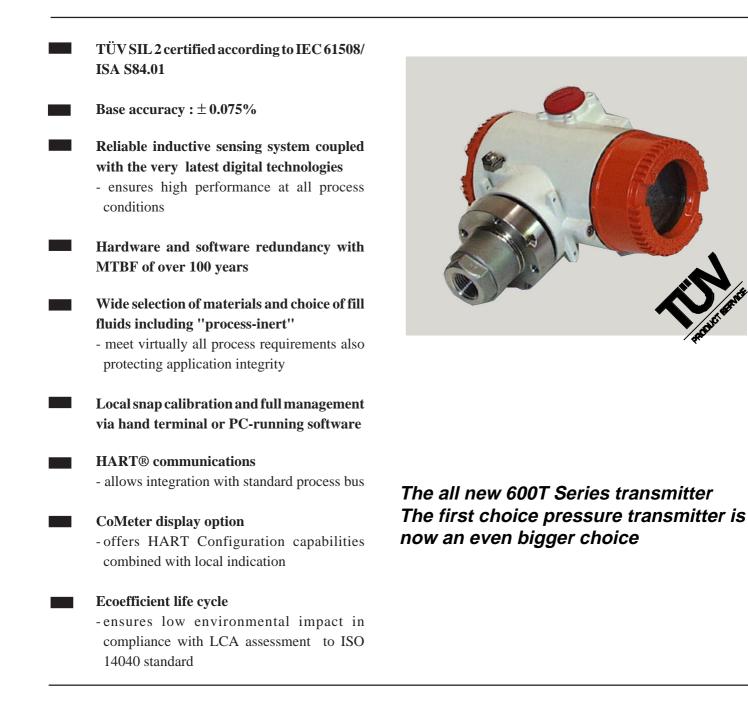
Specification sheet

600T EN Series Pressure Transmitters

Model 624SG Gauge Model 624SA Absolute





FUNCTIONAL SPECIFICATIONS

Range and span limits

Sensor Deper Lower			Turndown ratio (TI 624SG 624SA					
code	Range Limit (URL)	Range Limit (LRL)	Normal	Extended	Maximum	Normal	Extended	Maximum
D	160 kPa 1600 mbar 642 inH2O	0.07 kPa abs 0.7 mbar abs 0.5 mmHg	15	60	100	10	20	60
Е	600 kPa 6 bar 87 psi	0.07 kPa abs 0.7 mbar abs 0.5 mmHg	15	60	100	10	20	60
F	2400 kPa 24 bar 348 psi	0.07 kPa abs 0.7 mbar abs 0.5 mmHg	15	60	100	10	20	60
W	8000 kPa 80 bar 1160 psi	0.07 kPa abs 0.7 mbar abs 0.5 mmHg	15	60	100	10	20	60
U	16000 kPa 160 bar 2320 psi	0.07 kPa abs 0.7 mbar abs 0.5 mmHg	15	60	100	10	20	60

Span limits

Maximum span = URL

Minimum recommended span = URL/TD extended (can be further turndown to URL/TD maximum at no stated performances)

Zero suppression and elevation

Zero and span can be adjusted to any value within the range limits detailed in the table as long as: - calibrated span \geq minimum span

Damping

Selectable time constant : 0, 0.25, 0.5, 1, 2, 4, 8 or 16 sec.

Volume of process chamber

16 cm³ approx (1 in³)

Volumetric displacement

< 0.020 cm³ (0.0015 in³) for max span.

Electromagnetic compatibility (EMC)

Comply with EN 50081-2 for emission and EN 50082-2 for immunity requirements and test; CE marking.

Turn on time

Operation within specification in less than 2 sec. with minimum damping.

