



# SIGNAL CONDITIONERS

Temperature Transmitters, Alarm Units, Indicators,  
Signal Isolators, Configurations kits

**INOR**

## INOR



### Specialists in industrial temperature measurement

INOR is a world-leading manufacturer and supplier of signal conditioners for temperature measurement in the process industry. With more than 80 years of experience in developing and producing signal conditioners, INOR has gradually built up its reputation as an international leader. Along with our two subsidiaries in Germany, Finland and partners in more than 50 countries, we can provide products, solutions and services worldwide.

### Optimal products and solutions for all industries

INOR is always a fair and reliable partner to its customers, business partners and employees. We provide our customers with optimal products and solutions which always meet or exceed their expectations in terms of quality, performance capability, service and design. Our customers are registered in diverse branches of industry such as chemicals, petrochemicals, water, wastewater, food & beverages, pharmaceuticals, oil and gas, power plants, steel, pulp and paper etc.

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INOR environmental objectives are to prevent and reduce harmful effects on the environment, people and property caused by our processes, and to use natural resources in a sustainable manner. INOR continuously strive to improve its environmental performance, for instance by reducing our waste discharges, using green electricity while at the same time reducing the total use of electricity, reduce the use of hazardous substances in our production and replace paper documents with electronic documents. INOR has a high environmental focus on both our and our customers processes and has been ISO 14001 certified since 2002.

### Highlights

- Complete product portfolio in signal conditioning
- More than 80 years of experience
- Always the highest product quality
- Global network to provide products, solutions and services
- 5 year warranty



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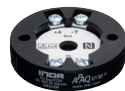
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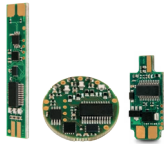


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# TEMPERATURE TRANSMITTERS

This section will describe the following basic facts about temperature transmitters:

1. What is a temperature transmitter?
2. Why using temperature transmitters?
3. Why using isolated transmitters?
4. Where to mount the transmitters?
5. 2-, 3- and 4-wire transmitter

## 1. What is a temperature transmitter?

A temperature transmitter is generally recognized as a device, which on the input side is connected to some sort of temperature sensor and on the output side generates a signal that is amplified and modified in different ways. Normally the output signal is directly proportional to the measured temperature within a defined measurement range. Many additional features can be added depending on the type of transmitter being used.

The features of the temperature transmitters are often described by using different terms with respect to technology, mounting method, functions etc.

The following is a short summary of the terms used.

### Technology

#### Digital transmitters

This transmitter type is mainly based on a microprocessor. They are often called intelligent transmitters, because they normally offer many extra features, which are not possible to realize in analog transmitters.

Read more about these features in the product descriptions for the IPAQ and MESO transmitters.

### Mounting method

#### In-head transmitters

In-head transmitters are designed for mounting in the connection heads of temperature sensors. All Inor's in-head transmitters fit into DIN B heads or larger. Special care has to be devoted to the ruggedness because of the harsh conditions that sometimes exist. It is important that associated screws are used when mounting.

#### DIN rail transmitters

Din rail transmitters are designed to be snapped onto a DIN rail. The Inor

transmitters fit on a 35 mm rail according to DIN EN 50022.

### Input type

#### RTD transmitters

RTD transmitters are used only for RTD sensors (Pt100, Pt1000, Ni100 etc.). Normally they can handle only one RTD type. Most of Inor's transmitters can handle more than one type of RTD, and are either fix-ranged or adjustable. They all have a temperature linear output.

#### Thermocouple (T/C) transmitters

A T/C transmitter measures a mV-signal from the T/C and compensates for the temperature of the cold junction. The cold junction compensation (CJC) is normally made by measuring the terminal temperature. Alternatively some transmitters can be adjusted to compensate for an external fixed cold junction temperature. Pure T/C transmitters are often not temperature linearized because of the complicated nonlinearity of the T/Cs.

#### Universal transmitters

Universal transmitters are normally of the intelligent (microprocessor based) type. They are programmable for different input types and ranges and have an accurate temperature linearization. The Inor transmitters in the IPAQ family are all universal with input types such as RTDs, T/Cs, resistance, voltage and current. For details, see the product descriptions.

### Output type

#### Analog output

The output signal is a current, 4-20 mA, some transmitters are also available with 0-20 mA or 0-10V output. The signal is normally proportional to the measured value within a defined measurement range (temperature linear).

#### Digital output

The measured value (temperature) is presented as a binary coded message. So called Fieldbus transmitters use this technique. The Fieldbus transmitters on the market today use different standards for the communication thus creating some problems when integrating them with other instrumentation.

Examples of standards available are: Profibus, Interbus, Foundation Fieldbus, LonWorks and CAN-bus.

#### Analog and digital output

The HART transmitters (see description under the MESO/IPAQ 520 transmitters) have an analog output with a superimposed digital signal on the same wires. Typically the analog signal is used for normal measurements and the digital signal only for temporary measurements because of the low communication speed. The digital signal is mainly used for configuration and status information.

### Output / power supply connection

(See also under part 2-, 3- and 4-wire transmitters)

#### 2-wire transmitters:

Totally two leads are used in common for power supply and output signal.

#### 3-wire transmitters:

Totally three leads are used for power supply and output signal. One lead is common.

#### 4-wire transmitters:

Totally four leads are used, two for the power supply and two for the output signal.

### Isolation

#### Non-isolated transmitters

These transmitters have leading connections between for instance input and output circuits. They should be used with care.

### Isolated transmitters

Isolated transmitters have no leading connections between circuits that are isolated from each other. The isolation effectively eliminates the risk for circulating currents and facilitates the connection of transmitters to control systems with grounded inputs.

Read more under "Why using isolated transmitters?"

## 2. Why using temperature transmitters?

The following part gives some important reasons for using temperature transmitters in temperature measurements.

### To convert the low-level sensor output to an amplified signal.

The amplified signal is much less sensitive to electrical disturbances. This is particularly important if the sensor is located far away from the receiving instrumentation. Long cables and low signal levels increase the risk for significant disturbances in the measurement.

### To convert the unlinear sensor output to a temperature linear standard signal.

Typical standard signals are 4-20 mA, 0-10 V. Other standard signals are 0-20 mA, 0-5 mA, 1-5 V, 2-10 V.

Thanks to the standard signals, which are proportional to the temperatures, it is possible to use standard instruments for indication, recording etc. and standard input modules in PLCs or DCSs. This greatly simplifies the plant engineering.

### To reduce the costs for cables and other instrumentation.

If field mounted transmitters are used, the cable costs can be reduced. Only two leads are required, if a 2-wire transmitter is used, compared to three or four for RTDs.

Standard signal cables can be used instead of more expensive compensation or extension cables for T/Cs.

Normally all the connected instrumentation is less expensive if using standard input signals like for instance 4-20 mA.

### To improve the safety of the temperature measurement.

The safety can be improved by letting the transmitter supervise the sensor leads. The Sensor Break Protection will indicate broken sensor leads and force the output to a user defined level.

### To improve the accuracy of the temperature measurement.

The accuracy can be improved by letting the transmitter compensate for sensor errors (Sensor Error Correction) or errors in connected instrumentation (System Error Correction).

See section Software / IPRO 4.

Measuring errors due to reduced isolation in the sensor or between the sensor leads can be avoided with the SmartSense function. This function is a standard feature in most of the Inor intelligent transmitters. See the description of SmartSense later in this section.

### To improve the functionality of the temperature measurement.

Useful functions can be included together with the measurement, especially when using the intelligent IPAQ and MESO transmitters.

Some examples are:

**Dampening function** to reduce instabilities of the measuring value.

**Loop calibration output.** The transmitter generates an accurate output signal that is used to calibrate or check other instruments in the measurement loop.

**On-screen real time presentation** of measured values (in °C or °F) and output signal. The presentation can be in numericals, as bar graphs or as a line recorder.

### 3. Why using isolated transmitters?

Fig. 1

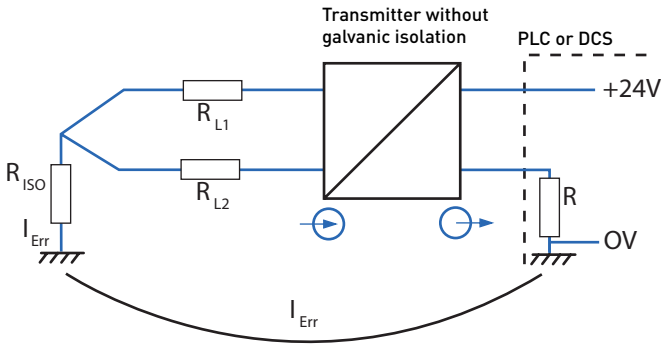
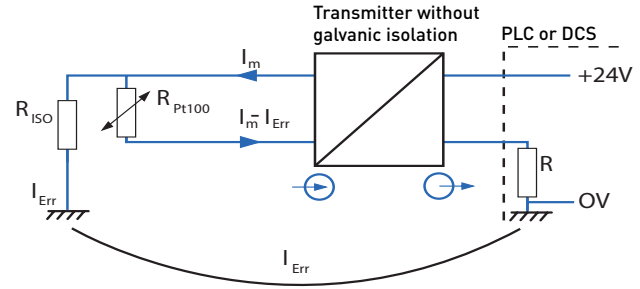


Fig. 2



#### Measurements with thermocouples

Figure 1 shows a typical situation, when using T/Cs connected to a PLC or DCS over a non-isolated transmitter.

The isolation to ground  $R_{ISO}$  is sometimes rather low, e.g. at high temperatures and/or small dimensions of the T/C.

An undesired "ground current"  $I_{Err}$  of variable magnitude, depending on the actual situation, will arise. The ground current will flow through the T/C and cause voltage drops over the resistances  $R_{L1}$  and  $R_{L2}$  in the T/C leads. These voltage drops will interact with the EMF generated by the T/C and can cause significant measuring errors.

It is sometimes hard to foresee and calculate these errors, but it is not unusual that they can reach 5-10 % of the measuring range.

If the transmitter is galvanically isolated between the input and output circuit, the ground loop will be cut off, and the ground current will be stopped. No errors will arise due to a low isolation between T/C and ground.

#### Measurements with RTDs

Figure 2 shows an RTD sensor connected to a PLC or DCS over a non-isolated transmitter.

The isolation to ground  $R_{ISO}$  is normally very high in a "healthy" RTD, typically 50 to 500 M $\Omega$ . However, under certain conditions it happens that the internal isolation of an RTD can be significantly reduced. Reasons might be wear or damage causing moisture to penetrate into the RTD.

Depending of the value of  $R_{ISO}$  a certain portion  $I_{Err}$  of the measuring current  $I_m$  will pass through the ground and not through the RTD sensor. This will cause a measuring error.

If the transmitter is galvanically isolated between the input and output circuit, the ground loop will be cut off, and the ground current will be stopped. No errors will arise due to a low isolation between RTD and ground.

#### Conclusion

To be sure about a good measuring result, use isolated transmitters!

## 4. Where to mount the transmitters?

In an industrial plant, where there are normally long distances between the measuring points and the receiving instrumentation, some important aspects regarding the location of the transmitters can be mentioned.

There are basically three different locations for the mounting of the temperature transmitters:

- In-head mounting - inside the connection head of the temperature sensors.
- Field mounting – close to the temperature sensors.
- Central mounting - in the vicinity of the control room.

### In-head mounting

The transmitters are mounted directly inside the connection head and are normally replacing the terminal block. All Inor's In-head transmitters fit in a DIN B head or larger. They are designed and tested for the harsh conditions that In-head transmitters will often meet.

This way of mounting normally offers the biggest advantages. It is however necessary to be aware of the environmental influence (mainly the temperature) on the measurement accuracy.

#### Advantages

- Maximum safety in the signal transmission. The amplified signal, e.g. 4-20 mA, is very insensitive to electrical disturbances being induced along the transmission cable.
- Cost savings for the transmission cables. Only two leads are required if a 2-wire transmitter is used.
- Cost savings for installation. No extra connection points because of the transmitter.
- Cost and space savings. No extra housings or cubicles are needed.
- Field instruments, e.g. indicators, can easily be installed, also at a later stage without redesigning the measuring circuits. For instance, if using the Inor IPAQ-H<sup>PLUS</sup>, IPAQ-HX<sup>PLUS</sup> or IPAQ 520 transmitters, an Inor digital display can be connected, or loop powered indicators can be installed in the 4-20 mA loop.

#### Disadvantages

- The ambient temperatures can be outside the allowed limits for the transmitters.
- The ambient temperature influence

on the measuring accuracy has to be considered. If the temperatures are expected to deviate strongly from normal room temperature, and if the highest possible accuracy is required, we recommend using Inor's high-performance transmitters IPAQ-H<sup>PLUS</sup>, IPAQ-HX<sup>PLUS</sup> or IPAQ 520 because of their extreme temperature stability.

- Extreme vibrations might cause malfunction of the transmitters.
- The location of the temperature sensor can give maintenance problems.

### Field mounting

The transmitters are either mounted directly beside the temperature sensors or in the vicinity of the sensors. Often more than one transmitter is mounted in the same field box.

This method is more expensive than In-head mounting, but otherwise a good alternative offering most of the advantages of In-head mounting without the disadvantages mentioned above.

#### Advantages

- High safety in the signal transmission. The main part of the signal transmission is made with an amplified signal.
- No extreme temperatures or vibrations exist. This facilitates accurate and safe measurements.
- Cost savings for transmission cables (See above).
- A wider selection of transmitters is available. DIN rail transmitters can also be used.
- Field instruments can often be installed easily (See above).
- Maintenance can normally be carried out without problems.

#### Disadvantages

- Higher installation costs compared to In-head mounting.
- Costs and space requirements for transmitter boxes or cubicles.

### Central mounting

In this case, the transmitters are placed in the vicinity of the control room or in another central part of the plant. They are often mounted inside cubicles, and/or closed rooms. The ambient conditions are normally very good and stable.

This method offers the most convenient conditions for maintenance and the best possible environment for

the transmitters. There are on the other hand some disadvantages that should be considered.

#### Advantages

- Convenient conditions for installation, commissioning and maintenance.
- Minimum risk for environmental influences (e.g. temperature influence).

#### Disadvantages

- Reduced safety in the signal transmission. The low-level sensor signal is rather sensitive to electrical disturbances being induced along the transmission cable.
- Relatively high costs for cabling. T/C measurements require compensation or extension cables all the way to the transmitters. RTD measurements with high accuracy should be done in 4-wire connection to get rid of the lead resistance influence (See section Transmitter Connections).
- Costs and space requirements for cubicles or frames.
- Rather complicated and expensive to connect field instruments, e.g. indicators.

## 5. 2-, 3- and 4-wire transmitter

This part describes three transmitter groups with respect to output and power supply connections:

**2-wire transmitters:** Totally two leads are used in common for power supply and output signal.

**3-wire transmitters:** Totally three leads are used for power supply and output signal. One lead is common.

**4-wire transmitters:** Totally four leads are used, two for the power supply and two for the output signal.

Fig. 3 2-wire transmitter

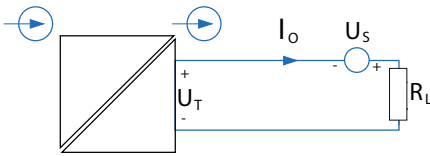


Fig. 4 3-wire transmitter

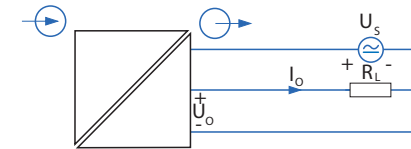
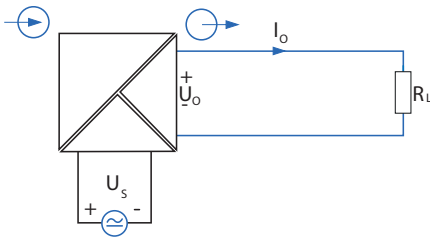


Fig. 5 4-wire transmitter



### 2-wire transmitters

This is the most frequently used transmitter type today, especially for field mounted transmitters and transmitters in hazardous locations.

Fig. 3 shows the principal diagram

The power supply  $U_S$  and the output signal  $I_o$  are using the same pair of leads.

The power supply is a DC voltage, which is allowed to vary according to the transmitter specifications, e.g. 6.5 to 36 VDC for IPAQ-H.

The output signal is standardized to 4-20 mA, but intermediate and reversed values occur too.

The maximum load  $R_L$  is depending on the supply voltage and the minimum voltage over the transmitter  $U_T$  and is specified separately for all 2-wire transmitters in a Load Diagram. For calculation of the maximum load, the formula can be used:

$$R_{L_{\max}} = \frac{U_S - U_T}{I_{\max}}$$

Advantages of 2-wire transmitters:

- Reduced cable and installation costs with only two leads.
- Reduced dimensions, heat losses and costs since a mains transformer is not needed.
- Direct connection to PLC or DCS using active inputs (using the system's internal transmitter supply).
- Allow for big variations in the supply voltage.
- Simple and cost effective Intrinsically Safe installations in hazardous locations.
- Well-established technique makes the 2-wire transmitters compatible with other instrumentation.

Disadvantages of 2-wire transmitters:

- Output signal limited to 4-20 mA (or intermediate values).
- Because of the low power supplied to the 2-wire transmitters (can be as low as 25 mW), power consuming functions (alarm relays etc.) can not be included.
- Since the power supply is galvanically connected to the output signal, special caution is necessary when using power supplies that are grounded and/or common for a number of transmitters.

### 3-wire transmitters

This transmitter type is rarely used for industrial applications, probably because it is a mixture of the 2- and 4-wire technique, not offering the full advantages of any of them. For the time being, Inor is not manufacturing 3-wire transmitters.

Fig. 4 shows the principal diagram.

The 3-wire transmitter has one power supply circuit and one output circuit. Because these circuits have one point in common, it is enough to use only three leads between transmitter and power supply/load.

The supply voltage  $U_S$  is typically 12-36

VDC, but other voltages such as 24 VAC can be found.

The output signal  $I_o$  or  $U_o$  can be a DC current or DC voltage, e.g. 0/4-20 mA, 0/1-5 V or 0/2-10 V.

The minimum and maximum load  $R_L$  depend on supply voltage and type of output.

Advantages of 3-wire transmitters:

- Reduced cable costs compared to 4-wire transmitters.
- Accept AC and DC supply voltage.
- Big variety of output signals.

Disadvantages of 3-wire transmitters:

- Since the power supply is galvanically connected to the output signal, special caution is necessary when using power supplies that are grounded and/or common for a number of transmitters.
- 3-wire transmitters are normally not designed for Intrinsically Safe installations.

### 4-wire transmitters

The 4-wire transmitters are used, when it is preferred to have the output and power supply isolated from each other, or when the transmitter functions (e.g. relays, lighted display etc.) require more power than what is available for 2-wire transmitters.

Fig. 5 shows the principal diagram.

In the 4-wire transmitters, the power supply  $U_S$  and the output signal  $I_o$  or  $U_o$  are separated and normally isolated from each other.

The supply voltage can vary from 12 VDC to 230 VAC.

The output signal  $I_o$  or  $U_o$  can be a DC current or DC voltage, e.g. 0/4-20 mA, 0/1-5 V or 0/2-10 V.

The minimum and maximum load  $R_L$  depend on supply voltage and type of output.

Advantages of 4-wire transmitters:

- Accept DC and AC (up to 230 V) supply voltage.
- Since the power supply is galvanically isolated from the output signal, there are no problems using power supplies that are grounded and/or common for a number of transmitters.
- Can handle more power consuming functions like relays, displays, sensor excitations etc.

Disadvantages of 4-wire transmitters:

- Higher cable and installation costs when field mounted (compared to 2-wire transmitters).
- Increased dimensions, heat losses and costs due to built-in mains transformer (compared to 2-wire transmitters).
- Normally have to be mounted outside the hazardous locations.

## 2-, 3- and 4-wire connection for RTD sensors

This part describes three connection types used for RTD:

**2-wire connection:** Two leads connect sensor and transmitter.

**3-wire connection:** Three leads connect sensor and transmitter.

**4-wire connection:** Four leads connect sensor and transmitter.

Fig. 6 2-wire connection

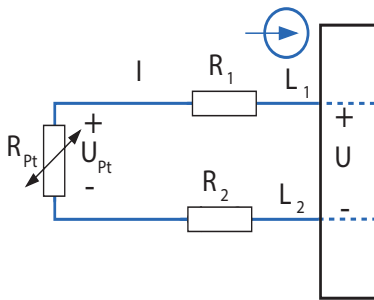
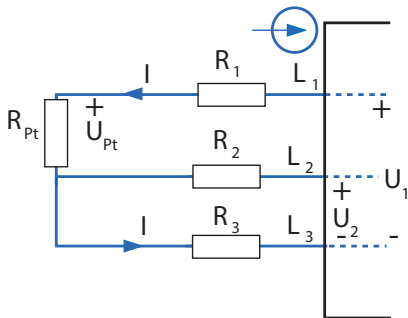


Fig. 7 3-wire connection



In the following part, the pros and cons of the different connection types are explained.

Things to observe and the effects of wrong connections are also mentioned.

The examples below are given for RTD's (e.g. Pt100 sensors), but in principle they apply to all resistance sensors.

The grouping is based on the transmitter design or configuration and not on the number of leads actually used between sensor and transmitter.

### 2-wire connection

This connection is seldom used in industrial measurements, because of the accuracy problems involved.

Fig. 6 shows the input wiring.

The transmitter sends out a constant measuring current  $I$ , which generates a voltage  $U$  measured by the transmitter.

The voltage is  $U = I \cdot (R_{Pt} + R_1 + R_2)$ .

The correct value would be the voltage over the sensor resistance  $R_{Pt}$  only, i.e.  $U_{Pt} = I \cdot R_{Pt}$ . Thus the lead resistances  $R_1$  and  $R_2$  create a measuring error.

As a rule of thumb, the error due to the lead resistance ( $R_1 + R_2$ ) is approximately 2.6 °C (4.7 °F) per ohm for a Pt100 sensor and 10 times less for a Pt1000 sensor.

If the lead resistance is known, the transmitter can be manually adjusted to compensate for the lead resistance.

Since this is a fixed compensation, changes in the lead resistance, due to temperature variations, will not be taken care of.

**Advantages of 2-wire connection:**

- Reduced cable costs (depends on distance).

**Disadvantages of 2-wire connection:**

- Considerable measuring errors can occur without compensation for lead resistance.
- Time-consuming compensation for lead resistance.
- Errors due to variation in the cable temperature can never be eliminated.

### 3-wire connection

The 3-wire connection is today the dominating technique for connection of RTD sensors, especially in industrial use. The reason is the combination of automatic compensation for the lead resistance and reasonable cable costs.

Fig. 7 shows the input wiring.

In principal, most transmitters for 3-wire connection work in the same way. A constant measuring current  $I$  is sent through lead  $L_1$ , the sensor element and lead  $L_2$ , generating a voltage  $U_1$ , which is  $U_1 = I \cdot (R_{Pt} + R_1 + R_2)$ .

To get rid of the influence of  $R_1$  and  $R_2$ , an extra lead  $L_3$  is connected to one side of the sensor element. No current is flowing in this lead because of a very high input impedance, so the voltage  $U_2$  is  $U_2 = I \cdot R_2$ . Assuming that the lead resistances are identical,  $R_1 = R_2 = R_L$ , and letting the transmitter calculate a voltage  $U$ , which is  $U = U_1 - 2 \cdot U_2$ , the result will be:

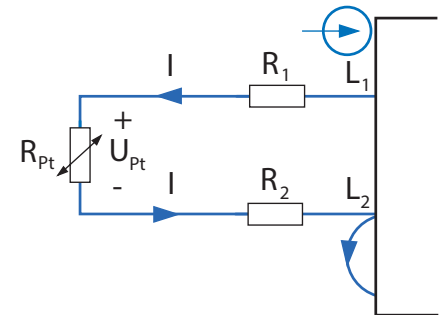
$$U = I \cdot R_{Pt} + 2 \cdot I \cdot R_L - 2 \cdot I \cdot R_L \text{ or:}$$

$$U = I \cdot R_{Pt} = U_{Pt}$$

Table 1

	Resistance difference, Rdiff	
	0,1 ohm	1,0 ohm
Pt 100	0,26°C/0,47°F	2,6°C/4,7°F
Pt 1000	0,03°C/0,05°F	0,26°C/0,47°F

Fig. 8 "Unclean" connection



Thus we have an expression, which vary directly with the sensor resistance and without influence of the lead resistances.

**Note:**

It is very important that lead  $L_1$  and  $L_2$  have equal resistance. To avoid the risk of mixing up the leads, always keep all 3 lead resistances as equal as possible.

For practical reasons, all transmitters have an upper limit for the lead resistances of typically 15-25 ohm per lead (see Specifications).

Table 1 shows examples of the errors in a 3-wire connection for Pt100 and Pt1000 caused by a difference in resistances, Rdiff, between  $L_1$  and  $L_2$ .

Examples of "unclean" connections

For different reasons, the user might connect sensors with only two leads or with four leads to transmitters for 3-wire connection.

**Two sensor leads together with transmitter for 3-wire connection**

A typical connection can be as shown in fig. 8.

It is important to note that, even if all three terminals of the transmitter are used, the automatic compensation for lead resistance is not working.

The error due to the lead resistance is the same as described above for 2-wire connection, i.e. approximately 2.6 °C (4.7 °F) per ohm total lead resistance ( $R_1+R_2$ ). Manual (fixed) compensation can normally be performed.

Fig. 9 "Unclean" connection

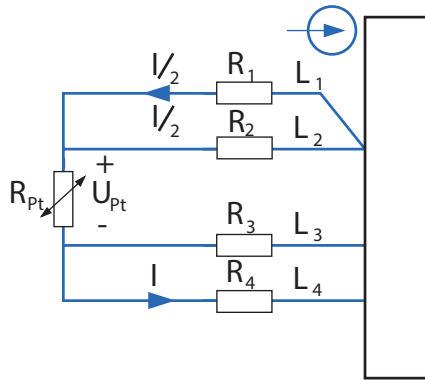


Fig. 10 4-wire connection

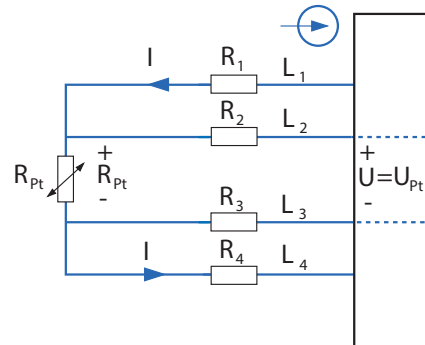


Fig. 11 "Unclean" connection

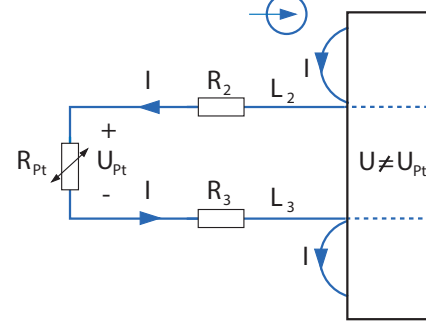
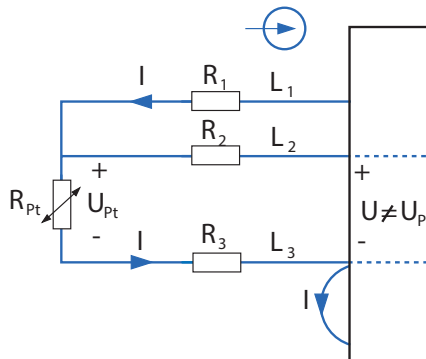


Fig. 12 "Unclean" connection



**Four sensor leads together with transmitter for 3-wire connection**

Sometimes the four sensor leads are connected as shown in fig. 9.

Because the three lead resistances, as seen from the transmitter, are not equal, the automatic compensation for lead resistance is not working properly. The measuring error depends on the difference in lead resistance, as described above.

**Solution:** Use only three of the sensor leads.

**Conclusion**

With two leads to the sensor, the 3-wire connection will neither improve the accuracy nor make it worse compared to the 2-wire connection.

With four leads to the sensor, the 3-wire connection will not compensate the lead resistance properly.

**Advantages of 3-wire connection:**

- Automatic compensation for the resistance in the leads connecting sensor and transmitter.
- Reduced cable costs compared to 4-wire connection.

**Disadvantages of 3-wire connection:**

- An unbalance in the resistance of the three sensor leads might cause consi-

derable measuring errors.

- Poor connections, i.e. corroded or loose terminals, can cause measuring errors due to extra and unequal resistances.

**4-wire connection**

The 4-wire connection of RTD sensors is used when the highest accuracy is required, e.g. in research laboratories and for critical industrial measurements. With the 4-wire connection, the influence of the lead resistances is fully eliminated. Even resistances due to poor connections will have no influence.

Fig. 10 shows the input wiring.

A constant measuring current  $I$  is sent through lead  $L_1$ , the sensor element and lead  $L_4$ , generating a voltage  $U_{Pt}$  over the sensor element, which is  $U_{Pt}=I \cdot R_{Pt}$ . This voltage is measured by connecting two leads,  $L_2$  and  $L_3$ , from the sensor to a high impedance input of the transmitter. Practically no current is flowing in  $L_2$  and  $L_3$ , so there is only a negligible voltage drop over these leads, and the transmitter will directly measure the voltage:

$$U = I \cdot R_{Pt} = U_{Pt}$$

the sensor resistance and that was reached without any reservations for the lead resistances.

For practical reasons, all transmitters have an upper limit for the lead resistance of typically 15-25 ohm per lead (see Specifications).

**Examples of "unclean" connections**

For different reasons, the user might connect sensors with only two leads or with three leads to transmitters for 4-wire connection.

**Two sensor leads together with transmitter for 4-wire connection**

A typical connection can be as shown in fig. 11.

Please note that, even if all four terminals of the transmitter are used, the lead resistances  $R_2$  and  $R_3$  will directly create a measuring error.

The voltage seen from the transmitter is

$$U = I \cdot (R_{Pt} + R_2 + R_3) \neq U_{Pt}$$

The error due to the lead resistance is the same as described above for 2-wire connection, i.e. approximately 2.6 °C (4.7 °F) per ohm total lead resistance ( $R_2+R_3$ ). Manual (fixed) compensation can normally be performed.



Three sensor leads together with transmitter for 4-wire connection

A typical connection can be as shown in fig. 12.

Even if all four terminals of the transmitter are used, in this example the lead resistance  $R_3$  will directly create a measuring error.

The voltage seen from the transmitter is

$$U = I \cdot (R_{pt} + R_3) \neq U_{pt}$$

The error due to the lead resistance is approximately 1.3 °C (2.3 °F) per ohm of the resistance in each lead ( $R_1$ ,  $R_2$  or  $R_3$ ). Manual (fixed) compensation can normally be performed.

#### Conclusion

With two leads to the sensor, the 4-wire connection will neither improve the accuracy nor make it worse compared to the 2-wire connection.

With three leads to the sensor, the 4-wire connection will make the accuracy worse compared to the 3-wire connection.

#### Advantages of 4-wire connection:

- High accuracy because the resistances in the leads connecting sensor and transmitter have no influence.
- Poor connections, i.e. corroded or loose terminals, will not influence the accuracy in most cases.

#### Disadvantages of 4-wire connection:

- Increased cable costs compared to 2-wire and 3-wire connection

# SMARTSENSE – SENSOR ISOLATION MONITORING

This section describes how the isolation influences the measurements with RTDs and Thermocouples - independent of manufacturer - and how to get an early warning regarding errors due to low isolation.

Fig. 1

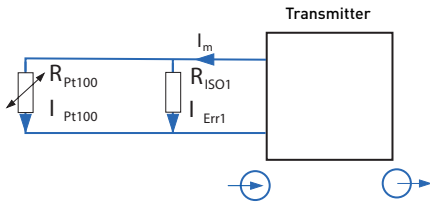


Fig. 2

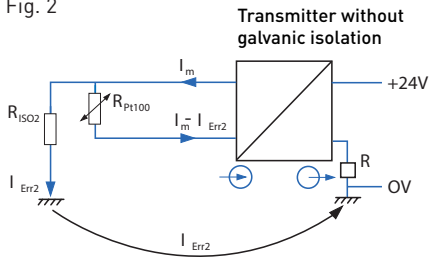
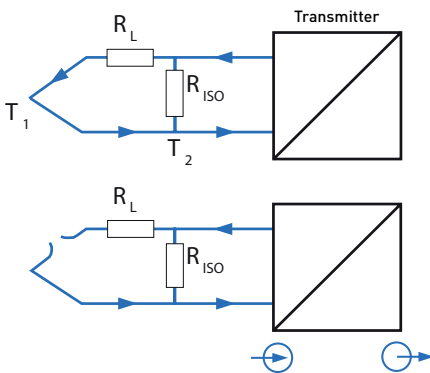


Fig. 3



The structures of Pt100 and thermocouple thermometers have properties, which can lead to erroneous measurements. This is independent of brand and type. One of these often neglected sources of error is the isolation in the thermometer, which, if too low, can give a serious degradation of the measurement. Heat, vibration, physical or chemical influence or radioactive influence can lower the isolation. This section will give an explanation to the necessity of keeping an eye on the isolation resistance and how to make this.

## The effect of low isolation

### Pt100

The Pt100 element is a low-resistance sensor, and a too low isolation resistance will influence the measurement. Figure 1 shows the electrical schematic for a Pt100 sensor in 2-wire connection with a temperature transmitter. The isolation resistance between the sensor leads is symbolized by  $R_{ISO1}$ .

See Figure 1.

The measuring current  $I_m$  shall go through the Pt100 element, but a negligible fraction  $I_{Err1}$  is normally passing through the high isolation resistance  $R_{ISO1}$ . When the isolation is lowered, a greater fraction of the current will pass through the isolation resistance. As a result of this, the measured voltage over the combined resistance of Pt100 and isolation resistance will be lower than if the isolation resistance was sufficiently high. This will give a too low measured temperature value, and this is not dependent on whether the transmitter is isolated or not.

