GAUGE PRESSURE TRANSMITTER (DIRECT MOUNT TYPE)

DATA SHEET FKP···6

The FKP model of 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 in terms of accuracy and stability.

FCX-A IV series of pressure transmitters comply with Safety Integrity Level2 or 3 according to IEC 61508 and IEC61511 standards.

FEATURES

1. High accuracy

Fuji Electric's micro-capacitive silicon sensor provides in standard ± 0.1% accuracy for all elevated or suppressed calibration ranges without additional adjustments.

2. Minimum inventory and design

Electronics parts, local indicators and electronics housing are interchageable 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 protocol

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 pair-points.

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. Contacless 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:

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

Service:

Liquid, gas, or vapour

Span, range and overrange limit:

Type	Span limit kPa {bar}		Range limit kPa {bar}	Overrange limit MPa {bar}
	Min.	Max.		
FKP□01	8.125 {0.08125}	130 {1.3}	−100 to +130 {−1 to +1.3}	1 {10}
FKP□02	31.25 {0.3125}	500 {5}	−100 to +500 {−1 to +5}	1.5 {15}
FKP□03	187.5 {1.875}	3000 {30}	−100 to +3000 {−1 to +30}	9 {90}
FKP□04	625 {6.25}	10000 {100}	−100 to +10000 {−1 to +100}	15 {150}

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:

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

Output signal:

4-20 mA with HART communication protocol.

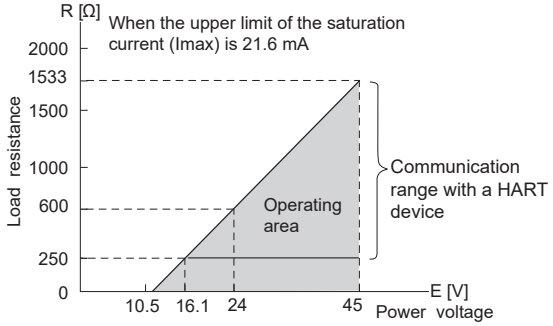
Power supply:

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]

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

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

Hazardous locations:

Marking (Digit 10th)		Protection type		
ATEX		Intrinsic Safety "i"		
		Ex II1 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_{200} 135°C Da (Ta: -40°C to +60°C)		
	K	Ex ia IIIC T_{200} 100°C Da (Ta: -40°C to +50°C)		
		Ui = 28Vdc, Ii = 110mA, Pi = 0.77W		
		Ci = 14.9nF (without optional Arrester)		
		Ci = 26.0nF (with optional Arrester)		
		Li = 0.181mH		
		IP66/67		
		Flameproof Enclosure "d"		
		Ex II2 G		
		Ex db IIC T6…T4 Gb		
	X	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
		IP66/67		
	M	Combination (K) + (X) pending		
IECEx		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_{200} 135°C Da (Ta: -40°C to +60°C)		
	T	Ex ia IIIC T_{200} 100°C Da (Ta: -40°C to +50°C)		
		Ui = 28Vdc, Ii = 110mA, Pi = 0.77W		
		Ci = 14.9nF (without optional Arrester)		
		Ci = 26.0nF (with optional Arrester)		
		Li = 0.181mH		
		IP66/67		
		Flameproof Enclosure "d"		
		Ex db IIC T6…T4 Gb		
	R	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
		IP66/67		
	N	Combination (T) + (R) pending		

