Data sheet

Axial piston pump DPVO

The Liebherr DPVO 550 axial piston pumps are designed as swashplates for open circuits. They were developed for mining applications. Thanks to their robust and reliable design, they are also highly suitable for industrial plant and maritime applications.

All these variable displacement pumps are available in nominal size 550 as a single pump with impeller, or as a double pump without an impeller. The nominal pressure of the units is 5,511 psi (380 bar) and the maximum pressure is 6,092 psi (420 bar) absolute.

The DPVO 550 models stand out with their wide swivel angle of 20° and high pressure capacity. The pumps offer 100% through-drive capability, and can be combined with hyperbolic power control with pressure control and pressure cut-off. With the impeller, higher speed and higher displacement are possible as well.

Valid for:
DPVO 550 / DPVO 550i

Features:
D series
Open circuit

Control types:
Additional control types upon request

Pressure range:
Nominal pressure p_N = 5,511 psi (380 bar)
Maximum pressure p_{max} = 6,092 psi (420 bar)

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LIEBHERR

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1 Type code

DPV	0	550	/			1				A				0	
1.	2.	3		4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.

1. Pump type

D series / pump / variable displacement	DPV

2. Type of circuit

Open	0

3. Nominal size (NS)

	550

4. Residual displacement $V_{g\ min}$

15% of $V_{g\ max}$, not adjustable, enter value in cm^3/rev (enter "not adjustable" in the order text)	■	
0 or 15% of $V_{g\ max}$, hydraulically adjustable, enter value in cm^3/rev (enter "hydraulically adjustable" in the order text)	■	

5. Activation / control type

Electro-proportional regulation (positive characteristic) / pressure cut-off	□	EL1 - DA
Power control / load sensing	□	LR - LS
Power control / steering pressure-proportional (positive characteristic) / pressure cut-off	■	LR - SD - DA
Electro-proportional regulation (positive characteristic) / load sensing	□	EL1 - LS
Pressure cut-off	□	DA
Total performance regulation / steering pressure-proportional (positive characteristic)	□	SL - SD
Load sensing / pressure cut-off	□	LS - DA

6. Design

	1

7. Direction of rotation (viewed towards the drive shaft)

right	□	R
left	■	L

8. Mounting flange

Diesel engine flange SAE J617a	SAE 1	□	11
	SAE 2	□	12
DIN / ISO 3019-2		■	31...
Special flange		□	51...

9. Shaft end

Splined shaft	DIN 5480	■	1
	ANSI B92.1a	□	2

10. Connections

ISO 6162-2 / SAE J518-2, high-pressure connection 6000 psi	A

■ = Available / □= On request / -= Not available

1 Type code

		550	

11. Add-on parts

Without add-on parts	■	0
With impeller	□	I

12. Gear pump

Without gear pump	■	00
With gear pump, V_g = XX cm^3, enter value in cm^3/rev	□	

13. Through-drive

Ready for through-drive, with cover closed				■	K02G
ANSI B 92.1a-1976, 1 in 15T 16/32 DP, SAE-B, 2-hole			Open hole	■	B21D
ISO 3019-2	DIN 5480	8-hole	Open hole	■	U32D
Special diameter	DIN 5480	Special design	Open hole	■	K33D

14. Valve

Without valve	**0**

15. Sensors

Without sensor	■	0
With angle sensor	■	W
With pressure sensor	□	P

■ = Available
□ = On request
\- = Not available

Note
Contact addresses for queries are provided on the back of this document.

2 Technical data

2.1 Table of values

Nominal size				550
Displacement volume		$V_{g\,max}$	cm^3	550
		$V_{g\,min}$	cm^3	0 or 82
Volume flow at $V_{g\,max}$ and n_{max}		$q_{v\,max}$	l/min	797
Min. speed* at $V_{g\,max}$ and p_{abs} = 1 bar at the suction port		n_{min}	rpm	500
Max. speed at $V_{g\,max}$ and p_{abs} = 1 bar at the suction port		n_{max}	rpm	1450
Torque at $V_{g\,max}$ and Δp = 380 bar		M_{max}	Nm	3330
Driving power at qv_{max} and Δp = 380 bar		p_{max}	kW	505
Driving gear moment of inertia		J_{TW}	kgm^2	0.28
Maximum angular acceleration**		α	rad/s^2	🕘
Weight without through-drive (approx.)		m	kg	373
Torsional rigidity	Driving shaft code “1”	kNm/rad		980

*) Depending on the application, a special approval for a lower minimum speed at a lower operating pressure is possible. Please consult Liebherr, stating the expected load cycle.

**) Missing values were not yet available by the editorial deadline.

Note
Theoretical rounded values, not taking into account efficiency, tolerances, contamination of the hydraulic fluid or deflection of the driving shaft.

2.1.1 Maximum radial and axial load of the driving shaft

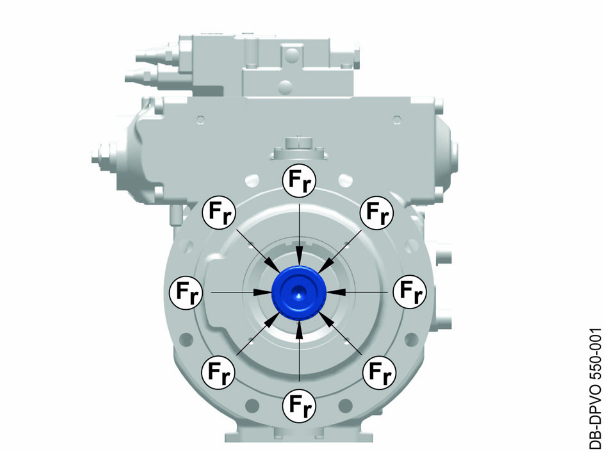
Note
The radial and axial loads are calculated separately and for the specific load cycles (pressure and direction of force). If planning a belt drive or if continuous axial and/or radial forces are expected, please contact Liebherr, stating the expected load cycle.

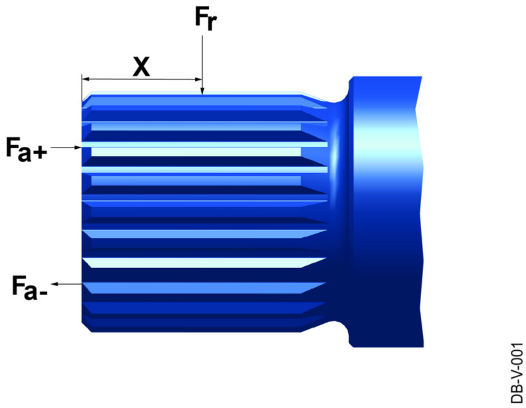
Note
Theoretical rounded values, not taking into account efficiency, tolerances, contamination of the hydraulic fluid or deflection of the driving shaft.

Generally applicable data for calculation

- Vg_{max}
- Operating pressure pHD: 380 bar

2 Technical data





Nominal size			550
X		mm	45
Position at which radial force is applied		-	All
Max. radial force F_r	Reduction of bearing service life by 20%	N	3000
	Reduction of bearing service life by 50%		10000
Max. axial force F_{a+}	Reduction of bearing service life by 20%	N	4000
	Reduction of bearing service life by 50%		12000
Max. axial force F_{a-}	Reduction of bearing service life by 20%	N	2000
	Reduction of bearing service life by 50%		6000

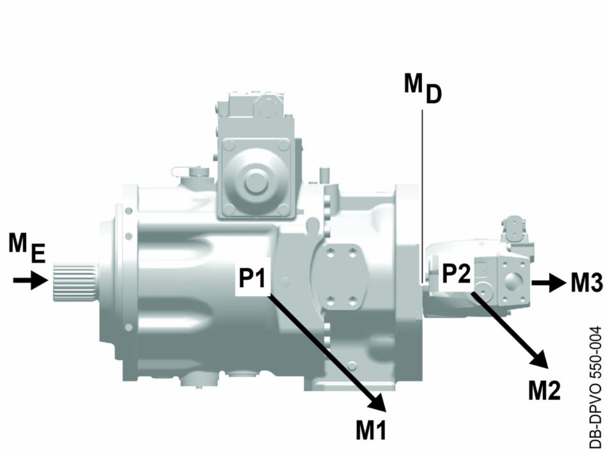
2.1.2 Maximum input and through drive torques

Note
Theoretical rounded values, not taking into account efficiency, tolerances, contamination of the hydraulic fluid or deflection of the driving shaft.

Generally applicable data for calculation

- Vg_{max}
- Operating pressure pHD: 380 bar

2 Technical data



M1	Torque of axial piston pump 1	P2	Axial piston pump 2
M2	Torque of axial piston pump 2	P3	Axial piston pump 3
M3	Torque of axial piston pump 3	M_E[1]	Input torque
P1	Axial piston pump 1	M_D[2]	Through drive torque

1) $M_E = M1+M2+M3$
$M_E < M_{E\ max}$

2) $M_D = M2+M3$
$M_D < M_{D\ max}$

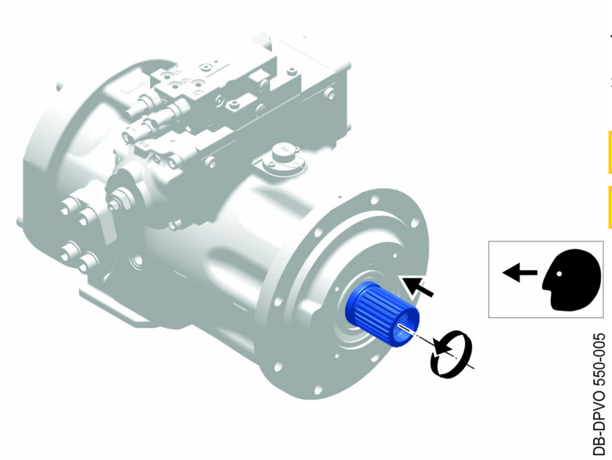
Nominal size					**550**
Torque* at $V_{g\ max}$ and Δp = 380 bar			M_{max}	Nm	3330
Max. torque of drive shaft input (installed without lateral force)	1	Ø80, 25 teeth, with undercutting	$M_{E\ max}$	Nm	6940
Max. torque of through drive			$M_{D\ max}$	Nm	3610

Note
Higher through-drive torques on request.

2 Technical data

2.2 Direction of rotation

DPV	0	550	/			1				A				0	
1.	2.	3		4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.



