Position Sensing Cylinders

CATERPILLAR®

COUNT ON THE HYDRAULICS EXPERT…

In any hydraulic system, a combination of critical components convert power into productive, efficient motion. As an original equipment manufacturer (OEM), you need hydraulic solutions that optimize the functionality and performance capabilities of your products — and enable your business to productively and efficiently move with the market. For superior hydraulic components and systems, look to the company that has provided powerful solutions to the construction, mining, waste management, agriculture, materials handling, on-highway and forestry markets for over 50 years… Caterpillar!

The toughness and durability of every Cat® component begins with innovative engineering. Utilizing sophisticated processes such as finite element analysis and a proprietary cylinder design tool, components are designed to meet the challenges of the most demanding applications, and harshest working environments.

Caterpillar is the world's largest consumer of mobile hydraulic cylinders. The global manufacturing capabilities of Caterpillar include facilities dedicated to hydraulic cylinder manufacturing. Our manufacturing materials and processes meet or exceed ASTM, DIN, ISO, and SAE standards. We follow the 6 Sigma methodology, which provides an integrated, disciplined and proven approach for delivering exceptional quality, lower costs and enhanced lifecycle value.

6 SIGMA

With a reputation for building rugged and reliable equipment, Caterpillar has the manufacturing and technical capabilities, along with the testing and quality processes necessary to produce cylinders to meet your application requirements.

Caterpillar can incorporate enhanced technologies such as electro-hydraulics or programmable hydraulic systems. In addition, systems can be designed to include pumps, motors, valves, fans, brakes, steering systems, hydrostatic transmissions, joysticks & much more — enabling you to meet your customers' unique requirements.

TABLE OF CONTENTS

durability

functionality

COUNT ON THE HYDRAULICS EXPERT…

Whether you need hydraulic cylinders or complete hydraulic systems, you can count on the reliability of Cat® products. Engineered for excellence, our cylinders have proven their value in applications as varied as construction, mining, waste management, agriculture and forestry for over 50 years.

The Caterpillar® Position Sensing Cylinder (PSC) features a magnetostrictive transducer in a corrosion resistant housing encapsulated within the cylinder to protect it from environmental conditions. Well-protected within the core of the cylinder, the Cat PSC technology is key in providing new linkage-based functions within a control system.

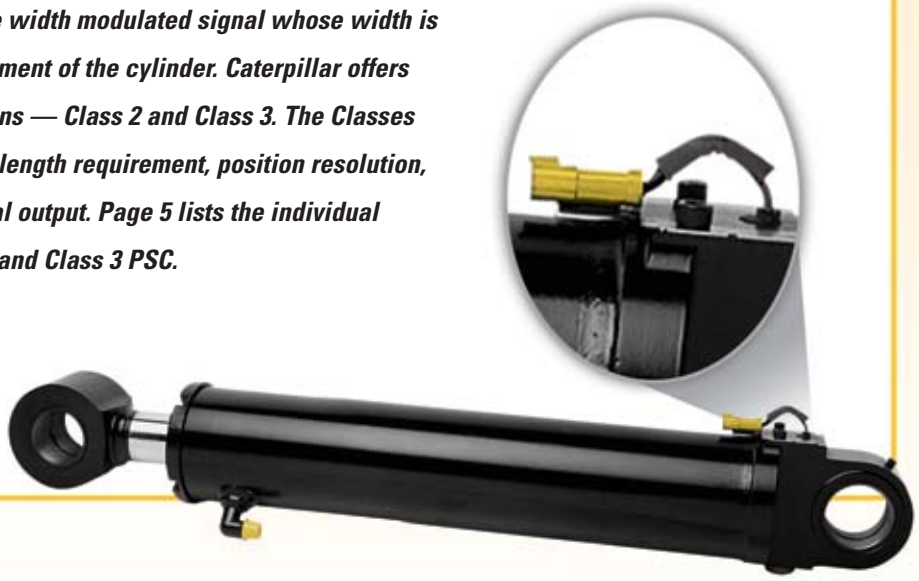
Additionally, the absolute measuring Cat PSC offers is a robust and cost effective alternative to linear potentiometers, Linear Variable Differential Transducers (LVDT) and linear encoders. The Cat PSC offers high reliability and durability.

FUNCTIONAL SPECIFICATIONS

Bore Diameters:	75mm to 160mm (3" through 6.3")
Rod Diameters:	50mm to 115mm (2" through 4.5")
Stroke:	Up to 2000mm (Up to 79")
Pressure Ratings:	Up to 311 bar (Up to 4,500 psi)
Media:	Hydraulic Oil — SAE 10W (Viscosity Requirements of SAE J300 Jun 86 for SAE Viscosity Grade 10W). If other medias are required please specify in the comments section of the Quote Request Form.
Temperature:	-40°C to 120°C (-105°F to 250°F)

The sensing element and electronics are integrated into a stainless steel package. By completely embedding the sensor into the cylinder, the Cat PSC offers better reliability, precision, and durability. Additionally, the Caterpillar proprietary design allows for minimal envelope changes in current or future application designs. Caterpillar offers electronic input devices and controls that can be added to optimize the functionality of the Caterpillar PSC.

The sensor output is a pulse width modulated signal whose width is proportional to the displacement of the cylinder. Caterpillar offers the PSC in two classifications — Class 2 and Class 3. The Classes are differentiated by stroke length requirement, position resolution, position accuracy and signal output. Page 5 lists the individual specifications for a Class 2 and Class 3 PSC.



