Delta Controls
CORPORATION

Product Catalog

2021-2022

Level | Flow | Temperature

Engineered Reliability

Delta Controls
CORPORATION

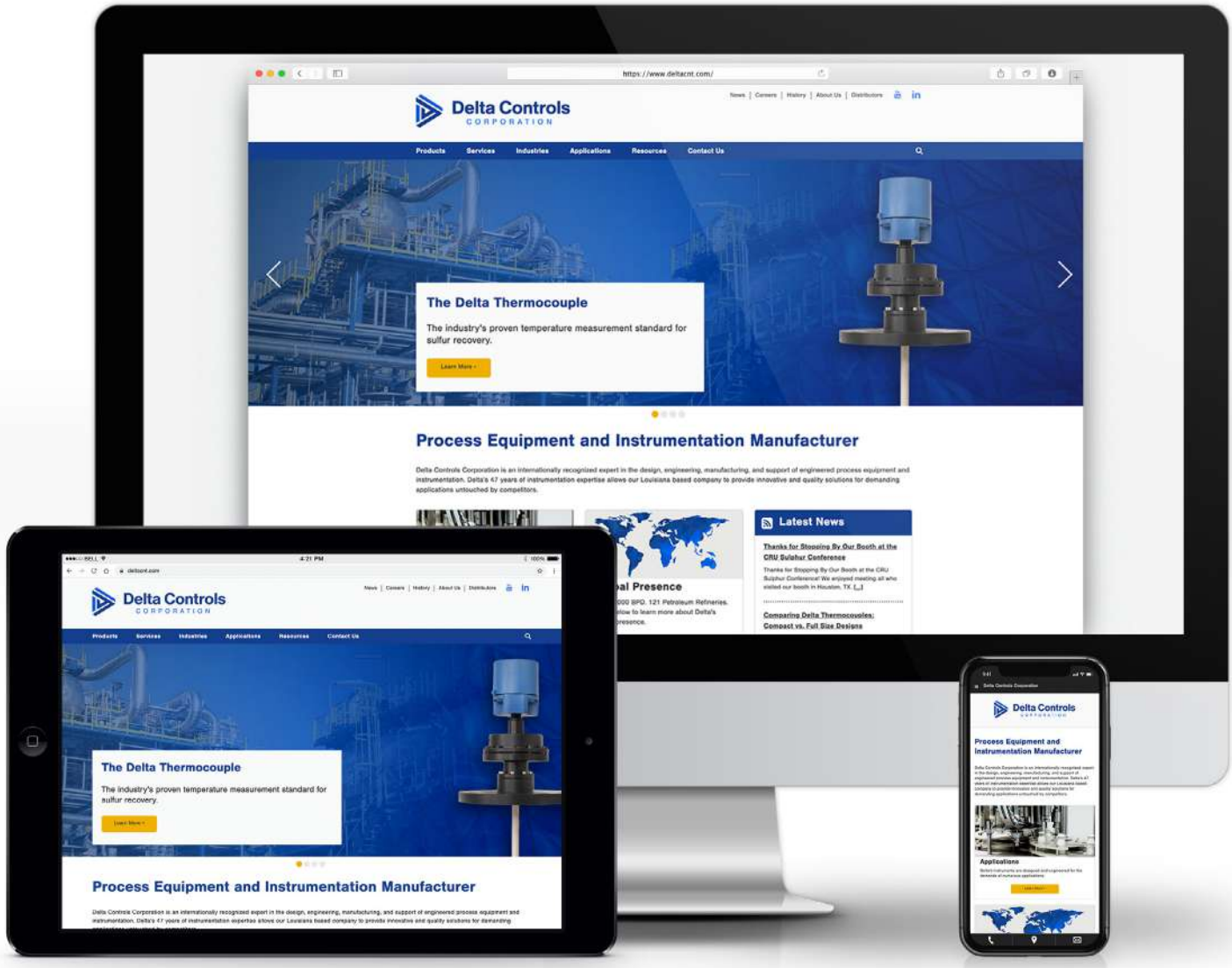
MADE IN U.S.A.  DELTACNT.COM

All Delta Controls products are designed, engineered, and manufactured at our facility in Shreveport, LA.

Delta Controls Catalog 2021

Welcome to the Delta Controls Corporation catalog. Since 1972 our products have been trusted in thousands of installations internationally. Our 2021 catalog continues to showcase our company legacy of unsurpassed reliability.

Delta Controls Online



Delta Controls Online

Visit www.deltacnt.com for the most current company and product information.

Stay Connected

Stay connected with Delta Controls Corporation news and updates on our various social media platforms.

Email us at **delta@deltacnt.com** to receive our email updates.

YouTube

LinkedIn

Facebook

Please note the Delta Controls website contains the most up-to-date information, product availability, and options as these may have changed from the publication date. Please also note that a wide range of custom offerings are available; please visit www.deltacnt.com/contactus or call +1.318.424.8471 to discuss with our team the best solution for your unique application. Our team is standing by to assist and can meet with you onsite.

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Global Distributor Network

Contact Delta Controls

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Shreveport, Louisiana, 71107

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Fax: +1.318.425.2421

www.deltacnt.com

Global Distributor Network

North America

1 **GS Hitech Controls Inc.**
British Columbia, Alberta, Saskatchewan, Manitoba

2 **Trillium Measurement & Control**
Ontario

3 **Bestobell Aquatronix**
Ontario, Quebec, Newfoundland and Labrador, Prince Edward Island, Nova Scotia, New Brunswick

4 **Arco Engineering**
Kentucky

5 **Allesco**
Houston, TX

6 **JK Kalb**
Corpus Christi, TX

7 **Engineered Parts & Services**
Puerto Rico and Virgin Islands

Central & South America

8 **USIICSA**
Mexico

9 **Tecno Control**
Chile

Europe

10 **Able Instruments**
United Kingdom and Ireland

11 **AI2C**
France

12 **Elektron S.R.L.**
Italy

Middle East

13 **STARC**
Kingdom of Saudi Arabia

14 **Systems & Equipment**
United Arab Emirates

15 **Integrated Engineering Services**
Pakistan

16 **Lucent Marcons Pvt. Ltd.**
India

Asia

17 **Wonder Engineering Tech. Ltd.**
China, Singapore, Malaysia, Thailand, Indonesia, Vietnam

18 **Tailok Industrial**
Taiwan

19 **LLT Inc.**
South Korea (Republic of Korea)

Africa

20 **JV Bailman**
South Africa

21 **Bernef Resources Limited**
Nigeria and Ghana

Inquiries:
inquiry@deltacnt.com

General Information:
delta@deltacnt.com

Core Values

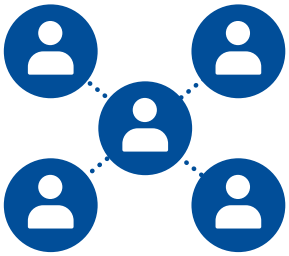
Delta Controls exists to be the premier manufacturer of industrial products and services that define industry expectations. We are a flat organization that values a culture of transparency, simplification, and redefined thinking. We strive to work by our core values to positively guide and impact our thinking.

Quality

High quality products and **services** are the foundation of our company. We take pride in our work.

Customers

We continuously focus on **customer needs** and **expectations**.



Employees

We focus on **empowering employees** by doing more with fewer, more capable people.

Integrity

Personal integrity and **mutual respect** will guide and strengthen our company.

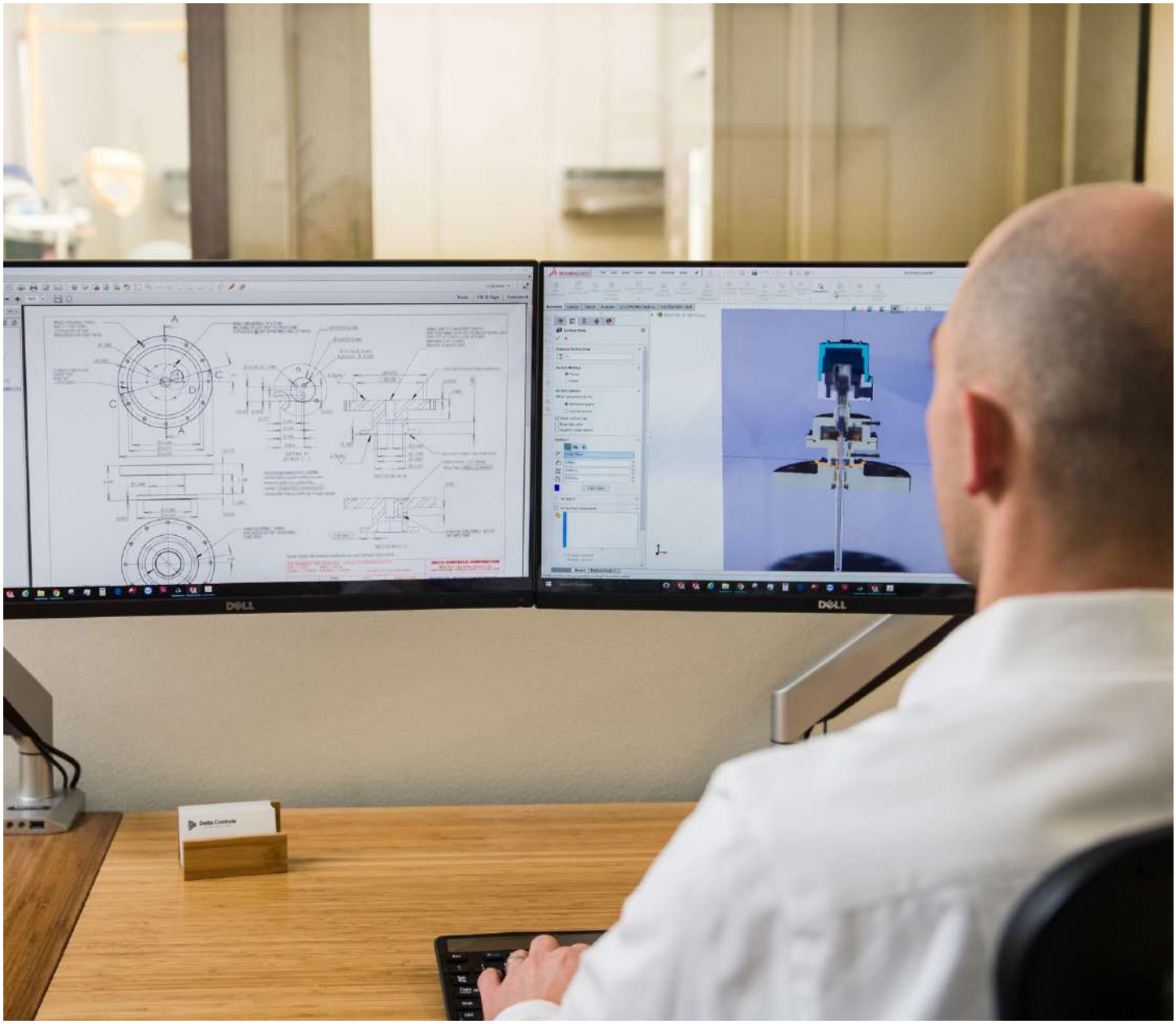
Teamwork

We function in **unity by loyalty** to the team effort. Our efforts are mutually beneficial to the company and the employee.

Responsibility

We are individually accountable for the **overall success** of the company.

About Us



About Us

Founded in 1972, Delta Controls Corporation is an internationally recognized expert in designing, engineering, manufacturing, and supporting process equipment. Delta's **45+ years** of instrumentation design expertise allows our Louisiana based company to provide innovative and quality solutions for demanding applications untouched by competitors.

Our Products

Delta offers the three main product lines of **level, flow, and temperature** encompassing a variety of technologies including thermocouple, pyrometer, pressure, capacitance, mechanical, and more. All Delta products are manufactured to the extensive, high quality standards of our Louisiana-based factory.

Our Commitment to Quality

Delta is committed to quality throughout our products, services, and company processes. We are ISO9001:2015 certified and **committed to exceeding the expectations** of our diverse customer base. Our quality team actively pursues initiatives to continuously improve our quality management system. Delta's **investment into quality** is also evident in our infrastructure, with the construction of a dedicated quality control and testing laboratory on site.

Industries We Serve

Delta's engineered product solutions are utilized in a **wide range of applications**, extending our company expertise into a variety of industries: oil and gas; chemical; energy and power; water and wastewater; pulp and paper; food and beverage; mining and metal; pharmaceutical; environmental; concrete; and building materials.

Our Global Representation

Delta is represented internationally by an experienced base of representatives and distributors allowing our expertise and support to be locally accessible far beyond our Louisiana headquarters. Delta **provides extensive support** to our international representation base furthering our growth as a quality provider of reliable and innovative instrumentation.

Our Presence in Global Energy

Delta Controls contributes to the processing of over 27,400,000 BPD of crude oil capacity and 13.3 BCFD gas processing capacity through an expansive international **network of 150 plants** utilizing Delta products.

The Delta Advantage

At Delta we are **much more than a manufacturer**. We are a team dedicated to the expertise of the industries we serve. Our company investment into employee continuing education and training allows Delta to provide unsurpassed customer service. We are members of API best practices committees, presenters of innovative instrumentation solutions at international conferences, invitees of industry respected technical symposiums, and much more. **Delta's 45+ years** of instrumentation experience along with dedication to research, quality, and innovation distinguish Delta from competition.

Temperature Series

Sulfur processing temperature experts ***for decades.***

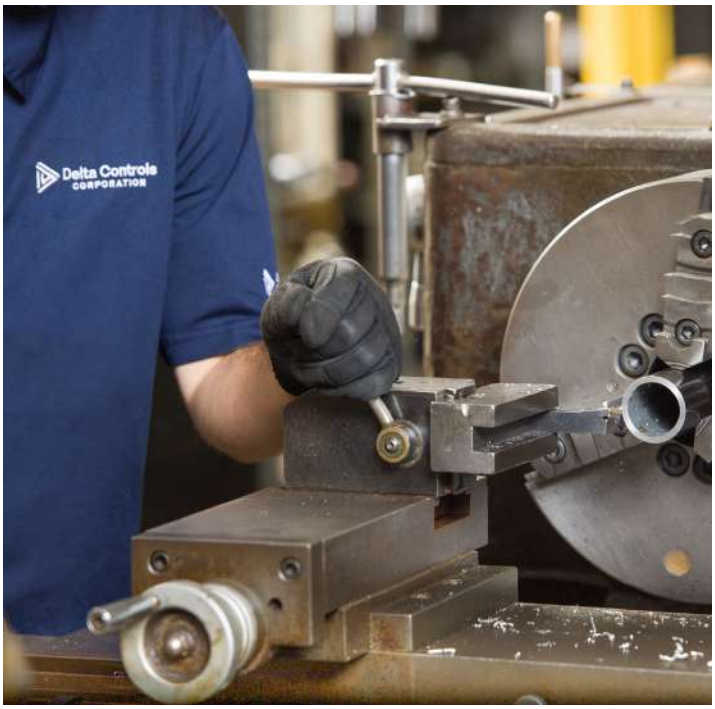
The most advanced and robust ***SRU temperature measurement*** *devices on the market.*


GAZ PROCESOWY

Temperature Series

Our dedication: *sulfur processing temperature measurement. 45+ years of evolutionary improvement and adaptations to solve temperature challenges in Claus thermal reactors.*

Temperature Measurement



THERMOCOUPLES

PYROMETERS

ACCESSORIES

49 Years and Counting.

Purged for a reason. The industry standard for sulfur recovery temperature measurement.

There is a reason Delta Controls purged type thermocouples are considered the industry standard for sulfur recovery. With over 150 installations internationally and 49 years of experience, the Delta Controls proprietary flush gas system continues to provide the industry's most renown reliability.

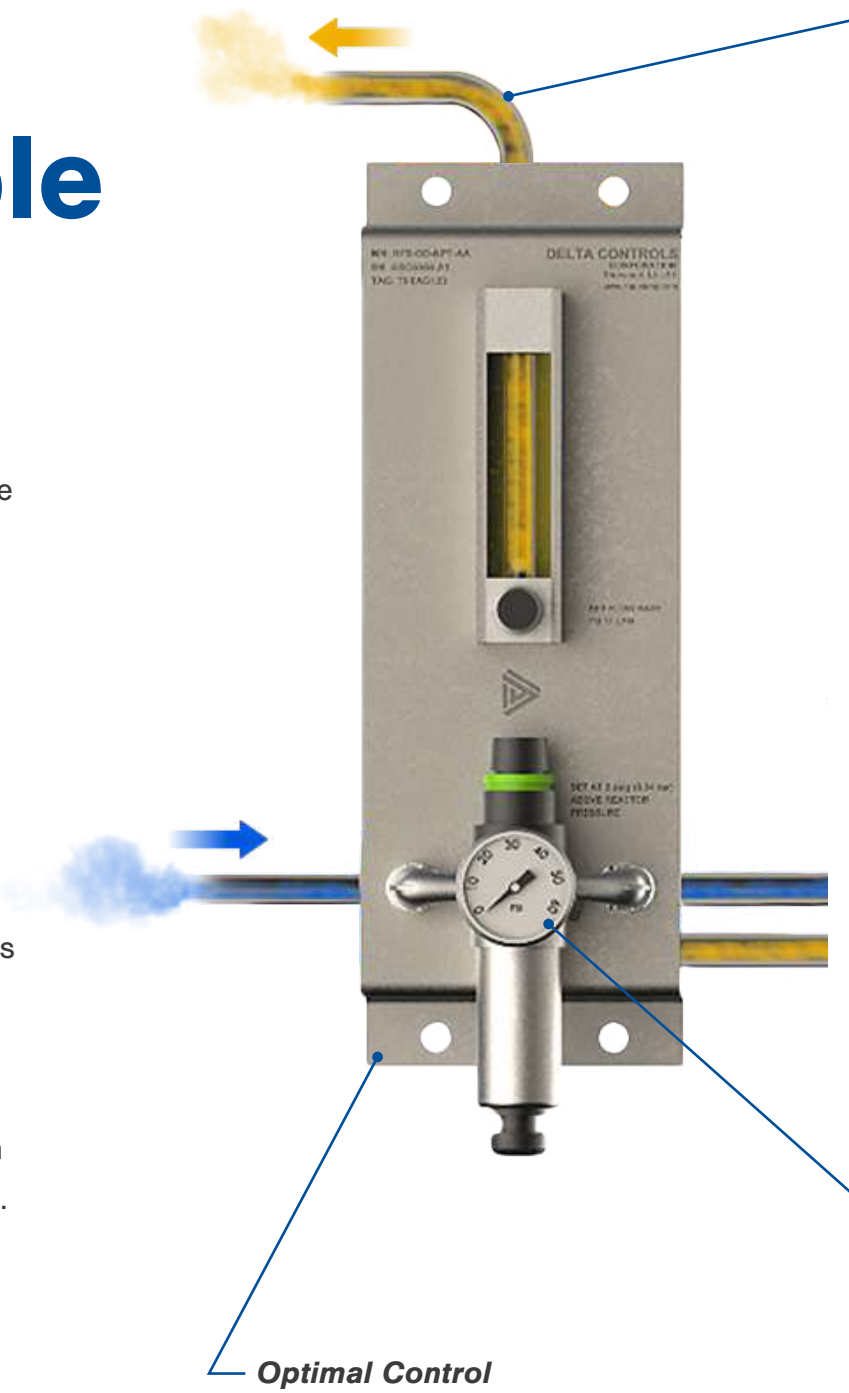
Purged Thermocouple

Thermocouple Theory of Operation

Thermocouples are two dissimilar metals that meet at a welded junction. When a heat source is applied to this junction, there is a resulting voltage produced that correlates to the temperature at the junction. Each wire's metal composition determines the temperature operating range.

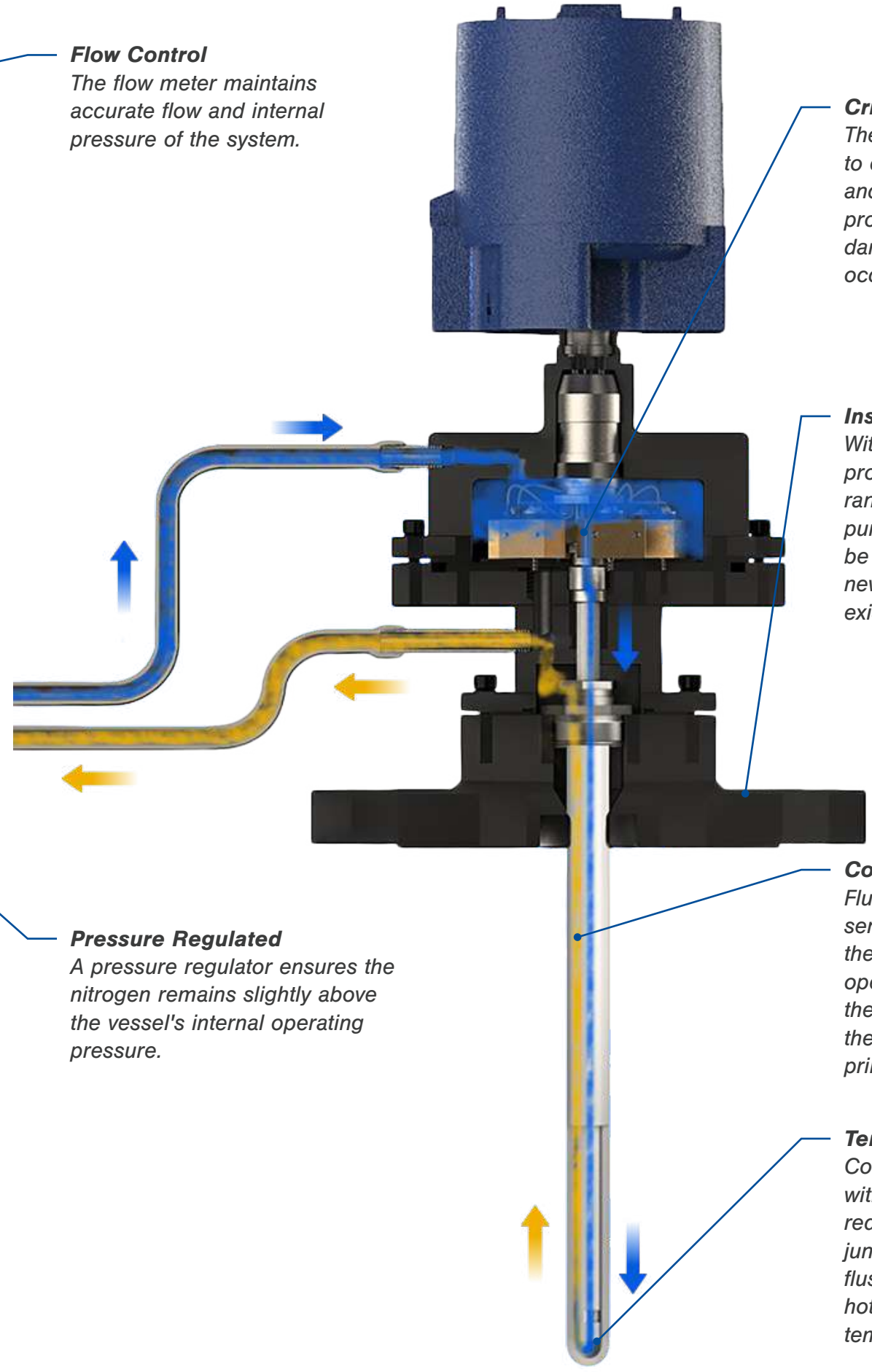
Flush Gas System in Purged Thermocouples

The flush gas system of purged thermocouples is to protect the thermocouple wires without cooling the temperature reading. The nitrogen flush gas is supplied to a pressure regulator which maintains pressure higher than the internal operating pressure of the reactor. The gas is piped to the upper chamber of the thermocouple where it then travels down the openings of the element support. The gas then envelops the sensing junction at the end of the support. Accumulated acid gas is mixed with the nitrogen, directed towards the outlet, piped through a flow meter, then safely routed to a nearby vent. The low flow rate ensures no undesired cooling of the thermocouple. The flow meter is designed to regulate the exhaust while maintaining positive pressure inside the thermocouple.



Optimal Control

Model HFS incorporates the proper pressure and flow control components to ensure the flush gas system is properly operated.



Flow Control
The flow meter maintains accurate flow and internal pressure of the system.

Critical Path
The system is designed to ensure the platinum and rhodium wires are protected from possible damaging reactions that occur in the environment.

Installation Versatility
With models offering process connections ranging from 2 to 6 inches, purged thermocouples can be successfully installed in new vessels or retrofitted to existing vessels.

Contaminant Removal
Flush gas enters the sensing junction through the element support openings and exits through the interior cavity between the element support and primary thermowell.

Pressure Regulated
A pressure regulator ensures the nitrogen remains slightly above the vessel's internal operating pressure.

Temperature Indication
Configure the thermocouple with up to 3 elements for redundancy. The sensing junction is designed to be flush with the refractory hot face for reliable temperature indication.

Model HTX • Thermocouple, Sulfur Processing Service, ATEX, IECEX

Features

- Worldwide standard for protecting Claus thermal reactors
- Maintenance free
- Remains accurate under extreme conditions
- Protects and extends the useful life of refractory and improves reactor up-time
- More than 45 years of proven results in hundreds of installations worldwide
- Keeps working accurately in sulfur service long after other thermocouple designs fail
- Accuracy is continuously verified

Model HTX with 6"/150# Flange

Description

The Delta Controls **Model HTX** Thermocouple is designed for the primary purpose of reliably protecting a vessel and its refractory lining from excessive temperatures. The HTX provides **long-term accuracy** and **reliability** in sulfur processing service.

The design of the HTX is a result of careful attention to design detail, more than 45 years of experience, and numerous field installations. The thermocouple junction is **protected** from corrosive and invasive gases by using a constant low-flow flush gas circulating across the junction. The **flush gas** is kept at a pressure higher than the internal reactor pressure to mitigate the migration of process gases through the primary thermowell, body, or seals. **Process gases** that enter are carried away by the flush gas. The **metered flush gas flow** has an insignificant effect on the accuracy of the temperature measurement.

The HTX is built to meet **each customer's specific installation requirements** such as thermocouple type, insertion length, and construction materials. Installation accessories are available, and recommended to **accurately produce** the refractory borehole in the correct size and alignment needed by the refractory thermowell and HTX Thermocouple assembly.

Specifications

Thermocouple Types:	B, R, S (others available)
Flange Material:	Carbon steel or stainless steel
Trim, Bolting, Seats:	Stainless steel
Primary Thermowell:	Blended alumina ceramic
Process Connection:	ANSI 6.0 in Class 150 std (other sizes, types, ratings available)
Flush Gas:	Nitrogen (11 L/h)
Working Pressure:	150 psig (10 bar) at vessel skin temperature of 500 °F (260 °C)
Working Temperature:	0 °F to +3100 °F (0 °C to +1700 °C)
Required Accessories:	Model HNP Nozzle Packing Kit Model HRW Refractory Thermowell Model HFS Flush Gas Station

Optional Accessories:

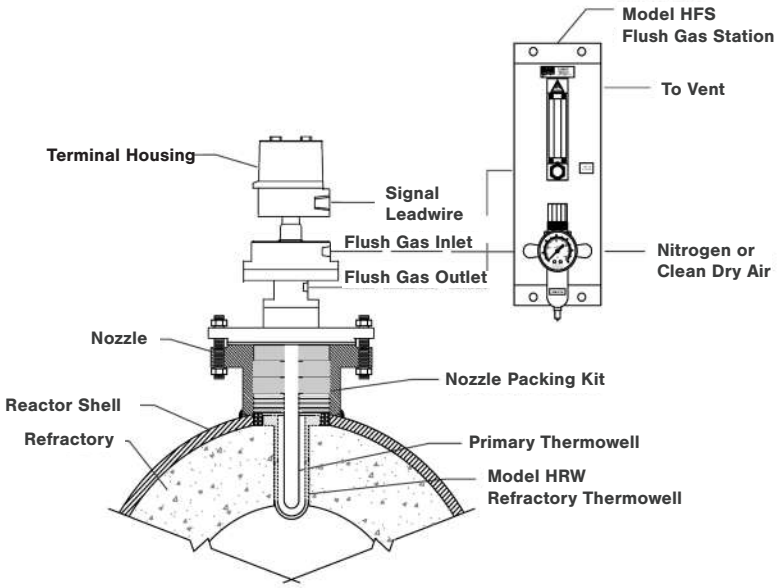
- Model HRG Refractory Drilling System
- Model TEW Thermocouple Extension Wire
- Model HMB Horizontal Mounting Bars
- Model HRS Refractory Stop
- Model HRM Casting Mandrel
- Field training, consultation and assistance

Certifications:

C SP US	70131733	Ex db IIB + H2 T2 Gb Class I Zone 1, AEx db IIB + H2 T2 Gb
Ex	Sira 18ATEX1044x	II 2G, Ex db IIB + H2 T2 Gb Ta = -4 °F to +158 °F (-20 °C to +70 °C)
IEC IECEx	IECEx SIR 18.0012x	Ex db IIB + H2 T2 Gb

HTX Installed in a Claus Thermal Reactor

The **clean flush gas flows** through the HTX and sweeps away hydrogen, sulfur compounds, and corrosive gases that may migrate through the primary thermowell. The gas flows into the upper chamber, down the ceramic element insulator annulus, over the thermocouple hot junction, up the inside of the primary thermowell, and out through the vent connection to the **Model HFS** Flush Gas Station. The pressure regulator output is set to approximately **5 psi (0.34 bar)** above the internal reactor pressure. The flow meter is set to **11 liters per hour**.



Model HTX • Thermocouple, Sulfur Processing Service, ATEX, IECEX

Model Numbering System

MODEL EXAMPLE	MODEL	-	T/C 1	-	T/C 2	-	T/C 3	-	INSERTION LENGTH	-	PROCESS CONNECTION	-	OPTIONS
	HTX	-	R	-	R	-	O	-	15.0	-	6"150RS	-	AA

MODEL	DESCRIPTION
HTX	Thermocouple, Sulfur Processing Service, ATEX, IECEX

T/C	DESCRIPTION	RANGE[1]
B	(-) +6% platinum / (+) platinum +30% rhodium	+212 °F to +3270 °F (+100 °C to +1799 °C)
R	(-) platinum / (+) platinum +13% rhodium	+32 °F to +3200 °F (0 °C to +1760 °C)
S	(-) platinum / (+) platinum +10% rhodium	+32 °F to +3200 °F (0 °C to +1760 °C)
O	None (T/C 2, T/C 3 only)	

INSERTION LENGTH	DESCRIPTION
**.*	**.* in from flange face to inside face of the refractory

PROCESS CONNECTION	DESCRIPTION
4"150RS	4 in Class 150 raised face flange, carbon steel
4"300RS	4 in Class 300 raised face flange, carbon steel
6"150RS	6 in Class 150 raised face flange, carbon steel
6"300RS	6 in Class 300 raised face flange, carbon steel
4"150RY	4 in Class 150 raised face flange, 316 Stainless Steel
4"300RY	4 in Class 300 raised face flange, 316 Stainless Steel
6"150RY	6 in Class 150 raised face flange, 316 Stainless Steel
6"300RY	6 in Class 300 raised face flange, 316 Stainless Steel

OPTIONS	DESCRIPTION
AA	None
XPB	304 Stainless Steel terminal housing

Notes:
[1] Temperature shown is the maximum recommended for continuous service

REQUIRED ORDERING INFORMATION

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to Additional Resources)

INSTALLATION DETAILS

- Nozzle inside diameter
- Shell thickness
- Nozzle inside height
- Refractory thickness
- Nozzle angle from vertical

Model HTP • Thermocouple, Sulfur Processing Service

Features

- Worldwide standard for protecting Claus thermal reactors
- Maintenance free
- Remains accurate under extreme conditions
- Protects and extends the useful life of refractory and improves reactor up-time
- More than 45 years of proven results in hundreds of installations worldwide
- Keeps working accurately in sulfur service long after other thermocouple designs fail
- Accuracy is continuously verified

Model HTP

Description

The Delta Controls **Model HTP** Thermocouple is designed for the primary purpose of reliably protecting a vessel and its refractory lining from excessive temperatures. The HTP provides long-term accuracy and reliability in sulfur processing service.

The design of the HTP is a **result of careful attention** to design detail, more than 45 years of experience, and numerous field installations. The thermocouple junction is isolated from corrosive and invasive gases by using a constant low-flow flush gas circulating across the junction. The **flush gas** is kept at a pressure higher than the internal reactor pressure to mitigate the migration of process gases through the primary thermowell, body or seals. **Process gases** that enter are carried away by the flush gas. The metered flush gas flow has an insignificant effect on the accuracy of the temperature measurement.

The HTP is built to meet each **customer's specific installation requirements**, such as thermocouple type, insertion length, and construction materials. Installation tools are available, and recommended to accurately produce the refractory aperture in the correct size and alignment needed by the refractory thermowell and HTP Thermocouple assembly.

Specifications

Thermocouple Types:	B, R, S (others available)
Flange Material:	Carbon steel or stainless steel
Trim, Bolting, Seats:	Stainless steel
Primary Thermowell:	Blended alumina ceramic
Process Connection:	ANSI 6.0 in Class 150 std (other sizes, types, ratings available)
Flush Gas:	Nitrogen (11 L/h)
Working Pressure:	150 psig (10 bar) at vessel skin temperature of 500 °F (260 °C)
Working Temperature:	0 °F to +3100 °F (0 °C to +1700 °C)
Required Accessories:	Model HNP Nozzle Packing Kit Model HRW Refractory Thermowell Model HFS Flush Gas Station

Optional Accessories:

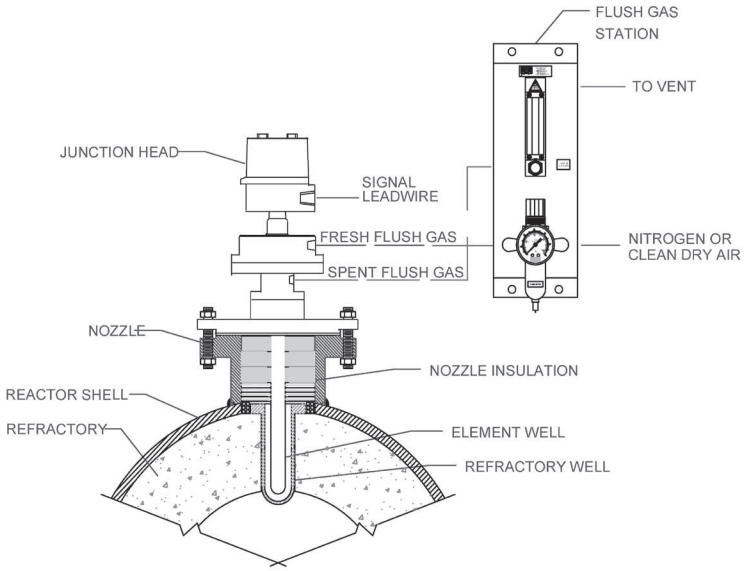
- Model HRG Refractory Drilling System
- Model TEW Thermocouple Extension Wire
- Model HMB Horizontal Mounting Bars
- Model HRS Refractory Stop
- Model HRM Casting Mandrel
- Field training, consultation and assistance

Certifications:	
Housing	Third Party Listed by CSA NRTL/C (USA and Canada) Class I, Groups B, C and D; Class II, Groups E, F and G; Class III; Encl 4X

Model HTP • Thermocouple, Sulfur Processing Service

HTP Installed in a Claus Thermal Reactor

The **clean flush gas flows** through the HTP and sweeps away hydrogen, sulfur compounds, and corrosive gases that may migrate through the primary thermowell. The gas flows from **Model HFS** Flush Gas Station into the upper chamber, down an annulus, over the thermocouple hot junction, up the inside of the primary thermowell, and out through the vent connection to the Model HFS Flush Gas Station. The pressure regulator output is set to approximately 5 psi (0.34 bar) above the internal reactor pressure. The flow meter is set to 11 liters per hour.



Model Numbering System

MODEL EXAMPLE	MODEL	-	T/C 1	-	T/C 2	-	T/C 3	-	INSERTION LENGTH	-	PROCESS CONNECTION	-	OPTIONS
	HTP	-	R	-	R	-	O	-	15.0	-	6"150RS	-	AA

MODEL	DESCRIPTION
HTP	Thermocouple, Sulfur Processing Service

T/C [1]	DESCRIPTION	RANGE [1]
B	(-) platinum +6% rhodium / (+) platinum +30% rhodium	+212 °F to +3270 °F (+100 °C to +1799 °C)
R	(-) platinum / (+) platinum +13% rhodium	+32 °F to +3200 °F (0 to +1760 °C)
S	(-) platinum / (+) platinum +10% rhodium	+32 °F to +3200 °F (0 to +1760 °C)
O	None (T/C 2, T/C 3 only)	

INSERTION LENGTH	DESCRIPTION
**.*	**.* in from flange face to inside face of the refractory

PROCESS CONNECTION	DESCRIPTION
4"150RS	4 in Class 150 raised face flange, carbon steel
4"300RS	4 in Class 300 raised face flange, carbon steel
6"150RS	6 in Class 150 raised face flange, carbon steel
6"300RS	6 in Class 300 raised face flange, carbon steel
4"150RY	4 in Class 150 raised face flange, 316 Stainless Steel
4"300RY	4 in Class 300 raised face flange, 316 Stainless Steel
6"150RY	6 in Class 150 raised face flange, 316 Stainless Steel
6"300RY	6 in Class 300 raised face flange, 316 Stainless Steel

Model Numbering System

	MODEL	-	T/C 1	-	T/C 2	-	T/C 3	-	INSERTION LENGTH	-	PROCESS CONNECTION	-	OPTIONS
MODEL EXAMPLE	HTP	-	R	-	R	-	O	-	15.0	-	6"150RS	-	AA

OPTIONS	DESCRIPTION
AA	None
XPB	304 Stainless Steel housing, NACE

Notes:
[1] Temperature shown is the maximum recommended for continuous service

REQUIRED ORDERING INFORMATION

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to Additional Resources)

INSTALLATION DETAILS

- Nozzle inside diameter
- Shell thickness
- Nozzle inside height
- Refractory thickness
- Nozzle angle from vertical

Model HTS • Thermocouple, Sulfur Processing Service, Compact

Features

- Compact thermocouple utilizing verified technology for sulfur processing service
- Worldwide standard for protecting Claus thermal reactors
- Maintenance free
- Remains accurate under extreme conditions
- Protects and extends the useful life of refractory and improves reactor up-time
- The only proven thermocouple technology to function reliably long term in sulfur service

Model HTS

Description

The Delta Controls **Model HTS** Thermocouple is designed for the primary purpose of reliably **protecting** a vessel and its refractory lining **from excessive temperatures**. The HTS is designed for installations unable to accommodate the recommended 6 inch process connection of the Model HTX. The HTS provides long term **accuracy** and **reliability** in sulfur processing service.

The design of the HTS is the result of attention to detail, more than 45 years of experience, and numerous field installations. The thermocouple junction is isolated from corrosive and invasive gases by using a constant low-flow flush gas circulating across the junction. The **flush gas** is kept at a pressure higher than the internal reactor pressure to mitigate the migration of process gases through the primary thermowell, body, or seals. **Process gases** that enter are carried away by the flush gas. The metered flush gas flow has an insignificant effect on the accuracy of the temperature measurement. The Model HNP, consisting of ceramic fiber rings sized for the customer's nozzle, is required with the use of the HTS.

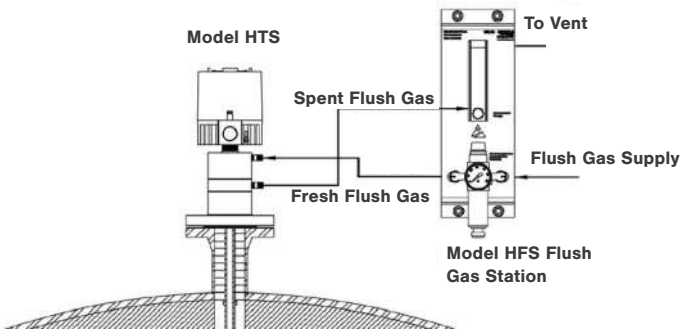
For most applications, Model HTX is preferred as it offers the **highest reliability** of any thermocouple. The HTS provides a highly reliable alternative compatible with smaller process connections for installations unable to accommodate the recommended 6 inch process connection of the Model HTX.

The HTS is built to meet **each customer's specific installation requirements**, such as thermocouple type, insertion length, and materials of construction.

Installation tools are available, and recommended to accurately produce the refractory borehole in the correct size and alignment needed by the refractory thermowell and HTS Thermocouple assembly.

Specifications

Thermocouple Types:	B, R, S (others available)
Body Material:	Stainless steel
Trim, Bolting, and Seats:	Stainless steel
Housing Material:	Aluminum or 304 Stainless Steel
Primary Thermowell	Blended alumina ceramic
Threaded Process Connection:	ANSI 1.5, 2.0 in MPT
Flanged Process Connection:	ANSI 1.5 in, 2.0 in, 3.0 in (other sizes, types ratings available)
Flush Gas:	Nitrogen (11 L/h)
Working Pressure:	150 psig (10.3 bar) at 500 °F (260 °C)
Working Temperature:	0 °F to 3100 °F[1] (-18 °C to 1704 °C)[1]
Required Accessories:	Model HFS Flush Gas Station Model HNP Nozzle Packing Kit
Optional Accessories:	• Model HRG Refractory Drilling System • Model TEW Thermocouple Extension Wire • Model HRM Casting Mandrel • Field training, consultation and assistance
Certifications:	
Housing	Third Party Listed by CSA NRTL/C (USA and Canada) Class I, Groups B, C and D; Class II, Groups E, F and G; Class III; Encl 4X



Model Numbering System

MODEL EXAMPLE	MODEL	-	T/C 1	-	T/C 2	-	T/C 3	-	INSERTION LENGTH	-	PROCESS CONNECTION	-	OPTIONS
	HTS	-	R	-	R	-	O	-	15.0	-	2"150RY	-	AA

MODEL	DESCRIPTION
HTS	Thermocouple, Sulfur Processing Service, Compact

T/C [1]	DESCRIPTION	RANGE [1]
B	(-) platinum +6% rhodium / (+) platinum +30% rhodium	+212 °F to +3270 °F (+100 °C to +1799 °C)
R	(-) platinum / (+) platinum +13% rhodium	+32 °F to +3200 °F (0 °C to +1760 °C)
S	(-) platinum / (+) platinum +10% rhodium	+32 °F to +3200 °F (0 °C to +1760 °C)
O	None (T/C 2, T/C 3 only)	

INSERTION LENGTH	DESCRIPTION
**.*	**.* in from flange face to inside face of the refractory

PROCESS CONNECTION	DESCRIPTION
1.5"MPTY	1.5 in male pipe thread, 316 Stainless Steel
2"MPTY	2 in male pipe thread, 316 Stainless Steel
2"150RY	2 in Class 150 raised face flange, 316 Stainless Steel
2"300RY	2 in Class 300 raised face flange, 316 Stainless Steel
3"150RY	3 in Class 150 raised face flange, 316 Stainless Steel
3"300RY	3 in Class 300 raised face flange, 316 Stainless Steel
3"MPTY	3 in MPT, 316 Stainless Steel

OPTIONS	DESCRIPTION
AA	None
XPB	304 Stainless Steel housing, NACE

Notes:
[1] Temperature shown is the maximum recommended for continuous service

REQUIRED ORDERING INFORMATION

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to Additional Resources)

INSTALLATION DETAILS

- Nozzle inside diameter
- Shell thickness
- Nozzle inside height
- Refractory thickness
- Nozzle angle from vertical

QSeal™

All of the reliability, none of the purge. Heritage meets Unpurged Thermocouple.

Introducing QSeal™, the new patent-pending Delta Controls unpurged thermocouple technology. Engineered Reliability in it's latest iteration as an unpurged alternative. The Delta Controls QSeal™ system utilizes equilibrium sealing technology to protect the thermocouple elements from embrittlement, degradation, and contamination.

Unpurged Thermocouple

One Part of the Equation
QSeal™ provides sealing mechanisms beyond that of the monocrystalline sapphire thermowell.

The Intrinsic Challenge

In harsh environments such as sulfur recovery, it is inevitable that trace gases will permeate and accumulate around and through thermowells and sealing elements over years of service. No thermocouple is immune to this process. QSeal™'s innovative design ensures the diffusion of permeating molecules is exterior to the thermocouple elements.

Protection Beyond the Thermowell

QSeal™ utilizes a monocrystalline sapphire thermowell as only one component of the patent pending protection system. While monocrystalline lattice structures inhibit permeation, additional protection mechanisms are necessary to prevent molecular accumulation over years in service.

Equilibrium Sealing

Equilibrium in the QSeal™ system refers to the concept of gases becoming uniformly distributed by reaching atmospheric equilibrium. This equilibrium is reached through diffusion of gases seeking equal concentrations.

QSeal™: Seal, Diffuse, Seal Design

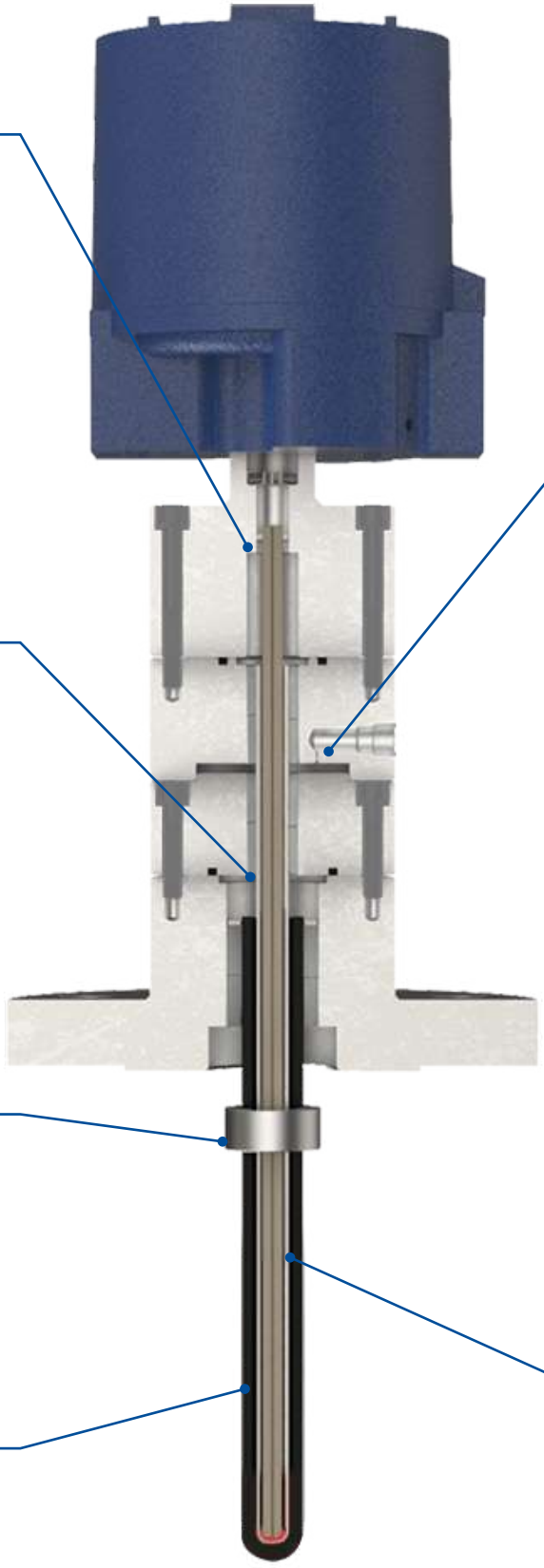
Four primary seals at 3 levels with secondary redundant backups and an isolated seal breather ensure proper molecular diffusion during normal operation and containment in the unlikely event of breakage.

Sealing Systems
This innovative system provides primary thermowell seals for direct process protection, secondary thermowell seals for permeating gas protection, as well as element support and element seals for added containment isolation.

Long-term Diffusion Control
The QSeal™ design ensures permeating molecules accumulate over years of service in designated interior cavities instead of circumventing sealing elements in other designs.

Support Collar
A thermowell support collar is available for process connections greater than 3 inches to securely position the nozzle packing kit.

Primary Thermowell
A silicon carbide primary thermowell provides robust thermal shock resistance due to silicon carbide's strength and stability.



Isolated Seal Breather
An isolated seal breather prevents molecular accumulation by maintaining interior equilibrium concentrations.

Secondary Thermowell
The crystalline matrix of the monocrystalline sapphire secondary thermowell significantly reduces permeation rates over standard alumina thermowells.

Model HTV • Thermocouple, Sulfur Processing Service, Unpurged

Features

- Patent pending QSeal™ technology
- Unpurged thermocouple for sulfur processing services
- Unique thermocouple element protection system
- Wide range of available process connections
- Streamlined installation and maintenance
- Designed to work accurately in sulfur service long after other unpurged thermocouple designs fail
- Dual thermowells provide robust corrosion protection

Model HTV

Description

The Delta Controls **Model HTV** Unpurged Thermocouple is designed for the primary purpose of reliably protecting a vessel and its refractory lining from excessive temperatures. The HTV is intended for installations **without** access to a **purge system**.

The design of the HTV is the result of attention to detail and more than 45 years of experience in the sulfur recovery industry. The thermocouple junction is isolated from the process gases by using a permeation resistant thermowell constructed of monocrystalline sapphire. The **patent-pending QSeal™** design prevents trace amounts of process gases from leaking past the seals and accumulating inside the thermowell. In the event of thermowell breakage, multiple redundant seals prevent the release of process gases.

For most applications, the Model HTX purged thermocouple is preferred as it offers the highest reliability and best track record of any thermocouple in sulfur processing service. However, Model HTV provides a highly reliable **alternative** for installations unable to accommodate the Model HTX's installation requirements.

The HTV is built to meet each **customer's specific installation** requirements such as thermocouple type, operating temperatures, nozzle size, insertion length, and materials of construction. The HTV assembly is furnished complete with all necessary installation components. Installation tools are available, and recommended, to accurately produce the refractory borehole in the correct size and alignment needed for the thermocouple assembly.

Specifications

Thermocouple Types:	B, R, S (others available)
Body Material:	Stainless steel
Trim, Bolting, and Seats:	Stainless steel
Housing Material:	Aluminum or 304 Stainless Steel
Primary Thermowell Material:	Silicon carbide
Secondary Thermowell Material:	Monocrystalline sapphire
Process Connection:	ANSI 1.5 in to 3.0 in MPT ANSI 1.5 in to 6.0 in (other classes, sizes, types, ratings available)
Working Pressure:	150 psig (10.3 bar) at 500 °F (260 °C)
Working Temperature:	0 °F to 3100 °F[1] (-18 °C to 1704 °C)[1]
Required Accessories:	Model HNP Nozzle Packing Kit Model HRW Refractory Well*

Optional Accessories:

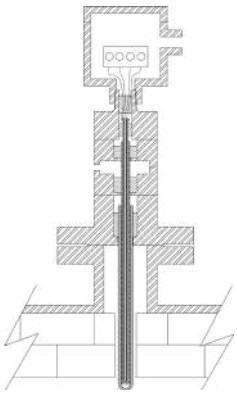
- Model HRS Nozzle Refractory Stop
- Model TEW Thermocouple Extension Leadwire
- Model HRM Casting Mandrel
- Field Training, Consultation and Assistance

Certifications:

Housing	Third Party Listed by CSA NRTL/C (USA and Canada) Class I, Groups B, C and D; Class II, Groups E, F and G; Class III; Encl 4X

*4 in to 6 in process connections only

Model HTV



Model Numbering System

MODEL EXAMPLE	MODEL	-	T/C 1	-	T/C 2	-	O	-	INSERTION LENGTH	-	PROCESS CONNECTION	-	OPTIONS
	HTV	-	R	-	R		O	-	15.0	-	2"150RY	-	AA

MODEL	DESCRIPTION
HTV	Thermocouple, Sulfur Processing Service, Unpurged

T/C [1]	DESCRIPTION	RANGE [1]
B	(-) platinum +6% rhodium / (+) platinum +30% rhodium	+212 °F to +3270 °F (+100 °C to +1799 °C)
R	(-) platinum / (+) platinum +13% rhodium	+32 °F to +3200 °F (0 °C to +1760 °C)
S	(-) platinum / (+) platinum +10% rhodium	+32 °F to +3200 °F (0 °C to +1760 °C)
O	None (T/C 2 only)	

INSERTION LENGTH	DESCRIPTION
**.*	Distance from flange face to inside face of the refractory (**.* *in*)

PROCESS CONNECTION	DESCRIPTION
1.5"MPTY	1.5 in male pipe thread, 316 Stainless Steel
2"MPTY	2 in male pipe thread, 316 Stainless Steel
2"150RY	2 in Class 150 raised face flange, 316 Stainless Steel
2"300RY	2 in Class 300 raised face flange, 316 Stainless Steel
3"150RY	3 in Class 150 raised face flange, 316 Stainless Steel
3"300RY	3 in Class 300 raised face flange, 316 Stainless Steel
4"150RY	4 in Class 150 raised face flange, 316 Stainless Steel
4"300RY	4 in Class 300 raised face flange, 316 Stainless Steel
6"150RY	6 in Class 150 raised face flange, 316 Stainless Steel
6"300RY	6 in Class 300 raised face flange, 316 Stainless Steel

OPTIONS	DESCRIPTION
AA	None

Notes:
[1] Temperature shown is the maximum recommended for continuous service

REQUIRED ORDERING INFORMATION

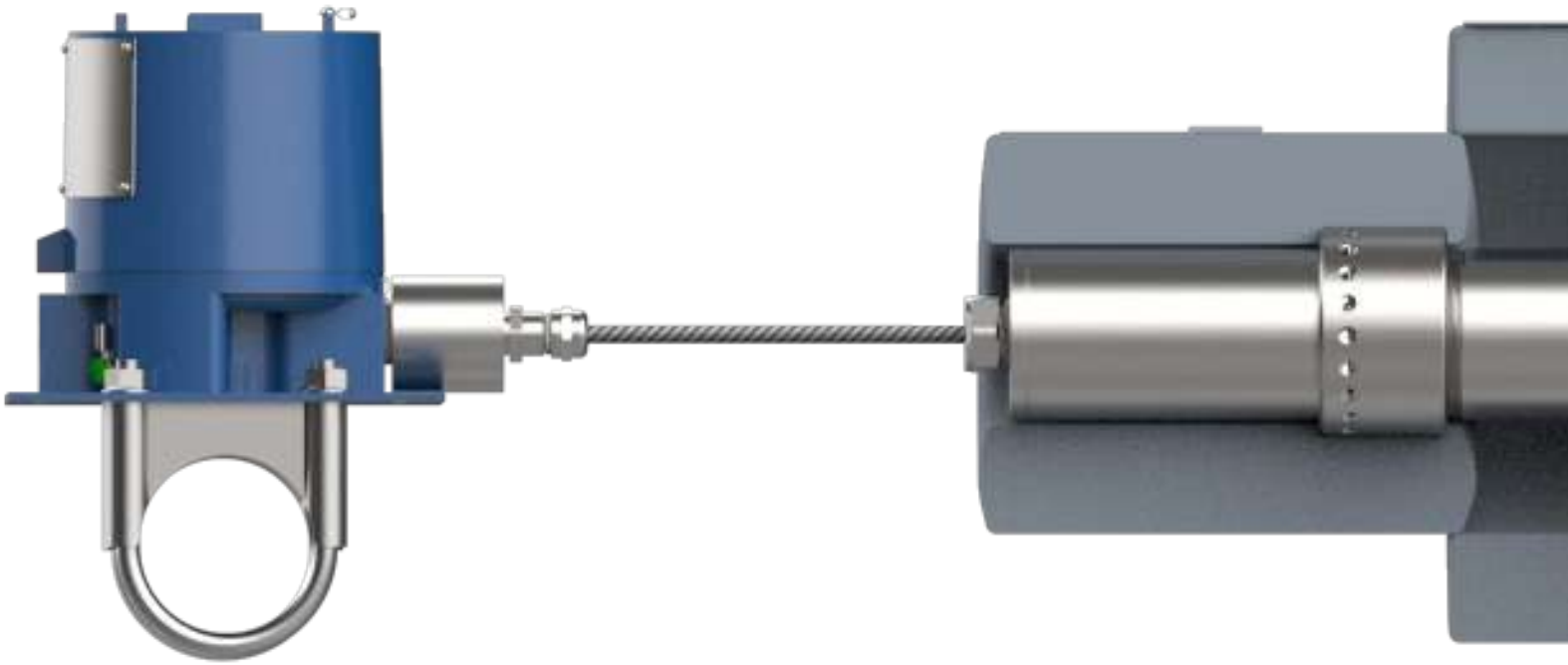
- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to Additional Resources)

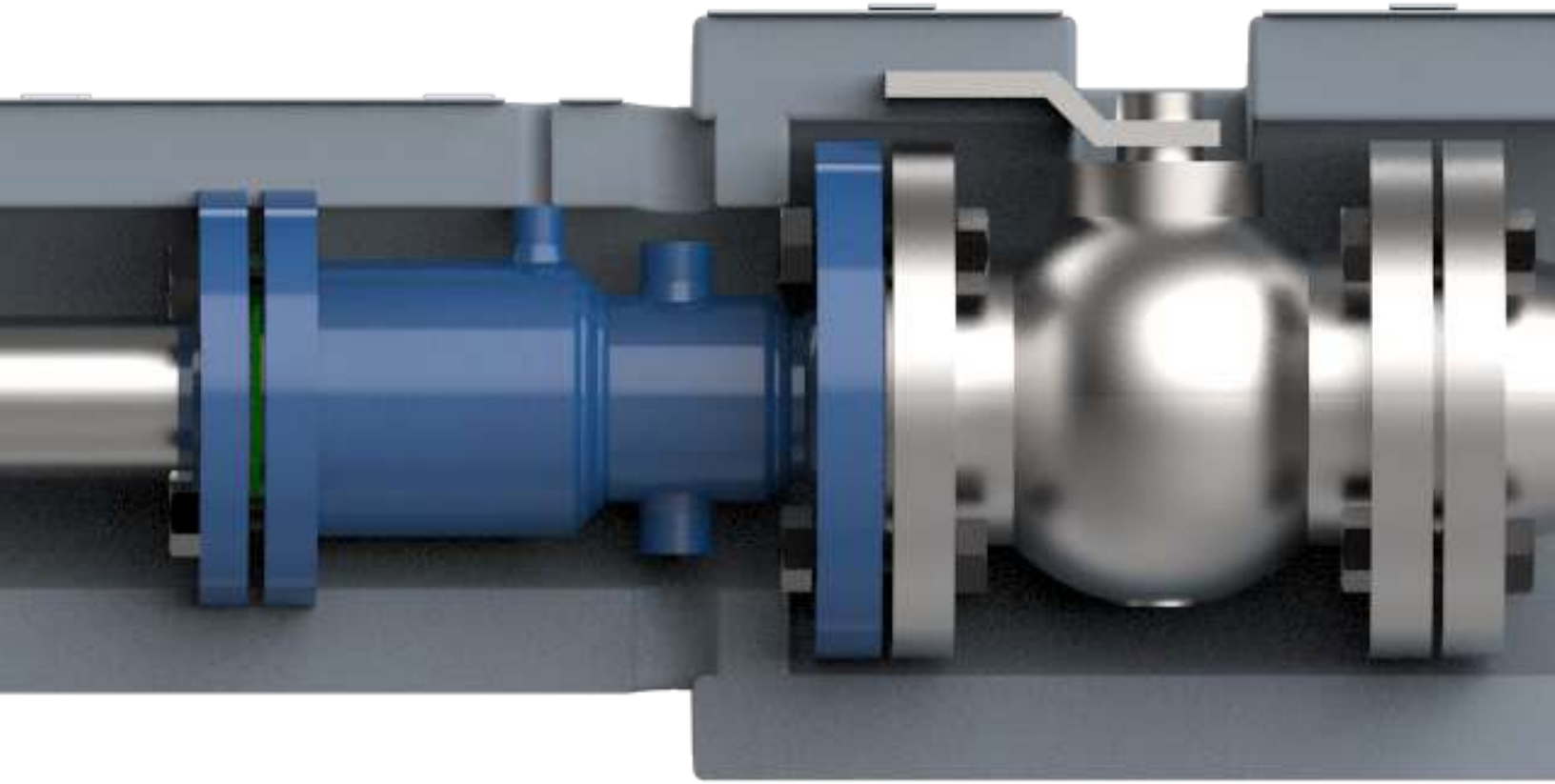
INSTALLATION WORKSHEET DETAILS

- Nozzle inside diameter
- Shell thickness
- Nozzle inside height
- Refractory thickness
- Nozzle angle from vertical

A better alternative.

The most reliable infrared pyrometers for sulfur service.





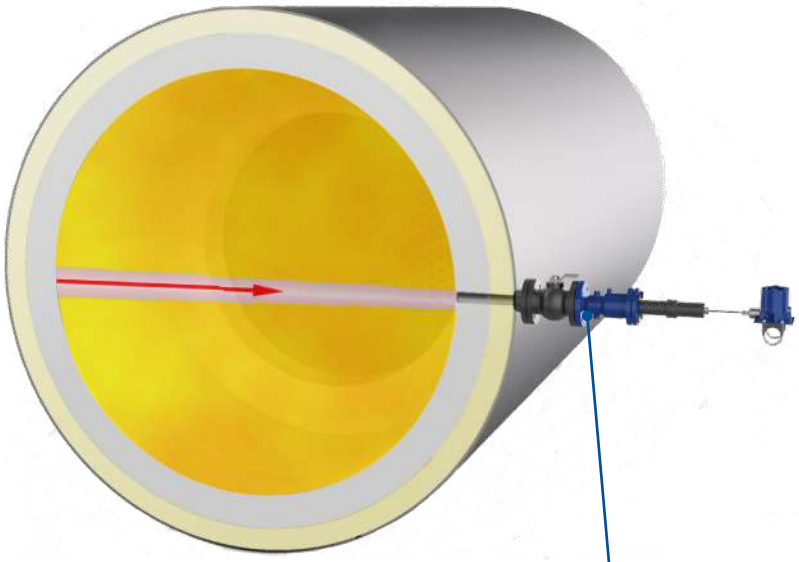
Infrared Pyrometer

Pyrometer Theory of Operation

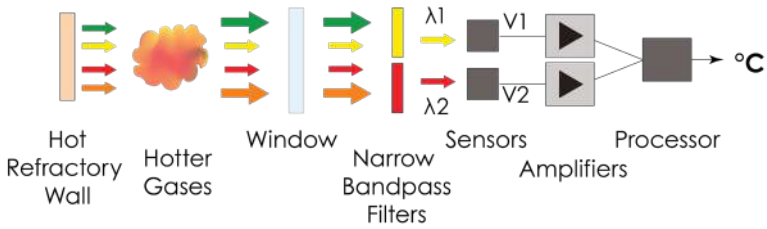
Pyrometers utilize an inferential temperature measurement method to measure the intensity of infrared energy inside the reactor. A broad spectrum of light is emitted by the refractory hot face in the reactor. Light passes through the reacting process gases that absorb and emit light in various wavelengths and amounts, depending on gas composition, concentration, and temperature. The light passes down the vessel nozzle and through a window. The optical filter passes a narrow band of wavelengths to a sensor that amplifies the output.

