

Temperature Transmitters & Instruments Index

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General Information

Temperature Transmitters & Instruments Section

SensorTec is now offering a full line of temperature transmitters and a line of hand held temperature instruments. From the economical universal mount Q3 series RTD transmitter, to the isolated programmable Q2 series transmitters, SensorTec can meet most all of your transmitter requirements. The Q7 series is a non-isolated version, which is in a low profile package for convenience of installation.

The Q2, Q3 and Q7 models are available in both RTD and thermocouple configurations. Please refer to the pages in this section for full specifications. For application assistance, availability and pricing, please contact SensorTec.

Also ask about our:

- Hart Protocol Transmitter
- Din Rail mounted version of our Q2 & Q7
- Power Supplies & More

The hand held instruments consist of single input thermocouple meters for J, K and T calibrations, and multi range dual input units that will accept J, K, E and T inputs. Refer to the catalog page in this section for further details.



Q2/Q2X Universal Intelligent 2-wire In-head Transmitters

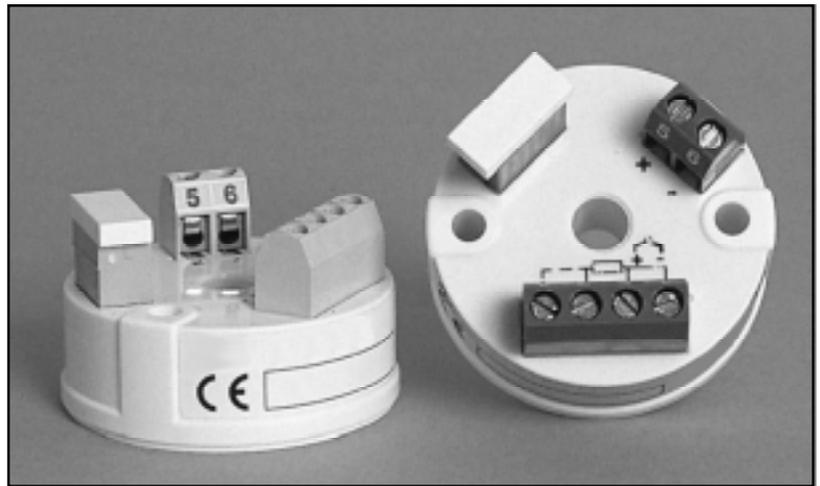
Actual size

SensorTec's Q2 is a universal and intelligent 2-wire In-head transmitter for temperature and other measurement applications.

Q2X is the Intrinsic Safe version for use in Ex-applications.

The combination of *competitive pricing, functionality and simple configuration* has made Q2 and Q2X leading in-head transmitters for industrial temperature measurements.

The Windows based and user friendly software, IPRO 4, is used for transmitter configuration, documentation, monitoring and calibration purposes.



Performance and design:

Excellent stability

- Long-term stability 0.1 %/year.

Enhanced total system accuracy

- Sensor error correction (for known sensor errors).
- System error correction (against known temperatures).

NAMUR-compliant

- Output limitations and fail currents according to NAMUR recommendations.

Input-Output isolation 1500 VAC

- Eliminates measuring errors due to ground loops.

High load capacity

- Only 6.5 V voltage drop over the transmitter (Q2) allows for high loads.

Designed for harsh conditions

- Operation temperature: -40 to +85 °C, -40 to 185 °F.
- Excellent EMC performance.
- Durable, shockproof design.

Simple mounting and connection

- For DIN head or larger.
- Large center hole (dia. 7 mm / 0.28 inch)

5 year limited warranty

Functions:

Input for RTDs, T/Cs, mV and resistance

- Reduced inventory costs.
- Simplified plant engineering.

True on-line communication

- Full access to all features while in operation.

Sensor diagnostics

- SmartSense detects low sensor isolation (essential for correct measurements).
- Selectable sensor break action.

Simplified loop check-up

- The transmitter works as an accurate current generator.

On-screen indications and line recording

- Valuable tools for temporary measurements.

Accuracy and stability

Q2/Q2X are designed for applications with standard industrial demands on accuracy. To reach these demands, the following factors are essential:

Linearity and calibration errors -The use of quality components and precision calibration equipment reduce these errors, e.g. $\pm 0.1\%$ of span for RTD inputs.

High long-term stability -Internal "self calibration", by means of continuous adjustment of important parameters after comparison with accurate built-in references, contributes to a stability of $\pm 0.1\%$ /year.

Measurements with RTDs and other resistances

Q2/Q2X accept inputs from standardized Platinum and Nickel RTDs like Pt10...Pt1000 acc. to IEC 751 ($\alpha=0.00385$), Pt100 acc. to JIS 1604 ($\alpha=0.003916$) and Ni100/Ni1000 acc. to DIN 43760, as well as inputs from plain resistance sensors such as potentiometers. 3- or 4-wire connection can be chosen.

Measurements with thermocouples and plain voltage

Q2/Q2X accept inputs from 11 types of standardized thermocouples as well as plain mV input.

For T/C input, the CJC (cold junction compensation) is fully automatic, by means of an accurate measurement of the terminal temperature. Alternatively, the CJC can be disabled.

Customized linearization and Engineering units

The *Customized linearization* can be used to create a 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 expressed in the primary process value. The sensor characteristics are described by a maximum of 9 data pairs. Fig. 1a and 1b.

Fig. 1a

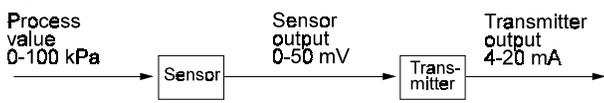
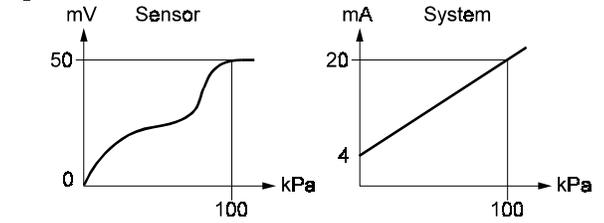


Fig. 1b

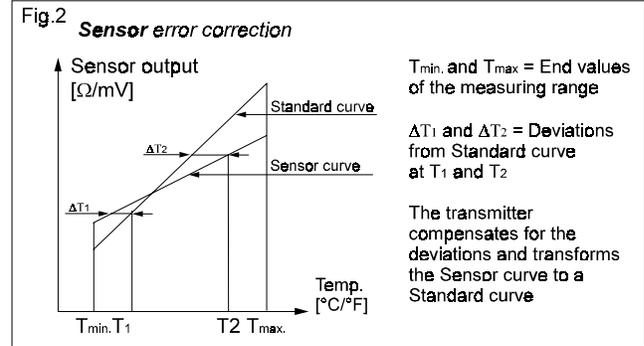


Example of a system (sensor + transmitter) with an output **linear** to the process value, in spite of a **non-linear** sensor.

