

NUCLEAR QUALIFIED ANALOG GAUGE PRESSURE TRANSMITTER

DATA SHEET
FYG...K, L

FYG nuclear qualified analog pressure transmitters accurately measure a gauge pressure and convert it into a directly proportional 4-20mA output signal.

The main measuring element consists of a silicon micro-capacitive sensor highly proven in the continuous process industries.

The FYG series of FCX analog transmitters are specifically designed for safety in nuclear applications requiring high reliability and long lifetime in harsh environments (up to 55 kGy Total Integrated Dose).



FEATURES

1. High accuracy

The silicon micro-capacitive sensor provides exceptional precision over different measurement ranges.

2. Minimal environmental influence

The concept of a "floating measuring cell" makes it possible to minimize errors due to variations in parameters such as temperature and overpressure.

3. Flexibility of use

The available options allow to address most applications encountered in the continuous process industry, such as

- Built-in RFI filter.
- Stainless steel transmitter housing.

4. Full analog design

The 100% analog design of the electronics ensures the highest level of reliability in nuclear applications.

FUNCTIONAL SPECIFICATIONS

Type:

FYG : Analog gauge pressure transmitter

Service:

Liquid, gas, or vapour

Span, range and over range limit:

Type	Span limit kPa {bar}		Range limit kPa {bar}		Overrange limit kPa {bar}
	Min.	Max.	Lower limit	Upper limit	
FYG□01	21.7 {0.217}	130 {1.3}	-100 {-1}	130 {1.3}	1 {10}
FYG□02	83.3 {0.833}	500 {5}	-100 {-1}	500 {5}	1.5 {15}
FYG□03	500 {5}	3 000 {30}	-100 {-1}	3 000 {30}	9 {90}
FYG□04	1700 {17}	10 000 {100}	-100 {-1}	10 000 {100}	15 {150}
FYG□05 ⁽¹⁾	10 000 {100}	50 000 ⁽²⁾ {500}	-100 {-1}	50 000 {500}	75 {750}

Note (1) :

For K3 and K3ad qualification (digit 8 = K): Upper Range Limit (URL) / Calibrated Span (CS) ratio, called rangeability or turn-down ratio, must be : ≤ 4:1 for FYG#05

Note (2) :

Maximum Working Pressure (MWP) MWP is limited to 250 bar (25 MPa) for version with gaskets (digit 14 = A or E)

Lower range limit: (vacuum limit)

See Figure 1 for details.

Output signal:

4-20 mA.

Power supply:

13 to 53V DC at transmitter terminals.

Load limitations:

Minimum = 0 Ω @ 13 V DC or 200 Ω @ 17 V DC.

Typic: 250 Ω @ 24 V DC.

Maximum = 600 Ω .

Zero/span adjustment:

Zero is adjustable with the external adjustment screw located on the electronics enclosure and the measuring scale from an internal adjustment screw.

Damping:

Possible settings : 0.4, 1.2, 3.2 sec.

Zero elevation / suppression:

Adjustable using the external screw of the electronic housing from -1bar to +84% of the max scale (except FYG#05 models). Adjustable using the external screw on the electronic housing from -1bar to +30% of the max scale for FYG#05 models.

Temperature limits:

Ambient : -35 to 70°C.

Process : -40 to +120°C (silicone oil).

Storage : -40 to +90°C.

Ambient pressure limit:

6 bar abs.

Humidity limit:

0 to 100% RH.

PERFORMANCE SPECIFICATIONS

(Reference conditions 23°C, SS316L measuring diaphragm, silicone oil, filled measuring cell)

URL = Upper Range Limit. G = Gain

Accuracy ratings:

(including linearity, hysteresis, and repeatability)

For all ranges (except FYG#05):

For span between 1/6 URL and URL ($1 < G \leq 6$):

$$\pm \left(0.1 \times \frac{\text{URL}}{\text{Span}} \right) \% \text{ of span.}$$

For span below 1/6 URL:

Fuji Electric doesn't guaranty the measurement accuracy.

For FYG#05:

For span between 1/5 URL and URL ($1 < G \leq 5$):

$$\pm \left(0.2 \times \frac{\text{URL}}{\text{Span}} \right) \% \text{ of span.}$$

For span below 1/5 URL:

Fuji Electric doesn't guaranty the measurement accuracy.