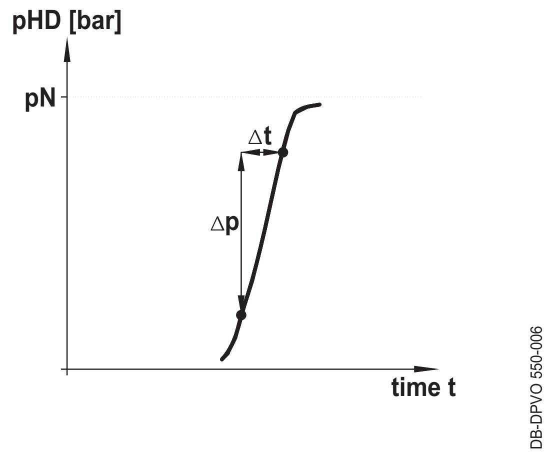
The direction of rotation is stated with view of the driving shaft, as shown in the figure.

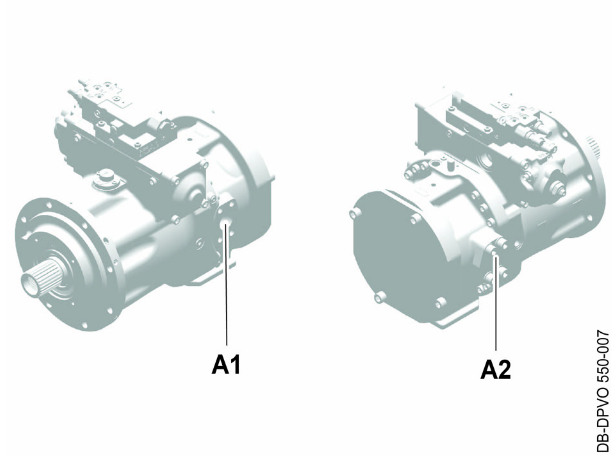
R	right	=	clockwise
L	left	=	anti-clockwise

2.3 Permitted pressure range

2.3.1 Operating pressure

Note
Standard with two opposite high-pressure connections A1 / A2.





Operating pressure at connection A1/A2				
Nominal size				**550**
Minimum pressure[1]	VG min	pHD min	bar	10
	VG max			18
Nominal pressure (fatigue resistant)		pHD N	bar	380

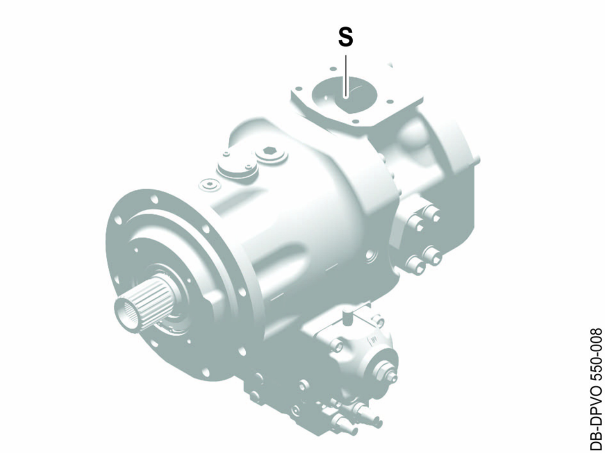
2 Technical data

Maximum pressure (single operating period)	pHD_{max}	bar	420
Single operating period at maximum pressure pHD_{max}	t	s	< 1
Total operating period at maximum pressure pHD_{max}	t	OH*	300
Rate of pressure change	RA	bar/s	17000

*) OH = operating hours

1) There must be minimum pressure in the working circuit at connection A1/A2 to ensure adequate lubrication of the driving gear at all swivel angles during operation.

DANGER
Failure of the fastening screws at working connection A1/A2
Danger to life.
Use fastening screws of strength category 10.9.



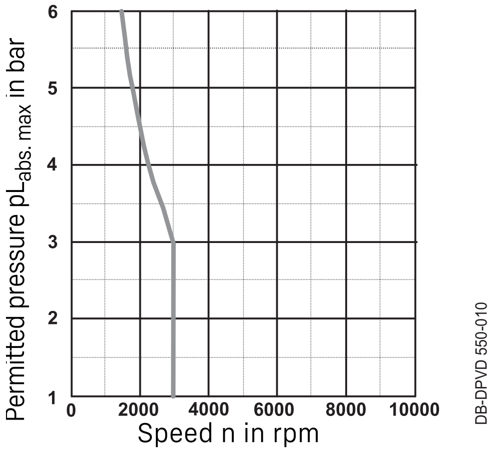
Suction pressure at port S			
Nominal size			**550**
Minimum absolute pressure	pS_{min}	bar	1*
Maximum absolute pressure	pS_{max}	bar	3*

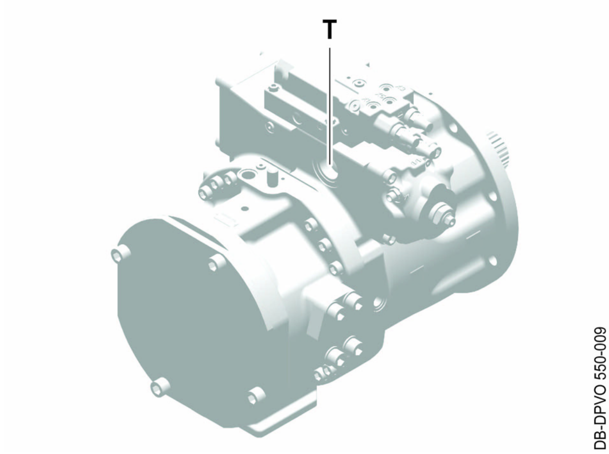
*) Other values upon request

2.3.2 Housing, leakage oil pressure

Leakage oil pressure at connection T			
Nominal size			**550**
Permanent absolute leakage oil pressure	pL	bar	3
Maximum absolute pressure	pL_{max}	bar	6*

2 Technical data





Characteristic curve	Nominal size	Shaft diameter (mm) Seat of the rotary shaft lip seal
—	550	90

*) Short pressure peaks of max. 10 bar abs. are permitted (t < 0.1 s).

Note
The pressure in the axial piston unit must, under all circumstances, be higher than the external pressure on the shaft lip seal.

2.4 Hydraulic fluids

2.4.1 General information

Selection of the appropriate hydraulic fluid is significantly influenced by the anticipated operating temperature relative to the ambient temperature, which is equivalent to the tank temperature.

ATTENTION
You must not mix different mineral oil hydraulic fluids!

Minimum required quality

Specification
LH-00-HYC3A
LH-00-HYE3A

Note
For additional information, see: www.liebherr.com (brochure: Lubricants and operating fluids) Alternatively: Contact lubricants@liebherr.com.

2.4.2 Fill quantity

Nominal size		550
Fill quantity	Litres	30

Note
Before commissioning, the axial piston unit must be filled with oil and vented.
This process must be checked and repeated if necessary during operation and after long downtimes!

2.4.3 Filtering

- Filtering of the hydraulic fluid is necessary to maintain the specified purity class "21/17/14 according to ISO 4406" under all circumstances.
- The hydraulic fluid is filtered by the device-specific use of oil filters in the hydraulic system.
- Cleaning and maintenance intervals for the oil filters and the entire oil circuit depend on use of the unit: see the device-specific operating instructions.

2 Technical data

2.5 Temperature

Note
The optimum operating range of the hydraulic fluid of 16-36 mm^2/s for Liebherr Hydraulic HVI (ISO VG 46) is from 32° to 62 °C.

If the axial piston unit is operated in the optimum operating range of the hydraulic fluid within the permitted operating conditions and operating limits, it is low-wear and is protected against temperature-dependent ageing. From a viscosity < 11 mm^2/s (for Liebherr Hydraulic HVI (ISO VG 46) = 80 °C), a halving of the service life of the hydraulic fluid must be assumed for every 10 °K increase in temperature.

If the optimum range cannot be met, a hydraulic fluid with a more suitable viscosity range must be selected or the hydraulic system must be preheated or cooled.

To prevent temperature shocks, the temperature difference between the hydraulic fluid and the axial piston unit must be kept to less than 25 °C. This can be achieved by, among other things, a continuous flow through all axial piston units in the hydraulic system.

2.5.1 Operating limits

Maximum values:

Maximum leakage oil temperature: 115 °C.

ATTENTION
The temperature should be assumed to be highest in the drive shaft bearing area (rotary shaft lip seal and bearing). Experience has shown this temperature to be 10-15 °K higher than the leakage oil temperature.

Low temperatures: (For additional information see: 2.5.2 Low temperatures, page 12)

Note
The operating limits of Liebherr hydraulic fluids are provided in the viscosity chart included below to allow users to make an informed choice.
(For additional information see: 2.5.6 Viscosity chart, page 17)

2.5.2 Low temperatures

ATTENTION
When temperatures drop below freezing point, the sealing lip of the rotary shaft lip seal may freeze if it becomes wet or frosted. This can cause the sealing lip to tear off when the axial piston unit is started. The risk must be prevented by preheating/thawing the rotary shaft lip seal/the shaft.

Note
At temperatures at which there is already a risk of hardening from freezing, the frictional heat may be sufficient to keep the seal elastic or to bring it to a functional state quickly enough after the start of movement.

2 Technical data

Overview

Temperature [°C]	Phase	Viscosity [mm^2/s]	Note
< -50 °C	Idle state	-*	No storage or operation permitted
< -40 °C	Idle state	-**	No operation permitted, preheat to at least -40 °C, select appropriate hydraulic fluid

***) Idle state < -50 °C**

ATTENTION
Temperatures < -50 °C on the system = no operation of the axial piston unit permitted.
Risk of damaging the sealing elements of the axial piston unit.
Avoid temperatures < -50 °C.

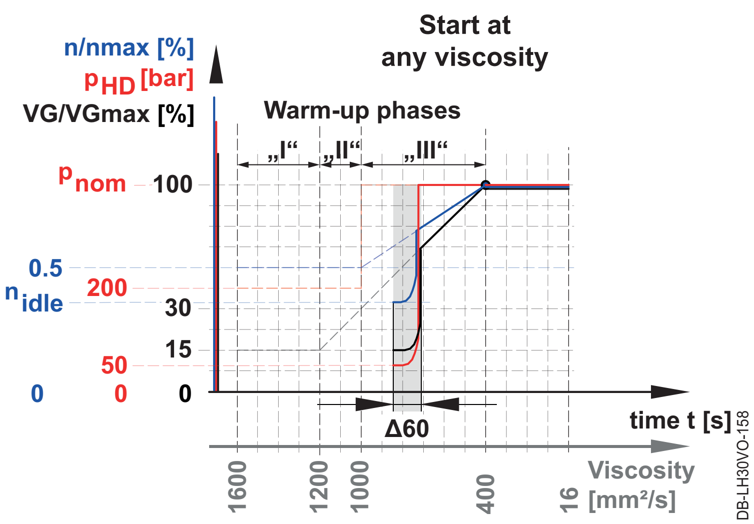
****) Idle state < -40 °C**

ATTENTION
Temperatures < -40 °C on the system = no operation of the axial piston unit permitted.
Functioning of the sealing elements in the axial piston unit is not guaranteed at temperatures < -40°C.
Preheat the axial piston unit and tank to at least -40 °C and use Liebherr Hydraulic Plus Arctic/ Liebherr Hydraulic FFE 30 hydraulic fluid with a viscosity < 1600 mm^2/s.
(For additional information see: 2.5.6 Viscosity chart, page 17)

Regardless of the viscosity < 1600 mm^2/s, the axial piston unit must be operated for at least 60 s under the following conditions before entering the cold start including the warm-up phases or on warm start:

- Operating pressure range: $p_{HD\ min} \leq p_{HD} \leq 50$ bar
- Speed: $n_{min} \leq n \leq 1000$ rpm, or idle speed of the drive motor*
- Displacement volume: $V_{g\ min} \leq V_g \leq 15\%$ of $V_{g\ max}$
- Do not move any of the equipment.