INTEGRATED POSITION SENSING CYLINDERS

Mounting
Available in Standard, Spherical, Clevis or Trunnion Mount

Sensor
- Embedded with Pulse Width Modulation (PWM) Electronics
- Electro Magnetic Compatibility (EMC) — Meeting SAE, FCC, and EU Standard Testing
- Stainless Steel Housing

High Pressure Seal
Also Compatible with Water-Based and Fire-Resistant Fluids

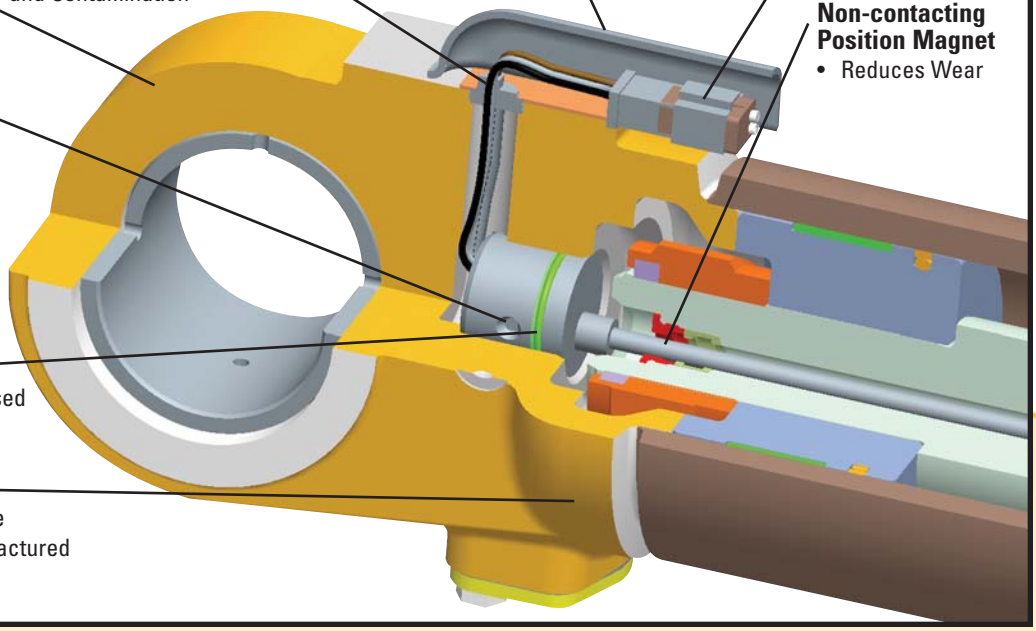
Hydraulic Cylinder
Double Acting/Single Stage Type
Caterpillar Designed and Manufactured

Electrical Port Sealed From Environmental Elements
- Prevents Moisture Entry and Contamination

Heavy Duty Steel Cover
- Prevents Damage to the Connector in the Roughest of Applications

4 Pin Deutsch DT Connector

Non-contacting Position Magnet
- Reduces Wear



CLASS 2 & CLASS 3 SENSOR SPECIFICATIONS

Sensor Characteristics	Class 2 Specifications/Description	Class 3 Specifications/Description
Supply Voltage	+10V +1V/-3	+10V +1V/-3
Current Draw	100mA maximum	100mA maximum
Displacement Range	50mm to 2000mm (2" to 79")	50mm to 1200mm (2" to 47")
Position Accuracy	+/-0.05% of full stroke or +/- resolution, whichever is greater+/-	0.1% of full stroke or +/- resolution, whichever is greater
Resolution	< 0.5 mm (for a controller sampling rate of 1 MHz) < 0.1 mm (for a controller sampling rate of 5 MHz)	< 4 mm (for a controller sampling rate of 1 MHz) < 1 mm (for a controller sampling rate of 5 MHz)
Frequency	115Hz +/- 15Hz	500Hz +/- 100Hz
Repeatability	+/- resolution	+/- resolution
Hysteresis	< 0.12mm + 0.004% of full stroke or 0.15mm, whichever is greater	< 1.5 X resolution + .6mm
Vibration Rating	15.3 Grms (24 to 2000Hz)	15.3 Grms (24 to 2000Hz)
Maximum Velocity	3,000 mm/second (118in/second)	3,000 mm/second (118in/second)
Outputs (PWM)	V (low) maximum < 1.0V and V (high) minimum > 3.9V	V (low) maximum < 1.0V and V (high) minimum > 3.9V

SELECTING A CYLINDER…

STEP 1 Are the cylinder bore and rod diameters known?

If **yes**, go to step 4. If **no**, go to step 2.

STEP 2 Determine the bore diameter.

Determining the bore diameter is an interactive process depending on your constraints. The following is an example of how the bore diameter is determined. The example assumes that the force required and system pressure are known. The equations can be used differently if you have different constraints or assumptions.

***Example**:*
Known requirements: If system pressure is 150 bar and minimum extension force is 85kN, the bore size can be found using this equation.

$$\text{Bore diameter(mm)} = \sqrt{\frac{(\text{Force(kN)} \times 40{,}000)}{\pi \times \text{Pressure(bar)}}} = 84.9\text{mm}$$

Select the bore size from the charts on pages 10 and 11 that is equal to, or the next size larger than the diameter that was calculated above. Selecting the size equal to or the next size larger than what you need will provide the lowest cost solution that will overcome the extension force. In the example, the next largest bore size is 85mm.

