

Data sheet

Axial piston pump DPVG



The Liebherr axial piston pumps in the DPVG series are designed as swashplates for closed circuits. The variable displacement pumps are available in nominal sizes ranging from 085 to 280. The nominal pressure of the units is 6,527 psi (450 bar) and the maximum pressure is 7,252 psi (500 bar) absolute.

Thanks to a hydrostatic swashplate design, this variable displacement pump stands out with its high reliability and long service life, even under the toughest of conditions.

The hydrostatic swashplate mount is available for the nominal sizes 085, 140, and 280.

The inverse drive with a swivel angle of 22° is very efficient and has a very high power density. The DPVG is available with the common controls.

A through-drive is possible, as is the configuration of two DPVG pumps to form a multi-circuit pump in a tandem layout.

Valid for:

DPVG 085
DPVG 108
DPVG 140
DPVG 165
DPVG 280

Features:

D series
Closed circuit

Control types:

Various control types can be selected

Pressure range:

Nominal pressure $p_N = 6,527$ psi (450 bar)
Maximum pressure $p_{max} = 7,252$ psi (500 bar)

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1 Type code

DPV	G		/	000		1				A	O				
1.	2.	3.	/	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.

1. Pump type

D series / pump / variable displacement	DPV
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2. Type of circuit

Closed	G
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3. Nominal size (NS)

	085	108	140	165	280	
--	-----	-----	-----	-----	-----	--

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

$V_{g \min} = 0 \text{ cm}^3$ / Enter value in cm^3/rev	■
---	---

5. Activation / control type

Electro-proportional regulation / pressure cut-off	■	■	■	■	■	EL - DA
Electro-proportional regulation	■	■	□	■	■	EL
Hydraulic proportional regulation, dependent on steering pressure	□	■	■	■	■	SD
Hydraulic proportional regulation, dependent on steering pressure / pressure cut-off	□	□	■	■	■	SD - DA
Hydraulically activated torque control with pressure cut-off (Hydraulic torque control)	-	□	□	■	■	TCH
Electrically activated torque control with pressure cut-off (Electric torque control with safety valve)	-	□	□	■	■	TCE
Electrical proportional regulation, with safety valve / pressure cut-off	■	■	■	■	■	ELS - DA
Electrical direct control	□	□	□	□	□	DS
Electrical direct control, pressure cut-off	■	□	■	□	□	DS-DA
Electrical proportional regulation, with safety valve	□	■	■	■	■	ELS
Hydraulic speed control / mechanical stroke limitation / pressure cut-off	□	□	□	■	■	DZH-M-DA

6. Design

	1
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7. Direction of rotation (viewed towards the drive shaft)

Right	□	■	■	■	■	R
Left	■	■	■	■	■	L

1 Type code

085	108	140	165	280
-----	-----	-----	-----	-----

8. Mounting flange

Diesel engine flange SAE J617a	SAE 1	□	□	□	□	□	11
	SAE 2	□	■	□	□	□	12
	SAE 3	□	□	□	□	□	13
	SAE 4	□	□	□	□	□	14
Mounting flange SAE J744	SAE C	□	-	-	-	-	23
	SAE D	-	■	■	□	□	24
	SAE E	-	-	-	□	■	25
Mounting flange ISO 3019-2	Ø 160	■	-	-	-	-	31*
	Ø 180	-	■	-	-	-	31*
	Ø 200	-	-	-	■	-	31*
	Ø 224	-	-	-	-	■	31*

*) Enter mounting flange diameter in the free text field, [see chapter 5](#).

9. Shaft end

Splined shaft	DIN 5480	■	■*	■*	■	■	1
Splined shaft	ANSI B92.1a	■	■	■	-	■	2

*) Enter splined shaft dimensions in the free text field, [see chapter 5](#).

10. Connections

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

11. Add-on parts

Without add-on parts	0
----------------------	---

12. Gear pump

Without gear pump	□	■	■	■	■	00
With gear pump $V_g = 24 \text{ cm}^3$, enter the value in cm^3/rev , without filter and cold start valve	■	□	□	-	-	24
With gear pump $V_g = 30 \text{ cm}^3$, enter the value in cm^3/rev , without filter and cold start valve	□	■	■	-	-	30
With gear pump $V_g = 40 \text{ cm}^3$, enter the value in cm^3/rev , without filter and cold start valve	-	■	■	□	-	40
With gear pump $V_g = 50 \text{ cm}^3$, enter the value in cm^3/rev , without filter and cold start valve	-	-	-	■	■	50

1 Type code

085	108	140	165	280
-----	-----	-----	-----	-----

13. Through drive

Standard Centring diameter		Fastening thread position according to SAE		Gearing							
No through drive							■	■	■	■	0000
Ø82.55	SAE A	Type K Basic (2-hole)	ANSI B92.1a 5/8 in 9T 16/32DP	□	□	□	□	■	A11D		
		Type S Basic (4-hole)		-	-	-	-	-	A12D		
Ø101.6	SAE B	Type K Basic (2-hole)	ANSI B92.1a 7/8 in 13T 16/32DP	■	■	■	■	■	B11D		
		Type S Basic (4-hole)		□	□	□	□	□	B12D		
	SAE BB	Type K Basic (2-hole)	ANSI B92.1a 1 in 15T 16/32DP	□	■	■	■	■	B21D		
		Type S Basic (4-hole)		□	□	□	□	□	B22D		
Ø127	SAE C**	Type K Basic (2-hole)	ANSI B92.1a 1 1/4 in 14T 12/24DP	□	■	■	■	■	C11D		
		Type S Basic (4-hole)		□	■	■	■	■	C12D		
	SAE CC**	Type K Basic (2-hole)	ANSI B92.1a 1 1/2 in 17T 12/24DP	□	■	□	■	■	C21D		
		Type S Basic (4-hole)		□	■	□	■	■	C22D		
	SAE C**	Type K Basic (2-hole)	DIN 5480 N30x2x14x10E	□	□	□	□	□	C31D		
		Type S Basic (4-hole)		□	□	□	□	■	C32D		
Ø152.4	SAE D**	Type K Basic (2-hole)	ANSI B92.1a 1 3/4 in 13T 8/16DP	-	□	□	□	□	D11D		
		Type S Basic (4-hole)		-	■	□	■	■	D12D		
		Type K Basic (2-hole)	DIN 5480 N40x2x18x10E	-	□	□	□	■	D31D*		
		Type S Basic (4-hole)		-	■	□	■	■	D32D*		
		Type K Basic (2-hole)	DIN 5480 N45x2x21x10E	-	□	□	□	■	D31D*		
		Type S Basic (4-hole)		-	■	□	■	■	D32D*		
		Type K Basic (2-hole)	DIN 5480 N50x2x24x10E	-	□	□	□	■	D31D*		
		Type S Basic (4-hole)		-	□	□	□	■	D32D*		
Ø165.1	SAE E**	Type K Basic (2-hole)	ANSI B92.1a 1 3/4 in 13T 8/16DP	-	-	-	-	-	E11D		
		Type S Basic (4-hole)		-	-	-	-	■	E12D		
		Type K Basic (2-hole)	DIN 5480 N50x2x24x10E	-	-	-	-	-	E31D*		
		Type S Basic (4-hole)		-	-	-	-	■	E32D*		
		Type K Basic (2-hole)	DIN 5480 N55x2x26x10E	-	-	-	-	-	E31D*		
		Type S Basic (4-hole)		-	-	-	-	■	E32D*		
Ø200	ISO 3019-2	(2-hole)	DIN 5480 N45x2x21x10E	-	-	-	-	-	V31D*		
		(4-hole)		-	-	-	-	■	V32D*		
						085	108	140	165	280	
Ø224	ISO 3019-2	(2-hole)	DIN 5480 N55x2x26x10E	-	-	-	-	-	W31D*		
		(4-hole)		-	-	-	-	■	W32D*		

*) Enter splined shaft dimensions in the free text field, see chapter 5.

**) Through-drives SAE-C, SAE-CC, SAE-D and SAE-E not possible in conjunction with integrated feed pump.

1 Type code

085	108	140	165	280
-----	-----	-----	-----	-----

14. Valve

High-pressure relief valve with feed function	■	■	■	■	■	NS-DB
High-pressure relief valve with feed function and feed pressure valve	■	■	■	■	■	NS-DB-DS

15. Sensors

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

- = 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

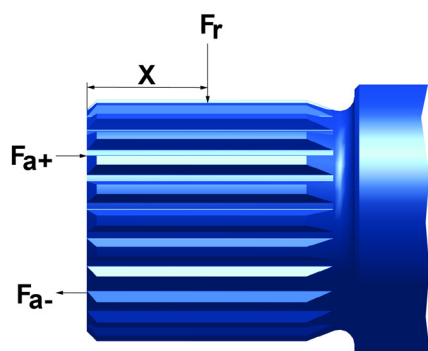
Nominal size			085	108	140	165	280			
Displacement volume	$V_{g \max}$	cm ³	88.4	107.7	140.2	167.8	283.4			
Max. speed at $V_{g \max}$	n_{\max}	rpm	3300	3000	2850	2700	2500			
Volume flow at n_{\max} and $V_{g \max}$	qv_{\max}	l/min	291	323	400	453	709			
Drive power at qv_{\max} and $\Delta p = 430$ bar	p_{\max}	kW	209	232	287	325	508			
Drive torque at $V_{g \max}$ and $\Delta p = 430$ bar	M_{\max}	Nm	604	737	959	1149	1940			
Torsional rigidity	Shaft DIN 5480		W35	W40	W45	W40	W50	W45	W55 (Yoke)	W55 (Cradle)
	Nm/rad		103003	177000	205550	195300	254330	255250	471010	409310
Driving gear moment of inertia	J_{TW}	kgm ²	0.0101	0017	0.024	0.03	0.0693			
Weight (approx.)	m	kg	63	69	79	96	134			



Note

The stated values (maximum values) are theoretical values, rounded, and without efficiencies or tolerances.

2.1.1 Maximum radial and axial load of the driving shaft



DB-V001

Nominal size			085	108	140	165	280
Max. radial force	$F_{r \max}$	N	Values upon request				
Max. axial force	$F_{a\pm \max}$	N					

2 Technical data

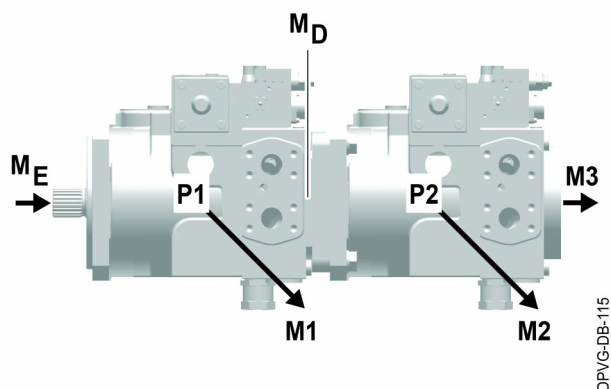


Note

The radial and axial loads depend on the load cycle, e.g. pressure, rpm and direction of force. If planning a belt drive or continuous axial and/or radial forces are expected, please contact Liebherr.

2.1.2 Maximum input and through drive torques

Nominal size			085	108	140	165	280
Max. torque of driving shaft input (installed without lateral force) at shaft end DIN 5480	$M_{E \max}$	Nm	Values upon request				
Max. torque of through drive	$M_{D \max}$	Nm					



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

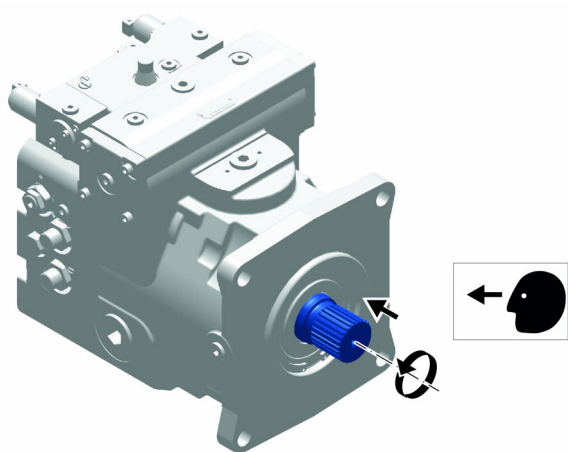
P2	Axial piston pump 2
M_E^1	Input torque
M_D^2	Through drive torque
-	-

- 1) $M_E = M_1 + M_2 + M_3$
 $M_E < M_{E \max}$
- 2) $M_D = M_2 + M_3$
 $M_D < M_{D \max}$

2 Technical data

2.2 Direction of rotation

DPV	G		/	000		1	7			A	O				
1.	2.	3.	/	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.



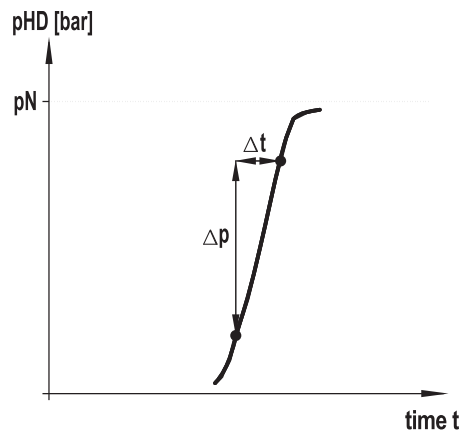
The direction of rotation is stated with view of the driving shaft, as shown in the figure.

- R** right = clockwise
- L** left = anti-clockwise

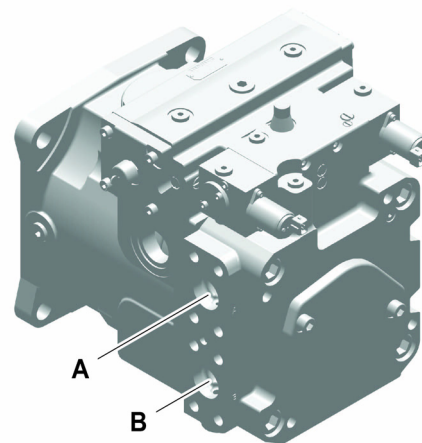
DPVG-DB-116

2.3 Permitted pressure range

2.3.1 Operating pressure



DELH30VO024



DPVG-DB-117

Operating pressure at connection A / B			
Nominal size	085 to 280		
Minimum pressure**	pHD _{min}	bar	20
Nominal pressure (fatigue resistant)	pHD _N	bar	450
Maximum pressure (single operating period)	pHD _{max}	bar	500
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

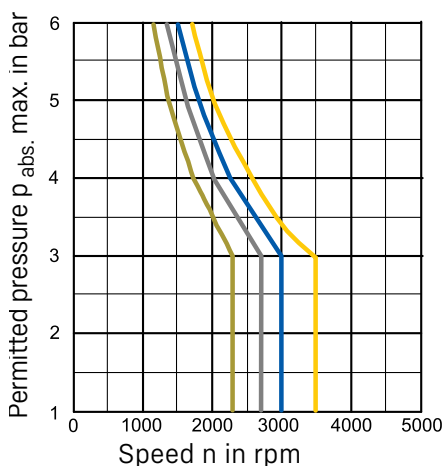
2 Technical data

***) There must be minimum pressure in the working circuit at port A to ensure adequate lubrication of the driving gear in all swivel angles during operation.

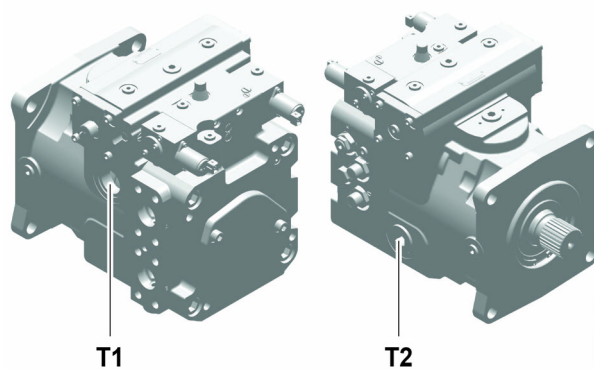


DANGER
Failure of the fastening screws at working connection A!
 Danger to life.
 Use fastening screws of strength category 10.9.

2.3.2 Housing, leakage oil pressure



HF2-DB-008



DPVG-DB-118

Characteristic curve	Nominal size	Shaft diameter (mm)
	085	40
	108	45
	165, 140	50, 56
	280	60

Leakage oil pressure at connection T1/T2			
Nominal size	085 to 280		
Permanent absolute leakage oil pressure	p_L	bar	3
Maximum absolute pressure	$p_{L \max}$	bar	6*

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



Note
 The pressure in the axial piston unit must always 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	Fill quantity
085 to 280	Values upon request



Note

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

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.
- The 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 mm²/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 mm²/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 operating 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 the freezing point, the sealing lip of the rotary shaft lip seal could freeze if it becomes wet or frosted. This can cause the sealing lip to tear off when the axial piston unit is started. The risk must be prevented by preheating/thawing the rotary shaft lip seal/the shaft.



Note

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

2 Technical data

Overview

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

*) Idle state < -50 °C

ATTENTION

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

***) Idle state < -40 °C

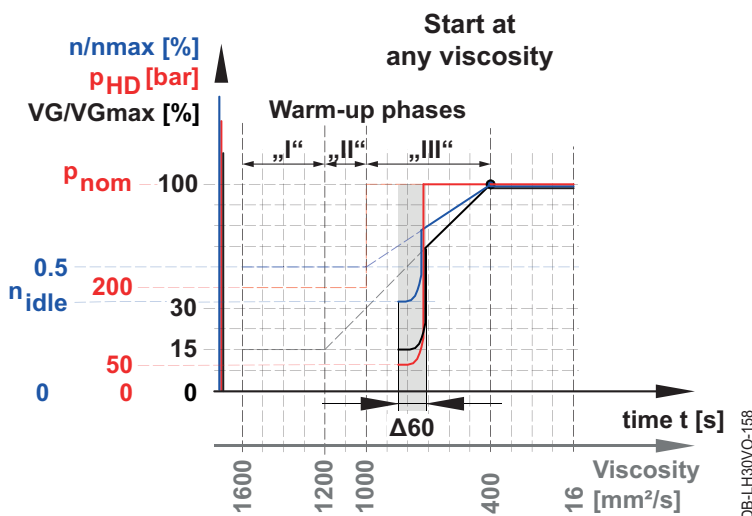
ATTENTION

Temperatures < -40 °C on the system = no operation of the axial piston unit permitted.
Functioning of the sealing elements in the axial piston unit is not guaranteed at temperatures < -40 °C.
Preheat the axial piston unit and tank to at least -40 °C and use Liebherr Hydraulic Plus Arctic/Liebherr Hydraulic FFE 30 hydraulic fluid with a viscosity < 1600 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: $p_{HD \min} \leq p_{HD} \leq 50 \text{ bar}$
- Speed: $n_{\min} \leq n \leq 1000 \text{ rpm}$, or idle speed of the drive motor*
- Displacement volume: $V_{g \min} \leq V_g \leq 15\% \text{ of } V_{g \max}$
- 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 [mm ² /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 [mm ² /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 Viscosity chart	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)

*) At maximum leakage oil temperature, the viscosity must not fall below 8 mm²/s (for a short period, i.e. < 3 minutes, it can be 7 mm²/s).

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**.

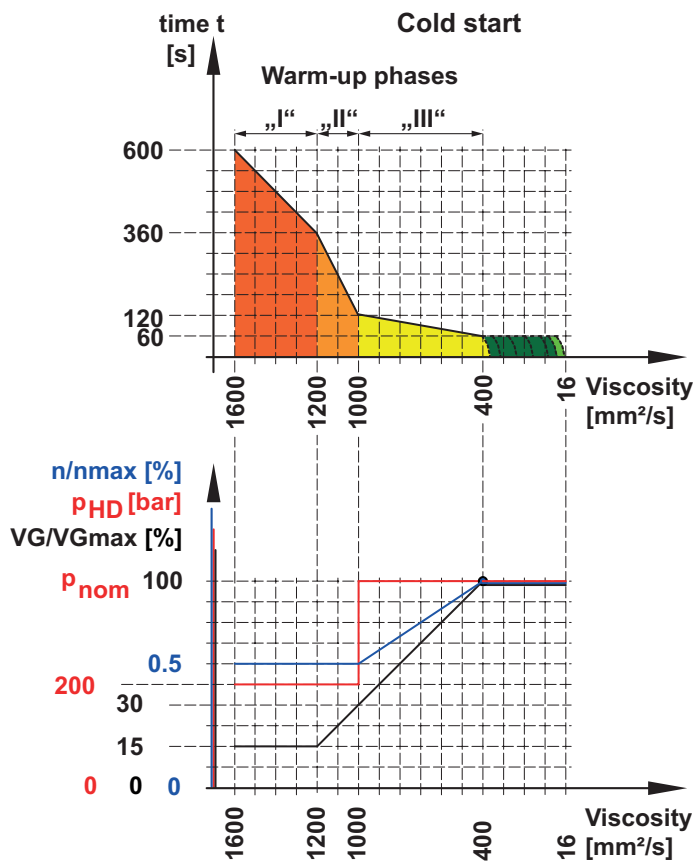
*) (for additional information see: 2.5.6 Viscosity chart, Page 17)

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



DB-LH80VO-157

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 mm²/s = operate the axial piston unit with measures listed below until a viscosity of 1200 mm²/s is reached.

Measures:

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

2 Technical data

Warm-up phase "II"

Condition:

- Viscosity: 1200-1000 mm²/s = operate the axial piston unit with measures listed below until a viscosity of 1000 mm²/s is reached.

Measures:

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

Warm-up phase "III"

Condition:

- Viscosity: 1000-400 mm²/s = operate the axial piston unit with measures listed below until a viscosity of 400 mm²/s is reached.

Measures:

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

Warm start

Condition:

- Viscosity: 400-16 mm²/s = operate the axial piston unit for at least 60 s, even at viscosity < 400 mm²/s, with measures listed below.

Measures:

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

2.5.5 Normal operation

Note



Optimum operating range: 16-36 mm²/s

The viscosity must not fall below 8 mm²/s (for a short period, thud < 3 minutes, 7 mm²/s) at maximum leakage oil temperature.

Note

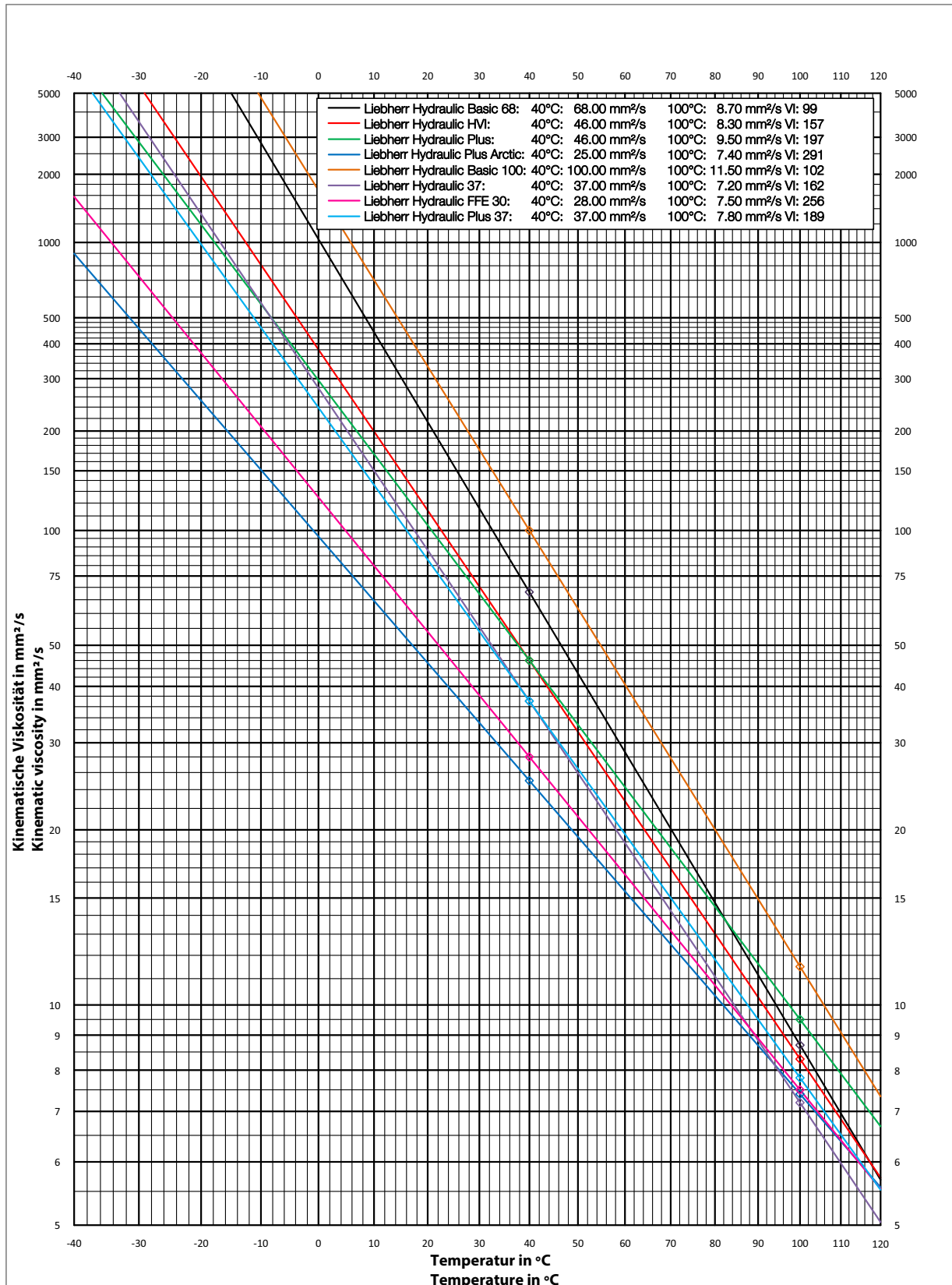


In the viscosity range of 400-8 mm²/s, the axial piston unit can be put under full load.

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

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.

2.7 Housing flushing

Various operating conditions, e.g. a very low flow rate over a longer period of time, could cause a critical temperature rise in the housing: [see chapter 2.8.1](#).

If this is the case, the housing must be flushed, so the “hot” hydraulic oil is directed to an external cooler where it cools down and from where it is fed back into the hydraulic system.

The flushing volume qV in L/min is to be individually set for each nominal size in connection with the application and is the responsibility of the device or system manufacturer.

2.8 Feed pump

DPV	G		/	000		1				A	O				
1.	2.	3.	/	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.

Note



A feed pump can be implemented only in combination with through-drive = B11D, B11G or 0000.
A joint feed pump on hydraulic pump 2 is recommended for multi-circuit pumps in tandem design, [see chapter 5.14](#).

00 Without feed pump

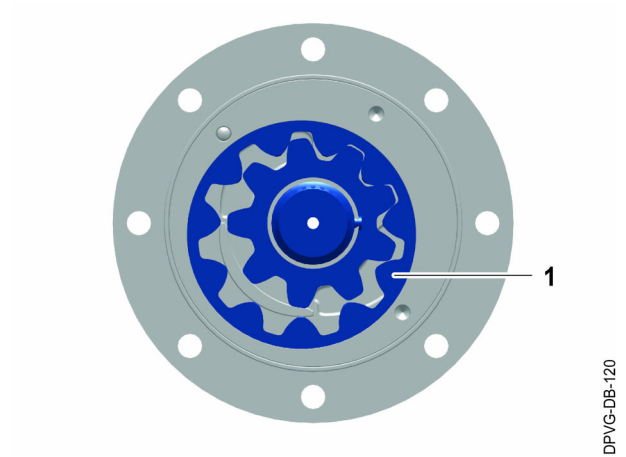
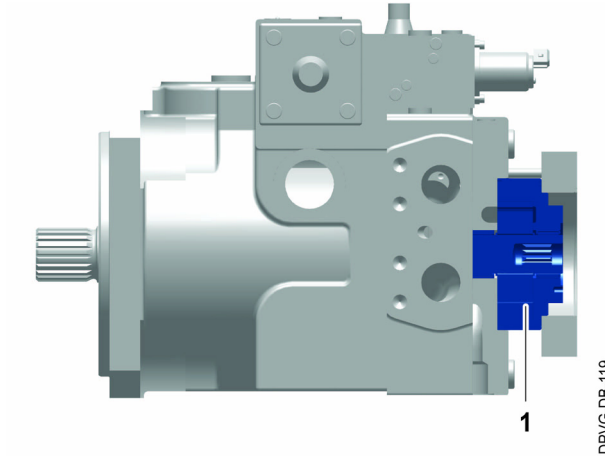
24 With feed pump ($V_g = 24 \text{ cm}^3$), without filter and cold-start valve

30 With feed pump ($V_g = 30 \text{ cm}^3$), without filter and cold-start valve

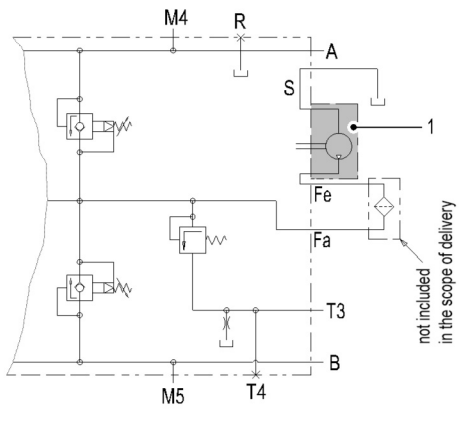
40 With feed pump ($V_g = 40 \text{ cm}^3$), without filter and cold-start valve

50 With feed pump ($V_g = 50 \text{ cm}^3$), without filter and cold-start valve

2 Technical data



2.8.1 Hydraulic diagram with feed pump



1	Feed pump
---	-----------

-	-
---	---

3 Activation and control type

3.1 Control types

DPV	G		/	000		1				A	O				
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 280. 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 responsibility of the manufacturer of the device or system to install a safety device e.g. an emergency stop.

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

3.1.1 Mechanical-hydraulic control

- SD- control, [see chapter 3.2.1](#)
- SD-DA- control, [see chapter 3.2.2](#)
- SD-DA1- control, [see chapter 3.2.3](#)
- TCH- control, [see chapter 3.2.4](#) / [see chapter 3.2.5](#)
- DZH-M-DA- control, [see chapter 3.2.16](#)

3.1.2 Electric-hydraulic control

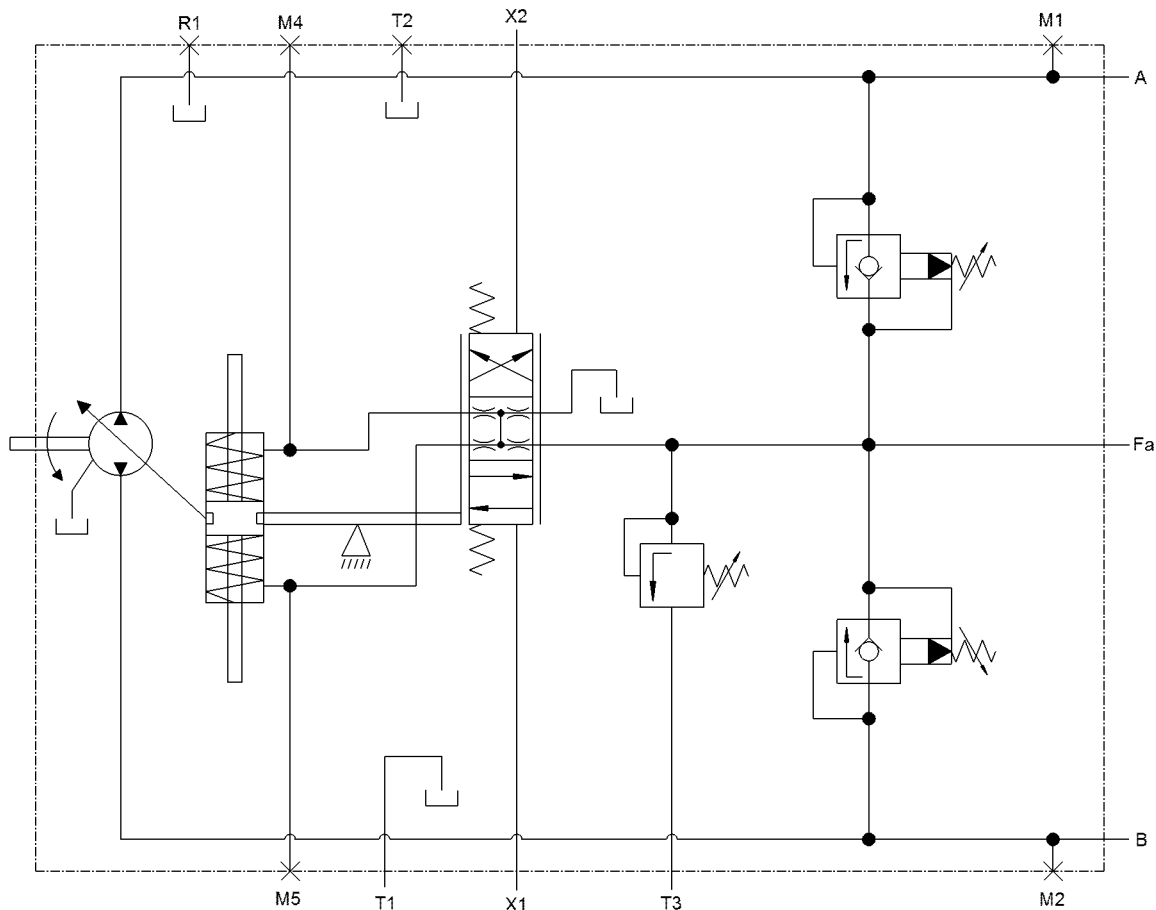
- EL- control, [see chapter 3.2.7](#)
- EL-DA- control, [see chapter 3.2.8](#)
- EL-DA1- control, [see chapter 3.2.9](#)
- ELS- control, [see chapter 3.2.10](#)
- ELS-DA- control, [see chapter 3.2.11](#)
- ELS-DA1- control, [see chapter 3.2.12](#)
- TCE- control, [see chapter 3.2.13](#) / [see chapter 3.2.14](#)
- DS-DA- control, [see chapter 3.2.15](#)
- DS-DA1- control, [see chapter 3.2.16](#)

Further control types are available upon request.

