

EATON

Vickers

**Hydraulic Cylinders
Heavy-Duty Large Bore Tie Rod Type**

Catalog

Series VG



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Design Features

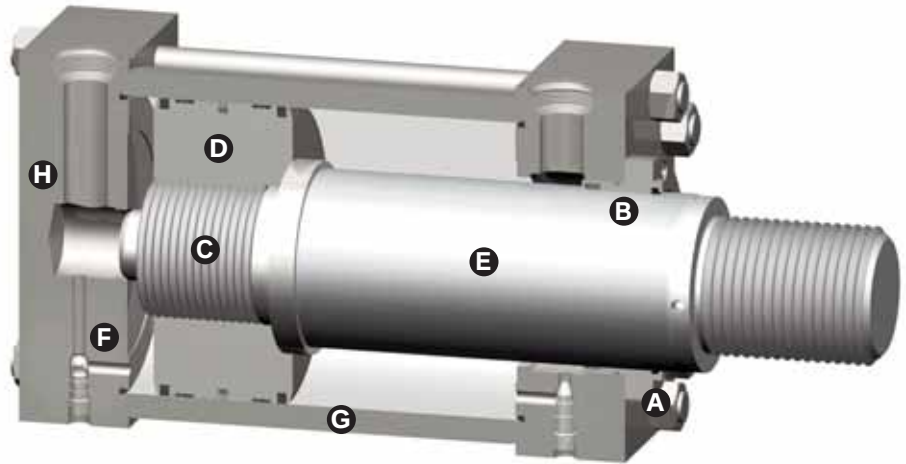
SPECIFICATIONS

Bore Sizes: 10" - 30"

Piston Rod Dia.: 4 1/2" - 14"

Pressure Ratings:

3,000 psi Nominal
Hydraulic Service



A. Heavy Duty Bolt-on Rod Cartridge

- Nitrided, bolt-on rod cartridge is pilot-fitted into the head and incorporates an outboard bearing design for maximum rod support and long life.

B. Rod Sealing System

- The normal high durometer, mechanically energized rod seal with a double lip rod wiper provides contamination exclusion and abrasion resistance to deliver exceptional performance and durability.
- Low friction and high temperature rod sealing systems are also available options.
- Metallic rod scraper is an available option for tough environmental conditions.

C. Secured Piston

- One piece, pilot-fitted, ductile iron piston is secured to the rod with anaerobic adhesive.
- Piston to rod set screw staking is an available option for high vibration applications.

D. Piston Sealing System

- Bi-directional, mechanically energized PTFE piston seal with outboard wear-bands prevent pressure trap and protect against sidelading. Cast iron rings on the outer edges protect the primary seal from fluid contaminants and provide extended seal life.
- Low friction and high temperature piston sealing systems are also available options.

E. High Yield Piston Rod

- High yield, turned, ground, and polished microalloy steel with hard chrome plate is standard to protect the rod surface and provide long rod seal life.
- Thicker plating and alternate rod coatings and materials are available premium options.

F. Cushions

- Adjustable design allows for tuning for smooth deceleration and is available for all bore and rod combinations.
- Ball check design allows for smooth acceleration when coming out of cushion.

G. High Yield Steel Tubing

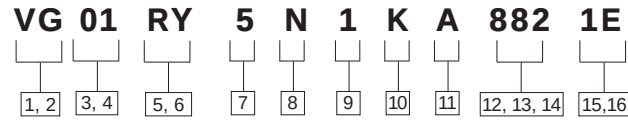
- High yield strength steel tubing is precision finished to provide extended piston seal life.
- Chrome-plated bores are available upon request.

H. Steel Heads and Caps

- Various robust mounting style options are available on either end to provide maximum design installation flexibility.
- A full range of ports are available to provide the broadest piping flexibility.

Model Code

All dimensions are in inches.



1, 2 Large Bore Cylinder

VG – 3000 psi Tie Rod

3, 4 Mounting Style

- 01** – Side Lug
- 08** – Head Square
- 09** – Head Rectangular
- 10** – Clevis
- 13** – Cap Square
- 14** – Cap Rectangular
- 15** – Intermediate Trunnion
- 16** – Cap Trunnion
- 17** – Head Trunnion
- 19** – Centerline Lug
- 21** – Cap End Extended Tie Rod
- 22** – Head End Extended Tie Rod
- 23** – Both Ends Extended Tie Rod
- 24** – No Mount
- 25** – Double Rod, Side Lug
- 32** – Double Rod, Head Square
- 33** – Double Rod, Head Rectangular
- 34** – Double Rod, Intermediate Trunnion
- 35** – Double Rod, Head Trunnion
- 37** – Double Rod, Centerline Lug
- 39** – Double Rod, Extended Tie Rod
- 40** – Double Rod, Both Ends Extended Tie Rod
- 41** – Double Rod, No Mount

5, 6 Bore and Rod Diameter

Code	Bore	Rod
RY	10	4-1/2
RZ	10	5
R1	10	5-1/2
R4	10	7
S1	12	5-1/2
S4	12	7
S6	12	8
T4	14	7
T6	14	8
T7	14	9
T8	14	10
U6	16	8
U7	16	9
U8	16	10
V7	18	9
V8	18	10
W8	20	10
Z9	24	11
Q3	30	14

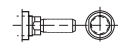
7 Rod End Types

Code - Rod End Style

2 - Short Female UNF Thd



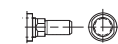
5 - Small Male UN Thd



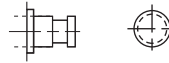
6 - Plain No Attachment



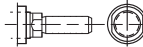
9 - Intermediate Male UN Thd.



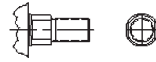
G - Grooved End



K - Extended Small Male UN Thd



M - Extended Int. Male UN Thd



8 Sealing Systems

N - Normal

L - Low Friction

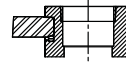
T - High Temperature

9 Ports

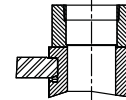
For maximum reliability, SAE ports are recommended.

Code - Port Style

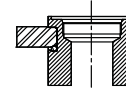
1 - NPTF



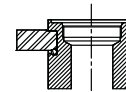
2 - Oversize NPTF



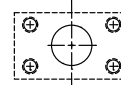
3 - SAE/UNF O-Ring



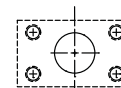
4 - Undersize SAE/UNF O-Ring



6 - SAE 4-Bolt Manifold

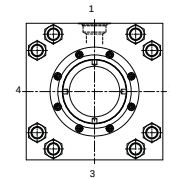


F - Undersize SAE 4-Bolt Manifold



10 Port Location

Ports are located as shown below when viewing cylinder from head end (mounting end of double rod cylinder). Some mounting styles have port location restrictions.



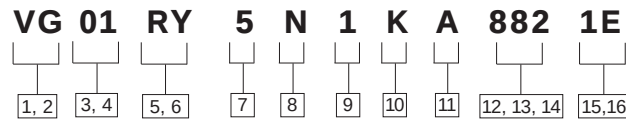
Code	Head	Cap
K	1	1
L	1	2
M	1	3
N	1	4
P	2	1
R	2	2
S	2	3
T	2	4
U	3	1
V	3	2
W	3	3
Y	3	4
1	4	1
2	4	2
3	4	3
4	4	4

11 Cushion Location

Code	Head	Cap
A	-	-
B	-	1
C	-	2
D	-	3
E	-	4
F	1	-
G	2	-
H	3	-
J	4	-
K	1	1
L	1	2
M	1	3
N	1	4
P	2	1

Model Code

All dimensions are in inches.



Cushion Location (cont.)

Code	Head	Cap
R	2	2
S	2	3
T	2	4
U	3	1
V	3	2
W	3	3
Y	3	4
1	4	1
2	4	2
3	4	3
4	4	4

12, 13, 14 Cylinder Stroke

Items 12 & 13 indicate total stroke length from 1 through 99 inches. Item 14 indicates fractions of an inch as follows:

Code	Fraction	Code	Fraction
0 -	0	8 -	1/2
1 -	1/16	9 -	9/16
2 -	1/8	A -	5/8
3 -	3/16	B -	11/16
4 -	1/4	C -	3/4
5 -	5/16	D -	13/16
6 -	3/8	E -	7/8
7 -	7/16	F -	15/16

15, 16 Enter Applicable Code for Either:

Extra Rod Projection ("C" dimension)

Position 15 indicates inches from 0 through 9.

Position 16 indicates fractions of an inch per codes shown for item 14.

OR
Proximity Switch, Gland Drain, Air Bleeder Option, Etc.

Extra Port Positions

Code	Head	Cap
EB	-	1
EC	-	2
ED	-	3
EE	-	4
EF	1	-

EG	2	-
EH	3	-
EJ	4	-
EK	1	1
EL	1	2
EM	1	3
EN	1	4
EP	2	1
ER	2	2
ES	2	3
ET	2	4
EU	3	1
EV	3	2
EW	3	3
EY	3	4
E1	4	1
E2	4	2
E3	4	3
E4	4	4

Gland Drain

Code	Location
G1	1
G2	2
G3	3
G4	4

Air Bleed Position

Code	Head	Cap
HB	-	1
HC	-	2
HD	-	3
HE	-	4
HF	1	-
HG	2	-
HH	3	-
HJ	4	-
HK	1	1
HL	1	2
HM	1	3
HN	1	4
HP	2	1
HR	2	2
HS	2	3
HT	2	4
HU	3	1
HV	3	2
HW	3	3
HY	3	4
H1	4	1
H2	4	2
H3	4	3
H4	4	4

Keyed Piston to Rod

Code	Type
KG	Grub Screw
KP	Roll Pin
KS	Staked Mechanically

Limit Switch Position

Code	Head	Cap
LB	-	1
LC	-	2
LD	-	3
LE	-	4
LF	1	-
LG	2	-
LH	3	-
LJ	4	-
LK	1	1
LL	1	2
LM	1	3
LN	1	4
LP	2	1
LR	2	2
LS	2	3
LT	2	4
LU	3	1
LV	3	2
LW	3	3
LY	3	4
L1	4	1
L2	4	2
L3	4	3
L4	4	4
*L5	1	1
*L6	2	2
*L7	3	3
*L8	4	4

Proximity Position

Code	Head	Cap
PB	-	1
PC	-	2
PD	-	3
PE	-	4
PF	1	-
PG	2	-
PH	3	-
PJ	4	-

*Single Pole Double through Double Break

Proximity Position (cont.)

Code	Head	Cap
PK	1	1
PL	1	2
PM	1	3
PN	1	4
PP	2	1
PR	2	2
PS	2	3
PT	2	4
PU	3	1
PV	3	2
PW	3	3
PY	3	4
P1	4	1
P2	4	2
P3	4	3
P4	4	4

Rod Material Options

- RH - Case Hardened
- RP - Thick Chrome Plate*
- RS - Stainless Steel 17-4
- RT - Stainless Steel 304**

*.001 Chrome thickness per side

**Consult Factory for pressure rating

Stop Tube Length (inches)

Code	Length	Code	Length
S1	1	S2	2
S3	3	S4	4
S5	5	S6	6
S7	7	S8	8
S9	9	S0	10
SA	11	SB	12
SC	13	SD	14
SE	15	SF	16
SG	17	SH	18
SJ	19	SK	20

Tail Rod End Type

Code	Rod End Type
T2	Short Female UNF Thd
T5	Small Male UN Thd
T6	Plain No Attachment
T9	Int. Male UN Thd
TG	Grooved End
TK	Ext. Small Male UN Thd
TM	Ext. Int. Male UN Thd

Standard Cylinders

Eaton has created an easy system for ordering Vickers™ Series VG cylinders. This system has been developed to improve our service to you. The model code consists of sixteen alpha-numeric digits which fully describe the most common standard options offered on Series VG cylinders.

To specify your Series VG cylinder, review the following pages for a full description of each option available and select the desired code.

This model code system will:

- Simplify the re-order process

Each Vickers cylinder is assigned a sixteen digit model code. That code is unique to a particular cylinder description. That way, when you re-order your Series VG cylinder, you're assured of exactly the same top quality cylinder design.

- Improve identification

Every cylinder has its sixteen digit model code clearly marked on the product. Each sixteen digit code completely describes a specific cylinder. This allows seals and

replacement components to be easily identified in the field.

- Facilitate communications

This fully descriptive model code system allows you to work directly with your local Eaton sales engineer to identify and service your Vickers cylinder.

Note: See pages 4 and 5 for a summary of model code options.

Custom Cylinders

New Cylinders

Although the model code has been arranged to cover the vast majority of available options, there will be occasions when you require an option which cannot be coded. When specifying such an option, enter an "X" for the appropriate item in the sixteen digit model code, then describe your requirements.

For example, if you have an application which requires a custom thread on the end of the piston rod, enter an "X" for item 7. Then add a full description at the end of the model code, such as "With 3.25 inch total rod projection and M22 x 1.5 thread 1375 inches long." The cylinder will then be given a unique five digit design number on receipt of order (as explained in next section).

Replacement Cylinders

Every custom Vickers cylinder is assigned a unique design number. This number is contained in the last five digits of the sixteen digit model code, and item 12 is always an alpha character. In other words, the "Stroke" and "Extra-Rod Projection" locations (items 12 through 16) become the "Design Number" items for custom cylinders. When ordering a replacement cylinder, simply give the sixteen digit model code or the five digit design number to your local Vickers cylinder sales representative.

Replacement Parts

Each design number is stored in a quick retrieval computerized storage system. This gives our field sales representatives rapid access to assist you in identifying and specifying genuine Vickers replacement parts.

Mounting Style and Installation Dimensions

Mounting Application Guide

Side Lug Mount

- Side lug mounts are for moving loads along a flat guided surface, as in a carriage along rails.
- The mounting surface should be flat and parallel to the centerline of the piston rod.
- The load should be guided to traverse along the centerline of the piston rod.
- With unsupported loads, the bearing must absorb more force. For these applications, the larger alternate rod is recommended and stop tubes should be considered.
- The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.
- Use high tensile socket head cap screws or hex head bolts tightened to the manufacturer's recommended torque.
- For high shock applications, dowel pins or shear keys should be incorporated in the mounting design.
- For severe side load applications, consult your local Eaton sales engineer.

Full Thickness Head Mount

- These mounts are ideal for straight line force transfer applications in which the cylinder is used in tension (pulling) as in pull presses. For compression applications (pushing), a cap rectangular / square mount is more appropriate.
- The mounting surface should be flat and the head bearing should be piloted into it.
- The force of the load should be perpendicular to the mounting surface and parallel the centerline of the piston rod. For eccentric loads, the oversize alternate rod is recommended and stop tubes should be considered.
- The frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.
- Use high tensile socket head cap screws or hex head bolts tightened to the manufacturer's recommended torque.

Clevis Mount

- This mount is for applications in which the machine member travels in a curved path within one plane.
- This mount can be used both in compression (push) and tension (pull). Care must be exercised to prevent rod buckling in compression applications with long strokes. See page 49 for stroke limitations.
- The centerline of the machine member that attaches to the swivel pin must be perpendicular to the centerline of the piston rod and the curved path must be in one plane only. Any misalignment will cause excess side loading on the bearing and piston. This will lead to premature failure.

Mounting Style and Installation Dimensions

Mounting Application Guide

Head and Cap Trunnion Mounts

- These mounts are for applications in which the machine member travels in a curved path within one plane.
- Either mount can be used both in compression (push) and tension (pull) applications. head trunnion mounts provide a longer maximum stroke than cap trunnion mounts, when used in compression.
- The trunnion pins are an integral part of the head and can be sleeved to provide an extremely tight fit to the mating machine member and permit curvilinear motion.
- It is recommended that rigidly mounted pillow blocks with bearings at least as long as the trunnion pins be used and be installed as close to the shoulder of the trunnion as possible.

Extended Tie Rod Mounts

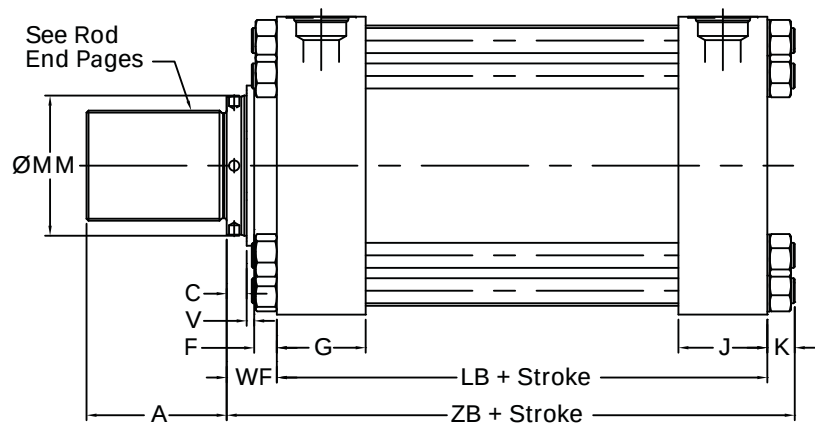
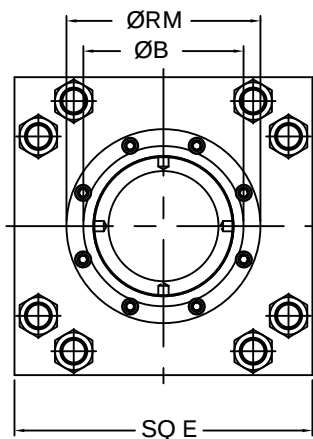
- These mounts are for straight line force transfer applications. The head end extended tie rod mount is recommended for tension (pulling) applications and the cap end extended tie rod mount is recommended for compression (pushing) applications. Both ends extended tie rod mounts are suited for tension and compression applications or applications where additional hardware is to be attached to the cylinders.
- The mounting surface should be flat and the frame on which the cylinder is mounted must be sufficiently rigid to resist bending moments.
- On head mount applications, the bearing provides a pilot diameter to align the rod in the mounting frame.
- Once fitted into the application framework, the nuts which are provided should be torqued to the values listed on page 48. On some Both ends extended tie rod mounts, the nuts must be loosened on the head then torqued following assembly to the framework.
- The force on the rod should be perpendicular to the mounting surface and coincide with the centerline of the piston rod. For eccentric loads, oversized alternate rods are recommended and stop tubes should be considered.

