Data sheet

Axial piston pump with variable displacement volume: LH30VO

The Liebherr axial piston pumps LH30VO are developed for open circuit in mobile and stationary applications.

The medium pressure pumps have a swashplate design and can be operated with through drive up to 130 %.

Other regulators have been added, including performance regulators (LR), electric volume flow regulators (VE) with rising characteristic and additional jump function in case of cable breakage (VK). They are designed for the most common applications, such as drive equipment, ventilation or steering and can also be used in power supply units.

The efficiency improvement and optimised production and installation processes make them LH30VO an interesting and powerful product for mobile and stationary applications that require pressure range up to 280 bar.

Valid for:
LH30VO 028
LH30VO 045
LH30VO 085

Features:
Series 20
Open circuit

Regulator types:
Pressure regulation
Volume flow regulation
Performance regulation
Various combined forms of regulation

Pressure range:
Nominal pressure pHD_N = 280 bar
Maximum pressure pHD_{max} = 320 bar

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LIEBHERR

Table of contents

Axial piston pump
LH30VO 028 to 085

1 Type code

Axial piston pump
LH30VO 028 to 085

1.	2.	3.	4.	5.	6.	7.		8	9.	10.	11.	12.	13.	14	15	16	17	18	19	20	21
L	H	3	0	V	O		/		20	V					0	00		000			

1. Manufacturer

Liebherr Machines Bulle SA	L

2. Department

Hydraulics	H

3. Nominal pressure range

Nominal pressure p_N = 280 bar / maximum pressure p_{max} = 320 bar	3

4. Setup

Single unit (pump) (inline multiple unit, see chapter 5.11)	0

5. Design

Variable	V

6. Circuit

Open circuit	O

7. Nominal size (NS)

NS (inline multiple unit, see chapter 5.11)	028	045	085	

8. Regulator (3 - / 6 - or 9-digit)

1. Regulator axis	**XX-**
2. Regulator axis (combination regulator)	**XX-XX-**
3. Regulator axis (combination regulator)	**XX-XX-XX-**

Mechanic-hydraulic regulators				
Pressure cut-off	■	■	■	DA-
Hydraulic pressure regulation (remote-controllable) / pressure cut-off (combined regulator)	■	■	■	DF-DA-
Load sensing regulator (without vent nozzle in regulator) / pressure cut-off (combined regulator)	▼	▼	▼	LS0DA-
Load sensing regulator (with vent nozzle in regulator) / pressure cut-off (combined regulator)	□	□	□	LS1DA-
Performance regulator	■	■	■	LR-
For 2-digit mechanic-hydraulic regulators, a hyphen must be appended. This applies to each regulator axis.				

1 Type code

Axial piston pump
LH30VO 028 to 085

	028	045	085	
Electro-hydraulic regulators				
Electric pressure regulation	▼	▼	▼	DE_
Load sensing regulator (without vent nozzle in regulator) / electric pressure regulation (combined regulator)	■	■	■	LS0DE_
Load sensing regulator (with vent nozzle in regulator) / electric pressure regulation (combined regulator)	□	□	□	LS1DE_
For electric regulators, the underscore is a placeholder for the desired voltage / characteristic / plug. Please select 1-8 instead of the underscore.				
Voltage / characteristic / plug: 24V, rising characteristic, Deutsch plug	■	■	■	1
Voltage / characteristic / plug: 24V, falling characteristic, Deutsch plug	■	■	■	2
Voltage / characteristic / plug: 12V, rising characteristic, Deutsch plug	■	■	■	3
Voltage / characteristic / plug: 12V, falling characteristic, Deutsch plug	■	■	■	4
Voltage / characteristic / plug: 24V, rising characteristic, AMP plug	▼	▼	▼	5
Voltage / characteristic / plug: 24V, falling characteristic, AMP plug	▼	▼	▼	6
Voltage / characteristic / plug: 12V, rising characteristic, AMP plug	■	■	■	7
Voltage / characteristic / plug: 12V, falling characteristic, AMP plug	■	■	■	8

Electric volume	■	■	■	VE_
Electric volume with jump function in case of cable breakage	■	■	■	VK_
Volume electrically overridden (retarder)	■	■	■	VO_
For electric volume flow regulators, the underscore is a placeholder for the desired voltage / characteristic / plug. Please select 1-7 instead of the underscore.				
Voltage / characteristic / plug: 24V, rising characteristic, Deutsch plug	□	□	□	1
Voltage / characteristic / plug: 12V, rising characteristic, Deutsch plug	□	□	□	3
Voltage / characteristic / plug: 24V, rising characteristic, AMP plug	■	■	■	5
Voltage / characteristic / plug: 12V, rising characteristic, AMP plug	□	□	□	7

Regulator availability matrix (1-3 regulator axes)

		Basic option										
		DA-	DE_	LS0DA-	LS1DA-	LS0DE_	LS1DE_	DF-DA-	DE_DA-	VE_	VK_	LR-
Additional option	None	■	▼	▼	□	■	□	■	■	■	■	■
	DA-	-	■	-	-	■	□	-	-	■	■	■
	VE_	■	■	■	□	■	□	■	■	-	-	-
	VK_	■	■	■	□	■	□	■	■	-	-	-
	LR-	■	-	■	□	■	□	■	■	-	-	-
	VO_	■	■	■	□	■	□	■	■	-	-	■

1 Type code

Axial piston pump
LH30VO 028 to 085

	028	045	085	
9. Series				
Design	20			
10. Sealing material				
Viton	V			
11. Direction of rotation (front view of the drive shaft)				
Left	■	■	■	L
Right	■	■	■	R
12. Mounting flange				
SAE B = 101.6 mm (SAE J744) 2-hole mounting	▼	▼	-	B2
SAE C = 127.0 mm (similar to SAE J744) 2+4-hole mounting	-	-	▼	C6
13. Driving shaft end				
ANSI, 7/8", 13 teeth, with undercutting	■	■	-	A1
ANSI, 7/8", 13 teeth, without undercutting	▼	■	-	A2
ANSI, 1", 15 teeth, with undercutting	□	■	-	A3
ANSI, 1", 15 teeth, without undercutting	□	▼	-	A4
ANSI, 1 1/4", 14 teeth, with undercutting	-	-	■	A5
ANSI, 1 1/4", 14 teeth, without undercutting	-	-	□	A6
ANSI, 1 1/2", 17 teeth, with undercutting	-	-	□	A9
ANSI, 1 1/2", 17 teeth, without undercutting	-	-	▼	A0
14. Working connection				
Metric mounting thread at the side ISO 6162-2 / SAE J518-2	□	■	▼	A1
Metric mounting thread at the rear ISO 6162-2 / SAE J518-2	□	■	■	A3
Metric mounting thread at the side ISO 6162-1 / SAE J518-1	▼	▼	-	B1
Metric mounting thread at the rear ISO 6162-1 / SAE J518-1	■	■	-	B3
15. Add-on parts				
Without add-on parts	0			
16. Gear pump				
Without gear pump	00			

1 Type code

Axial piston pump
LH30VO 028 to 085

			028	045	085	
17. Through drive						
Without through-drive			■	■	▼	0000
Centring diameter	Shaft teeth	Fastening				
82.55 diameter (SAE J744-A)	ANSI B92.1a 5/8 in 9T 16/32DP	2-hole / open bore	■	■	■	A11D
82.55 diameter (SAE J744-A)	ANSI B92.1a 3/4 in 11T 16/32DP	2-hole / open bore	■	■	■	A21D
101.6 diameter (SAE J744-B)	ANSI B92.1a 7/8 in 13T 16/32DP	2-hole / open bore	▼	■	■	B11D
101.6 diameter (SAE J744-B)	ANSI B92.1a 1 in 15T 16/32DP	2-hole / open bore	-	▼	■	B21D
127 diameter (SAE J744-C)	ANSI B92.1a 1 1/4 in 14T 12/24DP	2-hole / open bore	-	-	□	C11D
127 diameter (SAE J744-C)	ANSI B92.1a 1 1/2 in 17T 12/24DP	2-hole / open bore	-	-	▼	C21D
Special centring diameter	No shaft coupling	4-hole / closed bore	▼	▼	▼	K02G
18. Valves						
Without valve			000			
19. Sensors						
Without sensor			▼	▼	▼	0
Preparation for pressure measuring port (Minimess)			-	□	□	V
20. Swivel angle stops						
Standard (without Q_{min} + Q_{max} limit stop)			▼	▼	▼	0
With Q_{max} fixed stop (specify when ordering)			□	□	□	5
21. Special versions and options						
Primer			▼	▼	▼	G
Primer + finish (colour specified by customer)			□	□	□	F
Conservation without primer (tank pump)			□	□	□	K
Additional Leakage oil connection			■	■	■	Z

▼ = preferred series
■ = available
□ = on request
- = not possible

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

2.1 Table of values

Nominal size				028	045	085
Displacement volume		$V_{g\ max}$	cm^3	28.7	46.5	86.1
		$V_{g\ min}$	cm^3	0	0	0
Volume flow at $V_{g\ max}$ and n_{max}		$q_{v\ max}$	l/min	94.7	139.5	206.6
Min. revolutions at $V_{g\ max}$ and p_{abs} = 1 bar at the Suction port		n_{min}	rpm	100*	100*	100*
Max. revolutions at $V_{g\ max}$ and p_{abs} = 1 bar at the Suction port		n_{max}	rpm	3300	3000	2400
Torque at $V_{g\ max}$ and Δp = 280 bar		M_{max}	Nm	127.9	207.2	383.7
Driving power at qv_{max} and Δp = 280 bar		p_{max}	kW	44.2	65.1	96.4
Driving gear moment of inertia		J_{TW}	kgm^2	0.002	0.004	0.0097
Maximum Angular acceleration		α	rad/s^2	7300	5400	3900
Weight without through-drive (approx.)		m	kg	16	21	39
Weight with through-drive (approx.)		m	kg	18	24	43
Torsional rigidity	Driving shaft code “A1”	Nm/rad		19800	23600	-
	Driving shaft code “A2”			21600	27600	-
	Driving shaft code “A3”			□	32000	-
	Driving shaft code “A4”			□	32600	-
	Driving shaft code “A5”			-	-	69800
	Driving shaft code “A6”			-	-	80700
	Driving shaft code “A9”			-	-	□
	Driving shaft code “A0”			-	-	103300

□ = on request
- = not possible

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

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

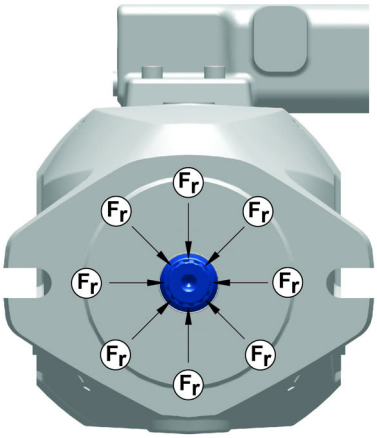
2.2 Maximum radial and axial load of the driving shaft

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 drive shaft.

Generally applicable data for calculation

- Vg_{max}
- Operating pressure pHD: 200 bar



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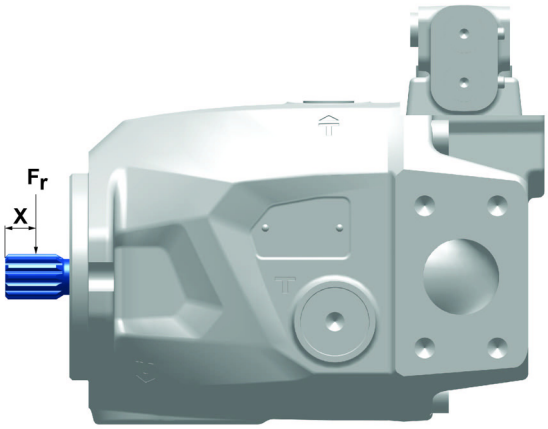
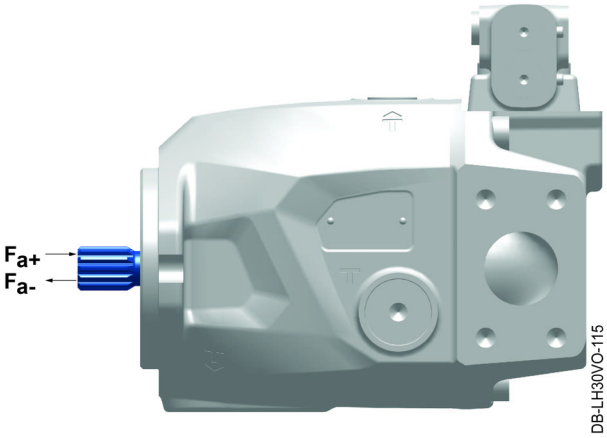


DB-LH30VO-114

Nominal size			028	045	085
X		mm	12.5	15	18
Position at which radial force is applied		-	All		
Max. radial force F_r	Reduces BSL* by 20 %	N	500	650	1550
	Reduces BSL* by 50 %		1400	1300	2800

BSL*) Bearing service life



Nominal size			028	045	085
Max. axial force F_{a+}	Reduces BSL* by 20 %	N	100	100	500
	Reduces BSL* by 50 %		300	500	1200
Max. axial force F_{a-}	Reduces BSL* by 20 %	N	1900	1550	2700
	Reduces BSL* by 50 %		2300	2200	4000

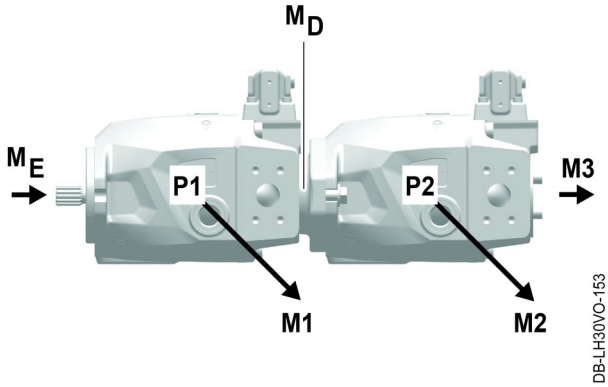
BSL*) Bearing service life

2.3 Maximum input and drive torques

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

Generally applicable data for calculation

- Vg_{max}
- Operating pressure pHD: 280 bar



M1	Torque of axial piston pump 1
M2	Torque of axial piston pump 2
M3	Torque of axial piston pump 3
P1	Axial piston pump 1

P2	Axial piston pump 2
M_E [1]	Input torque
M_D [2]	Drive torque
-	-

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

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

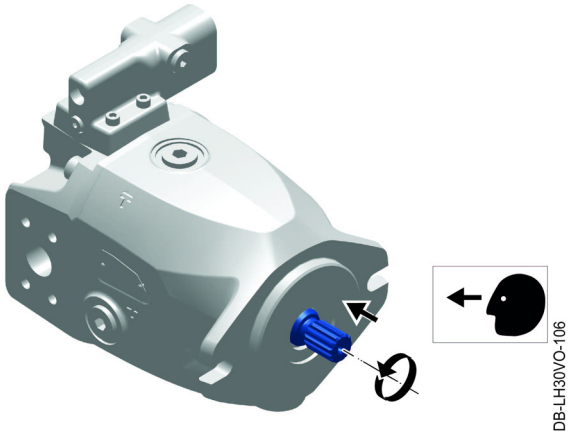
Nominal size					028	045	085
Torque* at $V_{g\ max}$ and Δp = 280 bar			M_{max}	Nm	127.9	207.2	383.7
Max. torque of drive shaft input (installed without lateral force)	A1	7/8", 13 teeth, with undercutting	$M_{E\ max}$	Nm	235	235	-
	A2	7/8", 13 teeth, without undercutting	$M_{E\ max}$	Nm	280	280	-
	A3	1", 15 teeth, with undercutting	$M_{E\ max}$	Nm	370	370	-
	A4	1", 15 teeth, without undercutting	$M_{E\ max}$	Nm	447	447	-
	A5	1 1/4", 14 teeth, with undercutting	$M_{E\ max}$	Nm	-	-	675
	A6	1 1/4", 14 teeth, without undercutting	$M_{E\ max}$	Nm	-	-	785
	A9	1 1/2", 17 teeth, with undercutting	$M_{E\ max}$	Nm	-	-	1280
	A0	1 1/2", 17 teeth, without undercutting	$M_{E\ max}$	Nm	-	-	1478
Max. torque of through drive			$M_{D\ max}$	Nm	158	300	532

□ = on request
- = not possible

Note
Higher through drive torques on request.

2.4 Direction of rotation

1.	2.	3.	4.	5.	6.	7.		8	9.	10.	11.	12.	13.	14	15	16	17	18	19	20	21
L	H	3	0	V	O		/		20	V					0	00		000			

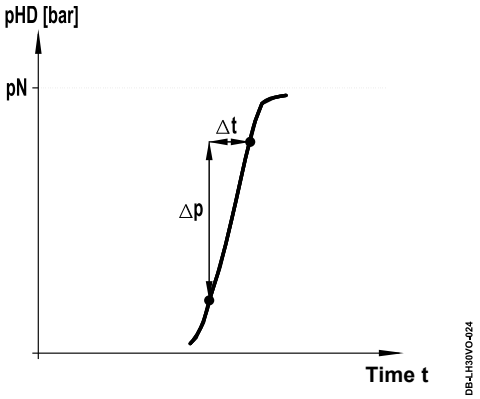


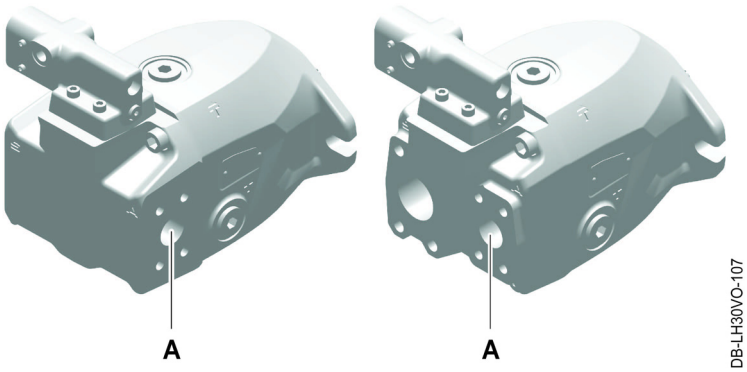
The direction of rotation is stated with view of the driving shaft, as shown in the figure.

R	right	=	clockwise
L	left	=	anti-clockwise

2.5 Permitted pressure range

2.5.1 Operating pressure

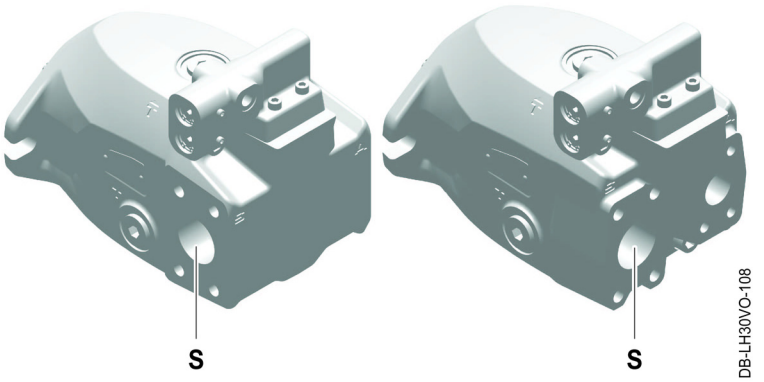




Operating pressure at connection A					
Nominal size			**028**	**045**	**085**
Minimum pressure[1]	pHD_{min}	bar	16		
Nominal pressure (fatigue endurable)	pHD_{N}	bar	280		
Maximum pressure (single operating period)	pHD_{max}	bar	320		
Single operating period at maximum pressure pHD_{max}	t	s	< 1		
Total 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 A to ensure adequate lubrication of the driving gear driving gear at all swivel angles during operation.
**) If nothing else is stated

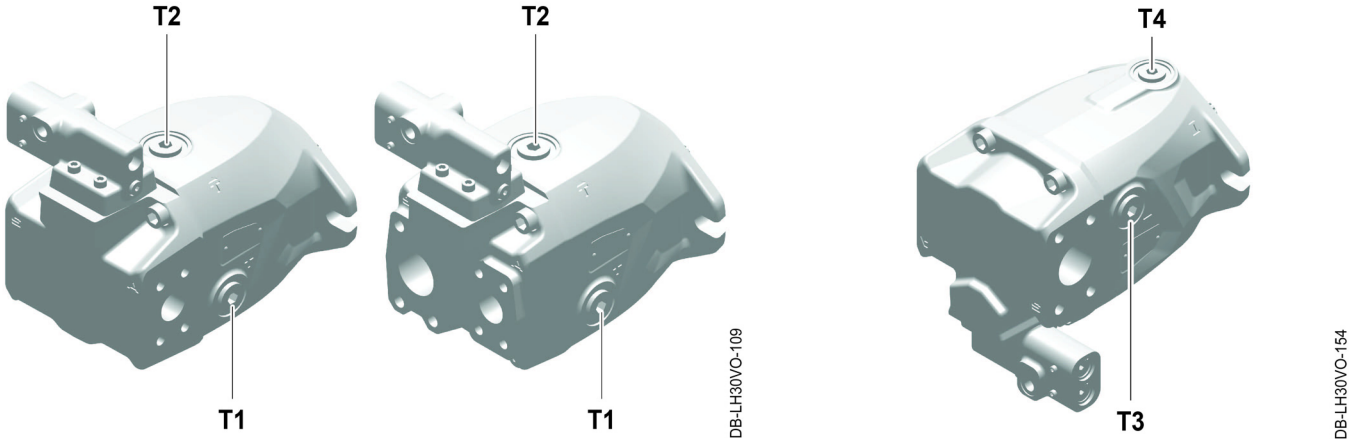
DANGER
Failure of the fastening screws at working connection A!
Danger to life.
Use fastening screws of strength category 10.9.