*) When using a drive with higher speeds than required in the conditions (e.g. an electric motor), please consult Liebherr, stating the potential speed(s).



After the 60 s have elapsed, determine the viscosity using the available temperature values and the viscosity chart, select the appropriate warm-up phase and operate the axial piston unit in the defined period and appropriate conditions (see Warm-up phases).

2 Technical data

Overview

Temperature [°C]	Phase	Viscosity [mm²/s]	Note
> -40 °C	Cold start	1600-400	The current viscosity of the hydraulic fluid before start-up determines the type of start. In the range of 1600-400 [mm²/s], it is a cold start. Entry into the warm-up phase must be selected according to the viscosity and the further warm-up phases must be run through according to the time specifications and operating conditions.
For additional information see: 2.5.6 Viscosity chart, page 17	Warm-up phase "I"	1600-1200	Observe conditions and measures (see Warm-up phase "I")
	Warm-up phase "II"	1200-1000	Observe conditions and measures (see Warm-up phase "II")
	Warm-up phase "III"	1000-400	Observe conditions and measures (see Warm-up phase "III")
	Normal operation	400-16*	Axial piston unit, fully loadable (see Normal operation)
	Optimum operating range	36-16	Axial piston unit, fully loadable (see Normal operation)

*) The viscosity must not fall below 8 mm^2/s (for a short period, i.e. < 3 minutes, 7 mm^2/s) at maximum leakage oil temperature.

2.5.3 Cold start with subsequent warm-up phases

ATTENTION

Before cold start, the viscosity* must be determined on the basis of the oil temperature (e.g. tank temperature) in order to avoid damage to the axial piston units from excessive viscosity* of the hydraulic fluid. At a viscosity* > 1600 mm^2/s, the hydraulic system must be preheated.

Using the determined viscosity*, the type and duration of the warm-up must be followed, using the cold start chart**.

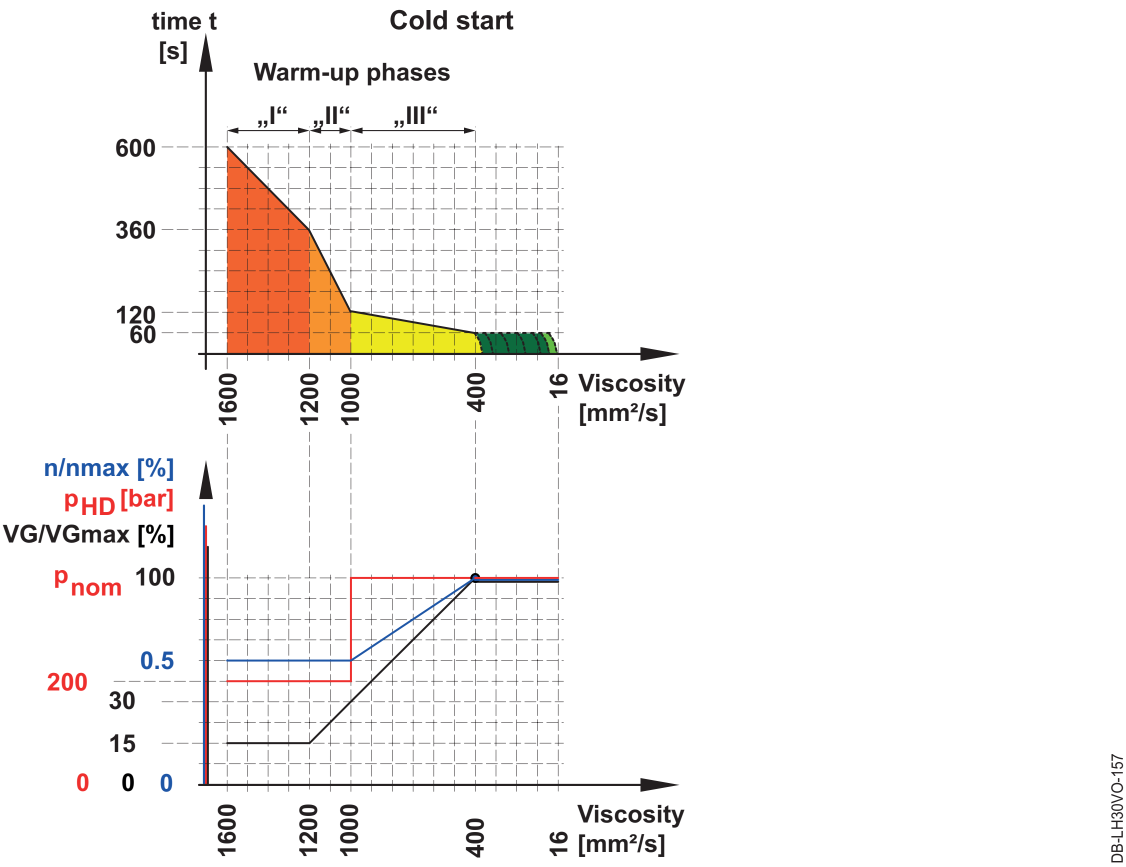
*) For additional information see: 2.5.6 Viscosity chart, page 17

The following conditions apply:

- Viscosity: 1600-1200 mm^2/s = operate the axial piston unit for 600-360 s with measures listed for Warm-up phase "I".
- Viscosity: 1200-1000 mm^2/s = operate the axial piston unit for 360-120 s with measures listed for Warm-up phase "II".
- Viscosity: 1000-400 mm^2/s = operate the axial piston unit for 120-60 s with measures listed for Warm-up phase "III".
- Viscosity: 400-16 mm^2/s = operate the axial piston unit for 60 s with measures listed for "Warm start". This means that even at ≤ 400 mm^2/s, the measures must be applied for at least 60 s.

2 Technical data

****) Cold start chart**



2.5.4 Warm-up phases

Note
Depending on the current viscosity, continue with the corresponding warm-up phase after the cold start. In the subsequent warm-up phases, the operating parameters may be increased to allow the hydraulic system to warm up rapidly.

Warm-up phase " I "

Condition:

- Viscosity: 1600-1200 mm^2/s = operate the axial piston unit with measures listed below until a viscosity of 1200 mm^2/s is reached.

Measures:

- Operating pressure range: $p_{HD\ min} \leq p_{HD\ Warm\text{-}up\ "I"} \leq$ 200 bar
- Speed: $n_{min} \leq n_{Warm\text{-}up\ "I"} \leq$ 50% of n_{max}
- Displacement volume: $V_{g\ min} \leq V_{g\ Warm\text{-}up\ "I"} \leq$ 15% of $V_{g\ max}$

2 Technical data

Warm-up phase "Ⅱ"

Condition:

- Viscosity: 1200-1000 mm^2/s = operate the axial piston unit with measures listed below until a viscosity of 1000 mm^2/s is reached.

Measures:

- Operating pressure range: $p_{HD\ min} \leq p_{HD\ Warm\text{-}up\ "II"} \leq$ 200 bar
- Speed: $n_{min} \leq n_{Warm\text{-}up\ "II"} \leq$ 50% of n_{max}
- Displacement volume: $V_{g\ min} \leq V_{g\ Warm\text{-}up\ "II"} \leq$ 15-30% of $V_{g\ max}$

Warm-up phase "Ⅲ"

Condition:

- Viscosity: 1000-400 mm^2/s = operate the axial piston unit with measures listed below until a viscosity of 400 mm^2/s is reached.

Measures:

- Operating pressure range: $p_{HD\ min} \leq p_{HD\ Warm\text{-}up\ "III"} \leq p_{HD\ max}$
- Speed: $n_{min} \leq n_{Warm\text{-}up\ "III"} \leq$ 50% of n_{max}
- Displacement volume: $V_{g\ min} \leq V_{g\ Warm\text{-}up\ "III"} \leq$ 30-100% of $V_{g\ max}$

Warm start

Condition:

- Viscosity: 400-16 mm^2/s = operate the axial piston unit for at least 60 s, even at viscosity < 400 mm^2/s, with measures listed below.

Measures:

- Operating pressure range: $p_{HD\ min} \leq p_{HD} \leq$ 50 bar
- Speed: $n_{min} \leq n \leq$ 1000 rpm, or idle speed of the drive motor
- Displacement volume: $V_{g\ min} \leq V_g \leq$ 15% of $V_{g\ max}$