Two-Wavelength Ratiometric Pyrometry

Two separate narrow bandpass filters pass different wavelengths of light to two sensors and each output is subsequently amplified. The non-linear sensor output as a function of temperature results in dissimilar output curves. The processor calculates the ratio of the two voltages using a formula, where reduction in V1 and V2 is caused by occlusion. The ratio cancels any attenuation caused by occlusion and remains independent of any output signal attenuation from material in the sight path. The ratio calculates the reactor temperature based on the measurable light reaching both sensors.

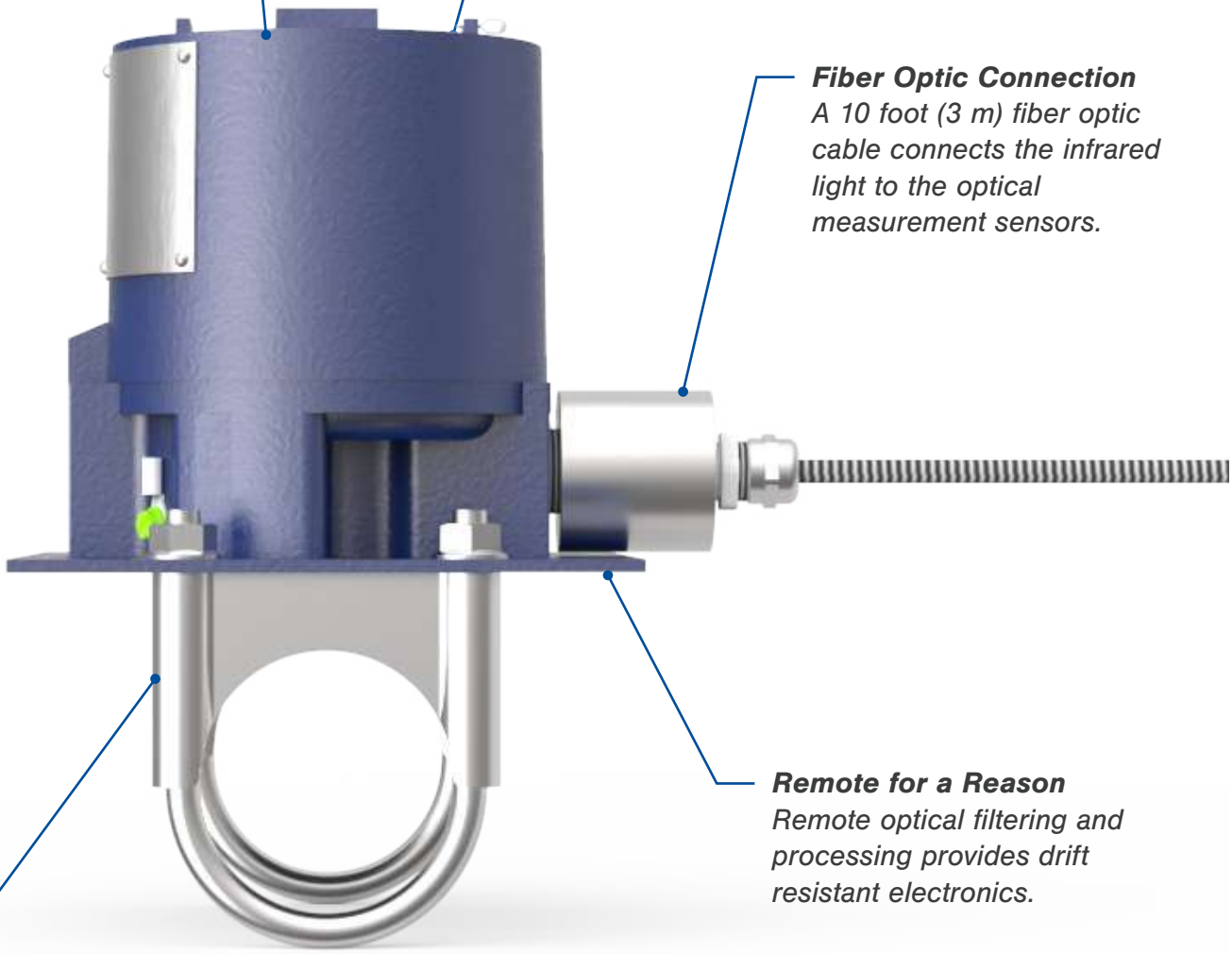


Two-Wavelength Pyrometry



Local Visibility
A LCD display and an enclosed sight glass offer local reading of temperature and other parameters.

Loop Power
The electronics features 4-20 mA DC loop power and standard HART® communication protocol.



Fiber Optic Connection
A 10 foot (3 m) fiber optic cable connects the infrared light to the optical measurement sensors.

Remote for a Reason
Remote optical filtering and processing provides drift resistant electronics.

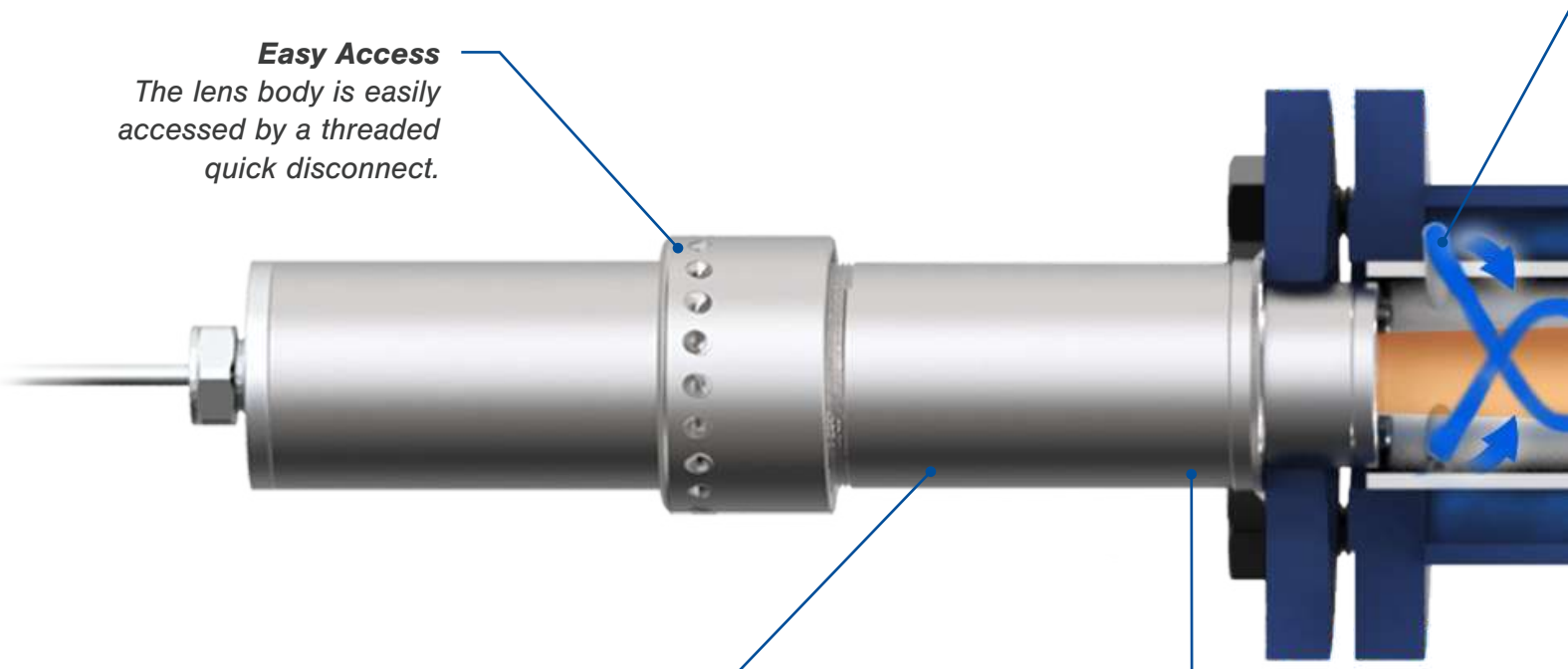
Streamlined Mounting
A U-bolt bracket allows for easy installation of the electronics enclosure to a nearby instrument stand, strut frame, or beam.

Infrared Pyrometer

Model HIR Pyrometer

Model HIR incorporates design principles set to maintain the sight-path and nozzle above sulfur's freezing point to prevent measurement issues caused by accumulated sulfur. The design utilizes a steam jacketed lens assembly and an insulation system to thermally maintain the nozzle, block valve, and lens assembly. A preheated, low-flow nitrogen lens sweep also prevents any cooling or occlusion buildup on the lens.

Easy Access
The lens body is easily accessed by a threaded quick disconnect.



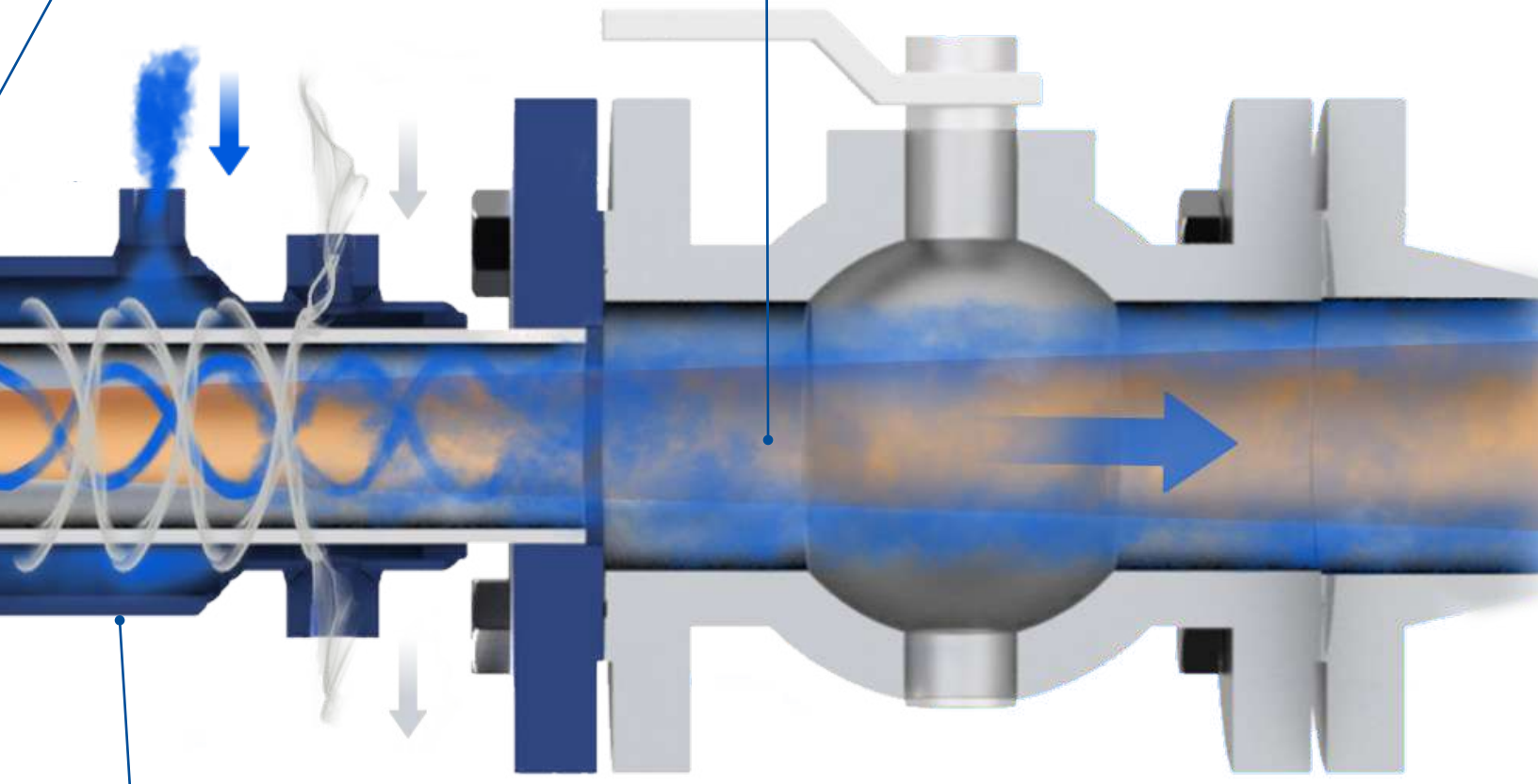
Streamlined Calibration
The optical lens tube is dimensionally designed to directly mount a handheld pyrometer for streamlined online calibration services.

Optical Alignment
An adjustable lens tube inside the lens assembly ensures the sensor is aligned with the nozzle borehole.

Unobstructed View
Vortices created by the flush gas inhibit sulfur from depositing and accumulating within the nozzle borehole.

Sight Path Management
Three lens sweep inlets route preheated nitrogen flush gas in front of the lens to prevent particulates from occluding the sight glass.

Thermal Management
A three-piece insulation system is available to ensure the long nozzle projection is thermally insulated to prevent heat loss.



External Steam Jacket
A steam jacketed assembly connects the block valve to the lens assembly and ensures the passageway remains above the freezing point of sulfur.

Model HIR • Infrared Pyrometer, Sulfur Processing Service

Features

- Operates accurately and reliably with up to 100% oxygen enrichment
- Measures refractory 'hot face' temperature
- HART® Registered
- Works in conjunction with Delta Controls Model HTX/HTP/HTS/HTV Thermocouple
- Verify calibration against installed thermocouple temperature monitoring system
- Limited maintenance required
- Stable electronics, no periodic factory recalibration required, 4-20 mA DC loop powered
- Insensitive to reaction gas infrared radiation absorption and flame luminosity
- No instrument case cooling or high voltage supply power required
- Wide sensing range, +662 °F to +3092 °F (+350 °C to +1700 °C)
- Insulation system included to ensure measurement accuracy
- Steam jacketed design prevents occlusion of the sighting window
- Nozzle clean-out not required

Description

The Delta Controls **Model HIR** Pyrometer detects the intensity of infrared energy radiated by the refractory hot face in a Claus thermal reactor. This sensed energy is converted into an electrical signal, which accurately displays the temperature. This is accomplished using narrow-bandpass **optical filters** and special sensors. The selected sensing spectrums avoid significant errors due to luminosity and absorption.

The HIR is **designed to be maintenance free**. The lens, sighting window, and nozzle are kept at a high temperature to avoid sulfur accumulation and the need to perform frequent periodic maintenance. This is accomplished by the **steam jacketed lens assembly** design that prevents sulfur from condensing onto the lens window or accumulating in the nozzle. In addition, the loop-powered, drift-free HIR electronics do not require frequent calibration service. Due to the high temperatures at the lens window, the electronics are

Model HIR Pyrometer

mounted away from the reactor and connected to the lens assembly by a 10 feet (3 meters) armored fiber optic cable, **eliminating** the need to provide cooling to the electronics housing. If it is impractical to mount the electronics within 10 feet of the reactor mounting nozzle, the fiber optic adapter wires can be extended up to an additional 25 feet (8 meter) using the 'RS' option.

The electronics employ a dual-wavelength ratiometric measurement that is unaffected by flames, partial nozzle obstructions, or occluded (coated) lens windows. In essence, the measurement is **based on the wavelength of the light** instead of the its intensity, as is usually done with a single wavelength measurement. In addition to the temperature, the amount of blockage can also be measured and used to generate an alarm.

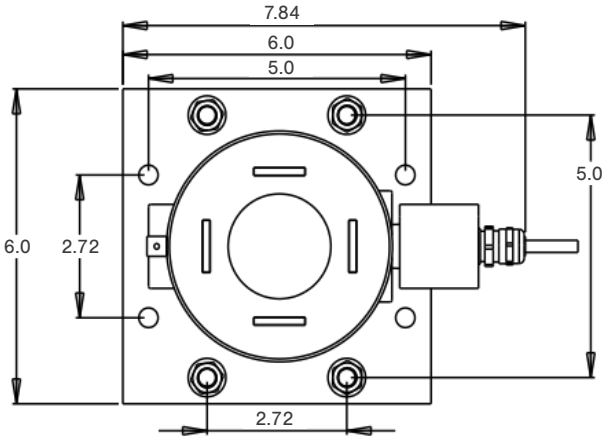
The HIR ideally operates **in conjunction** with, **or independently** of, Delta Controls Thermocouples to achieve turnaround-to-turnaround reliability with minimum maintenance. This is particularly advantageous when supplemental oxygen is employed or during upset conditions. The use of both technologies **eliminates** commonly caused errors and vastly improves overall system reliability.

A three section insulation system is included with each Model HIR. The insulation system is specifically engineered so the Model HIR **maintains proper temperature** along the isolation valve, steam jacketed assembly, and lens assembly. The insulation system retains the heat produced by the steam jacket assembly. This system maintains the temperature above the sulfur freezing point and ensures sulfur cannot accumulate on the lens and reduce the amount of infrared energy received.

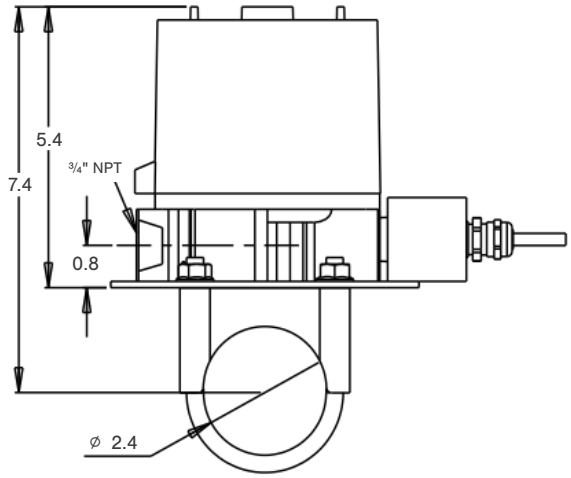
Specifications

Power:	24 DCV loop (3.5 bar to 7 bar)
Steam:	50 psig to 100 psig supply required
Lens Sweep:	≈ 25 L/m (nitrogen required)
Fiber Optic Interconnecting Cable:	PTFE jacketed over stainless steel armor; 10 ft (3 m) length std (see 'RS' option)
Electronics Enclosure:	Cast aluminum with viewing window; stainless steel mounting hardware
Conduit Connection:	0.75 in NPT
Process Connection:	2 in or 3 in ANSI flange standard; carbon steel steam jacketed body (other types and sizes available)
Steam Fixture and Lens Flange Materials:	Carbon steel
Mounting Hardware Materials:	Stainless steel
Lens Assembly Materials:	Stainless steel
Lens Cable Materials:	High temp armored fiber optic, PTFE jacketed
Ingress Protection:	IP65; Enclosure 4X
Ambient Temperature Limits:	Fiber Optics and Lens: -20 °F to +400 °F (-29 °C to +204 °C) Fiber Optic Adapter: -4 °F to +185 °F (-20 °C to +85 °C) Electronics: -4 °F to +158 °F (-20 °C to +69 °C)
Dual Wavelength Range:	+1472 °F to +3092 °F (+800 °C to +1700 °C)
Single Wavelength Range:	≤ +662 °F (+350 °C)
Certifications:	
2496557	Class I, Div 1, Groups B, C and D; Class II, Div 1, Groups E, F and G; Class III, Div1 Class I, Zone 1, Ex d IIB+H2 Class I, Zone 1, AEx d IIB+H2
Sira 17ATEX1232X	II 2 G Ex db IIB+H2 T6 Gb Ta = -4 °F to +158 °F (-20 °C to +70 °C)
IECEx SIR 17.0057X	Ex db IIB + H2 T2 Gb Ta = -4 °F to +158 °F (-20 °C to +70 °C)
	HART® Registered

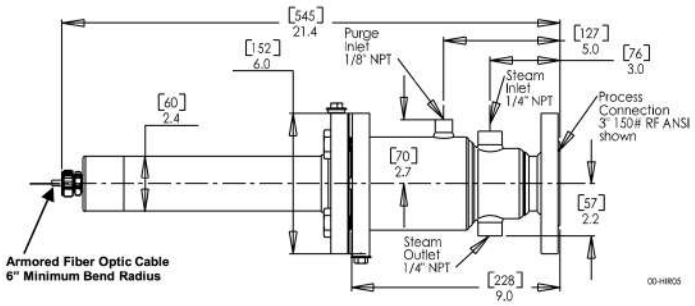
Remote Electronics Unit



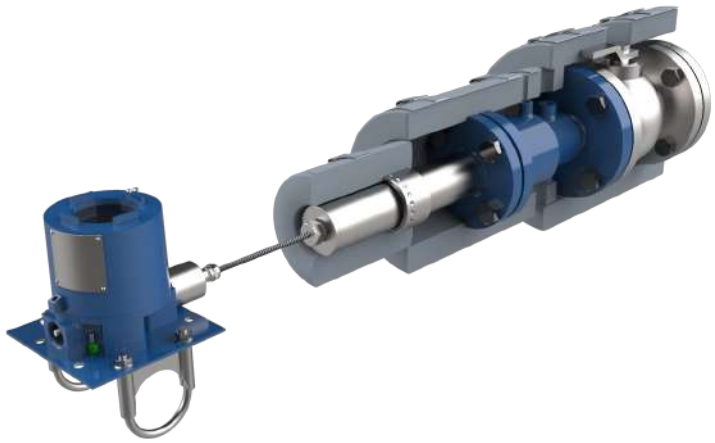
Pipe Stand Mounting Configuration



Steam Jacketed Lens Assembly / Process Connection Orientation



Model HIR • Infrared Pyrometer, Sulfur Processing Service



Model HIR with Insulation System

Model Numbering System

MODEL EXAMPLE	MODEL	-	SENSING RANGE	-	HOUSING RATING	-	CABLE LENGTH	-	PROCESS CONNECTION	-	OPTIONS
	HIR-A	-	F	-	7WR	-	10	-	2"150RS	-	AA

MODEL	DESCRIPTION
HIR-A	Infrared Pyrometer, Sulfur Processing Service

SENSING RANGE	DESCRIPTION	RANGE[1]
F	2 color	+662 °F to +3092 °F (+350 °C to +1700 °C)

HOUSING RATING	DESCRIPTION
7WR	Flameproof Ex db IIB + H2 T6 IP65

CABLE LENGTH	DESCRIPTION
10	10 ft fiber optic cable (3 m)

PROCESS CONNECTION	DESCRIPTION
2”150RS	2 in Class 150 raised face flange, Carbon steel
3”150RS	3 in Class 150 raised face flange, Carbon steel
2”300RS	2 in Class 300 raised face flange, Carbon steel
3”300RS	3 in Class 300 raised face flange, Carbon steel

OPTIONS	DESCRIPTION
AA	None
RS	Remote Sensor

REQUIRED ORDERING INFORMATION

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to Additional Resources)

Model HIP • Pyrometer, Handheld, Sulfur Processing Service

Features

- Handheld pyrometer for portable temperature verification
- For use with Delta Controls pyrometer or other models
- Highly reliable dual wavelength technology
- Lightweight for easily travel; includes carrying case
- Calibrate permanently installed pyrometer

Description

The Delta Controls **Model HIP** Handheld Pyrometer is a robust tool for troubleshooting temperature measurement issues and calibrating permanently installed pyometers. Model HIP detects the intensity of infrared energy radiated by the refractory hot face in a Claus thermal reactor. This sensed energy is converted into an electrical signal, which accurately displays the temperature. The electronics employ a dual-wavelength ratiometric measurement that is unaffected by flames, partial nozzle obstructions, or coated lens windows to **accurately measure** refractory temperature.

Model HIP

Specifications

Measurement Range:	+572 °F to +3092 °F (+300 °C to +1700 °C)
Readout:	LCD display with backlight
Power Required:	3 AA batteries
Ambient Temperature Limits:	-4 °F to +158 °F (-20 °C to +70 °C)

Model Numbering System

MODEL EXAMPLE **MODEL**

HIP

MODEL	DESCRIPTION
HIP	Handheld Infrared Pyrometer, Sulfur Processing Service

REQUIRED ORDERING INFORMATION

- Model number
- Documentation & testing packages (if required, refer to Additional Resources)

Accessories

Ensure reliability and simplify installation with turn-key tools and accessories.

Complete the package with operational accessories and installation tools engineered specifically for use with Delta Controls' precision instruments.


MN: HFS-BB-NPT-AA
SN: ABC5555-A1
TAG: TI-TAG123
DELTA CONTROLS
CORPORATION
Shreveport, LA USA
www.claustemp.com
SET FLOW RATE
TO 11lph
SET AT 5 psig (0.34 bar)
ABOVE REACTOR
PRESSURE
0
10
20
30
40
50
60
PSI

Model HRW • Refractory Thermowell

Features

- Protects thermocouple primary thermowell from thermal shock, flame impingement and steam quench
- Formulated material blends provide enhanced resistance to corrosion, temperature, and thermal shock

Description

The Delta Controls **Model HRW** Refractory Thermowell is designed to protect the thermocouple's primary thermowell from physical damage along with **protecting** the vessel nozzle and shell from the hot gas convection inside the reactor.

The HRW also **prevents** thermal shock damage to the primary thermowell by partially insulating it from sudden severe changes in gas temperature, such as during steam quenching. Several material formulations are offered. Each blend **enhances** various physical characteristics: mechanical strength, resistance to thermal shock, and the ability to withstand extremely high temperatures.

The HRW is placed at the base of the vessel nozzle and extends through the refractory lining borehole through the refractory lining in the base of the thermocouple nozzle on the Claus thermal reactor.

Model HRW

Specifications

	Model HRW1:	Model HRW2:	Model HRWZ:
Material:	Mullite ceramic	Alumina blend, re- crystallized	Zirconia blend, yttria stabilized
Maximum Temperature:	+2800 ºF (+1538 ºC)	+3200 °F (+1760 °C)	+4000 °F (+2204 °C)
Maximum Insertion B:	35 in (889 mm)	35 in (889 mm)	35 in (889 mm)
Well Outside Diameter:	2.0 in (50.8 mm)	2.0 in (50.8 mm)	2.0 in (50.8 mm)

Model Numbering System

MODEL EXAMPLE	MODEL	-	INSERTION LENGTH
	HRW2	-	12.0

MODEL	DESCRIPTION
HRW1	Refractory Thermowell, Mullite Ceramic Blend
HRW2	Refractory Thermowell, Alumina Ceramic Blend
HRWZ	Refractory Thermowell, Yttria Stabilized Zirconia Ceramic Blend

INSERTION LENGTH	DESCRIPTION
**.*	**.* in from outer lining of refractory to 1 in beyond refractory hot face

REQUIRED ORDERING INFORMATION

- Detailed model number
- Documentation & testing packages (if required, refer to Additional Resources)

Model HNP • Refractory Nozzle Packing Kit, For Use with All Delta Thermocouples

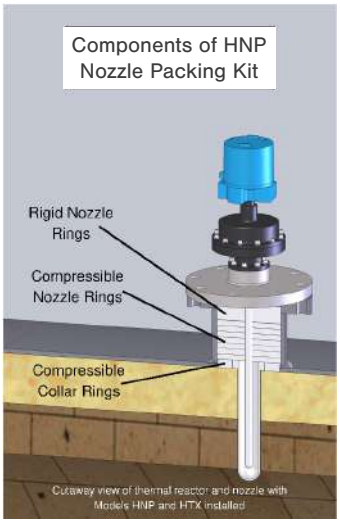
Features

- Prevents sulfur deposition in the reactor nozzle
- Secures and mechanically isolates thermowells
- Resilient; allows movement between the nozzle supported thermocouple and the refractory
- Proven in Claus thermal reactors service for more than 45 years

Model HNP

Description

The Delta Controls **Model HNP** Kit is designed to prevent sulfur components from forming inside the thermocouple nozzle. It **secures** and mechanically isolates the ceramic thermowells. HNP's **resilient design** allows movement between the nozzle-supported thermocouple and the refractory.



Specifications

Rigid Nozzle Rings:	1200 °F (650 °C) continuous service, calcium silicate blend
Compressible Collar Rings:	2300 °F (1250 °C) continuous service, alumina blend
Compressible Nozzle Rings:	2300 °F (1250 °C) continuous service, alumina blend

Model Numbering System

MODEL EXAMPLE	MODEL	-	NOZZLE INSIDE DIAMETER	-	NOZZLE INSIDE HEIGHT	-	OPTIONS
	HNP	-	5.7	-	8.0	-	E

MODEL	DESCRIPTION
HNP	Refractory Nozzle Packing Kit, For Use with All Delta Thermocouples

NOZZLE ID	DESCRIPTION
6.0	6.0 in (154 mm)
5.7	5.7 in (145 mm)
5.5	5.5 in (139 mm)
5.1	5.1 in (130 mm)
3.8	3.8 in (97 mm)
3.6	3.6 in (91 mm)
3.4	3.4 in (86 mm)
3.1	3.1 in (79 mm)
2.9	2.9 in (74 mm)
2.6	2.6 in (66 mm)
2.1	2.1 in (53 mm)
1.9	1.9 in (48 mm)
1.7	1.7 in (43 mm)

NOZZLE HEIGHT	DESCRIPTION
**.*	**.* in from flange face to outer refractory lining

OPTIONS	DESCRIPTION
AA	None
E	Collar and nozzle rings

REQUIRED ORDERING INFORMATION

- Detailed model number
- Documentation & testing packages (if required, refer to Additional Resources)

Model HFS • Flush Gas Station, For Use with Purged Thermocouples

Features

- Accurate flush gas pressure and flow control
- Insures maximum temperature sensing accuracy
- Corrosion resistant, suitable for the severe sulfur processing environments
- All stainless steel construction
- Two mounting options
- 5 micron filter traps particulates and prevents stoppage of the thermocouple internal passages

Description

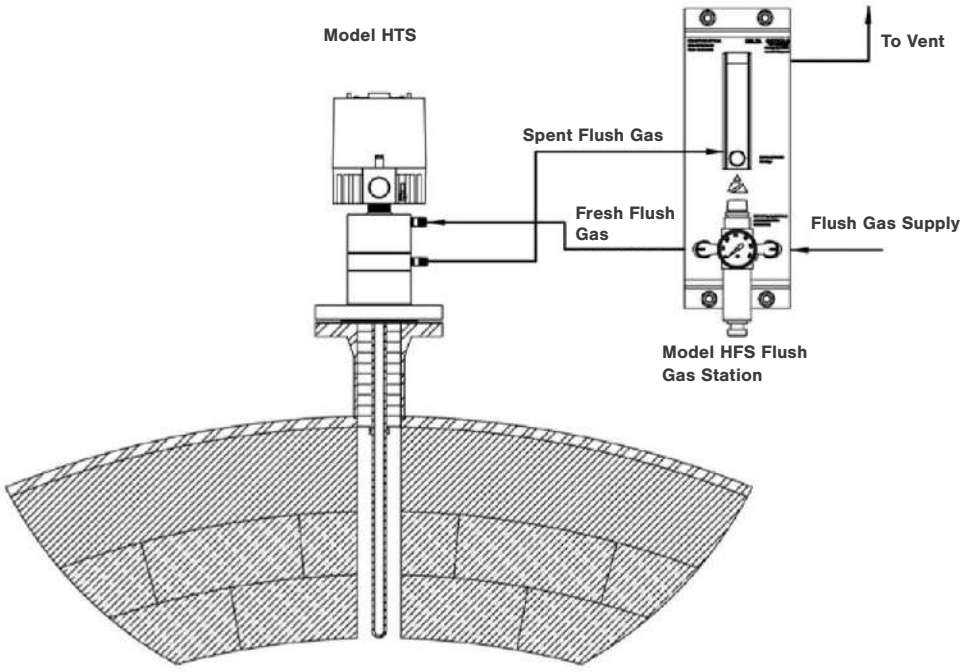
The Delta Controls **Model HFS** Flush Gas Station maintains the pressure inside Model HTP, HTX, and HTS Thermocouples above the operating reactor pressure. The flush gas pressure and flow control ensures maximum temperature sensing **accuracy**. The HFS **resists corrosion** and is suitable for the severe sulfur processing environments.

The HFS mounts on a vertical surface or a two inch pipe stand. Its five micron filter **traps particulates** and **prevents** stoppage of the thermocouple internal passages.

Model HFS

Specifications

Flow Range:	2 L/h to 17 L/h
Supply Pressure:	25 psig to 250 psig (1.75 bar to 17 bar)
Supply Gas:	Nitrogen
Pressure Indicator:	2.5 in diameter; 0 psig to 60 psig (0 bar to 4 bar)
Flow Control:	Constant mass flow rate type
Pressure Control:	2 psig to 50 psig (0.1 bar to 3.5 bar)
Filter:	5 µ sintered polypropylene
Drain:	Manual valve
Meter body:	Stainless steel
Pressure Body:	Stainless steel
Connection Fittings:	Stainless steel, 0.125 in FPT (other connections sizes and types available)
Mounting Plate:	Stainless steel
Pipe Clamps:	Stainless steel



Model Numbering System

MODEL EXAMPLE	MODEL	-	WETTED MATERIALS	-	CONNECTION TYPE & SIZE	-	OPTIONS
	HFS	-	BB	-	NPT	-	AA

MODEL	DESCRIPTION
HFS	Flush Gas Station, For Use with Purged Thermocouples

WETTED MATERIALS	DESCRIPTION
BB	All stainless steel

CONNECTION TYPE & SIZE	DESCRIPTION
NPT	0.125 in female pipe thread

OPTIONS	DESCRIPTION
AA	None
MT	Metal tube flowmeter

REQUIRED ORDERING INFORMATION

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to Additional Resources)

Model HFI • Flush Gas Station, For Use with HIR Pyrometer

Features

- Accurate, continuous purge flow rate
- Insures long-term temperature measurement reliability
- Corrosion resistant, suitable for Sulfur Unit environment
- All stainless steel construction
- Two mounting options
- Simple, easy installation

Description

The Delta Controls **Model HFI** Flush Gas Station provides a filtered purge gas across the process side of the Model HIR lens glass to **reduce particulates** from accumulating on lens. The HFI provides a single place at the reactor where the operator can **regularly monitor** and verify proper operation of the flush gas stream.

The HFI insures long-term temperature measurement reliability by flushing dust and ash from the pyrometer lens window. It is typically mounted on a vertical surface or two inch pipe stand. The HFI is suitable for the severe sulfur processing environments and is corrosion resistant.

Model HFI

Specifications

Flow Range:	4 L/min to 38 L/min std
Pressure Indicator:	2.5 in diameter, 0 psig to 60 psig (0 bar to 4.1 bar)
Flow Control:	Constant mass flow rate type
Pressure Control Range:	2 psig to 50 psig (0.1 bar to 3.4 bar)
Filter:	5 µ sintered polypropylene
Drain:	Manual valve
Meter body:	Stainless steel
Pressure Body:	Stainless steel
Connection Fittings:	Stainless steel, 0.125 in FPT pipe or millimeter size tubing
Faceplate and Pipe Clamps:	Stainless steel
Supply Pressure:	25 psig to 250 psig (1.7 bar to 17.2 bar)
Supply Gas:	Clean dry air or nitrogen

Model Numbering System

MODEL EXAMPLE	MODEL	-	WETTED MATERIALS	-	CONNECTION TYPE & SIZE	-	OPTIONS
	HFI	-	BB	-	NPT	-	AA

MODEL	DESCRIPTION
HFI	Flush Gas Station, For Use with HIR Pyrometer

WETTED MATERIALS	DESCRIPTION
BB	All stainless steel

CONNECTION TYPE & SIZE	DESCRIPTION
NPT	0.125 in female pipe thread

OPTIONS	DESCRIPTION
AA	None
MT	Metal tube flowmeter

REQUIRED ORDERING INFORMATION

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to Additional Resources)

Model HRG • Refractory Drilling System

Features

- Refractory drilling system for use with Delta Controls thermocouples and pyrometers
- Produces concentric refractory hole
- Drill guide is rigidly mounted on the vessel nozzle flange
- Diamond cutting fragments are embedded in a ceramometallic matrix
- Flushing promotes rapid cutting and straight drilling
- Water-cooled bit lengthens life

Description

The Delta Controls **Model HRG** Refractory Drilling System protects the thermocouple's clearance into the vessel by drilling straight, centered, and perpendicular holes. Using the HRG ensures **successful installation** of the Delta Controls Model HTP, HTX, and HTS thermocouples which require close tolerances in the borehole through the refractory.

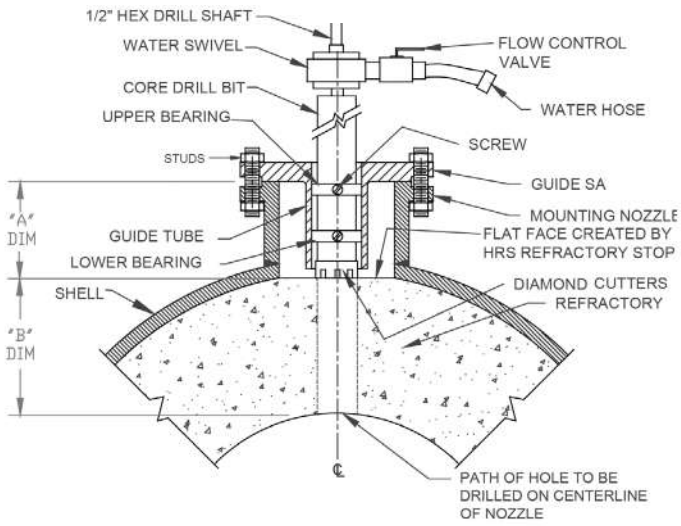
The HRG guide is mounted on the vessel nozzle flange and keeps the drill bit on the **centerline** of the nozzle during drilling. The water swivel adapter and flow control valve deliver the proper amount of water to facilitate the drilling without introducing excessive water to the vessel interior. The final result is a straight hole that is **properly positioned** to accept the refractory thermowell and the thermocouple.

This **precision hole** permits proper insertion of the Model HRW outer protective thermowell and provides **proper clearances** for refractory movement.

Model HRG

Specifications

Flange Size:	ANSI 4 in Class 150 to 6 in Class 300 DIN 90 to 175 mm
Nozzle Inside Diameter:	≥ 3.44 in (≥ 87 mm)
Nozzle Height and Refractory Thickness:	≤ 22 in (560 mm) (option EXD if longer)
Refractory Thickness:	≤ 22 in (560 mm)
Hole Size:	2.20 in (56 mm)
Drill Bit:	Diamond core type, requires water flushing
Water Swivel:	0.625 - 11 TPI to 0.5 in tri-shaft drill drive shaft, 0.75 in - 11 NH Female Hose connector, flow control valve, quarter turn hose coupling
Drill Bit Extension (Length as Required):	12 in (300 mm), ≥ 24 in (600mm)



GUIDE AND DRILL BIT IN PLACE.
READY TO PRODUCE A HOLE

Model Numbering System

MODEL EXAMPLE	MODEL	-	PROCESS CONNECTION	-	NOZZLE INSIDE HEIGHT	-	OPTIONS
	HRG	-	6"150R	-	8.0	-	AA

MODEL	DESCRIPTION
HRG	Refractory Drilling System

PROCESS CONNECTION	DESCRIPTION
4"150R	4 in Class 150 raised face flange
4"300R	4 in Class 300 raised face flange
6"150R	6 in Class 150 raised face flange
6"300R	6 in Class 300 raised face flange

NOZZLE HEIGHT	DESCRIPTION
**.*	**.* in from flange face to outer refractory lining

OPTIONS	DESCRIPTION
AA	None
EXD	Drill bit extension for insertion length ≥ 22 in

REQUIRED ORDERING INFORMATION

- Detailed model number
- Documentation & testing packages (if required, refer to Additional Resources)

Model HRM • Refractory Mandrel, For Use with All Delta Thermocouples

Features

- Allows for optimal thermocouple installation without drilling
- Produces concentric refractory hole
- Available for multiple nozzle sizes

Description

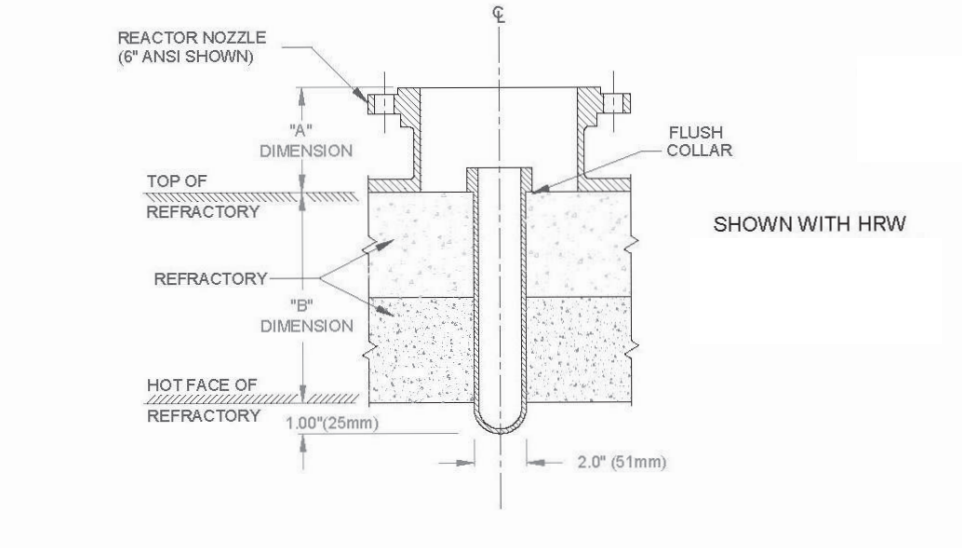
The Delta Controls **Model HRM** Refractory Mandrel is designed for installation on the thermocouple nozzle prior to installing the refractory material. It creates a centered, **accurate hole** through the refractory lining, and the attached stop disc keeps refractory mortar from accumulating in the nozzle interior. The stop disc is required so the HRW Refractory Thermowell is **positioned correctly** in relation to the mounting flange.

The HRM is used when **core drilling is undesirable**, such as when water (for drilling) may not be used. Use of the HRM will require cutting and fitting the refractory firebrick around the tapered mandrel pipe.

Model HRM

Specifications

Material:	Carbon steel
Flange Sizes:	4.0 in to 6.0 in
Class:	4 in Class 150 to 6 in Class 300
Nozzle Inside Diameter:	3.4 in to 6.0 in
Insertion:	As required



Model Numbering System

MODEL EXAMPLE	MODEL	-	PROCESS CONNECTION	-	NOZZLE INSIDE DIAMETER	-	INSERTION LENGTH	-	REFRACTORY THICKNESS	-	OPTIONS
	HRM	-	6"150RS	-	5.7	-	15.0	-	8.0	-	AA

MODEL	DESCRIPTION
HRM	Refractory Mandrel, for use with All Delta Thermocouples

PROCESS CONNECTION	DESCRIPTION
4"150RS	4 in Class 150 raised face flange, Carbon steel
4"300RS	4 in Class 300 raised face flange, Carbon steel
6"150RS	6 in Class 150 raised face flange, Carbon steel
6"300RS	6 in Class 300 raised face flange, Carbon steel

NOZZLE INSIDE DIAMETER	DESCRIPTION
6.0	6.0 in (154 mm)
5.7	5.7 in (145 mm)
5.5	5.5 in (139 mm)
5.1	5.1 in (130 mm)
3.8	3.8 in (97 mm)
3.6	3.6 in (91 mm)
3.4	3.4 in (86 mm)
3.1	3.1 in (79 mm)
2.9	2.9 in (74 mm)
2.6	2.6 in (66 mm)
2.1	2.1 in (53 mm)
1.9	1.9 in (48 mm)
1.7	1.7 in (43 mm)

INSERTION LENGTH	DESCRIPTION
**.*	**.* in from flange face to inside face of the refractory

REFRACTORY THICKNESS	DESCRIPTION
**.*	**.* in from refractory hotface to outer lining of refractory

OPTIONS	DESCRIPTION
AA	None

REQUIRED ORDERING INFORMATION

- Detailed model number
- Documentation & testing packages (if required, refer to Additional Resources)

Notes:
- Flange sizes with a larger ID can be accommodated. Flange sizes of ANSI 6 in (152 mm) are recommended for best results

Model HRS • Refractory Stop

Features

- Prevents castable refractory material from entering the mounting nozzle for Delta Controls Model HTP/HTX/HTV thermocouple
- Produces a smooth castable surface for Model HRW thermowell support collar
- Automatically centers in nozzle and is factory preset for nozzle inside height

Description

The Delta Controls **Model HRS** Refractory Stop prevents insulating castable refractory or mortar from entering the thermocouple nozzle during lining of the reactor. After the refractory has cured, the HRS is removed and the refractory is drilled using the **Model HRG drilling system**.

The castable surface must be flat, smooth, and even with the vessel shell's interior surface for the HRW refractory thermowell to be positioned and supported correctly. The HRS is fitted with an **adjustable seal plate** that is positioned to be flush with the nozzle bottom when even with the inside surface of the vessel shell. Alternative methods, such as taping or troweling, are not as effective in creating a smooth and level surface.

Refractory systems using insulating brick in place of insulating castable do not require the HRS.

Model HRS

Specifications

Flange Sizes:	4.0 in to 6.0 in
Class:	4 in Class 150 to 6 in Class 300
Nozzle Inside Diameter:	3.4 in to 6.0 in (86 mm to 154 mm)
Nozzle Inside Height:	As required
Disc Size:	As required
Disc Insertion:	As required ± 2.0 in (± 50 mm) adjustability
Disc Material:	Aluminum, PVC, plated steel
Bar Material:	Aluminum

Model Numbering System

MODEL EXAMPLE	MODEL	-	NOZZLE INSIDE DIAMETER	-	NOZZLE INSIDE HEIGHT	-	OPTIONS
	HRS	-	5.7	-	8.0	-	AA

MODEL	DESCRIPTION
HRS	Refractory Stop

NOZZLE INSIDE DIAMETER	DESCRIPTION
6.0	6.0 in (154 mm)
5.7	5.7 in (145 mm)
5.5	5.5 in (139 mm)
5.1	5.1 in (130 mm)
3.8	3.8 in (97 mm)
3.6	3.6 in (91 mm)
3.4	3.4 in (86 mm)
3.1	3.1 in (79 mm)
2.9	2.9 in (74 mm)
2.6	2.6 in (66 mm)
2.1	2.1 in (53 mm)
1.9	1.9 in (48 mm)
1.7	1.7 in (43 mm)

NOZZLE HEIGHT	DESCRIPTION
**.*	**.* in from flange face to outer refractory lining

OPTIONS	DESCRIPTION
AA	None

REQUIRED ORDERING INFORMATION

- Detailed model number
- Documentation & testing packages (if required, refer to Additional Resources)

Model TCP • Nozzle Obstruction Tool, For Use with HIR Pyrometer

Features

- Designed for cleaning obstructions from within small diameter nozzles
- Rigid stainless steel construction
- Removable tool head
- Ramrod clears obstructions

Description

The **Model TCP** Nozzle Obstruction Tool clears obstructions within small diameter nozzles. The stainless steel construction features a polished ramrod and removable head.

Model TCP

Specifications

Flange Material:	Carbon steel
Body and Internal Seals:	Stainless steel
Rigid Rod:	Stainless steel
Insertion Length:	60 in

Model Numbering System

MODEL EXAMPLE	MODEL	-	PROCESS CONNECTION	-	INSERTION	-	OPTIONS
	TCP	-	2"150RS	-	60	-	AA

MODEL	DESCRIPTION
TCP	Nozzle Obstruction Tool, For Use with HIR Pyrometer

PROCESS CONNECTION	DESCRIPTION
2"150RS	2 in Class 150 raised face flange, carbon steel

INSERTION	DESCRIPTION
60	60 in

OPTIONS	DESCRIPTION
AA	None

REQUIRED ORDERING INFORMATION

- Detailed model number
- Documentation & testing packages (if required, refer to Additional Resources)

Model HMB • Mounting Bars, For Use with Thermocouples

Features

- Used for non-vertical thermocouple installations
- Prevents damage to ceramic components
- Available for Delta Controls Model HTX/HTP/HTV Thermocouples

Description

The Delta Controls **Model HMB** Horizontal Mounting Bars are used to reliably install thermocouples in non-vertical mounting orientations. The bars allow the top-heavy thermocouple to more easily align and slide in the nozzle at a consistent angle.

Model HMB

Specifications

Bar Material:	Carbon steel
Available Lengths:	24 in, 30 in, 38 in
Compatible Flanges Sizes:	ANSI 4 in Class 150 to 6 in Class 300 (2 per set)

Model Numbering System

MODEL EXAMPLE	MODEL	-	FLANGE SIZE	-	BAR LENGTH
	HMB	-	6	-	30

MODEL	DESCRIPTION
HMB	Horizontal Mounting Bars, For Use with All Delta Thermocouples

FLANGE SIZE	DESCRIPTION
4	4 in
6	6 in

BAR LENGTH	DESCRIPTION
24	24 in, for insertion length ≤ 16 in
30	30 in, for insertion length ≤ 24 in
38	38 in, for insertion length ≤ 30 in

REQUIRED ORDERING INFORMATION

- Detailed model number
- Documentation & testing packages (if required, refer to Additional Resources)

Capacitance Series

*A Capacitance Level Solution for **Every Application.***

Capacitance Series

A capacitance level solution for every application.

With 20+ probe styles and service to 1500 psig and 850 °F, Delta has a capacitance solution for the more unique and demanding level applications of today's industries. Delta's probes are available in a variety of materials, including carbon steel, stainless steel, monel, Hastelloy®, Teflon™, ceramic, and others upon request. With 45+ years of expertise in capacitance technology, Delta's engineered products provide reliable and accurate operation in critical applications.

Engineered Capacitance Solutions

Theory of Operation

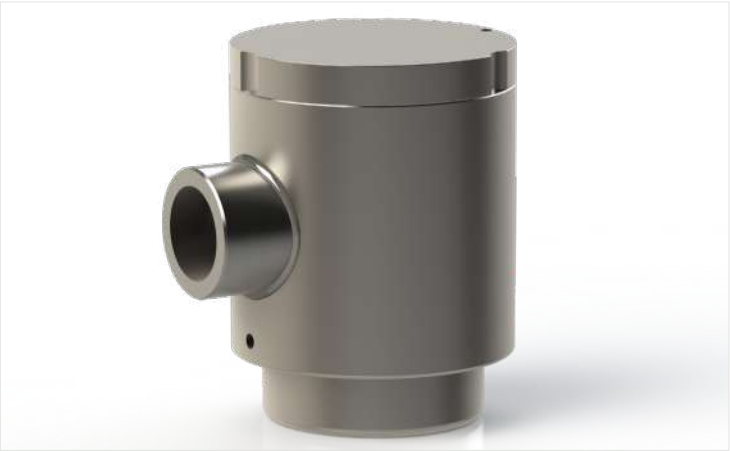
Capacitance technology *senses how much of a sensing probe is covered by a liquid. This is accomplished by generating a radio frequency pulse of energy which travels from the sensing probe to the ground reference (usually the tank wall). The amount of liquid between the two determines how much energy is transferred. The amount of energy flowing is a highly repeatable measure of the liquid level or interface position. The amount is compared to an internal reference and produces a switching action or 4-20 mA direct current signal output at a selected material elevation.*

Electronics Housings

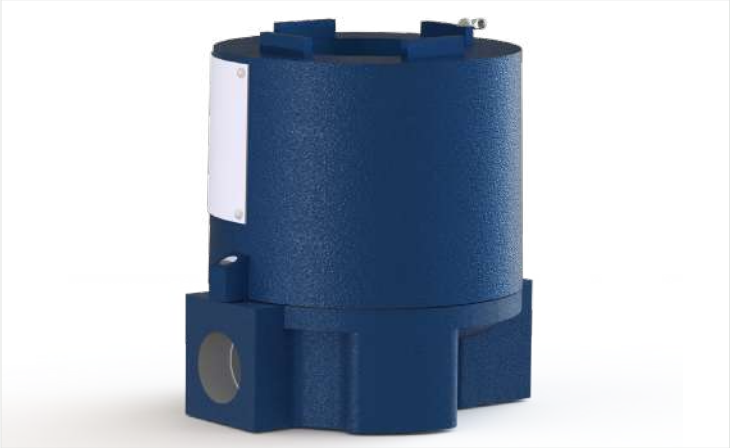
4X Housing

PH4 Housing

7T Housing



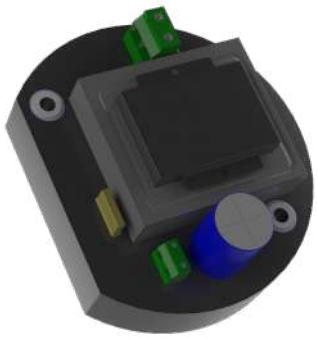
PH7 Housing



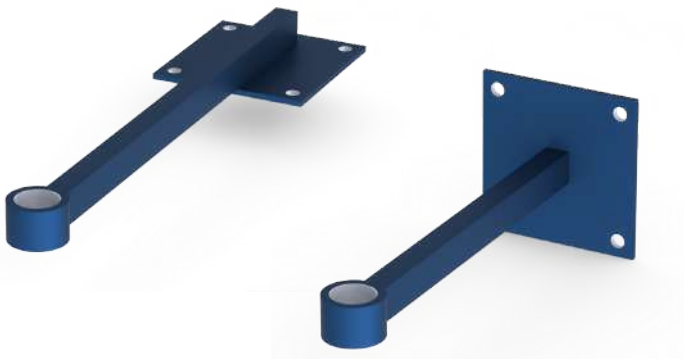
7W Housing

Options

Mounting Bracket
Available on certain models, the 'PSM' option offers a mounting bracket for a surface or 2 inch pipe stand mounting.



Power Supply
The optional 'PS1' power supply module offers 120 VAC to 24 VDC power mounted in the enclosure.



Cable Clamp Support Arms
Available on the P80 Series 2, the optional 'VBKT' and 'HBKT' carbon steel support arms offer cable or pipe clamp support for vertical and horizontal applications.

Temperature Extension
The optional temperature extensions are used to extend the electronics or remote cable away from high temperature processes to lower the ambient temperature. The temperature extension length measurement is separate from the total insertion length and inactive shield measurement.

Weight
Available on cable probes, the optional 'WT' offers a 6 lbs, 1.5 in outside diameter weight on the bottom termination to reduce probe movement.

Vacuum Service
The 'VR' option offers special probe sealing to permit reliable operation in vacuum service.

Intergland Vent Connection
The 'IC' option on the Model P55 and P56 offers an intergland vent connection on the probe for toxic and hazardous applications.

Display Window
The 'DW' option on the Model 107 offers a display window for external viewing of the standard LCD display.

Integral Mount
Electronics can typically be mounted integrally to the probe or remotely via PVC or FEP cable.

Probe Insertion Measurement
Probe insertion is measured from the tip of the probe to the base of the process connection.

Optional Inactive Shield
The optional inactive shield includes a portion of the probe that is not actively sensing the level. The inactive length is included in the total insertion length of the probe.

Model 105 • Capacitance Level Switch, DPDT

Features

- RF admittance measuring circuitry
- Insensitive to process coatings and buildup
- Integral or remote electronics housing
- Heavy-duty sealed relay contacts
- High or low relay fail-safe action
- Adjustable time delay of 1 to 60 seconds
- Sealed electronics module survives corrosive and harsh environments as well as area vibration
- Application specific probe shapes, styles, configurations, and process connections

Model 105

Description

The Delta Controls **Model 105** Capacitance Level Switch uses **RF Admittance technology** to produce a switching action when a material level crosses the set point. The interface position of two liquids with different dielectric constants is **accurately detected**, including with cloudy interface conditions. One of the liquids should be nonconductive. Model 105 is insensitive to specific gravity (SPG) variations.

Many probe configurations are available. Integral mounting produces a simple one-piece unit generally results in the **lowest installed cost**. Alternately, the Model 105 electronics module may be connected via coaxial cable up to 50 feet away.

Horizontal mounting is usually preferred for alarm action as it provides the sharpest switch point definition. Model 105 must be mounted vertically or at an angle to use the adjustable differential action. The material level must move past the two points on the probe where switch action is to occur.

Specifications

Range (Equivalent Admittance):	0 pF to 1000 pF (differential adjustable 1% to 50% of range)
Relay Contacts:	Sealed for corrosive conditions 5 A at 250 ACV DPDT
Time Delay:	0.25 s to 60 s
Basic Supply Voltage (Optional):	120 ACV, 24 DCV
Ambient Operating Temperature:	-40 °F to +185 °F (-40 °C to +85 °C)
Temperature Effect (0 °F to 150 °F):	Typically < 0.10 in (2 mm) (water)
Housings:	4X Hose-proof; Class 1, Division 1, Groups BCD, EFG explosion-proof
Housing Material:	Aluminum, PVC, stainless steel (other materials available)
Certifications:	
Housing Option	Third Party Listed by CSA NRTL/C (USA and Canada) Class I, Groups B, C and D; Class II, Groups E, F and G; Class III; Encl 4X

Model Numbering System

MODEL EXAMPLE	MODEL	-	SUPPLY VOLTAGE	-	HOUSING RATING	-	OPTIONS[1]
	105	-	1	-	7WR	-	15P

MODEL	DESCRIPTION
105	Capacitance Level Switch, DPDT

SUPPLY VOLTAGE	DESCRIPTION
1	120 ACV
2	240 ACV
3	24 DCV

HOUSING RATING	DESCRIPTION
4XI	Environment-proof, 4X, PVC, integral mount
4XR	Environment-proof, 4X, PVC, remote mount
7WI	Explosion-proof, 7X, aluminum, Classes 1 & 2, Divisions 1 & 2, Groups BCD, EFG, integral mount [3]
7WR	Explosion-proof, 7X, aluminum, Classes 1 & 2, Divisions 1 & 2, Groups BCD, EFG, remote mount
7TI	Explosion-proof, 7X, 300 Stainless Steel, Classes 1 & 2, Divisions 1 & 2, Groups BCD, EFG, integral mount
7TR	Explosion-proof, 7X, 300 Stainless Steel, Classes 1 & 2, Divisions 1 & 2, Groups BCD, EFG, remote mount
AA	None

OPTIONS[1]	DESCRIPTION
AA	None (integral)
PSM	Housing mounting bracket for remote mounting (surface or 2 in pipe mounting) [2]
**P	** feet of interconnecting cable for remote mounting, includes sensor and compensation cable, 160° PVC [2]
**D	** feet of interconnecting cable for remote mounting, includes sensor and compensation cable, 400° FEP [2]
ZZ2	Special housing orientation; ranged for low dielectric sensitivity for dry media; single direction time delay; set to time delay energizing of the relay; adjustable [3]

Notes:

1 A hyphen will separate multiple options selected

2 PSM, **P, **D only available with remote mount housing

3 ZZ2 only available with 7WI housing

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to Additional Resources)

Model 107 • Capacitance Level Switch, Multi-point, Two or Four DPDT Relays

Features

- RF admittance type circuitry
- Insensitive to process coatings and buildup
- LCD direct reading level display
- Digital pushbutton setup and calibration
- Simple, two point calibration without emptying tank
- Direct or reverse calibrated
- Built-in self-diagnostics
- Integral or remote mounted electronics housing
- Process temperature -350 °F to +750 °F (-210 °C to 435 °C)
- High or low relay fail-safe action
- Adjustable time delay of 1 to 60 seconds
- Epoxy sealed electronics module
- Pressure Rating: Vacuum to 10 000 psig (-1 bar to +700 bar)
- Application specific probe shapes, styles, configurations, and process connections
- Wetted material options include stainless steel, PTFE, Kynar®, Monel, and ceramic

Description

The Delta Controls **Model 107** Multi-point Capacitance Level Switch uses **RF admittance technology** to produce switching action when a material level crosses the switchpoint. The interface position between two liquids with different dielectric constants is **accurately detected**, including with cloudy interface conditions. One of the liquids should be nonconductive. Model 107 is not sensitive to specific gravity (SPG) variations.

Many probe configurations are available. The electronics module can be remotely mounted.

107 features digital circuitry, pushbutton setup, LCD display, and is potted for **severe environments**. Simple, two point calibration allows calibration and recalibration to occur without emptying tank. On/off elevation is separately selectable for each of the **5 A DPDT relays**.

Model 107

Specifications

Level range (Independently Programmable):	On and off set points along entire probe length, 0 pF to 8000 pF
Number of Relays:	Two or four relays; 5 A at 250 ACV DPDT
Time Delay:	0.25 s to 30 s
Basic Supply Voltage:	120 ACV (optional 240 ACV)
Ambient Operating Temperature:	-40 °F to +185 °F (-40 °C to +85 °C)
Temperature Effect (0 °F to 150 °F):	Typically < 0.25 in (6 mm) (water)
Housing:	4X hose-proof, 6 submersible, Class 1, Division 1, Groups BCD, EFG explosion-proof option
Housing Material:	Aluminum, PVC, stainless steel
Certifications:	
Housing Option	Third Party Listed by CSA NRTL/C (USA and Canada) Class I, Groups B, C and D; Class II, Groups E, F and G; Class III; Encl 4X

Model Numbering System

MODEL EXAMPLE	MODEL	-	SUPPLY VOLTAGE	-	HOUSING RATING	-	MOUNTING LOCATION	-	OPTIONS [1]
	107C	-	1	-	7WI	-	AA	-	AA

MODEL	DESCRIPTION
107C	Capacitance level switch, multi-point, 2 DPDT relays
107D	Capacitance level switch, multi-point, 4 DPDT relays

SUPPLY VOLTAGE	DESCRIPTION
1	120 ACV
2	240 ACV

HOUSING RATING	DESCRIPTION
4XR	Environment-proof, 4X, PVC, remote mount
7WI	Explosion-proof, 7X, aluminum, Classes 1 & 2, Divisions 1 & 2, Groups BCD, EFG, integral mount
7WR	Explosion-proof, 7X, aluminum, Classes 1 & 2, Divisions 1 & 2, Groups BCD, EFG, remote mount
7TI	Explosion-proof, 7X, 300 Stainless Steel, Classes 1 & 2, Divisions 1 & 2, Groups BCD, EFG, integral mount
7TR	Explosion-proof, 7X, 300 Stainless Steel, Classes 1 & 2, Divisions 1 & 2, Groups BCD, EFG, remote mount
AA	None

MOUNTING LOCATION	DESCRIPTION
AA	None (integral)
**P	** feet of interconnecting cable for remote mounting, includes sensor and compensation cable, 160° PVC[2]
**D	** feet of interconnecting cable for remote mounting, includes sensor and compensation cable, 400° FEP[2]

OPTIONS[1]	DESCRIPTION
AA	None
PSM	2 in pipe stand or surface remote kit [2]
DW	Display window for 4X hoseproof housing [3]

Notes:
1. A hyphen will separate multiple options selected
2. PSM, **P, **D only available with remote mount housing
3. DW only available with 4XR housing

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to Additional Resources)

Model 173 • Capacitance Level Transmitter, Loop Powered, Digital Circuitry

Features

- HART® protocol compliant
- 10-point linearizion for irregularly shaped tanks
- Digital RF admittance measuring circuitry
- Insensitive to process coatings and buildup
- Simple, two point calibration
- Reverse calibrated capability
- Built-in self-diagnostics
- Integral or remote electronics module
- Optional corrosion resistant NACE MR-01-75
- Wide choice of probe wetted materials including 316 Stainless Steel, PTFE, Alloy 20, PVDF, Monel, and ceramic
- LCD digital display with 4 key input
- Epoxy sealed electronics module survives harsh environments and area vibration
- Built-in voltage transient protection, heavy 12 gauge terminals

Description

The Delta Controls **Model 173** Capacitance Level Transmitter transmits a 4-20 mA direct current signal proportional to the level or volume in a vessel. Model 173 can be programmed for up to **10 fluid elevations** to linearize the output signal in irregularly shaped tanks. 173 has built-in self-diagnostic capabilities. The potted electronics module is capable of handling **severe environments** in most difficult services.

