e-Front runners

Fuji Electric France S.A.S.

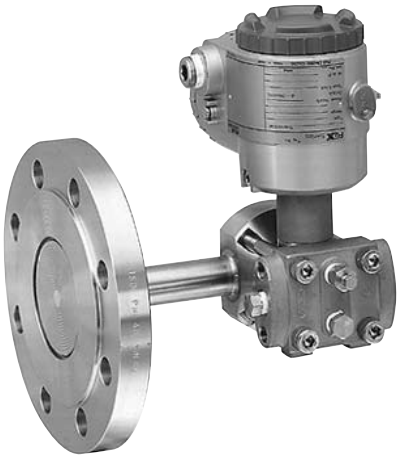
FCX-AII

LEVEL TRANSMITTER
EDF "Not Classified" version

DATASHEET

FKE...L

The FCX-AII series level transmitter accurately measures liquid level and transmits proportional 4 to 20mA signal. The transmitter utilizes the unique micro-machined capacitive silicon sensor with state-of-the-art microprocessor technology to provide exceptional performance and functionality.



FEATURES

1- High accuracy

0.17% accuracy is a standard feature. The Micro-capacitance silicon sensor assures this feature for all elevated or suppressed calibration ranges without additional adjustment.

0,1% accurancy is available as option.

2- Minimum environmental influence

The “Advanced Floating Cell” design which protects the pressure sensor against temperature variations, static pressure, and overpressure substantially reduces total measurement error in actual field applications.

3- Fuji/HART® bilingual communication protocol

FCX-AII series transmitter offers bilingual communication to speak both Fuji proprietary protocol and HART®.

Any HART® compatible devices can communicate with FCX-AII.

4- Application flexibility

Various options that render the FCX-AII suitable for almost any process applications includes :

- Analog indicator at either the electronics side or terminal side
- Full range of hazardous area approvals
- Built-in RFI filter and lightning arrester
- 5 digits LCD meter with engineering unit
- Stainless steel electronics housing
- Wide selection of materials

5- Programmble output Linearisation Function

Output signal is freely programmable.

(Up to 14 compensated points at approximation).

6- Burnout current flexibility

(Under Scale : 3,2 to 4,0mA, Over Scale : 20,0 to 22,5mA)

Burnout signal level is adjustable using Hand Held Communicator (Fuji FXW) to comply with NAMUR NE43.

7- Dry calibration without reference pressure

Thanks to the best combination of unique construction of mechanical parts (sensor unit) and high performance electronics circuit (electronics unit), reliability of dry calibration without reference pressure is at equal level as wet calibration.

Functional specifications

Type :

FKE : SMART, 4-20mA cc +Fuji/HART® digital signal

Service :

Liquid, gas or vapour

Static pressure, span and range limit :

Type	Staic pressure (bar)	Span limit (mmH_2O)		Range limit (mmH_2O)
		Mini.	Maxi.	
F□E□□ 2	up to flange rating	10	600	± 600
F□E□□ 3		32	3200	± 3200
F□E□□ 5		130	13000	±13000
F□E□□ 6		500	50000	± 50000
F□E□□ 8		3000	300000	± 300000

Remark : To minimize environment influence, span shoud be greater than 1/25 of the max span in most applications.

Minimum static pressure limit :

(vacuum limit)

Silicone filled sensor : cf. Fig.1

Fluorinated filled sensor : 660 mbar abs (500 torr), at temperature below 60°C (cf. Fig.2)

Overrange limit :

To maximum static pressure limit.

Output signal :

4 to 20 mA DC with digital signal superimposed on the 4 to 20 mA signal.

Power supply :

Transmitter operates on 10,5V to 53V DC at transmitter terminals

Load limitations :

Mini = 0Ω without digital communication
= 250 Ω mini for digital communication (Fuji or HART® protocols)
Maxi (Ω) = (V power supply - 10,5) / 0,0225 for default settings
Maxi (Ω) = (V power supply - 10,5) / (Imax +0,9) x 1000 for user settings, where Imax (mA) is the highest of the following values :
- Either the max output signal in case of electronics failure (Burnout), when OVER SCALE Burnout is selected
- Or the max output process signal in case saturation over 20mA, when "SATURATE CUR" is selected to "SAT HI"

For details, see FCXAII or FXW Hand Held Communicator manuals.

