



hidravlični cilindri hydraulic cylinder

VRSTA/SERIES MD18



tehnični katalog

MAPRO
HYDRAULIC MOVEMENT

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HIDRAVLIČNI CILINDER

Vrsta MD18

Nazivni tlak 18 MPa (180 bar)

- varjena izvedba
- dvostransko delujoči
- 8 pritrilnih oblik
- premer bata od 25 mm do 250 mm
- premer batnice od 14 mm do 160 mm
- dolžina hoda do 6 m
- delovna hitrost od 0.5 m/s do 15 m/s
- delovna temperatura od -30° C do +80° C
- delovno sredstvo: mineralno hidravlično olje
- testiran v skladu z ISO 10100:2001; Fluidna tehnika - Hidravlika - Valji - Prezemni preskusi
- tolerance vgradnih mer in hoda v skladu z ISO 6020-1:2007; Fluidna tehnika - Hidravlika
- Vgradne mere valjev z enostransko batnico vrste 16 MPa (160 bar) - 1.del: srednja vrsta
- možnosti izvedb tudi po željah kupca

HYDRAULIC CYLINDER

Series MD18

Nominal pressure 18 MPa (180 bar)

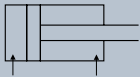
- welded version
- double acting
- 8 fixation modalities
- piston diameter from 25 mm to 250 mm
- piston rod diameter from 14 mm to 160 mm
- stroke length up to 6 m
- operation speed from 0.5 m/s to 15 m/s
- working temperature range from -30° C to +80° C
- working fluid: mineral hydraulic oil
- tested in accordance to ISO 10100:2001; Hydraulic fluid power-Cylinders-Acceptance tests
- tolerance of mounting dimensions and stroke in accordance with ISO 6020-1:2007;
- Hydraulic fluid power-Mounting dimensions for single rod cylinders, 16 MPa (160 bar) series - Part 1: Medium series
- possible modifications according to Customer's order

KAZALO/CONTENTS

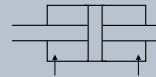
Tehnična navodila/ Technical instructions	3
Ključ za naročanje/ Ordering code	6
Vrsta/Series MD18 MM	7
Vrsta/Series MD18 MA	8
Vrsta/Series MD18 MB	9
Vrsta/Series MD18 MD	10
Vrsta/Series MD18 ME	11
Vrsta/Series MD18 MF	12
Vrsta/Series MD18 SM	13
Vrsta/Series MD18 SC	14
Zglobne glave/Rod ends	15
Navodila za vgradnjo, uporabo in vzdrževanje/ Instructions for mounting, use and maintenance	19

Hidravlični cilinder

Hidravlični cilinder je izvršilna sestavina v hidravliki. Njena vstopna veličina je hidravlično olje pod tlakom, ki deluje na površino bata cilindra. S tem povzroča premočrno gibanje bata in posledično batnice, ki je povezana z bremenom. Navadno ima hidravlični cilinder le eno batnico. Tak cilinder imenujemo diferencialni hidravlični cilinder. Lastnost tega cilindra je, da se površini bata, na katero deluje delovni tlak razlikujeta za površino batnice. Tak cilinder ima za razmerje površin večjo potisno silo v primerjavi z vlečno silo. Obratno je s hitrostjo delovnega in povratnega giba cilindra. Povratni hod je za razmerje površin hitrejši od delavnega. Cilindri z obojestransko batnico pa imajo navadno enaki površini bata ter enaki delovni in povratni hitrosti.



Simbol diferencialnega hidravličnega cilindra./Feature: Differential hydraulic cylinder.



Simbol cilindra z obojestransko batnico./Feature: Double-action cylinder.

Hydraulic cylinder

Hydraulic cylinder is executive component in hydraulics. Its input extent is represented by pressurized hydraulic fluid (oil) acting on cylinder piston surface area. This causes linear motion of piston and consecutively of piston rod, which is directly connected with the load. Generally hydraulic cylinders dispose with one single piston rod and are called differential hydraulic cylinders. Characteristic of this cylinder type is that surface areas of the piston, subject to working pressure, differ by surface area of the piston rod. Suchlike cylinder disposes with major pushing force (impetus) in comparison to tractive (pulling) force, by surface areas ratio. Inversely, the retract stroke speed is higher than extension stroke one, by surface areas ratio. Double-action (double piston rod) cylinders usually have equal piston surface areas and equal extension and retraction speeds.

Enačbe za določitev hidravličnega cilindra

Enačba za določitev premera bata cilindra:

Pri določevanju dimenzij hidravličnega cilindra moramo najprej poznati breme, katero bo cilinder premagoval. Če imamo poznano breme (potisno silo) in delovni tlak v sistemu, lahko izračunamo premer bata cilindra po enačbi 1.1. Dobljeno vrednost primerjamo s standardnimi premeri batov po katalogu. Izberemo prvo najbližjo večjo vrednost iz kataloga.

F	[N]	Želena potisna sila	Required pushing force
p	[bar]	Delovni tlak	Working pressure
D	[mm]	Premer bata	Piston diameter

Formulas to determine type of hydraulic cylinder

Formula to determine cylinder piston diameter:

Prior to define dimensions of hydraulic cylinder one needs to know exact overcoming load parameters: when load (impetus) and working pressure within the system are known, it is possible to calculate cylinder piston diameter by means of equation 1.1. One then compares the obtained value to standard piston diameters from the catalogue and selects the first higher given value.

$$D = \sqrt{\frac{4 \times F}{0.1 \times p \times \pi}} \quad [1.1]$$

Enačba za določitev premera batnice

Če imamo poznano breme, ki ga bo cilinder premagoval pri povratnem hodu (vlečno silo cilindra), delovni tlak, ter premer bata (izračunan po enačbi 1.1), lahko po enačbi 1.2 izračunamo premer batnice. Dobljeno vrednost primerjamo s standardnimi premeri batnic po katalogu. Izberemo prvo najbližjo manjšo vrednost iz kataloga.

F _v	[N]	Željena vlečna sila	Required tractive force
p	[bar]	Delovni tlak	Working pressure
D	[mm]	Premer bata	Piston diameter
d	[mm]	Premer batnice	Piston rod diameter

Formula to determine piston rod diameter

Once known the load that cylinder should overcome during the return stroke (cylinder tractive force), working pressure and piston diameter (calculated by means of equation 1.1), it is now possible to calculate piston rod diameter using equation 1.2. Obtained value is then compared to standard piston rod diameters from the catalogue. Always select the first lower given value.

$$d = \sqrt{D^2 - \frac{4 \times F_v}{0.1 \times p \times \pi}} \quad [1.2]$$

Pri daljših hodih cilindrov je nujno upoštevati še uklonsko dolžino. Uporaba daljših hodov od predpisanih ni dovoljena.

Within cylinders with longer strokes it is inevitable to consider submittal length. Employment of longer strokes than provided is not permitted.

Enačba za določitev potrebnega pretoka hidravlične črpalke

Če imamo poznan željen čas delovnega in čas povratnega hoda, premer bata ter premer batnice, izračunamo potreben pretok hidravlične črpalke po enačbi 1.3 in 1.4.

Formula to determine required hydraulic pump fluid flow

When required times of working and return stroke are known, as well as piston and piston rod diameters, it is possible to calculate needed hydraulic pump fluid flow according to equations 1.3 in 1.4.

t	[s]	Željen čas iztegovanja/krčenja	Required time of extension/retraction
h	[mm]	Hod cilindra	Cylinder stroke
D	[mm]	Premer bata	Piston diameter
d	[mm]	Premer batnice	Piston rod diameter
Q _d	[l/min]	Potreben pretok pri iztegovanju	Required fluid flow during extension
Q _p	[l/min]	Potreben pretok pri krčenju	Required fluid flow during retraction

$$Q_d = \frac{\pi \times D^2 \times h \times 60}{4 \times t \times 10^6} \quad \text{- Delovni hod/Working stroke} \quad [1.3]$$

$$Q_p = \frac{\pi \times (D^2 - d^2) \times h \times 60}{4 \times t \times 10^6} \quad \text{- Povratni hod/Return stroke} \quad [1.4]$$

■ Enačba za izračun iztislinske črpalke

Ko smo izračunali potreben pretok črpalke, lahko po enačbi 1.5 izračunamo iztislinsko črpalke. Vedno moramo računati z največjo dobljeno vrednostjo, v našem primeru pretok pri iztegovanju cilindra. To vrednost imenujemo pretok črpalke. Poznati moramo še število obratov pogonskega motorja ter volumetrični izkoristek črpalke.

q_c	[cm ³ /vrt]	Iztislinska črpalke	Pump capacity (fluid pressed out)
Q	[l/min]	Pretok črpalke	Pump fluid flow
n_c	vrt/min	Obrati pogonskega motorja	Propelling engine revolutions
η_c	-	Volumetrični izkoristek črpalke	Volumetric pump capacity

■ Formula to calculate pump capacity (quantity of fluid pressed out)

Once we calculated the required hydraulic pump fluid flow, we can proceed, using the equation 1.5, to calculate the pump capacity (quantity of fluid pressed out). One should always consider calculation with maximum obtained value, in our case flow during the cylinder extension cycle. This value is called pump flow. We furthermore need to know number of propelling motor revolutions (per minute) and volumetric productivity of the pump.

$$q_c = \frac{Q \times 1000}{n_c \times \eta_c} \quad [1.5]$$

■ Enačba za izračun potrebne moči pogonskega motorja

Ko imamo izračunane vse vrednosti, lahko izračunamo še potrebno moč pogonskega motorja po enačbi 1.6. Poznati moramo tlak nastavitve varnostnega ventila (ustrezno višji od potrebnega delovnega tlaka), tok črpalke in pa skupni izkoristek črpalke.

P	[Kw]	Moč pogonskega motorja	Propelling motor power
p_c	[bar]	Tlak črpalke (nastavitev varnostnega ventila)	Pump pressure (safety valve adjustment)
Q_c	[l/min]	Pretok črpalke	Pump fluid flow
η_s	-	Skupni izkoristek črpalke	Total pump rendition (productivity)

■ Formula to calculate required propelling engine power

Once we calculated all needed values we can now calculate required power of propelling motor by the use of equation 1.6. We need to know value of adjusted safety valve pressure (accordingly higher than required working pressure), pump fluid flow and total pump rendition.

$$P = \frac{p_c \times Q_c}{600 \times \eta_s} \quad [1.6]$$

Kontrola batnice na uklon

Določitev največjega dopustnega hoda cilindra
Pri cilindrih z daljšimi hodi je nujna kontrola na uklon.

