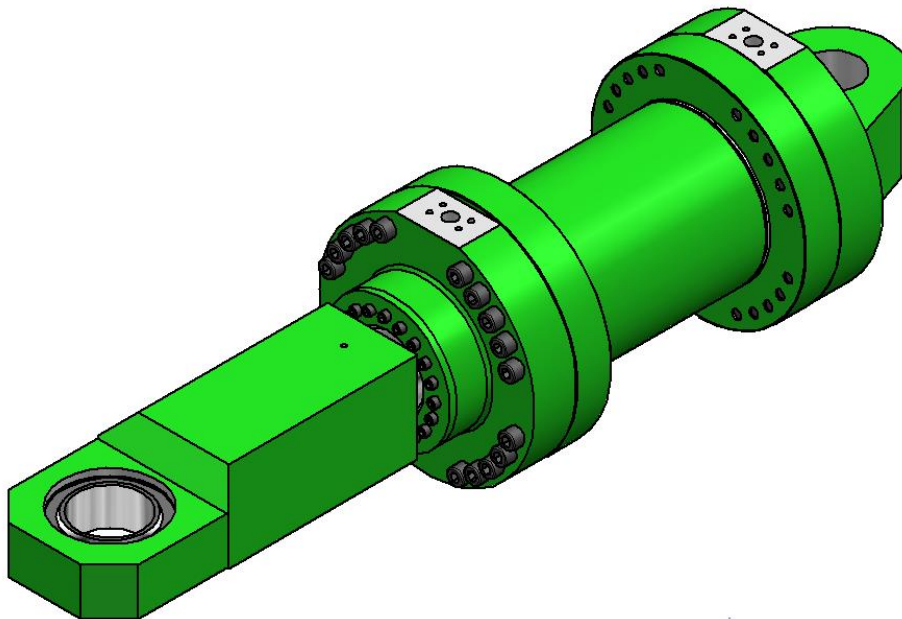


# Catalogue

## OF POWER HYDRAULICS ELEMENTS

1. Standard cylinders.
2. Piston rod ends.
3. Rods Cr.
4. Pipes.



VER. CATALOG / WHS / 2020-04

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## ABOUT THE COMPANY

Since 1985, our company's main assets have been the continuous experience, highly qualified staff and the highest quality of all products and services. We perform comprehensive implementation of projects related to power hydraulics on the basis of documentation provided by the customer and our own, which is prepared by our Research and Development Department.

We are a trusted, experienced, reliable and competent manufacturer of hydraulic cylinders and other hydraulic components, which for many years has been a popular choice of companies in Poland and worldwide (Germany, Russia, Norway, Africa, Turkey).

Since 1988 we have been working in accordance with the Quality Management System PN - EN ISO 9001:2015.

We cooperate with scientific and research centers, among others:

- Instytut Konstrukcji i Eksploatacji Maszyn Politechniki Wrocławskiej
- Instytut Trybologii Politechniki Wrocławskiej;
- Federacja Stowarzyszeń Naukowo – Technicznych NOT w Warszawie;
- Instytut Mechaniki Precyzyjnej w Warszawie.



## Our Partners:

1. HYDAC Sp. z o.o.
2. HYTECH (Norwegia)
3. MINE MASTER Sp. z o.o.
4. MERCUS Sp. z o.o. (KGHM)
5. KGHM Polska Miedź S.A.
6. Freyssinet Polska Sp. z o.o.
7. KGHM Zanam S.A.
8. HÖRMANN Poland Sp. z o.o.
9. Comerc Sp. z o.o. „
10. Hydro Extrusion Poland Sp. z o.o.
11. Remontowa Hydroster Systems Sp. z o.o.



*Your Partner in Business*

A blue, curved swoosh underline that starts under the first word and ends under the last word of the slogan.

## WROPOL Engineering policy:



**POLITYKA JAKOŚCI WROPOL ENGINEERING**  
wg **NORMY ISO 9001:2015**

**INNOWACYJNA PRODUKCJA NA NAJWYŻSZYM POZIOMIE**

Charakteryzuje nas innowacyjne podejście do:

- realizowanych projektów,
- technologii produkcji,
- inżynierii materiałowej.

**Jakość:** dokładne spełnienie wymagań zewnętrznych i wewnętrznych Klientów.

Nasze cele jakościowe to:

- utrzymywanie i ciągłe doskonalenie jakości na bazie normy PN-EN ISO 9001:2015,
- realizacja uzgodnionych zamówień – terminowo i na najwyższym poziomie,
- innowacje w realizowanych projektach,
- rozwój i modernizacja firmy.


Osiąganie powyższych celów w firmie Wropol Engineering dokonywane jest poprzez:

- umiejętne rozpoznawanie i spełnianie oczekiwań klienta,
- rozwój Technologiczny i innowacyjność firmy,
- doskonalenie Systemu Zarządzania Jakością wg normy PN-EN ISO: 9001,
- wysoką jakość i terminowość dostarczanych produktów i usług,
- odpowiedzialność kierownictwa za realizację polityki jakości,
- odpowiedzialność pracowników w procesie produkcji za politykę jakości,
- podnoszenie kwalifikacji zawodowych personelu.

Wzrost liczby zamówień  
 Wzrost liczby klientów  
 Wzrost liczby pracowników  
 Wzrost liczby innowacji

**WROPOL ENGINEERING**  
ul. Wróblowicka 3, 55-330 Miękinia  
inż. Józef Korsak 77 24  
01.06.2018

**Wzrost liczby zamówień**  
**Wzrost liczby klientów**  
**Wzrost liczby pracowników**  
**Wzrost liczby innowacji**  
inż. Kazimierz Kobiela  
01.06.2018



**CERTYFIKAT**

PCC-CERT  
potwierdza, że:

**WROPOL Engineering Józef Korsak**  
Lutynia, ul. Wróblowicka 3, 55-330 Miękinia



stosuje System Zarządzania Jakością i spełnia wymagania

**PN-EN ISO 9001:2015**  
w zakresie:

projektowania i produkcji maszyn i urządzeń.

Certyfikacji udzielono: 16.07.2018  
Certyfikat ważny do: 15.07.2021  
Nr rejestracyjny certyfikatu: PW-10807-18  
Data wydania certyfikatu: 16.07.2018

Dyrektor  
*Blaut*  
Miroslaw Blaut



AC 082  
QMS

Niniejszy certyfikat pozostaje w mocy pod warunkiem spełnienia wymagań umowy nr 311/2018

PCC-CERT Sp. z o.o. Sp.k., ul. Sportowa 29, 55-040 Koberzyce



### Hydraulic cylinder technical data:

1. Piston -  $\varnothing 25 \text{ mm} \div \varnothing 220 \text{ mm}^*$
2. Piston rod -  $\varnothing 16 \text{ mm} \div \varnothing 140 \text{ mm}$
3. Stroke – up to 4000 mm
4. Nominal pressure  $P_n = 25 \text{ MPa}$  (250 bar)
5. Test pressure  $P_p = 1.5 P_n$
6. Speed of piston travelling  $V_{\max} = 0.5 \text{ m/s}$
7. Temperature range:
  - working medium temperature:  $-25^\circ\text{C} \div +80^\circ\text{C}$  ( $249^\circ\text{K} \div 353^\circ\text{K}$ )
  - working environment temperature:  $-20^\circ\text{C} \div +50^\circ\text{C}$  ( $253^\circ\text{K} \div 323^\circ\text{K}$ )
8. Working medium: hydraulic oils, viscosity:  $\nu = 10 \div 450 \text{ cSt}$
9. Required nominal accuracy of working medium filtering  $< 100 \mu\text{m}$
10. Total efficiency  $> 0.95$
11. Optional equipment:
  - piston rod ends: to be screwed on, screwed in, welded, special to order
  - Z2S6, Z2S10 double controlled check valves - PONAR WADOWICE
  - SUN and HYDAC braking cartridge valves
  - sensors measuring stroke length of piston rod within the range from 25 mm to 4000 mm.



In the hydraulic cylinder production we use BUSAK-SHAMBAN, MERKEL, HALLITE, EVCO and INCO seals, or seals required by a customer.

In the hydraulic cylinder construction WROPOL ENGINEERING deploys finite element method (MES).



**NOTE:**

1. It is possible to make hydraulic cylinders with a piston diameter up to  $\varnothing$  500 mm and a piston rod up to  $\varnothing$  250 mm, on customer's order, we also make cylinders with a nominal pressure of 35 MPa (350 bar).
2. Special hydraulic cylinders are made according to the customer's construction documentation, or based on own documentation after prior approval of the documentation by the customer.
3. WROPOL ENGINEERING reserves the right to introduce constructional changes aimed at improving the quality of products.



## Custom design of the actuator

Please visit the website [www.wropol.pl](http://www.wropol.pl) to the DESIGN YOUR ACTUATOR tab.

### Example:

Step: 1 Select the actuator type.

### KONSTRUKTOR SIŁOWNIKÓW HYDRAULICZNYCH

Jako wieloletni producent siłowników hydraulicznych chcemy oferować **innowacyjne i komfortowe rozwiązania**. Wychodząc naprzeciw potrzebom naszych klientów, dajemy możliwość stworzenia na naszej stronie internetowej siłownika hydraulicznego, który będzie idealnie dopasowany do konkretnego zastosowania. Następnie cylinder zostanie przez nas wykonany zgodnie z Państwa zamówieniem. **Wystarczy kilka kliknięć, aby cieszyć się doskonałą jakością** i urządzeniami, które dzięki właściwemu dopasowaniu, będą zapewniać jeszcze większą wydajność i bardziej satysfakcjonujące efekty pracy. Stworzenie projektu takiego siłownika hydraulicznego to dosłownie parę kroków, w tym wybór typu, a także precyzyjne określenie parametrów produktu.

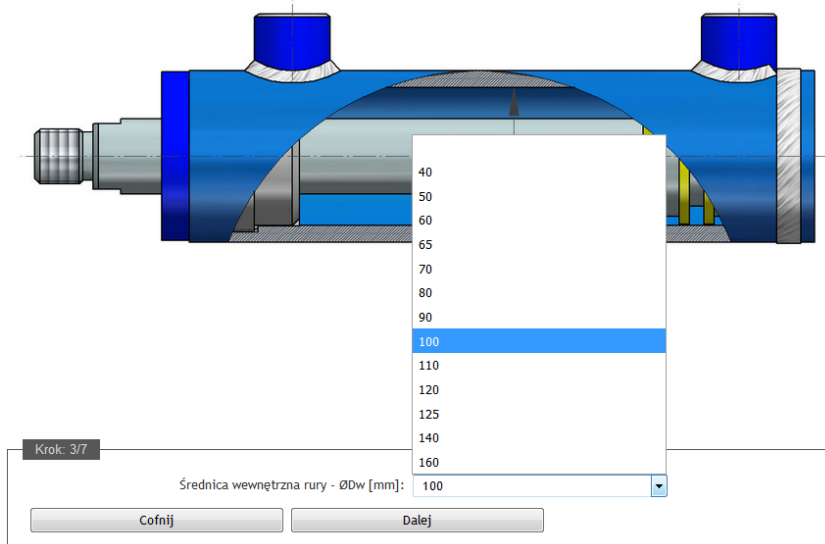
Utwórz swój własny siłownik typu:





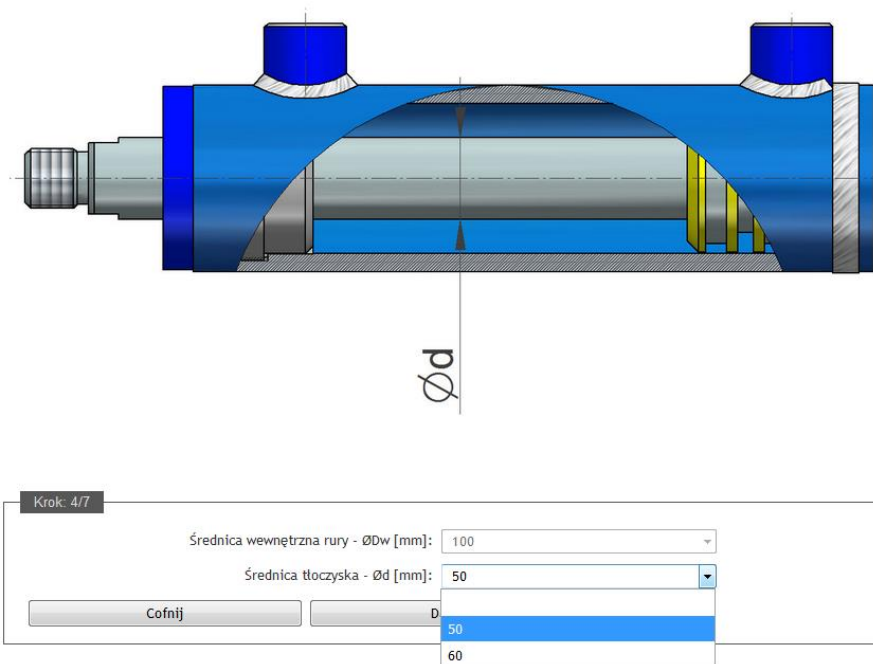
Step: 2 Choosing the end of the piston rod.  
Step: 3 Choosing the diameter of the cylinder.

Utwórz swój własny siłownik typu: WHC021



Step: 4 Selection of piston rod diameter.

