

Pneumatic Level Instruments For Oil Industries



Automat

... the level & gas people

Interface L.C Pg-1 Flex Tube L.C Pg-1,2 Micro Value L.C Pg-2 Internal Ball Float L.C Pg-3 Shut off Relife Angle Valve Pg-4 Temperature Controller Pg-5 Thermometers P-6

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Interface Level Controller

(With Proportional Pneumatic Output) Model 400-4
(Similar to M/s. Invalco/Natco Model No. CTMF402/CTQ-402)

Introduction

The Interface Controller has amplifying relay, nozzle and flapper which operates with filtered air supply or gas. Automat liquid interface Controller consist of displacer mounted to the flex tube. This flex tube is attached to a standard flange. Mounted on the reverse side of the flange is the carrier assembly with adjusting screw, nozzle and relay with the orifice with cleaning device which has been provided to clean clogged orifice. The flex tube is tube which permits vertical motion only. The Automat flex tube shaft extension rod transmits the displacer motion from within the shaft to the nozzle. The displacer has been specially designed to sense liquid interface even for **specific gravity difference of 0.05**. The interface Controller can also be fitted in tanks & similar vessels for controlling the desired level of the liquid.

Principle of Operation

Liquid interface controller operates on the change in buoyant force on the displacer. This force is proportional to the volume of liquid that is displaced. Any change in the liquid level will produce the change in the position of flex tube end. This causes movement of the flex tube shaft to which flapper is connected.

A booster relay has been added to the control to speed the response time which helps to remove heavier liquid (water) at faster speed. The relay is enclosed in a pressure tight housing allowing for the remote release of vented gases and protecting the pilot and pressure gauges from the elements and hose spray cleaning operations.

Technical Specifications

Operating Mode	Pneumatic, On-off Direct or Reverse. (Reverse action obtained by rotating Nozzle assembly by 180°)
Process Connection	Carbon Steel ASA flange. Process flanges min. 4" std is recommended because of limitation of displacer diameter for interface applications.
Working Pressure	upto 60 kg / cm ²
Temperature Limits	a) 150° with S.S. Float b) 100° with Phenolic float



Enclosures	Weather proof IP65
Supply Pressure	1.4 kg/cm ²
Output	0.2 - 1 kg/cm ²
Supply Connection	1.4" NPT
Output Connection	1/4" NPT
Exhaust	Screened Vent Connection
Gas consumption	15 CFH (Minimum) 35 CFH Throttle (Average)
Displacers	A) HORIZONTAL (Stainless Steel) 76mmØ x 440mm long C) VERTICAL (Stainless Steel) 76mmØ x 356mm long D) VERTICAL (Phenolic) 90mmØ x 115mm long
Differential*	A) 7 ± 3mm for S.G. difference of 0.1 C) 25 ± 5mm for S.G. difference of 0.1 D) 20 ± 5mm for S.G. difference of 0.1
S.G. difference	0.05 (min.)

* Differential increases proportionally with decrease in S.G.

Level Controller Flex (Tube)

(With Proportional Pneumatic Output) Model 40 DP-2
(Similar to M/s. Invalco/Natco Model No. CTMF402)

Introduction

Liquid Level Controller consists of displacer mounted to the flex tube. The flex tube has been an industry standard for over a decade in fluid Level Control. Its simplicity, reliability, ease of maintenance and rugged construction have made it popular where down time for repairs could be critical to process or where minimum maintenance is required. The Level Controller with Pilot Value and carrier assembly is housed in weather proof housing IP65. All exhaust gas is vented inside the enclosure and then to the atmosphere through a screened vent connection.

Principal of Operation

Liquid level controller operates on the change in buoyant force on the displacer. This force is proportional to the Volume of

liquid that is displaced. Any change in the liquid level will produce the change in the position of flex tube end. This causes movement of the flex tube shaft to which carrier assembly is attached. The carrier assembly covers or uncovers the nozzle for giving Pneumatic output from the pilot valve.