■ Eulerjeva enačba za elastični uklon:

F_k	[N]	Uklonska sila	Submittal force
F	[N]	Maksimalna sila cilindra	Maximum cylinder force
d	[mm]	Premer batnice	Piston rod diameter
E	[N/mm ²]	Modul elastičnosti za jeklo CK45 2.1x10 ⁵ N/mm ²	Elasticity mode (for C45E steel 2.1x10 ⁵ N/mm ²)
I_{min}	[mm ⁴]	Aksialni vztrajnostni moment batnice	Piston rod axial moment of inertia
l_0	[mm]	Prosta uklonska dolžina	Unforced submittal length
ν	-	Varnost (2÷10, navadno 3.5)	Safety (2÷10, usually 3.5)

Verification of piston rod against buckling

Defining maximum allowed cylinder stroke
In cylinders with longer strokes it is necessary to verify piston rod against buckling.

■ Euler's elastic buckling equation:

$$F_k = \pi^2 \frac{E \times I_{min}}{l_0^2} \quad [1.7]$$

$$F_k = F \times \nu \quad [1.8]$$

$$I_{min} = \frac{\pi \times d^4}{64} \quad [1.9]$$

$$d = \sqrt[4]{\frac{64 \times l_0^2 \times F \times \nu}{\pi^3 \times E}} \quad [1.10]$$

l_0 za različne tipe pritrditev cilindrov:

l_0 for various modalities of cylinder fixation:

MA, MB, SC:	$l_0 = l$	(l = razdalja med centroma ušes pri iztegnjenem cilindru)	(l = distance between both rod-end centers while cylinder extended)
MD:	$l_0 = l$	(l = razdalja med centrom tečaja in centrom ušesa pri iztegnjenem cilindru)	(l = distance between hinge center and rod-end center while cylinder extended)
ME, MF:	$l_0 = 0,7 \times l$	(l = razdalja od prirobnice do centra ušesa pri iztegnjenem cilindru)	(l = distance between cylinder bottom and rod-end center while cylinder extended)

Iz enačb 1.7, 1.8 in 1.9 izrazimo najmanjši dopustni premer batnice 1.10 pri določenem hodu.

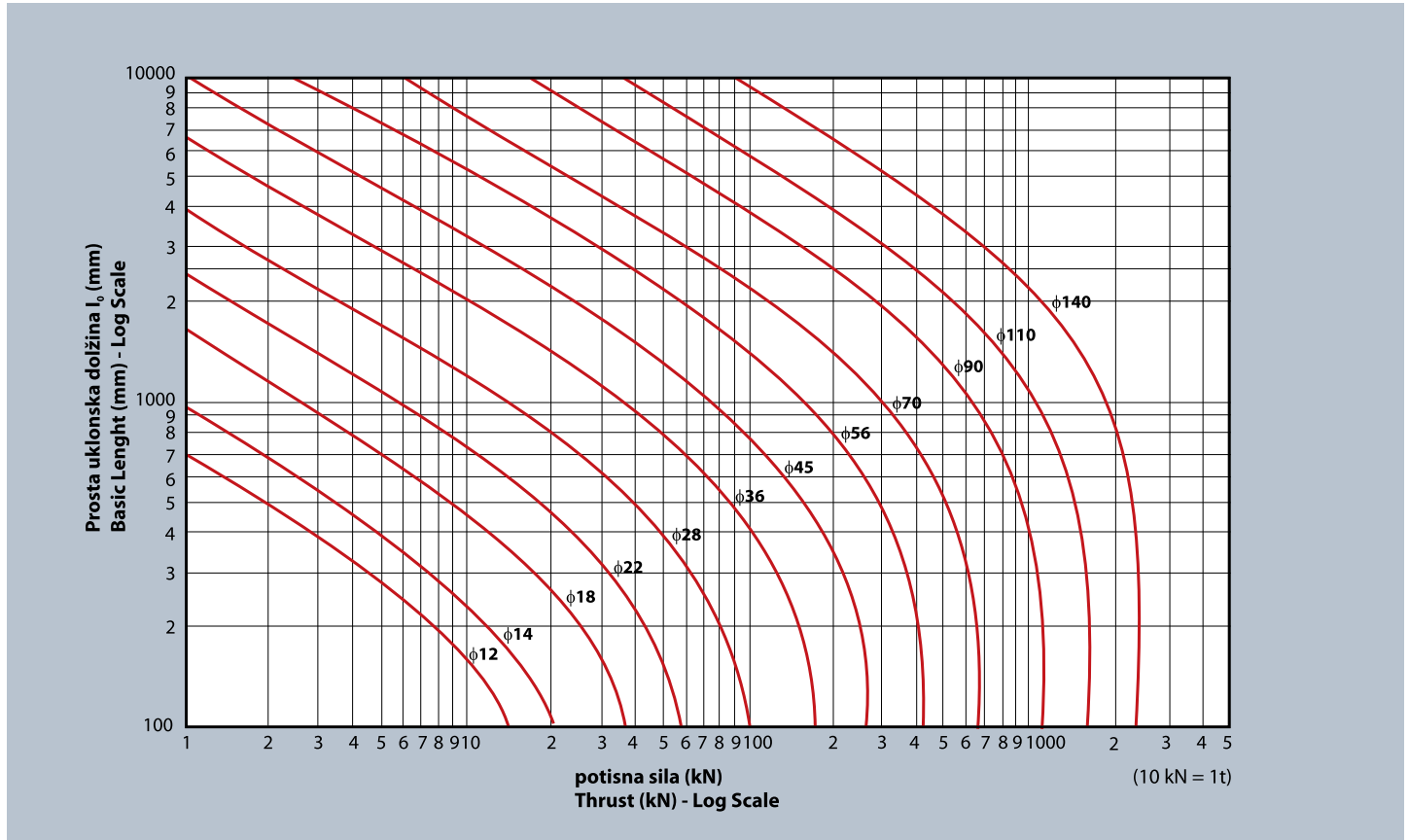
Izračunana vrednost premera batnice je zgolj orientacijska, zato je potrebno izbrati ustrezno večji premer batnice.

By means of equations 1.7, 1.8 and 1.9 define minimum admissible piston rod diameter 1.10 for given stroke.

Calculated value of piston rod diameter is merely an example, therefore anadequately larger diameter of piston rod needs to be selected.

Diagram za določanje velikosti batnice Piston Rod Selection Chart

Za enostavno kontrolo je priporočljivo uporabljati spodnji diagram (podatki v diagramu že vsebujejo faktor varnosti):
 For easy verification it is recommendable to observe the underneath diagram (given information include safety factor):



Tolerance vgradnih mer v odvisnosti od hoda za cilindre tipa **MD18**

Tolerances for mounting dimensions that are dependent on stroke for cylinders type **MD18**

Dimenzija/Dimension	ZJ ^a	ZP ^a	XO ^a	LO ^a	XV	WC	PJ ^a	Y
Hod/Stroke	Tolerance/Tolerances							
≤ 1250	± 1,5	± 1,5	± 1,5	± 1,5	± 2	± 2	± 1,5	± 2
> 1250 ≤ 3150	± 3	± 3	± 3	± 3	± 4	± 4	± 3	± 4
> 3150 ≤ 8000	± 5	± 5	± 5	± 5	± 8	± 8	± 5	± 8

^a - Dolžina vključuje hod. Tolerance hoda ne smejo biti dodane k tolerancam v tej tabeli.

^a - Length including stroke. Stroke tolerances shall not be added to the tolerances in this table.

Tolerance hoda

Tolerances on piston strokes

Hod/Stroke	Tolerance/Tolerances
≤ 1250	$\begin{matrix} +2 \\ 0 \end{matrix}$
> 1250 ≤ 3150	$\begin{matrix} +5 \\ 0 \end{matrix}$
> 3150 ≤ 8000	$\begin{matrix} +8 \\ 0 \end{matrix}$

Vse dimenzije so v milimetrih.

All dimensions are in millimetres.

Povzeto po standardu ISO 6020-1:2007 – Fluidna tehnika – Hidravlika – Vgradne mere valjev z enostransko batnico vrste 16 MPa (160 bar) - 1.del: srednja vrsta.
 Summarized ISO 6020-1:2007 Standard – Hydraulic fluid power-Mounting dimensions for single rod cylinders, 16 MPa (160 bar) series - Part 1: Medium series.

MD18 - [] - [] / [] x [] + [] - [] [] / [] []

Vrsta cilindra/Cylinder type

Oblika pritrditve/Mounting types

- MM - osnovna/basic
- MA - z zglobnim ležajem/with spherical bearing
- MB - z drsno pušo/with pivot lug
- MD - s tečajem/with pivot
- ME - s prirobnico spredaj/with flange front
- MF - s prirobnico zadaj/with flange rear
- SM ¹⁾
- SC ²⁾

Bat/Piston

Premer batnice/Piston rod

Hod/Stroke

Pritrditev spredaj/Rod end ³⁾

0 - brez/0 - without

Pozicija priključkov/Attachments position

- spredaj (glava)/Front (head)
- zadaj (dno)/Rear (bottom)

Vrsta tesnjenja/Sealing type

- P - klasično/Standard
- V - viton tesnila/Viton seals ³⁾
- G - zmanjšano trenje (servokvaliteta)/Reduced friction ("Servo-quality") ³⁾

Dodatne zahteve/Additional requirements ³⁾

S2 - obojestranska batnica pri tipih MM, MD, ME/Double sided piston rod within type MM, MD, ME ³⁾

Možne so tudi izvedbe s končnim dušenjem spredaj in/ali zadaj, vendar se ob nespremenjeni vgradnji meri zmanjša hod za dolžino dušenja.

Varieties with final front and/or rear shock-absorption are as well available. In this case cylinder stroke shall reduce (by the length of absorption function) if the basic build in dimension shall remain unaltered.

Opombe/Notes:

¹⁾ Krajša osnovna izvedba./Short basic version.

