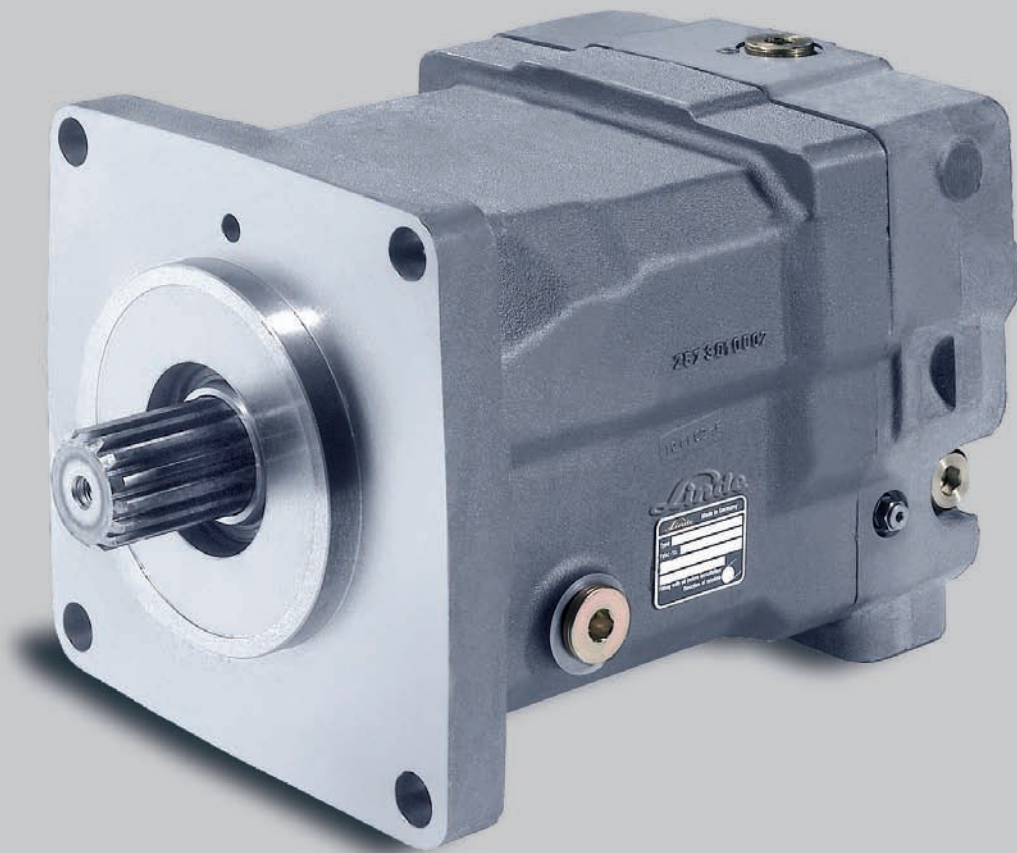
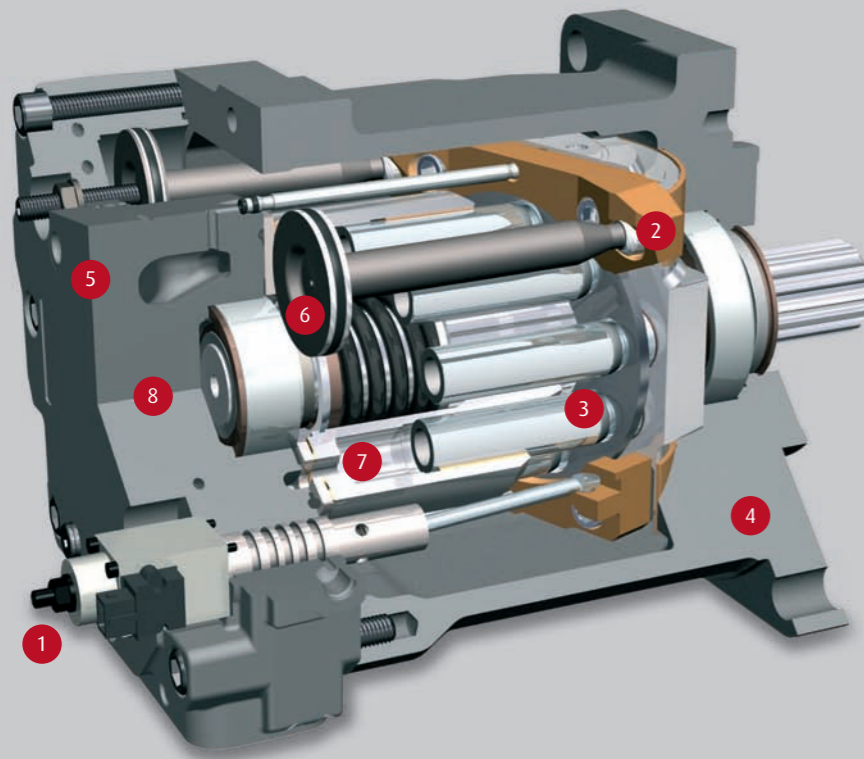


HMF / A / V / R-02.
Hydraulic motors for
closed and open loop operation.

Linde Hydraulics

Linde





- 1 **control**
optional swashing to 0 cm³/rev
- 2 **swash plate**
hydrostatic bearing
- 3 **piston-slipper assembly**
21° swash angle
- 4 **housing**
monoshell for high rigidity
- 5 **valve plate housing**
highly integrated
- 6 **control piston**
integrated, hydraulically captured
- 7 **rotating group**
precise torque transmission even at low speeds
- 8 **optional Trough-Drive**
available with two shaft ends for torque transmission

Design characteristics

- >> high pressure axial piston motor in swash plate design for closed and open loop systems
- >> optimised start-up and low-speed characteristics
- >> optionally with purge valves for circuit and case flushing
- >> HP valves possible
- >> through-shaft with bare shaft end or coupling flange
- >> SAE High pressure ports, radial or axial
- >> SAE mounting flange with ANSI or SAE spline shaft
- >> plug-in version optional
- >> speed sensor optional

Product advantages

- >> smooth low-speed operation
- >> high starting torque
- >> lower emissions through speed reduction
- >> compact design
- >> high power density
- >> high reliability
- >> long service life
- >> highly dynamic response characteristics
- >> simplified drive line

LinDrive = Precision × Dynamics × Reliability = Benefit⁰



Data Sheets Linde Hydraulics.

Find the right products for your application.

Product range

Product	Application	Linde product name
Pump	Self-regulating pump for open loop operation	HPR-02
	Variable pump for closed loop operation	HPV-02
Motor	Variable motor for closed and open loop operation	HMV-02
	Regulating motor for closed and open loop operation	HMR-02
	Fixed motor for closed and open loop operation	HMF-02
	Fixed motor for open loop operation	HMF-02 P
Directional control valve	for closed and open loop operation	HMA-02
	for open loop operation	VW
Electronics	Electronic control for open loop operation	CEB
	Electronic control for closed and open loop operation	CED
	Electronic control for closed and open loop operation	CEP
	Diagnosis software for closed and open loop operation	LinDiag®
	Peripheral equipment for closed and open loop operation	

Content HMF / A / V / R-02.

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The data on which this brochure is based correspond to the current state of development. We reserve the right to make changes in case of technical progress. The dimensions and technical data of the individual installation drawings are prevailing. The features listed in this data sheet are not available in all combinations and nominal sizes. Our sales engineers will be happy to provide advice regarding the configuration of your hydraulic system and on product selection.

General technical data.

The table shows the complete range of the motors.

Overview of technical data

Rated size			28	35	50/55	75	105
Displacement HMV-02 can be set to 0 cm ³ /rev displacement	Maximum V _{max} HMF 50-02 (w/o directional control valve) have 51.3 cm ³ /rev displacement, thus torque and power change accordingly	cm ³ /rev	28.6	35.6	54.8	75.9	105.0
	Minimum V _{min} only for variable and regulating motors	cm ³ /rev	-	-	18.3	25.3	35.0
Speed	Max. continuous speed (at 100% duty cycle) at maximum displacement	min ⁻¹	4500	4500	4100	3800	3500
	Max. speed (intermittent) at maximum displacement, higher speed on request	min ⁻¹	4800	4800	4400	4100	3800
	Max. continuous speed (at 100% duty cycle) at minimum displacement	min ⁻¹	-	-	4700	4400	4100
	Max. speed (intermittent) at minimum displacement, higher speed on request	min ⁻¹	-	-	5300	5000	4700
Pressure	Max. operating pressure other values on request	bar	420				
	Max. pressure (intermittent)	bar	500				
	Continuous pressure (Δp)	bar	250				
	Permissible housing pressure (absolute)	bar	2.5				
Torque (theoretical)	Continuous output torque at continuous pressure	Nm	114	142	199/218	302	418
	Max. output torque at maximum operating pressure	Nm	191	238	334/366	508	702
Power (theoretical)	Continuous power at maximum continuous speed, maximum displacement and continuous pressure	kW	54	67	85/94	120	153
	Maximum power at max. continuous speed, max. displacement and max. operating pressure	kW	90	112	143/157	202	257
Permissible shaft loads	Axial input force	N	2000				
	Axial output force	N	2000				
	Radial	N	on request				
Perm. housing temperature	Perm. housing temperature with minimum perm. viscosity > 10 cSt	°C	90				
Weights	Fixed displacement motor with 2-hole mounting flange	kg	16	16	19	26	33
	Variable and regulating motor with 2- or 4-hole mounting flange	kg	-	-	28	32	42
	Max. moment of inertia	kgm ² x10 ⁻²	0.25	0.25	0.49	0.79	1.44

Standard Linde-name plate

Each Linde Hydraulics unit features a name plate showing the type and the serial number. For a single order via 'open variant' a customer-specific number or free text with up to 15 characters can be stamped on the name plate.

Type	HMV105-02	Series 02 variable motor with the rated size of 105
	2581	the last 4 figures of the Bill of Material 2340002581
Serial-No.	H2X	
	234	Type number of HMV 105-02
	T	Letter indicating year of production
	12345	Serial number
Part No.	12345678	Free text field for up to 15 characters



General technical data.

The table shows the complete range of the motors.

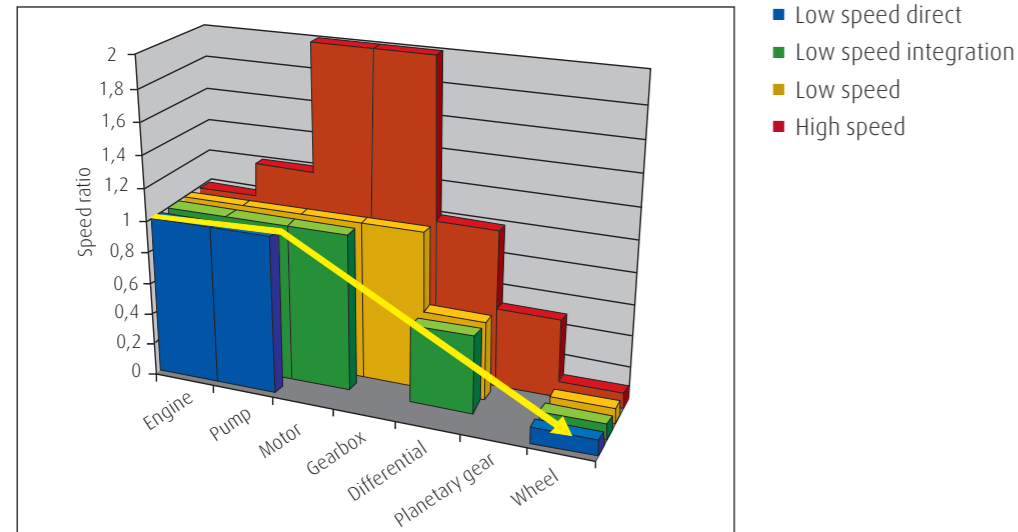
Overview of technical data

Rated size			135	165	210	280	135D
Displacement HMV-02 can be set to 0 cm ³ /rev displacement	Maximum V _{max} HMF 50-02 (w/o directional control valve) have 51.3 cm ³ /rev displacement, thus torque and power change accordingly	cm ³ /rev	135.6	165	210	280	270
	Minimum V _{min} only for variable and regulating motors	cm ³ /rev	45.2	55.2	70	93	67
Speed	Max. continuous speed (at 100% duty cycle) at maximum displacement	min ⁻¹	3200	3100	2700	2400	3200
	Max. speed (intermittent) at maximum displacement, higher speed on request	min ⁻¹	3500	3400	3000	2700	3500
	Max. continuous speed (at 100% duty cycle) at minimum displacement	min ⁻¹	3700	3500	3200	2900	3700
	Max. speed (intermittent) at minimum displacement, higher speed on request	min ⁻¹	4000	3900	3500	3200	4000
Pressure	Max. operating pressure other values on request	bar	420				
	Max. pressure (intermittent)	bar	500				
	Continuous pressure (Δp)	bar	250				
	Permissible housing pressure (absolute)	bar	2.5				
Torque (theoretical)	Continuous output torque at continuous pressure	Nm	540	657	836	1115	1075
	Max. output torque at maximum operating pressure	Nm	907	1104	1404	1872	1803
Power (theoretical)	Continuous power at maximum continuous speed, maximum displacement and continuous pressure	kW	181	213	236	280	360
	Maximum power at max. continuous speed, max. displacement and max. operating pressure	kW	304	358	397	470	605
Permissible shaft loads	Axial input force	N	2000				
	Axial output force	N	2000				
	Radial	N	on request				
Perm. housing temperature	Perm. housing temperature with minimum perm. viscosity > 10 cSt	°C	90				
Weights	Fixed displacement motor with 2-hole mounting flange	kg	39	75	100	-	-
	Variable and regulating motor with 2- or 4-hole mounting flange	kg	56	76	101	146	149
	Max. moment of inertia	kgm ² x10 ⁻²	2.15	3.06	4.68	9.36	2.15

Transmission concept.

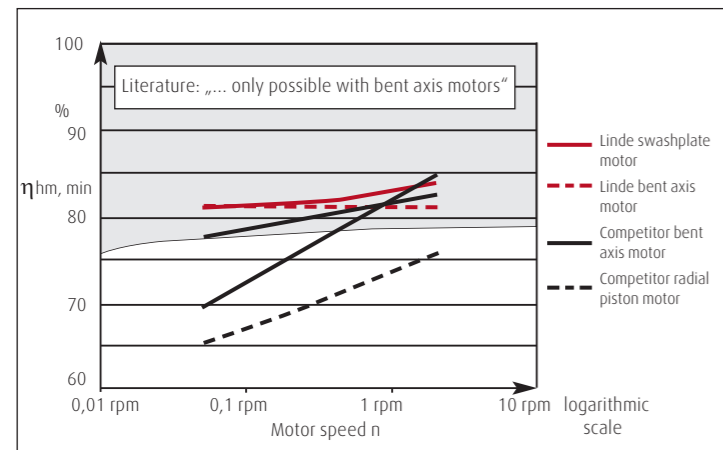
Equipment manufacturers profit by the Linde Hydraulics transmission concept. Due to the direct conversion of the prime mover speed into wheel speed it is possible to reduce the number of drive line components and the energy losses in the operating cycle.

Speed steps of transmission concepts



Starting torque

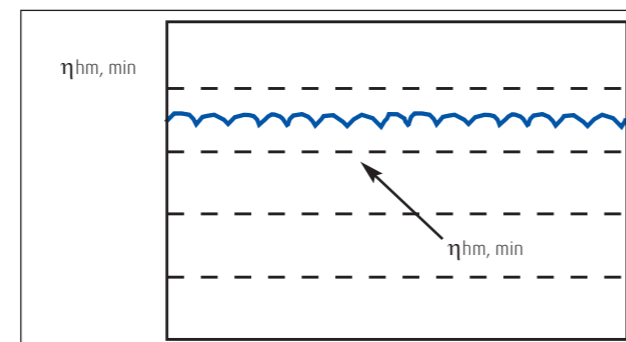
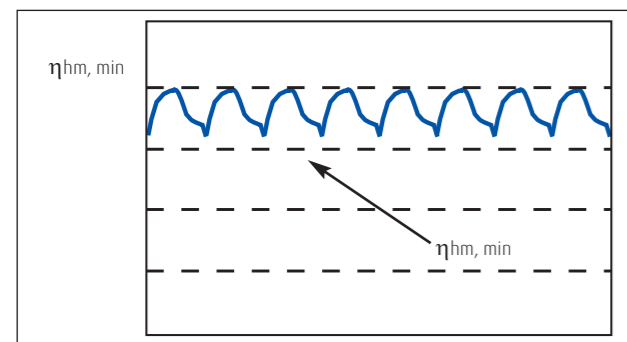
Linde hydraulic motors offer uniformly high torque for smooth start up. Right from the start.



