



Technology Solutions

TEK-FLEX 4100A

Explosion-Proof Guided Wave Radar Level Transmitter



LEVEL



Introduction

The Tek-Flex 4100A Explosion-Proof Guided Wave Radar Level Transmitter measures distance, level, interface, mass, and volume of liquids, pastes and slurries. It uses a probe to guide a signal to the measured product's surface; therefore, it can measure under challenging conditions. Tek-Flex 4100A performance is not affected by dust, foam, vapor, heated surfaces, boiling surfaces, pressure, temperature, and density changes. It's signal converter has four versions: compact, sensor extension with compact version, remote version, and double sensor extension with remote version. It is arranged with horizontal or vertical housing options for easy access to the device terminals and the optional display.



Fig 1: Tek-Flex 4100A

Working Principle

The Tek-Flex 4100A Explosion-Proof Guided Wave Radar (TDR) Level Transmitter is developed from a proven technology called Time Domain Reflectometry (TDR). It transmits low-intensity electromagnetic pulses of approximately one nanosecond width along a rigid or flexible conductor. These pulses transfer at the speed of light. When the pulses reach the product's surface to be measured it gets reflected with an intensity that depends on the dielectric constant (ϵ_r) of the product (for example, water has a high dielectric constant and reflects the pulse to the signal converter at 80% of its original intensity). Tek-Flex 4100A device measures the time duration from the pulse emission to received; where half of this time is equivalent to the distance from the device's reference point (the flange facing) to the product's surface. This measured time is converted into an output current of 4 to 20mA and/or a digital signal.

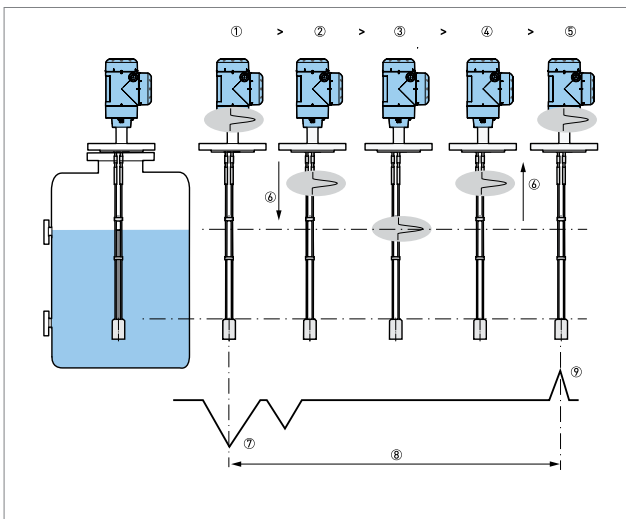


Fig 2: Measuring Principle of Tek-Flex 4100A

Where,

1. Time 0: The electromagnetic (EM) pulse is transmitted by the converter.
2. Time 1: The pulse goes down the probe at the speed of light in air, V_1 .
3. Time 2: The pulse is reflected.
4. Time 3: The pulse goes up the probe at speed, V_1 .
5. Time 4: The converter receives the pulse and records the signal.
6. The electromagnetic pulse transfer at speed, V_1 .
7. Transmitted electromagnetic pulse.
8. Half of this time is equivalent to the distance from the reference point of the device (the flange facing) to the product's surface.
9. Received electromagnetic pulse.