Utwórz swój własny siłownik typu: WHC021-100

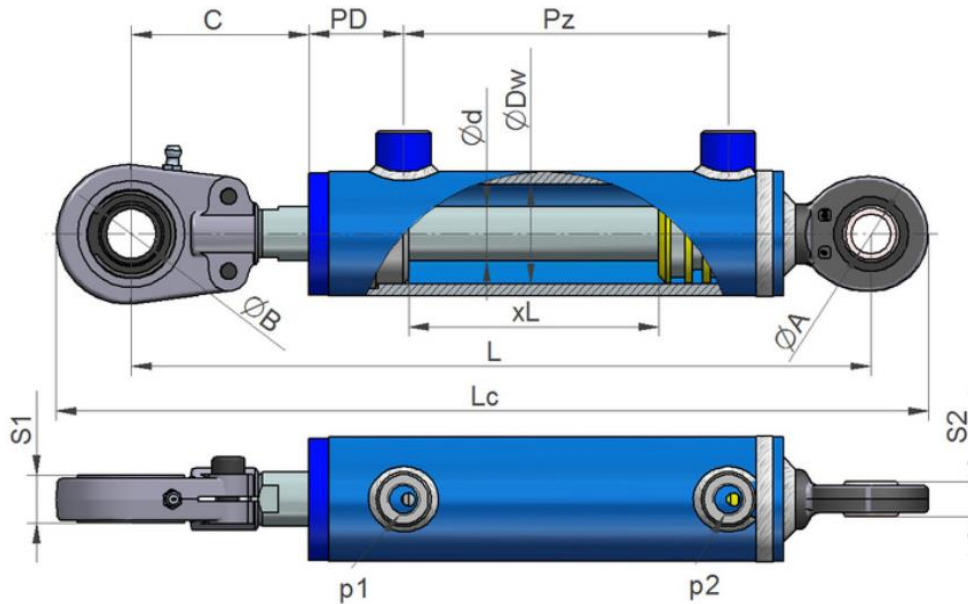


Step: 5 Entering the actuator stroke.



Step: 6 Enter additional data.  
Step: 7 Actuator created.

Utworzono siłownik typu: WHC 021-100x50x300



Zaprojektowałeś siłownik do 160 bar.

Wszystkie wymiary w mm

xL	$\phi Dw$	$\phi d$	Lc	L	Pz	p1	p2	$\phi A$	$\phi B$	C	S1	S2	PD
300	100	50	775	666	345	1/2"	1/2"	40	50	140	35	28	82

## Hydraulic cylinders marking

### 1. Hydraulic cylinder name and type:

WHC – two-way piston hydraulic cylinder  
 WHZ- two-way piston hydraulic cylinder with control valve  
 WHS – special piston hydraulic cylinder made to customer's order  
 WHT – telescopic hydraulic cylinder (in development)

### 2. WHC, WHS and WHZ piston hydraulic cylinders installation:

- 1 – by means of eye with slide bearing
- 2 – by means of eye with joint bearing
- 3 – with uniform (forged) piston rod
- 4 – by means of pins
- 5 – by means of flange
- 6 – by means of lugs
- 7 – according to customer requirements.

### 3. Piston diameter - D

### 4. Piston rod diameter - d

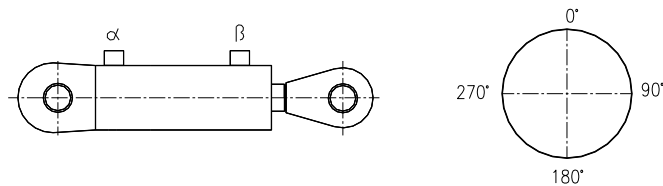
### 5. Hydraulic cylinder stroke - H

### 6. Dimension when closed - Lc

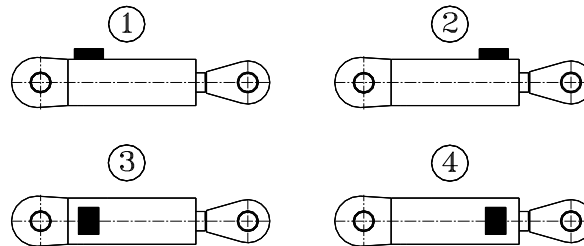
### 7. Additional piston rod extension - h

### 8a. WHC hydraulic cylinders feeding hole position:

- inlet -  $\alpha$
- outlet -  $\beta$



### 8b. Valve position in WHZ hydraulic cylinders:



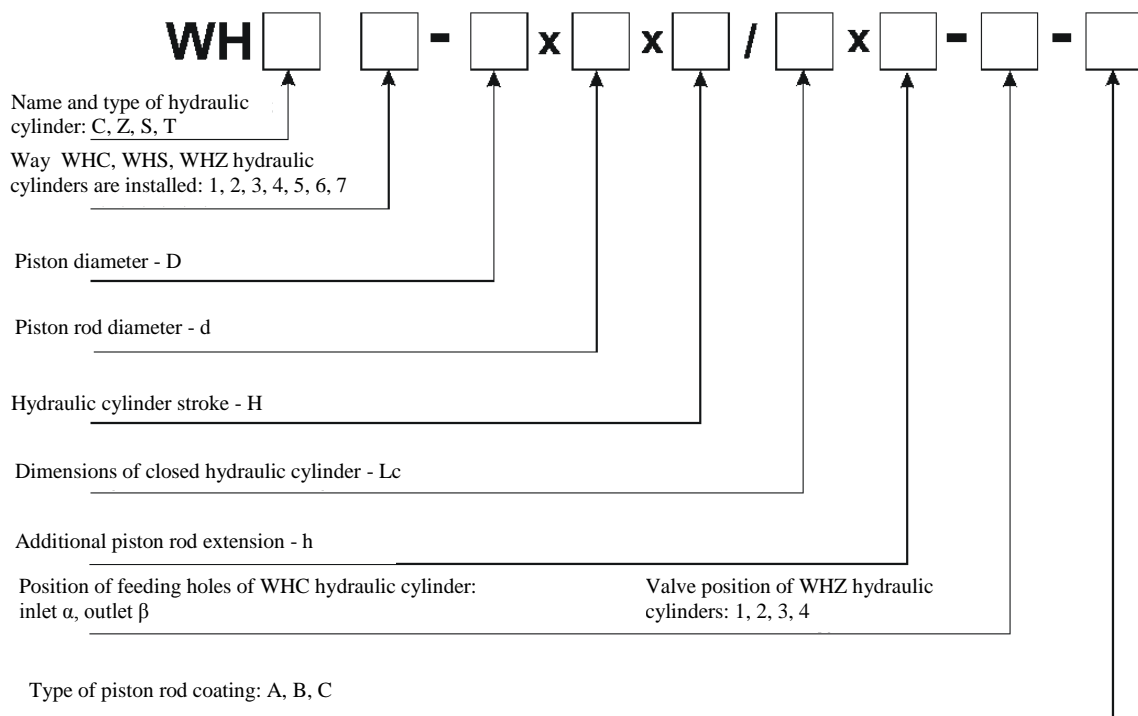
### 9. Piston rod coating:

- A – antysole - providing increased resistance to salt environment
- B – chromium (standard)
- C – NiCr

### EXAMPLE OF HYDRAULIC CYLINDER MARKING:

**WHC** hydraulic cylinder mounted on fixed bushes (1), piston diameter (D) 100 mm, piston rod diameter (d) 50 mm, stroke (H) 300 mm, dimension when closed (Lc) 650 mm, additional extension (h) 11 mm, feeding holes position ( $\alpha/\beta$ ) 0/0, with standard piston rod coating (B)..

### WHC 1-100x50x300 / 650x11-0/0-B



### Hydraulic cylinder dimension symbols

- D – inside diameter [mm]
- d – piston rod diameter - [mm]
- H – stroke [mm]
- h – additional piston rod extension [mm]
- Lc – hydraulic cylinder length when closed [mm]
- a – bearing breadth [mm]
- b – breadth of an end (b1 – cylinder; b2 – piston rod) [mm]
- c1, c2 – feeding hole distance [mm]
- C – breadth of piston rod race [mm]
- do – mounting bolt diameter [mm]
- D1 – outside cylinder diameter [mm]
- D2 – outside diameter of a cylinder nut [mm]
- D3 – outside diameter of a flange [mm]
- Dp – pitch diameter of flange mounting holes [mm]

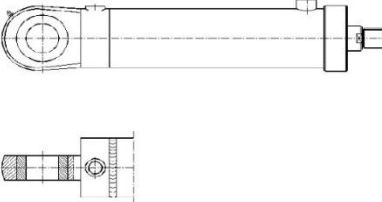
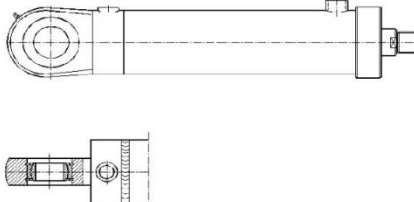

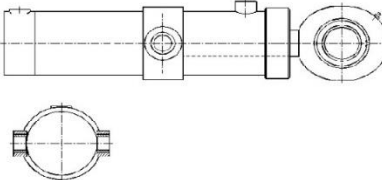

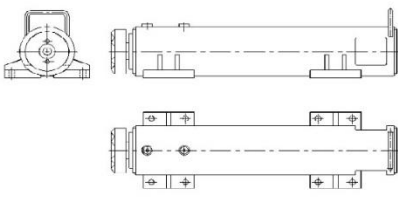



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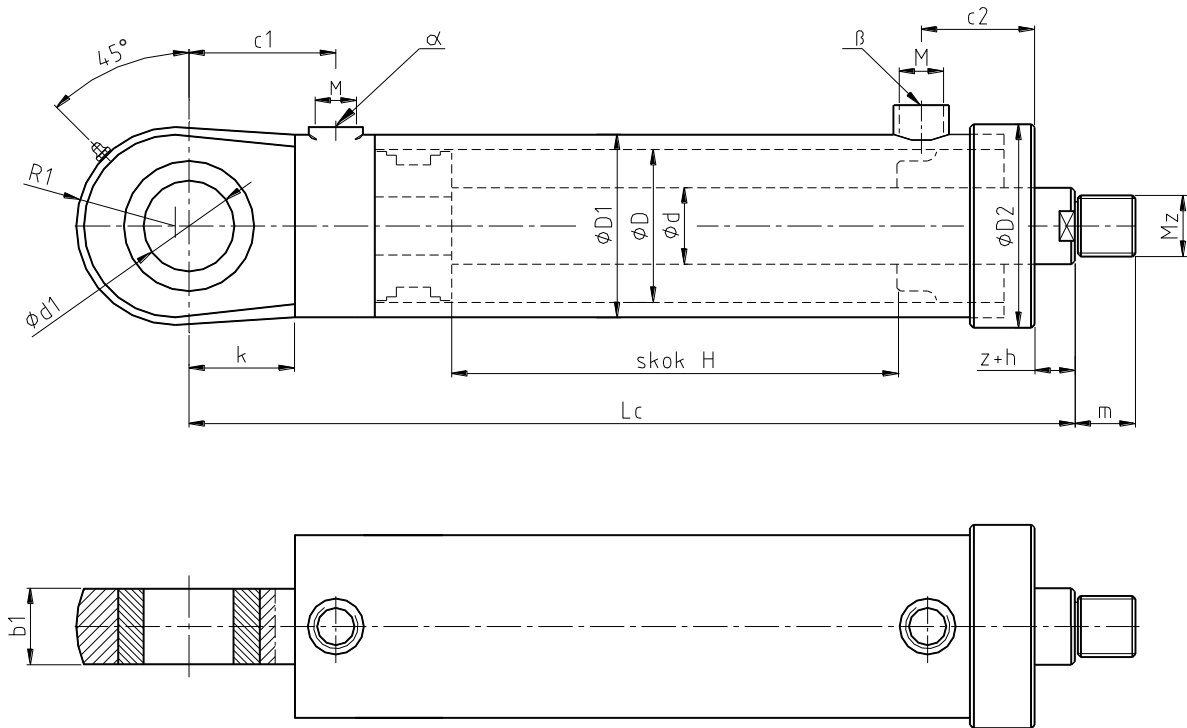
HYDRAULIC CYLINDERS

- f – height of a piston rod end to hole axis
- g – flange distance
- k – incision length of a cylinder eye [mm]
- M – thread of feeding holes
- Mz/Mw – thread on a piston rod (z – outside, w – inside)
- m – length of a piston rod thread [mm]
- n – boss height
- R – radius of an end (R1 – cylinder; R2 – piston rod) [mm]
- T – pin distance [mm]
- t – width of mounting pins [mm]
- w – flange thickness [mm]
- z – fixed length of a piston rod [mm]
- $\alpha, \beta$  – feeding hole position for WHC hydraulic cylinders [angle]

## Hydraulic cylinder installation

<p style="text-align: center;">WHC 1 by means of eye with slide bearing</p> 	<p style="text-align: center;">WHC 2 by means of eye with joint bearing</p> 
<p style="text-align: center;">WHC 3 with uniform (forged) piston rod</p> 	<p style="text-align: center;">WHC 4 by means of pins</p> 
<p style="text-align: center;">WHC 5 by means of flange</p> 	<p style="text-align: center;">WHC 6 by means of lugs</p> 
<p style="text-align: center;">WHC 7 in accordance with customer indications</p> 	<p style="text-align: center;">WHS special hydraulic cylinders</p> <ol style="list-style-type: none"> <li>1. Modular hydraulic cylinders.</li> <li>2. Hydraulic cylinders measuring the stroke length</li> <li>3. Special hydraulic supports</li> <li>4. Hydraulic intensifiers</li> <li>5. Hydraulic cylinders fed by piston rod</li> <li>6. Hydraulic cylinders with cartridge valves</li> </ol>

