DL2
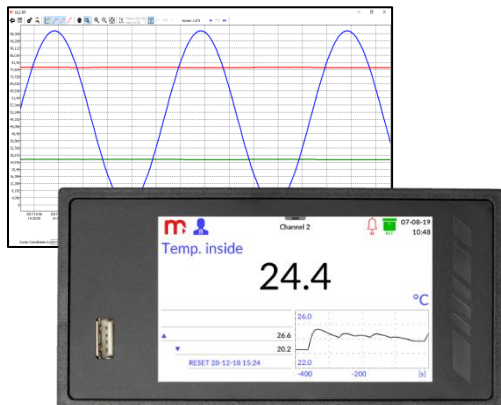## Electronic data logger

- Up to 12 input/output signals
- Up to 30 displayed channels
- 2 GB internal data memory, advanced data logging
- 4" touchscreen colour LCD
- USB port on front panel
- 4 solid state relays (max. 10) for alarm and control
- 1 analogue output 4-20 mA (max. 4) for retransmission value of one of the channels
- Ethernet port, Modbus TCP Client/Server
- RS-485 port, Modbus RTU Master/Slave
- Dedicated PC software for commissioning and archive data visualization
- Available languages: EN, DE, ES, FR, IT, PL, PT

DL2 is a modular data recorder, developed for wide range of applications and process measurements. Its modular construction and available up to twelve different I/O inputs, allows to configure customized measurement system.

The device is intended to measure process signals in industrial applications and may be used to measure physical values processed into a standard signals, e.g. temperature, humidity, pressure, flow, level and chemical parameters, etc. The device is perfectly suited for slow rate variable runs with changes at a few seconds intervals.

Device can communicate with master system through Ethernet port (Modbus TCP protocol, web server) or through RS-485 port (Modbus RTU protocol) and can work in distributed control systems.

Simple configuration does not requires extra programming skills. Device may be quickly configured by the user from front panel or using commissioning software on PC.

BASIC FUNCTIONS

- Measurement of process values
- Measurement of flow - two totalizers for each channel
- Two alarms or control thresholds for each channel
- Tracking the minimum and maximum values
- Math functions
- User characteristics
- Results displaying as graph charts and tables
- Data and events logging
- Communication with a computer system
- E-mails regarding alarm states and cyclical reports with totalizers values (up to 5 recipients)

RECORDING MEASUREMENT RESULTS

- Data recording rate for process values from 2 s up to 24 h; two recording rates, toggled by alarm state
- Data recording rate for totalizers from 1 min up to 24 h
- Recording data to internal memory, access to recorded data through USB port on the front panel or through Ethernet port
- Checksum secured files – protection against data manipulation

AVAILABLE OPTIONS AND ORDERING INFORMATION

Each DL2 device is composed of the basic M module, which is made up of: 4 solid state relays, one 4-20mA analog output, Ethernet port, RS-485 communication interface connector; power supply from 24 VDC. Depending on the client needs, up to two different input/output modules can be installed in the device.