Note : Above values are applicable for electronics from version 4FA (software 4.06), which includes K3A qualified models.

Hazardous locations :

Designed to meet international intrinsic safety and flameproof (explosionproof) standards.

Please consult the code symbols some pages further on, to know the different types of approvals.

Consult Fuji Electric for status..

Zero/span adjustment :

Zero and span are adjustable by the FXW communicator.

Local adjustment of zero and span are possible from outside screw on the electronics housing.

Damping :

Additional damping of the output signal is adjustable between 0,12 and 32 sec with the FXW communicator, and/or with the optional LCD indicator.

Zero elevation/suppression :

Adjustable with the FXW communicator or with the external screw on the electronics housing between -100% to +100% of URL.

Normal/reverse action :

Programmable with the FXW communicator.

Indication :

A plug-in analog indicator can be mounted on the electronics unit or the terminal block.

The local LCD indicator (5 digits) is assembled on the electronics unit.

Additional local adjustment facilities are possible by the integrated switches in the LCD indicator :

- "Local/comm" switch gives the possibilities to make local adjustments of zero/span, damping or to configure the transmitter with the FXW communicator.
- The "mode" switch with 7 positions gives local adjustment possibilities for zero/span, 4/20mA, enable or inhibit the local adjustments.
- Local damping adjustment is possible via the "Damp" switch.

Burnout direction : (selected from the FXW communicator)

If self-diagnostic detect transmitter failure, the analog signal will be driven to eighter "Output Hold", "Output Overscale" or "Output Underscale" modes.

"Output Hold" :
Output signal is hold as the value just before failure happens.

"Output Overscale" :
Adjustable within the range 20.0 mA to 22.5 mA from the FXW communicator.

"Sortie < à 4mA" :
Adjustable within the range 3.2 mA to 4.0 mA from the FXW communicator

Loop-check output :

Transmitter can be configured to provide constant signal 3.8mA through 21.6mA by the FXW communicator.

Temperature limit :

Ambient : -20 to +55°C
-20 à +55°C (optional LCD indicator)
-20 à +80°C (optional fluorinated oil)

For explosionproof units (flameproof or intrinsic safety), ambient temperature must be within the limits specified by each standard.

Process : (cf fig.1 or fig.2 page 4)

Note : For higher process temperature, please consult FUJI

Fill Fluid	13th digit of code symbols	Process temperature	Lower limit of static pressure
Fluorinated oil	W, A	-20 to +120°C	Atmospheric pressure (20 torr)
Silicone oil	Y, G	-40 to +150°C	

Storage : -40 to +90°C

Humidity : 0 to 100% RH (electronics housing closed and sealed)

Communication :

With HHC(1) (Model FXW, consult DS N° EDS8-47), following items can be remotely displayed or configured.

Note: HHC's version must be higher than 7.0 (or FXW □□□□1-□4), for FCX–AII for supporting these items: "Saturate current", "Write protect", and "History".

Items		Fuji Protocol with FXW		Hart® Protocol	
		Display	Set	Display	Set
Tag No.		v	v	v	v
Model No.		v	v	—	—
Serial No. & Software Version		v	—	v	—
Engineering unit		v	v	v	v
Range limit		v	—	v	—
Measuring range		v	v	v	v
Damping		v	v	v	v
Output mode	Linear	v	v	v	v
	Square root	v	v	v	v
Burnout direction		v	v	v	v
Calibration		v	v	v	v
Output adjust		—	v	—	v
Data		v	—	v	—
Self diagnoses		v	—	v	—
Printer (In case of FXW with printer option)		v	—	—	—
External switch lock		v	v	v	v
Transmitter display		v	v	v	v
Linearize		v	v	—	—
Rerange		v	v	v	v
Saturate current		v	v	v	v
Write protect		v	v	v	v
History – Calibration history		v	v	v	v

Programmable output linearization function :

Output signal can be characterized with "14 points linear approximation function" from the FXW communicator.

Performance specifications

(Reference conditions, silicone oil fill).