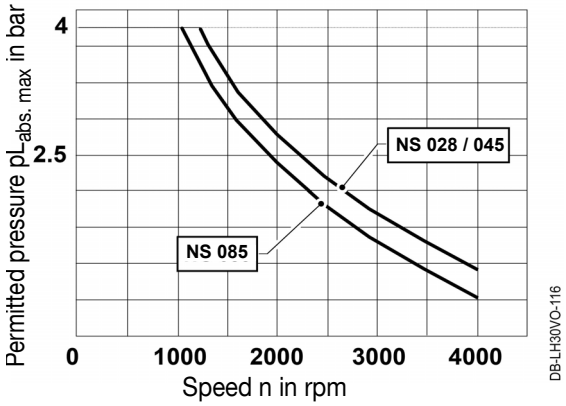
Suction pressure at connection S			
Nominal size			**028 to 085**
Minimum absolute pressure	pS_{min}	bar	0.8*
Maximum absolute pressure	pS_{max}	bar	2*

*) Other values upon request

2.5.2 Housing, leakage oil pressure



*) Leakage oil connection T4 can be ordered as a special design. For more information, see: Type code



Leakage oil pressure at connection T1/T2			
Nominal size			**028 to 085**
Maximum absolute pressure	pL_{max}	bar	2*

*) The housing or leakage oil pressure pL must not exceed the suction pressure at connection S + 0.5 bar in any operating state.

$pL \leq pS_{max} + 0.5$ bar

Note
The pressure in the axial piston unit must always be higher than the external pressure on the shaft lip seal.

2.6 Shaft lip seal

2.6.1 General information

The rotary shaft lip seals (RWDR) are special sealing elements that allow for a specific housing pressure. To ensure that the tribological system functions optimally, the operating conditions must be complied with.

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 may be around 20 °C to 40 °C above the leakage oil temperature of a hydraulic axial piston unit.

2.6.2 Temperature range

The FKM rotary shaft lip seal is permitted for leakage oil temperatures from -25 °C to +115 °C.
For applications under -25 °C: please contact us.

2.7 Hydraulic liquids

2.7.1 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 more information, see: www.liebherr.com (brochure: Lubricants and operating fluids)
Alternatively: Contact lubricants@liebherr.com.

2.7.2 Fill quantity

Nominal size		028	045	085
Fill quantity	Litres	0.55	0.6	1.6

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

2.7.3 Filtering

- To maintain the specified purity class “21/17/14 according to ISO 4406” under all circumstances, filtering of the hydraulic fluid is necessary.
- 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).

2.7.4 Operating limits

ATTENTION
Temperatures ≤ -40 °C in the system = axial piston unit must not be operated.
Pre-heat the axial piston unit to at least -40 °C.

Phase	Temperature [°C]**	Viscosity [mm^2/s]*
Cold start phase	-40 to -25	1600-1000
Warm-up phase	above -25	1000-500
Normal operation		< 500

*) Depending on the hydraulic fluid that is used
**) Relative to tank temperature

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.

- Cold start phase:

ATTENTION
The following operating conditions must be maintained during the cold start phase:

- Operating pressure range: $pHD_{min} < pHD_{cold\ start} < 30$ bar
- Speed $n_{cold\ start} \leq 1000$ rpm

Start the drive motor and operate the axial piston unit under the specified operating conditions until a temperature of at least -25 °C has been reached.

- Warm-up phase:

ATTENTION
The following operating conditions must be maintained during the warm-up phase:

- Operating pressure range: $pHD_{min} < pHD_{warm\text{-}up} < 50$ % of pHD_N
- Speed $n_{warm\text{-}up} \leq 50$ % of n_{max}

Start the drive motor and operate the axial piston unit under the specified operating conditions until a viscosity of approx. 500 mm^2/s has been reached.

- Normal operation:

Note
No restrictions apply to operating data.

3 Type of drive and regulator

Axial piston pump
LH30VO 028 to 085

3.1 Regulator types

1.	2.	3.	4.	5.	6.	7.		8	9.	10.	11.	12.	13.	14	15	16	17	18	19	20	21
L	H	3	0	V	O		/		20	V					0	00		000			

Note
Only one nominal size is illustrated per regulator type or function, typically nominal size 045. 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 regulator types:

DANGER
The spring-guided reset in the regulating valve is not a safety device!
Contaminants in the hydraulic system such as swarf or dirt from the device or system parts can cause blockages at undefined points of various regulator 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 regulator types can be ordered for the LH30VO series:

3.1.1 Mechanic-hydraulic regulators

- DA- regulator, see chapter 3.2.1
- DF-DA- regulator, see chapter 3.2.2
- LS0DA- regulator, see chapter 3.2.3

3.1.2 Electro-hydraulic regulators

- DE1/3/5/7 regulator, rising characteristic, see chapter 3.2.4
- DE2/4/6/8 regulator, falling characteristic, see chapter 3.2.5

- LS0DE1/3/5/7 regulator, rising characteristic, see chapter 3.2.6
- LS0DE2/4/6/8 regulator, falling characteristic, see chapter 3.2.7

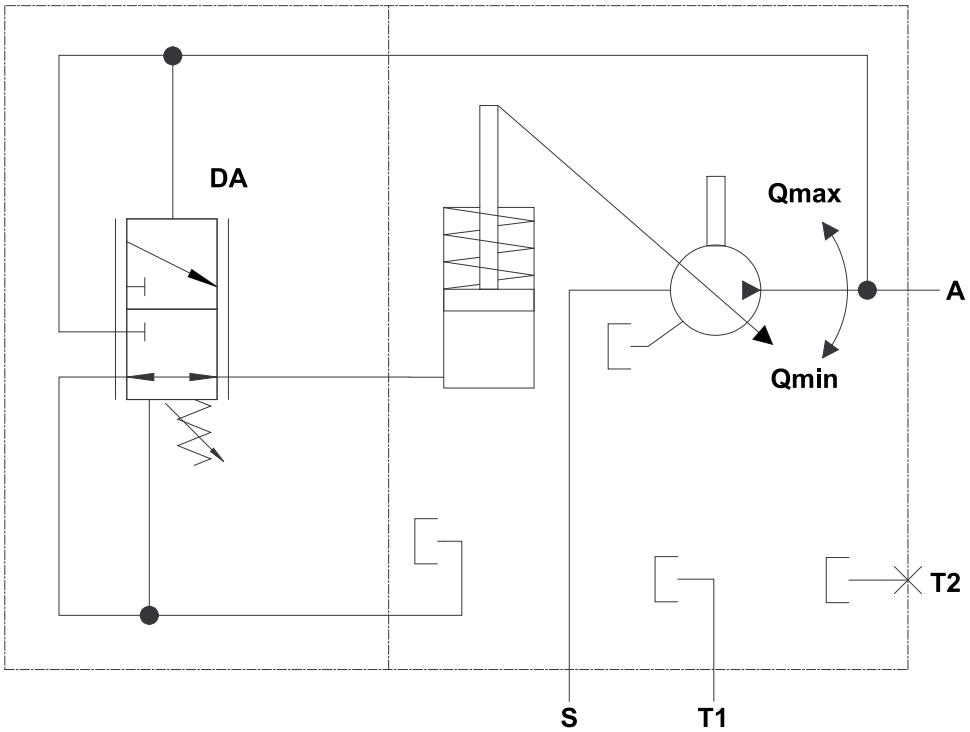
- VE1/3/5/7 regulator, rising characteristic, see chapter 3.2.8

- VO1/3/5/7 regulator, see chapter 3.2.9

Additional regulator types upon request.

3.2 Standard hydraulic diagrams

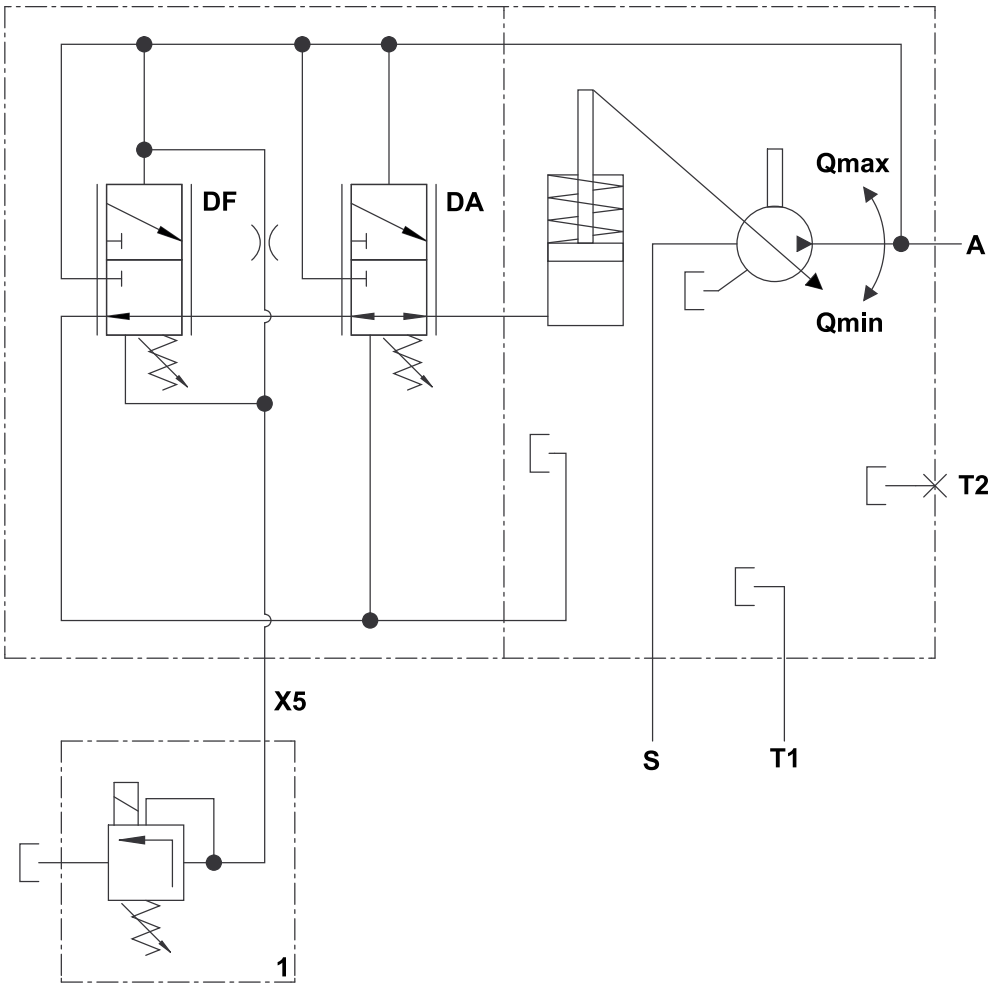
3.2.1 DA- - Pressure cut-off



DA- DB-LH30VO-056

A	Working connection ISO 6162-1/-2 (SAE J518)	T1, T2	Leakage oil connections ISO 11926
S	Suction port ISO 6162-1/-2 (SAE J518)	-	-

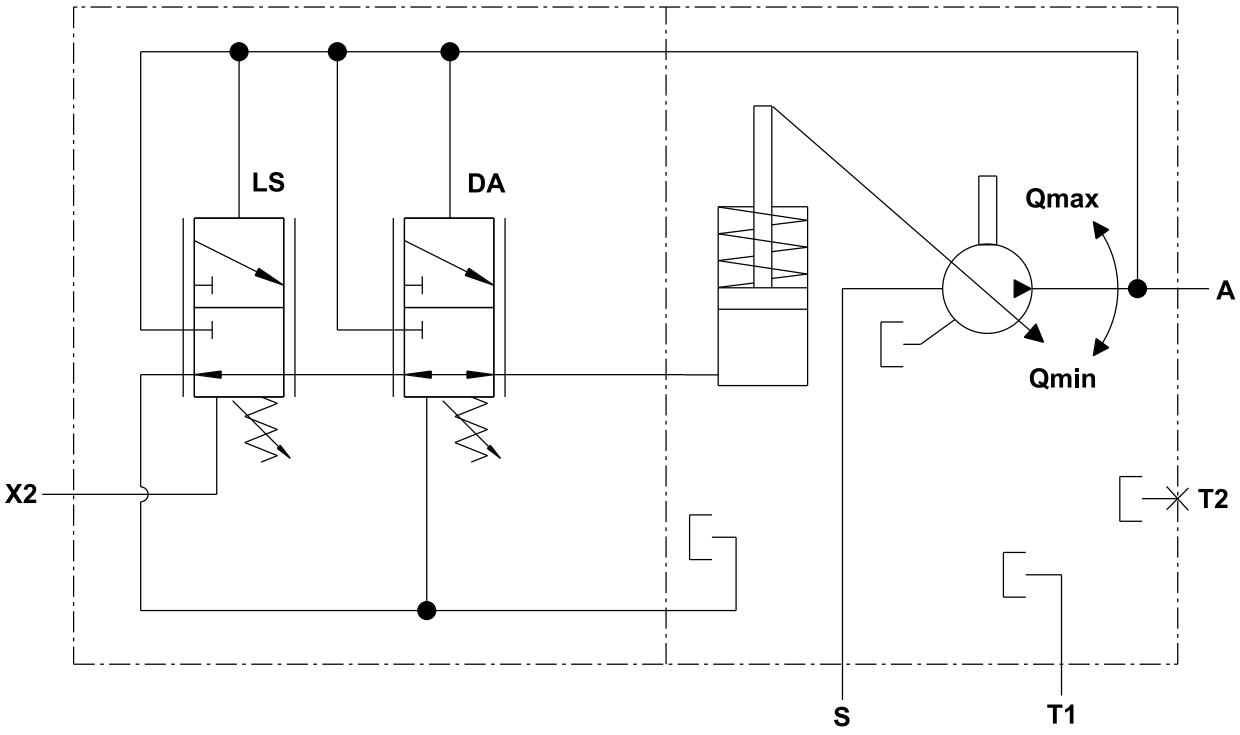
3.2.2 DF-DA- - Hydraulic pressure regulation, remote-controllable with pressure cut-off



DF-DA-

A	Working connection ISO 6162-1/-2 (SAE J518)	T1, T2	Leakage oil connections ISO 11926
S	Suction port ISO 6162-1/-2 (SAE J518)	X5	DF pressure ISO 9974-1-M12x1.5
1	Pressure limiting valve not included	-	-

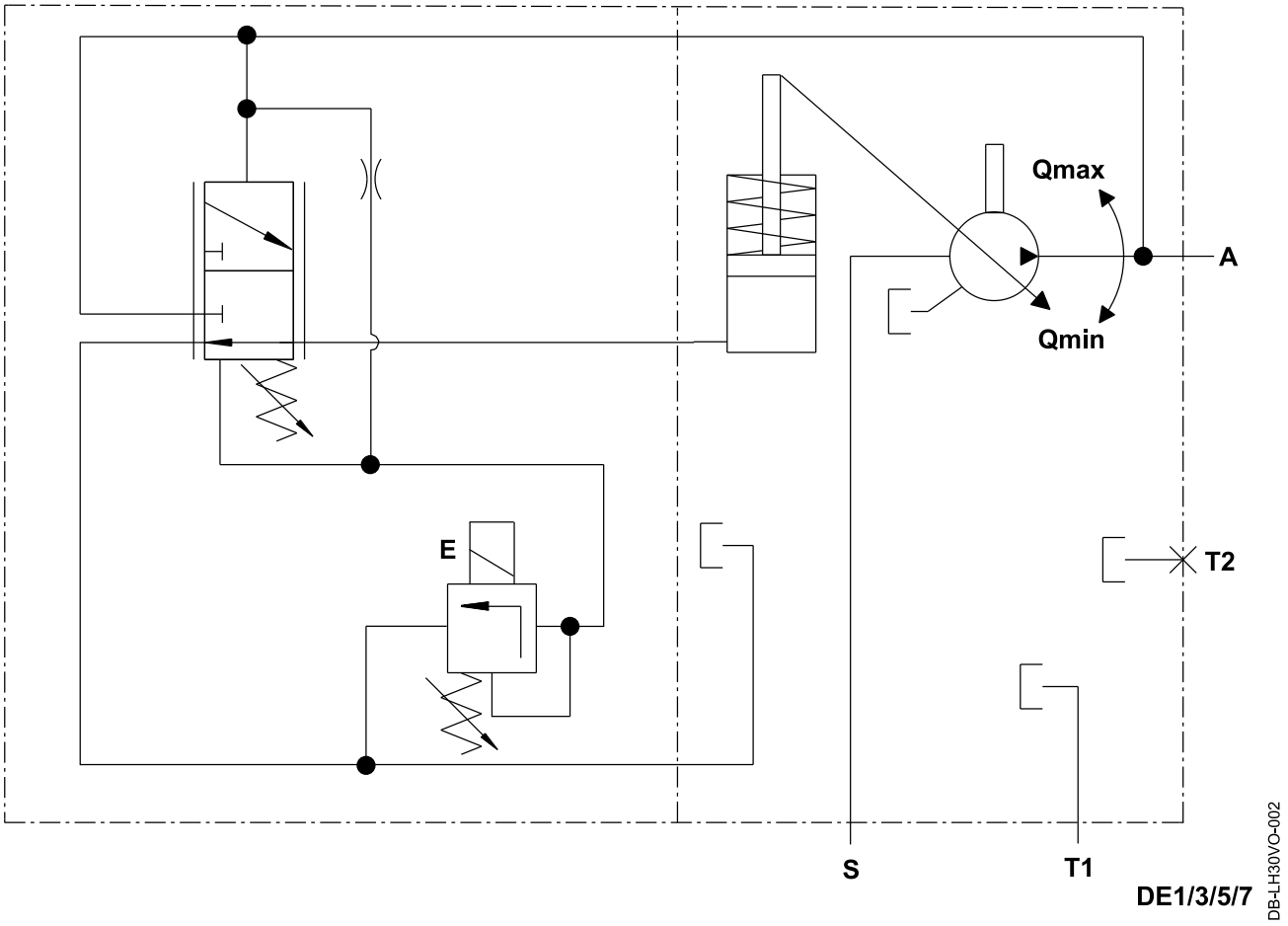
3.2.3 LS0DA- - Load Sensing + pressure cut-off



A	Working connection ISO 6162-1/-2 (SAE J518)	T1, T2	Leakage oil connections ISO 11926
S	Suction port ISO 6162-1/-2 (SAE J518)	X2	LS pressure ISO 9974-1

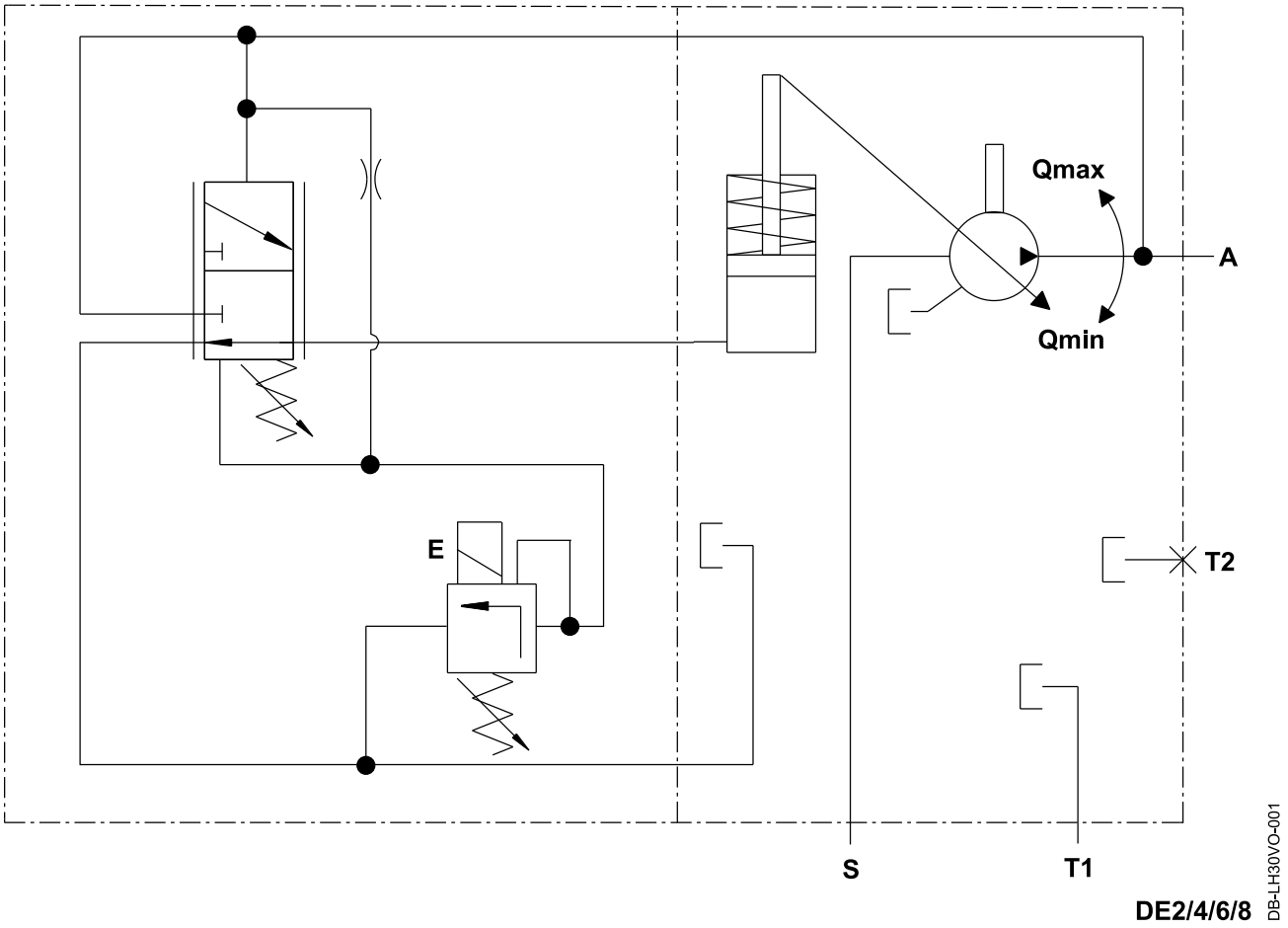
Note
The screen required for the LS function to generate the drop in pressure is not included in the scope of the axial piston unit.

