

DL2

MULTICHANNEL ELECTRONIC DATA LOGGER

- 3 to 12 measuring inputs
- Up to 30 displayed channels
- 1 analog output 4-20 mA (max. 4)
- 4 solid state relays (max.10)
- 4" touch screen LCD
- USB port on front panel
- Ethernet port and RS-485 port
- Internal data memory 2 GB

BASIC FUNCTIONS:

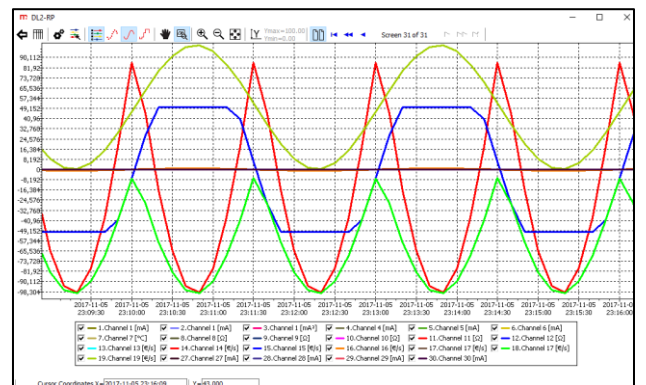
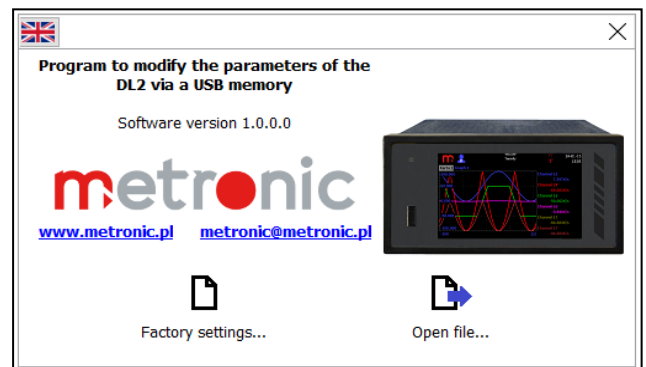
- Measurement of process values
- Measurement of flow
- Results displaying and data logging
- Alarm signaling and control
- Communication with a computer system

RECORDING MEASUREMENT RESULT:

- Data recording rate from 2 s up to 24 h
- Two recording frequencies toggled upon exceeding the set alarm thresholds
- Recording data to internal 2 GB memory, access to recorded data through USB port on the front panel or through Ethernet port

SOFTWARE FOR PC:

- CONFIG software for quick and easy device commissioning
- REPORT software for archived data, visualization and analysis; Advanced REPORT+ version available as an option



DL2 is a modular data recorder, created with a view to best adapt the device to individual customer needs. Each device includes a base module. Depending on the client needs, into device can be installed up to two, different input/output modules.

Device can communicate with master system through RS-485 port (Modbus RTU protocol) or through Ethernet port (Modbus TCP protocol, web server).

Device enable retransmission of one of the channels as a 4-20 mA current loop output signal.

Device has 4 solid state relays. There is opportunity to set up 2 alarm and control thresholds for each channel, also there is opportunity to set up alarm or control operating mode.

DL2 BASE SET

Each DL2 device is composed of:

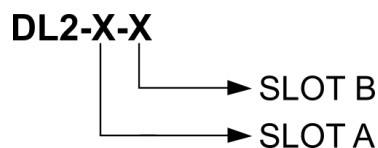
- housing,
- front panel with touchscreen colour LCD and USB port (type - A),
- the basic M module, which is made up of:
 - 4 solid state relays,
 - one 4-20 mA analog output,
 - Ethernet port,
 - RS-485 communication interface connector,
 - Power supply from 24 VDC.

Depending on the client needs, into device can be installed up to two, different input/output modules.

No.	Mark	Description	Number of inputs/outputs
11	IN6I(24V)	The 0/4-20mA input module IN6I(24V)	6
12	IN6I	The 0/4-20mA input module IN6I	6
21	IN6RTD	The RTD input module IN6RTD	6
22	IN3RTD	The RTD input module IN3RTD	3
31	IN6TC	The input module measuring the temperature and voltage mV IN6TC	6
41	IN6V	The voltage input module IN6V	6
51	IN3	Universal input module IN3	3
61	IN6D	Binary input PULS IN6D	6
71	IN2RS485(24V)	Digital input module (Modbus RTU) IN2RS485(24V)	2
72	IN2RS485	Digital input module (Modbus RTU) IN2RS485	2
81	OUT6RL	The two-state output module OUT6RL	6
91	OUT3	Analogue output module OUT3	3

ORDERING INFORMATION

A factory configuration code:



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:

DL2-41-0

Number 0 in this code mean, that in device is only one module (it is installed on SLOT A).

