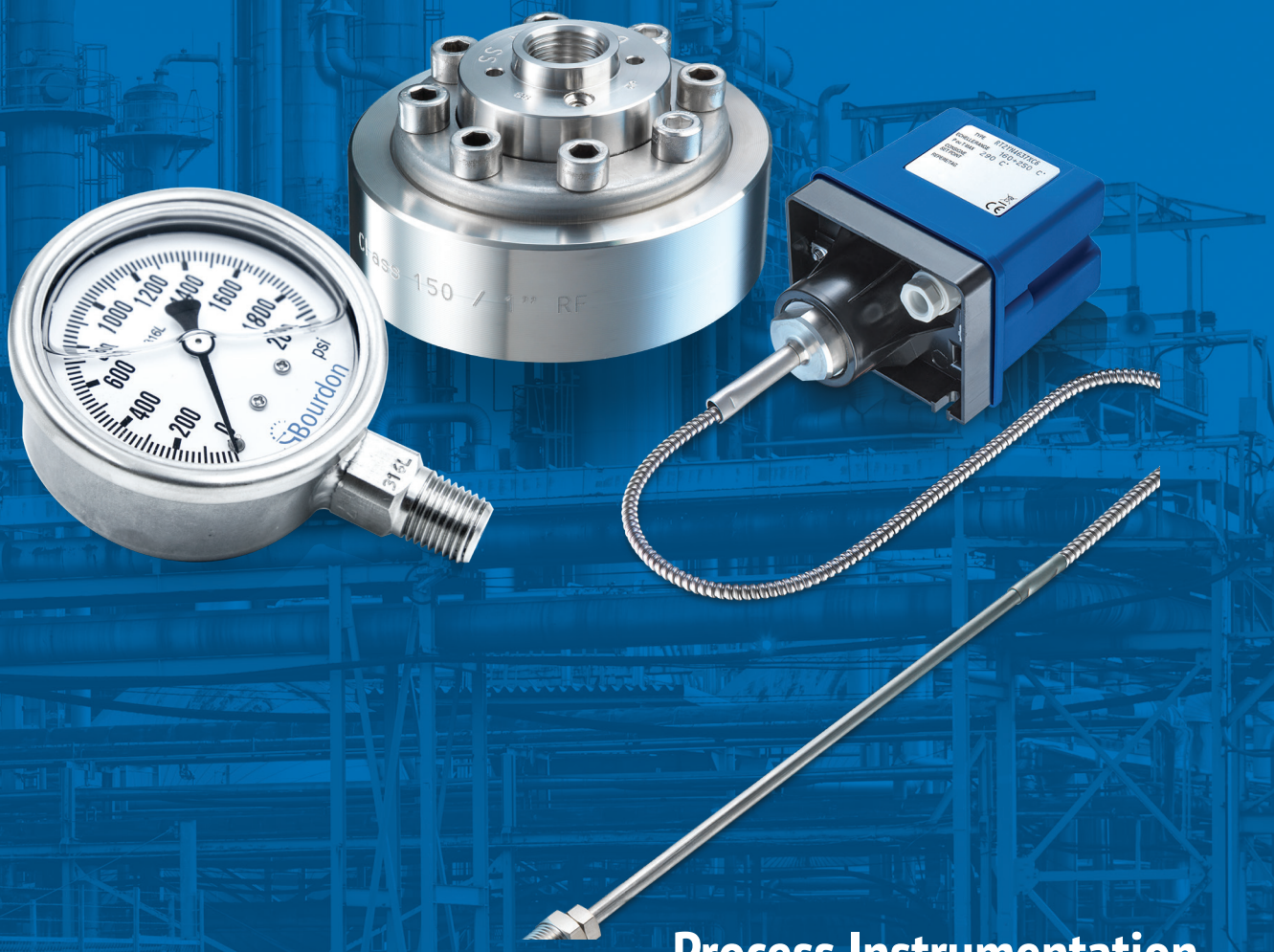
Bourdon

PRODUCT SELECTION GUIDE

PRESSURE & TEMPERATURE INSTRUMENTATION



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Process Instrumentation

KEEP THE OVERVIEW

Here are a few guidelines on how to specify our products. Intended as a quick reference, this pocket guide will help you ask the right questions to find the ideal, application-specific product.

CONTENTS

How to Specify a

PRESSURE TRANSMITTER

A pressure transmitter converts pressure into a signal that can be received by a device in a different location.

