



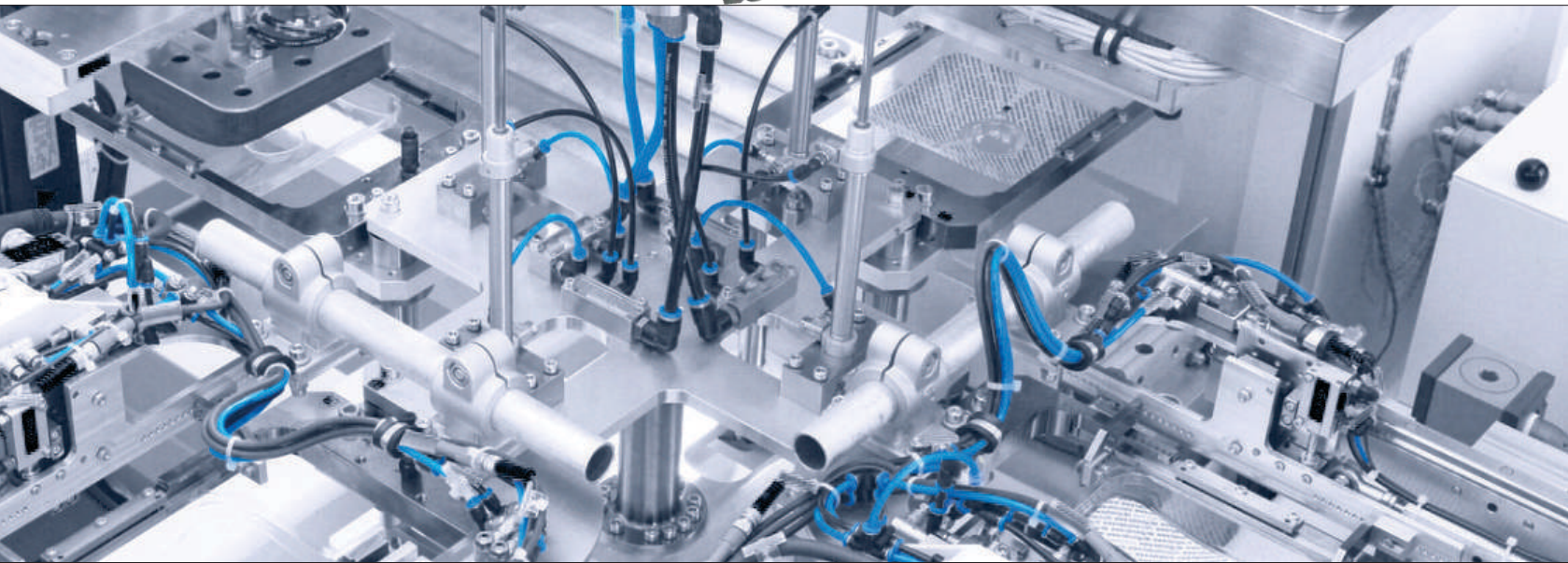
## Automation Products in Pneumatics & Hydraulics



## Pneumatic Cylinders



Luthra Hydro Pneumatic Industries



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| 5.0 Hydraulic Cylinder                                                                                                                                                                                                                                                                                                    | 22 - 23 |

## SERIES 50 - STANDARD RANGE (Heavy duty), Tie Rod Construction



### FEATURES

Covers : Cast Iron Heavy Duty  
 Tube : 40, 50, 63, 75 Aluminium  
 50 & 63 - available in Brass & steel also  
 75 - available in steel also  
 75-350 bore Steel duly honed & Hard chrome Plated

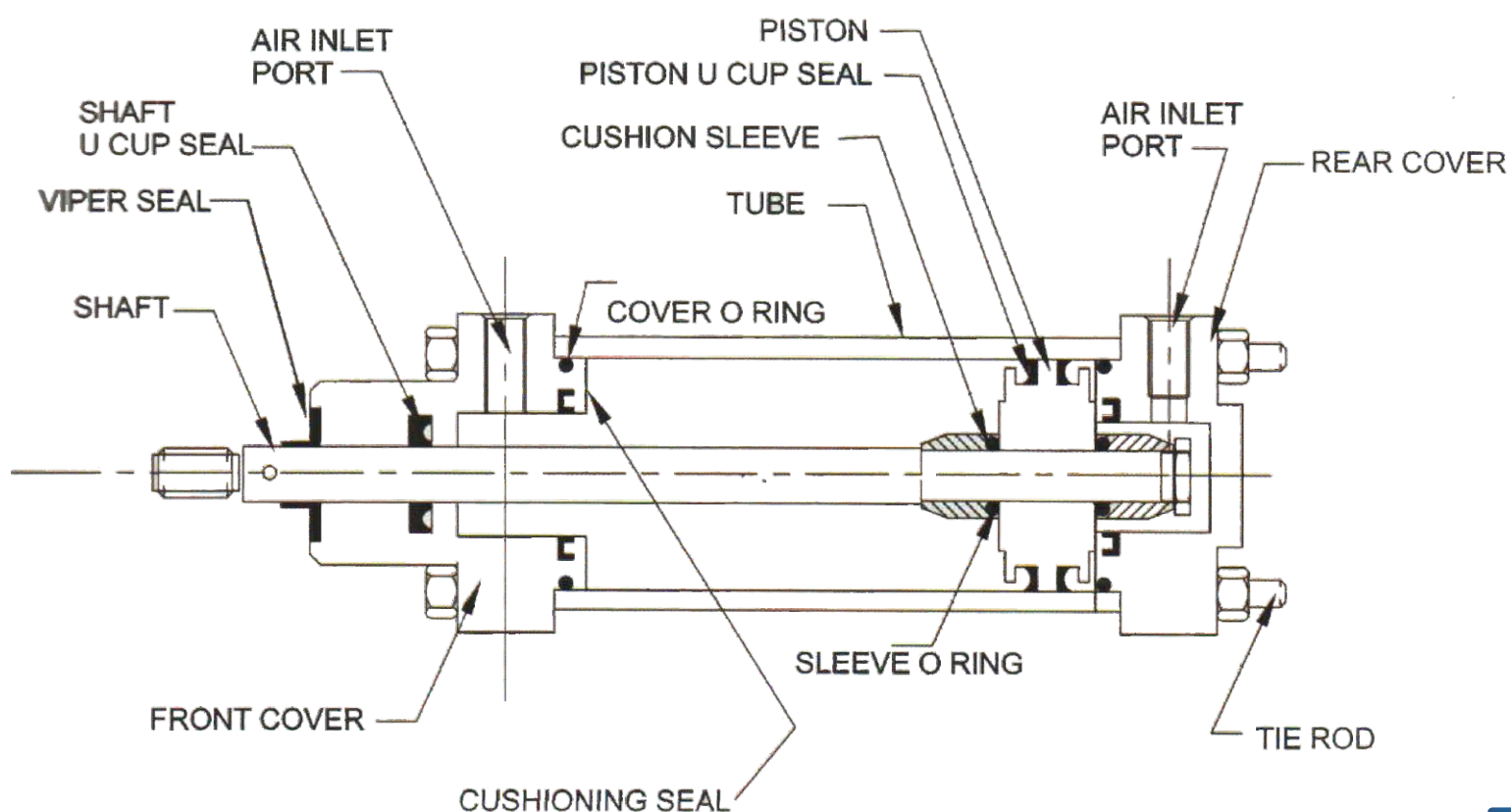
Pointer Rod : EN8 ground & hard chrome plated

Seals : Nitrile (80°C), Vitan (250°C)

### Types Available

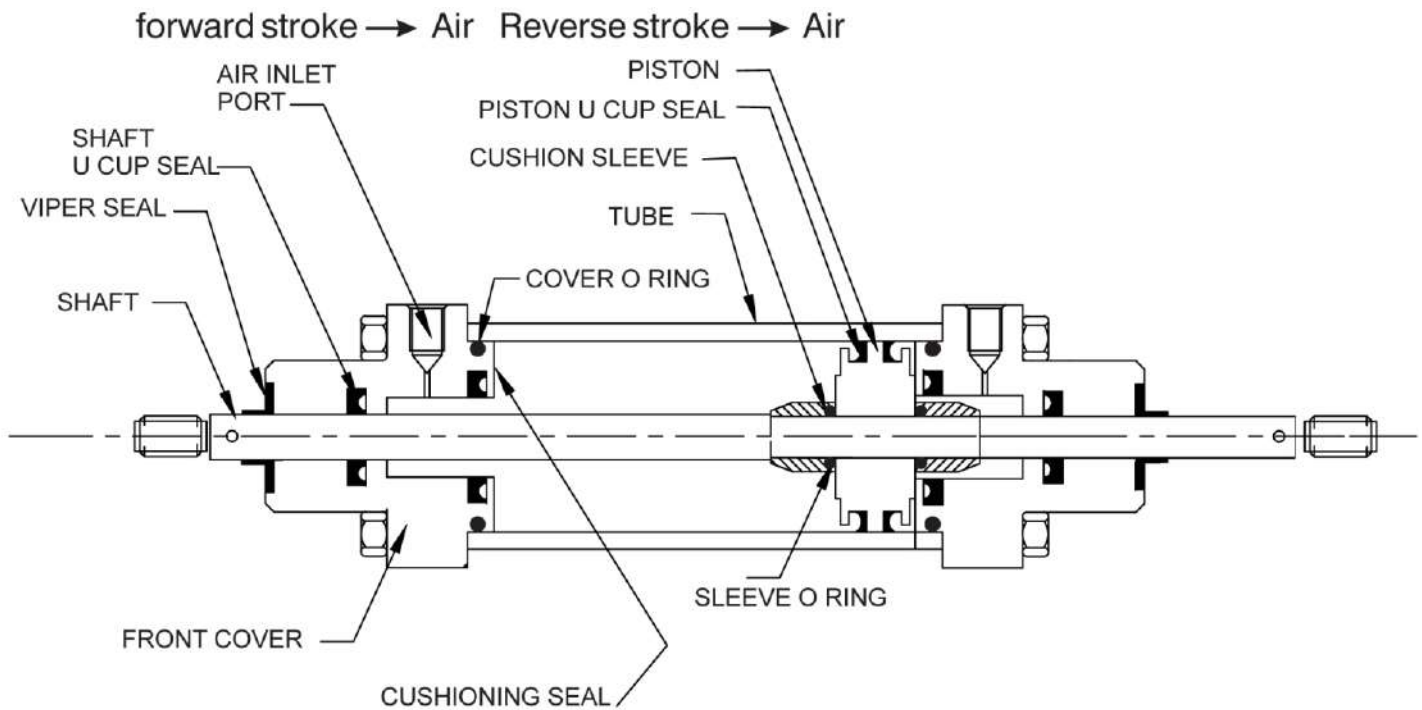
#### A) DOUBLE ACTING SINGLE ENDED

forward stroke ---> Air Reverse stroke ---> Air





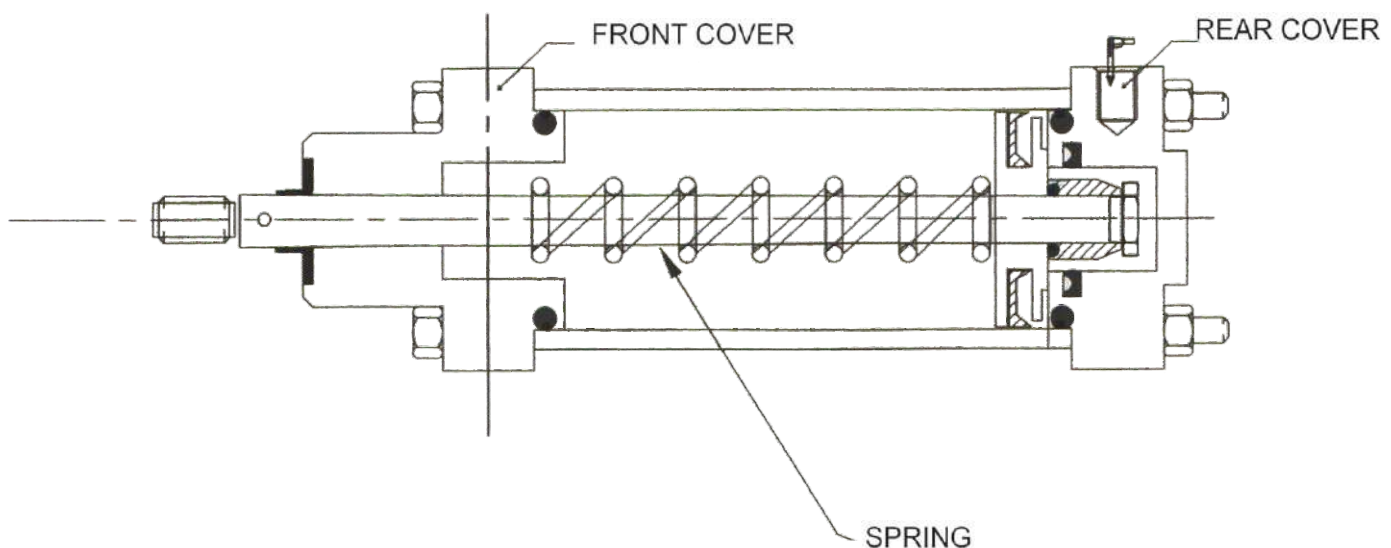
## B) DOUBLE ACTING DOUBLE ENDED ( Shaft on both side)



