

ZH2RT

## Linear hydraulic motors of the ZH2RT series

### TECHNICAL DESCRIPTION – PRODUCT FUNCTION

The ZH2RT linear hydraulic motor is the element that converts the pressure energy to the mechanical energy – to the axial power of the piston rod in both directions. They have – by their construction – no special demands for service and maintenance. It is necessary to obey the service and technical conditions for perfect and secure functionality.

The ZH2RT is a hydraulic motor with regulated dumping (decrease of the piston rod run) at end positions.

It is composed of the tube with precision worked inner diameter within the H8 allowance. On the tube there are welded the connection necks for inlet of the pressure oil with internal thread and the plug together with solid cylinder eye.

Both the cylinder eye and piston rod eye are equipped with the knuckle bearing as standard. The lid for piston rod guidance with the sealing elements is screwed into the tube of cylinder cover. On the grinded – polished and chromed piston rod with the dimension tolerance f7 there is the connection eye welded from one side and the second end is equipped with the piston.

### OPERATING CONDITIONS

The linear hydraulic motors of this kind do not require any special demands for service and maintenance.

- the mounting of LHM must be done under conditions preventing the damage of function parts and which secure the protection of inner space against penetration of impurities
- properly provide the connection of LHM to the pressure source (danger of oil pressure decrease) and the mounting of LHM into the kinematic system of the given machine/device
- the work position of LHM is optional if not otherwise specified
- radial load of the piston rod by external force (or its radial force, caused by the LHM camber of own weight) or its rotations during working time are not allowed
- take care during the work to prevent the mechanical damages of the piston rod
- the hydraulic motor must not be loaded in the end positions by external force or by power of steady mass corresponding to 1,25 multiple of rated pressure
- when mounted into the machine's mechanical parts (or into some device) the possibility of swiveling of hydraulic cylinder body must be secured in transverse direction in the area of allowed swiveling of knuckle bearing
- LHM must not be exposed to any aggressive agents, aggressiveness of which would exceed the guaranteed resistance value for the motor piston rod used. The resistance value is specified in technical conditions.

### TECHNICAL CONDITIONS

Work liquid	- hydraulic mineral oil (OH-HM 32, OH-HM 46, OH-HM 64)
Required filtration	- min. 40 µm, we recommend 25 µm
Temperature scope	- liquid -20°C ÷ +80°C - ambient -20°C ÷ +70°C
Climatic stability	- temperate climate WT
Rated pressure	- 20 MPa
Maximum pressure	- 25 MPa
Test pressure	- 32 MPa
Work speed	- maximum 0,5 m·s <sup>-1</sup>
The piston rod resistance value in the salt chamber pursuant to ISO 4540	- 120 hours

### MARKING

Each hydraulic motor manufactured in our factory is marked with following data:

**HYDRAULICS SEHRADICE**  
**ZH2RT D/d x Z R / K /**  
**MAX.OPERATING PRESSURE**  
**SERIAL NUMBER**

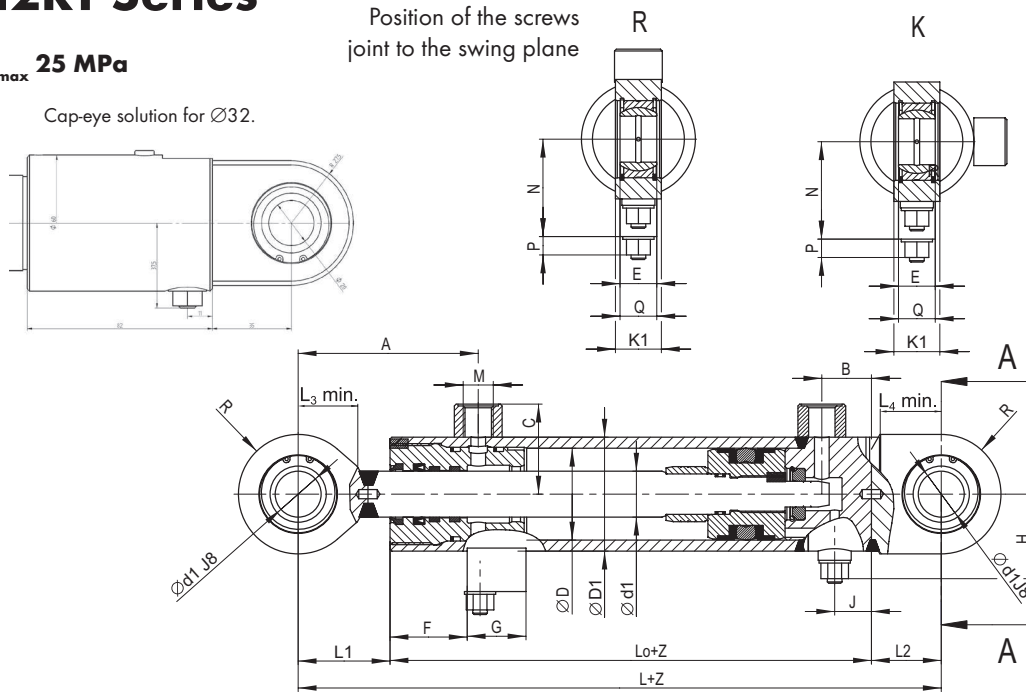
Part of the item delivery is the accompanying documentation containing

**ITEM SAFEGUARD and**  
**QUALITY CERTIFICATE** /document details see page no. 97-98/.

## ZH2RT Series

for  $P_{max}$  25 MPa

Cap-eye solution for  $\varnothing 32$ .



