BGS74+PQ2

Terminal Modbus remoto

- conexión hasta 16 dispositivos
- Orientación Vertical / horizontal
- 2 comunicación RS485
- 2 relés de alarma
- 1 entrada analógica
- 3 entradas digitales
- Multi-idioma: 5 idiomas
- hasta 4 variables por página

Remberg®

Manual de usuario

Table of contents

Introduction

Thank you for having chosen is instrument. DIS96-RS4 is a remote Modbus display to view and modify variables on slave devices connected to an RS485 network. In a 96x48mm format, it is supplied with 128x64 pixel graphical OLED display (monochrome yellow). Distinctive feature is the intuitive multi-language interface with detailed text menus. Connectivity is provided by a second RS485 serial port with Modbus RTU slave protocol and by a Virtual Comm Port on micro-USB.

1 Safety standards

Carefully read the instructions and safety measures in this manual before using the device. Disconnect power before performing any interventions on the electrical connections or hardware settings.

Only qualified personnel may use/perform maintenance in full respect of the technical data and declared environmental conditions.

Do not dispose of electrical appliances together with household waste.

In compliance with the European Directive 2002/96/EC, waste electrical equipment must be collected separately for eco-compatible reuse or recycling.

2 Identification of the model

Model 24..230 V AC/V DC +/-15% 50/60 Hz – 6 VA	
BQ74+PQ2	2 Relays 2 A + 3 digital inputs + 1 input analog + 2 RS485 + RFid

3 Technical data

3.1 General features

Display	2.42" monochrome (yellow) OLED graphical display
Operating temperature	Operating temperature 0-45°C - Humidity 35..95 Rh%
Protection	IP54 (on front) with gasket IP20 (container and terminals)
Material	Container: polycarbonate V0 Front panel: silicon rubber
Weight	Approximately 165g

4 Hardware features

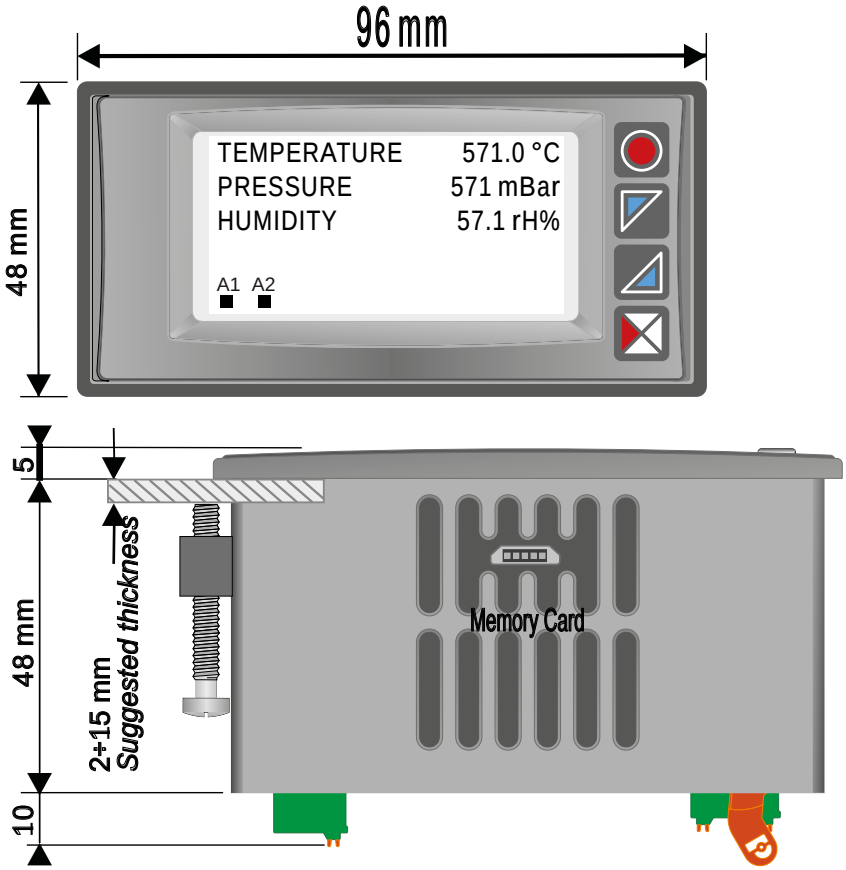
Power supply	Extended range power supply 24..230 V AC/V DC ±15% 50/60 Hz	Consumption: 6 VA.
COM1 serial port	Galvanically isolated RS485 interface	Modbus master Speed 1200..115200 bps
COM2 serial port	RS485 interface	Modbus Slave Speed 1200..115200 bps
Micro-USB port	USB device interface	For connection to PC and memory card management.
Relays output	2 Relays	2 A - 250 V AC contacts. Resistive load.
Digital inputs	3 Inputs	Configurable PNP/NPN (2) Configurable NO / NC
Potentiometer input	1 input to set values of the variables.	Minimum 1 KΩ (power supply 24V DC)
Display	2.42" monochrome yellow OLED technology.	Lifespan 150,000 hours (duration is specified as reaching 50% of the initial brightness)
Front keys	4 front keys	To browse and edit data.

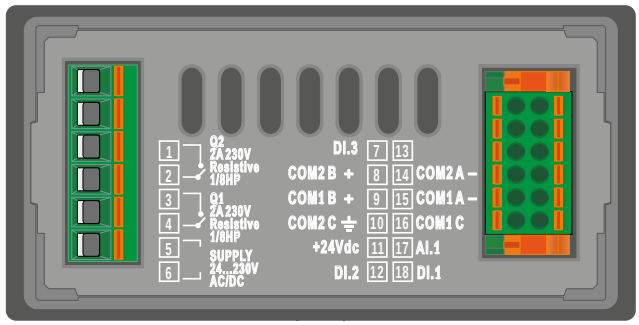
4.1 Software features

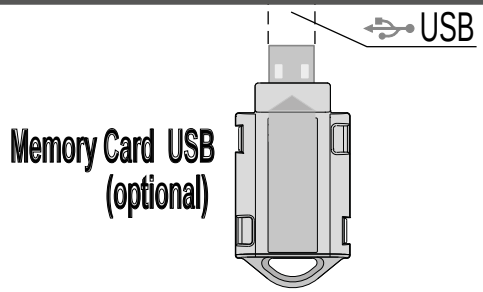
Multi-language menu	English/Italian/German/French/Spanish
Master COM1 serial port	Modbus Master / Multimaster RTU / ASCII protocol
Number of variables	Max 8 reading/writing variables on Modbus slave devices.
Viewing variables	Configurable display by means of 1-4 variable parameters per page. Automatic selection of the maximum display font size for enhanced data reading.
Configuration of variables	The following can be set for each variable: • Description (max 16 characters) • Unit of measurement (max 5 characters) • Selectable number of decimals • Format (bit, 16 bit, 32 bit, 32 bit floating point) • Numerical or enumerative display (for values 0..4): each numerical value has a corresponding displayed text • Processing of read data • Address of data and device
Automatic page scrolling	Possibility of enabling timed automatic scrolling of the display pages of the variables.
Encoder management from panel	Possibility of connecting a rotary encoder on the panel to the digital inputs to facilitate browsing of the various pages and to edit the variables and alarm setpoints. (Code 5300.55.001)
Communication status diagnosis	Possibility of viewing the communication status for each of the enabled variables.
Potentiometer setting	Possibility of setting the value of a variable with a potentiometer. Possibility of enabling writing of a variable by selecting it with a potentiometer. The potentiometer limits are stored with an acquisition procedure.

Alarms management	ON/OFF with hysteresis
Alarm mode	Absolute/Threshold, Band with instantaneous/delayed/ retentive action and by digital input/communication failure / activation from serial communication
Slave COM2 serial port	Modbus RTU slave protocol
USB port	Virtual Com Port with Modbus RTU slave protocol. Memory card connection for parameter configuration