WHAT WE NEED TO KNOW:

- Process media
- Process temperature
- Process connection
- Pressure range & units of measurement
- Accuracy
- Signal output
- Electrical connection
- Integrated/detached/without display
- Hazardous area classification
- IP protection requirements

How to Specify a

PRESSURE GAUGE

Pressure gauges are autonomous local pressure indicators without power supply. They are used in many applications for fast and easy pressure readout on an analog display. Equipped with the right diaphragm seal, electrical contact or accessory, a pressure gauge can be used in almost any application or process.

WHAT WE NEED TO KNOW:

- Process media
- Temperature (medium & ambient)
- Material of sensing element
- Type of process connection
- Location of process connection
- Mounting style (e.g. front flange, U-clamp)
- Pressure (relative, absolute, differential)
- Measurement range & unit
- Accuracy class
- Dry or filled with damping fluid
- Safety requirements
- Window material
- Special requirements & options
  - › Hazardous area classification
  - › Electrical output signal (contacts or analog)
  - › Pointer options
  - › IP protection

How to Specify a

PRESSURE SWITCH

Pressure switches are mechanical or electronic instruments with or without integrated display. They are used to signal excess pressure outside the defined limits to trigger an actuator in a regulation circuit or a 2-position control system.

WHAT WE NEED TO KNOW:

- Process media
- Pressure range
- Type of pressure (gauge or differential)
- Overpressure
- Temperature (medium & ambient)
- Wetted parts material
- Process connection
- Electrical connection
- Type of mounting
- Repeatability
- Number of contacts
- Setpoint & deadband
- Electrical contact rating
- Hazardous area classification
- Special requirements & options

How to Specify a

DIAPHRAGM SEAL

Diaphragm seals are used to protect pressure gauges against high temperatures, aggressive, crystallizing or corrosive fluids or to ensure hygienic requirements. Diaphragm seals are attached to pressure gauges, transmitters or pressure switches directly or via a flexible capillary.

WHAT WE NEED TO KNOW:

- Type of seal (threaded, flanged, hygienic, tubular etc.)
- Upper part / body material
- Lower part material (if applicable)
- Diaphragm material
- Coating of wetted parts (if required)
- Process connection
- Instrument connection
- Type of mounting (direct / remote)
- Capillary length (if remote)
- Capillary protection (if remote)
- Height difference between instrument and seal (if remote)
- Type of measuring instrument
- Pressure range
- Temperature (medium and ambient)
- Type of system fill fluid
- Special requirements & options
  - › Hygienic requirements (FDA / 3A / EHEDG)

How to Specify a

THERMOMETER

Thermometers are autonomous temperature indicators without power supply for fast and easy temperature readout on the analog display. Bi-metal thermometers are common use in standard applications up to 600 °C. Higher temperatures call for capillary measurement from remote.

WHAT WE NEED TO KNOW:

- Bi-Metal or gas filled system
- Process media
- Case diameter
- Case material
- Stem material
- Diameter and length of stem
- Type of process connection
- Stem outlet (back, bottom, every angle)
- Mounting style (e.g. surface mounted, spring clip)
- Capillary length (if applicable)
- Measurement range & unit
- Accuracy
- Electrical contacts (if applicable)
- Window material
- Pointer options
- Hazardous area classification
- Thermowell requirements
- Special requirements & options
  - › IP protection

How to Specify a

RTDS, THERMOCOUPLES, OR TRANSMITTERS

Sensing elements, either RTDs or thermocouples, detect the temperature being measured. This information is then converted by the transmitter into analog or digital communication to be read by a remote source.

WHAT WE NEED TO KNOW:

- Sensor element type (single / duplex, accuracy)
- Sensor insert (2-wire / 4-wire)
- Is transmitter included or not and which one is required
- Required output signal
- Accuracy
- Electrical isolation requirements
- Ambient temperature
- Process temperature
- Temperature range
- Process connection (industrial / hygienic environment)
- Sensor tube length
- Sensor tube diameter
- Response time
- Case type (IP-class, integrated display)
- Built-in display requirements
- Electrical connection
- Approvals and certifications (e.g. 3A, EHEDG, FDA, EN50155, ...)
- Hazardous area classification (Atex)
- Thermowell