If the transmitter is without galvanic isolation between input and output, a low isolation resistance between sensor and earth  $R_{ISO2}$  can carry a significant part  $I_{Err2}$  of the measuring current. This so called "ground current" will also cause a too low indicated temperature. With an isolated transmitter, this will not happen, because the isolation will cut off the loop, where the ground current is flowing.

See Figure 2.

### Thermocouples

Low isolation in thermocouple sensors will give other errors. The EMF from a thermocouple is not particularly sensitive for low isolation. The problem is rather that a low isolation will give a new measuring point in the location of the low isolation. If this location is near the real measuring point, the error will be negligible.

Figure 3 shows a thermocouple connected to a temperature transmitter. If the low isolation  $R_{ISO}$  is in a location where the temperature  $T_2$  differs from the temperature in the measuring point  $T_1$ , there is a possibility of a significant error. The measured temperature will correspond to an intermediate value of  $T_1$  and  $T_2$ .

Low isolation in thermocouple sensors can also make the sensor break detection to fail, because the monitoring current can still pass through  $R_{ISO}$ .

See Figure 3.

## Isolation monitoring with SmartSense

The transmitters in the IPAQ family from Inor are microcontroller based and do a couple of measurements and controls beyond the standard measurements. One of these controls (not included in IPAQ-L) is to monitor the isolation resistance of the sensor and the sensor leads. This function, named SmartSense, is available for Pt100 and thermo couple sensors. To accomplish the monitoring, the sensor must be furnished with an extra conductor. Under certain circumstances there is a possibility of using the cable shield. See Sensor solution below.

When the isolation resistance is too low, the IPAQ transmitter will signal this with a flashing LED in the front, and the output signal will go to a pre-programmed value.

### Pt100

For Pt100 the detection limit for "low isolation" is adjustable between 50 k $\Omega$  and 500 k $\Omega$ . The error due to the isolation value  $R_{ISO}$  has to be added to other measurement errors. By 400  $^{\circ}\text{C}/752$   $^{\circ}\text{F}$  the added error is 0.4  $^{\circ}\text{C}/0.7$   $^{\circ}\text{F}$  for

500 kΩ and 3.1°C/5.6°F for 50 k isolation.

See Figure 4.

### Thermocouples

For thermocouples the detection limit for "low isolation" is adjustable between 20 kΩ and 200 kΩ. The added error depends on the relation between the lead resistance  $R_L$  and the isolation resistance  $R_{ISO}$ . The error is also dependent on the temperature difference between the measuring point and the location of the low isolation. Under the following circumstances: measuring temperature 1000 °C/1832 °F, ambient temperature 25 °C/77 °F and  $R_L$  50 Ω there will be an error of 1% if the isolation resistance is 5 kΩ. This equals 10 °C. It is assumed that the low isolation is in the ambient temperature area.

### Sensor solution

The SmartSense function in the IPAQ transmitters is applicable for Pt100 in 3-wire connection and thermocouples. For a correct usage of the SmartSense, the sensor must have an extra conductor. This conductor will have a separate terminal and go through the sensor all the way to the sensor element.

See Figure 5.

Mineral isolated Pt100 sensors and thermocouples will use an unconnected conductor.

N.B. Due to the normally low isolation in mineral isolated thermocouples at high temperatures, it is not useful to monitor the high temperature end, above ~600 °C/1100 °F depending on application. Instead, it is important to monitor connections and cables from the sensor to the transmitter. It is not recommended to use the sheath of the sensor or a cable shield as the monitoring conductor. One task of the sheath is to keep interference outside the measurements. Connecting the sheath to the SmartSense terminal can lead to erroneous measurements. This is also applicable to the shield of cable sensors.

See Figure 6.

### Conclusion: Full control over sensor and connection

Too low isolation resistance in temperature sensors can give erroneous measurements independent of brand and type. SmartSense gives the possibility of substituting Pt100 (3-wire connected)

and thermocouple sensors with a low isolation resistance in time. SmartSense does not only monitor the sensor but also the conductors from the sensor terminals to the transmitter terminals. This gives a full control on the condition of the measuring chain from measuring point to transmitter.

### Causes of low isolation:

- Contamination
- Physical influence (wear, jamming)
- Chemical influence (corrosion)
- Vibration
- Radioactive radiation
- Humidity

### Examples of errors Pt100 by 400°C

Isolation $R_{ISO}$	Error
500 kΩ	0,4°C
100 kΩ	1,6°C
50 kΩ	3,1°C
10 kΩ	15°C

### Thermocouple type K by 1000°C $R_L=50 \Omega$ , $T_{AMB}=25^\circ\text{C}$

Isolation $R_{ISO}$	Error
50 kΩ	1°C
20 kΩ	3°C
5 kΩ	10°C

Fig. 4

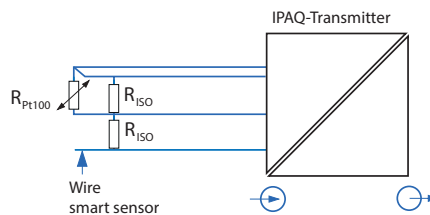


Fig. 5

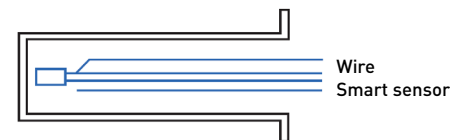
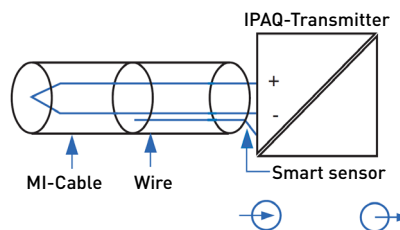







Fig. 6



## Transmitter selection list

	BASIC				UNIVERSAL
	APAQ C130 <sup>TC</sup> APAQ R130 <sup>TC</sup>	APAQ C130 <sup>RTD</sup> APAQ R130 <sup>RTD</sup>	APAQ-3HPT APAQ-3LPT	IPAQ C202 IPAQ R202	MINIIPAQ-HLP MINIIPAQ-L
					
Page	22/30	23/31	38/39	24/32	25/33
Design					
Head-mounted transmitter	✓	✓	✓	✓	✓
Intrinsically-safe head-mounted transmitter, Ex	-	-	-	✓	-
Rail-mounted transmitter	✓	✓	✓	✓	✓
Intrinsically-safe rail-mounted transmitter, Ex	-	-	-	-	-
SIL2	-	-	-	-	-
Input					
Resistance thermometer	2-wire	2-, 3- or 4-wire	3-wire	3-wire	3- or 4-wire
Thermocouples	B, E, J, K, N, R, S, T	-	-	-	B, C, E, J, K, L, N, R, S, T
Other	-	-	-	-	-
Channels/inputs					
1 Measuring channel	✓	✓	✓	✓	✓
2 Measuring channels	-	-	-	-	-
2 Inputs	-	-	-	-	-
Output					
4-20 mA	✓	✓	✓	✓	✓
0-10 V	-	-	-	-	-
HART®	-	-	-	-	-
Accuracy					
Accuracy classes	See Data Sheet	±0.15%	±0.15%	±0.1%	±0.15%
Circuit design					
Galvanic isolation	-	-	-	-	-
Power supply					
24 VDC	✓	✓	✓	✓	✓
230 VAC	-	-	-	-	-
Configuration					
Consoft (USB)	-	-	✓	✓	✓
HART®	-	-	-	-	-
NFC™	✓	✓	-	-	-
Bluetooth®	-	-	-	-	-
Accessoires					
Loop powered LED and LCD display, loop powered isolator and repeaters, transmitter configuration kit	✓	✓	✓	✓	✓
App INOR-Connect	✓	✓	-	-	-

DISCONTINUED

	UNIVERSAL			SMART	
	IPAQ C330 IPAQ R330	IPAQ-H <sup>PLUS</sup> IPAQ-L <sup>PLUS</sup>	IPAQ-4L	IPAQ C530 IPAQ R530	IPAQ C520 IPAQ R520
					
Page	26/34	27/35	40	28/36	29/37
Design					
Head-mounted transmitter	✓	✓	-	✓	✓
Intrinsically-safe head-mounted transmitter, Ex	✓	-	-	✓	✓
Rail-mounted transmitter	✓	✓	✓	✓	✓
Intrinsically-safe rail-mounted transmitter, Ex	✓	-	-	✓	✓
SIL2	-	-	-	-	✓
Input					
Resistance thermometer	2-, 3- or 4-wire	3- or 4-wire	3- or 4-wire	2-, 3- or 4-wire	2-, 3- or 4-wire
Thermocouples	B,C,E,J,K,L,N,R,S,T	B,C,E,K,L,N,R,S,T	B,C,D,E,J,K,N,R,S,U	B,C,D,E,J,K,N,R,S,T	B,C,D,E,J,K,N,R,S,T
Other	mV, Ω	mV, Ω	mV, Ω, mA	mV, Ω	mV, Ω
Channels/inputs					
1 Measuring channel	✓	-	-	✓	✓
2 Measuring channels	-	-	-	-	✓
2 Inputs	-	-	-	-	✓
Output					
4-20 mA	✓	-	-	✓	✓
0-10 V	-	-	-	-	-
HART®	-	-	-	✓	✓
Accuracy					
Accuracy classes	±0.08%	±0.05%	±0.1%	±0.08%	±0.05%
Circuit design					
Galvanic isolation	1500 VAC	3750 VAC	4000 VAC	1500 VAC	1500 VAC
Power supply					
24 VDC	✓	✓	✓	✓	✓
230 VAC	-	-	✓	-	-
Configuration					
Consoft (USB)	✓	✓	✓	✓	✓
HART®	-	-	-	✓	✓
NFC™	✓	-	-	✓	-
Bluetooth®	✓	-	-	✓	-
Accessories					
Loop powered LED and LCD display, loop powered isolator and repeaters, transmitter configuration kit	✓	✓	✓	✓	✓
App INOR-Connect	✓	-	-	✓	-

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DISCONTINUED

## APAQ C130<sup>TC</sup>

# Basic Programmable 2-wire Transmitter for Thermocouple



The APAQ C130<sup>TC</sup> is a modern transmitter with high reliability and great performance. External influences such as ambient temperature, vibration, moisture and EMC interference have minimal influence on the measurement result, thanks to the robust design.

- Type: Digital
- Input: TC
- Output: 4-20 mA
- Isolation: Unisolated
- Measuring channels: 1 channel

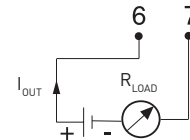
### Specifications:

<b>Input</b>	2-wire connection
TC type B - Pt30Rh-Pt6Rh (IEC 60584)	0...+1820 °C / +32...+3308 °F
TC type E - NiCr-CuNi (IEC 60584)	-270...+1000 °C / -454...+1832 °F
TC type J - Fe-CuNi (IEC 60584)	-210...+1200 °C / -346...+2192 °F
TC type K - NiCr-NiAl (IEC 60584)	-270...+1300 °C / -454...+2372 °F
TC type N - NiCrSi-NiSi (IEC 60584)	-270...+1300 °C / -454...+2372 °F
TC type R - Pt13Rh-Pt (IEC 60584)	-50...+1750 °C / -58...+3182 °F
TC type S - Pt10Rh-Pt (IEC 60584)	-50...+1750 °C / -58...+3182 °F
TC type T - Cu-CuNi (IEC 60584)	-270...+400 °C / -454...+752 °F
<b>Adjustments</b>	
Minimum span	
TC type B	700 °C / 1260 °F
TC type R, S,	300 °C / 540 °F
TC type E, J, K, T	50 °C / 90 °F
TC type N	100 °C / 180 °F
Zero adjustments	Any value within range limits
<b>Output</b>	4-20 mA, temperature linear
<b>Sensor failure indication</b>	Upscale ( $\geq 21.0$ mA) or downscale ( $\leq 3.6$ mA)
<b>NAMUR compliance</b>	Current limitations and failure currents acc. to NAMUR NE 43
<b>Response time</b>	0.4 to 26 s, adjustable filtering level
<b>Ambient temperature</b>	
Storage and operation	-40 to +85 °C / -40 to +185 °F
<b>Galvanic isolation</b>	None
<b>Power supply</b>	6 to 32 VDC
<b>Typical accuracy</b>	Max. of [CJC not included]
TC type R, S, T	$\pm 2.0$ °C or $\pm 0.2$ % of span / $\pm 3.6$ °F or $\pm 0.2$ % of span
TC type B (<100 °C / <212 °F)	not specified
TC type B (100 °C...400 °C / 212 °F...752 °F)	$\pm 10$ °C / $\pm 18$ °F
TC type B (>400 °C / >752 °F)	$\pm 2.0$ °C or $\pm 0.2$ % of span / $\pm 3.6$ °F or $\pm 0.2$ % of span
TC type E, J, K	$\pm 1$ °C or $\pm 0.2$ % of span / $\pm 1.8$ °F or $\pm 0.2$ % of span
TC type N [-100...+1300 °C]	$\pm 1$ °C or $\pm 0.2$ % of span / $\pm 1.8$ °F or $\pm 0.2$ % of span
TC type N [-270...-100 °C]	$\pm 2.0$ °C / $\pm 3.6$ °F
<b>Mounting</b>	DIN B-head or larger
<b>Vibration</b>	Acc. to IEC 60068-2-6, test Fc, 10...2000 Hz, 10 g
<b>EMC</b>	EN 61326-1 and EN 61326-2-3
<b>Configuration</b>	App Inor Connect via NFC™

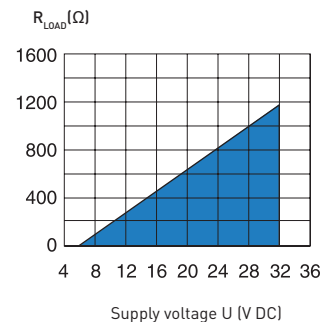
### Input connections



### Output connections

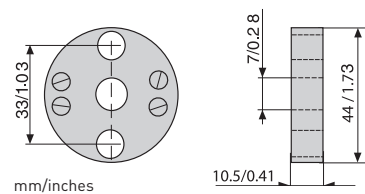


### Output load diagram



$$R_{LOAD} = (U - 6) / 0.022$$

### Dimensions



### Ordering information

APAQ C130 <sup>TC</sup>	70C1300211
Head mounting kit	70ADA00017
DIN-rail Adapter + Screw (10 pcs)	70ADA00027

## APAQ C130<sup>RTD</sup>

# Basic Programmable 2-wire Transmitter for Pt100 and Pt1000



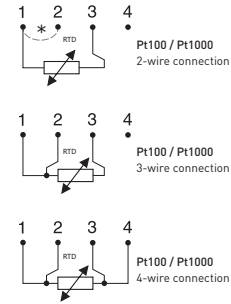
The APAQ C130<sup>RTD</sup> is a modern transmitter with high reliability and great performance. External influences such as ambient temperature, vibration, moisture and EMC interference have minimal influence on the measurement result, thanks to the robust design.

- Type: Digital
- Input: RTD
- Output: 4-20 mA
- Isolation: Unisolated
- Measuring channels: 1 channel

### Specifications:

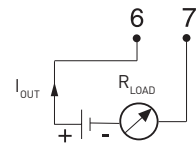
<b>Input</b>	2-, 3-, 4-wire connection Pt100 (IEC 60751, $\alpha=0.00385$ ) -200... +850 °C / -328...+1562 °F Pt1000 (IEC 60751, $\alpha=0.00385$ ) -200... +850 °C / -328...+1562 °F
<b>Adjustments</b>	
Minimum span	20 °C / 36 °F
Zero adjustments	Any value within range limits
<b>Output</b>	4-20 mA temperature linear
<b>Sensor failure indication</b>	Upscale ( $\geq 21.0$ mA) or downscale ( $\leq 3.6$ mA)
<b>NAMUR compliance</b>	Current limitations and failure currents acc. to NAMUR NE 43
<b>Response time</b>	0.4 to 26 s, adjustable filtering level
<b>Ambient temperature</b>	
Storage and operation	-40...+85 °C / -40...+185 °F
<b>Galvanic isolation</b>	None
<b>Power supply</b>	6 to 32 VDC
<b>Typical accuracy</b>	Max. of $\pm 0,15$ K or $\pm 0,15$ % of span
<b>Mounting</b>	DIN B-head or larger
<b>Vibration</b>	IEC 60068-2-6, 10 g
<b>EMC</b>	EN 61326-1 and EN 61326-2-3
<b>Configuration</b>	App INOR Connect via NFC™

### Input connections

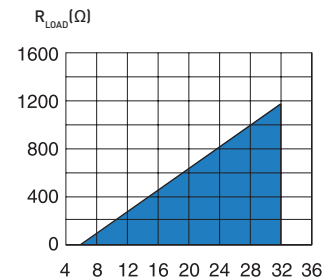


\* Short terminals 1 and 2 on the transmitter

### Output connections



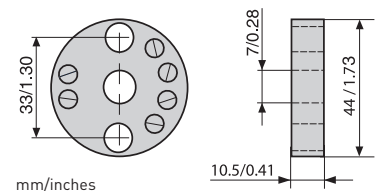
### Output load diagram



Supply voltage U [V DC]

$$R_{LOAD} = (U - 6) / 0.022$$

### Dimensions



### Ordering information

APAQ C130 <sup>RTD</sup>	70C1300011
Head mounting kit	70ADA00017
DIN-rail Adapter + Screw (10 pcs)	70ADA00027

## IPAQ C202

# Basic Programmable 2-wire Transmitter for Pt100



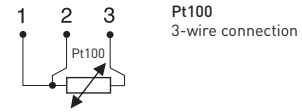
The IPAQ C202 is a digital, easy-to-use 2-wire temperature transmitter for measurement with a Pt100 resistance sensor. Its robust design and high quality gives excellent performance and accuracy also under harsh conditions. IPAQ C202 combines competitive cost with easy and user friendly functionality and reliable accuracy during the lifetime.

- Robust terminals with test connections
- Input: Pt100 in 3-wire connection
- PC configurable measuring ranges without need for calibration
- Temperature linear output
- Very short response time
- Excellent EMC immunity
- Configuration without external power
- Easy-to-use Windows configuration software
- USB communication
- Withstands vibrations up to 10 g
- Runtime counter
- Only 19.5 mm / 0.72 inch high

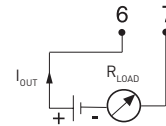
### Specifications:

<b>Input Pt100</b>	3-wire connection	
Pt100 ( $\alpha=0.00385$ )	-200 to +850 °C / -328 to +1562 °F	
<b>Sensor failure</b>	Upscale ( $\geq 21.0$ mA) or downscale ( $\leq 3.6$ mA) action	
<b>Adjustments</b>		
Zero adjustment	Any value within range limits	
Minimum span	20 °C / 36 °F	
Sensor error compensation	$\pm 10\%$ of span for span $< 100^\circ\text{C}/180^\circ\text{F}$ otherwise $\pm 10^\circ\text{C}/\pm 18^\circ\text{F}$	
<b>Output</b>	4...20 mA, temperature linear	
Adjustable filtering level	0.13 to 54 s, (default 0.9 s)	
Response time	$< 50$ ms	
<b>Environment conditions</b>		
Ambient temperature	-40 to +85 °C / -40 to +185 °F	
Humidity	0...98% RH (non-condensing)	
Vibrations	Acc. to IEC 60068-2-6, test Fc, 10...2000 Hz, 10 g	
EMC	Directive: 2014/30/EU Harmonized standards: EN 61326-1, EN 61326-2-3	
<b>Galvanic isolation</b>	No	
<b>Power supply</b>	Standard version	6.0...32.0 VDC
	Ex version	8.0...30.0 VDC
<b>Intrinsic safety</b>		
IPAQ C202X	ATEX:	II 1G Ex ia IIC T6...T4 Ga
	IECEx:	Ex ia IIC T6...T4 Ga
<b>Accuracy</b>	Max of $\pm 0,1\text{K}$ or $\pm 0,1\%$ of span	
Long-term stability	$\pm 0.1\%$ of span per year	
<b>Connection head</b>	DIN B or larger	
Weight	32 g / 0.07 lb	
Protection, housing / terminals	IP 65 / IP 00	

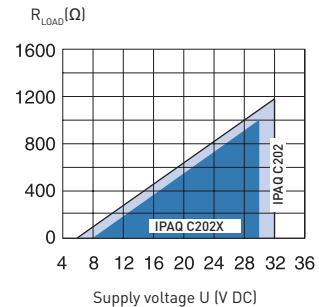
### Input connections



### Output connections



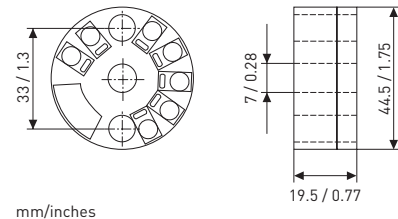
### Output load diagram



$$R_{LOAD} = (U-6)/0.022$$

$$R_{LOAD} = (U-8)/0.022$$

### Dimensions



### Ordering information

IPAQ C202	70C2020010
IPAQ C202 Ex	70C202X010
PC configuration kit (USB-conn.)	70CFGUSX01
Head mounting kit	70ADA00017
Rail mounting kit	70ADA00015



## MINIPAQ-HLP

# Basic Programmable 2-wire Transmitter



MINIPAQ-HLP is a basic, programmable non-isolated, easy-to-use 2-wire transmitter. The Low Profile housing has a height of only 19.5 mm / 0.77 inch. Configuration is made in seconds with the user friendly Windows software, MINIPAQ Soft. No external power supply required for configuration. The transmitter is programmable for RTD's in 3- and 4-wire connection according to different standards as well as for 11 T/C types. Useful error correction functions improve the accuracy.

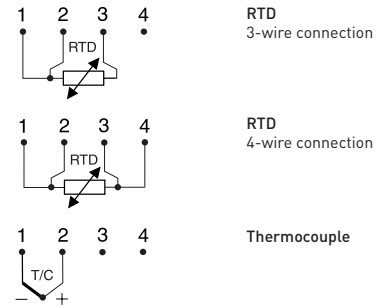
- Robust terminals with test connections
- Only 19.5 mm / 0.77 inch high
- Accepts RTD in 3- and 4-wire connection and 11 T/C types
- Temperature linear output
- Sensor error and system (sensor/transmitter) error correction for highest total accuracy
- Configuration without external power
- Easy-to-use Windows configuration software
- NAMUR compliant
- Rugged design tested for 10 g vibrations
- USB communication

### Specifications:

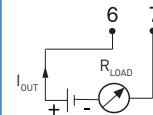
<b>Input RTD</b>	3-, 4-wire connection
Pt100 ( $\alpha=0.00385$ ) <sup>1)</sup>	-200 to +1000 °C / -328 to +1832 °F
Pt1000 ( $\alpha=0.00385$ ) <sup>1)</sup>	-200 to +200 °C / -328 to +392 °F
PtX $10 \leq X \leq 1000$ ( $\alpha=0.00385$ ) <sup>1)</sup>	Upper range depending on X-value
Pt100 ( $\alpha=0.003902$ )	-200 to +1000 °C / -328 to +1832 °F
Pt100 ( $\alpha=0.003916$ )	-200 to +1000 °C / -328 to +1832 °F
Ni100 <sup>2)</sup>	-60 to +250 °C / -76 to +482 °F
Ni1000 <sup>2)</sup>	-10 to +150 °C / +14 to +302 °F
Ni120 <sup>3)</sup>	-70 to +300 °C / -94 to +572 °F
Cu10 <sup>4)</sup>	-200 to +260 °C / -328 to +500 °F
<b>Input Thermocouples</b>	
Types	B, C, E, J, K, L, N, R, S, T, U
<b>Sensor failure</b>	Upscale, downscale or off
<b>Adjustments - Zero</b>	Any value within range limits
<b>Adjustments - Minimum spans</b>	
Pt100, Pt1000, Ni100, Ni1000	10 °C / 18 °F
T/C	2 mV
<b>Output</b>	4-20 mA, temperature linear
<b>Operating temperature</b>	-40 to +85 °C / -40 to +185 °F
<b>Galvanic isolation</b>	No
<b>Power supply</b>	8.0...32.0 VDC
<b>Typical accuracy</b>	±0.15 % of temperature span
<b>Connection head</b>	DIN B or larger

<sup>1)</sup>IEC 60751, <sup>2)</sup>DIN43760, <sup>3)</sup>Edison No.7, <sup>4)</sup>Edison No.15

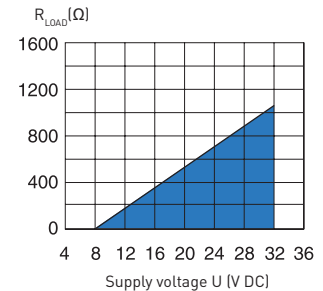
### Input connections



### Output connections

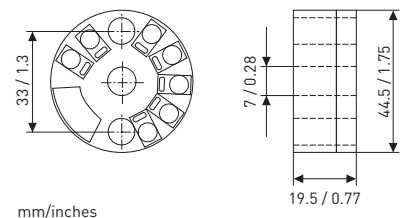


### Output load diagram



$$R_{LOAD} = (U-8)/0.022$$

### Dimensions



### Ordering information

MINIPAQ-HLP	70MQHLP002
PC Configuration Kit (USB conn.)	70CFGUSX01
Configuration	70CAL00001

# IPAQ C330

## Universal Programmable 2-wire transmitter



IPAQ C330 is a universal, isolated, temperature transmitter with additional voltage and resistance input. Its robust design and high quality gives excellent performance and accuracy also under harsh conditions.

IPAQ C330 supports communication via NFC® (Near-field communication) and Bluetooth® which makes it possible to configure and monitor the transmitter remotely.

- High accuracy and long term stability
- 50-point Customized Linearization and Callendar-Van Dusen
- Accepts RTD, T/C, mV and  $\Omega$
- Sensor error and system (sensor/transmitter) error correction for highest total accuracy
- Low temperature drift
- Configuration via USB or NFC without external power
- Runtime counter - hour counter for elapsed operational time
- Rugged design tested for 10 g vibrations
- High security - Password protection and date of changes logged

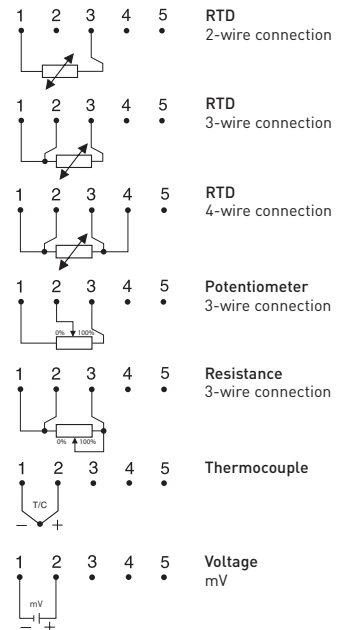
### Specifications:

<b>Input RTD</b>	2-, 3-, 4-wire connection
Pt100 ( $\alpha=0.00385$ )	-200 to +850 °C / -328 to +1562 °F
PtX $10 \leq X \leq 1000$ ( $\alpha=0.00385$ )	Upper range depending on X-value
Pt100 ( $\alpha=0.003916$ )	-200 to +850 °C / -328 to +1562 °F
Ni100 <sup>1)</sup> , Ni120 <sup>2)</sup>	-60 to +250 °C / -76 to +482 °F
Ni1000 <sup>1)</sup>	-50 to +180 °C / -58 to +356 °F
Cu10 <sup>3)</sup>	-50 to +200 °C / -58 to +392 °F
<b>Input Resistance / potentiometer</b>	0 to 10000 $\Omega$ / 100 to 10000 $\Omega$
<b>Input Thermocouples</b>	Types B, C, D, E, J, K, N, R, S, T
<b>Input mV</b>	-10 to +1000 mV
<b>Sensor failure</b>	Upscale ( $\geq 21.0$ mA) or downscale ( $\leq 3.6$ mA) action
<b>Adjustments - Zero</b>	Any value within range limits
<b>Adjustments - Minimum spans</b>	
Pt100, Pt1000, Ni100, Ni1000	10 °C / 18 °F
Potentiometer	10 $\Omega$
T/C, mV	2 mV
<b>Output</b>	4-20 / 20-4 mA, temperature linear
<b>Operating temperature</b>	-40 to +85 °C / -40 to +185 °F
<b>Galvanic isolation</b>	1500 VAC, 1 min
<b>Power supply</b>	IPAQ C330 8.0...36.0 VDC
	IPAQ C330X 8.0...30.0 VDC
<b>Intrinsic safety</b>	
IPAQ C330X ATEX:	II 1 G Ex ia IIC T6...T4 Ga
IPAQ C330X IECEx:	Ex ia IIC T6...T4 Ga
IPAQ C330X FM US:	CL I, Div 1, GP A, B, C and D / CL I, Zn 0, Ex ia IIC Ga
IPAQ C330X FM CA:	CL I, Div 1, GP A, B, C and D / CL I, Zn 0, Ex ia IIC Ga
<b>Typical accuracy</b>	$\pm 0.08$ °C or $\pm 0.08\%$ of span
<b>Connection head</b>	DIN B or larger

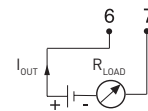
<sup>1)</sup>DIN 43760, <sup>2)</sup>Edison No.7, <sup>3)</sup>Edison No.15

### Input connections

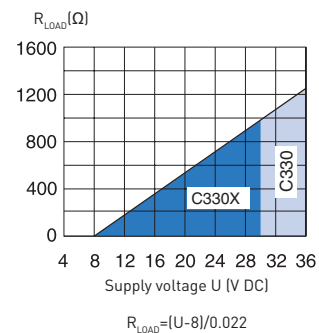
See data sheet for more alternatives



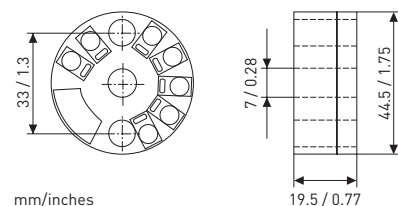
### Output connections



### Output load diagram



### Dimensions



### Ordering information

IPAQ C330	70C3300012
IPAQ C330X (ATEX / IECEx)	70C330X012
IPAQ C330X (cFMus)	70C330F012
PC configuration kit (USB-conn.)	70CFGUSX01
ICON-BT Bluetooth kit	70CFGBT001
Head mounting kit	70ADA00017
Rail mounting kit	70ADA00015

## IPAQ C310<sup>RTD</sup>

### Programmable 2-wire transmitter for RTD and Resistance inputs



The IPAQ C310<sup>RTD</sup> transmitter is a isolated temperature transmitter for measurement with a RTD sensor. It is compatible with Pt10 ... Pt1000 sensors with additional Ni100, Ni120, Ni1000 and resistance input. Its robust design and high quality gives excellent performance and accuracy also under harsh conditions.

IPAQ C310<sup>RTD</sup> supports communication via NFC (Near-field communication) and Bluetooth<sup>®</sup> which makes it possible to configure and monitor the transmitter remotely.

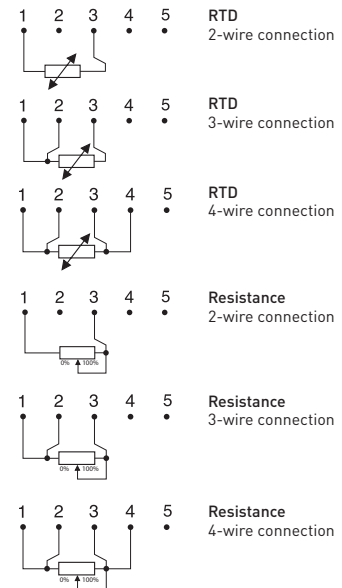
- High accuracy and long term stability
- Galvanic isolation
- Accepts RTD and  $\Omega$
- Sensor error and system (sensor+transmitter) error correction for highest total accuracy
- Low temperature drift
- Configuration via PC, NFC or Bluetooth<sup>®</sup> without external power
- Runtime counter - hour counter for elapsed operational time
- Rugged design tested for 10 g vibrations
- High security - Password protection and date of changes logged

### Specifications:

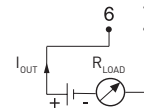
<b>Input RTD</b>	2-, 3-, 4-wire connection
Pt100 ( $\alpha=0.00385$ ) <sup>1)</sup>	-200 to +850 °C / -328 to +1562 °F
PtX 10 ≤ X ≤ 1000 ( $\alpha=0.00385$ ) <sup>1)</sup>	-200 to +850 °C / -328 to +1562 °F
Pt100 ( $\alpha=0.003916$ ) <sup>2)</sup>	-200 to +850 °C / -328 to +1562 °F
Ni100 <sup>3)</sup> , Ni120 <sup>4)</sup>	-60 to +250 °C / -76 to +482 °F
Ni1000 <sup>3)</sup>	-50 to +180 °C / -58 to +356 °F
<b>Input Resistance</b>	0 to 10 000 $\Omega$
<b>Sensor failure</b>	Upscale ( $\geq 21.0$ mA) or downscale ( $\leq 3.6$ mA) action
<b>Adjustments - Zero</b>	Any value within range limits
<b>Adjustments - Minimum spans</b>	
RTD	10 °C / 18 °F
Resistance	10 $\Omega$
<b>Output</b>	4-20 / 20-4 mA, temperature linear
<b>Operating temperature</b>	-40 to +85 °C / -40 to +185 °F
<b>Galvanic isolation</b>	1500 VAC, 1 min
<b>Power supply</b>	8.0...36.0 VDC
<b>Typical accuracy</b>	Max. of $\pm 0.1$ °C or $\pm 0.1$ % of span
<b>Connection head</b>	DIN B or larger

<sup>1)</sup> IEC 60751, <sup>2)</sup> JIS C 1604, <sup>3)</sup> DIN 43760, <sup>4)</sup> Edison Curve No. 7

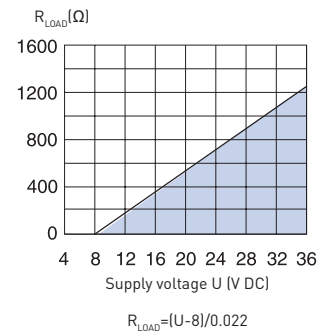
### Input connections



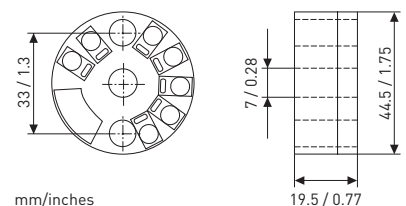
### Output connections



### Output load diagram



### Dimensions



### Ordering information

IPAQ C310 <sup>RTD</sup>	70C3100011
ICON-X, PC configuration kit	70CFGUSX01
ICON-BT, Bluetooth <sup>®</sup> configuration kit	70CFGBT001
Head mounting kit	70ADA00017
Rail mounting kit	70ADA00015

# IPAQ C530

## Smart HART-compatible 2-wire Transmitter



IPAQ C530 is a modern, HART® temperature transmitter developed to meet the highest standards of accuracy and reliability. A universal transmitter compatible with RTD, thermocouples, voltage and potentiometer sensors. It is fully compatible with HART® 7 and offers extended diagnostic information, for example device error, sensor and wiring conditions. IPAQ C530 supports communication via NFC® (Near-field communication) and Bluetooth® which makes it possible to configure and monitor the transmitter remotely.