Stability:

$\pm 0.4\%$ of upper range limit (URL) for 1 year.

Temperature effect:

Effects per 28°C change from reference conditions (23°C $\pm$ 1°C) at atmospheric pressure on -35°C to 70°C range.

Measuring range (Digit 6)	Total effect G=1 (*) (% of URL)
"1", "2", "3", "4"	$\pm 0.5 \%$
"5"	$\pm 1 \%$

(*) Multiply the total effect by G.

Ambient pressure effect:

$\pm 0.25\%$ of span / 6 bar abs for digit 6 = 5.

$\pm 0.1\%$ of span / 6 bar abs for other models.

Overrange effect:

Total effect : $\pm 0.1\%$ of URL up to maximum overrange.

Supply voltage effect:

$\pm 0.005\%/V$.

Response time: (at 63% of the output signal)

200 msec.

This value is for calibrated span set at URL; otherwise, this value has to multiplied by G.

Mounting position effect:

Zero shift:

Less than 0.1kPa {1mbar} for a 10° tilt in any plane.

No effect on span. This error can be corrected by adjusting Zero.

Vibration effect:

Lower than $\pm 1.5\%$ of span.

Frequency 10 to 500Hz, acceleration 9,8m/sec2.

Seismic resistance:

Digit 4 = 3, 8:

Seismic integrity and operability according to RCC-E "UK components" S1 & S2 spectrums (0x-0z, 0y-0z: S1 17.5g / S2 35 g).

Digit 4 = W, 6, 7:

Seismic integrity and operability according to RCC-E "Components" (0x-0z, 0y-0z: S1 15 g/S2 30 g).

Dielectric strength:

500Vrms, 50/60Hz during 1min. between terminals + & - on the one hand, and transmitter body on the other hand. Leak current less than 3 mA.

Insulation resistance:

More than 100M Ω at 500V DC during 1min. between terminals + & - on the one hand, and transmitter body on the other hand.

Turn-on time:

4 seconds.

Irradiation effect:

$\pm 2.5\%$ of URL at Total Integrated Dose (55 kGy).

Integrity after 55 kGy TID.

Pressure equipment Directive (PED) 2014/68/UE:

According to Article 4.3.

PHYSICAL SPECIFICATIONS

Electrical connections:

M20 x 1,5 or
Souriau 8N35 socket, or
Souriau 8N45S socket, or
Souriau 8N45 socket, or
SAIB NU25 ref. 251-103-401 / M20 x 1,5 socket.
(Compatible with 8N45 installed base)

Process connections:

Standard:
1/4 - 18 NPT.
Option:
1/2 - 14 NPT with oval flange.

Process-wetted parts material:

Material code (7th digit)	Process cover	Diaphragm	Cell body	Vent / Drain
V			SS 316 L	
A			C276 Alloy	
J	SS 316L	SS 316L + Au		SS 316L

Other material, upon request.

Process gasket:

EPDM O-ring (mandatory for K3 version).
FKM (Viton) O-ring high irradiation (digit 8 = L only).

Non-wetted parts material:

Electronics housing:
SS 316L.
Bolts and nuts:
SS 316L (digit 5 = "1", "2", "3" & "4").
SS 660 (digit 5 = "5").
Fill fluid:
Silicon oil.
Mounting bracket:
SS 304L.

Environmental protection:

IP66 and IP67.

Mounting:

Without mounting bracket:
Direct mounting on manifold.
With optional mounting bracket:
For DN50 (2") pipe or wall mounting.

Mass {weight}:

Transmitter only:
7 kg without options.
Add:
0.5 kg for mounting bracket (option).

OPTIONAL FEATURES

Degreasing:

Process wetted parts are cleaned.

Customer tag plate (75 x 20 mm):

A stainless steel tag with customer tag data is wired to the transmitter.

Vacuum service:

Special silicone oil and filling procedure are applied.

