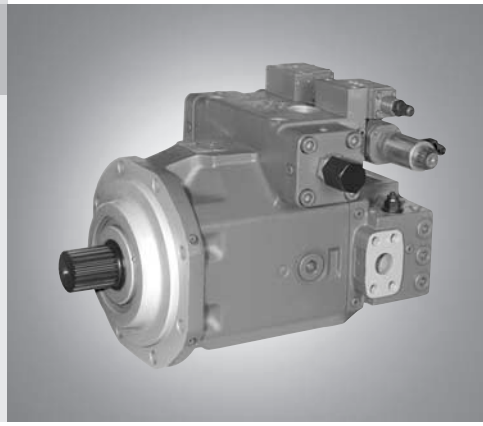
Rexroth
Bosch Group

Axial piston-compact unit A4CSG

RE 92 105/11.03 1/32

closed loop circuit



Size 250...750
Series 3
Nominal pressure 350 bar
Peak pressure 400 bar

Contents

Features

- Axialpiston pump-variable displacement, swashplate design for hydrostatic drives in closed circuits.
- The flow is proportional to input speed and displacement. It can be infinitely varied by adjustment of the swashplate.
- The necessary boostpump and all required controlvalves are integrated.
- One common auxiliary pump for boost and EP-control pressure
- Compact design (extremely small in length)
- Favourable power to weight ratio
- Low noise level
- Long service life
- High efficiency
- New electro-hydr. control EP with proportional solenoid and zero displacement position at power loss
- Throughdrive for multiple pumpcombinations also possible with integrated boost pump

- For further information on control- and regulating devices see separate data sheets
  RE 92 072, RE 92 076 und RE 92 080

Model code / standardprogram

Axial piston unit

Compact unit, swashplate design, variable	A4CS

Type of operation

Pump, closed circuit operation	G

Size

	250	355	500	750
≙ Displacement $V_{g\,max}$ (cm^3)				

Control and adjustment devices

		250	355	500	750		
Manual adjustment	MA	❍	❍	❍	–	MA	see RE 92072
Electric motor adjustment	EM	❍	❍	❍	–	EM..	see RE 92072
Hydr. adjustment, control volume dependent	HM	❍	❍	❍	❍	HM..	see RE 92076
Hydr. adjustment with servo-/ proportional valve	HS	❍	❍	❍	❍	HS..	see RE 92076
Electronic control	EO	❍	❍	❍	❍	EO..	see RE 92076
Hydr.control , pilot pressure dependent	HD	●	●	●	❍	HD..	see RE 92080
Electro-hydr. control with proportional solenoid	EP	●	●	●	●	EP..	see RE 92084 in prep.

Series

	30

Direction of rotation

viewing at shaft end	clockwise	R
	counter-clockwise	L

Seals

FPM (Fluorcarbon rubber)	V

Shaft end

	250	355	500	750	
Metric keyed parallel shaft DIN 6885	●	●	●	●	P
Metric splined shaft DIN 5480	●	●	●	●	Z

Mounting flange similar to ISO 3019-2

	250	355	500	750	
4-hole	●	●	–	–	B
8-hole	–	–	●	●	H

Port connections

Ports A,B: SAE flanged opposite sides Port S: SAE on side 90° offset	metric threaded bolt holes	35

Boost pump

	250	355	500	750	
with integrated boost pump	●	●	●	●	F
without integrated boost pump	❍	❍	●	❍	K

= Preferred program

● = available ❍ = in preparation – = not available

Model code / standardprogram

A4CS	G			/	30		–	V			35				

Axial piston unit

Type of operation

Size

Control and adjustment device

Series

Direction of rotation

Seals

Shaft end

Mounting flange

Port connections

Boost pump

Through drive

			250	355	500	750	
with through drive shaft, without coupler, without adapter flange, closed with cover			●	●	●	●	**99**
with through drive for mounting of second pump(for further options see page 18)							
Flange ISO 3019-2 (metr.)	coupler for shaft end DIN 5480	to mount					
125, 4-hole	W 32x2x30x14x9g	A4VSO/H/G 40	❍	❍	❍	❍	**31**
140, 4-hole	W 40x2x30x18x9g	A4VSO/H/G 71	❍	❍	❍	❍	**33**
160, 4-hole	W 50x2x30x24x9g	A4VSO/H/G 125, 180	●	●	❍	❍	**34**
224, 4-hole	W 60x2x30x28x9g	A4CSG, A4VSO/H/G 250	●	❍	❍	❍	**35**
224, 4-hole	W 70x3x30x22x9g	A4CSG, A4VSO/G 355	–	●	❍	❍	**77**
315, 8-hole	W 80x3x30x25x9g	A4CSG, A4VSO/G 500	–	–	●	❍	**43**
400, 8-hole	W 90x3x30x28x9g	A4CSG, A4VSO/G 750	–	–	–	❍	**76**
Flange ISO 3019-2 (metr.)	coupler for shaft SAE J744	to mount					
80, 2-hole	19-4 3/4in 11T (A-B)	A10VSO 10, 18	❍	❍	❍	❍	**B2**
100, 2-hole	22-4 7/8in 13T (B)	A10VSO 28	❍	❍	❍	❍	**B3**
100, 2-hole	25-4 1in 15T (B-B)	A10VSO 45	❍	❍	❍	❍	**B4**
125, 2-hole	32-4 11/4in 14T C)	A10VSO 71	❍	❍	❍	❍	**B5**
125, 2-hole	38-4 11/2in 17T (C-C)	A10VSO 100	❍	❍	❍	❍	**B6**
180, 4-hole	44-4 13/4in 13T (D)	A10VSO 140	❍	❍	❍	❍	**B7**
Flange SAE J 744	coupler for shaft SAE J744	to mount					
82-2 (A)	16-4 5/8in 9T (A)	AZPF, PGF2	●	●	●	❍	**01**
82-2 (A)	19-4 3/4in 11T (A-B)	A10VSO 10, 18	❍	❍	❍	❍	**52**
101-2 (B)	22-4 7/8in 13T (B)	AZPN/G	●	❍	●	❍	**02**
101-2 (B)	22-4 7/8in 13T (B)	A10VO 28, PGF3	●	●	●	❍	**68**
101-2 (B)	25-4 1in 15T (B-B)	A10VO 45, PGH4	❍	❍	●	❍	**04**
127-2 (C)	32-4 11/4in 14T (C)	A10VO 71	●	●	●	❍	**07**
127-2 (C)	38-4 11/2in 17T (C-C)	A10VO 100, PGH5	❍	❍	❍	❍	**24**
152-4 (D)	44-4 13/4in 13T (D)	A10VO 140	●	●	●	❍	**17**

Valves

Boost-, control press. relief- and flushing valve integrated; direct operated mainline relief valves integrated	❍	❍	❍	❍	**3**
Boost-, control press. relief- and flushing valve integrated; pilot operated mainline relief valves integrated	●	●	●	●	**4**

Filtration

without filter	●	●	●	●	**N**
with threaded connection for filter in boost circuit	●	●	●	●	**D**
with built on filter (optical-electr. dirt indicator) in boost circuit	●	●	●	❍	**M**
with threaded connection f. filter in boost circuit (D) a. sandwichplate filter for HS-control (see RE 92076)	❍	❍	–	–	**Z**
with built on filter in boost circuit (M) and sandwichplate filter for HS-control (see RE 92076)	❍	❍	–	–	**U**

Technical data

Fluid

Prior to project design, please see our data sheets RE 90220 (mineral oil) and RE 90221 (environmentally acceptable fluids) for detailed information on fluids and application conditions. The variable displacement pump A4CSG is suitable for operation on mineral oil. When using environmentally acceptable fluids attention must be paid to possible limitations of the technical data. If necessary please contact us (when ordering, please state in clear text the fluid to be used).

