Axial piston variable pump (A)A4CSG Series 3x

Americas

RE-A 92105
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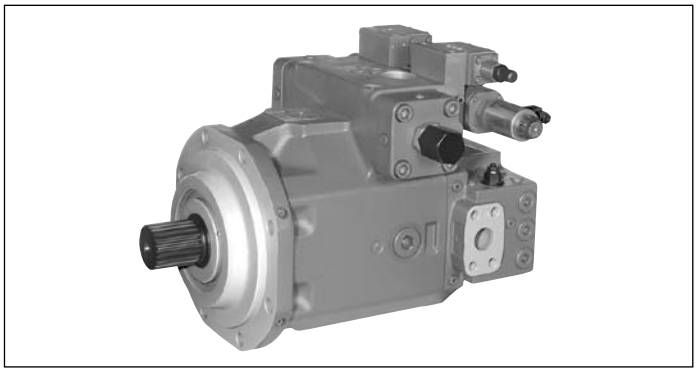

- Sizes 250 to 750
- Nominal pressure 5100 psi (350 bar)
- Maximum pressure 5800 (400 bar)
- Closed circuit

Features

- Variable pump in axial piston swashplate design for hydrostatic drives in closed circuit.
- The flow is proportional to the drive speed and displacement.
- By controlling the swashplate angle, infinitely variable flow is possible.
- The boost pump required for closed-circuit operation and the corresponding valve technology are integrated in the pump.
- The integrated boost pump acts as a feed pump and pilot pressure supply.
- Compact design with extremely short installation length
- Favorable power/weight ratio
- Low noise level
- Long service life
- High efficiency
- Electrohydraulic proportional control with neutral position in the event of a power failure
- Through drive and pump combination also possible with integrated boost pump
- For descriptions of the control devices, please refer to separate data sheets 92076, 92080, 92084.

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Type code for standard program

01	02	03	04	05		06	07		08	09	10	11	12	13	14	15
	A4CS	**G**			**/**			**–**	**V**			**35**				

Version

		250	355	500	750	
01	SAE-Version	●	●	–	–	**A**
	Metric version (without code)	–	–	●	●	

Axial piston unit

02	Swashplate design, variable, nominal pressure 5100 psi (350 bar), maximum pressure 5800 psi (400 bar)	**A4CS**

Operating mode

03	Pump, closed circuit	**G**

Size

		250	355	500	750
04	Geometric displacement, see technical data on page 7	**250**	**355**	**500**	**750**

Control device

				250	355	500	750	
05	Control system hydraulic	with control valve	see 92076	●	●	●	○	**HS5.**
		with proportional valve		○	●	●	○	**EO2**
	Proportional control	hydraulic control, pilot-pressure related	see 92080	●	●	●	●	**HD..**
		electrohydraulic	see 92084	●	●	●	●	**EP..**

Series

		250	355	500	750	
06	Standard version	–	●	–	●	**30**
	Efficiency-optimized version	●	○	●	○	**33**

Directions of rotation

07	Viewed on drive shaft	clockwise	**R**
		counter-clockwise	**L**

Sealing material

		250	355	500	750	
08	FKM (fluoroelastomer)	●	●	●	●	**V**

Drive shaft

		250	355	500	750	
09	Parallel keyed shaft SAE J744	●	●	–	–	**K**
	Splined shaft SAE J744	●		–	–	**S**
	Splined shaft acc. to SAE J744	–	●	–	–	**R**
	Parallel keyed shaft DIN 6885	–	–	●	●	**P**
	Splined shaft DIN 5480	–	–	●	●	**Z**

Mounting flange

			250	355	500	750	
10	Based on ISO 3019-1 (SAE)	4-hole	●	●	–	–	**D**
	Based on ISO 3019-2 (metric)	8-hole	–	–	●	●	**H**

Working port

11	SAE flange ports **A** and **B**, positioned laterally opposite each other, metric fastening thread	–	–	●	●	**35**
	SAE flange port **S**, positioned laterally offset from A and B by 90°, metric fastening thread					
	SAE flange ports **A** and **B**, positioned laterally opposite each other, UNF fastening thread	●	●	●	●	**85**
	SAE flange port **S**, positioned laterally offset from A and B by 90°, UNF fastening thread					

● = Available ○ = On request – = Not available

Notice

▶ Note the project planning notes on page 40!

01	02	03	04	05		06	07		08	09	10	11	12	13	14	15
	A4CS	**G**			**/**			**–**	**V**			**35**				

Boost pump

12	With integrated boost pump	●	●	●	●	**F**
	Without integrated boost pump	●	●	●	●	**K**

Through drive (for mounting options, see page 23)		**250**	**355**	**500**	**750**	
13	With through-drive shaft, without hub, without intermediate flange, closed with cover	●	●	●	●	**99**
	With through drive for mounting a second unit					
	Flange SAE J744 — Hub for splined shaft SAE J744					
	82-2 (A) — 5/8 in (16-4)	●	●	●	●	**01**
	82-2 (A) — 3/4 in (19-4)	○	●	●	○	**52**
	101-2 (B) — 7/8 in (22-4)	●	●	●	○	**68**
	101-2 (B) — 1 in (25-4)	○	●	●	○	**04**
	127-2 (C) — 1 1/4 in (32-4)	●	●	●	○	**07**
	127-4 (C) — 1 1/4 in (32-4)	○	○	○	○	**15**
	1 1/2 in (38-4)	○	○	–	–	**16**
	127-2 (C) — 1 1/2 in (38-4)	●	●	●	○	**24**
	152-4 (D) — 1 3/4 in (44-4)	●	●	●	●	**17**
	2 in (50-4)	○	○	–	–	**78**
	165-4 (E) — 2 in (50-4)	●	●	–	–	**18**
	Flange ISO 3019-2 (metric) — Hub for splined shaft DIN 5480					
	315, 8-hole — W80×3×25x9 g	–	–	●	○	**43**
	400, 8-hole — W90×3×28x9 g	–	–	–	○	**76**

Valves

14	Boost, control pressure relief and flushing valve integrated; direct operated high-pressure relief valve integrated	○	○	○	○	**3**
	Boost, control pressure relief and flushing valve integrated; pilot-operated high-pressure relief valve integrated	●	●	●	●	**4**

Filtration (see page 32)

15	Without filter	●	●	●	●	**N**
	With threaded port for filter in the boost circuit	●	●	●	●	**D**
	With mounted filter (optical/electrical contamination indicator) in the boost circuit	●	●	●	●	**M**
	With threaded port for filter in the boost circuit (D) and intermediate plate filter for HS control (see data sheet 92076)	○	●	–	–	**Z**
	With mounted filter in the boost circuit (M) and intermediate plate filter for HS control (see data sheet 92076)	○	○	–	–	**U**

● = Available ○ = On request – = Not available

Hydraulic fluids

The A4CSG variable pump is designed for operation with HLP mineral oil according to DIN 51524.
Application instructions and requirements for hydraulic fluids should be taken from the following data sheets prior to project planning:

- 90220: Hydraulic fluids based on mineral oils and related hydrocarbons
- 90221: Environmentally acceptable hydraulic fluids

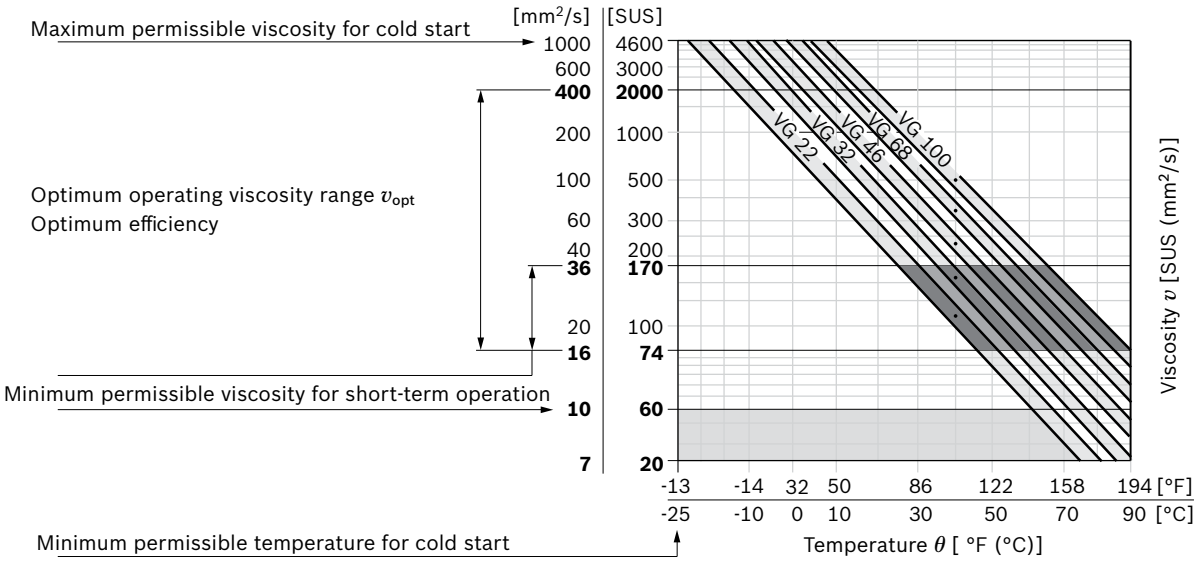
Notes on selection of hydraulic fluid
The hydraulic fluid should be selected so that the operating viscosity in the operating temperature range is within the optimum range (v_{opt}, see selection diagram).

Note
At no point on the component may the temperature be higher than 195 °F (90 °C). The temperature difference specified in the table is to be taken into account when determining the viscosity in the bearing.
If the above conditions cannot be maintained due to extreme operating parameters, please contact the responsible member of staff at Bosch Rexroth.

Viscosity and temperature of hydraulic fluids

	Viscosity	Temperature	Comment
Cold start	v_{max} ≤ 4600 SUS (1000 mm²/s)	θ_{St} ≥ -13 °F (-25 °C)	t ≤ 3 min, without load p ≤ 725 psi (50 bar)
Permissible temperature difference		ΔT ≤ 25 K	between axial piston unit and hydraulic fluid in the system
Warm-up phase	v = 4600 to 463 SUS (1000 to 100 mm²/s)	θ ≥ -13 °F (-25 °C)	at p_{nom}, 0.5 × n_{max} and t ≤ 15 min
Continuous operation	v = 463 to 80 SUS (100 to 16 mm²/s)	θ = -13 °F to +195 °F (-25 °C to +90 °C)	Note the permissible temperature range of the shaft seal measured at the drain port
	v_{opt} = 80 to 170 SUS (36 to 16 mm²/s)		Range of optimum operating viscosity and efficiency
Short-term operation	v_{min} ≤ 60 SUS (10 mm²/s)	θ_{max} = +195 °F (+90 °C)	t < 3 min, p < 0.3 × p_{nom}

▼ **Selection diagram**



Shaft seal

Filtration of the hydraulic fluid

Finer filtration improves the cleanliness level of the hydraulic fluid, which increases the service life of the axial piston unit.

A cleanliness level of at least 20/18/15 is to be maintained according to ISO 4406.

Depending on the system and application, we recommend for the A4CSG filter cartridges $\beta_{20} \geq 100$.

A “threaded port for filter in the boost circuit” is optionally available with order designation **D** or “a filter mounted in the boost circuit” with order designation **M**. For a description, see pages 32 to 33.

Bearing flushing

For the following operating conditions bearing flushing is required for a safe, continuous operation:

- Applications with special fluids (not mineral fluids) due to limited lubricity and narrow operating temperature range
- Operation with borderline conditions for temperature and viscosity during operation with mineral oil

With vertical installation (drive shaft upwards), bearing flushing is recommended for lubricating the front bearing and the shaft seal, otherwise a reduced service life of the shaft seal is to be expected.

Bearing flushing is realized at port “**U**” in the area of the front flange of the variable pump. The flushing fluid flows through the front bearing and discharges with the pump drain at the drain port.

Depending on the individual sizes, the following flushing flows are recommended:

Size			**250**	**355**	**500**	**750**
recommended flushing flow	q_{sp}	gpm (l/min)	2.64 (10)	3.96 (15)	5.28 (20)	7.93 (30)

For the flushing flows stated, there is a pressure differential of approximately 45 psi (3 bar) between the port “**U**” (including fitting) and the housing area.

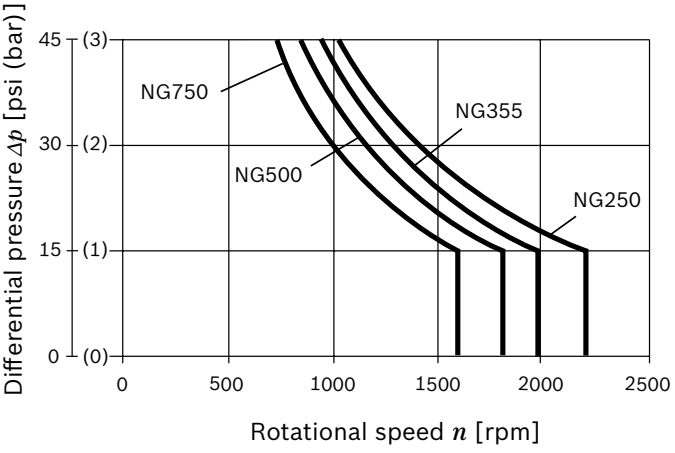
Note on bearing flushing

When using bearing flushing on port **U**, the throttle screw in port **U** must be turned in to the end stop.

Permissible pressure load

The service life of the shaft seal ring is affected by the rotational speed of the axial piston unit and the leakage pressure (case pressure). Momentary (t < 0.1 s) pressure peaks of up to 145 psi (10 bar) are permitted. The service life of the shaft seal decreases with an increase in the frequency of pressure peaks and an increase in the mean differential pressure.

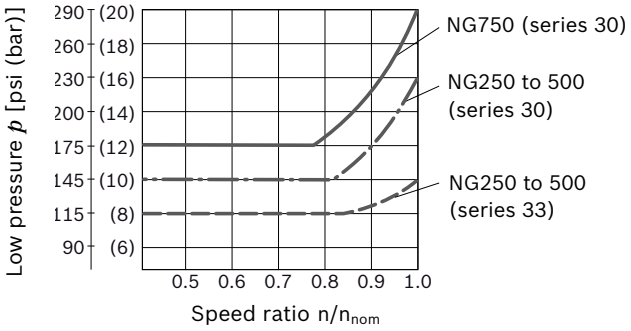
The pressure in the case must be equal to or greater than the ambient pressure.



