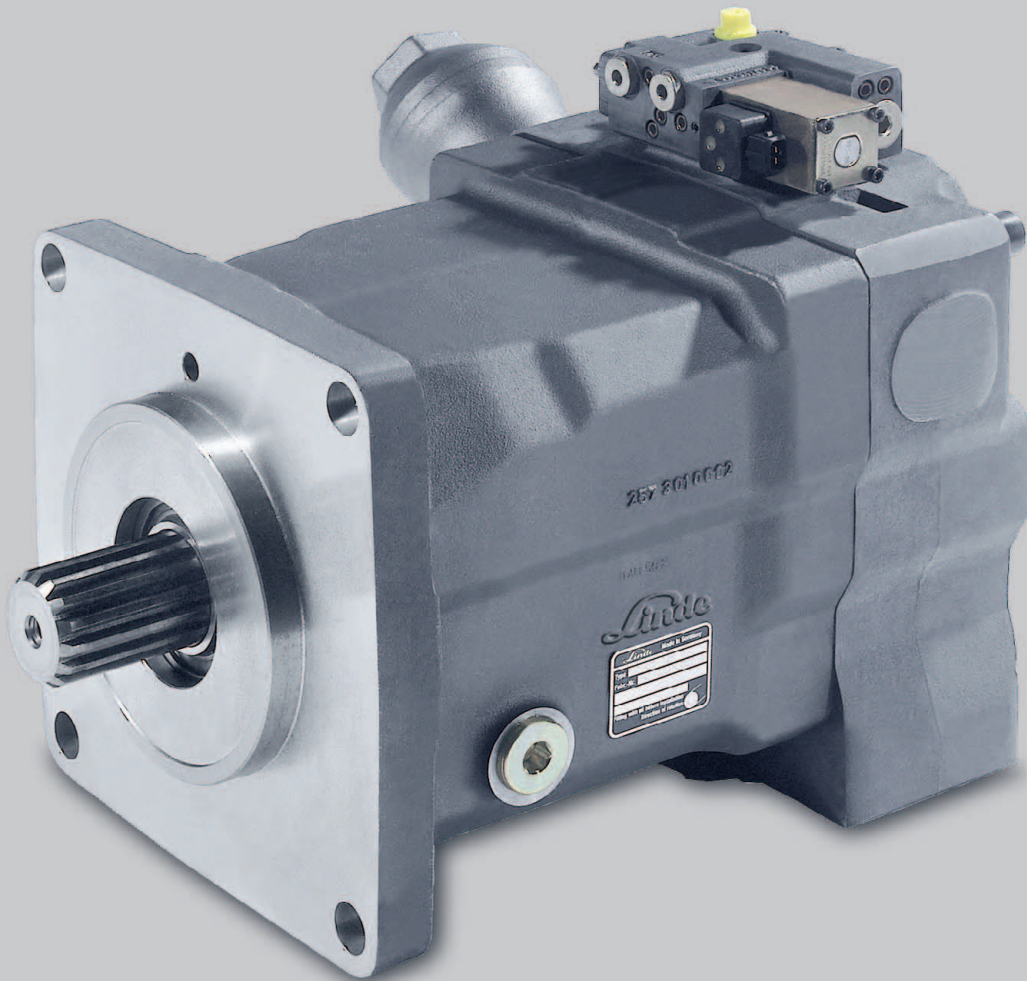
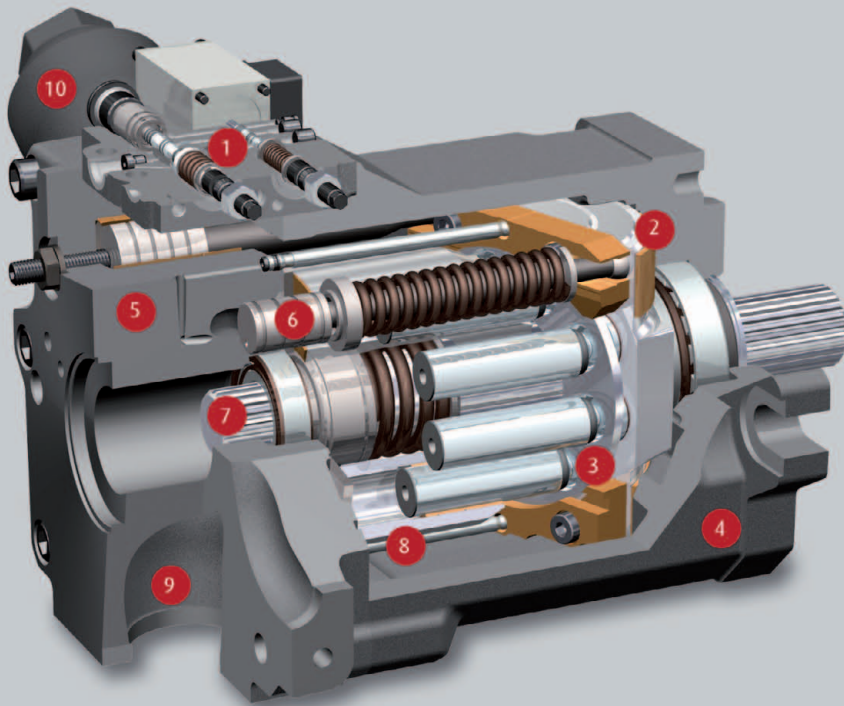


HPR-02.
Self-regulating pump
for open loop operation.

Linde Hydraulics

Linde





- 1 **LS-controller**
optimum utilisation of power
- 2 **swash plate**
hydrostatic bearing
- 3 **piston-slipper assembly**
21° swash angle
- 4 **housing**
one-piece design for high rigidity
- 5 **valve plate housing**
highly integrated
- 6 **two control pistons**
servo-controlled swash plate
- 7 **power take-off**
for mounting of additional pumps
- 8 **cylinder barrel**
compact due to 21° technology
- 9 **suction channel**
optimized suction capacity
without tank pressurization
- 10 **SPU**
reduced pressure pulsation
over the entire operating range

Design characteristics

- >> high pressure axial piston pump in swash plate design for open loop systems
- >> clockwise or counter clockwise rotation
- >> self-priming at high nominal speed
- >> higher rotating speed by tank pressurization or swash angle reduction
- >> adaptive noise optimization SPU
- >> decompression fluid is drained via pump housing for suction side stability
- >> exact and rugged load sensing controls
- >> SAE high pressure ports
- >> SAE mounting flange with ANSI or SAE spline shaft
- >> through shaft SAE A, B, B-B, C, D and E
- >> optional tandem and multiple pumps

Product advantages

- >> energy saving operation by "flow on demand" control
- >> dynamic response
- >> excellent suction up to rated speed
- >> noise optimization over the entire range of operation
- >> optimal interaction with Linde LSC-directional control valves and LinTronic
- >> compact design
- >> high power density
- >> high pressure rating
- >> high reliability
- >> long working life

Linde Hydraulics product range

Find the right products for your application.

Product range

| Product | | Application | Linde product name |
|------------------|-----------------------------|--------------------------------|--------------------|
| Pump | Self-regulating pump | open loop operation | HPR-02 |
| | Variable pump | closed loop operation | HPV-02 |
| Motor | Variable motor | closed and open loop operation | HMV-02 |
| | Regulating motor | closed and open loop operation | HMR-02 |
| | Fixed motor | closed and open loop operation | HMF-02 |
| | | open loop operation | HMF-02 P |
| Valve technology | LSC manifold plate | closed and open loop operation | HMA-02 |
| | | open loop operation | VT modular |
| | Monoblock | open loop operation | Monoblock |
| Electronics | Electronic control unit | closed and open loop operation | LINC |
| | Peripheral equipment | closed and open loop operation | |
| | Software | diagnosis and configuration | LinDiag® |

Content HPR-02.

| | | | |
|--|----|--|----|
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| Operational parameters | | >> H1L. LS with hydraulic override | 25 |
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| Noise reduction. SPU silencer | 10 | limitation and pressure cut-off | 30 |
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| >> E1L/H1L. LS with electric/hydraulic override | 23 | Contact | 48 |

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.

Overview of technical data

| | | | | | | | | | | | | | |
|---|--|-------------------------------|------------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-----|
| Rated Size | | | 55 | 75 | 105 | 135 | 165 | 210 | 280 | 105D | 125D | 165D | |
| | Maximum Displacement | cc/rev | 55 | 75.9 | 105 | 135.7 | 165.6 | 210.1 | 281.9 | 210 | 252 | 331.2 | |
| Speed | Max. operating speed Without tank pressuration | U/min | 2700 | 2500 | 2500 | 2350 | 2200 | 2100 | 2000 | 2450 | 2400 | 2150 | |
| Volume flow** | Max. oil flow | l/min | 148.5 | 189.8 | 262.5 | 318.9 | 364.3 | 441.2 | 563.8 | 514.5 | 604.8 | 712.1 | |
| Pressure | Nominal pressure | bar | 420 | 420 | 420 | 420 | 420 | 420 | 420 | 420 | 380 | 420 | |
| | Max. pressure*** | bar | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 500 | 420 | 500 | |
| | Perm. housing pressure | bar | 2.5 | | | | | | | | | | |
| Torque** | Torque ($\Delta p=420$ bar) | Nm | 368 | 507 | 702 | 907 | 1107 | 1404 | 1884 | 1404 | 1523 | 2214 | |
| Power** | Rated power at nominal pressure and max. operating speed | kW | 104.0 | 132.8 | 183.8 | 223.2 | 255.0 | 308.8 | 394.7 | 360.2 | 241.5 | 498.5 | |
| Response times Measured at fluid viscosity 20 cSt and input speed 1500 rpm | $V_{max} \rightarrow V_{min}$ Swashing at constant max. system pressure HP | HD 100 bar | ms | 120 | 120 | 120 | 140 | 150 | 200 | 300 | 200 | 140 | 150 |
| | | HD 200 bar | ms | 70 | 70 | 70 | 70 | 130 | 170 | 270 | 170 | 120 | 130 |
| | $V_{min} \rightarrow V_{max}$ Swashing from stand-by pressure and zero flow to system pressure HP | HD 100 bar | ms | 180 | 180 | 180 | 180 | 180 | 180 | 430 | 160 | 180 | 180 |
| | | HD 200 bar | ms | 160 | 160 | 160 | 160 | 160 | 160 | 350 | 160 | 160 | 160 |
| Permissible shaft loads | Axial | N | 2000 | | | | | | | | | | |
| | Radial | N | on request | | | | | | | | | | |
| Permissible housing temp. | Perm. housing temp. with min. perm. viscosity > 10 cSt | °C | 90 | | | | | | | | | | |
| Weights | HPR-02 without oil (approx.) | kg | 39 | 39 | 50 | 65 | 89 | 116 | 165 | 96 | 113 | 177 | |
| | Max. moment of inertia | $\text{kgm}^2 \times 10^{-2}$ | 0.79 | 0.79 | 1.44 | 2.15 | 3.41 | 4.68 | 8.34 | 2.88 | 2.95 | 6.88 | |

*) higher rotating speed by tank pressurization or swash angle reduction. See <<Suction speed>>

**) theoretical data of a single unit without efficiency effects

***) highest transient pressure, that can temporarily occur

Standard Linde-Typenschild

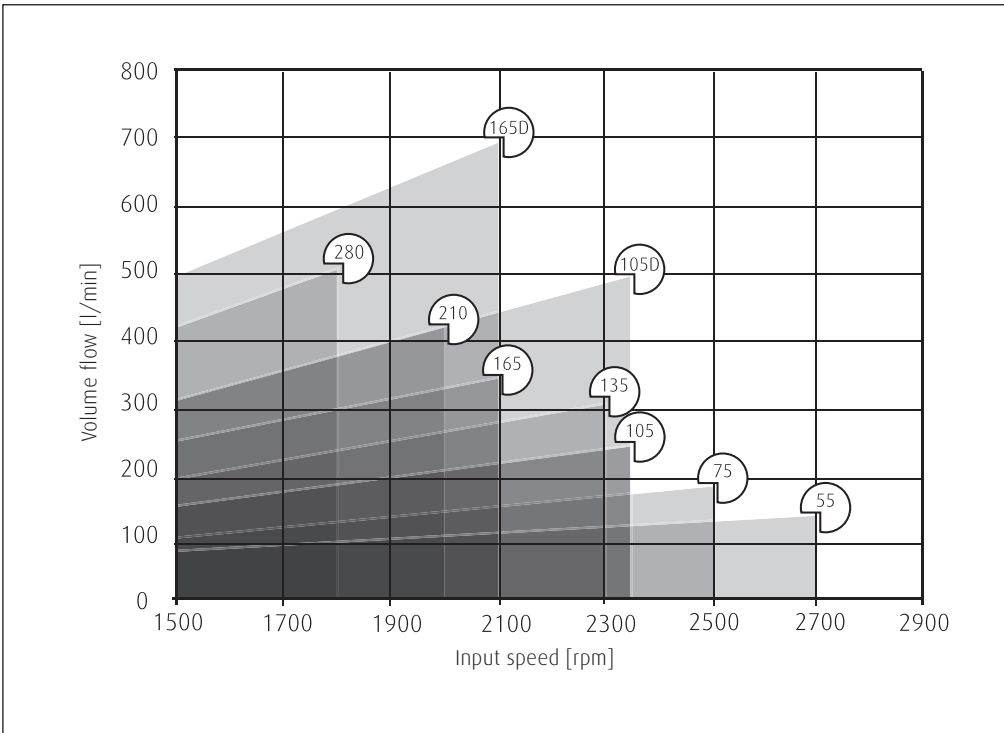
Each Linde Hydraulics unit features a name plate showing the type and the serial number. For a single order via „open variant“ a customer-specific number or free text with up to 15 characters can be stamped on the name plate.

| | | |
|------------|--------------------------|---|
| Type | HPR 105-02 R 2683 | Series 02 self-regulating pump, rated size 105 Right hand rotation The last 4 figures of the Bill of Material |
| Serial-No. | H2X 254 T 12345 | Type number of HPR-02 Letter indicating year of production Serial Number |
| Part No. | 12345678 | Free text field for up to 15 characters |

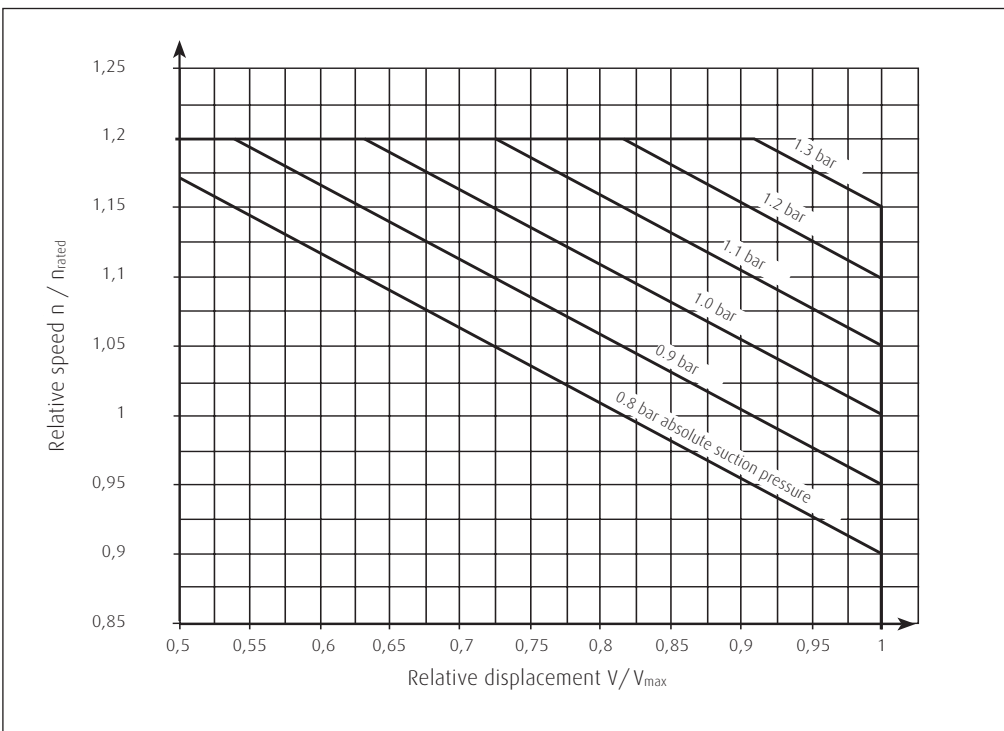


General technical data.

Selection diagram



Suction speeds



Operational parameters. Life time recommendations

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. Tank connection, filtration, mounting orientation

Tank connection

The leakage and decompression oil generated during pump operation is drained from the rotating group into the pump housing. Excessive housing pressure must be avoided through suitably dimensioned piping between the housing and the tank.

Filtration

High purity oil can extend the service time of the hydraulic system significantly. In order to guarantee long-term proper function and high efficiency of the hydraulic pumps the purity of the pressure fluid must comply with the following criteria.

| | | |
|---|--|---------------------------------------|
| >> 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 | purity class according to SAE AS 4059 |
| | 18/16/13 | corresponds to 8A/7B/7C |
| | 20/18/15 | 9A/8B/8C |

Mounting orientation

The preferred mounting orientation is generally horizontal. Pump configurations for vertical mounting with the shaft pointing upwards have an additional drain port "R" at the mounting flange. These units are available with certain combinations of features and have to be requested separately.

For further information concerning the installation of the unit please refer to the operating instructions manual.

Operational parameters. Pressure fluids

In order to ensure the functional performance and high efficiency of the hydraulic pumps 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 51524-2
- >> Biodegradable fluids in accordance with ISO 15380 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 or in special circumstances.

Viscosity recommendations

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

Linde LSC-System.

The Linde Synchron Control System (LSC-System) for open loop hydraulic circuits enables demand-orientated pump volume control based on load sensing technology (LS technology). A LSC-System compensates the effect of varying loads, varying numbers of actuators and different load levels at different actuators. This happens automatically, thereby making machine operation more convenient since, unlike in other systems, continuous corrective action is no longer required. The LSC-System enables high-efficiency hydraulic systems to be realized that are strictly orientated to the machine functions. Our application specialists will be happy to provide advice for individual machine configurations.

Functionality

- >> Demand-oriented pump control
- >> Excellent precision control characteristics without readjustment
- >> Exact reproducibility of machine movements through exact control of actuators
- >> Dynamic response characteristics
- >> Load-independent, synchronous movements of several actuators
- >> "Social" oil distribution even in the event of overload
- >> Automatic venting of directional control valve end caps
- >> Optimum movement continuity even for combined movements

Further optional functions such as

- >> Priority control of individual actuators
- >> Output control
- >> High-pressure protection
- >> Regeneration function
- >> Combined function shuttle valve
- >> Load holding function

Machine equipment

- >> Customized system design for optimum implementation of customer requirements
- >> Optimum utilization of the installed power with simultaneous improvement of energy consumption
- >> High flexibility through manifold plates
- >> Compact, integrated solutions
- >> Modular design of valve sections
- >> Add-on cylinder valves for direct and fast cylinder supply, no additional hose burst protection required
- >> Optimized piping

Benefits

- >> Perfect matching of the individual operating functions for customized machine characteristics
- >> Efficient and dynamic machine control for short operating cycles
- >> Optimized energy balance for reduced fuel consumption and enhanced handling performance
- >> Simple and safe machine operation for non-fatigue and efficient working
- >> Unsurpassed reliability even under harsh operating conditions
- >> Reduced installation times

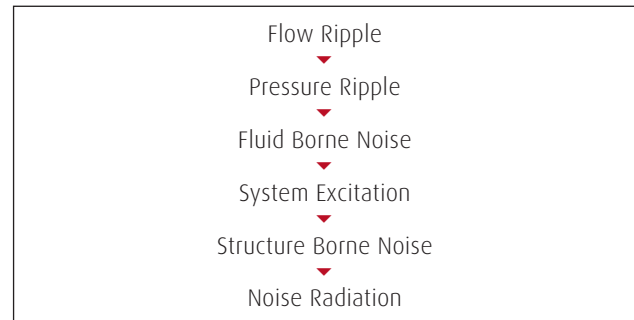
Noise reduction. SPU silencer

In hydraulic systems pressure pulsations can lead to noise emission. These pressure pulsations are a result of the inherent non-uniformity of the volume flow in rotary piston pumps. In open loop hydraulic circuits pressure pulsations primarily originate from within the hydraulic pump during the compression stroke, i.e. when a piston coming from the low-pressure side (suction side) enters the high-pressure side, where it is suddenly subjected to high pressure. The higher the pump speed and the pressure difference between the low-pressure and high-pressure side, the more pulsation energy is added to the hydraulic system via the hydraulic fluid. Pressure pulsations can cause components of the hydraulic system or the machine to oscillate, thereby generating noise that is perceivable for the human ear.

In principle noise emissions from machinery with hydraulic systems can be reduced in the following ways:

- >> Reduction of operating pressure and speed. This reduces the pulsation energy introduced into the hydraulic system
- >> Primary measures for optimizing the compression stroke in rotary piston machines with the aim of reducing pulsation
- >> Secondary measures such as vibration-optimized design and installation of machine components and sound-proofing for noise suppression

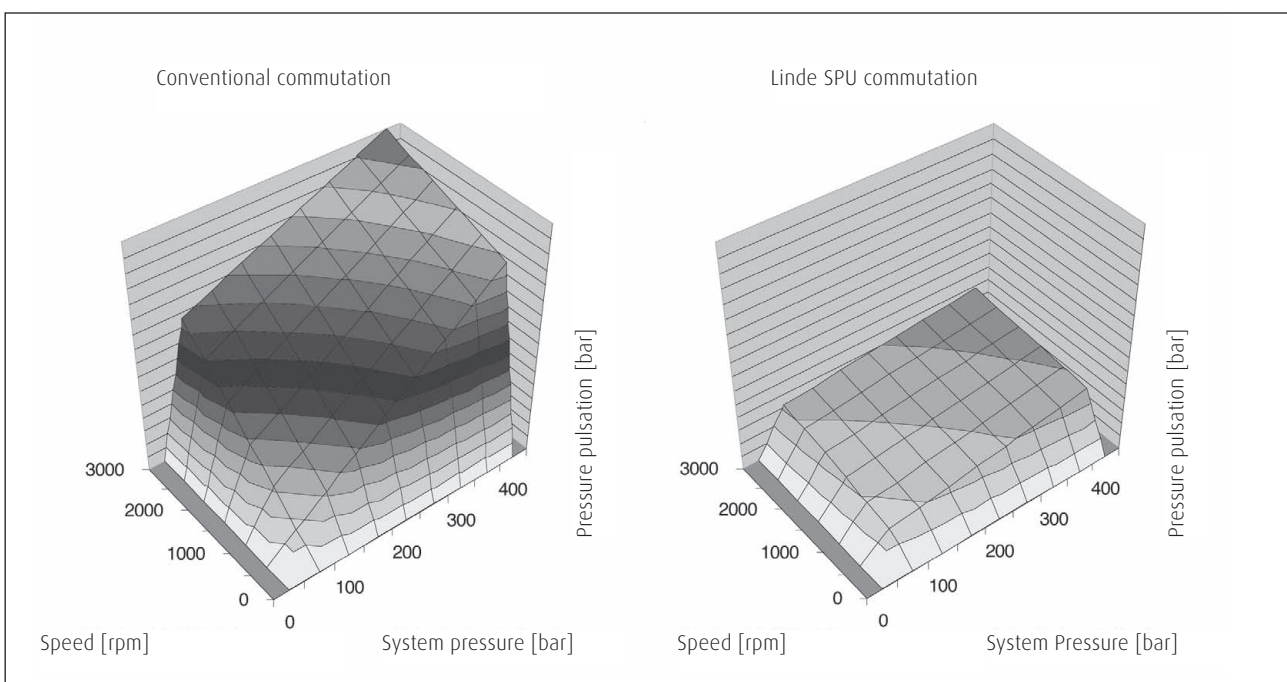
Noise Generation



Noise reduction. SPU silencer

All Linde hydraulic pumps are optimized with respect to pulsation characteristics and therefore noise generation. In addition to common primary measures such as exclusive use of pulsation-optimized port plates, Linde Hydraulics offers the SPU silencer for HPR-02 open loop pumps. Without affecting the functionality and efficiency of the pump, this system reduces pressure pulsations by up to 70 %, irrespective of pressure, speed or temperature. The SPU system is adaptive over the entire operating range. No setting up or maintenance is required.