Double Head Mounts

- Double end cylinders are specified when equal displacement is desired on both sides of the piston or when the application is such that another function can be performed simultaneously with a second rod.
- The single rod mount application data is applicable for all double head cylinders.

Mounting Style and Installation Dimensions

VG24 Basic Cylinder - No Mount



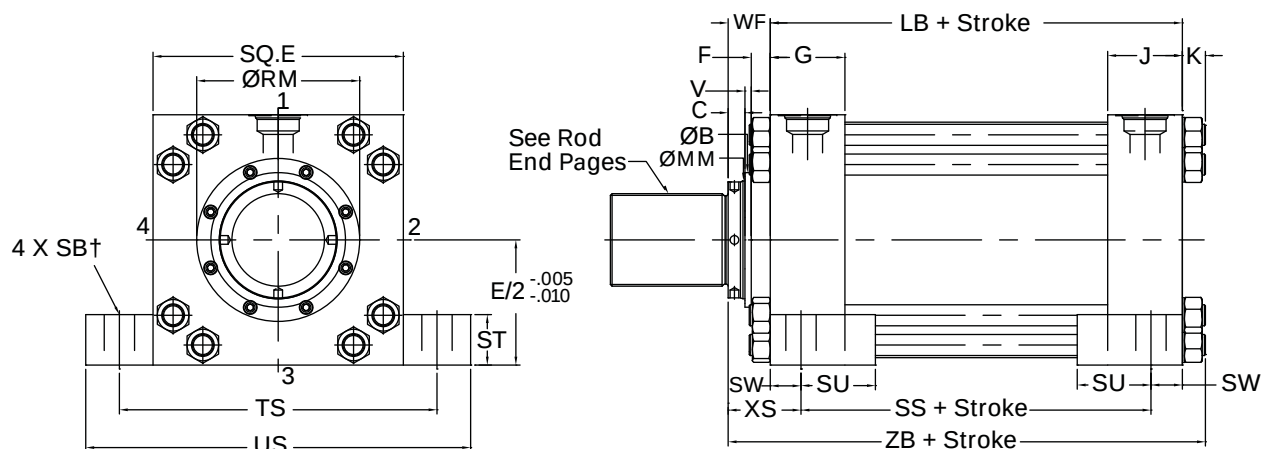
BORE	ROD DIA MM	B +0.000/-0.005	RM	C	E	F	V	WF	G	J	LB+	MAX ZB+	PISTON THICK	K
10.00	4.50	5.249	7.00	1.00	12.62	0.88	0.25	2.13	3.69	3.69	12.13	15.81	4.75	1.56
	5.00	5.749	7.50	1.00	12.62	0.98	0.25	2.23	3.69	3.69	12.13	15.91	4.75	1.56
	5.50	6.249	8.00	1.00	12.62	0.98	0.25	2.23	3.69	3.69	12.13	15.91	4.75	1.56
	7.00	7.999	9.69	1.00	12.62	1.13	0.38	2.50	3.69	3.69	12.13	16.19	4.75	1.56
12.00	5.50	6.249	8.00	1.00	14.88	0.98	0.25	2.23	4.44	4.44	14.50	18.06	5.62	1.34
	7.00	7.999	9.69	1.00	14.88	1.13	0.38	2.50	4.44	4.44	14.50	18.33	5.62	1.34
	8.00	8.999	10.69	1.00	14.88	1.50	0.38	2.88	4.44	4.44	14.50	18.71	5.62	1.34
14.00	7.00	7.999	9.69	1.00	17.13	1.13	0.38	2.50	4.88	4.88	15.63	19.69	5.88	1.56
	8.00	8.999	10.69	1.00	17.13	1.50	0.38	2.88	4.88	4.88	15.63	20.06	5.88	1.56
	9.00	9.999	11.69	1.00	17.13	1.50	0.38	2.88	4.88	4.88	15.63	20.06	5.88	1.56
	10.00	10.999	12.69	1.00	17.13	1.50	0.38	2.88	4.88	4.88	15.63	20.06	5.88	1.56
16.00	8.00	8.999	10.69	1.00	19.25	1.50	0.38	2.88	5.88	5.25	18.00	22.44	6.88	1.56
	9.00	9.999	11.69	1.00	19.25	1.50	0.38	2.88	5.88	5.25	18.00	22.44	6.88	1.56
	10.00	10.999	12.69	1.00	19.25	1.50	0.38	2.88	5.88	5.25	18.00	22.44	6.88	1.56
18.00	9.00	9.999	11.69	1.00	22.00	1.50	0.38	2.88	6.88	5.75	20.50	24.94	7.88	1.56
	10.00	10.999	12.69	1.00	22.00	1.50	0.38	2.88	6.88	5.75	20.50	24.94	7.88	1.56
20.00	10.00	10.999	12.69	1.00	24.00	1.50	0.38	2.88	7.88	6.50	23.25	27.69	8.88	1.56
24.00	11.00	12.000	16.00	1.00	31.00	2.69	0.81	4.50	10.00	10.00	29.50	37.00	9.50	3.00
30.00	14.00	15.000	19.00	1.00	37.50	3.13	0.38	4.50	12.38	12.38	36.25	44.25	11.50	3.50

+ Plus stroke
All dimensions are in inches.



Mounting Style and Installation Dimensions

VG01 Side Lug Mount 10.00" to 14"00" Bores



BORE	ROD DIA MM	B +.000/- .005	RM	C	E	F	V	WF	G	J	SW
10.00	4.50	5.249	7.00	1.00	12.62	0.88	0.25	2.13	3.69	3.69	1.63
	5.00	5.749	7.50	1.00	12.62	0.98	0.25	2.23	3.69	3.69	1.63
	5.50	6.249	8.00	1.00	12.62	0.98	0.25	2.23	3.69	3.69	1.63
	7.00	7.999	9.69	1.00	12.62	1.13	0.38	2.50	3.69	3.69	1.63
12.00	5.50	6.249	8.00	1.00	14.88	0.98	0.25	2.23	4.44	4.44	2.00
	7.00	7.999	9.69	1.00	14.88	1.13	0.38	2.50	4.44	4.44	2.00
	8.00	8.999	10.69	1.00	14.88	1.50	0.38	2.88	4.44	4.44	2.00
14.00	7.00	7.999	9.69	1.00	17.13	1.13	0.38	2.50	4.88	4.88	2.25
	8.00	8.999	10.69	1.00	17.13	1.50	0.38	2.88	4.88	4.88	2.25
	9.00	9.999	11.69	1.00	17.13	1.50	0.38	2.88	4.88	4.88	2.25
	10.00	10.999	12.69	1.00	17.13	1.50	0.38	2.88	4.88	4.88	2.25

Mounting Style and Installation Dimensions

VG01 Side Lug Mount 10.00" to 14"00" Bores



BORE	XS	SS+	SU	TS	US	ST	SB†	LB+	PISTON THICK	MAX ZB+	K
10.00	3.75	8.88	3.50	15.88	19.13	2.25	1.56	12.13	4.75	15.81	1.56
	3.85	8.88	3.50	15.88	19.13	2.25	1.56	12.13	4.75	15.91	1.56
	3.85	8.88	3.50	15.88	19.13	2.25	1.56	12.13	4.75	15.91	1.56
	4.13	8.88	3.50	15.88	19.13	2.25	1.56	12.13	4.75	16.19	1.56
12.00	4.23	10.50	4.25	18.88	22.88	3.00	1.56	14.50	5.62	18.06	1.34
	4.50	10.50	4.25	18.88	22.88	3.00	1.56	14.50	5.62	18.33	1.34
	4.88	10.50	4.25	18.88	22.88	3.00	1.56	14.50	5.62	18.71	1.34
14.00	4.75	11.13	4.75	21.63	26.13	4.00	2.31	15.63	5.88	19.69	1.56
	5.13	11.13	4.75	21.63	26.13	4.00	2.31	15.63	5.88	20.06	1.56
	5.13	11.13	4.75	21.63	26.13	4.00	2.31	15.63	5.88	20.06	1.56
	5.13	11.13	4.75	21.63	26.13	4.00	2.31	15.63	5.88	20.06	1.56

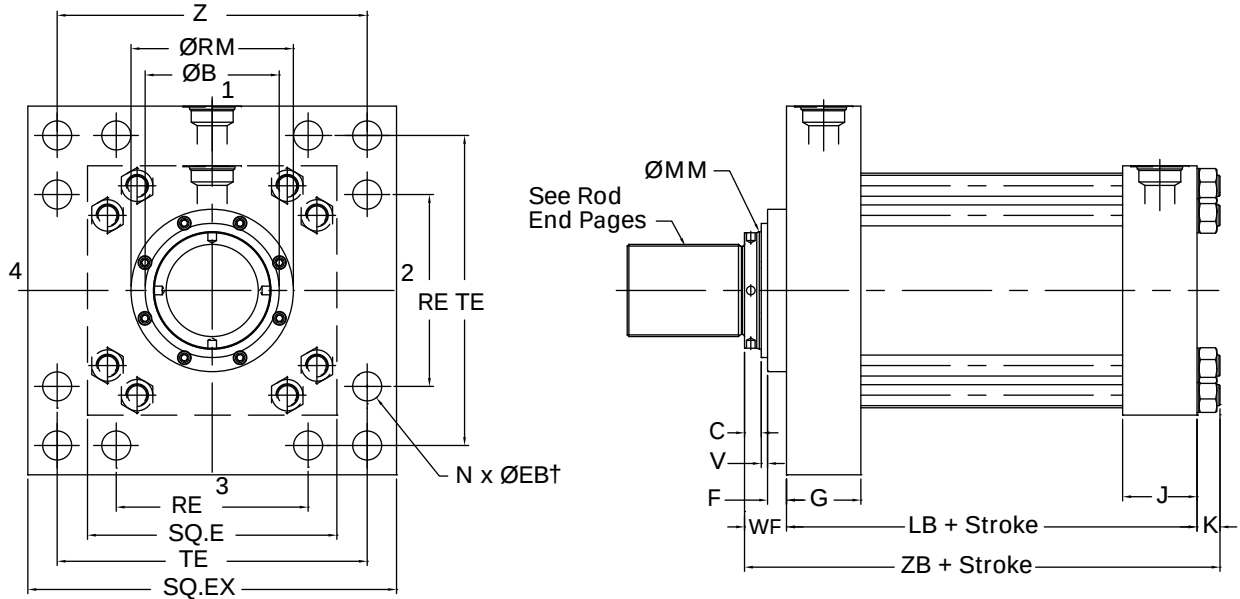
+ Plus stroke

† Use screws 1/16" smaller than Mounting Holes

All dimensions are in inches.

Mounting Style and Installation Dimensions

VG08 Head Square Mount 10.00" to 30.00" Bores



BORE	ROD DIA MM	B +.000/-0.005	RM +.000/-0.002	C	E	EX	F	V	WF	G	J
10.00	4.50	5.249	7.000	1.00	12.62	16.63	0.88	0.25	2.13	3.69	3.69
	5.00	5.749	7.500	1.00	12.62	16.63	0.98	0.25	2.23	3.69	3.69
	5.50	6.249	8.000	1.00	12.62	16.63	0.98	0.25	2.23	3.69	3.69
	7.00	7.999	9.687	1.00	12.62	16.63	1.13	0.38	2.50	3.69	3.69
12.00	5.50	6.249	8.000	1.00	14.88	19.75	0.98	0.25	2.23	4.44	4.44
	7.00	7.999	9.687	1.00	14.88	19.75	1.13	0.38	2.50	4.44	4.44
	8.00	8.999	10.687	1.00	14.88	19.75	1.50	0.38	2.88	4.44	4.44
14.00	7.00	7.999	9.687	1.00	17.13	21.75	1.13	0.38	2.50	4.88	4.88
	8.00	8.999	10.687	1.00	17.13	21.75	1.50	0.38	2.88	4.88	4.88
	9.00	9.999	11.687	1.00	17.13	21.75	1.50	0.38	2.88	4.88	4.88
	10.00	10.999	12.687	1.00	17.13	21.75	1.50	0.38	2.88	4.88	4.88

BORE	TE	RE	Z	EB†	N	LB+	PISTON THICK	MAX ZB+	K
10.00	14.13	9.89	-	1.31	8	12.13	4.75	15.81	1.56
	14.13	9.89	-	1.31	8	12.13	4.75	15.91	1.56
	14.13	9.89	-	1.31	8	12.13	4.75	15.91	1.56
	14.13	9.89	-	1.31	8	12.13	4.75	16.19	1.56
12.00	16.79	11.75	-	1.56	8	14.50	5.62	18.06	1.34
	16.79	11.75	-	1.56	8	14.50	5.62	18.33	1.34
	16.79	11.75	-	1.56	8	14.50	5.62	18.71	1.34
14.00	18.43	12.90	-	1.81	8	15.63	5.88	19.69	1.56
	18.43	12.90	-	1.81	8	15.63	5.88	20.06	1.56
	18.43	12.90	-	1.81	8	15.63	5.88	20.06	1.56
	18.43	12.90	-	1.81	8	15.63	5.88	20.06	1.56

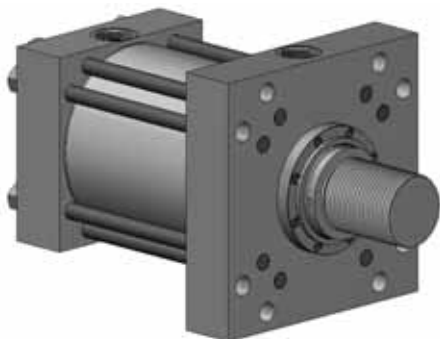
+ Plus stroke

† Use screws 1/16" smaller than Mounting Holes

All dimensions are in inches.

Mounting Style and Installation Dimensions

VG08 Head Square Mount 10.00" to 30.00" Bores



BORE	ROD DIA MM	B +.000/--.005	RM +.000/--.002	C	E	EX	F	V	WF	G	J
16.00	8.00	8.999	10.687	1.00	19.25	24.50	1.50	0.38	2.88	5.88	5.25
	9.00	9.999	11.687	1.00	19.25	24.50	1.50	0.38	2.88	5.88	5.25
	10.00	10.999	12.687	1.00	19.25	24.50	1.50	0.38	2.88	5.88	5.25
18.00	9.00	9.999	11.687	1.00	22.00	26.50	1.50	0.38	2.88	6.88	5.75
	10.00	10.999	12.687	1.00	22.00	26.50	1.50	0.38	2.88	6.88	5.75
20.00	10.00	10.999	12.687	1.00	24.00	29.00	1.50	0.38	2.88	7.88	6.50
24.00	11.00	12.000	16.000	1.00	31.00	36.00	2.69	0.81	4.50	10.00	10.00
30.00	14.00	15.000	19.000	1.00	37.50	47.00	3.13	0.38	4.50	12.38	12.38

BORE	TE	RE	Z	EB†	N	LB+	PISTON THICK	MAX ZB+	K
16.00	21.03	15.28	-	1.81	8	18.00	6.88	22.44	1.56
	21.03	15.28	-	1.81	8	18.00	6.88	22.44	1.56
	21.03	15.28	-	1.81	8	18.00	6.88	22.44	1.56
18.00	22.65	16.45	-	2.06	8	20.50	7.88	24.94	1.56
	22.65	16.45	-	2.06	8	20.50	7.88	24.94	1.56
20.00	24.87	18.07	-	2.06	8	23.25	8.88	27.69	1.56
24.00	31.25	22.13	-	2.56	8	29.50	9.50	37.00	3.00
30.00	40.75	23.75	40.75	3.06	12	36.25	11.50	44.25	3.50

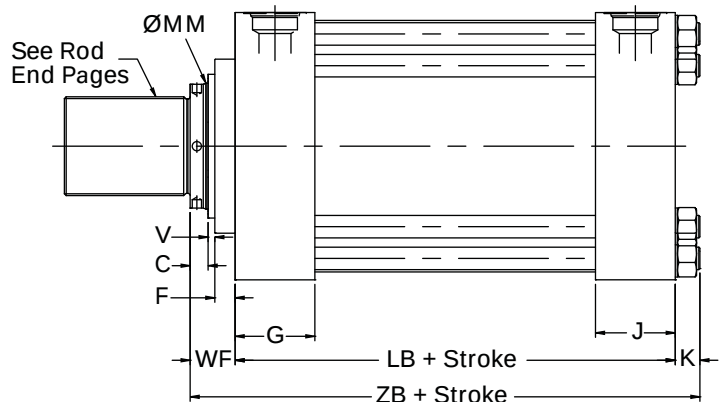
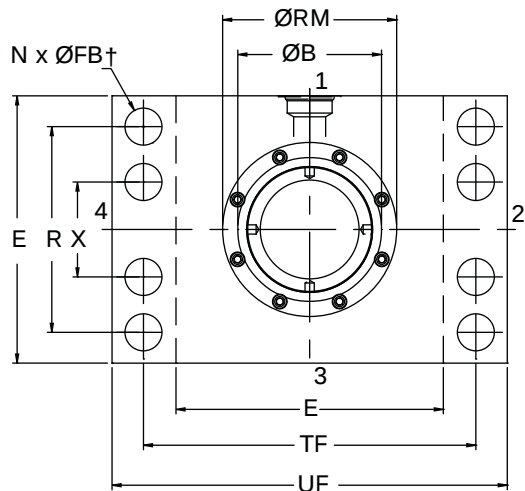
+ Plus stroke

† Use screws 1/16" smaller than Mounting Holes

All dimensions are in inches.