To calculate the force for a given bore size and known pressure, use the following equation:

$$\text{Force(kN)} = \text{Pressure(bar)} \times \frac{\pi}{40{,}000} \times (\text{Bore diameter mm})^2$$

If the units are different than above, convert them to metric units using the English to metric conversion equations on page 7, then use the above equations.

STEP 3 Determine the rod diameter.

Determining the rod diameter is an interactive process depending on your constraints. The following is an example of how a rod diameter is determined. The example assumes that the bore size, retract force required, stroke and system pressure are known. The equations can be used differently if you have different constraints or assumptions.

***Example**:*
Known requirements: Bore size = 85mm, Minimum retract force = 50kN, Stroke = 140mm, Pin to Pin Length = 600mm and the System Pressure = 150bar:

$$\text{Rod diameter(mm)} = \sqrt{(\text{Bore diameter(mm)})^2 - \frac{(\text{Retract force(kN)} \times 40{,}000)}{\pi \times \text{Pressure(bar)}}} = 54.6\text{mm}$$

In order to meet the retraction force, the rod diameter must be less than or equal to the value calculated above. Review the tables on pages 10 and 11 to find the rod diameters available for the selected bore size, in this example 85mm. The available rod sizes for an 85mm bore are: 50, 55 and 60mm. However, only the 50mm size will meet the minimum retraction force required. The max stroke, min and max pin to pin length and max full extension length must be checked to ensure it will meet the application requirements. In this example, the max full extension length, which is equal to the stroke plus the pin to pin length, is 740mm. These parameters all meet the restrictions outlined in the tables for a bore of 85mm and a rod of 50mm, therefore the rod size selected for this example is 50mm. Note that either class sensor fits the required size. The application accuracy requirements would then need to be taken into account.

STEP 4 Determine if the bore size and rod diameter meet your other requirements.

You may have cycle times, flow, and pressure constraints. Use these equations to determine if the selected bore size and rod diameter meets your other requirements.

English to metric conversion:
x(mm) = 25.4 x (length in inches)
x(bar) = 6.9 x 10^{-2} x (pressure in psi)
x(kN) = 4.4 x 10^{-3} x (force in lbf)
x(lpm) = 3.8 x (flow in gpm)

mm	=	millimeters
lpm	=	liters per minute
kN	=	kilonewtons
psi	=	pound force per square inch
lbf	=	pound force
gpm	=	gallons per minute

1. Determine the retraction force:

$$\text{Retract force(kN)} = \text{Pressure(bar)} \times \left(\frac{\pi \times ((\text{Bore diameter (mm)})^2 - (\text{Rod diameter (mm)})^2)}{40{,}000} \right)$$

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2. Determine the extension force:

$$\text{Force(kN)} = \frac{\pi \times \text{Pressure(bar)} \times (\text{Bore diameter(mm)})^2}{40{,}000}$$

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3. Determine the system pressure:

$$\text{Pressure(bar)} = \frac{(\text{Force (kN)} \times 40{,}000)}{\pi \times (\text{Bore diameter(mm)})^2}$$

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4. Determine the extension cycle time:

$$\text{Ext cycle time(min)} = \frac{\pi \times \text{Stroke(mm)} \times (\text{Bore diameter(mm)})^2}{4{,}000{,}000 \times \text{Cap flow(lpm)}}$$

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5. Determine the cap end flow:

$$\text{Cap flow(lpm)} = \frac{\pi \times \text{Stroke (mm)} \times (\text{Bore diameter(mm)})^2}{4{,}000{,}000 \times \text{Ext cycle time(min)}}$$

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6. Determine the retraction cycle time:

$$\text{Retraction cycle time(min)} = \frac{\pi \times \text{Stroke (mm)} \times ((\text{Bore diameter(mm)})^2 - (\text{Rod diameter(mm)})^2)}{4{,}000{,}000 \times \text{Rod flow(lpm)}}$$

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7. Determine the rod end flow:

$$\text{Rod flow(lpm)} = \frac{\pi \times \text{Stroke (mm)} \times ((\text{Bore diameter(mm)})^2 - (\text{Rod diameter(mm)})^2)}{4{,}000{,}000 \times \text{Retraction cycle time(min)}}$$

CONFIGURATOR & QUOTE REQUEST FORM

STEP 5 Complete the model code configurator below.

Formulate the model code configurator below and enter values in the boxes.

Cylinder Type	Bore	Rod	*Pin to Pin Length	Stroke	Sensor Type
examples: PT	85	50	600	140	2

See Standard Cylinder Specifications on pages 10-11. For combinations not listed, use the Custom Cylinder Quote Request form on page 9.

*Pin to pin is the distance between pins at the fully-collapsed state (i.e. zero extension)

MOUNTING STYLE

Cap End SC

Standard Cap = SC | Clevis Cap = CC | Spherical Cap = SPC

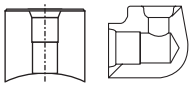
Rod End SE

Standard Eye = SE | Clevis Eye = CE | Spherical Eye = SPE

See mounting styles (p. 12-13). For combinations not listed, use the Custom Cylinder Quote Request form on page 9.

ROD END

Port Style E



Standard = S | 90° Elbow = E

PORT LOCATION

Rod End	Cap End
90	180

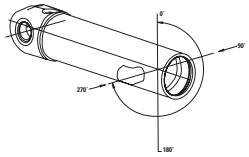
Default 0° (top) = 0

90° = 90

180° = 180

270° = 270

Other = Use Custom Cylinder Quote Request form on page 9.



STEP 6 Complete a request form.