Module code	Module type	Description
11	IN6I(24V)	six analog inputs with standard current loop output 0-20mA or 4-20mA powered from internal 24 VDC
12	IN6I	six analog inputs with standard current loop output 0-20mA or 4-20mA (or passive transmitters with external power supply)
21	IN6RTD	six analog inputs for connection temperature RTD sensors type Pt100, Pt200, Pt500, Pt1000, Ni100, Ni120, Ni1000, Cu50, Cu53, Cu100, KTY81, KTY83, KTY84; transducers with an output resistance in range 0 .. 4700 Ω
22	IN3RTD	three analog inputs for connection temperature RTD sensors type Pt100, Pt200, Pt500, Pt1000, Ni100, Ni120, Ni1000, Cu50, Cu53, Cu100, KTY81, KTY83, KTY84; transducers with an output resistance in range 0 .. 4700 Ω
31	IN6TC	six analog inputs for connecting thermocouples (TC) type J, L, K, U, E, N, B, R and S
41	IN6V	six analog inputs for connecting as standard -10 .. +10 V, 0..10 V, 2 .. 10 V, 0 .. 5 V, 1 .. 5 V
51	IN3	three universal analog inputs, enabling the connection of transducers as standard 0/4-20mA, 0/2-10 V, 0/1-5 V or temperature sensors RTD, TC and linear measurement of the resistance of 0..4000 Ω or voltage -140 .. +140 mV
61	IN6D	six PULS inputs; ability to work in a state mode, frequency measurement mode (0.1 .. 1000 Hz), pulse counting (0 .. 100 Hz)
71	2RS485(24V)	two independent and galvanically separated RS-485 ports for reading transducers or other devices operating in the Modbus RTU standard; extra 24VDC voltage source power supply for external transducers
72	2RS485	two independent and galvanically separated RS-485 ports for reading transducers or other devices operating in the Modbus RTU standard
75	1HRT	one HART (4-20 mA) port with the possibility of powering transmitters, operating in the Primary Master mode or in the Secondary Master mode
81	OUT6RL	six solid state relays output rated at 24 VAC / 0.5 A or 36 VDC / 0.5 A
91	OUT3	three programmable analogue outputs 0/4-20mA, 0/1-5V, 0/2-10V
95	PSBATT	supplying the device with NiMH storage batteries in the event of voltage break (backup) or periodic operation with battery power supply (from 1 to 20 hours depending on the configuration)

A factory configuration code:

DL2-X-X
→ SLOT B
→ SLOT A

In the place of letter X, a suitable module number should be provided as per the instruction described in the table above. For example:

- device with 6 TC temperature inputs and 6 relay outputs has code:

DL2-31-81

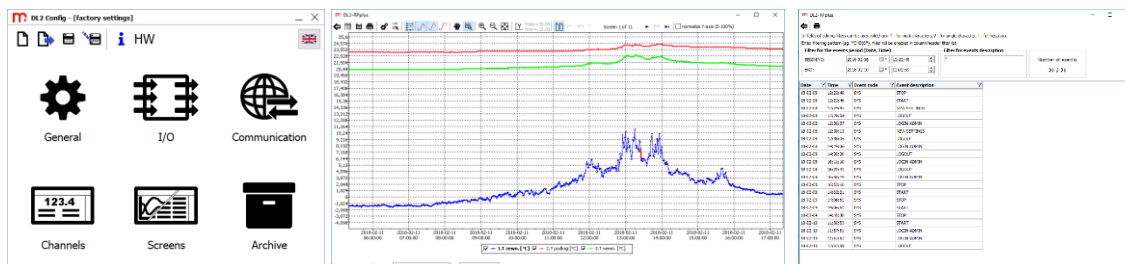- device with 6 voltage inputs has code:

DL2-41-00

Number 00 in this code mean, that in the device is only one module (it is installed on SLOT A).
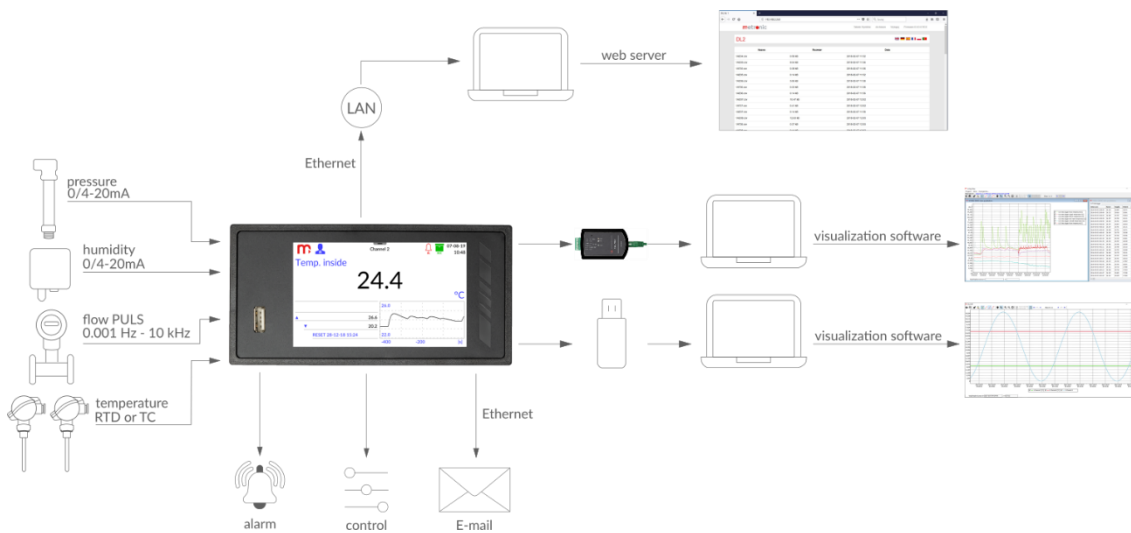
EXAMPLE DATA PRESENTATION
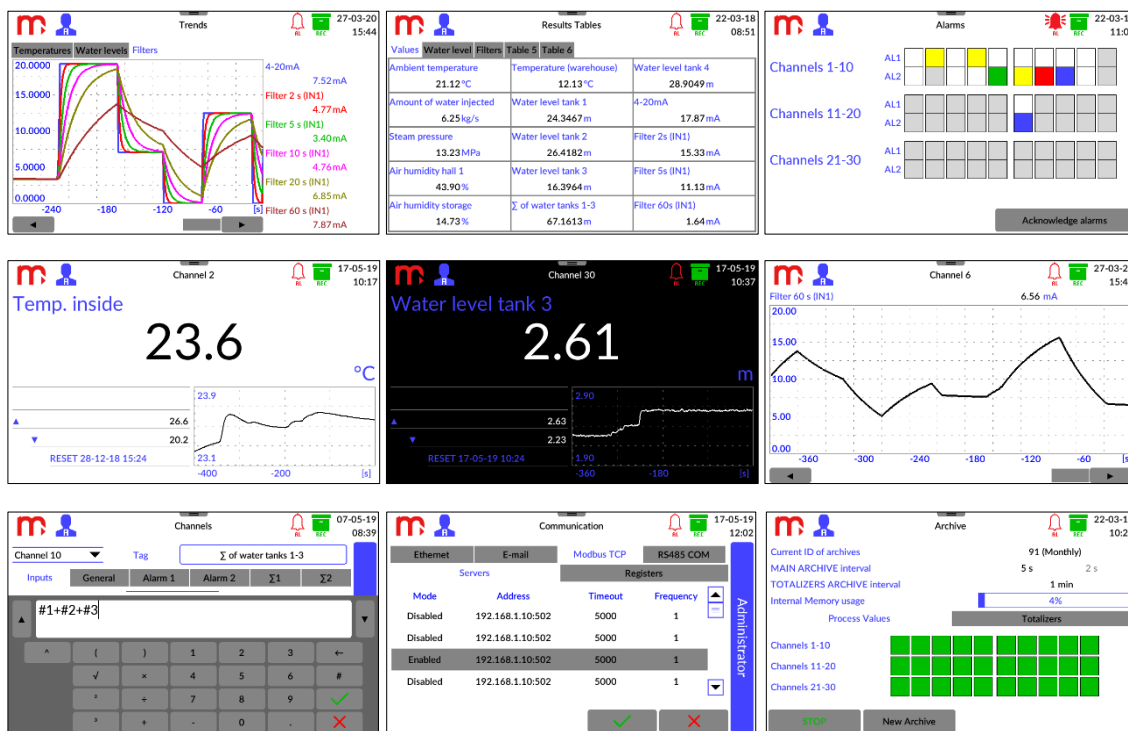
DEDICATED PC SOFTWARE

There is dedicated PC software for commissioning (DL2 Config) and archive data visualization (DL2-RP and DL2-RPplus).