2.5.5 Normal operation

Note

Optimum operating range: 16-36 mm^2/s

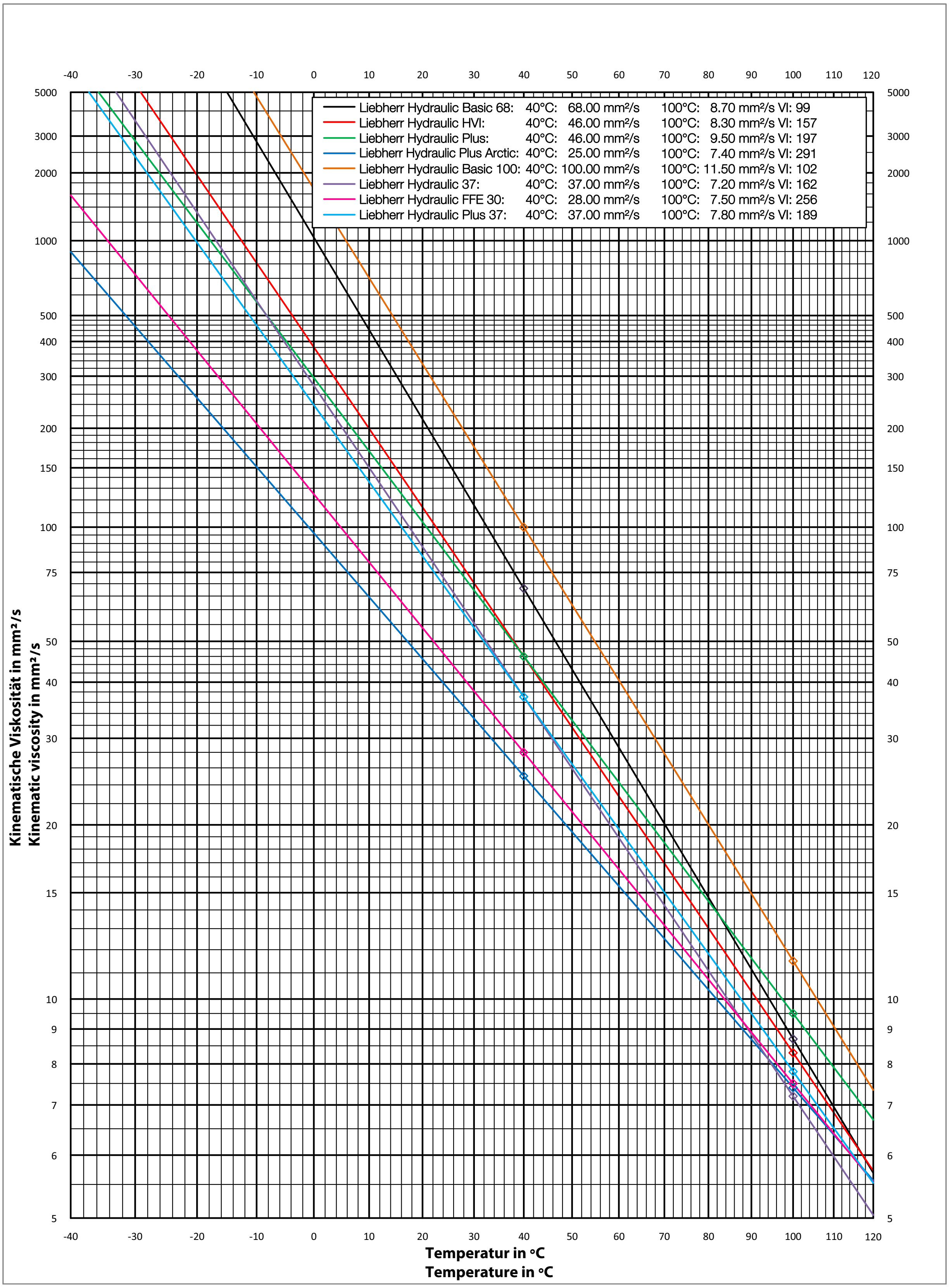
The viscosity must not fall below 8 mm^2/s (for a short period, thud < 3 minutes, 7 mm^2/s) at maximum leakage oil temperature.

Note

In the viscosity range of 400-8 mm^2/s, the axial piston unit can be put under full load.

- Operating pressure range: $p_{HD\ min} \leq p_{HD} \leq p_{HDmax}$
- Speed: $n_{min} \leq n \leq n_{max}$
- Displacement volume: $V_{G\ min} \leq V_G \leq V_{g\ max}$

2.5.6 Viscosity chart



2 Technical data

2.6 Shaft lip seal

2.6.1 General information

The rotary shaft lip seals (RWDR) are special sealing elements which permit a specific housing pressure. In order to ensure that the tribological system functions optimally, the operating conditions must be adhered to.

Sealing edge temperature varies due to the following factors in the housing:
- Circumferential speed
- Hydraulic fluid temperature
- Lubricating medium
- Pressure build-up

The sealing edge temperature could be 20 °C to 40 °C above the leakage oil temperature of a hydraulic axial piston unit.

3 Activation and control type

3.1 Control types

DPV	O	550	/			1				A				0	
1.	2.	3		4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.

Note
For each control type or function, only one nominal size is illustrated, typically nominal size 550. Special applications and designs are not included in this chapter. Always use the information from the installation drawing provided or contact Liebherr.

The following applies to all control types:

DANGER
The spring-guided reset in the regulating valve is not a safety device!
Contaminants in the hydraulic system such as chips or residual dirt from parts of the device or system can cause blockages at undefined points of various control components.
Under some circumstances, the machine operator's specifications can no longer be implemented.
It is the device or system manufacturer's responsibility to install a safety device e.g. an emergency stop.

DANGER
The regulating valve is not a safety device against overload!
It is the device or system manufacturer's responsibility to install protection against overload, e.g. a pressure limiting valve.
Pressure limiting valves are available in the portfolio and can be ordered separately.

The following modular control types can be ordered for the DPVO series:

3.1.1 Mechanical-hydraulic control

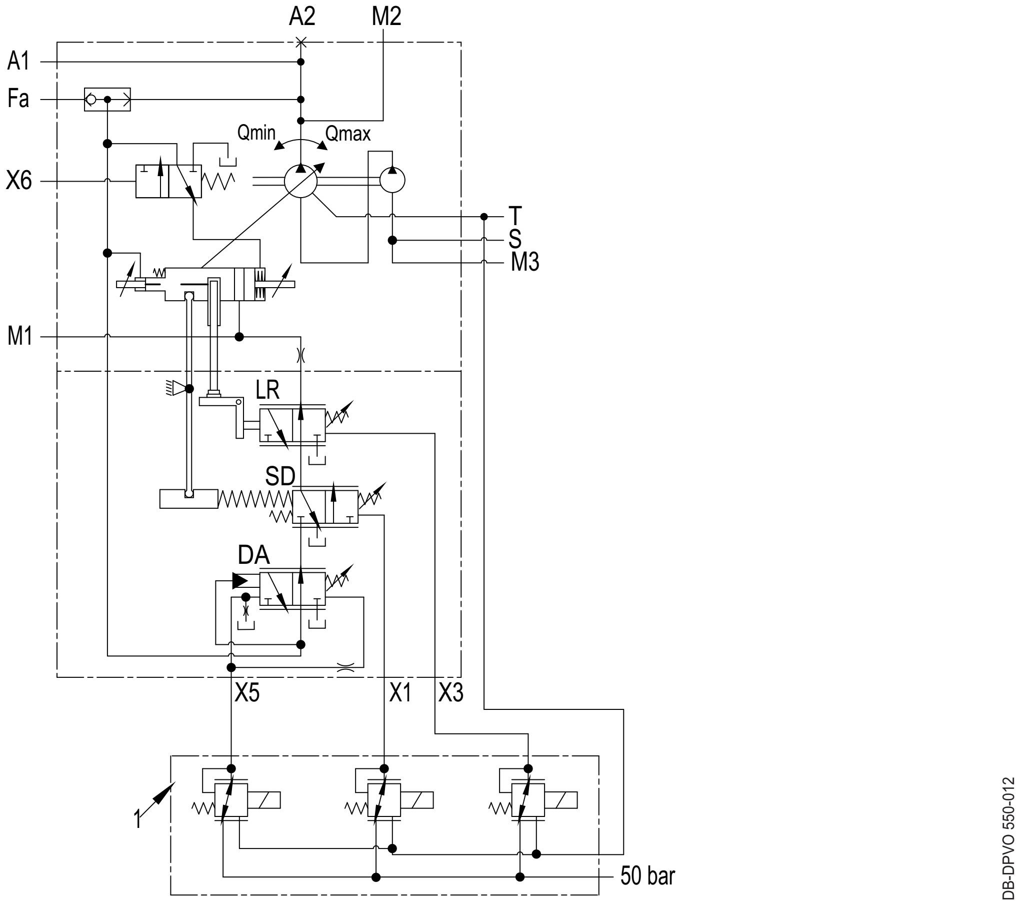
- LR-SD-DA- control, See chapter 3.2.1

Further control types on request.

3 Activation and control type

3.2 Standard hydraulic diagrams

3.2.1 LR-SD-DA- - power control/steering pressure-proportional/pressure cut-off



A1 / A2	Working connection (SAE J518) 2", 6000 psi	T	Leakage oil connections, oil filler neck or oil drain
S	Suction port (SAE J518) 5", 500 psi	Fa	Filter outlet ISO 9974-1
M3	Suction pressure measuring port, Minimess port	M2	High pressure measuring port, Minimess port
M1	Regulated high pressure measuring port, Minimess port	X6	Vg $_{min}$ regulation Screw connection GE 10LM
X1	SD steering pressure ISO 9974-1	TS	Thermostatic switch ISO 9974-1
X3	LR steering pressure ISO 9974-1	SS	Dirt switch ISO 9974-1
X5	DA- override pressure ISO 9974-1	GS	Housing flushing ISO 9974-1
1	Not included in the scope of delivery	BS1 / BS2	Acceleration sensor thread M8

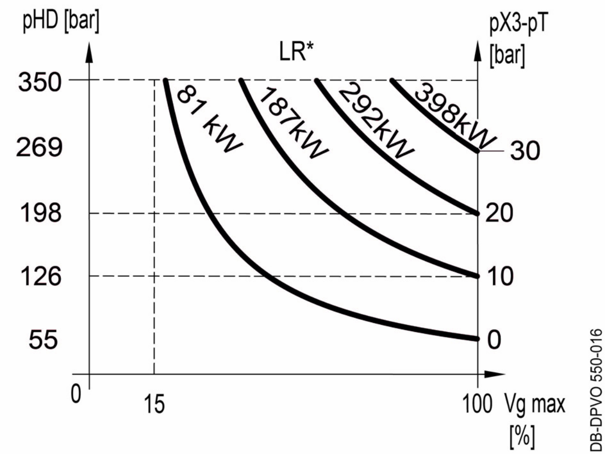
3 Activation and control type

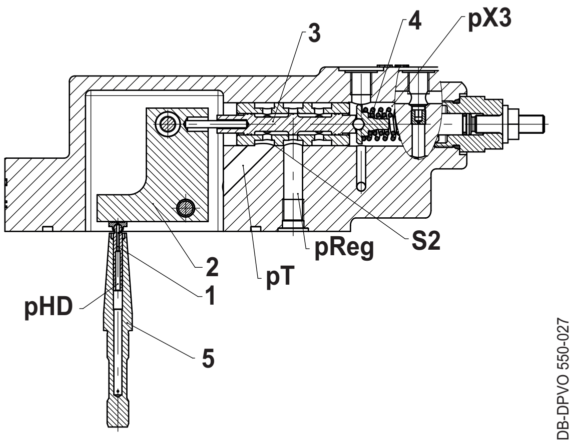
3.3 Control functions

- LR- function, power control, See chapter 3.3.1
- LR1- function, power control, override option, See chapter 3.3.2
- SD- function, steering pressure-dependent regulation, See chapter 3.3.3
- DA- function, pressure cut-off, See chapter 3.3.4
- DA1-function, pressure cut-off, override option, See chapter 3.3.5

3.3.1 LR- function

Characteristic





LR*) Maximum drive power for a driving gear at 1450 rpm

The LR function adjusts the flow rate V_g (volume flow) of the axial piston unit, depending on the pump high pressure pHD (the capacity reduction), to the performance characteristic of the drive motor while limiting the flow at a constant speed n.