Torque at 350 bar and 2 rpm

of a bent axis motor

of a swashplate motor



Operational parameters. Life time recommendations

Linde high pressure units are designed for excellent reliability and long service life. The actual service life of a hydraulic unit is determined by numerous factors. It can be extended significantly through proper maintenance of the hydraulic system and by using high-quality hydraulic fluid.

Beneficial conditions for long service life

>> Speed	lower continuous maximum speed
>> Operating pressure	less than 300 bar Δp on average
>> Max. pressure	only at reduced displacement
>> Viscosity	15 ... 30 cSt
>> Power	continuous power or lower
>> Purity of fluid	18/16/13 in accordance with ISO 4406 or better

Adverse factors affecting service life

>> Speed	between continuous maximum speed and intermittent maximum speed
>> Operating pressure	more than 300 bar Δp on average
>> Viscosity	less than 10 cSt
>> Power	continuous operation close to maximum power
>> Purity of fluid	lower than 18/16/13 in accordance with ISO 4406

Operational parameters. Filtration

In order to guarantee long-term proper function and high efficiency of the hydraulic motors the purity of the pressure fluid must comply with the following criteria according to Linde Works Standard WN 51 210. High purity oil can extend the service time of the hydraulic system significantly.

>> For reliable proper function and long service life	18/ 16/ 13 in accordance with ISO 4406 or better
>> Minimum requirements	20/ 18/ 15 in accordance with ISO 4406
>> Commissioning	The minimum purity requirement for the hydraulic oil is based on the most sensitive system component. For commissioning we recommend a filtration in order to achieve the required purity.
>> Filling and operation of hydraulic systems	The required purity of the hydraulic oil must be ensured during filling or topping up. When drums, canisters or large-capacity tanks are used the oil generally has to be filtered. We recommend the implementation of suitable measures (e.g. filters) to ensure that the required minimum purity of the oil is also achieved during operation.
>> International standard	code number according to ISO 4406 18/16/13 20/18/15
	purity class according to SAE AS 4059 corresponds to 8A/7B/7C 9A/8B/8C

Operational parameters. Pressure fluids

In order to ensure the functional performance and high efficiency of the hydraulic motors the viscosity and purity of the operating fluid should meet the different operational requirements. Linde recommends using only hydraulic fluids which are confirmed by the manufacturer as suitable for use in high pressure hydraulic installations or approved by the original equipment manufacturer.

Permitted pressure fluids

- >> Mineral oil HLP to DIN 51 524-2
- >> Biodegradable fluids in accordance with ISO 15 380 on request
- >> Other pressure fluids on request

Linde offers an oil testing service in accordance with VDMA 24 570 and the test apparatus required for in-house testing. Prices available on request.

Recommended viscosity ranges

Pressure fluid temperature range	[°C]	-20 to +90
Working viscosity range	[mm ² /s] = [cSt]	10 to 80
Optimum working viscosity	[mm ² /s] = [cSt]	15 to 30
Max. viscosity (short time start up)	[mm ² /s] = [cSt]	1000

In order to be able to select the right hydraulic fluid it is necessary to know the working temperature in the hydraulic circuit. The hydraulic fluid should be selected such that its optimum viscosity is within the working temperature range (see tables).

The temperature should not exceed 90 °C in any part of the system. Due to pressure and speed influences the leakage fluid temperature is always higher than the circuit temperature. Please contact Linde if the stated conditions cannot be met in special circumstances.

Viscosity recommendations

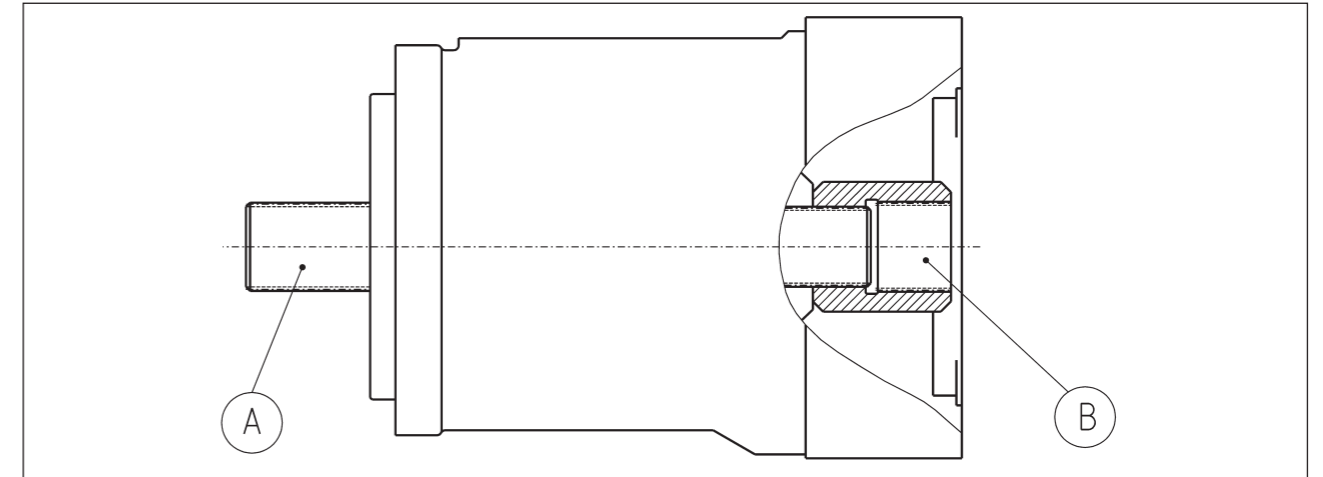
Working temperature [°C]	Viscosity class [mm ² /s] = [cSt] at 40 °C
approx. 30 to 40	22
approx. 40 to 60	32
approx. 60 to 80	46 or 68

Further information regarding installation can be found in the operating instructions.

Torque transmission.

Depending on the selected components, different torques may be transferred. Please ensure that the load transfer components such as mounting flange and PTO through-shaft are designed adequately. Our sales engineers will be pleased to provide design advice.

Torque transmission of HMF/ A / V / R-02



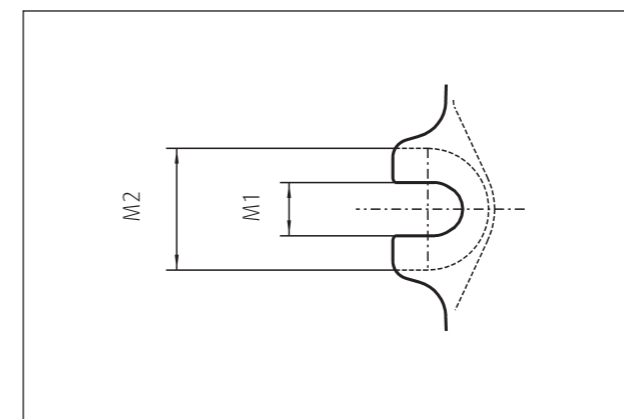
The diagram Torque transmission of HMF/ A / V / R-02 shows the output side (A) and the PTO through-shaft (B) of a motor. The information on the following pages refers to

- >> mounting flange and drive shaft (A)
- >> PTO flange and through shaft (B).

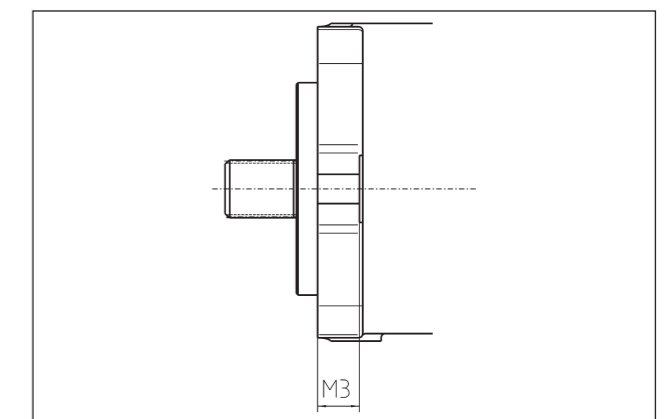
A) Flange profile

Bolt hole dimensions		Rated size HMF/ A / V / R-02							
		50/55	75	105	135	165	210	280	135 D
M1 inside diameter	mm	17.5	17.5	17.5	21.5	21.5	22	22	21.5
M2 outside diameter	mm	40	34	34	40	40	-	-	40
M3 length	mm	20	20	20	20	25	30	30	20

Bolt hole diameter



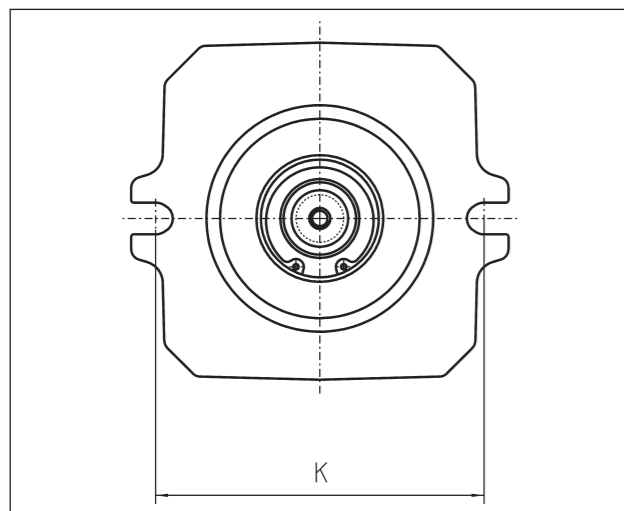
Bolt hole length



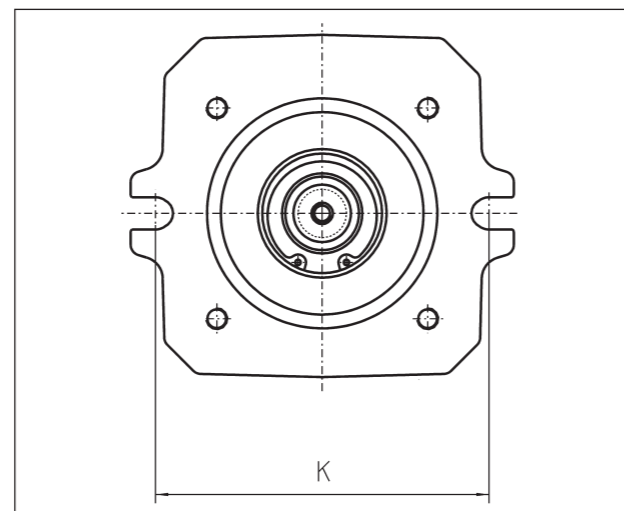
A) Mounting flange dimensions

Mounting flange dimensions in accordance with SAE J744	Dimension K [mm]	Rated size HMF/A/V/R-02								
		28/35	50/55	75	105	135	165	210	280	135D
SAE B, B-B	146.0	x								
SAE C, C-C 2-hole	181.0		x	x	x					
SAE D 2-hole	228.6					x	x			
SAE D 2-hole with 4 additional threaded holes	228.6									x
SAE D 2-hole with 4 additional bolt holes	228.6									x
SAE E 4-hole	224.5							x	x	
Plug-in housing with 2 hole flange, not for HMF-02	224			x						
Plug-in housing not for HMF-02	251.8				x	x				

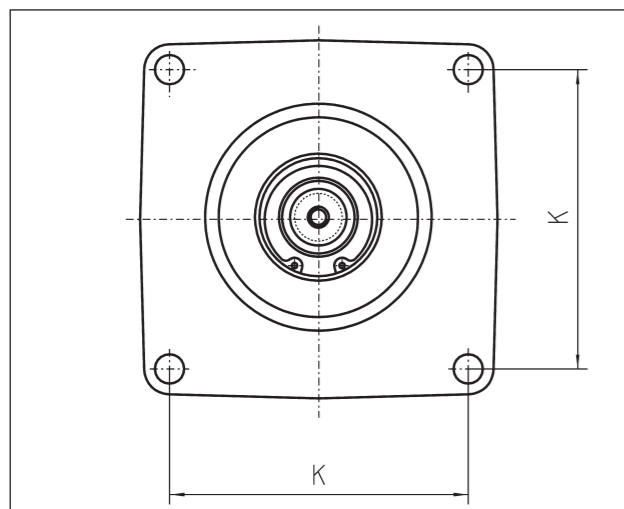
A) Fixing hole distance K
2-hole flange



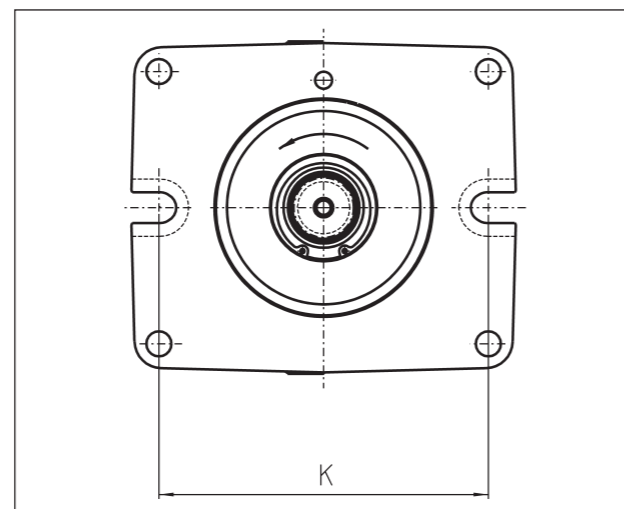
2-hole flange with 4 additional threaded holes



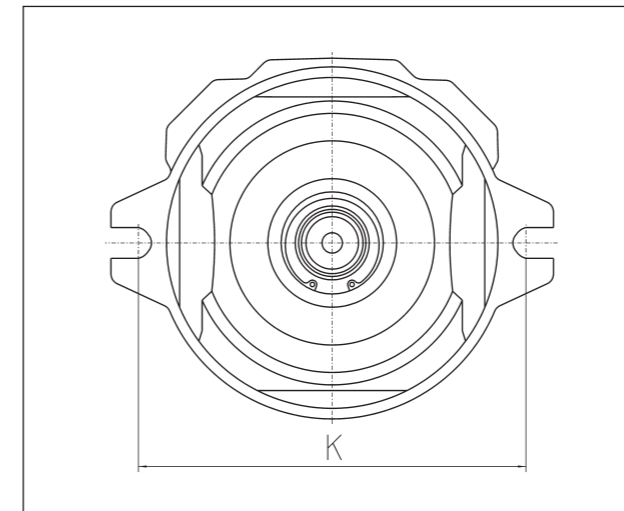
4-hole flange



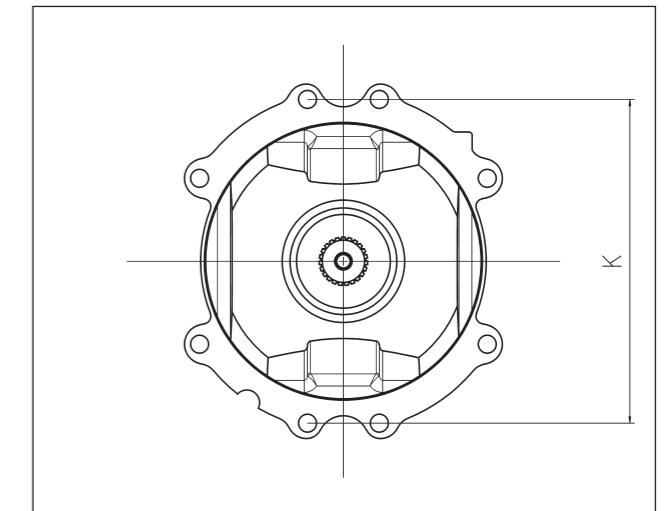
2-hole flange with 4 additional bolt holes



Plug-in housing with 2-hole flange



Plug-in flange



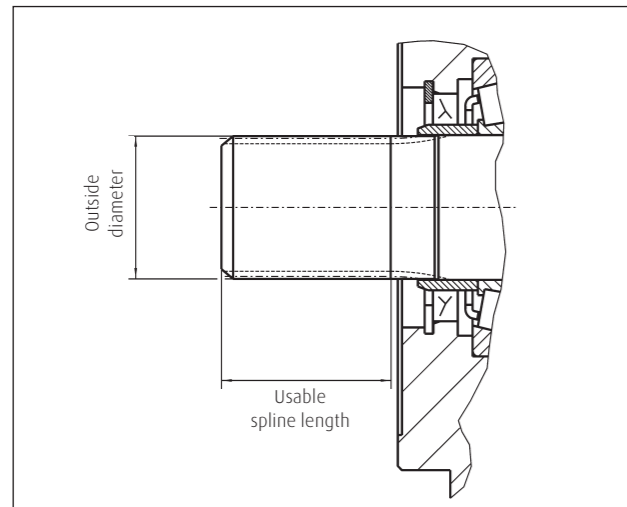
Torque transmission. Drive shaft

A) Dimensions drive shafts

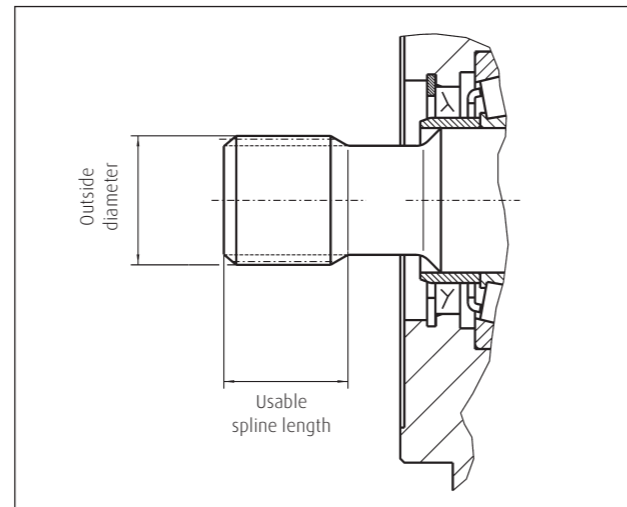
Shaft spline in accordance with ANSI B92.1	SAE J744 code for centering and shaft	Outside diameter [mm]	Usable spline length [mm]	Shaft type	Available for rated size									
					28/35	50/55	75	105	135	165	210	280	135D	
16/32, 15 t	B-B	24.98	29	1	x									
16/32, 21 t		34.51	39.5	1		x	x							
16/32, 23 t		37.68	38.5	1				x						
16/32, 27 t		44.05	62	1					x	x				x
12/24, 14 t	C	31.22	30	2			x							
8/16, 13 t	D	43.71	50	2					x	x				
8/16, 15 t		50.06	58	1							x	x		

A) Linde Hydraulics shaft types

Type 1. Without undercut



Type 2. With undercut



A) +B) Output shaft torque

The transferable torque of the drive shaft at PTO through-shaft (B) corresponds to the torque of the drive shaft (A).

