



IPAQ C310

RTD transmitter with NFC technology

The documentation is only complete when used in combination with the relevant documentation for the sensor.

1	Safety instructions	5
1.1	Intended use	5
1.2	Certifications	6
1.2.1	EU directive compliance	6
1.3	Safety instructions from the manufacturer	6
1.3.1	Copyright and data protection	6
1.3.2	Disclaimer	7
1.3.3	Product liability and warranty	7
1.3.4	Information concerning the documentation	7
1.3.5	Warnings and symbols used	8
1.4	Safety instructions for the operator	8
2	Device description	9
2.1	General description	9
2.2	Nameplate	9
2.3	Scope of delivery	10
3	Installation	11
3.1	In-head transmitter	11
4	Electrical connections	12
4.1	Safety instructions	12
4.2	Electrical connections of in-head transmitter	12
4.3	Connection diagram of in-head transmitter	13
5	Operation	14
5.1	Configuration and logging	14
5.2	Factory settings for configuration	14
5.3	Configuration with ConSoft	15
5.4	Diagnostic information according to NAMUR NE 107	17
5.5	Factory default settings	18
5.6	Sensor error monitoring	18
5.7	System or sensor error correction	18

6 Service	19
<hr/>	
6.1 Accessory parts	19
6.2 Spare parts availability	19
6.3 Availability of services	19
6.4 Returning the device to the manufacturer	19
6.4.1 General information	19
6.4.2 Form (for copying) to accompany a returned device	20
6.5 Disposal	21
6.5.1 Dispose of the transmitter	21
6.5.2 Disassembling and recycling	21
6.5.3 Disassembling and recycling of IPAQ C310	22
6.5.4 Packaging of IPAQ C310	24
7 Technical data	25
<hr/>	
7.1 Measuring principles	25
7.1.1 Resistance temperature sensor	25
7.2 Technical data	26
7.3 Dimensions	29
7.4 Output load diagram	29
7.5 RTD and accuracy table	30
8 Notes	31
<hr/>	

1.1 Intended use

The IPAQ C310 is a RTD 2-wire transmitter intended to be used in industrial environments and designed for measurements of:

- Temperature measurements with resistance thermometers
- Resistance measurement up to 10 k Ω

C310 is intended for installation in a DIN B-head or larger according to EN 50446.

The transmitters are configured from a PC by using the ConSoft program and a transmitter configuration kit (USB connection), or by a smartphone with built-in NFC support via app INOR Connect.



DANGER!

You may only use transmitters labelled with the "Ex" symbol in potentially explosive areas or connect them to a sensor located in those areas. Additionally always note the zone(s) for which the devices have an approval. Otherwise the transmitters might cause an explosion that can result in fatal injuries.



DANGER!

Responsibility for the correct use of the devices with special regard to suitability, intended use and the field of application lies solely with the operator. To avoid any kind of incorrect use, also note the information in the chapter "Device description".



DANGER!

The transmitters do not contain any serviceable parts inside. Always send defective devices to the manufacturer or the local distributor for repair or exchange. If this is the case, attach a clear description of the malfunction for warranty claims.



The manufacturer is not liable for any damage resulting from improper use or use for other than the intended purpose. To avoid any kind of incorrect use, also note the information in the chapter "Device description".



CAUTION!

Responsibility for the use of the measuring devices with regard to suitability, intended use and corrosion resistance of the used materials against the measured fluid lies solely with the operator.



This device is a Group 1, Class A device as specified within CISPR11. It is intended for use in industrial environment. There may be potential difficulties in ensuring electromagnetic compatibility in other environments, due to conducted as well as radiated disturbances.

1.2 Certifications

1.2.1 EU directive compliance

CE marking



The device fulfils all applicable statutory requirements of the following EU directives:

- EMC Directive 2014/30/EU, harmonized standards EN 61326-1 and EN 61326-2-3
- CE Directive 93/68/EC

The manufacturer certifies successful testing of the product by applying the CE marking.

1.3 Safety instructions from the manufacturer

1.3.1 Copyright and data protection

The contents of this document have been created with great care. Nevertheless, we provide no guarantee that the contents are correct, complete or up-to-date.

The contents and works in this document are subject to copyright. Contributions from third parties are identified as such. Reproduction, processing, dissemination and any type of use beyond what is permitted under copyright requires written authorisation from the respective author and/or the manufacturer.

The manufacturer tries always to observe the copyrights of others, and to draw on works created in-house or works in the public domain.

The collection of personal data (such as names, street addresses or e-mail addresses) in the manufacturer's documents is always on a voluntary basis whenever possible. Whenever feasible, it is always possible to make use of the offerings and services without providing any personal data.

We draw your attention to the fact that data transmission over the Internet (e.g. when communicating by e-mail) may involve gaps in security. It is not possible to protect such data completely against access by third parties.

We hereby expressly prohibit the use of the contact data published as part of our duty to publish an imprint for the purpose of sending us any advertising or informational materials that we have not expressly requested.

1.3.2 Disclaimer

The manufacturer will not be liable for any damage of any kind by using its product, including, but not limited to direct, indirect or incidental and consequential damages.

This disclaimer does not apply in case the manufacturer has acted on purpose or with gross negligence. In the event any applicable law does not allow such limitations on implied warranties or the exclusion of limitation of certain damages, you may, if such law applies to you, not be subject to some or all of the above disclaimer, exclusions or limitations.

Any product purchased from the manufacturer is warranted in accordance with the relevant product documentation and our Terms and Conditions of Sale.

The manufacturer reserves the right to alter the content of its documents, including this disclaimer in any way, at any time, for any reason, without prior notification, and will not be liable in any way for possible consequences of such changes.

1.3.3 Product liability and warranty

The operator shall bear responsibility for the suitability of the device for the specific purpose. The manufacturer accepts no liability for the consequences of misuse by the operator. Improper installation or operation of the devices (systems) will cause the warranty to be void. The respective "Standard Terms and Conditions" which form the basis for the sales contract shall also apply.

1.3.4 Information concerning the documentation

To prevent any injury to the user or damage to the device it is essential that you read the information in this document and observe applicable national standards, safety requirements and accident prevention regulations.

If this document is not in your native language and if you have any problems understanding the text, we advise you to contact your local office for assistance. The manufacturer cannot accept responsibility for any damage or injury caused by misunderstanding of the information in this document.

