Fuji Electric

FCX-AII

ABSOLUTE, DIFFERENTIAL AND GAUGE PRESSURE TRANSMITTER FOR REMOTE SEAL(S)

EDF "Not Classified" version and EDF "K3 Classification" version

DATA SHEET **FKB, FKD, FKM...K,L**

The FCX-AII series absolute, differential and gauge pressure transmitters accurately measures and transmits proportional 4 to 20mAdc signal.
The transmitters utilize the unique micromachined capacitive silicon sensor with state-of-the-art microprocessor technology to provide exceptional performance and functionality.

FEATURES

1. **Outstanding accuracy**
   0.07 % accuracy is a standard feature for differential and gauge pressure models and 0.2 % accuracy for absolute pressure models. The microcapacitance silicon sensor assures this feature for all elevated or suppressed calibration ranges without additional adjustment.
2. **Minimum inventory and design**
   Electronics unit, local indicators and electronics housing are interchageable among all FCX-AII transmitters.
3. **Minimum environment influence**
   The "Advanced Floating Cell" design which, protects the pressure sensor against changes in temperature, static pressure, and overpressure substantially reduces total measurement error in actual field applications.
4. **FUJI/HART®, bilingual communication protocol**
   FCX-AII series transmitter offers bilingual communications to speak both Fuji proprietary protocol and HART®. Any HART® compatible devices can communicate with FCX-AII.
5. **Application flexibility**
   Various options that render the FCX-AII suitable for almost any process applications includes :
   - Analog indicator at either the electronics side
   - Full range of hazardous area approvals
   - Built-in RFI filter and lightning arrester
   - 5-digits LCD meter
   - Stailess steel electronics housing
   - Wide selection of materials
   - High temperatures
6. **Programmable output Linearisation Function**
   Output signal can be freely programmable. Up to 14 compensated points at approximation.
7. **Burnout current flexibility : [Under Scale : 3.2 to 4.0 mA][Over Scale : 20.0 to 22.5 mA]**
   Burnout signal level is adjustable using model FXW or Hand Held Communicator (HHC) to comply with NAMUR NE43.
8. **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 reference pressure is at equal level as wet calibration.

Functional specifications

Type :

- FKD : differential pres. transmitter with remote seal(s)
- FKB : gauge pressure transmitter with remote seal
- FKM : absolute pressure transmitter with remote seal

Service :

Liquid, gas or vapour

Span and range limits :

Model	Span limits Minimum	Span limits Maximum	Range limits
	FKD		
	(mbar)	(mbar)	(mbar)
FKD□□3	3.2	320	± 320
FKD□□5	13	1300	± 1300
FKD□□6	50	5000	± 5000
FKD□□8	300	30000	± 30000
	FKB		
	(bar)	(bar)	(bar)
FKB□□1	0,013	1,3	-1 à + 1,3
FKB□□2	0,05	5	-1 à + 5
FKB□□3	0,3	30	-1 à + 30
FKB□□4	1	100	-1 à + 100
FKB□□5	5	500	-1 à + 500
	FKM		
	(bar abs.)	(bar abs.)	(bar abs.)
FKM□□1	0,016	0,16	0 à +0,16
FKM□□2	0,016	1,3	0 à +1,3
FKM□□3	0,05	5	0 à +5
FKM□□4	0,3	30	0 à +30

Note :
For K3A qualification, to minimise environment influence, span should be greater than 1/10 of the max span in most applications.

Overrange limit :
Equal to superior limit of static pressure

Output signal :
4 to 20 mA DC with digital signal Fuji or HART® superimposed on the analogic signal.

Power supply :
Transmitter operates on 10,5 V to 53 V 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 FCX-AII 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 Fuji Electric for other approuvals.

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 electronic housing between -100% to +100% of URL.

Normal / reverse action :
Programmable with FXW communicator.

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.
"Output Underscale":
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 3.8 mA through 21.6 mA by the FXW communicator.

Temperature limit :
Ambient : -25 to +55°C
-20 to +55°C (optional LCD indicator)
For explosionproof units (flameproof or intrinsic safety), ambient temperature must be within the limits specified by each standard.
Process :
Check in the seal - datasheet with the specific temperature conditions.
Storage :
-40 to +90°C

Humidity limit :
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	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	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, SS 316L isolating diaphragms, 4 to 20 mA analog output).

(Transmitter only)

Accurancy rating :
(including linearity, hysteresis and repeatability)
For span greater than 1/10 of URL :
±0,07 % of calibrated span for FKB and FKD
±0,2 % of calibrated span for FKM
For span smaller than 1/10 of URL :
±(0,02 + 0,05 x 0,1x URL / Span) % of span for FKB and FKD
±(0,05+0,05 x 0,1x URL / Span) % of span for FKM

Linearity :
0,05 % of calibrated span (FKB & FKD)
0,1 % of calibrated span (FKM)

Stability for 3 years :
±0,1 % of URL (FKB & FKD)
±0,2 % of URL (FKM)

Temperature effect : (transmitter only)
Effect per 28 °C change between -25 and +55 °C.
Model FKM :
Zero shift : ±(0,125 +0,1URL/span) % of URL
Total effect : ±(0,125 +0,1URL/span) % f URL
Models FKB & FKD :
Zero shift : ±(0,1+0,025%URL/span) % of URL
Total effect : ±(0,125 +0,025URL/span) % of URL

Static pressure effect (FKD) :
Zero shift : ± 0,05 % of URL for 100 bar
Span shift : -0,2 % of URL for 100 bar

Overrange effect (FKB & FKM) :
Zero shift : 0,2 % of URL, for any overrange pressures (limited to the max. overrange pressure).

Overrange effect (FKD) :
Zero shift : ±0,1 % of URL / 100 bar

Supply voltage effect :
Less than 0.05 % of calibrated span per 10V.

RFI effect :
Less than 0,2% of URL for the frequences of 20 to 1000 MHz and field strength of 10 V/m when electronics housing covers on. (Classification : 2-abc : 0,2 % of span according SAMA PMC 33.1)

Response time : (at 63,2% of output signal)
Time constant :
300 msec for FKD span code "3"
Time constant :
200 msec for other spans
Dead time :
300 msec
Response time = time constant + dead time

Mounting position effect :
Zero shift :
< 12 mm WC for 10° tilt in any position.
This shift can be corrected with the zero adjustment. This effect is doubled for fluorinated oil filling.
No influence on span adjustment.

Material fatigue :
Please consult Fuji Electric

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

Vibration effect :
< ±0,25 % of span for spans greater than 1/10 of URL.
Frequency 10 to 150 Hz, acceleration 39,2 m/sec^2 . These informations are available only for capillary mounting.

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

Turn-on time :
4 seconds

Internal resistance for external field indicator :
12 Ω max (connected to test terminal CK+ and CK-).

Physical specifications

Electrical connections :
M20 x 1,5 or
ATEX flameproof cable gland connector, or
Souriau 8N35 connector, or
Souriau 8N45S connector, or
Souriau 8N45 connector, or
SAIB NU25 ref. 251-103-401 / M20 x 1,5 connector (Compatible with 8N45 installed base)
Jaeger M20 x 1,5 connector ref. 536 006 006

Non wetted parts material :
Electronics housing :
Standard : SS 316
Bolts and nuts :
Standard : SS 316L
Filling fluid :
Standard : silicone oil
Mounting bracket :
SS 304L or SS 316L (option)

Environmental protection :
IEC IP66/IP67 and NEMA 4X

Mounting :
Without mounting bracket :
Direct mounting
With optional mounting bracket :
For 50 mm (2") pipe or direct wall mounting.

Weight :

Transmitter only :	about 6 kg
Add :	0,5 kg for the mounting bracket
	0,7 kg for indicator
	1,5 kg stainless steel housing (option)

Diaphragm seal(s) :
A comprehensive selection of seals can be chosen in accordance with the specific seal.