²⁾ Krajša izvedba z zglobnim ležajem./Short version with spherical bearing.

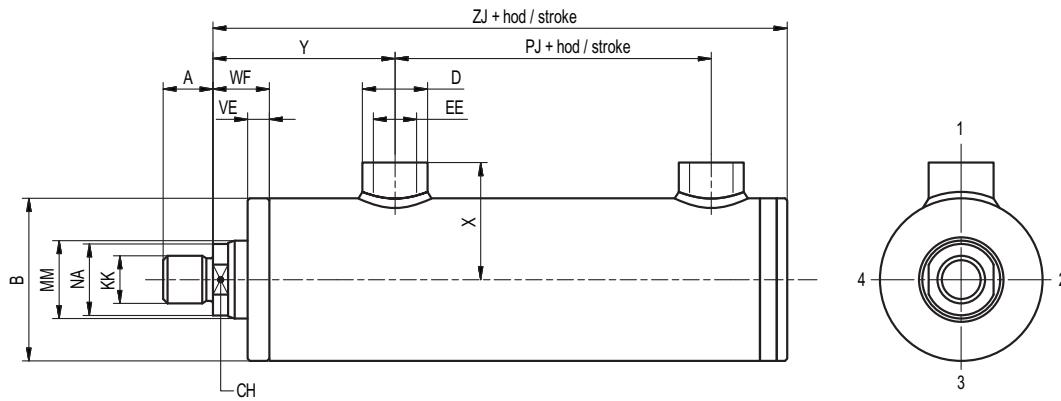
³⁾ Ne velja za obliko SM in SC./Not possible for version SM and SC.

Primer naročila/Order example

Dvostransko delujoči hidravlični cilinder vrste MD18 Double side acting hydraulic cylinder serie MD18

- | | |
|--|---|
| ■ Način pritrditve: MA - z zglobnim ležajem | ■ Fixing type: MA - with spherical bearing |
| ■ Premer bata: ϕ 63 mm | ■ Piston diameter: ϕ 63 mm |
| ■ Premer batnice: ϕ 36 mm | ■ Rod diameter: ϕ 36 mm |
| ■ Hod: 300 mm | ■ Stroke: 300 mm |
| ■ Pritrditev spredaj: MS30 U | ■ Rod end: MS30 U |
| ■ Pozicija priključkov: spredaj (glava) 1, zadaj (dno) 1 | ■ Attachments position: Front (head) 1, Rear (bottom) 1 |
| ■ Vrsta tesnjenja: P-klasično | ■ Sealing type: P-standard |

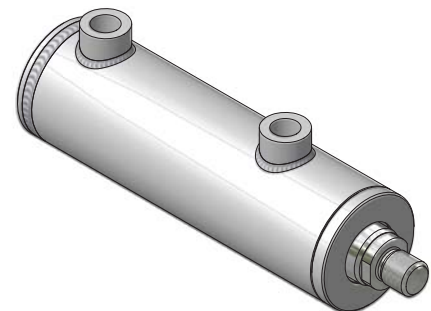
MD18 - MA - 63/36 x 300 + MS30U - 1 - 1/P

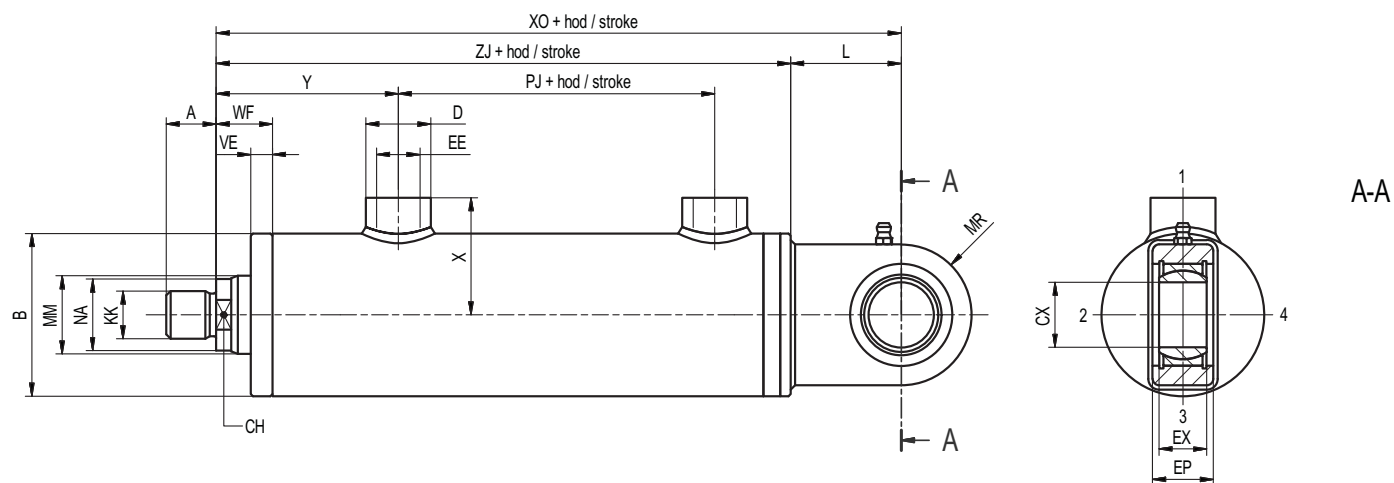


Vse dimenzije so v milimetrih./All dimensions are in millimetres.

Bat Piston Ø	MM Ø	A	B Ø	CH	X	D Ø	EE	KK	NA Ø	WF	VE	Y	PJ	ZJ
25	14	17	35	12	32	20	G 1/4	M 12×1.25	13	17	8	43	18*	78*
32	20	19	42	15	36	20	G 1/4	M 14×1.5	17	20	10	61	38*	129*
40	22/ 28	16	50	17	41	26	G 3/8	M 16×1.5	20	25	10	69	42	137
50	28/ 36	16	60	22	46	26	G 3/8	M 16×1.5	25	25	10	75	45	150
63	36/ 45	23	75	30	56	30	G 1/2	M 22×1.5	34	26	10	87	48	165
70	40/ 45	23	85	30	60	30	G 1/2	M 22×1.5	34	26	10	83	56	165
80	45/ 56	35	95	36	66	30	G 1/2	M 35×1.5	40	27	10	97	53	193
90	40/ 50	35	105	36	70	30	G 1/2	M 35×1.5	38	27	10	93	66	193
100	56/ 63/ 70	45	115	46	78	38	G 3/4	M 45×1.5	50	27	10	112	62	214
110	63/ 70	45	130	46	86	38	G 3/4	M 45×1.5	50	27	10	107	72	214
125	70/ 90	58	145	60	93	38	G 3/4	M 58×1.5	65	32	12	128	63	240
140	80/100	65	165	65	104	45	G 1	M 65×1.5	75	32	12	142	75	270
160	90/110	80	190	80	119	45	G 1	M 80×2	85	40	15	155	75	295
180	110/125	80	220	80	134	45	G 1	M 80×2	90	50	20	170	75	320
200	125/140	110	245	110	144	45	G 1	M 110×2	120	50	20	190	75	340
250	140/160	125	300	120	175	45	G 1	M 120×3	130	58	20	198	107	390

* Pri hodu do 10 mm se PJ in ZP podaljšata za 10 mm./At stroke up to 10 mm PJ and ZJ are extend for 10 mm.

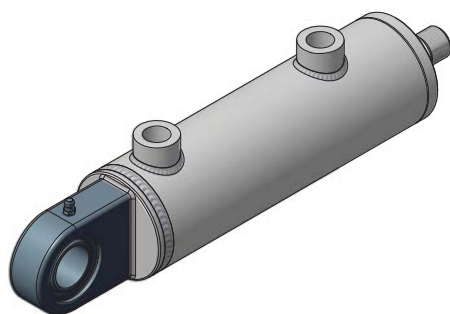




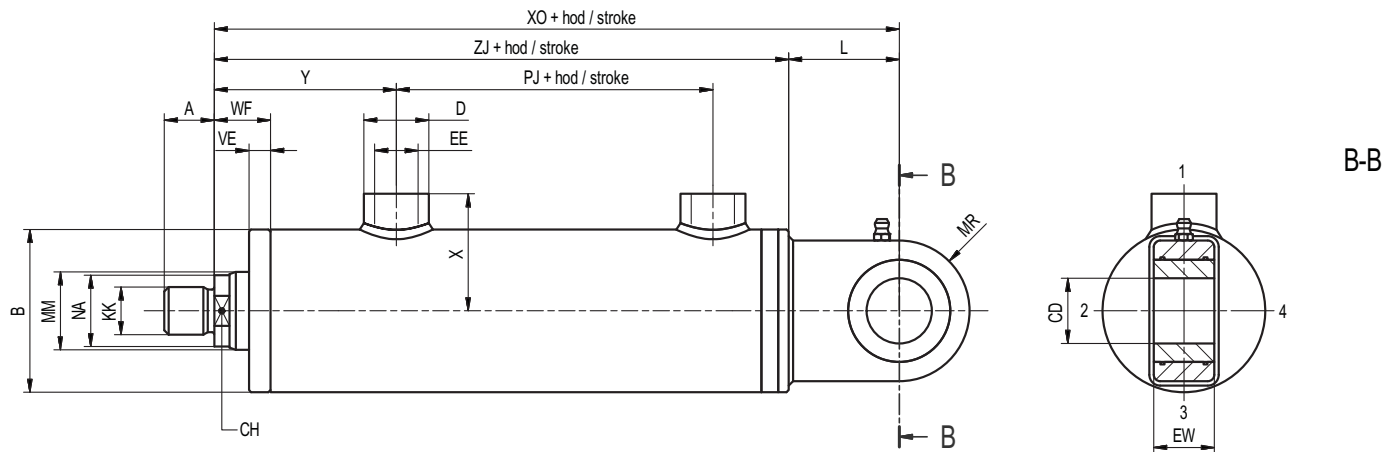
Vse dimenzije so v milimetrih./All dimensions are in millimetres.

