

## Stainless Steel Flat-1® Features and Benefits

- > Hygienic design is easy to clean and eliminates holes and crevices that can propagate bacterial growth.
- > All stainless steel construction provides superior corrosion resistance.
- > Hard chrome plated piston rod reduces wear on the rod seal.
- > IP69K rated design features a sealed outer body which prevents the ingress of washdown chemicals and application matter.
- > Food grade plastic rod bushing and food grade grease lubricant is ideal for food processing and packaging applications.

# How it Works

The Ideal Solution for Washdown and Other Corrosive Environments!

The compact Stainless Steel Flat-1® offers mounting styles to fit most every application!



Pivot Mount



Front Trunnion



Rear Trunnion



Threaded Front



Threaded Rear



F Series Front



F Series Rear



Basic

- > Minimal mounting holes present only where specified reduces catch points
- > Sealed outer body prevents outside contamination from penetrating cylinder body
- > F Series provides a mounting interchange to competitive designs

## Materials of Construction

**End Caps:** 303 Stainless Steel

**Inner and Outer Body:** 304 Stainless Steel

**Piston Rod:** 303 Hard Chrome Plated Stainless Steel

**Lubrication:** Food Grade Grease

**Seals:** Buna-N Standard; High and Low Temperature (optional)

## Engineering Specifications

**Temperature:** -20° F to 200° F Standard  
-40° F to 200° F (Low Temperature)  
0° F to 400° F (High Temperature)

**Pressure Rating:** 250 PSI

**Ingress Protection Rating:** IP69K

\* Cylinders operated for extended time at temperatures below 0° F or above 300° F may require special modifications.

## Stainless Steel Flat-1® Specifications

### Maximum Stroke + Extra Extension Lengths

Model	Bore Sizes	Maximum Stroke
SSFO (Standard Seals)	02 and 04	9"
SSFO (Standard Seals)	09 through 125	15"
SSFO (Low Friction Seals)	02 and 04	9"
SSFO (Low Friction Seals)	09 through 125	15"
SSFOD	All bore sizes	16"
SSFOS	All bore sizes	4"
SSFOR	02 through 50	4"
SSFOR	70 and 125	3"

### Cylinder Weights

#### Approximate Cylinder Weights (lbs)

BORE	SSFO		SSFOD		SSFOR/SSFOS				
	0" Stroke	Adder Per 1/8" Of Stroke	0" Stroke	Adder Per 1/8" Of Stroke	0" Stroke (Up To 1")	1" Stroke (Up To 2")	2" Stroke (Up To 3")	3" Stroke (Up To 4")	Adder Per 1/8" Of Stroke
9/16" (02)	0.15	0.01	0.17	0.01	0.20	0.36	0.52	0.68	0.01
3/4" (04)	0.27	0.02	0.31	0.02	0.34	0.56	0.78	1.00	0.02
1-1/16" (09)	0.70	0.03	0.76	0.03	0.78	1.14	1.47	1.85	0.02
1-1/2" (17)	1.20	0.04	1.35	0.05	1.34	1.88	2.43	2.97	0.03
2" (31)	1.63	0.05	1.82	0.06	1.81	2.45	3.02	3.72	0.04
2-1/2" (50)	3.13	0.05	3.44	0.07	3.42	4.58	5.63	6.79	0.04
3" (70)	3.97	0.07	4.35	0.09	4.35	5.58	7.00	8.19	0.05
4" (125)	6.20	0.09	8.17	0.12	8.49	9.96	11.63	13.08	0.07

### Length Adders for Low Friction Seals

	Bore Size							
	9/16" (02)	3/4" (04)	1-1/16" (09)	1-1/2" (17)	2" (31)	2-1/2" (50)	3" (70)	4" (125)
Length adder (in)	0.25	0.25	0.38	0.38	0.38	0.38	0.50	0.50