### WHC 1 two-way hydraulic cylinder



$$Lc=L+H+h$$

Example of hydraulic cylinder marking: **WHC 1-100x50x300 / 639x0-0/0-B**

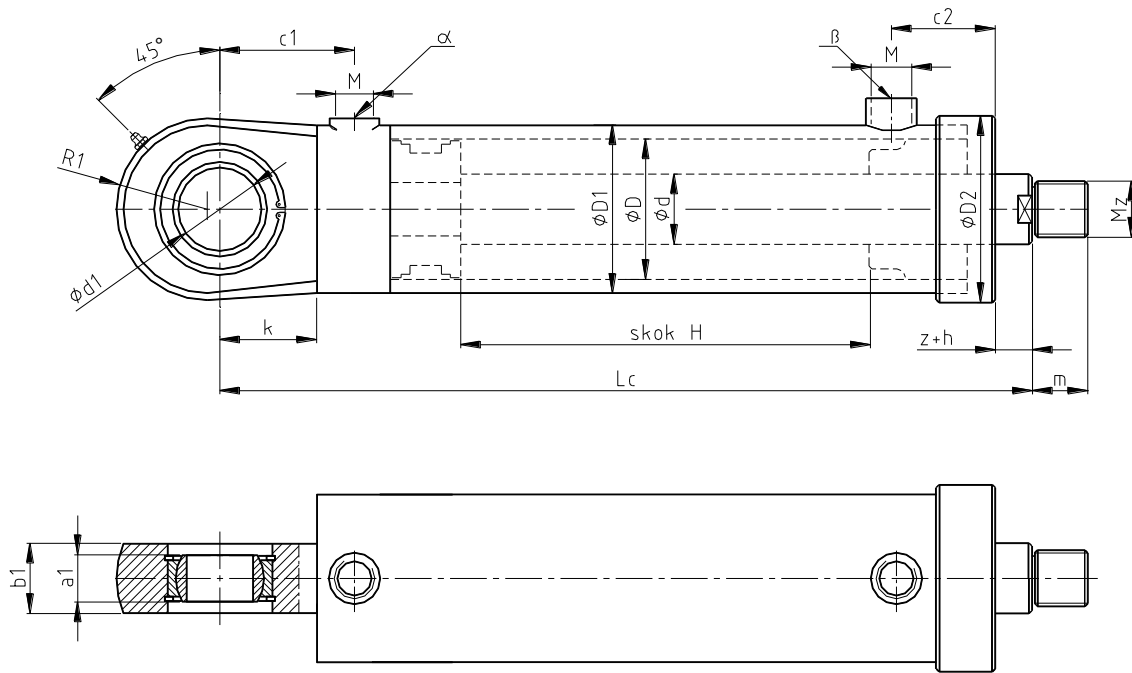
D	d	D1	D2	d1 H8	L	Mz	M	R1	b1	c1	c2	k	m	z
40	20	50	57	20	195	M16x1,5	M12x1,5	25,5	20	38	60	22	18	29
	25													
50	25	65	71	30	220	M20x1,5	M16x1,5	31,5	30	48	72	29	22	22
	30													
63	32	75	88	40	255	M24x1,5	M20x1,5	40	40	62	78	38	30	22
	36													
80	40	95	104	50	295	M30x1,5	M20x1,5	50	50	80	90	53	35	32
	50													
100	50	120	133	60	339	M39x2	M27x2	65	60	92	97	65	40	35
	60													
110	60	130	141	60	355	M45x2	M27x2	70	60	92	104	65	40	38
	70													
125	70	150	165	70	387	M48x2	M27x2	80	70	100	120	70	45	33
	80													
140	70	165	175	80	416	M48x2	M27x2	87,5	70	120	125	80	55	38
	80													
160	80	185	206	80	460	M52x2	M33x2	92,5	70	120	122	80	65	50
	90													

\* WROPOL ENGINEERING reserves the right to make construction changes without prior notification.



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### WHC 2 two-way hydraulic cylinder



$$L_c = L + H + h$$

Example of hydraulic cylinder marking: **WHC 2-100x50x300 / 639x0-0/0-B**

D	d	D1	D2	d1 H8	L	Mz	M	R1	a1	b1	c1	c2	k	m	z
40	20	50	57	20	195	M16x1,5	M12x1,5	25,5	16	20	38	60	22	18	29
	25														
50	25	65	71	30	220	M20x1,5	M16x1,5	31,5	22	30	48	72	29	22	22
	30														
63	32	75	88	40	255	M24x1,5	M20x1,5	40	28	40	62	78	38	30	22
	36														
80	40	95	104	50	295	M30x2	M20x1,5	50	40	50	80	90	53	35	32
	50														
100	50	120	133	60	339	M39x2	M27x2	65	50	60	92	97	65	40	35
	60														
110	60	130	141	60	355	M45x2	M27x2	70	50	60	92	104	65	40	38
	70														
125	70	150	165	70	387	M48x2	M27x2	80	60	70	100	120	70	45	33
	80														
140	70	165	175	80	416	M48x2	M27x2	87,5	65	70	120	125	80	55	38
	80														
160	80	185	206	80	460	M52x2	M33x2	92,5	65	70	120	122	80	65	50
	90														

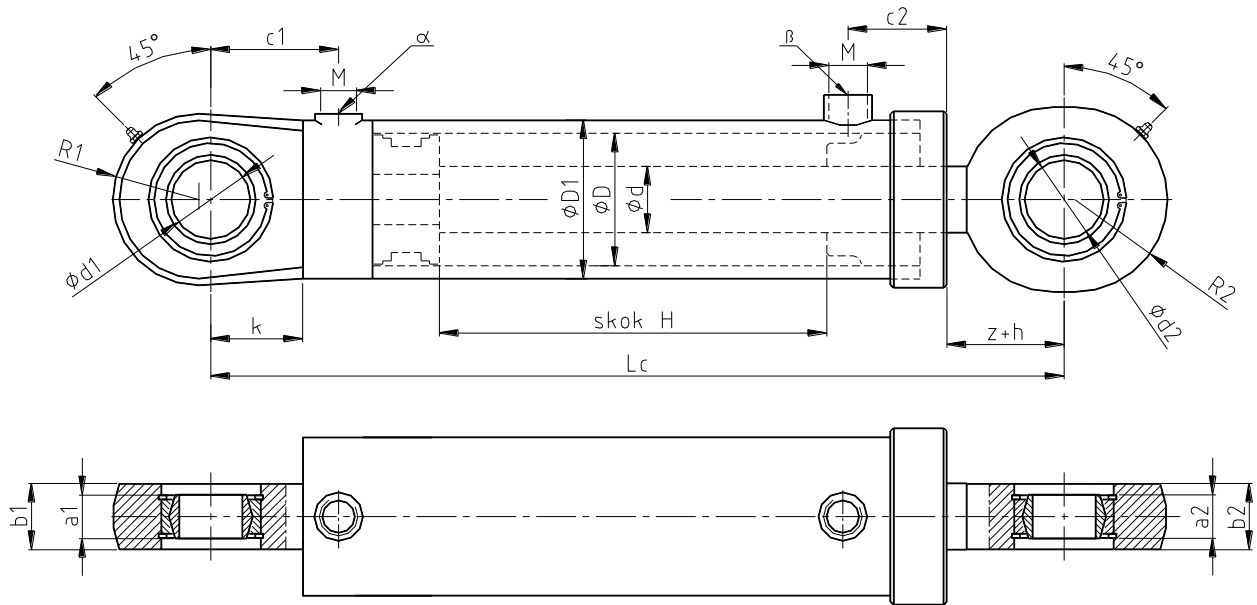
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### WHC 3 two-way hydraulic cylinder



$$Lc=L+H+h$$

Example of hydraulic cylinder marking: **WHC 3 – 100x50x560 / 1024x0 - 0/0 - B**

D	d	D1	L	d1 H8	d2 H8	M	R1	a1	a2	R2	b1	b2	c1	c2	k	z min
80	50	95	330	50	50	M20x1,5	65	40	40	57	50	50	80	90	50	70
100	50	120	374	60	50	M27x2	65	50	40	57	60	50	97	92	65	70
125	70	150	450	70	70	M27x2	80	60	60	85	70	70	100	120	70	105
140	80	165	500	80	80	M27x2	87,5	65	65	90	70	70	110	125	80	130
160	80	185	540	80	80	M33x2	92,5	65	65	92,5	70	70	120	122	80	130

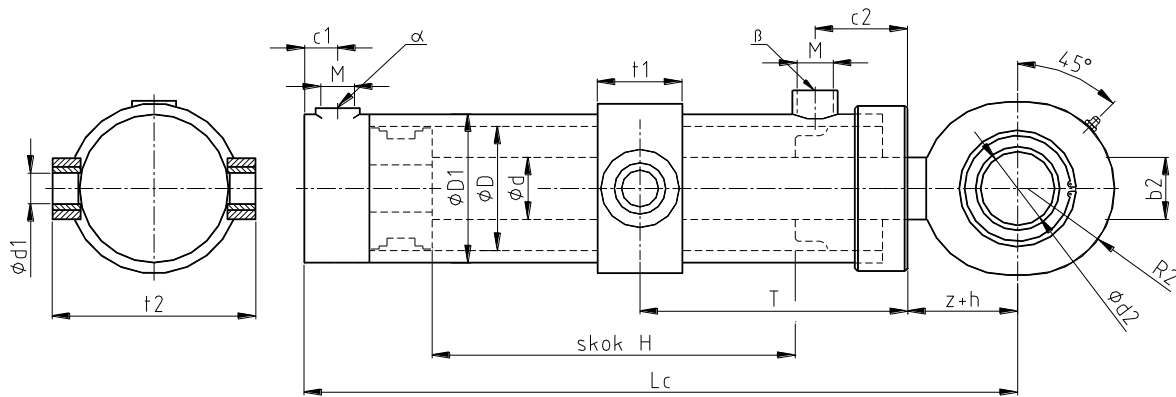
\* WROPOL ENGINEERING reserves the right to make construction changes without prior notification.



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HYDRAULIC CYLINDERS

### WHC 4 two-way hydraulic cylinder



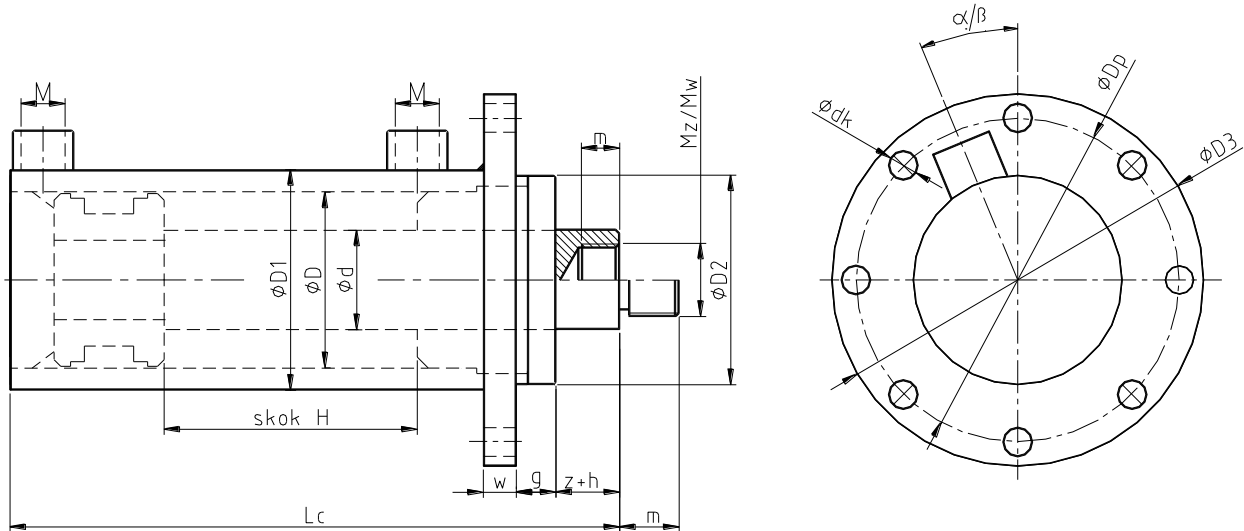
$$Lc=L+H+h$$

Example of hydraulic cylinder marking: **WHC 4 – 100x50x300 / 700x0- 0/0 -B**

D	d	D1	L	d1 H8	d2 H8	M	R2	T min	T max	b2	c1	c2	t 1	t 2	z min
80	50	95	280	50	50	M20x1,5	57	155	105 +skok	50	30	90	90	150	70
100	50	120	310	50	50	M27x2	57	165	130 +skok	50	30	92	90	180	70
140	80	165	420	80	80	M27x2	92,5	235	135 +skok	70	40	125	150	250	130
160	80	185	460	80	80	M33x2	92,5	235	175 +skok	70	40	122	150	270	130

\* WROPOL ENGINEERING reserves the right to make construction changes without prior notification.

### WHC 5 two-way hydraulic cylinder



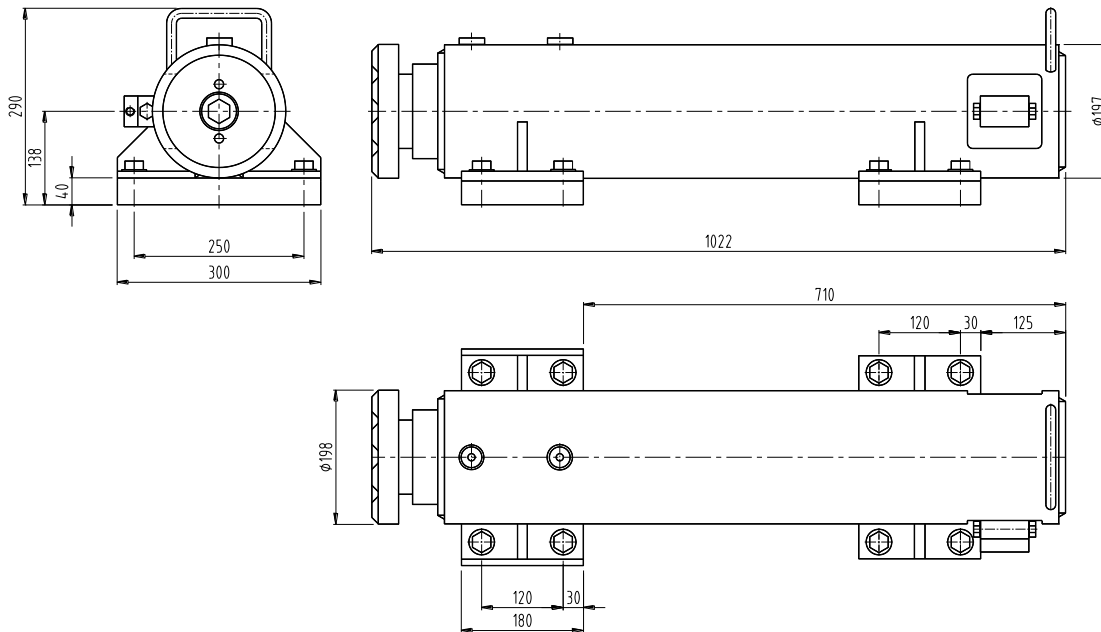
$$L_c = L + H + h$$

Example of hydraulic cylinder marking: **WHC 5 – 25x16x100 / 208x10- 0/0 -B**

D	d	D1	D2	D3	Dp	dk	L	M	Mz/Mw	z	m	g	w
25	16	35	35	80	60	9	103	G 1/4"	M 12x1,25 M 8x1	5	17	10	10
40	20	50	50	105	85	9	140	G 1/4"	M 14x1,5 M 12x1,25	5	19	10	12
	25												
50	25	65	65	120	95	11	140	G 1/4"	M 20x1,5 M 14x1,5	5	29	12	15
	30												
60	30	75	70	140	115	13	165	G 3/8"	M 27x2 M 20x1,5	10	37	15	15
	36												
65	30	78	75	140	115	13	165	G 3/8"	M 27x2 M 20x1,5	10	37	15	15
	36												
75	40	90	85	180	145	17	205	G 3/8"	M 33x2 M 27x2	10	46	20	20
	45												
80	45	100	95	180	145	17	205	G 3/8"	M 33x2 M 27x2	10	46	20	20
	50												
100	50	120	115	210	175	21	215	G 3/8"	M 42x2 M 33x2	15	57	20	30
	56												
110	60	130	125	220	185	21	235	G 1/2"	M 48x2 M 42x2	15	64	20	35
	70												

\* WROPOL ENGINEERING reserves the right to make construction changes without prior notification..

