Data sheet

Axial piston pump DPVD

The Liebherr DPVD 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 as a double pump [2 x 33.56 inch^3 (550 cm^3)] without an impeller, or as a single pump [33.56 inch^3 (550 cm^3)] with 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 DPVD 550 stands out with its wide swivel angle of 20° and high pressure capacity. The pumps can be combined with hyperbolic power control with pressure control and pressure cut-off. The model is configured as a double pump with a back to back arrangement. Connecting the hydraulic line is greatly simplified by a shared suction port.

Valid for:
DPVD 550

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

DPVD	0	550	/			1				A				0	
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1. Pump type

D series / pump / variable displacement / double	**DPVD**

2. Type of circuit

Open	**O**

3. Nominal size (NS)

	550

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

15% of $V_{g\ max}$ / enter value in cm^3/rev; not adjustable	■	
0 or 15% of $V_{g\ max}$ / enter value in cm^3/rev; hydraulically adjustable	☐	

5. Activation / control type

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

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**

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

Without through-drive	■	0000

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	82
Volume flow at $V_{g\ max}$ and n_{max}		$q_{v\ max}$	l/min	798
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	0.560
Maximum angle acceleration**		α	rad/s^2	🕘
Weight without through-drive (approx.)		m	kg	657
Torsional rigidity	Driving shaft code "1" (DIN 5480)	kNm/rad		980
	Driving shaft code "2" (ANSI B92.1a)			164

*) 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 still not 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

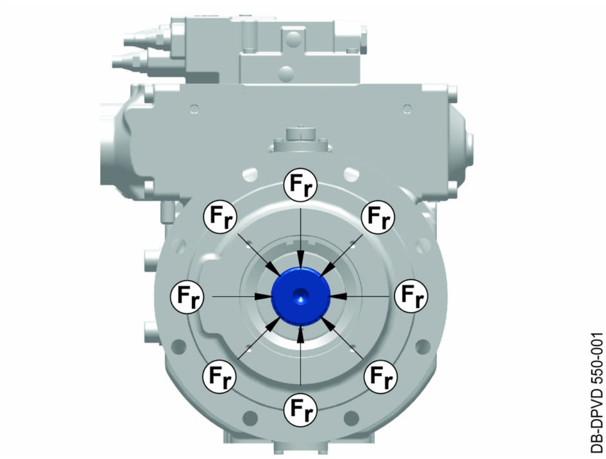
Note
The radial and axial loads are calculated separately and for the specific load cycles (pressure and direction of force). If planning a belt drive or if continuous axial and/or radial forces are expected, please contact Liebherr, stating the expected load cycle.

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

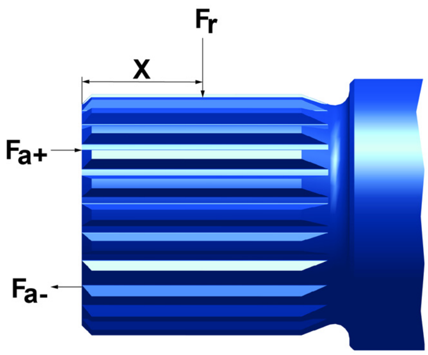
Generally applicable data for calculation

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

2 Technical data



DB-DPVD 550-001



DB-V-001

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

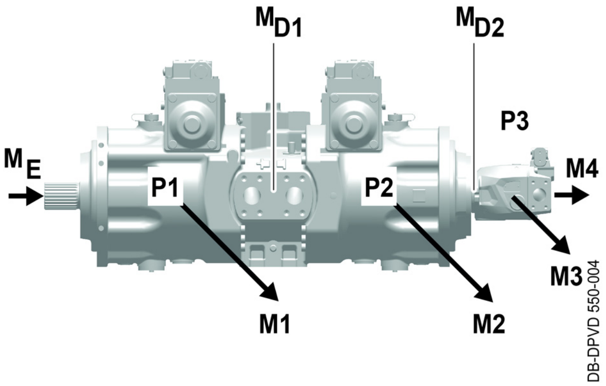
2.1.2 Maximum input and through drive torques

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	Through drive torque

1) M_E = M1+M2+M3+M4
$M_E < M_{E\,max}$

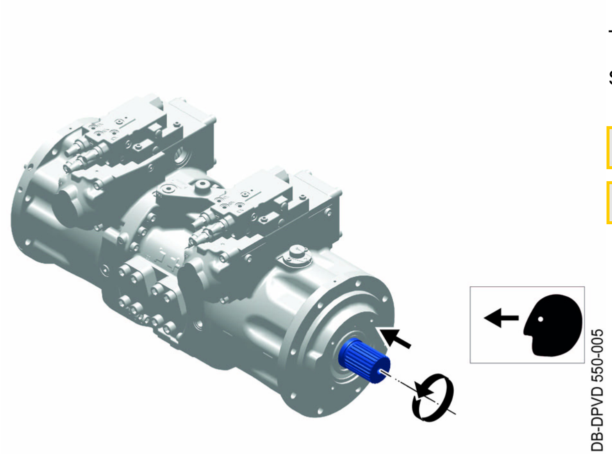
Nominal size					550
Torque* at $V_{g\,max}$ and Δp = 380 bar			M_{max}	Nm	3330

Max. torque of drive shaft input (Installed without lateral force)	1	Ø80, 25 teeth, with undercut	$M_{E\,max}$	Nm	6660

2 Technical data

2.2 Direction of rotation

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



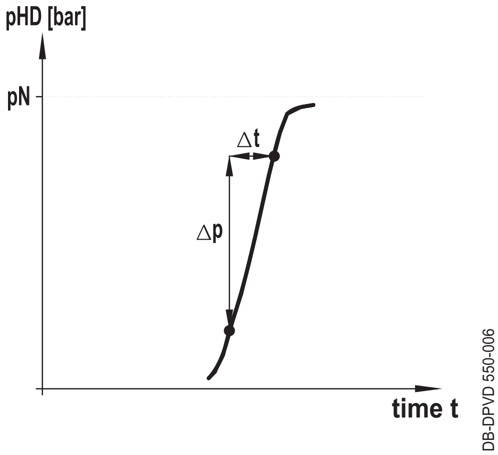
The direction of rotation is stated with view of the driving shaft, as shown in the figure.

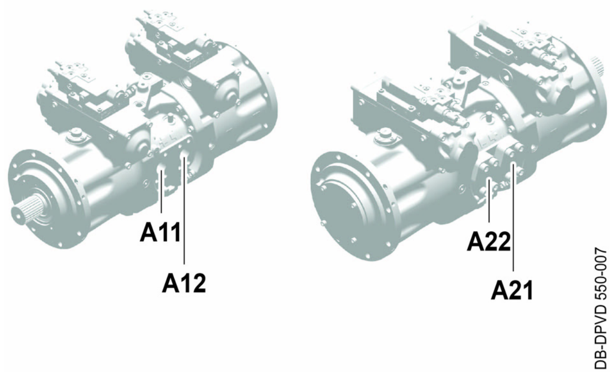
R	right	=	clockwise
L	left	=	anti-clockwise

2.3 Permitted pressure range

2.3.1 Operating pressure

Note
Standard with two opposite high pressure connections per axial piston unit.
A11/A21 for axial piston pump 1 and A12/A22 for axial piston pump 2.





