



## Liquid Level Switches

Top Mounted  
Float Operated  
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Top Mounted  
Displacer  
Operated  
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External  
Mounted Displacer  
Operated  
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External  
Mounted Float  
Operated  
Page 5,6

## Top Mounted (Float Operated) Level Switch Series 40H-3 Description

The 40H-3 level switch is designed for internal mounting through the top of the process vessel. The main advantage of these level switches is lower cost. Mounting connections are offered in as per table on page no. 3 and in a variety of flange sizes and pressure ratings.

### Principle of Operation

#### a) For Single Switch Mechanism (Series 311) (Refer Fig.1)

The operating principle provides for magnetic switch action resulting from a change in liquid level, which moves a magnetic Attraction Sleeve into the field of an externally located magnet. The illustrations given indicate the operating principle using a Float or Displacer to provide the operating motion. A falling level causes a downward movement of a magnetic Attraction Sleeve moving it below the magnetic field generated by the externally mounted alnico magnet. The bias spring then causes the magnet to pull away from Enclosing tube in turn actuating the Switch. The reverse function takes place on rising level with the Attraction Sleeve being moved into the field causing the magnet to pull in towards the Enclosing tube, in turn actuating the Switch.

**b) For Double Switch Mechanism (Series 321) (Refer Fig.2)** The Stainless Steel magnetic Attraction Sleeve (3) actuated by the float/displacer, is outside the field (2) of the Alnico permanent magnet (1) the switch is in the "Released" position & an electrical circuit is open for (L-C) connection of Micro Switch (4). The switch is held in the "Released" position by gravity and the tension of spring which provides the snap action when the spring operates. Refer figure 2A.

When the Float/Displacer causes the Attraction Sleeve to enter the field of permanent magnet associated with a given switch, the magnet swings into contact with the non magnetic Enclosing Tube (5) & the switch is then "Actuated" (Refer figure 2B). In the actuated position of the switch there is a closed electrical circuit, between L-C of Micro Switch.

#### Note1

Switch mechanism is interchangeable and may be fitted with any Level Switch provided the Switching gap does not exceed the maximum of 115 mm. Each switch unit has a nominal differential of maximum 30mm. If a differential greater than 30mm is required for the pump control, two switch unit must be used with a holding circuit arranged for the starter control circuit. With the switches set at the minimum operation the combined differential will be between 28mm to 35mm. Wider differential may be obtained by increasing the separation between the switches. Contact L-C is normally open contact and H-C is normally closed contact and these are marked on micro switch. The L-C circuit closes on a rise of water level, the HC circuit closes on a fall of water level. Each switch unit has a normal differential of maximum 30mm of liquid at SG 1.00

