

# PRESSURE TRANSMITTER

**DATA SHEET**
**FKG...6**

The FKG model of the FCX-A IV series of pressure transmitters accurately measures a gauge pressure and transmits a proportional 4-20 mA output signal

The transmitter uses an unique micro-capacitive silicon sensor in combination with a state-of-the-art digital signal processing to provide exceptional performances interms of accuracy and stability.

FCX-A IV series of pressure transmitters comply with Safety Integrity Level 2 or 3 according to IEC 61508 and IEC 61511 standards.

## FEATURES

**1. High accuracy up to ±0.04%**

Fuji Electric's micro-capacitive silicon sensor provides in standard ±0,065% accuracy for all elevated or suppressed calibration ranges without additional adjustments. ±0.04% accuracy is available in option.

**2. Minimum inventory and design**

Electronics parts, local indicators and electronics housing are interchangeable among all FCX-A IV transmitters.

**3. Minimum environmental influence**

The Advanced Floating Cell technology provides a high immunity against temperature variations and overpressure commonly found in the process industry and substantially reduces the overall measurement error.

**4. HART 7 communication protocols**

FCX-A IV series of pressure transmitters can communicate using the universal HART communication protocol.

By the use of the HART Device Description files, HART compatible devices can communicate with any FCX-A IV transmitter.

**5. Application flexibility**

Various options are available to address most of the process industry applications, including:

- Full range of hazardous area approvals
- Built-in RFI filter and lightning arrester
- 5 digits local display with engineering units
- Stainless steel electronics housing
- Wide selection of wetted part materials

**6. Programmable output Linearization Function**

The output signal can be linearized using up to 14 pairpoints.

**7. Burnout current flexibility**

The burnout current value can be adjusted in the ranges of [3.4 ; 3.8] and [20.8 ; 22.5] mA and can be compliant with NAMUR NE43 recommendations.

**8. Contactless local adjustment**

An optional local configurator with 3 magnetic switches allows to configure the transmitter without opening the indicator cover (flameproof approvals for hazardous locations). The Magnetic pen is required to enable the 3 magnetic switches (Please refer to ACCESSORIES).



## FUNCTIONAL SPECIFICATIONS

**Type:**

FKG: Smart, 4-20 mA with HART communication protocol

**Service:**

Liquid, gas, or vapour

**Span, range and overrange limit:**

Model	Span limit kPa {bar}		Range limit kPa {bar}		Overrange limit MPa {bar}
	Min.	Max.	Lower limit	Upper limit	
FKG□01	1.3 {0.013}	130 {1.3}	-100 {-1}	130 {1.3}	1 {10}
FKG□02	5 {0.05}	500 {5}	-100 {-1}	500 {5}	1.5 {15}
FKG□03	30 {0.3}	3000 {30}	-100 {-1}	3000 {30}	9 {90}
FKG□04	100 {1}	10000 {100}	-100 {-1}	10000 {100}	15 {150}
FKG□05	500 {5}	50000 {500}	-100 {-1}	50000 {500}	75 {750}

Note: Span higher than 1/10 of the URL is recommended for optimal accuracy.

**Lower range limit: (vacuum limit)**

Silicone fill sensor: see fig.1

Fluorinated fill sensor:

66kPa abs (500 mmHg abs) at temperature -20 to 60°C

**Output signal:**

4-20 mA with HART communication protocol.

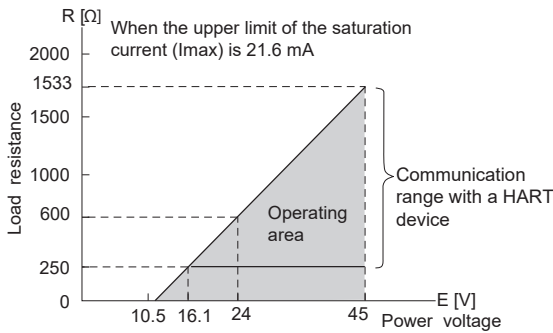
**Power supply:**

10.5 to 45 V DC at transmitter terminals.

10.5 to 32 V DC with the optional arrester.

Refer to hazardous location table for specific limitations

**Load limitations:** see figure below



Note 1 : The load resistance varies with the upper limit of the saturation current [I max]

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

Note 2 : For communication with a HART device, a minimum load of 250 Ω is required.

