the main menu, the device restarts in automatic mode, ignoring any timer that may have been set.</td></tr>
<tr><td>  </td><td colspan="2">Press and hold PAR to access the parameter menu.</td></tr>
</table>

7. DISPLAY MENU

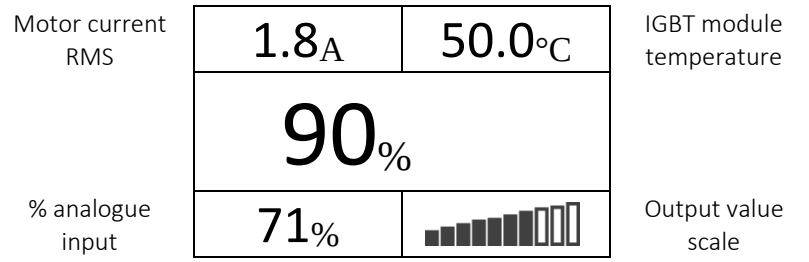
D001 – HOMEPAGE (FLOW RATE)



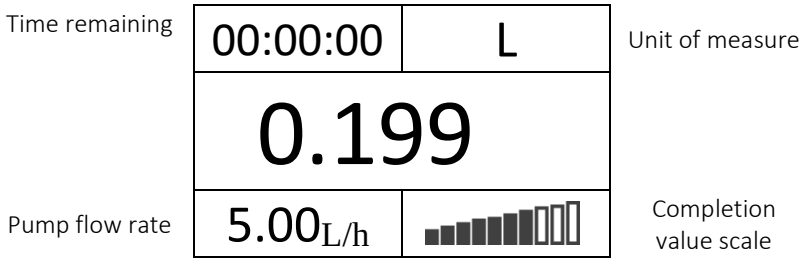
D002 – OUTPUT FREQUENCY



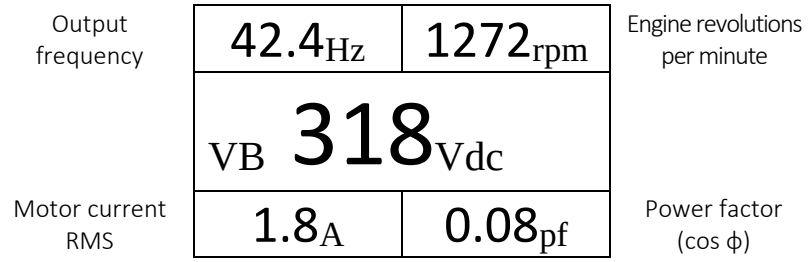
D003 – PERCENTUALE



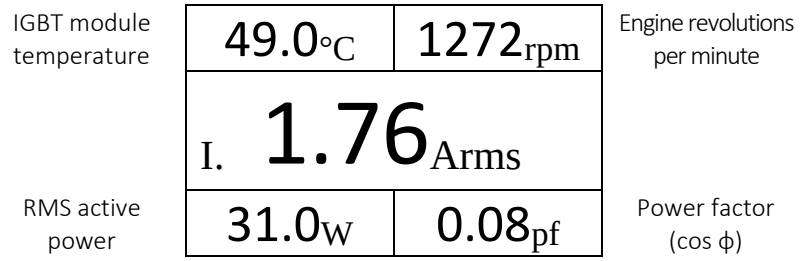
D004 - DISPENSER



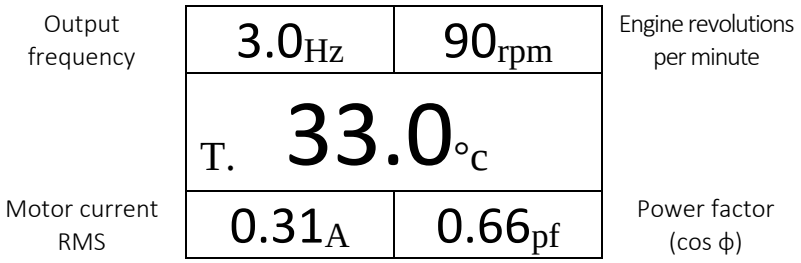
D005 - D.C. BUS VOLTAGE



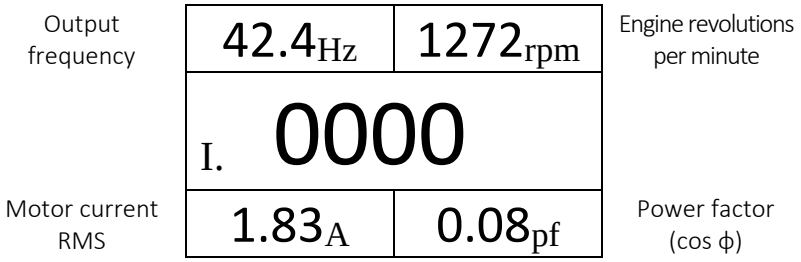
D006 - MOTOR CURRENT



D007 - INVERTER TEMPERATURE



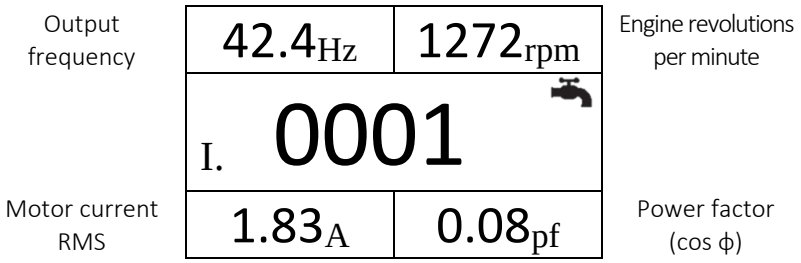
D008 – INPUTS



The layout of the inputs is as shown in the table below. Digit 1 is the one furthest to the right. For input status, 0 = OFF, 1 = ON.

