General characteristics of Hydraulic Equipment

Listing of characteristics	in accordance with VDI 3267 ... 3284
Terms and symbols	as per DIN ISO 1219
Units	SI units, as per the "regulation regarding the law relating to units of measurement" dated June 26, 1970
Dimensions without tolerances	General tolerances as per DIN ISO 2768-mH Deviating from this, the following apply: cast parts, dimensional variation GTB 16 as per DIN 1686 forged pieces, forge quality F as per DIN 7526
Mounting position	Any, if not otherwise stated
Ambient temperature	$t_{u\,min.}$ = – 10 °C $t_{u\,max.}$ = + 50 °C
Temperature range of fluid	$t_{m\,min.}$ = + 10 °C $t_{m\,max.}$ = + 60 °C

Oil recommendation

Oil temperature [°C]	Hydraulic oil as per DIN 51524-2	Application
10 – 40	HLP 22	Power units with poppet valves
15 – 50	HLP 32	Mechanical pumps
20 – 60	HLP 46	Power units with spool valves

Please contact us for other operating conditions.

Oil filtering	Max. degree of pollution of the pressure fluid class 20/17/13 as per ISO 4406 The need for a fine filtration is indicated on the corresponding data sheet

Seals

Material	Trade name	Temperature range**	Hydraulic fluid
NBR* (nitrile butadiene rubber)	e.g. perbunan	-30... + 80°C (100°C)*** –10... + 55°C	HLP HFA, HFB, HFC****
FKM (fluor caoutchouc)	e.g. VITON®	–20…+ 80°C (100°C)*** –20…+150°C (200°C)***	HLP HFDU****
FFKM (perfluoroelastomer)	ISOLAST® e.g. HTJ 8325	–10…+150°C (250°C)***	HFDR, HFDU****

* Standard, unless otherwise stated on the data sheet.
** Generally applicable, unless otherwise stated on the data sheet.
*** The temperature in brackets is a maximum value that must not be achieved simultaneously with the maximum operating pressure or the admissible lifting speed. Please contact us.
**** Highly inflammable hydraulic fluids as per ISO 12922
When using these liquids, the respective manufacturer should be consulted, above all with regard to the maximum operating pressure and the sealing compatibility.

Connecting thread	British standard pipe thread (Withworth form) with screw hole form X as per DIN 3852 sheet 2 (for cylindrical screwed plugs)
Fittings	as per DIN 2353, screwed plugs form B as per DIN 3852 sheet 2 (sealing by knife edge) or form E as per DIN 3852 page 11 (sealing by soft seal). Do not use additional sealing materials such as Teflon ribbon!
Hydraulic cylinders, hydraulic block cylinders	Data sheets B 1.2811, B 1.282, B 1.590, B 1.7385
Connecting dimensions	Cylinders without stroke end cushioning: Flange mounting dimensions as per DIN ISO 6020 Cylinders with sroke end cushioning: As per DIN ISO 6020, however with the exception of the shorter overall length
Adm. stroke speed	$v_{max.}$ = 0.50 m/s
Piston stroke	according to the standard strokes as per DIN 323 R 10
Leakage rate	When extending the piston rod, the double sealing lets pass only a micro-oil film to ensure the required lubrication of the seals and thus a high service life. Please note: The wiper avoids the entry of dirt and liquids in the hydraulic system. When retracting the piston rod, a part of the previously extended oil film will be wiped off by the pre-stressed wiper lip what can cause a small leakage over time. A visible leakage in the form of oil drops indicates a necessary replacement of wear parts. Static under pressure, all cylinders are leakage-free.

Block cylinders, clamping cylinders

Adm. stroke speed	$v_{min.}$ = 0.01 m/s $v_{max.}$ = 0.25 m/s
Piston stroke	relatively short stroke, corresponding to the usage as clamping cylinder
Stroke reserve	include at least 20% to guarantee safe clamping even with large workpiece tolerances and deformations.
Spring return force	generates an oil pressure between 1.5 and 5 bar, depending on the piston position. The counter pressure in the return line must not exceed 0.5 bar.
Life of the spring	To obtain an overall length as short as possible of the clamping cylinder, the return springs are not designed fatigue endurable for the maximum stroke and not for vibrating charges. Fatigue endurance can be expected for a stroke utilisation of 70 to 80%.
Piston side load	The admissible piston side load depends on the operating conditions. 3% of the nominal cylinder force must not be exceeded by no means (up to 50 mm stroke). Please contact us for the use of single-acting elements.
Leakage rate	Block cylinders, double acting When extending the piston rod, the double sealing lets pass only a micro-oil film to ensure the required lubrication of the seals and thus a high service life. Clamping cylinders, single and double acting Operating pressure 500 bar: For sealing the piston and the rod, sturdy high-pressure seals are used, which let pass a thin residual oil film when extending the piston and thus increase the service life of seals and guides. Operating pressure ≤ 200 bar: On request, softer seals can be installed in order to reduce the residual oil film on the piston rod. Please note! The wiper avoids the entry of dirt and liquids in the hydraulic system. When retracting the piston rod, a part of the previously extended oil film will be wiped off by the pre-stressed wiper lip what can cause a small leakage over time. A visible leakage in the form of oil drops on all cylinders indicates a necessary replacement of wear parts. Static under pressure, all cylinders are leakage-free.

Hinge clamps, swing clamps, work supports

Wiper systems

Wiper type:	**FKM wiper standard** series	**Metallic wiper edge** series	**Metallic wiper** option	**Special wiper** on request
Use in:				
Hinge clamps	✓	✓		✓
Swing clamps	✓		✓	✓
Work supports	✓	✓		✓
Protective effect with:				
Cooling and cutting fluids	•	(•)	(•)	(•)
Dirt, swarf	•	(•)	(•)	(•)
Coarse and/or hot swarf	• + →	•	•	–
Grinding swarf	•	(•)	–	(•)
Dry machining	•	(•)	–	(•)
Minimum quantity lubrication	•	(•)	–	(•)
Sticking particles	• + →	–	–	•

• = required
(•) = not required
– = not suitable
+ → = in addition, a wiper is required

FKM wiper	Very good wiping effect and temperature resistance. High chemical resistance against the most cooling and cutting fluids
Metallic wiper edge	Sharp-edged plunger or piston rod exit. Protects the subjacent FKM wiper against coarse and/or hot swarf. In dry machining applications, with minimum quantity lubrication or in case of accumulation of very small swarf, there can be a swarf holdup in the area of the metallic wiper edge. Remedy: Provide for regular cleaning or protective devices.
Metallic wiper	Optional equipment for swing clamps to protect the subjacent FKM wiper against coarse and/or hot swarf. Not suitable for dry machining or minimum quantity lubrication. With accumulation of smallest swarf or other particles that do not stick on the piston rod, the standard FKM wiper provides a sufficient protection.
Special wiper	If there is any danger that the smallest particles stick to the piston rod or dry, we offer other wiper solutions. Please contact us in time.

Clamping elements, work supports, hydraulic valves, power units and other hydraulic elements	indicated on the data sheets