Hydraulic cylinders type CK - square heads with tie rods to ISO 6020-2 - nominal pressure 16 MPa (160 bar) - max 25 MPa (250 bar)

CK cylinders have engineered double acting construction, designed to suit the requirements of industrial applications: top reliability, high performances and long working life.

- Bore sizes from 25 to 200 mm
- Up to 3 rod diameters per bore
- Strokes up to 5000 mm
- Single or double rod
- Rods and tie rods with rolled threads
- 15 standard mounting styles
- 6 seals options
- Adjustable or fixed cushioning
- Optional built-in position transducer, see tab. B310
- Attachments for rods and mounting styles, see tab. B500
For cylinder’s choice and sizing criteria see tab. B015

Available for download at www.atos.com

Software for assisted selection of Atos cylinders & servocylinders codes, including cylinder’s sizing, full technical information, 2D & 3D drawings in several CAD formats.

Mounting style, see sections B and C

C = fixed clevis
D = fixed eye
E = feet
G = front trunnion
H = rear trunnion
L = intermediate trunnion
N = front flange
P = rear flange
S = fixed eye + spherical bearing
V = threaded hole+tie rods extended
W = rear tie rods extended
X = basic execution
Y = front tie rods extended
Z = front threaded holes

REFERENCE ISO

MP1 (3)
MP3 (3)
M52
MT1 (3)
MT2 (3)
MT4 (4)
Me5
Me6 (3)
MPS5 (5)
MX7
MK2
MK1
MK3
MK5

Series number (1)

Heads’ configuration (2), see section D

Oil ports positions
B1 = front head
X = rear head
Cushioning adjustments positions, to be entered only if adjustable cushioning are selected
E1 = front head
Z = rear head
* = selected position (1, 2, 3 or 4)

Options (2)

Rod end, see section D
P = female thread
Q = light female thread
H = light male thread
Over sized oil ports, see section E
D = front oversized oil port
Y = rear oversized oil port
Proximity sensors, see section F
R = front sensor
S = rear sensor
Rod treatment, see section G
K = nickel and chrome plating
T = induction surface hardening and chrome plating
Air bleeds, see section H
A = front air bleed
W = rear air bleed
Draining, see section I
L = rod side draining

Sealing system, see section J

1 = (NBR + POLYURETHANE) high static and dynamic sealing
2 = (FKM + PTFE) very low friction and high temperatures
4 = (NBR + PTFE) very low friction and high speeds
6 = (NBR + PTFE) very low friction, single acting - pushing
7 = (NBR + PTFE) very low friction, single acting - pulling
8 = (NBR + PTFE and POLYURETHANE) low friction

Spacer, see section K

0 = none
2 = 50 mm
4 = 100 mm
6 = 150 mm
8 = 200 mm

Cushioning, see section L

Fast adjustable
1 = rear only
2 = front only
3 = front and rear
Slow adjustable
4 = rear only
5 = front only
6 = front and rear
Fast fixed
7 = rear only
8 = front only
9 = front and rear

(1) For spare parts request indicate the series number printed on the nameplate only for series < 30
(2) To be entered in alphabetical order
(3) Not available for double rod
(4) XV dimension must be indicated in the model code, see section
X = basic mounting

N (ISO ME5) = front flange mounting

P (ISO ME6) = rear flange mounting

C (ISO MP1) = fixed clevis mounting - supplied with pivot pin C-145

D (ISO MP3) = fixed eye mounting

S (ISO MP5) = fixed eye with spherical bearing mounting

E (ISO MS2) = side feet mounting

Top view of the rear foot
G (ISO MT1) = front trunnion mounting

H (ISO MT2) = rear trunnion mounting

L (ISO MT4) = intermediate trunnion mounting

V (ISO MX2) = rear tie rods extended mounting
Y (ISO MX3) = front tie rods extended mounting
W (ISO MX1) = both end tie rods extended mounting (*)
(*) see figure

Z (ISO MX5) = front threaded holes mounting
T (ISO MX7) = threaded holes with tie rods extended mounting (*)
(*) see figure

