General technical information

Power supply	96...245 VAC
Frequency	47...63 Hz
Max power consumption	6 W
Inputs 1 and 2	
Supported sensor types	see table below
Max. full scale error	0,5% (0,25% with RTD)
Measurement time	0,26 s with RTD in 3-wire circuit 0,16 s with RTD and TC in 2-or 4-wire circuit
Remote control input 2	potential free contact
External key max. resistance	0...1 kOhm if closed >100 kOhm if open
Outputs	
Number of outputs	2
Output type	two SPDT relays, 1 A, 250 V
Digital interface	RS485
Baudrate	2.4; 4.8; 9.6; 14.4; 19.6; 28.8; 38.4; 57.6; 115.2 Kbit/s
Wire type	shielded twisted pair
Enclosure	Black ABS, for panel mounting
Protection class (front panel/back)	IP54 / IP20
Dimensions	96×48×100 mm
Weight	<0,5 kg
Operating conditions	+1...+50°C, 30...80% RH without condensation, 84...106,7 kPa
CE marking	According to the 2014/30/EU Directive on electromagnetic compatibility and the Low Voltage Directive 2014/35/EU.

Delivery set

1. Controller E6212
2. Fixing accessories set (2 clamps, 2 screws M4×55)
3. Rectangular rubber gasket
4. User manual

Warranty

This product is warranted to be free from defects in material and workmanship for a period of one year from the date of original sale. During this warranty period Manufacturer will, at its option, either repair or replace product that proves to be defective. This warranty is void if the product has been operated in conditions outside ranges specified by Manufacturer or damaged by customer error or negligence or if there has been an unauthorized modification.

Supported sensors

Displayed as	Sensor type	Meassuremenr range
r385	Pt50 RTD α= 0,00385 °C $^{-1}$	-200…+750 °C
r.385	Pt100 RTD α	-200…+750 °C
r391*	50 Pt α=0,00391 °C $^{-1}$*	-200…+750 °C
r.391*	100 Pt α=0,00391 °C $^{-1}$*	-200…+750 °C
r-21*	46 Pt α=0,00428 °C $^{-1}$*	-200…+650 °C
r426	Cu50 RTD	-50…+200 °C
r.429	Cu100 RTD	-50…+200 °C
r-23*	53 Cu α=0,00426 °C $^{-1}$	-50…+200 °C
r428*	50 Cu α=0,00426 °C $^{-1}$	-190…+200 °C
r.428*	100 Cu α=0,00426 °C $^{-1}$	-190…+200 °C
E_A1	W-Re thermocouple A1 type	0…2500 °C
E_A2	W-Re thermocouple A2 type	0…1800 °C
E_A3	W-Re thermocouple A3 type	0…1800 °C
E_b	type B thermocouple	+200…+1800 °C
E_J	type J thermocouple	-200…+1200 °C
E_K	type K thermocouple	-200…+1300 °C
E_L**	type L thermocouple	-200…+800 °C
E_n	type N thermocouple	-200…+1300 °C
E_r	type R thermocouple	0…+1750 °C
E_S1	type S thermocouple	0…+1750 °C
E_t	type T thermocouple	-200…+400 °C
C0-5	current 0...5 mA	0…100%
C0.20	current 0...20 mA	0…100%
C4.20	current 4...20 mA	0…100%
U-50	voltage -50...+50 mV	0…100%
U0_1	voltage 0...1 V	0…100%

* not certified in EU
**factory preset

Evikon MCI OÜ Teaduspargi 7/1, Tartu info@evikon.eu
Tel.: +372 733 6310 50411 Estonia www.evikon.eu

Two-channel PID controller

E6212

User manual

Evikon

Description

Two-channel PID controller E6212 is intended for measurement and regulation of temperature, pressure, humidity, weight or other parameters. in a large variety of applications and industries. The device allows to control three way valve and may be used for automatization of heat carrier supply in a wide range of heating and cooling systems.
Universal input supports Pt50, Pt100, Pt500, Pt1000, Ni500 and Ni1000 RTD sensors in two, three or four wire circuit, or thermocouple types B, J, K, N, R, S or T with internal cold junction compensation.
The controller features enlarged dual LED display, two relay outputs, three way valve control mode and fast autotuning to reach a setpoint in the shortest time with minimum disturbance.

Security note

Please read this manual carefully before proceeding to the operation.
Always adhere to the safety provisions applicable in the country of use.
Do not connect any external device or perform any maintenance operation with the power on.
Keep electrical parts of the controller away from water or conductive pollution. It is not permitted to use the controller in an ambiance containing oils, acids or alkalis.

Interference elimination

The controller should be mounted in an earthed electrical cabinet made of metal. Do not locate power equipment in the same cabinet.
Do not put signal wires together with power cords in the same harness or ducting.The cables should be laid out so the length of signal lines is minimal.
The signal lines should be securely screened. One may use shielded cables or earthed steel tubes of appropriate diameter. Cable screens should be connected to earthed terminal of the control board. The thermocouple hot junction should be electrically insulated from external devices.
Power the device through the 220 V / 50 Hz mains, which is not connected to the heavy-duty equipment. Installation of the power switch and 0,5A fuses in the external circuit is recommended.
Earthing circuit should be star connected. Use wires of maximum thickness for earthing cirquit. It is recommended to use spark extinguishing filters in the power lines and interference filters in device's power lines.

Installation

Prepare a mounting hole in the panel according to the dimensions of the controller (see Annex 1).
Insert the controller into the mounting hole. Put the fixing clamps into the holes on the sides of the controller.
Tighten the M4×55 screws in clamps' holes in order that the controller is set closely against the panel.