ØD	Ød	ØD <sub>1</sub>	Ød <sub>1</sub>	L	L <sub>0</sub>	L <sub>1</sub>	L <sub>2</sub>	L <sub>3</sub> ± 1	L <sub>4</sub> ± 1	M	A	B	C	E	K <sub>1</sub>	R	F	G	H	J	N	P	Q	Maximum recom. lift acc. to selected Ød	Weight under given lift Z
32	18	42	20	205	125	45	35	30	30	12x1,5	42	10	39	16	20	27,5	33	32	38	11	43	10	20	160	2,15 + Z x 0,00656
32	20	42	20	205	125	45	35	30	30	12x1,5	42	10	39	16	20	27,5	33	32	38	11	43	10	20	220	2,15 + Z x 0,00703
40	22	50	20	215	135	45	35	30	30	16x1,5	42	15	43	16	20	27,5	33	32	41,5	13	47	10	20	200	2,85 + Z x 0,00853
40	25	50	20	215	135	45	35	30	30	16x1,5	42	15	43	16	20	27,5	33	32	41,5	13	47	10	20	290	3,05 + Z x 0,00940
45	25	55	25	225	137	50	38	33	33	16x1,5	45	16	45,5	20	25	32,5	38	32	42,5	17	49,5	10	20	240	3,30 + Z x 0,01000
45	28	55	25	225	137	50	38	33	33	16x1,5	45	16	45,5	20	25	32,5	38	32	42,5	17	49,5	10	20	340	3,46 + Z x 0,01100
50	25	62	25	250	162	50	38	33	33	16x1,5	48	16	49	20	25	32,5	42	32	45	20	53	10	20	200	4,75 + Z x 0,01214
50	28	62	25	250	162	50	38	33	33	16x1,5	48	16	49	20	25	32,5	42	32	45	20	53	10	20	280	4,85 + Z x 0,01312
55	28	70	25	260	161	57	42	37	36	16x1,5	50	17	53	20	25	35	38,5	38	48	18	60	11	23	240	4,62 + Z x 0,01640
55	32	70	25	260	161	57	42	37	36	16x1,5	50	17	53	20	25	35	38,5	38	48	18	60	11	23	350	4,80 + Z x 0,01787
60	32	75	25	265	166	57	42	37	36	16x1,5	53	16	55,5	20	25	35	43,5	38	50,5	17	62,5	11	23	310	6,01 + Z x 0,01880
60	36	75	25	265	166	57	42	37	36	16x1,5	53	16	55,5	20	25	35	43,5	38	50,5	17	62,5	11	23	420	7,04 + Z x 0,02047
63	36	78	30	285	175	65	45	44	39	16x1,5	58	16	57	22	28	42,5	45,5	38	52	17	64	11	23	390	7,58 + Z x 0,02103
63	40	78	30	285	175	65	45	44	39	16x1,5	58	16	57	22	28	42,5	45,5	38	52	17	64	11	23	510	7,81 + Z x 0,02290
65	36	80	30	290	180	65	45	44	39	22x1,5	58	22	58	22	28	42,5	45,5	38	55	21	65	11	23	370	8,78 + Z x 0,02140
65	40	80	30	290	180	65	45	44	39	22x1,5	58	22	58	22	28	42,5	45,5	38	55	21	65	11	23	490	8,89 + Z x 0,02327
70	40	85	30	295	185	65	45	44	39	22x1,5	58	23	60,5	22	28	42,5	47,5	42	59	21	74,5	12,5	25	440	9,71 + Z x 0,02420
70	45	85	30	295	185	65	45	44	39	22x1,5	58	23	60,5	22	28	42,5	47,5	42	59	21	74,5	12,5	25	600	9,92 + Z x 0,02680
75	40	90	35	335	205	75	55	53	48	22x1,5	63	23	63	25	30	47,5	50	42	61,5	21	77	12,5	25	380	11,16 + Z x 0,02512
75	45	90	35	335	205	75	55	53	48	22x1,5	63	23	63	25	30	47,5	50	42	61,5	21	77	12,5	25	530	11,39 + Z x 0,02774
80	45	95	35	340	205	80	55	53	48	22x1,5	65	25	65,5	25	30	47,5	53,5	42	64	21	79,5	12,5	25	480	14,46 + Z x 0,02866
80	50	95	35	340	205	80	55	53	48	22x1,5	65	25	65,5	25	30	47,5	53,5	42	64	21	79,5	12,5	25	630	15,36 + Z x 0,03160
90	50	105	40	375	230	85	60	57	53	22x1,5	70	28	70,5	28	35	52,5	61,5	46	72	25	84,5	12,5	25	530	18,90 + Z x 0,03344
90	55	105	40	375	230	85	60	57	53	22x1,5	70	28	70,5	28	35	52,5	61,5	46	72	25	84,5	12,5	25	680	19,90 + Z x 0,03668
100	55	120	45	410	250	95	65	67	57	27x2	80	30	82	32	38	60	66	50	76	30	95	11	32	570	28,10 + Z x 0,04578
100	63	120	45	410	250	95	65	67	57	27x2	80	30	82	32	38	60	66	50	76	30	95	11	32	810	27,60 + Z x 0,05160
110	63	130	50	430	255	105	70	70	62	27x2	85	30	87	35	40	62,5	73	50	81	28	100	11	32	710	29,40 + Z x 0,05406
110	70	130	50	430	255	105	70	70	62	27x2	85	30	87	35	40	62,5	73	50	81	28	100	11	32	930	31,22 + Z x 0,05980

Piston rod lift according to the customer's wish.

Lifts higher than maximum recommended need to be controlled for the ultimate strength.

The articulated bearing is designed also for lubrication with the pin.

The weights are informative within scope of ± 5% in kg.