Insulation resistance

> 100 M Ω @ 1000 Vdc (terminals to earth)

Temperature limits °C (°F) : • Ambient (is the operating temperature)

Filling	Model 624SG	Model 624SA
Silicone oil	-40 and +85	-40 and +85
	(-40 and +185)	(-40 and +185)
Inert	-20 and +85	-10 and +65
inort	(-4 and +185)	(+14 and +150)
KTFILL-1	-40 and +85	-10 and +85
	(-40 and +185)	(+14 and +185)

Lower ambient limit for LCD indicators: -20°C (-4°F) Upper ambient limit for CoMeter : +70°C (+158°F)

• Process (1)

Lower limit

- refer to lower ambient limits
- Upper limit
- Silicone oil and KTFILL-1 filling : 120°C (248°F) (2)
- Inert fluid filling : 100°C (212°F) (3)
- (1) Process temperature above 85°C (185 °F) requires derating the ambient limits by 1.5 : 1 ratio.
- (2) $100^{\circ}C$ (212°F) for application below atmospheric pressure
- (3) $\,65^\circ C$ (150°F) for application below atmospheric pressure

Storage

Lower limit : -50° C (-58° F); -40° C (-40° F) for LCD indicators Upper limit : $+120^{\circ}$ C ($+248^{\circ}$ F); $+85^{\circ}$ C ($+185^{\circ}$ F) for LCD indicators

Overpressure limits (without damage to the transmitter)

- Lower: 0.07 kPa abs, 0.7 mbar abs, 0.5 mmHg (double the value with inert filling)
- Upper
- sensor code D, E, F, W : 14 MPa, 140 bar, 2030 psi
- sensor code U : 25 MPa, 250 bar, 3620 psi

Proof pressure

The transmitter meets SAMA PMC 27.1 requirements and can be exposed without leaking to line pressure of up to 21.5 MPa, 215 her, 4500 pai for exposer orders D, E, E, W, H,

- 31.5 MPa, 315 bar, 4500 psi for sensor codes D, E, F, W, U

ELECTRICAL CHARACTERISTICS AND OPTIONS

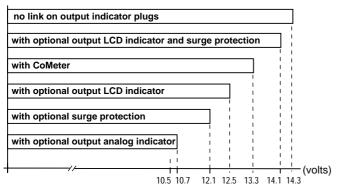
HART digital communication and 4 to 20 mA output Bower Supply

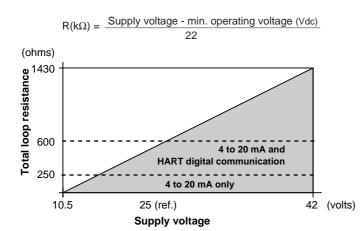
Power Supply

The transmitter operates from 10.5 to 42 Vdc with no load and is protected against reverse polarity connection (additional load allows operations over 42 Vdc).

For EEx ia and intrinsically safe approval power supply must not exceed 30 Vdc.

MINIMUM OPERATING VOLTAGES





Load limitations - 4-20 mA and HART total loop resistance :

Optional indicators

• Output meter (user adjustable)

- LCD: 3 1/2-digit with 10 mm (3/8 in) high, 7-segment characters. Engineering unit labels are provided. LCD output meter may be calibrated within the range -1999 to + 1999 with a span adjustable between 100 and 3998 units. (Display of decimal point, if required, is switch selectable)
 analog: 36 mm (1.4 in) scale on 90°
- CoMeter

5-digit (± 99999 counts) programmable with 7.6 mm. high (3 in), 7-segment numeric ci...racters plus sign and digital

- point10-segment bargraph display (10% per segment)
- 7-digit LCD with 6 mm. high (2.3 in), 14-segment alphanumeric characters.

Optional surge protection

Up to 2.5 kV (5 kA discharge current) of 8 μs rise time/20 μs decay.

Output signal

Two-wire 4 to 20 mA dc, user-selectable for linear or square root output, power of 3/2 or 5/2, 5th order or two 2nd order switching point selectable programmable polynomial output.

 ${\rm HART}^{\otimes}$ communication provides digital process variable (%, mA or engineering units) superimposed on 4 to 20 mA signal, with protocol based on Bell 202 FSK standard.

Output current limits (to NAMUR standard)

- Overload condition
- Lower limit: 3.8 mA dc
- Upper limit: 20.5 mA dc

Transmitter failure mode (to NAMUR standard)

The output signal can be user-selected to a value of 3.7 or 22 mA on gross transmitter failure condition, detected by self-diagnostics.

In case of CPU failure the output is driven <3.7 mA or >22 mA.