Arrester :

A built-in arrester protects the electronics from lightning surges.
Lightning surge immunity : 4 kV (1.2 × 50 µs)

Optional features

Indication :

A plug-in analog indicator (2.5% accuracy) 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, 4/20 mA, enable or inhibit the local adjustments.
- Local damping adjustment is possible via the "Damp" switch.

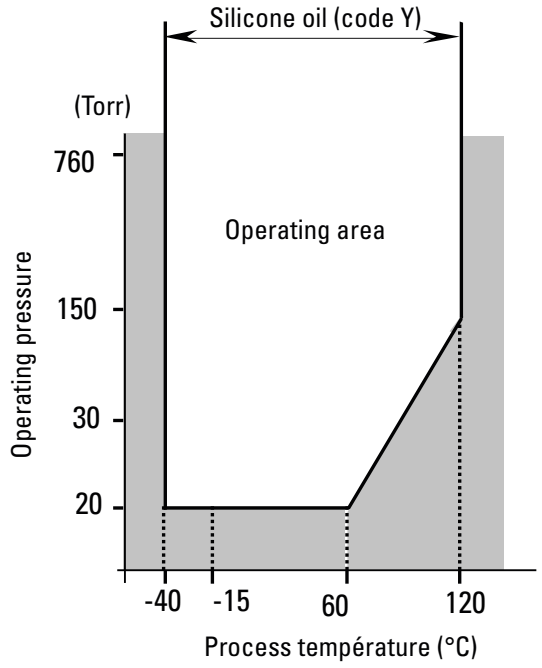
Degreasing :

Process-wetted parts are cleaned, but the fill fluid is standard silicone oil. Not for use on oxygen or chlorine measurement.

Customer tag :

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

Vacuum service :



Models FKB and FKD only

Relation between max. temperature and operating pressure for transmitters only.

Accessories

Hand Held Communicator (Fuji FXW) :

(Refer to datasheet EDS8-47)

Cable gland :

M20x 1.5 in stainless steel Exd IIC (obligatory for K3A transmitter with electrical connection M20 x 1.5)

Code Symbols - FKD

1	2	3	4	5	6	7	8		9	10	11	12	13	14	Description
F	K	D				V		-					Y		
															Differential pressure transmitter
															SMART : 4-20mAcc + FUJI et HART® digital signal
															Conduit connections
			W											(*9)	M20 x 1,5 (ATEX ADF cable gland for flameproof (optional))
			3												Souriau 8N45S connector
			6												Souriau 8N45 connector (not for EPR reactors)
			7												Souriau 8N35 connector (not for EPR reactors)
			8												SAIB NU25, ref. 251-103-401 / M20x1,5 connector (compatible with 8N45 installed equipment)
			9											(*8)	Jaeger (M20x1,5) connector ref. 536 006 006
															Diaphragm seal rating
				2											PN 25
				4											PN 20 - 150 Lbs
				6											PN 50 - 300 Lbs
				8											PN 40
				9											PN 16
				L											PN 100 - 600 Lbs
				M											PN 150 - 900 Lbs
				N										(*5)	PN 250 - 1500 Lbs
				P										(*5)	PN 420 - 2500 Lbs
														(*1)	**Spans**
					3									(*2)	0 to 3,2/320 mbar
					5									(*2)	0 to 0,013 / 1,3 bar
					6										0 to 0,05 / 5 bar
					8										0 to 0,3 / 30 bar
															Transmitter version and indicator
															Transmitter version / **Indicator** / **Initial setting**
						V	K	-	A					(*7)	EDF "K3 Classification" / None
						V	K	-	L						EDF "K3 Classification" / Digital, 0-100% linear scale
						V	L	-	A					(*7)	EDF "not classified" / None / 4 - 20 mA CC + Hart®/FUJI digital signal "Smart"
						V	L	-	B						EDF "not classified" / Analog, 0-100% linear scale
						V	L	-	C						EDF "not classified" / Analog, √ scale
						V	L	-	D						EDF "not classified" / Analog, customer sclae
						V	L	-	L						EDF "not classified" / Digital, 0-100% linear scale
						V	L	-	P						EDF "not classified" / Digital, customer scale
						V	L	-	M						EDF "not classified" / Digital, √ scale
															Appovals for hazardous locations (consulter Fuji)
										A					None (standard)
										X				(*6)	Flameproof housing ATEX Ⓔx II 2 GD - EEx d IIC T5/T6
														(*4)	**Mounting design (*3)** / **Ambient temperature correction**
											B				Capillary on HP side / Transmitter and diaphragm seal assembly
											C				Capillary on HP & BP side / Transmitter and diaphragm seal assembly
											E			(*4)	Rigid short design on HP & capillary on LP side / Transmitter and diaphragm seal assembly
											G				Capillaire côté HP / Transmitter
											H				Capillaire côtés HP & BP / Transmitter
															Cell flange design / **Stainless steel parts**
															Operating pressure / Bolts / nuts / Tag plate / Housing
												3			p ≤ 50 bar / None / None / Yes
												4			p ≤ 50 bar / None / Yes / Yes
												F			p ≤ 160 bar / SS 316(L)/SS 316(L) / None / Yes
												G			p ≤ 160 bar / SS 316(L)/SS 316(L) / Yes / Yes

Notes* : The gray lines are the optional qualified K3
All models are equipped with surge arrester specifically designed for EDF.

1- Turn down of 100:1 is possible, but should be used at the span greater than 1/10 of the maximum span for better performance
2- For DN = 50 consult Fuji Electric for your application with the specific operating conditions
3- Transmitter with capillary design has a standard mounting bracket
4- Transmitter and diaphragm seals with different diaphragm seals or capillary lenghtes on HP and LP side must be temperature corrected.
5- Bolting for static pressure > 160 bar, please consult Fuji Electric.
6- Not disponible SAIB, Souriau 8N35 / 8N45 / 8N45S and Jaeger sockets.
To be used with ATEX flameproof cable gland delivered by FUJI (option) or mounted by EDF.
7- Transmitters similar to K3A on AQ standard (ISO 9001)
8- Only applicable for "Not Classified" EDF transmitters version, Digit 8 code L
9- For K3A qualification, ADF ATEX cable gland is obligatory with M20 x 1.5 electrical connection

Code Symbols - FKB

1	2	3	4	5	6	7	8		9	10	11	12	13	14	Description
F	K	B				V		-					Y		
															Gauge pressure transmitter
															SMART : 4-20mAcc + FUJI et HART® digital signal
															Conduit connections
			W											(*9)	M20 x 1,5 (ATEX ADF cable gland for flameproof (optional))
			3												Souriau 8N45S connector
			6												Souriau 8N45 connector (not for EPR reactors)
			7												Souriau 8N35 connector (not for EPR reactors)
			8												SAIB NU25, ref. 251-103-401 / M20x1,5 connector (compatible with 8N45 installed equipment)
			9											(*8)	Jaeger (M20x1,5) connector ref. 536 006 006
															Diaphragm seal rating
				2											PN 25
				4											PN 20 - 150 Lbs
				6											PN 50 - 300 Lbs
				8											PN 40
				9											PN 16
				L											PN 100 - 600 Lbs
				M											PN 150 - 900 Lbs
				N											PN 250 - 1500 Lbs
				P											PN 420 bar - 2500 Lbs
														(*1)	**Spans**
					1									(*2)	0 to 0.013/1.3 bar
					2									(*3)	0 to 0.05/5 bar
					3										0 to 0.3/30 bar
					4									(*4)	0 to 1/100 bar
					5									(*4)	0 to 5/500 bar
															Transmitter version and indicator

Transmitter version	Indicator	Initial setting
V K - A	EDF "K3 Classification"	None	4 - 20 mA CC + Hart®/FUJI digital signal "Smart"
V K - L		digital, 0-100%	
V L - A	EDF "not classified"	None	
V L - B		analog, 0-100% linear scale	
V L - D		analog, customer scale	
V L - L		digital, 0-100%	
V L - P		digital, customer scale	

															Appovals for hazardous locations (consulter Fuji)
										A					None (standard)
										X				(*6)	Flameproof housing ATEX II 2 GD - EEx d IIC T5/T6
														(*5)	

	Mounting design (*5)	Ambient temperature correction
B	Capillary	Transmitter and diaphragm seal assembly
L	Rigid - Long design	Transmitter and diaphragm seal assembly
M	Rigid - Short design	Transmitter and diaphragm seal assembly
G	Capillary	Transmitter
S	Rigid - Long design	Transmitter
T	Rigid - Short design	Transmitter

Cell flange design

	Operating pressure	Bots/nuts	Tag plate	Housing and mounting bracket
3	p ≤ 50 bar	None	None	Yes
4	p ≤ 50 bar	None	Yes	Yes
F	p ≤ 100 bar	SS 316(L)/ SS 316(L)	None	Yes
G	p ≤ 100 bar	SS 316(L)/ SS 316(L)	Yes	Yes

Notes* :

The gray lines are the optional qualified K3
All models are equipped with surge arrester specifically designed for EDF.