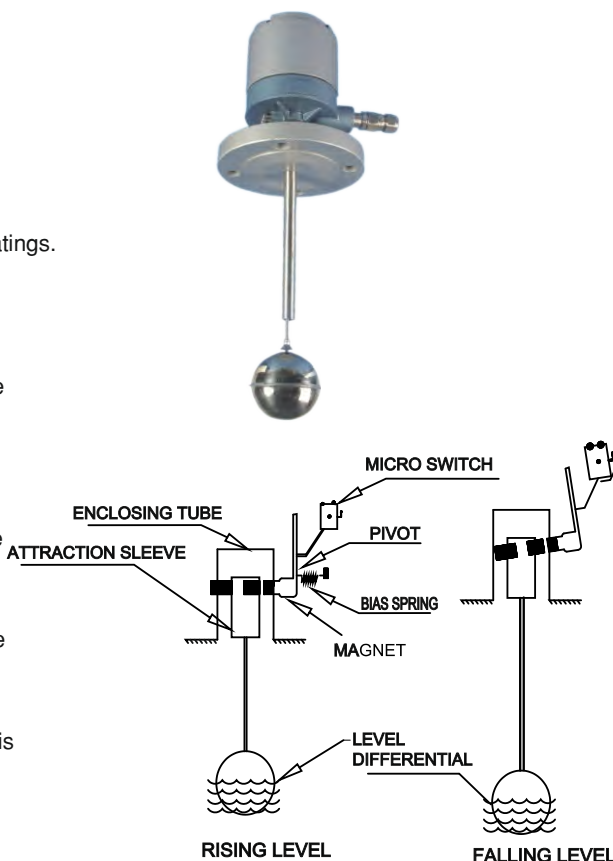


FIGURE 1

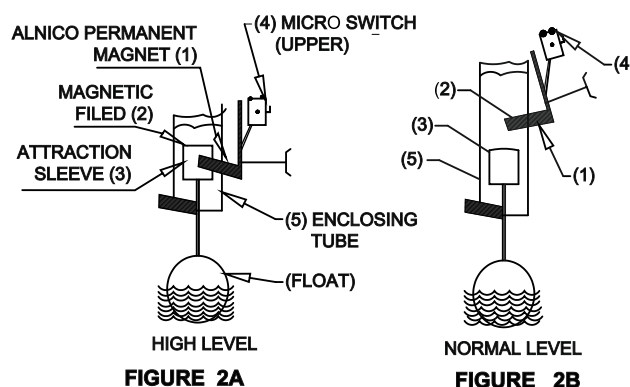


FIGURE 2A

FIGURE 2B

### Specifications (for 40H-3 Model)

Service .....	Condensation oil & Viscous liquids
Specific Gravity.....	Refer Table 2 on Page 3
Pressure .....	Refer Table 2 on Page 3
Temperature .....	150°C without cooling fins 350°C with cooling fins.
Differential .....	a) Maximum 30mm for 1 switch assembly model (Series 311) b) 130 mm maximum with individual differential of switch as maximum 30mm for low set point & 45mm for high set point 2 switch assembly model. (Series 321)
Attraction Sleeve.....	410 Series Stainless Steel.
Enclosing Tube.....	304 Stainless Steel



### Series Description

(Common for all 40H Series Models)

Series 40 H .....	Level switch in <b>Explosion proof &amp; Weather proof Enclosure</b> certified by CIMFR for groups IIA & IIB.
Series 40HWP .....	Level switch in <b>Weather Proof IP66</b> Enclosure certified by CIMFR.

Float Rod & Rod  
Guide Tube .....304/316 Stainless Steel  
Electrical Connection.....1/2" & 3/4" NPT(Single cable entry  
standard, others optional)  
Housing Material ..... Aluminium Alloy Base & Cover  
SS304/316

2

### Model Number Description

311 .....Level Switch with 1 Switch Assembly and 1 Float  
321 .....Level Switch with 2 Switch Assemblies and 1 Float

3

### Material of Construction

Description	Specify
C.S Plate Flange, IS 226	2
C.S Forged Flange, ASTM-A-105	3
Carbon Steel (for Threaded Connector)	4
304 SS Flange / Threaded Connector	5
316 SS Flange / Threaded Connector	6
PP Flange	7
Non Standard Flange Material	8

4

### Tank Connection and Float

Tank Connection Float		
Float, Float Rod		
Process Connection	SS 316	PP/PVC Teflon Coated
3"150 ASA	GSA	GPA
3"300 ASA	GSB	GPB
3"600 ASA	GSC	GPC
4"150 ASA	HSA	HPS
4"300 ASA	HSB	HPB
4"600 ASA	HSC	HPC
Any Other (Pls Spy.)	NSE	HPE

**Note:** For Corrosive application Float along with Float Rod and Rod Guide Pipe can be given in Teflon coated only, as solid teflon float would increase the weight of the float assembly and cause a problem in floating. Teflon is recommended for Atmospheric pressure only.