**ZH2RT**

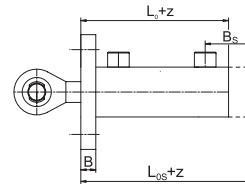
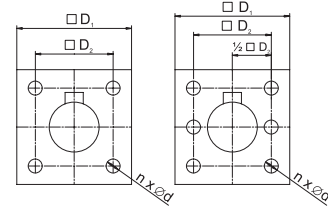
Linear hydraulic motors

ZH2RT Series hydraulic motors gripping

Gripping ZH2RT-A

ZH2RT-AS

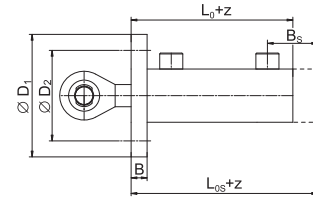
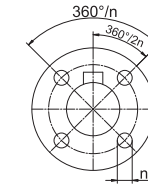
Cylinder	D <sub>1</sub>	D <sub>2</sub>	B	∅d	n	L <sub>0</sub>	L <sub>os</sub>	B <sub>s</sub>
32	67	50	10	8,4	4		125	10
40	98	80	12	8,4	6	135	164	40
45	103	85	12	10,5	6	137	169	44
50	113	95	13	10,5	6	162	192	49
55	118	100	13	10,5	6	161	195	52
60	128	108	13	10,5	6	166	204	53
63	138	115	15	13	6	175	215	55
65	138	115	15	13	6	180	215	55
70	148	120	15	13	6	185	221	58
75	155	130	16	15	6	205	242	62
80	168	140	18	15	6	205	242	62
90	178	150	20	15	6	230	277	72
100	200	170	20	17	6	250	296	77
110	210	180	22	17	6	255	310	83



Gripping ZH2RT-B

ZH2RT-BS

Cylinder	∅D <sub>1</sub>	∅D <sub>2</sub>	B	d	n	L <sub>0</sub>	L <sub>os</sub>	B <sub>s</sub>
32	88	70	10	8,4	4		125	10
40	98	80	12	8,4	6	135	164	40
45	103	85	12	8,4	6	137	169	44
50	113	95	13	10,5	6	162	192	49
55	118	100	13	10,5	6	161	195	52
60	128	108	13	10,5	6	166	204	53
63	138	115	15	13	6	175	215	55
65	138	115	15	13	6	180	215	55
70	148	120	15	13	6	185	221	58
75	155	130	16	13	6	205	242	62
80	168	140	18	15	6	205	242	62
90	178	150	20	15	6	230	277	72
100	198	170	20	17	6	250	296	77
110	208	180	22	17	6	255	310	83

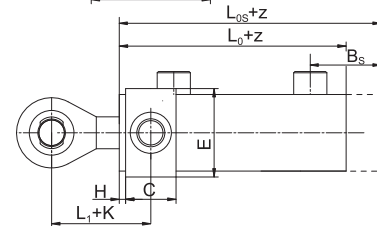
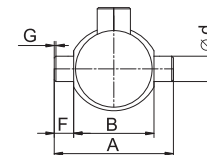


ZH2RT

Gripping ZH2RT-C

ZH2RT-CS

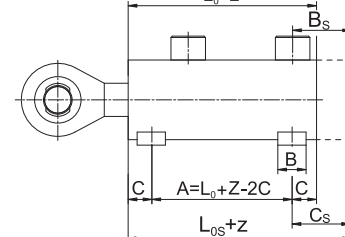
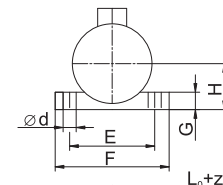
Cylinder	A	B h11	C	d f8	E	F	Gx45°	H	K	L <sub>0</sub>	L <sub>os</sub>	B <sub>s</sub>
32	90	55	28	20	53	17,5	1	5	19		125	10
40	105	65	28	20	65	20	1	5	19	135	164	40
45	110	70	33	25	70	20	1	5	22	137	169	44
50	120	80	33	25	80	20	1	5	22	162	192	49
55	135	90	35	25	90	22,5	1	5	23	161	195	52
60	140	95	35	25	95	22,5	1	7	25	166	204	53
63	150	100	40	30	100	25	1,5	7	27	175	215	55
65	155	105	40	30	100	25	1,5	7	27	180	215	55
70	160	110	40	30	105	25	1,5	7	27	185	221	58
75	180	120	45	35	115	30	1,5	7	30	205	242	62
80	185	125	45	35	115	30	1,5	8	31	205	242	62
90	205	135	50	40	135	35	1,5	8	33	230	277	72
100	220	150	55	45	150	35	1,5	10	38	250	296	77
110	240	160	60	50	160	40	1,5	10	40	255	310	83