Note : for parts and seal details Refer Page No.2

## C) SINGLE ACTING SPRING RETURN TYPE

forward stroke ---> Air Reverse stroke ---> by spring



## D) VALVE MOUNTED CYLINDER

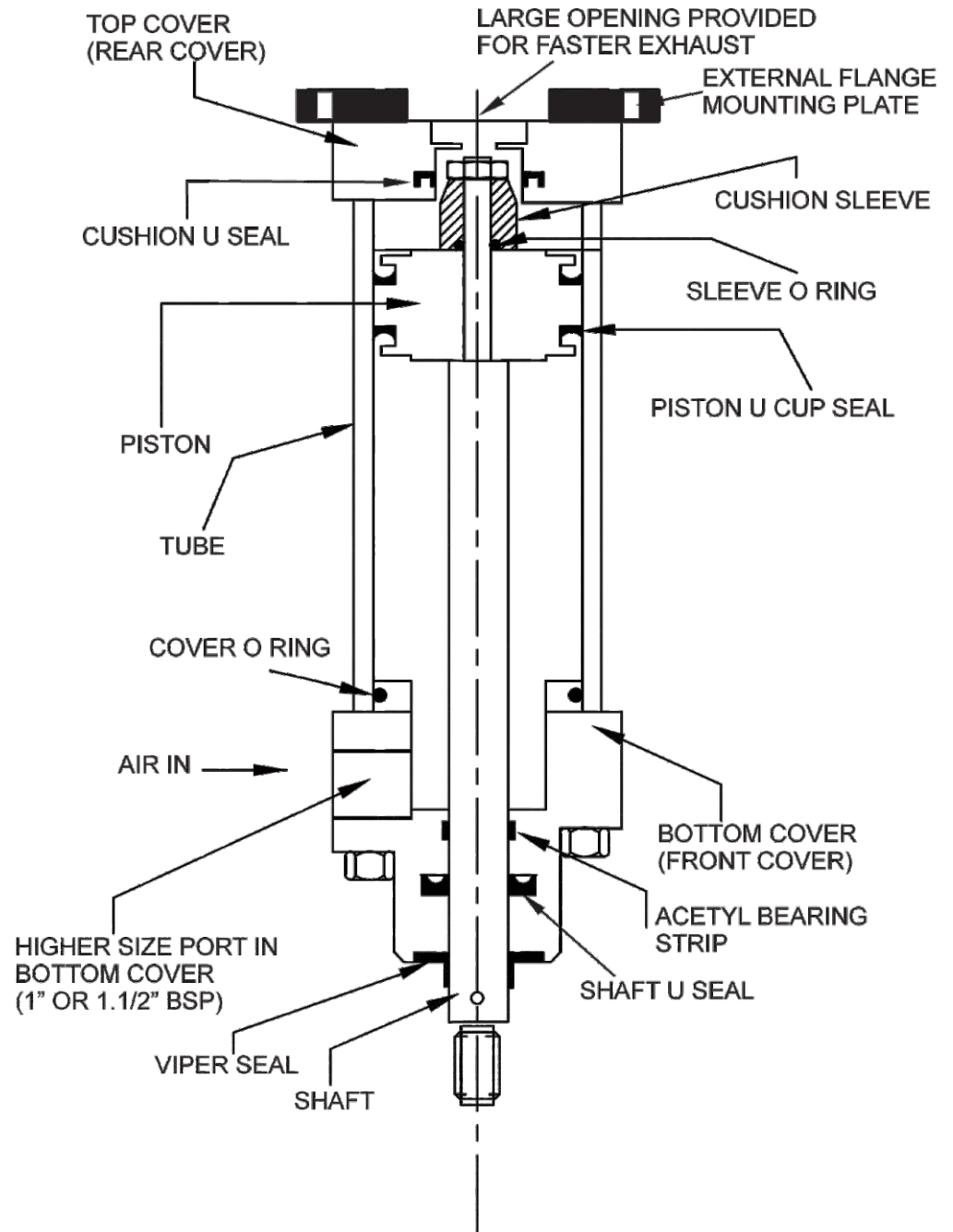
In this type cylinder construction is same as given on 'Pg 1' except that valve to operate the cylinder is mounted directly on the cylinder no external Tubing is Required from valve to cylinder port only one Inlet pressure port has to be connected to the valves inlet port. This type of cylinder is usually used to operate Butterfly valves.





## E) SINGLE ACTING Balancer Cylinder :

(for power presses Air to lift and return by load)



This larger type of cylinder has bottom cover thicker than the standard cylinder show on Pg2. to accommodate larger port size for inlet Air.

Also Top cover is provided with a circular opening at the back dully fitted with wire mesh for dust protection. This larger circular opening is provided for faster exhaust of the cylinder in the forward & Reverse stroke.

Dimension of Balancer Cylinder available on request only as most of the cylinders are made as per Individual clients requirements.

## ◆ COMPRESSED AIR CONSUMPTION :

Note : 1 cycle comprises of 1 forward and 1 return stroke of a standard pneumatic cylinder. The stroke length of the cylinder considered in this table is 100mm.

| Bore (mm)                |    | 20    | 25    | 32    | 40    | 50    | 63    | 80     | 100    | 125   | 150   | 200   | 250    | 300    |
|--------------------------|----|-------|-------|-------|-------|-------|-------|--------|--------|-------|-------|-------|--------|--------|
| ROD (mm)                 |    | 8     | 9.5   | 11.5  | 16    | 16    | 25    | 25     | 25     | 35    | 35    | 38    | 38     | 51     |
| Area (mm <sup>2</sup> )  | A  | 314   | 491   | 804   | 1256  | 1963  | 3116  | 5024   | 7850   | 12266 | 17663 | 31400 | 49063  | 70650  |
|                          | B  | 264   | 420   | 700   | 1055  | 1762  | 2625  | 4533   | 7359   | 11304 | 16701 | 30266 | 47021  | 68608  |
| Operating pressure (Bar) | 1  | 0.115 | 0.181 | 0.299 | 0.460 | 0.741 | 1.142 | 1.902  | 3.027  | 4.69  | 6.84  | 12.27 | 19.12  | 27.71  |
|                          | 2  | 0.172 | 0.271 | 0.448 | 0.689 | 1.110 | 1.711 | 2.848  | 4.533  | 7.02  | 10.24 | 18.38 | 28.63  | 41.50  |
|                          | 3  | 0.229 | 0.361 | 0.597 | 0.918 | 1.479 | 2.279 | 3.795  | 6.039  | 9.36  | 13.64 | 24.48 | 38.15  | 55.29  |
|                          | 4  | 0.287 | 0.452 | 0.746 | 1.146 | 1.847 | 2.848 | 4.741  | 7.544  | 11.69 | 17.05 | 30.59 | 47.66  | 69.08  |
|                          | 5  | 0.344 | 0.542 | 0.895 | 1.375 | 2.216 | 3.416 | 5.687  | 9.050  | 14.03 | 20.45 | 36.69 | 57.17  | 82.87  |
|                          | 6  | 0.401 | 0.632 | 1.044 | 1.604 | 2.585 | 3.984 | 6.633  | 10.556 | 16.36 | 23.85 | 42.80 | 66.69  | 96.65  |
|                          | 7  | 0.458 | 0.722 | 1.193 | 1.833 | 2.953 | 4.553 | 7.580  | 12.062 | 18.69 | 27.25 | 48.91 | 76.20  | 110.44 |
|                          | 8  | 0.515 | 0.812 | 1.342 | 2.062 | 3.322 | 5.121 | 8.526  | 13.568 | 21.03 | 30.65 | 55.01 | 85.71  | 124.23 |
|                          | 9  | 0.573 | 0.902 | 1.490 | 2.290 | 3.691 | 5.690 | 9.472  | 15.074 | 23.36 | 34.06 | 61.12 | 95.23  | 138.02 |
|                          | 10 | 0.630 | 0.992 | 1.639 | 2.519 | 4.060 | 6.258 | 10.418 | 16.580 | 25.69 | 37.46 | 67.22 | 104.74 | 151.81 |

Let us assume we have three cylinder working independently in different circuits.

Cylinder A : 25 mm Bore, stroke length 75mm operating at 12 cycles / minute

Cylinder B : 80 mm Bore, stroke length 250mm operating at 10 cycles / minute

Cylinder C : 200 mm Bore, stroke length 900mm operating at 13 cycles / minute

From the table given above the air consumption at 6 bar working pressure of the cylinder would be

Cylinder A : 0.632 x12cycles/min. x1.1( fos) = 8.34 lpm

Cylinder B : 6.633 x2.5(multiplication factor) x10cycles/min. x 1.1( fos) = 182.5 lpm

Cylinder C : 42.8 x9(multiplication factor) x13cycles/min. X1.1( fos) = 5508 lpm

Fos : Factor of safety (10%)

1lpm : 0.037 CFM

## ◆ FORCE CONSIDERATION :

Selection of cylinder is based upon the bore, stroke & the piston rod diameter. This is further based upon the force required to do the work & distance to be traversed. The force available at a certain pressure is determined by the following chart.

### FORCE CALCULATION FOR PNEUMATIC CYLINDER

Series 50 cylinder

E-EXTENDED STROKE

UNIT : NEWTONS

R-REVERSE STROKE

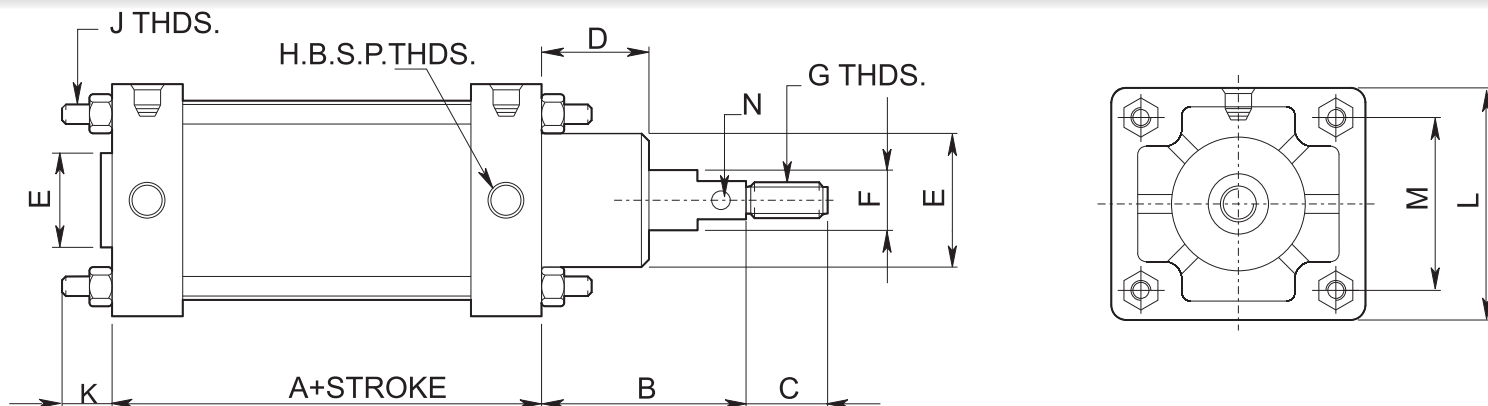
1 Newton approx.

equal to 0.1 Kg

BELOW VALUES ARE INCLUSIVE OF FRICTIONAL LOSSES

PRESSURE : BAR (KG/cm<sup>2</sup>)

| Normal Bore | Actual bore | Force(N) | 2 BAR | 3 BAR | 4 BAR | 5 BAR | 6 BAR | 7 BAR | 8 BAR | 9 BAR | 10 BAR |
|-------------|-------------|----------|-------|-------|-------|-------|-------|-------|-------|-------|--------|
| 25 mm       | 25.4 mm     | E        | 88    | 133   | 178   | 223   | 268   | 312   | 357   | 137   | 446    |
|             |             | R        | 76    | 115   | 153   | 192   | 230   | 269   | 306   | 338   | 370    |
| 40 mm       | 38 mm       | E        | 201   | 304   | 402   | 500   | 608   | 706   | 804   | 902   | 1000   |
|             |             | R        | 165   | 245   | 333   | 412   | 500   | 578   | 666   | 745   | 823    |
| 50 mm       | 54 mm       | E        | 402   | 598   | 804   | 1009  | 1205  | 1411  | 1607  | 1813  | 2019   |
|             |             | R        | 372   | 549   | 735   | 921   | 1107  | 1294  | 1470  | 1656  | 1842   |
| 65 mm       | 65 mm       | E        | 588   | 882   | 1176  | 1470  | 1764  | 2038  | 2332  | 2626  | 2920   |
|             |             | R        | 500   | 745   | 1000  | 1245  | 1490  | 1744  | 1989  | 2234  | 2499   |
| 75 mm       | 80.5 mm     | E        | 882   | 1323  | 1764  | 2254  | 2666  | 3097  | 3548  | 3979  | 4430   |
|             |             | R        | 804   | 1205  | 1607  | 2009  | 2401  | 2793  | 3205  | 3606  | 3998   |
| 100 mm      | 105 mm      | E        | 1529  | 2303  | 3058  | 3920  | 4606  | 5361  | 6125  | 6909  | 7644   |
|             |             | R        | 1441  | 2176  | 2891  | 3626  | 4332  | 5047  | 5782  | 6517  | 7252   |
| 125 mm      | 130 mm      | E        | 2352  | 3528  | 4704  | 5978  | 7056  | 8232  | 9369  | 10535 | 11711  |
|             |             | R        | 2176  | 3283  | 4361  | 5439  | 6546  | 7644  | 8722  | 9800  | 10878  |
| 150 mm      | 157 mm      | E        | 3430  | 5194  | 6860  | 8624  | 10290 | 12005 | 13720 | 15435 | 17150  |
|             |             | R        | 3283  | 4900  | 6517  | 8134  | 9761  | 11368 | 12985 | 14602 | 16268  |
| 200 mm      | 207.5 mm    | E        | 5978  | 8967  | 11956 | 15190 | 17934 | 20923 | 23912 | 26852 | 29890  |
|             |             | R        | 5782  | 8673  | 11564 | 14406 | 17326 | 20188 | 23079 | 25970 | 28812  |
| 250 mm      | 258.5 mm    | E        | 9310  | 13916 | 18522 | 23275 | 27832 | 32418 | 37044 | 41650 | 46354  |
|             |             | R        | 8918  | 13377 | 17836 | 22295 | 26754 | 31213 | 35672 | 40131 | 44590  |
| 300 mm      | 309.5 mm    | E        | 13328 | 19943 | 26558 | 33908 | 39886 | 47432 | 53116 | 59731 | 66346  |
|             |             | R        | 12936 | 19404 | 25872 | 32340 | 38808 | 42276 | 51695 | 58212 | 64631  |



◆ CHART A: DOUBLE ACTING SINGLE ENDED CYLINDER

| NOMINAL BORE |             |             |              |                 |             |
|--------------|-------------|-------------|--------------|-----------------|-------------|
|              | 25*(B)      | 40 (A)      | 50 (A) & (B) | 65 (A) & (B)    | 75 (A)      |
| I.D. OF TUBE | 25 (A)      | 38          | 50           | 63              | 80          |
| MODEL NO.    | 50201       | 50215       | 50A202       | 50A214 / 50B214 | 50A203      |
| N            | NN-         | 5           | 5            | 6.5             | 6.5         |
| M            | 24.25       | 36.5        | 47.5         | 57              | 70.5        |
| L            | 38          | 55          | 63           | 76              | 92          |
| K            | 19          | 20          | 20           | 25              | 30          |
| J            | M5          | M6          | M6           | M8              | M10         |
| H            | 1/8" B.S.P. | 1/4" B.S.P. | 1/4" B.S.P.  | 1/4" B.S.P.     | 1/2" B.S.P. |
| G            | M8 x 1.25   | M12 x 1.25  | M12 x 1.25   | M16 x 1.5       | M20 x 2.5   |
| F            | 9.5         | 15.9        | 15.9         | 25.4            | 25.4        |
| E            | 20          | 34          | 38           | 48              | 48          |
| D            | 10          | 26          | 26           | 30              | 35          |
| C            | 15          | 25          | 25           | 32              | 32          |
| B            | 16.5        | 38          | 38           | 46              | 51          |
| A            | 58          | 84          | 84           | 102             | 119         |