Sensor or System error correction

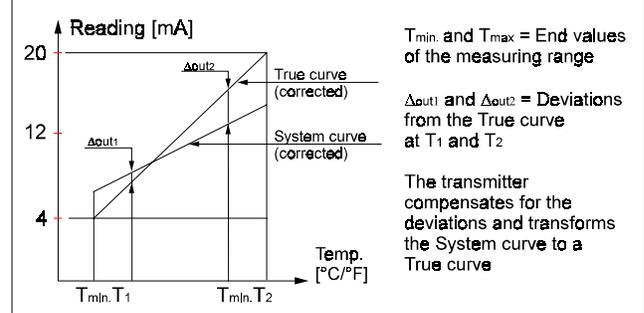
Q2/Q2X offer two ways of improving the measurement with temperature sensors:

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. Fig. 2.



System error correction -This method is used to correct the system error (sensor + transmitter error) by exposing the sensor to one (one-point correction) or two (two-point correction) accurately measured temperatures (true temperatures). The true temperature(s) are entered, and the transmitter automatically corrects for the system errors. Fig. 3.

Fig. 3 Two-point System error correction



SmartSense - Sensor isolation monitoring

SmartSense continuously monitors the isolation resistance of thermocouples and 3-wire connected RTDs as well as the cabling between sensor and transmitter. The transmitter will react by forcing the output to a user defined level if the isolation is too low. SmartSense requires an extra lead inside the thermocouple or RTD. Fig. 5.

Sensor break monitoring

Q2/Q2X monitor sensor break and force the output signal to a user defined level, when any sensor lead is broken or disconnected. The sensor break monitoring can be switched off. The monitoring is furnished with a pulsed excitation current. This eliminates the voltage drop in the lead wires (giving a measuring error), caused by a standard DC excitation current.

Controlled output for instrument calibration

Q2/Q2X can be set to automatically provide a recurring output current regardless of the input signal. The total time for the controlled output is adjustable up to 30 minutes.

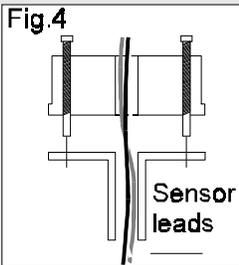
Dampening

The dampening function can be used to dampen undesired instabilities on the input signal. The dampening time is approximately 2 seconds. The dampening time, is the time required, in addition to the update time, for the output to reach 90% of its final value after a step change has been applied to the input.

Power supply

Q2/Q2X are loop-powered and will work on voltages down to 6.5 VDC (8 VDC for Q2X), thus giving good margins for high loads in the current loop. Reversed polarity will not damage the transmitter. Fig. 6

Mounting



Q2/Q2X are designed to fit inside connection heads type DIN or larger.

The large center hole, dia. 7 mm / 0.28 inch, facilitates the pulling through of the sensor leads or an insert tube, greatly simplifying the mounting procedure. Fig. 4.

Warranty

Q2/Q2X are covered by a 5 year limited warranty.

IPRO 4 - The user friendly software for all transmitters of the Q2 family

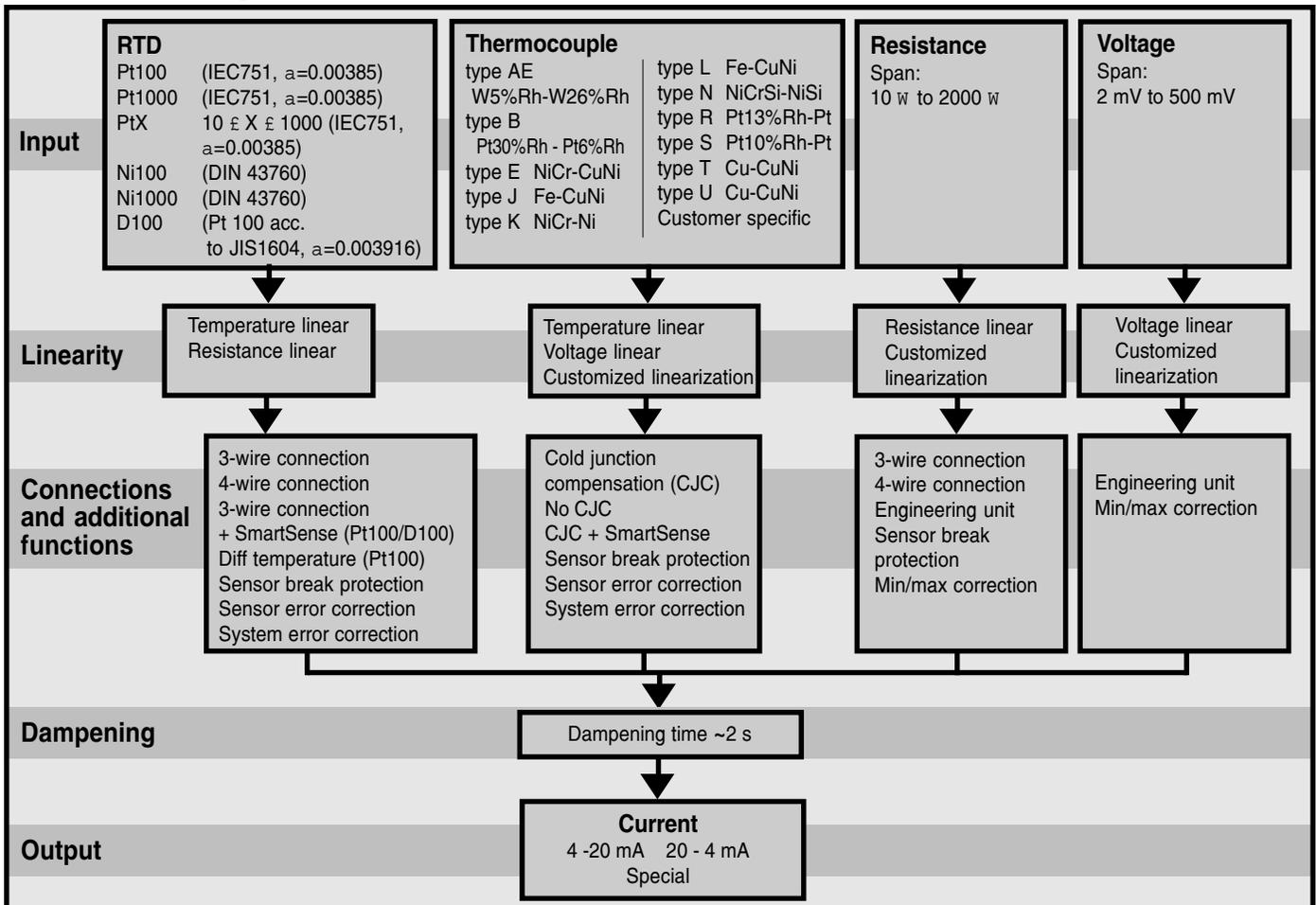
IPRO 4, which is used with all SensorTec intelligent - transmitters, is the tool to utilize all the versatile functions of the Q2/Q2X such as:

- Measurement configuration: Sensor type, range, sensor or system error correction, linearization, engineering units, output settings, filter activation, etc.
- Monitoring of sensor status: Sensor break and sensor isolation (SmartSense).
- On-screen real time presentation of measured values and output signal in the form of numbers, meters, bar graphs and line recorder.
- Transmitter calibration: Field calibration in one or two points and basic calibration.
- Documentation: Configuration files can be saved for future use and configuration protocols can easily be printed.