The 173 is easily calibrated using two levels in the tank. Filling or emptying the vessel is not required as a simple level change acquires the second known elevation.

Model 173

Specifications

Level Span:	10 pF min
Range:	2000 pF max
Zero Suppression:	≤ 2000 pF
Output:	4-20 mA, 2-wire, loop powered, isolated ≤ 0 pt linearization
Loop Supply Voltage Range:	13 DCV to 35 DCV
Maximum Loop Impedance:	450 Ω at 24 V max 1000 Ω at 35 V max
Ambient Operating Temperature:	-20 °F to +175 °F (-29 °C to +79 °C)
Accuracy and Stability:	≤ 0.2% of full scale (limited to 0.2 pF)
Temperature Effect:	0 °F to +150 °F (-18 °C to 67 °C) < 0.2 in (water)
Housing:	4X hose-proof; 6 submergible; Class 1, Division 1, Groups BCD, EFG explosion-proof optional
Housing Material:	Aluminum, PVC, stainless steel
Communication:	Device menus, HART COMMUNICATION PROTOCOL
Certifications:	
Housing Option	Third Party Listed by CSA NRTL/C (USA and Canada) Class I, Groups B, C and D; Class II, Groups E, F and G; Class III; Encl 4X

Model Numbering System

MODEL EXAMPLE	MODEL	-	HOUSING RATING	-	MOUNTING LOCATION	-	OPTIONS[1]
	173	-	7WI	-	AA	-	AA

MODEL	DESCRIPTION
173	Capacitance Level Transmitter, Loop Powered, Digital Circuitry

HOUSING RATING	DESCRIPTION
4XI	Environment-proof, 4X, PVC, integral mount
4XR	Environment-proof, 4X, PVC, remote mount
7WI	Explosion-proof, 7X, aluminum, Classes 1 & 2, Divisions 1 & 2, Groups BCD, EFG, integral mount
7WR	Explosion-proof, 7X, aluminum, Classes 1 & 2, Divisions 1 & 2, Groups BCD, EFG, remote mount
7TI	Explosion-proof, 7X, 300 Stainless Steel, Classes 1 & 2, Divisions 1 & 2, Groups BCD, EFG, integral mount
7TR	Explosion-proof, 7X, 300 Stainless Steel, Classes 1 & 2, Divisions 1 & 2, Groups BCD, EFG, remote mount
AA	None

MOUNTING LOCATION	DESCRIPTION
AA	None (integral)
**P	** feet of interconnecting cable for remote mounting, includes sensor and compensation cable, 160° PVC
**D	** feet of interconnecting cable for remote mounting, includes sensor and compensation cable, 400° FEP

OPTIONS[1]	DESCRIPTION
AA	None
PSM	Housing mounting bracket for remote mounting; surface or 2 in pipe mounting [3]

Notes:

[1] A hyphen will separate multiple options selected

[3] PSM **P, **D only available with remote mount housing

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to Additional Resources)

Model P21 • Capacitance Probe, Tubular Ground

Features

- High inherent gain sensitivity
- Allows full scale calibration over a modest level change
- Insensitive to surface turbulence
- Output signal is linear to liquid depth
- Calibration can be completed outside the vessel
- Use for sensing light hydrocarbons and materials with low dielectric constants
- Linear output in irregular tanks
- Built-in ground reference for plastic and lined tanks

Description

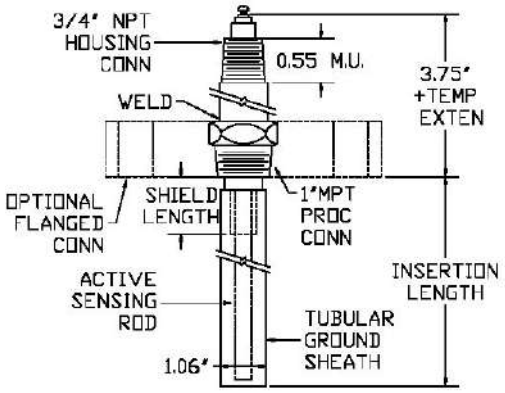
The Delta Controls **Model P21** Capacitance Probe has **high intrinsic gain**. It is equipped with a wrap around concentric ground reference sheath which acts as a ground reference when used in plastic and lined tanks. The linear ground sheath allows it to be used with transmitters in horizontal cylindrical tanks and other containers with nonlinear sidewalls.

The P21 requires a minimum process connection of a 1 inch NPT process connection. It has high inherent gain sensitivity and is useful on materials having low dielectric constants, such as **light hydrocarbons**. It allows full scale calibration over a modest level change and calibration can be done outside the vessel.

Model P21

Specifications

Working Pressure:	+1500 psig (+103.4 bar)
Working Temperature:	-460 °F to +450 °F (-273 °C to +232 °C)
Insertion Length:	≤ 20 ft (6 m)
Process Connection:	1 in MPT minimum
Threaded Process Connection:	1.0 in to 2.0 in
Flanged Process Connection:	1.5 in to 4.0 in
Flange Rating:	≤ 600 lb
Available Wetted Materials:	316 Stainless Steel, Hastelloy® C-276, PTFE, carbon steel
Ground Sheath:	Stainless steel (other materials available)



Model Numbering System

MODEL EXAMPLE	MODEL	-	INSERTION LENGTH	-	SHIELD & EXTENSION	-	PROCESS CONNECTION	-	OPTIONS[1]
	P21Y	-	**.*	-	AA	-	1"MPTY	-	AA

MODEL	DESCRIPTION
P21Y	Capacitance Probe, Tubular Ground, 316 Stainless Steel
P21G	Capacitance Probe, Tubular Ground, Hastelloy C-276

INSERTION LENGTH	DESCRIPTION
**.*	**.* in of insertion (20 ft max)

SHIELD & EXTENSION	DESCRIPTION
AA	None
T*	* in temperature extension
I*	* in inactive shield

PROCESS CONNECTION	DESCRIPTION
	Refer to 120 for process connections
	MPT sizes: 1 in minimum
	Flange sizes: 1.5 in to 4 in, Classes 150, 300, 600

OPTIONS[1]	DESCRIPTION
AA	None
PH4	Probe head housing with terminals for use with remote mounted electronics unit, 4X housing
PH7	Probe head housing with terminals for use with remote mounted electronics unit, 7X housing

Notes:
[1] A hyphen will separate multiple options selected

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to Additional Resources)

APPLICATION DETAILS:

- Process fluid or material name
- Process fluid or material dieletric constant
- Maximum process temperature
- Maximum process pressure

Model P25 • Capacitance Probe, High Temperature and Pressure Service, Tubular Ground

Features

- For high temperature and high pressure services
- High inherent gain sensitivity
- Allows full scale calibration over a modest change and narrow ranges
- Works with liquids carrying entrained solids low dielectric constant
- Insensitive to surface turbulence
- Built-in ground reference improves sensitivity
- Linear output signal in irregular tanks
- Allows calibration to be done outside the vessel
- Resists flowing currents, waves and vortices

Model P25

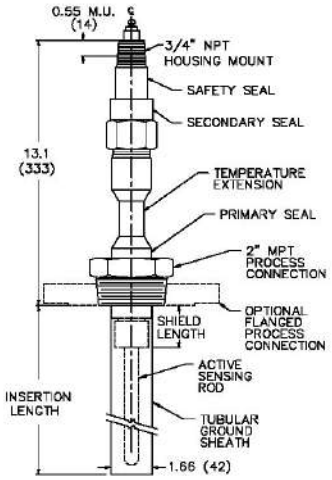
Description

The Delta Controls **Model P25** Capacitance Probe is intended for high temperature and pressure chemical processing as well as steam and slurry applications. It also very **corrosion resistant** and is equipped with **triple sealing** for utmost safety and reliability.

The P25 is fitted with a wrap-around tubular ground reference which allows **full scale range calibration** over just a few inches of conductive liquid. The relatively large ground tube provides an open bore. It can be used when the liquid is highly turbulent or carries entrained solids. The open bore also allows **fast response speed** and resists plugging. The tubular ground reference sheath produces a linear output signal when used in horizontal cylinders or other tanks with nonlinear sidewalls. The electronic module/probe combination **can be calibrated outside the vessel** for convenience, safety, and without varying the process liquid level.

Specifications

Working Pressure:	≤ +650 psig (+44.8 bar)
Working Temperature:	≤ +750 °F (+399 °C)
Insertion Length:	≤ 10 ft (3 m)
Process Connection:	2.0 MPT minimum
Threaded Process Connection:	2.0 in
Flanged Process Connection:	≥ 2.0 in
Flange Rating:	≤ 600 lb
Available Wetted Materials:	316 Stainless Steel, PTFE, carbon steel
Ground Sheath:	316 Stainless Steel (other materials available)



Model Numbering System

MODEL EXAMPLE	MODEL	-	INSERTION LENGTH	-	SHIELD & EXTENSION	-	PROCESS CONNECTION	-	OPTIONS[1]
	P25Y	-	**.*	-	AA	-	2"MPTY	-	AA

MODEL	DESCRIPTION
P25Y	Capacitance Probe, High Temperature and Pressure Service, Tubular Ground; 316 Stainless Steel

INSERTION LENGTH	DESCRIPTION
**.*	**.* in of insertion (120 in max)

SHIELD & EXTENSION	DESCRIPTION
AA	None
T*	* in temperature extension
I*	* in inactive shield

PROCESS CONNECTION	DESCRIPTION
	Refer to 120 for process connections
	MPT size 2 in minimum
	Flange sizes ≥ 2 in, Class 150

OPTIONS[1]	DESCRIPTION
AA	None
PH4	Probe head housing with terminals for use with remote mounted electronics unit, 4X housing
PH7	Probe head housing with terminals for use with remote mounted electronics unit, 7X housing

Notes:
[1] A hyphen will separate multiple options selected

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to Additional Resources)

APPLICATION DETAILS:

- Process fluid or material name
- Process fluid or material dieletric constant
- Maximum process temperature
- Maximum process pressure

Model P26 • Capacitance Probe, High Temperature and Pressure Service, Slotted Tubular Ground for Interface Service

Features

- For high temperature and high pressure services
- Slotted ground reference provides accuracy in interface service
- High inherent gain sensitivity
- Allows full scale calibration over a modest level change and narrow ranges
- Works with liquids carrying entrained solids and low dielectric constant
- Insensitive to surface turbulence
- Built-in ground reference improves sensitivity
- Linear output signal in irregular tanks
- Allows calibration to be done outside the vessel
- Strong and resists flowing currents, waves, vortices

Description

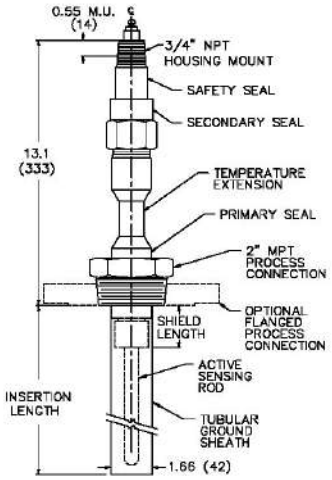
The Delta Controls **Model P26** Capacitance Probe is intended for high temperature/pressure chemical processing and steam/slurry applications. It is also greatly resistant to corrosion and is equipped with triple sealing for utmost **safety** and **reliability**.

The P26 has vertical slots milled into the tubular ground reference. These slots are offset and overlapping so that the interface liquids are always **free to flow** in or out. This is a necessity when used for interface service. The interface transition zone must be kept close to the sensing rod by a solid tube wall.

Model P26

Specifications

Working Pressure:	≤ +650 psig (+44.8 bar)
Working Temperature:	≤ +750 °F (+399 °C)
Insertion Length:	≤ 10 ft (3 m)
Process Connection:	2.0 MPT minimum
Threaded Process Connection:	2.0 in
Flanged Process Connection:	≥ 2.0 in
Flange Rating:	≤ 600 lb
Available Wetted Materials:	316 Stainless Steel, PTFE, carbon steel
Ground Sheath:	316 Stainless Steel (slotted) (other materials available)



Model Numbering System

MODEL EXAMPLE	MODEL	-	INSERTION LENGTH	-	SHIELD & EXTENSION	-	PROCESS CONNECTION	-	OPTIONS[1]
	P26Y	-	**.*	-	T6	-	2"MPTY	-	AA

MODEL	DESCRIPTION
P26Y	Capacitance Probe, High Temperature and Pressure Service, Slotted Tubular Ground for Interface Service; 316 Stainless Steel

INSERTION LENGTH	DESCRIPTION
**.*	**.* in of insertion (120 in max)

SHIELD & EXTENSION	DESCRIPTION
AA	None
T*	* in temperature extension
I*	* in inactive shield

PROCESS CONNECTION	DESCRIPTION
	Refer to 120 for process connections
	MPT size 2 in minimum
	Flange sizes 2 in to 4 in, Classes 150, 300, 600

OPTIONS[1]	DESCRIPTION
AA	None
PH4	Probe head housing with terminals for use with remote mounted electronics unit, 4X housing
PH7	Probe head housing with terminals for use with remote mounted electronics unit, 7X housing

Notes:
[1] A hyphen will separate multiple options selected

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to Additional Resources)

APPLICATION DETAILS:

- Process fluid or material name*
- Process fluid or material dieletric constant
- Maximum process temperature
- Maximum process pressure

*Upper and lower materials required for interface service

Model P31 • Capacitance Probe, External Cage, Vertical

Features

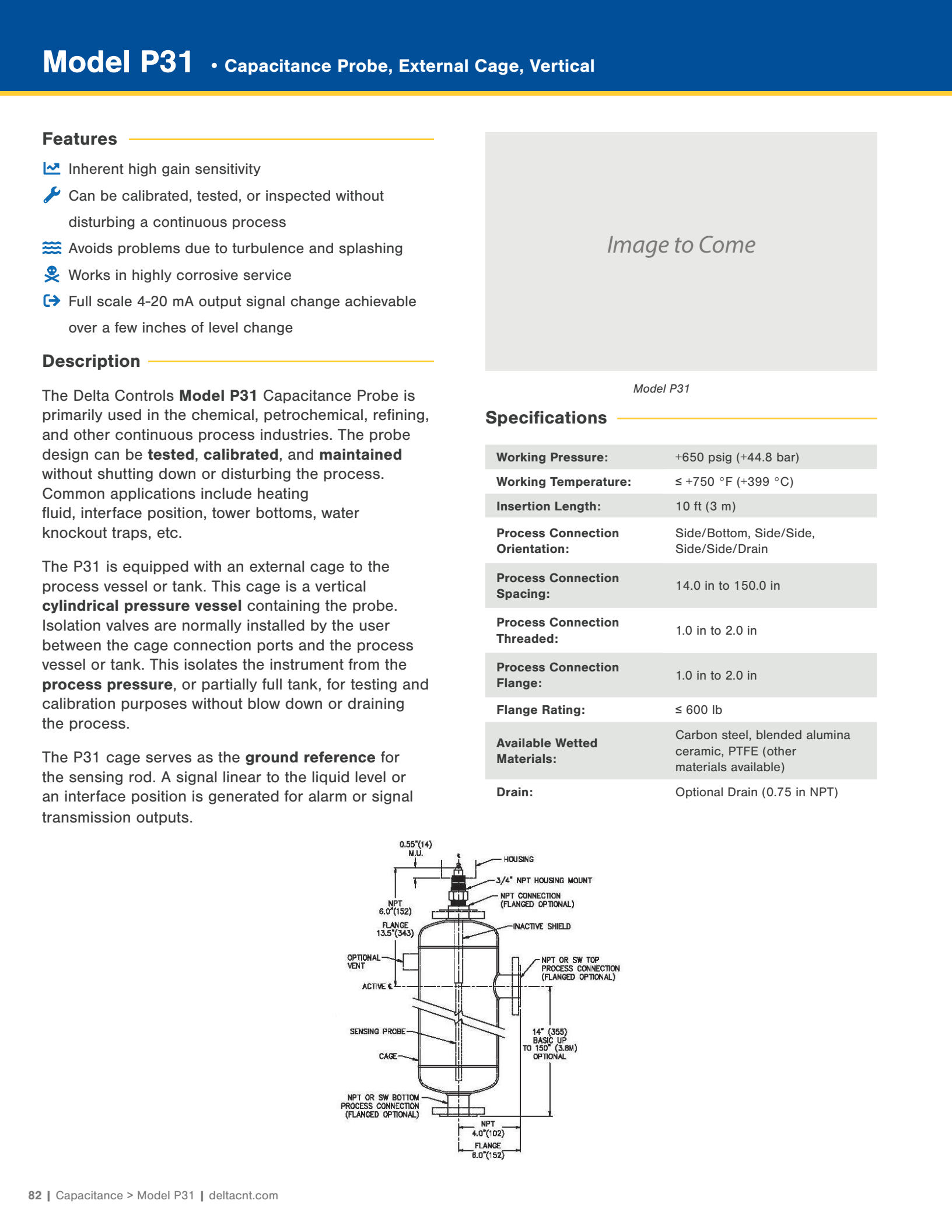
- Inherent high gain sensitivity
- Can be calibrated, tested, or inspected without disturbing a continuous process
- Avoids problems due to turbulence and splashing
- Works in highly corrosive service
- Full scale 4-20 mA output signal change achievable over a few inches of level change

Description

The Delta Controls **Model P31** Capacitance Probe is primarily used in the chemical, petrochemical, refining, and other continuous process industries. The probe design can be **tested**, **calibrated**, and **maintained** without shutting down or disturbing the process. Common applications include heating fluid, interface position, tower bottoms, water knockout traps, etc.

The P31 is equipped with an external cage to the process vessel or tank. This cage is a vertical **cylindrical pressure vessel** containing the probe. Isolation valves are normally installed by the user between the cage connection ports and the process vessel or tank. This isolates the instrument from the **process pressure**, or partially full tank, for testing and calibration purposes without blow down or draining the process.

The P31 cage serves as the **ground reference** for the sensing rod. A signal linear to the liquid level or an interface position is generated for alarm or signal transmission outputs.



Model P31

Specifications

Working Pressure:	+650 psig (+44.8 bar)
Working Temperature:	≤ +750 °F (+399 °C)
Insertion Length:	10 ft (3 m)
Process Connection Orientation:	Side/Bottom, Side/Side, Side/Side/Drain
Process Connection Spacing:	14.0 in to 150.0 in
Process Connection Threaded:	1.0 in to 2.0 in
Process Connection Flange:	1.0 in to 2.0 in
Flange Rating:	≤ 600 lb
Available Wetted Materials:	Carbon steel, blended alumina ceramic, PTFE (other materials available)
Drain:	Optional Drain (0.75 in NPT)

Model Numbering System

MODEL EXAMPLE	MODEL	-	PROCESS CONNECTION SPACING	-	PROCESS CONNECTION	-	TEMPERATURE EXTENSION	-	OPTIONS
	P31DS	-	14	-	SB/1"MPTS	-	AA	-	AA

MODEL	DESCRIPTION
P31DS	Capacitance Probe, External Cage, Vertical, PTFE Insulated
P31DY	Capacitance Probe, External Cage, Vertical, Ceramic Insulated

PROCESS CONNECTION SPACING	DESCRIPTION
14	14 in basic insertion
**.*	**.* in custom insertion (120 in max)

PROCESS CONNECTION	DESCRIPTION
SB/1"MPTS	Side/Bottom, 1 in MPT, carbon steel
SB/1"SWS	Side/Bottom, 1 in socket weld, carbon steel
SB/1"150RS	Side/Bottom, 1 in Class 150 raised face flange, carbon steel
SB/2"150RS	Side/Bottom, 2 in Class 150 raised face flange, carbon steel
SS/1"MPTS	Side/Side, 1 in MPT, carbon steel
SS/1"SWS	Side/Side, 1 in socket weld, carbon steel
SS/1"150RS	Side/Side, 1 in Class 150 raised face flange, carbon steel
SS/2"150RS	Side/Side, 2 in Class 150 raised face flange, carbon steel
SSD/1"MPTS	Side/Side Plus 0.75 in bottom drain, 1 in MPT, carbon steel
SSD/1"SWS	Side/Side Plus 0.75 bottom drain, 1 in socket weld, carbon steel
SSD/1"150RS	Side/Side Plus 0.75 bottom drain, 1 in Class 150 raised face flange, carbon steel
SSD/2"150RS	Side/Side Plus 0.75 bottom drain, 2 in Class 150 raised face flange, carbon steel

TEMPERATURE EXTENSION	DESCRIPTION
AA	None
T*	* in temperature extension

OPTIONS	DESCRIPTION
AA	None

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to Additional Resources)

APPLICATION DETAILS:

- Process fluid or material name*
- Process fluid or material dieletric constant
- Maximum process temperature
- Maximum process pressure

*Upper and lower materials required for interface service

Model P51 • Capacitance Probe, Solid Rod, General Purpose Use

Features

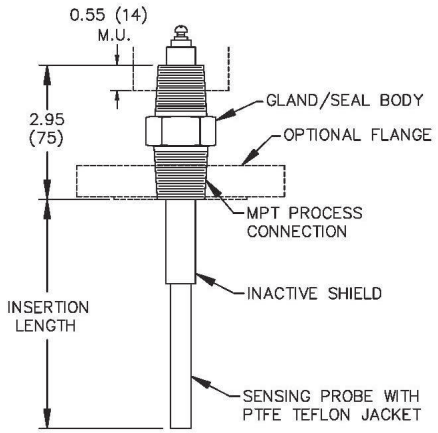
- General purpose probe for most applications
- Simple construction and easily installed
- PTFE insulation allows operation in conductive or nonconductive liquids at high temperatures
- Highly reliable clamped seal
- Open design resists material deposition and is easy to clean
- Easy to install vertically or horizontally
- Can be used in most slurry and entrained solids applications

Model P51

Description

The Delta Controls **Model P51** Capacitance Probe is a general purpose sensor. For a variety of applications, the sensing rod is jacketed in thick extruded and welded PTFE. There are no thin coatings or glued joints to fail. The P51 is intended for general purpose use.

The sealing gland is **extremely reliable**, sealing in process materials such as steam, hydrogen cyanide, gasoline, chlorine, liquid oxygen, and wastewater. The gland follower **seals reside inside the body** of a solid exterior. There are no screwed together joints in the gland which can inadvertently be turned, causing leaks, environmental spills, and toxic discharges. The **gland body** may be made of alternative metal or industrial plastics for highly corrosive service.



Specifications

Working Pressure:	+1500 psig (+103.4 bar)
Working Temperature:	-460 °F to +400 °F (-273 °C to +204 °C)
Insertion Length:	≤ 20 ft (6 m)
Process Connection:	0.75 in MPT minimum
Threaded Process Connection:	0.75 in to 2.0 in
Tri-clamp Process Connection:	1.5 in to 2.0 in
Flanged Process Connection:	1.5 in to 4.0 in
Flange Rating:	≤ 600 lb
Available Wetted Materials:	316 Stainless Steel, PTFE, carbon steel
Ground Sheath:	316 Stainless Steel (other materials available)
Other:	Optional wall mount support bracket

Model Numbering System

MODEL EXAMPLE	MODEL	-	INSERTION LENGTH	-	SHIELD & EXTENSION	-	PROCESS CONNECTION	-	OPTIONS[1]
	P51Y	-	**.*	-	AA	-	3/4"MPTY	-	AA

MODEL	DESCRIPTION
P51Y	Capacitance Probe, Solid Rod, General Purpose Use, 316 Stainless Steel

INSERTION LENGTH	DESCRIPTION
**.*	**.* in of insertion (240 in max)

SHIELD & EXTENSION	DESCRIPTION
AA	None
T*	* in temperature extension
I*	* in inactive shield

PROCESS CONNECTION	DESCRIPTION
	Refer to 120 for process connections
	MPT size 0.75 in minimum
	Flange sizes 1.5 in to 4 in, Classes 150, 300, 600
	Tri-clamp sizes 1.5 in, 2 in

OPTIONS[1]	DESCRIPTION
AA	None
VR	Vacuum retainer
PH4	Probe head housing with terminals for use with remote mounted electronics unit, 4X housing
PH7	Probe head housing with terminals for use with remote mounted electronics unit, 7X housing

Notes:
[1] A hyphen will separate multiple options selected

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to Additional Resources)

APPLICATION DETAILS:

- Process fluid or material name*
- Process fluid or material dieletric constant
- Maximum process temperature
- Maximum process pressure

*Upper and lower materials required for interface service

Model P52 • Capacitance Probe, Heavy-Duty

Features

- Heavy-duty purpose probe for more demanding applications
- Simple construction and easily installed
- PTFE insulation allows operation in conductive or nonconductive liquids at high temperatures
- Highly reliable clamped seal
- Open design resists material deposition and is easy to clean
- Easy to install vertically or horizontally
- Can be used in many slurry and entrained solids applications

Model P52

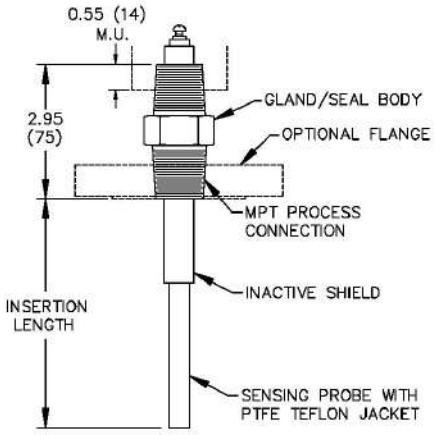
Description

The Delta Controls **Model P52** Capacitance Probe is a heavy-duty, general purpose sensor for use in a variety of applications. The sensing rod is jacketed in thick, extruded and welded PTFE. There are no thin coatings or glued joints to fail. The P52 is intended for use in services with **higher mechanical stress**, such as agitated tanks, services requiring long unsupported sensing rods, mixers, etc.

The sensing rod sealing gland is **extremely reliable**, sealing in such process materials as steam, hydrogen cyanide, gasoline, chlorine, liquid oxygen, and wastewater. The gland follower **seals reside inside the body of a solid exterior**. There are no screwed together joints in the gland which can inadvertently be turned, causing leaks, environmental spills, and toxic discharges. The **gland body** may be made of exotic metal or industrial plastics for highly corrosive service.

Specifications

Working Pressure:	+1500 psig (+103.4 bar)
Working Temperature:	-460 °F to +400 °F (-273 °C to +204 °C)
Insertion Length:	≤ 20 ft (6 m)
Process Connection:	1.5 in MPT minimum
Threaded Process Connection:	1.5 in to 2.0 in
Tri-clamp Process Connection:	1.5 in to 2.0 in
Flanged Process Connection:	1.5 in to 4.0 in
Flange Rating:	≤ 600 lb
Available Wetted Materials:	316 Stainless Steel, PTFE, carbon steel (other materials available)
Other:	Optional factory bent probe available to custom specifications, Optional vacuum service configuration



Model Numbering System

MODEL EXAMPLE	MODEL	-	INSERTION LENGTH	-	SHIELD & EXTENSION	-	PROCESS CONNECTION	-	OPTIONS[1]
	P52Y	-	**.*	-	AA	-	1"MPTY	-	AA

MODEL	DESCRIPTION
P52Y	Capacitance Probe, Heavy Duty, 316 Stainless Steel

INSERTION LENGTH	DESCRIPTION
**.*	**.* in of insertion (240 in max)

SHIELD & EXTENSION	DESCRIPTION
AA	None
T*	* in temperature extension
I*	* in inactive shield

PROCESS CONNECTION	DESCRIPTION
	Refer to 120 for process connections
	MPT size 1 in, 1.5 in, 2 in
	Flange sizes 1.5 in to 4 in, Classes 150, 300, 600
	Tri-clamp sizes 1.5 in, 2 in

OPTIONS[1]	DESCRIPTION
AA	None
VR	Vacuum retainer
PH4	Probe head housing with terminals for use with remote mounted electronics unit, 4X housing
PH7	Probe head housing with terminals for use with remote mounted electronics unit, 7X housing

Notes:
[1] A hyphen will separate multiple options selected

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to Additional Resources)

APPLICATION DETAILS:

- Process fluid or material name*
- Process fluid or material dieletric constant
- Maximum process temperature
- Maximum process pressure

*Upper and lower materials required for interface service

Model P53 • Capacitance Probe, Pressurized Vessel Insertion/Removal

Features

- Inspect, test, or service without shutting down or depressurizing the process
- Remove or insert 'up-from-the-bottom' or 'in-from-the-side' sensor without draining a tank
- Simple, direct inserted design useful for many common applications
- PTFE insulation allows operation on conductive or nonconductive materials
- High pressure PTFE seal is reliable, and corrosion proof
- Open design is easy to clean and resists material collection and deposition
- Easily installed in any orientation: vertically down or up, horizontal, or at an angle

Model P53

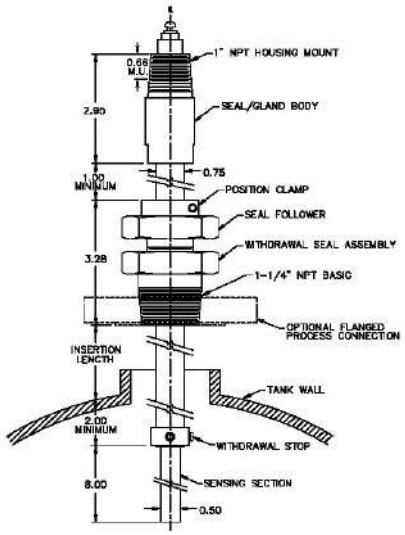
Description

The Delta Controls **Model P53** Capacitance Probe is intended for applications where it would be impractical, or impossible, to depressurize or drain the process system for **inspection** and **testing** of the probe instrument. Such processes include oil refineries, gas cycle plants, large storage tanks, and toxic materials.

The **gland body** is effectively elongated by the addition of a polished, seamless tube coaxially mounted over part of the sensing probe. A second sealing gland with PTFE seals is installed on the outside of the tube. An **isolation valve** on the vessel shuts off the tank liquid. The second gland is screwed into the isolation valve and **tightened to prevent leaks**. The valve is then opened and the P53 is pushed in through the valve until the active portion of the sensing rod is inside the vessel. A mechanical **clamp locks the probe** in position until a need to remove it occurs. The gland follower seal design has been **reliably used for more than 30 years**. The PTFE insulation jacket is a welded heavy extrusion instead of a thin coating or glued in place.

Specifications

Working Pressure:	-15 psig to +50 psig (-1.03 bar to +3.4 bar)
Working Temperature:	-460 °F to +400 °F (-273 °C to 204 °C)
Insertion Length:	≤ 20 ft (6 m)
Process Connection:	1.25 in MPT minimum
Threaded Process Connection:	1.25 in
Flanged Process Connection:	1.5 in minimum
Flange Rating:	≤ 600 lb
Available Wetted Materials:	316 Stainless Steel, PTFE, carbon steel (other materials available)
Other:	Optional isolation valve



P53 Shown Top Mounted

Model Numbering System

MODEL EXAMPLE	MODEL	-	INSERTION LENGTH	-	TUBE LENGTH	-	PROCESS CONNECTION	-	OPTIONS [1]
	P53Y	-	**.*	-	**.*	-	2"150RS	-	AA

MODEL	DESCRIPTION
P53Y	Capacitance Probe, Pressurized Vessel Insertion/ Removal, 316 Stainless Steel

INSERTION LENGTH	DESCRIPTION
**.*	**.* in of insertion (240 in)

TUBE LENGTH	DESCRIPTION
**.*	**.* in tube length

PROCESS CONNECTION	DESCRIPTION
	Refer to 120 for process connections
	MPT size 1.25 in minimum
	Flange size 1.5 in, Class 150 minimum

OPTIONS [1]	DESCRIPTION
AA	None
PH4	Probe head housing with terminals for use with remote mounted electronics unit, 4X housing
PH7	Probe head housing with terminals for use with remote mounted electronics unit, 7X housing

Notes:

[1] A hyphen will separate multiple options selected

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to Additional Resources)

APPLICATION DETAILS:

- Process fluid or material name
- Process fluid or material dieletric constant
- Maximum process temperature
- Maximum process pressure

Model P55 • Capacitance Probe, High Temperature and Pressure

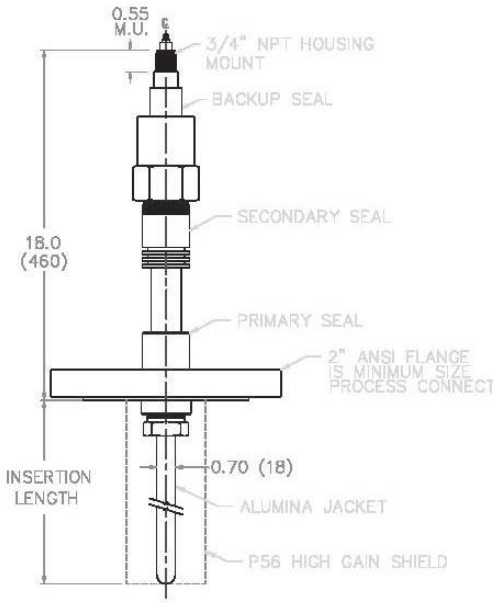
Features

- Ceramic primary seals and insulators
- Multiple sealing produces maximum reliability, safety, and long service life
- Alumina probe jacket withstands abrasion from slurries and entrained solids
- Can be used for steam condensate drainage under maximum service conditions

Description

The Delta Controls **Model P55** Capacitance Probe utilizes RF **admittance technology** for high pressure and temperature applications. Model P55 is designed to replace nuclear gamma ray sensors and solid mechanical displacers in many applications. Use of the P55 **avoids difficulty** due to large size, high purchase and installation costs.

The P55 can be installed in high pressure and temperature fatty acid reactors, steam condensate knockouts, coal gasification, and similarly difficult applications. The ceramic materials are **extremely strong**. Delta Controls has developed packaging that **protects the units** from inadvertent damage while being transported or stored.



Model P55

Specifications

Working Pressure:	≤ +2500 psig (+172.4 bar)
Working Temperature:	+1000 °F (+538 °C)
Insertion Length:	≤ 60 in (1.52 m)
Process Connection:	1.5 in MPT minimum
Threaded Process Connection:	1.5 in to 2.0 in
Flanged Process Connection:	1.5 in to 4.0 in
Flange Rating:	≤ 600 lb
Available Wetted Materials:	316 Stainless Steel, carbon steel, blended alumina ceramic (other materials available)
Other:	Optional intergland vent connection for lethal or toxic service

Model Numbering System

MODEL EXAMPLE	MODEL	-	INSERTION LENGTH	-	SHIELD & EXTENSION	-	PROCESS CONNECTION	-	OPTIONS[1]
	P55	-	**.*	-	T6	-	1.5"MPTY	-	AA

MODEL	DESCRIPTION
P55	Capacitance Probe, High Temperature and Pressure

INSERTION LENGTH	DESCRIPTION
**.*	**.* in of insertion (60 in max)

SHIELD & EXTENSION	DESCRIPTION
AA	None
T*	* in temperature extension
I*	* in inactive shield

PROCESS CONNECTION	DESCRIPTION
	Refer to 120 for process connections
	MPT size 1.5 in minimum
	Flange sizes 1.5 in to 4 in, Classes 150, 300, 600

OPTIONS[1]	DESCRIPTION
AA	None
IC	Intergland vent connection for toxic and hazardous services
PH7	Probe head housing with terminals for use with remote mounted electronics unit, 7X housing
DS	Dual seals with vent for toxic and hazardous service

Notes:
[1] A hyphen will separate multiple options selected

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to Additional Resources)

APPLICATION DETAILS:

- Process fluid or material name*
- Process fluid or material dieletric constant
- Maximum process temperature
- Maximum process pressure

*Upper and lower materials required for interface service

Model P56 • Capacitance Probe, High Temperature and Pressure, Tubular Ground

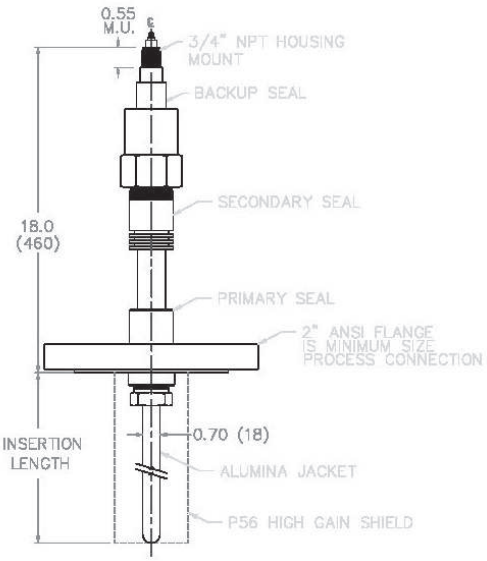
Features

- Ceramic primary seals and insulators
- Multiple sealing produces maximum reliability and safety as well as a long service life
- Alumina probe jacket withstands abrasion from slurries and entrained solids
- Can be used for steam condensate drainage under maximum service conditions
- Ground sheath provides measurement accuracy in low dieletric media

Description

The Delta Controls **Model P56** Capacitance Probe utilizes RF admittance technology for high pressure and temperature applications. The concentric ground sheath provides a ground reference for sensing low dieletric materials. Model P56 is designed to replace nuclear gamma ray sensors and solid mechanical displacers in many applications. Use of the P56 **avoids difficulty** due to large size as well as high purchase and installation costs.

The P56 can be installed in high pressure / temperature fatty acid reactors, steam condensate knockouts, coal gasification, and similar difficult applications. The ceramic materials used are **extremely strong**. Delta Controls has developed packaging that **protects the units** from inadvertent damage while being transported or stored.



Model P56

Specifications

Working Pressure:	≤ +2500 psig (+172.4 bar)
Working Temperature:	+1000 °F (+538 °C)
Insertion Length:	≤ 60 in (1.52 m)
Process Connection:	1.5 in MPT minimum
Threaded Process Connection:	1.5 in to 2.0 in
Flanged Process Connection:	1.5 in minimum
Flange Rating:	≤ 600 lb
Available Wetted Materials:	316 Stainless Steel, carbon steel, blended alumina ceramic
Ground Sheath:	316 Stainless steel (other materials available)
Other:	Optional intergland vent connection for lethal or toxic service

Model Numbering System

MODEL EXAMPLE	MODEL	-	INSERTION LENGTH	-	SHIELD & EXTENSION	-	PROCESS CONNECTION	-	OPTIONS[1]
	P56	-	**.*	-	AA	-	1.5MPTY	-	AA

MODEL	DESCRIPTION
P56	Capacitance Probe, High Temperature and Pressure, Tubular Ground

INSERTION LENGTH	DESCRIPTION
**.*	**.* in of insertion (60 in max)

SHIELD & EXTENSION	DESCRIPTION
AA	None
T*	* in temperature extension
I*	* in inactive shield

PROCESS CONNECTION	DESCRIPTION
	Refer to 120 for process connections
	MPT size 1.5 in minimum
	Flange size 1.5 in minimum, Class 150

OPTIONS[1]	DESCRIPTION
AA	None
IC	Intergland vent connection for toxic and hazardous services
PH7	Probe head housing with terminals for use with remote mounted electronics unit, 7X housing
DS	Dual seals with vent for toxic and hazardous service

Notes:
[1] A hyphen will separate multiple options selected

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to Additional Resources)

APPLICATION DETAILS:

- Process fluid or material name
- Process fluid or material dieletric constant
- Maximum process temperature
- Maximum process pressure

Model P57 • Capacitance Probe, Parallel Ground

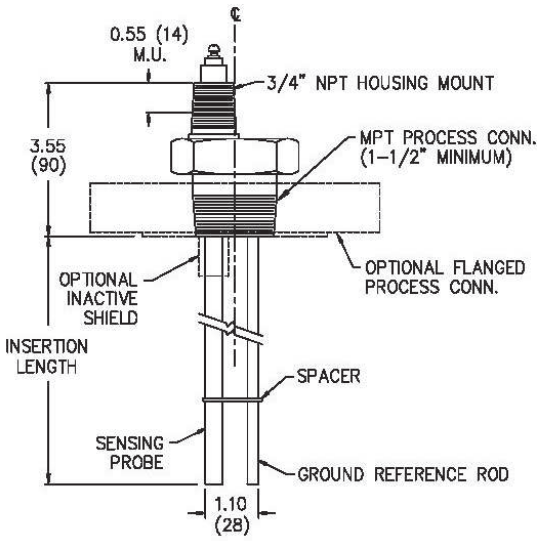
Features

- Direct insertion, open construction
- Rod parallel to sensing probe provides linear ground reference and increases sensitivity
- PTFE sensing rod jacket allows operation in conductive or nonconductive liquids
- Reliable high pressure PTFE seal
- Can be used to measure liquids with entrained solids in most applications
- Works in highly corrosive applications

Description

The Delta Controls **Model P57** Capacitance Probe is commonly used in tanks made of reinforced plastics or metal tanks lined with rubber, glass, or plastic which do not contain the ground reference plane required by a RF admittance instrument. The P57 has a ground rod mounted parallel to the insulated sensing probe, which provides the required **ground reference**.

The ground rod increases the probe's **stability** when when **long insertion lengths are configured**. The probe is widely used on water treating chemicals, stored fuel oil, day tanks, oil/water interface, and processed food oils. The open design allows it to be **used in many applications**, even when solids are entrained in the liquid.



Model P57

Specifications

Working Pressure:	≤ +1500 psig (+103.4 bar)
Working Temperature:	-460 °F to +450 °F (-273 °C to +232 °C)
Insertion Length:	≤ 20 ft (6 m)
Process Connection:	1.5 in MPT minimum
Threaded Process Connection:	1.5 in to 2.0 in
Flanged Process Connection:	1.5 in to 4.0 in
Flange Rating:	≤ 600 lb
Available Wetted Materials:	316 Stainless Steel, Hastelloy® C-276, PTFE, carbon steel
Ground Rod:	316 Stainless Steel, Hastelloy® C-276 (other materials available)

Model Numbering System

MODEL EXAMPLE	MODEL	-	INSERTION LENGTH	-	SHIELD & EXTENSION	-	PROCESS CONNECTION	-	OPTIONS[1]
	P57Y	-	**.*	-	AA	-	1.5"MPTY	-	AA

MODEL	DESCRIPTION
P57Y	Capacitance Probe, Parallel Ground Reference, 316 Stainless Steel
P57G	Capacitance Probe, Parallel Ground Reference, Hastelloy C-276

INSERTION LENGTH	DESCRIPTION
**.*	**.* in of insertion (240 in max)

SHIELD & EXTENSION	DESCRIPTION
AA	None
T*	* in temperature extension
I*	* in inactive shield

PROCESS CONNECTION	DESCRIPTION
	Refer to 120 for process connections
	MPT sizes 1.5 in minimum
	Flange sizes 1.5 in to 4 in, Classes 150, 300, 600

OPTIONS[1]	DESCRIPTION
AA	None
PH4	Probe head housing with terminals for use with remote mounted electronics unit, 4X housing
PH7	Probe head housing with terminals for use with remote mounted electronics unit, 7X housing

Notes:
[1] A hyphen will separate multiple options selected

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to Additional Resources)

APPLICATION DETAILS:

- Process fluid or material name*
- Process fluid or material dieletric constant
- Maximum process temperature
- Maximum process pressure

*Upper and lower materials required for interface service

Model P61 • Capacitance Probe, Sanitary Service

Features

- Natural PVDF or polypropylene comes in contact with process fluids
- Simple open construction is easily cleaned manually in place, or by steam
- General purpose sanitary applications
- Suitable for pharmaceutical, dairies and food processing, cosmetic and printing services
- Suitable for use with most slurry and entrained solids applications
- 316 Stainless Steel backed tri-clamp flange
- Metal clamps hold full pressure seal
- Works with conductive and nonconductive liquids

Description

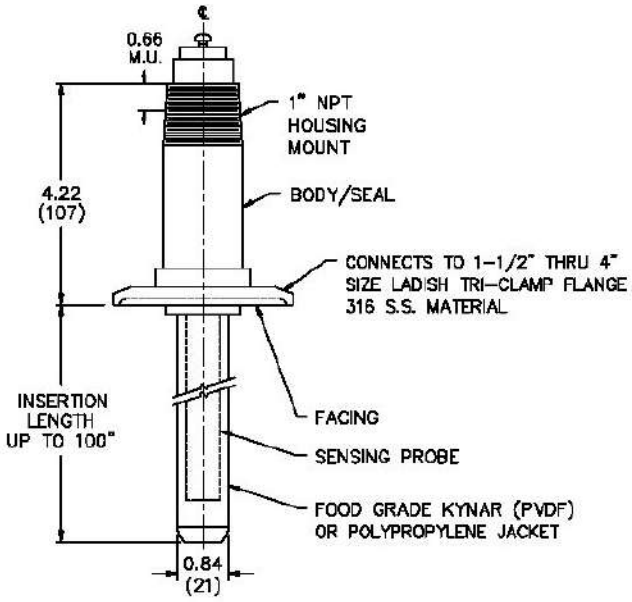
The Delta Controls **Model P61** Capacitance Probe is designed for sanitary or nonmetallic ion service which require **superior cleanliness** and **high reliability**. The wetted surfaces are composed entirely of virgin, **natural PVDF**. The surfaces are welded together into a single piece without joints, crevices, or cracks.

The P61 finished unit is flame-polished for the utmost **smoothness** and **cleanability**. The plastic flange facing has a 316 Stainless Steel backing plate for increased **strength and reliability**. The basic sanitary flange mates with a tri-clamp tubing size flange.

Model P61

Specifications

Working Pressure:	≤ +500 psig (34.5 bar)
Working Temperature:	-40 °F to +300 °F (-40 °C to +149 °C)
Insertion Length:	≤ 8 ft (3.5 m)
Process Connection:	1.5 in Tri-clamp minimum
Tri-clamp Process Connection:	1.5 in to 3.0 in Tri-clamp
Available Wetted Materials:	Kynar® PVDF, polypropylene (other materials available)



Model Numbering System

MODEL EXAMPLE	MODEL	-	INSERTION LENGTH	-	PROCESS CONNECTION	-	OPTIONS[1]
	P61K	-	**.*	-	1.5"TCY	-	AA

MODEL	DESCRIPTION
P61K	Capacitance Probe, Sanitary Service, Kynar®
P61P	Capacitance Probe, Sanitary Service, Polypropylene

INSERTION LENGTH	DESCRIPTION
**.*	**.* in of insertion (96 in max)

PROCESS CONNECTION	DESCRIPTION
	Refer to 120 for M/N
	Tri-clamp sizes 1.5 in minimum

OPTIONS[1]	DESCRIPTION
AA	None
PH4	Probe head housing with terminals for use with remote mounted electronics unit, 4X housing
PH7	Probe head housing with terminals for use with remote mounted electronics unit, 7X housing

Notes:
[1] A hyphen will separate multiple options selected

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to Additional Resources)

APPLICATION DETAILS:

- Process fluid or material name*
- Process fluid or material dieletric constant
- Maximum process temperature
- Maximum process pressure

*Upper and lower materials required for interface service

Model P62 • Capacitance Probe, Sanitary Service, Tubular Ground

Features

- Natural PVDF and polished 316 Stainless Steel comes in contact with process fluids
- Concentric ground reference tube provides a linear output in horizontal cylindrical tanks
- Used where agitation causes problems
- Easily cleaned manually, in-place, or by steaming
- Basic process connection mates with tri-clamp sanitary flange
- Suitable for pharmaceutical industry service
- Works with conductive liquids
- Suitable for ultralow dielectric liquids such as wax, grease, and pure oils
- Can be used to measure interface position

Description

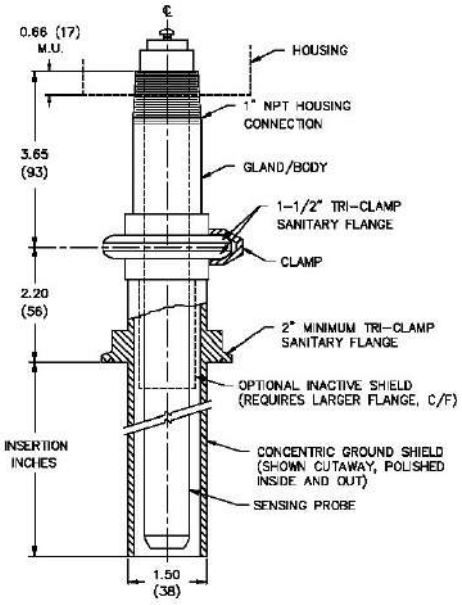
The Delta Controls **Model P62** Capacitance Probe is intended for sanitary service. The inner portion is connected to the concentric ground reference tube using a tri-clamp sanitary flange. The inner unit is **easily removed** from the outer ground reference tube for cleaning or inspection. The ground reference tube is mounted to the process vessel by a second tube with a tri-clamp sanitary flange. The ground reference tube can be left in place while the inner portion is withdrawn. The reference portion can then be **removed** as required.

The P62's PVDF sensing rod and seal jacket is a welded part without joints, cracks, or crevices. The finished unit is flame-polished for the utmost in **smoothness** and **cleanability**. The ground reference tube is made of 316 Stainless Steel and is polished both internally and externally. The integral ground reference allows the P62 to be used in plastic tanks and in lined tanks which do not provide the necessary parallel ground reference.

Model P62

Specifications

Working Pressure:	≤ +500 psig (+34.5 bar)
Working Temperature:	-40 °F to +300 °F (-40 °C to +149 °C)
Insertion Length:	≤ 4 ft (1.2 m)
Process Connection:	2.0 in Tri-clamp min
Tri-clamp Process Connection:	2.0 in to 3.0 in
Available Wetted Materials:	316 Stainless Steel, Kynar® PVDF
Ground Sheath:	316 Stainless Steel (other materials available)



Model Numbering System

MODEL EXAMPLE	MODEL	-	INSERTION LENGTH	-	PROCESS CONNECTION	-	OPTIONS[1]
	P62K	-	**.*	-	2"TCY	-	AA

MODEL	DESCRIPTION
P62K	Capacitance Probe, Sanitary Service, Tubular Ground, Kynar®

INSERTION LENGTH	DESCRIPTION
**.*	**.* in of insertion (4 ft max)

PROCESS CONNECTION	DESCRIPTION
	Refer to 120 for M/N
	Tri-clamp sizes 2 in, 2.5 in, 3 in

OPTIONS[1]	DESCRIPTION
AA	None
PH4	Probe head housing with terminals for use with remote mounted electronics unit, 4X housing
PH7	Probe head housing with terminals for use with remote mounted electronics unit, 7X housing

Notes:
[1] A hyphen will separate multiple options selected

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to Additional Resources)

APPLICATION DETAILS:

- Process fluid or material name
- Process fluid or material dieletric constant
- Maximum process temperature
- Maximum process pressure

Model P66 • Capacitance Probe, Sanitary Service, Metal Ion Free Service

Features

- Virgin polypropylene or Kynar® PVDF comes in contact with the process fluid
- Thick plastic jacketing is welded in place
- No cracks, joints, or crevices to collect contaminants
- Suitable for fluids used in silicon chip and electronics manufacturing
- For extremely corrosive industrial processes such as hydrofluoric acid plants, pickling lines, and plating solutions
- Plastic surfaces are flame smoothed for the best available surface

Description

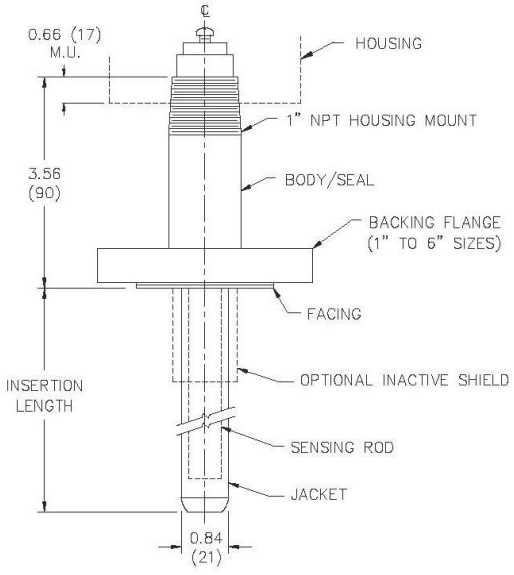
The Delta Controls **Model P66** Capacitance Probe uses all plastic wetted parts and is intended for sanitary service. The probe is designed for **use in processes** and **storage tanks** where the possibility of contamination is prohibited. Process examples include injectable solutions, pharmaceutical dilution fluids, heavy water for research, electronic chipmaking, and high quality plating systems.

The P66 is also commonly used in industrial process systems which are extremely corrosive. **Kynar® PVDF is highly inert** and unaffected by almost all strong acids and bases below a temperature of +275 °F (+135 °C). Applications include hydrofluoric acid level, refinery hydroformers, bromine condensers, chlorine generation cells, radioactive processes, and wastes.

Model P66

Specifications

Working Pressure:	-15 psig to +300 psig (-1.0 bar to +20.7 bar)
Working Temperature:	–40 °F to +300 °F (-40 °C to +149 °C)
Insertion Length:	≤ 10 ft (3 m)
Process Connection:	2.0 in minimum
Threaded Process Connection:	2.0 in to 3.0 in
Flanged Process Connection:	2.0 in to 4.0 in
Flange Rating:	≤ 600 lb
Available Wetted Materials:	Kynar® PVDF, Polypropylene, carbon steel (other materials available)



Model Numbering System

MODEL EXAMPLE	MODEL	-	INSERTION LENGTH	-	SHIELD & EXTENSION	-	PROCESS CONNECTION	-	OPTIONS[1]
	P66K	-	**.*	-	AA	-	2"MPTY	-	AA

MODEL	DESCRIPTION
P66K	Capacitance Probe, Sanitary Service, Metal Ion Free Service, Kynar®
P66P	Capacitance Probe, Sanitary Service, Metal Ion Free Service, Polypropylene

INSERTION LENGTH	DESCRIPTION
**.*	**.* in of insertion (120 in max)

SHIELD & EXTENSION	DESCRIPTION
AA	None
I*	* in inactive shield

PROCESS CONNECTION	DESCRIPTION
	Refer to 120 for process connections
	MPT size 2 in minimum
	Flange sizes 2 in to 4 in, Classes 150, 300, 600

OPTIONS[1]	DESCRIPTION
AA	None
PH4	Probe head housing with terminals for use with remote mounted electronics unit, 4X housing
PH7	Probe head housing with terminals for use with remote mounted electronics unit, 7X housing

Notes:
[1] A hyphen will separate multiple options selected

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to Additional Resources)

APPLICATION DETAILS:

- Process fluid or material name*
- Process fluid or material dieletric constant
- Maximum process temperature
- Maximum process pressure

*Upper and lower materials required for interface service

Model P68 • Capacitance Probe, Sanitary Service, Metal Ion Free Service, Parallel Ground

Features

- Virgin polypropylene or natural PVDF comes into contact with the process fluids
- Thick plastic jacketing is welded in place
- No cracks, joints, or crevices to collect contaminants
- Suitable for fluids used in silicon chip and electronics manufacturing
- Use in industrial processes which are extremely corrosive such as hydrofluoric acid plants, pickling lines, and plating solutions
- Plastic surfaces are flame smoothed for the best available surface

Model P68

Description

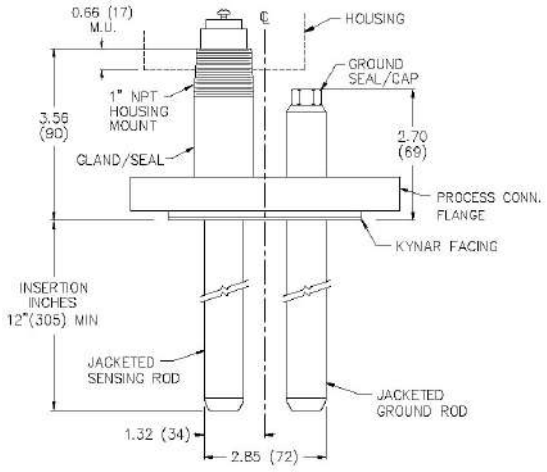
The Delta Controls **Model P68** Capacitance Probe uses all plastic wetted parts and is intended for sanitary service. The probe is designed for **use in processes** and **storage tanks** where the possibility of contamination is prohibited. Process examples include etchants, high purity plating solutions, and ferric chloride.

The P68 is also commonly used in industrial process systems which are extremely corrosive. **Kynar® PVDF is highly inert** and unaffected by almost all strong acids and bases below a temperature of 275 °F (135 °C). Applications include hydrofluoric acid level, refinery hydroformers, bromine condensors, chlorine generation cells, and radioactive wastes.

The P68 is a heavy-duty rugged sensing probe with jacketed ground reference rod and provides **high reliability** in difficult applications.

Specifications

Working Pressure:	-15 psig to +300 psig (-1.03 bar to +20.7 bar)
Working Temperature:	-40 °F to +300 °F (-40 °C to +159 °C)
Insertion Length:	≤ 6 ft (2 m)
Process Connection:	3.0 in minimum
Threaded Process Connection:	3.0 in
Flanged Process Connection:	3.0 in to 4.0 in
Flange Rating:	≤ 600 lb
Available Wetted Materials:	Kynar® PVDF, Polypropylene, carbon steel
Ground Rod:	Kynar® PVDF, Polypropylene (other materials available)



Model Numbering System

MODEL EXAMPLE	MODEL	-	INSERTION LENGTH	-	SHIELD & EXTENSION	-	PROCESS CONNECTION	-	OPTIONS[1]
	P68K	-	**.*	-	AA	-	2"MPTY	-	AA

MODEL	DESCRIPTION
P68K	Capacitance Probe, Sanitary Service, Metal Ion Free Service, Parallel Ground, Kynar®
P68P	Capacitance Probe, Sanitary Service, Metal Ion Free Service, Parallel Ground, Polypropylene

INSERTION LENGTH	DESCRIPTION
**.*	**.* in of insertion (72 in max)

SHIELD & EXTENSION	DESCRIPTION
AA	None
I*	* in inactive shield

PROCESS CONNECTION	DESCRIPTION
	Refer to 120 for process connections
	MPT size 3 in minimum
	Flange sizes 2 in to 4 in, Classes 150, 300, 600

OPTIONS[1]	DESCRIPTION
AA	None
PH4	Probe head housing with terminals for use with remote mounted electronics unit, 4X housing
PH7	Probe head housing with terminals for use with remote mounted electronics unit, 7X housing

Notes:
[1] A hyphen will separate multiple options selected

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to Additional Resources)

APPLICATION DETAILS:

- Process fluid or material name*
- Process fluid or material dieletric constant
- Maximum process temperature
- Maximum process pressure

*Upper and lower materials required for interface service

Model P71 • Capacitance Probe, Flexible Cable

Features

- Cable may be coiled for easy handling
- Easily installed in tall tanks
- May be installed in indoor tanks with low headroom
- PTFE insulation allows operation in conductive or nonconductive liquids at high temperatures
- Corrosion resistant PTFE seals and jacket
- Suitable for high pressures

Description

The Delta Controls **Model P71** Capacitance Probe features a cable that is jacketed with **PTFE insulating material**. The bottom cable fitting is electrically isolated from the cable.

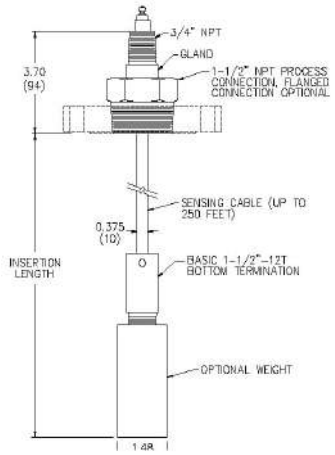
The P71 is primarily **intended for liquid** and **interface measurement service**. Some applications requiring these attributes include damp wood chips and pulpstock chests.

The probe should be located away from the vessel centerline by less than one quarter of the vessel's diameter. The cable is provided with a bolt thread for direct attachment to the bottom of the tank. It may also be equipped with a lower weight, using gravity to keep it straight. The cable **must be vertical** and taut after installation. A simple bottom weight is the preferred method in calm, still storage tanks. **A pipe stilling well** should be used in conjunction with the weight when the liquid is agitated or where strong flowing currents are present. Fastening the lower cable termination to the bottom of an agitated tank **is required** when a stilling well cannot be installed or in applications where the stilling well **may plug with deposits**.

Model P71

Specifications

Working Pressure:	+1500 psig (103.4 bar) at +100 °F (38 °C)
Working Temperature:	-460 °F to +400 °F (-273 °C to +204 °C)
Temperature Extension Required:	< -20 °F (-29 °C) or > +175 °F (+79 °C)
Insertion Length:	≤ 250 ft (75 m)
Process Connection:	1 in MPT minimum
Threaded Process Connection:	1.0 in to 2.0 in
Tri-clamp Process Connection:	2.0 to 3.0 in
Flanged Process Connection:	1.5 in to 4.0 in
Flange Rating:	≤ 600 lb
Available Wetted Materials:	316 Stainless Steel, PTFE, carbon steel (other materials available)



Model Numbering System

MODEL EXAMPLE	MODEL	-	INSERTION LENGTH	-	SHIELD & EXTENSION	-	PROCESS CONNECTION	-	OPTIONS[1]
	P71Y	-	**.*	-	AA	-	2"150RS	-	AA

MODEL	DESCRIPTION
P71Y	Capacitance Probe, Flexible Cable, 316 Stainless Steel

INSERTION LENGTH	DESCRIPTION
**.*	**.* in of insertion (3000 in max)

SHIELD & EXTENSION	DESCRIPTION
AA	None
T*	* in temperature extension
I*	* in inactive shield

PROCESS CONNECTION	DESCRIPTION
	Refer to 120 for process connections
	MPT size 1 in minimum
	Flange sizes 1.5 in to 4 in, Classes 150, 300, 600
	Tri-clamp sizes 2 in, 3 in

OPTIONS[1]	DESCRIPTION
AA	None
PH4	Probe head housing with terminals for use with remote mounted electronics unit, 4X housing
PH7	Probe head housing with terminals for use with remote mounted electronics unit, 7X housing
WT	1.5 in O.D. weight on bottom termination

Notes:
[1] A hyphen will separate multiple options selected

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to Additional Resources)

APPLICATION DETAILS:

- Process fluid or material name*
- Process fluid or material dieletric constant
- Maximum process temperature
- Maximum process pressure

*Upper and lower materials required for interface service

Model P72 • Capacitance Probe, Flexible Cable, Parallel Ground

Features

- Cable may be coiled for easy handling
- Easily installed in tall tanks
- May be installed in indoor tanks with low headroom
- PTFE insulation allows operation in conductive, or nonconductive liquids at high temperatures
- Corrosion resistant PTFE seals and jacket
- Suitable for high pressures and temperatures
- Flexible cable provides a linear ground reference

Description

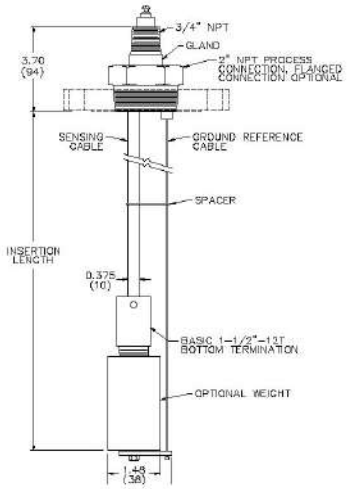
The Delta Controls Model P72 Capacitance Probe is commonly used in tanks made of reinforced plastics or metal tanks lined with rubber, glass, or plastic which do not contain the ground reference plane required by an RF admittance instrument. Model P72 should generally be used when the level change is less than ten feet, the tank diameter is greater than eight feet, or the measured liquid has a dielectric constant of less than 3.5 units. Low dielectric liquids include fuel oil, gasoline, benzene, and liquefied petroleum gases.

