

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 $\pm 0.1\%$ accuracy for all elevated or suppressed calibration ranges without additional adjustments.

2. Minimum inventory and design

Electronics parts, local indicators and electronics housing are 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 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. 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:

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.

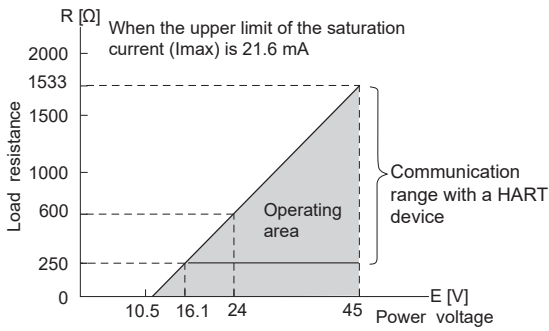
Power supply:

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]

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

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

Hazardous locations:

Marking (Digit 10 th)	Protection type			
ATEX	K	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)		
		Ex ia IIIC T ₂₀₀ 100°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 II2 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	
T4	-40°C to +60°C	-40°C to +120°C		
IP66/67				
M	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 ₂₀₀ 135°C Da (Ta: -40°C to +60°C)		
		Ex ia IIIC T ₂₀₀ 100°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	
IP66/67				
N	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 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-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":

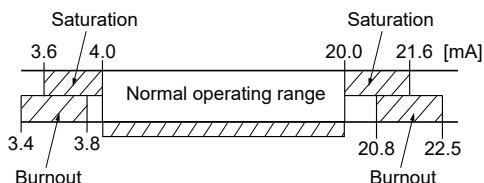
The output signal is set within the range of [20.8 to 22.5] mA, Default value: 21.6mA

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 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:

$\pm \left(0.05 + 0.005 \frac{\text{URL}}{\text{Span}} \right)$ % 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/sec²

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:

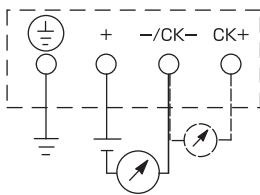
To be used with the 3 push-buttons optional indicators.

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-buttons.

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 ($1.2 \times 50 \mu\text{s}$)

Oxygen service:

Special cleaning procedures are applied during the manufacturing process to maintain oil-free all process wetted parts.

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.

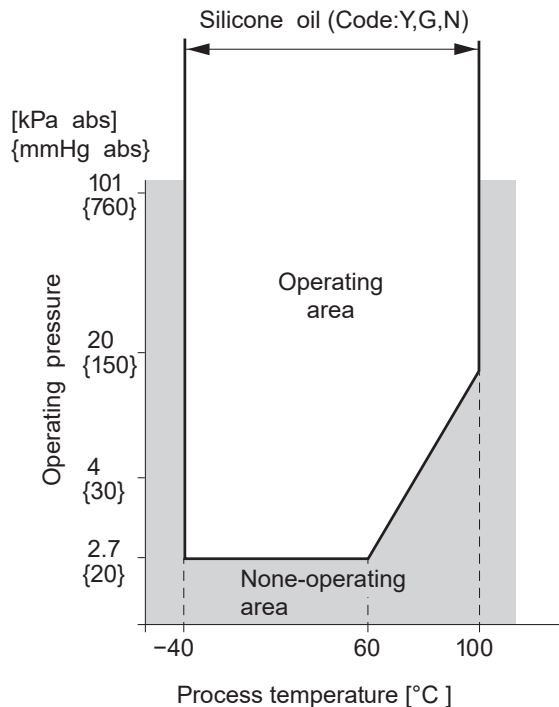


Fig. 1 Relation between process temperature and operating pressure

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 transmitter, direct mounting - Smart, 4-20 mA with HART communication protocol
																Connections
																Conduit connection
																Enclosure type
T																1/2-14 NPT
V																Pg13.5
W																M20×1.5
6																1/2-14 NPT
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)
0	1	J														SS 316L
0	2	V														SS 316L/gold coating
0	2	J														0.3125 to 5 bar (31.25 to 500 kPa)
0	3	V														SS 316L
0	3	J														SS 316L/gold coating
0	4	V														SS 316L
0	4	J														6.25 to 100 bar (625 to 10000 kPa)
																SS 316L/gold coating
																Improvement Symbol
																Indicator
																Arrester
A																None
E																None
L																Yes
P																Digital, 0-100% linear scale
Q																None
S																Digital, custom scale
1																Yes
2																Digital, 0-100% linear scale (Local configurator)
4																None
5																Digital, custom scale (Local configurator)
																Digital, 0-100% linear scale (Local configurator)
																Yes
																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
E																pending
J																(*2) cCSAus - Explosion proof
L																pending
R																cCSAus - Intrinsic Safety and Non Incendive
T																pending
N																(*2) cCSAus - Combination Explosion proof, Intrinsic Safety and Non Incendive
W																pending
																(*2) IECEX - Flameproof
																IECEX - Intrinsic Safety
																(*2) IECEX - Combination Flameproof and Intrinsic Safety
																pending
																(*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
B																None
C																Yes
E																None
																Yes
																Special applications & Filling fluids
																Application
																Filling fluid
Y																Standard
G																Silicone oil
A																Degreasing
N																Silicone oil
																Oxygen service
																Fluorinated oil
																NACE
																Silicone oil
																Process connection - Welded adaptor - All stainless steel parts
Y																1/2 - 14NPTI
B																Internal thread
C																Rc 1/2
D																Internal thread
E																1/4 - 18 NPTI
F																Internal thread
L																1/2 -14 NPTE
																External thread
																1/2 -14 NPTE
																External thread
																G1/2 A manometer fitting
																External thread
																M20 × 1.5
																External thread
																Special options
L																None
																Instruction manual unattached
																(*3) * special, no code available