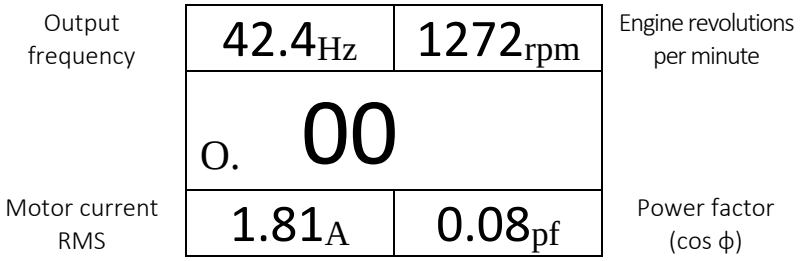
Digit 4	Digit 3	Digit 2	Digit 1
ENTRANCE 4 8.4	ENTRANCE 3 8.3	ENTRANCE 2 8.2	ENTRANCE 1 8.1

Inputs 8.1 and 8.2 are "non-blocking", i.e. they close the relay but the device will continue to operate; in the event of an ALARM, a flashing tap will appear on the screen next to digit 1, as shown in the image below.



Inputs 8.3 and 8.4 are "blocking", i.e. they close the relay and stop the device. All three LEDs (RUN, PRG and MAN) will start to flash and an error symbol will appear with the code of the input that caused the error.

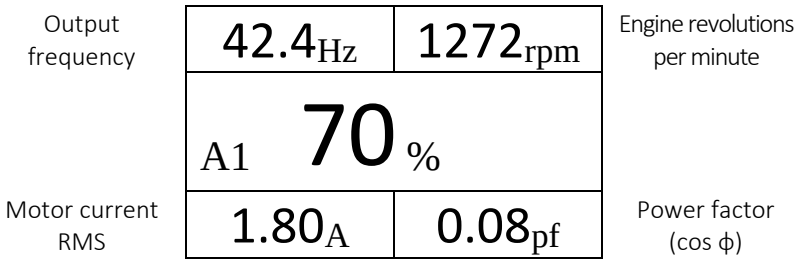
D009 – OUTPUTS



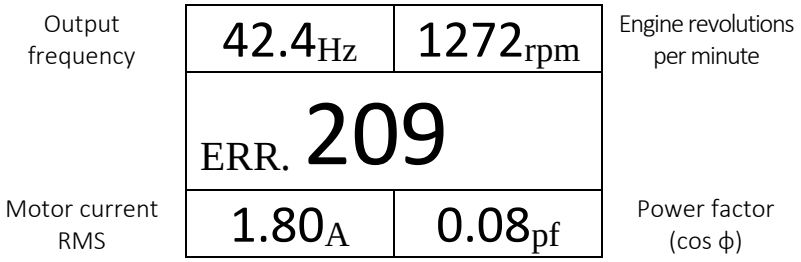
The layout of the outputs is as shown in the table below. Digit 1 is the one furthest to the right. For output status, 0 = OFF, 1 = ON.