Gripping ZH2RT-D

ZH2RT-DS

Cylinder	B	C	∅d	E	F	G	H	L <sub>0</sub>	L <sub>os</sub>	C <sub>s</sub>	B <sub>s</sub>
32	20	15	10,5	65	88	10	36		125	15	10
40	24	20	10,5	75	100	12	31	135	164	49	40
45	24	20	13	80	105	12	35	137	169	52	44
50	24	20	13	88	110	14	38	162	192	50	49
55	26	20	13	98	123	16	43	161	195	54	52
60	30	25	15	107	135	16	47	166	204	63	53
63	30	25	15	110	138	18	50	175	215	65	55
65	30	25	15	110	138	18	50	180	215	60	55
70	34	27	17	118	150	20	55	185	221	63	58
75	34	27	17	125	158	20	55	205	242	64	62
80	40	30	21	140	180	24	60	205	242	67	62
90	40	30	21	150	190	24	65	230	277	77	72
100	48	34	25	170	215	26	75	250	296	80	77
110	48	34	25	180	230	26	80	255	310	89	83



Dimensions LOS, BS and CS apply to the LHM design with a screwed plug.

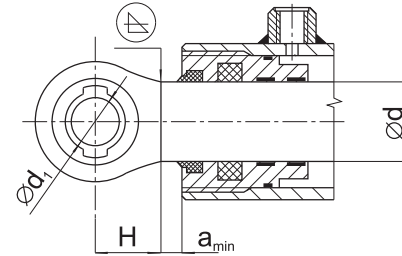
## Variants of piston rod end

Connection eye welded

**version 1**

$\varnothing d$	18	20	22	25	28	32	36	40	45	50	55	63	70	80	90	100	110
$a_{min}$	10	10	10	12	12	15	15	15	15	20	20	20	25	30	30	30	30

$\varnothing d_1$ . H - choose according to connection eye offer sheet (page 75+90)

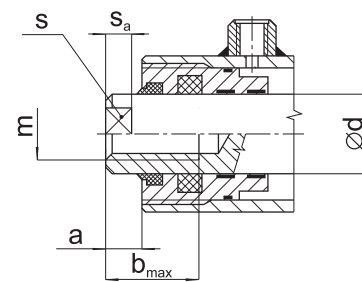


**ZH1**

internal thread

**version 2**

$\varnothing d$	20	22	25	28	32	36	40	45	50	55	63	70	80	90	100	110
$m$	14x1.5	16x1.5	18x1.5	20x1.5	24x1.5	24x1.5	27x2	27x2	30x2	36x2	42x2	42x2	60x2	68x2	75x2	75x2
$a$	12	12	15	17	17	20	20	20	25	25	30	30	35	40	45	45
$b_{max}$	40	40	56	56	60	70	70	70	80	90	90	100	100	110	110	110
$s$	18	19	22	24	28	30	36	38	41	46	55	60	70	80	90	100
$S_a$	8	8	10	12	12	15	15	15	18	18	20	20	25	30	35	35



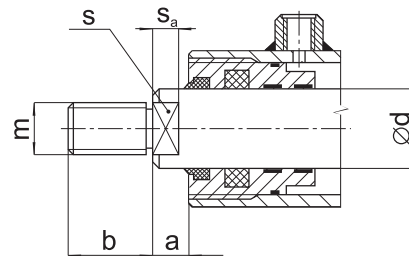
**ZH2**

**ZH2T**

external thread

**version 3**

$\varnothing d$	18	20	22	25	28	32	36	40	45	50	55	63	70	80	90	100	110
$m$	16x1.5	16x1.5	16x1.5	18x1.5	20x1.5	24x1.5	24x1.5	27x2	27x2	30x2	36x2	42x2	42x2	60x2	68x2	75x2	75x2
$a$	12	12	12	15	17	17	20	20	20	25	25	30	30	35	40	40	45
$b$	20	20	20	30	30	34	40	40	40	45	50	60	60	70	70	70	70
$s$	16	18	19	22	24	30	32	36	41	46	50	60	65	70	80	90	100
$S_a$	8	8	8	10	12	12	15	15	15	18	18	20	20	25	30	35	35