cCSAus pending		Intrinsic Safety/Non-Incendive
		IS Class I Division 1 Groups ABCD Ex ia
		Class II Groups EFG, Class III
		NI Class I Division 2 Groups ABCD
	J	T4 (-40°C ≤ Ta ≤ +60°C)
		T5 (-40°C ≤ Ta ≤ +50°C)
		Ui = 28Vdc, Ii = 110mA, Pi = 0.77W
		Ci = 14.9nF (without optional Arrester)
		Ci = 26.0nF (with optional Arrester)
		Li = 0.181mH
		Flameproof Enclosure
		XP Class I Division 1 Groups CD
		Class II Groups EFG, Class III
	E	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		*v*	*v*	*v*	*v*
Model Nb		*v*	*v*	*v*	*v*
Serial Nb & Software revision		*v*	—	*v*	—
Engineering units		*v*	*v*	*v*	*v*
Upper Range Value		*v*	—	*v*	—
Measuring Range		*v*	*v*	*v*	*v*
Damping		*v*	*v*	*v*	*v*
Output signal type	Linear	*v*	*v*	*v*	*v*
	Square Root	*v*	*v*	*v*	*v*
Burnout current		*v*	*v*	*v*	*v*
Calibration		*v*	*v*	*v*	*v*
Output Adjust		—	*v*	—	*v*
Measuring Value		*v*	—	*v*	—
Self Diagnosis		*v*	—	*v*	—
External Adj Screw Lock		*v*	*v*	*v*	*v*
Transmitter Display		*v*	*v*	*v*	*v*
Linearization		*v*	*v*	*v*	*v*
Rerange		*v*	*v*	*v*	*v*
Saturation Current		*v*	*v*	*v*	*v*
Write Protect		*v*	*v*	*v*	*v*
History – Calibration History – Ambient T° History		 *v* *v*	 *v* —	 *v* *v*	 *v* —

Zero and span adjustment:

Zero and span are remotly 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 bar to 100% of the URL of the sensor.

Normal/reverse action:

Selectable by range setting

Local indicator:

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

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”:

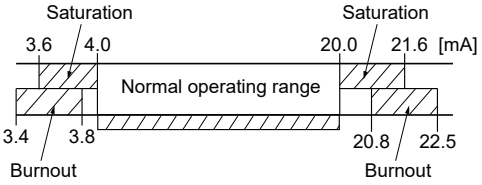
The output signal is set within the range of [20.8 to 22.5] mA, Default value: 21.6mA

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 316L isolating diaphragms, 4-20 mA analog output in linear mode.

Accuracy rating:

(including linearity, hysteresis, and repeatability)

For spans greater than 1/10 of URL:

±0.1% of span

For spans below 1/10 of URL:

$$\pm \left(0.05+0.005 \frac{\text{URL}}{\text{Span}} \right) \text{ \% of span}$$

Stability:

±0.2% of Upper range limit (URL) for 10 years

(In case of 6th digit code “2”, “3”, “4”)

Temperature effect:

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

Zero shift: $\pm(0.4+0.1 \frac{\text{URL}}{\text{Span}})$% / 28°C

Total effect: $\pm(0.475+0.1 \frac{\text{URL}}{\text{Span}})$% / 28°C

Overrange effect:

Zero shift, 0.3% of URL for any overrange to maximum limit

Supply voltage effect:

Less than 0.005% fo calibrated span per 1 V

Update rate:

40 msec

Turn on time:

6 sec

Response time: (63.3% of output signal without electrical 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 0.1kPa (1mbar) 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:

< ±0.25% of spans for spans greater than 1/10 of URL.

Frequency 10 to 150 Hz, acceleration 29.4 m/sec^2

Dielectric strength:

500 V AC, 50/60 Hz 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:

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

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

According to Article 4.3

PHYSICAL SPECIFICATIONS

Electrical conduit connection:

1/2-14 NPT, M20 × 1.5 or Pg13.5

Process connections:

1/2-14 NPT, 1/4-18 NPT, Rc 1/2, G 1/2 A manometer fitting, M20 × 1.5.

Process-wetted parts material:

Material code (7th digit in model code)	Process cover	Diaphragm	Wetted sensor body
J	SS 316L	SS 316L + Gold coating	SS 316L
V	SS 316L	SS 316L	SS 316L

Non-wetted parts material:

Electronics housing:

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

Filling fluid:

Silicone oil (standard) or fluorinated oil (option)

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 only: 1.7 kg without options.

Add: 0.2 kg for indicator

0.5 kg for mounting bracket

2.0 kg for stainless steel housing (option)

ACCESSORIES

Magnet pen:

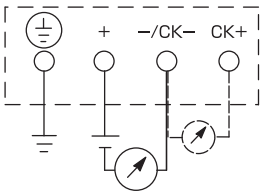
To be used with the 3 push-buttons optional indicators.

Order number = ZZP*TQ507742C1

Two valve Manifold:

Available in SS 316 and pressure rating 10 MPa (100bar).