### Maximum Insertion Depth to Actuating Level w.r.t. Specific Gravity

Liquid Specific Gravity	Float Diameter	Maximum Pressure Kg/cm <sup>2</sup>	Range in mm	Float Diameter	Maximum Pressure Kg/cm <sup>2</sup>	Range in mm	Float Diameter	Maximum Pressure Kg/cm <sup>2</sup>	Range in mm
1.0	Ø70x135	30	1000	Ø90	50	800	Ø90x135	30	2000
0.9	Ø70x135	30	800				Ø90x135	30	1500
0.8	Ø70x135	30	500				Ø90x135	30	1200
0.7	Ø70x115	10	800				Ø90x135	30	800
0.6	Ø70x115	10	500				Ø90x135	30	500

The insertion depth is applicable at Ambient temperature.

### Model Number Description (Series 40H-3)

1

2

3

4

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### 40HWP/311/2/GSA/SSW

Defines a level switch in weather proof enclosure with 1 float + 1 switch assembly. The flange is of carbon steel of 3" 150 ASA and float of 316 SS. Switch is SPDT of 5A 230 V AC rating.

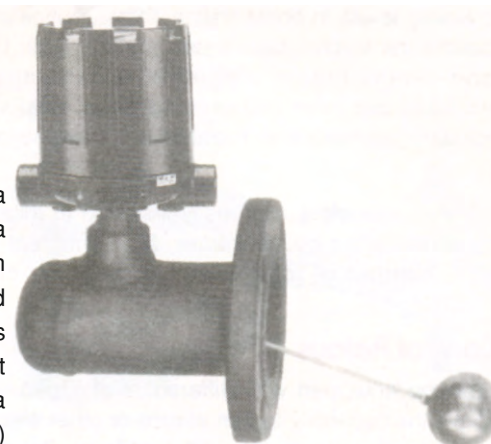
## Side Mounted( Magnetic) Float Operated Level Switch (Model 40H-2)

### Introduction

This series is designed for integral mounting through the side of the process vessel. The design provides for greater differential as compared to other float operated switches and as a result is better suited for turbulent applications.

### Principle of Operation

The basic operating principle provides for magnetic switch action resulting from a change in liquid level, which moves a magnetic attraction sleeve in to the field of an externally located magnet. This principle eliminates problems associated with flexing diaphragm seals, bellows seals as well as 'coating' problems encountered by probe type devices. Side mounting units employ permanent magnetic force as the only link between the float and the switching element. As the pivoted float follows liquid level change, it moves attraction sleeve into or out of the field of a switch actuating magnet causing switch operation. A enclosing (non-magnetic) tube effectively isolates the switch from the controlled liquid.



## Technical Specifications

Service.....	Condensate, Oil & Viscous liquid
Differential.....	25±5mm for float steam of 254mm ( Float Steam length is distance between the flange face to float end)
Working Pressure & Temperature.....	100kg/cm <sup>2</sup> @ 350°C
Float Size.....	a) 62mm Ø x152mm long b) 90mm Ø c) 90mm Ø x135mm long

### Model Number Description 40H-2



40HEP/GSB/SDE : Defines a level switch Model 40H-2 in Explosion Proof Housing having 3" 300ASA Process Connection of Carbon Steel & with DPDT Switch Assembly.

## Top Mounted (Displacer Operated) Level Switch Series 40H-4

The 40 H-4 Level Switch is designed for internal Mounting through the top of the Process Vessel and is also furnished with Chambers for External Mounting from the Process Vessel. The use of displacers as the sensing medium allows for wide switching differential, field adjustable switching points and use on high pressure applications. Mounting connections without chambers are offered in 3" NPT screwed & 4" 150 ASA Flanged as standard. For Level Switches with Chamber, process connections are offered in Threaded, Socket weld & flanged of sizes 1", 1½" & 2" ASA.

These Level Switches are offered with either Narrow or Wide Differential. Displacers are available in 316 Stainless Steel, Teflon or Polypropylene with a 2 Meter suspension cable as standard. Special cable lengths upto 40 meters are available for internal Mounted switches only.