3 Activation and control type

3.2 Standard hydraulic diagrams

3.2.1 SD- control



HF2-DB-023

X1, X2	Steering pressure connection ISO 9974-1	T2	Oil drain ISO 9974-1
A, B	Working connections SAE J 518	T3	Return for feed pressure ISO 9974-1
R1	Vent connection ISO 9974-1	M1, M2	High pressure measuring connections ISO 9974-1
Fa	Feed pressure connection ISO 9974-1	M4, M5	Adjusting pressure measuring connections ISO 9974-1
T1	Leakage oil connection ISO 9974-1	-	-

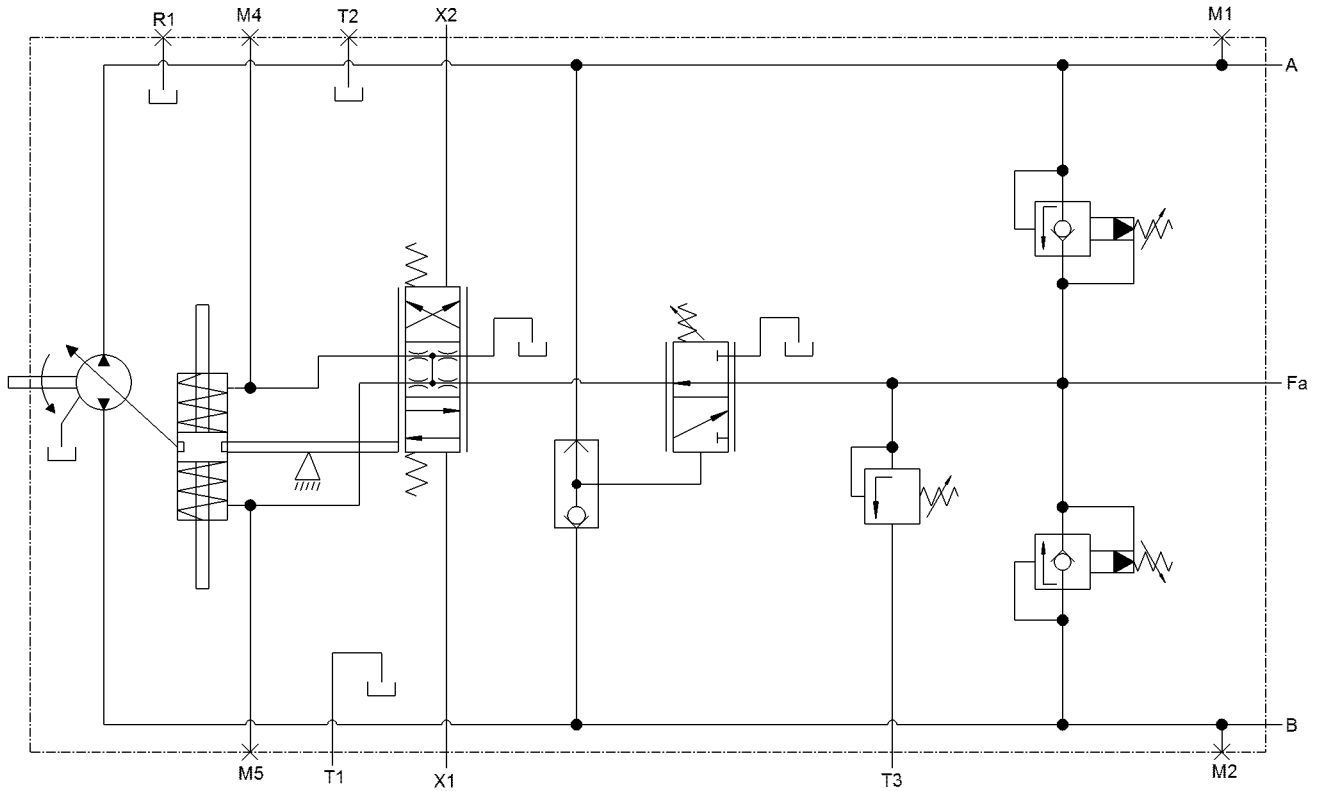
Note



X1 switched, direction of rotation: R = Oil outlet at connection A,
 direction of rotation: L = Oil outlet at connection B
 X2 switched, direction of rotation: R = Oil outlet at connection B,
 direction of rotation: L = Oil outlet at connection A

3 Activation and control type

3.2.2 SD-DA- control



HF2-DB-024

X1, X2	Steering pressure connection ISO 9974-1	T2	Oil drain ISO 9974-1
A, B	Working connections SAE J 518	T3	Return for feed pressure ISO 9974-1
R1	Vent connection ISO 9974-1	M1, M2	High pressure measuring connections ISO 9974-1
Fa	Feed pressure connection ISO 9974-1	M4, M5	Adjusting pressure measuring connections ISO 9974-1
T1	Leakage oil connection ISO 9974-1	-	-

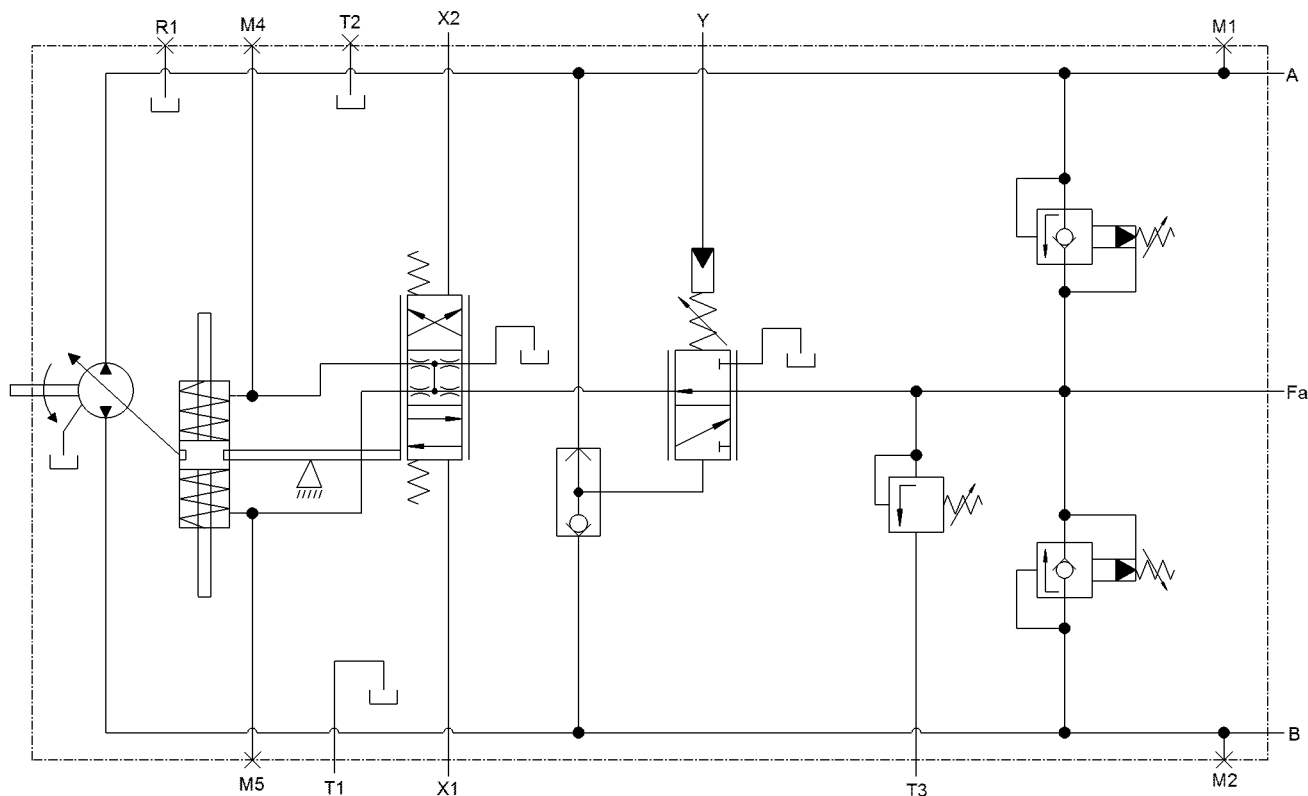
Note



X1 switched, direction of rotation: R = Oil outlet at connection A,
 direction of rotation: L = Oil outlet at connection B
 X2 switched, direction of rotation: R = Oil outlet at connection B,
 direction of rotation: L = Oil outlet at connection A

3 Activation and control type

3.2.3 SD-DA1- control



HF2-DB-025

X1, X2	Steering pressure connection ISO 9974-1	T1	Leakage oil connection ISO 9974-1
Y	DA1 override signal	T2	Oil drain ISO 9974-1
A, B	Working connections SAE J 518	T3	Return for feed pressure ISO 9974-1
R1	Vent connection ISO 9974-1	M1, M2	High pressure measuring connections ISO 9974-1
Fa	Feed pressure connection ISO 9974-1	M4, M5	Adjusting pressure measuring connections ISO 9974-1

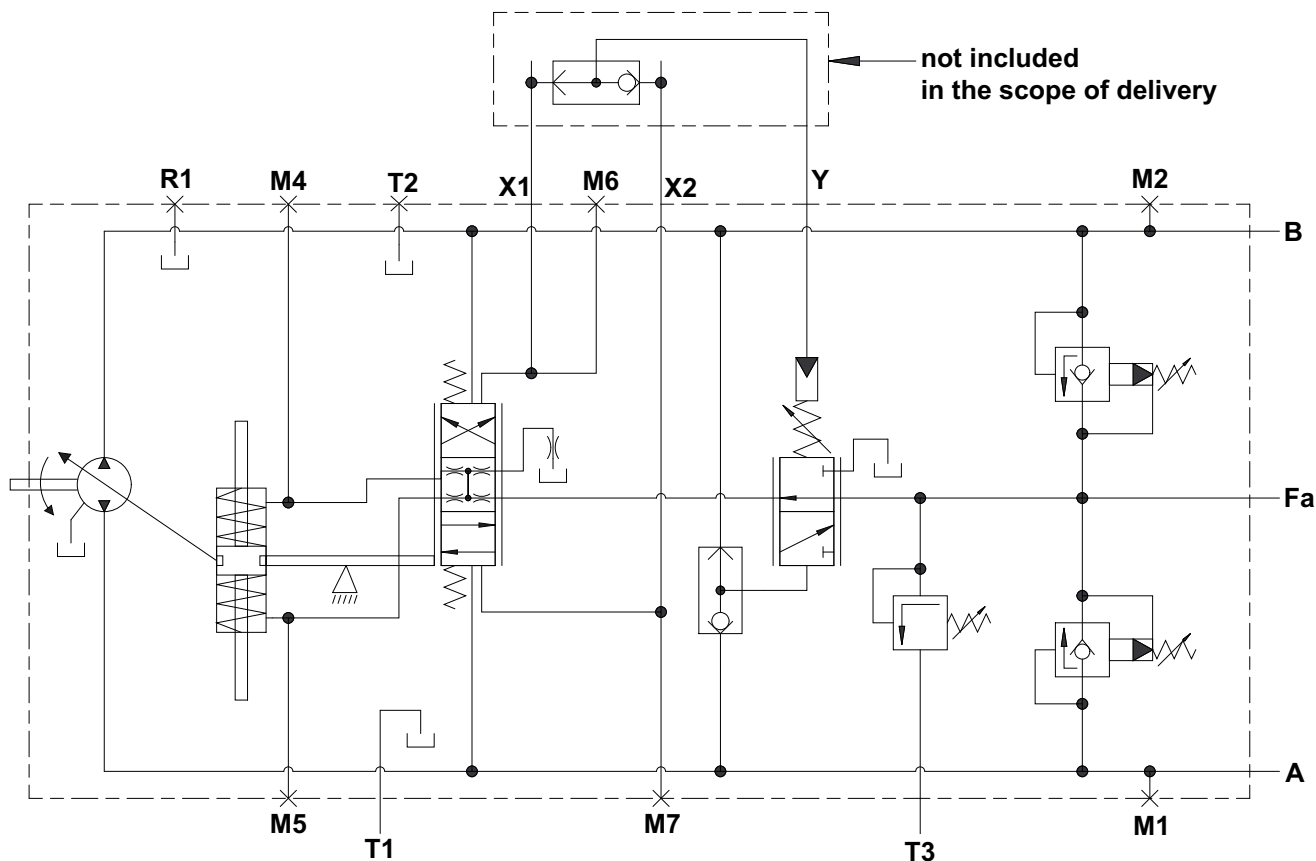


Note

X1 switched, direction of rotation: R = Oil outlet at connection A, L = Oil outlet at connection B
 X2 switched, direction of rotation: R = Oil outlet at connection B, L = Oil outlet at connection A

3 Activation and control type

3.2.4 TCH- control, anti-clockwise rotation



DB-DPVG-175

X1, X2	Steering pressure connections ISO 9974-1	T1, T2	Leakage oil connections ISO 9974-1
A, B	Working connections SAE J 518	T3	Return for feed pressure ISO 9974-1
R1	Vent connection ISO 9974-1	M1, M2	High pressure measuring connections ISO 9974-1
Y	DA1 override signal (weighed) ISO 9974-1	M4, M5	Adjusting pressure measuring connections ISO 9974-1
S	Suction port feed pump ISO 9974-1	M6, M7	Steering pressure measuring connections ISO 9974-1
Fa	Feed pressure connection ISO 9974-1	-	-

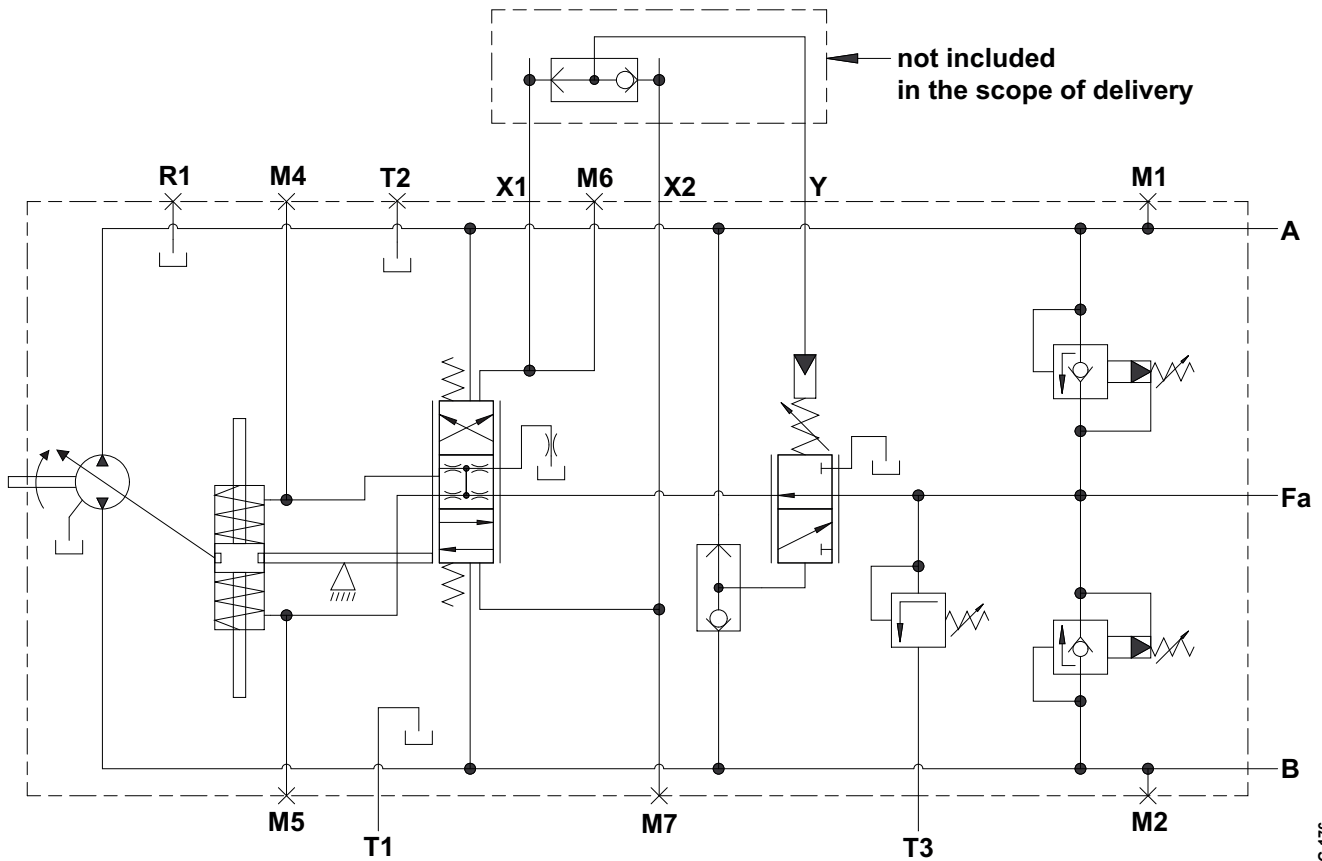


Note

X1 switched, direction of rotation: R = Oil outlet at connection A, L = Oil outlet at connection B
 X2 switched, direction of rotation: R = Oil outlet at connection B, L = Oil outlet at connection A

3 Activation and control type

3.2.5 TCH- control, clockwise rotation



DB-DPYG-176

X1, X2	Steering pressure connections ISO 9974-1	T3	Return for feed pressure ISO 9974-1
A, B	Working connections SAE J 518	M1, M2	High pressure measuring connections ISO 9974-1
R1	Vent connection ISO 9974-1	M4, M5	Adjusting pressure measuring connections ISO 9974-1
Y	DA1 override signal (weighed) ISO 9974-1	M6, M7	Steering pressure measuring connections ISO 9974-1
T1, T2	Leakage oil connections ISO 9974-1	Fa	Feed pressure connection ISO 9974-1

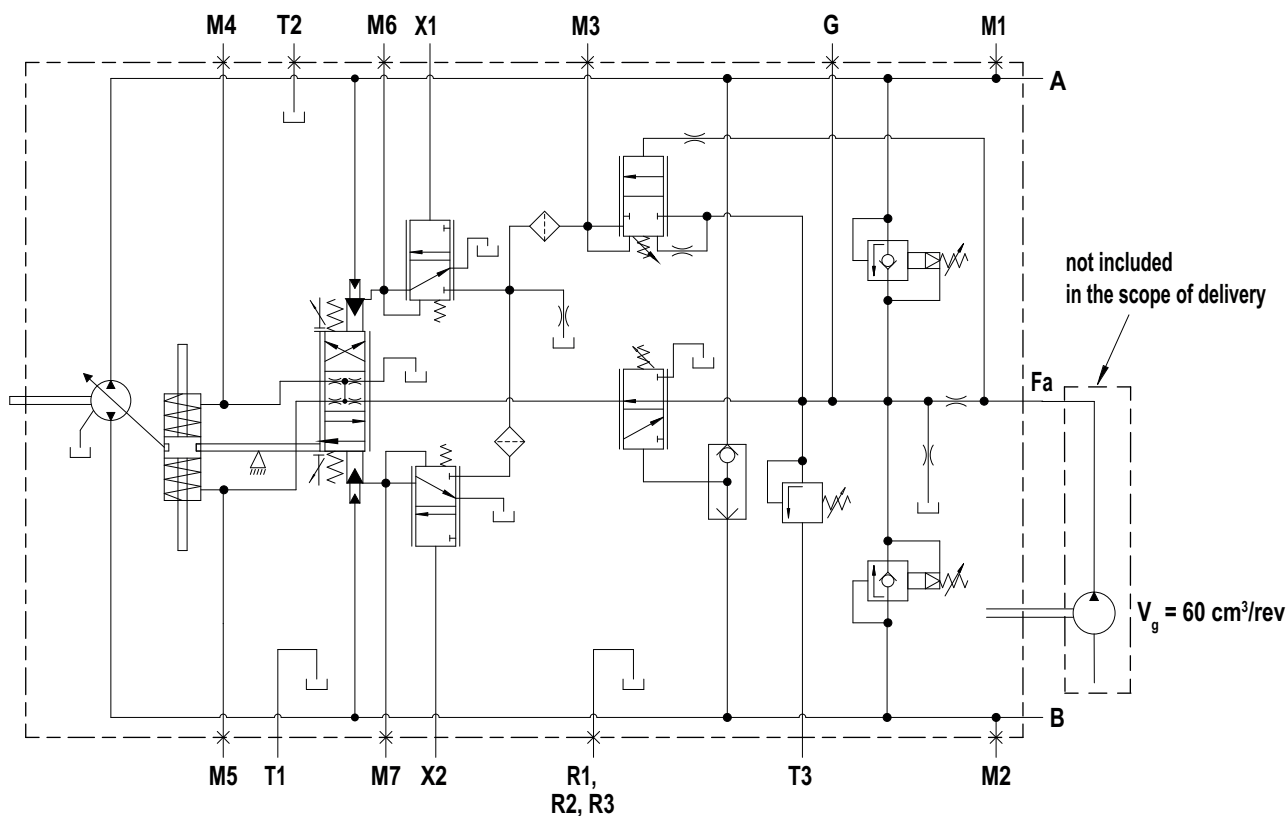


Note

X1 switched, direction of rotation: R = Oil outlet at connection A, L = Oil outlet at connection B
 X2 switched, direction of rotation: R = Oil outlet at connection B, L = Oil outlet at connection A

3 Activation and control type

3.2.6 DZH-M-DA- control



DB-DPVG-161

X1, X2	Steering pressure connections ISO 9974-1	T3	Return for feed pressure ISO 9974-1
A, B	Working connections SAE J 518	M1, M2	High pressure measuring connections ISO 9974-1
R1, R2, R3	Vent connection ISO 9974-1	M4, M5	Adjusting pressure measuring connections ISO 9974-1
G	Pressure connection for auxiliary circuits ISO 9974-1	M3, M6, M7	Steering pressure measuring connections ISO 9974-1
T1, T2	Leakage oil connections ISO 9974-1	Fa	Filter output ISO 9974-1

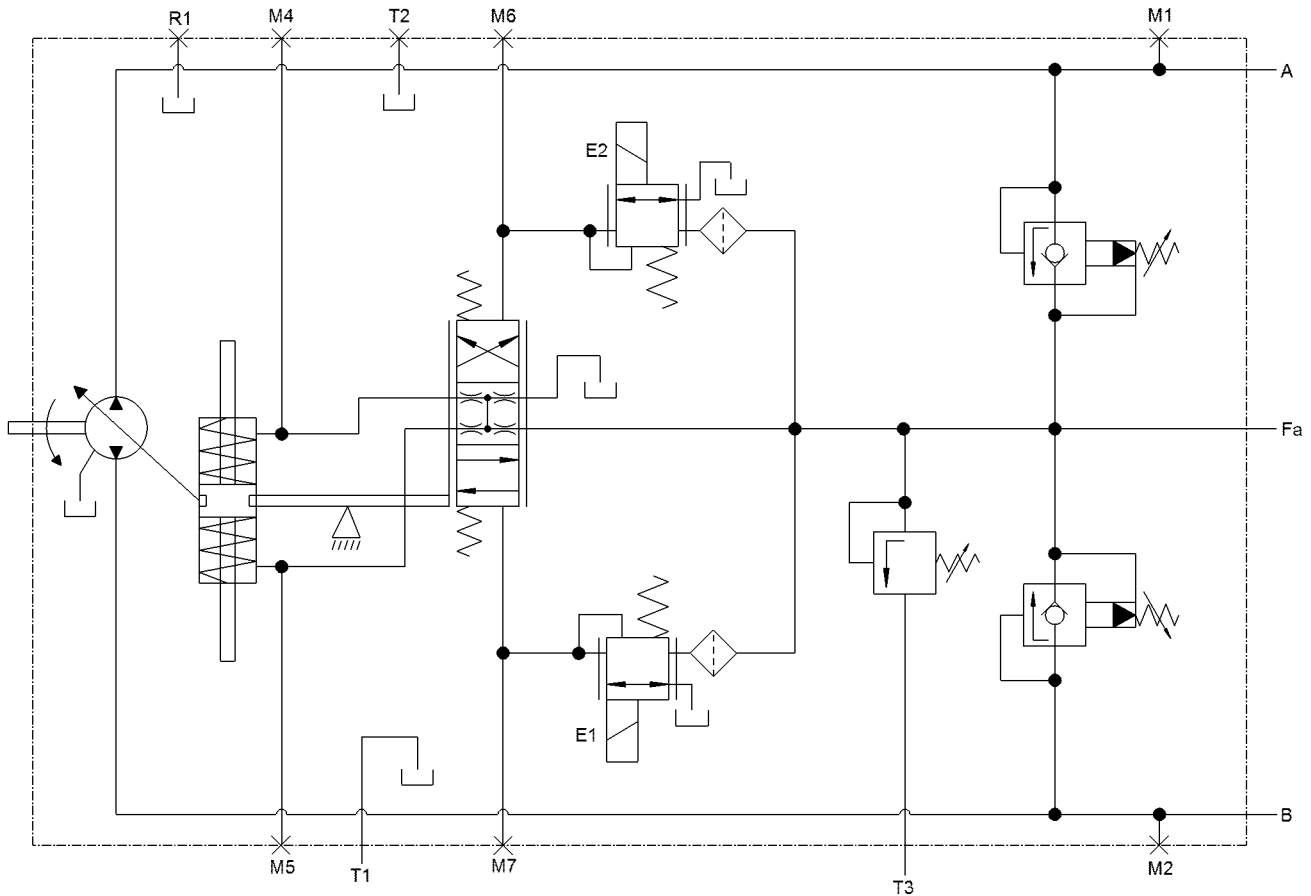


Note

X1 switched, direction of rotation: R = Oil outlet at connection B, L = Oil outlet at connection A
 X2 switched, direction of rotation: R = Oil outlet at connection A, L = Oil outlet at connection B

3 Activation and control type

3.2.7 EL- control



HF2-DB-016

A, B	Working connections SAE J 518	T3	Return for feed pressure ISO 9974-1
R1	Vent connection ISO 9974-1	M1, M2	High pressure measuring connections ISO 9974-1
Fa	Feed pressure connection ISO 9974-1	M4, M5	Adjusting pressure measuring connections ISO 9974-1
T1	Leakage oil connection ISO 9974-1	M6, M7	Steering pressure measuring connections ISO 9974-1
E1, E2	Pressure control valve, AMP Junior Timer plug-in terminal, 2-pin, PWM= 100 Hz, Un= 24V, Imax.= 750 mA	T2	Oil drain ISO 9974-1

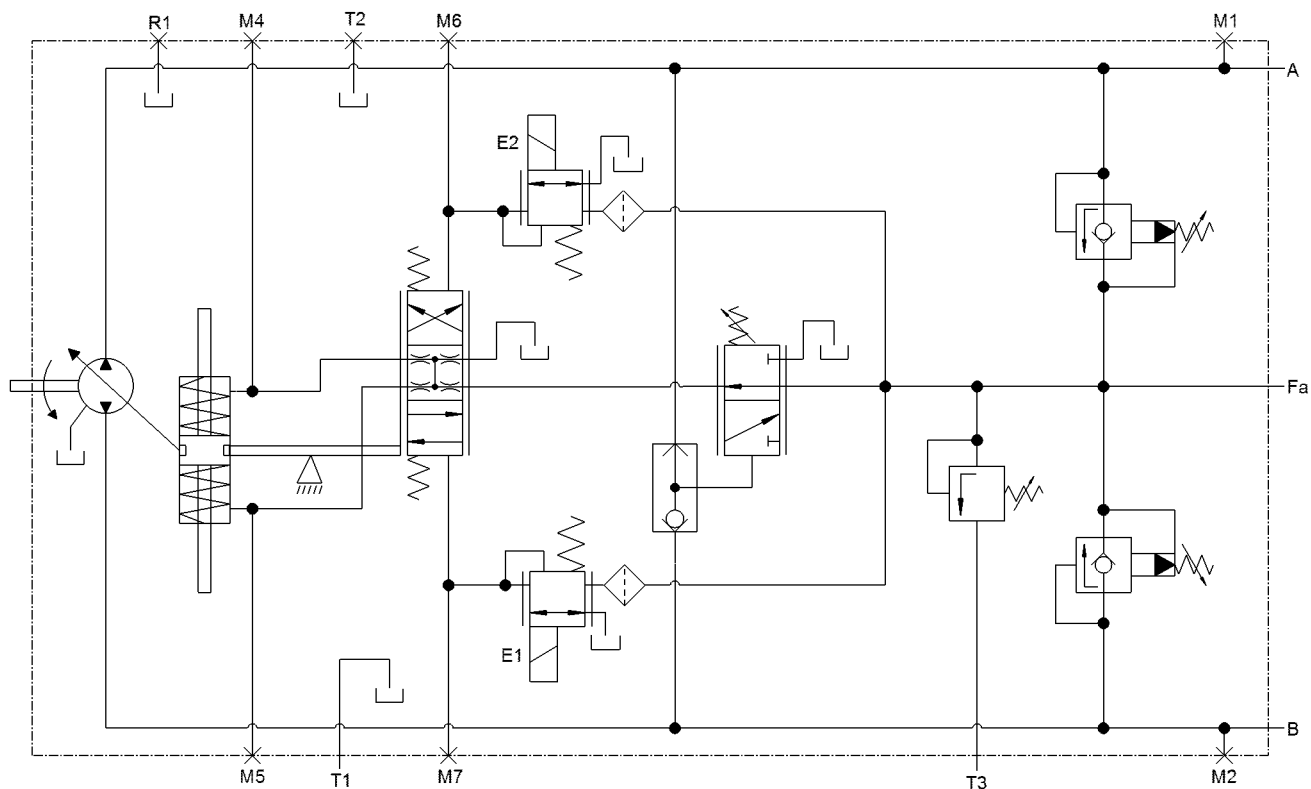


Note

Magnet E1 switched, direction of rotation: R = Oil outlet at connection A, L = Oil outlet at connection B
 Magnet E2 switched, direction of rotation: R = Oil outlet at connection B, L = Oil outlet at connection A

3 Activation and control type

3.2.8 EL-DA- control



HF2-DB-017

A, B	Working connections SAE J 518	T3	Return for feed pressure ISO 9974-1
R1	Vent connection ISO 9974-1	M1, M2	High pressure measuring connections ISO 9974-1
Fa	Feed pressure connection ISO 9974-1	M4, M5	Adjusting pressure measuring connections ISO 9974-1
T1	Flushing connection ISO 9974-1	M6, M7	Steering pressure measuring connections ISO 9974-1
E1, E2	Pressure control valve, AMP Junior Timer plug-in terminal, 2-pin, PWM= 100 Hz, Un= 24V, Imax.= 750 mA	T2	Tank connection ISO 9974-1

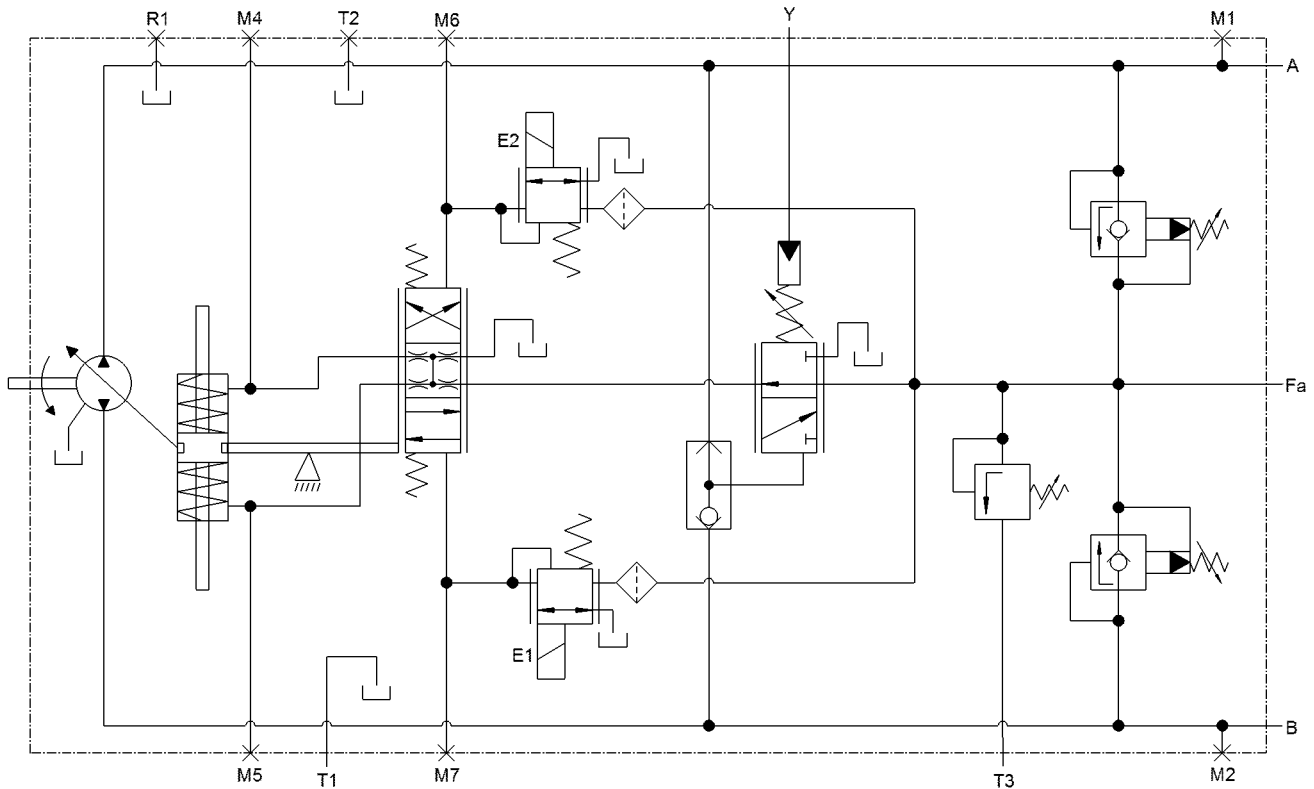


Note

Magnet E1 switched, direction of rotation: R = Oil outlet at connection A, L = Oil outlet at connection B
 Magnet E2 switched, direction of rotation: R = Oil outlet at connection B, L = Oil outlet at connection A