Mounting Style and Installation Dimensions

VG09 Head Rectangular Mount 10.00" to 20.00" Bores



BORE	ROD DIA MM	B +.000/-0.005	RM +.000/-0.002	C	E	F	V	WF	G	J	UF
10.00	4.50	5.249	7.000	1.00	12.62	0.88	0.25	2.13	3.69	3.69	19.00
	5.00	5.749	7.500	1.00	12.62	0.98	0.25	2.23	3.69	3.69	19.00
	5.50	6.249	8.000	1.00	12.62	0.98	0.25	2.23	3.69	3.69	19.00
	7.00	7.999	9.687	1.00	12.62	1.13	0.38	2.50	3.69	3.69	19.00
12.00	5.50	6.249	8.000	1.00	14.88	0.98	0.25	2.23	4.44	4.44	22.00
	7.00	7.999	9.687	1.00	14.88	1.13	0.38	2.50	4.44	4.44	22.00
	8.00	8.999	10.687	1.00	14.88	1.50	0.38	2.88	4.44	4.44	22.00
14.00	7.00	7.999	9.687	1.00	17.13	1.13	0.38	2.50	4.88	4.88	25.00
	8.00	8.999	10.687	1.00	17.13	1.50	0.38	2.88	4.88	4.88	25.00
	9.00	9.999	11.687	1.00	17.13	1.50	0.38	2.88	4.88	4.88	25.00
	10.00	10.999	12.687	1.00	17.13	1.50	0.38	2.88	4.88	4.88	25.00

BORE	TF	R	X	FB†	N	LB+	PISTON THICK	MAX ZB+	K
10.00	15.88	9.63	-	1.81	4	12.13	4.75	15.81	1.56
	15.88	9.63	-	1.81	4	12.13	4.75	15.91	1.56
	15.88	9.63	-	1.81	4	12.13	4.75	15.91	1.56
	15.88	9.63	-	1.81	4	12.13	4.75	16.19	1.56
12.00	18.50	11.45	-	2.06	4	14.50	5.62	18.06	1.34
	18.50	11.45	-	2.06	4	14.50	5.62	18.33	1.34
	18.50	11.45	-	2.06	4	14.50	5.62	18.71	1.34
14.00	21.00	13.26	-	2.31	4	15.63	5.88	19.69	1.56
	21.00	13.26	-	2.31	4	15.63	5.88	20.06	1.56
	21.00	13.26	-	2.31	4	15.63	5.88	20.06	1.56
	21.00	13.26	-	2.31	4	15.63	5.88	20.06	1.56

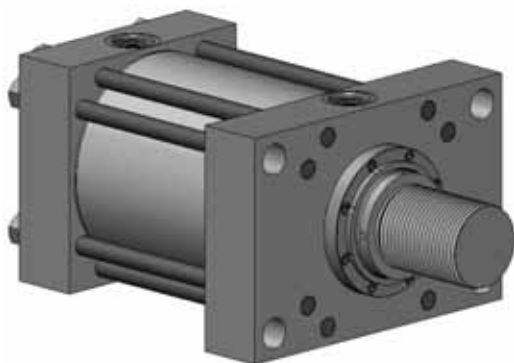
+ Plus stroke

† Use screws 1/16" smaller than Mounting Holes

All dimensions are in inches.

Mounting Style and Installation Dimensions

VG09 Head
Rectangular Mount
10.00" to 20.00" Bores



BORE	ROD DIA MM	B +.000/- .005	RM +.000/- .002	C	E	F	V	WF	G	J	UF
16.00	8.00	8.999	10.687	1.00	19.25	1.50	0.38	2.88	5.88	5.25	25.00
	9.00	9.999	11.687	1.00	19.25	1.50	0.38	2.88	5.88	5.25	25.00
	10.00	10.999	12.687	1.00	19.25	1.50	0.38	2.88	5.88	5.25	25.00
18.00	9.00	9.999	11.687	1.00	22.00	1.50	0.38	2.88	6.88	5.75	28.25
	10.00	10.999	12.687	1.00	22.00	1.50	0.38	2.88	6.88	5.75	28.25
20.00	10.00	10.999	12.687	1.00	24.00	1.50	0.38	2.88	7.88	6.50	31.00

BORE	TF	R	X	FB†	N	LB+	PISTON THICK	MAX ZB+	K
16.00	21.00	15.50	8.00	1.81	8	18.00	6.88	22.44	1.56
	21.00	15.50	8.00	1.81	8	18.00	6.88	22.44	1.56
	21.00	15.50	8.00	1.81	8	18.00	6.88	22.44	1.56
18.00	24.25	18.00	7.25	2.06	8	20.50	7.88	24.94	1.56
	24.25	18.00	7.25	2.06	8	20.50	7.88	24.94	1.56
20.00	26.50	20.00	8.00	2.06	8	23.25	8.88	27.69	1.56

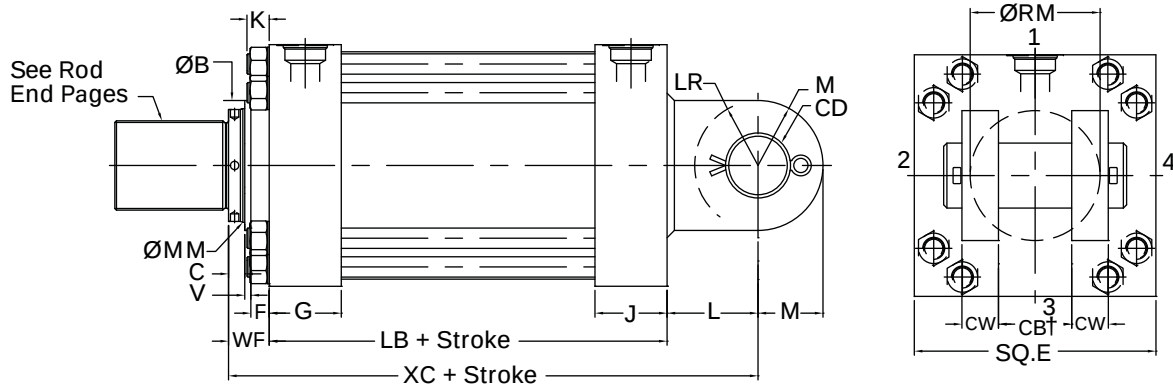
+ Plus stroke

† Use screws 1/16" smaller than Mounting Holes

All dimensions are in inches.

Mounting Style and Installation Dimensions

VG10 Clevis Mount 10.00" to 30.00" Bores



BORE	ROD DIA MM	B +0.000/-0.005	RM	C	E	F	V	WF	G	J	L
10.00	4.50	5.249	7.00	1.00	12.62	0.88	0.25	2.13	3.69	3.69	4.00
	5.00	5.749	7.50	1.00	12.62	0.98	0.25	2.23	3.69	3.69	4.00
	5.50	6.249	8.00	1.00	12.62	0.98	0.25	2.23	3.69	3.69	4.00
	7.00	7.999	9.69	1.00	12.62	1.13	0.38	2.50	3.69	3.69	4.00
12.00	5.50	6.249	8.00	1.00	14.88	0.98	0.25	2.23	4.44	4.44	4.50
	7.00	7.999	9.69	1.00	14.88	1.13	0.38	2.50	4.44	4.44	4.50
	8.00	8.999	10.69	1.00	14.88	1.50	0.38	2.88	4.44	4.44	4.50
14.00	7.00	7.999	9.69	1.00	17.13	1.13	0.38	2.50	4.88	4.88	5.75
	8.00	8.999	10.69	1.00	17.13	1.50	0.38	2.88	4.88	4.88	5.75
	9.00	9.999	11.69	1.00	17.13	1.50	0.38	2.88	4.88	4.88	5.75
	10.00	10.999	12.69	1.00	17.13	1.50	0.38	2.88	4.88	4.88	5.75

BORE	M	LR	CD	CW	CB†	LB+	XC+	PISTON THICK	K
10.00	3.50	3.63	3.50	2.00	4.00	12.13	18.25	4.75	1.56
	3.50	3.63	3.50	2.00	4.00	12.13	18.35	4.75	1.56
	3.50	3.63	3.50	2.00	4.00	12.13	18.35	4.75	1.56
	3.50	3.63	3.50	2.00	4.00	12.13	18.63	4.75	1.56
12.00	4.00	4.13	4.00	2.25	4.50	14.50	21.22	5.62	1.34
	4.00	4.13	4.00	2.25	4.50	14.50	21.50	5.62	1.34
	4.00	4.13	4.00	2.25	4.50	14.50	21.87	5.62	1.34
14.00	5.00	5.13	5.00	3.00	6.00	15.63	23.88	5.88	1.56
	5.00	5.13	5.00	3.00	6.00	15.63	24.25	5.88	1.56
	5.00	5.13	5.00	3.00	6.00	15.63	24.25	5.88	1.56
	5.00	5.13	5.00	3.00	6.00	15.63	24.25	5.88	1.56

+ Plus stroke

† Maximum width of mating part

All dimensions are in inches.

Mounting Style and Installation Dimensions

VG10 Clevis Mount 10.00" to 30.00" Bores



BORE	ROD DIA MM	B +.000/--.005	RM	C	E	F	V	WF	G	J	L
16.00	8.00	8.999	10.69	1.00	19.25	1.50	0.38	2.88	5.88	5.25	7.00
	9.00	9.999	11.69	1.00	19.25	1.50	0.38	2.88	5.88	5.25	7.00
	10.00	10.999	12.69	1.00	19.25	1.50	0.38	2.88	5.88	5.25	7.00
18.00	9.00	9.999	11.69	1.00	22.00	1.50	0.38	2.88	6.88	5.75	7.63
	10.00	10.999	12.69	1.00	22.00	1.50	0.38	2.88	6.88	5.75	7.63
20.00	10.00	10.999	12.69	1.00	24.00	1.50	0.38	2.88	7.88	6.50	8.75
24.00	11.00	12.000	16.00	1.00	31.00	2.69	0.81	4.50	10.00	10.00	17.00
30.00	14.00	15.000	19.00	1.00	37.50	3.13	0.38	4.50	12.38	12.38	21.00

BORE	M	LR	CD	CW	CB†	LB+	XC+	PISTON THICK	K
16.00	6.00	6.25	6.00	3.50	7.00	18.00	27.88	6.88	1.56
	6.00	6.25	6.00	3.50	7.00	18.00	27.88	6.88	1.56
	6.00	6.25	6.00	3.50	7.00	18.00	27.88	6.88	1.56
18.00	6.50	6.75	6.50	4.00	8.00	20.50	31.00	7.88	1.56
	6.50	6.75	6.50	4.00	8.00	20.50	31.00	7.88	1.56
20.00	7.50	6.19	7.50	4.50	9.00	23.25	34.88	8.88	1.56
24.00	9.00	-	9.00	5.00	11.00	29.50	51.00	9.50	3.00
30.00	11.00	-	11.00	6.00	12.00	36.25	61.75	11.50	3.50

+ Plus stroke

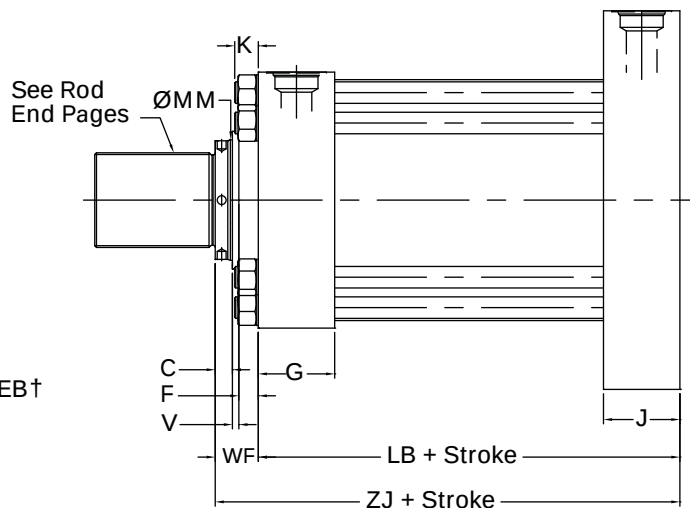
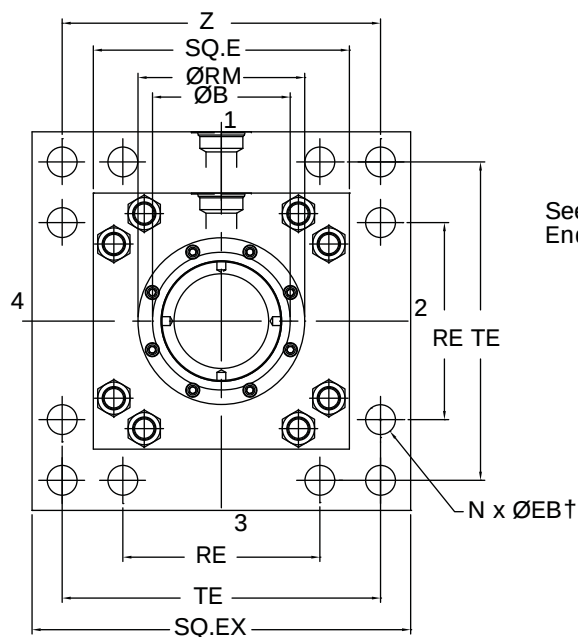
† Maximum width of mating part

All dimensions are in inches.

Mounting Style and Installation Dimensions

VG13 Cap Square Mount

10.00" to 30.00" Bores



BORE	ROD DIA MM	B +.000/- .005	RM	C	E	EX	F	V	WF	G	J
10.00	4.50	5.249	7.00	1.00	12.62	16.63	0.88	0.25	2.13	3.69	3.69
	5.00	5.749	7.50	1.00	12.62	16.63	0.98	0.25	2.23	3.69	3.69
	5.50	6.249	8.00	1.00	12.62	16.63	0.98	0.25	2.23	3.69	3.69
	7.00	7.999	9.69	1.00	12.62	16.63	1.13	0.38	2.50	3.69	3.69
12.00	5.50	6.249	8.00	1.00	14.88	19.75	0.98	0.25	2.23	4.44	4.44
	7.00	7.999	9.69	1.00	14.88	19.75	1.13	0.38	2.50	4.44	4.44
	8.00	8.999	10.69	1.00	14.88	19.75	1.50	0.38	2.88	4.44	4.44
14.00	7.00	7.999	9.69	1.00	17.13	21.75	1.13	0.38	2.50	4.88	4.88
	8.00	8.999	10.69	1.00	17.13	21.75	1.50	0.38	2.88	4.88	4.88
	9.00	9.999	11.69	1.00	17.13	21.75	1.50	0.38	2.88	4.88	4.88
	10.00	10.999	12.69	1.00	17.13	21.75	1.50	0.38	2.88	4.88	4.88

BORE	TE	RE	Z	EB†	N	LB+	PISTON THICK	ZJ+	K
10.00	14.13	9.89	-	1.31	8	12.13	4.75	14.25	1.56
	14.13	9.89	-	1.31	8	12.13	4.75	14.35	1.56
	14.13	9.89	-	1.31	8	12.13	4.75	14.35	1.56
	14.13	9.89	-	1.31	8	12.13	4.75	14.63	1.56
12.00	16.79	11.75	-	1.56	8	14.50	5.62	16.72	1.34
	16.79	11.75	-	1.56	8	14.50	5.62	17.00	1.34
	16.79	11.75	-	1.56	8	14.50	5.62	17.37	1.34
14.00	18.43	12.90	-	1.81	8	15.63	5.88	18.13	1.56
	18.43	12.90	-	1.81	8	15.63	5.88	18.50	1.56
	18.43	12.90	-	1.81	8	15.63	5.88	18.50	1.56
	18.43	12.90	-	1.81	8	15.63	5.88	18.50	1.56

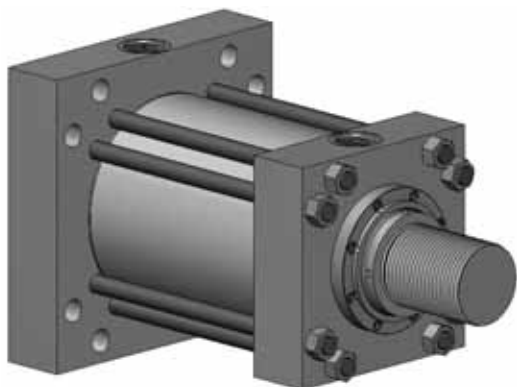
+ Plus stroke

† Use screws 1/16" smaller than Mounting Holes

All dimensions are in inches.

Mounting Style and Installation Dimensions

VG13 Cap Square Mount 10.00" to 30.00" Bores



BORE	ROD DIA MM	B +.000/--.005	RM	C	E	EX	F	V	WF	G	J
16.00	8.00	8.999	10.69	1.00	19.25	24.50	1.50	0.38	2.88	5.88	5.25
	9.00	9.999	11.69	1.00	19.25	24.50	1.50	0.38	2.88	5.88	5.25
	10.00	10.999	12.69	1.00	19.25	24.50	1.50	0.38	2.88	5.88	5.25
18.00	9.00	9.999	11.69	1.00	22.00	26.50	1.50	0.38	2.88	6.88	5.75
	10.00	10.999	12.69	1.00	22.00	26.50	1.50	0.38	2.88	6.88	5.75
20.00	10.00	10.999	12.69	1.00	24.00	29.00	1.50	0.38	2.88	7.88	6.50
24.00	11.00	12.000	16.00	1.00	31.00	36.00	2.69	0.81	4.50	10.00	10.00
30.00	14.00	15.000	19.00	1.00	37.50	47.00	3.13	0.38	4.50	12.38	12.38

BORE	TE	RE	Z	EB†	N	LB+	PISTON THICK	ZJ+	K
16.00	21.03	15.28	-	1.81	8	18.00	6.88	20.88	1.56
	21.03	15.28	-	1.81	8	18.00	6.88	20.88	1.56
	21.03	15.28	-	1.81	8	18.00	6.88	20.88	1.56
18.00	22.65	16.45	-	2.06	8	20.50	7.88	23.38	1.56
	22.65	16.45	-	2.06	8	20.50	7.88	23.38	1.56
20.00	24.87	18.07	-	2.06	8	23.25	8.88	26.13	1.56
24.00	31.25	22.13	-	2.56	8	29.50	9.50	34.00	3.00
30.00	40.75	23.75	40.75	3.06	12	36.25	11.50	40.75	3.50

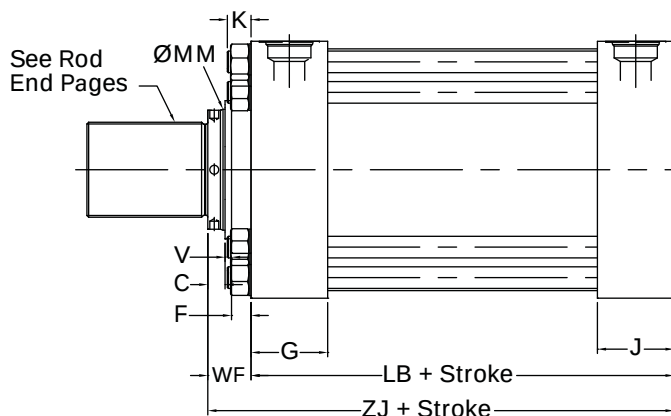
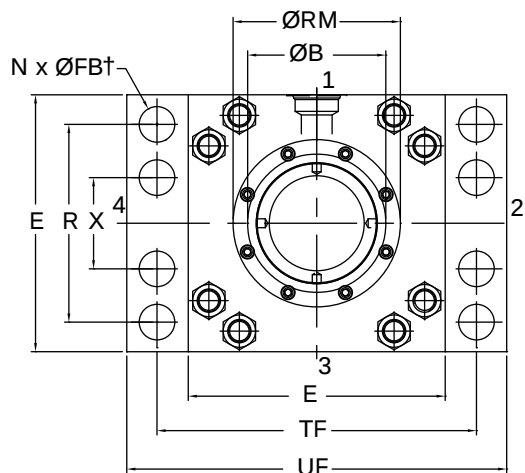
+ Plus stroke

† Use screws 1/16" smaller than Mounting Holes

All dimensions are in inches.