### Enclosed Spring Forces

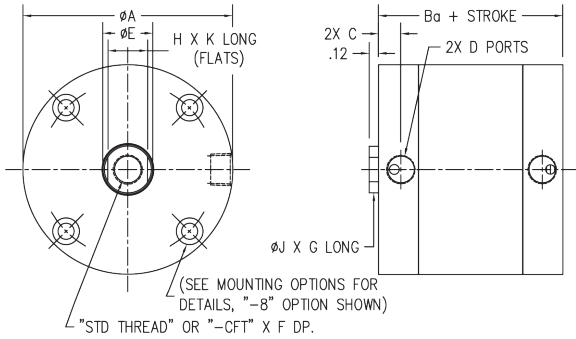
Bore	Maximum Force (Lb)	Spring Rates (Lb/In)			
		0.12 To 1" Stroke (Lb/In)	1.001 To 2" Stroke (Lb/In)	2.001 To 3" Stroke (Lb/In)	3.001 To 4" Stroke (Lb/In)
9/16" (02)	5.90	4.00	1.75	1.24	0.88
3/4" (04)	10.40	6.00	2.70	1.86	1.35
1-1/16" (09)	10.80	6.50	2.70	1.91	1.35
1-1/2" (17)	12.90	6.00	2.30	1.66	1.15
2" (31)	17.50	11.00	2.60	2.10	1.30
2-1/2" (50)	26.00	9.50	5.00	3.28	2.50
3" (70)	35.00	16.00	5.00	3.81	2.50
4" (125)	50.00	22.00	5.50	4.40	2.75

# How To Specify

## Stainless Steel Flat-1® Basic Model Dimensions (in)

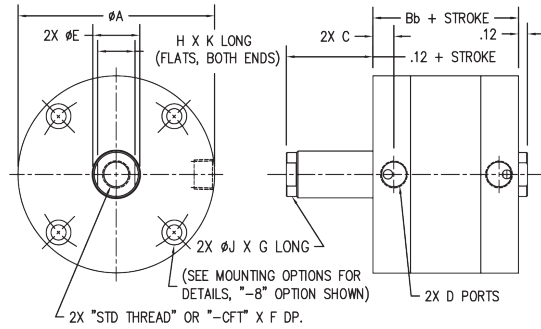
### Model SSFO

(Double Acting Single End Rod)



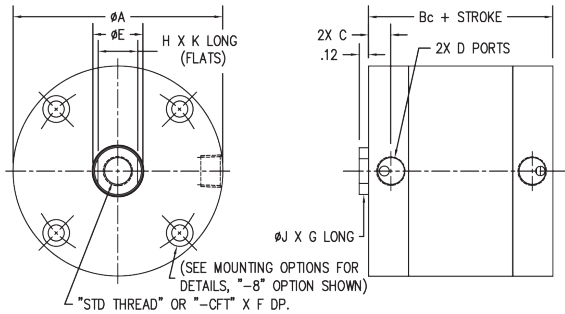
### Model SSFOD

(Double Acting Double End Rod)



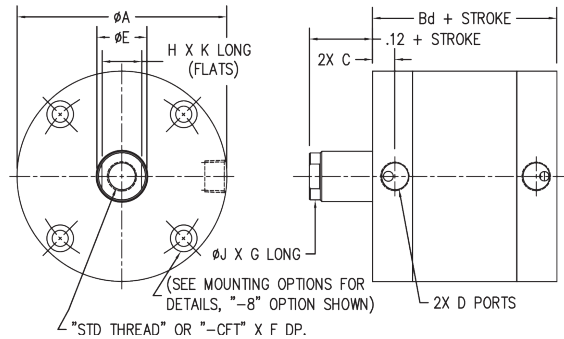
### Model SSFOS

(Single Acting Rod Normally Retracted)



### Model SSFOR

(Reverse Single Acting Rod Normally Extended)



Bore	A	Ba	Bb	Bc				Bd				C	D	E
				0-1"	1.01"-2"	2.01"-3"	3.01"-4"	0-1"	1.01"-2"	2.01"-3"	3.01"-4"			
9/16" (02)	1.13	0.56	0.69	0.81	1.38	1.96	2.52	1.06	1.63	2.14	2.70	0.17	#10-32	0.25
3/4" (04)	1.50	0.56	0.69	0.81	1.38	1.94	2.50	1.06	1.62	2.19	2.75	0.17	#10-32	0.31
1-1/16" (09)	2.00	0.88	0.94	0.88	1.50	2.13	2.75	1.38	2.00	2.63	3.25	0.28	1/8 NPT	0.50
1-1/2" (17)	2.63	0.88	1.00	0.88	1.50	2.13	2.75	1.38	2.00	2.63	3.25	0.28	1/8 NPT	0.63
2" (31)	3.13	0.94	1.06	0.94	1.56	2.19	2.81	1.44	2.06	2.69	3.31	0.28	1/8 NPT	0.75
2-1/2" (50)	3.75	1.19	1.31	1.19	2.06	2.94	3.81	1.94	2.81	3.69	4.56	0.35	1/4 NPT	0.75
3" (70)	4.25	1.25	1.37	1.25	2.12	3.00	3.87	2.00	2.88	3.75	N/A	0.35	1/4 NPT	0.88
4" (125)	5.50	1.56	1.69	1.57	2.45	3.32	4.20	2.32	3.20	4.07	N/A	0.42	3/8 NPT	1.00