The communication with the transmitter can be performed on line, i.e. with transmitter in operation. An isolated and Ex-approved communication cable is included in the software kit, IPRO-X.

IPRO 4 is compatible with Windows 3.1, Windows 3.11, Windows 95 and Windows NT Workstation 4.0. The program is menu-driven and easy to learn. On-line help is an effective tool for the user.

Q2/Q2X Configuration scheme



Specifications

Input

RTD's and Resistance

Pt100 (IEC751, $\alpha = 0.00385$)	3-, 4-wire connection	-200 to +1000 °C / -328 to +1832 °F
Pt1000 (IEC751, $\alpha = 0.00385$)	3-, 4-wire connection	-200 to +200 °C / -328 to +392 °F
PtX 10 ϵ X ϵ 1000 (IEC751, $\alpha = 0.00385$)	3-, 4-wire connection	Upper range depending on X-value
Ni100 (DIN 43760)	3-, 4-wire connection	-60 to +250 °C / -76 to +482 °F
Ni1000 (DIN 43760)	3-, 4-wire connection	-60 to +150 °C / -76 to +302 °F
D100 (Pt 100 acc. to JIS1604, $\alpha = 0.003916$)	3-, 4-wire connection	-200 to +1000 °C / -328 to +1832 °F
Potentiometer/resistance	3-, 4-wire connection	0 to 2000 ω
Sensor current		~ 0.4 mA
Maximum sensor wire resistance		25 ω /wire

Thermocouples and Voltage

T/C	Type: AE, B, E, J, K, L, N, R, S, T, U	Ranges according to users manual
Voltage input		-10 to +500 mV
Input impedance		>10 M ω
Maximum sensor wire resistance		500 ω (total loop)

Monitoring

Sensor break monitoring	User definable output	3.5 to 21.6 mA
SmartSense, sensor isolation monitoring	User definable output	3.5 to 21.6 mA

Adjustments

Zero adjustment	All inputs	Any value within range limits
Minimum spans	Pt100, Pt1000, Ni100, Ni1000	10 °C / 18 °F
	Potentiometer	10 ω
	T/C, mV	2 mV

Output

Straight, reversed or any intermediate value		4-20/20-4 mA
Resolution		5 μ A
Minimum output signal	Measurement/Failure	3.8 mA / 3.5 mA
Maximum output signal	Measurement/Failure	20.5 mA / 21.6 mA
Permissible load, <i>see fig.6</i>	Q2	795 ω @ 24 VDC, 22 mA
	Q2X	725 ω @ 24 VDC, 22 mA

Temperature

Ambient, storage		-40 to +85 °C / -40 to +185 °F
Ambient, operation	Q2	-40 to +85 °C / -40 to +185 °F
	Q2X	See Intrinsic Safety specifications

General data

Selectable dampening time		~ 2 s
Update time		~ 1.5 s
Isolation In - Out	Isolated version	1500 VAC, 1 min
Humidity (non-condensing)		0 to 95 %RH
Intrinsic safety	Q2X, Cenelec	EEx ia IIC T4, T5, T6
	FM	Class I, Div. 1, Group A-D, T4

Power supply, polarity protected

Supply voltage	Q2	6.5 to 36 VDC 2-wire
	Q2X	8.0 to 30 VDC 2-wire
Permissible ripple		4 V p-p @ 50/60 Hz

Accuracy

Linearity	RTD Potentiometer, mV	$\pm 0.1\%$ ¹⁾
	T/C	$\pm 0.2\%$ ¹⁾
Calibration	RTD	Max. of $\pm 0.2\text{ }^{\circ}\text{C}$ / $\pm 0.4\text{ }^{\circ}\text{F}$ or $\pm 0.1\%$ ¹⁾
	Potentiometer	Max. of $\pm 0.1\text{ W}$ or $\pm 0.1\%$ ¹⁾
	mV, T/C	Max. of $\pm 20\text{ }\mu\text{V}$ or $\pm 0.1\%$ ¹⁾
Cold Junction Compensation (CJC)	T/C	$\pm 0.5\text{ }^{\circ}\text{C}$ / $\pm 0.9\text{ }^{\circ}\text{F}$
Temperature influence ⁴⁾	All inputs	Max. of $\pm 0.25\text{ }^{\circ}\text{C}/25\text{ }^{\circ}\text{C}$ or $\pm 0.25\%/25\text{ }^{\circ}\text{C}$ ^{1) 3)}
		Max. of $\pm 0.5\text{ }^{\circ}\text{F}/50\text{ }^{\circ}\text{F}$ or $\pm 0.28\%/50\text{ }^{\circ}\text{F}$ ^{1) 3)}
Temperature influence CJC ⁴⁾	T/C	$\pm 0.5\text{ }^{\circ}\text{C}/25\text{ }^{\circ}\text{C}$ / $\pm 1.0\text{ }^{\circ}\text{F}/50\text{ }^{\circ}\text{F}$
Instrument calibration output	4-20 mA	$\pm 8\text{ }\mu\text{A}$
Sensor wire resistance influence	RTD, Potentiometer, 3-wire	Negligible ²⁾
	RTD, Potentiometer, 4-wire	Negligible
	mV, T/C	Negligible
Load influence		Negligible
Power supply influence		Negligible
RFI influence, 0.15 to 1000 MHz, 10 V or V/m		$\pm 0.1\%$ ¹⁾ (typical)
Long-term stability		$\pm 0.1\%$ ¹⁾ /year

Housing

Material / Flammability (UL)		PC + ABS/V0, Polyamide/V2
Mounting		DIN-head or larger, DIN rail (with mounting kit)
Connection	Single/stranded wires	-1.5 mm ² , AWG 16
Weight		50 g
Protection, housing / terminals		IP 50 / IP 10

¹⁾Of input span

²⁾With equal wire resistance

³⁾If zero-deflection > 100% of input span:
add 0.125% of input span/25 °C or 0.14%
of input span/50 °F per 100% zero-deflection

⁴⁾Reference temperature 23 °C / 73 °F

The User Instructions must be read prior to adjustment and/or installation.