This document is provided to help you establish operating conditions, which will permit safe and efficient use of this device. Special considerations and precautions are also described in the document, which appear in the form of icons as shown below.

1.3.5 Warnings and symbols used

Safety warnings are indicated by the following symbols.



DANGER!

This warning refers to the immediate danger when working with electricity.



DANGER!

This warning refers to the immediate danger of burns caused by heat or hot surfaces.



DANGER!

This warning refers to the immediate danger when using this device in a hazardous atmosphere.



DANGER!

These warnings must be observed without fail. Even partial disregard of this warning can lead to serious health problems and even death.



WARNING!

Disregarding this safety warning, even if only in part, poses the risk of serious health problems. There is also the risk of damaging the device or parts of the operator's plant.



CAUTION!

Disregarding these instructions can result in damage to the device or to parts of the operator's plant.



These instructions contain important information for the handling of the device.



LEGAL NOTICE!

This note contains information on statutory directives and standards.



• **HANDLING**

This symbol designates all instructions for actions to be carried out by the operator in the specified sequence.

➔ **RESULT**

This symbol refers to all important consequences of the previous actions.

1.4 Safety instructions for the operator



WARNING!

In general, devices from the manufacturer may only be installed, commissioned, operated and maintained by properly trained and authorized personnel.

This document is provided to help you establish operating conditions, which will permit safe and efficient use of this device.

2.1 General description

The IPAQ 310 is a smart, digital 2-wire transmitter for temperature measurements and other measurement applications in an industrial environment.

For further information about the possible measurements refer to *Intended use* on page 5.

Configuration of the transmitter is possible with:

- PC configuration software ConSoft with PC configuration kit ICON-X.
- NFC interface in a portable device such as a smartphone. The smartphone app - , makes it possible to read, write, save and share settings directly in the field.

The PC configuration software ConSoft is used for configuration, display and documentation.

The current ConSoft version is available for downloading on our website.

You can find configuration instructions in the ConSoft reference manual.

ConSoft is compatible with Windows XP/Vista/7/8/8.1/10.

2.2 Nameplate



Look at the device nameplate to ensure that the device is delivered according to your order.

The transmitter can be identified by the information on the nameplates.

Nameplate for in-head transmitter - Part no. 70C3100051

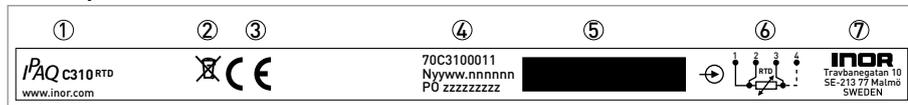


Figure 2-1: Example for nameplate for in-head transmitter

- ① Product name
- ② Electric/electronic device waste marking
- ③ CE marking (EU conformity)
- ④ Part number, serial number (yyww = year and week of manufacturing) and batch number
- ⑤ Printable field, sensor configuration
- ⑥ Connection diagram
- ⑦ Manufacturer and address

2.3 Scope of delivery



Inspect the packaging carefully for damages or signs of rough handling. Report damage to the carrier and to the local office of the manufacturer.



Do a check of the packing list to make sure that you have all the elements given in the order.



Look at the device nameplate to ensure that the device is delivered according to your order.

The scope of delivery always consists of the transmitter and its documentation.

3.1 In-head transmitter

The transmitter is intended for installation in DIN B connection head or larger. For detailed information refer to *Dimensions* on page 29.

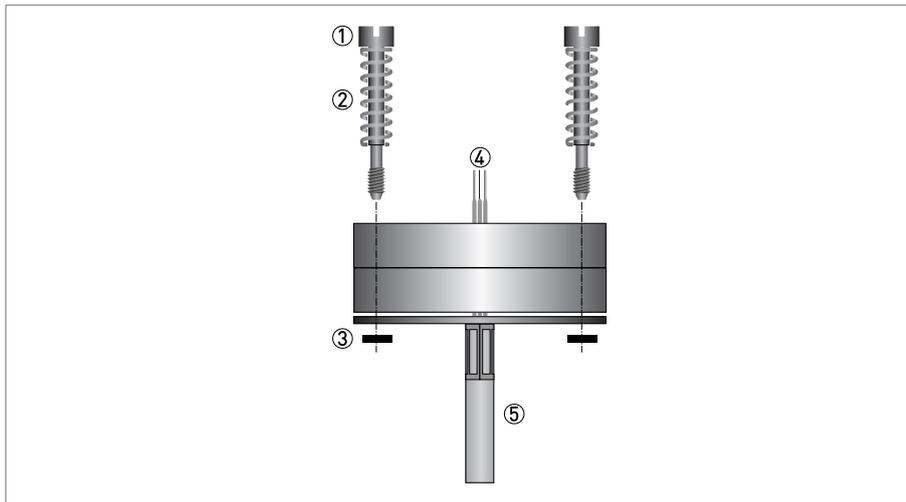


Figure 3-1: Connection head installation kit

- ① M4 screw
- ② Spring
- ③ Lock washer
- ④ Wires from the measuring insert.
- ⑤ MI cable



CAUTION!

For the electrical connection to the in-head transmitter, the maximum torque for screw terminals is 0.5 Nm, for both tightening and untightening the screw.



The connection head installation kit does not belong to the standard scope of delivery of the transmitter, you have to order it separately.



WARNING!

The transmitter has been developed for an operating temperature of $-40...+85\text{ °C}$ / $-40...+185\text{ °F}$. To avoid destruction or damage of the device, always assure that the operating temperature or ambient temperature does not exceed the permissible range and never fasten the transmitter against a solid back without using a resilient attachment. The thermowell also transfer the process temperature to the transmitter housing. If the process temperature is close to or exceeds the maximum temperature of the transmitter, then the temperature in the transmitter housing can rise above the maximum permissible temperature. One way to decrease the heat transfer via thermowell is to install the transmitter further away from the heat source. Inversely similar measurements can be done if the temperature gets below specified minimum temperature.

4.1 Safety instructions



DANGER!

All work on the electrical connections may only be carried out with the power disconnected. Take note of the voltage data on the nameplate!



DANGER!

Observe the national regulations for electrical installations!



The transmitter is protected against polarity reversal. No damage will occur to the device if the polarity of the supply voltage is switched. The output will then indicate 0 mA.



