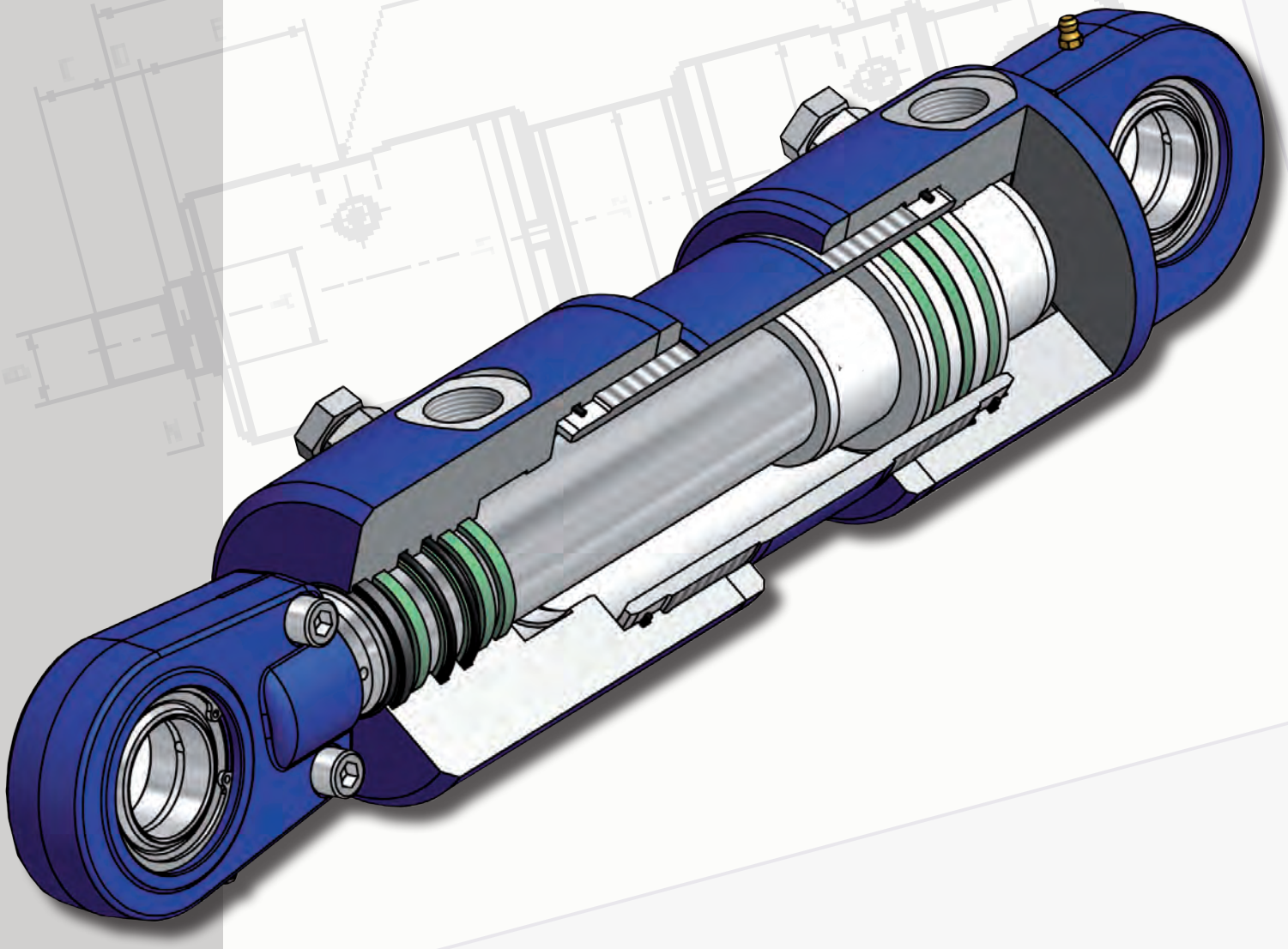
www.hydropa.de

hydropa®

HYDRAULISCHE ERZEUGNISSE GMBH & CIE. KG



HYDRAULIC CYLINDER
HYC

INTRODUCTION

The hydraulic cylinder, as a link between hydraulic control and the machine, is suitable for use in many areas of industry, such as pressing and joining applications, the chemical industry or tool making. Hydraulic cylinders can also be used without a problem in areas having extremely high or low ambient temperatures.

The Hydropa HYKS series of hydraulic cylinders exhibit a sturdy welded/bolted construction with honed and seamless cylinder barrels and ground, precision hard chrome-plated piston rods that are delivered with a prime coating as a standard feature. We are also happy to manufacture customized hydraulic cylinders. In order for us to submit an offer to meet your needs, please provide any special dimensions and requirements for the hydraulic cylinder along with your inquiry.

When designing hydraulic cylinders, the permissible collapse load for the particular stroke must be taken into consideration! If you cannot glean this information from the documents at your disposal, we would be happy to take care of this for you.

TABLE OF CONTENTS

GENERAL

GENERAL CHARACTERISTICS

Piston diameter:	40 to 200 mm
Perm. max. operating pressure:	250 bar
Test pressure:	300 bar
Piston speed:	0,5 m/s to 4 m/s
Temperature range:	-30° C to +80° C
Mounting position:	any
Damping adjustable:	piston-Ø ≥ 50 mm
Distance measurement:	transducer or inductive proximity switch

MATERIALS

Piston rod:	20MnV6
Cylinder:	St52
Seals:	• NBR • PTFE • POM • PU

The seals are designed for use with hydraulic oils in accordance with DIN 51524 and DIN 51525 and a temperature range of -30 ° C to +80 ° C. Seals for other temperature ranges and operating media as well as for other cylinder and rod materials are available upon request.

OPERATING PRESSURE

Our hydraulic cylinders are subjected to a static pressure test before delivery. The operating pressure can be selected freely on the basis of the operating conditions and the required level of safety – with reference to the test pressure.

PORTS

The oil ports are manufactured with standard metric fine thread or Whitworth pipe thread.

VENTILATION

Ventilation takes place at idling pressure through the base or rod-end oil port. Additional ventilation connections on the hydraulic cylinder can be provided upon customer request.

FILTERING

When the system is filled during operation, the hydraulic fluid must be filtered so that contamination with solids does not exceed the thresholds according to NAS 1638 Class 8 (Class 9 for 15µm and smaller) or ISO17/14. Finer filtration increases the lifetime of the equipment. Whatever the application, it must be ensured that the above limits are not exceeded.

DIFFERENTIAL CYLINDER

It must be ensured that differential cylinders have a free flow of hydraulic fluid from the piston rod end so that the pressure never exceeds the maximum operating pressure as a result of the pressure ratio.

SAFETY REGULATIONS

These instructions are intended for the safety work with hydraulic cylinders . They contain safety instructions that must be followed. The instructions must be available for all persons during their work with hydraulic cylinders. The instructions must always be complete and be in good readable condition. Only skilled workers, technicians and installers of machinery and equipment with hydraulic expertise are allowed to perform this work.

Technical knowledge means that the personnel must
- be able to read and completely understand technical specifications such as Circuit diagrams and product-specific design documents
- have knowledge about function and construction of hydraulic components

A qualified person is someone who has sufficient knowledge and is sufficiently familiar with the relevant provisions through technical training and experience that she/he
- can assess the work assigned to her/him
- can recognize potential hazards
- is able to use necessary measures to eliminate risks
- has repair and assembly knowledge

OPERATING INSTRUCTIONS

STORAGE

In order to ensure a long shelf life of the bearing surfaces and seals of hydraulic cylinders, and to protect them against corrosion, the piston rods should be retracted and the cylinders filled completely with oil. It is important to ensure that no air is trapped in the cylinder and that the connections are sealed airtight. The piston rod thread, the free rod end, and ball and socket joints should be coated lightly with anti-corrosion grease. If the cylinders are stored at fluctuating ambient temperatures, they must be protected with a pressure relief valve on each port end. After long periods of storage, pressure marks may occur at the seals, but these will disappear after the piston has been extended and retracted several times.

INSTALLATION

During the installation of hydraulic cylinders the following points should be noted:

- Before installing the hydraulic cylinder in the system, the type designation must be compared with the ordering data
- Make sure to keep the hydraulic cylinder and the area around it clean
- The operating fluid must be compatible with the sealing material
- Pipes should be cleaned of dirt, scale, chips, and the like before installation
- Never use lint-producing cloth or special paper for cleaning purposes
- The hydraulic cylinders must be installed and operated without any radial forces or stress. These transverse forces put a strain on the piston and piston rod guide of the hydraulic cylinder and lead to a shorter lifetime and leakages or even destruction.

COMMISSIONING

Before commissioning, the hydraulic cylinder must be vented. At idle pressure, open the bleeder screw / base- and rod-end screw and let the air escape. When no more bubbles come forth from the oil, re-tighten the bleed screw / screw.

MAINTENANCE

Hydraulic cylinders are generally maintenance free. For heavy-duty use, make sure to lubricate the bearings, such as the articulated and swivel eyes as well as the trunnion.

Seals and bearings are consumables. Once the internal or external leakage reaches an unacceptable level, we recommend that you replace the seals and bearings and check the cylinder for further wear. Of course we are always at your service to do this work for you.

ASSEMBLY AND DISASSEMBLY

When seals are changed, all seals and guide elements in general should be replaced. The contact surfaces of metallic parts should be checked for any cracks or score marks. If they do not exhibit any signs of damage or abnormal wear, then they can be re-used.