Connection of external devices and power

The controller is equipped with screw terminal block. For connection insert the wire end into the terninal and tihgten the screw.
To connect the controller proceed as follows:
— collect the cables for connection of the controller to the external devices, power source and RS-485 interface cable (see below for more details)
— connect the module to the power source (220 V / 50 Hz mains);
— connect the module to external devices (see Annex 1);
— connect the module to RS-485 interface ;

To secure the connections, it is recommented to use stranded copper wires with thoroughly cleared and tinned ends. The connected wires' bared ends should not protrude from the terminal block. Maximum cable core cross-section is 1 mm^2.
Maximum voltage on the terminal contacts of the controller should not exceed 250V. It is forbidden to connect the controller to higher voltage sources.
To avoid electrostatic discharge, before connecting the sensors to the controller, connect their wires for 1-2 s to the ground screw on the control board.
RS485 should be connected only if the device is to interact with a PC (for controlling, programming or data saving).

Sensor type	Max. line length	Max. ine resistance	Circuit
RTD	100 m	15 Ohm	2- or3 wire, cables of the same length and cross-section*
Thermocouple	20 m	100 Ohm	Compensating thermocouple wire
Current signal	100 m	100 Ohm	2-wire
Voltage signal	100 m	5 Ohm	2-wire

First srart

When all the necessary equipment is connected, turn the power on. For the next two seconds displays and LED indicators do not light, the output devices are off, then the device turns into operating mode.
In case of certain errors the following messages are displayed:
– Err.S – input error;
– Err.P – position sensor error;
– Err.C – calculation error.
For more information see Troubleshooting section.
Prior to operation:
– program the device,
– adjust the position sensor, if you plan to use it;
– perform the PID regulator tuning (see below).

PID-comntroller tuning

Autotuning

During autotuning the optimal PID-controller coefficients are calculated and recommended value of the RAMP parameter is determined. The obtained values are saved automatically into device's memory/
To start autotuning, proceed as follows:
1. Set the redulator setpoint SP in the range of 75-85% of maximal allowed value of the controlled parameter.
2. Set the PV0 parameter (see Annex 2). Parameter value may be set roughly preserving the order of value and the waveform.
3. Set r-S parameter to RUN.
4. Set AT parameter to RUN to launch the autotuning. If autotunning is in progress, the AT indicator 8 (see Annex 1) lights.
While autotuning is in progress, the device operates as two-position regulator. System performs oscillations.
When the autotuning is finished , the device turns automatically to the operating mode and the AT indicator fades. In case of fault, the autotuning ceases immediately and the AT indicator starts blinking. It is important to ensure protection against electromagnetic interferrence and other influences during autoting. If a fail occurs, stop the controller, turn off the power, then turn the power on and restart autotuning.
Notes:
In autotuning mode it is still possible to vary functional parameters and operational modes of thy device. However, the varying is not recommended since it may influence the process of tuning and therefore the results of parametres calculation. Operating in autotuning mode is allowed only if occilation of technological parameters around the setpoint are acceptable. Otherwise, the PID-controller should be configured manually.

Manual tuning

If the characteristics oa controled object are known or the adjustment of set parameters is necessary, the following PID-conrtoller parameters may be set manually:
– P – proportional band Xp;
– I – integral time constant τi;
– d – differential time constant τd;
To determine the optimal parameters, proceed as follows:
1. Turn the device on with running PID-controller (r-S = rUn).
2. Turn the quick setup mode off (rAMP=OFF)
3. Plot the time dependence of the measured value
4. If the plot is not prefect, adjust the PID-controller characteristics in following order: Xp, τi, τd

Operating

Swith the device to the operating mode. The control of the actuators starts in the automatic mode. If the output 1/2 is on, the LED 01/02 lights (see Annex 1 for more information on Front panel design). The device may continue working in automatic mode (in this case it is not permitted to vary the setpoint), or controlled manually (by means of buttons on the front panel) or via RS485 network.
In automatic mode the output controlling signal is determined by the device, user has to perform the tuning, specify the setpoint and turn on the controller.
To specify the setpoint (SP parameter), hold the button 13 (forward)) until MENu appears on the upper display, select the LVOP menu with 11 (up) and 12 (down) buttons and press 13. Press 13 one more time to enter the setpoint editing mode (SET indicator lights), set the necessary value on the lower display and press 13. Setpoint editing is available if the value of diS1 or diS3 parameters of the DISP group is on.
The control may be stopped by changing the r-S parameter from RUN to STOP (STOP indicator lights).
In the manual mode the position of the valve is set by user with the buttons on the device front panel. The external control, including RS485 commands, is completely blocked. To switch to the manual mode, hold 13 (forward) and 11 (up) buttons. MAN indicator starts lighting, the valve does not change its position. The valve position may be changed by pressing "up" button for opening and "down" button for closing. To quit the manual mode hold the button 13 ("forward"). The MAN indicator goes off, the device switches to setup mode and works in automatic or remote control mode depending on r-L parameter value.
In case of remote control mode, the output signal is set by user via RS485 interface. The remote control is performed with two operating parameters:
– r- L: 0 - automatic control, 1 - remote control
– r.OUt: output signal, permitted values –1.000…1.000
If r- L parameter is set as 1, COM indicator lights shortly. The correct position of the valve is set by user with r.OUt parameter.
– r.OUt > 0 –the valve is open to (r. Out ×100)%; (fully open at r.OUt=1),
– r.OUt < 0 –the valve is closed to (r. Out ×100)%, (fully closed at r.OUt=-1),
– r.OUt = 0 – the valve position does not change.
If r-L=0, the COM indicator goes out, the device switches to automatic mode.