CONNECTION DIAGRAM



OPTIONAL FEATURES

Local indicator:

An optional 5 digit indicator with engineering units is available.

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

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

The filling fluid is fluorinated oil.

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.

Optional tag plate:

An extra stainless steel tag plate with customer tag data is wired to the transmitter to the transmitter.

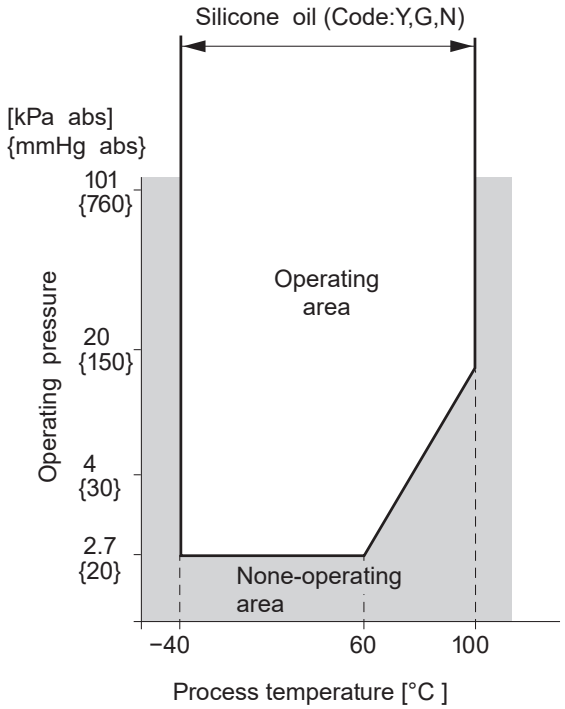


Fig. 1 Relation between process temperature and operating pressure

MODEL CODE SYMBOLS

1	2	3	4	5	6	7	8	–	9	10	11	12	13	–	14	15	–	16	DESCRIPTION
F	K	P					6	–						–			–		**Type**
																			Gauge pressure transmiter, direct mounting - Smart, 4-20 mA with HART communication protocol
																			Connections

	Conduit connection	Enclosure type
T	1/2-14 NPT	"L" Shape
V	Pg13.5	
W	M20×1.5	
6	1/2-14 NPT	"T" Shape
7	Pg13.5	
8	M20×1.5	

Range and materials

			(*1)	Measuring ranges	Diaphragm	Wetted cell body
0	1	V		0.08125 to 1.3 bar (8.125 to 130 kPa)	SS 316L	SS 316L
0	1	J			SS 316L/gold coating	
0	2	V		0.3125 to 5 bar (31.25 to 500 kPa)	SS 316L	
0	2	J			SS 316L/gold coating	
0	3	V		1.875 to 30 bar (187.5 to 3000 kPa)	SS 316L	
0	3	J			SS 316L/gold coating	
0	4	V		6.25 to 100 bar (625 to 10000 kPa)	SS 316L	
0	4	J			SS 316L/gold coating	

							6												**Improvement Symbol**

	Indicator	Arrester
A	None	None
E	None	Yes
L	Digital, 0-100% linear scale	None
P	Digital, custom scale	
Q	Digital, 0-100% linear scale	Yes
S	Digital, custom scale	
1	Digital, 0-100% linear scale (Local configurator)	None
2	Digital, custom scale (Local configurator)	
4	Digital, 0-100% linear scale (Local configurator)	Yes
5	Digital, custom scale (Local configurator)	

																			Hazardous location approvals

A																			None
X																	(*2)		ATEX - Flameproof
K																			ATEX - Intrinsic Safety
M																	(*2)		ATEX - Combination Flameproof and Intrinsic Safety pending
E																	(*2)		cCSAus - Explosion proof pending
J																			cCSAus - Intrinsic Safety and Non Incendive pending
L																	(*2)		cCSAus - Combination Explosion proof, Intrinsic Safety and Non Incendive pending
R																	(*2)		IECEx - Flameproof
T																			IECEx - Intrinsic Safety
N																	(*2)		IECEx - Combination Flameproof and Intrinsic Safety pending
W																	(*2)		IECEx - ATEX - cCSAus - Explosion/Flameproof, Intrinsic Safety and Non Incendive pending