In order to disassemble the hydraulic cylinder, unscrew the rod guide (12) from the cylinder housing (7) using a hook wrench. Pull the rod (1) out of the cylinder housing (7). After removing the piston (3) by means of a hook wrench, all of the sealing elements (5, 6, 8, 9, 11, 13) and guide elements (4, 10) can now be replaced.

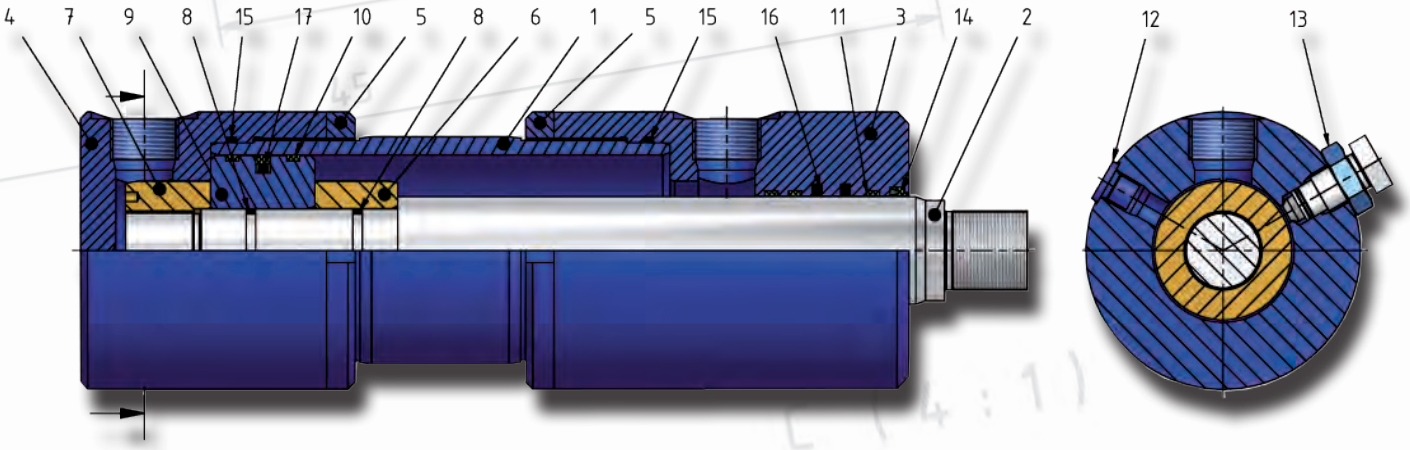
Oil the seals lightly and slip on with the help of a round-pointed tool. Be sure to install the rod seal (11) and the scraper ring (13) in the right direction. Once all of the seal and guide elements have been replaced, insert the piston into the lubricated cylinder housing (7). Lubricate the thread of the rod guide (12) and screw in firmly into the cylinder housing (7). Mount the assembled cylinder on a test bench to check for proper functioning and leaks.

REPLACMENT PARTS

When ordering spare parts, always include the imprinted order number, which is located to the right of the base-end connection (in reference to the piston rod).

PLEASE NOTE :

Installation, repair and commissioning of cylinders may be carried out only by trained specialist personnel with the necessary expertise. Hydropa assumes no liability for any damage resulting from installation, repairs and commissioning, which were not carried out or commissioned by Hydropa.



Pos.	Description	Pos.	Description
1	Cylinder tube	10	Piston rings
2	Piston rod	11	Rod rings
3	Cylinder head / Rod guide	12	Venting
4	Cylinder Base	13	Damping- and check valve
5	Hex nut	14	Scraper
6	Damping bush	15	O-Ring
7	Damping nut	16	Rod seal
8	O-Ring	17	Piston seal
9	Piston		

BASIS OF CALCULATIONS FOR HYDRAULIC CYLINDERS

Piston and ring surfaces / lifting and tractive forces					
Piston Ø (mm)	Rod Ø A (mm)	Piston area (cm^2)	Ring area (cm^2)	Theoretical compressive force at 210 bar (kN)	Theoretical tractive force at 210 bar (kN)
40	22	12,566	8,765	26,39	18,41
	28		6,409		13,46
50	28	19,635	13,477	41,23	28,30
	36		9,456		19,86
63	36	31,172	20,994	65,46	44,09
	45		15,268		32,06
80	45	50,265	34,361	105,56	72,16
	56		25,635		53,83
100	56	78,540	53,910	164,93	113,21
	70		40,055		84,12
125	70	122,718	84,234	257,71	176,89
	90		59,101		124,11
140	90	153,938	90,321	323,27	189,67
	100		75,398		158,34
160	100	201,062	122,522	422,23	257,30
	110		106,029		222,66
180	110	254,469	159,436	534,38	334,82
	125		131,751		276,68
200	125	314,159	191,441	659,73	402,03
	140		160,221		336,46

EFFICIENCY FACTOR

The values given in the table do not take into account the efficiency factor. Every hydraulic cylinder loses power due to the friction resistance of the sealing and guiding elements. Since the effect of these losses is different at different pressures, the following average values are anticipated as the efficiency factors:

Efficiency factor				
Pressure (bar)	20	120	160	250
Efficiency factor µ	0,85	0,9	0,92	0,97

PISTON FORCES

p = pressure
A = effective piston surface
F = effective piston force
d1 = piston diameter
d2 = piston rod diameter
μ = efficiency factor of the cylinder

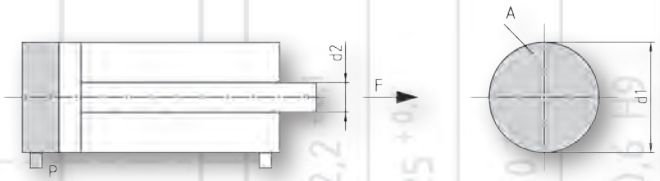
Effective piston force:
F = p * A * μ

example

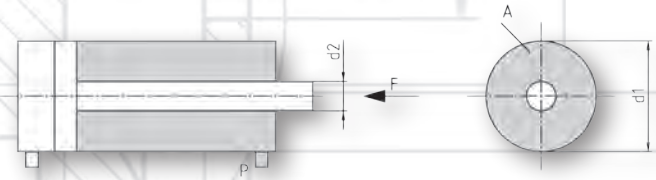
given:
Hydraulic cylinder with d1 = 100 mm, d2 = 70 mm,
μ = 0.85, p = 60 bar [1 bar = 10 N/cm2]

needed:
Effective piston force (F)

extension:
F = p * A * μ
= 600 N/cm2 * (π * (10 cm)2 / 4) * 0.85
= 40.055 N



retraction:
F = p * A * μ
= 600 N/cm2 * (π * ((10 cm)2 - (7 cm)2) / 4) * 0.85
= 20.428 N



PISTON SPEED

Q = volumetric flow rate
A = effective piston surface
v = piston speed

Piston speed:
v = Q / A

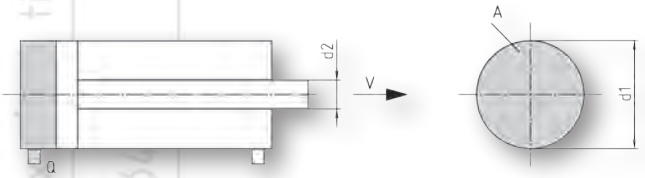
example

given:
Hydraulic cylinder with d1 = 50 mm, d2 = 36 mm,
Q = 12 l/min

needed:
Piston speed (v)

extension:

$$\mathbf{v} = \frac{Q}{A} = \frac{12.000 cm^3 / min}{\frac{((\pi * (5cm)^2)}{4}} = 611 \frac{cm}{min} = \mathbf{6{,}11} \frac{\mathbf{m}}{\mathbf{min}}$$



retraction:

$$\mathbf{v} = \frac{Q}{A} = \frac{12.000 cm^3 / min}{\frac{((\pi * (5cm)^2)}{4} - \frac{((\pi * (3{,}6cm)^2)}{4}} = 1.269 \frac{cm}{min} = \mathbf{12{,}69} \frac{\mathbf{m}}{\mathbf{min}}$$

TECHNICAL DATA

Buckling calculation

The calculation of buckling S_K is carried out according to Euler, whereby in simplified terms the piston rod and tube can be regarded as a slender rod.

Euler case 2 using articulated / swivel eye as an example

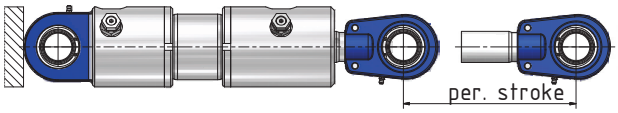
$$S_K = \frac{\sqrt{\frac{\pi^2 * E * J}{F * S}} - (A + \text{add. meas.})}{2}$$

Euler case 3 using head flange as an example

$$S_K = \frac{\sqrt{\frac{\pi^2 * E * J}{F * S}}}{0{,}707} - (A + \text{add. meas.})$$

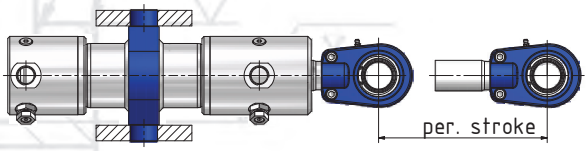
The tables show the permissible stroke in mm at buckling stress (compressive stress) according to Euler with 3.5 times the safety factor and flexibly guided load.