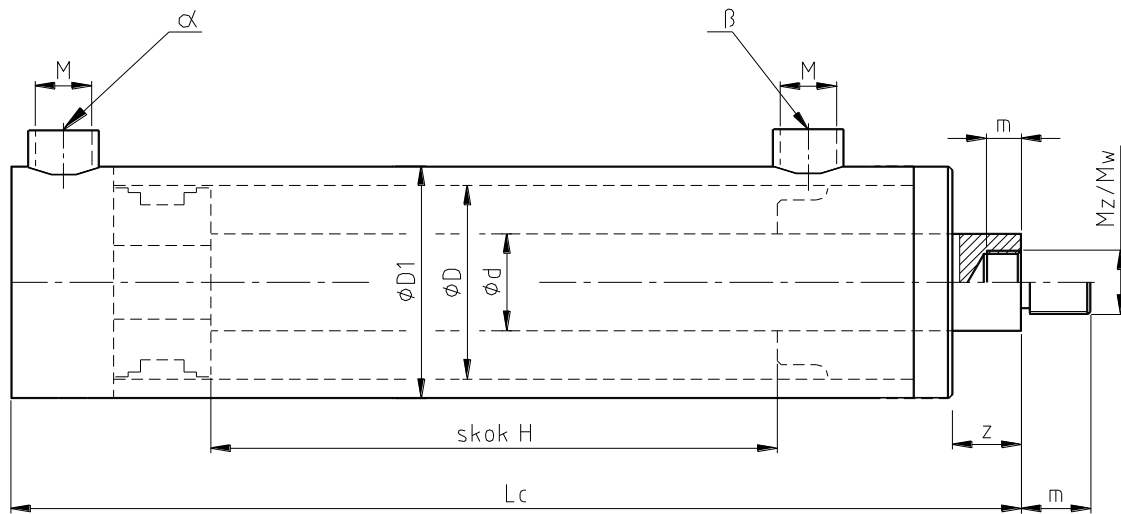
**WHC 6 two-way hydraulic cylinder**



Technical data:

- piston diameter D – Ø 110 mm
- piston rod diameter d – Ø 70 mm
- hydraulic cylinder stroke H – 550 mm
- working pressure – 16 MPa
- max. push force – 11.0 T
- max. pull force – 5.7 T

### WHC 7 two-way hydraulic cylinder



$$L_c = L + H + h$$

Example of hydraulic cylinder marking: **WHC 7A-25x16x100 / 208x10- 0/0 -B**

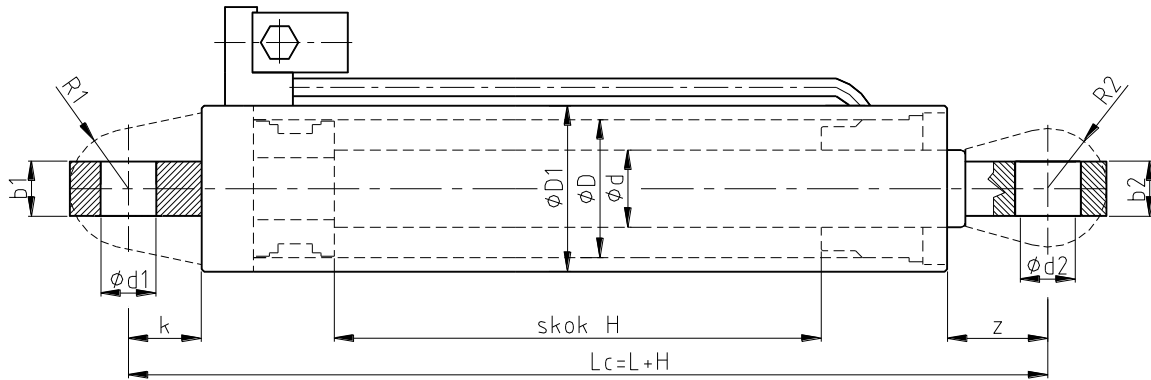
D	d	D1	z	L	Mz/Mw	m	M
25	16	35	5	103	M 12x1,25 M 8x1	17	G 1/4"
40	20	50	5	140	M 14x1,5 M 12x1,25	19	G 1/4"
	25						
50	25	65	5	140	M 20x1,5 M 14x1,5	29	G 1/4"
	30						
60	30	75	10	165	M 27x2 M 20x1,5	37	G 3/8"
	36						
65	30	78	10	165	M 27x2 M 20x1,5	37	G 3/8"
	36						
75	40	90	10	205	M 33x2 M 27x2	46	G 3/8"
	45						
80	45	100	10	205	M 33x2 M 27x2	46	G 3/8"
	50						
100	50	120	15	215	M 42x2 M 33x2	57	G 3/8"
	56						
110	60	130	15	235	M 48x2 M 42x2	64	G 1/2"
	70						
120	63	140	20	290	M 48x2 M 42x2	64	G 1/2"
	70						

\* WROPOL ENGINEERING reserves the right to make construction changes without prior notification.



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**WHZ two-way hydraulic cylinders with a double controlled check valve**



Example of hydraulic cylinder marking: **WHZz 1- 100x56x200 / 530x0 - 3 -B**

D	d	D1	H	L	d1 H8	d2 H8	R1	R2	b1	b2	k	z
100	56	120	*	330	40	40	50	43	40	40	53	73
125	70	150	**	453	50	50	50	50	50	50	65	140

\* stroke series – 180, 200, 315, 350, 370, 425, 500, 890, 1000

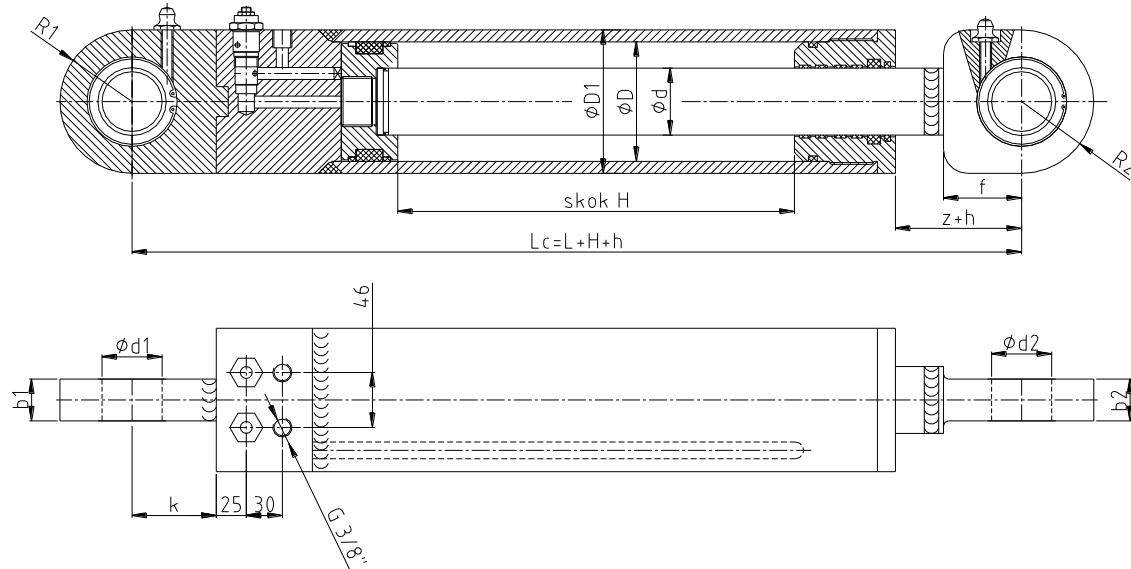
\*\* stroke series – 290, 330, 420, 500, 535, 715, 740, 860

HYDRAULIC CYLINDERS



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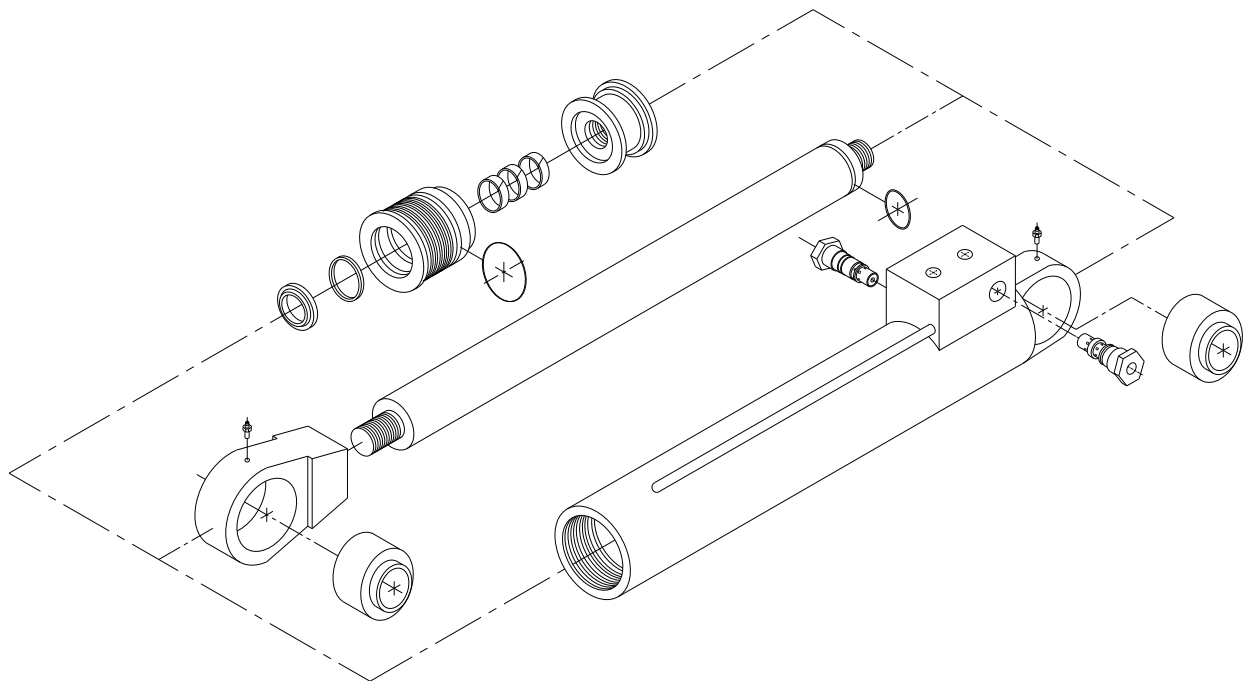
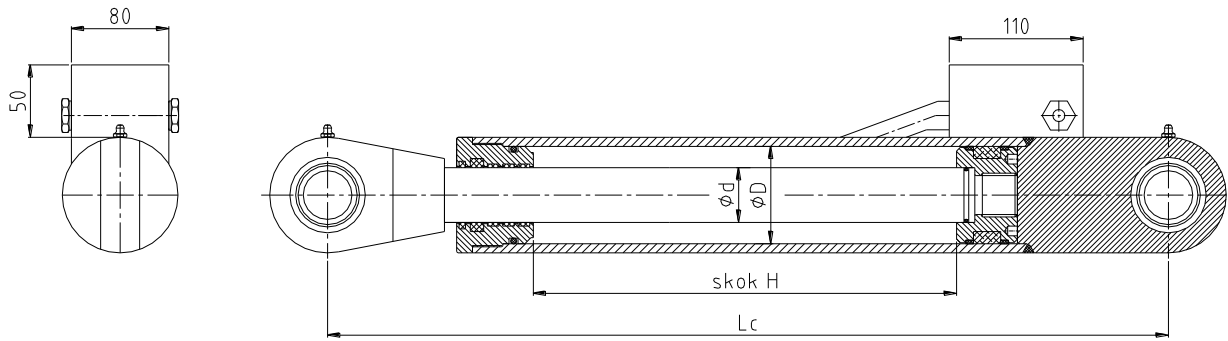
**WHZn hydraulic cylinder with cartridge valves built in hydraulic cylinder bottom**



Example of hydraulic cylinder marking: **WHZn 2- 95x56x300 / 710x13-1-B**

D	d	D1	L	d1 H8	d2 H8	R1	R2	b1	b2	f	k	Z
95	56	120	397	50	50	60	60	50	50	70	70	95
100	56	120	410	50	50	60	60	56	56	65	70	105
115	85	140	425	60	60	70	70	70	70	65	85	120