1- Turn down of 100 : 1 is possible, but should be used at the span greater than 1/10 of the maximum span for better performance.
2- Consult Fuji Electric for your application with the specific operating conditions
3- For DN < 50 : consult Fuji Electric for your application with the specific operating conditions
4- Flange rating according max. operating pressure - for size PN > 100 bar, consult Fuji Electric
5- Transmitter with capillary design has a standard mounting bracket - rigid mounting design are always without mounting bracket
6- Not disponible SAIB, Souriau 8N35 / 8N45 / 8N45S and Jaeger connectors.
To be used with ATEX flameproof cable gland delivered by FUJI (option) or mounted by EDF
7- Transmitters similar to K3A on AQ standard (ISO 9001)
8- Only applicable for "Not Classified" EDF transmitters version, Digit 8 code L
9- For K3A qualification, ADF ATEX cable gland is obligatory with M20 x 1.5 electrical connection

Code Symbols - FKM

1	2	3	4	5	6	7	8		9	10	11	12	13	14	Description
F	K	M				V		-					Y		
															Absolute pressure transmitter SMART : 4-20mAcc + FUJI et HART® digital signal
															Conduit connections
			W												M20 x 1,5 (ATEX ADF cable gland for flameproof (optional))
			3												Souriau 8N45S connector
			6												Souriau 8N45 connector (not for EPR reactors)
			7												Souriau 8N35 connector (not for EPR reactors)
			8												SAIB NU25, ref. 251-103-401 / M20x1,5 connector (compatible with 8N45 installed equipment)
			9												Jaeger (M20x1,5) connector ref. 536 006 006
															Diaphragm seal rating
				2											PN 25
				4											PN 20 - 150 Lbs
				6											PN 50 - 300 Lbs
				8											PN 40
				9											PN 16
														(*1)	**Spans**
					1									(*2)	0 to 0,016/0,16 bar abs
					2									(*3)	0 to 0,016/1,3 bar
					3										0 to 0,05/5 bar
					4										0 to 0,3/30 bar
															Transmitter version, indicator and arrester

Transmitter version	Indicator	Initial setting
V L - A	None	4 - 20 mA CC + Hart®/FUJI digital signal "Smart"
V L - B	Analog, 0-100% linear scale	
V L - D	Analog, customer scale	
V L - L	Digital, 0-100%	
V L - P	Digital, customer scale	

															Appovals for hazardous locations (consult Fuji)
										A					None (standard)
										X				(*5)	Flameproof housing ATEX II 2 GD - EEx d IIC T5/T6
														(*4)	**Mounting design** (*4) / **Ambient temperature correction**
											B				Capillary — Transmitter and diaphragm seal assembly
											L				Rigid - Long design — Transmitter and diaphragm seal assembly
											M				Rigid - Short design — Transmitter and diaphragm seal assembly
											G				Capillary — Transmitter
											S				Rigid - Long design — Transmitter
											T				Rigid - Short design — Transmitter
															Stainless steel parts

Operating pressure	Bolts / nuts	Tag plate	Housing
3 p ≤ 50 bar	None (capillary mounting)	None	Yes
4 p ≤ 50 bar	None (capillary mounting)	Yes	Yes
F p ≤ 100 bar	SS 316(L) / SS 316(L)	None	Yes
G p ≤ 100 bar	SS 316(L) / SS 316(L)	Yes	Yes

Notes* :

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

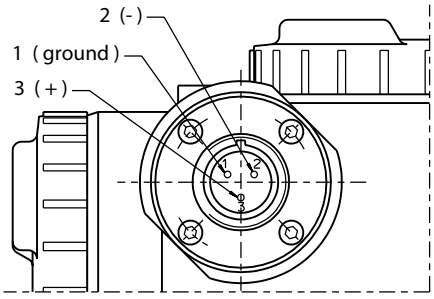
1- Turn down of 100:1 is possible, but should be used at the span greater than 1/10 of the maximum span for better performance.
2- Consult Fuji Electric for your application with the specific operating conditions
3- For DN50 consult Fuji Electric for your application with the specific operating conditions
4- Transmitter with capillary design has a standard mounting bracket - rigid mounting design are always without mounting bracket
5- Not disponible SAIB, Souriau 8N35 / 8N45 / 8N45S Jaeger connectors.
To be used with ATEX flameproof cable gland delivered by FUJI (option) or mounted by EDF
6- Transmitters similar to K3A on AQ standard (ISO 9001)

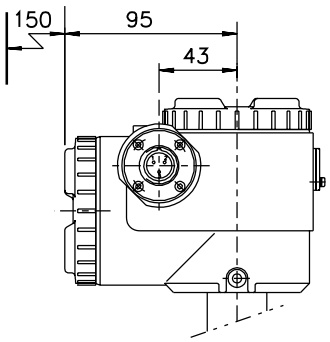
OUTLINE DIAGRAM (unit : mm)

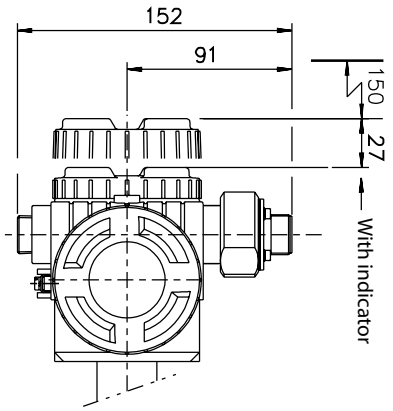
Conduit connection for SOURIAU connectors (4th digit = code 3, 6 or 7)