WARNING!

Observe without fail the local occupational health and safety regulations. Any work done on the electrical components of the measuring device may only be carried out by properly trained specialists.



Look at the device nameplate to ensure that the device is delivered according to your order. Check for the correct supply voltage printed on the nameplate (applies only to the intrinsically safe versions).

4.2 Electrical connections of in-head transmitter

The input and output signals and the power supply must be connected in accordance with the following illustrations. The transmitter is easy to install with the connection head installation kit. To avoid measuring errors, all cables must be connected properly and the screws tightened correctly.

Pt100...Pt1000, Ni100, Ni120 2-wire connection	Pt100...Pt1000, Ni100, Ni120 3-wire connection	Pt100...Pt1000, Ni100, Ni120 4-wire connection
Resistance, 2-wire connection	Resistance, 3-wire connection	Resistance, 4-wire connection

Table 4-1: RTD measurement

4.3 Connection diagram of in-head transmitter



CAUTION!

Always establish the electrical connections according to the following diagrams. Otherwise it can come to destruction or damage of the transmitter. Note that the maximum output load always depends on the power supply. If the maximum output load is exceeded, then the measured value will become incorrect. For further information refer to Technical data on page 26.

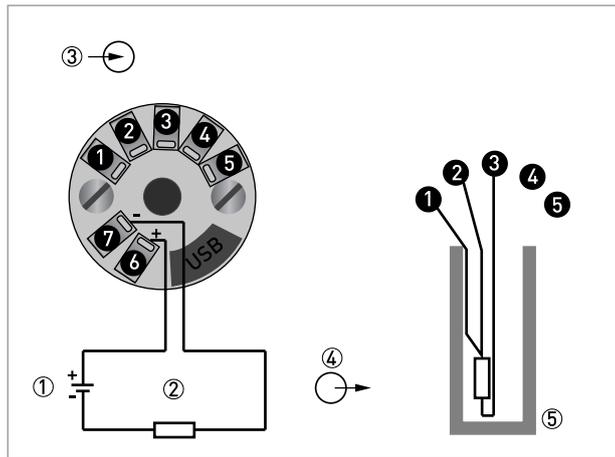


Figure 4-1: Connection diagram

- ① Voltage supply VDC (terminals 6, 7)
- ② R_{Load}
- ③ Input
- ④ Output
- ⑤ Typical Pt100 3-wire connection

5.1 Configuration and logging

The IPAQ 310 contains an NFC interface for communication with a smartphone app.

The configuration procedure uses the NFC function in combination with a smartphone with built-in NFC support to perform all settings of the transmitter.

The transmitter does not need any power or other external connection, just to be close to the smartphone.

The app makes it possible to read, write, save and share settings directly in the field.

When connecting the TT-CON BT to the transmitter and activating the Bluetooth configuration kit on the mobile device the same functionality are available and a logger feature. The logging function give the possibility to log events directly in the field without any other equipment beside the smartphone. The logged data can be stored or shared by the mobile network. It makes it also very simple to read and display the actual measuring value in the transmitter.

The app does also give direct access to the transmitter documentation and calibration data through an internet connection.

5.2 Factory settings for configuration

The transmitters are delivered with either a factory settings or configured according to customers' specifications.

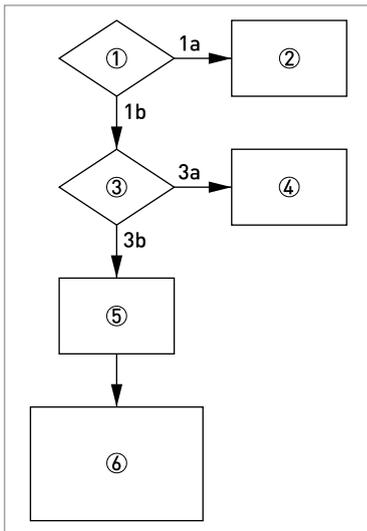
Parameter	Factory settings
Type of sensor	RTD Pt100 $\alpha = 0.003850$
Number of wires	3
PV Lower range value	0
PV Upper range value	100
Temperature units	°C
Damping value	1.4s
Sensor break (Downscale/Upscale)	Upscale
Sensor short circuit (Downscale/Upscale)	Upscale

Table 5-1: Factory settings for configuration

5.3 Configuration with ConSoft

The ConSoft is a PC based graphical user interface for configuration of the transmitters. The PC configuration software ConSoft is used for configuration, display and documentation. The current software versions of ConSoft and the USB interface are available for downloading on our website.

To upgrade your USB interface software to the latest version, use the following flow chart.



- ① Is the USB interface version 1.2.00 or higher?
- 1a No
- 1b Yes
- ② No possibility of updating for hardware version below 1.2.00. Replace the USB interface with newer version.
- ③ Is a ConSoft version 1.2.0.0 or higher installed on your PC?
- 3a No
- 3b Yes
- ④ Download the current ConSoft version from our website and install it on your PC.
- ⑤ Download the current software file [USB_x.y.zz.hex] for the USB interface from our website to your PC either on your desktop or in a folder made for this purpose.
- ⑥
 1. Start ConSoft
 2. Connect the USB interface to the PC. Note that no other device should be connected during updating of the USB interface.
 3. Click on Options/Update USB Interface/Load file (type the path for the software file downloaded on your desktop or in a separate folder).
 4. Wait until "File OK" message is on the screen.
 5. Click on "Start update". A message "Programming!" and a green status indicator show up on the screen. The update will take about one minute.
 6. Wait until "Ready USB Interface" message is displayed on the screen. Close the update window. The USB interface is now ready for use.



Full functionality of the transmitter is achieved with ConSoft program version 3.2.0 or later and the firmware in the USB Interface must have a version number 1.2.07 or later. Consoft is compatible with Windows XP/Vista/7/8/8.1/10. The current software version of ConSoft and the USB interface are available for downloading on our website.



CAUTION!

Only use the manufacturer's configuration kit for PC configuration. Another configuration kit could destroy or damage the transmitter.

Proper connection of the transmitters with a PC requires the USB interface which is included in the ICON-X configuration kit. For connection of the transmitters refer to the following connection diagrams during configuration.