If you are not able to complete the model code due to the number of available options, please complete the Custom Cylinder Quote Request Form on page 9. If you were able to complete the model code, then please complete the Cylinder Quote Request Form below..

CYLINDER QUOTE REQUEST FORM

Fax to: OEM Solutions Group U.S.A.: 1.309.636.1087 • Switzerland: 41.22.849.4075 • Singapore: 65.6.662.8347
Email: OEMSolutions@cat.com

Contact (please print): _____ Company: _____

Fax: _____ Phone: _____ E-mail: _____

MODEL CODE (copy from above)

PT										
Type	Bore	Rod	Pin to Pin Length	Stroke	Mounting Style Rod End	Mounting Style Cap End	Rod End Port Style	Port Location Rod End	Port Location Cap End	Sensor Type (2 or 3)

SYSTEM INFORMATION

System pressure (bar): _____ Max force in tension (kN): _____ Desired life cycles: _____

Rod end relief (bar): _____ Max compression force (kN): _____ Desired life (in service machine hours): _____

Cap end relief (bar): _____ Max side loading (kN): _____

QUANTITY & DUE DATE

Quantity to Quote: _____ Annual: _____ Comments: _____

Date Required: _____ Monthly: _____

One-time: _____

CUSTOM CYLINDER QUOTE REQUEST FORM

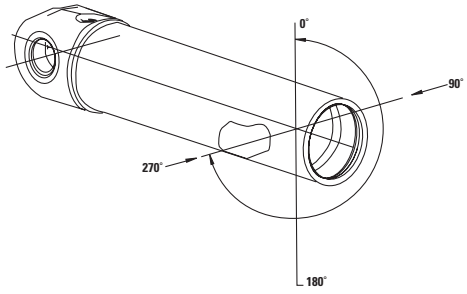
CUSTOM CYLINDER QUOTE REQUEST FORM

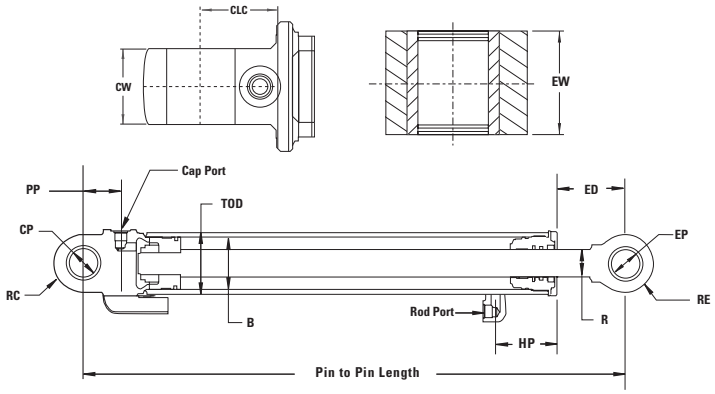
Fax to: OEM Solutions Group U.S.A.: 1.309.636.1087 • Switzerland: 41.22.849.4075 • Singapore: 65.6.662.8347
Email: OEMSolutions@cat.com

Contact (please print): _____ Company: _____

Fax: _____ Phone: _____ E-mail: _____

DIMENSIONAL INFORMATION





PLEASE SPECIFY DIMENSIONS IN mm:

Bore (B): _____
Rod (R): _____
Pin to pin: _____
Stroke: _____
TOD: _____
CW: _____
CLC: _____
PP: _____
Cap port size: _____
Cap end port location (see diagram above): _____
CP: _____
RC: _____

Rod port size: _____
Rod end port location (see diagram above): _____
HP: _____
EP: _____
EW: _____
RE: _____
ED: _____

Select a rod & cap end type from pages 12-13 or send an illustration showing your requirements:
Rod end: _____
Cap end: _____
Sensor Type (2 or 3): _____

Cyl. pressure rating (bar): _____
System pressure (bar): _____
Rod end relief (bar): _____
Cap end relief (bar): _____
Max compression force (kN): _____
Max tension force (kN): _____
Max side loading (kN): _____
Desired life in cycles: _____
Desired life in machine service hours: _____

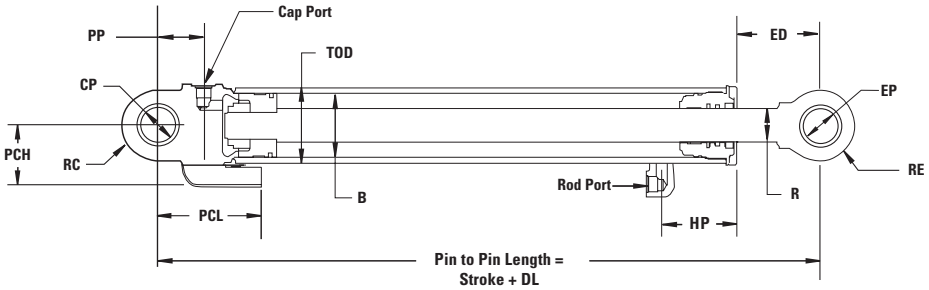
QUANTITY & DUE DATE

Quantity to Quote: _____ Annual: _____ Comments: _____
Date Required: _____ Monthly: _____ _____
One-time: _____ _____

STEP 7 Submit the form.

