Fuji Electric

FCX-AII

ABSOLUTE AND GAUGE PRESSURE TRANSMITTER FOR REMOTE SEAL

DATASHEET **FKP, FKH...F**

The FCX-AII pressure transmitter accurately measures gauge pressure and level and transmits proportional 4 to 20 mA 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. High accuracy
0,1 % accuracy is the standard feature for all gauge pressure models. 0,2% accuracy for all absolute pressure.
The micro-capacitance 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.
Our gauge and absolute pressure transmitters for remote seal(s) are welded design with reduced volume flange welded on cell's body to guarantee a perfect vaccum tightness and high pressure services.

3. Minimum environmental influence
The "Advance Floating Cell" design which protects the pressure sensor against changes in temperature, and over-pressure substantially reduces total measurement error in actual field applications

4- 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.

5- Application flexibility
Example of options that render the FCX-AII series 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 digit LCD meter.
- Stainless steel electronics housing.
- Wide selection of materials.
- High temperature and high vacuum seals.

6- Programmable output Linearization 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 : 20,8 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), reliability of dry calibration without reference pressure is at equal level as wet calibration.

SPECIFICATIONS

Functional specifications

Type :
- FKH or FKP : Smart, 4-20 mA DC + Fuji/Hart® digital signal

Service :
Liquid, gas or vapour.

Span, range and overrange limits :

Model	Span limits (bar)		Range limits (bar)	Overrange limits (bar)
	Minimum	Maximum		
	FKP			
F□P□01	0,08125	1,3	-1 à +1,3	10
F□P□02	0,3125	5	-1 à +5	15
F□P□03	1,875	30	-1 à +30	90
F□P□04	6,25	100	-1 à +100	150
	FKH (bar abs)		(bar abs)	(bar abs)
F□H□02	0,08125	1,3	0 à +1,3	5
F□H□03	0,3125	5	0 à +5	15
F□H□04	1,875	30	0 à +30	90

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

Output signal :

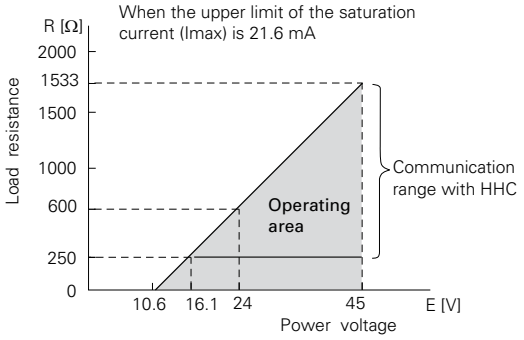
4 to 20 mA DC with digital signal superimposed on the analogic signal

Power supply :

Transmitter operates on 10,5 to 45 V DC at transmitter terminals

10,5 to 32 V DC for the units with optional arrester.

Load limitations :see figure below



Note) The load resistance varies with the upper limit of the saturation current [I max]

$$R\,[\Omega] = \frac{E\,[V] - 10.5}{(I\ max\ [mA] + 0.9) \times 10^{-3}}$$

Note : digital communication with FXW/HART™ requires min 250Ω load resistance.

Hazardous locations :

Authority (Digit 10 =)	Intrinsic safety
ATEX (K)	Ex II 1 G Ex ia IIC T5 (-40°C ≤ Ta ≤ +50 °C) Ex ia IIC T4 (-40°C ≤ Ta ≤ +70 °C) IP66/67 Entity Parameters: Ui ≤ 28 Vdc, Ii ≤ 94.3 mA, Pi ≤ 0.66 W Ci = 36 nF/26 nF for models with/without Arrester Li = 0.7 mH/0.6 mH for models with/without Analog Indicator
Factory Mutual (H)	Class I II III Div.1 Groups A, B, C, D, E, F, G T4 Entity Type 4X Entity Parameters: Vmax=42.4V, Imax=113mA, Pi=1W, Ci=35.98nF, Li=0.694mH
CSA (J)	Ex ia Class I, Groups A, B, C and D; Class II, Groups E,F and G; Class III Per drawing TC 522873 Temp. code T5 for Tamb max = +50°C Temp. code T4 for Tamb max = +70°C Entity Parameters: Vmax = 28 Vdc, Imax = 94.3 mA, Pmax = 0.66 W Ci = 36 nF/25 nF for models with/without Arrester Li = 0.7 mH/0.6 mH for models with/without Analog Indicator
IECEx (T)	Ex ia IIC T5 (-40°C ≤ Ta ≤+50 °C) Ex ia IIC T4 (-40°C ≤ Ta ≤+70 °C) IP66/67 Entity Parameters: Ui ≤ 28 Vdc, Ii ≤ 94.3 mA, Pi ≤ 0.66 W Ci = 36 nF/26 nF for models with/without Arrester Li = 0.7 mH/0.6 mH for models with/without Analog Indicator

Model code

9th digit	13th digit	Tamb
A,B,C,D,J	Y,G,N	-40°C to +85°C
L,P,M,1,2,3	Y,G,N	-20°C to +80°C
Q,S,N,4,5,6	Y,G,N	-20°C to +60°C
E,F,G,H,K	Y,G,N	-40°C to +60°C
-	W,A,D	-10°C to +60°C

Authority	Flameproof
ATEX (X)	Ex II 2 GD Ex d IIC T6 (-40°C ≤ Ta ≤ +65 °C) Ex d IIC T5 (-40°C ≤ Ta ≤ +85 °C) Ex tD A21 IP66/67 T 85°C Ex tD A21 IP66/67 T 100°C Electrical ratings Model Without arrester: Ui ≤ 45 Vdc, 4-20 mA loop powered, Pi ≤ 1.0125 W Model With arrester: Ui ≤ 32 Vdc, 4-20 mA loop powered, Pi ≤ 1.0125 W
Factory Mutual (D)	Class I Div.1 Groups B, C, D T6 Type 4X Class II III Div.1 Groups E, F, G T6 Type 4X Tamb max = +60°C
CSA (E)	Class I, Groups C and D; Class II, Groups E,F and G ; Class III Maximum ambient temperature 85°C Maximum working pressure 50 Mpa Electrical ratings Model Without arrester: Ui ≤ 45 Vdc, 4-20 mA Model With arrester: Ui ≤ 32 Vdc, 4-20 mA Note: "Seal not required"
IECEx (R)	Ex d IIC T6 (-40°C ≤ Ta ≤ +65 °C) Ex d IIC T5 (-40°C ≤ Ta ≤ +85 °C) DIP A21 IP66/67 T 85°C DIP A21 IP66/67 T 100°C Electrical ratings Model Without arrester: Ui ≤ 45 Vdc, 4-20 mA loop powered, Pi ≤ 1.0125 W Model With arrester: Ui ≤ 32 Vdc, 4-20 mA loop powered, Pi ≤ 1.0125 W