Components of Tek-Flex 4100A

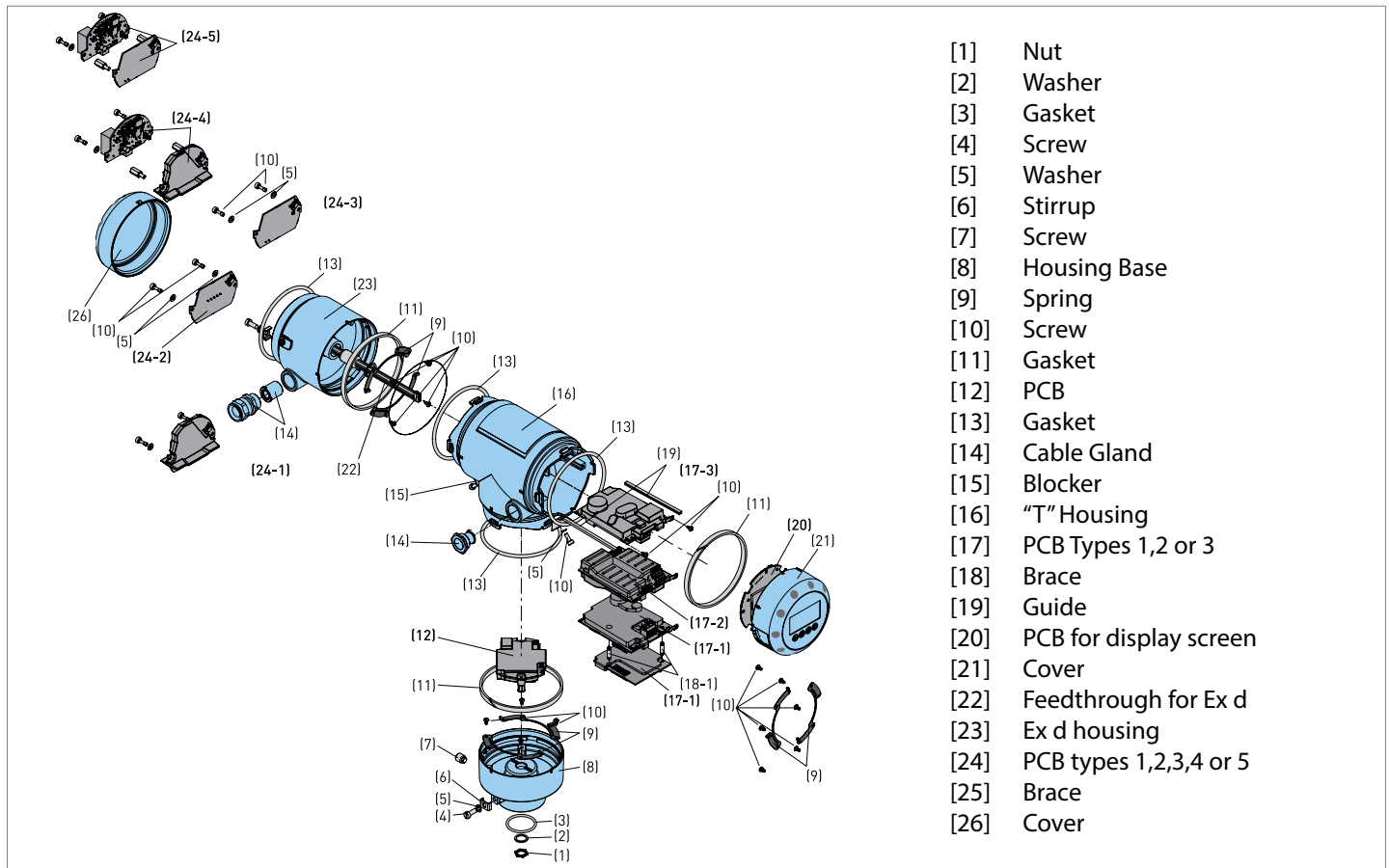


Fig 3: Components of Tek-Flex 4100A

Benefits

- Continuous level measurement in process or storage tanks, reactors, and pressure vessels.
- Precisely measures liquids, slurries, and solids level.
- Robust design.
- Highly accurate and reliable.
- High-end guided radar.
- Measuring distance up to 60m.
- 2-wire guided radar level transmitter based on the Time Domain Reflectometry (TDR) technology.
- Cost-effective and maintenance-free.
- Rotatable and removable transmitter.
- Stainless Steel housing for corrosive environment.
- Suitable for liquid storage and process applications.
- Pre-calibrated from factory for easy installation.
- Programmable fail safe mode.

Applications

- Oil and Gas Industries.
- Chemical Industries.
- Petrochemical Industries.
- Metal Industries.
- Minerals and Mining Industries.