- High accuracy and long term stability
- Accepts RTD, T/C, mV and ohm
- Sensor error and system (sensor/transmitter) error correction
- 50-point Customized Linearization and Callendar-Van Dusen
- Rugged design tested for 10 g vibrations
- Configuration via USB, without external power
- Runtime counter - hour counter for elapsed operational time
- Communicates with HART Communicator or PC via modem
- Integrated in Emerson AMS and Siemens PDM systems

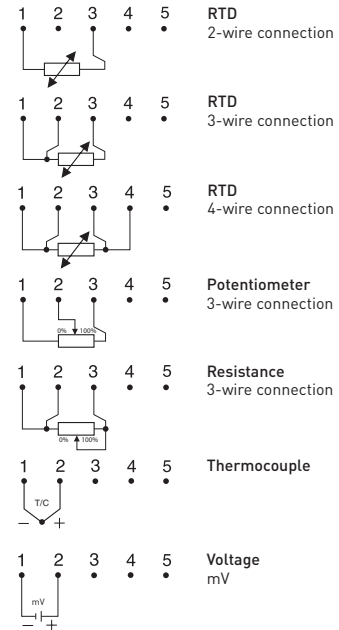
### Specifications:

<b>Input RTD</b>	2-, 3-, 4-wire connection	
Pt100 ( $\alpha = 0.00385$ )	-200 to +850 °C / -328 to +1562 °F	
PtX $10 \leq X \leq 1000$ ( $\alpha = 0.00385$ )	Upper range depending on X-value	
Pt100 ( $\alpha = 0.003916$ )	-200 to +850 °C / -328 to +1562 °F	
Ni100 <sup>1)</sup> , Ni120 <sup>2)</sup>	-60 to +250 °C / -76 to +482 °F	
Ni1000 <sup>1)</sup>	-50 to +180 °C / -58 to +356 °F	
Cu10 <sup>3)</sup>	-50 to +200 °C / -58 to +392 °F	
<b>Input Resistance / potentiometer</b>	0 to 10000 Ω / 100 to 10000 Ω	
<b>Input Thermocouples</b>	Types B, C, D, E, J, K, N, R, S, T	
<b>Input mV</b>	-10 to +1000 mV	
<b>Sensor failure</b>	Upscale ( $\geq 21.0$ mA) or downscale ( $\leq 3.6$ mA) action	
<b>Adjustments - Zero</b>	Any value within range limits	
<b>Adjustments - Minimum spans</b>		
Pt100, Pt1000, Ni100, Ni1000	10 °C / 18 °F	
Potentiometer	100 Ω	
T/C, mV	2 mV	
<b>Output</b>	4-20 / 20-4 mA, temperature linear	
<b>Operating temperature</b>	-40 to +85 °C / -40 to +185 °F	
<b>Galvanic isolation</b>	1500 VAC, 1 min	
<b>Power supply</b>	IPAQ C530	8.5...36.0 VDC
	IPAQ C530X	8.5...30.0 VDC
<b>Intrinsic safety</b>		
IPAQ C530X ATEX:	II 1G Ex ia IIC T6...T4 Ga	
IPAQ C530X IECEx:	Ex ia IIC T6...T4 Ga	
IPAQ C330X FM US:	CL I, Div 1, 6P A, B, C and D / CL I, Zn 0, Ex ia IIC Ga	
IPAQ C330X FM CA:	CL I, Div 1, 6P A, B, C and D / CL I, Zn 0, Ex ia IIC Ga	
<b>Typical accuracy</b>	$\pm 0.08$ °C or $\pm 0.08$ % of span	
<b>Connection head</b>	DIN B or larger	

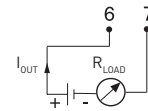
<sup>1)</sup>IEC 60751,  $\alpha = 0.00385$  and Pt100 acc. to JIS 1604,  $\alpha = 0.003916$  <sup>2)</sup>DIN 43760

<sup>3)</sup>Temperature, resistance or voltage linear, customized linearization possible

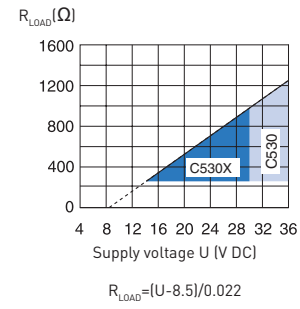
### Input connections



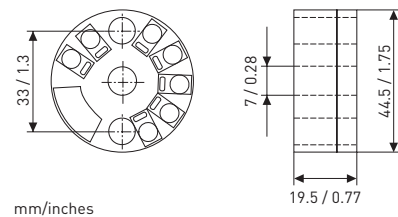
### Output connections



### Output load diagram



### Dimensions



### Ordering information

IPAQ C530	70C5300010
IPAQ C530X (ATEX / IECEx)	70C530X010
IPAQ C530X (cFMus)	70C530F010
HART PC modem USB	70MEM00003
PC configuration kit (USB-conn.)	70CFGUSX01
ICON-BT Bluetooth kit	70CFGBT001
Configuration	70CAL00001

# IPAQ C520

## Smart HART-compatible Dual-input 2-wire Transmitter



The IPAQ C520 transmitters are universal, isolated, dual-input temperature transmitters with additional voltage and resistance input. C520X/C520XS are Intrinsically Safe versions for use in Ex-Zone 0, 1 and 2. The transmitters are compatible with the HART 6 protocol. Typical characteristics are the high accuracy, stability and reliability combined with a robust housing.

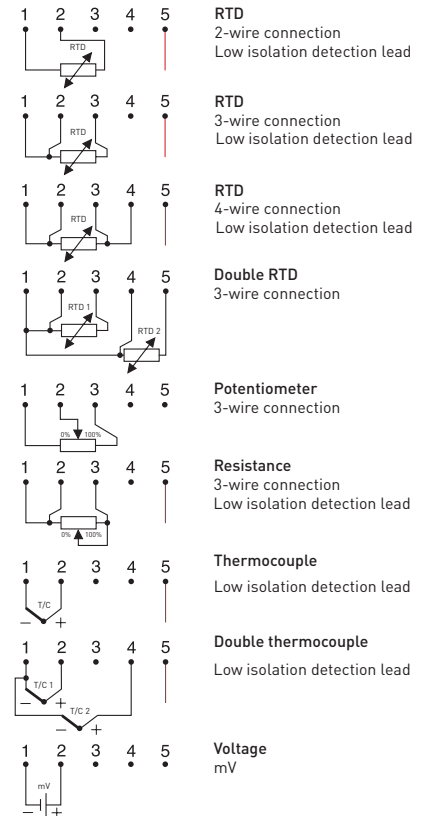
- Universal, dual-input for RTD and T/C
- SIL 2 compatible according to IEC 61508-2
- 5 year guaranteed stability
- Withstands 10 g vibrations
- Complies with NAMUR NE 21, NE 43, NE 53, NE 89 and NE 107
- EMC immunity according to Criteria A
- Sensor Backup
- Sensor Drift Monitoring
- Sensor Isolation Monitoring
- Sensor matching
- 50 point customized linearization
- Integrated in Emerson AMS and Siemens PDM systems

### Specifications:

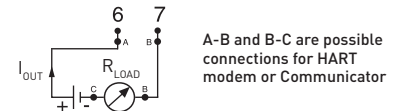
Input RTD		
Pt100	(IEC 60751, $\alpha=0.00385$ )	-200 to +850 °C
PtX (10 ≤ X ≤ 1000)	(IEC 60751, $\alpha=0.00385$ )	Corresp. to max. 4 000 Ω
Pt100	(JIS C 1604, $\alpha=0.003916$ )	-200 to +850 °C
Ni100	(DIN 43760)	-60 to +250 °C
Ni120	(Edison Curve No. 7)	-60 to +250 °C
Ni1000	(DIN 43760)	-50 to +180 °C
Cu10	(Edison Cu Windings No. 15)	-50 to +200 °C
Input connections	One sensor	2-, 3- and 4-wire connection
	Two sensors	2- and 3-wire connection
Input Thermocouple		
	T/C types	B, C, D, E, J, K, N, R, S, T
Input Resistance		
	Potentiometer	100 to 4000 Ω, 2-, 3- and 4-wire connection
Input Voltage		
		-10 to +1000 mV
Double inputs for RTD and Thermocouple		
Measure mode		T1 or T2 or difference, average, min, max of T1 and T2
Sensor Redundancy		Automatic switchover to undamaged sensor
Sensor Drift Monitoring		Adjustable maximum temp. difference T1-T2
Output		
Output signal	Temperature linear	4-20 mA, 20-4 mA or customized
NAMUR compliance	Measure and fail currents	NAMUR, NE 43
Galvanic isolation		1500 VAC, 1 min
Ex-classifications	C520X/C520XS	ATEX: II 1G Ex ia IIC T6...T4 Ga IECEx: Ex ia IIC T6...T4 Ga
Power supply		
	C520/C520S	10...36.0 VDC, Standard power supply
	C520X/C520XS	10...30.0 VDC, I.S. power supply
Ambient temperature		
	Storage/operation	-40 to +85 °C
Accuracy		
	RTD (Pt and Ni sensors)	Max. of ±0.1 °C or ±0.05 % of span
	Thermocouple	Typical ±0.05 % of span
	Resistance/voltage	See data sheet
Long-term stability		
		Max. drift: ±0.05 % of span / 5 years
Connection head		
		DIN B or larger

### Input connections

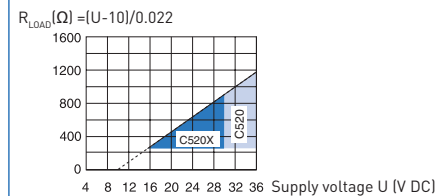
See data sheet for more alternatives



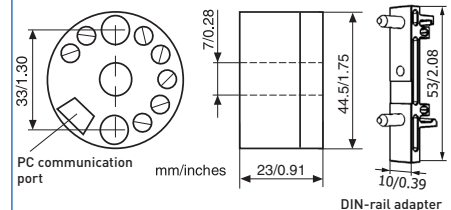
### Output connections



### Output load diagram



### Dimensions



### Ordering information

IPAQ C520	70C5200010
IPAQ C520S, SIL 2 compatible	70C5200510
IPAQ C520X	70C520X010
IPAQ C520XS, SIL 2 compatible	70C520XS10
ICON PC configuration kit (USB-conn.)	70CFGUSX01
Configuration	70CAL00001
Head mounting kit - 10 pcs	70ADA00027

# APAQ R130<sup>TC</sup>

## Basic Programmable 2-wire Transmitter for Thermocouple



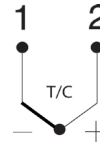
The APAQ R130<sup>TC</sup> is a modern transmitter with high reliability and great performance. External influences such as ambient temperature, vibration, moisture and EMC interference have minimal influence on the measurement result, thanks to the robust design.

- Type: Digital
- Input: TC
- Output: 4-20 mA
- Isolation: Unisolated
- Measuring channels: 1 channel

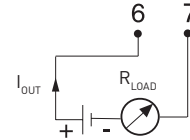
### Specifications:

<b>Input</b>	2-wire connection
TC type B - Pt30Rh-Pt6Rh (IEC 60584)	0...+1820 °C / +32...+3308 °F
TC type E - NiCr-CuNi (IEC 60584)	-270...+1000 °C / -454...+1832 °F
TC type J - Fe-CuNi (IEC 60584)	-210...+1200 °C / -346...+2192 °F
TC type K - NiCr-NiAl (IEC 60584)	-270...+1300 °C / -454...+2372 °F
TC type N - NiCrSi-NiSi (IEC 60584)	-270...+1300 °C / -454...+2372 °F
TC type R - Pt13Rh-Pt (IEC 60584)	-50...+1750 °C / -58...+3182 °F
TC type S - Pt10Rh-Pt (IEC 60584)	-50...+1750 °C / -58...+3182 °F
TC type T - Cu-CuNi (IEC 60584)	-270...+400 °C / -454...+752 °F
<b>Adjustments</b>	
Minimum span	
TC type B	700 °C / 1260 °F
TC type R, S,	300 °C / 540 °F
TC type E, J, K, T	50 °C / 90 °F
TC type N	100 °C / 180 °F
Zero adjustments	Any value within range limits
<b>Output</b>	4-20 mA, temperature linear
<b>Sensor failure indication</b>	Upscale (≥21.0 mA) or downscale (≤3.6 mA)
<b>NAMUR compliance</b>	Current limitations and failure currents acc. to NAMUR NE 43
<b>Response time</b>	0.4 to 26 s, adjustable filtering level
<b>Ambient temperature</b>	
Storage and operation	-40 to +85 °C / -40 to +185 °F
<b>Galvanic isolation</b>	None
<b>Power supply</b>	6 to 32 VDC
<b>Typical accuracy</b>	Max. of (CJC not included)
TC type R, S, T	±2.0 °C or ±0.2 % of span / ±3.6 °F or ±0.2 % of span
TC type B (<100 °C / <212 °F)	not specified
TC type B (100 °C...400 °C / 212 °F...752 °F)	± 10 °C / ± 18 °F
TC type B (>400 °C / >752 °F)	±2.0 °C or ±0.2 % of span / ±3.6 °F or ±0.2 % of span
TC type E, J, K	±1 °C or ±0.2 % of span / ±1.8 °F or ±0.2 % of span
TC type N (-100...+1300 °C)	±1 °C or ±0.2 % of span / ±1.8 °F or ±0.2 % of span
TC type N (-270...-100 °C)	±2.0 °C / ±3.6 °F
<b>Mounting</b>	35 mm DIN rail acc. to EN 60715
<b>Vibration</b>	Acc. to IEC 60068-2-6, test Fc, 10...2000 Hz, 5 g
<b>EMC</b>	EN 61326-1 and EN 61326-2-3
<b>Configuration</b>	App Inor Connect via NFC™

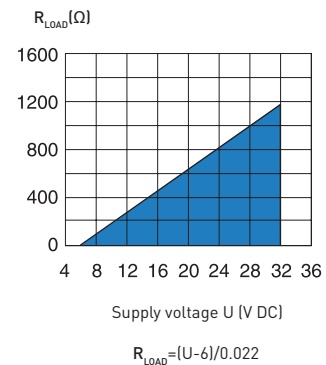
### Input connections



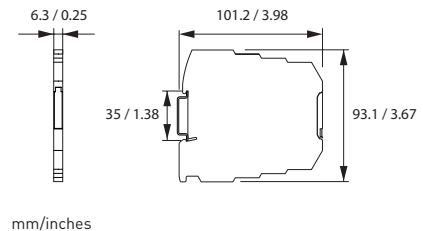
### Output connections



### Output load diagram



### Dimensions



### Ordering information

APAQ R130<sup>TC</sup>

70R1300211

# APAQ R130<sup>RTD</sup>

## Basic Programmable 2-wire Transmitter for Pt100 and Pt1000



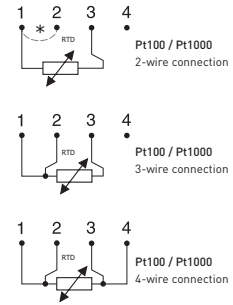
The APAQ R130<sup>RTD</sup> is a modern transmitter with high reliability and great performance. External influences such as ambient temperature, vibration, moisture and EMC interference have minimal influence on the measurement result, thanks to the robust design.

- Type: Digital
- Input: RTD
- Output: 4-20 mA
- Isolation: Unisolated
- Measuring channels: 1 channel

### Specifications:

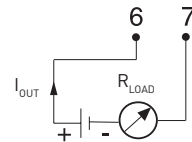
<b>Input</b>	2-, 3-, 4-wire connection Pt100 (IEC 60751, $\alpha=0.00385$ ) -200... +850 °C / -328...+1562 °F Pt1000 (IEC 60751, $\alpha=0.00385$ ) -200... +850 °C / -328...+1562 °F
<b>Adjustments</b>	
Minimum span	20 °C / 36 °F
Zero adjustments	Any value within range limits
<b>Output</b>	4-20 mA temperature linear
<b>Sensor failure indication</b>	Upscale ( $\geq 21.0$ mA) or downscale ( $\leq 3.6$ mA)
<b>NAMUR compliance</b>	Current limitations and failure currents acc. to NAMUR NE 43
<b>Response time</b>	0.4 to 26 s, adjustable filtering level
<b>Ambient temperature</b>	
Storage and operation	-40...+85 °C / -40...+185 °F
<b>Galvanic isolation</b>	None
<b>Power supply</b>	6 to 32 VDC
<b>Typical accuracy</b>	Max. of $\pm 0,15$ K or $\pm 0,15$ % of span
<b>Mounting</b>	35 mm DIN rail acc. to EN 60715
<b>Vibration</b>	IEC 60068-2-6, test Fc, 10...2000 Hz, 5 g
<b>EMC</b>	EN 61326-1 and EN 61326-2-3
<b>Configuration</b>	App INOR Connect via NFC <sup>TM</sup>

### Input connections

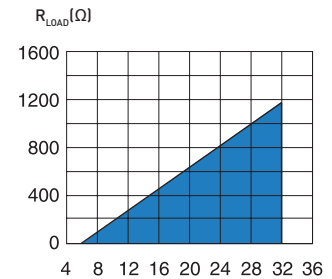


\* Short terminals 1 and 2 on the transmitter

### Output connections



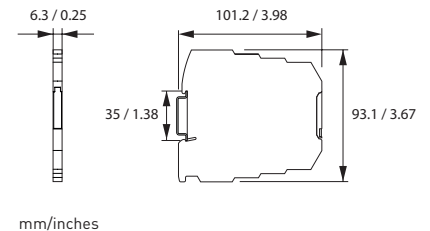
### Output load diagram



Supply voltage U (V DC)

$$R_{LOAD} = (U - 6) / 0.022$$

### Dimensions



### Ordering information

APAQ R130<sup>RTD</sup>

70R1300011

## IPAQ R202

# Basic Programmable 2-wire Transmitter for Pt100



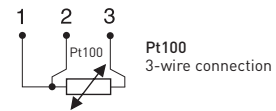
IPAQ R202 is a digital, easy-to-use temperature transmitter developed for measurements with Pt100 sensors. Its robust design and high quality gives excellent performance and accuracy also under harsh conditions. With the new runtime counter function you can easily supervise the elapsed operational time between calibrations.

- Input: Pt100 in 3-wire connection
- PC configurable measuring ranges without need for calibration
- Freely adjustment of zero point and input range
- Temperature linear output
- Runtime counter
- Excellent EMC immunity
- Configuration without external power
- Easy-to-use Windows configuration software
- USB communication
- Withstands vibrations up to 5 g

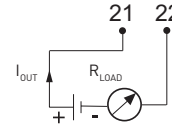
### Specifications:

<b>Input Pt100</b>	3-wire connection
Pt100 ( $\alpha=0.00385$ )	-200 to +850 °C / -328 to +1562 °F
<b>Sensor failure</b>	Upscale ( $\geq 21.0$ mA) or downscale ( $\leq 3.6$ mA) action
<b>Adjustments</b>	
Zero adjustment	Any value within range limits
Minimum span	20 °C / 36 °F
Sensor error compensation	$\pm 10\%$ of span for span <100°C/180°F otherwise $\pm 10^\circ\text{C}/\pm 18^\circ\text{F}$
<b>Output</b>	4...20 mA, temperature linear
Adjustable filtering level	0.13 to 54 s, (default 0.9 s)
Permissible load	818 $\Omega$ @ 24 VDC
Response time	< 50 ms
<b>Environment conditions</b>	
Ambient temperature	-40 to +85 °C / -40 to +185 °F
Humidity	0...98% RH (non-condensing)
Vibrations	Acc. to IEC 60068-2-6, test Fc, 10...2000 Hz, 5 g
EMC	Directive: 2014/30/EU Harmonized standards: EN 61326-1, EN 61326-2-3
<b>Galvanic isolation</b>	No
<b>Power supply</b>	6.0...32.0 VDC
<b>Accuracy <sup>1)</sup></b>	Max of $\pm 0,1\text{K}$ or $\pm 0,1\%$ of span
Long-term stability	$\pm 0.1$ % of span per year
<b>Mounting</b>	35 mm DIN rail acc. to EN 60715
Weight	50 g / 0.11 lb
Protection, housing / terminals	IP 20 / IP 00

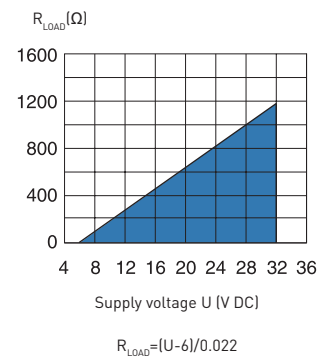
### Input connections



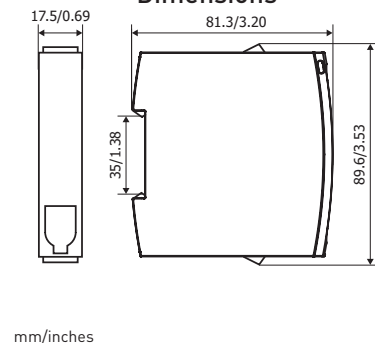
### Output connections



### Output load diagram



### Dimensions



### Ordering information

IPAQ R202	70R2020010
PC configuration kit (USB-conn.)	70CFGUSX01



# MINIPAQ-L

## Basic Programmable 2-wire Transmitter



MINIPAQ-L is a basic, programmable non-isolated, easy-to-use 2-wire transmitter. Configuration is made in seconds with the user friendly Windows software. No external power supply required for configuration. MINIPAQ-L is programmable for RTD's in 3- and 4-wire connection according to different standards as well as for 11 T/C types. Useful error correction functions improve the accuracy.

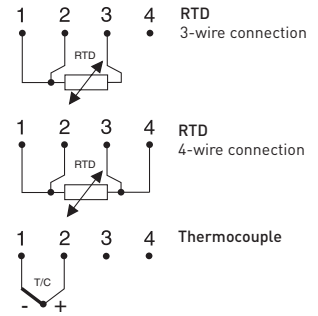
- Accepts RTD in 3- and 4-wire connection and 11 T/C types
- Temperature linear output
- Sensor error and system (sensor/transmitter) error correction for highest total accuracy
- Configuration without external power
- Easy-to-use Windows configuration software
- NAMUR compliant
- Test output without breaking the loop
- USB communication
- Withstands vibrations up to 5 g

### Specifications:

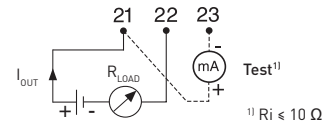
<b>Input RTD</b>	3-, 4-wire connection
Pt100 ( $\alpha=0.00385$ ) <sup>1)</sup>	-200 to +1000 °C / -328 to +1832 °F
Pt1000 ( $\alpha=0.00385$ ) <sup>1)</sup>	-200 to +200 °C / -328 to +392 °F
PtX $10 \leq X \leq 1000$ ( $\alpha=0.00385$ ) <sup>1)</sup>	Upper range depending on X-value
Pt100 ( $\alpha=0.003902$ )	-200 to +1000 °C / -328 to +1832 °F
Pt100 ( $\alpha=0.003916$ )	-200 to +1000 °C / -328 to +1832 °F
Ni100 <sup>2)</sup>	-60 to +250 °C / -76 to +482 °F
Ni1000 <sup>2)</sup>	-10 to +150 °C / +14 to +302 °F
Ni120 <sup>3)</sup>	-70 to +300 °C / -94 to +572 °F
Cu10 <sup>4)</sup>	-200 to +260 °C / -328 to +500 °F
<b>Input Thermocouples</b>	
Types	B, C, E, J, K, L, N, R, S, T, U
<b>Sensor failure</b>	Upscale, downscale or off
<b>Adjustments - Zero</b>	Any value within range limits
<b>Adjustments - Minimum spans</b>	
Pt100, Pt1000, Ni100, Ni120, Ni1000	10 °C / 18 °F
T/C	2 mV
<b>Output</b>	4-20 mA, temperature linear
<b>Operating temperature</b>	-20 to +70 °C / -4 to +158 °F
<b>Galvanic isolation</b>	No
<b>Power supply</b>	8.0...32.0 VDC
<b>Typical accuracy</b>	±0.15 % of temperature span
<b>Mounting</b>	35 mm DIN rail acc. to EN 60715

<sup>1)</sup> IEC 60751, <sup>2)</sup> DIN 43760, <sup>3)</sup> Edison No.7, <sup>4)</sup> Edison No.15

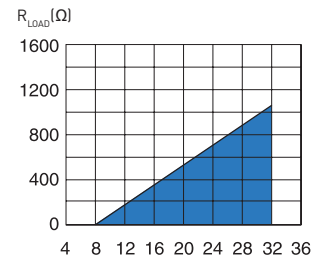
### Input connections



### Output connections



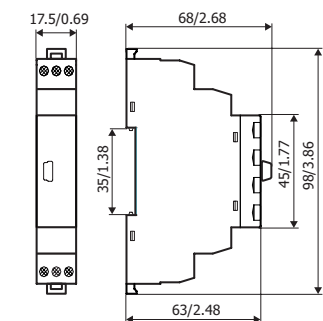
### Output load diagram



Supply voltage U (V DC)

$$R_{LOAD} = (U-8)/0.022$$

### Dimensions



mm/inch

### Ordering information

MINIPAQ-L	70MQL00003
PC Configuration Kit (USB conn.)	70CFGUSX01
Configuration	70CAL00001

# IPAQ R330

## Universal Programmable 2-wire transmitter



IPAQ R330 is a universal, isolated, temperature transmitter with additional voltage and resistance input. Its robust design and high quality gives excellent performance and accuracy also under harsh conditions.

IPAQ R330 supports communication via NFC® (Near-field communication) and Bluetooth® which makes it possible to configure and monitor the transmitter remotely.

- High accuracy and long term stability
- 50-point Customized Linearization and Callendar-Van Dusen
- Accepts RTD, T/C, mV and Ω
- Sensor error and system (sensor/transmitter) error correction for highest total accuracy
- Low temperature drift
- Configuration via USB, without external power
- Runtime counter - hour counter for elapsed operational time
- Rugged design tested for 5 g vibrations
- High security - Password protection and date of changes logged

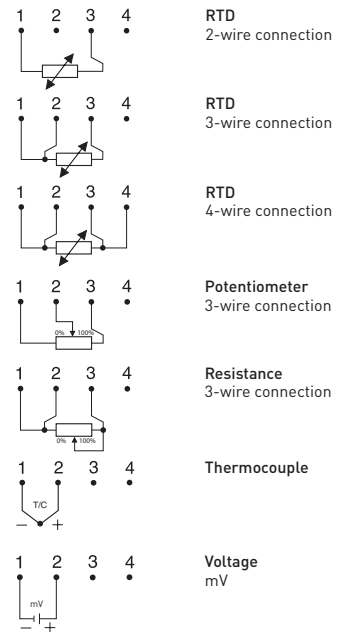
### Specifications:

<b>Input RTD</b>	2-, 3-, 4-wire connection
Pt100 (α=0.00385)	-200 to +850 °C / -328 to +1562 °F
PtX 10 ≤ X ≤ 1000 (α=0.00385)	Upper range depending on X-value
Pt100 (α=0.003916)	-200 to +850 °C / -328 to +1562 °F
Ni100 <sup>1)</sup> , Ni120 <sup>2)</sup>	-60 to +250 °C / -76 to +482 °F
Ni1000 <sup>1)</sup>	-50 to +180 °C / -58 to +356 °F
Cu10 <sup>3)</sup>	-50 to +200 °C / -58 to +392 °F
<b>Input Resistance / potentiometer</b>	0 to 10000 Ω / 100 to 10000 Ω
<b>Input Thermocouples</b>	Types B, C, D, E, J, K, N, R, S, T
<b>Input mV</b>	-10 to +1000 mV
<b>Sensor failure</b>	Upscale (≥21.0 mA) or downscale (≤3.6 mA) action
<b>Adjustments - Zero</b>	Any value within range limits
<b>Adjustments - Minimum spans</b>	
Pt100, Pt1000, Ni100, Ni1000	10 °C / 18 °F
Potentiometer	10 Ω
T/C, mV	2 mV
<b>Output</b>	4-20 / 20-4 mA, temperature linear
<b>Operating temperature</b>	-40 to +85 °C / -40 to +185 °F
<b>Galvanic isolation</b>	1500 VAC, 1 min
<b>Power supply</b>	IPAQ R330: 8.0...36.0 VDC IPAQ R330X: 8.0...30.0 VDC
<b>Intrinsic safety</b>	
IPAQ R330X ATEX:	II 1 G Ex ia IIC T6...T4 Ga
IPAQ R330X IECEx:	Ex ia IIC T6...T4 Ga
IPAQ R330X FM US:	CL I, Div 1, GP A, B, C and D / CL I, Zn 0, Ex ia IIC Ga
IPAQ R330X FM CA:	CL I, Div 1, GP A, B, C and D / CL I, Zn 0, Ex ia IIC Ga
<b>Typical accuracy</b>	±0.08°C or ±0.08% of span
<b>Mounting</b>	35 mm DIN rail acc. to EN 60715

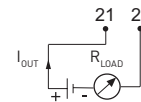
<sup>1)</sup>DIN 43760, <sup>2)</sup>Edison No.7, <sup>3)</sup>Edison No.15

### Input connections

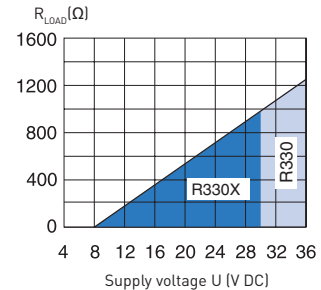
See data sheet for more alternatives



### Output connections

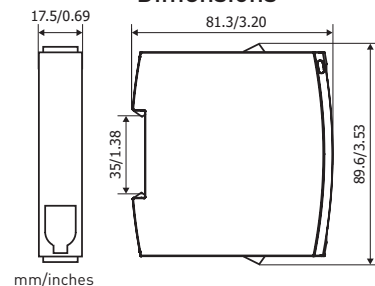


### Output load diagram



$$R_{LOAD} = (U - 8) / 0.022$$

### Dimensions



### Ordering information

IPAQ R330	70R3300012
IPAQ R330X (ATEX / IECEx)	70R330X012
IPAQ R330X (cFMus)	70R330F012
PC configuration kit (USB-conn.)	70CFGUSX01
ICON-BT Bluetooth kit	70CFGBT001
Configuration	70CAL00001

# IPAQ-L<sup>PLUS</sup>

## High-precision Universal Programmable 2-wire Transmitter



IPAQ-L<sup>PLUS</sup> offers outstanding accuracy, stability and high isolation combined with short response time and extended functionality. It is a universal 2-wire transmitter for high-demand temperature and process measurement applications. Error corrections and sensor diagnostics improve the measurement accuracy and safety.