Technical Specifications

Operating Mode	Pneumatic, On-off Direct or Reverse. (Reverse action obtained by rotating Nozzle assembly by 180°)
Process Connection	2" & 4" standard flange of 150ASA, 300 ASA & 600 ASA.
Process Connection Material	Carbon Steel / Stainless Steel
Working Pressure	upto 60 kg / cm ²
Temperature Limits	a) 150°C with S.S. Float b) 100°C with Phenolic float c) 75°C with Acrylic float
Enclosure	Weather proof IP65
Supply Pressure	1.4 kg/cm ²
Output	0-1 kg/cm ² (Proportional, Non Linear)
Supply Connection	1.4" NPT
Output Connection	1/4" NPT
Flex Tube	316SS / 410SS / 304SS
Displacers	A) HORIZONTAL (Stainless Steel) 76mm 9x152 mm long



	B) VERTICAL (Stainless Steel) 76mm - 356mm long C) VERTICAL (Stainless Steel) 42mm -200mm long D) VERTICAL (Phenolic) 90mm -115 mm long
Differential	a) 10mm-30mm depending upon displacer size & Specific Gravity (HORIZONTAL FLOAT) b) 20mm depending upon displacer size & Specific Gravity (VERTICAL FLOAT)

Micro Valve Level Controller

(With Pneumatic Output) Model 40 P-1 (Snap Acting Level Switch)
 (Similar to M/s. Invalco/Natco, Model No. CTAF-402S/810-CMAO-403)

Description

This is a snap-action float operated level controls, equipped with 3 way MICRO VALVE unit, actuated by two adjustable york-type pusher arms. Adjustable pusher arms permit the control range to be adjusted easily and accurately to the range desired.

With the liquid level is below the float the 3 way Micro Valve will be in the low level position, and will remain there until the float rises to the pre-set high level. The Micro Valve then will reverse positions until the float drops to the pre-set low level position.

Model No.	Nominal Connection Size, Type, Max. Pressure	Material	
		Body	Float
40-P1	4" 150 ASA flange, 15 kg/cm ²	C.S.	316 SS
	4" Groova Grooved Coupling, 15 kg/cm ²	C.S.	316 SS

Installation

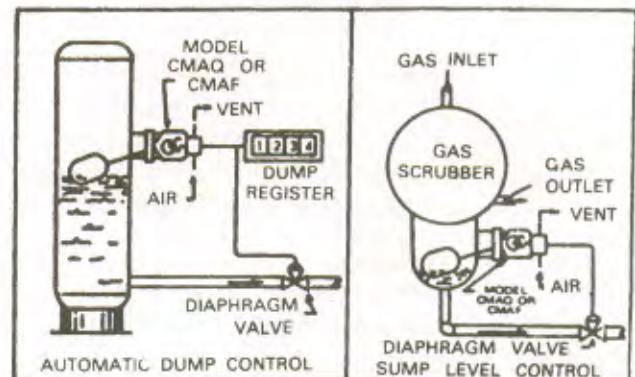
This model is equipped with Flange/Groova Grooved Coupling for mounting on to the vessel from side. The float is designed to pass through a 100mm tank nozzle.

Operations

This model is equipped with a three way Micro Valve with three 1/4" NPT ports. The Micro Valve has a standard working pressure of 2kg/cm². Connection to the ports depend on the control action desired.



Application of Micro Valve Level Controller



WITH FLOAT AT LOW LEVEL	WITH FLOAT AT HIGH LEVEL
Port 1 closed to 2 Post 2 common Port 3 open to 2	Port 1 open to 2 Port 2 common Port 3 closed to 2

Technical Specifications

Service	Crude Oil / Oil / Condensate
Operating Pressure	15 Kg./Cm ²
Operating Temp.	100°C
Specific Gravity	0.6-1.2
Float Stem	316SS
Float Size	90mmØ x 135mm long
Mounting	Side Internal

Output	0-1 Kg/cm ² (Proportional, Non Linear, Snap Action)
Action	Direct (increase in level increases output) Reverse (increase in level decreases output)
Distance (Float centre to Flange face)	415mm
Differential	400mm (Maximum) 150mm (Minimum)
Air Connection	1/4" NPT
Micro Valve Port	1/4" NPT (F)
Plunger	304 SS
Supply Pressure	2kg/cm ²
Housing	Weather Proof