X = basic mounting for double rod

E = feet mounting for double rod
### INSTALLATION DIMENSIONS [mm] - see figures in section [4]

<table>
<thead>
<tr>
<th>Ø Rod</th>
<th>25</th>
<th>32</th>
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<th>50</th>
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<th>80</th>
<th>100</th>
<th>125</th>
<th>160</th>
<th>200</th>
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<td>28</td>
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<td>0.008</td>
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### RECOMMENDED SPACERS [mm]

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<th>0 ±0.12</th>
<th>14 ±0.12</th>
<th>16 ±0.13</th>
<th>20 ±0.12</th>
<th>22 ±0.12</th>
<th>28 ±0.12</th>
<th>35 ±0.12</th>
<th>40 ±0.15</th>
<th>55 ±0.15</th>
<th>70 ±0.2</th>
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</thead>
<tbody>
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<td>14</td>
<td>18</td>
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<td>28</td>
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<td>45</td>
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<td>156</td>
<td>188</td>
<td>220</td>
<td>260</td>
</tr>
</tbody>
</table>

### NOTES TO TABLE

1. If not otherwise specified in the figures in section 3, this value is the front and rear square heads dimension for all the mounting styles (see figure below).

2. This additional dimension has to be considered only for bores 25 and 32.

3. M - For strokes longer than M, one or more intermediate tie rods supports (Ø) are fitted on the cylinder housing to maintain the radial tension on the tie rods, thus keeping them rigidly fixed to the cylinder housing. The support has a larger overall dimensions of the square heads as indicated in note (t).

4. When oversized oil ports are selected (see section 4 and table 4 for dimensions and position) dimensions PJ and Y are respectively modified into PJ2 and Y1.

5. XV - For cylinders with mounting style L the stroke must always exceed the minimum values reported in the table. The requested XV value must be included between XV min and XV max and it must be always indicated, with dimension in millimeters, together with the cylinder code. See the following example:

   - C6K / 50 / 22 / 0500 - L301 - D - B163X1Z3

   - XV = 200

6. The tolerance is valid for strokes up to 1250 mm, for longer strokes the upper tolerance is given by the max stroke tolerance in section 4.

### STROKE SELECTION

Stroke to be selected a few mm longer than the working stroke, to prevent to use the cylinder heads as mechanical stroke-end.

Standard strokes to ISO 4393:

<table>
<thead>
<tr>
<th>Length</th>
<th>25</th>
<th>30</th>
<th>50</th>
<th>80</th>
<th>100</th>
<th>125</th>
<th>160</th>
<th>200</th>
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<tbody>
<tr>
<td>Strokes</td>
<td>250</td>
<td>300</td>
<td>500</td>
<td>800</td>
<td>1000</td>
<td>1250</td>
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<td></td>
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</table>

Maximum stroke:
- [2600 mm] for bores up to 40 mm
- [5000 mm] for other bores

Stroke tolerances:
- [± 2 mm] for strokes up to 1250 mm
- [± 5 mm] for strokes from 1250 to 3150 mm
- [± 8 mm] for strokes over 3150 mm

### SPACER

For strokes longer than 1000 mm, proper spacers have to be introduced in the cylinder's construction to increase the rod and piston guide and to protect them from overloads and premature wear. Spacers can be omitted for cylinders working in traction mode. The introduction of spacers increases the overall cylinder's dimensions: spacers' length has to be added to all stroke dependent dimensions in section 4.
## 6 ROD END DIMENSIONS [mm]