5 Dimension and installation







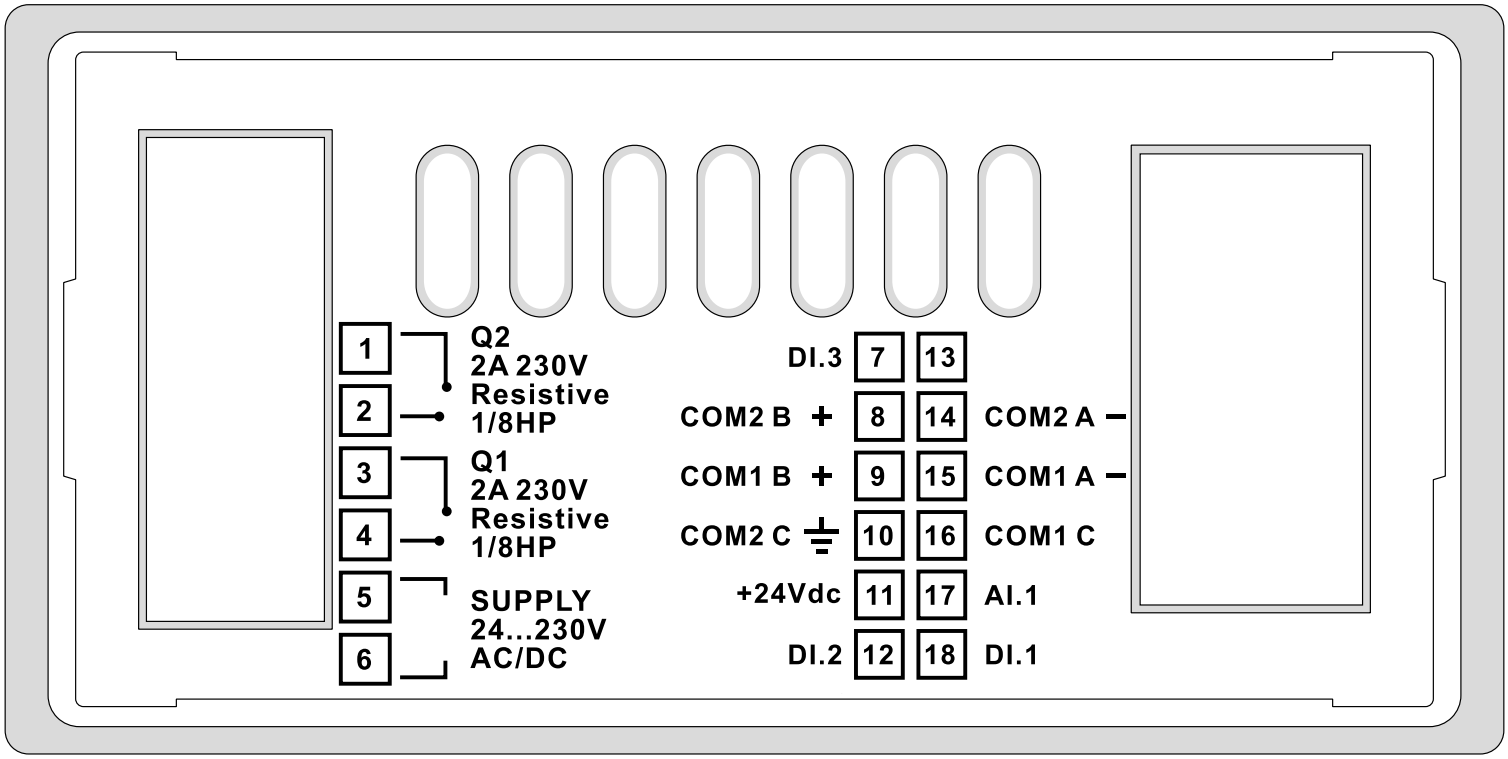
45 x 91 mm
Frontal panel cut-out

6 Electrical connections

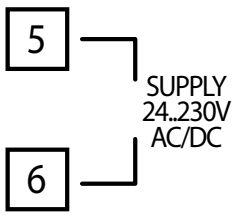
Even though this instrument has been designed to withstand the most heavy-duty disturbances in industrial environments, the following precautions should be taken:

- Distinguish the supply line from the power lines.
- Keep contactor units, electromagnetic contactors and high power motors away from each other and anyway use specific filters.
- Keep power units away from each other, especially if with phase control.

6.1 Connection diagram

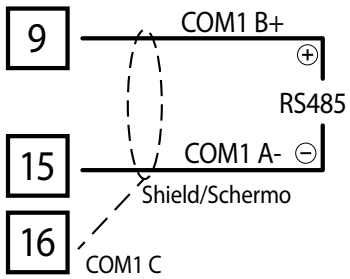


Power supply



Extended range switching power supply 24..230 V AC/V DC ±15% 50/60 Hz – 6 VA (with galvanic isolation).

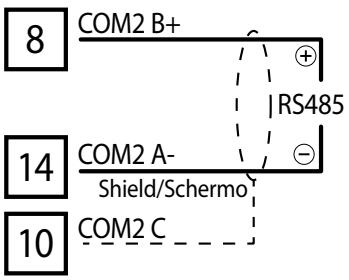
COM1 serial port (Modbus master)



For connection to Modbus slave devices

- RS485 interface
- 1/4 line load (up to 128 nodes on bus)
- Common mode power supply +/-25V
- Protection from failure +/-60V
- Modbus master or multimaster protocol
- RTU and Ascii mode.

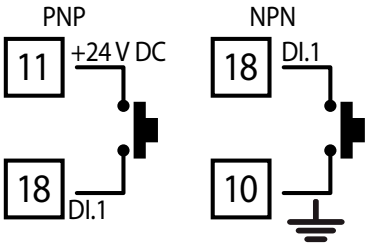
COM2 serial port (Modbus slave)



For connection to a Modbus master device

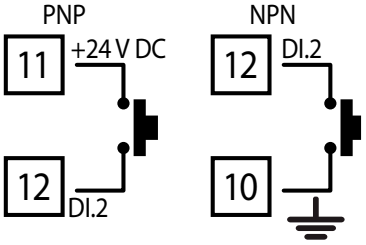
- RS485 interface
- 1/4 line load (up to 128 nodes on bus)
- Common mode power supply +/-25V
- Protection from failure +/-60V
- Modbus slave RTU protocol

Digital input DI.1



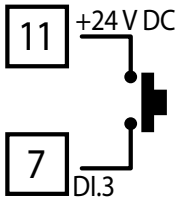
- **PNP configuration**, to activate input DI.1, short circuit terminals 11 (+24V DC) and 18 (DI.1).
  (*Activation Vi > 8.7V Deactivation Vi < 7.2V*)
- **NPN configuration**, to activate input DI.1, short circuit terminals 10 (GND) and 18 (DI.1).
  (*Activation Vi < 7.2V Deactivation Vi < 8.7V*)

Digital input DI.2



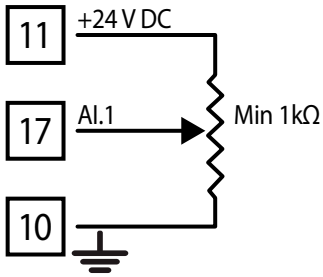
- **PNP configuration**, to activate input DI.2, short circuit terminals 11 (+24V DC) and 12 (DI.2).
  (*Activation Vi > 8.7V Deactivation Vi < 7.2V*)
- **NPN configuration**, to activate input DI.2, short circuit terminals 10 (GND) and 12 (DI.2).
  (*Activation Vi < 7.2V Deactivation Vi < 8.7V*)

Digital input DI.3



To activate input DI.3, short circuit the terminals 11 (+24 V DC) and 7 (DI.3).
(*Activation Vi > 12.1V* *Deactivation Vi < 12.0V*)

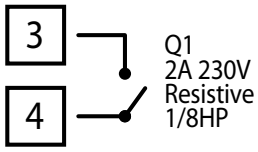
Potentiometer



For linear potentiometers.

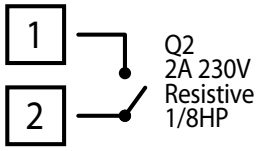
- Use potentiometers with a resistive value greater than 1KΩ.
- When using a shielded cable, the shield must be connected to terminal 10 (GND).

Q1 Relay Output

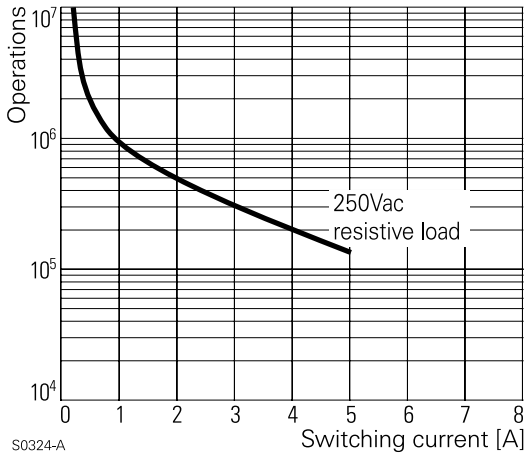


2 A / 250 V AC contacts capacity for resistive loads.
NB: see graph below

Q2 Relay Output

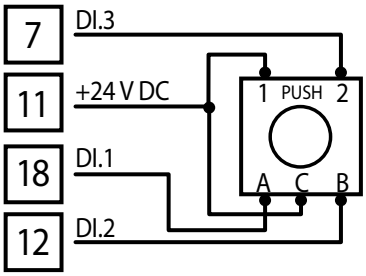


2 A / 250 V AC contacts capacity for resistive loads.
NB: see graph below



Electrical endurance Q1 / Q2.
2 A, 250 V AC, resistive load, 10^5 operations.
20/2 A, 250 V AC, cosφ = 0.3, 10^5 operations.

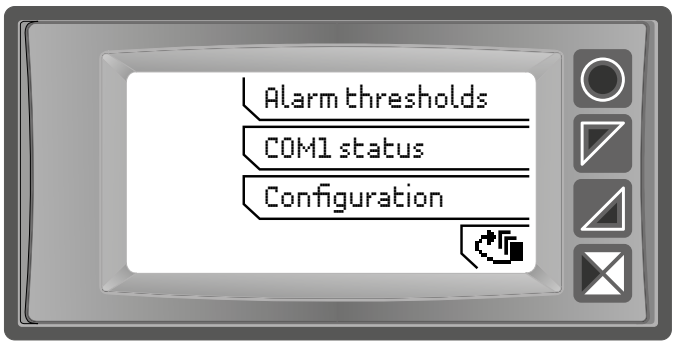
Encoder connection from panel



The drawing shows how to connect the encoder from the optional panel to browse and edit the values of the variables. (Code 5300.55.001)

7 Function of keys and of the display

7.1 Keys



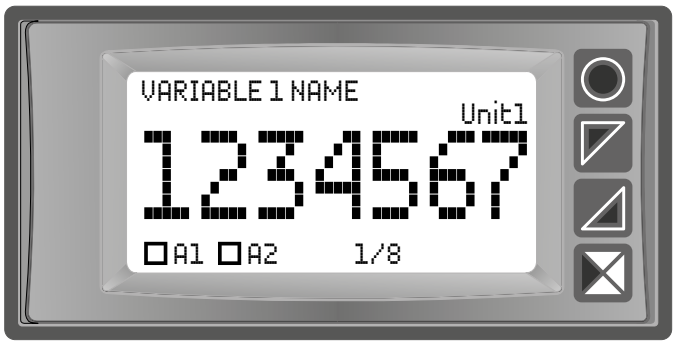
The keys are multifunction: the instrument shows the meaning of the various buttons on the display near the relative key. If there is no text near the key, press any button to display it. Some menus are only displayed if activated.