Rated size		28/ 35	50/55	75	105	135	165	210	280	135D
Continuous transfer torque	Nm	114/ 142	199/218	302	418	540	657	836	1114	1075
Max. transfer torque	Nm	191/ 238	334/366	508	702	907	1104	1404	1872	1803

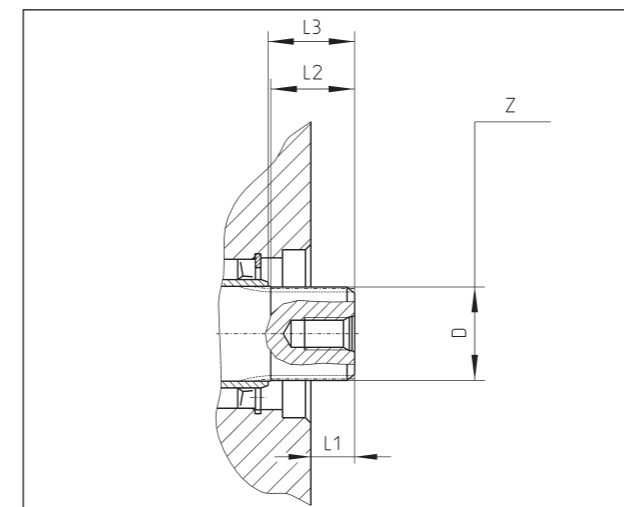
Torque transmission. PTO Through-Drive Motor

Based on a standard Series 02 hydraulic motor with single shaft end, the PTO Through-Drive Motor features two shaft ends for torque transfer. This enables the hydraulic motor to be installed directly in the drive line without transfer gearbox, reducing noise emission and fuel consumption. At the same time the overall efficiency increases.

B) PTO dimensions

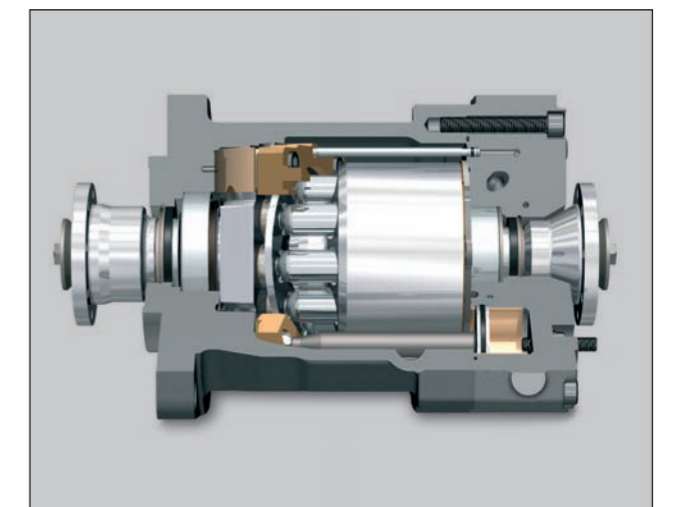
Rated size		105	135	165	210	280
Z drive shaft profile in accordance with ANSI B92.1		16/32, 19 t	16/32, 21 t	16/32, 22 t	16/32, 24 t	16/32, 27 t
D shaft diameter	mm	31.2	34.51	36.05	39.27	44.05
L1 shaft end length-housing	mm	30.1	16.2	-0.5	20.9	18
L2 usable spline length	mm	41.5	31	31	44	47
L3 bearing stop	mm	49.6	32	32.8	57.2	62

B) PTO dimensions



PTO Through-Drive Motor with coupling flanges

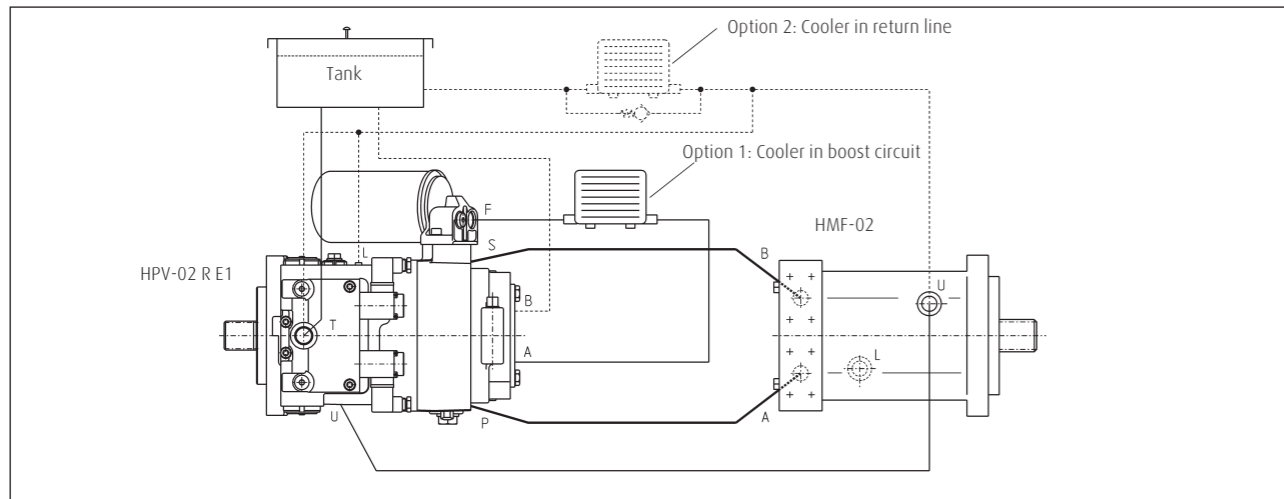
For a direct installation into the drive line



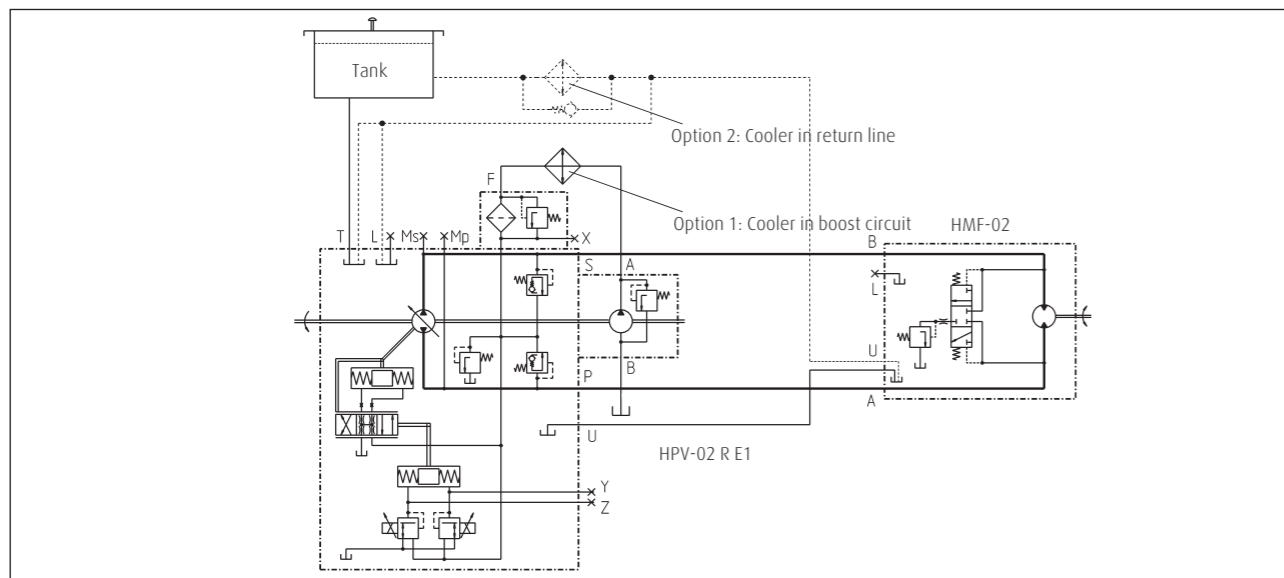
The closed loop.

Representation of the hydraulic components of a closed loop hydrostatic drive: Variable electro-hydraulic controlled pump HPV-02 E1 and fixed displacement motor HMF-02 plus filter, cooler and oil tank. The function diagram and the circuit diagram show two types of cooling.

Function diagram



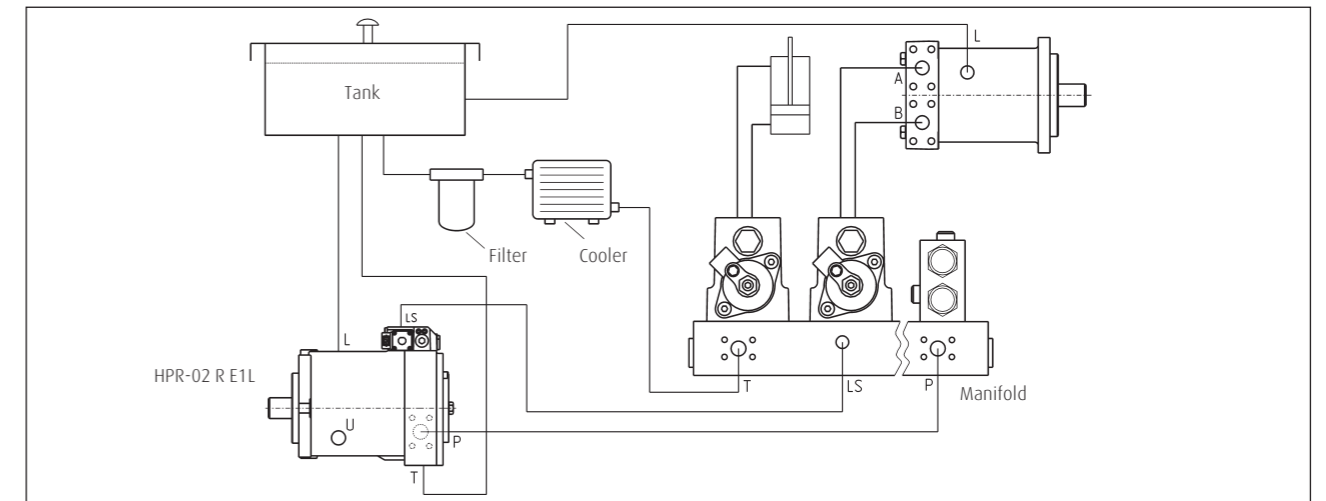
Circuit diagram



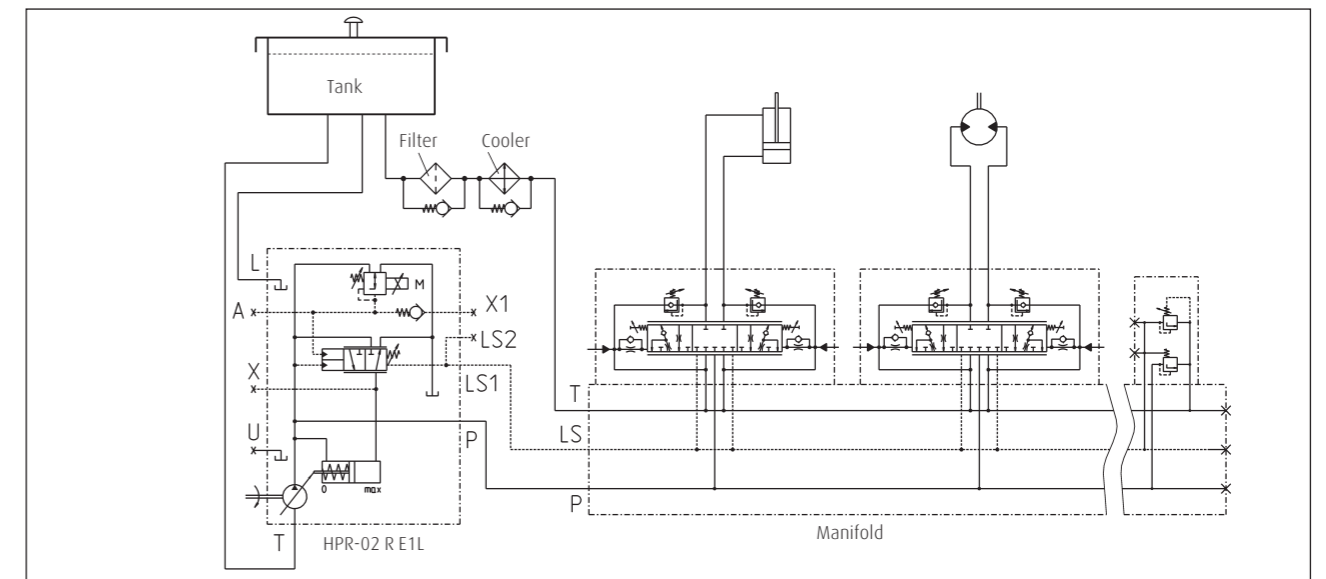
The open loop.

Representation of hydraulic components in an open loop circuit, based on the LSC system as an example: A HPR-02 regulating pump with load sensing function for energy-saving flow on demand control and VW load sensing directional control valves for load-independent and simultaneous movements of several consumers without mutual influencing. The system is complemented with proven Linde products such as electronic controllers, swing drive and hydraulic motors. The following motor types and equipment options are available for optimising your application.

Function diagram



Circuit diagram



Further information about the LSC system is available in the HPR-02 data sheet or directly from our sales engineers.