Notes* :

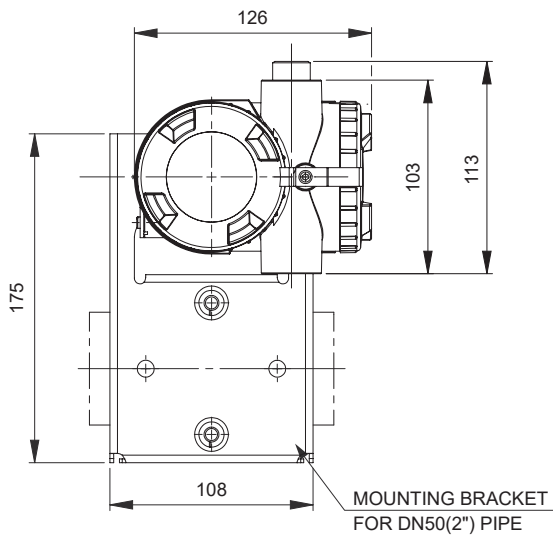
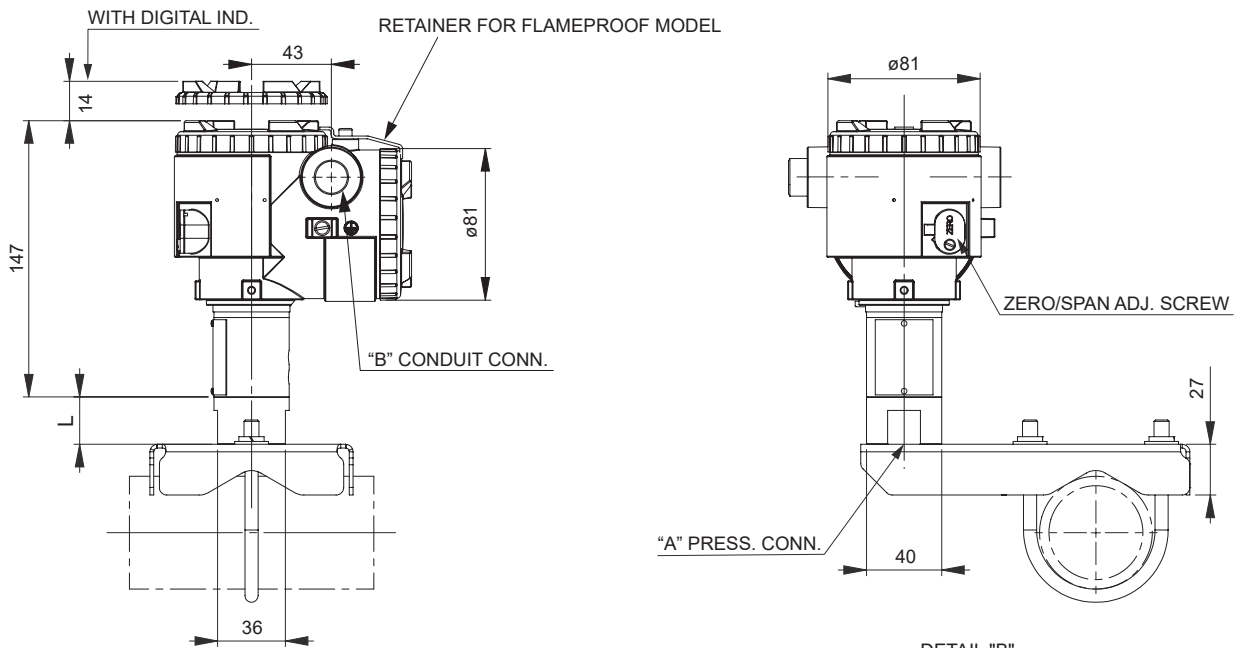
1- A Turn Down Ratio ≤10 is recommended for optimal performance.