7.2 Display

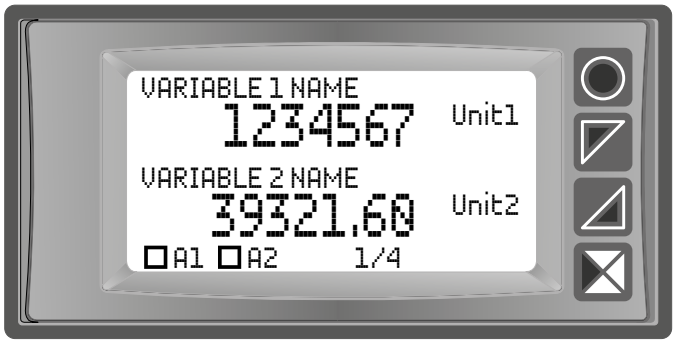
Shows the values of the variables, the alarm setpoints, information regarding communication and all the configuration parameters. The multi-language interface makes navigation and access to the various functions intuitive.

Upon first start-up the display shows the language selection.

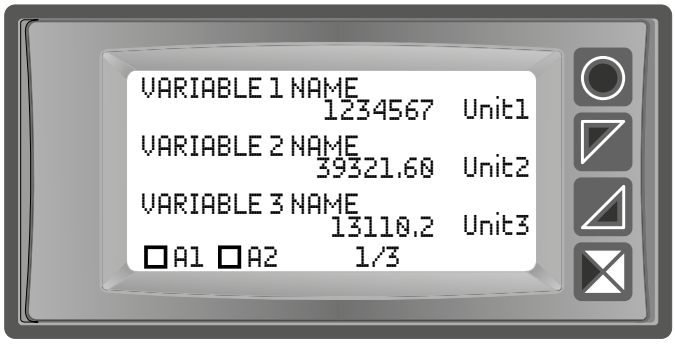
7.3 Display mode



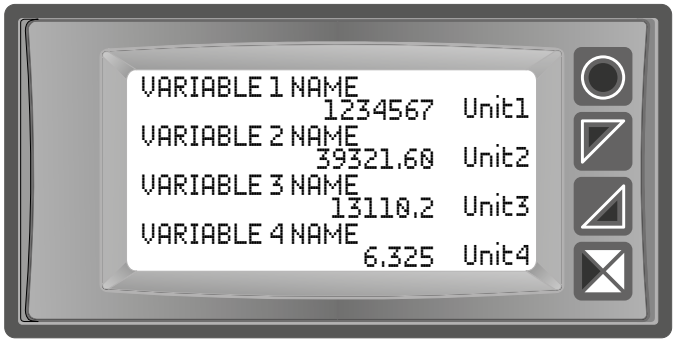
Shows the value of the first variable enabled with relative description, unit of measurement and the status of the alarm relays. The figure represents the display of “1 val. per page” setting in “Display -> View” parameter. The 1/8 text at the bottom indicates that the first of 8 pages used to represent enabled variables is being displayed.



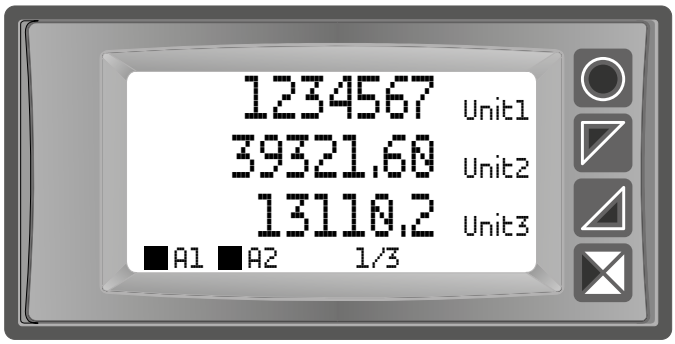
Shows the value of the first two variables enabled with relative description, unit of measurement and status of the alarm relays. The figure represents the display of “2 val. per page” setting in “Display -> View” parameter.



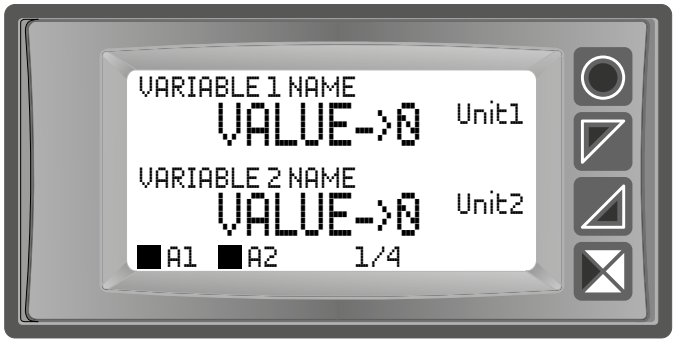
Shows the value of the first three variables enabled with relative description, unit of measurement and status of the alarm relays. The figure represents the display of “3 val. per page” setting in “Display -> View” parameter.



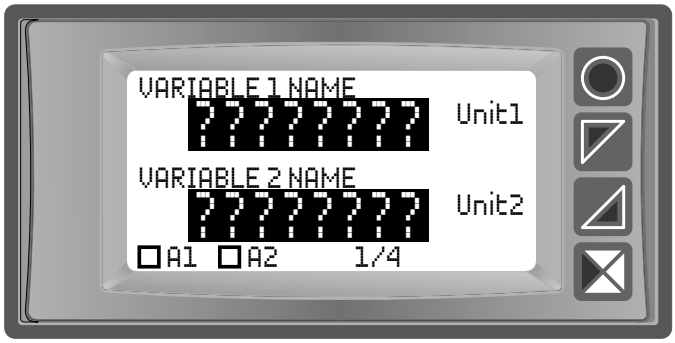
Shows the value of the first four variables enabled with relative description, unit of measurement and status of the alarm relays. The figure represents the display of “4 val. per page” setting in “Display -> View” parameter.



Shows the value of the first three variables enabled, in **expanded view** mode. This mode, which can only be enabled when viewing 3 or 4 variables per page, displays the values of the variables with a larger character than that normally used for this representation, without viewing the description of the variables and only leaving the unit of measurement. This mode is enabled by setting the description of the relative variables as a sequence of spaces (zero description).



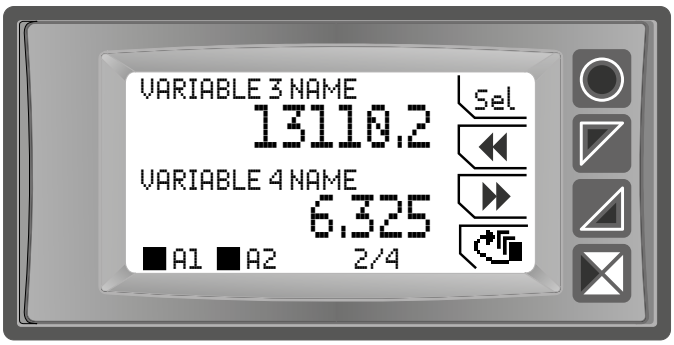
Shows the value of a variable by means of alphanumerical strings instead of the corresponding numerical value. This is possible for variable values between 0 and 4. A text string 8 characters long can be set for each of these values. For values lower than 0 and higher than 4, the variable is displayed in the traditional numerical format.



Represents the typical display of variables in offline mode. If the display cannot establish the connection with the slave of the variable, and therefore cannot read/write the relative value, the numerical display is replaced by flashing question marks.

8 Functions of the instrument

8.1 Displaying the variables



If the set variables require more than one screen for their complete display, there are three ways to change the screen.

- **Automatic mode**. By setting the *Scroll time* parameter other than *Disabled*, if no keys are pressed, the screens will be displayed in cyclical timed mode with the interval set in the parameter. The display will then pass from one page to another automatically.
- **Manual mode from keyboard**. During standard display of the variables, pressing one of the buttons on the keyboard displays the navigation menu near the keys. You may scroll the display screens of the variables forward and backward using the ◀◀ and ▶▶ keys. The currently viewed page number together with the total number of pages are displayed at the bottom of the screen.
- **Manual mode with encoder from panel**. By using the optional panel encoder accessory, connected to appropriately configured digital inputs, simply rotating the knob will allow you to scroll the display screens of the variables forwards or backwards.