**Hazardous locations:**

Marking (Digit 10 <sup>th</sup> )	Protection type			
ATEX	K	Intrinsic Safety "i"		
		Ex II 1 G/D		
		Ex ia IIC T4 Ga (Ta: -40°C to +60°C)		
		Ex ia IIC T5 Ga (Ta: -40°C to +50°C)		
		Ex ia IIIC T <sub>200</sub> 135°C Da (Ta: -40°C to +60°C)		
		Ex ia IIIC T <sub>200</sub> 100°C Da (Ta: -40°C to +50°C)		
		Ui = 28Vdc, li = 110mA, Pi = 0.77W		
		Ci = 14.9nF (without optional Arrester)		
		Ci = 26.0nF (with optional Arrester)		
		Li = 0.181mH		
	IP66/67			
	X	Flameproof Enclosure "d"		
		Ex II 2 G		
		Ex db IIC T6... T4 Gb		
		Temperature class	Ambient temperature	Process temperature
		T6	-40°C to +65°C	-40°C to +85°C
		T5	-40°C to +85°C	-40°C to +100°C
M	IP66/67			
	Combination (K) + (X) pending			
IECEX	T	Intrinsic Safety "i"		
		Ex ia IIC T4 Ga (Ta: -40°C to +60°C)		
		Ex ia IIC T5 Ga (Ta: -40°C to +50°C)		
		Ex ia IIIC T <sub>200</sub> 135°C Da (Ta: -40°C to +60°C)		
		Ex ia IIIC T <sub>200</sub> 100°C Da (Ta: -40°C to +50°C)		
		Ui = 28Vdc, li = 110mA, Pi = 0.77W		
		Ci = 14.9nF (without optional Arrester)		
		Ci = 26.0nF (with optional Arrester)		
		Li = 0.181mH		
		IP66/67		
	R	Flameproof Enclosure "d"		
		Ex db IIC T6... T4 Gb		
		Temperature class	Ambient temperature	Process temperature
		T6	-40°C to +65°C	-40°C to +85°C
		T5	-40°C to +85°C	-40°C to +100°C
		T4	-40°C to +60°C	-40°C to +120°C
	N	IP66/67		
Combination (T) + (R) pending				

cCSAus pending		Intrinsic Safety/Non-Incendive
		J
E	Flameproof Enclosure XP Class I Division 1 Groups CD Class II Groups EFG, Class III T6 (-40°C ≤ Ta ≤ +65°C) T5 (-40°C ≤ Ta ≤ +85°C) T4 (-40°C ≤ Ta ≤ +60°C) Vmax = 45Vdc	
L	Combination (J) + (E)	

**Configuration:**

Configuration of the FCX-A IV series of pressure transmitters can be carried out by either using a HART device or the optional local configurator.

A third party HART device can be used in combination with Fuji Electric FCX-A IV HART Device Description files. (<https://fieldcommgroup.org>).

Functions	HART Protocol		Local configurator	
	Display	Set	Display	Set
Tag Nb	✓	✓	✓	✓
Model Nb	✓	✓	✓	✓
Serial Nb & Software revision	✓	—	✓	—
Engineering units	✓	✓	✓	✓
Upper Range Value	✓	—	✓	—
Measuring Range	✓	✓	✓	✓
Damping	✓	✓	✓	✓
Output signal type	Linear	✓	✓	✓
	Square Root	✓	✓	✓
Burnout current	✓	✓	✓	✓
Calibration	✓	✓	✓	✓
Output Adjust	—	✓	—	✓
Measuring Value	✓	—	✓	—
Self Diagnosis	✓	—	✓	—
External Adj Screw Lock	✓	✓	✓	✓
Transmitter Display	✓	✓	✓	✓
Linearization	✓	✓	✓	✓
Rerange	✓	✓	✓	✓
Saturation Current	✓	✓	✓	✓
Write Protect	✓	✓	✓	✓
History				
– Calibration History	✓	✓	✓	✓
– Ambient T° History	✓	—	✓	—

**Zero and span adjustment:**

Zero and span are remotely adjustable by a HART device or locally by the local configurator or the external adjustment screw.

**Damping:**

The damping time constant can be adjusted within the range of [0.04 to 32] seconds.