PERFORMANCE SPECIFICATIONS

Stated at ambient temperature of 23°C ≤à3K (75°F ± 5), relative humidity of 50% ±20%, atmospheric pressure, zero based range for transmitter with isolating diaphragms in AISI 316 L ss or Hastelloy and silicone oil fill or KTFILL-1 and HART digital trim values equal to 4-20 mA span end points, in linear mode. Unless otherwise specified, errors are quoted as % of span. Some performance data are affected by the actual turndown (TD) as ratio between Upper Range Limit (URL) and calibrated span. IT IS RECOMMENDED TO SELECT THE TRANSMITTER SENSOR CODE PROVIDING THE TURNDOWN VALUE AS LOWEST AS POSSIBLE TO OPTIMIZE PERFORMANCE CHARACTERISTICS.

Accuracy rating

% of calibrated span, including d¤•bined effects of terminal based linearity, hysteresis and repeatability.

- Model 624SG
 - \pm 0.075% for TD from 1:1 to 15:1
 - $-\pm 0.005\%$ x $\frac{URL}{Span}$ or TD from 15:1 to 60:1
- Model 624SA
 - \pm 0.075% for TD from 1:1 to 10:1

- \pm 0.0075% x $\frac{URL}{Span}\,$ for TD from 10:1 to 20:1

Optional indicators accuracy

- analog output meter : \pm 2% full scale deflection
- LCD output meter : $\pm 0.1\%$ of calibrated span ± 1 unit CoMeter
- -digital : \pm 0.10% of max span(16 mA) \pm 1 digit

-analog (bargraph) : 10%

Operating influences

Ambient temperature per 20 K ($36^{\circ}F$) change between the limits of - $20^{\circ}C$ to + $65^{\circ}C$ (-4 to + $150^{\circ}F$) :

Model	Sensor code	for TD up to	
624SG	D,E,F,W,U	15:1	± (0.08% URL + 0.15% span)
624SA	D,E,F,W,U	10:1	± (0.08% URL + 0.15% span)

Multiply by 1.5 the above coefficients for 20 K (36°F) change between the limits of -40 to -20°C (-40 to -4°F) and of +65 to +85°C (+150 to 185°F)

Optional LCD output meter ambient temperature

per 1 K (1.8°F) change between the limits of -20 and +80°C (-4 and + 176°F) Total effect : \pm (0.0002 x span units + 0.1) of reading.

Optional CoMeter ambient temperature

Total reading error per 20K (36°F) change between the ambient limits of -20 and +70°C (-4 and +158°F) : \pm 0.15% of max span (16 mA).

Supply voltage

Within voltage/load specified limits the total effect is less than 0.005% of URL per volt.

Load

Within load/voltage specified limits the total effect is negligible.

Radio frequency interference

Total effect : less than 0.10% of span from 20 to 1000 MHz and for field strengths up to 30 V/m when tested with shielded conduit and grounding, with or without meter. Meets IEC 801.

Common mode interference

No effect from 100 V rms @ 50 Hz, or 50 Vdc.

Series mode interference

No effect from 1 V rms @ 50 Hz.

Mounting position

No effect.

Stability

 \pm 0.15% of URL over a thirty-six-month period

PHYSICAL SPECIFICATIONS

(Refer to ordering information sheets for variant availability related to specific model or versions code)

Materials

Process isolating diaphragms (*)

AISI 316 L ss, Hastelloy C276 \Diamond ; Tantalum; Hastelloy C276 \Diamond on AISI 316 L ss gasket seat.

Process connection (*)

AISI 316 L ss; Hastelloy C ◊.

Sensor fill fluid

Silicone oil (DC200) or inert fill (perfluorinated polyethers Galden ◊) or "process-inert" fill (KTFILL-1).

Mounting bracket (**)

Zinc plated carbon steel with chrome passivation; AISI 316 Lss.

Sensor housing: AISI 316 L ss

Electronic housing and covers

Barrel version

- Low-copper content aluminium alloy with baked epoxy finish; - AISI 316 L ss.

Covers O-ring: Buna N.

Local zero and span adjustments:

Glass filled polycarbonate plastic (removable)

Tagging

AISI 316 ss data plate attached to the electronics housing.

Calibration

- Standard: at maximum span, zero based range, ambient temperature and pressure
- Optional: at specified range and ambient conditions; or at operating temperature.