Authority (Digit 10 =)	Type n Nonincendive
ATEX (P)	Ex II 3 G Ex nA II T5 (-40°C ≤ Ta ≤+70 °C) IP66/67 Electrical ratings Model Without arrester: Ui ≤ 45 Vdc, 4-20 mA loop powered, Pi ≤ 1.0125 W Model With arrester: Ui ≤ 32 Vdc, 4-20 mA loop powered, Pi ≤ 1.0125 W Optional Analog indicator is not available for type "n"
Factory Mutual (H)	Class I II III Div.2 Groups A, B, C, D, F, G T4 Entity Type 4X
CSA (J)	Class I Div.2 Groups A, B, C, D Class II Div.2 Groups E, F, G Class III Div.2 Temp Code T5 Tamb max = +50°C Temp Code T4 Tamb max = +70°C Entity Parameters: Vmax = 28 Vdc, Imax = 94.3 mA, Pmax = 0.66 W Ci = 36 nF/25 nF for models with/without Arrester Li = 0.7 mH/0.6 mH for models with/without Analog Indicator
IECEx (Q)	Ex nA II T5 (-40°C ≤ Ta ≤+70 °C) IP66/67 Electrical ratings Model Without arrester: Ui ≤ 45 Vdc, 4-20 mA loop powered, Pi ≤ 1.0125 W Model With arrester: Ui ≤ 32 Vdc, 4-20 mA loop powered, Pi ≤ 1.0125 W Optional Analog indicator is not available for type "n"

Model code

9th digit	13th digit	Tamb
A,B,C,D,J	Y,G,N	-40°C to +85°C
L,P,M,1,2,3	Y,G,N	-20°C to +80°C
Q,S,N,4,5,6	Y,G,N	-20°C to +60°C
E,F,G,H,K	Y,G,N	-40°C to +60°C
-	W,A,D	-10°C to +60°C

Zero/span adjustment :

Zero and span are adjustable by hand held communicator in Hart® or Fuji protocol.

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

Damping:

Adjustable from HHC(1) or local adjustment unit with LCD display.

The time constant is adjustable between 0,06 to 32 sec.

Zero elevation/suppression:

-1 bar to 100% of URL for FKP

0 kPa Abs to +100 % of URL for FKH

Normal/reverse action:

Selectable from HHC(1).

Indication:

Analog indicator or 5 digit LCD meter, as specified.

Burnout direction: selected from the HHC

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

"Output Hold" :

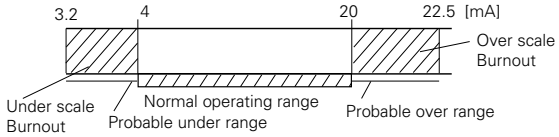
Output signal is hold as the value just before the failure happens.

"Output Overscale" :

Adjustable within the range 20,0 mA to 22,5 mA from the hand held communicator (HHC).

"Output Underscale" :

Adjustable within the range 3,2 mA to 4,0 mA from the HHC(1)



Output limits conforming to NAMUR NE43 by order.

Loop check output :

Transmitter can be configured via HHC to provide constant signal between 3,2 and 22,5 mA.

Temperature limit :

Ambient :

- 40 to + 85°C
- 20 to + 80°C (LCD indicator)
- 40 to + 60°C (arrester option)
- 10 to + 80°C (fluorinated oil filling of the cell)

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

Process :

Check in the seal datasheet with the specific temperature conditions

Storage : - 40 to + 90°C

Humidity :

0 to 100% RH (Relative Humidity)

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		By local configurator (with 3 push button), (LCD indicator)	
	Display	Set	Display	Set	Display	Set
Tag No.	*v*	*v*	*v*	*v*	*v*	*v*
Model No.	*v*	*v*	*v*	*v*	*v*	*v*
Serial No. & Software Version	*v*	—	*v*	—	*v*	—
Engineering unit	*v*	*v*	*v*	*v*	*v*	*v*
Range limit	*v*	—	*v*	—	*v*	—
Measuring range	*v*	*v*	*v*	*v*	*v*	*v*
Damping	*v*	*v*	*v*	*v*	*v*	*v*
Output mode: Linear	*v*	*v*	*v*	*v*	*v*	*v*
Output mode: Square root	*v*	*v*	*v*	*v*	*v*	*v*
Burnout direction	*v*	*v*	*v*	*v*	*v*	*v*
Calibration	*v*	*v*	*v*	*v*	*v*	*v*
Output adjust	—	*v*	—	*v*	—	*v*
Data	*v*	—	*v*	—	*v*	—
Self diagnoses	*v*	—	*v*	—	*v*	—
Printer (In case of FXW with printer option)	*v*	—	—	—	—	—
External switch lock	*v*	*v*	*v*	*v*	*v*	*v*
Transmitter display	*v*	*v*	*v*	*v*	*v*	*v*
Linearize*	*v*	*v*	—	—	—	—
Rerange	*v*	*v*	*v*	*v*	*v*	*v*
Saturate current	*v*	*v*	*v*	*v*	*v*	*v*
Write protect	*v*	*v*	*v*	*v*	*v*	*v*
History – Calibration history – Ambient temperature history	*v* *v*	*v* —	*v* *v*	*v* —	*v* *v*	*v* —

(Note) (1) HHC: Hand Held Communicator

***Local configurator with LCD display (option):**

Local configurator with 3 push button and LCD display can support all items (Fuji Protocol list) except "Linearize" function.

Programmable output linearization function:

Output signal can be characterized with "14 points linear approximation function" from HHC(1).

Performance specifications

Reference conditions, silicone oil fill, SS 316L isolating diaphragms, 4 to 20 mA analog output in linear mode.

Accuracy rating :

(Including linearity, hysteresis & repeatability)

For span greater than 1/10 of URL :

±0,1 % of calibrated span (FKP)

±0,2 % of calibrated span (FKH)

For span smaller than 1/10 of URL :

±(0,05 + 0,05 x 0,1 x URL/span) % of span (FKP)

±(0,1 + 0,1 x 0,1 x URL/span) % of span (FKH)

Stability :

±0,2% of upper range (URL) for 10 years

Temperature effect :

Effect per 28°C change between the limits of -40 and +85°C.

Model FKP :

Zero shift :

±(0,4 + 0,1 x URL/span) %/28°C

Total effect :

±(0,475 + 0,1 x URL/span) %/28°C

Model FKH :

Zero shift :

±(0,4 + 0,2 x URL/span) %/28°C

Total effect :

±(0,475 + 0,2 x URL/span) %/28°C

Overrange effect :

Zero shift :

±0,3% of URL

(max. overrange pressure = 1,5% max span)