8.2 Editing values of the variables

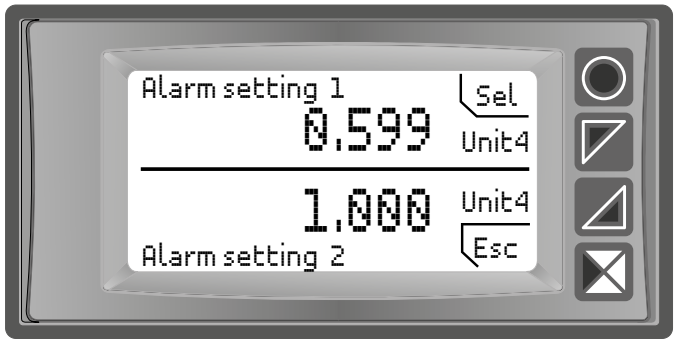
The navigation menus on the screens with variables which can be edited will also have the Sel key. If connected to the configured digital input 3, push the knob of the panel encoder instead of pressing the Sel and Ok keys. To edit a variable, see the procedure in the table below.

	Press	Effect	Execute
1	Sel	Selects the first variable to be edited. The value to be edited is highlighted. The navigation menu is replaced by the edit menu.	∧ and ∨ to edit the value. Or, if available, use the knob of the panel encoder. The ▯▮▯▯ key allows you to edit one digit at a time.
2	Ok	Confirms the edited value. If the page has another variable to be edited, it selects it. If there are no more variables to be edited, see point 3.	See point 1.
3	Ok	∧ and ∨ of the edit menu disappear and the navigation menu re-appears.	For further editing, see point 1.

You exit the edit menu 5 seconds after the last key has been pressed. In this case, the modified data is saved.

8.3 Editing alarm thresholds

Setting one or more absolute or band alarms allows you to edit the triggering thresholds directly from the user menu without entering configuration.



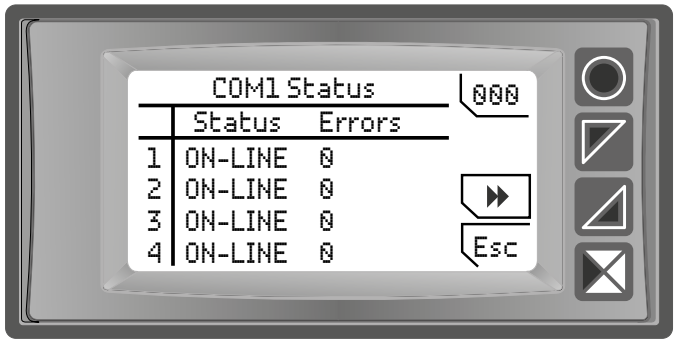
Pressing Alarm thresholds grants access to the thresholds edit page.

See the procedure in the table below.
If connected to the configured digital input 3, push the knob of the panel encoder instead of pressing the Sel and Ok keys.

	Press	Effect	Execute
1	Sel	Selects the setpoint to edit	∧ and ∨ to edit the value. Or, if available, use the knob of the panel encoder. The ▯▮▯▯ key allows you to edit one digit at a time.
2	Ok	If active, the subsequent setpoint is selected. Otherwise go to point 3.	See point 1.
3	Ok	∧ and ∨ disappear	Esc to exit the setpoint edit page.

8.4 COM1 status

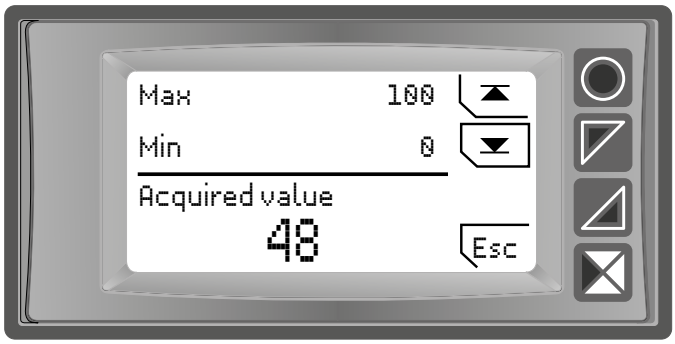
This function, accessed by pressing Status CO on the main menu, allows you to monitor the communication status of each of the enabled variables.



It indicates the current status of the variable (ON-LINE, OFF-LINE) and the number of communication errors or timeouts since the instrument was switched on.
Pressing 000 allows you to reset the error counters, while pressing ◀◀ and ▶▶ displays the data of the variables not currently viewed on the page.

8.5 Acquisition of potentiometer limits

This function allows you to activate an "on field" calibration procedure of the minimum and maximum limits for the potentiometer input.
This function is enabled for configuration in the "**Potentiom. input**" section at the item "**Acquisition**". Once acquisition has been enabled and you have exited configuration, the following screen appears automatically.



At this point, proceed as follows:

- Set the potentiometer at the position you wish to associate to the **Minimum value**.
- Press ▼ to acquire the position and to store the value. The **Acquired value** will indicate the **Min.** value showing that the command has been executed.
-
- Set the potentiometer at the position you wish to associate to the **Maximum value**.
-
- Press ▲ to acquire the position and to store the value. The **Acquired value** will indicate the **Max.** value showing that the command has been executed.

At this point, the potentiometer acquisition procedure is finished; check that the potentiometer position and the **Acquired value** correspond.
Press Esc to exit the procedure.

8.6 Digital input 1 and 2 functions

The Modbus remote display integrates some functions relative to the digital inputs: they can be enabled by configuring the **Digital input 1 -> Input function** parameter and the **Digital input 2 -> Input function** parameter.

- **Enable outputs**: activates alarm relays.
- **Reset alarms**: if one or more alarms are set with manual reset and the alarm conditions are no longer present, closing the digital input allows you to restore the alarm output.
- **Config. Block**: you may not access configuration with the digital input enabled.
- **Incr. variab. x**: with the digital input enabled, the corresponding variable is increased. The autorepeat function is enabled.
- **Decr. variab. x**: with the digital input enabled, the corresponding variable is decreased. The autorepeat function is enabled.
- **Incr. var. sel.**: with the digital input enabled, the variable currently selected is increased. The autorepeat function is enabled.
- **Decr. var. sel.**: with the digital input enabled, the variable currently selected is decreased. The autorepeat function is enabled.
- **Encoder modif.**: the digital input is enabled (coupled to the other digital input) to manage the panel encoder to modify variables and alarm setpoints.

By setting **Digital input 1** or **Digital input 2** in the **Alarm x -> Alarm type** parameters, the relative relays activate simultaneously with the digital input. The functions set in the **Digital input 1 -> Input function** and **Digital input 2 -> Input function** parameters continue to work.

By setting **Digital input 1** or **Digital input 2** in the **Variable x** -> **Data source** parameters, the corresponding variable will take on the value 0 or 1 depending on the status of the digital input. The functions set in the **Digital input 1 -> Input function** and **Digital input 2 -> Input function** parameters continue to work.

8.7 Digital input 3 functions

The Modbus remote display integrates a further digital input associated to the function selected by the **Digital input 3 -> Input function** parameter

- **Select variab.**: the digital input allows you to enable or confirm editing of the variables on the currently displayed screen. This function is useful when using the panel encoder to edit values by means of digital inputs 1 and 2. In this case, pushing the encoder connects this input.

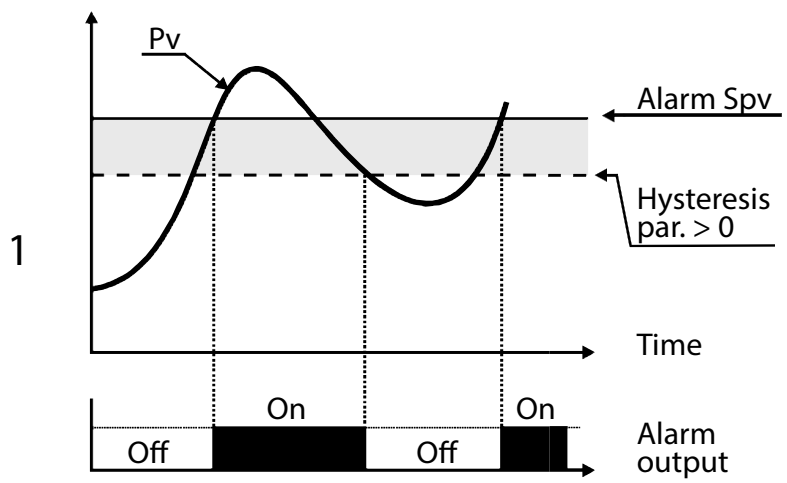
By setting **Digital input 3** in the **Alarm x -> Alarm type** parameters, the relative relays activate simultaneously with the digital input. The function set in the **Digital input 3 -> Input function** parameter continues to work.

By setting **Digital input 3** in the **Variable x -> Data source** parameters, the corresponding variable will take on the value 0 or 1 depending on the status of the digital input. The function set in the **Digital input 3 -> Input function** parameter continues to work.

8.8 Alarm triggering modes

Display implements various alarm modes, described below.

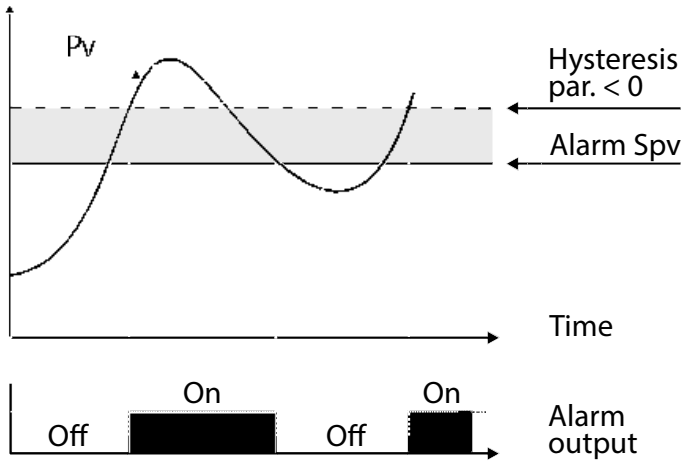
Absolute alarm ("Absolute" selection)



Absolute alarm and hysteresis value greater than "0" (Par.58 **Hysteresis**> 0).

