Flanged External Cage Float Actuated Liquid Level Switches

DESCRIPTION

External cage type level switches are completely self-contained units designed for side mounting to a tank or vessel with threaded or flanged pipe connections. In hundreds of industrial applications throughout the petroleum refining, petrochemical production and power generation markets, these switches have thoroughly demonstrated their worth for years.

FEATURES

- Carbon steel float chamber.
- Easy inspection of float chamber through removable head.
- Stainless steel float and trim.
- Service pressures up to 900 psig (62 bar).
- Process temperatures up to +1000° F (+538° C).
- Specific gravity ratings as low as 0.40.
- Available switch styles including dry contact, hermetically sealed and pneumatic.
- Single or multiple switch mechanisms available.
- Available switch enclosures include:

  NEMA 1 carbon steel for pneumatics

  TYPE 4X/7/9 Class I, Div. 1 Groups C & D aluminum

  TYPE 4X/7/9, Class I, Div. 1, Group B, aluminum
- 1", 1½", or 2" tank connections available in either NPT, socket weld, flanged side/side or flanged side/bottom construction.
- Optional high temperature insulation available. See bulletin 41-106.

APPLICATIONS

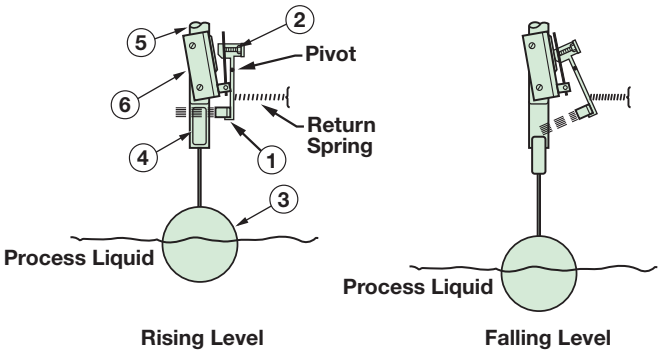
- Accumulators
- Receivers
- Flare pots
- Scrubbers
- Flash tanks
- Knockout drums
- Storage tanks
- Separators

OPTIONS

- Interface calibration
- Extreme temperature modifications
- Customized installation dimensions
- Special exterior surface preparation and finish
- Special tank connections
- Special actuation levels

TECHNOLOGY

A permanent magnet ① is attached to a pivoted switch actuator and adjustment screw ②. As the float ③ rises following the liquid level, it raises the attraction sleeve ④ into the field of the magnet, which then snaps against the non-magnetic enclosing tube ⑤, actuating the switch ⑥. The enclosing tube provides a static pressure boundary between the switch mechanism and the process. On a falling level, an Inconel® spring retracts the magnet, deactivating the switch.



SPECIFICATIONS

SWITCH MECHANISMS AND ENCLOSURES

SERIES B, C, D & R DRY CONTACT SWITCHES

- Dry contact for most applications
- Designs for AC and DC current applications
- Process temperatures to +1000° F (+538° C)

SERIES F, HS, 8 & 9 HERMETICALLY SEALED SWITCHES

- Ideal for use in salt and other corrosive atmospheres
- HS is a positively pressurized capsule for entire mechanism and contacts
- Process temperatures to +1000° F (+538° C)

SERIES J & K PNEUMATIC SWITCHES

- Suited for applications where electrical power is not available
- Bleed and non-bleed designs
- Process temperatures to +400° F (+204° C)

SWITCH ENCLOSURES

- TYPE 4X/7/9 aluminum enclosures
- Designed to meet Class I, Div. 1, Groups C & D and Class I, Div. 1 Group B
- Optional housing heaters and drains available for some enclosures
- Pneumatic switch mechanisms available with a NEMA 1 enclosure

BASIC ELECTRICAL RATINGS

Voltage	Switch Series and Non-Inductive Ampere Rating							
	B	C	D	F	HS	R	8	9
120 VAC	15.00	15.00	10.00	2.50	5.00	1.00	1.00	—
240 VAC	15.00	15.00	—	—	5.00	1.00	—	—
24 VDC	6.00	10.00	10.00	4.00	5.00	1.00	3.00	0.50
120 VDC	0.50	1.00	10.00	0.30	0.50	0.40	—	—
240 VDC	0.25	0.50	3.00	—	0.25	—	—	—

