

**Panel mounting indicator
ITU 402 / 412**



INSTRUCTIONS MANUAL

BAMO MESURES

22, Rue de la Voie des Bâns - Z.I. de la Gare - 95100 ARGENTEUIL
Tél : (+33) 01 30 25 83 20 - Web : www.bamo.fr
Fax : (+33) 01 34 10 16 05 - E-mail : info@bamo.fr

Panel mounting indicator
ITU 402 / 412

10-02-2010

222 M1 03 A

MES

222-03/1

TABLE OF CONTENTS

Warnings	4
Safety instructions.....	5
Front and back layout	8
Applications.....	9
Technical characteristics	9
Mounting	9
Applications.....	10
Electrical specifications.....	11
Sensor error detection	15
Connections	16
Block diagram	17
Routing diagram.....	18
Scrolling help text	20
Configuration / operating the function keys	22
Graphic depiction of the relay function setpoint	23



GENERAL

WARNING!

This module is designed for connection to hazardous electric voltages. Ignoring this warning can result in severe personal injury or mechanical damage. To avoid the risk of electric shock and fire, the safety instructions of this manual must be observed and the guidelines followed. The specifications must not be exceeded, and the module must only be applied as described in the following. Prior to the commissioning of the module, this manual must be examined carefully. Only qualified personnel (technicians) should install this module. If the equipment is used in a manner not specified by the manufacturer, the protection provided by the equipment may be impaired.



**HAZARD-
OUS
VOLTAGE**

WARNING!

Until the module is fixed, do not connect hazardous voltages to the module. The following operations should only be carried out on a disconnected module and under ESD safe conditions: Troubleshooting the module.



Repair of the module must be done by the manufacturer.

SYMBOL IDENTIFICATION



Triangle with an exclamation mark: Warning / demand. Potentially lethal situations.



The CE mark proves the compliance of the module with the essential requirements of the directives.

SAFETY INSTRUCTIONS

DEFINITIONS:

Hazardous voltages have been defined as the ranges: 75 to 1500 Volt DC, and 50 to 1000 Volt AC.

Technicians are qualified persons educated or trained to mount, operate, and also troubleshoot technically correct and in accordance with safety regulations. Operators, being familiar with the contents of this manual, adjust and operate the knobs or potentiometers during normal operation.

RECEIPT AND UNPACKING:

Unpack the device without damaging it. The packing should always follow the device until this has been permanently mounted. Check at the receipt of the device whether the type corresponds to the one ordered.

ENVIRONMENT:

Avoid direct sunlight, dust, high temperatures, mechanical vibrations and shock, as well as rain and heavy moisture. If necessary, heating in excess of the stated limits for ambient temperatures should be avoided by way of ventilation.

All modules fall under Installation Category II, Pollution Degree 1, and Insulation Class II.

MOUNTING:

Only technicians who are familiar with the technical terms, warnings, and instructions in the manual and who are able to follow these should connect the module.

Should there be any doubt as to the correct handling of the module, please contact us.

Mounting and connection of the module should comply with national legislation for mounting of electric materials, i.a. wire cross section, protective fuse, and location. Descriptions of Input / Output and supply connections are shown in the block diagram and side label.

The following apply to fixed hazardous voltages-connected modules:

The max. size of the protective fuse is 10 A and, together with a power switch, it should be easily accessible and close to the module. The power switch should be marked with a label telling it will switch off the voltage to the module.

UL INSTALLATION REQUIREMENTS:

For use on a flat surface of a type 1 enclosure

Use 60/75°C copper conductors only

Max. ambient temperature..... 60°C

Max. wire size, pins 41...46..... AWG 30-16

Max. wire size, others AWG 30-12

UL file number..... E248256

CALIBRATION AND ADJUSTMENT:

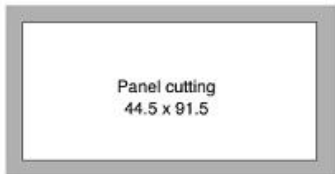
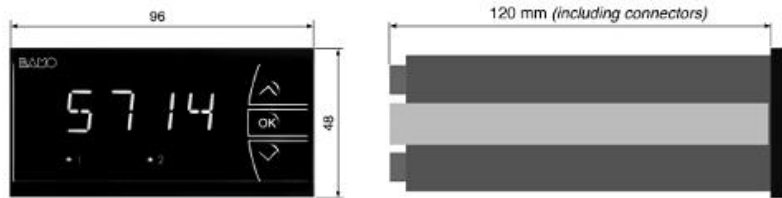
During calibration and adjustment, the measuring and connection of external voltages must be carried out according to the specifications of this manual. The technician must use tools and instruments that are safe to use.