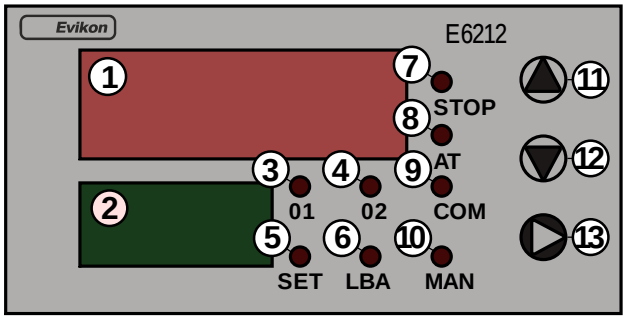
Data security

It is possible to protect several or all parameters from reading/editing (see list of parameters in the Annex 2). To enter the security parameters group, hold "up", "down" and "forward" buttons simultaneously, then enter the pass (100).

Return to factory settings

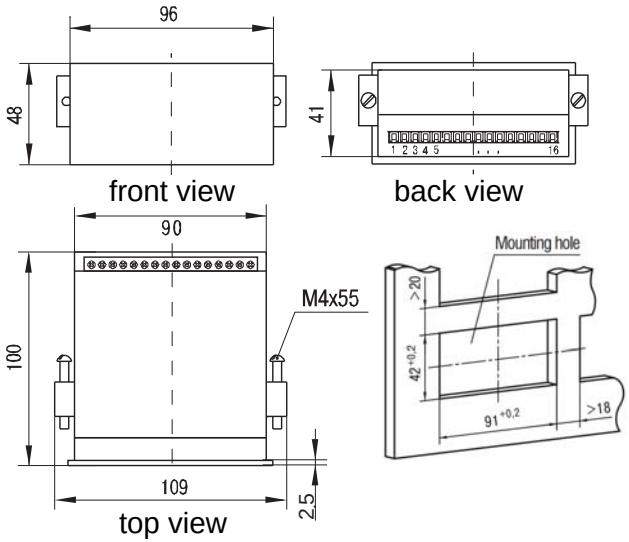
To return the device parameters to factory settings, switch off the power for more than 1 minute and holding "up" and "down" buttons swith it on. When {---} is displayed, release the buttons.

Front panel design

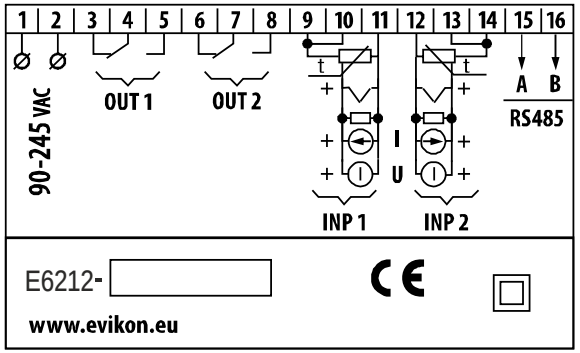


1. Display 1: measured value, parameter designation (in programming mode), *MENU* in MENU mode, error report
2. Display 2: measured value, setup value and output signal, parameter value in programming mode, parameters' group designation in MENU mode; error report
3. 01 lights when the output 1 is on
4. 02: lights when the output 2 is on
5. SET: lights in setup mode
6. LBA=Loop Break Alarm: blinks when the control loop is broken
7. STOP: lights when the device is shut down
   blinks if the shut-down is due to loop breakage or hardware error
8. AT: lights when auto-tuning is in progress
   goes out if auto-tuning is successfully done
   blinks if auto-tuning is failed
9. COM: flashes for 0.1 s when data transfer is in progress
   lights constantly in remote control mode
10. MAN: lights in Manual mode
11. Increases a value in Setup mode.
12. Decreases a value in Setup mode.
13. Long touch: enter the Setup mode
    Short touch: enter parameters group or saving the value and pass to the next parameter in the group

Mounting dimensions



Connection diagram



Parameter	Designation	Permitted values	Comments	Factory setting
LuoP (LVOP) group. Operating parameters				
Pu 1 (PV1)	Measured value at input 1	Input 1 sensor measurement range	Inducible (not settable) parameters	—
Pu2 (PV2)	Measured value at input 2	Input 2 sensor measurement range		—
LUPu (LUPV)	Value at calculator output	According to display capacity -1999...9999		—
SP (SP)	Controller setting	Determined by SL-L and SL-H	Parameter is not displayed on the screen	30
SEt.P (Set.P)	Controller setting current value in operating mode	SL-L and SL-H	Correction and rate of change taken into account. Available only via RS485.	—
r-S (r-S)	Control start/stop	rUn StoP	ON OFF	StoP
At (At)	Autotuning start/stop	rUn StoP	does not occur if r-R=STOP ON OFF	StoP
o (O)	PID-controller output power	0,0...100,0	Only if output device 1 is analog Inducible (not settable) parameters	—
InCt (Init)Inputs parameters				
In.t1 (In.t1)	Sensor type for input 1	see Supported sensors table		r385
In.t2 (In.t2)	Sensor type for input 2			r385
dPt 1 (DPT1)	Accuracy of temperature read-out for input 1	0, 1	Number of decimal places on the display for input 1 temperature read-out	1
dPt2 (DPT2)	Accuracy of temperature read-out for input 2	0, 1	Number of decimal places on the display for input 2 temperature read-out	1
dP 1 (dP1)	Decimal point position for input 1	0, 1, 2, 3	Number of decimal places on the display for analog input 1	1
dP2 (dP2)	Decimal point position for input 2	0, 1, 2, 3	Number of decimal places on the display for analog input 2	1
in.L1 (in.L1)	Measurement range lower limit for input 1	-1999...9999		0.0
in.L2 (in.L2)	Measurement range lower limit for input 2	-1999...9999		0.0
in.H1 (in.H1)	Measurement range upper limit for input 1	-1999...9999		100.0
in.H1 (in.H2)	Measurement range upper limit for input 2	-1999...9999		100.0
Sqr 1 (SQR1)	Square root calculator for input 1	on oFF	ON OFF	OFF