Digit 2	Digit 1
OUTPUT 2 7.3 - 7.4 [1]	OUTPUT 1 7.1 – 7.2

D010 – % ANALOGUE INPUT



D100 – NUMBER OF ERRORS STORED



D101 – D105 – LAST FIVE ERRORS OCCURRED

In these menus, D101 to D105, the codes of the last 5 errors occurred will be displayed. For further details, please refer to the chapter "Diagnostics and troubleshooting".

D140-D141- ROOT PASSWORD[2]

The root password is a 4-digit numerical password which, once set, allows access to and modification of the parameters in the setup menu to be blocked.
Parameter D141 allows the password to be set. Once a password other than 0000 has been set, access to the settings menu is blocked. In order to access and modify the parameters, the password must be entered in D140. If the root password is set, the display of parameter D141 is protected until the password is entered again on D140.

[1] Output 2 not available on all models.
[2] Factory preset

If the display is password-protected and unlocked, access to the setup menu will be automatically locked again after one minute of inactivity on the keys.
To remove the root password, simply reset parameter D141 to 0000.

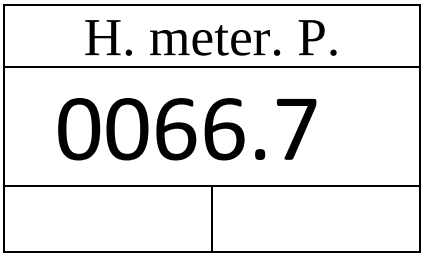
D150-D151- USER PASSWORD

Same principle as D140-D141, with the difference that this password blocks access and modification of the user setup menu. The same rules as for parameters D140-D141 apply.

D199 - PUMP SERIAL NUMBER DISPLAY

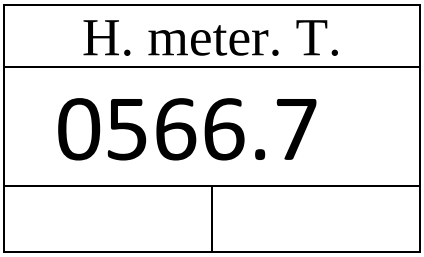
This parameter allows the serial number of the machine to be displayed.

D200 - PARTIAL HOUR COUNTER – Hours and tenths of hours



Pressing and holding the **SEL** button for 5 seconds will reset the partial hour meter.

D201 – TOTAL HOUR COUNTER – Hours and tenths of hours



8. SETUP MENU[1]

PARAMETER	DESCRIPTION	VALUES	UNIT OF MEASURE	DEFAULT
S001	TOTAL FLOW	2÷6000	l/h	**2**
S002	NUMBER OF PULSES/HOUR	2÷60000	-	**9367**
S003	REDUCTION RATIO (INPUT PULSES)	0.10÷999	-	**1.00**
S004	ENABLING PULSE COUNTER MODE	ON÷OFF	-	**OFF**
S005	LINE Q ADJUSTMENT (FLOW RATE) SECTION 0÷10 Hz	-20÷20	%	**0**
S006	LINE Q ADJUSTMENT (FLOW RATE) SECTION 10÷20 Hz	-20÷20	%	**0**
S007	LINE Q ADJUSTMENT (FLOW RATE) SECTION 20÷30 Hz	-20÷20	%	**0**
S008	LINE Q ADJUSTMENT (FLOW RATE) SECTION 30÷40 Hz	-20÷20	%	**0**
S009	LINE Q ADJUSTMENT (FLOW RATE) SECTION 40÷50 Hz	-20÷20	%	**0**
S010	LINE Q ADJUSTMENT (FLOW RATE) SECTION 50÷60 Hz	-20÷20	%	**0**
S011	INPUT 1 CONFIGURATION (8.1)	N.O./N.C.	-	**N.O.**
S012	INPUT CONFIGURATION 2 (8.2)	N.O./N.C.	-	**N.O.**
S013	INPUT 3 CONFIGURATION (8.3)	N.O./N.C.	-	**N.O.**