NORMAL OPERATION:

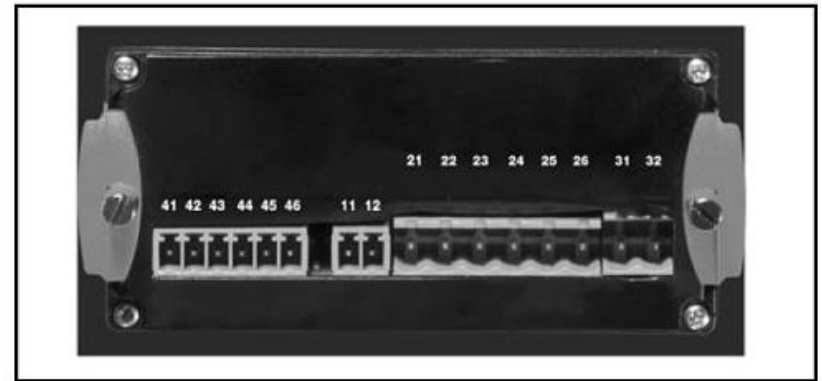
Operators are only allowed to adjust and operate modules that are safely fixed in panels, etc., thus avoiding the danger of personal injury and damage. This means there is no electrical shock hazard, and the module is easily accessible.

CLEANING:

When disconnected, the module may be cleaned with a cloth moistened with distilled water.



Picture 1: Front



Picture 2: Back

- 4-digit 14-segment LED indicator
- Input for mA, V, potentiometer, RTD and TC
- 2 relays and analogue output
- Universal voltage supply
- Front key programmable

Applications

Application:

- Display for digital readout of current, voltage, temperature or potentiometer signals.
- Process control with 2 pairs of potential-free relays and / or analogue output.
- For local readout in extremely wet atmospheres with a specially designed splash-proof cover.

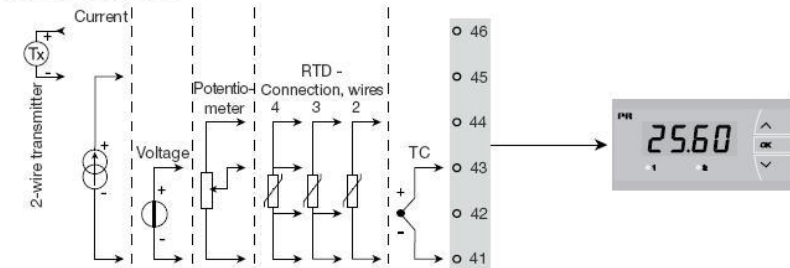
Technical characteristics:

- 4-digit LED indicator with 13.8 mm 14-segment characters. Max. display readout
- 1999...9999 with programmable decimal point, relay ON / OFF indication.
- All operational parameters can be adjusted to any application by use of the front keys.
- The device is available fully-configured acc. to specifications ready for process control and visualisation.
- Help texts in eight languages can be selected via a menu item.
- In versions with relay outputs the user can minimise the installation test time by activating / deactivating each relay independently of the input signal.

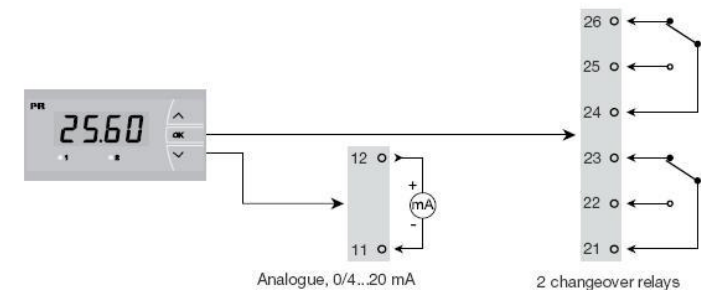
Mounting:

- To be mounted in front panel. The included rubber packing must be mounted between the panel cutout hole and the display front to obtain IP65 (NEMA 4) tightness. For extra protection in extreme environments, the device can be delivered with a specially designed splash-proof cover as accessory.

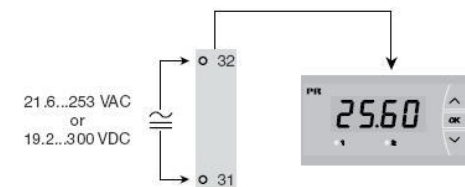
Input signals:



Output signals:



Supply:



Electrical specifications:

Specifications range:

-20°C to +60°C

Common specifications:

Supply voltage, universal 21.6...253 VAC, 50...60 Hz or
19.2...300 VDC

Consumption

Type	Internal consumption	Max. consumption
ITU 402	2.7 W	3.0 W
ITU 412	3.2 W	3.5W

Isolation voltage, test / operation 2.3 kVAC / 250 VAC

Signal- / noise ratio Min. 60 dB (0...100 kHz)