**Zero elevation/suppression:**

Zero can be adjusted within the range of -1 barg to +100% of the URL of the sensor.

**Normal/reverse action:**

Selectable by range setting

**Local indicator:**

Optional 5-digits LCD unit or local configurator with 3 magnetic switches and push-buttons.

A magnetic pen is required to enable this local configurator function.

(Please refer to the ACCESSORIES section.)

**Saturation currents:**

Lower limit: 3.6 to 4.0mA, Default value: 3.8mA  
 Upper limit: 20.0 to 21.6mA, Default value: 20.8mA

**Burnout direction and output current:**

In the self-diagnostic functions detect a transmitter failure, the burnout function will drive the output signal to either "Output Hold", "Output Overscale" or "Output Underscale" modes.

When "Output Hold":

The output signal is held as the latest value just before the failure happens.

When "Output Overscale":

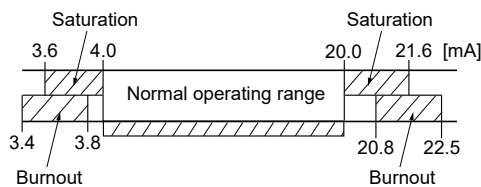
The output signal is set within the range of [20.8 to 22.5] mA, Default value: 21.6mA

When "Output Underscale":

The output signal is set within the range of [3.4 to 3.8] mA, Default value: 3.6mA

IEC 61511 considerations:

For safety applications, the "Output Hold" MUST NOT be used. Only "Output Overscale" and "Output Underscale" must be used to clearly notify a "failure" state.

**Loop-check/fixed output current:**

The transmitter can be configured to provide a constant output signal from 3.4 up to 22.5 mA.

**Temperature limit:**

Ambient  
 -40 to +85°C  
 -20 to +80°C (with optional LCD unit)  
 -40 to +60°C (with optional arrester)

Please refer to the hazardous locations table for ambient temperature limitations according to the standard and type of protection.

Process: -40 to +100°C for silicone fill sensor  
 -20 to +80°C for fluorinated oil fill sensor

Storage: -40 to +90°C

**Humidity limit:**

0 to 100% RH (Relative Humidity)

**PERFORMANCE SPECIFICATIONS**

Reference conditions, silicone oil filling, SS 316 isolating diaphragms, 4-20 mA analog output.

**Accuracy rating:**

(including linearity, hysteresis, and repeatability)

**For models up to 10000 kPag:**

For spans > 1/10 of URL:  
 $\pm 0.065\%$  (standard) of span or  
 $\pm 0.04\%$  (option) of span  
 For < 1/10 of URL:  
 $\pm \left( 0.015 + 0.005 \frac{\text{URL}}{\text{Span}} \right) \%$  of span

**For 50000 kPag model:**

For spans > 1/10 of URL:  $\pm 0.1\%$  of span  
 For spans < 1/10 of URL:  
 $\pm \left( 0.05 + 0.005 \frac{\text{URL}}{\text{Span}} \right) \%$  of span

**Stability:**

$\pm 0.1\%$  of upper range limit (URL) for 10 years.

**Temperature effect:**

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

Zero shift:  $\pm \left( 0.075 + 0.0125 \frac{\text{URL}}{\text{Span}} \right) \%$

Total effect:  $\pm \left( 0.095 + 0.0125 \frac{\text{URL}}{\text{Span}} \right) \%$

Double the effects for material code (7th digit in model code) "H", "M", "T"

**Overrange effect:**

Zero shift:  
 0.2% of URL for any overrange to maximum limit

**Supply voltage effect:**

Less than 0.005% of calibrated span per 1 V

**Update rate:**

40 msec

**Turn on time:**

6 sec

**Response time:** (63.3% of output signal without damping)

Time constant: 0.08 sec (at 23°C)

Dead time: about 0.06 sec

Response time = time constant + dead time

**Electromagnetic compatibility:**

FCX-A IV transmitters are in accordance with the following harmonized standards:

- EN 61326-1
- EN 61326-2-3
- EN 61326-3-1

**RFI effect:**

< 0.2% of the URL for the frequencies from 20 up to 1000 MHz with an electrical field strength of 10 V/m and housing covers in place. (Classification: 2-abc: 0.2% of span according SAMA PMC 33.1).