<table>
<thead>
<tr>
<th>Ø Rod</th>
<th>Male thread</th>
<th>Female thread</th>
<th>KK</th>
<th>KK1 (option N)</th>
<th>KF</th>
<th>KF1 (option F)</th>
<th>G</th>
<th>A1 or A2 (option KF1)</th>
<th>B</th>
<th>CH</th>
<th>F</th>
<th>RD</th>
<th>VE</th>
<th>VL</th>
<th>WF</th>
<th>WH</th>
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<tbody>
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<td>NA</td>
<td>6g</td>
<td>6g H6</td>
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<td>10</td>
<td>18</td>
<td>6</td>
<td>16</td>
<td>3</td>
<td>25</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>18</td>
<td>M14x1.5</td>
<td>M10x1.25</td>
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<td>18</td>
<td>18</td>
<td>14</td>
<td>10</td>
<td>30</td>
<td>10</td>
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<td>25</td>
<td>15</td>
<td>5</td>
</tr>
<tr>
<td>32</td>
<td>M12x1.25</td>
<td>M10x1.25</td>
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<td>16</td>
<td>22</td>
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<td>25</td>
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<tr>
<td>40</td>
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<td>24</td>
<td>28</td>
<td>18</td>
<td>10</td>
<td>62</td>
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<td>35</td>
<td>25</td>
<td>5</td>
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</tr>
<tr>
<td>50</td>
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<td>28</td>
<td>36</td>
<td>22</td>
<td>10</td>
<td>74</td>
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<td>41</td>
<td>25</td>
<td>7</td>
<td></td>
<td></td>
</tr>
<tr>
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<td>M16x1.5</td>
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<td>25</td>
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<tr>
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<td>45</td>
<td>10</td>
<td>105</td>
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<tr>
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<td>57</td>
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<tr>
<td>125</td>
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<td>63</td>
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<td>150</td>
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<td>57</td>
<td>35</td>
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<tr>
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<td>140</td>
<td>95</td>
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<td>3</td>
<td>57</td>
<td>35</td>
<td>15</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Notes:
- Dimensions A and A1 are according to ISO 4395 short type.
- Tolerances: max for male thread; min for female thread.

## 7 CYLINDER’S HOUSING FEATURES
The cylinder’s housings are made in “cold drawn and stressed steel”; the internal surfaces are lapped; diameter tolerance H8; roughness Ra ≤ 0.25 µm.

## 8 TIE RODS FEATURES
The cylinder’s tie rods are made in “normalized automatic steel”; end-threads are rolled to improve the file accuracy, improved fatigue working life and high wear resistance. See tab. B015 for the calculation of the expected rod fatigue life. The rod and piston are mechanically coupled by a threaded connection in which the thread on the rod is at least equal to the external thread KK, indicated in the table. The piston is screwed to the rod by a prefixed tightening torque in order to improve the fatigue resistance. The stop pin avoids the piston unscrewing. Contact our technical office in case of heavy duty applications.

## 9 RODS FEATURES and options
The rods materials have high strength, which provide safety coefficients higher than 4 in static stress conditions, at maximum working pressure. The rod surface is chrome plated; diameter tolerances IT7; roughness Ra ≤ 0.25 µm. Corrosion resistance of 200 h in neutral spray to ISO 9227 NSS.

### Rod diameters from 12 to 70 mm have rolled threads; in rolling process the component material is stressed beyond its yield point, which being deformed plastically. This offers many technical advantages: higher profile accuracy, improved fatigue working life and high wear resistance. See tab. B015 for the calculation of the expected rod fatigue life. The rod and piston are mechanically coupled by a threaded connection in which the thread on the rod is at least equal to the external thread KK, indicated in the table. The piston is screwed to the rod by a prefixed tightening torque in order to improve the fatigue resistance. The stop pin avoids the piston unscrewing. Contact our technical office in case of heavy duty applications.

### Rods corrosion resistance and hardness can be improved selecting the options K and T (option K affects the strength of standard rod, see tab. B015 for the calculation of the expected rod fatigue life):
- K = Nickel and chrome-plating (for rods from 22 to 110 mm)
- T = Induction surface hardening and chrome plating
- 56-60 HRC (613-697 HV) hardness

## 10 DOUBLE ROD
Double rod cylinders ensure the same pushing and pulling areas, thus the same speeds and forces. Rod2 (see figure at side) is screwed into the male thread of Rod1, consequently the Rod2 load is weaker than the other and it is strongly recommended to use this one only to compensate the areas; the stronger rod is identified by the number ‘1’ stamped on its end. For double rod cylinders, rod end dimensions indicated in section 10 are valid for both the rods.
OIL PORTS AND ROD SPEEDS

The fluid speed in pippings connected to the cylinder oil ports should not exceed 6 m/s in order to minimize the turbulence flow, the pressure drop and water hammer. The table below shows the max recommended speed relative to 6 m/s flow velocity.