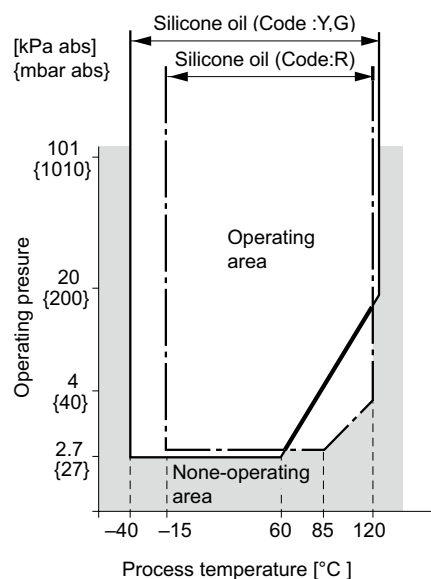


Fig.1 Relation between the temperature of process in contact with cell's diaphragms and operating pressure.

OPTIONAL ACCESSORIES

Oval flanges:

Converts process connection to 1/2 - 14 NPT.

MODEL CODE SYMBOLS - FYG

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16				
F	Y	G		0				-			-								
																Description			
																Analog gauge pressure transmitter			
																4-20 mA			
																Connections			
																Process	Oval flange	Conduit	
																(3)	1/4-18 NPT	M10 or M12	M20 x 1,5
																(7)	1/4-18 NPT	M10 or M12	Souriau 8N45S socket
																(6)	1/4-18 NPT	M10 or M12	Souriau 8N45 socket (not for EPR)
																(6)	1/4-18 NPT	M10 or M12	Souriau 8N35 socket (not for EPR)
																(7)	1/4-18 NPT	M10 or M12	SAIB NU25, ref 251-103-401 / M20 x 1,5 socket (compatible with 8N45 installed equipment)
																Ranges & materials			
																Measuring ranges	Process cover	Diaphragm	Wetted cell body
																0 1 V			
																0 1 A	217 to 1300 mbar	Alloy C276	Alloy C276
																0 1 J		SS 316L	SS 316L + Au
																0 2 V		SS 316L	SS 316L
																0 2 A	833 to 5000 mbar	Alloy C276	Alloy C276
																0 2 J		SS 316L	SS 316L + Au
																0 3 V		SS 316L	SS 316L
																0 3 A	5 to 30 bar	Alloy C276	Alloy C276
																0 3 J		SS 316L	SS 316L + Au
																0 4 V		SS 316L	SS 316L
																0 4 A	17 to 100 bar	Alloy C276	Alloy C276
																0 4 J		SS 316L	SS 316L + Au
																0 5 V	(1)	SS 316L	SS 316L
																0 5 A	(1)	Alloy C276	Alloy C276
																0 5 J	(1)	SS 316L	SS 316L + Au
																K		Transmitter version	
																L		EDF "K3ad Classification"	
																- A		EDF "Not Classified"	
																A		Approvals for hazardous locations	
																		None (Standard)	
																G		Vent / Drain	Mounting bracket (SS 304L)
																H		Universal, direct mounting	None
																		Universal, direct mounting	Without - Recommended for UTO stock
																C		Customer tag plate (option)	Electronics housing
																E		Without	SS 316L
																		SS 316L	
																Y		Treatment	Fill fluids
																G		None	Silicone Oil
																R		Degreasing	
																		Vacuum service	
																- 0		(5)	None
																- A		(8)	Viton
																- E		(9)	EPDM
																E		(2)	Bolts and nuts material
																W			SS 316L/316L (Bolts/nuts) - M10
																			SS 660/660 (Bolts/nuts) - M12
																			Accessories (optional)
																0			None
																1	(3)		Cable gland

Notes* :

- Oval flange thread is M12 if operating pressure > 100 barg (6th digit = 5)
- M10 bolting (15th digit = E) if operating pressure ≤ 100 barg
M12 bolting (15th digit = W) if operating pressure > 100 barg
- Only with 8th digit = L.
- Transmitters' design is similar to K3Aad but with standard Quality Acceptance (ISO 9001) assembling process.
- Screwed (M12) and welded process covers if operating pressure > 250 barg
(only for not qualified version with digit 8 = L)
- FYG6 & FYG7 transmitters can only be used in existing power plants (not for EPR)
- FYG3 & FYG8 transmitters can be used in existing power plants and EPR.
- Operating pressure ≤ 250 barg (25 MPa), digit 8 = L only.
- Operating pressure ≤ 250 barg (25 MPa), digit 8 = K or L.