- Fully universal, linearized and highly isolated
- Accepts RTD, T/C, mV and  $\Omega$
- Extra high accuracy and stability
- Sensor error and system (sensor/transmitter) error correction for highest total accuracy
- 40 point linearization - any sensor can be matched
- Configuration without external power
- High speed update (300 ms)
- Selectable output limits
- Low sensor isolation detection
- Full access to all features while in operation
- NAMUR compliant
- Simplified loop check-up with calibration support
- Test output without breaking the loop
- Consoft, easy-to-use Windows configuration software

### Specifications:

<b>Input RTD</b>	3-, 4-wire connection
Pt100 ( $\alpha=0.00385$ )	-200 to +1000 °C / -328 to +1832 °F
Pt1000 ( $\alpha=0.00385$ )	-200 to +200 °C / -328 to +392 °F
PtX $10 \leq X \leq 1000$ ( $\alpha=0.00385$ )	Upper range depending on X-value
Pt100 ( $\alpha=0.003902$ )	-200 to +1000 °C / -328 to +1832 °F
Pt100 ( $\alpha=0.00391$ )	-200 to +200 °C / -328 to +1832 °F
Ni100 <sup>1)</sup> , Ni120 <sup>2)</sup>	-60 to +250 °C / -76 to +482 °F
Ni1000 <sup>1)</sup>	-100 to +150 °C / -148 to +302 °F
Cu10 <sup>3)</sup>	-50 to +260 °C / -328 to +500 °F
<b>Input Potentiometer / resistor</b>	2-, 4-wire connection 0 to 2000 $\Omega$
<b>Input Thermocouples</b>	Types B, C, E, J, K, L, N, R, S, T, U
<b>Input mV</b>	-10 to +500 mV
<b>Sensor failure / Low isolation</b>	User definable output
<b>Adjustments - Loop</b>	Any value within range limits
<b>Adjustments - Minimum spans</b>	
Pt100, Pt1000, Ni100, Ni1000	10 °C / 18 °F
Potentiometer	5 $\Omega$
T/C, mV	2 mV
<b>Output</b>	4-20/20-4 mA, temperature linear
<b>Operating temperature</b>	-20 to +70 °C / -4 to +158 °F
<b>Galvanic isolation</b>	3750 VAC, 1 min
<b>Power supply</b>	7.5...36.0 VDC
<b>Typical accuracy</b>	$\pm 0.05$ % of span
<b>Mounting</b>	35 mm DIN rail acc. to EN 60715

<sup>1)</sup> DIN 43760 <sup>2)</sup> Edison No. 7 <sup>3)</sup> Edison No. 15

### Input connections

1 2 3 4 RTD 4-wire connection

1 2 3 4 RTD 3-wire connection Low isolation detection lead (Pt100)

2 3 4 Pt100 Diff temperature T1 > T2

1 2 3 4 Potentiometer 2-wire connection

1 2 3 4 Potentiometer 4-wire connection

mV Voltage mV

1 2 3 4 Thermocouple Low isolation detection lead

### Output connections

5 6 7 Test<sup>1)</sup>

$I_{OUT}$   $R_{LOAD}$  mA

<sup>1)</sup>  $R_i \leq 10 \Omega$

### Output load diagram

$R_{LOAD} (\Omega)$

Supply voltage U (V DC)

$R_{LOAD} = (U - 7.5) / 0.022$

### Dimensions

17,5/0,69 58/2,28 35/1,38 45/1,77 90/3,54

mm/inches

### Ordering information

IPAQ-L <sup>PLUS</sup>	701PLP0001
PC Configuration Kit	70CFGUSX01
Configuration	70CAL0001

# IPAQ R530

## Smart HART-compatible 2-wire Transmitter



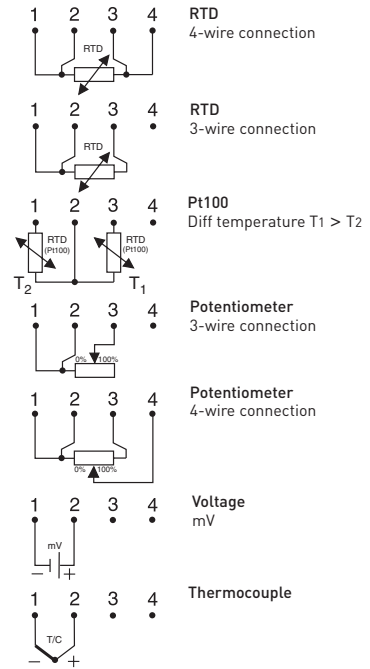
IPAQ R530 is a modern, HART® temperature transmitter developed to meet the highest standards of accuracy and reliability. A universal transmitter compatible with RTD, thermocouples, voltage and potentiometer sensors. It is fully compatible with HART® 7 and offers extended diagnostic information, for example device error, sensor and wiring conditions. IPAQ R530 supports communication via NFC® (Near-field communication) and Bluetooth® which makes it possible to configure and monitor the transmitter remotely.

- High accuracy and long term stability
- Accepts RTD, T/C, mV and ohm
- Sensor error correction
- 50-point Customized Linearization and Callendar-Van Dusen
- Low temperature drift
- High security - Password protection and date of changes logged
- Configuration via USB, without external power
- Runtime counter - hour counter for elapsed operational time
- Communicates with HART Communicator or PC via modem
- Integrated in Emerson AMS and Siemens PDM systems

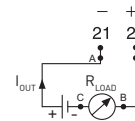
### Specifications:

<b>Input RTD</b>	2-, 3-, 4-wire connection
Pt100 ( $\alpha=0.00385$ )	-200 to +850 °C / -328 to +1562 °F
PtX 10 ≤ X ≤ 1000 ( $\alpha=0.00385$ )	Upper range depending on X-value
Pt100 ( $\alpha=0.003916$ )	-200 to +850 °C / -328 to +1562 °F
Ni100 <sup>1)</sup> , Ni120 <sup>2)</sup>	-60 to +250 °C / -76 to +482 °F
Ni1000 <sup>1)</sup>	-50 to +180 °C / -58 to +356 °F
Cu10 <sup>3)</sup>	-50 to +200 °C / -58 to +392 °F
<b>Input Resistance / potentiometer</b>	0 to 10000 Ω / 100 to 10000 Ω
<b>Input Thermocouples</b>	Types B, C, D, E, J, K, N, R, S, T
<b>Input mV</b>	-10 to +1000 mV
<b>Sensor failure</b>	Upscale ( $\geq 21.0$ mA) or downscale ( $\leq 3.6$ mA) action
<b>Adjustments - Zero</b>	Any value within range limits
<b>Adjustments - Minimum spans</b>	
Pt100, Pt1000, Ni100, Ni1000	10 °C / 18 °F
Potentiometer	100 Ω
T/C, mV	2 mV
<b>Output</b>	4-20 / 20-4 mA, temperature linear
<b>Operating temperature</b>	-40 to +85 °C / -40 to +185 °F
<b>Galvanic isolation</b>	1500 VAC, 1 min
<b>Power supply</b>	IPAQ R530 8.5...36.0 VDC
	IPAQ R530X 8.5...30.0 VDC
<b>Intrinsic safety</b>	
IPAQ R530X ATEX:	II 1G Ex ia IIC T6...T4 Ga
IPAQ R530X IECEx:	Ex ia IIC T6...T4 Ga
IPAQ R330X FM US:	CL I, Div 1, GP A, B, C and D / CL I, Zn 0, Ex ia IIC Ga
IPAQ R330X FM CA:	CL I, Div 1, GP A, B, C and D / CL I, Zn 0, Ex ia IIC Ga
<b>Typical accuracy</b>	$\pm 0.08^\circ\text{C}$ or $\pm 0.08\%$ of span
<b>Mounting</b>	35 mm DIN rail acc. to EN 60715
<sup>1)</sup> IEC 60751, $\alpha=0.00385$ and Pt100 acc. to JIS 1604, $\alpha=0.003916$	<sup>2)</sup> DIN 43760
<sup>3)</sup> Temperature, resistance or voltage linear, customized linearization possible	

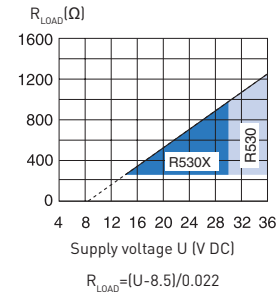
### Input connections



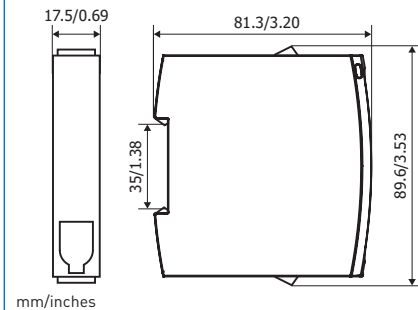
### Output connections



### Output load diagram



### Dimensions

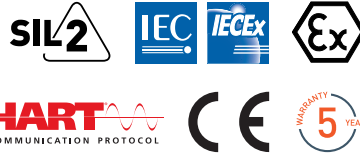


### Ordering information

IPAQ R530	70R5300010
IPAQ R530X (ATEX / IECEx)	70R530X010
IPAQ R530X (cFMus)	70R530F010
HART PC modem USB	70MEM00003
PC configuration kit (USB-conn.)	70CFGUSX01
ICON-BT Bluetooth kit	70CFGBT001
Configuration	70CAL00001

# IPAQ R520

## Smart HART-compatible Dual-input 2-wire Transmitter



The IPAQ R520 transmitters are universal, isolated, dual-input temperature transmitters with additional voltage and resistance input. R520X/R520XS are Intrinsically Safe versions for use in Ex-Zone 1 and 2. The transmitters are compatible with the HART 6 protocol. Typical characteristics are the high accuracy, stability and reliability combined with a robust housing.

- Universal, dual-input for RTD and T/C
- SIL 2 compatible according to IEC 61508-2
- 5 year guaranteed stability
- Withstands vibrations up to 5 g
- Complies with NAMUR NE 21, NE 43, NE 53, NE 89 and NE 107
- EMC immunity according to Criteria A
- Sensor Backup
- Sensor Drift Monitoring
- Sensor Isolation Monitoring
- Sensor Matching
- 50 point customized linearization
- Integrated in Emerson AMS and Siemens PDM systems

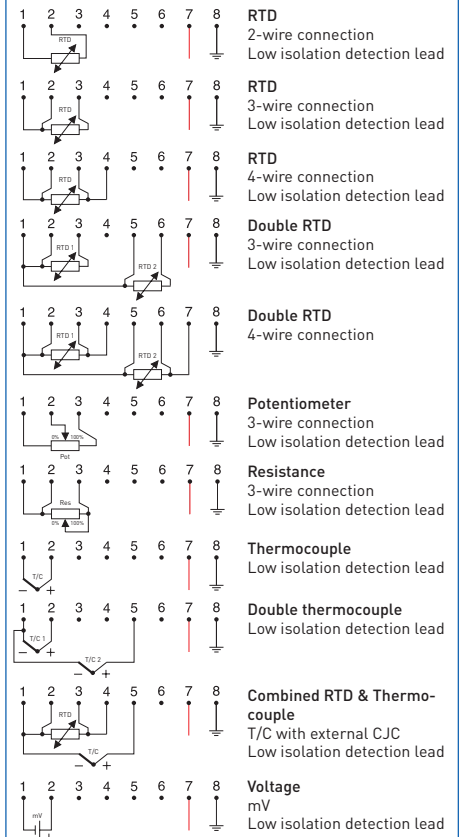
### Specifications:

Input RTD		
Pt100	(IEC 60751, $\alpha=0.00385$ )	-200 to +850 °C
PtX (10 ≤ X ≤ 1000)	(IEC 60751, $\alpha=0.00385$ )	Corresp. to max. 4000 Ω
Pt100	(JIS C 1604, $\alpha=0.003916$ )	-200 to +850 °C
Ni100	(DIN 43760)	-60 to +250 °C
Ni120	(Edison Curve No. 7)	-60 to +250 °C
Ni1000	(DIN 43760)	-50 to +180 °C
Cu10	(Edison Cu Windings No. 15)	-50 to +200 °C
Input connections	One sensor	2-, 3- and 4-wire connection
	Two sensors	2-, 3- and 4-wire connection
Input Thermocouple	T/C types	B, C, D, E, J, K, N, R, S, T
Input Resistance	Potentiometer	100 to 4000 Ω, 2-, 3- and 4-wire connection
Input Voltage		-10 to +1000 mV
Double inputs for RTD and Thermocouple		
Measure mode		T1 or T2 or difference, average, min, max of T1 and T2
Sensor Redundancy		Automatic switchover to undamaged sensor
Sensor Drift Monitoring		Adjustable maximum temp. difference T1-T2
Output		
Output signal	Temperature linear	4-20 mA, 20-4 mA or customized
NAMUR compliance	Measure and fail currents	NAMUR, NE 43
Test output		mA meter with impedance ≤10 Ω
Galvanic isolation		1500 VAC, 1 min
Ex-classifications	R520X/R520XS	ATEX: II 2(1)G Ex ia [ia Ga] IIC T6...T4 Gb <sup>1)</sup> IECEx: Ex ia [ia Ga] IIC T6...T4 Gb <sup>1)</sup>
Power supply	R520/R520S	10.0...36.0 VDC, Standard power supply
	R520X/R520XS	10.0...30.0 VDC, I.S. power supply
Ambient temperature	Storage/operation	-20 to +70 °C
Accuracy	RTD (Pt and Ni sensors)	Max. of ±0.1 °C or ±0.05 % of span
	Thermocouple	Typical ±0.05 % of span
	Resistance/voltage	See data sheet
Long-term stability		Max. drift: ±0.05 % of span / 5 years
Mounting		35 mm DIN rail acc. to EN 60715

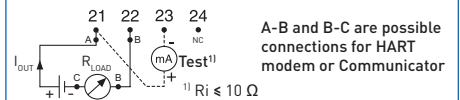
<sup>1)</sup> For Tambient, see the manual

### Input connections

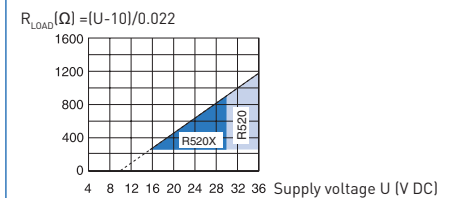
See data sheet for more alternatives



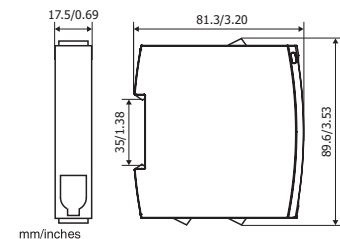
### Output connections



### Output load diagram



### Dimensions



### Ordering information

IPAQ R520	70R5200010
IPAQ R520S, SIL 2 compatible	70R5200S10
IPAQ R520X	70R520X010
IPAQ R520XS, SIL 2 compatible	70R520XS10
ICON PC configuration kit (USB-conn.)	70CFGUSX01
Configuration	70CAL00001

# APAQ-3HPT

## Basic Analog Adjustable 3-wire Transmitter



APAQ-3HPT is a multirange 3-wire temperature transmitter with Pt100 input and 0-10 V output. Main applications are in the HVAC sector, where the control systems often require 0-10 V input signals. APAQ-3HPT is designed for high reliability and good industrial performance. The "low profile" housing is extremely durable and facilitates easy connection and adjustments.

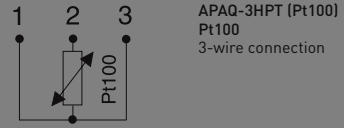
- 0-10 V output
- Rangeable with solder pads and potentiometers
- Temperature linear output
- Selectable sensor break function
- Short-circuit protected output
- Polarity protected power supply
- Easy wiring, large center hole
- Moulded electronics for high protection

### Specifications:

APAQ-3HPT (Pt100)	
<b>Input</b>	Pt100 <sup>1)</sup> , 3-wire connection
Maximum lead resistance	11 Ω / wire
Sensor break	Upscale (> 11 V), or downscale (< 0 V)
<b>Adjustments</b>	
Span	50/100/150/200/250/300 °C 100/200/300/400 °F
Fine adjustment	±0.1% / 100 °C
Zero	-50 to +125 °C
<b>Output</b>	0-10 V, 3-wire connection
Minimum load	10 kΩ
Short-circuit protection	Yes
Operating Temperature	-25 to +85 °C / -40 to +185 °F
Linearization	Temperature linear output
Galvanic isolation	No
Power Supply	15 to 30 VDC (polarity protected)
Current consumption	10 mA
Typical accuracy	±0.1% of temperature span
Connection head	DIN B or larger

<sup>1)</sup>IEC 60751, α=0.00385

### Input connections

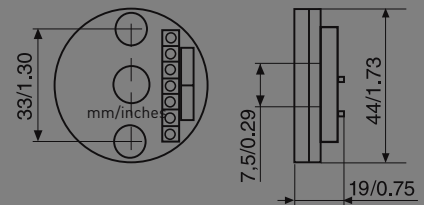


### Output & power supply connections



DISCONTINUED

### Dimensions

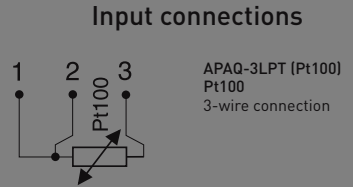


### Ordering information

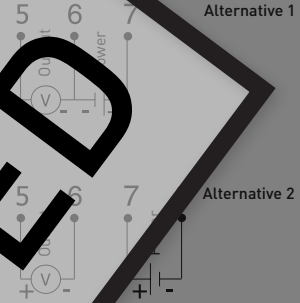
APAQ-3HPT (Pt100)	70AP3H0001
Configuration	70CAL00001

# APAQ-3LPT

## Basic Analog Adjustable 3-wire Transmitter



### Output & power supply connections



APAQ-3LPT is a multirange 3-wire temperature transmitter with Pt100 or Pt1000 input and 0-10 V output. Main applications are in the HVAC sector, where the control systems often require 0-10 V input signals. APAQ-3LPT is designed for high reliability and good industrial performance.

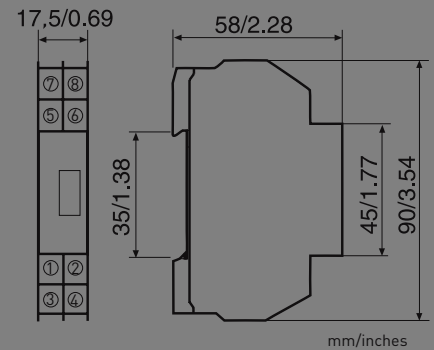
- 0-10 V output
- Rangeable with solder pads and potentiometers
- Temperature linear output
- Selectable sensor break function
- Short-circuit protected output
- Polarity protected power supply

DISCONTINUED

### Specifications:

	APAQ-3LPT (Pt100)
<b>Input</b>	Pt100 3-wire connection
Maximum lead resistance	11 Ω / 0.43 Ω
<b>Sensor break</b>	On/Off (0 V), Diagnostics (0 V)
<b>Adjustments</b>	
Span	50/100/150/200 °C 50/300/500 °F
Fine adjustment	±10 %
Zero	-50 to +150 °C -50 to +120 °F
<b>Output</b>	0-10 V, 3-wire connection
Minimum load	0 kΩ
Short-circuit protection	Yes
<b>Operating temperature</b>	-20 to +70 °C / -4 to +158 °F
<b>Linearization</b>	Temperature linear output
<b>Galvanic isolation</b>	No
<b>Power Supply</b>	15 to 30.0 VDC (polarity protected)
Current consumption	10 mA
<b>Typical accuracy</b>	±0.15 % of temperature span
<b>Mounting</b>	35 mm DIN rail acc. to EN 60715

### Dimensions



### Ordering information

APAQ-3LPT (Pt100)	70AP3L0001
Configuration	70CAL00001

<sup>1)</sup> IEC 60751, α=0.00385

# IPAQ-4L

## Universal High-Isolation 4-wire Transmitter



IPAQ-4L is a fully universal and programmable 4-wire (separately powered) transmitter. The high isolation provides safe and problem free measurements. Offering both current and voltage output, IPAQ-4L meets any process requirements. Designed for wall and DIN-rail mounting.

- High level isolation - 4000 VAC
- Fully universal and linearized
- Accepts RTD, T/C, mV, V, mA and  $\Omega$
- Current and voltage output
- Sensor and system error correction
- Full access to all features while in operation
- NAMUR compliant
- Consistent sensor break function
- Simplified loop check-up with calibration output
- Low sensor isolation detection
- IPRO, easy-to-use Windows configuration software

### Specifications:

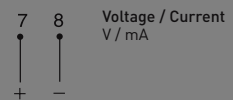
<b>Input RTD and Resistance</b>	3-, 4-wire connection
Pt100 <sup>1)</sup>	-200 to +1000 °C / -328 to +1832 °F
Pt1000 ( $\alpha=0.00385$ )	-200 to +200 °C / -328 to +392 °F
PtX $10 \leq X \leq 1000$ ( $\alpha=0.00385$ )	Temperature range depending on X value
Ni100 <sup>2)</sup> , Ni120 <sup>3)</sup>	-60 to +250 °C / -76 to +482 °F
Ni1000 <sup>2)</sup>	-100 to +150 °C / -148 to +302 °F
Cu10 <sup>4)</sup>	-200 to +500 °C / -328 to +500 °F
Potentiometer / resistance	0 to 8000 $\Omega$
<b>Input Thermocouple</b>	B, C, E, J, K, L, N, R, S, T, U
<b>Input Voltage</b>	-10 to +500 mV / -10 to +50 V
<b>Input Current</b>	0 to +50 mA
<b>Sensor failure / Low isolation</b>	User definable output
<b>Adjustments - Zero</b>	Any value within range limits
<b>Adjustments - Minimum spans</b>	
Pt100, Pt1000, Ni100, Ni1000	10 °C/18 °F
Potentiometer	10 $\Omega$ for $R \leq 2000 \Omega$ , 100 $\Omega$ for $R > 2000 \Omega$
T/C, mV	2 mV
Volt	0,25 V
Current	0.4 mA
<b>Output</b>	0/4-20 or 20-4/0 mA, 0/2-10 or 10-2/0 V
<b>Operating temperature</b>	-20 to +70 °C/-4 to +158 °F
<b>Galvanic isolation</b>	4000 VAC, 1 min
<b>Power supply</b>	Part No. 70IP4L0001 90.0...250.0 VAC / 110 to 220 VDC Part No. 70IP4L0002 20.0...30.0 VDC
<b>Typical accuracy</b>	$\pm 0.1\%$ of span
<b>Mounting</b>	35 mm DIN rail acc. to EN 60715 and wall (brackets)

<sup>1)</sup>  $\alpha=0.00385$ ,  $\alpha=0.003916$  or  $\alpha=0.003902$  <sup>2)</sup> DIN 43760 <sup>3)</sup> Edison No. 7 <sup>4)</sup> Edison No. 15

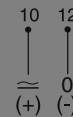
### Input connections



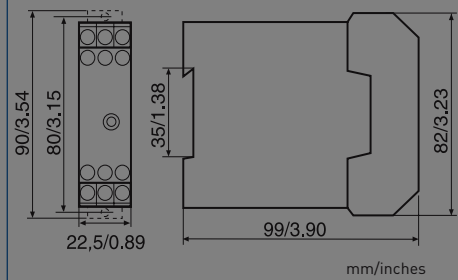
### Output connections



### Power supply



### Dimensions



### Ordering information

IPAQ-4L	70IP4L0001
[Power supply 90-250 VAC/110-220 VDC]	
IPAQ-4L	70IP4L0002
[Power supply 20-30 VDC]	
PC Configuration Kit	70CFGUSX01
Configuration	70CAL00001



# IPAQ-CT20

Analog  
PC-configurable  
compact transmitter



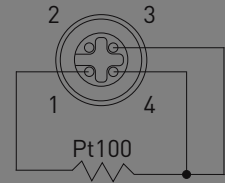
IPAQ CT20 is a compact, analog, non-isolated, 2-wire temperature transmitter for Pt100 3W input with a temperature linear 4-20 mA output signal. The transmitter has integrated M12 connectors for both input and output connections. It comes in a robust, IP67 casing with M12 connections in both ends and offers the highest levels of flexibility and reliability.

- Input: Pt100 in 3-wire connection
- PC configurable measuring ranges without need for calibration
- Temperature linear output
- Very short response time
- Configuration without external power
- Easy-to-use Windows configuration software

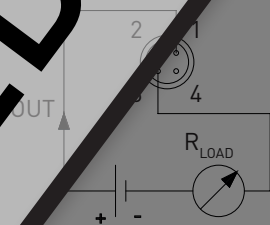
## Specifications:

Input	3-wire Pt100 IEC 60751, $\alpha=0.00385$
Sensor current	1 mA
Output	Analog, 4-20 mA, temperature linear
Response time (90%)	< 10 ms
Permissible load	750 $\Omega$ @ 24 VDC
Measuring range limit	-50...+200 °C
Zero limits	-50...+50 °C
Minimum span	50 °C or 20 °C
Sensor error compensation	Max. $\pm 1$ % of span (2 points compensation)
Sensor break	Selectable, Upscale ( $\geq 21.0$ mA) or downscale ( $\leq 3.6$ mA) action
Sensor short-circuit	Fixed, downscale ( $\leq 3.6$ mA) action
Ambient temperature	-40 to +85 °C (storage and operation)
Humidity	0 to 100 %RH
Vibrations	Acc. to IEC 60068-2-6, test Fc, 10-2000 Hz, 10g
EMC	Acc. to IEC 61326-1
<b>General data</b>	
Galvanic isolation	No
Power supply	7.5...32.0 VDC, polarity protected
Basic accuracy	Max. of $\pm 0.2$ °C or $\pm 0.2$ % of span
Temperature influence	Max. of $\pm 0.01$ °C per °C or $\pm 0.01$ % of span per °C
Long-term stability	$\pm 0.1$ % of span per year
Process connection input	M12x1, 4-pin, A-coded, Female
Process connection output	M12x1, 4-pin, A-coded, Male
Weight	16 g
Protection	IP67

## Input connections

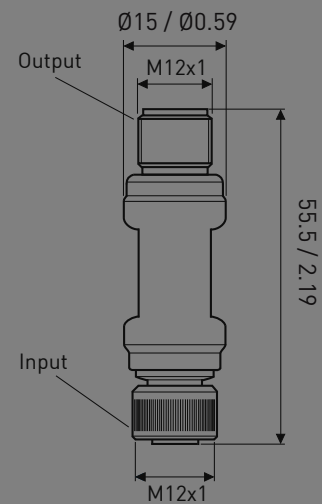


## Output connections



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## Dimensions



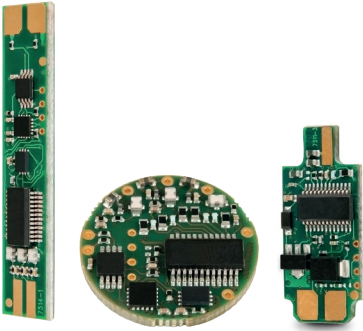
mm/inches

## Ordering information

IPAQ CT20	70CT200010
ICON-X Configuration Kit	70CFGUSX01
M12 adapter cable for USB Interface	4004430401
Output connecting cable with angled M12 connector, length 2 m	4003211501
Output connecting cable with angled M12 connector, length 5 m	4003211502

## OEM202

### Digital temperature transmitters for integration



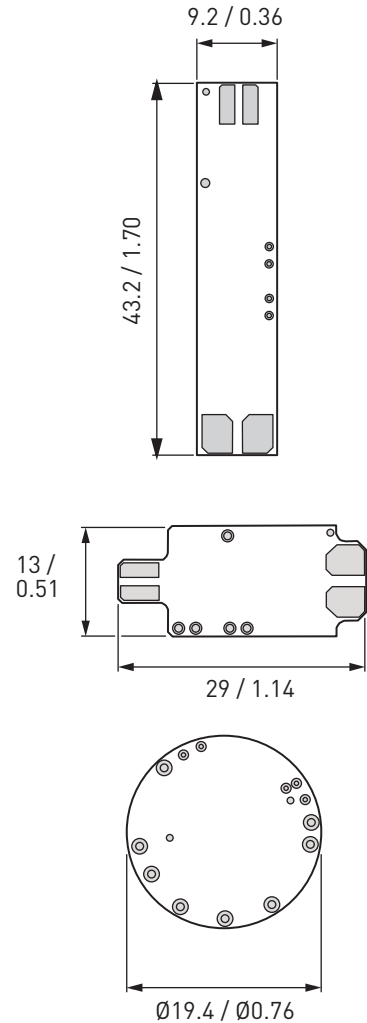
OEM202 are digital temperature transmitters for integration into temperature sensors, systems or machines, for converting a low-level sensor output to an amplified signal. Based on INOR's successful transmitter IPAQ C202, OEM202 offers high accuracy and fast response time. The small form factor and the three different designs, allows it to fit almost any application. The transmitter range is available in preconfigured, as well as configurable versions. The transmitter is connected to the process and sensor with solder pads.

- Input: Pt100 and Pt1000 in 2-, 3-, 4-wire connection
- PC configurable measuring ranges without need for calibration
- Temperature linear output
- Very short response time
- Configuration without external power
- Easy-to-use Windows configuration software

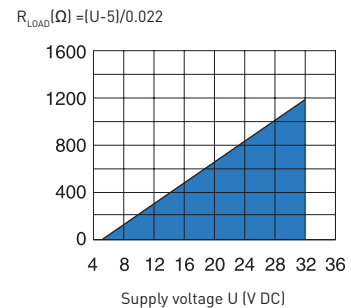
#### Specifications:

Input Pt100/Pt1000	2-, 3-, 4-wire connection
Pt100	-200... +850 °C / -328... +1562 °F
Pt1000	-200... +850 °C / -328... +1562 °F
Output	4...20 mA
Sensor break	Upscale / Downscale alarm
Sensor short-circuit	Upscale / Downscale alarm
Measuring range	-200... +850 °C / -328... +1562 °F
Ambient temperature	Operating: -40...+85°C / -40... +185 °F Storage: -50...+100°C / -58... +212 °F
Humidity	0... 98% RH non condensing
Vibration	Acc. to IEC20068-2-6, test Fc, 10-2000Hz, 10g
Shock	Acc. to IEC60068-2-31, test Ec
EMC	Acc. to IEC61326-1
Accuracy	Max of ±0,1°C or ±0,1% of span
Long-term stability	Max of ±0,25° or ±0,25% / 5 year of span
Adjustable Filter	0,15 to 20sec (or more)
EMC	Acc. to IEC 61326-1
<b>General data</b>	
Galvanic isolation	No
Power supply	5.0...32.0 VDC
Permissible load	(Supply voltage-5) / 0.022

#### Dimensions



#### Output load diagram



mm/inches

#### Ordering information

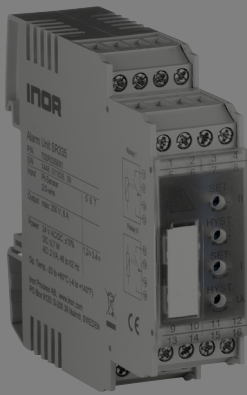
OEM202W	700EM202W1
OEM202R	700EM202R1
OEM202P	700EM202P1



Go to  
Application  
Guidelines

# SR335

## Alarm Unit with Pt100 Input and Double Relay Outputs



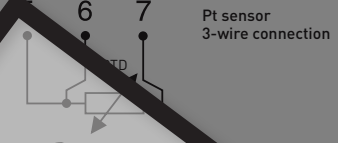
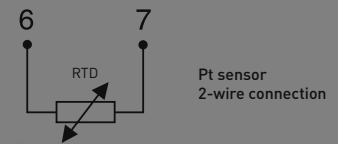
SR335 is designed for industrial temperature monitoring with Pt100 sensors in 2- or 3-wire connection. Two output relays with individually adjustable trip functions are available. LED's in the front indicate alarm state and correct power supply.

- Input from Pt100 sensors in 2- or 3-wire connection
- Selectable, pre-calibrated temperature ranges
- Two relay outputs with independent switch functions
- Monostable relays for safe tripping at power failure
- SPDT relays with 6 A switch capacity
- High configuration flexibility with DIP switches
- Trip levels and hysteresis adjustable from the front
- Three front LED's for trip indication and power supply monitoring
- 4 kV isolation between input, output and power supply
- Protective Separation acc. to EN 60178
- Universal 24 V AC and DC power supply
- DIN-rail mounting

### Specifications:

<b>Input</b>	
Sensor	Pt100, Pt200, Pt500 and Pt1000 (switch selectable)
Standard	IEC 60751, $\alpha = 0$
Measuring range	Zero: -100 / -50 / 0 / +50 °C (switch selectable) Span: 100 / 200 / 300 / 400 °C (switch selectable)
Sensor connection	2-wire and 3-wire (switch selectable)
Sensor wire resistance	≤10 Ω per wire
<b>Output, Relay 1 &amp; 2</b>	
Relay contacts	1-pole with overvoltage contact (SPDT)
Contact rating	250 VAC/DC, 6 A / 300 VA
Relay function	Adjustable, normally active or passive (switch selectable)
Alarm functions, relay 1	High/Low alarm (switch selectable)
Alarm functions, relay 2	High/Low alarm or Power failure alarm (switch selectable)
Alarm indication	Alarm state indicated by yellow LED
Adjustable alarm set-point	0 to 100 % of input range (12-turn potentiometers in front)
Adjustable hysteresis	0 to 60 % of span (12-turn potentiometers in front)
Response time	ca. 20 ms (fixed)
Operation temperature	-20 to +60 °C / -4 to +140 °F
<b>Galvanic isolation</b>	
Input / power supply / relay output	4.0 kV / 1 min
Relay 1 / Relay 2	1.5 kV / 1 min
<b>Power supply</b>	
Voltage	24 VAC/DC ±15 %, 48 to 62 Hz (AC supply)
Power consumption	AC: ca. 2 VA, DC: ca. 1 W
Typical accuracy	Trip point: ±0.2 % of span
Mounting	35 mm DIN rail acc. to EN 60715

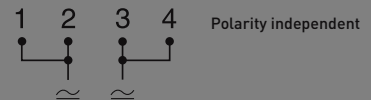
### Input connections



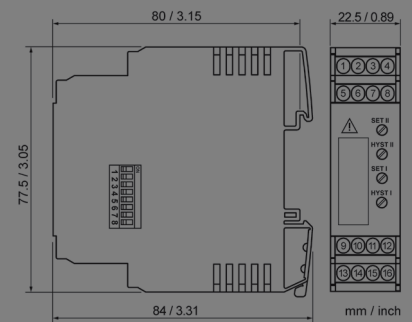
### Output connections



### Power supply



### Dimensions



### Ordering information

SR335, 24 VAC/DC	70SR335001
Configuration	70CAL0001

SR360 is not RoHS compliant and only sold as sparepart.

# SR361

## Alarm Unit with Current and Voltage Input and Double Relay Outputs



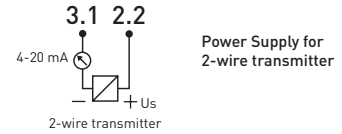
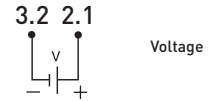
SR361 is designed for monitoring current and voltage signals in the process industry. Two output relays can be configured independently or simultaneously of each other. LED's in the front indicate alarm state and correct power supply.