AGENCY APPROVALS

AGENCY	APPROVED MODEL	AREA CLASSIFICATION
FM FM APPROVED	All with an electric switch mechanism and a housing listed as TYPE 4X	Non-Hazardous TYPE 4X
	All with an electric switch mechanism and a housing listed as TYPE 4X/7/9	Class I, Div 1, Groups C & D Class II, Div 1, Groups E, F & G
	All with an electric switch mechanism and a housing listed as TYPE 4X/7/9 Class I, Div 1, Group B	Class I, Div 1, Groups B, C & D Class II, Div 1, Groups E, F & G
CSA	All with an electric switch mechanism and a housing listed as CSA TYPE 4X	Non-Hazardous CSA TYPE 4X
	All with a Series HS, F, 8 or 9 electric switch mechanism and a housing listed as CSA TYPE 4X	Class I, Div 2, Groups B, C & D
	All with an electric switch mechanism and a housing listed as TYPE 4X/7/9	Class I, Div 1, Groups C & D Class II, Div 1, Groups E, F & G
	All with an electric switch mechanism and a housing listed as TYPE 4X/7/9 Class I, Div 1, Group B	Class I, Div 1, Groups B, C & D Class II, Div 1, Groups E, F & G
ATEX / IEC Ex ②	All with an electric switch mechanism and an ATEX housing ①	ATEX II 2 G EEx d IIC T6 94/9/EC IEC Ex Ex d IIC T6 IP 66
CE	Low Voltage Directive 2006/95/EC Per Harmonized Standard: EN 61010-1/1993 & Amendment No. 1	Installation Category II Pollution Degree 2

① Dual stage units with 'HS' switches are not ATEX approved.

② IEC Installation Instructions:

The cable entry and closing devices shall be Ex d certified suitable for the conditions of use and correctly installed.

For ambient temperatures above +55° C or for process temperatures above +150° C, suitable heat resistant cables shall be used.

Heat extensions (between process connection and housing) shall never be insulated.

Special conditions for safe use:

When the equipment is installed in process temperatures higher than +85° C the temperature classification must be reduced according to the following table as per IEC60079-0.

Maximum Process Temperature	Temperature Classification
< 85° C	T6
< 100° C	T5
< 135° C	T4
< 200° C	T3
< 300° C	T2
< 450° C	T1

These units are in conformity with IECEx KEM 05.0020X
Classification Ex d IIC T6
$T_{ambient}$ -40° C to +70° C

DIMENSIONAL SPECIFICATIONS

INCHES (mm)

CHAMBERS WITH 1-INCH CONNECTIONS

INCHES

	Min. Sp. Gr.	1" NPT Threaded & Socket Weld			1" Flanged Upper Side/Bottom			1" Flanged Side/Side			Actuating Levels	
		A	B	C	A	B	C	A	B	C	HL	LL
C29	.76	9.94	3.02	13.50	12.81	5.87	16.44	13.46	5.87	17.06	2.95	3.85
D30	.65	9.19	3.27	12.75	12.06	6.12	15.63	12.71	6.12	16.25	2.50	3.33
J30	.48	10.19	4.33	14.63	13.06	7.18	17.50	13.71	7.18	18.19	2.61	3.34
L30	.40										3.24	3.98
B60	.68	9.81	3.80	14.25	12.68	6.68	17.12	13.33	6.68	17.75	2.77	3.44
C60	.55										2.87	3.60

MILLIMETERS

	Min. Sp. Gr.	1" NPT Threaded & Socket Weld			1" Flanged Upper Side/Bottom			1" Flanged Side/Side			Actuating Levels	
		A	B	C	A	B	C	A	B	C	HL	LL
C29	.76	252	76	342	325	149	417	341	149	433	74	97
D30	.65	233	83	323	306	155	397	322	155	412	63	84
J30	.48	258	109	371	331	182	444	348	182	462	66	84
L30	.40										82	101
B60	.68	248	96	361	322	169	434	338	169	450	70	87
C60	.55										72	91

Levels ±0.25" (6 mm)

CHAMBERS WITH 1½-INCH CONNECTIONS

INCHES

	Min. Sp. Gr.	1½" NPT Threaded & Socket Weld			1½" Flanged Upper Side/Bottom			1½" Flanged Side/Side			Actuating Levels	
		A	B	C	A	B	C	A	B	C	HL	LL
C29	.76	9.75	3.44	14.38	13.81	6.87	18.38	14.46	6.87	19.06	2.02	2.92
D30	.65	9.00	3.69	13.12	13.06	7.12	17.19	13.71	7.12	17.88	1.87	2.70
J30	.48	10.00	4.75	15.06	14.06	8.18	19.12	14.71	8.18	19.75	1.97	2.70
L30	.40										2.60	3.34
B60	.68	9.62	4.22	14.69	13.68	7.68	18.75	14.33	7.68	19.38	1.46	2.13
C60	.55										1.93	2.66