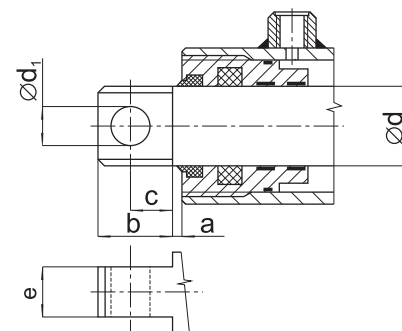


**ZH2RT**

neck hole

**version 4**

$\varnothing d$	18	20	22	25	28	32	36	40	45	50	55	63	70
$d_1$	10	12	12	14	15	17	20	22	26	28	30	40	50
$a$	6	6	8	8	8	10	10	12	12	15	15	18	18
$b$	25	30	35	40	45	50	60	70	80	95	100	120	135
$c$	15	18	22	25	29	31	36	43	50	59	64	80	85
$e$	13	15	16	18	20	24	26	28	32	34	38	40	46



The highlighted dimensions are default.

# Linear hydraulic motors

## Ordering code

For standard linear hydraulic motors  
**ZH1, ZH1 – A až ZH2RT – D Series**  
 Acc. to the table on page 15, 19, 23, 27.

And for linear hydraulic motors using the construction module  $L_0$  and another then standard piston rods ends and connection eyes ends.



ZH1, ZH1-A, ZH1-AS  
 ZH1-B, ZH1-BS  
 ZH1-C, ZH1-CS  
 ZH1-D, ZH1-DS  
 ZH2, ZH2-A, ZH2-AS  
 ZH2-B, ZH2-BS  
 ZH2-C, ZH2-CS  
 ZH2-D, ZH2-DS  
 ZH2T, ZH2T-A, ZH2T-AS  
 ZH2T-B, ZH2T-BS  
 ZH2T-C, ZH2T-CS  
 ZH2T-D, ZH2T-DS  
 ZH2RT, ZH2RT-A,  
 ZH2RT-AS  
 ZH2RT-B, ZH2RT-BS  
 ZH2RT-C, ZH2RT-CS  
 ZH2RT-D, ZH2RT-DS

**Cylinder cover eye marking**  
 - (in case of not employing any eye from our catalogue fill in 0 to the code)  
 - page 75÷90.

**Piston rod eye marking**  
 - (in case of not employing any eye from our catalogue fill in 0 to the code) - page 75÷90.

**Piston rod end** - (for single solution without rod eye the highlighted dimensions are valid. In case of not employing any eye from our catalogue fill in 0 to the code) - page 29.

**The position of pressure inputs to welded-on eye on cylinder surface** (valid only for ZH1, ZH2, ZH2T, ZH2RT) - according to herein stated drawings.

**Lift** - due to Your actual need - it is necessary to check the maximal possible lift because of the ultimate strength - the diagram of ultimate strength can be helpful according to Euler page 93.