Accuracy rating :

(Including linearity, hysteresis, and repeatability)

For spans greater than 1/10 of URL :

±0,17% of span

For spans below 1/10 of URL :

$$\pm(0{,}1 + 0{,}1\,\frac{0{,}1 \times URL}{Span})\% \text{ of span}$$

(Option)

For spans greater than 1/10 of URL :

±0,1% of span

For spans below 1/10 of URL :

$$\pm(0{,}05 + 0{,}05\,\frac{0{,}1 \times URL}{Span})\% \text{ of span}$$

Stability :

± 0,2% of upper range limit (URL) for 3 years

Temperature effect :

Effect per 28°C change between the limits of -25 and +55°C

Zero shift transmitter :

±(0,1 + 0,025 (URL/Span))% of URL

Zero shift level kit :

+0,3 mbar/28°C

Total shift :

Zero shift of transmitter and level kit :

± 0,3% of URL

Note : the indicated values are for temperature compensation made on transmitter only, without level kit. Zero shift is improved (2 to 3 times) by an additional temperature compensation of the complete level transmitter (level kit and transmitter).

Static pressure effect :

Zero shift :

± 0.2% of URL for flange rating pressure

Span shift :

-0,2% ±0,2% of calibrated span for flange rating

Supply voltage effect :

Less than 0,05% of calibrated span per 10 V.

Overrange effect :

Zero shift :

± 0,1% ± 0.1% of URL for flange rating pressure

RFI effect :

Less than 0.2% of URL for the frequencies of 20 to 1000 MHz and field strength 30 V/m when electronics covers mounted.

(Classification : 2-abc : 0.2% span per SAMA PMC 33.1)

Response time : (at 63,2% of output signal)

Range code	Time constant	Dead time
"3"	550 msec	Approx. 200 msec
"5" to "8"	300 msec	

Response time = time constant + dead time

Mounting position effect :

Zero shift :

< 30 mmH_2O for a 10° tilt in any plane.

(No extension). No effect on span.

This error can be corrected by adjusting zero.

Material fatigue :

Consult Fuji Electric

Dielectric strength :

500V AC, 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 100MΩ at 500V DC during 1min. between terminals **+** & **-** on the one hand, and transmitter body on the other hand.

Turn-on time : 4 seconds

Internal resistance for external field indicator :

12Ω max (connected to test terminal CK+ and CK-)

Physical specifications

Electrical connections :

M20 x 1,5 or
ATEX flameproof cable gland, 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)
Jaeger M20 x 1,5 socket ref. 536 006 006

Process connections :

LP side : 1/4"-18 NPT
HP side : ANSI or DIN raised face flange
(Refer to “Code symbols”)
Raised face flange machining :
Stockfinish - SS316 L diaphragm
Smooth finish - other diaphragm materials

Process-wetted parts material :

Material code (7th digit)	BP side			HP side
	Process cover	Diaphragm	Wetted sensor body	Diaphragm and flange face
V	SS 316	SS 316L	SS 316	SS 316L
H	SS 316	SS 316L	SS 316	Hastelloy C
B	SS 316	SS 316L	SS 316	SS 316L + gold coating

Process cover gasket : Viton O-ring or PTFE/15% graphite square section gasket

Non-wetted parts material :

Electronics housing :
Standard :
Low copper die-cast aluminum alloy, finished with epoxy / polyurethane double coating.
Option : SS 316
Bolts and nuts :
SS 316
Fill fluid :
Standard : silicone oil for the measuring cell and fluorinated oil (or specific oils upon request) for the level kit
Mounting flange : SS 304

Environmental protection :

IP66 / IP67

Weight :

Transmitter alone :	13kg
Add :	
Indicator (option) :	0.34 kg (0,68 kg SS)
SS housing (option) :	1.4 kg

1.0 kg per 50mm extension

Optional features

Indicator :

A plug-in turnable analog indicator (1.5% accuracy) can be located in the electronics compartment or in the terminal box of the housing. Alternatively, an optional 5 digits LCD meter is also available on the electronic side only.

Oxygen service :

Special cleaning procedures are followed through the process to maintain all process wetted parts oil-free. The filling fluid is fluorinated oil.

Degreasing :

Process-wetted parts are cleaned, but the filling fluid is standard silicone oil. This option must not be selected for oxygen or chlorine applications.