P72 is also used in tanks with sizeable or nonlinear side walls, as well as when indoor tanks have limited headspace. Most applications require the optional bottom weight (option WT) to keep the cable taut.

Model P72

Specifications

Working Pressure:	+1500 psig (103.4 bar) at +100 °F (38 °C)
Working Temperature:	-460 °F to +400 °F (-273 °C to +204 °C)
Temperature Extension Required:	< -20 °F (-29 °C) or > +175 °F (+79 °C)
Insertion Length:	≤ 250 ft (75 m)
Process Connection:	2.0 in MPT minimum
Threaded Process Connection:	2.0 in
Tri-clamp Process Connection:	2.0 in to 3.0 in
Flanged Process Connection:	2.0 in to 4.0 in
Flange Rating:	≤ 600 lb
Available Wetted Materials:	316 Stainless Steel, PTFE, carbon steel (other materials available)



Model Numbering System

MODEL EXAMPLE	MODEL	-	INSERTION LENGTH	-	SHIELD & EXTENSION	-	PROCESS CONNECTION	-	OPTIONS[1]
	P72Y	-	**.*	-	AA	-	2"150RS	-	AA

MODEL	DESCRIPTION
P72Y	Capacitance Probe, Flexible Cable, 316 Stainless Steel

INSERTION LENGTH	DESCRIPTION
**.*	**.* in of insertion (3000 in max)

SHIELD & EXTENSION	DESCRIPTION
AA	None
T*	* in temperature extension
I*	* in inactive shield

PROCESS CONNECTION	DESCRIPTION
	Refer to 120 for process connections
	MPT size 2 in
	Flange sizes 2 in to 4 in, Classes 150, 300, 600
	Tri-clamp sizes 2 in, 3 in

OPTIONS[1]	DESCRIPTION
AA	None
PH4	Probe head housing with terminals for use with remote mounted electronics unit, 4X housing
PH7	Probe head housing with terminals for use with remote mounted electronics unit, 7X housing
WT	1.5 in outside diameter weight on bottom termination

Notes:
[1] A hyphen will separate multiple options selected

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to Additional Resources)

APPLICATION DETAILS:

- Process fluid or material name
- Process fluid or material dieletric constant
- Maximum process temperature
- Maximum process pressure

Model P80 Series 1 • Capacitance Probe, Rigid Rod, Dry Granulated Solids and Powders

Features

- Full length concentric rod/insulator/body design withstands heavy loads and resists bending
- Secondary PTFE seal prevents failures and false alarms due to moisture and condensation
- For alarm or high/low control action
- Can be installed in tiled or concrete silos
- Heavy-duty, proven reliability
- Suitable for many chunk solid applications
- Easy model selection when using picofarad calculations to accurately forecast service results

Model P80 Series 1 (P81)

Description

The side-mounted Delta Controls **Model P80 Series 1** Capacitance Probes feature a full length concentric rod/insulator/body design to withstand heavy loads and resist bending. The secondary PTFE seal **prevents failures** and **false alarms** due to moisture and condensation, or high/low control action.

The probes are rigid and rod-type for dry powders and granular solids. The sensing rod has a through-the-gland design for maximum strength and is resistant to bending. The glands are sealed against water and moisture. The sensing rod and body are 300 Stainless Steel. The insulator is Delrin® and the seal is PTFE.

The P80 Series are heavy-duty with proven reliability in tiled or concrete silos. The weight factor and picofarad calculations should be used to model probe results.

Model P81 is a general-duty side inserted probe. The probe may be covered by 26 feet of sand or 65 feet of grain.

Model P82 is a medium-duty, rugged, side inserted probe. The probe may be covered with up to 55 feet of sand or 130 feet of grain.

Model P83 is a heavy-duty, side-inserted probe for more demanding applications. The probe may be covered with up to 75 feet of sand or 180 feet of grain and will withstand small to medium size chunk solids.

Model P84 is an extreme-duty side-inserted probe for the toughest of applications. The probe may be covered with up to 150 feet of sand or 375 feet of grain and can withstand larger chunk size solids.

Specifications

Type:	Side Mount
Working Pressure:	+1500 psig (+103.4 bar) at +100 °F (38 °C)
Working Temperature:	-460 °F to +400 °F (-273 °C to +204 °C)
Bulk Density:	3150 lb/ft³ to 14 900 lb/ft³
Insertion Length:	Custom
Process Connection:	0.75 in to 1.25 in MPT
Available Wetted Materials:	316 Stainless Steel, PTFE

COMPARISON CHART OF MODELS

	MPT	"H"	"S"	O.D.	NPT
P81	0.75 in	3.0 (76)	1.0 (25)	0.37 (9)	0.75 in
P82	0.75 in	3.0 (76)	1.5 (38)	0.50 (13)	0.75 in
P83	1 in	3.1 (79)	2.0 (51)	0.625 (16)	1 in
P84	1.25 in	3.7 (94)	2.0 (51)	0.875 (22)	1 in

WEIGHT FACTORS*

P81	3,150
P82	6,590
P83	8,880
P84	14,900

*Use to calculate Maximum Allowable Material Elevation

Maximum Allowable Elevation of Material

The horizontal sensing probe can withstand heavy loads without bending or failing. The loading on a probe is a function of the material's density. How deeply the sensing probe is covered, and the probe rod size and location. Delta Controls has simplified this complex relationship into a simple and easy to use equation. A “Weight Factor” value has been derived for each model. The maximum amount of coverage is easily determined by dividing the weight factor by the bulk density of the process material as follows:

$$\frac{\text{Weight Factor}}{\text{Bulk Density (lb/ft}^3\text{)}} = \text{Maximum Allowable Feet of Coverage}$$

$$\text{Maximum Coverage} = \frac{\text{Weight Factor}}{\text{lb/ft}^3} = \text{Height of Material in Feet}$$

WEIGHT FACTORS			
P81	P82	P83	P84
3,150	6,590	8,880	14,900

EXAMPLE: Using a Model P82 sensing probe for 48 lb/ft^3 of whole kernel corn

$$\text{Maximum Coverage} = \frac{6590}{48} = 137 \text{ ft (42 m)}$$

Model Numbering System

MODEL EXAMPLE | **MODEL** - **PROCESS CONNECTION** - **OPTIONS**

P81 - 0.75"MPTY - AA

MODEL	DESCRIPTION
P81	Capacitance Probe, Rigid Rod, Dry Granulated Solids and Powders, General-duty
P82	Capacitance Probe, Rigid Rod, Dry Granulated Solids and Powders, Medium-duty
P83	Capacitance Probe, Rigid Rod, Dry Granulated Solids and Powders, Heavy-duty
P84	Capacitance Probe, Rigid Rod, Dry Granulated Solids and Powders, Extreme-duty

PROCESS CONNECTION	DESCRIPTION	AVAILABLE TYPES
0.75 MPTY	0.75 in MPT, 316 Stainless Steel	P81, P82
1 in MPTY	1 in MPT, 316 Stainless Steel	P83
1.25 in MPTY	1.25 in MPT, 316 Stainless Steel	P84

OPTIONS	DESCRIPTION
AA	None
PH4	Probe head housing with terminals for use with remote mounted electronics unit, 4X housing
PH7	Probe head housing with terminals for use with remote mounted electronics unit, 7X housing

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to Additional Resources)

APPLICATION DETAILS:

- Process fluid or material name
- Process fluid or material dieletric constant
- Maximum process temperature
- Maximum process pressure

Model P80 Series 2 • Capacitance Probe, Flexible Cable, Dry Granulated Solids and Powders

Features

- Strong, highly reliable and heavy-duty cables
- Durable gland to cable connection
- Fiber filled Delrin® insulators and support for longterm reliability
- Secondary seal of PTFE prevents moisture and condensation from causing false switching
- Bare stainless steel sensing rods and cables resist abrasion and corrosion
- Proven reliability in wide-ranging solids applications

Description

The top-mounted Delta Controls **P80 Series 2** Capacitance Probes are top-mounted on a tank or silo with a cable hanging inside the vessel. Bottom weights are required when strong air currents are present. The insertion should be limited to 6 feet when high velocity air currents are present. The glands are **sealed against moisture and wate**r. All materials are 316 Stainless Steel.

Model P87 and Model P87W are general-duty probes with a 0.125 inch diameter (3 mm) cable without a weight. It is intended for service where roiling or side-to-side movement of the process solids occur. Applications include cement load out bins, flour bins, bottom centerline takeout pellet hoppers, etc.

Model P87W has a weighted bottom to provide cable stability.

Model P88 is a heavy-duty probe with a 0.19 inch diameter (5 mm) cable and a bottom weight for service in heavy granules and similar small chunks. Taconite, marble chips, and similar materials are reliably sensed.

Model P89A is a heavy-duty cable probe which is hung from an internal support to the tank support. The lower end is free to move and follow the flow of material.

Model P89B has an additional tie-off at the tank's bottom and is recommended when there is substantial horizontal material flow. Multiple switch points or a 4-20 mA signal are common output signals. Used for service in tall cement silos, etc.

Model P80 Series 2

Specifications

Type:	Top Mount
Working Pressure:	+1500 psig (+103.4 bar) at +100 °F (+38 °C)
Working Temperature:	-460 °F to +400 °F (-273 °C to +204 °C)
Bulk Density:	1230 lb/ft³ to 6500 lb/ft³
Insertion Length:	Custom
Process Connection:	0.75 in NPT minimum
Threaded Process Connection:	0.75 in to 1.0 in
Available Wetted Materials:	316 Stainless Steel

Model Numbering System

MODEL EXAMPLE	MODEL	-	INSERTION LENGTH	-	PROCESS CONNECTION	-	OPTIONS[1]
	P87	-	**.*	-	0.75"MPTY	-	AA

MODEL	DESCRIPTION
P87	Capacitance Probe, Flexible Cable, Dry Granulated Solids and Powders, General-duty
P87W	Capacitance Probe, Flexible Cable, Dry Granulated Solids and Powders, General-duty, Weighted
P88	Capacitance Probe, Flexible Cable, Dry Granulated Solids and Powders, Heavy-duty
P89A	Capacitance Probe, Flexible Cable, Dry Granulated Solids and Powders, Heavy-duty, Internal Mount
P89B	Capacitance Probe, Flexible Cable, Dry Granulated Solids and Powders, Heavy-duty, Internal Mount with Support

INSERTION LENGTH	DESCRIPTION
**.*	**.* ft of insertion

PROCESS CONNECTION	DESCRIPTION	AVAILABLE TYPES
0.75"MPTY	0.75 MPT, 316 Stainless Steel	P87, P87W
1"MPTY	1 in MPT, 316 Stainless Steel	P88, P89A, P89B

OPTIONS[1]	DESCRIPTION
AA	None
VBKT	Cable clamp support arm for vertical mounting, carbon steel
HBKT	Cable clamp support arm for horizontal mounting, carbon steel
PH4	Probe head housing with terminals for use with remote mounted electronics unit, 4X housing
PH7	Probe head housing with terminals for use with remote mounted electronics unit, 7X housing

Notes:
[1] A hyphen will separate multiple options selected

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to Additional Resources)

Application Details:

- Process fluid or material name
- Process fluid or material dielectric constant
- Maximum process temperature
- Maximum process pressure

Model P91 • Capacitance Probe, Floating Probe for Oil Skimmer

Features

- Measures 2 inches to 36 inches (50 mm to 900 mm) of oil floating on water
- Supports oil or water total elevation change up to 50 ft (15 mm)
- Works on large tank tramp oil collectors
- Works well with fresh or salt water
- Entire transmitter may be submerged to 50 feet (15 meter)
- For highly corrosive and offshore applications, 316 Stainless Steel electronic housings are optional
- Optional Hastelloy® C-276
- Unaffected by foam, bubbles, and froth
- Functions well with lip type rotatable skimmers

Description

The Delta Controls **Model P91** Capacitance Probe is designed for interface measurement. The probe floats on the top surface of oil in a skimmer basin or separation vessel. A **vertical sensing rod**, with parallel ground reference rods, is supported by outrigger floats. The sensing rod goes through the floating oil and into the water.

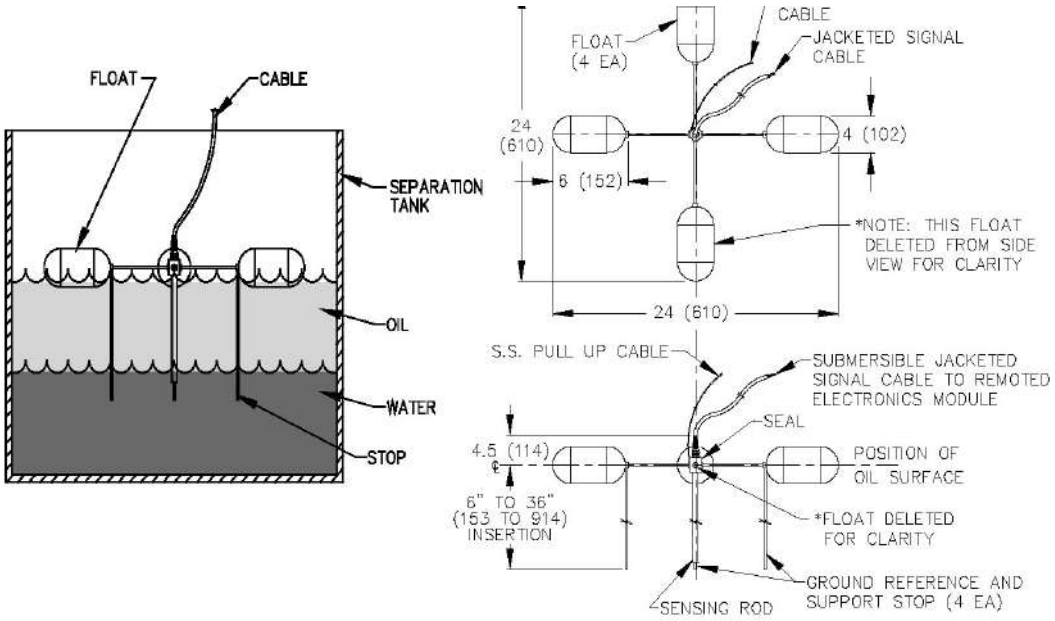
The P91 measures the distance from the top of the oil to the interface between the water and the floating oil. This measurement is then converted into a 4-20 mA direct current signal equivalent to the thickness of oil present. Optionally, an on/off differential control signal can be produced to **control** a **drainage pump** or **skimmer trough**.

The interconnection allows pull up for testing and maintenance as well as acting as a tether in large pond applications. The P91 is typically used in petroleum refineries, machinery manufacturing plants, oil field salt water disposal companies, and similar industrial operating companies.

Model P91

Specifications

Electronic Module:	Remote from sensor
Range:	≤ 6 in to ≤ 36 in (150 mm to 900 mm)
Specific Gravity (Oil):	0.70 min
Attachment Cable:	0.0625 in 316 Stainless Steel
Interconnection:	Oil resistant
Rubber Tubular Jacket over Signal Cable:	≤ 60 ft (20 m)
Available Wetted Materials:	316 Stainless Steel, PTFE
Floats and Frame Support:	316 Stainless Steel
Sensing Rod Jacket and Seals:	PTFE extruded and welded



Model Numbering System

MODEL EXAMPLE	MODEL	-	INSERTION LENGTH	-	CABLE LENGTH	-	OPTIONS
	P91Y	-	**.*	-	**.*	-	AA

MODEL	DESCRIPTION
P91Y	Capacitance Probe, Floating Probe for Oil Skimmer, 316 Stainless Steel

INSERTION LENGTH	DESCRIPTION
**.*	**.* in of insertion (1 in to 36 in)

CABLE LENGTH	DESCRIPTION
**.*	**.* in of rubber outer jacketed cable (720 in max)

OPTIONS	DESCRIPTION
AA	None
HP	Pressurized tank modification

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to Additional Resources)

APPLICATION DETAILS:

- Process fluid or material name*
- Process fluid or material dieletric constant
- Maximum process temperature
- Maximum process pressure

*Upper and lower materials required for interface service

Capacitance Technical Resources

Probe Temperature Extension

Probe Extension Length	Integral Mount Range	Remote Mount Range (*P cable)
0.0 in	-40 °F to +200 °F (-40 °C to +93 °C)	-60 °F to +200 °F (-51 °C to +93 °C)
3 in	-45 °F to +255 °F (-42 °C to +123 °C)	-80 °F to +225 °F (-62 °C to +123 °C)
6 in	-60 °F to +325 °F (-51 °C to +162 °C)	-100 °F to +285 °F (-73 °C to +140 °C)
9 in	-70 °F to +450 °F (-56 °C to +232 °C)	-120 °F to +350 °F (–84 °C to +176 °C)

Probe Process Connections

Carbon Steel			
Model Number	**Size**	**Type**	**Material**
1.5"150RS	1.5 in	Class 150 raised face flange	carbon steel
1.5"300RS	1.5 in	Class 300 raised face flange	carbon steel
1.5"600RS	1.5 in	Class 600 raised face flange	carbon steel
2"150RS	2 in	Class 150 raised face flange	carbon steel
2"300RS	2 in	Class 300 raised face flange	carbon steel
2"600RS	2 in	Class 600 raised face flange	carbon steel
3"150RS	3 in	Class 150 raised face flange	carbon steel
3"300RS	3 in	Class 300 raised face flange	carbon steel
3"600RS	3 in	Class 600 raised face flange	carbon steel
4"150RS	4 in	Class 150 raised face flange	carbon steel
4"300RS	4 in	Class 300 raised face flange	carbon steel
4"600RS	4 in	Class 600 raised face flange	carbon steel

304 Stainless Steel			
Model Number	**Size**	**Type**	**Material**
1.5"150RB	1.5 in	Class 150 raised face flange	304 Stainless Steel
1.5"300RB	1.5 in	Class 300 raised face flange	304 Stainless Steel
1.5"600RB	1.5 in	Class 600 raised face flange	304 Stainless Steel
2"150RB	2 in	Class 150 raised face flange	304 Stainless Steel
2"300RB	2 in	Class 300 raised face flange	304 Stainless Steel
2"600RB	2 in	Class 600 raised face flange	304 Stainless Steel
3"150RB	3 in	Class 150 raised face flange	304 Stainless Steel
3"300RB	3 in	Class 300 raised face flange	304 Stainless Steel
3"600RB	3 in	Class 600 raised face flange	304 Stainless Steel
4"150RB	4 in	Class 150 raised face flange	304 Stainless Steel
4"300RB	4 in	Class 300 raised face flange	304 Stainless Steel
4"600RB	4 in	Class 600 raised face flange	304 Stainless Steel

316 Stainless Steel			
Model Number	**Size**	**Type**	**Material**
0.75"MPTY	0.75 in	MPT	316 Stainless Steel
1"MPTY	1 in	MPT	316 Stainless Steel
1"150RY	1 in	Class 150 raised face flange	316 Stainless Steel
1"300RY	1 in	Class 300 raised face flange	316 Stainless Steel
1"600RY	1 in	Class 600 raised face flange	316 Stainless Steel
1.5"MPTY	1.5 in	MPT	316 Stainless Steel
1.5"TCY	1.5 in	Tri-clamp	316 Stainless Steel
1.5"150RY	1.5 in	Class 150 raised face flange	316 Stainless Steel
1.5"300RY	1.5 in	Class 300 raised face flange	316 Stainless Steel
1.5"600RY	1.5 in	Class 600 raised face flange	316 Stainless Steel
2"MPTY	2 in	MPT	316 Stainless Steel
2"TCY	2 in	Tri-clamp	316 Stainless Steel
2"150RY	2 in	Class 150 raised face flange	316 Stainless Steel
2"300RY	2 in	Class 300 raised face flange	316 Stainless Steel
2"600RY	2 in	Class 600 raised face flange	316 Stainless Steel
2.5"TCY	2.5 in	Tri-clamp	316 Stainless Steel
3"TCY	3 in	Tri-clamp	316 Stainless Steel
3"150RY	3 in	Class 150 raised face flange	316 Stainless Steel
3"300RY	3 in	Class 300 raised face flange	316 Stainless Steel
3"600RY	3 in	Class 600 raised face flange	316 Stainless Steel
4"150RY	4 in	Class 150 raised face flange	316 Stainless Steel
4"300RY	4 in	Class 300 raised face flange	316 Stainless Steel
4"600RY	4 in	Class 600 raised face flange	316 Stainless Steel

Hastelloy C-276			
Model Number	**Size**	**Type**	**Material**
2"MPTG	2 in	MPT	Hastelloy C-276

Probe Performance Graphs

Contact Delta Controls for further information.

Interface Detection

Unique Capacitance Solutions for interface detection. ***Retractable*** *and* ***serviceable*** *while in service. Never shut your plant down again due to an unaccessible level probe.*

Model IPT • Capacitance Interface Transmitter, Refinery Desalter

Features

- Continuous interface position signal
- Up to 6 feet (1.8 m) measurement range
- Extract/Remove sensor or clean in place while in service
- Pushbutton interface calibration
- 2-wire 4-20 mA interface position signal
- HART® Protocol compliant

Description

The Delta Controls **Model IPT** Interface Transmitter senses the interface position by measuring energy transferred from the probe into the surrounding material. The energy transfer is at a minimum when the probe is covered with crude oil and at a maximum when it is covered with water. The Model IPT transmitter is calibrated by entering two interface elevation points. The transmitter **calculates** a curve through those points. The result is a 4-20 mA direct output signal that is proportional to the elevation of the interface position. This information is displayed on the integral LCD display.

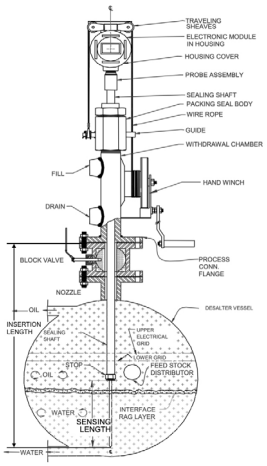
The Model IPT is a specially designed probe interface transmitter that **does not require shutdown** and is less sensitive to carbon, wax, water emulsions and other material buildup than analog type capacitance level transmitters. It permits easy and safe extraction, cleaning, and reinsertion of the probe without disrupting operation.

The Model IPT assembly is top-mounted on a desalter isolation valve, allowing **removal without depressurizing** the desalter. For access, the sensing probe is withdrawn into a chamber located above the isolation valve. The valve is then closed, permitting depressurization of the withdrawal chamber for cleaning. If required, the Model IPT can be completely removed without disturbing the desalter.

Model IPT

Specifications

Output:	4-20 mA loop signal
Maximum Loop Impedance:	500 Ω at 24 DCV, 900 Ω at 30 DCV
Display:	LCD Screen, 2 line, 8 character, alphanumeric
Calibration Entry:	4 pushbutton switches
Voltage Requirements:	12 DCV to 30 DCV loop power
Ambient Temperature Range:	-20 °F to +175 °F (-30 °C to +80 °C)
Best Display Readability Range:	+30 °F to +125 °F (-1 °C to +50 °C)
Flanged Connection:	3.0 in to 6.0 in
Flange Rating:	≤ 300 lb, ANSI or equivalent DIN, JIS flanges
Available Wetted Materials:	316 Stainless Steel, carbon steel, PTFE
Housing Material:	Aluminum, stainless steel
Communication:	Device menus, HART COMMUNICATION PROTOCOL
Certifications:	
Housing Option	Third Party Listed by CSA NRTL/C (USA and Canada) Class I, Groups B, C, and D; Class II, Groups E, F and G; Class III; Encl 4X



Model Numbering System

MODEL EXAMPLE	MODEL	-	INSERTION LENGTH	-	ACTIVE LENGTH	-	PROCESS CONNECTION	-	OPTIONS
	IPT	-	149.0	-	49.0		4"150RS		AA

MODEL	DESCRIPTION
IPT	Capacitance Interface Transmitter, Refinery Desalter

INSERTION LENGTH	DESCRIPTION
**.*	**.* in of insertion

SENSING LENGTH	DESCRIPTION
**.*	**.* in of active sensing length

PROCESS CONNECTION	DESCRIPTION
3"150RS	3 in Class 150 raised face flange, carbon steel
3"300RS	3 in Class 300 raised face flange, carbon steel
4"150RS	4 in Class 150 raised face flange, carbon steel
4"300RS	4 in Class 300 raised face flange, carbon steel
6"150RS	6 in Class 150 raised face flange, carbon steel
6"300RS	6 in Class 300 raised face flange, carbon steel
3"150RY	3 in Class 150 raised race flange, 316 Stainless Steel
3"300RY	3 in Class 300 raised face flange, 316 Stainless Steel
4"150RY	4 in Class 150 raised race flange, 316 Stainless Steel
4"300RY	4 in Class 300 raised face flange, 316 Stainless Steel
6"150RY	6 in Class 150 raised face flange, 316 Stainless Steel
6"300RY	6 in Class 300 raised face flange, 316 Stainless Steel

OPTIONS	DESCRIPTION
AA	None

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to Additional Resources)
- Model IPT Installation Details worksheet (contact Delta Controls for information)

Interface Detection Technical Resources

Probe Temperature Extension

Probe Extension Length	Integral Mount Range	Remote Mount Range (*P cable)
0.0 in	-40 °F to +200 °F (-40 °C to +93 °C)	-60 °F to +200 °F (-51 °C to +93 °C)
3 in	-45 °F to +255 °F (-42 °C to +123 °C)	-80 °F to +225 °F (-62 °C to +123 °C)
6 in	-60 °F to +325 °F (-51 °C to +162 °C)	-100 °F to +285 °F (-73 °C to +140 °C)
9 in	-70 °F to +450 °F (-56 °C to +232 °C)	-120 °F to +350 °F (–84 °C to +176 °C)

Probe Process Connections

Carbon Steel			
Model Number	**Size**	**Type**	**Material**
1.5"150RS	1.5 in	Class 150 raised face flange	carbon steel
1.5"300RS	1.5 in	Class 300 raised face flange	carbon steel
1.5"600RS	1.5 in	Class 600 raised face flange	carbon steel
2"150RS	2 in	Class 150 raised face flange	carbon steel
2"300RS	2 in	Class 300 raised face flange	carbon steel
2"600RS	2 in	Class 600 raised face flange	carbon steel
3"150RS	3 in	Class 150 raised face flange	carbon steel
3"300RS	3 in	Class 300 raised face flange	carbon steel
3"600RS	3 in	Class 600 raised face flange	carbon steel
4"150RS	4 in	Class 150 raised face flange	carbon steel
4"300RS	4 in	Class 300 raised face flange	carbon steel
4"600RS	4 in	Class 600 raised face flange	carbon steel

304 Stainless Steel			
Model Number	**Size**	**Type**	**Material**
1.5"150RB	1.5 in	Class 150 raised face flange	304 Stainless Steel
1.5"300RB	1.5 in	Class 300 raised face flange	304 Stainless Steel
1.5"600RB	1.5 in	Class 600 raised face flange	304 Stainless Steel
2"150RB	2 in	Class 150 raised face flange	304 Stainless Steel
2"300RB	2 in	Class 300 raised face flange	304 Stainless Steel
2"600RB	2 in	Class 600 raised face flange	304 Stainless Steel
3"150RB	3 in	Class 150 raised face flange	304 Stainless Steel
3"300RB	3 in	Class 300 raised face flange	304 Stainless Steel
3"600RB	3 in	Class 600 raised face flange	304 Stainless Steel
4"150RB	4 in	Class 150 raised face flange	304 Stainless Steel
4"300RB	4 in	Class 300 raised face flange	304 Stainless Steel
4"600RB	4 in	Class 600 raised face flange	304 Stainless Steel

316 Stainless Steel			
Model Number	**Size**	**Type**	**Material**
0.75"MPTY	0.75 in	MPT	316 Stainless Steel
1"MPTY	1 in	MPT	316 Stainless Steel
1"150RY	1 in	Class 150 raised face flange	316 Stainless Steel
1"300RY	1 in	Class 300 raised face flange	316 Stainless Steel
1"600RY	1 in	Class 600 raised face flange	316 Stainless Steel
1.5"MPTY	1.5 in	MPT	316 Stainless Steel
1.5"TCY	1.5 in	Tri-clamp	316 Stainless Steel
1.5"150RY	1.5 in	Class 150 raised face flange	316 Stainless Steel
1.5"300RY	1.5 in	Class 300 raised face flange	316 Stainless Steel
1.5"600RY	1.5 in	Class 600 raised face flange	316 Stainless Steel
2"MPTY	2 in	MPT	316 Stainless Steel
2"TCY	2 in	Tri-clamp	316 Stainless Steel
2"150RY	2 in	Class 150 raised face flange	316 Stainless Steel
2"300RY	2 in	Class 300 raised face flange	316 Stainless Steel
2"600RY	2 in	Class 600 raised face flange	316 Stainless Steel
2.5"TCY	2.5 in	Tri-clamp	316 Stainless Steel
3"TCY	3 in	Tri-clamp	316 Stainless Steel
3"150RY	3 in	Class 150 raised face flange	316 Stainless Steel
3"300RY	3 in	Class 300 raised face flange	316 Stainless Steel
3"600RY	3 in	Class 600 raised face flange	316 Stainless Steel
4"150RY	4 in	Class 150 raised face flange	316 Stainless Steel
4"300RY	4 in	Class 300 raised face flange	316 Stainless Steel
4"600RY	4 in	Class 600 raised face flange	316 Stainless Steel

Hastelloy C-276			
Model Number	**Size**	**Type**	**Material**
2"MPTG	2 in	MPT	Hastelloy C-276

Probe Performance Graphs

Contact Delta Controls for further information.

Pressure Series

Pressure transmitters for water, wastewater, and more.

Pressure Series

30+ Years of Dependable Service
Dedicated Commitment to Delivery
Engineered for Demanding Applications

The Delta Controls pressure transmitters offer a heavy duty engineered design for wide-ranging applications; including those with agitation, corrosive materials, sanitary materials, and atmospheric pressure. Each can be specifically configured for the unique needs of each application offering custom cable lengths, process connections, materials of construction, and numerous options. Due to the critical role level transmitters play in many modern processes, Delta is committed to quick shipments to ensure smooth operations.

Pressure Transmitters

Theory of Operation

A silicon diaphragm is doped to construct a strain gauge bridge. The pressure to be sensed is applied to one side of the diaphragm, which flexes a minute amount, causing a resistive unbalance in the bridge. This change—linearly proportional to the applied pressure amount—generates a millivolt signal sensed by an electronics network. Using stored calibration parameters, the signal is scaled to produce a process variable representing pressure, level, or volume. The process variable is then scaled using stored upper and lower range values thus creating a representation between zero and one hundred percent. Finally, the percentage is scaled to a 4 to 20 mA loop current. The silicon diaphragm is isolated from the measured liquid by a metal or elastomer diaphragm.

Electronics Housings & Options

Housings

4X Housing

7T Housing

7W Housing

Options

Face Guard
Cable suspended transmitters are available with a protected face guard for clean liquids as well as an open face guard for entrained solids.

Cable
For cable suspended transmitters, cable is available in PVC and Tefzel outer jacketed material.

Optional Bail Hanger or Stainless Steel Pipe
For models offering cable or pipe suspended, stainless steel bail hanger cable can be supplied. The optional stainless steel pipe is sectioned into 120 inch threaded pieces for economical shipment.

Stem to Cable Seal
The optional 'CTV' Nylon stem to cable seal can be used with remoted transmitter housing.

Cable Support Clamp
The optional 316 Stainless Steel 'CCY' cable support clamp offers additional support for the heavy weight of cable lengths exceeding 150 feet (46 meters).

Flanged Process Connection Adapter
The optional 'FLA' flanged process connection adapter can be used for adaptation with user provided 1 inch support pipe.

Options

Isolation Bladder
The optional 'SCT' isolation bladder includes a tubular type isolation bladder that can be mounted in a separate user provided enclosure.

Desiccant Dryer
The optional 'DDI' refillable desiccant dryer for vent tube is an individual component that can be used for mounting in a separate user provided enclosure.

Options

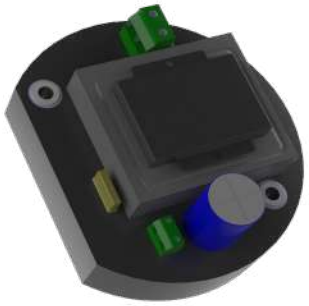
Sensors
Sensors are available in 316 Stainless Steel and Hastelloy® C-276 with measurements in psig, psia, and psiv.

Kalrez Seals
The optional 'KZ' Kalrez seals provide added process media compatibility in certain applications.

Temperature Indicator
The optional 'TI' provides a temperature output reading output available through device menus or through a HART interface.

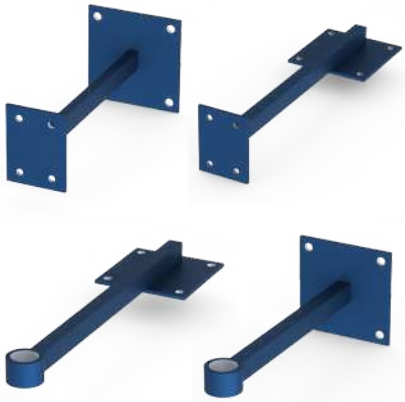
Alarm Relay
The optional '341' alarm module provides a single 5A SPDT relay that is mounted in the transmitter enclosure.

Options



Power Supply
The optional 'PS1' power supply module offers 120 VAC to 24 VDC power mounted in the transmitter enclosure.

Mounting Bracket
Available on certain models, the optional 'PSM' option offers a mounting bracket for 2 inch pipe stand mounting.



Cable Clamp Support Arms
The optional 'VBKT', 'HBKT', 'VBKTP', and 'HBKTP' carbon steel support arms offer cable or pipe clamp support for vertical and horizontal applications.

Internal Vent Tube
The optional 'SCI' internal vent tube isolation bladder is a permanent non-refillable bladder that can be included in the transmitter enclosure.

External Vent Tube
The optional 'SCJ' external vent tube isolation bladder is tubular type bladder that is mounted in a factory provided poly-carbonate enclosure.

Model 551 • Pressure Transmitter, Compact Size

Features

- Compact size for tight places
- 4-20 mA 2-wire loop powered
- HART® protocol compliant
- Integral Electronics/Sensor Module
- Potted for corrosive locations
- Used for pressure or level measurement
- NPT, ANSI, DIN, or JIS process connection
- Ranges from 12 inches of water to 1000 psi (+0.3 bar to +70 bar)
- Maintenance free operation

Model 551

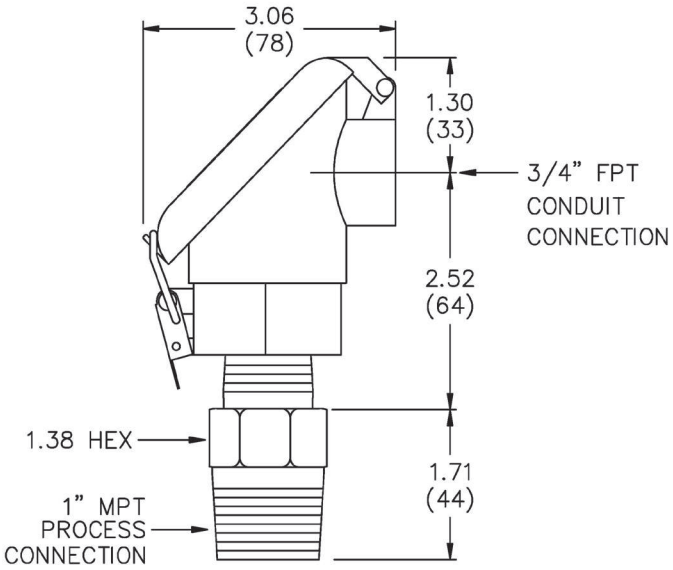
Description

The Delta Controls **Model 551** Pressure Transmitter Sensor includes an oil-filled 316-L Stainless Steel or Hastelloy® C-276 diaphragm that isolates the strain gauge bridge from the process liquid or gas. The back of the sensor is usually **vented** to atmosphere to compensate for barometric pressure changes.

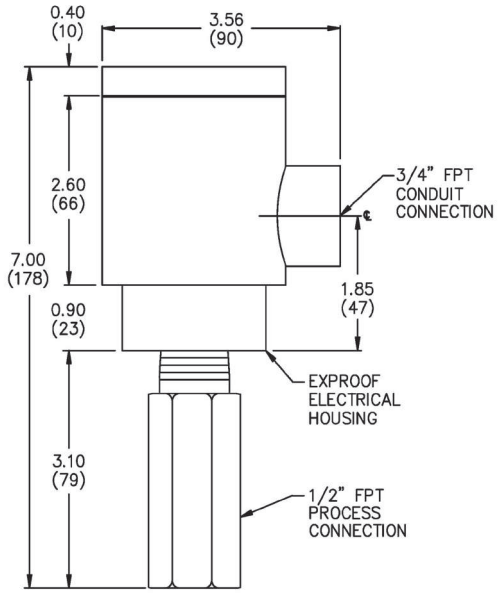
The 551 has the entire electronics assembly epoxy sealed into the body. The advantage is the **smaller size**.

Specifications

Technology:	Silicon strain gauge
Supply Power:	13 DCV to 35 DCV, 2-wire loop powered
Output:	4-20 mA isolated
Maximum Loop Impedance:	550 Ω at 24 DCV, 1100 Ω at 35 DCV
Over Pressure Range:	2X range or 35 psi min (+2.5 bar) 3X range or 1000 psi min (+70 bar)
Process Temperature:	-20 °F to +220 °F (-29 °C to +104 °C)
Electronics Temperature:	-20 °F to +185 °F (-29 °C to +85 °C)
Compensated Temperature:	+30 °F to +180 °F (-1 °C to +82 °C) (other available)
Accuracy:	≥ ±0.25% FS
Thermal Error:	± 0.02% FS/°F max
Barometric Effect:	None
Communication:	HART COMMUNICATION PROTOCOL
Certifications:	
Stainless Steel Housing Option	Third Party Listed by CSA NRTL/C (USA and Canada)



Model 551 with 4X
Flip-Top Housing



Model 551 With S.S.
Exproof Housing

Model 551 • Pressure Transmitter, Compact Size

Model Numbering System

MODEL EXAMPLE	MODEL	-	SENSOR	-	HOUSING RATING	-	PROCESS CONNECTION	-	OPTIONS[1]
	551Y	-	G4Y	-	7WF	-	2"150RS	-	AA

MODEL	DESCRIPTION
551Y	Pressure Transmitter, Compact Size, 316 Stainless Steel
551G	Pressure Transmitter, Compact Size, Hastelloy® C-276

SENSOR	RATING	MATERIAL	WATER RANGE
G1Y	1.5 psig	316 Stainless Steel	3.5 ft
G2Y	3.0 psig	316 Stainless Steel	7.0 ft
G3Y	7.5 psig	316 Stainless Steel	17.5 ft
G4Y	15.0 psig	316 Stainless Steel	35 ft
G5Y	30.0 psig	316 Stainless Steel	70 ft
G6Y	60.0 psig	316 Stainless Steel	125 ft
G7Y	120.0 psig	316 Stainless Steel	250 ft
G8Y	250.0 psig	316 Stainless Steel	500 ft
G9Y	500.0 psig	316 Stainless Steel	1250 ft
G10Y	1000 psig	316 Stainless Steel	2500 ft
A4Y	15 psia	316 Stainless Steel	
A5Y	30 psia	316 Stainless Steel	
A6Y	60 psia	316 Stainless Steel	
A7Y	120 psia	316 Stainless Steel	
V8Y	30 psia	316 Stainless Steel	
V9Y	30 psia	316 Stainless Steel	
V10Y	45 psia	316 Stainless Steel	
V11Y	75 psia	316 Stainless Steel	
V12Y	135 psia	316 Stainless Steel	
G1G	1.5 psig	Hastelloy C-276	3.5 ft
G2G	3.0 psig	Hastelloy C-276	7.0 ft
G3G	7.5 psig	Hastelloy C-276	17.5 ft
G4G	15.0 psig	Hastelloy C-276	35 ft
G5G	30.0 psig	Hastelloy C-276	70 ft
G6G	60.0 psig	Hastelloy C-276	125 ft
G7G	120.0 psig	Hastelloy C-276	250 ft
G8G	250.0 psig	Hastelloy C-276	500 ft
G9G	500.0 psig	Hastelloy C-276	1250 ft

HOUSING RATING	RATING	MATERIAL	CLASS/DIVISION	ELECTRICAL
AA	None			
4XF	Environment-proof, 4X	PVC		Flying leads
7WF	Explosion-proof, 7X	Aluminum	Classes 1 & 2, Divisions 1 & 2, Groups ABCD, EFG	Flying leads
7TF	Explosion-proof, 7X	300 Stainless Steel	Classes 1 & 2, Divisions 1 & 2, Groups ABCD, EFG	Flying leads
4XT	Environment-proof, 4X	PVC		Terminal block
7WT	Explosion-proof, 7X	Aluminum	Classes 1 & 2, Divisions 1 & 2, Groups ABCD, EFG	Terminal block
7TT	Explosion-proof, 7X	300 Stainless Steel	Classes 1 & 2, Divisions 1 & 2, Groups ABCD, EFG	Terminal block

MODEL EXAMPLE	MODEL	-	SENSOR	-	HOUSING RATING	-	PROCESS CONNECTION	-	OPTIONS[1]
	551Y	-	G4Y	-	7WF	-	2"150RS	-	AA

PROCESS CONNECTION	DESCRIPTION
½"FPTY	0.5 in FPT, 316 Stainless Steel
1"MPTY	1.0 in MPT, 316 Stainless Steel
½"FPTG	0.5 in FPT, Hastelloy C-276
1"MPTG	1.0 in MPT, Hastelloy C-276
1"150RY	1.0 in Class 150 raised face flange, 316 Stainless Steel
1"300RY	1.0 in Class 300 raised face flange, 316 Stainless Steel
2"150RY	2.0 in Class 150 raised face flange, 316 Stainless Steel
2"150RS	2.0 in Class 150 raised face flange, Carbon steel
2"300RS	2.0 in Class 300 raised face flange, Carbon steel
2"600RS	2.0 in Class 600 raised face flange, Carbon steel

OPTIONS[1]	DESCRIPTION
AA	None
KZ	Kalrez seals
TI	Temperature Indicator

Notes:

[1] A hyphen will separate multiple options selected
- 551G available only in 0.5 in FPTG and 1 in MPTG process connections
- 551Y not available with 0.5 in FPTG and 1 in MPTG process connections

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Factory calibration: custom range or full-scale
- Documentation & testing packages (if required, refer to Additional Resources)

Model 552 • Pressure Transmitter, Modular Electronics

Features

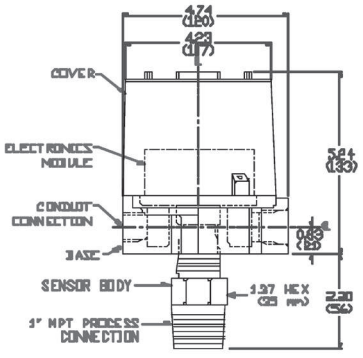
- General purpose pressure/level service
- 4-20 mA 2-wire loop powered
- Heavy-duty, rugged body
- Measures liquid level in pressurized tanks
- Ranges from 12 inches of water to 1000 psi (+0.3 bar to +70 bar)
- Surge protection
- Optional integral power supply module
- Maintenance free operation
- HART® protocol compliant, optional

Model 552

Description

The Delta Controls **Model 552** Pressure Transmitter Sensor includes an oil-filled 316-L Stainless Steel or Hastelloy® C-276 diaphragm to **isolate** the strain gauge bridge from the process liquid or gas. Model 552 can be **field calibrated**.

Model 552 features a robust potted electronics module. To compensate for barometric pressure changes, the back of the sensor is **vented** to atmosphere.



Specifications

Technology:	Silicon strain gauge
Supply Power:	13 DCV to 35 DCV 2-wire loop powered
Output:	4-20 mA isolated
Maximum Loop Impedance:	550 Ω at 24 VDC 1100 Ω at 35 DCV
Over Pressure:	2X range or 35 psi min (+2.5 bar) 3X range or 1000 psi min (+70 bar)
Process Temperature:	-20 °F to +220 °F (-29 °C to +104 °C)
Electronics Temperature:	-20 °F to +185 °F (-29 °C to +85 °C)
Compensated Temperature:	+30 °F to +130 °F (-1 °C to +54 °C) (higher available)
Accuracy:	≥ ± 0.25% FS
Thermal Error:	± 0.02% FS/ °F max
Barometric Effect:	None
Communication:	Device menus, HART COMMUNICATION PROTOCOL
Certifications:	
Explosion-proof Housing	Third Party Listed by CSA NRTL/C (USA and Canada) Class I, Groups B, C and D; Class II, Groups E, F and G; Class III; Encl 4X:

Model Numbering System

MODEL EXAMPLE	MODEL	-	SENSOR	-	HOUSING RATING	-	PROCESS CONNECTION	-	OPTIONS [3-5]
	552Y	-	G4Y	-	7WI		1"MPTY		AA

MODEL [1-2]	DESCRIPTION
552Y	Pressure Transmitter, Modular Electronics, 316 Stainless Steel [1]
552G	Pressure Transmitter, Modular Electronics, Hastelloy® C-276 [2]

SENSOR	RATING	MATERIAL	RANGE (H2O)
G1Y	1.5 psig	316 Stainless Steel	3.5 ft
G2Y	3.0 psig	316 Stainless Steel	7.0 ft
G3Y	7.5 psig	316 Stainless Steel	17.5 ft
G4Y	15.0 psig	316 Stainless Steel	35 ft
G5Y	30.0 psig	316 Stainless Steel	70 ft
G6Y	60.0 psig	316 Stainless Steel	125 ft
G7Y	120.0 psig	316 Stainless Steel	250 ft
G8Y	250.0 psig	316 Stainless Steel	500 ft
G9Y	500.0 psig	316 Stainless Steel	1250 ft
G10Y	1000.0 psig	316 Stainless Steel	2500 ft
A4Y	15 psia	316 Stainless Steel	
A5Y	30 psia	316 Stainless Steel	
A6Y	60 psia	316 Stainless Steel	
A7Y	120 psia	316 Stainless Steel	
V8Y	30 psia	316 Stainless Steel	
V9Y	30 psia	316 Stainless Steel	
V10Y	45 psia	316 Stainless Steel	
V11Y	75 psia	316 Stainless Steel	
V12Y	135 psia	316 Stainless Steel	
G1G	1.5 psig	Hastelloy® C-276	3.5 ft
G2G	3.0 psig	Hastelloy® C-276	7.0 ft
G3G	7.5 psig	Hastelloy® C-276	17.5 ft
G4G	15.0 psig	Hastelloy® C-276	35 ft
G5G	30.0 psig	Hastelloy® C-276	70 ft
G6G	60.0 psig	Hastelloy® C-276	125 ft
G7G	120.0 psig	Hastelloy® C-276	250 ft
G8G	250.0 psig	Hastelloy® C-276	500 ft
G9G	500.0 psig	Hastelloy® C-276	1250 ft

PROCESS CONNECTION	DESCRIPTION
½"FPTY	0.5 in FPT, 316 Stainless Steel
1"MPTY	1.0 in MPT, 316 Stainless Steel
1"MPTG	1.0 in MPT, Hastelloy® C-276
1"150RY	1.0 in Class 150 raised face flange, 316 Stainless Steel
1"300RY	1.0 in Class 300 raised face flange, 316 Stainless Steel
2"150RY	2.0 in Class 150 raised face flange, 316 Stainless Steel
3"150RY	3.0 in Class 150 raised face flange, 316 Stainless Steel
4"150RY	4.0 in Class 150 raised face flange, 316 Stainless Steel
2"150RS	2.0 in Class 150 raised face flange, Carbon steel
2"300RS	2.0 in Class 300 raised face flange, Carbon steel
2"600RS	2.0 in Class 600 raised face flange, Carbon steel
3"150RS	3.0 in Class 150 raised face flange, Carbon steel
4"150RS	4.0 in Class 150 raised face flange, Carbon steel

OPTIONS [3-5]	DESCRIPTION
AA	None
HRT	HART® communication protocol
PS1	Internal power supply, 120 ACV to 24 DCV
KZ	Kalrez seals
TI	Temperature Indicator [4]
DW	Display window [5]

HOUSING RATING	DESCRIPTION
AA	None
4XI	Environment-proof, 4X, PVC, Integral mount
7WI	Explosion-proof, 7X, Aluminum, Classes 1 & 2, Divisions 1 & 2, Groups BCD, EFG, Integral mount
7TT	Explosion-proof, 7X, 300 Stainless Steel, Classes 1 & 2, Divisions 1 & 2, Groups BCD, EFG, Terminal block

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Factory calibration: custom range or full-scale
- Documentation & testing packages (if required, refer to Additional Resources)

Notes:

[1] 551Y not available with 1 in MPTG process connections
[2] 552G available only with 1 in MPTG process connections
[3] A hyphen will separate multiple options selected
[4] TI only available with HRT option
[5] DW only available with 7W housing. Included standard on 4X housing

Model 562 • Pressure Transmitter, Cable Suspended, Pipe Supported

Features

- 4-20 mA 2-wire loop powered
- Suitable for difficult liquids and slurries
- NPT, ANSI, DIN, or JIS Process Connection
- Ranges from 12 inches of water to 15 psi (+1 bar to +70 bar)
- Surge protection
- Unaffected by process coating
- HART® protocol compliant, optional
- Maintenance free operation

Model 562

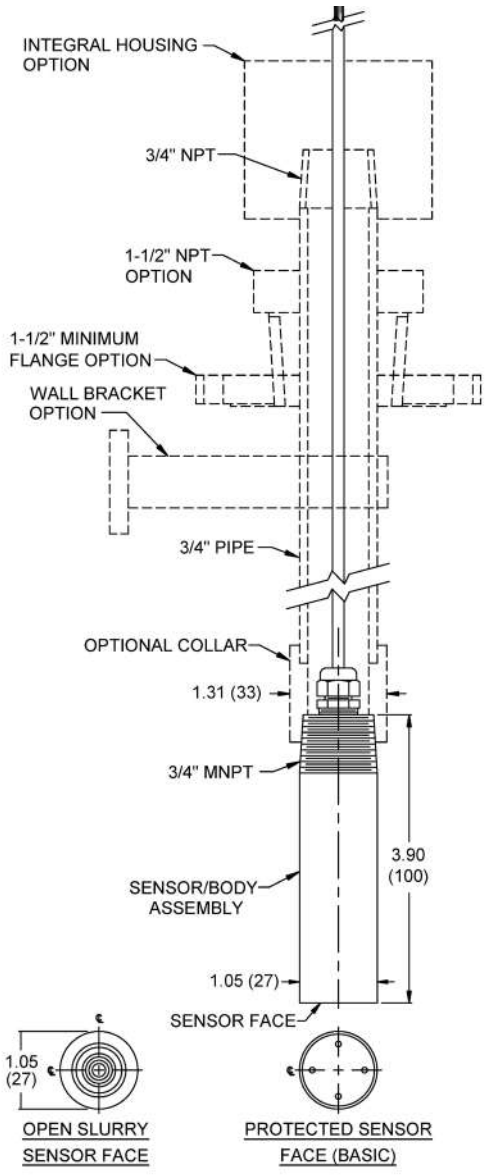
Description

The Delta Controls **Model 562** Pressure Transmitter consists of a potted electronic module and modular pressure sensor assembly packaged as an integral unit. This transmitter is useful for **pressure measurement** of pipelines handling liquids with entrained solids. It does not have recessed cavities and therefore will not collect particles or plug up. The sensor includes an oil-filled **316-L Stainless Steel** or platinum diaphragm which isolates the strain gauge bridge from the process liquid or gas. The back of the sensor is usually vented to atmosphere to compensate for barometric pressure changes. The **electronics module** is potted in a dual system of silicon rubber and epoxy to protect against moisture, corrosion, and vibration.

The 562 is commonly used as a liquid **level transmitter** in tanks. The pressure at the bottom of a vented tank containing a liquid is linearly proportional to the height and density of the liquid.

Specifications

Technology:	Silicon strain gauge
Supply Power:	13 DCV to 35 DCV 2-wire loop powered
Output:	4-20 mA isolated
Maximum Loop Impedance:	550 Ω at 24 DCV, 1100 Ω at 35 DCV
Over Pressure:	2X range or 35 psi min (+2.5 bar) 3X range or 1000 psi min (+70 bar)
Process Temperature:	-20 °F to +220 °F (-29 °C to +104 °C)
Electronics Temperature:	-20 °F to +180 °F (-29 °F to +82 °C)
Compensated Temperature:	+30 °F to +130 °F (-1 °C to +54 °C)
Accuracy:	≥ 0.25% FS
Thermal Error:	0.02% FS/°F max
Insertion Length (Flush with Mounting Connection):	3 in to 600 in (120 in or shorter increments)
Communication:	Device menus, HART COMMUNICATION PROTOCOL
Certifications:	
Explosion-proof Housing Option	Third Party Listed by CSA NRTL/C (USA and Canada) Class I, Groups B, C and D; Class II, Groups E, F and G; Class III; Encl 4X:


INTEGRAL HOUSING OPTION
3/4" NPT
1-1/2" NPT OPTION
1-1/2" MINIMUM FLANGE OPTION
WALL BRACKET OPTION
3/4" PIPE
OPTIONAL COLLAR
1.31 (33)
3/4" MNPT
3.90 (100)
SENSOR/BODY ASSEMBLY
1.05 (27)
SENSOR FACE
1.05 (27)
OPEN SLURRY SENSOR FACE
PROTECTED SENSOR FACE (BASIC)

Model 562 • Pressure Transmitter, Cable Suspended, Pipe Supported

Model Numbering System

MODEL EXAMPLE	MODEL	-	SENSOR	-	FACE GUARD	-	HOUSING RATING	-	CABLE LENGTH	-	PROCESS CONNECTION	-	OPTIONS [1-4]
	562Y	-	G4Y	-	P	-	7WI	-	30V	-	1.5"MPTS	-	AA

MODEL	DESCRIPTION
562Y	Pressure Transmitter, Cable Suspended, Pipe Supported, 316 Stainless Steel

SENSOR	RATING	MATERIAL	WATER RANGE
G1Y	1.5 psig	316 Stainless Steel	3.5 ft
G2Y	3.0 psig	316 Stainless Steel	7.0 ft
G3Y	7.5 psig	316 Stainless Steel	17.5 ft
G4Y	15.0 psig	316 Stainless Steel	35 ft

FACE GUARD	DESCRIPTION
P	Protected, for clean liquids
S	Open, for entrained solids

HOUSING RATING	DESCRIPTION
AA	None
4XI	Environment-proof, 4X, PVC, Integral mount
7WI	Explosion-proof, 7X, Aluminum, Classes 1 & 2, Divisions 1 & 2, Groups BCD, EFG, Integral mount
7TI	Explosion-proof, 7X, 300 Stainless Steel, Classes 1 & 2, Divisions 1 & 2, Groups BCD, EFG, Integral mount
4XR	Environment-proof, 4X, PVC, Remote mount
7WR	Explosion-proof, 7X, Aluminum, Classes 1 & 2, Divisions 1 & 2, Groups BCD, EFG, Remote mount
7TR	Explosion-proof, 7X, 300 Stainless Steel, Classes 1 & 2, Divisions 1 & 2, Groups BCD, EFG, Remote mount

CABLE LENGTH	DESCRIPTION
**V	** feet PVC outer jacketed cable
**R	** feet Tefzel™ outer jacketed cable

PROCESS CONNECTION	DESCRIPTION
AA	None
1.5"MPTS	1.5 in MPT, Carbon steel
1.5"150RS	1.5 in Class 150 raised face flange, Carbon steel
2"150RS	2 in Class 150 raised face flange, Carbon steel
3"150RS	3 in Class 150 raised face flange, Carbon steel
4"150RS	4 in Class 150 raised face flange, Carbon steel
1.5"MPTY	1.5 in MPT, 316 Stainless Steel
1.5"150RY	1.5 in Class 150 raised face flange, 316 Stainless Steel
2"150RY	2 in Class 150 raised face flange, 316 Stainless Steel
3"150RY	3 in Class 150 raised face flange, 316 Stainless Steel
4"150RY	4 in Class 150 raised face flange, 316 Stainless Steel

MODEL EXAMPLE	MODEL	-	SENSOR	-	FACE GUARD	-	HOUSING RATING	-	CABLE LENGTH	-	PROCESS CONNECTION	-	OPTIONS [1-4]
	562Y	-	G4Y	-	P	-	7WI	-	30V	-	1.5"MPTS	-	AA

OPTIONS[1-4]	DESCRIPTION
AA	None
CTV	Stem to cable seal for use with remoted housing, Nylon
DW	Display window [2]
HRT	HART® communication protocol
HBKT	Cable clamp support arm for horizontal mounting, Carbon steel [3]
HBKTP	Pipe clamp support arm for horizontal mounting, Carbon steel [3]
VBKT	Cable clamp support arm for vertical mounting, Carbon steel [3]
VBKTP	Pipe clamp support arm for vertical mounting, Carbon steel [3]
KZ	Kalrez seals
PS1	Internal power supply, 120 ACV to 24 DCV
PSM	2 in pipe stand housing mounting bracket
SCI	Internal vent tube isolation bladder, Permanent, Non-refillable
TI	Temperature indicator [4]

Notes:

[1] A hyphen will separate multiple options selected
[2] DW only available with 7W housing. Included standard on 4X housing.
[3] Only one option can be selected of VBKTP, HBKTP, VBKT, HBKT
[4] TI only available with HRT option

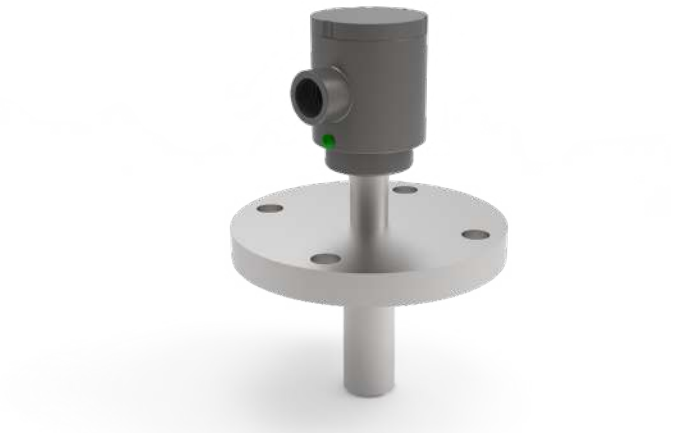
REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Factory calibration: custom range or full-scale
- Documentation & testing packages (if required, refer to Additional Resources)

Model 563 • Pressure Transmitter, Modular Electronics, Extended Face

Features

- 4-20 mA 2-wire loop powered
- Suitable for difficult liquids and slurries
- NPT, ANSI, DIN, or JIS Process Connection
- 12 inches of water to 500 psig (+1 bar to +34.5 bar)
- Surge protection
- Unaffected by process coating
- HART® protocol compliant, optional
- Maintenance free operation



Model 563

Description

The Delta Controls **Model 563** Pressure Transmitter consists of a potted electronic module and a flush diaphragm pressure sensor packaged in a one piece unit. The sensor is equipped with an oil-filled **316 Stainless Steel** or **Hastelloy® C-276 diaphragm** that isolates the strain gauge bridge from the process liquid or gas. The back of the diaphragm is vented to atmosphere to compensate for barometric pressure changes. A **desiccant filter** or **isolation bladder** prevents moisture accumulation in the vent tube.

The 563 is side or bottom mounted on a vessel and measures the pressure exerted on the sensor face by the liquid head. The pressure at the bottom of a vented tank containing fluid is linearly proportional to the height and density of the fluid.

The **flush diaphragm** is intended for measurement of dirty or high solids content products that might easily plug the small openings and tubing connections of typical transmitters. The **extended diaphragm** is used to gain access to the inside of a tank to avoid being plugged by deposits and sediment. The **extended face** allows the sensor to be located inside the vessel to insure that solids do not cause measurement errors. Model 563 is useful for pressure measurement of pipelines handling liquids with entrained solids. The sensor has **no recessed cavities** that would collect particles or become plugged.

Specifications

Technology:	Silicon strain gauge
Supply Power:	13 DCV to 35 DCV 2-wire loop powered
Output:	4-20 mA isolated
Maximum Loop Impedance:	550 Ω at 24 DCV, 1100 Ωat 35 DCV
Over Pressure:	2X range or 35 psi min (+2.5 bar) 3X range or 1000 psi min (+70 bar)
Process Temperature:	-20 °F to +220 °F (-29 °C to 104 °C)
Electronics Temperature:	-20 °F to +180 °F (-29 °F to +82 °C)
Compensated Temperature:	+30 °F to +130 °F (-1 °C to +54 °C)
Accuracy:	≥ 0.25% FS
Thermal Error:	0.02% FS/°F max
Communication:	Device menus, HART COMMUNICATION PROTOCOL
Certifications:	
Explosion-proof Housing Option	Third Party Listed by CSA NRTL/C (USA and Canada) Class I, Groups B, C and D; Class II, Groups E, F and G; Class III; Encl 4X:

Model Numbering System

MODEL EXAMPLE	MODEL	-	SENSOR	-	HOUSING RATING	-	INSERTION	-	PROCESS CONNECTION	-	OPTIONS [1-3]
	563Y	-	G4Y	-	7WI	-	6	-	3"MPTS	-	AA

MODEL	DESCRIPTION
563Y	Pressure Transmitter, Modular Electronics, Extended Face, 316 Stainless Steel
563G	Pressure Transmitter, Modular Electronics, Extended Face, Hastelloy® C-276

SENSOR	RATING	MATERIAL	WATER RANGE
G1Y	1.5 psig	316 Stainless Steel	3.5 ft
G2Y	3.0 psig	316 Stainless Steel	7.0 ft
G3Y	7.5 psig	316 Stainless Steel	17.5 ft
G4Y	15.0 psig	316 Stainless Steel	35 ft
G5Y	30.0 psig	316 Stainless Steel	70 ft
G6Y	60.0 psig	316 Stainless Steel	125 ft
G7Y	120.0 psig	316 Stainless Steel	250 ft
G8Y	250.0 psig	316 Stainless Steel	500 ft
G9Y	500.0 psig	316 Stainless Steel	1250 ft

HOUSING RATING	DESCRIPTION
AA	None
4XI	Environment-proof, 4X, PVC, Integral mount
7WI	Explosion-proof, 7X, Aluminum, Classes 1 & 2, Divisions 1 & 2, Groups BCD, EFG, Integral mount
7TI	Explosion-proof, 7X, 300 Stainless Steel, Classes 1 & 2, Divisions 1 & 2, Groups BCD, EFG, Integral mount

INSERTION	DESCRIPTION
F	Flush sensor face
2	2 in sensor face extension
4	4 in sensor face extension
6	6 in sensor face extension
8	8 in sensor face extension

PROCESS CONNECTION	DESCRIPTION
1.5”MPTS	1.5 in MPT, Carbon steel
3"MPTS	3.0 in MPT, Carbon steel
1.5"150RS	1.5 in Class 150 raised face flange, Carbon steel
2”150RS	2 in Class 150 raised face flange, Carbon steel
3”150RS	3 in Class 150 raised face flange, Carbon steel
4”150RS	4 in Class 150 raised face flange, Carbon steel
6”150RS	6 in Class 150 raised face flange, Carbon steel
1.5”MPTY	1.5 in MPT, 316 Stainless Steel
3”MPTY	3.0 in MPT, 316 Stainless Steel
1.5”150RY	1.5 in Class 150 raised face flange, 316 Stainless Steel
2”150RY	2 in Class 150 raised face flange, 316 Stainless Steel
3”150RY	3 in Class 150 raised face flange, 316 Stainless Steel
4”150RY	4 in Class 150 raised face flange, 316 Stainless Steel
6”150RY	6 in Class 150 raised face flange, 316 Stainless Steel

OPTIONS[1-3]	DESCRIPTION
AA	None
DW	Display window [2]
HRT	HART® communication protocol [3]
KZ	Kalrez seals
PS1	Internal power supply, 120 ACV to 24 DCV
TI	Temperature Indicator

Notes:

[1] A hyphen will separate multiple options selected

[2] DW only available with 7W housing. Included standard on 4X housing.