[1] This menu is configured at the factory during testing and is not accessible to the user

S014	INPUT CONFIGURATION 4 (8.4)	N.O./N.C.	-	**N.O.**
S015	BEHAVIOUR IN CASE OF ERROR ON IN.3	STOP/RESTART	-	**RESTART**
S016	BEHAVIOUR IN CASE OF ERROR ON IN.4	STOP/RESTART	-	**RESTART**
S017	ERROR IN CASE OF SENSOR FAILURE	ON/OFF	-	**ON**
S018	PARAMETER DISPLAYED AT SWITCH-ON	1÷202	-	**1**
S019	MAXIMUM INVERTER MOTOR TEMPERATURE	45÷80	-	**80**
S020	UNIT OF MEASURE	°C,L/h or °F, gal/h	-	**°C,L/h**
S021	COUNTER MODE	Up/Down	-	**Down**
S022	ANALOGUE INPUT CONFIGURATION	4-20mA or 0-10V	-	**4-20mA**
S023	MAXIMUM FREQUENCY	25÷60	Hz	**60**
S024	ACCELERATION RAMP	0.5÷60	s	**1**
S025	DECELERATION RAMP	0.5÷60	s	**0.35**
S026	PWM MODULATION FREQUENCY	2.5-5-7.5-10-12.5-15	kHz	**5**
S027	MAXIMUM CURRENT (I)[1]	0÷8	A	**-**
S028	ERROR RESET	Skip/Reset	-	**Skip**
S029	SERIAL NUMBER SETTING	-	-	**-**
S030	MOTOR VOLTAGE	110÷230	V	**230**[2]
S031	V. CONST.	Enabled/Disabled	-	**Disabled**
S099	RESET TO DEFAULT VALUES	43	-	**43**

8.1 DETAILED DESCRIPTION OF THE MAIN REGISTERS

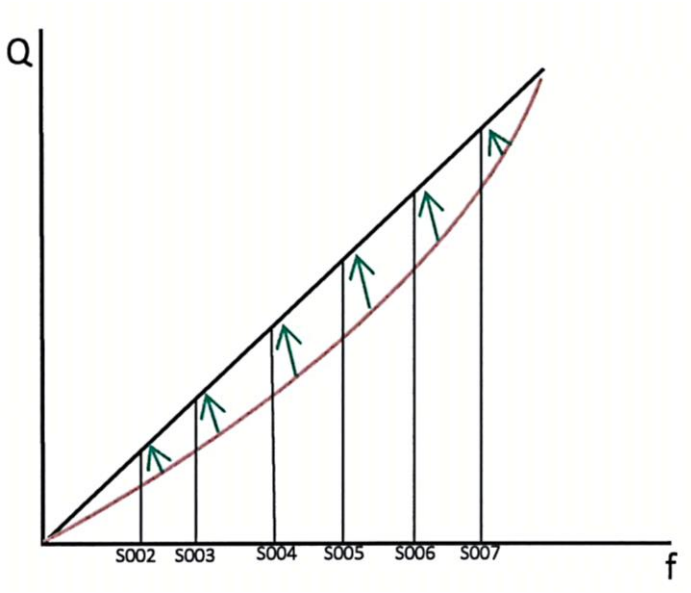
S001 – TOTAL FLOW RATE – Allows the flow rate to be changed according to the pump connected. Changing this parameter allows the times to be displayed correctly.

S002 –S003 – S004 – PULSE MODE – Changing these parameters enables and changes the pulse mode that can be used in the dosing mode. For more information see the chapter on operating modes.

S005 - ADJUSTMENT OF LINE Q (FLOW RATE) SECTION 0÷10 - By modifying this parameter it is possible to change the values of the flow rate as a function of frequency for the range of the Q line from 0%÷10%.

S006 - ADJUSTMENT OF LINE Q (FLOW RATE) SECTION 10÷20 - By modifying this parameter it is possible to change the values of the flow rate as a function of frequency for the range of the Q line from 11%÷20%.

S007 - ADJUSTMENT OF LINE Q (FLOW RATE) SECTION 20÷30 - By modifying this parameter it is possible to change the values of the flow rate as a function of frequency for the range of the Q line from 21%÷40%.