Operating viscosity range

For optimum efficiency and service life we recommend that the operating viscosity (at oprating temperature) be selected in the range

ν_{opt} = optimum operating viscosity 16 .... 36 mm^2/s

referred to circuit temperature (closed circuit)

Viscosity range for operation with 100% duty cycle

$\nu_{operating}$ = 16 .... 100 mm^2/s

Limit of viscosity range

For critical operating conditions the following values apply:

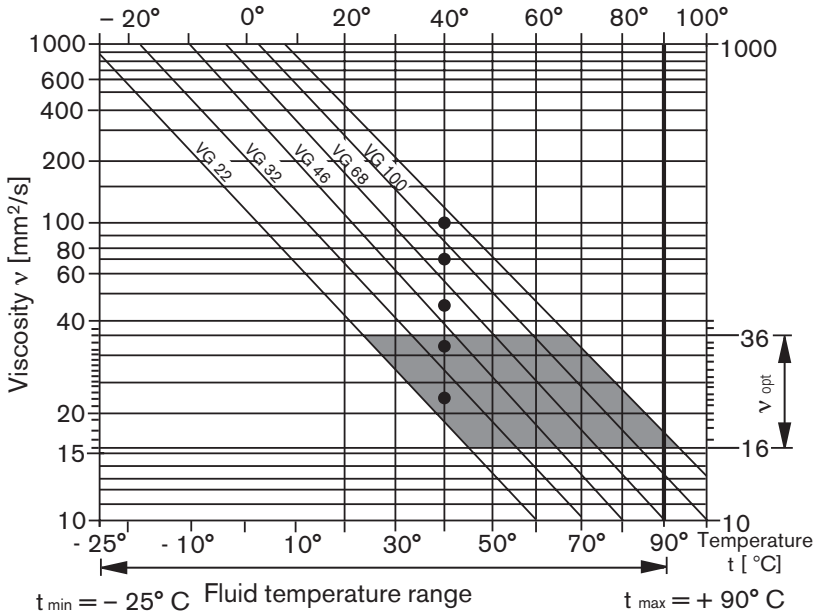
ν_{min} = 10 mm^2/s
for short periods (t < 3 min.)
at max. leakage fluid temp. of 90 °C.

ν_{max} = 1000 mm^2/s
for short periods on cold start (the optimum viscosity should be reached within 15 minutes)
$t_{min} \geq -25°$ C

Temperature range (see selection diagram)

t_{min} = – 25° C
t_{max} = + 90° C

Selection diagram



Notes on the selection of hydraulic fluid

In order to select the correct fluid, it is necessary to know the operating temperature in the closed circuit in relation to the ambient temperature.

The hydraulic fluid should be selected so that within the operating temperature range, the viscosity lies within the optimum range (ν_{opt} .; see shaded section of the selection diagram). We recommend that the higher viscosity grade is selected in each case.

Example: at an ambient temperature of X°C the operating temperature in the circuit is 60 °C. In the optimum viscosity range ν_{opt} (shaded area), this corresponds to viscosity grades VG 46 or VG 68, VG 68 should be selected.

Important: The leakage oil temperature is influenced by pressure and speed and is typically higher than the circuit temperature. However max. temperature at any point in the system may not exceed 90 °C.

If the above mentioned conditions cannot be kept due to extreme operating parameters or high ambient temperatures, please consult us.

Filtration of fluid

The finer the filtration, the better the achieved cleanliness of the fluid and the longer the life of the axial piston unit.

To ensure a reliable functioning of the axial piston unit, a minimum cleanliness of

20/18/15 acc. to ISO 4406 is necessary.

If above conditions cannot be met, we ask you to consult with us. For notes on the types of filtration see page 25.

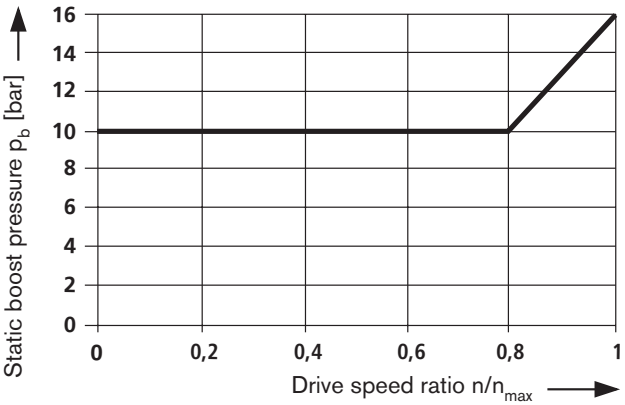
Technical Data (valid for operation on mineral oil)

Operating pressure range

Inlet

(Pressures acc. to DIN 24312)

Required static boost pressure, depending on drive speed



Required static boost pressure(at $n/n_{max}=1$)

$p_{b\ min}$ _____ 16 bar*

Minimum static boost pressure (short periods), relief valve setting

at $p_{b\ min}$ _____ 8 bar*

Maximum static boost pressure

$p_{b\ max}$ (for MA, EM, HM2/3, HS, EO2, HD u. EP), _____ 20 bar*

$p_{b\ max}$ (for HM1 u. EO1), _____ 30 bar*

* absolute pressure at port M_{E3} with flushingvalve spool in shifted position .

Permissible pressure spikes in boostcircuit min. ____ 4 bar abs.

max. _____ 40 bar abs.

Depending on the behaviour of the transmitted hydraulic energy in the system, boost pressure fluctuations can occur. In order to prevent damage in the system, boost pressure protection, which monitors the static boostpressure part is necessary. Ports M_{E3} or M_{K4} are suitable to monitor the boost pressure. It is recommended to check regularly the boost pressure for the permissible max. and min. spikes with suitable measuring equipment.

In order to prevent excessive boost pressure spikes, a low pressure accumulator can be connected to ports E_2, E_3 or K_4 . Accumulator sizing as well as the selection for the optimum connecting location depend on the system behaviour and the operating conditions under consideration of the available boost flow. Depending on the total systems leakage fluid flow, it may be necessary to increase the boost flow by means of a larger, or additional boost pump.

With integrated auxiliary pump - Version F..

Inlet pressure at port S

$p_{S\ min}$ _____ ≥ 0,8 bar abs.

$p_{S\ max}$ _____ 30 bar abs.

Outlet

(Pressures acc. to DIN 24312)

Variable pump:

Pressure at port A or B

nominal pressure p_N _____ 350 bar

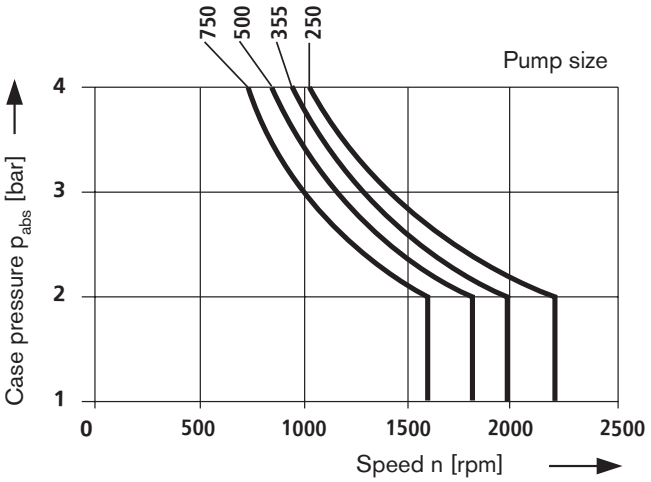
Peak pressure p_{max} _____ 400 bar

Case drain pressure

The service life of the shaft seal depends on the drive speed and case pressure. The diagram shows permissible limiting values at intermittent pressure loads on the shaft seal, which may not be exceeded.

A static case pressure, close to the max. limit will result in decreased service life of the shaft seal.

