Electronic Liquid-Level Transmitters and Pneumatic Controllers

W4067-2

W3121-3

- **Available are the 2390 Series electronic transmitter and 2500 Series pneumatic controller. Both use 249 Series displacer-type Level-Trol® sensors**
- **The displacer sensor measures changes in liquid level, specific gravity, or interface level, and the instrument transmits an electronic or pneumatic signal that is proportional to the changes.**
- **The displacer is contained in a rugged cage for mounting on the side of a tank, or the displacer can be suspended in a tank without a cage.**

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2390-249 Series Electronic Transmitters

Changes in liquid level or density are transmitted from the displacer through the torque tube to the transmitter. A Hall-effect sensor converts this rotary motion to an electronic signal.

Zero and span adjustments are located outside the housing and are non-interactive.

Field wiring connectors are in a separate compartment to protect the circuits from field wiring moisture.

Transmitter filters eliminate displacer-induced ripple voltages from the signals and help provide protection against electromagnetic interference.

W4067-2/IL

The transmitter can be positioned to the right or left of the sensor and to any of several locations around the sensor (refer to the 249 Series sensor section)

Normal ambient temperature for the transmitter portion is -40 to 80°C. Refer to 249 Series sensor section for more information on temperatures.

An output meter and a heat insulator are optional.

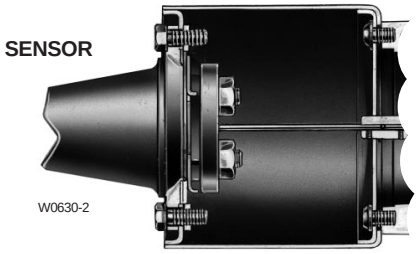
2390-249 Series Physical Specifications

STANDARD DISPLACER LENGTHS				STANDARD DISPLACER VOLUMES, cm^3	MINIMUM SPECIFIC GRAVITY	SPAN ADJUSTMENT	ZERO ADJUSTMENT	ENCLOSURE
249 Series, mm	All Others, mm	249 Series, mm	All Others, Inches					
356 or 813	356	14 or 32	14	■ 1639 for all types except ■ 983 for Types 249C and 249CP	0.1 with standard volume displacers	10 to 100% of displacer length (level applications with standard displacer)	100% of displacer length	**Type 2390:** Meets NEMA 4X, CSA Type 4X, and IP65 **Type 2390B:** Meets EN 60 529 IP66
	813		32					
	1219		48					
	1524		60					
	1829		72					
	2134		84					
	2438		96					
	2743		108					
	3048		120					

H429T03

W4093

Optional Output Meter



W0630-2

Optional Heat Insulator

2390-249 Series Electronic Transmitters (Continued)

Type 2390 and 2390B Electrical Specifications

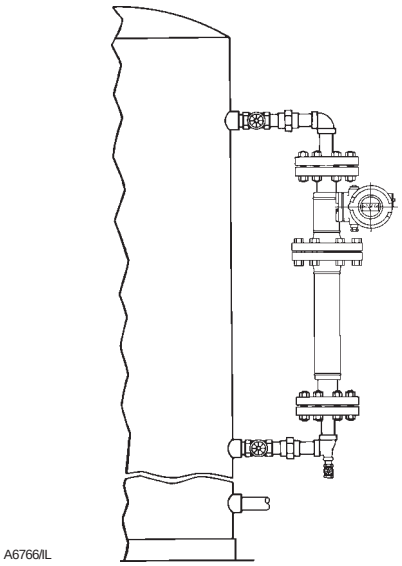
OUTPUT SIGNAL	POWER SUPPLY				TRANSIENT POWER SURGE PROTECTION
	Standard	LCIE or PTB (CENELEC) Approved	CSA or SAA Certified or FM Approved	Load Resistance	
4 to 20 mA dc either ■ direct or ■ reverse acting (with direct action, increasing level increases the output signal)	11 to 45 V dc with reverse polarity protection	11 to 32.5 V dc for intrinsically safe (PTB) and 11 to 45 V dc (with reverse polarity protection) for flameproof (LCIE)	11 to 30 V dc with reverse polarity protection	Refer to the curve on page 4. Maximum for a 4 - 20 mA circuit is 1700 ohms at 45 V	No damage for a line-to-line surge of up to 100 kilowatts for 100 nanoseconds or 1.5 kilowatts for 1 millisecond