Parameter	Designation	Permitted values	Comments	Factory setting
InCt (Init)Inputs parameters (continued)				
Sqr2 (SQR2)	Square root calculator for input 2	on oFF	ON OFF	OFF
SH 1 (SH1)	Characteristic shift for input 1	-500...+500	to be added to measured value	0,0
SH2 (SH2)	Characteristic shift for input 2	-500...+500	to be added to measured value	0,0
KU 1 (KU1)	Characteristic slope for input 1	0,500...2,000	To be multiplied to measured value	1,000
KU2 (KU2)	Characteristic slope for input 2	0,500...2,000	To be multiplied to measured value	1,000
Fb 1 (Fb1)	Digital filter band for input 1	0...9999		0,0
Fb2 (Fb2)	Digital filter band for input 2	0...9999		0,0
inF 1 (inF1)	Digital filter time constant for input 1	1...999 OFF	measurement unit: s exponential filter is off	OFF
inF2 (inF2)	Digital filter time constant for input 2	1...999 OFF	measurement unit: s exponential filter is off	OFF
AdJ (AdV) group. Control and LBA parameters				
inP2 (inP2)	Input 2 function	Available if r-S = StoP OFF — the sensor is off in.t2 — the sensor is set with in.t2 parameter Eunt — key u.Ptr — resistance position sensor u.CS — current position sensor		OFF
CALC (CALC)	Calculator formula	Available if inP2 = in.t2 A.SUn — weighted arithmetic mean rAt — ratio SqPu— square root of the weighted mean Cr-AF — setup correction		A.SUM
KPu 1 (KPV1)	Weighting factor for PV1	-19,99...99,99	Available if inP2=in.t2, CALC ≠ Cr-AF Do not set KPU2=0 if CALC=rAt	1,00
KPu2 (KPV2)	Weighting factor for PV2	-19,99...99,99		1,00
SL-L (SL-L)	Setting lower limit	-1999...3000		-199,9
SL-H (SL-H)	Setting upper limit	-1999...3000		3000

E6212 User manual. Annex 2 Programmable parameters (continued, part 2/2)

Parameter	Designation	Permitted values	Comments	Factory setting
AdV (AdV) group. Regulation and LBA parameters (continued)				
nuEr (MVEr)	Output signal in case of error	CLOS — the valve is fully closed HOLd — the position of the valve does not change OPEn — the valve is fully open		CLOS
		0...100	% (for analog valve)	0
ndSt (MdSt)	Output state if control is stopped	Only for analog output devices MVST — set by MVST parameter (see below) O — the last value of the output signal		MVST
orEU (OREU)	Control type	or-r	"Reverse" control. Used for heater type actuators	Or-r
		or-d	"Direct" control. Used for refrigerator type actuators	
Pu0 (PV0)	Controlled value at zero output power	-100...2000		20
rAMP (RAMP)	Fast setpoint atteinment mode	OFF ON		OFF
P (P)	PID-controller proportional band	0,001...9999		30,0
I (I)	PID-controller integral time constant	0...3999	measurement unit: s	100
d (D)	PID-controller differential constant	0...3999	measurement unit: s	20
db (Db)	PID-controller dead band	0...200		0,0
uSP (VSP)	Rate of setting change	0...9999	measured value unit/min	0,0
oL-L (OL-L)	Output power lower limit	0...OL-H	measurement unit: %	0
oL-H (OL-H)	Output power upper limit	OL-L...100	measurement unit: %	100
nuSt (MVST)	Output signal if regulation is stopped	See MVEr parameter		CLOS
LbA (LbA)	Loop break diagnostics time	0...9999 0	s Diagnostics is off	0
LbAb (LbAb)	Width of loop breakage diagnostics zone	0...9999		10.0
ALt (ALt)	Comparator logic type	0-14	for analog valve	
AL-d (AL-d)	Comparator operating threshold	–1999…3000		10.0
AL-H (AL-H)	Comparator hysteresis	0…3000		0.0

Parameter	Designation	Permitted values	Comments	Factory setting
uALu (VALV) group. Valve parameters				
u.tot (V.MOT)	Full valve running time	5...999	s	30.0
u.db (V.db)	Valve dead band	0…9999 0…100	ms % for analog valve	0
u.GAP (V.GAP)	Backlash elimination time	0.0…10.0	s	0.0
u.rEu (V.rEV)	Minimum reverse time	0.0…10.0	s	0.0
u.toF (V.toF)	Time between refinement pulses	0....9 OFF	s the finisher is off	2
diSP (DISP) gpoup. Displaying parameters.				
diS1 (diS1)	type 1	OFF ON	off on: PV1 on the upper display SP on the lower display	ON
rEt (rEt)	Setup mode exit time	5...99	s, time interval, after which the device returns to displaying the first parameter from LVOP group	OFF
		OFF	No automatical return to indication	
GrAF (GrAF)group. Setting correction plot parameters. (Available if **CALC = GrAF**)				
nodE (nOdE)	Number of nodes	0...10		1
x (X)	External parameter value at i-th point	–1999…3000		0.0
y (Y)	Setting correction value at i-th point			0.0
Conn (COMM) group. Communication parameters.				
Prot (Prot)	Communication protocol	OWEN, M.rtU, M.ASC	OWEN, Modbus RTU, M. ASCII	OWEN
bPS (bPS)	Communication rate	2,4; 4,8; 9,6; 14,4;19,2; 28,8; 38,4; 57,6; 115,2	kbit/s	115.2
ALEn (A.Len)	Network address length	8,11	bit	8b
Addr (Addr)	Base address	0...247	Every device at the bus should have its unique address	0
rSdL (rSdL)	RS-485 response delay	1...45	ms	20
SECr (SECr) group. Security parameters (enter with **PASS= 100**)				
oAPt (oAPt)	Parameters read protection	0 - all the parameters are accessible 1 - only LVOP group parameters are accessible 2 - only SP is accessible		0
wtPt (wtPt)	Parameters write protection	0 - all the parameters may be varied 1 - varying is forbidden for all parameters except LVOP group 2 -varying is forbidden for all parameters except r-S and SP 3 -varying is forbidden for all parameters except SP 4 -varying is forbidden for all parameters		0
EdPt (EdPt)	Read/write protection of selected parameters	OFF ON		OFF