Operating pressure at connection A11/A12/A21/A22				
Nominal size				**550**
Minimum pressure[1]	VG_{min}	pHD_{min}	bar	10
	VG_{max}			18
Nominal pressure (fatigue resistant)		pHD_N	bar	380

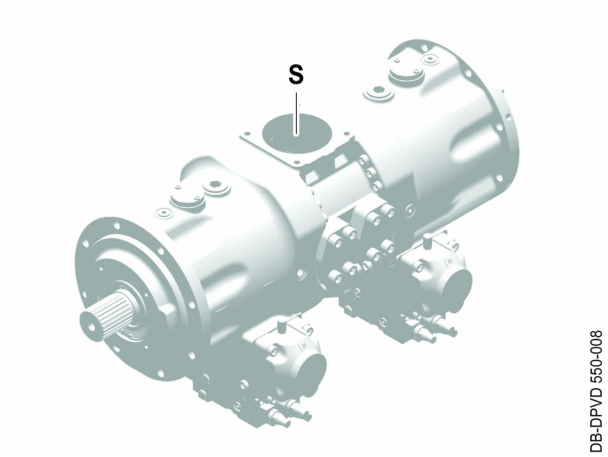
2 Technical data

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 A11/A12/A21/A22 to ensure adequate lubrication of the driving gear in all swivel angles during operation.

DANGER
Failure of the fastening screws at working connection A11/A12/A21/A22!
Danger to life.
Use fastening screws of strength category 10.9.



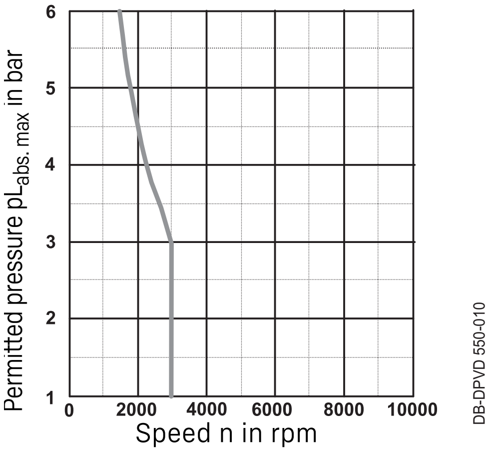
Suction pressure at connection S			
Nominal size			**550**
Minimum absolute pressure	pS_{min}	bar	1*
Maximum absolute pressure	pS_{max}	bar	3*

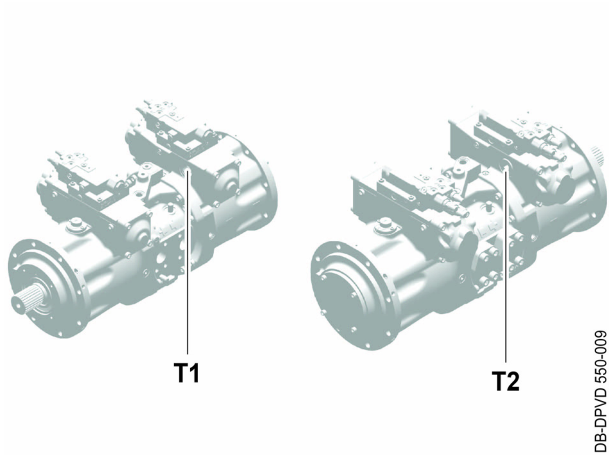
*) Other values upon request

2.3.2 Housing, leakage oil pressure

Leakage oil pressure at connection T1/T2			
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 Technical data

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	48

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 [mm²/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.

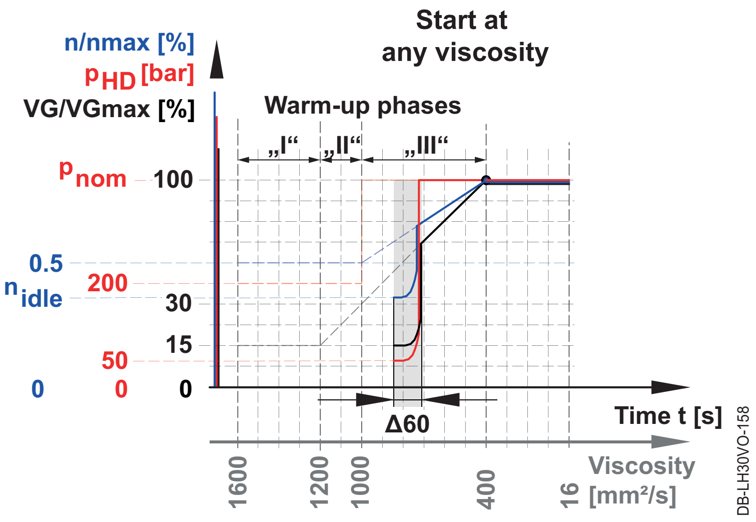
****) Idle state < -40 °C**

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 mm²/s.
(For additional information see: 2.5.6 Viscosity chart, page 17)

Regardless of the viscosity < 1600 mm²/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 mm²/s (for a short period, i.e. < 3 minutes, 7 mm²/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 mm²/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**.

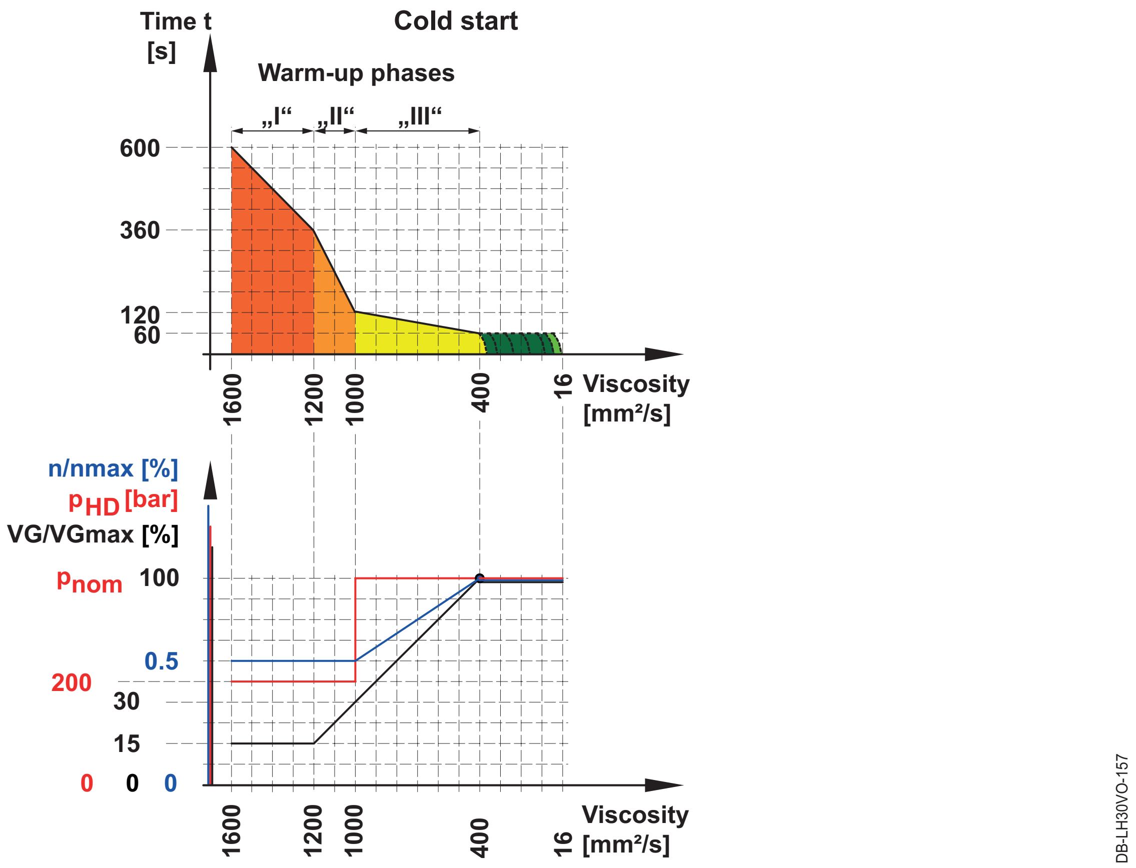
*) For additional information see: 2.5.6 Viscosity chart, page 17