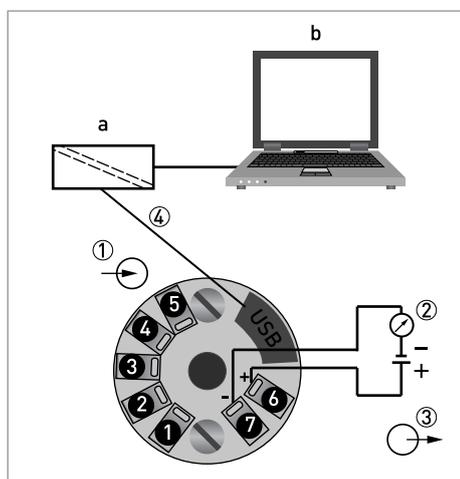


Figure 5-1: Connection during configuration of in-head transmitter

a = PC configuration kit; b = PC software ConSoft

- ① Input
- ② R_{Load}
- ③ Output voltage supply (terminals 6 and 7)
- ④ Communication with USB interface and a PC software ConSoft

5.4 Diagnostic information according to NAMUR NE 107

Diagnostic information about the connected sensor is available in the configuration software ConSoft or via NFC when using a portable device.

In accordance with NAMUR NE 107 for:

- Sensor break (failure / sensor wire break)
- Sensor short-circuit (failure / sensor wire short-circuit)
- Transmitter error (failure/transmitter error, non-correctable in the transmitter)

For complete information about all diagnostic information available from the transmitters, connection to the chosen sensor and current loop should be established.

Messages in ConSoft		Actions
Device specific	Error message	Error correction
Device Specific Status additional device status information, which are described below.		
Transmitter	Underrange	Measurement is under specified range. Check the specified lower range and sensor and sensor connection. If error remains replace the sensor.
Transmitter	Overrange	Measurement is over specified range. Check the specified high range and sensor and sensor connection. If error remains replace the sensor.
Transmitter	Ad_short	See Sensor short circuit (same error cause).
Transmitter	Ad_open	See Sensor break (same error cause).
Transmitter	Sensor break	Sensor wire broken. Check the sensor and sensor connection. If error remains replace the sensor.
Transmitter	Sensor short circuit	Sensor wire shorted. Check the sensor and sensor. If error remains replace the sensor.
Transmitter	Sensor invalid	Invalid sensor selected. Check the sensor selection. If error remains replace device.
Transmitter	Linearization table invalid	Linearization table invalid. Check Linearization table settings. If error remains replace device.
Transmitter	Loop voltage too low	N/A
Transmitter	Dac out of range	Digital-to-Analog-Converter out of max range. Power cycle the device. If error remains replace device.
Transmitter	Dac feedback error (+/- 10%)	N/A
Transmitter	Loop resistance out of range	Loop Resistance out of range ($R_{Load} [\Omega] = (U-)/0.022$). Check loop connection and voltage. If error remains replace device.
Transmitter	Dac acknowledge error	No acknowledge from Digital-to-Analog-Converter. Power cycle the device. If error remains replace device.
Transmitter	System non-recoverable errors	Internal system non-recoverable error. Power cycle the device. If error remains replace device.
Transmitter	Process	Maintenance required: Process
Transmitter	Configuration	Maintenance required: Configuration
Transmitter	Electronics	Maintenance required: Electronics
Transmitter	Sensor	Maintenance required: Sensor
Transmitter	Process	Out of Specification: Process
Transmitter	Configuration	Out of Specification: Configuration

Messages in ConSoft		Actions
Device specific	Error message	Error correction
Transmitter	Electronics	Out of Specification: Electronics
Transmitter	Sensor	Out of Specification: Sensor
Transmitter	Process	Check: Process
Transmitter	Configuration	Check: Configuration
Transmitter	Electronics	Check: Electronics
Transmitter	Sensor	Check: Sensor
Transmitter	Process	Failure: Process
Transmitter	Configuration	Failure: Configuration
Transmitter	Electronics	Failure: Electronics
Transmitter	Sensor	Failure: Sensor
Transmitter	High Alarm	Check the sensor and sensor connection. If error remains replace the sensor.
Transmitter	Low Alarm	Check the sensor and sensor connection. If error remains replace the sensor.

Table 5-2: Error messages

5.5 Factory default settings

The transmitters are delivered with a factory configuration Pt100 ($\alpha = 0.00385$), 3-wire connection 0...+100°C / +32...+212°F, sensor error monitoring "Upscale", filtering level or configured according to customer's requirements.

Due to the long-term drift of max. $\pm 0.02\%$ of span per year, a re-calibration of the transmitter is normally not needed. Should you for any reason require the re-calibration, the transmitter must be returned to the factory.

5.6 Sensor error monitoring

In case of a sensor break or short circuit the transmitter indicates this by either drop the output <3.6 mA or lift it to >21.0 mA. The sensor error indication is individually configurable and is set via the configuration tool.

5.7 System or sensor error correction

System error correction

To perform a system error correction a dry block cell or a temperature bath together with a calibrated reference thermometer is needed. The system is the sensor + transmitter. Expose the sensor to one (one-point correction) or two (two-point correction) accurately measured temperatures (true temperatures), while the transmitter is connected to the configuration software. The true temperature(s) are entered into the software, and the transmitter automatically corrects for the system errors.

Sensor error correction

If the temperature sensor is calibrated, or the sensor error compared to the standard curve is known, then the sensor error (deviation from the standard curve) can be entered into the transmitter via the configuration software and the transmitter corrects for the sensor errors.

6.1 Accessory parts

Accessory part	Order code
Universal rail mounting kit for in-head version	70ADA00015
Ex configuration kit including Ex approved communication interface, software ConSoft and cables for USB connection.	70CFGUSX01
Connection Head installation kit	70ADA00017
ICON-BT, Bluetooth configuration kit	70CFGBT001

6.2 Spare parts availability

The manufacturer adheres to the basic principle that functionally adequate spare parts for each device or each important accessory part will be kept available for a period of 3 years after delivery of the last production run for the device.

This regulation only applies to spare parts which are subject to wear and tear under normal operating conditions.

6.3 Availability of services

The manufacturer offers a range of services to support the customer after expiration of the warranty. These include repair, maintenance, technical support and training.



For more precise information, please contact your local sales office.

6.4 Returning the device to the manufacturer

6.4.1 General information

This device has been carefully manufactured and tested. If installed and operated in accordance with these operating instructions, it will rarely present any problems.