MILLIMETERS

	Min. Sp. Gr.	1½" NPT Threaded & Socket Weld			1½" Flanged Upper Side/Bottom			1½" Flanged Side/Side			Actuating Levels	
		A	B	C	A	B	C	A	B	C	HL	LL
C29	.76	247	87	365	350	174	466	367	174	484	51	74
D30	.65	228	93	333	331	180	436	348	180	454	47	68
J30	.48	254	120	382	357	207	485	374	207	501	50	68
L30	.40										66	84
B60	.68	244	107	373	347	195	476	363	195	492	37	54
C60	.55										49	67

Levels ±0.25" (6 mm)

CHAMBERS WITH 2-INCH CONNECTIONS

INCHES

	Min. Sp. Gr.	2" NPT Threaded & Socket Weld			2" Flanged Upper Side/Bottom			2" Flanged Side/Side			Actuating Levels	
		A	B	C	A	B	C	A	B	C	HL	LL
C29	.76	10.00	3.56	14.44	13.81	6.87	18.25	14.46	6.87	18.94	2.02	2.97
D30	.65	8.75	3.81	13.25	13.06	7.12	17.56	13.71	7.12	18.25	1.50	2.33
J30	.48	9.74	4.87	15.19	14.06	8.18	19.50	14.71	8.18	20.12	1.60	2.33
L30	.40										2.23	2.97
B60	.68	9.38	4.34	14.81	13.68	7.68	19.12	14.33	7.68	19.75	1.52	2.19
C60	.55										1.99	2.72

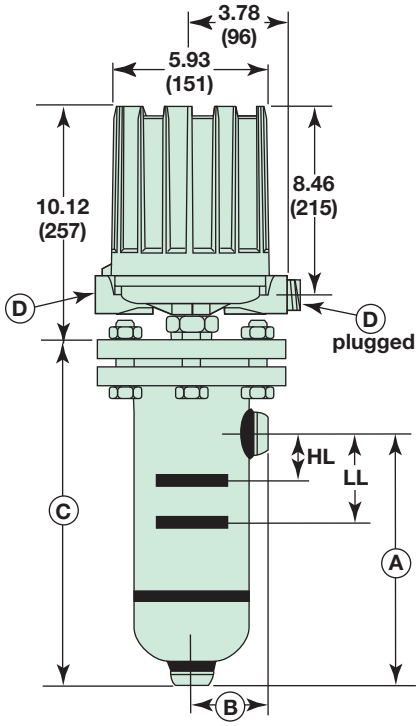
MILLIMETERS

	Min. Sp. Gr.	2" NPT Threaded & Socket Weld			2" Flanged Upper Side/Bottom			2" Flanged Side/Side			Actuating Levels	
		A	B	C	A	B	C	A	B	C	HL	LL
C29	.76	254	90	366	350	174	463	367	174	481	52	75
D30	.65	222	96	336	331	180	446	348	180	463	38	59
J30	.48	247	123	385	357	207	495	374	207	511	40	59
L30	.40										56	75
B60	.68	238	110	376	347	195	485	363	195	501	38	55
C60	.55										50	69

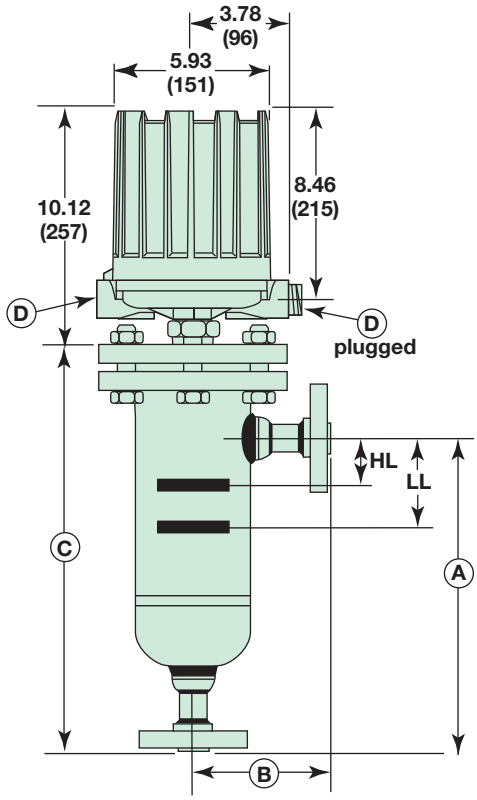
Levels ±0.25" (6 mm)