E6212 User manual Annex 3 Operating via Modbus protocol (page 1/2)

Supported Modbus functions

Function (hex)	Operation	Note
03	Current value of single or multiple registers	
10	Record the values to multiple registers	
08	Connection diagnostics	The only supported code is 00 - Renders the query used for Master - Slave connection diagnostics.

Supported standard error codes

Code	Error	Note
01	ILLEGAL FUNCTION	Function code is not supported
02	ILLEGAL DATA ADDRESS	Data address (register number) indicated in the query is not in use
03	ILLEGAL DATA VALUE	Invalid data – the value is beyond allowed range; – response length exceeds the communication buffer; – the real data bytes quantity in the package does not correspond to the indicated package length
04	SLAVE DEVICE FAILURE	The command cannot be executed For more details read the 0108H register value

Modbus regisrers

Parameter name	Designation	Modbus address (hex)	Data type	Number of decimal places	Value range (dec)
LvoP group. Operational parameters (read-only: 0x03 function)					
VER	Device version	0x 1004 0x 1005 0x 1006 0x 1007	Char[8]	–	V03.00xx
STAT	Status register	0x 0000	binary	–	16 bit (see "STAT register bits designation" table)
PV1	Measuredvalue at the input 1	0x 0001	Signed Int16	–	sensor's measurement range
PV2	Measuredvalue at the input 2	0x 0002	Signed Int16	–	sensor's measurement range
LUPV	calculation result	0x 0003	Signed Int16	–	sensor's measurement range
SP	Setpoint	0x 0004	Signed Int16	–	SL–L … SL–H
SET.P	Current setpoint of the operationg controller	0x 0005	Signed Int16	–	SL–L … SL–H
O	PID-controller output power (valve position)	0x 00006	Int 16	–	0.0 …100.0 (for versions with analog outputs only)

Modbus regisrers (continued)

Parameter name	Designation	Modbus address (hex)	Data type	Number of decimal places	Value range (dec)
LvoP group. Operational parameters (reading: 0x03 function /recording: 0x10 function)					
r-L	External control	0x 0007	Int16	0	0,1
r.out	Regulator output signal	0x 0008	Signed Int16	3	-1.000 … 1.000 (discrete output) 0.000…1.000 (analog output)
R-S	Regulation start/stop	0x 0009	Int16	0	0 – stop; 1 – start
AT	Autotuning start/stop	0x 000A	Int16	0	0 – stop; 1 – start
LvoP group. Operational parameters (read-only: 0x03 function)					
STAT	Status register	0x 1008			
PV1	Measuredvalue at the input 1	0x 1009 0x 100A	Float32	–	sensor's measurement range
PV2	Measuredvalue at the input 2	0x 100B 0x 100C	Float32	–	sensor's measurement range
LUPV	calculation result	0x100D 0x100E	Float32	–	sensor's measurement range
SP	Controller setpoint	0x100F 0x1010	Float32	–	SL–L … SL–H
SET.P	Current setpoint of the operationg controller	0x1011 0x1012	Float32	–	SL–L … SL–H
O	PID-controller output power (valve position	0x1013 0x1014	Float32	–	0.0 …100.0 (for versions with analog outputs only)

E6212 User manual Annex 3 Operating via Modbus protocol (continued, page 2/3)

Modbus regisrers (continued)

Parameter name	Designation	Modbus address (hex)	Data type	Number of decimal places	Value range (dec)
Comm group Communication parameters (reading: 0x03 function /recording: 0x10 function)					
Prot	Communication protocol	0x 0100	Int16	0	1 – ModBus-RTU, 2 – ModBus-ASCII
bPS	Communication rate	0x0101	Int16	0	[kbps] 0 – 2.4; 1 – 4.8; 2 – 9.6; 3 – 14.4; 4 – 19.2; 5 – 28.8; 6 – 38.4; 7 –57.6; 8 – 115.2
A.Len	Network address length	0x0102	Int16	0	0 – 8 bit
Addr	Base address	0x0103	Int16	0	1 – 247
rSdL	RS-485 response delay	0x0104	Int16	0	0... 45 ms
Len	Dataword length	0x0105	Int16	0	0: 7 bits 1:8 bits
PrtY	Parity	0x0106	Int16	0	0 – none
Sbit	Number of stop-bits	0x0107	Int16	0	0: 1 stop-bit 1: 2 stop-bits
n.Err	Network error code at last device addressing	0x0108	Hex word	0	0x06 – the mabntissa value exceeds descriptor limitations 0x28 – descriptor not found 0x31 – unexpected size of data field 0x32 – unexpected value of query bit 0x33 – parameter editing is forbidden by specific attribute 0x34 – linear index is too large 0x47 – invalid parameters' values combination (parameter editing is locked by one or several other parameters values)
PRTL	Command for communication protocol changing	0x0109	Int16	–	1
APLY	Command for changing the network parameters' values	0x010A	Int16	–	1
INIT	Restart (similar to OFF-ONN)	0x010B	Int16	–	1