**Mounting position effect:**

Zero shift:  
 Less than 0.1 kPa {1 m bar} for a 10° tilt in any position. This error can be corrected by adjusting zero. (Double the effect for fluorinated fill sensors).  
 No effect on span.

**Vibration effect:**

<  $\pm 0.25\%$  of URL  
 Frequency 10 to 150 Hz, acceleration 29.4 m/sec<sup>2</sup>

**Dielectric strength:**

500 V AC, 50/60Hz 1 min., between circuit and earth (except with the optional arrester)

**Insulation resistance:**

More than 100 MΩ at 500 V DC.

**Internal resistance for external field indicator:**

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

**Pressure equipment directive (PED) 2014/68/EU:**

According to Article 4.3

## PHYSICAL SPECIFICATIONS

### Electrical conduit connections:

1/2"-14 NPT, Pg13.5 or M20 × 1.5

### Process connections:

Standard: 1/4"-18 NPT

Option: 1/2"-14 NPT with oval flanges.

Remark: the codification doesn't include the oval flange accessories.

### Process-wetted parts material:

Material code (7th digit in the model code)	Process cover	Diaphragm	Wetted sensor body	Vent/drain
V	SS 316L	SS 316L	SS 316L	SS 316L
W	SS 316L	Hastelloy-C	SS 316L	SS 316L
J	SS 316L	SS 316L +Au coating	SS 316L	SS 316L
H	SS 316L	Hastelloy-C	Hastelloy-C	SS 316L
M	SS 316L	Monel	Monel lining	SS 316L
T	SS 316L	Tantalum	Tantalum lining	SS 316L

Remark: Gasket : Viton o-ring or PTFE square section gasket.  
Availability of above material design depends on ranges and static pressure.  
Refer to "Model codes".

### Non-wetted parts material:

#### Electronics housing:

Low copper die-cast aluminum alloy finished with polyester coating (standard) or SS 316 (option)

#### Bolts and nuts:

Carbon steel, SS 316L or SS 660

#### Filling fluid:

Standard: Silicone oil

Option: Fluorinated oil

#### Mounting bracket: SS 316L (option)

### Environmental protection:

IEC IP66 & IP67 and Type 4X

### Mounting:

DN50(2") pipe or wall mounting using the mounting bracket.

Direct to process cover connections without the mounting bracket.

### Mass {weight}:

Transmitter: 3.0 kg without options.

Add: 0.2 kg for indicator

0.5 kg for mounting bracket

2 kg for stainless steel housing (option)

## ACCESSORIES

### Oval flanges:

Converts process connection to 1/2"-14 NPT.

### Magnet pen:

To be used with the 3 push-buttons optional indicators.

Order number = ZZP\*TQ507742C1

## OPTIONAL FEATURES

### Local indicator:

An optional 5 digits indicator with engineering units is available.

A local configurator can be carried out using the 3 magnetic switches and push-buttons.

A separately ordered magnet pen is required for adjustment using the 3 magnetic push-buttons.

See the accessories section.

### Arrester:

A built-in arrester protects the electronics from lightning surges.

Lightning surge immunity: ±4 kV (1.2 × 50 μs)

### Oxygen service:

Special cleaning procedures are applied during the manufacturing process to maintain oil free all process wetted part. The filling fluid is fluorinated oil.

### Chlorine service:

Same procedures and filling fluid as for oxygen service.

### Degreasing:

Process-wetted parts are cleaned and the filling fluid is standard silicone oil. Not for use with oxygen or chlorine presence.

### NACE specification:

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 plate with customer tag data is wired to the transmitter.