Mounting Style and Installation Dimensions

VG14 Cap Rectangular Mount 10.00" to 20.00" Bores



BORE	ROD DIA MM	B +0.000/-0.005	RM	C	E	F	V	WF	G	J	UF
10.00	4.50	5.249	7.00	1.00	12.62	0.88	0.25	2.13	3.69	3.69	19.00
	5.00	5.749	7.50	1.00	12.62	0.98	0.25	2.23	3.69	3.69	19.00
	5.50	6.249	8.00	1.00	12.62	0.98	0.25	2.23	3.69	3.69	19.00
	7.00	7.999	9.69	1.00	12.62	1.13	0.38	2.50	3.69	3.69	19.00
12.00	5.50	6.249	8.00	1.00	14.88	0.98	0.25	2.23	4.44	4.44	22.00
	7.00	7.999	9.69	1.00	14.88	1.13	0.38	2.50	4.44	4.44	22.00
	8.00	8.999	10.69	1.00	14.88	1.50	0.38	2.88	4.44	4.44	22.00
14.00	7.00	7.999	9.69	1.00	17.13	1.13	0.38	2.50	4.88	4.88	25.00
	8.00	8.999	10.69	1.00	17.13	1.50	0.38	2.88	4.88	4.88	25.00
	9.00	9.999	11.69	1.00	17.13	1.50	0.38	2.88	4.88	4.88	25.00
	10.00	10.999	12.69	1.00	17.13	1.50	0.38	2.88	4.88	4.88	25.00

BORE	TF	R	X	FB†	N	LB+	PISTON THICK	ZJ+	K
10.00	15.88	9.63	-	1.81	4	12.13	4.75	14.25	1.56
	15.88	9.63	-	1.81	4	12.13	4.75	14.35	1.56
	15.88	9.63	-	1.81	4	12.13	4.75	14.35	1.56
	15.88	9.63	-	1.81	4	12.13	4.75	14.63	1.56
12.00	18.50	11.45	-	2.06	4	14.50	5.62	16.72	1.34
	18.50	11.45	-	2.06	4	14.50	5.62	17.00	1.34
	18.50	11.45	-	2.06	4	14.50	5.62	17.38	1.34
14.00	21.00	13.26	-	2.31	4	15.63	5.88	18.13	1.56
	21.00	13.26	-	2.31	4	15.63	5.88	18.50	1.56
	21.00	13.26	-	2.31	4	15.63	5.88	18.50	1.56
	21.00	13.26	-	2.31	4	15.63	5.88	18.50	1.56

+ Plus stroke

† Use screws 1/16" smaller than Mounting Holes

All dimensions are in inches.

Mounting Style and Installation Dimensions

VG14 Cap Rectangular Mount 10.00" to 20.00" Bores



BORE	ROD DIA MM	B +.000/--.005	RM	C	E	F	V	WF	G	J	UF
16.00	8.00	8.999	10.69	1.00	19.25	1.50	0.38	2.88	5.88	5.25	25.00
	9.00	9.999	11.69	1.00	19.25	1.50	0.38	2.88	5.88	5.25	25.00
	10.00	10.999	12.69	1.00	19.25	1.50	0.38	2.88	5.88	5.25	25.00
18.00	9.00	9.999	11.69	1.00	22.00	1.50	0.38	2.88	6.88	5.75	28.25
	10.00	10.999	12.69	1.00	22.00	1.50	0.38	2.88	6.88	5.75	28.25
20.00	10.00	10.999	12.69	1.00	24.00	1.50	0.38	2.88	7.88	6.50	31.00

BORE	TF	R	X	FB†	N	LB+	PISTON THICK	ZJ+	K
16.00	21.00	15.50	8.00	1.81	8	18.00	6.88	20.88	1.56
	21.00	15.50	8.00	1.81	8	18.00	6.88	20.88	1.56
	21.00	15.50	8.00	1.81	8	18.00	6.88	20.88	1.56
18.00	21.00	18.00	7.25	2.06	8	20.50	7.88	23.38	1.56
	21.00	18.00	7.25	2.06	8	20.50	7.88	23.38	1.56
20.00	26.50	20.00	8.00	2.06	8	23.25	8.88	26.13	1.56

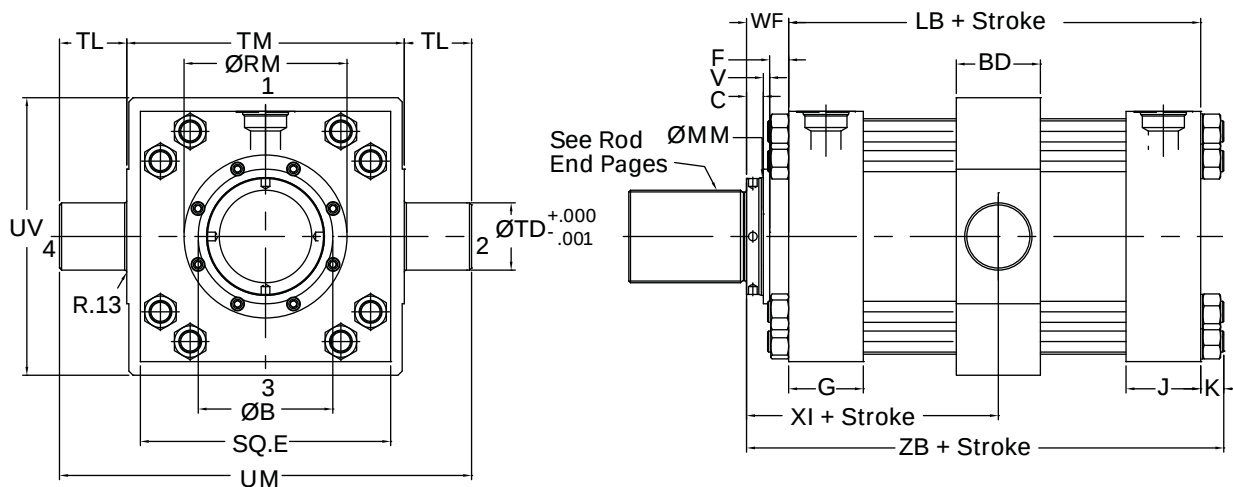
+ Plus stroke

† Use screws 1/16" smaller than Mounting Holes

All dimensions are in inches.

Mounting Style and Installation Dimensions

VG15 Intermediate Trunnion Mount 10.00" to 20.00" Bores



BORE	ROD DIA MM	B +.000/- .005	RM	C	E	F	V	WF	G	J	UM	TL
10.00	4.50	5.249	7.00	1.00	12.62	0.88	0.25	2.13	3.69	3.69	21.00	3.50
	5.00	5.749	7.50	1.00	12.62	0.98	0.25	2.23	3.69	3.69	21.00	3.50
	5.50	6.249	8.00	1.00	12.62	0.98	0.25	2.23	3.69	3.69	21.00	3.50
	7.00	7.999	9.69	1.00	12.62	1.13	0.38	2.50	3.69	3.69	21.00	3.50
12.00	5.50	6.249	8.00	1.00	14.88	0.98	0.25	2.23	4.44	4.44	24.50	4.00
	7.00	7.999	9.69	1.00	14.88	1.13	0.38	2.50	4.44	4.44	24.50	4.00
	8.00	8.999	10.69	1.00	14.88	1.50	0.38	2.88	4.44	4.44	24.50	4.00
14.00	7.00	7.999	9.69	1.00	17.13	1.13	0.38	2.50	4.88	4.88	28.50	4.50
	8.00	8.999	10.69	1.00	17.13	1.50	0.38	2.88	4.88	4.88	28.50	4.50
	9.00	9.999	11.69	1.00	17.13	1.50	0.38	2.88	4.88	4.88	28.50	4.50
	10.00	10.999	12.69	1.00	17.13	1.50	0.38	2.88	4.88	4.88	28.50	4.50

BORE	TM	TD	UV	BD	XI MIN	XI STD¥	XI MAX+	LB+	PISTON THICK	ZB+	K
10.00	14.00	3.50	14.00	4.00	7.88	8.19	8.50	12.13	4.75	15.81	1.56
	14.00	3.50	14.00	4.00	7.98	8.29	8.60	12.13	4.75	15.91	1.56
	14.00	3.50	14.00	4.00	7.98	8.29	8.60	12.13	4.75	15.91	1.56
	14.00	3.50	14.00	4.00	8.25	8.56	8.88	12.13	4.75	16.19	1.56
12.00	16.50	4.00	16.50	5.00	9.23	9.47	9.72	14.50	5.62	18.06	1.34
	16.50	4.00	16.50	5.00	9.50	9.75	10.00	14.50	5.62	18.33	1.34
	16.50	4.00	16.50	5.00	9.88	10.12	10.37	14.50	5.62	18.71	1.34
14.00	19.50	4.50	19.50	5.50	10.19	10.31	10.44	15.63	5.88	19.69	1.56
	19.50	4.50	19.50	5.50	10.56	10.69	10.81	15.63	5.88	20.06	1.56
	19.50	4.50	19.50	5.50	10.56	10.69	10.81	15.63	5.88	20.06	1.56
	19.50	4.50	19.50	5.50	10.56	10.69	10.81	15.63	5.88	20.06	1.56

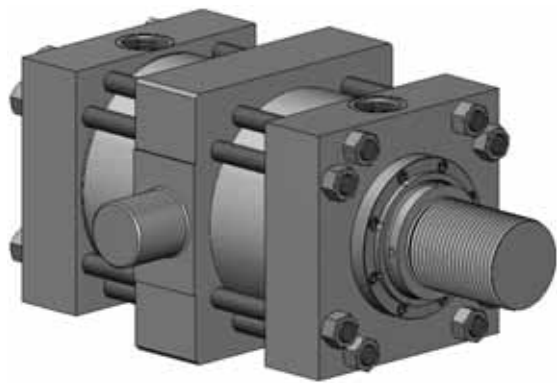
¥ Standard XI dimension is stroke/2 + XI (std) unless otherwise specified.

+ Plus stroke

All dimensions are in inches.

Mounting Style and Installation Dimensions

VG15 Intermediate Trunnion Mount 10.00" to 20.00" Bores



BORE	MAXIMUM WORKING PRESSURE (PSI)
10.00	1600
12.00	1500
14.00	1400
16.00	3000
18.00	3000
20.00	3000

BORE	ROD DIA MM	B +.000/- .005	RM	C	E	F	V	WF	G	J	UM	TL
16.00	8.00	8.999	10.69	1.00	19.25	1.50	0.38	2.88	5.88	5.25	45.25	8.00
	9.00	9.999	11.69	1.00	19.25	1.50	0.38	2.88	5.88	5.25	45.25	8.00
	10.00	10.999	12.69	1.00	19.25	1.50	0.38	2.88	5.88	5.25	45.25	8.00
18.00	9.00	9.999	11.69	1.00	22.00	1.50	0.38	2.88	6.88	5.75	51.25	9.00
	10.00	10.999	12.69	1.00	22.00	1.50	0.38	2.88	6.88	5.75	51.25	9.00
20.00	10.00	10.999	12.69	1.00	24.00	1.50	0.38	2.88	7.88	6.50	57.50	10.00

BORE	TM	TD	UV	BD	XI MIN	XI STD¥	XI MAX+	LB+	PISTON THICK	ZB+	K
16.00	29.25	8.00	26.50	8.75	13.19	11.88	11.19	18.00	6.88	22.44	1.56
	29.25	8.00	26.50	8.75	13.19	11.88	11.19	18.00	6.88	22.44	1.56
	29.25	8.00	26.50	8.75	13.19	11.88	11.19	18.00	6.88	22.44	1.56
18.00	33.25	9.00	30.00	9.75	14.69	13.13	12.69	20.50	7.88	24.94	1.56
	33.25	9.00	30.00	9.75	14.69	13.13	12.69	20.50	7.88	24.94	1.56
20.00	37.50	10.00	33.50	10.75	16.19	14.50	14.19	23.25	8.88	27.69	1.56

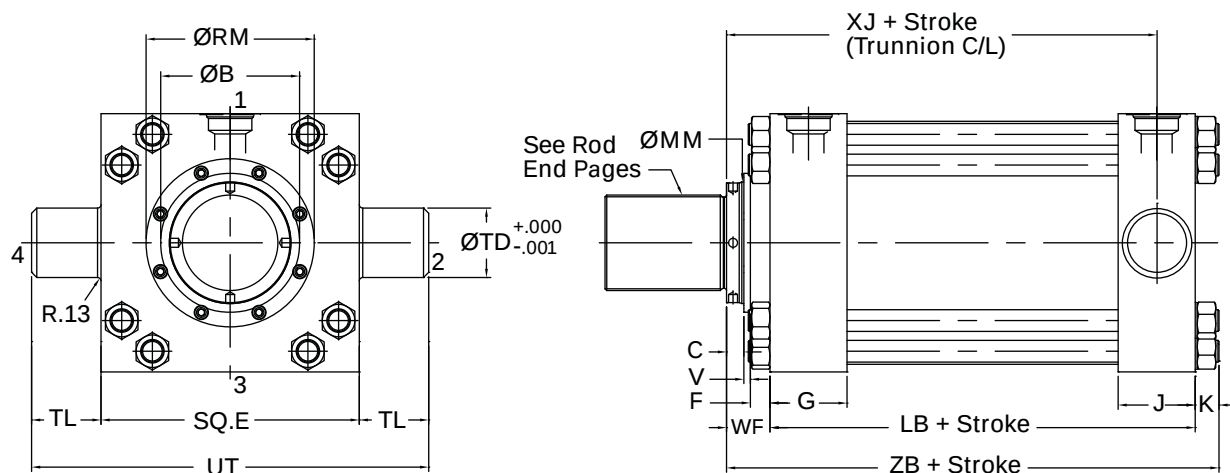
¥ Standard XI dimension is stroke/2 + XI (std) unless otherwise specified.

+ Plus stroke

All dimensions are in inches.

Mounting Style and Installation Dimensions

VG16 Cap Trunnion Mount 10.00" to 30.00" Bores



BORE	ROD DIA MM	B +.000/-0.005	RM	C	E	F	V	WF	G	J	UT
10.00	4.50	5.249	7.00	1.00	12.62	0.88	0.25	2.13	3.69	3.69	19.63
	5.00	5.749	7.50	1.00	12.62	0.98	0.25	2.23	3.69	3.69	19.63
	5.50	6.249	8.00	1.00	12.62	0.98	0.25	2.23	3.69	3.69	19.63
	7.00	7.999	9.69	1.00	12.62	1.13	0.38	2.50	3.69	3.69	19.63
12.00	5.50	6.249	8.00	1.00	14.88	0.98	0.25	2.23	4.44	4.44	22.88
	7.00	7.999	9.69	1.00	14.88	1.13	0.38	2.50	4.44	4.44	22.88
	8.00	8.999	10.69	1.00	14.88	1.50	0.38	2.88	4.44	4.44	22.88
14.00	7.00	7.999	9.69	1.00	17.13	1.13	0.38	2.50	4.88	4.88	26.13
	8.00	8.999	10.69	1.00	17.13	1.50	0.38	2.88	4.88	4.88	26.13
	9.00	9.999	11.69	1.00	17.13	1.50	0.38	2.88	4.88	4.88	26.13
	10.00	10.999	12.69	1.00	17.13	1.50	0.38	2.88	4.88	4.88	26.13

BORE	TL	TD	XJ+	LB+	PISTON THICK	MAX ZB+	K
10.00	3.50	3.50	12.41	12.13	4.75	15.81	1.56
	3.50	3.50	12.51	12.13	4.75	15.91	1.56
	3.50	3.50	12.51	12.13	4.75	15.91	1.56
	3.50	3.50	12.78	12.13	4.75	16.19	1.56
12.00	4.00	4.00	14.50	14.50	5.62	18.06	1.34
	4.00	4.00	14.78	14.50	5.62	18.33	1.34
	4.00	4.00	15.15	14.50	5.62	18.71	1.34
14.00	4.50	4.50	15.69	15.63	5.88	19.69	1.56
	4.50	4.50	16.06	15.63	5.88	20.06	1.56
	4.50	4.50	16.06	15.63	5.88	20.06	1.56
	4.50	4.50	16.06	15.63	5.88	20.06	1.56

+ Plus stroke
All dimensions are in inches.