The following conditions apply:

- Viscosity: 1600-1200 mm²/s = operate the axial piston unit for 600-360 s with measures listed for Warm-up phase "I".
- Viscosity: 1200-1000 mm²/s = operate the axial piston unit for 360-120 s with measures listed for Warm-up phase "II".
- Viscosity: 1000-400 mm²/s = operate the axial piston unit for 120-60 s with measures listed for Warm-up phase "III".
- Viscosity: 400-16 mm²/s = operate the axial piston unit for 60 s with measures listed for "Warm start". This means that even at ≤ 400 mm²/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 $V_{g\ max}$

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: $p_{HD\ min} \le p_{HD\ Warm\text{-}up\ "II"} \le 200$ bar
- Speed: $n_{min} \le n_{Warm\text{-}up\ "II"} \le 50\%$ of n_{max}
- Displacement volume: $V_{g\ min} \le V_{g\ Warm\text{-}up\ "II"} \le$ 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: $p_{HD\ min} \le p_{HD\ Warm\text{-}up\ "III"} \le p_{HD\ max}$
- Speed: $n_{min} \le n_{Warm\text{-}up\ "III"} \le 50\%$ of n_{max}
- Displacement volume: $V_{g\ min} \le V_{g\ Warm\text{-}up\ "III"} \le$ 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: $p_{HD\ min} \le p_{HD} \le 50$ bar
- Speed: $n_{min} \le n \le 1000$ rpm, or idle speed of the drive motor
- Displacement volume: $V_{g\ min} \le V_g \le 15\%$ 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.

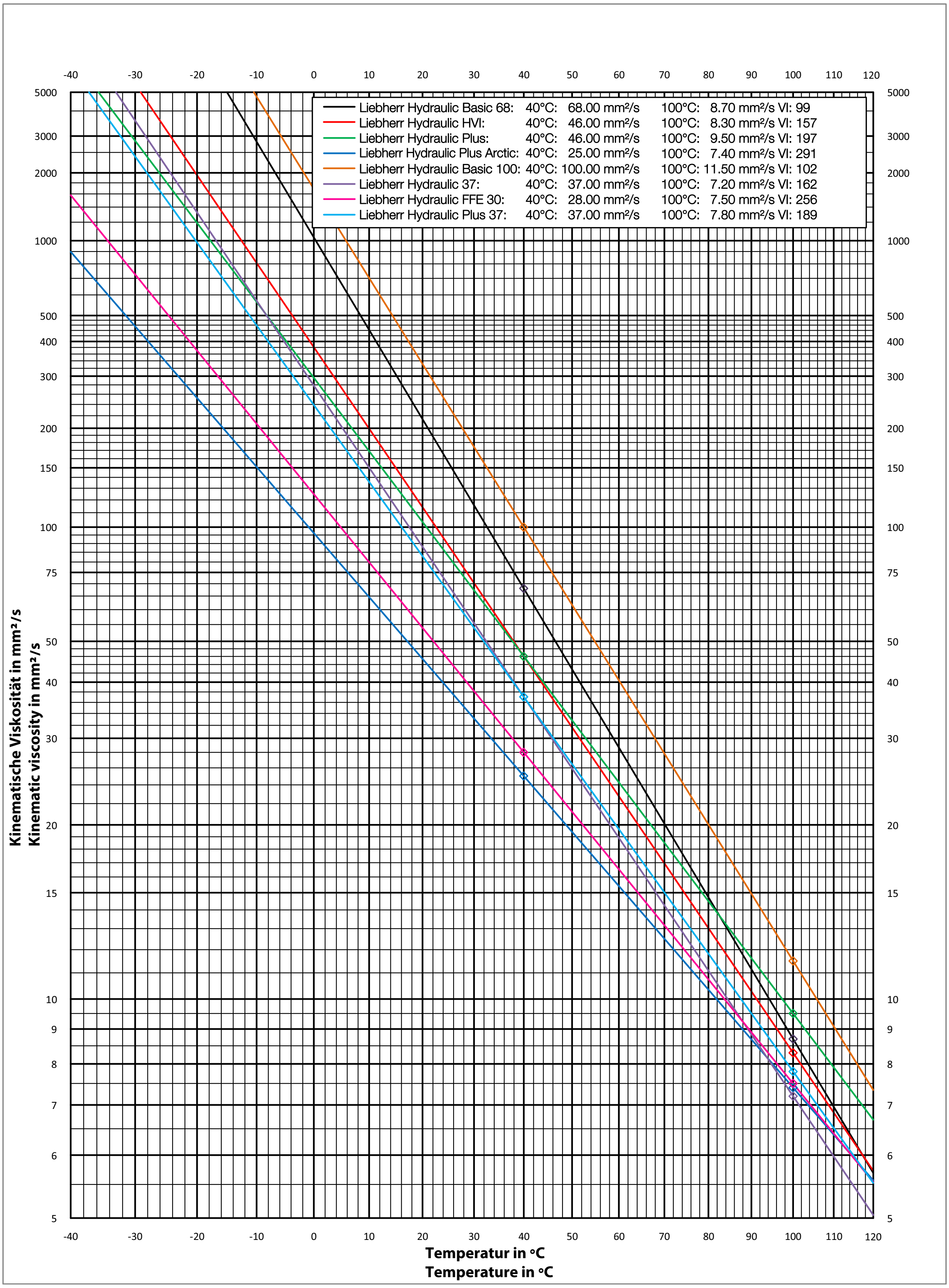
Note

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

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

2 Technical data

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

DPVD	0	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 DPVD series:

3.1.1 Mechanical-hydraulic control

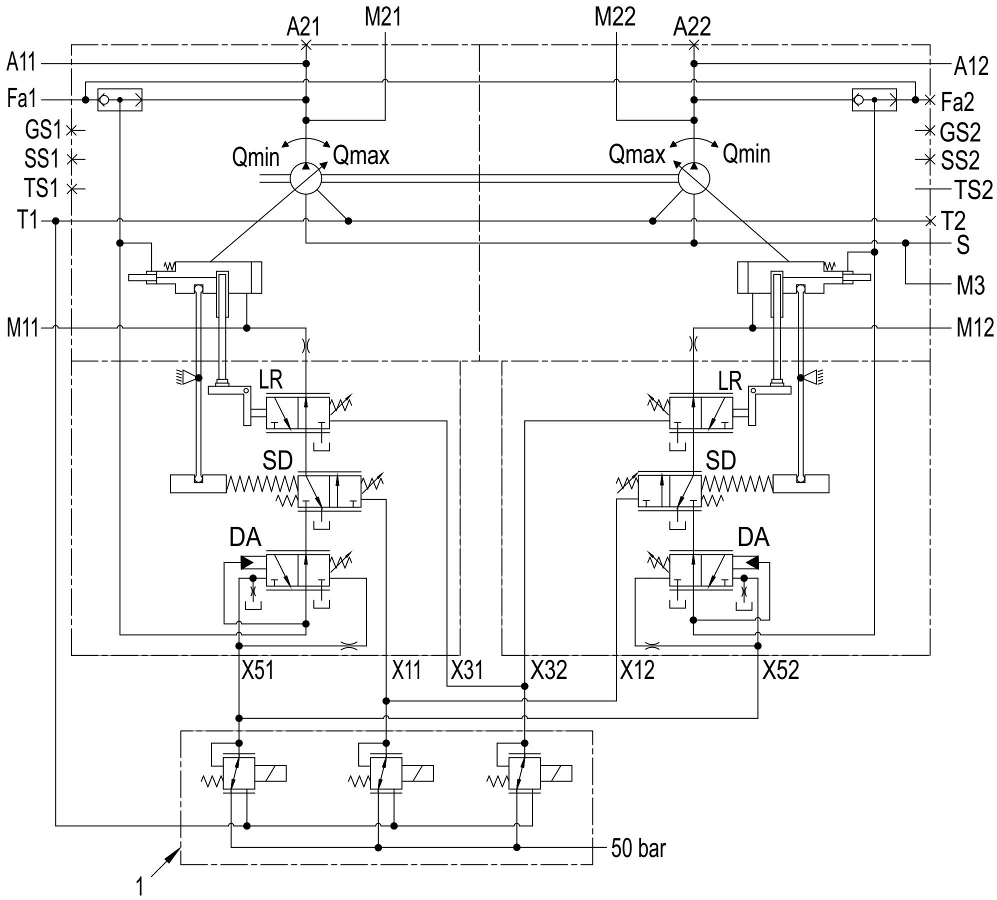
- LR-SD-DA- control, see chapter 3.2.1

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



DB-DPVD 550-012

A11 / A12 A21 / A22	Working connection (SAE J518) 2", 6000 psi	T1, T2	Leakage oil connections: oil filler neck or oil drain
S	Suction port (SAE J518) 6", 500 psi	Fa1 / Fa2	Filter outlet ISO 9974-1
M3	Suction pressure measuring port, Minimess port	M21 / M22	High pressure measuring port, Minimess port
M11 / M12	Regulated high pressure, Minimess port	X61 / X62	Vg_{min} regulation (deactivated) screw connection DIN 3901-L-12M
X11 / X12	SD- steering pressure ISO 9974-1	TS1 / TS2	Thermostatic switch ISO 9974-1
X31 / X32	LR- steering pressure ISO 9974-1	SS1 / SS2	Dirt switch ISO 9974-1
X11 / X12	DA- override pressure GE 10	GS1 / GS2	Housing flushing ISO 9974-1
1	not included in the scope of delivery	-	-

3 Activation and control type

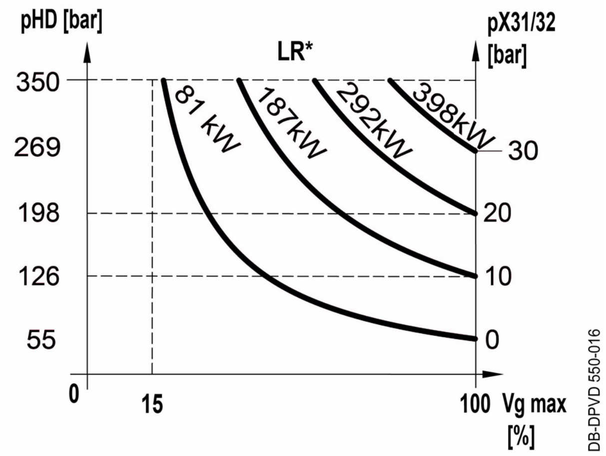
3.3 Control functions

- LR- function, power control, see chapter 3.3.1
- SD- function / steering pressure-dependent regulation, see chapter 3.3.2
- DA- function / pressure cut-off, see chapter 3.3.3

3.3.1 LR- function

The swivel angle is regulated as a function of the load-depending operating pressure pHD so that, as constant speed, the maximum torque permitted by the drive motor is not exceeded.

Characteristic



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

The LR- function prevents the maximum available mechanical drive power from being exceeded by the axial piston unit.

As the LR- steering pressure increases at X31/X32, the function can be raised to a higher performance curve while simultaneously pivoting the axial piston unit to a larger swivel angle in the $V_{g\ max}$ direction.
As the operating pressure pHD increases, the axial piston unit swivels back in the $V_{g\ min}$ direction when the value of the start of the regulation is reached.

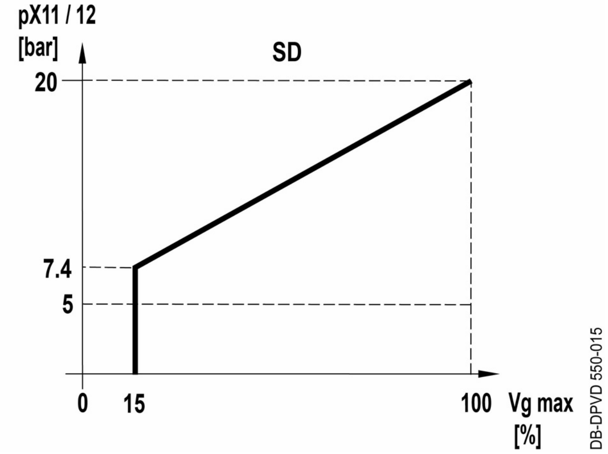
Note
Liebherr recommends combining the LR- function with a pressure cut-off.

3 Activation and control type

3.3.2 SD- function

SD control is suitable for applications which require a proportionally controlled 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 ring area, and the regulated high pressure pReg is applied to the adjusting piston bottom area.