Pressure pulsations with and without SPU

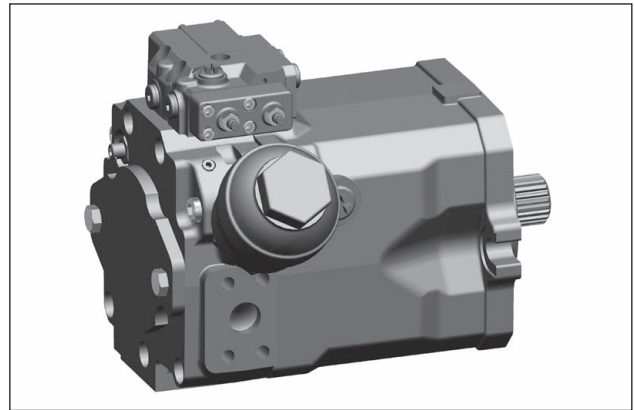


Noise reduction. SPU silencer

SPU silencer function

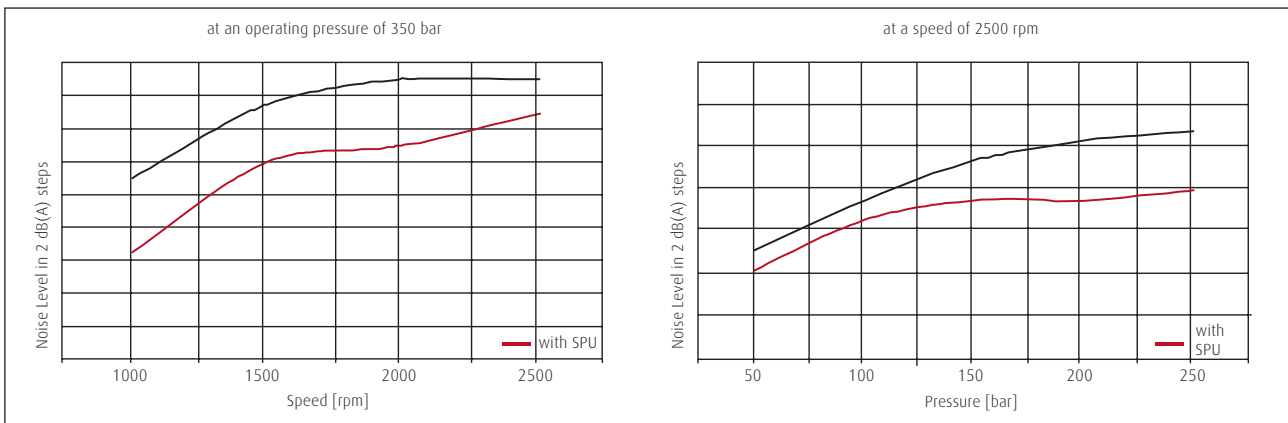
- >> Reduction of pressure pulsations over the entire operating range
- >> Reduction of noise emission by approx. 50 % (equals approx. 3 dB(A))
- >> Reduction of volume flow fluctuations
- >> No impairment of efficiency
- >> Ready for use immediately, no maintenance required
- >> Simple and rugged design
- >> Minimum increase in weight and volume

HPR-02 with SPU



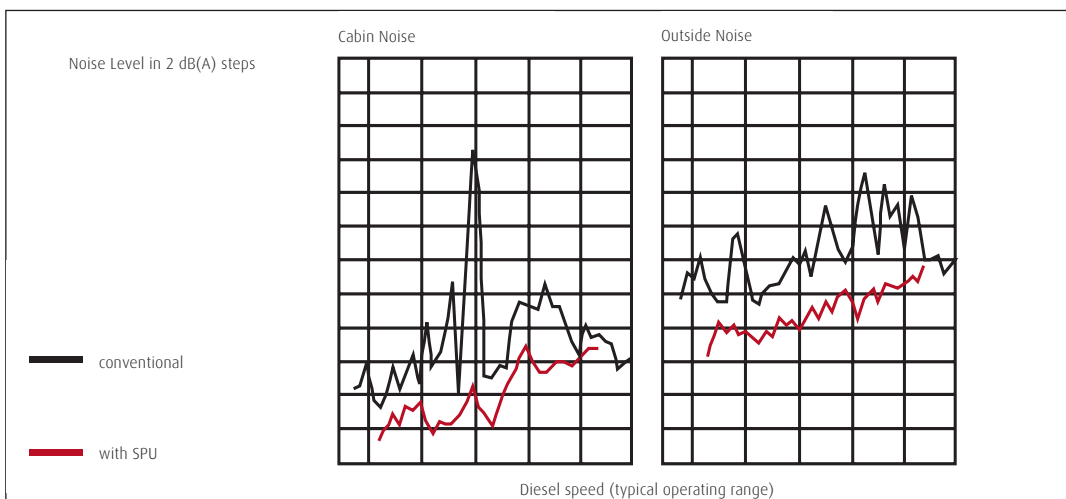
The following diagrams illustrate the immediate effect of pulsation level reduction via SPU on the sound pressure level and therefore the perceived noise emission.

Comparison of sound pressure levels for a HPR 75-02 pump with and without SPU



Comparison of resulting noise emission

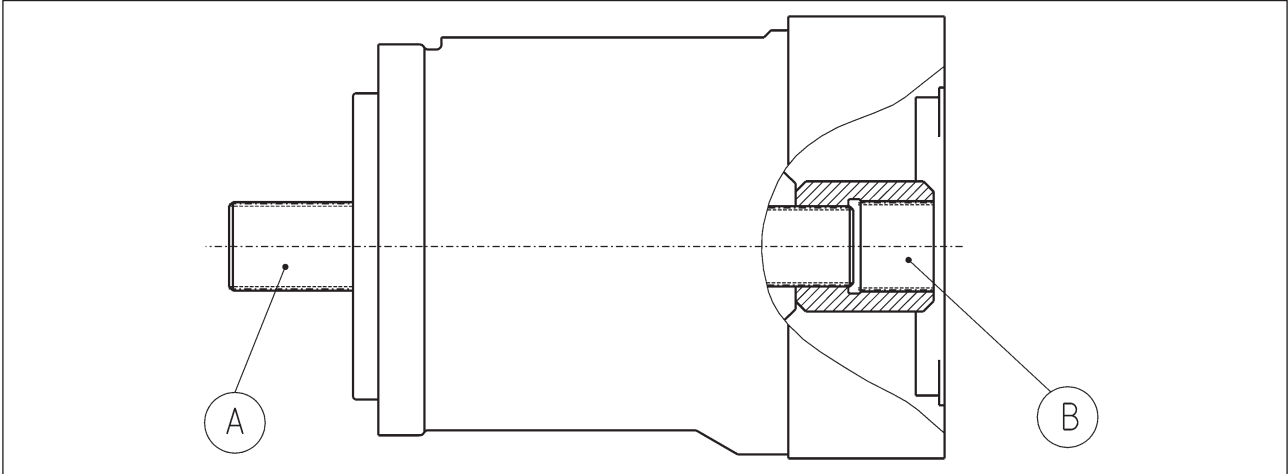
Shown in 2 dB(A) steps over a typical diesel engine operating speed range.



Torque transmission.

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

Torque transmission of HPR-02



This shows the input side (A) and PTO- / output side (B) of a HPR-02 pump.

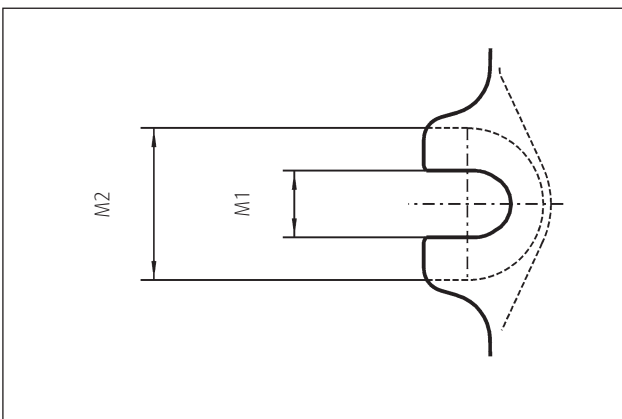
The information on the following pages refers to

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

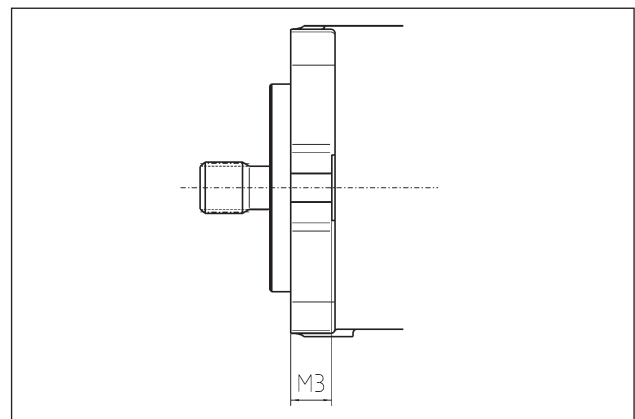
A) Flange profile

| Bolt hole dimensions | | Rated size HPR-02 | | | | | | | | |
|----------------------|----|-------------------|------|------|------|------|-----|-------|-----|-------|
| | | 55 | 75 | 105 | 135 | 165 | 210 | 105 D | 280 | 165 D |
| M1 inside diameter | mm | 17.5 | 17.5 | 17.5 | 21.5 | 21.5 | 22 | 17.5 | 22 | 17.5 |
| M2 outside diameter | mm | 34 | 34 | 40 | 40 | 40 | - | 40 | - | - |
| M3 bolt hole length | mm | 20 | 20 | 20 | 20 | 25 | 26 | 20 | 30 | 25 |

Bolt hole diameter



Bolt hole length

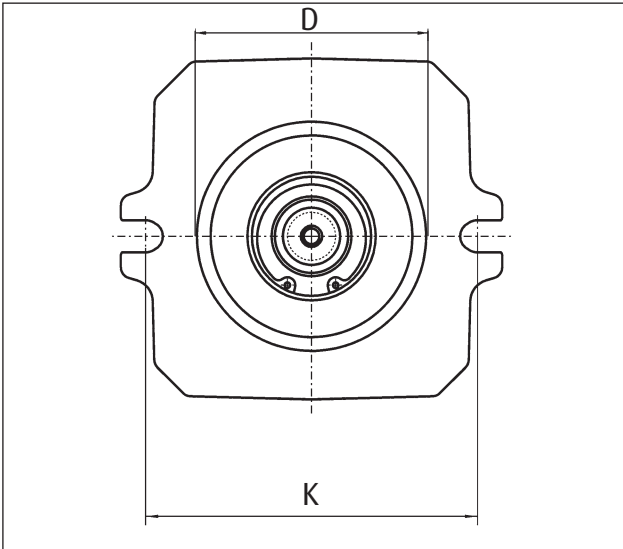


Torque transmission. Mounting flange

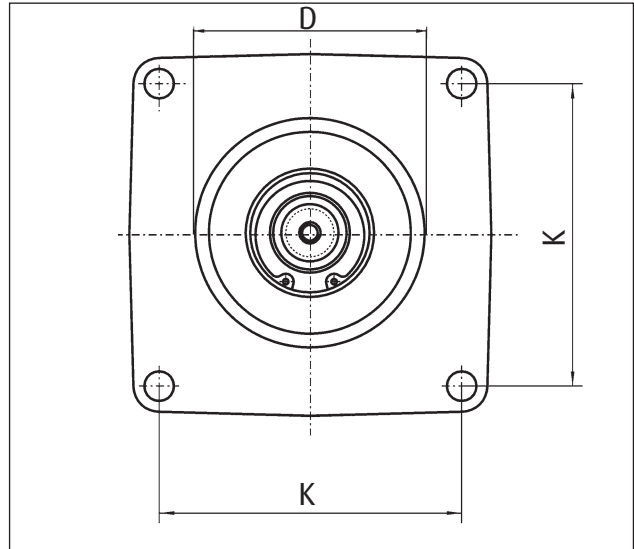
| Mounting flange in accordance with SAE J744 | For rated size | Mounting | | | | Dimensions | | | | |
|--|----------------|----------|-------|-------------------------|---------------------------|------------|-----------|-----------|-----------|-----------|
| | | Washer | Screw | Torque (8.8) [Nm] | Torque (10.9)* [Nm] | K [mm] | D [mm] | H [mm] | V [mm] | G [mm] |
| SAE C, 2 hole | 55, 75, 105 | 17x33x10 | M16 | 195 | 275 | 181.0 | 127 | - | - | - |
| SAE C, 2 hole with 4 additional threads M12 | 105 | 17x33x10 | M16 | 195 | 275 | 181.0 | 127 | - | - | 114 |
| SAE C, 2 hole with 4 additional holes (d=10.5 mm) | 105D | 17x33x10 | M16 | 195 | 275 | 181.0 | 127 | 178 | 178 | - |
| SAE D, 2 hole | 135 | 21x37x8 | M20 | 385 | 540 | 228.6 | 152.4 | - | - | - |
| SAE D, 2 hole with 4 additional threads M16 | 135 | 21x37x8 | M20 | 385 | 540 | 228.6 | 152.4 | - | - | 138 |
| SAE D 2 hole with additional bolt holes (d=17.5 mm) | 165 & 165D | 21x37x8 | M20 | 385 | 540 | 228.6 | 152.4 | 230 | 190 | - |
| SAE E, 4 hole | 210 & 280 | - | M20 | 385 | 540 | 224.5 | 165.1 | - | - | - |

*) Option for standard design, necessary for tandem units

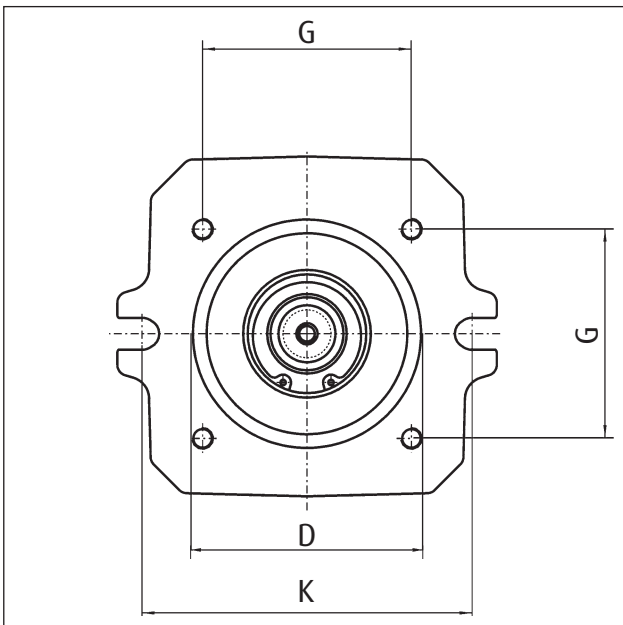
2-hole flange



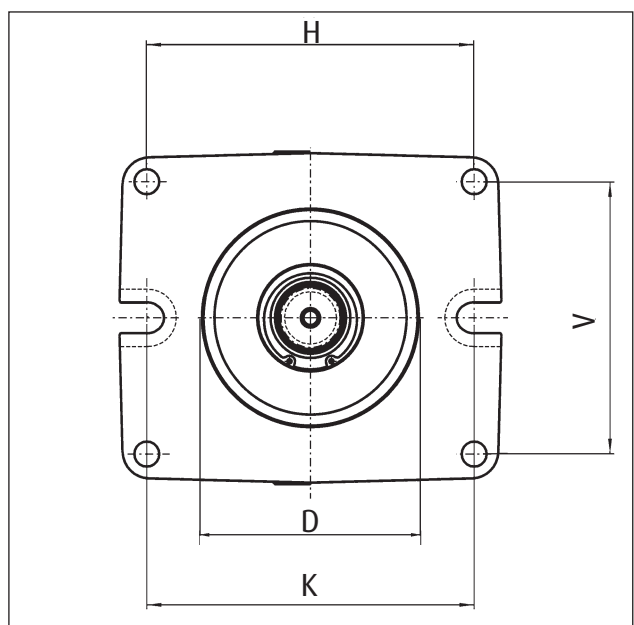
4-hole flange



2-hole flange with 4 additional threaded holes



2-hole flange with 4 additional bolt holes



Torque transmission. Drive shaft

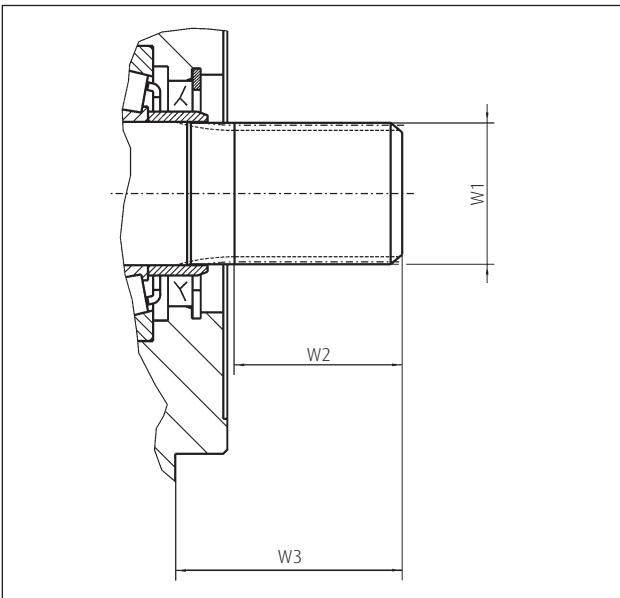
A) Dimensions drive shafts

| Shaft spline (in accordance with ANSI B92.1) | SAE-J744 Code (for centring and shaft) | Outside diameter W1 [mm] | Useable spline length W2 [mm] | Shaft type | Available for rated size | | | | | | | | |
|--|---|--------------------------------|-------------------------------------|------------|--------------------------|----|-----|------|-----|-----|------|-----|-----|
| | | | | | 55 | 75 | 105 | 105D | 135 | 165 | 165D | 210 | 280 |
| 12/24, 14 t | C | 31.22 | 30 | 2 | x | x | x | - | - | - | - | - | - |
| 16/32, 21 t | | 34.51 | 39.5 | 1 | - | x* | - | - | - | - | - | - | - |
| 12/24, 17 t | C-C | 37.68 | 30 | 2 | - | - | x | x | x | - | - | - | - |
| 16/32, 23 t | | 37.68 | 38.5 | 1 | - | - | x* | x | - | - | - | - | - |
| 8/16, 13 t | D, E | 43.71 | 50 | 2 | - | - | - | - | x | x | x | - | - |
| 16/32, 27 t | | 44.05 | 62 | 1 | - | - | - | - | x | x* | x | x | - |
| 8/16, 15 t | F | 50.06 | 58 | 1 | - | - | - | - | - | - | - | x* | x |

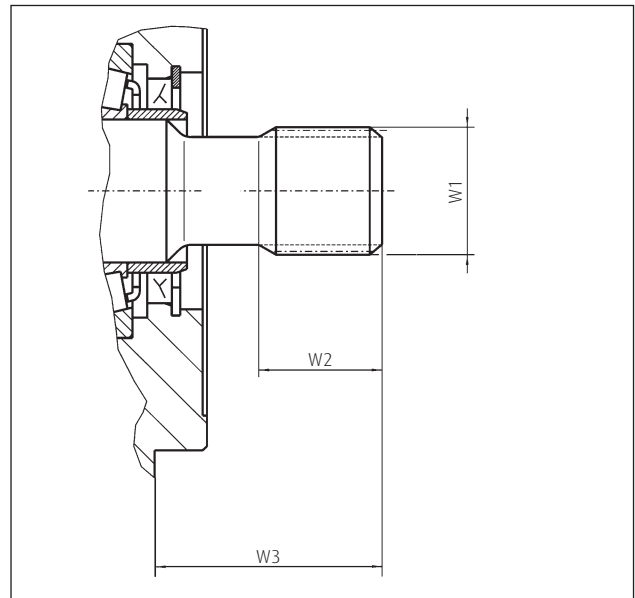
*) Recommended for tandem configurations

A) Linde Hydraulics shaft types

Type 1. Without undercut



Type 2. With undercut



| Rated size | | 55 | 75 | 105 | 105D | 135 | 165 | 165D | 210 | 280 |
|------------------|----|----|----|-----|------|-----|-----|------|-----|-----|
| Excess length W3 | mm | 54 | 55 | 55 | 61.3 | 75 | 75 | 75 | 75 | 75 |

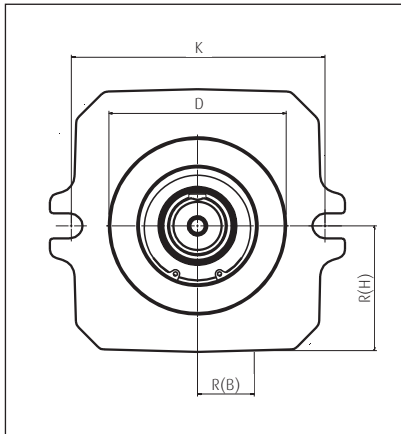
Torque transmission. Pumps according to ISO 3019-2 and SAE J617a

The previously given information and dimensions refer to pumps according to ISO 3019-1 (SAE J 744). In addition to that, certain configurations are available according to ISO 3019-2. These units offer an additional drain port "R" at the mounting flange for upright installation and a keyed drive shaft.

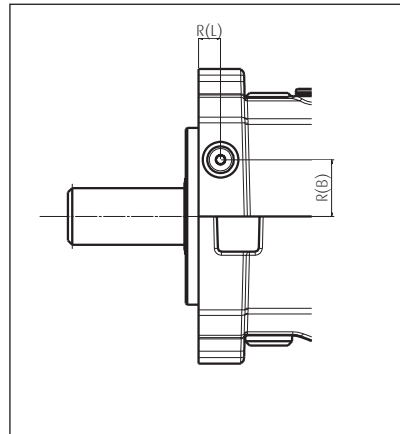
| | | | |
|------------------------|----------|---------------------|-------------------|
| Rated size | | 105 | 280 |
| Mounting flange | | 125A2SW | 224B4SW |
| Mounting | | 2-hole | 4-hole |
| Screw hole diameter | M1 | 17.5 | 22 |
| Screw contact surface | M2 | 40 | 40 |
| Clamping length | M3 | 30 | 30 |
| Centring | D | 125 | 224 |
| Mounting hole distance | K | 180 | 198 |
| Shaft diameter | W1 | 40 | 60 |
| Key acc. to DIN 6885 | W2 | 12x8x80 | 18x11x100 |
| Excess length | W3 | 92 | 115 |
| Height | W4 | 23 | 53 |
| Port R | Size | M14x1.5 13 deep | |
| | Position | bottom, as port "T" | side, as port "U" |
| | R(L) | 15.5 | 15 |
| | R(H) | approx. 80 | 50 |
| | R(B) | 40 | 152 |

>> Further dimensions and position of the other ports, see <<Dimensions. Single pumps HPR-02 for TL2, LEP, ETP>>

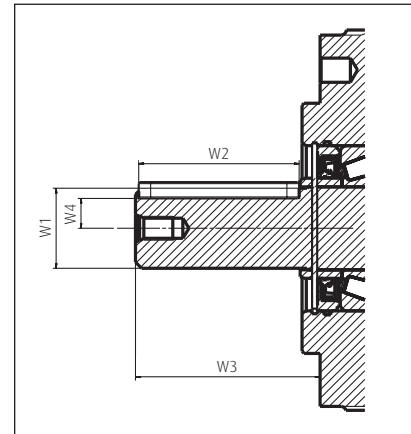
Detailed shaft view



View on R



Mounting flange



Linde HPR pumps can be delivered matching a flange according to SAE J617a. The pumps are therefore equipped with an adaptor. Depending on the rated size, the base unit is a standard HPR-02 or a plug-in type HPR-02. The plug-in-flange is shown in section <<Dimensions. Double pumps and plug-in pumps>>.

| According to SAE J617a | Rated size | Base unit |
|------------------------|----------------|---|
| SAE 3 | 105, 105D, 135 | plug-in |
| SAE 3 | 165, 165D | SAE D 2-hole with 4 additional bolt holes |
| SAE 4 | 105, 105D, 135 | plug-in |
| SAE 5 | 55, 75, 105 | SAE C 2-hole |

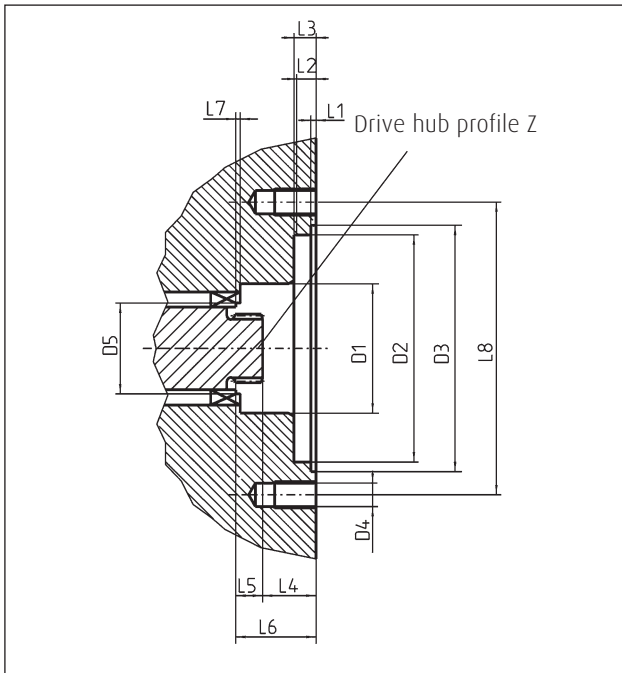
Torque transmission. PTO through drive

Linde pumps can be combined into tandem and multiple pumps. The combination options are determined by the permitted transfer torque. The following data refers to the PTO (pump output side, without further attachments).

