

# 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.

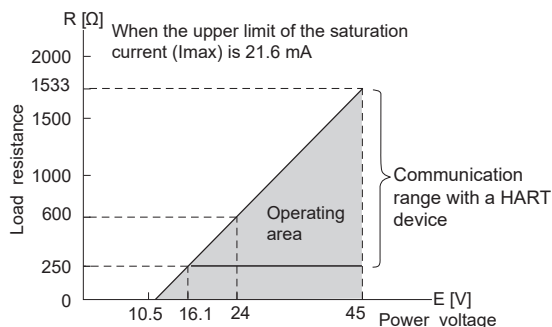
### Power supply:

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]

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

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

#### Hazardous locations:

Marking (Digit 10 <sup>th</sup> )	Protection type		
<b>ATEX</b>	<b>K</b>	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 <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	
	<b>X</b>	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	
	<b>M</b>	Combination (K) + (X) pending	
<b>IECEx</b>	<b>T</b>	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	
	<b>R</b>	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	
	<b>N</b>	Combination (T) + (R) pending	

<b>cCSAus pending</b>	<b>J</b>	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
		T4 (-40°C ≤ Ta ≤ +60°C)
		T5 (-40°C ≤ Ta ≤ +50°C)
		Ui = 28Vdc, li = 110mA, Pi = 0.77W
		Ci = 14.9nF (without optional Arrester)
		Ci = 26.0nF (with optional Arrester)
		Li = 0.181mH
	<b>E</b>	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
	<b>L</b>	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":

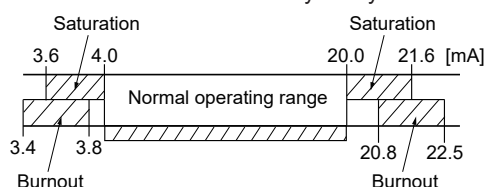
The output signal is set within the range of [20.8 to 22.5] mA, Default value: 21.6mA

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:

$\pm 0.1\%$  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:**

$\pm 0.2\%$  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:  $\pm (0.4 + 0.1 \frac{\text{URL}}{\text{Span}}) \% / 28^\circ\text{C}$

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

**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:**

<  $\pm 0.25\%$  of spans for spans greater than 1/10 of URL.

Frequency 10 to 150 Hz, acceleration 29.4 m/sec<sup>2</sup>

**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:

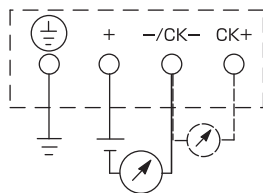
To be used with the 3 push-buttons optional indicators.

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:  $\pm 4$  kV ( $1.2 \times 50 \mu s$ )