## Principle of Operation

Displacer operated Level Switch offer control features not found in float operated controls. The basic sensing means utilizes displacer heavier than the liquid which is suspended from a spring. When the liquid contacts the displacer, a buoyancy force is produced, which causes the effective weight of the displacer to change, in turn causing the spring to seek a new balance position which moves the attraction sleeve into the field of the magnet. This principle provides for wide switching differential and allows the desired level switching point to be adjusted by moving the displacers up or down the suspension cable. Further advantage allows for adoption to high pressure applications since displacers have substantial heavier wall thickness than floats and in many cases are made out of solid materials.

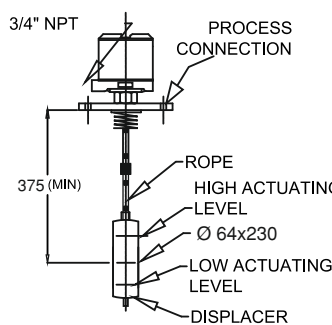


FIGURE 3: MODEL 411

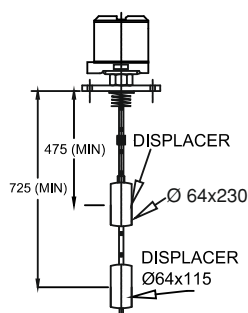


FIGURE 4: MODEL 412

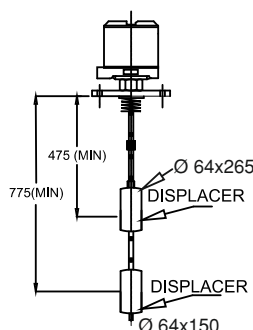


FIGURE 5: MODEL 422

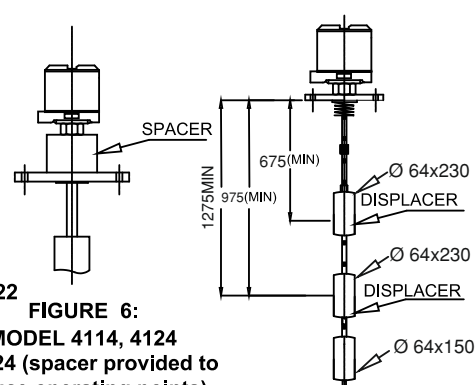


FIGURE 6:  
MODEL 4114, 4124  
& 4224 (spacer provided to  
reduce operating points)

FIGURE 5: MODEL 433

## 5

### Model Number Description (Series 40H-4)

- 411 : Narrow differential (fixed) type using **One** Switch Assembly and **One** Displacer. (Min. Operating point of 375 mm. (Refer Fig. 3)
- 412 : Wide Differential (Adjustable) type using **One** Switch Assembly and **Two** Displacers. (With Minimum upper & lower operating points of 475 mm & 725mm respectively. (Refer Fig. 4)
- 422 : Narrow Differential (Fixed) type using **Two** Switch Assemblies and **Two** Displacers. Each switch is actuated at different level and calibrated with Narrow Differential Band (with minimum upper and lower operating point of 475 mm & 775 mm respectively. (Refer Fig.5)
- 433 : **Three** Switch Assembly & **Three** Displace minimum operation set point form top 675mm & 975mm x1275mm
- 4114 : Narrow Differential (Fixed) type using **One** switch assembly and **One** Displacer. (Min. operating point of 100 mm. (Refer Fig. 6)
- 4124 : Wide Differential (Adjustable) type using **One** Switch Assembly and **Two** Displacers. (With minimum upper & lower operating points of 100mm & 425mm respectively. (Refer Fig. 6)
- 4224 : Narrow Differential (Fixed) type using **Two** Switch Assemblies and **Two** Displacers. Each switch is actuated at different level and calibrated with Narrow Differential Band (With minimum upper & lower operating point of 100 mm and 400 mm respectively. (Refer Fig. 6)
- 4334 : Narrow Differential (Fixed) type using **Three** switch assembly & **Three** Desplacer minimum operation set point form top 100mm & 400x 700mm

### Technical Specifications

S.G.....0.6 (Minimum)

Differential..... Maximum 70mm at S.G. 1 for models 411, 422, 4114 & 4224. Differential for Model 412 & 4124 depends upon distance between the displacers.