Optimal performance utilisation is achieved, if the regulation runs along the hyperbolic characteristic.
When regulation of the axial piston unit starts, the working pressure pHD in the system rises to the pressure at regulation start. This increases the force at the measuring piston 1 to lever 2. The spool 3 is moved against the pressure spring package 4 and opens the connection of the adjusting chamber pReg to the tank T via a steering cam S2.

The axial piston unit thereby pivots back in direction $V_{g\ min}$.

The force of the lever 2 on the spool 3 decreases so that the pressure spring package 4 pushes the spool 3 back to its neutral position. The connection of the adjusting chamber pReg to the tank pT is interrupted. The axial piston unit stops at a constant flow rate that corresponds to a constant performance decrease at the existing high pressure pHD.

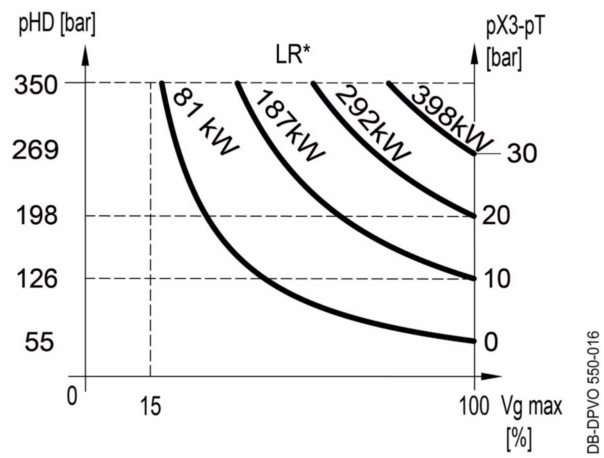
Options
Combination with other control types
Override LR1

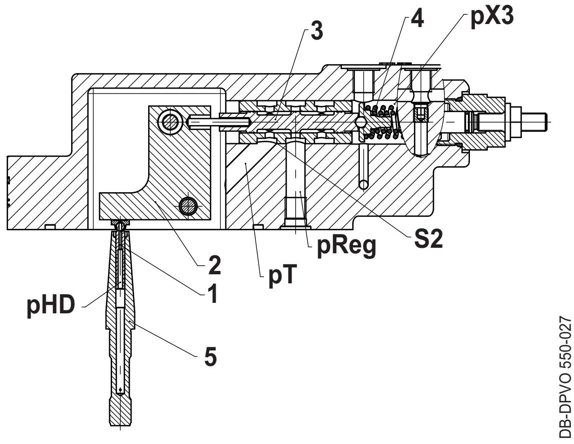
Note
Liebherr recommends combining the LR function with a pressure cut-off.

3 Activation and control type

3.3.2 LR1- function

Characteristic





Override

The external control pressure pX3 is directed to the LR control axis via port X3 and acts against the spool 3 in addition to the force of the pressure spring package 4, so that the pressure spring package 4 pushes the spool 3 back to its neutral position. The connection of the adjusting chamber pReg to the tank pT is interrupted. To maintain the force balance, the axial piston unit swivels towards $V_{g\ max}$ to a higher performance level.

The load limiting regulation is independent of the drive motor speed.

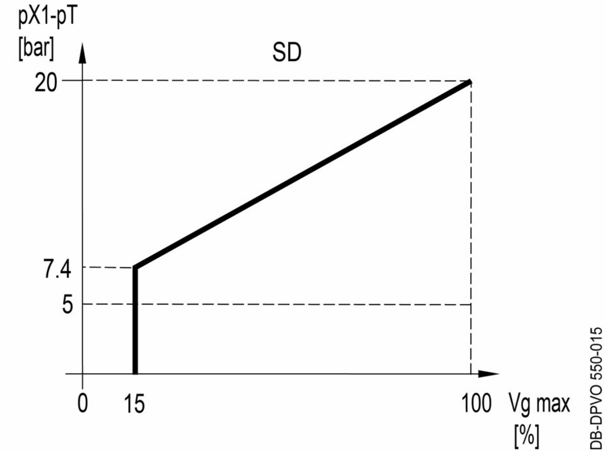
With increasing regulating pressure pX3, the pressure for starting the regulation of the axial piston unit increases proportionally.

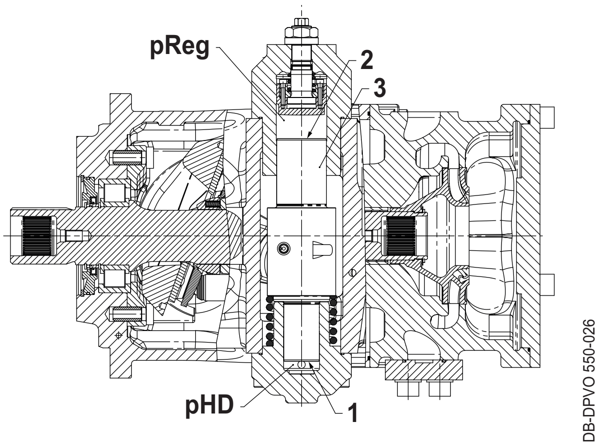
3 Activation and control type

3.3.3 SD- function

SD regulation is suitable for applications that require proportional regulation of the volume flow.

Characteristic





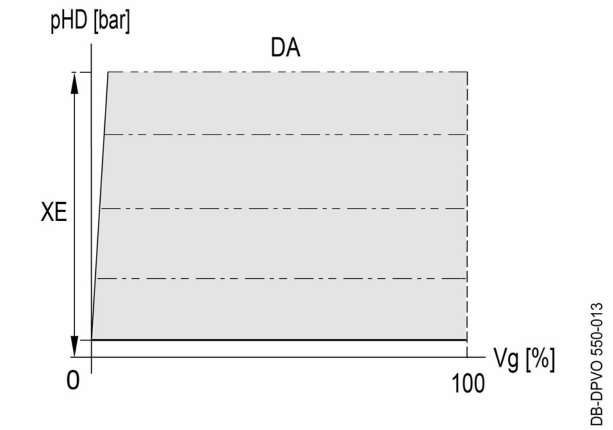
By adjusting the drive from $V_{g\ min}$ towards $V_{g\ max}$, the axial piston unit swivels to a larger displacement volume V_g with increasing SD steering pressure.
The high pressure pHD is applied to the adjusting piston bottom area 1, and the regulated high pressure pReg is applied to the adjusting piston bottom area 2.
If pReg x adjusting piston bottom area 2 is larger than pHD x adjusting piston ring area 1, the adjusting piston 3 moves and swivels the axial piston unit towards $V_{g\ max}$.

The hydraulic fluid required for this purpose is taken from high pressure pHD. At high pressure of pHD < 50 bar, the connection Fa must be supplied with auxiliary pressure to ensure that regulation is possible.
If high pressure pHD < pFA, pFA takes over the supply of the regulation and the control.

If the activating signal is missing or defective, the axial piston unit swivels to $V_{g\ min}$.

3.3.4 DA- function

Characteristic



Additional technical data

DA setting range	XE	300-320 bar*

*) depending on requirement

DA pressure control minimizes or limits (cut-off) the volume flow of the axial piston unit, when a fixed high pressure value pHD is reached. Swivelling in the direction of $V_{g\ min}$ protects the hydraulic system from damage and overload.

Swivelling continues in direction $V_{g\ min}$ only until the volume flow of the axial piston unit exactly matches the consumer need at this pressure stage.

If the system pressure falls below the fixed high-pressure value pHD, the axial piston unit swivels until $V_{g\ max}$.

With its function, the pressure control ensures that the pressure is kept constant even when the volume flow in the system changes. This compensates all internal and external leakage oil losses.

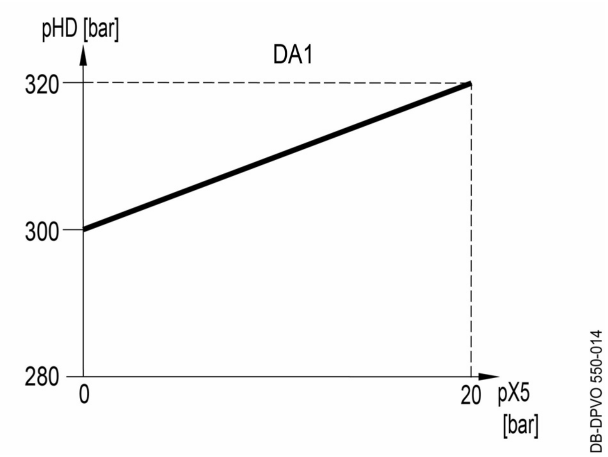
Options

- Pressure cut-off with override function, See chapter 3.3.5

3 Activation and control type

3.3.5 DA1- function

Characteristic



The DA1 override has the task of overriding the fixed DA cut-off pressure using an externally supplied steering pressure pX5-pT at port X5 in order to increase the high pressure pHD as required.

It is therefore suitable for systems or devices that need a controlled way to increase performance or are subject to a multiple use. Examples are working hydraulics in wheeled excavators and their driving hydraulic system. The effective steering pressure at port X5 is the difference between the total steering pressure applied and the housing pressure.

At a ratio of 1:1, the high pressure pHD reacts with an increase of 20 bar at maximum steering pressure pX5-pT of 20 bar.

