

# 2-WIRE PROGRAMMABLE TRANSMITTER



- Input for RTD, TC, mV, linear resistance, mA, and V
- 3.75 kVAC galvanic isolation
- 4...20 mA loop output
- 1- and 2-channel versions
- ATEX Ex version
- DIN rail mounting



**Application:**

Electronic temperature measurement with resistance sensor or thermocouple sensor. • Ex barrier for temperature sensors, potentiometers and current / voltage signals. • Conversion of current signals from supplied transmitters to 2-wire 4...20 mA signals. • Amplification of mV signals. • Conversion of linear resistance variation. • Galvanic isolation of analogue signals. • Measurement of floating signals. • Linearisation of non-linear Ohm, mV, mA, or voltage signals. • Separation of circuits in PELV/SELV installations.

**Technical characteristics:**

The unit is based on a microprocessor core with an efficient program operation. The basic calibration data and present set-up are stored in an EEPROM thereby avoiding the loss or change of data at power off. The 2-channel version has a full galvanic isolation between the channels. By way of a jumper on the PCB, the input in the standard version can be programmed either for a temperature or a current / voltage input. This means that one channel can work as for instance a temperature transmitter and the other can work as an isolation amplifier. Measurement range, signal parameters, and output span are configured to the present task by way of a PC and PR electronics A/S' communications interface Loop Link.

**Input types:**

**Temperature input - jumper in position 1:**

**Thermocouple input (TC)** for standard thermocouples type B, E, J, K, L, N, R, S, T, U, W3, W5, LR according to the norms IEC 584, DIN 43710, ASTM E988-90 and GOST 3044-84.

The CJC can be selected in 3 different ways: internally in the terminal, externally by way of a Pt100/Ni100 sensor, or externally with a constant temperature. If internal compensation is selected, a terminal with a built-in temperature sensor must be ordered separately (PR type no. 5910 and 5913). Sensor error detection is available.

**RTD input** for Pt100...Pt1000 according to the norm IEC 751 and Ni100...Ni1000 according to the norm DIN 43760. Automatic cable compensation at a 3 or 4-wire connection. At a 2-wire connection, the cable resistance can be entered or measured by the configuration program and sent to the module which then compensates by the entered cable resistance. Sensor error detection is available.

**Resistance input** for resistance measurement with cable compensation as described under the RTD input. Sensor error detection is available.

**The mV input** is programmable in the range -150...+150 mV.

**Current / voltage input - jumper in position 2:**

**The current input** is programmable in the range 0...100 mA, for instance 4...20 mA.

**The voltage input** is programmable in the range 0...250 VDC.

**Output:**

Standard loop 4...20 mA current output. The output signal is proportional and linear to the value of the input signal. Special set-ups can be selected in the configuration program, for instance a customised linearisation, a reversed output, a limiter according to the selected output span, and selection of an output value in case of a sensor error. Maximum load on the current output is 1375 Ω.

**Sensor error detection:**

The output can be set up at a RTD-, thermocouple and linear resistance input to go to *max.*, to *min.*, *entered value*, NAMUR NE43 *Upscale* or *Downscale* at sensor error detection.

**Configuration:**

The transmitter is configured to the present task by way of a PC and PR electronics A/S' communications interface Loop Link. The transmitter can be configured with or without a connected supply voltage as the communications interface supplies the necessary voltage to the set-up. The communications interface is galvanically isolated to protect the PC port. Communication is 2-way to allow the retrieval of the transmitter set-up into the PC and to allow the transmission of the PC set-up to the transmitter. For users who do not wish to do the set-up themselves, the 5131 can be delivered configured according to customer specifications: input type, measurement range, sensor error detection, and output signal.