Functions. Overview

Closed loop circuit

	Servo pressure supply			Purge and case flushing			Crossline relief protection			Brake pressure shut off		Speed sensor	
	external	internal from low pressure	internal from high pressure	without	standard 10 l/min	reduced 5 l/min	without	fixed	dual setting	without	with	without	with
HMF-02				on request	●	○	○	o.r.		○		○	○
HMF-02 P					●	○	○	o.r.		○		○	○
HMA-02					●	○	○			○		○	○
HMV-02 H1	●	○			●	○	○			○		○	○
HMV-02 H2	●	○			●	○	○			○		○	○
HMV-02 E1	●	○			●	○	○			○		○	○
HMV-02 E2	●	○			●	○	○			○		○	○
HMV-02 EH1P		○			●	○ at 20 bar supply pressure, 14 bar CBV	○			○		○	○
HMR-02 pneumatic V _{max} control			○		●	○	○	○			○	○	○
HMR-02 hydraulic V _{max} control, low pressure			○		●	○	○	○			○	○	○
HMR-02 hydraulic V _{max} control, high pressure			○		●	○	○	○			○	○	○
HMR-02 electric V _{max} control			○		●	○	○	○			○	○	○

● Standard ○ Option

Functions. Overview

Closed loop circuit

	Servo pressure supply	Purge and case flushing		Crossline relief protection			Counterbalance valve		Speed sensor	
	internal from high pressure	without	flow control	without	fixed	dual setting	without	with	without	with
HMF-02		●	○	○	o.r.	o.r.	○		○	○
HMF-02 P		●	○	○	o.r.	○	○		○	○
HMA-02		●	○	○			○		○	○
HMV-02 H1		●	○	○			○		○	○
HMV-02 H2	○	●	○	○			○		○	○
HMV-02 E1		●	○	○			○		○	○
HMV-02 E2	○	●	○	○			○		○	○
HMR-02 pneumatic V _{max} control	○	●	○	○	○		○	○	○	○
HMR-02 hydraulic V _{max} control, low pressure	○	●	○	○	○		○	○	○	○
HMR-02 hydraulic V _{max} control, high pressure	○	●	○	○	○		○	○	○	○
HMR-02 electric V _{max} control	○	●	○	○	○		○	○	○	○

● Standard ○ Option

Functions. Purge and case flushing

Purge and case flushing is used

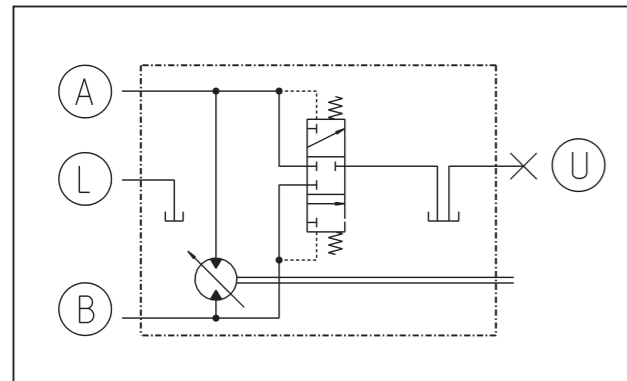
- >> for reducing the temperature of the motor and the system in the open and closed loop circuits
- >> for replacing the oil in the circuit
- >> to enhance filtration and
- >> for removing air from the system

For equipment options for Series 02 motors please refer to the function overview.

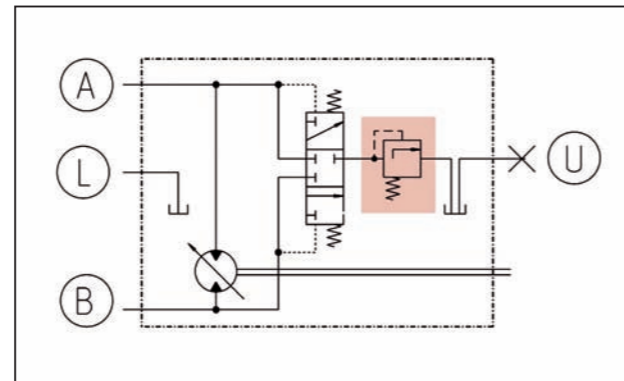
Purge flow in closed loop circuit

Version	Purge valve pressure CBV setting	Diagram	Sizes 28 to 135	Sizes 165 to 280
Standard	10 bar with 19 bar feed pressure	2	16 l	18 l
Standard	14 bar with 19 bar feed pressure	2	8 l	10 l
Restricted with 2.5 mm orifice	10 bar with 19 bar feed pressure	3	6.5 l	7.5 l
Restricted with 2.5 mm orifice	14 bar with 19 bar feed pressure	3	4.5 l	5.5 l
Increased	10 bar with 30 bar feed pressure	2	28 l	30 l
Increased	14 bar with 30 bar feed pressure	2	25 l	27 l

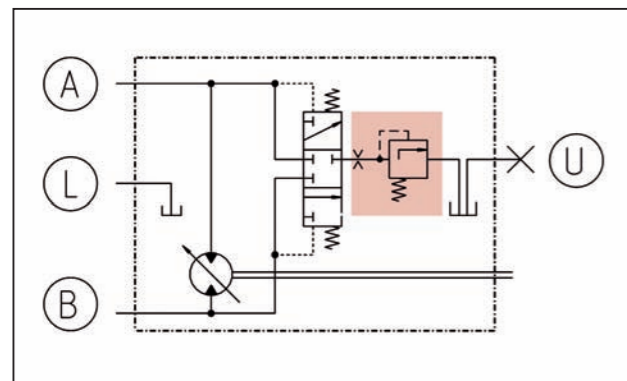
Purge valve 1. Without (0 l/min)



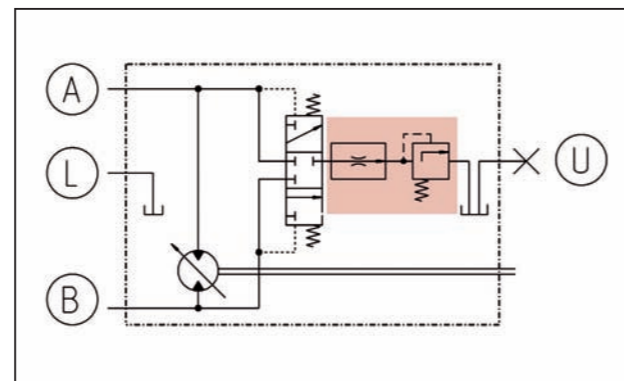
Purge valve 2. Standard and increased



Purge valve 3. Restricted



Purge valve 4. Flow controlled

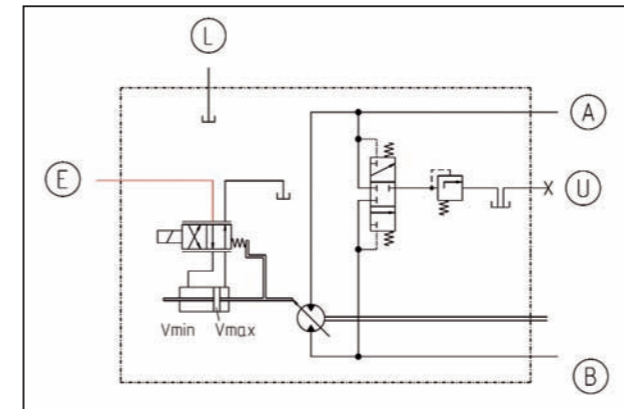


Flow-controlled purge flushing in an open loop circuit approx. 4 l/min at 5 bar set pressure (independent of low pressure) diagram 4

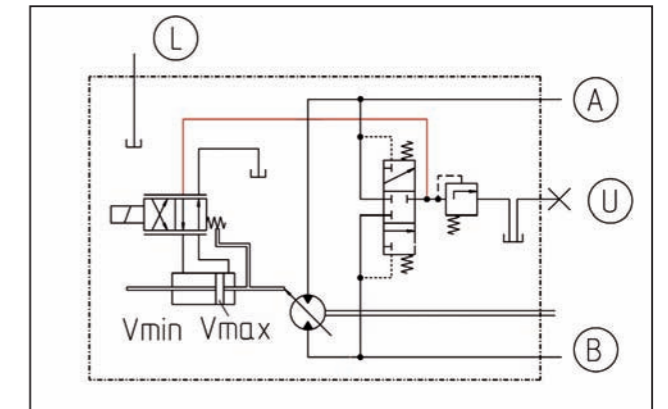
Functions. Servo Supply Pressure Feed

Servo supply pressure delivers the force needed to change the position of the swash plate in variable displacement and pressure regulated motors. For equipment options for Series 02 motors please refer to the function overview.

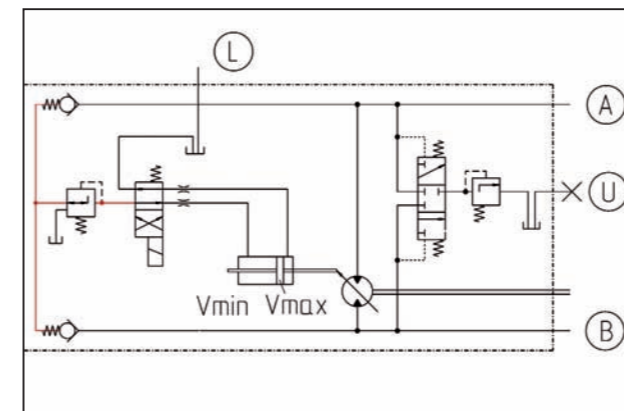
For HMV-02 variable motors External supply



Internal supply. Purge circuit



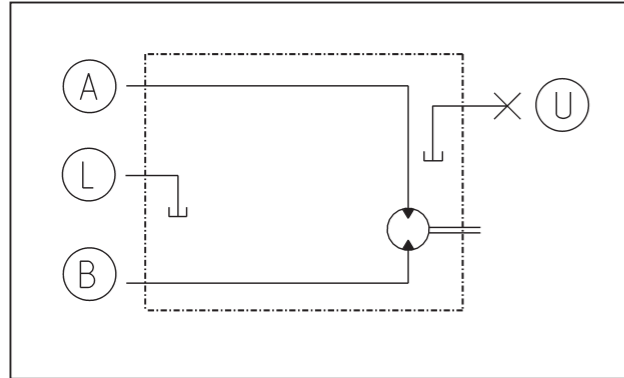
For HMR-02 Regulating motors Internal supply. High pressure circuit



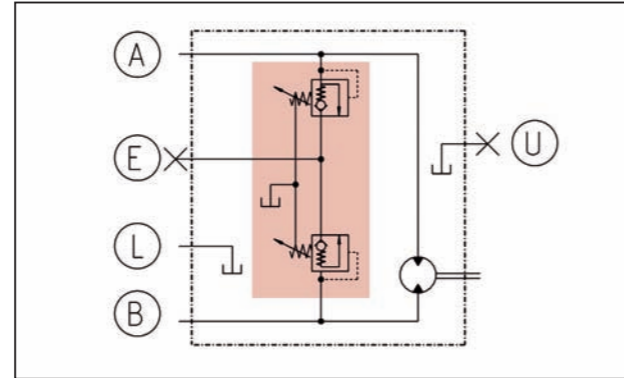
Functions. Crossline relief (secondary) protection

The secondary valves (crossline relief valves) protect the system from pressure overload by using two interlinked pressure relief valves (combined with check valves). It is recommended for applications where this protective function is not provided by other means (e.g. through primary protection at the pump or LS valves). The secondary protection includes a make-up function. It prevents cavitation and is required in an open loop circuit if the motor requires more oil than is supplied. For special situations like in the swing gear drive the installation of controllable secondary valves is recommended. For equipment options for Series 02 motors please refer to the function overview.

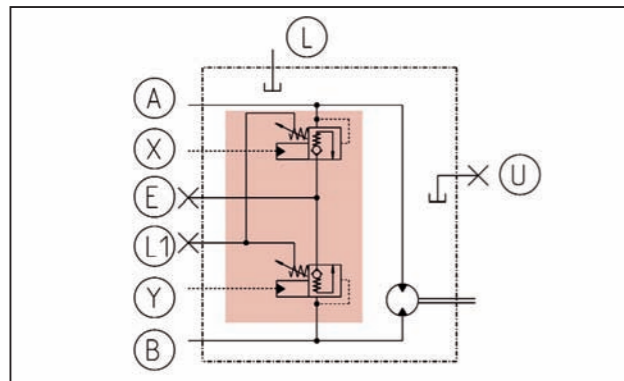
Without crossline relief valve



With crossline relief valve protection



With dual pressure crossline relief valve protection

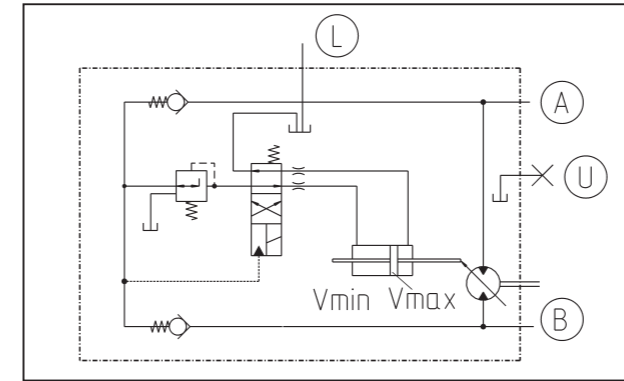


- A, B Work ports
- L, L1, U Case drain/ vent connections
- X, Y Control connection for dual pressure crossline relief valve
- E Make up connection

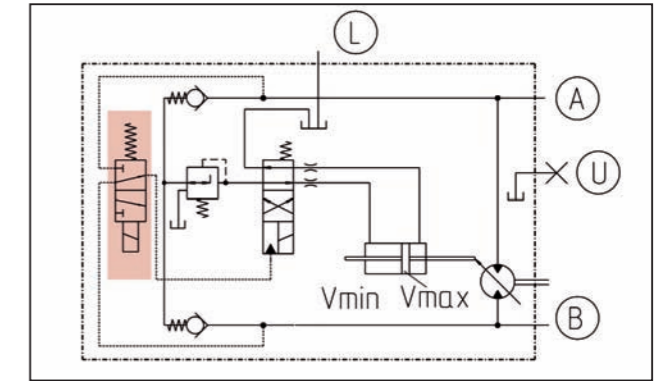
Functions. Brake pressure shut off

Pressure regulated motors shift to maximum displacement at high operating pressure, irrespective of which side is under pressure and in propel situations this can have undesirable effects. For example, if the motor shifts to maximum displacement during the transition phase from downhill travel (low system pressure) to overrun (high pressure on the reverse side) an extremely strong vehicle braking effect will occur. The brake pressure shut off valve prevents the regulator being subjected to this braking pressure and, therefore, ensures that the motor remains at minimum displacement. For equipment options for Series 02 motors please refer to the function overview.

Without brake pressure shut off



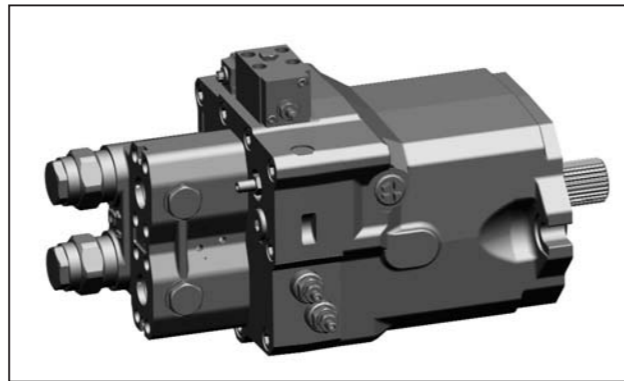
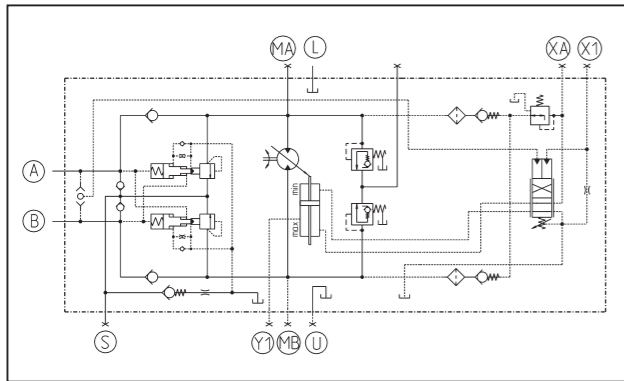
With brake pressure shut off



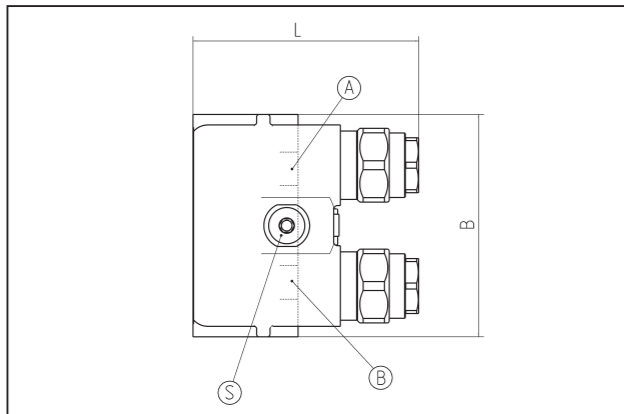
Functions. Counterbalance valve

The counterbalance (brake) valve prevents the motor over speeding during an over-run situation. To achieve this, the motor return flow is automatically and continuously metered such that it always matches the input flow. Different braking responses are possible. The integrated make-up function simultaneously prevents cavitation. A purge and case flushing function is also integrated. Counterbalance (brake) valves are typically used for drive systems in open loop circuits. Further types of counterbalance valves are shown in section Dimensions. HMR-02.