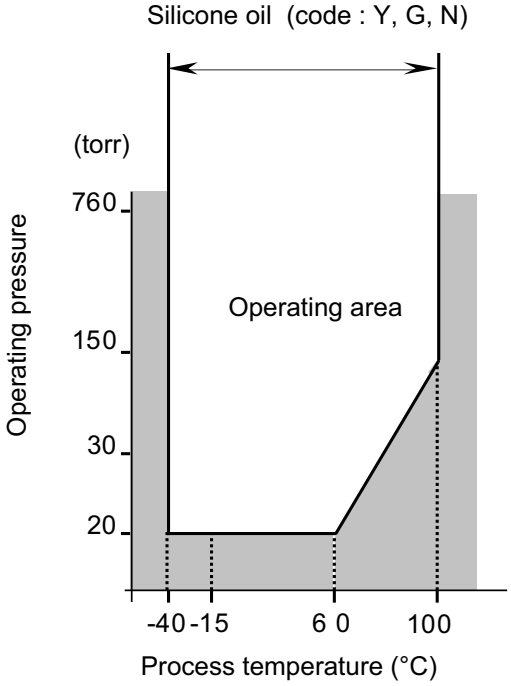
Supply voltage effect :
< 0,05% of calibrated span per 10 V.
RFI effect :
< 0,2% of URL for the frequences of 20 to 1000 MHz and field strength of 10 V/m when electronic housing covers are on (Classification : 2-abc : 0,2% of span according SAMA PMC 33.1)
Response time : (at 63,3% of output signal without damping)
Time constant : 200 msec
Dead time : about 300 msec
Response time = time constant + dead time
Mounting position effect :
Zero shift : <10mm WC for 10° incline in any position.
This shift can be corrected with the zero adjustment.
(Effect is doubled for fluorinated oil filling).
No influence on span adjustment.
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 .
Material fatigue:
Please consult Fuji Electric.
Dielectric strength :
500 V AC 50/60 Hz during 1 minute between circuit and earth.
Insulation resistance :
> 100 MΩ at 500 Vdc.
Turn on time :
4 seconds
Internal resistance for external field indicator :
12 Ω maxi (connected to test terminal CK+ and CK-)
Pressure equipment directive (PED) 97/23/EC
According to Article 3.3

Physical specifications

Electrical connections :
1/2"-14 NPT, Pg13,5 or M20x1,5
Non wetted parts material :
Electronics housing :
Low copper die cast aluminium alloy finished with polyester coating (standard), or SS 316L as specified.
Bolts and nuts :
Standard : Cr-Mo alloy
Option : SS 316(L)
Fill fluid :
Standard : Silicone oil
Mounting bracket :
SS 304L
Environmental protection :
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 :
Refer to the page 9 and 10
Diaphragm seal(s) :
For seal selection, please refer to enclosed datasheet for diaghragm seals.

Optional features

Indicator :
A plug-in analog indicator (2.5% accuracy) can be housed in the electronics compartment or in the terminal box of the housing.
An optional 5 digit LCD meter with engineering unit is also availabl
Arrester :
A built-in arrester protects the electronics from lightning surges.
Lightning surge immunity: 4 kV (1.2 x 50 µs)
NACE specifications :
Metallic materials for all pressure boundary parts comply with NACE MR 0175 / ISO 15156.
SS 660 or SS 660/660 bolts and nuts comply with NACE MR 0175 / ISO 15156.
Optional tag plate:
An extra stainless steel tag with customer tag data is wired to the transmitter.
Vacuum service :



Relation between transmitter temperature and operating pressure

ACCESSORIES

Hand Held Communicator :
(Model FXW, refer to datasheet N° EDS8-47)

CODE SYMBOLS FKP...F

1	2	3	4	5	6	7	8		9	10	11	12	13			DESCRIPTION
F	K	P					F	-					Y			**Type**
																Smart, 4-20 mAdc + Fuji/Hart® digital signal
																Conduit connection
			T													1/2-14 NPT
			V													Pg 13,5
			W													M 20 x 1,5
																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 - 600Lbs
																Span
					1	V										0,08125/1,3 bar
					2	V										0,3125/5 bar
					3	V										1,875/30 bar
					4	V										6,25/100 bar
																Indicator & Arrester
							F	-	A							None / none
							F	-	B							Analog, 0-100% linear scale / none
							F	-	D							Analog, Custom scale / none
							F	-	J							Analog, double scale / none
							F	-	E							None / yes / 4-20 mA DC
							F	-	F							Analog, 0-100% linear scale / yes
							F	-	H							Analog, Custom scale / yes / +
							F	-	K							Analog, double scale / yes
							F	-	L							Digital, 0-100% / none / Hart® / Fuji digital signal "SMART"
							F	-	P							Digital, Custom scale / none
							F	-	Q							Digital, 0-100% / yes
							F	-	S							Digital, Custom scale / yes
							F	-	1							Digital, 0-100% with push button / none
							F	-	2							Digital, Custom scale with push button / none
							F	-	4							Digital, 0-100% with push button / yes
							F	-	5							Digital, Custom scale with push button / yes
										A						**Approvals for hazardous locations (consult FUJI for availability)**
										A						None (Standard)
										X						ATEX - Flameproof enclosures (digit 4 = "T" & "W" only)
										K						ATEX - Intrinsic Safety
										D					(*1)	FM - Explosion-Proof (digit 4 = "T" only)
										E						CSA - Explosion-Proof (digit 4 = "T" only)
										H						FM - Intrinsic Safety and Non Incendive
										J						CSA - Intrinsic Safety
										P						ATEX - Type "n" (digit 9 = A, E, 1, 2, 3, 4 & 5 only)
										Q						IECEx - Type "n" (digit 9 = A, E, 1, 2, 3, 4 & 5 only)
										R						IECEx - Flameproof enclosures (digit 4 = "T" & "W" only)
										T						IECEx - Intrinsic Safety
										L						CSA - Explosion-Proof & Intrinsic Safety combined approval (digit 4 = "T" only)
										M						ATEX - Flameproof enclosures & Intrinsic Safety combined approval (digit 4 = "T" & "W" only)
										N						IECEx - Flameproof enclosures & Intrinsic Safety combined approval (digit 4 = "T" & "W" only)
										V						FM - Explosion-Proof & Intrinsic Safety combined approval (digit 4 = "T" only)
											B					**Mounting design** / **Ambiant temperature correction**
											B					Capillary / Transmitter and diaphragm seal assembly
											G					Capillary / Transmitter
											L					Rigid / Transmitter and diaphragm seal assembly
											S					Rigid / Transmitter
																Stainless Steel parts
																Tag plate / Housing
												Y	Y			None / None
												B	Y			Yes / None
												C	Y			None / Yes
												E	Y			Yes / Yes

Note* :

1- Codes "D" and "V", FM approval only possible with electrical connection 1/2" - 14 NPT.

CODE SYMBOLS FKH...F

1	2	3	4	5	6	7	8		9	10	11	12	13			DESCRIPTION
F	K	H					F	-					Y			
																Type
																Smart, 4-20 mAdc + Fuji/Hart™ digital signal
																Conduit connection
			T													1/2-14 NPT
			V													Pg 13,5
			W													M 20 x 1,5
																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 - 600Lbs
																Span
					2	V										0,08125/1,3 bar abs
					3	V										0,3125/5 bar abs
					4	V										1,875/30 bar abs
																Indicator & Arrester
							F	-	A							None / None
							F	-	B							Analog, 0-100% linear scale / None
							F	-	D							Analog, Custom scale / None
							F	-	J							Analog, double scale / None
							F	-	E							None / yes
							F	-	F							Analog, 0-100% linear scale / yes
							F	-	H							Analog, Custom scale / yes
							F	-	K							Analog, double scale / yes
							F	-	L							digital, 0-100% / None
							F	-	P							digital, Custom scale / None
							F	-	Q							digital, 0-100% / yes
							F	-	S							digital, Custom scale / yes
							F	-	1							digital, 0-100% with push button / None
							F	-	2							digital, Custom scale with push button / None
							F	-	4							digital, 0-100% with push button / yes
							F	-	5							digital, Custom scale with push button / yes
										A						**Approvals for hazardous locations (consult FUJI for availability)**
										A						None (Standard)
										X						ATEX - Flameproof enclosures (digit 4 = "T" & "W" only)
										K						ATEX - Intrinsic Safety
										D					(*1)	FM - Explosion-Proof (digit 4 = "T" only)
										E						CSA - Explosion-Proof (digit 4 = "T" only)
										H						FM - Intrinsic Safety and Non Incendive
										J						CSA - Intrinsic Safety
										P						ATEX - Type "n" (digit 9 = A, E, 1, 2, 3, 4 & 5 only)
										Q						IECEx - Type "n" (digit 9 = A, E, 1, 2, 3, 4 & 5 only)
										R						IECEx - Flameproof enclosures (digit 4 = "T" & "W" only)
										T						IECEx - Intrinsic Safety
										L						CSA - Explosion-Proof & Intrinsic Safety combined approval (digit 4 = "T" only)
										M						ATEX - Flameproof enclosures & Intrinsic Safety combined approval (digit 4 = "T" & "W" only)
										N						IECEx - Flameproof enclosures & Intrinsic Safety combined approval (digit 4 = "T" & "W" only)
										V						FM - Explosion-Proof & Intrinsic Safety combined approval (digit 4 = "T" only)
																Mounting design / Ambiant temperature correction
											B					Capillary / Transmitter and diaphragm seal assembly
											G					Capillary / Transmitter
											L					Rigid / Transmitter and diaphragm seal assembly
											S					Rigid / Transmitter
																Stainless Steel parts
																Tag plate / Housing
												Y	Y			None / None
												B	Y			Yes / None
												C	Y			None / Yes
												E	Y			Yes / Yes