3 Activation and control type

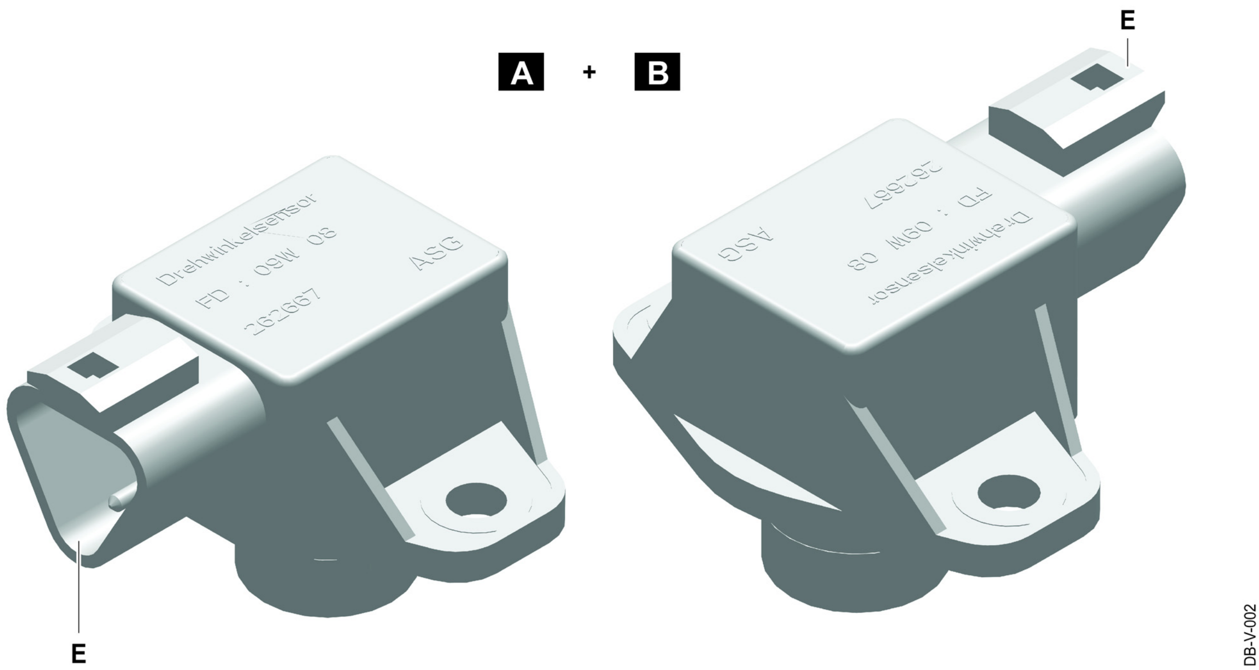
3.4 Electrical components

3.4.1 Sensors

DPV	0	550	/			1				A				0	
1.	2.	3		4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.

Rotation angle sensor

0	Without sensor
W	With rotation angle sensor



Technical data			
Option A		Option B	
Rated voltage U	5 V	Rated voltage U	8-30 V
Measuring range	-27° to +27°	Measuring range	-27° to +27°
Output signal -27° 0° +27°	 0.5 VDC 2.5 VDC 4.5 VDC	Output signal -27° 0° +27°	 4 mA 12 mA 20 mA
Working temperature	-40 °C to +125 °C	Working temperature	-40 °C to +85 °C
Deutsch DT04-3P electrical plug-in terminal			

Note
The angle sensor cannot be retrofitted and must be included in the configuration of the DPVO.
Dimensions for variant A and B are identical; specify desired variant when ordering.

4 Installation conditions

4.1 General information about project planning

The installation variant for the device or system must be coordinated with Liebherr, as well as the installation position, at the conceptual design stage of the axial piston unit and must be approved by Liebherr.

ATTENTION
Damage of the hydraulic product.
Lack of lubrication on the hydraulic product!
Make sure that the following requirements are observed:
- Comply with the approved installation positions for the hydraulic product.
- For other installation positions, contact Liebherr customer service.
- Housing is completely filled with hydraulic fluid during commissioning and operation.
- Housing is vented after commissioning and during operation.

Liebherr distinguishes between two installation variants for axial piston units:

A: Under-the-tank installation (axial piston unit is installed **under** the minimum liquid level of the tank)
B: Over-the-tank installation (axial piston unit is installed **above** the minimum liquid level of the tank)

Liebherr distinguishes between two installation positions for axial piston units:

1/3/5/7/9/11: Driving shaft horizontal
2/4/6/8/10/12: Driving shaft vertical

Note
Liebherr recommends:
Installation variant: Under-the-tank installation A
Installation location: 1/3/5/7/9/11 Driving shaft horizontal with "control at top"

*) For installation positions 2/4/6/8 with driving shaft vertical and 1/3/5/7 with driving shaft horizontal with "control at bottom", complete filling and venting is critical. The axial piston unit must then be connected, filled and vented before final positioning in installation position 1/3/5/7/9 "control at top". It can then be rotated to the final installation position 2/4/6/8 driving shaft vertical or 1/3/5/7 driving shaft horizontal with "control at bottom".

On some axial piston units, an additional T4 leakage oil connection is provided for the installation positions 2/4/6/8 driving shaft vertical and 1/3/5/7 driving shaft horizontal with control at bottom:
Order leakage oil connection T4 as special design. (For additional information see: 1 Type code, page 3)

4.1.1 Suction line

Given the laws of physics and under simple assumptions about the hydraulic fluid, temperature and ambient pressures, the maximum suction head is 750 mm. This applies in particular to installation variant B: over-the-tank installation.

At low temperatures with high viscosities, it is essential to observe the minimum suction pressure for axial piston units. (For additional information see: 2.3 Permitted pressure range, page 8)

The suction line must open into the tank at a minimum distance of 115 mm from the tank bottom to prevent particles of dirt in the tank from being sucked in.

The suction line must open into the tank at a maximum distance from the leakage oil line to prevent hot leakage oil from being sucked in directly.

4 Installation conditions

4.1.2 Leakage oil lines

To prevent draining of the axial piston unit during long downtimes, the leakage oil line must be routed in a bend so that it runs at the minimum dimension Ü1 = 30 mm above the highest possible level of the axial piston unit. This applies in particular to installation variant B: over-the-tank installation.

Connect the leakage oil line to the top leakage oil connection T1, T2, T3....Tx depending on the installation position.

The leakage oil line must open into the tank at a minimum distance of 115 mm from the tank bottom to prevent stirring up dirt particles in the tank.

The leakage oil line must open into the tank at a minimum distance of 250 mm below the minimum liquid level to prevent foaming in the tank.

The leakage oil line must open into the tank at a maximum distance from the suction line to prevent hot leakage oil from being sucked in directly.

At low temperatures with high viscosities, it is essential to observe the maximum housing pressure for axial piston units with multiple driving gears and with a shared leakage oil line. (For additional information see: 2.3.2 Housing, leakage oil pressure, page 9) If the maximum housing pressure is outside the tolerance limit, a separate leakage oil line must be connected for each driving gear.

4.1.3 Hydraulic fluid tank

Design the hydraulic fluid tank so that the hydraulic oil cools off sufficiently during circulation and impurities that develop during operation settle to the bottom of the tank.

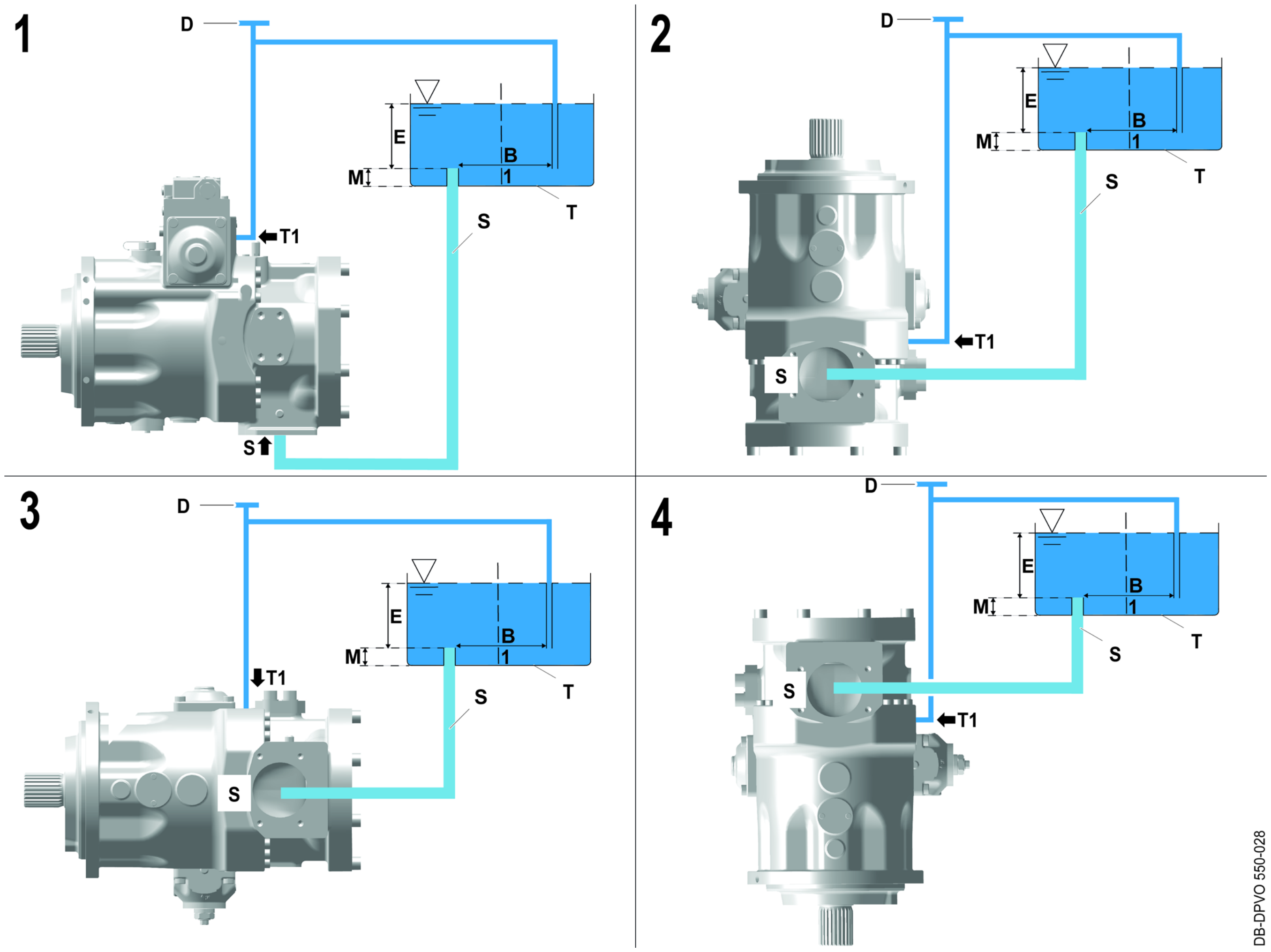
Make sure that the lines are connected according to recommendations and that they open into the hydraulic fluid tank. (For additional information see: 4.1.1 Suction line, page 27 and For additional information see: 4.1.2 Leakage oil lines, page 28)

4 Installation conditions

4.2 Installation variants

4.2.1 Under-the-tank installation variant

Note
Liebherr recommends: Under-the-tank installation A, so that:
- There is hydraulic fluid at suction port S when not operated.
- The housing cannot empty to the tank.