With counterbalance (brake) valve, here: axial attachment



Dimensions

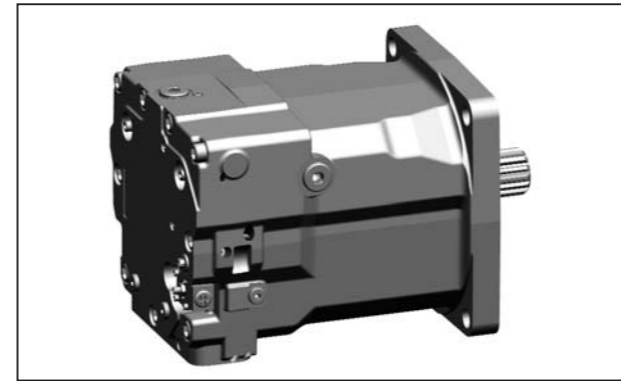


Brake valve	1"	1 1/4"
Length L	168.5	168.5
Width B	165.7	195
Height	136.6	143

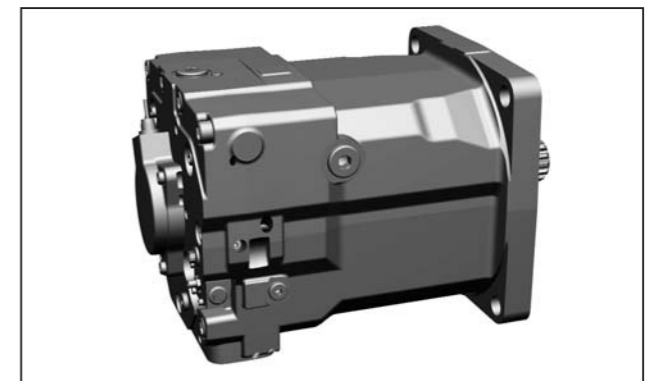
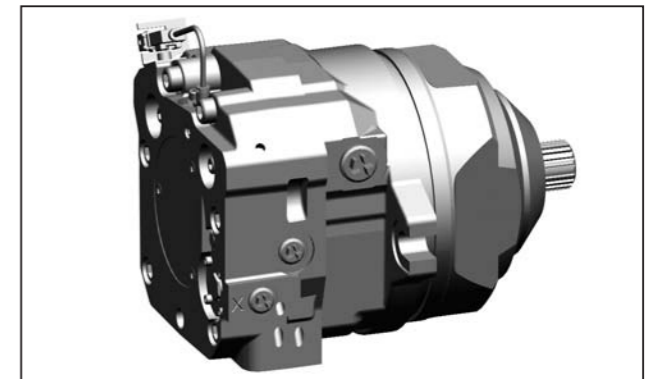
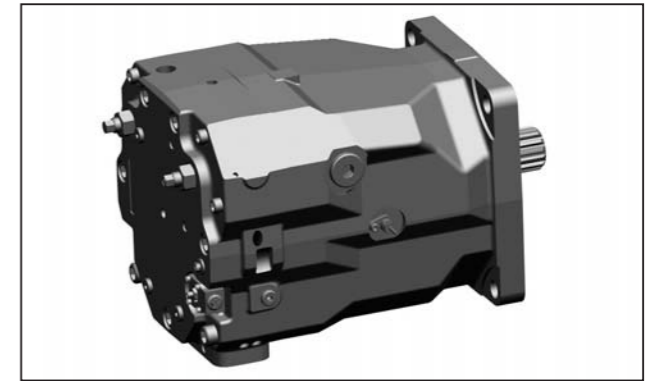
Functions. Speed Sensor

Speed sensors electronically register the motor speed and send an associated input signal to electronic drive controls. Examples are shown below.

Without speed sensor



With speed sensor



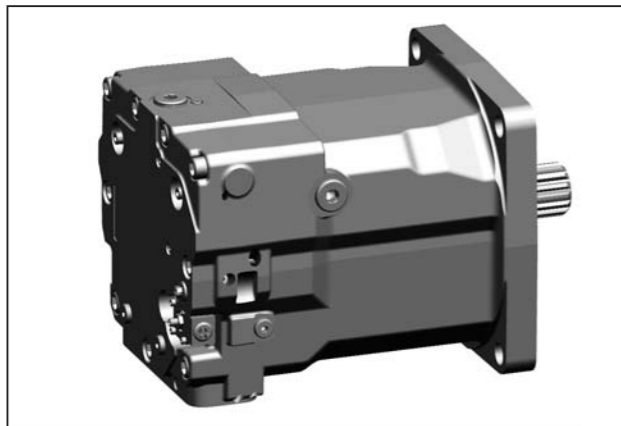
Motor types.

Based on the respective system requirements, Linde Hydraulics offers fixed displacement, variable displacement and regulating motors with high starting torque for open and closed loop operation. Optional auxiliary functions, zero displacement capacity and PTO through-shaft enable higher machine design flexibility and increase the efficiency of the travel drive. The motors are optionally controlled electrically, hydraulically or pneumatically.

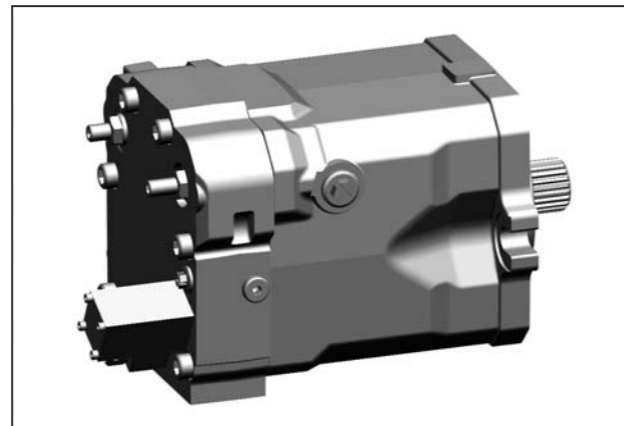
Function overview

Motor type	Control/ function	Product name
Fixed displacement motor		HMF-02
	with swing drive function	HMF-02 P
	displacement adjustable	HMA-02
Regulating motor	V_{max} pneumatic	HMR-02
	V_{max} hydraulic, low pressure	HMR-02
	V_{max} hydraulic, high pressure	HMR-02
	V_{max} electric	HMR-02
Variable displacement motor	stepless variable control, hydraulic	HMV-02 H1
	stepless variable control, electric	HMV-02 E1
	two position control (flip-flop), hydraulic	HMV-02 H2
	two position control (flip-flop), electric	HMV-02 E2
	stepless variable control with pressure override	HMV-02 EH1P

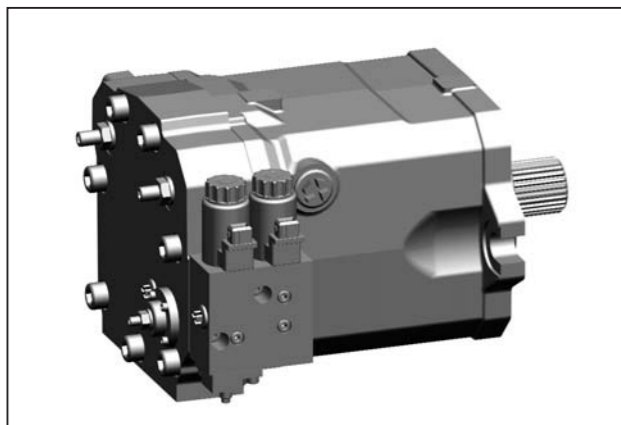
HMV-02 H



HMV-02 E

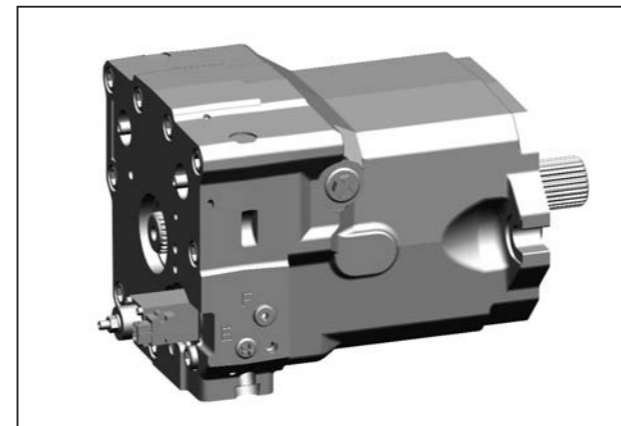


HMV-02 EH1P

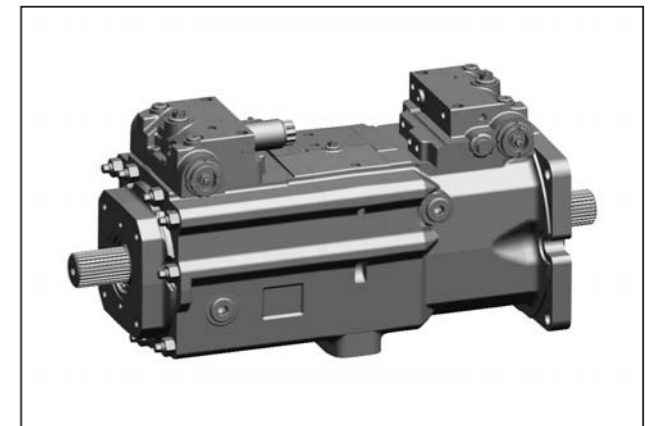


Motor types.

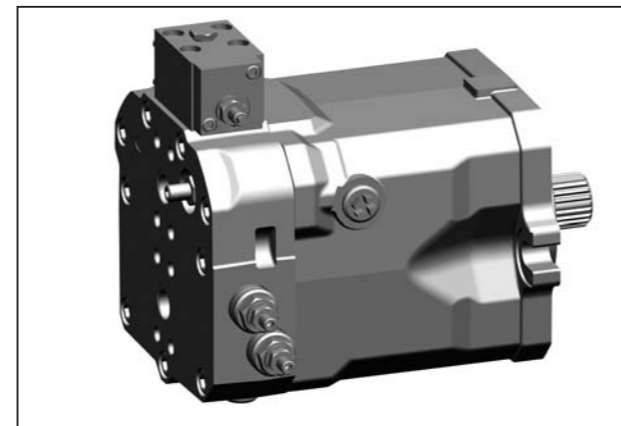
HMV-02 PTO



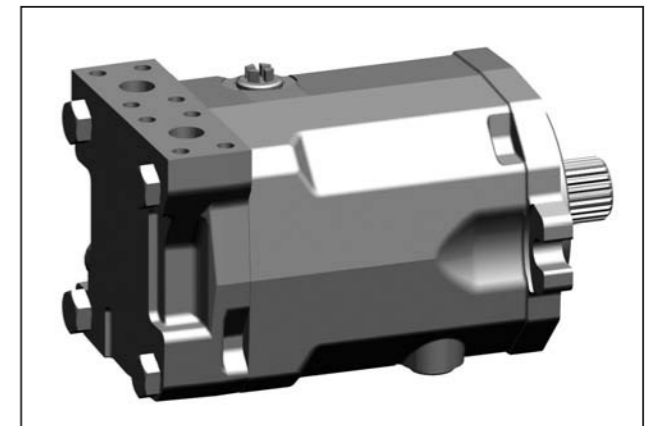
HMV-02 D



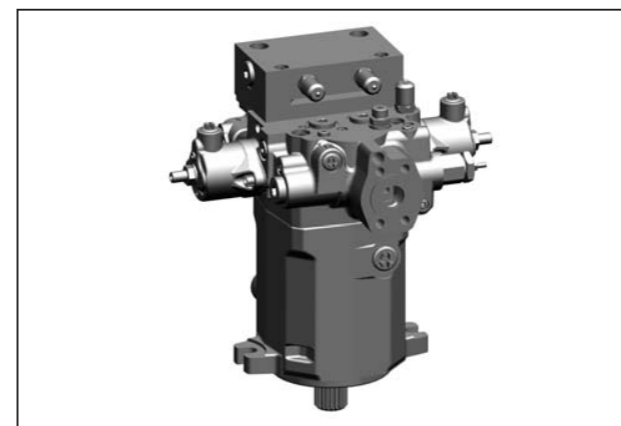
HMR-02



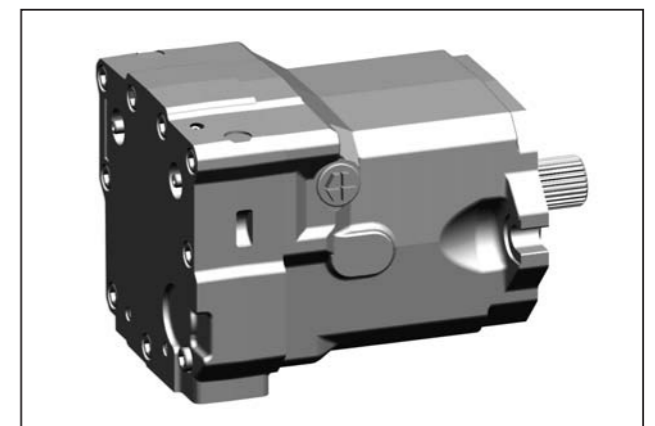
HMF-02



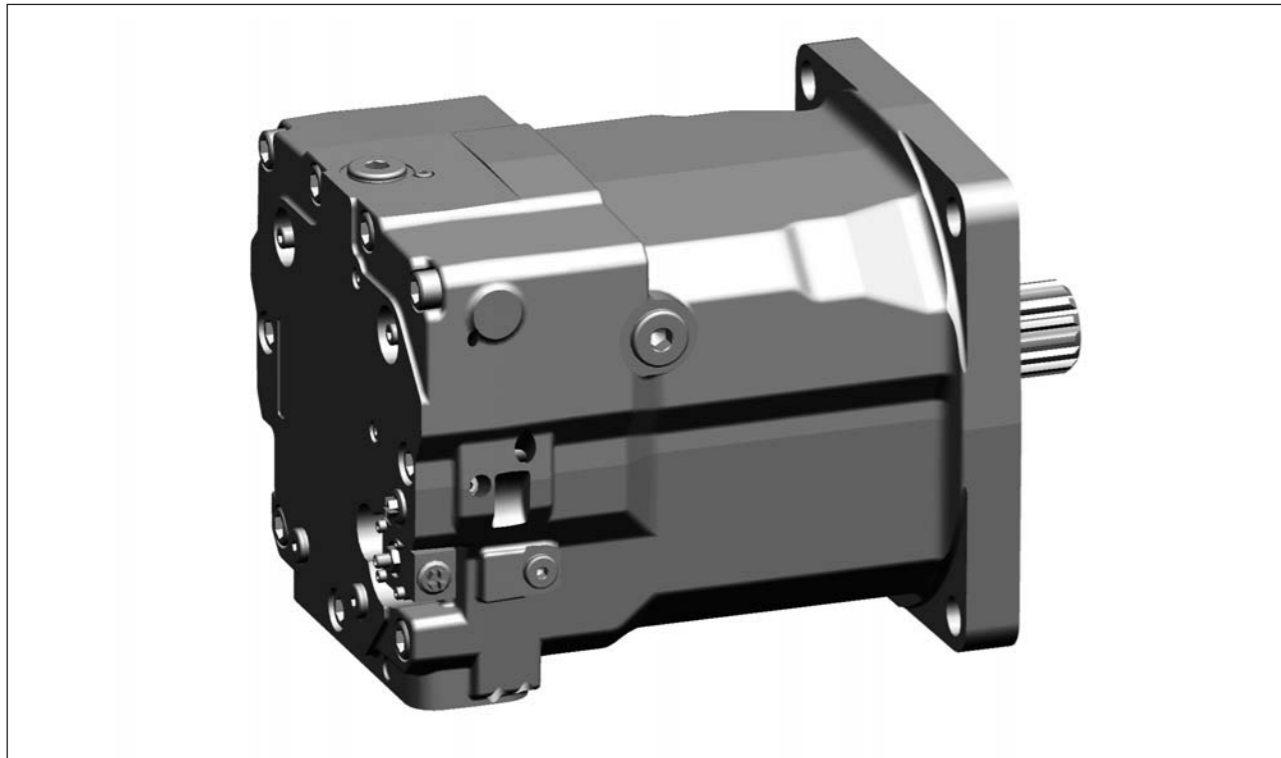
HMF-02 P



HMA-02



Motor types. HMV-02



Further features

- >> stepless or two position control
- >> electric or hydraulic control
- >> override pressure control possible
- >> brake pressure shut off possible
- >> can be set to 0 cm³/rev
- >> double motor available

Product benefits

- >> smooth low-speed operation
- >> high starting torque
- >> wide torque/speed conversion range
- >> highly dynamic response characteristics
- >> compact design
- >> high power density
- >> high reliability
- >> long service life
- >> simplified drive line

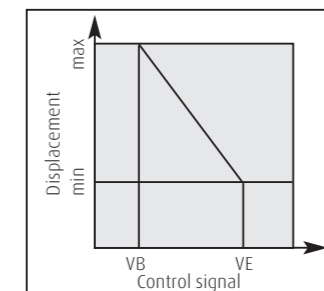
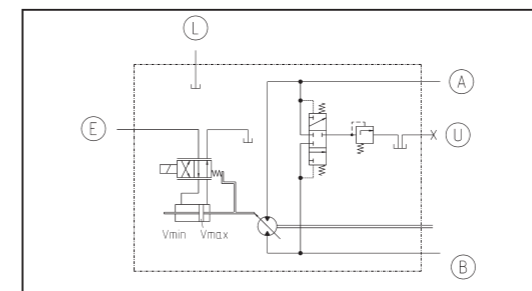
Motor types. HMV-02 stepless

Motors with stepless variable control are suitable for open and closed loop circuits. Without control signal they shift to maximum displacement V_{max} . Displacement control is hydraulic or via an electric proportional control signal. Servo pressure supply is optionally internal or external, see section Functions. Servo pressure supply. The following data are independent of the nominal motor size.