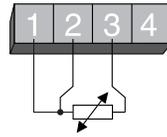
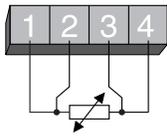
Intrinsic Safety specifications

Specifications	Q2X, isolated and non-isolated	Q2X, isolated
Approval	Demko / Cenelec	Factory Mutual (FM)
Classification	EEx ia IIC T4, T5, T6 T4/+85°C, T5/+65°C, T6/+50°C	IS for use in Class I, Div. 1, Group A-D, T4/+80°C
Certificate No.	95D.117989X	J.I. 0D6A8.AX, Drw. 3-7851
Output/Supply		
Max voltage to transmitter	U _i = 30 Vdc	V _{max} = 30 Vdc
Max current to transmitter	I _i = 100 mA	I _{max} = 100 mA
Max power to transmitter	P _i = 900 mW	P _{max} = 900 mW
Internal inductance	L _i = 0 mH	L _i = 2.5 mH
Internal capacitance	C _i = 0 μF	C _i = 0 μF
Input (Sensor)		
Max voltage from transmitter	U _o = 30 Vdc	V _{oc} = 30 Vdc
Max current from transmitter	I _o = 25 mA	I _{sc} = 25 mA
Max power from transmitter	P _o = 188 mW	Not specified
Max inductance (input loop)	L _o = 50 mH	L _a = 56.8 mH
Max capacitance (input loop)	C _o = 66 nF	C _a = 0.12 μF

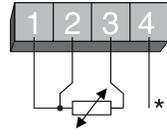
INPUTS

RTD

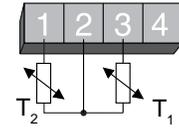
Pt100, Pt1000, Ni100, Ni1000, PtX, D100
4-wire connection 3-wire connection



Pt100, D100
3-wire connection

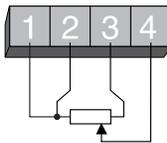


Pt100
Diff temperature $T_1 > T_2$

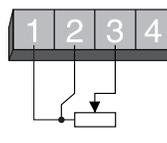


Potentiometer

4-wire connection

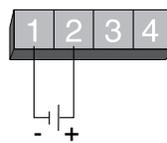


3-wire connection



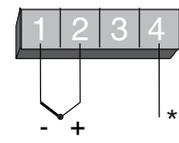
Voltage

millivolt



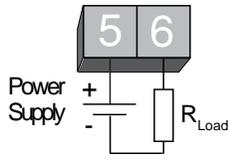
Thermocouple

AE, B, E, J, K, L, N, R, S, T, U
or customer specific

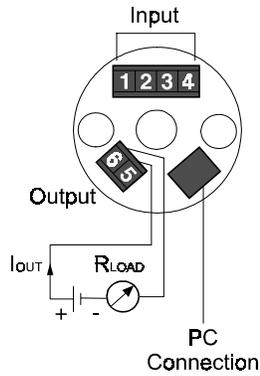


OUTPUT

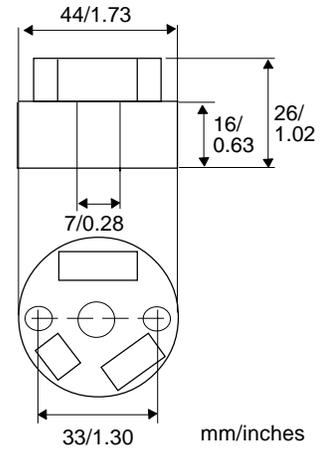
4-20 mA Output



Connections

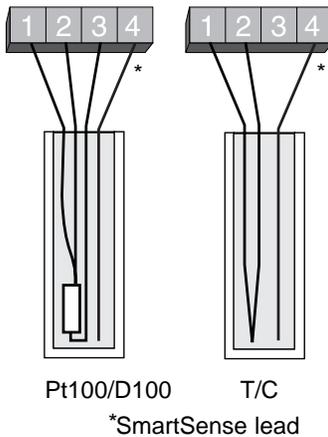


Dimensions



SmartSense

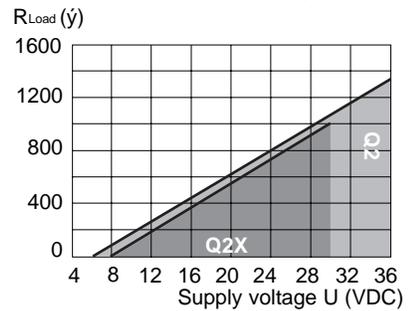
Fig.5



Output load diagram

Fig.6

Permissible R_{Load} at 22 mA output



$$R_{Load} = (U - 6.5) / 0.022 \quad (Q2) \quad R_{Load} = (U - 8) / 0.022 \quad (Q2X)$$

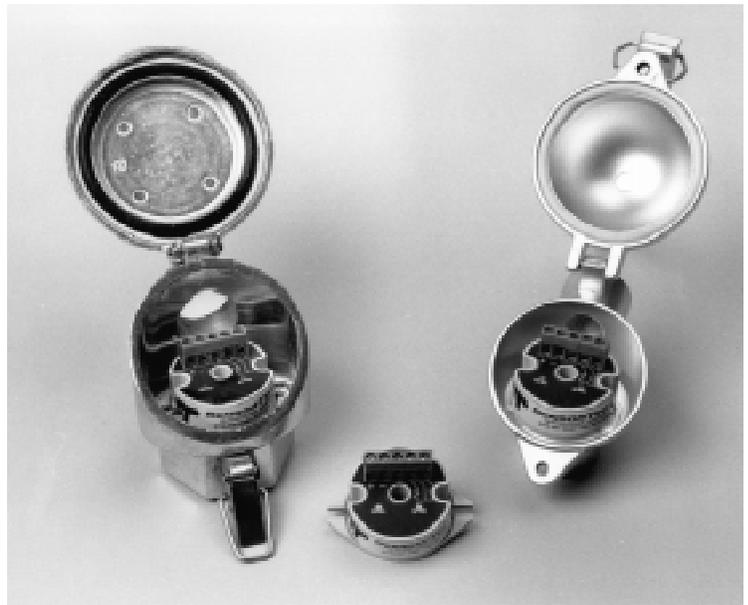
Patented Design

Q3 Universal Mount Intelligent 2-wire In-head Transmitters

SensorTec's Q3 is a universal mount and intelligent 2-wire In-head transmitter for temperature measurement applications.

The combination of *competitive pricing, functionality and simple configuration* has made the Q3 a leading in-head transmitter for industrial temperature measurements.

The simple and user friendly Windows based software is used for transmitter configuration, documentation, and calibration purposes.



Performance and design:

Excellent stability

- Long-term stability 0.2 % per year.

No external power supply for configuration

- Edit or read the configuration off-line by just connecting a PC.