S008 - ADJUSTMENT OF LINE Q (FLOW RATE) SECTION 30÷40 - By modifying this parameter it is possible to change the values of the flow rate as a function of frequency for the range of the Q line from 41%÷60%.

[1] 0.18-0.25kW = 3A; 0.37-0.55kW = 4A; 0.75kW = 8A

[2] May vary for special motors/voltages

S009 - ADJUSTMENT OF LINE Q (FLOW RATE) 40÷50 - By modifying this parameter it is possible to change the values of the flow rate as a function of frequency for the range of the Q line from 61%÷80%.

S0010 - ADJUSTMENT OF LINE Q (FLOW RATE) 50÷60 - By modifying this parameter it is possible to change the values of the flow rate as a function of frequency for the range of the Q line from 81%÷100%.

S015 – S016 – BEHAVIOUR IN CASE OF ERROR ON INPUTS 3 AND 4 – Allows you to choose what to make the system do if an error occurs on one of the two inputs. With RESTART the system will restart automatically once normal operation is restored, with STOP the system will remain stationary until manually restarted.

S017 – ERROR FOR LACK OF SENSOR – If enabled, the system will enter an error if it detects a missing sensor (input signal). If disabled, the system continues to function correctly even without the presence of the latter.

S021 - COUNTER MODE – Allows you to choose how the system displays the count: as a countdown from the set parameter to zero, or as a pure count, starting from zero and arriving at the set parameter.

S024 - ACCELERATION RAMP - Time taken to accelerate from 0 to 50 Hz. The total acceleration time of the motor will depend on the speed jump being made (e.g. if the maximum frequency set is 100 Hz, the value "5" set in this parameter will result in an acceleration time of 10 seconds when going from 0 to 100Hz). The following formula is useful for calculating ramps:

$$x = \frac{t^*}{f^*} \cdot 50$$

Where x is the value to be set in S009, t^* is the desired acceleration time in seconds and f^* is the desired frequency to be reached by the motor-inverter.

Caution: Excessively short ramps may result in tripping of the overcurrent protection during acceleration and overvoltage protection during deceleration.
Below 1.00 s, it varies in steps of 0.05 s.

S025 - DECELERATION RAMP - Time taken to decelerate from 50 to 0 Hz. The same principle applies as for acceleration.

S099 – RESET DEFAULT VALUES – S099 = 43 resets the values of the set-up parameters to their default values shown in the table above.

9 USER SETUP MENU

In this menu it is possible to modify user settings for the correct operation of the system. All these parameters can also be configured via the SETUP MENU (which is protected and set at the factory during testing). Changing one of these parameters will automatically change the equivalent parameter in the factory setup menu and vice versa.

PARAMETER	DESCRIPTION	VALUES	UNIT OF MEASURE	DEFAULT
SU001	INPUT 1 CONFIGURATION (8.1)	N.O./N.C.	-	**N.O.**
SU002	INPUT CONFIGURATION 2 (8.2)	N.O./N.C.	-	**N.O.**
SU003	INPUT 3 CONFIGURATION (8.3)	N.O./N.C.	-	**N.O.**
SU004	INPUT CONFIGURATION 4 (8.4)	N.O./N.C.	-	**N.O.**
SU005	BEHAVIOUR IN CASE OF ERROR ON IN.3	STOP/RESTART	-	**RESTART**
SU006	BEHAVIOUR IN CASE OF ERROR ON IN.4	STOP/RESTART	-	**RESTART**
SU007	ERROR IN CASE OF SENSOR FAILURE	ON/OFF	-	**ON**
SU008	PARAMETER DISPLAYED AT SWITCH-ON	1÷202	-	**1**
SU009	UNIT OF MEASURE	°C, L/h or °F, gal/h	-	**°C,L/h**
SU010	COUNTER MODE	Up/Down	-	**Down**
SU011	ANALOGUE INPUT CONFIGURATION	4-20mA or 0-10V	-	**4-20mA**

10 MODE OF OPERATION

10.1 AUTOMATIC MODE

Valid for menus D001, D002, D003. Entering one of these pages, pressing the RUN button will start the system and use the analogue input to adjust the range or the arrows on the keypad for manual mode when this mode has previously been selected via the MAN button.