B) Dimensions PTO

| Rated size | | 55 | 75 | 105 | 135 | 165 | 210 | 280 |
|--|----|----------------|----------------|----------------|----------------|---------------|----------------|---------------|
| Z drive hub profile (in accordance with ANSI B92.1) | | 16/32, 18 t | 16/32, 18 t | 16/32, 19 t | 16/32, 21 t | 16/32 23 t | 16/32, 24 t | 16/32 27 t |
| D1 | mm | 47 | 47 | 48 | 54 | 55 | 63 | 72 |
| D2 spigot pilot diameter | mm | 82.55 | | | | | | |
| D3 | mm | 89.5 | | | | | | |
| D4 | | M 10 | | | | | | |
| D5 max. bearing clearance | mm | 30 | 35 | 38 | 43 | 42 | 46 | 51 |
| L1 | mm | 1.5 | | | | 1.9 | 1.9 | 1.9 |
| L2 adapter length | mm | 7 | | | | 8 | 8 | 8 |
| L3 | mm | 9 | | | | | | |
| L4 minimum distance | mm | 35 | 39 | 33 | 35 | 57.8 | 46 | 47.5 |
| L5 usable spline length | mm | 18 | 18 | 24 | 15.8 | 24.4 | 29.5 | 39 |
| L6 distance to bearing | mm | 48 | 48 | 52.7 | 54.2 | 83.3 | 46 | 86 |
| L7 min. bearing clearance | mm | 3 | | | | 5 | | 0.7 |
| L8 hole distance 2-hole | mm | 106.4 | | | | | | |

B) Dimensions PTO



Torque transmission. PTO flange and output shaft

Beside the combination of the HPR with other HPRs or HPVs to create multiple and tandem units (see section <<Dimensions. Multiple pumps>>), single HPRs can be prepared ex works for the combination with other pumps. Depending on the rated size, we offer different centrings for the rear pump. A matching coupling muff for the drive shaft can also be selected. Currently, the following combinations are available. For more information about the output torque, see annotations to table at chapter <<General technical data>>.

B) PTO mounting possibilities

| Centring symbol acc. to SAE J 744 | Coupling muff, acc. to ANSI B92.1 | Rated size | | | | | | |
|--------------------------------------|--------------------------------------|------------|----|-----|-----|-----|-----|-----|
| | | 55 | 75 | 105 | 135 | 165 | 210 | 280 |
| Directly mounted Linde gear pumps | | X | X | X | X | X | X | X |
| A | without | X | X | X | X | X | X | X |
| A | 16/32 9 t (A) | X | X | X | X | X | X | - |
| A | 16/32 11 t | - | - | - | - | - | X | - |
| A | 16/32 13 t | - | - | X | X | - | X | X |
| B | without | X | X | X | X | X | X | X |
| B | 16/32 13 t (B) | X | X | X | X | X | X | X |
| B | 16/32 15 t (B-B) | X | X | X | X | - | - | X |
| C | without | X | X | X | X | X | X | X |
| C | 12/24 14 t (C) | X | X | X | X | X | X | X |
| C | 16/32 21 t | - | X | X | X | - | X | - |
| C | 16/32 23 t | - | - | X | X | X | X | - |
| D | without | - | - | - | X | X | X | X |
| D | 8/16 13 t (D) | - | - | - | X | - | - | - |
| D | 12/24 17 t | - | - | - | X | - | - | - |
| D | 16/32 27 t | - | - | - | X | X | X | - |
| E | without | - | - | - | - | - | X | X |
| E | 16/32 27 t | - | - | - | - | - | X | - |

B) Output shaft transfer torque

| Rated size | | 55 | 75 | 105 | 135 | 165 | 210 | 280 |
|----------------------------|----|-----|-----|-----|------|------|------|------|
| Continuous transfer torque | Nm | 219 | 302 | 418 | 540 | 659 | 836 | 1122 |
| Max. transfer torque | Nm | 433 | 598 | 763 | 1069 | 1069 | 1655 | 2221 |

Gear pumps.

The gear pumps are available in two designs. Internal gear pumps (IGP) and external gear pumps (EGP). Both types can be used for the control circuits as well as the cooling circuit. The suction is always external for both types, when used in combination with a HPR-02. The internal connection of the IGP is closed.

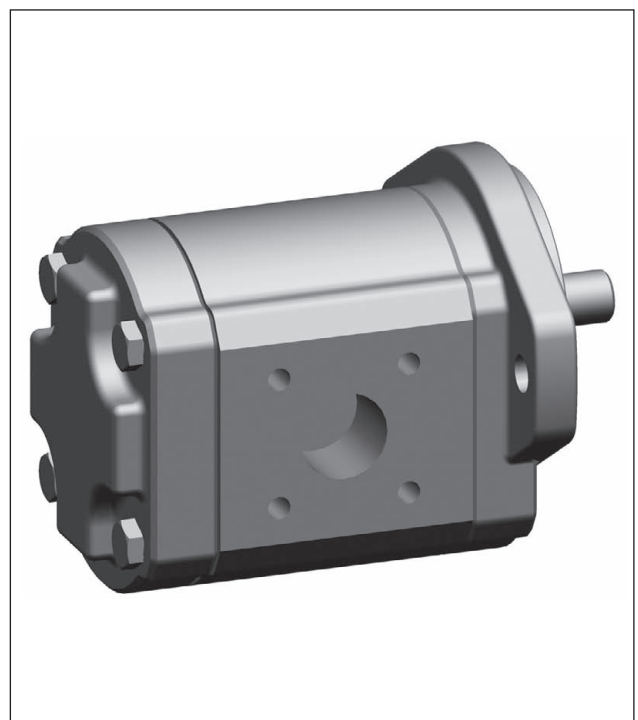
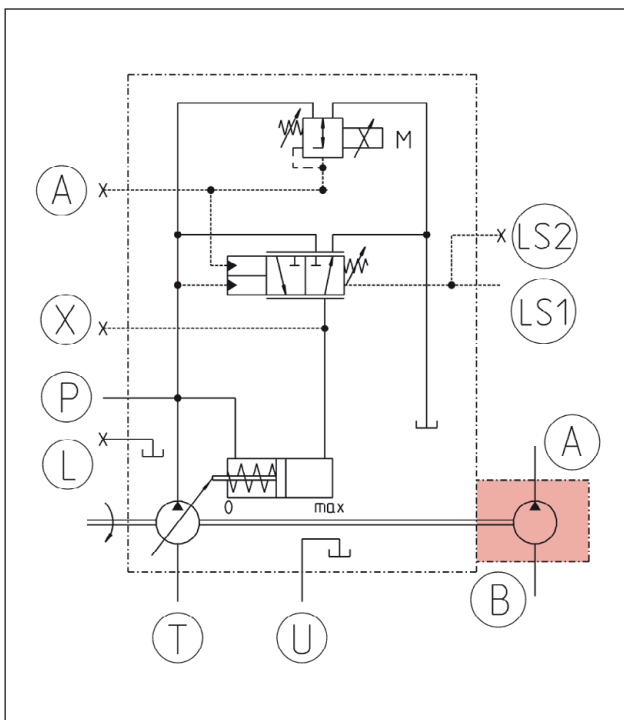
Internal gear pumps offer a cold start valve and a PTO interface for mounting further pumps. The possible combinations of IGP and EGPs are determined by PTO option and the permitted shaft torque.

Overview gear pumps

| | | | | | | | |
|--|--------|----------------------|--------------------|----------------------|---------------------|----------------------|----------------------|
| Displacement | cc/rev | 16 | 19 | 22.5 | 31 | 38 | 44 |
| Type of gear pump | | IGP | EGP | IGP | EGP | EGP | EGP |
| Mounting flange and drive shaft profile | | SAE A 16/32, 18 t | SAE A 16/32 9 t | SAE A 16/32, 18 t | SAE A 16/32, 9 t | SAE A 16/32, 13 t | SAE A 16/32, 13 t |
| Type of suction in conjunction with HPR-02 | | external | | | | | |
| Max. perm. operating pressure Observe max permissible rated pressures for filter and cooler | bar | 40 | 210 | 40 | 165 | 275 | 220 |
| Supply pressures min. | bar | 0.8 (absolut) | | | | | |
| Supply pressures max. | bar | 3.0 (absolut) | | | | | |
| Cold start relief valve | | integrated | - | integrated | - | - | - |

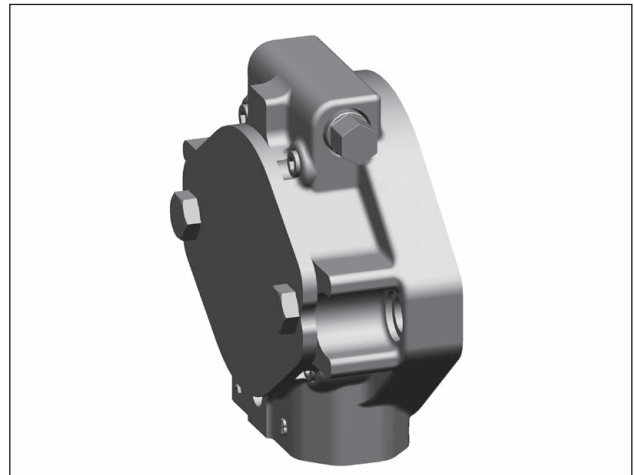
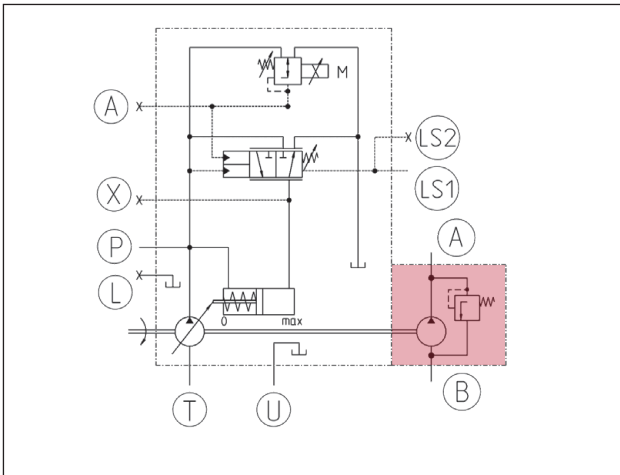
- >> Port names clockwise rotation: A pressure port, B suction port (as shown)
- >> Port names counter-clockwise rotation: A suction port, B pressure port (not shown)
- >> Ports according to ISO 6149-1
- >> Alternatively DIN 3852-1
- >> Suction port of the IGP according to ISO 8434-1 L28

External gear pump EGP



Gear pumps.

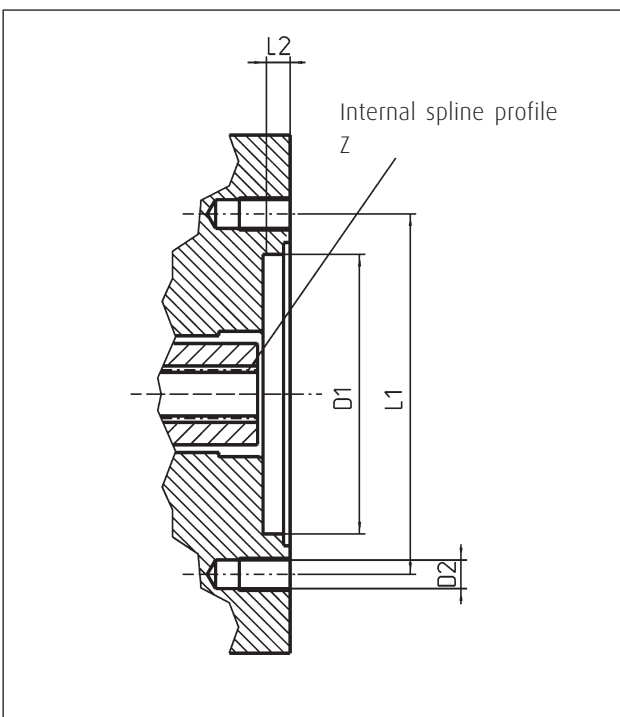
Internal gear pump IGP with external suction



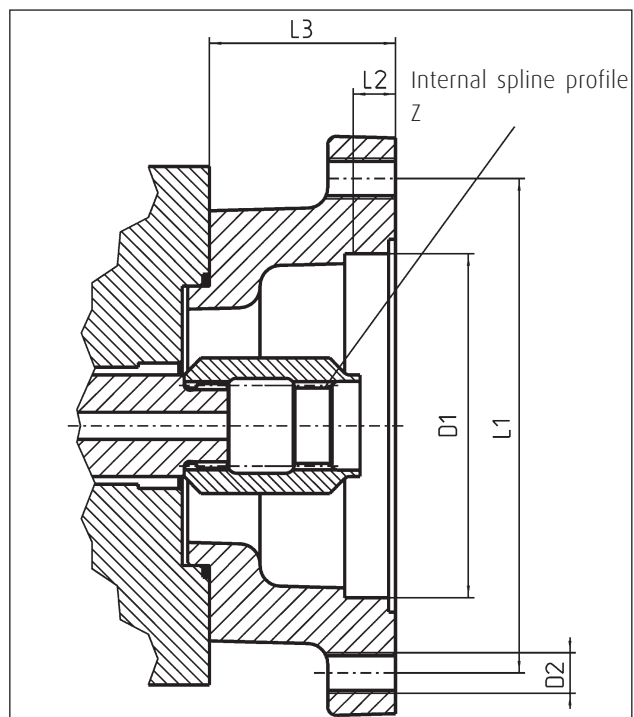
PTO flange with IGP

| Flange profile 2-hole | | SAE A | SAE B | SAE B-B | SAE C |
|--|----|------------|-------------|-------------|-------------|
| Z internal spline profile in accordance with ANSI B92.1 | | 16/32, 9 t | 16/32, 13 t | 16/32, 15 t | 12/24, 14 t |
| D1 spigot pilot diameter | mm | 82.55 | 101.6 | 127 | |
| D2 thread size | | M 10 | M 12 | M 16 | |
| L1 hole distance | mm | 106.4 | 146 | 181 | |
| L2 adapter length | mm | 7 | 11 | 13 | |
| L3 flange length | mm | - | 55 | 72 | |
| Continuous transfer torque | Nm | 75 | 175 | 250 | |
| Maximum transfer torque | Nm | 107 | 250 | | |

PTO SAE A with IGP



PTO SAE B, B-B, and C with IGP



Controllers.

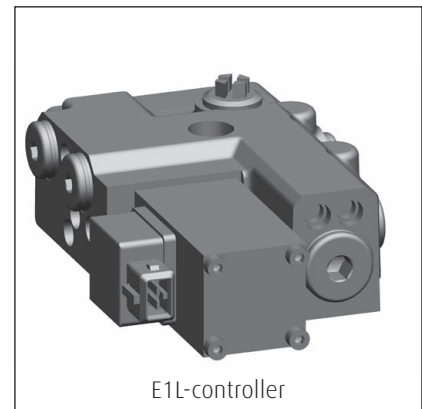
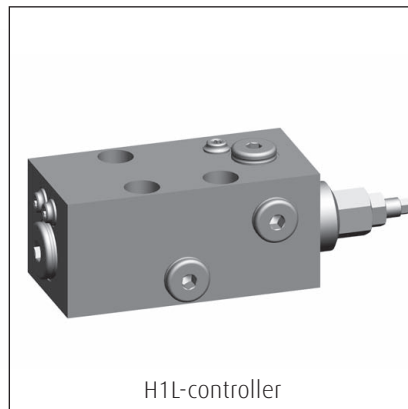
The modular controller unit enables a wide range of functional system requirements to be met. In all controller unit versions, the regulating functions are integrated in a housing in order to ensure direct signal transfer without delays and with maximum compactness. All controllers equipped with load sensing function are fully compatible with the Linde Synchron Control System (see section <<Linde LSC-System>>).

Technical data

| Type of regulation | Additional function | Swashplate position feedback | Name |
|--------------------|--|------------------------------|---------|
| Load Sensing | With pressure cut-off | without | LP |
| | with Δp_{LS} override | without | E1L/H1L |
| | with hyperbolic power limiting | with | TL2 |
| | electro-proportional flow limitation and pressure cut-off | with | LEP |
| Control | electro proportional flow setting, power limitation and pressure cut-off | with | ETP |

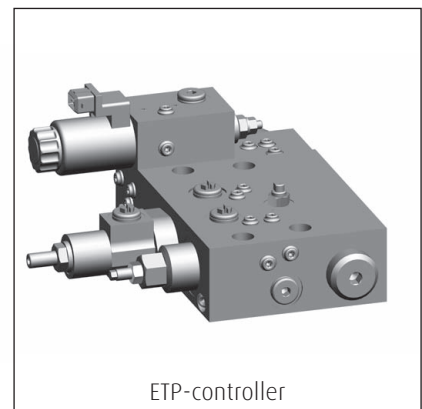
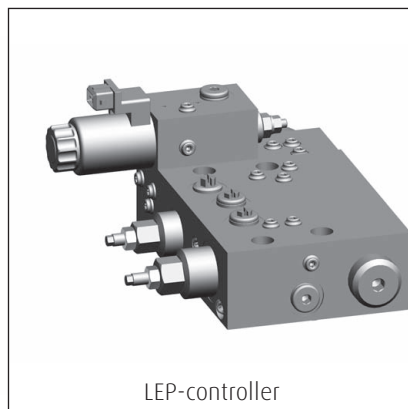
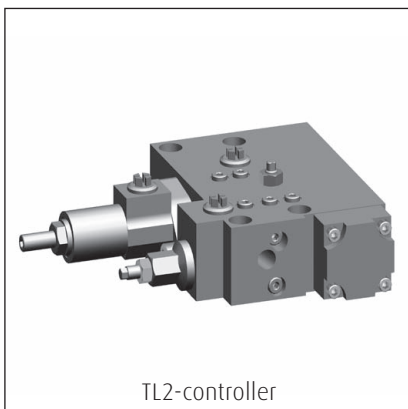
Controllers without swashplate position feedback.

Mounting on the port plate housing



Controllers with swashplate position feedback.

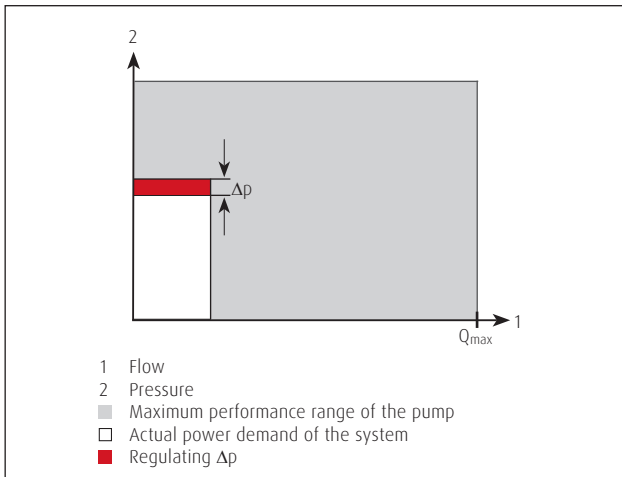
Mounting on the pump housing



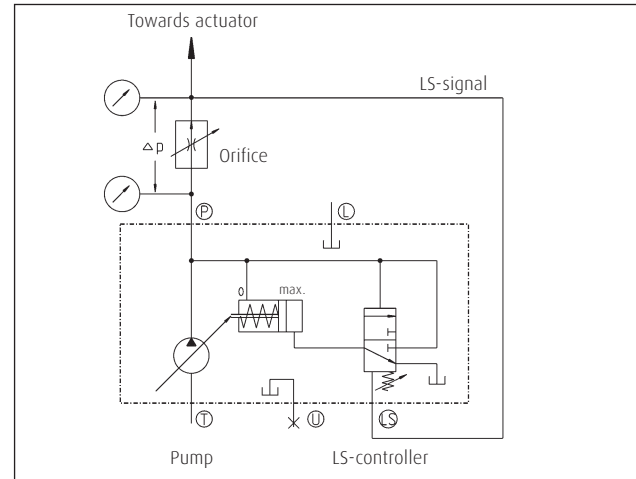
Controllers. LS. Load Sensing

Linde pumps with load sensing control enable the movement speed required of the selected actuator, e.g. of a boom, to be specified via the valve opening. The measured pump and load pressures are continuously balanced by the load sensing controller of the hydraulic pump.

Load Sensing. Flow on demand control

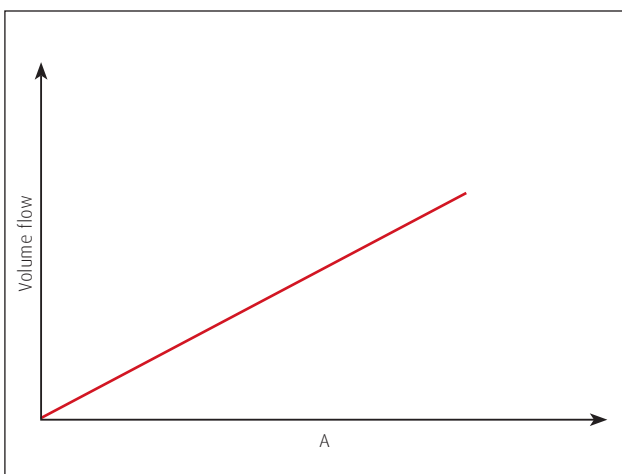


Self-regulating pump with LS-controller and measure orifice (in valve)

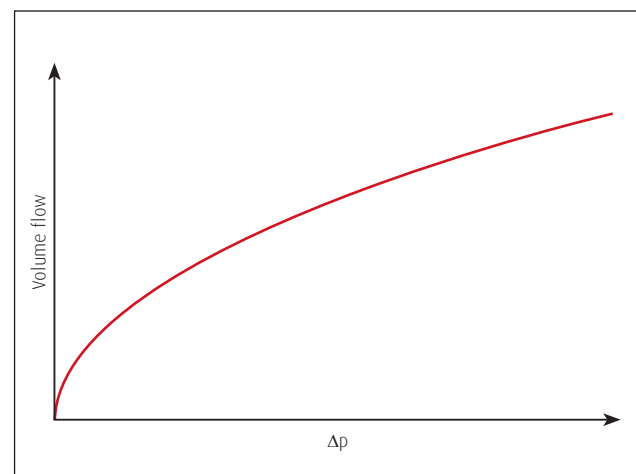


A pressure gradient is set at the controller, which is defined by the actuator requirements. The volume flow results from the orifice A of the control valve and the actual pressure gradient. Due to the LS-controller, the Δp corresponds to the setting value. If the required volume flow differs, the pump displacement is changed accordingly. This happens automatically and reduces the effort required by the operator. Since varying loads and varying numbers of actuators are compensated automatically. The Δp LS basic setting is possible from 16 to 27 bar with 20 bar as standard (the LS differential pressure influences the response times of the pump system).

LS-function at $\Delta p = \text{constant}$



LS-function at area A = constant



Benefits of LS-control

- >> Any volume flow below the pump's maximum can be set
- >> Response speed of the machine can be defined
- >> OEM-specific machine response is possible
- >> Optimum precision control capability

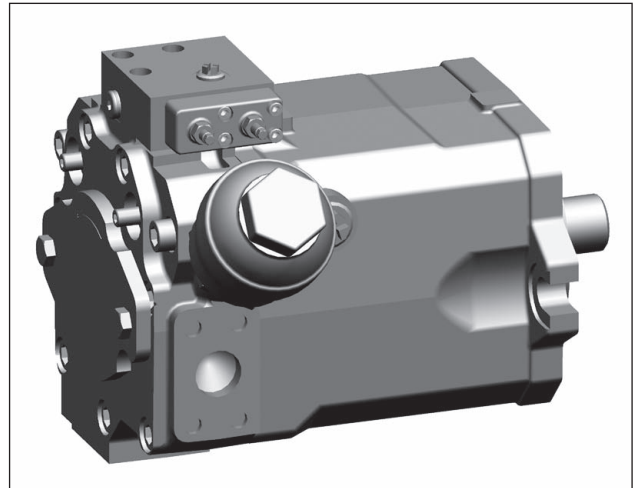
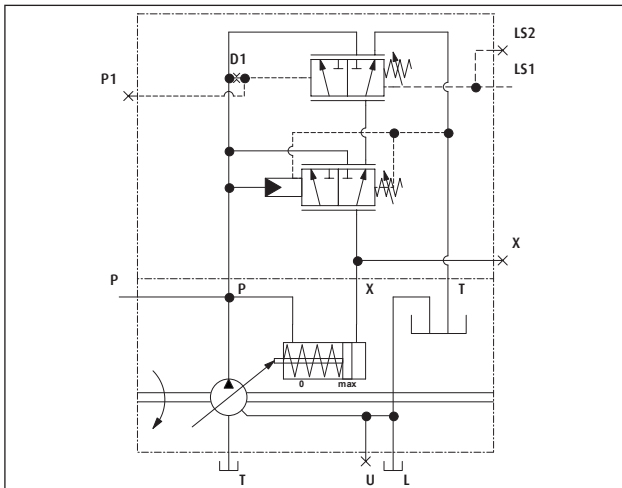
Demand-oriented pump control offers the following benefits

- >> Load-independent machine control
- >> Minimum heat generation
- >> Increased pump service life
- >> Low noise generation in the whole system
- >> Fewer components for the control mechanism
- >> Lower energy consumption, particularly with partial volume flow

Controllers. LP. Load Sensing with hydraulic pressure cut-off

In addition to the load sensing function the LP-controller offers maximum pressure limitation. Once the system pressure reaches the set pressure of the pressure cut-off valve, the LS-controller is overridden and the pump swashes back, whilst maintaining the system's regulating pressure. The hydraulic pump remains in this state until the system pressure falls below the set pressure. The hydraulic pump then returns to normal LS operation.