Linearization

- Fully temperature linear output for RTD or thermocouple

Sensor failure monitoring.

- Selectable sensor failure action, upscale or downscale

NAMUR-compliant

- Output limitations and fail currents according to NAMUR recommendations.

Designed for harsh conditions

- Operation temperature: -40 to +85 °C, -40 to 185 °F.
- Durable, shockproof design.

Simple mounting and connection

- For DIN head or larger.
- Fit all standard American style heads
- Large center hole will accept up to a 0.250 diameter probe

5 year limited warranty

Functions:

Input for RTDs, T/Cs

- Reduced inventory costs.
- Simplified plant engineering.

Versatile programmable design

- Accepts both Pt100 DIN (0.00385 per IEC751) and Pt100 JIS 1604 (0.003916).
- Accepts inputs from 11 types of standard thermocouples and utilizes automatic CJC (cold junction compensation). Alternatively, the CJC can be disabled.

Measurements with RTD's

Q3 accepts inputs from standardized Platinum RTD's. Pt100, acc. to IEC 751 ($\alpha=0.00385$) and Pt100 acc. to JIS 1604 ($\alpha=0.003916$). 3-wire connection is used.

Measurements with thermocouples and plain voltage

Q3 accepts inputs from 11 types of standardized thermocouples.

For T/C input, the CJC (cold junction compensation) is fully automatic, by means of an accurate measurement of the terminal temperature. Alternatively, the CJC can be disabled

Sensor failure monitoring

Q3 monitors sensor break and short-circuit and forces the output signal upscale or downscale (selectable), when any sensor lead is broken, disconnected or short-circuited. The sensor monitoring can be switched off. The monitoring is furnished with a pulsed excitation current. This eliminates the voltage drop in the lead wires (giving a measuring error), caused by a standard DC excitation current.

Power supply

Q3 is loop-powered and will work on voltages down to 8 VDC, thus giving good margins for high loads in the current loop. Reversed polarity will not damage the transmitter.

Warranty

Q3 is covered by a 5-year limited warranty.

Q3Pro Simple Configuration Software

Q3 Pro is used for the configuration of the Q3

Measurement configuration: Sensor type, range, filter activation, CJC, etc.

Monitoring of sensor status: Sensor failure upscale or downscale action of the output signal.

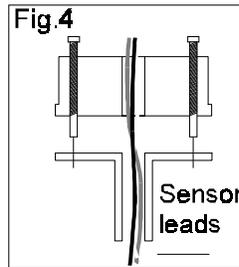
Documentation: configuration files can be saved for future use.

Q3 is configured with need of power supply.

A communication cable is included in the configuration kit, Q3 Pro off-line package.

Q3 Pro is compatible with Windows 3.1, Windows 95, Windows 98, and Windows NT. The program is menu-driven and extremely easy to use.

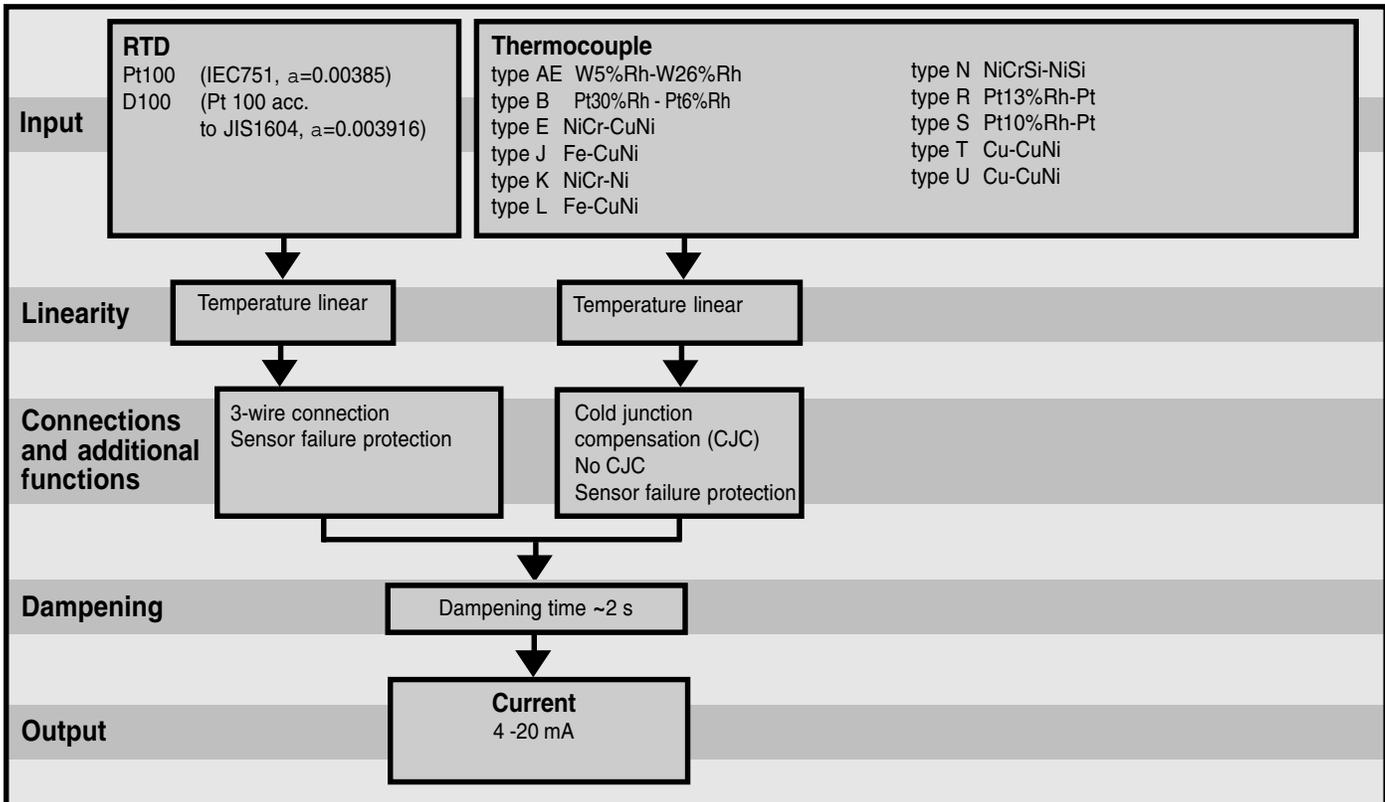
Mounting



Q3 is designed to fit inside connection heads type DIN B or larger.

The large center hole, dia 0.28 inch, facilitates the pulling through of the sensor leads or tube, simplifying the mounting procedure.