Optional extras

Mounting brackets

For 60 mm. (2 in) pipes or wall mounting.

Output indicator:

plug-in rotatable type, LCD or analog.

Standard LCD output meter scale is 0 to 100% linear; special linear scale to specified range and engineering unit is available.Standard analog output meter scale is 0 to 100% linear; special graduation is available.

Supplemental customer tag

AISI 316 ss tag fastened to the transmitter with stainless steel wire for customer's tag data up to a maximum of 56 characters and spaces on two lines for tag number and tag name, and up to a maximum of 28 characters and spaces for calibration details.

Surge protection

Cleaning procedure for oxygen service

Material traceability; manifold

Environmental protection

Wet and dust-laden atmospheres

The transmitter is dust and sand tight and protected against immersion effects as defined by IEC 529 (1989) to IP 67 (IP 68 on request) or by NEMA to 4X or by JIS to C0920

Hazardous atmospheres

With or without output meter/integral display INTRINSIC SAFETY/EUROPE: ATEX/TÜV approval EC-Type Examination Certificate no. EX5 00 12 42206 001 II 1 G T50°C, EEx ia IIC T5 (-40°C \leq Ta \leq +40°C) T95°C, EEx ia IIC T4 (-40°C \leq Ta \leq +85°C) FLAMEPROOF/EUROPE: ATEX/CESI approval; EC-Type Examination Certificate no. CESI 00 ATEX 035 II 1/2 GD T80°C, EEx d IIC T6 (-40°C \leq Ta \leq +70°C) T95°C, EEx d IIC T5 (-40°C \leq Ta \leq +85°C) FACTORY MUTUAL (pending) : - Explosionproof: Class I, Div. 1, Groups A, B, C, D - Dust ignitionproof : Class II, Div. 1, Groups E, F, G

Process connections

1/2 NPT-f or DIN-EN837-1 G 1/2" B

Electrical connections

Two 1/2 NPT or M20x1.5 or PG 13.5 or 1/2 GK threaded conduit entries, direct on housing; straight or angle Harting HAN connector and one plug, on request.

Terminal block

HART version

Three terminals for signal/external meter wiring up to 2.5 mm² (14 AWG) and three connection points for test and communication purposes.

Grounding

Internal and external 6 mm² (10 AWG) ground termination points are provided.

Mounting position

Transmitter can be mounted in any position. Electronics housing may be rotated to any position. A positive stop prevents over travel.

Mass (without options)

1.7 kg approx (4 lb); add 1.5 kg (3.4 lb) for AISI housing. Add 650 g (1.5 lb) for packing.

Packing

Carton 26 x 26 x 18 cm approx (10 x 10 x 7 in).

A Hastellov is a Cabot Corporation trademark O Galden is a Montefluos trademark

Wetted parts of the transmitter.

U-bolt material: AISI 400 ss; screws material: high-strength alloy steel or AISI 316 ss.

CONFIGURATION

• Transmitter with HART communication and 4 to 20 mA Standard configuration

Transmitters are factory calibrated to customer's specified range. Calibrated range and tag number are stamped on the tag plate. If a calibration range and tag data are not specified, the transmitter will be supplied with the plate left blank and configured as follows:

- Engineering Unit: Specify code option Zero
- 4 mA:
- 20 mA: •
- Output :

Upper Range Limit (URL) Linear 1 sec.

Upscale

Blank

- Damping: Transmitter failure mode:
- Software tag characters:
- Optional LCD output indicator : 0 to 100.0% linear

Any or all the above configurable parameters, including Lower range-value and Upper range-value which must be the same unit of measure, can be easily changed using the HART hand-held communicator. The transmitter database is customized with specified flange type and material, O-ring and drain/vent materials and meter code option.