Specifications

Accuracy	Standard:	±0.08" (±2mm) (distance ≤ 10m / 33ft) ±0.02% of measured distance (distance > 10m / 33ft)
	Interface:	±0.2" (±5 mm) (distance ≤ 10m / 33ft) ±0.05% of measured distance (distance > 10m/ 33ft)
Probe Options	Single Rod (Ø1/4" (Ø8mm)): Single-Piece or Segmented Type; Single Rod (Ø3/8" (Ø10mm)): Single-piece fully PTFE coated; Single Cable (Ø1/8" (Ø4mm))	
Measuring Range	Single-Piece or Single-piece fully PTFE coated: 3.28 to 13.12ft (0.6 to 4m); Segmented: 3.28 to 19.69ft (0.6 to 6m); Single Cable: 3.28 to 196.85ft (1 to 60m)	
Resolution	0.004" (0.1 mm)	
Repeatability	±0.04" (±1 mm)	
Temperature Limits	+59 to + 77°F (+15 to +25°C)	
Operating Temperature	-58 to + 482°F (-50 to +250°C); -58 to +302°F (-50 to 150°C)	
Ambient Temperature	-40 to + 176°F (-40 to +80°C)	
Storage Temperature	-58 to + 185°F (-50 to +85°C)	
Pressure Limits	Single fully PTFE-coated: -14.5 to 580psig (-1 to 40barg); Single ceramic process seal system: -14.5 to 1450psig (-1 to 100 barg)	
Humidity	60% ±15%	
Viscosity	10000mPa·s / 10000cP	
Dielectric Constant	≥1.6 in direct mode (interface: $\epsilon_r(\text{interface}) \gg \epsilon_r(\text{level})^2$)	
Material	316L SS; Hastelloy C; PTFE	
Process Connection	Thread, Flange	
Output Signal	4 to 20mA or HART output	
Power Supply	11.5 to 30VDC; 13.5 to 34VDC	
Display	LCD display (128 × 64 pixels in 8-step greyscale with 4-button keypad)	
Protection Class	IP68; IP66	
Enclosure	NEMA 4x	
Approvals	CE, Class I Div 1	

Dimensional Drawings

- Signal Converter and Probe Electronics Options

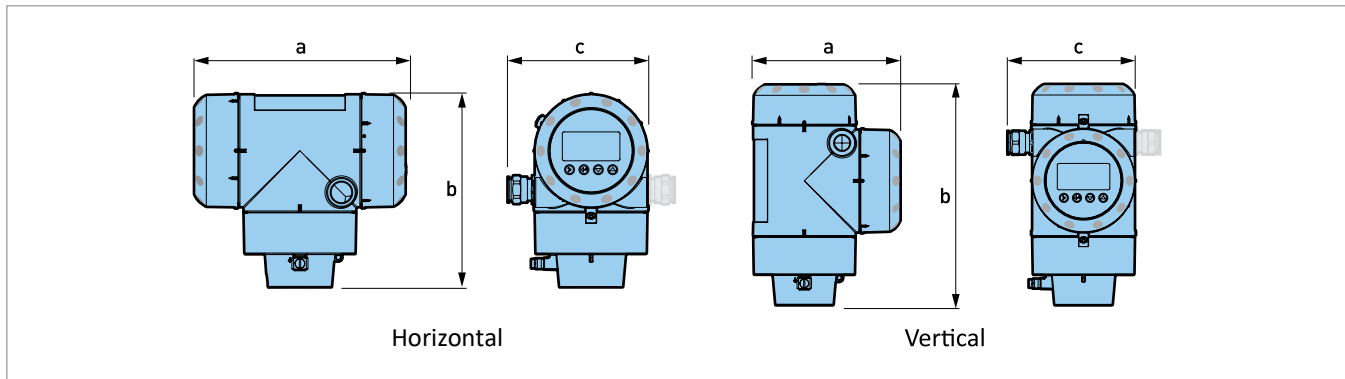


Fig 4: Compact Version

	a in (mm)		b in (mm)		c in (mm)	
	Horizontal	Vertical	Horizontal	Vertical	Horizontal	Vertical
Non-Ex / Ex i / IS	7 ½"(191)	5 ¾"(147)	7"(175)	8 ¾"(218)	5"(125)	5"(125)
Optional output / Ex d / XP	10 ¼"(258)	8 ½"(210)	7"(175)	8 ¾"(218)	5"(125) [6 ⅛"(153)]	5"(125) [6 ⅛"(153)]

*Note: Use the dimension in square brackets if the device has 2 current outputs or a switch output (relay).