Bat Piston Ø	MM Ø	A	B Ø	CH	X	D Ø	EE	KK	NA Ø	WF	VE	Y	PJ	ZJ
25	14	17	35	12	32	20	G 1/4	M 12×1.25	13	17	8	43	18*	78*
32	20	19	42	15	36	20	G 1/4	M 14×1.5	17	20	10	61	38*	129*
40	22/ 28	16	50	17	41	26	G 3/8	M 16×1.5	20	25	10	69	42	137
50	28/ 36	16	60	22	46	26	G 3/8	M 16×1.5	25	25	10	75	45	150
63	36/ 45	23	75	30	56	30	G 1/2	M 22×1.5	34	26	10	87	48	165
70	40/ 45	23	85	30	60	30	G 1/2	M 22×1.5	34	26	10	83	56	165
80	45/ 56	35	95	36	66	30	G 1/2	M 35×1.5	40	27	10	97	53	193
90	40/ 50	35	105	36	70	30	G 1/2	M 35×1.5	38	27	10	93	66	193
100	56/ 63/ 70	45	115	46	78	38	G 3/4	M 45×1.5	50	27	10	112	62	214
110	63/ 70	45	130	46	86	38	G 3/4	M 45×1.5	50	27	10	107	72	214
125	70/ 90	58	145	60	93	38	G 3/4	M 58×1.5	65	32	12	128	63	240
140	80/100	65	165	65	104	45	G 1	M 65×1.5	75	32	12	142	75	270
160	90/110	80	190	80	119	45	G 1	M 80×2	85	40	15	155	75	295
180	110/125	80	220	80	134	45	G 1	M 80×2	90	50	20	170	75	320
200	125/140	110	245	110	144	45	G 1	M 110×2	120	50	20	190	75	340
250	140/160	125	300	120	175	45	G 1	M 120×3	130	58	20	198	107	390

* Pri hodu do 10 mm se PJ in ZJ podaljšata za 10 mm./At stroke up to 10 mm PJ and ZJ are extend for 10 mm.



Bat Piston Ø	XO	L	CX Ø	EX	EP	MR
25	94	16	12	12	10	16
32	149	20	16	16	14	20
40	175	38	20	16	19	25
50	195	45	25	20	23	27.5
63	216	51	30	22	28	32.5
70	216	51	30	22	28	32.5
80	262	69	40	28	35	50
90	262	69	40	28	35	50
100	302	88	50	35	40	61.5
110	302	88	50	35	40	61.5
125	340	100	60	44	50	70
140	385	115	70	49	55	82
160	436	141	80	55	60	90
180	461	141	80	55	60	90
200	510	170	100	70	70	125
250	575	185	110	70	80	147.5

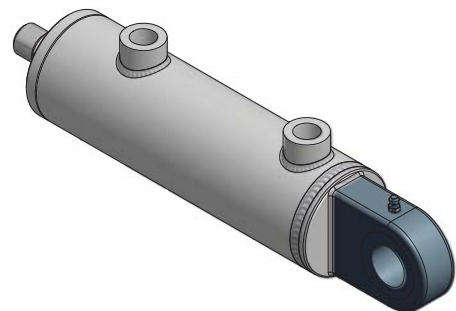


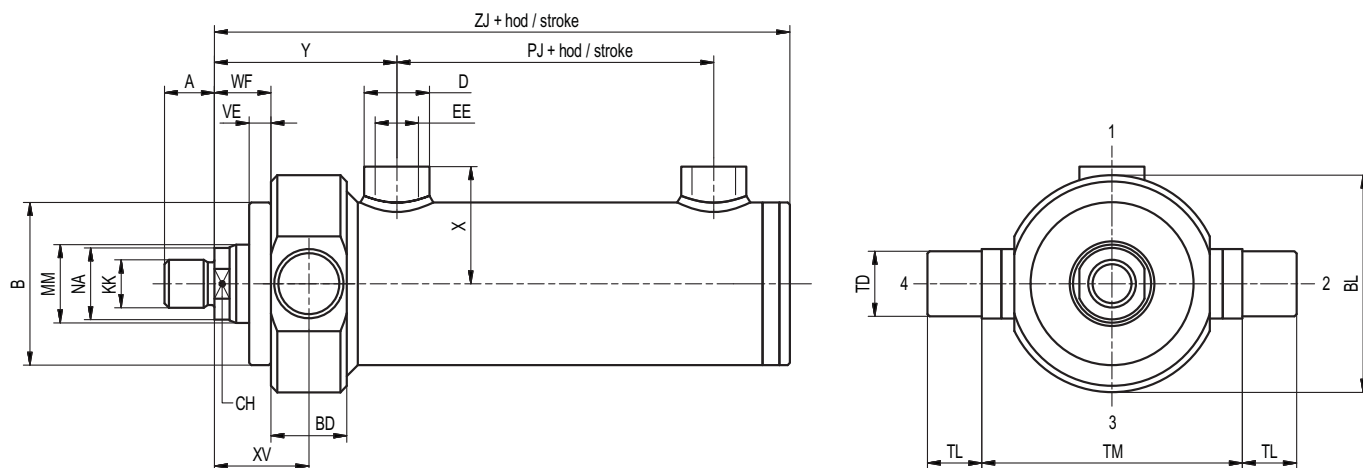
Vse dimenzije so v milimetrih./All dimensions are in millimetres.

Bat Piston Ø	MM Ø	A	B Ø	CH	X	D Ø	EE	KK	NA Ø	WF	VE	Y	PJ	ZJ
25	14	17	35	12	32	20	G 1/4	M 12×1.25	13	17	8	43	18*	78*
32	20	19	42	15	36	20	G 1/4	M 14×1.5	17	20	10	61	38*	129*
40	22/ 28	16	50	17	41	26	G 3/8	M 16×1.5	20	25	10	69	42	137
50	28/ 36	16	60	22	46	26	G 3/8	M 16×1.5	25	25	10	75	45	150
63	36/ 45	23	75	30	56	30	G 1/2	M 22×1.5	34	26	10	87	48	165
70	40/ 45	23	85	30	60	30	G 1/2	M 22×1.5	34	26	10	83	56	165
80	45/ 56	35	95	36	66	30	G 1/2	M 35×1.5	40	27	10	97	53	193
90	40/ 50	35	105	36	70	30	G 1/2	M 35×1.5	38	27	10	93	66	193
100	56/ 63/ 70	45	115	46	78	38	G 3/4	M 45×1.5	50	27	10	112	62	214
110	63/ 70	45	130	46	86	38	G 3/4	M 45×1.5	50	27	10	107	72	214
125	70/ 90	58	145	60	93	38	G 3/4	M 58×1.5	65	32	12	128	63	240
140	80/100	65	165	65	104	45	G 1	M 65×1.5	75	32	12	142	75	270
160	90/110	80	190	80	119	45	G 1	M 80×2	85	40	15	155	75	295
180	110/125	80	220	80	134	45	G 1	M 80×2	90	50	20	170	75	320
200	125/140	110	245	110	144	45	G 1	M 110×2	120	50	20	190	75	340
250	140/160	125	300	120	175	45	G 1	M 120×3	130	58	20	198	107	390

* Pri hodu do 10 mm se PJ in ZP podaljšata za 10 mm./At stroke up to 10 mm PJ and ZJ are extend for 10 mm.

Bat Piston Ø	XO	L	CD Ø	EW	MR
25	94	16	12	12	16
32	149	20	16	16	20
40	175	38	20	20	25
50	195	45	25	25	27.5
63	216	51	30	30	32.5
70	216	51	30	30	32.5
80	262	69	40	40	50
90	262	69	40	40	50
100	302	88	50	50	61.5
110	302	88	50	50	61.5
125	340	100	60	60	70
140	385	115	70	70	82
160	436	141	80	80	90
180	461	141	80	80	90
200	510	170	100	100	125
250	575	185	110	110	147.5

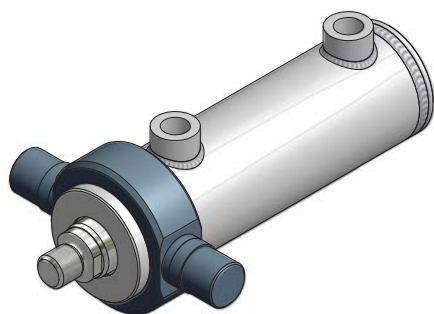




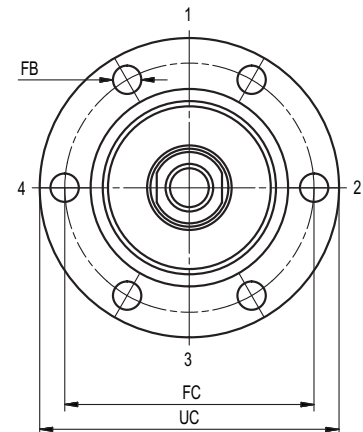
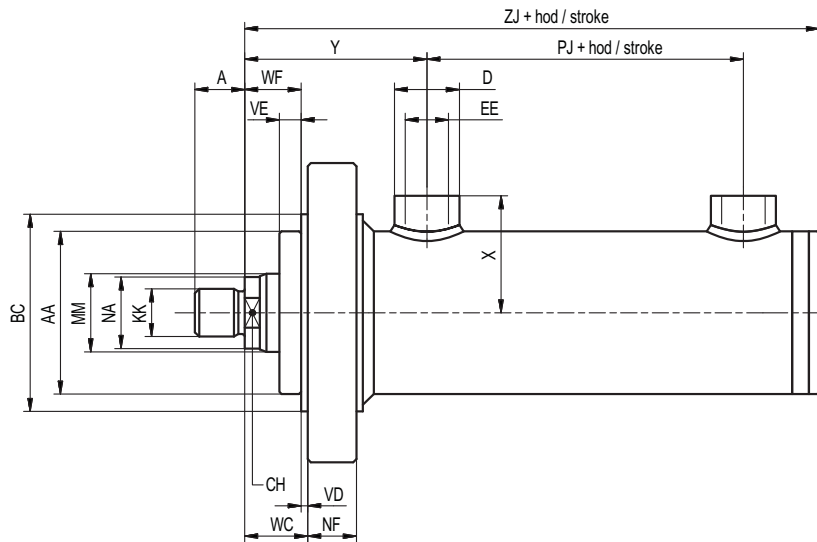
Vse dimenzije so v milimetrih./All dimensions are in millimetres.

