



**MAGNETROL®**

**AMETEK®**

**LEVEL MEASUREMENT  
SOLUTIONS**

## External Chamber Sealed or Flanged Top

### DESCRIPTION

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The Magnetrol® external chamber is a self-contained cage designed for use with our top mounting level transmitters or switches. Quality construction and a wide selection of configurations make this cage an ideal means of utilizing the power of our many technologies without mounting directly into the process vessel. The chamber is suitable for use with Eclipse® Guided Wave Radar and Kotron® RF Capacitance transmitters, all electronic point sensors, and top mounted displacer switches.

### FEATURES

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- Sealed or flanged-top chamber options
- 2" and 3" nominal chamber diameters to accommodate all sensing elements
- Carbon steel or 316 stainless steel materials of construction
- Rugged Magnetrol commercial construction available as well as ASME B31.3, ASME B31.1, NACE or combined NACE and ASME B31.3 construction options
- Rated for pressures up to 6250 psi (431 bar)
- For applications to +850 °F (+450 °C)
- Lengths for measuring ranges to twenty feet (6.1 m)
- Broad selection of process connections sizes and types
- Head flange bolting included with flange-top models
- Optimal design for use with Eclipse Guided Wave Radar transmitter:
  - Smallest possible chamber diameters
  - Pressure rating to match High Temperature, High Pressure (HTHP) and High Pressure (HP) probes
  - Temperature rating to match HTHP probe
  - Minimal space above and below measuring range to accommodate measurement transition zones
- Suitable for use with RF capacitance transmitters, all electronic point sensors and top mounted displacer switches



### APPLICATIONS

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- Replace existing caged torque-tube controls
- New construction as well as retrofits
- Boiler feed-water heaters
- High pressure process vessels
- Turbulent vessel conditions
- Isolation of instrument desirable
- Elevated temperature process conditions
- Hydrocarbon and chemical process tanks

## COMMERCIAL DESIGN

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- ASTM materials per model number
- Slip-on head and process flanges (A) (unless weld neck connections are specified in model number)
- Branch connections are pipe to pipe (B) for  $\leq 600\#$  construction and Bonney type fittings (C) for  $\geq 900\#$  construction
- Welding per ASME Section IX procedures
- Hydrostatic test at  $1.5 \times$  rated pressure
- Flanged or sealed cages

## ASME B31.1 DESIGN CODE

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- ASME grade materials procured with Certificate of Conformance
- Slip-on head and process flanges (A) for  $\leq 300\#$  construction (unless weld neck connections are specified in model number), weld neck head (D) and process flanges (F) for  $\geq 600\#$  construction
- Branch connections are Bonney type fittings (C)
- Welding done by ASME qualified welders per ASME Section IX procedures
- Full penetration chamber branch welds (G)
- Full penetration circumferential welds (H) for  $\geq 600\#$  construction
- 100% visual inspection of circumferential welds for full penetration for  $\geq 600\#$  construction
- Certified ten minute hydrostatic test at  $1.5 \times$  rated pressure
- Flanged or sealed cages
- Stress limits per code

## ASME B31.3 DESIGN CODE

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- ASME grade materials procured with Certificate of Conformance
- Slip-on head and process flanges (A) for  $\leq 900\#$  construction and 2" 1500# cages (unless weld neck connections are specified in model number)
- Weld neck head flange (D), slip-on process flanges for (A) 3" 1500# cages (unless weld neck connections are specified in model number)
- Weld neck head (D) and process flanges (F) for 5000 psi construction
- Branch connections are Bonney type fittings (C)
- Welding done by ASME qualified welders per ASME Section IX procedures
- Full penetration chamber branch welds (G)
- Full penetration circumferential welds (H) for 5000 psi construction and 3" 1500# cages
- 100% visual inspection of circumferential welds for full penetration for  $\geq 600\#$  construction
- Certified ten minute hydrostatic test at  $1.5 \times$  rated pressure
- Five percent radiographic examination of full penetration circumferential welds
- Flanged or Sealed cages
- Stress limits per code

## NACE DESIGN CODE

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- ASME grade and NACE listed materials procured with Certificate of Conformance
- Slip-on head and process flanges (A) (unless weld neck connections are specified in model number)
- Branch connections are pipe to pipe (B) for  $\leq 600\#$  construction and Bonney type fittings (C) for  $\geq 900\#$  construction
- Welding done by ASME qualified welders per ASME Section IX procedures
- Hydrostatic test at  $1.5 \times$  rated pressure
- Carbon steel cage assembly is post weld heat treated
- Welds and adjacent heat affected zones are hardness tested
- 316 stainless steel pressure boundary parts are annealed, if required, to achieve required hardness
- Flanged or sealed cages