3.2.4 DE_ - Electric pressure, rising characteristic (DE1/3/5/7)



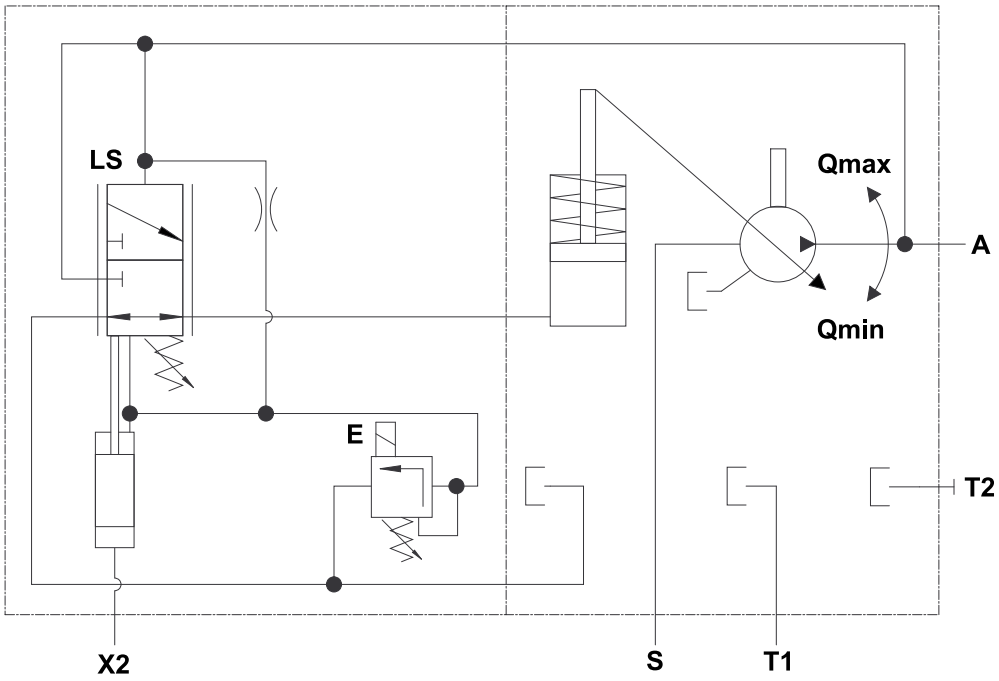
A	Working connection ISO 6162-1/-2 (SAE J518)	T1, T2	Leakage oil connections ISO 11926
S	Suction port ISO 6162-1/-2 (SAE J518)	E	_1 / _3: Deutsch plug DT04-2P 2-pin _5 / _7: AMP Junior Timer 2-pin plug

3.2.5 DE_ - Electric pressure, falling characteristic (DE2/4/6/8)



A	Working connection ISO 6162-1/-2 (SAE J518)	T1, T2	Leakage oil connections ISO 11926
S	Suction port ISO 6162-1/-2 (SAE J518)	E	_2 / _4: Deutsch plug DT04-2P 2-pin _6 / _8: AMP Junior Timer 2-pin plug

3.2.6 LS0DE_ - Load sensing + electric pressure, rising characteristic (LS0DE1/3/5/7)

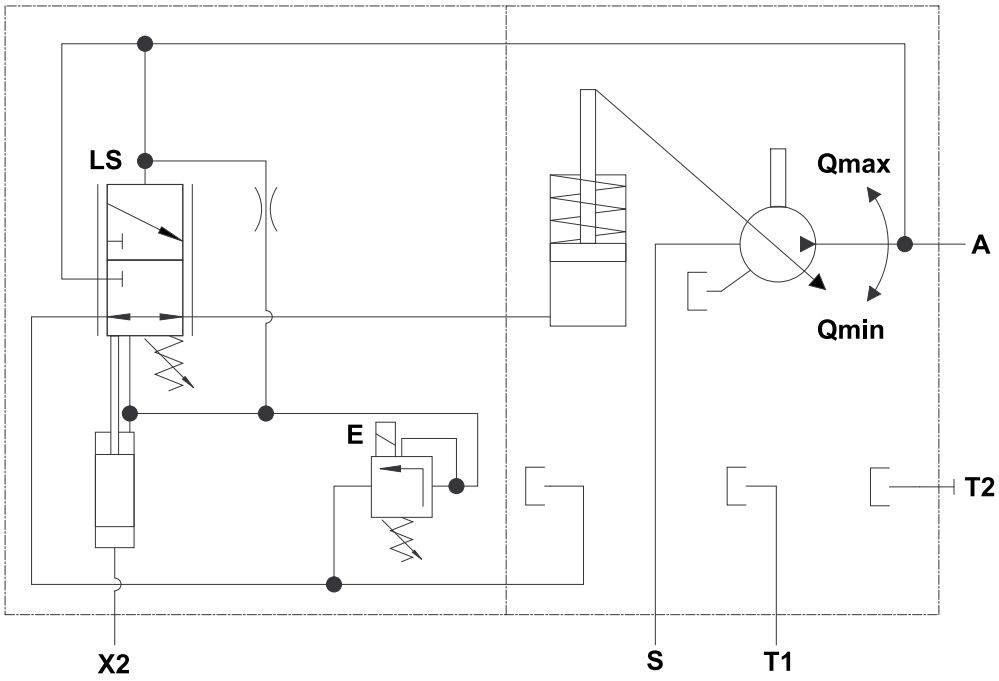


LS0DE1/3/5/7

DB-LH30VO-061

A	Working connection ISO 6162-1/-2 (SAE J518)	T1, T2	Leakage oil connections ISO 11926
S	Suction port ISO 6162-1/-2 (SAE J518)	X2	LS pressure ISO 9974-1
E	1 / _3: Deutsch plug DT04-2P 2-pin _5 / _7: AMP Junior Timer 2-pin plug	-	-

3.2.7 LS0DE_ - Load sensing + electric pressure, falling characteristic (LS0DE2/4/6/8)

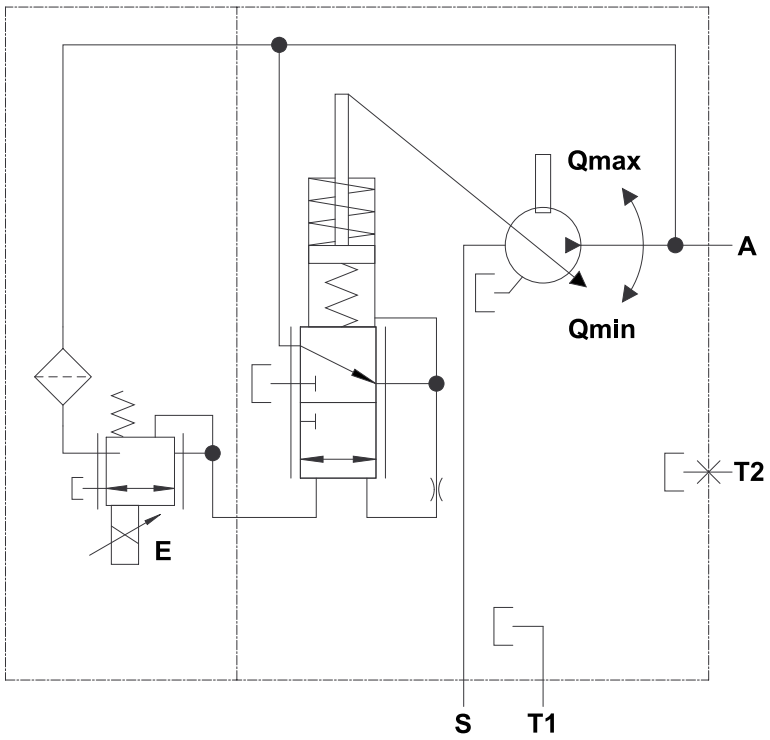


LS0DE2/4/6/8

DB-LH30VO-060

A	Working connection ISO 6162-1/-2 (SAE J518)	T1, T2	Leakage oil connections ISO 11926
S	Suction port ISO 6162-1/-2 (SAE J518)	X2	LS pressure ISO 9974-1
E	_2 / _4: Deutsch plug DT04-2P 2-pin _6 / _8: AMP Junior Timer 2-pin plug	-	-

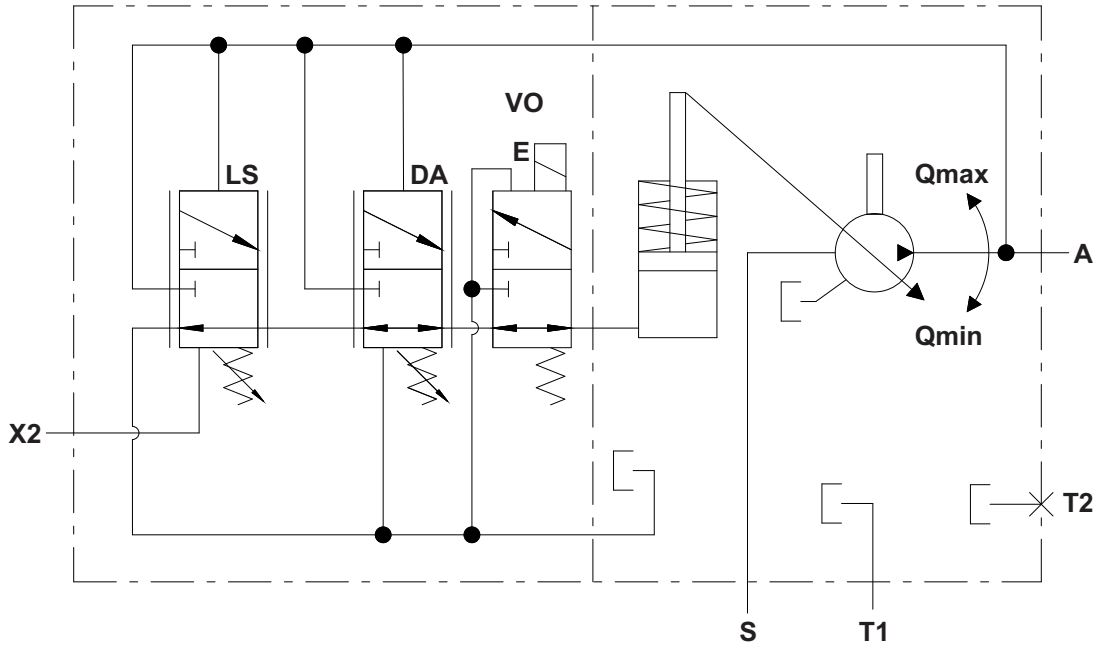
3.2.8 VE_ - Volume electric, rising characteristic (VE1/3/5/7)



VE1/3/5/7 DB-LH30VO-058

A	Working connection ISO 6162-1/-2 (SAE J518)	T1, T2	Leakage oil connections ISO 11926
S	Suction port ISO 6162-1/-2 (SAE J518)	E	_1 / _3: Deutsch plug DT04-2P 2-pin _5 / _7: AMP Junior Timer 2-pin plug

3.2.9 VO_ - Retarder (VO1/3/5/7)



VO1/3/5/7

DB-LH30VO-141

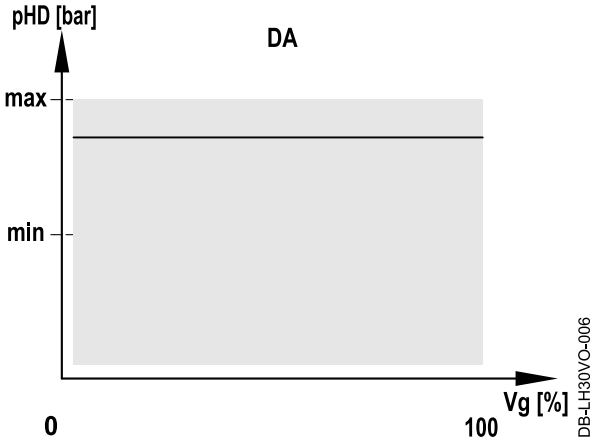
A	Working connection ISO 6162-1/-2 (SAE J518)	X2	LS pressure ISO 9974-1
S	Suction port ISO 6162-1/-2 (SAE J518)	T1, T2	Leakage oil connections ISO 11926
E	_1 / _3: Deutsch plug DT04-2P 2-pin _5 / _7: AMP Junior Timer 2-pin plug	-	-

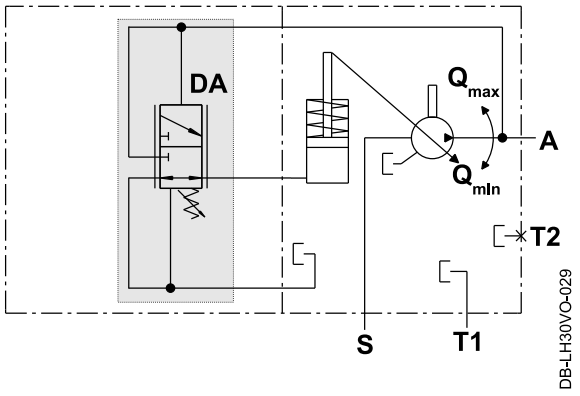
3.3 Regulator functions

- DA- function/pressure cut-off, see chapter 3.3.1
- DF- function/hydraulic pressure regulation, remote-controllable, see chapter 3.3.2
- LS0- function/Load-Sensing without vent nozzle in regulator, see chapter 3.3.3
- LR- function, performance regulator, see chapter 3.3.4
- DE1/3/5/7- function/pressure regulation, rising characteristic, see chapter 3.3.5
- DE2/4/6/8- function/pressure regulation, falling characteristic, see chapter 3.3.6
- VE1/3/5/7- function, rising characteristic, see chapter 3.3.7
- VK1/3/5/7- function, rising characteristic, see chapter 3.3.8
- VO1/3/5/7- function, retarder, see chapter 3.3.9

3.3.1 DA- function

Characteristic





Additional technical data

DA setting range	150-280 bar*

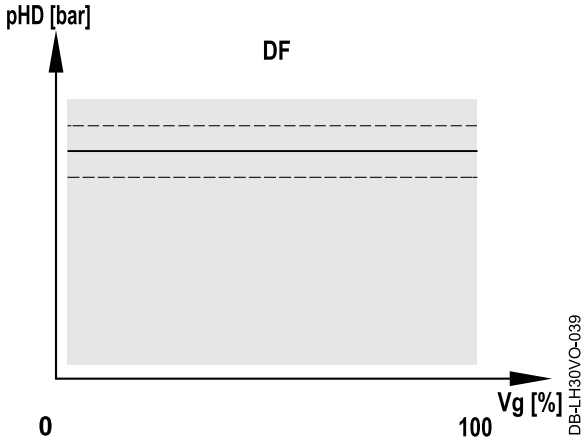
*) depending on requirement

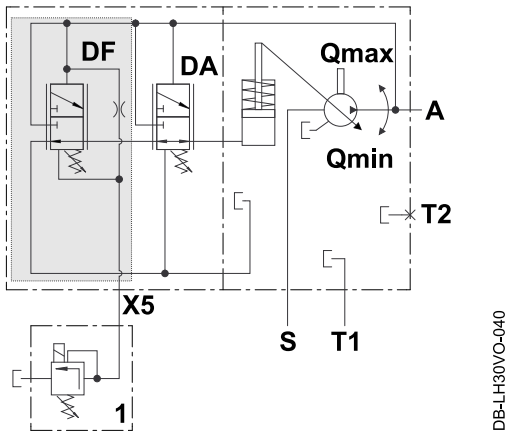
The DA pressure regulator limits the maximum high pressure of the axial piston unit in the regulator range. When a set high pressure value pHD is reached, the axial piston unit swivels in direction $V_{g\ min}$ and the hydraulic system is protected against damage and overloading. It continues to swivel 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 to $V_{g\ max}$.

3.3.2 DF- function

Characteristic





Additional technical data

Δp setting range	14-25 bar*

*) depending on requirement

The DF function can be ordered only in combination with the DA function for safety reasons.

The remote control can be used to limit the system pressure through an external pressure limiting valve* Pos. 1. The DF pressure regulator provides a fixed set pressure difference Δp.

As the total of the set pressure value of the external pressure limiting valve and Δp of the DF pressure regulator, any system pressure below the fixed set DA cut-off pressure can be set. More information: see chapter 3.3.1.

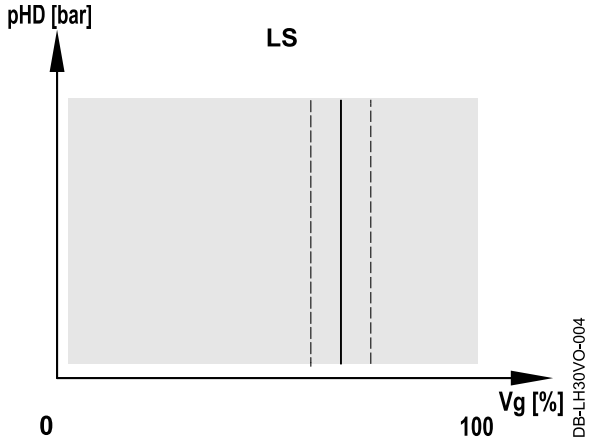
If the X5 port is relieved towards the tank, the pump operates in “stand-by” mode. This mode is suitable for the starting up the axial piston unit from the idle state.

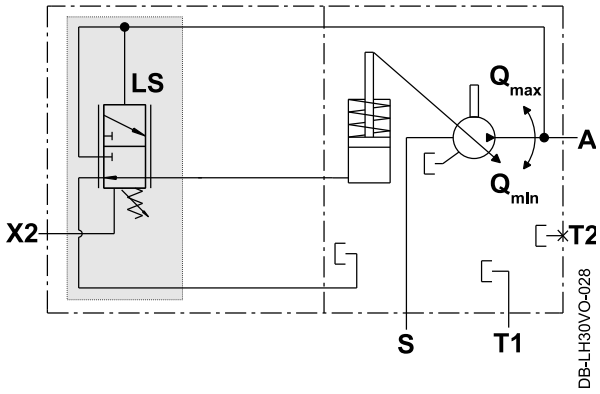
*) not included in the scope of delivery

Note
The DF function can be ordered only in combination with the pressure cut-off (DA-).

3.3.3 LS0- function

Characteristic





Additional technical data

LS pressure setting range	Δp	14-25 bar*

*) depending on requirement

The dynamic characteristics of the control system of variable axial piston pumps can be further improved by load sensing systems, such as the LS0DA regulator. The LS0 function is designed as a so-called load pressure reporting system that adapts the volume flow to the current requirements of one or more consumers. It reduces loss of performance compared to regulator functions that convey at maximum volume with lower required volume flow.

The pressure differential Δp between the highest LS pressure in the system (controlled via shuttle valves for multiple consumers) and the high pressure pHD is compared at an external adjustable measuring orifice and kept in balance by the pressure compensator (LS axis), which adjust to the demand from the consumers. The LS pressure depends on the spring force and can therefore be adjusted.

If there is no demand from consumers, the axial piston unit adjusts in direction $V_{g\ min,}$ until the value is equal to the set LS pressure.

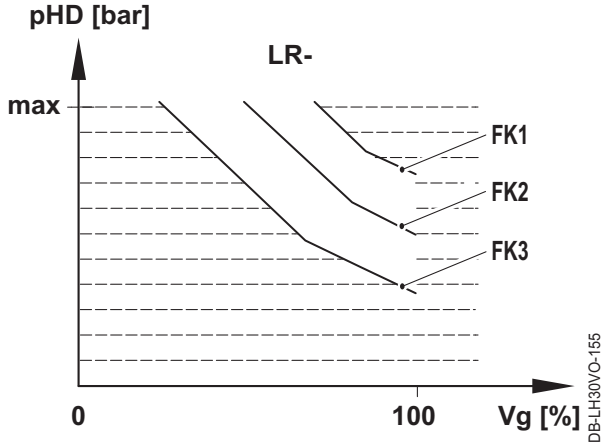
If the demand from consumers increases (rising Δp at the orifice), the axial piston unit adjusts in direction $V_{g\ max,}$ until the working pressure pHD is equal to the sum of the demand-dependent LS pressure + Δp.

Note
The LS function can be ordered only in combination with the pressure cut-off (DA-) or electrical pressure regulation DE_.

3.3.4 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



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

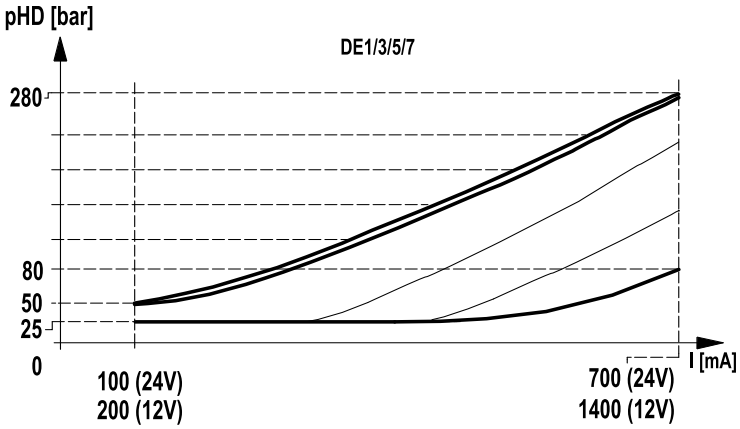
Below the spring characteristic (FK1 to FK3), the weighing spring presses the axial piston unit to the maximum swivel angle, $V_{g\,max}$. At increasing operating pressure pHD, the axial piston unit swivels back when the value of the start of regulation is reached, direction $V_{g\,min}$.