Permissible case pressure(housing pressure) depending on the drive speed



Max. case pressure (housing pressure)

$p_{L\ abs\ max}$ _____ 4 bar

Technical Data

Table of values (theoretical values, without considering η_{mh} und η_v; values rounded)

Size				**250**	**355**	**500**	**750**
Displacement	Variabe pump	$V_{g\,max}$	cm³	250	355	500	750
	integr. boost pump	$V_{g\,H}$	cm³	63	80	98	143
Drive speed	max. speed	n_{max}	rpm	2200	2000	1800	1600
	min. speed	n_{min}	rpm	800	800	800	800
Max. flow (variable pump)	at n_{max}	$q_{v\,max}$	L/min	550	710	900	1200
	at n_E = 1500 rpm		L/min	375	533	750	1125
Max. power	at $n_{o\,max}$	$P_{o\,max}$	kW	321	414	525	700
(Δp = 350 bar)	at n_E = 1500 rpm		kW	219	311	438	656
Torque at $V_{g\,max}$	Δp = 350 bar	T_{max}	Nm	1391	1976	2783	4174
Variable pump (without boost pump)	Δp = 100 bar	T	Nm	398	564	795	1193
Moment of inertia about drive axis		J	kgm²	0,0959	0,19	0,3325	0,66
Max. perm. angular acceleration			rad/s²	775	600	540	400
Torsional stiffness	Shaft end P		kNm/rad	527	800	1145	1860
	Shaft end Z		kNm/rad	543	770	1209	1812
Case volume			L	10	8	14	19
Weight approx.. (Pump with EP-control a. integr. boost pump)		m	kg	214	237	350	500

Calculation of size

Flow $q_v = \dfrac{V_g \cdot n \cdot \eta_v}{1000}$ [L/min]

Drive torque $T = \dfrac{1{,}59 \cdot V_g \cdot \Delta p}{100 \cdot \eta_{mh}}$ [Nm]

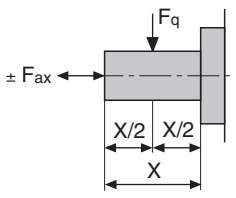
Power $P = \dfrac{2\pi \cdot T \cdot n}{60\,000} = \dfrac{q_v \cdot \Delta p}{600 \cdot \eta_t}$ [kW]

V_g = geometr. displacement per revolution in cm³
Δp = Pressure differential in bar
n = Drive speed in rpm
η_v = volumetriic efficiency
η_{mh} = mechanical-hydraulic efficiency
η_t = Overall efficiency ($\eta_t = \eta_v \cdot \eta_{mh}$)

Permissible forces on drive shaft

Size			**250**	**355**	**500**	**750**
Permissible radial force	$F_{q\,max}$	N	2000	2200	2500	3000
Permissible axial force	$\pm F_{ax\,max}$	N	1800	2000	2000	2200

Application of forces



Technical Data

Bearing flushing

For the following operating conditions bearing flushing is required for reliable continuous operation :

- Applications with special fluids (non mineral oils), due to limited lubricity and narrow operating temperature range
- Operation with critical conditions of temperature and viscosity with mineral oil
- With vertical mounting position of pump (shaft upwards) in order to ensure lubrication of front bearing and shaft seal.

Flushing is carried out via port "U", which is located in the front flange area of the pump. The flushing oil flows through the front bearing and leaves the system together with the leakage oil at the case drain port.

The following flushing flows are recommended for the various pump sizes:

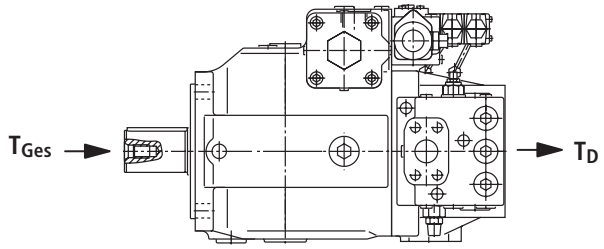
Size			250	355	500	750
Flushing flow	q_{sp}	L/min	10	15	20	30

These flushing flows create a pressure drop of approx. 3 bar between port "U" and pump housing (including fitting).

Notes regarding bearing flushing

When using bearing flushing at port "U" the throttle screw, which can be found at port "U", has to be turned in all the way to its stop.

Maximum drive and through drive torques



The split in torque between the 1. and 2. pump is optional.

The max. permissible drive torque T_{Ges} as well as the max. permissible through drive torque T_D may not be exceeded.

Size			250	355	500	750
Max. perm. drive torque on pump 1 with shaft "**Z**"	T_{Ges}	Nm	2782	3952	5566	8348
Max. perm. through drive torque	T_D	Nm	1391	1976	2783	4174

Size			250	355	500	750
Max. perm. drive torque on pump 1 with shaft "**P**"	T_{Ges}	Nm	2300	3557	5200	7513
Max. perm. through drive torque	T_D	Nm	1391	1976	2783	4174

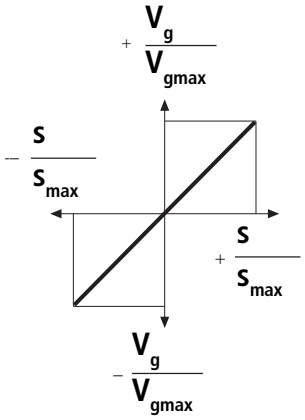
T_{Ges} = Max.permissible drive torque on pump 1

T_D = Max. permissible through drive torque

Summary of control and adjustment devices

Manuel adjustment MA

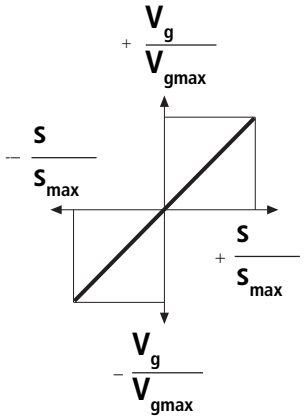
Handwheel operated stepless adjustment of displacement



see RE 92072

Electric motor adjustment EM

Stepless adjustment of displacement via an electric motor.
With a programmed sequence control, various intermediate displacements can be selected by means of built-on limit switches or a potentiometer.



see RE 92072

Hydraulic displacement control HM 1/2/3 control volume dependent

The pump displacement is infinitely variable in relation to the pilot oil volume at ports X_1 and X_2

Application: – 2-point control
– basic control device for servo- or proportional control

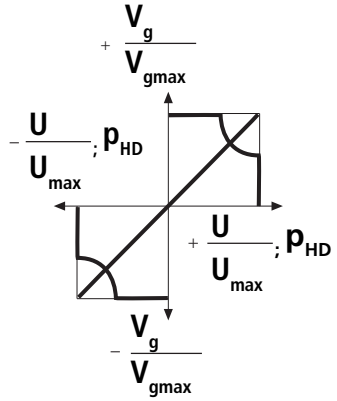
see RE 92076

Hydraulic displacement control HS, HS1, HS3 with servo- or proportional valve

The stepless displacement control is accomplished by means of a servo- or proportional valve with electrical feedback of the swivel angle.

Electronic control

Optional: servo valve (HS/HS1), proportional valve (HS3), short circuit valve (HS1K, HS3K), without valves (HSE, HS1E, HS3E) The **HS3P-** control is fitted with a built-on pressure transducer so that it can be utilised for **electrical pressure- and power control**



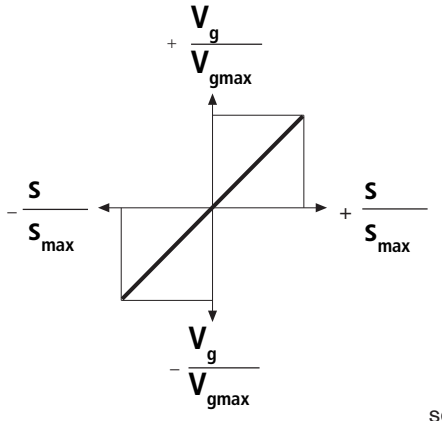
see RE 92076

Summary of control and adjusment devices

Hydraulic-electronically operated displacement control EO 1/2

The stepless adjustment of the displacement is accomplished by means of a proportional valve with electrical feedback of the swivel angle.
Electronically controlled

Optional:
Short circuit valve (EO1K, EO2K)
Without valves (EO1E, EO2E)

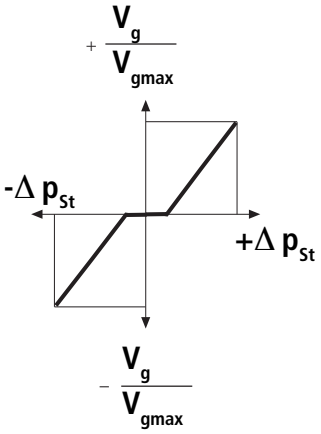


see RE 92076

Hydraulic control HD1/2/3 pilot pressure dependent

Stepless adjustment of pump displacement in relation to pilot pressure.
The displacement is proportional to the applied pilot pressure.