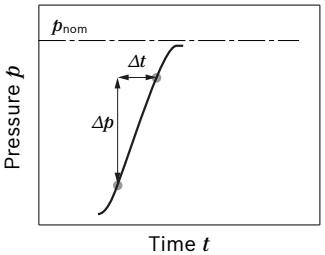
Working pressure range

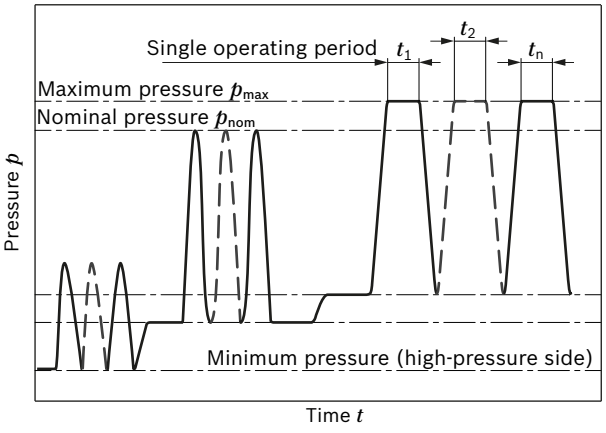
Pressure at working ports A or B			**Definition**
Nominal pressure p_{nom}		5100 psi (350 bar)	The nominal pressure corresponds to the maximum design pressure.
Maximum pressure p_{max}		5800 psi (400 bar)	The maximum pressure corresponds to the maximum working pressure within the single operating period. The sum of the single operating periods must not exceed the total operating period.
	Single operating period	1 s	
	Total operating period	300 h	
Minimum pressure (high-pressure side)		220 psi (15 bar)	Minimum pressure at the high-pressure side (**A** or **B**) which is required to prevent damage to the axial piston unit.
Minimum pressure (low-pressure side)		Speed related (see diagram)	Minimum pressure at the low-pressure side (**A** or **B**) which is required in order to prevent damage to the axial piston unit. The low pressure is present at port **M_{K4}** with the flushing slide deflected.
Rate of pressure change $R_{A\,max}$		232000 psi/s (16000 bar/s)	Maximum permissible speed of pressure build-up and reduction during a pressure change across the entire pressure range.
Boost pressure			
Minimum boost pressure p_{Sp} (at n_{nom})		230psi (16 bar)	NG250 to 500 series 30
		290 psi (20 bar)	NG750 series 30
		145 psi (10 bar)	NG250 to 500 series 33
Maximum static boost pressure $p_{Sp\,max}$		435 psi (30 bar)	Measuring port **M_{K4}** (Please contact us for coupled multiple pumps)
Permissible pressure peaks in boost pressure	minimum	60 psi (4 bar)	
	maximum	580 psi (40 bar)	
Pressure at suction port S (version with integrated boost pump)			
Minimum pressure $p_{S\,min}$		≥ 12 psi absolute (≥ 0.8 bar absolute)	Minimum pressure at suction port S (inlet) that is required in order to avoid damage to the axial piston unit.
Maximum pressure $p_{S\,max}$		435 psi absolute (30 bar absolute)	
Control pressure for EP and HD control.			
Minimum required control pressure $p_{Sr\,min}$		double boost pressure at NG 355 +75 psi (5 bar)	Measuring port **M_1** (small stroking chamber)

▼ **Required low pressure depending on the speed ratio**



▼ **Rate of pressure change**





Total operating period = $t_1 + t_2 + ... + t_n$

Notice
Working pressure range valid when using hydraulic fluids based on mineral oils. Values for other hydraulic fluids, please contact us.

Technical data

Size		NG		250	355	500	750
Displacement, geometric, per revolution	Variable pump	$V_{g\,max}$	in³ (cm³)	15.26 (250)	21.7 (355)	30.51 (500)	45.8 (750)
	Integrated boost pump	$V_{g\,Sp}$	in³ (cm³)	3.84 (63)	4.88 (80)	5.98 (98)	8.72 (143)
Rotational speed[1]	maximum at $V_{g\,max}$	n_{nom}	rpm	2200	2000	1800	1600
	minimal[2]	n_{min}	rpm	800	800	800	800
Flow (variable pump) at $V_{g\,max}$ and	n_{max}	q_v	gpm (l/min)	145.3 (550)	187.6 (710)	237.8 (900)	317 (1200)
	n_E = 1200 rpm	q_{VE}	gpm (l/min)	79.3 (300)	112.5 (426)	158.5 (600)	237.8 (900)
	n_E = 1800 rpm	q_{VE}	gpm (l/min)	118.9 (450)	168.8 (639)	237.7 (900)	– (–)
Power[3] at $V_{g\,max}$, Δp = 5100 psi (350 bar) and	n_{max}	P	HP (kW)	432 (321)	558 (414)	525	700
	n_E = 1200 rpm	P_E	HP (kW)	236 (175)	334.7 (248)	471.6 (350)	707.6 (525)
	n_E = 1800 rpm	P_E	HP (kW)	353.8 (263)	502.3 (373)	707 (525)	– (–)
Torque[3] at $V_{g\,max}$ and	Δp = 5100 psi (350 bar)	T	lb-ft (Nm)	1032 (1391)	1465 (1976)	2064 (2783)	3096 (4174)
	Δp = 1450 psi (100 bar)	T	lb-ft (Nm)	295 (398)	416 (564)	586 (795)	879 (1193)
Rotary stiffness of drive shaft	P K	c	lb-ft/rad (kNm/rad)	388399 (527) 326491 (443)	– 589600 (814)	843865 (1145) –	1370820 (1860) –
	S/R/Z	c	lb-ft/rad (kNm/rad)	–	350075 (475)	891033 (1209)	1335444 (1812)
Moment of inertia for rotary group		J_{TW}	lb-ft² (kgm²)	2276 (0.0959)	4509 (0.19)	7809 (0.3325)	15660 (0.66)
Maximum angular acceleration[4]		α	rad/s²	775	600	540	400
Case volume		V	gal (l)	2.6 (10)	2.1 (8)	3.7 (14)	5.0 (19)
Weight (pump with EP control and integrated boost pump without filter) approx.		m	lbs (kg)	573 (260)	606 (275)	860 (390)	1146 (520)

Determining the characteristics

Flow $q_v = \dfrac{V_g \cdot n \cdot \eta_v}{231\ (1000)}$ [gpm (l/min)]

Torque $T = \dfrac{V_g \cdot \Delta p}{24\ (20) \cdot \pi \cdot \eta_{mh}}$ [lb-ft (Nm)]

Power $P = \dfrac{2\,\pi \cdot T \cdot n}{33000\ (60000)} = \dfrac{q_v \cdot \Delta p}{1714\ (600) \cdot \eta_t}$ [HP (kW)]

Key

V_g	=	Displacement per revolution [in³ (cm³)]
Δp	=	Differential pressure [psi (bar)]
n	=	Rotational speed [rpm]
η_v	=	Volumetric efficiency
η_{mh}	=	Mechanical-hydraulic efficiency
η_t	=	Total efficiency ($\eta_t = \eta_v \cdot \eta_{mh}$)

1) The values are applicable:
   – for the optimum viscosity range from ν_{opt} = 36 to 16 mm²/s
   – for hydraulic fluid based on mineral oils
2) Lower values on request
3) Without boost pump
4) The data are valid for values between the minimum required and maximum permissible rotational speed.
   Valid for external excitation (e.g. diesel engine 2 to 8 times rotary frequency, cardan shaft twice the rotary frequency).
   The limit value is only valid for a single pump.
   The load capacity of the connecting parts must be considered.

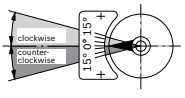
Notice

- Theoretical values, without efficiency and tolerances; values rounded
- Operation above the maximum values or below the minimum values may result in a loss of function, a reduced service life or in the destruction of the axial piston unit. Bosch Rexroth recommends testing the loads by means of experiment or calculation / simulation and comparison with the permissible values.

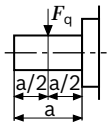
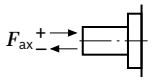
Flow direction

Direction of rotation		Swiveling range*
clockwise	counter-clockwise	
B to A	A to B	clockwise
A to B	B to A	counter-clockwise

* cf. swivel angle indicator



Permissible radial and axial forces of the drive shafts

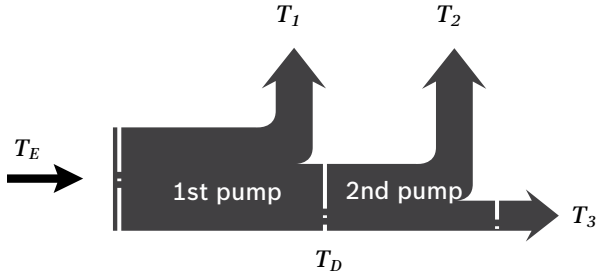
Size		NG		250	355	500	750
Drive shaft							
Maximum radial force at X/2		$F_{q\,max}$	lb (N)	450 (2000)	495 (2200)	560 (2500)	675 (3000)
Maximum axial force		$\pm F_{ax\,max}$	lb (N)	405 (1800)	450 (2000)	450 (2000)	450 (2000)
					T_D <	$T_{D\,max}$	

Note
Special requirements apply in the case of belt drives.
Please contact us.

Permissible input and through-drive torques

Size		NG		250	355	500	750
Torque at $V_{g\,max}$ and Δp = 350 bar[1)]		T_{max}	lb-ft (Nm)	1026 (1391)	1457 (1976)	2053 (2783)	3079 (4174)
Maximum input torque at drive shaft[2)]							
	Splined shaft S/R/Z	$T_{E\,max}$	lb-ft (Nm)	2052 (2782)	2917 (3952)	4105 (5566)	6157 (8348)
	Shaft key K/P	$T_{E\,max}$	lb-ft (Nm)	1696 (2300)	2624 (3557)	3835 (5200)	5542 (7513)
Maximum through-drive torque				$T_{D\,max} = T_{E\,max}$			

Distribution of torques



Torque at 1st pump	T_1		
Torque at 2nd pump	T_2		
Torque at 3rd pump	T_3		
Input torque	T_E	=	$T_1 + T_2 + T_3$
	T_E	<	$T_{E\,max}$
Through-drive torque	T_D	=	$T_2 + T_3$

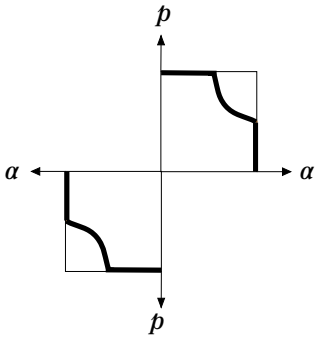
1) Efficiency not considered
2) For drive shafts free of radial force

Overview of control devices

HS5. – control system, hydraulic with proportional valve
(see data sheet 92076)
The stepless displacement control is accomplished by means of a proportional valve and electrical feedback of the swivel angle.
The HS5**P** control system is equipped with mounted pressure transducers, which means that it can be used for electric pressure and power control.

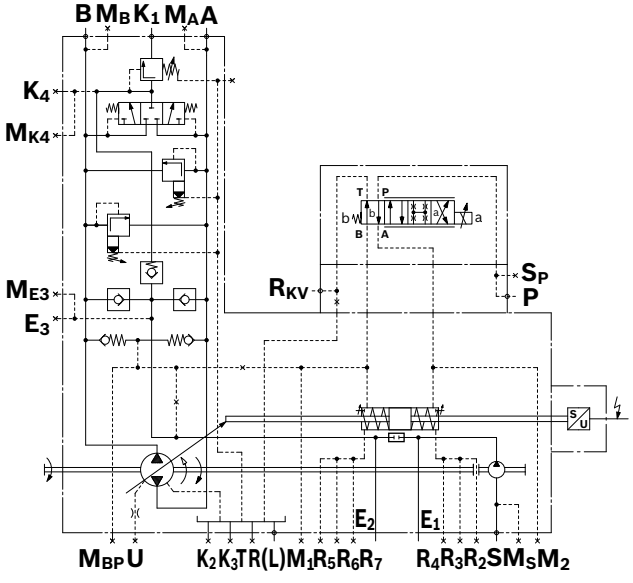
Optional:
- With pressure transducer (HS5P)
- Short circuit valve (HS5K, HS5KP)
- For oil-immersed use (HS5M)
- With On Board Elektronik OBE (HS5E)

▼ **Characteristic curve**



▼ **Circuit diagram**

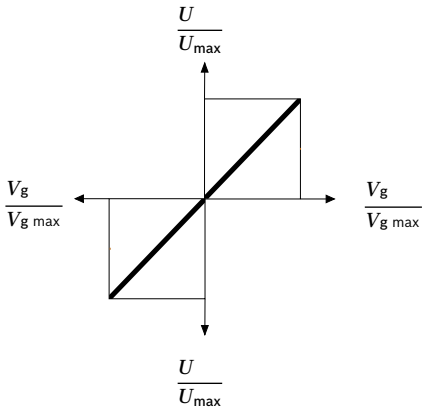
Example: A4CSG 250/355 HS5...F..4D



EO2 – control system, hydraulic with proportional valve
(see data sheet 92076)
The stepless control of the displacement flow is accomplished by means of a proportional valve and electrical feedback of the swivel angle.
Thus, the control can be used as an electric displacement control.

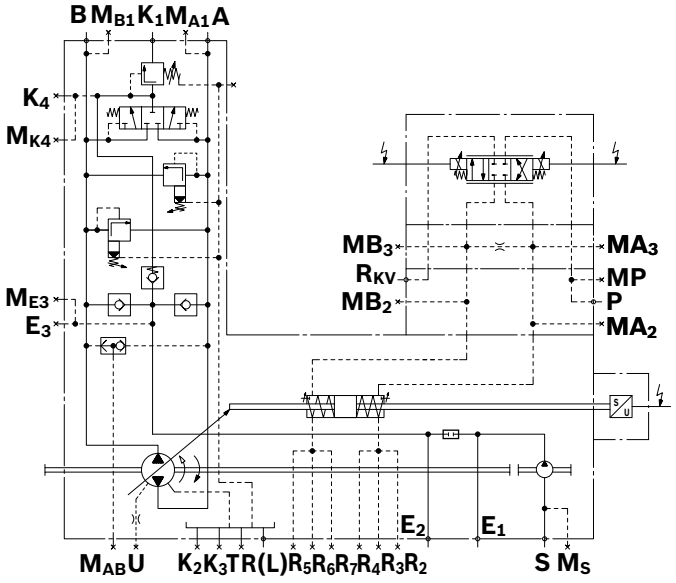
Optional:
- Short circuit valve (EO2K)

▼ **Characteristic curve**



▼ **Circuit diagram**

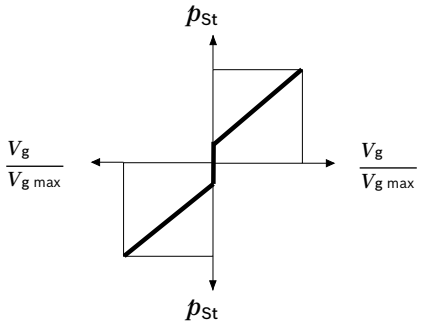
Example: A4CSG 500/750 EO2...F..4D



HD – Proportional control, hydraulic, pilot-pressure related (see data sheet 92080)
Stepless adjustment of the pump displacement according to the pilot pressure. The control is proportional to the specified pilot pressure setpoint value (difference between $\mathbf{X_1}$, $\mathbf{X_2}$).
For version **F** with integrated boost pump, the control is supplied internally with the control pressure from the boost circuit. This saves using a separate control pressure pump.