In high dynamic systems the rod can reach even higher speeds (after a careful check of dampable masses, see tab. B015). In these cases it is recommended to use piping’s diameters larger than the cylinder oil ports and to introduce proper reductions just near the cylinder oil ports.

<table>
<thead>
<tr>
<th>Ø Bore</th>
<th>D (mm)</th>
<th>EE</th>
<th>Internal pipe Ø (mm)</th>
<th>Rod speed V (m/s)</th>
<th>EE</th>
<th>Internal pipe Ø (mm)</th>
<th>Rod speed V (m/s)</th>
</tr>
</thead>
<tbody>
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<td>25</td>
<td>21</td>
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<td>7.5</td>
<td>0.54</td>
<td>25</td>
<td>G 3/8</td>
<td>9</td>
</tr>
<tr>
<td>32</td>
<td>21</td>
<td>G 1/4</td>
<td>7.5</td>
<td>0.33</td>
<td>25</td>
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<td>G 3/8</td>
<td>9</td>
<td>0.30</td>
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<td>0.47</td>
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<td>0.13</td>
<td>58</td>
<td>G 1 1/2</td>
<td>40</td>
</tr>
</tbody>
</table>

Note to table:
(1) For mounting styles C, D, E, N, P, S the dimension P2J reported in section 1 is modified, contact our technical office.

CUSHIONING

Cushioning are recommended for applications where: • the piston makes a full stroke with speed over than 0.05 m/s; • it is necessary to reduce undesirable noise and mechanical shocks; • vertical movement due to earth vibrations requires the use of a cushioning device to slow down the rod speed before the cylinder’s mechanical stroke-end (see the graphics at side). Two types of cushioning are available depending to the rod speed V:

1. Slow version for V ≤ 0.5 • Vmax
2. Fast version for V > 0.5 • Vmax

See the table below for Vmax values and tab. B015 for the max damping energy.

<table>
<thead>
<tr>
<th>Ø Rod</th>
<th>12</th>
<th>16</th>
<th>22</th>
<th>28</th>
<th>36</th>
<th>45</th>
<th>56</th>
<th>70</th>
<th>90</th>
<th>110</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lf (front cushioning)</td>
<td>21</td>
<td>17</td>
<td>23</td>
<td>17</td>
<td>26</td>
<td>25</td>
<td>28</td>
<td>26</td>
<td>27</td>
<td>28</td>
</tr>
<tr>
<td>Lf (rear cushioning)</td>
<td>13</td>
<td>15</td>
<td>27</td>
<td>28</td>
<td>30</td>
<td>32</td>
<td>32</td>
<td>32</td>
<td>41</td>
<td>56</td>
</tr>
</tbody>
</table>

POSITION COMBINATION FOR OIL PORTS AND CUSHIONING ADJUSTMENTS

FRONT HEAD: B* = oil port position; E* = cushioning adjustment position REAR HEAD: X* = oil port position; Z* = cushioning adjustment position

The table below shows all the available configurations for the oil port and cushioning adjustment positions. Each configuration for the front head can be variously combined with any one of the rear head. Cushioning adjustment positions E*, Z* have to be entered only if adjustable cushioning are selected.

Example of model code: CK-50/22 *3000-S301 - A - B2E3X1Z4

Contact our technical office for combinations not included in the table.

SEALING SYSTEM FEATURES

The sealing system must be chosen according to the working conditions of the system: speed, operating frequencies, fluid type and temperature. Additional verifications according minimum oil in/out rod speeds are suggested, see tab. B015.