Note* :

1- Code "D" FM approval only possible with electrical connection 1/2" NPT.

DIAPHRAGM SEALS

Diaphragm seals are used to measure accurately hydrostatic level liquid on open tanks or pressure measurment in line. The use of the diaphragm seal avoids that the measuring cell is directly in contact with the process.
The welded seal construction assures excellent reliability in high temperature and vacuum applications. The seals can be used for high corrosive, viscous, sticking, crystallizable and abrasive process conditions.

FEATURES

1- Construction

The diaphragm seals are mounted on gauge and absolute pressure transmitters of FCX-AII series. The seal is rigid, (direct) mounted on the transmitter. For capillary mounting design, please consult Fuji Electric.

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 transfered by the filling to the measuring cell of the pressure transmitter.

3- Parts materials

Wetted parts materials (diaphragm and gasket face) are in Stailess Steel, Tantalum, Hastelloy, Monel, Titanium, Zirconium, Nickel depending on the application requirements.

Other parts are in stainless steel : reduced volume flange, diaphragm seal body, direct mouting connection parts.

Standard filling fluid is silicone oil. Fluorinated oil, sanitary oil, high temperature oil and vacuum service filling are available through model code selection.

4- Diaphragm seal types

According to the mounting and operating conditions different seal types can be useful :

- Flush mounting design for DN40 to DN125.
- Seals with extensions (50 to 200 mm).
- Seals for sanitary applications according DIN, SMS, Tri-Clamp standards.
- Flange type adaptors, with welded or screwed tip
- For specific flanges, consult Fuji Electric.

SPECIFICATIONS

Diaphragm seal application :

The seal 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.

Temperature limit :

Ambiant temperature : -40 to 85°C for transmitter

Capillary tube specifications:

Standard capillary lengthes :

1,5 / 3 / 6 m (other upon request)

Inside diameter :

1 mm standard

2 mm for vacuum service (high process temperature applications), short response time requirements.

Smallest bending radius of the capillary :

100 mm

Capillary tube sheald possibilities :

For the 2 capillary tube versions :

Temperature limit :

PVC sheald :

-10 à 80°C

Stainless steel sheald :

-40 à 350°C

Pressure limits :

Working pressure :

Working pressure of the transmitter or 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.

The lowest vacuum is 20 Torr or 27 mbar abs for gauge presure transmitters.

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 a diaphragm seal on a transmitter increases the accurancy error at reference conditions of 0,1% of the span.

Ambient temperature effect :

Effect when transmitter alone is corrected.
(See digit 11 codes G, S of the transmitters' codification).

Seal	Effect	Effet on capillary
DN50/2" (SS diaphragm)	2,03	1,5
DN80/3" (SS diaphragm)	0,11	0,08
DN80/3" (other diaphragm material)	0,22	0,2
DN100/4" (SS diaphragm)	0,04	0,03
Adaptor (SS diaphragm)	0,11	0,08
Clamp 2"	2,06	
DN 50 or 2" (SMS or DIN 11851)	2,85	
No dead volume	5,16	
G 1" 1/2	5,16	
G 2"	2,03	

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

Effect when transmitter and the seal assembly is corrected.
(See digit 11 codes B, L of the transmitters' codification).

According to the complete 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 (trasnmitter and seals).
A thermal isolation or a heating of the capillaries minimises the ambient temperature effect.

Process temperature effect :

Seal	Effect (mbar/10°C)
DN50/2" (SS diaphragm)	1,24
DN80/3" (SS diaphragm)	0,17
DN80/3" (other diaphragm material)	0,73
DN100/4" (SS diaphragm)	0,08
Adaptor (SS diaphragm)	0,17
Clamp 2"	2,61
DN 50 or 2" (SMS or DIN 11851)	4,22
No dead volume	5,16
G 1" 1/2	1,42
G 2"	1,24

Oil filling	Code digit 7	Density at 25°C	Reponse time 0 to 1.3 bar
Standard silicone oil	Y, G	0,95	0,037
Fluorinated oil	W,A,D	1,84	0,04
Oil for vaccul service or high temperature	U, V, X	1,07	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.

Filling fluid of the diaphragm seals :

Code digit 7	Designation	Temperature resistance (°C)		Density (25°C)
		P abs ≥ 1bar	P abs < 1bar	
Y	Silicone oil	-40 to +150	-40 to +120	0,95
W	Fluorinated oil	-20 to +100	-20 to +80	1,84
F	Sanitary fill fluid	-10 to +150	-10 to +120	0,94
V	Silicone oil	20 to +200		1,07
U	Silicone oil	0 to +300	0 to +200	1,07
X	Silicone oil	20 to +350	0 to +200	1,09

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

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 PN 20 DN 80		
		5							ANSI-150LB 4"-ISO PN 20 DN 100		
		6							ANSI-300LB 3"-ISO PN 50 DN 80		
		7							ANSI-300LB 4"-ISO PN 50 DN 100		
		8							DIN PN40 DN80		
		9							DIN PN16 DN100		
		H						(*2)	ANSI-150LB 2"-ISO PN 20 DN 50		
		J						(*2)	ANSI-300LB 2"-ISO PN 50 DN 50		
		G						(*2)	DIN PN40 DN50		
		K						(*9)	G 2" screwed seal		
		L						(*9)	G 1 1/2" screwed seal		
		U							PN 25 / DN 50 - coupling nut	DIN 11851 design	material code "V" only
		V							PN 40 / DN 50 - coupling nut	SMS	material code "V" only
		W							PN 40 / DN 50	Clamp	material code "V" only
		X							No dead volume	Sanitary	material code "V" only
		A						(*3)	Flange adaptor PN 40 DN 25		material code "V" - others UR
		B						(*3)	Flange adaptor ISO PN 20 DN 25 (1"-150 ANSI)		material code "V" - others UR
		C						(*3)	Flange adaptor ISO PN 50 DN 25 (1"- 300 ANSI)		material code "V" - others UR
		D						(*3)	Flange adaptor PN 40 DN 40		material code "V" - others UR
		E						(*3)	Flange adaptor ISO PN 20 DN 40 (1"1/2 - 150 ANSI)		material code "V" - others UR
		F						(*3)	Flange adaptor ISO PN 50 DN 40 (1"1/2 - 300 ANSI)		material code "V" - others UR
		S						(*3)	Screwed 1/2 NPTE		material code "V" - others UR
		T						(*3)	To be welded (pipe 2"1/2)		material code "V" - others UR