DIMENSIONAL SPECIFICATIONS

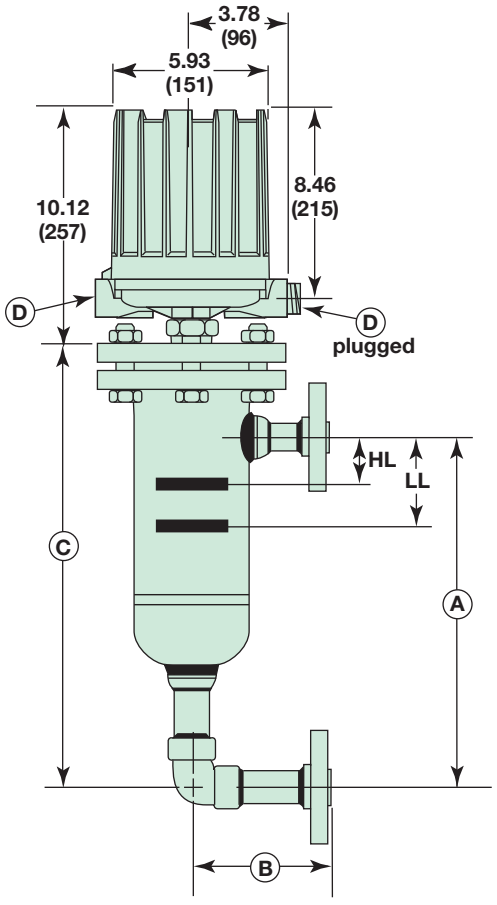
INCHES (mm)



Threaded and Socket Weld



Side/Bottom Flanged



Side/Side Flanged

Conduit Connections D	
Electrical Switches	
TYPE 4X/7/9:	1" NPT
Group B:	1" NPT
Pneumatic Switches	
NEMA 1:	¼" NPT

NOTES:

1. Switch actuating levels (HL & LL) are given for minimum specific gravity conditions. Levels will be lower in the float chamber for higher specific gravities.
2. Standard process connections are a combination of 1" NPT and 1" socket weld coupling.
3. Allow overhead clearance of 10 inches (254 mm) for TYPE 4X/7/9 housing.

MODEL NUMBER

Models available for quick shipment, usually within one week after factory receipt of a complete purchase order, through the Expedite Ship Plan (ESP)

MODEL NUMBER CODE

① Model No.	Minimum Specific Gravity ② for Models with Material of Construction Code		Pressure Rating									
			psig @ ° F					bar @ ° C				
	1	2	100	450	750	900	1000	38	232	399	482	538
C29	0.76	0.81	500	465	403	388	383	34	32	28	27	26
D30 ③	0.65	0.69	250	—	201	194	191	17	—	14	13	13
J30	0.48	0.51	400 ④	372	322 ④	310	167	28 ④	26	22 ④	21	12
L30	0.40	0.42	300 ④	—	242 ④	233	167	21 ④	—	17 ④	16	12
B60	0.68	0.71	900	—	725	496	182	62	—	50	34	13
C60	0.55	0.59	500	465	403	388	182	34	32	28	27	13

MATERIALS OF CONSTRUCTION

1	Carbon steel chamber, 316 stainless steel float, 400 stainless steel sleeve
2	Carbon steel chamber, 316 stainless steel float, 316 stainless steel sleeve

TANK CONNECTION TYPE AND SIZE

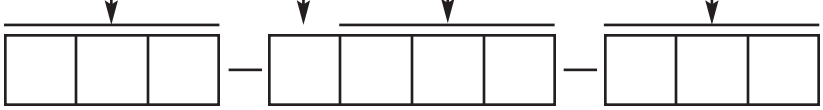
Connection Type	Connection Size								
	1"			1½"			2"		
Threaded Side/Bottom	B20			C20			D20		
Socket Weld Side/Bottom	B30			C30			D30		
	Cage Mounting Flange Rating (lbs.)								
	150	300	600	150	300	600	150	300	600
Flanged Upper Side/Bottom	N30	N40	N50	P30	P40	P50	Q30	Q40	Q50
Flanged Side/Side	S30	S40	S50	T30	T40	T50	V30	V40	V50

Connection flanges are ASME B16.5 raised face.