- Sensor Extension with Vertical Compact Version

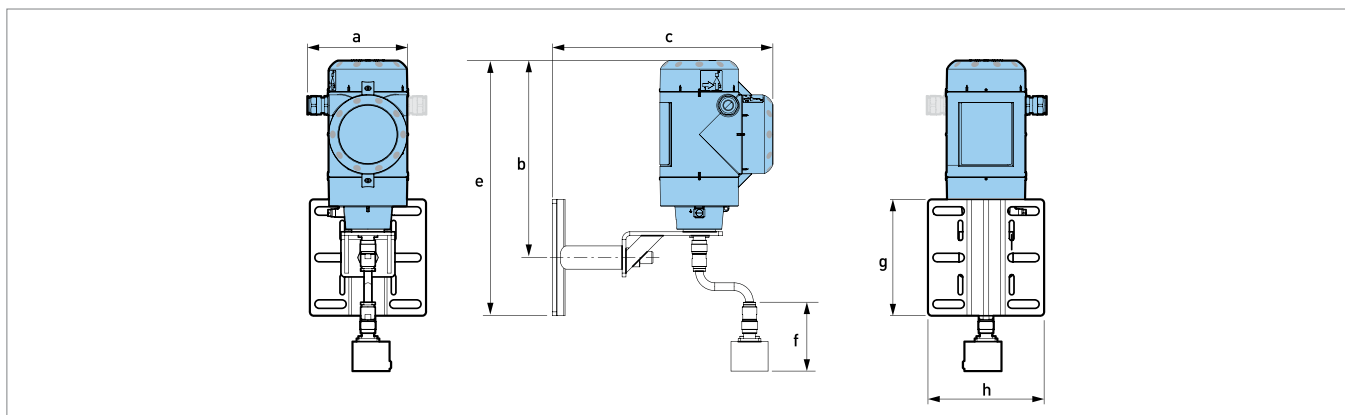


Fig 5: Vertical Sensor Extension

	a in (mm)	b in (mm)	c in (mm)	e in (mm)	f in (mm)	g in (mm)	h in (mm)
Non-Ex / Ex i / IS	5"(125)	10"(250)	11 ¼"(280.75)	13 ¼"(329)	3 ½"(89)	6"(150)	6"(150.4)
Optional output / Ex d / XP	5"(125) [6 ⅛"(153)]	10"(250)	13 ¾"(348.4)	13 ¼"(329)	3 ½"(89)	6"(150)	6"(150.4)

*Note: Use the dimension in square brackets if the device has 2 current outputs or a switch output (relay)

• **Double Sensor Extension with Remote Version- Wall Bracket**

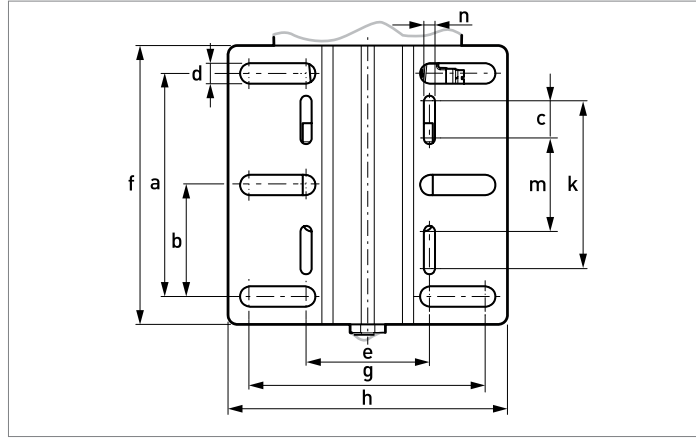


Fig 6: Wall Bracket

	a in (mm)	b in (mm)	c in (mm)	d in (mm)	e in (mm)	f in (mm)	g in (mm)	h in (mm)	k in (mm)	m in (mm)	n in (mm)
Wall Bracket	4 ¾" (120)	2 ¼" (60)	¾" (20)	3/8" (10)	2 ¾" (67.4)	6" (150)	5" (126.4)	6" (150.4)	3 ½" (90)	2" (50)	¼" (6)

*Note: Use the dimension in square brackets if the device has 2 current outputs or a switch output (relay).