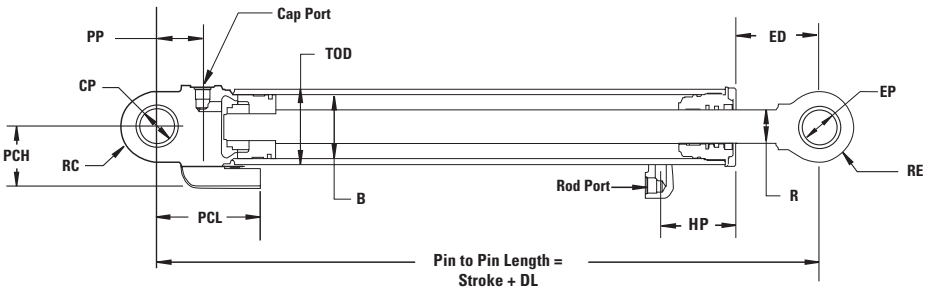
After you have completed the appropriate request form, fax or email the form to one of the contacts listed on the back of the catalog. You will receive price and availability once your request is processed.

STANDARD CYLINDER SPECIFICATIONS…



Bore (B)	Rod (R)	TOD	PP	HP	ED	PCH	PCL	Class 2 Sensor DL	Class 3 Sensor DL	Class 2 Sensor Max Pin to Pin Length	Class 3 Sensor Max Pin to Pin Length	Class 2 Sensor Max Stroke	Class 3 Sensor Max Stroke	Class 2 Sensor Max Extension Length	Class 3 Sensor Max Extension Length	Pressure Rating Bar (psi)
75	50	87	130	82	105	84	155	460	440	1110	1090	650	650	1760	1740	245 (3550)
80	55	95	90	82	70	92.5	160	435	420	1235	1220	800	800	2035	2020	224 (3250)
85	50	100	103	82	70	92.5	160	425	410	975	960	550	550	1525	1510	173 (2500)
	55	100	103	82	70	92.5	160	425	410	1175	1160	750	750	1925	1910	183 (2650)
	60	100	103	82	70	92.5	160	425	410	1325	1310	900	900	2225	2210	193 (2800)
90	50	105	103	82	70	92.5	160	440	420	940	920	500	500	1440	1420	231 (3350)
	55	105	103	82	70	92.5	160	440	420	1140	1120	700	700	1840	1820	242 (3500)
	60	105	103	82	70	92.5	160	440	420	1290	1270	850	850	2140	2120	252 (3650)
	65	105	103	82	70	92.5	160	440	420	1440	1420	1000	1000	2440	2420	269 (3900)
95	50	110	91/103	82	76	99	165	440	425	890	875	450	450	1340	1325	207 (3000)
	55	110	91/103	82	76	99	165	440	425	1040	1025	600	600	1640	1625	207 (3000)
	65	110	91/103	82	107	99	165	475	460	1425	1410	950	950	2375	2360	228 (3300)
	70	110	91/103	82	107	99	165	475	460	1575	1560	1100	1100	2675	2660	242 (3500)
100	50	115	79	82	76	99	165	450	435	850	835	400	400	1250	1235	214 (3100)
	55	115	79	82	76	99	165	450	435	1000	985	550	550	1550	1535	221 (3200)
	60	115	79	82	76	99	165	450	435	1200	1185	750	750	1950	1935	231 (3350)
	65	115	79	82	107	99	165	485	470	1335	1320	850	850	2185	2170	242 (3500)
	70	115	79	82	107	99	165	485	470	1535	1520	1050	1050	2585	2570	252 (3650)
	75	115	79	82	107	99	165	485	470	1685	1670	1200	1200	2885	2870	269 (3900)
110	50	128	78	82	76	103.5	165	455	440	855	840	400	400	1255	1240	173 (2500)
	55	128	78	82	76	103.5	165	460	445	910	895	450	450	1360	1345	293 (4250)
	65	128	78	82	107	103.5	165	495	475	1245	1225	750	750	1995	1975	311 (4500)
	70	128	78	82	107	103.5	165	495	475	1395	1375	900	900	2295	2275	311 (4500)
	75	128	78	82	107	103.5	165	460	445	1560	1545	1100	1100	2660	2645	311 (4500)
	80	128	78	82	107	103.5	165	460	445	1710	1645	1250	1200	2960	2845	311 (4500)

All dimensions are in mm unless otherwise stated.