PNEUMATIC SWITCH MECHANISM AND ENCLOSURE

Switch Description	Maximum Supply Pressure		Maximum Process Temperature		Bleed Orifice Diameter		Models with Material of Construction Code 1	Code 2
	psig	bar	° F	° C	inches	mm	NEMA 1	NEMA 1
Series J Bleed Type	100	7	+400	+204	.063	1.6	JDG	JDE
	60	4	+400	+204	.094	2.3	JEG	JEE
Series K Non-Bleed	100	7	+400	+204	—	—	KOE	KOE
	40	3	+400	+204	—	—	KOG	—

Electric switch mechanism and enclosure codes on next page



① Models are limited to maximum temperature rating of selected switch mechanisms.

② For single stage models only. Consult factory for multiple stages.

③ Model D30 recommended for Dowtherm applications.

④ Float cage rated 600 psig @ +100° F (41 bar @ +38° C) and 340 psig @ +750° F (23 bar @ +399° C).

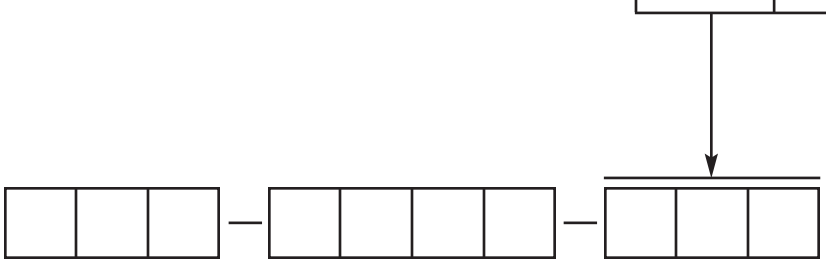
⑤ Process temperature based on +100° F (+38° C) ambient.

⑥ Consult factory for NEMA 4X/7/9 cast iron housing codes.

⑦ On condensing applications, temperature down-rated to +400° F (+209° C) process at +100° F (+38° C) ambient.