**Electrical specifications:****Specifications range:**

-20°C to +60°C

**Common specifications:**

Supply voltage..... 7.5...35 VDC  
 Fuse..... 50 mA SB / 250 VAC  
 Consumption during programming ... 3...8 mA  
 Isolation voltage, test / operation..... 3.75 kVAC / 250 VAC  
 Communications interface ..... Loop Link  
 Signal / noise ratio..... Min. 60 dB (0...100 kHz)  
 Signal dynamics, input ..... 22 bit  
 Signal dynamics, output..... 16 bit  
 Updating time:  
 Temperature input..... 115 ms  
 mA / V / mV input ..... 75 ms  
 Response time (0...90%, 100...10%), programmable:  
 Temperature input..... 400 ms...60 s  
 mA / V / mV input ..... 250 ms...60 s  
 Calibration temperature..... 20...28°C  
 Accuracy, the greater of the general and basic values:

| General values |                   |                         |
|----------------|-------------------|-------------------------|
| Input type     | Absolute accuracy | Temperature coefficient |
| All            | ≤ ±0.05% of span  | ≤ ±0.01% of span / °C   |

| Basic values                    |                |                         |
|---------------------------------|----------------|-------------------------|
| Input type                      | Basic accuracy | Temperature coefficient |
| mA                              | ≤ ±4 µA        | ≤ ±0.4 µA/°C            |
| Volt                            | ≤ ±10 µV       | ≤ ±1 µV/°C              |
| RTD                             | ≤ ±0.2°C       | ≤ ±0.01°C/°C            |
| Lin. R                          | ≤ ±0.1 Ω       | ≤ ±10 mΩ/°C             |
| TC type:<br>E, J, K, L, N, T,   | ≤ ±1°C         | ≤ ±0.05°C/°C            |
| TC type: B, R, S,<br>W3, W5, LR | ≤ ±2°C         | ≤ ±0.2°C/°C             |

EMC immunity influence ..... < ±0.5% of span  
 Extended EMC immunity:  
 NAMUR NE 21, A criterion, burst..... < ±1% of span  
 Effect of supply voltage change ..... < 0.005% of span / VDC  
 Wire square (max.)..... 1 x 2.5 mm<sup>2</sup> stranded wire  
 Screw terminal torsion..... 0.5 Nm  
 Humidity ..... < 95% RH (non-cond.)  
 Dimensions (HxWxD)..... 109 x 23.5 x 130 mm  
 DIN rail type..... DIN 46277  
 Protection degree..... IP20  
 Weight ..... 195 g

**Electrical specifications, temperature input:****TC input:**

| Type | Min. temperature | Max. temperature | Min. span | Standard     |
|------|------------------|------------------|-----------|--------------|
| B    | +400°C           | +1820°C          | 200°C     | IEC584       |
| E    | -100°C           | +1000°C          | 50°C      | IEC584       |
| J    | -100°C           | +1200°C          | 50°C      | IEC584       |
| K    | -180°C           | +1372°C          | 50°C      | IEC584       |
| L    | -100°C           | +900°C           | 50°C      | DIN 43710    |
| N    | -180°C           | +1300°C          | 100°C     | IEC584       |
| R    | -50°C            | +1760°C          | 200°C     | IEC584       |
| S    | -50°C            | +1760°C          | 200°C     | IEC584       |
| T    | -200°C           | +400°C           | 50°C      | IEC584       |
| U    | -200°C           | +600°C           | 75°C      | DIN 43710    |
| W3   | 0°C              | +2300°C          | 200°C     | ASTM E988-90 |
| W5   | 0°C              | +2300°C          | 200°C     | ASTM E988-90 |
| LR   | -200°C           | +800°C           | 50°C      | GOST 3044-84 |

Max. offset..... 50% of selec. max. value  
 Sensor error current ..... Nom. 30 µA  
 CJC ..... ≤ ±1°C  
 Sensor error detection..... Yes

**mV input:**

Measurement range ..... -150...+150 mV  
 Min. measurement range..... 5 mV  
 Max. offset..... 50% of selec. max. value  
 Input resistance..... Nom. 10 MΩ

**RTD and linear resistance input:**

| Type   | Min. value | Max. value | Min. span | Standard  |
|--------|------------|------------|-----------|-----------|
| Pt100  | -200°C     | +850°C     | 25°C      | IEC 751   |
| Ni100  | -60°C      | +250°C     | 25°C      | DIN 43760 |
| Lin. R | 0 Ω        | 5000 Ω     | 30 Ω      | -----     |

Max. offset..... 50% of selec. max. value  
 Max. cable resistance per wire..... 10 Ω  
 Sensor current..... Nom. 0.2 mA  
 Effect of sensor cable resistance  
 (3- / 4-wire) ..... < 0.002 Ω/Ω  
 Sensor error detection..... Yes