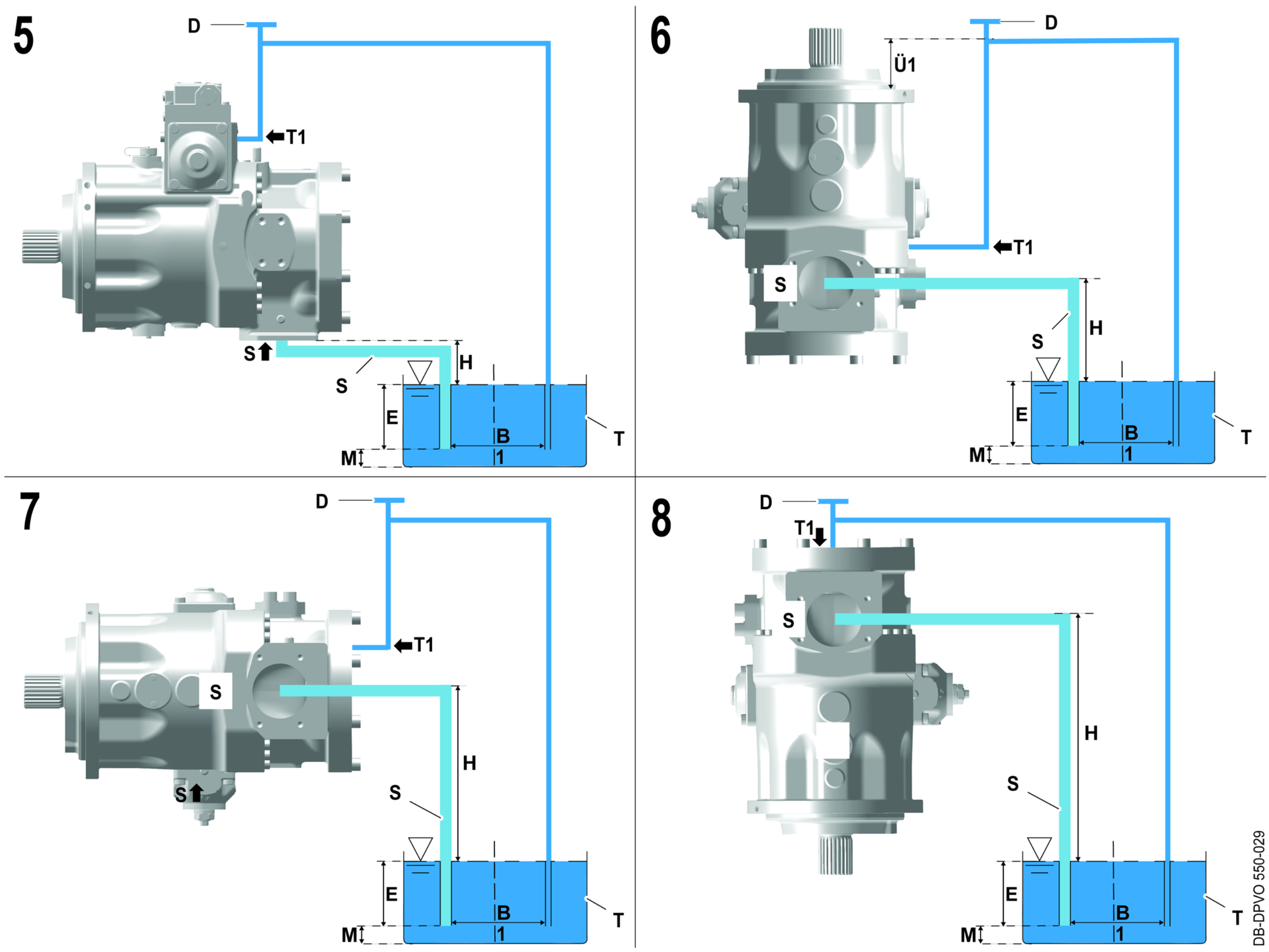
1	Baffle (to calm the hydraulic fluid in the tank)	M	Minimum line end distance from tank bottom = 115 mm
B	Distance between suction port and leakage oil connection in the tank (the larger the better)	S	Suction line connection
D	Fill and vent connection (external, not included in scope of delivery)	T	Tank
E	Minimum immersion depth = 250 mm	T_	Leakage oil connections T1 / T2 / T3 / T4 (T4 = optional)

4.2.2 Over-the-tank installation variant

ATTENTION
Damage of the hydraulic product.
The air cushion in the bearing area or on the rotary shaft lip seal “runs hot” in over-the-tank installation position (installation variant B)! Make sure that the following requirements are observed:

- Housing is completely filled with hydraulic fluid during commissioning and operation.
- Housing is vented after commissioning and during operation.

Note
To prevent draining of the axial piston unit during long shutdowns, the leakage oil line must be routed in a bend so that it runs at the minimum dimension Ü1 = 30 mm above the highest possible level of the axial piston unit.



1	Baffle (to calm the hydraulic fluid in the tank)	M	Minimum line end distance from tank bottom = 115 mm
B	Distance between suction port and leakage oil connection in the tank (the larger the better)	S	Suction line connection

4 Installation conditions

D	Fill and vent connection (external, not included in scope of delivery)	T	Tank
E	Minimum immersion depth = 250 mm	T_	Leakage oil connections T1 / T2 / T3 / T4 (T4 = optional)
H	Maximum suction head = 750 mm	Ü1	Minimum leakage oil line height = 30 mm

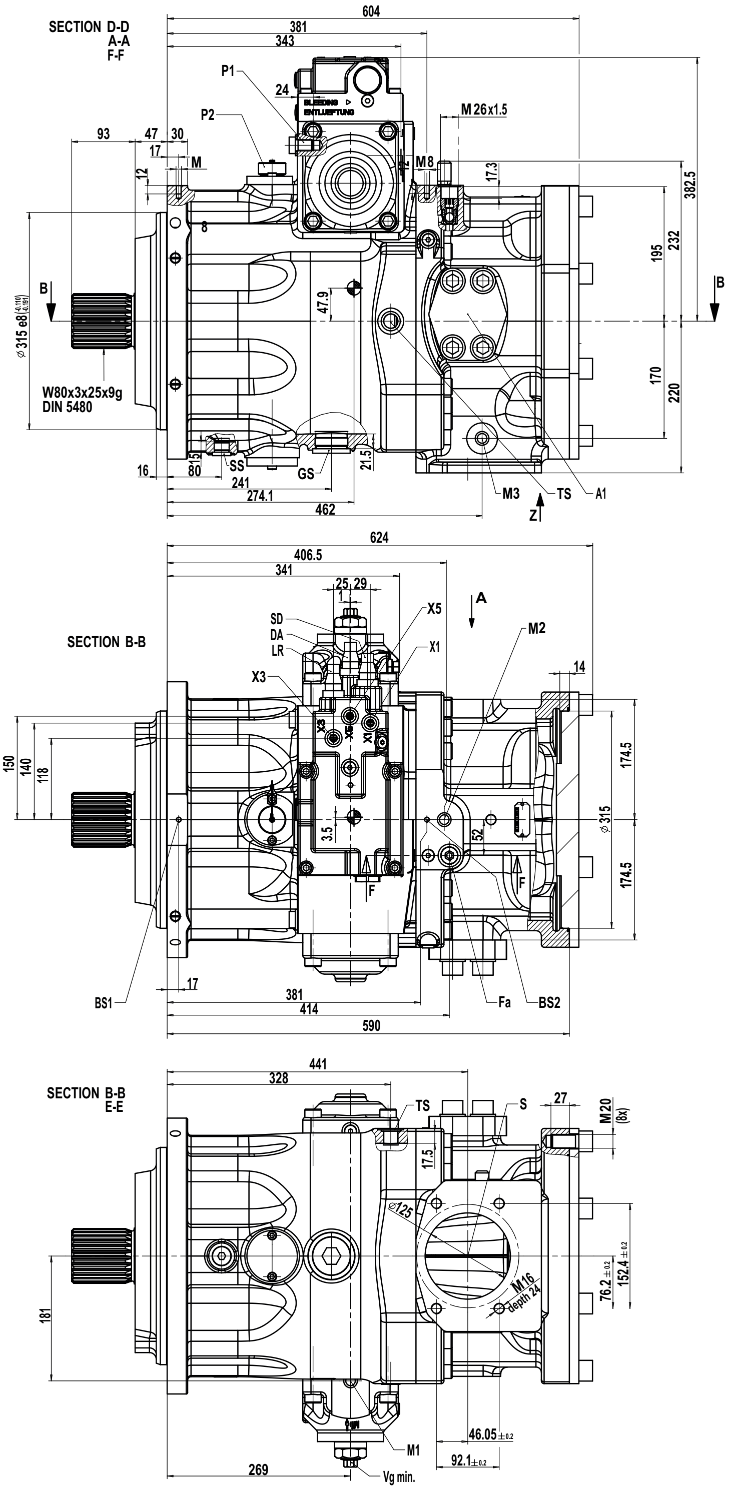
5 Dimensions

5.1 Main dimensions

5.1.1 Control type LR-SD-DA

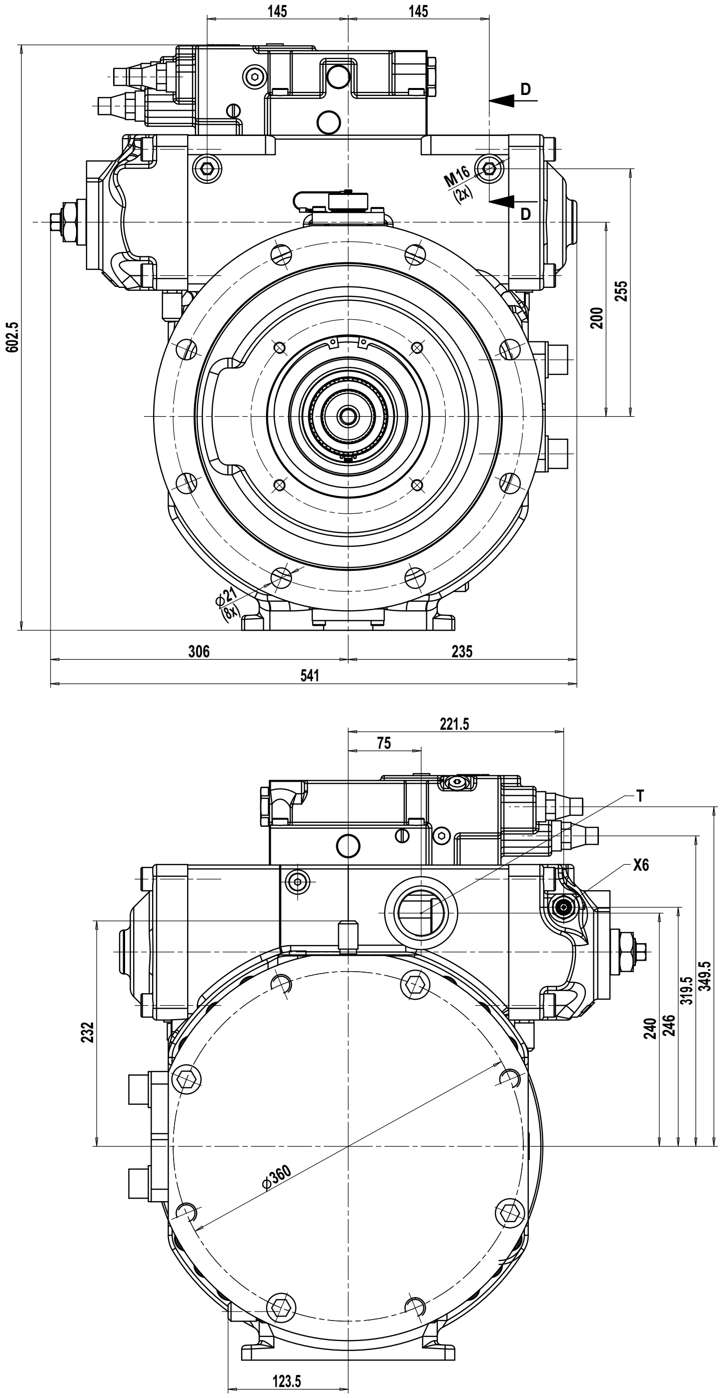
DPV	0	550	/	082	LR-SD-DA	1	L	31	1	A	I	00	K02G	0	0
1.	2.	3		4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.