**WHZn hydraulic cylinder with cartridge valves built in block**



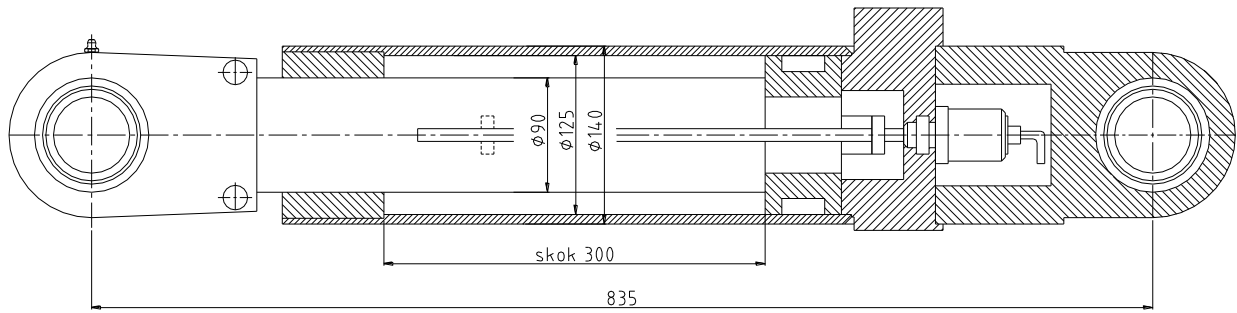
HYDRAULIC CYLINDERS



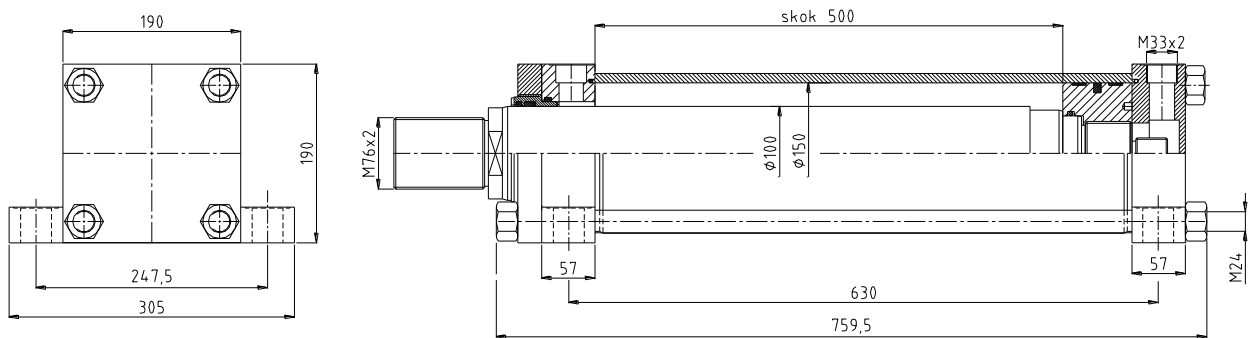
**WHS special hydraulic cylinders**

Special hydraulic cylinders are manufactured according to construction documentation of the ordering party, or on the basis of company's own documentation after its approval by the ordering party.

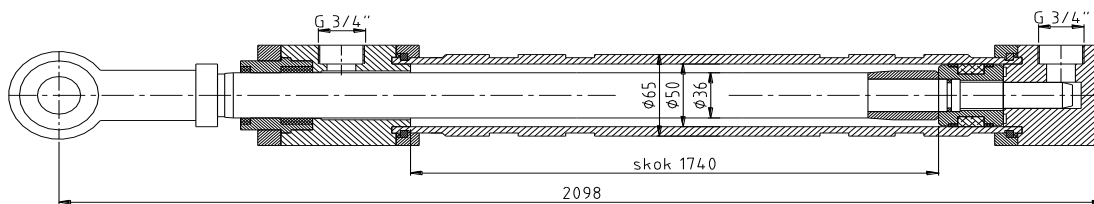
**Sample special hydraulic cylinders made to individual customer order.**



Picture 1 – Hydraulic cylinders with stroke length measurement.

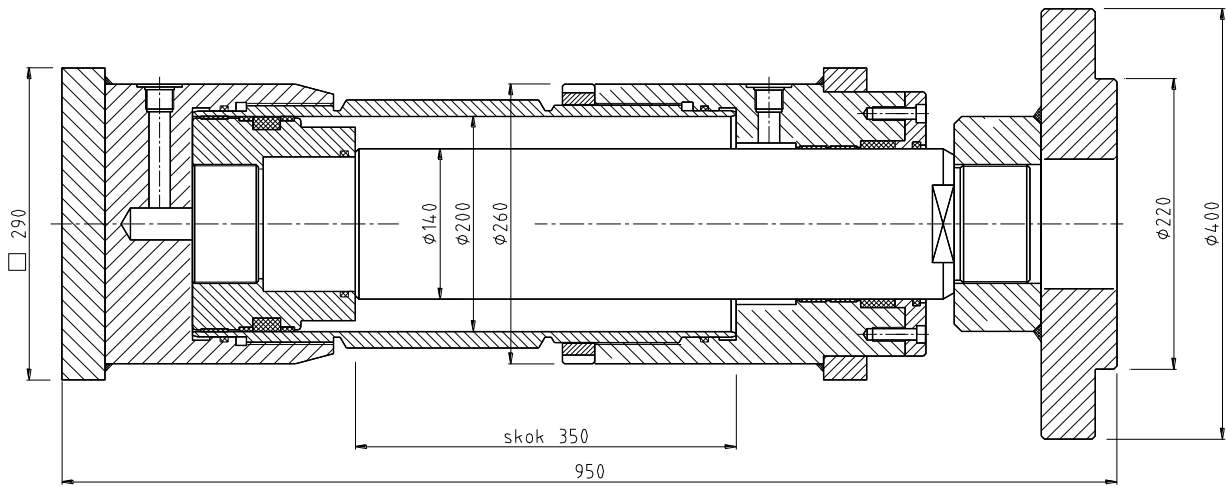


Picture 2 – Modular hydraulic cylinder.

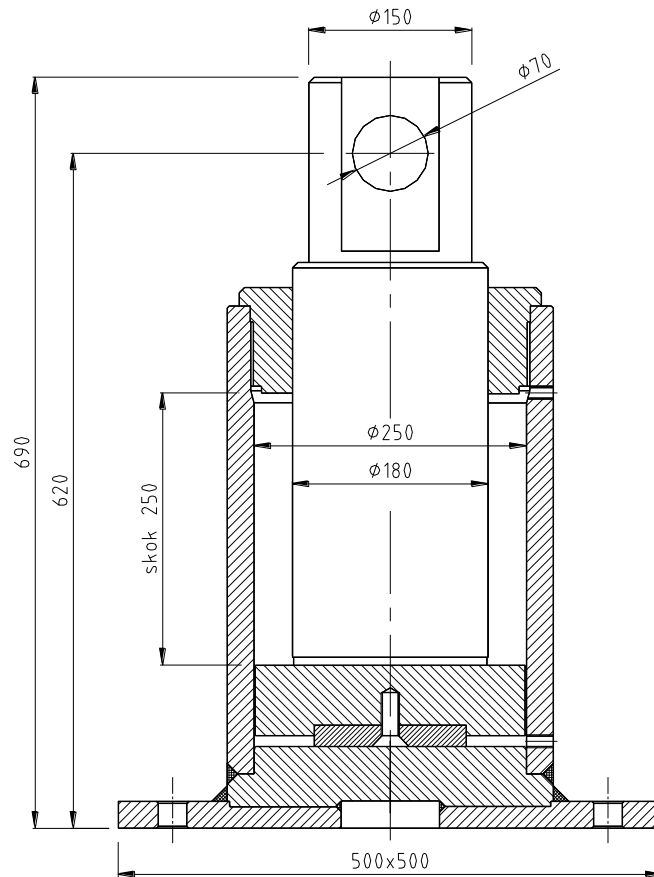


Picture 3 – Modular hydraulic cylinder with GIKFR end.

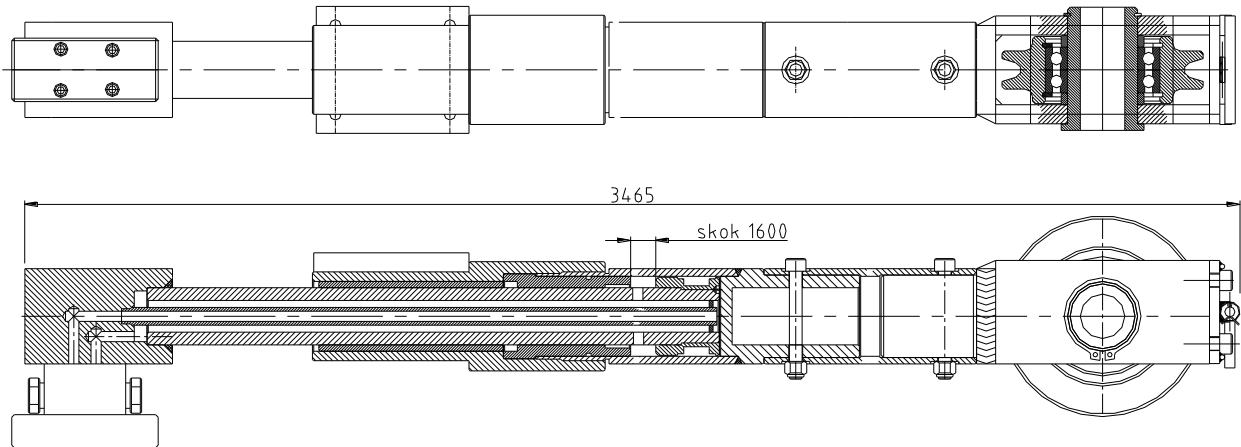
HYDRAULIC CYLINDERS



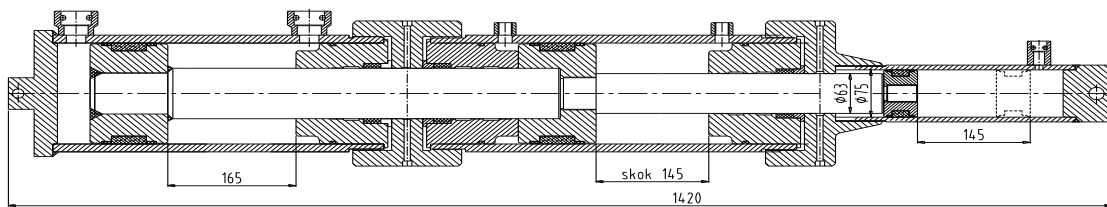
Picture 4 – Hydraulic support.



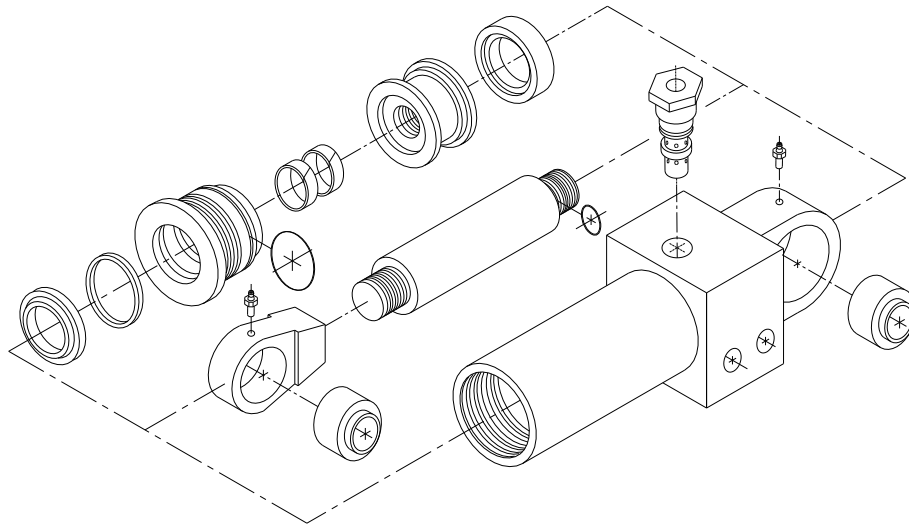
Picture 5 – Hydraulic support.



Picture 6 – Hydraulic cylinder fed by piston rod



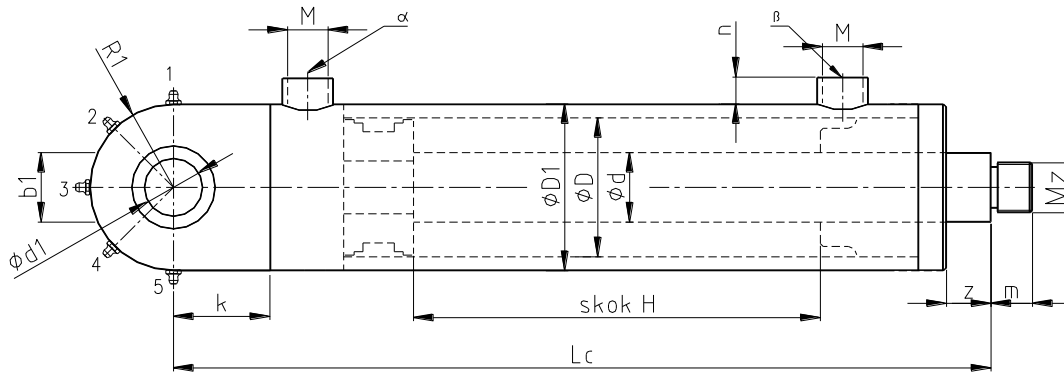
Picture 7 – Hydraulic intensifier



Picture 8 – Hydraulic cylinder with cartridge valve

HYDRAULIC CYLINDERS

**Order card for a WHC 1 hydraulic cylinder  
according to individual requirements**



hydraulic cylinder marking: **WHC 1 - ..... X..... X..... X / .....X - ..... - .....**  
D d H Lc α/β A,B,C

- piston rod end: : .....
- bush material (S – steel; B – bronze): .....
- grease nipple position: .....

D	d	D1	D2	Lc	H	d1 H8	M	R1	b1	k	n	z	Mz	m

\*\* WROPOL ENGINEERING reserves the right to make construction changes without prior notification.