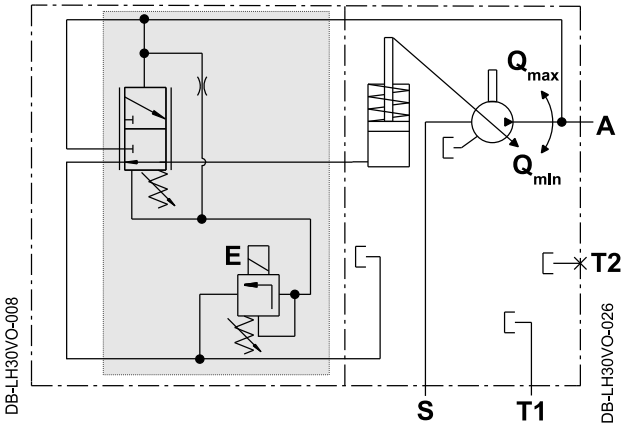
Note
Liebherr recommends combining the LR function with a pressure regulator.

FK1, FK2 and FK3 are currently available spring characteristics that are specially designed for different applications and are preset on installation. To select the appropriate spring characteristic, the desired start of regulation must be specified in pHD [bar] at maximum swing angle in the free text when ordering.

3.3.5 DE- function, rising characteristic (DE1/3/5/7)

Characteristic





Additional technical data

Resulting regulating start	max	50 bar
	min	25 bar
Setting range of regulating end	max	280 bar
	min	80 bar
Standby pressure pStbyD* at Δp = 20 bar		25-50 bar

Note
Technical data of proportional magnet, see chapter 3.4.

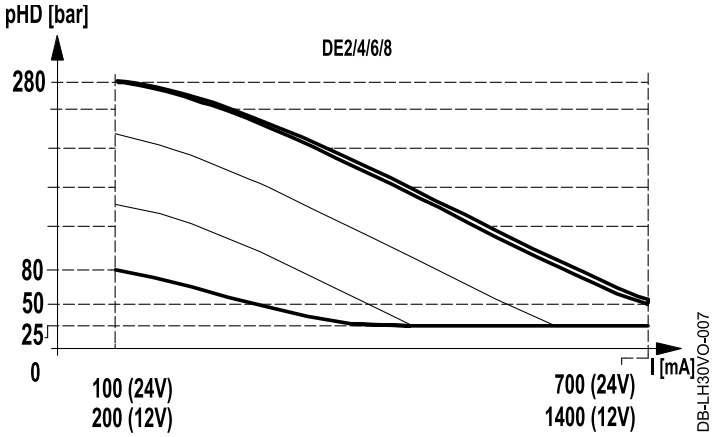
The DE function is an electronic pressure regulator, the pressure level for which can be set infinitely variably by a specified, variable magnet current at the proportional magnet.

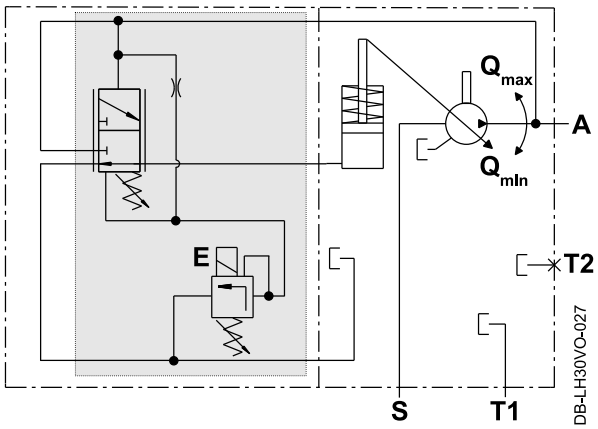
The pump is kept at $V_{g\ max}$ by a spring. The high pressure is passed to a proportional pressure limiting valve via a pressure compensator. When the opening pressure is reached, the pressure limiting valve of the pump switches and the high pressure swivels the pump in direction $V_{g\ min}$, until the pressure in the system is once again below the set value for the proportional pressure limiting valve.

When the magnet current at the proportional magnet is reduced, the axial piston unit swings in the direction $V_{g\ min}$; if it disappears completely, the unit settles at the standby pressure (pStby).

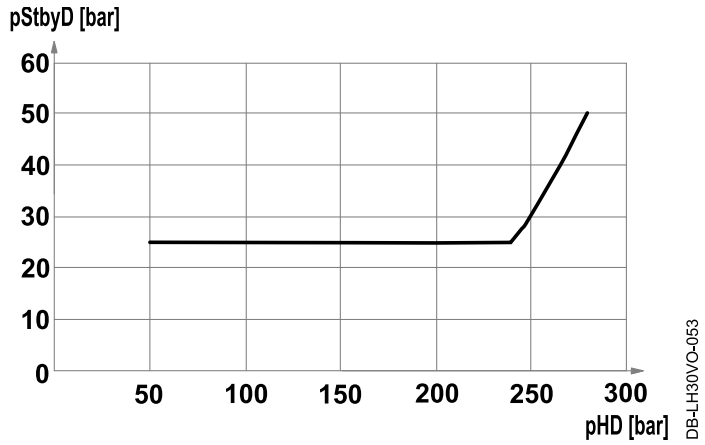
3.3.6 DE- function, falling characteristic (DE2/4/6/8)

Characteristic





Standby pressure vs. high pressure (at I_{max})



Additional technical data

Regulating start setting range	max	280 bar
	min	80 bar
Resulting regulating end	max	50 bar
	min	25 bar
Standby pressure pStbyD* at Δp = 20 bar		25-50 bar

*) see diagram

Note
Technical data of proportional magnet, see chapter 3.4.

The DE function is an electronic pressure regulator, the pressure level for which can be set infinitely variably by a specified, variable magnet current at the proportional magnet.

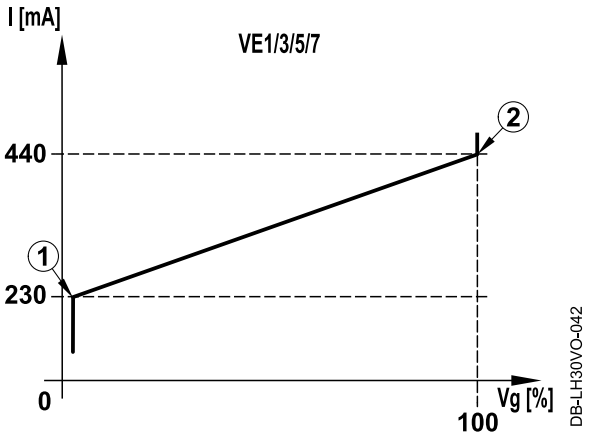
The pump is kept at $V_{g\ max}$ by a spring. The high pressure is passed to a proportional pressure limiting valve via a pressure compensator (to a pressure limiting valve). When the opening pressure is reached, the pressure limiting valve of the pump switches and the high pressure swivels the pump in direction $V_{g\ min}$, until the pressure in the system is once again below the set value for the proportional pressure limiting valve.

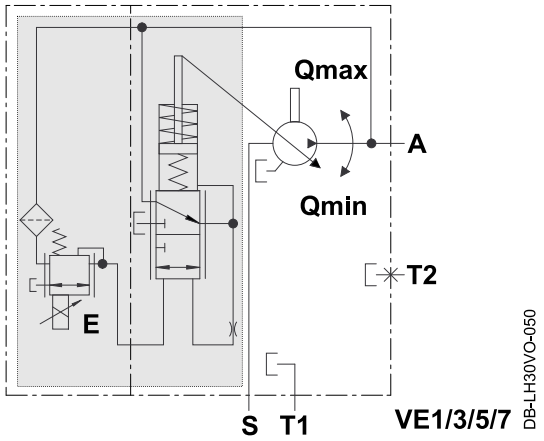
When used for, e.g. fan drives, the axial piston unit swivels to $V_{g\ max}$ if the magnetic current at the proportional magnet is not present or is incorrect.

When the magnet current at the proportional magnet is increased to I_{max}, the axial piston unit swings in the direction $V_{g\ min}$ and settles at the standby pressure (pStby).

3.3.7 VE- function, rising characteristic

Characteristic





Additional technical data

Note
For technical data of pressure reduction valve, see chapter 3.4.3.

For the VE function, the displacement volume V_g of the axial piston unit is adjusted continuously via a proportional magnet. The VE function is designed with a positive characteristic as standard. (**VE1/3/5/7**)

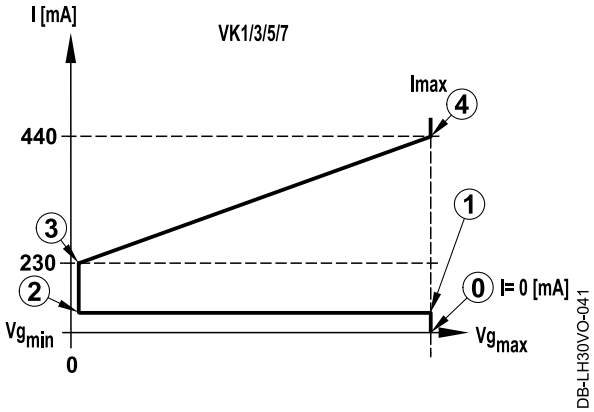
When not under pressure, the spring support pushes the axial piston unit to the maximum swivel angle $V_{g\ max}$. This ensures that pressure builds up. The LH30VO therefore does not require external auxiliary pressure.

At a pressure of > 10 bar and a control current of I < 230 mA (start of regulation 1), the axial piston unit swivels to $V_{g\ min}$ and can then be swivelled to any angle by increasing control current I (> 230 mA, start of regulation 1). $V_{g\ max}$ is reached at control current I = 440 mA (end of regulation 2).

The VE function can be subordinate to a pressure cut-off (DA) function, i.e. the control current-dependent VE function only operates below the set value for the pressure cut-off until end of regulation 2.

3.3.8 VK- function, rising characteristic

Characteristic



Additional technical data

Note
For technical data of pressure reduction valve, see chapter 3.4.3.

Based on the VE function (Items 2-4) with positive characteristic (VE1/3/5/7), the VE function also has a jump function, which allows the axial piston unit to swivel to $V_{g\,max}$ if the activating signal is missing or defective, e.g. on cable breakage.

The proportional magnet be constantly energized by a control current of I > 160 mA (Item 2) to maintain the regulation function.

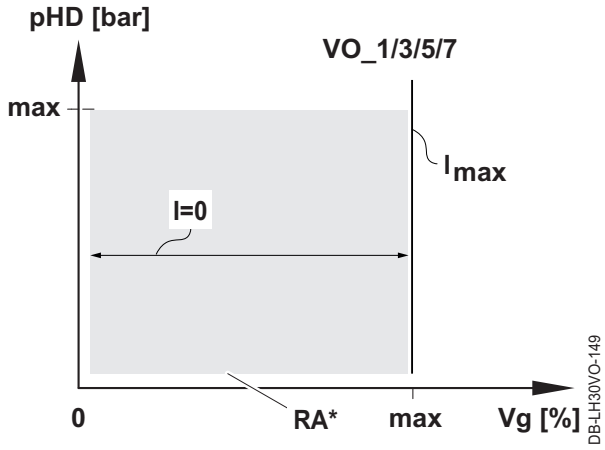
If, as a result of external interferences (activating signal is missing or defective), the control current I falls below 160 mA, the axial piston unit swivels to $V_{g\,max}$.

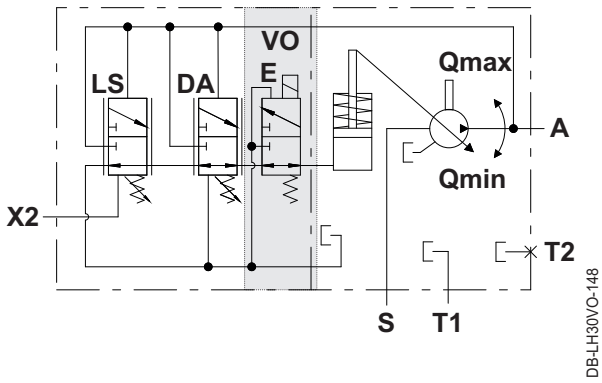
When restarting the machine or after activating the jump function (control current I < 160 mA), the proportional magnet must be energized once with a control current I_{max} = 440 mA (Item 4) so that the axial piston unit can swivel again to any angle.

3.3.9 VO- function

The functions of other regulator axes, such as LS0DA-, are overridden by the VO_ function.

Characteristic





RA*) Further regulator axes

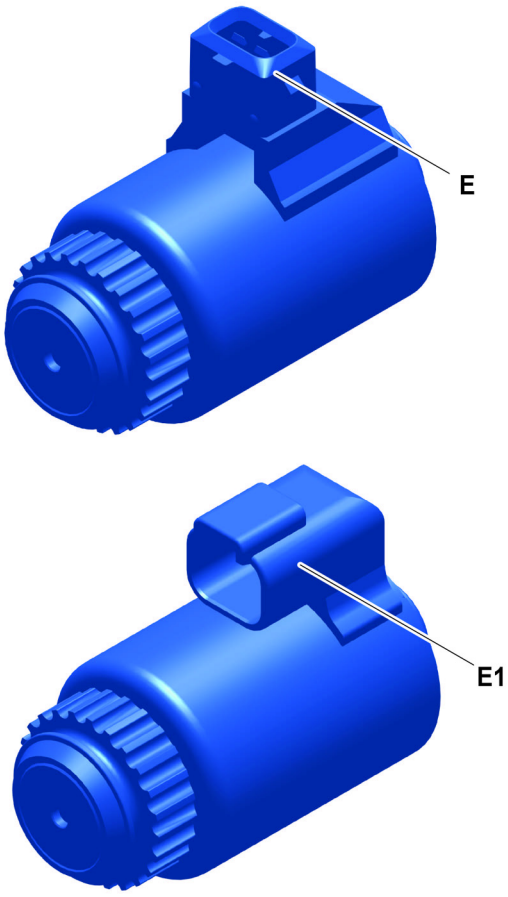
The electrically operated retarder function adjusts the axial piston unit to Vg max by energising the solenoid switch at connection E. Other retarder axes, such as LS0DA-, are thereby disabled.

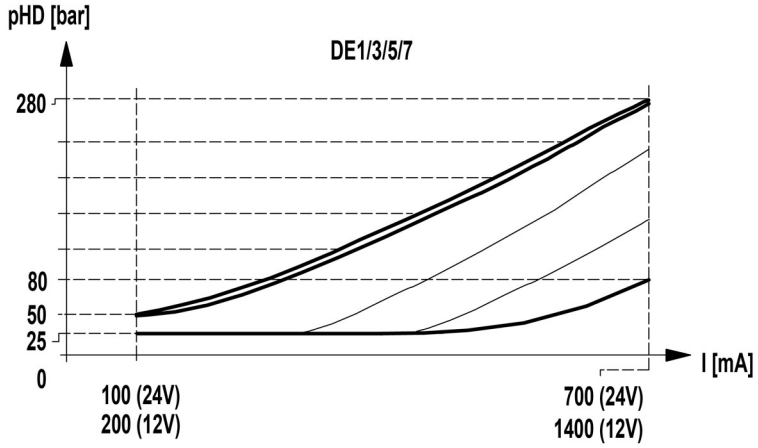
If the solenoid switch at connection E is not energised (I= 0 mA), the other regulator axes are active.

Note
The VO_ function is only available as a combined regulator with additional regulator axes, shown here with LS0DA- as an example.

3.4 Electrical components

3.4.1 DE_1/3/5/7 (proportional magnet, rising characteristic)

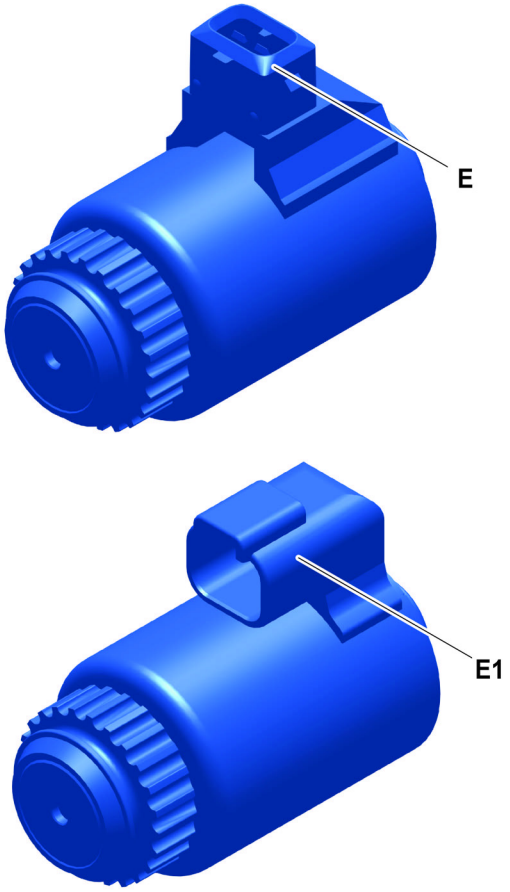


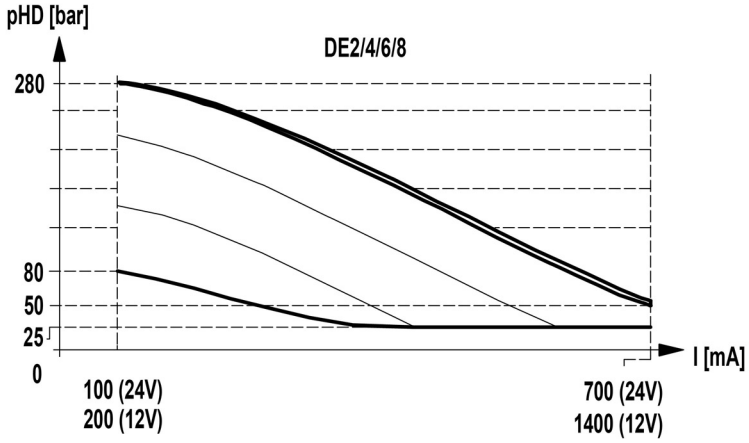


DB-LH30VO-111

Technical data of proportional magnet DE_	1/5	3/7
Connection E	AMP Junior Timer	
Connection E1	Deutsch DT04-2P	
Rated voltage U	24 V	12 V
Current $I_{max.}$	700 mA	1400 mA
Nominal resistance R	24.4 - 26.2 Ω	6.0 - 6.4 Ω
Power P	18.7 W	18.3 W
Dither frequency	100 - 200 Hz	
Minimum variation range of dither within the regulating range	240 mA	120 mA
Duty cycle	100 %	
Protection class according to DIN VDE0470 when assembled and connected	max. IP 65	
Permissible ambient temperature	-20 °C to +80 °C	

3.4.2 DE_2/4/6/8 (proportional magnet, falling characteristic)

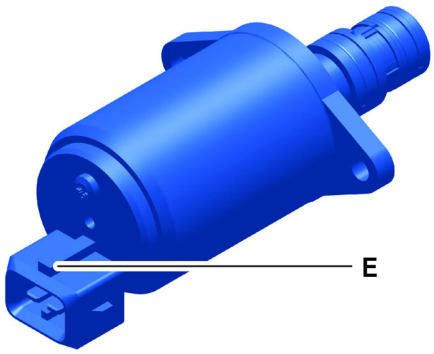


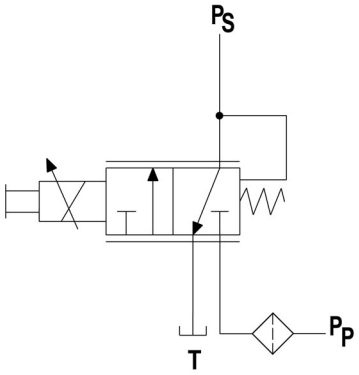


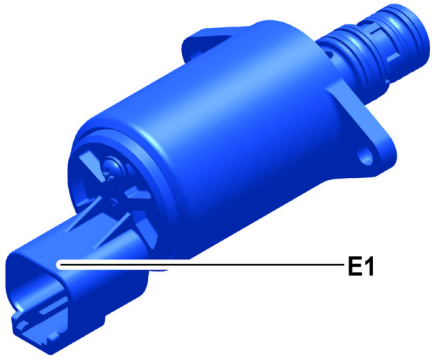
DB-LH30VO-110

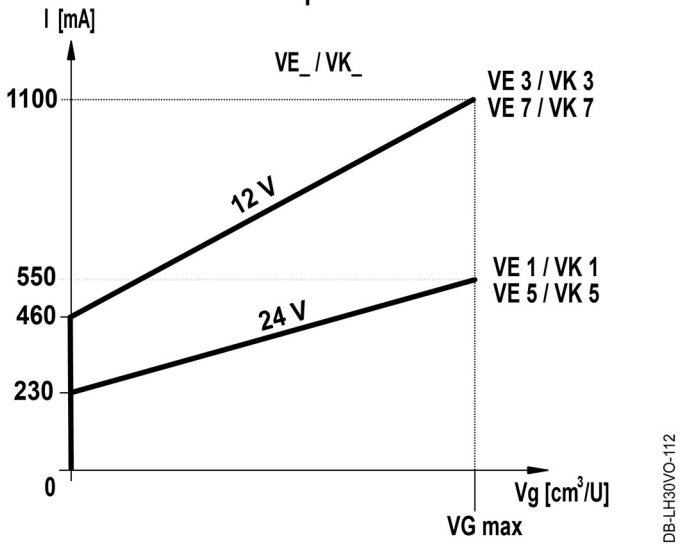
Technical data of proportional magnet DE_	2/6	4/8
Connection E	AMP Junior Timer	
Connection E1	Deutsch DT04-2P	
Rated voltage U	24 V	12 V
Current $I_{max.}$	700 mA	1400 mA
Nominal resistance R	24.4 - 26.2 Ω	6.0 - 6.4 Ω
Power P	18.7 W	18.3 W
Dither frequency	100 - 200 Hz	
Minimum variation range of dither within the regulating range	240 mA	120 mA
Duty cycle	100 %	
Protection class according to DIN VDE0470 when assembled and connected	max. IP 65	
Permissible ambient temperature	-20 °C to +80 °C	

3.4.3 VE_/ VK_1/3/5/7 (pressure reduction valve)



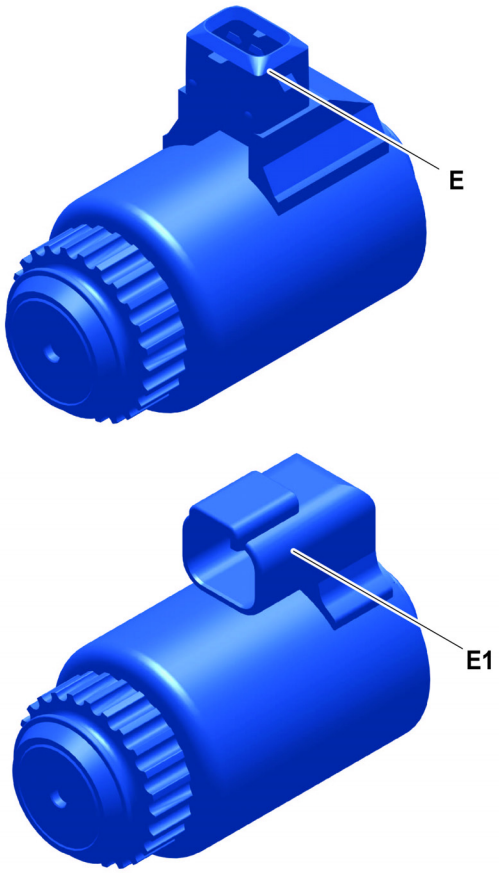






Technical data of pressure reduction valve, VE_/ VK_	1/5	3/7
Connection E	AMP Junior Timer	
Connection E1	Deutsch DT04-2P	
Rated voltage U	24 V	12 V
Current $I_{max.}$	750 mA	1500 mA
Supply pressure $p_{max.}$	350 bar	
Nominal resistance R	22.0 Ω ± 6 %	5.3 Ω ± 6 %
Dither frequency	100 - 200 Hz	
Protection class according to DIN VDE0470/EN when assembled and connected	max. IP 67	
Permissible ambient temperature	-30 °C to +90 °C	

3.4.4 VO_1/3/5/7 (solenoid switch)



DB-LH30VO-140

Technical data for solenoid switch VO_	1/5	3/7
Connection E	AMP Junior Timer	
Connection E1	Deutsch DT04-2P	
Rated voltage U	24 V	12 V
Current $I_{max.}$	700 mA	1400 mA
Nominal resistance R	24.4 - 26.2 Ω	6.0 - 6.4 Ω
Power P	18.7 W	18.3 W
Dither frequency	100 - 200 Hz	
Minimum variation range of dither within the regulating range	240 mA	120 mA
Duty cycle	100 %	
Protection class according to DIN VDE0470 when assembled and connected	max. IP 65	
Permissible ambient temperature	-20 °C to +80 °C	

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.