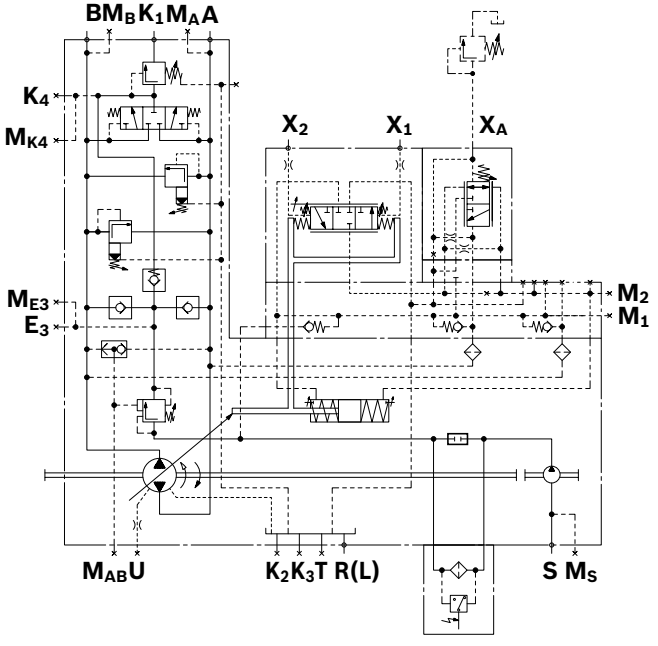
Optional:
- Control characteristics (HD1, HD2, HD3)
- Pressure control (HD.A, HD.B, HD.D)
- Remote pressure control (HD.GA, HD.GB, HD.G)
- Power control (HD1P)
- Electrical control of pilot pressure (HD1T)

▼ **Characteristic curve**



▼ **Circuit diagram**

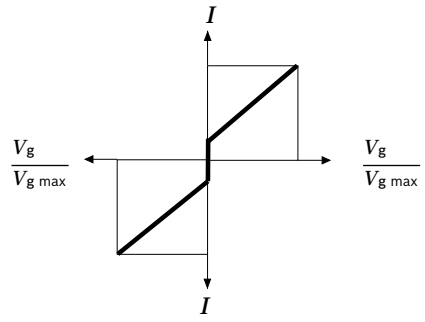
Example: A4CSG 500/750 HD1...F..4M



EP – proportional control, electrohydraulic
(see data sheet 92084)
The EP control adjusts the pump displacement proportionally to the current at the solenoid. Current-regulated control units with pulse-width modulation are recommended for controlling the solenoids.
For version **F** with integrated boost pump, the control is supplied internally with the control pressure from the boost circuit. This saves using a separate control pressure pump.

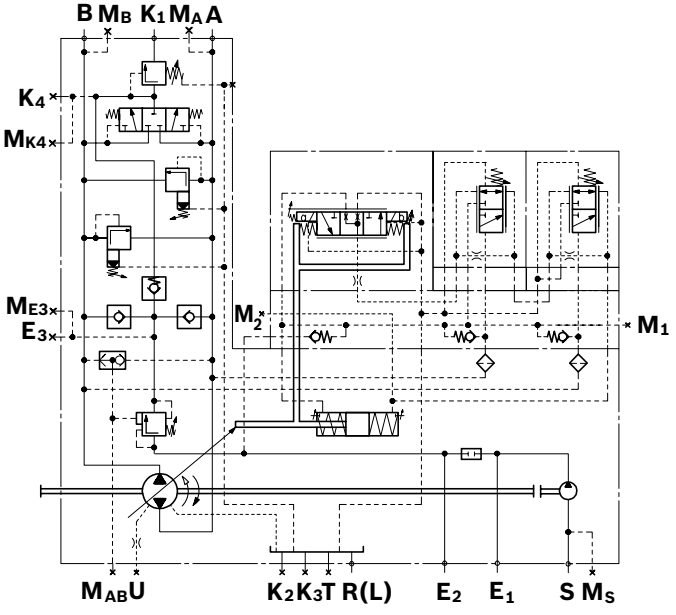
Optional:
- Pressure control (EPA, EPB, EPD)
- Remote pressure control (EPGA, EPGB, EPG)

▼ **Characteristic curve**



▼ **Circuit diagram**

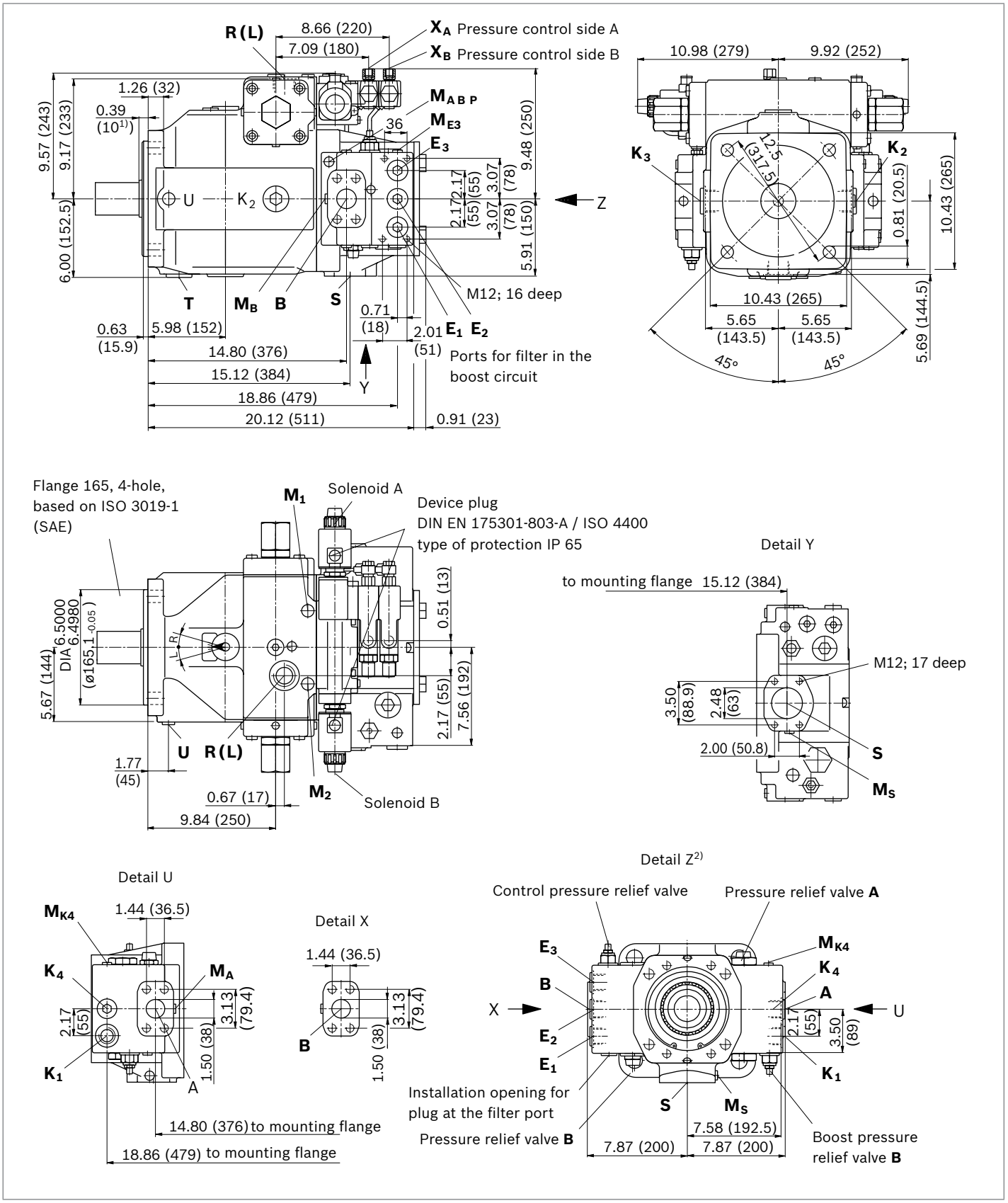
Example: A4CSG 500/750 EPD...F..4D[1)]



1) Version M with filter, see page 30

Dimensions, size 250

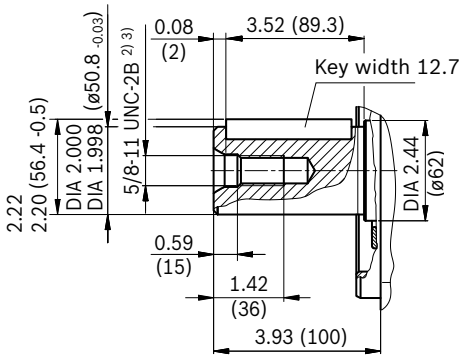
AA4CSG250EPG/30R-XXB85F994N



1) Up to shaft collar
2) Through drive F99 shown without cover, for dimensions see page 24

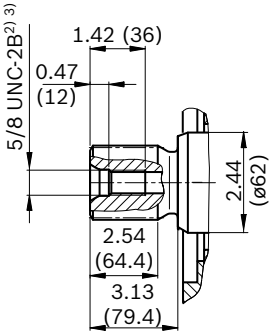
▼ **Parallel keyed shaft ISO 3019-1**

K – 2in



▼ **Splined shaft SAE J744**

S – 2in 15T 8/16DP[1] (SAE F)

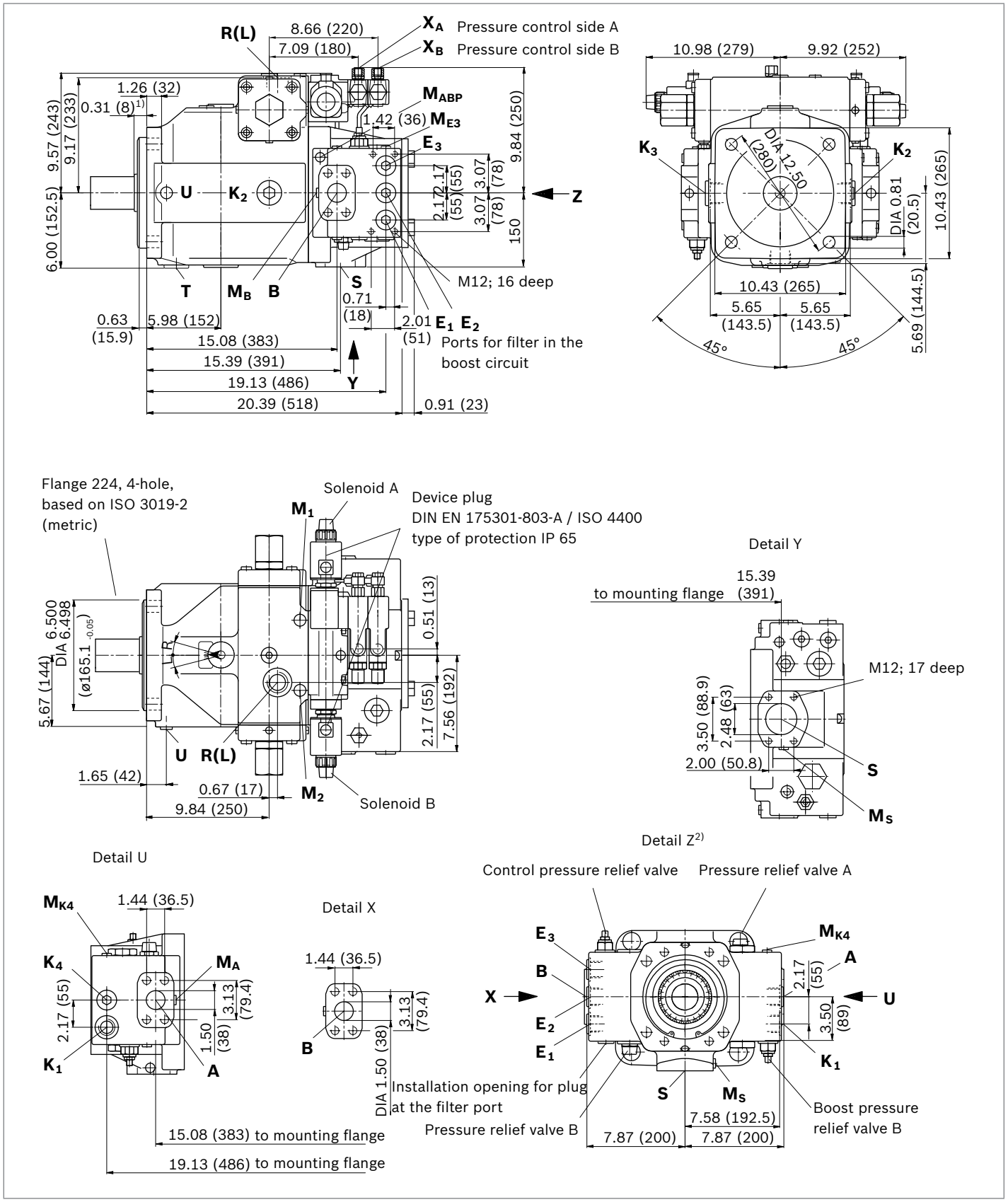


Ports		Standard	Size[2]	p_{max} [psi (bar)][4]	State[7]
A, B	Working line (high-pressure series)	SAE J518	1 1/2 in	5800 (400)	O
	Fastening thread A/B	ASME B1.1	5/8-11UNC-2B; 1.14 (29) deep		
S	Suction port (standard pressure series)	SAE J518	2 1/2 in	435 (30)	O
	Fastening thread S	ASME B1.1	1/2-13UNC-2B; 1.06 (27) deep		
M_A, M_B, M_{ABP}	Measuring working pressure A/B	ISO 11926	9/16-18UNF-2B; 0.51 (13) deep	5800 (400)	X
M_S	Measuring suction	ISO 11926	9/16-18UNF-2B; 0.51 (13) deep	435 (30)	X
T	Fluid drain	ISO 11926[5]	1 5/8-12UN-2B; 0.79 (20) deep	60 (4)	X[6]
E_1	Filter, supply	ISO 11926	1 5/16-12UN-2B; 0.79 (20) deep	580 (40)	X
E_2	Filter, return	ISO 11926	1 5/16-12UN-2B; 0.79 (20) deep	580 (40)	X
K_1	Flushing port	ISO 11926	1 5/16-12UN-2B; 0.79 (20) deep	76 (5)	O
K_2, K_3	Fluid filling + air bleeding	ISO 11926[5]	1 5/8-12UN-2B; 0.79 (20) deep	60 (4)	X[6]
R(L)	Return flow (drain port)			60 (4)	O[6]
U	Bearing flushing	ISO 11926[5]	7/16-20UNF-2B; 0.47 (12) deep	100 (7)	X
E_3	Boost pressure supply	ISO 11926	1 5/16-12UN-2B; 0.79 (20) deep	580 (40)	X
M_{E3}	Measuring boost pressure	ISO 11926	9/16-18UNF-2B; 0.51 (13) deep	580 (40)	X
K_4	Accumulator port	ISO 11926	1 5/16-12UN-2B; 0.79 (20) deep	580 (40)	X
M_{K4}	Measuring boost pressure	ISO 11926	9/16-18UNF-2B; 0.51 (13) deep	580 (40)	X
M_1, M_2	Measuring control pressure	DIN 3852	M18 × 1.5; 12 deep	5800 (400)	X
X_A, X_B	Pilot pressure, remote control pressure controller	ISO 11926	9/16-18UNF-2B; 0.51 (13) deep	5100 (350)	O