Diaphragm seal material

		Diaphragm	Flange raised face	Flange
	V	SS 316L	SS 316L	SS 316L
	H	Hastelloy-C	Hastelloy-C	SS 316L
	B	Monel	Monel	SS 316L
	T	Tantalum	Tantalum	SS 316L
(*8)	P	Titanium	Titanium	SS 316L
(*8)	R	Zirconium	Zirconium	SS 316L
	C	SS 316L + gold coat	SS 316 L	SS 316L
(*4)	F	SS 316L + PFA lining	SS 316L + PFA lining	SS 316L

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	
	J	Diaphragm extension 50 mm	
	K	Diaphragm extension 100 mm	material code "B" - digit 4
	L	Diaphragm extension 150 mm	
	M	Diaphragm extension 200 mm	
	P	Diaphragm extension 50 mm	
	R	Diaphragm extension 100 mm	material code "T" - digit 4
	S	Diaphragm extension 150 mm	
	T	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
(*5) G	Capillary	1,5 m	SS sheald
(*5) H	Capillary	3 m	SS sheald
(*5) K	Capillary	6 m	SS sheald
(*5) L	Capillary	Upon request	SS sheald
(*10) S	Rigid design - not possible with digit 2 = R, W ; max. process temperature : 150°C		

Special applications and fill fluid for the diaphragm seal only

	Treatment	Fill fluid
Y	None (standard)	Silicone oil
W	None (standard)	Fluorinated oil
F	None (standard)	Sanitary fill fluid
D	Chlorine service	Fluorinated oil
G	Degreasing	Silicone oil
A	Oxygen service	Fluorinated oil - materiel code "V" only
N	NACE	Silicone oil
(*6) V	Vacuum	Silicone oil
(*6) U	Very high temperature (0 to 300°C)	Silicone oil
(*6) X	Very high temperature (20 to 350°C)	Silicone oil

-	*		
			Special options or design
		(*7)	Special, no code available

Notes :
- *1 Different flange machinings (recess, groove, ...) upon request
- *2 Only available with span higher than 0 to 0,5/5 bar - max process température : 150°C - Consult Fuji Electric with operating conditions
- *3 Axial diaphragm seal connection - no extension possible
- *4 Not possible with digit 7 : V, H, T
- *5 Recommended for Vacuum or High Temperature applications T > 120°C - (Capillary internal Ø = 2mm)
- *6 Consult FUJI for your application with the specific operating conditions
- *7 When no code can be found in the current code symbols, place * in concerned code digit(s) & add * in 8 th digit
- *8 Max process temperature 150 °C
- *9 Only for rigid mounted design on FKP, FKH transmitter - Only available with span ≥ 0 to 0,5/5 bar
- *10 Process temperature limit 260°C if no vacuum and 180°C if vacuum

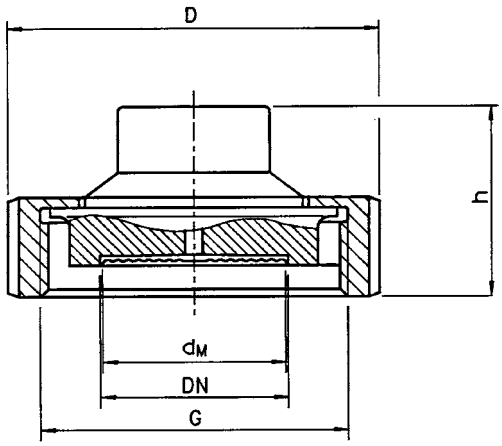
Outline dimensions of sanitary diaphragm seals (units : mm)

The seals for the sanitary and pharmaceutical applications are available according DIN, SMS and Tri-Clamp standards

Seals according DIN 11851 et SMS

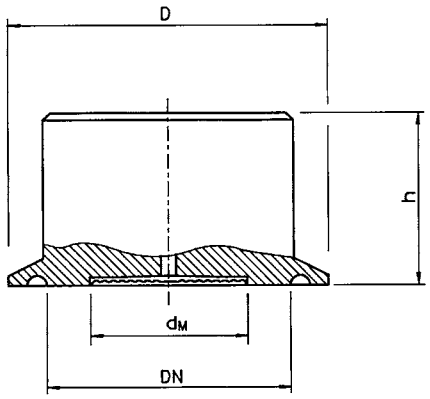
2 differents design exist for DIN 11851 and SMS :

Coupling nut design



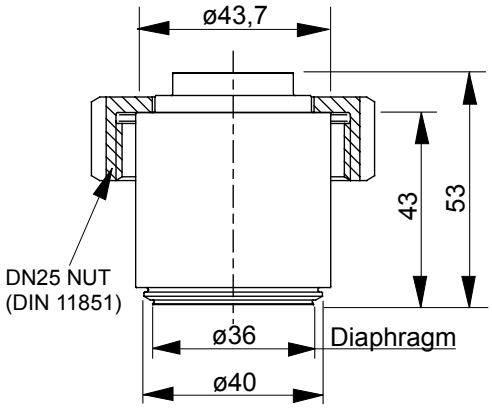
DIN 11851					
DN	PN (Max)	D	h	d_M	G
25	40	63	36	25	Rd 52 x 1/6
32	40	70	36	32	Rd 58 x 1/6
40	40	78	36	40	Rd 65 x 1/6
50	40	112	36	52	Rd 78 x 1/6
65	40	112	36	65	Rd 95 x 1/6
80	40	127	36	76	Rd 110 x 1/4
SMS					
38	40	74	38	40	Rd 48 x 1/6
51	40	84	38	52	Rd 60 x 1/6
63,5	40	100	38	65	Rd 85 x 1/6
76	40	114	38	76	Rd 98 x 1/6

Tri Clamp design

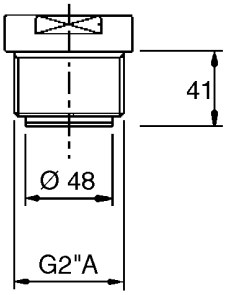


DN	PN (Max)	D	h	d_M
1"1/2	40	50	35	32
2"	40	64	35	40
2"1/2	40	77,5	35	50
3"	40	91	35	65