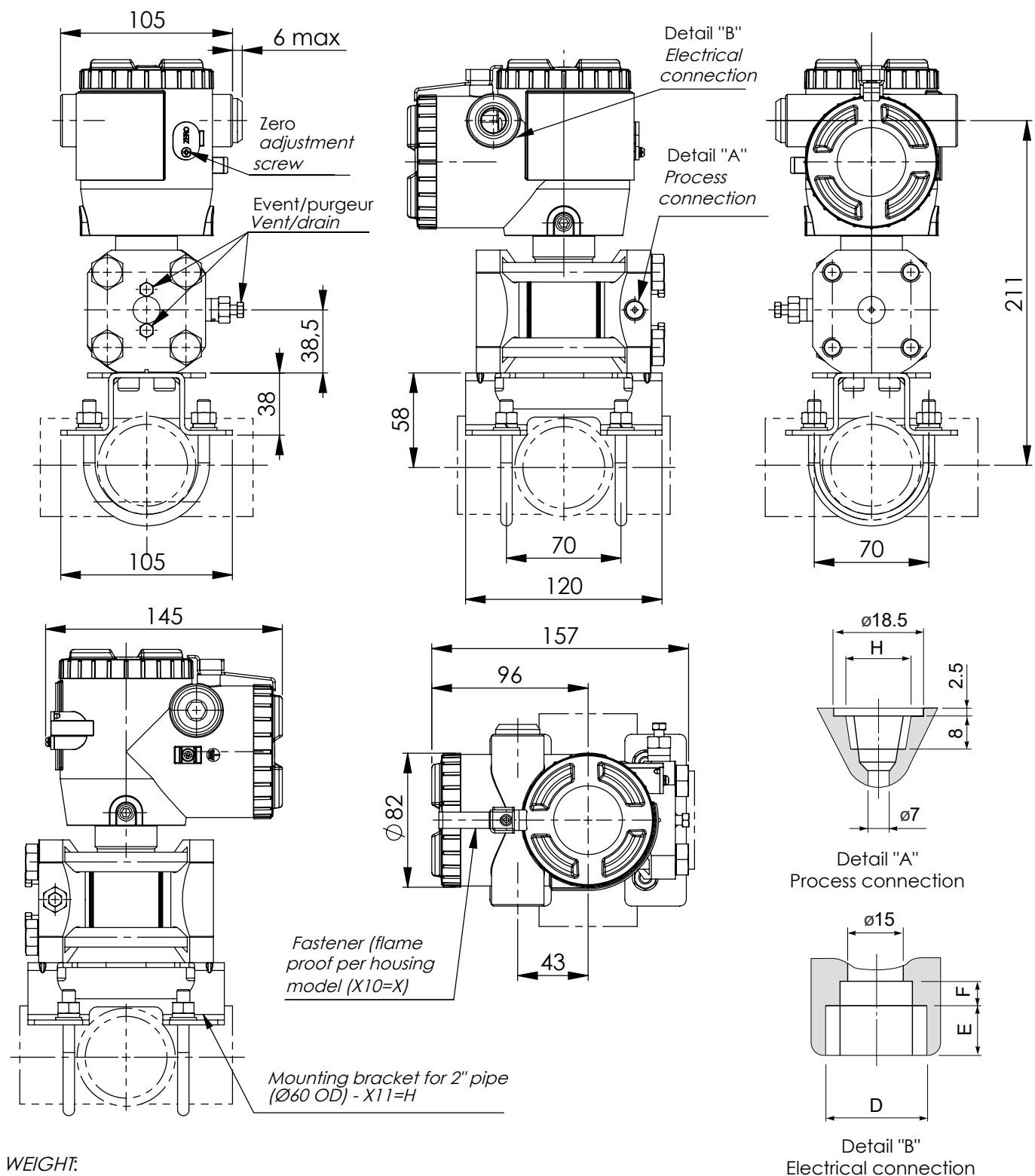
<SCREWED PROCESS COVERS> <DIGIT 4 = W>



	SPAN LIMIT	
	Min.	Max.
FYGW01	21.7 KPa (0.217 bar)	130 KPa (1.3 bar)
FYGW02	83.3 KPa (0.833 bar)	500 kPa (5 bar)
FYGW03	500 KPa (5 bar)	3 MPa (30 bar)
FYGW04	1700 KPa (17 bar)	10 MPa (100 bar)
FYGW05	10000 kPa (100 bar)	25 MPa (250 bar)