For Souriau 8N35 connector

CONDUIT CONNECTION - SOURIAU 8N35

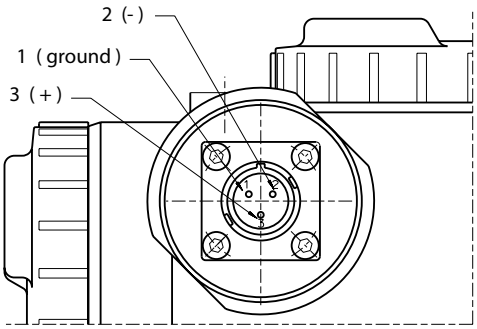


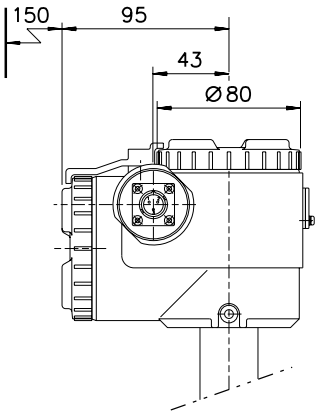


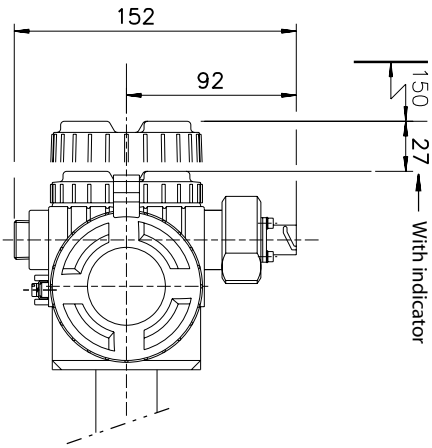


For Souriau 8N45 / 8N45S connector

CONDUIT CONNECTION - SOURIAU 8N45

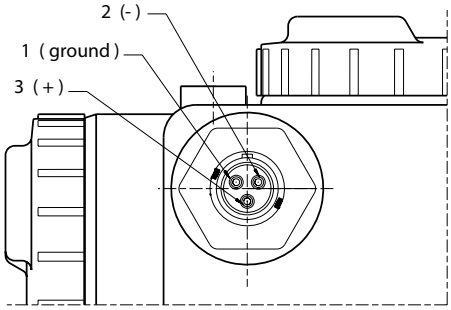


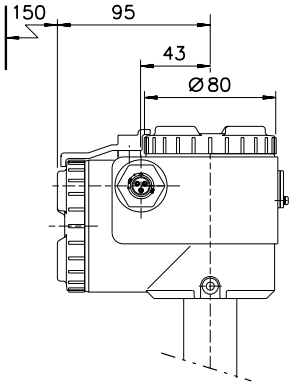


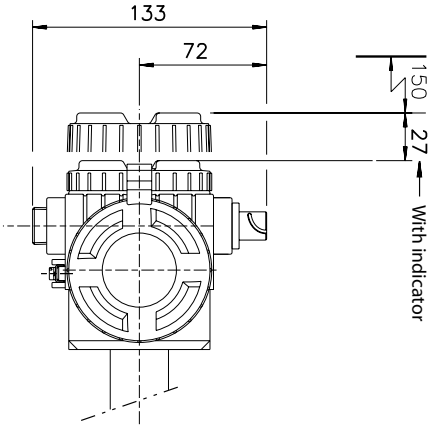


Conduit connection SAIB connector (4th digit = code 8)

CONDUIT CONNECTION - SAIB socket

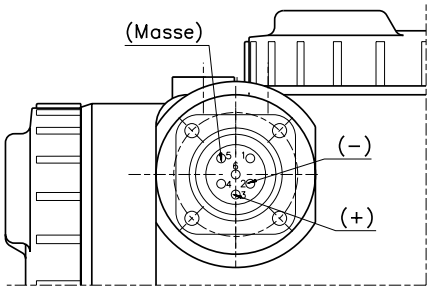


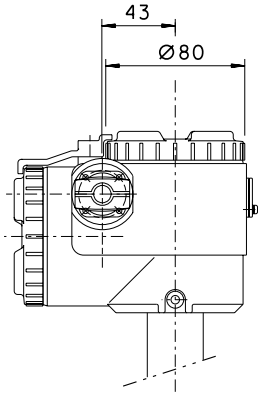


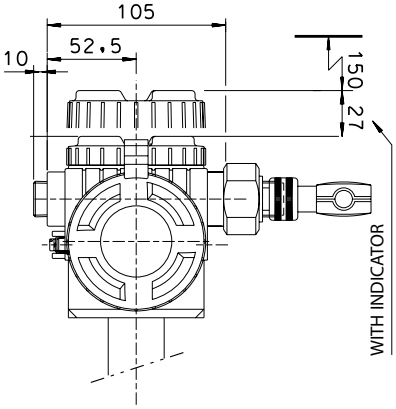


Conduit connection JAEGER connector (4th digit = code 9)

CONDUIT CONNECTION JAEGER réf 536 006 006



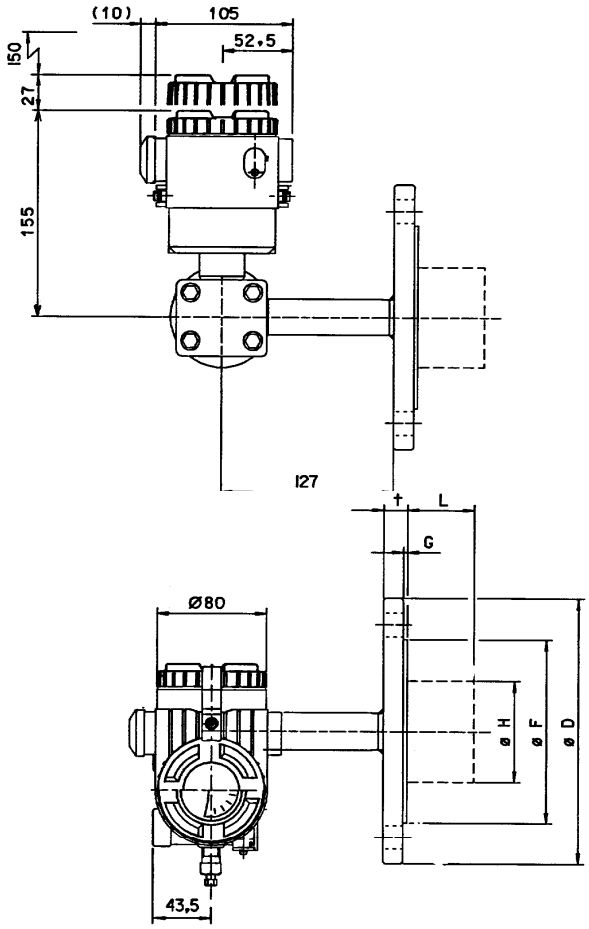


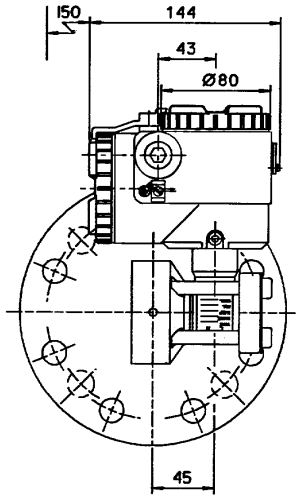


Outline dimensions for rigid mounted diaphragm seal on a gauge or an absolute pressure transmitter (units : mm)

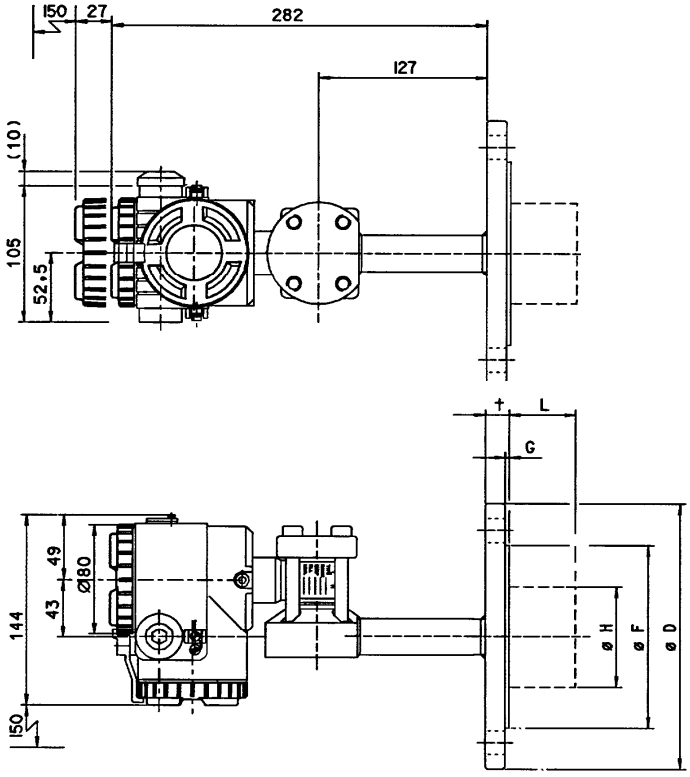
Dimensions of the seal - refer to page 15/16