S_K = per. stroke length in mm
E = modulus of elasticity $2{,}1 * 10^5$ for steel in N/mm²
J = moment of area im mm⁴
for circular cross-section = $\frac{d^4 * \pi}{64}$
F = compressive force in N/cm²
A = measurement A of the piston rod eye, see pg. 17
S = 3.5 (safety factor)



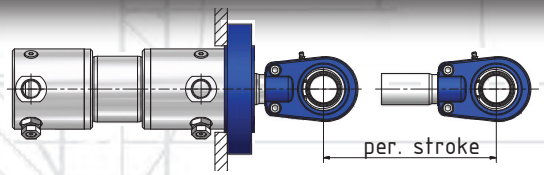
Mounting type articulated / swivel eye HYC-...-G/S-... (with measurement "L" and piston rod eye)

Piston Ø (mm)	40		50		63		80		100		125		140		160		180		200	
Piston rod Ø (mm)	22	28	28	36	36	45	45	56	56	70	70	90	90	100	100	110	110	125	125	140
Working pressure (bar)	permissible stroke (mm)																			
50	405	690	510	950	700	1195	880	1480	1105	1865	1400	2500	2170	2755	2330	2895	2480	3325	2920	3775
100	255	445	315	625	440	790	560	985	710	1245	905	1680	1440	1855	1540	1940	1635	2230	1935	2540
150	185	335	225	480	325	610	420	765	535	970	685	1320	1115	1455	1190	1520	1260	1745	1500	1995
200	145	270	160	395	256	505	335	635	430	810	555	1105	925	1215	985	1265	1035	1455	1240	1670
250	120	225	140	335	210	435	280	545	360	695	465	960	795	1055	840	1095	885	1260	1065	1445



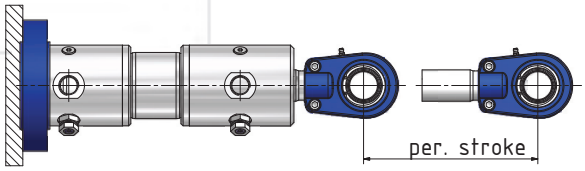
Mounting type trunnion HYC-...-M-... (with measurement "L" and piston rod eye)

Piston Ø (mm)	40		50		63		80		100		125		140		160		180		200	
Piston rod Ø (mm)	22	28	28	36	36	45	45	56	56	70	70	90	90	100	100	110	110	125	125	140
Working pressure (bar)	permissible stroke (mm)																			
50	570	1000	765	1350	1025	1690	1280	2080	1595	2605	2005	3470	3045	3825	3275	4030	3505	4625	4105	5245
100	365	670	500	915	680	1150	855	1420	1070	1785	1345	2385	2075	2625	2225	2760	2375	3170	2790	3595
150	275	525	385	720	525	910	670	1130	835	1420	1055	1900	1640	2090	1760	2195	1875	2525	2210	2865
200	220	440	315	610	435	765	555	955	695	1200	880	1615	1385	1840	1485	1860	1575	2140	1860	2430
250	185	380	265	530	375	670	480	835	600	1050	760	1415	1210	1560	1295	1630	1370	1875	1625	2135



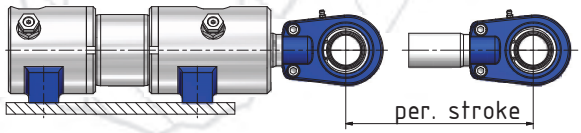
Mounting type head flange HYC-...-K-... (with measurement “L” and piston rod eye)

Piston Ø (mm)	40		50		63		80		100		125		140		160		180		200	
Piston rod Ø (mm)	22	28	28	36	36	45	45	56	56	70	70	90	90	100	100	110	110	125	125	140
Working pressure (bar)	permissible stroke (mm)																			
50	1405	2285	1795	3040	2370	3780	2935	4625	3630	5780	4555	7670	6795	8450	7325	8925	7850	10235	9145	11565
100	980	1590	1235	2115	1635	2635	2035	3230	2515	4030	3155	5360	4735	5900	5100	6230	5455	7140	6360	8075
150	790	1280	990	1705	1315	2125	1635	2610	2020	3255	2535	4335	3820	4775	4110	5035	4390	5770	5130	6525
200	675	1095	840	1465	1120	1825	1395	2240	1725	2795	2165	3725	3275	4100	3525	4320	3760	4950	4395	5605
250	600	965	740	1295	990	1615	1235	1990	1520	2480	1915	3310	2905	3640	3120	3835	3330	4390	3890	4975



Mounting type base flange HYC-...-B-... (with measurement “L” and piston rod eye)

Piston Ø (mm)	40		50		63		80		100		125		140		160		180		200	
Piston rod Ø (mm)	22	28	28	36	36	45	45	56	56	70	70	90	90	100	100	110	110	125	125	140
Working pressure (bar)	permissible stroke (mm)																			
50	635	1040	790	1415	1070	1770	1355	2200	1670	2740	2105	3660	3210	4035	3450	4250	3695	4885	4330	5540
100	420	690	510	950	700	1200	905	1505	1110	1870	1405	2505	2175	2760	2335	2900	2495	3335	2965	3790
150	325	535	390	750	540	945	705	1195	860	1480	1095	1995	1720	2195	1845	2350	1965	2650	2320	3015
200	270	445	315	625	440	795	585	1010	715	1250	910	1690	1445	1860	1550	1950	1645	2245	1950	2555
250	230	380	265	545	375	690	505	885	610	1095	785	1480	1260	1630	1350	1705	1430	1965	1700	2240

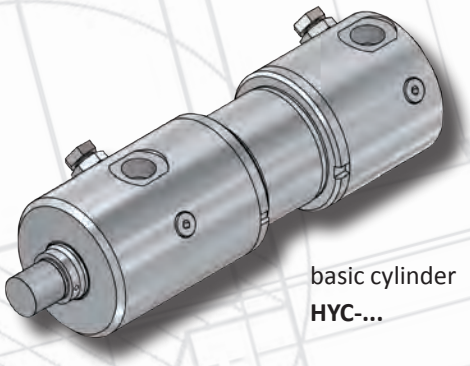


Mounting type tangential feet HYC-...-T-... (with measurement “D” and piston rod eye)

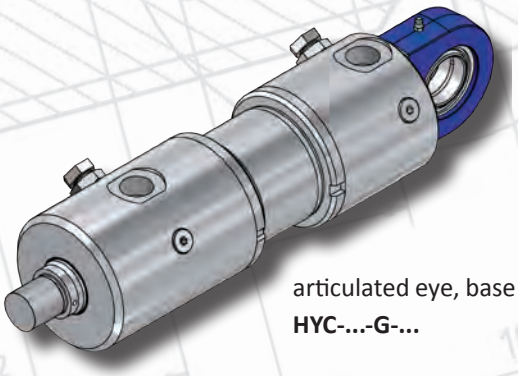
Piston Ø (mm)	40		50		63		80		100		125		140		160		180		200	
Piston rod Ø (mm)	22	28	28	36	36	45	45	56	56	70	70	90	90	100	100	110	110	125	125	140
Working pressure (bar)	permissible stroke (mm)																			
50	1405	2285	1795	3040	2370	3780	2935	4625	3630	5780	4555	7670	6795	8450	7325	8925	7850	10235	9145	11565
100	980	1590	1235	2115	1635	2635	2035	3230	2515	4030	3155	5360	4735	5900	5100	6230	5455	7140	6360	8075
150	790	1280	990	1705	1315	2125	1635	2610	2020	3255	2535	4335	3820	4775	4110	5035	4390	5770	5130	6525
200	675	1095	840	1465	1120	1825	1395	2240	1725	2795	2165	3725	3275	4100	3525	4320	3760	4950	4395	5605
250	600	965	740	1295	990	1615	1235	1990	1520	2480	1915	3310	2905	3640	3120	3835	3330	4390	3890	4975

MOUNTING METHODS

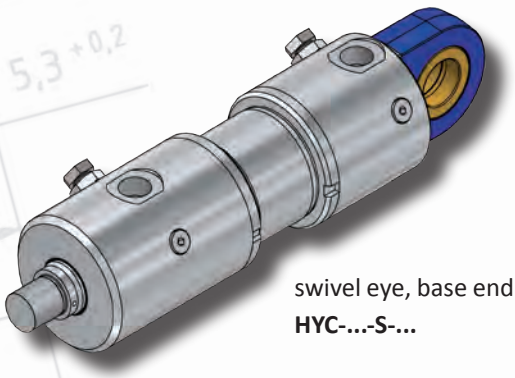
Optional: Piston rod eye, fork head
We also build other models according to customer specifications.



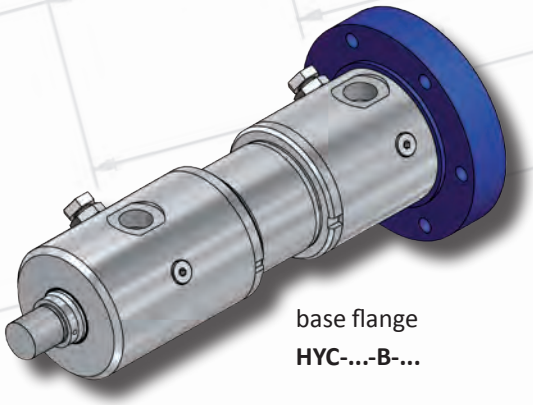
basic cylinder
HYC-...