Liebherr distinguishes between three installation variants for axial piston units: A, B and C; as well as six installation positions: 1-6.

Note
Liebherr recommends:
Installation variant: Under-the-tank installation A
Installation position: 2 Horizontal driving shaft, regulator on top

ATTENTION
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)!
Damage of the hydraulic product.
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*.

*) For installation positions 3 and 4, complete filling and venting is not possible without an additional leakage oil connection. The axial piston unit must then be connected, filled and vented before final positioning in installation position 2. It can then be turned in installation position 3 or 4.

If installation position 3 and 4 are planned: Order leakage oil connection T4 as special design.
“Type code” on page 3

Note
For the over-the-tank installation B installation variant: a non-return valve must be installed in the leakage oil line.
maximum opening pressure of 0.5 bar. Emptying of the axial piston unit is prevented.

4.1.1 Leakage oil lines

Note
Lay the leakage oil lines so that they are above the level of the axial piston unit.

4.1.2 Hydraulic fluid tank

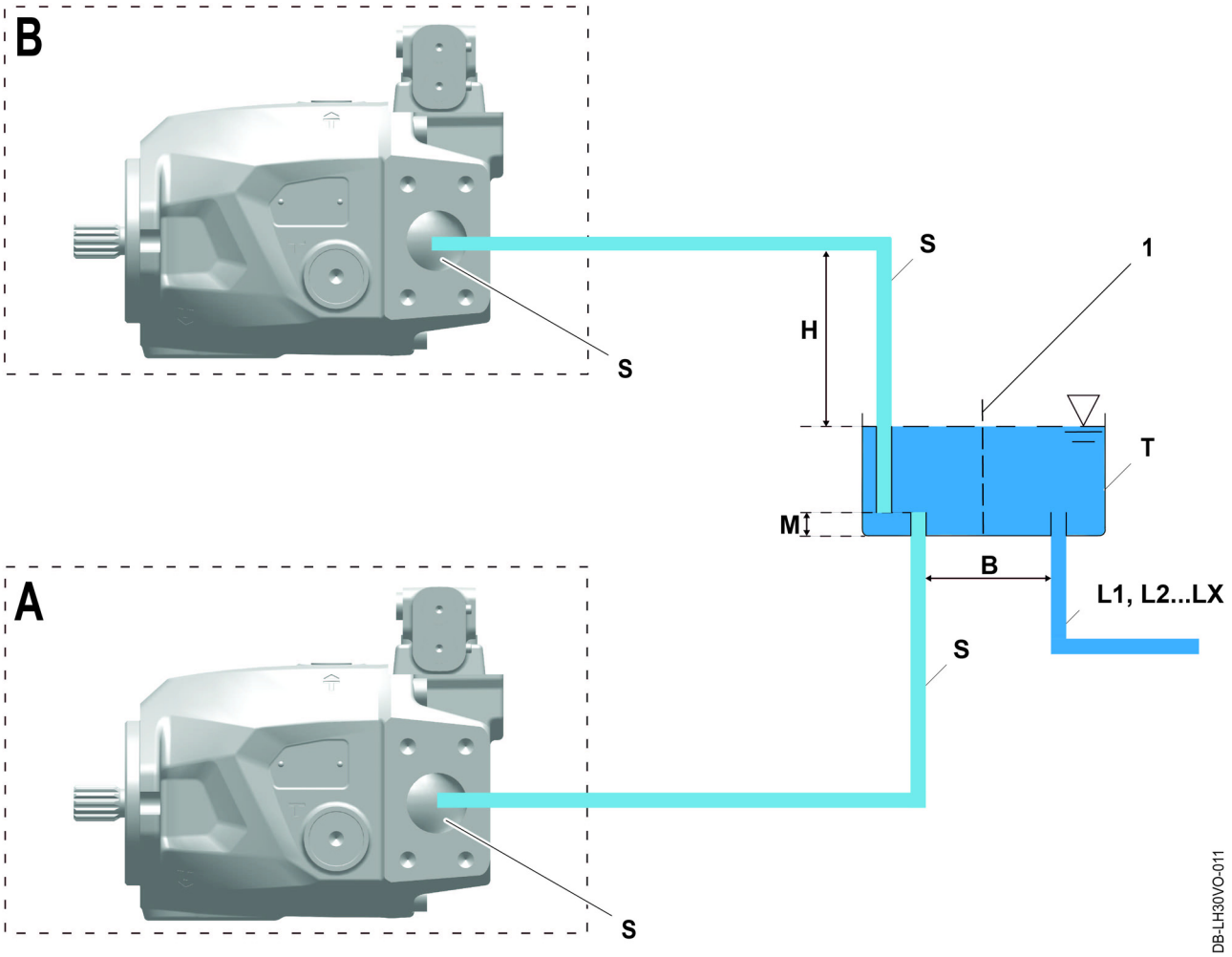
Design the hydraulic fluid tank so that the hydraulic oil cools off sufficiently during circulation and impurities that develop during operation settle to the bottom of the tank.

Prevent foaming: Make sure that the lines meet at least 200 mm below the minimum liquid level in the hydraulic fluid tank in every installation variant/position.

4.2 Installation variants

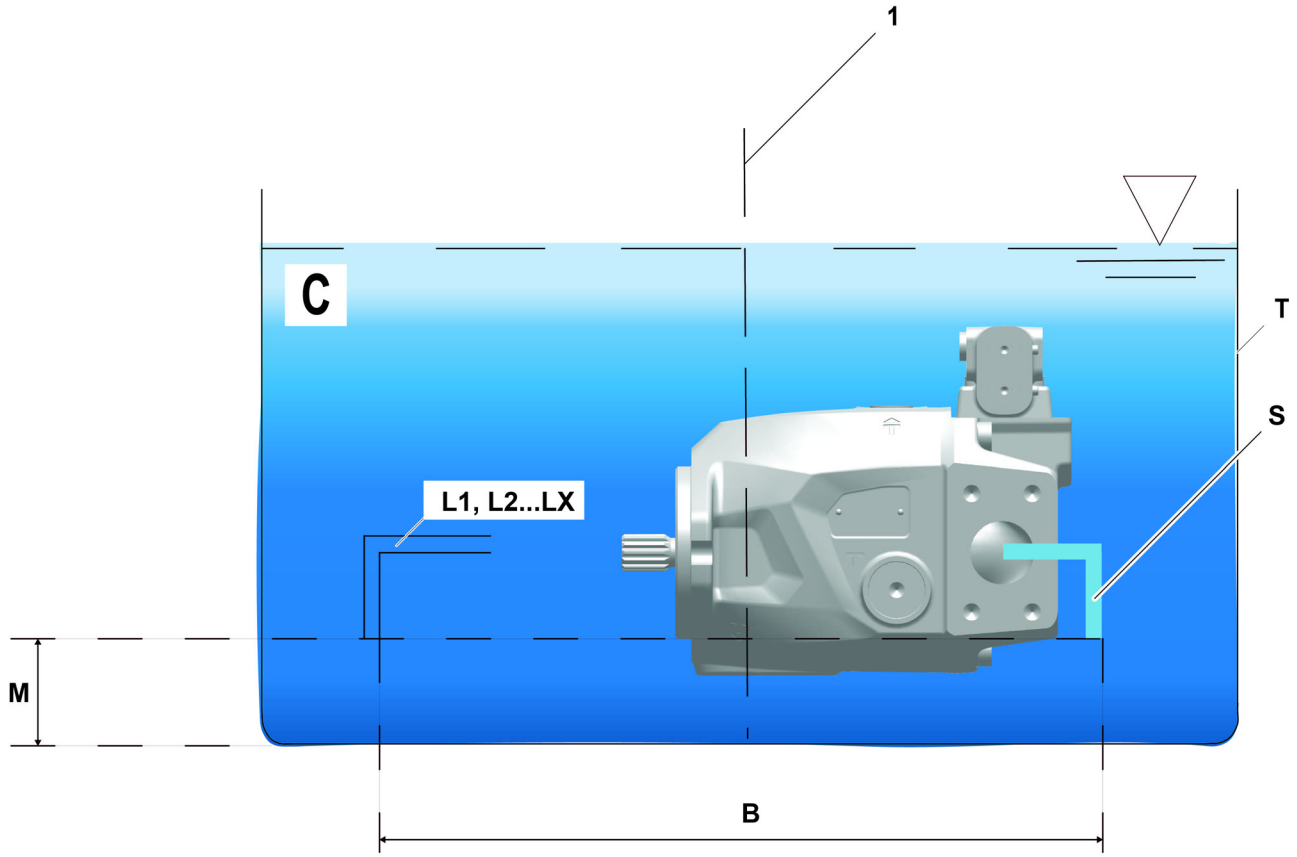
Note
Liebherr recommends: Under-the-tank installation A, so that:
- There is hydraulic fluid at suction port S when not operated.
- The housing cannot empty to the tank.

Under-the-tank installation "A": Axial piston unit is installed **under** the minimum liquid level of the tank.
Over-the-tank installation "B": Axial piston unit is installed **over** the minimum liquid level of the tank.



1	Baffle	To calm the hydraulic fluid in the tank
B	Distance	Between suction port and leakage oil connection in the tank (the larger the better)
H	Max. suction height (only for over-the-tank installation)	750 mm
L	Leakage oil connections	-
M	Minimum line end distance from tank bottom	115 mm
S	Suction line connection	-
T	Tank	-

Tank installation “C”: Axial piston unit is installed **below** the minimum liquid level **in the tank**. This tank installation variant is not permitted for axial piston units with electrical components (for example: electric proportional magnet).

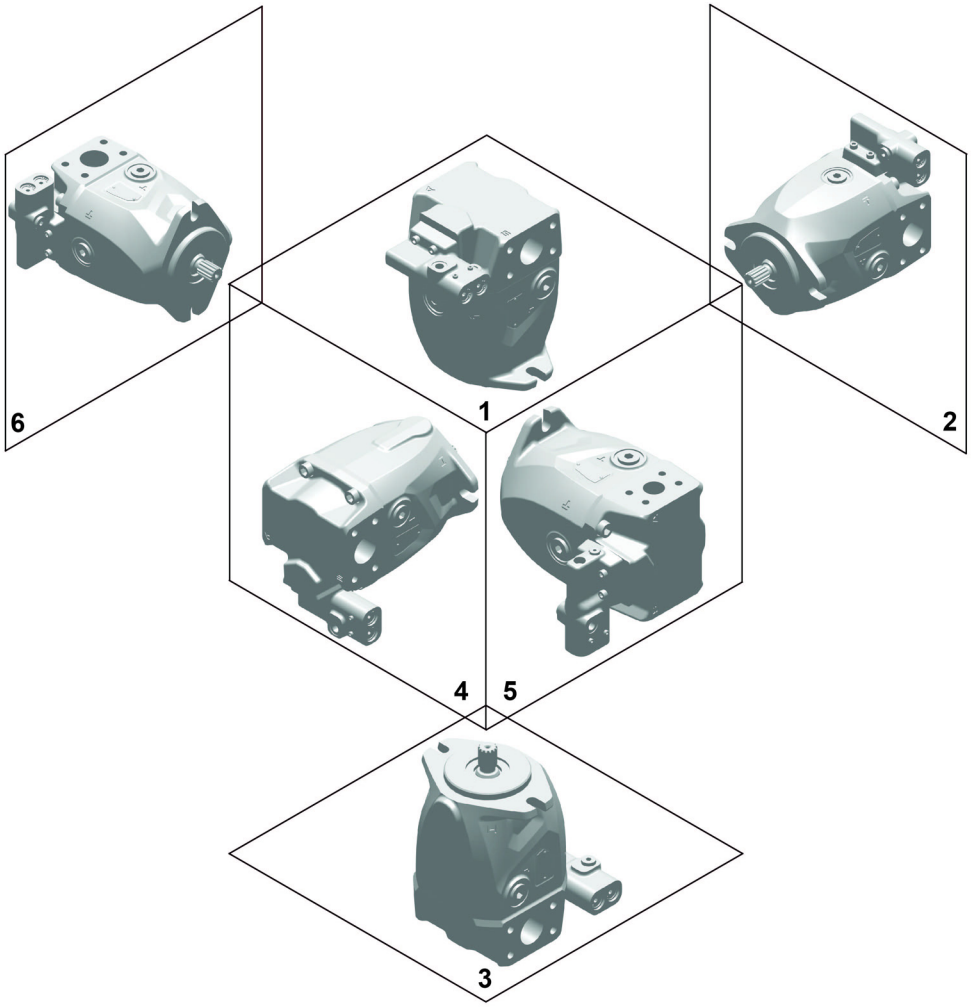


1	Baffle	To calm the hydraulic fluid in the tank
B	Distance	Between suction port and leakage oil connection in the tank (the larger the better)
L	Leakage oil connections	-
M	Minimum line end distance from tank bottom	115 mm
S	Suction line connection	-
T	Tank	-

Note
For the tank installation C installation variant, the hydraulic product must be ordered and used as a special design without primer. “Type code” on page 3

4.3 Installation locations

In each of the three installation variants, there are six possible installation locations.



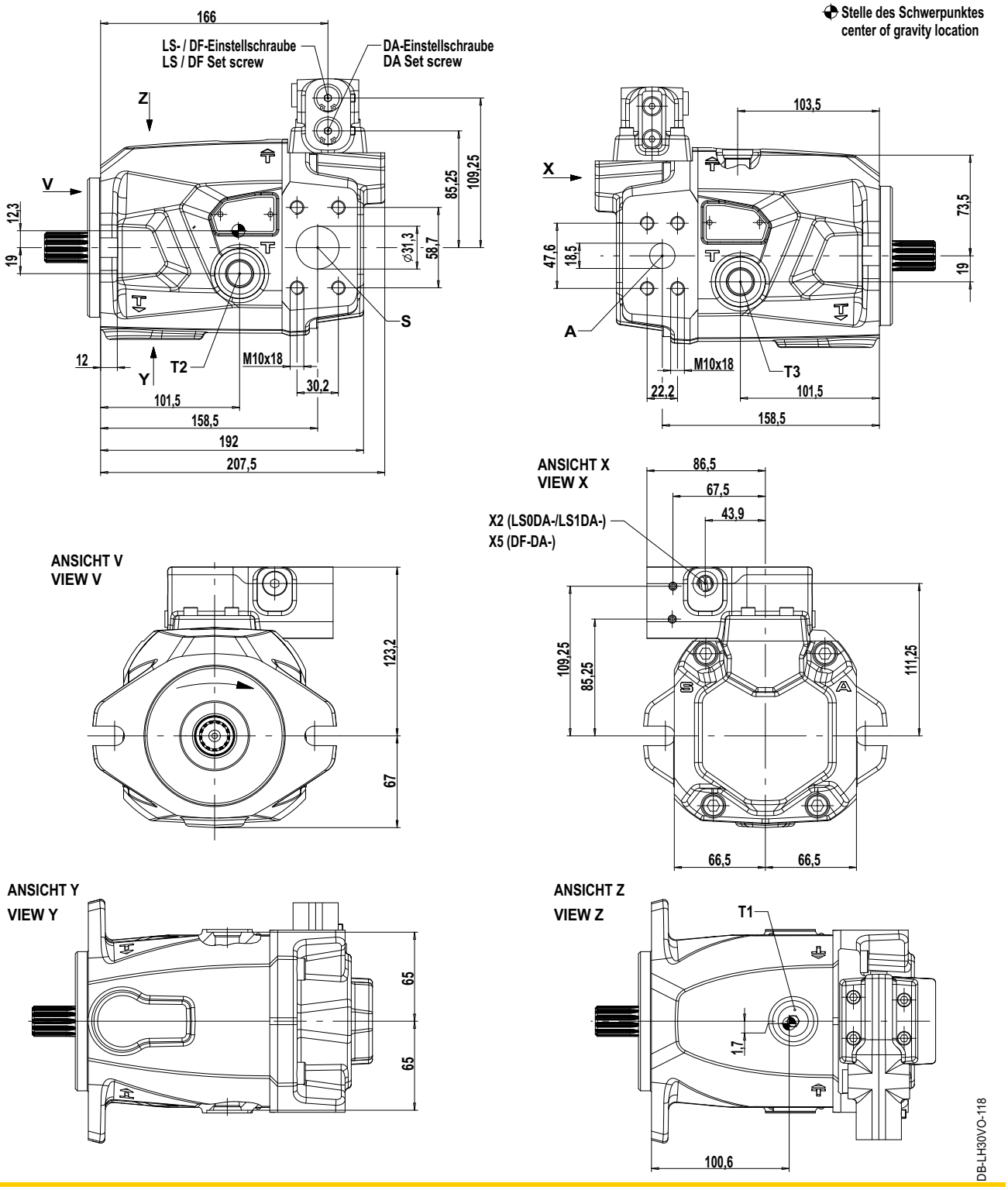
DB-LH30VO-105

Note
Installation positions 3 and 4 are critical for filling and venting. More information: see chapter 4.1.

5.1 Nominal size 028, main dimensions

5.1.1 Working connection on side, regulator type LS0DA- / LS1DA- / DF-DA-

1.	2.	3.	4.	5.	6.	7.		8	9.	10.	11.	12.	13.	14	15	16	17	18	19	20	21
L	H	3	0	V	O	028	/	LS0DA-	20	V	R	B2		B1	0	00	0000	000			



A	Working connection ISO 6162-1 (SAE J518-1) - 3/4"
S	Suction port ISO 6162-1 (SAE J518-1) - 1 1/4"
T1, T2, T3	Leakage oil connections ISO 11926 - 3/4-16 UNF-2B

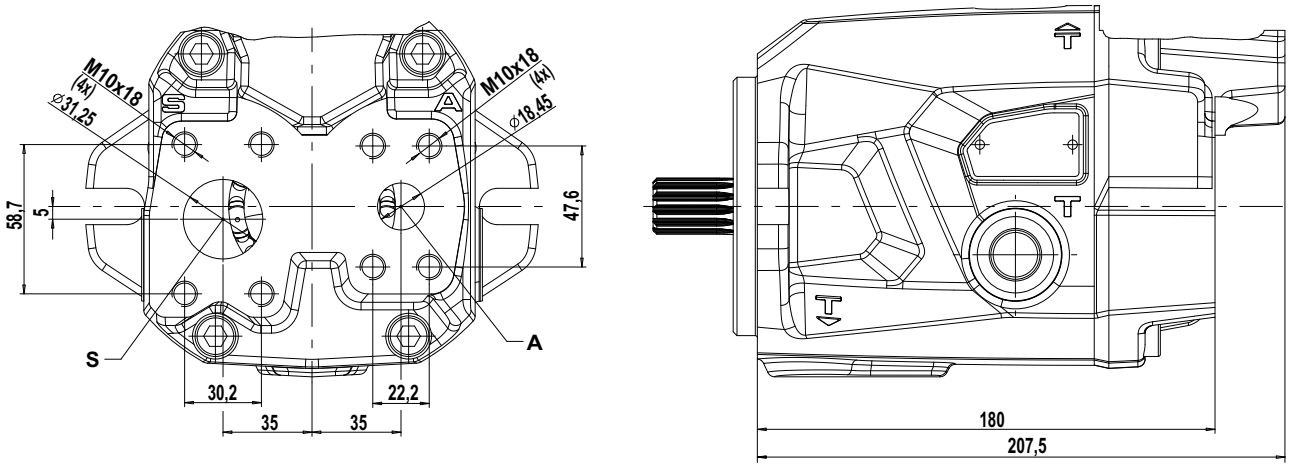
X2	LS0DA: LS pressure port ISO 9974-1-M12x1.5 LS1DA: LS pressure port ISO 9974-1-M12x1.5
X5	DF-DA-: DF control pressure connection for external DBV, ISO 9974-1-M12x1.5
-	-

Note
Anti-clockwise rotation: Terminal board and regulator arranged on other side (mirror image).