When single acting seals are selected (types 6 and 7), the not pressurized cylinder’s chamber must be connected to the tank. Special sealing system for low temperatures, high frequencies (up to 20 Hz), long working life and heavy duty are available, see tab. TB020. All the seals, static and dynamic, must be periodically replaced: proper spare kits are available, see section 3. Contact our technical office for the compatibility with other fluids not mentioned below and specify type and composition. See section 3 for fluid requirements.

<table>
<thead>
<tr>
<th>Sealing system</th>
<th>Material</th>
<th>Features</th>
<th>Max speed [m/s]</th>
<th>Fluid temperature range</th>
<th>Fluids compatibility</th>
<th>ISO Standards for seals</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>NBR + POLYURETHANE</td>
<td>high static and dynamic sealing</td>
<td>0.5 -20°C to 85°C</td>
<td>Mineral oils HH, HL, HLP, HLP-D, HM, HV, MIL-H-5606</td>
<td>ISO 7425/1</td>
<td>ISO 65597/1</td>
</tr>
<tr>
<td>2</td>
<td>FKMs + PTFE</td>
<td>very low friction and high temperatures</td>
<td>4 -20°C to 120°C</td>
<td>Mineral oils HH, HL, HLP, HLP-D, HM, HV, MIL-H-5606</td>
<td>ISO 7425/1</td>
<td>ISO 7425/2</td>
</tr>
<tr>
<td>4</td>
<td>NBR + PTFE</td>
<td>very low friction and high speeds</td>
<td>4 -20°C to 120°C</td>
<td>Mineral oils HH, HL, HLP, HLP-D, HM, HV, MIL-H-5606</td>
<td>ISO 7425/1</td>
<td>ISO 7425/2</td>
</tr>
<tr>
<td>6 - 7</td>
<td>NBR + PTFE</td>
<td>very low friction single act. - pushing/pulling</td>
<td>4 -20°C to 85°C</td>
<td>Mineral oils HH, HL, HLP, HLP-D, HM, HV, MIL-H-5606</td>
<td>ISO 7425/1</td>
<td>ISO 7425/2</td>
</tr>
<tr>
<td>8</td>
<td>PTFE + NBR + POLYURETHANE</td>
<td>low friction</td>
<td>0.5 -20°C to 85°C</td>
<td>Mineral oils HH, HL, HLP, HLP-D, HM, HV, MIL-H-5606</td>
<td>ISO 7425/1</td>
<td>ISO 7425/2</td>
</tr>
</tbody>
</table>
**Fluid Requirements**

Cylinders and servocylinders are suitable for operation with mineral oils with or without additives (HH, HL, HLP, HLP-D, HM, HV), fire resistant fluids (HFA oil in water emulsion, 90-95% water and 5-10% oil; HFB water in oil emulsion, 40% water; HFC water (glycol, max 45% water) and synthetic fluids (HFD-U organic esters, HFD-R phosphate esters). The fluid must have a viscosity within 15 and 100 mm²/s, a temperature within 0 and 70°C and fluid contamination class ISO 21348/18/15 according to ISO 4406 NAS1638 class 9, see also filter section at www.atos.com or KTF catalog.
### CYLINDERS MASSES [kg] (tolerance ± 5%)