N.B. The example refers to alarm 1; the function can also be enabled for alarm 2.

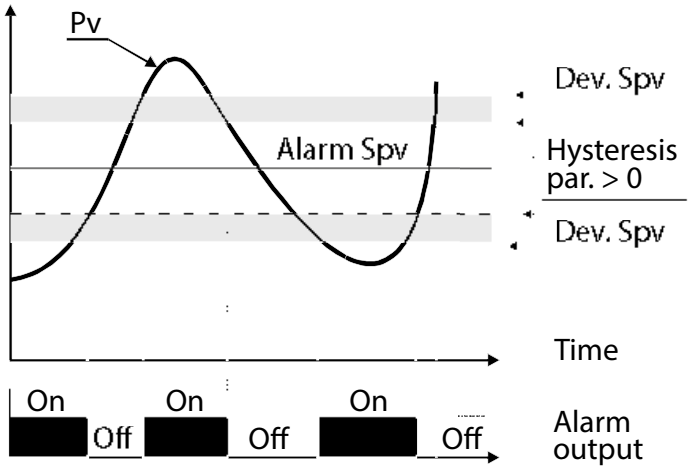
2



Absolute alarm and hysteresis value less than “0” (Par.58 **Hysteresis** < 0).
N.B. The example refers to alarm 1; the function can also be enabled for alarm 2.

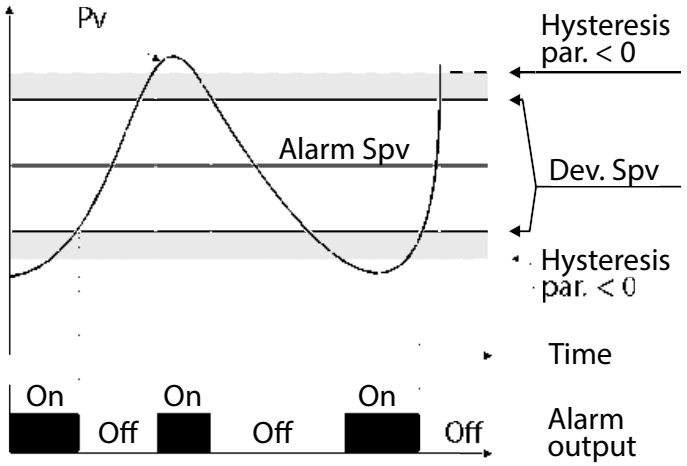
Band Alarm (Band selection)

1



Hysteresis band alarm value greater than “0” (Par.58 **Hysteresis** > 0).
N.B. The example refers to alarm 1; the function can also be enabled for alarm 2.

2



Hysteresis band alarm value less than “0” (Par.58 **Hysteresis**< 0).
N.B. The example refers to alarm 1; the function can also be enabled for alarm 2.

Digital input alarm ("Digital input 1..3" selection)

Alarm relating to digital input: the relay is activated with the digital input enabled.

Communication alarm ("Serial error") selection

Alarm related to an error (offline) of the COM1 serial port. The relay is activated when at least one variable exchanged on COM1 is OFF-LINE.

Remote control alarm ("Remote ctrl" selection)

The relay is activated by writing 1 on Modbus 906 word for alarm 1 and Modbus 907 word for alarm 2. Writing 0 deactivates the relay.

9 COM1 serial port in Multimaster mode

The Dis96.rs4 device, aside from implementing standard Modbus master protocol, also implements a variant called Multimaster. This mode makes it possible to connect, aside from the various Modbus slave devices, up to 16 Modbus multimaster devices on the RS485 serial network. This means that it will be possible to implement reading and writing of slave data from several Dis96.rs4 devices located at various points of the system.

A maximum of 16 is devices can be connected on the same network in multimaster mode. The slave devices connected to a network with devices in multimaster mode can have addresses from 1 to 238.

To configure the network of the multimaster system and to make it as efficient as possible, it is recommended to number the is devices starting from the address 254 (for the first multimaster device) and to descend to the address 239 (for the 16th and last multimaster device).

10 COM2 Serial Communication

Dis96.rs4 has the COM2 serial port (RS485) on which the Modbus RTU slave protocol is active. This makes it possible to connect the device to a supervision system or, more in general, to a Modbus RTU master device. Each instrument will respond to an interrogation by the Master only if it has the same address as that in the parameter *COM2 serial port -> Slave address*. The addresses allowed go from 1

to 254 and there must not be devices with the same address on the same line. The address 255 can be used by the master to communicate with any appliance connected, regardless of its address, while with the address 0 all the devices receive the command, but no response is expected (broadcast mode).
Dis96.rs4 can introduce a delay (in milliseconds) before the response to the master's request. This delay must be set in the parameter *COM2 serial port -> Response delay*. For the complete list of COM2 serial port parameters, see section "*COM2 serial port*" in the chapter "Configuration parameters table".
NB: By means of the COM2 serial port it is also possible to edit the instrument's configuration parameters; therefore pay attention that every time parameters are changed, the instrument saves the values in the EEPROM memory (100000 writing cycles). This means that continuous texts with parameter values which always change, after exceeding the allowed number of writing cycles, can damage the EEPROM memory.

NB: changes to words other than those provided in the following table can cause the instrument to malfunction.

Modbus RTU slave protocol features			
Baud-rate	Selectable from par. **COM2 serial port-> Baud rate**:		
	1,200 baud	9,600 baud	38,400 baud
	2,400 baud	19,200 baud	57,600 baud
	4,800 baud	28,800 baud	115,200 baud
Format	Selectable from par. **COM2 serial port-> Serial format**:		
	8, N, 1 (8 bits, no parity, 1 stop bit)		
	8, E, 1 (8 bits, even parity, 1 stop bit)		
	8, O, 1 (8 bits, odd parity, 1 stop bit)		
	8, N, 2 (8 bits, no parity, 2 stop bits)		
	8, E, 2 (8 bits, even parity, 2 stop bits)		
	8, O, 2 (8 bits, odd parity, 2 stop bits)		

Modbus RTU slave protocol features	
Functions supported	WORD READING (max 20 word) (0x03, 0x04) SINGLE WORD WRITING (0x06) MULTIPLE WORDS WRITING (max 20 words) (0x10)

The following is a list of all the addresses available and the functions supported:

RO	Read Only	R/W	Read / Write	WO	Write Only

Modbus Address	Description	Read Write	Reset value
0	Device type	RO	EEPROM
1	Software version	RO	EEPROM
5	Address slave	R/W	EEPROM
500	Reload default data The following values (commands) are accepted: **9999** Reload all the fault parameters **9998** Reload all default parameters, leaving the baud rate, COM2 serial communication format and the device address (slave address) unchanged **9997** Reload all default parameters, leaving the baud rate and COM2 serial port format unchanged **9996** Reload all default parameters, leaving the device address (slave address) unchanged *Once the command received has been executed, the device restarts so that it is correctly initialised*.	R/W	0
900	Alarm relay status (0 = Off, 1 = On): Bit 0 = Relay **Q1** Bit 1 = Relay **Q2**	RO	0
901	Digital inputs status (0 = Off, 1 = On): Bit 0 = **DI.1** Bit 1 = **DI.2** Bit 2 = **DI.3**	RO	-

Modbus Address	Description	Read Write	Reset value
902	Key status (0 = released, 1 = pressed): Bit 0 =  Bit 1 =  Bit 2 =  Bit 3 = 	RO	0
903	Error flags Bit 0 = Incorrect calibration data Bit 1 = Incorrect parameters Bit 2 = Incorrect status data Bit 3 = EEProm memory writing error Bit 4 = EEProm memory reading error	RO	0
904	Alarm status (0 = Absent, 1 = Present) Bit 0 = Alarm 1 Bit 1 = Alarm 2	RO	0
905	Manual reset: write 0 to rearm all the alarms. In reading (0 = Not resettable, 1 = Resettable Bit 0 = Alarm 1 Bit 1 = Alarm 2	R/W	0
906	Alarm 1 status (remote control)	R/W	0
907	Alarm 2 status (remote control)	R/W	0
908	Potentiometer value	R	-
909	Displayed variables page	R/W	0
1000	Modbus Variable 1 (H)	R	0
1001	Modbus Variable 1 (L)	R	0
1002	Modbus Variable 2 (H)	R	0
1003	Modbus Variable 2 (L)	R	0
1004	Modbus Variable 3 (H)	R	0
1005	Modbus Variable 3 (L)	R	0
1006	Modbus Variable 4 (H)	R	0
1007	Modbus Variable 4 (L)	R	0
1008	Modbus Variable 5 (H)	R	0
1009	Modbus Variable 5 (L)	R	0
1010	Modbus Variable 6 (H)	R	0