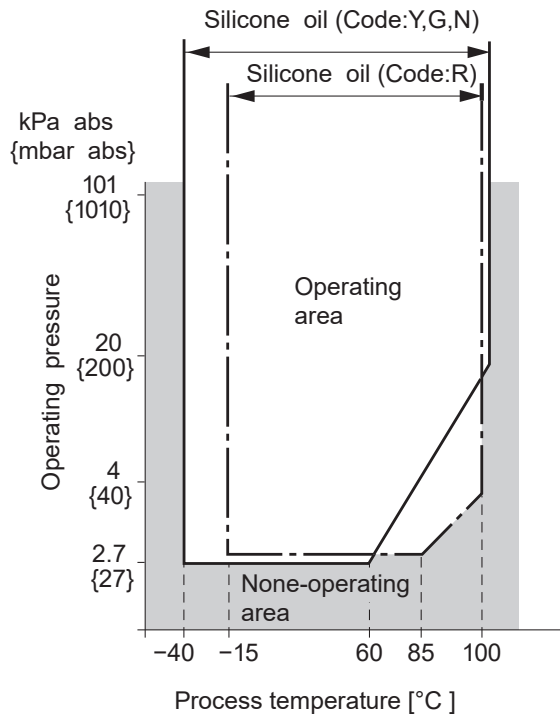
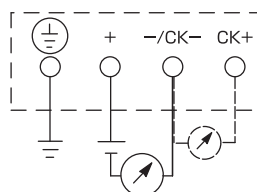


Fig. 1 Relation between process temperature and operating pressure

## CONNECTION DIAGRAM



# MODEL CODE SYMBOLS

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	DESCRIPTION
F	K	G			6											Type
																Gauge pressure transmitter - Smart, 4-20 mA with HART communication protocol
																Connections
																Process Connection
																Oval flange threading
																Conduit connection
																Enclosure type
R																M20x1.5
T																1/2-14 NPT
X																Pg13.5
3																M20x1.5
6																1/2-14 NPT
9																Pg13.5
																Range and materials
																(*1) Measuring ranges
																Process cover
																Diaphragm
																Wetted cell body
0	1	V														SS 316L
0	1	W														Hastelloy C
0	1	H														Monel
0	1	M														Gold coating
0	1	J														Tantalum
0	1	T														Hastelloy C
9	1	H														Monel
9	1	M														Gold coating
9	1	T														Tantalum
																(*2) SS 316L
0	2	V														PVDF insert
0	2	W														Monel
0	2	H														Gold coating
0	2	M														Gold/ceramics
0	2	J														Tantalum
0	2	C														Hastelloy C
0	2	T														Monel
9	2	H														Gold coating
9	2	M														Gold/ceramics
9	2	T														Tantalum
																(*3) SS 316L
0	3	V														PVDF insert
0	3	W														Monel
0	3	H														Gold coating
0	3	M														Gold/ceramics
0	3	J														Tantalum
0	3	C														Hastelloy C
0	3	T														Monel
9	3	H														Gold coating
9	3	M														Gold/ceramics
9	3	T														Tantalum
																(*2) SS 316L
0	4	V														PVDF insert
0	4	W														Monel
0	4	H														Gold coating
0	4	M														Gold/ceramics
0	4	J														Tantalum
0	4	C														Hastelloy C
0	4	T														Monel
																(*3) SS 316L
0	5	V														PVDF insert
0	5	W														Monel
0	5	H														Gold coating
0	5	J														Gold/ceramics
																(*2) SS 316L
																Improvement Symbol
																Indicator
																Arrester
A																None
E																None
L																Yes
P																Digital, 0-100% linear scale
Q																Digital, custom scale
S																Digital, 0-100% linear scale
1																Yes
2																Digital, custom scale
4																Digital, 0-100% linear scale (Local configurator)
5																Digital, custom scale (Local configurator)
																None
																Yes