[3] TI only available with HRT option

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Factory calibration: custom range or full-scale
- Documentation & testing packages (if required, refer to Additional Resources)

Model 565 • Pressure Transmitter, Large Diaphragm, Integral Electronics

Features

- Flexible isolator for wastewater and slurries
- Large, rugged EPDM diaphragm
- Supported by rigid pipe or flexible cable
- 4-20 mA, 2-wire loop powered
- 316 Stainless Steel body
- PVC or TEF cable jacket
- Surge protection
- Optional cable junction box with isolation bladder
- Reliable, no maintenance
- HART® protocol compliant

Model 565

Description

The Delta Controls **Model 565** Pressure Transmitter is a completely **self-contained** head pressure type level transmitter. When installed in a lift station, sump, basin, or other containment, the strain gauge sensor **detects the liquid level** as a function of the height and density of the liquid above it. The electronics and calibration adjustments are contained inside the body with the strain gauge sensor, and the cable is sealed to the transmitter body. It is of **modular construction**.

The open diaphragm cannot become plugged or rendered inoperable by liquids with high solids content such as sewage, wastewater, and slurries. The diaphragm is fabricated from **tough EPDM** rubber, and is coupled to the strain gauge through a nontoxic fill. The face has **superior resistance** to damage from gravel, and other moving solids. Its large three inch active face size, and its smooth outer surface makes it **extremely durable** and **reliable** in harsh services. A vent tube connected directly to the sensor compensates for atmospheric pressure changes. The optional **desiccant filter**, or isolation bladder, prevents condensation in the vent tube. No refilling or maintenance is required for the bladder.

Specifications

Technology:	Silicon strain gauge
Supply Power:	13 DCV to 35 DCV, 2-wire loop powered
Output Signal:	4-20 mA isolated
Maximum Loop Impedance:	550 Ω at 24 DCV, 1100 Ω at 35 DCV
Protective Devices:	Transient suppressors and lightning arrestors
Liquid Temperature:	-20 °F to +220 °F (-29 °C to +104 °C)
Electronics Temperature:	-20 °F to +180 °F (-29 °C to +82 °C)
Compensated Temperature:	+30 °F to +130 °F (-1 °C to +54 °C)
Accuracy:	≥ +0.25% FS
Thermal Error:	+0.015% FS/ ºF max
Barometric Effects:	None
Over Pressure:	2X range or 35 psi min (+2.5 bar)
Communication:	HART COMMUNICATION PROTOCOL

Model Numbering System

MODEL EXAMPLE	MODEL	-	MOUNTING CONNECTION	-	SENSOR	-	CABLE LENGTH	-	OPTIONS [1]
	565Y	-	10C	-	G4Y	-	30V	-	VBKTP

MODEL	DESCRIPTION
565Y	Pressure Transmitter, Large Diaphragm, Integral Electronics, 316 Stainless Steel

MOUNTING CONNECTION	DESCRIPTION
AA	None
**C	** feet cable with bail hanger
**P	** feet 1.0 in stainless steel pipe

SENSOR [4]	RATING	MATERIAL	WATER RANGE
G1Y	1.5 psig	316 Stainless Steel	3.5 ft
G2Y	3.0 psig	316 Stainless Steel	7.0 ft
G3Y	7.5 psig	316 Stainless Steel	17.5 ft
G4Y	15.0 psig	316 Stainless Steel	35 ft
G5Y	30.0 psig	316 Stainless Steel	70 ft
G6Y	60.0 psig	316 Stainless Steel	125 ft
G7Y	120.0 psig	316 Stainless Steel	250 ft
G8Y	250.0 psig	316 Stainless Steel	500 ft
G9Y	500.0 psig	316 Stainless Steel	1250 ft
G10Y	1000 psig	316 Stainless Steel	2500 ft
A4Y	15 psia	316 Stainless Steel	
A5Y	30 psia	316 Stainless Steel	
A6Y	60 psia	316 Stainless Steel	
A7Y	120 psia	316 Stainless Steel	
V8Y	30 psia	316 Stainless Steel	
V9Y	30 psia	316 Stainless Steel	
V10Y	45 psia	316 Stainless Steel	
V11Y	75 psia	316 Stainless Steel	
V12Y	135 psia	316 Stainless Steel	

CABLE LENGTH	DESCRIPTION
**V	** feet PVC outer jacketed cable
**R	** feet Tefzel® outer jacketed cable

OPTIONS [1-4]	DESCRIPTION
AA	None
VBKT	Cable clamp support arm for vertical mounting, Carbon steel [3]
TI	Temperature Indicator
HBKT	Cable clamp support arm for horizontal mounting, Carbon steel [3]
VBKTP	Pipe clamp support arm for vertical mounting, Carbon steel [3]
HBKTP	Pipe clamp support arm for horizontal mounting, Carbon steel [3]
SCT	Isolation bladder only, tube type for mounting in enclosures by others [2,4]
SCJ	Vent tube isolation bladder, Tubular type in polycarbonate housing [2,4]
DDI	Conventional refillable desiccant dryer for vent tube, For mounting in enclosure by others [2,4]
FLA	Flanged process connection adapter for user's 1 in support pipe

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Factory calibration: custom range or full-scale
- Documentation & testing packages (if required, refer to Additional Resources)

Notes:

1. A hyphen will separate multiple options selected
2. Only one option can be selected of SCT, SCJ, DDI
3. Only one option can be selected of VBKTP, HBKTP, VBKT, HBKT
4. SCT, SCJ, DDI not available with G9, G10, V9, V10, V11, V12 sensors

Model 566 • Pressure Transmitter, Large Diaphragm, Remote Electronics

Features

- Large, rugged EPDM rubber diaphragm isolator for wastewater and slurries
- Supported by rigid pipe or cable
- 4-20 mA 2-wire looped powered
- 316 Stainless Steel or Hastelloy® C-276 body
- PVC or TEF cable jacket
- Calibrate, test from electronic module or HART®
- Top side housing holds electronics
- Field repairable, modular design
- HART® protocol compliant, optional

Model 566

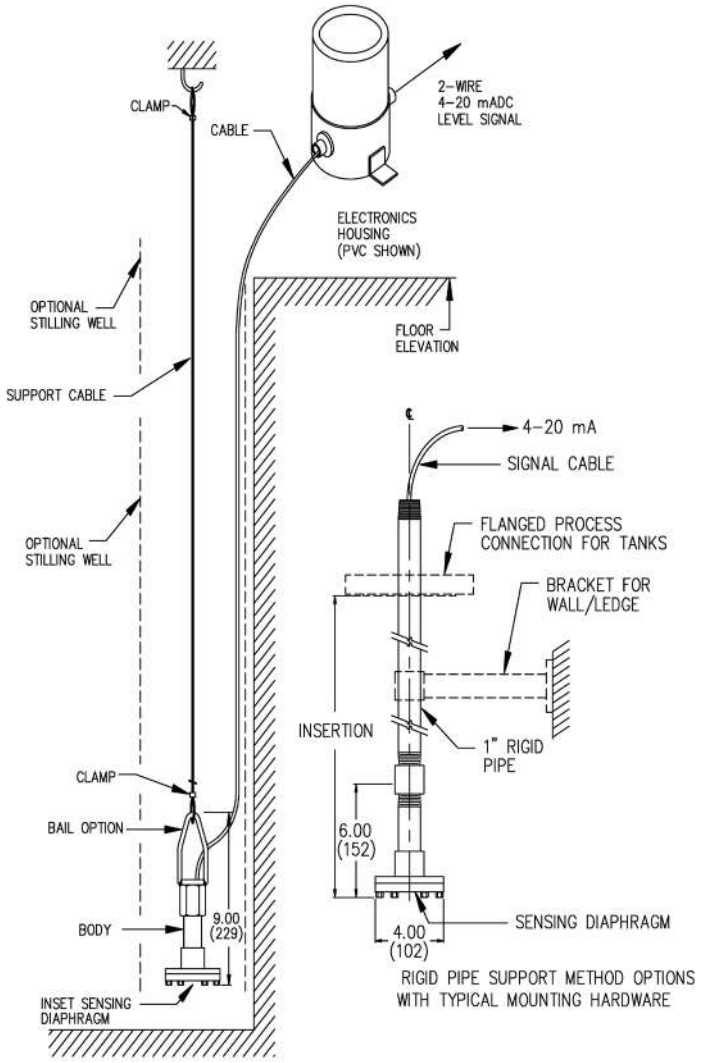
Description

The large diaphragm Delta Controls **Model 566** Pressure Transmitter features an electronics housing mounted above ground for easy testing, recalibration, and inspection. When installed in a lift station, sump, basin, or other containment, the strain gauge sensor **detects the liquid level** as a function of the height and density of the liquid above it. 566's electronics and calibration adjustments are contained inside the remote enclosure the with strain gauge sensor separate in the sensor body. It is of **remote construction** and is **field repairable**.

The open diaphragm cannot become plugged or rendered inoperable by liquids with high solids content such as sewage, wastewater, and slurries. The diaphragm is fabricated from **tough EPDM** rubber, and is coupled to the strain gauge through a nontoxic fill. The face has **superior resistance** to damage from gravel, and other moving solids. 566's large three inch active face size, and its smooth outer surface makes it **extremely durable** and **reliable** in harsh services. A vent tube connected directly to the sensor compensates for atmospheric pressure changes. The optional **desiccant filter**, or isolation bladder, prevents condensation in the vent tube. No refilling or maintenance is required for the bladder.

Specifications

Technology:	Silicon strain gauge
Supply Power:	13 DCV to 35 DCV, 2-wire loop powered
Output Signal:	4-20 mA isolated
Maximum Loop Impedance:	550 Ω at 24 DCV, 1100 Ω at 35 DCV
Protective Devices:	Transient suppressors and lightning arrestors
Liquid Temperature:	-20 °F to +220 °F (-29 °C to +104 °C)
Electronics Temperature:	-20 °F to +180 °F (-29 °C to +82 °C)
Compensated Temperature:	+30 °F to +130 °F (-1 °C to +54 °C)
Accuracy:	≥ +0.25% FS
Thermal Error:	+0.015% FS / °F max
Barometric Effects:	None
Over Pressure:	2X range or 35 psi min (+2.5 bar)
Communication:	Device menus, HART COMMUNICATION PROTOCOL
Certifications:	
Explosion-proof Housing Option	Third Party Listed by CSA NRTL/C (USA and Canada) Class I, Groups B, C and D; Class II, Groups E, F and G; Class III; Encl 4X:



TYPICAL SUMP
INSTALLATION

Model 566 • Pressure Transmitter, Large Diaphragm, Remote Electronics

Model Numbering System

MODEL EXAMPLE	MODEL	-	MOUNTING CONNECTION	-	SENSOR	-	HOUSING RATING	-	CABLE LENGTH	-	OPTIONS [1-5]
	566Y	-	AA	-	G4Y	-	7WR	-	30V	-	PSM

MODEL	DESCRIPTION
566Y	Pressure Transmitter, Large Diaphragm, Remote Electronics, 316 Stainless Steel
566V	Pressure Transmitter, Large Diaphragm, Remote Electronics, PVC

MOUNTING CONNECTION	DESCRIPTION
AA	None
**C	** feet cable
**P	** feet 1.0 in stainless steel pipe

SENSOR	RATING	MATERIAL	RANGE (H2O)
G1Y	1.5 psig	316 Stainless Steel	3.5 ft
G2Y	3.0 psig	316 Stainless Steel	7.0 ft
G3Y	7.5 psig	316 Stainless Steel	17.5 ft
G4Y	15.0 psig	316 Stainless Steel	35 ft
G5Y	30.0 psig	316 Stainless Steel	70 ft
G6Y	60.0 psig	316 Stainless Steel	125 ft
G7Y	120.0 psig	316 Stainless Steel	250 ft
G8Y	250.0 psig	316 Stainless Steel	500 ft
G9Y	500.0 psig	316 Stainless Steel	1250 ft
G10Y	1000 psig	316 Stainless Steel	2500 ft
A4Y	15 psia	316 Stainless Steel	
A5Y	30 psia	316 Stainless Steel	
A6Y	60 psia	316 Stainless Steel	
A7Y	120 psia	316 Stainless Steel	
V8Y	30 psia	316 Stainless Steel	
V9Y	30 psia	316 Stainless Steel	
V10Y	45 psia	316 Stainless Steel	
V11Y	75 psia	316 Stainless Steel	
V12Y	135 psia	316 Stainless Steel	

HOUSING RATING	DESCRIPTION
AA	None
4XI	Environment-proof, 4X, PVC, Integral Mount
7WI	Explosion-proof, 7X, Aluminum, Classes 1 & 2, Divisions 1 & 2, Groups BCD, EFG, Integral Mount
7TI	Explosion-proof, 7X, 300 Stainless Steel, Classes 1 & 2, Divisions 1 & 2, Groups BCD, EFG, Integral Mount
4XR	Environment-proof, 4X, PVC, Remote Mount
7WR	Explosion-proof, 7X, Aluminum, Classes 1 & 2, Divisions 1 & 2, Groups BCD, EFG, Remote Mount
7TR	Explosion-proof, 7X, 300 Stainless Steel, Classes 1 & 2, Divisions 1 & 2, Groups BCD, EFG, Remote Mount

CABLE LENGTH	DESCRIPTION
**V	** feet PVC outer jacketed cable
**R	** feet Tefzel™ outer jacketed cable

MODEL EXAMPLE	MODEL	-	MOUNTING CONNECTION	-	SENSOR	-	HOUSING RATING	-	CABLE LENGTH	-	OPTIONS [1-5]
	566Y	-	AA	-	G4Y	-	7WR	-	30V	-	PSM

OPTIONS[1-5]	DESCRIPTION
AA	None
DW	Display window [2]
FLA	Flanged process connection adapter for user's 1.0 in support pipe
HRT	HART® communication protocol
HBKT	Pipe clamp support arm for horizontal mounting, Carbon steel [3]
HBKTP	Cable clamp support arm for horizontal mounting, Carbon steel [3]
VBKT	Pipe clamp support arm for vertical mounting, Carbon steel [3]
VBKTP	Cable clamp support arm for vertical mounting, Carbon steel [3]
PS1	Internal power supply; 120 ACV to 24 DCV
PSM	2 in pipe stand housing mounting bracket
SCI	Internal vent tube isolation bladder, Permanent, Non-refillable [4]
TI	Temperature Indicator [5]
341A	Alarm module, One relay, 4-20 mA, 5 A at 240 ACV or 30 DCV

Notes:

[1] A hyphen will separate multiple options selected
[2] DW only available with 7W housing. Included standard on 4X housing.
[3] Only one option can be selected of VBKTP, HBKTP, VBKT, HBKT
[4] SCI not available with G9, G10, V9, V10, V11, V12 sensors
[5] TI only available with HRT option

Required Ordering Information:

- Detailed model number
- Tag or nameplate detail (if required)
- Factory calibration: custom range or full-scale
- Documentation & testing packages (if required, refer to Additional Resources)

Model 571 • Pressure Transmitter, Compact Size, Sanitary Service

Features

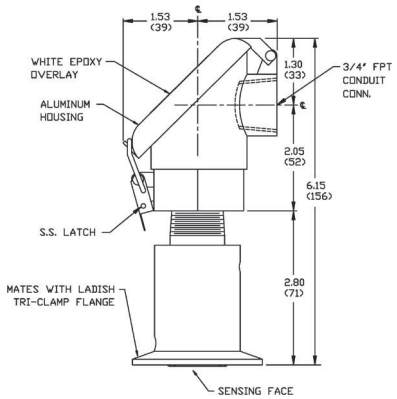
- 2-wire loop powered 4-20 mA transmitter
- Tri-clamp, APC, and other sanitary connection styles available
- Ultraclean and CIP service applications
- Standard polished body
- One piece electronics/sensor module
- Suitable for tank level measurements
- Surge protection
- Maintenance free operation
- HART® protocol compliant

Description

The Delta Controls **Model 571** Pressure Transmitter is designed for food, pharmaceutical, and ultraclean applications. The sensor is constructed entirely of **316 Stainless Steel**. It is completely free from process wetted crevices, cracks, and voids that may harbor contaminants. The back of the sensor assembly is usually **vented to atmosphere** to compensate for barometric pressure changes.

The electronics and sensor are sealed and potted as an inner module which is located in the transmitter's stem. Model 571's **compact size** is ideal in **confined spaces** that do not accommodate standard transmitters.

571 is commonly used as a liquid **level transmitter** in vented tanks. The pressure at the bottom of a **vented tank** containing fluid is linearly proportional to the height and density of the fluid above the sensor.



4X HOUSING

Model 571

Specifications

Technology:	Silicon strain gauge
Supply Power:	13 DCV to 35 DCV 2-wire loop powered
Output Signal:	4-20 mA isolated
Maximum Loop Impedance:	550 Ω at 24 DCV, 1100 Ω at 35 DCV
Over Pressure:	2X range or 35 psi min (+2.5 bar) 3X range or 1000 psi min (+70 bar)
Process Temperature:	-20 °F to +220 °F (-29 °C to +104 °C)
Electronics Temperature:	-20 °F to +185 °F (-29 °C to +85 °C)
Compensated Temperature:	+30 °F to +130 °F (-1 °C to +55 °C) (higher available)
Accuracy:	≥ ± 0.25% FS
Thermal Error:	± 0.02% FS/ °F max
Barometric Effect:	None
Communication:	HART COMMUNICATION PROTOCOL
Certifications:	
Stainless Steel Housing Options Only	Third Party Listed by CSA NRTL/C (USA and Canada)

Model Numbering System

MODEL EXAMPLE	MODEL	-	SENSOR	-	HOUSING RATING	-	PROCESS CONNECTION	-	OPTIONS[1]
	571Y	-	G4Y	-	7WT	-	1"TCY	-	AA

MODEL	DESCRIPTION
571Y	Pressure Transmitter, Compact Size, Sanitary Service, 316 Stainless Steel

SENSOR	RATING	MATERIAL	RANGE (H2O)
G4Y	15.0 psig	316 Stainless Steel	35 ft
G5Y	30.0 psig	316 Stainless Steel	70 ft
G6Y	60.0 psig	316 Stainless Steel	125 ft
G7Y	120.0 psig	316 Stainless Steel	250 ft
G8Y	250.0 psig	316 Stainless Steel	500 ft
G9Y	500.0 psig	316 Stainless Steel	1250 ft
G10Y	1000 psig	316 Stainless Steel	2500 ft
A4Y	15 psia	316 Stainless Steel	
A5Y	30 psia	316 Stainless Steel	
A6Y	60 psia	316 Stainless Steel	
A7Y	120 psia	316 Stainless Steel	
V8Y	30 psia	316 Stainless Steel	
V9Y	30 psia	316 Stainless Steel	
V10Y	45 psia	316 Stainless Steel	
V11Y	75 psia	316 Stainless Steel	
V12Y	135 psia	316 Stainless Steel	

PROCESS CONNECTION	DESCRIPTION
1"TCY	1.0 in Tri-clamp, 316 Stainless Steel
1.5"TCY	1.5 in Tri-clamp, 316 Stainless Steel
2"TCY	2.0 in Tri-clamp, 316 Stainless Steel

OPTIONS[1]	DESCRIPTION
AA	None
TI	Temperature Indicator

HOUSING RATING	RATING	MATERIAL	CLASS/DIVISION	ELECTRICAL
AA	None			
4XF	Environment-proof, 4X	PVC		Flying leads
7WF	Explosion-proof, 7X	Aluminum	Classes 1 & 2, Divisions 1 & 2, Groups ABCD, EFG	Flying leads
7TF	Explosion-proof, 7X	300 Stainless Steel	Classes 1 & 2, Divisions 1 & 2, Groups ABCD, EFG	Flying leads
4XT	Environment-proof, 4X	PVC		Terminal block
7WT	Explosion-proof, 7X	Aluminum	Classes 1 & 2, Divisions 1 & 2, Groups ABCD, EFG	Terminal block
7TT	Explosion-proof, 7X	300 Stainless Steel	Classes 1 & 2, Divisions 1 & 2, Groups ABCD, EFG	Terminal block

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Factory calibration: custom range or full-scale
- Documentation & testing packages (if required, refer to Additional Resources)

Notes:

[1] A hyphen will separate multiple options selected

Model 572 • Pressure Transmitter, Modular Electronics, Sanitary Service

Features

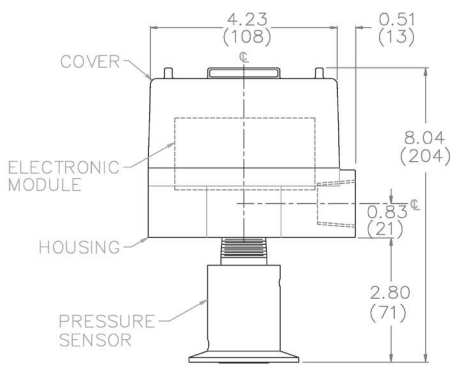
- Two-wire loop powered 4-20 mA signal
- Fits Tri-clamp, APC, and other sanitary connections
- Ultraclean water service applications
- CIP/SIP service applications
- Removable electronic module
- Polished body
- Surge protection
- Maintenance free operation
- HART® protocol compliant, optional

Model 572

Description

The Delta Controls **Model 572** Pressure Transmitter is designed specifically for food, pharmaceutical, and ultraclean applications. The 572 consists of a potted electronic module in a housing which is mounted with a modular pressure sensor as a packaged assembly. The wetted sensor is constructed of **316 Stainless Steel**. The body is polished and free from crevices, cracks, and voids that can harbor contaminants. The back of the sensor is usually **vented to atmosphere** to compensate for barometric pressure changes.

Easily clean Model 572 by disassembling and manually washing, or clean and sterilized in place. The 572 is used as a **liquid level transmitter** in vented tanks. The pressure at the bottom of a **vented tank** containing liquid is linearly proportional to the height and density of the liquid.



Specifications

Technology:	Silicon strain gauge
Supply Power:	13 DCV to 35 DCV 2-wire loop powered
Output Signal:	4-20 mA, isolated
Maximum Loop Impedance:	550 Ω at 24 DCV, 1100 Ω at 35 DCV
Over Pressure:	2X range or 35 psi min (+2.5 bar) 3X range or 1000 psi min (+70 bar)
Process Temperature:	-20 °F to +220 °F (-29 °C to +104 °C)
Electronics Temperature:	-20 °F to +185 °F (-29 °C to +85 °C)
Compensated Temperature:	+30 °F to +130 °F (-1 °C to +55 °C) (higher available)
Accuracy:	≥ ± 0.25% FS
Thermal Error:	± 0.02% FS/ °F max
Barometric Effect:	None
Communication:	Device menus, HART COMMUNICATION PROTOCOL
Certifications:	
Explosion-proof Housing Option	Third Party Listed by CSA NRTL/C (USA and Canada) Class I, Groups B, C and D; Class II, Groups E, F and G; Class III; Encl 4X:

Model Numbering System

MODEL EXAMPLE	MODEL	-	SENSOR	-	HOUSING RATING	-	PROCESS CONNECTION	-	OPTIONS [1-3]
	572Y	-	G4Y	-	7WI	-	1.5"TCY	-	AA

MODEL	DESCRIPTION
572Y	Pressure Transmitter, Modular Electronics, Sanitary Service, 316 Stainless Steel

SENSOR	RATING	MATERIAL	RANGE (H2O)
G4Y	15.0 psig	316 Stainless Steel	35 ft
G5Y	30.0 psig	316 Stainless Steel	70 ft
G6Y	60.0 psig	316 Stainless Steel	125 ft
G7Y	120.0 psig	316 Stainless Steel	250 ft
G8Y	250.0 psig	316 Stainless Steel	500 ft
G9Y	500.0 psig	316 Stainless Steel	1250 ft
G10Y	1000 psig	316 Stainless Steel	2500 ft
A4Y	15 psia	316 Stainless Steel	
A5Y	30 psia	316 Stainless Steel	
A6Y	60 psia	316 Stainless Steel	
A7Y	120 psia	316 Stainless Steel	
V8Y	30 psia	316 Stainless Steel	
V9Y	30 psia	316 Stainless Steel	
V10Y	45 psia	316 Stainless Steel	
V11Y	75 psia	316 Stainless Steel	
V12Y	135 psia	316 Stainless Steel	

OPTIONS[1-3]	DESCRIPTION
AA	None
DW	Display window [2]
HRT	HART® communication protocol [3]
PS1	Internal power supply, 120 ACV to 24 DCV
TI	Temperature Indicator

HOUSING RATING	DESCRIPTION
AA	None
4XI	Environment-proof, 4X, PVC, Integral mount
7WI	Explosion-proof, 7X, Aluminum, Classes 1 & 2, Divisions 1 & 2, Groups BCD, EFG, Integral mount
7TT	Explosion-proof, 7X, 300 Stainless Steel, Classes 1 & 2, Divisions 1 & 2, Groups BCD, EFG, Integral mount

PROCESS CONNECTION	DESCRIPTION
1"TCY	1 in Tri-clamp, 316 Stainless Steel
1.5"TCY	1.5 in Tri-clamp, 316 Stainless Steel
2"TCY	2 in Tri-clamp, 316 Stainless Steel

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Factory calibration: custom range or full-scale
- Documentation & testing packages (if required, refer to Additional Resources)

Notes

[1] A hyphen will separate multiple options selected
[2] DW only available with 7W housing. Included standard on 4X housing.
[3] TI only available with HRT option

Model 591 • Pressure Transmitter, Cable Suspended, Integral Electronics

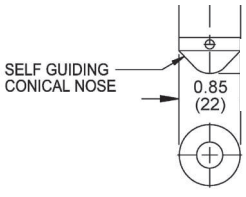
Features

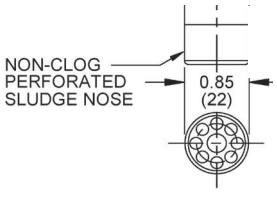
- 4-20 mA signal, 2-wire loop
- Small size is easy to install
- Fits 0.75 in NPT (23 mm) and easily slides into a 1.0 in (27 mm) pipe
- Resistant to down hole pumps
- Ranges 1 ft to 2500 ft (0.3 m to 762 m) in water
- Support cable up to 4000 ft (1219 m) long
- Unaffected by algae and buildup
- Surge protectors
- Optional cable support clamp
- Sludge nose optional for dirty liquids
- Second vent tube in cable to check down hole sealing
- Maintenance free operation
- HART® protocol compliant

Description

The Delta Controls **Model 591** Pressure Transmitter incorporates both sensor and electronics units in a single potted module that is **protected** by a Viton® sealed heavy stainless steel body. The lower body, sealed to an electrical cable, is **supported** from the well head. A vent tube in the cable connects and references the sensor to atmospheric pressure. The detected pressure, linearly proportional to the height of water above, **converts** it to a 4-20 mA signal equivalent to the liquid's level.

It is **maintenance free**, and, unlike capacitance / admittance type devices, Model 591 is **unaffected by algae growth** and **sludge coating**. Calibration is checked without the unit being installed in a well or pit. The 591 is also useful for **measuring tank levels**. The flexible cable is easy to install, even with minimal head room. The small body diameter allows installation through a 0.75 inch NPT hole. The optional Tefzel cable jacket and Hastelloy® C-276 body are **resistant** to most corrosive agents.





Model 591

Specifications

Technology:	Silicon strain gauge
Supply Power:	13 DCV to 35 DCV 2-wire loop powered
Output Signal:	4-20 mA, isolated
Maximum Loop Impedance:	550 Ω at 24 DCV, 1100 Ω at 35 DCV
Vent Tube:	Desiccant filter or isolation bladder
Over Pressure:	2X range or 35 psi min (+2.5 bar) 3X range or 1000 psi min (+70 bar)
Operating Temperature:	-20 °F to +180 °F (-29 °C to +82 °C)
Intermittent Temperature:	-40 °F to +220 °F (-40 °C to +104 °C)
Compensated Temperature:	+30 °F to +130 °F (-1 °C to +55 °C) (higher available)
Accuracy:	≥ ± 0.25% FS
Thermal Error:	± 0.02% FS/ °F max
Barometric Effect:	None
Communication:	HART COMMUNICATION PROTOCOL

Model Numbering System

MODEL EXAMPLE	MODEL	-	NOSE TYPE	-	SENSOR	-	CABLE LENGTH	-	OPTIONS [1]
	591Y	-	CN	-	G4Y	-	30V	-	AA

MODEL	DESCRIPTION
591Y	Pressure Transmitter, Cable Suspended, Integral Electronics, 316 Stainless Steel
591G	Pressure Transmitter, Cable Suspended, Integral Electronics, Hastelloy® C-276

NOSE TYPE	DESCRIPTION
CN	Conical Nose, Basic
SN	Sludge Nose, Perforated

SENSOR	RATING	MATERIAL	WATER RANGE
G1Y	1.5 psig	316 Stainless Steel	3.5 ft
G2Y	3.0 psig	316 Stainless Steel	7.0 ft
G3Y	7.5 psig	316 Stainless Steel	17.5 ft
G4Y	15.0 psig	316 Stainless Steel	35 ft
G5Y	30.0 psig	316 Stainless Steel	70 ft
G6Y	60.0 psig	316 Stainless Steel	125 ft
G7Y	120.0 psig	316 Stainless Steel	250 ft
G8Y	250.0 psig	316 Stainless Steel	500 ft
G9Y	500.0 psig	316 Stainless Steel	1250 ft
G10Y	1000 psig	316 Stainless Steel	2500 ft
A4Y	15 psia	316 Stainless Steel	
A5Y	30 psia	316 Stainless Steel	
A6Y	60 psia	316 Stainless Steel	
A7Y	120 psia	316 Stainless Steel	
V8Y	30 psia	316 Stainless Steel	
V9Y	30 psia	316 Stainless Steel	
V10Y	45 psia	316 Stainless Steel	
V11Y	75 psia	316 Stainless Steel	
V12Y	135 psia	316 Stainless Steel	

CABLE LENGTH	DESCRIPTION
**V	** feet PVC outer jacketed cable
**R	** feet Tefzel® outer jacketed cable

OPTIONS[1]	DESCRIPTION
AA	None
TI	Temperature Indicator
SCT	Isolation bladder, Tube-type for mounting in enclosures by others
SCJ	Vent tube isolation bladder, Tubular type in polycarbonate housing
DDI	Conventional refillable desiccant dryer for vent tube, For mounting in enclosure by others
CCY	Cable support clamp, 316 Stainless Steel
KZ	Kalrez® seals
VBKT	Cable clamp support arm for vertical mounting, Carbon steel
HBKT	Cable clamp support arm for horizontal mounting, Carbon steel

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Factory calibration: custom range or full-scale
- Documentation & testing packages (if required, refer to Additional Resources)

Notes:

[1] A hyphen will separate multiple options selected
- Only one option can be selected of VBKT, HBKT
- Only one option can be selected out of SCJ,DDI
- SCT, SCJ, DDI not available with G9, G10, V9, V10, V11, V12 sensors

Model 592 • Pressure Transmitter, Cable Suspended, Remote Electronics

Features

- 4-20 mA signal, 2-wire loop
- Small and easy to install
- Fits 0.75 in NPT (23 mm) and easily slides into a 1.0 in (27 mm) pipe
- Ranges 1 ft to 2500 ft (0.3 m to 762 m) in water
- Support cable up to 4000 feet (1219 m) long
- Unaffected by algae and wet buildup
- Surge protection
- Sensor located at bottom of well bore or tank
- Remote housing for electronics
- Field serviceable units
- Optional cable support clamp
- Sludge nose option for dirty liquids
- Second vent tube can check for downhole sealing
- Maintenance free operation
- HART® Protocol compliant, optional

Description

The Delta Controls **Model 592** Pressure Transmitter features an electronics housing mounted above ground for easy testing, recalibration, and inspection. Both are potted for maximum reliability. The sensor is mounted in a 316 Stainless Steel body. A rugged electrical cable interconnects the housing and sensor, and supports the body. The sensor measures the pressure of the liquid above it. The detected pressure, linearly proportional to the height of water above, **converts** it to a 4-20 mA signal equivalent to the liquid's level. The sensor is connected through a vent tube to atmospheric pressure for a reference.

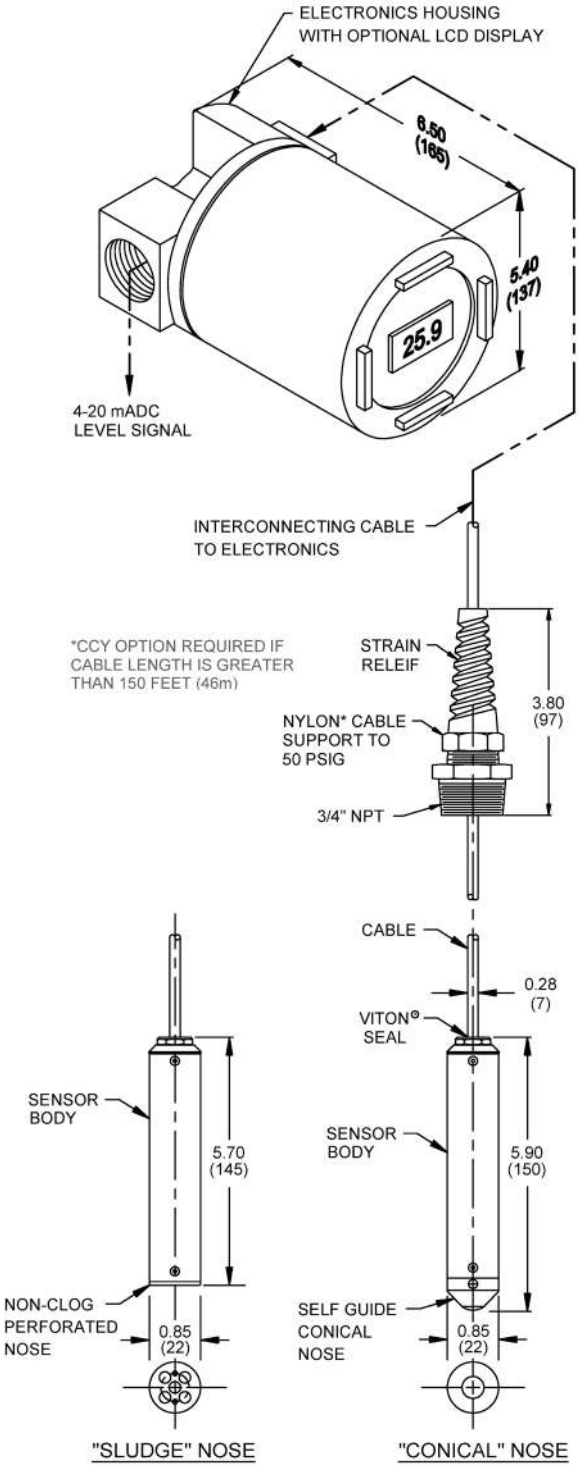
Unlike capacitance and admittance type devices, the 592 is **unaffected by algae** and **sludge coating**. Its calibration may be checked or changed without the unit being installed in a well or pit.

The 592 is useful for **measuring levels in tanks**. The flexible cable is easy to install, even with minimal head room. The small body diameter allows it to be installed through a 0.75 inch NPT hole.

Model 592

Specifications

Technology:	Silicon strain gauge
Supply Power:	13 DCV to 35 DCV, 2-wire loop powered
Output Signal:	4-20 mA, isolated
Maximum Loop Impedance:	550 Ω at 24 DCV, 1100 Ω at 35 DCV
Over Pressure:	2X range or 35 psi min (+2.5 bar) 3X range or 1000 psi min (+70 bar)
Vent Tube:	Desiccant filter or isolation bladder
Operating Temperature:	-20 °F to +220 °F (-29 °C to +104 °C)
Intermittent Temperature:	-40 °F to +275 °F (-40 °C to +135 °C)
Compensated Temperature:	+30 °F to +130 °F (-1 °C to +55 °C) (higher available)
Accuracy:	≥ ± 0.25% FS
Thermal Error:	± 0.02% FS/ °F max
Barometric Effect:	None
Communication:	Device menus, HART COMMUNICATION PROTOCOL
Certifications:	
Explosion-proof Housing Option	Third Party Listed by CSA NRTL/C (USA and Canada) Class I, Groups B, C and D; Class II, Groups E, F and G; Class III; Encl 4X:


ELECTRONICS HOUSING
WITH OPTIONAL LCD DISPLAY
6.50
(165)
5.40
(137)
25.9
4-20 mADC
LEVEL SIGNAL
INTERCONNECTING CABLE
TO ELECTRONICS
*CCY OPTION REQUIRED IF
CABLE LENGTH IS GREATER
THAN 150 FEET (46m)
STRAIN
RELEIF
NYLON* CABLE
SUPPORT TO
50 PSIG
3.80
(97)
3/4" NPT
CABLE
0.28
(7)
VITON©
SEAL
SENSOR
BODY
5.70
(145)
NON-CLOG
PERFORATED
NOSE
0.85
(22)
SENSOR
BODY
5.90
(150)
SELF GUIDE
CONICAL
NOSE
0.85
(22)
"SLUDGE" NOSE
"CONICAL" NOSE

Model 592 • Pressure Transmitter, Cable Suspended, Remote Electronics

Model Numbering System

MODEL EXAMPLE	MODEL	-	NOSE TYPE	-	SENSOR	-	HOUSING & RATING	-	CABLE LENGTH	-	OPTIONS [1-7]
	592Y	-	CN	-	G4Y	-	4XR	-	70V	-	PSM

MODEL	DESCRIPTION
592Y	Pressure Transmitter, Cable Suspended, Remote Electronics, 316 Stainless Steel

NOSE TYPE	DESCRIPTION
CN	Conical Nose, Basic
SN	Sludge Nose, Perforated

SENSOR	RATING	MATERIAL	WATER RANGE
G1Y	1.5 psig	316 Stainless Steel	3.5 ft
G2Y	3.0 psig	316 Stainless Steel	7.0 ft
G3Y	7.5 psig	316 Stainless Steel	17.5 ft
G4Y	15.0 psig	316 Stainless Steel	35 ft
G5Y	30.0 psig	316 Stainless Steel	70 ft
G6Y	60.0 psig	316 Stainless Steel	125 ft
G7Y	120.0 psig	316 Stainless Steel	250 ft
G8Y	250.0 psig	316 Stainless Steel	500 ft
G9Y	500.0 psig	316 Stainless Steel	1250 ft
G10Y	1000 psig	316 Stainless Steel	2500 ft
A4Y	15 psia	316 Stainless Steel	
A5Y	30 psia	316 Stainless Steel	
A6Y	60 psia	316 Stainless Steel	
A7Y	120 psia	316 Stainless Steel	
V8Y	30 psia	316 Stainless Steel	
V9Y	30 psia	316 Stainless Steel	
V10Y	45 psia	316 Stainless Steel	
V11Y	75 psia	316 Stainless Steel	
V12Y	135 psia	316 Stainless Steel	

HOUSING & RATING	DESCRIPTION
AA	None
4XI	Environment-proof, 4X, PVC, Integral mount
7WI	Explosion-proof, 7X, Aluminum, Classes 1 & 2, Divisions 1 & 2, Groups BCD, EFG, Integral mount
7TI	Explosion-proof, 7X, 300 Stainless Steel, Classes 1 & 2, Divisions 1 & 2, Groups BCD, EFG, Integral mount
4XR	Environment-proof, 4X, PVC, Remote mount
7WR	Explosion-proof, 7X, Aluminum, Classes 1 & 2, Divisions 1 & 2, groups BCD, EFG, Remote mount
7TR	Explosion-proof, 7X, 300 Stainless Steel, Classes 1 & 2, Divisions 1 & 2, Groups BCD, EFG, Remote mount

CABLE LENGTH	DESCRIPTION
**V	** feet PVC outer jacketed cable
**R	** feet Tefzel™ outer jacketed cable

MODEL EXAMPLE	MODEL	-	NOSE TYPE	-	SENSOR	-	HOUSING & RATING	-	CABLE LENGTH	-	OPTIONS [1-7]
	592Y	-	CN	-	G4Y	-	4XR	-	70V	-	PSM

OPTIONS[1-7]	DESCRIPTION
AA	None
CCY	Cable support clamp, 316 Stainless Steel [2]
DW	Display window [3]
FLA	Flanged process connection adapter for user's 1.0 in support pipe
HRT	HART® communication protocol
HBKT	Pipe clamp support arm for horizontal mounting, Carbon steel [4]
VBKT	Pipe clamp support arm for vertical mounting, Carbon steel [4]
KZ	Kalrez seals
PS1	Internal power supply, 120 ACV to 24 DCV
PSM	2 in pipe stand housing mounting bracket [5]
SCI	Internal vent tube isolation bladder, Permanent, non-refillable [6]
TI	Temperature Indicator [7]
341A	Alarm Module, One Relay, 4-20 mA, 5 A at 240 ACV or 30 DCV

Notes:

[1] A hyphen will separate multiple options selected
[2] If cable length ≥150 ft, option CCY is recommended
[3] DW only available with 7W housing. Included standard on 4X housing.
[4] Only one option can be selected of VBKT, HBKT
[5] PSM only available with remote mount housing
[6] SCI not available with G9, G10, V9, V10, V11, V12 sensors
[7] TI only available with HRT option

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Factory calibration: custom range or full-scale
- Documentation & testing packages (if required, refer to Additional Resources)

Mechanical Series

*Float and displacer switches for **any application**.*


T-3043

Mechanical Series

Internationally recognized
40+ years of service
Unsurpassed durability

With 45+ years in production, the Delta Controls Series 700 mechanical switches are the industry standard for quality engineered mechanical level switches. With service up to 20,000 psig and 1100 °F, the Delta mechanical switches are available in a wide range of materials, process connections, and configurations to provide reliable service in even the most challenging applications. For process conditions beyond the limits of standard instrumentation, Delta has an engineered mechanical solution.

Mechanical Switches

Theory of Operation

Displacers

Operation is based on the liquid displacement principle. A displacer, which is more dense than the process liquid, is supported by a spring. The length of the spring is proportional to the amount of weight that it supports: the less weight, the longer the spring will be. When liquid covers a displacer an amount of weight, equal to displaced process liquid, is removed from the spring and is supported by the process liquid. The spring length is proportionally increased and the attractor is raised into the switch station magnet's field. The magnet is pulled in against the outside of the sealing tube and the output switch is activated.

Similarly, when the process fluid uncovers the displacer, the liquid weight equal to the volume of the displacer is transferred back to the spring. The length of the spring decreases to its original length and the attractor is lowered from the magnet field. The magnet is pulled back to its original position and output switch.

Floats

Operation is based on buoyancy. A sensing float is attached to a vertical shaft, which moves up and down. The output switch station activates when the float rises. The switch station is on the outside of a solid, non-magnetic pipe wall. A permanent magnet is attached to the switch's actuating lever. As the liquid level rises, the float is carried upwards and the attractor is carried into the magnet's field. The magnet is attracted and pulled against the wall of the sealing tube. This movement actuates the output switch.

When the liquid level falls the float drops, the attractor is pulled out of the field of the magnet, and the output switch returns to its original position.

Floats/Displacers/Configurations, Housings & Options

Options

Housing Heater
The 'HH' option offers a 120 ACV heater that is mounted in the housing. The housing heater is recommended for low ambient temperatures and prevents formation of condensation and icing.

Ground Level Checker
The 'GLC' option is available on certain models. It provides a lever actuated checking mechanism that offers verification of switch functionality.

Temperature Extensions
Optional temperature extensions are used to extend the housing and switch station(s) away from high temperature processes to lower the ambient temperature.

Configurations

Insertion
Insertion is measured from the base of process connection to the bottom of the float or displacer. Cable suspended displacer switches are supplied with at a minimum of 10 feet of cable (can be shortened in field) and a maximum of 50 feet. The level typically rises 60 percent of the total height of each float or displacer before moving up (consult Delta Controls for specific calculations).

Process Connection Configurations
Vertical caged models typically offer process connections available as side/side, side/bottom, or side/side with drain. Custom process connection spacing is typically available in each configuration allowing flexible solutions for existing installation sites. Spacing is measured by centerline to centerline on side/side and side/side/drain configurations and centerline to bottom connection face on side/bottom configurations.

Switch Stations
A variety of microswitches are available in SPDT and DPDT configurations. For models offering differential control, a single switch station is used in either a SPDT or DPDT configuration.

Housings

C Housing

T Housing

Model 709 • Float Switch, Top Inserted, Single Point

Features

- Simple mechanical device
- High reliability
- Sensing float
- High level alarms
- Float guide always located 3 inches above float
- Non-magnetic, heavy-duty sealing tube

Description

The Delta Controls **Model 709** Float Switch is a simple mechanical device which is **highly reliable** over long periods of time. An alarm switch-type action is provided as the liquid level surface passes through the elevation where the **sensing float** has been positioned. The sensing float is attached to a vertical shaft, which can move up and down. Lifting the float causes the output switch station to activate. The switch station is on the outside of a solid, non-magnetic pipe wall. This isolation **eliminates** the possibility of leaking seals and flex tube failures, which are problems in many other designs.

The 709 is commonly used for high level alarms and shutdown on tanks. The float may be extended down into the tank to **12 feet**. It provides switch action as far as 12 feet down into the tank and allows the 709 to be used as a **low-level alarm**.

Unlike most competitive switches, the **709 float rod guide** is always located just three inches above the float and thus avoids the need for any type of 'stilling well.' Moderate swirling or fluid motion **will not damage** the 709. A **permanent magnet** is attached to the actuating lever of the switch. As the liquid level rises, the float is carried upwards and the attractor is carried into the field of the magnet. The magnet is attracted and pulled against the wall of the sealing tube. This movement **actuates the output switch**. When the liquid level falls, the float drops, the attractor is pulled out of the field of the magnet and the output switch returns to its original position.

Model 709

Specifications

Wetted Material:	316 Stainless Steel, carbon steel
Insertion (Below Process Connection):	≤ 12 ft (3.5 m)
Switch Action:	Single point alarm
Sensing Element:	316 Stainless Steel
Specific Gravity:	0.4 to 2.40
Temperature:	-150 °F to +750 °F (-101 °C to +399 °C)
Pressure:	-15 psig to +1200 psig (-1 bar to +80 bar)
Threaded Process Connection:	1 in to 4 in MPT
Flanged Process Connection:	2 in to 8 in
Flange Rating:	≤ 300 lb ANSI, Grayloc® hub, DIN, JIS equivalents
Certifications:	
C SP® US 2476133	Class I, Division 1, Groups B, C and D; Class II, Division 1, Groups E, F and G Class I, Zone 1, Ex d IIB+H2 Class I, Zone 1, AEx d IIB+H2

Model Numbering System

MODEL EXAMPLE	MODEL	-	SENSING FLOAT	-	INSERTION DISTANCE	-	PROCESS CONNECTION	-	SWITCHING & HOUSING	-	OPTIONS[1]
	709	-	TY	-	11.0	-	2"MPTS	-	L1C	-	AA

MODEL	DESCRIPTION
709	Float Switch, Top Inserted, Single Point

SENSING FLOAT

Elements (inches)				WKG psig at °F			Min Connection Size		Min SPG at Insertion Distances (inches)									
M/N	MATERIAL	OD	LENGTH	100	450	750	FPT	FLANGED	13	18	24	36	48	60	72	96	120	150
TY	316 Stainless Steel	2.6	7.0	275	185	160	2.5 in	3 in S160	0.76	0.78	0.79	0.81	0.85	0.88	0.92	NA	NA	NA
14Y	316 Stainless Steel	3.5	7.0	265	175	145	NA	4 in S120	0.56	0.57	0.58	0.59	0.62	0.65	0.67	0.73	0.78	0.85
15Y	316 Stainless Steel	5.5	Ball	425	300	250	NA	6 in S80	0.40	0.41	0.41	0.42	0.43	0.45	0.46	0.49	0.51	0.55
PY	316 Stainless Steel	7.0	Ball	425	275	235	NA	8 in S120	0.56	0.56	0.56	0.57	0.57	0.58	0.59	0.60	0.61	0.63
Interface Service																		
IY	316 Stainless Steel	7.0	Ball	730	475	400	NA	8 in S120	0.45 min spg, 0.10 min spg Differential									

INSERTION DISTANCE	DESCRIPTION
**.*	**.* in of insertion (11 in to 150 in)

PROCESS CONNECTION	DESCRIPTION
	Refer to 'Mechanical Technical Resources'
	MPT sizes 1 in to 4 in
	Flange sizes 1 in to 8 in, Classes 150, 300

SWITCHING & HOUSING	DESCRIPTION
	Refer to 'Mechanical Technical Resources'

OPTIONS[1]	DESCRIPTION
AA	None
T6	6 in temperature extension (see 'Mechanical Technical Resources')
T12	12 in temperature extension (see 'Mechanical Technical Resources')
HH	120 ACV housing heater

Notes:
[1] A hyphen will separate multiple options selected
- SPG: Specific Gravity Unit
- Inferface service min difference between the SPG of the 2 liquids: 0.10
- Inferface min SPG of the heavier liquid: 0.45
- Centerline of switch band: 4 in above insertion depth

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer "Additional Resources")

APPLICATION DETAILS:

- Process fluid or material name*
- Process fluid or material specific gravity
- Maximum process temperature
- Maximum process pressure

*Upper and lower materials required for interface service

Model 710 • Float Switch, Top Inserted, Two Point

Features

- Variable liquid output switching
- Both high and low level alarms
- Attractor located inside barrier tube
- Switching stations located outside tube
- Vertically mounted on top of vessel
- Two fixed switching points

Description

The Delta Controls **Model 710** Float Switch offers two configurations, A and D, for variable liquid output switching. **Model 710A** provides **output switching** at two points based on a varying liquid level. The 710 is commonly used with a preliminary warning which announces that 'shutdown' may soon occur and remedial action should be taken at once.

The unit is located on top of the vessel with the primary element extending down into the vessel. The float rides on the surface of the liquid and is carried up and down as the liquid level varies. The **attractor** is coupled to the float by the float rod and also moves up and down as the level varies. The attractor is located inside of the barrier tube and is in contact with the **process fluid.**

The switching stations are located on the outside of the tube and are isolated from the process fluid. Each station contains a magnet which is magnetically attracted to magnetic materials such as the attractor. The attractor is lifted into the magnetic field of the bottom switch station. The magnet is pulled in against the barrier tube, an output switch is connected to the magnet and is actuated. **Additional increases** in the liquid level lift the attractor into the magnetic field of the top switch station and its output switch also actuates. Falling liquid level sequentially pulls the attractor out of the field of the switch station magnetic fields and each output switch deactuates. Separation between the **two output switch actuation points** is two inches to three inches, depending on the actual specific gravity (SPG) of the liquid.

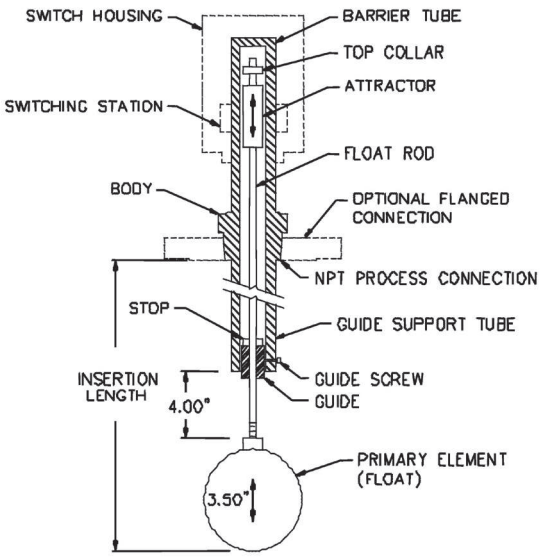
Model 710

The 710 should be mounted vertically on top of the vessel. The **guide tube/float rod** must be long enough so that the float centerline extends down approximately two inches below the point where switch action is desired. A baffle or stilling well is required if the **fluid is agitated** or has surface turbulence; otherwise the switching action may be erratic. The switching points are fixed by the length of the float rod/guide tube. The process connection should be large enough to admit the float into the vessel. If not, then the float must be unscrewed from the float rod and installed from inside the vessel after the body/attractor assembly has been mounted on top of the vessel.

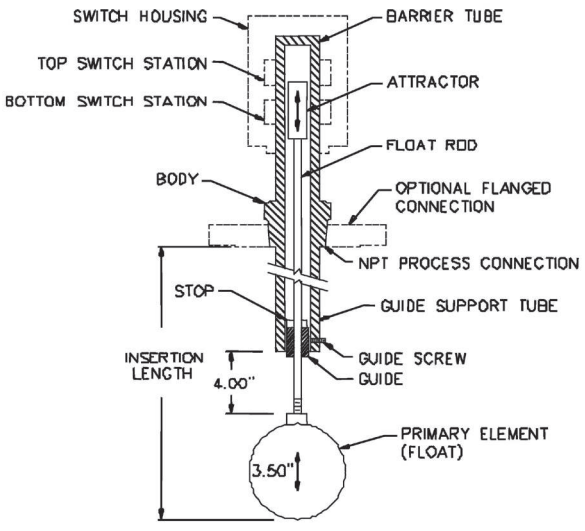
The **Model 710D** Differential Option has a single switch station and is equipped with a differential device. The station activates at a high level and remains activated unit the liquid level falls to a lower elevation. The additional amount that it must fall, before the station deactivates, is called the **Differential**. This amount is adjustable from about one inch to two and one half inches depending upon the specific gravity (spg) of the liquid. The 710D is commonly used where a considerable amount of surface agitation or splashing is expected to occur. This design results in a **more stable** and **reliable alarm action**, particularly as the level approaches the switching point. It can also serve as a pump control in large tanks.

Specifications

Wetted Material:	316 Stainless Steel, carbon steel
Insertion (Below Process Connection):	≤ 10 ft
Switch Action:	2 alarm points and/or differential
Sensing Element:	316 Stainless Steel
Specific Gravity:	0.43 to 2.40
Temperature Range:	-150 °F to +750 °F (-101 °C to +399 °C)
Pressure:	-15 psig to +1200 psig (-1.0 bar to +82.7 bar)
Threaded Process Connection:	1.0 in to 3.0 in MPT
Flanged Process Connection:	2.0 in to 8.0 in
Flange Rating:	≤ 300 lb ANSI flanges, Grayloc® hub, DIN or JIS equivalents
Certifications:	
C SP US 2476133	Class I, Division 1, Groups B, C and D; Class II, Division 1, Groups E, F and G Class I, Zone 1, Ex d IIB+H2 Class I, Zone 1, AEx d IIB+H2



MODEL 710D



MODEL 710A

Model 710 • Float Switch, Top Inserted, Two Point

Model Numbering System

MODEL EXAMPLE	MODEL	-	SENSING FLOAT	-	INSERTION DISTANCE	-	PROCESS CONNECTION	-	SWITCHING & HOUSING	-	OPTIONS[1]
	710A	-	TY	-	13.0	-	3"150RS	-	L1C	-	AA

MODEL	DESCRIPTION
710A	Float Switch, Top Inserted, Two Point
710D	Float Switch, Top Inserted, Two Point, Differential

SENSING FLOAT

Elements (inches)				WKG psig at °F			Min Process Connection		Type Action	Min SPG at Insertion Distances (inches)									
M/N	MATERIAL	OD	LENGTH	100	450	750	FPT	FLANGED		13	18	24	36	48	60	72	96	120	150
TY	316 Stainless Steel	2.6	7.0	275	185	160	2.5 in	3 in S160	AD	0.79	0.80	0.82	0.84	0.88	0.91	NA	NA	NA	NA
									2 STA	0.89	0.91	0.93	NA	NA	NA	NA	NA	NA	NA
14Y	316 Stainless Steel	3.5	7.0	265	175	145	NA	4 in S120	AD	0.62	0.63	0.65	0.66	0.69	0.71	0.74	0.79	0.85	0.92
									2 STA	0.70	0.71	0.72	0.74	0.76	0.79	0.82	0.87	0.92	NA
15Y	316 Stainless Steel	5.5	Ball	425	300	250	NA	6 in S80	AD	0.43	0.44	0.45	0.45	0.47	0.48	0.50	0.52	0.55	0.58
									2 STA	0.49	0.50	0.51	0.51	0.53	0.55	0.55	0.58	0.61	0.64
PY	316 Stainless Steel	7.0	Ball	425	275	235	NA	8 in S120	AD	0.57	0.58	0.58	0.58	0.59	0.60	0.60	0.62	0.63	0.65
										0.61	0.61	0.61	0.62	0.62	0.63	0.64	0.65	0.66	0.68
Interface Service																			
IY	316 Stainless Steel	7.0	Ball	730	475	400	NA	8 in S120	0.50 for adjustable differential, 0.125 units 0.52 for 2 station alarm, Differential										

INSERTION DISTANCE	DESCRIPTION
**.*	**.* in of insertion (13 in to 150 in)

PROCESS CONNECTION	DESCRIPTION
	Refer to 'Mechanical Technical Resources' for M/N
	MPT sizes 1 in to 4 in
	Flange sizes 1 in to 8 in, Classes 150, 300

SWITCHING & HOUSING	DESCRIPTION
	Refer to 'Mechanical Technical Resources' for options

MODEL EXAMPLE	MODEL	-	SENSING FLOAT	-	INSERTION DISTANCE	-	PROCESS CONNECTION	-	SWITCHING & HOUSING	-	OPTIONS[1]
	710A	-	TY	-	13	-	3"150RS	-	L1C	-	AA

OPTIONS[1]	DESCRIPTION
AA	None
T6	6 in temperature extension (see 'Mechanical Technical Resources')
T12	12 in temperature extension (see 'Mechanical Technical Resources')
HH	120 ACV housing heater

Notes:
[1] A hyphen will separate multiple options selected
- SPG: Specific Gravity Unit
- Inferface service min difference between the spg of 2 liquids: 0.1
- Inferface min SPG of the heavier liquid: 0.5
- Centerline of switch band: 4 in above insertion depth

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer "Additional Resources")

APPLICATION DETAILS:

- Process fluid or material name*
- Process fluid or material specific gravity
- Maximum process temperature
- Maximum process pressure

*Upper and lower materials required for interface service

Model 711 • Float Switch, Top Inserted, Two Point, Wide Separation

Features

- Two alarm points
- Horizontal position maintained by stroke rod
- High and low alarm
- Liquid supported float
- Does the job of two conventional float switches

Description

The **Model 711** Float Switch provides two point alarms with 6 to 65 inches of spacing between the two switching points. The switching points may be easily changed in the field by repositioning the stops. The normal application would be for **high/low alarm**. Note that the liquid should not leave significant coatings or deposits on the rod.

A float is supported by the liquid's surface and freely travels up and down the stroke rod. The horizontal position is maintained by the stroke rod when the liquid level varies. The attractor is supported at the midpoint of its travel by a spring. When the **level increases**, the float lifts until it contacts the upper stop. The stroke rod is then lifted and the attractor is pulled into the station's magnetic field. The magnet pulls in against the outside of the sealing tube and the switch activates. A falling level drops the float away from the upper stop, the attractor moves down, and the switch deactivates.

Similarly, a **falling level** carries the float down until it contacts the lower stop. The weight of the float pushes the rod down, lowers the attractor to be in front of the magnet, and the lower switch actuates. Once the float rises above the stop, the spring pulls the attractor from the lower switch station's magnetic field and deactuates.

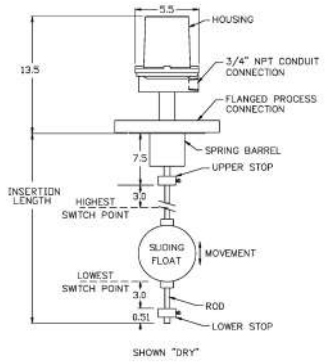
The 711 functions in many applications that would otherwise require the use of two separate conventional float switches. This **results in cost savings** for both the equipment and the decreased installation required.

Model **711D, Differential Option**, is a single switching station normally used to control pumping action in a process vessel or storage tank. The station activates when the float rises to the upper stop and lifts the stroke rod attractor into the station's magnetic field. The station stays activated until the float moves against the lower stop. The stroke rod attractor is pulled from the magnetic field and the switch station deactivates. It remains deactivated until the float contacts the upper stop.

Model 711

Specifications

Wetted Material:	316 Stainless Steel, carbon steel
Insertion (Below Process Connection):	≤ 10 ft
Switch Action:	2 alarm points and/or differential
Specific Gravity:	0.35 to 2.40
Temperature Range:	-150 °F to +750 °F (-101 °C to +399 °C)
Pressure:	-15 psig to +1200 psig (-1.0 bar to +82.7 bar)
Threaded Process Connection:	1.0 in to 3.0 in NPT
Flanged Process Connection:	2.0 in to 8.0 in
Flange Rating:	≤ 300 lb ANSI flanges, or Grayloc® hub, DIN, JIS equivalents
Certifications:	
C SP® US 2476133	Class I, Division 1, Groups B, C and D; Class II, Division 1, Groups E, F and G Class I, Zone 1, Ex d IIB+H2 Class I, Zone 1, AEx d IIB+H2



Model Numbering System

MODEL EXAMPLE	MODEL	-	SENSING ELEMENT	-	INSERTION DISTANCE	-	PROCESS CONNECTION	-	SWITCHING & HOUSING	-	OPTIONS
	711A	-	11Y	-	13.0	-	4"150RS	-	L1C	-	AA

MODEL	DESCRIPTION
711A	Float Switch, Top Inserted, Two Point, Wide Separation
711D	Float Switch, Top Inserted, Two Point, Wide Separation, Differential

SENSING ELEMENT

Elements (inches)					WKG psig at °F			Minimum Flanged
M/N	MATERIAL	SPG	OD	LENGTH	100	250	450	PROCESS CONNECTION NOZZLE
11Y	316 Stainless Steel	0.60	3.6	7.6	185	145	120	4 in SCH 80
12Y	316 Stainless Steel	0.65	5.1	Ball	450	350	290	6 in SCH 160
13Y	316 Stainless Steel	0.35	7.2	Ball	375	295	295	8 in SCH 80

INSERTION LENGTH	DESCRIPTION
**.*	**.* in of insertion (13 in to 150 in)

PROCESS CONNECTION	DESCRIPTION
	Refer to 'Mechanical Technical Resources' for M/N
	MPT sizes 4 in
	Flange sizes 4 in to 8 in, Classes 150, 300

SWITCHING & HOUSING	DESCRIPTION
	Refer to 'Mechanical Technical Resources' for options

OPTIONS	DESCRIPTION
AA	None
HH	120 ACV housing heater

Notes:
- SPG: Specific Gravity Unit
- Note: Limited to 250 °F with 316 Stainless Steel range spring
- Up to 450 °F with Inconel® range spring

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer "Additional Resources")

APPLICATION DETAILS:

- Process fluid or material name
- Process fluid or material specific gravity
- Maximum process temperature
- Maximum process pressure

Model 715 • Displacer Switch, Top Inserted, Single Point

Features

- Single switch station activation
- High or low alarm for liquid level or interface position
- Suitable for floating roof type tanks
- Optional brass displacer
- Optional ground level checker

Description

The **Model 715** Top Displacer Switch provides activation of a **single switch station** as the liquid level surface rises past the elevation at which the displacer has been positioned. Similarly, the switch station is deactivated as the liquid level falls below the displacer.