WARNING!

Should you nevertheless need to return a device for inspection or repair, please pay strict attention to the following points:

- *Due to statutory regulations on environmental protection and safeguarding the health and safety of the personnel, the manufacturer may only handle, test and repair returned devices that have been in contact with products without risk to personnel and environment.*
- *This means that the manufacturer can only service this device if it is accompanied by the following certificate (see next section) confirming that the device is safe to handle.*



WARNING!

If the device has been operated with toxic, caustic, radioactive, flammable or water-endangering products, you are kindly requested:

- *to check and ensure, if necessary by rinsing or neutralising, that all cavities are free from such dangerous substances,*
- *to enclose a certificate with the device confirming that it is safe to handle and stating the product used.*

6.4.2 Form (for copying) to accompany a returned device

**CAUTION!**

To avoid any risk for our service personnel, this form has to be accessible from outside of the packaging with the returned device.

Company:		Address:	
Department:		Name:	
Telephone number:		Email address:	
Manufacturer order number or serial number:			
The device has been operated with the following medium:			
This medium is:	radioactive		
	water-hazardous (Biological risks etc...)		
	toxic		
	caustic, acid, corrosive, reactive etc...		
	flammable		
	We checked that all cavities in the device are free from such substances.		
	We have flushed out and neutralized all cavities in the device.		
We hereby confirm that there is no risk to persons or the environment caused by any residual media contained in this device when it is returned.			
Date:		Signature:	
Stamp:			

6.5 Disposal



LEGAL NOTICE!

Disposal must be carried out in accordance with legislation applicable in your country.

Separate collection of WEEE (Waste Electrical and Electronic Equipment):



According to the directive 2012/19/EU or UK Regulation 2013 No. 3113, the monitoring and control instruments marked with the WEEE symbol and reaching their end-of-life **must not be disposed of with other waste.**

The user must dispose of the WEEE to a designated collection point for the recycling of WEEE or send them back to our local organisation or authorised representative.

6.5.1 Dispose of the transmitter

Dispose of the transmitter, sensor and packaging materials in an environmentally compatible way and in accordance with the country-specific waste disposal regulations.

6.5.2 Disassembling and recycling

This section describes (in short) the instructions of handling and disassembling the device when it's reached EOL (end of life) or is disposed after usage. The information given is sufficient to gather the most important parts of the device (by the end-user) which can be used for recycling.



The products do not contain dangerous gases or materials. If there is contamination from the process, refer to Returning the device to the manufacturer on page 19.



Plastic parts in this product do not contain brominated flame retardants and are halogen free.



All plastic parts of this product weight below 50 g and as such very difficult to mark.



Printed circuit boards (PCB) for IPAQ C310 is halogen free by design and it is encapsulated in the casting polymer plastic, which means that dismantling the product is not possible. Please sort as electronic waste.

6.5.3 Disassembling and recycling of IPAQ C310

Type	IPAQ	
Model	C310	
Usage	Signal conditioner for resistance	
	Weight [g]	Weight [lb]
Total	34.5	0.0761
Metal parts	9.8	0.0216
Ceramic fibers	0.3	0.0007
Plastic parts	24.4	0.0538

Table 6-1: Total weight

To achieve reliability and quality performance of the product IPAQ C310 is encapsulated in casting polymer plastic resulting in that dismantling of the IPAQ C310 is not possible. The exploded view and the content of the IPAQ C310 can be found in below.

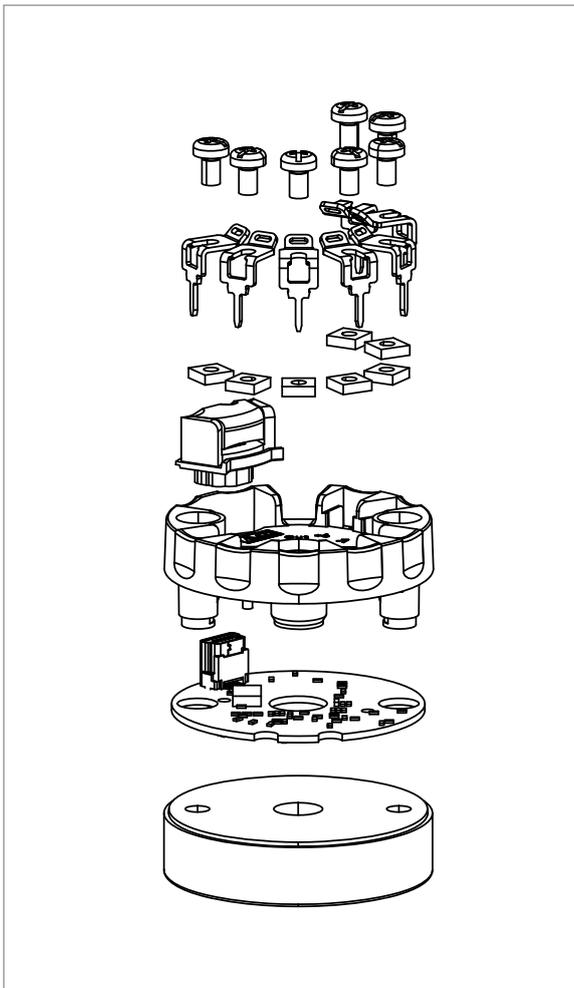


Figure 6-1: Exploded view

	Material	CAS	Weight [g]	Weight [%]
	Thermoplastic PC (polycarbonate)	-	8.2	23.8
	Thermoplastic (Casting polymer-PA)	-	11.1	32.2
	Thermoplastic (Polyester)	-	0.2	0.6
	Silicone	7440-21-3	1.2	3.5
	Stainless steel	-	6.9	20.0
	Brass	-	0.7	2.0
	Zinc	7440-66-6	0.4	1.2
	Epoxy	-	3.6	10.4
	Lead free solder	-	0.3	0.9
	Nitrile	-	0.1	0.3
	Copper	7440-50-8	0.9	2.6
	Nickel	7723-14-0	0.5	1.4
	Alumina (Al2O3)	1344-28-1	0.2	0.6
	Gold (Au)	7444-57-6	0.1	0.3
	Barium titanat (BaTiO3)	12047-27-7	0.1	0.3
RoHS	Polybrominated diphenyl Ethers (PBDE)	-	0	0
	Cadmium (Cd)	7440-43-9	0	0
	Mercury (Hg)	7439-97-6	0	0
	Lead (Pb)	7440-31-7	0	0
	Chrome VI (Cr VI)	7440-47-3	0	0
	Polybrominated biphenyls (PBB)	-	0	0
	Bis (2-ethylhexil) phthalate (DEHP)	117-81-7	0	0
	Butyl benzyl phthalate (BBP)	85-68-7	0	0
	Dibutyl phthalate (DBP)	84-74-2	0	0
	Diisobutyl phthalate (DIBP)	84-69-5	0	0

Table 6-2: Weight per material

6.5.4 Packaging of IPAQ C310

The products are delivered to the customers in corrugated cardboard boxes, which protect products against moisture and provides sustainable packaging solutions.