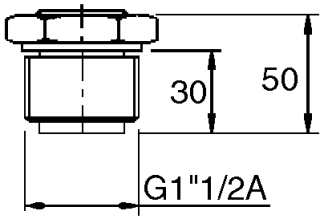
Dead volume seal



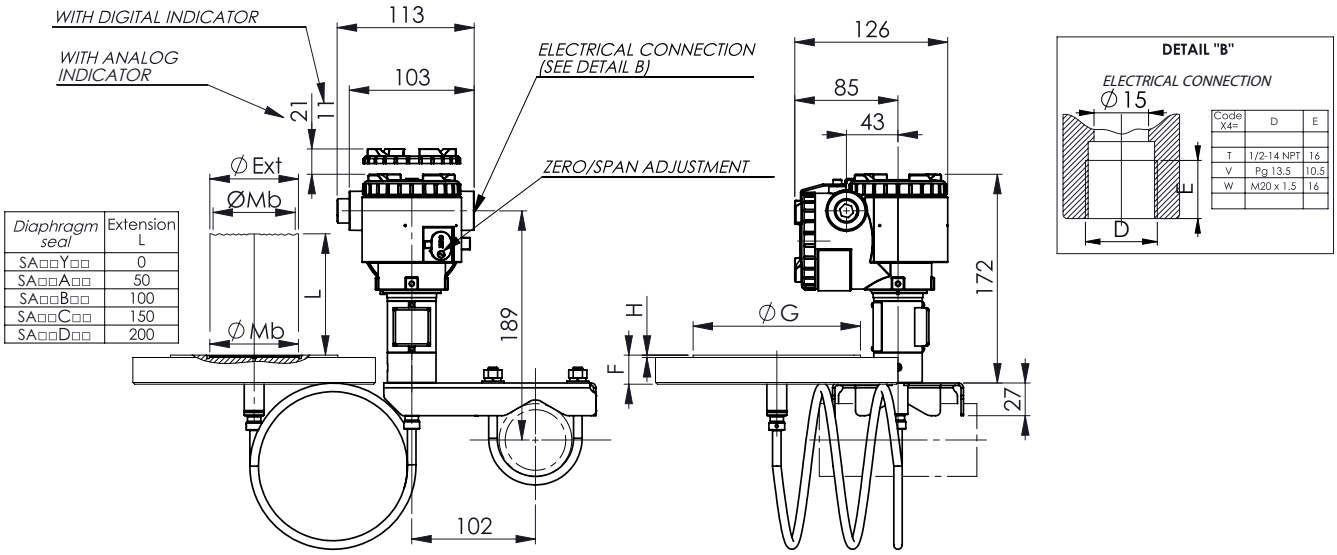
Screwed G 2"A



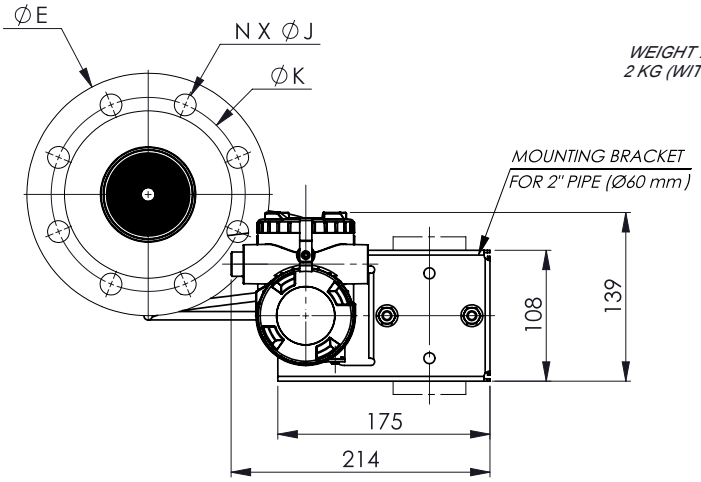
Screwed G 1"1/2 A



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



Diaphragm seal	Extension L
SA□□Y□□	0
SA□□A□□	50
SA□□B□□	100
SA□□C□□	150
SA□□D□□	200



WEIGHT :
2 KG (WITHOUT OPTION)
ADD
- *FLANGES' WEIGHT (SEE TABLE)*
- *1 KG PER 50 MM EXTENSION*
- *0,5 KG FOR INDICATOR OPTION*
- *2 KG FOR STAINLESS STEEL HOUSING OPTION*

FLANGES DIMENSIONS ACCORDING TO EN 1092-1 & EN 1759-1										*SS 316L*		*Exotic material*	
diaphragm seal	EN 1092-1	EN 1759-1	ØE	F min	ØG	H	N x ØJ	ØK	*Weight* (kg)	L=0 ØMb	L≠0 ØExt=ØMb	L=0 ØMb	L≠0 ØExt(ØMb)
SAG□□□□	DN50 PN40		165	20	102	2	4 x 18	125	3,3	59	48	59	48,3 (47)
SAH□□□□		2" CLASS 150	152	21	92	1,6	4 x 19	120,6	2,7	59	48	59	48,3 (47)
SAJ□□□□		2" CLASS 300	165	22,5	92	1,6	8 x 19	127	3.7	59	48	59	48,3 (47)
SA8□□□□	DN80 PN40		200	24	138	2	8 x 18	160	5,8	73	73	89	76 (72)
SA4□□□□		3" CLASS 150	190	24	127	1,6	4 x 19	152,4	5,3	73	73	89	76 (72)
SA6□□□□		3" CLASS 300	210	28,5	127	1,6	8 x 22,2	168,3	7,8	73	73	89	76 (72)
SA9□□□□	DN100 PN16		220	22	158	2	8 x 18	180	5,9	96	96	89	94 (89)
SA5□□□□		4" CLASS 150	229	24	157	1,6	8 x 19	190,5	7,7	96	96	89	94 (89)
SA7□□□□		4" CLASS 300	254	32	157	1,6	8 x 22,2	200	12,7	96	96	89	94 (89)