1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Center bore according to DIN 332 (thread according to ASME B1.1)
3) For notes on tightening torques, see the instruction manual
4) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
5) The countersink can be deeper than that specified in the standard.
6) Depending on the installation position, T, K_2, K_3 or R(L) must be connected (see also pages 34 to 36)
7) O = Must be connected (plugged when delivered)
X = Plugged (in normal operation)

Dimensions, size 355

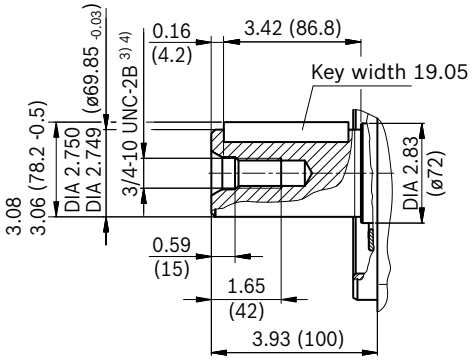
A4CSG355EPG/30R-XXB85F994N



1) Up to shaft collar
2) Through drive F99 shown without cover, for dimensions see page 24

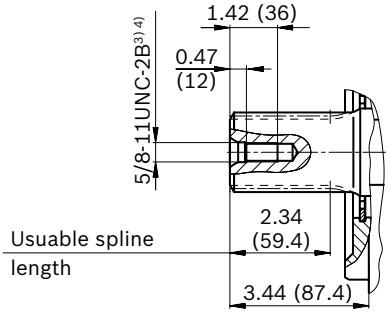
▼ **Parallel keyed shaft ISO 3019-1**

K – 2 3/4in



▼ **Splined shaft SAE J744**

R – 2in 15T 8/16DP (SAE 50-4 (F))[1)2)]

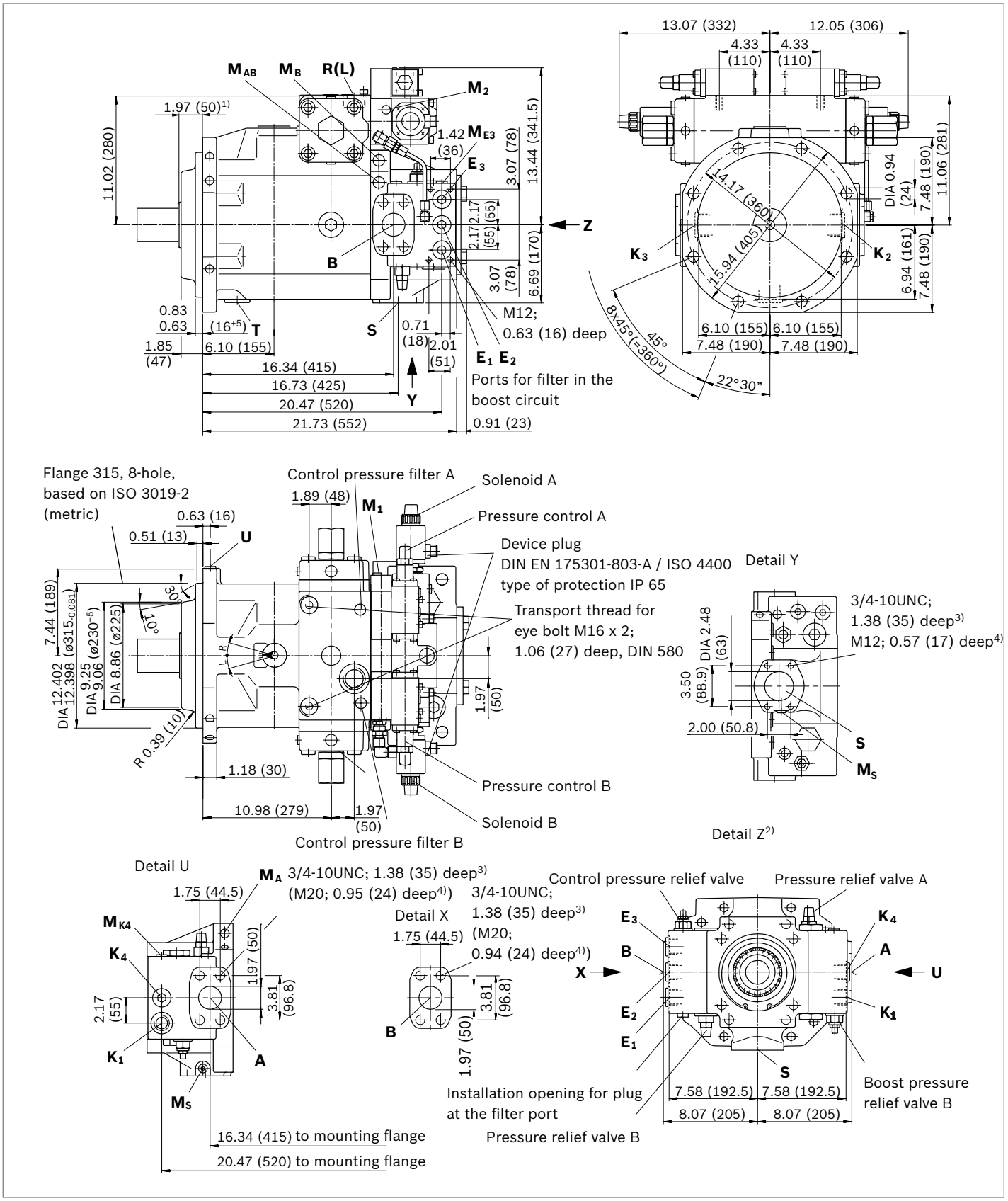


Ports		Standard	Size[4)]	p_{max} [psi (bar)][5)]	State[8)]
A, B	Working line (high-pressure series)	SAE J518	1 1/2 in	5800 (400)	O
	Fastening thread A/B	ASME B1.1	5/8-11UNC-2B; 1.14 (29) deep		
S	Suction port (standard pressure series)	SAE J518	2 1/2 in	435 (30)	O
	Fastening thread S	ASME B1.1	1/2-13UNC-2BG; 1.06 (27) deep		
M_A, M_B, M_{ABP}	Measuring working pressure A/B	ISO 11926	9/16-18UNF-2B; 0.51 (13) deep	5800 (400)	X
M_S	Measuring suction	ISO 11926	9/16-18UNF-2B; 0.51 (13) deep	435 (30)	X
T	Fluid drain	ISO 11926[6)]	1 5/8-12UN-2B; 0.79 (20) deep	60 (4)	X[7)]
E_1	Filter, supply	ISO 11926	1 5/16-12UN-2B; 0.79 (20) deep	580 (40)	X
E_2	Filter, return	ISO 11926	1 5/16-12UN-2B; 0.79 (20) deep	580 (40)	X
K_1	Flushing port	ISO 11926	1 5/16-12UN-2B; 0.79 (20) deep	76 (5)	O
K_2, K_3	Fluid filling + air bleeding	ISO 11926[6)]	1 5/8-12UN-2B; 0.79 (20) deep	60 (4)	X[7)]
R(L)	Return flow (drain port)			60 (4)	O[7)]
U	Bearing flushing	ISO 11926[6)]	3/4-16UNF-2B; 0.59 (15) deep	100 (7)	X
E_3	Boost pressure supply	ISO 11926	1 5/16-12UN-2B; 0.79 (20) deep	580 (40)	X
M_{E3}	Measuring boost pressure	ISO 11926	9/16-18UNF-2B; 0.51 (13) deep	580 (40)	X
K_4	Accumulator port	ISO 11926	1 5/16-12UN-2B; 0.79 (20) deep	580 (40)	X
M_{K4}	Measuring boost pressure	ISO 11926	9/16-18UNF-2B; 0.51 (13) deep	580 (40)	X
M_1, M_2	Measuring control pressure	DIN 3852	M18 × 1.5; 12 deep	5800 (400)	X
X_A, X_B	Pilot pressure, remote control pressure controller	ISO 11926	9/16-18UNF-2B; 0.51 (13) deep	5100 (350)	O

1) Involute spline according to ANSI B92.1a, 30° pressure angle, flat root, side fit, tolerance class 5
2) Splines according to ANSI B92.1a, run out of spline is a deviation from standard.
3) Center bore according to DIN 332 (thread according to ASME B1.1)
4) For notes on tightening torques, see the instruction manual
5) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
6) The countersink can be deeper than that specified in the standard.
7) Depending on the installation position, T, K_2, K_3 or R(L) must be connected (see also pages 34 to 36)
8) O = Must be connected (plugged when delivered)
X = Plugged (in normal operation)

Dimensions, size 500

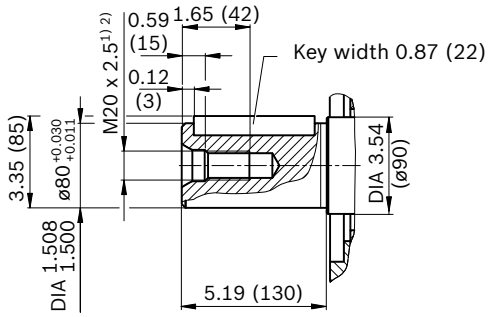
A4CSG500EPD/30R-XXH35F994N / A4CSG500EPD/30R-XXH85F994N



1) Up to shaft collar
2) Through drive F99 shown without cover, for dimensions see page 24
3) Only port plate 85
4) Only port plate 35

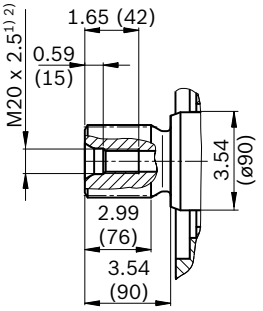
▼ **Parallel keyed shaft DIN 6885**

P – AS22x14x125



▼ **Splined shaft DIN 5480**

Z – W80x3x25x9 g



Ports metric version; port plate 35

Ports		Standard	Size[2)]	p_{max} [psi (bar)][5)]	State[7)]
A, B	Working line (high-pressure series)	SAE J518[4)]	2 in	5800 (400)	O
	Fastening thread A/B	DIN 13	M20 × 2.5; 24 deep		
S	Suction port (standard pressure series)	SAE J518[4)]	2 1/2 in	435 (30)	O
	Fastening thread S	DIN 13	M12 x 1.75; 17 deep		
M_A, M_B, M_{ABP}	Measuring working pressure A/B	DIN 3852	M14 × 1.5; 12 deep	5800 (400)	X
M_S	Measuring suction	DIN 3852	M14 × 1.5; 12 deep	435 (30)	X
T	Fluid drain	DIN 3852[5)]	M48 × 2; 22 deep	60 (4)	X[6)]
E_1	Filter, supply	DIN 3852	M33 × 2; 18 deep	580 (40)	X
E_2	Filter, return	DIN 3852	M33 × 2; 18 deep	580 (40)	X
K_1	Flushing port	DIN 3852	M33 × 2; 18 deep	76 (5)	O
K_2, K_3	Fluid filling + air bleeding	DIN 3852[5)]	M48 × 2; 22 deep	60 (4)	X[6)]
R(L)	Return flow (drain port)			60 (4)	O[6)]
U	Bearing flushing	DIN 3852[5)]	M18 × 1.5; 12 deep	100 (7)	X
E_3	Boost pressure supply	DIN 3852	M33 × 2; 18 deep	580 (40)	X
M_{E3}	Measuring boost pressure	DIN 3852	M14 × 1.5; 12 deep	580 (40)	X
K_4	Accumulator port	DIN 3852	M33 × 2; 18 deep	580 (40)	X
M_{K4}	Measuring boost pressure	DIN 3852	M14 × 1.5; 12 deep	580 (40)	X
M_1	Measuring stroking chamber pressure	DIN 3852	M22 × 1.5; 14 deep	5800 (400)	X
M_2	Measuring stroking chamber pressure	DIN 3852	M14 × 1.5; 12 deep	5800 (400)	X
X_A, X_B	Pilot pressure, remote control pressure controller	ISO 11926	M14 × 1.5; 12 deep	5100 (350)	O

Ports for port plate 85 see page 18

1) Center bore according to DIN 332 (thread according to DIN 13)
2) For notes on tightening torques, see the instruction manual
3) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
4) Only dimensions according to SAE J518, metric fastening thread is a deviation from standard.
5) The countersink can be deeper than that specified in the standard.
6) Depending on the installation position, T, K_2, K_3 or R(L) must be connected (see also pages 34 to 36)
7) O = Must be connected (plugged when delivered)
X = Plugged (in normal operation)