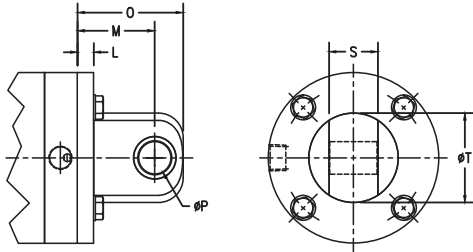
Bore	Std Thread	CFT	F	G	H	J	K
9/16" (02)	#8-32 UNC-2B	N/A	0.46	0.14	0.22	0.24	0.13
3/4" (04)	#10-32 UNF-2B	#10-24 UNC-2B	0.46	0.14	0.25	0.29	0.13
1-1/16" (09)	5/16-24 UNF-2B	5/16-18 UNC-2B	0.70	0.14	0.44	0.48	0.13
1-1/2" (17)	3/8-24 UNF-2B	3/8-16 UNC-2B	0.70	0.14	0.50	0.59	0.13
2" (31)	1/2-20 UNF-2B	1/2-13 UNC-2B	0.70	0.14	0.62	0.71	0.13
2-1/2" (50)	1/2-20 UNF-2B	1/2-13 UNC-2B	0.70	0.14	0.62	0.71	0.13
3" (70)	5/8-18 UNF-2B	5/8-11 UNC-2B	0.73	0.14	0.75	0.84	0.13
4" (125)	3/4-16 UNF-2B	3/4-10 UNC-2B	0.80	0.14	0.87	0.96	0.13

## Stainless Steel Flat-1® Mounting Options and Dimensions (in)

### Pivot Mount (Option 1 or 1N)

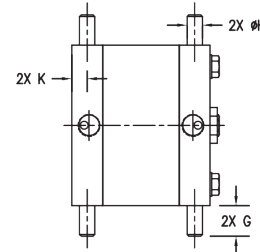
Available in standard or 90°

Complete with FDA compliant Pivot Bushing  
Option 1 is shown; not available as an accessory



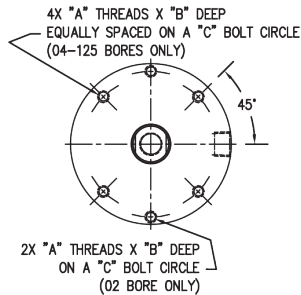
### Trunnion Mount (Option 2, 2F, or 2R)