Optional:
Pilot pressure curves (HD1, HD2, HD3)
Pressure control (HD.A, HD.B, HD.D)
Remote pressure control (HD.GA, HD.GB, HD.G)
Power control (HD.P)
Electric control of pilot pressure (HD.T)



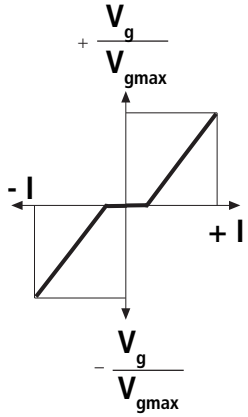
see RE 92080

Electro -hydraulic control EP with proportional solenuid

A valve with two proportional solenoids gives a pressure signal to one of the pumps pilot control chambers. The pressure signal and also the displacement is proportional to the solenoid current. Each solenoid operates one direction of flow.

Voltage 24 V
Nominal current 800 mA
Resistance at 20°C 19 Ω

Optional:
with pressure control (EPA, EPB, EPD);
with pressure control remote (EPGA, EPGB, EPG)

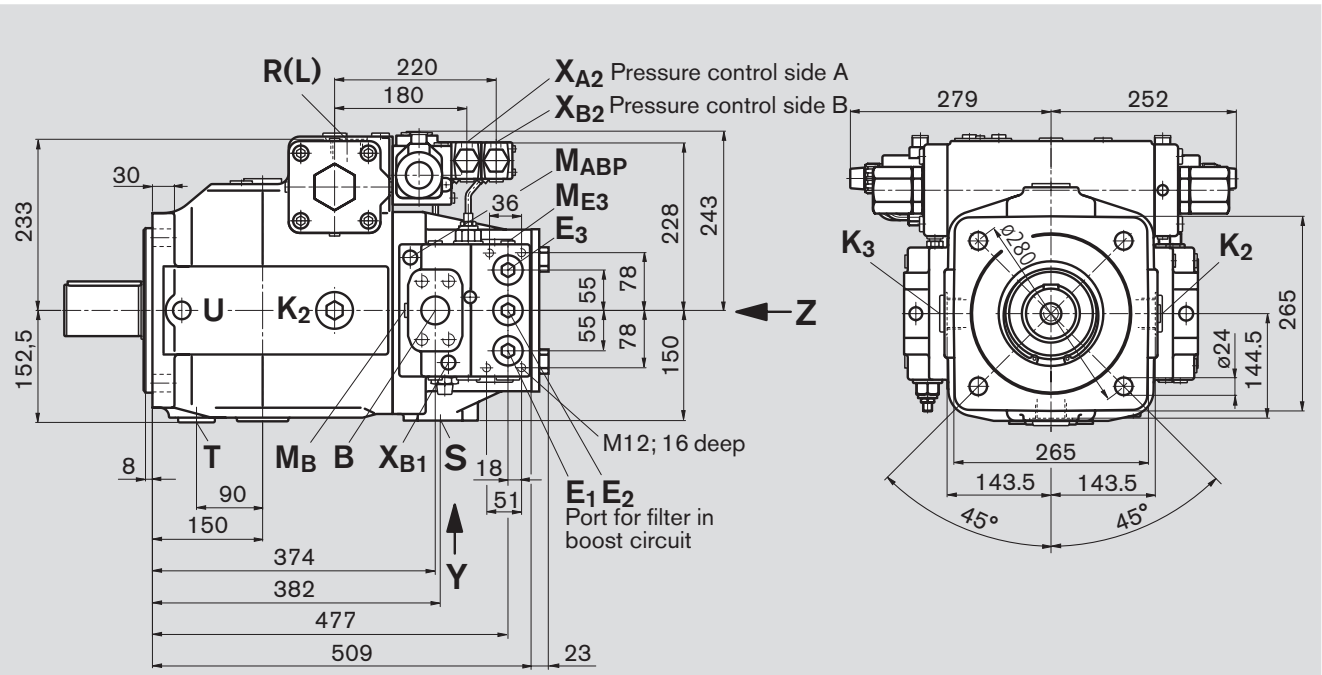


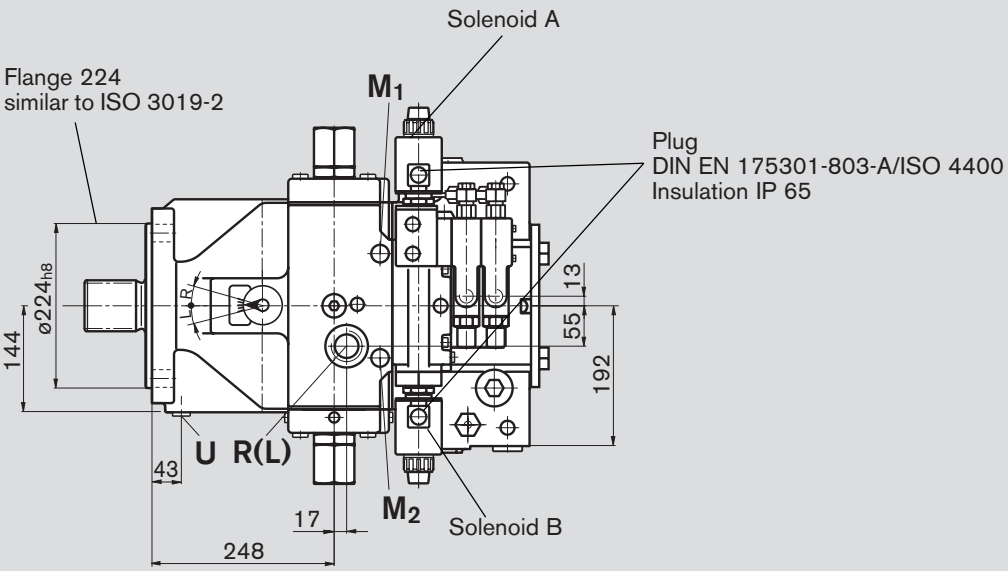
see RE 92084
(in preparation)