Bat Piston Ø	MM Ø	A	B Ø	CH	X	D Ø	EE	KK	NA Ø	WF	VE	Y	PJ	ZJ
25	14	17	35	12	32	20	G 1/4	M 12×1.25	13	17	8	43	18*	78*
32	20	19	42	15	36	20	G 1/4	M 14×1.5	17	20	10	61	38*	129*
40	22/ 28	16	50	17	41	26	G 3/8	M 16×1.5	20	25	10	69	42	137
50	28/ 36	16	60	22	46	26	G 3/8	M 16×1.5	25	25	10	75	45	150
63	36/ 45	23	75	30	56	30	G 1/2	M 22×1.5	34	26	10	87	48	165
70	40/ 45	23	85	30	60	30	G 1/2	M 22×1.5	34	26	10	83	56	165
80	45/ 56	35	95	36	66	30	G 1/2	M 35×1.5	40	27	10	97	53	193
90	40/ 50	35	105	36	70	30	G 1/2	M 35×1.5	38	27	10	93	66	193
100	56/ 63/ 70	45	115	46	78	38	G 3/4	M 45×1.5	50	27	10	112	62	214
110	63/ 70	45	130	46	86	38	G 3/4	M 45×1.5	50	27	10	107	72	214
125	70/ 90	58	145	60	93	38	G 3/4	M 58×1.5	65	32	12	128	63	240
140	80/100	65	165	65	104	45	G 1	M 65×1.5	75	32	12	142	75	270
160	90/110	80	190	80	119	45	G 1	M 80×2	85	40	15	155	75	295
180	110/125	80	220	80	134	45	G 1	M 80×2	90	50	20	170	75	320
200	125/140	110	245	110	144	45	G 1	M 110×2	120	50	20	190	75	340
250	140/160	125	300	120	175	45	G 1	M 120×3	130	58	20	198	107	390

* Pri hodu do 10 mm se PJ in ZJ podaljšata za 10 mm./At stroke up to 10 mm PJ and ZJ are extend for 10 mm.



Bat Piston Ø	XV	BD	TD Ø f8	TM	TL	BL
25	25	16	12	50	14	45
32	30	20	17	68	17	60
40	37.5	25	20	90	16	70
50	40	30	25	105	20	80
63	43.5	35	30	120	25	100
70	43.5	35	30	120	25	110
80	49.5	45	40	135	32	125
90	49.5	45	40	135	32	135
100	54.5	55	50	160	40	150
110	54.5	55	50	160	40	150
125	64.5	65	60	195	50	180
140	67	70	65	220	60	200
160	82.5	85	80	240	60	235
180	82.5	85	80	270	60	265
200	102.5	105	100	295	80	295
250	123	130	125	365	100	360

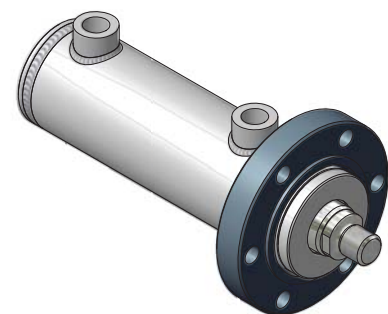


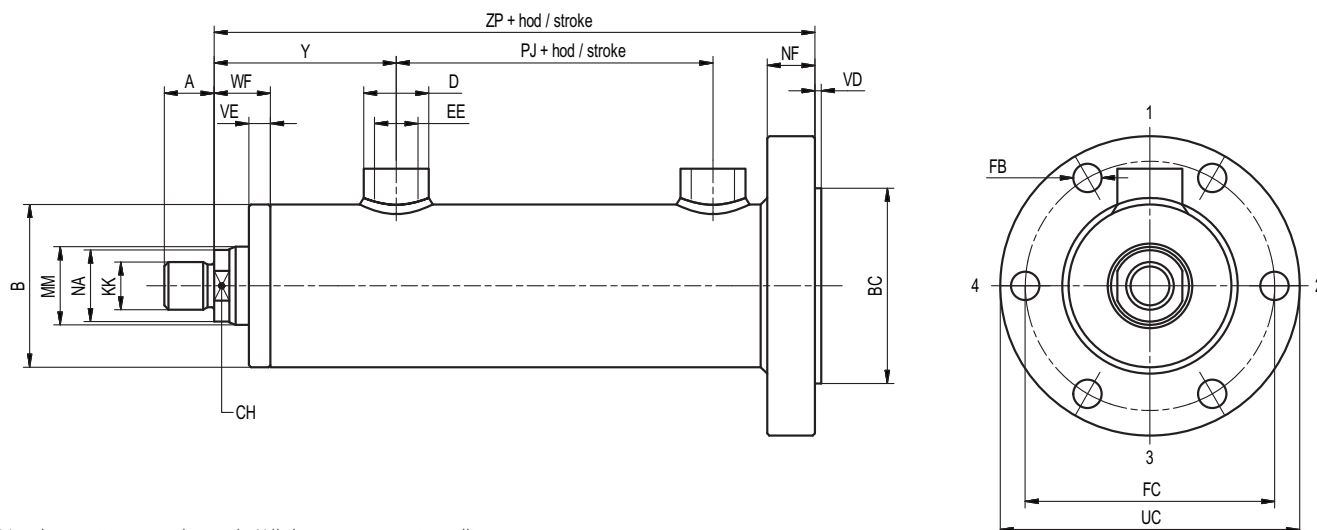
Vse dimenzije so v milimetrih./All dimensions are in millimetres.

Bat Piston Ø	MM Ø	A	B Ø	CH	X	D Ø	EE	KK	NA Ø	WF	VE	Y	PJ	ZJ
25	14	17	35	12	32	20	G 1/4	M 12×1.25	13	17	8	43	18*	78*
32	20	19	42	15	36	20	G 1/4	M 14×1.5	17	20	10	61	38*	129*
40	22/ 28	16	50	17	41	26	G 3/8	M 16×1.5	20	25	10	69	42	137
50	28/ 36	16	60	22	46	26	G 3/8	M 16×1.5	25	25	10	75	45	150
63	36/ 45	23	75	30	56	30	G 1/2	M 22×1.5	34	26	10	87	48	165
70	40/ 45	23	85	30	60	30	G 1/2	M 22×1.5	34	26	10	83	56	165
80	45/ 56	35	95	36	66	30	G 1/2	M 35×1.5	40	27	10	97	53	193
90	40/ 50	35	105	36	70	30	G 1/2	M 35×1.5	38	27	10	93	66	193
100	56/ 63/ 70	45	115	46	78	38	G 3/4	M 45×1.5	50	27	10	112	62	214
110	63/ 70	45	130	46	86	38	G 3/4	M 45×1.5	50	27	10	107	72	214
125	70/ 90	58	145	60	93	38	G 3/4	M 58×1.5	65	32	12	128	63	240
140	80/100	65	165	65	104	45	G 1	M 65×1.5	75	32	12	142	75	270
160	90/110	80	190	80	119	45	G 1	M 80×2	85	40	15	155	75	295
180	110/125	80	220	80	134	45	G 1	M 80×2	90	50	20	170	75	320
200	125/140	110	245	110	144	45	G 1	M 110×2	120	50	20	190	75	340
250	140/160	125	300	120	175	45	G 1	M 120×3	130	58	20	198	107	390

* Pri hodu do 10 mm se PJ in ZP podaljšata za 10 mm./At stroke up to 10 mm PJ and ZJ are extend for 10 mm.

Bat Piston Ø	WC	VD	NF	BC Ø e8	FC	UC	FB	AA
25	20	3	8	45	65	85	9	35
32	23	3	10	55	75	95	9	42
40	28	3	14	65	85	104	11	50
50	28	3	17	75	95	118	11	60
63	29	3	22	90	115	138	13	75
70	29	3	25	100	125	158	13	85
80	30	3	27	115	145	178	17	95
90	30	3	27	125	155	188	17	105
100	30	3	32	140	170	205	17	115
110	30	3	32	160	190	225	17	130
125	35	3	35	165	205	245	21	145
140	35	3	35	200	250	300	26	165
160	43	3	40	225	275	335	30	190
180	53	3	50	255	310	380	30	200
200	53	3	50	285	345	410	33	230
250	61	3	60	345	405	470	33	280

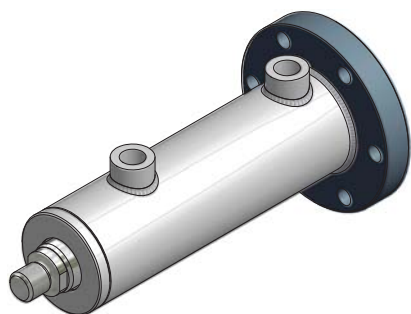




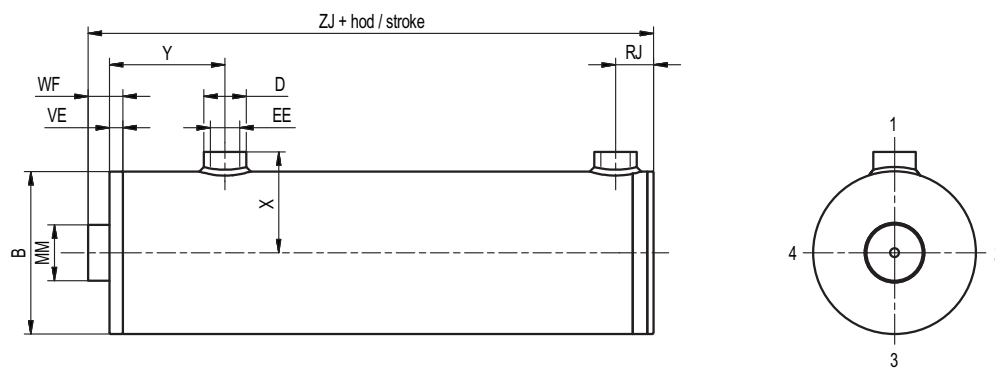
Vse dimenzije so v milimetrih./All dimensions are in millimetres.