Mounting Style and Installation Dimensions

VG16 Cap Trunnion Mount 10.00" to 30.00" Bores



BORE	MAXIMUM WORKING PRESSURE (PSI)
10.00	1800
12.00	1900
14.00	1400
16.00	1350
18.00	1600
20.00	2000

BORE	ROD DIA MM	B +.000/--.005	RM	C	E	F	V	WF	G	J	UT
16.00	8.00	8.999	10.69	1.00	19.25	1.50	0.38	2.88	5.88	5.25	29.25
	9.00	9.999	11.69	1.00	19.25	1.50	0.38	2.88	5.88	5.25	29.25
	10.00	10.999	12.69	1.00	19.25	1.50	0.38	2.88	5.88	5.25	29.25
18.00	9.00	9.999	11.69	1.00	22.00	1.50	0.38	2.88	6.88	5.75	33.50
	10.00	10.999	12.69	1.00	22.00	1.50	0.38	2.88	6.88	5.75	33.50
20.00	10.00	10.999	12.69	1.00	24.00	1.50	0.38	2.88	7.88	6.50	36.12
24.00	11.00	12.000	16.00	1.00	31.00	2.69	0.81	4.50	10.00	10.00	46.00
30.00	14.00	15.000	19.00	1.00	37.50	3.13	0.38	4.50	12.38	12.38	56.50

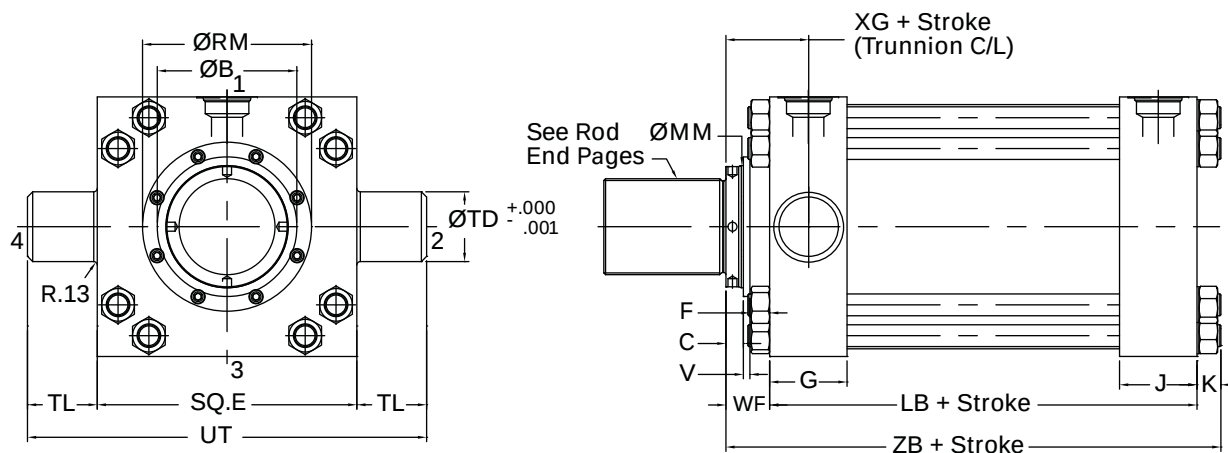
BORE	TL	TD	XJ+	LB+	PISTON THICK	MAX ZB+	K
16.00	5.00	5.00	18.25	18.00	6.88	22.44	1.56
	5.00	5.00	18.25	18.00	6.88	22.44	1.56
	5.00	5.00	18.25	18.00	6.88	22.44	1.56
18.00	5.75	5.75	20.50	20.50	7.88	24.94	1.56
	5.75	5.75	20.50	20.50	7.88	24.94	1.56
20.00	6.06	6.25	22.88	23.25	8.88	27.69	1.56
24.00	7.50	7.50	29.00	29.50	9.50	37.00	3.00
30.00	9.50	9.50	34.56	36.25	11.50	44.25	3.50

+ Plus stroke

All dimensions are in inches.

Mounting Style and Installation Dimensions

VG17 Head Trunnion Mount 10.00" to 30.00" Bores



BORE	ROD DIA MM	B +0.000/-0.005	RM	C	E	F	V	WF	G	J
10.00	4.50	5.249	7.00	1.00	12.62	0.88	0.25	2.13	3.69	3.69
	5.00	5.749	7.50	1.00	12.62	0.98	0.25	2.23	3.69	3.69
	5.50	6.249	8.00	1.00	12.62	0.98	0.25	2.23	3.69	3.69
	7.00	7.999	9.69	1.00	12.62	1.13	0.38	2.50	3.69	3.69
12.00	5.50	6.249	8.00	1.00	14.88	0.98	0.25	2.23	4.44	4.44
	7.00	7.999	9.69	1.00	14.88	1.13	0.38	2.50	4.44	4.44
	8.00	8.999	10.69	1.00	14.88	1.50	0.38	2.88	4.44	4.44
14.00	7.00	7.999	9.69	1.00	17.13	1.13	0.38	2.50	4.88	4.88
	8.00	8.999	10.69	1.00	17.13	1.50	0.38	2.88	4.88	4.88
	9.00	9.999	11.69	1.00	17.13	1.50	0.38	2.88	4.88	4.88
	10.00	10.999	12.69	1.00	17.13	1.50	0.38	2.88	4.88	4.88

BORE	UT	TL	TD	XG+	LB+	PISTON THICK	MAX ZB+	K
10.00	19.63	3.50	3.50	3.97	12.13	4.75	15.81	1.56
	19.63	3.50	3.50	4.07	12.13	4.75	15.91	1.56
	19.63	3.50	3.50	4.07	12.13	4.75	15.91	1.56
	19.63	3.50	3.50	4.34	12.13	4.75	16.19	1.56
12.00	22.88	4.00	4.00	4.44	14.50	5.62	18.06	1.34
	22.88	4.00	4.00	4.72	14.50	5.62	18.33	1.34
	22.88	4.00	4.00	5.09	14.50	5.62	18.71	1.34
14.00	26.13	4.50	4.50	4.94	15.63	5.88	19.69	1.56
	26.13	4.50	4.50	5.31	15.63	5.88	20.06	1.56
	26.13	4.50	4.50	5.31	15.63	5.88	20.06	1.56
	26.13	4.50	4.50	5.31	15.63	5.88	20.06	1.56

+ Plus stroke
All dimensions are in inches.

Mounting Style and Installation Dimensions

VG17 Head Trunnion Mount 10.00" to 30.00" Bores



BORE	MAXIMUM WORKING PRESSURE (PSI)
10.00	1800
12.00	1900
14.00	1400
16.00	1350
18.00	1600
20.00	2000

BORE	ROD DIA MM	B +.000/--.005	RM	C	E	F	V	WF	G	J
16.00	8.00	8.999	10.69	1.00	19.25	1.50	0.38	2.88	5.88	5.25
	9.00	9.999	11.69	1.00	19.25	1.50	0.38	2.88	5.88	5.25
	10.00	10.999	12.69	1.00	19.25	1.50	0.38	2.88	5.88	5.25
18.00	9.00	9.999	11.69	1.00	22.00	1.50	0.38	2.88	6.88	5.75
	10.00	10.999	12.69	1.00	22.00	1.50	0.38	2.88	6.88	5.75
20.00	10.00	10.999	12.69	1.00	24.00	1.50	0.38	2.88	7.88	6.50
24.00	11.00	12.000	16.000	1.00	31.00	2.69	0.81	4.50	10.00	10.00
30.00	14.00	15.000	19.000	1.00	37.50	3.13	0.38	4.50	12.38	12.38

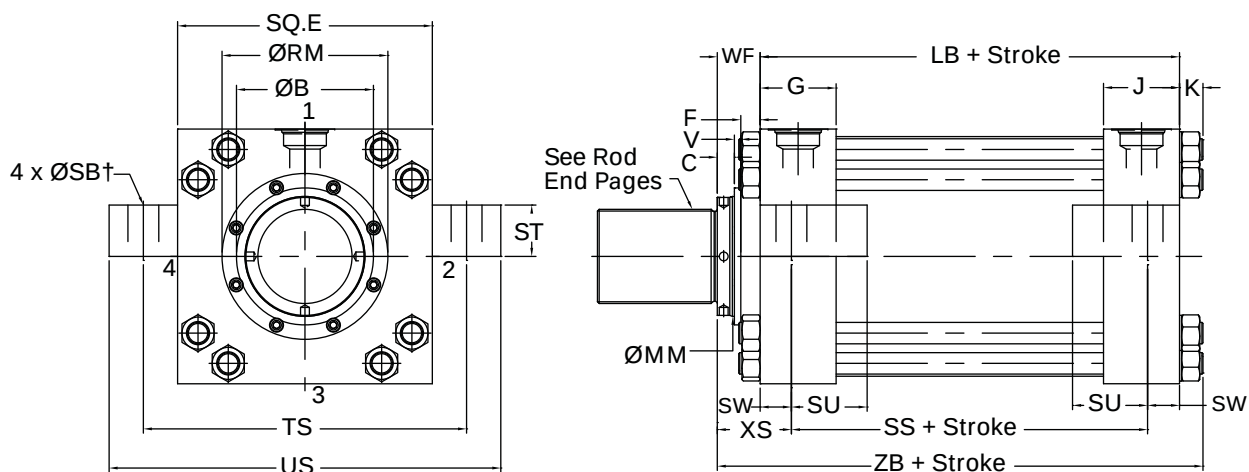
BORE	UT	TL	TD	XG+	LB+	PISTON THICK	MAX ZB+	K
16.00	29.25	5.00	5.00	5.81	18.00	6.88	22.44	1.56
	29.25	5.00	5.00	5.81	18.00	6.88	22.44	1.56
	29.25	5.00	5.00	5.81	18.00	6.88	22.44	1.56
18.00	33.50	5.75	5.75	6.31	20.50	7.88	24.94	1.56
	33.50	5.75	5.75	6.31	20.50	7.88	24.94	1.56
20.00	36.12	6.06	6.25	6.81	23.25	8.88	27.69	1.56
24.00	46.00	7.50	7.50	9.50	29.50	9.5	37.00	3.00
30.00	56.50	9.50	9.50	10.75	36.25	11.5	44.25	3.50

+ Plus stroke

All dimensions are in inches.

Mounting Style and Installation Dimensions

VG19 Center Line Lug Mount 10.00" to 14.00" Bores



BORE	ROD DIA MM	B +.000/--.005	RM	C	E	F	V	WF	G	J
10.00	4.50	5.249	7.00	1.00	12.62	0.88	0.25	2.13	3.69	3.69
	5.00	5.749	7.50	1.00	12.62	0.98	0.25	2.23	3.69	3.69
	5.50	6.249	8.00	1.00	12.62	0.98	0.25	2.23	3.69	3.69
	7.00	7.999	9.69	1.00	12.62	1.13	0.38	2.50	3.69	3.69
12.00	5.50	6.249	8.00	1.00	14.88	0.98	0.25	2.23	4.44	4.44
	7.00	7.999	9.69	1.00	14.88	1.13	0.38	2.50	4.44	4.44
	8.00	8.999	10.69	1.00	14.88	1.50	0.38	2.88	4.44	4.44
14.00	7.00	7.999	9.69	1.00	17.13	1.13	0.38	2.50	4.88	4.88
	8.00	8.999	10.69	1.00	17.13	1.50	0.38	2.88	4.88	4.88
	9.00	9.999	11.69	1.00	17.13	1.50	0.38	2.88	4.88	4.88
	10.00	10.999	12.69	1.00	17.13	1.50	0.38	2.88	4.88	4.88

Mounting Style and Installation Dimensions

VG19 Center Line Lug Mount 10.00" to 14.00" Bores



BORE	SW	XS	SS+	SU	TS	US	ST	SB†	LB+	PISTON THICK	MAX ZB+	K
10.00	1.63	3.75	8.88	3.50	15.88	19.13	2.25	1.56	12.13	4.75	15.81	1.56
	1.63	3.85	8.88	3.50	15.88	19.13	2.25	1.56	12.13	4.75	15.91	1.56
	1.63	3.85	8.88	3.50	15.88	19.13	2.25	1.56	12.13	4.75	15.91	1.56
	1.63	4.13	8.88	3.50	15.88	19.13	2.25	1.56	12.13	4.75	16.19	1.56
12.00	2.00	4.23	10.50	4.25	18.88	22.88	3.00	1.56	14.50	5.62	18.06	1.34
	2.00	4.50	10.50	4.25	18.88	22.88	3.00	1.56	14.50	5.62	18.33	1.34
	2.00	4.88	10.50	4.25	18.88	22.88	3.00	1.56	14.50	5.62	18.71	1.34
14.00	2.25	4.75	11.13	4.75	21.63	26.13	4.00	2.31	15.63	5.88	19.69	1.56
	2.25	5.13	11.13	4.75	21.63	26.13	4.00	2.31	15.63	5.88	20.06	1.56
	2.25	5.13	11.13	4.75	21.63	26.13	4.00	2.31	15.63	5.88	20.06	1.56
	2.25	5.13	11.13	4.75	21.63	26.13	4.00	2.31	15.63	5.88	20.06	1.56

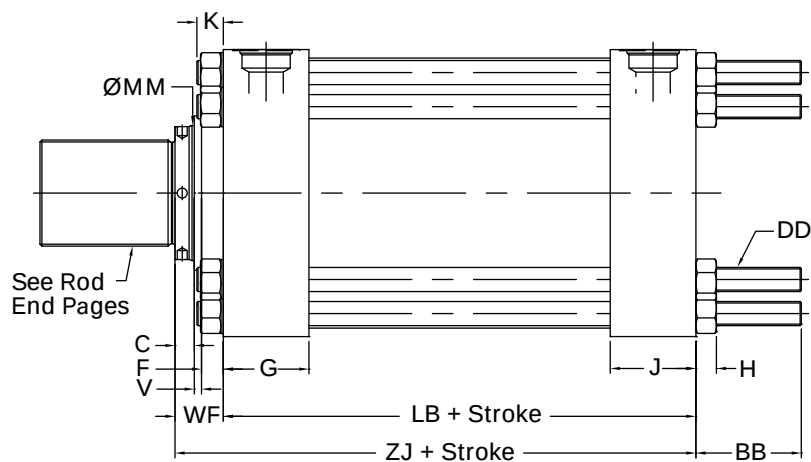
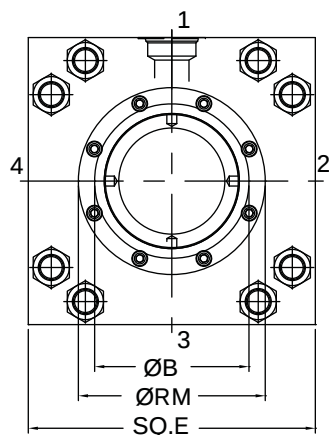
+ Plus stroke

† Use screws 1/16" smaller than Mounting Holes

All dimensions are in inches.

Mounting Style and Installation Dimensions

VG21 Cap End Extended Tie Rod Mount 10.00" to 14.00" Bores



BORE	ROD DIA MM	B +.000/--.005	RM	C	E	F	V	WF	G	J
10.00	4.50	5.249	7.00	1.00	12.62	0.88	0.25	2.13	3.69	3.69
	5.00	5.749	7.50	1.00	12.62	0.98	0.25	2.23	3.69	3.69
	5.50	6.249	8.00	1.00	12.62	0.98	0.25	2.23	3.69	3.69
	7.00	7.999	9.69	1.00	12.62	1.13	0.38	2.50	3.69	3.69
12.00	5.50	6.249	8.00	1.00	14.88	0.98	0.25	2.23	4.44	4.44
	7.00	7.999	9.69	1.00	14.88	1.13	0.38	2.50	4.44	4.44
	8.00	8.999	10.69	1.00	14.88	1.50	0.38	2.88	4.44	4.44
14.00	7.00	7.999	9.69	1.00	17.13	1.13	0.38	2.50	4.88	4.88
	8.00	8.999	10.69	1.00	17.13	1.50	0.38	2.88	4.88	4.88
	9.00	9.999	11.69	1.00	17.13	1.50	0.38	2.88	4.88	4.88
	10.00	10.999	12.69	1.00	17.13	1.50	0.38	2.88	4.88	4.88

Note: For Tie Rod coordinates and torque values, refer to page 46.

Mounting Style and Installation Dimensions

VG21 Cap End Extended
Tie Rod Mount
10.00" to 14.00" Bores



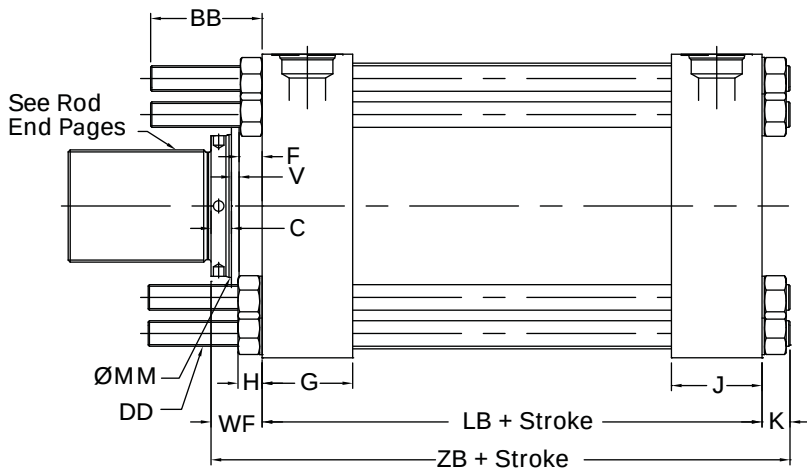
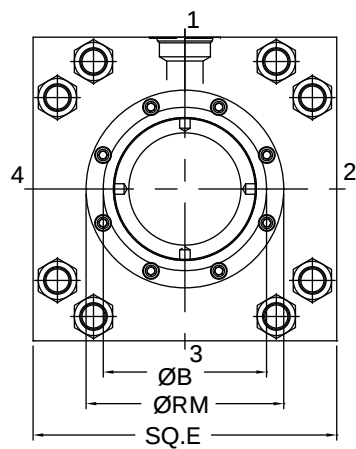
BORE	DD (UNTHDS.)	BB	H	LB+	PISTON THICK	ZJ+	K
10.00	1.500-12	5.19	1.32	12.13	4.75	14.25	1.56
	1.500-12	5.19	1.32	12.13	4.75	14.35	1.56
	1.500-12	5.19	1.32	12.13	4.75	14.35	1.56
	1.500-12	5.19	1.32	12.13	4.75	14.63	1.56
12.00	1.250-12	5.69	1.09	14.50	5.62	16.72	1.34
	1.250-12	5.69	1.09	14.50	5.62	17.00	1.34
	1.250-12	5.69	1.09	14.50	5.62	17.37	1.34
14.00	1.500-12	6.38	1.32	15.63	5.88	18.13	1.56
	1.500-12	6.38	1.32	15.63	5.88	18.50	1.56
	1.500-12	6.38	1.32	15.63	5.88	18.50	1.56
	1.500-12	6.38	1.32	15.63	5.88	18.50	1.56

+ Plus stroke

All dimensions are in inches.