A displacer, which is more dense than the process liquid, is supported by a spring. The length of the spring is proportional to the amount of weight that it supports—the less the weight, the longer the spring will be. When liquid covers a displacer the amount of weight, equal to the weight of the process liquid displaced, is removed from the spring and is **supported by the process liquid**. The spring length proportionally increases and the attractor moves into the switch station's magnetic field. The magnet is pulled against the outside of the sealing tube, and the **output switch is activated**.

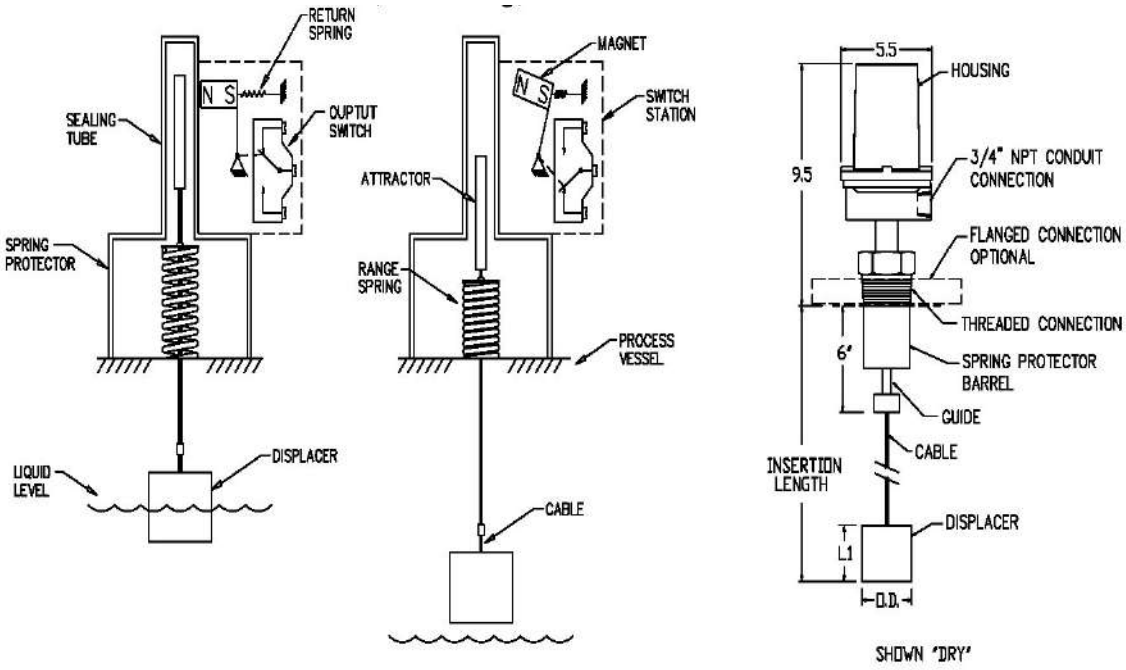
Similarly, when the process fluid uncovers the displacer, the liquid weight equal to the volume of the displacer is transferred back to the spring. The length of the spring decreases to its original length and the attractor is pulled out of the magnetic field. The magnet is pulled back to its original position and the output switch deactuates. For floating roof type tanks, the 715 may be used to **detect** the position of the roof.

The 715 may be equipped with a **lead weight** instead of a displacer. When positioned on the top of a floating roof tank, the roof lifts the weight as the 715 rises, triggers an alarm switch to warn that the roof has reached the **limit**.

Model 715

Specifications

Wetted Material:	316 Stainless Steel, lead, brass, carbon steel
Insertion (Below Process Connection):	≤ 50 ft (16 m) max
Switch Action:	Single point alarm
Specific Gravity:	0.50 to 2.0
Temperature Range:	-20 °F to +500 °F (-29 °C to +260 °C)
Pressure Range:	-15 psig to +2200 psig (-1 bar to +151.7 bar)
Threaded Process Connection:	2.0 in to 3.0 in NPT
Flanged Process Connection:	4.0 in to 8.0 in
Flange Rating:	≤ 300 lb ANSI flanges or Grayloc® hub DIN or JIS equivalents
Certifications:	
C SP® US 2476133	Class I, Division 1, Groups B, C and D; Class II, Division 1, Groups E, F and G Class I, Zone 1, Ex d IIB+H2 Class I, Zone 1, AEx d IIB+H2


RETURN SPRING
N S
SEALING TUBE
OUPTUT SWITCH
SPRING PROTECTOR
LIQUID LEVEL
DISPLACER
MAGNET
SWITCH STATION
ATTRACTOR
RANGE SPRING
PROCESS VESSEL
CABLE
5.5
HOUSING
9.5
3/4" NPT CONDUIT CONNECTION
FLANGED CONNECTION OPTIONAL
THREADED CONNECTION
6"
SPRING PROTECTOR BARREL
GUIDE
CABLE
INSERTION LENGTH
DISPLACER
L1
O.D.
SHOWN "DRY"

Model 715 • Displacer Switch, Top Inserted, Single Point

Model Numbering System

MODEL EXAMPLE	MODEL	-	SENSING ELEMENT	-	INSERTION DISTANCE	-	PROCESS CONNECTION	-	SWITCHING & HOUSING	-	OPTIONS[1]
	715	-	44Y	-	10.0	-	2"MPTS	-	L1C	-	AA

MODEL	DESCRIPTION
715	Displacer Switch, Top Inserted, Single Point

SENSING ELEMENT

		Displacer (inches)				WKG psig at °F		Min ANSI Flanged		
M/N	MATERIAL*	MIN SPG	MAX SPG	OD	Length	100	250	450	NPT	NOZZLE
38Y	316 Stainless Steel	0.40	1.05	2.9	10.0	510	400	320	3 in	3 in SCH 80
39Y	316 Stainless Steel	0.50	1.85	1.9	14.0	1500	1300	1150	2 in	2 in SCH 80
40Y	316 Stainless Steel	0.60	1.80	1.9	12.0	1500	1300	1150	2 in	2 in SCH 80
44Y	316 Stainless Steel	0.85	2.00	1.9	8.0	1500	1300	1150	2 in	2 in SCH 80
Interface Service										
		MIN DIFFERENCE BETWEEN LIQUIDS		MIN SPG OF HEAVIER LIQUID: 0.50 UNITS						
45Y	316 Stainless Steel	0.22 SPG Units		2.9	12.0	510	400	335	3 in	3 in SCH 80
46Y	316 Stainless Steel	0.15 SPG Units		3.5	12.5	300	300	255	NA	4 in SCH 120
47Y	316 Stainless Steel	0.10 SPG Units		2.5	18.0	300	300	255	NA	4 IN SCH 120
High Position of Floating Tank Roof										
48Z	Lead	Position		1.0	4.0	NA	NA	NA	NA	NA
44L	Brass	Position, Rainwater		1.9	8.0	NA	NA	NA	NA	NA

INSERTION DISTANCE	DESCRIPTION
**.*	**.* feet of 316 Stainless Steel cable (10 ft to 50 ft)

PROCESS CONNECTION	DESCRIPTION
	Refer to 'Mechanical Technical Resources' for M/N
	MPT sizes 2 in to 4 in
	Flange sizes 2 in to 8 in, Classes 150, 300

SWITCHING & HOUSING	DESCRIPTION
	Refer to 'Mechanical Technical Resources' for options

MODEL EXAMPLE	MODEL	-	SENSING ELEMENT	-	INSERTION DISTANCE	-	PROCESS CONNECTION	-	SWITCHING & HOUSING	-	OPTIONS[1]
	715	-	44Y	-	10.0	-	2"MPTS	-	L1C	-	AA

OPTIONS[1]	DESCRIPTION
AA	None
HH	120 ACV housing heater
GLC	Ground Level Checker

Notes:
[1] A hyphen will separate multiple options selected
- Min insertion distance 10 ft
- Max insertion distance 50 ft
- SPG: Specific Gravity Unit

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer "Additional Resources")

APPLICATION DETAILS:

- Process fluid or material name
- Process fluid or material specific gravity
- Maximum process temperature
- Maximum process pressure

Model 716 • Displacer Switch, Top Inserted, Two Point

Features

- Top inserted
- Spring supported displace level switch
- Two point switch stations
- High and/or low alarm
- Single and multiple pump control
- Optional ground level checker

Description

The Delta Controls **Model 716** Displacer Switch provides output switching at two field adjustable points based on a varying liquid level. The unit is located on top of the vessel with the primary element extending down into the vessel. The spring supported **displacer type level switches** are used in sumps, tanks, and vessels where long insertions and switching over wide variations in liquid level are required.

Displacer actuated units are less sensitive to surface wave action than other models which are actuated by floats. Spring opposed displacer type units are suited to **difficult services** where the fluid contains entrained solids or otherwise would tend to cause hang-ups in float actuated units.

Operation is based on **liquid displacement**. A displacer, which is more dense than the process liquid is suspended from a spring. The length of the spring is proportional to the amount of weight that it supports; the less the weight, the longer the spring will be. When liquid covers a displacer, an amount of weight equal to the weight of the process liquid displaced, is removed from the spring and supported by the process liquid. The spring length is proportionally increased and the attractor is moved up into the field of the switch station magnet. The **magnet** is pulled in against the outside of the sealing tube and the output switch is actuated.

Similarly, when the process fluid **uncovers** the displacer, the displacer liquid weight is transferred back to the spring. The length of the spring is decreased to its original length and the attractor is pulled out of the field of the magnet. The magnet returns to its original position and the output switch **deactivates**. The two separate displacers are supported by a single spring. As the liquid covers the first displacer, the spring lifts the entire displacer assembly (along with the attractor) upward a precise amount. The second switch station will be operated as the liquid level continues to rise covering the **upper displacer**. The displacers may be placed on the cable at widely separated points and the switch action will then be produced when the liquid level surface covers a displacer at the separated points.

Model 716

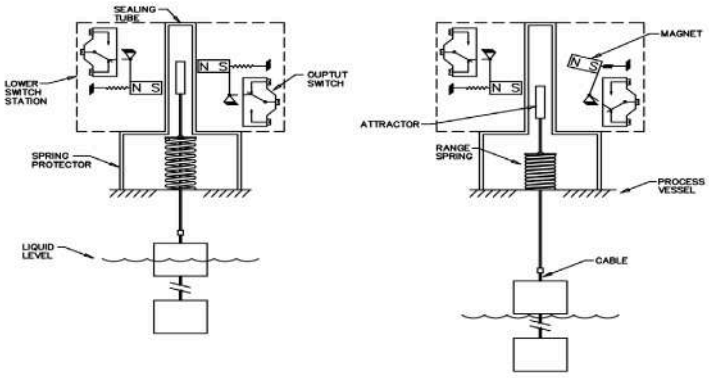
Units equipped with the optional **GLC Ground Level Checker** include a mechanical arm that allows the switch to be manually operated. Operating this lever allows the user to manually verify the function of the switch without changing the level in the tank. Pulling the lever caused the lever arm to raise the **switch actuator** through the switchpoints. Releasing the lever returns the switch to its previous position. The checker lever can be operated via a cable attached to it and routed to ground level.

Model 716D Differential Option is equipped with only a single switch station and is setup for adjustable differential control action. The **most common application** is turning a pump on and off to control the filling or emptying of tanks and sumps.

Specifications

Wetted Material:	316 Stainless Steel, lead, brass, carbon steel
Insertion (Below Process Connection):	≤ 50 ft (16 m) max
Switch Action:	2 alarm points and/or differential
Specific Gravity:	0.45 to 2.10
Temperature Range:	-20 °F to +500 °F (-29 °C to +260 °C)
Pressure Range:	-15 psig to +2200 psig (-1 bar to +151.6 bar)
Threaded Process Connection:	3.0 in to 4.0 in NPT

Flanged Process Connection:	3.0 in to 8.0 in
Flange Rating:	≤ 300 lb ANSI flanges or Grayloc® hub DIN or JIS equivalents
Certifications:	
2476133	Class I, Division 1, Groups B, C and D; Class II, Division 1, Groups E, F and G Class I, Zone 1, Ex d IIB+H2 Class I, Zone 1, AEx d IIB+H2



Model Numbering System

MODEL EXAMPLE	MODEL	-	SENSING ELEMENT	-	INSERTION DISTANCE	-	PROCESS CONNECTION	-	SWITCHING & HOUSING	-	OPTIONS
	716A	-	54Y	-	10.0	-	3"MPTS	-	L1C	-	AA

MODEL	DESCRIPTION
716A	Displacer Switch, Top Inserted, Two Point
716D	Displacer Switch, Top Inserted, Two Point, Differential

SENSING ELEMENT

Displacer (inches)						WKG psig at °F			Min ANSI Flanged	
M/N	MATERIAL*	MIN SPG	MAX SPG	OD	Length	100	250	450	NPT	NOZZLE
49Y	316 Stainless Steel	0.45	0.90	3.5	5.9, 12.5	385	300	250	NA	4 in SCH 80
50Y	316 Stainless Steel	0.60	1.20	3.5	4.8, 10.0	385	300	250	NA	4 in SCH 80
51Y	316 Stainless Steel	0.60	1.07	2.9	7.1, 14.9	500	400	325	3 in	3 in SCH 80
52Y	316 Stainless Steel	0.70	1.10	2.9	5.9, 12.0	500	400	325	3 in	3 in SCH 80
54Y	316 Stainless Steel	0.85	1.20	2.9	4.8, 10.0	400	400	325	3 in	3 in SCH 80
55Y	316 Stainless Steel	1.01	2.10	2.9	4.8, 10.0	500	400	325	3 in	3 in SCH 80
High Position of Floating Tank Roof										
52L	Brass	0.70	1.10	2.5	10.0, 12.0	375	300	260	3 in	3 in SCH 80
52Z	Lead	Position		1.0	4.0, 4.0	NA	NA	NA	2.0	C/F

INSERTION DISTANCE	DESCRIPTION
**	** feet of 316 Stainless Steel cable (10 ft to 50 ft)

SWITCHING & HOUSING	DESCRIPTION
	Refer to 'Mechanical Technical Resources' for options

PROCESS CONNECTION	DESCRIPTION
	Refer to 'Mechanical Technical Resources' for M/N
	MPT sizes 3 in to 4 in
	Flange sizes 3 in to 8 in, Classes 150, 300

OPTIONS	DESCRIPTION
AA	None
HH	120 ACV housing heater
GLC	Ground Level Checker

Notes:
- Min insertion distance 10 ft
- Max insertion distance 50 ft
- SPG: Specific Gravity Unit

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer "Additional Resources")

APPLICATION DETAILS:

- Process fluid or material name
- Process fluid or material specific gravity
- Maximum process temperature
- Maximum process pressure

Model 717 • Displacer Switch, Top Inserted, Three Point

Features

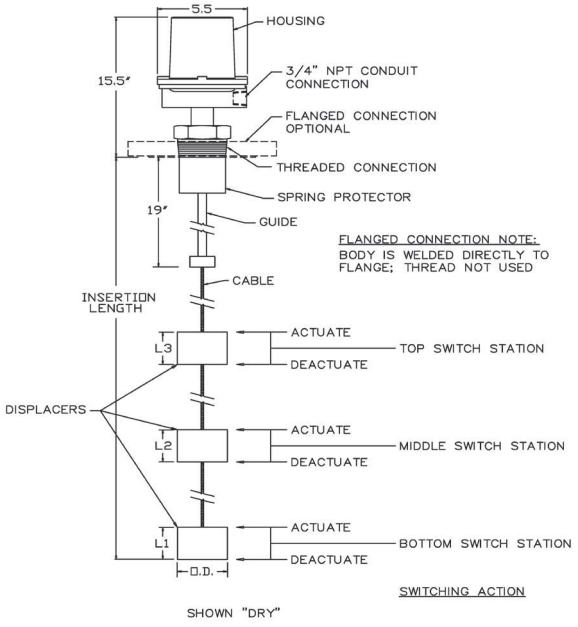
- Top inserted
- Three alarm points
- Three switching station displacers
- Displacer weight is supported by a spring
- High and/or low alarm
- Single and multiple pump control

Description

The Delta Controls **Model 717** Displacer Switch has three alarm points, three switching stations and three displacers. A precise **on/off action** occurs in the appropriate switch station when the liquid level surface passes the elevation of the related displacer element.

Model 717A is commonly used to **control two pumps** acting to empty a sump. Each of the two top displacers starts a pump; the lower displacer operates a DPDT switch, which **acts to stop both pumps** at the same place. Latch/unlatch pump starters are normally used in this arrangement.

Model 717D utilizes an adjustable differential device has been added, and only two switch stations are utilized. The lower switch station is activated when the liquid surface covers the middle displacer and stays activated until the liquid level falls below the bottom displacer. A typical application is to **control a single pump** with a high or low level alarm.



Model 717

Specifications

Wetted Material:	316 Stainless Steel, carbon steel
Insertion (Below Process Connection):	≤ 50 ft max
Switch Action:	3 alarm points and/or differential
Specific Gravity:	0.55 to 1.45
Temperature Range:	-20 °F to +500 °F (-29 °C to +260 °C)
Pressure Range:	-15 psig to +2200 psig (1 bar to +151.6 bar)
Threaded Process Connection:	3.0 in to 8.0 in NPT
Flanged Process Connection:	3.0 in to 12 in
Flange Rating:	≤ 300 lb ANSI flanges or Grayloc® hub DIN or JIS equivalents
Certifications:	
C SP® US 2476133	Class I, Division 1, Groups B, C and D; Class II, Division 1, Groups E, F and G Class I, Zone 1, Ex d IIB+H2 Class I, Zone 1, AEx d IIB+H2

Model Numbering System

MODEL EXAMPLE	MODEL	-	SENSING ELEMENT	-	INSERTION DISTANCE	-	PROCESS CONNECTION	-	SWITCHING & HOUSING	-	OPTIONS
	717A	-	64Y	-	15	-	3"150RS	-	L1C	-	AA

MODEL	DESCRIPTION
717A	Displacer Switch, Top Inserted, Three Point
717D	Displacer Switch, Top Inserted, Three Point, Differential

SENSING ELEMENT

717A Displacer (inches)						WKG psig at °F			Min ANSI Flanged	
M/N	MATERIAL*	MIN SPG	MAX SPG	OD	Length	100	250	450	NPT	NOZZLE
60Y	316 Stainless Steel	0.55	0.68	3.5	5.9, 10, 10	385	300	250	NA	4 in SCH 80
61Y	316 Stainless Steel	0.60	0.75	3.5	5.9, 10, 10	385	300	250	NA	4 in SCH 80
62Y	316 Stainless Steel	0.70	0.90	2.9	7.1, 12, 12	500	400	325	3 in	3 in SCH 80
63Y	316 Stainless Steel	0.80	0.99	2.9	7.1, 12, 12	500	400	325	3 in	3 in SCH 80
64Y	316 Stainless Steel	0.90	1.10	2.9	5.9, 10, 10	500	400	325	3 in	3 in SCH 80
68Y	316 Stainless Steel	1.15	1.45	2.9	4.8, 8.2, 8.2	500	400	325	3 in	3 in SCH 80

717D Displacer (inches)						WKG psig at °F			Min ANSI Flanged	
M/N	MATERIAL*	MIN SPG	MAX SPG	OD	Length	100	250	450	NPT	NOZZLE
73Y	316 Stainless Steel	0.60	0.73	3.5	8.1, 10, 12.5	385	300	250	NA	4 in SCH 80
74Y	316 Stainless Steel	0.70	0.85	2.9	10, 12, 14.9	500	400	325	3 in	3 in SCH 80
75Y	316 Stainless Steel	0.80	0.99	2.9	10, 12, 14.9	500	400	325	3 in	3 in SCH 80
77Y	316 Stainless Steel	0.90	1.08	2.9	8.2, 10, 12	500	400	325	3 in	3 in SCH 80
79Y	316 Stainless Steel	1.01	1.20	2.9	8.2, 10, 12	500	400	325	3 in	3 in SCH 80
81Y	316 Stainless Steel	1.10	1.30	2.9	4.8, 5.9, 7.1	500	400	325	3 in	3 in SCH 80

INSERTION DISTANCE	DESCRIPTION
**	** feet of 316 Stainless Steel cable (10 ft to 50 ft)

PROCESS CONNECTION	DESCRIPTION
	Refer to 'Mechanical Technical Resources' for M/N
	MPT sizes 3 in to 4 in
	Flange sizes 3 in to 8 in, Classes 150, 300

SWITCHING & HOUSING	DESCRIPTION
	Refer to 'Mechanical Technical Resources' for options

OPTIONS	DESCRIPTION
AA	None
HH	120 ACV housing heater
GLC	Ground Level Checker

Notes:
- SPG: Specific Gravity Unit

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer "Additional Resources")

APPLICATION DETAILS:

- Process fluid or material name
- Process fluid or material specific gravity
- Maximum process temperature
- Maximum process pressure

Model 718 • Displacer Switch, Top Inserted, Four Point

Features

- Top inserted
- Four alarm points
- High and/or low alarm
- Single and multiple pump control
- Field-adjustable cable

Description

The Delta Controls **Model 718** Displacer Switch has two alarm points, four switching stations, and two displacers. A precise **On/Off action** occurs in the appropriate switch station when the liquid level surface passes the elevation of the related displacer element. The 718 is **commonly used** to provide a 'High' warning alarm, a 'High-High' shutdown action, a 'Low' warning alarm, and a 'Low-Low' shutdown action. The type service is found in processes where a **heater must not be uncovered** and the tank must not overflow. Another application is emptying a sump using three pumps. Each of the three top displacers starts a pump, the bottom displacer simultaneously stops all three pumps.

Options: The Model 718 Option D utilizes a four-point alarm, three switch stations, and an adjustable differential device. The **lower switch station activates** when the liquid level covers the L2 displacer and stays activated until the liquid level drops below the L1 displacer. The middle switch station activates when the liquid level covers the L3 displacer and stays activated until the liquid level drops below the L2 displacer. The upper switch station activates when the liquid level covers the L4 displacer and **stays activated** until the liquid level drops below the L3 displace.

Model 718

Specifications

Wetted Material:	316 Stainless Steel, carbon steel
Insertion (Below Process Connection):	≤ 50 ft max
Switch Action:	4 alarm point and/or differential
Specific Gravity:	0.75 to 1.20
Temperature Range:	-20 °F to +500 °F (-29 °C to +260 °C)
Pressure Range:	+15 psig to +2200 psig (+1 bar to +151.6 bar)
Threaded Process Connection:	3.0 in to 4.0 in NPT
Flanged Process Connection:	3.0 in to 8.0 in
Flange Rating:	≤ 300 lb ANSI flanges or Grayloc® hub DIN or JIS equivalents
Certifications:	
C SP® US 2476133	Class I, Division 1, Groups B, C and D; Class II, Division 1, Groups E, F and G Class I, Zone 1, Ex d IIB+H2 Class I, Zone 1, AEx d IIB+H2

Model Numbering System

MODEL EXAMPLE	MODEL	-	SENSING ELEMENT	-	INSERTION DISTANCE	-	PROCESS CONNECTION	-	SWITCHING & HOUSING	-	OPTIONS
	718A	-	21Y	-	15	-	3"150RS	-	S1C	-	AA

MODEL	DESCRIPTION
718A	Displacer Switch, Top Inserted, Four Point
718D	Displacer Switch, Top Inserted, Four Point, Differential

SENSING ELEMENT

		Displacer (inches)				WKG psig at °F			Min ANSI Flanged	
M/N	MATERIAL*	MIN SPG	MAX SPG	OD	Length	100	250	450	NPT	NOZZLE
21Y	316 Stainless Steel	0.75	0.85	2.9	7.1, 10, 10, 12	500	400	325	3 in	3 in SCH 80
22Y	316 Stainless Steel	0.80	0.94	2.9	7.1, 10, 10, 12	500	400	325	3 in	3 in SCH 80
23Y	316 Stainless Steel	0.90	1.06	2.9	7.1, 10, 10, 12	500	400	325	3 in	3 in SCH 80
25Y	316 Stainless Steel	1.01	1.20	2.9	5.9, 8.2, 8.1, 10	500	400	325	3 in	3 in SCH 80
64Y	316 Stainless Steel	0.90	1.10	2.9	5.9, 10, 10	500	400	325	3 in	3 in SCH 80
68Y	316 Stainless Steel	1.15	1.45	2.9	4.8, 8.2, 8.2	500	400	325	3 in	3 in SCH 80

INSERTION DISTANCE	DESCRIPTION
**	** feet of 316 Stainless Steel cable (10 ft to 50 ft)

PROCESS CONNECTION	DESCRIPTION
	Refer to 'Mechanical Technical Resources' for M/N
	MPT sizes 3 in to 4 in
	Flange sizes 3 in to 8 in, Classes 150, 300

SWITCHING & HOUSING	DESCRIPTION
	Refer to 'Mechanical Technical Resources'. Only available in options S1C, S2C, S1T, S2T

OPTIONS	DESCRIPTION
AA	None
HH	120 ACV housing heater
GLC	Ground Level Checker

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer "Additional Resources")

APPLICATION DETAILS:

- Process fluid or material name
- Process fluid or material specific gravity
- Maximum process temperature
- Maximum process pressure

Model 735 • Float Switch, Side Inserted, Single Point

Features

- Single alarm point
- Horizontal side inserted float type level switch
- Highly reliable design
- Dual opposed magnets

Description

The Delta Controls **Model 735** Float Switch's small design **easily handles** high pressures and temperatures, and is immune to most heavy vibrations. .

The 735 provides switch action as the liquid moves past a fixed point on the side of the vessel or tank. The float is inserted into the vessel through a **flanged** or **threaded connection**. The vessel connection must be located at the elevation where switch action is to occur.

This type level switch uses a counterbalance principal which allows the use of **smaller, heavy wall floats**. The use of these heavy-duty floats significantly improves the safety and reliability of the switch. The purpose of the counterweight is to offset the extra weight of the heavy-duty float. This results in the element only having to provide enough flotation to operate the **switch magnet**. In addition, the element is smaller, which allows the use of smaller process connections.

A **counterbalanced float** is held in a horizontal position by a pivot mechanism. As the liquid level rises, the float moved upwards. This movement results in a rotary motion of the drive magnet, which carries it into the field of the **switch station magnet**. The switch station magnet is driven against the outside of the sealing tube and the output switch is actuated.

Similarly, as the liquid level falls, the **sensing element** moves downward. The drive magnet is rotated back through the field of the switch station magnet. The switch station magnet is operated, returns to its original position, and the output is deactuated. This **dual opposed magnet design** provides snap action, immunity from vibration, and greatly improves reliability.

Model 735

Specifications

Wetted Material:	304 Stainless Steel, 316 Stainless Steel, Hastelloy® C-276, carbon steel
Switch Action:	Single point alarm
Insertion (From Process Connection):	12 in to 24 in
Specific Gravity:	0.50 to 2.40
Temperature Range:	-85 °F to +1000 °F (-65 °C to +538 °C)
Pressure Range:	-15 psig to +2250 psig (-1 bar to +155.1 bar)
Threaded Process Connection:	1.0 in to 3.0 in
Flanged Process Connection:	2.0 in to 8.0 in
Flange Rating:	≤ 900 lb ANSI flanges or Grayloc® hub DIN or JIS equivalents
Certifications:	
C SP® US 2476133	Class I, Division 1, Groups B, C and D; Class II, Division 1, Groups E, F and G Class I, Zone 1, Ex d IIB+H2 Class I, Zone 1, AEx d IIB+H2

Model Numbering System

MODEL EXAMPLE	MODEL	-	SENSING ELEMENT	-	INSERTION DISTANCE	-	PROCESS CONNECTION	-	SWITCHING & HOUSING	-	OPTIONS
	735	-	VY	-	12	-	2"150RS	-	L1C	-	AA

MODEL	DESCRIPTION
735	Float Switch, Side Inserted, Single Point

SENSING ELEMENT

Sensing Float/Displacer				Min SPG & Insertion Distance		WKG psig at °F			Min ANSI Flanged	
M/N	MATERIAL (**)	OD	LENGTH	SPG	Inches	100	450	750	MPT	NOZZLE
30Y	316 Stainless Steel	1.0	12.0	0.60	15	275	175	155	1 in	N/A
31P	Polypropylene	1.0	12.0	0.60	15	2200	^	^	1 in	N/A
32P	Polypropylene	1.6	7.0	0.60	14	2200	^	^	2 in	2 in SCH 160
VY	316 Stainless Steel	2.0	3.5	0.50	12	375	245	210	2 in	2 in SCH 40
VG	Hastelloy C-276	1.9	3.5	0.75	12	100	65	60	2 in	2 in SCH 80
16Y	316 Stainless Steel	2.5	Ball	0.50	12	860	550	500	2.5 in	3 in SCH 160
Interface Service										
IHY	316 Stainless Steel	5.0	Ball	*	13.5	950	625	550	N/A	6 in SCH 160

INSERTION DISTANCE

Insertion (Inches)	Min SPG at Inches						
M/N	30Y	31P	32P	VY	VG	16Y	IHY
12	N/A	N/A	N/A	0.50	0.75	0.50	N/A
13.5	N/A	N/A	N/A	N/A	N/A	N/A	*
14	N/A	N/A	0.60	N/A	N/A	N/A	N/A
15	0.60	0.60	N/A	N/A	N/A	N/A	N/A
18	N/A	N/A	N/A	0.50	N/A	0.75	N/A
24	N/A	N/A	N/A	0.60	N/A	0.85	N/A

PROCESS CONNECTION	DESCRIPTION
	Refer to 'Mechanical Technical Resources' for M/N
	30Y, 31P only available in 1"MPT
	32P, VY only available in 2"MPT, Flanges 2 in to 8 in, Class 150, 300
	VG requires Hastelloy C-276 process connection

SWITCHING & HOUSING	DESCRIPTION
	Refer to 'Mechanical Technical Resources' for options

OPTIONS	DESCRIPTION
AA	None
HH	120 ACV housing heater

Notes:
- SPG: Specific Gravity Unit
- * Min difference between the SPG of the 2 liquids is 0.10
- Min SPG of the heavier liquid is 0.47
- ^ Max operating temperature is 220 °F
- ** 735-VG has all wetted parts of Hastelloy C-276

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer "Additional Resources")

APPLICATION DETAILS:

- Process fluid or material name*
- Process fluid or material specific gravity
- Maximum process temperature
- Maximum process pressure

*Upper and lower materials required for interface service

Model 740 • Float Switch, Side Inserted, Two Point

Features

- Two alarm points
- Side inserted float switch
- Optional differential
- Barrel tube encased attractor
- Two switch actions occur as the elevation varies

Description

The Delta Controls **Model 740** Float Switch provides two separate alarm points with up to an eight inch spacing between them. The spacing between the **switch points** is controlled by the length of the float insertion and the differential adjustment setting.

The 740 is located on the side of the **vessel** with the float extending into the vessel. The float moves with the surface of the liquid and is carried up and down as the liquid level varies. The attractor is coupled to the float by the linkage and also moves up and down as the level varies. The attractor is located inside of the barrier tube and contacts the process fluid. The **switching stations** are located on the outside of the barrier tube and are isolated from the process fluid. Each switch station contains a magnet whose magnetic lines of force penetrate the **nonmagnetic barrier** and are magnetically attracted to magnetic materials such as the attractor. The magnet is pulled in against the tube as the attractor moves up into its magnetic field. The magnet is connected to an output switch which actuates as the magnet is pulled in against the barrier tube.

Options: The Model 740 Option D uses an adjustable differential device and a single switch station. The float moves down as the **liquid level drops**. This causes the attractor to be moved into the field of the switch station magnet; the magnet is pulled against the sealing tube and the switch is actuated. The switch stays activated until the liquid level rises significantly (an adjustable mount). The attractor is then pulled out of the field of the switch magnet and the switch deactivates. The amount of differential is controlled by the length of the float insertion and the setting of the differential device; up to 16 inch differential is possible. Typical applications include **'Low' alarm** and **'Low-Low' shutdown** for pump protection; control of a pump in a catch tank; and similar services.

Model 740

Specifications

Wetted Material:	304 Stainless Steel, 316 Stainless Steel, carbon steel
Switch Action:	2 points of alarm and/or differential
Insertion (From Process Connection):	12 in to 48 in
Specific Gravity:	0.50 to 2.40
Temperature Range:	-50 °F to +750 °F (-45 °C to +399 °C)
Pressure Range:	-15 psig to +2200 psig (-1 bar to +151.6 bar)
Threaded Process Connection:	3.0 in to 4.0 in NPT
Flanged Process Connection:	3.0 in to 8.0 in
Flange Rating:	≤ 300 lb ANSI flanges or Grayloc® hub DIN or JIS equivalents
Certifications:	
C SP US 2476133	Class I, Division 1, Groups B, C and D; Class II, Division 1, Groups E, F and G Class I, Zone 1, Ex d IIB+H2 Class I, Zone 1, AEx d IIB+H2

Model Numbering System

MODEL EXAMPLE	MODEL	-	SENSING ELEMENT	-	INSERTION DISTANCE	-	PROCESS CONNECTION	-	SWITCHING & HOUSING	-	OPTIONS[1]
	740A	-	TY	-	12	-	3"150RS	-	L1C	-	AA

MODEL	DESCRIPTION
740A	Float Switch, Side Inserted, Two Point
740D	Float Switch, Side Inserted, Two Point, Differential

SENSING ELEMENT

Sensing Float				Min ANSI Process Connection		WKG psig at °F		
M/N	MATERIAL	OD	LENGTH	NPT	Flanged Nozzle	100	450	750
TY	316 Stainless Steel	2.6	7.0	3.0 in*	3 in SCH 160	275	185	155
16Y	316 Stainless Steel	2.5	Ball	3.0 in*	3 in SCH 160	860	560	470
DY	316 Stainless Steel	3.5	Ball	N/A	4 in SCH 120	500	330	275
YY	316 Stainless Steel	3.5	Ball	N/A	4 in SCH 120	1760	1150	970

INSERTION DISTANCE

Insertion (Inches)	Min SPG at Inches				Diff Adj.	
M/N	TY	16Y	DY	YY	Min	Max
12	0.50	0.70	0.60	0.40	2.0	5.0
24	0.50	0.77	0.55	0.73	3.5	8.0
36	0.55	N/A	0.50	N/A	5.0	12.0
48	0.60	N/A	0.55	N/A	7.5	16.0

PROCESS CONNECTION	DESCRIPTION
	Refer to 'Mechanical Technical Resources' for M/N
	MPT sizes 3 in to 4 in
	Flange sizes 3 in to 8 in, Classes 150, 300

SWITCHING & HOUSING	DESCRIPTION
	Refer to 'Mechanical Technical Resources' for options

OPTIONS[1]	DESCRIPTION
AA	None
T6	6 in temperature extension
T12	12 in temperature extension
HH	120 ACV housing heater

Notes:
[1] A hyphen will separate multiple options selected
- 16Y, YY Float not available with 36 and 48 insertion

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer "Additional Resources")

APPLICATION DETAILS:

- Process fluid or material name
- Process fluid or material specific gravity
- Maximum process temperature
- Maximum process pressure

Model 750 • Float Switch, External Cage, Horizontal

Features

- One alarm point
- Small, vertical mounting
- External cage mounted outside of vessel
- Float type leveling switch
- Balanced horizontal element design

Description

The Delta Controls **Model 750** Float Switch utilizes a balanced horizontal element design for point level detection. Model 750 is suitable for **high temperature** and **pressure**. The sensing elements can be made solid for high pressures, better reliability, and corrosion resistance. A float is held in a horizontal position by a counterweight pivot mechanism. As the liquid level rises, the sensing element is moved vertically up. This movement results in short stroke rotary motion which carries the **drive magnet** into the field of the switch station magnet.

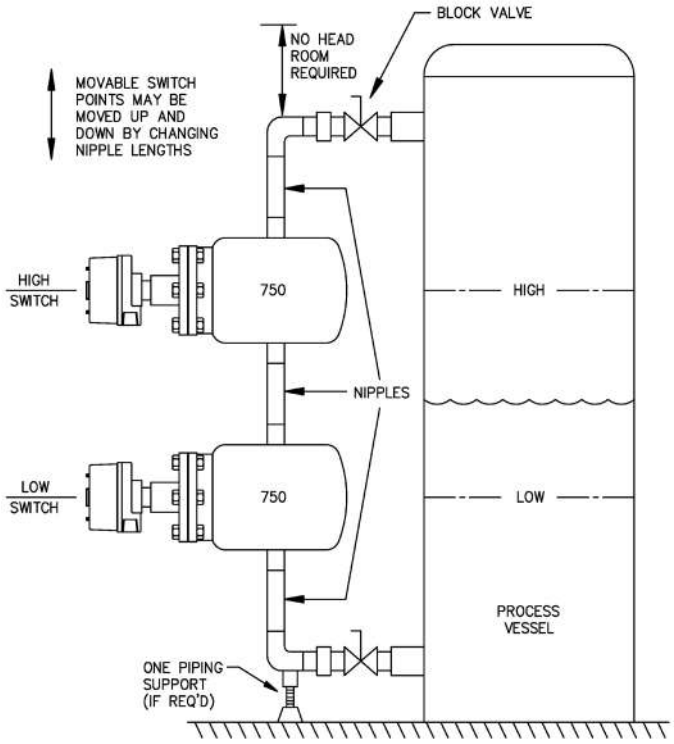
The vertical dimension has a nominal requirement. Its **dual magnet positive switching action** is reliable as well as insensitive to vibration and shock. This modern design has significant advantages over vertically rising float design. The straight through piping is **efficient**, lowers installation costs, and switch point can be set to a new elevation without cutting on the process vessel.

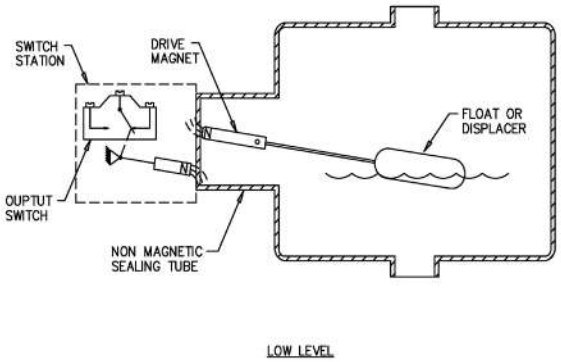
The switch magnet is pushed against the side of the sealing tube and the output switch is actuated. When the liquid level falls, the **sensing element** moves down with it. The drive magnet is rotated back through the magnet fields; the switch magnet is repulsed, the switch returns to its original position, and the output switch deactuates. The dual opposed magnet design provides **snap action** of the switch mechanism; immunity from vibration, and greatly improved reliability.

Model 750

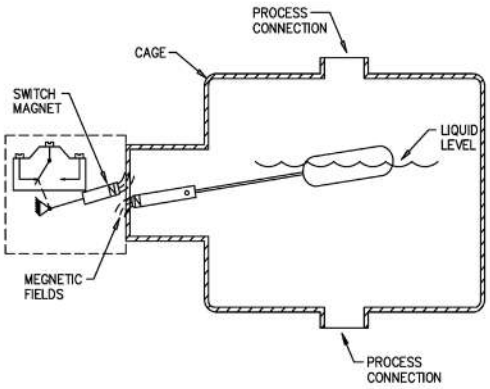
Specifications

Wetted Material:	316 Stainless Steel, carbon steel
Switch Action:	Single point alarm
Specific Gravity:	0.50 to 2.40
Temperature Range:	-200 °F to +1100 °F (-129 °C to +593 °C)
Pressure Range:	-15 psig to +1750 psig (-1 bar to +120.7 bar)
Orientation:	Top/Bottom
Butt or Socket Weld:	1.0 in
Threaded Process Connection:	1.0 in FPT to 2.0 in FPT 1.0 in to 4.0 in MPT
Flanged Process Connection:	1.0 in to 8.0 in
Flange Rating:	≤ 1500 lb ANSI flanges, Grayloc® hub, DIN or JIS equivalents
Certifications:	
C SP® US 2476133	Class I, Division 1, Groups B, C and D; Class II, Division 1, Groups E, F and G Class I, Zone 1, Ex d IIB+H2 Class I, Zone 1, AEx d IIB+H2





LOW LEVEL



HIGH LEVEL

Model 750 • Float Switch, External Cage, Horizontal

Model Numbering System

MODEL EXAMPLE	MODEL	-	SENSING ELEMENT	-	BODY CAGE CONNECTION	-	PROCESS CONNECTION	-	SWITCHING & HOUSING	-	OPTIONS
	750	-	VY	-	W	-	1"150RY	-	L1C	-	AA

MODEL	DESCRIPTION
750	Float Switch, External Cage, Horizontal

SENSING ELEMENT

* Element Assembly				Assembly Working psig at F			
Material							
M/N	FLOAT	CAGE	MIN SPG	100	450	750	1000
VS	316 Stainless Steel	Steel	0.80	375	235	200	85
VY	316 Stainless Steel	316 Stainless Steel	0.80	375	235	200	185
XS	316 Stainless Steel	Steel	0.50	965	630	935	80
XY	316 Stainless Steel	316 Stainless Steel	0.50	720	580	510	475
YS	316 Stainless Steel	Steel	0.40	1750	1100	1060	275
YY	316 Stainless Steel	316 Stainless Steel	0.40	1585	1100	1060	875
Interface Service							
KIS	316 Stainless Steel	Steel	*0.15	400	260	245	200
KIY	316 Stainless Steel	316 Stainless Steel	*0.15	400	260	245	200

BODY CAGE CONNECTION	DESCRIPTION
W	Welded, No flanged cage connection
F	Flanged cage connection

PROCESS CONNECTION	DESCRIPTION
	Refer to 'Mechanical Technical Resources' for M/N
	FPT size 1 in to 2.0 in
	Flange sizes 1 in to 8 in, Class 150 to 1500
	Process connection material must match cage material

SWITCHING & HOUSING	DESCRIPTION
	Refer to 'Mechanical Technical Resources' for options

OPTIONS	DESCRIPTION
AA	None
HH	120 ACV housing heater

Notes:
- SPG: Specific Gravity Unit
- Steel cage is A-106B material, Limited to 800 °F max continous service
- * 'KI' min difference between the SPG of the 2 liquids is 0.15
- Min SPG of the heavier liquid: 0.40

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer "Additional Resources")

APPLICATION DETAILS:

- Process fluid or material name*
- Process fluid or material specific gravity
- Maximum process temperature
- Maximum process pressure

*Upper and lower materials required for interface service

Model 760 • Float Switch, External Cage, Vertical

Features

- Recognized worldwide
- One alarm point
- External cage float mounted outside of vessel
- Available in threaded, socket welded, or flanged process connections
- Simple, yet robust design

Description

The Delta Controls **Model 760** Float Switch is an industry standard. Thousands of units are providing continuous general purpose level detection service with **highly reliable** monitoring of liquid levels and interfaces.

The 760 external cage mounted float actuated switches are used to provide **alarm functions**. These actions are produced in response to a float position as it rides up and down the surface of the process liquid level or interface dividing line. All units are equipped with a guide bushing at the lower end of the stroke rod. This feature keeps the **float** and **attractor mechanism centered** in the cage and prevents the float from dragging on the cage wall. Failures due to dragging, sideways binding, and bent rods have historically been problems with older vertically rising float designs.

The 760 is available with a flanged external cage, which allows access to the float and internal parts for inspection and maintenance. The flange is an ANSI design and usually carries the same pressure rating as the element assembly with higher pressure ratings available. It is available with **standard or special connection configurations**. These include side/bottom, side/side, and side/side/bottom drain. All connections are available either threaded, socket weld, or flanged.

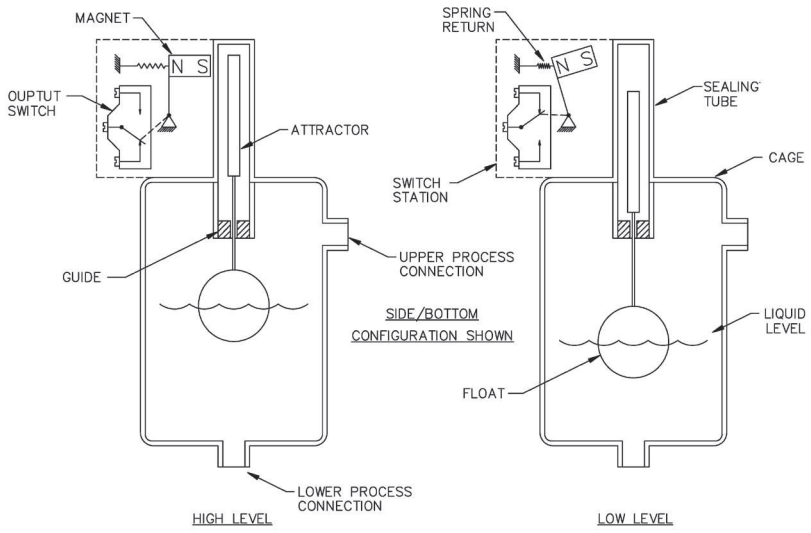
The float inside the cage rests on the surface of the liquid and rides up and down with as the level changes. An attractor is attached to the float and also moves with the liquid level. When the level rises, the attractor is move up into the field of the switch station magnet. The **magnet is free to move** and is pulled in against the side of the nonmagnetic sealing tube. The output switch is actuated by the movement of the magnet. Similarly, when the liquid level falls, the attractor is pulled out of the magnet. The return spring pulls the magnet back to its **original position** and the output switch is deactuated.

Model 760

Specifications

Wetted Material:	304 Stainless Steel, 316 Stainless Steel, carbon steel
Switch Action:	Single point alarm
Specific Gravity:	0.50 to 2.40
Temperature Range:	-100 °F to +800 °F (-73 °C to +427 °C)
Pressure Range:	-15 psig to +20 000 psig (-1 bar to +1378.9 bar)
Optional Drain:	1.0 in NPT
Orientation:	Side/Bottom, Side/Side, Side/Side with Drain
Socket Welded Connection:	1.0 in
Threaded Process Connection:	1.0 in FPT to 2.0 FPT
Flanged Process Connection:	1.0 to 2.0 in
Flange Rating:	≤ 600 lb ANSI flanges or Grayloc® hub DIN or JIS equivalents
Certifications:	
C SP® US 2476133	Class I, Division 1, Groups B, C and D; Class II, Division 1, Groups E, F and G Class I, Zone 1, Ex d IIB+H2 Class I, Zone 1, AEx d IIB+H2

Model 760 • Float Switch, External Cage, Vertical



Model Numbering System

MODEL EXAMPLE	MODEL	-	SENSING ELEMENT	-	BODY CAGE CONNECTION	-	CONNECTION SPACING	-	ORIENTATION	-	PROCESS CONNECTION	-	SWITCHING & HOUSING	-	OPTIONS[1]
	760	-	CZ	-	W	-	B	-	SS	-	1"FPTS	-	L1C	-	AA

MODEL	DESCRIPTION
760	Float Switch, External Cage, Vertical

SENSING ELEMENT

* Element Assembly						
Material				Assembly Working psig at F		
M/N	FLOAT	CAGE	MIN SPG	100	450	750
FS	316 Stainless Steel	Steel	0.80	1320	865	735
FB	316 Stainless Steel	304 Stainless Steel	0.80	875	605	500
FY	316 Stainless Steel	316 Stainless Steel	0.80	875	605	500
CZ	316 Stainless Steel	Steel	0.80	600	500	400
CS	316 Stainless Steel	Steel	0.75	1050	680	595
CB	316 Stainless Steel	304 Stainless Steel	0.75	970	680	535
CY	316 Stainless Steel	316 Stainless Steel	0.75	970	680	535
GS	316 Stainless Steel	Steel	0.70	850	565	485
GB	316 Stainless Steel	304 Stainless Steel	0.70	850	565	500
GY	316 Stainless Steel	316 Stainless Steel	0.70	850	565	500
HS	316 Stainless Steel	Steel	0.60	1170	755	665
HB	316 Stainless Steel	304 Stainless Steel	0.60	730	505	420
HY	316 Stainless Steel	316 Stainless Steel	0.60	730	505	420
LS	316 Stainless Steel	Steel	0.50	470	305	260
LB	316 Stainless Steel	304 Stainless Steel	0.50	470	305	260
LY	316 Stainless Steel	316 Stainless Steel	0.50	470	305	260
Interface Service						
IS	316 Stainless Steel	Steel	^	730	475	400
IB	316 Stainless Steel	304 Stainless Steel	^	730	475	400
IY	316 Stainless Steel	316 Stainless Steel	^	730	475	400

Model Numbering System Cont.

MODEL EXAMPLE	MODEL	-	SENSING ELEMENT	-	BODY CAGE CONNECTION	-	CONNECTION SPACING	-	ORIENTATION	-	PROCESS CONNECTION	-	SWITCHING & HOUSING	-	OPTIONS[1]
	760	-	CZ	-	W	-	B	-	SS	-	1"FPTS	-	L1C	-	AA

BODY CAGE CONNECTION	DESCRIPTION
W	Welded, No flanged cage connection
F	Flanged cage connection

CONNECTION SPACING	DESCRIPTION
B	Basic spacing
C**.*	Custom, **.* in spacing

ORIENTATION	DESCRIPTION
SB	Side/Bottom
SS	Side/Side
SSD	Side/Side plus 1 in bottom drain

PROCESS CONNECTION	DESCRIPTION
	Refer to 'Mechanical Technical Resources' for M/N
	FPT size 1 in to 2.0 in
	Flange sizes 1 in to 2 in, Classes 150, 300, 600
	Socket weld size 1 in
	Process connection material must match cage material

SWITCHING & HOUSING	DESCRIPTION
	Refer to 'Mechanical Technical Resources' for options

OPTIONS[1]	DESCRIPTION
AA	None
T6	6 in temperature extension ('Mechanical Technical Resources' for ratings)
T12	12 in temperature extension ('Mechanical Technical Resources' for ratings)
HH	120 ACV housing heater

Notes:
[1] A hyphen will separate multiple options selected
- SPG: Specific Gravity Unit
- * Steel cage is A-106B carbon steel material: Limit -20 °F
- ^ Min difference between the SPG of the 2 liquid: 0.10

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer "Additional Resources")

APPLICATION DETAILS:

- Process fluid or material name*
- Process fluid or material specific gravity
- Maximum process temperature
- Maximum process pressure

*Upper and lower materials required for interface service

Model 762 • Displacer Switch, External Cage, Vertical, High Pressure

Features

- Mechanical simplicity produces maximum reliability
- Designed in accordance with ANSI B31
- Low specific gravity operation, optional pressure to 20 000 psig
- Interface detection at high pressures
- Insensitive to high frequency vibration
- No seals to leak, magnetically coupled

Description

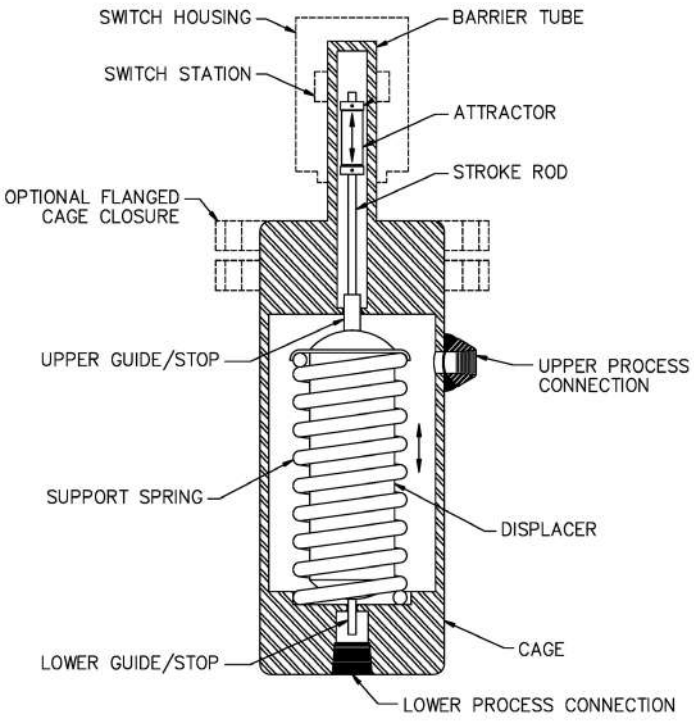
The Delta Controls **Model 762** Displacer Switch provides high temperature and high pressure output switching at one elevation of a varying liquid level. The unit's primary element mounted outside the process vessel. The **external cage design** is utilized to minimize process turbulence effects and so that the level alarm may be valved off from the process vessel. It can then be depressurized for testing and maintenance without disturbing the operation of the process. The output of the unit consists of a switching action at a **preset liquid level elevation**. The liquid level rises and the displacer lifts the attractor in front of the switch station magnet. This external magnet pulls in and the output switch is actuated. Decreasing liquid level moves the displacer assembly downwards. The output switch deactuates when the attractor is pulled out of the switch station's magnetic field.

The switch station is mounted external to the **barrier tube** and is isolated from the process liquid. It is equipped with a magnet whose lines of force pass through the non-magnetic barrier tube. The magnet is pulled in against the outside of the tube and actuates the microswitch(s) when the attractor is lifted into the **magnetic field** inside the tube. This unit utilizes thick wall displacers for sensing elements. The support spring offsets most of the displacer weight so that liquid buoyancy requirements are **minimized**. It is designed for very high pressure services, even those with low specific gravities.

Model 762

Specifications

Wetted Material:	304 Stainless Steel, 316 Stainless Steel, carbon steel
Switch Action:	Single point alarm
Specific Gravity:	0.40 to 2.40
Temperature:	-100 °F to +800 °F (-73 °C to +427 °C)
Pressure:	-15 psig to 20 000 psig (-1 bar to +1400 bar)
Optional Drain:	1.0 in NPT
Orientation:	Side/Bottom, Side/Side, Side/Side/Drain
Socket Welded Process Connection:	1.0 in
Threaded Process Connection:	1.0 in FPT to 2.0 FPT
Flanged Process Connection:	1.0 in to 2.0 in
Flange Rating:	≤ 2500 lb ANSI flanges or Greyloc® hub DIN or JIS equivalents
Certifications:	
C SP® US 2476133	Class I, Division 1, Groups B, C and D; Class II, Division 1, Groups E, F and G Class I, Zone 1, Ex d IIB+H2 Class I, Zone 1, AEx d IIB+H2


SWITCH HOUSING
BARRIER TUBE
SWITCH STATION
ATTRACTOR
STROKE ROD
OPTIONAL FLANGED CAGE CLOSURE
UPPER GUIDE/STOP
UPPER PROCESS CONNECTION
SUPPORT SPRING
DISPLACER
CAGE
LOWER GUIDE/STOP
LOWER PROCESS CONNECTION

Model 762 • Displacer Switch, External Cage, Vertical, High Pressure

Model Numbering System

MODEL EXAMPLE	MODEL	-	SENSING ELEMENT	-	BODY CAGE CONNECTION	-	CONNECTION SPACING	-	ORIENTATION	-	PROCESS CONNECTION	-	SWITCHING & HOUSING	-	OPTIONS
	762	-	17S	-	W	-	B	-	SSD	-	1"FPTS	-	L1C	-	AA

MODEL	DESCRIPTION
762	Displacer Switch, External Cage, Vertical, High Pressure

SENSING ELEMENT

Displacer Sensing Element						
	Material		Min SPG °F		Assembly Working psig at °F	
M/N	ELEMENT	CAGE	215	450	215	450
17S	316 Stainless Steel	Steel	0.60	0.65	1325	1015
17B	316 Stainless Steel	304 Stainless Steel	0.60	0.65	1260	1015
17Y	316 Stainless Steel	316 Stainless Steel	0.60	0.65	1260	1015
19S	316 Stainless Steel	Steel	0.40	0.45	1010	810
19B	316 Stainless Steel	304 Stainless Steel	0.40	0.45	1010	810
19Y	316 Stainless Steel	316 Stainless Steel	0.40	0.45	1010	810
33S	316 Stainless Steel	Steel	0.40	0.50	3000	3000
34S	316 Stainless Steel	Steel	0.40	0.50	4500	4500
35S	316 Stainless Steel	Steel	0.40	0.50	6000	6000
36S	316 Stainless Steel	Steel	0.40	0.50	7500	7500
37S	316 Stainless Steel	Steel	0.40	0.50	10 000	10 000
38S	316 Stainless Steel	Steel	0.40	0.50	20 000	20 000

BODY CAGE CONNECTION	DESCRIPTION
W	Welded, No flanged cage connection
F	Flanged cage connection

CONNECTION SPACING	DESCRIPTION
B	Basic spacing
C**.*	Custom, **.* in spacing

ORIENTATION	DESCRIPTION
SB	Side/Bottom
SS	Side/Side
SSD	Side/Side plus 1 in bottom drain

PROCESS CONNECTION	DESCRIPTION
	Refer to 'Mechanical Technical Resources' for M/N
	FPT size 1 in to 2.0 in
	Flange sizes 1 in to 2 in, Classes 150 to 2500
	Socket weld size 1 in
	Process connection material must match cage material

MODEL EXAMPLE	MODEL	-	SENSING ELEMENT	-	BODY CAGE CONNECTION	-	CONNECTION SPACING	-	ORIENTATION	-	PROCESS CONNECTION	-	SWITCHING & HOUSING	-	OPTIONS
	762	-	17S	-	W	-	B	-	SSD	-	1"FPTS	-	L1C	-	AA

SWITCHING & HOUSING	DESCRIPTION
	Refer to 'Mechanical Technical Resources' for options

OPTIONS	DESCRIPTION
AA	None
HH	120 ACV housing heater

Notes:
- SPG: Specific Gravity Unit
- Note: Units for highter pressure and temperature are optional Contact the factory

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to "Additional Resources")

APPLICATION DETAILS:

- Process fluid or material name
- Process fluid or material specific gravity
- Maximum process temperature
- Maximum process pressure

Model 763 • Float Switch, External Cage, Horizontal, High Temperature and Pressure

Features

- Single alarm point
- High pressure service
- Reliable operation in steam condensate applications
- Simple, robust design

Description

The Delta Controls **Model 763** Float Switch is specially intended for the tough applications found in boiler houses and heating facilities. The 763's are typically used in steam drum level and drip leg services and similar environments.

Various element styles are utilized to produce the most reliable operation under the **specific service conditions**. Dual magnets are standard in all models providing reliable and positive switching. They also make the units immune to the vibration-induced false alarms and shutdowns.

The **763 condensate level switch** produces a switching action when a liquid level passes a selected elevation. The sensing element is mounted in an external cage. An **external cage** is utilized to minimize the effects of turbulence, boiling, and splashing on the measurement. The cage can also be valved off from the process, cooled and depressurized which allows for inspection, testing, maintenance, etc.

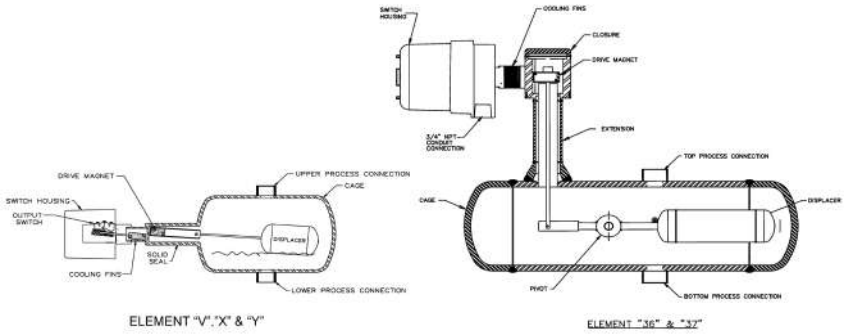
The output signal from the 763 consists of one or more heavy **SPDT dry contacts**. The unit has a strong heavy-wall displacer sensing element. The weight of this element is partially offset by a pivoted counterweight. The displacer net weight is strictly a function of the earth's gravity. Switch action is **unaffected by process temperature** and other variables. This design allows it to work reliably at temperatures in excess of 1500 °F (815 °C).

The 763 is **highly reliable** and operates at high temperatures and pressures. Only a single weight which is kept in position by a pivot shaft, moves. Reliable magnet lines of force penetrate the cage wall and connect up to the output switch.

Model 763

Specifications

Wetted Material:	316 Stainless Steel, carbon steel
Switch Action:	Single point alarm
Specific Gravity:	0.30 to 2.40
Interface Differential:	0.1 min
Temperature:	-350 °F to +1100 °F (-212 °C to +593 °C)
Pressure:	-15 psig to 6000 psig (-1 bar to +414 °C)
Orientation:	Top/Bottom
Threaded Process Connection:	
Flanged Process Connection:	
Butt or Socket Welded Process Connection:	1.0 in
Flange Rating:	
Certifications:	
C SP US 2476133	Class I, Division 1, Groups B, C and D; Class II, Division 1, Groups E, F and G Class I, Zone 1, Ex d IIB+H2 Class I, Zone 1, AEx d IIB+H2



Model Numbering System

MODEL EXAMPLE	MODEL	-	SENSING ELEMENT	-	BODY CAGE CONNECTION	-	PROCESS CONNECTION	-	SWITCHING & HOUSING	-	OPTIONS
	763	-	36S	-	W	-	1"SWS	-	L1C	-	AA

MODEL	DESCRIPTION
763	Float Switch, External Cage, Horizontal, High Temperature and Pressure

SENSING ELEMENT

Min Specific Gravity Limitations for Steam						Working psig at °F Vapor Temperature			
Material			Process Connection Spacing (Inches) **	Service psig* Saturation Steam		A106 Carbon Steel		316 Stainless Steel	
M/N	SENSOR	CAGE		PSI	°F	-20 to +650	+750	+1000	+1150
36S	316 Stainless Steel	Carbon Steel	8.0	2000	636	1800	1550	–	–
36Y	316 Stainless Steel	316 Stainless Steel	8.0	2000	636	–	–	3000	2500
37S	316 Stainless Steel	Carbon Steel	11.9	3000	695	3000	2670	–	–
37Y	316 Stainless Steel	316 Stainless Steel	11.9	3000	695	–	–	3000	2500

BODY CAGE CONNECTION	DESCRIPTION
W	Welded, No flanged cage connection

PROCESS CONNECTION	DESCRIPTION
	Refer to 'Mechanical Technical Resources' for M/N
	Socket welded size 1 in
	Butt welded size 1 in

SWITCHING & HOUSING	DESCRIPTION
	Refer to 'Mechanical Technical Resources' for options

OPTIONS	DESCRIPTION
AA	None
HH	120 ACV housing heater

Notes:
- SPG: Specific Gravity Unit
- Min SPG requirement occurs when presurized steam is at its saturation temperature
- The element is suitable for superheated steam and for higher pressures
- ** Other connection spacing available. Contact factory

REQUIRED ORDERING INFORMATION:
- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer "Additional Resources")

APPLICATION DETAILS:
- Process fluid or material name
- Process fluid or material specific gravity
- Maximum process temperature
- Maximum process pressure

Model 765 • Float Switch, External Cage, Vertical, Two Point

Features

- Exterior barrier tube switch station
- Designed in accordance with ANSI standards
- Low specific gravity operation
- Insensitive to high frequency vibration

Description

The Delta Controls **Model 765** Float Switch has a float differential range of up to 72 inches and utilizes two switch stations. This design **allows both monitoring and shutdown operation** of critical liquid levels with a single control. It can provide a 'High' alarm and a 'High-High' shutdown action with one control unit.