If the pReg x adjusting piston bottom area is larger than the pHD x adjusting piston ring area, the adjusting piston moves and swivels the axial piston unit towards $V_{g\ max}$.

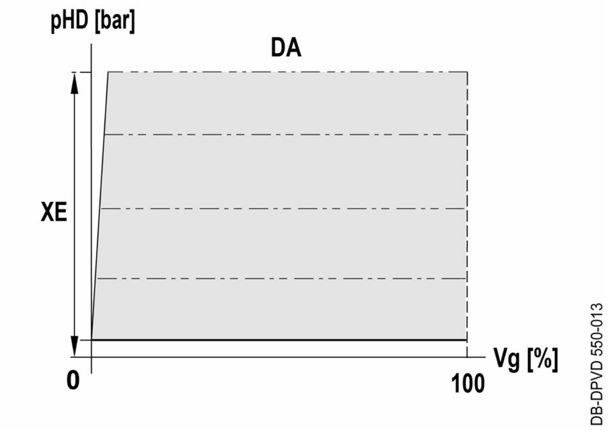
The hydraulic fluid required for this purpose is taken from high pressure pHD. At a low high pressure of pHD < 50 bar, the Fa1/Fa2 port must be supplied with auxiliary pressure of approx. 50 bar to ensure that regulation is possible.

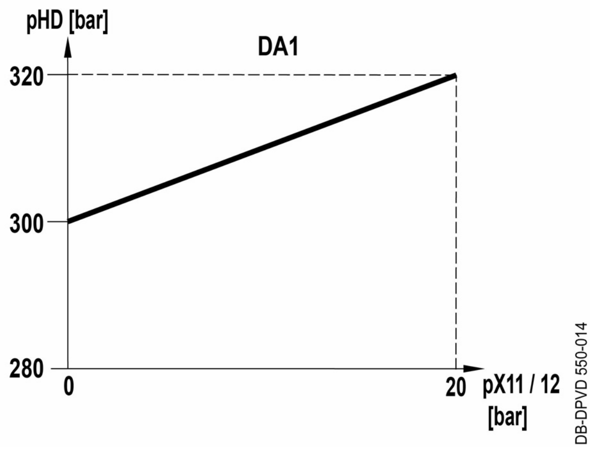
If the activating signal is missing or defective, the axial piston unit swivels to $V_{g\ min}$.

3 Activation and control type

3.3.3 DA- function

Characteristic





Additional technical data

DA setting range	XE	300-320 bar*

*) depending on requirement

The DA pressure control ensures that the maximum high pressure of the axial piston unit is limited within the regulation range. When a set high pressure value pHD is reached, the axial piston unit swivels in direction $V_{g\ min}$ and the hydraulic system is protected against damage and overloading.

It continues to swivel in direction $V_{g\ min}$, until the generated flow equals the set high pressure value pHD.

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

The DA override (DA1 function) has the task of overriding the set DA cut-off pressure of pressure stage 1 (e.g. 300 bar) via an externally supplied steering pressure pX-pT at port X11/X12 and thereby increasing the high pressure to the set DA cut-off pressure of pressure stage 2 (e.g. to 320 bar).

The override function DA1 thus represents a two-stage pressure cut-off with 2 pressure stages.

- Pressure stage 1, e.g.: 300 bar, or

- Pressure stage 2, e.g.: 320 bar

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 X11/X12 is the difference between the total steering pressure applied and the housing pressure.

3 Activation and control type

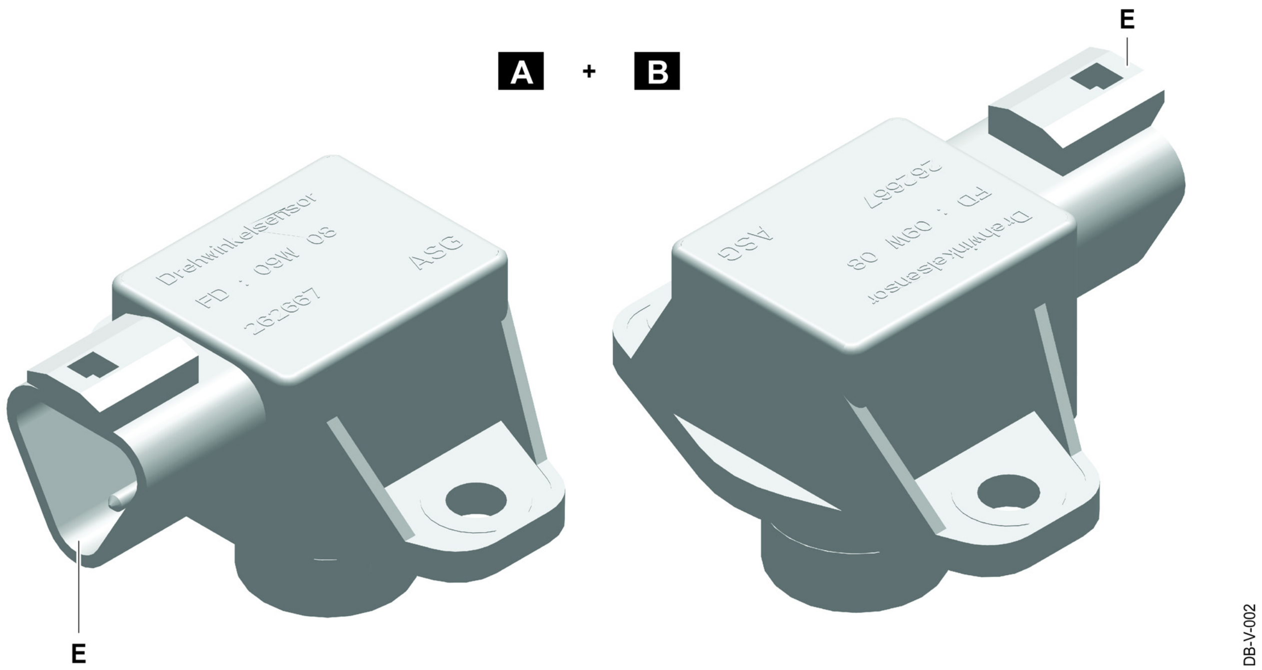
3.4 Electrical components

3.4.1 Sensors

DPVD	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			
Variant A		**Variant 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 when planning the DPVD project.
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.