Mounting Style and Installation Dimensions

VG22 Head End Extended Tie Rod Mount 10.00" to 14.00" Bores

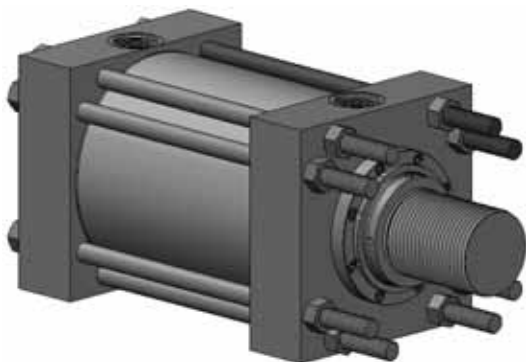


BORE	ROD DIA MM	B +.000/--.005	RM	C	E	F	V	WF	G	J
10.00	4.50	5.249	7.00	1.00	12.62	0.88	0.25	2.13	3.69	3.69
	5.00	5.749	7.50	1.00	12.62	0.98	0.25	2.23	3.69	3.69
	5.50	6.249	8.00	1.00	12.62	0.98	0.25	2.23	3.69	3.69
	7.00	7.999	9.69	1.00	12.62	1.13	0.38	2.50	3.69	3.69
12.00	5.50	6.249	8.00	1.00	14.88	0.98	0.25	2.23	4.44	4.44
	7.00	7.999	9.69	1.00	14.88	1.13	0.38	2.50	4.44	4.44
	8.00	8.999	10.69	1.00	14.88	1.50	0.38	2.88	4.44	4.44
14.00	7.00	7.999	9.69	1.00	17.13	1.13	0.38	2.50	4.88	4.88
	8.00	8.999	10.69	1.00	17.13	1.50	0.38	2.88	4.88	4.88
	9.00	9.999	11.69	1.00	17.13	1.50	0.38	2.88	4.88	4.88
	10.00	10.999	12.69	1.00	17.13	1.50	0.38	2.88	4.88	4.88

Note: For Tie Rod coordinates and torque values, refer to page 46.

Mounting Style and Installation Dimensions

VG22 Head End
Extended Tie Rod Mount
10.00" to 14.00" Bores



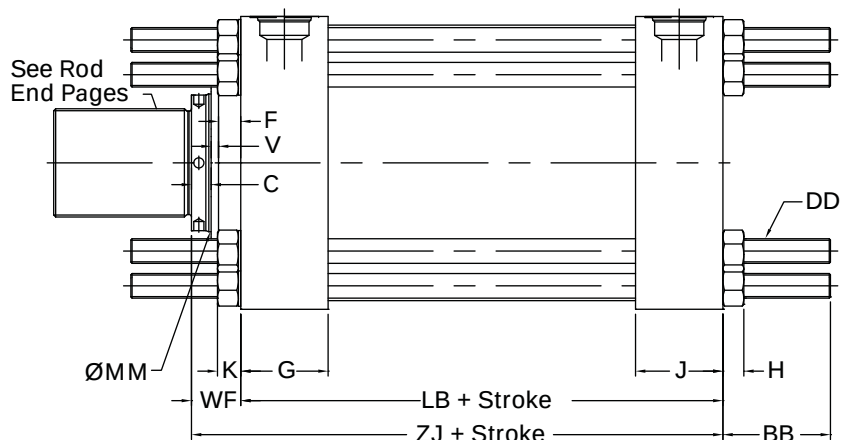
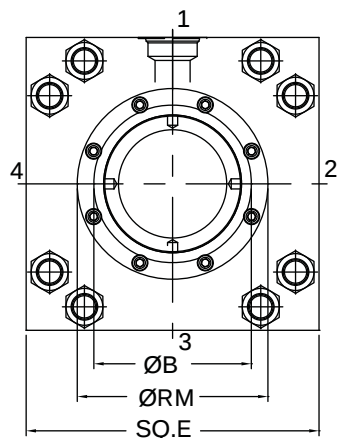
BORE	DD (UNTHDS.)	BB	H	LB+	PISTON THICK	ZB+	K
10.00	1.500-12	5.19	1.32	12.13	4.75	15.81	1.56
	1.500-12	5.19	1.32	12.13	4.75	15.94	1.56
	1.500-12	5.19	1.32	12.13	4.75	15.91	1.56
	1.500-12	5.19	1.32	12.13	4.75	16.19	1.56
12.00	1.250-12	5.69	1.09	14.50	5.62	18.06	1.34
	1.250-12	5.69	1.09	14.50	5.62	18.33	1.34
	1.250-12	5.69	1.09	14.50	5.62	18.71	1.34
14.00	1.500-12	6.38	1.32	15.63	5.88	19.69	1.56
	1.500-12	6.38	1.32	15.63	5.88	20.06	1.56
	1.500-12	6.38	1.32	15.63	5.88	20.06	1.56
	1.500-12	6.38	1.32	15.63	5.88	20.06	1.56

+ Plus stroke

All dimensions are in inches.

Mounting Style and Installation Dimensions

VG23 Both Ends Extended Tie Rod Mount

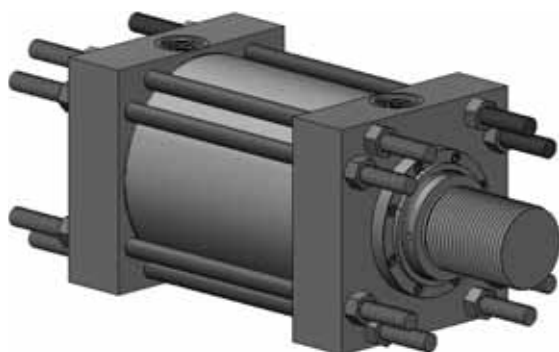


BORE	ROD DIA MM	B +0.000/-0.005	RM	C	E	F	V	WF	G	J
10.00	4.50	5.249	7.00	1.00	12.62	0.88	0.25	2.13	3.69	3.69
	5.00	5.749	7.50	1.00	12.62	0.98	0.25	2.23	3.69	3.69
	5.50	6.249	8.00	1.00	12.62	0.98	0.25	2.23	3.69	3.69
	7.00	7.999	9.69	1.00	12.62	1.13	0.38	2.50	3.69	3.69
12.00	5.50	6.249	8.00	1.00	14.88	0.98	0.25	2.23	4.44	4.44
	7.00	7.999	9.69	1.00	14.88	1.13	0.38	2.50	4.44	4.44
	8.00	8.999	10.69	1.00	14.88	1.50	0.38	2.88	4.44	4.44
14.00	7.00	7.999	9.69	1.00	17.13	1.13	0.38	2.50	4.88	4.88
	8.00	8.999	10.69	1.00	17.13	1.50	0.38	2.88	4.88	4.88
	9.00	9.999	11.69	1.00	17.13	1.50	0.38	2.88	4.88	4.88
	10.00	10.999	12.69	1.00	17.13	1.50	0.38	2.88	4.88	4.88

Note: For Tie Rod coordinates and torque values, refer to page 46.

Mounting Style and Installation Dimensions

VG23 Both Ends Extended Tie Rod Mount



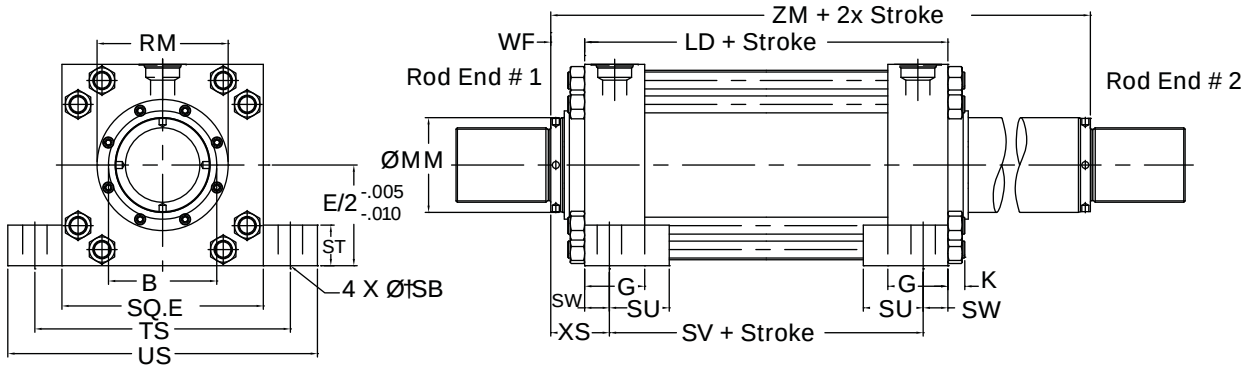
BORE	DD (UNTHDS.)	BB	H	LB+	PISTON THICK	ZJ+	K
10.00	1.500-12	5.19	1.32	12.13	4.75	14.25	1.56
	1.500-12	5.19	1.32	12.13	4.75	14.35	1.56
	1.500-12	5.19	1.32	12.13	4.75	14.35	1.56
	1.500-12	5.19	1.32	12.13	4.75	14.63	1.56
12.00	1.250-12	5.69	1.09	14.50	5.62	16.72	1.34
	1.250-12	5.69	1.09	14.50	5.62	17.00	1.34
	1.250-12	5.69	1.09	14.50	5.62	17.37	1.34
14.00	1.500-12	6.38	1.32	15.63	5.88	18.13	1.56
	1.500-12	6.38	1.32	15.63	5.88	18.50	1.56
	1.500-12	6.38	1.32	15.63	5.88	18.50	1.56
	1.500-12	6.38	1.32	15.63	5.88	18.50	1.56

+ Plus stroke

All dimensions are in inches.

Mounting Style and Installation Dimensions

Double Rod End



MOUNT	VG MOUNT CODE
Side Lug	25
Head Square	32
Head Rectangular	33
Intermediate Trunnion	34
Head Trunnion	35
Center Line Lug Mount	37
Head End Extended Tie Rod	39
Both End Extended Tie Rod	40
No Mount	41

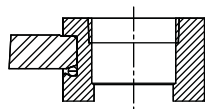
BORE	MM	LD	ZM
10.00	4.50	12.13	16.38
10.00	5.00	12.13	16.38
10.00	5.50	12.13	16.38
10.00	7.00	12.13	17.13
12.00	5.50	14.50	18.95
12.00	7.00	14.50	19.50
12.00	8.00	14.50	20.25
14.00	7.00	15.63	20.63
14.00	8.00	15.63	21.38
14.00	9.00	15.63	21.38
14.00	10.00	15.63	21.38
16.00	8.00	18.63	24.38
16.00	9.00	18.63	24.38
16.00	10.00	18.63	24.38
18.00	9.00	21.63	27.38
18.00	10.00	21.63	27.38
20.00	10.00	24.63	30.38

- NOTES:**
- 1) Dimensions shown are supplement to Single Rod End Cylinders.
 - 2) If only one end cushioning is required, clearly indicate which is required.
 - 3) Mount Offerings and Pressure ratings remain same as Single Rod cylinders.
 - 4)† Use Screws 1/16" Smaller than Mounting Holes.

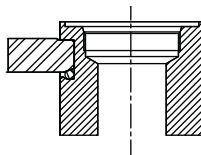
Common Options

Port Options

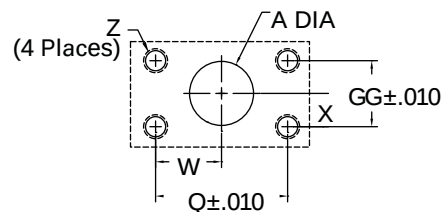
Port Code 1



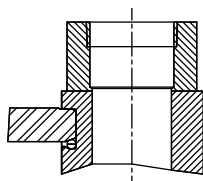
Port Codes 3 and 4



Port Codes 6 and F



Port Code 2



Port Code 6 Reference Table

FLANGE SIZE	A	Q	W	X	Z	GG
1.5 (-24)	1.50	2.750	1.380	0.700	1/2-13	1.406
2 (-32)	2.00	3.062	1.531	0.844	1/2-13	1.688
2 1/2 (-40)	2.50	3.500	1.750	1.000	1/2-13	2.000
3(48)	3.00	4.188	2.094	1.217	5/8-11	2.438

VG Series Port Options

BORE Ø	PORT CODE 1	2	3	4	6	F
in.	NPTF* Pipe	NPTF* Pipe	J1926 UN Thread O-Ring/Thread Size	J1926 UN Thread O-Ring/Thread Size	SAE 518 Code 61 Flange	SAE 518 Code 61 Flange
10	2	2 1/2	#32	#24	2 (-32)	1.50 (-24)
12	2 1/2	3	#32	#24	2 1/2(-40)	2 (-32)
14	2 1/2	3	#32	#24	2 1/2(-40)	2 (-32)
16	3	-	#32	#24	3(-48)	2 1/2 (-40)
18	3	-	#32	#24	3(-48)	2 1/2 (-40)
20	3	-	#32	#24	3(-48)	2 1/2 (-40)
24	3	-	#32	#24	3(-48)	2 1/2 (-40)
30	3	-	#32	#24	3(-48)	2 1/2 (-40)

*+ NPTF ports are not recommended for maximum reliability on new application.

Common Options

Rod End Selection

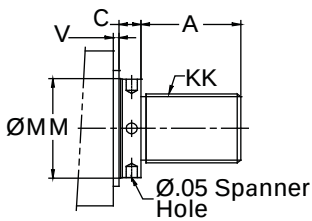
In addition to selecting the correct bore, you must specify the appropriate rod size and rod end configuration for your application.

Seven different inch rod end configurations are available. If a custom design is required, contact your local Eaton Vickers sales engineer, and we will build to your requirements.

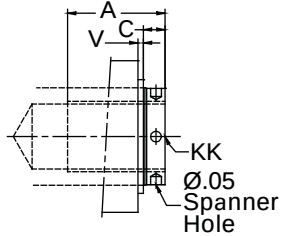
The table on page 49 gives maximum allowable length between the mounting points at various operating pressures for available rod diameters of Series VG cylinders.

Rod ends on rigid mount cylinders should be supported. Longer strokes are allowable for pull only applications. Contact your local Eaton Vickers sales engineer for application assistance if necessary.

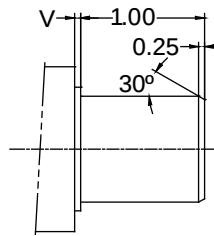
Type #5 Small Male UN Thread



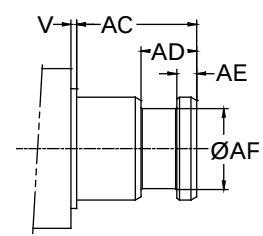
Type #2 Short Female UNF Thread



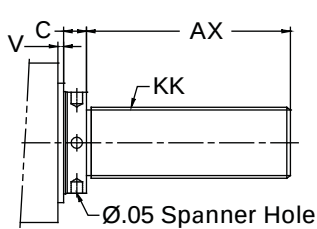
Type #6 Plain - No Attachment



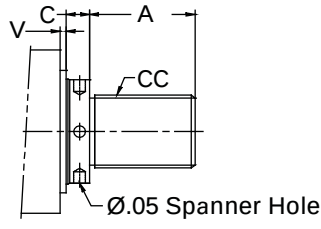
Type #G Grooved Rod End



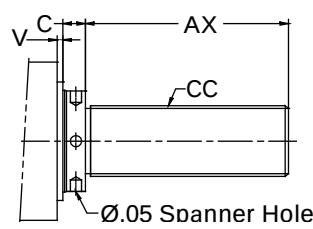
Type #K Extended Small Male UN Thread



Type #9 Intermediate Male UN Thread



Type #M Extended Int. Male UN Thread



ROD SIZE MM	A	AX	KK	CC	AC	AD	AE	AF
4.50	4.50	6.75	3.250-12	4.250-12	5.25	3.19	1.50	3.50
5.00	5.00	7.50	3.500-12	4.750-12	5.38	3.19	1.50	3.88
5.50	5.50	8.25	4.000-12	5.250-12	6.25	3.94	1.88	4.38
7.00	7.00	10.50	5.500-12	6.500-12	6.50	4.06	2.00	5.75
8.00	8.00	12.00	6.000-12	7.500-12	6.50	4.06	2.00	6.50
9.00	9.00	13.50	6.500-12	8.500-12	6.75	4.13	2.00	7.25
10.00	10.00	15.00	7.500-12	9.000-12	7.25	4.63	2.38	8.00
11.00	11.00	16.50	8.000-8	-	-	-	-	-
14.00	14.00	21.00	11.000-8	-	-	-	-	-

NOTES:

1) Dimensions in inches.

Common Options Section

Sealing Option

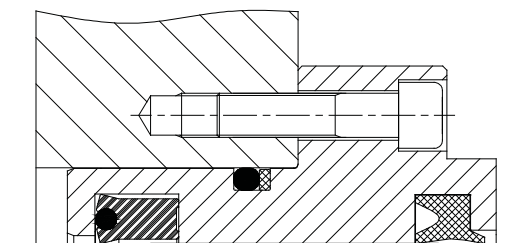
Three different sealing systems are available in Series VG cylinders.

Determine the correct seal code for your application, then enter it as item 8 in the model code.