Available in Front, Rear, or Both Locations  
Not available in 9/16" bore

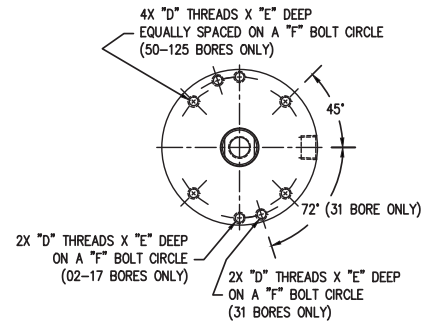


### Threaded Mounting Holes (Option 3F and 3R)

Available in Front or Rear Locations

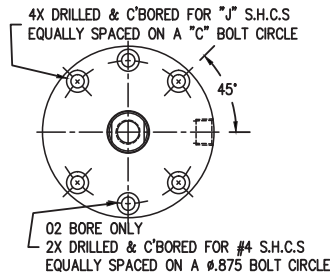


### F Series Interchange Threaded Mounting Holes (Option 7F and 7R) Available in Front or Rear Locations



### Basic Model (Option 8)

Counterbored Mounting Holes Both Ends



## Mounting Option Dimensions

Bore	Front/Rear Mount															
	A	B	C	D	E	F	G	H	J	K	L	M	O	P	S	T
9/16" (02)*	#4-40 UNC-2B	0.22	0.88	#6-32 UNC-2B	0.20	0.88	N/A	N/A	#4	N/A	0.19	0.75	1.00	0.19	0.38	0.63
3/4" (04)	#6-32 UNC-2B	0.20	1.22	#8-32 UNC-2B	0.20	1.19	0.31	0.13	#6	0.17	0.19	0.75	1.00	0.19	0.38	0.75
1-1/16" (09)	#6-32 UNC-2B	0.36	1.69	#10-32 UNF-2B	0.30	1.69	0.50	0.25	#6	0.25	0.25	0.81	1.06	0.19	0.38	0.75
1-1/2" (17)	#10-24 UNC-2B	0.30	2.19	#10-32 UNF-2B	0.30	2.38	0.50	0.25	#10	0.25	0.25	1.19	1.63	0.38	0.75	1.38
2" (31)	#10-24 UNC-2B	0.33	2.69	1/4-20 UNC-2B	0.31	2.81	0.50	0.25	#10	0.25	0.31	1.25	1.69	0.38	0.75	1.38
2-1/2" (50)	1/4-20 UNC-2B	0.42	3.25	1/4-20 UNC-2B	0.42	3.25	0.63	0.31	1/4	0.33	0.38	1.31	1.75	0.38	0.75	1.38
3" (70)	1/4-20 UNC-2B	0.44	3.78	1/4-20 UNC-2B	0.44	3.81	0.63	0.31	1/4	0.33	0.38	1.69	2.25	0.63	1.00	1.88
4" (125)	5/16-18 UNC-2B	0.57	4.94	1/4-20 UNC-2B	0.59	5.00	0.75	0.38	5/16	0.42	0.44	1.75	2.31	0.63	1.00	1.88

\*=only 2 holes

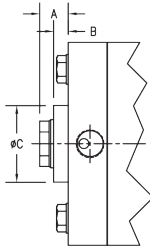
# How To Specify

## Stainless Steel Flat-1® Cylinder Options and Dimensions (in)

FLAT CYLINDERS

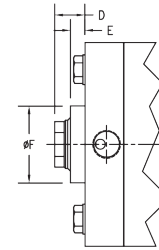
### Rod Wiper (Option W)

WIPER (-W OPTION)



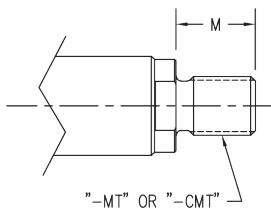
### Metallic Rod Scraper (Option Z)

SCRAPER (-Z OPTION)



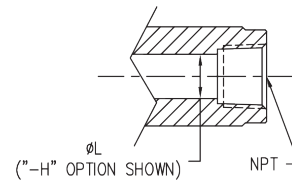
Bore	Wiper			Scraper		
	A	B	C	D	E	F
9/16" (02)	0.46	0.27	0.56	0.51	0.32	0.65
3/4" (04)	0.46	0.27	0.68	0.51	0.32	0.75
1-1/16" (09)	0.46	0.27	0.87	0.54	0.36	0.93
1-1/2" (17)	0.39	0.19	0.99	0.51	0.30	1.06
2" (31)	0.39	0.19	1.12	0.51	0.30	1.18
2-1/2" (50)	0.39	0.19	1.12	0.51	0.30	1.18
3" (70)	0.39	0.19	1.24	0.51	0.30	1.37
4" (125)	0.39	0.19	1.37	0.51	0.30	1.43

### Male Rod End Dimension for MT or CMT Options



"-MT" OR "-CMT"