3 Activation and control type

3.2.9 EL-DA1- control



HF2-DB-026

A, B	Working connections SAE J 518	M4, M5	Adjusting pressure measuring connections ISO 9974-1
R1	Vent connection ISO 9974-1	M6, M7	Steering pressure measuring connections ISO 9974-1
Fa	Feed pressure connection ISO 9974-1	Y	DA1 override signal ISO 9974-1
T1, T2	Tank connection ISO 9974-1	-	-
E1, E2	Pressure control valve, AMP Junior Timer plug-in terminal, 2-pin, PWM= 100 Hz, Un= 24V, Imax.= 750 mA	T3	Return for feed pressure ISO 9974-1
E5	Rotation angle sensor to ISP ID.No. 11118356 Connector 3-pin, DT04-3P Deutsch Co.	M1, M2	High pressure measuring connections ISO 9974-1

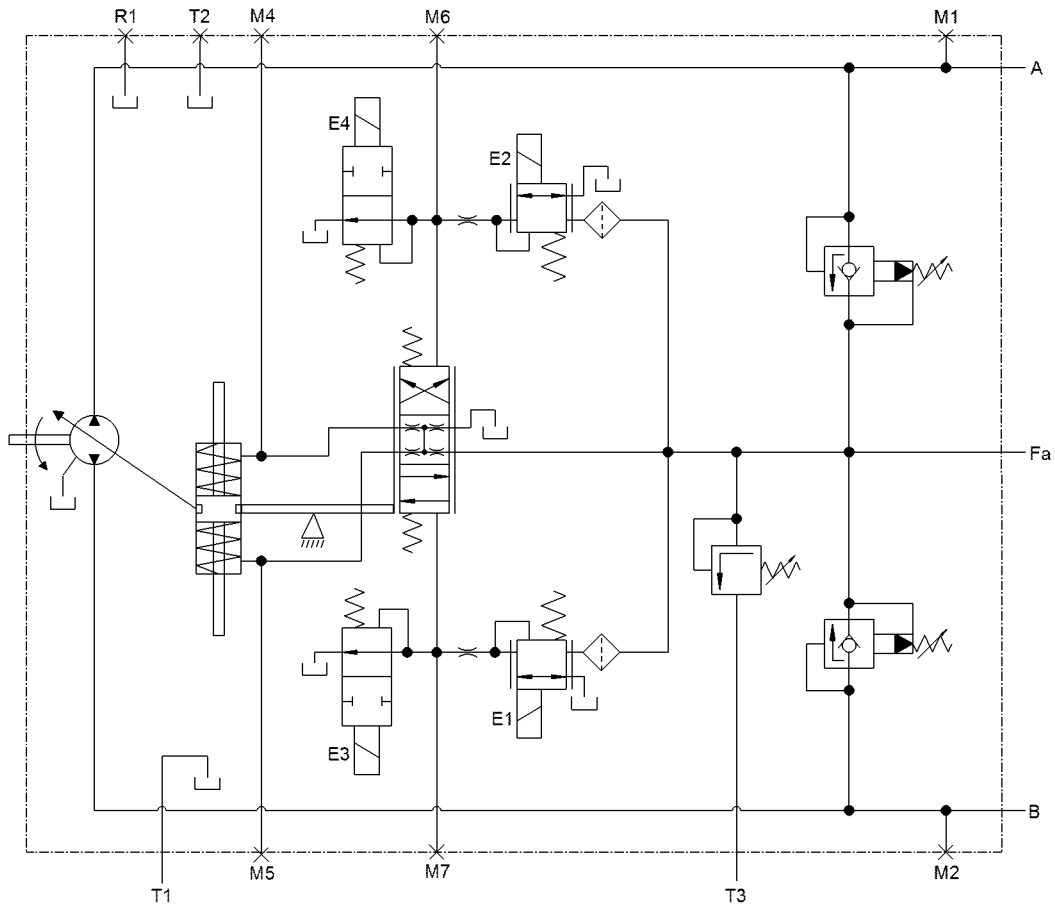


Note

Magnet E1 switched, direction of rotation: R = Oil outlet at connection B, L = Oil outlet at connection A
Magnet E2 switched, direction of rotation: R = Oil outlet at connection A, L = Oil outlet at connection B

3 Activation and control type

3.2.10 ELS- control



HF2-DB-027

A, B	Working connections SAE J 518	M4, M5	Adjusting pressure measuring connections ISO 9974-1
R1	Vent connection ISO 9974-1	M6, M7	Steering pressure measuring connections ISO 9974-1
Fa	Feed pressure connection ISO 9974-1	-	-
E1, E2	Pressure control valve, AMP Junior Timer plug-in terminal, 2-pin, PWM= 100 Hz, Un= 24V, I _{max.} = 750 mA	T1, T2	Tank connection ISO 9974-1
E3, E4	Shut-off valve, plug-in terminal: Deutsch connector DT04-2P, IG=0.58 A-100% ED UN=24V, R=25 Ohm	T3	Return for feed pressure ISO 9974-1
E5	Rotation angle sensor to ISP ID.No. 11118356 Connector 3-pin, DT04-3P Deutsch Co.	M1, M2	High pressure measuring connections ISO 9974-1

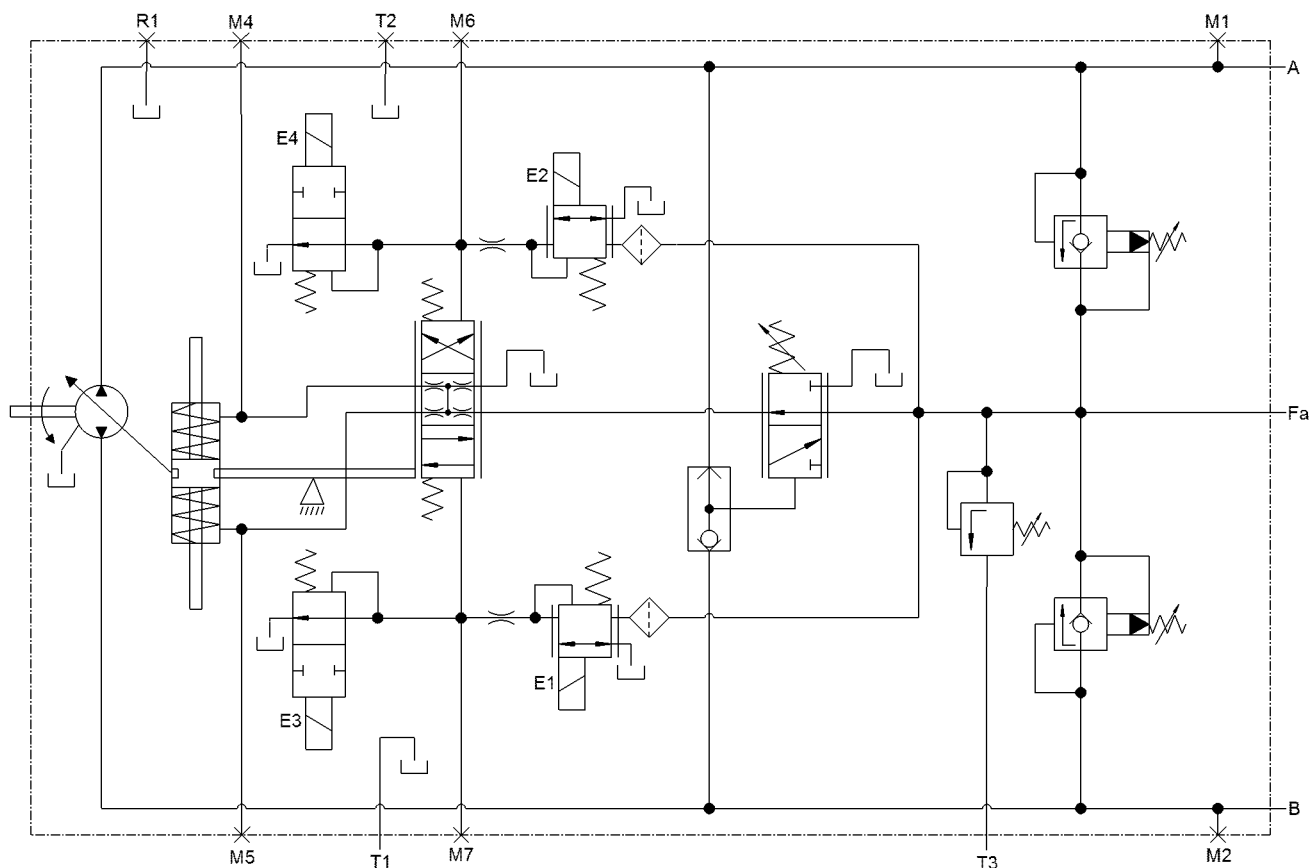


Note

Magnet E1 switched, direction of rotation: R = Oil outlet at connection A, L = Oil outlet at connection B
Magnet E2 switched, direction of rotation: R = Oil outlet at connection B, L = Oil outlet at connection A

3 Activation and control type

3.2.11 ELS-DA- control



HF2-DB-018

A, B	Working connections SAE J 518	M4, M5	Adjusting pressure measuring connections ISO 9974-1
R1	Vent connection ISO 9974-1	M6, M7	Steering pressure measuring connections ISO 9974-1
Fa	Feed pressure connection ISO 9974-1	-	-
E1, E2	Pressure control valve, AMP Junior Timer plug-in terminal, 2-pin, PWM= 100 Hz, Un= 24V, I _{max.} = 750 mA	T1, T2	Tank connection ISO 9974-1
E3, E4	Shut-off valve, plug-in terminal: Deutsch connector DT04-2P, IG=0.58 A-100% ED UN=24V, R=25 Ohm	T3	Return for feed pressure ISO 9974-1
E5	Rotation angle sensor to ISP ID.No. 11118356 Connector 3-pin, DT04-3P Deutsch Co.	M1, M2	High pressure measuring connections ISO 9974-1

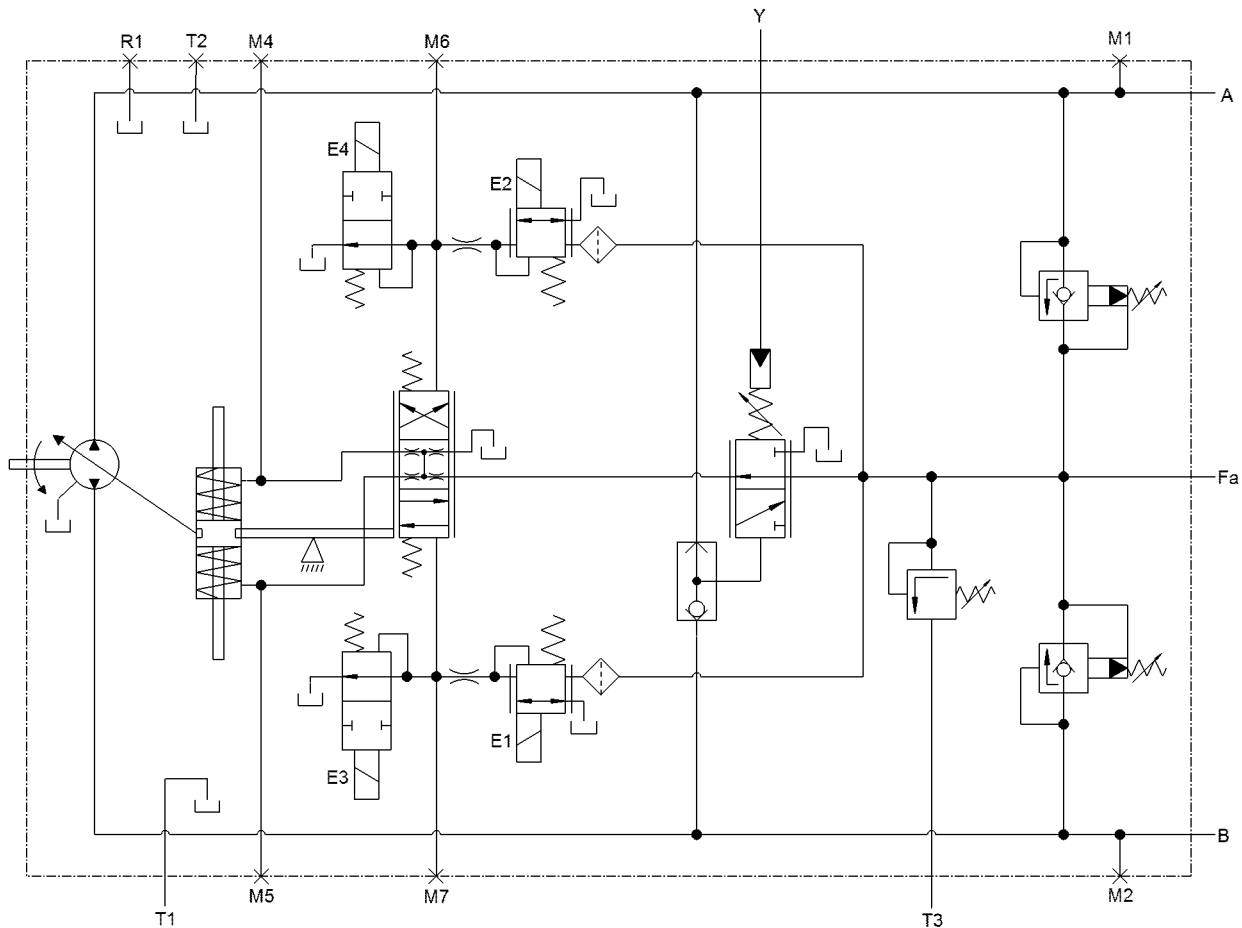


Note

Magnet E1 switched, direction of rotation: R = Oil outlet at connection A, L = Oil outlet at connection B
Magnet E2 switched, direction of rotation: R = Oil outlet at connection B, L = Oil outlet at connection A

3 Activation and control type

3.2.12 ELS-DA1- control



HF2-DB-028

A, B	Working connections SAE J 518	M4, M5	Adjusting pressure measuring connections ISO 9974-1
R1	Vent connection ISO 9974-1	M6, M7	Steering pressure measuring connections ISO 9974-1
Fa	Feed pressure connection ISO 9974-1	Y	DA1 override signal ISO 9974-1
T1, T2	Tank connection ISO 9974-1	M1, M2	High pressure measuring connections ISO 9974-1
E1, E2	Pressure control valve, AMP Junior Timer plug, 2-pin, PWM= 100 Hz, U= 24V, I _{max} .= 750 mA	T3	Return for feed pressure ISO 9974-1
E3, E4	Shut-off valve, plug-in terminal: Deutsch connector DT04-2P, IG=0.585 A-100% ED UN=24V, R=25 Ohm	-	-

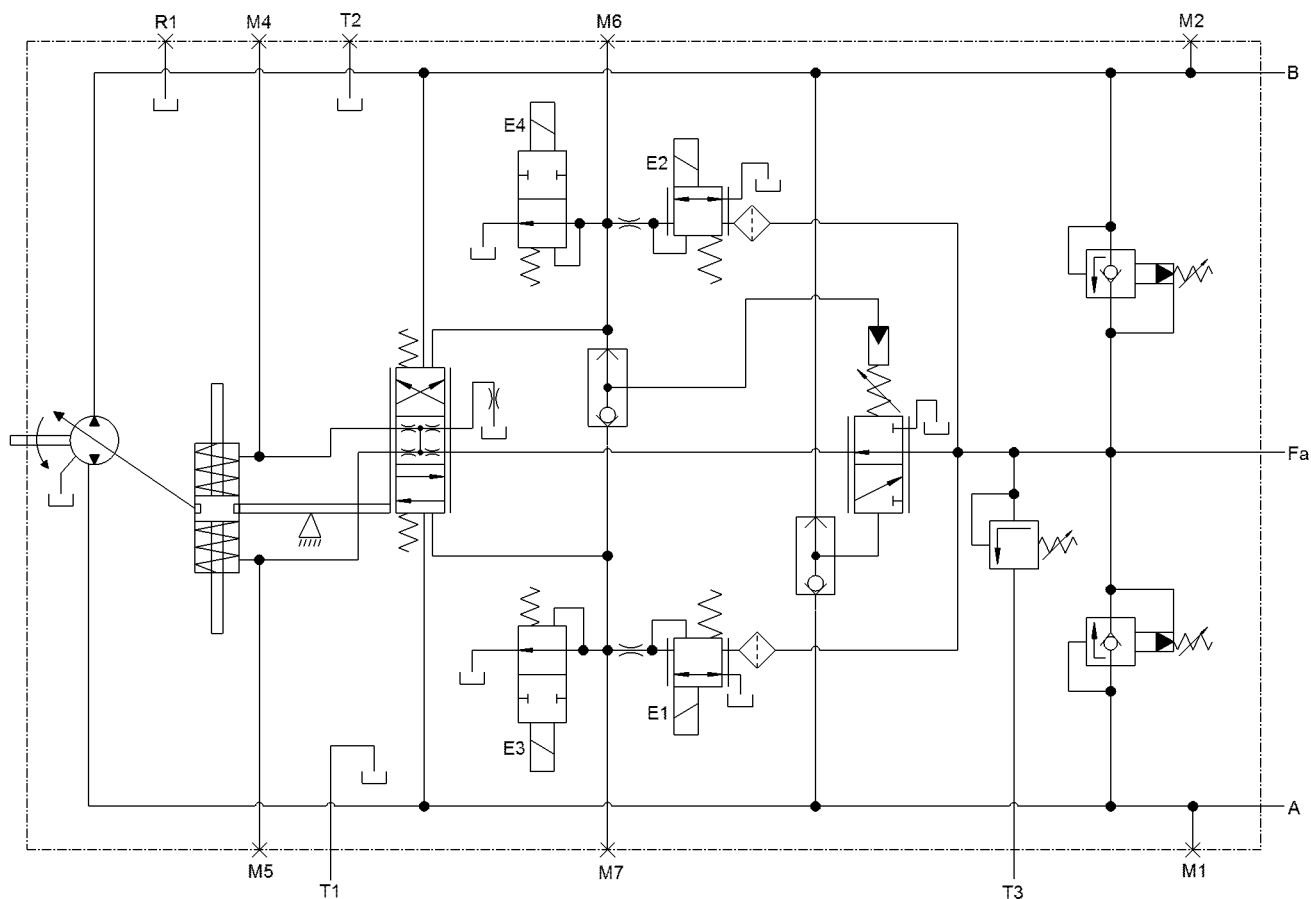


Note

Magnet E1 switched, direction of rotation: R = Oil outlet at connection A, L = Oil outlet at connection B
Magnet E2 switched, direction of rotation: R = Oil outlet at connection B, L = Oil outlet at connection A

3 Activation and control type

3.2.13 TCE- control, anti-clockwise rotation



HF2-DB-019

A, B	Working connections SAE J 518	M1, M2	High pressure measuring connections ISO 9974-1
R1	Vent connection ISO 9974-1	M4, M5	Adjusting pressure measuring connections ISO 9974-1
Fa	Feed pressure connection ISO 9974-1	M6, M7	Steering pressure measuring connections ISO 9974-1
E1, E2	Pressure control valve, AMP Junior Timer plug-in terminal, 2-pin, PWM= 100 Hz, Un= 24V, I _{max.} = 750 mA	T1, T2	Tank connection ISO 9974-1
E3, E4	Shut-off valve, plug-in terminal: Deutsch connector DT04-2P, IG=0.58 A-100% ED UN=24V, R=25 Ohm	T3	Oil return for feed pressure valve ISO 9974-1

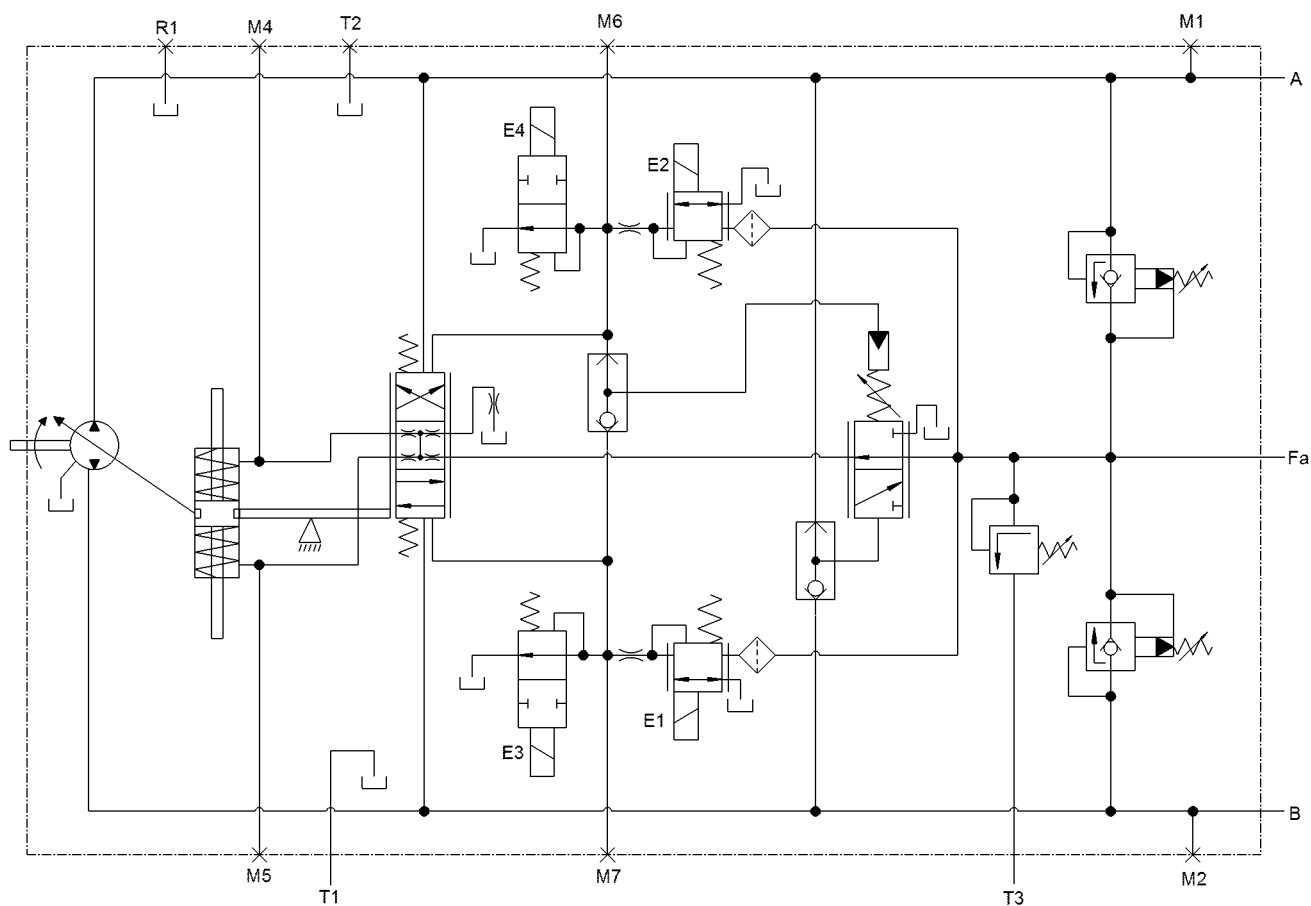


Note

Magnet E1 switched, direction of rotation: L = Oil outlet at connection B
Magnet E2 switched, direction of rotation: L = Oil outlet at connection A

3 Activation and control type

3.2.14 TCE- control, clockwise rotation



HF2-DB-041

A, B	Working connections SAE J 518	M1, M2	High pressure measuring connections ISO 9974-1
R1	Vent connection ISO 9974-1	M4, M5	Adjusting pressure measuring connections ISO 9974-1
Fa	Feed pressure connection ISO 9974-1	M6, M7	Steering pressure measuring connections ISO 9974-1
E1, E2	Pressure control valve, AMP Junior Timer plug-in terminal, 2-pin, PWM= 100 Hz, Un= 24V, I _{max.} = 750 mA	T1, T2	Tank connection ISO 9974-1
E3, E4	Shut-off valve, plug-in terminal: Deutsch connector DT04-2P, IG=0.58 A-100% ED UN=24V, R=25 Ohm	T3	Oil return for feed pressure valve ISO 9974-1

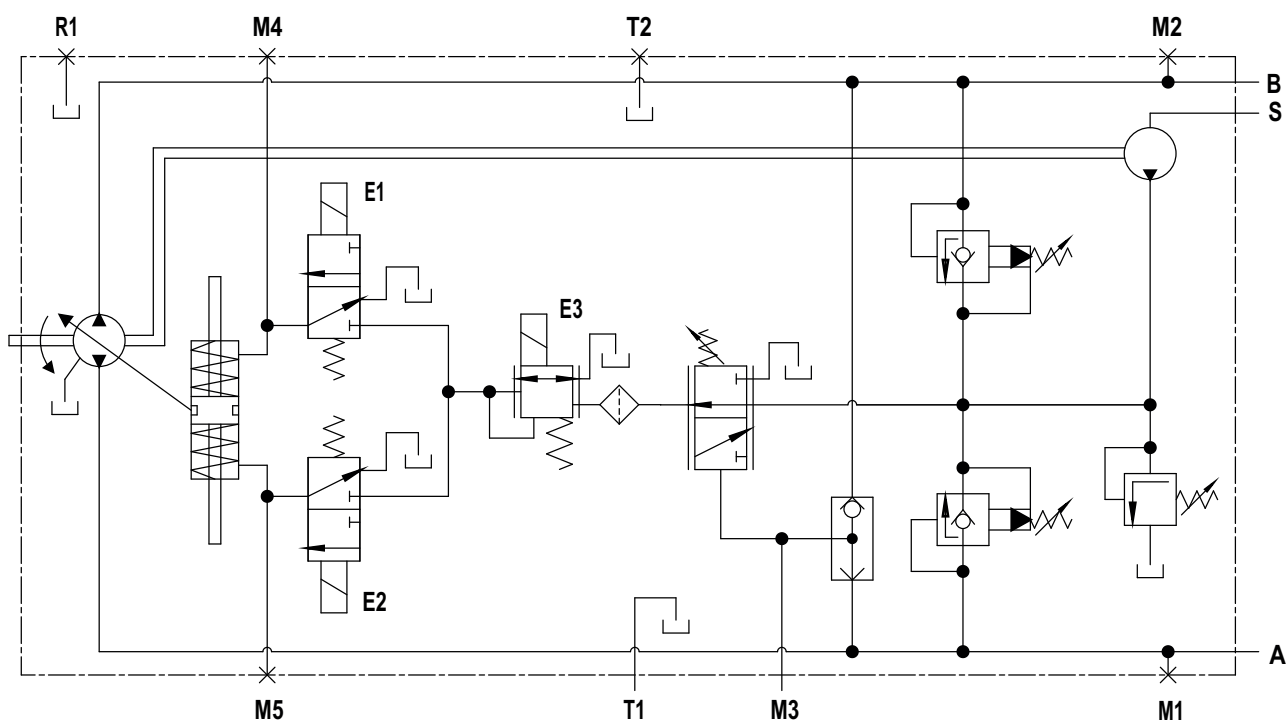


Note

Magnet E1 switched, direction of rotation: R = Oil outlet at connection A
 Magnet E2 switched, direction of rotation: R = Oil outlet at connection B

3 Activation and control type

3.2.15 DS-DA- control



DPVG-DB-110

A, B	Working connections SAE J 518	T1, T2	Tank connection ISO 9974-1
R1	Vent connection ISO 9974-1	S	Suction port ISO 9974-1
E1, E2	Switching valve, Deutsch plug-in terminal DT04-2P, IG=0.58 A-100% ED UN=24V, R=25 Ohm	M1, M2, M3	High pressure measuring connections ISO 9974-1
E3	Pressure control valve, Deutsch plug-in terminal DT04-2P, PWM = 100 Hz, UN=24V, I _{max} = 750 mA	M4, M5	Adjusting pressure measuring connections ISO 9974-1

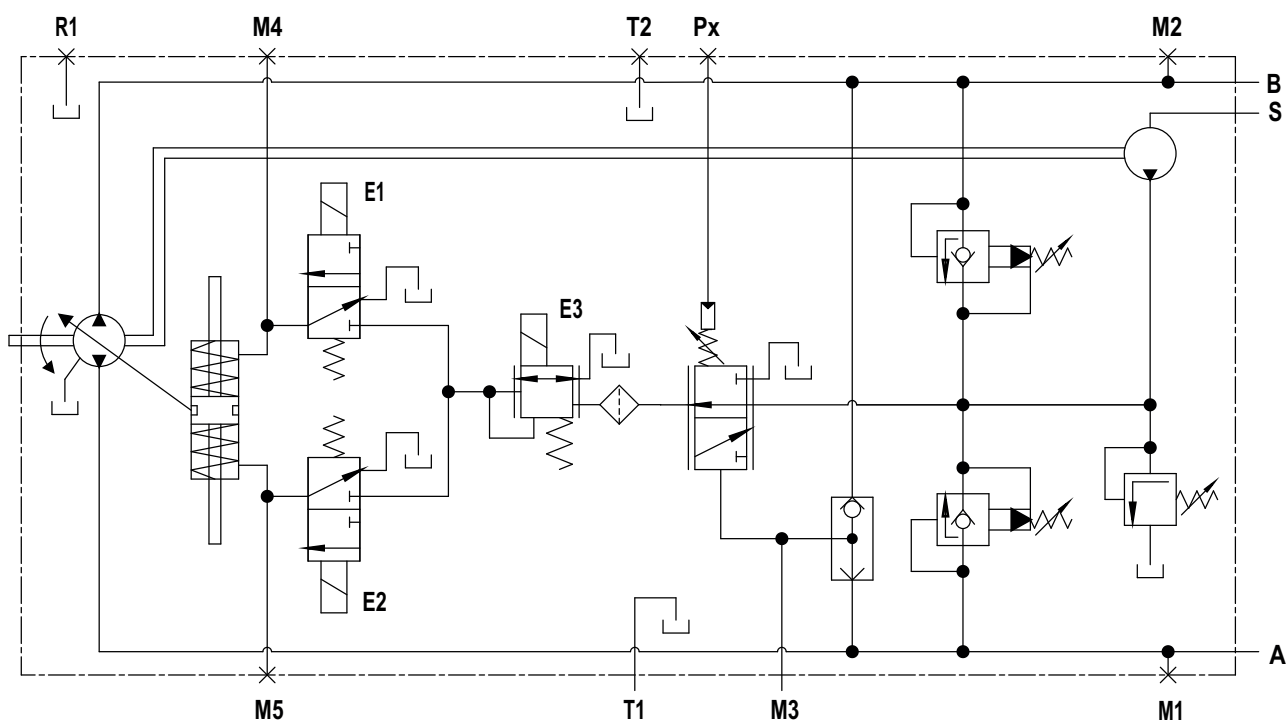


Note

Magnet E1 switched, direction of rotation: L = Oil outlet at connection A
 Magnet E2 switched, direction of rotation: L = Oil outlet at connection B

3 Activation and control type

3.2.16 DS-DA1- control



DPVG-DB-112

A, B	Working connections SAE J 518	S	Suction port ISO 9974-1
R1	Vent connection ISO 9974-1	M1, M2, M3	High pressure measuring connections ISO 9974-1
E1, E2	Switching valve, Deutsch plug-in terminal DT04-2P, IG=0.58 A-100% ED UN=24V, R=25 Ohm	M4, M5	Adjusting pressure measuring connections ISO 9974-1
E3	Pressure control valve, Deutsch plug-in terminal DT04-2P, PWM = 100 Hz, UN=24V, I _{max} = 750 mA	Px	DA1 override signal ISO 9974-1
T1, T2	Tank connection ISO 9974-1	-	-



Note

Magnet E1 switched, direction of rotation: L = Oil outlet at connection A
 Magnet E2 switched, direction of rotation: L = Oil outlet at connection B

3 Activation and control type

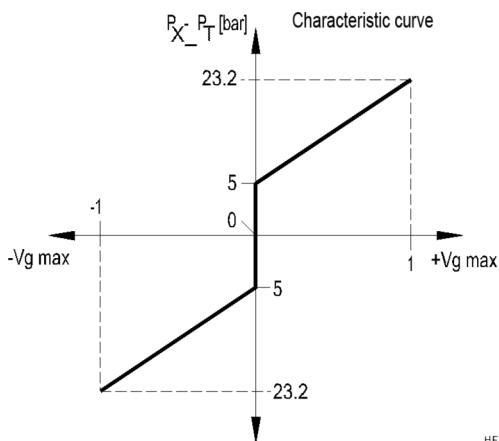
3.3 Control functions

- SD- function / steering-pressure proportional hydraulic regulation, [see chapter 3.3.1](#)
- DA- function / pressure cut-off, [see chapter 3.3.2](#)
- DA1- function / pressure cut-off with override, [see chapter 3.3.3](#)
- TCH- function / hydraulically activated torque control with pressure cut-off, [see chapter 3.3.4](#)
- DZH- function / hydraulically controlled speed regulation with mechanical stroke limitation and with pressure cut-off, [see chapter 3.3.4](#)
- EL- function / electro-proportional regulation, [see chapter 3.3.6](#)
- ELS- function / electro-proportional regulation with safety valve, [see chapter 3.3.7](#)
- TCE- function / electrically activated torque control with pressure cut-off, [see chapter 3.3.8](#)
- DS- function / direct control, [see chapter 3.3.9](#)

3.3.1 SD- function

SD- control is suitable for applications which require a proportionally controlled volume flow.