Data sheet version: 180307EN Device version: 1.0

VERSIONS OF INPUT/OUTPUT MODULES

The 0/4-20mA input module IN6I(24V), IN6I

No.	Mark	Number of inputs	Description
11	IN6I(24V)	6	<ul style="list-style-type: none"> transducers with standard current loop output 0-20 mA or 4-20 mA powered from internal 24 VDC linear current measurement in range -20 .. +20 mA inputs galvanically isolated from the other circuits of the device a two-colour LED diode informing about the module's operating status
12	IN6I	6	<ul style="list-style-type: none"> active transducers with standard current loop output 0-20 mA or 4-20 mA (or passive transmitters with external power supply) linear current measurement in range -20 .. +20 mA inputs galvanically isolated from the other circuits of the device a two-colour LED diode informing about the module's operating status

The RTD input module measuring the temperature and the resistance IN6RTD (IN3RTD)

No.	Mark	Number of inputs	Description
21	IN6RTD	6	<ul style="list-style-type: none"> temperature sensors of Pt, Ni, Cu, type (for full list of sensors refer to the technical data) transducers with an output resistance in range 0 .. 4000 Ω inputs galvanically isolated from the other circuits of the device a two-colour LED diode informing about the module's operating status
22	IN3RTD	3	<ul style="list-style-type: none"> temperature sensors of Pt, Ni, Cu, type (for full list of sensors refer to the technical data) transducers with an output resistance in range 0 .. 4000 Ω inputs galvanically isolated from the other circuits of the device a two-colour LED diode informing about the module's operating status

The input module measuring the temperature and voltage mV IN6TC

No.	Mark	Number of inputs	Description
31	IN6TC	6	<ul style="list-style-type: none"> thermocouple temperature sensors (for full list of sensors refer to the technical data) cold junction compensation (constant value or measured with external sensor) linear voltage measurement in range -140 .. +140 mV inputs galvanically isolated from the other circuits of the device a two-colour LED diode informing about the module's operating status

The voltage input module IN6V

No.	Mark	Number of inputs	Description
41	IN6V	6	<ul style="list-style-type: none"> transducers with standard voltage output 0-10 V, 2-10 V, 0-5 V, 1-5 V linear voltage measurement in the range -10 .. +10 V inputs galvanically isolated from the other circuits of the device a two-colour LED diode informing about the module's operating status

Universal input module IN3

No.	Mark	Number of inputs	Description
51	IN3	3	<ul style="list-style-type: none"> interfacing with the active transducers with the standard current output 0/4-20 mA (or passive transducers with additional external power supply); temperature measurements using the Pt, Ni, Cu, KTY type sensors (a complete list of sensors is given in the chapter discussing the technical data); temperature measurements using thermocouples; interface with the standard output transducers and the voltage of 0 .. 10 V, -10 .. +10 V linear current measurement within the range or sub-range of -20 .. +20 mA; linear measurement of the resistance within the range or sub-range 0 .. 4000 Ω; linear measurement of the voltage within the range or sub-range -140 .. +140 mV, -10 .. +10 V 3 measurement inputs galvanically separated from the remaining circuits a two-colour LED diode informing about the module's operating status

Binary input module IN6D

No.	Mark	Number of inputs	Description
61	IN6D	6	<ul style="list-style-type: none"> the ability to work in a toggle mode, frequency measurement mode or pulse counting the ability to track a binary signal open / close Frequency measurement in the range of 0.1 .. 1000 Hz (pulse counting 0.1 .. 100 Hz) cooperation with passive pulse transmitter (contact transistor configuration OC), the source voltage or current pulses 6 measurement inputs galvanically separated from the remaining circuits a two-colour LED diode informing about the module's operating status

Digital input module (Modbus RTU) IN2RS485(24V) / IN2RS485

No.	Mark	Number of inputs	Description
71	IN2RS485(24V)	2	<ul style="list-style-type: none"> designed to work with instruments and sensors that communicate with the RS-485 digital bus according to the Modbus RTU protocol possibility of reading and recording 25 digital values 2 independent RS485 ports galvanically separated 24 VDC (max 200 mA) output for powering external transducers a two-colour LED diode informing about the module's operating status
72	IN2RS485	2	<ul style="list-style-type: none"> designed to work with instruments and sensors that communicate with the RS-485 digital bus according to the Modbus RTU protocol possibility of reading and recording 25 digital values 2 independent RS485 ports galvanically separated a two-colour LED diode informing about the module's operating status