Response time (0...90 %, 100...10 %), programmable:

Temperature input..... 1...60 s

Current / voltage input..... 0.4...60 s

Calibration temperature..... 20...28°C

Accuracy, the greater of general and basic values:

General values		
Input type	Absolute accuracy	Temperature coefficient
All	≤ ±0.1% of reading	≤ ±0.01% of reading / °C

Basic values		
Input type	Basic accuracy	Temperature coefficient
mA	≤ ±4 μA	≤ ±0.4 μA / °C
Volt	≤ ±20 μV	≤ ±2 μV / °C
Potentiometer	≤ ±0.1 Ω	≤ ±0.01 Ω / °C
Pt100	≤ ±0.2°C	≤ ±0.02°C / °C
Ni100	≤ ±0.3°C	≤ ±0.03°C / °C
TC type: E, J, K, L, N, T, U	≤ ±1°C	≤ ±0.05°C / °C
TC type: R, S, W3, W5, LR	≤ ±2°C	≤ ±0.2°C / °C
TC type: B 85...400°C	≤ ±4.5°C	≤ ±0.45°C / °C
TC type: B 400...1820°C	≤ ±2°C	≤ ±0.2°C / °C

EMC immunity influence < ±0.5% of reading

Auxiliary supplies:

2 wire supply (pin 46...45)..... 25...15 VDC / 0...20 mA

Wire size, pin 41...46 (max.)..... 1 x 1.5 mm² stranded wire

Wire size, others (max.)..... 1 x 2.5 mm² stranded wire

Relative humidity..... < 95% RH (non cond.)

Dimensions (HxWxD)..... 48 x 96 x 120 mm

Cutout dimensions 44.5 x 91.5 mm

Protection degree (mounted in panel)..... IP65

Weight 230 g

RTD and potentiometer input:

Input type	Min. value	Max. value	Standard
Pt100	-200°C	+850°C	IEC60751
Ni100	-60°C	+250°C	DIN 43760
Potentiometer	10 Ω	100 kΩ	-

Input for RTD types:

Pt10, Pt20, Pt50, Pt100, Pt200, Pt250, Pt300, Pt400, Pt500, Pt1000
Ni50, Ni100, Ni120, Ni1000

Cable resistance pr. wire, RTD (max.)..... 50 Ω

Sensor current, RTD..... Nom. 0.2 mA
 Effect of sensor cable resistance
 (3- / 4-wire), RTD..... < 0.002 Ω / Ω
 Sensor error detection, RTD Yes
 Short circuit detection, RTD..... < 15 Ω

TC input:

Type	Min. value	Max. value	Standard
B	0°C	+1820°C	IEC 60584-1
E	-100°C	+1000°C	IEC 60584-1
J	-100°C	+1200°C	IEC 60584-1
K	-180°C	+1372°C	IEC 60584-1
L	-200°C	+900°C	DIN 43710
N	-180°C	+1300°C	IEC 60584-1
R	-50°C	+1760°C	IEC 60584-1
S	-50°C	+1760°C	IEC 60584-1
T	-200°C	+400°C	IEC 60584-1
U	-200°C	+600°C	DIN 43710
W3	0°C	+2300°C	ASTM E988-90
W5	0°C	+2300°C	ASTM E988-90
LR	-200°C	+800°C	GOST 3044-84

NB.: TC input type B can be measured and configured down to 0°C, but the basic accuracy is only valid in the range 85...1820°C

Cold junction compensation (CJC)

via internally mounted sensor < ±2.0°C ±0.2°C/°C
 Sensor error detection, all TC types Yes
 Sensor error detection Yes
 Sensor error current:
 when detecting..... Nom. 2 µA
 else 0 µA

Current input:

Measurement range 0...20 mA
 Programmable measurement ranges..... 0...20 and 4...20 mA
 Input resistance..... Nom. 20 Ω + PTC 25 Ω
 Sensor error detection:
 loop break 4...20 mA..... Yes

Voltage input:

Measurement range 0...12 VDC
 Programmable measurement ranges..... 0...1 / 0,2...1 /
 0...10 / 2...10 VDC
 Input resistance..... Nom. 10 MΩ

Outputs:

Display:

Display readout -1999...9999 (4 digits)
 Decimal point Programmable
 Digit height 13.8 mm
 Display updating 2.2 times / s
 Input outside input range is
 indicated by..... Explanatory text

Current output:

Signal range (span)..... 0...20 mA
 Programmable signal ranges 0...20 / 4...20 /
 20...0 / 20...4 mA
 Load (max.)..... 20 mA / 800 Ω / 16 VDC
 Load stability ≤ 0.01% of span / 100 Ω
 Sensor error detection 0 / 3.5 / 23 mA / none
 NAMUR NE 43 up / downscale 23 mA / 3.5 mA
 Output limitation:
 on 4...20 and 20...4 mA signals..... 3,8...20.5 mA
 on 0...20 and 20...0 mA signals..... 0...20.5 mA
 Current limit..... ≤ 28 mA