Bat Piston Ø	MM Ø	A	B Ø	CH	X	D Ø	EE	KK	NA Ø	WF	VE	Y	PJ
25	14	17	35	12	32	20	G 1/4	M 12×1.25	13	17	8	43	18*
32	20	19	42	15	36	20	G 1/4	M 14×1.5	17	20	10	61	38*
40	22/ 28	16	50	17	41	26	G 3/8	M 16×1.5	20	25	10	69	42
50	28/ 36	16	60	22	46	26	G 3/8	M 16×1.5	25	25	10	75	45
63	36/ 45	23	75	30	56	30	G 1/2	M 22×1.5	34	26	10	87	48
70	40/ 45	23	85	30	60	30	G 1/2	M 22×1.5	34	26	10	83	56
80	45/ 56	35	95	36	66	30	G 1/2	M 35×1.5	40	27	10	97	53
90	40/ 50	35	105	36	70	30	G 1/2	M 35×1.5	38	27	10	93	66
100	56/ 63/ 70	45	115	46	78	38	G 3/4	M 45×1.5	50	27	10	112	62
110	63/ 70	45	130	46	86	38	G 3/4	M 45×1.5	50	27	10	107	72
125	70/ 90	58	145	60	93	38	G 3/4	M 58×1.5	65	32	12	128	63
140	80/100	65	165	65	104	45	G 1	M 65×1.5	75	32	12	142	75
160	90/110	80	190	80	119	45	G 1	M 80×2	85	40	15	155	75
180	110/125	80	220	80	134	45	G 1	M 80×2	90	50	20	170	75
200	125/140	110	245	110	144	45	G 1	M 110×2	120	50	20	190	75
250	140/160	125	300	120	175	45	G 1	M 120×3	130	58	20	198	107

* Pri hodu do 10 mm se PJ in ZP podaljšata za 10 mm./At stroke up to 10 mm PJ and ZP are extend for 10 mm.



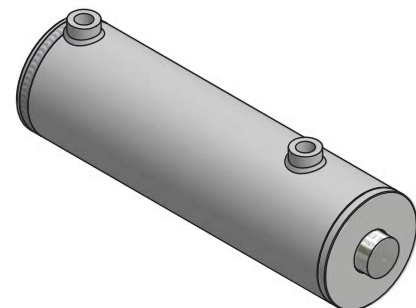
Bat Piston Ø	ZP	VD	NF	BC Ø e8	FC	UC	FB
25	98*	3	8	45	65	85	9
32	129*	3	10	55	75	95	9
40	142	3	14	65	85	104	11
50	158	3	17	75	95	118	11
63	177	3	22	90	115	138	13
70	180	3	25	100	125	158	13
80	208	3	27	115	145	178	17
90	208	3	27	125	155	188	17
100	231	3	32	140	170	205	17
110	231	3	32	160	190	225	17
125	255	3	35	165	205	245	21
140	285	3	35	200	250	300	26
160	310	3	40	225	275	335	30
180	335	3	50	255	310	380	30
200	360	3	50	285	345	410	33
250	405	3	60	345	405	470	33

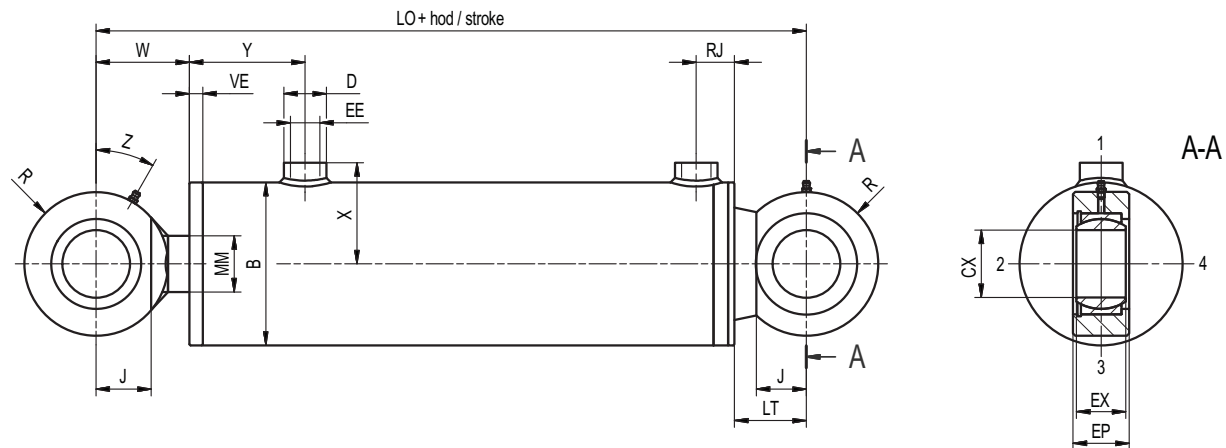


Vse dimenzije so v milimetrih./All dimensions are in millimetres.

Bat Piston Ø	MM Ø	B	X	D	EE	WF	VE	Y	RJ	ZJ
25	14	35	32	20	G 1/4	14	8	34	13	75*
40	20/25	50	41	26	G 3/8	26	10	47	16	125
50	25/32	60	46	26	G 3/8	28	10	47	15	126
63	32/40	75	56	30	G 1/2	21	10	55	17	129
80	40/45	95	66	30	G 1/2	25	10	62	22	150
100	50/63	115	78	38	G 3/4	44	10	67	22	174
125	70	145	93	38	G 3/4	38	12	80	30	190

* Pri hodu do 10 mm se ZJ podaljša za 10 mm./At stroke up to 10 mm ZJ is extend for 10 mm.



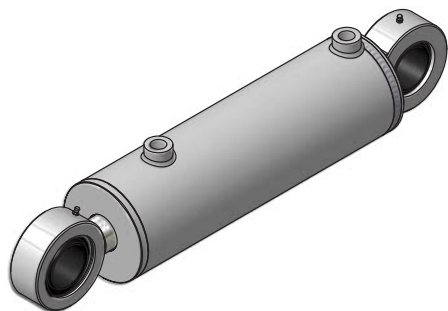


Vse dimenzije so v milimetrih./All dimensions are in millimetres.

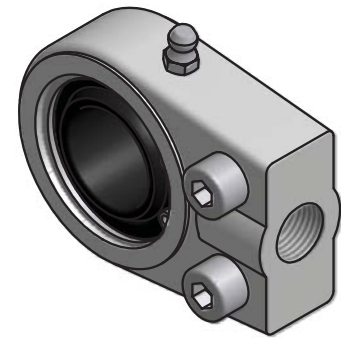
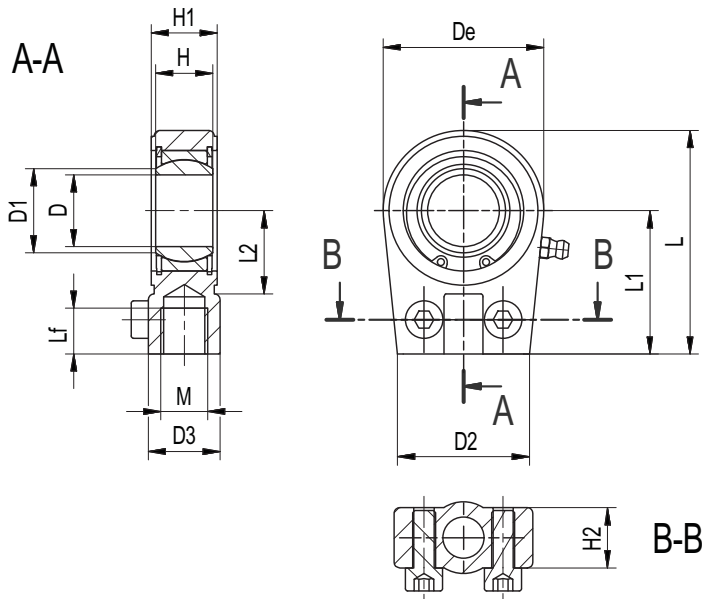
Bat Piston Ø	MM Ø	B	X	D	EE	WF	VE	Y	RJ
25	14	35	32	20	G 1/4	14	8	34	13
40	20/25	50	41	26	G 3/8	26	10	47	16
50	25/32	60	46	26	G 3/8	28	10	47	15
63	32/40	75	56	30	G 1/2	21	10	55	17
80	40/45	95	66	30	G 1/2	25	10	62	22
100	50/63	115	78	38	G 3/4	44	10	67	22
125	70	145	93	38	G 3/4	38	12	80	30

* Pri hodu do 10 mm se LO podaljša za 10 mm./At stroke up to 10 mm LO is extend for 10 mm.

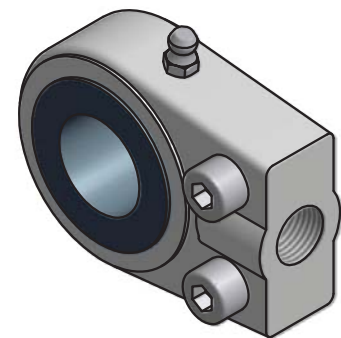
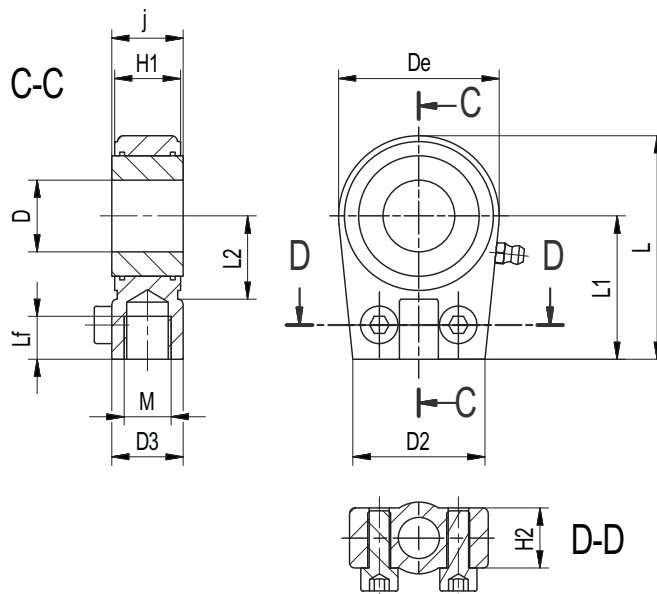
Bat Piston Ø	R	J	W	LT	Z	CX Ø	EX	EP	LO
25	16	11	22	16	0	10	9	12	107*
40	27.5	20	44	27.5	0	20	16	20	180
50	32	25	50	32	30	25	20	25	190
63	38	30	49	38	30	30	22	28	205
80	45	35	60	45	30	35	25	30	240
100	53	42	87	53	0	45	32	35	280
125	70	57	96	70	0	60	44	50	330