10.2 TIMED MODE

Valid for menus D001, D002, D003. With the system stopped, two times can be set by pressing the SEL button:

- Wait start: waiting time before departure;
- Timer ON: time during which the system must be switched on;

Once the parameters have been set, pressing the MAN button will activate the timer mode: the system will be stopped for the time set in "wait start" and will remain on for the time set in "timer on". Use the arrows to adjust the flow rate.
Note: If timer ON is set to zero, the system will turn on after waiting for the "wait start" time and will remain in that state until it is turned off via the RUN button.

10.3 PRIMING MODE

To enter this mode, with the system stationary, press the up and down arrow keys simultaneously for more than 5 seconds.

Press MAN key to set the priming time.
Press SEL to set the minutes and seconds digits and set the desired time using the arrows or press MAN to set the priming frequency, always using SEL to navigate between the digits.
Press MAN for the third time to exit the settings.
To start priming, press the RUN button, and to exit, press PAR.

10.4 BATCH DOSING MODE

This mode is accessed via menu D004. By pressing the MAN key the absolute quantity in litres to be dosed can be changed. This value can be changed using the up and down arrow keys to adjust the digits and the SEL key to move between them. The RUN key starts the system.
Depending on the value of parameter S004, the system operates differently:

- S004 = OFF (pulse counter mode disabled): Starting the system by pressing RUN, the dosing time will be modulated by the ratio between the set absolute litre value and the pump flow rate value in l/h (set in S001).
- S004 = ON (pulse counter mode enabled): Starting the system by pressing RUN, the dosing time will be a function of parameters S001, S002, S003, thus taking into account the actual SPM of the pump mechanism and any variations.
  Note: If the pulse sensor is faulty or not connected, the dosing count will remain unchanged, without signalling any error.

11 CONNECTION DIAGRAMS

ATTENTION: the version with graphic panel display is supplied with all the necessary connections already made. You only need to read this chapter if you need to reconnect the display to the inverter.

11.1 DISPLAY BOARD LAYOUT

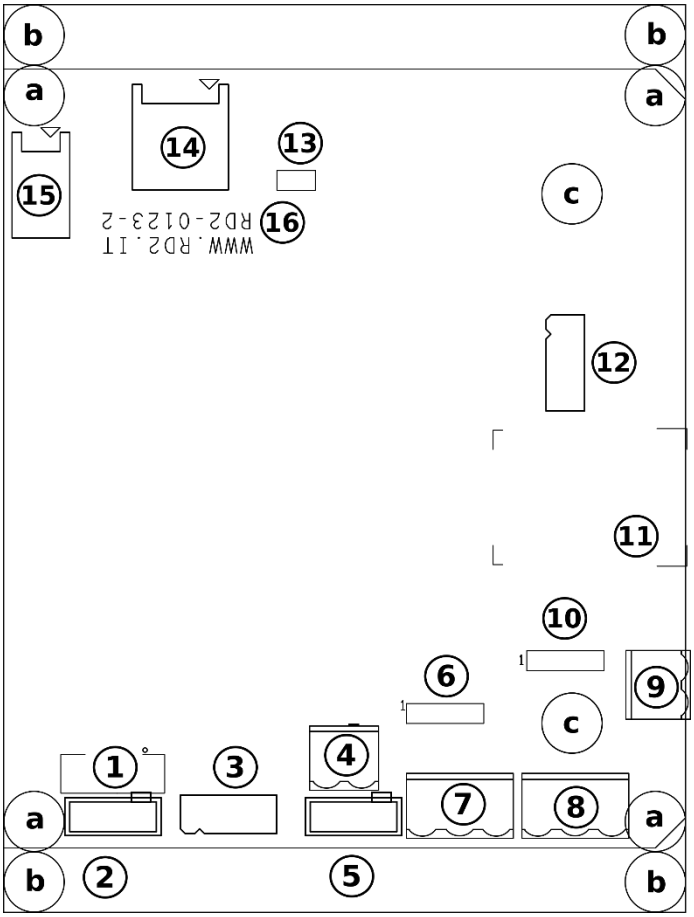


FIGURE 1

Key:

1	JST power connector
2	AMP MOD II power connector
3	Pin Header 5x2 inverter-display communication
4	RS485 serial auxiliary connection
5	RS485 serial auxiliary connection
6	Reserved for special applications
7	Reserved for special applications
8	Reserved for special applications

9	Reserved for special applications
10	Reserved for special applications
11	WiFi antenna[1]
12	WiFi Mesh addressing jumper
13	Reserved CANBUS connector[2]
14	Reserved CANBUS connector
15	Reserved CANBUS connector
16	Hardware version

[1] For more information on using the display with integrated WiFi, please contact our Technical Service.
[2] For further information on the use of CanBus, please contact our Technical Service.