Customer tag :

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

Vacuum service:

Standard level transmitter with silicone oil filling fluid can be used according fig.1

Fluorinated oil filling of the level kit (see fig. 2)

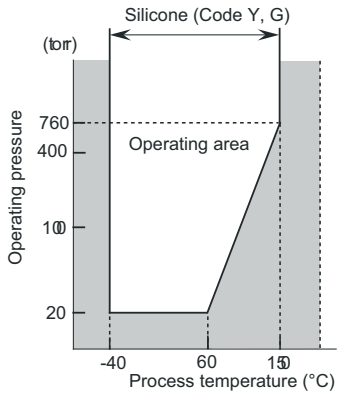


Fig.1

Relation between process temperature and operating pressure

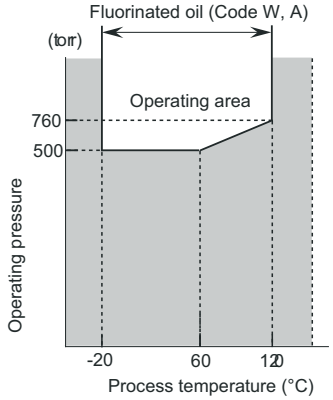


Fig.2

Relation between process temperature and operating pressure

ACCESSORIES

Oval flanges LP side :

Converts process connection to 1/4"-18 NPT.

Hand held communicator FXW :

Refer to Data Sheet No.EDS8-47

CODIFICATION

1	2	3	4	5	6	7	8	-	9	10	11	12	13	-	14	15	16		Description
F	K	E																	**Level transmitter**
																			Smart, 4-20 mAdc + Fuji/Hart® digital signal
																			Connections

	LP side connections		Conduit connection
	Process	Oval flange screw	
W	1/4-18 NPT	M10 or M12	M20 x 1,5 (ATEX ADF socket (optional))
3	1/4-18 NPT	M10 or M12	Souriau 8N45S socket
6	1/4-18 NPT	M10 or M12	Souriau 8N45 socket
7	1/4-18 NPT	M10 or M12	Souriau 8N35 socket
8	1/4-18 NPT	M10 or M12	SAIB (M20x1,5) socket ref 251-103-401 (8N45 compatible)
9	1/4-18 NPT	M10 or M12	JAEGER (M20x1,5) socket ref 635 006 006

Mounting flange

	Material	Size and rating	Flange mounting position
4	SS 316L	ANSI-150LB3"-ISO PN 20 DN80	Long design
5		ANSI-150LB4"-ISO PN 20 DN100	
8		DIN PN40 DN80	
9		DIN PN16 DN100	
L		ANSI-150LB3"-ISO PN 20 DN80	Short design
M		ANSI-150LB4"-ISO PN 20 DN100	
P		DIN PN40 DN80	
Q		DIN PN16 DN100	

Measuring range (mmH$_2$O) (*1)

2	10	600
3	32	3200
5	130	13000
6	500	50000
8	3000	300000

Material

	LP side			HP side
	Process cover	Diaphragm	Wetted sensor body	Diaphragm and flange
V (*2)	SS 316	SS 316L	SS 316	SS 316L
H (*2)	SS 316	SS 316L	SS 316	Hastelloy-C
B (*2)	SS 316	SS 316L	SS 316	SS 316L + gold coat

Transmitter version & Indicator

	Transmitter version	Indicator	Initial setting
L - A	EDF "Not Classified"	None	4-20mA DC + Hart®/Fuji digital signal "SMART"
L - B		Analog, 0-100% linear scale	
L - D		Analog, customer scale	
L - L		Digital, 0-100%	
L - P		Digital, customer scale	

Appovals for hazardous locations (consulter Fuji)

A	None (standard)
X (4*)	Flameproof housing ATEX ⟨Ex⟩ II 2 GD - EEx d IIC T5/T6

Diaphragm extension (mm)

	Extension (mm)	Applicable material code
Y	0	Any
A (*3)	50	Material code "V"
B (*3)	100	
C (*3)	150	
D (*3)	200	
E (*3)	50	Material code "H"
F (*3)	100	
G (*3)	150	
H (*3)	200	

Tag plate & Electronics housing

	Tag plate	Electronics Housing
Y	Without	Aluminium - Not for use inside salty atmosphere or irradiated area
B	SS 316L	Aluminium - Not for use inside salty atmosphere or irradiated area
C	Without	SS 316
E	SS 316L	SS 316

Special applications and fill fluid (fill fluid of cell = Silicone oil)

	Treatment	Fill fluid of diaphragm seal
Y	None	Silicone oil
G	Degreasing	Silicone oil
A	Oxygen service	Fluorinated oil cell and seal (material code "V" only)
V	Vacuum service (max 27 mbar abs)	Silicone oil

Process cover gasket

- A	Viton

Bolts / nuts material

E	SS 316 / 316 (Bolts/nuts) - M10

Accessories (optional)

1	ATEX - Flameproof cable gland

Notes* :

All models are equipped with surge arrester specifically designed for EDF.