**Piston rod diameter**

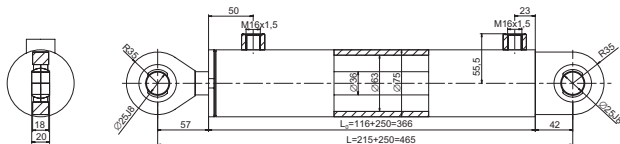
∅D	∅d	∅D <sub>1</sub>	∅d <sub>1</sub>	L
25	14	35	12	142
25	12	35.1	12	142

**Rated diameter of cylinder**

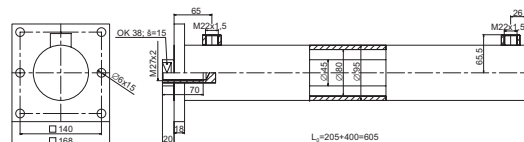
∅D	∅d	∅D <sub>1</sub>	∅d <sub>1</sub>	L
25	14	35	12	142
25	12	35.1	12	142

Example:

**ZH1 – 63/36 x 250 – R**



**ZH2T –A–80/45x400–2–0–0**



Customer's form

CUSTOMER'S FORM

Company  ID   
 Contact person  tel/fax/e-mail

**Linear hydraulic motor:**  piston diameter /  rod diameter /  lift

**Plunger** - without guided piston  - with piston rod pull-out end stop in cylinder   
 - with guided piston  - without end stop (with piston rod pull-out end stop on the construction)

-piston rod return movement - mechanically - by external force   
 - by spring in the plunger

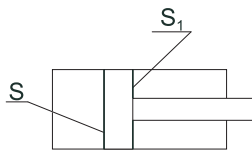
**Single acting linear hydraulic motor** - it is exactly double acting linear hydraulic motor where the pressure oil is in one chamber only - the second one is filled with air.

**Double acting linear hydraulic motor**

**Double acting linear hydraulic motor** - with continuous piston rod

- damping at end positions - no  - yes

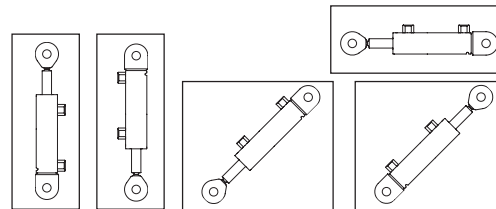
without regulation   
 regulation of both positions   
 regulation on piston rod pull-out -  $S_1$    
 regulation on piston rod pull-in - S



**Operating parameters**

Pressure min.  $S_1$   MPa  
 Pressure min. S  MPa  
 Operating pressure  $S_1$   MPa  
 Operating pressure S  MPa  
 Pressure max.  $S_1$   MPa  
 Pressure max. S  MPa  
 Pressure peak  $S_1$   MPa  
 Pressure peak S  MPa

Piston rod pull-out speed  m/s  
 Piston rod pull-in speed  m/s  
 Oil temperature  °C  
 Ambient temperature  °C  
 Working medium   
 Working position of the hydraulic motor