7.1 Measuring principles

The kind of the measuring principle depends on the measuring insert that you combine with the transmitter. In matters of the thermometer type the manufacturer offers two different measuring inserts, either with a resistance thermometer or with a thermocouple. This transmitter supports both types.

7.1.1 Resistance temperature sensor

The measuring insert with a temperature-sensitive sensor made from a platinum(Pt) RTD, whose value at 0 °C / +32 °F is 100 Ω. That is where the name "Pt100" comes from.

It is generally valid that the electric resistance of metals increases according to a mathematical function as the temperature rises. This effect is taken advantage of by resistance temperature sensors to measure temperature. The "Pt100" temperature sensors features a measuring resistance with defined characteristics, standardised in IEC 60751. The same is true for the tolerances. The average temperature coefficient of a Pt100 is $3.85 \times 10^{-3} \text{ K}^{-1}$ in the range from 0...+100 °C / +32...+212 °F.

During operation, a constant current I ($\leq 1 \text{ mA}$) flows through the Pt100 RTD, which brings about a voltage drop U . The resistance R is calculated using Ohm's Law ($R=U/I$). As the voltage drop U at 0 °C / +32 °F is 100 mV, the resulting resistance of the Pt100 temperature assembly is 100 Ω ($100 \text{ mV} / 1 \text{ mA} = 100 \text{ Ω}$).

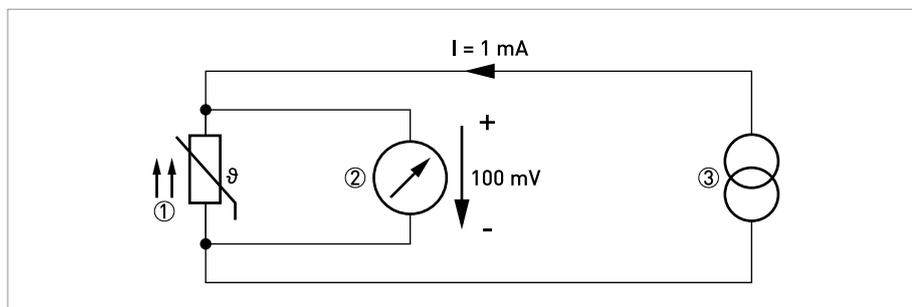


Figure 7-1: Pt100 resistance temperature sensor at 0°C / +32 °F, schematic

- ① Pt100 RTD
- ② Voltage meter
- ③ Current source

7.2 Technical data



- The following data is provided for general applications. If you require data that is more relevant to your specific application, please contact us or your local sales office.
- Additional information (certificates, special tools, software,...) and complete product documentation can be downloaded free of charge from the website.

Measuring system

Application range	Temperature measurements of solids, liquids and gases in industrial environment.
-------------------	--

Design

Versions	
C310	In-head transmitters which are intended for installation in a DIN B-head or larger according to DIN EN 50446.
Features	
NFC	NFC enables wireless communication and configuration between transmitter and a portable device such a smartphone.
Sensor matching	A matching to a calibrated temperature sensor can easily be performed by entering the sensor deviation in the low and high ends of the measuring ranges.
PC programmable	Measuring ranges are set from PC.
	Full accuracy is provided without any need for calibration.
	Configuration without external power.
Runtime counter	Hour counter for elapsed operational time.
Simulated output	Fixed current output during a maximum time of 15 minutes.

Measuring accuracy

Accuracy & stability	Typical accuracy is max. of $\pm 0.1^\circ\text{C}$ or $\pm 0.1\%$ of span. (Pt100, 3-wire or 4-wire connection)
Ambient temperature influence	RTD: for detailed information refer to <i>RTD and accuracy table</i> on page 30.
	Resistance: $\pm 0.01\% < 4000 \Omega$ (2000 Ω at 2-wire) $< \pm 0.02\%$ of span per $^\circ\text{C}$
Supply voltage influence	$< \pm 0.005\%$ of span per V
Long-term drift	Max. of $\pm 0.02^\circ\text{C}$ or $\pm 0.02\%$ of span per year

Operating conditions

Temperature	
In-head transmitter	Operating and storage temperature: Standard version: $-40\dots+85^\circ\text{C}$ / $-40\dots+185^\circ\text{F}$
Humidity	0...95% RH (non-condensing)
Protection category	
In-head transmitter	Housing: IP65, Terminals: IP00

Installation conditions

Mounting	In-head transmitter: DIN B-head or larger, DIN-rail (with adapter) Maximum torque for screw terminals: 0.5 Nm for both tightening and untightening
	For detailed information refer to <i>Installation</i> on page 11.
Weight	In-head transmitter: 35 g / 0.08 lb
Dimensions	For detailed information refer to <i>Dimensions</i> on page 29.