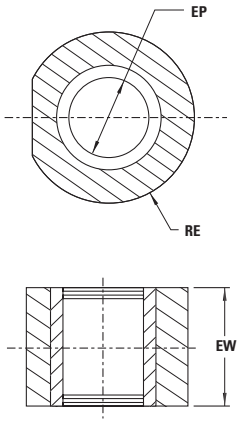
Bore (B)	Rod (R)	TOD	PP	HP	ED	PCH	PCL	Class 2 Sensor DL	Class 3 Sensor DL	Class 2 Sensor Max Pin to Pin Length	Class 3 Sensor Max Pin to Pin Length	Class 2 Sensor Max Stroke	Class 3 Sensor Max Stroke	Class 2 Sensor Max Extension Length	Class 3 Sensor Max Extension Length	Pressure Rating Bar (psi)
115	50	138	76	82	79	100	165	475	455	825	805	350	350	1175	1155	197 (2850)
	55	138	76	82	79	100	165	475	460	875	860	400	400	1275	1260	279 (4050)
	60	138	76	82	79	100	165	470	455	1020	1005	550	550	1570	1555	311 (4500)
	65	138	76	82	79	100	165	460	445	1210	1195	750	750	1960	1945	311 (4500)
	70	138	76	82	79	100	165	505	490	1405	1390	900	900	2305	2290	311 (4500)
	75	138	76	82	80	100	165	465	450	1515	1500	1050	1050	2565	2550	311 (4500)
	90	138	76	82	114	100	165	490	475	2040	1675	1550	1200	3590	2875	311 (4500)
120	50	138	78/106	82	79	95	165	460	440	810	790	350	350	1160	1140	179 (2600)
	55	138	78/106	82	79	95	165	460	440	960	940	500	500	1460	1440	245 (3550)
	60	138	78/106	82	79	95	165	480	465	980	965	500	500	1480	1465	311 (4500)
	65	138	78/106	82	79	95	165	480	465	1130	1115	650	650	1780	1765	311 (4500)
	70	138	78/106	82	79.8	95	165	480	465	1330	1315	850	850	2180	2165	311 (4500)
	75	138	78/106	82	80	95	165	515	500	1515	1500	1000	1000	2515	2500	311 (4500)
	80	138	78/106	82	114	95	165	515	500	1615	1600	1100	1100	2715	2700	311 (4500)
	85	138	78/106	82	114	95	165	495	480	1795	1680	1300	1200	3095	2880	311 (4500)
130	65	154	110.5	82	79	112	165	515	500	1115	1100	600	600	1715	1700	269 (3900)
	70	154	110.5	82	79	112	165	515	500	1265	1250	750	750	2015	2000	276 (4000)
	75	154	110.5	82	114	112	165	515	500	1365	1350	850	850	2215	2200	283 (4100)
	80	154	110.5	82	114	112	165	510	495	1560	1545	1050	1050	2610	2595	293 (4250)
	90	154	110.5	82	114	112	165	510	495	1860	1695	1350	1200	3210	2895	311 (4500)
	100	154	110.5	82	114	112	165	510	495	2210	1695	1700	1200	3910	2895	311 (4500)
140	65	163	91	82	100	129	175	560	545	1060	1045	500	500	1560	1545	228 (3300)
	70	163	91	82	100	129	175	560	545	1160	1145	600	600	1760	1745	221 (3200)
	90	163	91	82	125	129	175	555	540	1805	1740	1250	1200	3055	2940	248 (3600)
	100	163	91	82	125	129	175	555	540	2105	1740	1550	1200	3655	2940	266 (3850)
150	70	175	90	82	123	134	185	550	535	1150	1135	600	600	1750	1735	207 (3000)
	75	175	90	82	123	134	185	550	535	1250	1235	700	700	1950	1935	210 (3050)
	110	175	90	82	148	134	185	625	610	2375	1810	1750	1200	4125	3010	311 (4500)
	115	175	90	82	148	134	185	625	610	2525	1810	1900	1200	4425	3010	311 (4500)
160	110	190	124.61	82	148	132	185	625	610	2275	1810	1650	1200	3925	3010	311 (4500)

All dimensions are in mm unless otherwise stated.

MOUNTING STYLES AND DIMENSIONS…

ROD END

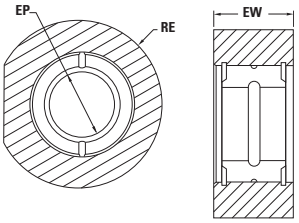
Standard Eye Dimensions



Bore	Rod	EP	EW	RE
75	50	35 + 0.191	50	42.5
80	55	45.295 ± 0.020	70	57.5
85	50, 55, 60	45.295 ± 0.020	70	57.5
90	50, 55, 65	45.295 ± 0.020	70	57.5
95	50, 55, 60, 65, 70	51.013 ± 0.020	76.2	65
100	50, 55, 60	51.013 ± 0.020	76.2	65
100	65, 70, 75	51.013 ± 0.020	63.5	60
110	50, 55, 60	51.013 ± 0.020	76.2	65
110	65, 70, 75, 80	51.013 ± 0.020	63.5	60
115	50, 55, 60, 65, 70	55.309 ± 0.020	78	65
115	75	55.309 ± 0.020	92	56

Bore	Rod	EP	EW	RE
115	90	55.309 ± 0.020	84	55
120	50, 55, 60, 65	55.309 ± 0.020	78	65
120	70	63.741 ± 0.020	97	65
120	75	55.309 ± 0.020	92	56
120	80, 85	55.309 ± 0.020	84	55
130	65, 70	55.309 ± 0.020	78	65
130	75, 80, 85, 90, 95, 100	55.309 ± 0.020	84	65
140	65, 70, 90, 100	76.481 ± 0.020	100	75
150	70, 75, 110, 115,	89.25 ± 0.020	114	85
160	110	89.25 ± 0.020	114	85

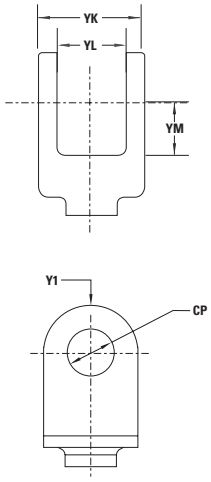
Spherical Eye Dimensions



Bore	Rod	EP	EW	RE	Change in DL From Std.
75	50	38.1 - 0.013	64	57.2	-34
90	50, 55	38.1 - 0.013	55	57.2	1
90	60	50.8 - 0.013	76	75	15
90	65	50.8 - 0.013	85	72.5	16.7

Bore	Rod	EP	EW	RE	Change in DL From Std.
100	50, 55	38.1 - 0.013	64	57.2	-5
100	60	50.8 - 0.013	76	75	9
100	65,70,75	50.8 - 0.013	85	72.5	-20.3
140	65, 70	50.8 - 0.013	85	72.5	-13.3