Unit dimensions size 250

Before finalising your design, please request a certified installation drawing

Example A4CSG250EPG/30R-XXB35F994N





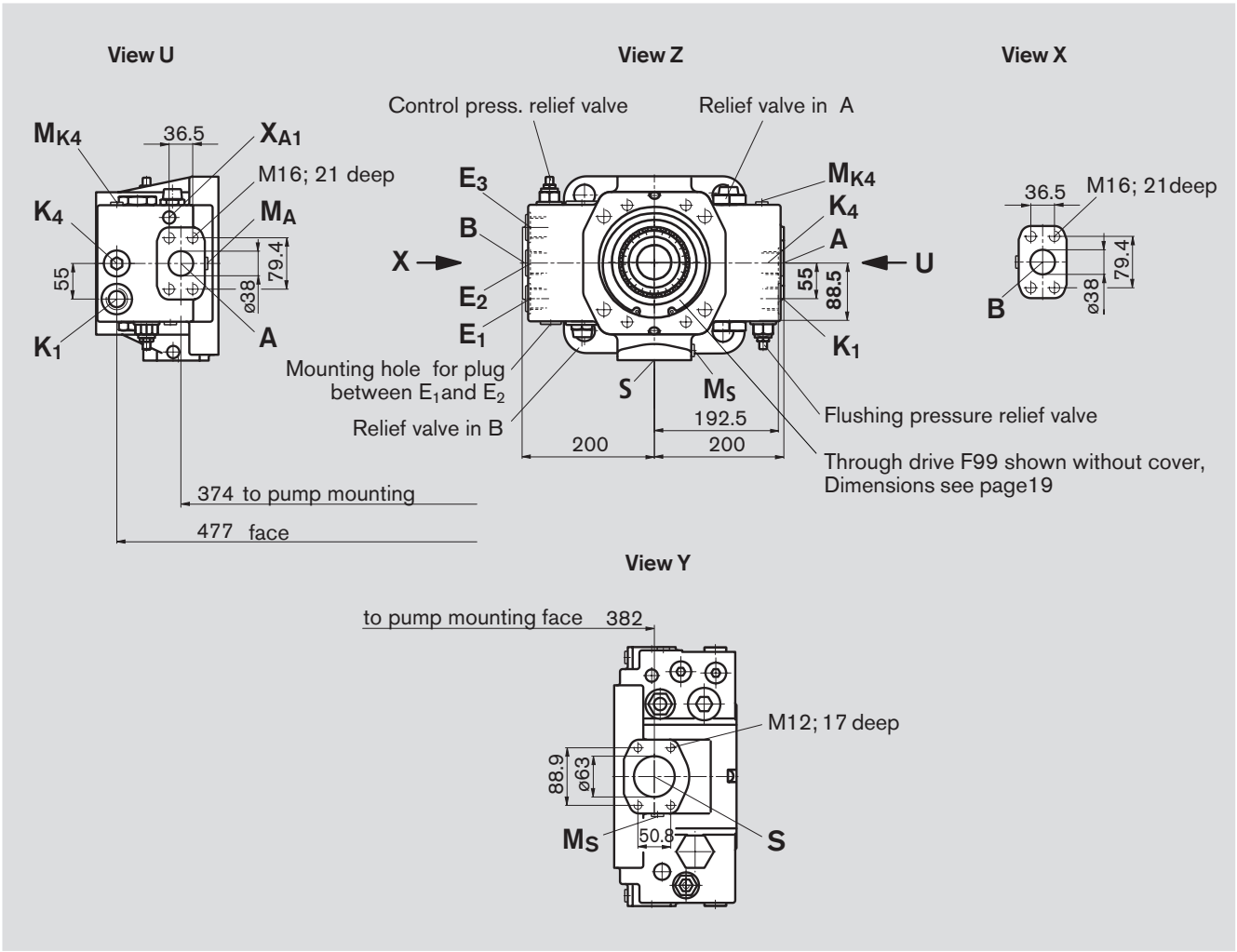
Further views and ports on page 11

Ports					Max. tightening torque [1]
A, B	Pressure port, high press. range fixing thread	SAE J518c DIN 13	1 1/2 in M16;	21 deep	– see safety instructions
S	Inlet port, standard press. range fixing thread	SAE J518c DIN 13	2 1/2 in M12;	17 deep	– see safety instructions
M_A,M_B,M_{ABP}	Test points press. ports	DIN 3852	M14x1,5;	12 deep (closed)	80 Nm
M_S	Test point inlet pressure	DIN 3852	M14x1,5;	12 deep (closed)	80 Nm
T	Oil drain	DIN 3852	M42x2;	20 deep (closed)	720 Nm
E_1	To filter	DIN 3852	M33x2;	18 deep (closed)	540 Nm
E_2	From filter	DIN 3852	M33x2;	18 deep (closed)	540 Nm
K_1	Flushing port	DIN 3852	M33x2;	18 deep	540 Nm