Accuracy.....  $\pm 3\%$

Repeatability.....  $\pm 1\%$

#### A) Without External Chamber:

Pressure.....50 kg/cm<sup>2</sup> (Maximum)

Temperature.....a) S.S. & Teflon Displacers 150°C  
b) Polypropelene Displacers 70°C

#### B) With External Chamber:

Pressure.....100 kg/cm<sup>2</sup> (Maximum)

Temperature.....150°C

#### Model Number Description (Without External Chamber) Series 40H-4

**1** / **5** / **3** / **4** / **7** / **9**  
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**40HWP / 411 / 3 / HSA / SDW/5**

Defines a level switch in Weather Proof Housing with 1 Switch Assembly & 1 Displacer. Flange is of 4", 150 ASA forged A-105, Switch is DPDT of 5A 230V AC rating ac & steel well not required.

### Perforated Still Well if Required

Perforated Still Well in MS	1
Perforated Still Well in SS304	2
Perforated Still Well in SS316	3
Perforated Still Well in PP/PVC	4
Perforated Still Well Not Required	5
Perforated Still Well in other MOC	6

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### External Mounted Displacer Operated Level Switch(40H-6)

Note: Chambers are supplied for all models as Standard. Contact Factory for other models with Chambers.

#### Model Number Example : (With External Chamber)

#### Series 40H-4

**1** / **5** / **3** / **7** / **8**  
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#### 40HWP / 411 / 6 / SSW / E6-IV

Defines a level switch weather proof Housing having 1 switch assembly. The process flange is of 1" 150 ASA, external cage MOC 316 SS. Switch is SPDT having 5A 230V AC rating. The process Connection are side-side.



## External Mounted level Switch (Float Operated) Series 40H-5

### Description

The 40H-5 level switches are designed for mounting externally on the process vessel and when used with isolation valves allows the switch to be isolated from the process. This feature is useful during startup, or when maintenance is required. The chambers are offered with NPT, Socket weld and flanged connections as standard. The External cage can be welded type which makes it less prone to leakage, lighter in weight and consequently less expensive. Optionally Bolted type External cage is available which is comparatively heavier, but has an edge over former for ease in cleaning, inspection and has replacement feature of float Assemblies.



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### Principle of Operation

The operating principle provides for magnetic Switch action resulting from a change in liquid level, which moves a magnetic attraction sleeve into the field of an externally located magnet. This principle eliminates problems associated with flexing diaphragm seals, bellow seals, as well as coating problems encountered by probe type devices.

### Specifications

Pressure & Temperature Rating.....Refer below  
Attraction Sleeve .....410 Series Stainless Steel  
Enclosing Tube..... 304 SS  
Electrical Connection ..... 3/4" NPT (Others optional)  
Drain ..... 3/4" NPT (Standard)  
Repeatability.....  $\pm 1.5$  mm at S.G. 1

### 6 Cage Description (For 40H-5 Model)

Cage Type		Min. S.G.	Differential at S.G. 1	Pressure (Maximum)	Temperature (Maximum)	Cooling Fins	Expection Loop
Sealed	Flanged						
54S	54F	0.6	Maximum 30 mm	76 kg/cm <sup>2</sup>	0-150C <sup>o</sup>	Not Required	NA
60S		0.5		160 kg/cm <sup>2</sup>			NA
74S	74F	0.7		70kg/cm <sup>2</sup>	150°C-300C <sup>o</sup>	Provided	If Required
80S		0.6		100kg/cm <sup>2</sup>	300°C-350C <sup>o</sup>		NA