Characteristic



HF2-DB-029

By adjusting the drive from $V_{g \text{ min}}$ towards $V_{g \text{ max}}$, the pump swivels to a larger displacement volume V_g with increasing SD- steering pressure at X1 / X2.

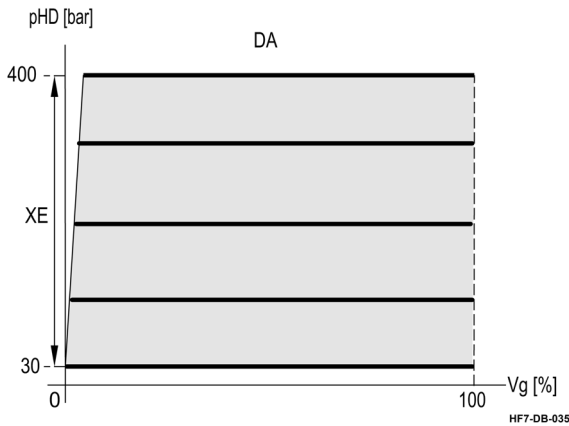
If X1 / X2 is activated, the spool moves in the control unit. By means of mechanical transmission via an adjusting lever, the deflection directly leads to the swivel yoke / pan-tilt, for pivoting the swivel yoke / pan-tilt against the spring force of the return springs, in $V_{g \text{ max}}$ direction.

If the activating signal at X1 / X2 is weakening, missing or defective, the pump swivels towards $V_{g \text{ min}}$.

3 Activation and control type

3.3.2 DA- function

Characteristic



The DA pressure control ensures that the minimization or limitation of the volume flow of the axial piston unit upon reaching a permanently set high pressure value pHD. Swivelling in the direction of $V_{g \min}$ protects the hydraulic system from damage and overload.

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

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

XE setting range approx. 30 - 400 bar.

Options

- Additional internal design measures for vibration damping on request.
- Pressure cut-off with override function: [see chapter 3.3.3](#)

3.3.3 DA1- function

In the closed circuit, the override function DA1 corresponds to a two-stage pressure cut-off with two pressure stages.

- Pressure stage 1, e.g.: 250 bar, or
- Pressure stage 2, e.g.: 400 bar

The DA1- function on the DA- axle in the pressure control has the task of overriding the set DA- cut-off pressure of pressure stage 1 (e.g. 250 bar) via an externally supplied steering pressure pY-pT at port Y and thereby increasing the high pressure to the set DA- cut-off pressure of pressure stage 2 (e.g. to 400 bar).

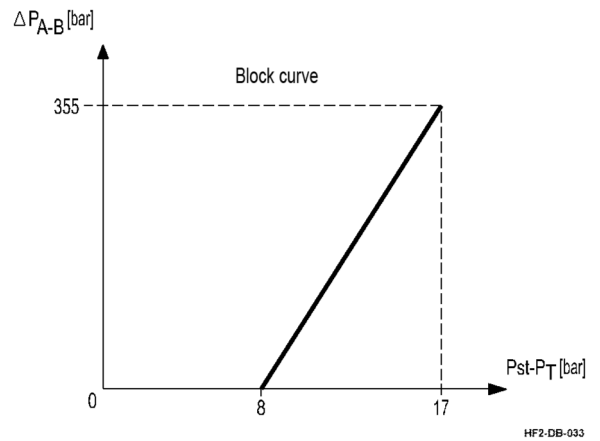
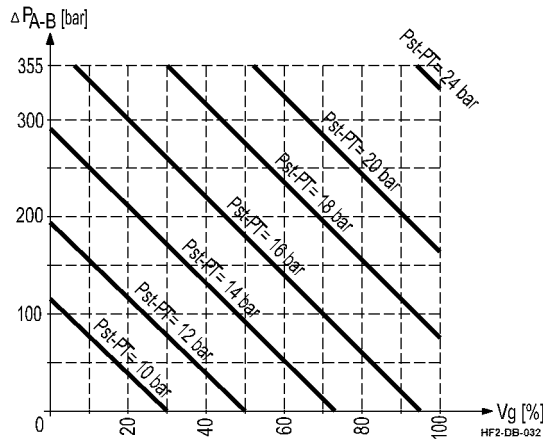
It is therefore suitable for systems or devices that need a controlled way to increase torque or are subject to a multiple use. Examples are working hydraulics in wheeled excavators and their driving hydraulic system.

3 Activation and control type

3.3.4 TCH- function

In the TCH function, the displacement volume V_g of the hydraulic pump can be set in several stages dependent on the steering pressure at X1 / X2- (pst-pT) and proportional to the high pressure pHD. In this manner, constant rotational speeds of the rotary ring are realized, while at the same time being able to limit the maximum power consumption.

Characteristic



With increasing steering pressure at X1 / X2, the hydraulic pump swivels in the direction $V_{g \max}$ and at the same time with increasing pressure difference ΔP_{A-B} it swivels in the direction $V_{g \min}$. (See diagram)

The respective high pressure is fed back to the pilot control valve and counteracts the control signal.

When the drive is stationary, the pressure differential ΔP_{A-B} can be established in the system in proportion to the control signal at X1 / X2, e.g. to hold a superstructure when working on a slope. (See block curve)

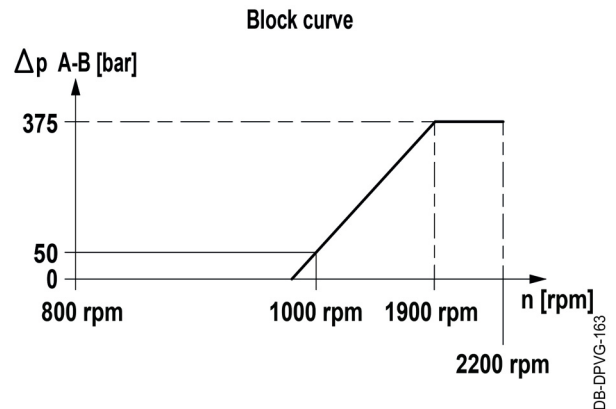
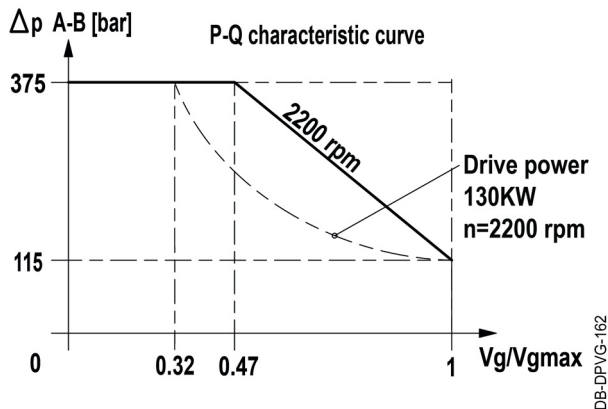
The TCH function is combined with the DA function (see chapter 3.3.2) and is particularly suitable for e.g. turntable controls.

3 Activation and control type

3.3.5 DZH- function

Depending on the drive speed, the steering pressure is generated continuously in proportion to the speed.

Characteristic



The generated volume of the feed pump flows through a measuring orifice via the "FA" port.

A "delta p" pressure is generated at this measuring orifice, which is reported to the pressure booster. This booster translates this into a steering pressure which is proportional to the "delta p" at the measuring orifice and therefore also proportional to the speed.

When steering pressure is applied to the piston of the servo control, the pump swivels out proportionally. An increasing drive speed produces a larger swivel angle.

The operating pressure acts on the servo control via the pistons and causes the pump to swivel back. An increasing operating pressure produces a smaller swivel angle.

The applied operating pressure thereby counteracts the applied speed-dependent steering pressure. This provides the speed-dependent pressure control (block curve).

In combination with this, a constant-torque control is imposed via the depression of the diesel speed.

The start-up speed is reached when the steering pressure overcomes the preload force of the pressure spring via the piston.

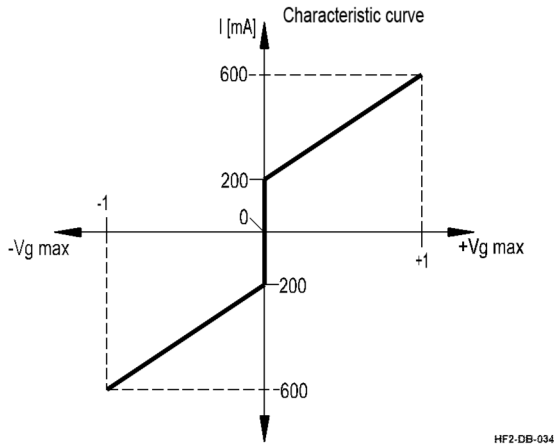
The direction of travel can be selected using the 3/2-way valves. These two valves simultaneously reduce the steering pressure at the piston proportionally depending on the steering pressure at port X1 or X2.

This results in the pump swivelling back when the speed is high (for inching function and deceleration on coasting).

3 Activation and control type

3.3.6 EL- function

Characteristic



For the EL function, the displacement volume V_g of the axial piston unit is adjusted proportionally and continuously via an electromagnet.

The EL function is subordinate to the DA function, i.e. the control-current-dependent EL function is only executed below the set value for the pressure cut-off.

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 control current = I at the proportional magnet DRE.

If E1 / E2 is activated, the spool moves in the control unit. By means of mechanical transmission via an adjusting lever, the deflection directly leads to the swivel yoke / pan-tilt, for pivoting the swivel yoke / pan-tilt against the spring force of the return springs, in $V_{g \max}$ direction.

The hydraulic fluid required for this purpose is taken from high pressure pHD. At high pressure pHD < 30 bar, the Fa port must be supplied with a feed pressure of approx. 30 bar to ensure that regulation is possible.

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

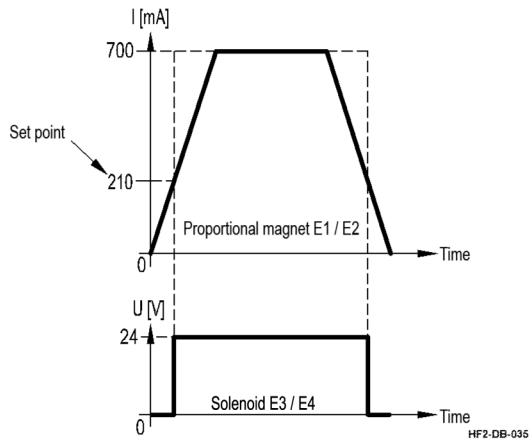
Options

- Safety function: [see chapter 3.3.7](#)

3 Activation and control type

3.3.7 ELS- function

Characteristic



If the current consumption at the proportional magnet DRE exceeds a defined value (for example, 210 mA), a solenoid E3 / E4 is additionally supplied with voltage and closes a channel against tank pressure p_T in the respective shut-off valve. This process is repeated with each activation of the proportional magnet DRE.

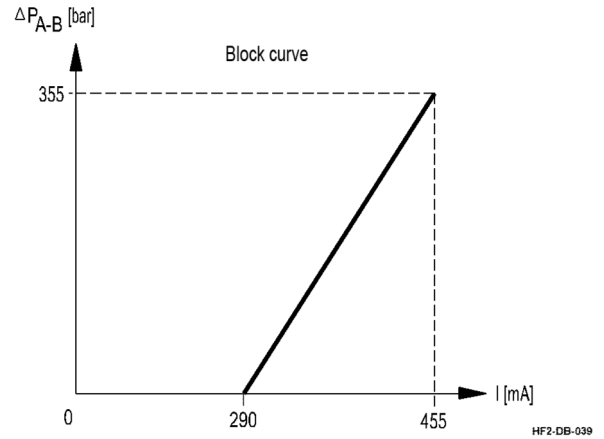
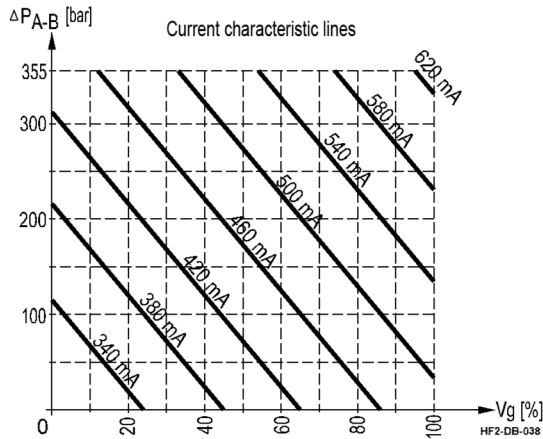
In case of a damage of the proportional magnet (for example, clamping caused by abrasion), the solenoid E3 / E4 is de-energized by switching off the control current I at E1 / E2 by the machine operator, and the channel to the tank pressure p_T opens in the respective shut-off valve, and the steering pressure is relieved. The axial piston unit pivots in direction $V_{g \min}$.

3 Activation and control type

3.3.8 TCE- function

In the TCE function, the displacement volume V_g of the hydraulic pump can be set in several stages dependent on the control current I [mA] and proportionally to the high pressure pHD. In this manner, constant rotational speeds of the rotary ring are realized, while at the same time being able to limit the maximum power consumption.

Characteristic



The hydraulic pump swivels with increasing control current I [mA] at the DRE- proportional magnet E1 / E2 in the $V_{g \max}$ direction and at the same time, it pivots with increasing pressure difference ΔP_{A-B} in the direction $V_{g \min}$. (See diagram)

The respective high pressure is fed back to the pilot control valve and counteracts the control signal.

When the drive is stationary, one can establish the pressure difference ΔP_{A-B} in the system in proportion to the control current I [mA] at the DRE- proportional magnet E1 / E2, for holding the superstructure when working on a slope. (See block curve)

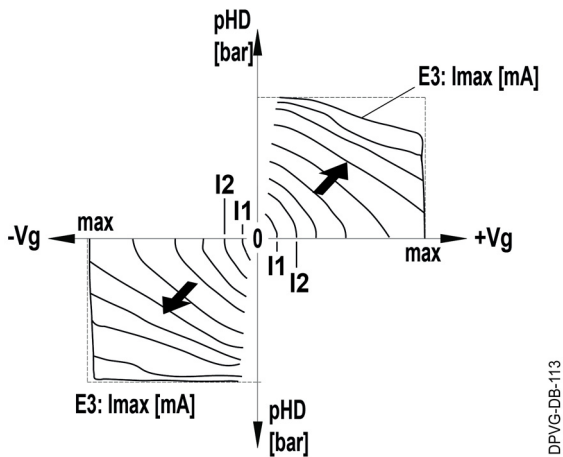
The TCE function is combined with the DA function (see chapter 3.3.2) and is particularly suitable e.g. for turntable controls.

3 Activation and control type

3.3.9 DS- function

In the DS function, the displacement volume V_g of the hydraulic pump can be set continuously in each flow direction. The displacement volume V_g of the hydraulic pump is influenced by the current at the proportional magnet E3, the system pressure, and the pump drive speed.

Characteristic



Depending on the activation at E1 or E2, the hydraulic fluid outlet is at working connection A or B.



Note

Magnet E1 switched, direction of rotation: L = Oil outlet at connection A
Magnet E2 switched, direction of rotation: L = Oil outlet at connection B

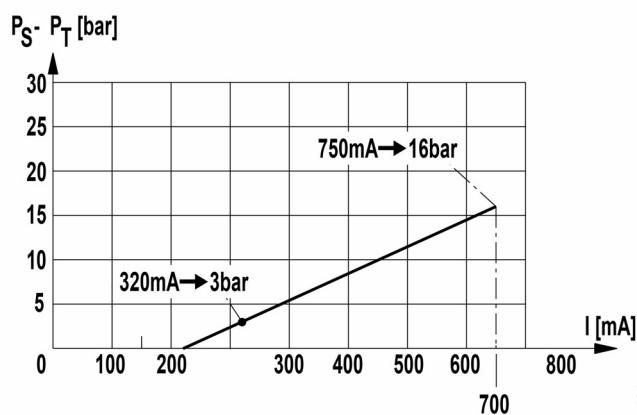
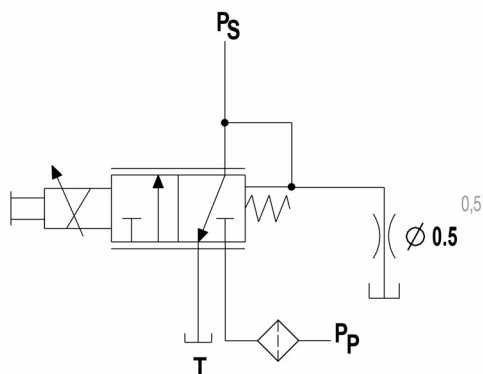
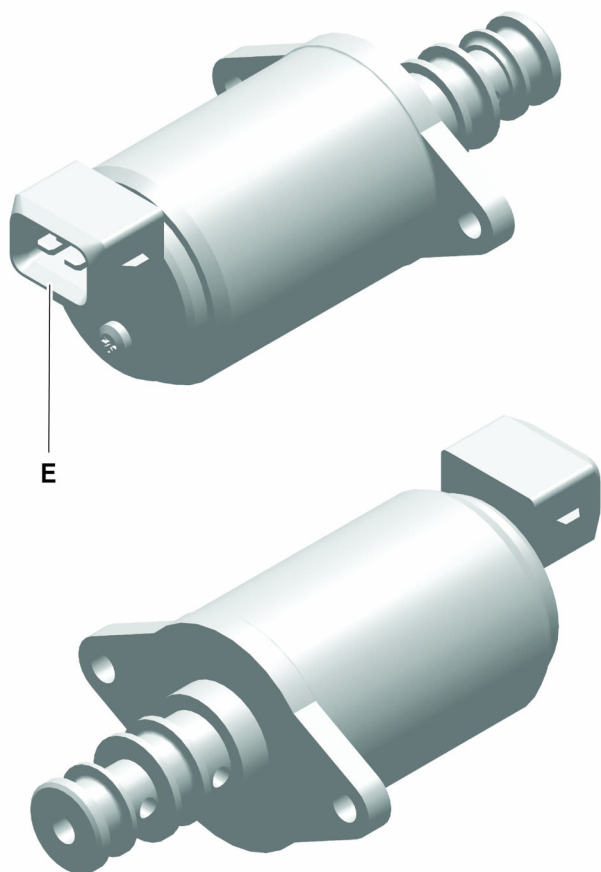
As the current at E3 increases, the hydraulic pump flow rate increases as well.
As the system pressure increases, the hydraulic pump flow rate decreases.
As the pump drive speed increases, the hydraulic pump flow rate increases.

The DS function is combined with the DA function ([see chapter 3.3.2](#)) and is particularly suitable for e.g. travel drives.

3 Activation and control type

3.4 Electrical components

3.4.1 Pressure control valve (DRE) variant 1



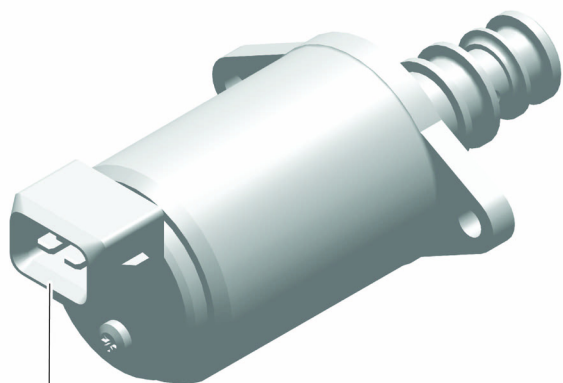
T	Tank	PS	Output DRE
PP	Input DRE	E	Connection AMP Junior Timer

General information

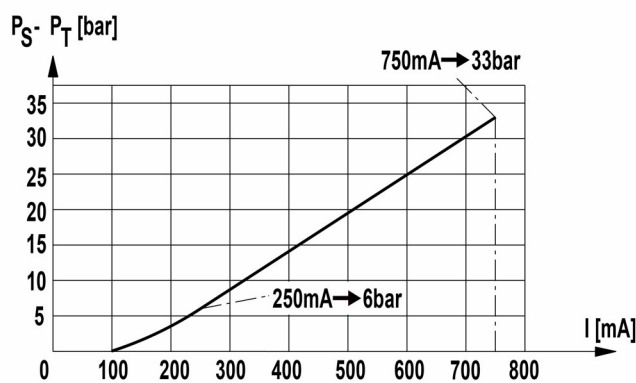
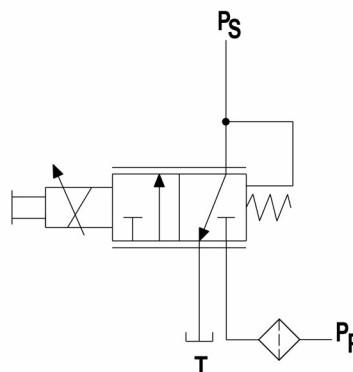
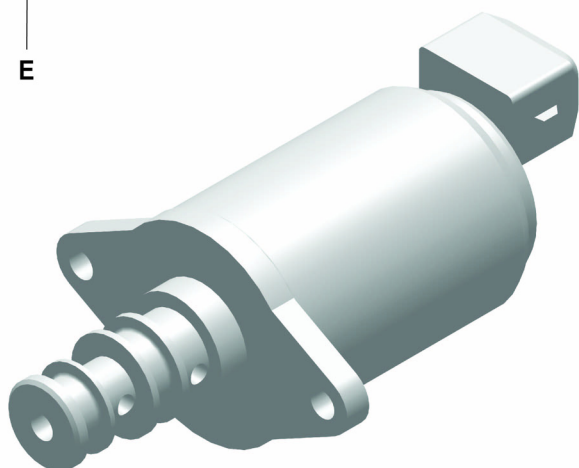
Technical data of pressure control valve	
Rated voltage U	24 V
Current I_{max}	750 mA
Supply pressure p_{max}	50 bar
Magnet characteristic curve: flat around the regulating position	-
AMP JUNIOR TIMER plug-in terminal, 2-pin	-

3 Activation and control type

3.4.2 Pressure control valve (DRE) variant 2



E



031 UNBERT 1.04

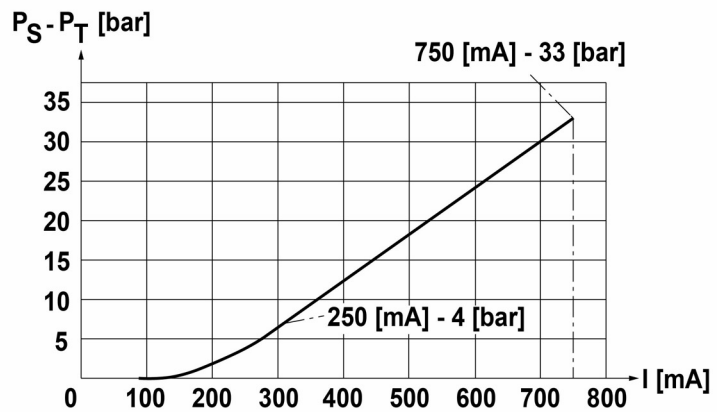
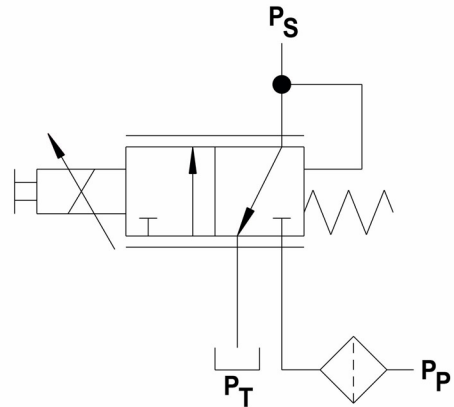
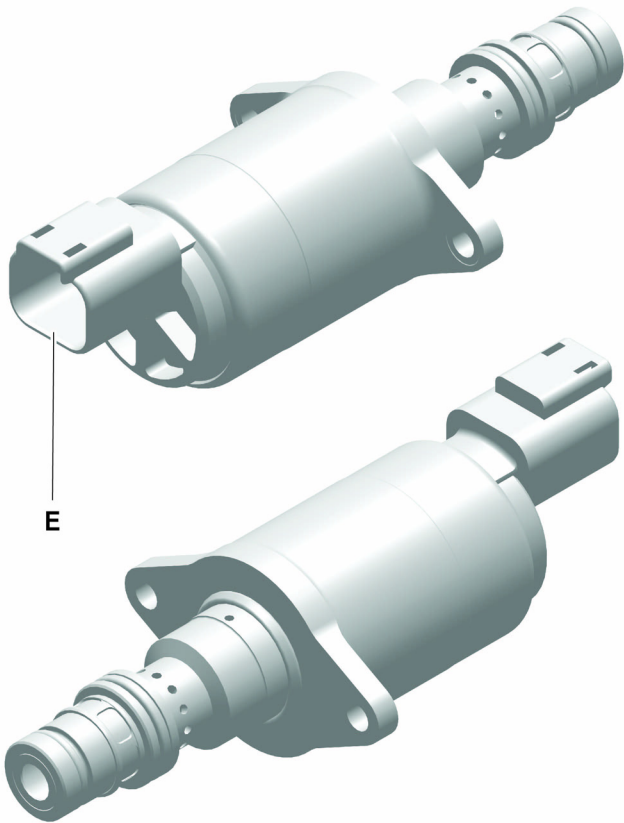
T	Tank	PS	Output DRE
PP	Input DRE	E	Connection AMP Junior Timer

General information

Technical data of pressure control valve	
Rated voltage U	24 V
Current I _{max.}	750 mA
Supply pressure p _{max.}	350 bar
Magnet characteristic curve: flat around the regulating position	-
AMP Junior Timer plug-in terminal	-

3 Activation and control type

3.4.3 Pressure control valve (DRE) variant 3



DPVG-DB-109

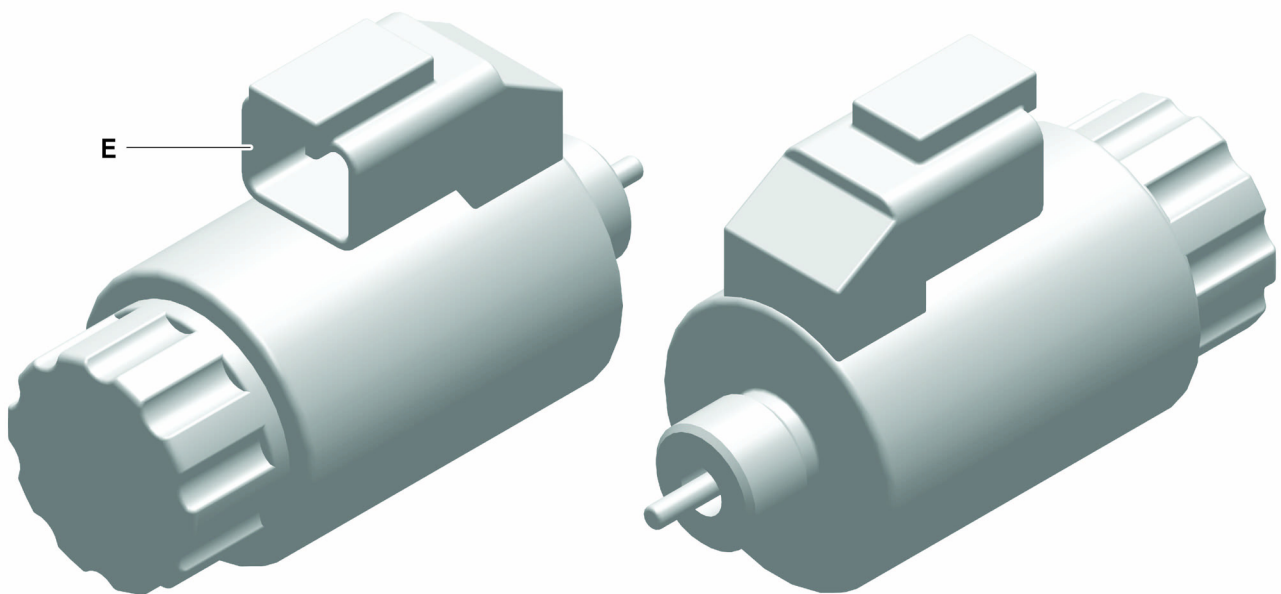
E	Deutsch plug-in terminal DT04-2P	PS	Output DRE
PT	Tank	PP	Input DRE

General information

Technical data of pressure control valve	
Rated voltage U	24 V
Current I _{max.}	750 mA
Supply pressure p _{max.}	50 bar
Magnet characteristic curve: flat around the regulating position	-
Deutsch plug-in terminal DT04-2P	-

3 Activation and control type

3.4.4 Solenoid (safety function)



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E	Deutsch plug-in terminal DT04-2P	-	-
---	----------------------------------	---	---

General information

Technical data - solenoid	
Rated voltage U	24 V
Current I _{max.}	585 mA
Resistor	25 Ω
Deutsch plug-in terminal DT04-2P	-

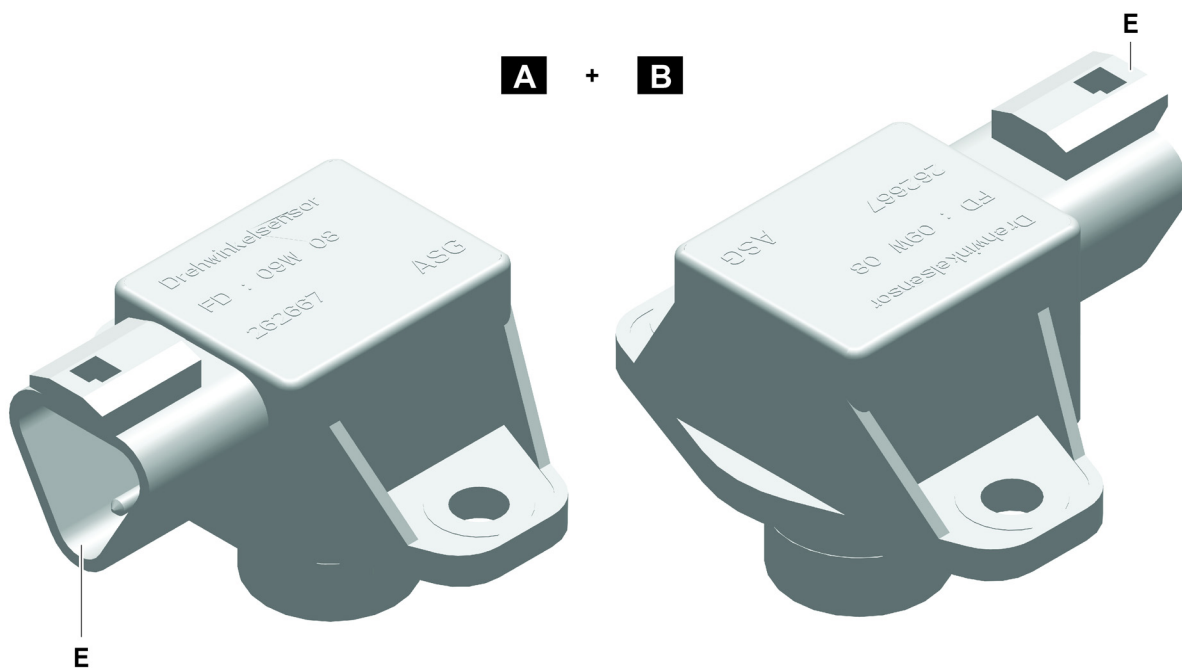
3 Activation and control type

3.4.5 Sensors

DPV	G		/	000		1				A	O				
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



DB-V-002

Technical data			
Option A		Option B	
Rated voltage U	5 V	Rated voltage U	8-30 V
Measuring range	-27° to +27°	Measuring range	-27° to +27°
Output signal		Output signal	
-27°	0.5 VDC	-27°	4 mA
0°	2.5 VDC	0°	12 mA
+27°	4.5 VDC	+27°	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 DPVG. Dimensions for variants 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, along with its installation position, must be coordinated with Liebherr at the conceptual design stage of the axial piston unit and must be approved by Liebherr.

ATTENTION



Lack of lubrication on the hydraulic product!

Damage of 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](#))

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](#))

4 Installation conditions

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.