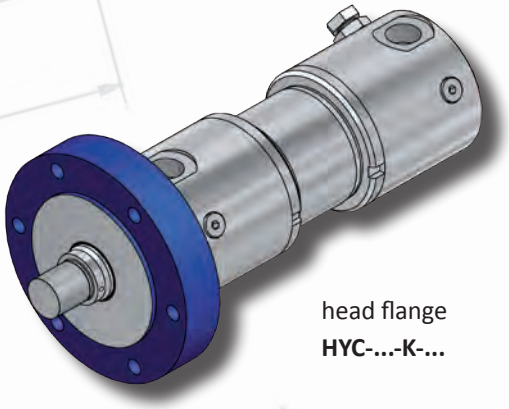
articulated eye, base end
HYC-...-G-...



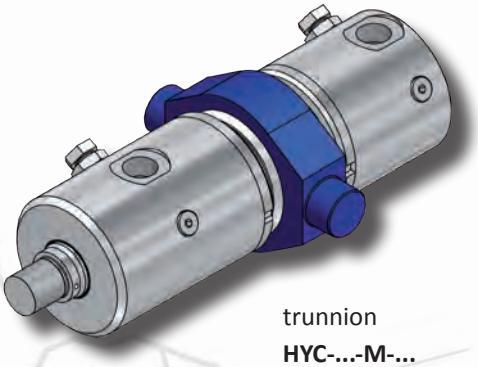
swivel eye, base end
HYC-...-S-...



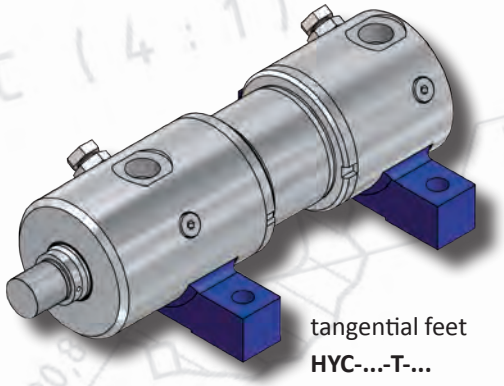
base flange
HYC-...-B-...



head flange
HYC-...-K-...



trunnion
HYC-...-M-...



tangential feet
HYC-...-T-...

PRODUCT KEY HYDRAULIC CYLINDER SERIES: HYC

HYC - [ ] - [ ] / [ ] / [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ] - [ ]

1 2 3 4 5 6 7 8 9 10

1 MOUNTING TYPE
- G = articulated eye
- S = swivel eye
- K = head flange
- B = base flange
- M = trunnion
- T = tangential feet

2 PISTON DIAMETER (mm)

3 ROD DIAMETER (mm)
... =piston rod material 20MnV6 (standard)

4 ROD DIAMETER (mm)
(for synchronous cylinder only)
... = piston rod material 20MnV6 (standard)

5 STROKE (mm)

6 OIL PORT THREAD
- „no specification“ = pipe thread
- M = metric thread

7 TYPE OF MOUNTING ON PISTON ROD
- „no specification“ = Piston rod thread
- GIHR-K = Piston rod eye,clampable
- SA-K = Swivel eye, clampable
- GK = Clevis, clampable

8 MEASURING SYSTEM
- BTL = linear transducer
- BES = inductive proximity swich

9 ADDITIONAL DISCLOSURES
- „no specification“ = Standard
- SO = Sondermaße

10 SEALS
- C04 = sealing stick-slip-free with retaining function
- C06 = same as C04, Material: viton® fluoroelastomers*
- C15 = Seals like customer information

EXAMPLE

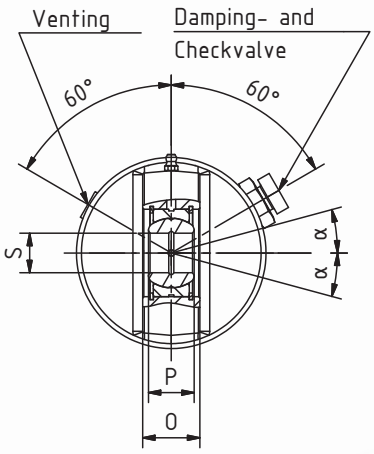
HYC - G - 063 / 036 / ... - 0100 -...- GIHR-K 35 - ... - SO - C04