Materials

Housing	PC/ABS + PA
Flammability according to UL	In-head transmitter: V0

Electrical connections

Power supply	8...36 VDC
Isolation	Galvanically isolated (in-out), 1500 VAC, 1 minute
Connection	Single/stranded wires: max. 1.5 mm ² / AWG 16
Reverse Polarity Protection	Yes

Inputs / Outputs

Input - RTD	
Pt100 (IEC 60751, $\alpha = 0.00385$)	-200...+850°C / -328...+1562°F
Pt100 (JIS C1604-1981, $\alpha = 0.003916$)	
PtX ($10 \leq X \leq 1000$) (IEC 60751, $\alpha = 0.00385$)	The upper range depends on the X value, max. input temperature corresponding to 4000 Ω .
Ni100 (DIN 43760)	-60...+250°C / -76...+482°F
Ni120 (Edison No. 7)	
Ni1000 (DIN 43760)	-50...+180°C / -58...+356°F
Sensor current	$\leq 300 \mu\text{A}$
Maximum sensor wire resistance	3-wire and 4-wire connection: 50 Ω /wire 2-wire connection: compensation for 0 to 100 Ω loop resistance
Adjustment	Minimum span 10°C / 18°F
	Sensor error compensation $\pm 10\%$ of span for span <50°C / 90°F, otherwise $\pm 5^\circ\text{C}$ / $\pm 9^\circ\text{F}$
Input - resistance	
Range (resistance)	0...10000 Ω
Zero adjustment	Within range
Max offset adjustment	50% of selected max. value
Minimum span	10 Ω
Sensor current	$\leq 300 \mu\text{A}$
Maximum sensor wire resistance	In-head transmitter: 50 Ω /wire

Output	
Output signal	4...20 mA, 20...4 mA; temperature, resistance or voltage linear, customised linearisation possible.
Permissible load	[Supply voltage - 8.0] / 0.022
NAMUR compliance	Output limits and failure currents according to NAMUR NE 43
Adjustable filtering level	0.17...90 s, (3-wire RTD)
Monitoring	Sensor break and short circuit monitoring, selectable, upscale ≥ 21.0 mA or downscale ≤ 3.6 mA action, individually configurable.
Configuration	
ConSoft	The PC configuration software, ConSoft, is a versatile and user-friendly tool for transmitter configuration.
	ConSoft is compatible with Windows XP/Vista/7/8/8.1/10
	ConSoft is part of the complete configuration kit, which also contains a USB interface and necessary cables. Full functionality of the transmitter is achieved with ConSoft program version 3.4.0 or later and the firmware in the USB Interface must have a version number 1.2.07 or later.
INOR connect	The app INOR Connect for portable devices (smartphones) is a versatile and user-friendly tool for wireless configuration through Bluetooth® or NFC technology. Communication via Bluetooth® requires the Bluetooth® configuration kit - ICON-BT, which can be ordered from the manufacturer.

Approvals and certifications

CE	The device fulfils the statutory requirements of the EU directives. The manufacturer certifies that these requirements have been met by applying the CE marking.
Other standards and approvals	
Vibration resistance	According to IEC 60068-2-6, test Fc, 10...2000 Hz, 10 g
Radio Equipment Directive	EN 300 330
	EN 61326-1 EN 61326-2-3 EN 61000-6-2 EN 61000-6-4
	EN 61010-1
NAMUR compliance	According to NAMUR NE21
RoHS	Directive: 2011/65/EU and 2015/863/EU Harmonized standard: EN IEC 63000

7.3 Dimensions

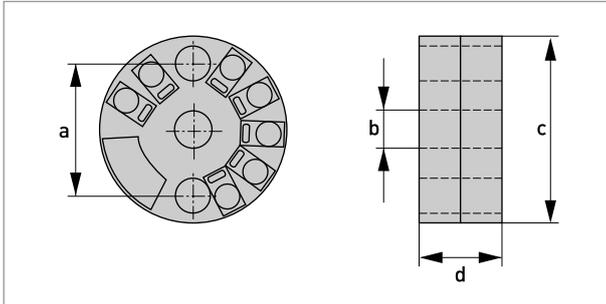


Figure 7-2: In-head transmitter

	Dimensions	
	[mm]	[inch]
a	33.0	1.30
b	7.0	0.28
c	44.5	1.75
d	19,5	0.77

Table 7-1: Dimensions in mm and inch

7.4 Output load diagram

Formula for the maximum permissible output load:
 permissible $R_{Load} [\Omega] = (U - 8.0) / 0.022$

Standard transmitter

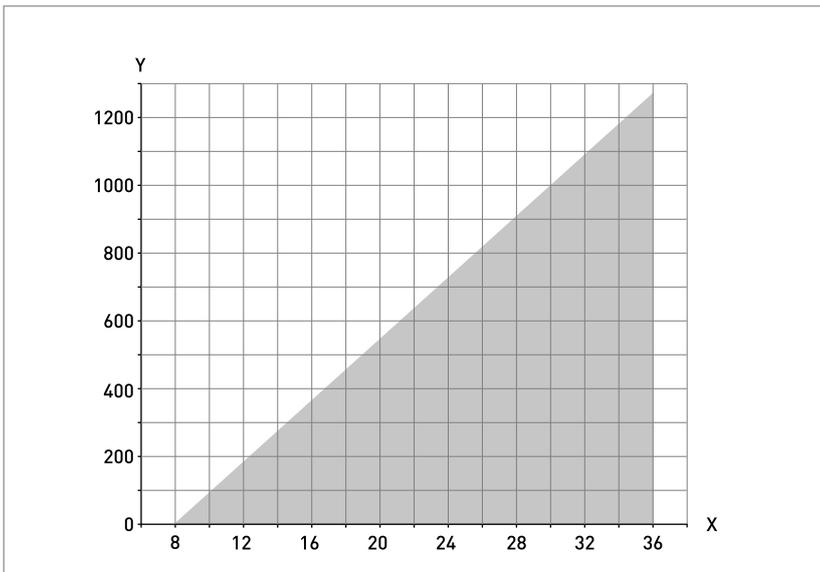


Figure 7-3: Output load diagram

X: Power supply U [VDC]
 Y: Total output load R [Ω]

7.5 RTD and accuracy table

Typical accuracy $\pm 0.1\%$ of span, max. of ± 0.1 K or $\pm 0.1\%$ of span
(Pt100, 3-wire or 4-wire connection)

For factory settings Pt100, 3-wire connection,
accuracy for 0..100°C applies $\pm 0.1^\circ\text{C}$ and for 32...212°F applies $\pm 0.18^\circ\text{F}$

Conformance level 95% (2σ)