Custom configuration (option)

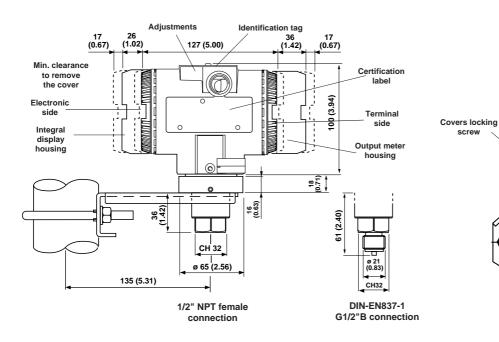
The following data may be specified in addition to the standard configuration parameters:

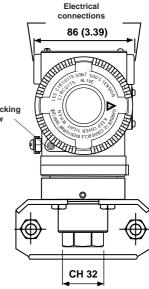
- Descriptor : 16 alphanumeric characters
- Message: 32 alphanumeric characters
- Day, month, year Date:
- Seconds Damping:

Available engineering units of pressure measure are : Pa, kPa, MPa inH2O@4°C, mmH2O@4°C, psi inH2O@20°C, ftH2O@20°C, mmH2O@20°C inHg, mmHg, Torr g/cm², kg/cm², atm mbar, bar

____ MOUNTING DIMENSIONS _____ (not for construction unless certified)

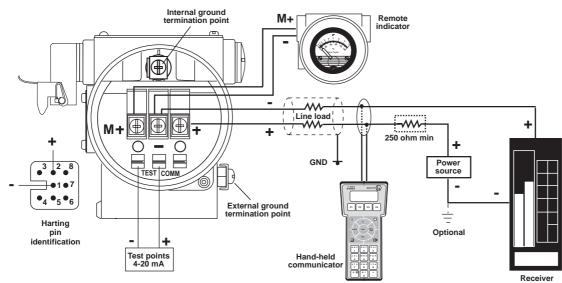
• Sensor codes D, E, F, W, U





ELECTRICAL CONNECTIONS

• HART Version



HART hand-held communicator may be connected at any wiring termination point in the loop, providing the minimum resistance is 250 ohm. If this is less than 250 ohm, additional resistance should be added to allow communications.

ORDERING INFORMATION model 624SG Gauge Pressure Transmitter

Select one character or set of characters from each category and specify complete catalog number. Refer to supplementary code and specify another number for each transmitter if additional options are required.

PRODUCT CODE	abcde	fg	<u>h</u>	<u> </u> -	j	k	<u>I</u> m ∏ ∏	n	op
BASE MODEL				0		0			
ELECTRICAL CERTIFICATION TOP WORKS ELECTRICAL OPTIONS									

abcde BASE MODEL - 1st to 5th characters Code Gauge pressure transmitter 624SG

SENSOR

f Span limits - 6th character

2.67 and 160 kPa	26.7 and 1600 mbar	10.7 and 642 inH2O	D
10 and 600 kPa	0.1 and 6 bar	1.45 and 87 psi	E
40 and 2400 kPa	0.4 and 24 bar	5.8 and 348 psi	F
133 and 8000 kPa	1.33 and 80 bar	19.3 and 1160 psi	W
267 and 16000 kPa	2.67 and 160 bar	38.7 and 2320 psi	U

7th character

g	Diaphragm material (*)	Fill fluid	
	AISI 316 L ss	Silicone oil (**)	2
	Hastelloy C276 ◊ (AISI seat)	Silicone oil (**)	6
·	Hastelloy C276 ◊	Silicone oil (**)	3
	Tantalum	Silicone oil (**)	5
	AISI 316 L ss	Inert fluid	A
	Hastelloy C276 (AISI seat)	Inert fluid	7
	Hastelloy C276 ◊	Inert fluid	В
	Tantalum	Inert fluid	D
	AISI 316 L ss	KTFILL-1 (**)	L
	Hastelloy C276 ◊ (AISI seat)	KTFILL-1 (**)	Р
	Hastellov C276 ◊	KTFILL-1 (**)	N

BOTTOM WORKS

1
3
Α
С

9th character

h

li

	Use code	0
	MOUNTING BRACKET - 10th character	
j	Material	
	None	1
	Carbon steel Not available with AISI 316 L ss housing material code A, C, D, F at position "n"	2
	AISI 316 L ss	3
k	11th character	

Use code

12th character	

HART digital communication and 4 to 20 mA - SIL 2 according to IEC 61508 / ISA S84.01

S

0

(*) Process wetted-parts
 (**) Not available for oxygen service

Compliance to NACE class II bolting, according to specification MR0175, latest revision Process wetted-parts