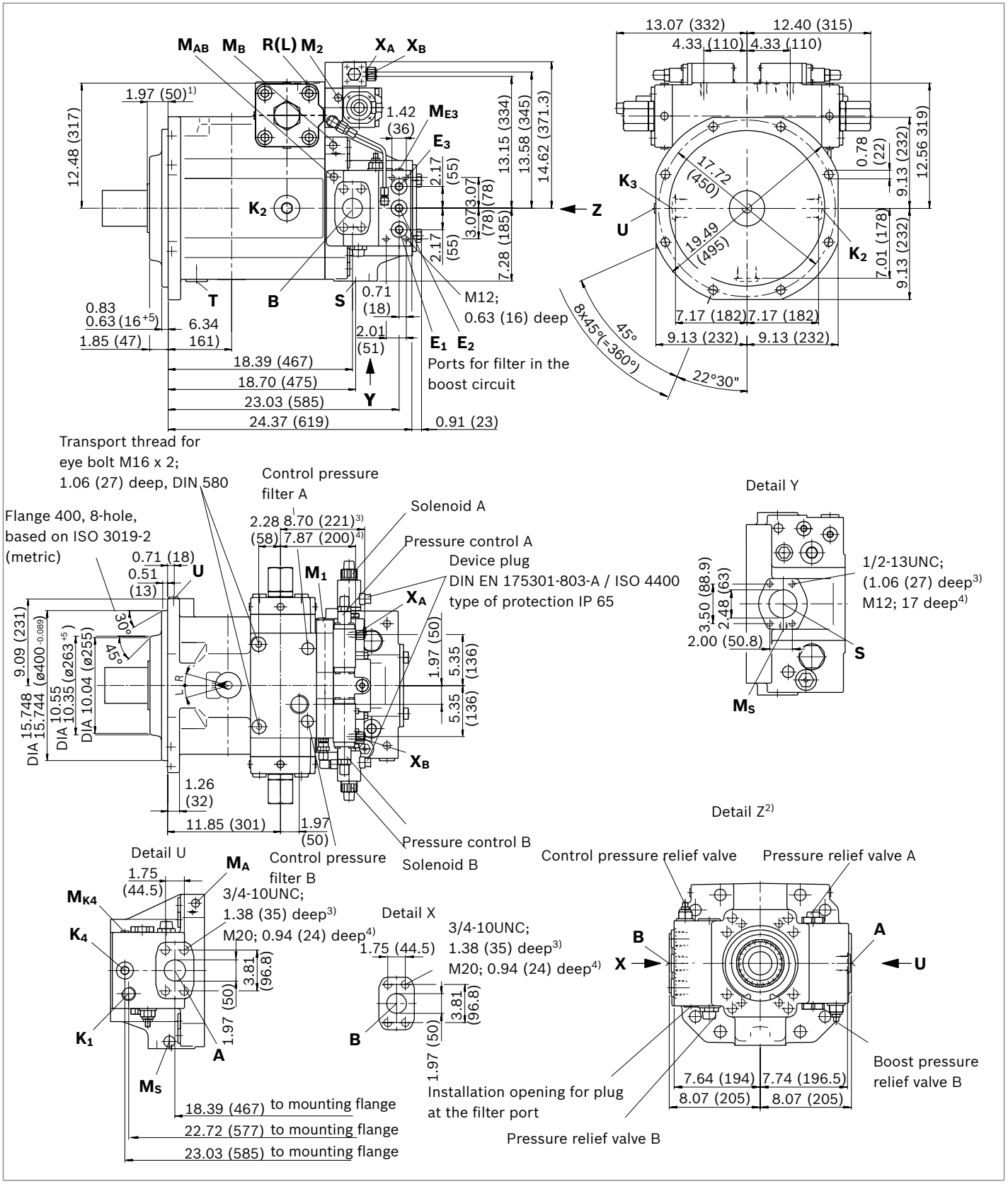
Ports SAE version; port plate 85

Ports		Standard	Size[1]	p_{max} [psi (bar)][2]	State[5]
A, B	Working line (high-pressure series)	SAE J518	2 in	5800 (400)	O
	Fastening thread A/B	ASME B1.1	3/4-10UNC-2B; 1.38 (35) deep		
S	Suction port (standard pressure series)	SAE J518	2 1/2 in	435 (30)	O
	Fastening thread S	ASME B1.1	1/2-13UNC-2B; 1.06 (27) deep		
M_A, M_B, M_{ABP}	Measuring working pressure A/B	ISO 11926	9/16-18UNF-2B; 0.51 (13) deep	5800 (400)	X
M_S	Measuring suction	ISO 11926	9/16-18UNF-2B; 0.51 (13) deep	435 (30)	X
T	Fluid drain	ISO 11926[3]	1 7/8-12UN-2B; 0.79 (20) deep	60 (4)	X[4]
E_1	Filter, supply	ISO 11926	1 5/16-12UN-2B; 0.79 (20) deep	580 (40)	X
E_2	Filter, return	ISO 11926	1 5/16-12UN-2B; 0.79 (20) deep	580 (40)	X
K_1	Flushing port	ISO 11926	1 5/16-12UN-2B; 0.79 (20) deep	76 (5)	O
K_2, K_3	Fluid filling + air bleeding	ISO 11926[3]	1 7/8-12UN-2B; 0.79 (20) deep	60 (4)	X[4]
R(L)	Return flow (drain port)			60 (4)	O[4]
U	Bearing flushing	ISO 11926[3]	3/4-16UNF-2B; 0.59 (15) deep	100 (7)	X
E_3	Boost pressure supply	ISO 11926	1 5/16-12UN-2B; 0.79 (20) deep	580 (40)	X
M_{E3}	Measuring boost pressure	ISO 11926	9/16-18UNF-2B; 0.51 (13) deep	580 (40)	X
K_4	Accumulator port	ISO 11926	1 5/16-12UN-2B; 0.79 (20) deep	580 (40)	X
M_{K4}	Measuring boost pressure	ISO 11926	9/16-18UNF-2B; 0.51 (13) deep	580 (40)	X
M_1	Measuring stroking chamber pressure	DIN 3852	M22 × 1.5; 14 deep	5800 (400)	X
M_2	Measuring stroking chamber pressure	DIN 3852	M14 × 1.5; 12 deep	5800 (400)	X
X_A, X_B	Pilot pressure, remote control pressure controller	ISO 11926	9/16-18UNF-2B; 0.51 (13) deep	5100 (350)	O

1) For notes on tightening torques, see the instruction manual
2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
3) The countersink can be deeper than that specified in the standard.
4) Depending on the installation position, T, K_2, K_3 or R(L) must be connected (see also pages 34 to 36)
5) O = Must be connected (plugged when delivered)
X = Plugged (in normal operation)

Dimensions, size 750

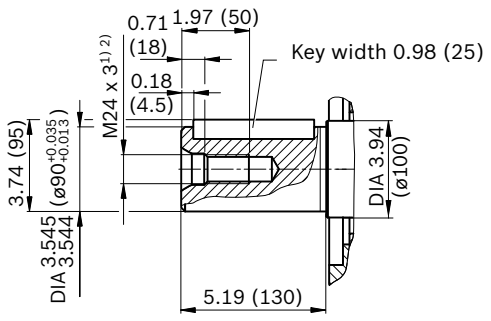
A4CSG750EPG/30R-XXH35F994N / A4CSG750EPG/30R-XXH85F994N



1) Up to shaft collar
2) Through drive F99 shown without cover, for dimensions see page 24
3) Only port plate 85
4) Only port plate 35

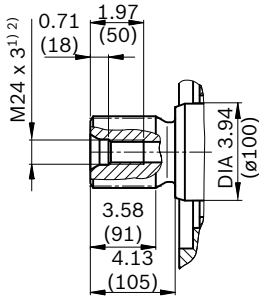
▼ **Parallel keyed shaft DIN 6885**

P – AS25x14x125



▼ **Splined shaft DIN 5480**

Z – W90x3x28x9 g



Ports metric version; port plate 35

Ports		Standard	Size[2)]	p_{max} [bar][3)]	State[7)]
A, B	Working line (high-pressure series)	SAE J518[4)]	2 in	400	O
	Fastening thread A/B	DIN 13	M20 × 2.5; 24 deep		
S	Suction port (standard pressure series)	SAE J518[4)]	2 1/2 in	30	O
	Fastening thread S	DIN 13	M12 x 1.75; 17 deep		
M_A, M_B, M_{ABP}	Measuring working pressure A/B	DIN 3852	M14 × 1.5; 12 deep	400	X
M_S	Measuring suction	DIN 3852	M14 × 1.5; 12 deep	30	X
T	Fluid drain	DIN 3852[5)]	M48 × 2; 22 deep	4	X[6)]
E_1	Filter, supply	DIN 3852	M33 × 2; 18 deep	40	X
E_2	Filter, return	DIN 3852	M33 × 2; 18 deep	40	X
K_1	Flushing port	DIN 3852	M33 × 2; 18 deep	5	O
K_2, K_3	Fluid filling + air bleeding	DIN 3852[5)]	M48 × 2; 22 deep	4	X[6)]
R(L)	Return flow (drain port)			4	O[6)]
U	Bearing flushing	DIN 3852[5)]	M18 × 1.5; 12 deep	7	X
E_3	Boost pressure supply	DIN 3852	M33 × 2; 18 deep	40	X
M_{E3}	Measuring boost pressure	DIN 3852	M14 × 1.5; 12 deep	40	X
K_4	Accumulator port	DIN 3852	M33 × 2; 18 deep	40	X
M_{K4}	Measuring boost pressure	DIN 3852	M14 × 1.5; 12 deep	40	X
M_1	Measuring stroking chamber pressure	DIN 3852	M22 × 1.5; 14 deep	400	X
M_2	Measuring stroking chamber pressure	DIN 3852	M14 × 1.5; 12 deep	400	X
X_A, X_B	Pilot pressure, remote control pressure controller	DIN 3852	M14 × 1.5; 12 deep	350	O

Ports for port plate 85 see page 21

1) Center bore according to DIN 332 (thread according to DIN 13)
2) For notes on tightening torques, see the instruction manual
3) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
4) Only dimensions according to SAE J518, metric fastening thread is a deviation from standard.
5) The countersink can be deeper than that specified in the standard.
6) Depending on the installation position, T, K_2, K_3 or R(L) must be connected (see also pages 34 to 36)
7) O = Must be connected (plugged when delivered)
X = Plugged (in normal operation)

Ports SAE version; port plate 85

Ports		Standard	Size[1]	p_{max} [psi (bar)][2]	State[5]
A, B	Working line (high-pressure series)	SAE J518	2 in	5800 (400)	O
	Fastening thread A/B	ASME B1.1	3/4-10UNC-2B; 1.38 (35) deep		
S	Suction port (standard pressure series)	SAE J518	2 1/2 in	435 (30)	O
	Fastening thread S	ASME B1.1	1/2-13UNC-2B; 1.06 (27) deep		
M_A, M_B, M_{ABP}	Measuring working pressure A/B	ISO 11926	9/16-18UNF-2B; 0.51 (13) deep	5800 (400)	X
M_S	Measuring suction	ISO 11926	9/16-18UNF-2B; 0.51 (13) deep	435 (30)	X
T	Fluid drain	ISO 11926[3]	1 7/8-12UN-2B; 0.79 (20) deep	60 (4)	X[4]
E_1	Filter, supply	ISO 11926	1 5/16-12UN-2B; 0.79 (20) deep	580 (40)	X
E_2	Filter, return	ISO 11926	1 5/16-12UN-2B; 0.79 (20) deep	580 (40)	X
K_1	Flushing port	ISO 11926	1 5/8-12UN-2B; 0.79 (20) deep	76 (5)	O
K_2, K_3	Fluid filling + air bleeding	ISO 11926[3]	1 7/8-12UN-2B; 0.79 (20) deep	60 (4)	X[4]
R(L)	Return flow (drain port)			60 (4)	O[4]
U	Bearing flushing	ISO 11926[3]	3/4-16UNF-2B; 0.59 (15) deep	100 (7)	X
E_3	Boost pressure supply	ISO 11926	1 5/16-12UN-2B; 0.79 (20) deep	580 (40)	X
M_{E3}	Measuring boost pressure	ISO 11926	9/16-18UNF-2B; 0.51 (13) deep	580 (40)	X
K_4	Accumulator port	ISO 11926	1 5/16-12UN-2B; 0.79 (20) deep	580 (40)	X
M_{K4}	Measuring boost pressure	ISO 11926	9/16-18UNF-2B; 0.51 (13) deep	580 (40)	X
M_1	Measuring stroking chamber pressure	DIN 3852	M22 × 1.5; 14 deep	5800 (400)	X
M_2	Measuring stroking chamber pressure	DIN 3852	M14 × 1.5; 12 deep	5800 (400)	X
X_A, X_B	Pilot pressure, remote control pressure controller	ISO 11926	9/16-18UNF-2B; 0.51 (13) deep	5100 (350)	O

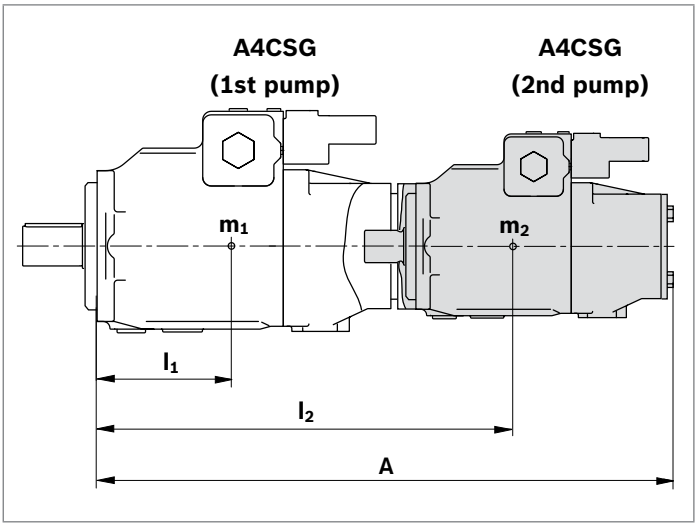
1) For notes on tightening torques, see the instruction manual
2) Depending on the application, momentary pressure peaks can occur. Keep this in mind when selecting measuring devices and fittings.
3) The countersink can be deeper than that specified in the standard.
4) Depending on the installation position, T, K_2, K_3 or R(L) must be connected (see also pages 34 to 36)
5) O = Must be connected (plugged when delivered)
X = Plugged (in normal operation)

Through drive

The variable pump (A)A4CSG can be supplied with through drive despite the integrated boost pump, in accordance with the type code on page 3.
If no further pumps are to be mounted at the factory, then the simple type designation is sufficient.

The scope of delivery then includes

- for all through drives except F/K99:
  hub, mounting bolts, seal and, if applicable, an intermediate flange
- for F/K99:
  with through-drive shaft, without hub, without intermediate flange; unit with closed fluid-tight, pressure-tight cover



Combination pumps

By using combination pumps, it is possible to have independent circuits without the need for splitter gearboxes.
When ordering combination pumps, the type designations of the 1st and 2nd pump must be connected by a "**+**".

- **Order example:**
  A4CSG 500 EPG / 30 R – VPH35F434M +
  A4CSG 500 EPG / 30 R – VZH35F994M

For through drives **F/K01**, **04**, **07**, **24**, **52**, and **68**, various possible attachment angle positions are available. As standard, the second pump is attached at the same angle as the supplied screws, as shown in the drawing on pages 28 and 29. If this angle differs, please contact us.
If a **gear pump** is to be **mounted at the factory as an attachment pump**, please contact us.
For maximum permissible drive and through-drive torques, see page 8.

m_1, m_2 [lbs (kg)]
l_1, l_2 [in (mm)]

$$T_m = \left(m_1 \bullet l_1 \quad + m_2 \bullet l_2 \quad + m_3 \bullet l_3\right) \frac{1}{12\ (102)} \quad \text{[lb-ft (Nm)]}$$

Total length A

A4CSG	A4CSG (2nd pump with through drive F/k99, without filter)			
(1st pump)	NG250	NG355	NG500	NG750
NG250	42.04 (1068)	–	–	–
NG355	42.32 (1075)	42.60 (1082)	–	–
NG500	45.08 (1145)	45.35 (1152)	48.62 (1235)	–
NG750	47.72 (1212)	47.99 (1219)	51.26 (1302)	54.96 (1396)

Permissible mass torque

Size			250	355	500	750
Permissible mass torque	T_m	lb-ft (Nm)	6858 (9300)	6958 (9300)	11505 (15600)	14380 (19500)
Permissible mass torque for dynamic mass acceleration $10g \triangleq 98.1$ m/s²	T_m	lb-ft (Nm)	686 (930)	686 (930)	1150 (1560)	1438 (1950)
Weight	m_1	lbs (kg)	573 (260)	606 (275)	859 (390)	1146 (520)
Distance from center of gravity	l_1	in (mm)	10.63 (270)	11.02 (280)	11.81 (300)	12.99 (330)