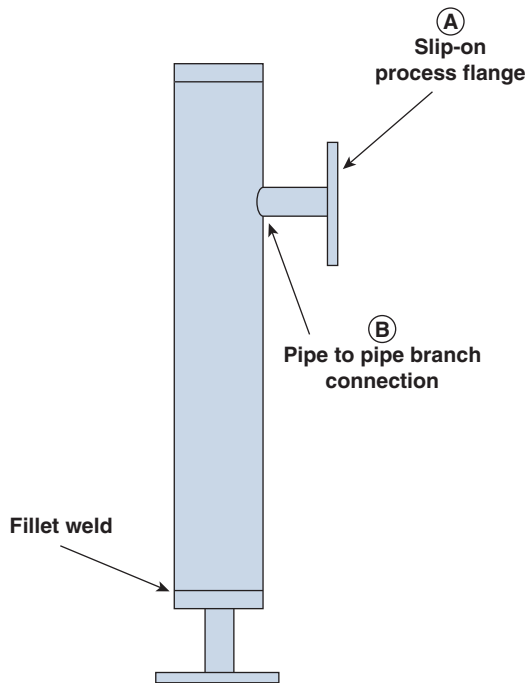
# DESIGN CONSTRUCTION COMPARISON

	Comm	B31.3	B31.1	NACE
ASME grade and NACE listed materials		•	•	•
Certificate of Conformance on materials		•	•	•
Slip-on head and process flanges <sup>①</sup>	•	≤1500# <sup>②</sup>	≤300#	•
Weld neck head and slip-on process flanges <sup>①</sup>		3" 1500#		
Weld neck head and process flanges		5000 psi	≥600#	
Pipe to pipe branch connections	≤600#			≤600#
Bonney type fittings	≥900#	•	•	≥900#
ASME Section IX welding procedures	•			
Welding by ASME qualified welders per ASME Section IX procedures		•	•	•
Full penetration chamber branch welds		•	•	
Full penetration circumferential welds		≥1500# <sup>③</sup>	≥600#	
100% visual inspection of circumferential welds for full penetration		≥1500# <sup>③</sup>	≥600#	
Hydrostatic test at 1.5 × rated pressure	•			•
Certified ten minute hydrostatic test at 1.5 × rated pressure		•	•	
Five percent radiographic examination of full penetration circumferential welds		•		
Post weld heat treatment				CS
Annealing, if required for hardness				SS
Hardness testing of welds and adjacent heat affected zones				•
Flanged or sealed chambers	•	•	•	•
Stress limits per design code		•	•	

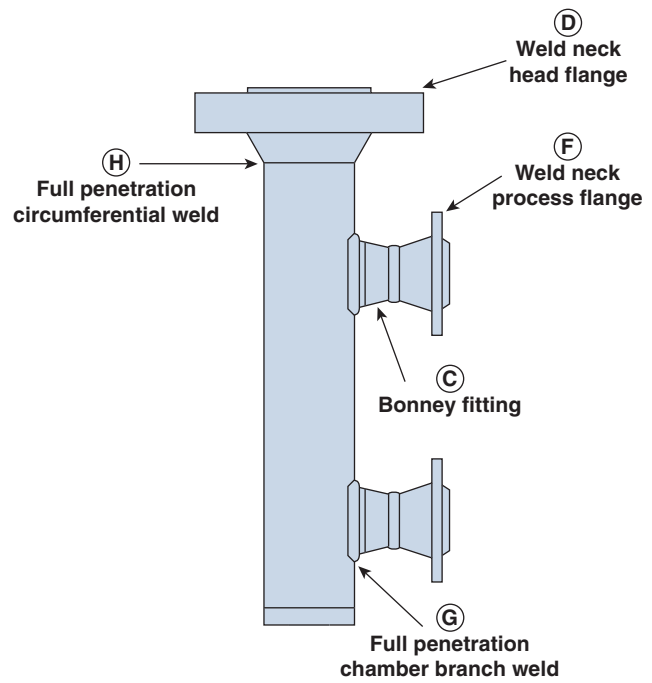
① Unless weld neck process flanges are specified in model number