TUBE (A) - Aluminium (B) - Brass

◆ CHART B : DOUBLE ACTING SINGLE ENDED CYLINDER (STEEL TUBE )

| BORE         |             |             |             |             |             |             |             |             |           |
|--------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-----------|
|              | 65 S        | 75 S        | 100 S       | 125 S       | 150 S       | 200 S       | 250 S       | 300 S       | 350 S     |
| I.D. OF TUBE | 63          | 80          | 105         | 130         | 157         | 207.5       | 258.5       | 309.5       | 357       |
| MODEL NO.    | 50214       | 50203       | 50204       | 50205       | 50206       | 50208       | 50210       | 50212       | 50216     |
| N            | 6.5         | 6.5         | 6.5         | 8           | 8           | 10          | 10          | 10          |           |
| M            | 57          | 70.5        | 88          | 112         | 126         | 170.5       | 210         | 247         | 292       |
| L            | 76          | 95          | 122         | 152         | 172         | 230         | 286         | 345         | 382       |
| K            | 25          | 30          | 30          | 35          | 35          | 45          | 50          | 55          |           |
| J            | M8          | M10         | M10         | M12         | M12         | M20         | M20         | M24         | 27x2      |
| H            | 1/4" B.S.P" | 1/2" B.S.P" | 1/2" B.S.P" | 1/2" B.S.P" | 1/2" B.S.P" | 3/4" B.S.P" | 3/4" B.S.P" | 3/4" B.S.P" | 1" B.S.P" |
| G            | M16 x 1.5   | M20 x 2.5   | M20x2.5     | M24x3       | M24x3       | M30x3.5     | M42x4.5     | M42x4.5     | 2" B.S.P" |
| F (Rod dia.) | 25.4        | 25.4        | 25.4        | 35          | 35          | 38          | 50.7        | 50.7        | 60        |
| E            | 48          | 48          | 55          | 64          | 64          | 70          | 90          | 90          | 110       |
| D            | 30          | 35          | 35          | 40          | 44          | 50          | 55          | 55          | 38        |
| C            | 32          | 32          | 32          | 45          | 45          | 56          | 68          | 68          | 75        |
| B            | 46          | 51          | 51          | 58          | 62          | 68          | 75          | 75          | 60        |
| A            | 102         | 119         | 119         | 132         | 135         | 162         | 205         | 205         | 230       |

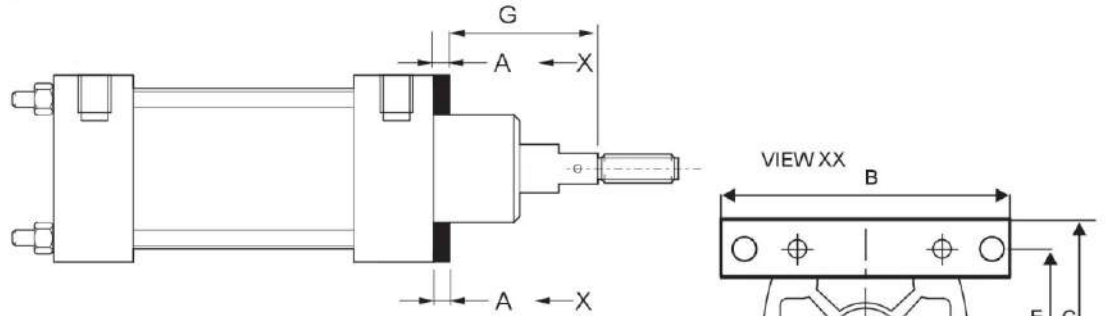
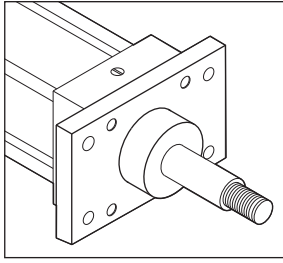
Note: 1) Piston rod diameter threads are subject to change for stroke lengths above 1200 mm stroke.

The same will be as per mutual agreement between client and vendor. Separate dimensional drawing will be submitted by us.

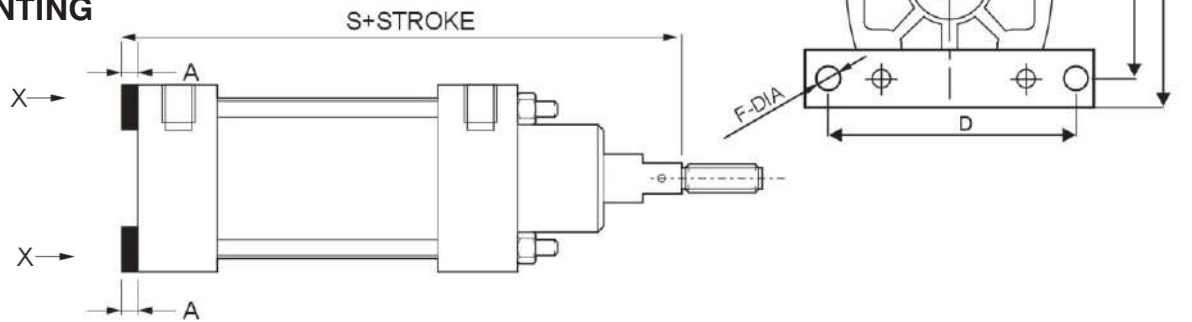
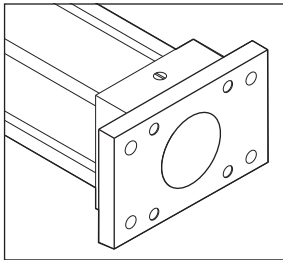
2) TUBE Mabel • A - Aluminium • B - Brass • S - Steel



## ◆ FRONT FLANGE MOUNTING

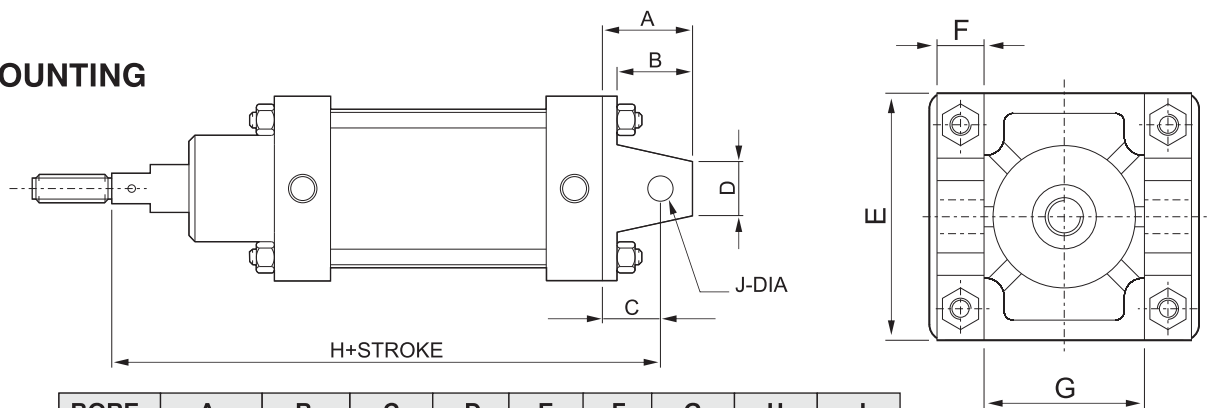
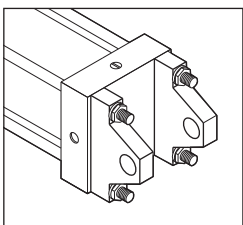


## ◆ REAR FLANGE MOUNTING



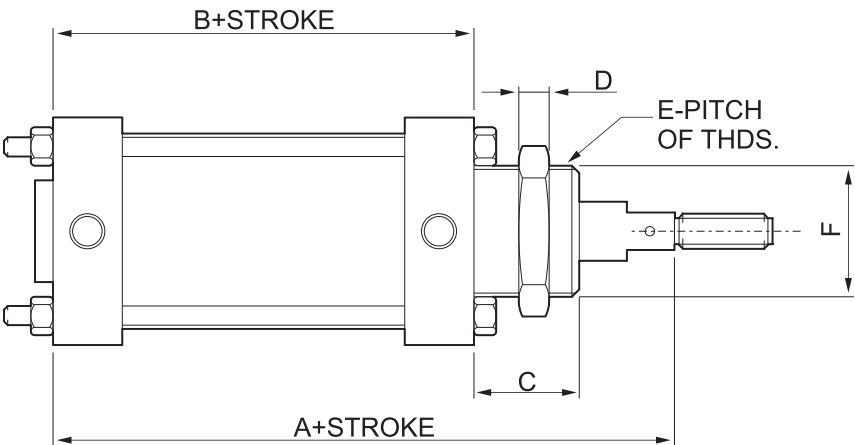
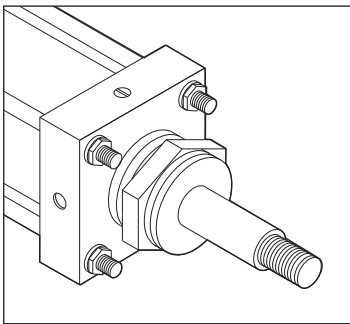
| BORE | A  | B   | C     | D   | E     | F    | G    | S    |
|------|----|-----|-------|-----|-------|------|------|------|
| 19   | 5  | 53  | 29    | 43  | 19    | 5.5  | -    | 76   |
| 25   | 5  | 62  | 38    | 52  | 28    | 5.5  | 11.5 | 80.5 |
| 40   | 10 | 80  | 50    | 67  | 36.5  | 6.5  | 28   | 132  |
| 50   | 10 | 102 | 63    | 84  | 45    | 8.5  | 28   | 134  |
| 65   | 13 | 140 | 80    | 110 | 56    | 10.5 | 33   | 160  |
| 75   | 13 | 140 | 92    | 116 | 68    | 10.5 | 38   | 183  |
| 100  | 13 | 160 | 117   | 137 | 93    | 10.5 | 38   | 183  |
| 125  | 19 | 160 | 150   | 170 | 112   | 12.5 | 39   | 205  |
| 150  | 19 | 216 | 174   | 190 | 126   | 12.5 | 43   | 214  |
| 200  | 25 | 315 | 220.5 | 265 | 170.5 | 21   | 49   | 254  |
| 250  | 30 | 360 | 267   | 310 | 210   | 21   | 43   | 309  |
| 300  | 30 | 450 | 310   | 385 | 247   | 25   | 43   | 309  |

## ◆ REAR CLEVIS MOUNTING

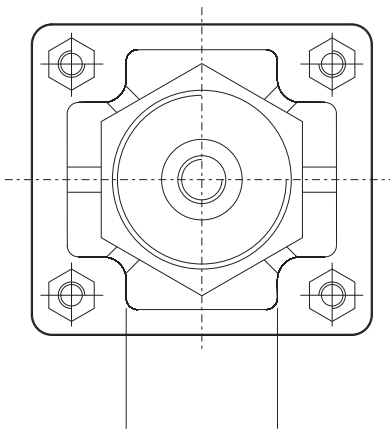


| BORE | A   | B  | C    | D    | E   | F   | G    | H    | J  |
|------|-----|----|------|------|-----|-----|------|------|----|
| 19   | 19  | -  | 12.5 | 16   | 29  | 8   | S.P. | 82.5 | 6  |
| 25   | 22  | -  | 13   | 20   | 38  | 10  | S.P. | 87.5 | 8  |
| 40   | 35  | 20 | 25   | 16   | 50  | 9.5 | 27.5 | 147  | 12 |
| 50   | 37  | 23 | 25   | 16   | 63  | 9.5 | 38.5 | 147  | 12 |
| 65   | 46  | 30 | 30   | 26.6 | 80  | 15  | 45   | 178  | 16 |
| 75   | 49  | 36 | 32   | 22   | 92  | 16  | 54.5 | 202  | 20 |
| 100  | 55  | 36 | 38   | 25   | 114 | 16  | 72   | 208  | 20 |
| 125  | 70  | 45 | 45   | 35   | 150 | 22  | 90   | 234  | 25 |
| 150  | 70  | 45 | 45   | 41   | 160 | 22  | 103  | 240  | 25 |
| 200  | 85  | 55 | 50   | 50   | 215 | 38  | 132  | 279  | 32 |
| 250  | 115 | 77 | 75   | 64   | 270 | 38  | 172  | 354  | 38 |
| 300  | 115 | 77 | 78   | 64   | 316 | 38  | 209  | 354  | 38 |

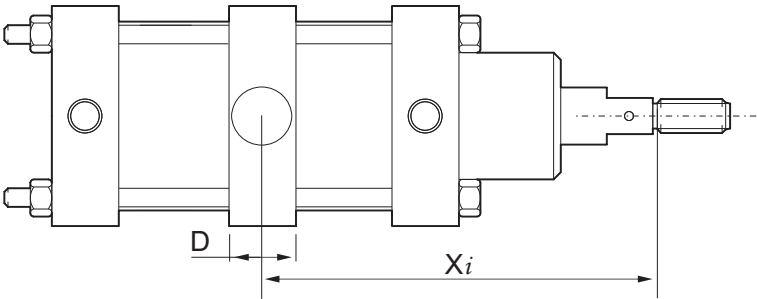
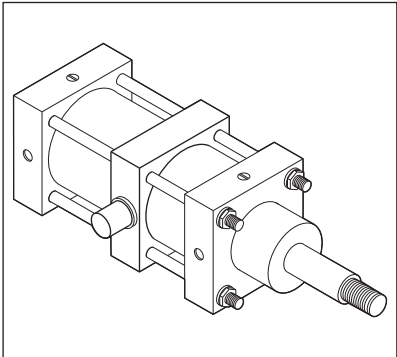
◆NECK MOUNTING



| BORE | A    | B    | C  | D   | E   | F  |
|------|------|------|----|-----|-----|----|
| 19   | 79   | 53.5 | 19 | 7   | 1.5 | 10 |
| 25   | 83.5 | 58   | 19 | 7   | 1.5 | 20 |
| 40   | 122  | 84   | 26 | 9.5 | 2   | 34 |
| 50   | 122  | 84   | 26 | 9.5 | 2   | 38 |
| 65   | 148  | 102  | 30 | 9.5 | 2   | 38 |
| 75   | 170  | 119  | 35 | 9.5 | 2   | 48 |
| 100  | 170  | 119  | 35 | 9.5 | 2   | 55 |