Relay outputs:

Relay function..... Setpoint
 Hysteresis, in % / display counts 0.1...25% / 1...2999
 On and Off delay 0...3600 s
 Sensor error detection Make / Break / Hold
 Max. voltage..... 250 VRMS
 Max. current 2 A / AC
 Max. AC power 500 VA
 Max. current at 24 VDC..... 1 A

Marine approval:

Det Norske Veritas, Ships & Offshore Standard for Certification No. 2.4

Observed authority requirements: Standard:

EMC 2004/108/EC EN 61326-1
 LVD 2006/95/EC..... EN 61010-1
 UL, Standard for Safety UL 508

Sensor error detection / sensor error detection outside range:

Sensor error check in 5714 variants		
Variant:	Configuration	Sensor error detection:
ITU 402	ERR1=NONE, ERR2=NONE:	OFF
	else:	ON
ITU 412	ERR1=NONE, ERR2=NONE, O.ERR=NONE:	OFF
	else:	ON

Outside range readout (IN.LO, IN.HI): If the valid range of the A/D converter or the polynomial is exceeded			
Input	Range	Readout	Limit
VOLT	0..1 V / 0.2..1 V	IN.LO	< -25 mV
		IN.HI	> 1.2 V
	0..10 V / 2..10 V	IN.LO	< -25 mV
		IN.HI	> 12 V
CURR	0..20 mA / 4..20 mA	IN.LO	< -1.05 mA
		IN.HI	> 25.05 mA
POTM	-	IN.LO	< -0.5%
		IN.HI	> 100.5%
TEMP	TC / RTD	IN.LO	< temperature range
		IN.HI	> temperature range

Sensor error detection (SE.BR, SE.SH):			
Input	Range	Readout	Limit
CURR	Loop break (4..20mA)	SE.BR	<= 3.6 mA; >= 21 mA
		SE.SH	> ca. 750 kohm / (1,25V)
TEMP	TC	SE.BR	> ca. 15 kohm
		SE.SH	< ca. 15 ohm
	Pt100 2-wire No SE.SH for Pt10, Pt20 and Pt50	SE.BR	> ca. 15 kohm
		SE.SH	< ca. 15 ohm
	Pt100 3-wire No SE.SH for Pt10, Pt20 and Pt50	SE.BR	> ca. 15 kohm
		SE.SH	< ca. 15 ohm
Pt100 4-wire No SE.SH for Pt10, Pt20 and Pt50	SE.BR	> ca. 15 kohm	
	SE.SH	< ca. 15 ohm	

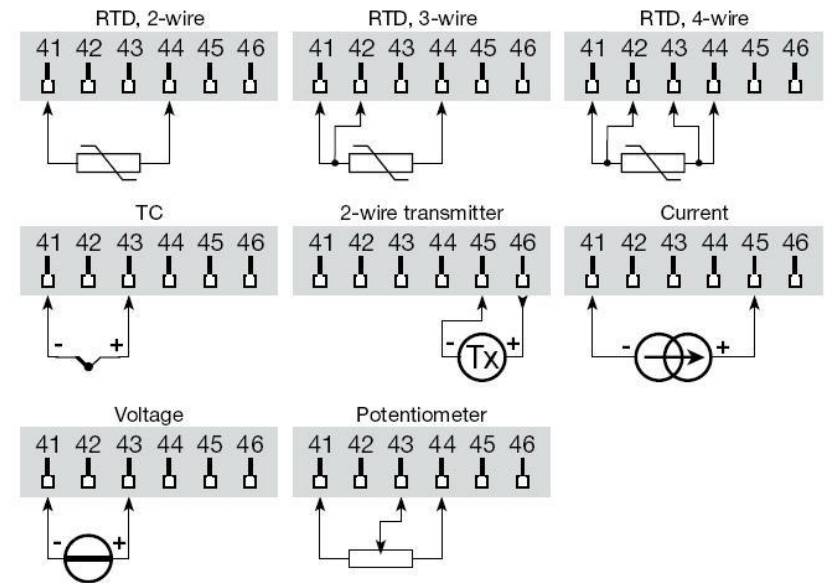
Display readout below min. / above max. (-1.9.9.9, 9.9.9.9):			
Input	Range	Readout	Limit
CURR	All	-1.9.9.9	Display readout <-1999
		9.9.9.9	Display readout >9999
VOLT	All	-1.9.9.9	Display readout <-1999
		9.9.9.9	Display readout >9999
POTM	-	-1.9.9.9	Display readout <-1999
		9.9.9.9	Display readout >9999