② Except 3" 1500# cage

③ Except 2" 1500# cage



Sealed Chamber



Flanged Chamber

# DIMENSIONAL INFORMATION

## HEAD FLANGE TYPE

Design Standard (third digit)	Chamber Rating (fifth digit)	Process Connection Type (seventh digit)						
		NPT (A, G)	Socket Weld (B, H)	Slip-on RF (D, K)	Weldneck RF (E, L)	Weldneck RTJ (F, M)		
Commercial (1, 5)	150# (A)	Slip-on raised face			Weldneck raised face			
	300# (B)							
	600# (C)							
	900# (D)							
	1500# (E)							
	5000 psi (F)							
ASME B31.3 (4, 7)	150# (A)	Weldneck raised face			Slip-on raised face			
	300# (B)							
	600# (C)							
	900# (D)							
	1500# (E)						*	
	5000 psi (F)						n/a	
ASME B31.1 (3)	150# (A)	Weldneck raised face			Slip-on raised face			
	300# (B)							
	600# (C)						n/a	
	900# (D)							
	1500# (E)							
	5000 psi (F)							

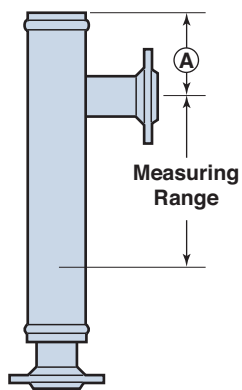
\* 1500# ASME B31.3 will have a slip-on head flange on 2" cage and weld neck head flange on 3" cage

## PROBE LENGTH

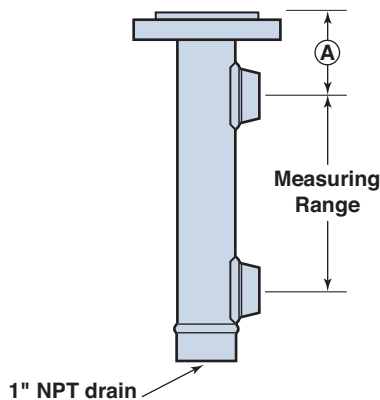
If utilizing a sealed top chamber, go to page 5 for 'A' dimension.

To properly size your sensing element when mounting in a flange top chamber, it is necessary to determine the dimension from the face of the head flange to the centerline of the upper process connection. To determine this dimension:

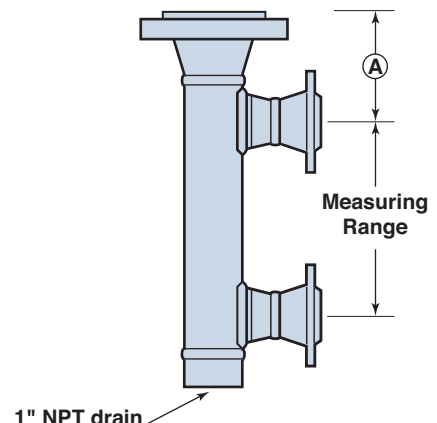
1. Use the third, fifth & seventh digits of your chamber model number and the above chart to verify the type of head flange on your chamber.
2. On page 5, locate the 'A' dimension of your chamber according to the chamber pressure rating, head flange type, design standard, chamber size & process connection size.
3. Go to the formulas on page 6 for probe or cable lengths. Using your 'A' dimension and measuring range (customer designated), determine your required probe length.



**Sealed Chamber**



**Slip-on head flange**



**Weld neck head flange**

See bulletin 41-640 for additional dimensional information.

# DIMENSIONAL INFORMATION

## SEALED CHAMBER ("A" DIMENSION)

**Commercial** – all pressures, chamber sizes, & connection sizes = 7.00" (178 mm)

**ASME 31.3** – all pressure, chamber sizes, & process connection sizes = 7.68" (195 mm)  
Slip-on process flanges not available on 5000 psi construction

**ASME 31.1** – all pressure, chamber sizes, & process connection sizes = 7.68" (195 mm)  
Slip-on process flanges not available on 600#, 900#, 1500#, and 5000 psi construction