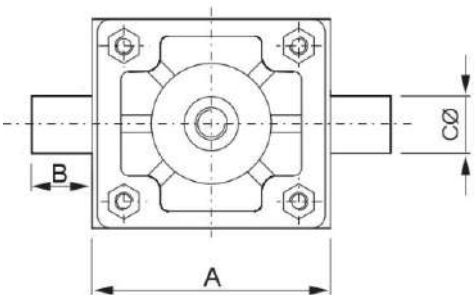


◆INTERMEDIATE TRUNNION



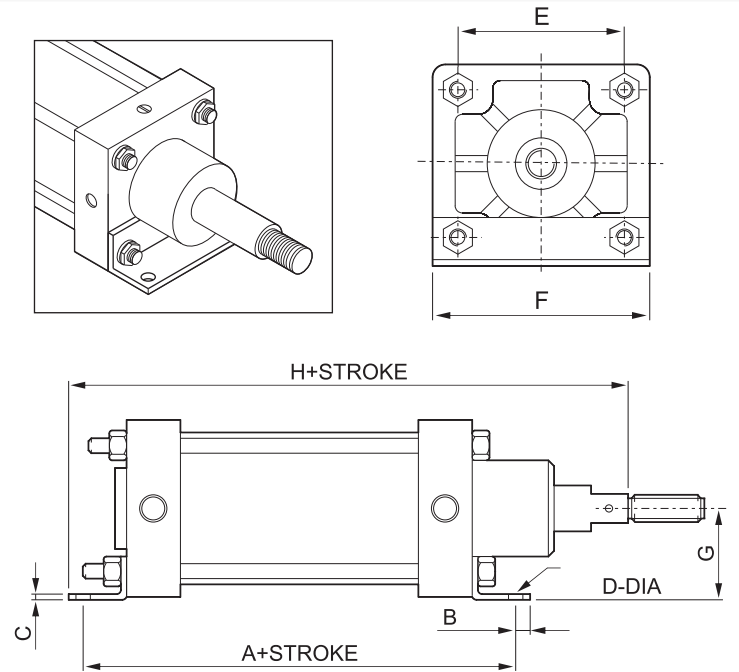
$X_i$  : to be specified by client

| BORE | A    | B  | C  | D  |
|------|------|----|----|----|
| 50   | 70   | 15 | 15 | 18 |
| 65   | 80.5 | 20 | 20 | 25 |
| 75   | 105  | 25 | 20 | 25 |
| 100  | 130  | 30 | 25 | 32 |
| 125  | 160  | 20 | 25 | 35 |
| 150  | 185  | 40 | 35 | 38 |
| 250  | 290  | 50 | 50 | 52 |
| 200  | 240  | 40 | 40 | 45 |



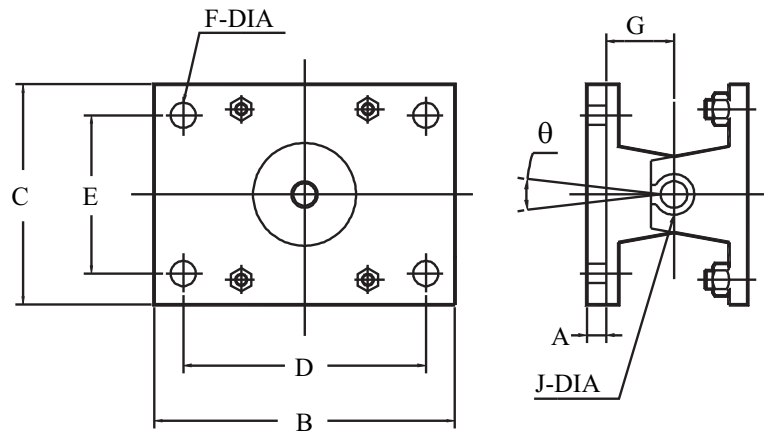
## ◆ FOOT MOUNTING

| BORE | A   | B   | C    | D    | E     | F   | G    | H     |
|------|-----|-----|------|------|-------|-----|------|-------|
| 19   | NIL | NIL | NIL  | NIL  | NIL   | NIL | NIL  | NIL   |
| 25   | 90  | 7   | 2    | 5.5  | 24.25 | 38  | 21.6 | 97.5  |
| 40   | 122 | 9   | 3    | 6.5  | 36.5  | 50  | 29   | 150   |
| 50   | 134 | 10  | 3    | 8.5  | 45    | 63  | 36   | 157   |
| 65   | 152 | 10  | 3    | 8.5  | 60    | 80  | 45   | 190   |
| 75   | 179 | 12  | 4    | 10.5 | 70.5  | 92  | 52   | 212   |
| 100  | 179 | 12  | 4    | 10.5 | 88    | 114 | 63   | 212   |
| 125  | 195 | 16  | 6    | 12.5 | 112   | 145 | 80   | 220   |
| 150  | 205 | 16  | 6    | 12.5 | 126   | 160 | 87   | 247   |
| 200  | 252 | 22  | 9.5  | 21   | 170.5 | 215 | 112  | 296.5 |
| 250  | 295 | 22  | 12.7 | 21   | 210   | 260 | 140  | 346   |
| 300  | 312 | 26  | 12.7 | 25   | 247   | 300 | 164  | 359   |



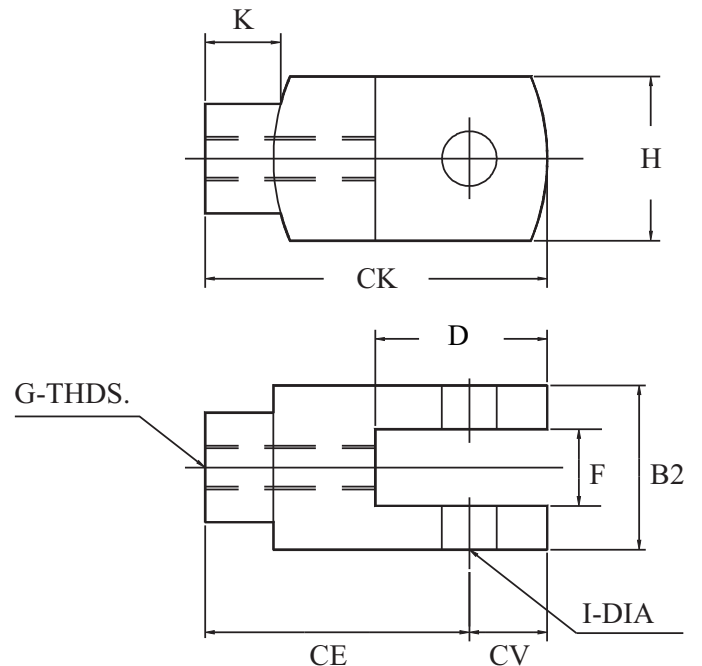
## ◆ REAR CLEVIS WITH SWIVEL BRACKET

| BORE DIA | A  | B   | C     | D   | E     | F    | G  | H    | J  | θ  |
|----------|----|-----|-------|-----|-------|------|----|------|----|----|
| 25       | 5  | 62  | 38    | 52  | 28    | 5.5  | 13 | 82.5 | 8  | 40 |
| 40       | 10 | 80  | 50    | 67  | 36.5  | 6.5  | 25 | 147  | 12 | 40 |
| 50       | 10 | 102 | 63    | 84  | 45    | 8.5  | 25 | 147  | 12 | 40 |
| 65       | 13 | 140 | 80    | 110 | 56    | 10.5 | 30 | 178  | 16 | 40 |
| 75       | 13 | 140 | 92    | 116 | 68    | 10.5 | 32 | 202  | 20 | 40 |
| 100      | 13 | 160 | 117   | 137 | 93    | 10.5 | 38 | 208  | 20 | 40 |
| 125      | 19 | 190 | 150   | 170 | 112   | 12.5 | 45 | 234  | 25 | 40 |
| 150      | 19 | 216 | 174   | 190 | 126   | 12.5 | 45 | 240  | 25 | 40 |
| 200      | 25 | 315 | 220.5 | 265 | 170.5 | 21   | 50 | 279  | 32 | 40 |
| 250      | 30 | 360 | 267   | 310 |       | 21   | 75 | 354  | 38 | 40 |
| 300      | 30 | 450 | 310   | 385 | 247   | 25   | 78 | 354  | 38 | 40 |



## ◆ ROD END FORK

| BORE DIA | D  | F    | G THD.   | K  | CV | CE  | B2 | H  | CK  | I DIA |
|----------|----|------|----------|----|----|-----|----|----|-----|-------|
| 40       | 24 | 9.5  | M12X1.25 | -  | 10 | 30  | 19 | 19 | 40  | 9.5   |
| 50       | 50 | 16   | M12X1.25 | 12 | 18 | 59  | 32 | 32 | 77  | 16    |
| 65       | 50 | 20   | M16X1.5  | 15 | 18 | 62  | 38 | 38 | 80  | 20    |
| 75       | 50 | 20   | M20X2.5  | 15 | 18 | 62  | 38 | 38 | 80  | 20    |
| 100      | 50 | 20   | M20X2.5  | 15 | 18 | 62  | 38 | 38 | 80  | 20    |
| 125      | 60 | 25.7 | M24X3    | 25 | 24 | 76  | 50 | 50 | 100 | 25.4  |
| 150      | 60 | 25.7 | M24X3    | 25 | 24 | 76  | 50 | 50 | 100 | 25.4  |
| 200      | 70 | 34   | M30X3.5  | -  | 30 | 80  | 64 | 64 | 110 | 30    |
| 250      | 90 | 40   | M42X4.5  | -  | 40 | 125 | 88 | 80 | 165 | 36    |
| 300      | 90 | 40   | M42X4.5  | -  | 40 | 125 | 88 | 80 | 165 | 36    |



# Modeling Chart for Series 50 Cylinder

## ◆Series 50 Cylinder

The chart given below gives the criteria for selecting your model number while ordering spares. However, stroke length is not determined by the chart and has to be specified while ordering spare cylinders.

| FIRST AND SECOND DIGIT |                                                                              |
|------------------------|------------------------------------------------------------------------------|
| SR. NO.                | DESCRIPTION                                                                  |
| 50                     | DIMENSIONS AS PER ‘LUTHRA’ STANDARD                                          |
| 51                     | DIMENSIONS AS PER CLIENTS DRAWING                                            |
| 52                     | DIMENSIONS AS PER STANDARD CATALOGUE EXCEPT LARGER PISTON ROD DIAMETER USED. |
| 60                     | VALVE MOUNTING TYPE                                                          |

| THIRD DIGIT |                                                       |
|-------------|-------------------------------------------------------|
| SR.NO.      | DESCRIPTION                                           |
| 1           | SINGLE ACTING GRAVITY RETURN TYPE / BALANCER CYLINDER |
| 2           | DOUBLE ACTING TYPE                                    |
| 3           | DOUBLE ENDED TYPE                                     |
| 4           | SINGLE ACTING SPRING RETURN TYPE                      |
| 5           | SINGLE ACTING SPRING TO FORWARD TYPE                  |
| 6           | TANDEM                                                |
| 7           | STROKE ADJUSTABLE                                     |

| FOURTH AND FIFTH DIGIT |    |     |     |     |     |     |     |     |     |     |     |     |     |     |
|------------------------|----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| SR. NO.                | 00 | ‘01 | ‘11 | ‘15 | ‘02 | ‘14 | ‘03 | ‘04 | ‘05 | ‘06 | ‘08 | 10  | 12  | 16  |
| DESC.<br>(bore,mm)     | 19 | 25  | 32  | 40  | 50  | 65  | 75  | 100 | 125 | 150 | 200 | 250 | 300 | 350 |

| SIXTH DIGIT : MOUNTING TYPE |                     |                 |                |                 |                |                   |      |      |                           |
|-----------------------------|---------------------|-----------------|----------------|-----------------|----------------|-------------------|------|------|---------------------------|
| SR.NO. BLANK                |                     | 1               | 2              | 3               | 4              | 5                 | 6    | 7    | 8                         |
| DESC.                       | STD.TIE<br>ROD TYPE | FRONT<br>FLANGE | REAR<br>FLANGE | FRONT<br>CLEVIS | REAR<br>CLEVIS | CENTRE<br>TRUNION | FOOT | NECK | REAR<br>TRUNION<br>(MALE) |

e.g.: Serial no. 52 5 14 3 pneumatic cylinder implies standard ‘ LUTHRA’ dimensions with larger dia piston rod, single acting spring to forward type, bore 65mm and front clevis mounting.



## ◆ Series 'T' Midget Cylinders

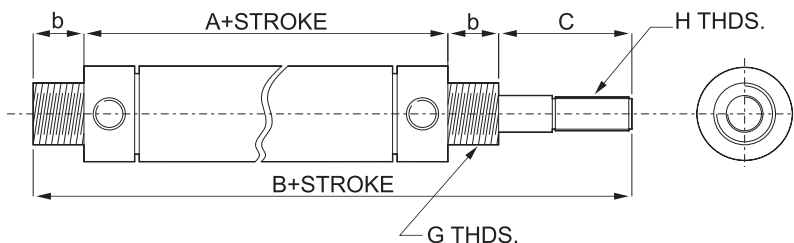
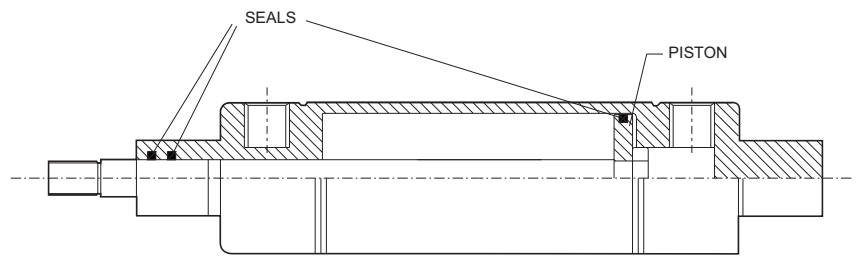


Series - T cylinders are available in bore sizes of 25mm. Higher bore sizes of upto 40mm are available on request. These cylinders have improved aesthetic quality as compared to Tie rod mounted cylinder. Also as the front cover is threaded to the tube, seals can be easily replaced. Cylinder can be directly neck mounted as the front / rear covers are threaded reducing system installation time.