### 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.

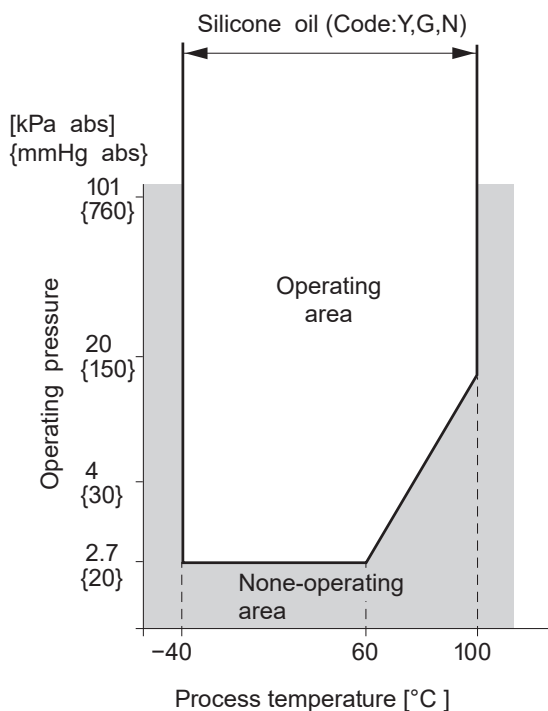


Fig. 1 Relation between process temperature and operating pressure

# 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
																1/2-14 NPT
																Pg13.5
																M20×1.5
																1/2-14 NPT
																Pg13.5
																M20×1.5
																Range and materials
																Measuring ranges
																Diaphragm
																Wetted cell body
																0.08125 to 1.3 bar (8.125 to 130 kPa)
																SS 316L
																SS 316L/gold coating
																0.3125 to 5 bar (31.25 to 500 kPa)
																SS 316L
																SS 316L/gold coating
																1.875 to 30 bar (187.5 to 3000 kPa)
																SS 316L
																SS 316L/gold coating
																6.25 to 100 bar (625 to 10000 kPa)
																SS 316L
																SS 316L/gold coating
																Improvement Symbol
																Indicator
																Arrester
																None
																None
																Yes
																Digital, 0-100% linear scale
																None
																Digital, custom scale
																Digital, 0-100% linear scale
																Yes
																Digital, custom scale
																Digital, 0-100% linear scale (Local configurator)
																None
																Digital, custom scale (Local configurator)
																Digital, 0-100% linear scale (Local configurator)
																Yes
																Digital, custom scale (Local configurator)
																Hazardous location approvals
																None
																(*) ATEX - Flameproof
																ATEX - Intrinsic Safety
																(*) ATEX - Combination Flameproof and Intrinsic Safety
																pending
																(*) cCSAus - Explosion proof
																pending
																(*) cCSAus - Intrinsic Safety and Non Incendive
																pending
																(*) cCSAus - Combination Explosion proof, Intrinsic Safety and Non Incendive
																pending
																(*) IECEx - Flameproof
																IECEX - Intrinsic Safety
																(*) IECEx - Combination Flameproof and Intrinsic Safety
																pending
																(*) IECEx - ATEX - Explosion/Flameproof, Intrinsic Safety and Non Incendive
																pending
																Mounting bracket
																None
																SS 316L
																Stainless steel parts
																TAG plate
																Housing
																None
																None
																Yes
																None
																Yes
																Special applications & Filling fluids
																Application
																Filling fluid
																Standard
																Silicone oil
																Degreasing
																Silicone oil
																Oxygen service
																Fluorinated oil
																NACE
																Silicone oil
																Process connection - Welded adaptor - All stainless steel parts
																1/2 - 14NPTI
																Internal thread
																Rc 1/2
																Internal thread
																1/4 - 18 NPTI
																Internal thread
																1/2 - 14 NPTE
																External thread
																G1/2 A manometer fitting
																External thread
																M20 × 1.5
																External thread
																Special options
																None
																Instruction manual unattached
																(*) special, no code available

Notes\* :

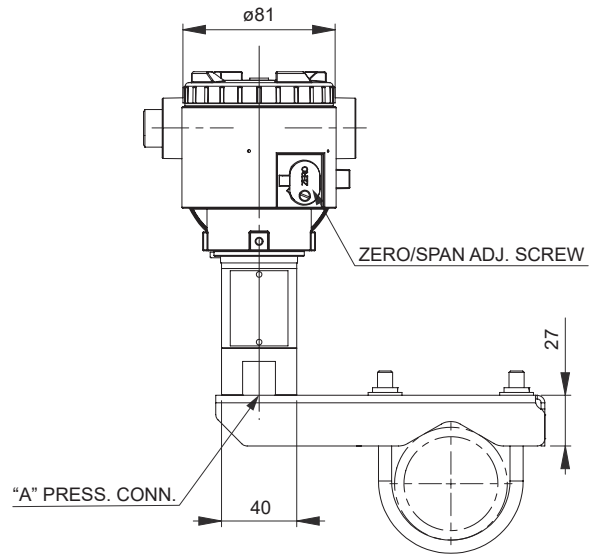
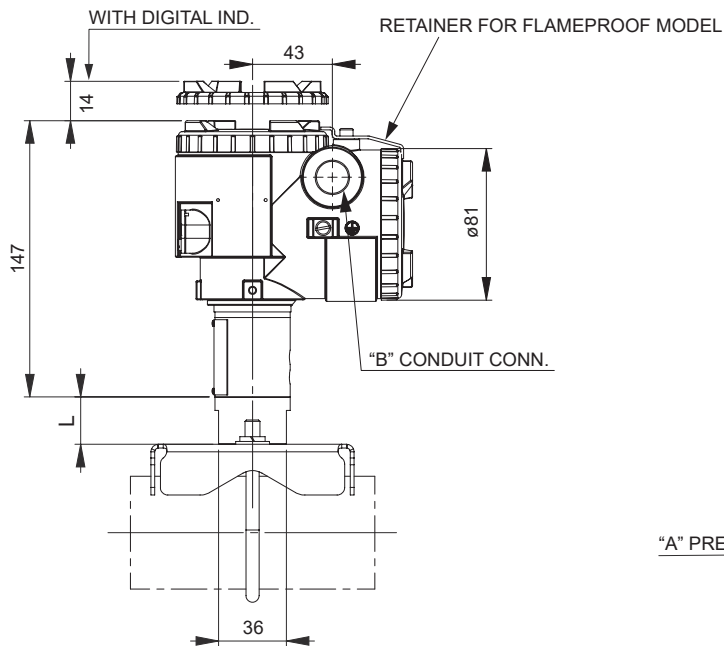
1- A Turn Down Ratio ≤10 is recommended for optimal performance.