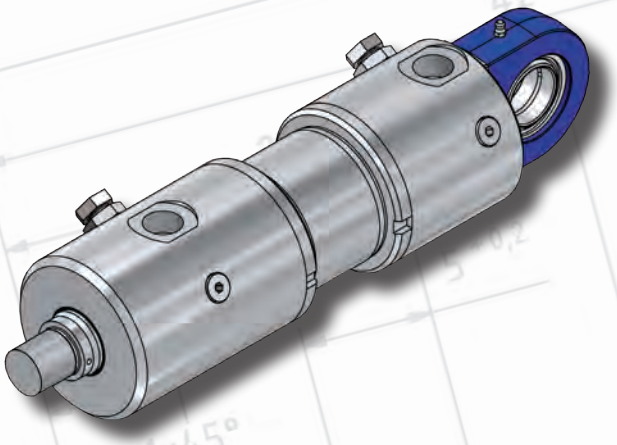
1 2 3 4 5 6 7 8 9 10

*Viton® is a registered trademark of DuPont Performance Elastomers

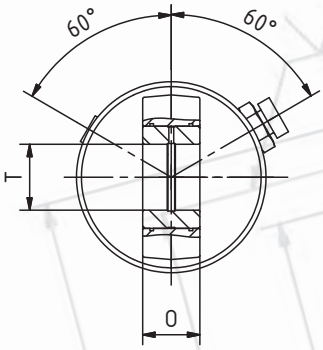
DIFFERENTIAL CYLINDER WITH ARTICULATED / SWIVEL EYE

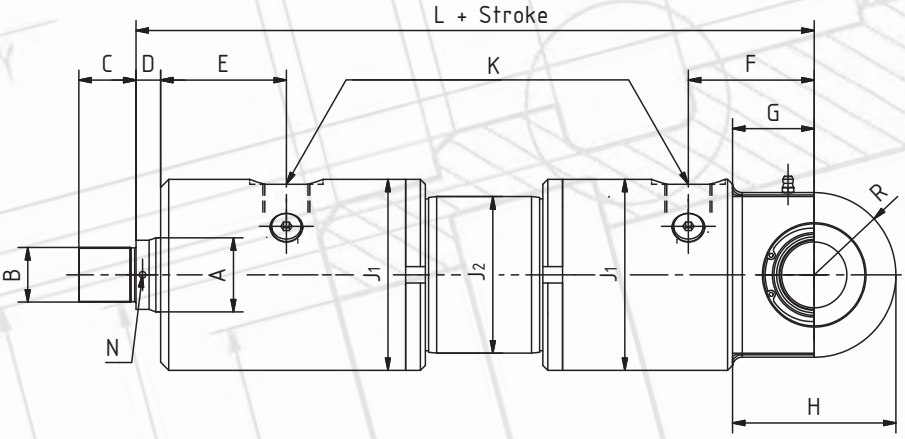
HYC-G





HYC-S

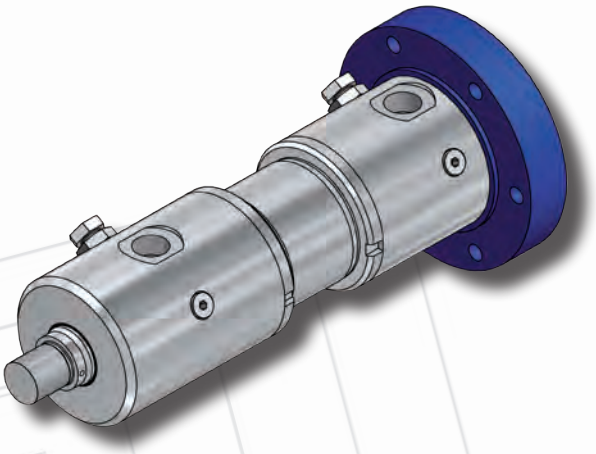


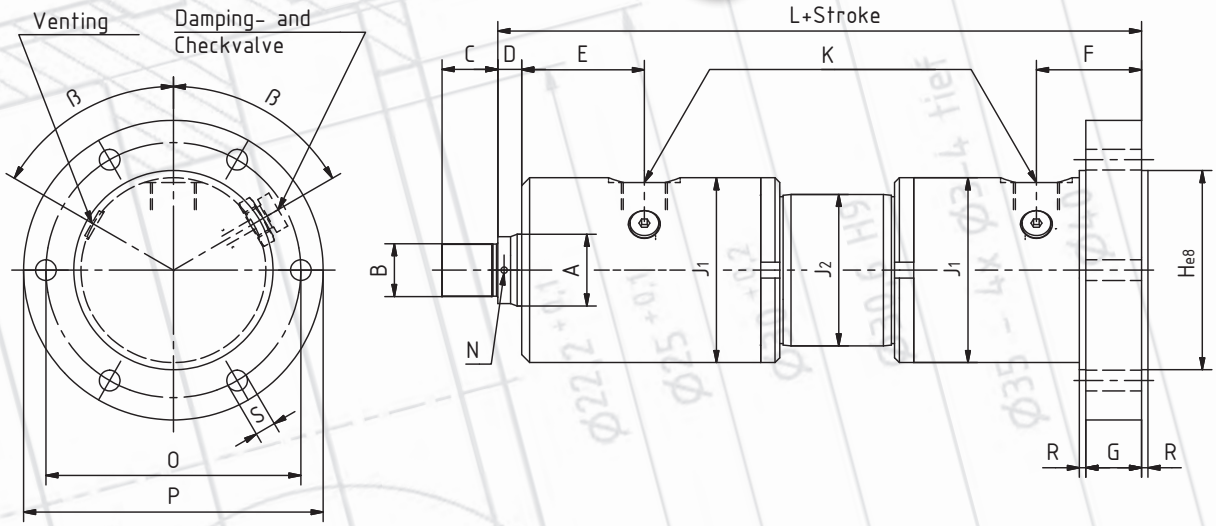


Differential cylinder with articulated / swivel eye

Type	Piston Ø (mm)	Piston rod Ø A (mm)	B	C	D	E	F	G	H	J_1 Ø	J_2 Ø	K W-Tube (Standard)	K Metr.	L	N Ø	O	P	R	S Ø	T H11 Ø	Tilt angle α	GIHR-K, SA-K, GK (equipm.)	Damping	Weight (kg) for stroke 0mm	Weight (kg) each-100mm of stroke
HYC-...-G/S-40/22-...	40	22	M16 x 1,5	16	10	50	48	30	62	68	50	G 3/8	M18 x 1,5	175±1	2,5	23	20	28	25 -0,01	25	7°	25	20	3,6	0,9
HYC-...-G/S-40/28-...		28													3									3,7	1
HYC-...-G/S-50/28-...	50	28	M22 x 1,5	22	11	57	56	35	69	87	62	G 1/2	M22 x 1,5	200±1	3	28	22	32	30 -0,01	30	6°	30	20	7	1,3
HYC-...-G/S-50/36-...		36													4									7,1	1,6
HYC-...-G/S-63/36-...	63	36	M28 x 1,5	28	12	63	67	45	87	97	75	G 1/2	M22 x 1,5	225±1	4	30	25	39	35 -0,012	35	6°	35	25	9,3	1,8
HYC-...-G/S-63/45-...		45													4									9,5	2,3
HYC-...-G/S-80/45-...	80	45	M35 x 1,5	35	15	77	77	50	100	116	95	G 3/4	M27 x 2	265±2	4	35	28	47	40 -0,012	40	7°	40	30	18	2,9
HYC-...-G/S-80/56-...		56													5									18,2	3,6
HYC-...-G/S-100/56-...	100	56	M45 x 1,5	45	20	80	96	60	123	138	120	G 3/4	M27 x 2	305±2	5	40	35	58	50 -0,012	50	6°	50	35	31	4,7
HYC-...-G/S-100/70-...		70													6									32	5,8
HYC-...-G/S-125/70-...	125	70	M58 x 1,5	58	20	98	108	70	140	165	145	G 1	M33 x 2	350±2	6	50	44	65	60 -0,015	60	6°	60	40	51	6,4
HYC-...-G/S-125/90-...		90													6									53	8,4
HYC-...-G/S-140/90-...	140	90	M65 x 1,5	65	22	102	112	75	157	188	165	G 1	M33 x 2	370±3	6	55	49	77	70 -0,015	70	6°	70	40	75	10
HYC-...-G/S-140/100-..		100													8									77	11
HYC-...-G/S-160/100-..	160	100	M80 x 2	80	25	110	131	85	180	213	190	G 1 1/4	M42 x 2	415±3	8	60	55	88	80 -0,015	80	6°	80	50	99	12
HYC-...-G/S-160/110-..		110													8									101	15
HYC-...-G/S-180/110-..	180	110	M100 x 2	100	30	115	148	95	208	240	220	G 1 1/4	M42 x 2	478±3	8	65	60	103	90 -0,015	90	5°	90	70	136	15
HYC-...-G/S-180/125-..		125													8									137	19
HYC-...-G/S-200/125-..	200	125	M110 x 2	110	32	120	182	115	240	268	245	G 1 1/4	M42 x 2	500±3	8	70	70	115	100 -0,015	100	7°	100	70	185	20
HYC-...-G/S-200/140-..		140													8									186	24

DIFFERENTIAL CYLINDER WITH BASE FLANGE

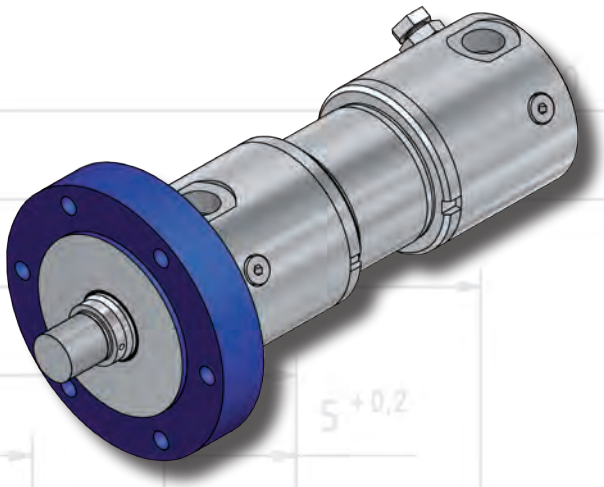


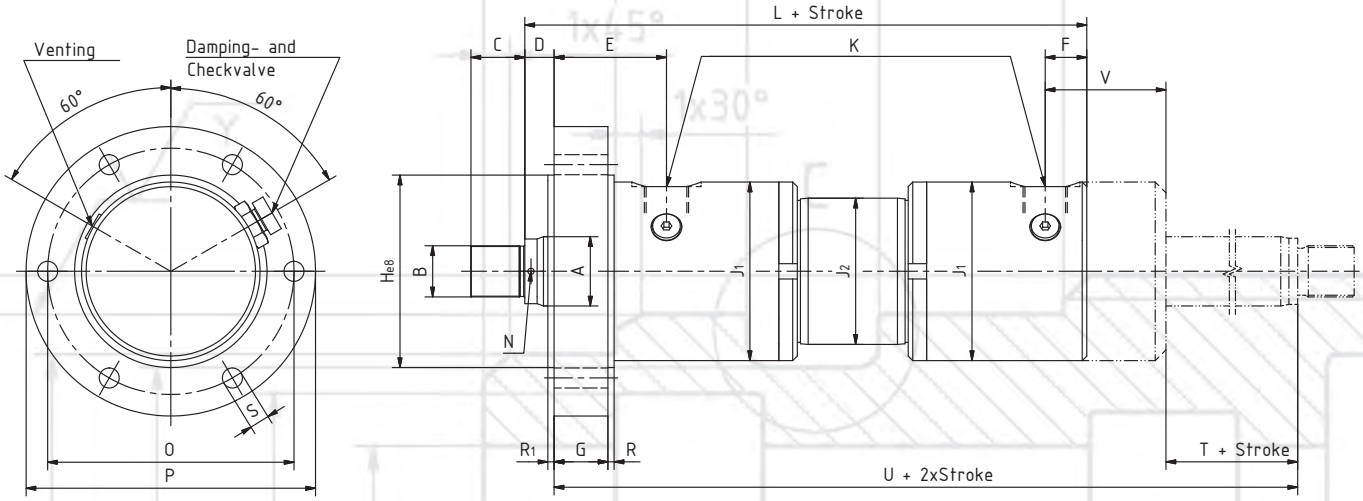


Differential cylinder with base flange

Type	Piston Ø (mm)	Piston rod Ø A (mm)	B	C	D	E	F	G	H e8	J_1 Ø	J_2 Ø	K		L	N Ø	O Ø	P Ø	R	R_1	S Ø	min. Hub	GIHR-K, SA-K, GK (equipm.)	Damping	Weight (kg)	
												W-Tube (Standard)	Metr.											for stroke 0mm	each 100mm of stroke
HYC-...-B-40/22-...	40	22	M16 x 1,5	16	10	50	41,5	20	75	68	50	G 3/8	M18 x 1,5	168±1	2,5	100	120	3,5	3,5	9	70	25	20	5,5	0,9
HYC-...-B-40/28-...		28													3									5,6	1
HYC-...-B-50/28-...	50	28	M22 x 1,5	22	11	57	49,5	25	90	87	62	G 1/2	M22 x 1,5	193±1	3	115	140	3,5	3,5	11	85	30	20	9,8	1,3
HYC-...-B-50/36-...		36													4									9,9	1,6
HYC-...-B-63/36-...	63	36	M28 x 1,5	28	12	63	55,5	30	100	97	75	G 1/2	M22 x 1,5	213±1	4	135	160	3,5	3,5	13	90	35	25	13,8	1,8
HYC-...-B-63/45-...		45													4									14	2,3
HYC-...-B-80/45-...	80	45	M35 x 1,5	35	15	77	66	35	125	116	95	G 3/4	M27 x 2	254±2	4	160	190	4	4	13	90	40	30	25,5	2,9
HYC-...-B-80/56-...		56													5									25,7	3,6
HYC-...-B-100/56-...	100	56	M45 x 1,5	45	20	80	80	40	150	138	120	G 3/4	M27 x 2	289±2	5	185	220	4	4	17	95	50	35	40,5	4,7
HYC-...-B-100/70-...		70													6									41,5	5,8
HYC-...-B-125/70-...	125	70	M58 x 1,5	58	20	98	93	50	180	165	145	G 1	M33 x 2	335±2	6	220	270	5	5	22	120	60	40	70	6,4
HYC-...-B-125/90-...		90													6									72	8,4
HYC-...-B-140/90-...	140	90	M65 x 1,5	65	22	102	92	50	200	188	165	G 1	M33 x 2	350±3	6	245	290	5	5	22	130	70	40	93	10
HYC-...-B-140/100-...		100													8									95	11
HYC-...-B-160/100-...	160	100	M80 x 2	80	25	110	111	60	220	213	190	G 1 1/4	M42 x 2	395±3	8	270	320	5	5	30	160	80	50	121	12
HYC-...-B-160/110-...		110													8									123	15
HYC-...-B-180/110-...	180	110	M100 x 2	100	30	115	119	60	250	240	220	G 1 1/4	M42 x 2	449±3	8	305	360	6	6	33	170	90	70	168	15
HYC-...-B-180/125-...		125													8									170	19
HYC-...-B-200/125-...	200	125	M110 x 2	110	32	120	133	60	280	268	245	G 1 1/4	M42 x 2	451±3	8	340	390	6	6	33	185	100	70	228	20
HYC-...-B-200/140-...		140													8									229	24