**Electrical specifications, mA / V / mV input:****Current input:**

Measurement range ..... 0...100 mA  
 Min. measurement range (span)..... 4 mA  
 Max. offset..... 50% of selec. max. value  
 Input resistance:  
 Supplied unit..... Nom. 10 Ω + PTC 10 Ω  
 Non-supplied unit ..... RSHUNT = ∞, VDROPP < 6 V

**Voltage input:**

Measurement range ..... 0...250 VDC  
 Min. measurement range (span)..... 5 mVDC  
 Max. offset..... 50% of selec. max. value  
 Input resistance ≤ 2,5 VDC ..... Nom. 10 MΩ  
 > 2,5 VDC ..... Nom. 5 MΩ


**Electrical specifications - OUTPUT:**

Signal range (span)..... 4...20 mA  
 Min. signal range (span) ..... 10 mA  
 Max. offset..... 50% of selec. max. value  
 Load resistance ..... ≤ (Vsupply - 7.5)/0.023 A [Ω]  
 Load stability ..... ≤ 0.01% of span / 100 Ω  
 Current limit..... ≤ 28 mA

**Sensor error detection:**

Programmable..... 3.5...23 mA  
 NAMUR NE43 Upscale ..... 23 mA  
 NAMUR NE43 Downscale ..... 3.5 mA  
 No function..... Not defined

**EEx / I.S. approval:**

DEMKO 99ATEX124572 .....  II (1) GD  
 [EEx ia] IIC  
 Applicable for zone..... 0, 1, 2, 20, 21 or 22

**Ex / I.S. data:**

U<sub>m</sub> ..... : 250 V  
 U<sub>0</sub> ..... : 8.0 VDC  
 I<sub>0</sub> ..... : 10.0 mADC  
 P<sub>0</sub> ..... : 20 mW  
 L<sub>0</sub> ..... : 200 mH  
 C<sub>0</sub> ..... : 1.0 µF

**GOST R approval:**

VNIIM & VNIIFTRI, Cert. no. .... www.prelectronics.com

**Observed authority requirements: Standard:**

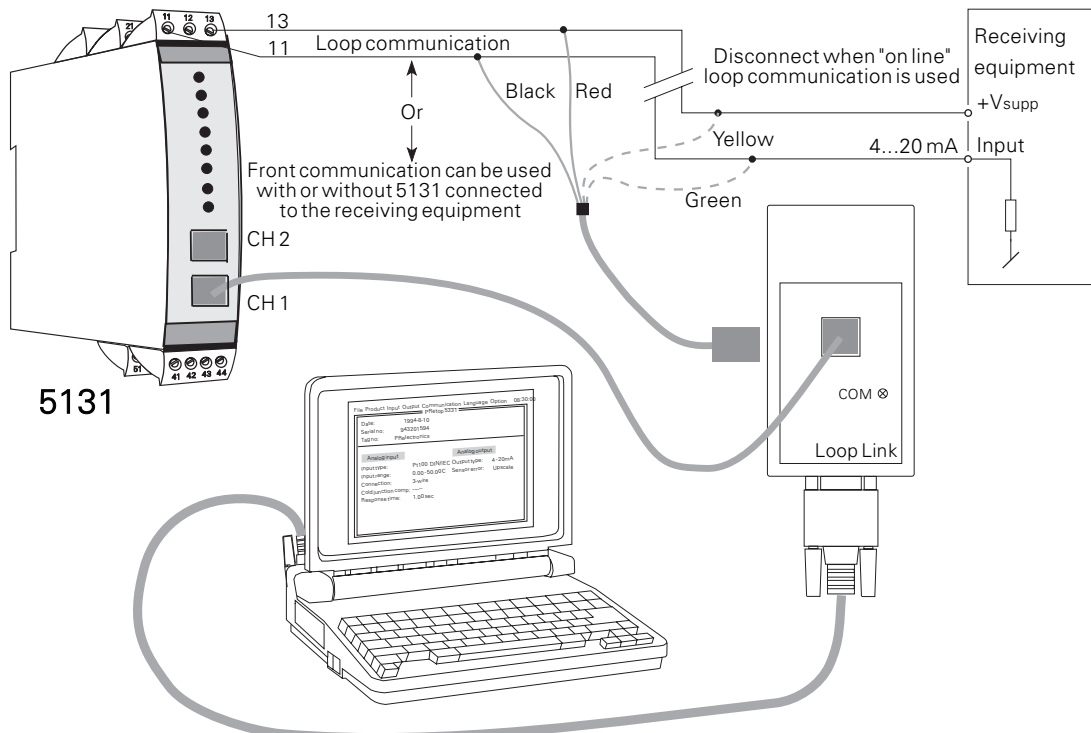
EMC 2004/108/EC ..... EN 61326-1  
 LVD 2006/95/EC ..... EN 61010-1  
 PELV/SELV ..... IEC 364-4-41  
 and EN 60742  
 ATEX 94/9/EC ..... EN 50014, EN 50020  
 and 50281-1-1