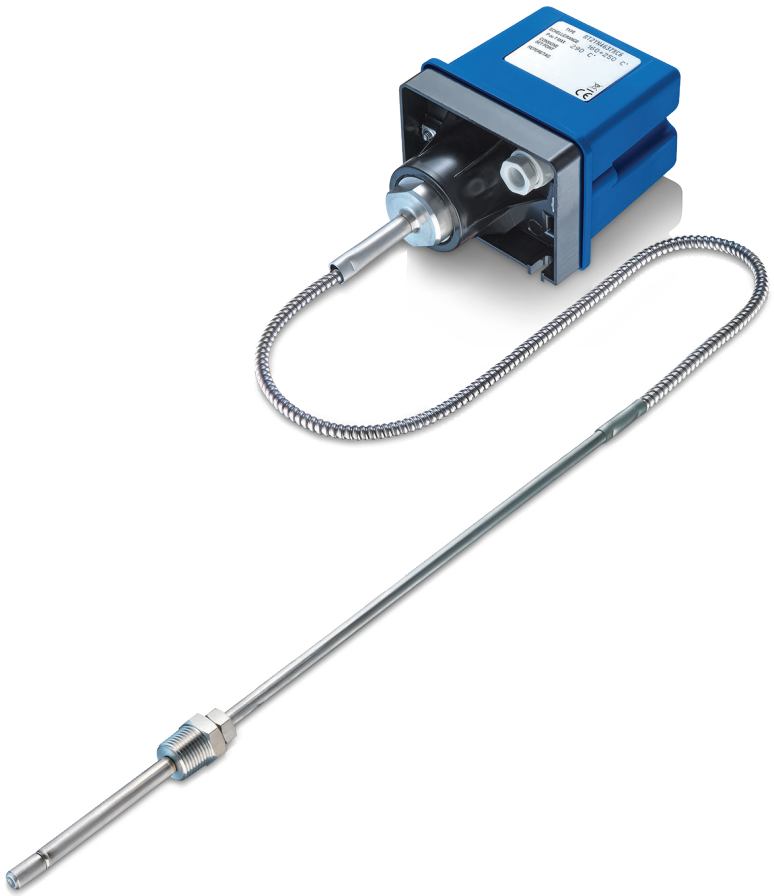
How to Specify a

TEMPERATURE SWITCH

Temperature switches are mechanical or electronic instruments with or without integrated display. They are used to signal excess temperature outside the defined limits to trigger an actuator in a regulation circuit or a 2-position control system.

WHAT WE NEED TO KNOW:

- Process media
- Temperature range
- Wetted parts material
- Process connection
- Electrical connection
- Type of mounting
- Length of capillary
- Repeatability
- Number of contacts
- Setpoint and deadband
- Electrical contact rating
- Hazardous area classification
- Thermowell requirements
- Special requirements & options



How to Specify a

TEMPERATURE TRANSMITTER

A transmitter is simply an electronic temperature or pressure gauge that sends a signal to a remote device or computer. Typically, this computer is located in a control room or someplace that someone can monitor the readings. Some transmitters also trigger switches or some other device to do something in response.

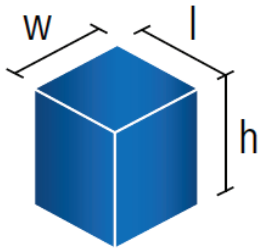
WHAT WE NEED TO KNOW:

- Din rail or head mounting
- Type of sensor input
- Wiring configuration
- Output signal – mA / HART
- Hazardous area classification
- Programming of measuring range
- Failure mode settings

TANK VOLUMES

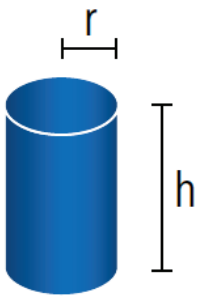
Volume of a rectangle tank

$v = l \times h \times w$



Volume of a cylindrical tank

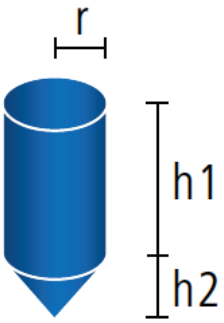
$v = 3.142\ r^2 \times h$



Volume of a conical tank

= volume of cone + cylinder

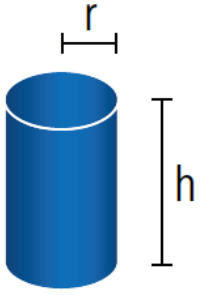
$= 1/3\ (3.142 \times r^2 \times h2) + (3.142 \times r^2 \times h1)$