- Current and voltage input
- A transmitter supply is provided for the operation of 2-wire transmitters
- Two relay outputs with independent or simultaneously switch functions
- Monostable relays for safe tripping at power failure
- SPDT relays with 6 A switch capacity
- High configuration flexibility with DIP switches
- Trip levels and hysteresis adjustable from the front
- Three front LED's for trip indication and power supply monitoring
- 4 kV isolation between input, output and power supply
- Protective Separation acc. to EN 61140
- 24 V DC power supply
- DIN-rail mounting

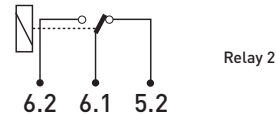
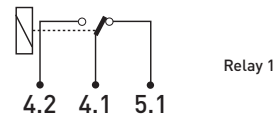
### Specifications:

<b>Input Current</b>	0(4) to 20 mA
<b>Input impedance</b>	5 Ω
<b>Maximum overload</b>	200 mA
<b>Input Voltage</b>	0(2) to 10 V
<b>Input impedance</b>	120 kΩ
<b>Maximum overload</b>	300 V
<b>2-wire Transmitter Supply +Us</b>	16 V at UPower = 24 V, (13 ... 22 V depending on the supply voltage) current limited ≤ 30 mA
<b>Output, Relay 1 &amp; 2</b>	
<b>Relay contacts</b>	1-pole switch over contact (SPDT)
<b>Contact rating</b>	250 VAC / 6 A, 1500 VA   250 VDC / 0.2 A, 115 VDC / 0.3 A, 30 VDC / 6 A
<b>Relay function</b>	Monostable, Open/Closed-Circuit Operation (switch selectable)
<b>Alarm functions, relay 1</b>	High/Low alarm (switch selectable)
<b>Alarm functions, relay 2</b>	High/Low alarm (switch selectable)
<b>Alarm indication</b>	Alarm state indicated by yellow LED
<b>Adjustable alarm set-point</b>	0 to 110 % with 12-turn potentiometer, independently adjustable for each relay output
<b>Adjustable hysteresis</b>	0 to 6 % or 0 to 60 % of input span, switchable and adjustable in front
<b>Response time</b>	Ca. 20 ms (fixed)
<b>Operation temperature</b>	-20 to +60 °C / -4 to +140 °F
<b>Galvanic isolation</b>	
<b>Input / power supply / relay outputs</b>	Test Voltage: 4 kV AC Working voltage: 1 kV AC/DC for OVC II, 600 V AC/DC for OVC III)
<b>Relay 1 / Relay 2</b>	Test Voltage: 3 kV AC   Working Voltage: 300 V AC/DC
<b>Power supply</b>	
<b>Supply voltage</b>	24 V DC, ± 15 %, approx. 1.0 W
<b>Typical accuracy</b>	Trip point: ±0.2 % of span
<b>Mounting</b>	35 mm DIN rail acc. to EN 60715

### Input connections



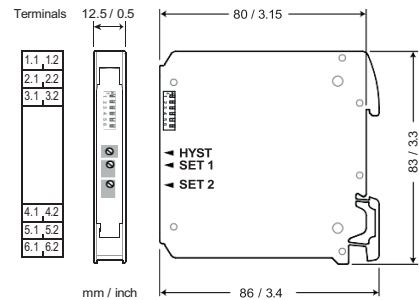
### Output connections



### Power supply



### Dimensions



### Ordering information

SR361

70SR361001



## ICON-X

# Ex-certified Transmitter Configuration Kit



ICON-X is a complete kit for PC configuration of all\* PC programmable transmitters in the INOR product line. The kit contains the INOR USB Interface, transmitter cables and the software, Consoft. Communication with the connected transmitter is established automatically, without any problems to match the PC communication port to the software.

ICON-X is Ex-certified, which allows the transmitter to be configured in a safe area with the temperature sensor still connected in an explosive atmosphere.

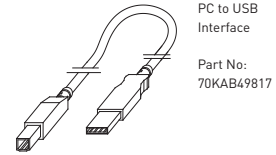
- USB communication
- Automatic matching of communication ports
- Automatic transmitter identification for quick start up
- Diagnostic LED's on the USB Interface show the communication status
- Simple installation of configuration software and drivers for the USB Interface
- Free download of configuration software, Consoft, and USB Interface software from our website
- Protection against supply of energy in an explosive atmosphere

### Specifications:

Input (PC to USB Interface)	USB cable type A to type B
Output (USB Interface to transmitter)	Changeable transmitter cables
Power Supply	PC's USB port, 5 VDC, 74 mA max
Ambient temperature	
Operation	0 to 50 °C / 32 to 122 °F
Storage	-20 to 70 °C / -4 to 140 °F
Humidity	0 to 90 % RH
Galvanic isolation	1500 VAC
USB compliance	1x USB 1.1 or higher port type A
System requirements	
Windows	32- or 64-bit edition of Windows XP (SP2+) / Vista / 7 / 8 / 8.1 / 10
Free hard drive space	185 MB
PC Port	1x USB 1.1 or higher port type A
EX data	
0539 II (1)G [Ex ia Ga] IIC	U <sub>0</sub> : 9.4 V
KIWA 16ATEX0011X	I <sub>0</sub> : 96 mA
IECEx KIWA 16.0005X	P <sub>0</sub> : 0.68 W
FM18US0117X	Associated Intrinsically Safe Apparatus
FM18CA0056X	Associated Intrinsically Safe Apparatus
Um : 250 V AC/DC	

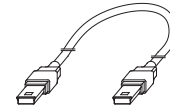
\* Cables for IPAQ CT20 and OEM 201/202 are not included in the kit

### Connection cables



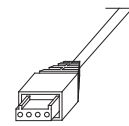
PC to USB  
Interface

Part No:  
70KAB49817



USB Interface to  
IPAQ C201  
MiniIPAQ-HLP/-L  
IPAQ C202/C202X  
IPAQ R202  
IPAQ C330/C330X  
IPAQ R330/R330X  
IPAQ C530/C530X  
IPAQ R530/R530X  
IPAQ C520/C520X  
IPAQ R520/R520X

Part No:  
70KAB49717



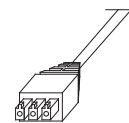
USB Interface to  
IPAQ-Hplus/-Lplus  
IPAQ-21L/-22LX  
ProfIPAQ-H/-HX/-L

Part No:  
70KAB49717



USB Interface to  
IPAQ-L/LX  
IPAQ-4L

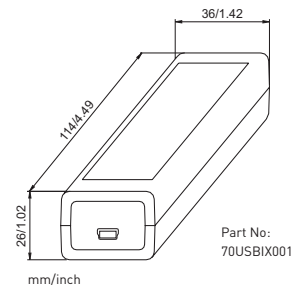
Part No:  
70KAB49719



USB Interface to  
IPAQ-H/-HX

Part No:  
70KAB49726

### USB Interface



Part No:  
70USBIX001

### Ordering information

ICON-X Configuration Kit [Ex]

70CFGUSX01



## ICON-BT

### Configuration kit for remote configuration and monitoring



ICON-BT is a Bluetooth® modem for wireless communication between smartphones/tablets and INOR temperature transmitters. Together with the app INOR Connect, you can configure and monitor the transmitter while it is still mounted in the process. Simply plug in your ICON-BT to the USB connector on the transmitter and connect with your portable device. Thanks to the extended range that Bluetooth offers you can communicate with the transmitter remotely.

- Communication via Bluetooth®
- Great tool for service and maintenance
- Optimised for work on the field
- Small form factor of ICON-BT modem
- Live monitoring and diagnostics

### Specifications:

Ambient temperature operating	-20... +50 °C / - 4...+122 °F.
Bluetooth	BLE 4.2
Size	71 x 28 x 24 mm
Weight	50 gram including batteries
DID	D038134
Included in the kit	ICON-BT USB-Cable Batteries Quick guide

### Download Inor Connect

#### App Store



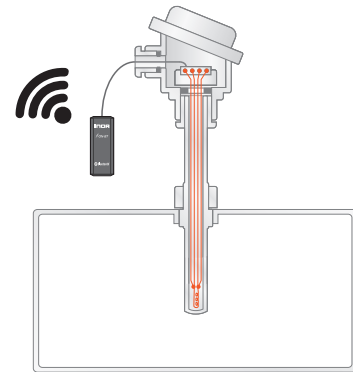
#### Google Play Store



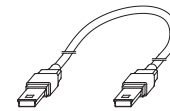
#### Huawei AppGallery



### Installation

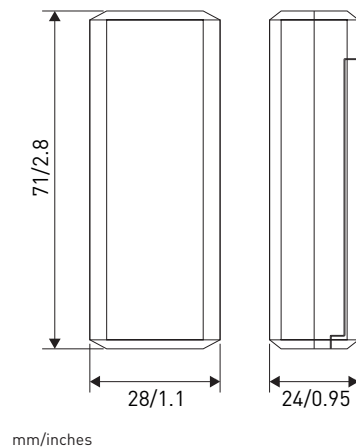


### Connection cable



USB Mini-B  
From Bluetooth modem  
to transmitter

### Dimensions



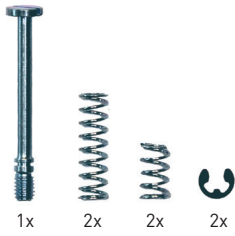
### Ordering information

ICON-BT Kit

70CFGBT001

## Mounting Accessories

### Head mounting kit



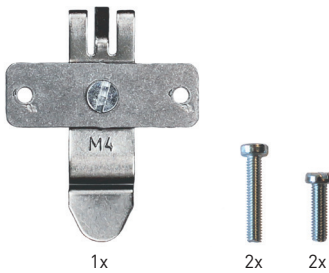
Head mount kit that fits Transmitter: IPAQ-C 130, IPAQ C202, miniIPAQ-H, IPAQ C330, IPAQ C520 and IPAQ C530

#### Ordering information

Head mounting kit 70ADA00017



### Rail clip - heavy duty

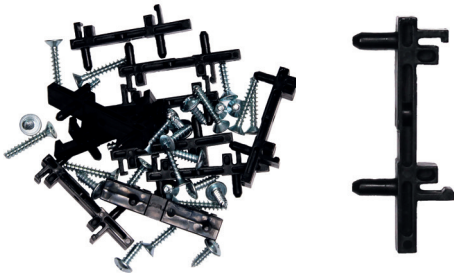


- Rail clip with heavy duty aluminium plate to mount in-head transmitter on DIN rail.
- Fits all in-head transmitters

#### Ordering information

Rail clip with heavy duty 70ADA00013

### Rail clip - with general purpose



- Rail clip with general purpose PVA to mount in-head transmitter on DIN rail.
- Package contains 10 sets
- Fits all in-head transmitters

#### Ordering information

Rail clip with general purpose 70ADA00027

### Surface mount box

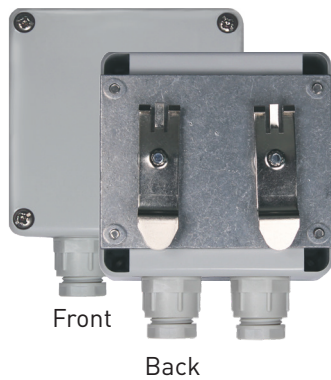


- Field box for surface mounting.
- Measurements:  
D:55/2.17 H:100/3.94 W:82/3.23 mm/inches
- Fits all in-head transmitters

#### Ordering information

Surface mount box 70ADA00008

## Rail mount box

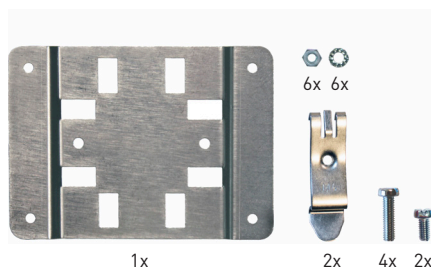


- Field box for DIN rail mounting.
- 35 mm DIN rail
- Measurements: D:55/2.17 H:100/3.94 W:82/3.23 mm/inches
- Fits all in-head transmitters

### Ordering information

Rail mount box 70ADA00009

## DIN Rail mounting kit

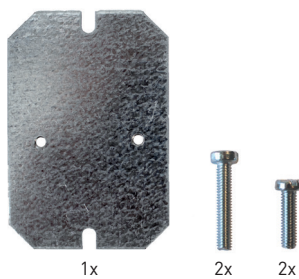


DIN Rail mounting kit for LED-W11 and LED-W11X

### Ordering information

DIN Rail mounting kit 70ADA00022

## Transmitter mounting kit

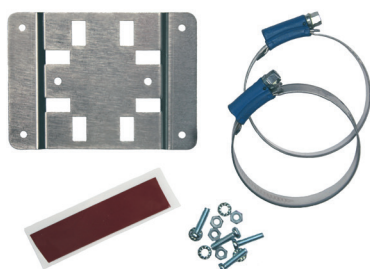


Transmitter mounting kit for LED-W11 and LED-W11X

### Ordering information

Transmitter mounting kit 70ADA00024

## Pipe mounting kit



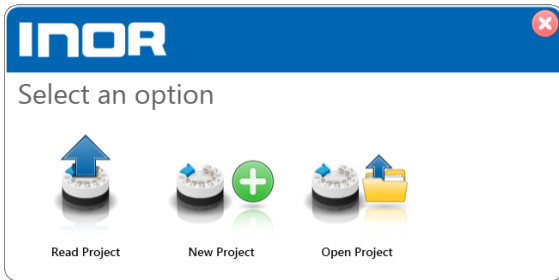
Pipe mounting kit for LED-W11 and LED-W11X

### Ordering information

Pipe mounting kit 70ADA00021



# ConSoft - INOR Configuration Software



Consoft is an intuitive tool for safe and simple configuration of all PC programmable INOR transmitters. The configuration software offers a wide range of functions such as real-time monitoring with logging. ConSoft is available in 5 languages making it an easy-to-use tool for many markets.

## Measurements with RTDs and other resistances

The transmitters can be configured for inputs from standardized Platinum and Nickel RTDs like the ones mentioned in the list below, as well as inputs from plain resistance sensors such as potentiometers.

- Pt10 to Pt1000 acc. to IEC 60751 ( $\alpha = 0.00385$ )
- Pt100 ( $\alpha = 0.003916$  or  $0.003902$ )
- Ni100/Ni1000 acc. to IEC 60751

2-, 3- or 4-wire connection can be chosen and the measuring ranges are freely selectable.

## Measurements with thermocouples and voltage

The configuration possibilities also cover inputs from 11 types of standardized thermocouples as well as plain mV input. The measuring ranges are freely selectable. For T/C input, the CJC (cold junction compensation) is fully automatic, by means of an accurate measurement of the terminal temperature.

## Descriptions of the most common features

### Filter function

The filter function provides a stable signal even in noisy environments or when the measurement varies rapidly. By measuring the average value within the set filter time, the fluctuations of the signal are reduced.

### Password protection

In ConSoft you have the possibility to set password in the transmitter. The password can be 8 letters or numbers long and prevents non authorized people to do changes in the configuration of the transmitter.

### Runtime counter

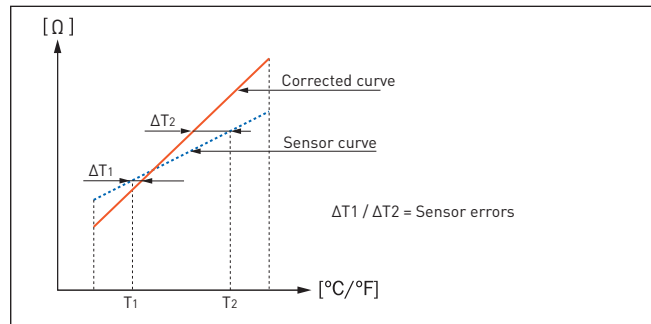
The runtime function counts the number of hours the transmitter has been in operation. This makes it easy to check how long it was since the last calibration.

### Simulated output

The simulated output function makes it possible to set fixed current output during maximum time of 15 min regardless of the input signal. In that way you can ensure the function of the output. This is feature facilitates easier commissioning and troubleshooting.

## Sensor error correction

Known sensor errors compared to the standard curve, e.g. for a calibrated sensor, are entered, and the transmitter automatically corrects for the sensor errors.



## System error correction

This method is used to correct the system errors (sensor and/or transmitter error) by exposing the sensor to one or two accurately measured temperatures (true temperatures). The true temperature(s) and the corresponding transmitter reading(s) are entered, and the transmitter automatically corrects for the system errors.

## Sensor failure detection

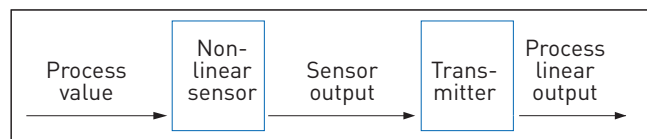
The Sensor failure detection checks the sensor leads and forces the output signal to a user defined level, if any of the sensor leads are broken or short circuited.

## Customized linearization

A very accurate and versatile multi-point customized linearization is available for IPAQ-HPLUS/-LPLUS and transmitters within the new IPAQ platform (IPAQ 330, IPAQ 530 and IPAQ 520). It offers up to 50 linearization points. In Consoft it is also possible to use the Callendar-Van Dusen equation that describes the relationship between resistance (R) and temperature (t) of platinum resistance thermometers (RTD).

The multi-point linearization can be used to create almost any type of linearization curve for RTD, T/C, resistance and mV inputs.

By combining Customized linearization with the use of engineering units, the transmitters can be programmed to give a linear output corresponding to a specific measuring range of the primary process value.



*Example of a system (sensor + transmitter) with an output linear to the process value, in spite of a non-linear sensor.*

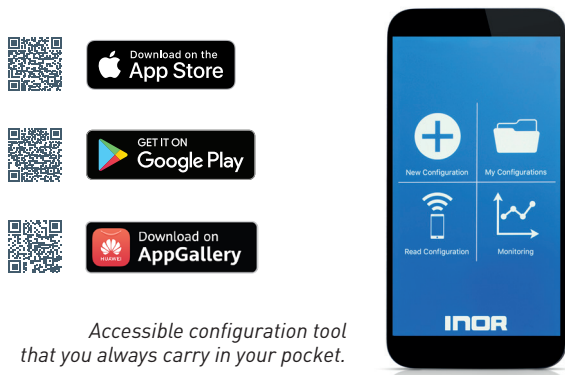
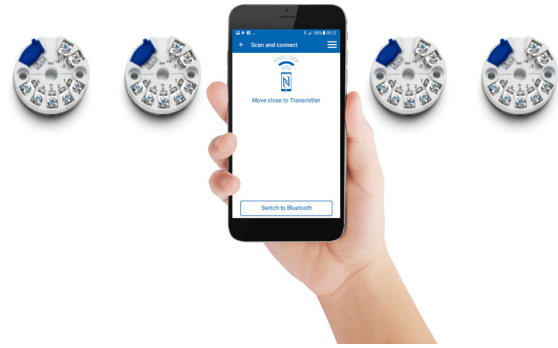
## Operating system requirements

ConSoft is compatible with Windows XP (SP3), Windows Vista, Windows 7, Windows 8 and Windows 10.

# INOR Connect - App for Configuration

INOR offers a new way of configuring and monitoring your transmitter. Connect your smartphone/ tablet to your transmitter via NFC™ or Bluetooth® and configure it through the new app: INOR Connect. Thanks to the wireless communication, the transmitter can remain installed in the process.

With the intuitive and easy-to-use interface in the app, the work becomes a pleasure. INOR Connect offers the same great configuration capabilities as the ConSoft software but with an even more user-friendly interface. Configuration of a transmitter has never been easier and more convenient!



*Accessible configuration tool that you always carry in your pocket.*

## Configure with the app: INOR Connect

In addition to the user-friendly interface, INOR Connect also offers automatic updates. That means you never have to worry about using the latest software. We have also added quick links to each product page if you need extra information about the transmitter. INOR Connect is available for both iOS and Android.

## Copy and save time

The great benefit of NFC™ is the smooth and fast communication between the transmitter and the smartphone without any cables. INOR has taken advantage of that by creating a new function that makes it possible to copy and paste a configuration to as many transmitters as you like without making any changes and it only takes seconds.



*Monitor and configure your transmitter even in the tightest mounting locations.*

## Remote configuration and monitoring via Bluetooth®

With ICON-BT you can configure and monitor the transmitter while it is still mounted in the process. Simply plug in your ICON-BT to the USB connector on the transmitter and connect with your smartphone. Thanks to the extended range that Bluetooth offers you can communicate with the transmitter remotely.

## Great tool for service and maintenance

The wireless concept is a great tool for people working with service and maintenance as it provides a quick health check of your process. The live monitoring and diagnostics in the INOR Connect app makes it possible to follow the process temperature in real time.

In the app you can also see the ambient temperature and supply voltage the transmitter has been exposed to. This allows you to detect peaks that could damage the process control.



*ICON-BT, INOR Connect and IPAQ C/R530*



## LCD-W110

### Loop Powered LCD Indicator with backlight for field mounting



LCD-W110 is a digital indicator with backlight for installation directly in a 4-20 mA loop without need for external power. The backlight makes it easy to read and LCD-W110 comes with a high contrast LCD display. The indicator is designed for field mounting on wall, pipe or DIN rail and have a rugged and splash proof housing. The scale is easily programmable with push buttons or via NFC communication using the app INOR Connect. A temperature transmitter can be integrated for direct sensor input.

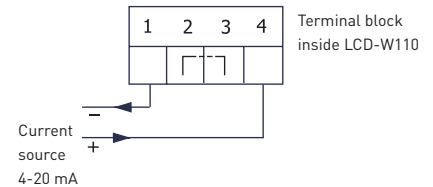
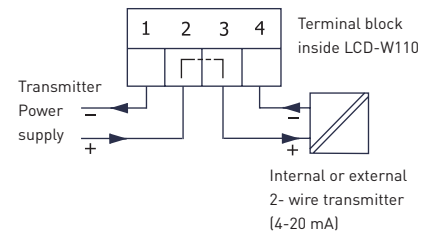
#### LCD-W110

- High contrast, 4-digit LCD display with 17.8 mm / 0.7" digits
- Installation directly in a 4-20 mA loop without need for separate power supply
- Loop powered backlight
- Simple scaling with push buttons or NFC communication
- Any range between -1999 to 9999 for 4 to 20 mA input
- Labels for different engineering units are included
- Typical accuracy of 0.05 % allows for high precision read-outs
- HART transparent
- Integrated transmitter as added option
- Field mounting in rugged IP65 / NEMA 4X housing with double cable conduits
- Stores max and min value

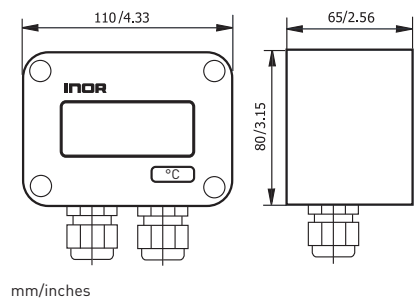
#### Specifications:

Input Current	4-20 mA
Maximum current	30 mA
Minimum current for operation	-3.5 mA
Voltage drop	4.2 V
<b>Indication</b>	
Display	7-segment black LCD with clear background
Backlight	White LED powered from the 4-20 mA loop
Indication range	4 digits (-1999 to 9999)
Digit height	17.8 mm / 0.7"
Decimals	Selectable, 0 to 3
Under range / Over range	Flashing symbols Lo ( $I \leq 3.6 \text{ mA}$ ) / HI ( $I \geq 21.0 \text{ mA}$ )
Engineering units	Set of self-adhesive labels included for units: °C, °F, mA, mV, V, bar, mbar, Pa, kPa, MPa, pH, %, s, ms, µs, mm, cm, m
Response time	Appr. 1 s Power on delay: 5 s and stable after 1 min
Temperature influence	$\leq \pm 0.01 \%$ FS / °C
Configuration method	3 push buttons or NFC, located on the rear of the display
Operation temperature	-20 to +70 °C / -4 to +158 °F
Typical accuracy	$\pm 0.05\%$ of span $\pm 1$ digit
Dimensions	80 x 110 x 65 mm / 3.15 x 4.33 x 2.56"
Protection	IP65 / NEMA 4X
Connections	Push-in spring connection, Wire cross section 0.25 mm <sup>2</sup> -1.5 mm <sup>2</sup> AWG 24-16
Cable entries	2x cable glands M20x1.5 for cable diameter 5-13 mm (0.20-0.51") (1x blanking plug included)
NAMUR NE 43 compliance	Yes
HART transparent	Yes
Mounting	Wall, 35 mm DIN rail acc. to EN 60715 or 50-65 mm [2-2.55"] pipe with mounting kit

#### Connections



#### Dimensions



#### Ordering information

LCD-W110	70LCDW1102
Pipe mounting kit	70ADA00021
DIN-Rail mounting kit	70ADA00022
In-head transmitter mounting kit	70ADA00024

# LED-W11X

## Loop Powered, Ex-approved LED Indicator for Gas Zone 1 & 2



LED-W11X is a digital indicator for installation directly in a 4-20 mA loop without need for external power.

The indicator is equipped with bright, easy-to-read LED digits.

LED-W11X is designed for field mounting on a wall or, by means of mounting kit, on a pipe or a DIN-rail. It has a rugged and splash proof housing with protection IP65/NEMA 4X.

The scale is easily programmable, without reference signal, by two internal pushbuttons for any values between -1999 and 9999.

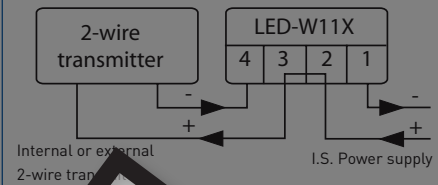
A temperature transmitter can be integrated for direct sensor input.

- Intrinsically Safe for gas Zone 1 & 2
- Bright, 4-digit LED display with red 14.2 mm [0.56"] digits
- Installation directly in a 4-20 mA loop without need for power supply
- Simple pushbutton scaling without reference signal
- Any range between -1999 to 9999 for 4 to 20 mA input
- Labels for different engineering units are included
- Typical accuracy of 0.05 % allows for high precision readings
- HART transparent
- Built-in temperature transmitter as an option
- Field mounting in rugged IP65 / NEMA 4X housing with double cable conduits

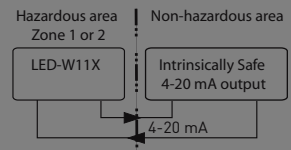
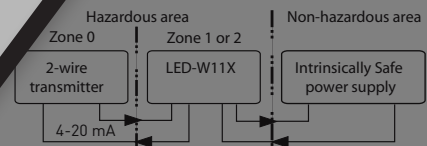
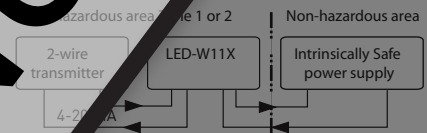
### Specifications:

Input Current	4-20 mA
Maximum current	30 mA
Minimum current for operation	3.5 mA
Voltage drop	2.5 V
Indication	LED with 4 digits including minus sign
Display	14.2 mm [0.56"]
Digit height	range between -1999 to 9999
Indication range	Selectable, 0 to 3
Decimals	Flashing symbols LO/HI
Under range / Over range	Set of labels included (including blanks)
Engineering units	~ 0.5 s
Response time	Two pushbuttons inside the housing
Scale setting	-13 to +140 °C (-13 to +140 °F)
Operation temperature	±0.05 % FS ±1 digit
Typical accuracy	80 x 125 x 63 mm [3.15 x 4.92 x 2.48"]
Dimensions	IP65 / NEMA 4X
Protection	Stranded, ≤ 1.5 mm <sup>2</sup> , AWG 16, 2 conduits M16x1.5
Connection	Wall, pipe or DIN-rail with mounting kit
Mounting	ATEX II 2/1 G Ex ia IIC T4-T6
Ex-classification	Acc. to certificate DEMKO 07 ATEX 142834X
Ex-data	

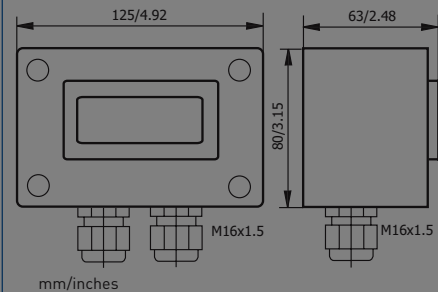
### Connections



### Installation alternatives



### Dimensions



### Ordering information

LED-W11X	70LEDW11X1
Pipe mounting kit	70ADA00021
DIN-Rail mounting kit	70ADA00022
Transmitter mounting kit	70ADA00032
Configuration	70CAL00001
Mounting of transmitter	60VERMONT1

DISCONTINUED



## LCD-H20

### Loop Powered LCD Indicator for In-head Mounting



LCD-H20 is a digital indicator for installation directly in a 4-20 mA loop without need for external power.

LCD-H20 is designed for in-head mounting in a sensor connection head with glass window.

The indicator is equipped with high-contrast, easy-to-read LCD digits.

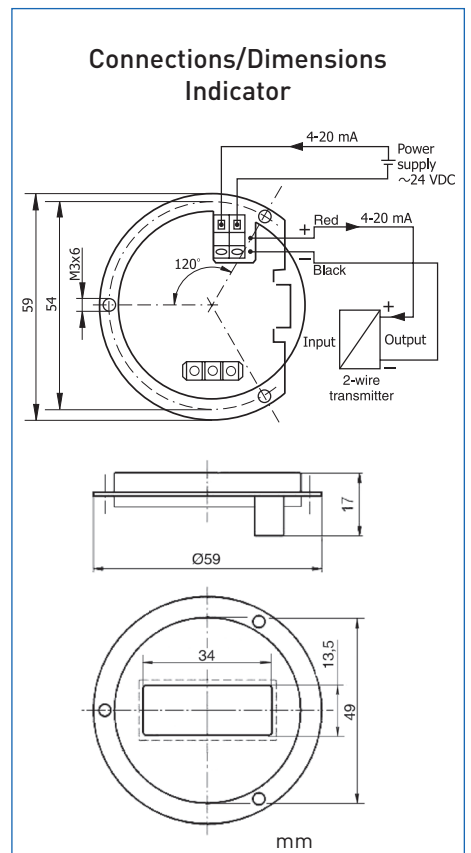
The scale is easily programmable, without reference signal, by three pushbuttons for any values between -1999 and 9999.

As an option, LCD-H20 can be delivered mounted in a connection head.

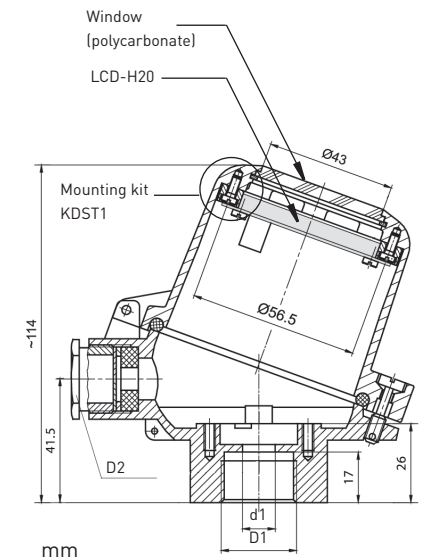
- Installation directly in a 4-20 mA loop without need for power supply
- 2.5 V voltage drop
- High-contrast, 4-digit LCD display with 12 mm digits
- Simple pushbutton scaling without reference signal
- Any range between -1999 to 9999 for 4 to 20 mA input
- Labels for different engineering units are included
- Typical accuracy of 0.1 % allows for high precision read-outs
- HART transparent
- Designed for ambient temperatures between -20 to +70 °C / -4 to +158 °F
- Protection IP65 when mounted in connection head Type 1 or Type 2

#### Specifications:

<b>Input Current</b>	4 - 20 mA
<b>Operating range</b>	3.8 - 22 mA
<b>Voltage drop</b>	2.5 V
<b>Indication</b>	
Display	Black LCD with 4 digits incl. minus sign
Digit Height	12 mm
Indication range	Any range between -1999 to 9999
Decimals	Selectable, 0 to 3
Engineering units	Set of labels included (including blanks)
Response time	Adjustable 0.25 s to 2 s
Scale setting	3 pushbuttons
<b>Operating temperature</b>	-20 to +70 °C / -4 to +158 °F
<b>Typical accuracy</b>	±0.1 % of programmed span ±1 digit
<b>Dimensions</b>	Diameter 59 mm, thickness 20 mm
<b>Protection</b>	IP20 (IP65 in connection head)
<b>Connection</b>	Stranded, ≤ 1 mm <sup>2</sup> , AWG 16
<b>Mounting</b>	Connection head Type 1 or Type 2 with mounting kit KDST1



#### Dimensions connection head



	D1	d1	D2
Head Type 1	M24x1.5	14	M20x1.5
Head Type 2	½"NPT	17	¾"NPT

#### Ordering information

LCD-H20 indicator only	70LCDH2001
LCD-H20	
in connection head Type 1	70LCDH2011
in connection head Type 2	70LCDH2011US
Configuration	70CAL00001

## LCD-H30

### Loop Powered Heavy-duty LCD Field Indicator



LCD-H30 is a digital, heavy-duty LCD indicator for installation directly in a 4-20 mA loop without need for external power.

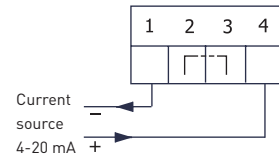
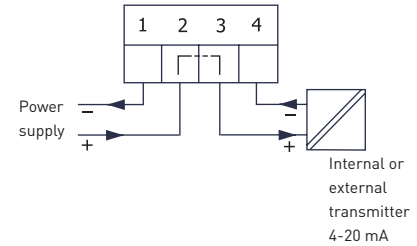
The indicator is equipped with high-contrast, easy-to-read LCD digits with backlight. The scale is easily programmable, without reference signal, by two push buttons for any values between - 1999 and 9999.