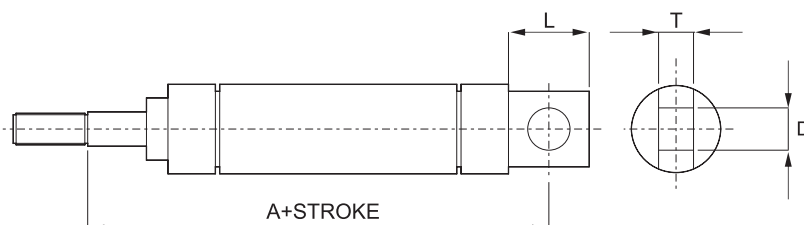
\*Available in non-cushioned & fixed cushioning type.

## ◆ Technical Characteristics

Working Pressure : 1 to 10 bar  
 Ambient Temperature : -20 to 80°C  
 Fluid : filtered air / water  
 Barrel : Brass  
 End Caps : Aluminium  
 Piston : Aluminium  
 Piston Rods : En8 Hard chrome plated  
 Seals : Nitrile



| Bore | A  | b  | F  | c  | G thds.  | H thds. | B   |
|------|----|----|----|----|----------|---------|-----|
| 25   | 72 | 14 | 55 | 22 | M 20X1.5 | M8X1.25 | 124 |



| Bore | L  | T  | D  | A   |
|------|----|----|----|-----|
| 25   | 25 | 12 | 12 | 107 |



## TYPES

### SERIES A

Tie Rod Mounted  
Round Aluminum Tube

### SERIES AX

Square Aluminium Tube  
Instead Road Aluminium Tube  
to improve Aesthetics



## Characteristic

Tube - Aluminium

Cover - Die Casted Aluminium

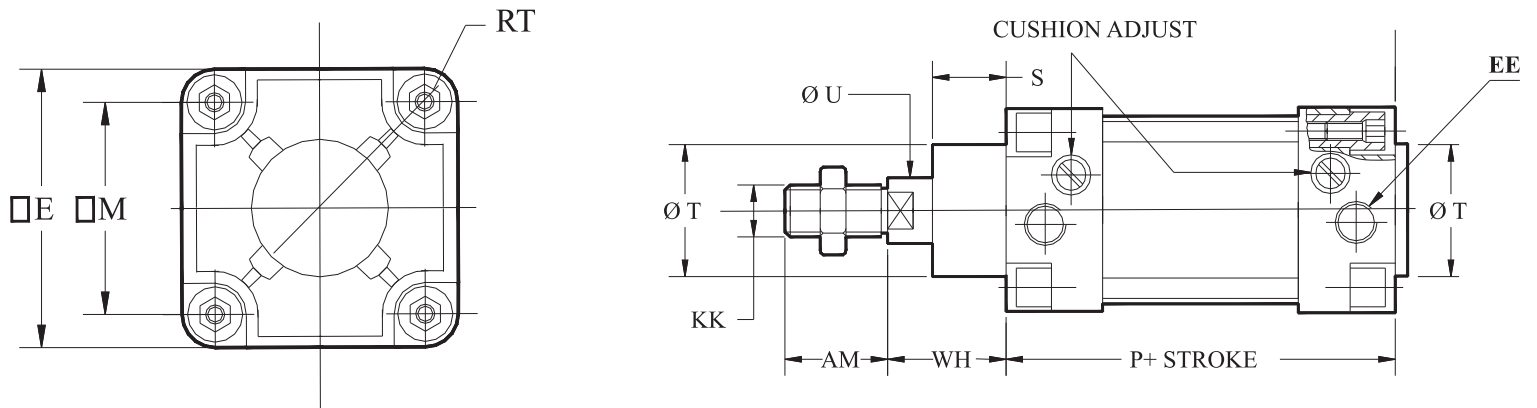
Piston - Delrin

Seals - Nitrile.

## FEATURES

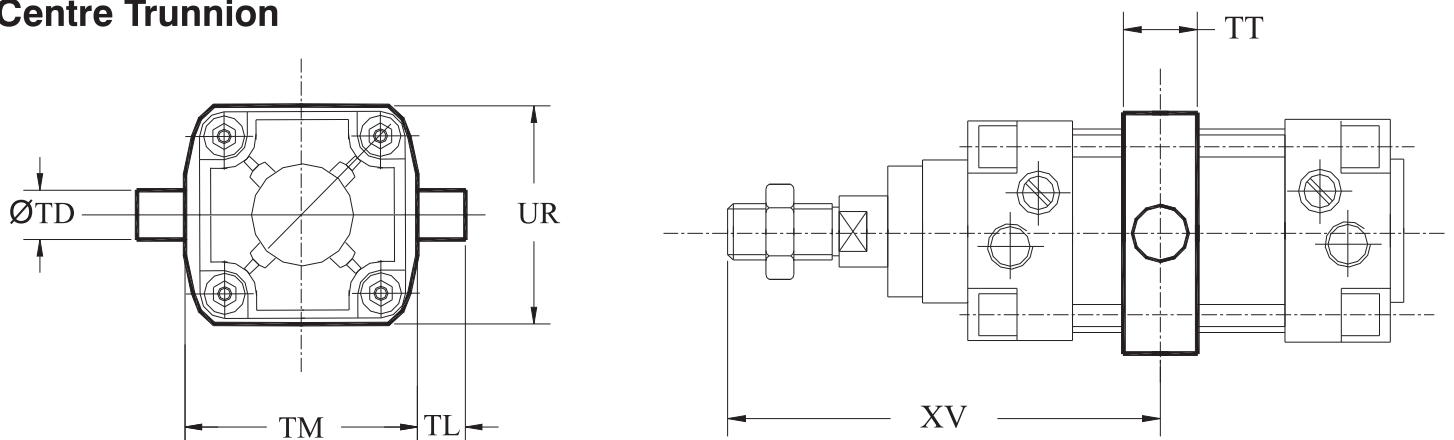
Internal Seals Orientation & parts details

Series 50 cylinder s refer pg. no. 2



| BORE DIA | KK       | AM | dia U | dia T e11 | S  | sq.E max. | sq.M | RT  | EE   | WH | P   |
|----------|----------|----|-------|-----------|----|-----------|------|-----|------|----|-----|
| 32       | M10x1.25 | 20 | 11.3  | 28        | 16 | 45        | 32.5 | M5  | G1/8 | 26 | 94  |
| 40       | M12x1.25 | 22 | 16    | 34        | 20 | 55        | 38   | M6  | G1/4 | 30 | 105 |
| 50       | M16x1.5  | 32 | 20    | 43        | 22 | 64.5      | 46.5 | M6  | G1/4 | 34 | 111 |
| 63       | M16x1.5  | 32 | 20    | 47.5      | 22 | 80        | 56.5 | M8  | G3/8 | 37 | 124 |
| 80       | M20X1.5  | 42 | 25    | 48        | 26 | 97        | 72   | M10 | G3/8 | 41 | 136 |
| 100      | M20X1.5  | 42 | 25    | 48        | 34 | 118       | 89   | M10 | G1/2 | 47 | 144 |

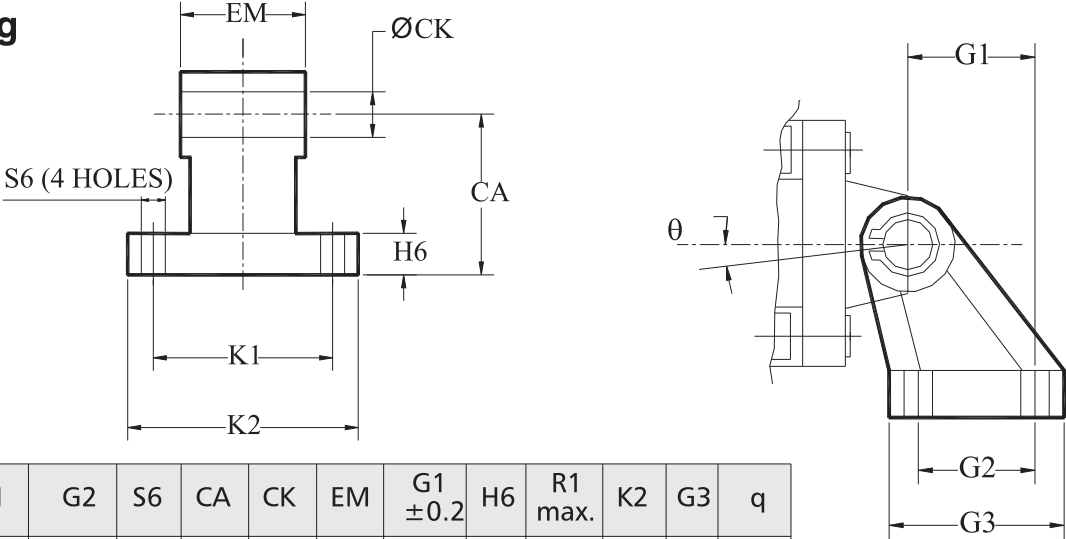
## ◆ Centre Trunnion



| BORE DIA | TD | TL | TM  | UR  | TT | XV |
|----------|----|----|-----|-----|----|----|
| 32       | 12 | 12 | 50  | 65  | 16 | *  |
| 40       | 16 | 16 | 63  | 71  | 22 | *  |
| 50       | 16 | 16 | 75  | 92  | 24 | *  |
| 63       | 20 | 20 | 90  | 102 | 28 | *  |
| 80       | 20 | 20 | 110 | 122 | 32 | *  |
| 100      | 25 | 25 | 132 | 135 | 40 | *  |

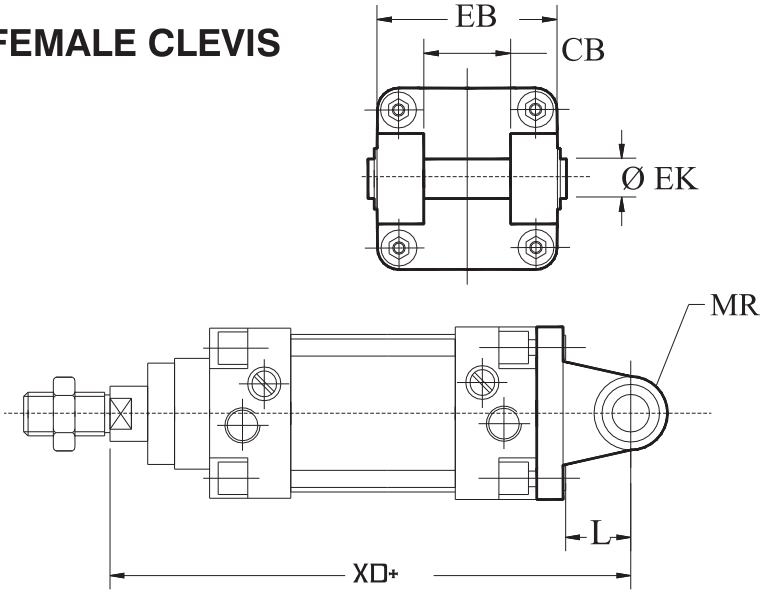
\* : to be specified by client

◆ Clevis Foot Mounting



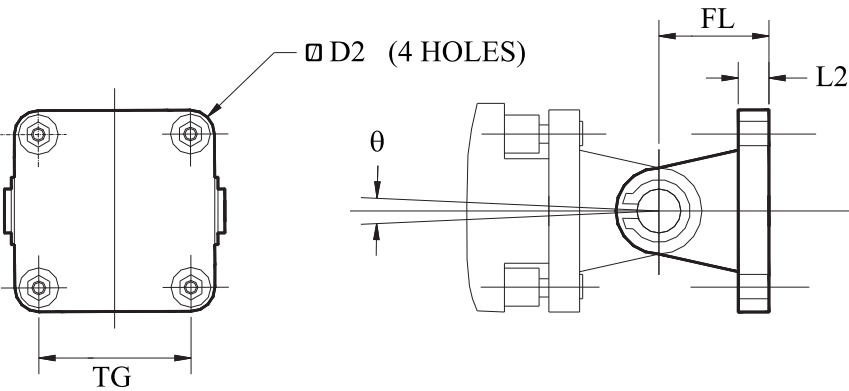
| BORE DIA | K1 | G2 | S6  | CA | CK | EM | G1 ±0.2 | H6 | R1 max. | K2 | G3 | q  |
|----------|----|----|-----|----|----|----|---------|----|---------|----|----|----|
| 32       | 38 | 18 | 5.5 | 32 | 10 | 26 | 21      | 8  | 10      | 51 | 31 | 17 |
| 40       | 41 | 22 | 5.5 | 36 | 12 | 28 | 24      | 10 | 12      | 54 | 35 | 17 |
| 50       | 50 | 30 | 6.6 | 45 | 12 | 32 | 33      | 12 | 12      | 65 | 45 | 17 |
| 63       | 52 | 35 | 6.6 | 50 | 16 | 40 | 37      | 12 | 16      | 67 | 50 | 17 |
| 80       | 66 | 40 | 9   | 63 | 16 | 50 | 47      | 14 | 16      | 86 | 60 | 17 |
| 100      | 76 | 50 | 9   | 71 | 20 | 60 | 55      | 15 | 20      | 96 | 80 | 10 |

◆ FEMALE CLEVIS



| BORE DIA | EB max | dia EK | L  | MR | CB | XD+ | tol |
|----------|--------|--------|----|----|----|-----|-----|
| 32       | 45     | 10     | 13 | 11 | 26 | 142 | ± 2 |
| 40       | 52     | 12     | 15 | 13 | 28 | 160 | ± 2 |
| 50       | 60     | 12     | 16 | 13 | 32 | 170 | ± 2 |
| 63       | 70     | 16     | 20 | 17 | 40 | 190 | ± 2 |
| 80       | 90     | 16     | 23 | 17 | 50 | 210 | ± 2 |
| 100      | 110    | 20     | 25 | 21 | 60 | 230 | ± 2 |