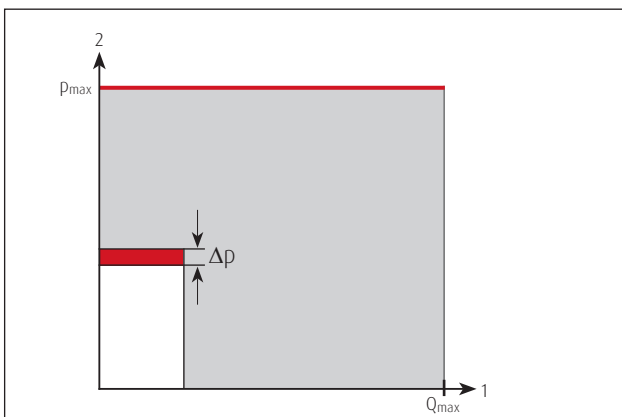
LP. LS with hydraulic pressure cut-off



The maximum pressure cut-off valve prevents prolonged operation of pressure relief valves installed in the hydraulic system for protection. This has the following benefits for the hydraulic system:

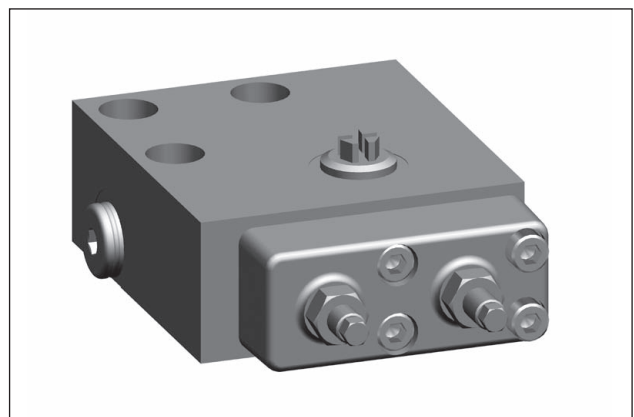
- >> Operating pressure is maintained
- >> No operation in the overload range
- >> Any operating point under the power curve remains accessible
- >> Demand-oriented volume flow generation
- >> Minimum power loss
- >> Reduced heat and noise generation
- >> Longer service life of the pump and the entire hydraulic system
- >> Improved energy consumption of the overall system

LP-characteristic curve



- 1 Flow
- 2 Pressure
- Maximum performance range of the pump
- Actual power demand of the system
- Regulating Δp
- Pressure cut-off characteristic

LP-controller



Possible maximum pressure control setting ranges

- >> 125 - 230 bar
- >> 231 - 350 bar
- >> 351 - 420 bar

Controllers. E1L/H1L. Load Sensing with electric / hydraulic override

In addition to the load sensing function, HPR-02 pumps with H1L or E1L controllers offer the possibility of overriding the Δp LS-signal hydraulically or electrically. This enables a so called mode control for selecting different operating points or enables a power limit regulation (underspeed control). The integration of all functions in the pump controller enables direct signal transfer without delay. The controller-specific data are independent of the nominal pump size.

Possible applications of the LS signal override

>> Mode-control

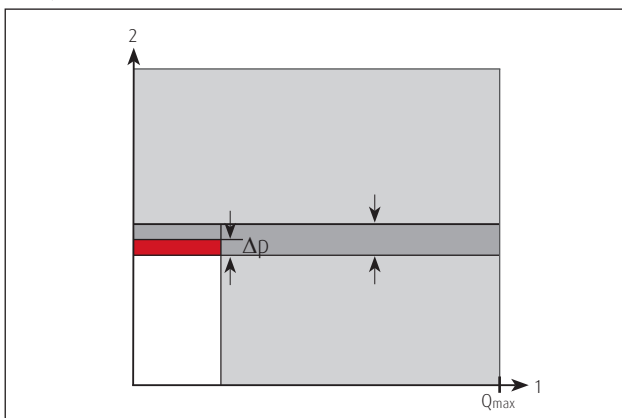
A mode control (mode selection) modulates electrically the Δp LS-signal at an orifice (e.g. directional control valve). The current Δp LS value is reduced proportionally or in steps and the pump output adjusted via the pressure reducing valve (see the diagrams on following pages.) In this way the volume flow of the pump can be reduced using the same orifice. In applications with proportional valves this leads to enhanced control resolution, enabling particularly precise and sensitive actuator movement.

>> Power limit regulation

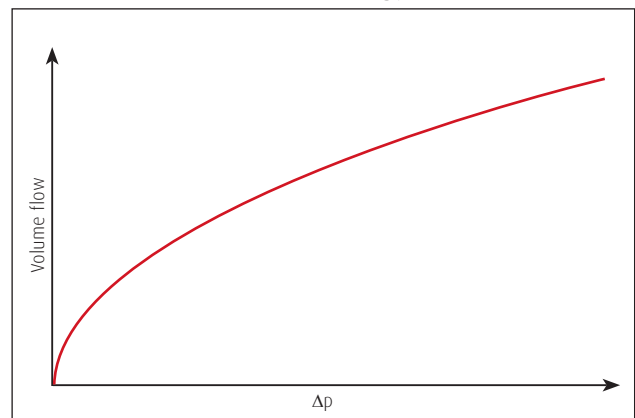
Any reduction in the prime mover speed is detected in conjunction with an electronic control unit, and the pump's volume flow is limited through modulation of the Δp LS value to ensure that the maximum power capacity is not exceeded. The maximum prime mover power is thus available at all times, irrespective of ambient influences and the number of actuators.

In principle, the Δp LS value acting at the LS-pilot can be modulated down to zero, whereas modified response times of the pump system should be expected in the operating range near zero.

E1L/H1L-characteristic curve



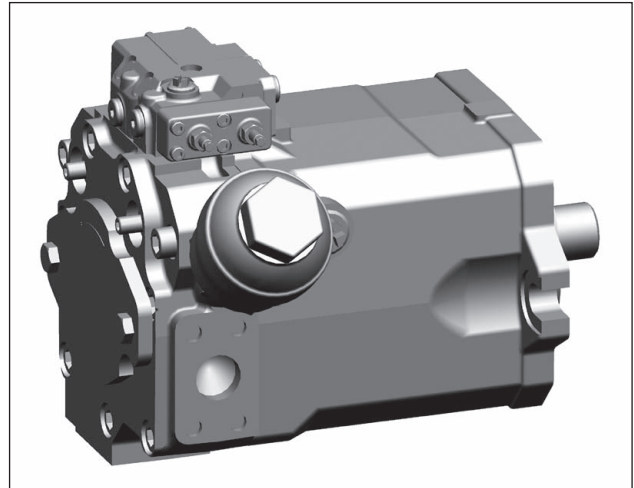
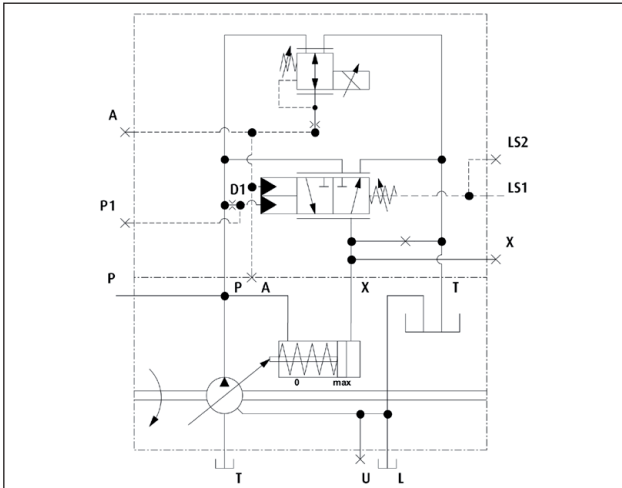
Pump volume flow at fixed orifice (e.g. directional control valve opening)



- 1 Flow
- 2 Pressure
- Maximum performance range of the pump
- Actual power demand of the system
- Mechanical Δp basic setting
- Effective, modulated regulating Δp

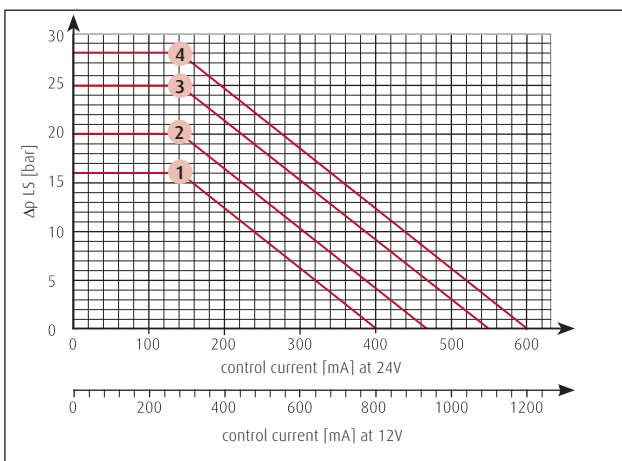
Controllers. E1L. Load Sensing with electric override

In addition to the load sensing function, the HPR-02 E1L offers an electric override for mode selection and power limit regulation (underspeed control). The integration of all functions in the pump controller enables direct signal transfer without delays. The controller-specific data are independent of the nominal pump size.

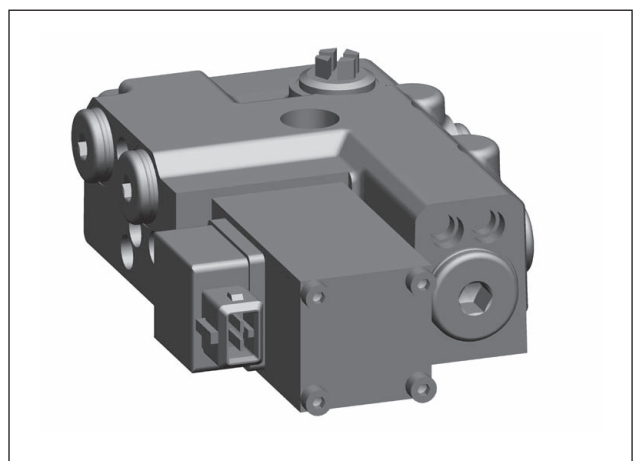


In the event of an electric override of the LS-signal, a pressure reducing valve is activated via the proportional solenoid. The control pressure generated in this way acts proportionally against the LS-spring, and the effect of the Δp LS signal is modulated accordingly. This causes the pump to swash back, thereby reducing its output. The function between control current (I) at the control solenoid and the associated Δp LS value is shown in the diagram. At the port "A", the control pressure can be picked up and forwarded to an H1L controller at another HPR pump, which follows the first pump with the E1L controller (master-slave-operation).

Δp LS-reduction



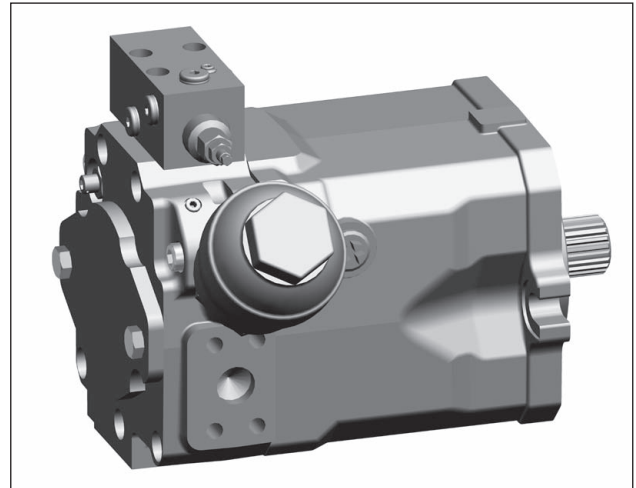
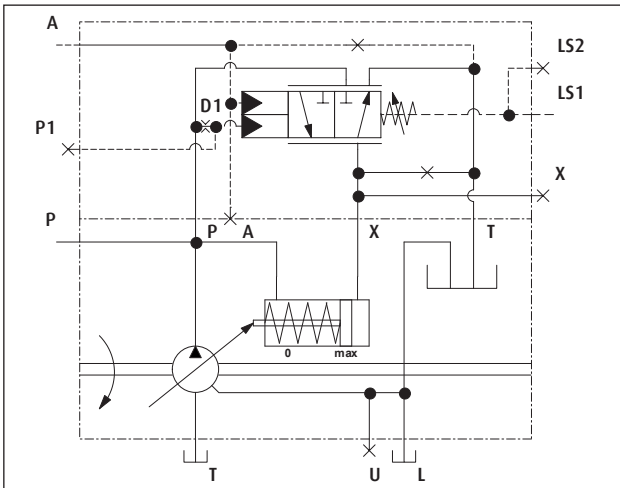
E1L-controller



- 1 16 bar Δp setting
- 2 20 bar Δp setting
- 3 25 bar Δp setting
- 4 28 bar Δp setting

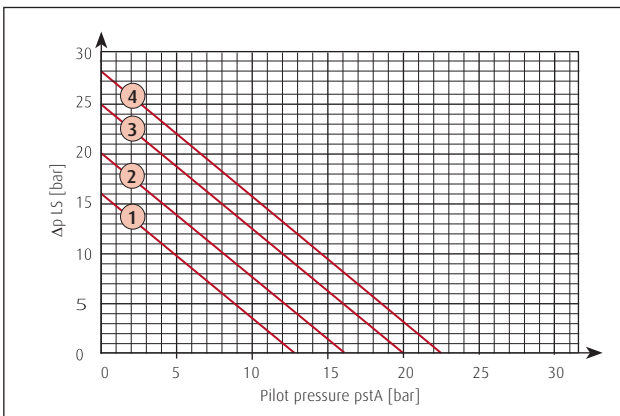
Controllers. H1L. Load Sensing with hydraulic override

In addition to the load sensing function, HPR-02 pumps with H1L-controller offer the possibility of overriding the Δp LS-signal hydraulically. This enables either a so called mode control for selecting different operation points or establish a power limit regulation (underspeed control). The integration of all functions in the pump controller enables direct signal transfer without delay. The controller-specific data are independent of the nominal pump size. The H1L-controller is particularly useful for tandem configurations of two HPR-02 pumps, in which the first is equipped with an E1L-controller. The second pump with H1L-controller uses the resulting hydraulic signal of the first controller and follows the first pump's actions (master-slave-configuration).

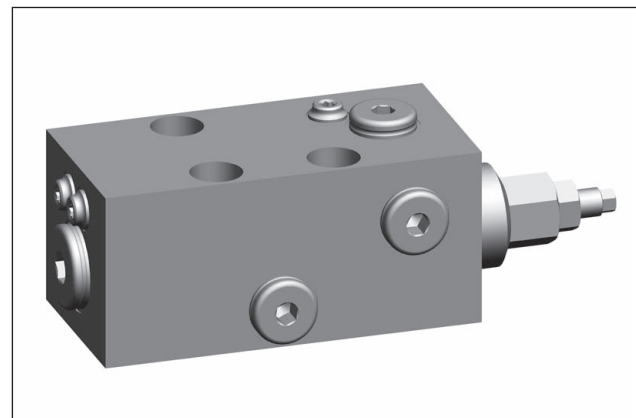


In the event of hydraulically overriding the LS-signal, a control pressure is applied to the port "A" of the controller. This pressure acts proportionally against the LS-spring, and the LS signal is modulated accordingly. This causes the pump to swash back, thereby reducing its output. The function between control pressure at the port A and the associated Δp LS value is shown in the following diagram.

Δp LS-reduction



H1L-controller



- 1 16 bar Δp setting
- 2 20 bar Δp setting
- 3 25 bar Δp setting
- 4 28 bar Δp setting

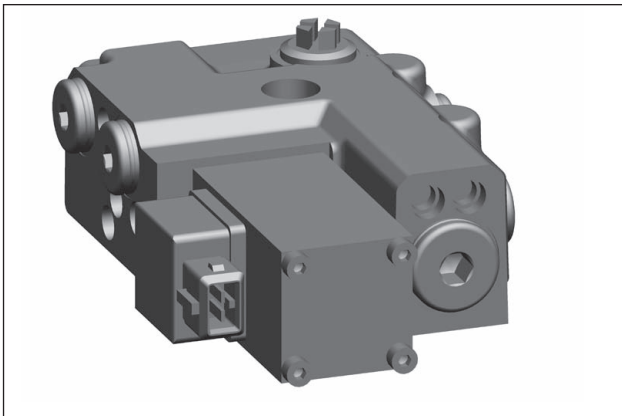
Controllers. Electrical properties

| | | | | |
|-----------------------------------|--|----|--|-----|
| Supply voltage = limiting voltage | | V | 12 | 24 |
| Control types | Digital control via Pulse Width Modulation PWM | | 100 Hz rectangle, pulse duty ratio variable over control range | |
| | Analogue | | Direct current with dither overlay (dither frequency nom. 35 Hz, duty cycle 1:1). Further details on request | |
| Connector type | | | DIN EN 175301-803, Deutsch, AMP Junior Timer (2-pin) | |
| Protection class | | | IP54 (DIN), IP67 (Deutsch), IP6K6K (AMP) | |
| Voltage type | | | Direct Current (DC) | |
| Power consumption | | W | 15.6 | |
| Rated current = limiting current | | mA | 1200 | 600 |
| Relative duty cycle | | % | 100 | |

Further details on request

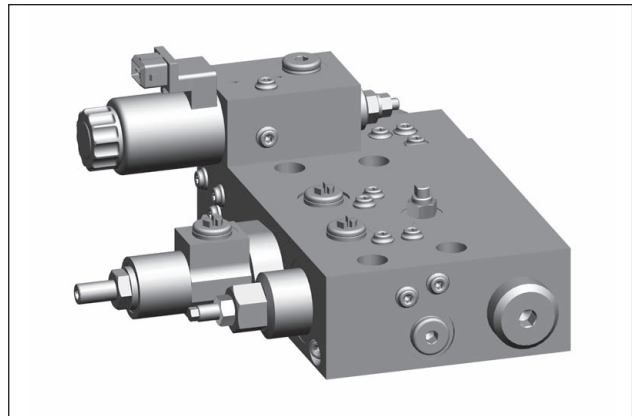
E1L-controller.

Rectangular solenoid and AMP-connector



ETP-controller.

Tubular solenoid and AMP-connector

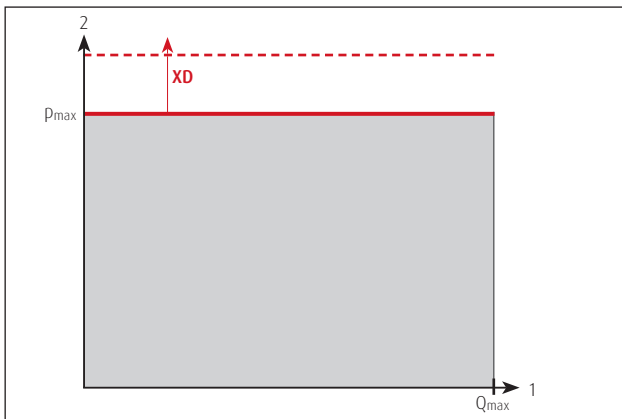


Pump controllers with position feedback

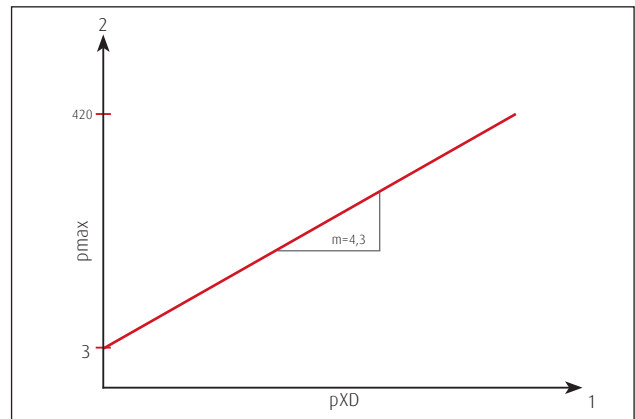
TL2-, LEP- and ETP-controllers offer a feedback of the swashplate position. Therefore they are – unlike LP-, E1L- and H1L-controllers – not mounted on the valve plate housing, but on the pump housing. Besides their individual characteristics, these controllers have some similar features.

P-axis (LEP/ETP): Pressure cut-off characteristic

LEP- and ETP-controllers offer a pressure cut-off (PCO), just like the LP-controller. This prevents the pump pressure exceeding a previously set maximum. The PCO is set to a customer-specific value between 125 bar and 420 bar ex works. Using a control signal at the XD port, the actual response pressure of the PCO valve of LEP- and ETP-controllers can be increased steplessly. The response pressure of the valve is increased by 4.3 bar by every bar increase at the XD port. The maximum pressure of 420 bar must not be exceeded.



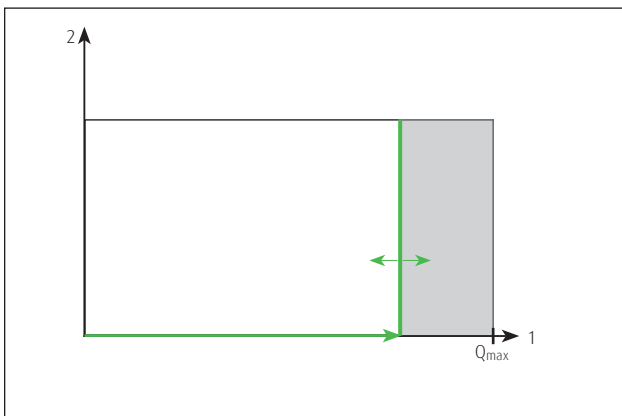
- 1 Displacement volume
- 2 Pressure
- Maximum performance range of the pump
- Pressure cut-off basic setting
- - Characteristic shifting by control signal



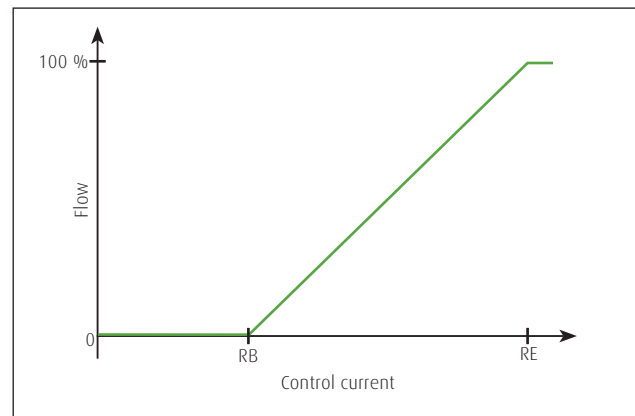
- 1 Control pressure at XD port
- 2 Pressure cut-off response pressure
- 3 Pressure cut-off basic setting

E-Axis (LEP/ETP): Electric flow setting

The swash angle and thus the flow of the pump is set by means of an electric signal with the LEP and ETP controller. The actual current depends on the voltage-level of the application and the nominal size of the pump. Without an electric signal, the pump swashes to minimal displacement.



- 1 Displacement
- 2 Pressure
- Maximum performance range of the pump
- Electro-proportional flow setting
- Provided power



| Rated size | | Control current | |
|------------------------|-----------|-----------------|--------|
| | | 12 V | 24 V |
| RB Regulation begin | 105,135 | 464 mA | 232 mA |
| | 210 | 490 mA | 245 mA |
| | 280 | 524 mA | 262 mA |
| RE Regulation end | 105 - 280 | 1200 mA | 600 mA |

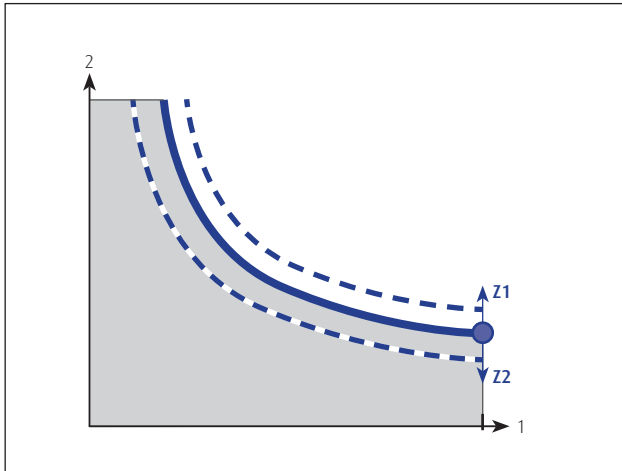
Pump controllers with position feedback

T-Axis (TL2/ETP): hydraulic movement of the regulation begin

Controllers of the TL2 and ETP type offer a power limitation with a hyperbolic characteristic. The controller is set ex works to a customer specific power limit value. The volume flow is restricted, when this limit is exceeded. By means of control ports at the controller, the point at which the power limiter sets in can be raised, as well as lowered during operation.

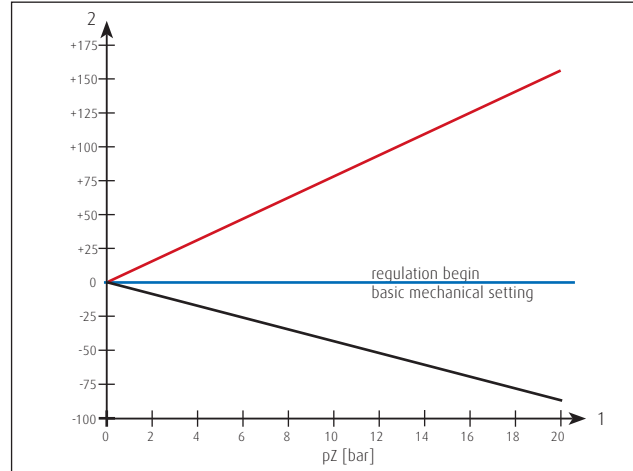
Dependent on the rated size of the unit, there is a minimum value for the power limitation which must not be underrun, neither by the ex work setting, nor by shifting. The maximum mechanically set value at which the power limitation sets in, is 250 bar, independent of the pump's rated size and speed. The pump must never be operated with more than its maximum power.