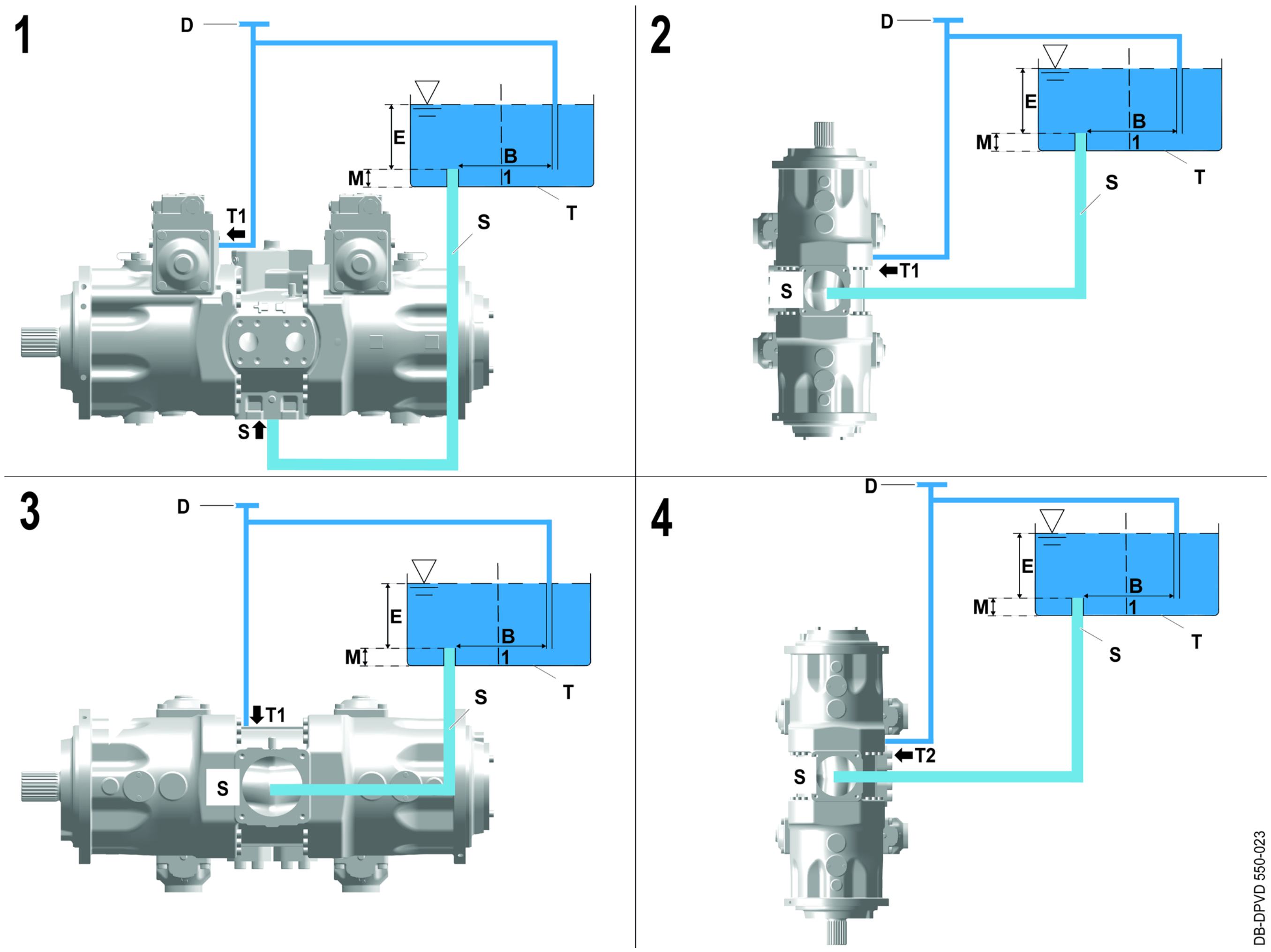
Make sure that the lines are connected according to recommendations and that they open into the hydraulic fluid tank. (For additional information see: 4.1.1 Suction line, page 25 and For additional information see: 4.1.2 Leakage oil lines, page 26)

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)