11.2 CONNECTING THE DISPLAY TO THE INVERTER

The display must be connected to the inverter via two cables:

- The 5x2 flat cable is used for communication between the inverter and the display;
- The power cable for the display.

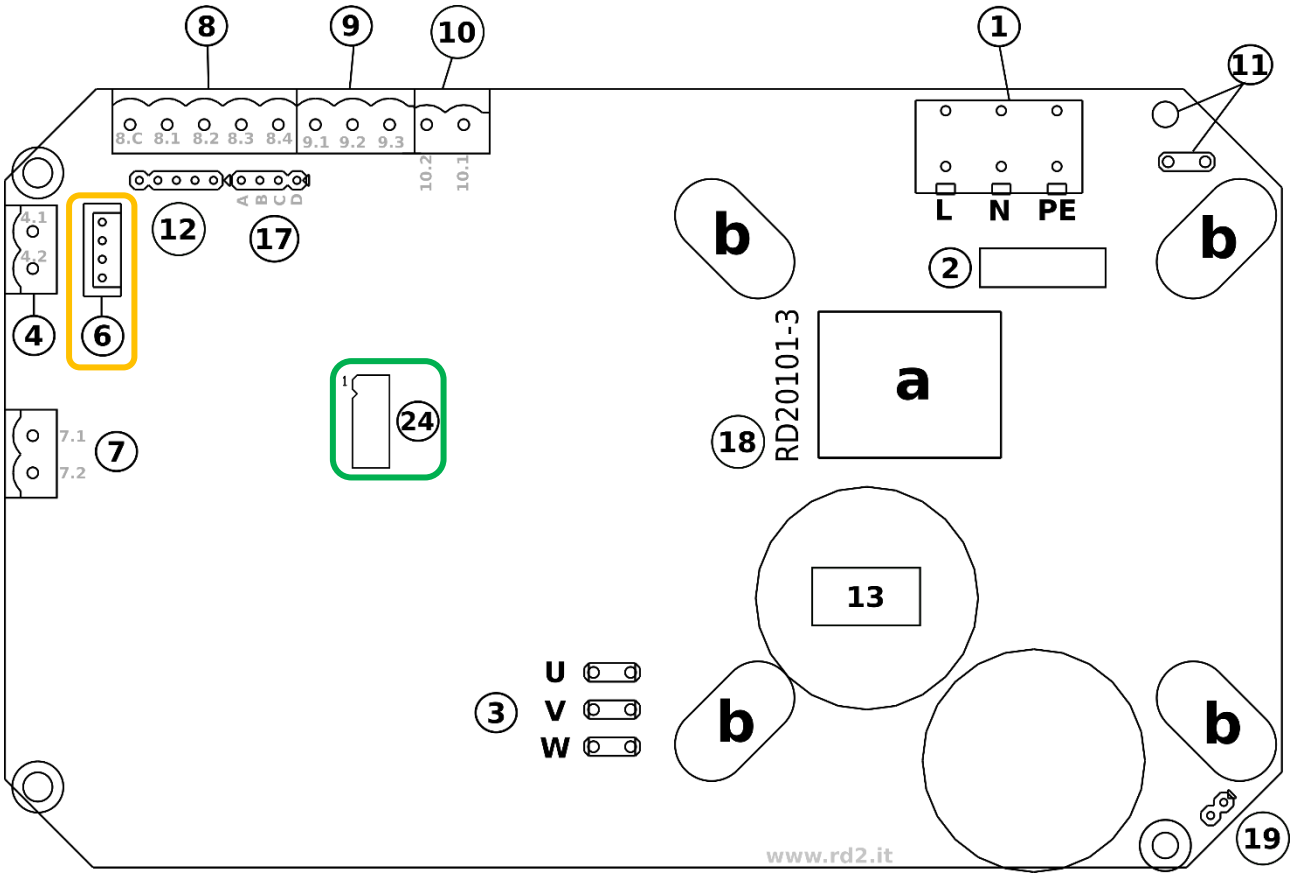
11.2.1 Connecting cables to the display

Connect the flat to the display, paying attention to its polarity: the arrow on the cable connector (coinciding with the wire of a different colour) must be aligned with pin 1 marked by the indentation on connector number 3 (see Figure 1). Then connect the power cable to the connector numbered 1 (see Figure 1).

11.2.2 Connecting the display to the inverter

Once the cables on the display board have been connected, proceed to connect them to the inverter board. Connect the power cable to connector number 6 and the flat cable to connector number 24, again paying attention to the polarity of the connection.

INVERTER BOARD LAYOUT



11.2.3 Quick start button and sensor connection

Connecting the start button: 8.C and 10.2
Pulse counter connection: positive on 8.C, negative on 9.1 and input on 10.1.

12 DIAGNOSTICS AND TROUBLESHOOTING

12.1 INTERVENTION OF PROTECTIONS

Tripping of any inverter protection will cause the motor to stop. The display shows:

- the number of protection errors that occurred;
- the codes for the last five errors.

The "error in progress" condition and error codes can also be acquired via ModBus (ask for the "ModBus Manual" for full details).
Appropriate programming of the outputs can allow the signalling to external equipment of the possible presence of errors (or the NON-presence of the same). The programmability of the output function is limited to the error condition only, it is not possible through the digital outputs to obtain information about the type (code) of error occurred.

The electronic protections in the inverter are as follows:

- Over-temperature: Triggers when the temperature of the power module exceeds 80°C. In the event of an intervention, check that the motor-inverter is installed in an area with sufficient air exchange to lap the inverter's external enclosure. Warning: this protection has no connection with the engine temperature. However, optimum thermal protection of the motor is already achieved with cosϕ control (see cosϕ protection, explained later).