Power limiter characteristic curve



- 1 Displacement
- 2 Pressure
- Power range of the pump
- Regulation begin power limitation

Shifting of the regulation begin



- 1 Pilot pressure port Z1, Z2
- 2 Displacement of the regulation begin [bar]
- Pilot pressure port Z1
- Pilot pressure port Z2

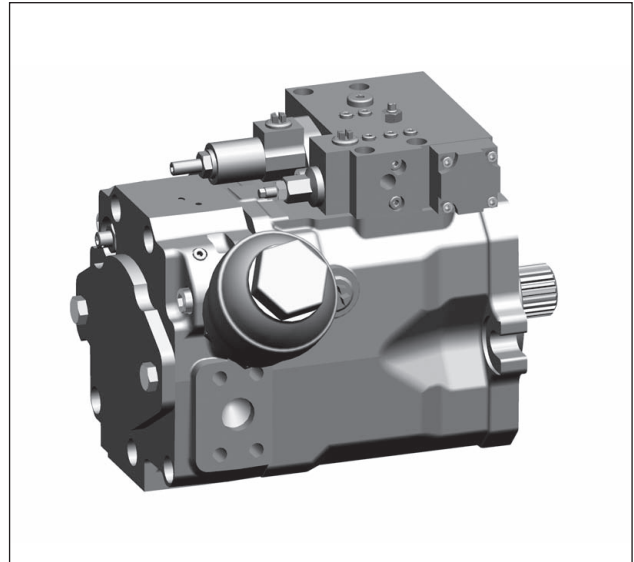
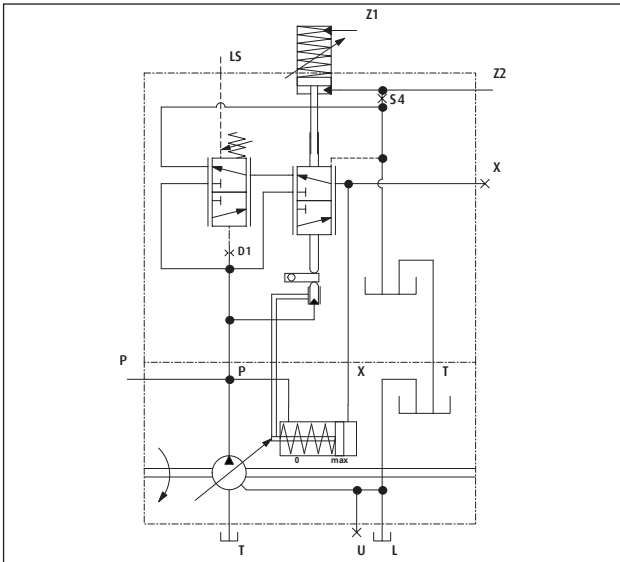
Power limiter performance

| | Rated size | | | | | |
|--|------------|---------|----------|----------|----------|------|
| | 75 | 105 | 135 | 210 | 280 | |
| Ex works setting [kW] | 6 - 82 | 9 - 106 | 12 - 136 | 24 - 184 | 32 - 221 | |
| Shifting of the regulation begin [bar/bar] | Z1 | 7.1 | 7.1 | 7.1 | 7.4 | 7.8 |
| | Z2 | -3.2 | -3.2 | -3.2 | -3.3 | -3.4 |
| Regulation begin minimum [bar] | 60 | 60 | 60 | 80 | 80 | |
| Regulation begin [bar] (mechanically set) | 250 | | | | | |
| Max. pressure at Z1/Z2 [bar] | 25 | | | | | |

Controllers. TL2. Load Sensing with hyperbolic power limitation

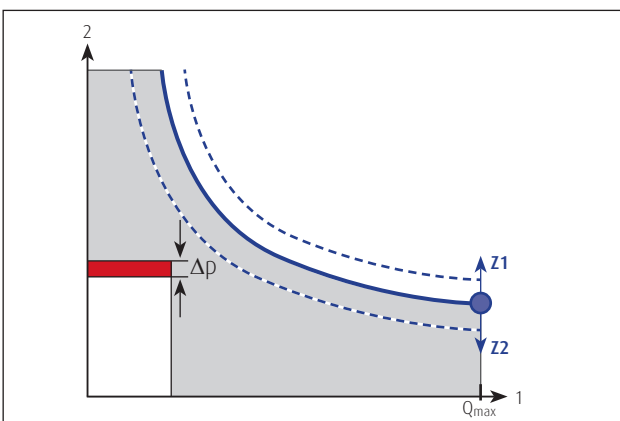
The control principle with power limitation is used to optimize power utilization of the prime mover in applications where less than the full power capacity is available for the hydraulic system. In addition to the load sensing function the HPR-02 TL2 offers hyperbolic power limitation. The volume flow is limited when the set value is reached.

TL2. LS with hyperbolic power limitation



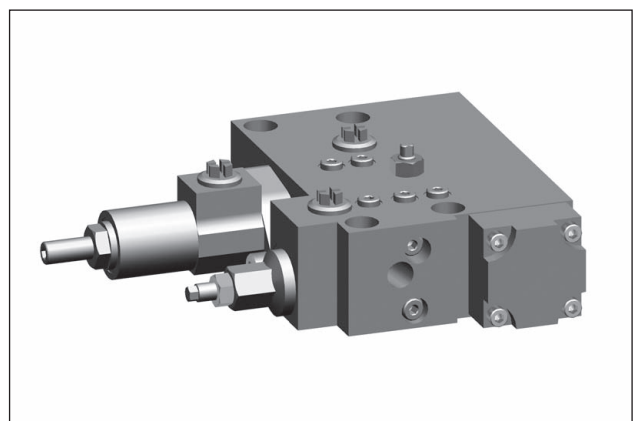
The TL2 controller offers a so called hydraulic power mode function. This means, that the regulation begin of the power limitation / torque control can be shifted from its mechanical basic setting by means of a remote control port Z1/Z2 at the controller. If the regulation begin is intended to be below the basic setting, which means that the pump performance is reduced, then the port Z2 is used while S4 is closed. If the mode function is not used at all, or only with the Z1 port, S4 is equipped with an orifice. Z2 is then sealed pressure tight. For details, see <<Pump controllers with position feedback. T-axis>>

TL2-characteristic curve



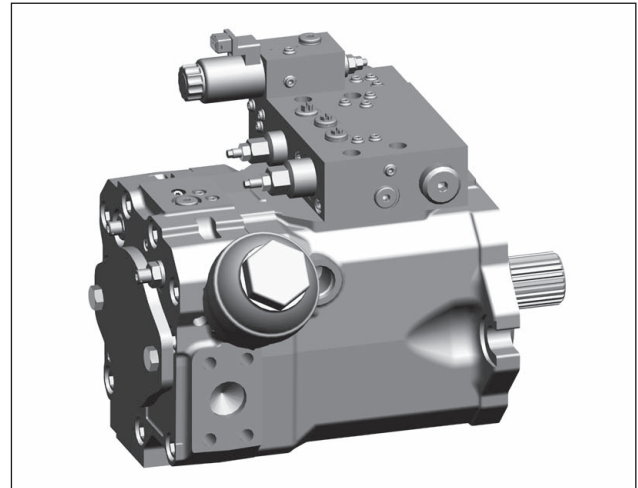
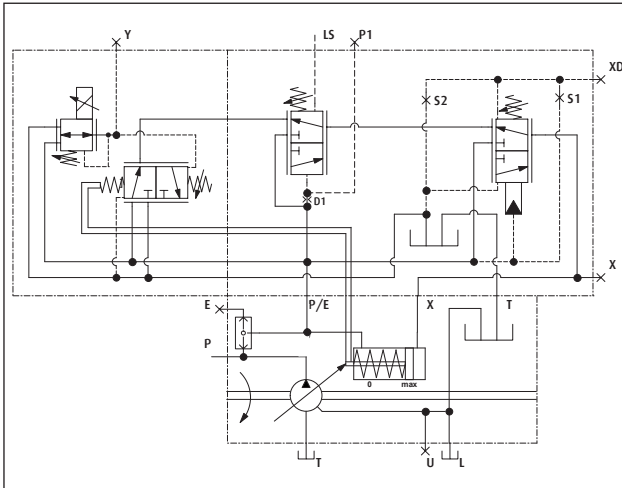
- 1 Flow
- 2 Pressure
- Maximum performance range of the pump
- Actual power demand of the system
- Regulating Δp
- Power limitation regulation begin
- Power limitation basic setting
- - Characteristic shifting by control signal

TL2-controller



Controllers. LEP. Load Sensing with electro-proportional flow limitation and pressure cut-off

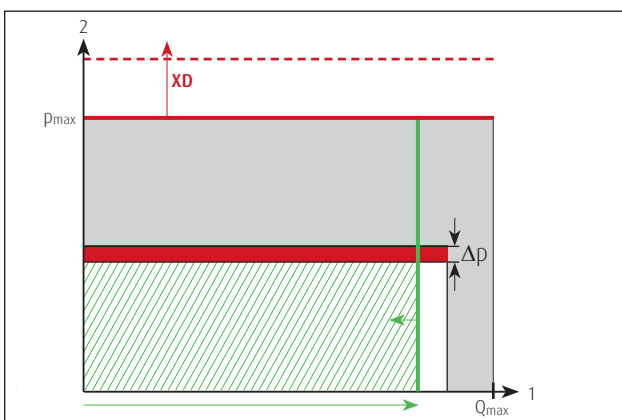
The HPR with LEP-controller offers an on-demand load sensing flow control. The actual volume flow, delivered by the pump can be restricted by an electrical signal in certain points of operation. A pressure cut-off function protects the hydraulic system from overload.



Without any signal at the solenoid or the LS-port, the pump is swashed back to stand-by position. Both signals at the same time are required for the pump to leave stand-by position. The actual swash angle of the pump is determined by the signal with the lower target value.

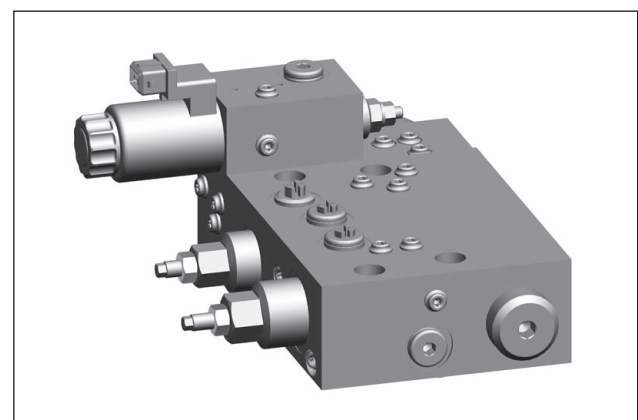
The responding behaviour of the pressure cut-off can be remote-controlled by a hydraulic signal at the XD port as an option. S1 is then equipped with an orifice and S2 is sealed. If only the mechanical preset of the PCO is used, S1 is sealed and S2 is not equipped. Details, see <<Pump controllers with position feedback. P-axis>>

Characteristic LEP controller



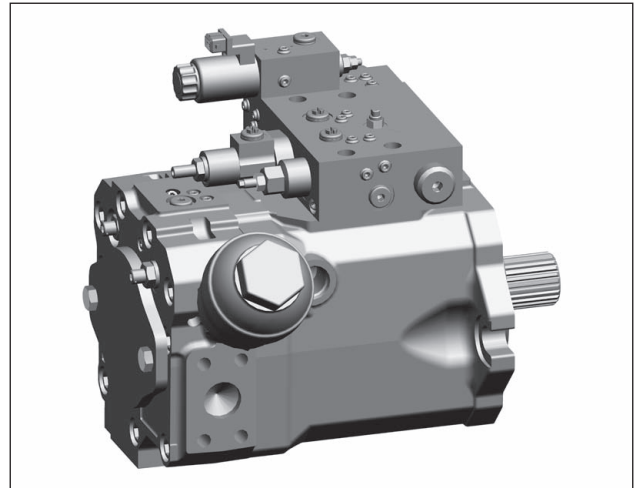
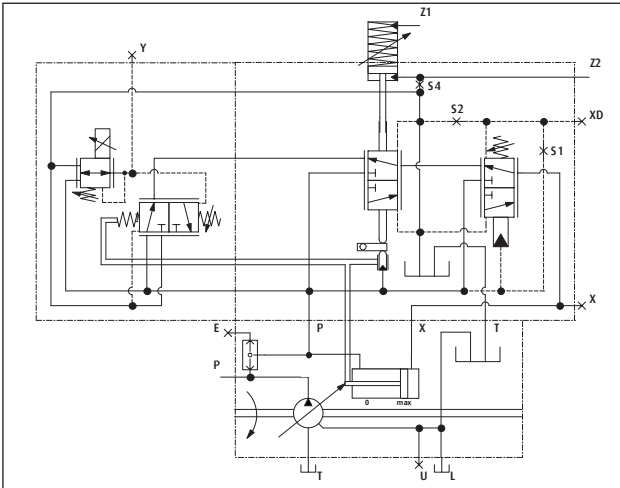
- 1 Flow
- 2 Pressure
- Maximum performance range of the pump
- Actual power demand of the system
- Regulating Δp
- Provided power
- Pressure cut-off basic setting
- - Characteristic shifting by control signal
- Electro-proportional flow setting

LEP-controller



Controllers. ETP. Electro-proportional flow setting, power limitation and pressure cut-off

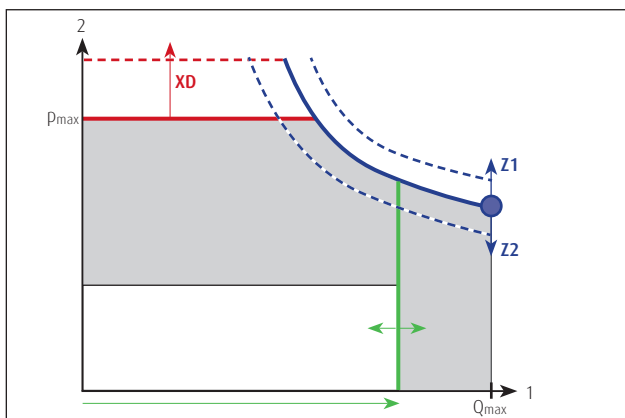
The HPR with ETP-controller delivers a volume flow which is exactly proportional to the electric control signal. Superposed, the controller offers a hyperbolic power limitation, which optimally exploits the power of the prime mover and also protects it from overload. In addition to this, a pressure cut-off protects the hydraulic system. The controller is supplied via a feed port "E" at the port plate housing.



The ETP-controller offers a so called hydraulic power mode function. This means, that the regulation begin of the power limitation can be shifted from its mechanical basic setting by means of a remote control port Z1/Z2 at the controller. If the regulation begin is intended to be below the basic setting, which means that the pump performance is reduced, then the port Z2 is used, S4 is closed. If the mode function is not used at all, or only with the Z1 port, S4 is equipped with an orifice. Z2 is then sealed pressure tight. For details, see <<Pump controllers with position feedback. T-axis>>

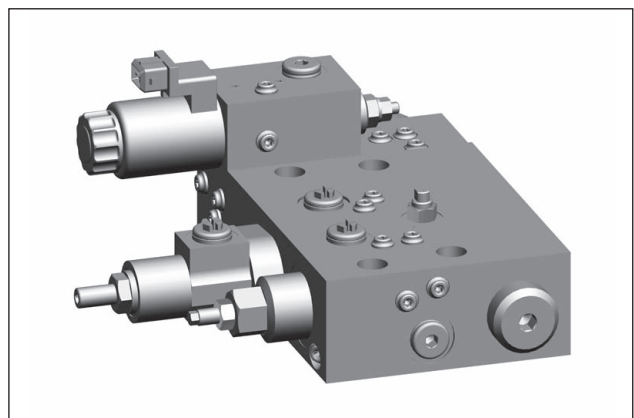
The responding behaviour of the pressure cut-off can be remote-controlled by an hydraulic signal at the XD port as an option. S1 is then equipped with an orifice and S2 is sealed. If only the mechanical preset of the PCO is used, S1 is sealed and S2 is not equipped. Details, see <<Pump controllers with position feedback. P-axis>>

Characteristic ETP-controller

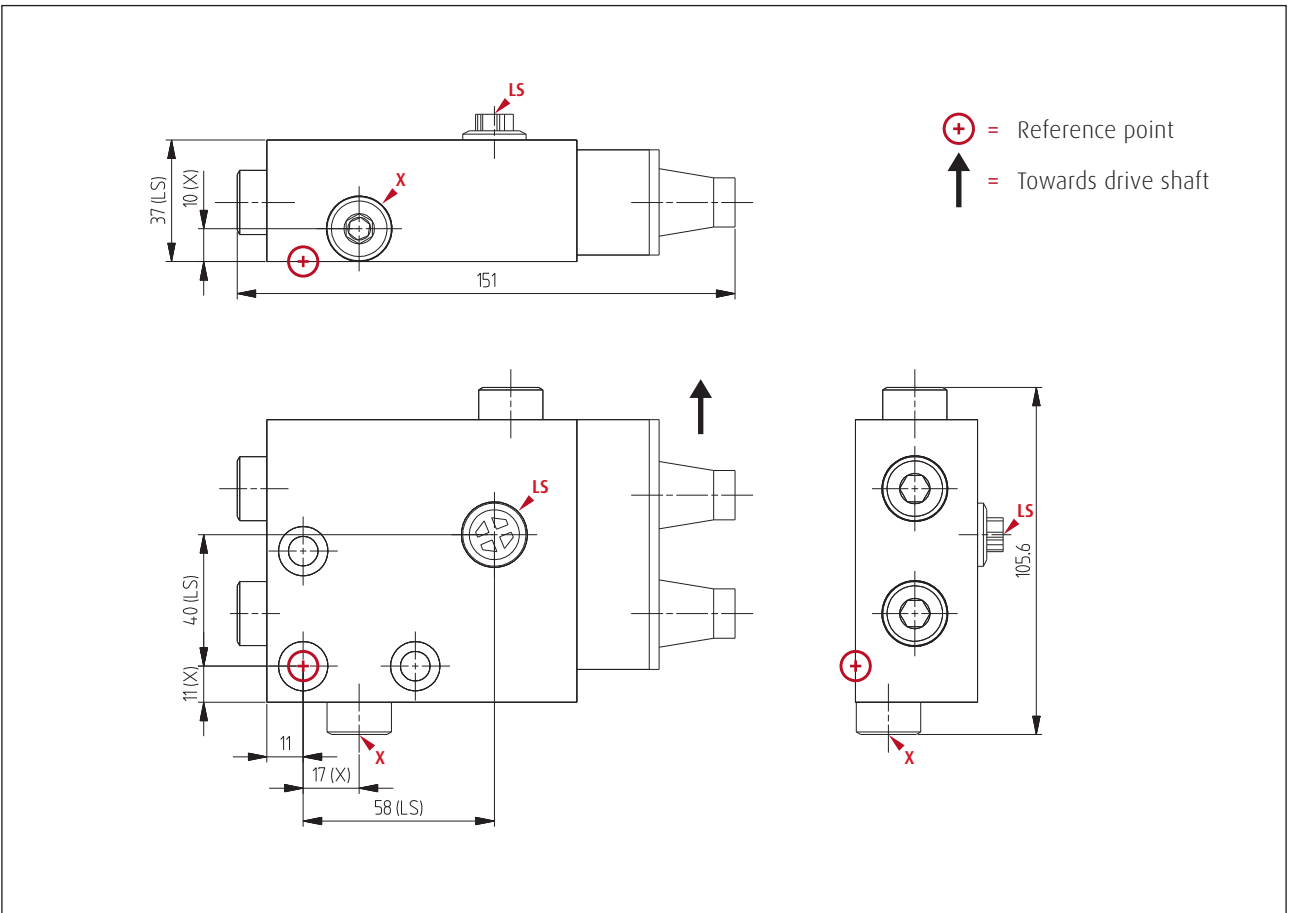
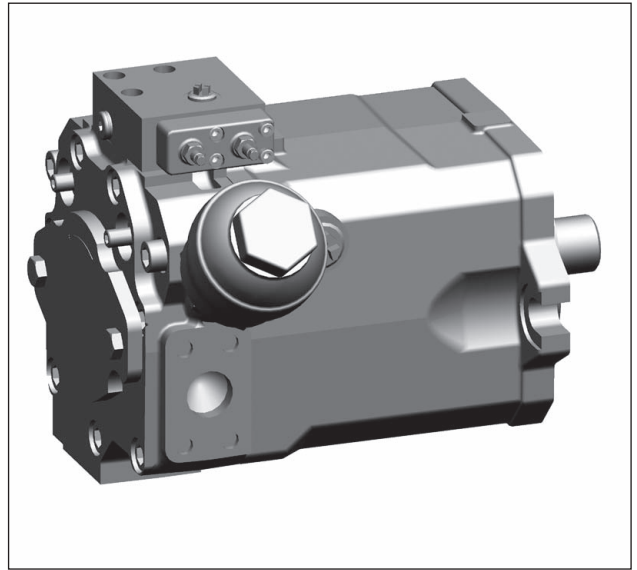
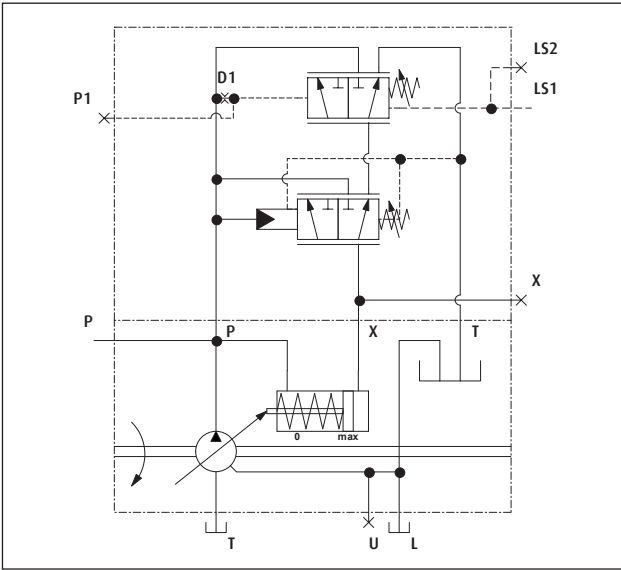


- 1 Displacement
- 2 Pressure
- Maximum performance range of the pump
- Electro-proportional flow setting
- Provided power
- Regulation begin power limitation
- Pressure cut-off basic setting
- - Characteristic shifting by control signal
- Pressure cut-off basic setting
- - Characteristic shifting by control signal