ORDERING INFORMATION model 624SG Gauge Pressure Transmitter

m ELECTRICAL CERTIFICATION - 13th character

General Purpose	1
ATEX Group II Category 1/2 GD - Flameproof EEx d CESI approval	F
ATEX Group II Category 1 G - Intrinsic Safety EEx ia TÜV approval	L
Factory Mutual (FM - Explosion proof only) approval (only with 1/2" NPT and M20 electrical connection)	9

TOP WORKS - 14th character

n	Housing material	Electrical connection	
		1/2" NPT	1
		M20 x 1.5 (CM 20)	2
	Aluminium alloy	Pg 13.5	3
	(Barrel version)	1/2" GK	4
		Harting HAN connector - straight entry (Note)	5
		Harting HAN connector - angle entry (Note)	6
		1/2" NPT	А
	AISI 316 L ss	M20 x 1.5 (CM 20)	С
	(Barrel version)	Pg 13.5	D
		1/2" GK	F

Note : requires certification code 1 at position "m"

ELECTRICAL OPTIONS - 15th character

	ELECTRICAL OPTIONS - 15th character	
0	Internal meter type	
	None	1
	Digital LCD output indicator linear 0-100%, user scalable	3
	Digital LCD output indicator linear scale (specify range and engineering units)	5
	Analog output indicator linear 0-100% scale	7
	Analog output indicator, special graduation (to be specified for linear scale)	9
	Programmable signal meter and HART configurator (CoMeter)	Р

16th character

р	Electrical options	Labels language	
		English	1
	Standard terminal block	German	2
		Italian	7
	Surge protector	English	3
	(Requires certification code, 1, F, 9 at position "m")	German	4
		Italian	8
		English	5
	Terminal block for external meter	German	6
		Italian	9

ORDERING INFORMATION model 624SA Absolute Pressure Transmitter

Select one character or set of characters from each category and specify complete catalog number. Refer to supplementary code and specify another number for each transmitter if additional options are required.

PRODUCT CODE	abcde	fg	<u>h</u> i	j	k	⊥ m ⊤ ⊤	n 	op
BASE MODEL					0			
ELECTRICAL CERTIFICATION								
ELECTRICAL OPTIONS								

abcd	BASE MODEL - 1st to 5th characters	Code	
	Absolute pressure transmitter	624SA	

SENSOR

f Span limits - 6th character

8 and 160 kPa	80 and 1600 mbar	60 and 1200 mmHg	D
30 and 600 kPa	0.3 and 6 bar	4.35 and 87 psi	E
120 and 2400 kPa	1.2 and 24 bar	17.4 and 348 psi	F
400 and 8000 kPa	4 and 80 bar	58 and 1160 psi	W
800 and 16000 kPa	8 and 160 bar	116 and 2320 psi	U

7th character

g	Diaphragm material (*)	Fill fluid	
	AISI 316 L ss	Silicone oil (**)	2
	Hastelloy C276 (AISI seat)	Silicone oil (**)	6
	Hastelloy C276 ◊	Silicone oil (**)	3
	AISI 316 L ss	Inert fluid	Α
	Hastelloy C276 (AISI seat)	Inert fluid	7
	Hastelloy C276 0	Inert fluid	В
	AISI 316 L ss	KTFILL-1 (**)	L
	Hastelloy C276 (AISI seat)	KTFILL-1 (**)	Р
	Hastelloy C276 0	KTFILL-1 (**)	N

BOTTOM WORKS

	Process connection (*)	-	8th character
- 1	Market State		

	- Process connection (*) - Bin character		
ľ	Material	Connection	
	AISI 316 L ss	1/2" NPT-f	1
	/ 10/ 0/0 E 33	DIN-EN837-1 - G 1/2"B	3
	Hastelloy C 0	1/2" NPT-f	Α
	(Not applicable with AISI 316 L ss diaphragm code 2, A and L at position "g")	DIN-EN837-1 - G 1/2"B	С

9th character ١i

Use code		G)
			_

MOUNTING BRACKET - 10th character

j	Material		
	None		1
	Carbon steel	Not available with AISI 316 L ss housing material code A, C, D, F at position "n"	2
	AISI 316 L ss		3