DIFFERENTIAL CYLINDER WITH HEAD FLANGE

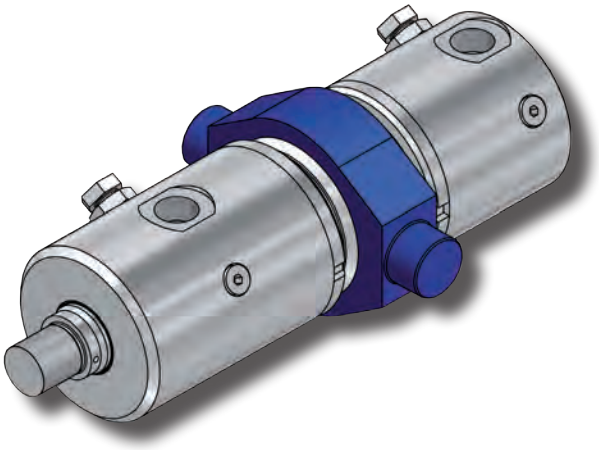


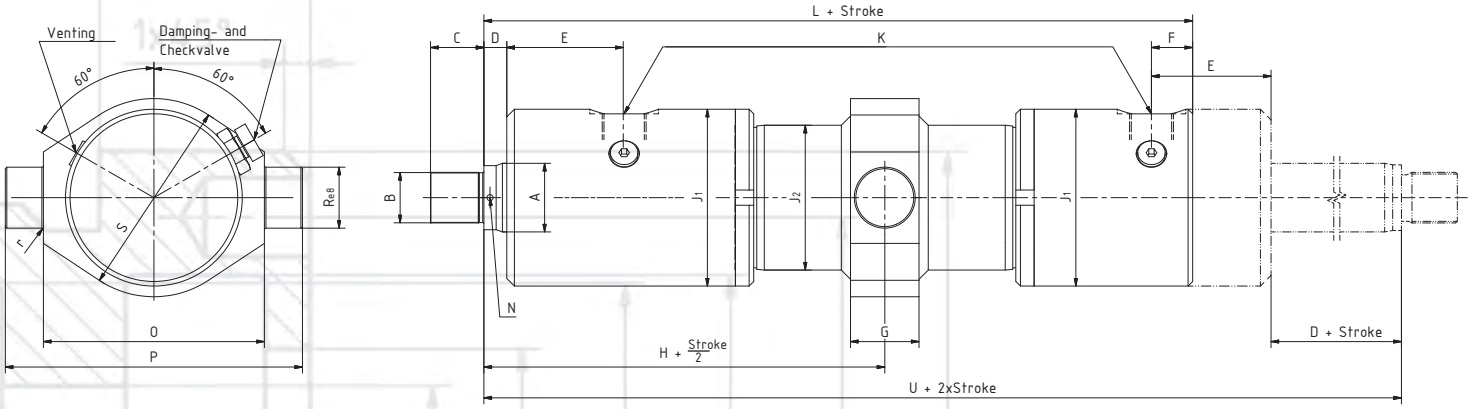


Differential cylinder with head flange

Type	Piston Ø (mm)	Piston rod Ø A (mm)	B	C	D	E	F	G	H e8	J_1 Ø	J_2 Ø	K W-Tube (Standard)	K Metr.	L	N Ø	O Ø	P Ø	R	R_1	S Ø	T	U	V	min. Hub	GIHR-K, SA-K, GK (equipm.)	Damping	Weight (kg) for stroke 0mm	Weight (kg) each 100mm of stroke
HYC-...-K-40/22-...	40	22	M16 x 1,5	16	13,5	46,5	18	20	75	68	50	G 3/8	M18 x 1,5	145±1	2,5	100	120	3,5	3,5	9	10±1	187	50	70	25	20	4,6	0,9
HYC-...-K-40/28-...		28													3												4,7	1
HYC-...-K-50/28-...	50	28	M22 x 1,5	22	14,5	53,5	21	25	90	87	62	G 1/2	M22 x 1,5	165±1	3	115	140	3,5	3,5	11	11±1	212	57	85	30	20	8,7	1,3
HYC-...-K-50/36-...		36													4												8,8	1,6
HYC-...-K-63/36-...	63	36	M28 x 1,5	28	15,5	59,5	22	30	100	97	75	G 1/2	M22 x 1,5	180±1	4	135	160	3,5	3,5	13	12±1	233	63	90	35	25	12	1,8
HYC-...-K-63/45-...		45													4												12,5	2,3
HYC-...-K-80/45-...	80	45	M35 x 1,5	35	19	73	27	35	125	116	95	G 3/4	M27 x 2	215±2	4	160	190	4	4	13	15±2	280	77	90	40	30	22,5	2,9
HYC-...-K-80/56-...		56													5												23	3,6
HYC-...-K-100/56-...	100	56	M45 x 1,5	45	24	76	36	40	150	138	120	G 3/4	M27 x 2	245±2	5	185	220	4	4	17	20±2	309	80	95	50	35	35	4,7
HYC-...-K-100/70-...		70													6												36	5,8
HYC-...-K-125/70-...	125	70	M58 x 1,5	58	25	93	38	50	180	165	145	G 1	M33 x 2	280±2	6	220	270	5	5	22	20±2	359	98	120	60	40	61	6,4
HYC-...-K-125/90-...		90													6												63	8,4
HYC-...-K-140/90-...	140	90	M65 x 1,5	65	26	97	37	50	200	188	165	G 1	M33 x 2	295±3	6	245	290	5	5	22	22±3	381	102	130	70	40	81	10
HYC-...-K-140/100-..		100													8												83	11
HYC-...-K-160/100-..	160	100	M80 x 2	80	30	105	46	60	220	213	190	G 1 1/4	M42 x 2	330±3	8	270	320	5	5	30	25±3	419	110	160	80	50	106	12
HYC-...-K-160/110-..		110													8												108	15
HYC-...-K-180/110-..	180	110	M100 x 2	100	36	109	53	60	250	240	220	G 1 1/4	M42 x 2	383±3	8	305	360	6	6	33	30±3	475	115	170	90	70	148	15
HYC-...-K-180/125-..		125													8												150	19
HYC-...-K-200/125-..	200	125	M110 x 2	110	38	114	67	60	280	268	245	G 1 1/4	M42 x 2	385±3	8	340	390	6	6	33	32±3	470	120	185	100	70	200	20
HYC-...-K-200/140-..		140													8												201	24