The two-state output module OUT6RL

No.	Mark	Number of outputs	Description
81	OUT6RL	6	<ul style="list-style-type: none"> • solid state relays (SSR) AC / DC-carrying capacity 0.5 A • outputs galvanically isolated from each other and other circuits of the device • a two-colour LED diode informing about the module's operating status

Analogue output module OUT3

No.	Mark	Number of outputs	Description
91	OUT3	3	<ul style="list-style-type: none"> • 3 galvanically separated channels of analogue outputs, each can work as a power source or a voltage source in the following ranges: <ul style="list-style-type: none"> – 0-20 mA (active power source) – 4-20 mA (active power source) – 0-24 mA (active power source) – 0-5 V (voltage source) – 0-10 V (voltage source) • program mode selected, each channel can be configured to work in a different mode and range • each channel has two connectors for connecting the receiver, one is for connecting the current loop receiver, the other one for the voltage receiver, there is no possible to use both: current and voltage source for a given channel at the same time • analogue output is based on a specialized A/D converter with a resolution of 12 bits

TECHNICAL DATA

FRONT PANEL	
Type of display	LCD TFT 4" 800 px X 480 px LED backlight
Reading field size	86.4 mm X 52.5 mm
Keyboard	resistive touch panel
Indication	LED RGB
USB Port (front panel)	
Version	USB 2.0 (with limited functionality, for connection of FLASH storage)
Port socket	USB standard 'A' type socket
Protection class	IP20
Ethernet Port (rear panel)	
Interface	10/100Base-T Ethernet
Transmission protocol	Modbus TCP ICMP (ping)
Number of connections opened simultaneously	Max 4
Connection	RJ-45
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
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 differential voltage A(+), B(-)	-7 V ... +12 V
Minimum output signal of transmitter	1.5 V (at $R_L = 54 \Omega$)
Minimum sensitivity of receiver	200 mV / $R_{IN} = 12 \text{ k}\Omega$
Minimum impedance of data transmission line	54 Ω
Short-circuit / thermal protection	Yes / Yes
Internal terminating resistor	Yes, activation of terminator on rear panel, switch
Internal data memory	
Memory type	Flash
Capacity	2GB
Estimated recording time for recording speed every 10 s for 20 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	wire 1.5 mm ² max cord 1 mm ² max cord with sleeve connectors 0.25 .. 1.5 mm ² AWG 30 / 14

Mechanical Dimensions – Housing	
Type of housing	For panel surface, nonflammable plastic material „Noryl”
Dimensions (h X w X d)	72 mm X 144 mm X 127 mm
Dimensions of panel cut-out	138 ⁺¹ mm X 68 ^{+0.7} mm
Maximum panel thickness	5 mm
Weight	0.5 kg
Protection class	IP20 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)
Height	< 2000 m n.p.m.
Storage temperature	-30° .. +70° C
Degree of pollution	PD2
EMC	EMC Directive 2014/30/UE EN 61326-1:2013 Table 2 (immunity) EN 55011:2009+A1:2010 Class A (emission)
RoHS	RoHS Directive 2011/65/EU
⁽¹⁾ If module IN6I(24V) or IN2RE485(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	External (typically 24 VDC)
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	Functional, 250 VAC
Relay outputs	
Number of outputs	4
Outputs type	Solid state relays
Maximum voltage	60 V AC/DC
Maximum load current	0.1 A

VERSION

0/4-20mA input module IN6I(24V), IN6I	
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:	
• for module IN6I(24V)	24 VDC ±15% / max 0.25 mA
• for module IN6I	None
Galvanic separation from the other circuits	250 VAC; 1500 VAC for 1 minute
Galvanic separation between channels	None

RTD input module measuring the temperature and the resistance IN6RTD, IN3RTD	
Number of inputs:	
<ul style="list-style-type: none"> • for module IN6RTD • for module IN3RTD 	6 3
Sensor type	<ul style="list-style-type: none"> • Resistive (refer the table below) • Linear resistance
Sensor connection type	2-wire; 3-wire; 4-wire
Sensor current	200 μ A
Measuring range	0 .. 4000 Ω
Resolution	0.05 Ω
Wire resistance compensation in the 3-wire connection	Automatic
Wire resistance compensation in the 2-wire, 3-wire, 4-wire connection	Constant within the range of -99.99 .. +99.99 Ω
Maximum resistance of wires supplying power to the sensor	20 Ω
Maximum input voltage	\pm 40 VDC
Galvanic separation from the other circuits	250 VAC; 1500 VAC for 1 minute
Galvanic separation between channels	None