Note: above 400°C Boiler Drum Level Gauge Provide

### 7 Switch & Enclosure Details (Common for 40H-3, 40H-4, & 40H-5 Models)

Switch Description	Rating		Contacts	Switch Enclosures	
	AC	DC		W.Proof (40 HWP)	Ex. Proof (40 H)
Type 'A' Standard Micro Switch (Silver Plated)	5A. 230V AC	0.5A, 110V DC or 0.25A, 230V DC	SPDT DPDT	SSW SDW	SSE SDE
Type 'C' Micro Switch (Silver Plated) for Process temp of 300C & above	5A. 230V AC	0.5A, 110V DC or 0.25A, 230V DC	SPDT DPDT	TSW TDW	TSE TDE
Type 'D' Micro Switch Silver plated in V. Automat's Hermatically Sealed	5A. 230V AC	5A, 28V DC	SPDT DPDT	ASW ADW	ASE ADE
Type 'R' Hermatically Sealed Reed Switch (Rhodium Plated)	0.25A 230V AC	0.25A, 24V DC	SPDT DPDT	RSW RDW	RSE RDE
Type '1HM1'(Honeywell) Micro Switch Hermatically Sealed (Silver Plated)	4A, 115V AC	4A, 28V DC	SPDE DPDT	1HSW 1HDW	1HSE 1HDE
Type '3 HM1'(Honeywell) Micro Switch Hermatically Sealed (Gold Plated)	1A, 115 V AC	1A, 28V DC	SPDT DPDT	3HSW 3HDW	3 HSE 3HDE

## 8 Type of Process Connections

Connection	Material				Style
	CS	304SS	316SS	PP	
1" NPT	A3	A4	A6	NA	I
1 1/2" NPT	B3	B4	B6		II
1" S.W.	C3	C4	C6	NA	III
1 1/2" S.W.	D3	D4	D6		IV
1" 150 ASA	E3	E4	E6	E8	Refer Below
1" 300 ASA	G3	G4	G6	G8	
1" 600 ASA	H3	H4	H6	H8	
1" 900 ASA	J3	J4	J6	J8	
1 1/2" 150 ASA	K3	K4	K6	K8	V
1 1/2" 300 ASA	M3	M4	M6	M8	VI
1 1/2" 600 ASA	P3	P4	P6	P8	
1 1/2" 900ASA	R3	R4	R6	R8	
NON STANDARD	S3	S4	S6	S8	

Model Number Description (Series 40H-5)

**1**

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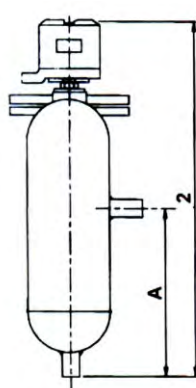
**8**

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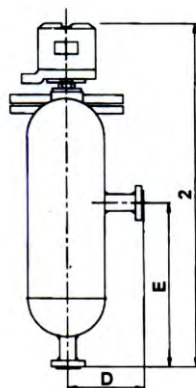
40HWP / 74F / TSW / A3/IV

Defines a level switch in weather proof enclosure having Flanged Cage. Temperature upto 300°C and Pressure less than 40 kg/cm<sup>2</sup>. Switch is of 'C' type in SPDT. Cage is of Carbon Steel with 1" NPT Process Connection on Side and Side.

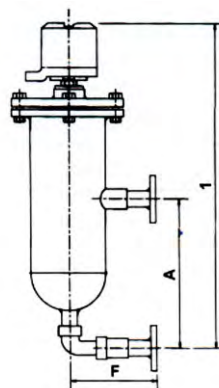
### (CHAMBER STYLE)