Stepless variable control features

External servo pressure supply	Minimum tripping	bar	20		
	Maximum permissible	bar	40		
Hydraulic control if $V_{min, eff} > V_{min, nominal}$ is the resolution lower	Control range	bar	$\Delta = 6$		
	Control begin	bar	7, 8, 9 or 9.5		
	Maximum permissible pressure	bar	40		
Electric control	Connector type		Hirschmann, AMP Junior Timer, 2-pin		
	Rated voltage = max. continuous voltage	V	12	24	
	Voltage type		DC voltage		
	Power input	W	15.6		
	Rated current = max. continuous current	mA	1300		
	Control current	Swash begin	mA	450	225
		Swash end	mA	1200	600
	Relative duty cycle	%	100		
	Protection class		IP 6K6K, part 9		
	Control types	Digital control via Pulse Width Modulation PWM with Linde transducers		100 Hz rectangle, Pulse duty ratio variable over control range	
Analog control with alternative transducers			Direct current (With or without superimposed dither signal for stability and reducing hysteresis, dither: ± 125 mA, 32-40 Hz, duty cycle ratio 1:1)		
Minimum response time with standard orifice with 20 bar servo pressure		S	0.5		

Stepless variable motor with electric displacement control and external servo supply pressure



- A, B Work port connections
- L, U Case drain/ vent connections
- E Servo supply pressure connections
- Mx Control solenoid
- VB Swash begin
- VE Swash end

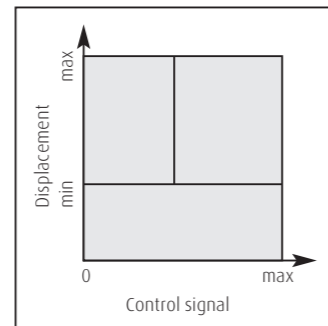
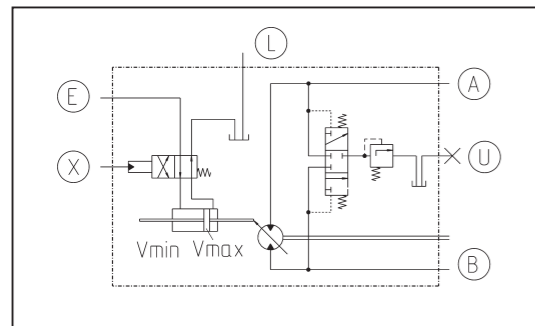
Motor types. HMV-02 H2 and E2 two position

Two position motors are suitable for open and closed loop operation. Without control signal they are set to maximum displacement V_{max} . Adjustment between V_{min} and V_{max} is smooth and with short response time. The required switching signal can optionally be hydraulic or electric, the servo pressure supply internal or external, see section Functions. Servo pressure supply. The following data are independent of the rated motor size.

Two position control features

External servo pressure supply	Minimum tripping		bar	20	
	Maximum permissible tripping		bar	40	
Hydraulic control	Shifting pressure	Minimum tripping	bar	20	
		Maximum permissible tripping	bar	40	
Electric Control	Connector type		Hirschmann, AMP Junior Timer, 2-pin		
	Rated voltage = max. continuous voltage		V	12	24
	Voltage type		DC voltage		
	Power input (cold)		W	≤ 26	
	Relative duty cycle		%	100	
	Protection class		IP 6K6K, part 9		
Minimum response time with standard orifice with 20 bar servo pressure			S	0.5	

Two position motor with hydraulic control pressure and external servo supply pressure



- A, B Work port connections
- L, L1, U Case drain/ vent connections
- E Servo supply pressure connection
- X Control connection

Motor types. HMV-02 EH1P stepless with pressure override

This motor is used primarily for closed loop operation together with speed-dependent hydraulic pump, type HPV-02 CA. Alternatively, with hydraulically or electro-hydraulically pilot-operated drives for which a high pressure regulating function is also required. Without control signal the motor shifts to maximum displacement V_{max} . Stepless variable control to lower displacement is hydraulic, with control pressure generated by the speed dependent pump. The motor is also equipped with a system pressure override which, at a predefined setting, automatically increases its displacement in response to system related torque demand. The following data are independent of the rated motor size.

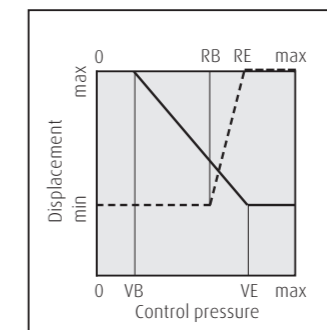
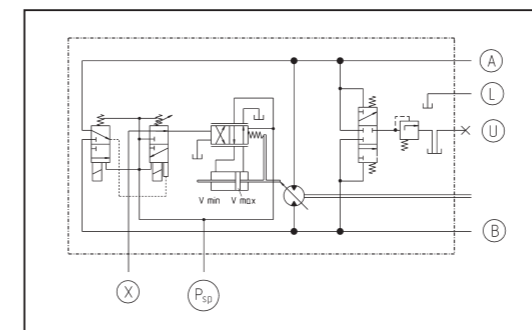
Features of stepless variable control with pressure override

Hydraulic control signal	Control pressure range		bar	8 to 14	
	Maximum permissible pressure		bar	40	
Hydraulic pressure override	Regulation begin pressure adjustable, please specify with order		bar	190-260	
	Regulation end pressure		bar	5% above regulation begin pressure	
Electric control signal	Connector type		Hirschmann, AMP Junior Timer, 2-pin		
	Rated voltage = max. continuous voltage		V	12	24
	Voltage type		DC voltage		
	Power input (cold)		W	≤ 26	
	Relative duty cycle		%	100	
	Protection class		IP 6K6K, part 9		
Minimum response time with standard orifice with 20 bar servo pressure			S	0.5	

Auxiliary functions

- >> Electric V_{max} control, independent of signal pressure, for maximum displacement motor operation
- >> Electric brake pressure shut off for controlled deceleration

Stepless variable displacement control motor with pressure override, electric maximum displacement override, and brake pressure shut off.

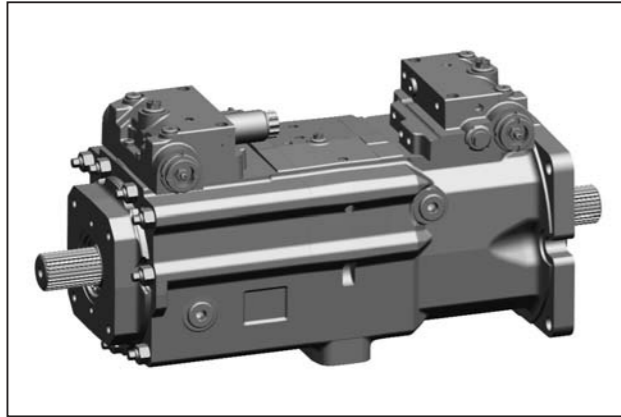


- A, B Work port connections
- L, U Case drain/ vent connections
- X Pressure connection for infinitely variable control
- M1 Solenoid for maximum displacement override
- M2 Solenoid for brake pressure shut off
- VB Swash begin
- VE Swash end
- RB Start of pressure override
- RE End of pressure override
- Operating pressure
- Control pressure

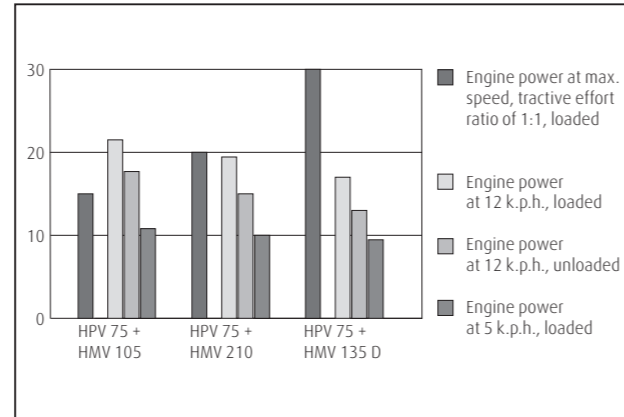
Motor types. HMV-02 D double motor

The double motor consists of two Series 02 variable motors arranged back-to-back. In addition to a wide torque/speed conversion range it offers the option of direct installation in the drive line, since one or two shaft ends are optionally available for torque output. Noise emission and fuel consumption are reduced because no transfer gearbox is required. At the same time the overall efficiency increases. The performance comparison diagram shows the required drive capacity for different design variants at 4 operating points.

HMV-02 D



Performance comparison



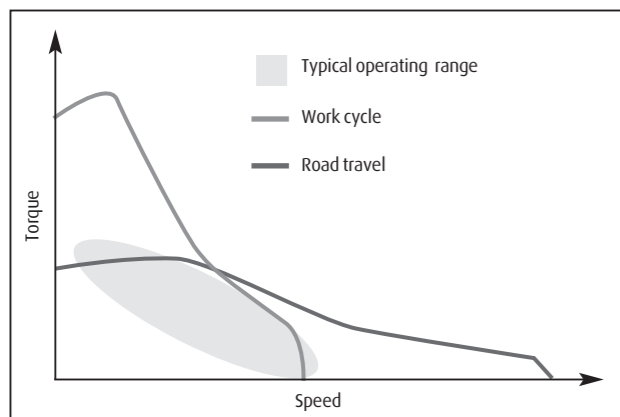
Further features

- >> two HMV-02 arranged back-to-back
- >> connection for high pressure, servo and control pressure for each motor
- >> motor control optionally through 1 signal or 2 separate signals
- >> both motors can be set to 0 cm³/rev
- >> possible conversion ratio 1:6
- >> optionally 2 shaft ends for direct installation in the drive line

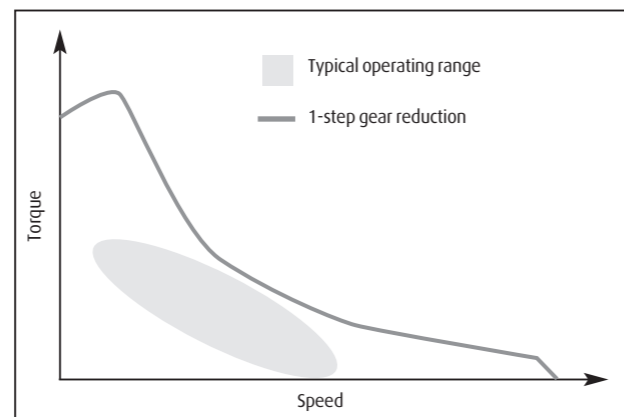
Product benefits

- >> wide conversion range for stepless acceleration
- >> simplified drive line
- >> high tractive effort and high terminal speed
- >> highly dynamic response characteristics
- >> high starting torque

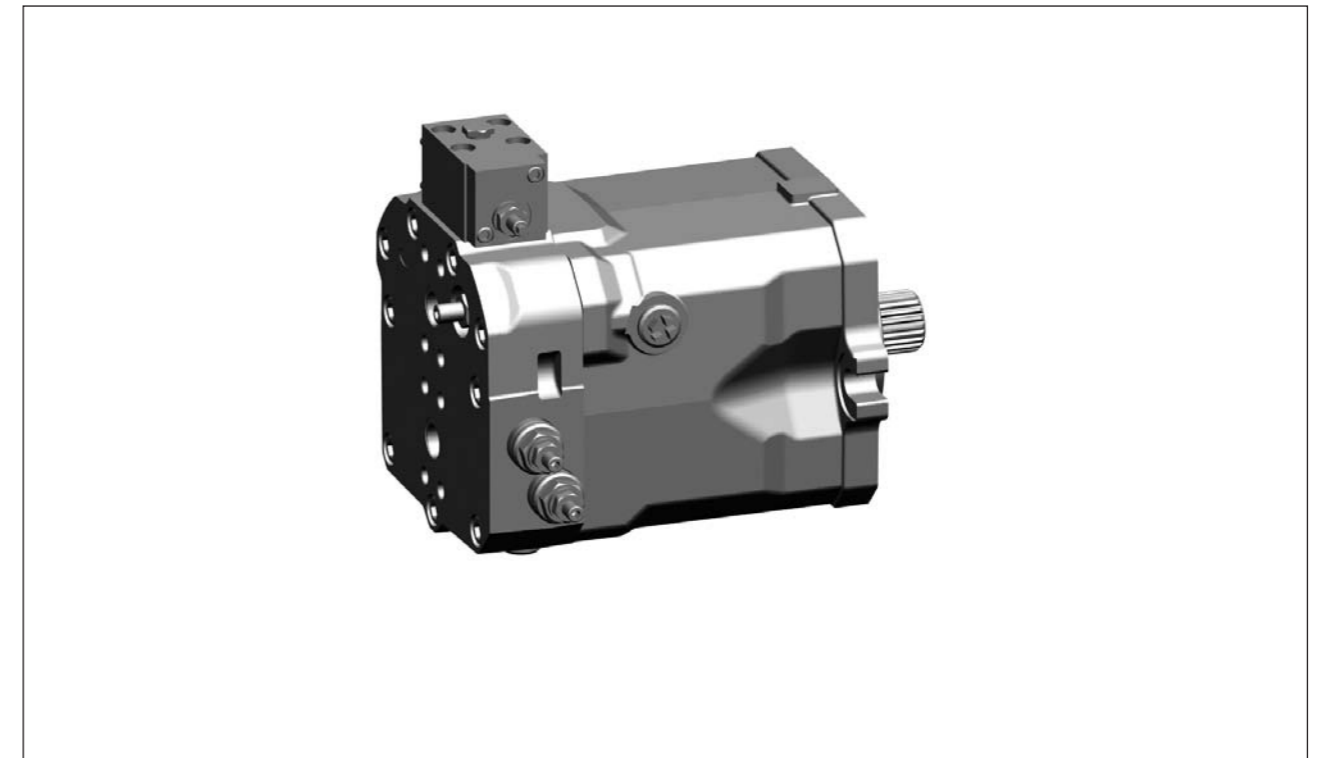
2-position gearbox w/ conventional transmission



Stepless with double motor



Motor types. HMR-02



Further features

- >> optionally with purge valve for circuit and case flushing in closed loop circuit
- >> system pressure regulation, no external control lines required
- >> brake pressure shut off for closed loop circuit
- >> counterbalance (brake) valve CBV optional

Product benefits

- >> smooth low-speed operation
- >> high starting torque
- >> wide conversion range
- >> compact design
- >> high power density
- >> high reliability
- >> long service life
- >> highly dynamic response characteristics
- >> simplified drive line

Motor types. HMR-02

Linde regulating motors are suitable for open and closed loop operation. They are high-pressure regulated and shift to minimum displacement V_{min} at system pressures below the regulation begin point. When the defined high pressure regulation set point is reached, the motor smoothly increases displacement to match the torque required by the system. The following data are independent of the rated motor size.

Typical equipment options

- >> Open loop circuit. Secondary (crossline relief) valves or counterbalance (brake) valves
- >> Closed loop circuit. Electric brake pressure shut off

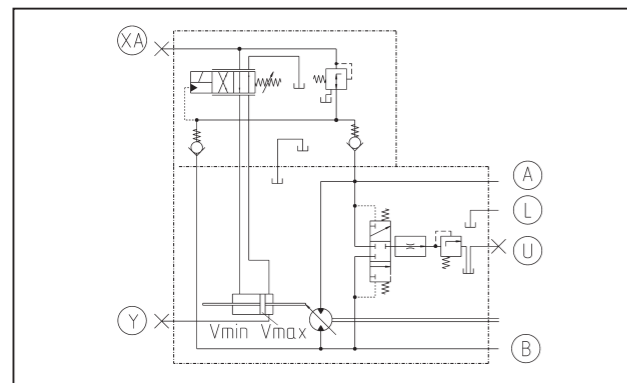
Regulating motor features

Hydraulic regulation	Regulation begin pressure adjustable, please specify with the order	bar	190 to 260	
	Regulation end pressure	bar	5% above regulation begin pressure	
Pneumatic V_{max} override control	Shift pressure min/ max	bar	4 to 8	
Hydraulic V_{max} override control	Shift pressure min/ max Low pressure	bar	20 to 30	
	Shift pressure min/ max High pressure	bar	30 to 420	
Electric control signal	Connector type		Hirschmann, AMP Junior Timer, 2-pin	
	Rated voltage = max. continuous voltage	V	12	24
	Voltage type		DC voltage	
	Power input (cold)	W	≤ 26	
	Relative duty cycle	%	100	
	Protection class		IP 6K6K, part 9	

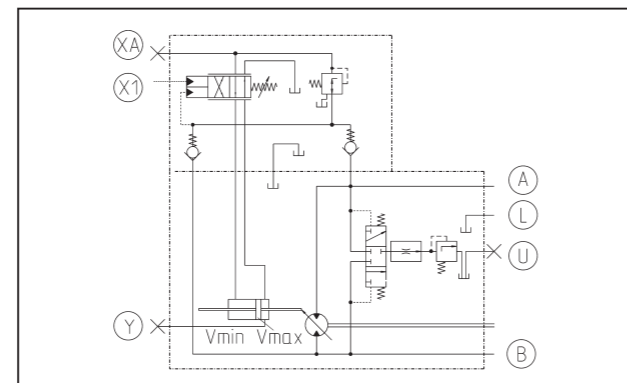
V_{max} control

The additional V_{max} control enables fixed displacement motor operation independent of the control pressure.