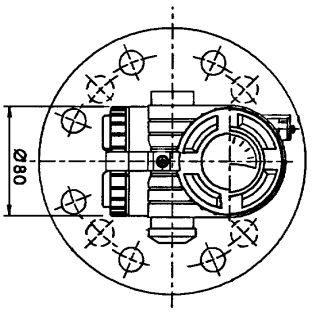
Short mounting design





Long mounting design

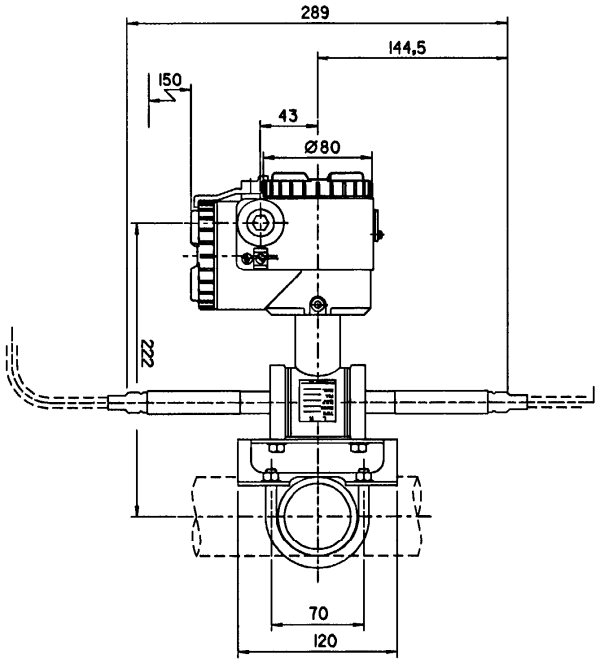


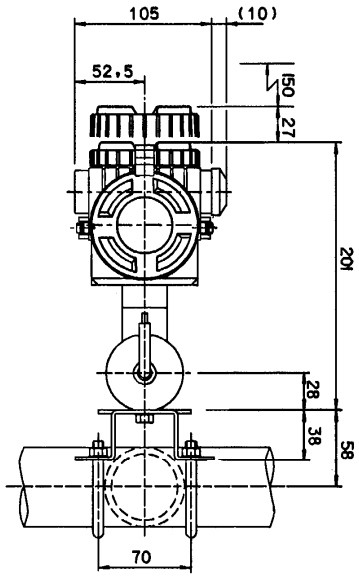


Outline dimensions for capillary mounted diaphragm seal(s) on a differential pressure transmitter (units : mm)

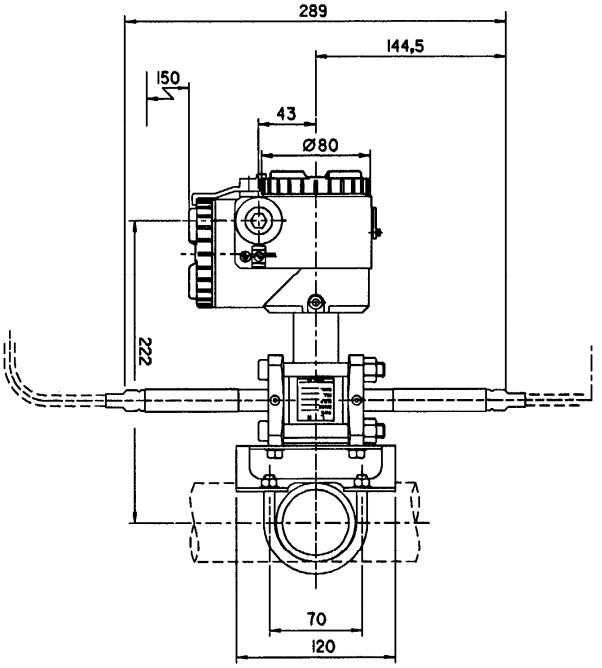
Dimensions of the seal - refer to page 15/16

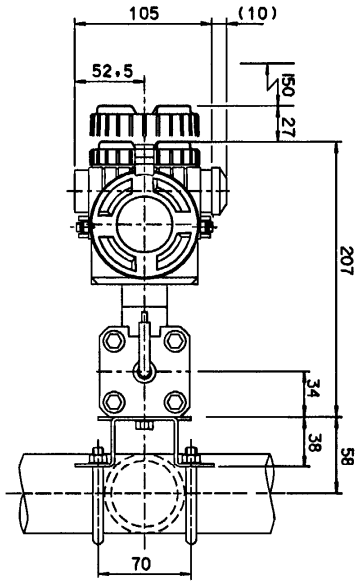
For PN ≤ 50 bar : reduced volume flanges are welded on the measuring cell

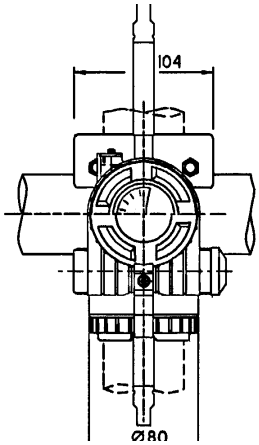




For PN > 50 bar : reduced volume flanges are welded and bolted on the measuring cell



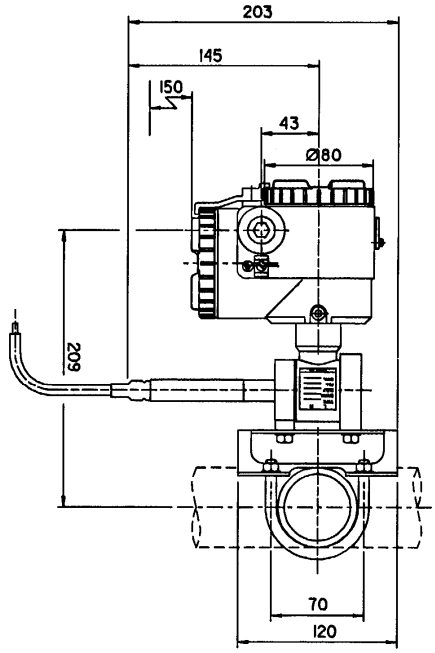


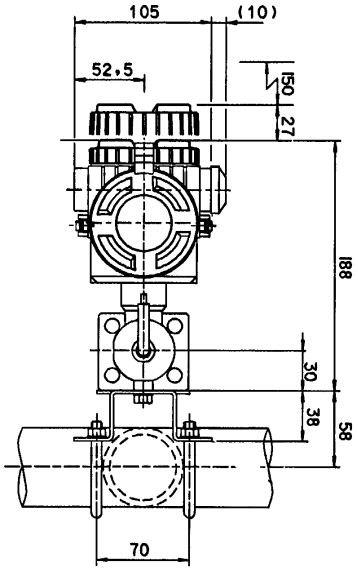


Outline dimensions for capillary mounted diaphragm seal(s) on a gauge or absolute pressure transmitter (units : mm)

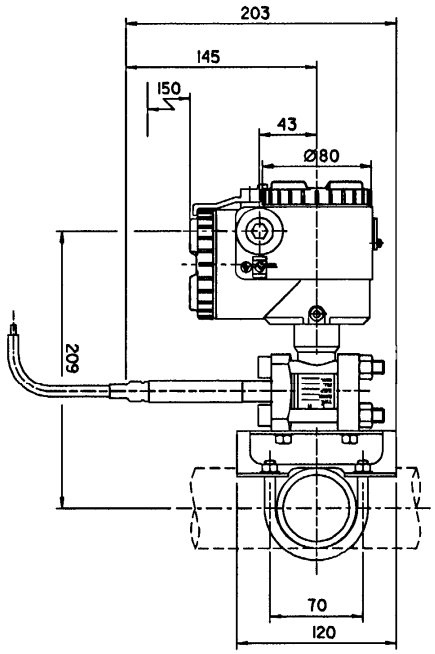
Dimensions of the seal - refer to page 15/16