[1]) Follow manufacturer's instructions of used fittings

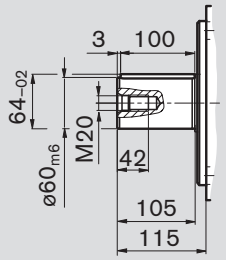
Unit dimensions size 250

Before finalising your design, please request a certified installation drawing

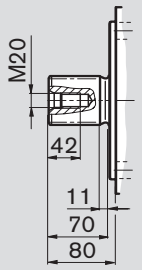


Shaft ends

P Keyed DIN 6885
AS 18x11x100



Z Splined DIN 5480
W60x2x30x28x9g

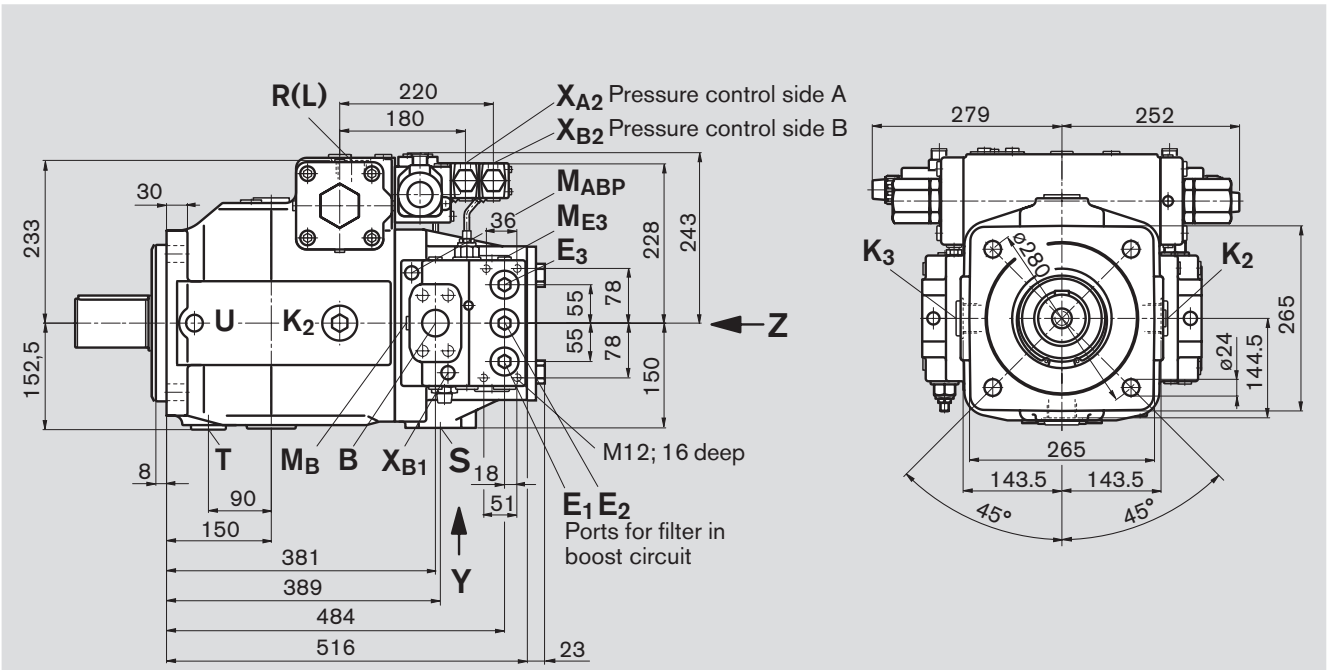


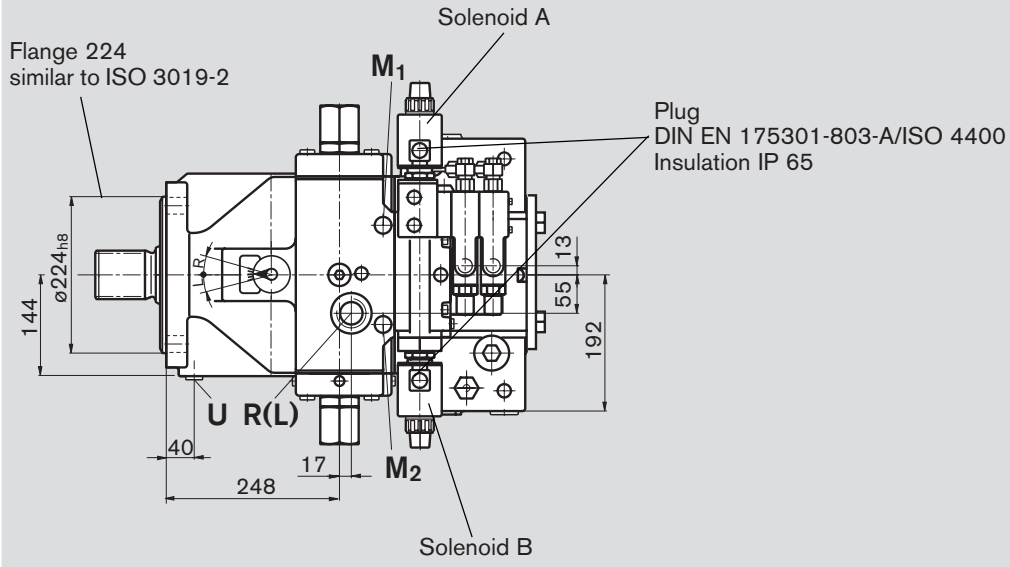
Ports				Max. tightening torque [1]
K_2, K_3	Flushing port	DIN 3852	M42x2; 20 deep (closed)	720 Nm
R(L)	Oil fill and air bleed	DIN 3852	M42x2; 20 deep	720 Nm
U	Bearing flushing port	DIN 3852	M14x1,5; 12 deep (closed)	80 Nm
E_3	External boost flow port	DIN 3852	M33x2; 18 deep (closed)	540 Nm
M_{E3}	Test point boost pressure	DIN 3852	M14x1,5; 12 deep (closed)	80 Nm
K_4	Accumulator port	DIN 3852	M33x2; 18 deep (closed)	540 Nm
M_{K4}	Test point loop flushing press.	DIN 3852	M14x1,5; 12 deep (closed)	80 Nm
M_1, M_2	Test point control pressure	DIN 3852	M18x1,5; 12 deep (closed)	140 Nm
X_{A1}	Pilot port relief valve in A	DIN 3852	M14x1,5; 12 deep (closed)	80 Nm
X_{B1}	Pilot port relief valve in B	DIN 3852	M14x1,5; 12 deep (closed)	80 Nm
X_{A2}, X_{B2}	Pilot port for pressure control	DIN 3852	M14x1,5; 12 deep	80 Nm

Unit dimensions size 355

Before finalising your design, please request a certified installation drawing

Example A4CSG355EPG/30R-XXB35F994N





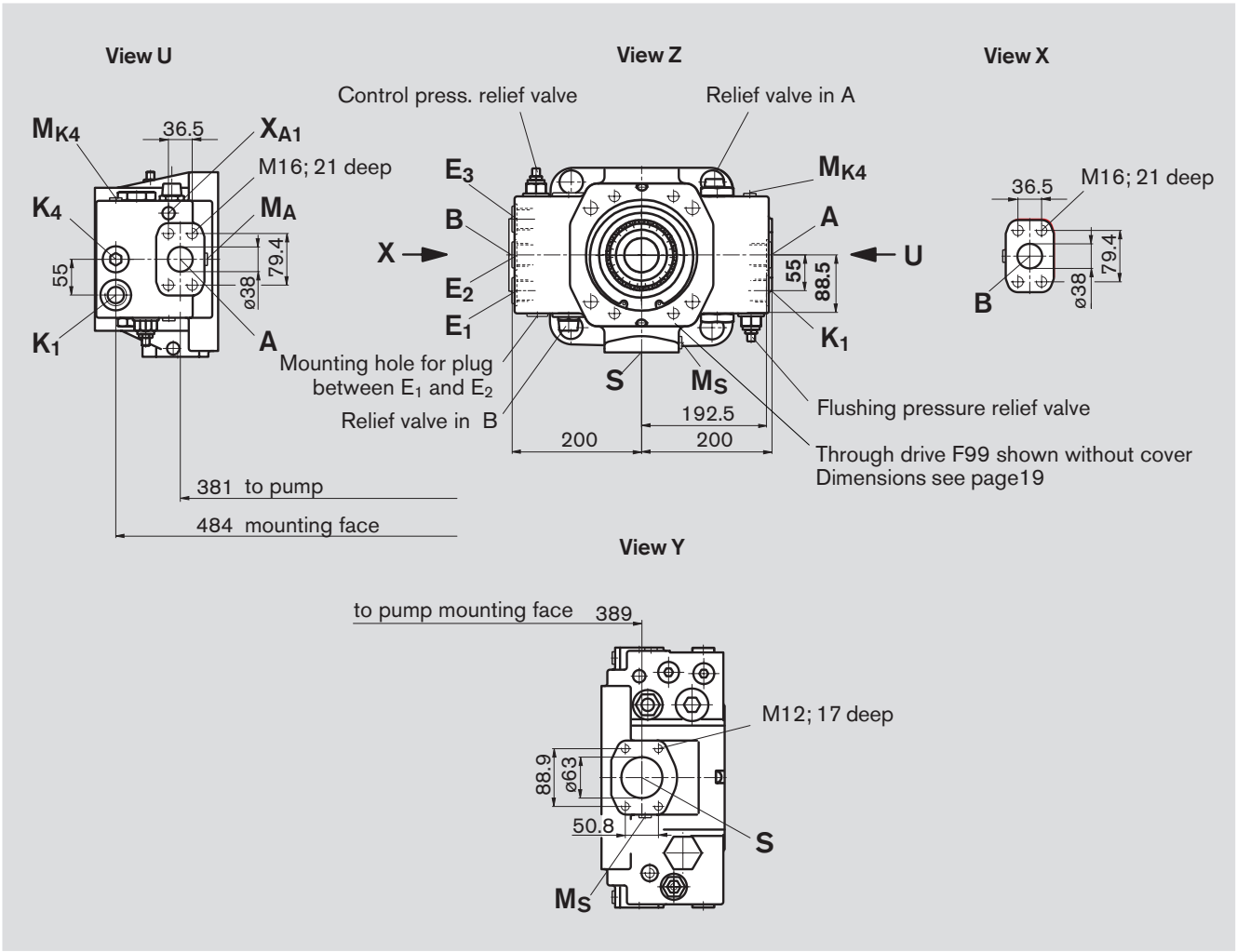
Further views and ports on page 13

Ports					**Max. tightening torque**[1]
A, B	Pressure port,high press. range fixing thread	SAE J518c DIN 13	1 1/2 in M16;	21 deep	– see safety instructions
S	Inlet port, standard press. range fixing thread	SAE J518c DIN 13	2 1/2 in M12;	17 deep	– see safety instructions
M_A,M_B,M_{ABP}	Test points press. ports	DIN 3852	M14x1,5;	12 deep (closed)	80 Nm
M_S	Test point inlet pressure	DIN 3852	M14x1,5;	12 deep (closed)	80 Nm
T	Oil drain	DIN 3852	M42x2;	20 deep (closed)	720 Nm
E_1	To filter	DIN 3852	M33x2;	18 deep (closed)	540 Nm
E_2	From filter	DIN 3852	M33x2;	18 deep (closed)	540 Nm
K_1	Flushing port	DIN 3852	M33x2;	18 deep	540 Nm

