TEKTROL
Technology Solutions

# TEK-FLEX 4100A

## Explosion-Proof Guided Wave Radar Level Transmitter

LEVEL

www.tek-trol.com

Flow | Level | Temperature | Pressure | Valves | Analyzers | Accessories | TekValSys

## 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 ($\varepsilon_r$) 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.

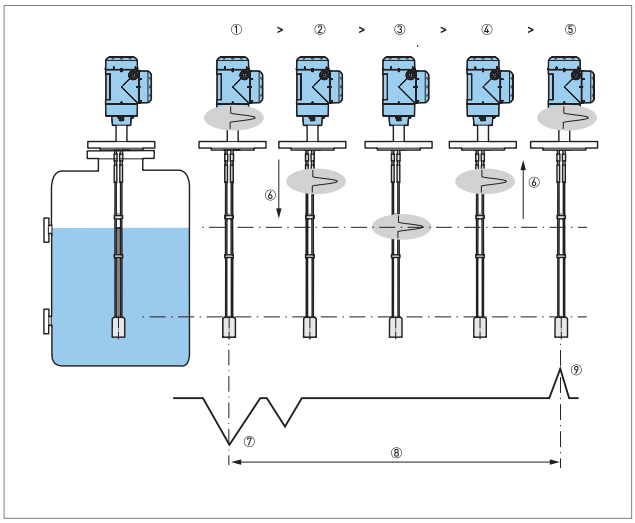
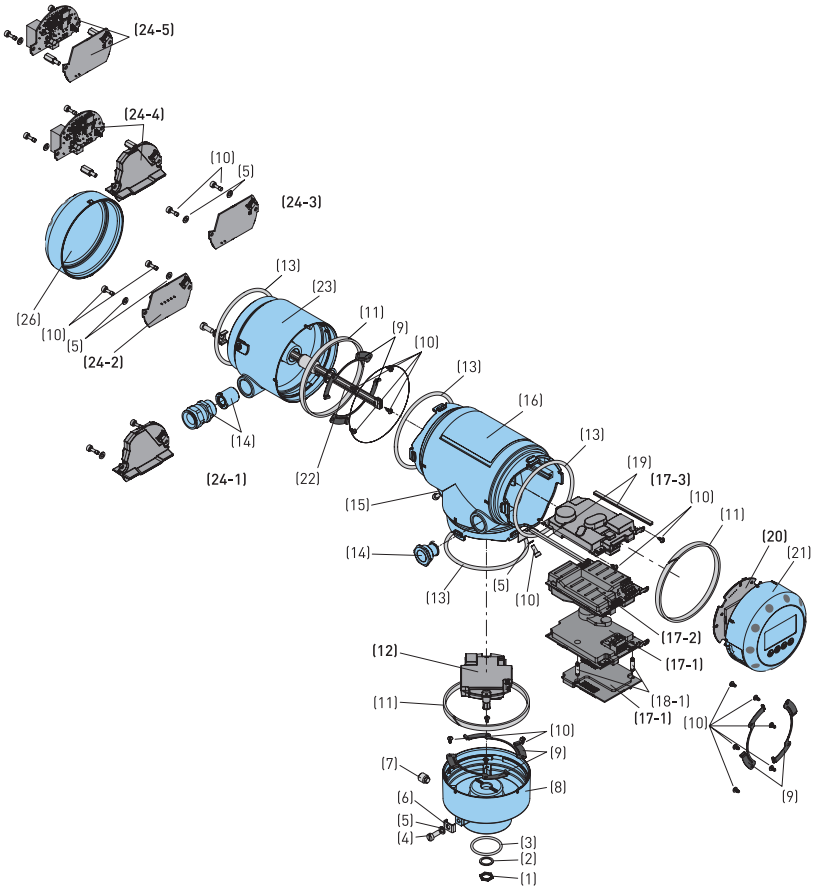