- Can be used with any DIN B transmitter or as display only
- Installation directly in a 4-20 mA loop without need for power supply
- 5 V voltage drop
- High-contrast, 4-digit LCD display with LED backlight
- Simple push button scaling without reference signal
- Any range between -1999 to 9999 for 4 to 20 mA input
- Labels for different engineering units are included
- Typical accuracy of 0.05 % allows for high precision read-outs
- HART transparent
- Choice of transmitter can be integrated as added option
- Designed for ambient temperatures between -20 to +70 °C / -4 to +158 °F
- Field mounting in rugged IP 68 housing
- 90° indexing of display orientation

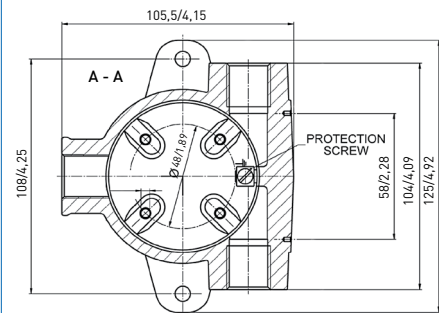
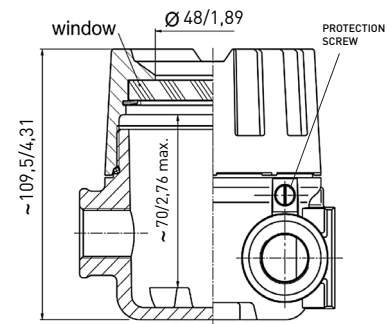
#### Specifications:

<b>Input Current</b>	4-20 mA
Maximum current	30 mA
Minimum current for operation	-3.5 mA
<b>Voltage drop</b>	-5 V
<b>Indication</b>	
Display	LCD with 4 digits including minus sign
Digit height	8.89 mm / 0.35"
Indication range	Any range between -1999 to 9999
Decimals	Selectable, 0 to 3
Under range / Over range	Flashing symbols LO/HI
Engineering units	Set of labels included (including blanks)
Response time	Appr. 0.5 s
Scale setting	2 pushbuttons inside the housing
<b>Operation temperature</b>	-20 to +70 °C / -4 to +158 °F
Typical accuracy	±0.05 % FS ±1 digit
<b>Protection</b>	Up to IP68
<b>Connections</b>	Stranded, ≤ 2.5 mm
<b>Mounting</b>	Wall mount or 2" pipe clamp
<b>Enclosure</b>	
Material	Pressure Die Cast Aluminium; Silicone Rubber gasket
Paint	Spray Epoxy Primer with Polyurethane Top Coat. Color: RAL 5005 Signal Blue
Conduit Connections	Threaded ports M20x1.5, 1/2 NPT, 3/4 NPT

#### Connections



#### Dimensions



mm/inches

#### Ordering information

LCD-H30 - w/head M20x1,5	4007330601
LCD-H30 - w/head 1/2" NPT	4007330701
LCD-H30 - customized	On request
2" Pipe clamp in stainless steel	4003435101
For indicator only (without housing)	On request

# Safe Potential Separation and System Integration

Based on know-how combined with an innovative approach, the IsoPAQ family of Isolators and Isolation Transmitters offers high-quality products for signal isolation in the process and automation industry. The versatility and performance of the products, such as accuracy, response time and isolation level, can be chosen to meet requirements of very cost-effective basic installations as well as applications with the highest demands on performance and safety for service personnel and connected equipment.

## Extensive Range Selection

The input and output signals can easily be selected by the integrated DIP switches. For some units recalibration is not even necessary. This feature provides excellent flexibility and low storage and installation costs.

## Universal Power Supply for 20 to 253 VAC/DC

The universal power supply for 20 to 253 VAC/DC (24 VAC/DC for *COMPACT LINE*) allows for a world-wide use of the IsoPAQ products. With only one version needed, storage and maintenance are simplified. The universal power supply provides immunity to voltage variations as well as mistakes in the power supply connection.

## Compact Line

*COMPACT LINE* is a line of very compact and cost-optimized Isolators, Transmitter Repeaters and Isolating Transmitters within the IsoPAQ family.

The small dimensions - only 60 mm deep and 11.2 mm wide - and the favorable pricing allow for space saving and economic installations.

## 6 mm Line

The 6 mm line offers the same high standards as the other products in IsoPAQ family but in just 6.2 mm thin housing. The units can be mounted close to each other without air gap, which saves space in the cabinet and allows more devices to be installed.

## In-Rail-Bus System

The In-Rail-Bus system is a user-friendly and highly flexible system for reliable and quick transmission of signals, data and energy. It can be easily integrated in the 35 mm standard DIN rail. The great benefit of the In-Rail-Bus system is that it reduces costs for wiring when it comes to connection, distribution or even power supply.

## Protective Separation

IsoPAQ products with the feature "Protective Separation" have a 3-port isolation with high test voltage and are designed according to EN 61010. They provide a safe protection for service personnel and downstream devices against impermissibly high voltages.

## Innovative design

Thanks to an efficient and patented signal conditioning and high cut-off frequency, the IsoPAQ products have negligible distortion of the measurement signals. The input circuits are designed to minimize the load of the primary signals.

All Isolation Transmitters have linear zero crossing, which makes zero and span adjustments very easy (on transmitters with this feature) and provides accurate measurement values also close to zero.

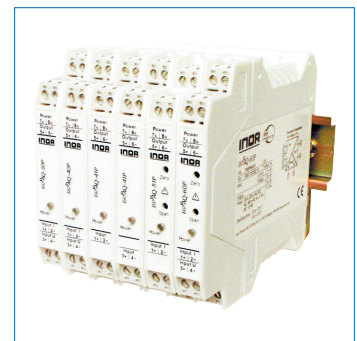
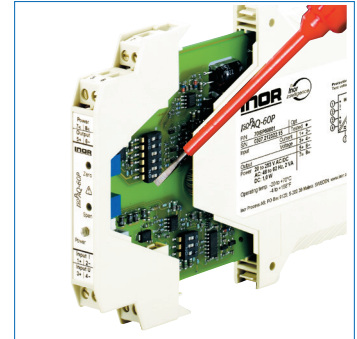
The EMC design includes no Y-capacitors, which gives an excellent decoupling of the sensor circuit even for fast input signal changes and an efficient rejection of transient interferences.

## Excellent Reliability and Long Term Stability



Based on a special circuitry for the universal power supply with a special switching technique, the IsoPAQ transmitters have extremely low energy losses. Self heating is therefore strongly minimized, which also reduces the component aging efficiently. Integrated protection components and big load margins are further important features for a stable and safe operation over many years.







## 5 Year Warranty

As all other Inor products for signal conditioning the IsoPAQ products are supplied with a 5 year limited warranty.






# IsoPAQ Selection Tables






Isolators & Transmitter Repeaters	IsoPAQ-11L Loop Powered Isolator	IsoPAQ-12L Loop Powered Isolator	IsoPAQ-611 Loop Powered Isolator	IsoPAQ-612 Loop Powered Isolator	IsoPAQ-110L Loop Powered Isolator
					
Page	60	60	58	58	62
One channel	✓	-	✓	-	✓
Two channels	-	✓	-	✓	✓
Passive input	✓	✓	✓	-	✓
Active input / Transmitter supply	-	-	-	-	-
Power supply	-	-	-	-	-
Input signal	0(4)...20 mA	0(4)...20 mA	0(4)...20 mA	0(4)...20 mA	0(4)...20 mA
Output signal	0(4)...20 mA	0(4)...20 mA	0(4)...20 mA	0(4)...20 mA	0(4)...20 mA
Typical accuracy	±0.1 % FS	±0.1 % FS	±0.1 % FS	±0.1 % FS	±0.15 % FS
Isolation level	1.5 kV, 50 Hz	1.5 kV, 50 Hz	3 kV, 50 Hz	3 kV, 50 Hz	2.5 kV, 50 Hz
Working voltage	-	-	600 VAC/DC	600 VAC/DC	600 VAC/DC
Protective separation	-	-	✓	✓	✓
Response time	< 5 ms	< 5 ms	5 ms	5 ms	< 5 ms
Voltage drop	< 2.0 V	< 2.0 V	2.3 V	2.3 V	< 3.0 V
Operation temperature	-20...+70 °C	-20...+70 °C	-25...+70 °C	-25...+70 °C	0...+55 °C
Plug-in screw terminals	✓	✓	-	-	-
Housing width	12.5 mm	12.5 mm	6.2 mm	6.2 mm	11.2 mm
Installation depth	104 mm	104 mm	101 mm	101 mm	60 mm

Isolation Transmitters	IsoPAQ-30P Universal	IsoPAQ-131P	IsoPAQ-632 Isolation Signal Splitter	IsoPAQ-641 Isolation Signal Splitter	IsoPAQ-40P Universal	IsoPAQ-41P
						
Page	70	72	74	76	78	80
Input signal	0...20 mA 4...20 mA 0...10 V	0...20 mA 4...20 mA 0...10 V	0...20 mA 4...20 mA 0...5 V 0...10 V 1...5 V 2...10 V	0...20 mA 4...20 mA 0...10 V 2...10 V	0...20 mA 4...20 mA 0...10 V	0...20 mA 4...20 mA 0...10 V
Outputs signal	0...20 mA 4...20 mA 0...10 V	0...20 mA 4...20 mA 0...10 V	0...20 mA 4...20 mA 0...5 V 0...10 V 1...5 V 2...10 V	0...20 mA 4...20 mA 0...10 V 2...10 V	0...20 mA 4...20 mA 0...10 V	0...20 mA 4...20 mA 0...10 V
Bipolar input	-	-	-	-	-	-
Bipolar output	-	-	-	-	-	-
Calibrated range selection	✓	-	✓	✓	✓	-
Range selection	-	-	-	-	-	-
Fixed ranges	-	✓	-	-	-	✓
Zero / Span adjustment	-	-	-	-	-	-
Typical accuracy	±0.3 % FS	±0.2 % FS	±0.1 % FS	±0.1 % FS	±0.1 % FS	±0.1 % FS
Isolation level	2.5 kV, 50 Hz	2.5 kV, 50 Hz	3 kV, 50 Hz	3 kV, 50 Hz	4 kV, 50 Hz	4 kV, 50 Hz
Working voltage	600 VAC/DC	600 VAC/DC	600 VAC/DC	600 VAC/DC	600 VAC/DC	600 VAC/DC
Protective separation	-	✓	✓	✓	✓	✓
Response time, Cut-off frequency	1 kHz	< 5 ms	150 µs, 5 kHz	7 ms, 100 Hz	30 Hz/1 kHz switch select.	1 kHz
Power supply	20-253 VAC/DC	24 VAC/DC	24 VDC	24 VDC	20-253 VAC/DC	20-253 VAC/DC
Operation temperature	-10...+60 °C	0...+55 °C	-25...+70 °C	-25...+70 °C	-20...+70 °C	-20...+70 °C
Plug-in screw terminals	✓	-	-	-	✓	✓
Housing width	12.5 mm	11.2 mm	6.2 mm	6.2 mm	12.5 mm	12.5 mm
Installation depth	104 mm	60 mm	101 mm	101 mm	104 mm	104 mm

\* 4 ... 20 mA with HART signal



Isolators & Transmitter Repeaters	IsoPAQ-21L Loop Powered Isolator	IsoPAQ-22L Loop Powered Isolator	IsoPAQ-610 Transmitter Repeater	IsoPAQ-110R Transmitter Repeater
				
Page	64	64	66	68
One channel	✓	-	✓	✓
Two channels	-	✓	-	-
Passive input	✓	✓	-	-
Active input / Transmitter supply	-	-	✓	✓
Power supply	No	No	24 VDC	15...30 VDC
Input signal	0(4)...20 mA	0(4)...20 mA	0(4)...20 mA*	4...20 mA
Output signal	0(4)...20 mA	0(4)...20 mA	0(4)...20 mA*	4...20 mA
Typical accuracy	±0.1 % FS	±0.1 % FS	±0.1 % FS	±0.1 % FS
Isolation level	4 kV, 50 Hz	4 kV, 50 Hz	3 kV, 50 Hz	2.5 kV, 50 Hz
Working voltage	600 VAC/DC	600 VAC/DC	600 VAC/DC	600 VAC/DC
Protective separation	✓	✓	✓	✓
Response time	< 5 ms	< 5 ms	5 ms	< 10 ms
Voltage drop	< 2.0 V	< 2.0 V	2.3 V	< 5.0 V
Operation temperature	-20...+70 °C	-20...+70 °C	-25...+70 °C	0...+55 °C
Plug-in screw terminals	✓	✓	-	-
Housing width	12.5 mm	12.5 mm	6.2 mm	11.2 mm
Installation depth	104 mm	104 mm	101 mm	60 mm

Isolation Transmitters	IsoPAQ-51P	IsoPAQ-661	IsoPAQ-161P	IsoPAQ-60P Universal	IsoPAQ-80S Universal
					
Page	82	84	86	88	90
Input signal	0(4)...20 mA	±10 mA ±20 mA 0(2)...10 mA 0(4)...20 mA ±5 V ±10 V 0(1)...5 V 0(2)...10 V	±10 V ±10 V ±5 V ±5 V 0 - 5 V 0 - 5 V ±10 mA	±10 mA ±20 mA 0(2)...10 mA 0(4)...20 mA ±5 V ±10 V 0(1)...5 V 0(2)...10 V	±60 mV to ±500 mV 0...60 mV to 0...500 mV
Outputs signal	0(4)...20 mA	±10 mA ±20 mA 0(2)...10 mA 0(4)...20 mA ±5 V ±10 V 0(1)...5 V 0(2)...10 V	4...20 mA 0-10 V 4...20 mA 0-10 V 4...20 mA 0-10 V 4...20 mA	±10 mA ±20 mA 0(2)...10 mA 0(4)...20 mA ±5 V ±10 V 0(1)...5 V 0(2)...10 V	±10 mA ±20 mA 0(2)...10 mA 0(4)...20 mA ±5 V ±10 V 0(1)...5 V 0(2)...10 V
Bipolar input	-	✓	✓	✓	✓
Bipolar output	-	✓	-	✓	✓
Calibrated range selection	-	✓	-	-	-
Range selection	-	-	-	✓	✓
Fixed ranges	✓	-	✓	-	-
Zero / Span adjustment	✓	✓	-	✓	✓
Typical accuracy	±0.1 % FS	±0.1 % FS	±0.2 % FS	±0.1 % FS	±0.1 % FS
Isolation level	4 kV, 50 Hz	3 kV, 50 Hz	2.5 kV, 50 Hz	4 kV, 50 Hz	4 kV, 50 Hz
Working voltage	600 VAC/DC	600 VAC/DC	600 VAC/DC	1000 VAC/DC	1000 VAC/DC
Protective separation	✓	✓	✓	✓	✓
Response time, Cut-off frequency	1 kHz	7 ms, 100 Hz	< 5 ms	30 Hz/10 kHz switch select.	30 Hz/10 kHz switch select.
Power supply	20-253 VAC/DC	24 VDC	24 VAC/DC	20-253 VAC/DC	20-253 VAC/DC
Operation temperature	-20...+70 °C	-25...+70 °C	0...+55 °C	-20...+70 °C	-20...+70 °C
Plug-in screw terminals	✓	-	-	✓	✓
Housing width	12.5 mm	6.2 mm	11.2 mm	12.5 mm	12.5 mm
Installation depth	104 mm	101 mm	60 mm	104 mm	104 mm

## 1- & 2-channel Loop Powered Isolators for separation of 0(4)-20 mA Signals

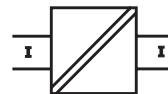
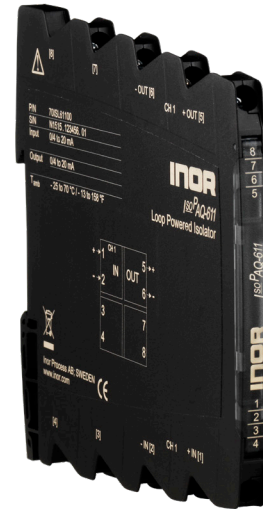
The input loop-powered isolators IsoPAQ-611/-612 provides galvanic separation for 0(4) ... 20 mA standard signals, while transferring the measurement signal to the output with a high degree of accuracy.

The unit avoids interference voltage carry-over and effectively suppressing parasitic noise. The very low drop voltage of 2.3 V and the high level of accuracy work together to make the IsoPAQ-611/-612 the first choice in system design.

Intelligent design and their consequential avoidance of highly integrated components result in extremely long service lives and reliability - without any falsification of the measurement signal.

The IsoPAQ-611/-612 requires no additional power supply since the auxiliary power is obtained from the input signal without distorting it. This not only saves costs during installation, but also increases reliability.

- **Galvanic isolation across input and output**  
Protection against erroneous measurements due to parasitic voltages or ground loops
- **No power supply required**  
Saving costs since wiring is reduced and line influences are omitted
- **Extremely slim design**  
Only 3.1 mm DIN-rail per channel
- **Protective Separation acc. to EN 61140**  
Protects service personnel and downstream devices against impermissibly high voltage
- **Maximum reliability**  
No maintenance costs

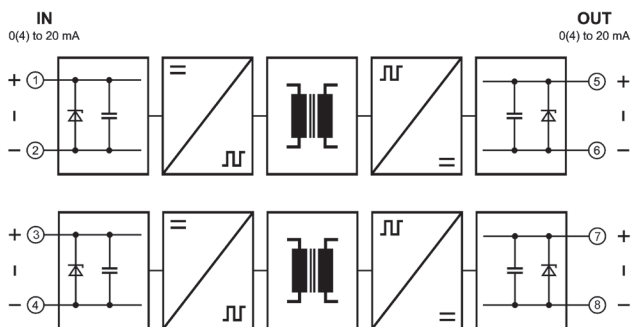


Specifications:

Input	
Input signal	0(4) ... 20 mA
Start-up current	< 200 $\mu$ A
Voltage drop	Approx. 2.3 V at 20 mA
Overload	$\leq$ 50 mA, 30 V
Output	
Output signal	0(4) ... 20 mA
Load	600 $\Omega$
Cut-off frequency -3 dB	100 Hz
Response time T <sub>99</sub>	5 ms
Residual ripple	< 10 mV <sub>rms</sub>
General Data	
Transmission error	< 0.1 % full scale
Load error	< 0.05 % of measured value / 100 $\Omega$ load
Temperature coefficient <sup>1)</sup>	< 100 ppm/K
Test voltage	3 kV AC, 50 Hz, 1 min. all circuits against one another
Working voltage <sup>2)</sup> (Basic insulation)	600 V AC/DC for overvoltage category II and pollution degree 2 acc. to EN 61010-1
Protection against electrical shock <sup>2)</sup>	Protective separation according to EN 61140 by reinforced insulation in accordance with EN 61010-1 up to 300 V AC/DC for overvoltage category II and pollution degree 2 between all circuits
Ambient temperature	Operation -25 to +70 °C (-13 to +158 °F) Transport and Storage -40 to +85 °C (-40 to +185 °F)
EMC <sup>3)</sup>	EN 61326-1
Construction	6.2 mm (0.244") housing, protection class IP 20, mounting on 35 mm DIN rail acc. to EN 60715
Weight	Approx. 70 g

1) Average TC related to full scale value in specified operating temperature range, reference temperature 23 °C  
 2) For applications with high working voltages, ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.  
 3) Minor deviations possible during interference

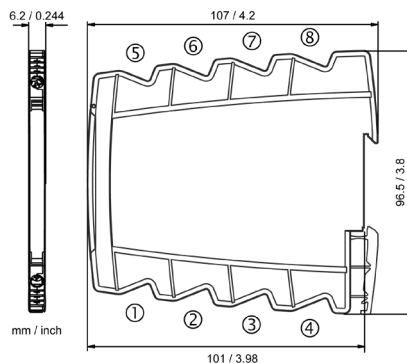
Block diagram/Connections



Ordering information

Product	Channels	Part No.
IsoPAQ-611	1-channel loop powered isolator	70ISL61100
IsoPAQ-612	2-channel loop powered isolator	70ISL61200

Dimensions



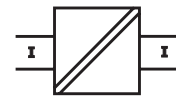
# 1- & 2-channel Loop Powered Isolators for Separation of 0(4)-20 mA Signals

IsoPAQ-11L and IsoPAQ-12L are 1- and 2-channel loop powered isolators used for electrical isolation of 0(4)-20 mA signals to avoid measurement errors due to different voltage potentials or ground loops in an instrument installation.

The 2-channel version, IsoPAQ-12L offers a very cost effective alternative combined with a high-density mounting.

The isolators need no power supply, which contributes to reduced installation costs compared to isolation transmitters.

The high reliability ensures a safe system operation and low maintenance costs.



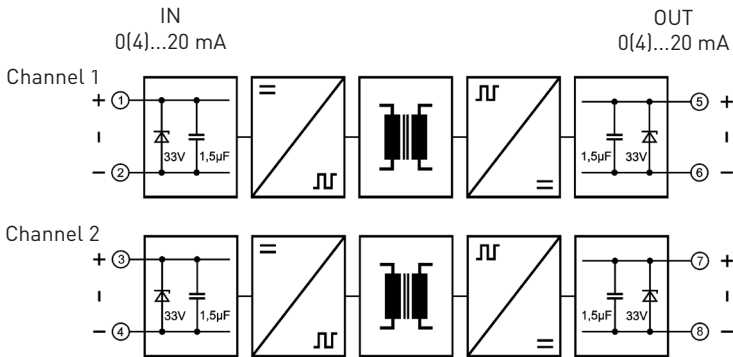
- **Input to output galvanic isolation**  
Protection against erroneous measurements due to parasitic voltages or ground loops
- **1- and 2-channel versions**  
Allows for optimal cost efficiency
- **No power supply required**  
Reduced wiring saves installation costs
- **Low voltage drop**  
Input voltage drop of less than 2 V reduces impact on the primary current loop
- **High accuracy**  
Negligible additional measurement errors in the loop
- **High-density DIN-rail mounting**  
12.5 mm (0.5") housing combined with very low self heating allows for high density mounting
- **Plug-in screw terminals**  
Simplifies installation and maintenance

## Specifications:

Input		
Input signal	0(4)-20 mA/max. 30 V	
Operating current	< 20 $\mu$ A	
Voltage drop	< 2 V	
Overload	$\leq$ 100 mA, $\leq$ 30 V	
Output		
Output signal	0(4)-20 mA/max. 28 V	
Response time (10 to 90 % of end value)	2 ms @ 250 $\Omega$ load/6 ms @ 750 $\Omega$ load	
Ripple	< 0.07 % of measured value, ~100 kHz	
General data		
Transmission error	$\pm$ 0.1 % of end value	
Load error	$\pm$ 0.03 % of measured value/100 $\Omega$ load	
Temperature coefficient <sup>1)</sup>	$\pm$ 0.0015 %/K of measured value/100 $\Omega$ load	
Test voltage	1.5 kV, 50 Hz	Between all circuits
Ambient temperature	Operation	-20 to +70 °C [-4 to +158 °F]
	Transport and storage	-35 to +85 °C [-31 to +185 °F]
EMC <sup>2)</sup>	EN 61326-1	
Construction	12.5 mm (0.5") housing, protection class: IP20	
Connection	$\leq$ 2.5 mm <sup>2</sup> , AWG 14	
Weight	Approx. 100 g	

1) Average TC in specified operating temperature range  
 2) Minor deviations possible during interference

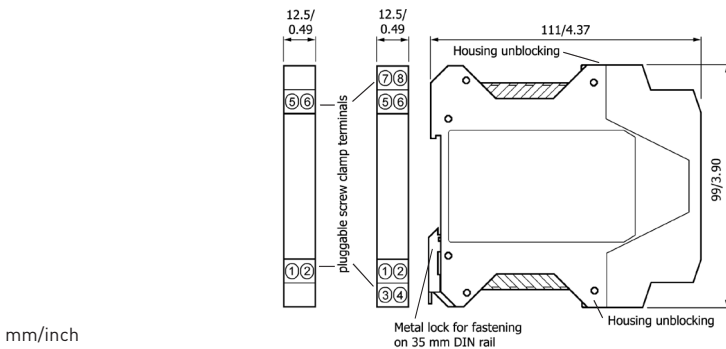
## Block diagram/Connections



## Ordering information

Product	Input / Output	Part No.
IsoPAQ-11L	1-channel, 0(4)-20 mA	70ISL11001
IsoPAQ-12L	2-channel, 0(4)-20 mA	70ISL12001

## Dimensions



mm/inch

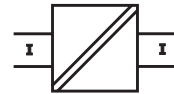
# 1- & 2-channel Loop Powered Isolators for 0(4)-20 mA Signals

IsoPAQ-110L is a loop powered isolator, available in 1- and 2-channel versions. It is used for electrical isolation of 0(4)-20 mA signals to avoid measurement errors due to different voltage potentials or ground loops in an instrument installation.

The 2-channel version, IsoPAQ-110L offers a very cost effective alternative combined with a high-density mounting.

The isolator need no power supply, which contributes to reduced installation costs compared to Isolation Transmitters.

The high reliability ensures a safe system operation and low maintenance costs.



## Compact line

Compact line is a line of very compact and cost-optimized Isolators, Transmitter Repeaters and Isolating Transmitters within the IsoPAQ family.

The small dimensions - only 60 mm deep and 11.2 mm wide - and the favorable pricing allow for space saving and economic installations.

- Input to output galvanic isolation**  
 Protection against erroneous measurements due to parasitic voltages or ground loops
- 1- and 2-channel versions**  
 Allows for optimal cost efficiency
- No power supply required**  
 Reduced wiring saves installation costs
- Fixed ranges**  
 Ready to use without any settings
- Protective Separation acc. to EN 61140**  
 The design and high isolation level (2.5 kV) provides protection for service personnel and downstream devices against impermissibly high voltage
- Compact DIN-rail mounting**  
 11.2 mm (0.44") housing combined with very low self heating allows for high density mounting. With a depth of only 60 mm, compact standard boxes can be used



Specifications:

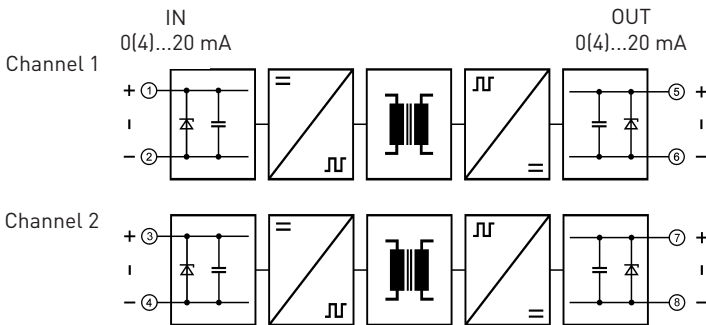
Input	
Input signal	0(4)-20 mA
Operating current	< 100 $\mu$ A
Voltage drop	< 3 V
Overload	$\leq$ 50 mA, $\leq$ 15 V
Output	
Output signal	0(4)-20 mA
Load	< 600 $\Omega$
Response time (10 to 90 % of end value)	5 ms @ 500 $\Omega$ load
Ripple	< 0.1 % of end value, $\sim$ 100 kHz
General data	
Transmission error	$\pm$ 0.1 % of end value
Load error	$\pm$ 0.05 % of measured value/100 $\Omega$ load
Temperature coefficient <sup>1)</sup>	$\pm$ 0.004 %/K of measured value/100 $\Omega$ load
Test voltage	2.5 kV, 50 Hz <span style="float:right">Between all circuits</span>
Working voltage <sup>2)</sup> (Basic Insulation)	600 VAC/DC for overvoltage category II and pollution degree 2 acc. to EN 61010 part 1 between all circuits.
Protection against electrical shock <sup>2)</sup>	Protective separation acc. to EN 61140 by reinforced insulation acc. to EN 61010 part 1 up to 300 VAC/DC for overvoltage category II and pollution degree 2 between all circuits.
Ambient temperature	Operation <span style="float:right">0 to +55 °C (32 to +131 °F)</span> Transport and storage <span style="float:right">-25 to +80 °C (-13 to +176 °F)</span>
EMC <sup>3)</sup>	EN 61326-1
Construction	11.2 mm (0.44") housing, protection class: IP20
Connection	$\leq$ 2.5 mm <sup>2</sup> , AWG 14
Weight	Approx. 50 g

1) Average TC in specified operating temperature range

2) As far as relevant the standards and rules mentioned above are considered by development and production of our devices. In addition relevant assembly rules are to be considered by installation of our devices in other equipments. For applications with high working voltages, take measures to prevent accidental contact and make sure that there is sufficient distance or insulation between adjacent situated devices.

3) Minor deviations possible during interference

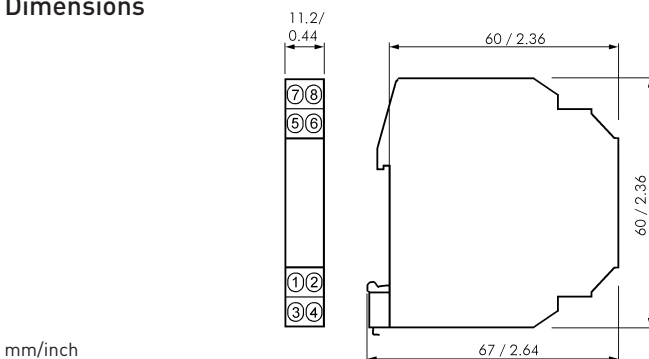
Block diagram/Connections



Ordering information

Product	Input / Output	Part No.
IsoPAQ-110L	1-channel, 0(4)-20 mA	70ISC11001
IsoPAQ-110L	2-channel, 0(4)-20 mA	70ISC11002

Dimensions



mm/inch

# 1- & 2-channel Loop Powered Isolators for 0(4)-20 mA Signals with High Isolation and Protective Separation

IsoPAQ-21L and IsoPAQ-22L are 1- and 2-channel loop powered isolators used for electrical isolation of 0(4)-20 mA signals to avoid measurement errors due to different voltage potentials or ground loops in an instrument installation.

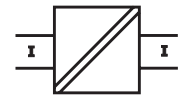
The isolators need no power supply, which contributes to reduced installation costs compared to isolation transmitters.

The high isolation level of 4 kV provides an effective protection for downstream devices.

The 2-channel version, IsoPAQ-22L offers a very cost effective alternative combined with a high-density mounting.

The high reliability and the Protective Separation are additional features that ensure a safe system operation.

- Input to output galvanic isolation**  
 Protection against erroneous measurements due to parasitic voltages or ground loops
- 1- and 2-channel versions**  
 Allows for optimal cost efficiency
- No power supply required**  
 Reduced wiring saves installation costs
- Low voltage drop**  
 Input voltage drop of less than 2 V reduces impact on the primary current loop
- Protective Separation acc. to EN 61140**  
 The design and high isolation level (4 kV) provides protection for service personnel and downstream devices against impermissibly high voltage
- High accuracy**  
 Negligible additional measurement errors in the loop
- High-density DIN-rail mounting**  
 12.5 mm (0.5") housing combined with very low self heating allows for high density mounting
- Plug-in screw terminals**  
 Simplifies installation and maintenance





Specifications:

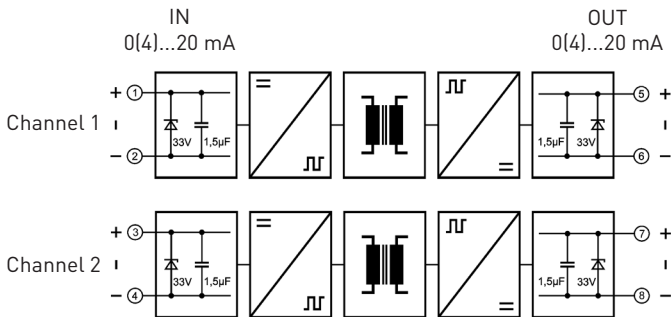
<b>Input</b>	
Input signal	0(4)-20 mA / max. 30 V
Operating current	< 20 $\mu$ A
Voltage drop	< 2 V
Overload	$\leq$ 100 mA, $\leq$ 30 V
<b>Output</b>	
Output signal	0(4)-20 mA / max. 28 V
Response time (10 to 90 % of end value)	2 ms @ 250 $\Omega$ load / 6 ms @ 750 $\Omega$ load
Ripple	< 0.07 % of measured value, ~100 kHz
<b>General data</b>	
Transmission error	$\pm$ 0.1 % of end value
Load error	$\pm$ 0.03 % of measured value / 100 $\Omega$ load
Temperature coefficient <sup>1)</sup>	$\pm$ 0.0015 %/K of measured value / 100 $\Omega$ load
Test voltage	4 kV, 50 Hz <span style="float:right">Between all circuits</span>
Working voltage <sup>2)</sup> (Basic Insulation)	600 VAC/DC for overvoltage category II and pollution degree 2 acc. to EN 61010 part 1 between all circuits.
Protection against electrical shock <sup>2)</sup>	Protective separation acc. to EN 61140 by reinforced insulation acc. to EN 61010 part 1 up to 300 VAC/DC for overvoltage category II and pollution degree 2 between all circuits.
Ambient temperature	Operation <span style="float:right">-20 to +70 <math>^{\circ}</math>C [-4 to +158 <math>^{\circ}</math>F]</span> Transport and storage <span style="float:right">-35 to +85 <math>^{\circ}</math>C [-31 to +185 <math>^{\circ}</math>F]</span>
EMC <sup>3)</sup>	EN 61326-1
Construction	12.5 mm (0.5") housing, protection class: IP20
Connection	$\leq$ 2.5 mm <sup>2</sup> , AWG 14
Weight	Approx. 100 g

1) Average TC in specified operating temperature range

2) As far as relevant the standards and rules mentioned above are considered by development and production of our devices. In addition relevant assembly rules are to be considered by installation of our devices in other equipments. For applications with high working voltages, take measures to prevent accidental contact and make sure that there is sufficient distance or insulation between adjacent situated devices.

3) Minor deviations possible during interference

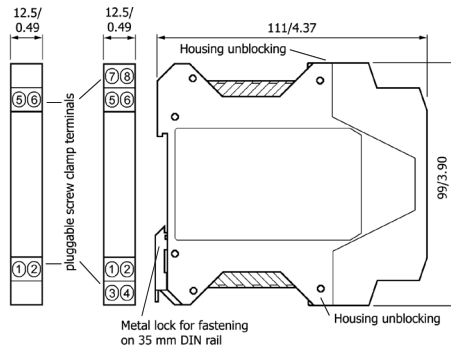
Block diagram/Connections



Ordering information

Product	Input / Output	Part No.
IsoPAQ-21L	1-channel, 0(4)-20 mA	70ISL21001
IsoPAQ-22L	2-channel, 0(4)-20 mA	70ISL22001

Dimensions



mm/inch

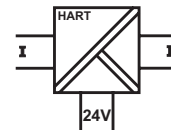
## Transmitter repeater for powering and isolation of 2-,3- and 4-wire transmitters

The Repeater Power Supply IsoPAQ-610 is used to supply and separate 2- and 3-wire SMART Transmitters and active sensor signals with HART communication.

It supplies the transmitter with power and transmits the measuring signal with high accuracy galvanic isolated to the output. Alternative the measuring input accepts active 0/4 ... 20 mA signals from 4-wire transmitters.