Of span = Of the presently selected range

**Configuration index for the 5131 programmable transmitter:**  
(Use this as a checklist when ordering configured units)

| <b>TEMPERATURE INPUT</b><br>TC / RTD / Linear resistance / mV  |   |  |  | <b>CURRENT / VOLTAGE INPUT</b><br>mA / Voltage  |  |
|--|---|--|--|---|--|
| <b>RTD type:</b><br>Pt100 (DIN/IEC)<br>Ni100   | <b>Thermocouple type:</b><br>Type B : Pt30%Rh-Pt6%Rh<br>Type E : NiCr-CuNi<br>Type J : Fe-CuNi<br>Type K : NiCr-Ni<br>Type L : Fe-CuNi<br>Type N : NiCrSi-NiSi<br>Type R : Pt13%Rh-Pt<br>Type S : Pt10%Rh-Pt<br>Type T : Cu-CuNi<br>Type U : Cu-CuNi<br>Type W3 : W3%Re/W25%Re<br>Type W5 : W5%Re/W26%Re<br>Type LR : Fe-CuNi | <b>Linear resistance range:</b><br>(30 Ω ≤ range ≤ 5000 Ω)   | <b>mV range:</b><br>5 mV ≤ range ≤ 150 mV                                      | <b>mA input range:</b><br>4 mA ≤ range ≤ 100 mA | <b>Voltage input range:</b><br>50 mV ≤ range ≤ 250 VDC |
| Specify range °C: ____   | Specify range °C : ____   | Specify range Ω: ____  | Specify range mV: ____   | Specify range mA: ____                          | Specify range mV/V: ____                               |
| <b>RTD connection:</b><br>2-wire, no compens.<br>2-wire, fixed line res.<br>3-wire compensation<br>4-wire compensation<br>Specify connection: ____ | <b>CJC:</b><br>Internal CJC (Pt100):<br>External CJC (Pt100):<br>External CJC (Ni100):<br>Fixed external CJC:<br>(Specify °C) ____  | <b>Resistance connection:</b><br>2-wire, no compensation:<br>2-wire, fixed line resistance<br>3-wire compensation:<br>4-wire compensation:<br>Specify connection: ____ | <b>Linearisation</b><br>No linearisation:<br>Customer linearisation (specify): |   |  |
| <b>OUTPUT</b>  |   |  |  |   |  |
| <b>mA output:</b><br>4...20 mA   |   |  |  |   |  |
| <b>Response time:</b><br>500/1000 ms ≤ response time ≤ 60 s<br>(min. response time depending on input type)  |   |  |  |   |  |
| <b>Sensor error action:</b>  |   |  |  |   |  |
| Selected value<br>NAMUR NE43 Upscale<br>NAMUR NE43 Downscale   |   |  | Output to max.<br>Output to min.<br>No sensor error                            |   |  |

**5131 connection to Loop Link:**



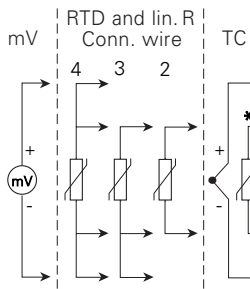
Order: 5131

| Type | Version      | Input  | Channels   |
|------|--------------|--|------------|
| 5131 | Standard : A | RTD / TC / R / mA / V / mV : -   | Single : A |
|      | ATEX Ex : B  | RTD / TC / mV / R : 1<br>mA / V / mV : 2<br>Channel 1, RTD / TC / mV / R : 3<br>Channel 2, mA / V / mV | Double : B |

**Note!** For TC inputs with internal CJC, remember to order the CJC connectors type 5910 / 5910 EEx (ch. 1) and 5913 / 5913 EEx (ch. 2).