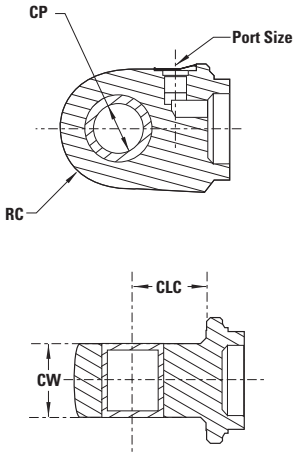
Clevis Eye Dimensions



Bore	Rod	YK	YL	YM	Y1	CP	Change in DL From Std.
90	50, 55, 60, 65	140	88	78	68	45.2	100
95	50, 55, 60	140	88	78	68	45.2	94
95	65	140	88	78	68	45.2	60
95	70	184	88	98	70	45.2	77
100	50, 55, 60	140	88	78	68	45.2	94
100	65	140	88	78	68	45.2	60
100	70, 75	184	88	98	70	45.2	77
115	50, 55, 60, 65	140	88	78	68	65.322 ± 0.020	90
115	70	184	88	98	70	65.322 ± 0.020	73
115	75	184	88	98	70	65.322 ± 0.020	113
115	90	232	136	116	82	65.322 ± 0.020	183
120	50, 55, 60, 65	140	88	78	68	65.322 ± 0.020	90
120	75, 80, 85	184	88	98	70	65.322 ± 0.020	73

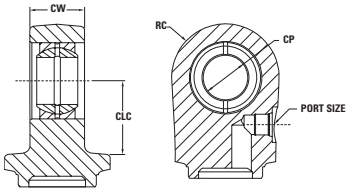
CAP END

Standard Cap Dimensions



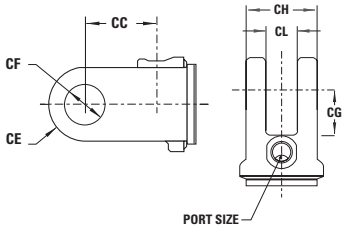
Bore	Rod	CP	RC	CW	CLC	Port Size
75	50	35 + 0.191	44	74	60	8 PORT THD
80	55	45.295 ± 0.020	52.5	74	80.5	8 PORT THD
85	50, 55, 60	45.295 ± 0.020	52.5	74	80.5	8 PORT THD
90	50, 55, 60	45.295 ± 0.020	52.5	74	80.5	10 PORT THD
95	50, 55, 60, 65, 70	51.013 ± 0.020	59	74	60	10 PORT THD
100	50, 55, 60, 65, 70, 75	51.013 ± 0.020	59	74	60	10 PORT THD
110	50, 55, 60, 65, 70, 75, 80	51.013 ± 0.020	63.5	74	62	12 PORT THD
115	55, 60, 65, 70, 75, 90	55.309 ± 0.020	60	92	63	12 PORT THD
120	50, 55, 60, 65, 70, 75, 80, 85	55.309 ± 0.020	55	97	72	12 PORT THD
130	65, 70, 75, 80, 85, 90, 95, 100	55.309 ± 0.020	72	97	72	12 PORT THD
140	60, 70, 90, 100	76.481 ± 0.020	89	97	108	25.5 FLANGE
150	70, 75, 110, 115	89.25 ± 0.020	94	114.3	103	25.5 FLANGE
160	110	89.25 ± 0.020	92	114.3	103	25.5 FLANGE

Spherical Cap Dimensions



Bore	Rod	CP	RC	CW	CLC	Port Size	Change in DL From Std.
75	50	44.45 - 0.013	50	74	60	8 PORT THD	13.2
90	50, 55, 60, 65	44.45 - 0.013	52	74	63	8 PORT THD	6.7
100	50, 55, 60, 65, 70, 75	44.45 - 0.013	63	74	63	8 PORT THD	4.0
140	65, 70, 75, 85, 90, 100	63.492 ± 0.008	89	100	64	25.5 FLANGE	5.6

Clevis Cap Dimensions



Bore	CH	CL	CG	CF	CE	CC	Port Size	Change in DL From Std.
90	90	40	58	45.20	50	80	12 PORT THD	12
95	90	40	58	45.20	50	80	12 PORT THD	26
100	90	40	61	45.20	50	83	12 PORT THD	25
115	180	83	72.5	65.322 ± 0.020	73	121	12 PORT THD	61
120	180	83	72	65.322 ± 0.020	73	121	12 PORT THD	34.5

Trunnion Mounting

If you are interested in a Trunnion Mounted Cylinder, please fill out the Custom Cylinder Request Form and indicate Trunnion Mounting for Cap Type. A sales engineer will then contact you for further information.