APPLICATION EXAMPLE

TECHNICAL SPECIFICATIONS

Front panel	
Type of display	LCD TFT 4" 800 px X 480 px LED backlight
Display size	86.4 mm X 52.5 mm
Keyboard	resistive touch panel
Additional indication	LED RGB

USB Port - front panel	
Version	USB 2.0 (with limited functionality, for connection of FLASH storage)
Connector type	USB standard 'A' type socket

Ethernet Port - rear panel	
Interface	10/100 Base-T Ethernet
Connector type	RJ-45
Transmission protocol	Server WWW, Modbus TCP Client/Server ICMP (ping)

Modbus TCP Client	
Number of connections opened simultaneously	Max 20
Number of read values	Max 30

Modbus TCP Server	
Number of connections opened simultaneously	Max 4

RS-485 Serial Port - rear panel	
Signals output on terminal block	A(+), B(-)
Galvanic separation	None
Maximum load	32 receivers/transmitters
Transmission protocol	Modbus RTU Slave
Transmission rate	1.2, 2.4, 4.8, 9.6, 19.2, 38.4, 57.6, 115.2 kbps
Parity control	Even, Odd, None
Frame	1 start bit, 8 data bits, 1 stop bit
Maximum length of line	1200 m
Internal terminating resistor	Vcc-A(+)-B(-)-G: 390 Ω - 220 Ω - 390 Ω (activated by DIP-switches)
Maximum differntial voltage A(+), B(-)	-7 V .. +12 V
Minimum output signal of transmitter	1.5 V (at R_L= 54 Ω)
Minimum sensitivity of receiver	200 mV / R_{IN}= 12 kΩ
Minimum impedance of data transmission line	54 Ω
Short-circuit/thermal protection	Yes/Yes

Internal data memory	
Memory type	Flash
Capacity	2 GB
Estimated recording time for recording speed every 5 s for 16 measuring channels	ca. 2 years

Supply	
Supply voltage	24 VDC (20 .. 30 VDC)
Maximum power consumption	12 W
Security	The internal delay fuse 3.15 A, the exchange only by the service company

Electrical connections (terminal connectors)

Type	screw terminal connectors
Wire cross section	solid and flexible: 0.14 .. 1.5 mm^2 flexible with bootlace ferrule 0.25 .. 1.5 mm^2 AWG 30 / 14

Mechanical Dimensions – Housing

Type of housing	panel mount, nonflammable plastic material „Noryl"
Dimensions with connectors (w X h w X d)	144 mm X 72 mm X 127 mm
Dimensions of panel cut-out (w X h)	138^{+1} mm X 68$^{+0.7}$ mm
Maximum panel thickness	5 mm
Weight	0.5 kg
Protection class	IP30 on front panel side IP20 on rear panel side

Environmental conditions

Ambient temperature	0 .. +50 °C or 0 .. +40 °C depends on the device hardware configuration[1]
Relative humidity	5 .. 95% (without steam condensation)
Maximum altitude	< 2000 m above sea level
Storage temperature	-30 .. +70 °C
Degree of pollution	PD2
EMC	EMC Directive 2014/30/EU EN 61326-1:2013 Table 2 (immunity) EN 61326-1:2013 Class A (emission)
RoHS	RoHS Directive 2011/65/EU

[1]If module IN6I(24V) or 2RS485(24V) installed and operating as a power supply source for external devices, ambient temperature is limited to 0 .. +40 °C. In all other configurations the ambient temperature range is 0 .. +50 °C.

Analog output 4-20mA

Output signal	4-20 mA (3.6 .. 22 mA)
Current loop supply	no (external supply required)
Maximum voltage between I+ and I-	28 VDC
Minimum supply current loop voltage	9 VDC (R_L = 0 Ω)
Loop resistance (R_L)	0 .. 500 Ω
Galvanic isolation to supply voltage	250 VAC; 1500 VAC for 1 minute

Relay outputs

Number of outputs	4
Outputs type	Solid state relays
Maximum voltage	60 V AC/DC
Maximum load current	0.1 A