The 765 float inside the cage rests on the surface of the liquid and rides up and down as the level changes. An **attractor** is attached to the float and also moves with the station magnet. When the level rises, the attractor is moved up into the field of the **switch station magnet**. The magnet is free to move and is pulled in against the side of the nonmagnetic sealing tube. The output switch is actuated by the movement of the magnet. If the level continues to rise, the attractor is pushed into the field of the upper switch station magnet and that output switch is actuated.

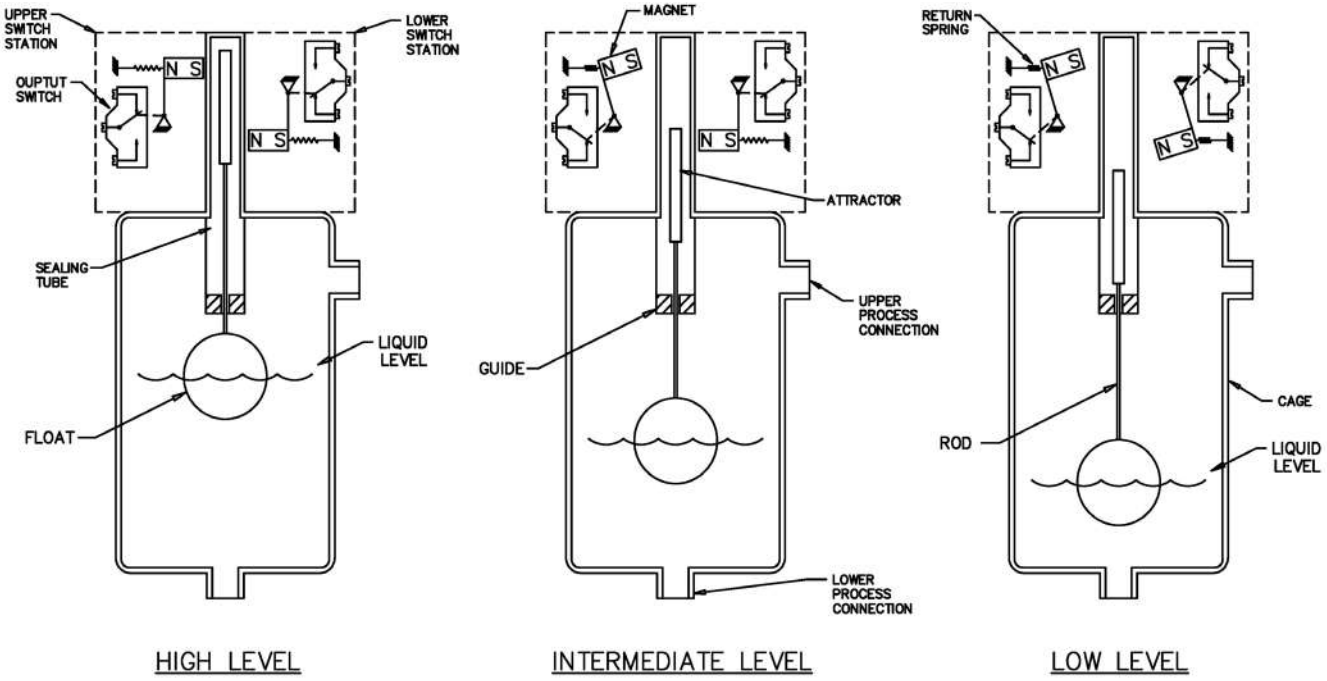
Similarly, when the liquid level falls the attractor is sequentially pulled out of the field of each magnet. The magnet moves back to its **original position** and the output switch is deactuated. Note that extra force (greater specific gravity [SPG]) is required for operating the second switch station.

Option: The Model 765 Option D body, mechanism, and float utilizes a single switching station. The station activates when the sensing float rises to the upper stop and lifts the guide rod attractor into the field of the station magnet. The **station stays activated** until the float moves down against the lower stop. The guide rod-attractor is then pulled down out of the magnetic field and the switch station deactivates. It remains in that condition until the float again rises up against the upper stop and activates the switch.

Model 765

Specifications

Wetted Material:	304 Stainless Steel, 316 Stainless Steel, carbon steel
Switch Action:	2 alarm points and/or differential
Differential:	≤ 72 in (1.83 m)
Specific Gravity:	0.4 to 2.40
Temperature:	-20 °F to +750 °F (-29 °C to +399 °C)
Pressure:	-15 psig to +2200 psig (-1 bar to 151.6 bar)
Optional Drain:	1.0 in NPT
Orientation:	Side/Bottom, Side/Side, Side/Side/Drain
Socket Welded Process Connection:	1.0 in
Threaded Process Connection:	1.0 in FPT to 2.0 in FPT
Flanged Process Connection:	1.0 to 2.0 in
Flange Rating:	≤ 600 lb ANSI 2 in Greyloc® clamp hubs DIN or JIS equivalents
Certifications:	
C SP® US 2476133	Class I, Division 1, Groups B, C and D; Class II, Division 1, Groups E, F and G Class I, Zone 1, Ex d IIB+H2 Class I, Zone 1, AEx d IIB+H2


UPPER SWITCH STATION
LOWER SWITCH STATION
OUPTUT SWITCH
N S
N S
SEALING TUBE
LIQUID LEVEL
FLOAT
HIGH LEVEL
MAGNET
N S
N S
ATTRACTOR
UPPER PROCESS CONNECTION
GUIDE
LOWER PROCESS CONNECTION
INTERMEDIATE LEVEL
RETURN SPRING
N S
N S
CAGE
ROD
LIQUID LEVEL
LOW LEVEL

Model 765 • Float Switch, External Cage, Vertical, Two Point

Model Numbering System

MODEL EXAMPLE	MODEL	-	SENSING ELEMENT	-	BODY CAGE CONNECTION	-	CONNECTION SPACING	-	ORIENTATION	-	PROCESS CONNECTION	-	SWITCHING & HOUSING	-	OPTIONS[1]
	765A	-	DS	-	W	-	B	-	SSD	-	1"FPTS	-	L1C	-	A

MODEL	DESCRIPTION
765A	Float Switch, External Cage, Vertical, Two Point
765D	Float Switch, External Cage, Vertical, Two Point, Differential

SENSING ELEMENT

ES Element Assembly						
Material				Assembly Working psig at F		
M/N	FLOAT	CAGE	MIN SPG	100	450	750
DS	316 Stainless Steel	Steel	0.85	525	350	300
DB	316 Stainless Steel	304 Stainless Steel	0.85	525	350	300
DY	316 Stainless Steel	316 Stainless Steel	0.85	525	350	300
GS	316 Stainless Steel	Steel	0.70	850	565	485
GB	316 Stainless Steel	304 Stainless Steel	0.70	850	565	500
GY	316 Stainless Steel	316 Stainless Steel	0.70	850	565	500
HS	316 Stainless Steel	Steel	0.60	1170	755	665
HB	316 Stainless Steel	304 Stainless Steel	0.60	730	505	420
HY	316 Stainless Steel	316 Stainless Steel	0.60	730	505	420
LS	316 Stainless Steel	Steel	0.50	470	305	260
LB	316 Stainless Steel	304 Stainless Steel	0.50	470	305	260
LY	316 Stainless Steel	316 Stainless Steel	0.50	470	305	260
Interface Service						
IS	316 Stainless Steel	Steel	^	730	475	400
IB	316 Stainless Steel	304 Stainless Steel	^	730	475	400
IY	316 Stainless Steel	316 Stainless Steel	^	730	475	400

BODY CAGE CONNECTION	DESCRIPTION
W	Welded, No flanged cage connection
F	Flanged cage connection

CONNECTION SPACING	DESCRIPTION
B	Basic spacing
C**.*	Custom, **.* in spacing

ORIENTATION	DESCRIPTION
SB	Side/Bottom
SS	Side/Side
SSD	Side/Side plus 1 in bottom drain

MODEL EXAMPLE	MODEL	-	SENSING ELEMENT	-	BODY CAGE CONNECTION	-	CONNECTION SPACING	-	ORIENTATION	-	PROCESS CONNECTION	-	SWITCHING & HOUSING	-	OPTIONS[1]
	765A	-	DS	-	W	-	B	-	SSD	-	1"FPTS	-	L1C	-	A

PROCESS CONNECTION	DESCRIPTION
	Refer to 'Mechanical Technical Resources'for M/N
	FPT size 1 in to 2 in
	Flange sizes 1 in to 2 in, Classes 150, 300, 600
	Socket weld size 1 in
	Process connection material must match cage material

SWITCHING & HOUSING	DESCRIPTION
	Refer to 'Mechanical Technical Resources' for options

OPTIONS[1]	DESCRIPTION
AA	None
T6	6 in temperature extension ('Mechanical Technical Resources' for ratings)
T12	12 in temperature extension ('Mechanical Technical Resources' for ratings)
HH	120 ACV housing heater

Notes:
[1] A hyphen will separate multiple options selected
- SPG: Specific Gravity Unit
- Steel cage: A-106B carbon steel
- ^ Min difference between the SPG of the upper and lower liquids: 0.10

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer "Additional Resources")

APPLICATION DETAILS:

- Process fluid or material name*
- Process fluid or material specific gravity
- Maximum process temperature
- Maximum process pressure

*Upper and lower materials required for interface service

Model 767 • Float Switch, External Cage, Vertical, Two Point, Wide Separation

Features

- 2 alarm points and/or differential
- Two switch point stations
- Vertical mounted between process connections
- Customizable spacing

Description

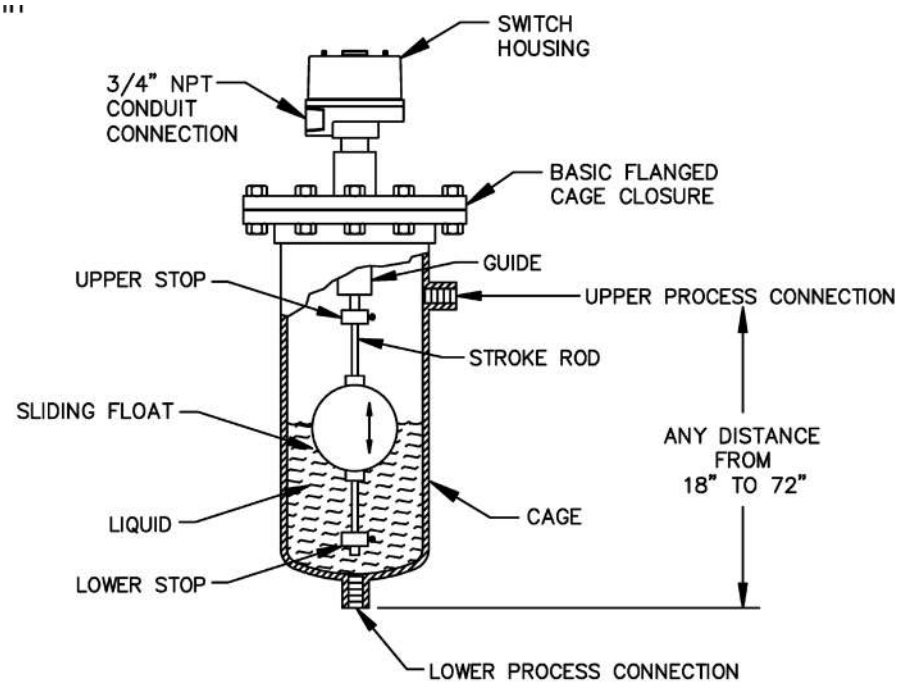
The **Model 767** Float Switch provides two point alarms with from 6 to 72 inches of elevation spacing between the two switching points. The float features an extra wide spacing between the liquid level positions at which switch action occurs. The **wide spacing** is accomplished by allowing the float to slide on the float rod. No switch action occurs as long as the liquid level is varying between stops. The float is carried against a stop when it rises or falls far enough. The float pushes against the stop and **causes switch action to occur**. A counter spring offsets the weight of the attractor, rod, and inner works. The attractor is held in the middle of its travel as long as the liquid supporting the float between stops. The weight of the float pulls the attractor down on low level and its buoyancy lifts it up on high level. Each of these movements produces a switch action. The 767 **provides two switch points** at widely spaced alarm point locations.

Options: The Model 767 Option D utilizes a differential device and one switch station. It provides pumping control between the high and low switching points. The switch magnet is **attracted** and the switch station actuates when the upper stop is lifted by a float. The station stays actuated until the level drops enough for the float to push the lower stop down. The attractor is pulled away from the switch magnet; the switch **deactivates**, and stays that way until the upper stop is lifted again.

Model 767

Specifications

Wetted Material:	304 Stainless Steel, 316 Stainless Steel, carbon steel
Switch Action:	2 alarm points and/or differential
Differential:	≤ 72 in (1.83 m)
Specific Gravity:	0.40 to 2.40
Temperature:	-20 °F to +750 °F (-29 °C to +399 °C)
Pressure:	-15 psig to 2200 psig (-1 bar to +151.7 bar)
Optional Drain:	1.0 in NPT
Orientation:	Side/Bottom, Side/Side, Side/Side/Drain
Socket Welded Process Connection:	1.0 in
Threaded Process Connection:	1.0 in FPT to 2.0 in FPT
Flanged Process Connection:	1.0 to 2.0 in
Flange Rating:	≤ 600 lb ANSI flanges or Grayloc® hub DIN or JIS equivalents
Certifications:	
C SP® US 2476133	Class I, Division 1, Groups B, C and D; Class II, Division 1, Groups E, F and G Class I, Zone 1, Ex d IIB+H2 Class I, Zone 1, AEx d IIB+H2


SWITCH HOUSING
3/4" NPT CONDUIT CONNECTION
BASIC FLANGED CAGE CLOSURE
GUIDE
UPPER STOP
UPPER PROCESS CONNECTION
STROKE ROD
SLIDING FLOAT
ANY DISTANCE FROM 18" TO 72"
CAGE
LIQUID
LOWER STOP
LOWER PROCESS CONNECTION

Model 767 • Float Switch, External Cage, Vertical, Two Point, Wide Separation

Model Numbering System

MODEL EXAMPLE	MODEL	-	SENSING ELEMENT	-	BODY CAGE CONNECTION	-	CONNECTION SPACING	-	ORIENTATION	-	PROCESS CONNECTION	-	SWITCHING & HOUSING	-	OPTIONS
	767A	-	11S	-	F	-	B	-	SSD	-	1"FPTS	-	L1C	-	AA

MODEL	DESCRIPTION
767A	Float Switch, External Cage, Vertical, Two Point, Wide Separation
767D	Float Switch, External Cage, Vertical, Two Point, Wide Separation, Differential

SENSING ELEMENT

* Element Assembly						
Material			Min SPG	Assembly Working psig at F		
M/N	FLOAT	CAGE	A	100	250	450
11S	316 Stainless Steel	Steel	0.60	185	145	120
11B	316 Stainless Steel	304 Stainless Steel	0.60	185	145	120
11Y	316 Stainless Steel	316 Stainless Steel	0.60	185	145	120
12S	316 Stainless Steel	Steel	0.65	450	350	290
12B	316 Stainless Steel	304 Stainless Steel	0.65	450	350	290
12Y	316 Stainless Steel	316 Stainless Steel	0.65	450	350	290
13S	316 Stainless Steel	Steel	0.35	375	295	245
13B	316 Stainless Steel	304 Stainless Steel	0.35	375	295	245
13Y	316 Stainless Steel	316 Stainless Steel	0.35	375	295	245

BODY CAGE CONNECTION	DESCRIPTION
F	Flanged cage connection

CONNECTION SPACING	DESCRIPTION
B	Basic spacing
C**.*	Custom, **.* in spacing

ORIENTATION	DESCRIPTION
SB	Side/Bottom
SS	Side/Side
SSD	Side/Side plus 1 in bottom drain

PROCESS CONNECTION	DESCRIPTION
	Refer to 'Mechanical Technical Resources' for M/N
	FPT size 1 in to 2 in
	Flange sizes 1 in to 2 in, Classes 150, 300, 600
	Socket weld size 1 in
	Process connection material must match cage material

MODEL EXAMPLE	MODEL	-	SENSING ELEMENT	-	BODY CAGE CONNECTION	-	CONNECTION SPACING	-	ORIENTATION	-	PROCESS CONNECTION	-	SWITCHING & HOUSING	-	OPTIONS
	767A	-	11S	-	F	-	B	-	SSD	-	1"FPTS	-	L1C	-	AA

SWITCHING & HOUSING	DESCRIPTION
	Refer to 'Mechanical Technical Resources' for options

OPTIONS	DESCRIPTION
AA	None
HH	120 ACV housing heater

Notes:
- SPG: Specific Gravity Unit
- Steel cage: A-106B carbon steel
- Flanged cleanout rating: Same as cage
- Min SPG: Increased by 6% above 300 °F

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer "Additional Resources")

APPLICATION DETAILS:

- Process fluid or material name
- Process fluid or material specific gravity
- Maximum process temperature
- Maximum process pressure

Model 770 • Float Switch, External Cage, Vertical, Multipoint

Features

- 4 alarm points
- 1 to 3 switch stations
- External cage design with raised ANSI flanged closure, optional
- Wide-ranging differential points available

Description

The Delta Controls **Model 770** Float Switch provides up to four switching alarm contacts at varying liquid levels. The unit features an externally mounted caged float outside the process vessel. This design minimizes process turbulence effects and in order that the level control may be valved off from the process vessel and depressurized for maintenance **without disturbing** the operation of
the process.

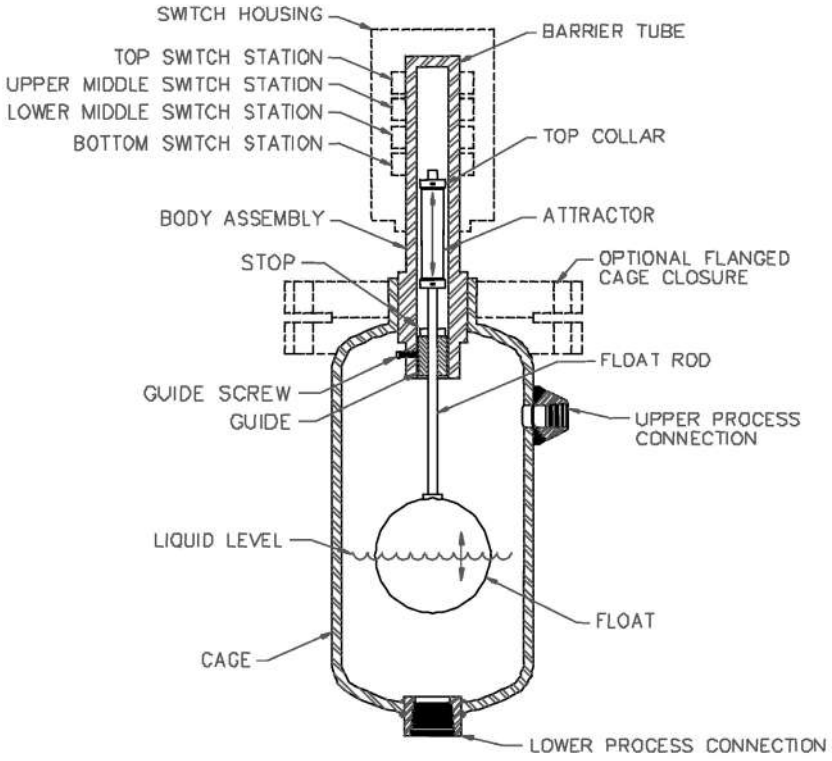
The output of the control consists of **switching action** as the liquid level varies with up to four switch stations operating. Action occurs as the attractor arrives at each switching station. The switch stations are on the outside of the **barrier tube** which isolates them from the process liquid. Each is equipped with a magnet whose lines of force pass through the nonmagnetic barrier tube. The magnet is pulled in against the outside of the tube when the attractor is lifted into the magnetic field inside the tube. The liquid level rises and the float lifts the attractor in front of each switch station magnet. The magnet pulls in and its output switch is actuated. Each magnet pulls in sequentially as the liquid level continues to rise, and stays in as long as the liquid level is above that point. Decreasing liquid level moves the float/rod/collars/attractor downward.

Each output switch remains actuated until the **attractor** is pulled out of its magnetic field—it then deactuates. The 770 is to be mounted vertically near the process vessel containing the liquid level to be monitored. It should be positioned so that the desired switching points are located between the upper and lower process connections on the element body. Long lines connecting the process vessel to the element chamber should be avoided; but when necessary, they should be sloped one inch per foot towards the process vessel to limit sedimentation buildup. The 770 provides switching alarm contacts at **four elevations** of a varying liquid level. The switching alarm points are separated from each other by approximately one and one half inches.

Model 770

Specifications

Wetted Material:	304 Stainless Steel, 316 Stainless Steel, carbon steel
Switch Action:	4 alarm points or 1 to 3 switch stations
Differential:	≤ 72 in (1.83 m)
Specific Gravity:	0.40 to 2.40
Temperature:	-20 °F to +750 °F (-29 °C to +399 °C)
Pressure:	-15 psig to 2200 psig (-1 bar to +151.7 bar)
Optional Drain:	1.0 in NPT
Orientation:	Side/Bottom, Side/Side, Side/Side/Drain
Socket Welded Process Connection:	1.0 in
Threaded Process Connection:	1.0 in FPT to 2.0 in FPT
Flanged Process Connection:	1.0 to 2.0 in
Flange Rating:	≤ 600 lb ANSI flanges or Grayloc® hub DIN or JIS equivalents
Certifications:	
C SP® US 2476133	Class I, Division 1, Groups B, C and D; Class II, Division 1, Groups E, F and G Class I, Zone 1, Ex d IIB+H2 Class I, Zone 1, AEx d IIB+H2


SWITCH HOUSING
TOP SWITCH STATION
UPPER MIDDLE SWITCH STATION
LOWER MIDDLE SWITCH STATION
BOTTOM SWITCH STATION
BODY ASSEMBLY
STOP
GUIDE SCREW
GUIDE
LIQUID LEVEL
CAGE
BARRIER TUBE
TOP COLLAR
ATTRACTOR
OPTIONAL FLANGED CAGE CLOSURE
FLOAT ROD
UPPER PROCESS CONNECTION
FLOAT
LOWER PROCESS CONNECTION

Model 770 • Float Switch, External Cage, Vertical, Multipoint

Model Numbering System

MODEL EXAMPLE	MODEL	-	SENSING ELEMENT	-	BODY CAGE CONNECTION	-	CONNECTION SPACING	-	ORIENTATION	-	PROCESS CONNECTION	-	SWITCHING & HOUSING	-	OPTIONS[1]
	770A	-	HS	-	W	-	B	-	SSD	-	1"FPTS	-	L1C	-	AA

MODEL	DESCRIPTION
770A	Float Switch, External Cage, Vertical, Four Alarm Points
770B	Float Switch, External Cage, Vertical, Three Switch Stations
770C	Float Switch, External Cage, Vertical, Two Switch Stations
770D	Float Switch, External Cage, One Heavy Duty Switch Station
770E	Float Switch, External Cage, Vertical, Two Heavy Duty Switch Stations

SENSING ELEMENT

* Element Assembly								
Material			Min SPG/Suffix			Assembly Working psig at °F		
M/N	FLOAT	CAGE	A & B	C	D	100	450	450
HS	316 Stainless Steel	Steel	0.80	0.72	0.61	470	305	260
HB	316 Stainless Steel	304 Stainless Steel	0.80	0.72	0.61	470	305	260
HY	316 Stainless Steel	316 Stainless Steel	0.80	0.72	0.61	470	305	260
MS	316 Stainless Steel	Steel	0.65	0.58	0.45	475	315	270
MB	316 Stainless Steel	304 Stainless Steel	0.65	0.58	0.45	475	315	270
MY	316 Stainless Steel	316 Stainless Steel	0.65	0.58	0.45	475	315	270
Interface Service								
IS	316 Stainless Steel	Steel	0.55 to 1.5 avg SPG			730	475	400
IB	316 Stainless Steel	304 Stainless Steel	0.18 min differential			730	475	400

BODY CAGE CONNECTION	DESCRIPTION
W	Welded, No flanged cage connection
F	Flanged cage connection

CONNECTION SPACING	DESCRIPTION
B	Basic spacing
C**.*	Custom, **.* in spacing

ORIENTATION	DESCRIPTION
SB	Side/Bottom
SS	Side/Side
SSD	Side/Side plus .75 in bottom drain

PROCESS CONNECTION	DESCRIPTION
	Refer to 'Mechanical Technical Resources' for M/N
	FPT size 1 in to 2 in
	Flange sizes 1 in to 2 in, Classes 150, 300, 600
	Socket weld size 1 in
	Process connection material must match cage material

MODEL EXAMPLE	MODEL	-	SENSING ELEMENT	-	BODY CAGE CONNECTION	-	CONNECTION SPACING	-	ORIENTATION	-	PROCESS CONNECTION	-	SWITCHING & HOUSING	-	OPTIONS[1]
	770A	-	HS	-	W	-	B	-	SSD	-	1"FPTS	-	L1C	-	AA

SWITCHING & HOUSING	DESCRIPTION
	Refer to 'Mechanical Technical Resources' for options
	Only S* switch station available with 770A
	S* switch station not available with 770D, 770E

OPTIONS[1]	DESCRIPTION
AA	None
T6	6 in temperature extension ('Mechanical Technical Resources' for ratings)
T12	12 in temperature extension ('Mechanical Technical Resources' for ratings)
HH	120 ACV housing heater

Notes:

[1] A hyphen will separate multiple options selected

- SPG: Specific Gravity Unit
- Steel cage: A-106B material
- For 316 Stainless Steel cage instead of 304 Stainless Steel: Change 'B' to 'Y'
- Higher temperatures and pressures available: C/F
- Other materials are available: C/F

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer "Additional Resources")

APPLICATION DETAILS:

- Process fluid or material name*
- Process fluid or material specific gravity
- Maximum process temperature
- Maximum process pressure

*Upper and lower materials required for interface service

Mechanical Technical Resources

700 Switch/Housing

SWITCHING & HOUSING	DESCRIPTION	SPDT / DPDT	MICROSWITCH RATING	MICROSWITCH TEMPERATURE RATING	HOUSING RATING	HOUSING MATERIAL
T1C	High temperature	SPDT	5 A at 125/250/480 ACV	-65 °F to 400 °F (-54 *C to 204 °C)	Explosion-proof*	Aluminum
T2C	High temperature	DPDT	5 A at 125/250/480 ACV	-65 °F to 400 °F (-54 °C to 204 °C)	Explosion-proof*	Aluminum
H1C	Environmentally sealed	SPDT	15 A at 125/250/480 ACV	-67 °F to 185 °F (-55 °C to 85 °C)	Explosion-proof*	Aluminum
H2C	Environmentally sealed	DPDT	15 A at 125/250/480 ACV	-67 °F to 185 °F (-55 °C to 85 °C)	Explosion-proof*	Aluminum
L1C	AC motor loads	SPDT	15 A at 125/250/480 ACV	-67 °F to 185 °F (-55 °C to 85 °C)	Explosion-proof*	Aluminum
L2C	AC motor loads	DPDT	15 A at 125/250/480 ACV	-67 °F to 185 °F (-55 °C to 85 °C)	Explosion-proof*	Aluminum
D1C	High DC loads	SPDT	10 A at 125 ACV/DCV	-67 °F to 180 °F (-55 °C to 82 °C)	Explosion-proof*	Aluminum
D2C	High DC loads	DPDT	10 A at 125 ACV/DCV	-67 °F to 180 °F (-55 °C to 82 °C)	Explosion-proof*	Aluminum
T1T	High temperature	SPDT	5 A at 125/250/480 ACV	-65 °F to 400 °F (-54 °C to 204 °C)	Explosion-proof*	300 Stainless Steel
T2T	High temperature	DPDT	5 A at 125/250/480 ACV	-65 °F to 400 °F (-54 °C to 204 °C)	Explosion-proof*	300 Stainless Steel
H1T	Environmentally sealed	SPDT	15 A at 125/250/480 ACV	-67 °F to 185 °F (-55 °C to 85 °C)	Explosion-proof*	300 Stainless Steel
H2T	Environmentally sealed	DPDT	15 A at 125/250/480 ACV	-67 °F to 185 °F (-55 °C to 85 °C)	Explosion-proof*	300 Stainless Steel
L1T	AC motor loads	SPDT	15 A at 125/250/480 ACV	-67 °F to 185 °F (-55 °C to 85 °C)	Explosion-proof*	300 Stainless Steel
L2T	AC motor loads	DPDT	15 A at 125/250/480 ACV	-67 °F to 185 °F (-55 °C to 85 °C)	Explosion-proof*	300 Stainless Steel
D1T	High DC loads	SPDT	10 A at 125 ACV/DCV	-67 °F to 180 °F (-55 °C to 82 °C)	Explosion-proof*	300 Stainless Steel
D2T	High DC loads	DPDT	10 A at 125 ACV/DCV	-67 °F to 180 °F (-55 °C to 82 °C)	Explosion-proof*	300 Stainless Steel
S1C	General use	SPDT	5 A at 125/250/480 ACV	-65 °F to 250 °F (-54 °C to 121 °C)	Explosion-proof*	Aluminum
S2C	General use	DPDT	5 A at 125/250/480 ACV	-65 °F to 250 °F (-54 °C to 121 °C)	Explosion-proof*	Aluminum
S1T	General use	SPDT	5 A at 125/250/480 ACV	-65 °F to 250 °F (-54 °C to 121 °C)	Explosion-proof*	300 Stainless Steel
S2T	General use	DPDT	5 A at 125/250/480 ACV	-65 °F to 250 °F (-54 °C to 121 °C)	Explosion-proof*	300 Stainless Steel

Notes:
- * CSA Rating
- Housing types ‘C’ and ‘T’
- Cl I Div 1, Gr B,C,D; Cl II, Div 1 Gr E,F,G; CL III Div 1
- Class I Zone 1, Ex/AEx d IIB+H2
- General use

Optional Temperature Extension

		Max process temperature (°F)					
		Condensing service			Noncondensing service		
M/N	DESCRIPTION	D	S,L,H	T	D	S,L,H	T
AA	None	400	500	750	500	600	850
T6	6 in	500	575	950	600	700	1100
T12	12 in	600	650	1250	800	925	1500

700 Process Connections

M/N	SIZE	TYPE	MATERIAL
1”FPTS	1 in	FPT	Carbon Steel
2"FPTS	2 in	FPT	Carbon Steel
1"MPTS	1 in	MPT	Carbon Steel
2"MPTS	2 in	MPT	Carbon Steel
2.5"MPTS	2.5 in	MPT	Carbon Steel
3”MPTS	3 in	MPT	Carbon Steel
4"MPTS	4 in	MPT	Carbon Steel
1"150RS	1 in	Class 150 raised face flange	Carbon Steel
1"300RS	1 in	Class 300 raised face flange	Carbon Steel
1"600RS	1 in	Class 600 raised face flange	Carbon Steel
1"900RS	1 in	Class 900 raised face flange	Carbon Steel
1"1500RS	1 in	Class 1500 raised face flange	Carbon Steel
1"2500RS	1 in	Class 2500 raised face flange	Carbon Steel
2"150RS	2 in	Class 150 raised face flange	Carbon Steel
2"300RS	2 in	Class 300 raised face flange	Carbon Steel
2"600RS	2in	Class 600 raised face flange	Carbon Steel
2"900RS	2in	Class 900 raised face flange	Carbon Steel
2"1500RS	2in	Class 1500 raised face flange	Carbon Steel
2"2500RS	2in	Class 2500 raised face flange	Carbon Steel
3”150RS	3 in	Class 150 raised face flange	Carbon Steel
3"300RS	3 in	Class 300 raised face flange	Carbon Steel
4”150RS	4 in	Class 150 raised face flange	Carbon Steel
4”300RS	4 in	Class 300 raised face flange	Carbon Steel
6”150RS	6 in	Class 150 raised face flange	Carbon Steel
6”300RS	6 in	Class 300 raised face flange	Carbon Steel
8”150RS	8 in	Class 150 raised face flange	Carbon Steel
8”300RS	8 in	Class 300 raised face flange	Carbon Steel
1"SWS	1 in	Socket weld	Carbon Steel
1"BWS	1 in	Butt weld	Carbon Steel

M/N	SIZE	TYPE	MATERIAL
1”FPTY	1 in	FPT	316 Stainless Steel
2"FPTY	2 in	FPT	316 Stainless Steel
1"MPTY	1 in	MPT	316 Stainless Steel
2"MPTY	2 in	MPT	316 Stainless Steel
2.5"MPTY	2.5 in	MPT	316 Stainless Steel
3”MPTY	3 in	MPT	316 Stainless Steel
4"MPTY	4 in	MPT	316 Stainless Steel
1"150RY	1 in	Class 150 raised face flange	316 Stainless Steel
1"300RY	1 in	Class 300 raised face flange	316 Stainless Steel
1"600RY	1 in	Class 600 raised face flange	316 Stainless Steel
1"900RY	1 in	Class 900 raised face flange	316 Stainless Steel
1"1500RY	1 in	Class 1500 raised face flange	316 Stainless Steel
1"2500RY	1 in	Class 2500 raised face flange	316 Stainless Steel
2"150RY	2 in	Class 150 raised face flange	316 Stainless Steel
2"300RY	2 in	Class 300 raised face flange	316 Stainless Steel
2"600RY	2in	Class 600 raised face flange	316 Stainless Steel
2"900RY	2in	Class 900 raised face flange	316 Stainless Steel
2"1500RY	2in	Class 1500 raised face flange	316 Stainless Steel
2"2500RY	2in	Class 2500 raised face flange	316 Stainless Steel
3”150RY	3 in	Class 150 raised face flange	316 Stainless Steel
3"300RY	3 in	Class 300 raised face flange	316 Stainless Steel
4”150RY	4 in	Class 150 raised face flange	316 Stainless Steel
4”300RY	4 in	Class 300 raised face flange	316 Stainless Steel
6”150RY	6 in	Class 150 raised face flange	316 Stainless Steel
6”300RY	6 in	Class 300 raised face flange	316 Stainless Steel
8”150RY	8 in	Class 150 raised face flange	316 Stainless Steel
8”300RY	8 in	Class 300 raised face flange	316 Stainless Steel
1"SWY	1 in	Socket weld	316 Stainless Steel
1"BWY	1 in	Butt weld	316 Stainless Steel

M/N	SIZE	TYPE	MATERIAL
1”FPTB	1 in	FPT	304 Stainless Steel
2"FPTB	2 in	FPT	304 Stainless Steel
1"MPTB	1 in	MPT	304 Stainless Steel
2"MPTB	2 in	MPT	304 Stainless Steel
2.5"MPTB	2.5 in	MPT	304 Stainless Steel
3”MPTB	3 in	MPT	304 Stainless Steel
4"MPTB	4 in	MPT	304 Stainless Steel
1"150RB	1 in	Class 150 raised face flange	304 Stainless Steel
1"300RB	1 in	Class 300 raised face flange	304 Stainless Steel
1"600RB	1 in	Class 600 raised face flange	304 Stainless Steel
2"150RB	2 in	Class 150 raised face flange	304 Stainless Steel
2"300RB	2 in	Class 300 raised face flange	304 Stainless Steel
2"600RB	2 in	Class 600 raised face flange	304 Stainless Steel

M/N	SIZE	TYPE	MATERIAL
3”150RB	3 in	Class 150 raised face flange	304 Stainless Steel
3"300RB	3 in	Class 300 raised face flange	304 Stainless Steel
4”150RB	4 in	Class 150 raised face flange	304 Stainless Steel
4”300RB	4 in	Class 300 raised face flange	304 Stainless Steel
6”150RB	6 in	Class 150 raised face flange	304 Stainless Steel
6”300RB	6 in	Class 300 raised face flange	304 Stainless Steel
8”150RB	8 in	Class 150 raised face flange	304 Stainless Steel
8”300RB	8 in	Class 300 raised face flange	304 Stainless Steel

Tilt Series

*Tilt switches for a **variety** of applications.*

Tilt Series

Reliable Tilt Level Detection

The Delta Controls tilt series has provided decades of accurate level detection in a variety of industries including mining, agriculture, and others. Available in six different probe styles and materials of stainless steel, Kynar®, and polyurethane, the Series 60 probes offer a level detection solution to a wide range of applications.

Theory of Operation

Tilt switches detect the presence or absence of material at the probe's elevation. The arriving material pushes the lower end of the hanging probe to one side. An internal drop of liquid acts as a tilt sensor and signals when the probes moves to an angle of 15° away from vertical. The output relay energizes if the probe remains vertical for the preset time period.

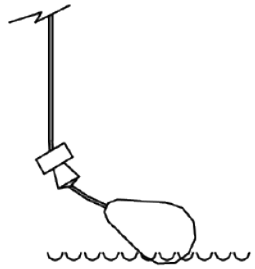
Tilt Level Detection

60 Series, Tilt Probes **216**

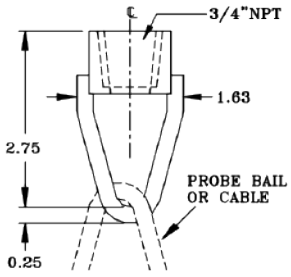
Additional Options

Weight
The 'WT' option provides a 6 pound, 1.5 inch outside diameter weight on the bottom termination to reduce probe movement.

Hanger
The optional 'HB' stainless steel hanger offers a 0.75 inch FPT pipe mounted hanger to support all bail or cable support probes.



'WT' Weight Option



'HB' Hanger Option

Tilt Probes

Tilt probes are available in 316 Stainless Steel, Kynar®, and polyurethane materials. The probe offerings include designs for use with general purpose solids, moving solids, heavy duty solids, low density solids, slurries, and liquids.

Series 60 Probes • Tilt Probes

Features

- Easy installation
- Rugged and reliable
- Long life probe cable
- Probes available for solids, liquids, powders, and slurries

Description

The Delta Controls **Series 60 Tilt Probes** are designed for use with liquids, lump, granulated, or powdered solids. Slurries and liquids vary from extremely heavy and viscous to thin and watery. Stainless steel bail material is basic and suitable for most services. All-stainless probes are ideal when area is wet or corrosive while polished all-stainless probes are required for **3**A sanitary services.

Model 60 is a general purpose sensor for most level detecting jobs.

Model 61 paddle end probe is ideal for most moving material detection needs. The large sensing area provides high sensitivity and is less affected by voids.

Model 62 heavy duty rod probe is best for solids and uses a stainless steel body.

Model 63 is usually required when the material is an aerated powder or has a low density.

Models 64 and 66 are normally used with clean, light slurries, and liquids with entrained solids. Model 64 features a float while Model 66 features a cable suspended tilting float.

Model 65 works well on heavy slurries and is cable suspended.

Option 'HB' stainless steel hanger should be considered for cable suspended probes without bails, such as Models 65 and 66, when surface choppiness, ripples, or roiling are present. Option 'HB' can be connected to support pipe for fixed location mounting.

Model 60 with HB option

Specifications

Tilt Sensor:	1 A rating Liquid drop inside a welded steel chamber
Tilt Angle Sensed:	15° from vertical in any direction, no additional action occurs during a global probe tilt
Temperature Limits:	-40 °F to +220 °F (-40 °C to +104 °C)
Wetted Materials:	Stainless steel, nylon, PVC, Kynar®
Probe Cable:	Oil resistant rubber insulation and jacket, flexible 41 x 34 stranded copper, 18 gauge

Model Numbering System

MODEL EXAMPLE	MODEL	-	CABLE LENGTH	-	OPTIONS[1]
	60	-	30.0	-	HB

MODEL	DESCRIPTION
60	Tilt Probe, General Purpose Rod, For Solids, Stainless Steel Body
61	Tilt Probe, Paddle End For Moving Solids, Stainless Steel Body
62	Tilt Probe, Heavy Duty Rod For Solids, Stainless Steel Body
63	Tilt Probe, Nylon Rod For Low Density Solids, Stainless Steel Body
64	Tilt Probe, Float For Light Slurries And Liquids, Stainless Steel Body
65	Tilt Probe, Buoyant Rod For Slurries, Kynar® Body
66	Tilt Probe, Tilting Float For Liquids, Polyurethane Body

CABLE LENGTH	DESCRIPTION
**.*	**.* in of rubber outer jacketed cable (2000 ft max)

OPTIONS[1]	DESCRIPTION
AA	None
WT	1.5 in O.D. weight on bottom termination
HB	Stainless steel hanger

Notes:
[1] A hyphen will separate multiple options selected

REQUIRED ORDERING INFORMATION:

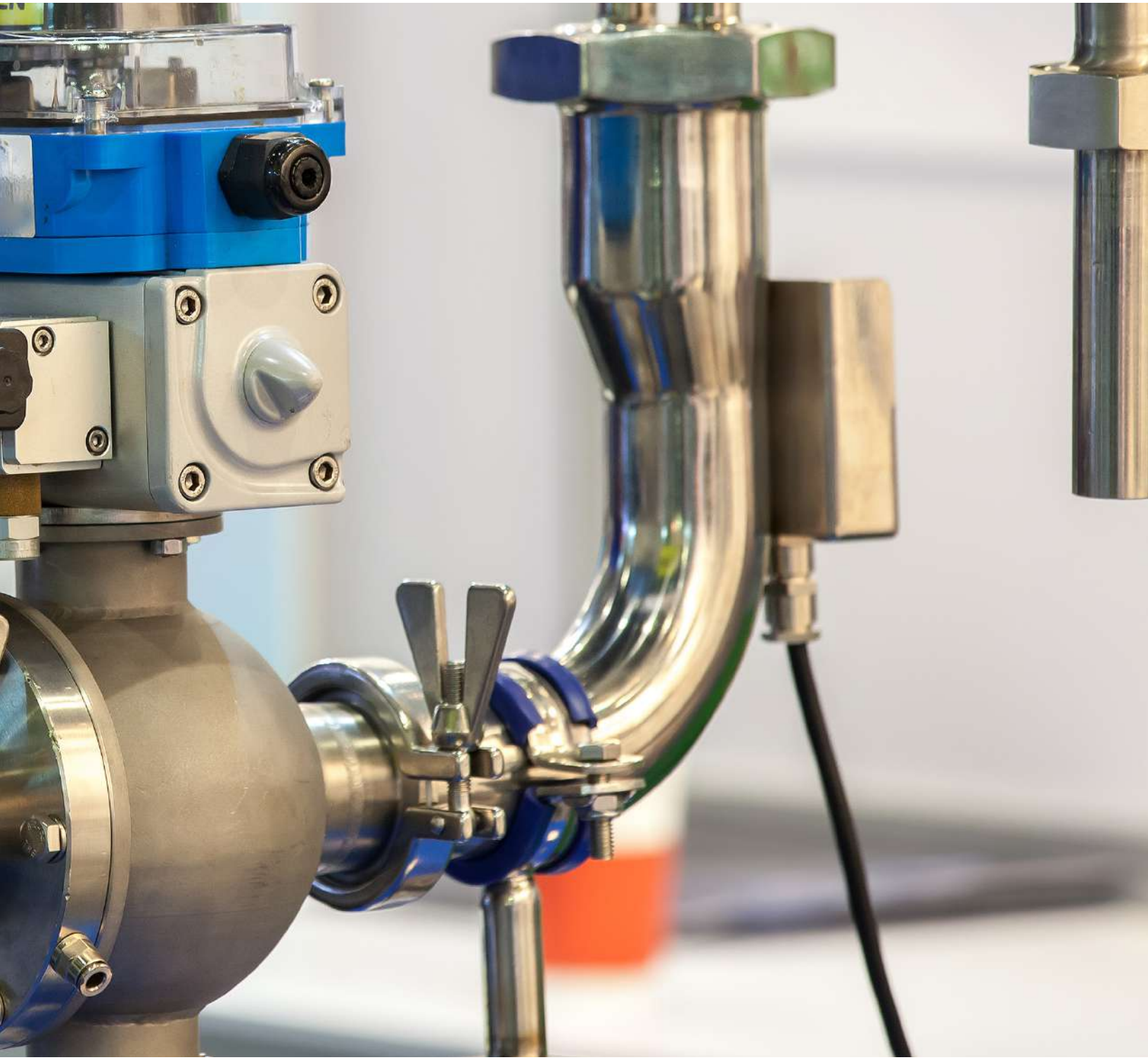
- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing package available upon request

APPLICATION DETAILS:

- Process fluid or material name
- Process fluid or material specific gravity
- Maximum process temperature
- Maximum process pressure

Flow Series

***Engineered** flow instruments.*



Flow Series

An Engineered Flow Detection Solution

Delta Controls' flow products provide custom engineered solutions for pipelines of various configurations. Designed for the detection of flow, each instrument is manufactured to the exacting specification of the pipeline size, schedule, position, angle, process connection, nozzle height, and more. Delta's flow products are also engineered to accommodate the needs of each application's process properties such as material specific gravity, viscosity, temperature, and pipeline pressure. Offering both paddle and electronic types, Delta's instruments are built to withstand the rigorous demands of today's flow applications.

Engineered Flow Instruments

Theory of Operation

Flow Switches
A pivoted paddle extends down into the flowing stream. The flowing fluid creates a force as it strikes a paddle. For piston actuated models, the fluid flows through a restricted nozzle and impinges a paddle. At a predetermined velocity, the force causes the paddle and the attractor to rotate around the pivot point. The magnet reacts to the new attractor position and the output switch operates. As the flow decreases, the paddle rotates back to its original position, and the output switch returns to its original position.

Material Detector
A sensor extends down into the pipeline. The nature of the process fluid is determined as a function of the effect that the fluid has on a high frequency signal impressed on the sensing probe. Adjustable setpoints operate output signaling relays or the optional 4-20 mA output.

Housings & Options

Housings

4X Housing

7X Housing

Options

Vertical Upflow
The 'VU' option allows paddle operation in vertical installations; factory adjustment increases minimum setpoint by 20 percent.

Terminal Strip
The 'TS' option provides a terminal strip located in the housing instead standard flying leads. The 'TSG' option provides a gold plated terminal block.

Blanking Flange
The 'BF' option provides a blanking flange constructed that affixes to the switch body in case the switch insert is removed for an extended period.

Model 621 • Flow Switch, Inline Body

Features

- Highly reliable magnetic design
- Notifies user of flow or lack of flow
- Multiple process connection sizes available
- Full bore body
- Built to ANSI, ASME, and PED specifications

Description

The Delta Controls **Model 621** Flow Switch is equipped with inside body dimensions and end connections that conform to the pipeline. The 621 is built to ANSI, ASME, and PED specifications. These switches protect pumps, blowers, heat exchangers, etc. The paddle **magnetically** connects to the output switch. A heavy-duty solid sealing tube separates the process fluid from the switch mechanism. Failures due to seal, diaphragm, and bellows leaks are eliminated.

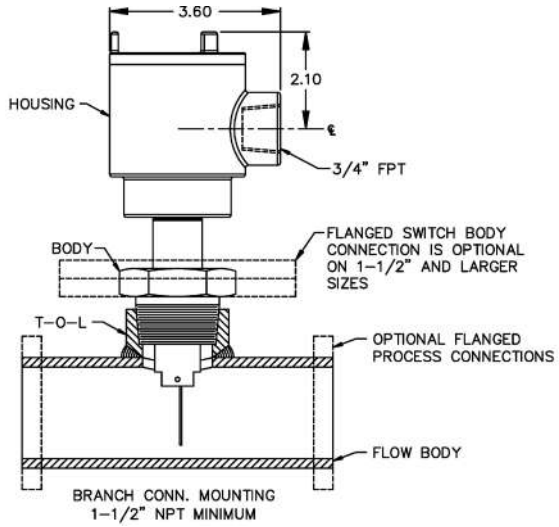
Model 621 are **factory calibrated** to standard or custom setpoints. An internal adjustment allows small switch point changes in the field.

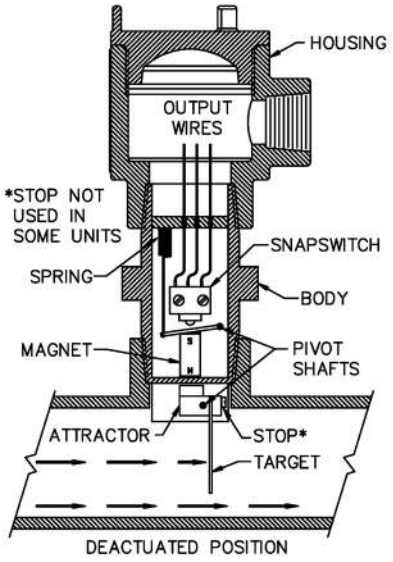
A **pivoted paddle** extends into the flowing stream creating force as it strikes the paddle. At a predetermined velocity, the force causes the paddle and the attractor to rotate about the pivot point. The magnet reacts to the new attractor position and the output switch operates. As the flow decreases, the paddle and output switch return to the original states.

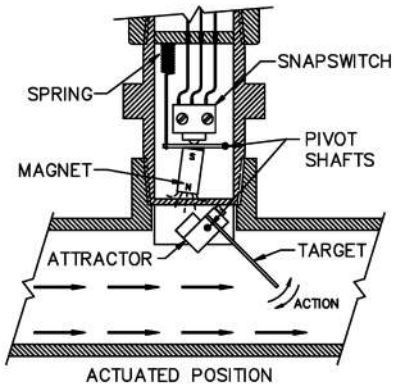
Model 621

Specifications

Style:	Inline
Type:	Paddle
Temperature:	-4 °F to +400 °F (-20 °C to +204 °C)
Pressure:	≤ +2000 psi (≤ +137.9 bar)
Actuation:	≥ 1.6 gpm (6.0 L/min)
Deactuation:	≥ 1.3 gpm (4.9 L/min)
Accuracy:	≤ 10%
Output:	SPDT or DPDT, 5 A
Wetted Material:	300 Stainless Steel, 400 Stainless Steel, brass, carbon steel (other materials available)
Housing:	Stainless steel, aluminum
Threaded Process Connection:	0.5 in to 4.0 in FPT
Flanged Process Connection:	0.5 in to 4.0 in
Flange Rating:	Rating: ≤ 150 lb
Certifications:	
Stainless Steel Housing Option Only	Third Party Listed by CSA NRTL/C (USA and Canada)


3.60
2.10
HOUSING
3/4" FPT
BODY
FLANGED SWITCH BODY CONNECTION IS OPTIONAL ON 1-1/2" AND LARGER SIZES
T-O-L
OPTIONAL FLANGED PROCESS CONNECTIONS
FLOW BODY
BRANCH CONN. MOUNTING 1-1/2" NPT MINIMUM


HOUSING
OUTPUT WIRES
*STOP NOT USED IN SOME UNITS
SNAPSWITCH
SPRING
BODY
MAGNET
PIVOT SHAFTS
ATTRACTOR
STOP*
TARGET
DEACTUATED POSITION


SNAPSWITCH
SPRING
PIVOT SHAFTS
MAGNET
ATTRACTOR
TARGET
ACTION
ACTUATED POSITION

Model 621 • Flow Switch, Inline Body

Model Numbering System

MODEL EXAMPLE	MODEL	-	WETTED MATERIAL[2]	-	OUTPUT SWITCH[3]	-	PROCESS CONNECTION	-	OPTIONS[1]
	621	-	YCY	-	A	-	1"FPTY	-	AA

MODEL	DESCRIPTION
621	Flow Switch, Inline Body

WETTED MATERIAL[2,3]	BODY	TRIM	PADDLE
LCY	Brass	Stainless steel	316 Stainless Steel[2]
SCY	Carbon Steel	Stainless steel	316 Stainless Steel[2]
YCY	316 Stainless Steel	Stainless steel	316 Stainless Steel[2]
YYY	316 Stainless Steel[2]	316 Stainless Steel[2]	316 Stainless Steel[3]

OUTPUT SWITCH[3]	DESCRIPTION
A	General purpose, SPDT, 5 A, +220 °F max
B	High temperature, SPDT, 5 A, +450 °F max
C	General purpose, DPDT, 5 A, +220 °F max[3]
H	High temperature, DPDT, 5 A, +450 °F max[3]

PROCESS CONNECTION	DESCRIPTION	AVAILABLE TYPES
0.5"FPTL	0.5 in FPT, Brass	LCY
0.75"FPTL	0.75 in FPT, Brass	LCY
1"FPTL	1 in FPT, Brass	LCY
1.5"FPTL	1.5 in FPT, Brass	LCY
2"FPTL	2 in FPT, Brass	LCY
2.5"FPTL	2.5 in FPT, Brass	LCY
3"FPTL	3 in FPT, Brass	LCY
4"FPTL	4 in FPT, Brass	LCY
0.5"FPTS	0.5 in FPT, Carbon steel	SCY
0.75"FPTS	0.75 in FPT, Carbon steel	SCY
1"FPTS	1 in FPT, Carbon steel	SCY
1.25"FPTS	1.25 in FPT, Carbon steel	SCY
1.5"FPTS	1.5 in FPT, Carbon steel	SCY
2"FPTS	2 in FPT, Carbon steel	SCY
2.5"FPTS	2.5 in FPT, Carbon steel	SCY
3"FPTS	3 in FPT, Carbon steel	SCY
4"FPTS	4 in FPT, Carbon steel	SCY
0.5"150RS	0.5 in Class 150 raised face flange, Carbon steel	SCY
0.75"150RS	0.75 in Class 150 raised face flange, Carbon steel	SCY
1"150RS	1 in Class 150 raised face flange, Carbon steel	SCY
1.5"150RS	1.5 in Class 150 raised face flange, Carbon steel	SCY
2"150RS	2 in Class 150 raised face flange, Carbon steel	SCY
2.5"150RS	2.5 in Class 150 raised face flange, Carbon steel	SCY
3"150RS	3 in Class 150 raised face flange, Carbon steel	SCY
4"150RS	4 in Class 150 raised face flange, Carbon steel	SCY

(continued on following page)

MODEL EXAMPLE	MODEL	-	WETTED MATERIAL	-	OUTPUT SWITCH[3]	-	PROCESS CONNECTION	-	OPTIONS[1]
	621	-	YCY	-	A	-	1"FPTY	-	AA

(continued from previous page)

PROCESS CONNECTION	DESCRIPTION	AVAILABLE TYPES
0.5”FPTY	0.5 in FPT, 316 Stainless Steel	YCY, YYY
0.75”FPTY	0.75 in FPT, 316 Stainless Steel	YCY, YYY
1”FPTY	1 in FPT, 316 Stainless Steel	YCY, YYY
1.5”FPTY	1.5 in FPT, 316 Stainless Steel	YCY, YYY
2”FPTY	2 in FPT, 316 Stainless Steel	YCY, YYY
2.5”FPTY	2.5 in FPT, 316 Stainless Steel	YCY, YYY
3”FPTY	3 in FPT, 316 Stainless Steel	YCY, YYY
4”FPTY	4 in FPT, 316 Stainless Steel	YCY, YYY
0.5”150RY	0.5 in Class 150 raised face flange, 316 Stainless Steel	YCY, YYY
0.75”150RY	0.75 in Class 150 raised face flange, 316 Stainless Steel	YCY, YYY
1"150RY	1 in Class 150 raised face flange, 316 Stainless Steel	YCY, YYY
1.5"150RY	1.5 in Class 150 raised face flange, 316 Stainless Steel	YCY, YYY
2"150RY	2 in Class 150 raised face flange, 316 Stainless Steel	YCY, YYY
2.5"150RY	2.5 in Class 150 raised face flange, 316 Stainless Steel	YCY, YYY
3"150RY	3 in Class 150 raised face flange, 316 Stainless Steel	YCY, YYY
4"150RY	4 in Class 150 raised face flange, 316 Stainless Steel	YCY, YYY

OPTIONS[1]	DESCRIPTION
AA	None
CS	Custom flow setpoint
VU	Vertical upflow (increases minimum set point by 20%)
SH	Stainless steel housing
TS	Terminal strip

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Detailed application number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to the Additional Resources section)

Notes:

[1] A hyphen will separate multiple options selected

[2a] LCY, SCY, & YCY with process connections less than 1.5 in utilize 300 Stainless Steel trim & paddle

[2b] LCY, SCY, & YCY with process connections 1.5 in or larger utilize 400 Stainless Steel trim & 316 Stainless Steel paddle

[3] YYY only available with 1.5 in or larger process connections

[4] C and H switches not available with YYY

Model 621 • Flow Switch, Inline Body

Application Number

Installation details are required to ensure proper operation of the flow switch.

APPLICATION EXAMPLE

MODEL	-	SWITCH POINT	-	SWITCH ACTION	-	ORIENTATION	-	MAXIMUM PRESSURE	-	PIPELINE I.D. [1]	-	SPECIFIC GRAVITY	-	VISCOSITY	-	MATERIAL	-	NORMAL FLOW	-	MAXIMUM FLOW
621	-	A	-	N	-	H	-	100	-	1.6	-	1.0	-	1.0	-	Water	-	18	-	25

MODEL

621

SWITCH POINT	DESCRIPTION
*	Switch Point letter as denoted in Water / Air Table
**.*	**.* gpm of desired switch point

SWITCH ACTION	DESCRIPTION
D	Deactivate on decreasing flow
N	Actuate on increasing flow

ORIENTATION	DESCRIPTION
H	Horizontal
U	Vertical (option 'VU' required)

MAXIMUM PRESSURE	DESCRIPTION
**	** psig pressure

PIPELINE INSIDE DIAMETER (I.D.) [1]	DESCRIPTION
**.*	**.* inches inside diameter of the pipeline [1]

SPECIFIC GRAVITY	DESCRIPTION
**.*	**.* specific gravity of the material

VISCOSITY	DESCRIPTION
**	** centipose at operating temperature

MATERIAL	DESCRIPTION
**	Material name

NORMAL FLOW	DESCRIPTION
**	** gpm at normal flow rate

MAXIMUM FLOW	DESCRIPTION
**	** gpm at maximum flow rate

Note:
[1] Only required if inside pipeline diameter is ≥ 1.5 in

WATER TABLE[1]								
WETTED MATERIAL: LCY								
SWITCH POINT	0.5 IN	0.75 IN	1 IN	1.25 IN	1.5 IN	2 IN	3 IN	4 IN
A	1.6 / 1.3	2.6 / 2.3	3.5 / 3.1	4.3 / 3.9	7.0 / 3.0	7.0 / 4.0	11.0 / 7.0	17.0 / 12.0
B	2.2 / 1.8	3.5 / 3.1	4.0 / 3.5	4.9 / 4.4		15.0 / 8.0	23.0 / 14.0	27.0 / 19.0
C	3.0 / 2.4	4.3 / 3.8	4.6 / 4.2	5.5 / 5.0			45.0 / 22.0	50.0 / 35.0
D			5.6 / 5.2	6.0 / 5.6				95.0 / 40.0
E			6.3 / 6.1	7.0 / 6.6				
F			8.0 / 7.5	8.0 / 7.6				
G				10.0 / 9.0				
H				12.0 / 10.0				
WETTED MATERIAL: YCY, YYY, SCY								
SWITCH POINT	0.5 IN	0.75 IN	1 IN	1.25 IN	1.5 IN	2 IN	3 IN	4 IN
A	1.1 / 0.9	2.0 / 1.5	2.8 / 2.4	5.0 / 4.5	7.0 / 3.0	7.0 / 4.0	11.0 / 7.0	17.0 / 12.0
B	1.5 / 1.3	2.5 / 2.0	3.4 / 3.0	5.5 / 5.0		15.0 / 8.0	23.0 / 14.0	27.0 / 19.0
C	2.1 / 1.7	3.5 / 3.0	4.0 / 3.6	6.2 / 5.7			45.0 / 22.0	50.0 / 35.0
D		7.0 / 5.5	5.0 / 4.5	6.8 / 6.3				95.0 / 40.0
E		10.0 / 8.0	6.5 / 6.1	8.5 / 7.8				
F			9.0 / 8.2	10.0 / 9.2				
G				12.0 / 10.0				

[1]Notes:
- Actuation / Deactivation rates in gpm
- Rates are based on a horizontal pipe installation
- Rates are based on water with a specific gravity of 1.0
- Custom vanes are recommended if normal flow exceeds actuation rate by less than or equal to 10%
- Fluids with different specific gravities: divide the rate by the square root of the specific gravity to determine actual actuation/ deactivation rates
- Maximum flow rate is 4488 gpm

AIR TABLE[2]								
WETTED MATERIAL: LCY								
SWITCH POINT	0.5 in	0.75 in	1 in	1.25 in	1.5 IN	2 IN	3 IN	4 IN
A	6.4 / 3.8	13.0 / 12.0	16.0 / 15.0	20.0 / 18.0	32.0 / 17.0	65.0 / 32.0	210.0 / 105.0	400 / 200
B	10.0 / 7.0	15.0 / 14.0	18.0 / 16.0	21.0 / 19.0		23.0 / 13.0	120.0 / 70.0	195 / 140
C	12.0 / 9.0	20.0 / 16.0	19.0 / 17.0	23.0 / 21.0			60.0 / 48.0	135 / 100
D			22.0 / 20.0	24.0 / 22.0				65 / 50
E			25.0 / 23.0	28.0 / 25.0				
F			32.0 / 28.0	33.0 / 30.0				
G				38.0 / 35.0				
H				45.0 / 42.0				
WETTED MATERIAL: YCY, YYY, SCY								
SWITCH POINT	0.5 IN	0.75 IN	1 IN	1.25 IN	1.5 IN	2 IN	3 IN	4 IN
A	6.4 / 3.8	8.0 / 6.5	12.0 / 10.0	21.0 / 18.0	32.0 / 17.0	65.0 / 32.0	210.0 / 105.0	400 / 200
B	10.0 / 7.0	11.0 / 10.0	14.0 / 12.0	22.0 / 20.0		23.0 / 13.0	120.0 / 70.0	195 / 140
C	12.0 / 9.0	14.0 / 13.0	16.0 / 14.0	24.0 / 22.0			60.0 / 48.0	135 / 100
D		27.0 / 24.0	19.0 / 17.0	28.0 / 26.0				65 / 50
E		39.0 / 36.0	26.0 / 24.0	33.0 / 30.0				
F			32.0 / 3.0	37.0 / 34.0				
G				43.0 / 40.0				

[2]Notes:
- Actuation / Deactivation rates in scfm
- Rates are based on a horizontal pipe installation
- Rates are based on air in normal conditions
- For gases at other pressures, temperatures, or specific gravities, consult factory for equivalent flow approximations
- Maximum flow rate is 600 scfm

Face to Face Dimensions (Threaded Models)		
PIPELINE SIZE	BRASS	STAINLESS STEEL
0.5 in	2.25 in	2.25 in
0.75 in	2.38 in	2.63 in
1 in	2.50 in	3 in
1.25 in	2.63 in	3.50 in
1.5 in	2.96 in	4 in
2 in	3 in	4.75 in
3 in	4 in	
4 in	5.50 in	

Face to Face Dimensions (Flanged Models)	
PIPELINE SIZE	DIMENSIONS
0.5 in	7.5 in
0.75 in	7.5 in
1 in	7.5 in
1.25 in	7.5 in
1.5 in	7.5 in
2 in	8 in
3 in	8 in
4 in	8 in

Model 622 • Flow Switch, Directly Inserted

Features

- Notifies user of flow or lack of flow
- Highly reliable magnetic design
- Inserts directly into 1.5 in to 60 in (38 mm to 1524 mm) pipelines and ducts
- Inserts through welded branch fitting pipeline tee or flange
- Multiple paddle sizes available for wide-ranging applications
- Electrical contacts can be replaced while in service

Description

The Delta Controls **Model 622** Flow Switch produces on/off switching action in response to liquid or gas flow through horizontal or vertical pipelines and ducts. The general purpose is to detect loss of adequate flow or to **alarm** of excessive flow thus **protecting** pumps, blowers, heat exchangers, etc. The paddle extends into the flowing stream and operates an output switch at the setpoint flow rate.