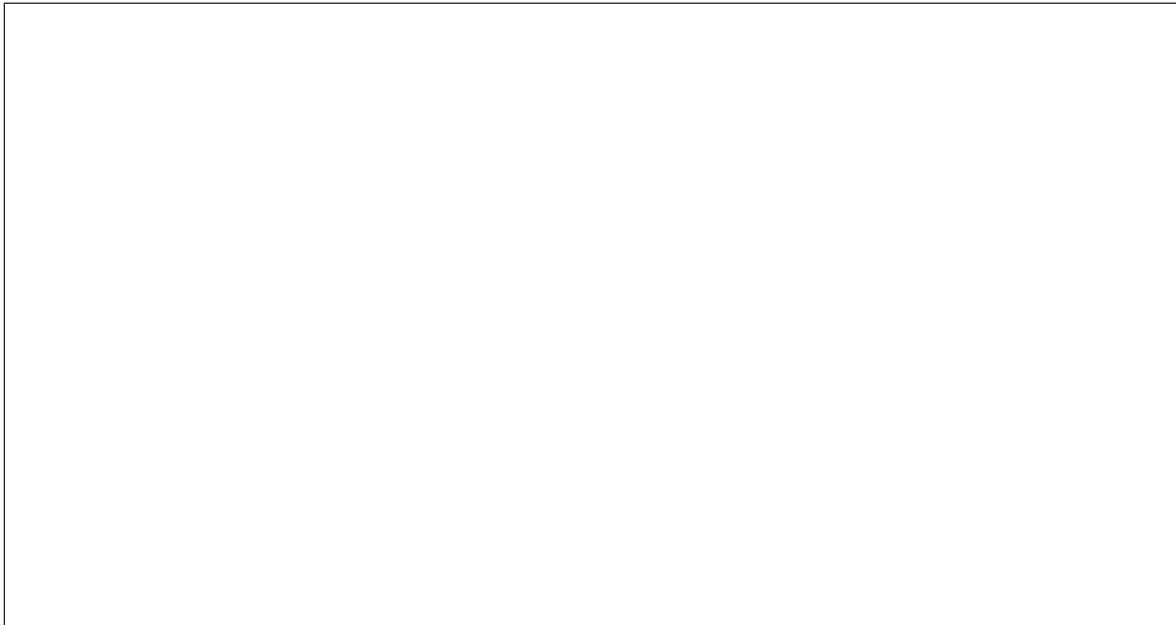
**Operating conditions**

Type of device   
 Function of the hydraulic motor   
 Work intensity  (cycles/hour, min, sec, ...)  
 Provoz  occasional  one-working  two-working  three-working  continual

**Operating environment**

Weather conditions  Dust  Clear  Water  chem. corrosive  Other

## Hydraulic motor drawing



## Technical parameters of used materials

## Commonly used types

**CYLINDER COVER** - the tube welded and calibrated within the inner diameter allowance  
H9 - Rm = 570 MPa - DIN 2393

- the tube cold-drawn and rolled or honed within the inner diameter allowance  
H8 - Rm = 570 MPa - DIN 2391

**BAR**

- 20MnV6 - bar with a chrome layer 20-30  $\mu\text{m}$  - Rm = 500 MPa

- 42CrMo4V - bar with a chrome layer 20-30  $\mu\text{m}$  - Rm = 900 MPa

- HIPERCHOM 200 - material 20MnV6 - bar with a chrome layer c. 50  $\mu\text{m}$  -  
Rm = 500 MPa - resistance in soil chamber 200 hours to defined damage

- NiCr 350 - material 20MnV6 - common bar with a chrome and nickel layers -  
Rm = 500 MPa - resistance in soil chamber 350 hours to defined damage

- Ck 45 or C50 - surface-hardened bar with a chrome layer 20-30  $\mu\text{m}$  - Rm = 500 MPa

- 42CrMo4V - IH - surface-hardened bar with a chrome layer 20-30  $\mu\text{m}$  - Rm = 900 MPa

- stainless steel rod with hardened chrome surface finish 20-30  $\mu\text{m}$



### HYDRAULIC MOTORS TESTS

Each LHM manufactured in Hydraulics company is tested before delivery to the customer via final inspection. It is separated to several levels:

- visual check
- check of construction and integration dimensions
- leak test (done on test stand using the pressure mineral oil HM32)

Inspection methodology is based on: ČSN 11 9008  
ČSN 11 9372  
ČSN 11 9373, resp. ISO 10 100

### SURFACE FINISH

In common order the surface adjustment is the final operation. As a standard it is done by painting with base synthetic colour S 2035 hue 0840 / red-brown/.

There are many ways of the surface adjustment:

- with other colour with other hue
- galvanization
  - zinc deposition
  - nickel plating
- with nitride
- without surface adjustment - pure metal

### GUARANTEE

Our products - linear hydraulic motors - are subject to warranty under the commercial code. During the warranty period, the manufacturer shall, free of charge, without any undue delays remedy all functional defects, which shall be duly claimed and which were not due to incorrect usage of the product or failure to adhere to technical conditions.

The warranty period is 12 months from the date of sale.

We must also keep an eye on the life cycle of the LHM. It is determined according to ČSN 11 9372 to minimum of  $10^6$  cycles (lifts) for hydraulic motor lift to 500 mm, or 1000 km of course under given parameters.

In some cases it is possible to determine different warranty conditions.