Modbus Address	Description	Read Write	Reset value
1011	Modbus Variable 6 (L)	R	0
1012	Modbus Variable 7 (H)	R	0
1013	Modbus Variable 7 (L)	R	0
1014	Modbus Variable 8 (H)	R	0
1015	Modbus Variable 8 (L)	R	0
1100	Modbus Variable 1 (L)	R	0
1101	Modbus Variable 1 (H)	R	0
1102	Modbus Variable 2 (L)	R	0
1103	Modbus Variable 2 (H)	R	0
1104	Modbus Variable 3 (L)	R	0
1105	Modbus Variable 3 (H)	R	0
1106	Modbus Variable 4 (L)	R	0
1107	Modbus Variable 4 (H)	R	0
1108	Modbus Variable 5 (L)	R	0
1109	Modbus Variable 5 (H)	R	0
1110	Modbus Variable 6 (L)	R	0
1111	Modbus Variable 6 (H)	R	0
1112	Modbus Variable 7 (L)	R	0
1113	Modbus Variable 7 (H)	R	0
1114	Modbus Variable 8 (L)	R	0
1115	Modbus Variable 8 (H)	R	0
1200	Modbus Variable 1 (L)	R	0
1201	Modbus Variable 2 (L)	R	0
1202	Modbus Variable 3 (L)	R	0
1203	Modbus Variable 4 (L)	R	0
1204	Modbus Variable 5 (L)	R	0
1205	Modbus Variable 6 (L)	R	0
1206	Modbus Variable 7 (L)	R	0
1207	Modbus Variable 8 (L)	R	0
1500	Displayed variable 1 (H)	R/W	EEPROM
1501	Displayed variable 1 (L)	R/W	EEPROM

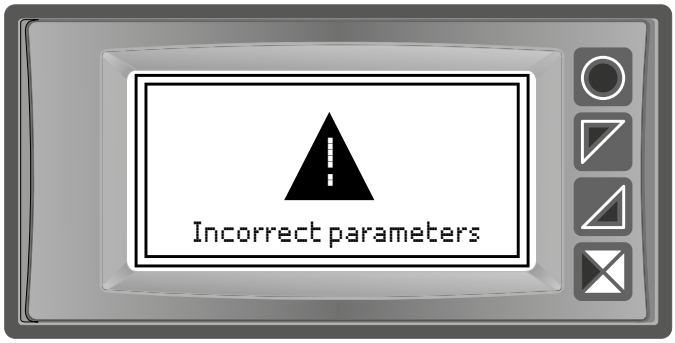
Modbus Address	Description	Read Write	Reset value
1502	Displayed variable 2 (H)	R/W	EEPROM
1503	Displayed variable 2 (L)	R/W	EEPROM
1504	Displayed variable 3 (H)	R/W	EEPROM
1505	Displayed variable 3 (L)	R/W	EEPROM
1506	Displayed variable 4 (H)	R/W	EEPROM
1507	Displayed variable 4 (L)	R/W	EEPROM
1508	Displayed variable 5 (H)	R/W	EEPROM
1509	Displayed variable 5(L)	R/W	EEPROM
1510	Displayed variable 6 (H)	R/W	EEPROM
1511	Displayed variable 6 (L)	R/W	EEPROM
1512	Displayed variable 7 (H)	R/W	EEPROM
1513	Displayed variable 7 (L)	R/W	EEPROM
1514	Displayed variable 8 (H)	R/W	EEPROM
1515	Displayed variable 8 (L)	R/W	EEPROM
1600	Displayed variable 1 (L)	R/W	EEPROM
1601	Displayed variable 1 (H)	R/W	EEPROM
1602	Displayed variable 2 (L)	R/W	EEPROM
1603	Displayed variable 2 (H)	R/W	EEPROM
1604	Displayed variable 3 (L)	R/W	EEPROM
1605	Displayed variable 3 (H)	R/W	EEPROM
1606	Displayed variable 4 (L)	R/W	EEPROM
1607	Displayed variable 4 (H)	R/W	EEPROM
1608	Displayed variable 5 (L)	R/W	EEPROM
1609	Displayed variable 5 (H)	R/W	EEPROM
1610	Displayed variable 6 (L)	R/W	EEPROM
1611	Displayed variable 6 (H)	R/W	EEPROM
1612	Displayed variable 7 (L)	R/W	EEPROM
1613	Displayed variable 7 (H)	R/W	EEPROM
1614	Displayed variable 8 (L)	R/W	EEPROM
1615	Displayed variable 8 (H)	R/W	EEPROM
1700	Displayed variable 1 (L)	R/W	EEPROM

Modbus Address	Description	Read Write	Reset value
1701	Displayed variable 2 (L)	R/W	EEPROM
1702	Displayed variable 3(L)	R/W	EEPROM
1703	Displayed variable 4 (L)	R/W	EEPROM
1704	Displayed variable 5 (L)	R/W	EEPROM
1705	Displayed variable 6 (L)	R/W	EEPROM
1706	Displayed variable 7 (L)	R/W	EEPROM
1707	Displayed variable 8 (L)	R/W	EEPROM
...	...		
2001	Parameter 1 (H)	R/W	EEPROM
2002	Parameter 1 (L)	R/W	EEPROM
2003	Parameter 2 (H)	R/W	EEPROM
2004	Parameter 2 (L)	R/W	EEPROM
...	...		
2997	Parameter 499 (H)	R/W	EEPROM
2998	Parameter 499 (L)	R/W	EEPROM
2999	Parameter 500 (H)	R/W	EEPROM
3000	Parameter 500 (L)	R/W	EEPROM
4001	Parameter 1 (H)*	R/W	EEPROM
4002	Parameter 1 (L)*	R/W	EEPROM
4003	Parameter 2 (H)*	R/W	EEPROM
4004	Parameter 2 (L)*	R/W	EEPROM
...	...		
4997	Parameter 499 (H)*	R/W	EEPROM
4998	Parameter 499 (L)*	R/W	EEPROM
4999	Parameter 500 (H)*	R/W	EEPROM
5000	Parameter 500 (L)*	R/W	EEPROM

* *Parameters edited using serial addresses from 4001 to 5000 are only saved in eeprom 10" after the last parameter is written.*

11 Error messages

The instrument signals failures/anomalies by means of messages on the display. The following are the possible messages:



Incorrect parameters	An error was detected in the configuration parameters of the instrument.
Incorrect status data	An error was detected in the saved instrument status data.
Eeprom reading error	An error was detected in the Eeprom memory reading sequence.
Eeprom writing err.	An error was detected in the Eeprom memory writing sequence.

In all of these situations, the instrument might not be able to operate correctly. Switch it off and back on. If the problem persists, contact assistance.

12 Configuration

12.1 Editing configuration parameters

For the configuration parameters, see par. 11

	Press	Effect	Execute
1	Configuration	The password 0000 appears on the display with the 1st digit selected	
2	∧ and ∨	The selected digit is modified and you go to the next by pressing 0▮00	Enter the password 1234

	Press	Effect	Execute
3	Sel to confirm	The names of the groups of parameters appear on the display	
4	∧ and ∨	Scroll the groups of parameters	
5	Sel to enter the group of parameters	The list of parameters belonging to the selected group appears on the display	∧ and ∨ to select the parameter to be edited
6	Sel to enter parameter edit mode	The list of possible selections of the parameter or the numerical value of the parameter appear on the display	∧ and ∨ to edit the parameter. For numerical parameters, one digit at a time can be edited by pressing ▯▮▯. Sel to confirm the change. ← to exit without editing.

12.2 Loading default values

Entering the password 9999 loads the instrument's default settings.
As a result of this operation, the instrument is restarted so that it is initialised correctly.

12.3 Configuration via memory card

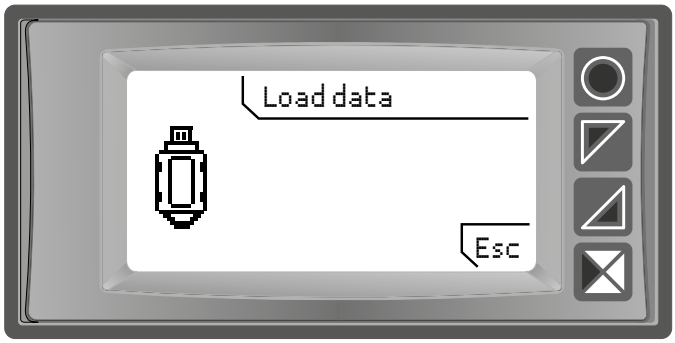
The instrument can be configured quickly via a memory card (2100.30.013). The memory card is connected to the micro-USB connector at the bottom of the instrument.

12.4 Creation of the memory card

To save a configuration of parameters on the memory card, with the instrument on, connect it to the micro-USB connector, enter configuration, set the parameters necessary and exit configuration. At this point, the instrument acknowledges the presence of the memory card and saves the configuration just made on the memory card as well.
Saving is signalled by a message on the display.

12.5 Loading configuration from memory card

To load a configuration previously made and saved on a memory card, connect it to the micro-USB connector and power the instrument. At this point, if the memory card is detected and the data it contains are considered valid, the display will view the request for loading data from the memory card. The user can either Load data load the parameters from the memory card or Esc cancel the operation without modifying the current configuration.



13 Configuration parameters table

The next page has the complete list of the parameters.

13.1 Display

Parameters for configuring the display.

1 Language

Select the language

English (**Default**)
Italiano
Deutsch
Francais
Español

2 View

Selects the viewing mode of the values of the variables used

1 value per page **(Default)**
2 values per page
3 values per page
4 values per page

When this parameter is set, if more variables are used that can be viewed on a page, several pages are used to complete the display of all the values.

3 Scroll time

When there are several pages of variables, automatic scrolling of the various pages can be set. This parameter sets the time interval to view each page, before switching to the next one. Time starts over when any button is pressed.