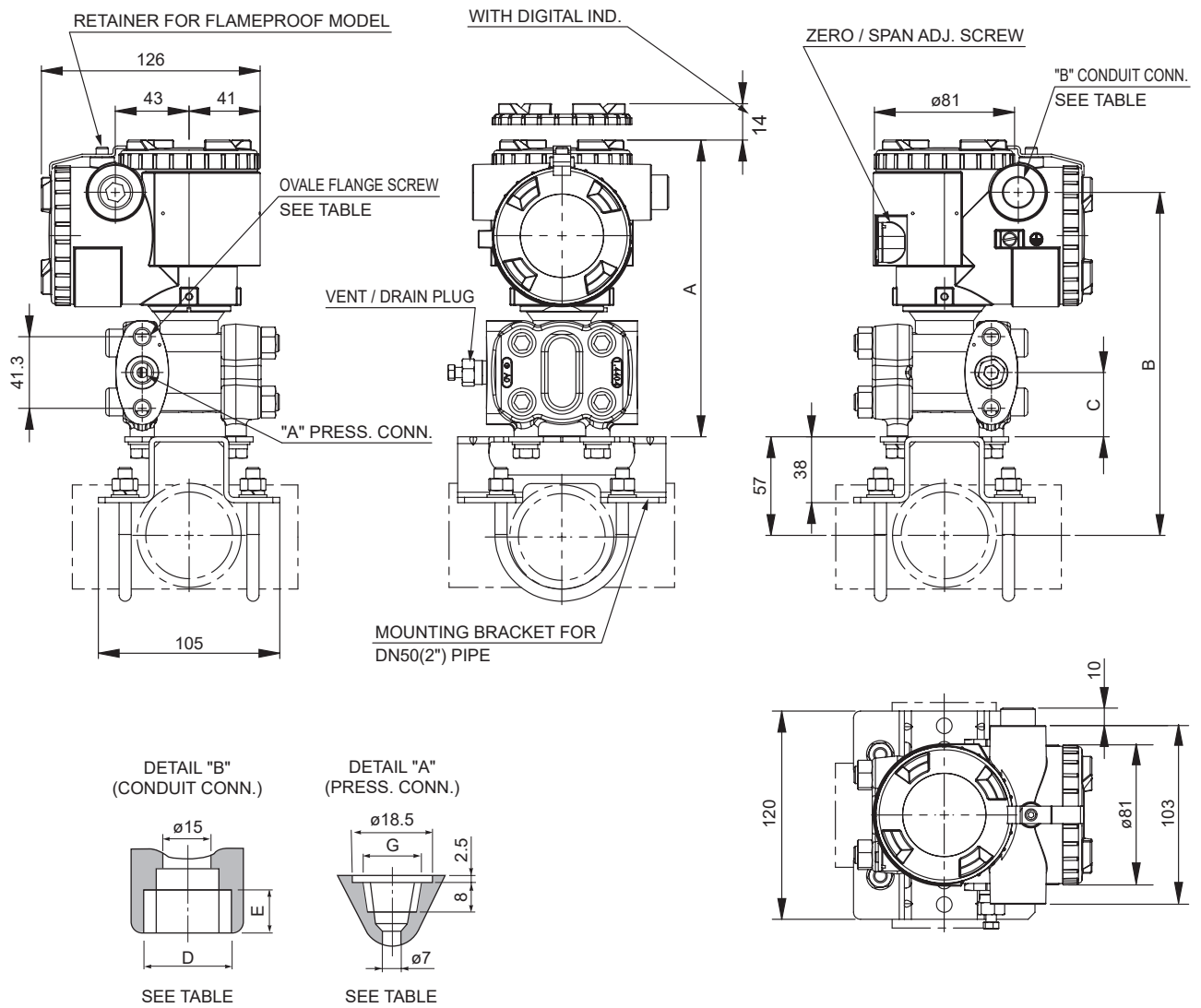
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	DESCRIPTION
F	K	G					6									<b>Hazardous location approvals</b>
A																None
X																(*4) ATEX - Flameproof
K																ATEX - Intrinsic Safety
M																(*4) ATEX - Combination Flameproof and Intrinsic Safety pending
E																cCSAus - Explosion proof pending
J																cCSAus - Intrinsic Safety and Non Incendive pending
L																(*4) cCSAus - Combination Explosion proof, Intrinsic Safety and Non Incendive pending
R																IECEX - Flameproof
T																IECEX - Intrinsic Safety
N																(*4) IECEX - Combination Flameproof and Intrinsic Safety pending
W																IECEX - ATEX - cCSAus - Explosion/Flameproof, Intrinsic Safety and Non Incendive pending
A																(*2) <b>Side vent/drain</b>
K																<b>Mounting bracket</b>
D																None (standard)
L																SS 316L
																Yes
																None
																SS 316L
																<b>Stainless steel parts</b>
																<b>TAG plate</b>
Y																None
B																Yes
C																None
E																Yes
																None
																Yes
																<b>Housing</b>
																None
																Yes
																<b>Paint of detecting unit</b>
																None
																<b>Special applications &amp; Filling fluids</b>
																<b>Treatment</b>
Y																None
W																Silicone oil
G																Fluorinated oil
A																Degreasing
D																Oxygen service
N																Fluorinated oil (only with digit 7=J,V,W)
																Chlorine service
																Fluorinated oil (only with digit 7=H,T)
																NACE
																Silicone oil
																<b>Process cover gasket</b>
C																PTFE square section gasket
G																Standard type
H																Carbon steel - M10 for static pressure < 160 bar (16MPa)
J																SS 316L / 316L - M10 for static pressure < 160 bar (16MPa)
K																Carbon steel - M12for static pressure > 160 bar (16MPa)
D																PTFE square section gasket
E																Standard type
M																Carbon steel - M10 for static pressure < 160 bar (16MPa)
4																SS 660 / 660 - M10 for static pressure < 160 bar (16MPa)
5																PTFE square section gasket in PVDF insert
6																Standard type
7																Carbon steel - M10 for static pressure < 160 bar (16MPa)
8																SS 316L / 316L - M10 for static pressure < 160 bar (16MPa)
																PTFE square section gasket in PVDF insert
																Standard type
																Carbon steel - M12for static pressure > 160 bar (16MPa)
																SS 660 / 660 - M10 for static pressure < 160 bar (16MPa)
																SS 660 / 660 - M12 for static pressure > 160 bar (16MPa)
																Viton
																Standard type
																Carbon steel - M10 for static pressure < 160 bar (16MPa)
																SS 316L / 316L - M10 for static pressure < 160 bar (16MPa)
																Viton
																Standard type
																Carbon steel - M10 for static pressure < 160 bar (16MPa)
																SS 660 / 660 - M10 for static pressure < 160 bar (16MPa)
																(*5) Viton
																Standard type
																SS 660 / 660 - M12 for static pressure > 160 bar (16MPa)
																(*5) Viton
																Standard type
																SS 660 / 660 - M10 for static pressure < 160 bar (16MPa)
																SS 660 / 660 - M12 for static pressure > 160 bar (16MPa)
																<b>Special options</b>
L																None
T																High accuracy type
																Instruction manual unattached
																(*6) * special, no code available