Readout at hardware error		
Error search	Readout	Error cause
Test of internal communication uC / ADC	HW.ER	Permanent error in ADC
Test of internal CJC sensor	CJ.ER	CJC sensor defect
Check-sum test of the configuration in RAM	RA.ER	Error in RAM
Check-sum test of the configuration in EEPROM	EE.ER	Error in EEPROM

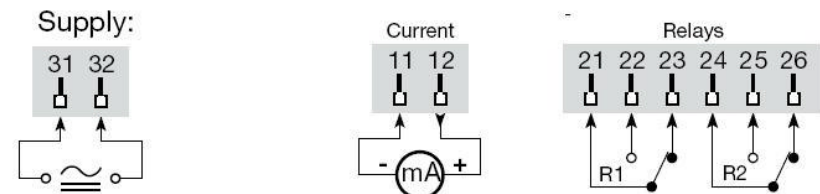
! Error indications in the display blink once a second. The help text explains the error.

CONNECTIONS

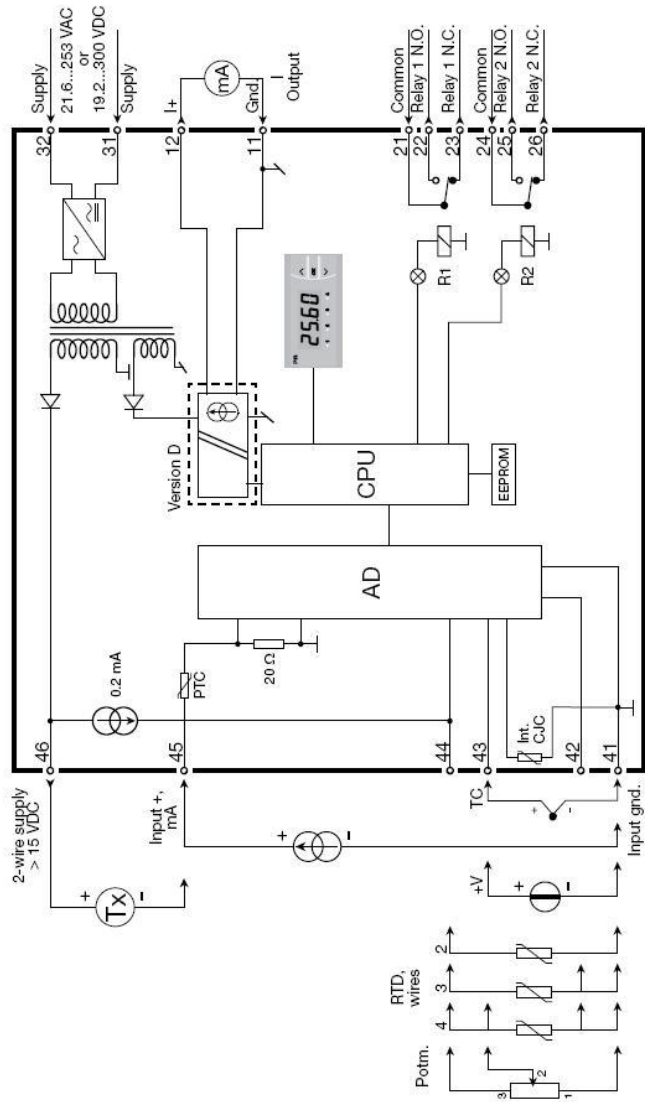
Inputs:



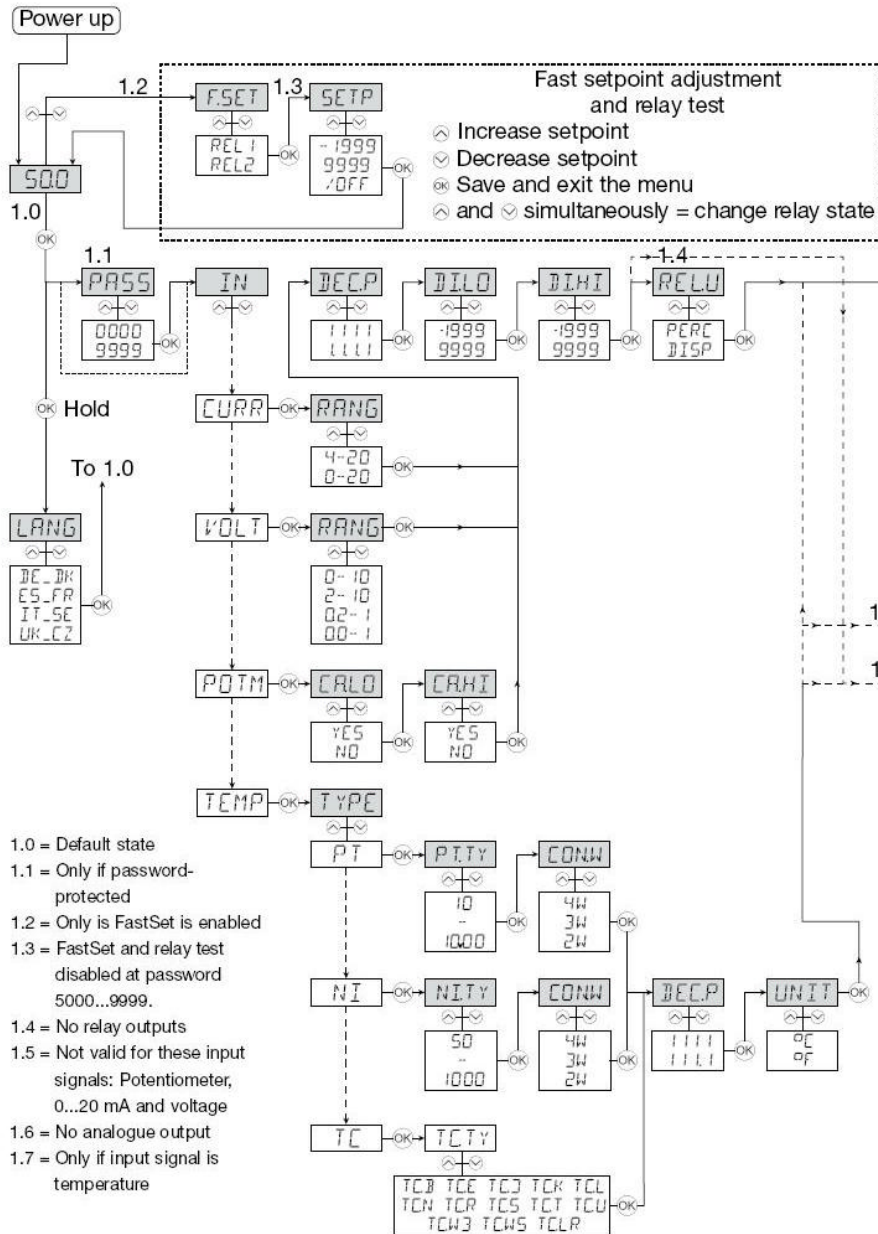
Output:



BLOCK DIAGRAM

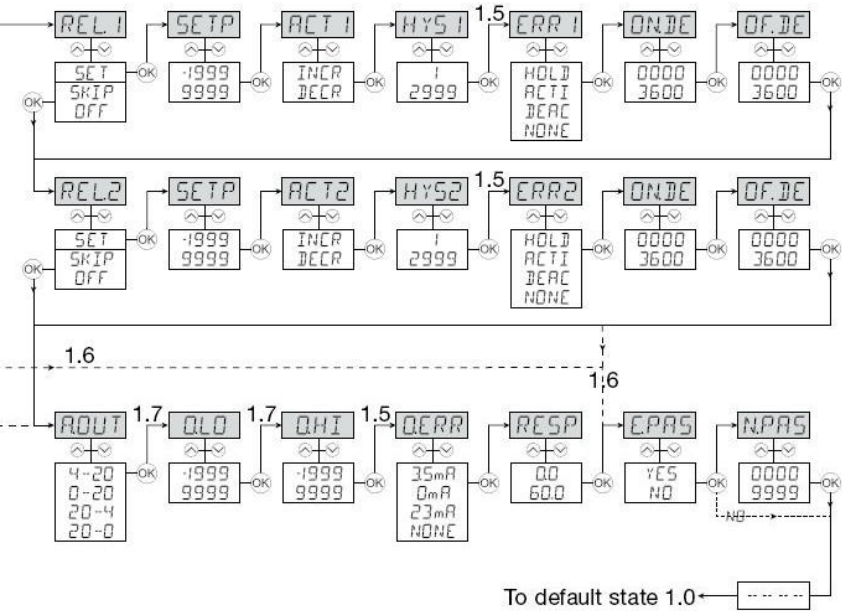


ROUTING DIAGRAM



If no keys are activated for 2 minutes the display returns to default state 1.0 without saving configuration changes..