ETP Regler

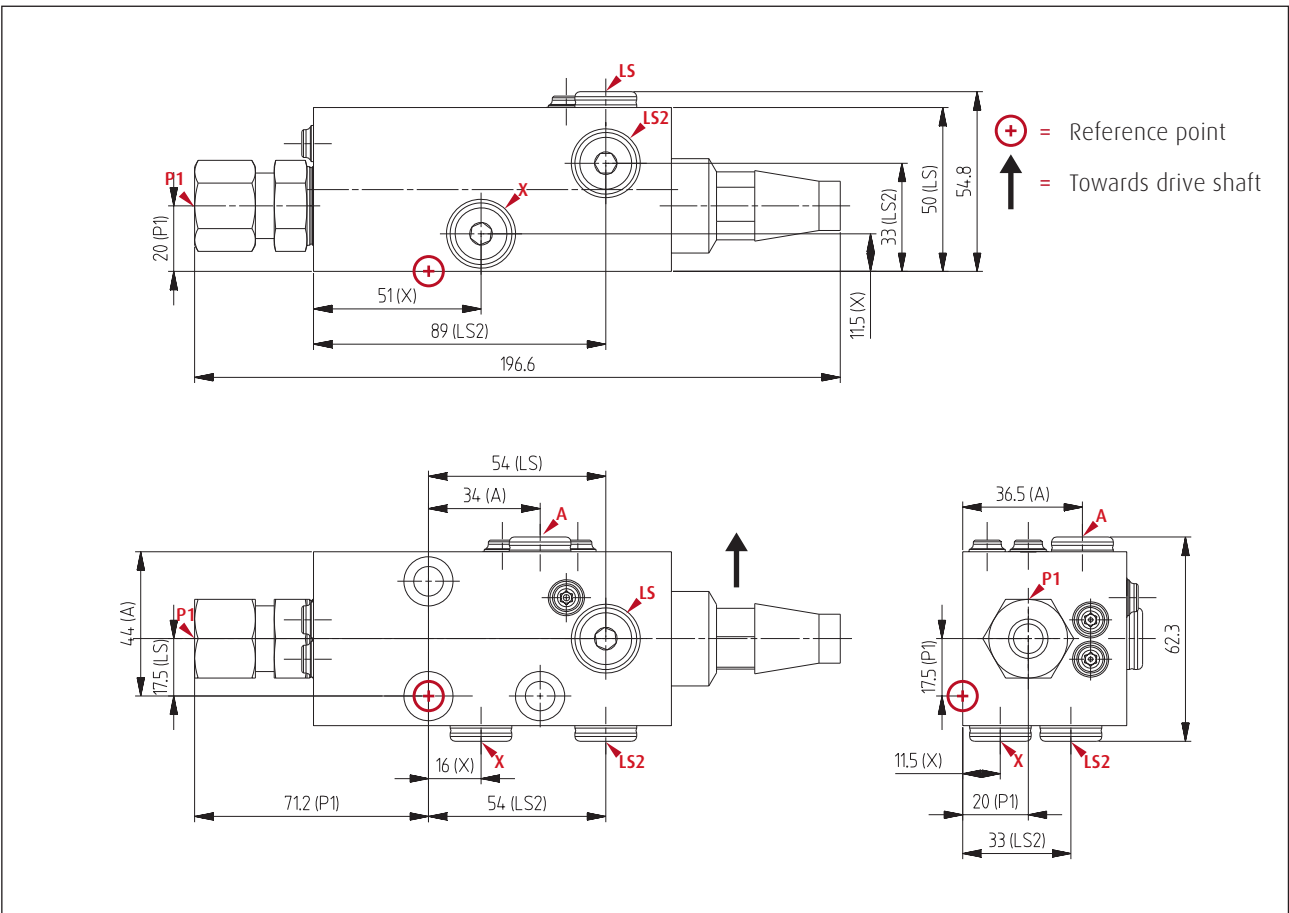
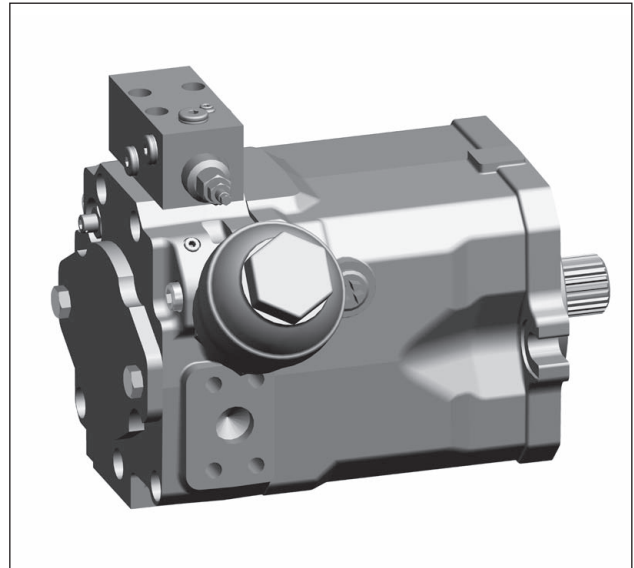
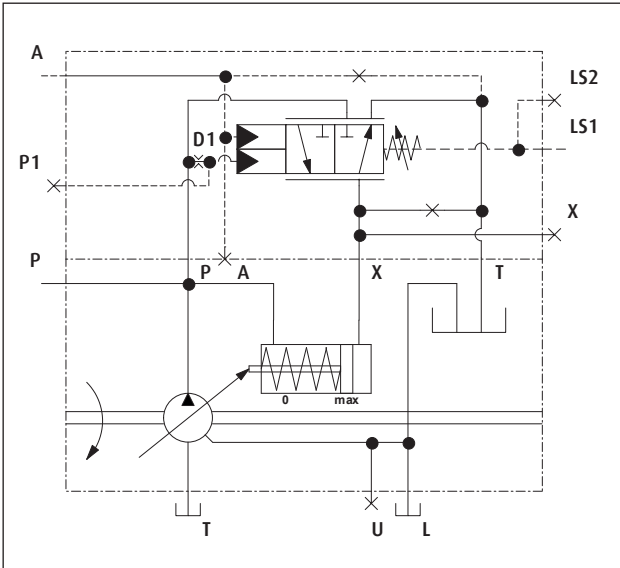


Dimensions. LP-controller



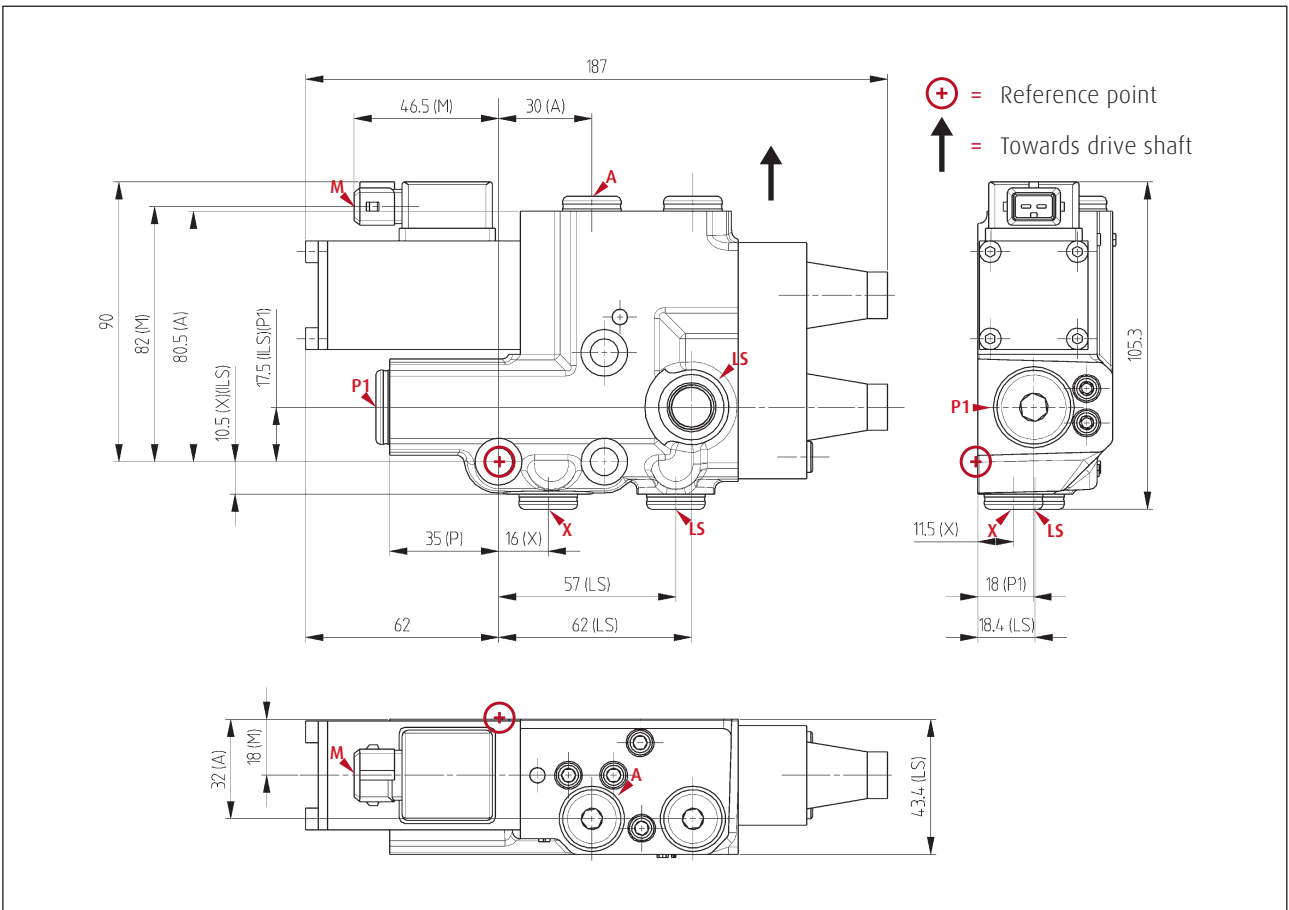
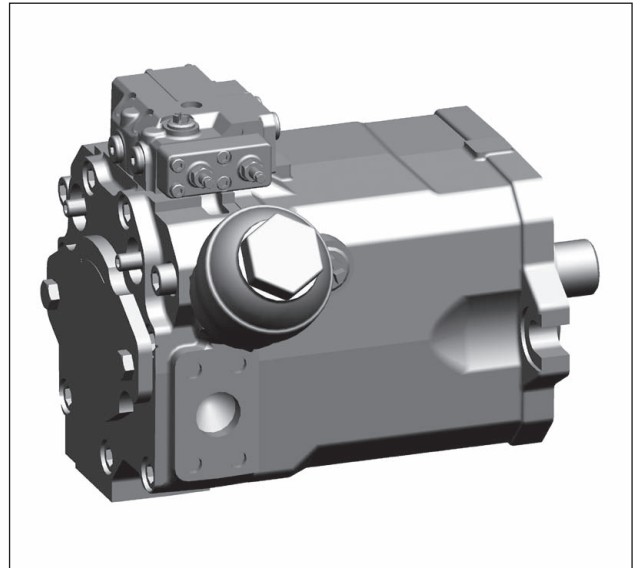
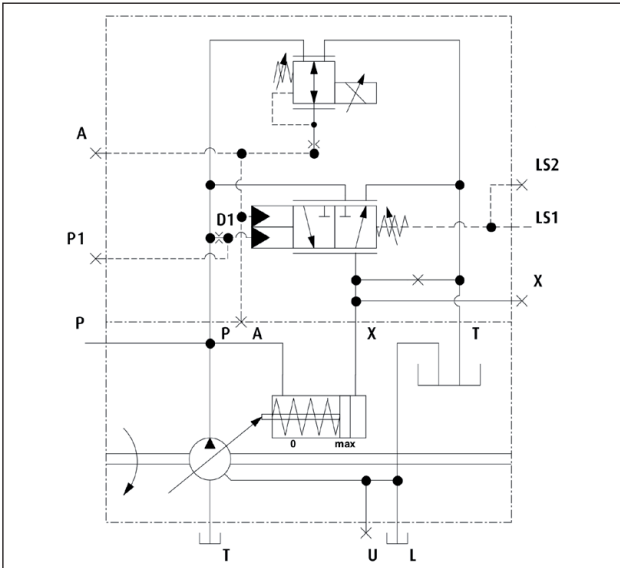
| | | |
|--------------|-----------------------------|---|
| Dimensions: | approx. 151 x 105.6 x 37 mm | |
| Connections: | X | Test port actuating pressure M14x1.5 |
| | LS1, 2 | Load sensing signal / test port M14x1.5 |
| | P1 | Test port pump pressure M14x1.5 |

Dimensions. H1L-controller



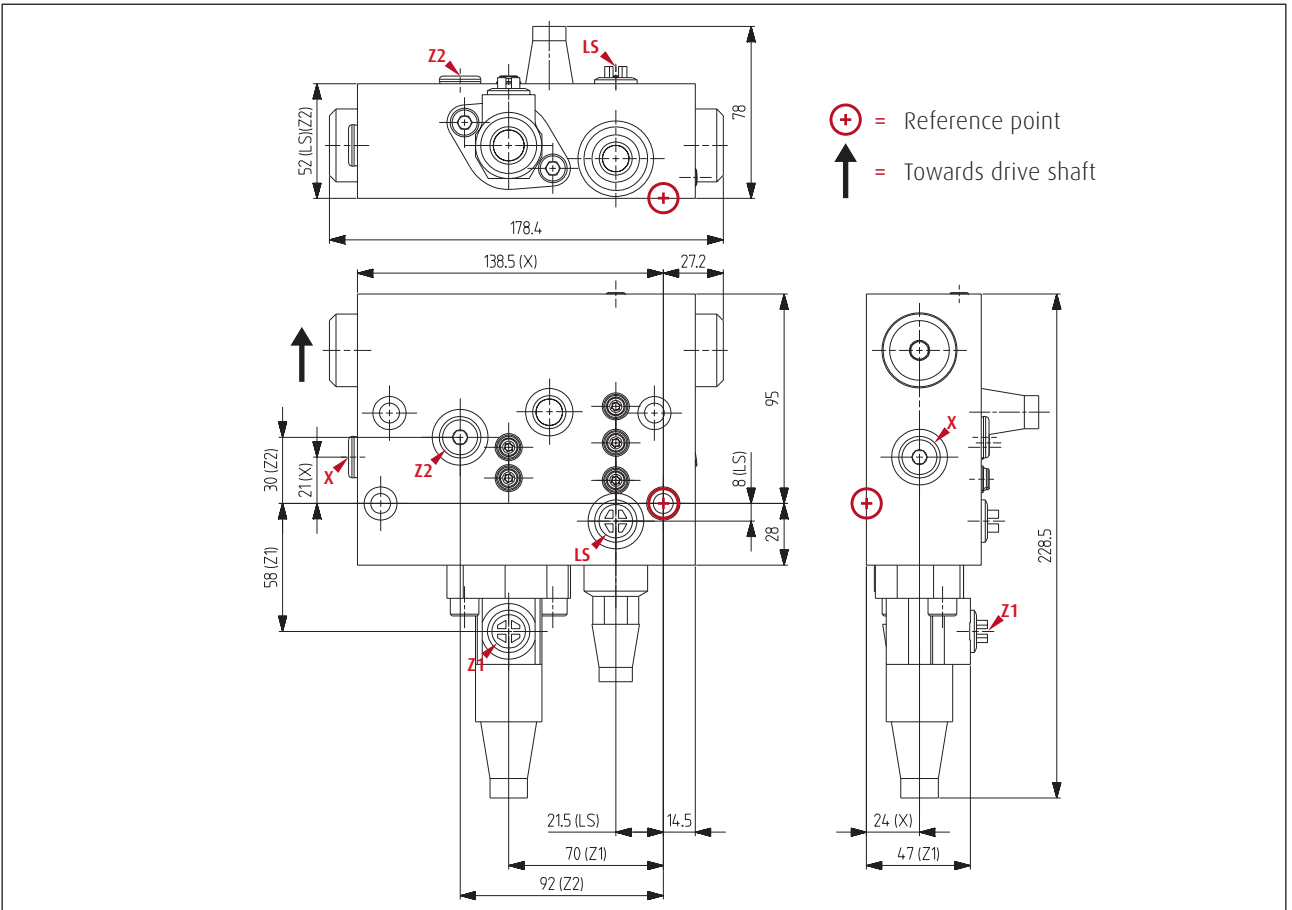
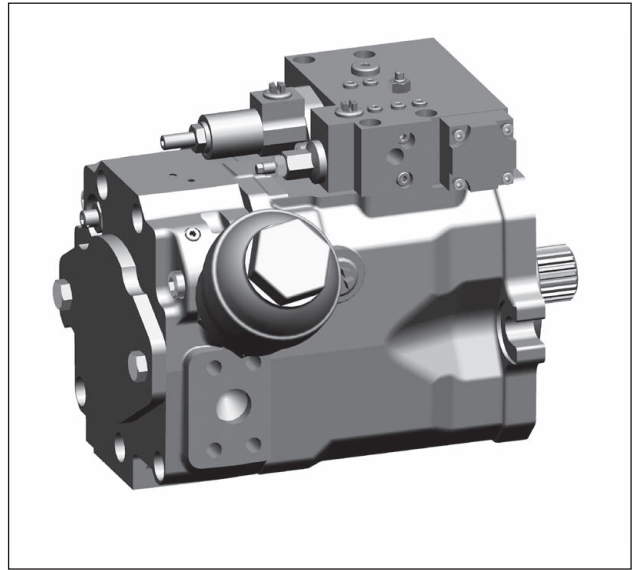
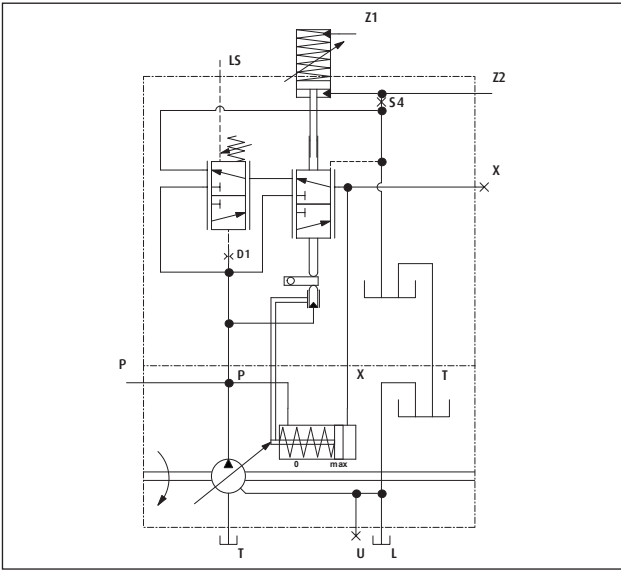
| | | |
|--------------|--------------------------------|---|
| Dimensions: | approx. 196.6 x 62.3 x 54.8 mm | |
| Connections: | A | Test port control pressure M14x1.5 |
| | X | Test port actuating pressure M14x1.5 |
| | LS/LS2 | Load sensing signal / test port M14x1.5 |
| | P1 | Test port pump pressure 12 S (ISO 8434-1) |

Dimensions. E1L-controller



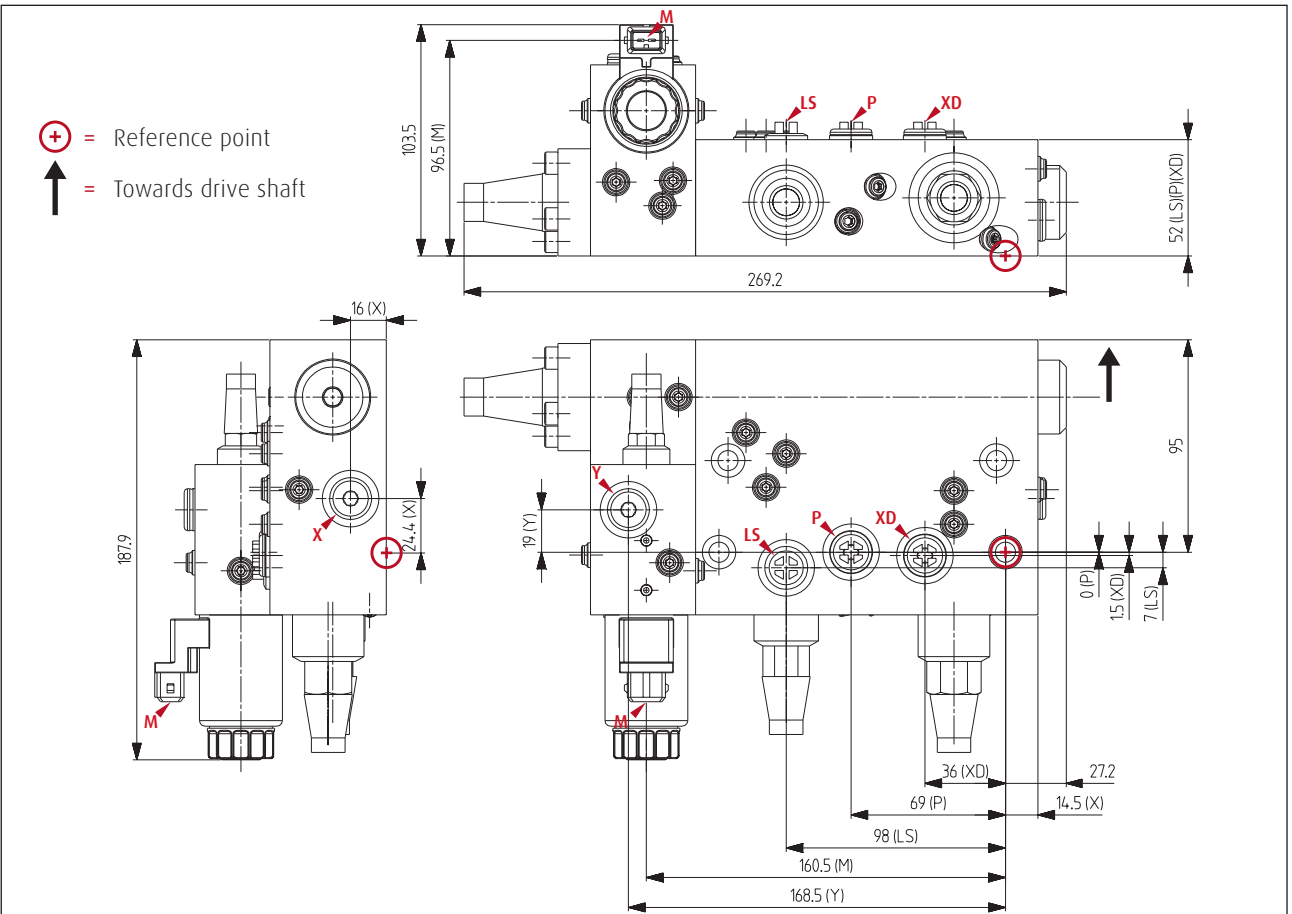
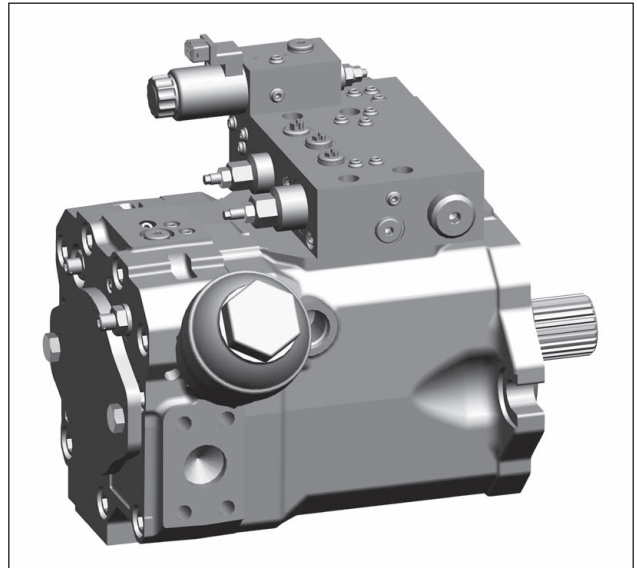
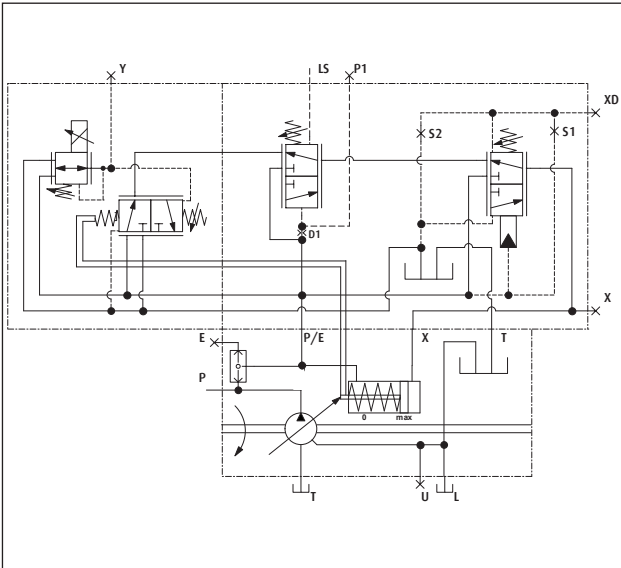
- Dimensions: approx. 187 x 105.3 x 43.4 mm
- Connections:
- | | | |
|-------|---|---------|
| A | Test port control pressure | M14x1.5 |
| X | Test port actuating pressure | M14x1.5 |
| LS1,2 | Load sensing signal / test port | M14x1.5 |
| P1 | Test port pump pressure | M18x1.5 |
| M | Solenoid with AMP-JPT connector (example) | |
- Further information, see <<Controllers. Electrical properties>>