5.1.2 Nominal size 028, working connection, rear

1.	2.	3.	4.	5.	6.	7.		8	9.	10.	11.	12.	13.	14	15	16	17	18	19	20	21
L	H	3	0	V	O	028	/		20	V	R	B2		B3	0	00	0000	000			

Note
For dimensions that are not shown, see chapter 5.1.
Anti-clockwise rotation: Terminal board and regulator arranged on other side (mirror image).



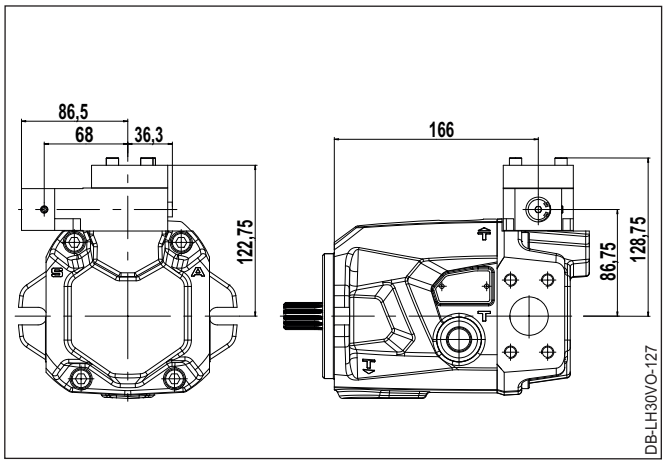
DB-LH30VO-120

5.1.3 Nominal size 028, other regulator types

1.	2.	3.	4.	5.	6.	7.		8	9.	10.	11.	12.	13.	14	15	16	17	18	19	20	21
L	H	3	0	V	O	028	/		20	V	R				0	00	0000	000			

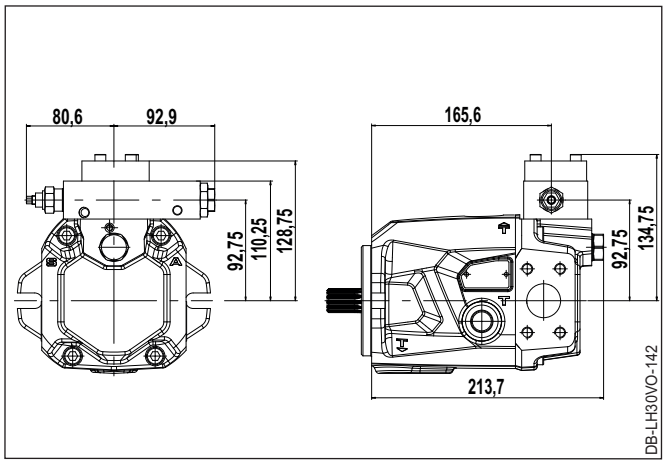
Note
For dimensions of regulator types LS0DA- / LS1DA- / DF-DA-, see chapter 5.1.
Anti-clockwise rotation: Terminal board and regulator arranged on other side (mirror image).

DA-



-	-
-	-

LR-



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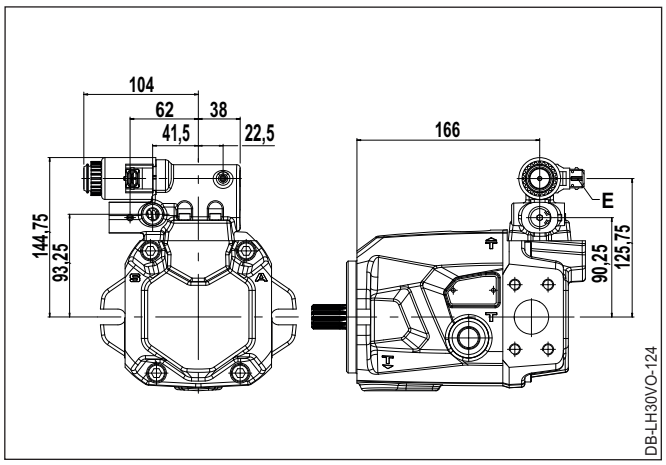
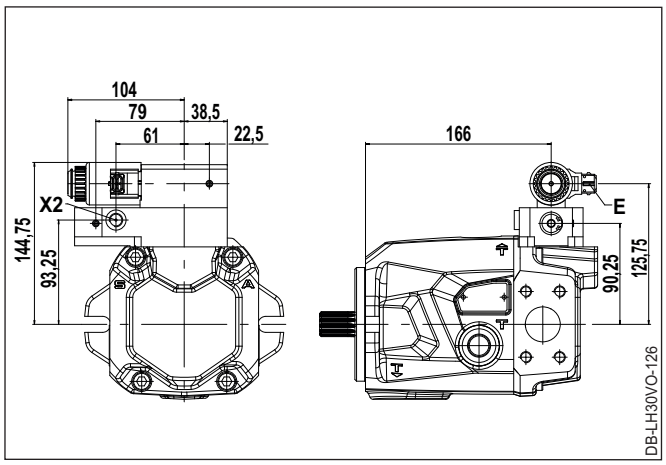
DE_



E	1/2/3/4: Deutsch plug DT04-2P 2-pin 5/6/7/8: AMP Junior Timer 2-pin plug
-	-

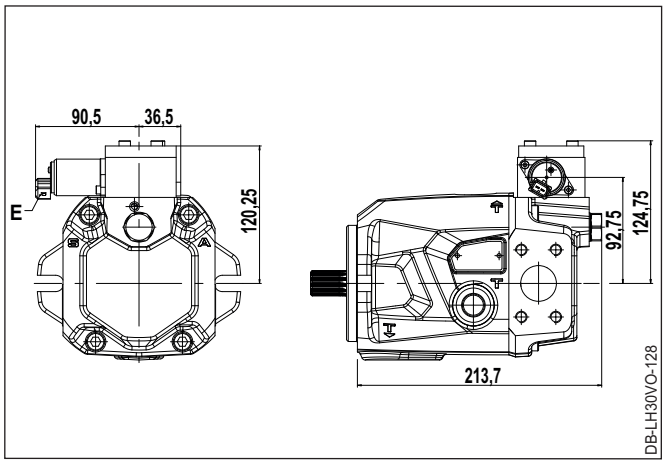
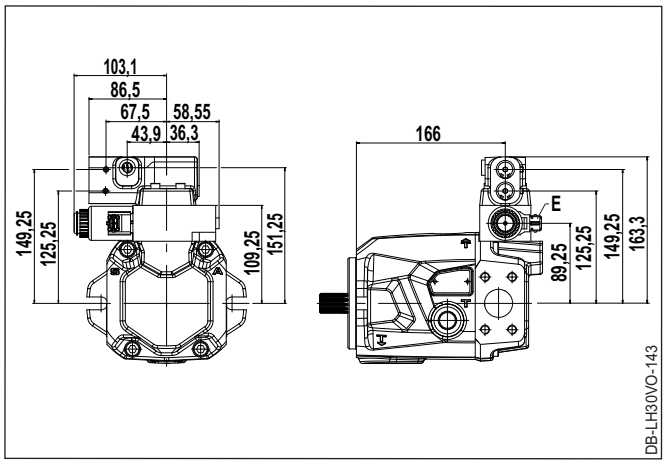
LS0DE_ / LS1DE_



E	1/2/3/4: Deutsch plug DT04-2P 2-pin 5/6/7/8: AMP Junior Timer 2-pin plug
X2	LS0DE_: LS pressure port ISO 9974-1-M12x1.5 LS1DE_: LS pressure port ISO 9974-1-M12x1.5

5 Dimensions

Axial piston pump
LH30VO 028 to 085

VE_ / VK_	LS0DA-VO_
	

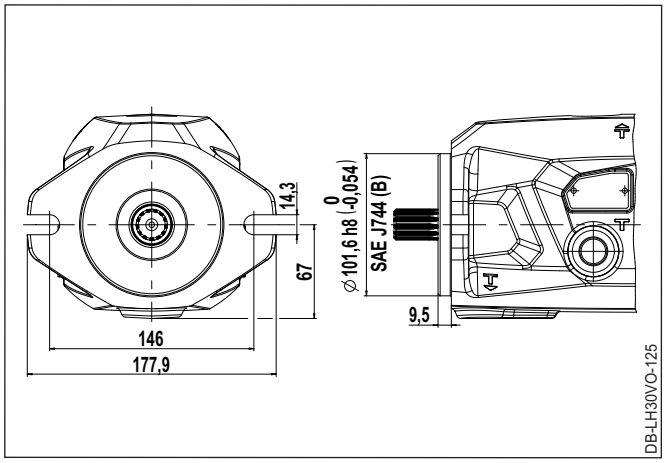
E	1/3: Deutsch plug DT04-2P 2-pin 5/7: AMP Junior Timer 2-pin plug
-	-

E	1/3: Deutsch plug DT04-2P 2-pin 5/7: AMP Junior Timer 2-pin plug
-	-

5.2 Nominal size 028, mounting flange

1.	2.	3.	4.	5.	6.	7.		8	9.	10.	11.	12.	13.	14	15	16	17	18	19	20	21
L	H	3	0	V	O	028	/		20	V		B2			0	00		000			

SAE B, (SAE J744)

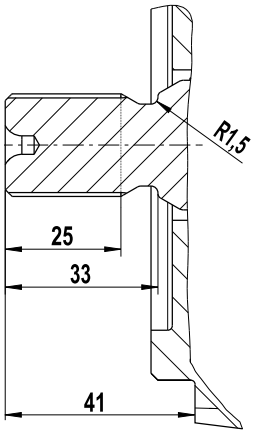


B2

5.3 Nominal size 028, shaft end

1.	2.	3.	4.	5.	6.	7.		8	9.	10.	11.	12.	13.	14	15	16	17	18	19	20	21
L	H	3	0	V	O	028	/		20	V					0	00		000			

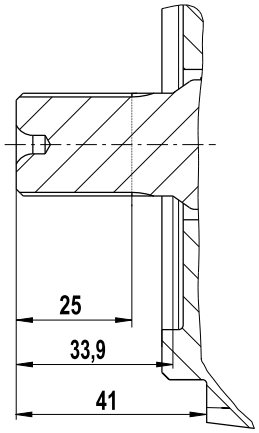
Gear shaft ANSI B92.1a-1976 7/8'' 13T, with undercutting



DB-LH30VO-072

A1

Gear shaft ANSI B92.1a-1976 7/8'' 13T, without undercutting



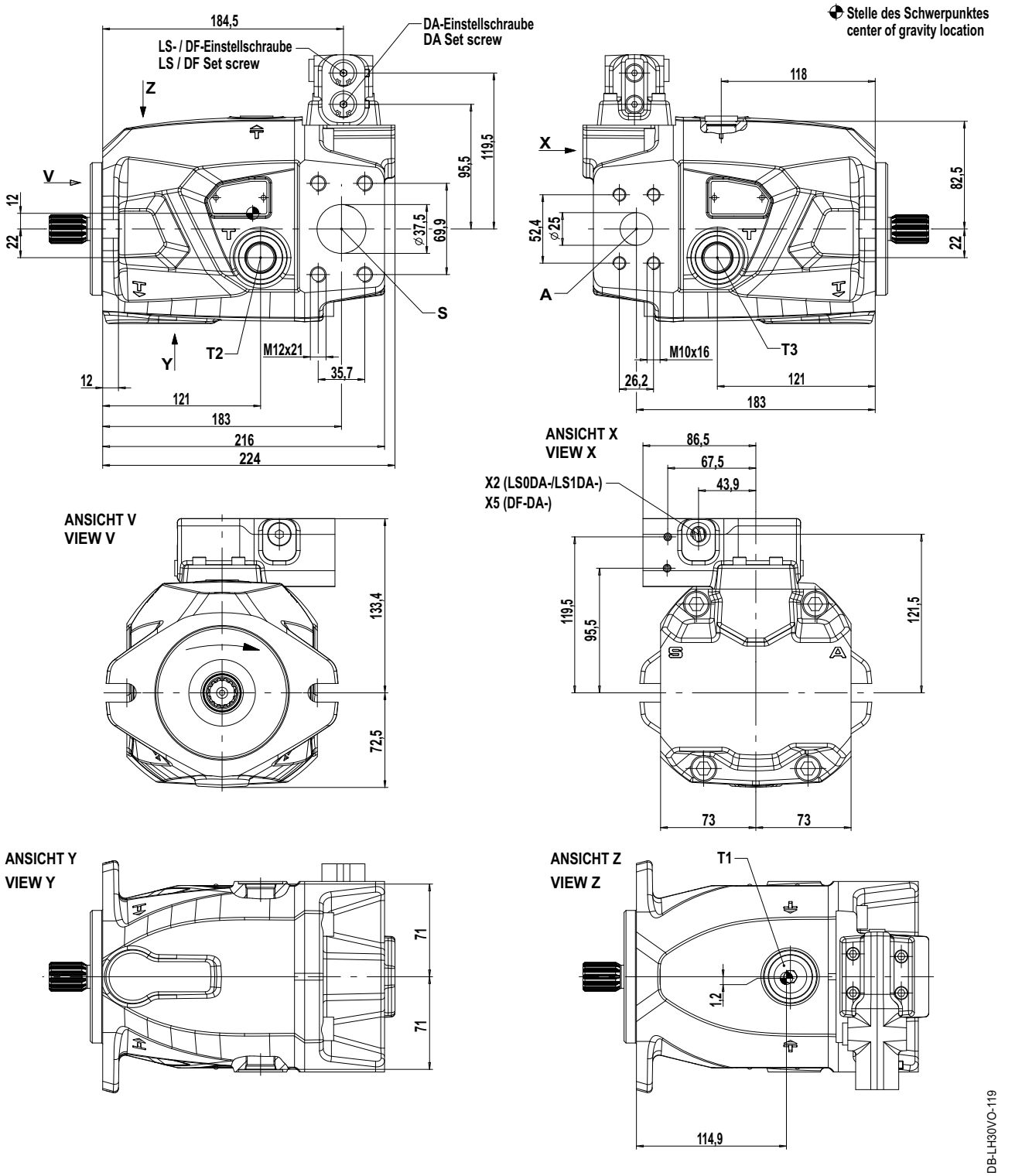
DB-LH30VO-071

A2

5.4 Nominal size 045, main dimensions

5.4.1 Working connection on side, regulator type LS0DA- / LS1DA- / DF-DA-

1.	2.	3.	4.	5.	6.	7.		8	9.	10.	11.	12.	13.	14	15	16	17	18	19	20	21
L	H	3	0	V	O	045	/	LS0DA-	20	V	R	B2		B1	0	00	0000	000			



A	Working connection ISO 6162-1/-2 (SAE J518-1/-2) - 1"
S	Suction port ISO 6162-1/-2 (SAE J518-1/-2) - 1 1/2"
T1, T2, T3	Leakage oil connections ISO 11926 - 7/8-14 UNF-2B

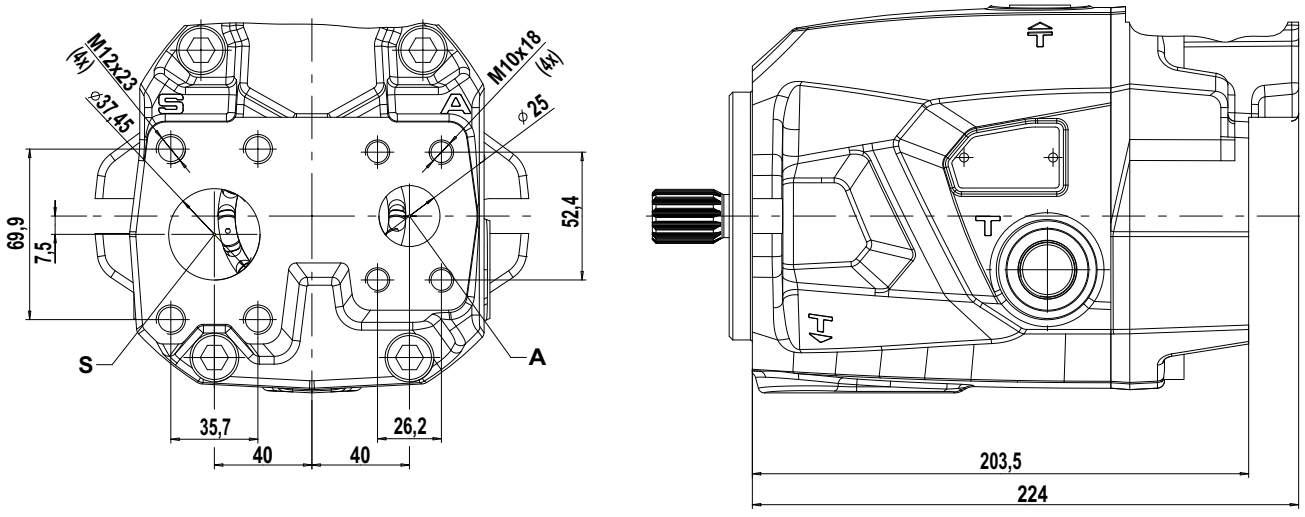
X2	LS0DA: LS pressure port ISO 9974-1-M12x1.5 LS1DA: LS pressure port ISO 9974-1-M12x1.5
X5	DF-DA-: DF control pressure connection for external DBV, ISO 9974-1-M12x1.5
-	-

Note
Anti-clockwise rotation: Terminal board and regulator arranged on other side (mirror image).

5.4.2 Nominal size 045, working connection, rear

1.	2.	3.	4.	5.	6.	7.		8	9.	10.	11.	12.	13.	14	15	16	17	18	19	20	21
L	H	3	0	V	O	045	/		20	V	R			B3	0	00	0000	000			

Note
For dimensions that are not shown, see chapter 5.1.
Anti-clockwise rotation: Terminal board and regulator arranged on other side (mirror image).



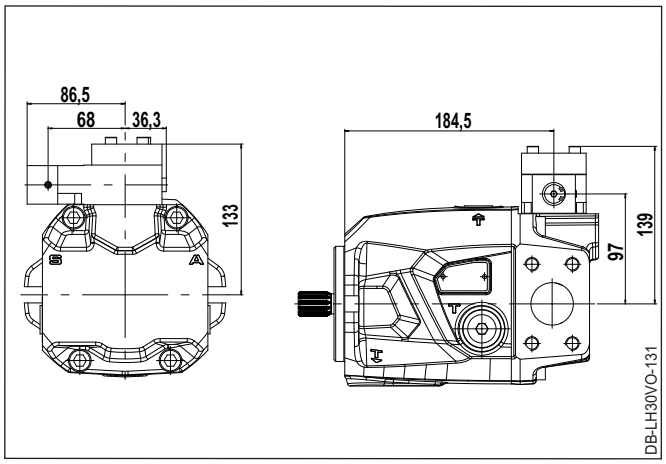
DB-LH30VO-122

5.4.3 Nominal size 045, other regulator types

1.	2.	3.	4.	5.	6.	7.		8	9.	10.	11.	12.	13.	14	15	16	17	18	19	20	21
L	H	3	0	V	O	045	/		20	V	R			B1	0	00	0000	000			

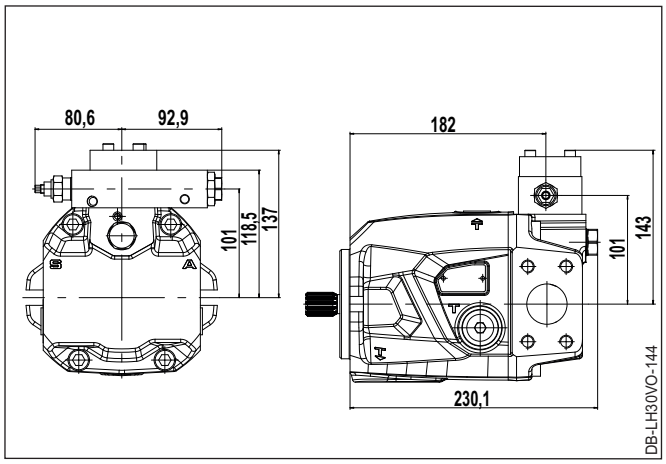
Note
For dimensions of regulator types LS0DA- / LS1DA- / DF-DA-, see chapter 5.1.
Anti-clockwise rotation: Terminal board and regulator arranged on other side (mirror image).