MS_U

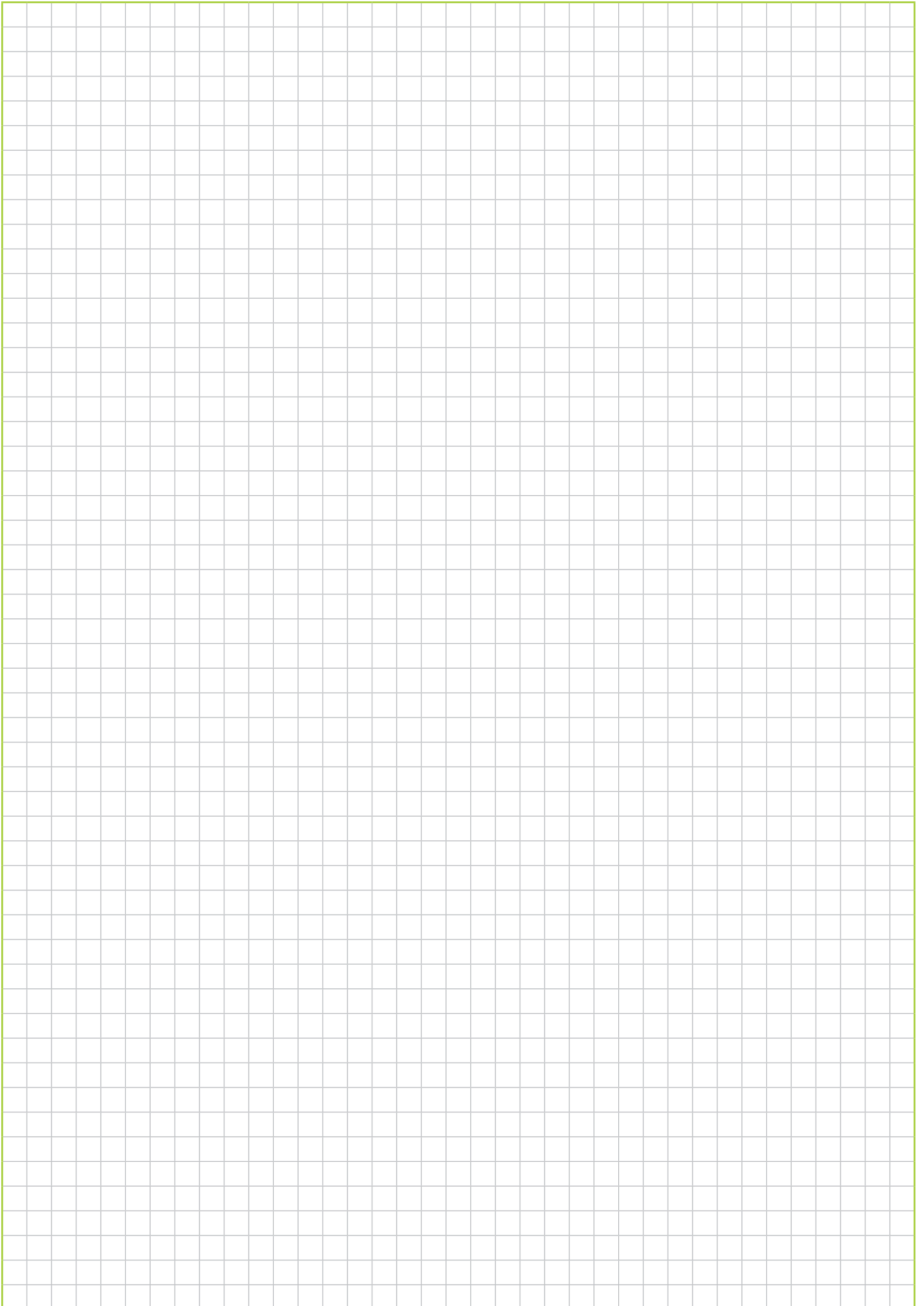


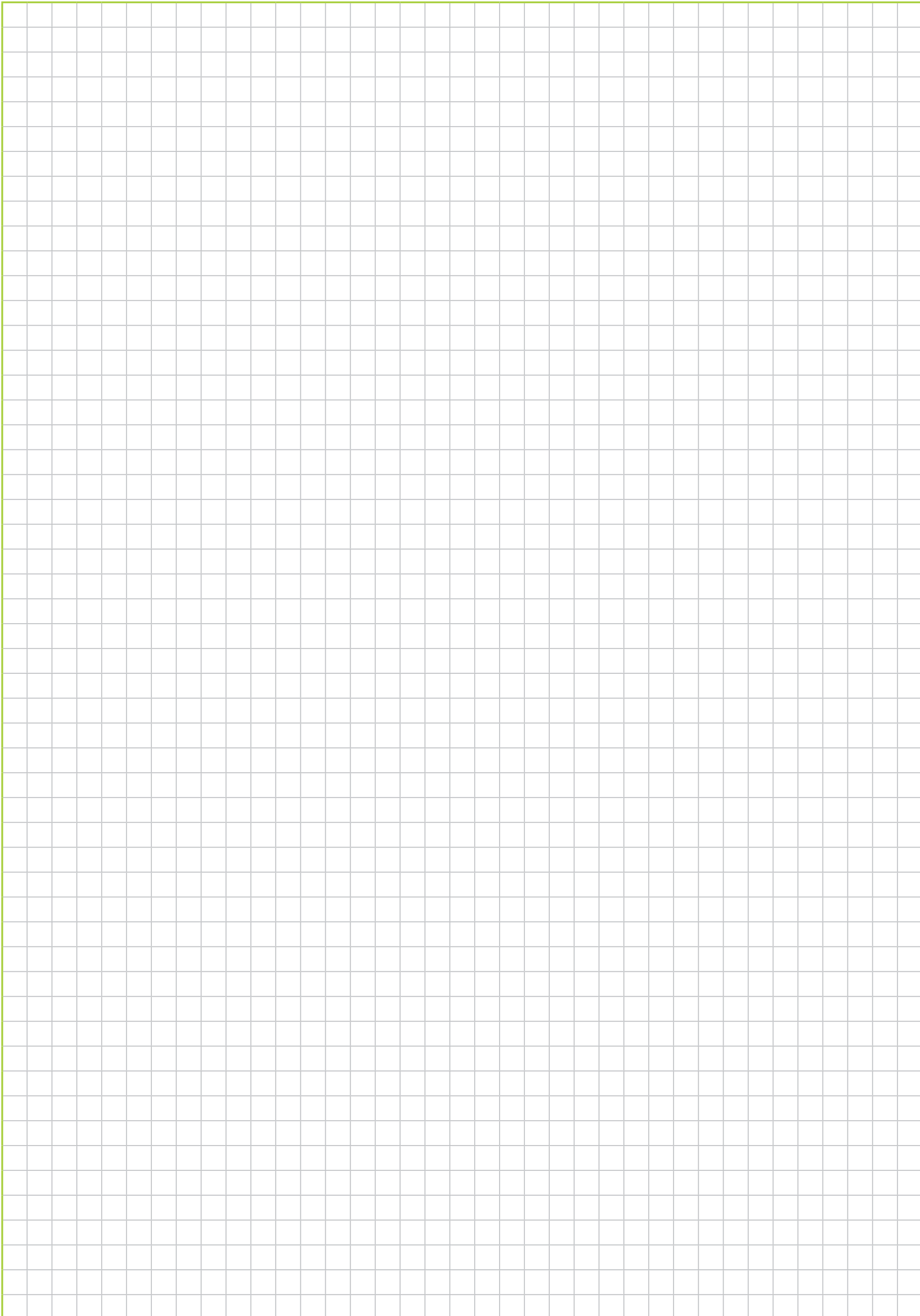
MS_P

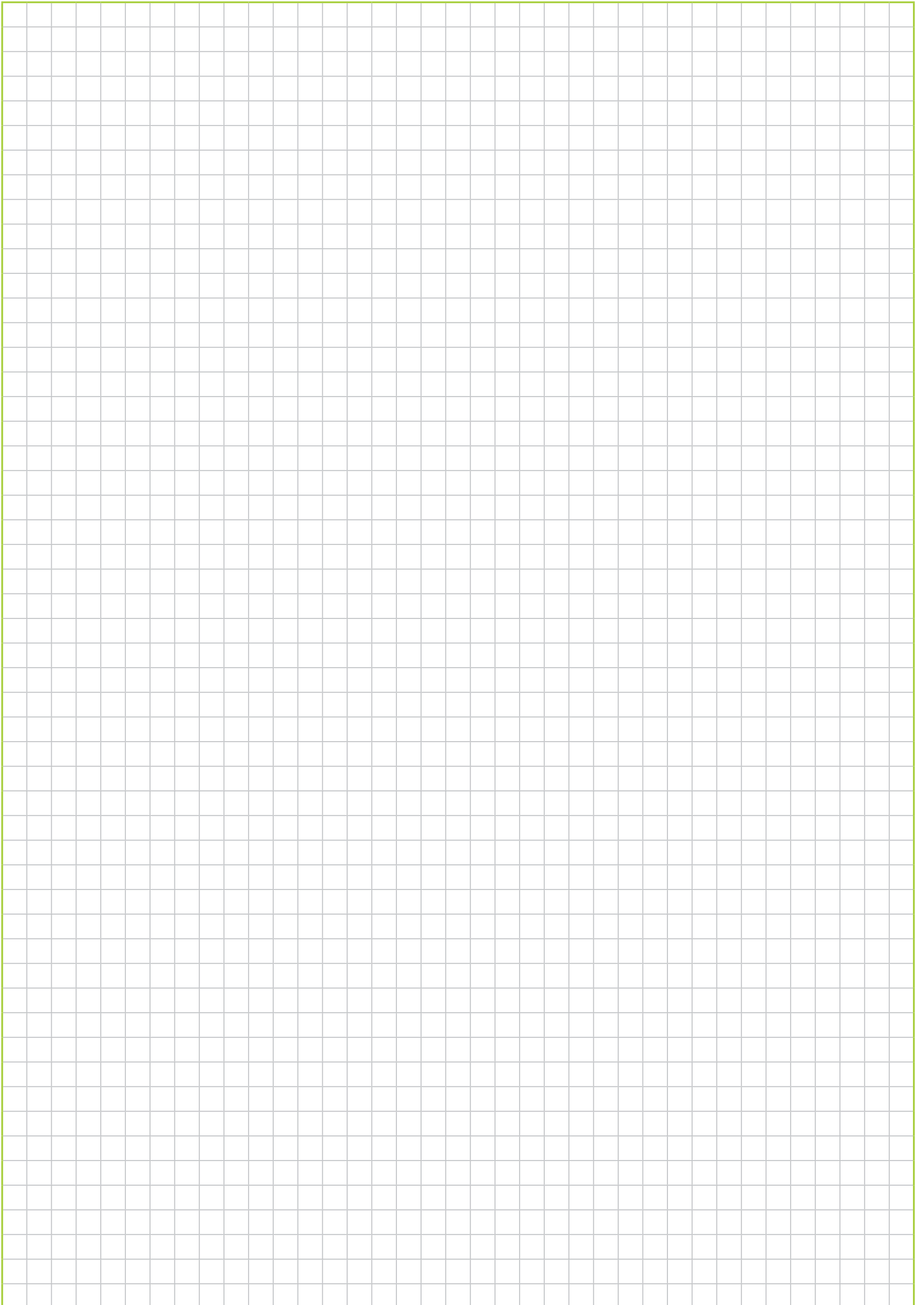


Vse dimenzije so v milimetrih./All dimensions are in millimetres.

Oznaka Types	Bat Piston Ø	M	D Ø	L	L2	Lf	L1	De	D2	D3	H1	H2	j	H	D1 Ø
MS 12U-LO MS 12P	25	M 12x1.25	12	54	14	17	38	32	32	16,5	10,6	15	12	12	15,5
MS 16U-LO MS 16P	32	M 14x1.5	16	64	20	19	44	40	40	21	13	15	16	16	20
MS 20U MS 20P	40	M 16x1.5	20	80	25	17	50	56	46	25	19	17	20	16	24,1
MS 25U MS 25P	50	M 16x1.5	25	80	28	17	50	56	46	25	23	21	25	20	29,3
MS 30U MS 30P	63/ 70	M 22x1.5	30	94	30	23	60	64	50	32	28	26	30	22	34,2
MS 40U MS 40P	80/ 90	M 35x1.5	40	135	45	36	85	94	76	49	35	33	40	28	45
MS 50U MS 50P	100/110	M 45x1.5	50	168	55	46	105	116	90	61	40	37	50	35	56
MS 60U MS 60P	125	M 58x1.5	60	200	65	59	130	130	120	75	50	46	60	44	66,8
MS 70U MS 70P	140	M 65x1.5	70	232	75	66	150	155	130	86	55	51	70	49	77,8
MS 80U MS 80P	160/180	M 80x2	80	265	80	81	170	177	160	102	60	55	80	55	89,4
MS 100U MS 100P	200	M110x2	100	360	105	111	235	230	200	138	70	65	100	70	109,5
MS 110U MS 110P	250	M120x3	110	407.5	115	125	265	265	220	152	80	75	110	70	121,2







Vgradnja

1. Skladiščenje pred vgradnjo

Hidravlični cilindri naj bodo skladiščeni v pokritem, suhem prostoru brez industrijskih par ali kislih snovi in pri konstantni temperaturi, ki ni manjša od 5° C.

Kadar je skladiščna doba daljša od 6 mesecev, je potrebno hidravlični cilinder priklopiti na hidravlični sistem in ga vsakih 6 mesecev vsaj 5-krat premakniti iz začetnega v končni položaj.

2. Priprava za vgradnjo

Priključne cevi in ostale priključne elemente je potrebno pred priključitvijo na hidravlični cilinder znotraj očistiti in izprati.

Glede na velikost cilindra in način pritrditve v sistem je potrebno zagotoviti zadostno oporo in ustrezne pritrdilne elemente.

Vse notranje dele hidravličnega cilindra je potrebno ohranjati čiste, zato naj se zaščitne čepe odstrani šele pred priklopom cevovodov.

3. Vgradnja v sistem

Položaj vgradnje hidravličnega cilindra je poljuben, omogoča naj le ustrezen dostop za kasnejše vzdrževanje.

Hidravlični cilinder je lahko le delovni element, ki je vgrajen tako, da na batnico in ohišje (cevi) v mirovanju ne deluje nobena zunanja obremenitev. Pri obratovanju pa sme obremenitev delovati le v aksialni smeri, saj lahko radialne in tangencialne obremenitve povzročijo uničenje vodilnih elementov, tekalnih površin, tesnil in ostalih delov cilindra.

Cevovodi naj bodo kratki in speljani čim bolj ravno brez nepotrebnih kotnih priključkov in krivin, ki povzročajo padec tlaka.

Priklop cevovodov naj opravi usposobljen strokovnjak s področja hidravlike.

Pri dvostransko delujočih hidravličnih cilindrih mora biti omogočen prosti povratni tok hidravličnega medija iz hidravličnega cilindra nazaj v sistem.

Uporaba

1. Zagon

Pred zagonom hidravličnega sistema v maksimalnih delovnih pogojih je potrebno vse dele sistema dobro izprati. Za ta namen je potrebno priključke hidravličnega cilindra premostiti s fleksibilnimi cevimi zvezami. Po pranju je potrebno elemente filtriranja skrbno očistiti ali po potrebi zamenjati z novimi. Hidravlični cilinder je potrebno z odzračevalnimi vijaki ali z odvijanjem priključkov temeljito odzračiti.

Ko olje v sistemu doseže svojo delovno temperaturo, je potrebno preveriti, če vsi spoji in priključki popolnoma tesnijo. Po potrebi naj se še dodatno privijejo.

2. Obratovanje

Pri dvostransko delujočih cilindrih tlak na strani batnice (glava) ne sme preseči delovnega tlaka. Zaradi razmerja med površino bata in batnice je na strani bata (dno) dovoljeno obratovati le takrat, ko ni nevarnosti pojava zastojnih tlakov v hidravličnem cilindru.

3. Neustrezni delovni pogoji

Delovni medij mora ustrezati predpisanim zahtevam.

Delovni tlak in temperatura ne smeta presegati predpisanih vrednosti.

Vzdrževanje

Vsi hidravlični deli so mazani z delovnim medijem, zato posebno vzdrževanje ni potrebno.

V rednih časovnih intervalih je potrebno preverjati puščanje medija. V primeru večje netesnosti je potrebno zamenjati tesnila ali pa vrniti hidravlični cilinder v naše podjetje na kontrolo in menjavo tesnil.