1- Turn down of 100 : 1 is possible, but it should be used at a span greater than 1/25 of the maximum span for better performance.

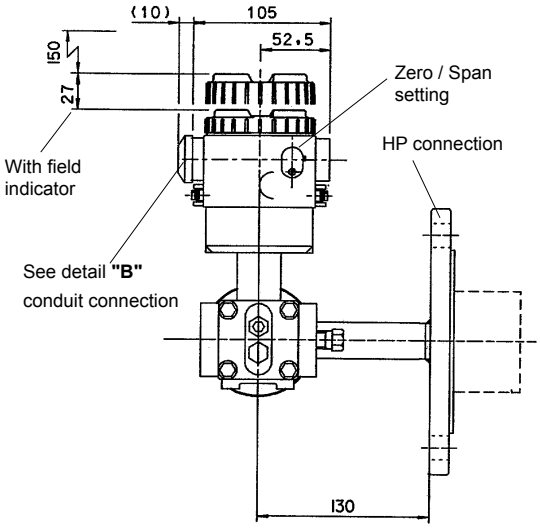
2- DN80 PN40 or ANSI-150 Lbs 3" flange rate, DN100 or 4" add values are available upon request, LP side writed cell body diaphragm in exotic materials are available upon request

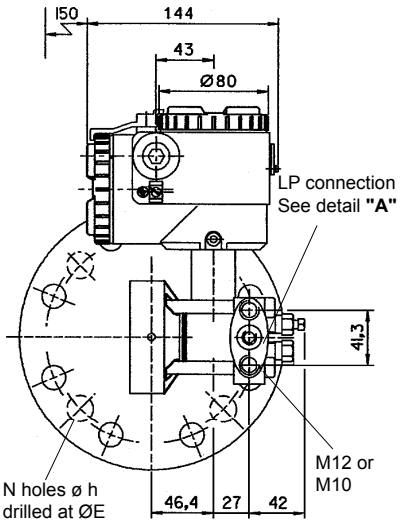
3- All wetted parts in the same material (diaphragm, extension, flange gasket area); 3th digit code 4, 5, 6, 7, 8, 9,H, J, G

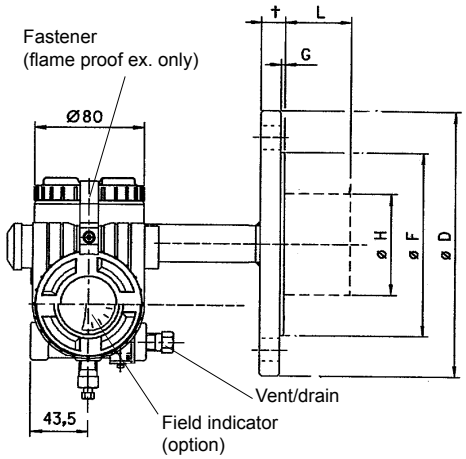
4- Not available for SAIB, Souriau 8N35 / 8N45 / 8N45S and Jaeger sockets.
To be used with flameproof cable gland ATEX delivered by FUJI (option) or mounted by EDF.

5- Only applicable for transmitter version EDF "Not Classified" Digit 8 code L

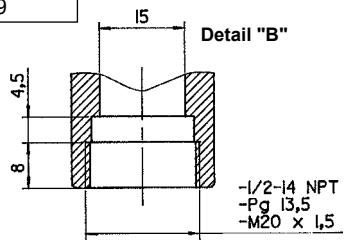
OUTLINE DIAGRAM for short design (unit : mm)