Volume of a hemispherical tank

= volume of hemisphere + cylinder

$= 2/3\ (3.142 \times r^2 \times h2) + (3.142 \times r^2 \times h1)$



How to calculate and convert important data

CONVERSION FACTORS

Pressure:

	PA	MBAR	H20	PSI	TORR
1 Pa =	1	0.01	0.102 mm	0.000145	0.0075
1 kPa =	1000	10	102.0 mm	0.145	7.5
1 bar =	100 000	1 000	10.2 m	14.5	750.2
1 m H20 =	9810	98.10	1 000 m	1.422	73.56
1 psi =	6 895	68.95	0.703 m	1	51.72
1 Torr =	133.3	1.333	13.6 mm	0.01933	1

*Values partly rounded

Temperature:

˚C	-20	0	20	40	60	80	100	120	140	160	180	200	220	240
˚F	-4	32	68	104	140	176	212	248	284	320	356	392	428	464

˚F	-40	0	40	80	120	160	200	240	280	320	360	400	440	460
˚C	-40	-18	4	27	49	71	93	116	138	160	182	204	227	238

*Values partly rounded

Dimension:

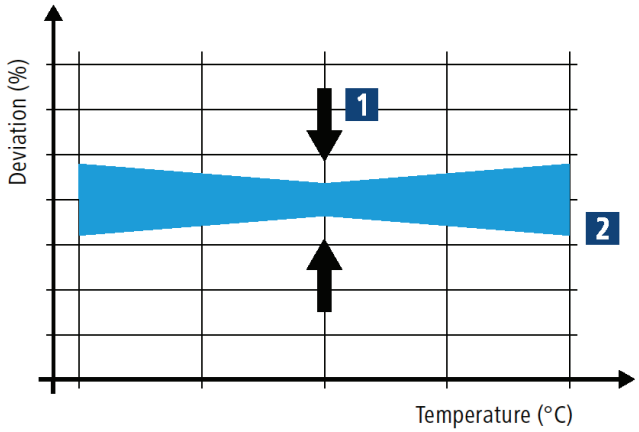
	MM	CM	M	FT	INCH
1 mm =	1	0.1	0.001	0.003281	0.03937
1 cm =	10	1	0.01	0.03281	0.3937
1 m =	1000	100	1	3.281	39.37
1 ft =	304.8	30.48	0.3048	1	12
1 inch =	25.4	2.54	0.0254	0.8333	1

*Values partly rounded

STUCK ON THE MEANING OF A WORD?

Total Error:

Cumulated error of non-linearity, hysteresis, non-repeatability, error of span and error at zero point, long term drift and temperature coefficients.

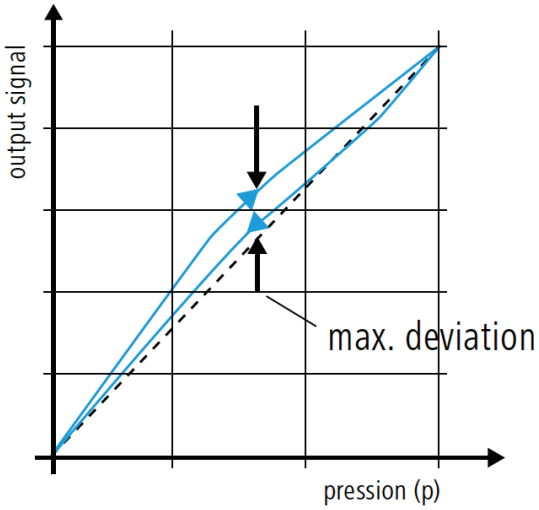


1 Characteristic deviation at ambient temperature

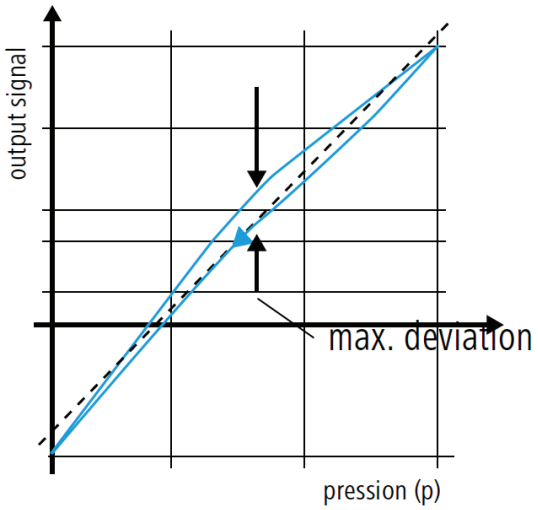
2 Thermal drift

Accuracy:

- Setpoint adjustment (% in full scale): Nonlinearity, hysteresis, repeatability, error of span and error at zero point in reference to ideal curve.
- Best fit straight line (% in full scale): Nonlinearity, hysteresis, repeatability in reference to best fit straight line.