Parameter name	Designation	Modbus address (hex)	Data type	Number of decimal places	Value range (dec)
init group. Input parameters (reading: 0x03 function /recording: 0x10 function)					
in.t1	Sensor type (or inpur signal type) for input 1	0x 0200	Int16	0	1... 26
dPt1	Accuracy of temperature read-out for input 1	0x 0201	Int16	0	0,1
dP1	Decimal point position for input 1	0x 0202	Int16	0	0,1,2,3
in.L1	Measurement range lower limit for input 1	0x 0203	Signed Int16	*	-1999…9999
in.H1	Measurement range upper limit for input 1	0x 0204	Signed Int16	*	-1999…9999
SH1	Input 1 characteristic shift	0x 0205	Signed Int16	*	-500…+500
KU1	Input 1 characteristic slope	0x 0206	Int16	3	0.500…2.000
Fb1	Input 1 filter band	0x 0207	Int16	*	0…9999
inF1	Input 1 filter time constant	0x 0208	Int16	0	0…999
Sqr1	Square root calculator for analog input 1	0x 0209	Int16	0	0 – OFF; 1 – ON
in.t2	Sensor type (or inpur signal type) for input 2	0x 020A	Int16	0	1... 26
dPt2	Accuracy of temperature read-out for input 2	0x 020B	Int16	0	0,1
dP2	Decimal point position for input 2	0x 020C	Int16	0	0,1,2,3
in.L2	Measurement range lower limit for input 2	0x 020D	Signed Int16	**	-1999…9999
in.H2	Measurement range upper limit for input 2	0x 020E	Signed Int16	**	-1999…9999
SH2	Input 2 characteristic shift	0x 020F	Signed Int16	**	-500…+500
KU2	Input 2 characteristic slope	0x 0210	Int16	3	0.500…2.000
Fb2	Input 2 filter band	0x 0211	Int16	**	0…9999
inF2	Input 2 filter time constant	0x 0212	Int16	0	0…999
Sqr2	Square root calculator for analog input 2	0x 0213	Int16	0	0 – OFF; 1 – ON

Modbus regisrers (continued)

Parameter name	Designation	Modbus address (hex)	Data type	Number of decimal places	Value range (dec)
Adv group. Control parameters (reading: 0x03 function /recording: 0x10 function)					
inP2	Input 2 function	0x 0300	Int16	0	0 – OFF; 1 – measuring input; 2 – key; 3 –resistance position sensor; 4 – current position sensor
CALC	Calculator formula	0x 0301	Int16	0	0 – weighted mean, 1 – ratio, 2 – square root of the weighted mean, 3 – setup correction
kPV1	Weighting factor for PV1	0x 0302	Signed Int16	2	-19.99 … 99.99
kPV2	Weighting factor for PV2	0x 0303	Signed Int16	2	-19.99 … 99.99
SL-L	Setpoint low limit	0x 0304	Signed Int16	*	-1999 … 3000
SL-H	Setpoint upper limit	0x 0305	Signed Int16	*	-1999 … 3000
orEU	Control type during regulating	0x 0306	Int16	0	0 – heater; 1 – cooler
PV0	Supported value at 0% power	0x 0307	Signed Int16	0	-100 … 2000
ramP	Quick setup mode	0x 0308	Int16	0	0 – OFF; 1 – ON
P	PID controller proportional band	0x 0309	Int16	*	1… 9999
I	PID controller integral constant	0x 030A	Int16	0	0…3999
D	PID controller differential constant	0x 030B	Int16	0	0…3999
dB	PID controller deadband	0x 030C	Int16	*	0…200
vSP	Rate of the setpoint change	0x 030D	Int16	*	0…9999
OL-L	Minimum output power	0x 030E	Int16	0	0… OL-H
OL-H	Maximum output power	0x 030F	Int16	0	OL-L… 100
LbA	Loop break diagnostics time	0x 0310	Int16	0	0… 9999
LbAb	Loop break diagnostics zone width	0x 0311	Int16	*	0… 9999
Alt	Comparatop operationg logic	0x 0315	Int16	0	0 – 14
AL-d	Comparator operation threshold	0x 0316	Int16	*	-1999 …3000
AL-H	Comparator hysteresis	0x 0317	Int16	*	0 … 3000

Parameter name	Designation	Modbus address (hex)	Data type	Number of decimal places	Value range (dec)
valv grour. Valve parameters (reading: 0x03 function /recording: 0x10 function)					
v.Mot	Full valve running time	0x 0400	Int16	0	5…999
V.db	Valve dead band	0x 0401	Int16	0	0…9999 0…100 (for versions with analog output)
V.GAP	Backlash elimination time	0x 0402	Int16	1	0… 10 (only for versions with discrete outputs)
V.rEV	Minimum reverse time	0x 0403	Int16	1	
V.tOF	Time between refinement pulses	0x 0404	Int16	0	
DISP group. Indication parameters (reading: 0x03 function /recording: 0x10 function)					
rEt	Setup mode exit time	0x 0500	Int16	0	5 … 100 s, 100 – OFF
DiS1	Indication mode 1	0x 0501	Int16	0	0 – OFF; 1 – ON
DiS2	Indication mode 2	0x 0502	Int16	0	0 – OFF; 1 – ON
DiS3	Indication mode 3	0x 0503	Int16	0	0 – OFF; 1 – ON
DiS4	Indication mode 4	0x 0504	Int16	0	0 – OFF; 1 – ON
DiS5	Indication mode 5	0x 0505	Int16	0	0 – OFF; 1 – ON
GraF group. Setting correction plot parameters (reading: 0x03 function /recording: 0x10 function)					
Node	Nodal points number	0x 0600	Int16	0	1…10
X1	External parameter value in point 1	0x 0601	Signed Int16	*	-1999 … 3000
Y1	Correctional setup value in point 2	0x 0602	Signed Int16	*	-1999 … 3000
X2 - X10 **Y2 - Y10**	X2 (0x 0603); Y2 (0x 0604); X3 (0x 0605); Y3 (0x 0606); X4 (0x 0607); Y4 (0x 0608); X5 (0x 0609); Y5 (0x 060A); X6 (0x 060B); Y6 (0x 060C); X7 (0x 060D); Y7 (0x 060E); X8 (0x 060F); Y8 (0x 0610); X9 (0x 0611); Y9 (0x 0612); X10 (0x 0613); Y10 (0x 0614)		Similar to X1, Y1	deter-mined by dP1 parame-ter	Similar to X1, Y1
SECR group. Security parameters (reading: 0x03 function /recording: 0x10 function)					
oAPt	Parameters read protection	0x 0700	Int16	0	0... 2
wtPt	Parameters write protection	0x 0701	Int16	0	0... 4
EdPt	Read/write rotection of selected parameters	0x 0702	Int16	0	0 – OFF; 1 – ON