[1]) Follow manufacturer's instructions of used fittings

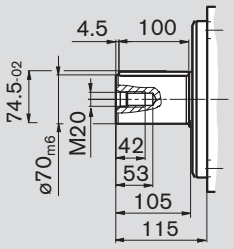
Unit dimensions size 355

Before finalising your design, please request a certified installation drawing

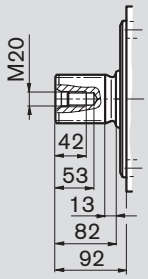


Shaft ends

P Keyed DIN 6885
AS 20x12x100



Z Splined DIN 5480
W70x3x30x22x9g

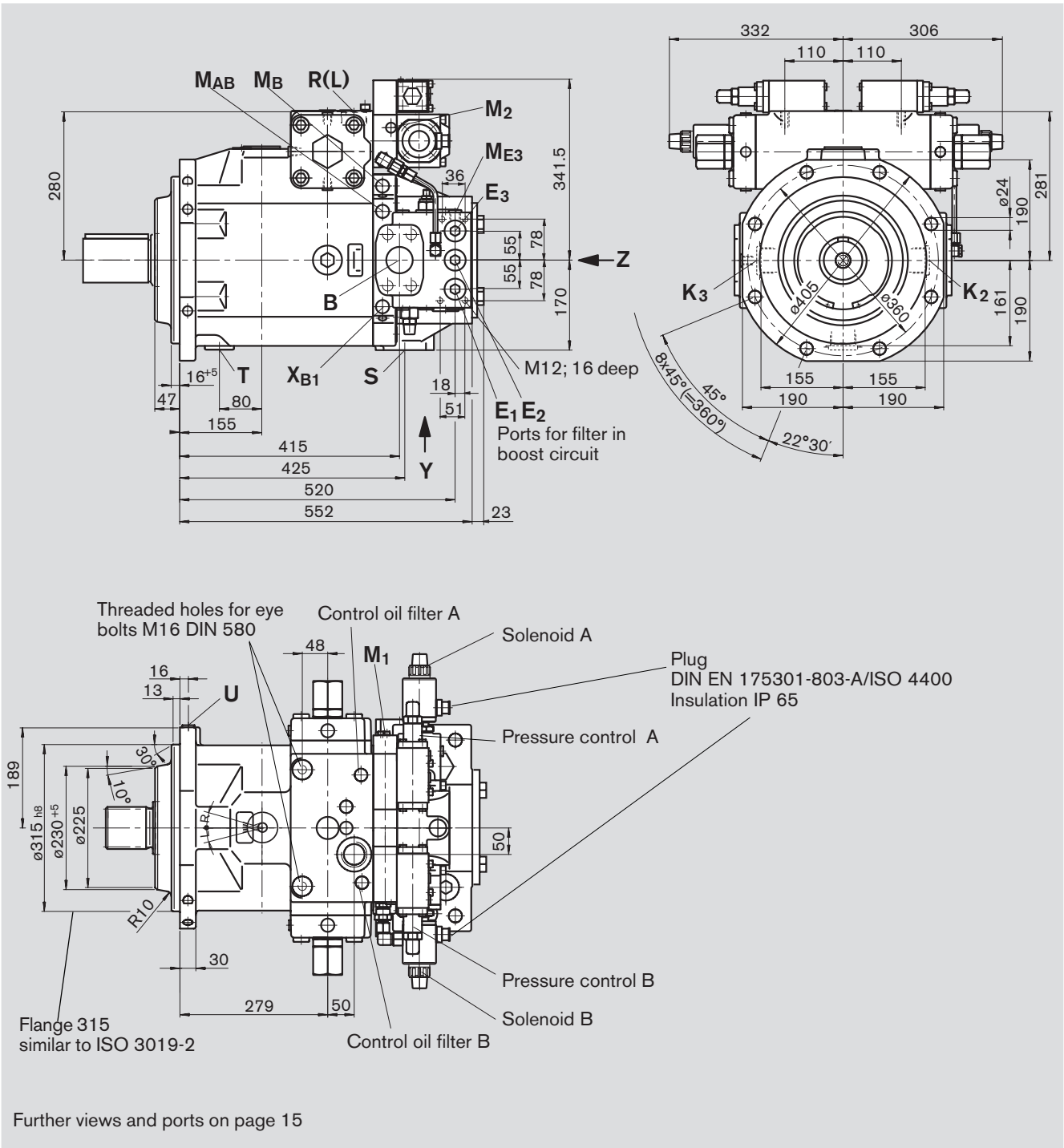


Ports				Max. tightening torque. [1]
K_2, K_3	Flushing port	DIN 3852	M42x2; 20 deep (closed)	720 Nm
R(L)	Oil fill +air bleed	DIN 3852	M42x2; 20 deep	720 Nm
U	Bearing flushing port	DIN 3852	M18x1,5; 12 deep (closed)	140 Nm
E_3	External boost flow port	DIN 3852	M33x2; 18 deep (closed)	540 Nm
M_{E3}	Test point boost pressure	DIN 3852	M14x1,5; 12 deep (closed)	80 Nm
K_4	Accumulator port	DIN 3852	M33x2; 18 deep (closed)	540 Nm
M_{K4}	Test point loop flushing pressure	DIN 3852	M14x1,5; 12 deep (closed)	80 Nm
M_1, M_2	Test point control pressure	DIN 3852	M18x1,5; 12 deep (closed)	140 Nm
X_{A1}	Pilot port relief valve in A	DIN 3852	M14x1,5; 12 deep (closed)	80 Nm
X_{B1}	Pilot port relief valve in B	DIN 3852	M14x1,5; 12 deep (closed)	80 Nm
X_{A2}, X_{B2}	pilot port pressure control	DIN 3852	M14x1,5; 12 deep	80 Nm