**NOTES:**

**CUSTOMER:**

**Company name:**.....

**Address:**.....

**Name and surname:** .....

**e-mail:**.....

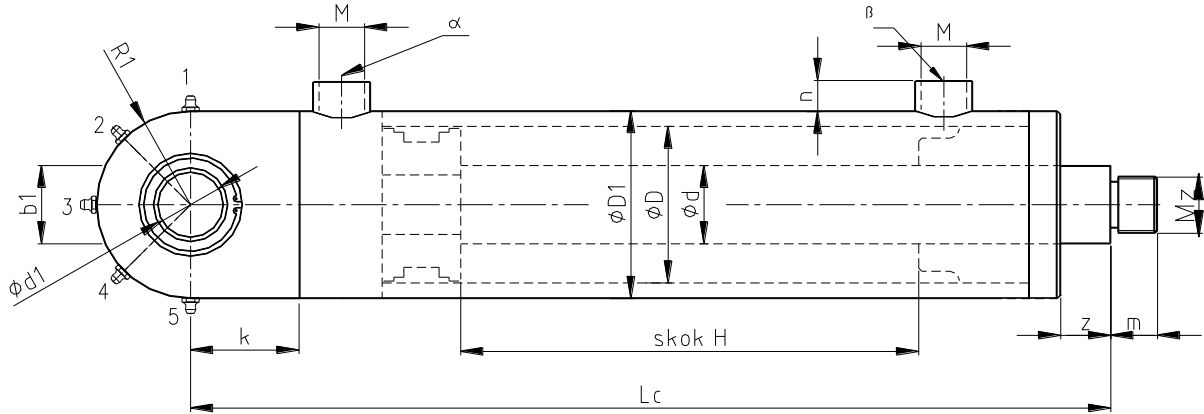
**tel/ fax:** .....

HYDRAULIC CYLINDER ORDER CARD



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**Order card for a WHC 2 hydraulic cylinder according to individual requirements**



hydraulic cylinder marking: **WHC 2** - ..... **x**..... **x**..... **x** / .....**x** - ..... - .....

D      d      H      Lc      α/β      A,B,C

- piston rod end: .....
- bearing type: .....
- grease nipple position: .....

D	d	D1	D2	Lc	H	d1 H8	M	R1	b1	k	n	z	Mz	m

\* WROPOL ENGINEERING reserves the right to make construction changes without prior notification.

**NOTES:**

**CUSTOMER:**

Company name: .....

Address: .....

Name and surname: .....

e-mail: .....

tel/ fax: .....

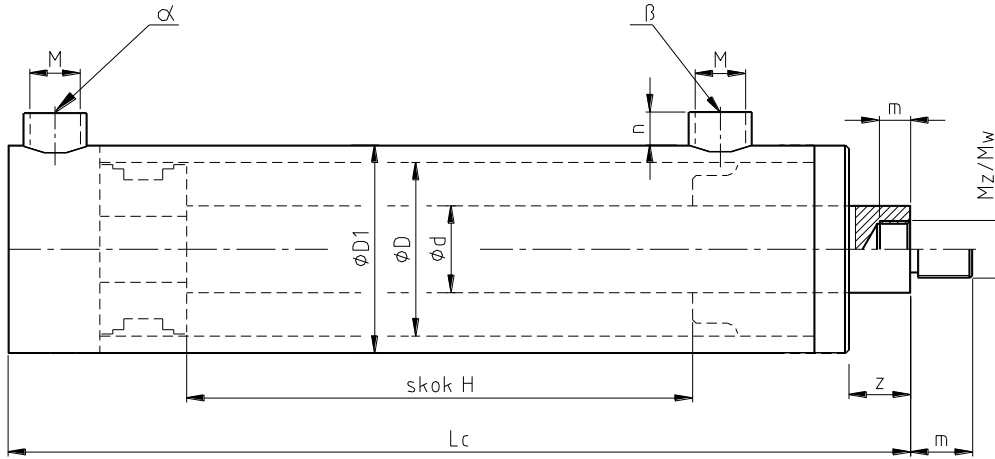


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HYDRAULIC CYLINDER ORDER CARD



**Order card for a WHC 7+ hydraulic cylinder  
cylinder end according to individual requirements**



hydraulic cylinder marking: **WHC 7**..... - ..... **x**..... **x**..... **x /** .....**x** - ..... - .....  
(A-H) D d H Lc  $\alpha/\beta$  A,B,C

- piston rod end:.....
- cylinder end: .....

D	d	D1	Lc	H	z	M	Mz	Mw	m	n

\* Firma WROPOL ENGINEERING zastrzega sobie prawo wprowadzania zmian konstrukcyjnych bez uprzedzenia.

**NOTES:**

**CUSTOMER:**

Company name:.....

Address: .....

Name and surname: .....

e-mail: :.....

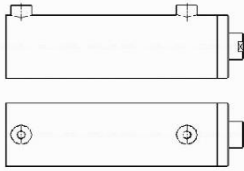
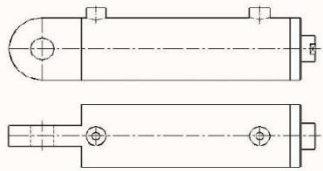
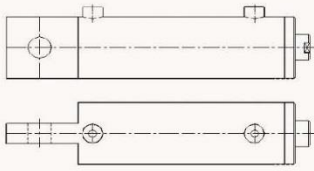
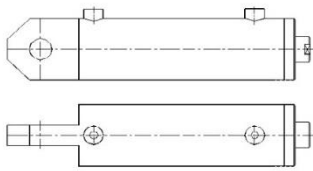
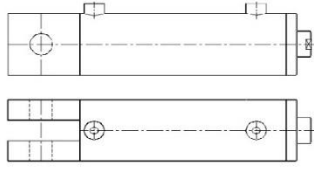
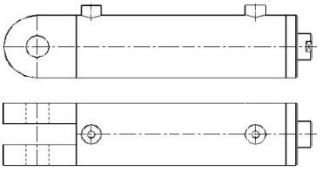
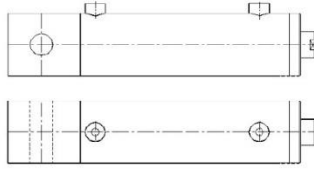
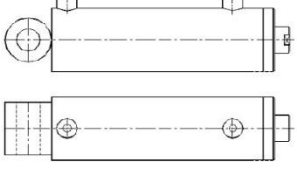
tel/ fax:.....



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HYDRAULIC CYLINDER ORDER CARD

**Cylinder ends for WHC 7 hydraulic cylinders**

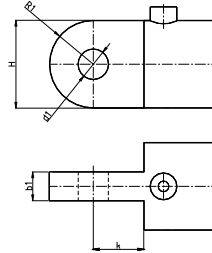
<p>A type without eye</p> 	<p>B type with rounded Eye</p> 
<p>C type with straight eye</p> 	<p>D type with shrear eye</p> 
<p>E type with fork straight eye</p> 	<p>F type with fork rounded eye</p> 
<p>G type with round eye</p> 	<p>H type with bush</p> 

CYLINDER ENDS FOR HYDRAULIC CYLINDERS



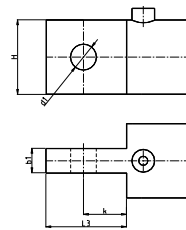
**B type – with rounded eye**

b1	d1	R1	k	L1



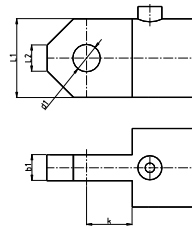
**C type – with straight eye**

b1	d1	k	L1	L3



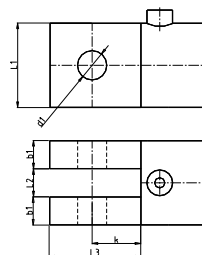
**D type – with shear eye**

b1	d1	k	L1	L3



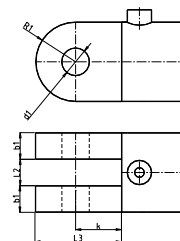
**E type – with straight fork eye**

b1	d1	k	L1	L2	L3



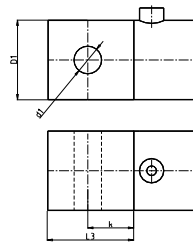
**F type – with rounded fork eye**

b1	d1	k	R1	L2	L3



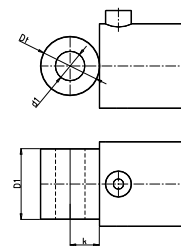
**G type – with round eye**

b1	d1	k	R1	L3



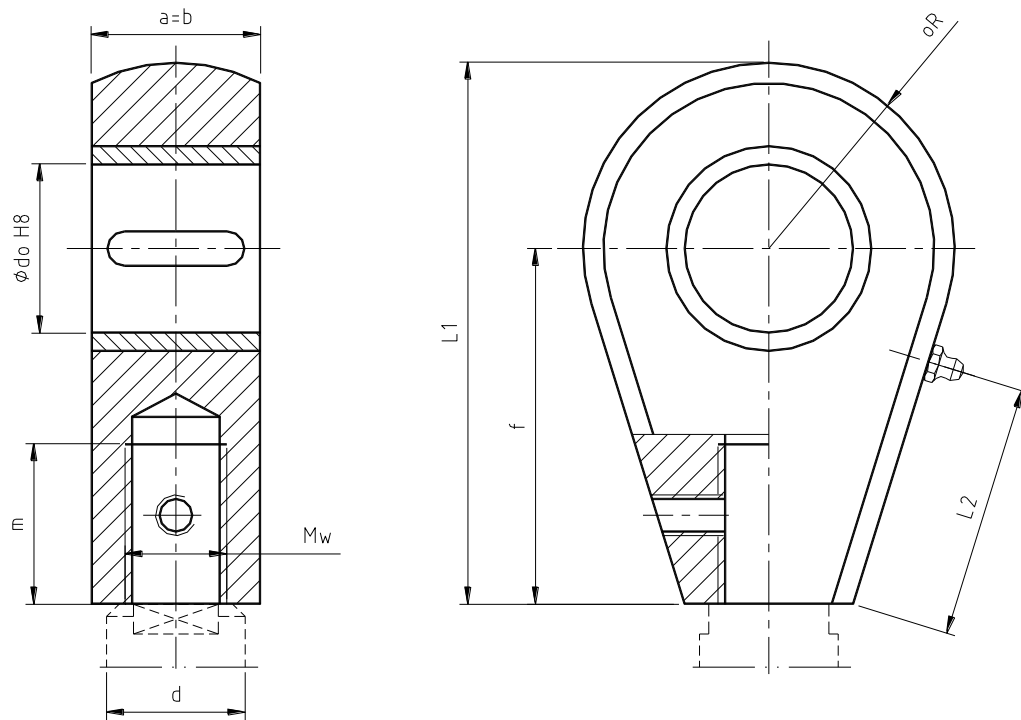
**H type – with bush**

b1	d1	k	Dt



**S type – special type according to customer order (draft)**

### KT-1 piston rod end



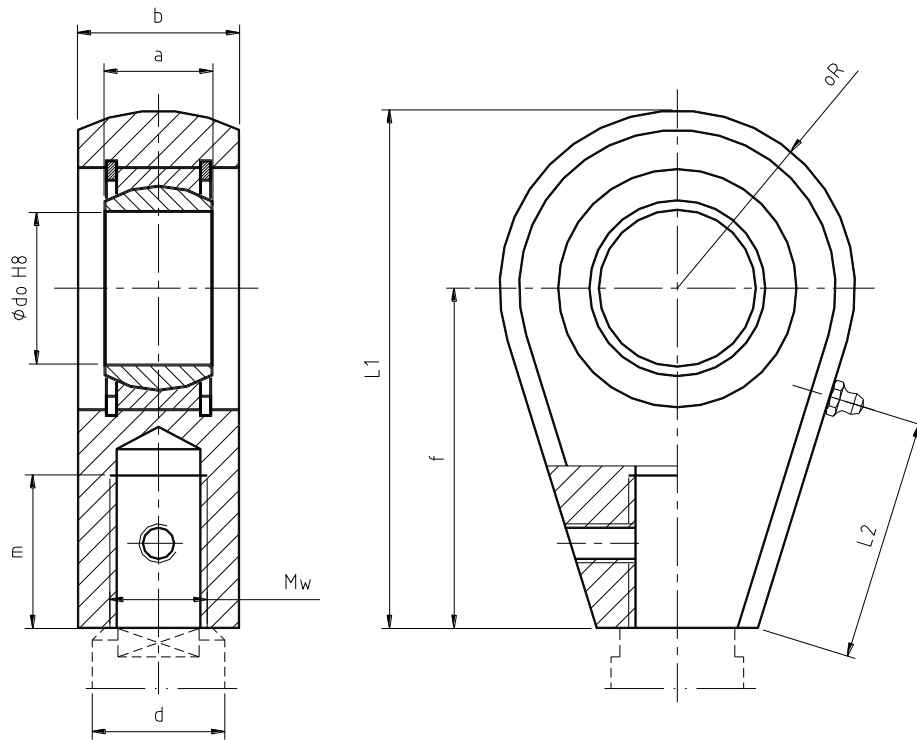
Designation	d	Mw	do H8	a=b	f	L 1	L 2	m	oR
KT1-40	20	M 16x1,5	20	20	50	78	35	20	26
KT1-50	25	M 20x1,5	30	30	65	105	41	25	31
KT1-65	32	M 24x1,5	40	40	85	130	60	35	40
KT1-80	40	M 30x2	50	50	105	161	75	40	55
	50								
KT1-100	50	M 39x2	60	60	125	194	85	47	65
	60								
KT1-110	60	M 45x2	60	60	125	194	85	47	65
	70								
KT1-125	70	M 48x2	70	70	145	232	100	50	80
	80								
KT1-140	70	M 48x2	80	70	150	242	100	57	85
	80								
KT1-160	80	M 52x2	80	70	150	242	100	67	85
	90								

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### KT-2 piston rod end



Designation	d	Mw	do H8	a	b	f	L 1	L 2	m	oR
KT2-40	20	M 16x1,5	20	20	16	50	78	35	20	26
KT2-50	25	M 20x1,5	30	30	22	65	105	41	25	31
KT2-65	32	M 24x1,5	40	40	28	85	130	60	35	40
KT2-80	40	M 30x2	50	50	40	105	161	75	40	55
	50									
KT2-100	50	M 39x2	60	60	50	125	194	85	47	65
	60									
KT2-110	60	M 45x2	60	60	50	125	194	85	47	65
	70									
KT2-125	70	M 48x2	70	70	60	145	232	100	50	80
	80									
KT2-140	70	M 48x2	80	70	65	150	242	100	57	85
	80									
KT2-160	80	M 52x2	80	70	65	150	242	100	67	85
	90									