																			Mounting bracket
			A																None
			K																SS 316L

																			Stainless steel parts

	TAG plate	Housing
Y	None	None
B	Yes	
C	None	Yes
E	Yes	

																			Special applications & Filling fluids

	Application	Filling fluid
Y	Standard	Silicone oil
G	Degreasing	Silicone oil
A	Oxygen service	Fluorinated oil
N	NACE	Silicone oil

																			Process connection - Welded adaptor - All stainless steel parts

															Y				1/2 - 14NPTI Internal thread
															B				Rc 1/2 Internal thread
															C				1/4 - 18 NPTI Internal thread
															D				1/2 -14 NPTE External thread
															E				G1/2 A manometer fitting External thread
															F				M20 × 1.5 External thread

																			Special options
																L			None Instruction manual unattached
																	(*3)	*	special, no code available

Notes* :

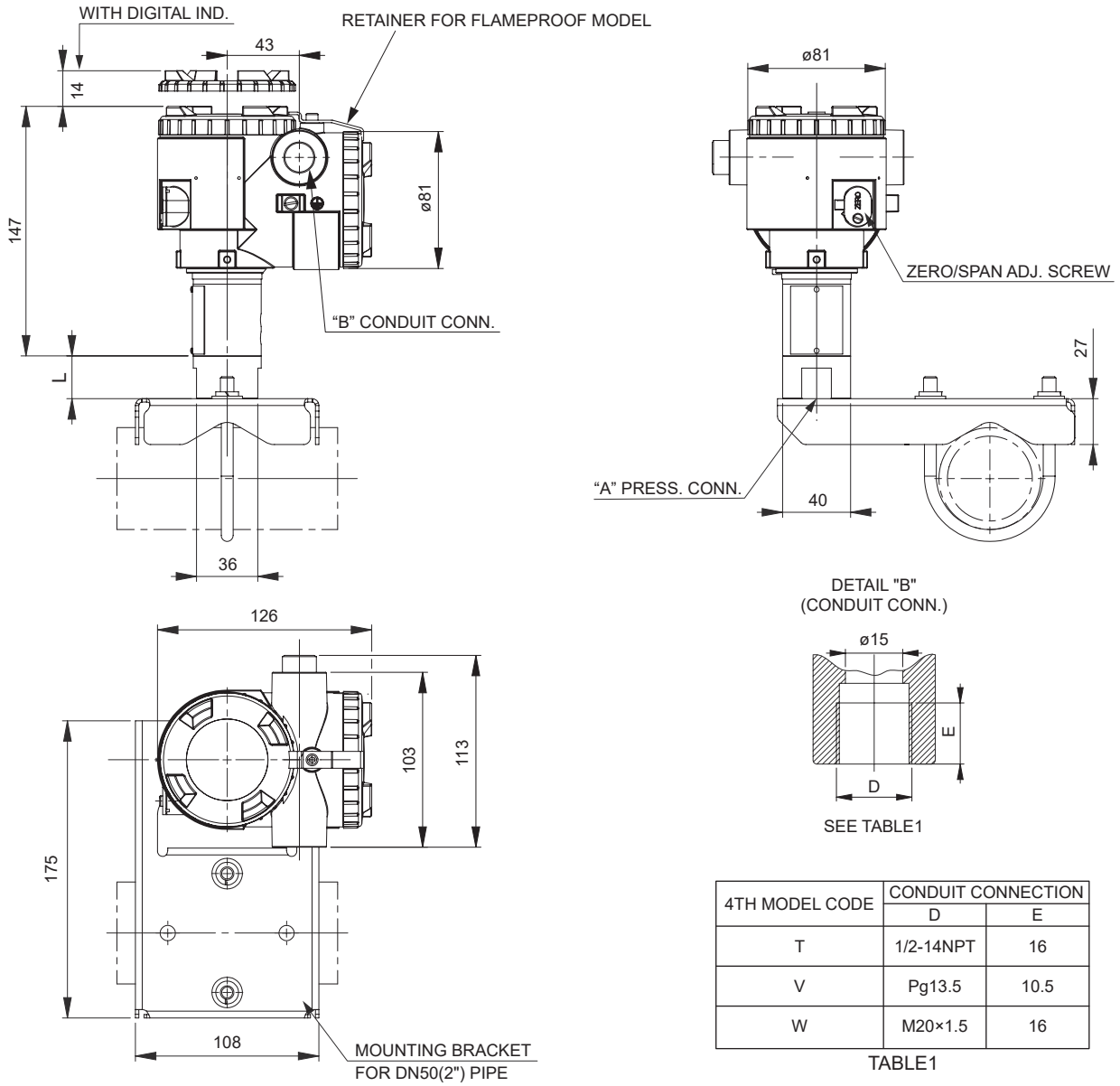
1- A Turn Down Ratio ≤10 is recommended for optimal performance.