11th character k

Use code

12th character

OUTPUT Lт

HART digital communication and 4 to 20 mA - SIL 2 according to IEC 61508 / ISA S84.01

S

0

Compliance to NACE class II bolting, according to specification MR0175, latest revision In the second Process wetted-parts Not available for oxygen service

ORDERING INFORMATION model 624SA Absolute Pressure Transmitter

m ELECTRICAL CERTIFICATION - 13th character

General Purpose	1
ATEX Group II Category 1/2 GD - Flameproof EEx d CESI approval	F
ATEX Group II Category 1 G - Intrinsic Safety EEx ia TÜV approval	L
Factory Mutual (FM - Explosion proof only) approval (only with 1/2" NPT and M20 electrical connection)	9

TOP WORKS - 14th char	acter	
Housing material	Electrical connection	
	1/2" NPT	
	M20 x 1.5 (CM 20)	
Aluminium alloy	Pg 13.5	
(Barrel version)	1/2" GK	
	Harting HAN connector - straight entry (Note)	
	Harting HAN connector - angle entry (Note)	
	1/2" NPT	
AISI 316 L ss	M20 x 1.5 (CM 20)	
(Barrel version)	Pg 13.5	
, , ,	1/2" GK	

Note : requires certification code 1 at position "m"

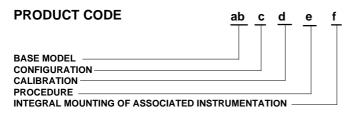
	ELECTRICAL OPTIONS - 15th character	
0	Internal meter type	
	None	1
	Digital LCD output indicator linear 0-100%, user scalable	3
	Digital LCD output indicator linear scale (specify range and engineering units)	5
	Analog output indicator linear 0-100% scale	7
	Analog output indicator, special graduation (to be specified for linear scale)	9
	Programmable signal meter and HART configurator (CoMeter)	Р

16th character

р	Electrical options	Labels language	
	Standard terminal block	English	1
		German	2
		Italian	7
	Surge protector	English	3
	(Requires certification code, 1, F, 9 at position "m")	German	4
		Italian	8
	Terminal block for external meter	English	5
		German	6
		Italian	9

ORDERING INFORMATION

Select one character or set of characters from each category and specify complete catalog number in addition to each transmitter code, if required.



ab	BASE MODEL - 1st to 2nd characters	Code]
	Supplementary code	SC	

c CONFIGURATION - 3rd character

~ 1			
	Standard - Pressure = kPa; Temperature = deg. C	1	
	Standard - Pressure = inH2O/psi (@ 20°C); Temperature = deg. F	2	1
	Standard - Pressure = inH2O/psi (@ 4°C); Temperature = deg. F	3	1
	Standard - Pressure = inH2O/psi (@ 20°C); Temperature = deg. C	4	1
	Standard - Pressure = inH2O/psi (@ 4°C); Temperature =- deg. C	5	1
	Custom	С	1

_ CALIBRATION - 4th character

d	Calibration range	Calibration	Certificate	
	Standard (max span = 0 to URL)	Reference temperature	None	1
			Yes (3 copies)	2
		Operating temperature	None	3
			Yes (3 copies)	4
	At specified range	Reference temperature	None	5
			Yes (3 copies)	6
		Operating temperature	None	7
			Yes (3 copies)	8

5th character

е	PROCEDURE Material traceability			
	None	None		0
		To EN10204 - 3.1.B (certificates for flanges, adapters, diaphragms)		A
		To EN10204 - 2.1 (declaration for instrument)		В
	Oxygen service cleaning	None		2
		To EN10204 - 3.1.B (certificates for flanges, adapters, diaphragms)		С
		To EN10204 - 2.1 (declaration for instrument)		F



INTEGRAL	MOUNTING OF	ASSOCIATED	INSTRUMENTATION -	6th character
INTEGRAE				





ABB Instrumentation spa Via Statale 113 22016 Lenno (Como) Italia Tel. 0344 58111 Facsimile 0344 56278

ABB Automation Ltd.

Howard Road St. Neots, Cambs. England PE19 3EU Tel. (01480) 475321, Facsimile (01480) 217948

specifications contained herein without notice.

The Company's policy is one of continuous product improvement and the right is reserved to modify the

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