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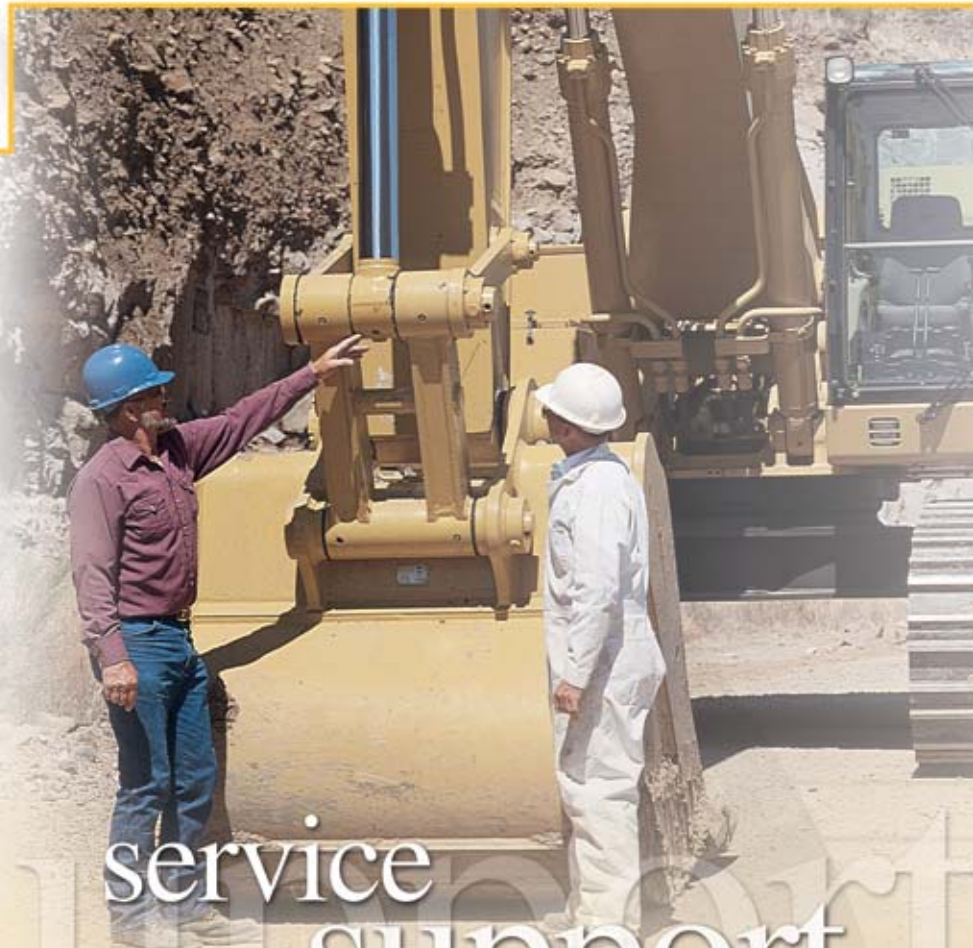

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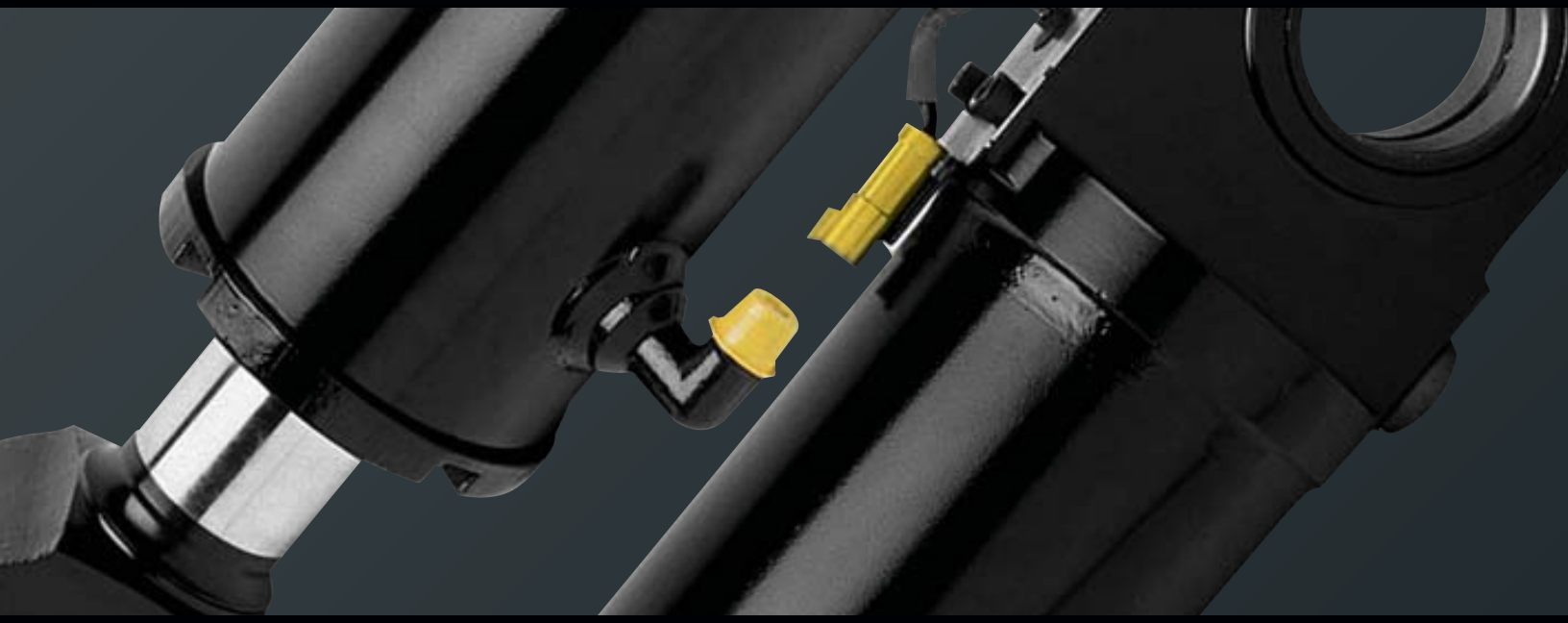

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