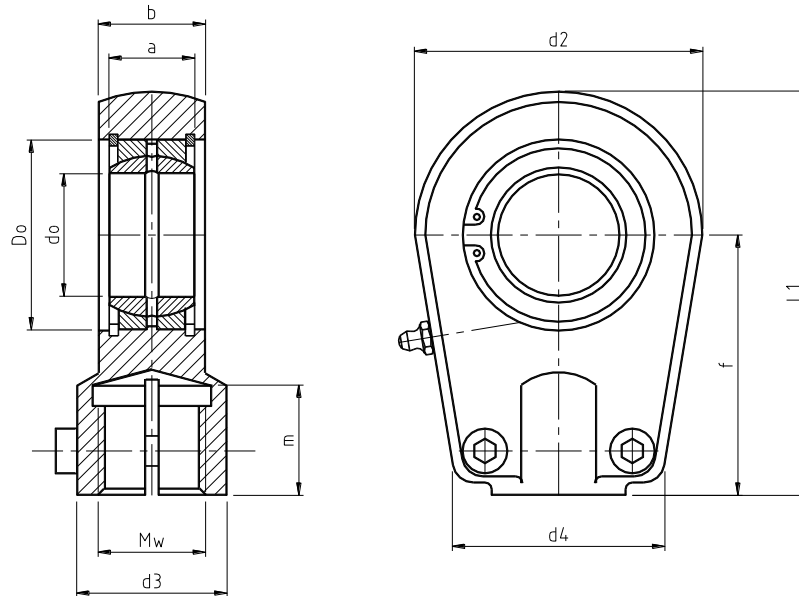
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PISTON ROD ENDS

### GIHR-K...DO piston rod end



GIHR-K...DO	do	Do	a	b	d2	d3	d4	f	L1	Mw	m	Dyn./Stat. load		mass
	mm											kN		kg
GIHR-K 20 DO	20 -0,010	35 -0,011	16 -0,12	19	56	25	41	50	78	M16x1,5	17	30	81,1	0,43
GIHR-K 25 DO	25 -0,010	42 -0,011	20 -0,12	23	56	25	41	50	78	M16x1,5	17	48	65,4	0,48
GIHR-K 30 DO	30 -0,010	47 -0,011	22 -0,12	28	64	32	46	60	92	M22x1,5	23	62	96,7	0,74
GIHR-K 40 DO	40 -0,012	62 -0,013	28 -0,12	30	78	40	58	70	109	M28x1,5	29	80	140	1,2
GIHR-K 45 DO	45 -0,012	68 -0,013	32 -0,12	35	94	49	66	85	132	M35x1,5	36	100	227	2
GIHR-K 50 DO	50 -0,012	75 -0,013	35 -0,12	40	116	61	88	105	163	M45x1,5	46	156	333	3,8
GIHR-K 60 DO	60 -0,015	90 -0,015	44 -0,15	50	130	75	90	130	200	M58x1,5	59	245	326	5,4
GIHR-K 70 DO	70 -0,015	105 -0,015	49 -0,15	55	154	86	100	150	232	M65x1,5	66	315	440	8,5
GIHR-K 80 DO	80 -0,015	120 -0,015	55 -0,15	60	176	102	125	170	165	M80x2	81	400	550	12
GIHR-K 90 DO	90 -0,020	130 -0,018	60 -0,20	65	206	124	146	210	323	M100x2	101	490	810	21,5
GIHR-K 100 DO	100 -0,020	150 -0,018	70 -0,20	70	230	138	166	235	360	M110x2	111	610	920	27,5
GIHR-K 110 DO	110 -0,020	160 -0,025	70 -0,20	80	265	152	190	265	407	M120x2	125	655	1382	40,5
GIHR-K 120 DO	120 -0,020	180 -0,025	85 -0,20	90	340	172	217	310	490	M130x2	135	950	2373	76

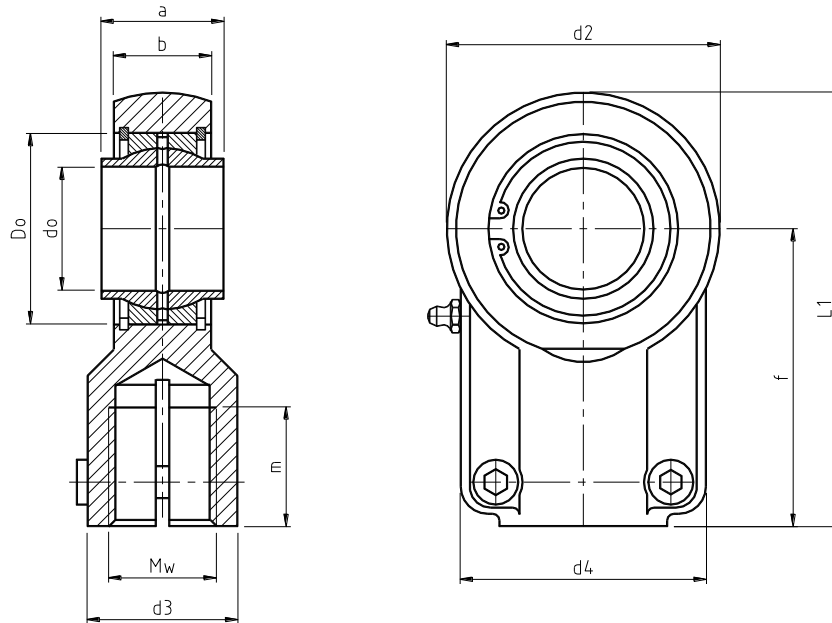
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### GIHN-K...LO piston rod end

Dimensions in accordance with DIN 24338; ISO 6982



GIHN-K ... LO	do	Do	a	b	d2	d3	d4	f	L1	Mw	m	Dyn./Stat. load		ma ss
	mm											kN	kg	
GIHN-K 12 LO	12 +0,018	22 -0,009	12 -0,18	10,6	32	16,5	32	38	54	M12x1,5	17	10,8	24	0,1
GIHN-K 16 LO	16 +0,018	28 -0,009	16 -0,18	13	40	21	40	44	64	M14x1,5	19	17,6	35,3	0,2
GIHN-K 20 LO	20 +0,021	35 -0,011	20 -0,21	17	47	25	47	52	75	M16x1,5	23	30	41,4	0,4
GIHN-K 25 LO	25 +0,021	42 -0,011	25 -0,21	21	58	30	54	65	94	M20x1,5	29	48	69,9	0,6 6
GIHN-K 32 LO	32 +0,025	52 -0,013	32 -0,25	27	70	38	66	80	115	M27x2	37	67	98,8	1,2
GIHN-K 40 LO	40 +0,025	62 -0,013	40 -0,25	32	89	47	80	97	141	M33x2	46	100	175	2,1
GIHN-K 50 LO	50 +0,025	75 -0,013	50 -0,25	40	108	58	96	120	174	M42x2	57	156	268	4,4
GIHN-K 63 LO	63 +0,030	95 -0,015	63 -0,30	52	132	70	114	140	211	M48x2	64	255	320	7,6
GIHN-K 70 LO	70 +0,030	105 -0,015	70 -0,30	57	155	80	135	160	245	M56x2	76	315	475	9,5
GIHN-K 80 LO	80 +0,030	120 -0,015	80 -0,30	66	168	90	148	180	270	M64x3	86	400	527	14, 5
GIHN-K 90 LO	90 +0,035	130 -0,018	90 -0,35	72	185	100	160	195	296	M72x3	91	490	660	17
GIHN-K 100 LO	100 +0,035	150 -0,018	100 -0,35	84	210	110	178	210	322	M80x3	96	610	840	28
GIHN-K 110 LO	110 +0,035	160 -0,025	110 -0,35	88	235	125	190	235	364	M90x3	106	655	1100	32
GIHN-K 125 LO	125 +0,040	180 -0,025	125 -0,40	102	262	135	200	260	405	M100x3	113	950	1393	43
GIHN-K 160 LO	160 +0,040	230 -0,030	160 -0,40	130	326	165	250	310	488	M125x4	126	1370	2080	80
GIHN-K 200 LO	200 +0,046	290 -0,035	200 -0,46	162	418	215	320	390	620	M160x4	161	2120	3456	16 5

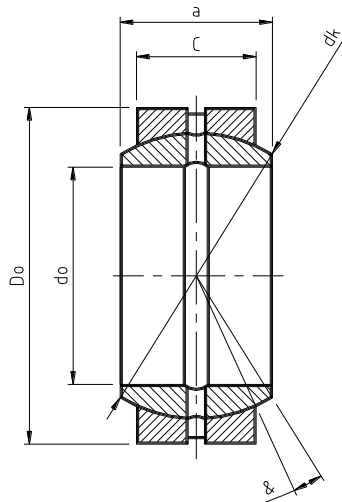
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PISTON ROD ENDS

### GE DO 2RS joint slide bearing



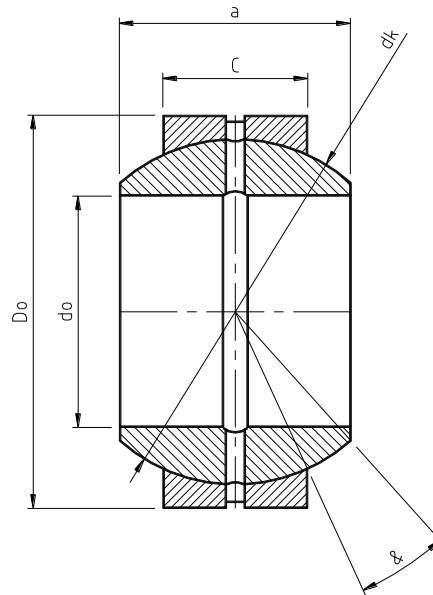
GE...DO - GE...DO-2RS		do	Do	a	C	dk	$\alpha$	Dyn./Stat. load	mass	
		mm						angle	KN	Kg.
GE 6 DO		6 -0,008	14 -0,008	6 -0,12	4 -0,24	10	13	3,4 17	0,004	
GE 8 DO		8 -0,008	16 -0,008	8 -0,12	5 -0,24	13	15	5,5 27,5	0,007	
GE 10 DO		10 -0,008	19 -0,009	9 -0,12	6 -0,24	16	12	8,15 40,5	0,011	
GE 12 DO		12 -0,008	22 -0,009	10 -0,12	7 -0,24	18	11	10,8 54	0,016	
GE 15 DO	GE 15 DO-2RS	15 -0,008	26 -0,009	12 -0,12	9 -0,24	22	8	17 85	0,025	
GE 16 DO		16 -0,008	30 -0,009	14 -0,12	10 -0,24	25	10	21,2 106	0,038	
GE 17 DO	GE 17 DO-2RS	17 -0,008	30 -0,009	14 -0,12	10 -0,24	25	10	21,2 106	0,041	
GE 20 DO	GE 20 DO-2RS	20 -0,010	35 -0,011	16 -0,12	12 -0,24	29	9	30 146	0,061	
GE 25 DO	GE 25 DO-2RS	25 -0,010	42 -0,011	20 -0,12	16 -0,24	35,5	7	48 240	0,11	
GE 30 DO	GE 30 DO-2RS	30 -0,010	47 -0,011	22 -0,12	18 -0,24	40,7	6	62 310	0,14	
GE 35 DO	GE 35 DO-2RS	35 -0,012	55 -0,013	25 -0,12	20 -0,30	47	6	80 400	0,22	
GE 40 DO	GE 40 DO-2RS	40 -0,012	62 -0,013	28 -0,12	22 -0,30	53	7	100 500	0,30	
GE 45 DO	GE 45 DO-2RS	45 -0,012	68 -0,013	32 -0,12	25 -0,30	60	7	127 640	0,40	
GE 50 DO	GE 50 DO-2RS	50 -0,012	75 -0,013	35 -0,12	28 -0,30	66	6	156 780	0,54	
GE 60 DO	GE 60 DO-2RS	60 -0,015	90 -0,015	44 -0,15	36 -0,40	80	6	245 1220	1,00	
GE 70 DO	GE 70 DO-2RS	70 -0,015	105 -0,015	49 -0,15	40 -0,40	92	6	315 1560	1,50	
GE 80 DO	GE 80 DO-2RS	80 -0,015	120 -0,015	55 -0,15	45 -0,40	105	6	400 2000	2,20	
GE 90 DO	GE 90 DO-2RS	90 -0,020	130 -0,018	60 -0,20	50 -0,50	115	5	490 2450	2,70	
GE 100 DO	GE 100 DO-2RS	100 -0,020	150 -0,018	70 -0,20	55 -0,50	130	7	610 3050	4,30	
GE 110 DO	GE 110 DO-2RS	110 -0,020	160 -0,025	70 -0,20	55 -0,50	140	6	655 3250	4,70	
GE 120 DO	GE 120 DO-2RS	120 -0,020	180 -0,025	85 -0,20	70 -0,50	160	6	950 4750	8,00	

GE 140 DO	GE 140 DO-2RS	140 -0,025	210 -0,030	90 -0,25	70 -0,60	180	7	1080 5400	11,00
GE 160 DO	GE 160 DO-2RS	160 -0,025	230 -0,030	105 -0,25	80 -0,60	200	8	1370 6800	13,50
GE 180 DO	GE 180 DO-2RS	180 -0,025	260 -0,035	105 -0,25	80 -0,70	225	6	1530 7650	18,50
GE 200 DO	GE 200 DO-2RS	200 -0,030	290 -0,035	130 -0,30	100 -0,70	250	7	2120 10600	28,00
	GE 220 DO-2RS	220 -0,030	320 -0,040	135 -0,30	100 -0,80	275	8	2320 11600	35,50
	GE 240 DO-2RS	240 -0,030	340 -0,040	140 -0,30	100 -0,80	300	8	2250 12700	40,00
	GE 260 DO-2RS	260 -0,035	370 -0,040	150 -0,35	110 -0,80	325	7	2550 12700	50,00
	GE 280 DO-2RS	280 -0,035	400 -0,040	155 -0,35	120 -0,80	350	6	3050 15300	64,00
	GE 300 DO-2RS	300 -0,035	430 -0,045	165 -0,35	120 -0,90	375	7	3550 18000	75,00