Seal Code	Rod Seal Configuration	Piston Seal Configuration	Temp °F	Seal Material	Fluid	Application
N	Loaded Cup Seal (1) Wiper (1)	GFT w/Nitrile Energizer(1) Wearbands (2) Metallic Ring (2)	-20 to 200	Nitrile Filled PTFE Cast Iron	Petroleum based oil Mineral based oil Water in oil emulsions	Normal Typical Industrial
L	Loaded Cup Seal (1) Wiper (1)	GFT w/Nitrile Energizer(1) Wearbands	-20 to 200	Filled PTFE Nitrile	Petroleum based oil Mineral based oil Water in oil emulsions	Low friction servo
T	Loaded Cup Seal (1) Wiper (1)	GFT w/Viton Energizer(1) Wearbands Metallic Ring (2)	-20 to 400	Fluorocarbon PTFE Cast Iron	Petroleum based oil Mineral based oils Water under 150° F Phosphate esters	High Temperature

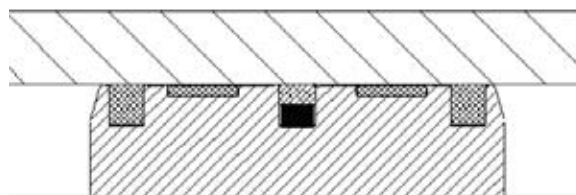
ROD SEAL CONFIGURATION

N, L and T Seal Options

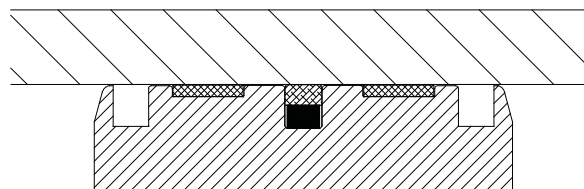


PISTON SEAL CONFIGURATION

N and T Seal Options



L Seal Option

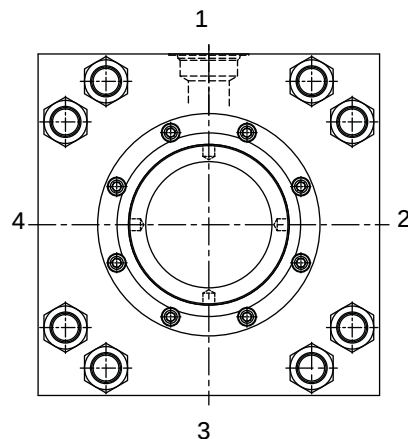


Common Options

Port and Cushion Selection

Port and cushion locations are identified by viewing the cylinder from the head end (or from the mounting end of double rod cylinder). The location numbers are shown to the right.

Certain port and cushion locations cannot be specified with some mounting styles. The table below indicates which of the head and cap port locations are available for each Series VG mounting style.



Port Location Availability Chart

MOUNTING STYLE CODE	DESCRIPTION	HEAD LOCATION				CAP LOCATION			
		1	2	3	4	1	2	3	4
01	Side Lug	A	A	A	A	A	A	A	A
08	Head Square	A	A	A	A	A	A	A	A
09	Head Rectangular	A	A	A	A	A	A	A	A
10	Cap Clevis	A	A	A	A	A	A	A	A
13	Cap Square	A	A	A	A	A	A	A	A
14	Cap Rectangular	A	A	A	A	A	A	A	A
15	Intermediate Trunnion	A	A	A	A	A	A	A	A
16	Cap Trunnion	A	A	A	A	A	N	A	N
17	Head Trunnion	A	N	A	N	A	A	A	A
19	Center Line Lug	A	N	A	N	A	N	A	N
24	No Mount	A	A	A	A	A	A	A	A
25	Double Rod Side Lug	A	A	N	A				
33	Double Rod Rectangular	A	A	A	A				
34	Double Rod Intermediate Trunnion	A	A	A	A				
41	Double Rod No Mount	A	A	A	A				

A- Available

N- Not available

Cushion Availability Chart

MOUNTING STYLE CODE	DESCRIPTION	HEAD LOCATION				CAP LOCATION			
		1	2	3	4	1	2	3	4
01	Side Lug	A	A	A	A	A	A	A	A
08	Head Square	A	A	A	A	A	A	A	A
09	Head Rectangular	A	N	A	N	A	A	A	A
10	Cap Clevis	A	A	A	A	A	A	A	A
13	Cap Square	A	A	A	A	N	N	N	N
14	Cap Rectangular	A	A	A	A	A	N	A	N
15	Intermediate Trunnion	A	A	A	A	A	A	A	A
16	Cap Trunnion	A	A	A	A	A	N	A	N
17	Head Trunnion	A	N	A	N	A	A	A	A
19	Center Line Lug	A	N	A	N	A	N	A	N
24	No Mount	A	A	A	A	A	A	A	A
25	Double Rod Side Lug	A	A	A	A				
33	Double Rod Rectangular	A	N	A	N				
34	Double Rod Intermediate Trunnion	A	A	A	A				
41	Double Rod No Mount	A	A	A	A				

A- Available

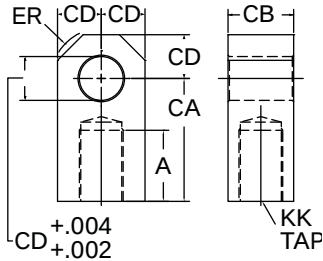
N- Not available

Mounting Accessories

All rod accessories must be torqued against the rod shoulder. Mounting brackets, rod clevises and rod eyes are available from Eaton. These accessories are detailed below showing

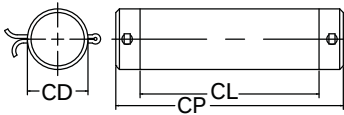
part numbers and all the pertinent dimensional data. Make sure the rod end type selected has threads that match the threads of any required accessory.

Rod Eye



CYL. BORE DIA.	ROD DIA.	PART NUMBER	A	CA	CB	CD	ER	KK	STATIC TENSILE LOAD(LB)
10.00	4.50	SH-1060	4.50	7.63	4.00	3.50	3.88	3.250-12	158200
12.00	5.50	SH-1260	5.50	9.13	4.50	4.00	4.44	4.000-12	211500
14.00	7.00	SH-1460	7.00	11.75	6.00	5.00	5.25	5.500-12	337500
16.00	8.00	SH-1660	9.00	14.25	7.00	6.00	6.25	6.000-12	450000

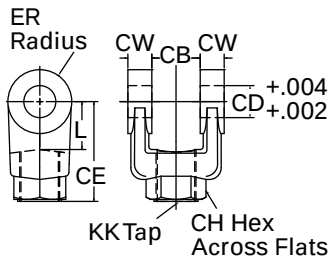
Pivot Pin



CYL. BORE DIA.	PART NUMBER	CD	CL	CP	STATIC TENSILE LOAD(LB)
10.00	VG-1083-10	3.50	8.00	9.63	401775
12.00	VG-1283-10	4.00	9.00	10.63	524750
14.00	VG-1483-10	5.00	12.00	13.63	819950
16.00	VG-1683-10	6.00	14.00	15.63	1180725

Note: 1. CL = 2 x CW + CB

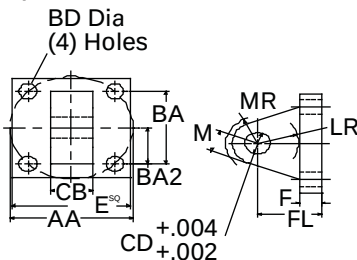
Pivot Clevis



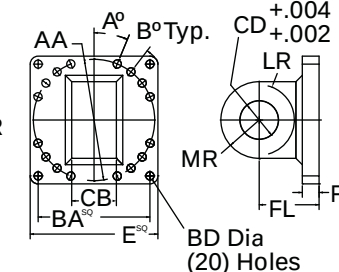
CYL. BORE DIA.	ROD DIA.	PART NUMBER	CB	CD	CE	CH	CW	ER	L	KK	STATIC TENSILE LOAD(LB)
10.00	4.50	SH-1062-10	4.00	3.50	8.50	5.00	2.00	3.50	4.00	3.250-12	142500
12.00	5.50	SH-1262-10	4.50	4.00	10.00	6.13	2.25	4.00	4.50	4.000-12	182500
14.00	7.00	SH-1462-10	6.00	5.00	12.75	-	3.00	5.25	5.75	5.500-12	300000
16.00	8.00	SH-1662-10	7.00	6.00	15.75	-	3.50	6.25	6.75	6.000-12	390000

Eye Bracket

Up to 10.00 & 12.00 Bores



14.00 & 16.00 Bores



Accessories

Recommended Torque Values

Using MOS₂ lubricant with .12 coefficient of friction.
For accessories above 18 inch, please consult factory.

THREAD SIZE	TORQUE (FT-LBS)
3.250-12	7.940
4.000-12	12.560
5.500-12	16.275
6.000-12	21.600

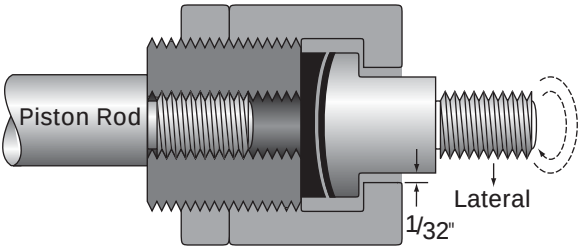
CYLINDER BORE DIA.	ROD DIA.	PART NUMBER	CB	CD	BD	E	F	FL	LR	M	MR	BA	A	B	AA	STATIC TENSILE LOAD(LB)
10.00	4.50	SH-1052-10	4.00	3.50	1.78	12.63	1.69	5.69	3.50	3.50	3.50	9.62	-	-	13.60	60000
12.00	5.50	SH-1252-10	4.50	4.00	2.03	14.88	1.94	6.44	3.88	3.88	4.00	11.50	-	-	16.20	75000
14.00	7.00	SH-1452-10	6.00	5.00	1.03	17.25	2.19	7.94	5.00	5.00	5.25	14.41	27.60	11.60	17.31	95650
16.00	8.00	SH-1652-10	7.00	6.00	1.28	20.00	2.63	9.38	5.50	6.00	6.25	17.50	22.50	15.00	19.00	187500

- Note: 1. The load is maximum load in tension
2. The Pull Load of the cylinder should be less than the listed load for the respective selected rod accessory.
3. Pivot pin is rated in shear.
4. All rod accessories must be torqued against rod shoulder.

Mounting Accessories

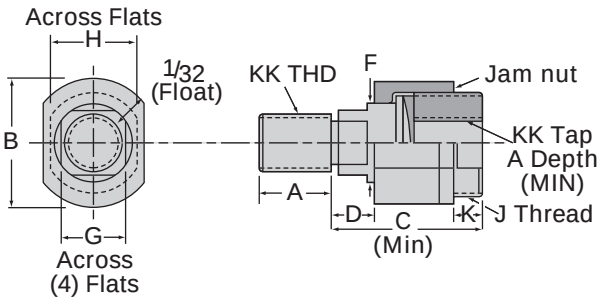
Self-Aligning Coupler

Lateral movement (on push only) and radial movement provide precision alignment between cylinder and machine. Couplers preset with proper clearances and completely lubricated at factory before shipping.



Self-aligning Coupler

Note
When ordering oversize and 2:1 rod cylinders, specify modification to suit standard rod diameter's coupler.



Self-aligning Rod End Coupler

PART NUMBER	ROD DIA	A	B	C	D	F	G	H	J	K	KK	MAX PULL AT YIELD
AC-2-36	4 ¹ / ₂	4 ¹ / ₂	6	7 ⁷ / ₈	1	4 ¹⁵ / ₃₂	▲	4 ³ / ₄	5 ¹ / ₄ -12UN	1 ⁵ / ₈	3 ¹ / ₄ -12	475,500
AC-2-44	5 ¹ / ₂	5 ¹ / ₂	7 ¹ / ₄	9 ³ / ₈	1	5 ¹⁵ / ₃₂	▲	5 ³ / ₄	6 ¹ / ₂ -12UN	1 ⁷ / ₈	4-12	750,010

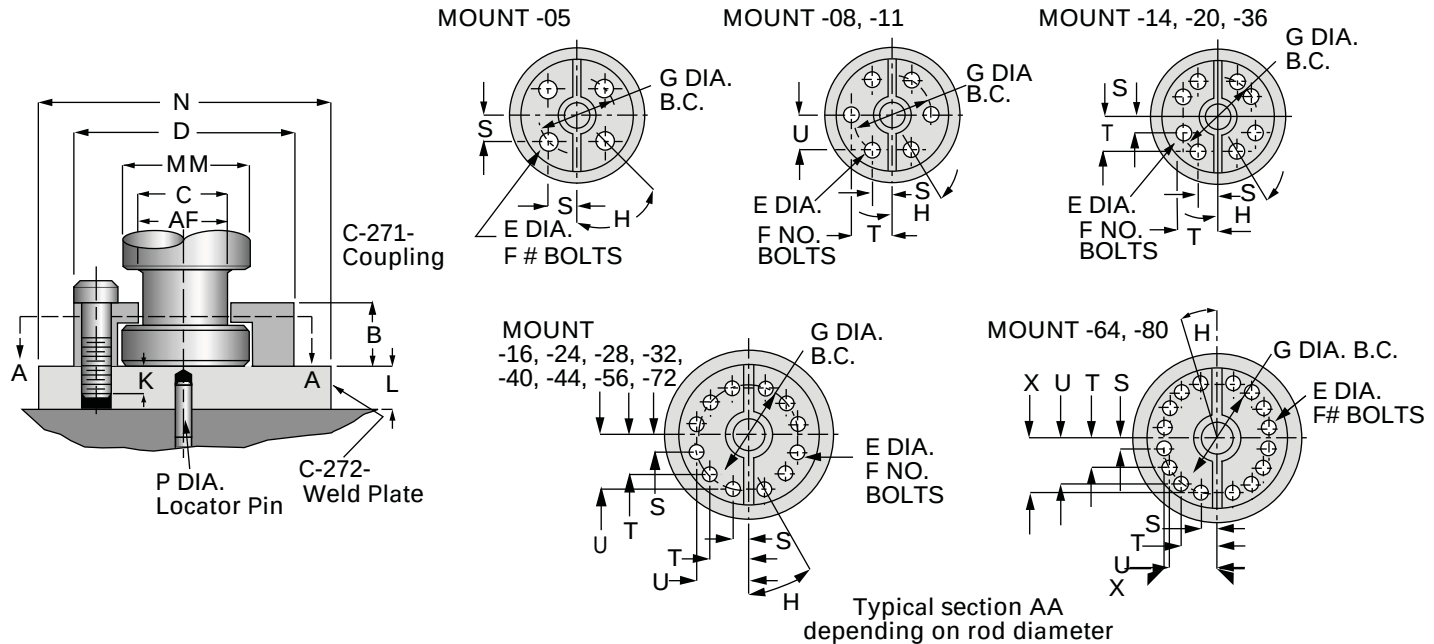
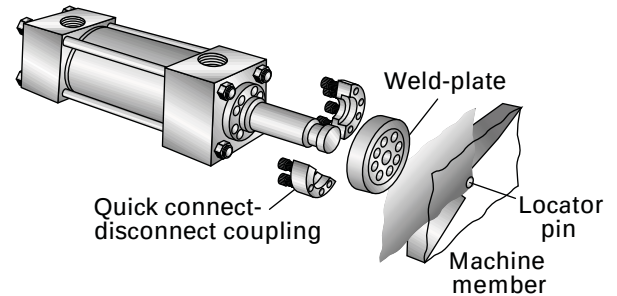
▲ Four 1/2" diameter x 1/2" deep spanner holes instead of flats.

Mounting Accessories

Grooved Rod End Coupling

Used with the Vickers style G rod end, the rod end coupling provides for close lateral alignment between the rod end and machine member.

The two-piece steel coupling features high tensile strength socket head cap screws (with safety factor designed to take full load), permits quick assembly / disassembly for fast and easy installation and servicing.



CPLNG C-271-	ROD DIA MM	AF	B	C	D	E	F	G	H	K	WELD PLATE C-272-	L	N	P	WELD HD CAP SCREWS	SOC. TORQ. FT/LB S	T	U	X
C-271-36	4.500	3.50	2.38	3.62	6.88	.781	8	5.69	22° 30'	1.12	C-272-36	1.25	7.50	.38	1/4-10 x 3.5	450	1.088	2.627	-
C-271-40	5.000	3.88	2.50	4.00	7.38	.656	12	6.18	15°	1.25	C-272-40	1.38	8.00	.38	5/8-11 x 3.75	255	.801	2.188	2.988
C-271-44	5.500	4.38	3.12	4.50	8.25	.781	12	6.88	15°	1.38	C-272-44	1.50	9.00	.38	3/4-10 x 4.5	450	.890	2.431	3.320
C-271-56	7.000	5.75	4.00	5.94	10.38	1.031	12	8.75	15°	1.50	C-272-56	1.75	11.00	.50	1-8 x 5.5	1090	1.132	3.094	4.226
C-271-64	8.000	6.50	4.00	6.69	11.38	1.031	16	9.75	11° 15'	1.50	C-272-64	2.00	12.00	.50	1-8 x 5.5	1090	.951	2.708	4.053
C-271-72	9.000	7.25	4.00	7.50	13.12	1.281	12	11.12	15°	2.00	C-272-72	2.25	14.00	.50	1 1/4-7 x 6	2180	1.440	3.933	5.373
C-271-80	10.000	8.00	4.50	8.25	14.12	1.281	16	12.12	11° 15'	2.00	C-272-80	2.50	15.00	.50	1 1/4-7 x 6.5	2180	1.183	3.368	5.040

To order C-271- and C-272- as an assembly, see part no. C-275-.

Application/ Engineering Data

Stop Tube Selection

As the stroke length of a cylinder increases, the resultant bearing loads on the piston rod becomes greater. To keep these bearing loads from exceeding design limitations and to obtain optimum life from a cylinder, stop tubes should be specified according to the following procedures:

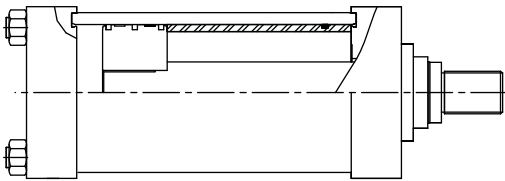
Specify one inch of stop tube for each 10 inches (or fractions thereof) of stroke in excess of the maximums listed in the table below.