Dimensions. TL2-controller



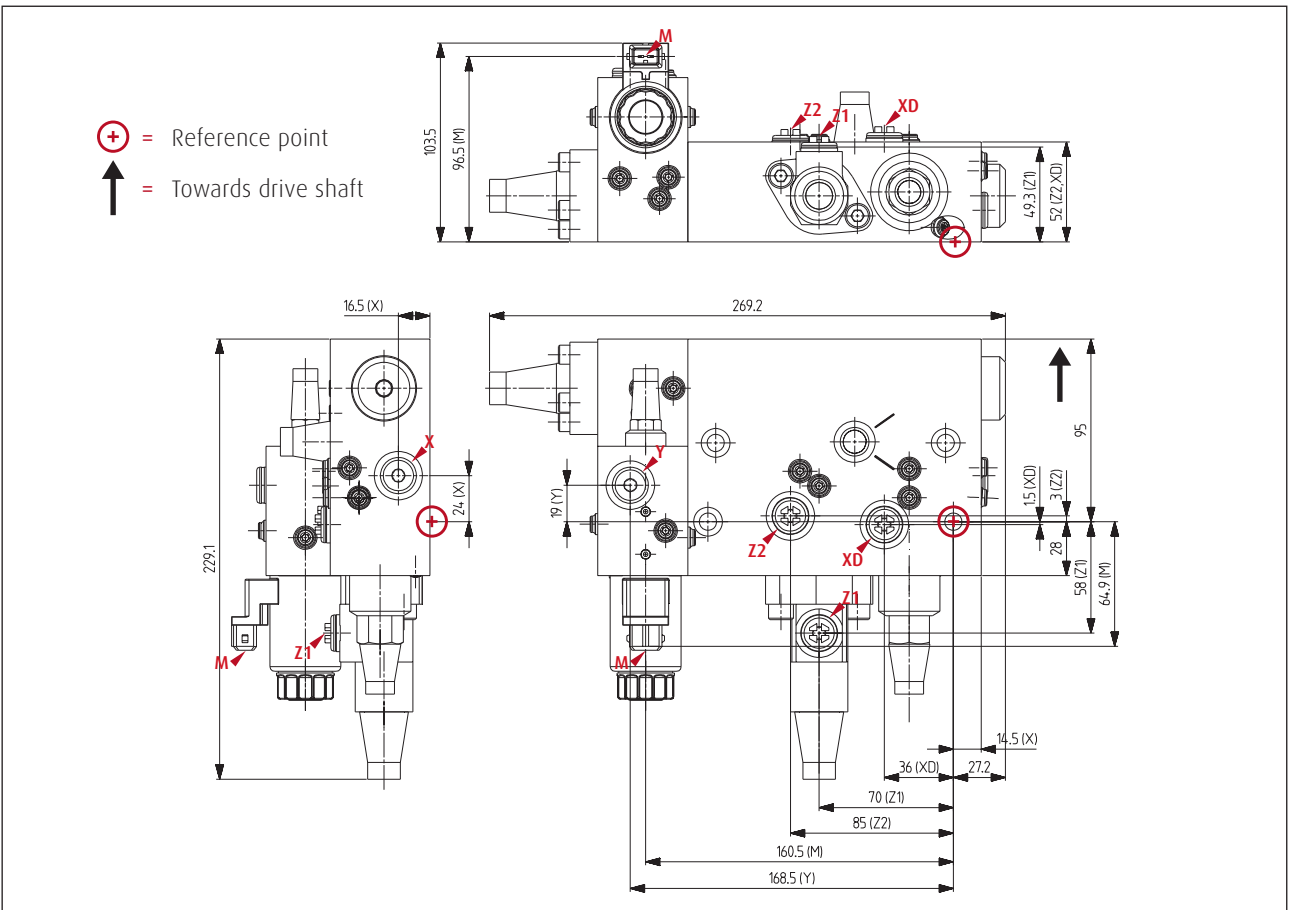
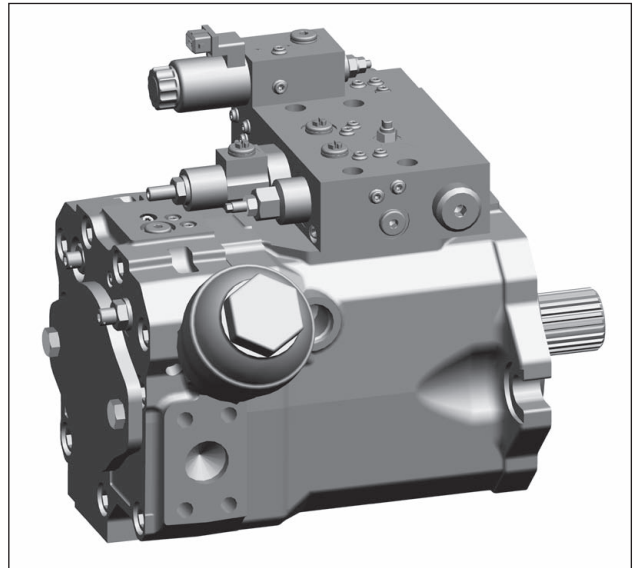
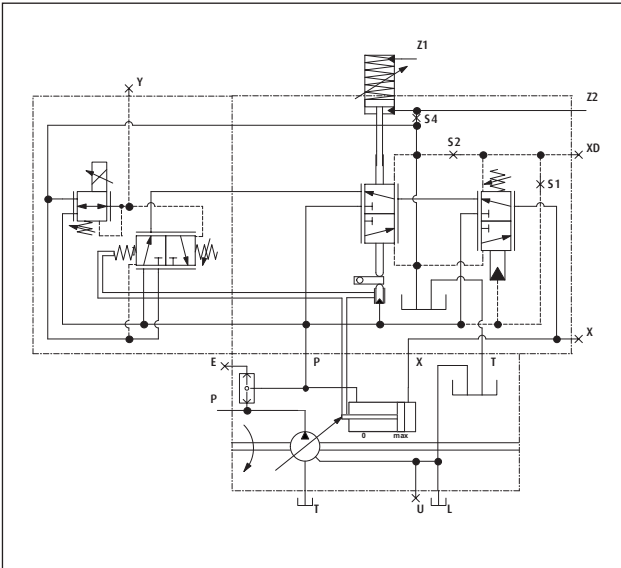
| | | |
|--------------|---|---------|
| Dimensions: | approx. 178.4 x 228.5 x 78 mm | |
| Connections: | X Test port actuating pressure | M14x1.5 |
| | LS Load sensing signal | M14x1.5 |
| | Z1/Z2 Remote control for power limitation | M14x1.5 |

Dimensions. LEP-controller



| | | |
|--------------|---|--|
| Dimensions: | approx. 269.2 x 187.9 x 103.5 mm | |
| Connections: | X | Test port actuating pressure M14x1.5 |
| | Y | Test port pressure-reducing valve M14x1.5 |
| | XD | Port for external pressure cut-off M14x1.5 |
| | LS | Load sensing signal M14x1.5 |
| | P | Test port pump pressure M14x1.5 |
| | M | Solenoid with AMP-JPT connector (example) |
| | Further information, see <<Controllers. Electrical properties>> | |

Dimensions. ETP-controller



Dimensions. Single pumps HPR-02 for LP, E1L, H1L

The dimensioning is shown by one exemplary pump configuration. The external dimensions are determined by the individual configuration, including the choice of a controller, direction of rotation, optional SPU and the settings of the pump. Further information can be found in the specific sections of this datasheet, in particular the sections <<Torque transmission. Mounting flange>> and <<Torque transmission. Drive shaft>>.

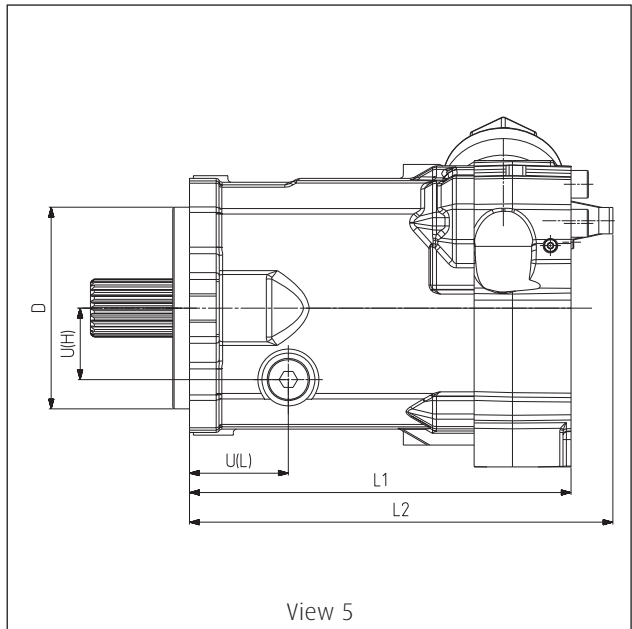
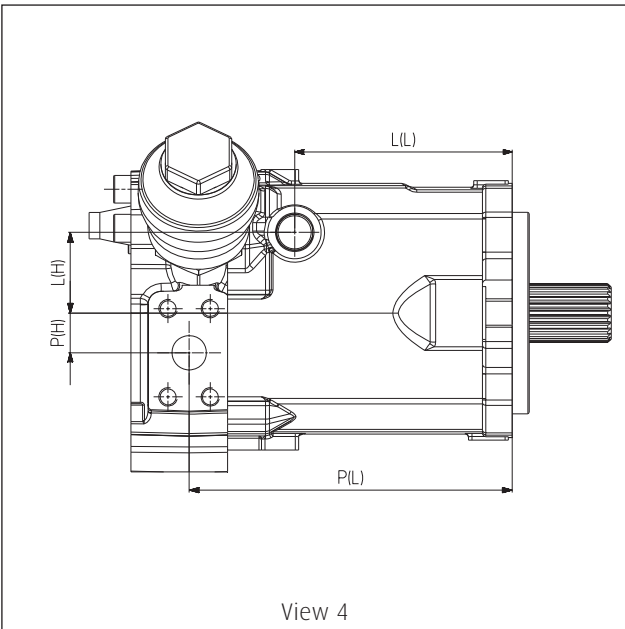
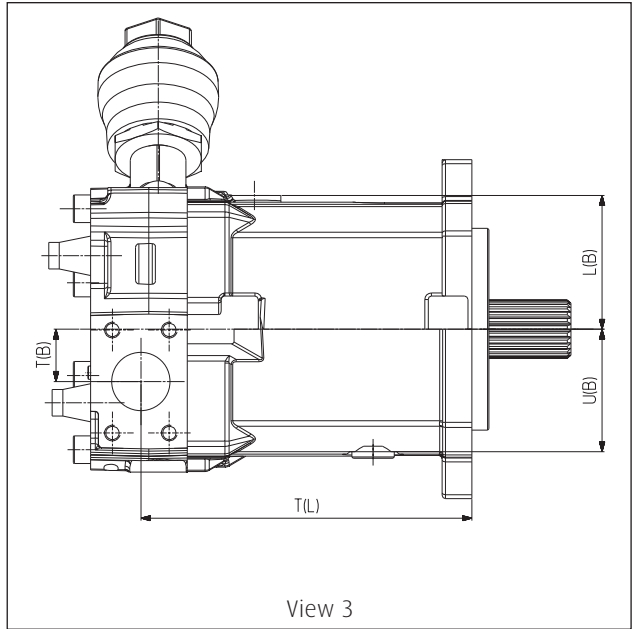
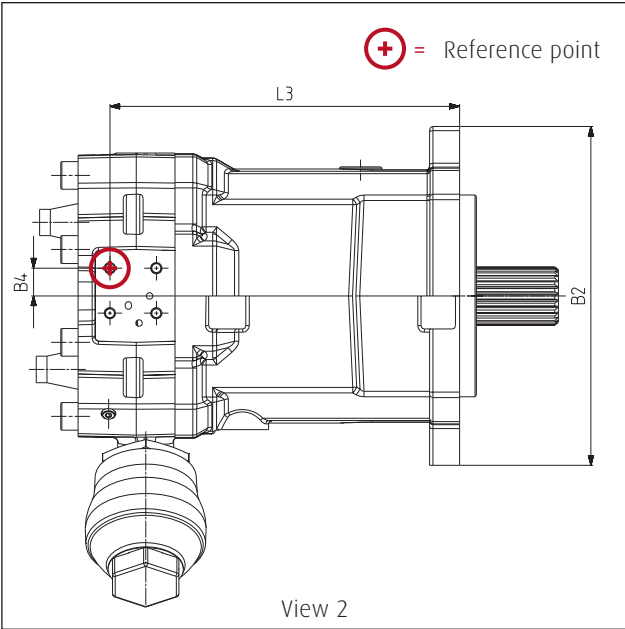
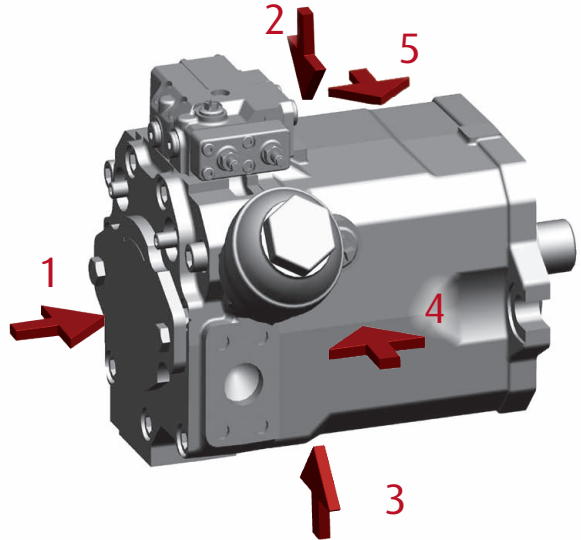
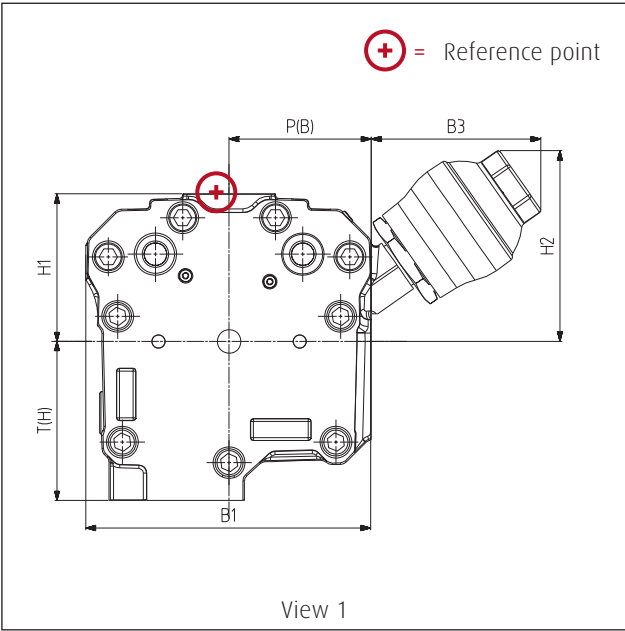
Dimensions of the pump without controller

| Rated size | 55 | 75 | 105 | 135 | 165 | 210 | 280 |
|------------|-------|-------|-------|-------|-------|-------|-------|
| D | 127 | 127 | 127 | 152.4 | 152.4 | 165.1 | 224 |
| L1 | 220.3 | 231.8 | 262 | 284.5 | 333.1 | 348 | 403 |
| L2 | 259.3 | 270.8 | 301 | 323.5 | 372.1 | 387 | 442 |
| L3 | 207.3 | 220.3 | 241 | 263.5 | 317.1 | 333 | 375 |
| H1 | 100 | 102 | 103.5 | 111.5 | 128.5 | 134.5 | 152 |
| H2 | 146 | 146 | 136 | 145.5 | 152.4 | 143.5 | 238 |
| B1 | 111 | 190.3 | 199.6 | 216 | 251.5 | 268 | 306.1 |
| B2 | 208 | 208 | 207 | 256 | 269 | 268.8 | 314.5 |
| B3 | 120 | 111 | 122 | 129 | 128.9 | 126.5 | 125.1 |
| B4 | 21 | 21 | 21 | 21 | 19 | 21 | 21 |

Ports

| Rated size | 55 | 75 | 105 | 135 | 165 | 210 | 280 |
|------------|---------|---------|---------|-------|-------|-------|-------|
| P | ¾" | ¾" | 1" | 1 ¼" | 1 ¼" | 1 ½" | 1 ½" |
| P(L) | 182.8 | 194.3 | 218 | 243.5 | 283.1 | 295 | 344.5 |
| P(H) | 23.5 | 23.5 | 26 | 30 | 43 | 27 | 46 |
| P(B) | 91 | 90.5 | 100 | 107 | 134.5 | 134.5 | 149.5 |
| T | 1 ½" | 1 ½" | 2" | 2" | 2 ½" | 3" | 3 ½" |
| T(L) | 189.8 | 201.3 | 227 | 249.5 | 285.6 | 298 | 344.5 |
| T(H) | 94 | 94 | 103.5 | 120 | 119 | 149 | 167 |
| T(B) | 21 | 21 | 25 | 30 | 0 | 57 | 57 |
| L/U | M22x1.5 | M22x1.5 | M22x1.5 | M27x2 | M27x2 | M27x2 | M33x2 |
| L(L) | 112.8 | 124.3 | 142 | 164 | 180.6 | 197.5 | 215.5 |
| L(H) | 52 | 52 | 53 | 61 | 65 | 71.5 | 80.5 |
| L(B) | 86.5 | 86.5 | 85 | 101.5 | 108 | 128 | 145 |
| U(L) | 72 | 72 | 72 | 74.5 | 81.1 | 83 | 109 |
| U(H) | 44 | 44 | 54 | 54 | 62 | 60 | 68 |
| U(B) | 78.5 | 78.5 | 92.5 | 92.5 | 101 | 118 | 129.5 |

Dimensions. Single pumps HPR-02 for LP, E1L, H1L



Dimensions. Single pumps HPR-02 for TL2, LEP, ETP

The dimensioning is shown with one exemplary pump configuration. The external dimensions are determined by the individual configuration, including the choice of a controller, direction of rotation, optional SPU and the settings of the pump. Further information can be found in the specific sections of this datasheet, in particular the sections <<Torque transmission. Mounting flange>> and <<Torque transmission. Drive shaft>>.

Dimensions of the pump without controller

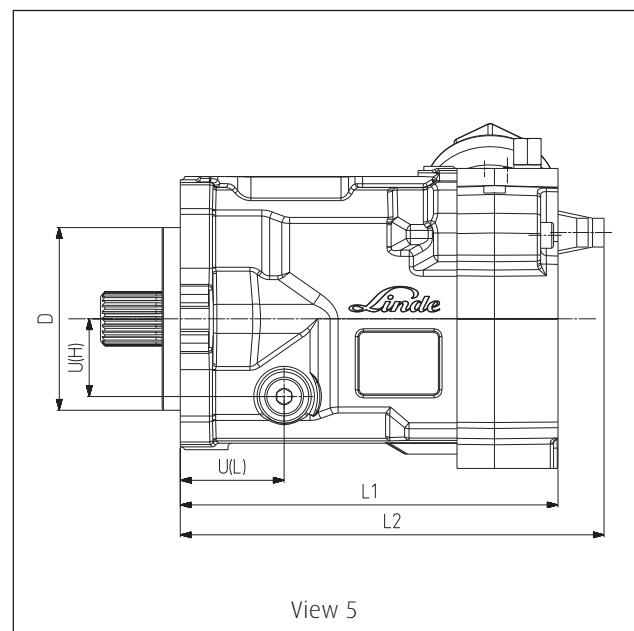
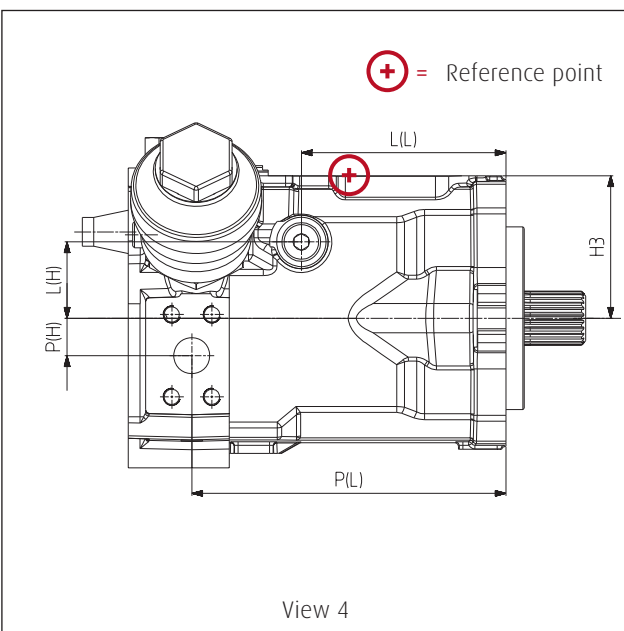
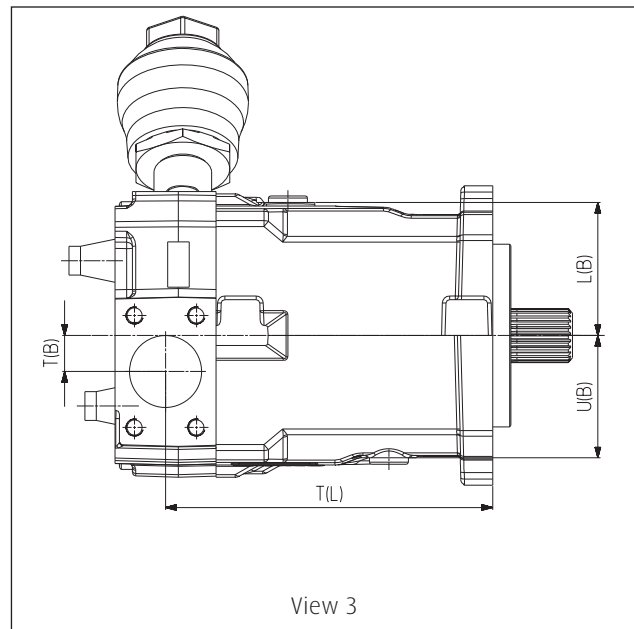
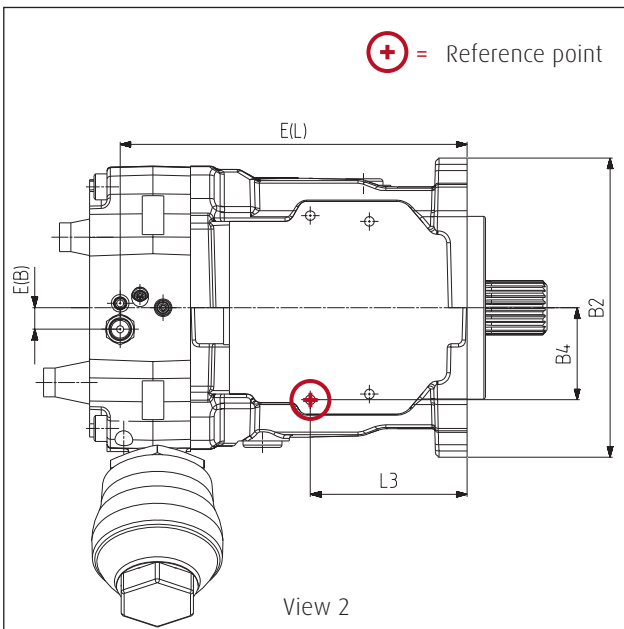
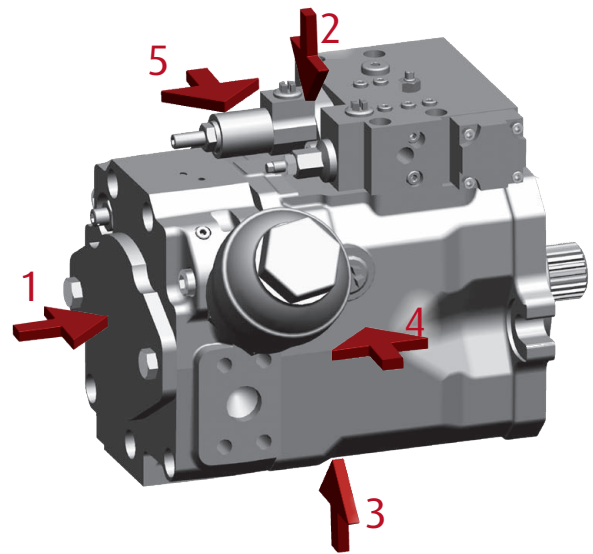
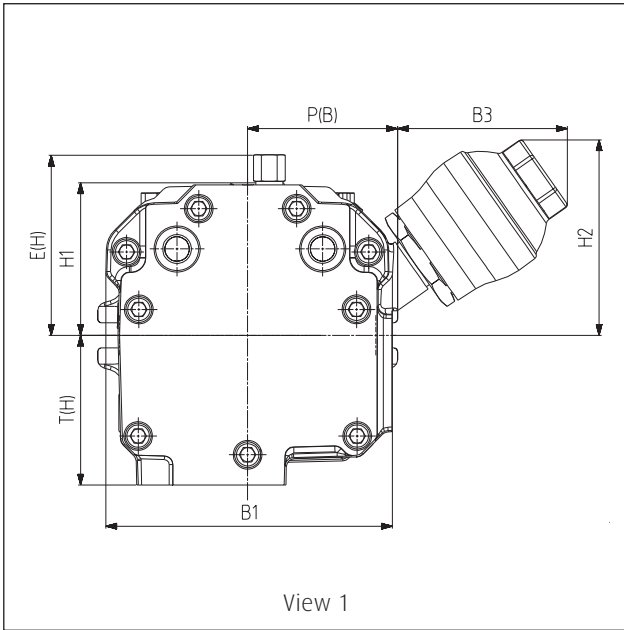
| | | | | | | |
|-----------------------------|-------|-------|-------|-------|-------|-------|
| Rated size | 105 | 105 | 135 | 210 | 280 | 280 |
| In accordance with ISO 3019 | -1 | -2 | -1 | -1 | -1 | -2 |
| D | 127 | 125 | 125.4 | 165.1 | 165 | 224 |
| L1 | 262 | 272 | 284.5 | 348 | 403 | 403 |
| L2 | 301 | 311 | 323.5 | 387 | 442 | 442 |
| L3 | 108.9 | 118.5 | 82.8 | 138.5 | 168 | 168 |
| H1 | 104.5 | 104.5 | 111.5 | 134.5 | 152 | 152 |
| H2 | 134 | 134 | 144 | 144.3 | 200.7 | 238 |
| H3 | 104.5 | 104.5 | 104 | 135 | 135 | 144.5 |
| B1 | 194.5 | 194.5 | 214.8 | 266.3 | 314.5 | 314.5 |
| B2 | 208 | 208 | 256.5 | 269 | 272 | 272 |
| B3 | 118 | 116 | 106.7 | 102.4 | 119.5 | 120.2 |
| B4 | 64 | 64 | 64 | 64 | 82.5 | 82.5 |