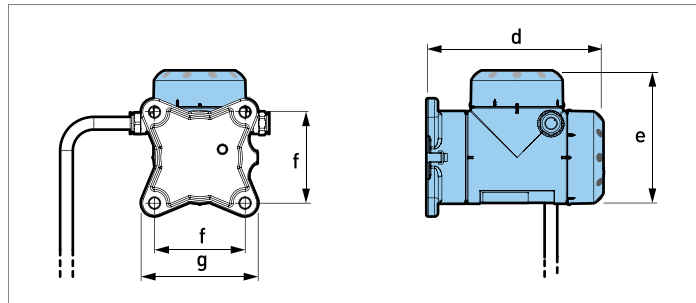


Fig 7: Remote Converter Housing

	d in (mm)	e in (mm)	f in (mm)	g in (mm)
Non-Ex / Ex i / IS	7 ¾" (195)	5 ¾" (146)	4" (100)	5 ¼" (130)
Optional output / Ex d / XP	7 ¾" (195)	5 ¾" (146)	4" (100)	5 ¼" (130)

• **Double Sensor Extension with Remote Version- Wall Bracket**

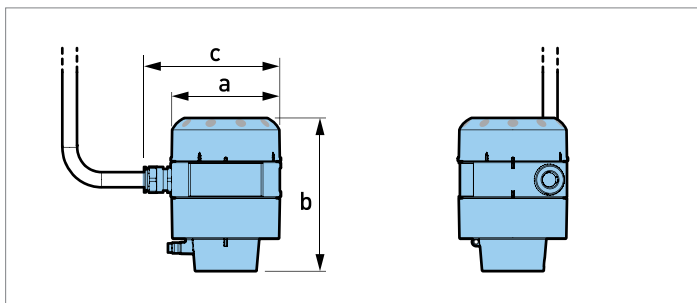


Fig 8: Probe Electronic Housing

	a in (mm)	b in (mm)	c in (mm)
Non-Ex / Ex i / IS	4 ¼" (104)	5 ¾" (142)	4" (100)
Optional output / Ex d / XP	7 ¾" (195)	5 ¾" (146)	4" (100)

- *Double Sensor extension with remote version- Probe Electronic Housing*

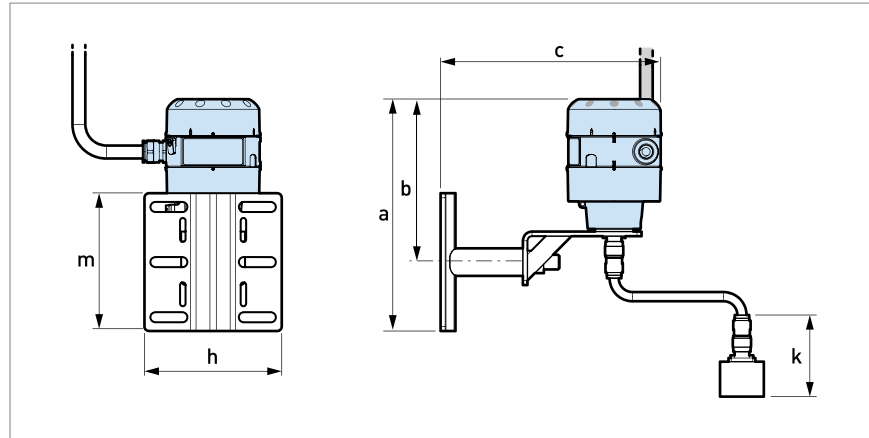


Fig 9: Double Sensor Extension-Probe Electronics Housing

	a in (mm)	b in (mm)	c in (mm)	h in (mm)	k in (mm)	m in (mm)
Probe Electronics Housing with Sensor Extension	10 1/8" (252.3)	7 1/8" (177.3)	9 3/4" (241)	6" (150.4)	3 1/2" (88.9)	6" (150)

Probe Options

- *Single Probe*

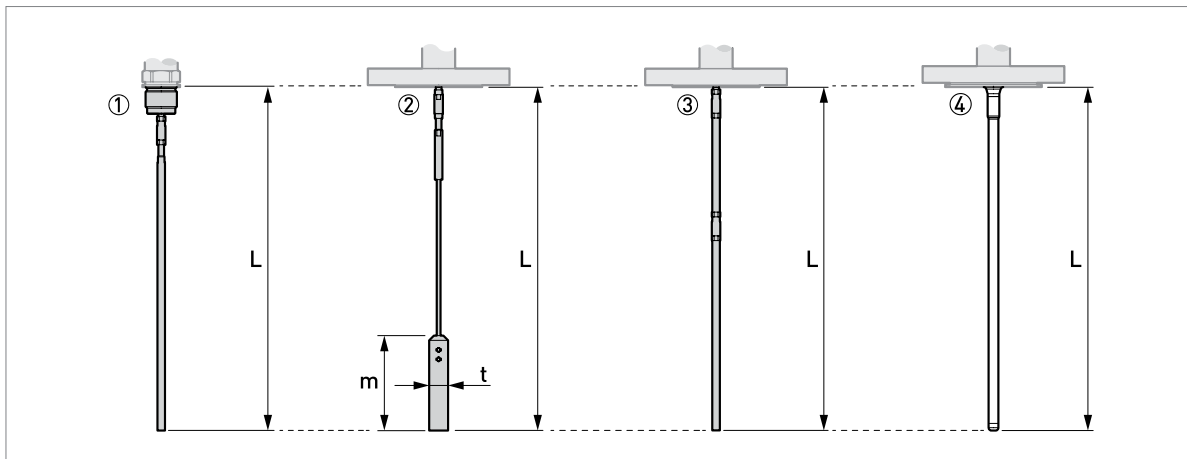


Fig 10: Single Probes

1. Single rod $\varnothing 1/4"$ ($\varnothing 8\text{mm}$)
2. Single cable $\varnothing 1/8"$ ($\varnothing 4\text{mm}$)
3. Single rod $\varnothing 1/4"$ ($\varnothing 8\text{mm}$) (segmented version)
4. Single rod $\varnothing 1/8"$ ($\varnothing 8\text{mm}$) with PTFE coating

Probes	L min in (mm)	L Max in (mm)	m in (mm)	t in (mm)
Single rod $\text{\O}1/4"$ ($\text{\O}8\text{mm}$)	24" (600)	160" (4000)	-	-
Single cable $\text{\O}1/8"$ ($\text{\O}4\text{mm}$)	40" (1000)	2400" (60000)	4" (100)	$3/4"$ (20)
Single rod $\text{\O}1/4"$ ($\text{\O}8\text{mm}$) (segmented version)	24" (600)	240" (6000)	-	-
Single rod $\text{\O}1/8"$ ($\text{\O}4\text{mm}$) with PTFE coating	24" (600)	160" (4000)	-	-

- Probe End Options for the $\text{\O}1/8"$ ($\text{\O}4\text{mm}$) Single Cable Probe