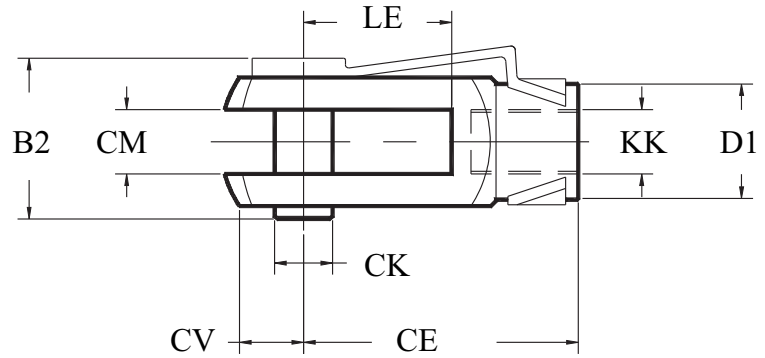
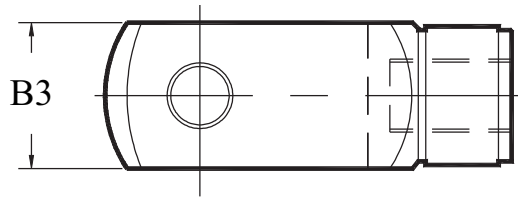
◆ REAR CLEVIS WITH MOUNTING BRACKET



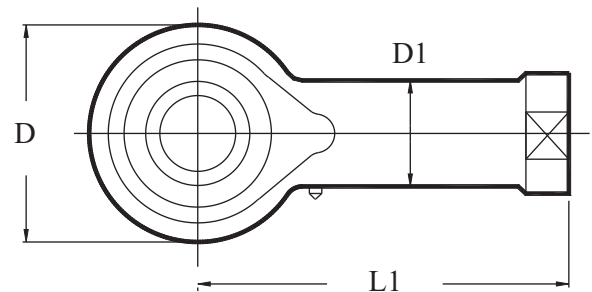
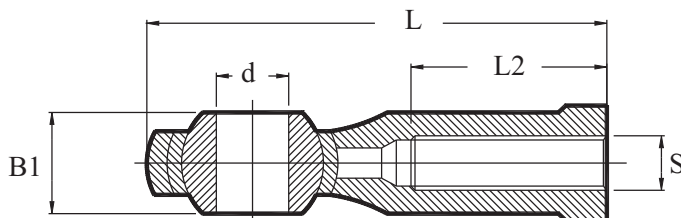
| BORE DIA | TG | D2   | L2   | FL | q  |
|----------|----|------|------|----|----|
| 32       | 32 | 6.4  | 5.5  | 22 | 50 |
| 40       | 40 | 6.4  | 8.5  | 25 | 50 |
| 50       | 48 | 6.4  | 8    | 27 | 40 |
| 63       | 60 | 8.4  | 10.5 | 32 | 50 |
| 80       | 72 | 10.5 | 14.5 | 36 | 36 |
| 100      | 89 | 10.5 | 14.5 | 41 | 36 |



## ◆ ROD END FORK

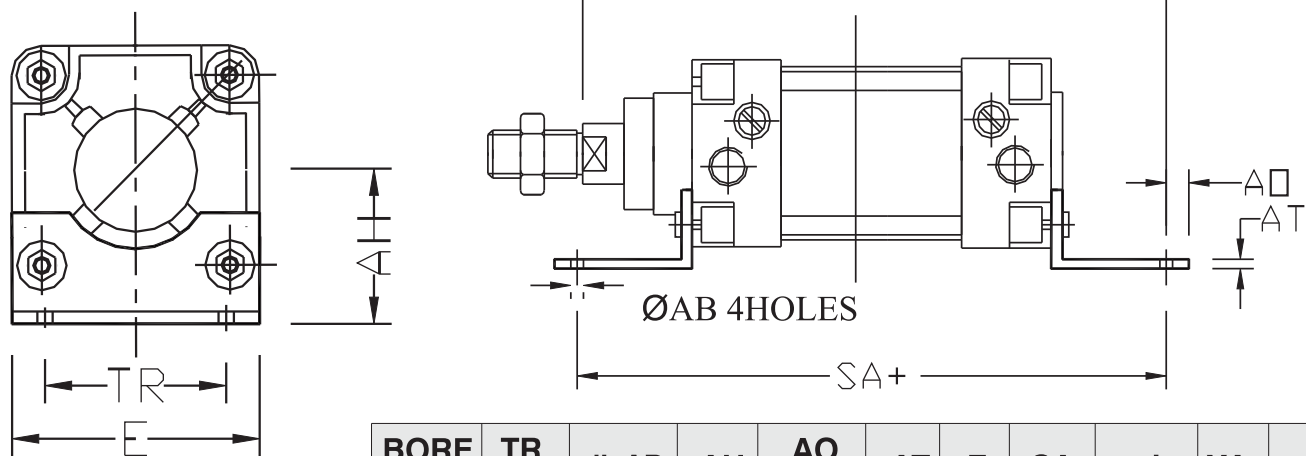


| BORE DIA. | KK       | B2 | B3 | CE<br>±0.4 | CK<br>Dia<br>H9 | CM | CV | LE |
|-----------|----------|----|----|------------|-----------------|----|----|----|
| 32        | M10X1.25 | 26 | 20 | 40         | 10              | 10 | 12 | 20 |
| 40        | M12X1.25 | 31 | 24 | 48         | 12              | 12 | 14 | 24 |
| 50        | M16X1.5  | 39 | 32 | 64         | 16              | 16 | 19 | 32 |
| 63        | M16X1.5  | 39 | 32 | 64         | 16              | 16 | 19 | 32 |
| 80        | M20X1.5  | 54 | 40 | 80         | 20              | 20 | 25 | 40 |
| 100       | M20X1.5  | 54 | 40 | 80         | 20              | 20 | 25 | 40 |



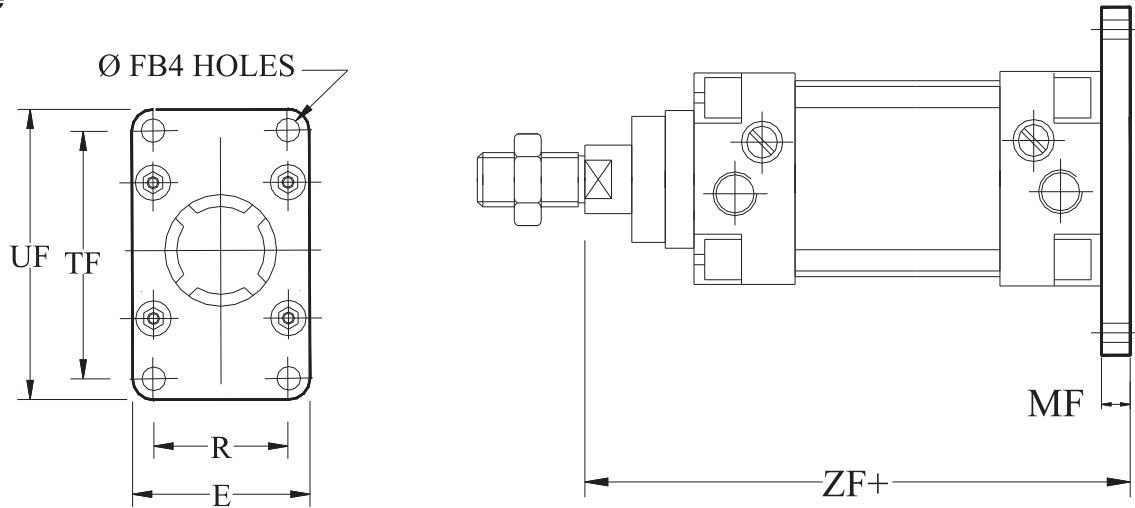
| BORE                                          | d<br>ISO<br>H7 | Thread S | D  | B1 | L   | L1  | L2 | D1   | BALL<br>DIA<br>INCH | Basic static<br>load capacity<br>Cs<br>kgf |
|-----------------------------------------------|----------------|----------|----|----|-----|-----|----|------|---------------------|--------------------------------------------|
| 32                                            | 10             | M10X1.25 | 26 | 14 | 56  | 43  | 21 | 15   | 3/4                 | 1360                                       |
| 40                                            | 12             | M12X1.25 | 30 | 16 | 65  | 50  | 24 | 17.5 | 7/8                 | 1730                                       |
| 50 / 63                                       | 16             | M16X1.5  | 38 | 21 | 83  | 64  | 33 | 22   | 1 1/8               | 2590                                       |
| 80 / 100                                      | 18             | M20X1.5  | 46 | 25 | 100 | 77  | 40 | 27.5 | 1 3/8               | 3620                                       |
| <b>SERIES 50 PNEUMATIC CYLINDER: MOUNTING</b> |                |          |    |    |     |     |    |      |                     |                                            |
| <b>40/50/65 MM BORE SAME AS ABOVE</b>         |                |          |    |    |     |     |    |      |                     |                                            |
| 75/100                                        | 20             | M20X2.5  | 46 | 25 | 100 | 77  | 40 | 27.5 | 1 3/8               | 3620                                       |
| 125/150                                       | 25             | M24X3    | 60 | 31 | 124 | 94  | 48 | 33.5 | 1 11/16             | 7410                                       |
| 200                                           | 30             | M30X3.5  | 70 | 37 | 145 | 110 | 56 | 40   | 2                   | 9400                                       |
| FOR HIGHER SIZE CONTACT FACTORY               |                |          |    |    |     |     |    |      |                     |                                            |

◆ Foot Mounting

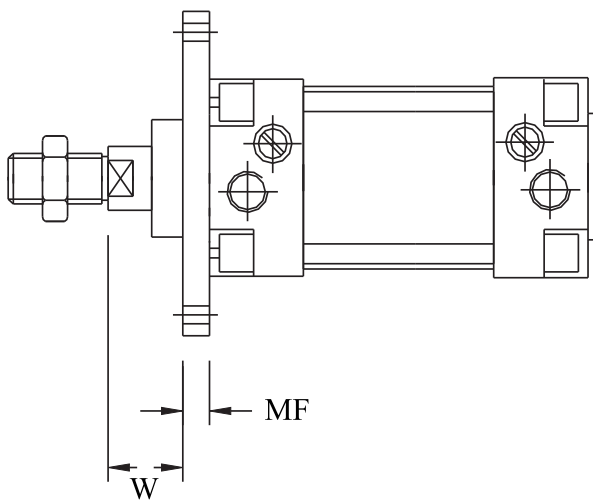


| BORE DIA | TR ± 0.3 | diaAB | AH | AO max. | AT | E   | SA  | tol.   | XA  | tol.   |
|----------|----------|-------|----|---------|----|-----|-----|--------|-----|--------|
| 32       | 32       | 7     | 32 | 11      | 4  | 43  | 142 | ± 1.25 | 144 | ± 1.25 |
| 40       | 36       | 9     | 36 | 15      | 4  | 54  | 161 |        | 163 |        |
| 50       | 45       | 9     | 45 | 15      | 6  | 62  | 170 |        | 175 |        |
| 63       | 50       | 9     | 50 | 15      | 6  | 82  | 185 | ± 1.6  | 190 | ± 1.6  |
| 80       | 63       | 12    | 63 | 16      | 6  | 100 | 210 |        | 215 |        |
| 100      | 75       | 14    | 71 | 18      | 6  | 117 | 220 |        | 230 |        |

◆ Rear Flange



◆ Front Flange



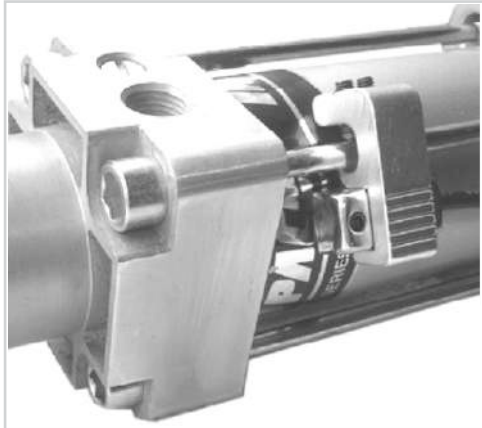
| BORE DIA | TF ±0.3 | R ±0.3 | FB H13 | MF | UF  | E   | ZF  | W  | tol. |
|----------|---------|--------|--------|----|-----|-----|-----|----|------|
| 32       | 64      | 32     | 7      | 10 | 80  | 46  | 130 | 16 | ±2   |
| 40       | 72      | 36     | 9      | 10 | 90  | 55  | 145 | 20 |      |
| 50       | 90      | 45     | 9      | 12 | 110 | 65  | 155 | 25 |      |
| 63       | 100     | 50     | 9      | 12 | 120 | 83  | 170 | 25 | ±2.5 |
| 80       | 126     | 63     | 12     | 16 | 155 | 101 | 190 | 30 |      |
| 100      | 150     | 75     | 14     | 16 | 185 | 118 | 205 | 35 |      |

## ◆ Reed Switch

For Magnetic cylinders only

Function :

The Reed switch is mounted on the tie rod of the pneumatic cylinder. It is used for proximity sensing of the magnet present on the piston of the cylinder. The reed switch sends an electrical impulse to the solenoid valve / other control device when the piston approaches the sensing position.