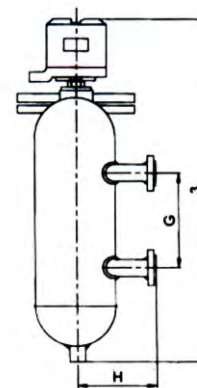
Style I



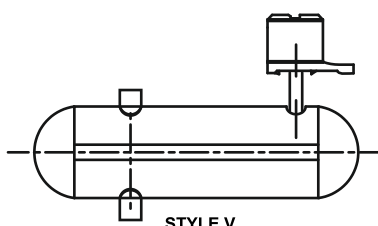
Style II



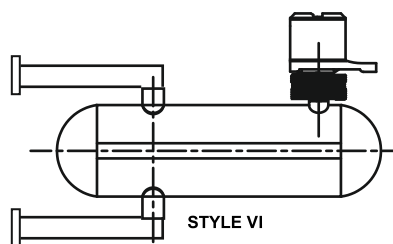
Style III



Style IV



STYLE V



STYLE VI

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## LIST OF PROCESS CONTROL INSTRUMENTS

SN	Items	SN	Items
<b>Liquid Level Switches</b>		<b>Level Gauges</b>	
1	Float Operated	1	Reflex Type
2	Displacer Type	2	Transparent Type
3	Rotary Paddle Type	3	Tubular Type
4	RF Type	4	Float and board
5	Conductivity Type	5	Float and Dial
6	Electronic Conductivity Type	6	Gear Type Level Gauge
7	Capacitance Type	<b>Level Transmitters</b>	
8	Balloon Type	1	Smart Displacement Type Level Transmitter(DGMS Approved)
9	Vibrating Rod/Fork Type	2	Bi-Color Magnetic Level Indicator/ Transmitter
<b>Flow Switch</b>		3	Non-Contact Radar Level Transmitter
1	Flapper Type (DGMS Approved)	4	Guided Wave Radar Level Transmitter
2	Plug Type (DGMS Approved)	5	Differential Pressure Flow Transmitter
<b>Flow Indicator</b>		6	Differential Pressure Level Transmitter
1	Rota meter	7	Pressure Transmitter
2	Side Flow Indicator	8	Ultrasonic Type Level Transmitters
<b>Valve Positioner &amp; Accessories</b>		9	Temperature Transmitter
1	Smart Positioner	10	Gear Type Level Gauge/Transmitters
2	Electro Pneumatic Positioner	<b>Pneumatic Level Instrument for Oil Industries</b>	
3	Pneumatic-Pneumatic Positioner	1	Interface Level Controller
4	Positioner Transmitter	2	Level Controller Flex (Tube)
5	Volume Booster	3	Micro Valve Level Controller
6	Air Filter Regulator	4	Level Controller (Internal Ball Float)
7	I/P Converter	<b>Instruments for Oil Production Industries</b>	
8	Pressure Controller	1	Safety System for Heaters
<b>GAS ANALYSERS (EMISSION)</b>		2	Low Temperature Shut Down Switch for Pilot Burner
1	Nox	3	Self-Operated Temperature Controller/ Regulator with Mercury filled
2	Sox	4	Element
3	Co	5	Electronic Remote Igniter (Weather Proof / Explosion Proof)
4	Co2	6	Flare Pilot Burner
5	O2	7	Air/ Gas Pressure Regulators
6	H2	8	Time Cycle Controller (DGMS Approved)
7	HF	<b>WATER ANALYSERS</b>	
8	HCL	1	BOD
9	H2S	2	COD
10.	O3	3	TOC
11	NH3	4	TSS
12	CL2	5	TDS
<b>Ambient Air Quality Monitoring System</b>		6	DO
1	SO2, NO2, NO, CO, CO2, NH3, H2S, O3 O2 PM 2.5 PM 10	7	PH
<b>WIRELESS INSTRUMENTS</b>		8	ORP
1	GSM	9	CONDUCTIVITY
2	GPRS	10	TURBIDITY
3	2.4 / 5.8 GHZ	11	ARSENIC
4	Real Time Online Monitoring System	12	AMMONIA
		13	Water Hardness Analyzer
		14	Silica Analyzer
		15	Metal Analyzer
		<b>Other Instruments</b>	
		1	Electronic Time Cycle Controller
		2	Silo Material Blockage Removal Machine
		3	Plunger Lift Components
		4	Portable Corrosion & Hydrogen Flux Monitor