Q3 Configuration scheme



Specifications

Input

RTD's and Resistance

Pt100 (IEC751, $\alpha = 0.00385$)	3-, 4-wire connection	-200 to +1000 °C / -328 to +1832 °F
D100 (Pt 100 acc. to JIS1604, $\alpha = 0.003916$)	3-, 4-wire connection	-200 to +1000 °C / -328 to +1832 °F
Sensor current		~ 0.4 mA
Maximum sensor wire resistance		25 Ω /wire

Thermocouples

T/C	Type: AE, B, E, J, K, L, N, R, S, T, U	Ranges according to users manual
Input impedance		>10 M Ω
Maximum sensor wire resistance		500 Ω (total loop)

Monitoring

Sensor failure monitoring	Upscale or downscale
---------------------------	----------------------

Adjustments

Zero adjustment	All inputs	Any value within range limits
Minimum spans		Pt10010 °C / 18 °F
	T/C	2 mV

Output

Analog		4-20 mA temperature linear
Resolution		5 μ A
Minimum output signal	Measurement/Failure	3.8 mA / 3.5 mA
Maximum output signal	Measurement/Failure	20.5 mA / 21.6 mA
Permissible load, <i>see load diagram</i>		725 Ω @ 24 VDC, 22 mA

Temperature

Ambient, storage and operation	-40 to +85 °C / -40 to +185 °F
Ambient, operation	-40 to +85 °C / -40 to +185 °F

General data

Selectable dampening time	~ 2 s
Update time	~ 1.5 s
Isolation In - Out	Non isolated
Humidity (non-condensing)	0 to 95 %RH

Power supply, polarity protected

Supply voltage	8 to 36 VDC 2-wire
Permissible ripple	4 V p-p @ 50/60 Hz

Accuracy

Typical accuracy	RTD	$\pm 0.2\%$ ¹⁾
	T/C	$\pm 0.3\%$ ¹⁾
Cold Junction Compensation (CJC)	T/C	$\pm 0.5\text{ °C} / \pm 0.9\text{ °F}$
Temperature influence ⁴⁾	All inputs	Max. of $\pm 0.25\text{ °C} / 25\text{ °C}$ or $\pm 0.25\% / 25\text{ °C}$ ^{1) 3)} Max. of $\pm 0.5\text{ °F} / 50\text{ °F}$ or $\pm 0.28\% / 50\text{ °F}$ ^{1) 3)}
Temperature influence CJC ⁴⁾	T/C	$\pm 0.5\text{ °C} / 25\text{ °C} / \pm 1.0\text{ °F} / 50\text{ °F}$
Sensor wire resistance influence		Negligible ²⁾
Load influence		Negligible
Power supply influence		Negligible
RFI influence, 0.15 to 1000 MHz, 10 V or V/m		$\pm 0.5\%$ ¹⁾ (typical)
Long-term stability		$\pm 0.2\%$ ¹⁾ /year

Housing

Material / Flammability (UL)		PC + ABS/V0, Polyamide/V2
Mounting		DIN-head or larger, DIN rail (with mounting kit)
Connection	Single/stranded wires	-1.5 mm ² , AWG 16
Weight		50 g
Protection, housing / terminals		IP 50 / IP 10

¹⁾ Of input span

²⁾ With equal wire resistance

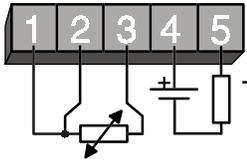
³⁾ If zero-deflection > 100% of input span: add 0.125% of input span/25 °C or 0.14% of input span/50 °F per 100% zero-deflection

⁴⁾ Reference temperature 23 °C / 73 °F

Connections

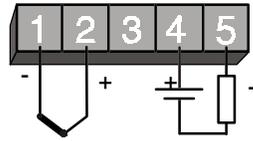
RTD

Pt100 (a=0.00385),
D100 (a=0.003916)
3-wire connection



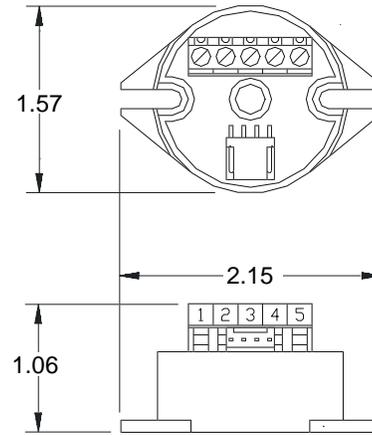
Thermocouple

AE,B,E,J,K,
L,N,R,S,T,U



Dimensions

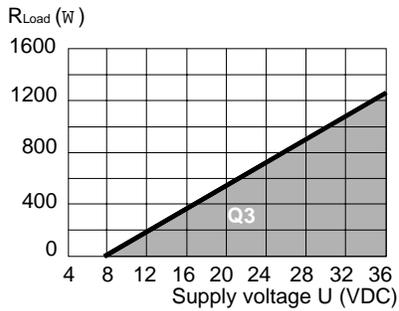
The SensorTec Universal Mount transmitter can be installed in either DIN style connection heads or American style. To install in European DIN heads snap off the removable mounting tabs on either side of the transmitter



Output load diagram

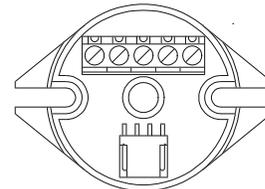
Fig.6

Permissible R_{Load} at 22 mA output

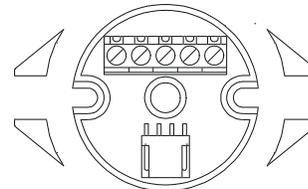


$$R_{Load} = (U - 8) / 0.022$$

Patented Universal Mount



Oval Shaped Head (American style) mounting
w/ break away tabs intact



Round Shaped Head (DIN style) mounting
w/ break away tabs removed

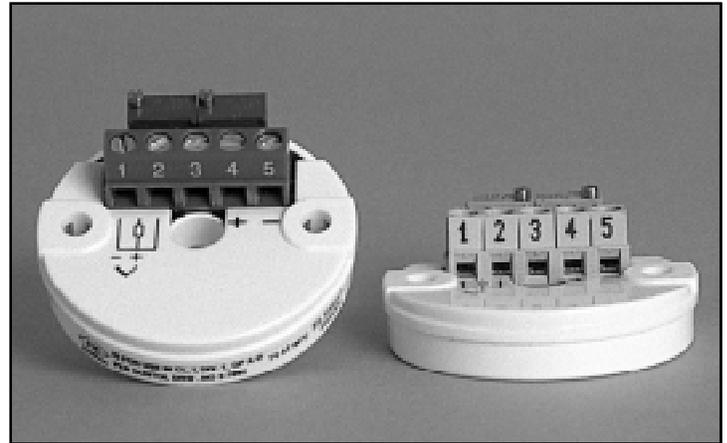


Q7 Multirange 2-wire In-head Transmitters

Actual size

Q7 series is a family of multirange 2-wire temperature transmitters for in-head mounting in DIN or larger connection heads.