2- Only with M20×1.5 and 1/2-14NPT electical conduit (4th model code "T", "W", "6", "8").

3- 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: T, V, W>



DETAIL "B"
(CONDUIT CONN.)

SEE TABLE1

4TH MODEL CODE	CONDUIT CONNECTION	
	D	E
T	1/2-14NPT	16
V	Pg13.5	10.5
W	M20×1.5	16

TABLE1

DETAIL "A"
(PRESS. CONN.)

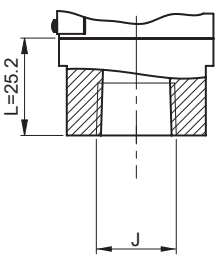
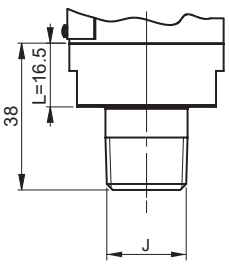
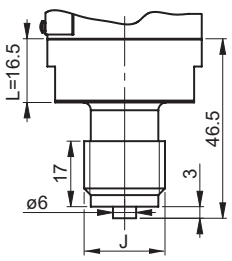
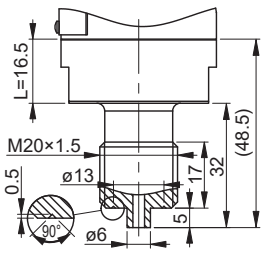
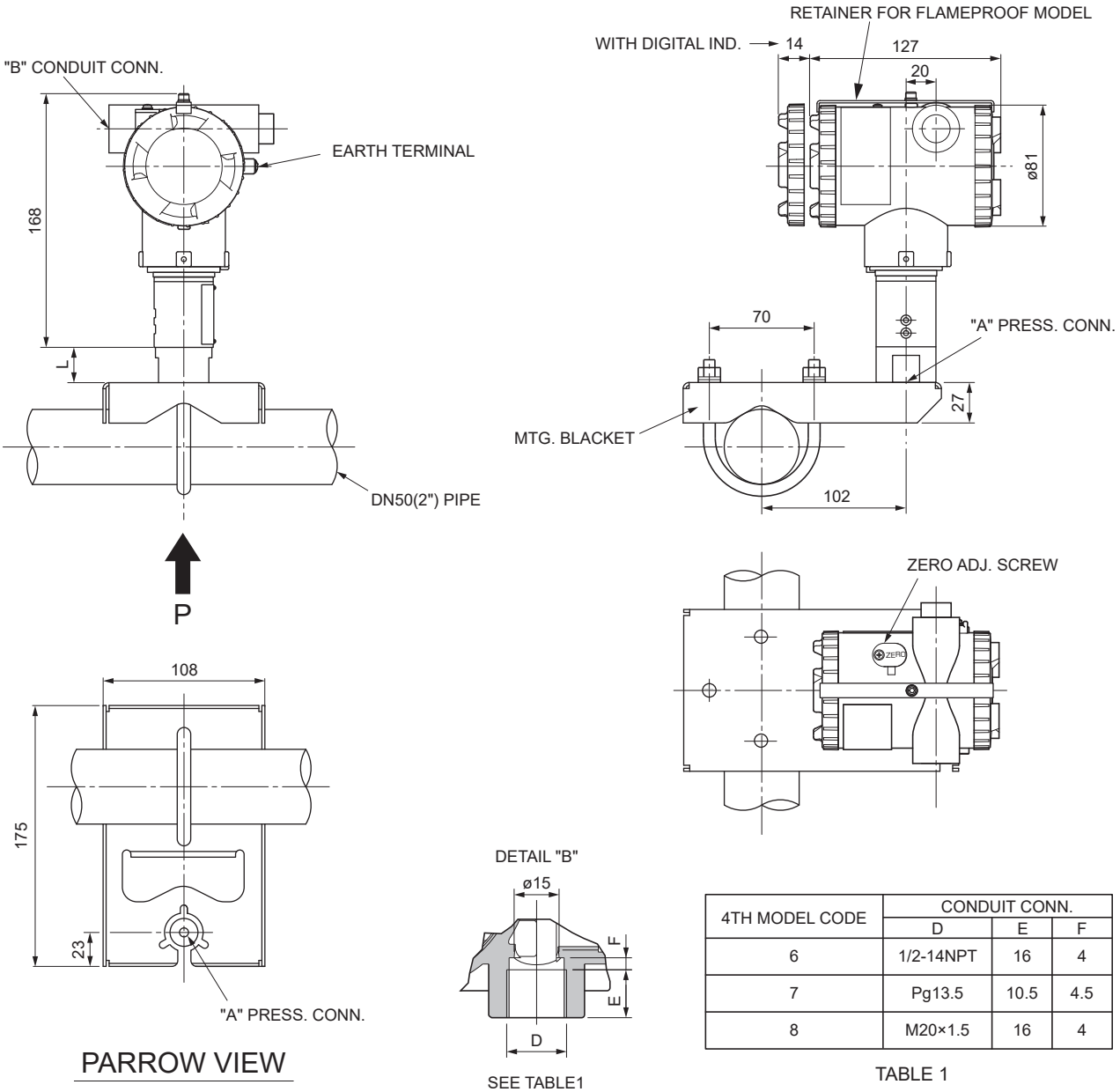
14TH MODEL CODE		Y	B	C	D	E	F
DIMENSIONS							
	J	1/2-14 NPTI	Rc 1/2	1/4-18 NPTI	1/2-14 NPTE	G1/2 A	M20×1.5