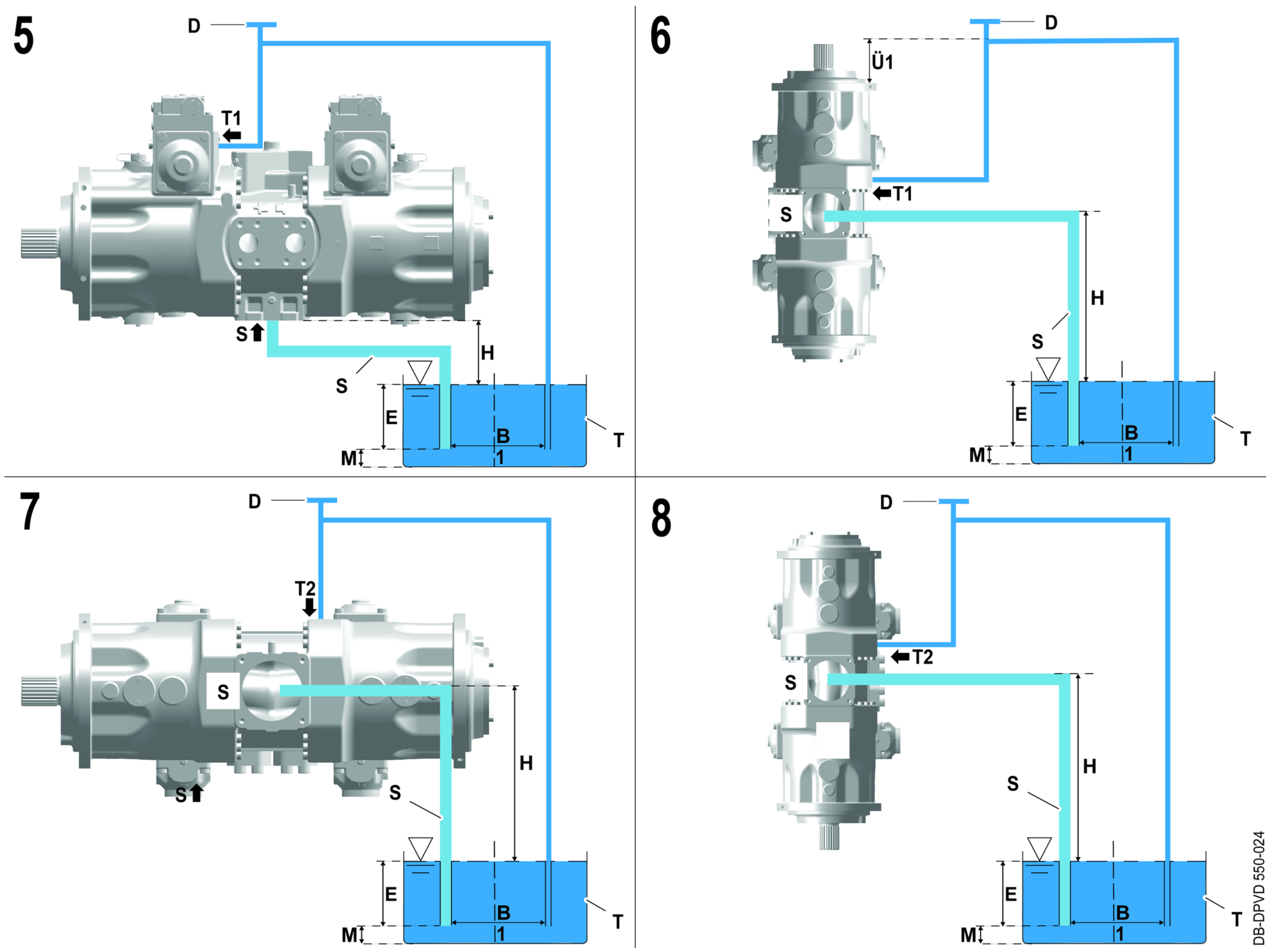
4 Installation conditions

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

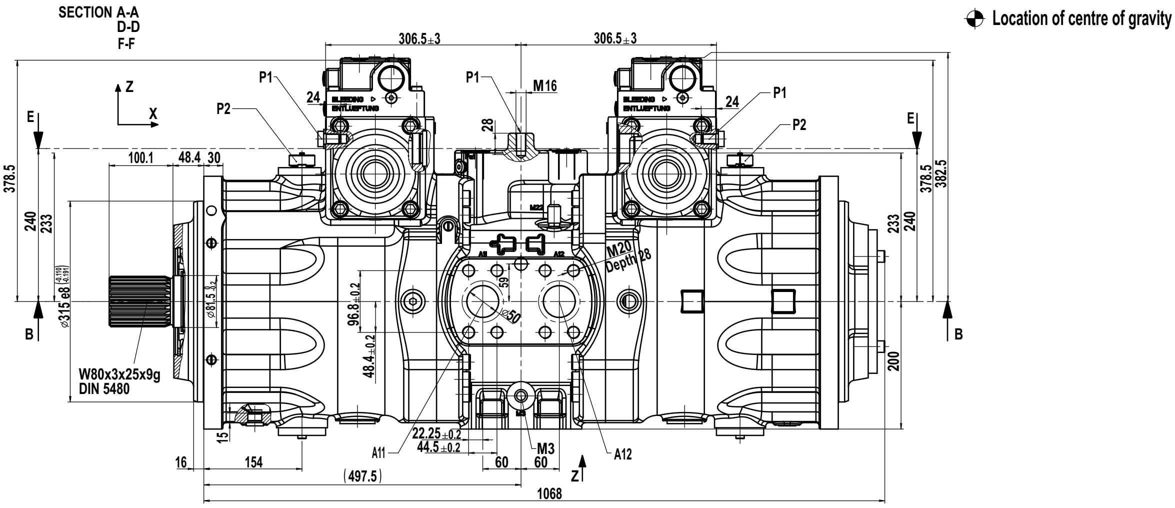
D	Fill and vent connection (external, not included in scope of delivery)	T	Tank
E	Minimum immersion depth = 250 mm	T_	Leakage oil connections T1 / T2 / T3 / T4 (T4 = optional)
H	Maximum suction head = 750 mm	Ü1	Minimum leakage oil line height = 30 mm

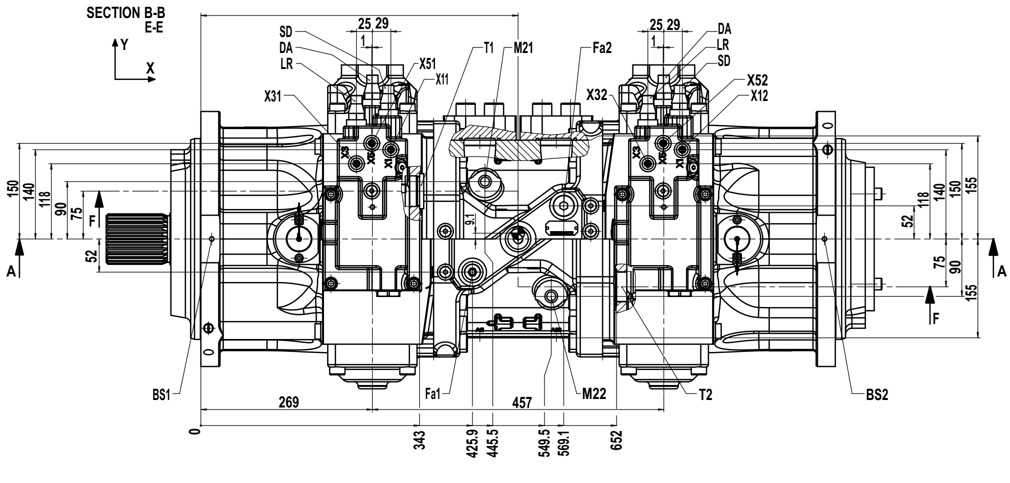
5 Dimensions

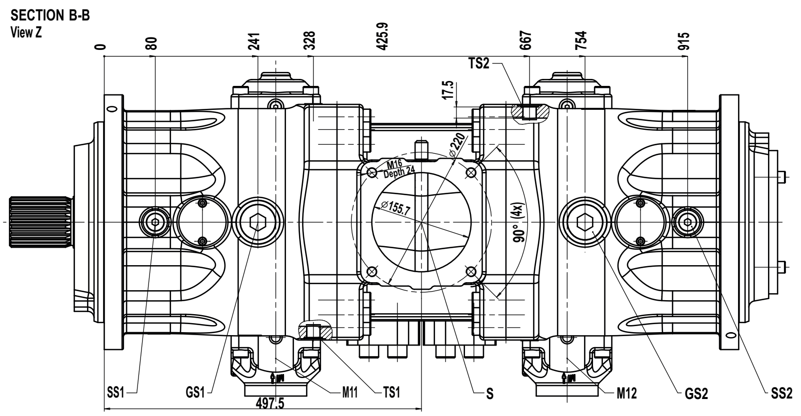
5.1 Main dimensions

5.1.1 Control type LR-SD-DA

DPVD	0	550	/	082	LR-SD-DA	1	L	31	1	A	0	0	0000	0	0
1.	2.	3		4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.