4.1.2 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 $\ddot{U}1 = 30$ 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 warm 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. [\(for additional information see: 2.3 Permitted pressure range\)](#) 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. [\(for additional information see: 4.1.1 Suction line and for additional information see: 4.1.2 Leakage oil lines\)](#)

4 Installation conditions

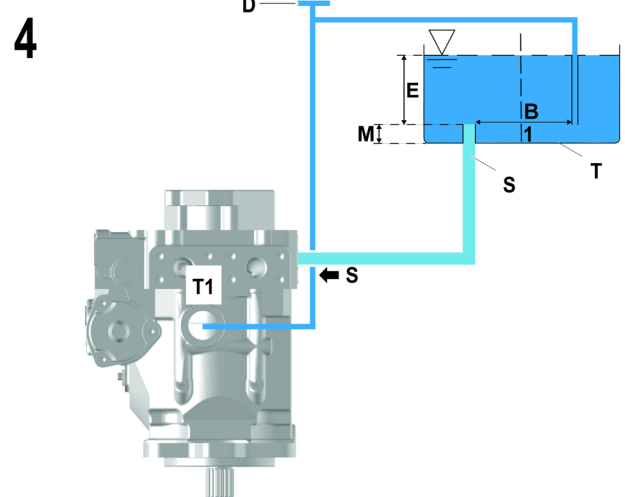
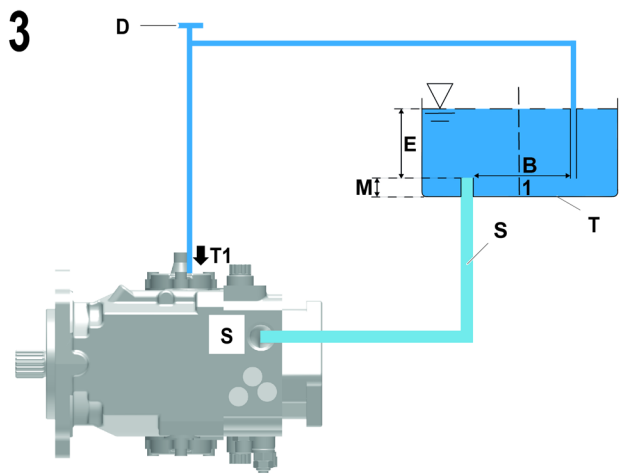
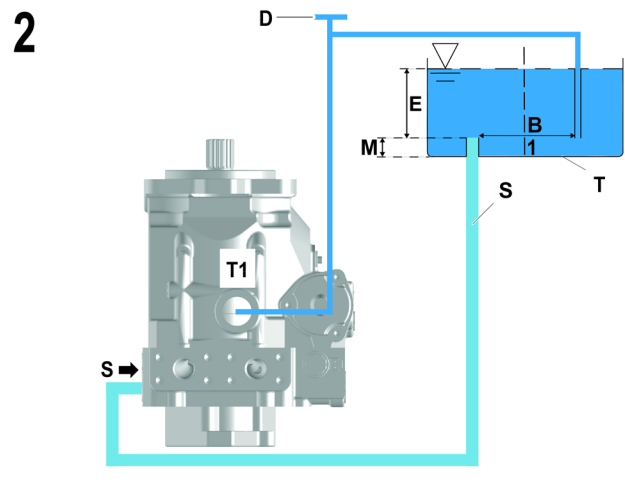
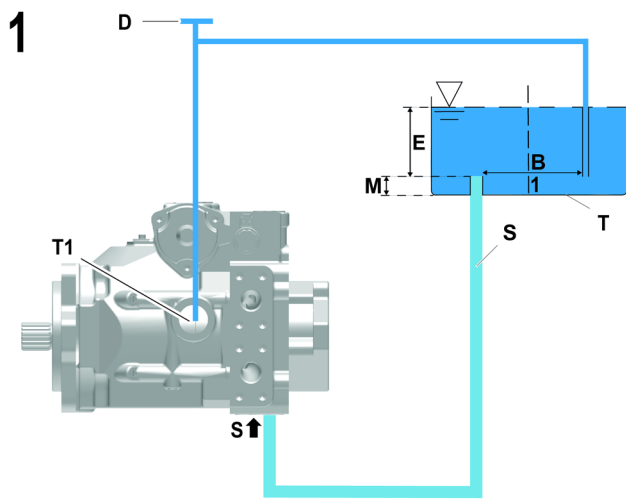
4.2 Installation variants

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.



DB-DPVG-159

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

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:

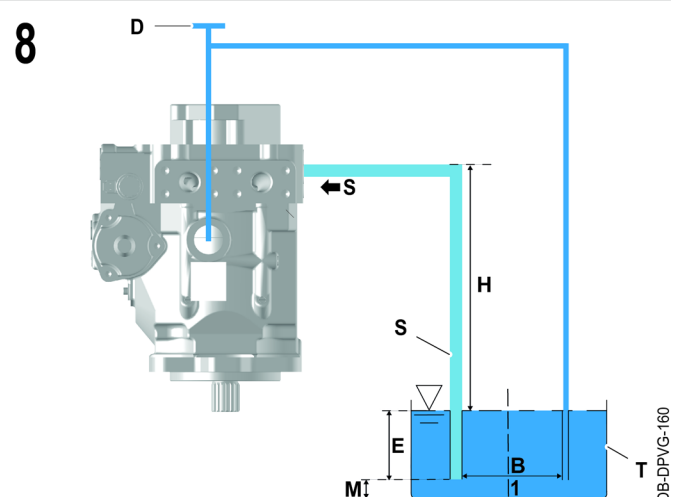
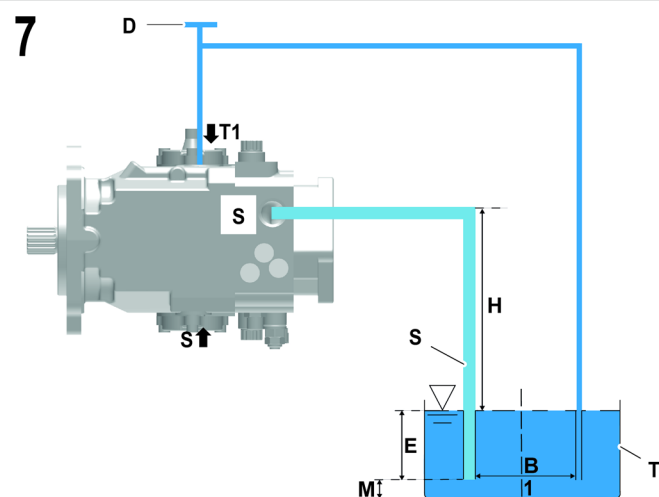
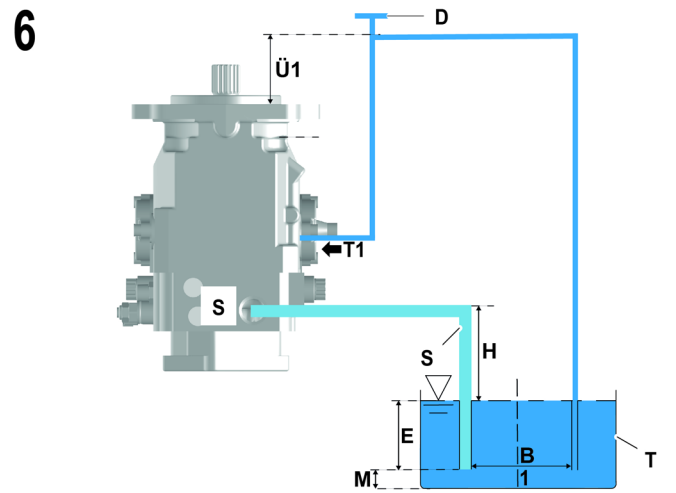
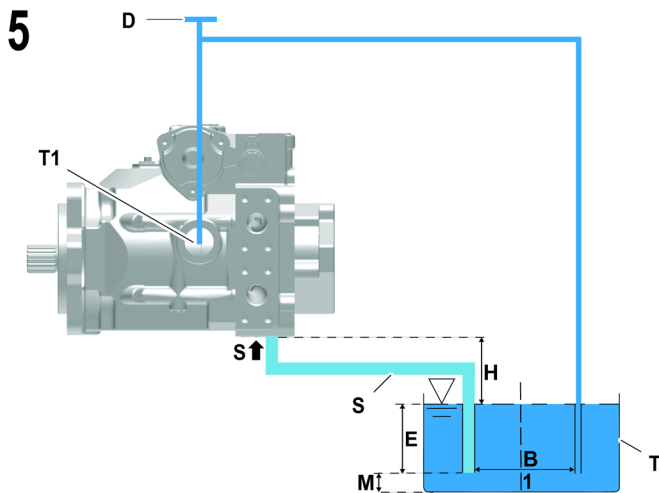
- Housing is completely filled with hydraulic fluid during commissioning and operation.

- Housing is vented after commissioning and during operation*.

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 $\dot{U}1 = 30 \text{ mm}$ above the highest possible level of the axial piston unit.



DB-DPVG-160

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

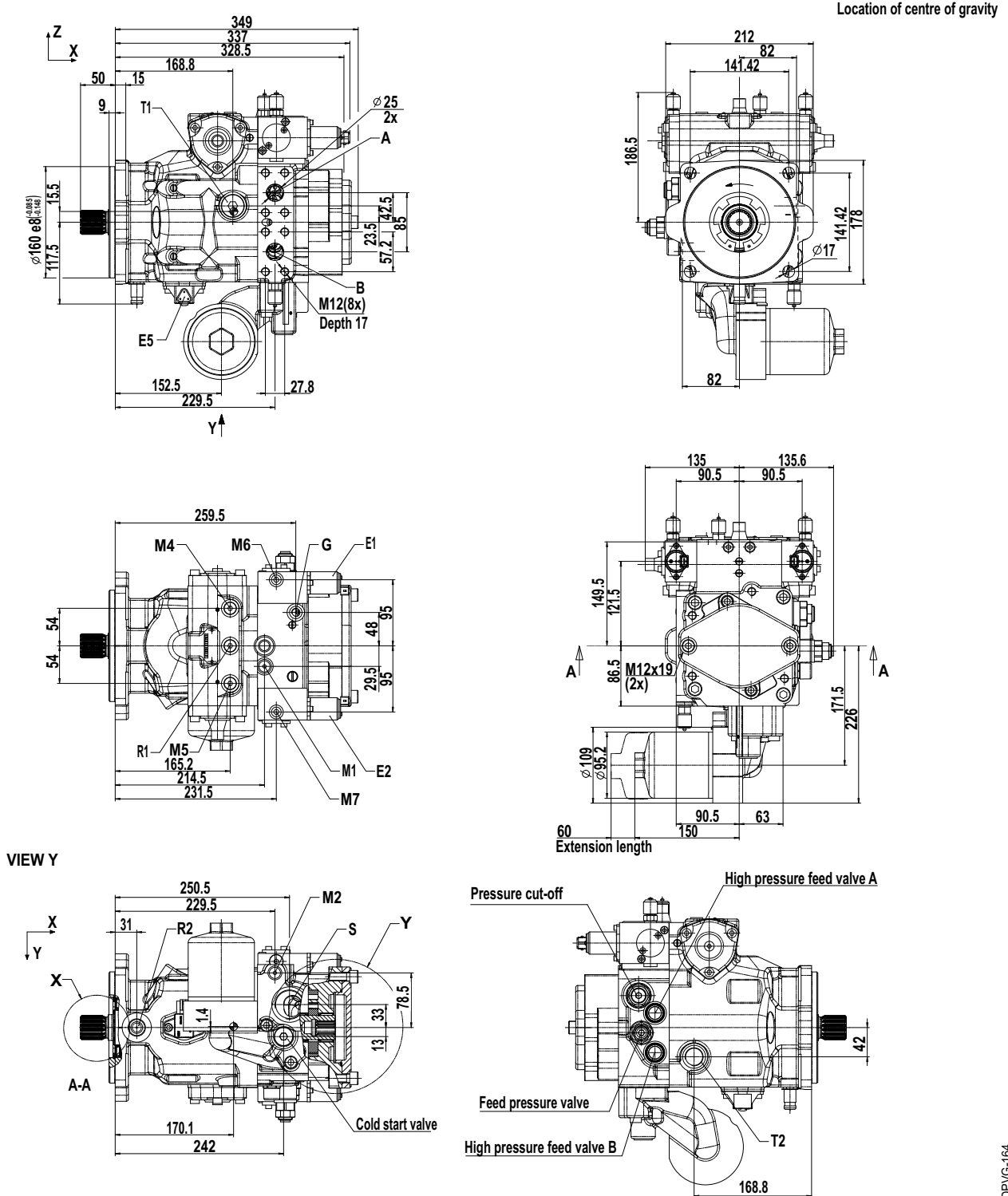
4 Installation conditions

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 NS 085

5.1.1 Nominal size 085, EL-DA control type



DB-DPYG-164

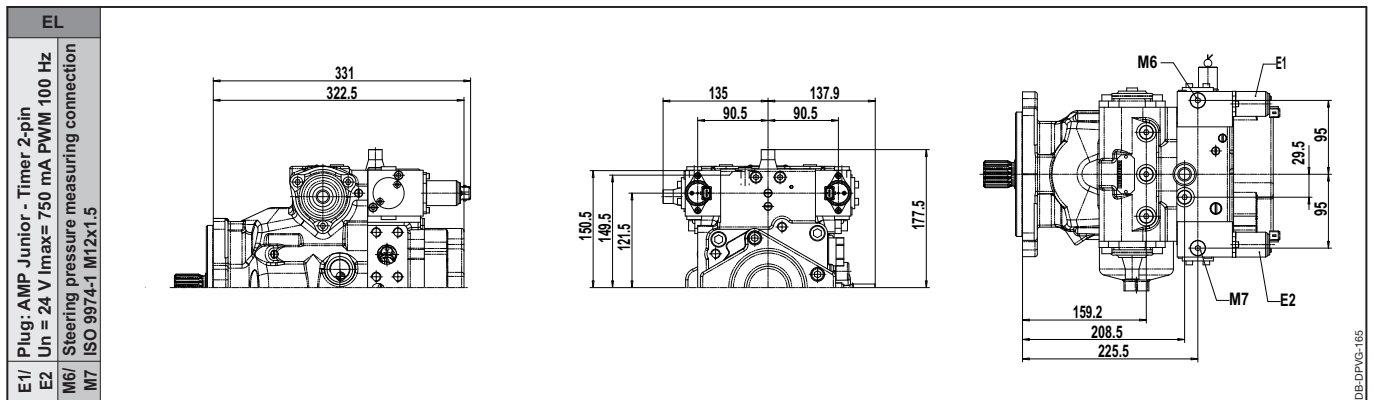
A / B	Working connection SAE J 518 - 1", 6000 psi
R1	Ventilation ISO 9974-1 M12x1.5

T1, T2	Leakage oil connection M26x1.5
-	-

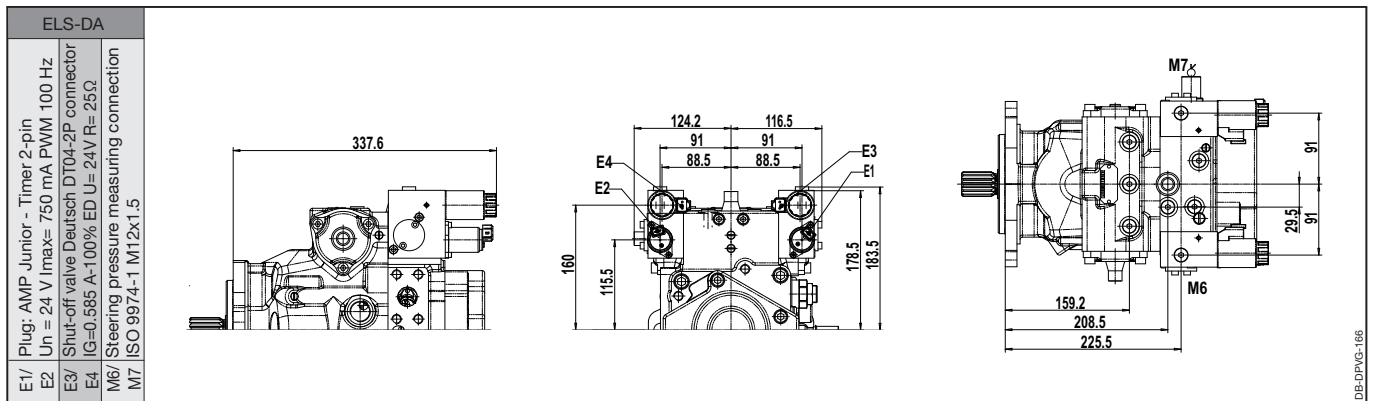
5 Dimensions

G	Adjusting pressure supply ISO 9974-1, M12x1.5 min 30 bar - max 40 bar	S	Feed pump suction port ISO 9974-1 M42x2
M1 / M2	High-pressure measuring connection Minimess 1620 Form F M12x1.5-M16x2	R2	Ventilation Minimess 1620 Form F M12x1.5-M16x2
M4 / M5	Adjusting pressure measuring connection ISO 9974-1 M12x1.5	E1 / E2	Pressure control valve, plug: AMP Junior Timer 2-pin, PWM= 100 Hz, U= 24 V, I _{max} = 750 mA
M6 / M7	Steering pressure measuring connection Minimess 1620 Form F M14x1.5-M16x2	E5	Angle sensor; plug: Deutsch 3-pin DT-04-3P power supply U= 24 V,

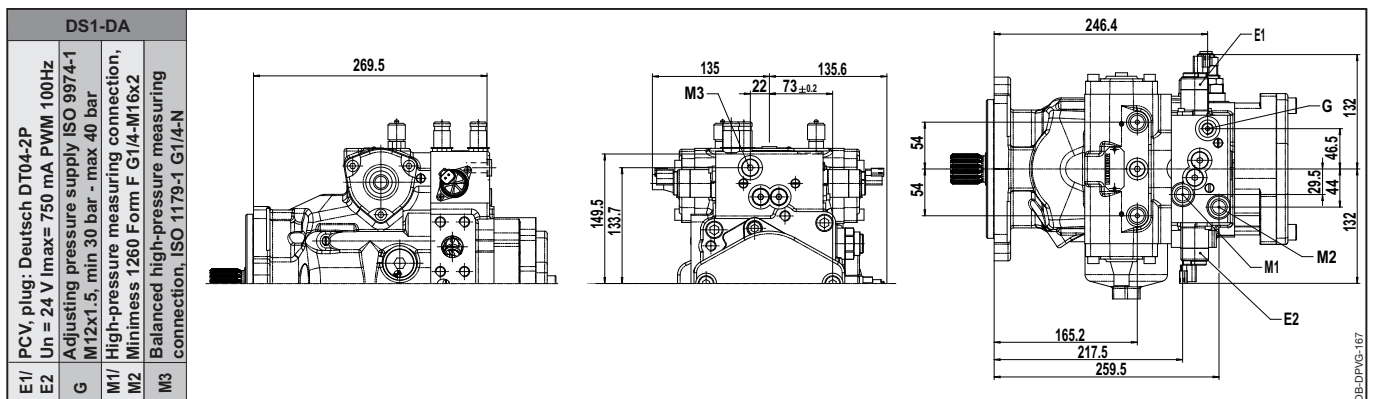
5.1.2 Nominal size 085, other control types



DB-DPVG-166



DB-DPVG-166



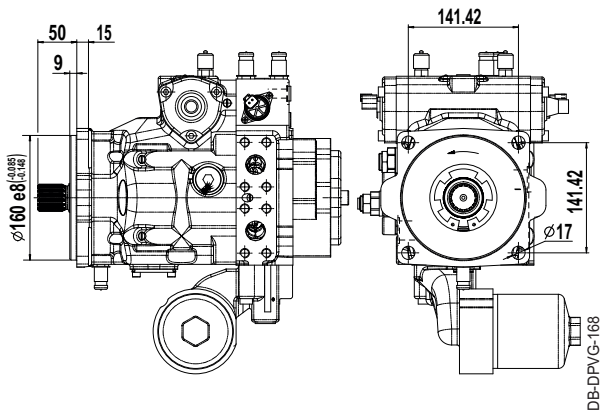
DB-DPVG-167

5 Dimensions

5.2 Nominal size 085, mounting flange

DPV	G		/	000		1				A	O				
1.	2.	3.	/	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.

ISO 3019-2

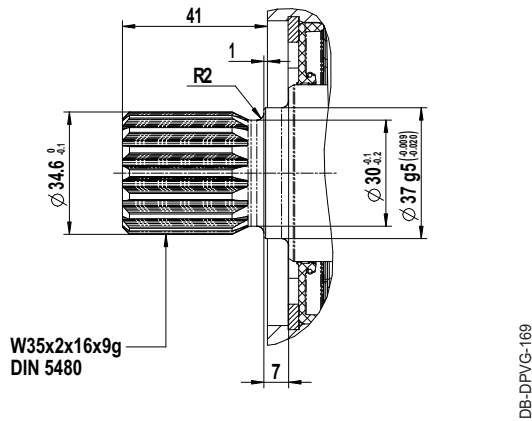


31

5.3 Nominal size 085, shaft end

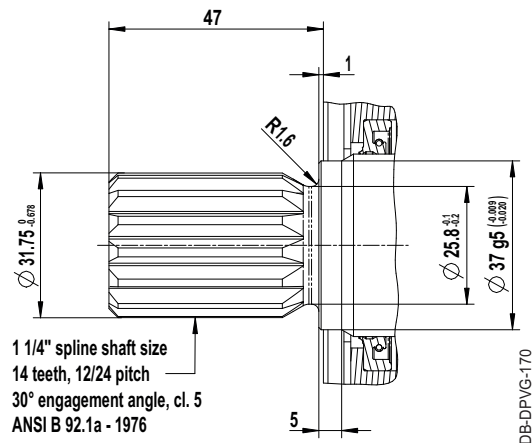
DPV	G		/	000		1				A	O				
1.	2.	3.	/	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.

W35x2x16x9g splined shaft DIN 5480



1

ANSI B92.1a splined shaft 1 1/4 in 14T 12/24 pitch

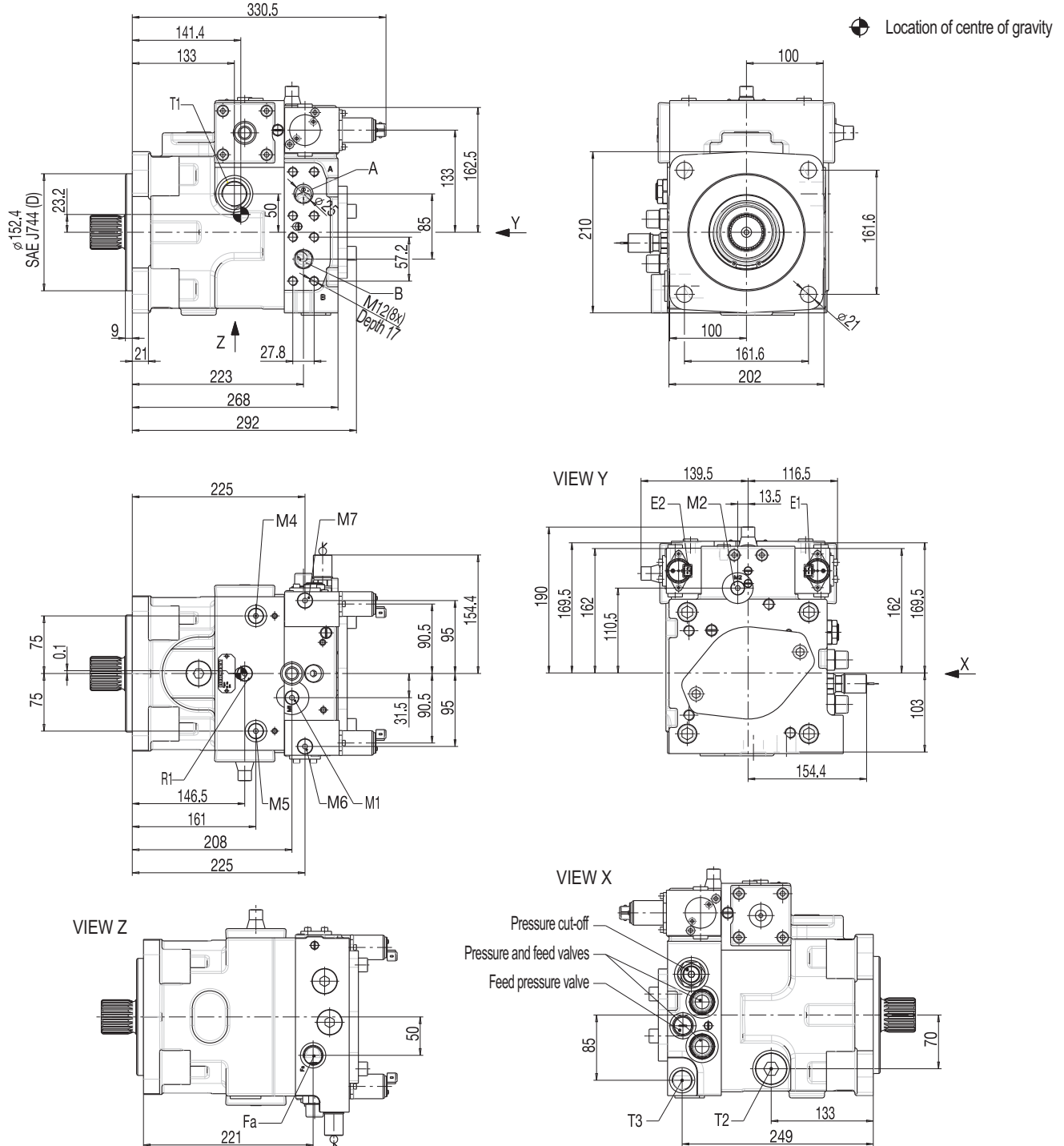


2

5 Dimensions

5.4 NS 108

5.4.1 Nominal size 108, EL-DA control type



HF2-DB-055

A / B	Working connection SAE J 518 - 1", 6000 psi
R1	Ventilation M14x1.5

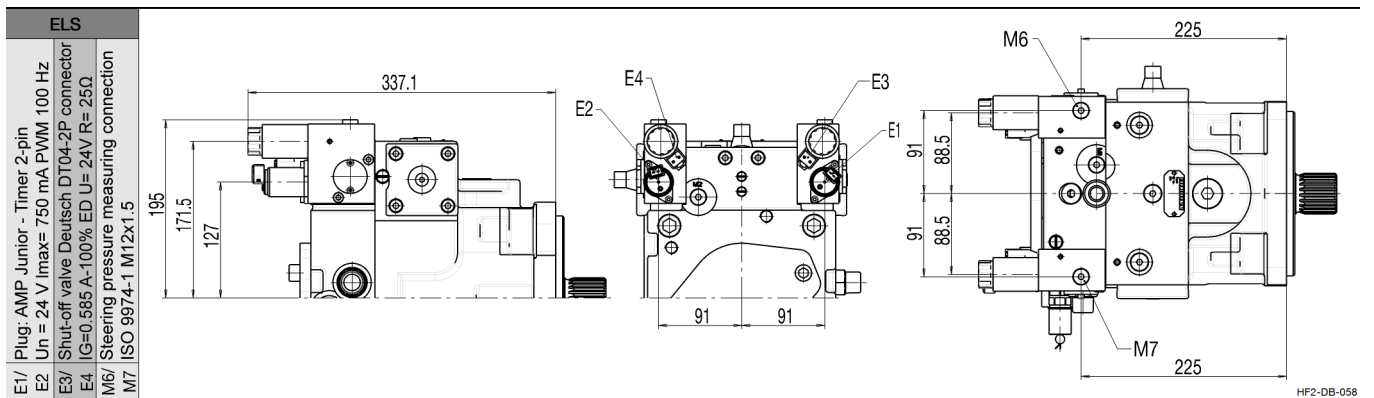
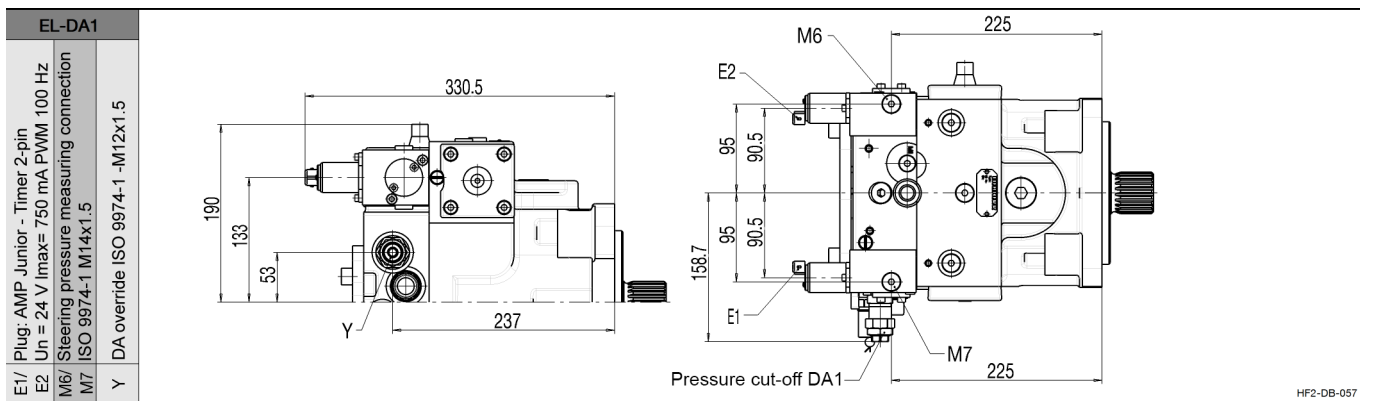
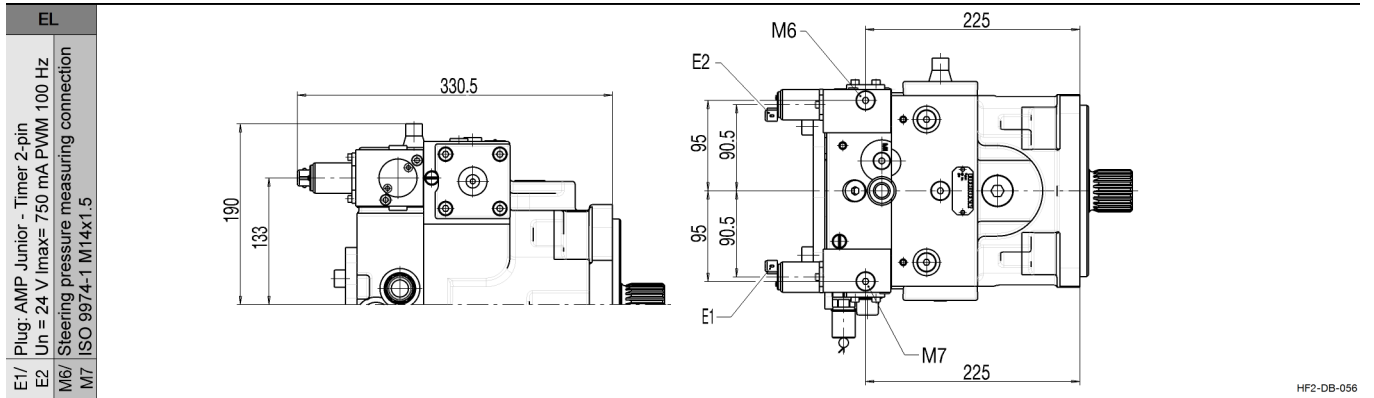
T1, T2	Leakage oil connection M33x2
Fa	Feed pressure connection M26x1.5

5 Dimensions

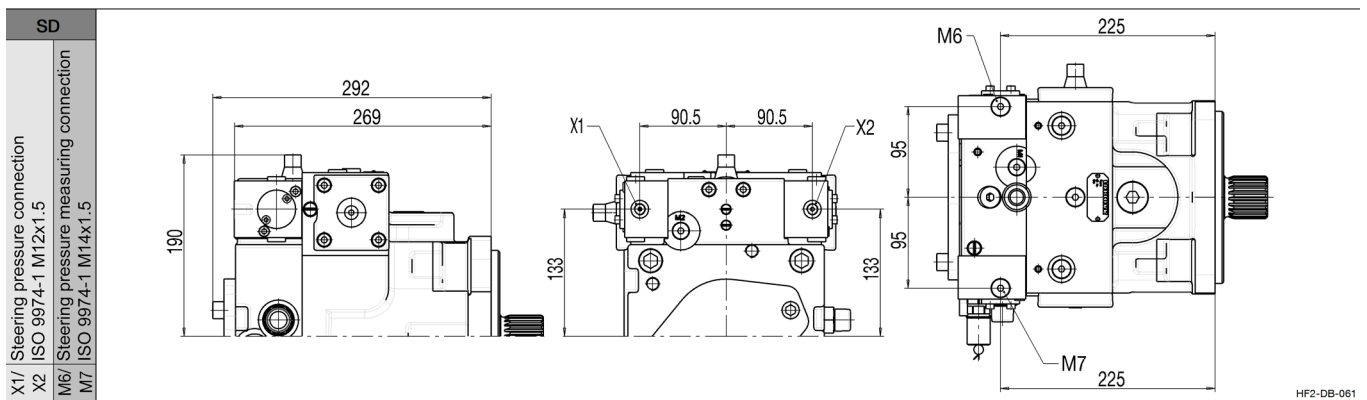
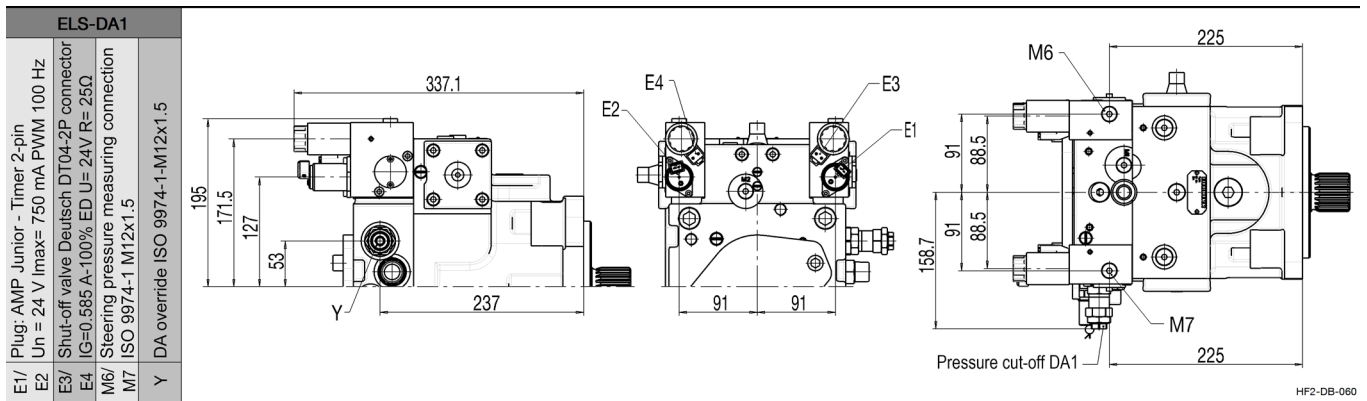
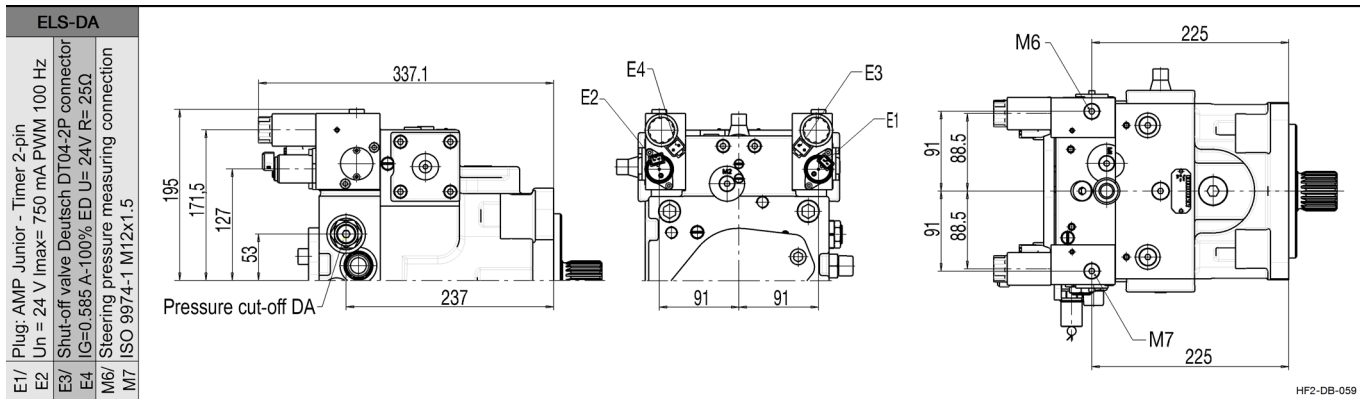
M1 / M2	High pressure measuring connection M12x1.5
M4 / M5	Adjusting pressure measuring connection M14x1.5
T3	Return for feed pressure valve

M6 / M7	Steering pressure measuring connection M14x1.5
E1 / E2	Pressure control valve, plug: AMP Junior Timer 2-pin, PWM= 100 Hz, U= 24 V, I _{max} . = 750 mA
-	-

5.4.2 Nominal size 108, other control types



5 Dimensions

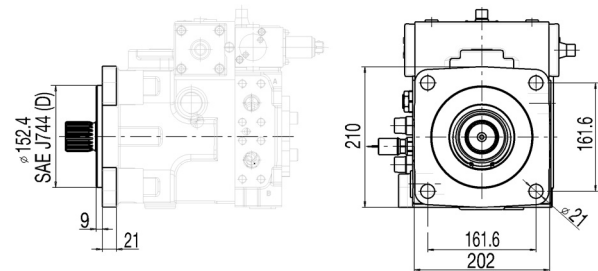


5 Dimensions

5.5 Nominal size 108, mounting flange

DPV	G		/	000		1			A	O					
1.	2.	3.	/	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.