In addition to the analog signal, the IsoPAQ-610 also transmits data protocols for HART communication. It allows bidirectional communication with the field device from every point of the cabling.

The auxiliary power can be supplied via the connection terminals or via the optional In-Rail-Bus connector. A green LED on the front of the unit has been provided to monitor the power supply.



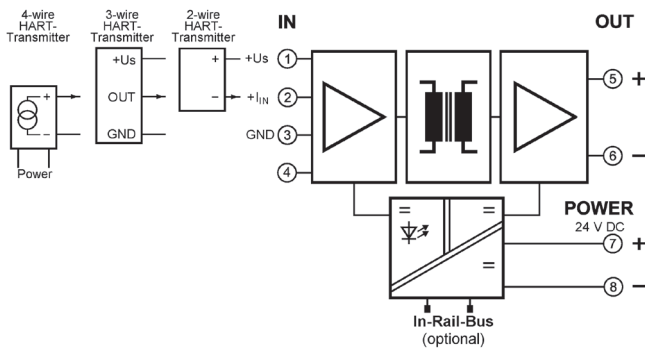
- **Universal operation of SMART Transmitters**  
Energization and separation of field located 2-, 3- and 4-wire transmitters
- **Bidirectional HART transmission**  
HART data transfer for repeater and isolator operation
- **3-Port isolation**  
Protection against erroneous measurements due to parasitic voltages or ground loops
- **Extremely slim design**  
6.2 mm slim housing for a simple and space saving installation
- **Optional In-Rail-Bus mounting rail connector**  
allows for fast and economical installation
- **Protective Separation acc. to EN61140**  
Protects service personnel and downstream devices against impermissibly high voltage

Specifications:

Input		
Input signal	0/4... 20 mA	(4... 20 mA with HART signal)
Input resistance	≤50 Ω	
Over load	50 mA / 30 V	
Transmitter supply (Tx)	16 V (open circuit voltage/short circuit current < 22 V/35 mA)	
Communication signal	Bidirectional HART transmission, internal AC impedance 250 Ω	
Output		
Output signal	0/4... 20 mA	(4... 20 mA with HART signal)
Load	0... 600 Ω (at 20 mA)	(230... 600 Ω with HART signal)
Linear transmission range	-1... +110 %	
Residual ripple	< 10 mV <sub>rms</sub>	
General Data		
Transmission error	< 0.1 % full scale	
Temperature coefficient <sup>1)</sup>	< 100 ppm/K	
Cut-off frequency -3 dB	100 Hz	> 2,5 kHz HART signal
Response time T <sub>99</sub>	7 ms	
Test voltage	3 kV AC, 50 Hz, 1 min.	Input against output against power supply
Working voltage <sup>2)</sup> [Basic Insulation]	600 V AC/DC for overvoltage category II and pollution degree 2 acc. to EN 61010-	
Protection against electrical shock <sup>2)</sup>	Protective separation according to EN 61140 by reinforced insulation in accordance with EN 61010 -1 up to 300 V AC/DC for overvoltage category II and pollution degree 2	
Ambient temperature	Operation	-25°C to +70°C (-13 to +158°F)
	Transport and storage	-40°C to +85°C (-40 to +185°F)
Power supply	24 V DC	voltage range 16.8 V ... 31.2 V DC, approx. 1.3 W
EMC <sup>3)</sup>	EN 61326-1	
Construction	6.2 mm (0.244") housing, protection class IP 20, mounting on 35 mm DIN rail acc. to EN 60715	
Weight	Approx. 70 g	

1) Average TC related to full scale value in specified operating temperature range, reference temperature 23 °C  
 2) For applications with high working voltages, ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.  
 3) Minor deviations possible during interference

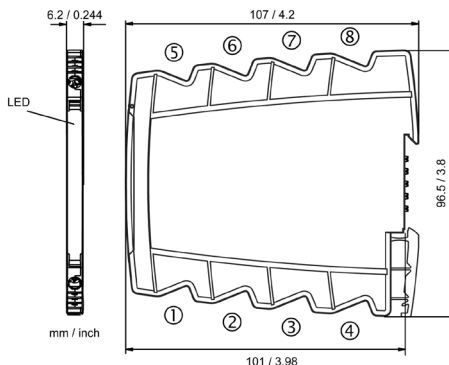
Block diagram/Connections



Ordering information

Product	Type	Part No.
IsoPAQ-610	Transmitter repeater	70ISR61000

Dimensions



## Transmitter Repeater for Powering and Isolation of 2-wire Transmitters

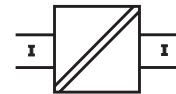
IsoPAQ-110R is a Transmitter Repeater for powering and isolation of a non-isolated 2-wire transmitter.

Thanks to the isolation, the 4-20 mA transmitter signal can be connected to a grounded input circuit of a control system without risk for measurement errors due to ground loops.

The Transmitter Repeater needs no power supply, which contributes to reduced installation costs.

The high reliability ensures a safe system operation and low maintenance costs.

- **Transmitter isolation**  
Problem-free connection of non-isolated 2-wire transmitters to grounded control system inputs
- **Transmitter powering**  
The 24 VDC power from the control system is transferred to the 2-wire transmitter
- **High accuracy**  
Negligible additional measurement errors in the loop
- **HART communication**  
Separate input terminals with built-in 250 Ω load resistor
- **Fixed ranges**  
Ready to use without any settings
- **Protective Separation acc. to EN 61140**  
The design and high isolation level (2.5 kV) provides protection for service personnel and downstream devices against impermissibly high voltage
- **Compact DIN-rail mounting**  
11.2 mm (0.44") housing combined with very low self heating allows for high density mounting. With a depth of only 60 mm, compact standard boxes can be used



### Compact line

Compact line is a line of very compact and cost-optimized Isolators, Transmitter Repeaters and Isolating Transmitters within the IsoPAQ family.

The small dimensions - only 60 mm deep and 11.2 mm wide - and the favorable pricing allow for space saving and economic installations.



## Specifications:

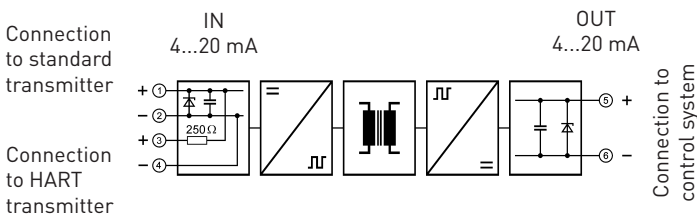
Input	
Input signal	4-20 mA
Operating current range	2-23 mA
Voltage drop	~ 4.7 V
HART communication	Separate terminals with 250 Ω input resistance. Additional voltage drop 5V @ 20 mA
Short circuit input current	≤ 50 mA
Output	
Output signal	4-20 mA
Supply voltage	15-30 VDC
Response time (10 to 90 % of end value)	< 10 ms
Ripple	< 0.2 % of end value, ~ 100 kHz
General data	
Transmission error	± 0.1 % of end value
Supply voltage influence	± 0.01 % of end value/V (deviation from 24 VDC)
Temperature coefficient <sup>1)</sup>	± 0.01 %/K of end value
Test voltage	2.5 kV, 50 Hz <span style="float: right;">Between all circuits</span>
Working voltage <sup>2)</sup> (Basic Insulation)	600 VAC/DC for overvoltage category II and pollution degree 2 acc. to EN 61010 part 1 between all circuits.
Protection against electrical shock <sup>2)</sup>	Protective separation acc. to EN 61140 by reinforced insulation acc. to EN 61010 part 1 up to 300 VAC/DC for overvoltage category II and pollution degree 2 between all circuits.
Ambient temperature	Operation <span style="float: right;">0 to +55 °C (32 to +131 °F)</span> Transport and storage <span style="float: right;">-25 to +80 °C (-13 to +176 °F)</span>
EMC <sup>3)</sup>	EN 61326-1
Construction	11.2 mm (0.44") housing, protection class: IP20
Connection	≤ 2.5 mm <sup>2</sup> , AWG 14
Weight	Approx. 50 g

1) Average TC in specified operating temperature range

2) As far as relevant the standards and rules mentioned above are considered by development and production of our devices. In addition relevant assembly rules are to be considered by installation of our devices in other equipments. For applications with high working voltages, take measures to prevent accidental contact and make sure that there is sufficient distance or insulation between adjacent situated devices.

3) Minor deviations possible during interference

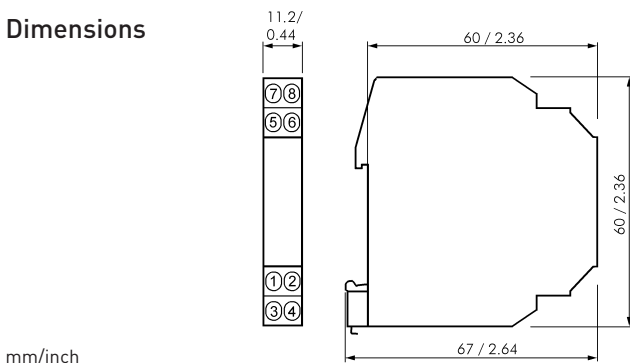
## Block diagram/Connections



## Ordering information

Product	Input / Output	Part No.
IsoPAQ-110R	4-20 / 4-20 mA	4003083301

## Dimensions

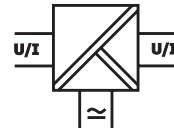


# Basic Isolation Transmitter for Unipolar mA/V Signals with Calibrated Range Selection

The Isolation Transmitter IsoPAQ-30P is a low-cost transmitter used for basic isolation and conversion of 0-20 mA, 4-20 mA and 0-10 V unipolar signals.

Due to the calibrated range selection of the input/output signals and the universal power supply, IsoPAQ-30P provides excellent flexibility and low storage and installation costs.

The high reliability ensures a safe system operation and low maintenance costs.



- Calibrated range selection**  
Input and output range in mA or V can be set by using DIP switches without any further adjustments
- Universal power supply for 20 to 253 VAC/DC**  
Applicable world-wide for all common supply voltages
- 3-port isolation**  
Protection against erroneous measurements due to parasitic voltages or ground loops
- High-density DIN-rail mounting**  
12.5 mm (0.5") housing combined with very low self heating allows for high density mounting
- Plug-in screw terminals**  
Simplifies installation and maintenance
- Excellent reliability**  
Low self heating thanks to patented high-efficiency power supply provides long-term reliability and stability

## Specifications:

Input				
Input signal	0-20 mA <sup>1)</sup>	4-20 mA	0-10 V	Terminal/switch selectable
Input resistance	Current input		22 Ω	
	Voltage input		1 MΩ	
Overload	Current input		≤ 200 mA	
	Voltage input		Voltage limitation via 30 V Z-Diode, max.continuous current 30 mA	
Output				
Output signal	0-20 mA <sup>1)</sup>	4-20 mA	0-10 V	Switch selectable
Load	Current output		≤ 500 Ω	
	Voltage output		≥ 1 kΩ	
Offset	20 μA / 10 mV			
Ripple	< 0.2 % of end value, ~150 kHz			
General data				
Transmission error	± 0.3 % of measured value			
Temperature coefficient <sup>2)</sup>	± 0.015 %/K of end value			
Cut-off frequency (-3 dB)	Approx. 1 kHz			
Test voltage	2.5 kV, 50 Hz		Input against output against power supply	
Working voltage <sup>3)</sup> (Basic Insulation)	600 VAC/DC for overvoltage category II and pollution degree 2 acc. to EN 61010 part 1 between all circuits.			
Ambient temperature	Operation		-10 to +60 °C (+14 to +140 °F)	
	Transport and storage		-20 to +80 °C (-4 to +176 °F)	
Power supply	20 to 253 VAC/DC		AC 48 to 62 Hz, approx. 3 VA	
			DC approx. 1.5 W	
EMC <sup>4)</sup>	EN 61326-1			
Construction	12.5 mm (0.5") housing, protection class: IP20			
Connection	≤ 2.5 mm <sup>2</sup> , AWG 14			
Weight	Approx. 100 g			

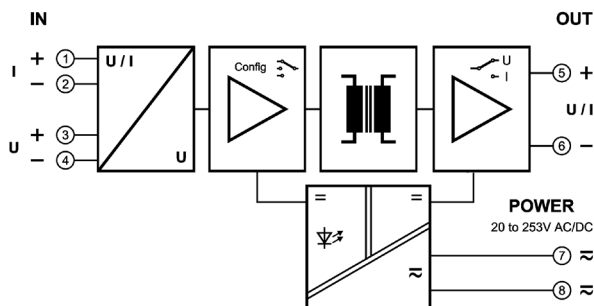
1) Factory setting

2) Average TC in specified operating temperature range

3) As far as relevant the standards and rules mentioned above are considered by development and production of our devices. In addition relevant assembly rules are to be considered by installation of our devices in other equipments. For applications with high working voltages, take measures to prevent accidental contact and make sure that there is sufficient distance or insulation between adjacent situated devices.

4) Minor deviations possible during interference

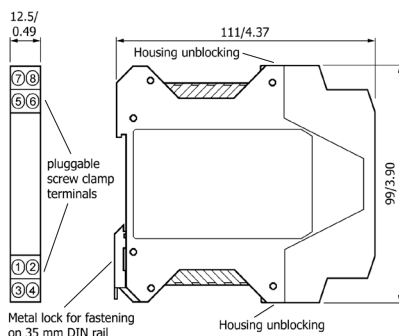
## Block diagram/Connections



## Ordering information

Product	Input / Output	Part No.
IsoPAQ-30P	Calibrated range selection	70ISP30001

## Dimensions



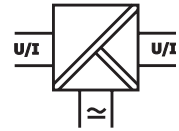
mm/inch

# Isolation Transmitter for Unipolar mA/V Signals with Fixed Ranges

The Isolation Transmitter IsoPAQ-131P is used for isolation and conversion of 0-20 mA, 4-20 mA and 0-10 V unipolar signals.

For applications where normally one signal combination only is used, IsoPAQ-131P offers a cost-effective alternative.

The high reliability and the Protective Separation are further features, which ensure a safe system operation.



## Compact line

Compact line is a line of very compact and cost-optimized Isolators, Transmitter Repeaters and Isolating Transmitters within the IsoPAQ family.

The small dimensions - only 60 mm deep and 11.2 mm wide - and the favorable pricing allow for space saving and economic installations.

- 3-port isolation**  
 Protection against erroneous measurements due to parasitic voltages or ground loops
- Fixed ranges**  
 Ready to use without any settings
- Universal power supply for 24 VAC/DC**  
 Increased flexibility in industrial applications
- Protective Separation acc. to EN 61140**  
 The design and high isolation level (2.5 kV) provides protection for service personnel and downstream devices against impermissibly high voltage
- Compact DIN-rail mounting**  
 11.2 mm (0.44") housing combined with very low self heating allows for high density mounting. With a depth of only 60 mm, compact standard boxes can be used.
- Excellent reliability**  
 Low self heating thanks to high-efficiency power supply provides long-term reliability and stability





Specifications:

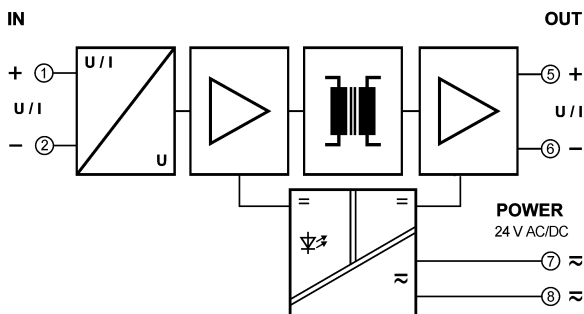
<b>Input</b>				
Input signal	0-20 mA	4-20 mA	0-10 V	Factory set as ordered
Input resistance	Current input	5 Ω		
	Voltage input	1 MΩ		
Overload	Current input	≤ 200 mA		
	Voltage input	≤ 250 V		
<b>Output</b>				
Output signal	0-20 mA	4-20 mA	0-10 V	Factory set as ordered
Load	Current output	≤ 500 Ω		
	Voltage output	≥ 2kΩ		
Ripple	< 0.2 % of end value, ~ 100 kHz			
<b>General data</b>				
Transmission error	± 0.2 % of end value			
Temperature coefficient <sup>1)</sup>	± 0.02 %/K of end value			
Response time	< 5 ms			
Test voltage	2.5 kV, 50 Hz Between all circuits			
Working voltage <sup>2)</sup> (Basic Insulation)	600 VAC/DC for overvoltage category II and pollution degree 2 acc. to EN 61010 part 1 between all circuits.			
Protection against electrical shock <sup>2)</sup>	Protective separation acc. to EN 61140 by reinforced insulation acc. to EN 61010 part 1 up to 300 VAC/DC for overvoltage category II and pollution degree 2 between all circuits.			
Ambient temperature	Operation	0 to +55 °C (32 to +131 °F)		
	Transport and storage	-25 to +80 °C (-13 to +176 °F)		
Power supply	24 VAC/DC, ± 15 %	AC 48 to 62 Hz, approx. 2 VA		
		DC approx. 0.7 W		
EMC <sup>3)</sup>	EN 61326-1			
Construction	11.2 mm (0.44 ") housing, protection class: IP20			
Connection	≤ 2.5 mm <sup>2</sup> , AWG 14			
Weight	Approx. 50 g			

1) Average TC in specified operating temperature range

2) As far as relevant the standards and rules mentioned above are considered by development and production of our devices. In addition relevant assembly rules are to be considered by installation of our devices in other equipments. For applications with high working voltages, take measures to prevent accidental contact and make sure that there is sufficient distance or insulation between adjacent situated devices.

3) Minor deviations possible during interference

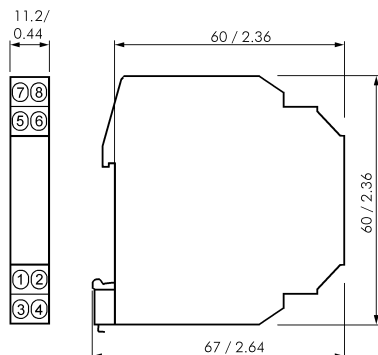
Block diagram/Connections



Ordering information

Product	Input / Output	Part No.
IsoPAQ131P	0-20 mA / 0-20 mA	70ISC13112
	4-20 mA / 0-20 mA	70ISC13132
	0-10 V / 0-20 mA	70ISC13152
	0-20 mA / 4-20 mA	70ISC13114
	4-20 mA / 4-20 mA	70ISC13112
	0-10 V / 4-20 mA	70ISC13154
	0-20 mA / 0-10 V	70ISC13116
	4-20 mA / 0-10 V	70ISC13136
	0-10 V / 0-10 V	70ISC13156
	Power connector set for up to 10 units	

Dimensions



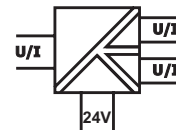
mm/inch

## Signal Splitter/Repeater with double outputs for mA and V signals

The Signal Splitter/Repeater IsoPAQ-632 is used for isolation, conversion and distribution of 0/4 ... 20 mA, 0/1 ... 5 V and 0/2 ... 10 V standard signals. The measuring input can also supply the loop power for 2-wire transmitters.

The input and two isolated outputs can be easily configured by using DIP switch. Due to the calibrated range selection no further adjustment is necessary.

The auxiliary power can be supplied via the connection terminals or via the optional In-Rail-Bus connector. A green LED on the front of the unit has been provided to monitor the power supply.



- Calibrated signal setting via DIP switch**  
 Input and outputs can be set by using DIP switch – high precision without any further adjustment
- 4-Port isolation**  
 Protection against erroneous measurements due to parasitic voltages or ground loops
- Extremely slim design**  
 6.2 mm slim housing for a simple and space saving DIN rail mounting
- Optional In-Rail-Bus mounting rail connector**  
 allows for fast and economical installation
- Protective Separation acc. to EN 61140**  
 Protects service personnel and downstream devices against impermissibly high voltage
- Maximum reliability**  
 No maintenance costs

Specifications:

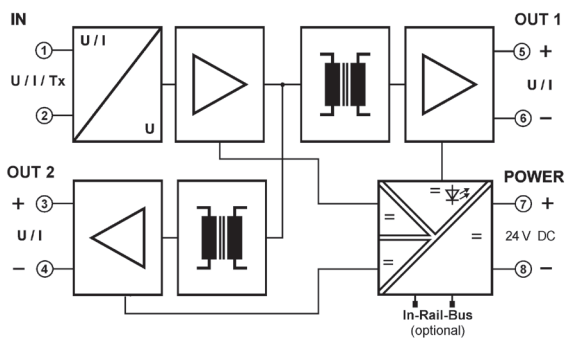
Input			
Input signal	0... 20 mA	0... 10 V	0... 5 V
(calibrated switchable)	4... 20 mA	2... 10 V	1... 5 V
Input resistance	Current input	≤ 35 Ω	
	Voltage input	≥ 100 kΩ	
Overload	Current input	< 50 mA	
	Voltage input	< 30 V	
Transmitter supply Tx (switchable)	16 V (open circuit voltage/short circuit current ≤ 22 V/35 mA)		
Output I / Output II			
Output signal	0... 20 mA	0... 10 V	0... 5 V
(calibrated switchable)	4... 20 mA	2... 10 V	1... 5 V
Load	Current output: ≤ 6 V (300 Ω at 20 mA)		Voltage output: ≤ 5 mA (2 kΩ at 10 V)
Linear transmission range	-1 ... +110 %		
Residual ripple	< 10 mV <sub>rms</sub>		
General Data			
Transmission error	< 0.1 % full scale		
Temperature coefficient <sup>1)</sup>	< 100 ppm/K		
Cut-off frequency -3 dB	5 kHz		
Response time T <sub>99</sub>	150 μs		
Test voltage	3 kV AC, 50 Hz, 1 min. Input against Output 1 against Output 2 against power supply		
Working voltage <sup>2)</sup> (Basic Insulation)	600 V AC/DC for overvoltage category II and pollution degree 2 acc. to EN 61010-1		
Protection against electrical shock <sup>2)</sup>	Protective separation according to EN 61140 by reinforced insulation in accordance with EN 61010-1 up to 300 V AC/DC for overvoltage category II and pollution degree 2 between all circuits		
Ambient temperature	Operation	-25°C to +70°C	(-13 to +158°F)
	Transport and storage	-40°C to +85°C	(-40 to +185°F)
Power supply	24 V DC voltage range 16.8 ... 31.2 V DC, approx. 1.4 W		
EMC <sup>3)</sup>	EN 61326-1		
Construction	6.2 mm (0.244") housing, protection class IP 20, mounting on 35 mm DIN rail acc. to EN 60715		
Weight	Approx. 70 g		

1) Average TC related to full scale value in specified operating temperature range, reference temperature 23 °C

2) For applications with high working voltages, ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.

3) Minor deviations possible during interference

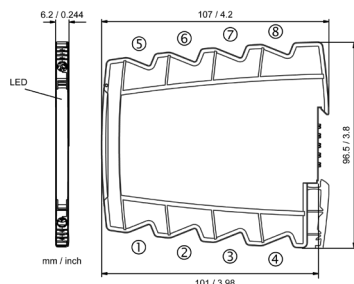
Block diagram/Connections



Ordering information

Product	Type	Part No.
IsoPAQ-632	Signal splitter/repeater	70ISL63200

Dimensions

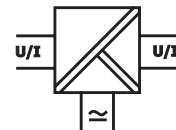
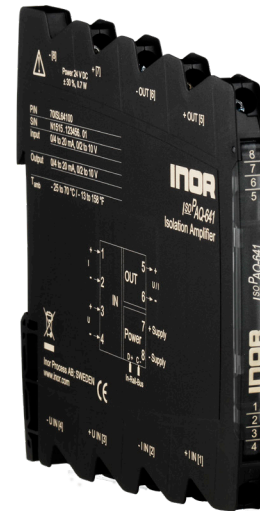


## High-performance isolation transmitter for mA/V Signals with calibrated range selection

The Isolation Amplifier IsoPAQ-641 is used for isolation and conversion of 0/4 ... 20 mA and 0/2 ... 10 V standard signals.

The input and output range of IsoPAQ-641 can be easily set by using DIP switch. Due to the calibrated range selection no further adjustment is necessary. Also the cut-off frequency can be adapted to the measurement task by using the DIP Switch.

The auxiliary power can be supplied via the connection terminals or via the optional In-Rail-Bus connector. A green LED on the front of the unit has been provided to monitor the power supply.



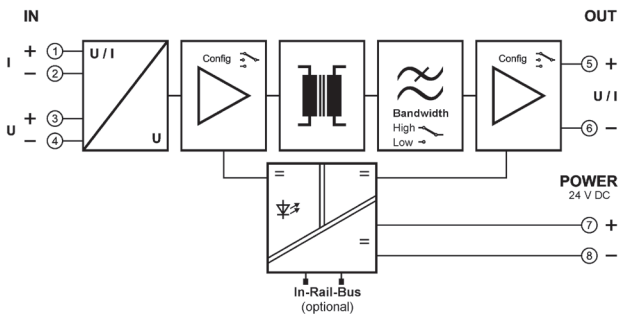
- **Calibrated signal setting via DIP switch**  
Input and output range can be set by using DIP switch – high precision without any further adjustment
- **3-Port Isolation**  
Protection against erroneous measurements due to parasitic voltages or ground loops
- **Extremely slim design**  
6.2 mm slim housing for a simple and space saving DIN rail mounting
- **Optional In-Rail-Bus mounting rail connector**  
allows for fast and economical installation
- **Protective Separation acc. to EN 61140**  
Protects service personnel and downstream devices against impermissibly high voltage
- **Maximum reliability**  
No maintenance costs

Specifications:

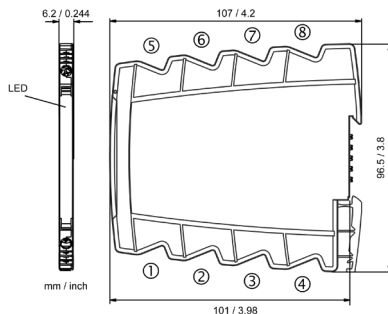
Input		
Input signal	0 ... 20 mA	4 ... 20 mA
(calibrated switchable)	0 ... 10 V	2 ... 10 V
Input resistance	Current input	≤ 25 Ω
	Voltage input	≥ 100 kΩ
Overload	Current input	< 50 mA
	Voltage input	< 30 V
Output		
Output signal	0 ... 20 mA	4 ... 20 mA
(calibrated switchable)	0 ... 10 V	2 ... 10 V
Load	Current output: ≤ 12 V (600 Ω at 20 mA)	Voltage output: ≤ 5 mA (2 kΩ at 10 V)
Linear transmission range	-1 ... +110 %	
Residual ripple	< 10 mV <sub>rms</sub>	
General Data		
Transmission error	< 0.1 % full scale	
Temperature coefficient <sup>1)</sup>	< 100 ppm/K	
Cut-off frequency -3 dB (switchable)	5 kHz	100 Hz      10Hz
Response time T <sub>99</sub>	150 μs	7 ms      70 ms
Test voltage	3 kV AC, 50 Hz, 1 min.	Input against output against power supply
Working voltage <sup>2)</sup> (Basic insulation)	600 V AC/DC for overvoltage category II and pollution degree 2 acc. to EN 61010-1	
Protection against electrical shock <sup>2)</sup>	Protective separation according to EN 61140 by reinforced insulation in accordance with EN 61010-1 up to 300 V AC/DC for overvoltage category II and pollution degree 2 between all circuits	
Ambient temperature	Operation	-25°C to +70°C
	Transport and storage	-40°C to +85°C
Power supply	24 V DC	voltage range 16.8 V ... 31.2 V, approx. 0.7 W
EMC <sup>3)</sup>	EN 61326-1	
Construction	6.2 mm (0.244") housing, protection class IP 20, mounting on 35 mm DIN rail acc. to EN 60715	
Weight	Approx. 70 g	

1) Average TC related to full scale value in specified operating temperature range, reference temperature 23 °C  
 2) For applications with high working voltages, ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.  
 3) Minor deviations possible during interference

Block diagram/Connections



Dimensions



Ordering information

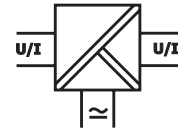
Product	Type	Part No.
IsoPAQ-641	High performance isolator	70ISL64100

# High-performance Isolation Transmitter for Unipolar mA/V Signals with Calibrated Range Selection

The Isolation Transmitter IsoPAQ-40P is used for high-precision isolation and conversion of 0-20 mA, 4-20 mA and 0-10 V unipolar signals.

Due to the calibrated range selection of the input/output signals, the selectable bandwidth and the universal power supply, IsoPAQ-40P provides excellent flexibility and low storage and installation costs.

The high reliability and the Protective Separation are additional features that ensure a safe system operation.



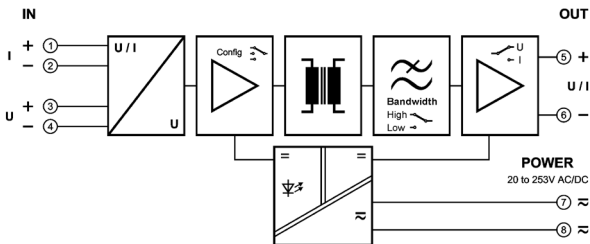
- Calibrated range selection**  
Input and output range in mA or V can be set by using DIP switches without any further adjustments
- Protective Separation acc. to EN 61140**  
The design and high isolation level (4 kV) provides protection for service personnel and downstream devices against impermissibly high voltage
- High accuracy**  
Negligible additional measurement errors in the loop
- Universal power supply for 20 to 253 VAC/DC**  
Applicable world-wide for all common supply voltages
- 3-port isolation**  
Protection against erroneous measurements due to parasitic voltages or ground loops
- High-density DIN-rail mounting**  
12.5 mm (0.5") housing combined with very low self heating allows for high density mounting
- Plug-in screw terminals**  
Simplifies installation and maintenance
- Excellent reliability**  
Low self heating thanks to patented high-efficiency power supply provides long-term reliability and stability

Specifications:

Input				
Input signal	0-20 mA <sup>1)</sup>	4-20 mA	0-10 V	Terminal/switch selectable
Input resistance	Current input		22 Ω	
	Voltage input		1 MΩ	
Input capacitance	Approx. 1 nF			
Overload	Current input		≤ 200 mA	
	Voltage input		Voltage limitation via 30 V Z-Diode, max.continuous current 30 mA	
Output				
Output signal	0-20 mA <sup>1)</sup>	4-20 mA	0-10 V	Switch selectable
Load	Current output		≤ 600 Ω	
	Voltage output		≥ 1 kΩ	
Linear transmission range	-2 to +110 %			
Ripple	< 0.1 % of end value, ~150 kHz			
General data				
Transmission error	± 0.1 % of end value			
Temperature coefficient <sup>2)</sup>	± 0.005 %/K of end value			
Cut-off frequency (-3 dB)	> 1 kHz <sup>1)</sup> Switchable to < 30 Hz			
Test voltage	4 kV, 50 Hz Input against output against power supply			
Working voltage <sup>3)</sup> (Basic insulation)	600 VAC/DC for overvoltage category II and pollution degree 2 acc. to EN 61010 part 1 between all circuits.			
Protection against electrical shock <sup>3)</sup>	Protective separation acc. to EN 61140 by reinforced insulation acc. to EN 61010 part 1 up to 300 VAC/DC for overvoltage category II and pollution degree 2 between all circuits.			
Ambient temperature	Operation		-20 to +70 °C [-4 to +158 °F]	
	Transport and storage		-35 to +85 °C [-31 to +185 °F]	
Power supply	20 to 253 VAC/DC		AC 48 to 62 Hz, approx. 2 VA	
			DC approx. 1 W	
EMC <sup>4)</sup>	EN 61326-1			
Construction	12.5 mm (0.5") housing, protection class: IP20			
Connection	≤ 2.5 mm <sup>2</sup> , AWG 14			
Weight	Approx. 100 g			

- 1) Factory setting
- 2) Average TC in specified operating temperature range
- 3) As far as relevant the standards and rules mentioned above are considered by development and production of our devices. In addition relevant assembly rules are to be considered by installation of our devices in other equipments. For applications with high working voltages, take measures to prevent accidental contact and make sure that there is sufficient distance or insulation between adjacent situated devices.
- 4) Minor deviations possible during interference

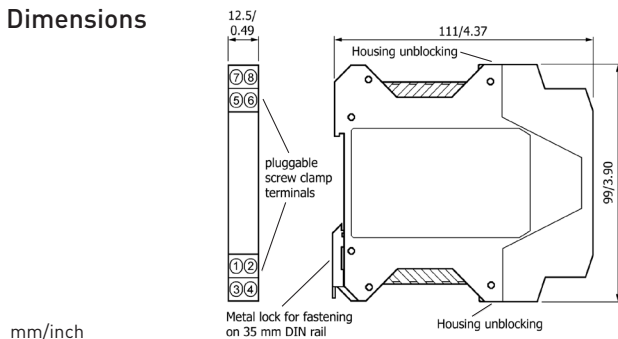
Block diagram/Connections



Ordering information

Product	Input / Output	Part No.
IsoPAQ-40P	Calibrated range selection	70ISP40001

Dimensions

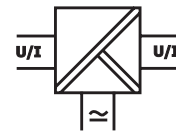


# High-performance Isolation Transmitter for Unipolar mA/V Signals with Fixed Ranges

The Isolation Transmitter IsoPAQ-41P is used for high-precision isolation and conversion of 0-20 mA, 4-20 mA and 0-10 V unipolar signals.

For applications where normally only one signal combination is used, IsoPAQ-41P offers a cost-effective alternative.

The high reliability and the Protective Separation are additional features that ensure a safe system operation.