ØMb = *Ø diaphragm*
ØExt = extension

Wetted parts material

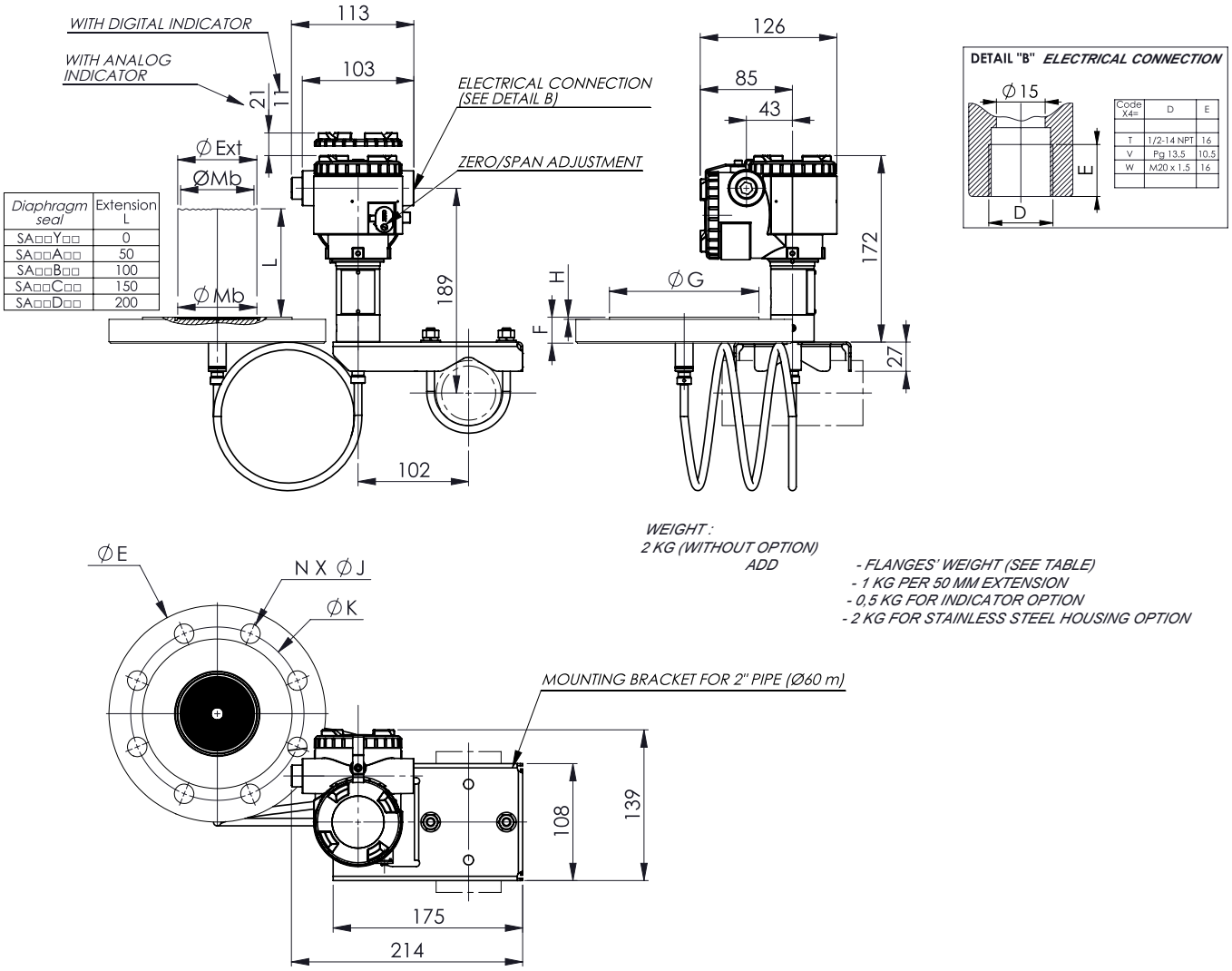
Diaphragm seal :

X_1 X_2 X_3 X_4 X_5 X_6 X_7 X_8 - X_9 X_{10} X_{11} X_{12} X_{13}
F K H □□□ V F -□□□□ Y
X11 = B, G

X_1 X_2 X_3 X_4 X_5 X_6 X_7
S A □□□□□
X11 = A, B, C, D, G, H, K, L

	SPAN LIMIT	
	Min.	Max.
FKH□□2	8,125 kPa (81,25 mbar)	130 kPa (1300 mbar)
FKH□□3	31,25 kPa (0,3125 bar)	500 kPa (5 bar)
FKH□□4	187,5 kPa (1,875 bar)	3000 kPa (30 bar)

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



Diaphragm seal	Extension L
SA□□Y□□	0
SA□□A□□	50
SA□□B□□	100
SA□□C□□	150
SA□□D□□	200

WEIGHT :
2 KG (WITHOUT OPTION)
ADD
- FLANGES' WEIGHT (SEE TABLE)
- 1 KG PER 50 MM EXTENSION
- 0,5 KG FOR INDICATOR OPTION
- 2 KG FOR STAINLESS STEEL HOUSING OPTION

FLANGES DIMENSIONS ACCORDING TO EN 1092-1 & EN 1759-1										*SS 316L*		*Exotic material*	
diaphragm seal	EN 1092-1	EN 1759-1	ØE	F min	ØG	H	N x ØJ	ØK	*Weight* (kg)	L=0 ØMb	L≠0 ØExt=ØMb	L=0 ØMb	L≠0 ØExt(ØMb)
SAG□□□□	DN50 PN40		165	20	102	2	4 x 18	125	3,3	59	48	59	48,3 (47)
SAH□□□□		2" CLASS 150	152	21	92	1,6	4 x 19	120,6	2,7	59	48	59	48,3 (47)
SAJ□□□□		2" CLASS 300	165	22,5	92	1,6	8 x 19	127	3.7	59	48	59	48,3 (47)
SA8□□□□	DN80 PN40		200	24	138	2	8 x 18	160	5,8	73	73	89	76 (72)
SA4□□□□		3" CLASS 150	190	24	127	1,6	4 x 19	152,4	5,3	73	73	89	76 (72)
SA6□□□□		3" CLASS 300	210	28,5	127	1,6	8 x 22,2	168,3	7,8	73	73	89	76 (72)
SA9□□□□	DN100 PN16		220	22	158	2	8 x 18	180	5,9	96	96	89	94 (89)
SA5□□□□		4" CLASS 150	229	24	157	1,6	8 x 19	190,5	7,7	96	96	89	94 (89)
SA7□□□□		4" CLASS 300	254	32	157	1,6	8 x 22,2	200	12,7	96	96	89	94 (89)