Level Controller (Internal Ball Float)

(With On-Off Pneumatic Output) Model 401-2, Russian Design/Fisher Design
(Similar to M/s. Fisher U.S.A., Model No. 231C-779K)

Introduction

Internal Ball Float Level Controller has been designed and developed especially for various types of liquid level control service used in Refineries, Gasoline Plants, Industrial Plants, Oil and Gas Separators and other similar installations. This unit is installed directly to the flanged opening on the side of the vacuum towers, soaking drums, oil and gas separators, fractionating columns, all type of liquid containers where a float operating inside of the tower can be used to an advantage. These units with floats operating inside the main level container are not recommended where turbulence or foaming on the liquid surface occurs. For such installation, the external float cage type Level Controller is recommended. Refer Bulletin 1200 for details of Displacement Type Level Controller (Pneumatic)

Operation

The operation of the Level Controller is based on the principle that Ball float position is determined by the Fluid Level variations actuating the rod through a system of levers. This controller operates on Archimedes Principle. The increase in level causes float to move up which is helped by counterweight for upward movement. The linkage operates plunger of pneumatic relay for changing output pressure which finally operates control valve to control level of liquid. The maximum angle of the plug turn is 50° and corresponds to the level change within the range of 300mm. The pneumatic relay is supplied with purified natural gas or air at a pressure of 1.1 to 2.5 Kg./Cm².

Construction

Ball Float, Float rod, Shaft, Coller & Gland housing are made of Stainless Steel. Pneumatic Relay is of Brass which is weather proof enabling the instrument suitable for outdoor and moist atmosphere.

Technical Specifications

Service	Crude Oil (Oil/Gas interface)
Operating Pressure	Upto 40 Kg./Cm ²
Operating Temp.	120°C



Specific Gravity	0.7 (Minimum)
Float	304 SS
Float Size (±5mm)	(A) 7½ inches Ø (197 mm) (B) 9½ inches Ø (248 mm)
Mounting	Side Internal
Flange Details	a) 8" x 150 ASA (b) 10" x 150 ASA c) 2" BSP Threads
Flange Material	Carbon Steel
Supply	1.1 kg/cm ² to 2.5 kg/cm ² (Clean, dry & oil free air or gas)
Output	ON-OFF (Proportional)
Action	Direct (Increase in level increases output) Reverse (Increase in level decreases output)
Float Travel Stopper	Provided
Float Stem	606 mm Std. (others on request)
Packing	Teflon
Float Travel	300 mm
Plug Turn Angle	50°
Pneumatic Connection	1/4" NPT

Shut off Valve, Relief Valve & Angle Valve

Shut off Valve Model 1100-1

(Similar to M/s. Invalco / Natco, Model No. RDSG-101-503)

Technical Specifications

Body Material	C.S
End Connection	Threaded
Body Cover/Lower Dia. Case	C.S
Diaphragm Operator	Upper Dia. Cast Aluminum with Buna-N Diaphragm
Packing	Standard O Ring-Buna-N
Maximum Working Pressure	8kg/cm ²
Temperature Limits	- 10 to +100°C
Stem Material.	304 SS.
End Connection Size	3/4" NPT and 1" NPT
Trim.	S.S. Throttling Teflon insert
Cv	6 for 3/4" orifice 12 for 1" orifice



(SHUT OFF VALVE)

Relief Valve Model 1100-3

(Similar to M/s. Invalco / Natco Model No. RDSG-301-503)

Body	Cast Iron/C.S.
Diaphragm Case	Pressed Steel
Containment Pressure	10 kg/cm ²
End Connection Size	2" & 3" Threaded
Diaphragm	Nylon Re-inforced Buna-N
Temperature Limits	- 10° to +100°C
Internal Trim	304 Stainless with moulded Buna Plug 1½" Orifice
Flow Capacity	Cv -27 (All Models)

PRESSURE INCREASE REQUIRED FROM FULL CLOSED TO FULL OPEN.