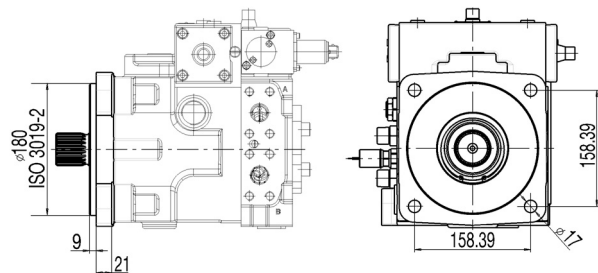
SAE D (SAE J744)



24

HF2-DB-066

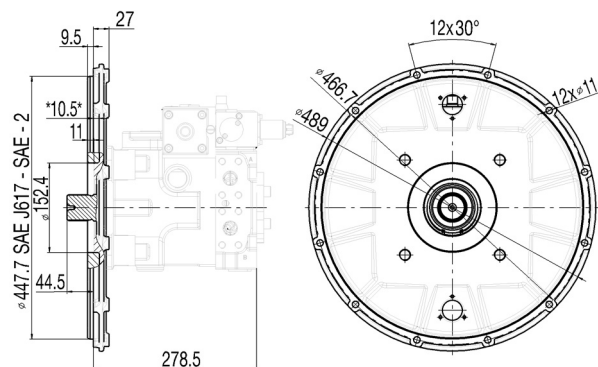
ISO 3019-2



31

HF2-DB-067

Diesel engine flange SAE 2 (SAE J617)



12

HF2-DB-068

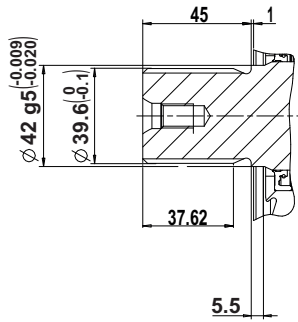
10.5*) Shift from mounting flange

5 Dimensions

5.6 Nominal size 108, shaft end

DPV	G		/	000		1				A	O				
1.	2.	3.	/	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.

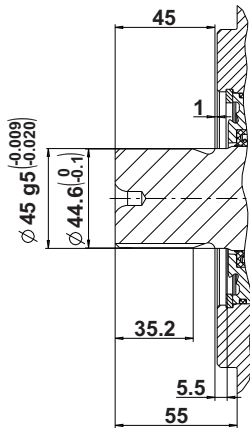
W40x2x18x9g splined shaft DIN 5480



DPVG-DB-137

1

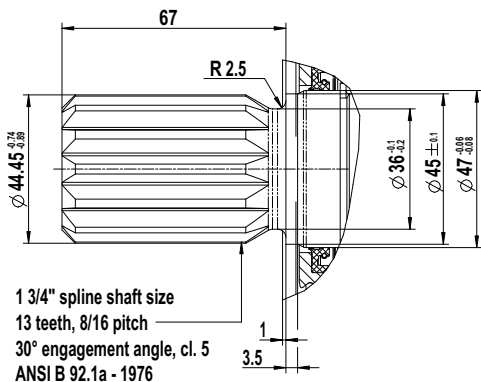
W45x2x21x9g splined shaft DIN 5480



DPVG-DB-138

1

ANSI B92.1a splined shaft 1 3/4 in 13T 8/16 pitch



DB-DPVG-171

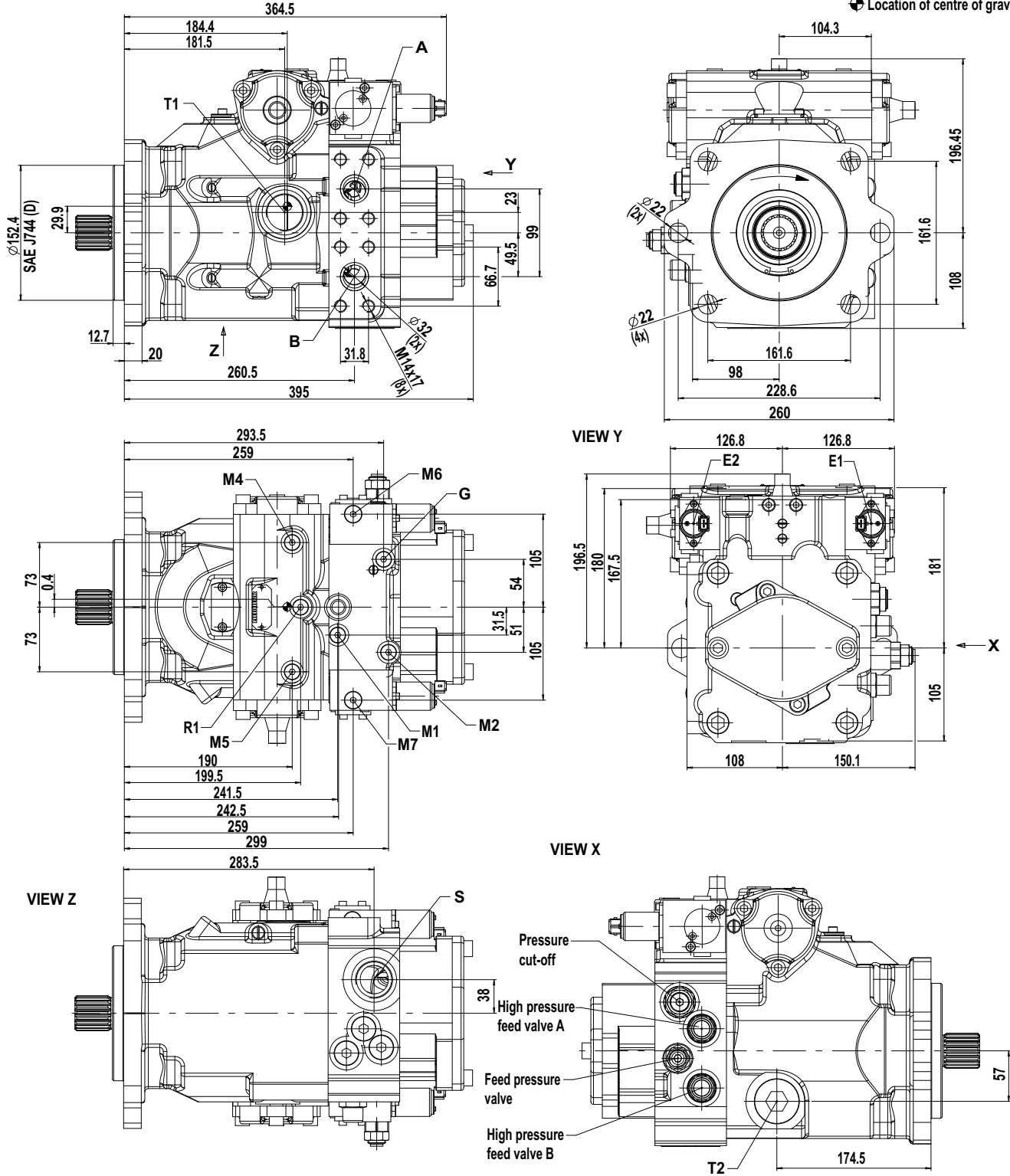
2

5 Dimensions

5.7 NS 140

5.7.1 Nominal size 140, EL-DA control type

☉ Location of centre of gravity



A, B	Working connections SAE J 518
R1	Vent connection ISO 9974-1

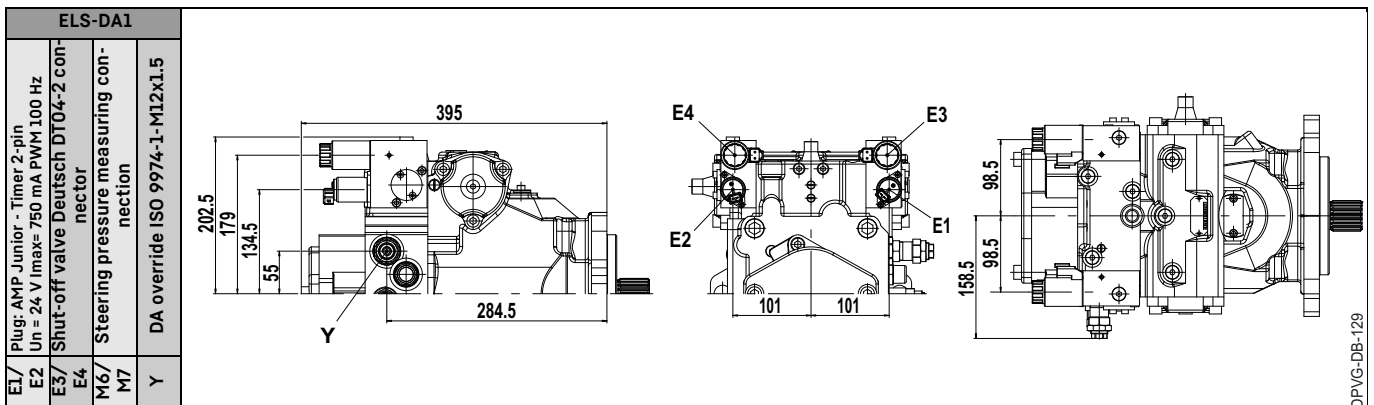
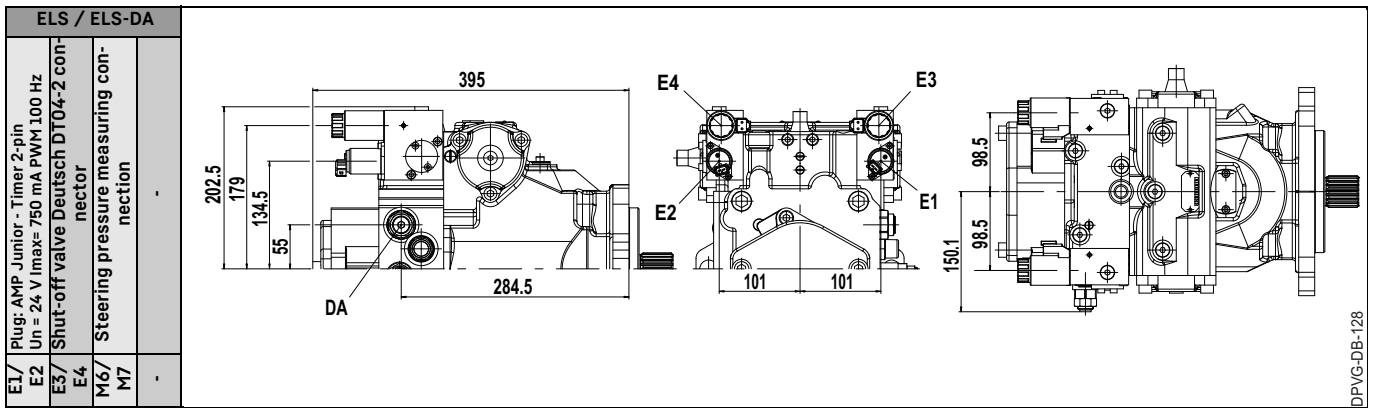
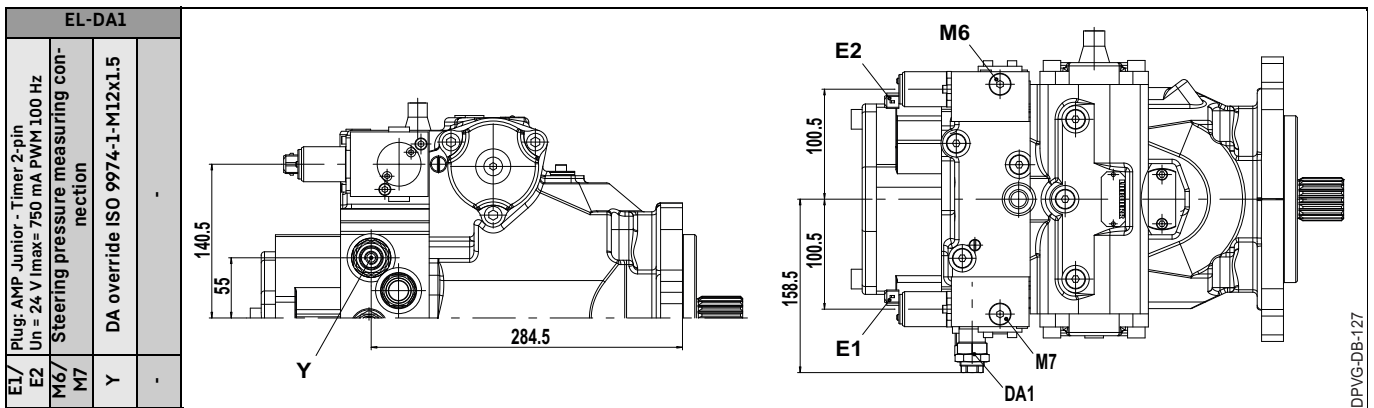
T1, T2	Leakage oil connection ISO 9974-1
M1, M2	High pressure measuring connections ISO 9974-1

5 Dimensions

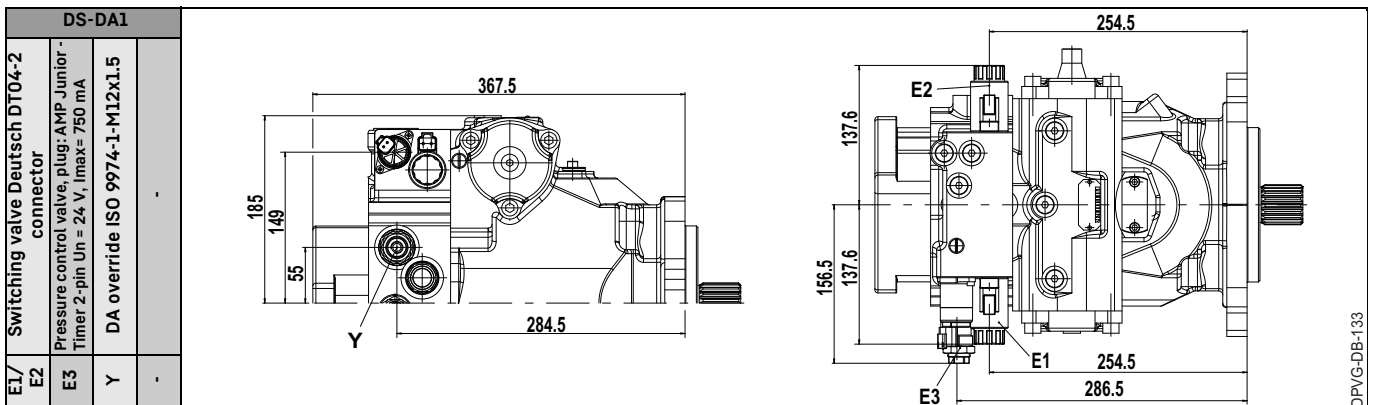
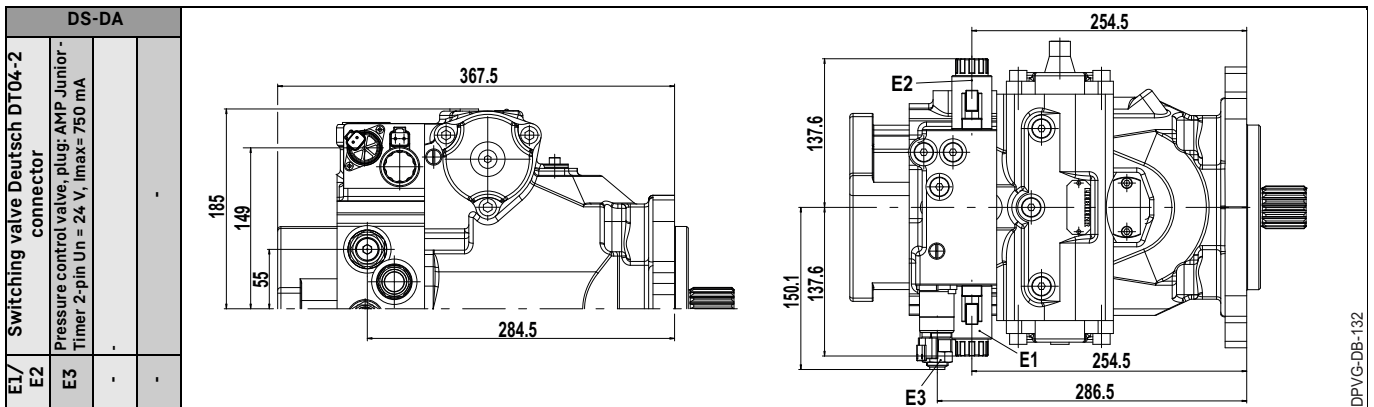
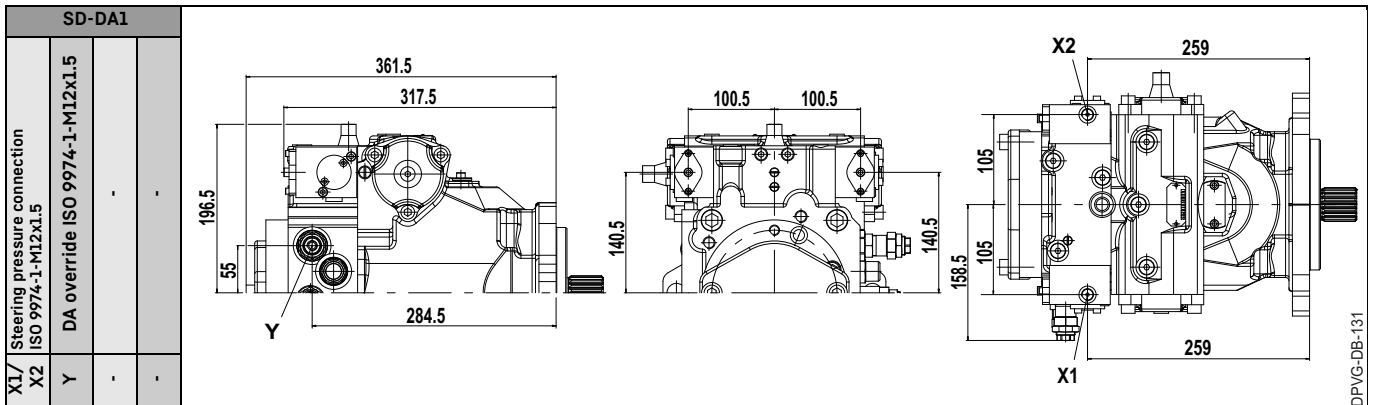
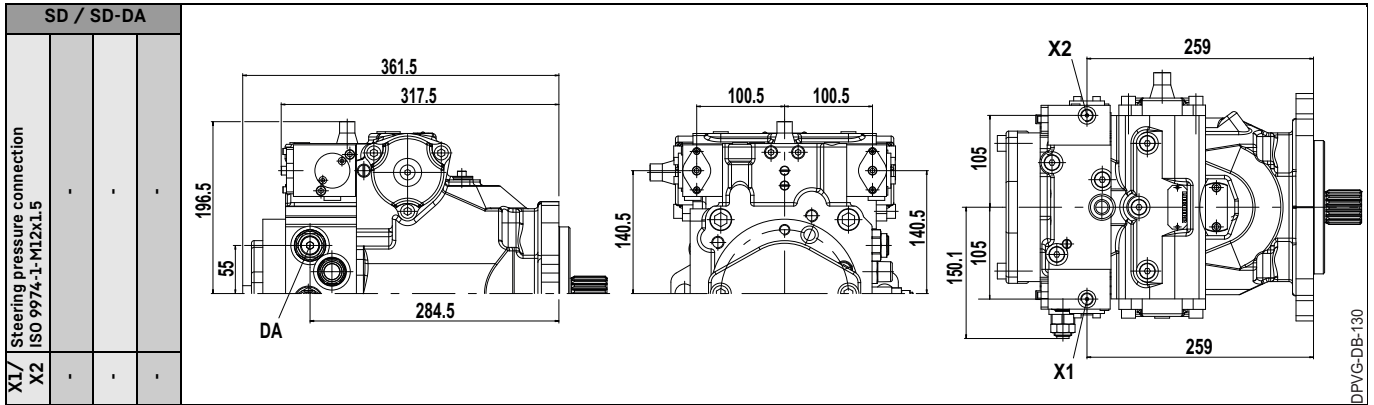
G	Pressure connection for auxiliary circuits ISO 9974-1
E1, E2	Pressure control valve, AMP Junior Timer plug-in terminal, 2-pin, PWM= 100 Hz, Un= 24V, I _{max.} = 750 mA
S	Gear pump suction port ISO 9974-1

M4, M5	Adjusting pressure measuring connections ISO 9974-1
M6, M7	Steering pressure measuring connections ISO 9974-1
-	-

5.7.2 Nominal size 140, other control types



5 Dimensions

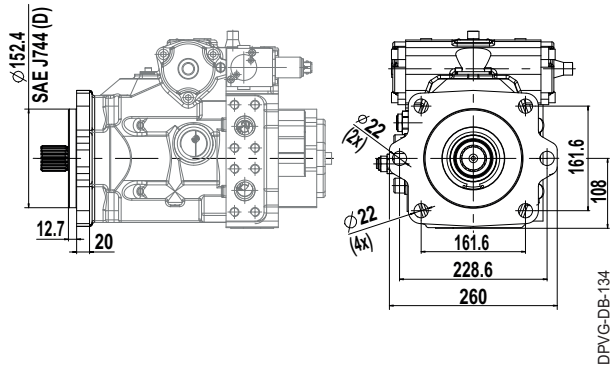


5 Dimensions

5.8 Nominal size 140, mounting flange

DPV	G		/	000		1				A	O				
1.	2.	3.	/	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.

SAE D (SAE J744)

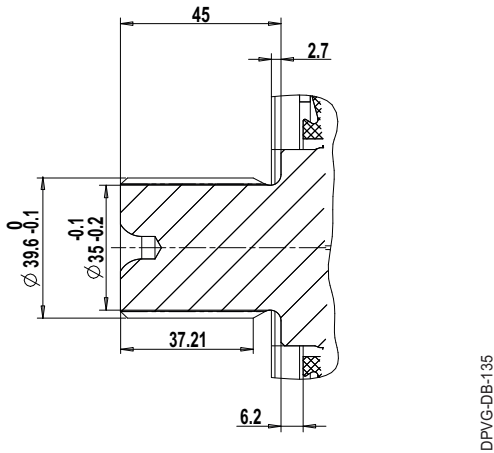


24

5.9 Nominal size 140, shaft end

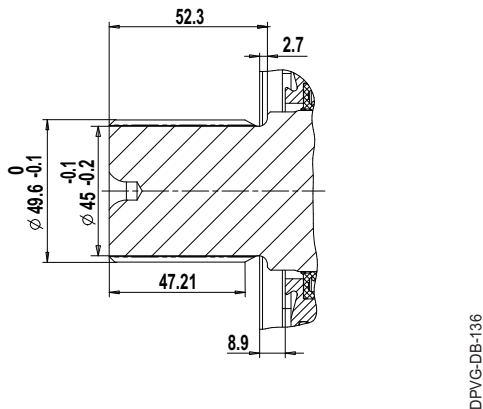
DPV	G		/	000		1				A	O				
1.	2.	3.	/	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.

W40x2x18x9g splined shaft DIN 5480



1

W50x2x24x9g splined shaft DIN 5480

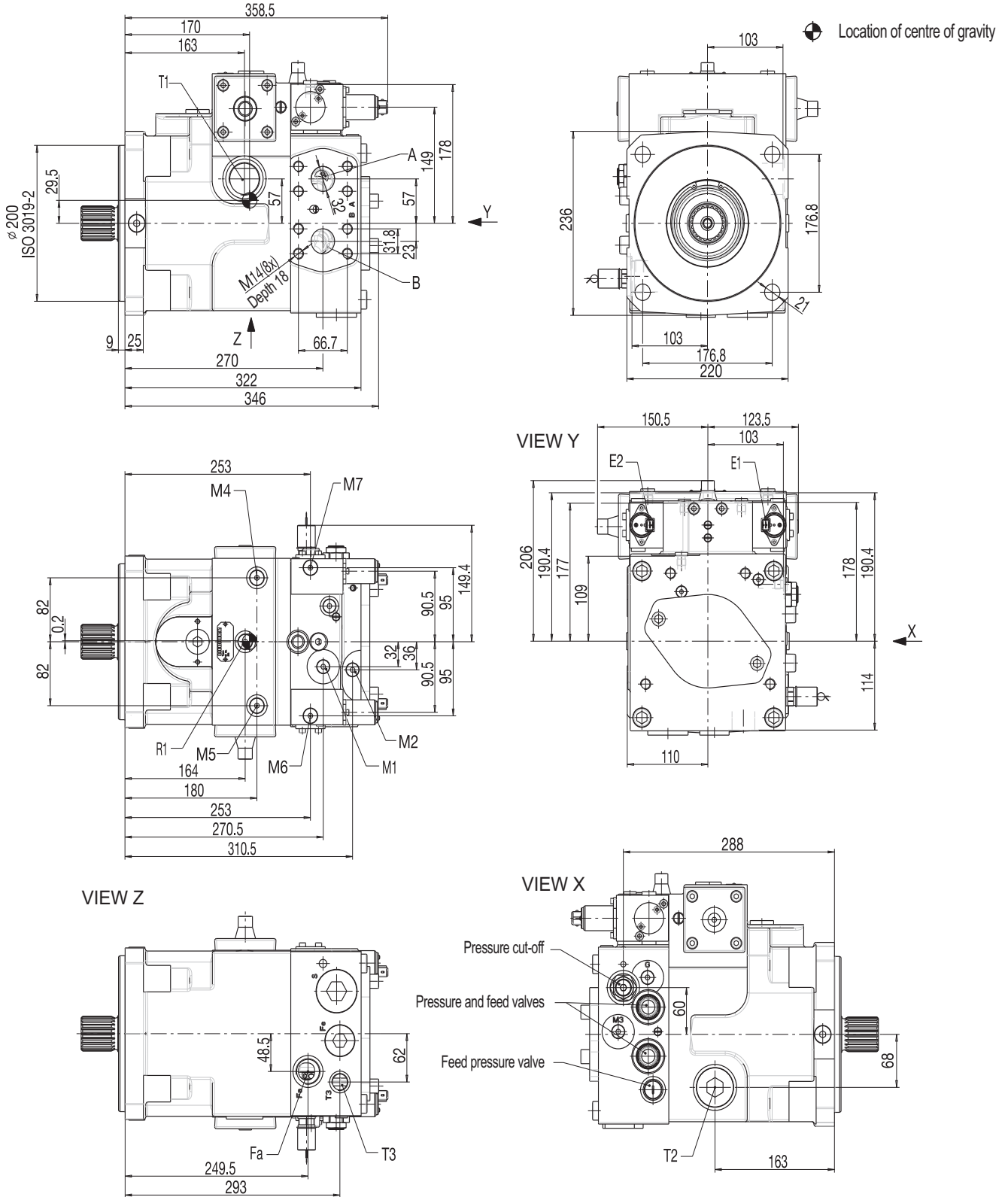


1

5 Dimensions

5.10 NS 165

5.10.1 Nominal size 165, EL-DA control type



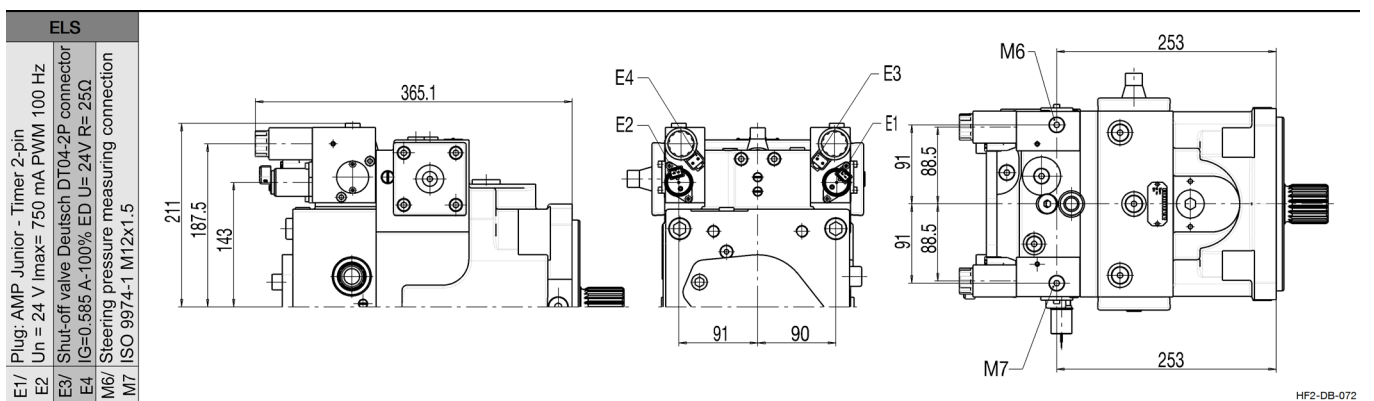
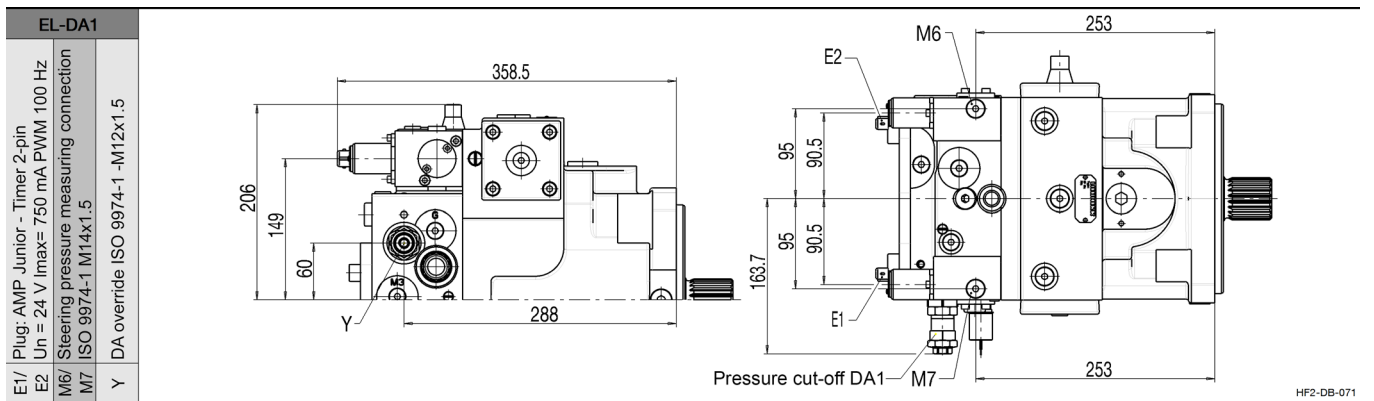
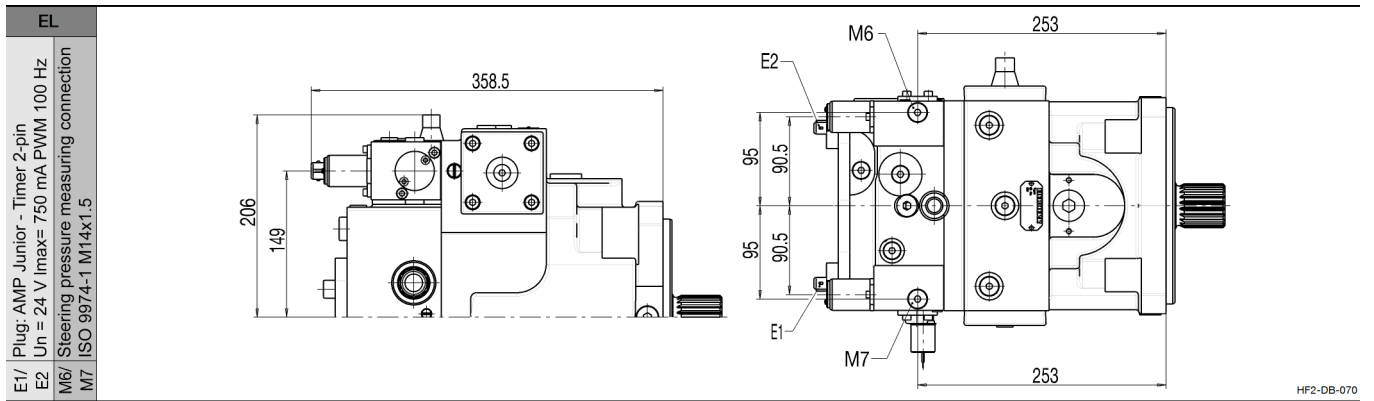
HF2-DB-069