Limite points adjustement



Best fit straight line (BFSL)

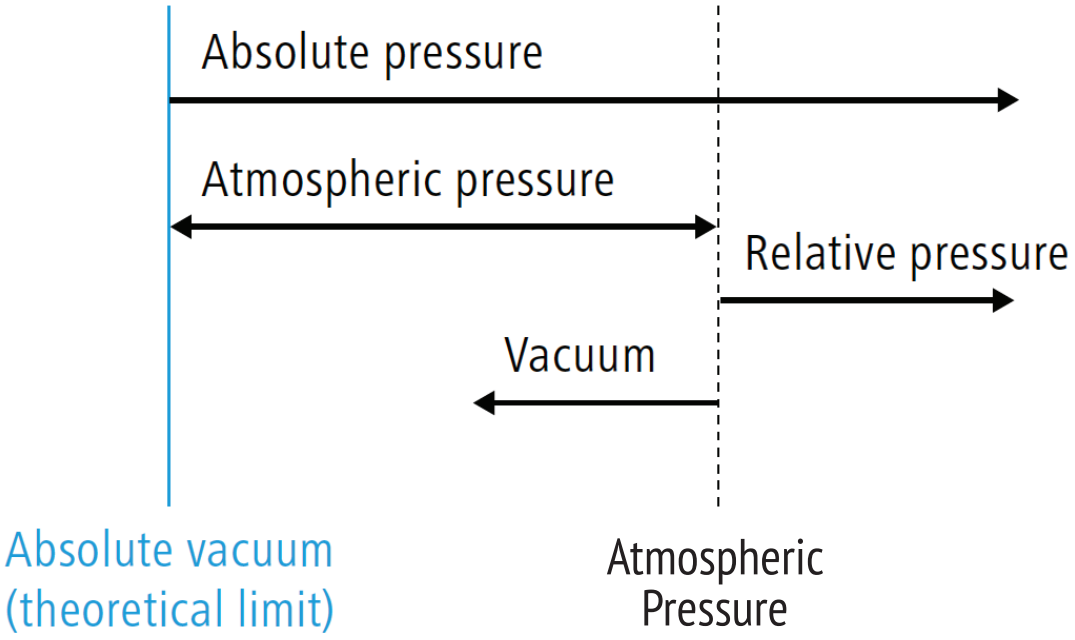
STUCK ON THE MEANING OF A WORD?

Absolute: Measurement of pressure with respect to vacuum.

Relative: Measurement of pressure with respect to atmospheric pressure.

Differential: Measurement of the difference between two pressures.

Compound: Measurement of gauge or differential pressure from negative to positive values.



Thermocouple: Two dissimilar metals joined at a hot point, which produce a millivolt signal in proportion to the surrounding temperature. Different metal combinations produce different millivolt tables to give temperature sensing up to 2 300 °C.

Resistance thermometer: The resistance of a metal is proportional to temperature. Generally platinum is used with a resistance of 100 Ohm at 0 °C but older options of copper or nickel are also used. These are often more accurate than thermocouples but have upper temperature limitations of 840 °C.

CERTIFICATES

Certificate according SN/EN 10204:2004	Declaration of compliance 2.1	Test report 2.2	Inspection certificate 3.1
What does it say?	Confirmation of compliance with the order	Confirmation of compliance with the order in reference to chosen quality characteristics	Confirmation of compliance with the order in reference to chosen quality characteristics
		Surface roughness	Material analysis / Calibration
		Free of oil and grease	
		Ferrite content	
		Material	
How is it tested?	No real test, just documentation of delivered products	No specific measurement, quality characteristics are confirmed by means of our production standard	Specific measurement of quality characteristics
Along with which product can it be ordered?	All products	All products, but certain parameters are only available if applicable to the reference product	

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