DA-



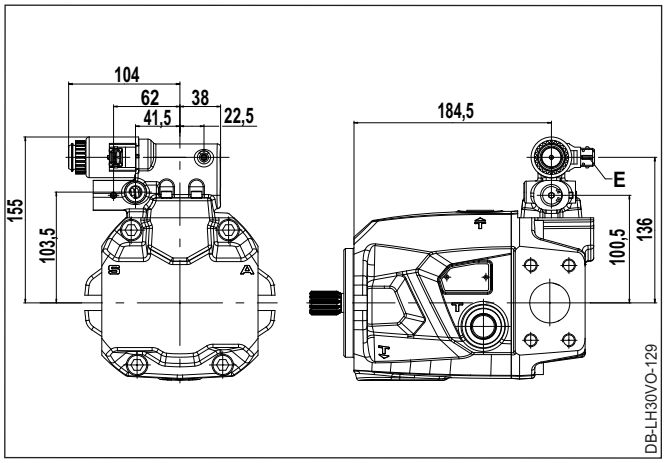
-	-
-	-

LR-



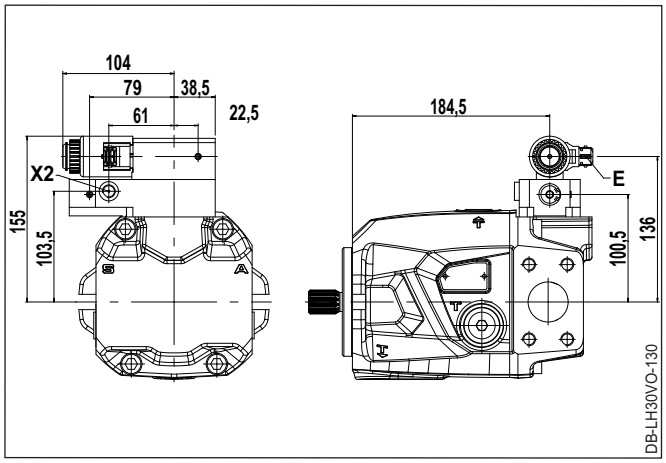
-	-
-	-

DE_



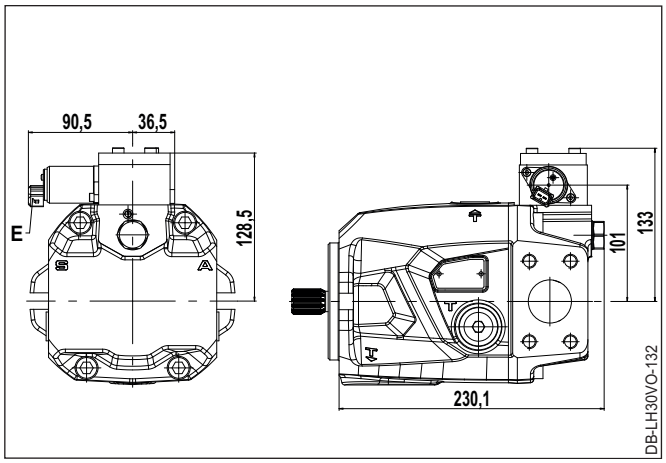
E	1/2/3/4: Deutsch plug DT04-2P 2-pin 5/6/7/8: AMP Junior Timer 2-pin plug
-	-

LS0DE_ / LS1DE_



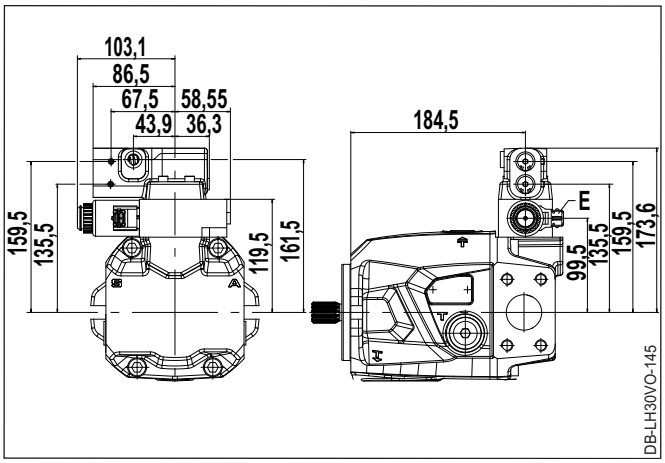
E	1/2/3/4: Deutsch plug DT04-2P 2-pin 5/6/7/8: AMP Junior Timer 2-pin plug
X2	LS0DE_: LS pressure port ISO 9974-1-M12x1.5 LS1DE_: LS pressure port ISO 9974-1-M12x1.5

VE_ / VK_



E	1/3: Deutsch plug DT04-2P 2-pin 5/7: AMP Junior Timer 2-pin plug
-	-

LS0DA-VO_

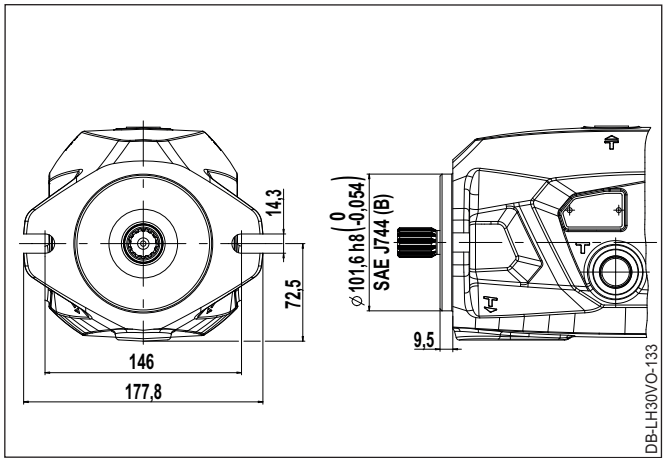


E	1/3: Deutsch plug DT04-2P 2-pin 5/7: AMP Junior Timer 2-pin plug
-	-

5.5 Nominal size 045, mounting flange

1.	2.	3.	4.	5.	6.	7.		8	9.	10.	11.	12.	13.	14	15	16	17	18	19	20	21
L	H	3	0	V	O	045	/		20	V		B2			0	00		000			

SAE B, (SAE J744)

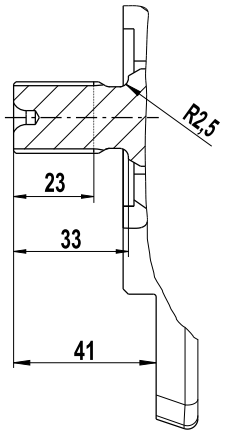


B2

5.6 Nominal size 045, shaft end

1.	2.	3.	4.	5.	6.	7.		8	9.	10.	11.	12.	13.	14	15	16	17	18	19	20	21
L	H	3	0	V	O	045	/		20	V					0	00		000			

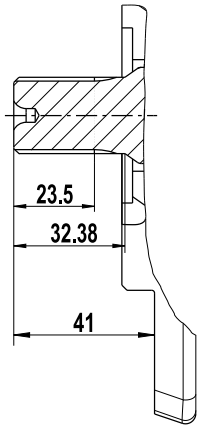
Gear shaft ANSI B92.1a-1976 7/8'' 13T, with undercutting



DB-LH30VO-073

A1

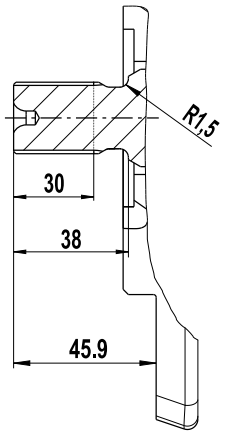
Gear shaft ANSI B92.1a-1976 7/8'' 13T, without undercutting



DB-LH30VO-074

A2

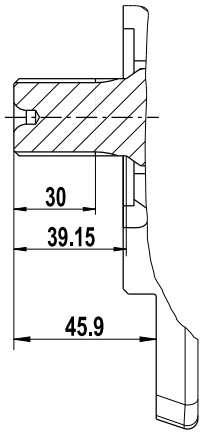
Gear shaft ANSI B92.1a-1976 1'' 15T, with undercutting



DB-LH30VO-075

A3

Gear shaft ANSI B92.1a-1976 1'' 15T, without undercutting



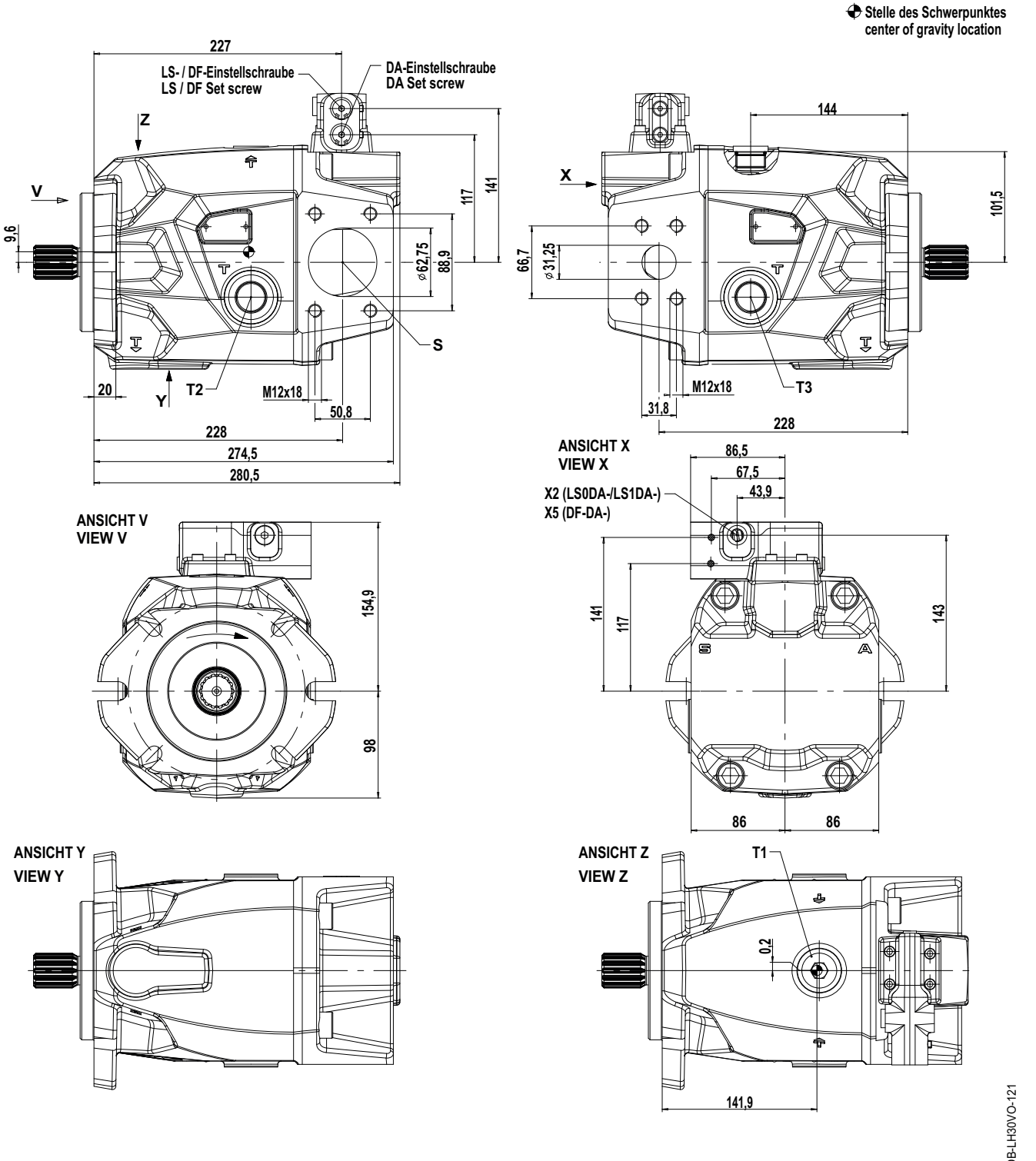
DB-LH30VO-076

A4

5.7 Nominal size 085, main dimensions

5.7.1 Working connection on side, regulator type LS0DA- / LS1DA- / DF-DA-

1.	2.	3.	4.	5.	6.	7.		8	9.	10.	11.	12.	13.	14	15	16	17	18	19	20	21
L	H	3	0	V	O	085	/	LS0DA-	20	V	R	C6		A1	0	00	0000	000			



A	Working connection ISO 6162-2 (SAE J518-2) - 1 1/4"
S	Suction port ISO 6162-2 (SAE J518-2) - 2 1/2"
T1, T2, T3	Leakage oil connections ISO 11926 - 1 1/16-12 UNF-2B

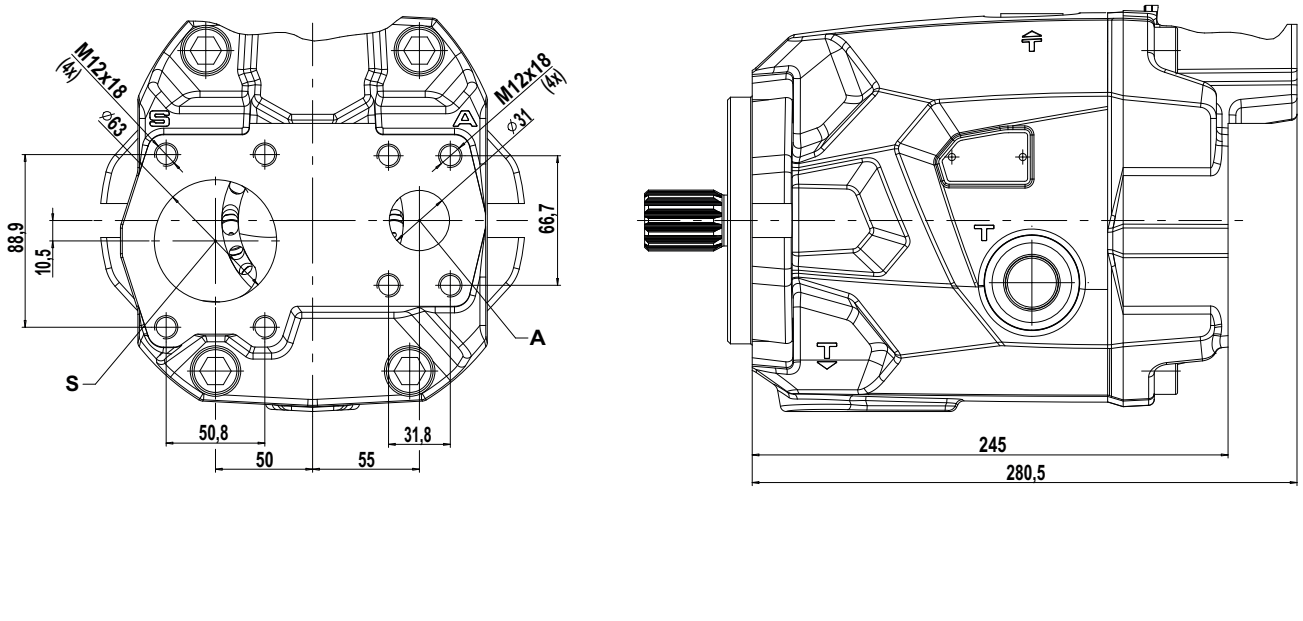
X2	LS0DA: LS pressure port ISO 9974-1-M12x1.5 LS1DA: LS pressure port ISO 9974-1-M12x1.5
X5	DF-DA-: DF control pressure connection for external DBV, ISO 9974-1-M12x1.5
-	-

Note
Anti-clockwise rotation: Terminal board and regulator arranged on other side (mirror image).

5.7.2 Nominal size 085, working connection, rear

1.	2.	3.	4.	5.	6.	7.		8	9.	10.	11.	12.	13.	14	15	16	17	18	19	20	21
L	H	3	0	V	O	085	/		20	V	R	C6		A3	0	00	0000	000			

Note
For dimensions that are not shown, see chapter 5.1.
Anti-clockwise rotation: Terminal board and regulator arranged on other side (mirror image).

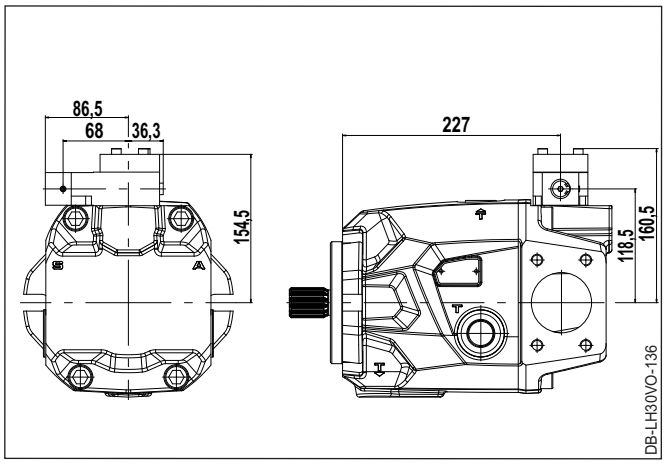


5.7.3 Nominal size 085, other regulator types

1.	2.	3.	4.	5.	6.	7.		8	9.	10.	11.	12.	13.	14	15	16	17	18	19	20	21
L	H	3	0	V	O	085	/		20	V	R			A1	0	00	0000	000			

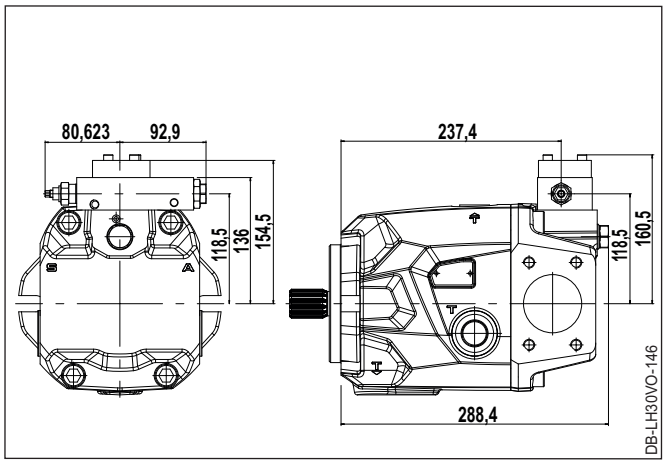
Note
For dimensions of regulator types LS0DA- / LS1DA- / DF-DA-, see chapter 5.1.
Anti-clockwise rotation: Terminal board and regulator arranged on other side (mirror image).

DA-



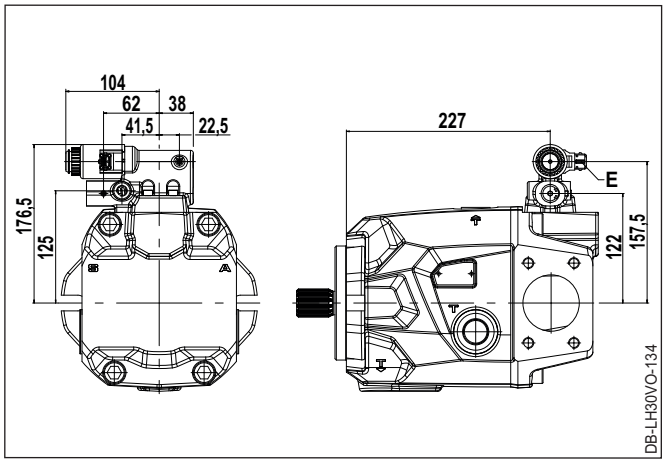
-	-
-	-

LR-



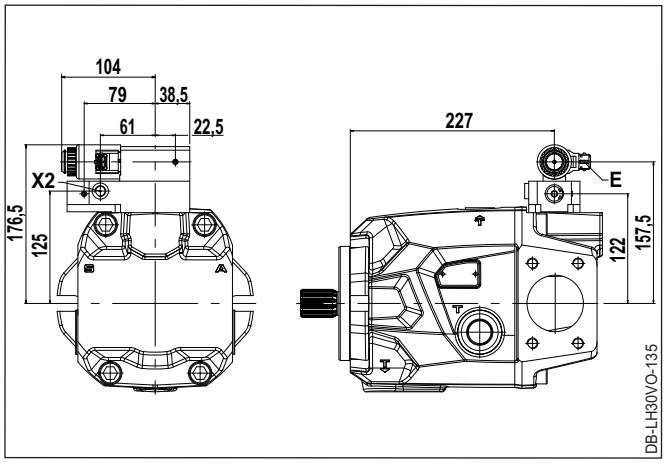
-	-
-	-

DE_



E	1/2/3/4: Deutsch plug DT04-2P 2-pin 5/6/7/8: AMP Junior Timer 2-pin plug
-	-

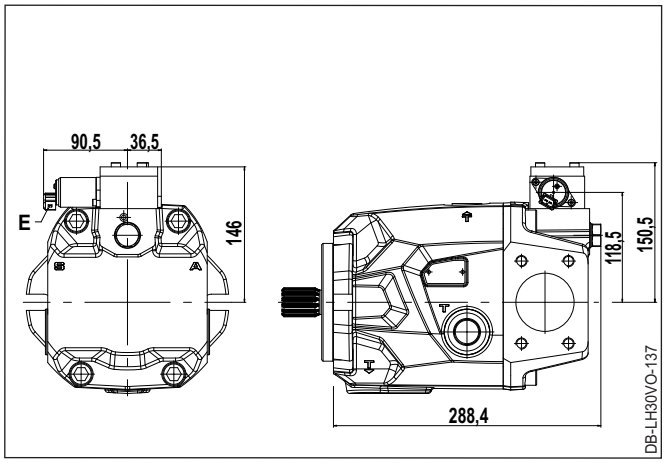
LS0DE_ / LS1DE_



E	1/2/3/4: Deutsch plug DT04-2P 2-pin 5/6/7/8: AMP Junior Timer 2-pin plug
X2	LS0DE_: LS pressure port ISO 9974-1-M12x1.5 LS1DE_: LS pressure port ISO 9974-1-M12x1.5

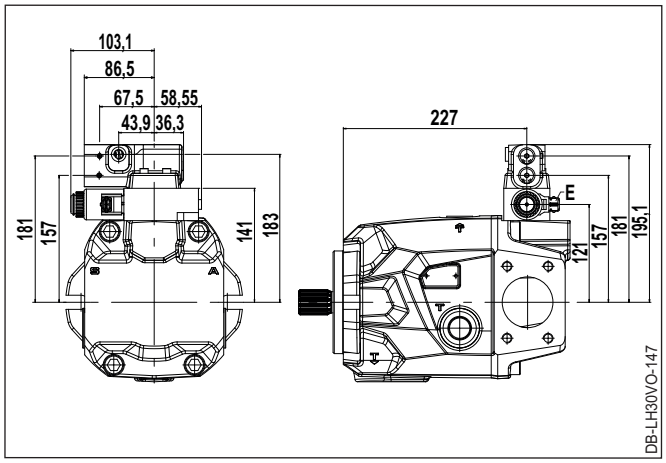
Note
Clockwise rotation: Terminal board and regulator arranged on other side (mirror image).