5 Dimensions

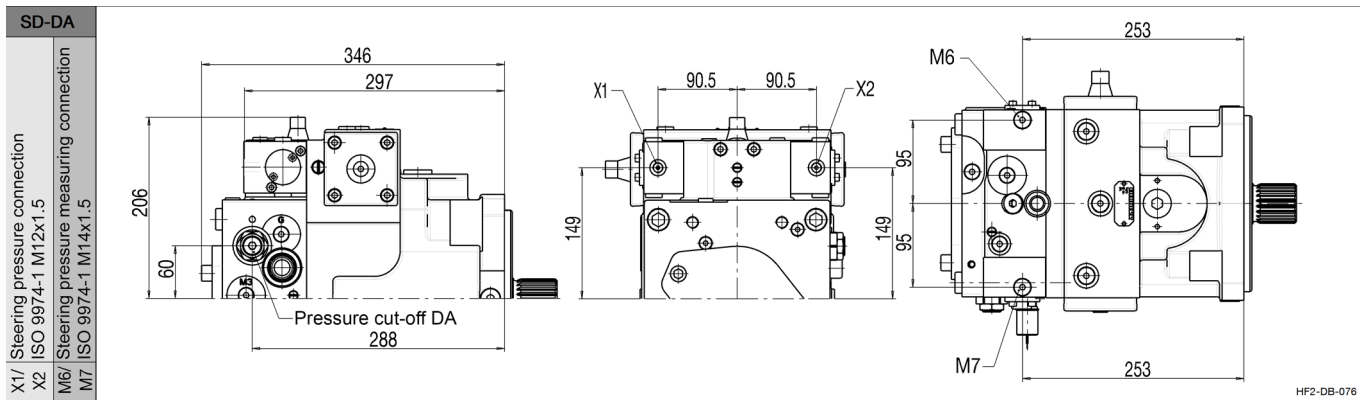
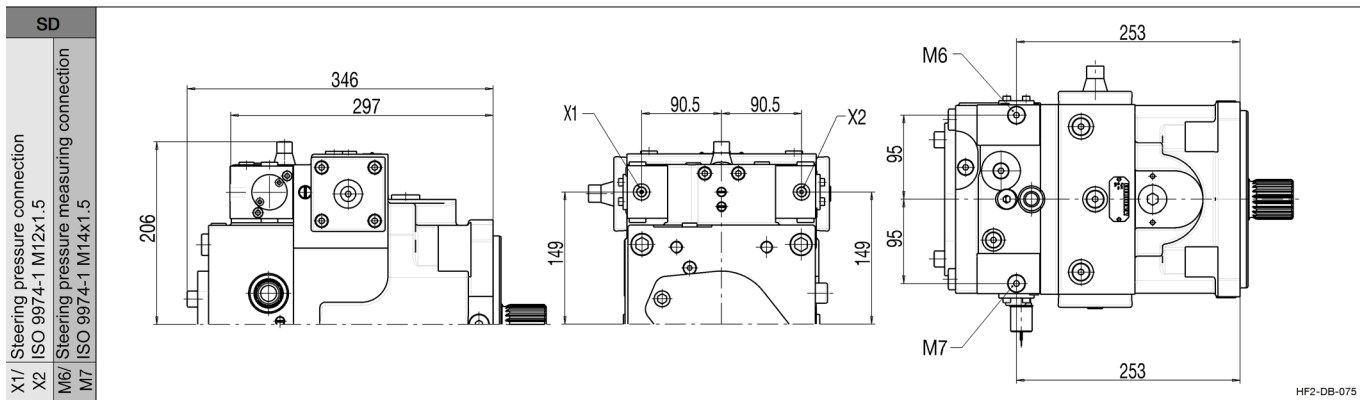
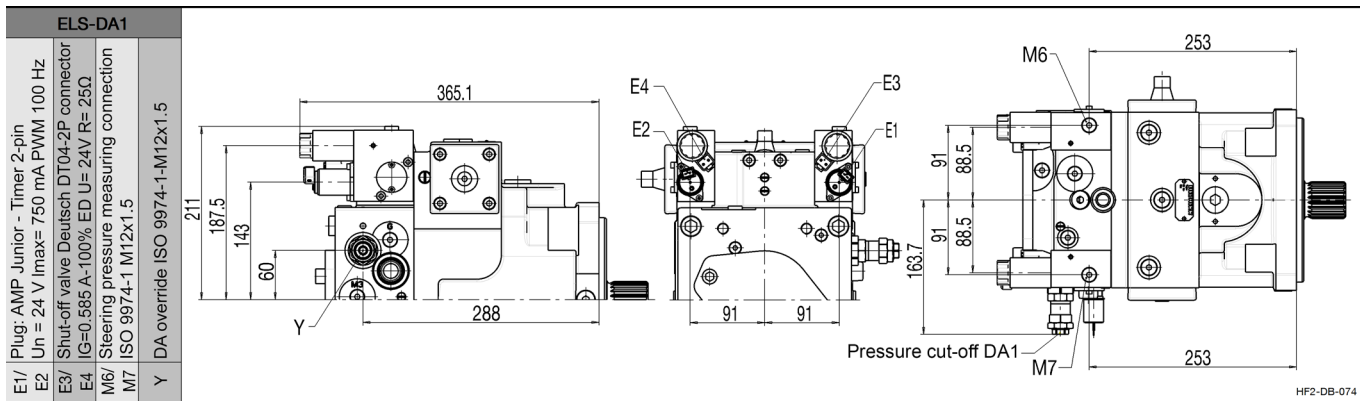
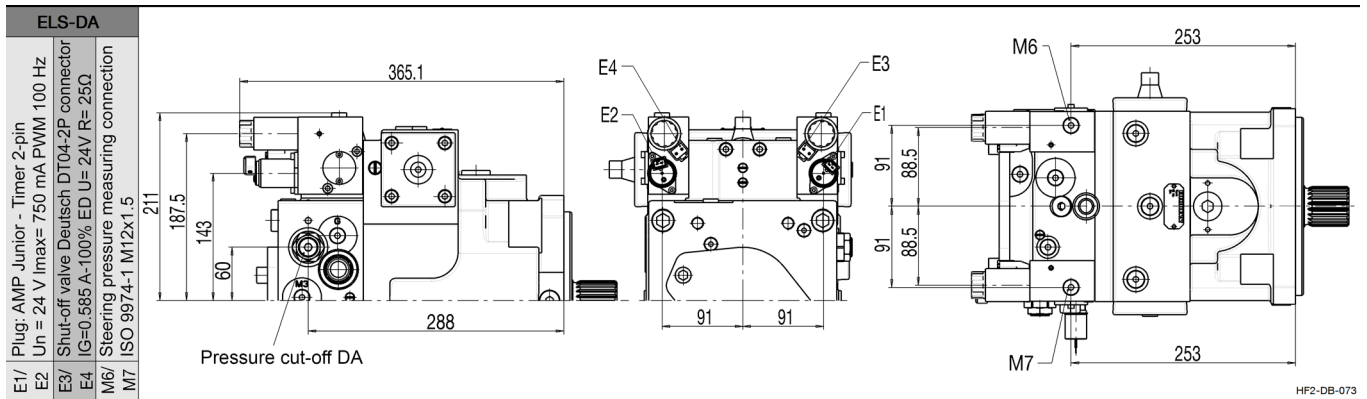
A / B	Working connection SAE J 518 - 11/4", 6000 psi
R1	Ventilation M14x1.5
M1 / M2	High pressure measuring connection M12x1.5
M4 / M5	Adjusting pressure measuring connection M14x1.5
T3	Return for feed pressure valve M22x1.5

T1, T2	Leakage oil connection M42x2
Fa	Feed pressure connection M33x2
M6 / M7	Steering pressure measuring connection M14x1.5
E1 / E2	Pressure control valve, plug: AMP Junior Timer 2-pin, PWM= 100 Hz, U= 24 V, I _{max} .= 750 mA
-	-

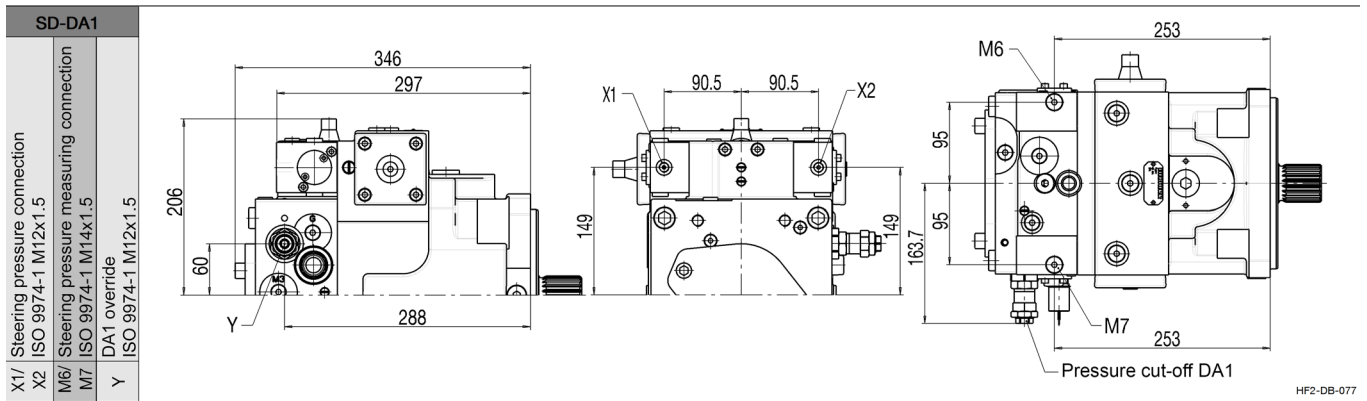
5.10.2 Nominal size 165, other control types



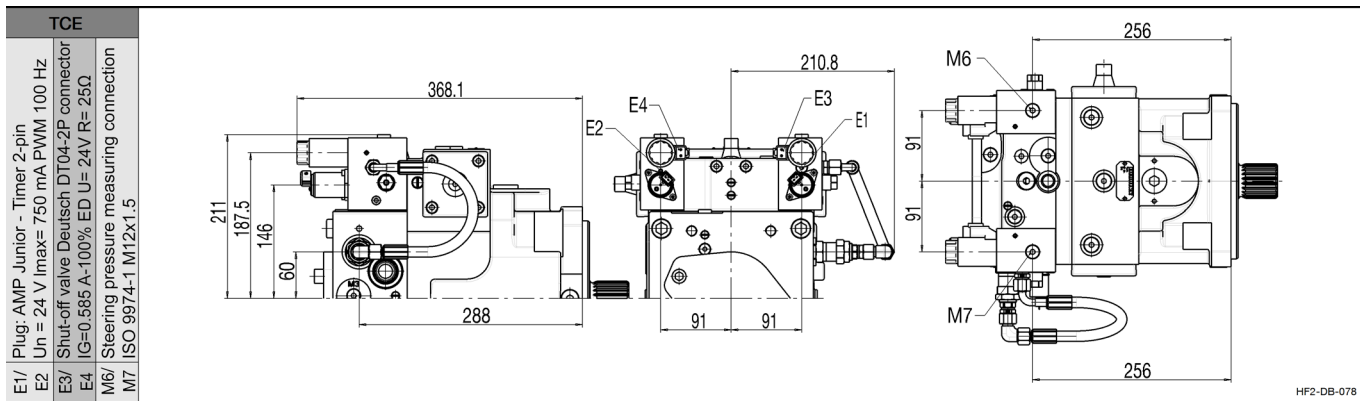
5 Dimensions



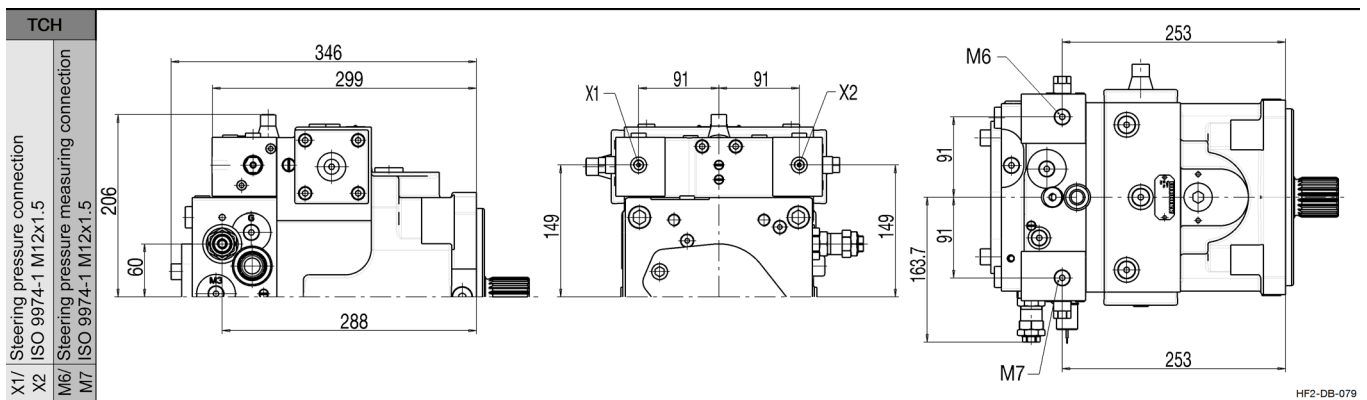
5 Dimensions



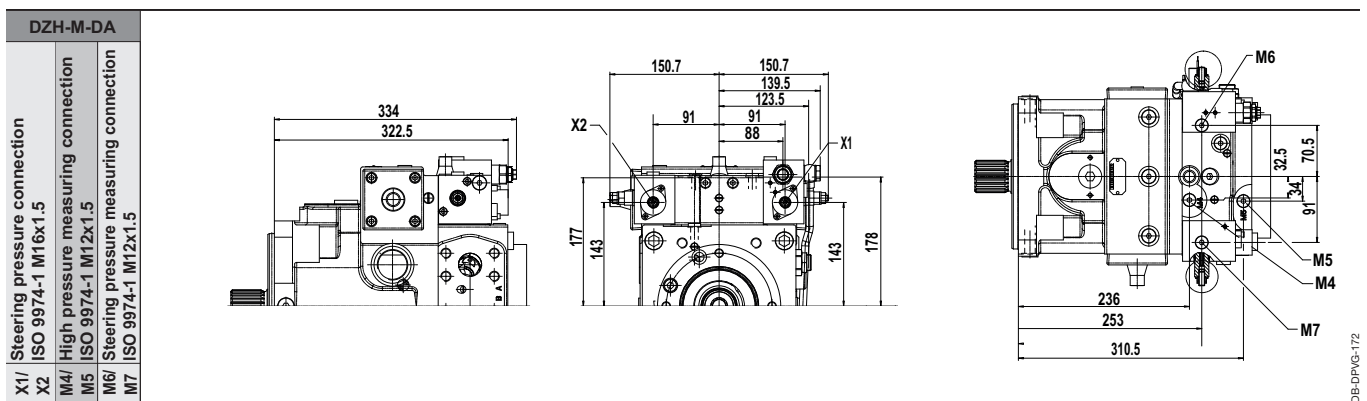
HF2-DB-077



HF2-DB-078



HF2-DB-079



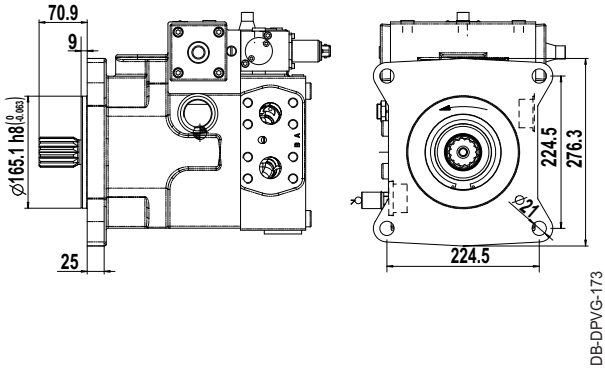
10B-DPVG-172

5 Dimensions

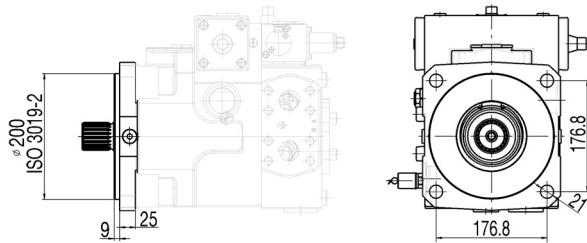
5.11 Nominal size 165, mounting flange

DPV	G		/	000		1		8.	9.	A	O				
1.	2.	3.	/	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.

SAE E (SAE J744)



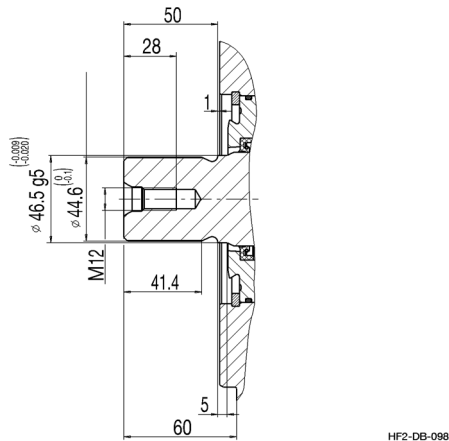
ISO 3019-2



5.12 Nominal size 165, shaft end

DPV	G		/	000		1		8.	9.	A	O				
1.	2.	3.	/	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.

W45x2x21x9g splined shaft DIN 5480

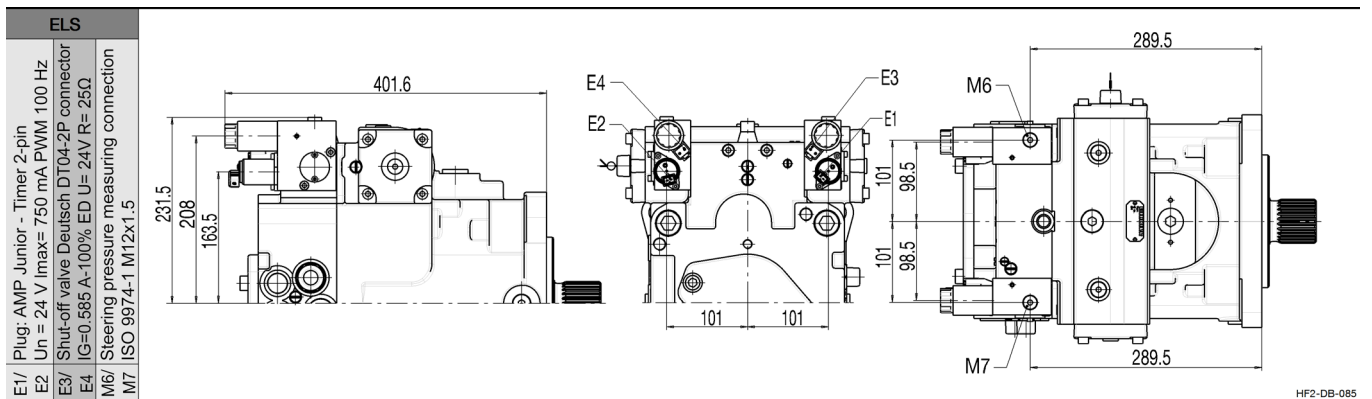
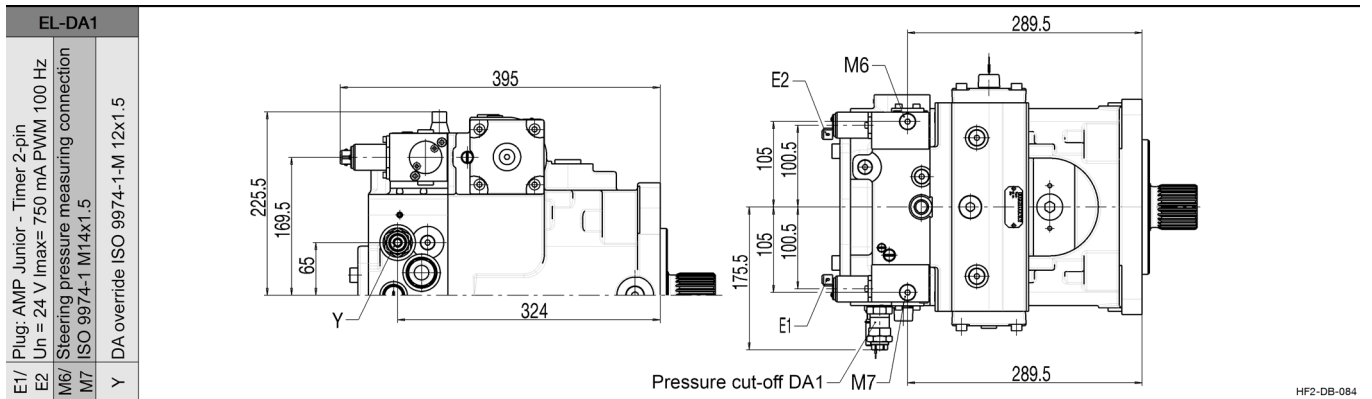
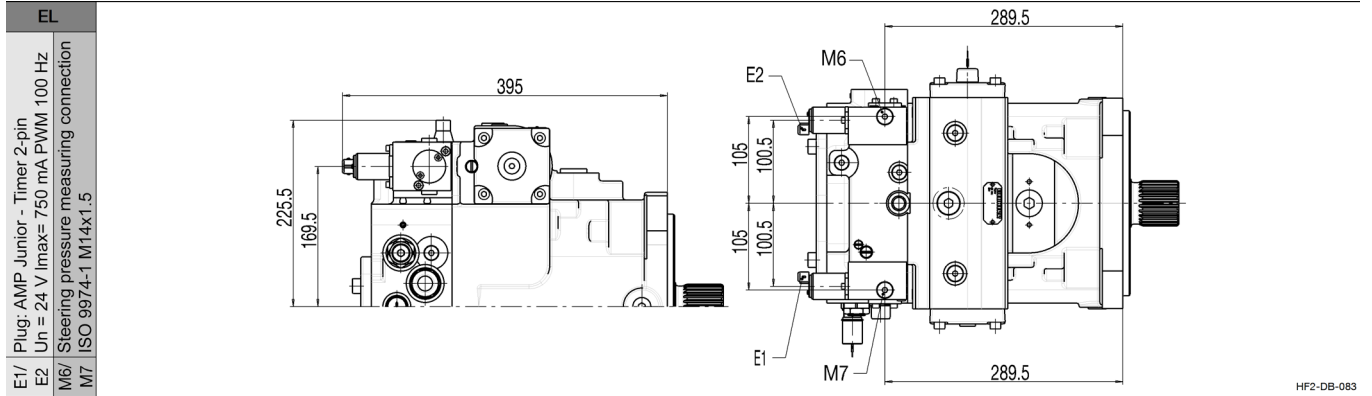


5 Dimensions

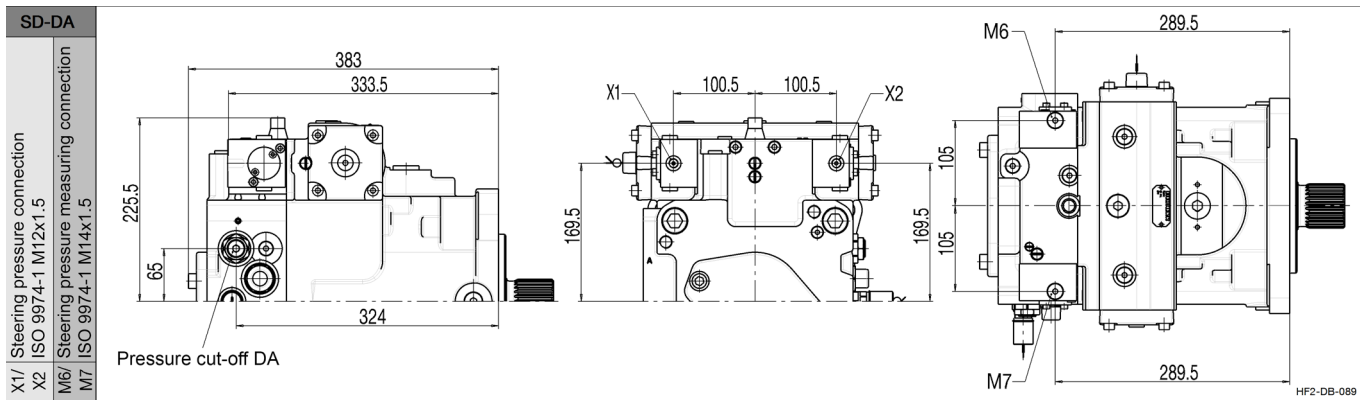
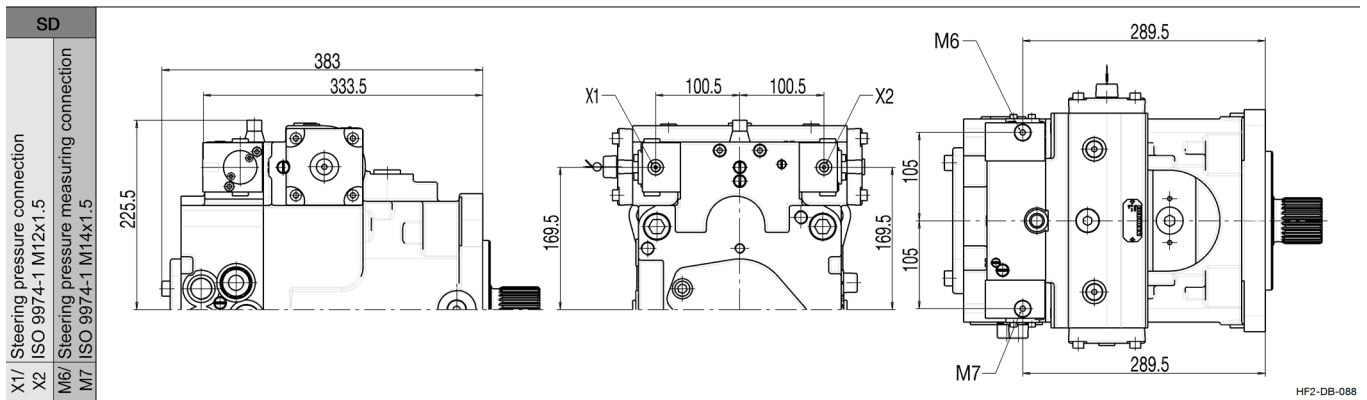
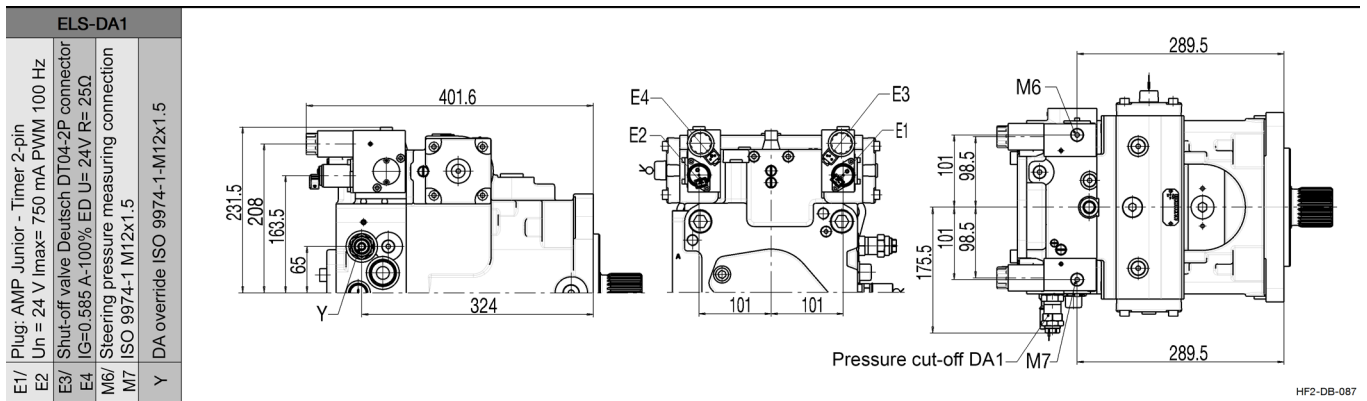
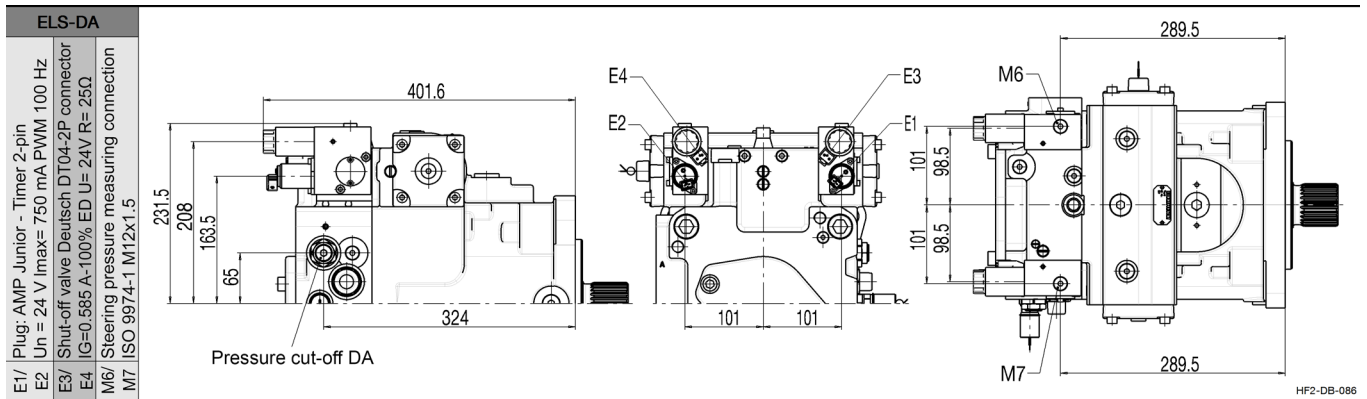
A / B	Working connection SAE J 518 - 1 1/2", 6000 psi
R1	Ventilation M22x1.5
M1 / M2	High pressure measuring connection M12x1.5
M4 / M5	Adjusting pressure measuring connection M14x1.5
T3	Return for feed pressure valve M26x1.5

T1, T2	Leakage oil connection M42x2
Fa	Feed pressure connection M26x1.5
M6 / M7	Steering pressure measuring connection M14x1.5
E1 / E2	Pressure control valve, plug: AMP Junior Timer 2-pin, PWM= 100 Hz, U= 24 V, I _{max} = 750 mA
-	-