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

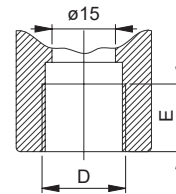
3- When no code can be found in the current model code, place "\*" in the corresponding digit code as well as in the 16th digit.

# **OUTLINE DIAGRAM (Unit : mm)**

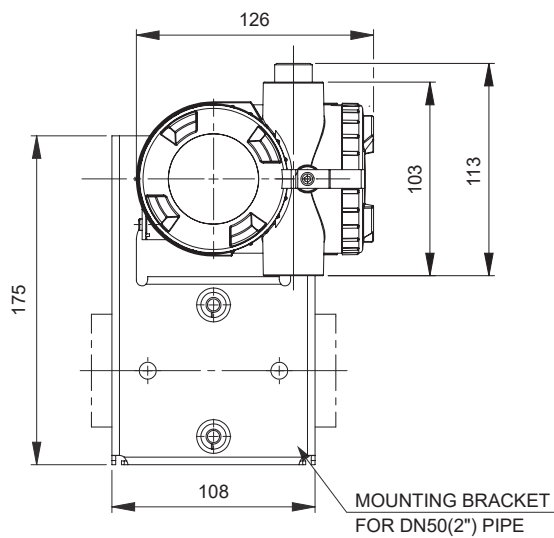
<L SHAPE> <4TH DIGIT CODE: T, V, W>



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.)

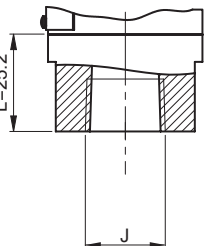
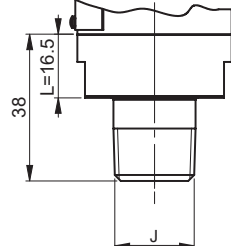
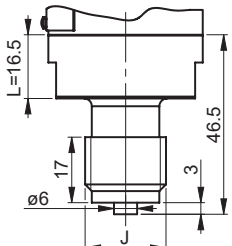
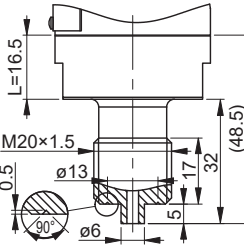
14TH MODEL CODE	Y	B	C	D	E	F
DIMENSIONS						
	J	1/2-14 NPTI	Rc 1/2	1/4-18 NPTI	1/2-14 NPTE	G1/2 A

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

**<T SHAPE> <4TH DIGIT CODE: 6, 7, 8>**



SEE TABLE 1

TABLE 1

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.)

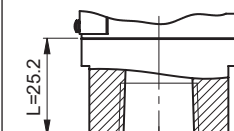
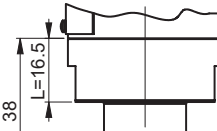
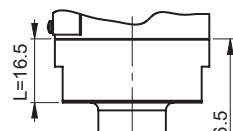
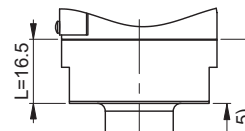
14TH MODEL CODE	Y	B	C	D	E	F
DIMENSIONS						
	J	1/2-14 NPTI	Rc 1/2	1/4-18 NPTI	1/2-14 NPTE	G1/2 A

TABLE 2

ADD : - 0.2 kg FOR INDICATOR

- 0.5 kg FOR MOUNTING BRACKET

- 2.0 kg FOR STAINLESS STEEL HOUSING OPTION



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