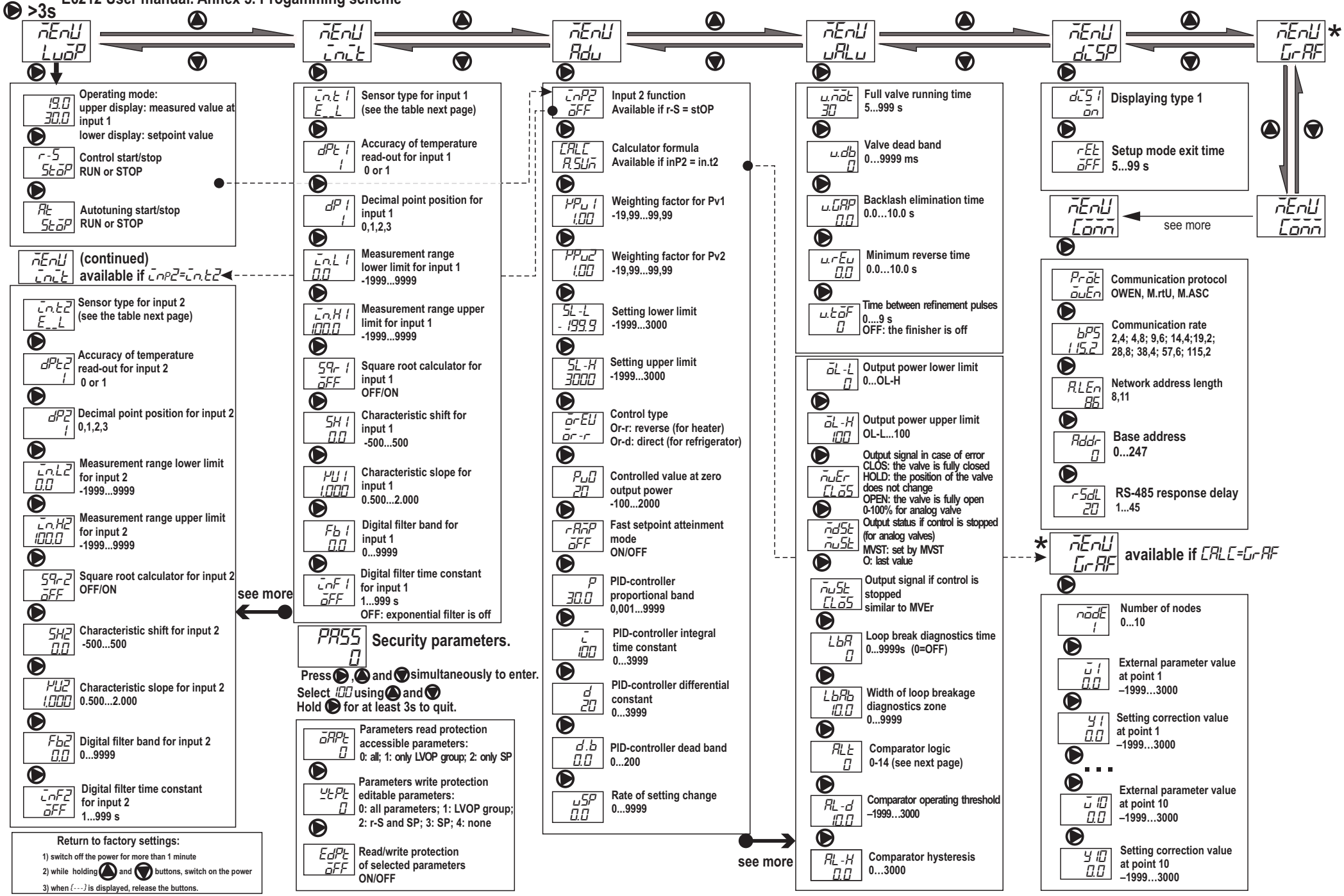
E6212 User manual. Annex 4 Troubleshooting

The controller can inentify following types of malfunctions:
– Err.S – input error;
– Err.P – position sensor error;
– Err.C – calculation error;
– Er.Ad – internal convertion error

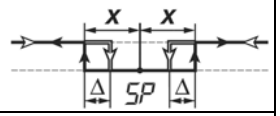
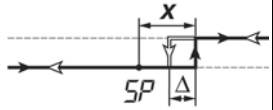
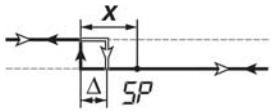
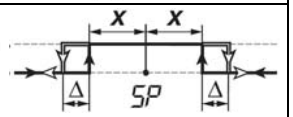
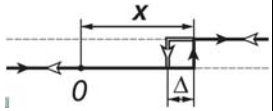
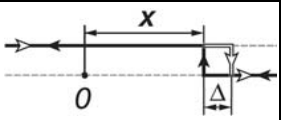
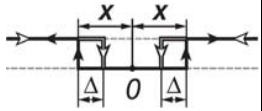
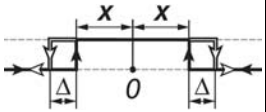
The input error appears if the measured value is beyond sensor's range, or in case of sensor breakage, short circuit etc. Ia a thermocouple is used, the cold junction temperature, equal to output connector temperature, is displayed. For 0...5 mA, 0...20 mA, 0... 1 V devices the measurement range lower limit (in.L parameter value) is displayed.When the problem is fixed, the controller returns automatically into normal operating mode.
For type B thermocouples Err.S is not displayed in the range 0...200 °C.
More troubles are listed in the table below. If the trouble cannot be identified or fixed, address the repair service.