### NPT Thread Dimensions for FOD Cylinders



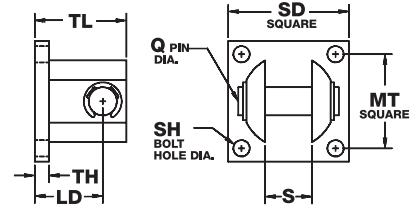
Bore	Rod Thread				
	Mt	Cmt	Npt	L	M
9/16" (02)	#8-32 UNC-2A	N/A	N/A	0.14	0.38
3/4" (04)	#10-32 UNF-2A	#10-24 UNC-2A	N/A	0.14	0.38
1-1/16" (09)	5/16-24 UNF-2A	5/16-18 UNC-2A	1/8 NPT	0.22	0.50
1-1/2" (17)	3/8-24 UNF-2A	3/8-16 UNC-2A	1/8 NPT	0.28	0.50
2" (31)	1/2-20 UNF-2A	1/2-13 UNC-2A	1/8 NPT	0.38	0.63
2-1/2" (50)	1/2-20 UNF-2A	1/2-13 UNC-2A	1/4 NPT	0.38	0.63
3" (70)	5/8-18 UNF-2A	5/8-11 UNC-2A	3/8 NPT	0.44	0.75
4" (125)	3/4-16 UNF-2A	3/4-10 UNC-2A	1/2 NPT	0.50	0.75

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## Stainless Steel Flat-1® accessory Options and Dimensions (in)

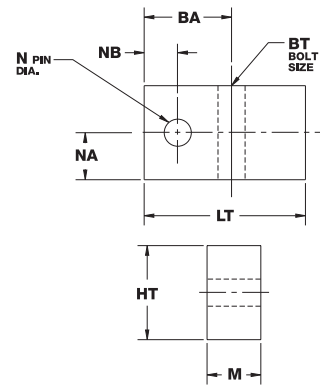
Stainless Steel Clevis Bracket complete with Stainless Steel Pin;  
Designed for use with Pivot Mounted Cylinder (Option 1 or 1N)

BORE	MODEL	LD	MT	Q	S	SH	SD	TH	TL
9/16" (02)	BC-1-SS	0.56	0.75	0.19	0.39	0.16	1.00	0.16	0.78
3/4" (04)	BC-1-SS	0.56	0.75	0.19	0.39	0.16	1.00	0.16	0.78
1-1/16" (09)	BC-1-SS	0.56	0.75	0.19	0.39	0.16	1.00	0.16	0.78
1-1/2" (17)	BC-2-SS	0.94	1.38	0.38	0.77	0.22	1.75	0.22	1.34
2" (31)	BC-2-SS	0.94	1.38	0.38	0.77	0.22	1.75	0.22	1.34
2-1/2" (50)	BC-2-SS	0.94	1.38	0.38	0.77	0.22	1.75	0.22	1.34
3" (70)	BC-3-SS	1.25	2.00	0.63	1.02	0.25	2.50	0.25	1.81
4" (125)	BC-3-SS	1.25	2.00	0.63	1.02	0.25	2.50	0.25	1.81



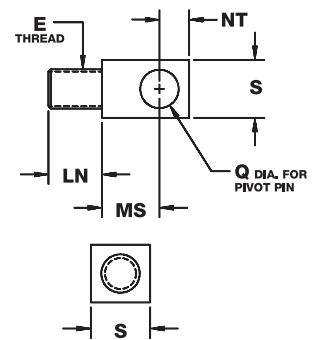
## Stainless Steel Trunnion Bracket (2 pieces)

BORE	MODEL	BA	BT	HT	LT	M	N	NA	NB
3/4" (04)	BT-1-SS	0.56	0.22	0.62	1.13	0.31	0.13	0.30	0.22
1-1/16" (09)	BT-2-SS	0.81	0.28	0.87	1.50	0.50	0.25	0.38	0.31
1-1/2" (17)	BT-2-SS	0.81	0.28	0.87	1.50	0.50	0.25	0.38	0.31
2" (31)	BT-2-SS	0.81	0.28	0.87	1.50	0.50	0.25	0.38	0.31
2-1/2" (50)	BT-3-SS	0.94	0.34	0.98	1.63	0.63	0.32	0.45	0.38
3" (70)	BT-3-SS	0.94	0.34	0.98	1.63	0.63	0.32	0.45	0.38
4" (125)	BT-4-SS	1.06	0.41	1.23	1.88	0.75	0.38	0.55	0.44