Regulating motor with electrical V_{max} override control

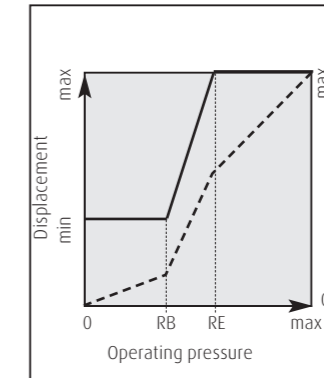
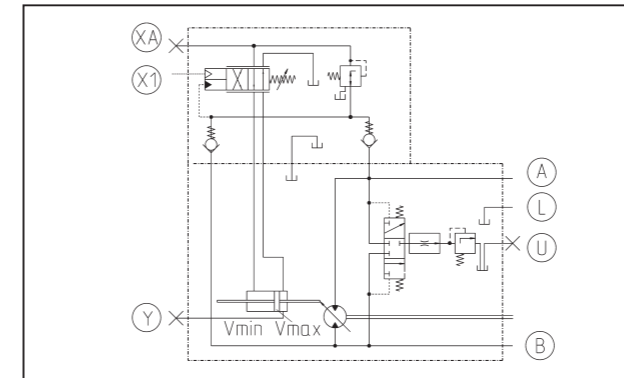


Regulating motor with hydraulic HP V_{max} override control



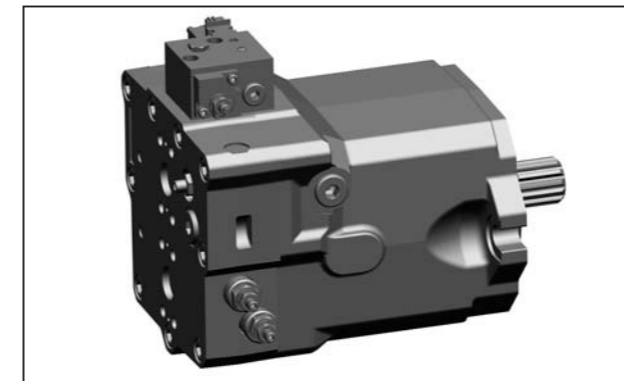
Motor types. HMR-02

Regulating motor with pneumatic V_{max} override control

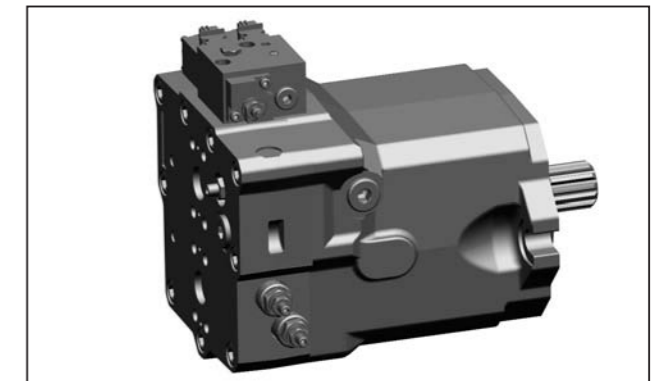


- A, B Work port connections
- L, U Case drain/ vent connections
- XA, Y Gauge ports
- RB Regulation begin
- RE Regulation end
- Drive torque
- Control pressure

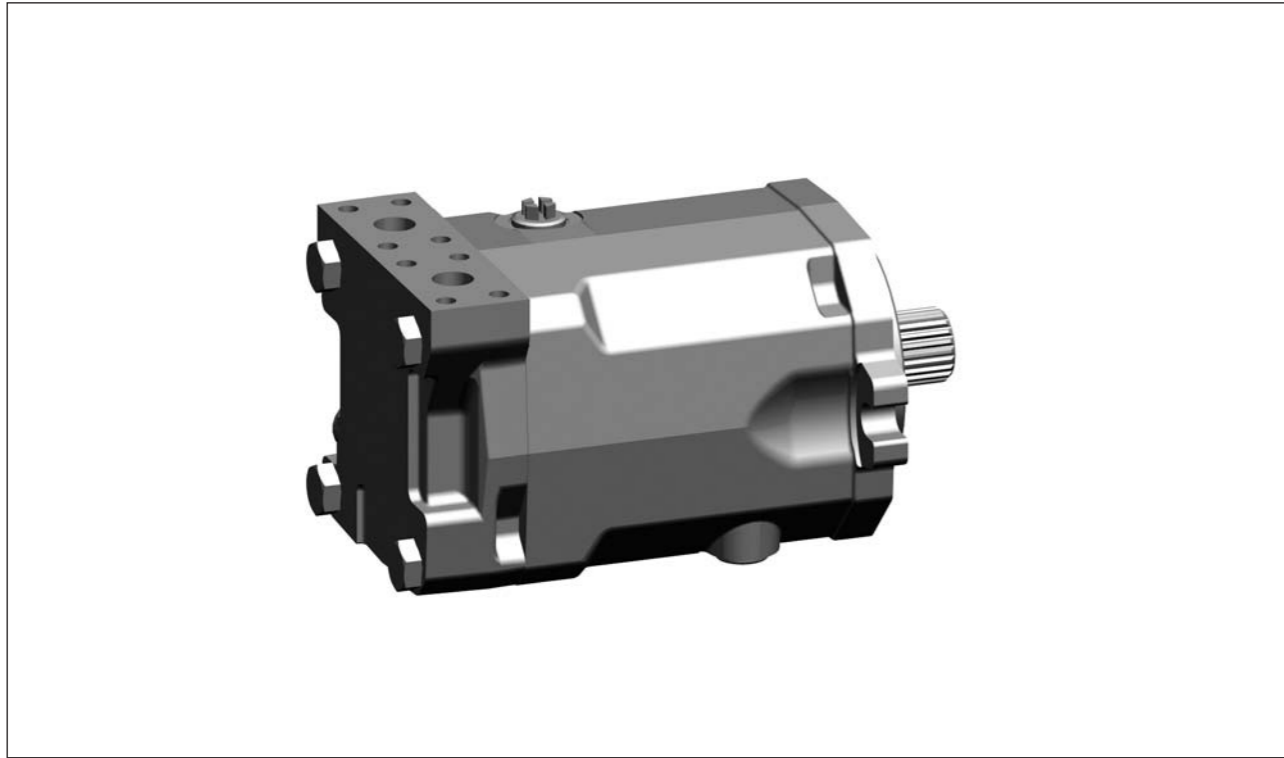
HMR-02 with override electric maximum displacement override



HMR-02 with electric maximum displacement and brake pressure shut off



Motor types. HMF-02



Further features

- >> optimised start-up and low-speed characteristics
- >> optionally with purge valves for purge and case flushing
- >> fixed and dual setting secondary valves optional

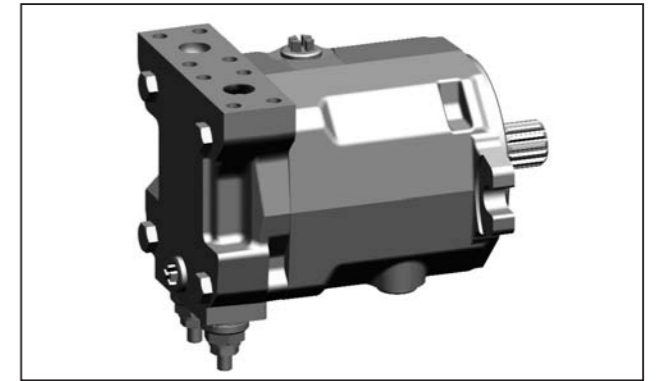
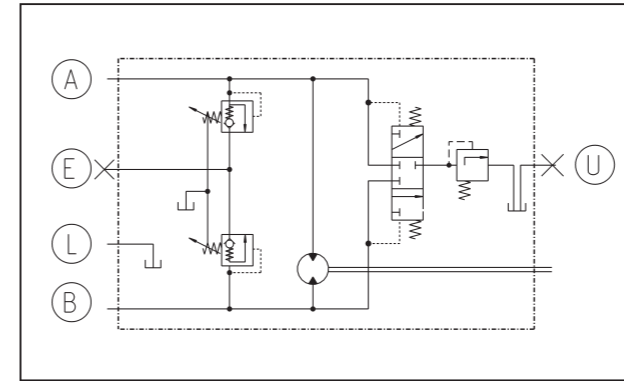
Product benefits

- >> smooth low-speed operation
- >> high starting torque
- >> compact design
- >> high power density
- >> high reliability
- >> long service life

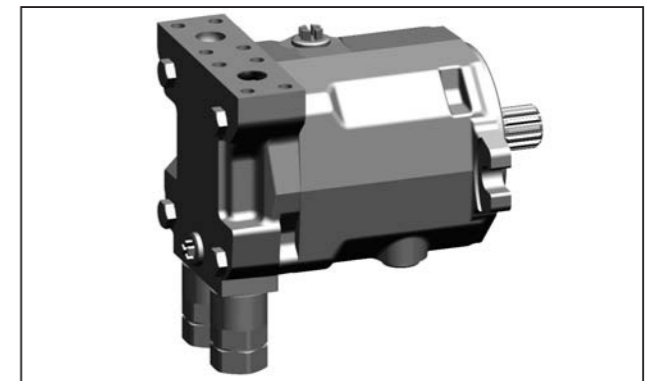
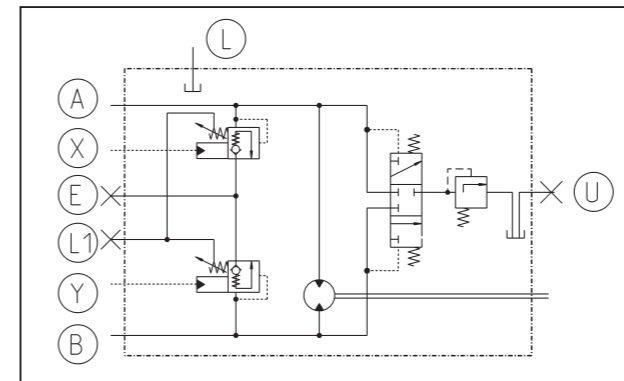
Motor types. HMF-02

The HMF-02 motor is a high-pressure fixed displacement motor for open and closed loop operation. Secondary valves enable customised definition of soft motor start-up and slowdown. With dual setting secondary valves the maximum acceleration and braking torque is additionally available. The settings and shifting ranges can be adjusted according to project-specific requirements, see section Function. Secondary protection and HMF-02 P.

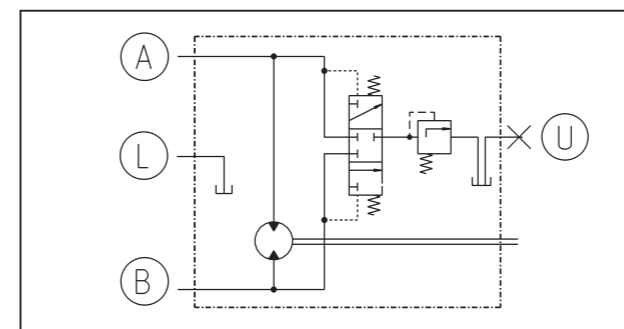
Fixed displacement motor with crossline relief valves fixed setting



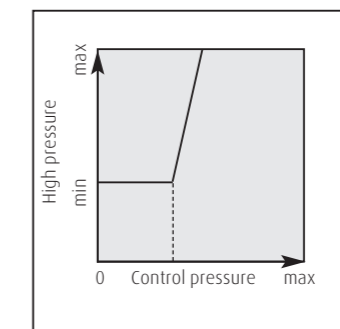
Motor with dual pressure crossline relief valves



Fixed displacement motor HMF-02



Pressure setting of the dual pressure relief valve

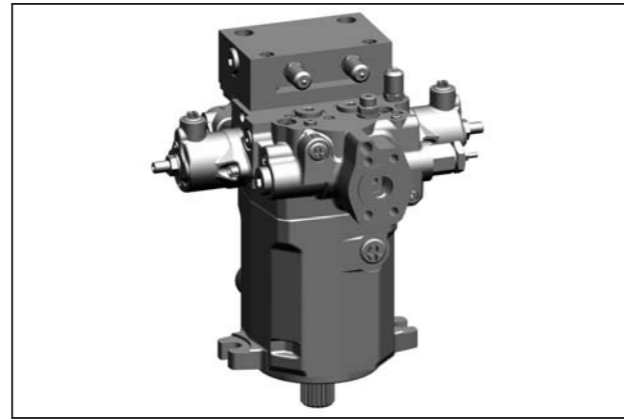
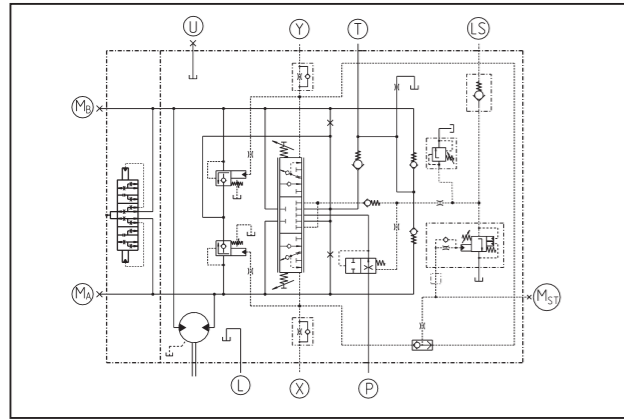


- A, B Work port connections
- L, L1, U Case drain/ vent connections
- X, Y Control connections for dual pressure crossline relief valve
- E Make up connection

Motor types. HMF-02 P

The HMF-02 motor is a high-pressure fixed displacement motor for open loop operation. With integrated LS directional control valve and TC torque control it combines the benefits of the Series 02 with all auxiliary functions typically required for application in swing and winch drives.

HMF-02 P with anti-reaction valve



Further features

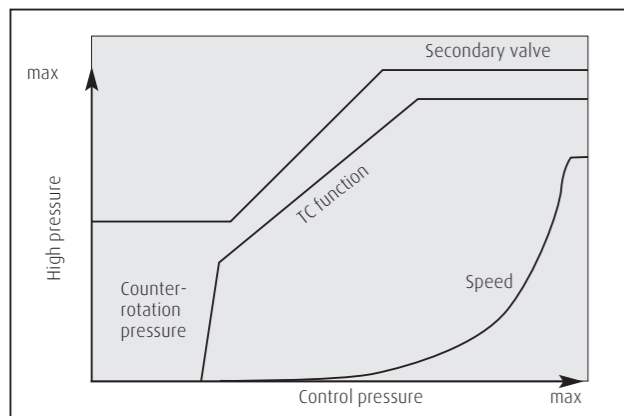
- >> directional control valve function
- >> torque control function
- >> HP valves with controllable characteristic curve
- >> priority function
- >> secondary protection combined with make-up function
- >> purge and case flushing function

Product benefits

- >> smooth low-speed operation
- >> high starting torque
- >> torque and speed control
- >> controllable counter-rotation
- >> compact design
- >> high power density
- >> high reliability
- >> long service life

TC function

For powerful and dynamic application in swing drives the TC function enables control pressure-dependent acceleration. Once the maximum rotating speed is reached, torque control is superimposed and pressure level is reduced for energy-saving operation. If the control valve is reset to the neutral position, no additional control signal is generated and the rotary motion slows down uniformly. Active counter-rotation is possible with controllable secondary valves. A counteractive control signal is generated, and the rotary motion is decelerated along the characteristic counter-rotation pressure curve.