H429T09

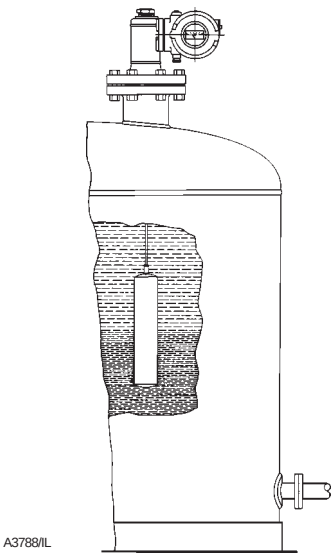
Type 2390 and 2390B Certifications

INTRINSIC SAFETY OR NON-INCENDIVE			FLAMEPROOF	CE MARK TO EMC DIRECTIVE (TYPE 2390B)	DIVISION 2		EXPLOSION-PROOF
PTB (Type 2390B)	BASEEFA (Type 2390B)	CSA[1] or FM[1] (Type 2390B)	LCIE (CENELEC) (Type 2390)		CSA (Type 2390)	FM (Type 2390)	CSA or FM (Type 2390)
EEx ia IIC T4	EEx ia IIC ET AL	Class I, Division 1, Groups[1] A, B, C, D T4	EEx d IIC T6	EN 50081-1 & EN 50082-1	Class I Division 2, Groups A, B, C, D Class II, Division 2, Groups E, F, G	Class I Division 2, Groups A, B, C, D Class II, Division 2, Groups F, G	Class I Division 1, Groups A, B, C, D Class II, Division 1, Groups F, G
1. Contact your nearest sales office or sales representative for the appropriate FM entity ratings and CSA parametric ratings for each group.							

H429T01

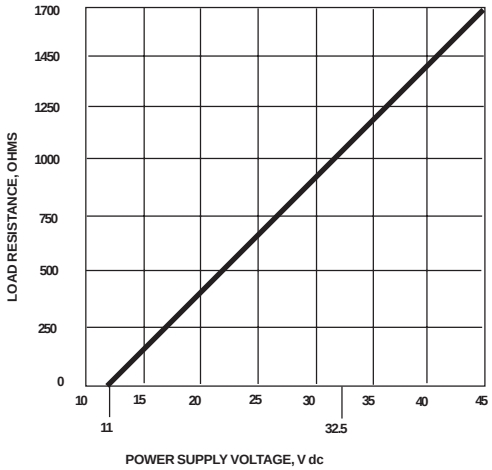


Transmitter with Cage-Type Sensor



Transmitter with Cageless Sensor

2390-249 Series Electronic Transmitters (Continued)



Load Resistance (Also Refer to the Table on Page 3)

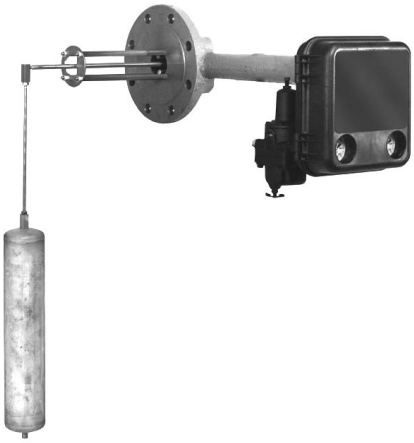
2500-249 Series Pneumatic Controllers and Transmitters

Changes in liquid level or density are transmitted from the displacer through the torque tube to the controller. A nozzle-flapper, bourdon tube or bellows, and pneumatic relay convert this rotary motion to a pneumatic control signal.

Proportional, proportional-plus-reset, differential gap (on-off) control modes are available.

Anti-reset windup is available for the proportional-plus-reset mode. A pneumatic transmitter also is available.

Set point, proportional band, and reset adjustments are made with simple dial controls.