## Stainless Steel Rod Pivot; complete with Stainless Steel Nut

BORE	MODEL	E	LN	MS	NT	Q	S
9/16" (02)	RP-1/2-SS	#8-32 UNC	0.38	0.47	0.25	0.19	0.38
3/4" (04)	RP-1-SS	#10-32 UNF	0.38	0.47	0.25	0.19	0.38
1-1/16" (09)	RP-2-SS	5/16-24 UNF	0.63	0.47	0.25	0.19	0.38
1-1/2" (17)	RP-3-SS	3/8-24 UNF	0.63	0.72	0.44	0.38	0.75
2" (31)	RP-4-SS	1/2-20 UNF	0.75	0.72	0.44	0.38	0.75
2-1/2" (50)	RP-4-SS	1/2-20 UNF	0.75	0.72	0.44	0.38	0.75
3" (70)	RP-5-SS	5/8-18 UNF	0.88	1.00	0.63	0.63	1.00
4" (125)	RP-6-SS	3/4-16 UNF	0.88	1.00	0.63	0.63	1.00



# How to Order

The Model Number for all Stainless Steel Flat-1® cylinders consists of three alphanumeric clusters. These designate type, bore size, stroke length, and mounting and special options. Please refer to the charts below for an example of Model Number SSFO-170.25-1V. This is a stainless steel, double acting, 1-1/2" bore, 1/4" stroke, pivot mount cylinder with high temperature option.

Type	
SSFO	Stainless Steel Double Acting
SSFOD	Stainless Steel Double End Rod
SSFOR	Stainless Steel Reverse Acting
SSFOS	Stainless Steel Single Acting

Bore Size			
02	9/16"	31	2"
04	3/4"	50	2-1/2"
09	1-1/16"	70	3"
17	1-1/2"	125	4"

Stroke Length	
0.25	1/4"
0.375	3/8"
ETC.	

**SSFO - 17 0.25 - 1 V**

Mounting Options	
Enter in numerical order	
1	Pivot mount
1N	Pivot mount 90° from standard
2	Trunnion both ends <sup>1</sup>
2F	Front trunnion mount <sup>1</sup>
2R	Rear trunnion <sup>1</sup>
3F	Threaded mounting holes, front
3R	Threaded mounting holes, rear
7F	F series interchange, threaded holes, front <sup>2</sup>
7R	F series interchange, threaded holes, rear <sup>2</sup>
8	Basic model (standard counterbored mounting holes, both ends)

Options	
Enter in numerical order, except for EE, which is last	
99	Oil pre-lube
B	Bumpers, both ends <sup>1 2</sup>
BF	Bumper, front only <sup>1 2</sup>
BR	Bumper, rear only <sup>1 2</sup>
CFT	Coarse female thread (fine thread standard) (see page 186)
CMT	Male rod end (coarse thread) (see page 188)
D	Low pressure hydraulic design (250 PSI maximum)
H	Hollow rod (FOD models only) (see page 188)
J	Failsafe operation, spring retract (FOD models)
L	Low friction seals (see table page 185 for length adders)
MT	Male rod end (fine thread) (see page 188)
NPT	Female NPT thread, both ends (FOD models only) <sup>4</sup>
NPTF	Female NPT thread, front (FOD models only) (see page 188) <sup>4</sup>
NPTR	Female NPT thread, rear (FOD models only) (see page 188) <sup>4</sup>
NT	Non-threaded rod
Q	Low temperature design (-40° F to 200° F)
SR	Stainless steel rod (no chrome plating)
V	High temperature option (0° F to 400° F) <sup>2</sup>
W	Rod wiper (Buna N only) (see page 188)
X	X-ring piston seal <sup>3</sup>
Z	Metallic rod scraper (see page 188)
EE0.375	3/8" extra rod extension, etc.
EE1	1" extra rod extension, etc.

<sup>1</sup> Not available in 9/16" bore  
<sup>2</sup> Available in 02, 04, and 09 bores only

NOTE: To minimize catchpoints where application debris and bacteria may collect, mounting holes are present only where specified by part number. For example, when ordering the -3R option, you will receive threaded mounting holes on the rear cap. There will be NO mounting holes on the front cap.

<sup>1</sup> There is no stroke reduction when the supply pressure is 80 PSI or greater. At 0 PSI, there will be a stroke reduction of approximately .040". Bumper compression is linear from 0 PSI to 80 PSI. FOS models have a rear bumper only, FOR models a front bumper only.  
<sup>2</sup> Bumper material is rated to 200° F.  
<sup>3</sup> Optional piston seal which may improve performance in certain short stroke applications where back pressure due to flow controls or reduced exhaust flow may exist.  
<sup>4</sup> Must be ordered with Hollow Rod (H) option.