Model : LSBD2 PM  
(WITH LED)



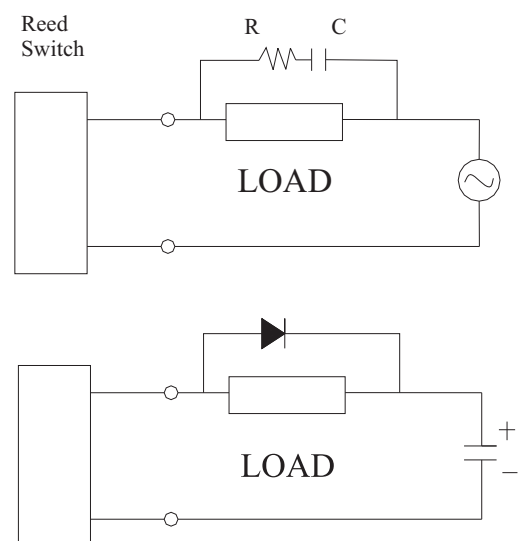
Model : R1  
(WITH LED)

Note :

- 1) When inductive loads are switched, a high voltage peak is produced at the moment of switch - off. For , this reason, proximity switch must be provided with a protective circuit.
- 2) The cylinder with magnetically actuated reed switches should not be fitted at places where there are strong magnetic fields.

| Model                | r1                        |
|----------------------|---------------------------|
| Operating voltage    | UPTO 48 VDC / 4 - 240 VAC |
| Switching current    | 5 - 40 mA                 |
| Operating temerature | 5 - 60 degrees Celcius    |
| Response time        | On / Off < 1 ms           |
| Contact rating       | 6 (3) W, 8 (4) VA         |
| Swicth type          | Normally open             |

### External Protection circuit



**R and C** : rating should be based on the load condition

◆ISO 6431 Cylinder

| FIRST DIGIT                  |
|------------------------------|
| A - Round Aluminum Tube type |
| AX - Square Profile Tube     |

| SECOND DIGIT - TYPE |                                 |
|---------------------|---------------------------------|
| 2                   | Double acting type              |
| 3                   | Double Ended                    |
| 4                   | Single Acting Spring Return     |
| 5                   | Single Acting Spring to Forward |

| THIRD & FOURTH DIGIT - BORE SIZE |    |    |    |    |    |
|----------------------------------|----|----|----|----|----|
| DIGIT                            | 32 | 40 | 50 | 63 | 80 |
| BORE                             | 32 | 40 | 50 | 63 | 80 |

| FIFTH DIGIT : MOUNTING TYPE |                  |              |             |              |             |                |      |      |                     |
|-----------------------------|------------------|--------------|-------------|--------------|-------------|----------------|------|------|---------------------|
| SR.NO. BLANK                |                  | 1            | 2           | 3            | 4           | 5              | 6    | 7    | 8                   |
| DESC.                       | STD.TIE ROD TYPE | FRONT FLANGE | REAR FLANGE | FRONT CLEVIS | REAR CLEVIS | CENTRE TRUNION | FOOT | NECK | REAR TRUNION (MALE) |

\* Available with External Mounting only

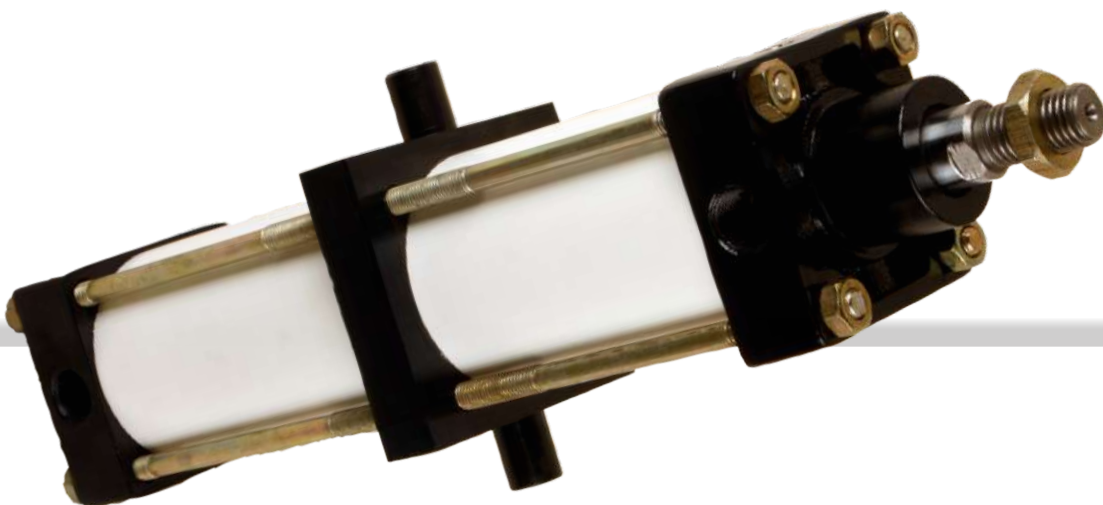
### Features:

- 1) **Cover** - Aluminum Bore 40 - 80 Bore  
Cast Iron - 100 - 250 Bore
- 2) **TUBE** - Aluminum Bore 40 - 80 Bore  
M.S. duly Honed - Bore 100 to 250  
Hard Chrome Plated
- 3) **Seals** - Nitrile Suitable for 80°C Max.

### COMPARISON TO STANDARD SERIES 50 LUTHRA CYLINDERS

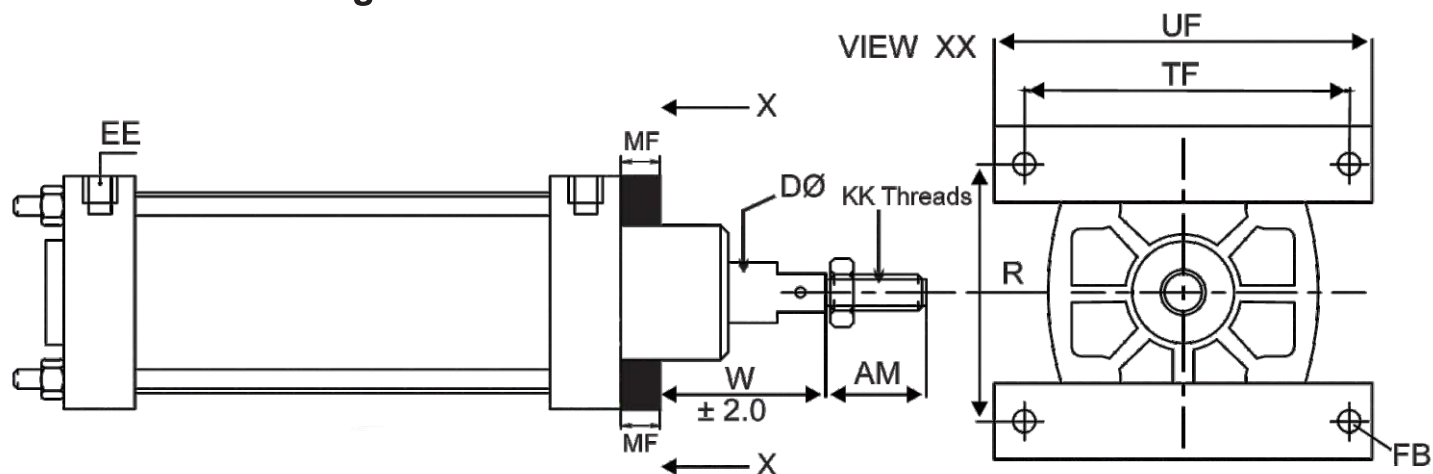
- a) More Heavy Duty
- b) Mounting Dimensions are totally different
- c) Shaft diameter and threads are different compared to series 50 cylinders

Parts Seals orientation :- Same as shown in Pg. No.2

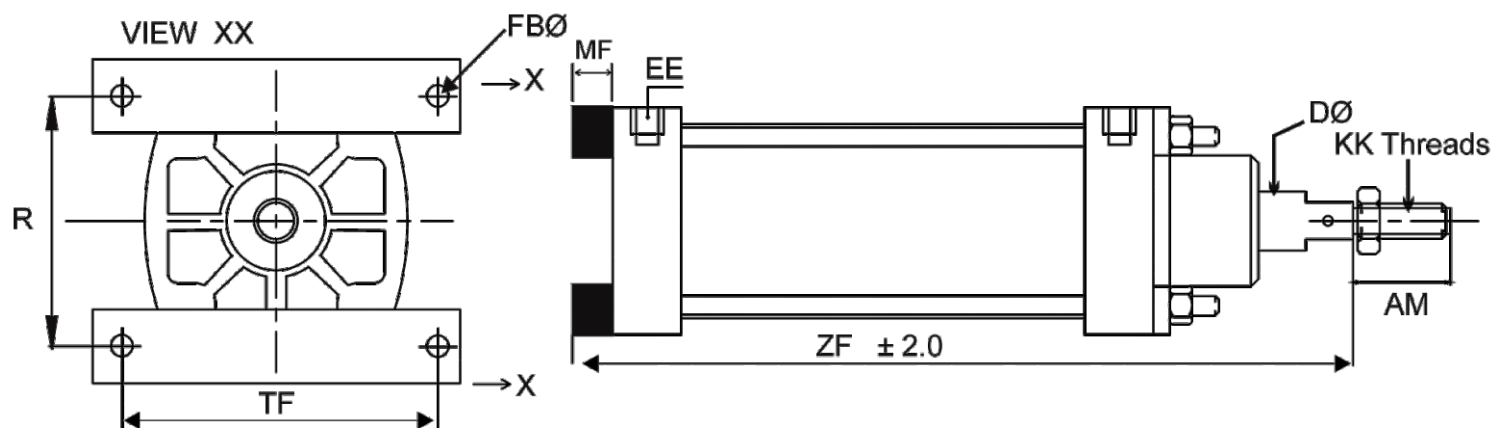




## ♦ Series 90 - Front Flange

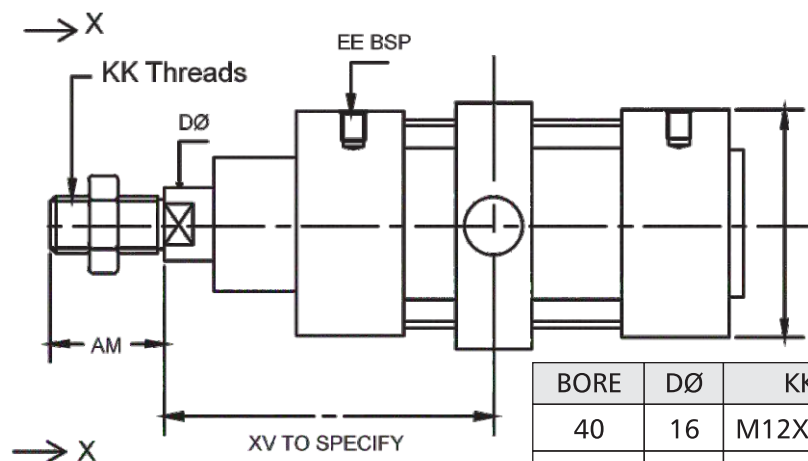


## ♦ Series 90 - Rear Flange

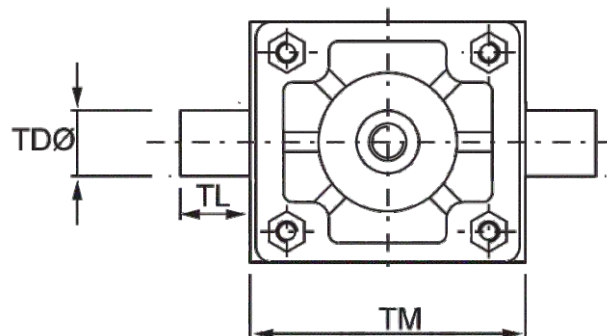


| BORE | DØ   | KK       | AM | EE     | W  | ZF  | TF  | R   | UF  | FbØ | MF |
|------|------|----------|----|--------|----|-----|-----|-----|-----|-----|----|
| 40   | 16   | M12X1.25 | 24 | 1/4BSP | 20 | 145 | 72  | 36  | 96  | 9   | 9  |
| 50   | 20   | M16X1.5  | 32 | 1/4BSP | 25 | 155 | 90  | 45  | 115 | 9   | 9  |
| 63   | 20   | M16X1.5  | 32 | 3/8BSP | 25 | 170 | 100 | 50  | 130 | 9   | 12 |
| 60   | 25.4 | M20X1.5  | 40 | 3/8BSP | 30 | 190 | 126 | 63  | 165 | 12  | 13 |
| 100  | 25.4 | M20X1.5  | 40 | 1/2BSP | 35 | 205 | 150 | 75  | 187 | 14  | 13 |
| 125  | 35   | M27X2    | 55 | 1/2BSP | 45 | 245 | 180 | 90  | 224 | 16  | 19 |
| 160  | 40   | M36X2    | 72 | 3/4BSP | 60 | 280 | 230 | 115 | 280 | 18  | 19 |
| 200  | 40   | M36X2    | 72 | 3/4BSP | 70 | 300 | 270 | 135 | 320 | 22  | 25 |
| 250  | 50.8 | M42X2    | 84 | 3/4BSP | 80 | 330 | 330 | 165 | 395 | 26  | 25 |

## ♦ Series 90 - ISO 15552 Mounting - Centre Trunion

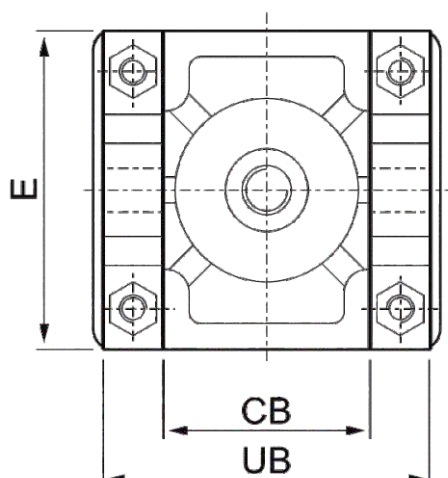
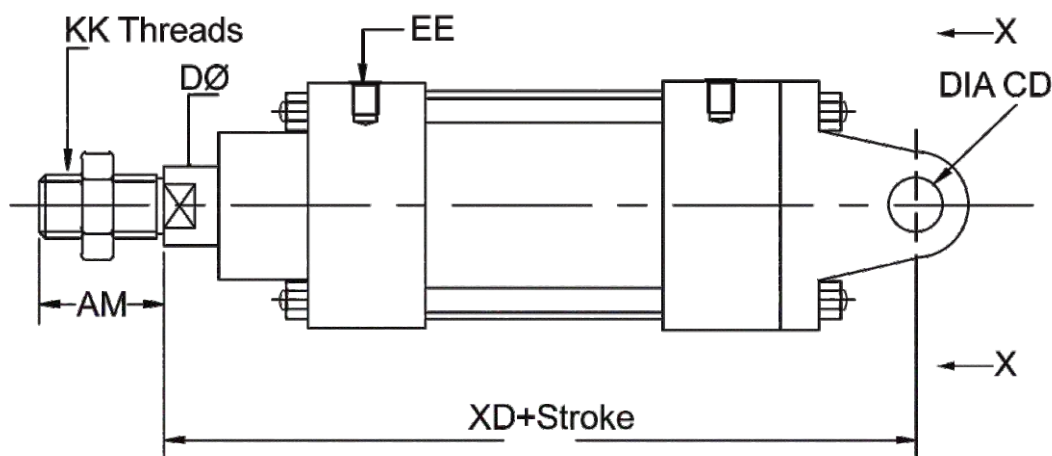


VIEW XX



| BORE | DØ   | KK       | AM | EE(BSP) | TM  | TL | TD | LSQ |
|------|------|----------|----|---------|-----|----|----|-----|
| 40   | 16   | M12X1.25 | 24 | 1/4BSP  | 63  | 16 | 16 | 55  |
| 50   | 20   | M16X1.5  | 32 | 1/4BSP  | 75  | 16 | 16 | 63  |
| 63   | 20   | M16X1.5  | 32 | 3/8BSP  | 90  | 20 | 20 | 76  |
| 60   | 25.4 | M20X1.5  | 40 | 3/8BSP  | 110 | 20 | 20 | 92  |
| 100  | 25.4 | M20X1.5  | 40 | 1/2BSP  | 132 | 25 | 25 | 122 |
| 125  | 35   | M27X2    | 55 | 1/2BSP  | 160 | 25 | 25 | 152 |
| 160  | 40   | M36X2    | 72 | 3/4BSP  | 200 | 32 | 32 | 172 |
| 200  | 40   | M36X2    | 72 | 3/4BSP  | 250 | 32 | 32 | 230 |
| 250  | 50.8 | M42X2    | 84 | 3/4BSP  | 320 | 40 | 40 | 286 |