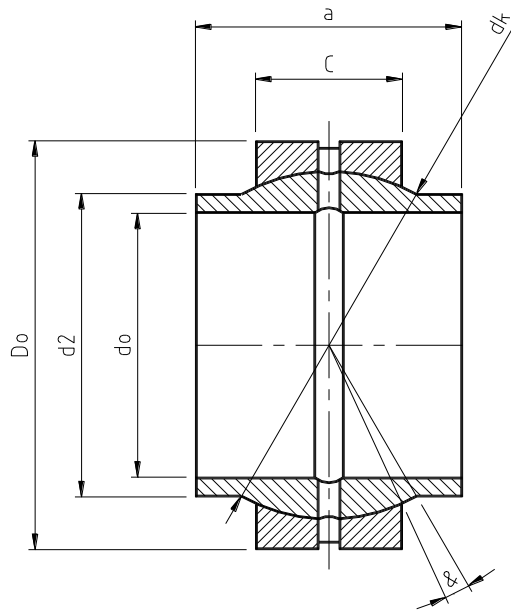
### GE FO 2RS joint slide bearing



GE...FO - GE...FO-2RS	do	Do	a	C	dk	$\alpha$	Dyn./Stat. load.	mass	
	mm								angle
GE 6 FO	6 -0,008	16 -0,008	9 -0,12	5 -0,24	13	21	5,5 27,5	0,008	
GE 8 FO	8 -0,008	19 -0,009	11 -0,12	6 -0,24	16	21	8,15 40,5	0,014	
GE 10 FO	10 -0,008	22 -0,009	12 -0,12	7 -0,24	18	18	10,8 54	0,020	
GE 12 FO	12 -0,008	26 -0,009	15 -0,12	9 -0,24	22	18	17 85	0,034	
GE 15 FO	GE 15 FO-2RS	15 -0,008	30 -0,009	16 -0,12	10 -0,24	25	16	21,2 106	0,046
GE 17 FO	GE 17 FO-2RS	17 -0,008	35 -0,011	20 -0,12	12 -0,24	29	19	30 146	0,078
GE 20 FO	GE 20 FO-2RS	20 -0,010	42 -0,011	25 -0,12	16 -0,24	35,5	17	48 240	0,15
GE 25 FO	GE 25 FO-2RS	25 -0,010	47 -0,011	28 -0,12	18 -0,24	40,7	17	156 780	0,19
GE 30 FO	GE 30 FO-2RS	30 -0,010	55 -0,013	32 -0,12	20 -0,30	47	17	62 310	0,29
GE 35 FO	GE 35 FO-2RS	35 -0,012	62 -0,013	35 -0,12	22 -0,30	53	16	80 400	0,39
GE 40 FO	GE 40 FO-2RS	40 -0,012	68 -0,013	40 -0,12	25 -0,30	60	17	100 500	0,52
GE 45 FO	GE 45 FO-2RS	45 -0,012	75 -0,013	43 -0,12	28 -0,30	66	15	127 640	0,68
GE 50 FO	GE 50 FO-2RS	50 -0,012	90 -0,015	56 -0,15	36 -0,40	80	17	156 780	1,40
GE 60 FO	GE 60 FO-2RS	60 -0,015	105 -0,015	63 -0,15	40 -0,40	92	17	245 1220	2,00
GE 70 FO	GE 70 FO-2RS	70 -0,015	120 -0,015	70 -0,15	45 -0,40	105	16	315 1560	2,90
GE 80 FO	GE 80 FO-2RS	80 -0,015	130 -0,018	75 -0,15	50 -0,40	115	14	400 2000	3,50
GE 90 FO	GE 90 FO-2RS	90 -0,020	150 -0,018	80 -0,20	55 -0,50	130	15	490 2450	5,40
GE 100 FO	GE 100 FO-2RS	100 -0,020	160 -0,025	85 -0,20	55 -0,50	140	14	610 3050	5,90
GE 110 FO	GE 110 FO-2RS	110 -0,020	180 -0,025	100 -0,20	70 -0,50	160	12	655 3250	9,70

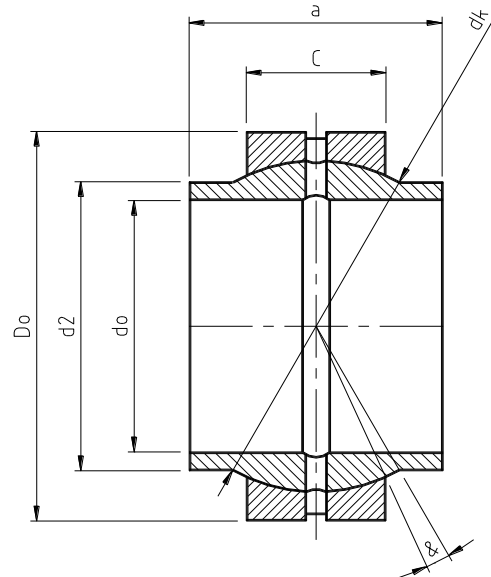
GE 120 FO	GE 120 FO-2RS	120 -0,020	210 -0,030	115 -0,20	70 -0,50	180	16	1080 5400	15,0
GE 140 FO	GE 140 FO-2RS	140 -0,025	230 -0,030	130 -0,25	80 -0,60	200	16	1370 6800	18,5
GE 160 FO	GE 160 FO-2RS	160 -0,025	260 -0,035	135 -0,25	80 -0,60	225	16	1530 7650	22,00
GE 180 FO	GE 180 FO-2RS	180 -0,025	290 -0,035	155 -0,25	100 -0,70	250	14	2120 10600	35,50
	GE 200 FO-2RS	200 -0,030	320 -0,040	165 -0,30	100 -0,70	275	15	2320 11600	45,00
	GE 220 FO-2RS	220 -0,030	340 -0,040	175 -0,30	100 -0,80	300	16	2250 12700	51,00
	GE 240 FO-2RS	240 -0,030	370 -0,040	190 -0,30	110 -0,80	325	15	3050 15300	64,00
	GE 260 FO-2RS	260 -0,035	400 -0,040	205 -0,35	120 -0,80	350	15	3550 18000	81,00
	GE 280 FO-2RS	280 -0,035	430 -0,045	210 -0,35	120 -0,90	375	15	3800 19000	94,00

### GE LO joint slide bearing



GE...LO	do	Do	a	C	dk	d2	$\alpha$	Dyn./Stat. load		mass
	mm							ange	KN	
GE 12 LO	12 +0,018	22 -0,009	12 -0,18	7 -0,24	18	15,5	4	10,8	54	0,020
GE 16 LO	16 +0,018	28 -0,009	16 -0,18	9 -0,24	23	20	4	17,6	88	0,030
GE 20 LO	20 +0,021	35 -0,011	20 -0,21	12 -0,24	29	25	4	30	146	0,070
GE 25 LO	25 +0,021	42 -0,011	25 -0,21	16 -0,24	35,5	30,5	4	48	240	0,12
GE 32 LO	32 +0,025	52 -0,013	32 -0,25	18 -0,30	44	38	4	67	335	0,20
GE 40 LO	40 +0,025	62 -0,013	40 -0,25	22 -0,30	53	46	4	100	500	0,34
GE 50 LO	50 +0,025	75 -0,013	50 -0,25	28 -0,30	66	57	4	156	780	0,56
GE 63 LO	63 +0,030	95 -0,015	63 -0,30	36 -0,40	83	71,5	4	255	1270	1,20
GE 70 LO	70 +0,030	105 -0,015	70 -0,30	40 -0,40	92	79	4	315	1560	1,70
GE 80 LO	80 +0,030	120 -0,015	80 -0,30	45 -0,40	105	91	4	400	2000	2,40
GE 90 LO	90 +0,035	130 -0,018	90 -0,35	50 -0,50	115	99	4	490	2450	3,20
GE 100 LO	100 +0,035	150 -0,018	100 -0,35	55 -0,50	130	113	4	610	3050	4,80
GE 110 LO	110 +0,035	160 -0,025	110 -0,35	55 -0,50	140	124	4	655	3250	5,80
GE 125 LO	125 +0,040	180 -0,025	125 -0,40	70 -0,50	160	138	4	950	4750	8,50
GE 160 LO	160 +0,040	230 -0,030	160 -0,40	80 -0,60	200	177	4	1370	6800	16,50
GE 200LO	200 +0,046	290 -0,035	200 -0,46	100 -0,70	250	221	4	2120	10600	32,00
GE 250 LO	250 +0,046	400 -0,040	250 -0,46	120 -0,80	350	317	4	3550	18000	99,00
GE 320 LO	320 +0,057	520 -0,050	320 -0,57	160 -0,90	450	405	4	6100	30500	225,0

### GE HO 2RS joint slide bearing



GE...HO-2RS	do	Do	a	C	dk	d2	$\alpha$	Dyn./Stat. load		mass
	mm							ange	KN	
GE 17 HO-2RS	17 <sup>-0,008</sup>	30 <sup>-0,009</sup>	21 <sup>±0,2</sup>	10 <sup>-0,24</sup>	25	21	3	21,2	106	0,040
GE 20 HO-2RS	20 <sup>-0,010</sup>	35 <sup>-0,011</sup>	24 <sup>±0,2</sup>	12 <sup>-0,24</sup>	29	24	3	30	146	0,057
GE 25 HO-2RS	25 <sup>-0,010</sup>	42 <sup>-0,011</sup>	29 <sup>±0,3</sup>	16 <sup>-0,24</sup>	35,5	29	3	48	240	0,10
GE 30 HO-2RS	30 <sup>-0,010</sup>	47 <sup>-0,011</sup>	30 <sup>±0,3</sup>	18 <sup>-0,24</sup>	40,7	34,2	3	62	310	0,14
GE 35 HO-2RS	35 <sup>-0,012</sup>	55 <sup>-0,013</sup>	35 <sup>±0,3</sup>	20 <sup>-0,30</sup>	47	40	3	80	400	0,24
GE 40 HO-2RS	40 <sup>-0,012</sup>	62 <sup>-0,013</sup>	38 <sup>±0,3</sup>	22 <sup>-0,30</sup>	53	45	3	100	500	0,29
GE 45 HO-2RS	45 <sup>-0,012</sup>	68 <sup>-0,013</sup>	40 <sup>±0,3</sup>	25 <sup>-0,30</sup>	60	51,5	3	127	640	0,43
GE 50 HO-2RS	50 <sup>-0,012</sup>	75 <sup>-0,013</sup>	43 <sup>±0,3</sup>	28 <sup>-0,30</sup>	66	56,5	3	156	780	0,54
GE 60 HO-2RS	60 <sup>-0,015</sup>	90 <sup>-0,015</sup>	54 <sup>±0,3</sup>	36 <sup>-0,40</sup>	80	67,7	3	245	1220	1,10
GE 70 HO-2RS	70 <sup>-0,015</sup>	105 <sup>-0,015</sup>	65 <sup>±0,3</sup>	40 <sup>-0,40</sup>	92	78	3	315	1560	1,60
GE 80 HO-2RS	80 <sup>-0,015</sup>	120 <sup>-0,015</sup>	74 <sup>±0,3</sup>	45 <sup>-0,40</sup>	105	90	3	400	2000	2,40

JOINT SLIDE BEARINGS



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### **Tubes for hydraulic cylinders**

Tubes are made of ST52 steel (equivalent of 18G2A grade according to PN)  
 Inside diameter tolerance H8 according to ISO  
 Inside surface roughness Ra=0,4 µm  
 Straightness: 1mm/2m

Item	Inside diameter x outside diameter
1	25 x 35
2	32 x 40
3	35 x 45
4	40 x 50
5	45 x 60
6	50 x 60
7	50 x 65
8	55 x 65
9	55 x 70
10	60 x 72
11	60 x 72
12	60 x 75
13	60 x 80
14	63 x 75
15	63 x 78
16	63 x 83
17	65 x 78
18	65 x 80
19	70 x 82
20	70 x 85
21	70 x 90
22	75 x 90
23	75 x 95
24	80 x 92
25	80 x 95

Item	Inside diameter x outside diameter
26	80 x 100
27	80 x 105
28	90 x 105
29	90 x 110
30	90 x 115
31	95 x 120
32	100 x 120
33	100 x 130
34	105 x 125
35	110 x 130
36	115 x 140
37	120 x 145
38	125 x 150
39	125 x 160
40	130 x 160
41	140 x 165
42	150 x 175
43	160 x 185
44	160 x 195
45	180 x 210
46	200 x 230
47	200 x 240
48	200 x 245
49	220 x 273
50	250 x 298,5

**PIPES FOR HYDRAULIC CYLINDERS**



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### Chromium plated rods for piston rods

Rods are made of 20 MnV6 steel  
 Diameter tolerance f7 according to ISO  
 Surface roughness Ra=0,1 µm - 0,15 µm  
 Chromium layer thickness 25 +/-5 µm

Item	Diameter [mm]
1	8
2	10
3	11
4	12
5	14
6	15
7	16
8	18
9	20
10	22
11	25
12	28
13	30
14	32
15	35
16	36
17	38

Item	Diameter [mm]
18	40
19	45
20	50
21	55
22	56
23	60
24	63
25	65
26	70
27	75
28	80
29	85
30	90
31	100
32	110
33	125
34	140

### Tubular piston rods

Rods are made of ST 52 steel S/S according to DIN 2391  
 Diameter tolerance f7 according to ISO  
 Surface roughness Ra=0,1 µm - 0,15 µm  
 Chromium layer thickness 25 +/-5 µm

Item	Diameter [mm]
1	30 x 5
2	30 x 7,5
3	40 x 10
4	45 x 5
5	45 x 10
6	50 x 5
7	50 x 7,5
8	60 x 7,5
9	65 x 7,5
10	70 x 7,5
11	70 x 10
12	75 x 7,5
13	80 x 10
14	100 x 7,5

CHROMIUM PLATED RODS FOR PISTON RODS



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**NOTES**

**NOTES**



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