Input module measuring the temperature and voltage mV IN6TC	
Number of inputs	6
Sensor type	<ul style="list-style-type: none"> • 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 $^{\circ}$ C/ $^{\circ}$ F) or a constant value, for thermocouple B – no compensation
Maximum input voltage	\pm 40 VDC
Galvanic separation from the other circuits	250 VAC; 1500 VAC for 1 minute
Galvanic separation between channels	None

Voltage input module IN6V	
Number of inputs	6
Sensor type	<ul style="list-style-type: none"> • 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 ($T_a = +25^{\circ}$ C)	< \pm 0.1% measuring range (typically < \pm 0.05%)
Temperature drift	< \pm 0.02% / $^{\circ}$ C measuring range
Input resistance	>100 k Ω
Maximum input voltage	\pm 40 VDC
Galvanic separation from the other circuits	250 VAC; 1500 VAC for 1 minute
Galvanic separation between channels	None

Universal input module IN3	
Number of inputs	3
Sensor type	<ul style="list-style-type: none"> • 0–20 mA; 4–20 mA (without loop supply module) • ± 10 V / 0-10 V (2-10 V, 0-5 V, 1-5 V) • 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
The parameters 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 ($T_a = +25^\circ \text{C}$)	$< \pm 0,1\%$ measuring range (typically $< \pm 0,05\%$)
Temperature drift	$< \pm 0,02\% / ^\circ\text{C}$ measuring range
Input resistance	12 $\Omega \pm 10\%$
Input protection	Polymer fuse 50 mA
Parameters for input type ± 10 V / 0-10V	
Measuring range	-10 .. +10 VDC (or sub-range) (the actual range -11 .. +11 VDC)
Resolution	0.0001 V
Measuring range ($T_a = +25^\circ \text{C}$)	$< \pm 0.1\%$ measuring range (typically $< \pm 0.05\%$)
Temperature drift	$< \pm 0.02\% / ^\circ\text{C}$ measuring range
Input resistance	> 100 k Ω
Parameters for input type TC	
Measuring range	-140 .. +140 mV
Resolution	0.01 mV
Cold junction compensation	Any other temperature measuring channel (in $^\circ\text{C}/^\circ\text{F}$) or a constant value, for thermocouple B – no compensation
Parameters 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 compensation in the 2-wire, 3-wire, 4-wire connection	Constant within the range of -99.99 .. $+99.99$ Ω
Maximum resistance of wires supplying power to the sensor	20 Ω

Binary inputs module IN6D	
Number of inputs	6
Sensor type:	<ul style="list-style-type: none"> • State • Frequency measurement 0.1 .. 1000 Hz • Counting pulses (at frequencies 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⁾ (implementation of the characteristic PN-EN61131-2)
Maximum input voltage	-0.3 VDC / +36 VDC
Filter contacts oscillations	off / 1 ms / 3 ms
Power transmitters with device	24 VDC ±15% / max 50 mA Secured thermal fuse
Galvanic separation from the other circuits	250 VAC; 1500 VAC for 1 minute
Galvanic separation between channels	None
⁽²⁾ In special cases, there is a possibility to change the level of switching using the jumpers located on the module. Other available values level switching: 0.45mA, 1.55mA, 2.44mA.	

Digital Input Module (Modbus RTU) IN2RS485(24V), IN2RS485	
Number of ports	2
Maximum number of reads	25
Signals output on terminal block	A(+), B(-), 2x G (G - signal ground)
Maximum load	32 receivers / transmitters
Transmission protocol	Modbus RTU
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 differential 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	<ul style="list-style-type: none"> • For the IN2RS485(24V) module <ul style="list-style-type: none"> • 3 four pole terminal block (+ + - -) • 24 VDC ±15% / max 200 mA • For the IN2RS485 module <ul style="list-style-type: none"> • None

The two-state outputs module OUT6RL	
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