V rednih časovnih intervalih je potrebno opraviti mazanje ležajev in puš.

Pri naročilu nadomestnih delov je potrebno definirati tip hidravličnega cilindra.

Vgradnjo hidravličnih cilindrov, zagon in kasnejše vzdrževanje naj opravljajo ustrezno kvalificirane osebe. Upoštevati je potrebno dana navodila in vzdrževati čistočo sistema, da bo doseženo brezhibno delovanje in dolga življenjska doba.

Mounting

1. Storage prior to mounting

Hydraulic cylinders need to be stored in covered dry premises with no industrial vapours or acid substances, at a constant minimum ambient temperature of 5° C.

Should the storage period exceed 6 months, hydraulic cylinder need to be connected to hydraulic circuit, 5 complete cycles from initial to maximum extended position need to be performed every 6 months.

2. Preparing cylinder for mounting

Before connecting to hydraulic cylinder connection hoses and other connection elements shall be cleaned and washed from inside.

With regard to cylinder dimensions and modality of fixation into the circuit sufficient support and adequate fixing elements need to be assured.

As all internal parts of hydraulic cylinder need to be kept clean, it is recommended to remove protective caps just before connection of piping.

3. Assembling into the system

Mounting position of hydraulic cylinder is arbitrary according to user's requirements, but it shall allow adequate access to maintenance personnel.

Hydraulic cylinder as a working appliance shall be installed in a manner to prevent any external charge acting onto piston rod and cylinder barrel (body) while not in function. During operation load may act exclusively in axial direction, as radial and tangential charges might lead to damage of rod gland, rolling surfaces, seals, bearings and other parts of the cylinder.

Piping should be as short and as straight as possible without needless angle junctions and curves, as they might result in pressure decrease.

Piping connection shall be performed only by qualified hydraulics technician.

In double-acting hydraulic cylinders return hydraulic oil flow from the cylinder back into the circuit shall be enabled.

Use

1. Activation

All parts of hydraulic system need to be well washed prior to activation of the system in maximum working conditions. Connectors to hydraulic cylinder shall be surmounted by flexible piping for this purpose. Once washed, filtering elements need to be thoroughly cleaned or replaced if required.

Hydraulic cylinder needs to be thoroughly vented by the use of air vent screws or simply unscrewing the connectors.

Once hydraulic oil inside the circuit attains its working temperature it is necessary to check seals to prevent oil from leaking. If necessary they should be screwed additionally.

2. Operation

In double-acting cylinders piston rod side (head) pressure should not exceed working pressure. Due to surface area ratio between piston and piston rod, operation on piston (bottom) side is allowed only when there is no risk of standstill pressure inside the hydraulic cylinder.

3. Poor operation conditions

Hydraulic fluid needs to meet all prerequisite requirements.

Working pressure and temperature may not exceed prescribed values.

Maintenance

As greasing of all hydraulic components is assured by hydraulic fluid, particular maintenance is not required.

Eventual oil leakage shall be checked in regular maintenance intervals. In case when major leakage is observed, seals should be replaced or have cylinder controlled and seals replaced by manufacturer.

Greasing of bearings and ear style bearings shall be performed in regular maintenance intervals.

When ordering spare parts please refer to your type of hydraulic cylinder.

Mounting, activation and maintenance of hydraulic cylinders shall be performed exclusively by qualified personnel. Instructions need to be thoroughly observed and hydraulic system kept clean to assure impeccable operation and longer operational life.



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