Overview of mounting options on A4CSG

Through drive - A4CSG			**Mounting option 2nd pump**				
Flange	**Hub for splined shaft[1)]**	**Code**	**A4CSG NG (shaft)**	**A4VSO/G NG (shaft)**	**A10V(S)O/31/32[4)] NG (shaft)**	**A10V(S)O/52/53 NG (shaft)**	**External/internal gear pump**
Flange SAE J744 (ISO 3019-1)[2)]							
82-2 (A)	5/8 in (16-4)	**F/K01**	–	–	–	–	AZPF-1X-004 to 022[3)]
	3/4 in (19-4)	**F/K52**	–	–	18 (S)/31	10 (S)	–
101-2 (B)	7/8 in (22-4)	**F/K68**	–	–	28 (S)/31	28 (S)	AZPN-1X-020 to 032[3)]
	1 in (25-4)	**F/K04**	–	–	45 (S)/31	45 (S)	PGH4
127-2 (C)	1 1/4 in (32-4)	**F/K07**	–	–	71 (S)/31	–	–
	1 1/2 in (38-4)	**F/K24**	–	–	100 (S)/31	85 (S)	PGH5
127-4 (C)	1 1/4 in (32-4)	**F/K15**	–	40 (S)	71 (S)/32	–	–
	1 1/2 in (38-4)	**F/K 16**		71 (S)			
152-4 (D)	1 3/4 in (44-4)	**F/K17**	–	125 (S)	140 (S)/31	–	–
	2 in (50-4)	**F/K78**		180 (S)			
165-4 (E)	2 in (50-4)	**F/K18**		250 (S) 355 (R)			
Flange ISO 3019-2 (metric)							
315, 8-hole	W80	**F/K43**	500 (Z)	500 (Z)	–	–	–
400, 8-hole	W90	**F/K76**	750 (Z)	750 (Z)	–	–	–

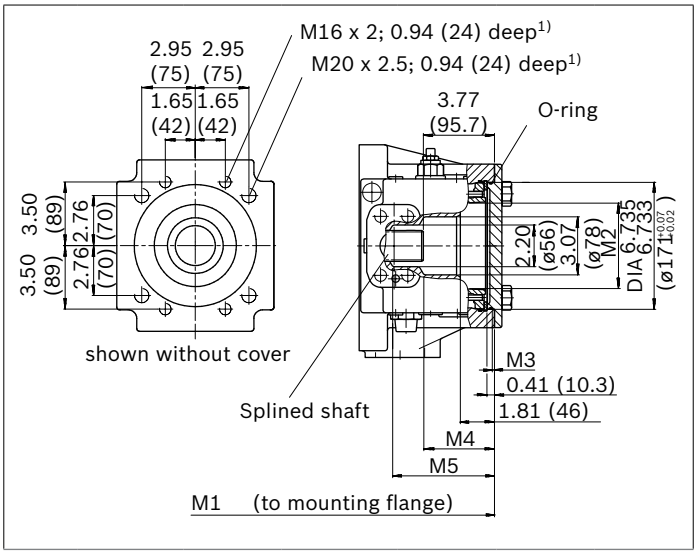
1) According to DIN 5480 (e.g. W32) or according to SAE J744 (e.g. 3/4 in)
2) 2 = 2-hole, 4 = 4-hole
3) Bosch Rexroth recommends special versions of the gear pumps. Please contact us.
4) If a through drive for an A10V(S)O with R-shaft is desired, please contact us.

Dimensions through drive

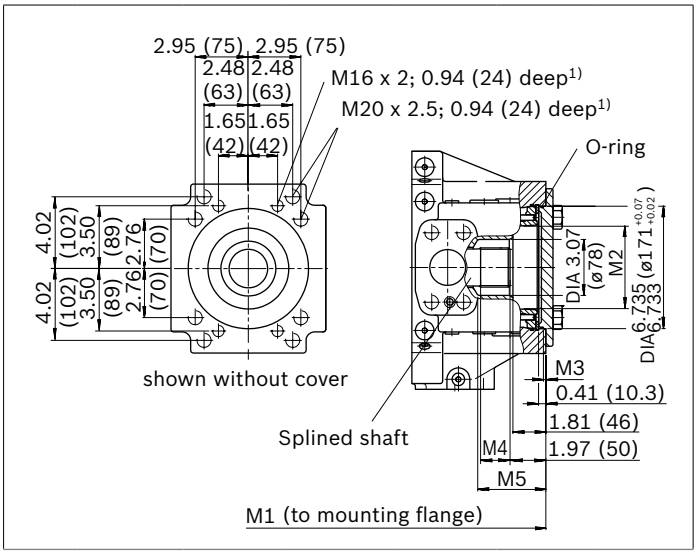
with through-drive shaft	**Splined shaft DIN 5480**	**Availability over sizes**				**Code**
without hub or intermediate flange,	**Diameter**	**250**	**355**	**500**	**750**	**F/K**
plugged with fluid-tight, pressure-tight cover and O-ring for later mounting	W42×1.25×32×9 g	●	●	–	–	**99**
	W55x1.25x42x9 g	–	–	●	●	**99**

● = Available – = Not available

▼ **F/K99**



▼ **F/K99**



99	**NG**	**M1**	**M2**	**M3**	**M4**	**M5**
	250	20.12 (511)	DIA 4.53 ø115	0.12 (3)	3.74 (95)	5.39 (137)
	355	20.39 (518)	DIA 4.53 ø115	0.12 (3)	3.74 (95)	5.39 (137)

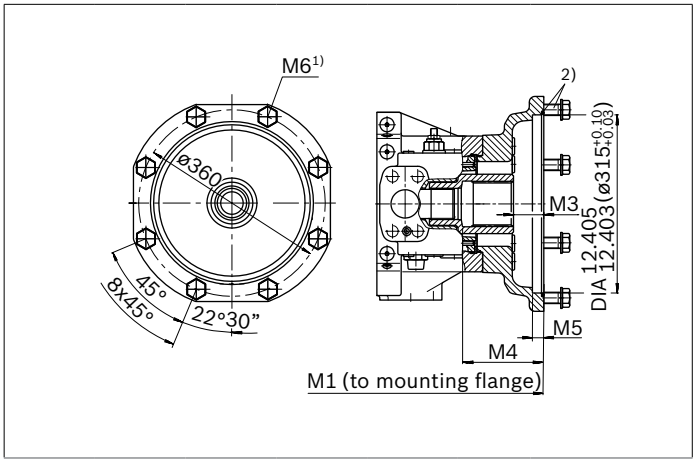
99	**NG**	**M1**	**M2**	**M3**	**M4**	**M5**
	500	21.73 (552)	DIA 4.53 ø115	0.13 (3.4)	1.61 (41)	0.35 (95)
	750	24.37 (619)	DIA 4.53 ø115	0.13 (3.4)	1.77 (45)	4.59 (116.6)

1) Thread according to DIN 13, see instruction manual for details on tightening torques

Flange ISO 3019-2		**Availability over sizes**				**Code**
Diameter	**Hub for splined shaft DIN 5480**	**250**	**355**	**500**	**750**	**F/K**
315, 8-hole	W80x3x25x9 g	○	○	●	○	**43**

● = Available ○ = On request

▼ **F/K43**



43	**NG**	**M1**	**M3**	**M4**	**M5**	**M6**
	500	25.98 (660)	2.11 (53.5)	5.63 (143)	0.75 (19)	M20; 1.02 (26) deep

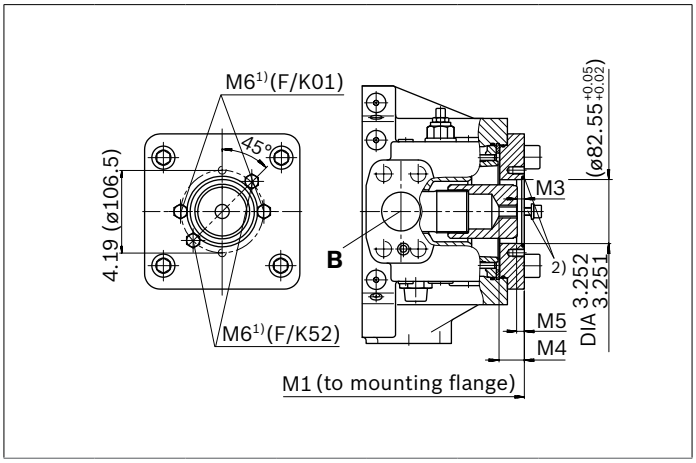
1) Thread according to DIN 13, see instruction manual for details on tightening torques

2) 8 mounting bolts and O-ring seal are included in the scope of delivery.

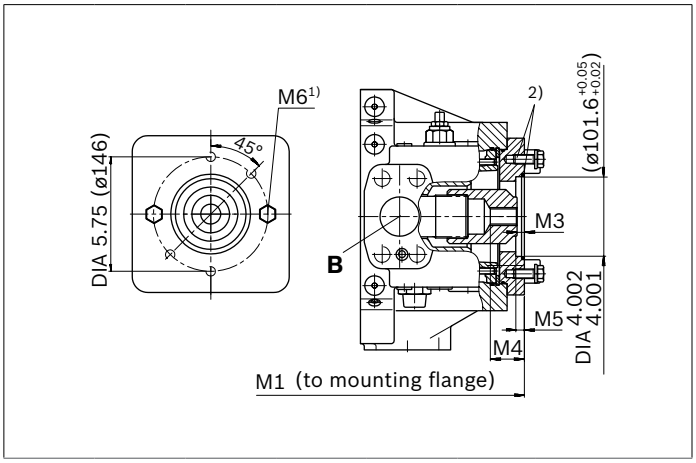
Flange SAE J744 (ISO 3019-1)		Availability over sizes				Code
Diameter	**Hub for splined shaft SAE J744**	**250**	**355**	**500**	**750**	**F/K**
82-2 (A)	5/8 in 9T 16/32DP	●	●	●	●	**01**
82-2 (A)	3/4 in 11T 16/32DP	○	●	●	○	**52**
101-2 (B)	7/8 in 13T 16/32DP	●	●	●	○	**68**
101-2 (B)	1 in 15T 16/32DP	○	●	●	○	**04**

● = Available ○ = On request

▼ **F/K01; F/K52**



▼ **F/K68; F/K04**



01	NG	M1	M3	M4	M5	M6
	250	20.98 (533)	0.41 (10.5)	1.30 (33)	0.39 (10)	M10; 0.59 (15) deep
	355	21.26 (540)	0.41 (10.5)	1.30 (33)	0.39 (10)	
	500	22.60 (574)	0.37 (9.3)	1.30 (33)	0.39 (10)	
	750	25.24 (641)	0.37 (9.3)	1.30 (33)	0.39 (10)	

68	NG	M1	M3	M4	M5	M6
	250	20.98 (533)	0.73 (18.5)	1.71 (43.5)	0.39 (10)	M12; 0.59 (15) deep
	355	21.26 (540)	0.73 (18.5)	1.71 (43.5)	0.39 (10)	
	500	22.60 (574)	0.73 (18.5)	1.71 (43.5)	0.39 (10)	

52	NG	M1	M3	M4	M5	M6
	355	21.26 (540)	0.77 (19.5)	1.59 (40.5)	0.39 (10)	M10; 0.59 (15)5 deep
	500	22.60 (574)	0.77 (19.5)	1.59 (40.5)	0.39 (10)	

04	NG	M1	M3	M4	M5	M6
	355	21.26 (540)	0.74 (18.9)	1.91 (48.4)	0.39 (10)	M12; 0.59 (15) deep
	500	22.60 (574)	0.76 (19.4)	1.91 (48.4)	0.39 (10)	

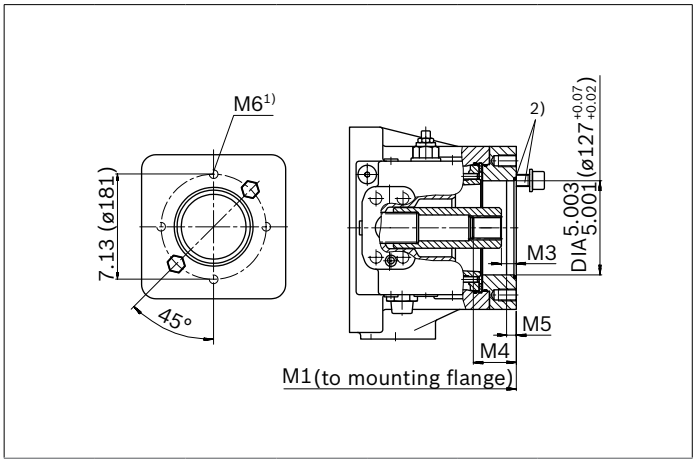
1) Thread according to DIN 13, see instruction manual for details on tightening torques

2) 2 mounting bolts and O-ring seal are included in the scope of delivery.

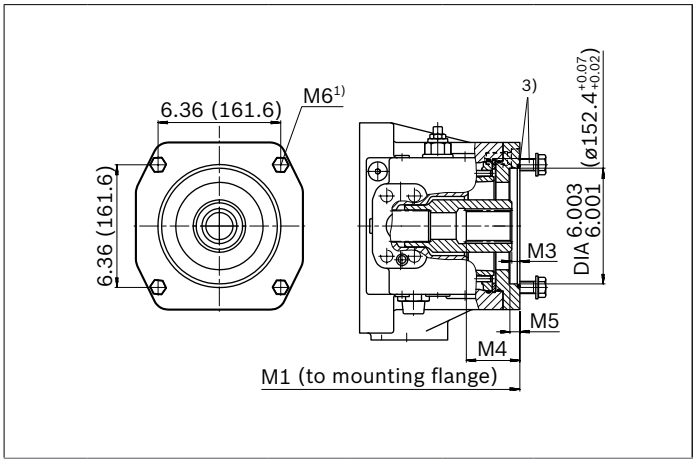
Flange SAE J744 (ISO 3019-1)		Availability over sizes				Code
Diameter	**Hub for splined shaft SAE J744**	**250**	**355**	**500**	**750**	**F/K**
127-2 (C)	1 1/4 in 14T 12/24DP	●	●	●	○	**07**
127-2 (C)	1 1/2 in 17T 12/24DP	○	●	●	○	**24**
127-4 (C)	1 1/2 in 17T 12/24DP	○	○	–	–	**16**
152-4 (D)	1 3/4 in 13T 8/16DP	●	●	●	●	**17**

● = Available ○ = On request

▼ **F/K07; F/K24**



▼ **F/K17**



07	NG	M1	M3	M4	M5	M6
	250	21.53 (547)	0.78 (19.9)	2.28 (58)	0.51 (13)	
	355	21.81 (554)	0.78 (19.9)	2.28 (58)	0.51 (13)	M16; 0.94 (24) deep
	500	23.15 (588)	0.72 (18.3)	2.28 (58)	0.51 (13)	

24	NG	M1	M3	M4	M5	M6
	250	21.53 (547)	0.41 (10.4)	2.95 (75)	0.51 (13)	
	355	21.81 (554)	0.41 (10.4)	2.95 (75	0.51 (13)	M16; 0.94 (24) deep
	500	23.15 (588)	0.40 (10.3)	2.64 (67)	0.51 (13)	

17	NG	M1	M3	M4	M5	M6
	250	20.98 (533)	0.41 (10.4)	2.87 (73)	0.51 (13)	M16; 0.87 (22) deep
	355	21.26 (540)	0.41 (10.4)	2.87 (73)	0.51 (13)	
	500	23.62 (600)	0.41 (10.4)	2.87 (73)	0.51 (13)	M16; 1.26 (32) deep
	750	26.26 (667)	0.41 (10.4)	2.87 (73)	0.51 (13)	

1) Thread according to DIN 13, see instruction manual for details on tightening torques

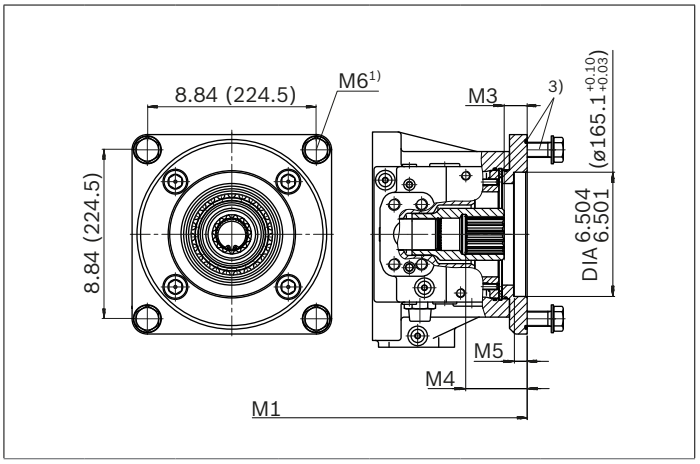
2) 2 mounting bolts and O-ring seal are included in the scope of delivery.