OUTLINE DIAGRAM (Unit : mm)

<SCREWED/WELDED PROCESS COVERS><DIGIT 4 = W>



WEIGHT:

6,7 kg WITHOUT OPTION

ADD : 0,5 kg OR MOUNTING BRACKET

X₁ X₂ X₃ X₄ X₅ X₆ X₇ X₈ - X₉ X₁₀ X₁₁ X₁₂ X₁₃ - X₁₄ X₁₅ X₁₆

Modèle : F Y G W 0 5 - A - 0 W

Model :

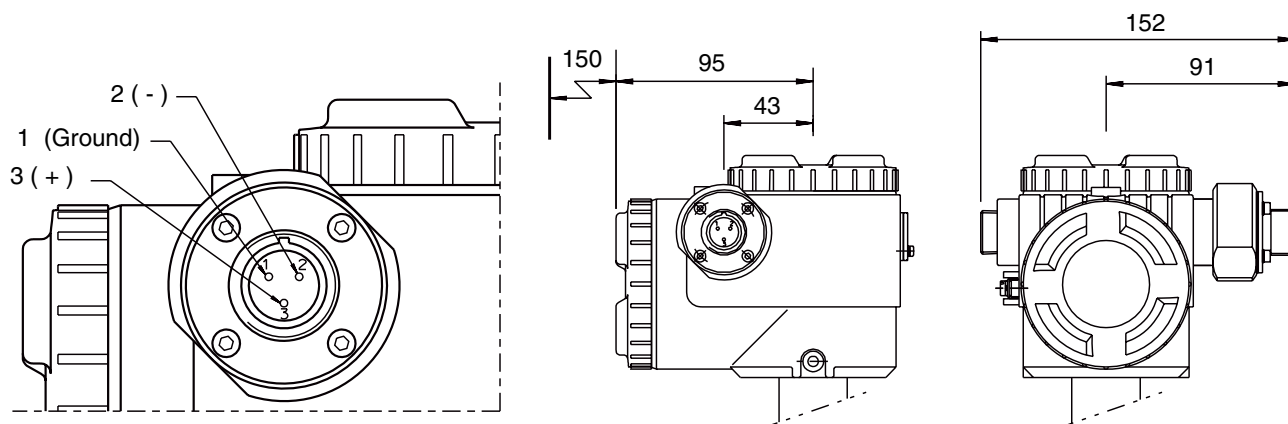
X₈ = L

SPAN LIMIT		
FYGW05	10 MPa (100 bar)	50000 kPa (500 bar)

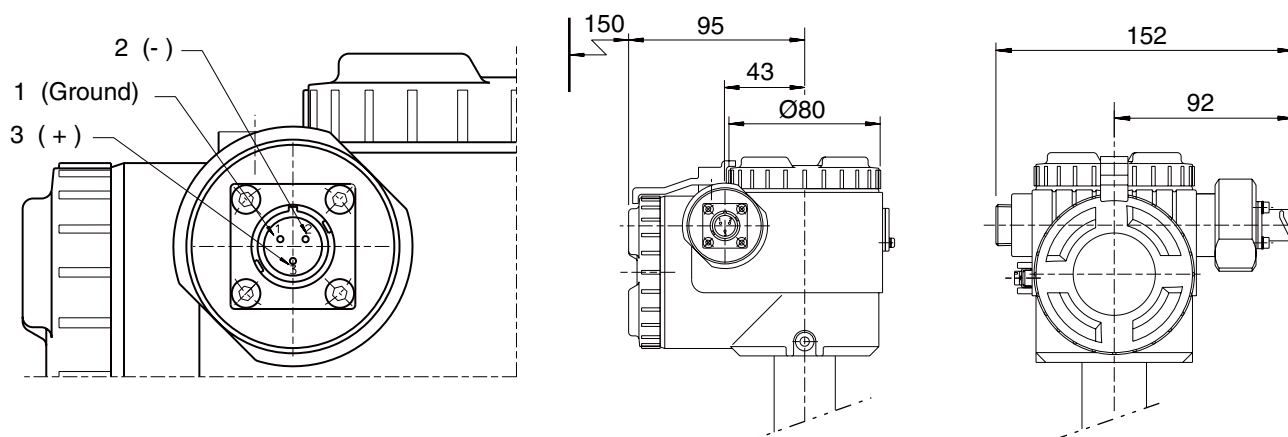
OUTLINE DIAGRAM (Unit : mm)