ELECTRIC SWITCH MECHANISM AND ENCLOSURE

Switch Description	Process ⑤ Temperature Range °F (°C)	Contacts	Set Points	All models with Material of Construction Code 1			All models with Material of Construction Code 2		
				TYPE 4X/7/9 Aluminum Enclosure ⑥					
				Class I, Div 1 Groups C&D	Class I, Div 1 Group B	ATEX Ex II 2 G EEx d IIC T6	Class I, Div 1 Groups C&D	Class I, Div 1 Group B	ATEX Ex II 2 G EEx d IIC T6
Series B Snap Switch	-40 to +250 (-40 to +121)	SPDT	1	BKA	BKJ	BCC	BKB	BKK	BC9
			2	BLA	BLJ	BDC	BLB	BLK	BD9
			3	BMA	BMJ	BEC	BMB	—	BE9
		DPDT	1	BNA	BNJ	BFC	BNB	BNK	BF9
			2	BOA	BOJ	BGC	BOB	BOK	BG9
Series C Snap Switch	-40 to +450 (-40 to +232)	SPDT	1	CKA	CKJ	CCC	CKB	CKK	CC9
			2	CLA	CLJ	CDC	CLB	CLK	CD9
			3	CMA	CMJ	CEC	CMB	CMK	CE9
		DPDT	1	CNA	CNJ	CFC	CNB	CNK	CF9
			2	COA	COJ	CGC	COB	COK	CG9
Series D DC Current Snap Switch	-40 to +250 (-40 to +121)	SPDT	1	DKB	DKK	DC9	DKB	DKK	DC9
			2	DLB	DLK	DD9	DLB	DLK	DD9
			3		—		DMB	DMK	DE9
		DPDT	1	DNB	DNK	DF9	DNB	—	DF9
			2	DOB	DOK	DG9	DOB	DOK	DG9
Series F Hermetically Sealed Snap Switch	-50 to +750 (-46 to +399)	SPDT	1	FKA	FKJ	FCC	FKB	FKK	FC9
			2	FLA	FLJ	FDC	FLB	FLK	FD9
		DPDT	1	FNA	FNJ	FFC	FNB	FNK	FF9
			2	FOA	FOJ	FGC	FOB	FOK	FG9
Series HS ⑦ Hermetically Sealed 5-amp Snap Switch with Wiring Leads	-50 to +550 (-46 to +288)	SPDT	1	HMJ	HMK	—	HMJ	HMK	—
			2	HMN	HMP		HMN	HMP	
		DPDT	1	HMS	HMT		HMS	HMT	
			2	HMY	HMZ		HMY	HMZ	
Series HS ⑦ Hermetically Sealed 5-amp Snap Switch with Terminal Block	-50 to +550 (-46 to +288)	SPDT	1	HM3	HM4	HA9	HM3	HM4	HA9
		DPDT	1	HM7	HM8	HB9	HM7	HM8	HB9
Series R High Temperature Snap Switch	-40 to +750 (-40 to +399)	SPDT	1	RKB	RKK	RC9	RKB	RKK	RC9
			2	RLB	RLK	RD9	RLB	RLK	RD9
		DPDT	1	RNB	RNK	RF9	RNB	RNK	RF9
			2	ROB	ROK	RG9	ROB	ROK	RG9
Series 8 Hermetically Sealed Snap Switch	-50 to +750 (-46 to +399)	SPDT	1	8KA	8KJ	8CC	8KB	8KK	8C9
			2	8LA	—	8DC	8LB	8LK	8D9
			3	8MA	—	8EC	8MB	8MK	8E9
		DPDT	1	8NA	8NJ	8FC	8NB	8NK	8F9
			2	8OA	—	8GC	8OB	8OK	8G9
Series 9 High Temperature Hermetically Sealed Snap Switch	-50 to +750 (-46 to +399)	SPDT	1	9KA	—	9CC	9KB	—	9C9
			2	9LA	—	9DC	9LB	—	9D9
			3	9MA	—	9EC	9MB	—	9E9
		DPDT	1	9NA	—	9FC	9NB	—	9F9
			2	9OA	—	9GC	9OB	—	9G9
				CS/Aluminum	Cast Iron		CS/Aluminum	Cast Iron	
				NEMA 4X	Class I, Div 1 Groups C&D	Class I, Div 1 Group B	NEMA 4X	Class I, Div 1 Groups C&D	Class I, Div 1 Group B
Series R High Temperature Snap Switch	-40 to +1000 (-46 to +538)	SPDT	1	R1M	RKM	RKW	R1M	RKM	RKW
			2	R3M	RLM	RLW	R3M	RLM	RLW
		DPDT	1	RDM	RNM	RNW	RDM	RNM	RNW
			2	REM	ROM	ROW	REM	ROM	ROW
Series 9 High Temperature Hermetically Sealed Snap Switch	-50 to +1000 (-46 to +538)	SPDT	1	9AD	9KD	—	9AM	9KM	9KW
			2	9BD	9LD	—	9BM	—	—
			3	9CD	—	—	9CM	—	—
		DPDT	1	9DD	9ND	—	9DM	9NM	9NW
			2	9ED	9OD	—	9EM	—	—



QUALITY

MAGNETROL REGISTERED TO ISO 9001
Your Assurance of Quality and Service

The quality assurance system in place at Magnetrol® guarantees the highest level of quality throughout the company. MAGNETROL is committed to providing full customer satisfaction both in quality products and quality service.

The MAGNETROL quality assurance system is registered to ISO 9001 affirming its commitment to known international quality standards providing the strongest assurance of product/service quality available.

ESP

Expedite
Ship
Plan

Several Flanged External Cage Level Switches are available for quick shipment, usually within one week after factory receipt of a complete purchase order, through the Expedite Ship Plan (ESP).

To take advantage of ESP, match the color coded model number codes in the selection charts (standard dimensions apply).

ESP service may not apply to orders of ten units or more. Contact your local representative for lead times on larger volume orders, as well as other products and options.

WARRANTY

All MAGNETROL mechanical level and flow controls are warranted free of defects in materials or workmanship for five full years from the date of original factory shipment.

If returned within the warranty period; and, upon factory inspection of the control, the cause of the claim is determined to be covered under the warranty; then, MAGNETROL will repair or replace the control at no cost to the purchaser (or owner) other than transportation.

MAGNETROL shall not be liable for misapplication, labor claims, direct or consequential damage or expense arising from the installation or use of equipment. There are no other warranties expressed or implied, except special written warranties covering some MAGNETROL products.

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