I/O MODULES

IN6I(24V); IN6I – 0-20mA or 4-20mA INPUT TYPE MODULE

Number of inputs	6
Measuring range	0–20 mA; 4–20 mA; (the actual range -22 .. 22 mA)
Resolution	0.001 mA
Measurement accuracy (T_a = +25 °C)	< ±0.1% measuring range (typically < ±0.05%)
Temperature drift	< ±0.02% /°C measuring range

Input resistance	12 Ω ±10%
Maximum input voltage	± 40 VDC
Input protection	Polymer fuse 50 mA
Transducers powered from device: • module IN6I(24V) • module IN6I	24 VDC ±15% / max 0.25 mA None
Galvanic separation from the other circuits	250 VAC; 1500 VAC for 1 minute
Galvanic separation between channels	None

IN6RTD; IN3RTD – RTD/R INPUT TYPE MODULE

Number of inputs: • module IN6RTD • module IN3RTD	 6 3
Sensor type	• Resistive (refer the table below) • Linear resistance
Sensor connection type	2-wire; 3-wire; 4-wire
Sensor current	200 μA
Measuring range	0 .. 4000 Ω
Resolution	0.05 Ω
Wire resistance compensation in the 3-wire connection	Automatic
Wire resistance correction in the 2-wire, 3-wire, 4-wire connection	Constant within the range of –99.99 .. +99.99 Ω
Maximum resistance of the sensor wires	20 Ω
Maximum input voltage	± 40 VDC
Galvanic separation from the other circuits	250 VAC; 1500 VAC for 1 minute
Galvanic separation between channels	None

IN6TC – mV TYPE INPUT MODULE

Number of inputs	6
Sensor type	• Thermocouple (refer the table below) • Linear voltage source
Measuring range	-140 .. +140 mV
Resolution	0.01 mV
Cold junction compensation	• Any other temperature measuring channel (in °C/°F) or a constant value • Internal sensor measurement: accuracy ±2.5 °C (value can be calibrated by the user) • for thermocouple B – no compensation
Maximum input voltage	± 40 VDC
Galvanic separation from the other circuits	250 VAC; 1500 VAC for 1 minute
Galvanic separation between channels	None

IN6V – VOLTAGE TYPE INPUT MODULE

Number of inputs	6
Sensor type	• 0-10 V (2-10 V, 0-5 V, 1-5 V) • Linear voltage source
Measuring range	-10 .. +10 VDC (or sub-range) (the actual range -11 .. +11 VDC)
Resolution	0.0001 V
Measuring range (T_a = +25 °C)	< ±0.1% measuring range (typically < ±0.05%)

Temperature drift	< ±0.02% /°C measuring range
Input resistance	>100 kΩ
Maximum input voltage	± 40 VDC
Galvanic separation from the other circuits	250 VAC; 1500 VAC for 1 minute
Galvanic separation between channels	None

IN3 – UNIVERSAL TYPE INPUT MODULE

Number of inputs	3
Sensor type	• 0–20mA; 4–20mA (without loop supply module) • ±10V / 0-10V (2-10V, 0-5V, 1-5V) • Thermocouple (Table below); ±100 mV • Resistance (Table below); 0 .. 4000 Ω
Maximum input voltage	± 30 VDC
Galvanic separation from the other circuits	250 VAC; 1500 VAC for 1 minute
Galvanic separation between channels	None

Specifications for input type 0-20mA, 4-20mA

Measuring range	0–20 mA; 4–20 mA; (the actual range -22 .. 22 mA)
Resolution	0.001 mA
Measurement accuracy (T_a = +25 °C)	< ±0.1% measuring range (typically < ±0.05%)
Temperature drift	< ±0.02% /°C measuring range
Input resistance	12 Ω ±10%
Input protection	Polymer fuse 50 mA

Specifications for input type ±10V / 0-10V

Measuring range	-10 .. +10 VDC (or sub-range) (the actual range -11 .. +11 VDC)
Resolution	0.0001 V
Measuring range (T_a = +25 °C)	< ±0.1% measuring range (typically < ±0.05%)
Temperature drift	< ±0.02% /°C measuring range
Input resistance	>100 kΩ