The 622 can be inserted into 1.5 through 60 inch (38 mm to 1524 mm) pipelines and ducts through a welded branch fitting pipeline tee or flange. The paddle magnetically connects to the output switch. A heavy-duty solid sealing tube separates the process fluid from the switch mechanism. Leaks and seal failures are eliminated because o-rings, diaphragms, etc, are not used.

They are factory calibrated to switch at the specified flow rate. An internal adjustment allows small switchpoint changes in the field. Large changes require changing the paddle size.

A **pivoted** paddle extends into the fluid stream creating force as it strikes the paddle. At a predetermined velocity, the force causes the paddle and attractor to rotate about the pivot point. The magnet reacts to the new attractor position and the output switch operates. As the flow decreases, the paddle and output switch return to the original states.

Model 622

Specifications

Style:	Direct Insert
Type:	Paddle
Temperature:	-4 °F to +400 °F (-20 °C to +204 °C)
Standard Pressure:	≤ +2000 psi (+137.9 bar)
Optional Pressure:	+5000 psi (+344.7 bar)
Actuation:	≥ 7.0 gpm (26.7 L/min) (water)
De-actuation:	≥ 3.0 gpm (11.7 L/min) (water)
Accuracy:	≤ 10%
Output:	SPDT or DPDT, 5 A
Wetted Materials:	316 Stainless Steel, 400 Stainless Steel, Monel, Hastelloy C-276, PVC (other materials available)
Housing Material:	Stainless Steel, aluminum
Threaded Process Connection:	1.5 in to 2.5 in MPT
Flanged Process Connection:	2 in to 3 in
Flange Rating:	≤ 600 lb
Certifications:	
Stainless Steel Housing Option Only	Third Party Listed by CSA NRTL/C (USA and Canada)

Model Numbering System

MODEL EXAMPLE	MODEL	-	WETTED MATERIAL	-	OUTPUT SWITCH	-	PROCESS CONNECTION	-	OPTIONS[1]
	622	-	YCY	-	A	-	1.5"MPTY	-	AA

MODEL	DESCRIPTION
622	Flow Switch, Directly Inserted

WETTED MATERIAL[2,3]	BODY	TRIM	PADDLE
LCY	Brass	Stainless steel	316 Stainless Steel
YCY	316 Stainless Steel	Stainless steel	316 Stainless Steel
YYY	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel[2,3]
VGG	PVC	Hastelloy	Hastelloy

OUTPUT SWITCH[2]	DESCRIPTION
A	General purpose, SPDT, 5 A, +220 °F max
B	High temperature, SPDT, 5 A, +450 °F max
C	General purpose, DPDT, 5 A, +220 °F max[2]
H	High temperature, DPDT, 5 A, +450 °F max[2]

PROCESS CONNECTION[3]	DESCRIPTION	AVAILABLE TYPES
1.5"MPTL	1.5 in MPT, Brass	LCY
1.5"MPTY	1.5 in MPT, 316 Stainless Steel	YCY,YYY
2"MPTY	2 in MPT, 316 Stainless Steel	YCY,YYY
2"150RY	2 in Class 150 raised face flange, 316 Stainless Steel	YCY,YYY
2"300RY	2 in Class 300 raised face flange, 316 Stainless Steel	YCY,YYY
2"600RY	2 in Class 600 raised face flange, 316 Stainless Steel	YCY,YYY
2.5"MPTY	2.5 in MPT, 316 Stainless Steel	YCY,YYY
2.5"150RY	2.5 in Class 150 raised face flange, 316 Stainless Steel	YCY,YYY
2.5"300RY	2.5 in Class 300 raised face flange, 316 Stainless Steel	YCY,YYY
2.5"600RY	2.5 in Class 600 raised face flange, 316 Stainless Steel	YCY,YYY
3"150RY	3 in Class 150 raised face flange, 316 Stainless Steel	YCY,YYY
3"300RY	3 in Class 300 raised face flange, 316 Stainless Steel	YCY,YYY
3"600RY	3 in Class 600 raised face flange, 316 Stainless Steel	YCY,YYY
2"MPTS	2 in MPT, Carbon steel	YCY,YYY
2"150RS	2 in Class 150 raised face flange, Carbon steel	YCY,YYY
2"300RS	2 in Class 300 raised face flange, Carbon steel	YCY,YYY
2"600RS	2 in Class 600 raised face flange, Carbon steel	YCY,YYY
2.5"MPTS	2.5 in MPT, Carbon steel	YCY,YYY
2.5"150RS	2.5 in Class 150 raised face flange, Carbon steel	YCY,YYY
2.5"300RS	2.5 in Class 300 raised face flange, Carbon steel	YCY,YYY
2.5"600RS	2.5 in Class 600 raised face flange, Carbon steel	YCY,YYY
3"150RS	3 in Class 150 raised face flange, Carbon steel	YCY,YYY
3"300RS	3 in Class 300 raised face flange, Carbon steel	YCY,YYY
3"600RS	3 in Class 600 raised face flange, Carbon steel	YCY,YYY
1.5"MPTV	1.5 in MPT, PVC	VGG

OPTIONS[1]	DESCRIPTION
AA	None
VU	Vertical upflow (increases minimum set point by 20%)
SH	Stainless steel housing
CS	Custom flow setpoint

Notes:
1. A hyphen will separate multiple options selected
2. C and H switches not available with YYY
3. YYY only available with 1.5 in or larger process connections

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Detailed application number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to the Additional Resources section)

Model 622 • Flow Switch, Directly Inserted

Application Number

Installation details are required to ensure proper operation of the flow switch.

APPLICATION EXAMPLE	MODEL	-	SWITCH POINT	-	SWITCH ACTION	-	ORIENTATION	-	MAXIMUM PRESSURE	-	PIPELINE INSIDE DIAMETER	-	DIMENSION 'A'	-	SPECIFIC GRAVITY	-	VISCOSITY	-
	622	-	10	-	N	-	H	-	100	-	2.1	-	3.5	-	1.0	-	1.0	

MODEL

622

SWITCH POINT	DESCRIPTION
*	Switch Action letter as denoted below
**.*	**.** gpm of desired switch point

SWITCH ACTION	DESCRIPTION
D	Deactivate on decreasing flow
N	Actuate on increasing flow

ORIENTATION	DESCRIPTION
H	Horizontal
U	Option 'VU" from Model Numbering System is required

MAXIMUM PRESSURE	DESCRIPTION
**	** psig pressure

PIPELINE INSIDE DIAMETER	DESCRIPTION
**.*	**.* inches inside diameter of the pipeline

DIMENSION 'A'	DESCRIPTION
**.*	**.* inches from top of process connection to inside bottom of pipeline

SPECIFIC GRAVITY	DESCRIPTION
.	**.* specific gravity of the material

VISCOSITY	DESCRIPTION
**	** centipoise at operating temperature

WATER[1]

Actuation/Deactivation rates in GPM

CONFIGURATION	1.5 IN	2 IN	3 IN	4 IN	6 IN	8 IN	10 IN	12 IN	14 IN	16 IN	18 IN	20 IN
A	7 / 3	7 / 4	11 / 7	17 / 12	40 / 30	80 / 65	135 / 100	200 / 140	290 / 200	360 / 250	460 / 325	575 / 400
B		15 / 8	23 / 14	27 / 19	60 / 45	120 / 90	230 / 150	310 / 200	430 / 280	550 / 360	700 / 450	850 / 550
C			45 / 22	50 / 35	80 / 60	160 / 115	300 / 180	450 / 275	600 / 350	750 / 450	1000 / 600	1200 / 700
D				95 / 40	130 / 90	230 / 150	450 / 250	650 / 350	900 / 500	1200 / 650	1450 / 800	1800 / 1000
E					210 / 120	375 / 175	600 / 300	900 / 450	1200 / 600	1400 / 800	2000 / 1000	2400 / 1200

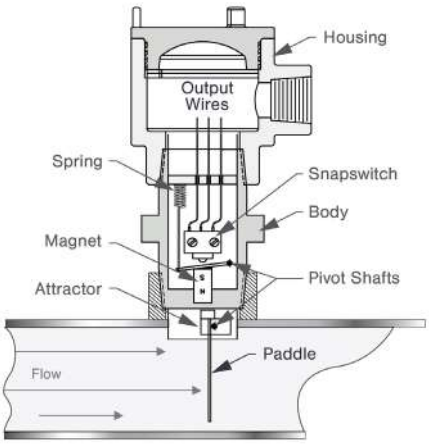
[1]Notes:
- Rates are based on horizontal pipe installation
- Rates are based on water with a specific gravity of 1.0
- If normal flow exceeds actuation rate by less than or equal to 10%, custom vanes are recommended
- To determine actual actuation/deactivation rates for fluids of different specific gravities, divide the rate by the square root of the specific gravity

MATERIAL	-	NORMAL FLOW	-	MAXIMUM FLOW
- Water	-	15	-	20

MATERIAL	DESCRIPTION
**	Material name

NORMAL FLOW	DESCRIPTION
**	** gpm normal flow rate

MAXIMUM FLOW	DESCRIPTION
**	** gpm maximum flow rate



Deactuated Position

AIR[2]												
Actuation/Deactivation rates in SCFM												
CONFIGURATION	**1.5 IN**	**2 IN**	**3 IN**	**4 IN**	**6 IN**	**8 IN**	**10 IN**	**12 IN**	**14 IN**	**16 IN**	**18 IN**	**20 IN**
A	32 / 17	23 / 13	60 / 48	65 / 50	210 / 120	310 / 250	650 / 525	1000 / 800	1600 / 1250	2200 / 1750	2800 / 2250	3550 / 2850
B		65 / 32	120 / 70	135 / 100	260 / 200	500 / 400	875 / 700	1250 / 1000	1900 / 1500	2500 / 2000	3100 / 2500	3900 / 3100
C			210 / 105	195 / 140	375 / 265	725 /500	1200 / 850	1850 / 1300	2600 / 1800	3350 / 2350	4300 / 3000	5300 / 3700
D				400 / 200	550 / 375	1100 / 700	1850 / 1200	2700 / 1750	3400 / 2200	4800 / 3100	6000 / 3900	7400 / 4800
E					950 / 475	1550 / 850	2400 / 1300	3450 / 1900	4700 / 2600	6400 / 3500	8000 / 4400	10000 / 5500

[2]Notes:
- Rates are based on a horizontal pipe installation
- Rates are based on air in normal conditions
- For gases at other pressures, temperatures, or specific gravities, consult factory for equivalent flow approximations

Model 623 • Flow Switch, Low Flow, Safety Shower and Eye Wash Station Services

Features

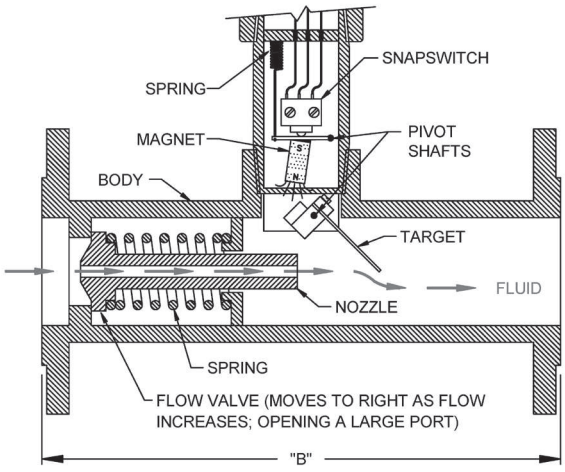
- Ideal alarm for reactor cooling water loss, eye wash station, or similar
- Low flow rate alarm in high velocity lines
- Batch process completion
- Dual Stage

Description

The Delta Controls **Model 623** Dual Stage Flow Switch actuates at low-flow rates and prevents high pressure drops at **50 times the actuation rate**. The switch output is used for alarm or control. The 623 consists of two sections: a flow sensing paddle and a pressure operated flow bypass valve.

As the flow rate increases from zero, the fluid flows through a restriction nozzle and impinges against a paddle, which rotates at the specified rate. The switch is magnetically coupled to the paddle and actuates as the rotation occurs. When the actuation rate is exceeded, the flow bypass valve opens to allow the additional fluid flow to bypass the restriction nozzle. The **pressure drop is limited** to a low value at high-flow rates.

OPERATING SCHEMATIC
(SHOWN WITH SWITCH ACTUATED & FLOW VALVE CLOSED)



Model 623

Specifications

Style:	Inline
Type:	Piston
Temperature:	≤ +220 °F (+104 °C)
Pressure:	≤ +1200 psig (+83 bar)
Actuation:	≥ 0.9 gpm (3.4 L/min) (water)
De-actuation:	≥ 0.5 gpm (1.9 L/min) (water)
Accuracy:	≤ 10%
Output:	SPDT or DPDT, 5 A
Wetted Material:	300 Stainless Steel
Housing Material:	316 Stainless Steel, aluminum
Threaded Process Connection:	1 in to 2 in FPT
Flanged Process Connection:	1 in to 2 in
Flange Rating:	≤ 150 lb
Certifications:	
Stainless Steel Housing Option Only	Third Party Listed by CSA NRTL/C (USA and Canada)

Model Numbering System

MODEL EXAMPLE	MODEL	-	WETTED MATERIAL	-	OUTPUT SWITCH	-	PROCESS CONNECTION	-	OPTIONS[1]
	623	-	YYY	-	A	-	1"FPTY	-	AA

MODEL	DESCRIPTION
623	Flow Switch, Low Flow, Dual Stage, Safety Shower and Eye Wash Station Services

WETTED MATERIAL	BODY	TRIM	PADDLE
YYC	316 Stainless Steel	316 Stainless Steel	300 Stainless Steel

OUTPUT SWITCH	DESCRIPTION
A	General purpose, SPDT, 5 A, +220 °F max
B	High temperature, SPDT, 5 A, +450 °F max
C	General purpose, DPDT, 5 A, +220 °F max

PROCESS CONNECTION	DESCRIPTION
1”FPTY	1 in FPT, 316 Stainless Steel
1.5”FPTY	1.5 in FPT, 316 Stainless Steel
2”FPTY	2 in FPT, 316 Stainless Steel
1”150RY	1 in Class 150 raised face flange, 316 Stainless Steel
1.5”150RY	1.5 in Class 150 raised face flange, 316 Stainless Steel
2"150RY	2 in Class 150 raised face flange, 316 Stainless Steel

OPTIONS[1]	DESCRIPTION
AA	None
SH	Stainless steel housing
TS	Terminal strip

Notes:
[1] A hyphen will separate multiple options selected

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to the Additional Resources section)

Model 624 • Flow Switch, Inline Body, Full Swing Paddle

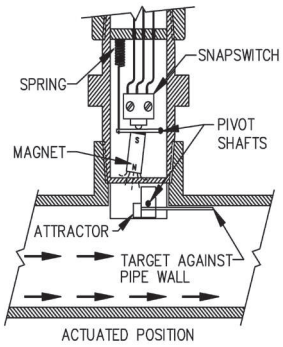
Features

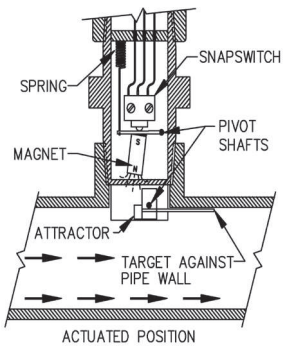
- Non-restricting full open bore
- Highly reliable magnetic coupling
- Compact size

Description

The Delta Controls Model 624 Flow Switch is highly reliable full swing, inline body switch. The paddle body fits into and becomes an unobstructed part of the pipeline. Model 624 is equipped with a **full swing** paddle and has an open bore matching the pipeline's. The 624 has a **flat blade-type paddle** that rotates 90 degrees in response to increased flow rate. The switch actuates at a pre-calibrated set point. The paddle moves until it is flush against the pipeline wall. The body bore is unobstructed, and the flow is unrestricted. The 624 has a negligible pressure drop at high velocities for 2 inch to 8 inch (50 to 200 millimeter) pipelines with flow velocities possible in excess of 50 feet per second (15 meters per second).

The paddle is magnetically connected to the output switch. A heavy-duty solid sealing tube separates the process fluid from the switch mechanism, eliminating failures due to seal, diaphragm, bellows corrosion and leaks.





Model 624

Specifications

Style:	Inline
Type:	Paddle, Full Swing
Temperature:	-4 °F to +400 °F (-20 °C to +204 °C)
Standard Pressure:	≤ +2000 psig (+137.9 bar)
Optional Pressure:	+5000 psig (+344.7 bar)
Actuation:	≥ 7.0 gpm (26.7 L/min) (water)
De-actuation:	≥ 3.0 gpm (11.7 L/min) (water)
Accuracy:	≤ 10%
Output:	SPDT or DPDT, 5 A
Wetted Material:	316 Stainless Steel, 400 Stainless Steel, carbon steel
Housing Material:	Stainless steel, aluminum
Threaded Connection:	2 in to 4 in FPT
Flanged Connection:	2 in to 4 in
Flange Rating:	≤ 150 lb
Certifications:	
Stainless Steel Housing Option Only	Third Party Listed by CSA NRTL/C (USA and Canada)

Model Numbering System

MODEL EXAMPLE	MODEL	-	WETTED MATERIAL	-	OUTPUT SWITCH	-	PROCESS CONNECTION	-	OPTIONS[1]
	624	-	SCY	-	A	-	2"150RS	-	TS

MODEL	DESCRIPTION
624	Flow Switch, Inline Body, Full Swing Paddle

WETTED MATERIAL[2]	BODY	TRIM	PADDLE
SCY	Carbon steel	Stainless steel	316 Stainless Steel
YYY	316 Stainless Steel	316 Stainless Steel	316 Stainless Steel[2]

OUTPUT SWITCH[2]	DESCRIPTION
A	General purpose, SPDT, 5 A, +220 °F max
B	High temperature, SPDT, 5 A, +450 °F max
C	General purpose, DPDT, 5 A, +220 °F max[2]
H	High temperature, DPDT, 5 A, +450 °F max[2]

PROCESS CONNECTION	DESCRIPTION	AVAILABLE TYPES
2”FPTS	2 in FPT, Carbon steel	SCY
2.5”FPTS	2.5 in FPT, Carbon steel	SCY
3”FPTS	3 in FPT, Carbon steel	SCY
2"150RS	2 in Class 150 raised face flange, Carbon steel	SCY
2.5"150RS	2.5 in Class 150 raised face flange, Carbon steel	SCY
3"150RS	3 in Class 150 raised face flange, Carbon steel	SCY
4"150RS	4 in Class 150 raised face flange, Carbon steel	SCY
2”FPTY	2 in FPT, 316 Stainless Steel	YYY
2.5”FPTY	2.5 in FPT, 316 Stainless Steel	YYY
3”FPTY	3 in FPT, 316 Stainless Steel	YYY
4”FPTY	4 in FPT, 316 Stainless Steel	YYY
2"150RY	2 in Class 150 raised face flange, 316 Stainless Steel	YYY
2.5"150RY	2.5 in Class 150 raised face flange, 316 Stainless Steel	YYY
3"150RY	3 in Class 150 raised face flange, 316 Stainless Steel	YYY
4"150RY	4 in Class 150 raised face flange, 316 Stainless Steel	YYY

OPTIONS[1]	DESCRIPTION
AA	None
VU	Vertical upflow (increases minimum set point by 20%)
SH	Stainless steel housing
CS	Custom flow setpoint
TS	Terminal strip

Notes:
[1] A hyphen will separate multiple options selected
[2] C and H switches not available with YYY wetted material

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Detailed application number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to the Additional Resources section)

REQUIRED FROM APPLICATION NUMBER:

- Basic Type, Switch Point, Switch Action, Flow Direction, Max Pressure, Pipeline Outside Diameter / Inside Diameter, Dimension 'A', Fluid SPG, Fluid Viscosity, Fluid Name, Normal Flow, Max Flow

Model 624 • Flow Switch, Inline Body, Full Swing Paddle

Application Number

Installation details are required to ensure proper operation of the flow switch.

APPLICATION EXAMPLE	MODEL	-	SWITCH POINT	-	SWITCH ACTION	-	ORIENTATION	-	MAXIMUM PRESSURE	-	PIPELINE INSIDE DIAMETER	-	SPECIFIC GRAVITY	-	VISCOSITY	-	MATERIAL	-
	624	-	A	-	N	-	H	-	100	-	2.1	-	1.0	-	1.0	-	Water	

MODEL
624

SWITCH POINT	DESCRIPTION
*	Switch Action letter as denoted below
**.*	**.** gpm of desired switch point

SWITCH ACTION	DESCRIPTION
D	Deactivate on decreasing flow
N	Actuate on increasing flow

ORIENTATION	DESCRIPTION
H	Horizontal
U	Option 'VU" from Model Numbering System is required

MAXIMUM PRESSURE	DESCRIPTION
**	** psig pressure

PIPELINE INSIDE DIAMETER	DESCRIPTION
**.*	**.* inches pipeline's inside diameter

SPECIFIC GRAVITY	DESCRIPTION
**.*	** gpm specific gravity of the material

VISCOSITY	DESCRIPTION
**	** centipoise at operating temperature

MATERIAL	DESCRIPTION
	Material name

WATER[1]

Actuation/Deactivation rates in gpm			
CONFIGURATION	2 IN	3 IN	4 IN
A	7 / 4	11 / 7	17 / 12
B	15 / 8	23 / 14	27 / 19
C		45 / 22	50 / 35
D			95 / 40

[1] Notes:
- Rates are based on horizontal pipe installation
- Rates are based on water with a specific gravity of 1.0
- Custom vanes are recommended if normal flow exceeds actuation rate by less than or equal to 10%
- For fluids of different specific gravities, divide the rate by the square root of the specific gravity to determine actual actuation/deactivation rates
- Maximum flow rate is 4488 gpm

NORMAL FLOW	-	MAXIMUM FLOW

- 15 - 40

NORMAL FLOW	DESCRIPTION
**	** gpm normal flow rate

MAXIMUM FLOW	DESCRIPTION
**	** gpm maximum flow rate

AIR[2]			
Actuation/Deactivation rates in SCFM			
CONFIGURATION	**2 IN**	**3 IN**	**4 IN**
A	23 / 13	60 / 48	65 / 50
B	65 / 32	120 / 70	135 / 100
C		210 / 105	195 / 140
D			400 / 200

[2] Notes:
- Rates are based on horizontal pipe installation
- Rates are based on air in normal conditions
- For gases at other pressures, temperatures, or specific gravities, consult factory for equivalent flow approximations
- Maximum flow rate is 4488 gpm

Model 625 • Flow Switch, Inline Body, Ultralow Flow, Adjustable Actuation

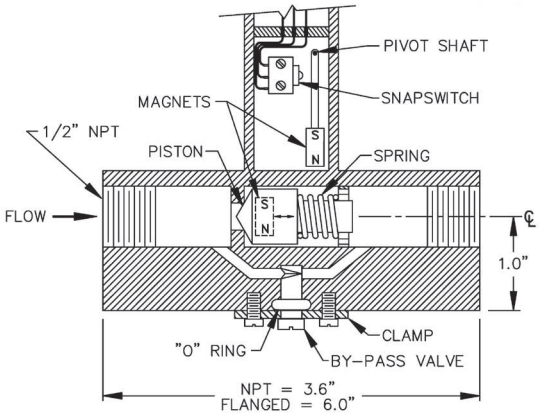
Features

- Detects ultralow flows for 0.25 inch to 1 inch pipelines
- Used for detection additives, oiling, purging, etc.
- Low pressure drop at 35 times detected flow rate
- Field adjustable

Description

The Delta Controls **Model 625** Flow Switch detects ultralow flows for 0.25 inch to 1.0 inch (6 mm to 25 mm) pipelines. Applications include flow protection, safety monitoring, purging for explosion proofing, as well as detection of additives, oiling, purging, etc with a low pressure drop at **35 times detected flow rate**. It produces on/off switching actions at a preset rate of flow and is field adjustable.

The flowing fluid passes through the **variable piston annulus** and/or the **adjustable bypass valve**. Increasing differential pressure causes the piston to move and compress the range spring. When the piston magnet is carried to the switch magnet, the **switch magnet** attracts and the output snap switch actuates. The size of the bypass valve opening determines the flow rate switching point.



Model 625

Specifications

Style:	Inline
Type:	Piston
Temperature:	-4 °F to +400 °F (-20 °C to +204 °C)
Standard Pressure:	≤ +2000 psi (≤ +137.9 bar)
Actuation:	0.04 gpm to 0.75 gpm (water) 0.18 scfm to 2.7 scfm (air)
De-actuation:	0.03 gpm to 0.6 gpm (water) 0.15 scfm to 2.0 scfm (air)
Accuracy:	≤ 10%
Output:	SPDT or DPDT, 5 A
Wetted Material:	300 Stainless Steel, brass, nitrile, Teflon®
Housing Material:	Stainless steel, aluminum
Threaded Process Connection:	0.5 in to 1 in FPT
Flanged Process Connection:	1 in
Flange Rating:	≤ 150 lb
Certifications:	
Stainless Steel Housing Option Only	Third Party Listed by CSA NRTL/C (USA and Canada)

Model Numbering System

MODEL EXAMPLE	MODEL	-	WETTED MATERIAL	-	OUTPUT SWITCH	-	PROCESS CONNECTION	-	OPTIONS[1]
	625	-	YYD	-	A	-	1"150RY	-	AA

MODEL	DESCRIPTION
625	Flow Switch, Inline Body, Ultralow Flow, Adjustable Actuation

WETTED MATERIAL	BODY	TRIM	PADDLE
LLZ	Brass	Brass	Nitrile
BCD	304 Stainless Steel	Stainless steel	Teflon®

OUTPUT SWITCH	DESCRIPTION
A	General purpose, SPDT, 5 A, +220 °F max
B	High temperature, SPDT, 5 A, +450 °F max
C	General purpose, DPDT, 5 A, +220 °F max

PROCESS CONNECTION	DESCRIPTION	AVAILABLE TYPES
0.5"FPTB	0.5 in FPT, 304 Stainless Steel	YYD
1"FPTB	1 in FPT, 304 Stainless Steel	YYD
1"150RY	1 in Class 150 raised face flange, 316 Stainless Steel	YYD
1"300RY	1 in Class 300 raised face flange, 316 Stainless Steel	YYD
0.5"FPTL	0.5 in FPT, Brass	LLZ

OPTIONS[1]	DESCRIPTION
AA	None
SH	Stainless steel housing
TS	Terminal strip

Notes
[1] A hyphen will separate multiple options selected

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to the Additional Resources section)

Model 626 • Flow Switch, Inline Body, Seawater Deluge Service

Features

- Detects a single nozzle discharge
- No pressure loss at high flow rates
- Full open bore, no pipeline restriction
- Proven reliability for decades
- Magnetic flow paddle to switch coupling
- Flow powered, no other power required
- Alloy materials suitable for seawater
- Insensitive to seawater deposits

Description

The Delta Controls **Model 626** Paddle Actuated Flow Switch is equipped with a body that becomes an unobstructed part of the pipeline. Model 626 is used to **detect very low-flow rates** in offshore deluge firewater piping systems. The Model 626 is equipped with a 'fitted' full swing-type paddle that fills the inside area of the in-line pipeline body under no flow conditions. It rotates **90 degrees** to rest against the inside of the pipeline when the flow rate exceeds the calibrated alarm activation flow rate. The paddle has been 'cupped' and 'fitted' to fill the pipe and is flush against the pipeline's interior curve during higher flow rates. Only the paddle's thin edge, plus its support block, is in the flow resulting in a full pipe size open bore. Therefore during **extremely high flow velocities** no damage or pressure loss occurs.

For more than **15 years**, the 626 has been used to **detect seawater** flow in deluge fire systems. It is also in service on **drill ships** and **floating production facilities**. Model 626 actuates at the very low-low rate which occurs when a single nozzle begins to operate. The paddle is magnetically connected to the output switch. A heavy-duty sealing tube separates seawater from the switch mechanism which eliminates failures occurring due to seal, diaphragm, and bellows leaks.

Model 626

Specifications

Style:	Inline
Type:	Full swing
Temperature:	-4 °F to +400 °F (-20 °C to +204 °C)
Standard Pressure:	≤ +2000 psig (+68.9 bar +137.9 bar)
Optional Pressure:	+5000 psig (+344.7 bar)
Actuation:	≥ 3.0 gpm (26.0 L/min) (water)
De-actuation:	≥ 3.9 gpm (14.8 L/min) (water)
Accuracy:	≤ 10%
Output:	Gold contacts; SPDT, 5 A, 220 °F max
Wetted Material:	316 Stainless Steel, Monel 400, titanium, Alloy 20 (other materials available)
Housing Material:	Stainless steel, aluminum
Flanged Process Connection:	2 in to 6 in
Flange Rating:	≤ 150 lb
Body Gasket:	Metal spiral; PTFE seal studs and bolts: A-193BB, A-194; stainless steel
Certifications:	
Stainless Steel Housing Option Only	Third Party Listed by CSA NRTL/C (USA and Canada)

Model Numbering System

MODEL EXAMPLE	MODEL	-	WETTED MATERIAL	-	OUTPUT SWITCH	-	PROCESS CONNECTION	-	OPTIONS[1]
	626	-	YG	-	A	-	2"150RYG	-	BF

MODEL	DESCRIPTION
626	Flow Switch, Inline Body, Seawater Deluge Service

WETTED MATERIAL	DESCRIPTION
YY	316 Stainless Steel
YG	Alloy 20
MD	Monel 400
TI	Titanium

OUTPUT SWITCH	DESCRIPTION
A	General purpose, SPDT, 5 A, +220 °F (+104 °C) max
AG	Gold contacts, SPDT, 5 A, +220 °F (+104 °C) max
C	General purpose, DPDT, 5 A, +220 °F (+104 °C) max
CG	Gold contacts, DPDT, 5 A, +220 °F (+104 °C) max

PROCESS CONNECTION	DESCRIPTION	AVAILABLE TYPES
2"150RY	2 in Class 150 raised face flange, 316 Stainless Steel	YY
3"150RY	3 in Class 150 raised face flange, 316 Stainless Steel	YY
4"150RY	4 in Class 150 raised face flange, 316 Stainless Steel	YY
6"150RY	6 in Class 150 raised face flange, 316 Stainless Steel	YY
2"150RYG	2 in Class 150 raised face flange, Alloy 20	YG
3"150RYG	3 in Class 150 raised face flange, Alloy 20	YG
4"150RYG	4 in Class 150 raised face flange, Alloy 20	YG
6"150RYG	6 in Class 150 raised face flange, Alloy 20	YG
2"150RM	2 in Class 150 raised face flange, Monel 400	MD
3"150RM	3 in Class 150 raised face flange, Monel 400	MD
4"150RT	4 in Class 150 raised face flange, Titanium	TI
6"150RT	6 in Class 150 raised face flange, Titanium	TI

OPTIONS[1]	DESCRIPTION
AA	None
BF	Blanking flange
TSG	Terminal strip, Gold plated
SH	Stainless steel housing
TS	Terminal strip

Notes
[1] A hyphen will separate multiple options selected

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Detailed application number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to the Additional Resources section)

REQUIRED FROM APPLICATION NUMBER:

- Basic Type, Switch Point, Pipeline Outside Diameter / Inside Diameter, Fluid Name

Model 626 • Flow Switch, Inline Body, Seawater Deluge Service

Application Number

Installation details are required to ensure proper operation of the flow switch.

APPLICATION EXAMPLE	MODEL	-	SWITCH POINT	-	SWITCH ACTION	-	ORIENTATION	-	MAXIMUM PRESSURE	-	PIPELINE INSIDE DIAMETER	-	SPECIFIC GRAVITY	-	VISCOSITY	-	MATERIAL	-
	626	-	35	-	N	-	H	-	100	-	5	-	1.0	-	1.0	-	Seawater	

MODEL

626

SWITCH POINT	DESCRIPTION
.	*.* gpm desired switch point, Custom flow

SWITCH ACTION	DESCRIPTION
D	Deactivate on decreasing flow
N	Actuate on increasing flow

ORIENTATION	DESCRIPTION
H	Horizontal
U	Vertical (option 'VU' required)

MAXIMUM PRESSURE	DESCRIPTION
**	** psig pressure

PIPELINE INSIDE DIAMETER	DESCRIPTION
**.*	**.* inch pipeline inside diameter

SPECIFIC GRAVITY	DESCRIPTION
.	*.* material specific gravity

VISCOSITY	DESCRIPTION
.	** centipoise operating temperature

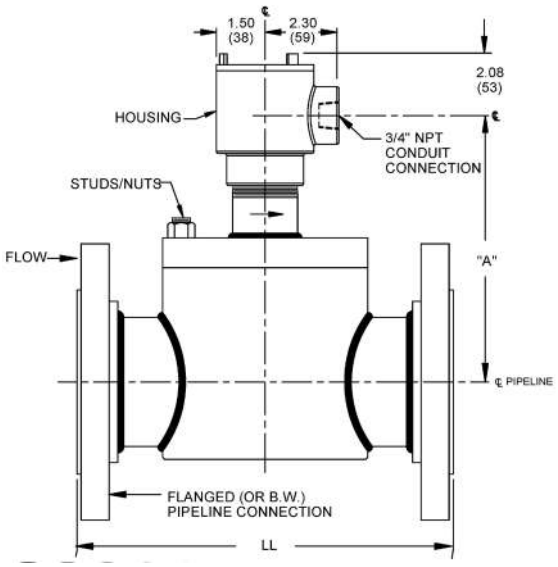
MATERIAL	DESCRIPTION
**	Material name

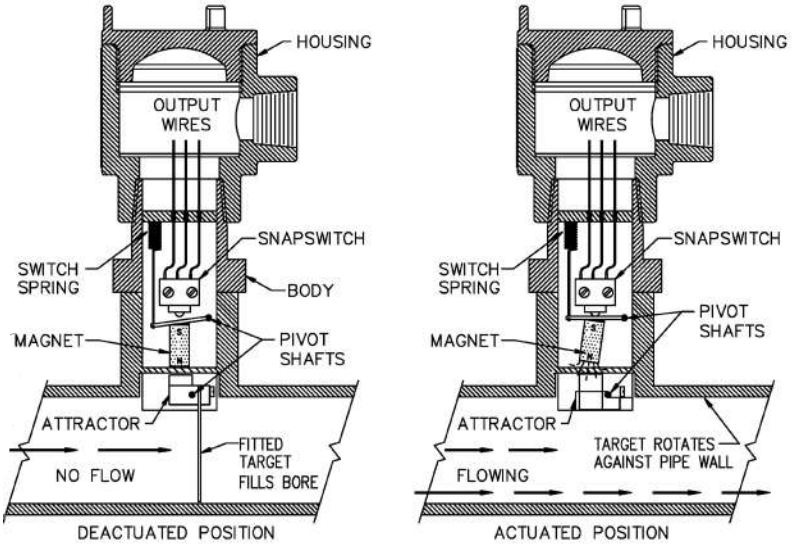
NORMAL FLOW	-	MAXIMUM FLOW
- 50	-	100

NORMAL FLOW	DESCRIPTION
**	** gpm normal flow rate

MAXIMUM FLOW	DESCRIPTION
**	** gpm maximum flow rate

WATER				
Minimum actuation rates				
	2 IN	3 IN	4 IN	6 IN
gpm	3	4.8	8.5	17.5
L/min	11.4	18.2	32.1	17.5





Model 633 • Fluid Detector, Electronic

Features

- Senses the pressure of gas or liquid contained in a pipeline
- Withstands abrasion from sand entrained in flowing fluids
- Contains no moving parts, pumps, filters, columns, or valve ports

Description

The Delta Controls **Model 633** Electronic Fluid Detector **senses** the pressure of a gas or liquid contained in a pipeline and if the pipeline is empty or full. Model 633 is the best option in situations where paddle-type flow switches do not provide complete or reliable detection causing spills, process shutdown, etc.

The 633 provides multiple contact closures signifying the type of fluid in the pipeline including gas, hydrocarbon, water, or a mixture. It can **withstand abrasion** from entrained sand in the flowing fluid. The 633 **contains no moving parts**.

Model 633 detects an interface as it moves down a pipeline and **determines what a pipeline contains**: gas, oil, water, or a mixture.

Model 633

Specifications

Style:	Inline
Type:	Capacitance
Wetted Material:	316 Stainless Steel, PTFE, blended alumina (other materials available)
Accuracy:	≥ 0.5% of range operating temperature
Electronics Temperature:	-40 °F to +180 °F (-40 °C to +82 °C)
Process Temperature:	-20 °F to +250 °F (-29 °C to +121 °C)
Basic Temperature:	-350 °F to +750 °F (-210 °C to +435 °C) (other options available)
Temperature Stability:	0.01% °F (0.6% °C)
Time Delay:	Adjustable 1 s to 90 s
Signal Outputs:	4-20 mA and/or 1 to 4, 5 A SPDT or DPDT dry contacts
Certifications:	
Stainless Steel Housing Option Only	Third Party Listed by CSA NRTL/C (USA and Canada)
Electronic Housing*	CSA explosion-proof, Class 1, Division 1, Groups BCD and 4X, IP67

Model Numbering System

MODEL EXAMPLE	MODEL	-	WETTED MATERIAL	-	OUTPUT	-	SUPPLY POWER	-	PROCESS CONNECTION	-	OPTIONS
	633	-	YD	-	C	-	1	-	1.5"MPTY	-	AA

MODEL	DESCRIPTION
633	Fluid Detector, Electronic

WETTED MATERIAL	JACKET	SEALS	BODY
YD	PTFE	PTFE	316 Stainless Steel
YZ	Alumina ceramic	PTFE	316 Stainless Steel

OUTPUT	DESCRIPTION
C	General purpose, DPDT, 5 A, 220 °F max
mA	4-20 mA output

SUPPLY POWER	DESCRIPTION
1	120 ACV
2	240 ACV
3	24 DCV

PROCESS CONNECTION	DESCRIPTION
1.5”MPTY	1.5 in MPT, 316 Stainless Steel
2”MPTY	2 in MPT, 316 Stainless Steel
3”MPTY	3 in MPT, 316 Stainless Steel
2”150RY	2 in Class 150 raised face flange, 316 Stainless Steel
3”150RY	3 in Class 150 raised face flange, 316 Stainless Steel
2”300RY	2 in Class 300 raised face flange, 316 Stainless Steel
3”300RY	3 in Class 300 raised face flange, 316 Stainless Steel

OPTIONS	DESCRIPTION
AA	None
SH	Stainless steel housing

REQUIRED ORDERING INFORMATION:

- Detailed model number
- Detailed application number
- Tag or nameplate detail (if required)
- Documentation & testing packages (if required, refer to the Additional Resources section)

REQUIRED FROM APPLICATION NUMBER:

- Basic Type, Pipeline Inside Diameter / Outside Diameter, Dimension 'A' Maximum Pressure, Maximum Temperature, Fluid Viscosity, Conductive/Non-Conductive Fluid Name, Fluid Coating, Non-Coating

Model 633 • Fluid Detector, Electronic

Application Number

Installation details are required to ensure proper operation of the flow switch.

APPLICATION EXAMPLE	MODEL	-	PIPELINE INSIDE DIAMETER	-	DIMENSION 'A'	-	MAXIMUM PRESSURE	-	TEMPERATURE	-	VISCOSITY	-	MATERIAL CONDUCTIVITY	-	MATERIAL COATING	-	MATERIAL
	633	-	2.1	-	3.3	-	100	-	100	-	1.0	-	C	-	N	-	Water

MODEL

633

PIPELINE INSIDE DIAMETER	DESCRIPTION
**.*	**.* inch inside diameter of the pipeline

DIMENSION 'A'	DESCRIPTION
**.*	**.* inch from top of process connection to inside bottom of pipeline

MAXIMUM PRESSURE	DESCRIPTION
**	** psig pressure

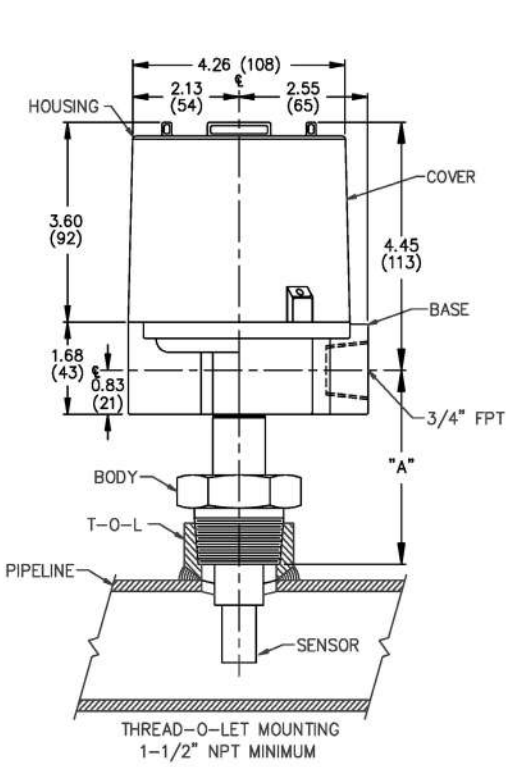
TEMPERATURE	DESCRIPTION
**	** °F operating temperature

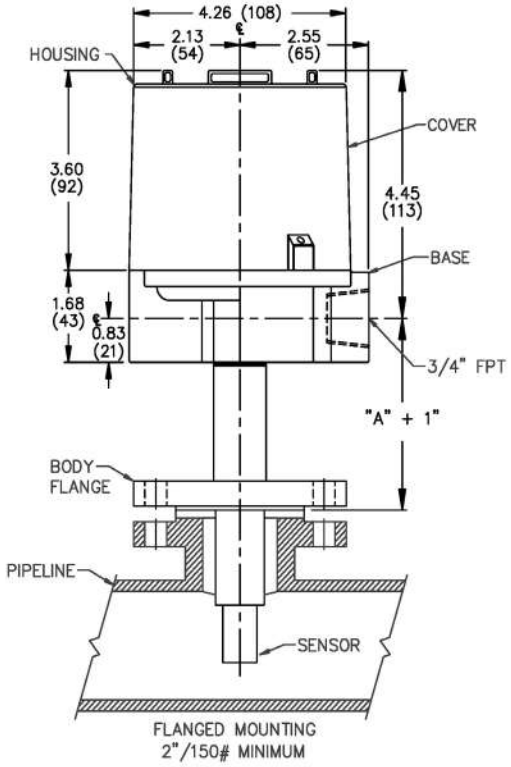
VISCOSITY	DESCRIPTION
**	** centipoise at operating temperature

MATERIAL CONDUCTIVITY	DESCRIPTION
C	Conductive
N	Non-conductive

MATERIAL COATING	DESCRIPTION
C	Coating
N	Non-coating

MATERIAL	DESCRIPTION
**	Material Name


4.26 (108)
2.13 (54)
2.55 (65)
HOUSING
COVER
3.60 (92)
4.45 (113)
BASE
1.68 (43)
0.83 (21)
3/4" FPT
"A"
BODY
T-O-L
PIPELINE
SENSOR
THREAD-O-LET MOUNTING
1-1/2" NPT MINIMUM


4.26 (108)
2.13 (54)
2.55 (65)
HOUSING
COVER
3.60 (92)
4.45 (113)
BASE
1.68 (43)
0.83 (21)
3/4" FPT
"A" + 1"
BODY FLANGE
PIPELINE
SENSOR
FLANGED MOUNTING
2"/150# MINIMUM

Additional Resources

Engineered Reliability. ***Tested****.*

Additional Resources

Delta Controls offers comprehensive documentation and testing packages to meet the needs of any technical requirements or budget.

Delta's products are thoroughly engineered, procured, manufactured, and tested to meet the requirements of our rigorous quality control standards. A variety of documentation, testing, and certification options offering detailed manufacturing records are available with all Delta products and are issued through our experienced documentation and testing team.

Documentation & Testing Packages

Miscellaneous Resources

Documentation & Testing Packages • Temperature

	H SERIES DOCUMENTATION PACKAGE 1	H SERIES DOCUMENTATION PACKAGE 2	H SERIES DOCUMENTATION PACKAGE 3
IOM	X	X	X
Certificate Of Conformance	X	X	X
Warranty Letter	X	X	X
ISO9001 Certificate	X	X	X
CSA Certificate Of Compliance (HTX)	X	X	X
CSA Certificate Of Compliance (HTP Housing)	X	X	X
Calibration/Functional Certificate (Single Point)	X	X	X
Material Test Report (MTR)	●	X	X
Bill of Material (BOM)		X	X
Drawings for Approval/Record		X	X
Instrument Data Sheet (IDS)		X	X
Catalog Sheet		X	X
NACE Certificate of Compliance		X	X
Index of Drawings and Documents			X
Inspection & Test Plan (ITP)			X
Pneumatic Pressure Test Certificate/Directive			X
Dimensional Inspection Test Certificate/Directive			X
Visual Inspection Test Certificate/Directive			X
Factory Acceptance Test Certificate/Directive			X
Packing Procedure			X
Spare Parts List for Commissioning & 2 Years Operation (SPIR)			X
Tag/Nameplate Drawings for Approval/Record			●
Third Party Factory Inspection Appointed by Delta Controls			●
Factory Hosting of Third Party Inspector Hired by Purchaser			●
Positive Material Identification (PMI) Testing			●
Liquid Dye-Penetrant Weld Testing			●
Final Quality/Technical Dossier Copy			●
Separate Dossier Shipping			●
Monthly Progress Report			●
Custom Template/Format			●
Manufacturing Schedule			●
SIL Certificate (HIR)			●
Von Karman Statement			●
5-Point Calibration/Test Certificate/Directive			●
Site Acceptance Certificate/Directive			●
Quality Manual			●
Certificate of Complete Shipment			●
Certificate of Delivery			●
CD-ROM Copy of Dossier			●
Paint Coating Inspection Test Directive			●

X - Included
● - Optional

Documentation & Testing Packages • Capacitance

	SERIES 100/IPT DOCUMENTATION PACKAGE 1	SERIES 100/IPT DOCUMENTATION PACKAGE 2	SERIES 100/IPT DOCUMENTATION PACKAGE 3
IOM	X	X	X
Certificate Of Conformance	X	X	X
Warranty Letter	X	X	X
Quality Control Certificate (Functional)	X	X	X
ISO9001 Certificate	X	X	X
CSA Certificate Of Compliance (Housing)	X	X	X
Calibration Certificate (if applicable)		X	X
Material Test Report (MTR)		X	X
Instrument Data Sheet (IDS)		X	X
Catalog Sheet		X	X
Inspection & Test Plan (ITP)			X
Hydrostatic Pressure Test Certificate/Directive			X
Dimensional Inspection Test Certificate/Directive			X
Visual Inspection Test Certificate/Directive			X
Factory Acceptance Test Certificate/Directive			X
Packing Procedure			X
Spare Parts List for Commissioning & 2 Years Operation (SPIR)			X
Third Party Factory Inspection Appointed by Delta Controls			●
Factory Hosting of Third Party Inspector Hired by Purchaser			●
Positive Material Identification (PMI) Testing			●
Tag/Nameplate Drawings for Approval/Record			●
Liquid Dye-Penetrant Weld Testing			●
Final Quality/Technical Dossier Copy			●
Separate Dossier Shipping			●
Monthly Progress Report			●
Paint Coating Inspection Test Directive			●
Site Acceptance Certificate/Directive			●
Quality Manual			●
Certificate of Complete Shipment			●
Certificate of Delivery			●
CD-ROM Copy of Dossier			●

X - Included
● - Optional

Documentation & Testing Packages • Pressure

	SERIES 500 DOCUMENTATION PACKAGE 1	SERIES 500 DOCUMENTATION PACKAGE 2
IOM	X	X
Certificate of Conformance	X	X
Warranty Letter	X	X
Quality Control Certificate (Functional)	X	X
ISO9001 Certificate	X	X
Dimensional Drawings for Approval/Record	X	X
Calibration Certificate	X	X
Instrument Data Sheet (IDS)	X	X
Catalog Sheet	X	X
Third Party Factory Inspection Appointed by Delta Controls		●
Factory Hosting of Third Party Inspector Hired by Purchaser		●
Positive Material Identification (PMI) Testing		●
Liquid Dye-Penetrant Weld Testing		●
Material Test Report (MTR)		●

X - Included
● - Optional

Documentation & Testing Packages • Mechanical

	SERIES 700 DOCUMENTATION PACKAGE 1	SERIES 700 DOCUMENTATION PACKAGE 2	SERIES 700 DOCUMENTATION PACKAGE 3
IOM	X	X	X
Certificate of Conformance	X	X	X
Warranty Letter	X	X	X
Quality Control Certificate (Functional)	X	X	X
ISO9001 Certificate	X	X	X
Ex Certificate	X	X	X
CSA Certificate of Compliance	X	X	X
Dimensional Drawings for Approval/Record		X	X
Material Test Report (MTR)		X	X
Bill of Material (BOM)		X	X
Instrument Data Sheet (IDS)		X	X
Catalog Sheet		X	X
Inspection & Test Plan (ITP)			X
Hydrostatic Pressure Test Certificate/Directive			X
Dimensional Inspection Test Certificate/Directive			X
Visual Inspection Test Certificate/Directive			X
Factory Acceptance Test Certificate/Directive			X
Packing Procedure			X
Spare Parts List for Commissioning & 2 Years Operation (SPIR)			X
Third Party Factory Inspection Appointed by Delta Controls			●
Factory Hosting of Third Party Inspector Hired by Purchaser			●
Positive Material Identification (PMI) Testing			●
Tag/Nameplate Drawings for Approval/Record			●
Liquid Dye-Penetrant Weld Testing			●
Separate Dossier Shipping			●
Monthly Progress Report			●
Paint Coating Inspection Test Directive			●
Site Acceptance Certificate/Directive			●
Quality Manual			●
Certificate of Complete Shipment			●
Certificate of Delivery			●
CD-ROM Copy of Dossier			●

X - Included
● - Optional

Documentation & Testing Packages . Flow

	SERIES 600 DOCUMENTATION PACKAGE 1	SERIES 600 DOCUMENTATION PACKAGE 2	SERIES 600 DOCUMENTATION PACKAGE 3
IOM	X	X	X
Certificate of Conformance	X	X	X
Warranty Letter	X	X	X
Quality Control Certificate (Functional)	X	X	X
ISO9001 Certificate	X	X	X
Ex Certificate	X	X	X
Ex Declaration of Conformity	X	X	X
Dimensional Drawings for Approval/Record	●	X	X
Flow Calibration Certificate	●	X	X
Material Test Report (MTR)		X	X
Instrument Data Sheet (IDS)		X	X
Catalog Sheet		X	X
Inspection & Test Plan (ITP)			X
Hydrostatic Pressure Test Certificate/Directive			X
Dimensional Inspection Test Certificate/Directive			X
Visual Inspection Test Certificate/Directive			X
Paint Coating Inspection Test Directive			X
Factory Acceptance Test Certificate/Directive			X
Packing Procedure			X
Spare Parts List for Commissioning & 2 Years Operation (SPIR)			X
Third Party Factory Inspection Appointed by Delta Controls			●
Factory Hosting of Third Party Inspector Hired by Purchaser			●
Positive Material Identification (PMI) Testing			●
Tag/Nameplate Drawings for Approval/Record			●
Liquid Dye-Penetrant Weld Testing			●
Separate Dossier Shipping			●
Monthly Progress Report			●
Paint Coating Inspection Test Directive			●
Site Acceptance Certificate/Directive			●
Quality Manual			●
Certificate of Complete Shipment			●
Certificate of Delivery			●
CD-ROM Copy of Dossier			●

X - Included
● - Optional

Flange/NPT Pressure Ratings

TABLE 1: CARBON STEEL

Pressure—Temperature Ratings for Carbon Steel Working Pressure by Classes, psig						
	Class 150	Class 300	Class 600	Class 900	Class 1500	Class 2500
100 °F (38 °C)	284	741	1,481	2,222	3,703	6,171
122 °F (50 °C)	278	727	1,453	2,181	3,635	6,058
212 °F (100 °C)	257	676	1,352	2,028	3,379	5,632
302 °F (150 °C)	229	654	1,308	1,961	3,269	5,448
392 °F (200 °C)	200	635	1,271	1,906	3,176	5,294
482 °F (250 °C)	175	608	1,217	1,825	3,041	5,069
572 °F (300 °C)	148	577	1,155	1,733	2,888	4,812
617 °F (325 °C)	135	561	1,123	1,684	2,808	4,679
662 °F (350 °C)	122	545	1,089	1,635	2,724	4,540
707 °F (375 °C)	107	528	1,054	1,582	2,637	4,396
752 °F (400 °C)	94	503	1,007	1,511	2,518	4,196
797 °F (425 °C)	80	418	834	1,252	2,086	3,477
842 °F (450 °C)	67	334	667	1,001	1,668	2,780
887 °F (475 °C)	54	252	506	759	1,265	2,107
932 °F (500 °C)	41	171	341	512	853	1,420
1000 °F (538 °C)	20	86	171	257	428	714

TABLE 2: 316 STAINLESS STEEL

Pressure—Temperature Ratings for Stainless Steel Working Pressure by Classes, psig						
	Class 150	Class 300	Class 600	Class 900	Class 1500	Class 2500
100 °F (38 °C)	231	600	1,199	1,800	2,999	5,000
122 °F (50 °C)	222	580	1,160	1,742	2,902	4,837
212 °F (100 °C)	193	505	1,009	1,514	2,522	4,205
302 °F (150 °C)	174	455	911	1,366	2,277	3,794
392 °F (200 °C)	162	424	846	1,269	2,115	3,524
482 °F (250 °C)	152	399	796	1,195	1,991	3,320
572 °F (300 °C)	145	379	756	1,134	1,890	3,150
617 °F (325 °C)	135	370	740	1,108	1,848	3,079
662 °F (350 °C)	122	364	727	1,091	1,819	3,030
707 °F (375 °C)	107	360	718	1,078	1,796	2,992
752 °F (400 °C)	94	352	705	1,057	1,762	2,937
797 °F (425 °C)	80	347	692	1,038	1,730	2,883
842 °F (450 °C)	67	339	679	1,018	1,698	2,830

TABLE 3: NPT/ISO PIPE END PRESSURE RATINGS, ANSI/ASME B31.3

	316 Stainless Steel		Brass		Carbon Steel	
	Male	**Female**	**Male**	**Female**	**Male**	**Female**
1/16 in	11,050	3,750	6,750	3,350	11,050	6,750
1/8 in	10,050	6,550	6,550	3,250	10,050	6,550
1/4 in	8,050	6,550	6,650	3,350	8,050	6,650
3/8 in	7,850	5,350	5,350	2,650	7,850	5,350
1/2 in	7,750	4,950	4,950	2,450	7,750	4,950
3/4 in	7,350	4,650	4,650	2,350	7,350	4,650
1 in	5,350	4,450	4,450	2,250	5,350	4,450
1-1/4 in	6,000	5,000	5,000	2,500	6,000	5,000
1-1/2 in	5,000	4,600	4,600	2,300	5,000	4,600
2 in	3,900	3,900	3,900	1,900	3,900	3,900

Terms & Conditions of Sale

1. ACCEPTANCE: The sale of goods is expressly conditional on Buyer's acceptance of Seller's terms and conditions as stated on this page, provided that Seller's terms and conditions have not been previously accepted by Buyer. Buyer's acceptance of goods shipped under this Agreement is acceptance of these terms and conditions.

2. DELAYS: Seller shall not be responsible for any failure or delay in delivery due to fires, floods, labor troubles, whether or not due to fault of Seller, breakdowns, delays of carriers, total or partial failure for any reason of usual sources of supply or transportation, requirements or request of government or sub-division thereof, or any similar or dissimilar cause beyond Seller's control. In the event of inability of Seller's control to supply the total demands for any product specified in this order, Seller may allocate its available supply among any or all Buyers, including new customers, subsidiaries, affiliates and departments of Seller, on such basis as Seller, in its sole discretion, may decide upon, without liability for any failure to perform the contract which may be a consequence thereof.

3. DOCUMENTATION: Unless otherwise agreed, goods are sold only with Seller's standard quality control tests and calibrations and Seller's standard documentation.

4. ORDER CHANGES: Buyer's changes made after Seller's acceptance of the order that affect the specifications or configurations of the goods or otherwise affect the scope of the order shall be submitted in writing by Buyer and shall become binding only if approved in writing by the cognizant contract administrator. All charges and shipping costs resulting from such changes shall be for the account of the Buyer thereof shall be solely determined by Seller and shall be binding upon Buyer. Such changes are to be payable by the Buyer upon presentation by the Seller.

5. TERMINATION AND SUSPENSION: Provided that Seller receives adequate written notice from Buyer, Buyer may terminate or suspend performance at Buyer's convenience subject to all reasonable charges, which charges shall be solely determined by Seller. Such charges are to be payable by the Buyer upon presentation by the Seller.

6. TAXES: The price specified herein does not include the amount of any present or future tax applicable to the sale, manufacture, delivery, use and/or other handling of material hereunder. All government charges upon the production, shipment and sale of goods covered by this agreement, including, but not limited to, use, occupation, export and import taxes, shall be paid by Buyer or, in lieu thereof, Buyer shall furnish Seller with a tax exemption certificate acceptable to the authority imposing the tax on Seller.

7. WARRANTY: In consideration of the herein stated purchase price of the goods, Seller grants only the stated express warranty herein. No other warranties are granted, including, but not limited to, express and implied warranties, of merchantability and fitness for a particular purpose or service use.

8. EXPRESS WARRANTY granted on products manufactured by the Seller is that the Seller undertakes that products sold hereunder to Buyer shall be free from defects in material and workmanship, and shall conform to specifications for a period of 12 months from the date of use or 18 months from the original date of shipment by the Seller, whichever time period proves to be shorter. If defect is suspected, and upon receipt of definite shipping instruction, Buyer shall return, transportation prepaid all defective product, or products not conforming to specifications, to Seller. Product returned to Seller must be in the same condition as when received by Buyer. After inspection by Seller, and at Seller's sole discretion, Seller will repair or replace any product found to be defective or not meeting specifications and return it to the Buyer, by prepaid lowest rate transportation, to destination within the 48 contiguous states. However, Seller shall not be obligated for such charges when product returned proves to be free from defect and to meet specifications. Product which proves to be free from defect and to meet specifications shall be held by the Seller for shipping instructions and Buyer shall furnish such instructions promptly upon request. Such product may be disposed of by the Seller as refuse or scrap, without further responsibility or liability to the Buyer, if the Buyer has not furnished such instructions to the Seller within 120 days after being so requested.

9. RESALE PRODUCTS: Resale products are goods that are sold with Seller's goods which are not manufactured by Seller and which are supplied as an accommodation to Buyer in accordance with Buyer's requirements. Seller's responsibility for resale products is limited to reasonable commercial effort to arrange for procurement and shipping. Unless otherwise agreed, all prices are F.O.B. resale product manufacturer's factory. Standard drawings shall be only as supplied by the resale product manufacturer. All source inspections shall be arranged by Buyer with the resale product manufacturer. Seller makes no warranty for resale products, either express or implied, including warranties of merchantability and fitness for a particular purpose. The sole warranty shall be that of the resale product manufacturer. Buyer agrees that Seller has no liability for resale products beyond the services within Seller's direct control necessary to reasonably discharge the above stated responsibility and that Seller's shall not be liable for delays caused by resale product manufacturer. Buyer further agrees that Buyer's sole and exclusive remedy for Seller's breach of the stated responsibility shall be limited to the difference between the resale product manufacturer's price to Seller and Seller's price to Buyer for resale products in such breach.

10. LIMITATIONS OF REMEDY: Seller shall not be liable for damages caused by delay in performance. The sole and exclusive remedy for breach of warranty shall be limited to repair or replacement under the standard express warranty clause, in no case, regardless of the form of the cause of action, shall Seller's liability exceed the price to Buyer of the specific goods manufactured by Seller giving rise to the cause of action. Buyer agrees that in no event shall Seller's liability extend to include incidental or consequential damages. Consequential damages shall include, but not be limited, to loss of anticipated profits, loss of use, loss of revenue, cost of capital and damage or loss of other property or equipment. In no event shall Seller be liable for property damage and/or indemnity coverage provided to Buyer, its assigns, and each successor in interest to the goods provided hereunder.

11. INSPECTION: Buyer may make reasonable inspections of goods at Seller's factory. Seller reserves the right to determine the reasonableness of the request and to select an appropriate time and location for such inspection. All costs of inspection shall be solely determined by Seller and shall be to Buyer's account. No inspection or expediting by Buyer at the facilities of Seller's suppliers is authorized.

12. PATENTS: Seller shall defend any suits brought against the Buyer based on a claim that the goods manufactured by Seller constitute an infringement of a valid patent of the United States, and shall pay any damages and reasonable costs awarded therein against Buyer, provided that Buyer promptly notifies Seller in writing and gives authority, information and assistance to Seller for the defense of such suit. In the event that only the goods manufactured by Seller are held to be infringing in such suit and their use is enjoined, Seller shall, at Seller's expense, provide a commercially acceptable alternative, including, but not limited to, procuring for Buyer the right to continue using the goods, replacing them with a non-infringing product or modifying them so they become non-infringing. Buyer agrees that Seller shall not be liable and that Buyer shall fully indemnify Seller if infringement is based upon the use of the goods in connection with goods not manufactured by Seller or in a manner for which the goods were not designed by the Seller or if the goods were designed by the Buyer or were modified by or for the Buyer in a manner to cause them to become infringing.

13. CREDIT: All shipments made hereunder shall, at all times, be subject to the approval of Seller's Credit Department. Terms of Sale shall be by agreement between, and adhered to by both, the Buyer and Seller. Any Trade Credit which may be extended by Seller to Buyer shall be at the sole discretion of Seller. Seller shall be under no obligation to extend such credit because of prior actions or for any other reason, whatsoever. If the financial responsibility of Buyer is unsatisfactory, or becomes impaired, or if Buyer fails to make payment in accordance to the terms of this, or any other contract with Seller, then, in such event, Seller may defer or decline to make any shipments hereunder except upon receipt of security satisfactory to Seller, or cash payments in advance, or Seller, at its sole discretion, may terminate the contract.

14. POINT OF DELIVERY: Delivery to carrier at the point of shipment shall constitute delivery to Buyer and Buyer shall assume all risk for subsequent loss of damage. The fact that in some instances a different "F.O.B." point may be shown on the face hereof, or that all or a part of freight charges may be prepaid, assumed, or allowed by Seller, is for Buyer's convenience only.

15. WAIVERS: No waiver by Seller of any breach of any provision hereof shall constitute a waiver of any other breach or of such provision. Seller's failure to object to provisions contained in any communication from Buyer shall not be deemed an acceptance of such provisions or as a waiver of the provisions of this contract.

16. GENERAL: Buyer shall not sign this agreement unless approved in writing by Seller, which approval shall not be unreasonably withheld.

Bespoke Engineering

Engineered Reliability. Customized.

Delta Controls has decades of customized product design and development experience. We understand that not every instrumentation challenge can be solved with off the shelf solutions. Our engineering staff can undertake contracts to design and manufacture hardware and software that performs in accordance with detailed specifications. Equipment can be provided to conform to international codes and meet the criteria for many third party agency approvals.

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All Delta Controls products are designed, engineered, and manufactured at our facility in Shreveport, LA.