DIFFERENTIAL CYLINDER WITH TRUNNION

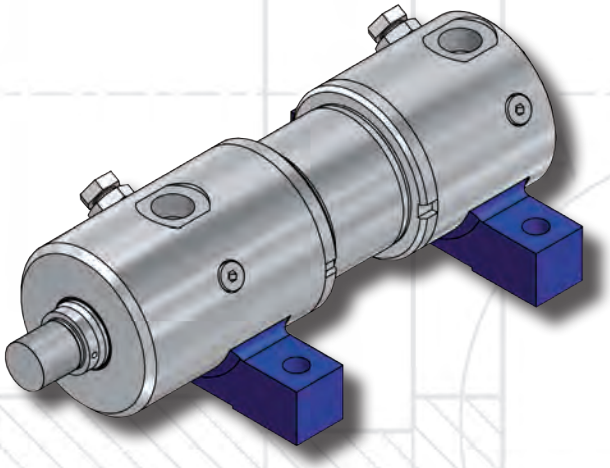


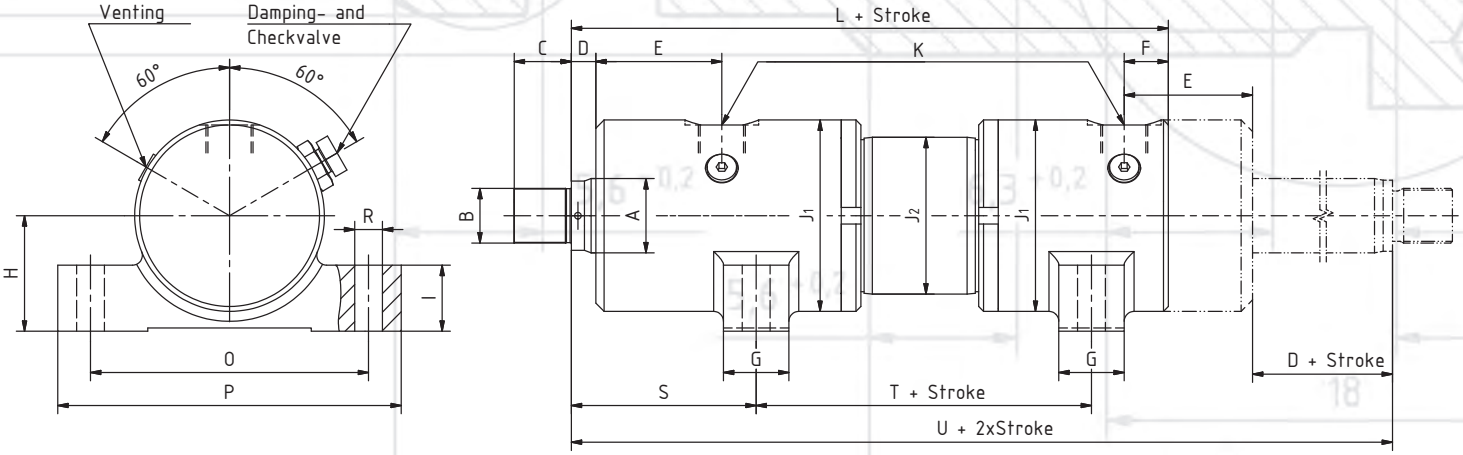


Differential cylinder with trunnion

Type	Piston Ø (mm)	Piston rod Ø A (mm)	B	C	D	E	F	G	H	J_1 Ø	J_2 Ø	K W-Tube (Standard)	K Metr.	L	N Ø	O	P	R e8 Ø	S Ø	r	U	min. Hub	GIHR-K, SA-K, GK (equipm.)	Damping	Weight (kg) for stroke 0mm	Weight (kg) each 100mm of stroke
HYC-...-M-40/22-...	40	22	M16 x 1,5	16	10	50	18	35	94	68	50	G 3/8	M18 x 1,5	145±1	2,5	95	135	30	70	1,6	187	100	25	20	4,3	0,9
HYC-...-M-40/28-...		28													3										4,4	1
HYC-...-M-50/28-...	50	28	M22 x 1,5	22	11	57	21	35	106	87	62	G 1/2	M22 x 1,5	165±1	3	115	155	30	85	1,6	212	110	30	20	7,8	1,3
HYC-...-M-50/36-...		36													4										7,9	1,6
HYC-...-M-63/36-...	63	36	M28 x 1,5	28	12	63	22	40	117	97	75	G 1/2	M22 x 1,5	180±1	4	130	170	35	105	2	233	120	35	25	10,5	1,8
HYC-...-M-63/45-...		45													4										10,7	2,3
HYC-...-M-80/45-...	80	45	M35 x 1,5	35	15	77	27	45	140	116	95	G 3/4	M27 x 2	215±2	4	145	195	40	130	2	280	120	40	30	20	2,9
HYC-...-M-80/56-...		56													5										20,2	3,6
HYC-...-M-100/56-...	100	56	M45 x 1,5	45	20	80	36	55	155	138	120	G 3/4	M27 x 2	245±2	5	175	235	50	155	2	309	135	50	35	32,5	4,7
HYC-...-M-100/70-...		70													6										33,5	5,8
HYC-...-M-125/70-...	125	70	M58 x 1,5	58	20	98	38	65	180	165	145	G 1	M33 x 2	280±2	6	210	290	60	190	2,5	359	160	60	40	55	6,4
HYC-...-M-125/90-...		90													6										57	8,4
HYC-...-M-140/90-...	140	90	M65 x 1,5	65	22	102	37	70	194	188	165	G 1	M33 x 2	295±3	6	230	315	65	210	2,5	381	175	70	40	77	10
HYC-...-M-140/100-...		100													8										79	11
HYC-...-M-160/100-...	160	100	M80 x 2	80	25	110	46	80	210	213	190	G 1 1/4	M42 x 2	330±3	8	275	380	75	240	2,5	419	190	80	50	102	12
HYC-...-M-160/110-...		110													8										104	15
HYC-...-M-180/110-...	180	110	M100 x 2	100	30	115	53	95	238	240	220	G 1 1/4	M42 x 2	383±3	8	300	410	85	270	2,5	475	210	90	70	142	15
HYC-...-M-180/125-...		125													8										143	19
HYC-...-M-200/125-...	200	125	M110 x 2	110	32	120	67	95	238	268	245	G 1 1/4	M42 x 2	385±3	8	320	430	90	300	2,5	470	210	100	70	194	20
HYC-...-M-200/140-...		140													8										195	24

DIFFERENTIAL CYLINDER WITH TANGENTIAL FEET



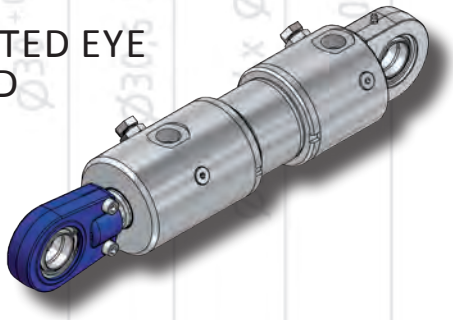


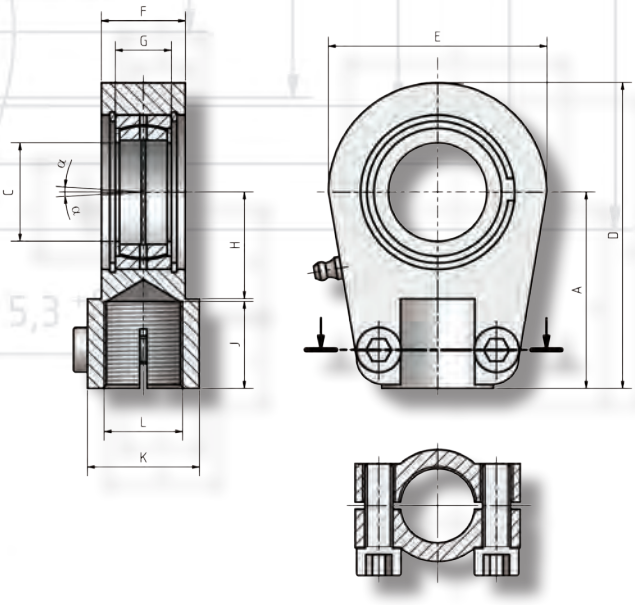
Differential cylinder with tangential feet

Type	Piston Ø (mm)	Piston rod Ø A (mm)	B	C	D	E	F	G	H	I	J_1 Ø	J_2 Ø	K		L	N Ø	O	P	R Ø	S	T	U	min. Hub	GIHR-K, SA-K, GK (equipm.)	Damping	Weight (kg)	
													W-Tube (Standard)	Metr.												for stroke 0mm	each 100mm of stroke
HYC-...-T-40/22-...	40	22	M16 x 1,5	16	10	50	18	25	45	25	68	50	G 3/8	M18 x 1,5	145±1	2,5	110	135	11	75	36	187	70	25	20	5,1	0,9
HYC-...-T-40/28-...		28														3										5,2	1
HYC-...-T-50/28-...	50	28	M22 x 1,5	22	11	57	21	25	50	30	87	62	G 1/2	M22 x 1,5	165±1	3	130	155	11	86	40	212	85	30	20	9,1	1,3
HYC-...-T-50/36-...		36														4										9,2	1,6
HYC-...-T-63/36-...	63	36	M28 x 1,5	28	12	63	22	30	55	35	97	75	G 1/2	M22 x 1,5	180±1	4	150	180	13	94	45	233	90	35	25	12,3	1,8
HYC-...-T-63/45-...		45														4										12,5	2,3
HYC-...-T-80/45-...	80	45	M35 x 1,5	35	15	77	27	40	70	40	116	95	G 3/4	M27 x 2	215±2	4	170	210	17	113	55	280	90	40	30	24,2	2,9
HYC-...-T-80/56-...		56														5										24,5	3,6
HYC-...-T-100/56-...	100	56	M45 x 1,5	45	20	80	36	50	85	50	138	120	G 3/4	M27 x 2	245±2	5	205	250	21	125	60	309	95	50	35	45,5	4,7
HYC-...-T-100/70-...		70														6										46,5	5,8
HYC-...-T-125/70-...	125	70	M58 x 1,5	58	20	98	38	60	105	60	165	145	G 1	M33 x 2	280±2	6	255	305	25	145	65	359	120	60	40	81	6,4
HYC-...-T-125/90-...		90														6										83	8,4
HYC-...-T-140/90-...	140	90	M65 x 1,5	65	22	102	37	65	115	65	188	165	G 1	M33 x 2	295±3	6	280	340	28	158	70	381	130	70	40	110	10
HYC-...-T-140/100-...		100														8										112	11
HYC-...-T-160/100-...	160	100	M80 x 2	80	25	110	46	75	135	70	213	190	G 1 1/4	M42 x 2	330±3	8	330	400	31	168	80	419	160	80	50	158	12
HYC-...-T-160/110-...		110														8										160	15
HYC-...-T-180/110-...	180	110	M100 x 2	100	30	115	53	85	150	80	240	220	G 1 1/4	M42 x 2	383±3	8	360	440	37	195	85	475	170	90	70	200	15
HYC-...-T-180/125-...		125														8										202	19
HYC-...-T-200/125-...	200	125	M110 x 2	110	32	120	67	90	160	85	268	245	G 1 1/4	M42 x 2	385±3	8	385	465	37	194	100	470	185	100	70	258	20
HYC-...-T-200/140-...		140														8										260	24