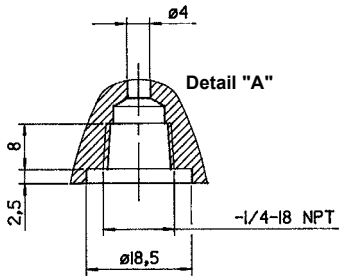




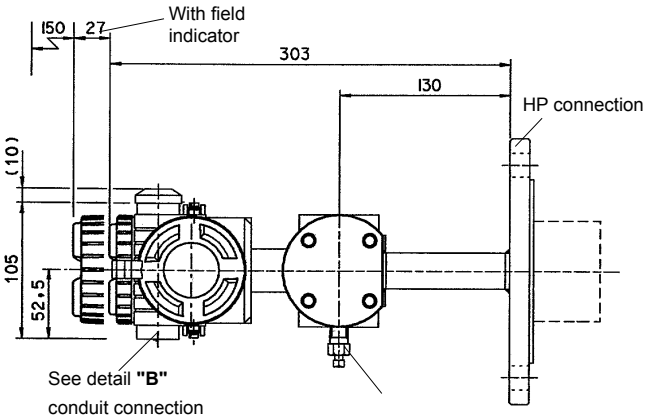


Extension L (mm)	Weight approx.(kg)
0	10 to 13,5
50	10 to 17,5
100	11 to 18
150	11,5 to 18,5
200	12 to 19

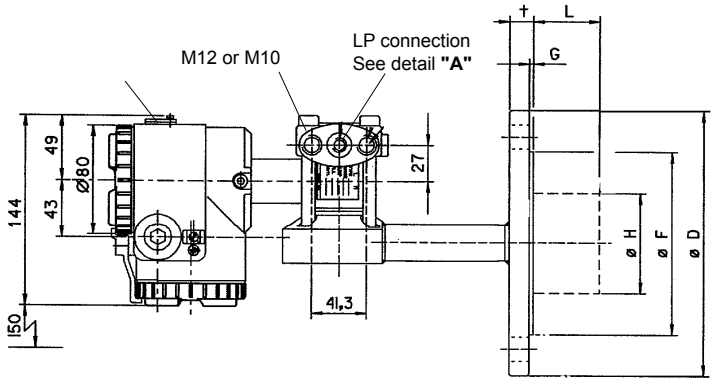


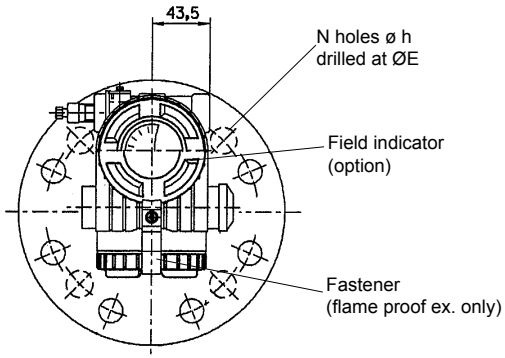


OUTLINE DIAGRAM for long design (unit : mm)



FLANGE DIMENSIONS									
DIN/ISO						Flush & Extension	Flush Others		
PN	DN	ØD	ØE	ØF	G	SS diaphragm	diaphragms	t	n-Øh
40	80	200	160	138	3	73	89	24	8-18
16	100	220	180	158	3	96	89	20	8-18
20	80	190	152,2	127	1,6	73	89	24	4-20
20	100	230	190,5	158	1,6	96	89	24	8-20



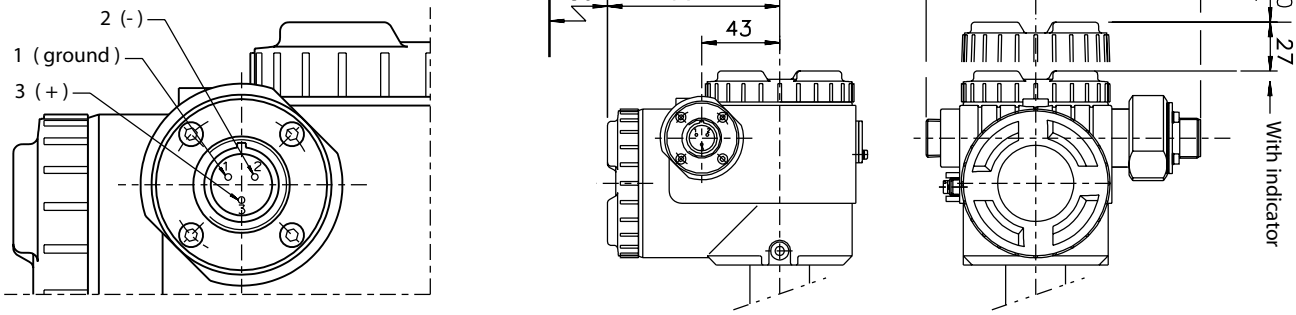


OUTLINE DIAGRAM (unit : mm)