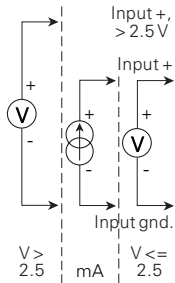
**Block diagram:**

Channel 1 shown as a temperature input:



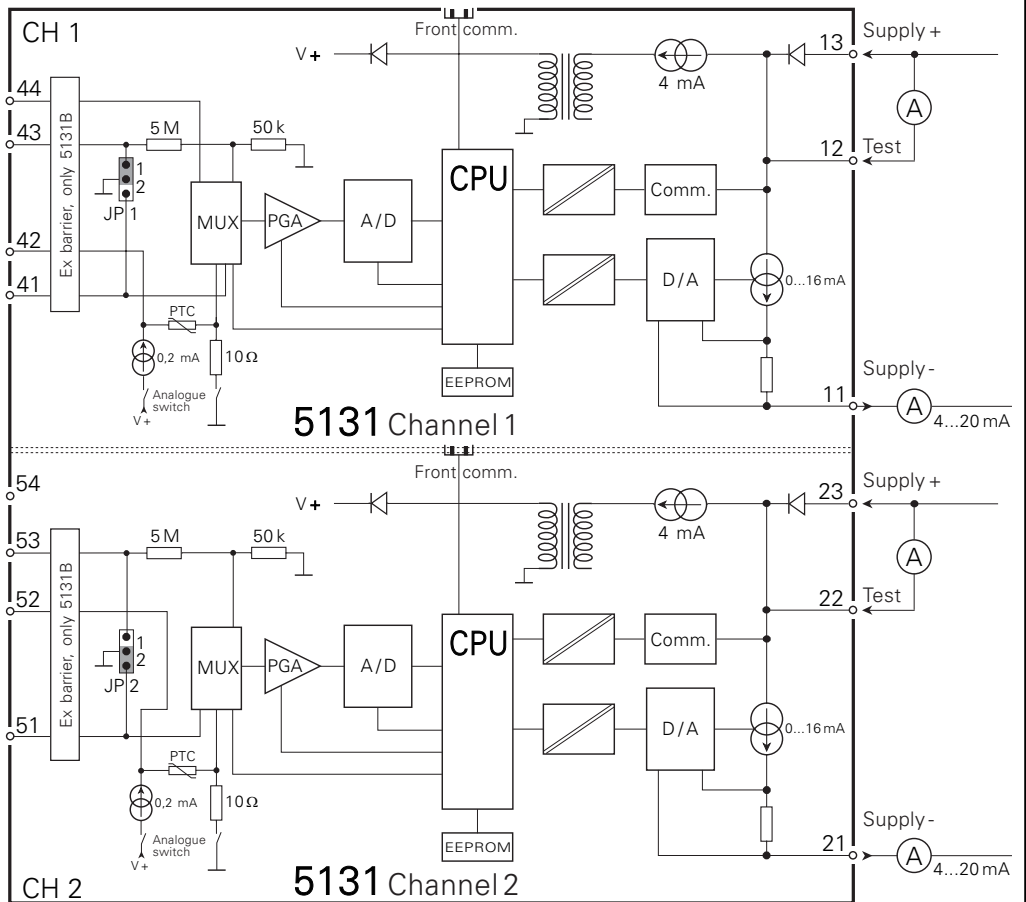
!! If channel 2, use terminal no. 54...51

Channel 2 shown as a current/voltage input:



!! If channel 1, use terminal no. 44...41

\* Accessories: 5910 CJC connector CH 1, 5913 CJC connector CH 2.



**Selection of input type: (5131A)**

| Input                       | JP 1 | JP 2 |
|-----------------------------|------|------|
| Temperature channel 1       | 1    | -    |
| Temperature channel 2       | -    | 1    |
| Current / voltage channel 1 | 2    | -    |
| Current / voltage channel 2 | -    | 2    |