Notes\* :

- 1- Turn Down Ratio < 10 is recommended for optimal performances.
- 2- Process cover with PVDF insert: 1/2-14 NPT side process connection only, square section PTFE gasket, no vent/drain
- 3- Gold/ceramic coating available upon request.
- 4- Only with M20 x 1.5 or 1/2-14 NPT electrical conduit
- 5- SS 660 bolts/nuts are in conformity with NACE MR0175/ISO 15156 and must be used for NACE service.
- 6- When no code can be found in the current model code, place "\*" in the corresponding digit code as well as in the 16th digit

# OUTLINE DIAGRAM (Unit : mm)

<L SHAPE> <4TH DIGIT CODE: R, T, X AND 7TH DIGIT CODE V, H, M, T>



4TH MODEL CODE	CONDUIT CONNECTION		PRESS. CONN.	OVAL FLANGE SCREW
	D	E	G	
R	M20×1.5	16	1/4-18NPT	7/16-20UNF
T	1/2-14NPT	16	1/4-18NPT	7/16-20UNF
X	Pg13.5	10.5	1/4-18NPT	7/16-20 UNF

TABLE

MODEL	DIMENSIONS		
	A	B	C
FKG□01	171 (175) NOTE	198 (202) NOTE	37 (38.5) NOTE
FKG□02			
FKG□03			
FKG□04			
FKG□05	172.5	199.5	38.5