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

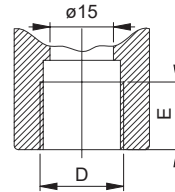
3- When no code can be found in the current model code, place "*" in the corresponding digit code as well as in the 16th digit.

OUTLINE DIAGRAM (Unit : mm)

<L SHAPE> <4TH DIGIT CODE: T, V, W>



DETAIL "B"
(CONDUIT CONN.)



SEE TABLE 1

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

TABLE 1

DETAIL "A"
(PRESS. CONN.)

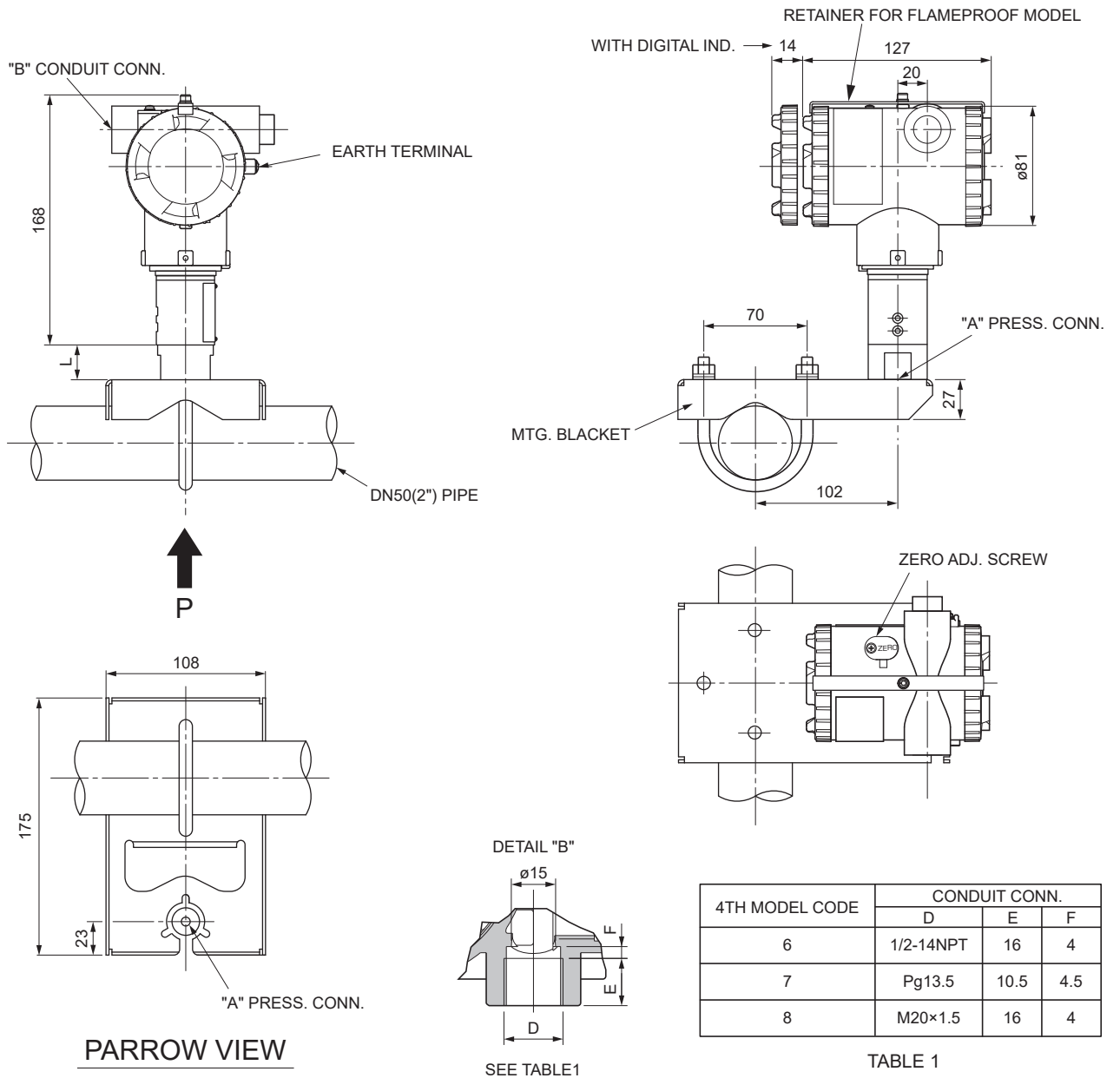
14TH MODEL CODE	Y	B	C	D	E	F
DIMENSIONS						
J	1/2-14 NPTI	Rc 1/2	1/4-18 NPTI	1/2-14 NPTE	G1/2 A	M20×1.5

TABLE 2

- 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>



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 NPT E	G1/2 A	M20×1.5

TABLE 2

- 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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