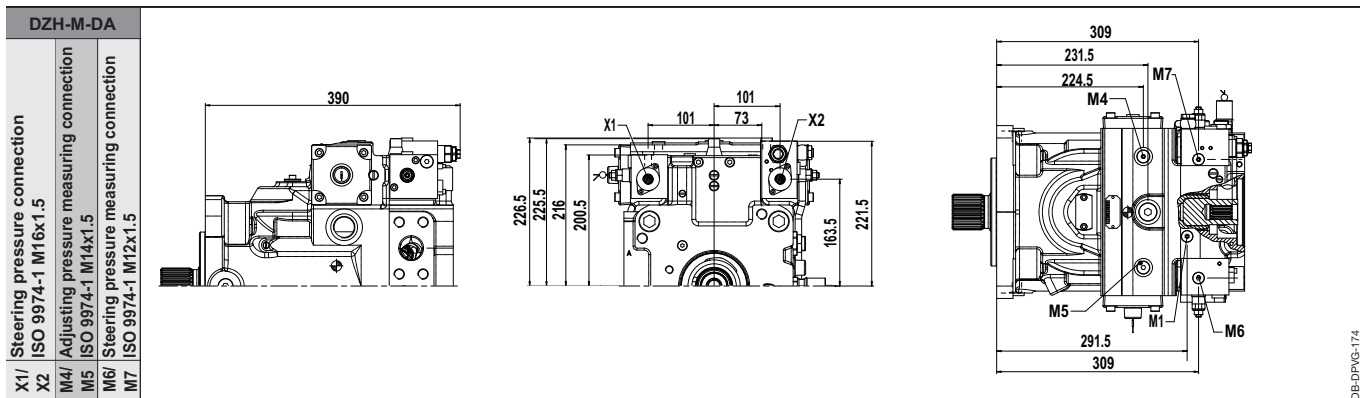
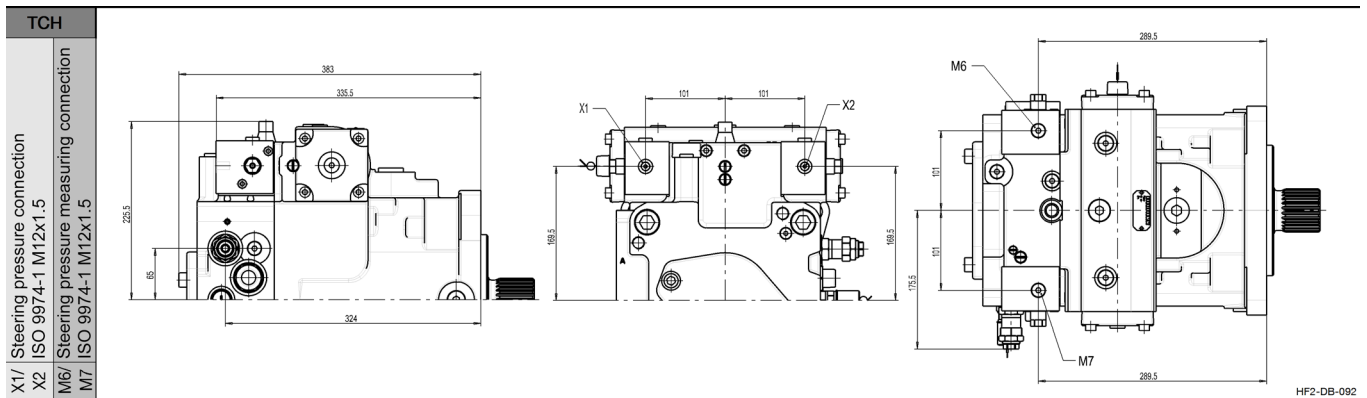
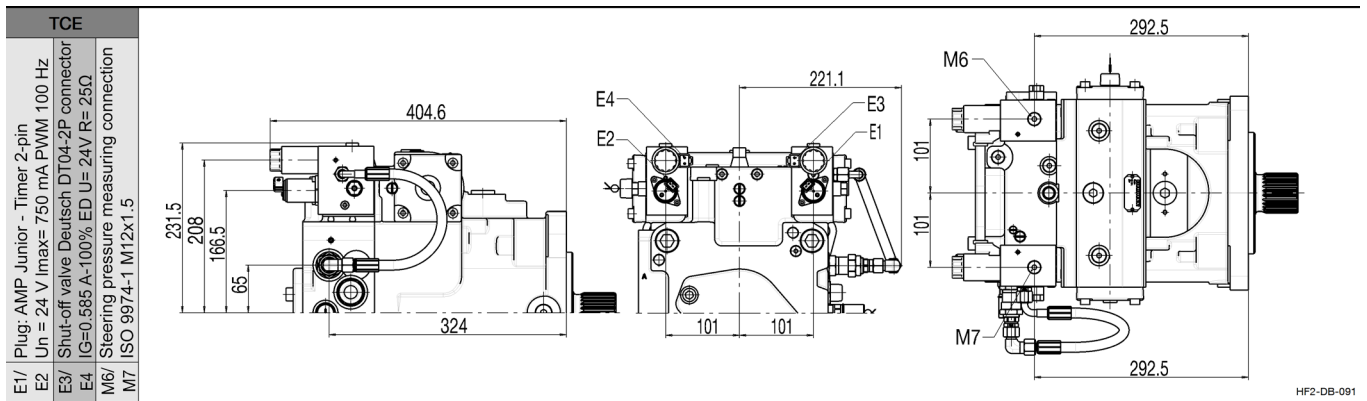
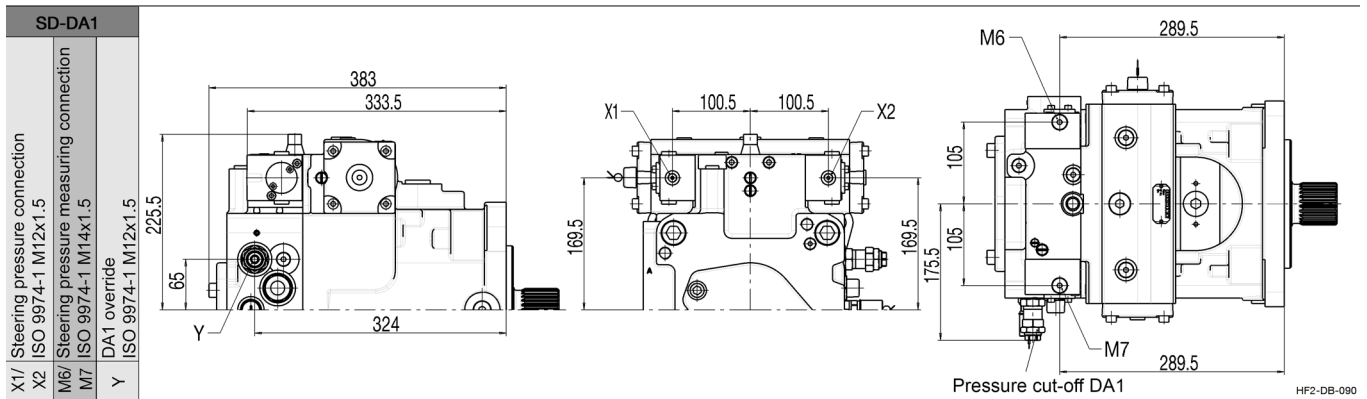
5.13.2 Nominal size 280, other control types



5 Dimensions



5 Dimensions

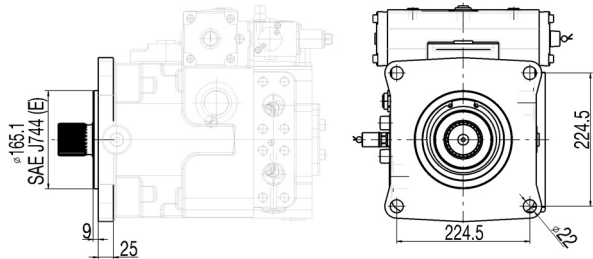


5 Dimensions

5.14 Nominal size 280, mounting flange

DPV	G		/	000		1				A	O				
1.	2.	3.	/	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.

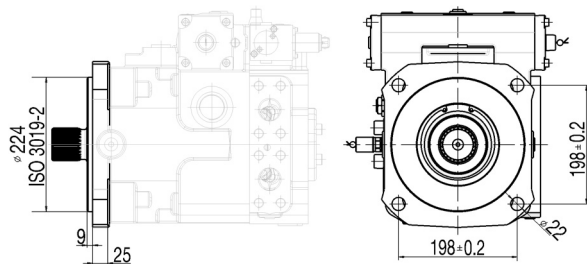
SAE E, (SAE J744)



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HF2-DB-093

ISO 3019-2



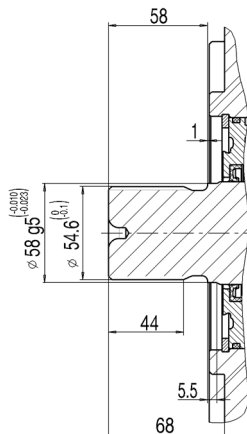
31

HF2-DB-094

5.15 Nominal size 280, shaft end

DPV	G		/	000		1				A	O				
1.	2.	3.	/	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.

W55x2x26x9g splined shaft DIN 5480

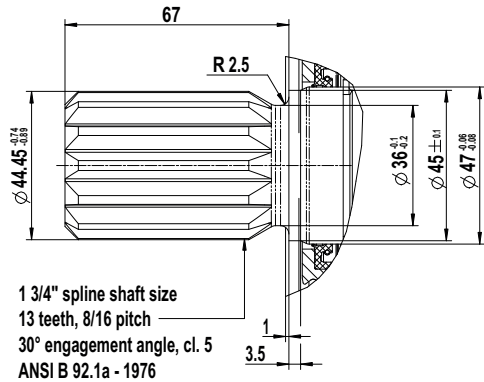


1

HF2-DB-099

5 Dimensions

ANSI B92.1a splined shaft 1 3/4 in 13T 8/16 pitch



DB-DPV/G-171

2

5.16 Through drive

DPV	G		/	000		1				A	O				
1.	2.	3.	/	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.

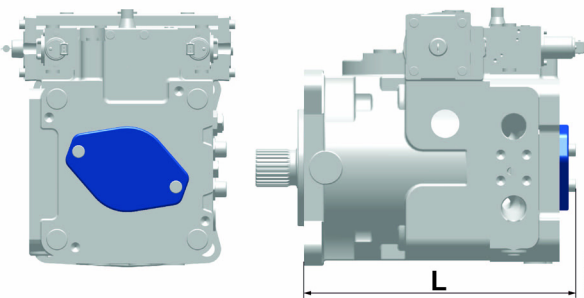
5.16.1 Axial piston unit without through-drive / with preparation for through-drive mounting kit

Note



Preparation for through-drive mounting kit, closed with cover.
To use the through-drive, the selected through-drive mounting kit including coupling ferrule (see installation drawing) must be ordered separately, the cover removed and the through-drive mounting kit installed.

0000 2-hole (NS 085 = 4-hole)



DPVG-DB-157

NS	L
085	322.5
108	292
140	395
165	346
280	383

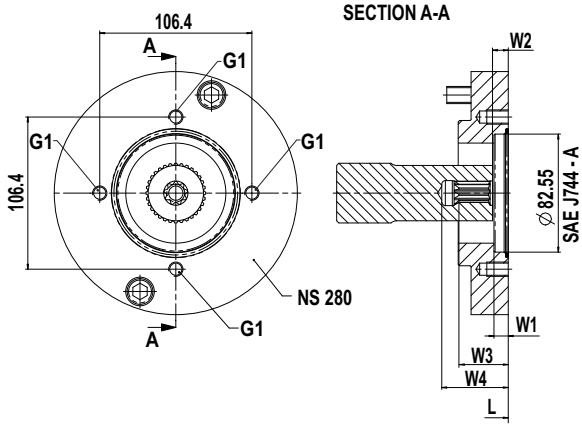
L) up to mounting flange

5 Dimensions

5.17 Through-drive - hole open

5.17.1 SAE A

Gearing: ANSI B92.1a-1976 5/8" 9T 16/32 DP



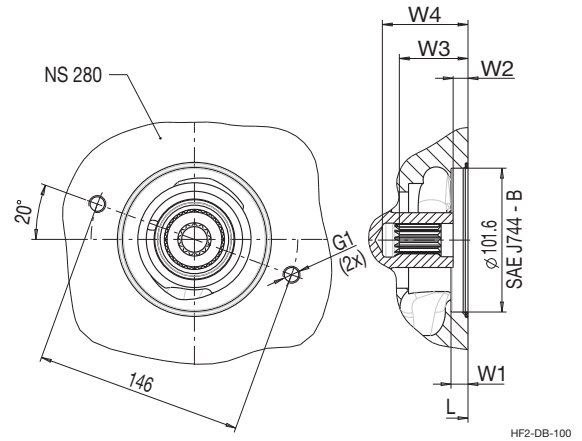
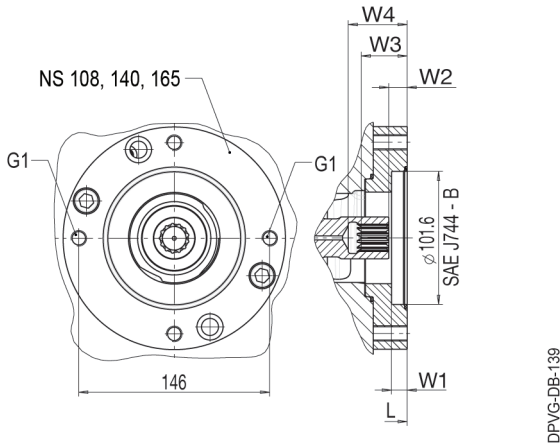
A11D 2-hole

NS	W1	W2	W3	W4	L	G1 (2-hole)
085	-	-	-	-	-	-
108	□	□	□	□	□	□
140	□	□	□	□	□	□
165	□	□	□	□	□	□
280	10	11	34.5	46.5	386	M10x1.5: 15 deep

L*) up to mounting flange/ □ = on request

5.17.2 SAE B

Gearing: ANSI B92.1a-1976 7/8" 13T 16/32 DP



2-hole: **B11D**

4-hole: **B12D**

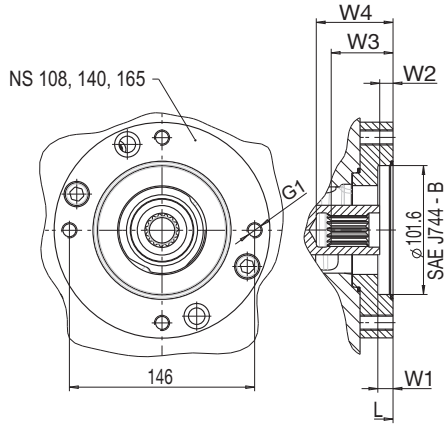
NS	W1	W2	W3	W4	L	G1 (2-hole)	G2 (4-hole)
085	□	□	□	□	□	□	□
108	12	10.5	48.5	60.5	294	M12x1.75: 26 deep	-
140	12	10.5	48.5	60.5	338.5	M12x1.75: 26 deep	-
165	12	14.1	35.1	45.1	348	M12x1.75: 26 deep	-
280	12	10.5	48.5	60.5	386	M12x1.75: 18 deep	-

L*) up to mounting flange / □ = on request

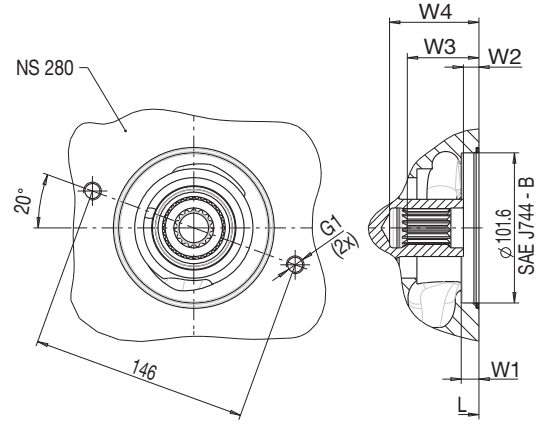
5 Dimensions

5.17.3 SAE BB

Gearing: ANSI B92.1a-1976 1" 15T 16/32 DP



DPVG-DB-140



HF2-DB-102

2-hole: **B21D**

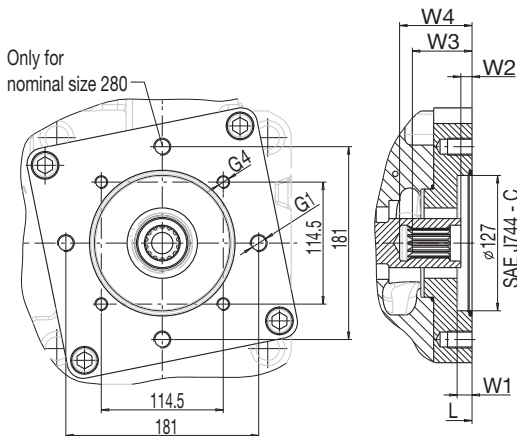
4-hole: **B22D**

NS	W1	W2	W3	W4	L	G1 (2-hole)	G2 (4-hole)
085	□	□	□	□	□	□	□
108	12	10.5	48.5	60.5	294	M12x1.75: 26 deep	-
140	12	10.5	48.5	60.5	338.5	M12x1.75: 26 deep	-
165	12	10.5	49	60.5	348	M12x1.75: 26 deep	-
280	12	10.5	48.5	60.5	386	M12x1.75: 18 deep	-

L*) up to mounting flange / □ = on request

5.17.4 SAE C

Gearing: ANSI B92.1a-1976 1 1/4" 14T 12/24 DP



C11D 2-hole

C12D 4-hole

DPVG-DB-162

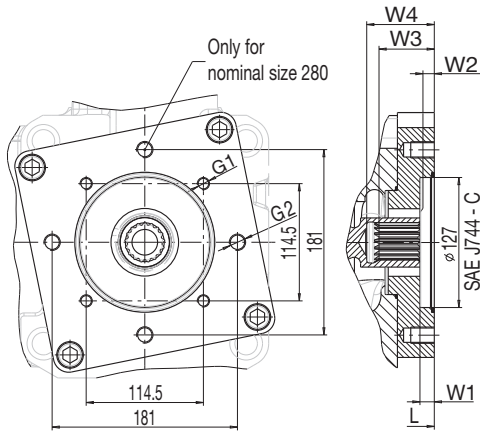
NS	W1	W2	W3	W4	L	G1 (2-hole)	G2 (4-hole)
085	□	□	□	□	□	□	□
108	14	23	53	65	304	M16x2: 23 deep	M12x1.75: 18 deep
140	14	10.5	56	68	362	M16x2: 25 deep	M12x1.75: 19 deep
165	14	13	54	59.5	358	M16x2: 23 deep	M12x1.75: 18 deep
280	14	10.5	56	68	396	M16x2: 23 deep	M12x1.75: 18 deep

L*) up to mounting flange/ □ = on request

5 Dimensions

5.17.5 SAE CC

Gearing: ANSI B92.1a-1976 1 1/2" 17T 12/24 DP



C21D 2-hole

C22D 4-hole

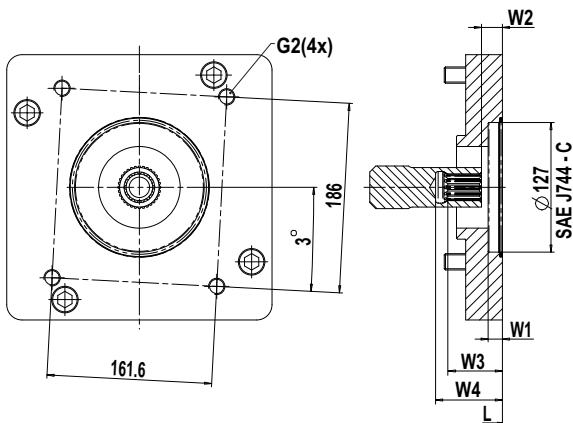
NS	W1	W2	W3	W4	L	G1 (2-hole)	G2 (4-hole)
085	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
108	14	13	53	65	304	M16x2: 23 deep	M12x1.75: 18 deep
140	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
165	14	13	54	65	358	M16x2: 23 deep	M12x1.75: 18 deep
280	14	14	54	66	396	M16x2: 23 deep	M12x1.75: 18 deep

DPVG-DB-153

L*) up to mounting flange/ = on request

5.17.6 SAE C

Gearing: DIN 5480 N30x2x14x10E



C31D 2-hole

C32D 4-hole

NS	W1	W2	W3	W4	L	G1 (2-hole)	G2 (4-hole)
085	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
108	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
140	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
165	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
280	14	20.5	53.5	65.5	396	<input type="checkbox"/>	M16x2: 23 deep

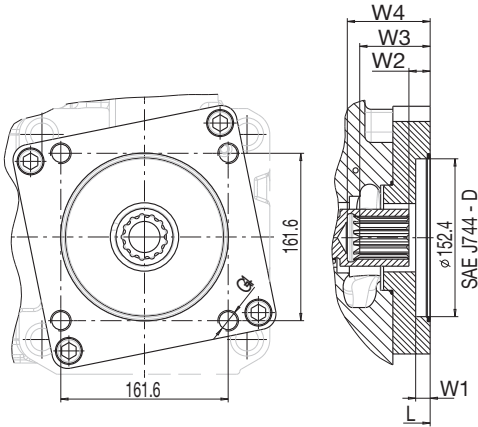
DPVG-DB-146

L*) up to mounting flange/ = on request

5 Dimensions

5.17.7 SAE D

Gearing: ANSI B92.1a-1976 1 3/4" 13T 8/16 DP



D11D 2-hole

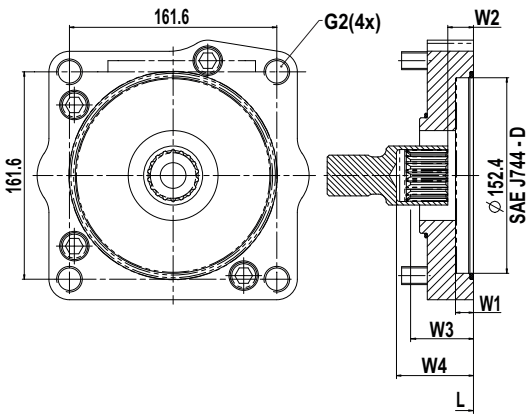
D12D 4-hole

NS	W1	W2	W3	W4	L	G1 (2-hole)	G2 (4-hole)
085	-	-	-	-	-	-	-
108	14	16.5	64	78	314	□	M20x2.5: 36 deep
140	□	□	□	□	□	□	□
165	14	21.5	68	80	358	□	M20x2.5: 36 deep
280	14	20.5	68	80	396	□	M20x2.5: 36 deep

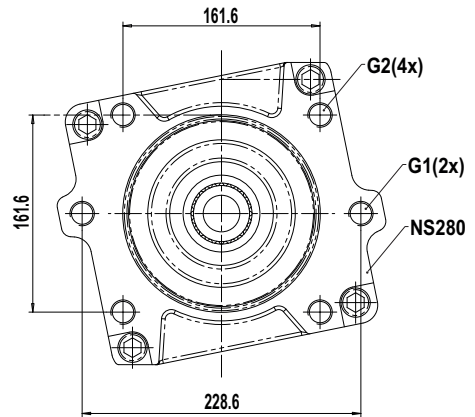
DPV/G-DB-154

L*) up to mounting flange/ □ = on request

Gearing: DIN 5480 N40x2x18x10E



DPV/G-DB-142



DPV/G-DB-144

2-hole: **D31D**

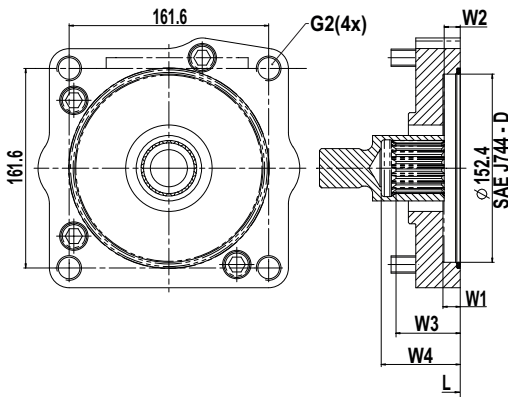
4-hole: **D32D**

NS	W1	W2	W3	W4	L	G1 (2-hole)	G2 (4-hole)
085	-	-	-	-	-	-	-
108	14	20	49	60	304	□	M20x2.5: 27 deep
140	□	□	□	□	□	□	□
165	14	20	49	60	358	□	M20x2.5: 27 deep
280	14	20.5	49.5	60.5	396	M20x2.5: 27 deep	M20x2.5: 27 deep

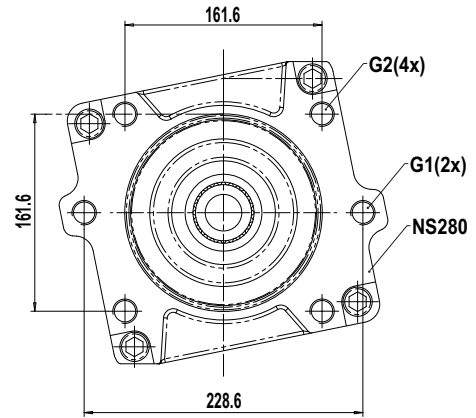
L*) up to mounting flange/ □ = on request

5 Dimensions

Gearing: DIN 5480 N45x2x21x10E



DPVG-DB-143



DPVG-DB-144

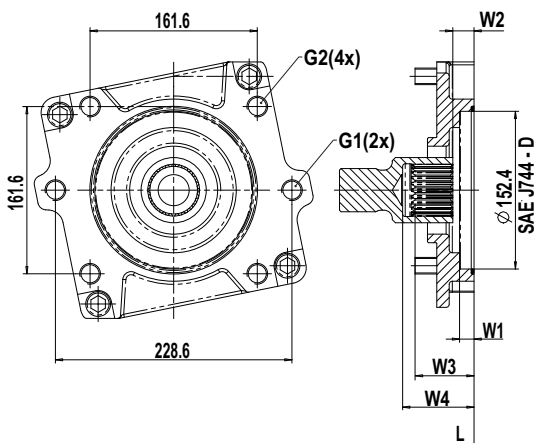
2-hole: **D31D**

4-hole: **D32D**

NS	W1	W2	W3	W4	L	G1 (2-hole)	G2 (4-hole)
085	-	-	-	-	-	-	-
108	14	13	52	64	304	□	M20x2.5: 27 deep
140	□	□	□	□	□	□	□
165	14	20	59	70	358	□	M20x2.5: 27 deep
280	14	19	55	67	396	M20x2.5: 27 deep	M20x2.5: 27 deep

L*) up to mounting flange/ □= on request

Gearing: DIN 5480 N50x2x24x10E



DPVG-DB-145

D31D 2-hole

D32D 4-hole

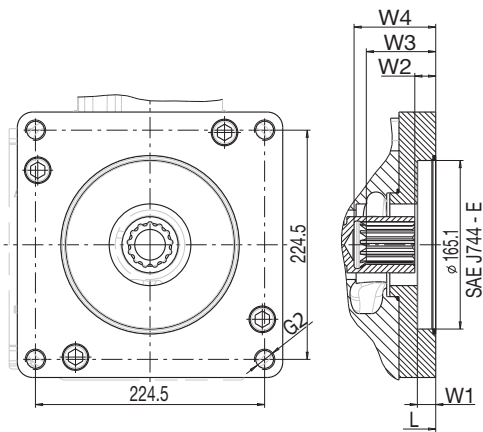
NS	W1	W2	W3	W4	L	G1 (2-hole)	G2 (4-hole)
085	-	-	-	-	-	-	-
108	□	□	□	□	□	□	□
140	□	□	□	□	□	□	□
165	□	□	□	□	□	□	□
280	14	20.5	57	69	396	M20x2.5: 27 deep	M20x2.5: 27 deep

L*) up to mounting flange/ □= on request

5 Dimensions

5.17.8 SAE E

Gearing: ANSI B92.1a-1976 1 3/4" 13T 8/16 DP



E11D 2-hole

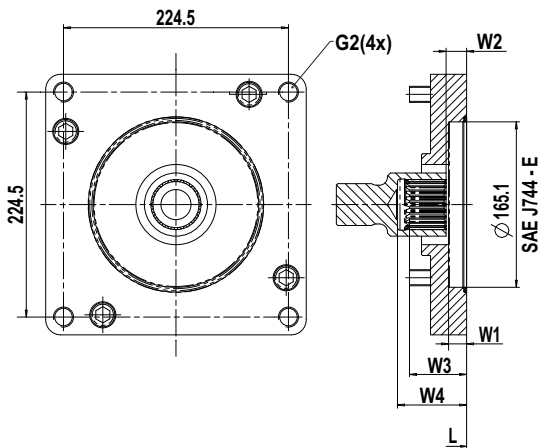
E12D 4-hole

NS	W1	W2	W3	W4	L	G1 (2-hole)	G2 (4-hole)
085	-	-	-	-	-	-	-
108	-	-	-	-	-	-	-
140	-	-	-	-	-	-	-
165	-	-	-	-	-	-	-
280	12	10.5	48.5	60.5	396	-	M20x2.5: 36 deep

DPV/G-DB-155

L*) up to mounting flange/ -= not possible

Gearing: DIN 5480 N50x2x24x10E



E31D 2-hole

E32D 4-hole

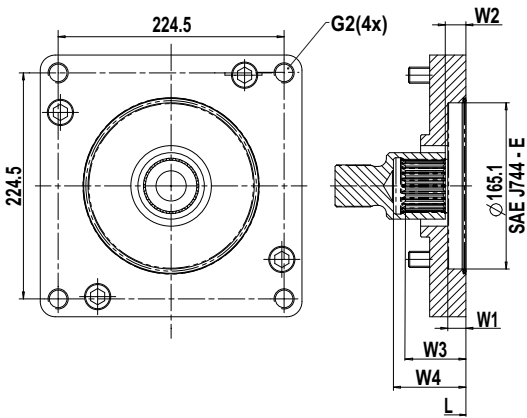
NS	W1	W2	W3	W4	L	G1 (2-hole)	G2 (4-hole)
085	-	-	-	-	-	-	-
108	-	-	-	-	-	-	-
140	-	-	-	-	-	-	-
165	-	-	-	-	-	-	-
280	18	20.5	57	69	396	-	M20x2.5: 36 deep

DPV/G-DB-148

L*) up to mounting flange/ -= not possible

5 Dimensions

Gearing: DIN 5480 N55x2x26x10E



E31D 2-hole

E32D 4-hole

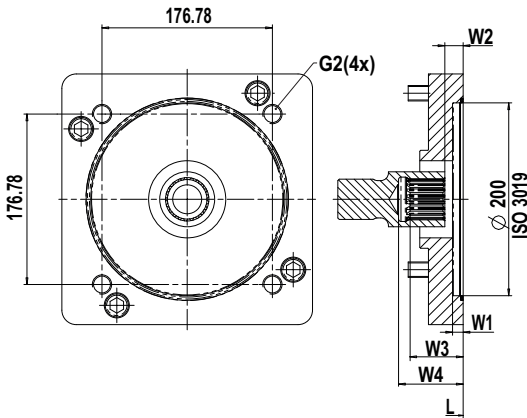
NS	W1	W2	W3	W4	L	G1 (2-hole)	G2 (4-hole)
085	-	-	-	-	-	-	-
108	-	-	-	-	-	-	-
140	-	-	-	-	-	-	-
165	-	-	-	-	-	-	-
280	18	20.5	60	72	396	-	M20x2.5: 36 deep

DPV/G-DB-149

L*) up to mounting flange/ -= not possible

5.17.9 ISO 3019-2 / DIN 5480

∅ 200 ISO 3019-2 / gearing: DIN 5480 N45x2x21x10E



V31D 2-hole

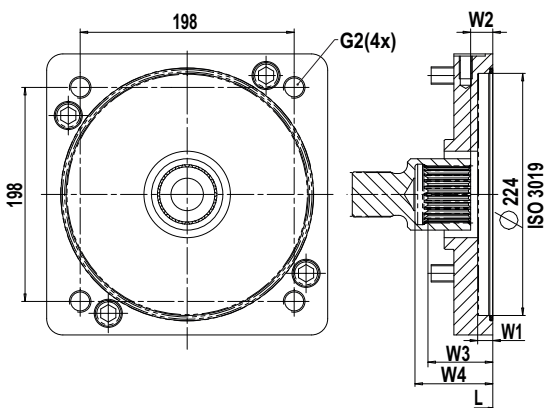
V32D 4-hole

NS	W1	W2	W3	W4	L	G1 (2-hole)	G2 (4-hole)
085	-	-	-	-	-	-	-
108	-	-	-	-	-	-	-
140	-	-	-	-	-	-	-
165	-	-	-	-	-	-	-
280	11	19	55	67	396	-	M20x2.5: 36 deep

DPV/G-DB-150

L*) up to mounting flange/ -= not possible

∅ 224 ISO 3019-2 / gearing: DIN 5480 N55x2x26x10E



W31D 2-hole

W32D 4-hole

NS	W1	W2	W3	W4	L	G1 (2-hole)	G2 (4-hole)
085	-	-	-	-	-	-	-
108	-	-	-	-	-	-	-
140	-	-	-	-	-	-	-
165	-	-	-	-	-	-	-
280	14	20.5	60	72	396	-	M20x2.5: 36 deep

DPV/G-DB-151

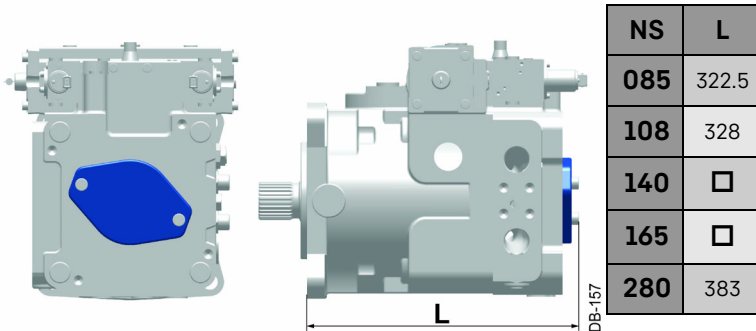
L*) up to mounting flange / -= not possible

5 Dimensions

5.18 Through-drive - hole closed with cover

Gearing: none

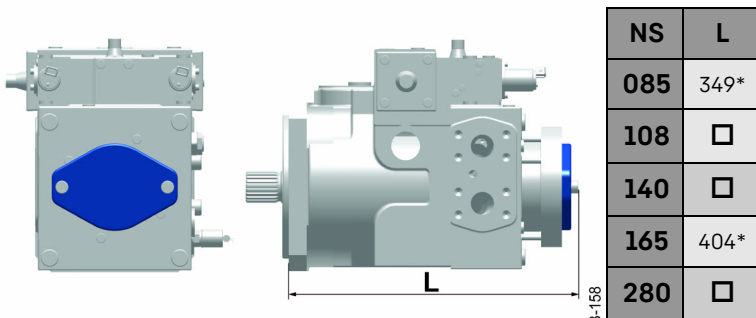
B01G 2-hole (NS 085 = 4-hole)



DPV(G-DB-157) L) up to mounting flange / □= on request

Gearing: ANSI B92.1a-1976 7/8" 13T 16/32 DP

B11G 2-hole



DPV(G-DB-158) L) up to mounting flange / □= on request

*) in combination with feed pump



Note

Other through-drive versions "hole closed with cover" possible upon request.
Additional details upon request.

5 Dimensions

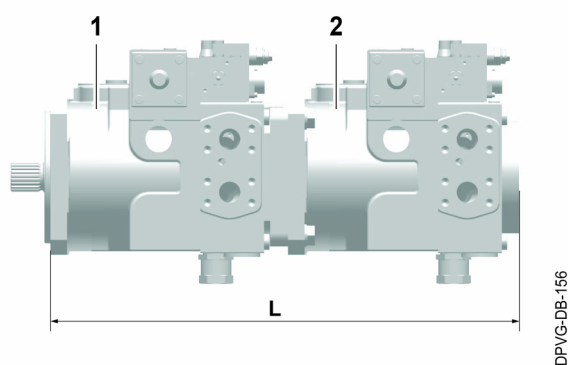
5.19 Multi-circuit pump in tandem design

General information

Multi axial piston units of two or more single units can be supplied on request.

In this case, the base axial piston pump P1 must be connected with another axial piston pump P2 by an intermediate flange 10 and a coupling ferrule 11.

The type code must be filled out separately for each single unit. An abbreviated type designation on an additional type plate is used to identify the multi-unit.



1	Base axial piston pump
2	Flanged axial piston pump

L	Multi-circuit pump overall length in mm
-	-



Note

Multi-circuit pump overall length on request.

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