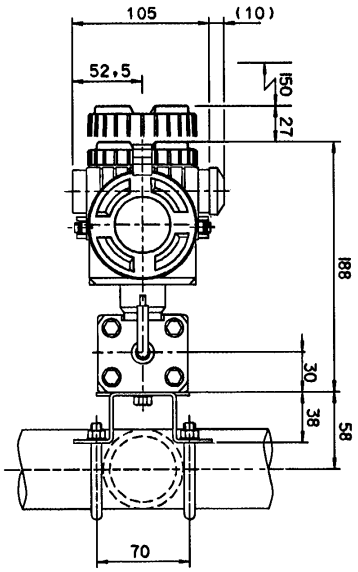
For PN ≤ 50bar : reduced volume flanges are welded on the measuring cell



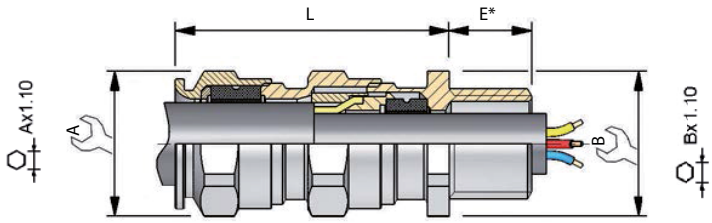


For PN > 50 bar :reduced volume flanges are welded and bolted on the measuring cell





Dimensions d'encombrement du Presse Etoupe M20 ADF



SELECTION TABLE				DIMENSIONS						SIZE
THREAD	THREAD CODE	THREAD	THREAD CODE	CLAMPING RANGE		WIRES	A	B	L	
ISO		NPT		INTERNAL SHEATH MIN - MAX	EXTERNAL SHEATH MIN - MAX	THICKNESS				
20	M20	1/2"	N05	7.0 - 12.0	10.0 - 16.0	0.2 -1.25	30	24	51	6

DIAPHRAGM SEAL(S)

DATA SHEET

S

Diaphragm seals designed by Fuji Electric are used to measure accurately liquid level, density on open and closed tanks, or flow measurement in pipes.
The use of the diaphragm seal(s) avoid(s) that the measuring cell is directly in contact with the process. High temperature, hig corrosives, viscous, sticking, crystallizable and abrasive process conditions) as well as to deport the transmitter electronic of the radiological atmospheres.

FEATURES

1- Construction

The diaphragm seals are mounted on differential, gauge and absolute pressure transmitters of FCX-AII series. The seal can be rigid, (direct) mounted on the transmitter or with capillaries between the seal and the transmitter.
The construction is an all welded design without any gasket between the seal and the transmitter diaphragm and is filled with the suitable oil for your application.

2- Operating principle

The measuring pressure is applied on the diaphragm seal and transferred by the filling fluid through the capillary tube to the measuring cell of the pressure transmitter.

3- Parts materials

Wetted parts materials (diaphragm and gasket face) are in SS 316L, Tantalum, Hastelloy, Monel.
Flange adaptors are available in SS316L or Hastelloy C276 alloy. In case of flange adaptor mounting, the seal face on the remote seal is located on the diaphragm, which means that the seal flange is not wetted.
Other parts are in SS 316L : capillary tube, reduced volume flange, diaphragm seal body, direct mounting connection parts.
Standard filling fluid is silicone oil.
High temperature oil and vacuum service filling are available upon request.

4- Diaphragm seal types

According to the mounting and operating conditions different seal types can be useful :
Flush mounting design from DN40 to DN100.
Seals with extensions (50 to 200 mm).
Flanged, screwed or weld neck adaptors
For specific seals, please consult Fuji Electric.

Functional specifications

Diaphragm seal application :

The seal(s) can be mounted direct or rigid on the transmitter (for example for liquid level measurement at the bottom of the tank) or capillary mounted to distance the measuring point away from the transmitter (for example in case of high process temperature).
The rigid mounted seal can be assembled in a long design or in a short (compact) design according to the physical dimension requests of the customer (see outline dimensions drawings).

Capillary tube specifications :

	Rigid mounting	Capillary mounting
FKB	Short or long design	HP side
FKM	Short or long design	HP side
FKD	See datasheet of FKE	HP and BP side HP and BP side

Standard capillary lengthes :
1,5 / 3 / 6 m (others upon request)
Inside diameter :
1 mm (standard)
2 mm for vacuum service and high process temperature applications
Smallest bending radius of the capillary :
50 mm

Capillary tube sheald possibilities :

PVC sheald temperature limit :
-10 à 80°C
Stainless steel sheald temperature limit :
-40 à 400°C

Process connection possibilities :

The diaphragme seals can be :
- Flush mounting design
- Extension mounting
- Adaptors mounting (flanged, screwed or welded neck).

The adaptors mounting can adapte the remote seals to special connection and to increase the sensibilty of the transmitter during special process conditions.

Temperature limits :

Ambiant temperature :

-40 to 85°C

Process temperature :

-40 to 150°C for rigid mounting,

-40 to 350°C for capillary design, and according the filling fluid limitations.

Pressure limits :

Working pressure :

Limited by the static pressure or the working pressure of the transmitter or by the nominal flange rating of the diaphragm seal (PN).

(Please take the smallest of both).

Vacuum limit :

Depending of the limit of the transmitter and the filling fluid of the seal.

For a differential or gauge pressure transmitter the lowest vaccum is 20 Torr (27 mbar abs.).

For the utilization of vacuum service < 20 Torr, please consult Fuji Electric with your service conditions.

The absolute pressure transmitter (FKM) can be used for absolute zero.

Codify "vaccum service" for all vaccum measure.

Performance specifications

To calculate the total performance, both the transmitter and the diaphragm seals performances have to be added.
(Under reference conditions, Silicone oil fill, isolated seals SS 316L, analogic output 4/20 mA at linear mode)

Accuracy :

The assembling of 1 or 2 diaphragm seals on a transmitter increases the accuracy error at reference conditions of ±0,1% of the span.

Influence de la température ambiante :

Effect when transmitter alone is corrected in temperature. (See digit 11 code G, S, T of the code symbols FKB and FKM and code G, H of the code symbols FKD).

Seal / Transmitters	DN50 2" SS Diaphragm	DN80/3" SS Diaphragm	DN80/3" Other diaphragm materials	DN100/4" SS Diaphragm	Adaptator SS Diaphragm
FKB / FKM - Gauge/absolute pressure	2.03	0.11	0.22	0.04	0.11
Capillary (m)	1.5	0.08	0.2	0.03	0.08
FKD - Differential Pressure	0.48	0.04	0.05	0.02	0.04
Capillary (m)	0.32	0.03	0.07	0.01	0.03

Note : the indicated values are in mbar/10°C for capillary length of 1m and internal capillary tube Ø of 1mm.

Effect when transmitter and the seal assembly is corrected (transmitter and seals). (See code B,C,L,M digit 11 of the code symbols FKB, FKD, FKM).

According to the complet transmitter design (transmitter and seals) a strong correction of the zero drift can be realized by an additional temperature correction operation on the complete transmitter unit (transitter and seals)

A thermal isolation or a heating of the capillaries minimises the ambient temperature effect.

Process temperature effect :

Seals / Transmitters	DN50/2" SS diaphragm	DN80/3" SS diaphragm	DN80/3" Other diaph. SS materials	DN100/4" SS diaphragm	Adaptator SS diaphragm
FKB / FKM	1.24	0.17	0.73	0.08	0. 17
FKD	0.5	0.09	0.22	0.05	0.09

Note : the indicated values are in mbar/10°C

Static pressure effect for ΔP transmitter with stainless steel diaphragms (FKD transmitter with DN80 and DN100 seals) :

Zero shift :

± 0,2% of URL for flange rating

Oil filling	Code digit 7	Response time	
		0 to 320 mbar	0 to 1,3 bar
Standard silicone oil	Y, G	0,15	0,037
Oil for vacuum or high temperature	V, U, X	0,25	0,065

Response time : (mean values)

The indicated values are in seconds per meter of capillary length with internal tube diameter Ø 1 mm.