VE_ / VK_



E	1/3: Deutsch plug DT04-2P 2-pin 5/7: AMP Junior Timer 2-pin plug
-	-

LS0DA-VO_

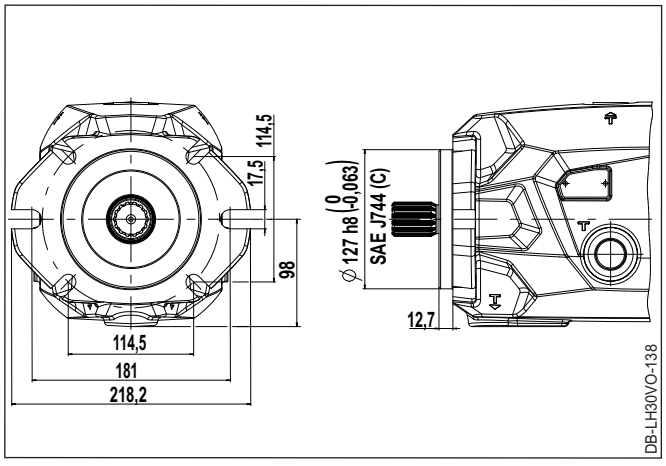


E	1/3: Deutsch plug DT04-2P 2-pin 5/7: AMP Junior Timer 2-pin plug
-	-

5.8 Nominal size 085, mounting flange

1.	2.	3.	4.	5.	6.	7.		8	9.	10.	11.	12.	13.	14	15	16	17	18	19	20	21
L	H	3	0	V	O	085	/		20	V		C6			0	00		000			

Similar to SAE C, (SAE J744), 2+4-hole mounting

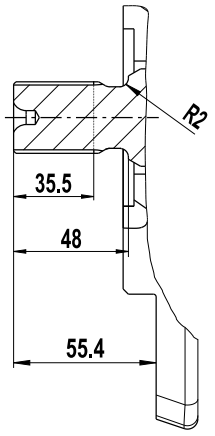


C6

5.9 Nominal size 085, shaft end

1.	2.	3.	4.	5.	6.	7.		8	9.	10.	11.	12.	13.	14	15	16	17	18	19	20	21
L	H	3	0	V	O	085	/		20	V					0	00		000			

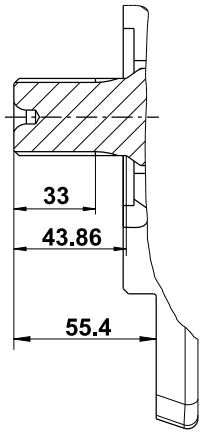
Gear shaft ANSI B92.1a-1976 1 1/4'' 14T, with undercutting



DB-LH30VO-078

A5

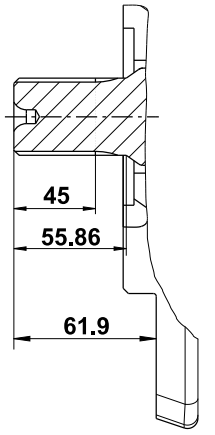
Gear shaft ANSI B92.1a-1976 1 1/4'' 14T, without undercutting



DB-LH30VO-077

A6

Gear shaft ANSI B92.1a-1976 1 1/2'' 17T, without undercutting



DB-LH30VO-079

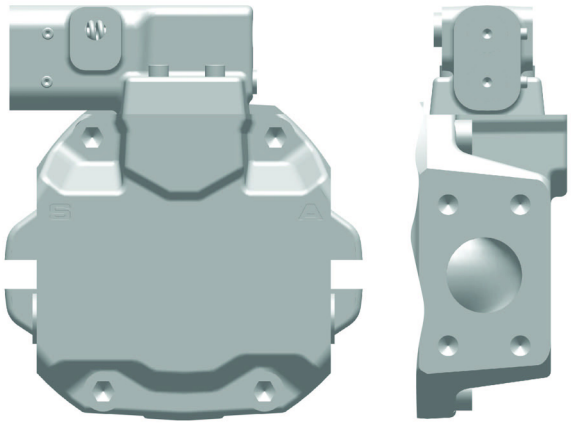
A0

5.10 Through drive

1.	2.	3.	4.	5.	6.	7.		8	9.	10.	11.	12.	13.	14	15	16	17	18	19	20	21
L	H	3	0	V	O		/		20	V					0	00		000			

5.10.1 Axial piston unit without through drive

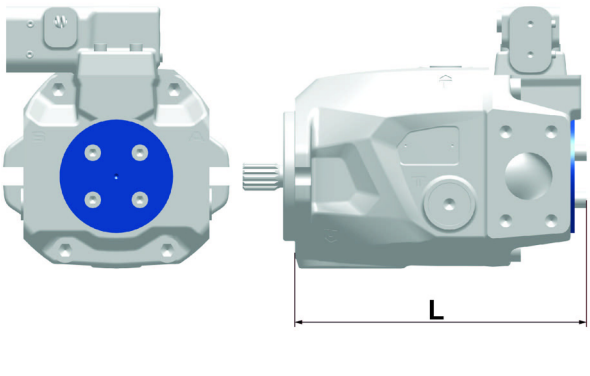
Note
Dimensions for axial piston unit without through drive, see main dimensions.



0000

5.10.2 Axial piston unit with preparation for adapter mounting kit

Note
Preparation for adapter mounting kit, closed with cover.
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.



K02G 4-hole

NS	L	L*
028	204.5	213.7
045	228.5	230.1
085	287	288.4

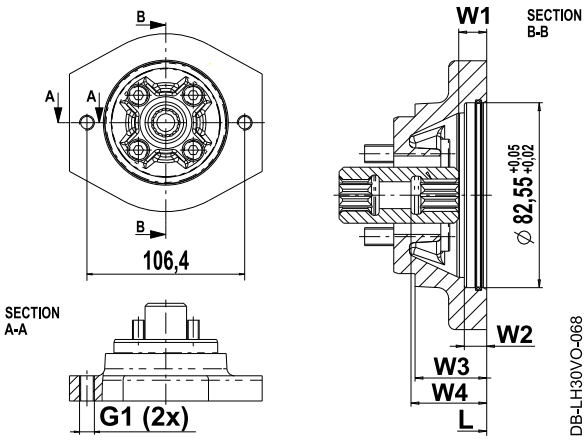
L) up to mounting flange
L*) Total length of axial piston unit with regulator type VE_/ VK_ and LR-, see note.

Note
NS 028: Total length of the axial piston unit with regulator type VE_/ VK_ and LR-, see chapter 5.1.3.
NS 045: Total length of the axial piston unit with regulator type VE_/ VK_ and LR-, see chapter 5.4.3.
NS 085: Total length of the axial piston unit with regulator type VE_/ VK_ and LR-, see chapter 5.7.3.

5.10.3 Axial piston unit with through drive SAE A

Note
O-ring to seal axial piston unit 2 is included in scope.
NS 028 / 045: For regulator type VE_/ VK_ and LR-, total length up to the mounting flange L + 13 mm applies.

Shaft teeth: 5/8 in 9T 16/32DP



A11D 2-hole

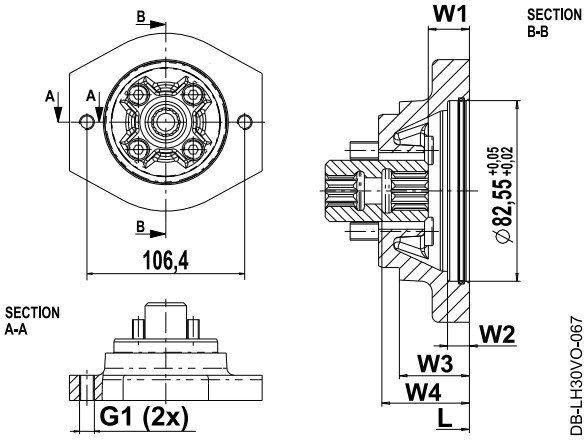
NS	W1	W2	W3	W4	L	G1 (2-hole)
028	9.9	10	32	33.8	220	M10x1.5; 17 deep
045	14.5	10	32	35.8	244	M10x1.5; 17 deep
085	13.4	10	19.5	34	290	M10x1.5; 19.5 deep

L*) up to mounting flange

5.10.4 Axial piston unit with through drive SAE A-B

Note
O-ring to seal axial piston unit 2 is included in scope.
NS 028 / 045: For regulator type VE_/ VK_ and LR-, total length up to the mounting flange L + 13 mm applies.

Shaft teeth: 3/4 in 11T 16/32DP



A21D 2-hole

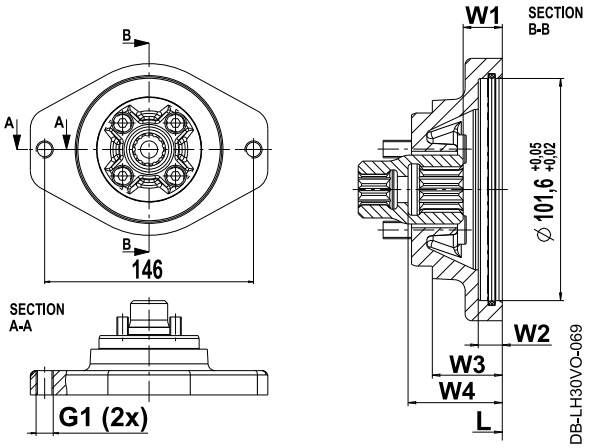
NS	W1	W2	W3	W4	L	G1 (2-hole)
028	18.8	10	32	40	220	M10x1.5; 17 deep
045	20.9	10	32	42.1	244	M10x1.5; 17 deep
085	23.6	10	19.5	40	290	M10x1.5; 19.5 deep

L*) up to mounting flange

5.10.5 Axial piston unit with through drive SAE B

Note
O-ring to seal axial piston unit 2 is included in scope.
NS 028 / 045: For regulator type VE_/ VK_ and LR-, total length up to the mounting flange L + 13 mm applies.

Shaft teeth: 7/8 in 13T 16/32DP



B11D 2-hole

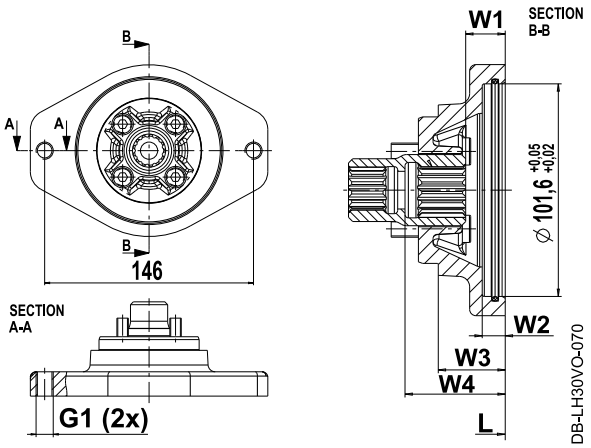
NS	W1	W2	W3	W4	L	G1 (2-hole)
028	17.8	11	32	43.1	220	M12x1.5; 17 deep
045	21.7	11	32	45.1	244	M12x1.5; 17 deep
085	20	11	26.5	43	297	M12x1.5; 18 deep

L*) up to mounting flange

5.10.6 Axial piston unit with through drive SAE B-B

Note
O-ring to seal axial piston unit 2 is included in scope.
NS 028 / 045: For regulator type VE_/ VK_ and LR-, total length up to the mounting flange L + 13 mm applies.

Shaft teeth: 1 in 15T 16/32DP



B21D 2-hole

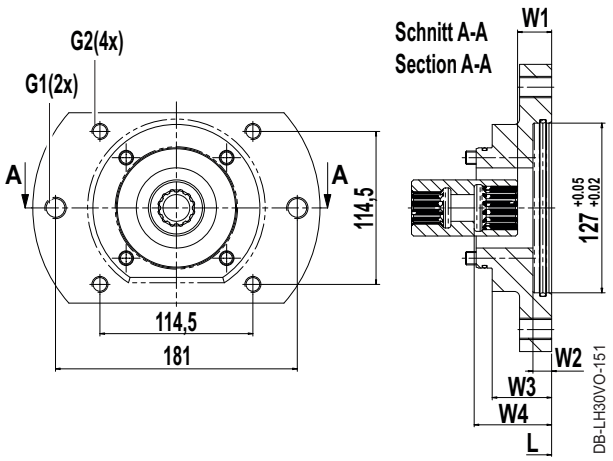
NS	W1	W2	W3	W4	L	G1 (2-hole)
028	-	-	-	-	-	-
045	20.9	11	32	49.9	244	M12x1.75; 17 deep
085	22.2	11	26.5	48	297	M12x1.75; 18 deep

L*) up to mounting flange
- not possible

5.10.7 Axial piston unit with through drive SAE C

Note
O-ring to seal axial piston unit 2 is included in scope.

Shaft teeth: 1 1/4 in 14T 12/24DP



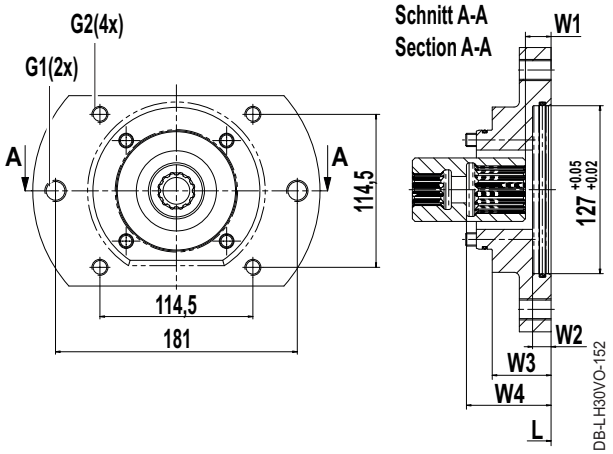
C11D 2-hole
C12D 4-hole

NS	W1	W2	W3	W4	L	G1 (2-hole) G2 (4-hole)
028	-	-	-	-	-	-
045	-	-	-	-	-	-
085	25.5	14	44.5	58	315	G1: M16x2; 24 deep G2: M12x1.75; 24 deep

5.10.8 Axial piston unit with through drive SAE C-C

Note
O-ring to seal axial piston unit 2 is included in scope.

Shaft teeth: 1 1/2 in 17T 12/24DP



C21D 2-hole
C22D 4-hole

NS	W1	W2	W3	W4	L	G1 (2-hole) G2 (4-hole)
028	-	-	-	-	-	-
045	-	-	-	-	-	-
085	19.4	14	44.5	64	315	G1: M16x2; 24 deep G2: M12x1.75; 24 deep

5.11 Multi axial piston unit

General information
Multi axial piston units of 2 or more single units can be supplied on request.

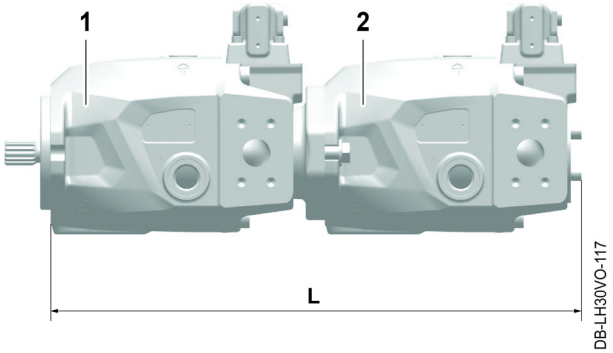
The type code must be filled out separately for each single unit. The type codes must be separated by a hyphen in the order.

The nominal sizes are shown on the separate nameplate for the multiple unit separated by a “+” sign. Only the code for the direction of rotation is entered after the last nominal size. (Spaces required before and after the letter)

1.	2.	3.	4.	5.	6.	7.	11.
L	H	3	8	V	O	045+045...	

Type code 4 on the type plate varies from 0 to 8 for the setup, and the multiple unit has the designation LH38VO.

See the nameplate for the single unit for details about the single units.



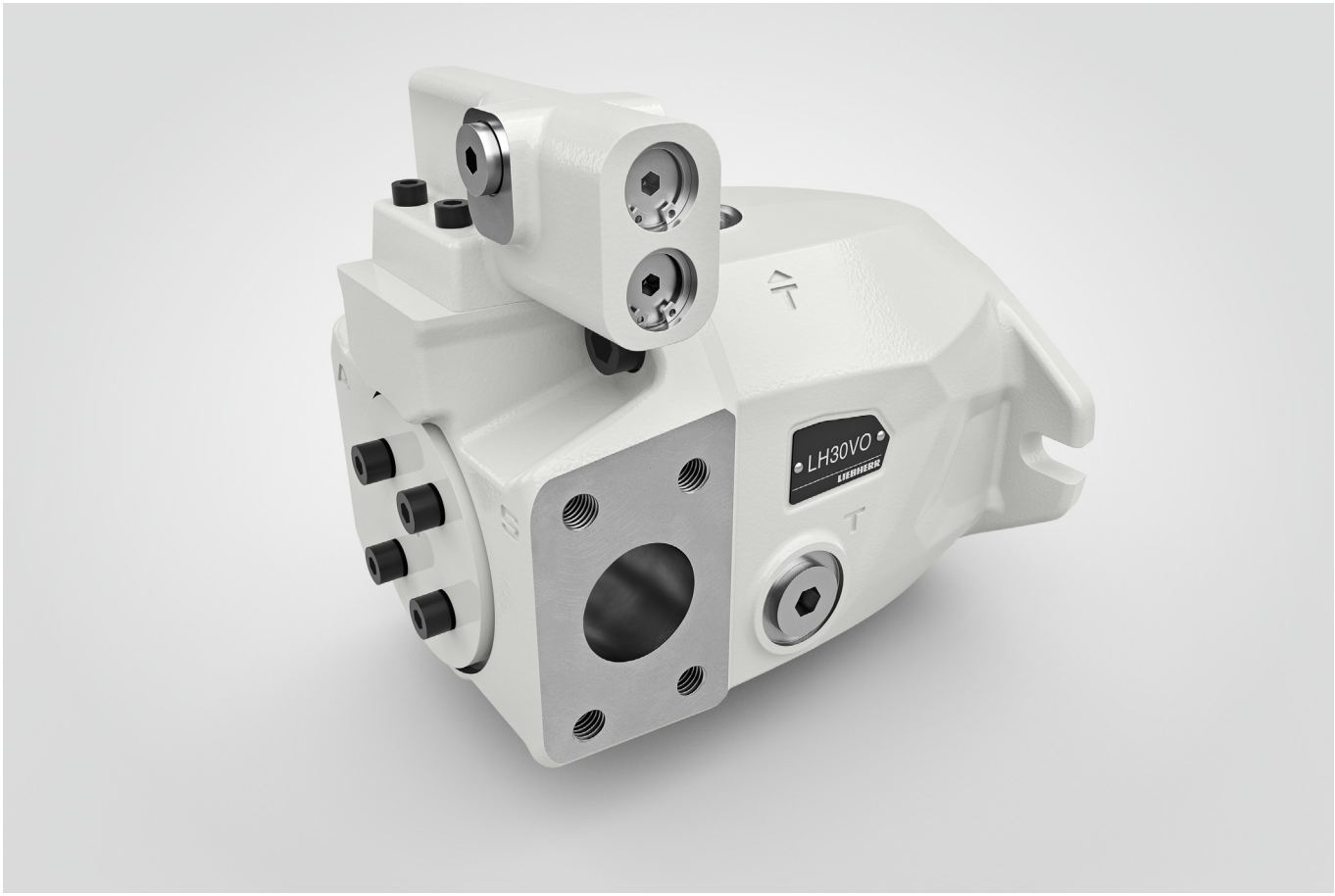
1	Base axial piston unit
2	Attached axial piston unit

L	Total length of multi-circuit axial piston unit in mm
-	-

5.11.1 Dimensions of multiple unit

Base axial piston unit 1		Attached axial piston unit 2 with Type code Through drive					
		Nominal size 028		Nominal size 045		Nominal size 085	
Nominal size	Type code Through drive	K02G	K02G with VE_/VK_/LR-	K02G	K02G with VE_/VK_/LR-	K02G	K02G with VE_/VK_/LR-
Nominal size 028	A11D	■ L = 424.5	■ L = 433.7	-	-	-	-
	A21D						
	B11D						
	B21D						
Nominal size 045	A11D	■ L = 448.5	■ L = 457.1	■ L = 472.5	■ L = 474.1	-	-
	A21D						
	B11D						
	B21D						
Nominal size 085	A11D	■ L = 494.5	■ L = 503.7	■ L = 518.5	■ L = 520.1	■ L = 577	■ L = 578.4
	A21D						
	B11D	■ L = 501.5	■ L = 510.7	■ L = 525.5	■ L = 527.1	■ L = 584	■ L = 585.4
	B21D						
	C11D	■ L = 519.5	■ L = 528.7	■ L = 543.5	■ L = 545.1	■ L = 602	■ L = 603.4
	C21D						

■ = available
□ = on request
- = not possible
L* = total length in mm



Changes, conditions, copyright

Subject to changes without prior notice in the course of technical development.

The user is not released from the obligation to complete its own evaluations and tests by the information in this data sheet.

An example configuration is illustrated in this data sheet; if not stated otherwise (LH30VO 045). The product delivered to you can therefore differ from the figures.

Deviations are likewise possible with data and values in this data sheet; these only serve to select the product configuration and are not binding. Unless indicated otherwise, the values stated are for the example configuration (LH30VO 045). Always use the values from the installation drawing provided.

The warranty and liability terms of the general terms and conditions of Liebherr Machines Bulle SA and Liebherr-Components AG are not extended in scope by the preceding information.

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