Input type	Temp. range	Min. span	Accuracy (maximum of)	Temp. influence (Dev. from ref. temp. 20°C)
	[°C]		[°C]	
RTD Pt100	-200...+850	10	$\pm 0.1^\circ\text{C}$ or $\pm 0.1\%$ of span ①	$\pm 0.01\%$ of span per °C
RTD PtX ②	Corresp. to max. 4 k Ω	10	$\pm 0.1^\circ\text{C}$ or $\pm 0.1\%$ of span ①	$\pm 0.01\%$ of span per °C ③
RTD Ni100	-60...+250	10	$\pm 0.1^\circ\text{C}$ or $\pm 0.1\%$ of span ①	$\pm 0.01\%$ of span per °C
RTD Ni120	-60...+250	10	$\pm 0.1^\circ\text{C}$ or $\pm 0.1\%$ of span ①	$\pm 0.01\%$ of span per °C
RTD Ni1000	-50...+180	10	$\pm 0.1^\circ\text{C}$ or $\pm 0.1\%$ of span ①	$\pm 0.01\%$ of span per °C ③

Table 7-2: Accuracies in °C

① Valid for 3-wire and 4-wire connection

② ($10 \leq X \leq 1000$)

③ For 2-wire connection and span $> 2000 \Omega$ applies $\pm 0.02\%$ of span per °C

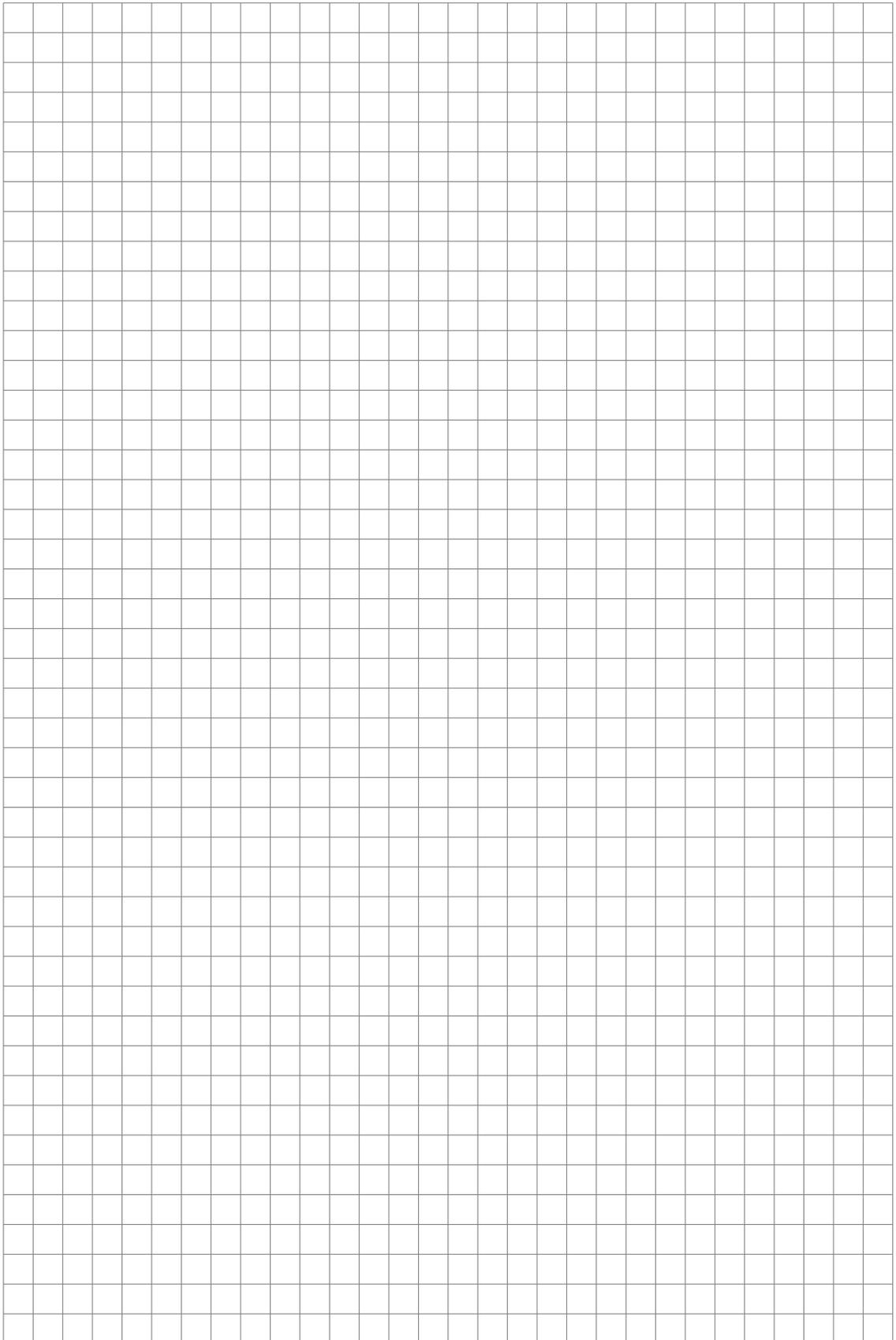
Input type	Temp. range	Min. span	Accuracy (maximum of)	Temp. influence (Dev. from ref. temp. 68°F)
	[°F]		[°F]	
RTD Pt100	-328...+1562	18	$\pm 0.18^\circ\text{F}$ or $\pm 0.1\%$ of span ①	$\pm 0.006\%$ of span per °F
RTD PtX ②	Corresp. to max. 4 k Ω	18	$\pm 0.18^\circ\text{F}$ or $\pm 0.1\%$ of span ①	$\pm 0.006\%$ of span per °F ③
RTD Ni100	-76...+482	18	$\pm 0.18^\circ\text{F}$ or $\pm 0.1\%$ of span ①	$\pm 0.006\%$ of span per °F
RTD Ni120	-76...+482	18	$\pm 0.18^\circ\text{F}$ or $\pm 0.1\%$ of span ①	$\pm 0.006\%$ of span per °F
RTD Ni1000	-58...+356	18	$\pm 0.18^\circ\text{F}$ or $\pm 0.1\%$ of span ①	$\pm 0.006\%$ of span per °F ③

Table 7-3: Accuracies in °F

① Valid for 3-wire and 4-wire connection

② ($10 \leq X \leq 1000$)

③ For 2-wire connection and span $> 2000 \Omega$ applies $\pm 0.02\%$ of span per 1.8°F



INOR Process AB
Travbanegatan 10
213 77 Malmö
Sweden
Tel.: +46-(0)40-312 560
sales@inor.se

The current list of all Inor contacts and addresses can be found at:
www.krohne-inor.se

INOR