Ports

| | | | | | | |
|------|---------|---------|---------|---------|---------|---------|
| P | 1" | 1" | 1 ¼" | 1 ½" | 1 ½" | 1 ½" |
| P(L) | 218 | 228 | 243.5 | 295 | 344.5 | 344.5 |
| P(H) | 26 | 26 | 30 | 27 | 46 | 46 |
| P(B) | 100 | 100 | 107 | 144.5 | 154.1 | 155.5 |
| T | 2" | 2" | 2" | 3" | 3 ½" | 3 ½" |
| T(L) | 227 | 237 | 249.5 | 298 | 344.5 | 344.5 |
| T(H) | 104 | 104 | 120 | 149 | 167 | 167 |
| T(B) | 25 | 25 | 39.5 | 27 | 44 | 57 |
| L/U | M22x1.5 | M22x1.5 | M27x2 | M27x2 | M33x2 | M33x2 |
| L(L) | 142 | 152 | 164 | 191 | 215.5 | 215.5 |
| L(H) | 53 | 53 | 61 | 97.5 | 80.5 | 80.5 |
| L(B) | 92.5 | 92.5 | 101 | 128 | 129.5 | 144.9 |
| U(L) | 72 | 82 | 74.5 | 83 | 109 | 109 |
| U(H) | 54 | 54 | 54 | 60 | 68 | 68 |
| U(B) | 85 | 85 | 92 | 118 | 159.5 | 131.3 |
| E* | M14x1.5 | M14x1.5 | M14x1.5 | M14x1.5 | M14x1.5 | M14x1.5 |
| E(L) | 240.8 | 250.8 | 249.5 | 303 | 375 | 346 |
| E(H) | 135.6 | 135.6 | 142.6 | 165.6 | 183.1 | 183.1 |
| E(B) | 15 | 15 | 16 | 20 | 20 | 20 |

*) ETP-controller only: External supply pressure

Dimensions. Single pumps HPR-02 for TL2, LEP, ETP

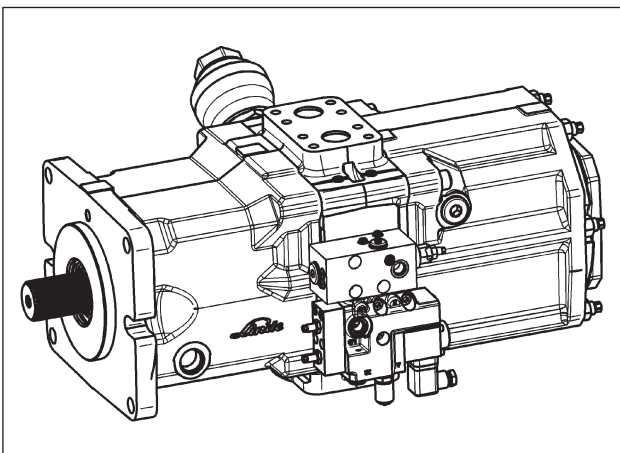


Dimensions. Double pumps and plug-in pumps

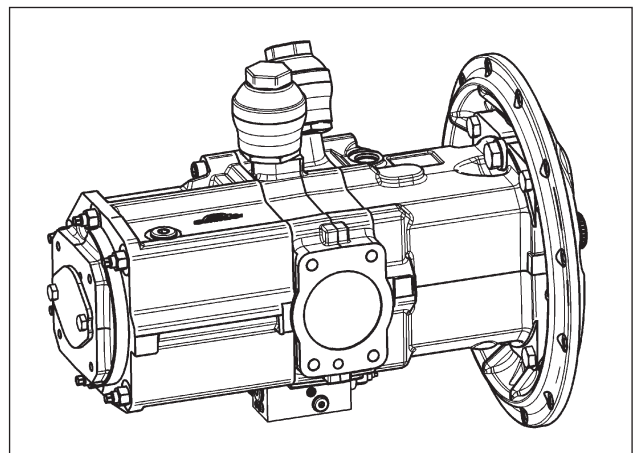
Double pumps consist of two HPR rotating groups, arranged back-to-back to a common port plate housing, sharing one common suction port. They are thus more compact than two standard pumps in a tandem configuration. Compared to a pump of equal rated size with a single rotating group, double pumps offer higher speed and more narrow radial dimensions. They also provide a PTO option. The position of the ports, controllers and SPU differs from the previously shown pumps. Further details on request.

| Rated size | 105D | 105D | 105D | 165D | 165D |
|------------------------------|------------------------------------|-----------------|---------------|------------------------------------|------------|
| Circuit | Single circuit pump | | | Single or dual circuit pump | |
| Flange | SAE C with 4 additional bolt holes | plug-in version | SAE 3 / SAE 4 | SAE D with 4 additional bolt holes | SAE 3 |
| D1 [mm] | 127 | 216 | SAE J617a | 152.4 | SAE J617a |
| D2 [mm] | - | - | | - | |
| D3 [mm] | - | - | | - | |
| B1 [mm] | 124 | 124 | 124 | 147 | 147 |
| B2 [mm] | 120 | 120 | 120 | 136 | 136 |
| B4 [mm] | - | 222 | 222 | 162.3 | 162.3 |
| H1 [mm] | 107 | 141 | 141 | 116 | 116 |
| H2 [mm] | 107 | 141 | 141 | 116 | 116 |
| H3 [mm] (105:LP, 165 E1L) | 138 | 144 | 144 | 170 | 170 |
| H4 [mm] | - | 137 | 137 | 255 | 255 |
| H5 [mm] port P | 75 | 75 | 75 | 80 | 80 |
| H6 [mm] port T | 38 | 38 | 38 | 0 | 0 |
| H7 [mm] | 195 | 196 | 196 | 260 | 260 |
| L1 [mm] | 474 | 358 | 450 | 587.6 | 587.6 |
| L2 [mm] | 478 | 376 | 468 | 601 | 625 |
| L3 [mm] | 61.3 | 171 | 79 | 74.6 | 50.1 |
| L4 [mm] | 232 | 116 | 208 | 286.1 | 310.6 |
| P (SAE) | 2 x 1" | 2 x 1" | 2 x 1" | 2 x 1 1/4" | 2 x 1 1/4" |
| T (SAE) | 1 x 3" | 1 x 3" | 1 x 3" | 1 x 4" | 1 x 4" |
| L | M22x1.5 | M22x1.5 | M22x1.5 | M27x2 | M27x2 |
| U | M22x1.5 | M22x1.5 | M22x1.5 | M27x2 | M27x2 |

Double pump with SAE J744 flange

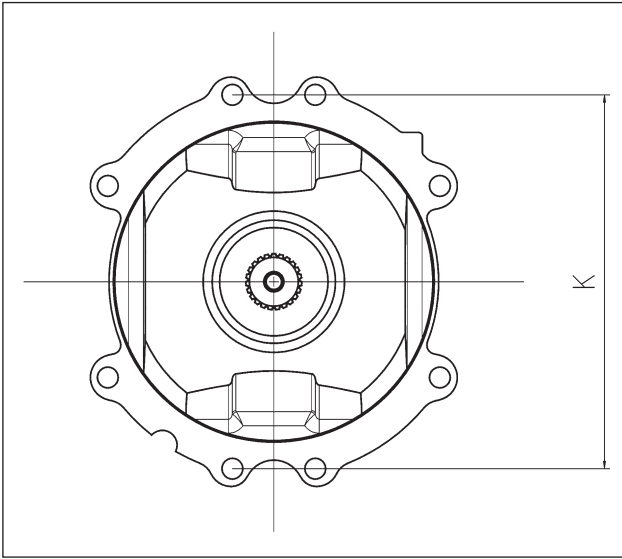


Double pump with SAE J617a flange

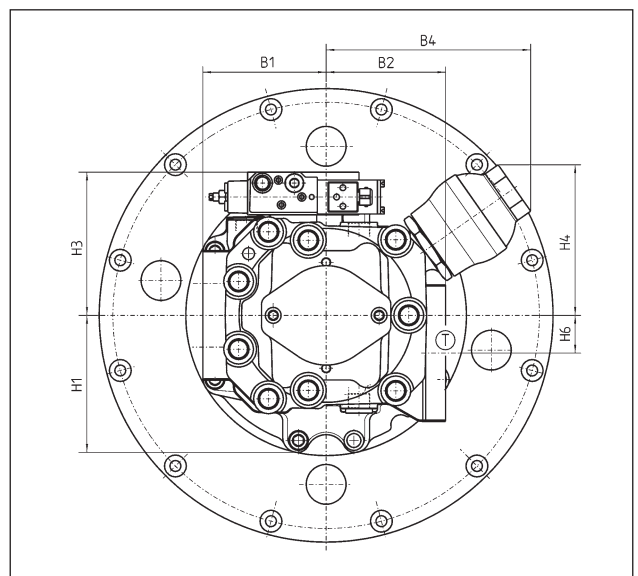
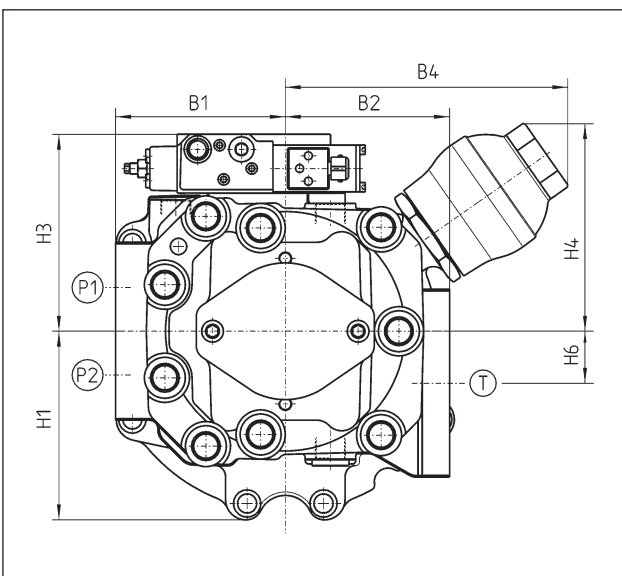
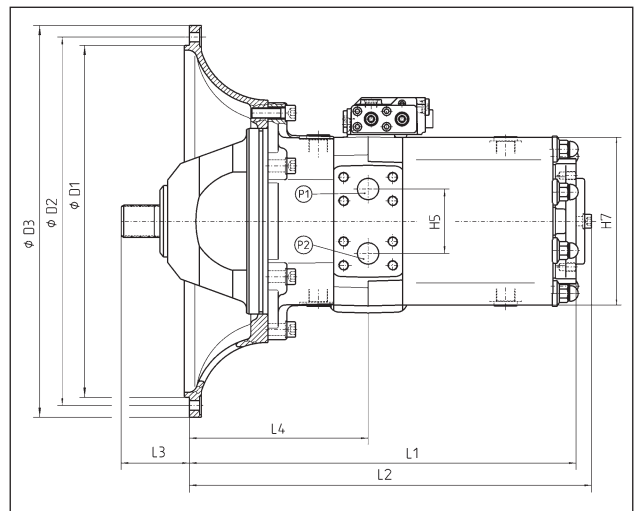
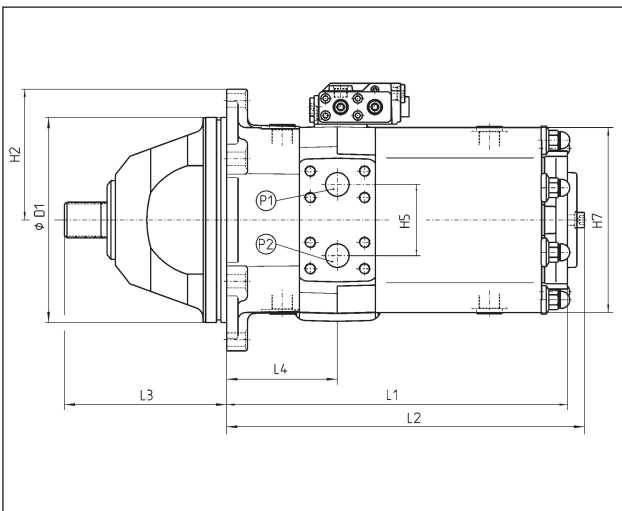
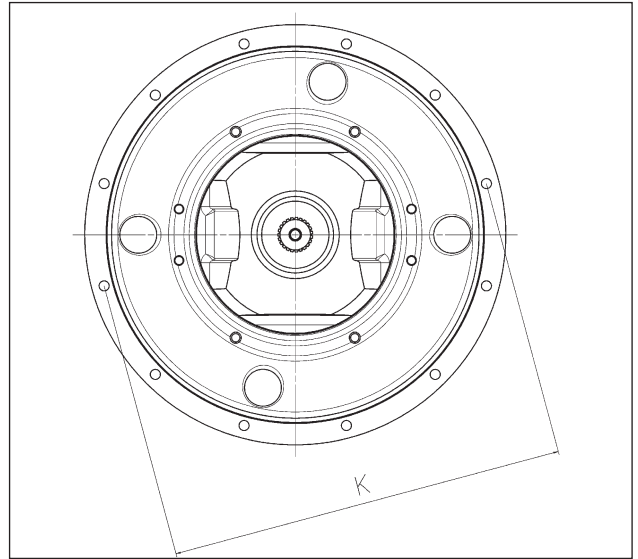


Dimensions. Double pumps and plug-in pumps

Plug-in flange



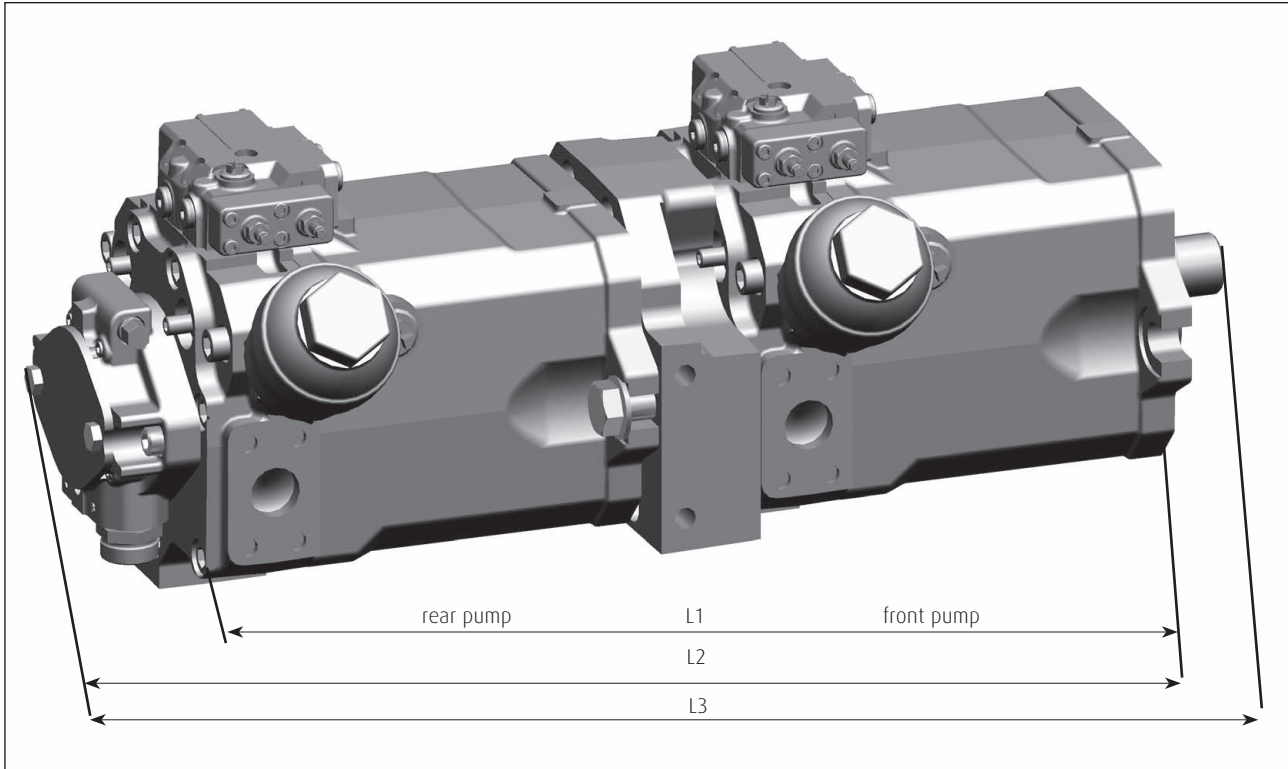
SAE bell housing



Dimensions. Multiple pumps

Multiple pumps are created by connecting individual pump units in series, with the pumps arranged by capacity. Positioning the gear pump(s) at the end of the tandem ensures optimum space utilisation, output allocation and load distribution. The following table is based on the attached gear pump acting as a pilot pressure pump for the control circuit.

Multiple pump HPR-HPR-02



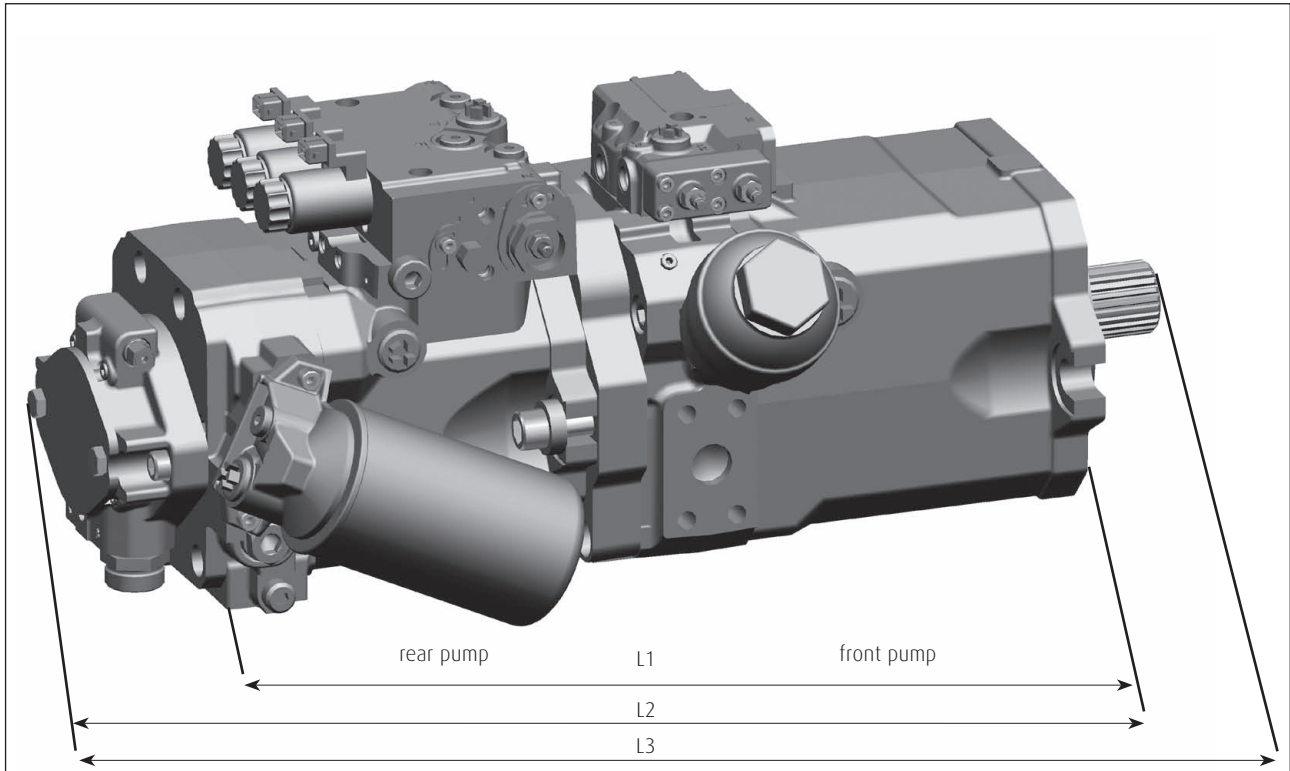
Overall length of multiple pump HPR-HPR-02

| Rated size | Rear pump | HPR 55 | HPR 75 | HPR 105 | HPR 135 | HPR 165 | HPR 210 | HPR 280 |
|------------|-------------|-----------|-------------|-------------|-------------|-----------|-----------|-----------|
| Front pump | Charge pump | 16 cc/rev | 22.5 cc/rev | 22.5 cc/rev | 22.5 cc/rev | 38 cc/rev | 38 cc/rev | 38 cc/rev |
| HPR 55 | L1 | 488 | - | - | - | - | - | - |
| | L2 | 548 | - | - | - | - | - | - |
| | L3 | 602 | - | - | - | - | - | - |
| HPR 75 | L1 | 500 | 511 | - | - | - | - | - |
| | L2 | 565 | 576 | - | - | - | - | - |
| | L3 | 620 | 631 | - | - | - | - | - |
| HPR 105 | L1 | 520 | 531 | 562 | - | - | - | - |
| | L2 | 585 | 596 | 627 | - | - | - | - |
| | L3 | 640 | 651 | 682 | - | - | - | - |
| HPR 135 | L1 | 536 | 547 | 578 | 619 | - | - | - |
| | L2 | 596 | 612 | 643 | 684 | - | - | - |
| | L3 | 671 | 667 | 698 | 759 | - | - | - |
| HPR 165 | L1 | 579 | 591 | 621 | 679 | 728 | - | - |
| | L2 | 754 | 766 | 796 | 854 | 903 | - | - |
| | L3 | 829 | 841 | 871 | 929 | 978 | - | - |
| HPR 210 | L1 | 600 | 612 | 642 | 701 | 749 | 751 | - |
| | L2 | 775 | 787 | 817 | 876 | 924 | 926 | - |
| | L3 | 850 | 862 | 892 | 951 | 999 | 1001 | - |
| HPR 280 | L1 | 669 | 680 | 711 | 727 | 775 | 790 | 845 |
| | L2 | 844 | 855 | 886 | 902 | 950 | 965 | 1020 |
| | L3 | 919 | 930 | 961 | 977 | 1025 | 1040 | 1095 |

Dimensions. Multiple pumps

Multiple pumps are created by combining individual pump units in series, with the pumps arranged by capacity. Positioning the gear pump(s) at the end of the unit ensures optimum space utilization, output allocation and load distribution. The following table is based on the gear pump acting as boost pump for the HPV-02 variable pump.

Multiple pump HPR-HPV-02



Overall length of multiple pump HPR-HPV-02

| Rated size | Rear pump | HPV 55 | HPV 75 | HPV 105 | HPV 135 | HPV 165 | HPV 210 | HPV 280 |
|------------|-------------|-----------|-------------|-------------|-------------|-----------|-----------|-----------|
| Front pump | Charge pump | 16 cc/rev | 22.5 cc/rev | 22.5 cc/rev | 22.5 cc/rev | 38 cc/rev | 38 cc/rev | 38 cc/rev |
| HPR 55 | L1 | 493 | - | - | - | - | - | - |
| | L2 | 553 | - | - | - | - | - | - |
| | L3 | 607 | - | - | - | - | - | - |
| HPR 75 | L1 | 504 | 521 | - | - | - | - | - |
| | L2 | 569 | 586 | - | - | - | - | - |
| | L3 | 624 | 641 | - | - | - | - | - |
| HPR 105 | L1 | 525 | 542 | 567 | - | - | - | - |
| | L2 | 590 | 607 | 632 | - | - | - | - |
| | L3 | 645 | 662 | 687 | - | - | - | - |
| HPR 135 | L1 | 541 | 558 | 583 | 623 | - | - | - |
| | L2 | 601 | 623 | 648 | 688 | - | - | - |
| | L3 | 676 | 678 | 703 | 763 | - | - | - |
| HPR 165 | L1 | 584 | 601 | 626 | 683 | 715 | - | - |
| | L2 | 759 | 776 | 801 | 858 | 890 | - | - |
| | L3 | 834 | 851 | 876 | 933 | 965 | - | - |
| HPR 210 | L1 | 605 | 622 | 647 | 704 | 736 | 749 | - |
| | L2 | 780 | 797 | 822 | 879 | 911 | 924 | - |
| | L3 | 855 | 872 | 897 | 954 | 986 | 999 | - |
| HPR 280 | L1 | 674 | 691 | 716 | 730 | 762 | 788 | 834 |
| | L2 | 849 | 866 | 891 | 905 | 937 | 963 | 1009 |
| | L3 | 924 | 941 | 966 | 980 | 1012 | 1038 | 1048 |

Modular system features.

The HPR-02 is based on a modular system with the following characteristics. This enables our distribution partners to configure the product according to your requirements. The latest characteristics and available options can be taken from the model code, which is available on our homepage.

- >> Rated size
- >> V_{max}
- >> Direction of rotation
- >> Pump controller
- >> Solenoid connector type
- >> Solenoid operating voltage
- >> Noise reduction SPU
- >> Port threads
- >> Mounting flange
- >> Drive Shaft
- >> PTO through-drive
- >> PTO attachment
- >> Gear pumps
- >> Gear pump PTO
- >> Pump settings like speed, LS-setting, pressure cut-off, power-limitation
- >> Pressure cut-off remote control
- >> Power limitation remote control
- >> Surface treatment
- >> Name plate



Product Catalogue

- >> Hydraulic and electric drive technology

Brochures

- >> LinDrive. The unbeatable driving experience
- >> Drive systems for construction machines.
- >> Drive systems for agricultural machines.
- >> HPV-CA. Unbeatable driving experience for applications with engine speed control
- >> LSC Linde Synchron Control. Performance meets Flexibility

Datasheets

- >> Model Code. Configuration of the series 02
- >> HMF/A/V/R-02. Hydraulic motors for closed and open loop operation
- >> HPR-02. Self-regulating pumps for open loop operation
- >> HPV-02. Variable pumps for closed loop operation
- >> VT modular. Modular system for LSC manifold valve plate
- >> LINC 1. Universal electronic drive control
- >> LINC 2. Universal electronic drive control
- >> Linde pressure definitions. According to DIN 24312
- >> Mineral-oil-based hydraulic fluids

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