Fig 2: Measuring Principle of Tek-Flex 4100A

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, V1.
3. Time 2: The pulse is reflected.
4. Time 3: The pulse goes up the probe at speed, V1.
5. Time 4: The converter receives the pulse and records the signal.
6. The electromagnetic pulse transfer at speed, V1.
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




| | |
|---|---|
| [1] | Nut |
| [2] | Washer |
| [3] | Gasket |
| [4] | Screw |
| [5] | Washer |
| [6] | Stirrup |
| [7] | Screw |
| [8] | Housing Base |
| [9] | Spring |
| [10] | Screw |
| [11] | Gasket |
| [12] | PCB |
| [13] | Gasket |
| [14] | Cable Gland |
| [15] | Blocker |
| [16] | "T" Housing |
| [17] | PCB Types 1,2 or 3 |
| [18] | Brace |
| [19] | Guide |
| [20] | PCB for display screen |
| [21] | Cover |
| [22] | Feedthrough for Ex d |
| [23] | Ex d housing |
| [24] | PCB types 1,2,3,4 or 5 |
| [25] | Brace |
| [26] | Cover |

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)<br>±0.02% of measured distance (distance > 10m / 33ft) |
| | **Interface:** | ±0.2" (±5 mm) (distance ≤ 10m / 33ft)<br>±0.05% of measured distance (distance > 10m/ 33ft) |
| **Probe Options** | Single Rod (Ø1/4" (Ø8mm)): Single-Piece or Segmented Type;<br>Single Rod (Ø3/8" (Ø10mm)): Single-piece fully PTFE coated;<br>Single Cable (Ø1/8" (Ø4mm)) | |
| **Measuring Range** | Single-Piece or Single-piece fully PTFE coated: 3.28 to 13.12ft (0.6 to 4m);<br>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);<br>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: $\varepsilon_r$(interface) >> $\varepsilon_r$ (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** | cQPSus XP-IS/DIP-IS CL I DIV 1 GP A-G + CL I Z1 AEx db ia/Ex db ia IIC T6...T' Gb + Z21 AEx ia tb/Ex ia tb IIIC T85$^0$C...T'$^0$C Db | |

# Dimensional Drawings

- ## Signal Converter and Probe Electronics Options

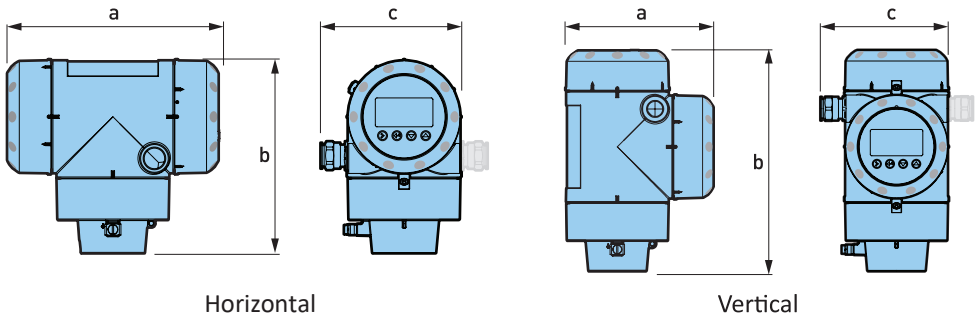



Fig 4: Compact Version

| | 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

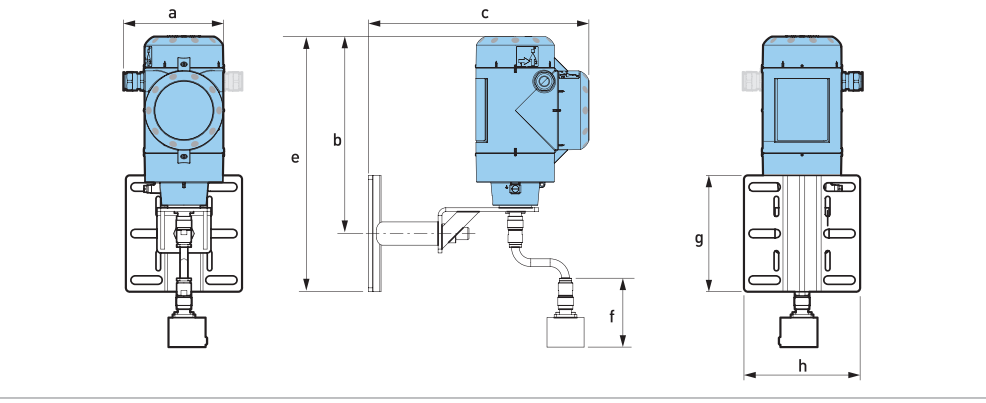



Fig 5: Vertical Sensor Extension

| | 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***

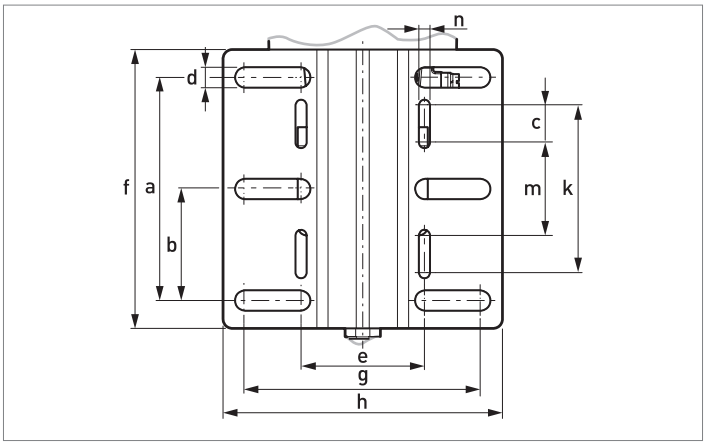



Fig 6: Wall Bracket

| | 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).

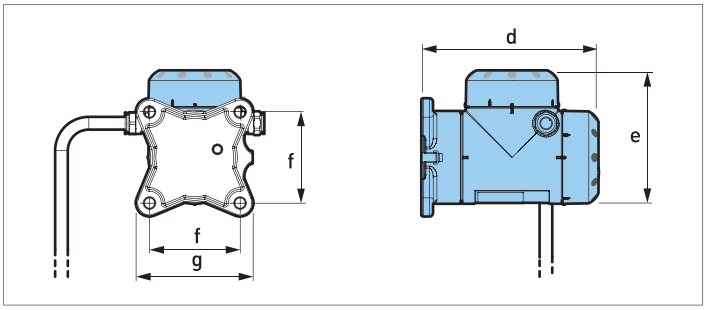



Fig 7: Remote Converter Housing

| | 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***

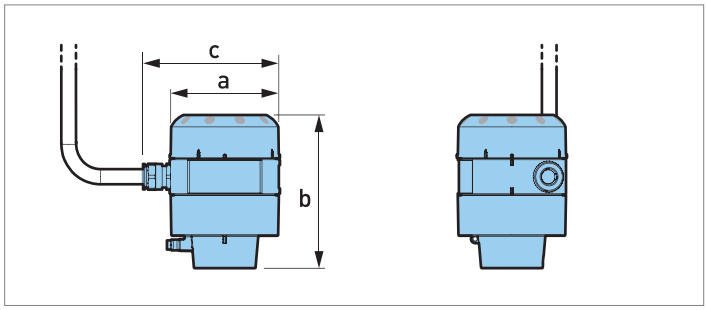



Fig 8: Probe Electronic Housing

| | 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*

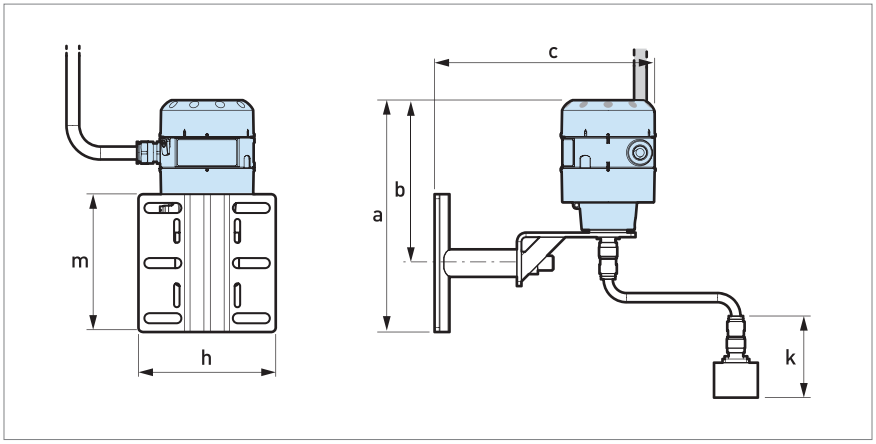



Fig 9: Double Sensor Extension-Probe Electronics Housing

| | 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 ¾" (241) | 6" (150.4) | 3 ½" (88.9) | 6" (150) |

# Probe Options

- *Single Probe*

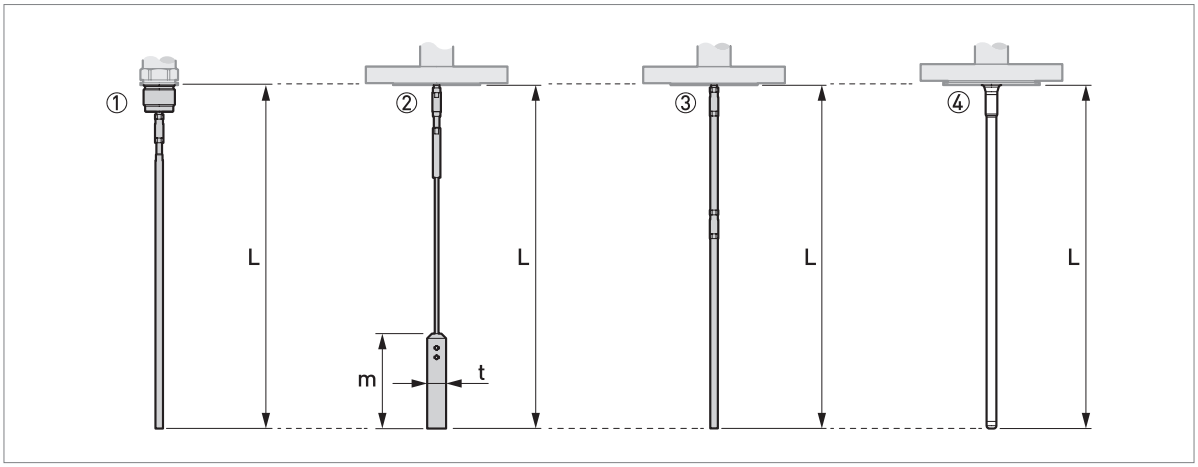



Fig 10: Single Probes

1. Single rod Ø¼" (Ø8mm)
2. Single cable Ø⅛" (Ø4mm)
3. Single rod Ø¼" (Ø8mm) (segmented version)
4. Single rod Ø⅛" (Ø8mm) with PTFE coating

| Probes | L min in (mm) | L Max in (mm) | m in (mm) | t in (mm) |
|---|---|---|---|---|
| Single rod Ø¼" (Ø8mm) | 24" (600) | 160" (4000) | - | - |
| Single cable Ø⅛" (Ø4mm) | 40" (1000) | 2400" (60000) | 4" (100) | ¾" (20) |
| Single rod Ø¼" ( Ø8mm) (segmented version) | 24" (600) | 240" (6000) | - | - |
| Single rod Ø⅛" ( Ø8mm) with PTFE coating | 24" (600) | 160" (4000) | - | - |

- ***Probe End Options for the Ø1/8" (Ø4mm) Single Cable Probe***

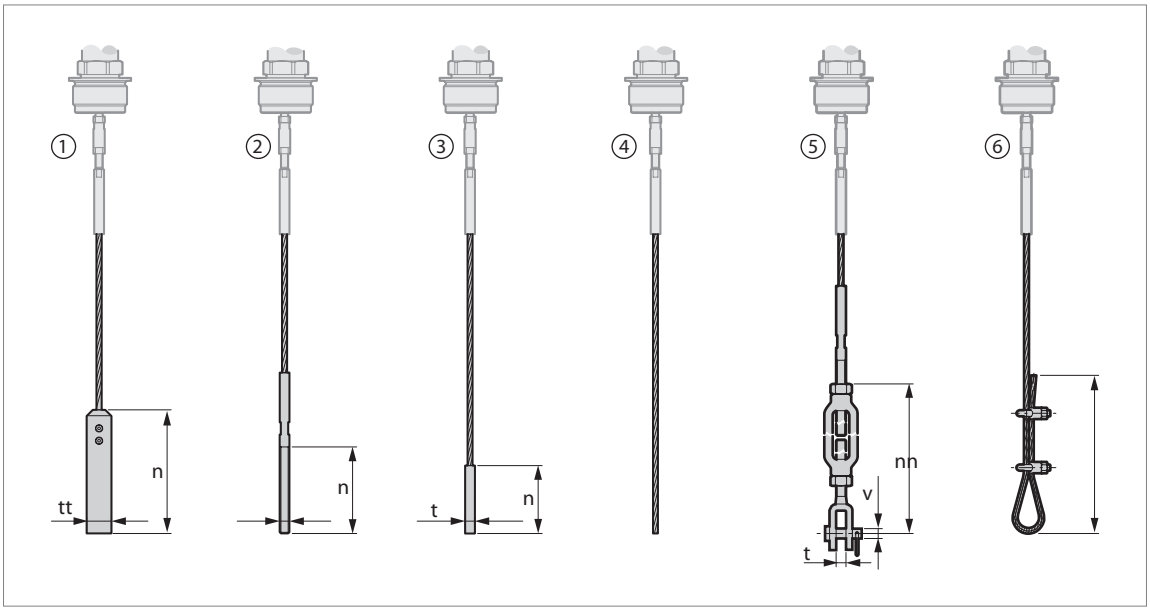



Fig 11: Probe End Options

| Probe End Type | n in (mm) | t in (mm) | v in (mm) |
|---|---|---|---|
| Counterweight | 4" (100) | Ø¾" (Ø20) | - |
| Threaded end | 2 ¾" (70) | M8 | - |
| Crimped end | 2 ¼" (55) | Ø¼" (Ø8) | - |
| Open end | - | - | - |
| Turnbuckle | 6 ¾" (172) | 3/8" (11) | Ø¼" (Ø6) |
| 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 | | | | | | | | | Without |
| | | 01 | | | | | | | | | ATEX 1 1 1 G Ex ia IIC T6 Ga + 1 1 1 D Ex ia IIIC Da |
| | | 02 | | | | | | | | | cQPSus XP-IS/DIP-IS CL I DIV 1 GP A-G + CL I Z1 AEx db ia/Ex db ia IIC T6...T' Gb + Z21 AEx ia tb/Ex ia tb IIIC T85°C...T'°C Db |
| **Wetted Material/ Pressure** | | | 01 | | | | | | | | 316L SS |
| | | | 02 | | | | | | | | HASTELLOY® C |
| **Probe type** | | | | 01 | | | | | | | Single rod Ø1/4" (Ø8mm) max. 4m (13.12ft) |
| | | | | 02 | | | | | | | Single rod Ø1/4" (Ø8mm) segmented max.6m (19.69ft) |
| | | | | 03 | | | | | | | Single rod Ø3/8" (Ø10mm) max. 4m (13.12ft) |
| | | | | 04 | | | | | | | Single cable Ø1/8" (Ø4mm) max. 60m (196.85ft) counterweight 3/4"X 4" (20×100mm) |
| | | | | 05 | | | | | | | Single cable Ø1/8" (Ø4mm) max. 60m (196.85ft) turnbuckle |
| | | | | 06 | | | | | | | Single cable Ø1/8" (Ø4mm) max. 60m (196.85ft) chuck |
| | | | | 07 | | | | | | | Single cable Ø1/8" (Ø4mm) max. 60m (196.85ft) threaded end |
| | | | | 08 | | | | | | | Single cable Ø1/8" (Ø4mm) max. 60m (196.85ft) crimped end |
| | | | | 09 | | | | | | | Single cable Ø1/8" (Ø4mm) max. 60m (196.85ft) open end |
| | | | | 10 | | | | | | | Coaxial Ø3/4"(Ø22mm) max.6m (19.69ft) |
| | | | | 11 | | | | | | | Coaxial Ø3/4"(Ø22mm) segmented max.6m (19.69ft) |
| | | | | 12 | | | | | | | Double rod 2× Ø1/4" (Ø8mm) max. 4m (13.12ft) |
| | | | | 13 | | | | | | | Double cable 2×Ø⅛" (Ø4mm) max. 14m(45.93ft) counterweight 1 ½"X 2 ¼" (40X60mm) |
| | | | | 14 | | | | | | | Reversed interface Ø⅜" (Ø10mm) max. 4m (13.12ft) |
| **Temperature** | | | | | A | | | | | | (-40 to +392°F (-40 to +200°C)) |
| | | | | | B | | | | | | (-4 to +392°F (-20 to +200°C)) |
| | | | | | C | | | | | | Standard / -50 to +150°C (-58 to +302°F) |
| **Process connection** | | | | | | A | | | | | 3/4" NPT |
| | | | | | | B | | | | | 1 NPT |
| | | | | | | C | | | | | 1½ NPT |
| | | | | | | D | | | | | 2" 150lb RF ASME B16.5 |
| | | | | | | E | | | | | 2" 300lb RF ASME B16.5 |
| **Probe Length** | | | | | | | XXX | | | | Probe length in inches |
| **Output** | | | | | | | | 01 | | | 2-wire / 4 to 20mA passive HART® |
| | | | | | | | | 02 | | | 2 × 2-wire / 4 to 20mA passive HART® + 4 to 20mA passive |
| | | | | | | | | 03 | | | 2-wire + 4-wire / 4 to 20mA passive HART® + switch output - relay (48VDC / 6 A; 24VDC / 6A) |
| **Orientation** | | | | | | | | | A | | Horizontal |
| | | | | | | | | | B | | Vertical |
| **Options** | | | | | | | | | | DCG | Dynamic Gas-phase Compensation (DGC) |
| | | | | | | | | | | CC | Calibration Certificate |
| | | | | | | | | | | WP | Weather Protection |
| | | | | | | | | | | Tag | Stainless Steel Tag Plate |

# Customer Service & Support



www.tek-trol.com

**Tek-Trol LLC**

796 Tek Drive Crystal Lake, IL 60014,
USA
Sales: +1 847-857-6076

Support: +1 847-857-6076 | Email: tektrol@tek-trol.com | www.tek-trol.com

Tek-Trol is a fully owned subsidiary of TEKMATION LLC. We offer our customers a comprehensive range of products and solutions for process, power and oil & gas industries. Tek-Trol provides process measurement and control products for Flow, Level, Temperature & Pressure measurement, Control valves & Analyzer systems. We are present in 15 locations globally and are known for our knowledge, innovative solutions, reliable products and global presence.