- **Fixed ranges**  
Ready to use without any settings
- **Protective Separation acc. to EN 61140**  
The design and high isolation level (4 kV) provides protection for service personnel and downstream devices against impermissibly high voltage
- **High accuracy**  
Negligible additional measurement errors in the loop
- **Universal power supply for 20 to 253 VAC/DC**  
Applicable world-wide for all common supply voltages
- **3-port isolation**  
Protection against erroneous measurements due to parasitic voltages or ground loops
- **High-density DIN-rail mounting**  
12.5 mm (0.5") housing combined with very low self heating allows for high density mounting
- **Plug-in screw terminals**  
Simplifies installation and maintenance
- **Excellent reliability**  
Low self heating thanks to patented high-efficiency power supply provides long-term reliability and stability



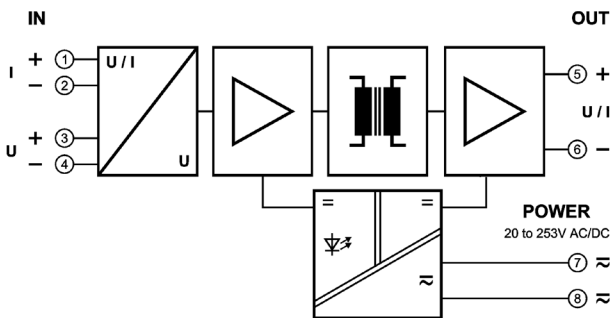


Specifications:

Input			
Input signal	0-20 mA 4-20 mA	0-10 V	Factory set as ordered
Input resistance	Current input	22 Ω	
	Voltage input	1 MΩ	
Input capacitance	Approx. 1 nF		
Overload	Current input	≤ 200 mA	
	Voltage input	Voltage limitation via 30 V Z-Diode, max. continuous current 30 mA	
Output			
Output signal	0-20 mA 4-20 mA	0-10 V	Factory set as ordered
Load	Current output	≤ 600 Ω	
	Voltage output	≥ 1 kΩ	
Linear transmission range	-2 to +110 %		
Ripple	< 0.1 % of end value, ~150 kHz		
General data			
Transmission error	± 0.1 % of end value		
Temperature coefficient <sup>1)</sup>	± 0.005 %/K of end value		
Cut-off frequency (-3 dB)	> 1 kHz		
Test voltage	4 kV, 50 Hz	Input against output against power supply	
Working voltage <sup>2)</sup> (Basic insulation)	600 VAC/DC for overvoltage category II and pollution degree 2 acc. to EN 61010 part 1 between all circuits.		
Protection against electrical shock <sup>2)</sup>	Protective separation acc. to EN 61140 by reinforced insulation acc. to EN 61010 part 1 up to 300 VAC/DC for overvoltage category II and pollution degree 2 between all circuits.		
Ambient temperature	Operation	-20 to +70 °C [-4 to +158 °F]	
	Transport and storage	-35 to +85 °C [-31 to +185 °F]	
Power supply	20 to 253 VAC/DC		AC 48 to 62 Hz, approx. 2 VA
			DC approx. 1 W
EMC <sup>3)</sup>	EN 61326-1		
Construction	12.5 mm (0.5") housing, protection class: IP20		
Connection	≤ 2.5 mm <sup>2</sup> , AWG 14		
Weight	Approx. 100 g		

- 1) Average TC in specified operating temperature range
- 2) As far as relevant the standards and rules mentioned above are considered by development and production of our devices. In addition relevant assembly rules are to be considered by installation of our devices in other equipments. For applications with high working voltages, take measures to prevent accidental contact and make sure that there is sufficient distance or insulation between adjacent situated devices.
- 3) Minor deviations possible during interference

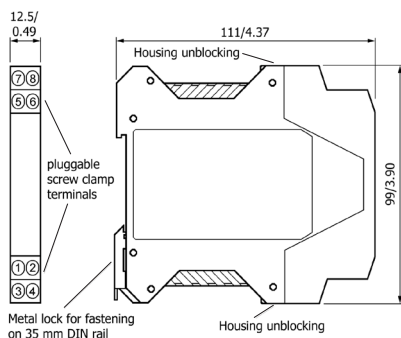
Block diagram/Connections



Ordering information:

Product	Input / Output	Part No.
IsoPAQ-41P	0-20 mA / 0-20 mA	70ISP41012
	4-20 mA / 0-20 mA	70ISP41032
	0-10 V / 0-20 mA	70ISP41052
	0-20 mA / 4-20 mA	70ISP41014
	4-20 mA / 4-20 mA	70ISP41012
	0-10 V / 4-20 mA	70ISP41054
	0-20 mA / 0-10 V	70ISP41016
	4-20 mA / 0-10 V	70ISP41036
	0-10 V / 0-10 V	70ISP41056

Dimensions



mm/inch

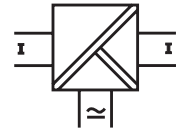
# High-performance Isolation Transmitter for Unipolar mA Signals with Fixed Range and Zero/Span Adjustment

The Isolation Transmitter IsoPAQ-51P is used for high-precision isolation of 0(4)-20 mA unipolar signals.

For applications where normally only one signal combination is used, IsoPAQ-51P offers a cost-effective alternative.

The zero and span adjustments allow for a fine-tuning of the measurement loop.

The high reliability and the Protective Separation are additional features that ensure a safe system operation.



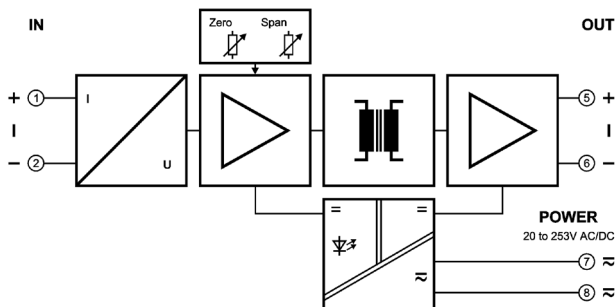
- **Fixed ranges**  
Ready to use without any settings
- **Zero/Span Adjustment**  
Allow for additional fine-tuning of the measurement loop
- **Protective Separation acc. to EN 61140**  
The design and high isolation level (4 kV) provides protection for service personnel and downstream devices against impermissibly high voltage
- **High accuracy**  
Negligible additional measurement errors in the loop
- **Universal power supply for 20 to 253 VAC/DC**  
Applicable world-wide for all common supply voltages
- **3-port isolation**  
Protection against erroneous measurements due to parasitic voltages or ground loops
- **High-density DIN-rail mounting**  
12.5 mm (0.5") housing combined with very low self heating allows for high density mounting
- **Plug-in screw terminals**  
Simplifies installation and maintenance
- **Excellent reliability**  
Low self heating thanks to patented high-efficiency power supply provides long-term reliability and stability

Specifications:

<b>Input</b>		
Input signal	0(4)-20 mA	
Input resistance	Approx. 25 Ω	
Overload	≤ 200 mA	
<b>Output</b>		
Output signal	0(4)-20 mA	
Load	≤ 600 Ω	
Linear transmission range	-2 to +110 %	
Ripple	< 0.1 % of end value, ~150 kHz	
<b>General data</b>		
Transmission error	± 0.1 % of end value	
Temperature coefficient <sup>1)</sup>	± 0.01 %/K of end value	
Zero/Span Adjustment	± 5 % of end value	
Cut-off frequency (-3 dB)	> 1 kHz	
Test voltage	4 kV, 50 Hz	Input against output against power supply
Working voltage <sup>2)</sup> (Basic Insulation)	600 VAC/DC for overvoltage category II and pollution degree 2 acc. to EN 61010 part 1 between all circuits.	
Protection against electrical shock <sup>2)</sup>	Protective separation acc. to EN 61140 by reinforced insulation acc. to EN 61010 part 1 up to 300 VAC/DC for overvoltage category II and pollution degree 2 between all circuits.	
Ambient temperature	Operation	-20 to +70 °C [-4 to +158 °F]
	Transport and storage	-35 to +85 °C [-31 to +185 °F]
Power supply	20 to 253 VAC/DC	AC 48 to 62 Hz, approx. 2 VA DC approx. 1 W
EMC <sup>3)</sup>	EN 61326-1	
Construction	12.5 mm (0.5") housing, protection class: IP20	
Connection	≤ 2.5 mm <sup>2</sup> , AWG 14	
Weight	Approx. 100 g	

- 1) Average TC in specified operating temperature range
- 2) As far as relevant the standards and rules mentioned above are considered by development and production of our devices. In addition relevant assembly rules are to be considered by installation of our devices in other equipments. For applications with high working voltages, take measures to prevent accidental contact and make sure that there is sufficient distance or insulation between adjacent situated devices.
- 3) Minor deviations possible during interference

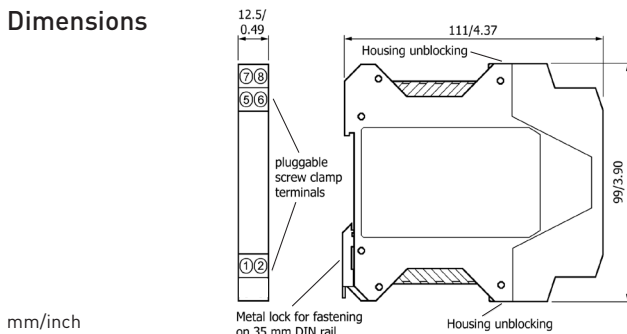
Block diagram/Connections



Ordering information:

Product	Input / Output	Part No.
IsoPAQ-51P	0(4)-20 mA / 0(4)-20 mA	70ISP51012

Dimensions



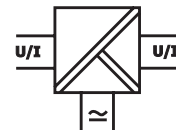
## Isolation transmitter for Bipolar and Unipolar mA/V signals with calibrated range selection

The Bipolar Isolation Amplifier IsoPAQ-661 is used for isolation and conversion of bipolar and unipolar industrial standard signals.

The input and output range of IsoPAQ-661 can be easily set by using DIP switch. Due to the calibrated range selection no further adjustment is necessary.

A switchable compensation of the measuring range can be performed at the Zero/Span potentiometers on the front panel. Also the cut-off frequency can be adapted to the measurement task by using the DIP Switch.

The auxiliary power can be supplied via the connection terminals or via the optional In-Rail-Bus connector. A green LED on the front of the unit has been provided to monitor the power supply.



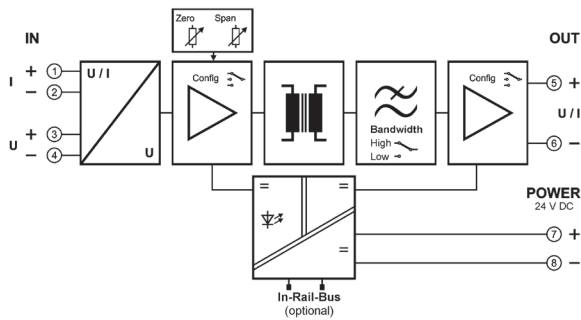
- Calibrated signal setting via DIP switch**  
 Input and output range can be set by using DIP switch – high precision without any further adjustment
- High bandwidth; short response time**  
 No signal distortion; no falsification of measured signal
- Switchable Zero/Span compensation**  
 For readjustment of the sensor or field device
- 3-Port isolation**  
 Protection against erroneous measurements due to parasitic voltages or ground loops
- Extremely slim design**  
 6.2 mm slim housing for a simple and space saving DIN rail mounting
- Optional In-Rail-Bus mounting rail connector**  
 allows for fast and economical installation
- Protective Separation acc. to EN 61140**  
 Protects service personnel and downstream devices against impermissibly high voltage

Specifications:

Input	Current	Voltage
Input signal (calibrated switchable)	$\pm 20$ mA    0... 20 mA    4... 20 mA	$\pm 10$ V    0... 10 V    2 ... 10 V
Input resistance	$\leq 25\Omega$	$\geq 1$ M $\Omega$
Overload	$< 50$ mA	$< 30$ V
Output	Current	Voltage
Output signal (calibrated switchable)	$\pm 20$ mA    0... 20 mA    4... 20 mA	$\pm 10$ V    0... 10 V    2... 10 V
Load	$\leq 12$ V    (600 $\Omega$ at 20 mA)	$\leq 5$ mA    (2 k $\Omega$ at 10 V)
Linear transmission range	unipolar: -1... +110 %	bipolar: -110... +110 %
Residual ripple	$< 10$ mV <sub>rms</sub>	
General Data		
Transmission error	$< 0.1$ % full scale	
Temperature coefficient <sup>1)</sup>	$< 100$ ppm/K	
Zero/Span compensation (switchable)	$\pm 5$ % of measuring range	
Cut-off frequency -3 dB (switchable)	8 kHz	100 Hz
Response time T <sub>99</sub>	100 $\mu$ s	7 ms
Test voltage	3 kV AC, 50 Hz, 1 min.	Input against output against power supply
Working voltage <sup>2)</sup> (Basic Insulation)	600 V AC/DC for overvoltage category II and pollution degree 2 acc. to EN 61010-1	
Protection against electrical shock <sup>2)</sup>	Protective separation according to EN 61140 by reinforced insulation in accordance with EN 61010-1 up to 300 V AC/DC for overvoltage category II and pollution degree 2 between all circuits	
Ambient temperature	Operation	-25°C to +70°C    (-13 to +158°F)
	Transport and storage	-40°C to +85°C    (-40 to +185°F)
Power supply	24 V DC	voltage range 16.8 V ... 31.2 V DC, approx. 0.8 W
EMC <sup>3)</sup>	EN 61326-1	
Construction	6.2 mm (0.244") housing, protection class IP 20, mounting on 35 mm DIN rail acc. to EN 60715	
Weight	Approx. 70 g	

1) Average TC related to full scale value in specified operating temperature range, reference temperature 23 °C  
 2) For applications with high working voltages, ensure there is sufficient spacing or isolation from neighboring devices and protection against electric shocks.  
 3) Minor deviations possible during interference

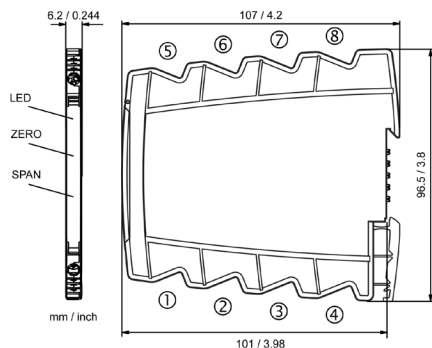
Block diagram/Connections



Ordering information

Product	Type	Part No.
IsoPAQ-661	Isolator Bipolar/Unipolar	70ISL66100

Dimensions

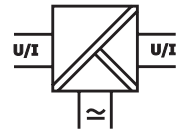


## Isolation Transmitter for Bipolar and Unipolar mA/V Signals with Fixed Ranges

The Isolation Transmitter IsoPAQ-161P is mainly used for isolation of bipolar signals, such as  $\pm 20$  mA,  $\pm 10$  mA,  $\pm 10$  V,  $\pm 5$  V, and conversion into unipolar output signals.

For applications where normally one signal combination only is used, IsoPAQ-161P offers a cost-effective alternative.

The high reliability and the Protective Separation are further features, which ensure a safe system operation.



### Compact line

Compact line is a line of very compact and cost-optimized Isolators, Transmitter Repeaters and Isolating Transmitters within the IsoPAQ family.

The small dimensions - only 60 mm deep and 11.2 mm wide - and the favorable pricing allow for space saving and economic installations.

- 3-port isolation**  
 Protection against erroneous measurements due to parasitic voltages or ground loops
- Bipolar input signals**  
 Bipolar input signals, e.g. -10..0..+10 V, as well as special ranges available
- Fixed ranges**  
 Ready to use without any settings
- Universal power supply for 24 VAC/DC**  
 Increased flexibility in industrial applications
- Protective Separation acc. to EN 61140**  
 The design and high isolation level (2.5 kV) provides protection for service personnel and downstream devices against impermissibly high voltage
- Compact DIN-rail mounting**  
 11.2 mm (0.44") housing combined with very low self heating allows for high density mounting. With a depth of only 60 mm, compact standard boxes can be used.
- Excellent reliability**  
 Low self heating thanks to high-efficiency power supply provides long-term reliability and stability



## Specifications:

Input			
Input signal <sup>1)</sup>	$\pm 20$ mA $\pm 10$ V	$\pm 10$ mA $\pm 5$ V	0-5 V Factory set as ordered
Input resistance	Current input	$5 \Omega$	
	Voltage input	$1 M\Omega$	
Overload	Current input	$\leq 200$ mA	
	Voltage input	$\leq 250$ V	
Output			
Output signal <sup>1)</sup>	0-20 mA 0-10 V	4-20 mA 0-5 V	Factory set as ordered
Load	Current output	$\leq 500 \Omega$	
	Voltage output	$\geq 2 k\Omega$	
Ripple	< 0.1 % of end value, ~ 100 kHz		
General data			
Transmission error	$\pm 0.2$ % of measuring span		
Temperature coefficient <sup>2)</sup>	$\pm 0.02$ %/K of measuring span		
Response time	< 5 ms		
Test voltage	2.5 kV, 50 Hz	Between all circuits	
Working voltage <sup>3)</sup> (Basic Insulation)	600 VAC/DC for overvoltage category II and pollution degree 2 acc. to EN 61010 part 1 between all circuits.		
Protection against electrical shock <sup>3)</sup>	Protective separation acc. to EN 61140 by reinforced insulation acc. to EN 61010 part 1 up to 300 VAC/DC for overvoltage category II and pollution degree 2 between all circuits.		
Ambient temperature	Operation	0 to +55 °C (32 to +131 °F)	
	Transport and storage	-25 to +80 °C (-13 to +176 °F)	
Power supply	24 VAC/DC, $\pm 15$ %	AC 48 to 62 Hz, approx. 2 VA DC approx. 0.7 W	
EMC <sup>4)</sup>	EN 61326-1		
Construction	11.2 mm (0.44") housing, protection class: IP20		
Connection	$\leq 2.5$ mm <sup>2</sup> , AWG 14		
Weight	Approx. 50 g		

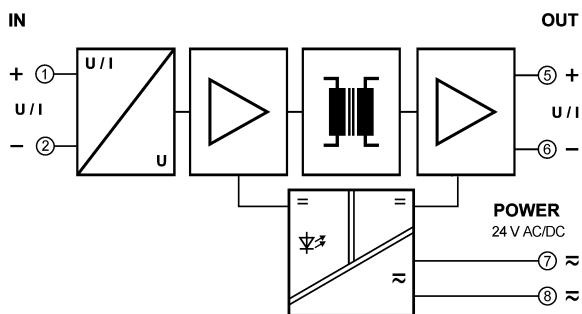
1) Other signals on request

2) Average TC in specified operating temperature range

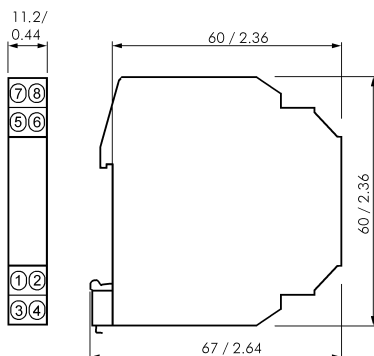
3) As far as relevant the standards and rules mentioned above are considered by development and production of our devices. In addition relevant assembly rules are to be considered by installation of our devices in other equipments. For applications with high working voltages, take measures to prevent accidental contact and make sure that there is sufficient distance or insulation between adjacent situated devices.

4) Minor deviations possible during interference

## Block diagram/Connections



## Dimensions



mm/inch

## Ordering information

Product	Input / Output	Part No.
IsoPAQ-161P	$\pm 10$ V / 4...20 mA	70ISC16114
	$\pm 10$ V / 0-10 V	70ISC16116
	$\pm 5$ V / 4...20 mA	70ISC16124
	$\pm 5$ V / 0-10 V	70ISC16126
	0 - 5 V / 4...20 mA	70ISC16134
	0 - 5 V / 0-10 V	70ISC16136
	$\pm 10$ mA / 4...20 mA	70ISC16154

Power connector set for up to 10 units 70ADA00030

# High-performance Isolation Transmitter for Bipolar and Unipolar mA/V Signals with Extensive Range Selection and Zero/Span Adjustment

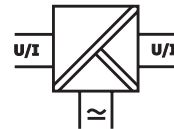
The Isolation Transmitter IsoPAQ-60P is used for highprecision isolation and conversion of 0-20 mA, 4-20 mA and 0-10 V bipolar and unipolar signals.

Due to the extensive range selection with a choice of 144 input/output signal combinations, the selectable bandwidth and the universal power supply, IsoPAQ-60P is a true universal transmitter for any demanding isolation application.

The zero and span adjustments allow for a fine-tuning of the measurement loop.

The high reliability and the Protective Separation are additional features that ensure a safe system operation.

- Extensive range selection**  
 Input and output range in mA or V can be set in 144 combinations by using DIP switches
- Zero/Span Adjustment**  
 Allow for additional fine-tuning of the measurement loop and recalibration after a range selection
- Extremely fast response**  
 Cut-off frequency higher than 10 kHz, switchable to 30 Hz
- Protective Separation acc. to EN 61140**  
 The design and high isolation level (4 kV) provides protection for service personnel and downstream devices against impermissibly high voltage
- High accuracy**  
 Negligible additional measurement errors in the loop
- Universal power supply for 20 to 253 VAC/DC**  
 Applicable world-wide for all common supply voltages
- 3-port isolation**  
 Protection against erroneous measurements due to parasitic voltages or ground loops
- High-density DIN-rail mounting**  
 12.5 mm (0.5") housing combined with very low self heating allows for high density mounting
- Plug-in screw terminals**  
 Simplifies installation and maintenance
- Excellent reliability**  
 Low self heating thanks to patented high-efficiency power supply provides long-term reliability and stability





## Specifications:

Input	Voltage			Current		
Input signal (terminal/switch selectable)	$\pm 10\text{ V}^{1)}$	0-10 V	2-10 V	$\pm 20\text{ mA}$	0-20 mA	4-20 mA
	$\pm 5\text{ V}$	0-5 V	1-5 V	$\pm 10\text{ mA}$	0-10 mA	2-10 mA
Input resistance	Approx. 1 M $\Omega$			Approx. 25 $\Omega$		
Input capacitance	Approx. 1 nF			Approx. 1 nF		
Overload	Voltage limitation via 30 V Z-Diode, max. continuous current 30 mA			$\leq 200\text{ mA}$		
Output	Voltage			Current		
Output signal (switch selectable)	$\pm 10\text{ V}^{1)}$	0-10 V	2-10 V	$\pm 20\text{ mA}$	0-20 mA	4-20 mA
	$\pm 5\text{ V}$	0-5 V	1-5 V	$\pm 10\text{ mA}$	0-10 mA	2-10 mA
Load	$\leq 10\text{ mA}$ (1 k $\Omega$ @ 10 V)			$\leq 12\text{ V}$ (600 $\Omega$ @ 20 mA)		
Linear transmission range	Unipolar: -2 to +110 %, Bipolar: -110 to +110 %					
Ripple	< 0.1 % of end value, ~150 kHz					
General data						
Transmission error	$\pm 0.1\%$ of end value					
Temperature coefficient <sup>2)</sup>	$\pm 0.01\%$ /K of end value					
Zero/Span adjustment	$\pm 10\%$ of end value					
Cut-off frequency (-3 dB)	> 10 kHz <sup>1)</sup>			Switchable to approx. 30 Hz		
Test voltage	4 kV, 50 Hz			Input against output against power supply		
Working voltage <sup>3)</sup> (Basic Insulation)	1000 VAC/DC for overvoltage category II and pollution degree 2 acc. to EN 61010 part 1 between all circuits.					
Protection against electrical shock <sup>3)</sup>	Protective separation acc. to EN 61140 by reinforced insulation acc. to EN 61010 part 1 up to 600 VAC/DC for overvoltage category II and pollution degree 2 between all circuits.					
Ambient temperature	Operation			-20 to +70 °C (+14 to +158 °F)		
	Transport and storage			-35 to +85 °C (-31 to +185 °F)		
Power supply	20 to 253 VAC/DC			AC 48 to 62 Hz, approx. 2 VA DC approx. 1 W		
EMC <sup>4)</sup>	EN 61326-1					
Construction	12.5 mm (0.5") housing, protection class: IP20					
Connection	$\leq 2.5\text{ mm}^2$ , AWG14					
Weight	Approx. 100 g					

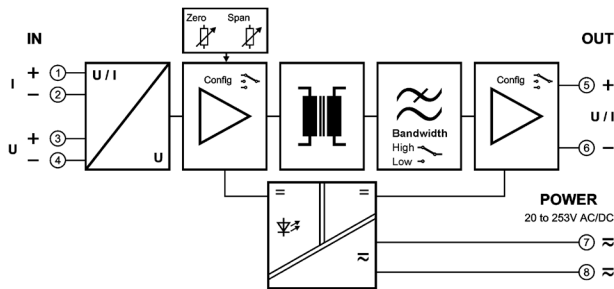
1) Factory settings

2) Average TC in specified operating temperature range

3) As far as relevant the standards and rules mentioned above are considered by development and production of our devices. In addition relevant assembly rules are to be considered by installation of our devices in other equipments. For applications with high working voltages, take measures to prevent accidental contact and make sure that there is sufficient distance or insulation between adjacent situated devices.

4) Minor deviations possible during interference

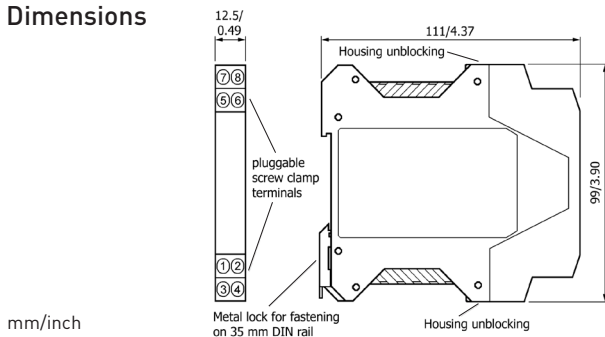
## Block diagram/Connections



## Ordering information:

Product	Input / Output	Part No.
IsoPAQ-60P	$\pm 10\text{V}/\pm 10\text{V}$	70ISP60001
Calibration for other range		on request

## Dimensions



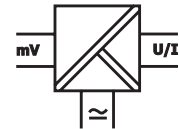
# High-performance Isolation Transmitter for Bipolar and Unipolar Shunt Voltages with Extensive Range Selection and Zero/Span Adjustment

The Isolation Transmitter IsoPAQ-80S is used for high-precision isolation and conversion of bipolar and unipolar shunt voltages into standard mA/V signals.

Due to the extensive range selection, the selectable bandwidth and the universal power supply, IsoPAQ-80S is a true universal transmitter for any demanding shunt voltage isolation application.

The zero and span adjustments allow for a fine-tuning of the measurement loop.

The high reliability and the Protective Separation are additional features that ensure a safe system operation.



- Extensive range selection**  
 Input ranges in mV and output ranges in mA or V can be set in 144 combinations by using DIP switches
- Zero/Span Adjustment**  
 Allow for additional fine-tuning of the measurement loop and recalibration after a range selection
- Extremely fast response**  
 Cut-off frequency higher than 10 kHz, switchable to 30 Hz
- Protective Separation acc. to EN 61140**  
 The design and high isolation level (4 kV) provides protection for service personnel and downstream devices against impermissibly high voltage
- High accuracy**  
 Negligible additional measurement errors in the loop
- Universal power supply for 20 to 253 VAC/DC**  
 Applicable world-wide for all common supply voltages
- 3-port isolation**  
 Protection against erroneous measurements due to parasitic voltages or ground loops
- High-density DIN-rail mounting**  
 12.5 mm (0.5") housing combined with very low self heating allows for high density mounting
- Plug-in screw terminals**  
 Simplifies installation and maintenance
- Excellent reliability**  
 Low self heating thanks to patented high-efficiency power supply provides long-term reliability and stability

## Specifications:

Input	Voltage					
Input signal (terminal/switch selectable)	$\pm 60 \text{ mV}^{1)}$ 0-60 mV	$\pm 100 \text{ mV}$ 0-100 mV	$\pm 150 \text{ mV}$ 0-150 mV	$\pm 250 \text{ mV}$ 0-250 mV	$\pm 300 \text{ mV}$ 0-300 mV	$\pm 500 \text{ mV}$ 0-500 mV
Input resistance	$> 100 \text{ k}\Omega$					
Input capacitance	Approx. 1 nF					
Overload	Voltage limitation via 30 V Z-Diode, max. continuous current 30 mA					
Output	Voltage			Current		
Output signal (switch selectable)	$\pm 10 \text{ V}^{1)}$ $\pm 5 \text{ V}$	0-10 V 0-5 V	2-10 V 1-5 V	$\pm 20 \text{ mA}$ $\pm 10 \text{ mA}$	0-20 mA 0-10 mA	4-20 mA 2-10 mA
Load	$\leq 10 \text{ mA}$ (1 k $\Omega$ @ 10 V)			$\leq 12 \text{ V}$ (600 $\Omega$ @ 20 mA)		
Linear transmission range	Unipolar: -2 to +110 %, Bipolar: -110 to +110 %					
Ripple	$< 0.2 \%$ of end value, ~150 kHz					
General data						
Transmission error	$\pm 0.1 \%$ of end value					
Temperature coefficient <sup>2)</sup>	$\pm 0.01 \%$ /K of end value					
Zero/Span adjustment	$\pm 10 \%$ of end value					
Cut-off frequency (-3 dB)	$> 10 \text{ kHz}^{1)}$ Switchable to approx. 30 Hz					
Test voltage	4 kV, 50 Hz      Input against output against power supply					
Working voltage <sup>3)</sup> (Basic Insulation)	1000 VAC/DC for overvoltage category II and pollution degree 2 acc. to EN 61010 part 1 between all circuits.					
Protection against electrical shock <sup>3)</sup>	Protective separation acc. to EN 61140 by reinforced insulation acc. to EN 61010 part 1 up to 600 VAC/DC for overvoltage category II and pollution degree 2 between all circuits.					
Ambient temperature	Operation		-20 to +70 °C (-4 to +158 °F)			
	Transport and storage		-35 to +85 °C (-31 to +185 °F)			
Power supply	20 to 253 VAC/DC		AC 48 to 62 Hz, approx. 2 VA		DC approx. 1 W	
EMC <sup>4)</sup>	EN 61326-1					
Construction	12.5 mm (0.5") housing, protection class: IP20					
Connection	$\leq 2.5 \text{ mm}^2$ , AWG 14					
Weight	Approx. 100 g					

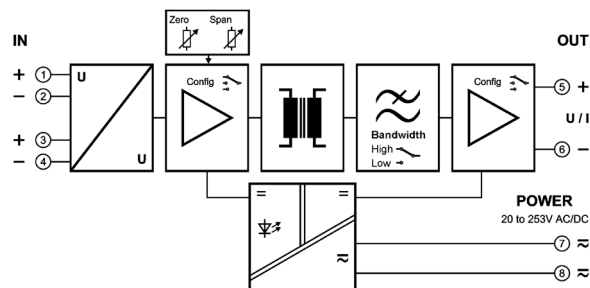
1) Factory setting

2) Average TC in specified operating temperature range

3) As far as relevant the standards and rules mentioned above are considered by development and production of our devices. In addition relevant assembly rules are to be considered by installation of our devices in other equipments. For applications with high working voltages, take measures to prevent accidental contact and make sure that there is sufficient distance or insulation between adjacent situated devices.

4) Minor deviations possible during interference

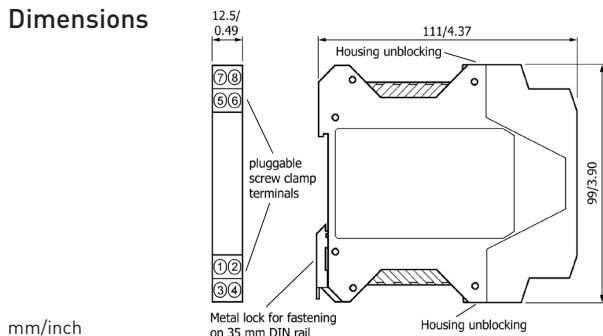
## Block diagram/Connections



## Ordering information:

Product	Input / Output	Part No.
IsoPAQ-80S	$\pm 60 \text{ mV} / \pm 10 \text{ V}$	70ISS80001
	Calibration for other range	on request

## Dimensions



## In-Rail-Bus Power Terminal

The 6.2 mm wide IsoPAQ-Connect power terminal is used for supplying the In-Rail-Bus DIN rail connector with supply voltage. Two separate and reverse polarity protected voltage inputs allow a redundant voltage supply of 24 V DC and a maximum current of 3 A (recommended fuse: 3,5 A, Slow-blow).

The status of the power supply of both voltage inputs will be displayed each by a LED on front. A green LED lights up when there is supply voltage on the voltage input. A red LED indicates reversed polarity.



- Feed-in of power supply to the In-Rail-Bus
- For 3 A maximum
- For up to 80 In-Rail-Bus devices
- Redundant power supply possible, decoupled via diodes
- Operating and fault indication by LED
- Output voltage = input voltage – 0.5 V
- Construction: 6.2 x 96 x 197 mm



### Ordering information

Product	Type	Part No.
IsoPAQ-Connect	Din-Rail power connector	70ISB60200
IsoPAQ-Rail Bus-250T	Din Rail 250 x 7,5 mm	70IST25075
IsoPAQ-Rail Bus-250D	Din Rail 250 x 15 mm	70IST25015
IsoPAQ-Rail Bus-500T	Din Rail 500 x 7,5 mm	70IST50075
IsoPAQ-Rail Bus-500D	Din Rail 500 x 15 mm	70IST50015
IsoPAQ-Rail Bus-caps	Din Rail safety clips	70IST00001
IsoPAQ Conenct Protection	Protecting label for Bus connector	70ISB00001

## In-Rail-Bus Bus Connector 5-wire bus system for DIN rail

The In-Rail-Bus system is a user-friendly and highly flexible system for reliable and quick transmission of signals, data and energy. It can be easily integrated in the 35 mm standard DIN rail and accommodates the Bus PCB that can be individually configured. The great benefit of the In-Rail-Bus system is that it reduces costs for wiring when it comes to connection, distribution or even power supply.

With its high flexibility this concept allows a variety of custom solutions and also later system changes simple. The IsoPAQ-Connect power terminal is used for supplying the In-Rail-Bus DIN rail connector with supply voltage.



- User friendly and easy to service
- Free choice of positions
- Connecting rather than wiring
- Highly scalable
- High contact reliability
- Cost-effective manufacturing and installation









## Contact

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