- ⊕ Increase value / choose next parameter
- ⊖ Decrease value / choose previous parameter
- ⊗ Accept the chosen parameter and go to the next menu
- Hold ⊗ Back to previous menu / return to menu 1.0 without saving



SCROLLING HELP TEXT

Display in default state xxxx, hardware error:

SE.BR --> SENSOR WIRE BREAKAGE
 SE.SH --> SENSOR SHORT CIRCUIT
 IN.HI --> INPUT OVERRANGE
 IN.LO --> INPUT UNDERRANGE
 9.9.9.9 --> DISPLAY OVERRANGE
 -1.9.9.9 --> DISPLAY UNDERRANGE
 HW.ER --> HARDWARE ERROR
 EE.ER --> EEPROM ERROR
 CHECK CONFIGURATION
 RA.ER --> RAM MEMORY ERROR
 CJ.ER --> CJC SENSOR ERROR

Fastset (Enabled):

F.SET
 REL1 --> FAST SET MENU -
 SELECT RELAY
 REL2 -->
 SETP
 xxxx --> RELAY SETPOINT - PRESS OK TO SAVE

Fastset (Disabled):

SETP
 xxxx --> RELAY SETPOINT - READ ONLY

Configuration menus:

LANG
 DE --> DE - WAEHLE DEUTSCHEN HILFETEXT
 DK --> DK - VÆLG DANSK HJÆLPETEKST
 ES --> ES - SELECCIONAR TEXTO DE AYUDA EN ESPANOL
 FR --> FR - SELECTION TEXTE D'AIDE EN FRANCAIS
 IT --> IT - SELEZIONARE TESTI DI AIUTO ITALIANI
 SE --> SE - VALJ SVENSK HJALPTEXT
 UK --> UK - SELECT ENGLISH HELPTEXT
 CZ --> CZ - VYBER CESKOU NAPOVEDU

PASS
 xxxx --> SET CORRECT PASSWORD

IN

C.LIN* --> TEXT ENTERED BY USER IN PRESET
 CURR --> CURRENT INPUT
 VOLT --> VOLTAGE INPUT
 POT.M --> POTENTIOMETER INPUT
 TEMP --> TEMPERATURE SENSOR INPUT

RANG When current selected:

0-20 --> INPUT RANGE IN mA
 4-20 --> INPUT RANGE IN mA

RANG When voltage selected:

0-10 --> INPUT RANGE IN VOLT
 2-10 --> INPUT RANGE IN VOLT
 0.0-1 --> INPUT RANGE IN VOLT
 0.2-1 --> INPUT RANGE IN VOLT

CA.LO

YES --> CALIBRATE POTENTIOMETER LOW
 NO --> CALIBRATE POTENTIOMETER LOW

CA.HI

YES --> CALIBRATE POTENTIOMETER HIGH
 NO --> CALIBRATE POTENTIOMETER HIGH

DEC.P

1111 --> DECIMAL POINT POSITION
 111.1 --> DECIMAL POINT POSITION
 11.11 --> DECIMAL POINT POSITION
 1.111 --> DECIMAL POINT POSITION

DI.LO

xxxx --> DISPLAY READOUT LOW

DI.HI

xxxx --> DISPLAY READOUT HIGH

REL.U

PERC --> SET RELAY IN PERCENTAGE
 DISP --> SET RELAY IN DISPLAY UNITS

TYPE

PT --> SELECT PT SENSOR TYPE
 NI --> SELECT NI SENSOR TYPE
 TC --> SELECT TC SENSOR TYPE

PT.TY

10 --> SELECT PT SENSOR TYPE
 20 --> SELECT PT SENSOR TYPE
 50 --> SELECT PT SENSOR TYPE
 100 --> SELECT PT SENSOR TYPE
 200 --> SELECT PT SENSOR TYPE
 250 --> SELECT PT SENSOR TYPE
 300 --> SELECT PT SENSOR TYPE
 400 --> SELECT PT SENSOR TYPE
 500 --> SELECT PT SENSOR TYPE
 1000 --> SELECT PT SENSOR TYPE

NI.TY

50 --> SELECT NI SENSOR TYPE
 100 --> SELECT NI SENSOR TYPE
 120 --> SELECT NI SENSOR TYPE
 1000 --> SELECT NI SENSOR TYPE

CONN

When Pt and Ni sensor selected
 2W --> SELECT 2-WIRE SENSOR CONNECTION
 3W --> SELECT 3-WIRE SENSOR CONNECTION
 4W --> SELECT 4-WIRE SENSOR CONNECTION

TC.TY

TC.B --> SELECT TC SENSOR TYPE
 TC.E --> SELECT TC SENSOR TYPE
 TC.J --> SELECT TC SENSOR TYPE
 TC.K --> SELECT TC SENSOR TYPE
 TC.L --> SELECT TC SENSOR TYPE
 TC.N --> SELECT TC SENSOR TYPE
 TC.R --> SELECT TC SENSOR TYPE
 TC.S --> SELECT TC SENSOR TYPE
 TC.T --> SELECT TC SENSOR TYPE
 TC.U --> SELECT TC SENSOR TYPE
 TC.W3 --> SELECT TC SENSOR TYPE
 TC.W5 --> SELECT TC SENSOR TYPE
 TC.LR --> SELECT TC SENSOR TYPE