CONDUIT CONNECTION FOR SOCKETS <4TH DIGIT = 3, 6, 7 OR 8>

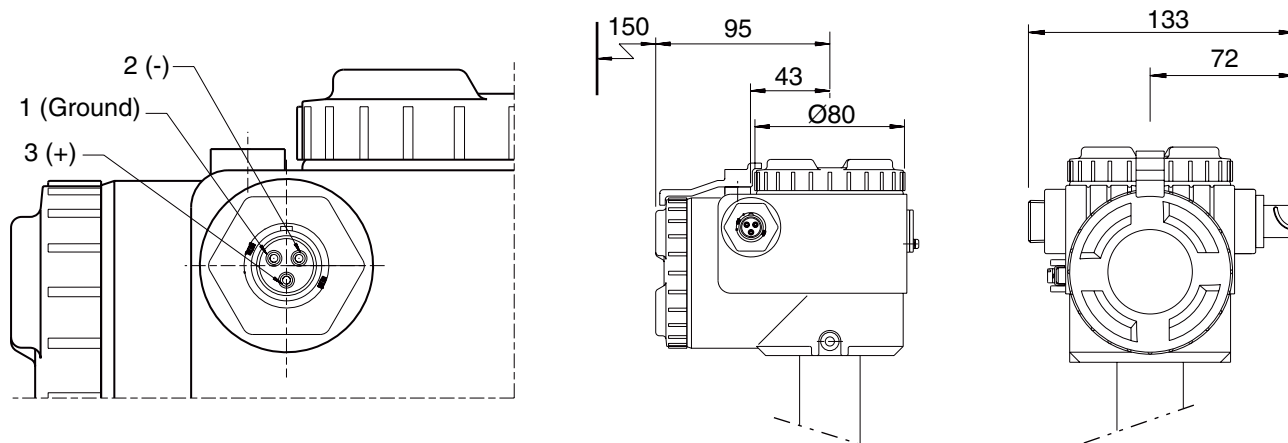
SOURIAU 8N35 SOCKET (4TH DIGIT = 7)



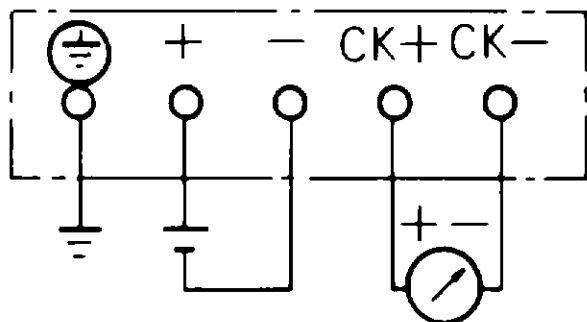
SOURIAU 8N45 (4TH DIGIT = 6) / 8N45S SOCKETS (4TH DIGIT = 3)



SAIB NU25 SOCKET (4TH DIGIT = 8)

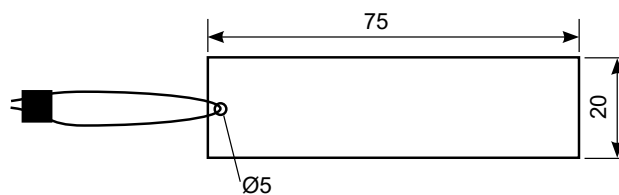


CONNECTION DIAGRAM



Ammeter connection for 4-20 mA testing purpose
(max impedance = 12Ω)

OPTIONAL CUSTOMER TAG PLATE



Attached to transmitter with SS 304 wire



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