W3120-2

Controller with Cageless Sensor

Supply and output pressure gauges are standard.

The controller can be positioned to the right or left of the sensor and to any of several locations around the sensor.

Normal ambient temperature for the controller or transmitter poriton is -40 to 71°C as standard and -18 to 104°C as optional. Refer to the 249 Series sensor section for more information on temperature.

A heat insulator and level indicator are optional.

2500-249 Series Controllers and Transmitters (Continued)

2500-249 Series Physical Specifications

STANDARD DISPLACER LENGTHS				STANDARD DISPLACER VOLUMES, cm^3	MINIMUM SPECIFIC GRAVITY	CONTROLLER SET POINT ADJUSTMENT	OTHER CONTROLLER ADJUSTMENTS	TRANSMITTER ZERO ADJUSTMENT
Type 249, mm	All Others, mm	Type 249, Inches	All Others, Inches					
356 or 813	356 813 1219 1524 1829 2134 2438 2743 3048	14 or 32	14 32 48 60 72 84 96 108 120	■ 1639 for all types except ■ 983 for Types 249C and 249CP	0.1 with standard volume displacers	Control point continuously adjustable over the entire displacer length	Refer to the following table	100% of displacer length

H429T05

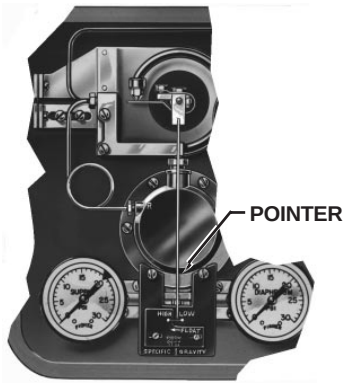
2500 Series Controller Selections

Mode	Adjustment	Type Number	Output Signal, Bar (Psig)	Notes
Proportional controller	Proportional band adjustable for full output pressure change over 10 to 100% of displacer length	2500 or 2500C	■ 0.2 to 1.0 or ■ 0.4 to 2.0 (■ 3 to 15 or ■ 6 to 30)	• Type numbers with the letter C include a mechanical level indicator. • Add the letter R to the type number for reverse action (rising level produces decreasing output signal). • Type 2503 adjustment will vary based on displacer length, specific gravity and supply pressure.
Proportional-plus-reset controller	Proportional band adjustable for full output change over 20 to 200% of displacer length	2502 or 2502C		
Proportional-plus reset controller with anti-reset windup	Proportional band adjustable for full output change over 20 to 200% of displacer length	2502F		
Proportional transmitter	Span adjustable for full output change over 20 to 100% of displacer length	2500T or 2500TC		
Differential gap (on-off) with full adjustment	Differential gap adjustable for full output change over 0 to 100% of displacer length	2500S or 2500SC	■ 0 and 1.4 or ■ 0 and 2.0 (■ 0 and 15 or ■ 0 and 30)	
Differential gap (on-off) with limited adjustment	Differential gap adjustable for full output change over 25 to 40% of displacer length (refer to notes)	2503	0 and full supply pressure	

H429T04

W0656-1

Typical Controller



W0648-1

Optional Level Indicator

2500-249 Series Controllers and Transmitters (Continued)

2500-249 Series Supply Pressure Data

OUTPUT SIGNAL		NORMAL OPERATING SUPPLY PRESSURE, BAR	MAXIMUM (TO PREVENT DAMAGE TO PARTS), BAR	AIR CONSUMPTION AT NORMAL OPERATING SUPPLY PRESSURE, Nm^3/H	
Bar	Psig			Minimum	Maximum
0.2 to 1.0 or 0 and 1.4 for on-off	3 to 15 or 0 and 20 for on-off	1.4	3.4	0.11	0.72
0.4 to 2.0 or 0 and 2.4 for on-off	6 to 30 or 0 and 35 for on-off	2.4	3.4	0.19	1.1

H429T06

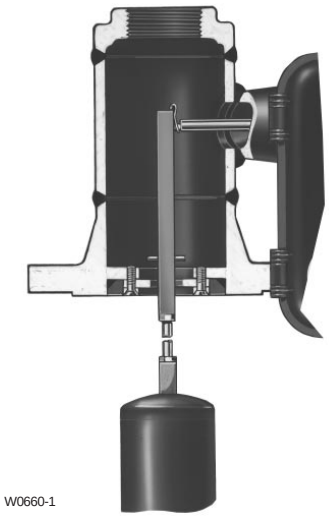
249 Series Level-Trol® Level Sensors

The 249 Series Level-Trol sensors are rugged displacer-type sensors.