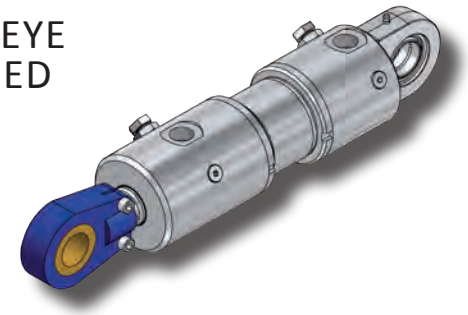
PISTON ROD EYES

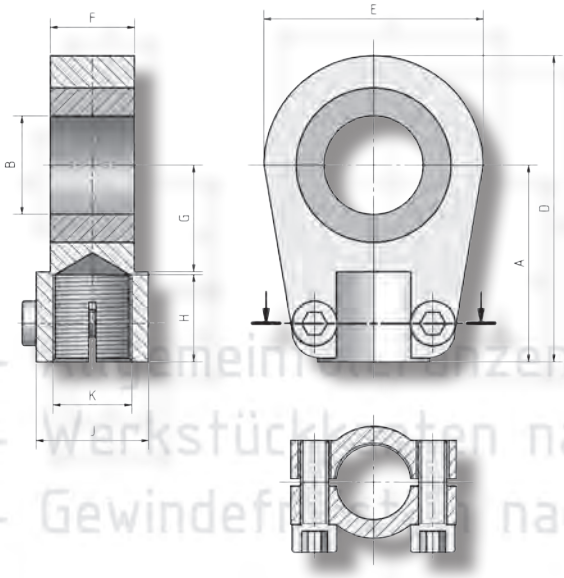
ARTIUCLATED EYE ROD SIDED





SWIVEL EYE ROD SIDED





Articulated eye

Type	A	C Ø	D	E	F	G	H	J	K	L	α	Weight (kg)
GIHR-K20	50	20 -0,010	80	56	19	16	25	17	25	M16 x 1,5	9°	0,5
GIHR-K25	50	25 -0,010	80	56	23	20	28	17	25	M16 x 1,5	7°	0,5
GIHR-K30	60	30 -0,010	94	64	28	22	30	23	32	M22 x 1,5	6°	0,8
GIHR-K35	70	35 -0,010	112	78	30	25	38	29	40	M28 x 1,5	6°	1,2
GIHR-K40	85	40 -0,012	135	94	35	28	45	36	49	M35 x 1,5	7°	2
GIHR-K50	105	50 -0,012	168	116	40	35	55	46	61	M45 x 1,5	6°	3,8
GIHR-K60	130	60 -0,012	200	130	50	44	65	59	75	M58 x 1,5	6°	5,4
GIHR-K70	150	70 -0,015	232	154	55	49	75	66	86	M65 x 1,5	6°	8,5
GIHR-K80	170	80 -0,015	265	176	60	55	80	81	105	M80 x 2	6°	12
GIHR-K90	210	90 -0,020	323	206	65	60	90	101	124	M100 x 2	5°	21,5
GIHR-K100	235	100 -0,020	360	230	70	70	105	125	138	M110 x 2	7°	27,5

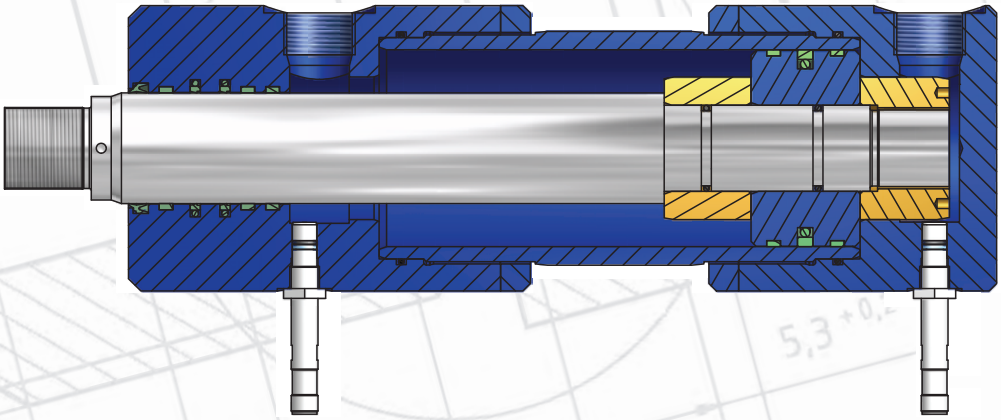
Swivel eye

Type	A	B H11 Ø	D	E	F	G	H	J	K	Weight (kg)
SA-K20	50	20	80	56	19	25	17	25	M16 x 1,5	0,5
SA-K25	50	25	80	56	23	28	17	25	M16 x 1,5	0,5
SA-K30	60	30	94	64	28	30	23	32	M22 x 1,5	0,8
SA-K35	70	35	112	78	30	38	29	40	M28 x 1,5	1,2
SA-K40	85	40	135	94	35	45	36	49	M35 x 1,5	2
SA-K50	105	50	168	116	40	55	46	61	M45 x 1,5	3,8
SA-K60	130	60	200	130	50	65	59	75	M58 x 1,5	5,4
SA-K70	150	70	232	154	55	75	66	86	M65 x 1,5	8,5
SA-K80	170	80	265	176	60	80	81	105	M80 x 2	12
SA-K90	210	90	323	206	65	90	101	124	M100 x 2	21,5
SA-K100	235	100	360	230	70	105	125	138	M110 x 2	27,5

END POSITION SENSING AND LINEAR POSITION MEASUREMENT SYSTEM

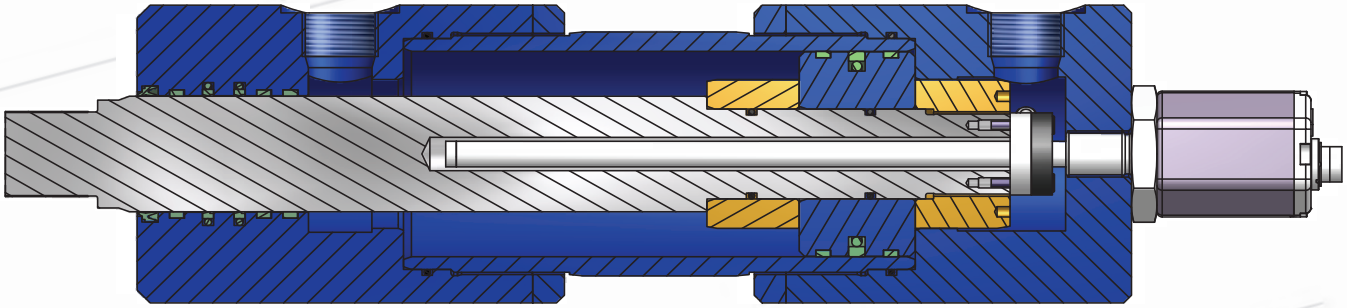
END POSITION SENSOR

+ available either with plug-in connector or moulded PU cable
+ high operational safety due to the detection of end position directly at the piston
+ lower installation costs, no external mechanism necessary
+ can be integrated into all series



LINEAR POSITION MEASUREMENT SYSTEM

+ impervious to shock, vibration, temperature, contamination and moisture
+ wear and maintenance-free due to non-contact detection of the measuring position
+ absolute output signal, even after a power interruption, no homing run required
+ high resolution, reproducibility and linearity
+ easy installation, no power supply to the position encoder is needed
+ pressure resistant to 600 bar, for integration into hydraulic cylinders
+ reliable operation, even under extreme environmental conditions
+ individual setting of the zero point possible



PLEASE NOTE !
The total length of the cylinder can vary slightly upwards depending on the size due to the installation of the end position sensor or the linear displacement measurement system. Our technicians would be glad to assist you with any questions about your particular needs. Please contact us.

CYLINDER REQUEST FORM

name of company _____
street _____
postal code/city _____
contact _____
telephone _____
fax _____
e-Mail _____
customer number _____

acc. to offer _____
dated _____
acc. to drawing _____
modification _____
previous order _____
delivered on _____
remarks _____

quantity: _____ series: HYKS
piston Ø _____ mm rod Ø _____ mm stroke _____ mm installation length _____ mm

o differential cylinder
o pressure cylinder
o synchronous cylinder
o venting both ends
o plunger cylinder
o pull cylinder

Mounting type:

o base-end bearing
o swivel eye
o articulated eye
o base flange
o head flange
o trunnion
o tangential feet
o custom mount
o Piston rod eye
o articulated eye, clampable
o swivel eye, clampable
o fork head, clampable

Piston rod:

o standard, chrome-plated
o stainless steel, chrome-plated
o hardened, chrome-plated
o custom coating

_____
_____

Seals:

o seal with retaining function
o seal for fire resistant fluids
o stick-slip-free seal
o custom seal

_____
_____

Technical data:

pressure force _____ kN
tractive force _____ kN
test pressure _____ bar
working pressure _____ bar

Stroke speed:

extension _____ m/s
retraction _____ m/s
strokes _____ min, h, day
oper. hrs. _____ hrs/day

Type of use:

purpose of the cylinder: _____ installation location: o indoors o outdoors
mounting position of the cylinder: _____

Additional information:

ambient temperature: _____ °C operating temperature _____ °C remarks: _____

Medium:

o HLP _____ o other _____

Coating:

o primed o RAL _____ o other _____

Additional remarks:

_____
_____

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