Specifications for input type TC

Measuring range	-140 .. +140 mV
Resolution	0.01 mV
Cold junction compensation	• Any other temperature measuring channel (in ° C/° F) or a constant value • Internal sensor measurement: accuracy ±2.5 °C (value can be calibrated by the user) • for thermocouple B – no compensation

Specifications for input type RTD

Sensor connection type	2-wire; 3-wire; 4-wire
Sensor current	200 μA
Measuring range	0 .. 4000 Ω
Resolution	0.05 Ω
Wire resistance compensation in the 3-wire connection	Automatic
Wire resistance correction in the 2-wire, 3-wire, 4-wire connection	Constant within the range of −99.99 .. +99.99 Ω
Maximum resistance of the sensor wires	20 Ω

IN6D – BINARY INPUTS MODULE

Number of inputs	6
Sensor type	• State tracking • Frequency measurement 0.1 .. 1000 Hz • Counting pulses (freq. range 0 .. 100 Hz)
Resolution measurement of frequency	0.1 Hz
Measuring range (measurement of frequency)	< ±0.01% measuring range (typically < ±0.005%)
Temperature drift (measurement of frequency)	< ±0.002% /°C measuring range
Input resistance	1.2 kΩ ±10%
Input voltage operation (switching level)	0 .. 4 VDC / 5.5 .. 34 VDC (3.6 mA)[2] (according to PN-EN61131-2 characteristic)
Maximum input voltage	-0.3 VDC / +36 VDC
Contacts debounce filtering	off / 1 ms / 3 ms
Power supply source for external transducers	24 VDC ±15% / max 50 mA Protected by thermal fuse
Galvanic separation from the other circuits	250 VAC; 1500 VAC for 1 minute
Galvanic separation between channels	None

[2]If required, other switching current level at 0.45 mA, 1.55 mA or 2.44 mA can be selected with jumpers located on the module PCB.

2RS485(24V); 2RS485 – RS485 PORTS INPUT MODULE (MODBUS RTU MASTER)

Number of ports	2
Maximum number of process values read	25 (one or both ports in total)
Signals output on terminal block	A(+), B(-), 2x G (G - signal ground)
Maximum bus load	32 receivers/transmitters
Transmission protocol	Modbus RTU Master
Transmission rate	1.2, 2.4, 4.8, 9.6 ,19.2, 38.4, 57.6, 115.2 kbps
Parity control	Even, Odd, None
Frame	1 start bit, 8 data bits, 1 stop bit
Galvanic separation	250 VAC; 1500 VAC for 1 minute
Maximum length of line	1200 m
Internal terminating resistor	Vcc-A(+)-B(-)-G: 390 Ω - 220 Ω - 390 Ω (activated by DIP-switches)
Maximum differntial voltage A(+), B(-)	-9 V .. +14 V
Minimum output signal of transmitter	1.5 V (at R_L= 54 Ω)
Minimum sensitivity of receiver	200 mV / R_{IN}= 12 kΩ
Minimum impedance of data transmission line	54 Ω
Short-circuit/thermal protection	Yes/Yes
Additional power supply 24 VDC source • 2RS485(24V) module • 2RS485 module	• 3 four pole terminal block (+ + - -) 24 VDC ±15% / max 200 mA • None

1HRT – HART (4-20 mA) PORT INPUT MODULE

Transmission protocol	• rev 4, rev 5, rev 6, rev 7 • Primary Master or Secondary Master
Functions	Supported 0, 1, 3, 6, 9 commands: • Reading PV, SV, TV, FV and DVC variables • Reading the Long Address (rev 5, rev 6, rev 7) • Changing the Short Address • Reading the unique identifier frame (test)
Maximum number of devices	15

Maximum number of variables read	25
Multidrop operating mode	Yes, up to 15 devices (multidrop)
Loop power supply	24 VDC (max 60 mA)
Analog reading of the 4-20mA line	No
Galvanic separation from the other circuits	250 VAC; 1500 VAC for 1 minute
Internal resistor	250 Ω, disabled by default[3]

[3]The resistor can be switched on/off in the data logger I/O settings menu. The resistor is automatically disconnected in the event of a power outage.