| Ø Bore [mm] | Ø Rod [mm] | Stroke 100 mm Each added 100 mm | Stroke 100 mm Each added 100 mm | Style C | Style D | Style E | Style G | Style L | Style N | Style P | Style S | Style VY | Style W | Each cushioning Each 50 mm spacer |
|-------------|------------|-------------------------------|---------------------------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|---------|---------|-------------------------------|
| 25          | 12         | 1.65                          | 0.47                            | 1.90   | 0.56   | 0.08   | 0.068  | 0.32   | -0.02  | 0.19   | 0.18   | 0.08   | 0.01   | 0.02   | 0.03   | 0.38                          |
| 18          | 14         | 2.23                          | 0.49                            | 2.69   | 0.61   | 0.17   | 0.15   | 0.24   | 0.02   | 0.29   | 0.18   | 0.14   | 0.02   | 0.04   | 0.04   | 0.50                          |
| 22          | 22         | 2.51                          | 0.67                            | 3.21   | 0.97   | 0.27   | 0.22   | 0.356  | 0.08   | 0.76   | 0.76   | 0.57   | 0.06   | 0.12   | 0.07   | 0.79                          |
| 28          | 40         | 4.90                          | 0.79                            | 6.78   | 0.99   | 5.15   | 1.19   | 0.50   | 0.84   | 0.74   | 2.89   | 0.64   | 0.32   | 0.13   | 1.15                          |
| 50          | 22         | 6.40                          | 1.18                            | 7.85   | 1.48   | 6.59   | 1.37   | 8.23   | 1.85   | 0.84   | 0.74   | 0.52   | 0.28   | 1.46   | 1.10   | 1.10   | 0.31   | 0.16   | 0.32   | 0.13   | 1.15                          |
| 36          | 26         | 7.20                          | 1.60                            | 9.45   | 2.48   | 8.70   | 1.62   | 11.08  | 2.10   | 0.52   | 0.41   | 1.54   | 0.26   | 2.17   | 1.34   | 1.34   | 0.34   | 0.16   | 0.32   | 0.25   | 1.68                          |
| 63          | 36         | 9.13                          | 1.93                            | 11.94  | 2.73   | 9.80   | 2.39   | 13.64  | 3.64   | 1.25   | 0.79   | 1.23   | 1.63   | 3.67   | 2.39   | 2.39   | 0.86   | 0.34   | 0.68   | 0.40   | 2.85                          |
| 80          | 45         | 11.50                         | 2.96                            | 20.40  | 3.76   | 17.76  | 3.46   | 21.97  | 4.71   | 3.05   | 2.31   | 1.63   | 1.00   | 5.46   | 2.94   | 2.94   | 1.77   | 0.34   | 0.68   | 0.60   | 4.15                          |
| 100         | 56         | 18.10                         | 4.09                            | 23.90  | 6.02   | 23.80  | 3.90   | 29.85  | 5.15   | 24.70  | 4.60   | 32.01  | 6.53   | 30.28  | 6.70   | 6.70   | 0.70   | 6.70   | 6.70   | 0.70                          |
| 125         | 70         | 45.24                         | 7.25                            | 58.55  | 10.27  | 45.82  | 9.72   | 73.88  | 14.20  | 3.95   | 2.87   | 4.60   | 1.50   | 8.60   | 5.65   | 5.65   | 4.65   | 0.90   | 1.80   | 1.15   | 6.61                          |
| 160         | 90         | 74.55                         | 8.75                            | 93.85  | 17.77  | 79.31  | 10.72  | 96.08  | 15.71  | 8.33   | 7.63   | 7.56   | 4.66   | 16.58  | 7.97   | 7.97   | 8.21   | 1.50   | 3.00   | 1.85   | 10.75                         |
| 200         | 110        | 130.39                        | 14.52                           | 142.65 | 21.98  | 123.60 | 12.50  | 136.52 | 17.49  | 10.20  | 13.82  | 14.6   | 9.86   | 37.00  | 16.78  | 16.82  | 14.80  | 2.50   | 5.00   | 2.50   | 15.86                         |
| 140         | 137.19     | 19.14                         | 148.78                          | 31.22  |         |         |        |        |        |        |        |        |        |        |        |        |        |        |        |        |        |                                |

**Note:** the masses related to the other options, not indicated in the table, don’t have a relevant influence on the cylinder’s mass.

### CYLINDER SECTION

![Diagram of cylinder section](image)

### SPARE PARTS - SEE TABLE SP-B137

Example for seals spare parts code

<table>
<thead>
<tr>
<th>Sealing system</th>
<th>Cylinder series</th>
<th>Bore size [mm]</th>
<th>Rod diameter [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>G</td>
<td>-</td>
<td>C</td>
<td>K</td>
</tr>
</tbody>
</table>

Second rod diameter for double rod [mm]: Omit if not requested

06/19