Location of centre of gravity



DB-DPVO 550-018

5 Dimensions



DB-DPVO 550-019

P1	Thread for suspending the pump
A1 / A2	Working connection (SAE J518) 2", 6000 psi
S	Suction port (SAE J518) 5", 500 psi
M3	Suction pressure measuring port, Minimess port

P2	Angle indicator (unscrew the cover)
T	Leakage oil connections, oil filler neck or oil drain
Fa	Filter outlet ISO 9974-1
M2	High pressure measuring port, Minimess port

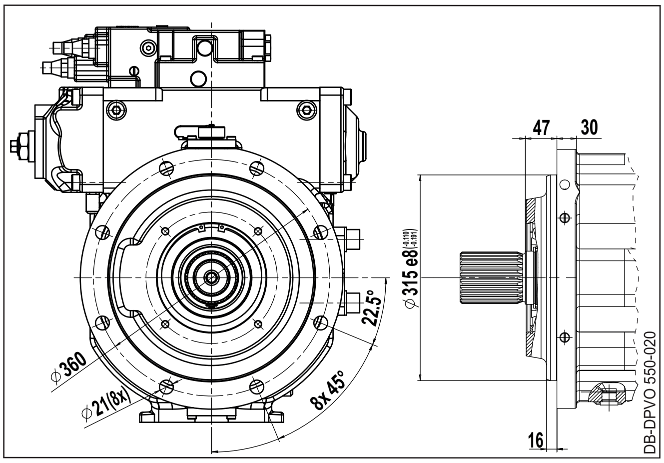
5 Dimensions

M1	Regulated high pressure, Minimess port	X6	Vgmin regulation (deactivated) screw connection DIN3901-L-12M
X1	SD steering pressure ISO 9974-1	TS	Thermostatic switch ISO 9974-1
X3	LR steering pressure ISO 9974-1	SS	Dirt switch ISO 9974-1
X5	DA- override pressure ISO 9974-1	GS	Housing flushing ISO 9974-1
BS1 / BS2	Acceleration sensor thread	-	-

5.2 Mounting flange

DPV	0	550	/	082	LR-SD-DA	1	L	31	1	A	I	00	K02G	0	0
1.	2.	3		4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.

DIN / ISO 3019-2

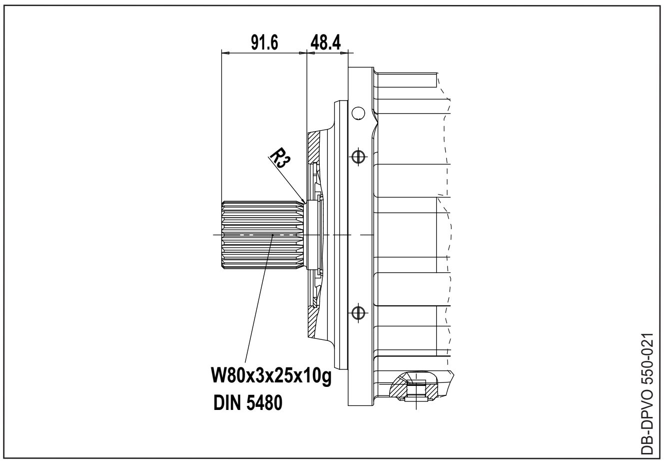


31

5.3 Shaft end

DPV	0	550	/	082	LR-SD-DA	1	L	31	1	A	I	00	K02G	0	0
1.	2.	3		4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.

Splined shaft DIN 5480 W80x3x25x10g, with undercut



1

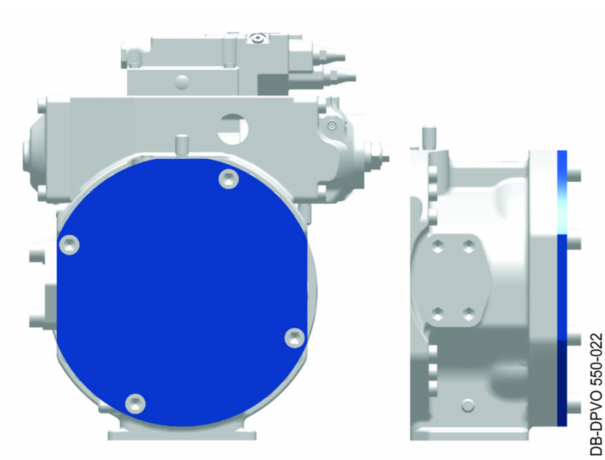
5 Dimensions

5.4 Through-drive

DPV	0	550	/	082	LR-SD-DA	1	L	31	1	A	I	00	K02G	0	0
1.	2.	3		4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.

5.4.1 Axial piston unit with preparation for mounting kit

Note
Preparation for adapter mounting kit, closed with cover.
Dimensions for axial piston unit with preparation for mounting kit; see main dimensions.

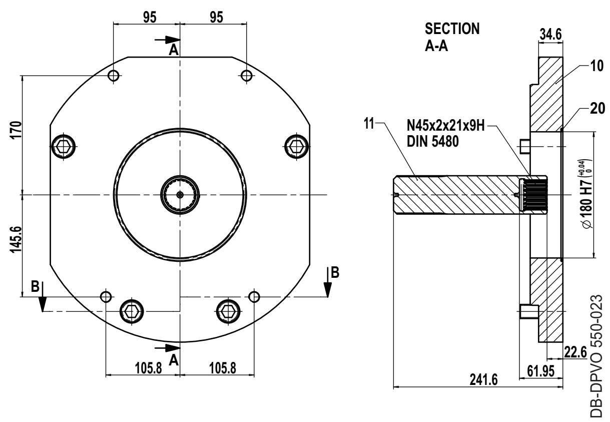


K02G

5.4.2 Axial piston unit with mounting kit Ø180 mm

Note
To use the through drive, the selected adapter mounting kit including coupling ferrule (see installation drawing) must be ordered separately, the cover removed and the adapter mounting kit installed.

Shaft spline DIN 5480 N45x2x21x9H



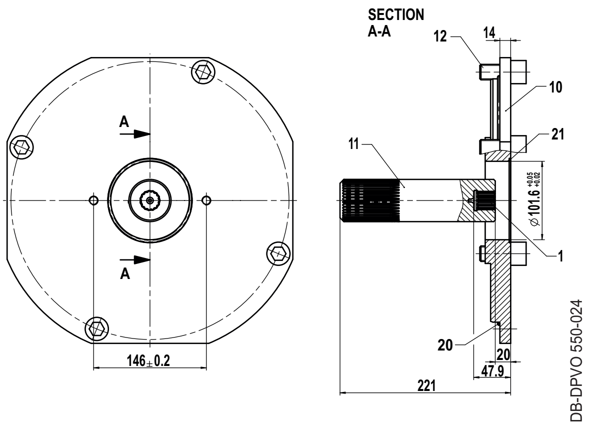
U32D

5 Dimensions

5.4.3 Axial piston unit with mounting kit SAE B

Note
To use the through drive, the selected adapter mounting kit including coupling ferrule (see installation drawing) must be ordered separately, the cover removed and the adapter mounting kit installed.

Shaft spline ANSI B 92.1a-1976 -1 in 15T 16/32 DP

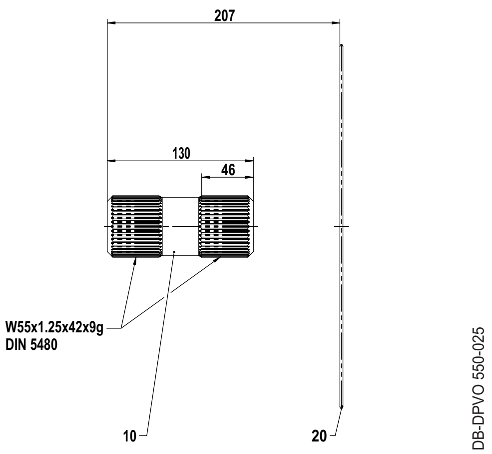


B21D

5.4.4 Axial piston unit with mounting kit, nominal size 550

Note
To use the through drive, the selected adapter mounting kit including coupling ferrule (see installation drawing) must be ordered separately, the cover removed and the adapter mounting kit installed.

Shaft spline DIN 5480 W55x1.25x42x9g



K33D

5 Dimensions

5.5 Multi-circuit pump

Multi-circuit pumps consisting of 2 or more single units can be supplied on request.

The complete type code must be filled out separately by the customer for each single unit.
These type codes must be written on separate lines. Each single unit has its own type plate.

An abbreviated type designation on an additional type plate attached to the product is used to identify the multi-circuit pump; see example: DPM

		550+550	/	LR-SD-DA+LR-SD-DA	_ _
1.	2.	3		4.	5.

The pump type (type code 1) changes from DPV to DPM.

If all the single units are in the open circuit (type code 2), the type code O stays on the type plate. If there is a mix between the circuits, the type code changes from O to Y. See the type plate of the single unit for details about the single units.

The nominal sizes (type code 3) and control types (type code 4) must be separated by a "+".

Write after the last control type (type code 5) for the direction of rotation. (Spaces required before and after the letter)

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