OUT6RL – RELAY OUTPUTS MODULE

Number of outputs	6
Sensor type	Solid-state relays (SSR)
Maximum operating voltage / operating current	24 VAC / 0.5 A or 36 VDC / 0.5 A
The maximum voltage allowed	42 VAC or 60 VDC
Maximum peak current	1.5 A for 1 ms
Galvanic separation from the other circuits	250 VAC; 1500 VAC for 1 minute
Galvanic separation between channels	250 VAC; 1500 VAC for 1 minute

OUT3 – ANALOGUE OUTPUTS MODULE

Number of outputs (channels)	3
Specifications for current output	
Range (program selected)	4 - 20 mA 0 - 20 mA 0 - 24 mA
Output type	Active current source
Possibility of powering the current loop from an external voltage source	None
Resolution	12 bit / 0.006 mA
Accuracy (R_L=350 Ω / T_a =+25 °C)	< ±0.15% (< ±0.036 mA) full range of measurement (FSR)
Accuracy (R_L=350 Ω / T_a = -40 °C .. +50 °C)	< ±0.3% (< ±0.072 mA) full range of measurement (FSR)
Load resistance R_L	0 Ω .. 500 Ω
Maximum output voltage (for $R_L = \infty$ Ω)	21.5 V
Specifications for voltage output	
Range (program selected)	0 - 5 VDC 0 - 10 VDC
Output type	DC voltage source
Resolution	12 bit (1.25 mV for 0 - 5 V) (2.5 mV for 0 - 10 V)
Accuracy (R_L=1 kΩ/C_L=200 pF/T_a=+25 °C)	< ±0.1% full range of measurement (FSR) (Typically < ±0.05% FSR)
Accuracy (R_L=1 kΩ/C_L=200 pF/T_a=-40 °C .. +50 °C)	< ±0.3% full range of measurement (FSR)
The minimum load resistance R_L	1 kΩ
The maximum load capacitance C_L	1 μF
Short-circuit protection	Yes
Specifications for current and voltage output	
Galvanic separation from other circuits	250 VAC; 1500 VAC for 1 minute
Galvanic separation between channels	250 VAC; 1500 VAC for 1 minute

PSBATT – MODULE FOR OPERATION WITH A BACK-UP BATTERY[4]

Input voltage 24 VDC IN	24 VDC / 2 .. 2.5 A
BATT1, BATT2 (capacity)	NiMH 2x9.6 V / 1000 .. 6000 mAh (Typically 4600 mAh or 2000 mAh)
BATT1, BATT2 temperature sensor	2x NTC 10 kΩ
Charging time	ca. 12 h (full charging)

[4]In the device, it is possible to instal only 1 PSBATT module. From April 1, 2020, the PSBATT module is manufactured only in version 1.2. Version 1.2 of the module is not backward compatible. The Datasheet contains information about the module's technical data in version 1.2. Technical details about the module in version 1.0 and in version 1.1 are available from the Manufacturer. Use only dedicated power supply.

TABLE OF RTD SENSORS

Sensor type	Range	Accuracy
Pt100, Pt200, Pt500, Pt1000 **(EN 60751+A2:1995)**	-200 °C .. +850 °C	±0.5 °C (typically ±0.3 °C)
	-328 °F .. +1562 °F	±0.9 °F (typically ±0.5 °F)
Ni100, Ni120, Ni1000 **(DIN43760 /08-1985)**	-60 °C .. +250 °C	±0.5 °C (typically ±0.3 °C)
	-76 °F .. +482 °F	±0.9 °F (typically ±0.5 °F)
Cu50, Cu53, Cu100 **(GOST6651-2009)**	-180 °C .. +200 °C	±0.5 °C (typically ±0.3 °C)
	-292 °F .. +392 °F	±0.9 °F (typically ±0.5 °F)
KTY81 **(NXP Rev05-25.04.2008)**	-55 °C .. +150 °C	±0.5 °C
	-67 °F .. +302 °F	±0.9 °F
KTY83 **(NXP Rev06-4.04.2008)**	-55 °C .. +175 °C	±0.5 °C
	-67 °F .. +347 °F	±0.9 °F
KTY84 **(NXP Rev06-8.05.2008)**	-40 °C .. +300 °C	±0.8 °C
	-40 °F .. +572 °F	±1.5 °F
Linear resistance	0 .. 4700 Ω (or sub-range)	±0.5 Ω (typically ±0.3 Ω)