Disabled
1 second
2 seconds
3 seconds
4 seconds
5 seconds (**Default**)
10 seconds
20 seconds
30 seconds
1 minute

4 Contrast

Determines the contrast value for the OLED display.
0%..100% (**Default**: 100%)

5 Reverse

Enables the reverse of the OLED display.
Disabled (**Default**)
Enabled

6 Standby time

Determines the time after which the display switches to standby mode when no key has been pressed, reducing brightness so as not to be an inconvenience in environments with little lighting and to extend the display's life time.
Always on **(Default)**

15 seconds	*2 minutes*	*30 minutes*
30 seconds	*5 minutes*	*1 hour*
1 minute	*10 minutes*	

13.2 COM1 serial port

Parameters for configuring the Modbus master serial port.

11 Mode

Selects the type of Modbus master protocol active on the COM1 serial port.
Master RTU (**Default**)
Master ASCII
Multimaster RTU
Multimaster ASCII

12 Multimaster address

Defines the Modbus address of the device in multimaster mode.
239..254 (**Default**: 254)

13 Baud rate

Selects the baud rate for serial communication

1,200 baud	*9,600 baud*	*39,400 baud*
2,400 baud	*19,200 baud* (**Default**)	*57,600 baud*
4,800 baud	*28,800 baud*	*115,200 baud*

14 Serial format

Selects the format for serial communication

8,N,1 (**Default**)	8 bit, No parity, 1 Stop bit
8,E,1	8 bit, Even parity, 1 Stop bit
8,O,1	8 bit, Odd parity, 1 Stop bit
8,N,2	8 bit, No parity, 2 Stop bit
8,E,2	8 bit, Even parity, 2 Stop bit
8,O,2	8 bit, Odd parity, 2 Stop bit

15 Transmission delay

Defines the minimum delay in ms which the Modbus master protocol introduces between complete reception of data by the slaves and a new interrogation.
0..200 ms (**Default**: 2 ms)

16 Reception timeout

Defines the maximum waiting time for the response of the slaves following the interrogation before interrupting reception due to timeout. If the slave's response does not arrive within that time, the lost packs' counter is increased.
10..1000 ms (**Default**: 100 ms)

17 Number of errors

Defines the number of consecutive errors (reception timeout, CRC error) for each communication, after which the OFF-LINE status is signalled for the variable. At each successful communication, the off-line management error count is reset. *1..100* (**Default**: 10)

18 Show status

This parameter allows you to enable or disable the display of the COM1 serial port communication status. By enabling this function, the item “COM1 status” appears in the tool menu.
no..yes (**Default**: si)

13.3 Variable 1..8

Parameters for configuration settings of variables 1..8.
The parameters of the variables 2..8 can be traced by adding 50 to the parameter number of variable 1 (e.g. 71 Data source). Whereas the parameters of the variable 3 can be viewed by adding 100 to the number of variable 1 (e.g. 121 Data source) and so on.

21 Data source

Defines the source of the value of the corresponding variable.

Disabled (**Default** var. 2..8)	The variable is not managed
COM1 serial port (**Default** var. 1)	The value of the variable is read/written via master serial communication or stored in the instrument.
Potentiometer	The variable takes on the value generated by the potentiometer
Digital input 1	The variable takes on the value of the status of the digital input (0..1)
Digital input 2	The variable takes on the value of the status of the digital input (0..1)
Digital input 3	The variable takes on the value of the status of the digital input (0..1)
Alarm 1 status	The variable takes on the value of the status of the alarm (0..1)
Alarm 2 status	The variable takes on the value of the status of the alarm (0..1)
COM2 serial port	The value of the variable is written via slave serial line and does not activate the master COM1 serial port.

22 Data format

Defines the format of the serial data relative to the variable.

16 bit signed (Default)	The value of the variable refers to a Modbus word interpreted as a signed data.
16 bit unsigned	The value of the variable refers to a Modbus word interpreted as an unsigned data.
32 bit signed	The value of the variable is managed as union of two consecutive words with sign.
32 bit floating point	The value of the variable is managed as union of two consecutive words organised as data in floating point.
Bit 0..Bit15	The value of the variable is managed as status of a single bit (0..1) within a 16 bit datum.

23 Sorting

Selects the order of the words when managing 32 bit data.

MSW first (**Default**)	The data consists of 2 consecutive words, the first word (lower Modbus address) is the most significant.
LSW first	The data consists of 2 consecutive words, the first word (lower Modbus address) is the least significant.

24 Description

Defines the 16 character alphanumerical string used as a description when displaying the variable. The text can be freely entered one character at a time. When viewing 3 or 4 variables per page, setting the empty description (“ “ 16 space characters) automatically enables the "expanded" mode of the variable, namely the space intended for description is used to view the value of the variable with a larger and more legible font.

“Vx “ (**Default**)

28 Unit of measurement

Defines the 5-character alphanumerical string used as a unit of measurement when displaying the variable. The text of the unit of measurement can be freely entered one character at a time.
"Ux " (**Default**)

30 Representation

Defines the mode in which the value of the variable will be displayed.

Numerical (**Default**)	The value of the variable will be displayed in decimal numerical format.
Enumerative	The value of the variable is displayed using 5 mnemonic texts associated to values from 0 to 4 (max 8 characters each). The rest of the values are always viewed with the decimal representation.

31 Decimal point

Defines the number of decimal digits in which the value of the variable will be displayed.

0 (**Default**)	no decimal	*0.0000*	4 decimal digits
0.0	1 decimal digit	*0.00000*	5 decimal digits
0.00	2 decimal digits	*0.000000*	6 decimal digits
0.000	3 decimal digits		

32 Lower input limit

Defines the lower limit of the variable used to enter the value.
-2147483648..2147483648 (**Default:** 0)

33 Upper input limit

Defines the upper limit of the variable used to enter the value.
-2147483648..2147483648 (**Default:** 1000)

34 Variation

Defines the increment/decrement value used when entering values with the arrow keys or the appropriately configured digital inputs.
-2147483648..2147483648 (**Default:** 1)

35 Processing type

Selects the type of processing which the variable value undergoes to get the value viewed on the display. On the other hand, once a new variable value is entered from the keyboard, with the inverse procedure the real value of the variable to be transferred to the remote device via serial communication will be calculated.

None (**Default**)	No processing, the value of the viewed variable coincides with the actual value of the variable.
Gain + offset	The value of the viewed variable is calculated with the following formula: Vvis. = Vvar. * Gain + Offset
Rescaling	The value of the viewed variable is calculated using in the linear proportion which puts the minimum Modbus value in relation with the minimum value viewed, and the maximum Modbus value in relation with the maximum value viewed.

36 Offset value

Defines the offset value used to calculate the value of the viewed variable if *Gain + Offset* is selected in the *Processing type* parameter.
-2147483648..2147483648 (**Default**: 0)

37 Gain value

Defines the Gain value used to calculate the value of the unit variable if *Gain + Offset* is selected in the *Processing type* parameter.
-1000.000..1000.000 (**Default:** 1.000)

38 Modbus minimum

Defines the minimum value of the Modbus variable used to calculate the value of the viewed variable if *Rescaling* is selected in the *Processing type* parameter.
-2147483648..2147483648 (**Default:** 0)

39 Minimum viewed

Defines the value of the viewed variable in *Modbus Minimum* if *Rescaling*, is selected in the parameter *Processing type*.
-2147483648..2147483648 (**Default:** 0)

40 Modbus maximum

Defines the maximum value of the Modbus variable used to calculate the value of the viewed variable if *Rescaling* is selected in the *Processing type* parameter.
-2147483648..2147483648 (**Default:** 1000)

41 Maximum viewed

Defines the value of the viewed variable in *Modbus Maximum* if *Rescaling* is selected in the *Processing type* parameter.
-2147483648..2147483648 (**Default:** 1000)

42 Refresh time

Defines the time interval with which the variable is refreshed. This interval also affects Modbus communication besides visualisation as the requests of the master to the slave devices respect this interval.
0.0..10.5 s (**Default:** 0.5 s)

43 Value memory

Selects whether the value of the variable must be stored in the internal memory of Dis96 in order to maintain the value even when power is missing and to re-present the last value set at the next switch-on.

No (**Default**)	The value of the variable is not stored. When starting up, the variable is loaded with the value set in the *Initial value* parameter.
Yes	The value of the variable is stored in the internal memory at every change from keyboard or from appropriately configured digital input. When starting up, the variable is loaded with the value saved previously.

44 Initial value

Defines the value the variable takes on when Dis96 is switched on. This parameter is only used when the *Value memory* parameter is set at *No*.
-2147483648..2147483648 (**Default:** 0)

45 Notation

Selects the mode in which the Modbus variable address to read/write is specified and the action to carry out on this Modbus location.

0..65535 (**Default**)	The address of the variable is set according to the numbering present on our products, namely distinguishing between bit and word data and addresses ranging from 0 to 65535.
Modbus 0..65535	The address of the variable is set according to standard Modbus numbering, namely distinguishing between Coil, discrete inputs, Holding register and Input register and addresses ranging from 0 to 65535.
Modicon 10K.40K	The address of the variable is set according to standard Modicon numbering, where the types of Modbus data are grouped based on the address. More precisely, addresses from 1 to 9999 correspond to Coil status, addresses from 10001 to19999 correspond to Input status, addresses from 30001 to 39999 correspond to Input register and addresses from 40001 to 49999 correspond to Holding register.