TABLE2

WEIGHT : - 1.7 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: 6, 7, 8>



4TH MODEL CODE	CONDUIT CONN.		
	D	E	F
6	1/2-14NPT	16	4
7	Pg13.5	10.5	4.5
8	M20×1.5	16	4

TABLE 1

DETAIL "A"
(PRESS. CONN.)

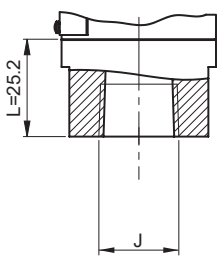
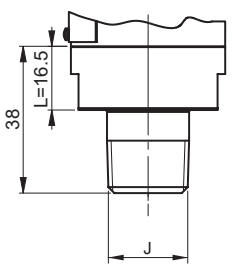
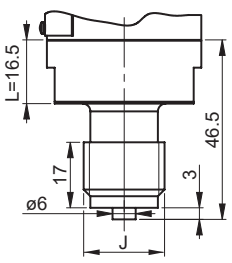
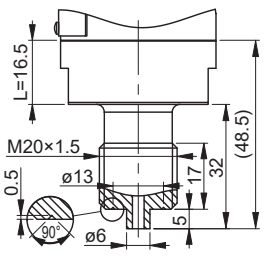
14TH MODEL CODE		Y	B	C	D	E	F
DIMENSIONS							
	J	1/2-14 NPTI	Rc 1/2	1/4-18 NPTI	1/2-14 NPTE	G1/2 A	M20×1.5

TABLE2

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

Fuji Electric

Fuji Electric India Private Limited

Company Name : Fuji Electric India Private Limited
Country of Manufacture : India
Contact of Address: 119, 120, 120A, Electrical and Electronics Industrial Estate, Perungudi, Chennai - 600 096, Tamil Nadu (India)
Email: enquiry.fei@fujielectric.com
Phone: +91 44 4000 4200
Website: www.fujielectric.co.in