TABLE OF THERMOCOUPLES (TC)

Sensor type	Range	Accuracy
J (Fe-CuNi) **(EN60584-1:1995)**	-210 °C .. +1200 °C (compensation range -100 °C .. +300 °C) -346 °F .. +2192 °F (compensation range -148 °F .. +572 °F)	±1.0 °C (typically ±0.5 °C) ±1.8 °F (typically ±0.9 °F) (without compensation)
K (NiCr-NiAl) **(EN60584-1:1995)**	-270 °C .. + 1372 °C (compensation range -100 °C .. +300 °C) -454 °F .. +2501.6 °F (compensation range -148 °F .. +572 °F)	±1.0 °C (typically ±0.5 °C) ±1.8 °F (typically ±0.9 °F) (without compensation)
N (NiCrSi-NiSi) **(EN60584-1:1995)**	-270 °C .. +1300 °C (compensation range -100 °C .. +300 °C) -454 °F .. +2372 °F (compensation range -148 °F .. +572 °F)	±2.0 °C (typically ±1.0 °C) ±3.6 °F (typically ±1.8 °F) (without compensation)
R (PtRh 13-Pt) **(EN60584-1:1995)**	-50 °C .. +1768 °C (compensation range -50 °C .. +300 °C) -58 °F .. +3214.4 °F (compensation range -58 °F .. +572 °F)	±2.0 °C (typically ±1.0 °C) ±3.6 °F (typically ±1.8 °F) (without compensation)
S (PtRh 10-Pt) **(EN60584-1:1995)**	-50 °C .. +1768 °C (compensation range -50 °C .. +300 °C) -58 °F .. +3214.4 °F (compensation range -58 °F .. +572 °F)	±2.0 °C (typically ±1.0 °C) ±3.6 °F (typically ±1.8 °F) (without compensation)
T (Cu-CuNi) **(EN60584-1:1995)**	-200 °C .. +400 °C (compensation range -50 °C .. +300 °C) -328 °F .. +752 °F (compensation range -58 °F .. +572 °F)	±1.0 °C (typically ±0.5 °C) ±1.8 °F (typically ±0.9 °F) (without compensation)

E (NiCr-CuNi) **(EN60584-1:1995)**	-270 °C .. +1000 °C (compensation range -50 °C .. +300 °C) -454 °F .. +1832 °F (compensation range -58 °F .. +572 °F)	±1.0 °C (typically ±0.5 °C) ±1.8 °F (typically ±0.9 °F) (without compensation)
B (PtRh30-PtRh6) **(EN60584-1:1995)**	+250 °C .. +1820 °C (without compensation) +482 °F .. +3308 °F (without compensation)	±2.0 °C (typically ±1.0 °C) ±3.6 °F (typically ±1.8 °F) (without compensation)
L (Fe-CuNi) **(DIN43710)**	-200 °C .. +900 °C (compensation range -50 °C .. +300 °C) -328 °F .. +1652 °F (compensation range -58 °F .. +572 °F)	±1.0 °C (typically ±0.5 °C) ±1.8 °F (typically ±0.9 °F) (without compensation)
U (Cu-CuNi) **(DIN43710)**	-200 °C .. +600 °C (compensation range -50 °C .. +300 °C) -328 °F .. +1112 °F (compensation range -58 °F .. +572 °F)	±1.0 °C (typically ±0.5 °C) ±1.8 °F (typically ±0.9 °F) (without compensation)
Line voltage	-140 .. +140 mV (or sub-range)	<0.2% full range

Data sheet version: 200806EN Device version: 1.4