Refer to the tables for some of the available ratings, end connections, and construction materials.

For the caged construction, connections between the tank can be on the ■ upper and lower side, ■ top and bottom, ■ top and lower side, or ■ bottom and upper side. Also, the torque tube arm, on which the controller or transmitter is mounted can be rotated to any of several positions either to the ■ right or ■ left of the sensor.

Jerguson gauges, which show the actual liquid level in the cage, are available as an option. Also available is the Type 67AFR filter-regulator for use as a supply pressure regulator.



W0660-1

Interior of a Cageless Sensor

W2141-1

Interior of a Caged Sensor

249 Series Level-Trol® Level Sensors (Continued)

249 Series Ratings and Connections

Rating	Material	Size	Connection Type	Sensor Type Number	Notes
Caged Displacers					**Abbreviations:** NPT (screwed ends) SWE (socket-weld ends) RF (raised-face flanges) RTJ (ring-type joint flanges) FF (flat-face flanges) **Type 249P:** Ratings to PN250 also are available. **Type 249K:** If a connection on top of the cage is specified, it will be 1-inch flanged
PN10/16, 25/40, or 63/100	Steel	DN 40	Flanged	249BF	
PN10/16 or 25/40		DN 50			
Class 600	Steel	1-1/2 or 2 inches	NPT or SWE		
Class 150, 300, or 600			RF or RTJ		
Class 1500	Steel	1-1/2 or 2 inches	RF or RTJ	249K	
Class 2500	Steel	2 inches (Refer to notes)	RTJ	249L	
Class 900	Steel	1-1/2 or 2 inches	RF or RTJ	249N	
Top-Mounted Cageless Sensors					
Class 150, 300, or 600	316 stainless steel	3 inches	RF	249CP	
PN10/16, 25/40, or 63 (Refer to notes)	Steel or stainless steel	DN 100	Flanged	249P	
Class 900 or 1500	Steel or stainless steel	4 inches	RF or RTJ		
Class 150 through 2500		6 or 8 inches	RF		
Side-Mounted Cageless Sensors					
Class 125 or 250	Cast iron	4 inches	FF	249V	
Class 150	Steel	4 inches	RF or FF		
Class 300 through 1500	Steel	4 inches	RF or RTJ		
Class 2500	Steel	4 inches	RTJ		
Class 150	Stainless steel	4 inches	RF or FF		
Class 300, 600, or 900	Stainless steel	4 inches	RF or RTJ		

H429T02

2500-249 Series Standard Materials

Part	Sensor Type	Standard Material	Notes
Cage, head, and torque tube arm	249BF	Steel	For optional materials and for parts not shown, contact your nearest sales office or sales representative.
	249CP	CF8M (316 stainless steel)	
	249K, 249L, and 249N	Steel	
	249P and 249V	Cast iron or steel	
Torque tube	All except 249CP	N05500 (K-Monel)	
	249CP	S31600 (316 stainless steel)	
Displacer	All except 249CP and 249L	S30400 (304 stainless steel)	
	249CP	S31600	
	249L	A91100F (solid aluminium)	
Bolting	All	B7 steel studs or cap screws and 2H steel nuts	