Analogue outputs module OUT3	
Number of outputs (channels)	3
Current output	
Measurement range (program selected)	4 - 20 mA 0 - 20 mA 0 - 24 mA
Output type	Current source (supplied from the device)
Possibility of powering the current loop from an external voltage source	None
Resolution	12 bit / 0,006 mA
Accuracy ($R_L=350 \Omega / T_a = +25^\circ \text{C}$)	$< \pm 0.15\%$ ($< \pm 0.036 \text{ mA}$) full range of measurement (FSR)
Accuracy ($R_L=350 \Omega / T_a = -40^\circ \dots +50^\circ \text{C}$)	$< \pm 0.3\%$ ($< \pm 0.072 \text{ mA}$) full range of measurement (FSR)
Load resistance R_L	$0 \Omega \dots 500 \Omega$
Maximum output voltage (for $R_L = \infty \Omega$)	21.5 V
Voltage output	
Measurement 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 ($R_L=1 \text{ k}\Omega / C_L=200 \text{ pF} / T_a = +25^\circ \text{C}$)	$< \pm 0.1\%$ full range of measurement (FSR) (Typically $< \pm 0,05\%$ FSR)
Accuracy ($R_L=1 \text{ k}\Omega / C_L=200 \text{ pF} / T_a = -40^\circ \dots +50^\circ \text{C}$)	$< \pm 0.3\%$ full range of measurement (FSR)
The minimum resistance of the load R_L	1 k Ω
The maximum load capacitance C_L	1 μF
Short-circuit protection	Yes
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

Table sensors RTD		
Sensor type	Range	Accuracy
Pt100, Pt200, Pt500, Pt1000 (EN 60751+A2:1995)	-200° .. +850° C -328° .. +1562° F	$\pm 0.5^\circ \text{C}$ (typically $\pm 0.3^\circ \text{C}$) $\pm 0.9^\circ \text{F}$ (typically $\pm 0.5^\circ \text{F}$)
Ni100, Ni120, Ni1000 (DIN43760 /08-1985)	-60° .. +250° C -76° .. +482° F	$\pm 0.5^\circ \text{C}$ (typically $\pm 0.3^\circ \text{C}$) $\pm 0.9^\circ \text{F}$ (typically $\pm 0.5^\circ \text{F}$)

Cu50, Cu53, Cu100 (GOST6651-2009)	-180° .. +200° C -292° .. +392° F	±0.5° C (typically ±0.3° C) ±0.9° F (typically ±0.5° F)
KTY81 (NXP Rev05-25.04.2008)	-55° .. +150° C -67° .. +302° F	±0.5° C ±0.9° F
KTY83 (NXP Rev06-4.04.2008)	-55° .. +175° C -67° .. +347° F	±0.5° C ±0.9° F
KTY84 (NXP Rev06-8.05.2008)	-40° .. +300° C -40° .. +572° F	±0.8° C ±1.5° F
Linear resistance	0 .. 4700 Ω (or sub-range)	±0.5 Ω (typically ±0.3 Ω)

Table thermocouples		
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...+527° F)	±1.0° C (typically ±0.5° C) ±33.8° F (typically ±32.9° 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...+527° F)	±1.0° C (typically ±0.5° C) ±33.8° F (typically ±32.9° F) (without compensation)
N (NiCrSi-NiSi) (EN60584-1:1995)	-270° C .. +1300° C (compensation range -100° C .. +300° C) -270° C .. +2372° F (compensation range -148° F...+527° F)	±2.0° C (typically ±1.0° C) ±35.6° F (typically ±33.8° 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...+527° F)	±2.0° C (typically ±1.0° C) ±35.6° F (typically ±33.8° 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...+527° F)	±2.0° C (typically ±1.0° C) ±35.6° F (typically ±33.8° 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...+527° F)	±1.0° C (typically ±0.5° C) ±33.8° F (typically ±32.9° 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...+527° F)	±1.0° C (typically ±0.5° C) ±33.8° F (typically ±32.9° F) (without compensation)
B (PtRh30-PtRh6) (EN60584-1:1995)	+270° C .. +1820° C (compensation range -50° C .. +300° C) -454° F .. +3308° F (compensation range -58° F...+527° F)	±2.0° C (typically ±1.0° C) ±35.6° F (typically ±33.8° 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...+527° F)	±1.0° C (typically ±0.5° C) ±33.8° F (typically ±32.9° F) (without compensation)
U (Cu-CuNi) (DIN43710)	-50° C .. +600° C (compensation range -50° C .. +300° C) -58° F .. +1112° F (compensation range -58° F...+527° F)	±1.0° C (typically ±0.5° C) ±33.8° F (typically ±32.9° F) (without compensation)
Line voltage	-140 .. +140 mV (or sub-range)	<0.2% full range