3) 4 mounting bolts and O-ring seal are included in the scope of delivery.

Flange SAE J744 (ISO 3019-1)		Availability over sizes				Code
Diameter	**Hub for splined shaft SAE J744**	**250**	**355**	**500**	**750**	**F/K**
152-4 (D)	2 in 15T 8/16DP	○	○	–	–	**78**
165-4 (E)	2 in 15T 8/16DP	●	●	–	–	**18**

● = Available ○ = On request

▼ **F/K18**



(to mounting flange)

18	NG	M1	M3	M4	M5	M6
	250	21.04 (534.5)	1.20 (30.5)	3.41 (86.7)	0.67 (17)	M16; 0.87 (22) deep
	355	21.32 (541.5)	1.20 (30.5)	3.41 (86.7)	0.67 (17)	

1) Thread according to DIN 13, see instruction manual for details on tightening torques

2) 2 mounting bolts and O-ring seal are included in the scope of delivery.

3) 4 mounting bolts and O-ring seal are included in the scope of delivery.

Integrated boost pump and valve technology (version F..)

High-pressure relief valve (Pos. 5)
Two pilot-operated pressure relief valves use pressure limitation to prevent damage to the hydraulic pump resulting from overpressure. A pressure relief valve is assigned to each pressure side.
Protection is provided by reducing the high pressure to the low pressure side.
Pressure limitation is set by default to 5100 psi (350 bar). If another setting is required, please state this in plain text.

Boost-pressure relief valve (Pos. 3)
direct operated
The boost pressure can be set on the boost-pressure relief valve.

Boost pressure
To prevent damage to the system, low pressure protection is recommended, which monitors the static pressure component. The ports $\mathbf{M_{E3}}$ or $\mathbf{M_{K4.}}$, for example, are suitable for low pressure monitoring. To prevent any impermissible drop in boost pressure a low pressure accumulator can be connected to the ports $\mathbf{E_2}$, $\mathbf{E_3}$ or $\mathbf{K_4}$. The design of the accumulator and the choice of the optimum connection location must be selected according to the hydraulic transmission behavior of the system and the operating conditions, taking the available boost volume into account. Depending on the quantity of system case drain fluid, it may be necessary to increase the boost volume with a larger or additional boost pump.

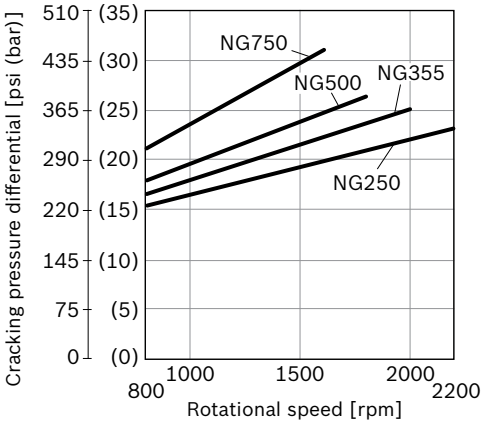
Integrated boost pump (Pos. 9)
Standard size

NG	250	355	500	750
in^3	3.84	4.88	5.98	8.72
(cm^3)	(63)[1)]	(80)[1)]	(98)	(143)

Control pressure relief valve (for EP and HD) (Pos. 8)
Direct operated, high-pressure-related relief
At low working pressure, the auxiliary pump pressure is regulated to the set value (e.g. 465 psi (32 bar)). This pressure is needed by the HD and EP controls to swivel out reliably. Using this valve saves the use of a separate control pressure pump.
If the working pressure exceeds the pressure of the boost pump, control is provided by the check valve via the high pressure. At the same time, the increase in working pressure relieves the control pressure relief valve.
The boost pump pressure is hereby reduced to the set boost pressure (e.g. 230 psi (16 bar)).
This function leads to energy savings, improved efficiency and a longer service life of the auxiliary pump.
For setting values, see page 6.
The control pressure relief valve is not required for the other control devices and is replaced with a threaded plug.

Control fluid filter (Pos. 10)
The HD and EP controls of the sizes 500 and 750 with internal control pressure supply from the high pressure are equipped with 0.008 in (0.2 mm) coarse dirt filters as standard (regardless of the filtration order designation)
The dimensions are as show on pages 12 to 19. See circuit diagram on page 29.

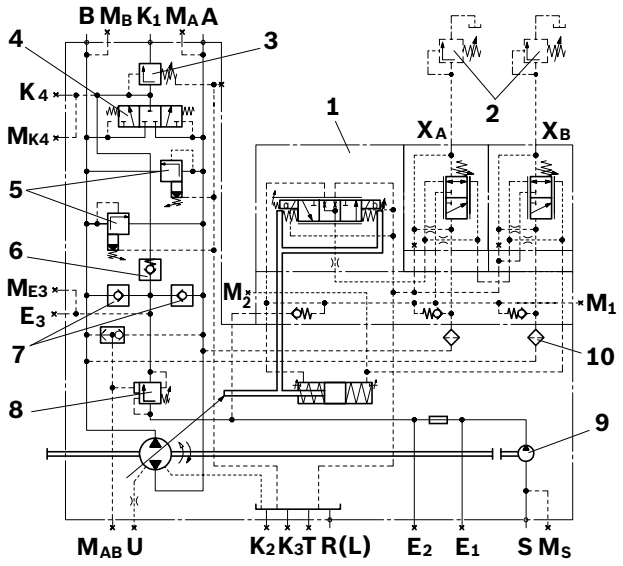
Flushing valve (Pos. 4)
To open the flushing valve safely, the pressure differential between **A** and **B** is required, as shown in the diagram. The required pressure differential depends on the rotational speed and the size. The circuit temperature needs to be monitored to avoid any damage to the system.



1) Larger boost pumps available on request

▼ **Circuit diagram**

Example: A4CSG...EPG...F..4N (without filter)
Sizes 500 and 750. Additional sizes available on request.



Circuit diagram NG 500/750 **with filter,** see page 32;
without integrated boost pump, see page 30

Components	
1	EPG control
2	**Pressure relief valves** (not included in the scope of delivery)
3	Boost-pressure relief valve
4	**Flushing valve**
5	High-pressure relief valves
6	Bypass valve
7	Boost check valves
8	Control pressure relief valve
9	Integrated boost pump
10	Control fluid filter for HD and EP (sizes 500 and 750)

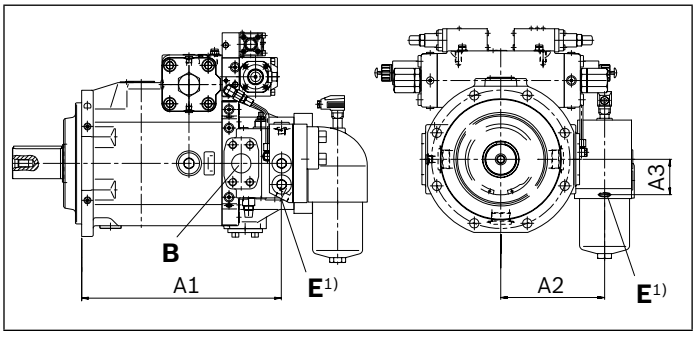
Ports		P_{max} [psi (bar)]	State
A, B	Working line (pressure port)	5800 (400)	O
S	Suction port	435 (30)	O
M_A, M_B, M_{AB}	Measuring working pressure A/B	5800 (400)	X
M_S	Measuring suction	435 (30)	X
T	Fluid drain	60 (4)	X
E_1	Filter, supply	580 (40)	X
E_2	Filter, return	580 (40)	X
K_1	Flushing port	76 (5)	O
K_2, K_3	Fluid filling + air bleeding	60 (4)	X
R(L)	Return flow (drain port)	60 (4)	O
U	Bearing flushing	100 (7)	X
E_3	Boost pressure supply	580 (40)	X
M_{E3}	Measuring boost pressure	580 (40)	X
K_4	Accumulator port	580 (40)	X
M_{K4}	Measuring boost pressure	580 (40)	X
M_1	Measuring stroking chamber pressure	5800 (400)	X
M_2	Measuring stroking chamber pressure	5800 (400)	X
X_A, X_B	Pilot pressure, remote control pressure controller	5100 (350)	O

External boost pressure supply

Without integrated boost pump (version K..)

Port **E** (or **E_2** for version K...N/D without filter) is intended as an external boost pressure supply and must be connected. To ensure functional reliability, maintain the required cleanliness level for the boost fluid fed in at port **E/E_2** (see page 5), and observe the boost pressure values (see page 6).

Dimensions, size 500



For the location and dimensions of the port E_2, see page 31

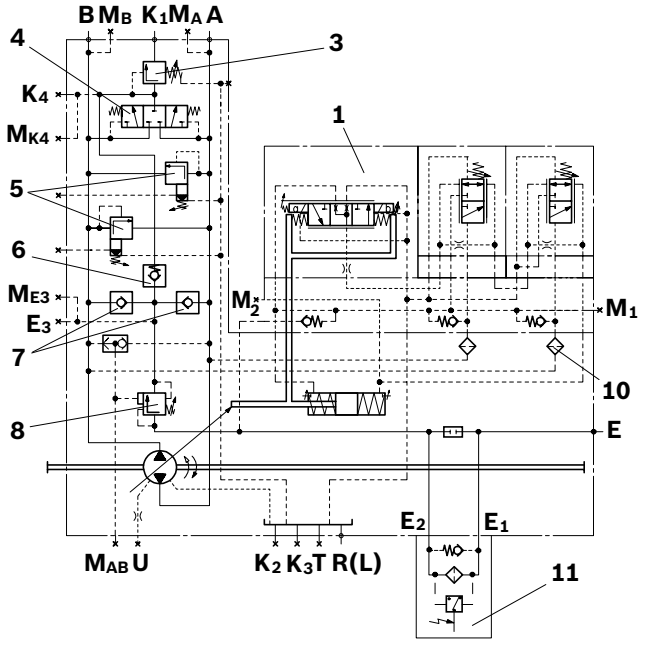
NG	A1	A2	A3	Port E[1)2)]
250	18.77 (477)	10.63 (270)	3.62 (92)	1 5/16-12UN-2B; 0.79 (20) deep[1)]
355	19.06 (484)	10.63 (270)	3.62 (92)	
500	20.47 (520)	10.63 (270)	3.62 (92)	
750	23.03 (585)	10.63 (270)	3.62 (92)	

Ports		P_{max} [psi (bar)]	State
E	Boost pressure supply for version with filter	580 (40)	O
E_2	Boost pressure supply for version without filter	580 (40)	O
A, B	Working line (pressure port)	5800 (400)	O
S	Suction port (only for version F)	435 (30)	O
M_A, M_B, M_{AB}	Measuring working pressure A/B	5800 (400)	X
M_S	Measuring suction	435 (30)	X
T	Fluid drain	60 (4)	X
E_1	Filter, supply	580 (40)	X
E_2	Filter, return (for version with filter)	580 (40)	X
K_1	Flushing port	76 (5)	O
K_2, K_3	Fluid filling + air bleeding	60 (4)	X
R(L)	Return flow (drain port)	60 (4)	O
U	Bearing flushing	100 (7)	X
E_3	Boost pressure supply	580 (40)	X
M_{E3}	Measuring boost pressure	580 (40)	X
K_4	Accumulator port	580 (40)	X
M_{K4}	Measuring boost pressure	580 (40)	X
M_1	Measuring stroking chamber pressure	5800 (400)	X
M_2	Measuring stroking chamber pressure	5800 (400)	X

Circuit diagram

Example: A4CSG...EPD...K..4M

Sizes 500 and 750. Additional sizes available on request.



Components	
1	EP control
3	Boost-pressure relief valve
4	Flushing valve
5	High-pressure relief valves
6	Bypass valve
7	Boost check valves
8	Control pressure relief valve
10	Control fluid filter for HD and EP (sizes 500 and 750)
11	Filter with bypass

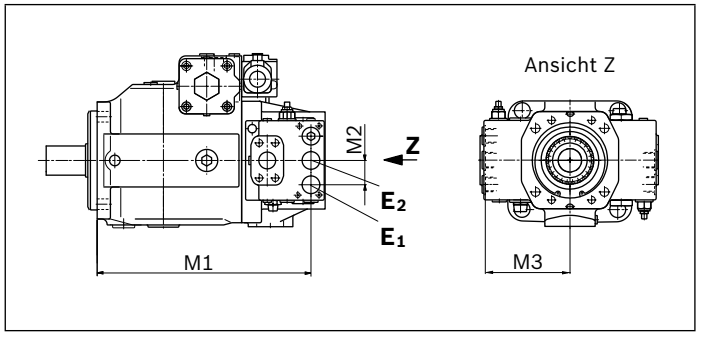
1) Port according to ISO 11926 at size 250 to 750 with portplate 85.
2) Port M33 × 2; 0.71 (18) deep according to DIN 3852 at size 500 to 750 with port plate 35

Filtration types[1)]

Regardless of the selected boost circuit filtration, the HD and EP controls in sizes 500 and 750 are equipped with 0.008 in (0.2 mm) control fluid coarse dirt filters as standard (see circuit diagram).

Without filter in the boost circuit (version N)
Ports E_1 and E_2 are delivered plugged, pressure-proof and internally connected.
A boost circuit filter can be connected to these ports later on.
The internal passage between **E_1** and **E_2** must be plugged for this purpose (please contact us).
For unit dimensions, see pages 12 to 19.
See circuit diagram on page 29.