- Overcurrent: Triggers in the event of an instantaneous overcurrent at the output (to the motor). It can also operate under special working conditions with particularly low supply voltages and high mechanical loads applied to the motor axis and presumably to the pump itself.
- Overvoltage: triggered when the voltage at the ends of the capacitors rises above the maximum permitted value. It is a condition that can occur if abrupt decelerations are performed with highly inertial loads (a very rare condition in this type of machine). It may also occur due to a supply voltage exceeding the inverter's operating limit. In this case, the deceleration time must be increased (parameter S010). In the case of repeated tripping, it is necessary to check whether the error occurs during engine deceleration, at standstill or at constant speed.
- Cosϕ protection: this is protection linked to the actual measurement of the power factor that the inverter takes on the motor moment by moment. The standard parameters on the basis of which the inverter performs the calculation (hidden parameters) provide extremely effective protection of the motor against overheating under all operating conditions. Changing these parameters is not normally recommended to solve problems related to the repeated triggering of this protection (which must be solved by adding auxiliary ventilation to the motor, otherwise the motor may burn out). Doseuro recommends the application of the servo-ventilated motor for continuous use (over 30 min.) of the pump at a frequency <= 20 Hz. For more details and possible optimisation of protection, please contact our Technical Support.
- RS485 communication error: intervenes in the event of a timeout on RS485 communication (refer to the "ModBus Manual" for full details).
- Communication Line" error: this is an internal error and indicates a probable fault on one of the two microprocessors in the inverter.

12.2 DISPLAYING ERRORS AND PROTECTIONS

Error codes (stored in parameters D101 to D105)

ERROR CODE	DISPLAY	DESCRIPTION
1	ERR OT	Power module overtemperature
2	ERR OL	Overcurrent
3	ERR EF	"External Fault' (emergency input activation)
4	ERR OV	Overvoltage
5	ERR PF	Motor protection for average cosϕ greater than the set value over a time greater than 5 times the reference parameter
10	ERR cL	“Communication Line” internal error
11	ERR cB	Communication timeout on RS485

Restarting the engine is always subject to removal of the cause of the error.
To restart the device, press the **RUN** button (automatic mode).

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