Manifestation	Possible cause	Fixing
Err.S on the display X in operating mode with connected sensor	Sensor failure	Replace the sensor
	Breakage or short cirquit of the sensor-controller line	
	Error sensor code	Set the correct value of Sn.t1 / Sn.t2 parameters
	Error in two-wire connection	Install the bridge between terminals 9 and 10 for input 1 and 13, 14 for input 2
	Error in sensor connection	Connect the sensor properly
	Device with current output is connected without reistor	Connect the load resistor
Err.P on the display 2 in operating mode with connected position sensor	Position sensor failure	Replace the sensor or disable it in the SnP2 parameter
	Breakage or short cirquit of the sensor-controller line	
	Error position sensor code	Set the correct value of SnP2 parameter
	Error in position sensor connection	Connect the sensor according to diagrams in the Annex 1
	Sensor adjustment was not performed	Adjust the sensor
Err.C on the display 1 in operating mode with connected sensor	Division by zero	Set a non-zero value of the HPu 1 parameter. Check if the measured value or K3 on the input 2 equals to zero
	The radicand is negative	Make sure that the sensors are connected correctly (see Annex X), check polarity.
[[[[on the display in operating mode	Measured or calculated value is more than 999,9 and cannot be displayed correctly	Set dPt 1 / dPt2 parameter to 0
]]]] on the display in operating mode	Measured or calculated value is less than -199,9 and cannot be displayed correctly	Set dPt 1 / dPt2 parameter to 0
Displayed temperature does not correspond to real one	Error sensor code	Set the correct value of Sn.t1 / Sn.t2 parameters
	Error in characteristic slope or shift	Set the correct values of SK1 (SK2) and HU1 (HU2) parameters. If no correction is required, set 0.0 and 1.000 respectively
	The sensor is connected by 2-wire scheme	
	Electromagnetic interference	Screen the sensor-controller connections, put the screen to earth at one point
Current signal is displayed as zeros	Error in sensor connection	Connect the sensor properly.
Measured temperature is decreasing during heating / increasing during cooling	Error in thermocouply connection	Change polarity
	PID-controller deadband is too large	Set the correct value (recommended range is 0...1)
	Error in coefficients of the PID-regulator	Use autotuning or manual mode
	Wrong valve parameters	Set the parameters as precise as possible. It is advisable to consult the actuatior's technical documentation
The controller shuts down, LBA lights	Diagnostics time in LbA parameter is too short	Increase diagnostics time or disable loop break alarm by setting LbA=0
Programming parameters cannot be changed	Parameters are protected against reading and/or modification	Change security parameters (see list of parameters in the Annex 2

E6212 User manual. Annex 5. Progamming scheme



Signalling in case controlled value is out of set limits

AL t value	Controlled value	Output device status
00	signalling is off	
01	Beyond the set range	
02	More than SP by X	
03	Less than SP by X	
04	Within the set range	
05	Similar to 01 with first operating blocked	
06	Similar to 02 with first operating blocked	
07	Similar to 03 with first operating blocked	
08	More than X	
09	Less than X	
10	Similar to 08 with first operating blocked	
11	Similar to 09 with first operating blocked	
12	Beyond the range of ±X	
13	Within the range of ±X	
14	Similar to 12 with first operating blocked	

X - comparator operating threshold (AL -d parameter, Adu group)
Δ - conparator hysteresis (AL -H parameter, Adu group)

Supported sensors

Displayed as	Sensor type	Meassuremenr range
r385	Pt50 RTD α= 0,00385 °C $^{-1}$	-200…+750 °C
r.385	Pt100 RTD α	-200…+750 °C
r391*	50 Pt α=0,00391 °C $^{-1}$*	-200…+750 °C
r.391*	100 Pt α=0,00391 °C $^{-1}$*	-200…+750 °C
r-21*	46 Pt α=0,00428 °C $^{-1}$*	-200…+650 °C
r426	Cu50 RTD	-50…+200 °C
r.429	Cu100 RTD	-50…+200 °C
r-23*	53 Cu α=0,00426 °C $^{-1}$	-50…+200 °C
r428*	50 Cu α=0,00426 °C $^{-1}$	-190…+200 °C
r.428*	100 Cu α=0,00426 °C $^{-1}$	-190…+200 °C
E_A1	W-Re thermocouple A1 type	0…2500 °C
E_A2	W-Re thermocouple A2 type	0…1800 °C
E_A3	W-Re thermocouple A3 type	0…1800 °C
E_b	type B thermocouple	+200…+1800 °C
E_J	type J thermocouple	-200…+1200 °C
E_K	type K thermocouple	-200…+1300 °C
E_L**	type L thermocouple	-200…+800 °C
E_n	type N thermocouple	-200…+1300 °C
E_r	type R thermocouple	0…+1750 °C
E_S1	type S thermocouple	0…+1750 °C
E_t	type T thermocouple	-200…+400 °C
C0-5	current 0...5 mA	0…100%
C0.20	current 0...20 mA	0…100%
C4.20	current 4...20 mA	0…100%
U-50	voltage -50...+50 mV	0…100%
U0_1	voltage 0...1 V	0…100%

* not certified in EU
**factory preset

Evikon