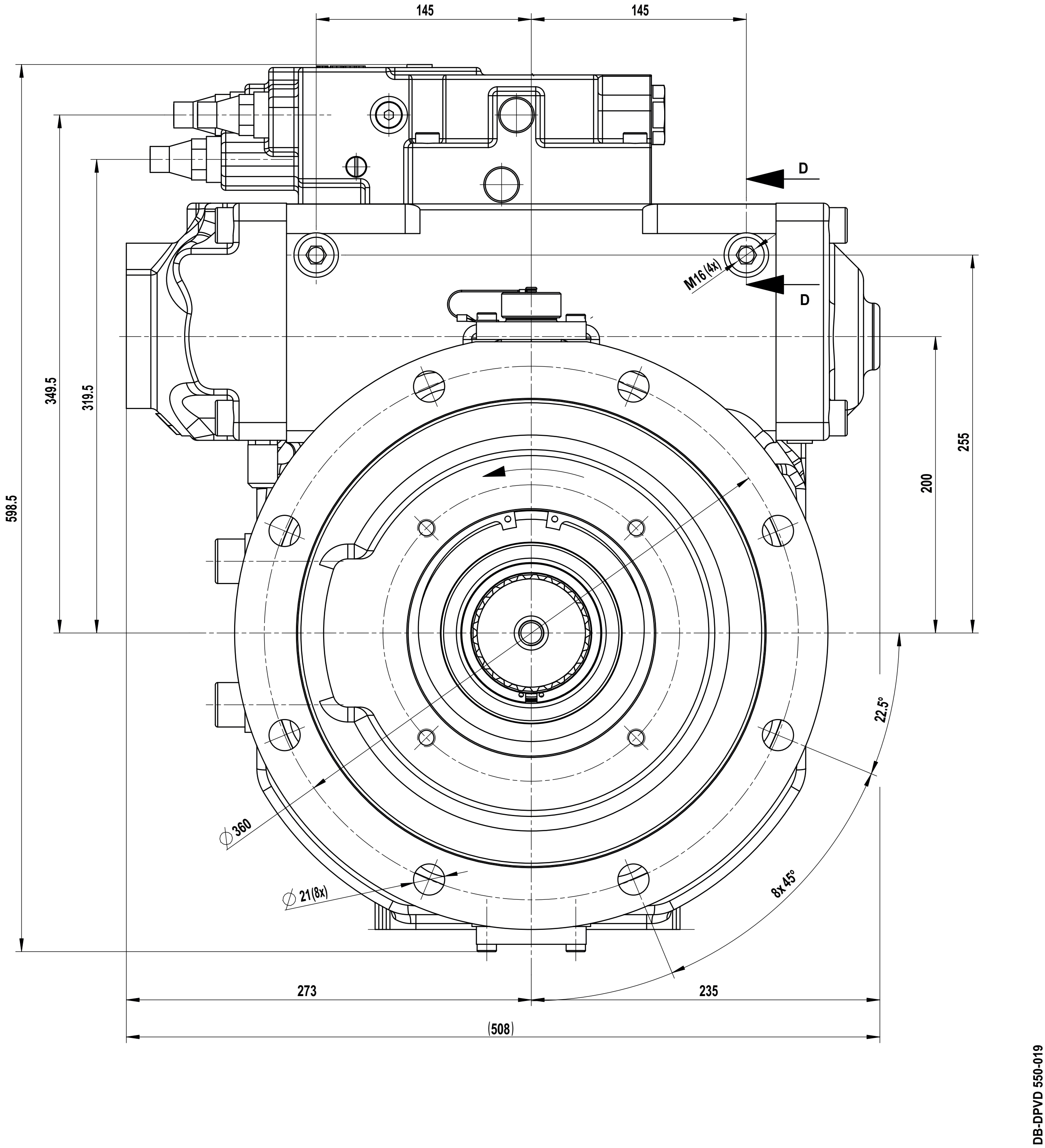






DB-DPVD 550-018

5 Dimensions



P1	Thread for suspending the pump		P2	Angle indicator (unscrew the cover)
A11 / A12 A21 / A22	Working connection (SAE J518) 2", 6000 psi		T1, T2	Leakage oil connections: oil filler neck or oil drain
S	Suction port (SAE J518) 6", 500 psi		Fa1 / Fa2	Filter outlet ISO 9974-1
M3	Suction pressure measuring port, Minimess port		M21 / M22	High pressure measuring port, Minimess port

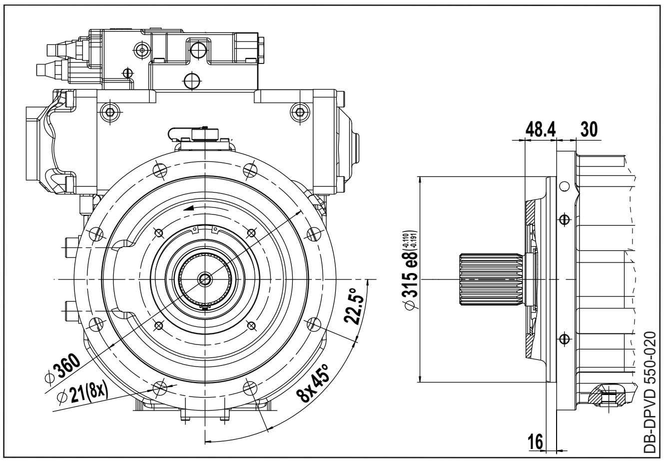
5 Dimensions

M11 / M12	Regulated high pressure, Minimess port		X61 / X62	Vg $_{min}$ regulation (deactivated) screw connection DIN 3901-L-12M
X11 / X12	SD- steering pressure ISO 9974-1		TS1 / TS2	Thermostatic switch ISO 9974-1
X31 / X32	LR- steering pressure ISO 9974-1		SS1 / SS2	Dirt switch ISO 9974-1
X11 / X12	DA- override pressure GE 10		GS1 / GS2	Housing flushing ISO 9974-1

5.2 Mounting flange

DPVD	0	550	/	082	LR-SD-DA	1	L	31	1	A	0	0	0000	0	0
1.	2.	3		4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.

DIN / ISO 3019-2

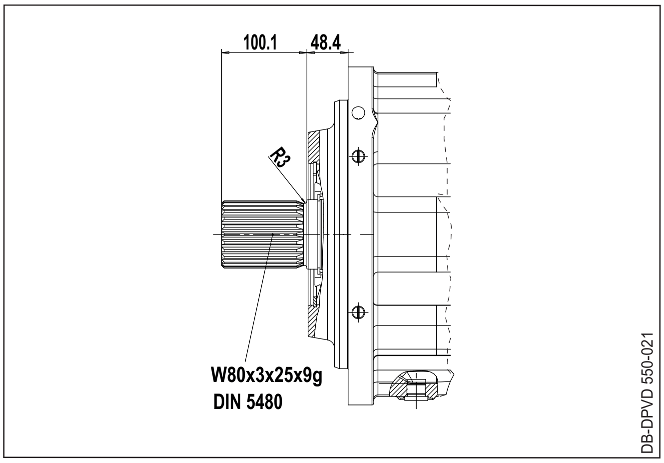


31

5.3 Shaft end

DPVD	0	550	/	082	LR-SD-DA	1	L	31	1	A	0	0	0000	0	0
1.	2.	3		4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.

Splined shaft DIN 5480 W80x3x25x9g, with undercut



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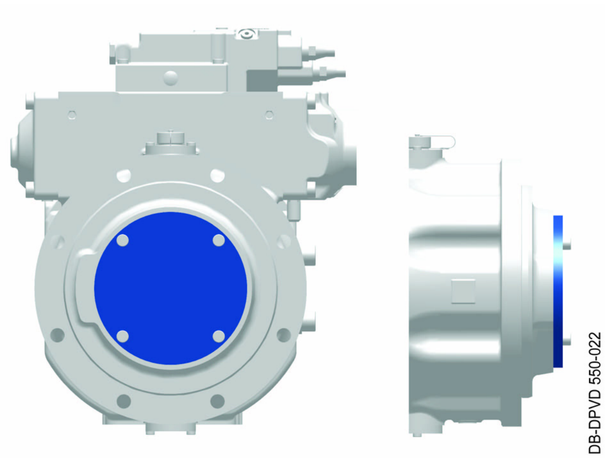
5 Dimensions

5.4 Through-drive

DPVD	0	550	/	082	LR-SD-DA	1	L	31	1	A	0	0	0000	0	0
1.	2.	3		4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.

5.4.1 Axial piston unit without through drive

Note
Dimensions for axial piston unit without through drive, see main dimensions.



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