## FLANGED CHAMBER ("A" DIMENSION)

Chamber Pressure Rating	Head Flange Type	Design Standard	2" Chamber				3" Chamber			
			Process Connection Size				Process Connection Size			
			¾"	1"	1½"	2"	¾"	1"	1½"	2"
150#	slip-on	Commercial	6.00" (152 mm)				6.00" (152 mm)			
		ASME 31.3								
		ASME 31.1								
	weldneck	Commercial	6.00" (152 mm)	7.50" (191 mm)						
		ASME 31.3								
		ASME 31.1								
300#	slip-on	Commercial	6.00" (152 mm)							
		ASME 31.3								
		ASME 31.1								
	weldneck	Commercial	6.00" (152 mm)	7.50" (191 mm)						
		ASME 31.3								
		ASME 31.1								
600#	slip-on	Commercial	6.00" (152 mm)							
		ASME 31.3								
		ASME 31.1					n/a			
	weldneck	Commercial	6.00" (152 mm)	7.50" (191 mm)	6.00" (152 mm) ①					
		ASME 31.3			6.00" (152 mm)		7.00" (178 mm)			
		ASME 31.1 ④								
900#	slip-on	Commercial	6.00" (152 mm)							
		ASME 31.3								
		ASME 31.1					n/a			
	weldneck	Commercial	6.00" (152 mm)	6.50" (165 mm)	6.00" (152 mm) ①					
		ASME 31.3			6.00" (152 mm)		7.00" (178 mm)			
		ASME 31.1 ④								
1500#	slip-on	Commercial	6.50" (165 mm)							
		ASME 31.3								
		ASME 31.1					n/a			
	weldneck	Commercial	6.50" (165 mm)	6.50" (165 mm)	6.50" (165 mm) ②					
		ASME 31.3			6.50" (165 mm)		7.50" (191 mm)			
		ASME 31.1 ④								
5000 psi	slip-on	Commercial	8.50" (216 mm)							
		ASME 31.3								
		ASME 31.1					n/a			
	weldneck	Commercial	8.50" (216 mm)	9.50" (241 mm)	8.50" (216 mm) ③					
		ASME 31.3 ④			8.50" (216 mm)		9.50" (241 mm)			
		ASME 31.1 ④⑤								

① Except with 2" weldneck process flanges = 7.00" (178 mm)

② Except with 1-1½" and 2" weldneck process flanges = 7.50" (191 mm)

③ Except with 1-1½" and 2" weldneck process flanges = 9.50" (241 mm)

④ No slip-on process flanges

⑤ Stainless steel materials of construction only. Carbon steel is not available.

# PHYSICAL SPECIFICATIONS

Measuring span length	From 12 to 240 inches (30-610 cm)
ECLIPSE probe length ①	
sealed cage	Measuring range ② + A + 5 inches (13 cm) (rounded down to nearest inch)
flanged cage	Measuring range ② + A + 6 inches (15 cm) (rounded down to nearest inch)
KOTRON probe length ③	
sealed cage	Measuring range ② + A + 3 inches (7 cm) (rounded down to nearest inch)
flanged cage	Measuring range ② + A + 4 inches (10 cm) (rounded down to nearest inch)
Displacer cable length (min.) ④⑤	Measuring range ② + A + 6 inches (15 cm) (rounded up to nearest foot)
Materials of Construction	Carbon steel or 316 stainless steel (head flange bolting ASTM A193 GrB7 regardless of chamber material)
Sensor Connections	¾" or 2" NPT, 2" or 3" flange from 150# to 2500# ANSI ⑥
Process Connection Sizes	¾", 1", 1½" or 2"
Process Connection Ratings	150#, 300#,600#, 900#, 1500# or 2500# ANSI ⑥
Process Connection Types	threaded, socketweld, slip-on RF flanges, weldneck RF flanges, weldneck RTJ flanges
Connection Configurations	Side-side, side-bottom
Process Pressures	Up to 6250 psi (431 bar)
Process Temperatures	Up to +850 °F (+450 °C)

- ① See bulletin 57-106 for Eclipse transmitter and probe part numbers.
- ② Measuring range is last three digits of chamber model number.
- ③ See bulletin 50-125 for Kotron probe part numbers.
- ④ See bulletin 45-115 for top mounted displacer switch part numbers and allowable high level dimension with respect to face of mounting flange.
- ⑤ Must be used in 3" flanged cage.
- ⑥ Maximum pressure rating of cage with 2500# flanges is 5000 psi @ 100 °F (345 bar @ 38 °C).

## MODEL NUMBER

### MOUNTING

S	Sealed external chamber (NPT sensor connection)
F	Flanged top external chamber

### NOMINAL CHAMBER DIAMETER

2	2 inch ⑦ If sealed chamber, ¾" NPT sensor conn. If flanged chamber, flanged sensor conn. same size as chamber
3	3 inch If sealed chamber, 2" NPT sensor conn. If flanged chamber, flanged sensor conn. same size as chamber

⑦ Displacer switches require 3" cage.

### DESIGN STANDARD

1	Commercial Construction
3	ASME B31.1 Certified ⑧⑨
4	ASME B31.3 Certified ⑧
5	Commercial Construction and NACE certified ⑧
7	ASME B31.3 Certified and NACE certified ⑧

⑧ Level switch/transmitter must also be specified to required code, if applicable.

⑨ ASME B31.1, 5000 psi chambers not available in carbon steel.