46 Slave address

Defines the address of the Modbus slave the variable refers to. The reading/writing operations relative to the variable will be executed using this address. For Multimaster RTU or Multimaster ASCII protocol, slave devices with a limited address range (1..238) can be connected because some addresses are used by the system to manage the multimaster protocol.

1..254 (**Default:** 1)

47 Data address

Defines the address of the Modbus word or bit the variable refers to. For the entry range, the setting must take into account the selection made for the *Notation* parameter.
0..65535 (**Default:** 0)

48 Action (notation)

Selects the reading/writing action executed by the instrument using the data entered in the ***Slave address*** and ***Data address*** parameters. This parameter only takes effect if ***0..65535*** is selected in the ***Notation*** parameter.

Read bit	*Write bit*	*R/W single register*
Read word (**Default**)	*Write word*	*R/W multiple register*

49 Action (Modbus notation)

Selects the reading/writing action executed by the instrument using the data entered in the *Slave address and Data address* parameters. This parameter only takes effect if *Modbus 0..65535* is selected in the *Notation* parameter.

01 Read coils	*06 Write single register*
02 Read discrete input	*16 Write multiple registers*
03 Read holding registers (**Default**)	*Read/Write single register*
04 Read input registers	*ReadWrite multiple registers*
05 Write single coil	

50 Action (Modicon notation)

Selects the reading/writing action executed by the instrument using the data entered in the *Slave address and Data address* parameters. This parameter only takes effect if *Modicon 10K.40K* is selected in the *Notation* parameter.

Read (Default)	*Write multiple*	*Read/Write multiple registers*
Write single	*Read/Write single register*	

51 Writing mode

Selects the mode with which dis96 manages writing on a slave device on variables which foresee writing operations of the value on a remote device.

Continuous (**Default**)	The value is written on the slave continuously, regardless if changed or not.
Upon variation	The data is written on the slave only when the variable value is edited.
Upon selection	The data is written on the slave only when the variable is selected by the value taken on by the potentiometer. For further information on this mode, refer to the potentiometer management parameters.

52 Value 0 text

Defines the text string (max 8 characters) with which the value "0" of the variable is displayed. This parameter only has meaning if *Text* is selected in the parameter *Representation*.

"0 " (**Default**)

54 Value 1 text

Defines the text string (max 8 characters) with which the value "1" of the variable is displayed. This parameter only has meaning if *Text* is selected in the *Representation* parameter.

"1 " (**Default**)

56 Value 2 text

Defines the text string (max 8 characters) with which the value “2” of the variable is displayed. This parameter only has meaning if *Text* is selected in the *Representation* parameter.

“2 ” (**Default**)

58 Value 3 text

Defines the text string (max 8 characters) with which the value “3” of the variable is displayed. This parameter only has meaning if *Text* is selected in the *Representation* parameter.

“3 ” (**Default**)

60 Value 4 text

Defines the text string (max 8 characters) with which the value “4” of the variable is displayed. This parameter only has meaning if *Text* is selected in the *Representation* parameter.

“4 ” (**Default**)

13.4 Potentiometer input

Parameters for configuring the potentiometer input.

421 Minimum value

Defines the generated value of the potentiometer at the lower calibration position.

-2147483648..2147483648 (**Default:** 0)

422 Maximum value

Defines the generated value of the potentiometer at the upper calibration position.

-2147483648..2147483648 (**Default:** 100)

423 Acquisition

Selects whether or not to activate the potentiometer limits acquisition procedure. If *Activated* is selected, when exiting the configuration, the display will show the minimum and maximum limits acquisition procedure of the potentiometer. At the end of the procedure, the parameter is automatically set at *Deactivated*.
(see paragraph 8.5)
Deactivated (**Default**)
Activated

424 Variable selection

Defines whether or not to activate the variable selection function by means of the position of the potentiometer. This function is useful to activate writing of a variable on the slave device, only when it is "selected" by the value generated by the position of the potentiometer. The values to select the variables range from 1 (variable 1 selection) to 8 (variable 8 selection). These values must therefore be entered respectively in the *Minimum value* and *Maximum value* parameters, and then the acquisition procedure must be carried out.
Deactivated (**Default**)
Activated

13.5 Alarm 1..2

Parameters for configuring alarms 1 and 2.
The parameters of alarm 2 can be traced by adding 20 to the parameter number of alarm 1 (e.g. 451 Alarm type).

431 Alarm type

Selects the type of alarm to manage.
Disabled (**Default**)
Absolute
Band
Digital input 1
Digital input 2
Digital input 3
Serial error
remote crtl

432 Contact type

Selects the type of contact for the alarm output and the type of intervention.
Norm. open (**Default**)
Norm. closed
N.O.-Dis.start
N.C.-Dis.start

433 Alarm source

Selects the source quantity for managing the alarm
Variable 1 (**Default**)
Variable 2
Variable 3
Variable 4
Variable 5
Variable 6
Variable 7
Variable 8
Potentiometer

434 Alarm threshold

Determines the alarm setpoint
Lower limit..Upper limit (**Default:** 0)

435 Deviation threshold

Determines the deviation from the alarm setpoint for band alarms.
-2147483648..2147483648 (**Default:** 0)

436 Hysteresis

Determines the hysteresis value in managing absolute and band alarms.
-2147483648..2147483648 (**Default:** 0)

437 Alarm message

Defines the text string (max 16 characters) of the message viewed when the alarm is triggered. If you do not want to view the message, set the text as zero string (16 spaces)
"Ax " (**Default**)

441 Reset type

Selects the type of reset of the alarm contact.

Automatic (**Default**)	Automatic reset when the alarm condition finishes.
Manual	Manual reset from keyboard or from appropriately *configured digital input*.
Man. stored	Maintains the status of the relay even after a power failure. The alarm is reset manually the same way as the *Manual* selection.

442 Error contact

Status of the contact if the variable selected by the parameter *Alarm threshold* is off-line.

Open (**Default**)

Closed

443 Triggering delay

Determines the delay in activating or deactivating the alarm.

-3600..3600 s (**Default**: 0 s)

Positive value: delay when alarm is being activated.

Negative value: delay when alarm is being deactivated.

444 Lower limit

Determines the minimum value for the alarm setpoint and for the *Alarm threshold* parameter.

-2147483648..2147483648 (**Default**: 0)

445 Upper limit

Determines the maximum value for the alarm setpoint and for the *Alarm threshold* parameter.

-2147483648..2147483648 (**Default**: 1000)

446 Protection

Selects the type of protection for the alarm set point.

Free (**Default**)	Can be freely changed by the user.
Blocked	Visible to the user but not editable.
Hidden	Not visible to the user.

13.6 Digital input 1..2

Parameters for configuring digital inputs 1 and 2.

The parameters of input 2 can be traced by adding 5 to the parameter number of input 1 (e.g. 476 Input type).

471 Input type

Selects the type of hardware of the digital input

PNP (**Default**)	Input suitable for sensors with PNP outlet. It is activated by bringing the digital input to 24 V DC (positive signal).
NPN	Input suitable for sensors with NPN outlet. It is activated by short circuiting the input on the exposed conductive part.

472 Contact type

Selects the rest contact of the digital input.

Norm. open (**Default**)	Executes the function with contact closed
Norm. closed	Executes the function with contact open

473 Input function

Selects the type of function executed by the digital input.

Disabled (**Default**)	*Decreases variable 1*
Enable outputs	*Decreases variable 2*
Reset alarms	*Decreases variable 3*
Configuration block	*Decreases variable 4*
Increases variable 1	*Decreases variable 5*
Increases variable 2	*Decreases variable 6*
Increases variable 3	*Decreases variable 7*
Increases variable 4	*Decreases variable 8*
Increases variable 5	*Increases selected variable*
Increases variable 6	*Decreases selected variable*
Increases variable 7	*Encoder editing*
Increases variable 8	

13.7 Digital input 3

Parameters for configuring digital input 3.

481 Contact type

Selects the rest contact of the digital input.

Norm. open (**Default**)	Executes the function with contact closed
Norm. closed	Executes the function with contact open

482 Input function

Selects the rest contact of the digital input.

Disabled (**Default**)

Variable selection	Option to connect the push contact of the panel encoder to edit the variables

13.8 COM2 serial port

Parameters for configuring the Modbus slave serial interface.

486 Slave address

Defines the Modbus address of the device for communication on COM2 serial port.

1..254 (**Default**: 240)

487 Baud rate

Selects the baud rate for serial communication

1,200 baud	*9,600 baud*	*39,400 baud*
2,400 baud	*19,200 baud*	*57,600 baud* (**Default**)
4,800 baud	*28,800 baud*	*115,200 baud*

488 Serial format

Selects the format for serial communication

8,N,1 (**Default**)	8 bit, No parity, 1 Stop bit
8,E,1	8 bit, Even parity, 1 Stop bit
8,O,1	8 bit, Odd parity, 1 Stop bit
8,N,2	8 bit, No parity, 2 Stop bit
8,E,2	8 bit, Even parity, 2 Stop bit
8,O,2	8 bit, Odd parity, 2 Stop bit

489 Response delay

Defines the minimum delay in ms, which the device introduces between reception of the interrogation of the Modbus master, at the start of transmission of the response *0..100 ms* (**Default**: 2 ms).

13.9 USB port

Parameters for configuring the USB port.

491 Mode

Defines the operating mode for the USB port.

Modbus slave (**Default**)

Read carefully the safety guidelines and programming instructions contained in this manual before using/connecting the device.

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