Spring Range, Kg/cm ²	Increase
0 -1.5	0.2 Kg/cm ²
1.25 - 2.75	0.3 Kg/cm ²
2.75 - 4.00	0.6 Kg/cm ²
4.00 - 6.00	0.7 Kg/cm ²

Settings

Any spring combination may be set to open at less than 5 psi WP, but, because the heavier springs are less sensitive, it is recommended that valves be selected to suit the pressure range required. The valve will be set at pressure required and a seal wire inserted.

Installation and operation

Valve is installed in the line so that flow pressure is exerted against the bottom of the plug. Line pressure is exerted against the diaphragm through the hollow stem connecting the diaphragm to the plug. When flow pressure exceeds the spring



(RELIEF VALVE)



(ANGLE VALVE)

setting pressure, valve opens and allows excess pressure to relief through the orifice of the valve and down the flow line. As pressure is relieved, spring pressure returns the plug against the seat for positive seal.

Temperature Controller (Pneumatic)

MODEL NO. 1501-1

(Similar to M/s. Invalco / Natco, Model No. (2361-CTS-5025-P15))

Introduction

The Model 1501 is the latest version of the thermal Expansion type temperature Controls. It is provided with two adjustments (1) temperature set point control and (2) a new unique proportionality control. The temperature set point control permits the instrument to be set at any position from -50°F to $+750^{\circ}\text{F}$. The proportionality control allows the operator to set the temperature span desirable. The proportionality control is calibrated from 5 to 60°F which is the temperature change required to produce $0.2-1 \text{ kg/cm}^2$ output.

The orifice in the seat is drilled eccentrically so that rotating the seat moves the Orifice with respect to the adjusting screw. This regulates the amount the orifice is opened per degree to temperature reduction.

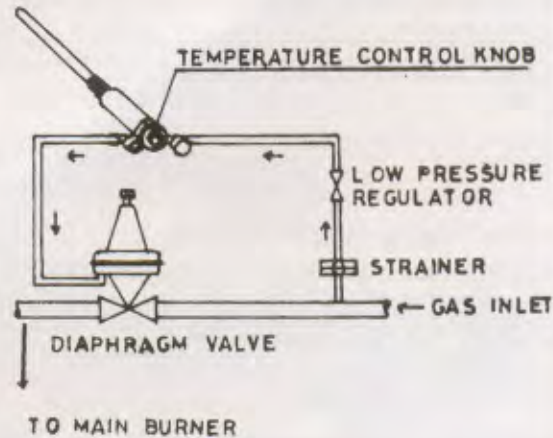
Principal of Operation

The temperature controller utilizes the difference in thermal expansion coefficient of two materials to produce a mechanical motion. The sensing element of the Controller is installed in the vessel. Temperature changes surrounding the element cause the following reactions :

1. The inner metal rod will expand on temperature increase or contract as temperature decreases. The change in length is proportional to the temperature change occurring.
2. The change in length of the outer metal tube, which has a low expansion coefficient is negligible. However since one end is attached to the outer metal tube, the inner rod moves as the outer tube changes length.
3. The opposite end of the inner rod pushes against and supports a floating link, holding it concentric with a spring loaded inner valve. With a decrease temperature the inner rod applies pressure on the floating link, causing it to pivot around the adjustment fulcrum point which tilts the inner valve plug of its seat allowing the output signal to increase. The temperature adjustment knob adjusts the set point by moving fulcrum point up or down.

Technical Specifications

Service	Oil or Water
Operating Pressure	20 kg/cm^2
Temperature Range	-50°F to $+750^{\circ}\text{F}$
Set Point	Provided
Supply	1.4 kg/Cm^2 (Natural Gas/ Compressed air)
Output	0.2 to 1 kg/cm^2
Air Connection	$1/4"$ NPT
Action	REVERSE (Increase in temperature decreases output)
Thermowell	$3/4"$ NPT Threads/316 SS
Insertion Length	295 mm



Bimetal Thermometers

(Similar to Invaou/natco Stock No. 4500 & 3645)