The indicated response time is based on a pressure change of 0 to 100 % of the calibrated span at reference temperature of 20 °C.

The indicated values do not include the response time of the transmitter. (Refer to the datasheet).

Filling fluid of the diaphragm seals :

Code digit 7	Designation	Densité	Temperature resistance (°C)	
			P abs ≥ 1 bar	P abs < 1 bar
Y and G	Silicone oil	0,95	-40 to +180	-40 to +120
V	Silicone oil	1,07	0 to +300	0 to +200

The indicated values and limits are indicated for the most common applications (standard filling fluids).

Please consult Fuji Electric for special applications indicating your temperature, pressure and vacuum conditions (vacuum and temperature can occure together).

Other filling fluids can be used for your applications.

Seals code symbols - S

1	2	3	4	5	6	7		8											DESCRIPTION
S							-												
	A																		Flanged axial diaphragm seal connection
	R																		Flanged radial diaphragm seal connection - Not possible with rigid mounting design digit 6 : code R
	W																		Wafer type - Not possible with rigid mounting design digit 6 : code R
																		(*1)	**Flanges RF (Flange size and rating)**
		4																	ANSI-150LB 3"-ISO PN20 DN80
		5																	ANSI-150LB 4"-ISO PN20 DN100
		6																	ANSI-300LB 3"-ISO PN50 DN80
		7																	ANSI-300LB 4"-ISO PN50 DN100
		8																	DIN PN40 DN80
		9																	DIN PN16 DN100
		H																	ANSI-150LB 2"-ISO PN20 DN50
		J																	ANSI-300LB 2"-ISO PN50 DN50
		G																	DIN PN40 DN50
		A																(*2)	Flange adaptor PN 40 DN 25
		B																(*2)	Flange adaptor ANSI-150 Lb 1" - ISO PN20 DN25
		C																(*2)	Flange adaptor ANSI-300 Lb 1" - ISO PN50 DN25
		D																(*2)	Flange adaptor PN40 DN40
		E																(*2)	Flange adaptor ANSI-150 Lb 1"1/2 - ISO PN20 DN40
		F																(*2)	Flange adaptor ANSI-150 Lb 1"1/2-ISO PN50 DN40
		M																(*2)	Flange adaptor PN40 DN50
		N																(*2)	Flange adaptor PN40 DN80
		P																(*2)	Flange adaptor PN40 DN100
		Q																(*2)	Flange adaptor PN16 DN100
		R																(*2)	Screwed adaptor 1/4 NPT female - 904L
		S																(*2)	Screwed adaptor 1/2 NPTE
		Y																(*2)	Welded adaptor on tube 3/8"

Diaphragm seal material

																		(*6)	Diaphragm	Flange raised face	Seal flange	Flange adaptor (*6) (if applicable)
			V																SS 316 L	SS 316 L	SS 316L	SS 316L
			H																Hastelloy-C 276	Hastelloy-C 276	SS 316L	SS 316L
			B																Monel	Monel	SS 316L	SS 316L
			T																Tantale	Tantale	SS 316L	SS 316L
			C																SS 316 L + gold coat	SS 316L	SS 316L	SS 316L
			N																Hastelloy-C 276	Hastelloy-C 276	SS 316L	Hastelloy-C 276

Diaphragm seal design

				Y															Flush mounting
				A															Diaphragm extension 50 mm
				B															Diaphragm extension 100 mm material code "V" - digit 4
				C															Diaphragm extension 150 mm
				D															Diaphragm extension 200 mm
				E															Diaphragm extension 50 mm
				F															Diaphragm extension 100 mm material code "H" - digit 4
				G															Diaphragm extension 150 mm
				H															Diaphragm extension 200 mm

Transmission diaphragm seal to measuring cell

																			Mounting design	Capillary length	Capillary design
					A														Capillary	1,5 m	PVC protection
					B														Capillary	3 m	PVC protection
					C														Capillary	6 m	PVC protection
					D														Capillary	Upon request	PVC protection
					G													(*3)	Capillary	1,5 m	SS sheald
					H													(*3)	Capillary	3 m	SS sheald
					K													(*3)	Capillary	6 m	SS sheald
					L													(*3)	Capillary	Upon request	SS sheald
						R													Rigid design - not possible with digit 2 = R, W - max. process temperature : 150°C - only for FKD, FKM, FKB

Special applications and fill fluid for the diaphragm seal only

																			Treatment	Filling fluid
							Y												None (standard)	Silicone oil
							G												Degreasing	Silicone oil
							V											(*4)	Vacuum service - max temp 200°C	Silicone oil
							U											(*4)	Very high temperature (0 to 300°C)	Silicone oil
							X											(*4)	Very high temperature (20 to 350°C)	Silicone oil

Special options

									-	*								(*5)	Special, no code available

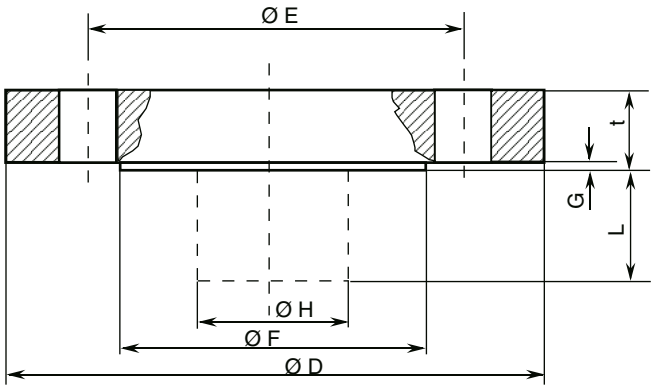
*Notes :

The gray lines are the qualified options for K3A

1- Different flange machinings (recess, groove, ...)
2- Axial diaphragm seal connection - no extension possible
3- Recommended for Vacuum or High Temperature applications T > 120 °C - (Capilary internal diameter = 2 mm)
4- Consult FUJI for your application with the specific operating conditions
5- When no code can be found in the current code symbols, place (*) in concerned code digit(s) & add (*) in 8 th digit
6- Unless explicitly stated in digit 3

Outline dimensions of the standard diaphragm seals
Flush and extension (units : mm)