## Series 90 - ISO 15552 Mounting - Female Rear Clevis



| BORE | DØ   | KK       | AM | EE     | XD  | CD | CB  | UB  | E   |
|------|------|----------|----|--------|-----|----|-----|-----|-----|
| 40   | 16   | M12X1.25 | 24 | 1/4BSP | 160 | 12 | 28  | 52  | 55  |
| 50   | 16   | M12X1.25 | 32 | 1/4BSP | 170 | 12 | 32  | 60  | 63  |
| 63   | 20   | M16X1.5  | 32 | 3/8BSP | 190 | 16 | 40  | 70  | 76  |
| 80   | 25.4 | M20X1.5  | 40 | 3/8BSP | 210 | 16 | 50  | 90  | 92  |
| 100  | 25.4 | M20X1.5  | 40 | 1/2BSP | 230 | 20 | 60  | 110 | 122 |
| 125  | 35   | M27X2    | 55 | 1/2BSP | 275 | 25 | 70  | 130 | 152 |
| 160  | 40   | M36X2    | 72 | 3/4BSP | 315 | 30 | 90  | 154 | 175 |
| 200  | 40   | M36X2    | 72 | 3/4BSP | 335 | 30 | 90  | 170 | 235 |
| 250  | 50.8 | M42X2    | 84 | 3/4BSP | 375 | 40 | 110 | 220 | 290 |



◆ Series 90 ISO 15552 Cylinder

FIRST & SECOND DIGIT = 90 FOR SERIES 90

THIRD DIGIT = 2 FOR DOUBLE ACTING TYPE

| FOURTH & FIFTH DIGIT - BORE SIZE |    |    |    |    |     |     |     |     |     |
|----------------------------------|----|----|----|----|-----|-----|-----|-----|-----|
| DIGIT                            | 40 | 50 | 63 | 80 | 04  | 05  | 06  | 08  | 10  |
| BORE                             | 40 | 50 | 63 | 80 | 100 | 125 | 160 | 200 | 250 |

| SIXTH DIGIT : MOUNTING TYPE |                     |                        |                       |                         |                          |                                  |
|-----------------------------|---------------------|------------------------|-----------------------|-------------------------|--------------------------|----------------------------------|
| SR.NO. BLANK                |                     | 1                      | 2                     | 4                       | 5                        | 8                                |
| DESC.                       | STD.TIE<br>ROD TYPE | FRONT<br>FLANGE<br>MF1 | REAR<br>FLANGE<br>MF2 | FEMALE<br>CLEVIS<br>MP2 | CENTRE<br>TRUNION<br>MT4 | REAR<br>TRUNION<br>(MALE)<br>MP4 |

Eg. 90206 - 1 = ISO 15552 Cylinder

160 Bore - Front Flange Mounted

## Series 10 : Hydraulic Cylinder



Hydraulic Cylinders find their application in FLUID POWER when Force requirement is on the higher side. They are sturdier in construction as compared to pneumatic cylinders and are preferred when jerk free motions are required. These cylinders are available in different shapes & sizes to suit client applications.

Series 10 - Square construction assembled and bolting using Tie rods. Simple construction enables easy change of seals. Available in Bore sizes of 40 mm to 200 mm and pressure up to 220 Bar. Mounting accessories can be provided on such as Flange, Pivot, Foot brackets, Trunion etc. Cushioning possible on both ends.

Different types manufactured in this series.

Double Acting - Forward and return motion by oil.

Single Acting - Forward stroke by oil & return by load exerted on the piston rod.

### SERIES 10 :

Features - Cushioning possible at both ends to reduce impact at the end of the stroke.

Material of construction -

Tube - Carbon Steel duly hard chrome plated.

Seals - Fabric reinforced.

Covers - Steel Piston - Steel.

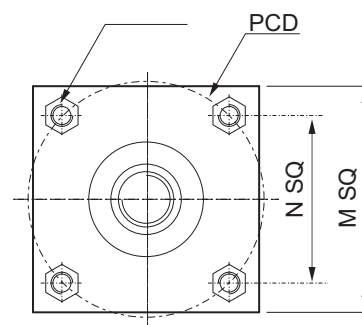
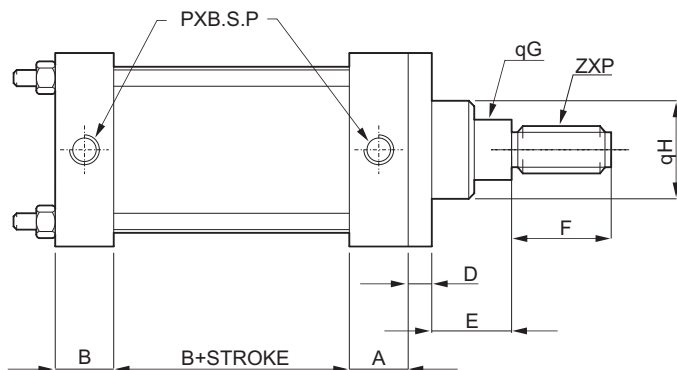
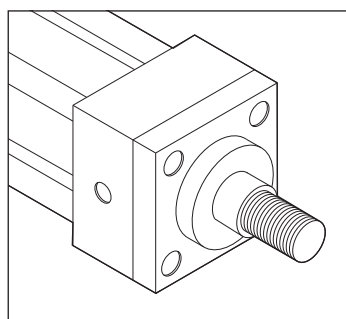
Piston Rod - En8 hard chrome plated.

Guide Bush - Gun Metal

Maxm operating pressure - 200 Bar Temperature Range - 85°C

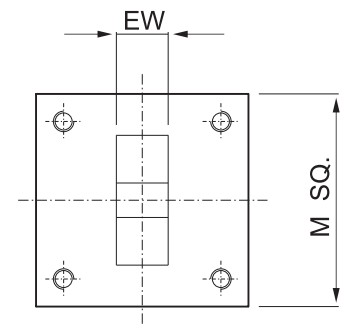
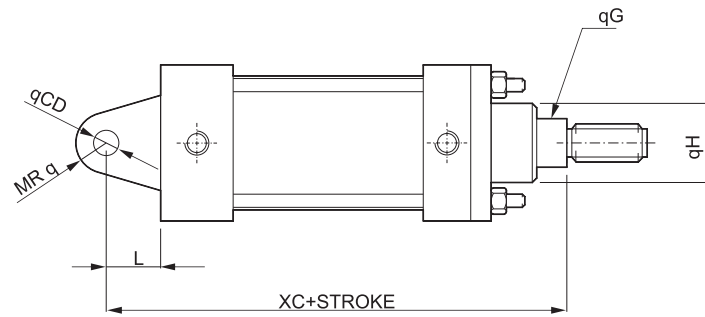
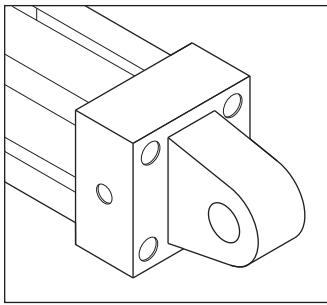


## Series 10 : Hydraulic Cylinder : Mounting

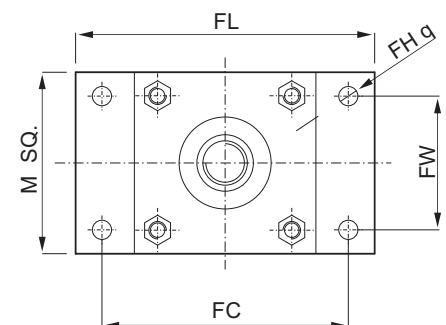
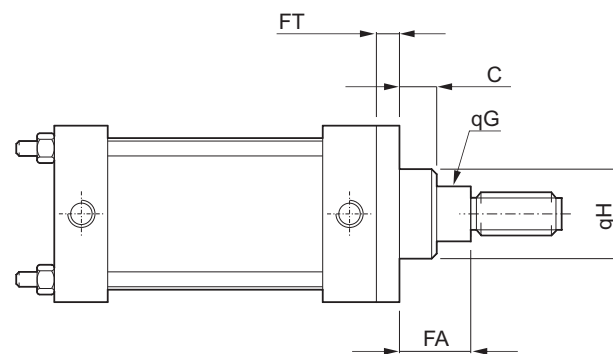
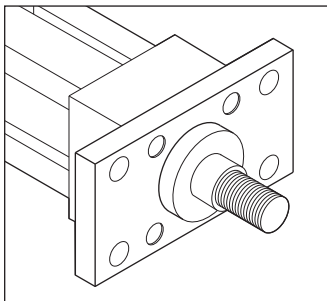


| SERIES 10: DOUBLE ACTING HYDRAULIC CYLINDER DIMENSION |     |          |       |    |    |    |    |    |    |     |     |      |         |
|-------------------------------------------------------|-----|----------|-------|----|----|----|----|----|----|-----|-----|------|---------|
| BORE                                                  | GØ  | ZXP      | PXBSP | A  | B  | S  | D  | E  | F  | MSQ | HØ  | N    | T       |
| 40                                                    | 18  | M14X1.5P | 3/8"  | 34 | 30 | 47 | 10 | 25 | 28 | 60  | 35  | 41.8 | M8      |
| 50                                                    | 25  | M20X1.5P | 3/8"  | 37 | 30 | 53 | 14 | 25 | 32 | 75  | 50  | 52.8 | M12     |
| 63                                                    | 35  | M27X2P   | 1/2"  | 38 | 30 | 69 | 18 | 29 | 45 | 88  | 55  | 65   | M12     |
| 80                                                    | 45  | M33X2P   | 3/4"  | 52 | 40 | 79 | 20 | 25 | 55 | 115 | 65  | 82.5 | M16X2   |
| 100                                                   | 50  | M33X2P   | 3/4"  | 58 | 49 | 88 | 22 | 35 | 57 | 125 | 75  | 97   | M16X2   |
| 125                                                   | 56  | M42X2P   | 3/4"  | 60 | 50 | 67 | 25 | 35 | 56 | 165 | 75  | 126  | M22X1.5 |
| 160                                                   | 70  | M48X2P   | 3/4"  | 65 | 56 | 86 | 30 | 35 | 68 | 208 | 92  | 155  | M27X2   |
| 200                                                   | 100 | M64X3    | 3/4"  | 76 | 50 | 78 | 38 | 48 | 90 | 265 | 140 | 198  | M36X2   |

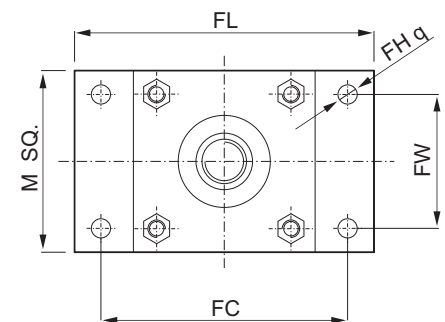
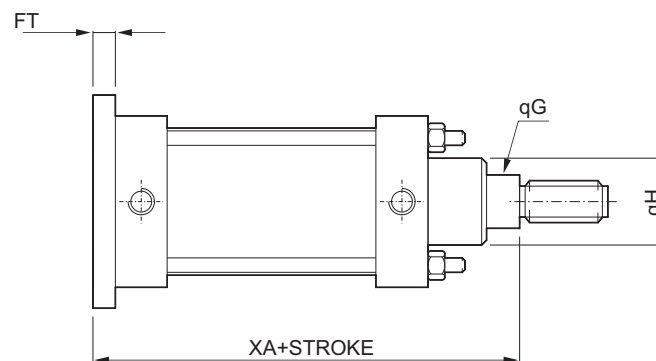
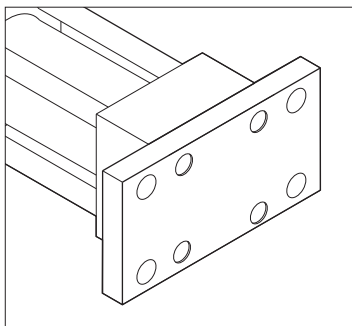
## ◆ Rear Pivot



## ◆ Front Flange



## ◆ Rear Flange



| BORE | XC  | CD | L  | EW | H <sub>0</sub> | G <sub>0</sub> | M   | MR <sub>0</sub> | FA | C  | FW  | FC  | FH <sub>0</sub> | FL  | FT | XA  |
|------|-----|----|----|----|----------------|----------------|-----|-----------------|----|----|-----|-----|-----------------|-----|----|-----|
| 40   | 167 | 14 | 22 | 20 | 30             | 18             | 60  | 17              | 22 | 7  | 41  | 87  | 11              | 115 | 10 | 155 |
| 50   | 193 | 20 | 36 | 30 | 50             | 25             | 75  | 22              | 23 | 7  | 52  | 106 | 13.5            | 140 | 14 | 171 |
| 63   | 226 | 20 | 36 | 30 | 55             | 35             | 88  | 22              | 29 | 9  | 65  | 117 | 14              | 142 | 18 | 208 |
| 80   | 256 | 25 | 40 | 38 | 65             | 45             | 115 | 32              | 25 | 5  | 83  | 149 | 18              | 182 | 20 | 236 |
| 100  | 307 | 36 | 55 | 50 | 75             | 50             | 125 | 45              | 35 | 10 | 97  | 162 | 17.5            | 210 | 22 | 274 |
| 125  | 307 | 45 | 64 | 60 | 85             | 56             | 166 | 50              | 32 | 8  | 126 | 208 | 22              | 260 | 28 | 271 |
| 160  | 344 | 50 | 70 | 70 | 110            | 70             | 208 | 55              | 32 | 10 | 155 | 253 | 26              | 320 | 30 | 304 |



## **LUTHRA HYDRO PNEUMATIC INDUSTRIES**

**2, Luthra Industrial Premises, 44- E, M.V. Marg, Safaid Pool, Mumbai- 400 072**

**Contact : +91-22-6691 6555 / 56 / 57**

**Email : [sales@hydropneumatic.net](mailto:sales@hydropneumatic.net)**

**Web : [www.luthrapneumsys.com](http://www.luthrapneumsys.com) | [www.hydropneumatic.net](http://www.hydropneumatic.net)**