Designed for highest reliability and cost-efficiently manufactured, Q7 represents a family of transmitters that combine attractive pricing with high quality and excellent industrial performance.



Main features

Multi-range design

- Q7RF for Pt100 input with selectable measurement ranges.
- Q7CF for T/C J, L, T, K and N inputs with continuous range adjustment.

Accurate measurements

- Temperature linear 4-20 mA output for Pt100 input.

Easy mounting and access

- Flat design gives easy access to terminals and adjustments.
- Large center hole lets the lead wires or sensor tube pass through easily.

Safety

- Genuine sensor break detection with selectable action, upscale or downscale.
- Excellent EMC performance.

High load capacity

- Only 6.5 V voltage drop over the transmitter allows for high loads.

Competitive pricing

5 year limited warranty

Description

Q7 is a family of analog, 2-wire, in-head transmitters with selectable ranges for Pt100 and selectable types and ranges for thermocouple input.

The "Low Profile" housing, with its protected electronics, is extremely durable and facilitates easy connections and adjustments.

Q7RF is adjustable for different Pt100 ranges in both °C and °F and provides a temperature linear output.

Q7CF covers 5 different thermocouple types, is continuously adjustable and provides a voltage linear output.

Adjustments are made with solder pads and potentiometers.

Intrinsically safe versions, Q7RFX (Pt100) and Q7CFX (T/C) are available with CENELEC approval. FM approval is expected during 1998.

Specifications

Input

Q7CF/HCFX

Pt100 (α = 0.00385), 3-wire connection	Adjustable to specific ranges within: -50 to +550 °C / -60 to +1120 °F	
Thermocouples	Selectable, type J, L, T, K and N with ranges within -5 to +55 mV	
Sensor current	~1.1 mA	
Input impedance	>5 MΩ	
Max. sensor wire resistance	15 Ω/wire	500 Ω (total loop)
Monitoring		
Sensor break detection, selectable	Upscale ~25 mA, downscale ~3 mA	Upscale ~25 mA, downscale ~3 mA
Adjustments		
Zero	-50 to +50 °C / -60 to +120 °F	±10 % of span
Span, selectable	50 to 500 °C / 100 to 1000 °F	10 to 50 mV
Span, fine adjustment	±10 % (± 5% for 600/800/1000°F)	±10 %
Output		
Current	4 - 20 mA	4 - 20 mA
Linearity	Temperature linear	Voltage linear
Current limitation	~ 25 mA	~ 25 mA
Permissible load	Q7RF/HCF	700 W @ 24 VDC, 25 mA
	Q7RFX/HCFX	620 W @ 24 VDC, 25 mA
Temperature		
Ambient, storage	-40 to +100 °C / -40 to +212°F	-40 to +100 °C / -40 to +212°F
Ambient, operating	Q7RF/HCF	-40 to +85 °C / -40 to +185 °F
	Q7RFX/HCFX	See "Intrinsic Safety specifications"
General data		
Response time 10-90%	- 0.2 s	- 0.2 s
Humidity (non-condensing)	0 to 95 %RH	0 to 95 %RH
Intrinsic safety	Q7RF/HCF	CENELEC: EEx ia IIC T4, T5, T6
	Q7RFX/HCFX	FM: Class I, Div.1, Gr.A-D (pending).
Power supply, polarity protected		
Supply voltage	Q7RF/HCF	6.5 to 32 VDC
	Q7RFX/HCFX	8.5 to 30 VDC ¹⁾
Permissible ripple	4 Vp-p @ 50/60 Hz	4 Vp-p @ 50/60 Hz
Accuracy		
Linearity	±0.1 % of span	±0.1 % of span
Calibration	±0.1 % of span	±0.1 % of span
Cold Junction Compensation (CJC)		±1.0 °C / ±1.8 °F
Temperature influence	±0.6 % of span/25 °C, ±0.7 % of span/50 °F	±0.6 % of span/25 °C, ±0.7 % of span/50 °F
Temperature influence CJC		±1.25 °C/25 °C, ±2.5 °F/50 °F ³⁾
Sensor wire influence	±0.005 °C/Ω / ±0.009 °F/Ω ²⁾	0.4 μV/Ω
RFI influence, 0.15-1000MHz, 10 V or V/m	±0.2 % of span(typical)	±0.2 % of span(typical)
Supply voltage influence	±0.02 % of span/V	±0.02 % of span/V
Supply ripple influence, 50/60 Hz, 4 Vp-p	±0.05 % of span	±0.05 % of span
Long term stability	±0.1 % of span/year	±0.1 % of span/year
Housing		
Material / Flammability(UL)	Zinc alloy + ABS / V0	Zinc alloy + ABS / V0
Mounting	DIN-head or larger	DIN-head or larger
Connection, single/stranded wires	-2.5 mm ² , AWG 14	-2.5 mm ² , AWG 14
Weight	40 g	40 g
Protection, housing with cover/terminals	IP 20 / IP 10	IP 20 / IP 10

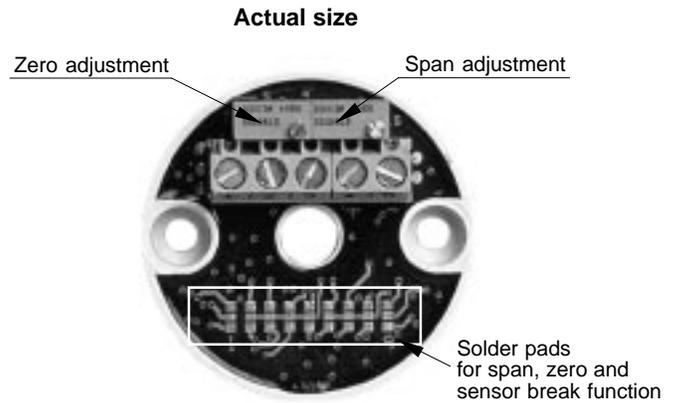
¹⁾ Preliminary data for FM approval

²⁾ Per wire, with equal resistance

³⁾ ±2.5 °C/25 °C, ±5.0 °F/50 °F for type T

Range adjustments Q7RF, Q7RFX

Zero adjustment	-50 to +50 °C	-60 to +120 °F
Span selection	50 °C	100 °F
	100 °C	200 °F
	150 °C	300 °F
	200 °C	400 °F
	300 °C	600 °F
	400 °C	800 °F
	500 °C	1000 °F



Zero adjustment Adjustable $\pm 10\%$ of span

Span selection	mV	T/C J *	T/C L *	T/C T *	T/C K *	T/C N *
10 to 50		186 - 870°C	183 - 855°C	213 - >400°C	246 - 1232°C	319 - >1300°C
(no gap)		335 - 1566°F	329 - 1540°F	383 - >720°F	443 - 2218°F	574 - >2340°F