DEC.P

1111 --> DECIMAL POINT POSITION
 111.1 --> DECIMAL POINT POSITION

UNIT

°C --> DISPLAY AND RELAY SETUP IN CELSIUS
 °F --> DISPLAY AND RELAY SETUP IN FAHRENHEIT

REL 1

SET --> ENTER RELAY 1 SETUP
 SKIP --> SKIP RELAY 1 SETUP
 OFF --> RELAY 1 DISABLED

SETP

xxxx --> RELAY SETPOINT

ACT1

INCR --> ACTIVATE AT INCREASING SIGNAL
 DECR --> ACTIVATE AT DECREASING SIGNAL

HYS1

xxxx --> RELAY HYSTERESIS

ERR1

HOLD --> HOLD RELAY AT ERROR
 ACT1 --> ACTIVATE RELAY AT ERROR
 DEAC --> DEACTIVATE RELAY AT ERROR
 NONE --> UNDEFINED STATUS AT ERROR

ON.DE

xxxx --> RELAY ON-DELAY IN SECONDS

OF.DE

xxxx --> RELAY OFF-DELAY IN SECONDS

REL 2

SET --> ENTER RELAY 2 SETUP
 SKIP --> SKIP RELAY 2 SETUP
 OFF --> RELAY 2 DISABLED

SETP

xxxx --> RELAY SETPOINT

ACT2

INCR --> ACTIVATE AT INCREASING SIGNAL
 DECR --> ACTIVATE AT DECREASING SIGNAL

HYS2

xxxx --> RELAY HYSTERESIS

ERR2

HOLD --> HOLD RELAY AT ERROR
 ACT1 --> ACTIVATE RELAY AT ERROR
 DEAC --> DEACTIVATE RELAY AT ERROR
 NONE --> UNDEFINED STATUS AT ERROR

ON.DE

xxxx --> RELAY ON-DELAY IN SECONDS

OF.DE

xxxx --> RELAY OFF-DELAY IN SECONDS

A.OUT

0-20 --> OUTPUT RANGE IN mA
 4-20 --> OUTPUT RANGE IN mA
 20-0 --> OUTPUT RANGE IN mA
 20-4 --> OUTPUT RANGE IN mA

O.LO

xxxx --> DISPLAY VALUE FOR OUTPUT LOW

O.HI

xxxx --> DISPLAY VALUE FOR OUTPUT HIGH

O.ERR

23 mA --> NAMUR NE43 UPSCALE AT ERROR
 3.5 mA --> NAMUR NE43 DOWNSCALE AT ERROR
 0mA --> DOWNSCALE AT ERROR
 NONE --> UNDEFINED OUTPUT AT ERROR

RESP

xxx,x --> ANALOGUE OUTPUT RESPONSE TIME IN SECONDS

E.PAS

NO --> ENABLE PASSWORD PROTECTION
 YES --> ENABLE PASSWORD PROTECTION

N.PAS

xxxx --> SELECT NEW PASSWORD

CONFIGURATION / OPERATING THE FUNCTION KEYS

Documentation for routing diagram.

In general:

When configuring the display you are guided through all parameters, you can choose the settings which fit the application. For each menu there is a scrolling help text which is automatically shown in the display, this starts after 5 seconds if no key has been activated.

Configuration is carried out by using the 3 function keys.

- ⬆ will increase the numerical value or choose the next parameter.
- ⬇ will decrease the numerical value or choose the previous parameter.
- Ⓚ will accept the chosen value and end the menu.

If a function does not exist in the display all parameters are skipped to make the configuration as simple as possible.

Once the configuration has been entered the display will show "----".

Pressing and holding Ⓚ will return to the previous menu or return to the default state (1.0) without saving the changed values or parameters.

If no key is activated for 2 minutes, the display will return to the default state (1.0) without saving the changed values or parameters.

Further explanations:

Fast setpoint adjustment and relay test: These menus allow you to change the set point quickly and to check the operation of the relays.

Pressing ⬆ and ⬇ at the same time will change the state of the relay – this change is indicated by the diodes on the display. Pressing Ⓚ will save the set point change.

Holding down Ⓚ for more than 0.5 seconds will return the unit to the default state without changing the set point.

Password protection:

Using a password will stop access to the menu and parameters. There are two levels of password protection. Passwords between 0000...4999 allow access to the fast set point adjustment and relay test. (Using this password stops access to all other parts of the menu). Passwords between 5000...9999 stop access to all parts of the menu, fast set point and relay test. (Current set point is still shown). By using the master password 2008, all configuration menus are available.

Graphic depiction of the relay function setpoint:

