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Instrumentation 2020

Signet

Insertion Flowmeters

Presented by:
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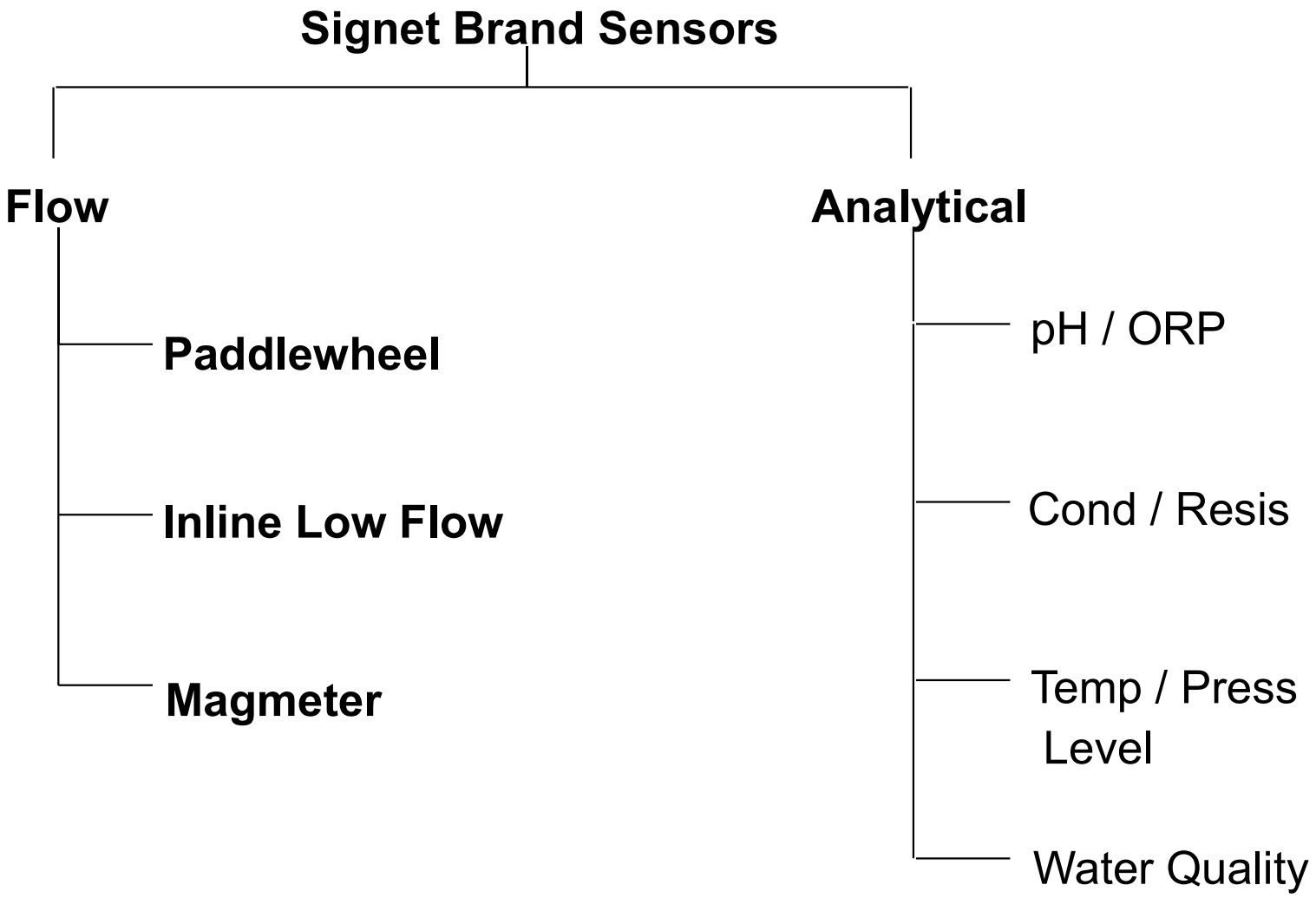
Dave Vollaire Product Manager

Flow: Introduction to GF Sensors



Flow Sensors - Paddlewheel

Paddlewheel

Metal

Adjustable Stainless
(Low Flow)

Hot-Tap

Metalex
(High Temp / Press)

Plastic

Rotor-X **Red Cap**
(Self-Powered)

Wet-Tap

Battery Operated

Low Flow **Blue Cap**
(Low Flow)

Wet-Tap

Blind Electronics

Flow Sensors -

Magmeter

2551 Blind

2551 w/
Display

2551 w/
Integral 9900

Paddlewheel

515 Rotor-X
Red Cap
(Self-Powered)

8150 Battery Operated

2536 Low Flow **Blue Cap**
(Low Flow)

2537 Blind Electronics

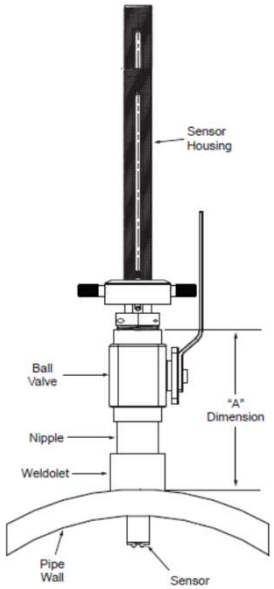
Flow Sensors - Magmeter

Magmeter

Metal

Adjustable

Hot-Tap



Plastic

Blind

Display

Flow Sensors – Inline Low Flow

Inline Low Flow

Turbine Flow
0.1 to 10 GPM

Micro Flow
0.03 to 3.2 GPM

Mini Flow
0.1 to 3.2 GPM

515 Rotor-X Paddlewheel Flow Sensor

- **Self-powered**
- 1 to 20 fps flow rates (20:1 turn-down ratio)
- Compatible with all Signet brand flow indicators
- Choices of chemical resistant materials
- Three Sizes (0.5”- 4”, 5” - 8”, 10” and above)
- Bi-Directional flow sensing
- 25’ cable, maximum 200’
- Requires Signet Installation Fitting

515 Rotor-X Paddlewheel Wet-Tap

3519 Wet-Tap Valve Assembly

- **Self-powered**
- 1 to 20 fps flow rates (20:1 turn-down ratio)
- Compatible with all Signet brand flow indicators
- Choices of chemical resistant materials
- Three Sizes (0.5”- 4”, 5” - 8”, 10” and above
- Bi-directional flow sensing
- 25’ cable, maximum 200’
- Requires Signet Installation Fitting
- Allows sensor removal at pressures up to 25 psi @ 72° F

The 3519 Wet-Tap consists flange /support plate that threads onto the pipe fitting insert, with PVC ball valve, extended length, wettap sensor inserted into pipe.

8150 Battery Operated Sensor / Meter

- **Battery Operated Flow / Totalizer**
- Nominal 4 year battery life
- 1 to 20 fps flow rates (20:1 turn-down ratio)
- Stand-alone
- Choices of chemical resistant materials
- Two Sizes (0.5”- 4” and 5” - 8”)
- Bi-Directional flow sensing
- Requires Signet Installation Fitting

2536 Rotor-X Paddlewheel Low Flow

- **Powered Open-Collector Pulse**
- Low flow 0.3 to 20 fps (66:1 turn-down ratio)
- Requires 3.3 - 24 VDC
- Interfaces w/ high-speed inputs on PLC's & Computers
- Choices of chemical resistant materials
- Three Sizes (0.5" - 4", 5" - 8", 10" and above
- Bi-directional flow sensing
- Strong noise immunity
- 25' cable, maximum 1000'
- Requires Signet Installation Fitting

2536 Rotor-X Paddlewheel Wet-Tap

- **Powered Open-Collector Pulse**
- Low flow 0.3 to 20 fps (66:1 turn-down ratio)
- Requires 3.3 - 24 VDC
- Interfaces w/ high-speed inputs on PLC's & Computers
- Choices of chemical resistant materials
- Three Sizes (0.5" - 4", 5" - 8", 10" and above
- Bi-directional flow sensing
- Strong noise immunity
- 25' cable, maximum 1000'
- Requires Signet Installation Fitting
- Allows sensor removal at pressures up to 25 psi @ 72° F

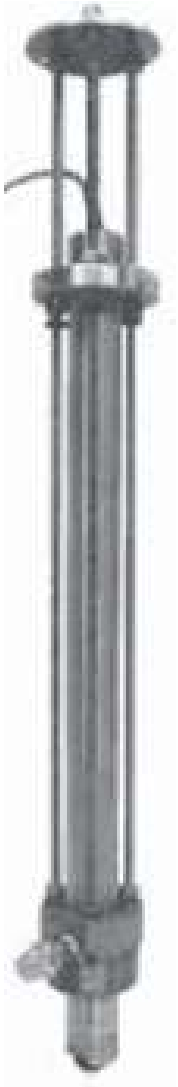
2537 Paddlewheel Flow Sensor

- **Choice of optional outputs**
- Low flow 0.3 to 20 fps (66:1 turn-down ratio)
- Proportional pulse, flow switch, S3L, or analog 4-20 mA
- Choices of chemical resistant materials
- Two Sizes (0.5” - 4”, 5” - 8”)
- Bi-directional flow sensing
- NEMA 4X
- Electronic Module for remote applications

2540 Stainless Paddlewheel Flow

- **Adjustable, one size fits 1.5” – 24”**
- Standard 1.5” F-NPT fittings (saddles, thread-o-lets)
- Low flow 0.3 to 20 fps (66:1 turn-down ratio)
- Requires 5-24 VDC
- For metal or plastic piping
- Open-collector pulse
- Interfaces w/ high-speed inputs on PLC’s & Computers
- Field replaceable sensor electronics
- 25’ cable, maximum 1000’

2540 Stainless Paddlewheel Flow Hot-Tap version



- **Adjustable, one size fits 1.5” – 24”**
- Standard 1.5” F-NPT fittings (saddles, thread-o-lets)
- Low flow 0.3 to 20 fps (66:1 turn-down ratio)
- Requires 5-24 VDC
- For metal or plastic piping
- Open-collector pulse
- Interfaces w/ high-speed inputs on PLC’s & Computers
- Field replaceable sensor electronics
- 25’ cable, maximum 1000’
- Hot-Tap for initial installation, and subsequent removal (requires pipe fitting, close nipple, full-port ball valve)

525 Metalex Paddlewheel Flow Sensor

- **High Pressure up to 1500 psi**
- High temperature up to 300° F
- 1.6 to 20 fps flow rates
- 316 Stainless Steel
- Two Sizes (0.5”-1”, 1.25” - 12”)
- 25’ cable, maximum 200’
- Requires Signet Metalex Installation Fitting

2551 Insertion Plastic Magmeter

- **No moving parts to wear or foul**
- Low flow 0.15 to 33 fps (220:1 turn-down ratio)
- Fits into Signet Installation Fittings
- Blind version options open-collector / S3L, or 4-20 mA
- Display w/ Freq, or display w/ 4-20 mA, plus relay option
- Choices of chemical resistant materials
- Three Sizes (0.5” - 4”, 5” - 8”, 10” and above)
- Bi-directional flow sensing

Plastic Insertion Sensors - Choice of Fittings

- Mount sensors in any Signet fitting from 0.5 to 12 inches (DN 15 to DN 200) (Special fittings available up to 36”)

Use any Signet Fitting:

PP

PVDF

PVC

CPVC

Iron

Carbon Steel

Copper

Brass

SST

Brass

Metric PP Union Tee Fittings

Iron Strap-on Saddles

PVC Clamp-on Saddles

CPVC (shown) or PVC Tees

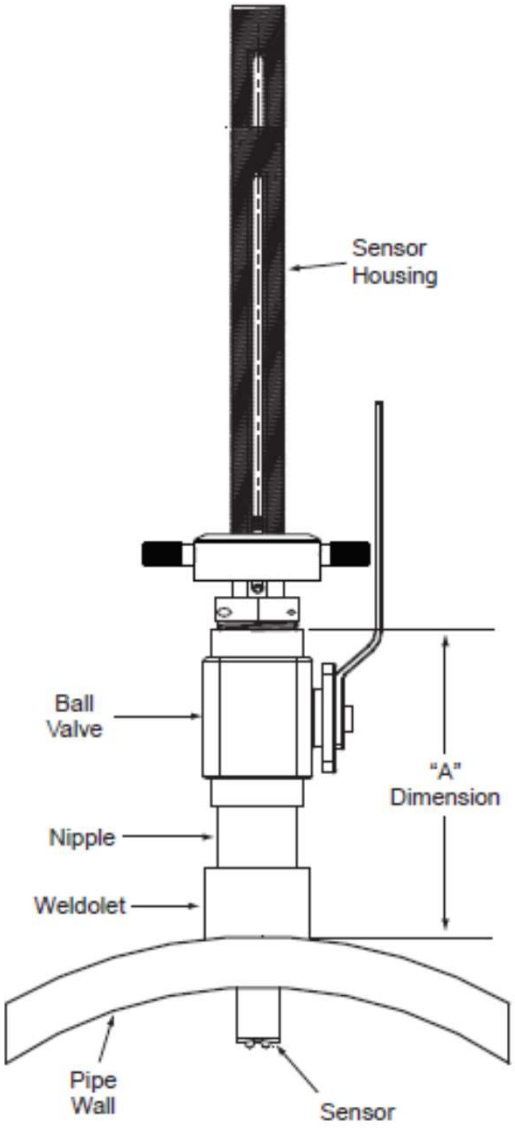
PP or PVDF Wafer Fittings

316 SS Threaded Tee w/PVDF insert

2552 Metal Magmeter Flow Sensor

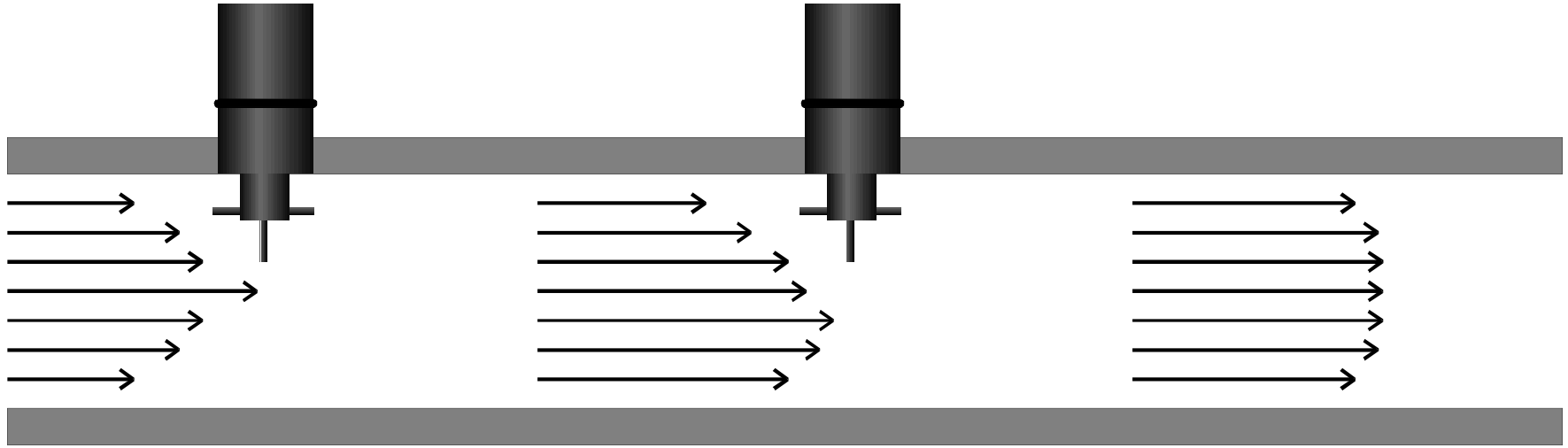
- **Adjustable, one size fits 2” - 48”**
- No moving parts to wear or foul
- More accurate than paddlewheels
- Standard 1.25” F-NPT fittings (saddles, thread-o-lets)
- Low flow 0.15 to 33 fps (220:1 turn-down ratio)
- Optional outputs (open-collector or analog 4-20 mA)
- Bi-directional flow sensing
- For metal or plastic piping
- Pressures up to 300 psi @ 77° F, or 185°F @ 10 psi

2552 Hot-Tap Magmeter Flow Sensor



- **Adjustable, one size fits 2” - 48”**
- No moving parts to wear or foul
- More accurate than paddlewheels
- Easily removed and reinstalled
- Standard 1.25” F-NPT fittings (saddles, thread-o-lets)
- Low flow 0.15 to 33 fps (220:1 turn-down ratio)
- Optional outputs (open-collector or analog 4-20 mA)
- Bi-directional flow sensing
- For metal or plastic piping
- Pressures up to 300 psi @ 77° F, or 104°F @ 200 psi
- Hot-Tap for initial installation, and subsequent removal (requires pipe fitting, close nipple, full-port ball valve)

Flow: Sensor - General Information, Flow Profile



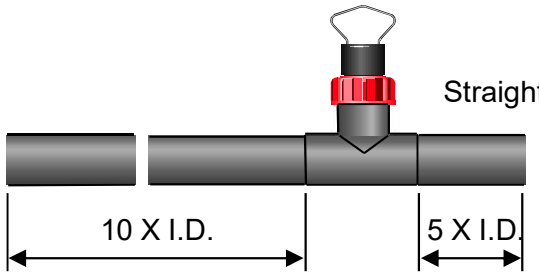
Laminar Flow: Usually occurs with highly viscous fluids or fluids traveling at a low velocity.

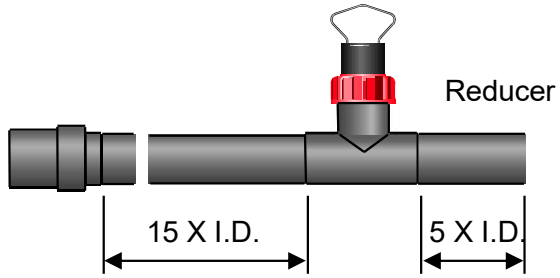
Disturbed Turbulent Flow: Usually occurs when flow is interrupted by a valve or close proximity of an elbow.

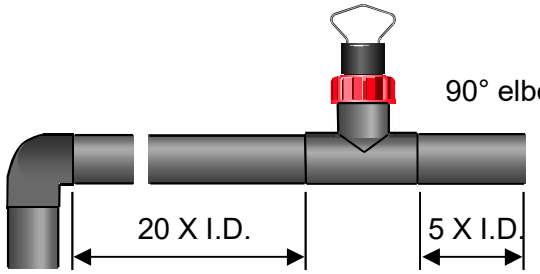
Developed Turbulent flow: Required for Signet sensors. The fully developed flow occurs when the sensor is installed in the proper location of the system.

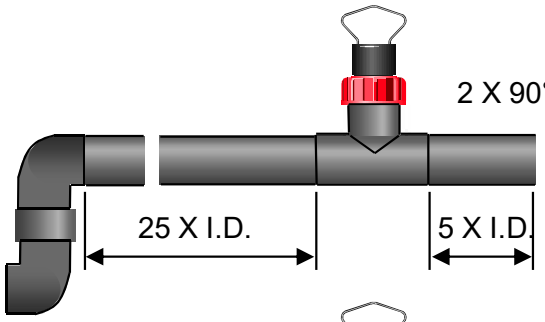
Flow: Sensor - General Information, Sensor Placement

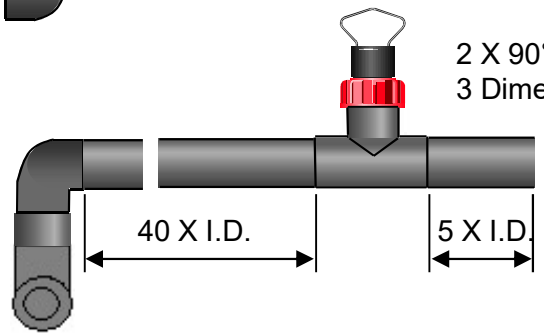
Upstream and Downstream mounting requirements:

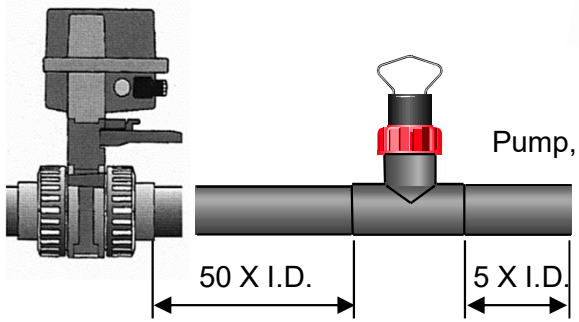








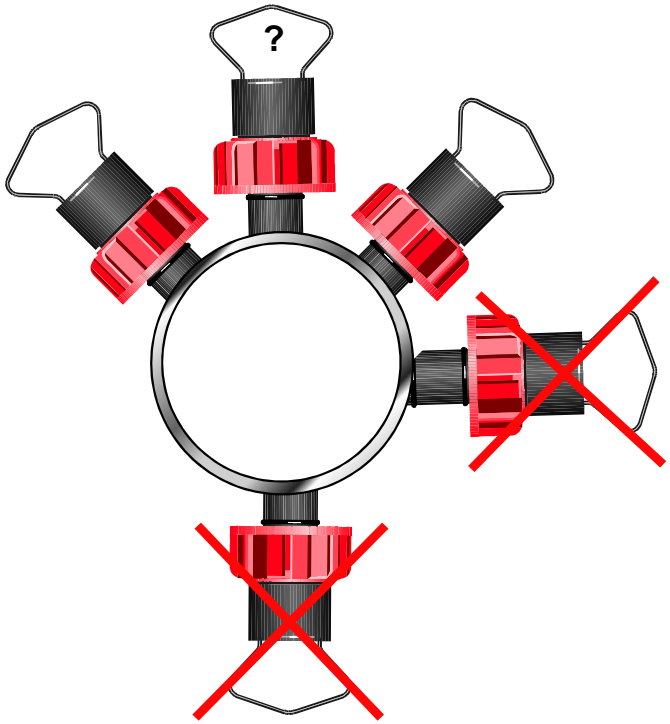




Flow: Sensor - General Information, Sensor Positioning

How important is the sensor position in the pipe?

- Signet fittings
- Each family of flow sensors have different mounting requirements, it can also be application dependent.
- Refer the specific flow sensor manual for correct procedures



Flow: Sensor - General Information, K- factor

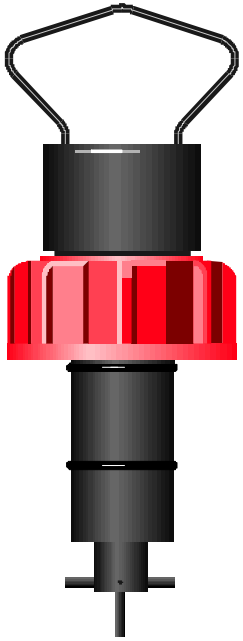
- K-Factor = Number of pulses generated by the sensor for each unit (liter or gallons) of liquid that passes the sensor
- K- Factor selection is determined by the pipe size and material
- K-Factor numbers are located in each flow sensor manual
- K-Factor is entered into the monitor/controller/transmitter
- NOTE: K Factor is based on water

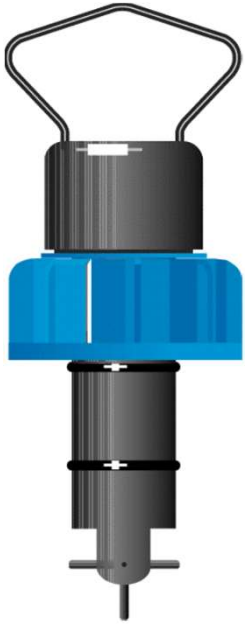
PIPE SIZE (IN.)	FITTING	515/8510-XX		2536/8512-XX	
		LITERS	U.S. GAL	LITERS	U.S. GAL
SCH 80 PVC TEES FOR SCH 80 PVC PIPE					
1/2	MPV8T005	137.42	520.12	271.37	1027.1
3/4	MPV8T007	78.61	297.52	154.08	583.19
1	MPV8T010	45.46	172.07	88.65	335.53
1-1/4	MPV8T012	24.19	91.54	47.24	178.79
1-1/2	MPV8T015	16.44	62.22	32.08	121.42
2	MPV8T020	9.60	36.32	18.87	71.44
SCH 80 PVC TEES FOR SCH 80 PVC PIPE					
2-1/2	PV8T025	5.7683	21.833	11.359	42.994
3	PV8T030	3.5775	13.541	7.0414	26.652
4	PV8T040	2.0147	7.6258	3.9645	15.006

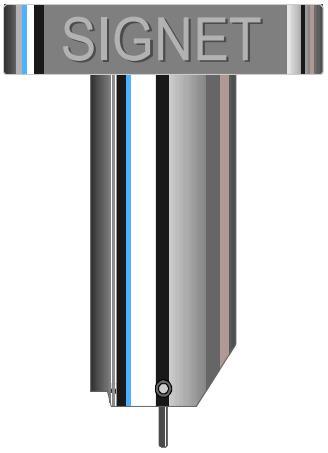
Flow: Introduction to Paddlewheel Sensors

- **Theory of operation:**

Paddlewheel



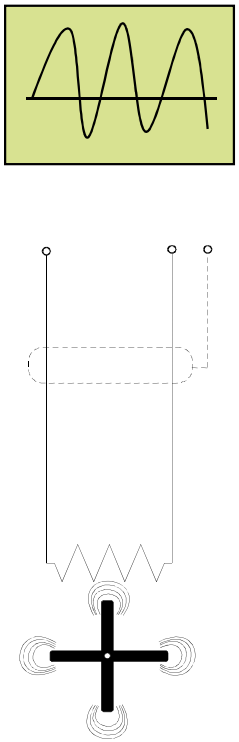




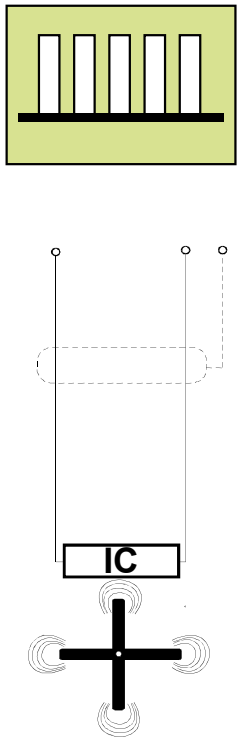
Flow: Paddlewheel Theory of Operation

Types of Sensors:

- **Inserted into each blade of the paddle wheel is a magnet.**

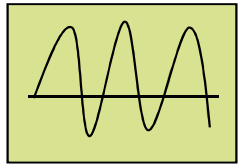


Paddlewheel with coil
Requires no external power

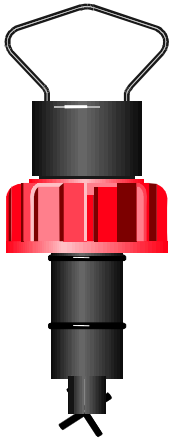


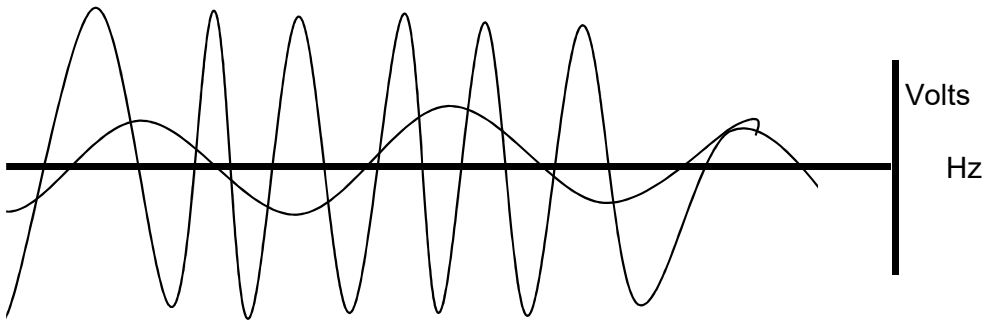
Paddlewheel with hall effect transistor output
Requires an external power source

Flow: Paddlewheel Theory of Operation, Sinusoidal Signal



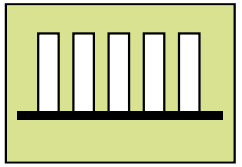
- **Sinusoidal (Sine wave)**



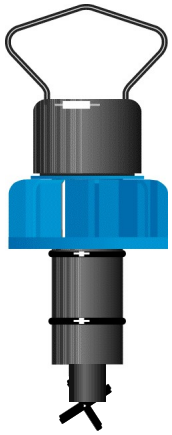


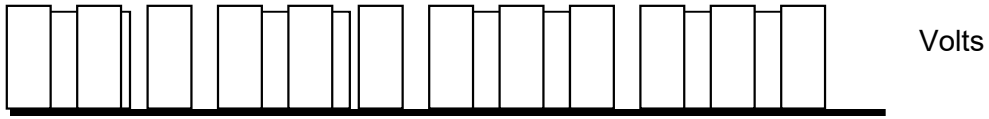
Frequency (Hz) and amplitude (voltage) vary with flow rate

Flow: Paddlewheel Theory of Operation, Open Collector Output



- Transistor Type (Square wave)

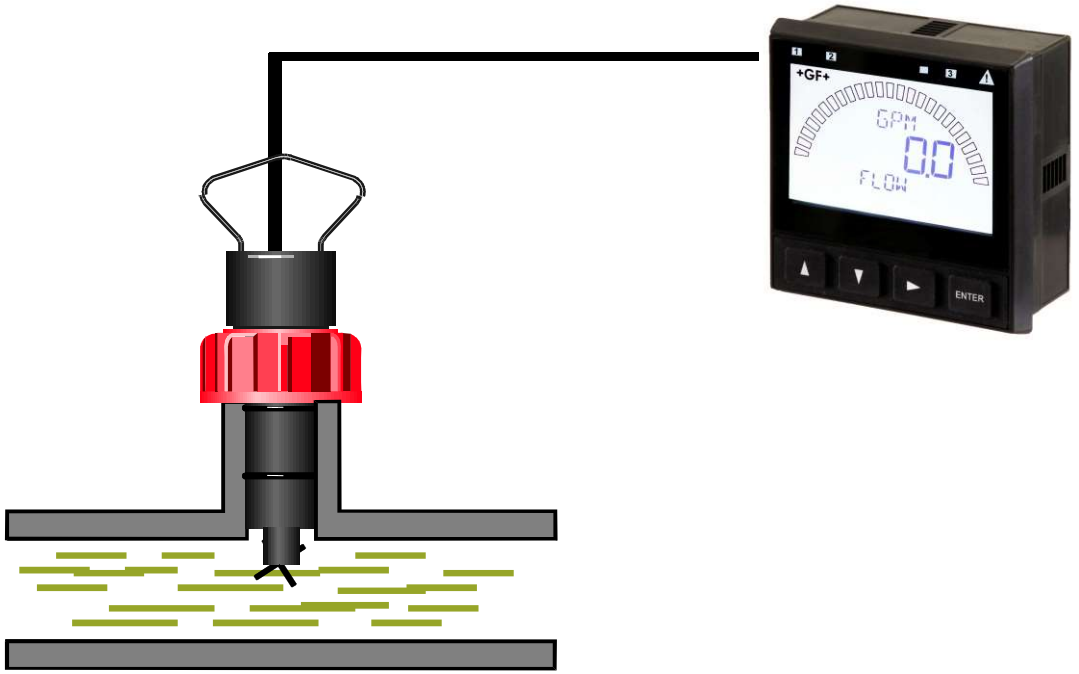




Frequency (Hz) vary with flow rate

Flow: Paddlewheel Theory of Operation

- As flow of the liquid passes the paddlewheel, a signal is generated.
- The frequency generated by the magnet and internal electronics are in direct proportion to the fluid's velocity.
- The signal is transmitted to the monitor/transmitter to be displayed, totalized, et cetera.

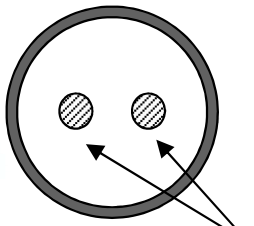


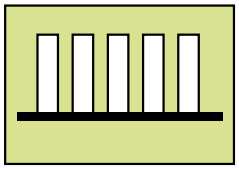
Flow: Theory of Operation, Electromagnetic Sensors

2552 Mag Meter

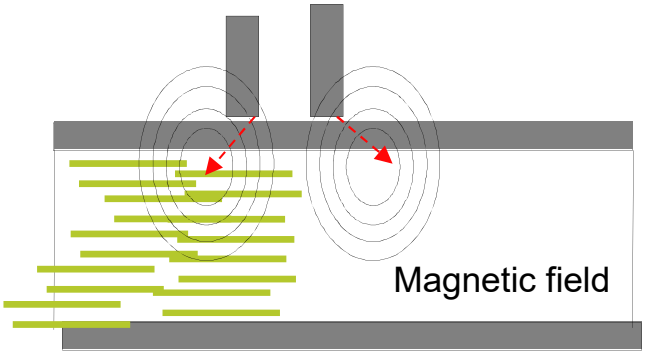
— **Sensor construction**

— **Measuring velocity**





2551 Mag Meter



The sensor consist of two metallic pins that produce a small magnetic field across the inside of the pipe
The metallic pins are mounted inside a insulating liner such as PVDF or PP
Electromagnetic “Mag” meters measure the velocity of a conductive liquid as it moves across a magnetic field inside the pipe and the sensor. The faster the flow the more the magnetic field distorts.

Magmeter technology is based on Faraday's Law which states that when a conductor moves through a magnetic field a voltage will be produced. The Magmeter sensor produces a magnetic field, and as a conductive material (fluid with a conductivity level of >20 µS) passes through the magnetic field, a voltage is produced. The two metallic pins located at the tip of the sensor sense the voltage and then convert the voltage into a frequency which is proportional to the flow rate.

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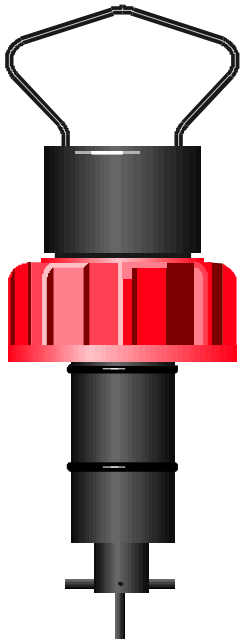
Flow

Installation Tips

Flow: Paddlewheel Installation Tips

Paddlewheels



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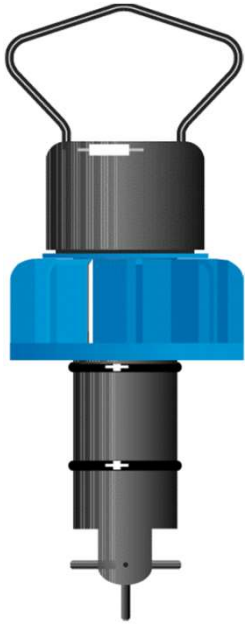

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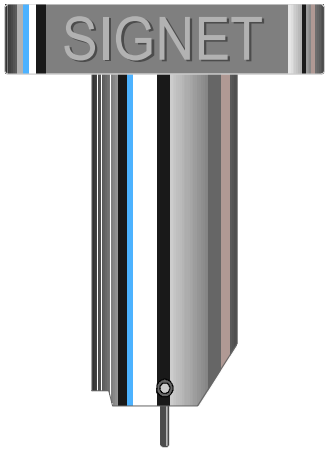

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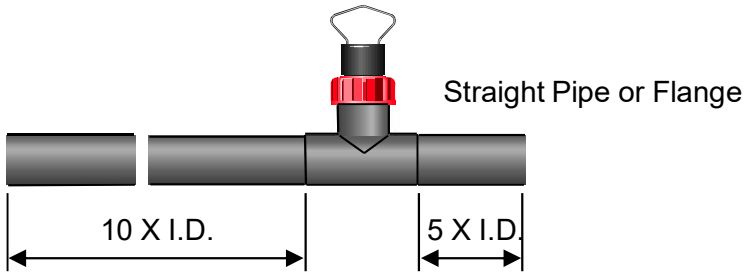
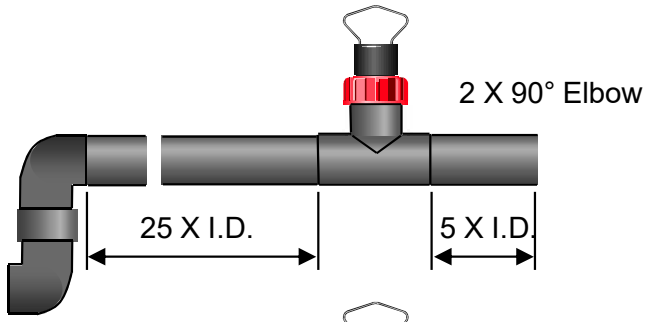
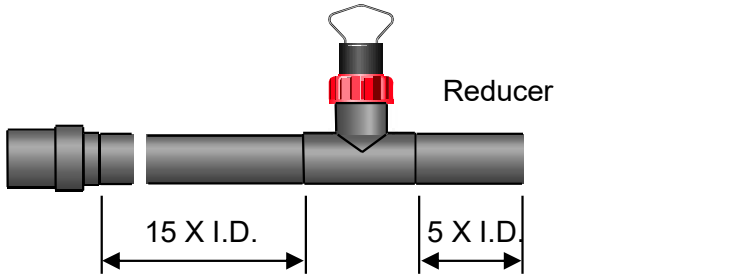
2540

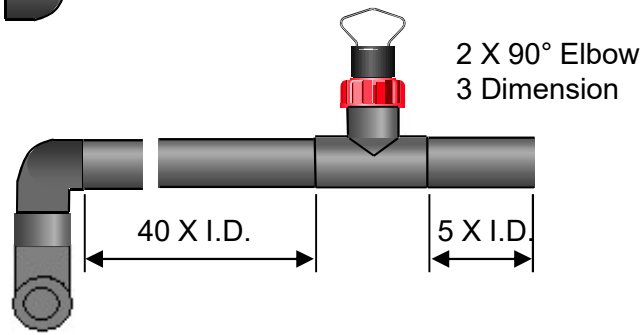
Flow: Paddlewheel Installation Tips

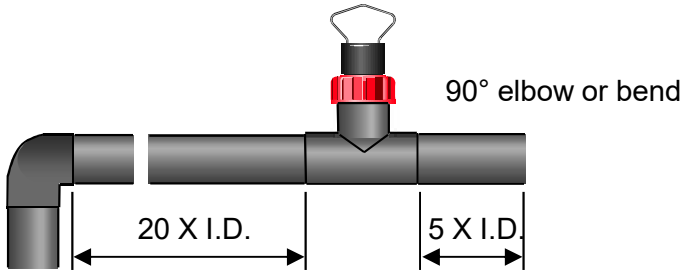
Upstream and Downstream mounting requirements:

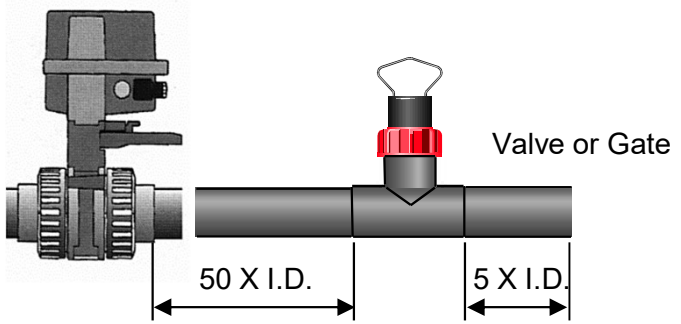










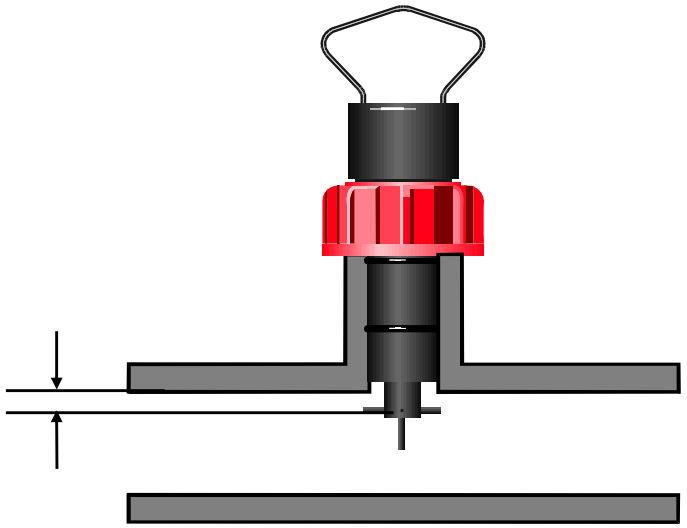


Flow: Paddlewheel Installation Tips

Sensor Depth:

- Proper depth placement
- Mount using proper Signet tee fittings

Insertion depth
= 10 to 12% pipe ID



Flow: 2540 Paddlewheel Install Tips (Adjustable depth)

Insertion depth Calculation:

Standard Sensors

H = 5.23 - pipe wall thickness - (0.10 X I.D.)

Example:

3" Sch 80 Steel;
Wall thickness = 0.3 in. / ID = 2.9 in.

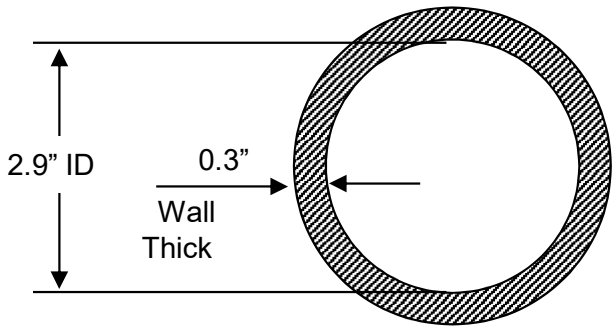
H = 5.23 - 0.3 - (0.10 X 2.9)

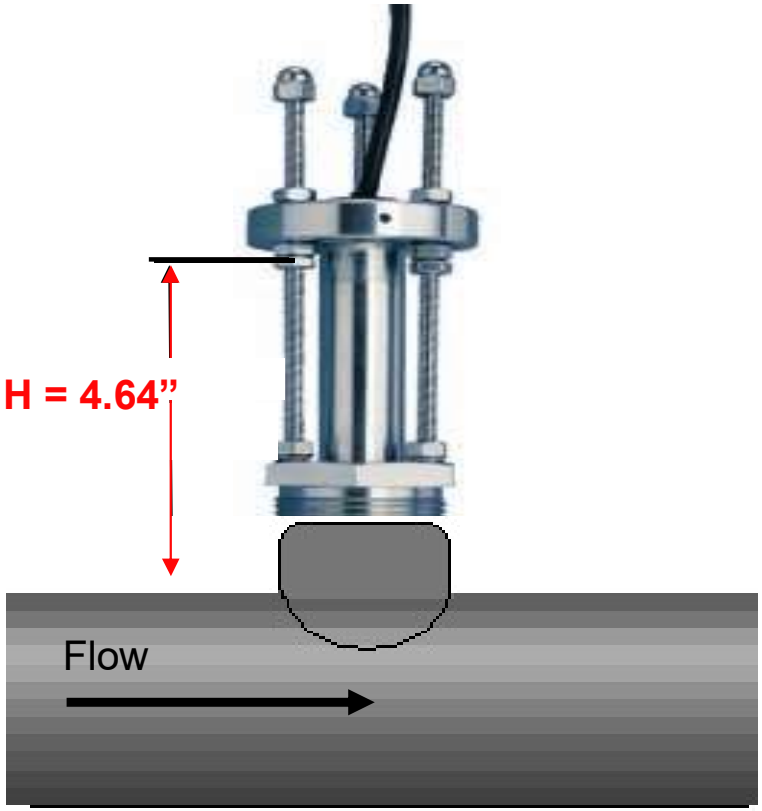
H = (4.64 in.)

"H" dimension for future reference: **H= 4.64**

Hot-Tap Sensors

H = 15.39 in. (with additional ball valve height)
- pipe wall thickness - (0.10 X I.D.)

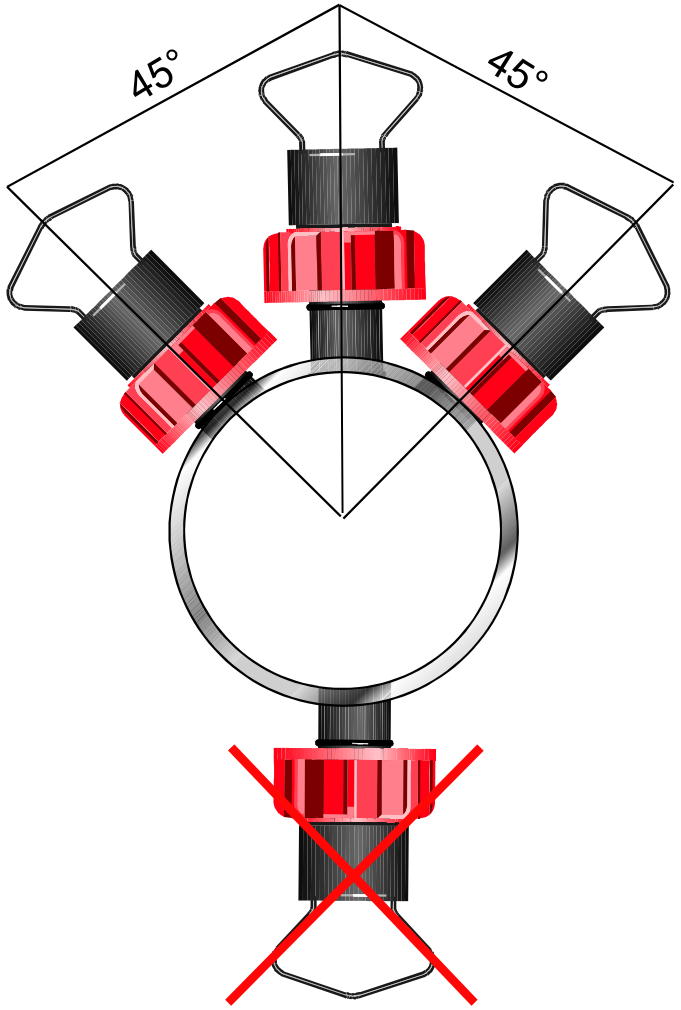




Flow: Paddlewheel Installation Tips

515 and 2536
Mounting Angles

NOTE: 12'Oclock mounting position is acceptable for paddlewheel sensors but NOT magmeters

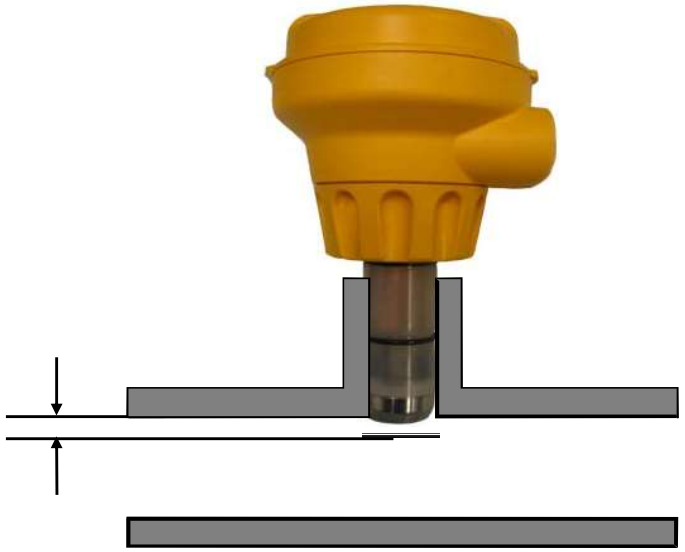


Flow: 2551 Magmeter Installation Tips

Sensor Depth:

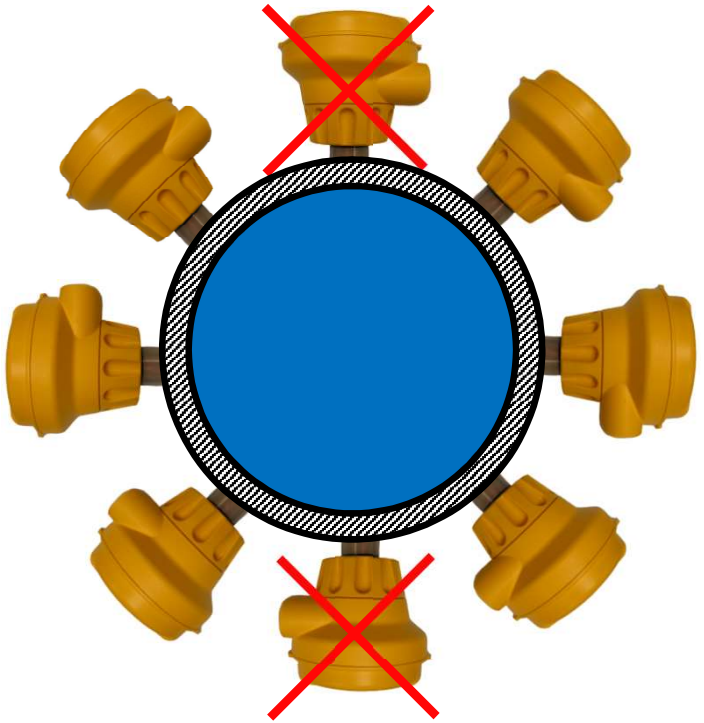
- Proper depth placement
- Mount using proper Signet tee fittings

Insertion depth
= 10- 12% of ID



Flow: Electromagnetic Sensors Installation Tips

- **Installation tips Magmeters**
  - 8 possible positions
  - Top and Bottom of pipe NOT recommended



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Flow Instrumentation

Transmitters and Controllers

9950 Dual Channel

9900s Field & Panel

8900 Multi Channel

8150
Field & Panel
Flow Totalizer

Flow: Controllers and Transmitters

The 9900 Transmitter (SINGLE Channel)

- Flow
- pH/ORP
- Conductivity/Resistivity
- Salinity
- Temperature
- Pressure
- Level
- 4-20 mA Signals

Flow: Controllers and Transmitters

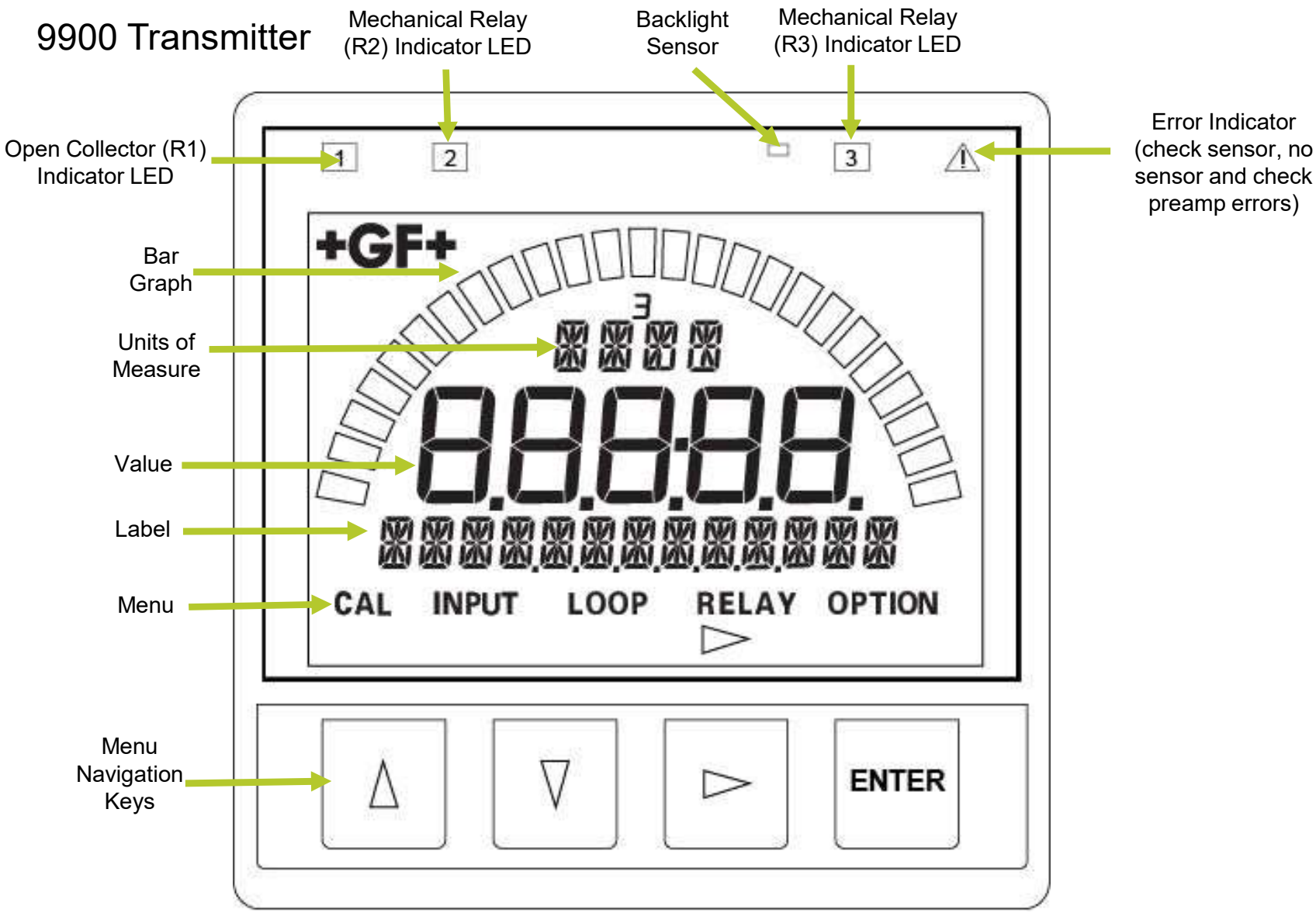
9900 Transmitter (SINGLE Channel)

- Available in Panel Mount and Field Mount
- 12 – 32 VDC
- Options
  - Direct Conductivity/Resistivity Module
  - Relay Module
  - H COMM Module
  - PC COMM Configuration Tool
  - Modbus Module supports RS485

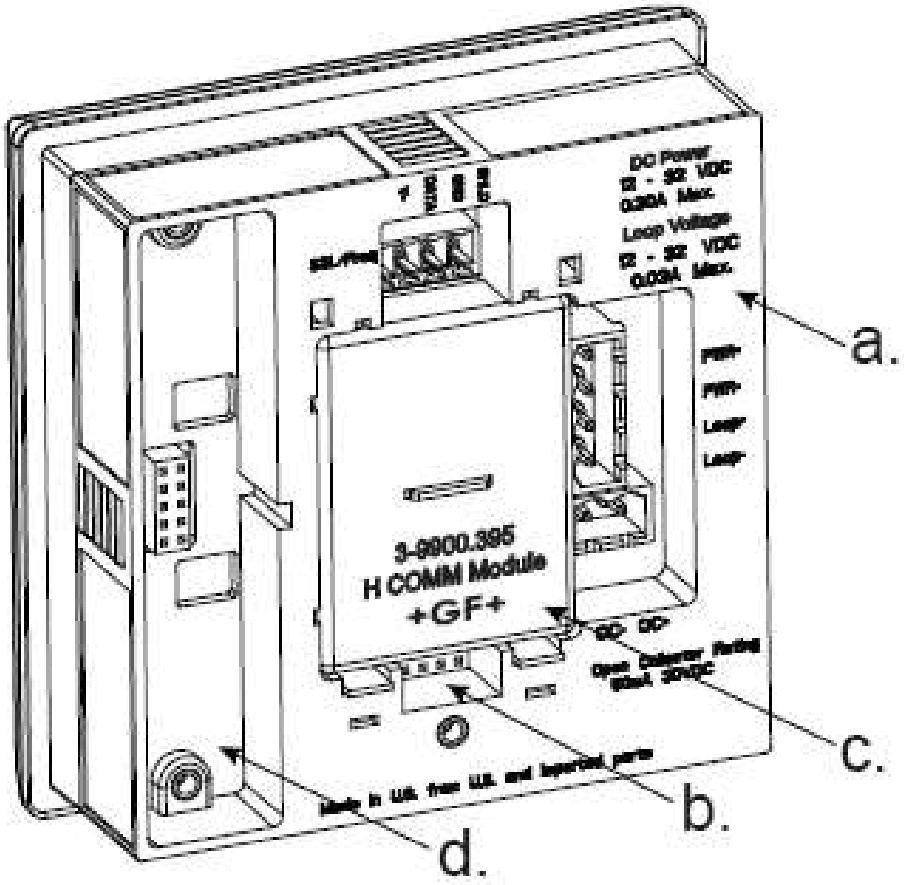
Hinged Cover

Flat Cover

Flow: Controllers and Transmitters



9900 Transmitter



a. Base Unit (required)

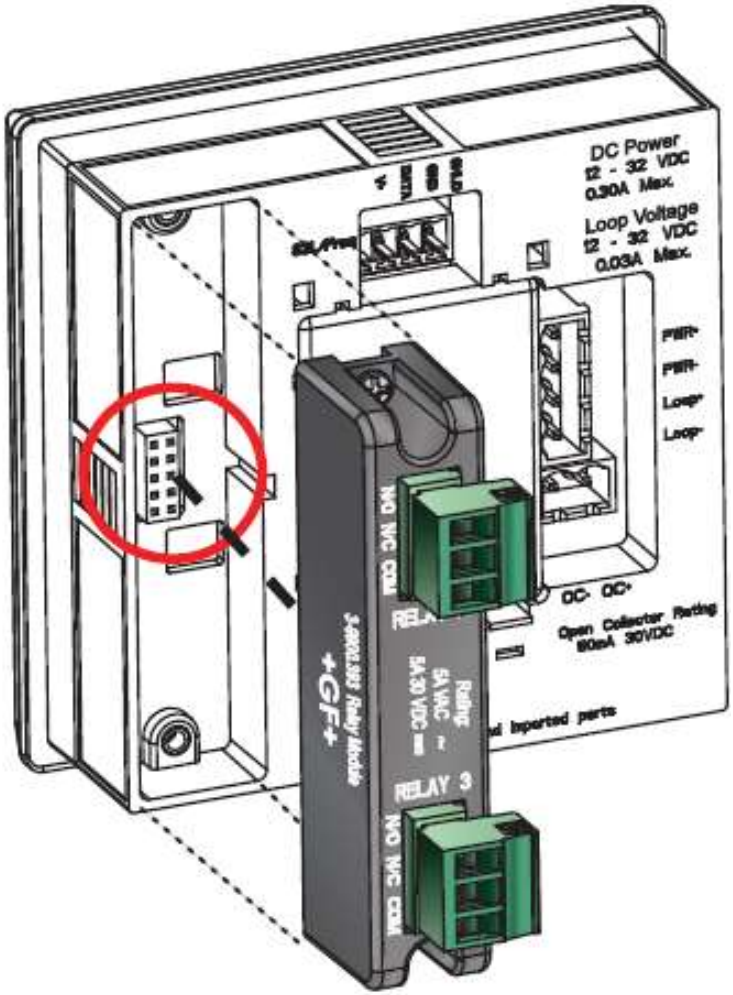
b. Slot for optional Cond/Res Module or second 4-20mA module or Modbus

c. Slot for optional H COMM Module

d. Slot for optional Relay Module.

9900 – Relay Module

9900 Transmitter



Mfr. Part No. – 3-9900.393

Description - Relay Module - Two dry-contact relays

Dry-Contact Relays

Type ..... SPDT
Form C
Max. Voltage Rating 30 VDC or 250 VAC
Max. Current Rating ..... 5 A resistive

4-20mA Output Module

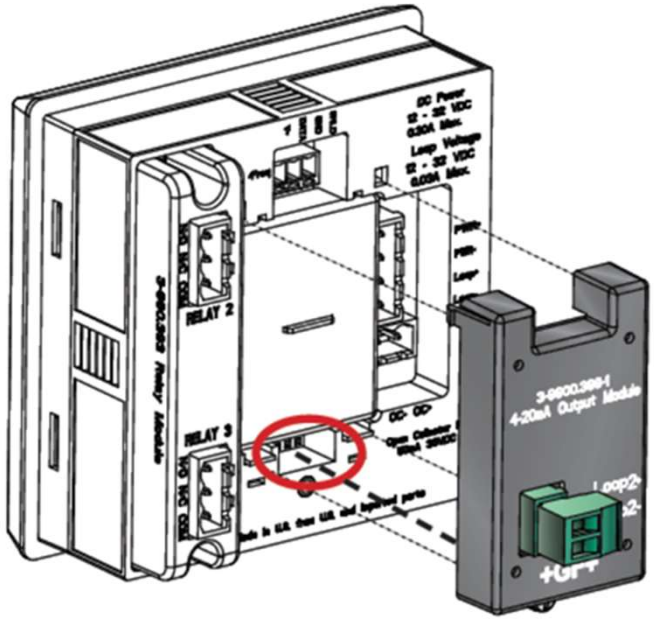
- 4 to 20 mA Output Module adds 'second' output to a 9900 SmartPro Transmitter

- Outputs can be used for Primary or Secondary measurements
  - Primary – Flow, Conductivity, pH, etc…
  - Secondary – Temperature and Volume

Description	Signet Part #	9 Digit
4 to 20 mA Output Module	3-9900.398-1	159 001 784

4-20mA Additional Output
How it Works…

- Plugs in like Conductivity and Batch Modules
  - Only one of these modules can plug in at one time
- Loop 1 is on base unit
- Loop 2 is on module



Product Overview

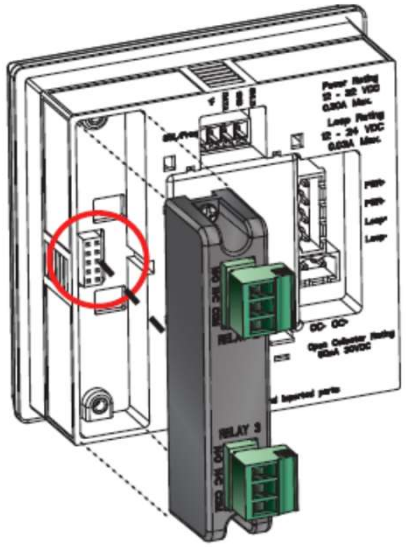
9900-1BC Batch Controller System

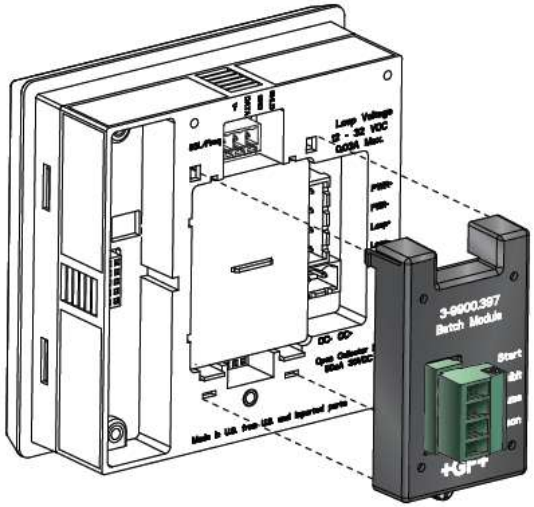
- Panel Mount
- Wall Mount
  - With optional enclosure (3-9900.392)
- 10.8 – 35.2 VDC
- Compatible with Signet models:
  - 515, 525, 2536, 2537 and 2540 Paddlewheel Flow sensors
  - 2551 and 2552 Insertion Magmeters
  - 2000, 2507 and 2100 In-line Flow sensors
  - Some third party sensors

9900-1BC

Includes Batch Module and Relay Module with system

- Converts a 9900 Transmitter Generation II to a Batch Controller
- Wire an external button or keypad to Start, Stop or Resume a batch remotely
- Wire an external input that can inhibit a batch from starting
- Relay Module included with Batch Controller System





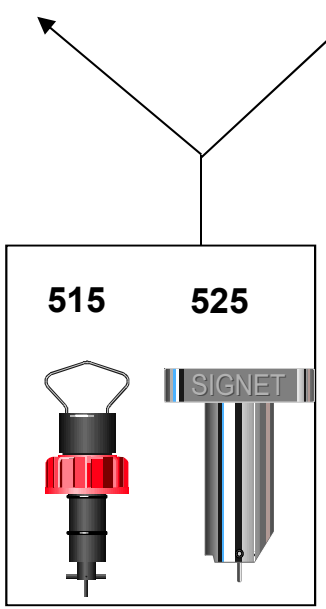
Flow: Controllers, Monitors, and Transmitters

8150 Battery powered flow totalizer

- Battery powered
- 3 Flow Totalizers
  - •2 resettable
  - •1 non resettable
- Integral option

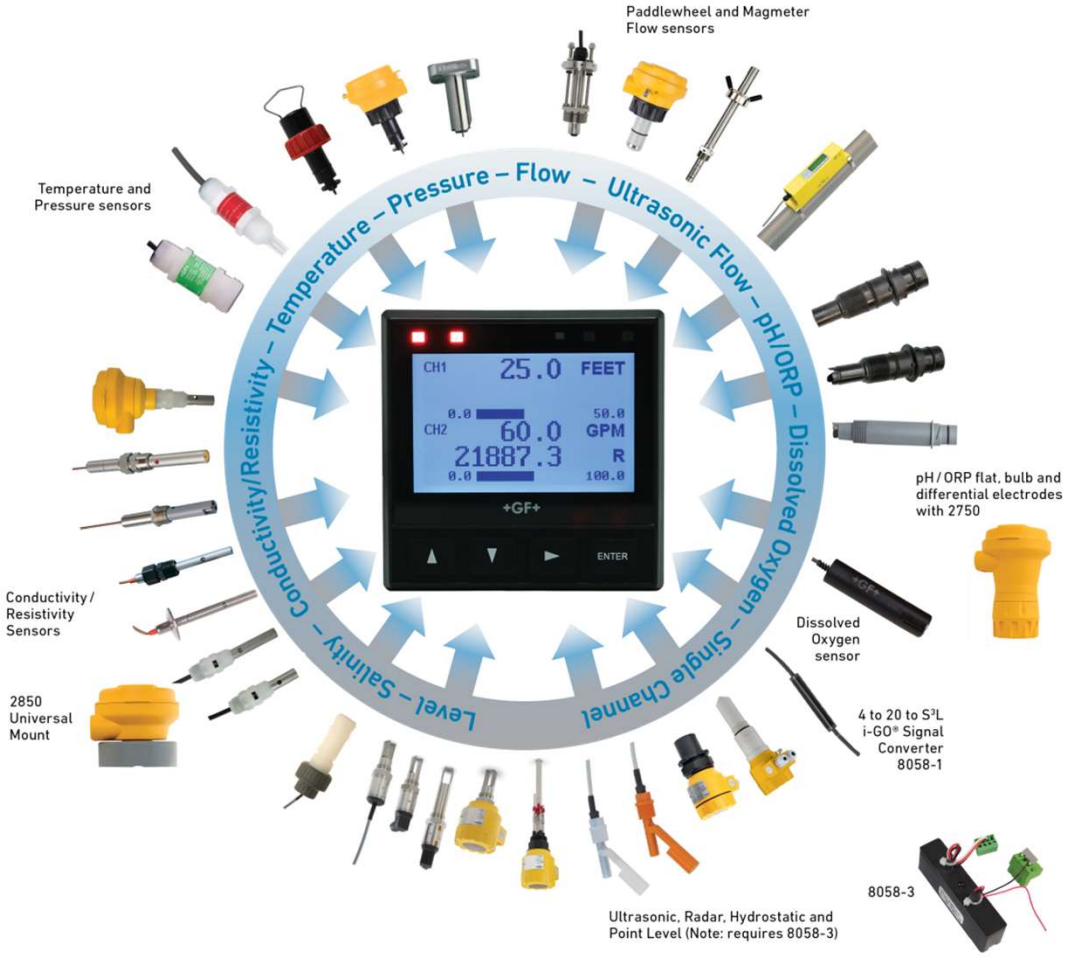
Field Mount

Panel Mount



9950 Dual Channel Transmitter

- Replaces Remaining ProcessPro's
- Two Independent Measurement Channels
- Frequency or S3L
- Bright Backlight Dot Matrix Display
- Optional Relay Modules
- Optional Switch Input Via Binary Function
- Derived Functions
- Boolean Logic
- Timer Functions
- DUAL Cond/Res card now available

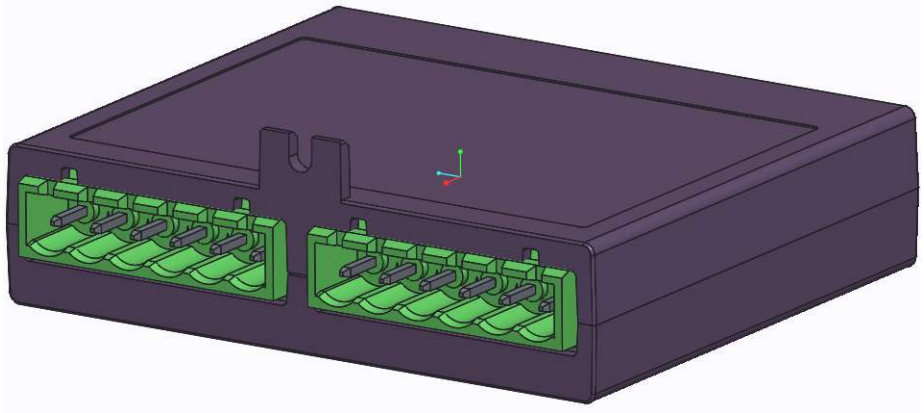


9950 Dual Channel Transmitter Base Unit Configuration

- AC/DC or DC Power Option
  - DC 12 to 32 VDC (3-9950-1)
  - AC 100 to 240 VAC 50/60Hz (3-9950-2)
- ¼ DIN Panel Mount
- Red backlight to indicate sensor fault conditions
- Two Current Loop Outputs Standard

Optional Relay Modules

Option 1 3-9950.393-1	Option 2 3-9950.393-2	Option 3 3-9950.393-3
4 Mechanical Relays	2 Mechanical Relays, 2 Solid State Relays	2 Mechanical Relays, 4 Binary Inputs

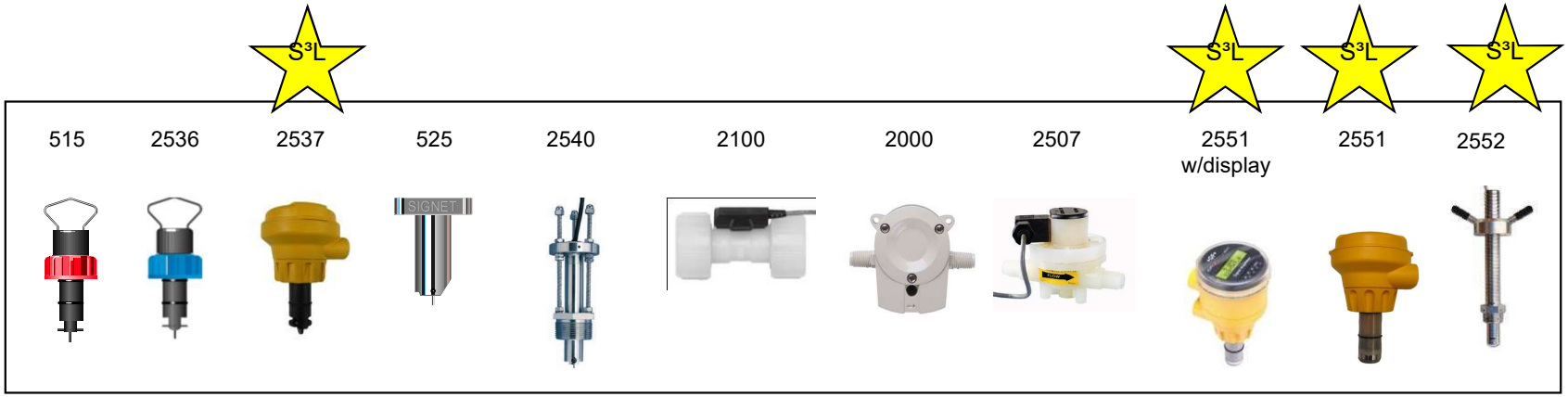


Flow: Controllers and Transmitters

8900 Multi-Parameter Controller (6 Input/ 4 Output Channels)

- Multi channel input (6 Channel)
- Digital display
- 4 to 20 mA output
- Two frequency inputs
- Sensor compatibility
- Relay output
- Other sensors, pH/ORP, Cond…

8058 Signal Converter



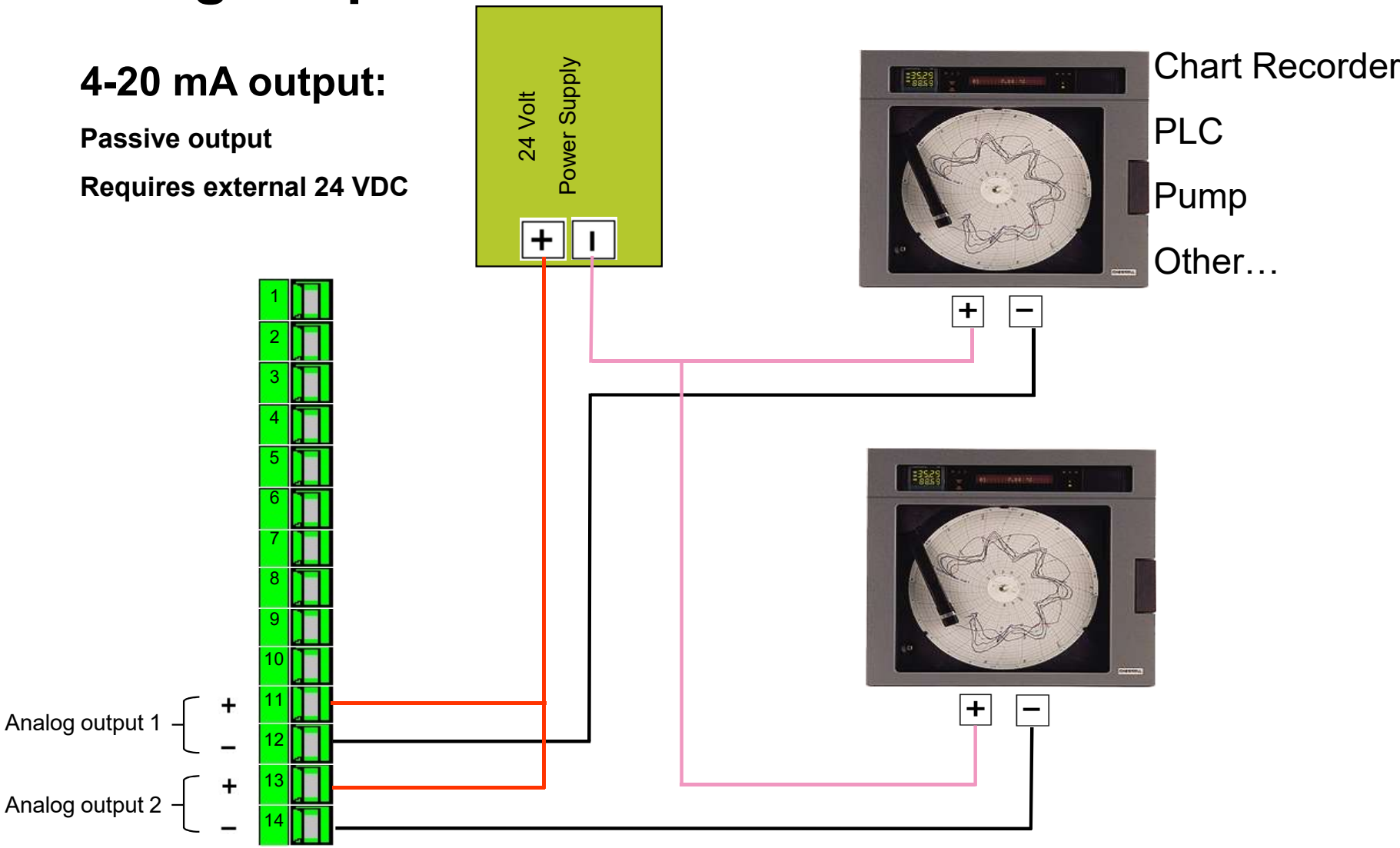
Multi-Parameter controllers (9900/9950/8900)

Analog Output – Passive 4-20 mA

4-20 mA output:

Passive output

Requires external 24 VDC

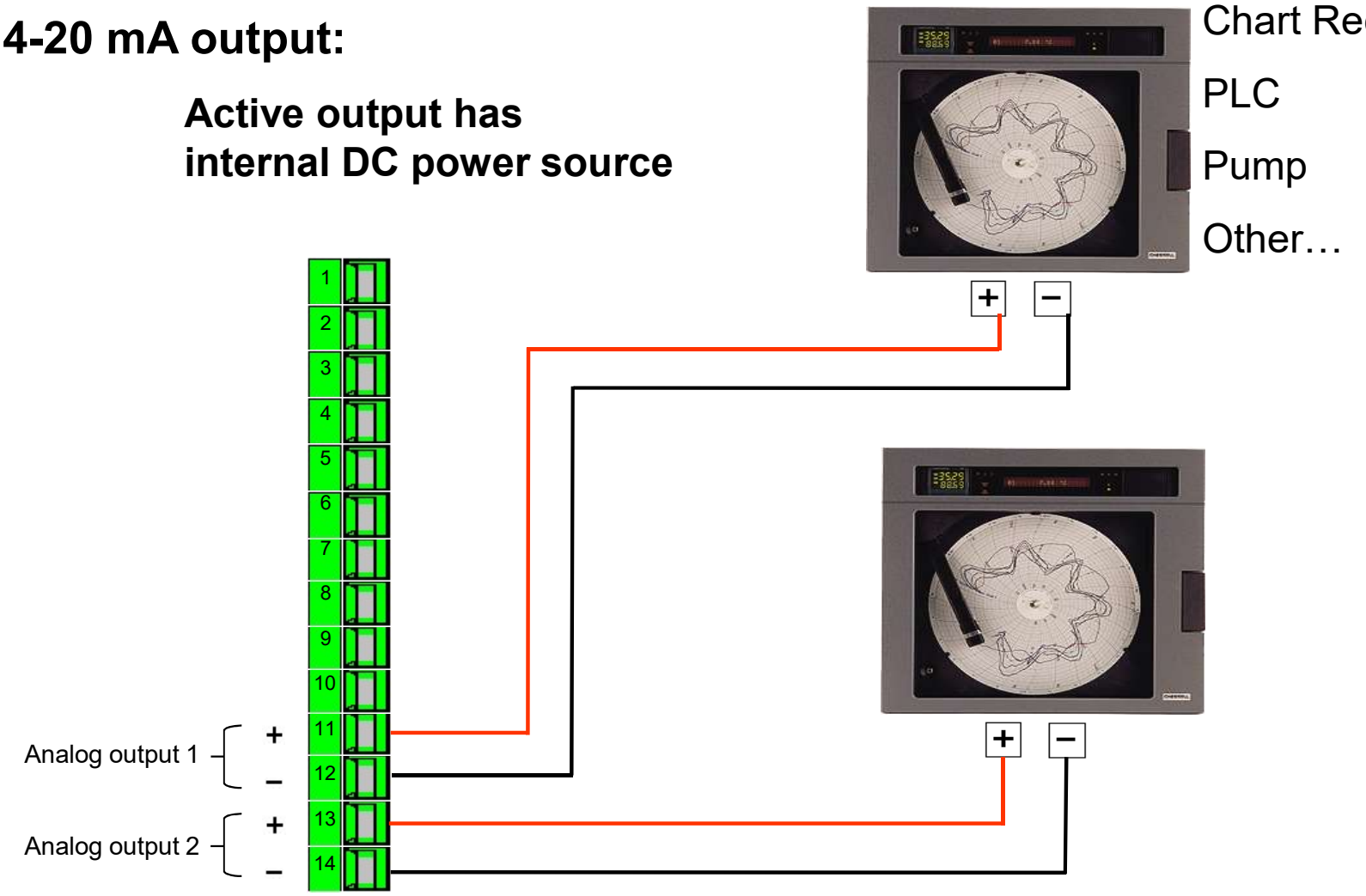


Multi-Parameter controller (only 8900)

Analog Output – Active 4-20 mA

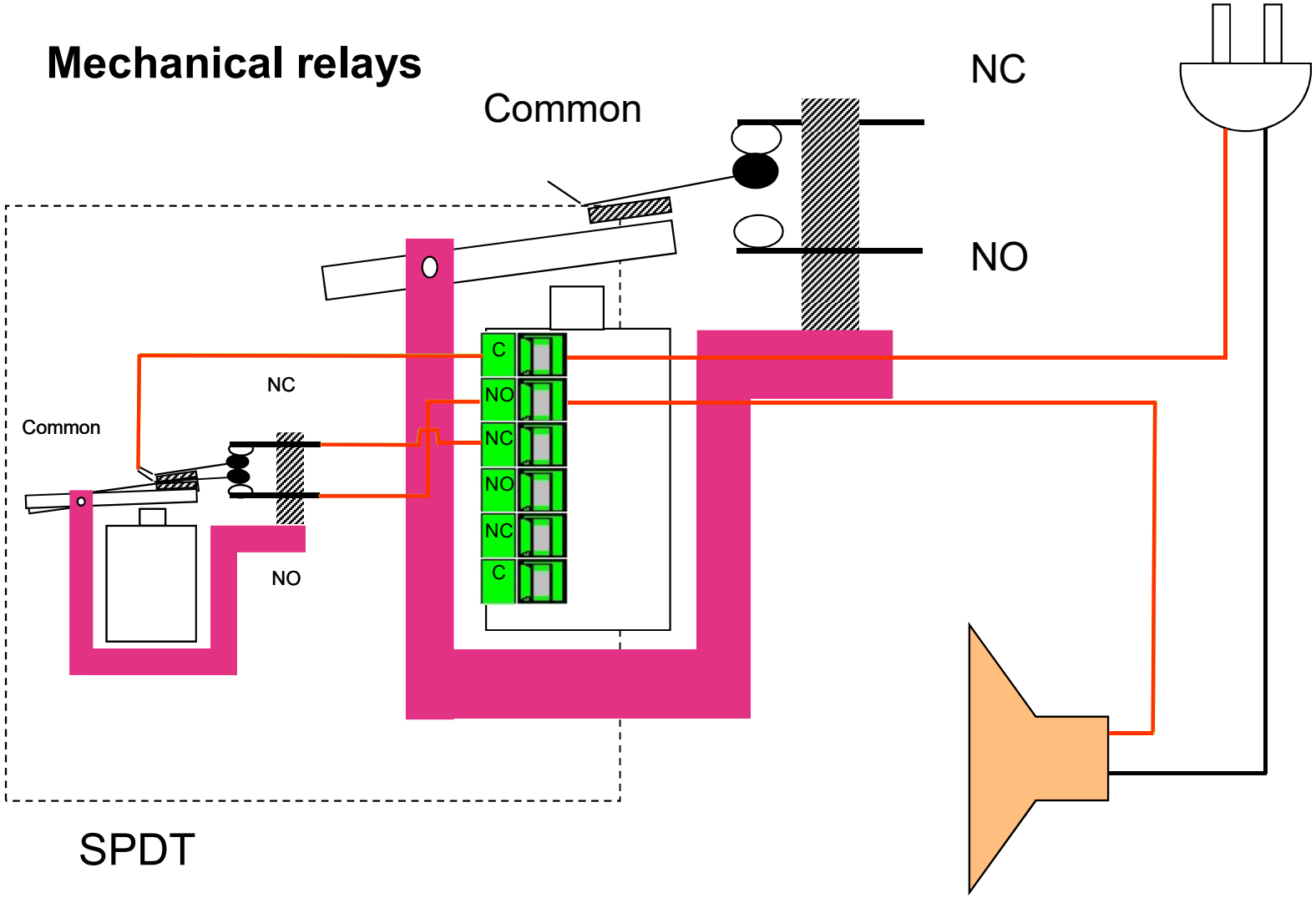
4-20 mA output:

Active output has internal DC power source



Multi-Parameter controllers (9900/9950/8900)

Control Output: Mechanical Relay



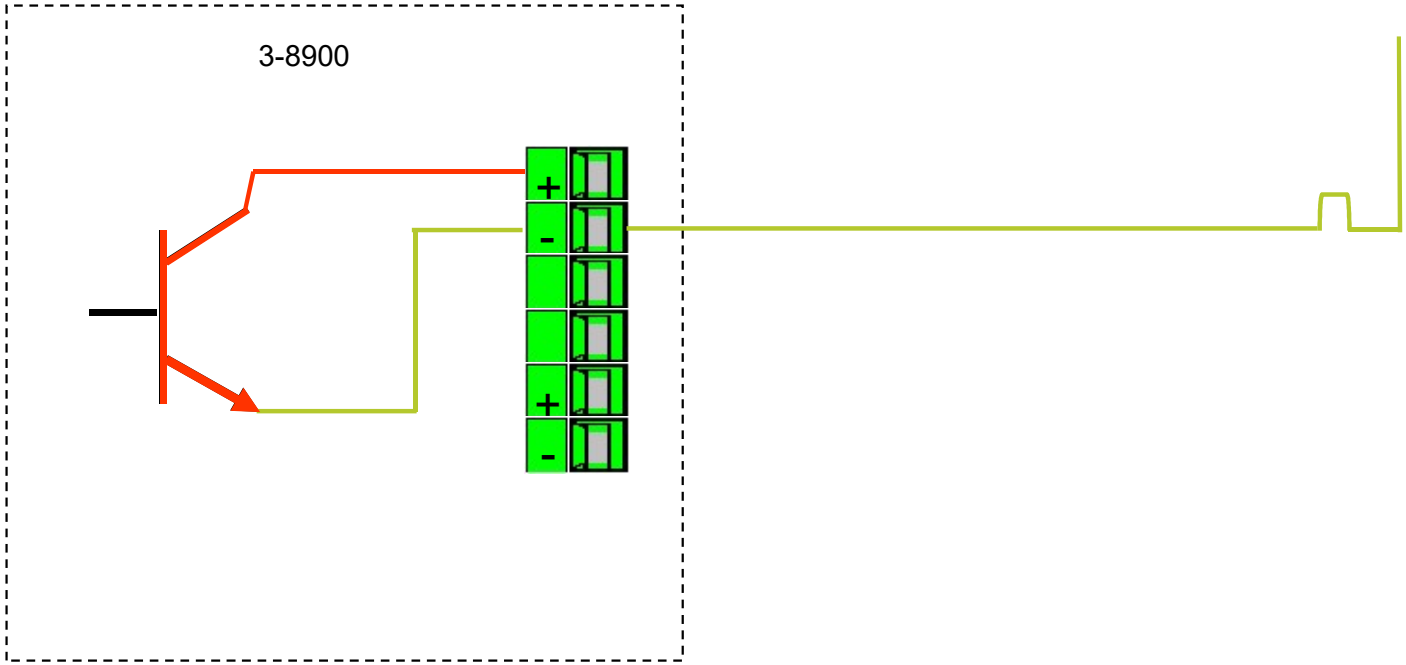
Multi-Parameter controller (9900/9950/8900)

Control Output: Open Collector Switch

Solid State Relays:

No Incandescent lamps, or external relays.

Use for PLC, Computers, Proportional Pulsing into Metering Pumps



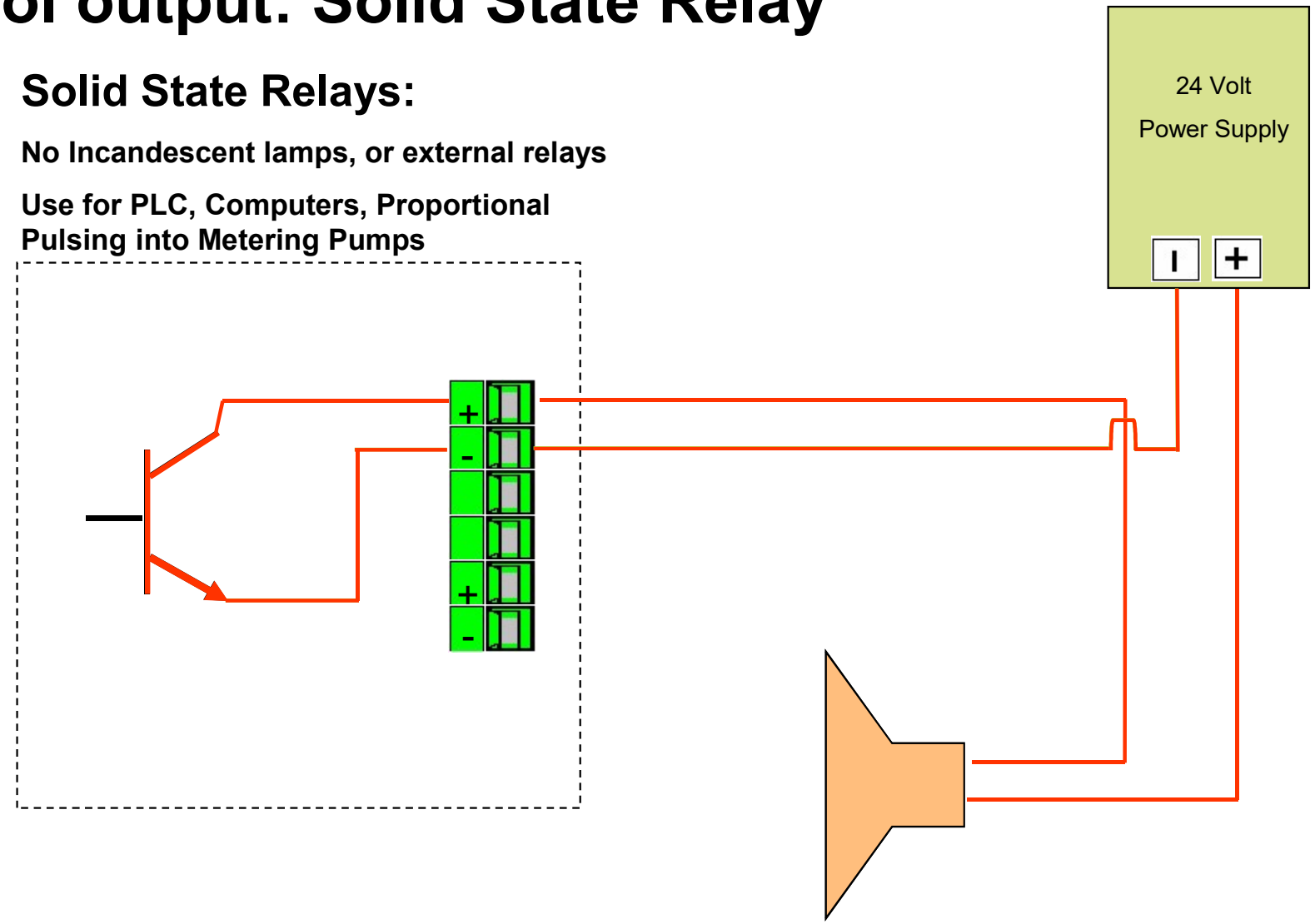
Multi-Parameter controller (9900/9950/8900)

Control output: Solid State Relay

Solid State Relays:

No Incandescent lamps, or external relays

Use for PLC, Computers, Proportional Pulsing into Metering Pumps



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Flow Instrumentation

System Selection

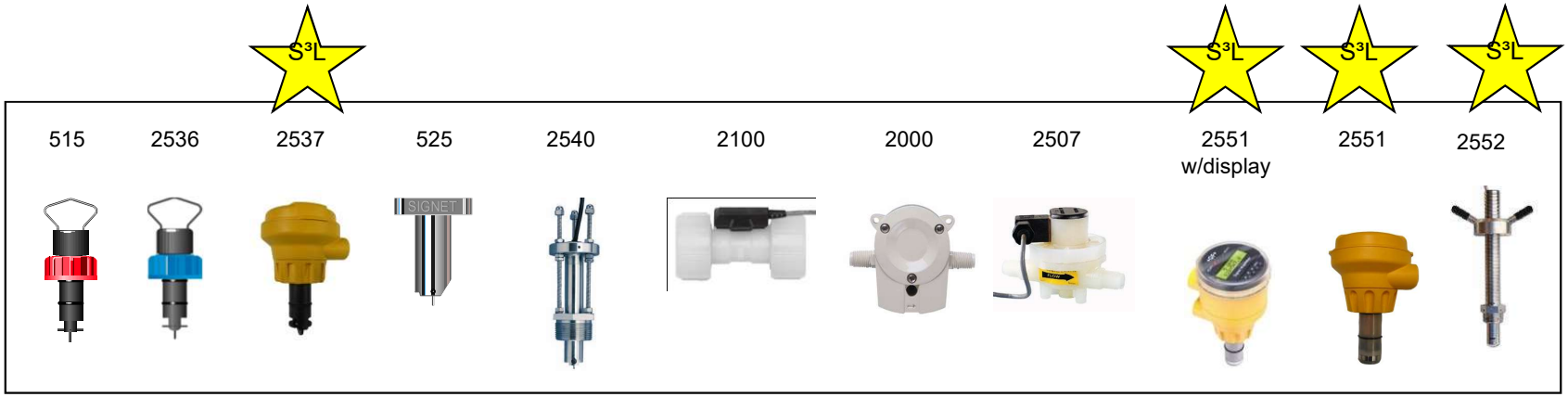
Determine Application Requirements

This section provides tips and suggestions on how to choose just the right flow system for your specific liquid application needs (in full pipes). For specific product information, refer to the individual catalog sheets.

- Flow rate (minimum and maximum)
- Installation requirements (pipe size, pipe material, pipe schedule)
- Chemical compatibility of all wetted parts with process chemicals
- System specification ranges (temperature and pressure)
- Performance requirements of sensor
- Particulates in fluid (what, size, percentage)
- Viscosity of fluids
- Reynolds Number for non-water fluids

Flow: Select Sensor Technology (Step 2)

Based on the application requirements determined in Step 1, choose a flow sensor. Then, determine your signal output requirement to allow you to match just the right instrument (see Step 3).

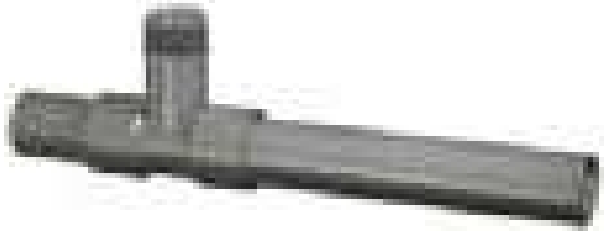


NEW 2580
Flowtramag
Accuracy 1%
3X2 Pipe ID

Flow: Determine Installation Requirements (Step 3)

Insertion flow sensors require installation fittings, and Signet offers the widest selection of paddlewheel installation fittings in the industry. These fittings are specifically designed to ensure the proper placement of the sensor in the system to achieve specification. Remember the 2540, and 2552 use standard, non-Signet, fittings.





Flow: Choose Instrument (Step 4)

Choose a flow instrument based upon display parameter, output requirements, an mounting configuration.

9950

9900

8900

8150
Totalizer

Questions & Answers