*The temperature spans correspond to the mV spans with zero adjustment = 0 % of span

Intrinsic Safety specifications

Specifications	Q7RFX Q7CFX
Approval	Demko / Cenelec
Classification	EEEx ia IIC T4, T5, T6 T4/+85°C, T5/+55°C, T6/+40°C
Certificate No.	96D.121000X, Appendix III
Output/Supply	
Max voltage to transmitter	U _i = 30 Vdc
Max current to transmitter	I _i = 100 mA
Max power to transmitter	P _i = 700 mW
Internal inductance	L _i = 0 mH
Internal capacitance	C _i = 0 nF
Input (Sensor)	
Max voltage from transmitter	U _o = 30 Vdc
Max current from transmitter	I _o = 100 mA
Max power from transmitter	P _o = 700 mW
Max inductance (input loop)	L _o = 5 mH
Max capacitance (input loop)	C _o = 66 nF

High Profile Q7



Delivery times on request (Non-stocked items)

Alternative design

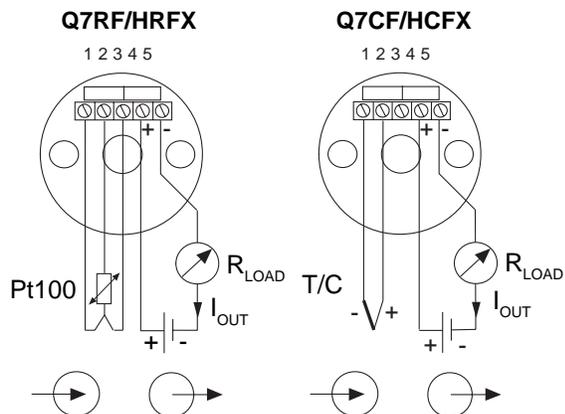
As alternative to the standard "Low Profile" types of Q7 described in this data sheet, all versions can also be supplied as "High Profile" types. For ordering information, see "Ordering table" below.

The only differences compared to the Low Profile types are:

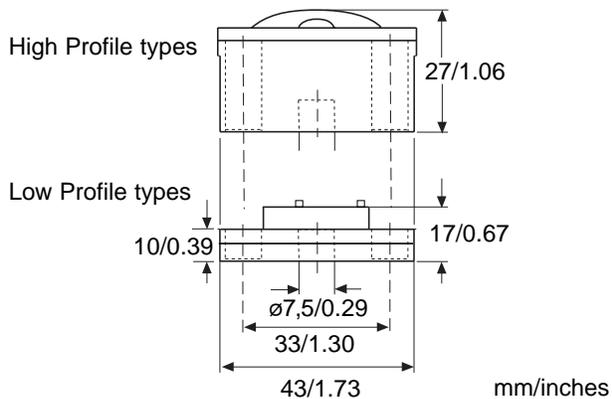
- The height including cover lid is 27 mm/1.06 inch (17 mm/0.67 inch for Low Profile).
- The weight is ~60 g (~40 g for Low Profile).

Before ordering, please consult sales for availability and delivery time.

Connections

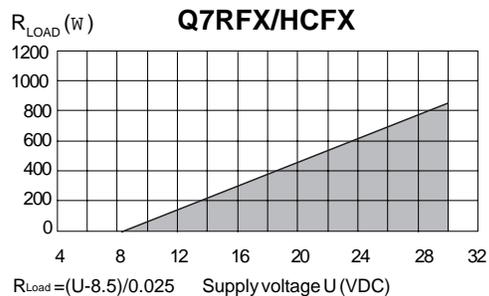
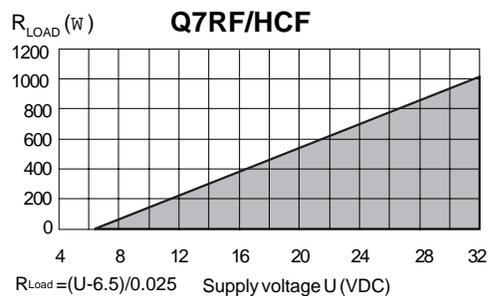


Dimensions



Output load diagrams

Permissible R_{Load} at 25 mA output



Hand Held Thermocouple Thermometers Single Input & Dual Input Models

SensorTec is pleased to offer a line of competitively priced hand held thermocouple meters. These meters feature an ergonomic design, sealed silicon rubber keypad, ABS/polycarbonate plastic case that is splash/dust resistant and a built-in stand. The single input meters will accept J, K and T calibration thermocouples. The dual input units will accept J, K, E and T calibration thermocouples. All of the meters have built-in mini plug receptacles. Temperatures can be displayed in °F or in °C. The hold feature allows you to record the temperature for later viewing, possibly while measuring in an inconvenient location. The resolution is auto-ranging, which is based upon the temperature being recorded.



Performance and design:

Power

- Two AA batteries (included)

Battery Life

- Approximately 200 hours

Dimensions

- 3.3"W x 6.2"H x 1.2" D (84mm x 158mm x 30mm)

Shipping Weight

- 0.7lbs (0.4kg)

Case construction

- ABS/polycarbonate plastic case.
- Splash/dust resistant construction

Intrinsically safe

- Certified for Class I: Groups A, B, C, and D: Division 1

3 year limited warranty

Functions:

Input for Thermocouples

- Single Input models: Type J, K, and T
- Multi range dual input model: Type J, K, E, and T

Temperature range

- Type J: -328 to 1832°F (-200 to 1000°C)
- Type K: -418 to 2501°F (-250 to 1372°C)
- Type T: -418 to 752°F (-250 to 400°C)
- Type E: -418 to 1832°F (-250 to 1000°C)

Accuracy

- $\pm 0.9^{\circ}\text{F}$ ($\pm 0.5^{\circ}\text{C}$) above -99° ; $\pm 2^{\circ}\text{F}$ ($\pm 1^{\circ}\text{C}$) below -99.9° ; or $\pm 0.2\%$ of reading, whichever is greater

Resolution

- 0.1° between -99.9° and 299.9°
- 1° below -99.9° and above 299.9°

Buttons

- Single range model; On/Off, Hold, Calibration, and °C/°F
- Multi range model; On/Off, Hold, Calibration, and °C/°F, J-T-E-K, maximum, minimum, differential, store, recall, clear, and, $0.1^{\circ}/1^{\circ}$

Coming Soon!

UNDER CONSTRUCTION



SensorTec is currently developing a “Standard Probe” page for our hand held instruments listed on the previous page. This page will be added in 2000. Please contact SensorTec for availability of probes for our hand held instruments. We can supply custom probes for basically all applications using the hand held instruments.

Some of our hand held probes:

- **Insertion Probes**
- **Surface Probe**
- **Air Probes**
- **Magnet Mount Probe**
- **& More**