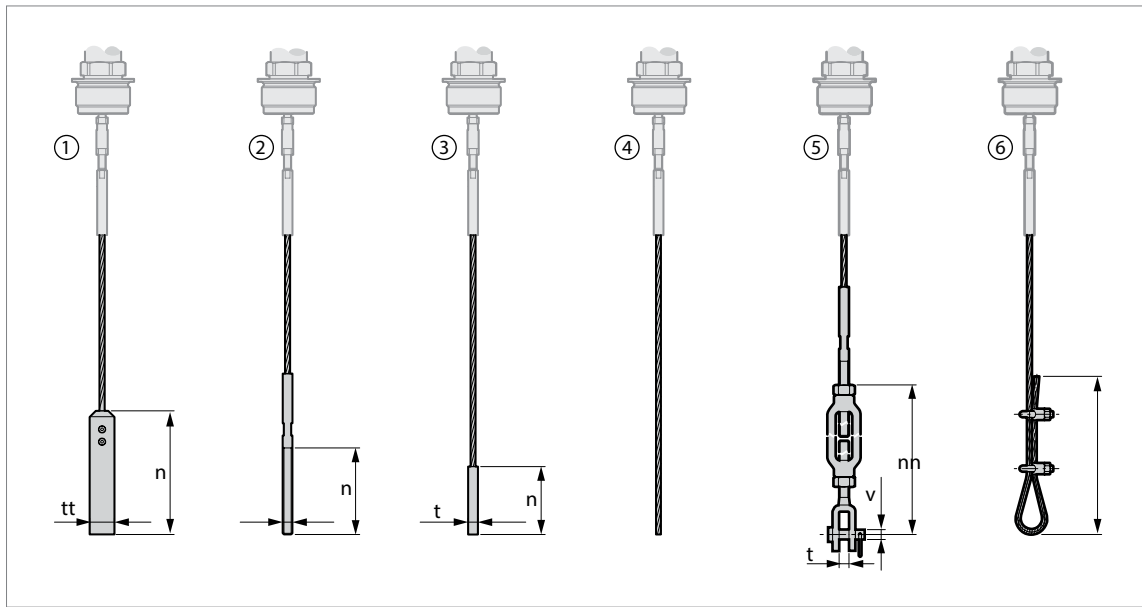


Fig 11: Probe End Options

Probe End Type	n in (mm)	t in (mm)	v in (mm)
Counterweight	4" (100)	$\text{\O}3/4"$ ($\text{\O}20$)	-
Threaded end	$2\ 3/4"$ (70)	M8	-
Crimped end	$2\ 1/4"$ (55)	$\text{\O}1/4"$ ($\text{\O}8$)	-
Open end	-	-	-
Turnbuckle	$6\ 3/4"$ (172)	$3/8"$ (11)	$\text{\O}1/4"$ ($\text{\O}6$)
Chuck	12" (300)	-	-

Model Chart

Example	Tek-Flex 4100A	00	01	01	A	A	XXX	01	A	DGC	Tek-Flex 4100A-00-01-01-A-A-XXX-01-A-DGC
Series	Tek-Flex 4100A										Explosion-Proof Guided Wave Radar Level Transmitter
Approval		00 01 02									Without ATEX 1 1 1 G Ex ia IIC T6 Ga + 1 1 1 D Ex ia IIIC Da FM IS CL 1/11/111 DIV 1 GPS A-G + CL I zone 0 Ex ia IIC T6 FM X P-AIS/ DIP/NI CL 1/11/111 Div 1 GPS A-G + CL I zone 1 I zone 2 Ex d[ia] I Ex nA[ia] IIC T6
Wetted Material/ Pressure			01 02								316L SS HASTELLOY® C
Probe type				01 02 03 04 05 06 07 08 09 10 11 12 13 14							Single rod Ø1/4" (Ø8mm) max. 4m (13.12ft) Single rod Ø1/4" (Ø8mm) segmented max.6m (19.69ft) Single rod Ø3/8" (Ø10mm) max. 4m (13.12ft) Single cable Ø1/8" (Ø4mm) max. 60m (196.85ft) counterweight 3/4"X 4" (20x100mm) Single cable Ø1/8" (Ø4mm) max. 60m (196.85ft) turnbuckle Single cable Ø1/8" (Ø4mm) max. 60m (196.85ft) chuck Single cable Ø1/8" (Ø4mm) max. 60m (196.85ft) threaded end Single cable Ø1/8" (Ø4mm) max. 60m (196.85ft) crimped end Single cable Ø1/8" (Ø4mm) max. 60m (196.85ft) open end Coaxial Ø3/4"(Ø22mm) max.6m (19.69ft) Coaxial Ø3/4"(Ø22mm) segmented max.6m (19.69ft) Double rod 2x Ø1/4" (Ø8mm) max. 4m (13.12ft) Double cable 2xØ1/8" (Ø4mm) max. 14m(45.93ft) counterweight 1 ½"X 2 ¼" (40X60mm) Reversed interface Ø3/8" (Ø10mm) max. 4m (13.12ft)
Temperature					A B C						(-40 to +392°F (-40 to +200°C)) (-4 to +392°F (-20 to +200°C)) Standard / -50 to +150°C (-58 to +302°F)
Process connection						A B C D E					3/4" NPT 1 NPT 1½ NPT 2" 150lb RF ASME B16.5 2" 300lb RF ASME B16.5
Probe Length							XXX				Probe length in inches
Output								01 02 03			2-wire / 4 to 20mA passive HART® 2 x 2-wire / 4 to 20mA passive HART® + 4 to 20mA passive 2-wire + 4-wire / 4 to 20mA passive HART® + switch output - relay (48VDC / 6 A; 24VDC / 6A)
Orientation									A B		Horizontal Vertical
Options										DCG CC WP Tag	Dynamic Gas-phase Compensation (DGC) Calibration Certificate Weather Protection Stainless Steel Tag Plate