- 1) TYPE: Horizontal, Vertical & All Angle.
- 2) DIAL SIZE: 63, 100 & 150mm.
- 3) ACCURACY: $+1\%$ of range span.
- 4) STEM & CONNECTION: Non ferrous & Stainless Steel.
- 5) CONNECTION: $1/2"$ BSP / $1/2"$ NPT / M20x1.5
- 6) MOUNTING:
 1. Horizontal with back entry.
 2. Vertical with bottom entry.
 3. Combination Horizontal & vertical with bottom/back entry.
- 7) CASE: Cast aluminium / Stainless Steel.
- 8) STEM DIA: 6/8/9/10/12mm.
- 9) IMMERSION LENGTH: 150mm (standard) to 500mm.
- 10) RANGES($^{\circ}\text{C}$): 50+50, 50, 100, 120, 150, 200, 250, 300, 400, 500 $^{\circ}\text{C}$.

Equivalent Instrument of Automat w.r.t.
a) Fisher & Governer (b) Natco / Invalco, (c) Camco (d) Magnetrol

EQUIPMENT : EMULSION HEATER TREATER	AUTOMAT MODEL NO.	COMPARABLE MANUFACTURER	COMPARABLE MANUFACTURER'S MODEL NO.
1. Pressure Indicating Controller, 0-250 kg/cm ²	200-1A	Fisher & Governer	4160
2. Interface Level Controller	401-4	Natco/Invalco	CTMF-402
3. Oil Level Controller Flex Tube Operated	40DP-2	Natco/Invalco	CTMF-402
4. Oil Shut Down Micro Valve Level Controller	40P-1	Natco/Invalco	CTAF-402-S
5. Temperature Controller (Reverse)	1501-1	Natco/Invalco	CTS-5025
6. Temperature Control Valve 1" Size (Air to open)	1100-13	Natco/Invalco	DSG-101B-46B
7. Gas Shut Off Valve 1" Size	1100-1	Natco/Invalco	RDSG-101-503
8. Gas Pressure Regulator 1" Size Non Bleed	1200-95L	Fisher & Governer	95L
9. Gas Pressure Regulator 1/4" Size Non Bleed	1200-912	Fisher & Governer	912
10. Air Filter Regulator 1/4" Size	1200-1	Fisher & Governer	67R
11. Temperature Indicator (Bimetallic) with 4" Dial and 1" NPT Thermowell Connection	1501-1-TI
12. Low Temperature Switch for Pilot Burner	1100/5	Natco/Invalco	CMA-100A
13. Burner Shut Off Panel with Alarm	1100/3
EQUIPMENT : OIL LIFTING STATION			
1. High Pressure Regulator 1/4" upto 150 kg/cm ²	1200-1301	Fisher & Governer	1301
2. Time Cycle Controller	1450	Camco	B-8
EQUIPMENT : TEST SEPARATOR			
1. Flow Dump Counter	1100-4-B
EQUIPMENT : GAS COMPRESSORS			
1. Displacement type level Controller	1200	Fisher & Governer	2500-249
2. Air Filter Regulator 1/4" Size	200-1	Fisher & Governer	67R
EQUIPMENT : GAS OIL SEPARATOR			
1. Internal Ball Float Level Controller	401-2	Fisher & Governer	231C-779K
2. Pressure Controller 0-250 kg/cm ²	200-1	Fisher & Governer	4160
3. Air Filter Regulator 1/4" Size	1200-1	Fisher & Governer	67R
EQUIPMENT : THREE FACE SEPARATOR			
1. Displacement type level Controller	1200	Fisher & Governer	2500-249
2. Interface Level Controller	401-4	Natco/Invalco	CTMF-402/CTQ-402
EQUIPMENT : VESSELS OF GROUP GATHERING STATOR			
1. Pressure Indicating Controller 0-250 kg/cm ²	200-1A	Fisher & Governer	4160
2. Pressure relief Valve for 3" N.B. Line	1100-3	Natco/Invalco	RDSG-301-503
EQUIPMENT : OIL TANKS			
1. Top Mounted Magnetic Level Switch	40H-3	Magnetrol	H3T21
2. External cage type Magnetic Level Switch	40H-5	Magnetrol	H575

NOTE : The dimensions of AUTOMAT Instruments are such that these can be replaced with equivalent imported instruments.

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