ØMb = *Ø diaphragm*
ØExt = extension

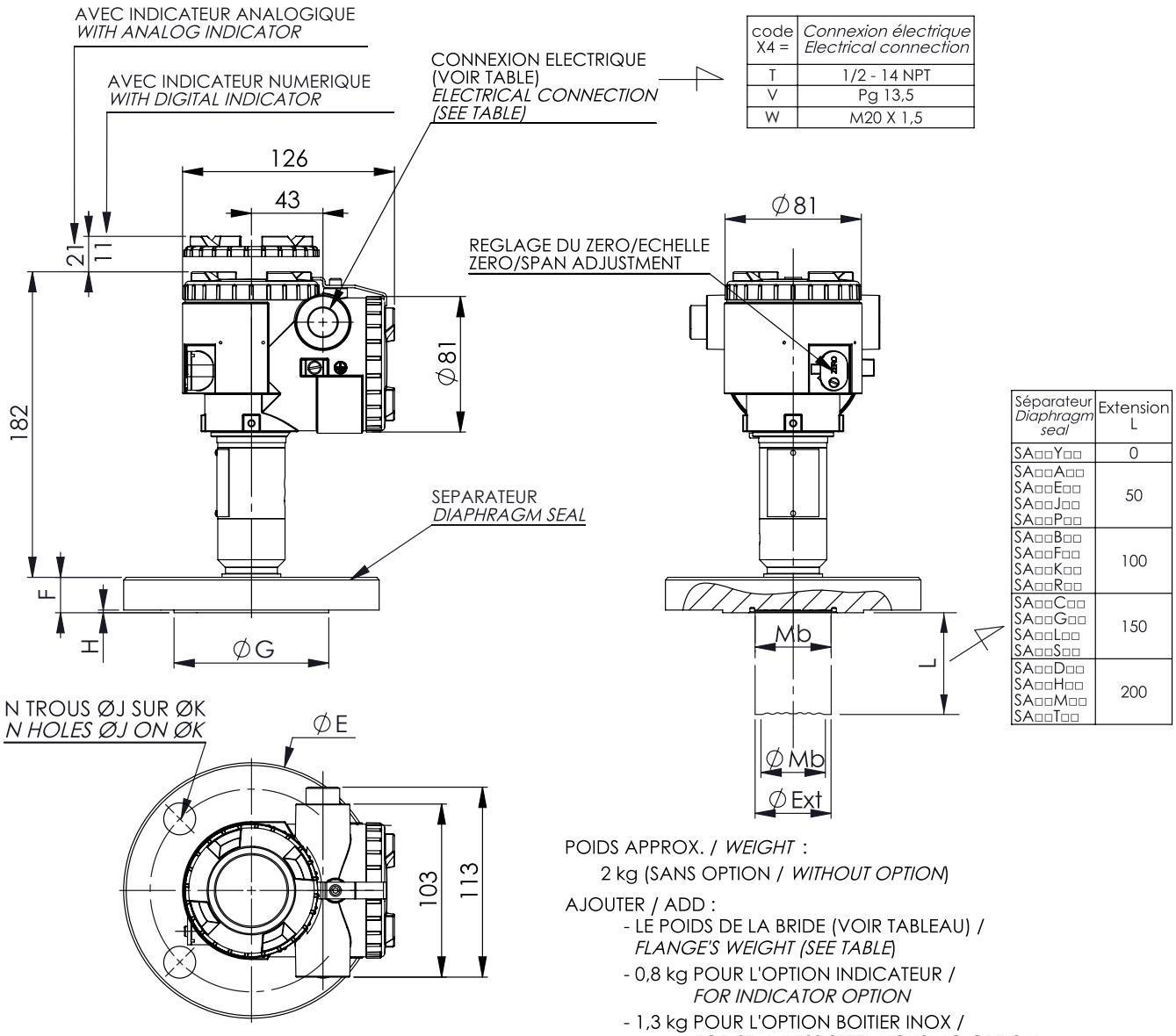
Wetted parts material

X_1 X_2 X_3 X_4 X_5 X_6 X_7 X_8- X_9 $X_{10}$$X_{11}$$X_{12}$$X_{13}$
F K P □□□ V F -□□□□ Y
X_{11} = B, G

Diaphragm seal :
X_1 X_2 X_3 X_4 X_5 X_6 X_7
S A □□□□□

	SPAN LIMIT	
	Min.	Max.
FKP□□1	8,125 kPa (81,25 mbar)	130 kPa (1300 mbar)
FKP□□2	31,25 kPa (0,3125 bar)	500 kPa (5 bar)
FKP□□3	187,5 kPa (1,875 bar)	3000 kPa (30 bar)
FKP□□4	625 kPa (6,25 bar)	10000 kPa (100 bar)

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



code X4 =	*Connexion électrique / Electrical connection*
T	1/2 - 14 NPT
V	Pg 13,5
W	M20 X 1,5

Séparateur / Diaphragm seal	Extension L
SA□□Y□□	0
SA□□A□□ SA□□E□□ SA□□J□□ SA□□P□□	50
SA□□B□□ SA□□F□□ SA□□K□□ SA□□R□□	100
SA□□C□□ SA□□G□□ SA□□L□□ SA□□S□□	150
SA□□D□□ SA□□H□□ SA□□M□□ SA□□T□□	200

POIDS APPROX. / *WEIGHT* :

2 kg (SANS OPTION / *WITHOUT OPTION*)

AJOUTER / ADD :

- LE POIDS DE LA BRIDE (VOIR TABLEAU) / *FLANGE'S WEIGHT (SEE TABLE)*
- 0,8 kg POUR L'OPTION INDICATEUR / *FOR INDICATOR OPTION*
- 1,3 kg POUR L'OPTION BOITIER INOX / *FOR STAINLESS STEEL HOUSING OPTION*

DIMENSIONS DES BRIDES SUIVANT EN 1092-1 & EN 1759-1 *FLANGES DIMENSIONS ACCORDING TO EN 1092-1 & EN 1759-1*										Inox 1.4404 *SS 316L*		Matériau exotique *Exotic material*	
Séparateur / diaphragm seal	EN 1092-1	EN 1759-1	ØE	F min	ØG	H	N x ØJ	ØK	Poids *Weight* (kg)	L=0 ØMb	L≠0 ØExt=ØMb	L=0 ØMb	L≠0 ØExt(ØMb)
SAG□□□□	DN50 PN40		165	20	102	2	4 x 18	125	3,3	59	48	59	48,3 (47)
SAH□□□□		2" CLASS 150	152	21	92	1,6	4 x 19	120,6	2,7	59	48	59	48,3 (47)
SAJ□□□□		2" CLASS 300	165	22,5	92	1,6	8 x 19	127	3.7	59	48	59	48,3 (47)
SA8□□□□	DN80 PN40		200	24	138	2	8 x 18	160	5,8	73	73	89	76 (72)
SA4□□□□		3" CLASS 150	190	24	127	1,6	4 x 19	152,4	5,3	73	73	89	76 (72)
SA6□□□□		3" CLASS 300	210	28,5	127	1,6	8 x 22,2	168,3	7,8	73	73	89	76 (72)
SA9□□□□	DN100 PN16		220	22	158	2	8 x 18	180	5,9	96	96	89	94 (89)
SA5□□□□		4" CLASS 150	229	24	157	1,6	8 x 19	190,5	7,7	96	96	89	94 (89)
SA7□□□□		4" CLASS 300	254	32	157	1,6	8 x 22,2	200	12,7	96	96	89	94 (89)

Materiau membrane et portée de joint
Wetted parts material

ØMb = Ø membrane = *Ø diaphragm*

ØExt = extension

Modèle : $X_1\ X_2\ X_3\ X_4\ X_5\ X_6\ X_7\ X_8 - X_9\ X_{10} X_{11} X_{12} X_{13}$
Model : F K P □□□ V F - □□□□ Y
X11 = L, S

Séparateur : $X_1\ X_2\ X_3\ X_4\ X_5\ X_6\ X_7$
Diaphragm seal : S A □□□ S □

	ETENDUES DE MESURE *SPAN LIMIT*	
	Min.	Max.
FKP□□1	8,125 kPa (0,08125 bar)	130 kPa (1,3 bar)
FKP□□2	31,25 kPa (0,3125 bar)	500 kPa (5 bar)
FKP□□3	187,5 kPa (1,875 bar)	3000 kPa (30 bar)
FKP□□4	625 kPa (6,25 bar)	10000 kPa (100 bar)

EMC Directive (2004/108/EC)

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

• the harmonized standards:

- EN 61326-1 : 2006 (Electrical equipment for measurement, control and laboratory use - EMC requirements).
- EN 61326-2-3 : 2006 (Part 2-3 : Particular requirements - Test configuration, operational conditions and performance criteria for tranducers with integrated or remote signal conditioning)

Emission limits : EN 61326-1 : 2006

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

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

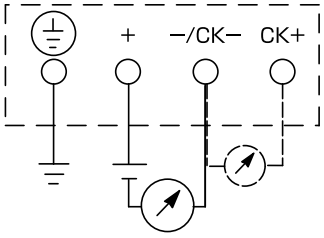
Phenomenon	Test value	Basic standard	Performance criteria
Electrostatic discharge (EDS)	4 kV (Contact) 8 kV (Air)	EN 61000-4-2 IEC 61000-4-2	**B**
Electromagnetic field	10V/m (80 to 1000 MHz) 3 V/m (1.4 to 2.0 GHz) 1 V/m (2.0 to 2.7 GHz)	EN 61000-4-3 IEC 61000-4-3	**A**
Rated power frequency Magnetic 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 line	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.

CONNECTION DIAGRAM



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