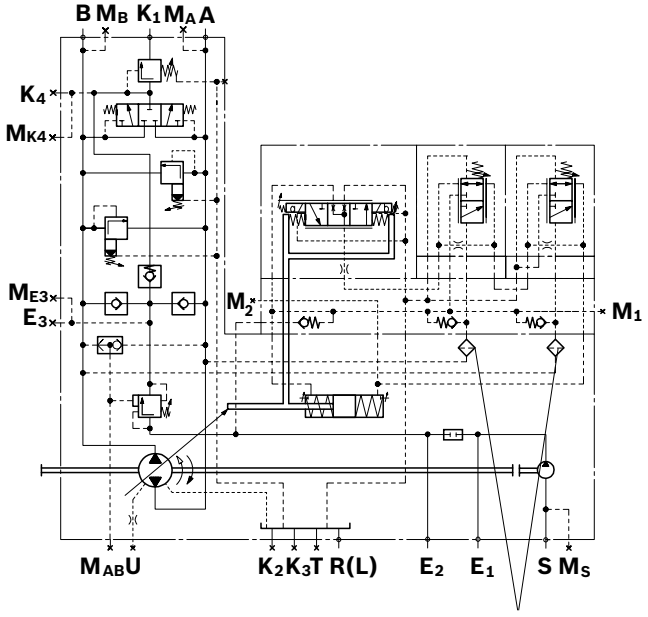
Ports for external boost circuit filtration (version D)
Ports E_1 and E_2 are intended for a filter port.
These ports are open and are only plugged with plastic screws for transportation.
The internal passage between **E_1** and **E_2** is plugged.



NG	M1	M2	M3	Port E1/E2[2)3)]
250	18.77 (477)	2.16 (55)	7.60 (193)	1 5/16-12UN-2B; 0.79 (20) deep[2)]
355	19.06 (484)	2.16 (55)	7.60 (193)	
500	20.47 (520)	2.16 (55)	7.60 (193)	
750	23.03 (585)	2.16 (55)	7.63 (194)	

Ports		p_{max} [psi (bar)]	State
E1	Filter, supply	725 (50)	O
E2	Filter, return	725 (50)	O

Circuit diagram[1)]
Example: A4CSG...EPD...F..4D
Sizes 500 and 750. Additional sizes available on request.



Control fluid filter for HD and EP (sizes 500 and 750)

1) For components and ports, see page 30
2) Port according to ISO 11926 at size 250 to 750 with portplate 85.
3) Port M33 × 2; 0.71 (18) deep according to DIN 3852 at size 500 to 750 with port plate 35

With mounted filter in the boost circuit (version M)

A filter is mounted directly on the pump in the pressure line of the boost pump, thus plugging the internal connection between E1 and E2.

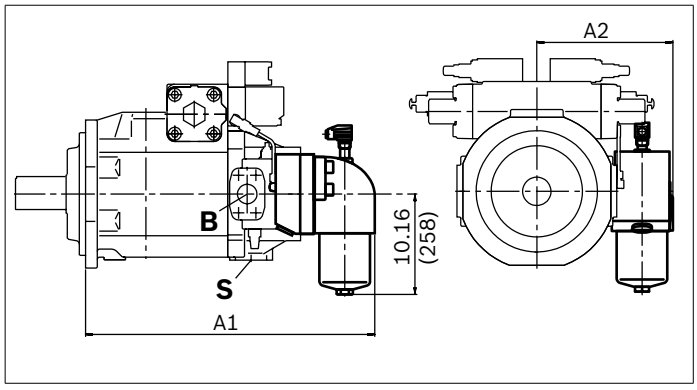
Filter version: Type DFBN/HC330QE10D1.X/V–L24

Filter with bypass and visual-electrical contamination indicator

Response pressure of the contamination indicator

Δp_a = 75 psi $^{-7.5\ psi}$ (5 bar $^{-0.5\ bar}$)

Cracking pressure of the bypass valve $\Delta p_{ö}$ = 90 psi $^{+9\ psi}$ (6 bar $^{+0.6\ bar}$)

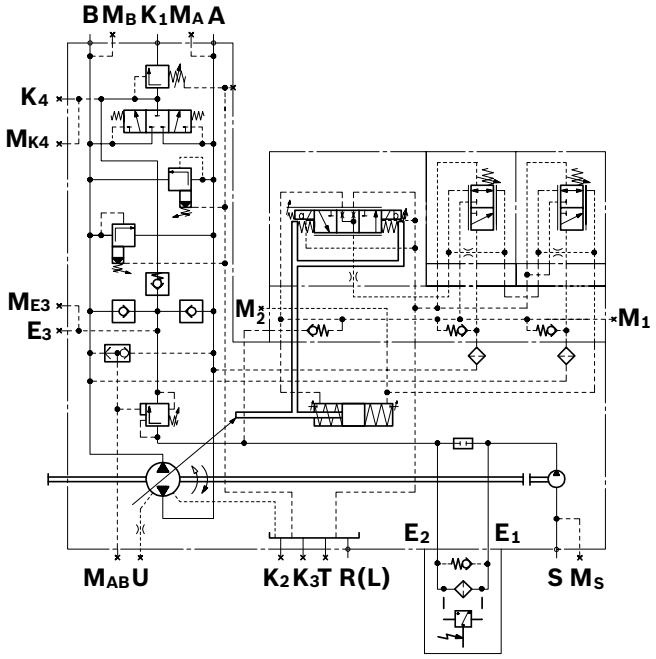


Size	A1	A2
250	27.54 (699.5)	7.87 (200)
355	27.81 (706.5)	13.66 (347)
500	29.23 (742.5)	
750		

Ports		p_{max} [psi (bar)]	State
A, B	Working line (pressure port)	5800 (400)	O
S	Suction port	435 (30)	O
M_A, M_B, M_{AB}	Measuring working pressure A/B	5800 (400)	X
M_S	Measuring suction	435 (30)	X
T	Fluid drain	60 (4)	X
E_1	Filter, supply	725 (50)	X
E_2	Filter, return	725 (50)	X
K_1	Flushing port	75 (5)	O
K_2, K_3	Fluid filling + air bleeding	60 (4)	X
R(L)	Return flow (drain port)	60 (4)	O
U	Bearing flushing	100 (7)	X
E_3	Boost pressure supply	580 (40)	X
M_{E3}	Measuring boost pressure	580 (40)	X
K_4	Accumulator port	580 (40)	X
M_{K4}	Measuring boost pressure	580 (40)	X
M_1	Measuring stroking chamber pressure	5800 (400)	X
M_2	Measuring stroking chamber pressure	5800 (400)	X

Example: A4CSG...EPD...F..4M

Sizes 250 and 355. Additional sizes available on request.



Installation instructions

General

The axial piston unit must be filled with hydraulic fluid and air bled during commissioning and operation. This must also be observed following a longer standstill as the axial piston unit may empty via the hydraulic lines.
With particular regard to the “drive shaft upwards” installation position, we recommend bearing flushing to lubricate the front bearing and shaft seal at port **U** . See page 5.
The leakage in the housing area must be directed to the reservoir via the highest drain port (**T**, **R**(**L**), **K_2**, **K_3**).
If a shared drain line is used for several units, make sure that the respective case pressure is not exceeded. The shared drain line must be dimensioned to ensure that the maximum permissible case pressure of all connected units is not exceeded in any operational conditions, particularly at cold start. If this is not possible, separate reservoir lines must be installed if necessary.
To achieve favorable noise values, decouple all connecting lines using elastic elements and avoid above-reservoir installation.
In all operating conditions, the suction lines and the drain lines must flow into the reservoir below the minimum fluid level. The permissible suction height h_S results from the overall loss of pressure, it must not, however, be higher than $h_{S\ max}$ = 31.50 in (800 mm). The minimum suction pressure at port **S** must also not fall below 12 psi (0.8 bar) absolute during operation.
For external boost pressure supply (version **K..**) please refer to the attachment pump data sheet for details on the minimum suction pressure.
When designing the reservoir, ensure that there is adequate spacing between the suction line and the drain line. This minimizes oil turbulence and carries out degassing, which prevents the heated hydraulic fluid from being sucked directly back in again.

Installation position

See the following examples **1** to **8**.
Further installation positions are available upon request.
Recommended installation position: **1**st

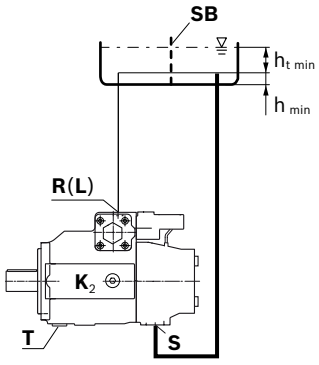
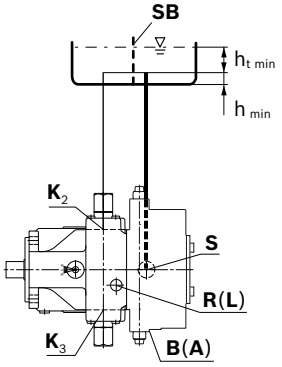
Notice

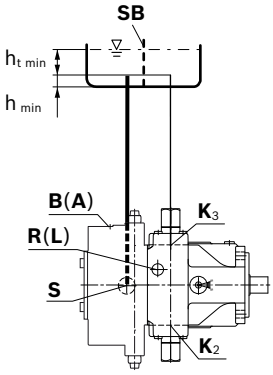
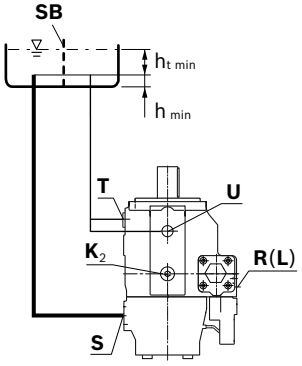
- To achieve an optimum control function, the stroking chambers must be air bled via the highest air bleed port **R2** to **R7** depending on the installation positions for HS5 and EO.
- You can expect installation positions **2**, **3**, **6** and **7** to affect the closed loop control. Due to gravity, dead weight and case pressure, minor characteristic shifts and actuating time changes may occur.

Key	
S	Suction port
T, **K_2**, **K_3**, **R**(**L**)	Fluid filling + air bleeding (drain port)
A, B	Pressure port
U	Bearing flushing port
SB	Baffle (baffle plate)
$h_{t\ min}$	Minimum required immersion depth (7.87 in (200 mm))
h_{min}	Minimum required distance to the reservoir bottom (3.94 in (100 mm))
$h_{s\ max}$	Maximum permissible suction height 31.50in (800 mm) for version F. For version K, observe the external boost pump specification.

Below-reservoir installation (recommended)

Below-reservoir installation means that the axial piston unit is installed outside of the reservoir and below the minimum fluid level of the reservoir.

Installation position	Air bleeding[1)]	Filling
1	**R**(**L**)	**R**(**L**)
		
2	**K_2; R**(**L**) plug	**K_2**
		

Installation position	Air bleeding[1)]	Filling
3	**K_3; R**(**L**) plug	**K_3**
		
4	**T; R**(**L**) plug	**T**
		

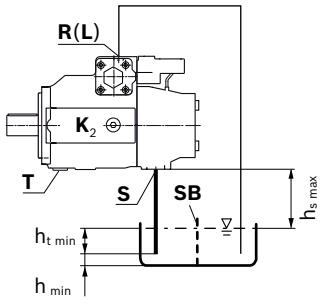
Key, see page 33.

1) To air bleed the stroking chamber, use the highest port on the control (see control data sheet)

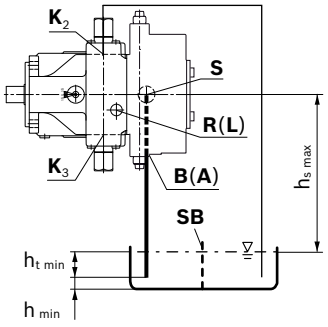
Above-reservoir installation

Above-reservoir installation means that the axial piston unit is installed above the minimum fluid level of the reservoir. A check valve in the drain line is to be avoided. Exceptions may be permissible, please consult us first.

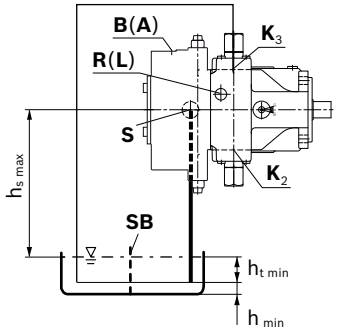
Installation position	Air bleeding[1)]	Filling
5	**R(L)**	**R(L)**



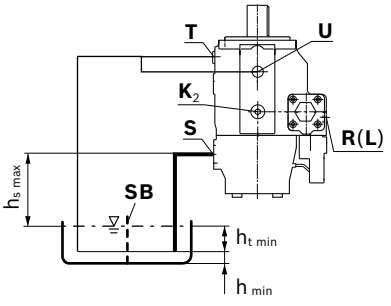
Installation position	Air bleeding[1)]	Filling
6	**K2, R(L)** plug	**K2**



Installation position	Air bleeding[1)]	Filling
7	**K3, R(L)** plug	**K3**



Installation position	Air bleeding[1)]	Filling
8	**T; R(L)** plug	**T**



Key, see page 33.

1) To air bleed the stroking chamber, use the highest port on the control (see control data sheet)

Project planning notes

- The pump (A)A4CSG is designed to be used in closed circuit.
- The project planning, installation and commissioning of the axial piston unit requires the involvement of qualified skilled personnel.
- Before using the axial piston unit, please read the corresponding instruction manual completely and thoroughly. If necessary, this can be requested from Bosch Rexroth.
- Before finalizing your design, please request a binding installation drawing.
- The specified data and notes contained herein must be observed.
- Preservation: Our axial piston units are supplied as standard with preservative protection for a maximum of 12 months. If longer preservative protection is required (maximum 24 months), please specify this in plain text when placing your order. The preservation periods apply under optimal storage conditions, details of which can be found in the data sheet 90312 or in the instruction manual.
- Depending on the operating conditions of the axial piston unit (working pressure, fluid temperature), the characteristic curve may shift.
- Not all versions of the product are approved for use in a safety function according to ISO 13849. Please consult the responsible contact person at Bosch Rexroth if you require reliability parameters (e.g. $MTTF_d$) for functional safety.
- Pressure controllers are not safeguards against pressure overload. Be sure to add a pressure relief valve to the hydraulic system.
- Working ports:
  - The ports and fastening threads are designed for the specified maximum pressure. The machine or system manufacturer must ensure that the connecting elements and lines correspond to the specified application conditions (pressure, flow, hydraulic fluid, temperature) with the necessary safety factors.
  - The working ports and function ports are only intended to accommodate hydraulic lines.

Safety instructions

- During and shortly after operation, there is a risk of getting burnt on the axial piston unit and especially on the solenoids. Take the appropriate safety measures (e.g. by wearing protective clothing).
- Moving parts in control equipment (e.g. valve spools) can, under certain circumstances, get stuck in position as a result of contamination (e.g. impure hydraulic fluid, abrasion, or residual dirt from components). As a result, the hydraulic fluid flow and the build-up of torque in the axial piston unit can no longer respond correctly to the operator's specifications. Even the use of various filter elements (external or internal flow filtration) will not rule out a fault but merely reduce the risk. The machine/system manufacturer must test whether remedial measures are needed on the machine for the application concerned in order to bring the driven consumer into a safe position (e.g. safe stop) and ensure any measures are properly implemented.

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