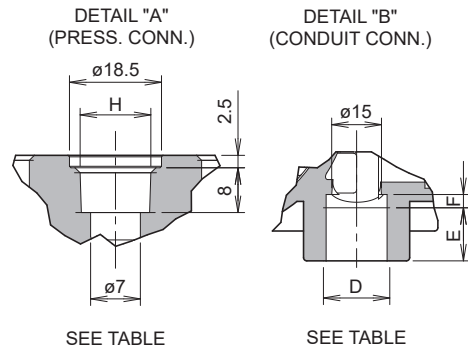
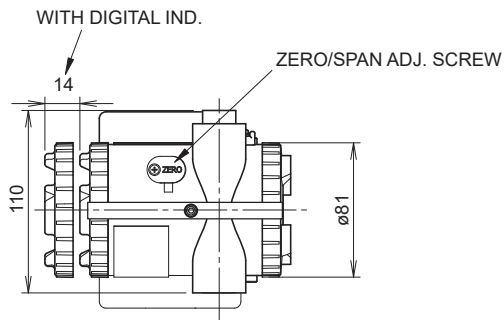
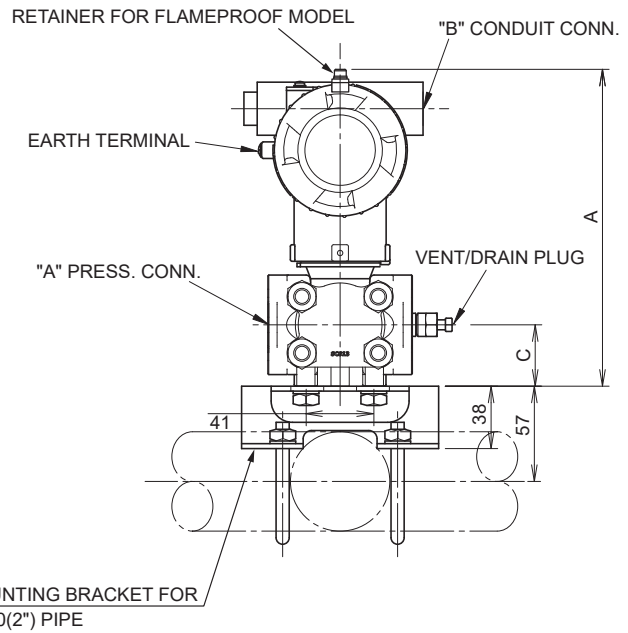
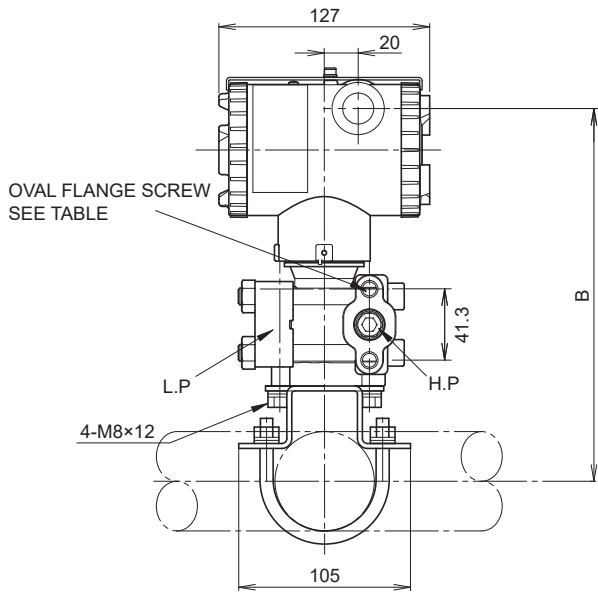
NOTE: 7TH MODEL CODE "M", "T"

- WEIGHT : - 3.0 kg (WITHOUT OPTION)  
 ADD : - 0.2 kg FOR INDICATOR  
 - 0.5 kg FOR MOUNTING BRACKET  
 - 2.0 kg FOR STAINLESS STEEL HOUSING OPTION



# OUTLINE DIAGRAM (Unit : mm)

<T SHAPE> <4TH DIGIT CODE: 3, 6, 9 AND 7TH DIGIT CODE V, H, M, T>



4TH MODEL CODE	CONDUIT CONNECTION			PRESS. CONN.	OVAL FLANGE SCREW
	D	E	F	H	
3	M20×1.5	16	4	1/4-18NPT	7/16-20UNF
6	1/2-14NPT	16	4	1/4-18NPT	7/16-20UNF
9	Pg13.5	10.5	4.5	1/4-18NPT	7/16-20UNF

TABLE

MODEL	DIMENSIONS		
	A	B	C
FKG□01			
FKG□02	192 (196)	225 (229)	37 (38.5)
FKG□03	NOTE	NOTE	NOTE
FKG□04			
FKG□05	193.5	226.5	38.5

NOTE: 7TH MODEL CODE "M", "T"

- WEIGHT : - 3.0 kg (WITHOUT OPTION)  
 ADD : - 0.2 kg FOR INDICATOR  
 - 0.5 kg FOR MOUNTING BRACKET  
 - 2.0 kg FOR STAINLESS STEEL HOUSING OPTION





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