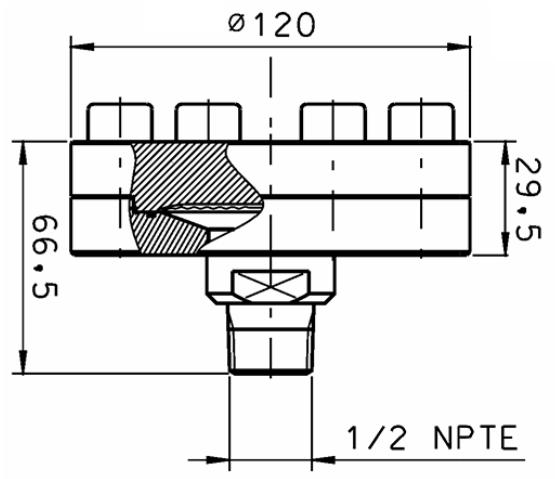
DN 50 / DN80 / DN100



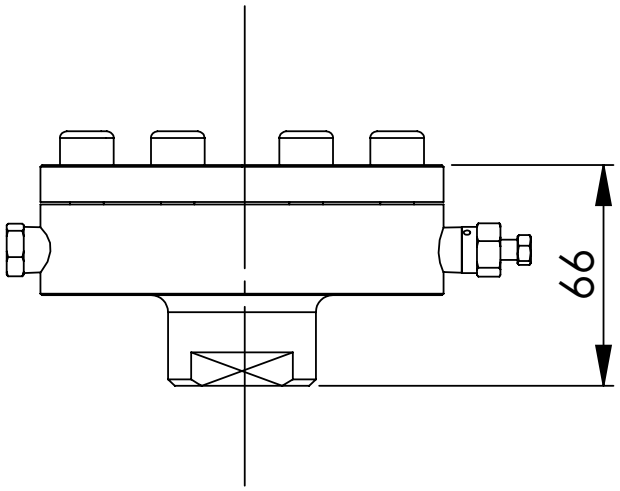
FLANGES DIMENSIONS ACCORDING B16.5 (EN 1759-1)										
DIN / ISO		ANSI								
PN	DN	NP	NW	ØD	ØE	ØF	G	ØH	t	N x Øh
40	50			165	125	102	3	48	20	4 x 18
40	80			200	160	138	3	73	20	8 x 18
16	100			220	180	158	3	96	20	8 x 18
20	50	150 lbs	2"	150	120,5	92	1,6	48	20	4 x 20
20	80	150 lbs	3"	190	152,5	127	1,6	73	24	4 x 20
20	100	150 lbs	4"	230	190,5	158	1,6	96	24	8 x 20
50	50	300 lbs	2"	165	127	92	1,6	48	22,5	8 x 20
50	80	300 lbs	3"	210	168,5	127	1,6	73	29	8 x 22
50	100	300 lbs	4"	255	200	158	1,6	96	32	8 x 22

Outline dimensions of the standard diaphragm seals with adaptors (units : mm)

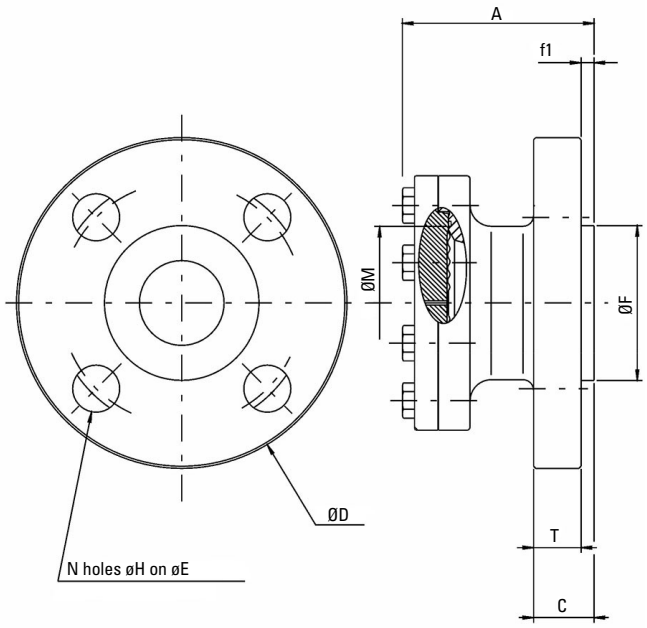
Screwed adaptors - 1/2 NPTE



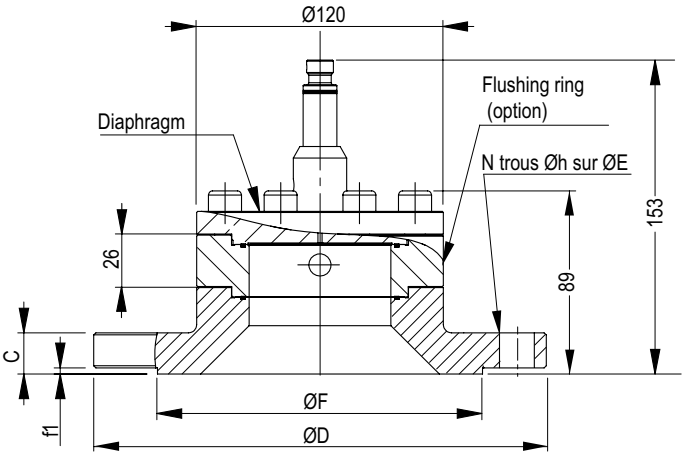
Screwed adaptors - 1/4" NPT female



Flange adaptor DN 25 to DN50

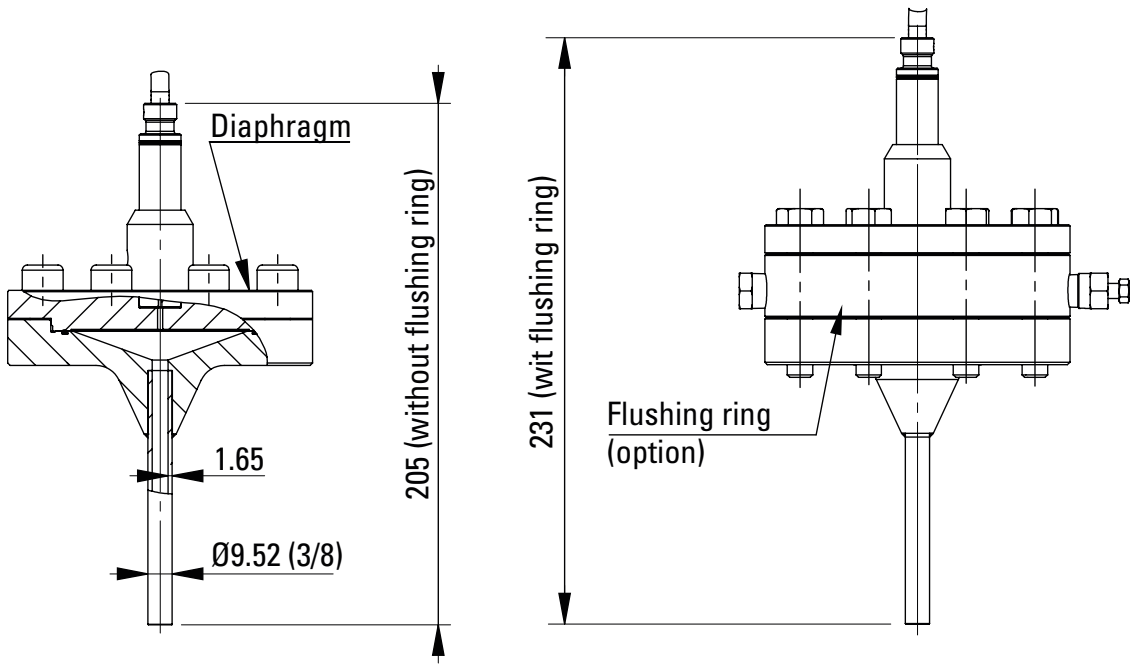


Flange adaptor DN 80 and DN100

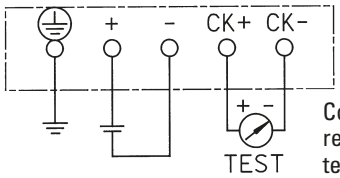


FLANGES DIMENSIONS FLANGE ADAPTORS ACCORDINGt DIN / EN 1092-1 et B16.5 (EN 1759-1)											
DIN / ISO		ANSI									
PN	DN	NP	NW	ØD	ØE	ØF	f1	C1 min	A	ØM	N x Øh
40	25			115	85	68	2	18	83	72,2	4 x 14
20	25	150 lbs	1''	108	79,4	50,8	1,6	16	81	72,2	4 x 15,8
50	25	300 lbs	1''	124	89	50,8	1,6	17,5	86	72,2	4 x 19
40	40			150	110	88	3	18	85	72,2	4 x 18
20	40	150 lbs	1''1/2	127	98,4	73	1,6	18	85	72,2	4 x 15,8
50	40	300 lbs	1''1/2	156	114,3	73	1,6	21	91	72,2	4 x 22,2
40	50			165	125	102	2	20	91	72,2	4 x 18
40	80			200	160	138	3	24	59,5	72,2	8 x 18
40	100			235	190	162	3	24	59,5	72,2	8 x 22
16	100			220	180	158	3	20	59,5	72,2	8 x 18

Welded adaptor 3/8"



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.

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