# MODEL NUMBER CONTINUED

## MATERIALS OF CONSTRUCTION ⑩

1	Carbon Steel, measuring range in inches ⑩
4	316/316L Stainless Steel, measuring range in inches

⑩ Process connection materials will match chamber materials

## CHAMBER RATING ⑩

A	150# ANSI class
B	300# ANSI class
C	600# ANSI class
D	900# ANSI class
E	1500# ANSI class
F	5000 psi (process flanges will be 2500# ANSI)

⑩ Process flange, if applicable, will match chamber rating, except as indicated

## PROCESS CONNECTION SIZE

1	¾"
2	1"
3	1½"
4	2"

## PROCESS CONNECTION TYPE AND CONFIGURATION ⑩

Side/Side Configurations		Head Flange Type
A	NPT	Slip-on or weld neck ⑩
B	SW	
D	Slip-on RF Flange ⑩	
E	Weldneck RF Flange Chamber rating codes A, B & C only	Weld neck
F	Weldneck RJ Flange Chamber rating codes C, D, E & F only	
Side/Bottom Configurations		
G	NPT	Slip-on or weld neck ⑩
H	SW	
K	Slip-on RF Flange ⑩	
L	Weldneck RF Flange Chamber rating codes A, B & C only	Weld neck
M	Weldneck RJ Flange Chamber rating codes C, D, E & F only	

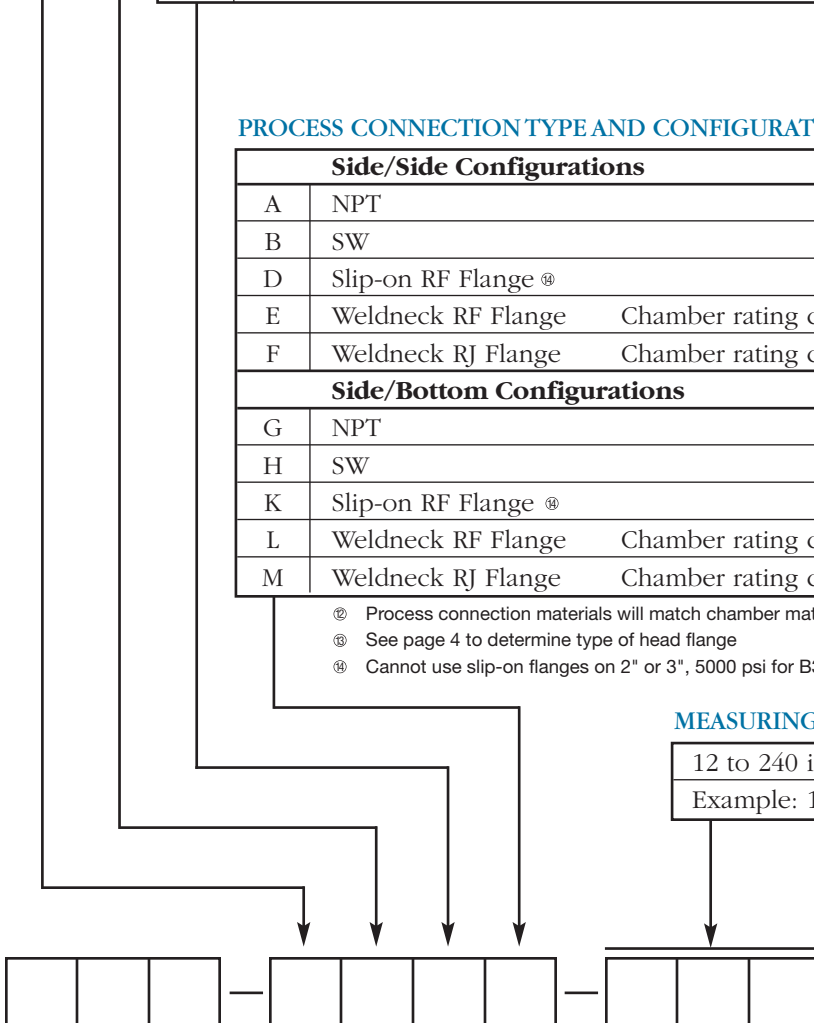
⑩ Process connection materials will match chamber materials

⑩ See page 4 to determine type of head flange

⑩ Cannot use slip-on flanges on 2" or 3", 5000 psi for B31.3, nor on 2" or 3", ≥600# for B31.1

## MEASURING RANGE

12 to 240 inches, fourth digit numeric
Example: 12 inches = 012



## QUALITY

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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.

## WARRANTY

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All Magnetrol mechanical level and flow controls are warranted free of defects in materials or workmanship for three 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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Performance specifications are effective with date of issue and are subject to change without notice.

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