Conduit connection for SOURIAU sockets (4th digit = code 3, 6 or 7)

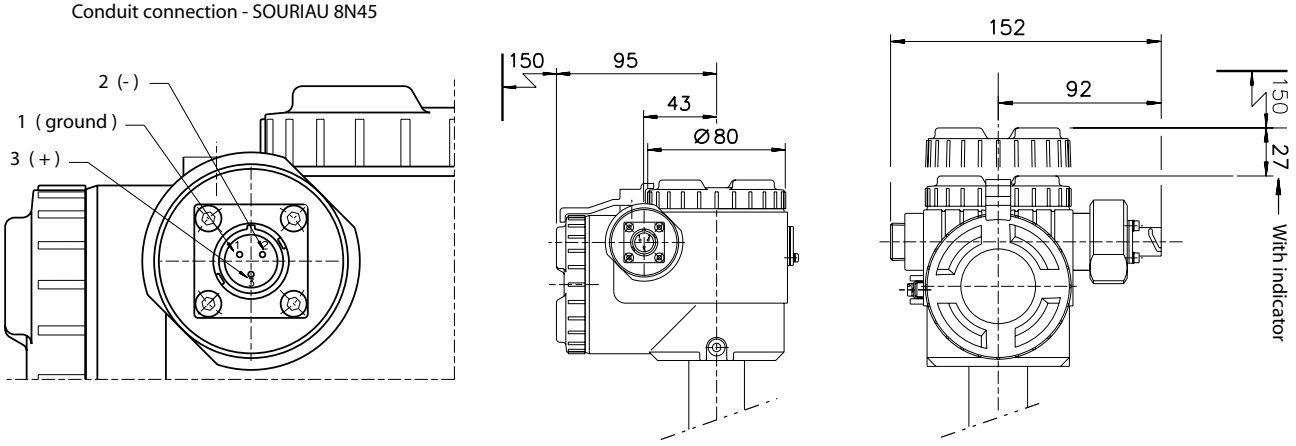
For Souriau 8N35 socket

Conduit connection - SOURIAU 8N35



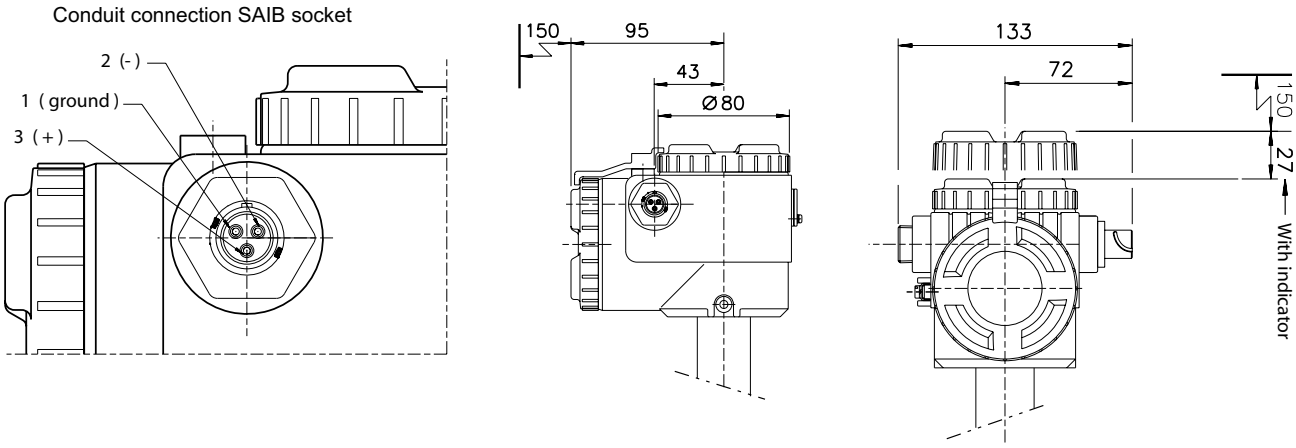
For Souriau 8N45 / 8N45S socket

Conduit connection - SOURIAU 8N45



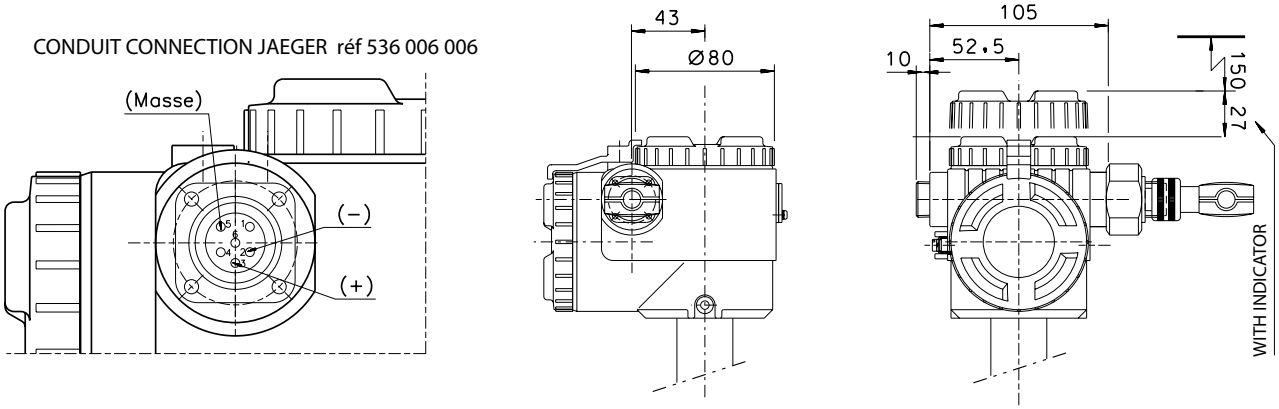
Conduit connection SAIB socket (4th digit = code 8)

Conduit connection SAIB socket

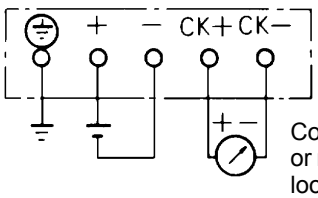


Conduit connection JAEGER socket (4th digit = code 9)

CONDUIT CONNECTION JAEGER réf 536 006 006



CONNECTION DIAGRAM



Connection of local analog indicator,
or remote indicator of current 4/20mA
loop test milliampmeter.
(max impedance = 12Ω

EMC Directive (2004/108/EC)

All models of **FCX** series transmitters type **FCX-AII & CII** are in accordance with :

- The harmonized standard EN 61326-1 : 2006 (Electrical equipment for measurement, control and laboratory use - EMC requirements).

Emission limits : EN 61326-1 : 2006

Frequency range (MHz)	Limits	Basic standard
30 to 230	40 dB (µV/m) quasi peak, measured at 10m distance	EN 55011 / CISPR 11 Group 1 Class A