H429T07

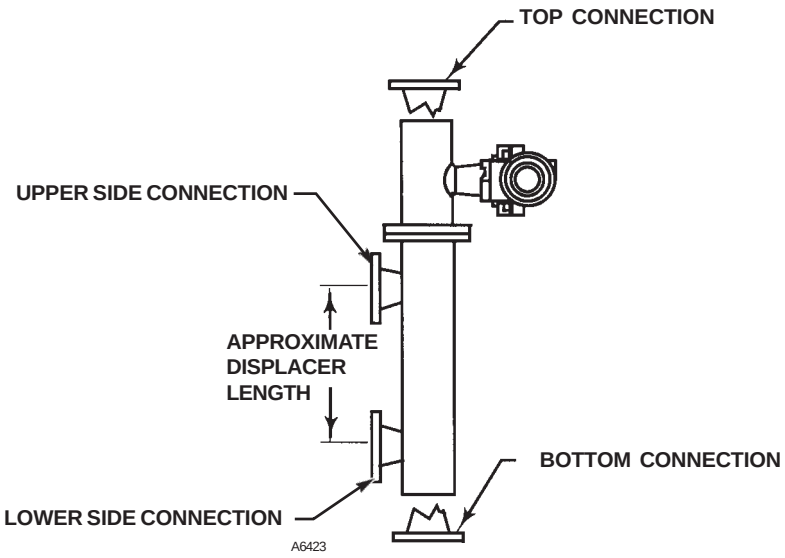
249 Series Level-Trol® Level Sensors (Continued)

2500-249 Series Temperature Capabilities with Standard Sensor Materials

Temperature	Type or Material	Temperature Capabilitiy, °C	Notes
Ambient	Types 2390 and 2390B	-40 to 80	• For process temperatures below -29°C and for guidance on the need for a heat insulator, contact your nearest sales office or sales representative. • If the ambient dew point is higher than the process temperature, ice might form and cause instrument malfunction and reduce insulator effectiveness.
	Standard 2500 Series	-40 to 71	
	High-temperature 2500 Series	-18 to 104	
Process	Cast iron sensor parts	-29 to 232	
	Steel sensor parts	-29 to 427	
	Stainless steel sensor parts	-198 to 427	
	N05500 torque tube	-198 to 371	
Combination of ambient and process	Some combinations of process and ambient temperatures within the above require an optional heat insulator to protect the instrument from high or low temperatures. For example, an ambient temperature of 30°C and a process temperature of 200°C require a heat insulator.		

H429T08

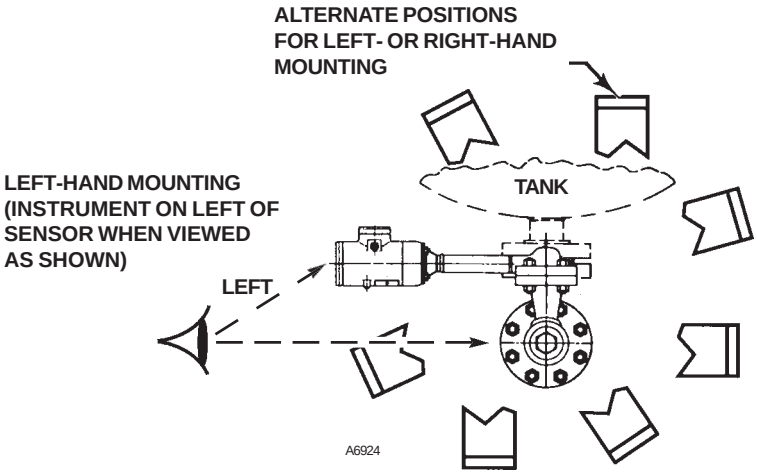
Connection Styles and Positions



Connection Types:	T = Threaded F = Flanged			
Connection Locations:	Style 1	Style 2	Style 3	Style 4
	Top and bottom	Top and lower side	Upper size and lower side	Upper side and bottom
Example:	F-1 means flanged connections at the top and bottom of the cage.			

H429T10

Connection Styles and Positions (Continued)



When Ordering, Specify...

Control Application--Specify electronic transmitter, pneumatic proportional controller, etc.

Liquid-Level Service--Specify pressure, temperature, and specific gravity.

Interface-Level Service--Specify the specific gravity of both liquids, the minimum proportional band, differential gap or span, as well as the pressure and temperature.

Density Service--Specify the minimum and maximum specific gravity as well as the pressure and temperature.

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