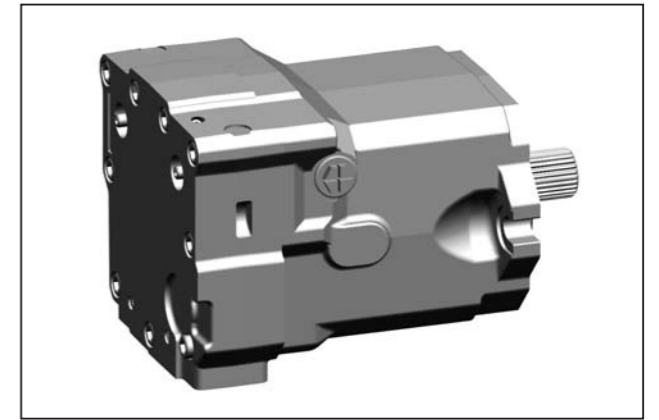
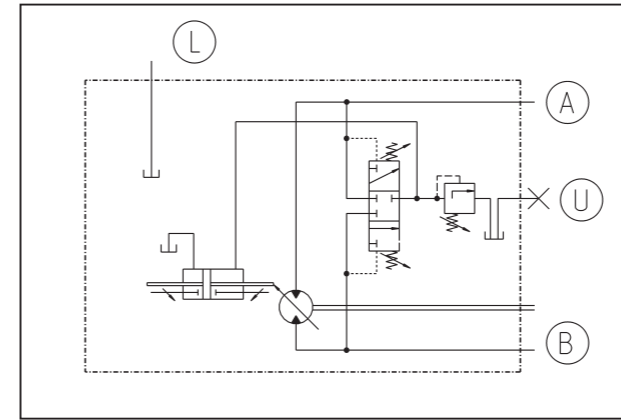


P, T Work port connections
 L, U Case drain/ vent connections
 LS LS-pressure connection
 M Gauge ports

Motor types. HMA-02

The HMA-02 motor is a high-pressure motor with adjustable displacement for open and closed loop operation. For application which requires dependent on the situation a reduced or increased displacement, the HMA-02 offers the expected flexibility. Since the displacement can be adjusted on request stepless at a screw. For a well-adjusted torque.

HMA-02 the adjustable fixed displacement motor



A, B Work port connections
 L, U Case drain/ vent connections

Dimensions. HMV-02

Rated size	55	75	105	135	165	210	280
Flange profile	2-hole mounting flange						4-hole
	SAE C			SAE D		SAE E	
Shaft profile in accordance with ANSI B92.1	16/32 spline pitch						8/16
	21 teeth		23 teeth	27 teeth		15 teeth	
D1 [mm]	127			152.4		165.1	
B1 [mm]	181			228.6		224.5	
B2 [mm]	208			258		269	
B3 [mm]	86	95	96	108	125	134	156
B4 [mm]	95		96	108	125	134	156
B5 [mm]	86	95	96	108	125	in development	
B6 [mm]	85	95	96	108	125	in development	
B7 [mm] with electric override control	-	180	181	193	in development		
B8 [mm] with electric override control	-	180	181	193	in development		
H1 [mm]	80	86	91	96	98	135	
H2 [mm]	83	93	99	103	98	135	
H3 [mm]	84	93	95	108	120	134	151.5
H4 [mm]	90	105	106	114	132	133	152.5
H5 [mm]	84	93	96	107	118	in development	
H6 [mm]	90	105		114	132	in development	
H7 [mm] with electric override control	-	88			in development		
H8 [mm] with electric override control	-	92			in development		
L1 [mm]	41	56		75			
L2 [mm]	212	226	247	270	314	336	381
L3 [mm] control	hydraulic control	33			5	5	8
	electric control	75			58	55	59
L4 [mm]	217	231	252	275	305	in development	
L5 [mm] control	hydraulic control	18			5	in development	
	electric control	70			58	in development	
L6 [mm] with electric override control	-	33			in development		
L7 [mm] with electric override control	-	28			in development		
L8 [mm] with electric override control	-	80			in development		
L, U	M22x1.5			M27x2		M33x2	
E Connection for external servo supply pressure feed				M14x1.5			
X Connection for hydraulic control				M14x1.5			
M, M1 Solenoid for electric control	see section Motor types. HMV-02 stepless						
M2 Solenoid for brake pressure shut off	see section Motor types. HMV-02 stepless						

Metric connection thread according to ISO 6149

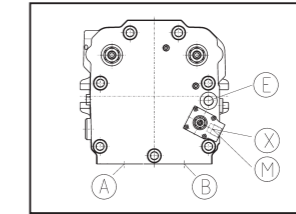
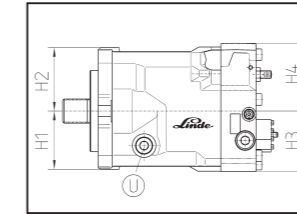
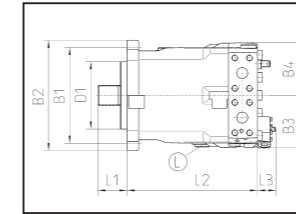
Locking thread for the SAE high pressure-connections, metric according to ISO 261

Hexagon socket head cap screws according to ISO 4762

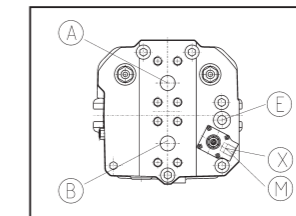
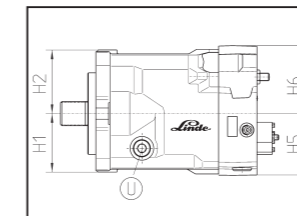
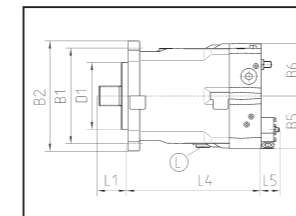
Further threads, dimensions and versions with speed sensor are available on request

Dimensions. HMV-02

Radial high pressure-connections

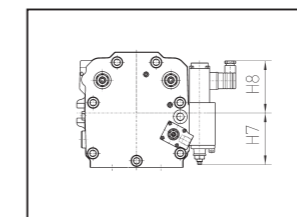
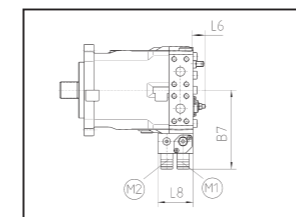


Axial high pressure-connections

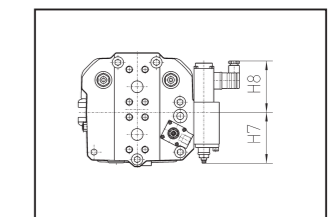
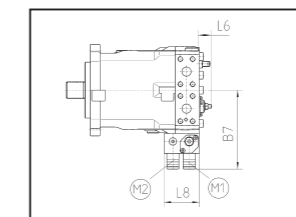


HMV-02 with electric override control.

Radial high pressure-connections

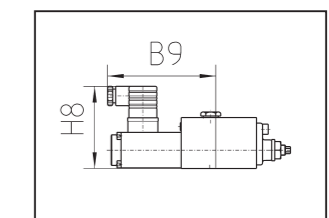
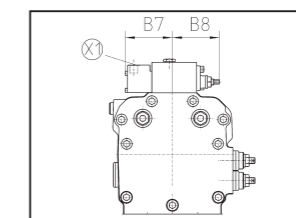
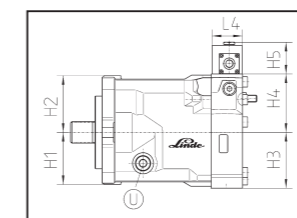
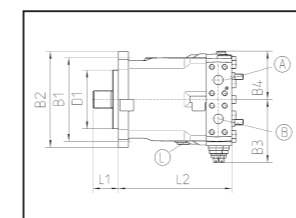


Axial high pressure-connections

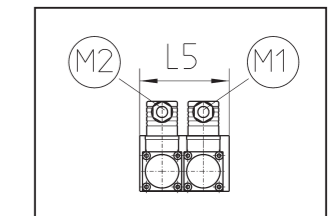
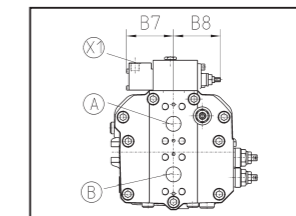
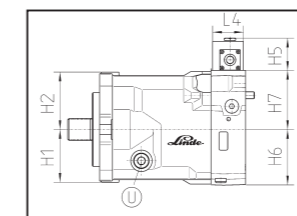
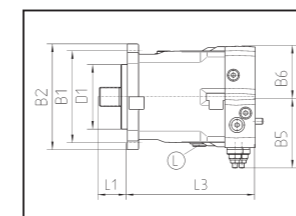


Dimensions. HMR-02

Radial high pressure-connections



Axial high pressure-connections



Dimensions. HMR-02

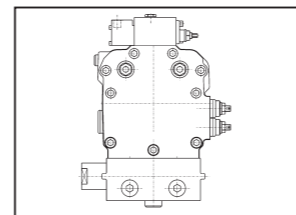
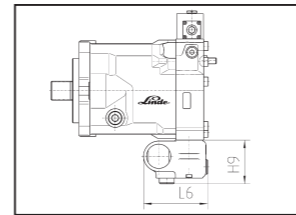
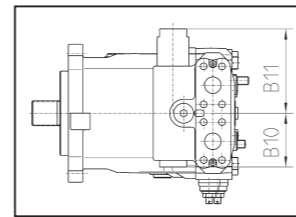
Rated size	75	105	135	165	
Flange profile	2-hole mounting flange				
	SAE C		SAE D		
Shaft profile in accordance with ANSI B92.1	16/32 spline pitch				
	21 teeth	23 teeth	27 teeth		
D1 [mm]	127		152.4		
B1 [mm]	181		228.6		
B2 [mm]	208		256		
B3 [mm] secondary relief valve	without	95	99	108	-
	with	135	136	140	-
B4 [mm] secondary relief valve	without	95	105	108	-
	with	12	105	114	-
B5 [mm] secondary relief valve	without	95	99	108	
	with	135	139	141	148
B6 [mm]	102	105	114	125	
B7 [mm]	pneumatic	74		-	
	hydraulic	62		46	
B8 [mm]	78				
B9 [mm]	103				
B10 [mm]	89			169	
B11 [mm]	130			107	
H1 [mm]	86	91	96	98	
H2 [mm]	93	99	100	105	
H3 [mm]	93	98	108	-	
H4 [mm]	102		110	-	
H5 [mm]	56				
H6 [mm]	91	96	107	118	
H7 [mm]	102	107	109	125	
H8 [mm]	81				
H9 [mm]	85			102	
L1 [mm]	56		75		
L2 [mm]	229	247	270	-	
L3 [mm]	231	252	275	304	
L4 [mm]	53				
L5 [mm] regulator with el. maximum displacement override and brake pressure shut off	80				
L6 [mm]	127			120	
L, U	M22x1.5			M27x2	
X1 connection for hydraulic or pneumatic max. displacement override	M14x1.5				
M1 solenoid for electric maximum displacement override	see section Motor types. HMR-02				
M2 solenoid for brake pressure shut off	see section Motor types. HMR-02				

Metric connection thread according to ISO 6149
 Locking thread for the SAE high pressure-connections, metric according to ISO 261
 Hexagon socket head cap screws according to ISO 4762

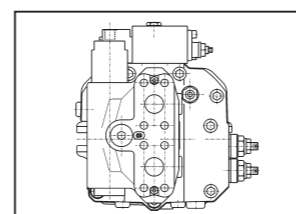
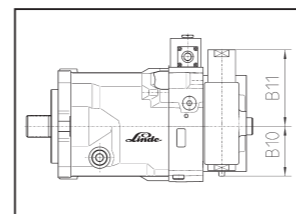
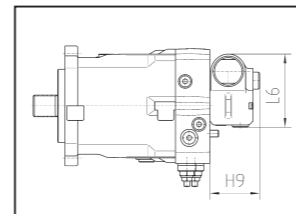
Further threads, dimensions and versions with speed sensor are available on request

HMR-02 with brake valve

Radial HP-connections



Axial HP-connections



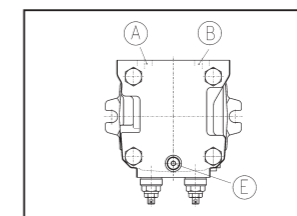
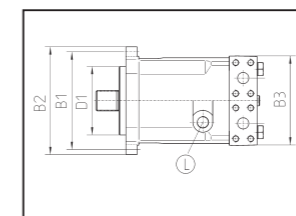
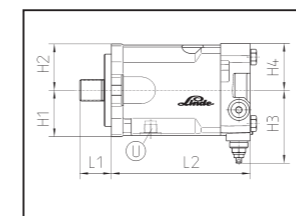
Dimensions. HMF-02

Rated size	28	35	50	75	105	135	165	210	
			Please, take the dimensions of the HMF 55-02 P from the installation drawing				HMA	HMA	
Flange profile	2-hole mounting flange							4-hole	
	SAE B		SAE C			SAE D		SAE E	
Shaft profile in accordance with ANSI B92.1	16/32 spline pitch							8/16	
	15 teeth		21 teeth		23 teeth	27 teeth		15 teeth	
D1 [mm]	101.6		127			152.4		165.1	
B1 [mm]	146		181			228.6		224.5	
B2 [mm]	162		200			250	258	269	
B3 [mm]	146			166			250	268	
B4 [mm]	149			169			250	268	
H1 [mm]	61	70	73	82	86	98	135		
H2 [mm]	61	70	73	82	86	98	135		
H3 [mm] crossover relief valves	without	67	72	78	83	89	120	134	
	with fixed setting	108	116	119	128	137	-	-	
	with dual pressure setting	129	137	140	149	158	-	-	
H4 [mm]	69		79	83	88	132	133		
H5 [mm]	64	69	75	80	86	132	133		
L1 [mm]	41	56			75				
L2 [mm]	193	202	229	254	277	314	336		
L3 [mm]	191	200	227	252	275	305	336		
L, U	M22x1.5						M27X2		
E connection for anti-cavitation oil supply	M18x1.5			M22x1.5			-	-	

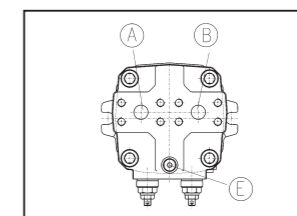
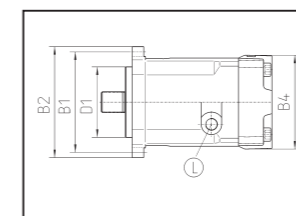
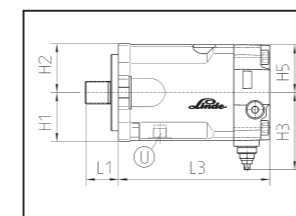
Metric connection thread according to ISO 6149
 Locking thread for the SAE high pressure-connections. Metric according to ISO 261
 Hexagon socket head cap screws according to ISO 4762

Further threads are available on request

Radial high pressure-connections



Axial high pressure-connections



How to reach us.

Linde Hydraulics. Sales and service partners.

Internet www.linde-hydraulics.com

Phone +49.60 21.99-42 01
+49.60 21.99-0 switchboard

Fax +49.60 21.99-42 02
+49.60 21.99-42 30

Email info@linde-hydraulics.com

Mail Linde Material Handling GmbH
Linde Hydraulics

Grossostheimer Str. 198
63741 Aschaffenburg

P.O. Box 100136
63701 Aschaffenburg

LHY.HMF/A/V/R.05/07.e

Linde Hydraulics. Sales companies.

- (E) Linde Material Handling Ibérica S. A.
Avda. Prat de la Riba, 181, 08780 Pallesa (Barcelona), phone +34.9 36 63 32 32, hidraulica@linde-mh.es
- (F) Fenwick Linde, Activité Linde Hydraulique
1, rue du Maréchal de Lattre de Tassigny, 78854 Elancourt Cedex, Telefon +33.1 30 68 46 47, contact.hydraulics@fenwick-linde.fr
- (GB) Linde Hydraulics Ltd.
7, Nuffield Way, Abingdon, Oxon OX14 1RJ, phone +44.12 35.52 28 28, enquiries@lindehydraulics.co.uk
- (I) Linde Material Handling Italia SPA.
Via Luguzzone, 21020 Buguggiate (VA), phone +39.03 32.877 111, vendita.idraulica@linde-mh.it
- (USA) Linde Hydraulics Corporation
P.O.Box 82, 5089 Western Reserve Road, Canfield Ohio 44 406, phone +1.330.5 33 68 01, info@lindeamerica.com
- (BR) Linde Hydraulics do Brasil
Rua Anhanguera, 897, Jd. Piratininga - CEP 06230-110, Osasco SP, phone +55.11.36 04 47 56, wilian.jorge@linde-mh.com.br
- (VRC) Linde (China) Forklift Truck Corporation Ltd., Division Hydraulics
No. 89 Jinshang Road, 361009 Xiamen, phone +86.592.55 33 291, haas@linde-china.com

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