Stop Tube Designs

Three typical stop tube designs are illustrated here.

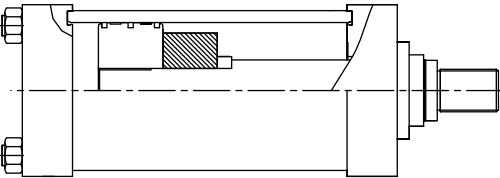
Design A (Stop Tube)

Used for cylinders non-cushioned on the rod



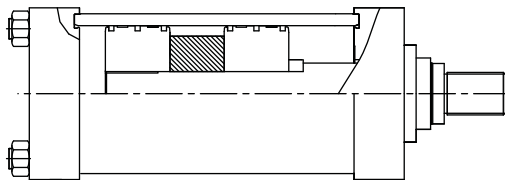
Design B (Stop Spacer)

Used for cushioned cylinders



Design C (Double Piston with Spacer)

The best choice for a cylinder with an exceptionally long stop tube requirement



Note that piston's effective bearing area is doubled, in addition to gaining the normal increased minimum distance between bearing points

Maximum Stroke Permissible without Stop Tube

BORE	PIVOT MOUNT CYLINDER (CLEVIS & TRUNNION)	RIGID MOUNT CYLINDERS (WITHOUT ROD SUPPORT)	RIGID MOUNT CYLINDERS (WITH ROD SUPPORT)
10.00 to 14.00	36 inch	40 inch	48 inch
16.00 and Above	Consult factory		

Application/ Engineering Data

Tie Rod Spacer Selection

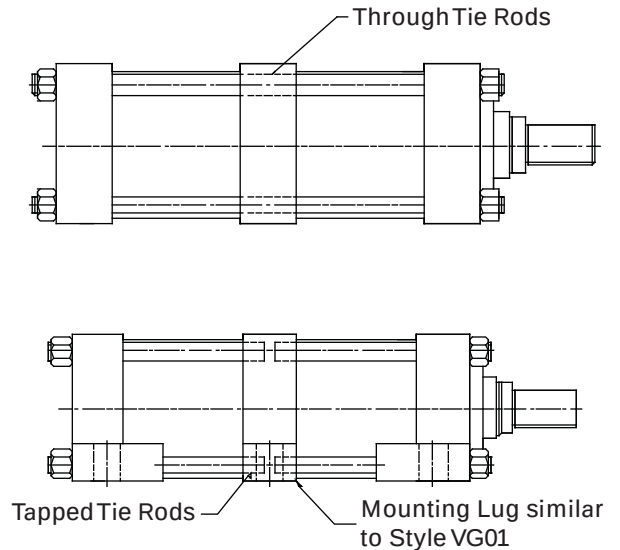
Tie rod spacers and center supports are used to improve the structural rigidity of long stroke tie rod cylinders. A tie rod spacer or center support should be applied when the stroke length exceeds 20 times the bore diameter.

Tie Rod Spacer

The spacers have through holes for the tie rods and are held in place on the cylinder barrel with a small tack weld or set screw. The spacers keep the tie rod in the proper position around the centerline of the cylinder and acts much like a truss in preventing excessive deflection in a long stroke cylinder that is not rigidly mounted (Clevis mount etc.).

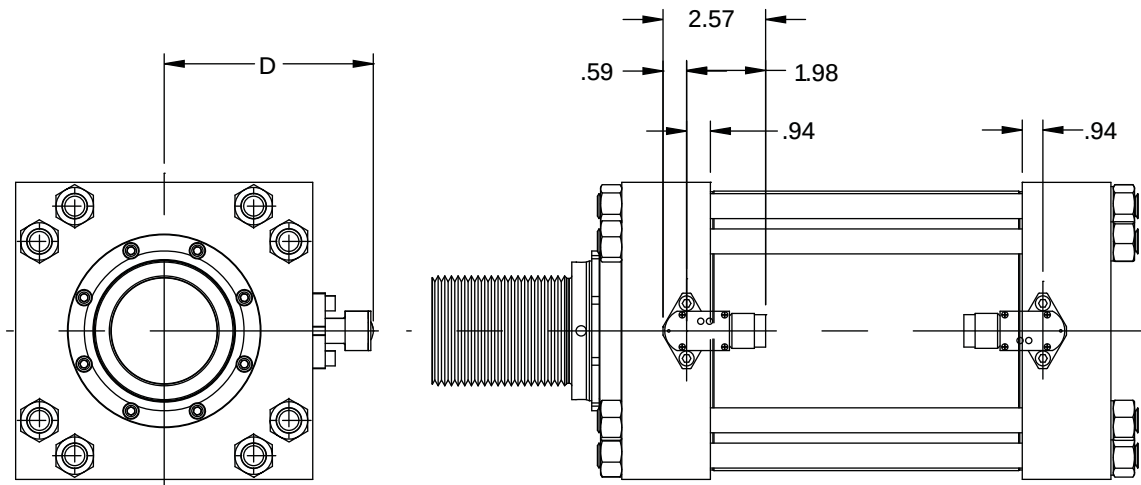
Tie Rod Center Support

The center support has side mounting lugs similar to side lug mount heads and serves as an additional mounting location. The tie rods are studded in to the center support and it becomes a load carrying component of the cylinder assembly. The exact location of the tie rod center support is generally optional, which greatly increases the flexibility in mounting a long stroke cylinder.



Application/
Engineering Data

PS200 Proximity
Switch



BORE	ROD DIA MM	ROD END SWITCH 7550-	SPACER 7551-	D	BLIND END SWITCH 7550-	D
10.00	4.50	3.750	N/A	7.74	3.750	7.74
	5.00	3.750	0.250	7.99	3.750	7.74
	5.50	3.750	0.500	8.24	3.750	7.74
	7.00	2.875	0.438	8.17	3.750	7.74
12.00	5.50	4.560	0.156	9.05	3.750	8.68
	7.00	3.775	0.188	9.07	3.750	8.68
	8.00	2.875	N/A	8.68	3.750	8.68
14.00	7.00	4.560	N/A	9.86	4.560	9.86
	8.00	4.560	0.344	10.36	4.560	9.86
	9.00	3.750	0.125	10.05	4.560	9.86
	10.00	3.750	0.500	10.49	4.560	9.86

PS200 Proximity Switches

PS200 Proximity Switches for Series VG cylinders are an inductive type switch with a sensing probe that "looks" at the cushion collar or button providing full extend or full retract indication. Since the probe is in the cylinder,

harsh, external environments do not affect sensing.

The 2-wire circuit will operate on AC and DC. It operates as reliable as a programmable controller.

PS200 proximity switches meet UL requirements for 3000 psi hydraulic cylinders.

Short circuit protection is a standard feature on the PS200 proximity switch. SCP protects the switch from shorts in the load or line. Upon sensing a short condition the switch assumes a non-conducting mode.

The fault condition must be removed and power turned off to reset, preventing automatic restarts.

Indication of switch in SCP mode is both LED's flashing.

Pressure	3000 psi/5000 psi Non-shock
Sensing Range	0.08" ±10%
Operating Temperature Range	-20° to 70° C
Repeatability	.001"
Switching Differential	20-220V AC/DC
"On-State" Voltage Drop	10V @ 5-500mA
Load Current Maximum	0.5 Amp
Inrush Current	3 Amp
Quiescent Current	1.7 mA Maximum
Indicating LED's standard	1] Power On/Non-conducting 2] Target present (both flashing = SCP mode)

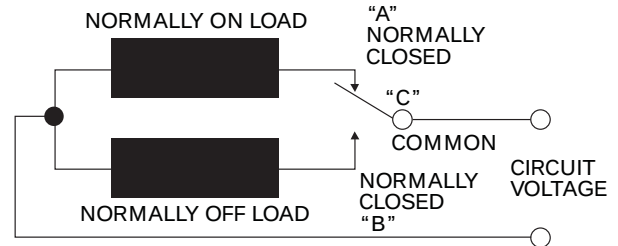
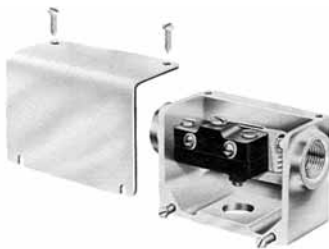
- Note:
- 1) 1/4-20 mounting screws to be torqued to 12 to 15 Ft-Lbs
 - 2) O-rings required
(1) Size -- 115 per switch
(2) Size -- 116 per spacer



Application/ Engineering Data

Limit Switches (Available up to 14" Bore)

Two different limit switches are available. Both switches come with a 1/2" pipe conduit connection in the enclosure wall. Switches 01 and 03 are available with quick disconnect plug factory-wired to the limit switch as an option.



SWITCH '01' SINGLE POLE, DOUBLE THROW (STANDARD)

15 Amperes	125 Volts AC
	250 Volts AC
	480 Volts AC
1/8 Horsepower	125 Volts AC
1/4 Horsepower	250 Volts AC
1/4 Ampere	250 Volts DC
1/2 Ampere	125 Volts DC

Switch Mounted on Rod End Only



Piston rod retracted or in motion - switch open.



Piston rod fully extended - switch closed.

Switches Mounted on Both Rod End and Blind End



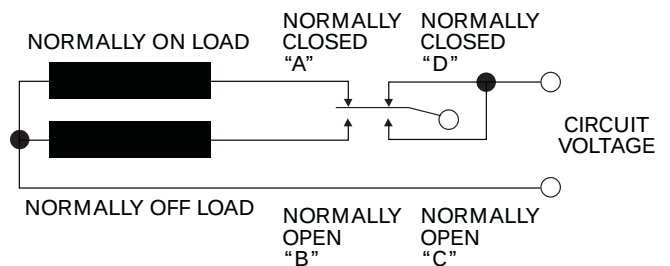
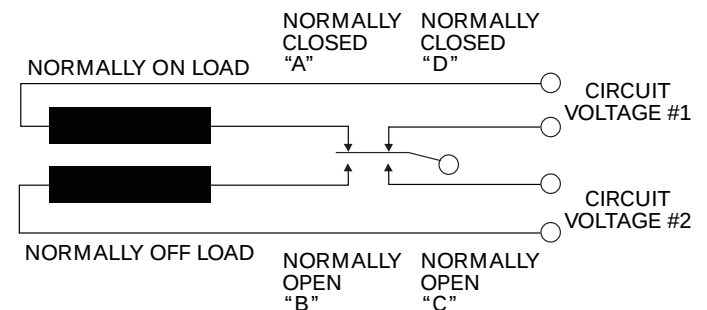
Piston rod fully retracted or in motion - blind end switch closed, rod end switch open.



Piston rod fully extended - rod end switch closed, blind end switch open.



Piston rod in motion - both switches open.

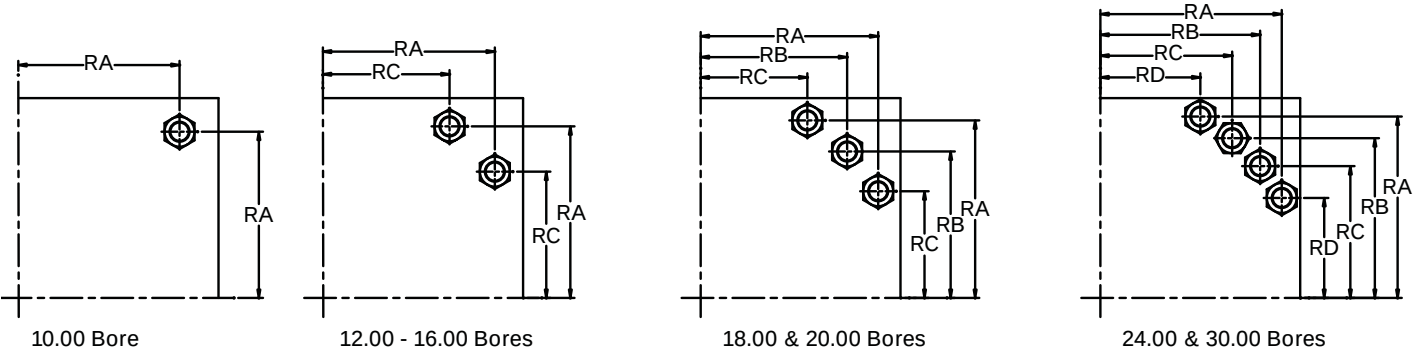


SWITCH '03' SINGLE POLE, DOUBLE THROW, DOUBLE BREAK (OPTIONAL)

15 Amperes	125 Volts AC
	250 Volts AC
1 Ampere	125 Volts DC
1/2 Ampere	250 Volts DC
1/4 Horsepower	125 Volts AC
1/2 Horsepower	250 Volts AC

Application/ Engineering Data

Tie Rod Information



DIM	10	12	14	16	18	20	24	30
RA	4.729	6.247	7.201	8.125	9.718	10.661	13.589	16.585
RB	-	-	-	-	7.910	8.795	11.722	14.380
RC	-	4.480	5.080	6.000	5.543	6.406	9.158	11.439
RD	-	-	-	-	-	-	6.050	7.911
Tie Rod Thread	1.500-12	1.250-12	1.500-12	1.500-12	1.500-12	1.500-12	2.000-12	2.250-12

BORE	TORQUE FT/LBS
10.00	1850
12.00	1100
14.00	1800
16.00	2450
18.00	2000
20.00	2500
24.00	3800
30.00	6800

Note: Recommended torque values using
MoS2 lubricant with .12 coefficient of friction.

*NPTF and BSPP ports are not recommended for maximum reliability on new applications.

Application/ Engineering Data

Buckling Chart

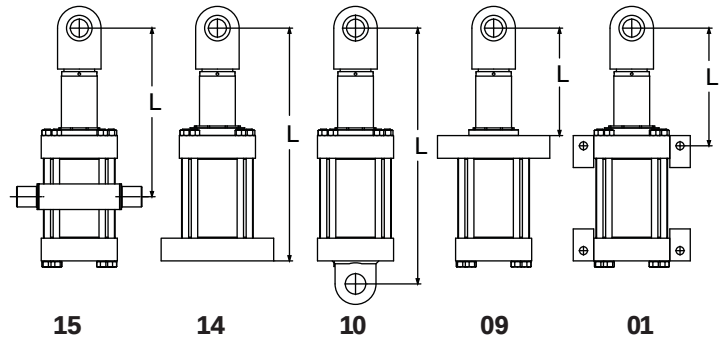
Buckling Chart

Maximum allowable length 'L' in full extend condition.

In push applications, a cylinder acts as a loaded column. To use the table below, first go to the section for your mounting style. Then locate the column with pressure which is closest to, but not below, your application's operating pressure. The intersection of operating pressure

and the bore / rod size represents the maximum allowable length 'L' in full extend condition. This maximum length is based on column loading analysis only and does not consider side loading, stop tube requirements, or other cylinder stroke limiter.

For pressures above 3000 psi, consult your local Eaton Vickers representative.



MAXIMUM LENGTH L (IN) AT WORKING PRESSURE (PSI) - Length L in full extend condition

		Rigid Mount Styles 01, 09, 14							Swivel Mount Styles 10, 15						
BORE	ROD														
Ø	Ø	3000	2000	1500	1000	750	500	250	3000	2000	1500	1000	750	500	250
in	in	psi	psi	psi	psi	psi	psi	psi	psi	psi	psi	psi	psi	psi	psi
10.00	4.50	120	147	170	208	240	294	416	85	104	120	147	170	208	294
	5.00	131	182	210	257	297	364	514	92	129	148	182	210	257	364
	5.50	180	220	254	311	359	440	622	127	156	180	220	254	311	440
	7.00	291	356	411	504	582	713	1008	206	252	291	356	411	504	713
12.00	5.50	141	183	212	259	299	367	518	100	130	150	183	212	259	367
	7.00	225	297	343	420	485	594	840	159	210	242	297	343	420	594
	8.00	316	388	448	548	633	776	1097	224	274	317	388	448	548	776
14.00	7.00	104	247	294	360	416	509	720	73	174	208	254	294	360	509
	8.00	245	332	384	470	543	665	940	173	235	271	332	384	470	665
	9.00	341	421	486	595	687	841	1190	241	297	344	421	486	595	841
	10.00	424	519	600	735	848	1039	1469	300	367	424	519	600	735	1039
16.00	8.00	118	282	336	411	475	582	823	84	199	237	291	336	411	582
	9.00	265	368	425	521	601	736	1041	187	260	301	368	425	521	736
	10.00	364	454	525	643	742	909	1285	257	321	371	454	525	643	909
18.00	9.00	133	317	378	463	534	654	925	94	224	267	327	378	463	654
	10.00	283	404	466	571	660	808	1143	200	286	330	404	466	571	808
20.00	10.00	148	353	420	514	594	727	1028	105	249	297	364	420	514	727
24.00	11.00	138	321	421	518	599	733	1037	98	227	297	367	423	518	733
30.00	14.00	229	429	547	672	776	950	1344	162	304	387	475	549	672	950

Formulas

Calculation according to Euler

$$P = \frac{C\pi^2EI}{FL^2} \quad \frac{L}{k} \geq \left[\frac{2C\pi^2E}{S_y} \right]$$

Calculation according to Jb Johnson

$$P = \frac{AS_y}{F} \left[1 - \frac{S_y L^2}{4C\pi^2 E k^2} \right] \quad \frac{L}{k} \leq \left[\frac{2C\pi^2 E}{S_y} \right]$$

End conditions for above chart:

Mount	Condition
01,09,14	Fixed-Guided
10,15	Pin-Pin

F Safety factor, 3.5 up to 10.00 inch rod.
3.00 for 11.00 and 14.00

P Critical load, Lb

E Modulus of elasticity, 30,000,000 psi

L Length, in

I Moment of inertia, in⁴

C End condition

Fixed-Guided 2

Fixed-Fixed 4

Pin-Pin 1

A Rod area, in²

k Radius of gyration, in

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Hydraulics Operations USA
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