230 to 1000	47 dB (µV/m) quasi peak, measured at 10m distance	

Immunity requirements : EN 61326-1 : 2006 (Table 2)

Phenomenon	Test value	Basic standard	Performance criteria
Electrostatic discharge	4 kV (Contact) 8 kV (Air)	EN 61000-4-2 IEC 61000-4-2	**B**
Electromagnetic field	10V/m (80 to 1000 MHz) 3 V/m (1.4 to 2.0 GHz) 1 V/m (2.0 to 2.7 GHz)	EN 61000-4-3 IEC 61000-4-3	**A**
Rated power frenquency magnetic field	30 A/m	EN 61000-4-8 IEC 61000-4-8	**A**
Burst	2 kV (5/50 NS, 5 kHz)	EN 61000-4-4 IEC 61000-4-4	**B**
Surge	1 kV Line to line 2 kV Line to ligne	EN 61000-4-5 IEC61000-4-5	**B**
Conducted RF	3 V (150 kHz to 80 MHz)	EN 61000-4-6 IEC61000-4-6	**A**

Performance criteria :

A : During testing, normal performance within the specification limits.

B : During testing, temporary degradation or loss of function or performance which is self-recovering.

Fuji Electric France S.A.S.

46, Rue Georges Besse - Z I du Brézet
63 039 Clermont-Ferrand cedex 2 — FRANCE
France : Tél. 04 73 98 26 98 - Fax 04 73 98 26 99
International : Tél. (33) 4 7398 2698 - Fax. (33) 4 7398 2699
E-mail : sales.dpt@fujielectric.fr