Unit dimensions size 500

Before finalising your design, please request a certified installation drawing

Example A4CSG500EPD/30R-XXH35F994N



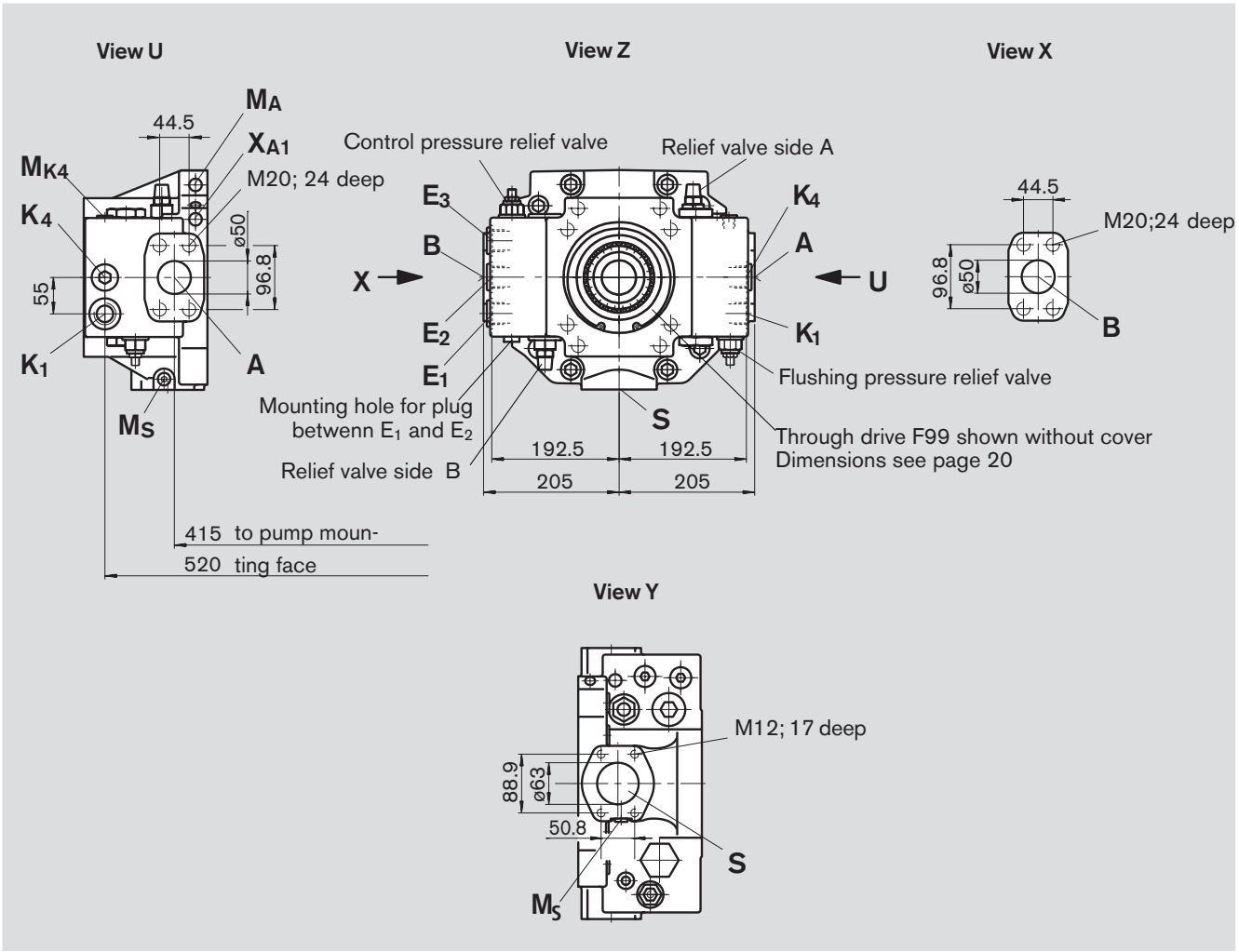
Further views and ports on page 15

Ports					**Max. tightening torque** [1]
A, B	Pressure port, high press. range fixing thread	SAE J 518c DIN 13	2 in M20;	24 deep	– see safety instructions
S	Inlet port, standardpress. range fixing thread	SAE J518c DIN 13	2 1/2 in M12;	17 deep	– see safety instructions
M_A,M_B,M_{AB}	Test points press. ports	DIN 3852	M14x1,5;	12 deep (closed)	80 Nm
M_S	Test point inlet pressure	DIN 3852	M14x1,5;	12 deep (closed)	80 Nm
T	Oil drain	DIN 3852	M48x2;	22 deep (closed)	960 Nm
E_1	To filter	DIN 3852	M33x2;	18 deep (closed)	540 Nm
E_2	From filter	DIN 3852	M33x2;	18 deep (closed)	540 Nm
K_1	Flushing port	DIN 3852	M33x2;	18 deep	540 Nm

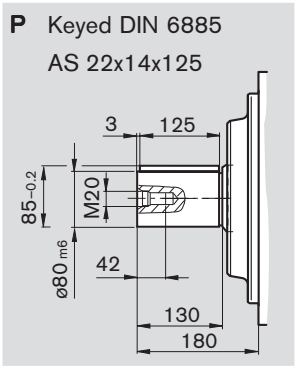
[1]) Follow manufacturer's instructions of used fittings

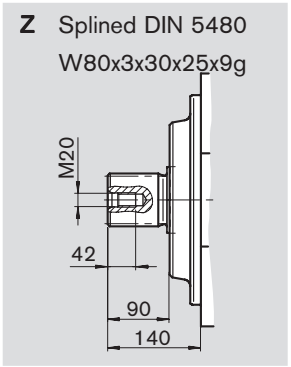
Unit dimensions size 500

Before finalising your design, please request a certified installation drawing



Shaft ends



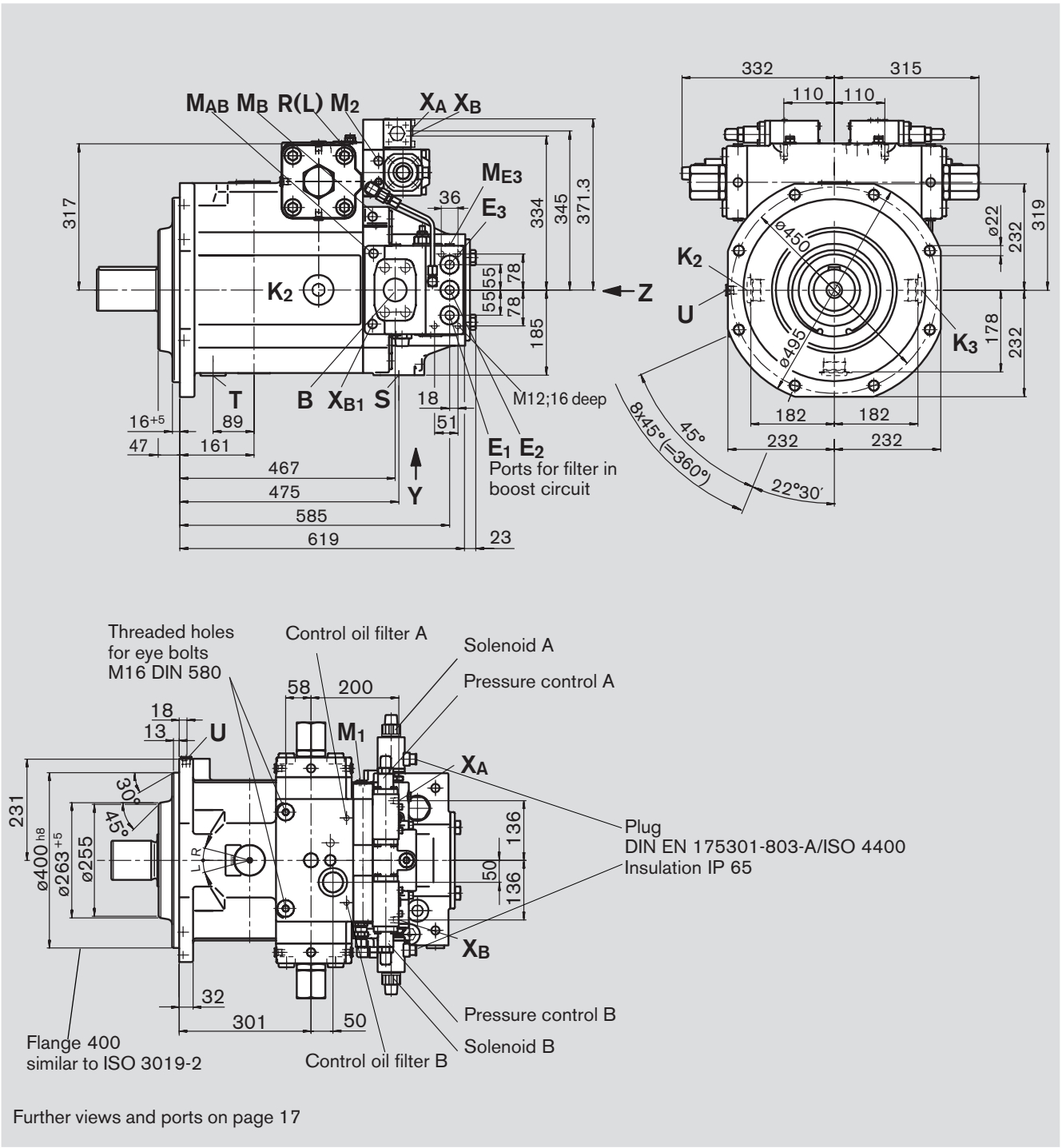


Ports				Max. tightening torque [1]
K_2, K_3	Flushing port	DIN 3852	M48x2; 22 deep (closed)	960 Nm
R(L)	Oil fill +air bleed	DIN 3852	M48x2; 22 deep	960 Nm
U	Bearing flushing port	DIN 3852	M18x1,5; 12 deep (closed)	140 Nm
E_3	External boost flow port	DIN 3852	M33x2; 18 deep (closed)	540 Nm
M_{E3}	Test point boost pressure	DIN 3852	M14x1,5; 12 deep (closed)	80 Nm
K_4	Accumulator port	DIN 3852	M33x2; 18 deep (closed)	540 Nm
M_{K4}	Test point loop flushing pressure	DIN 3852	M14x1,5; 12 deep (closed)	80 Nm
M_1	Test point control chamber press.	DIN 3852	M22x1,5; 14 deep (closed)	210 Nm
M_2	Test point control chamber press.	DIN 3852	M14x1,5; 12 deep (closed)	80 Nm
X_{A1}	Pilot port relief valve in A	DIN 3852	M14x1,5; 12 deep (closed)	80 Nm
X_{B1}	Pilot port relief valve in B	DIN 3852	M14x1,5; 12 deep (closed)	80 Nm

Unit dimensions size 750

Before finalising your design, please request a certified installation drawing

Example A4CSG750EPG/30R-XXH35F994N



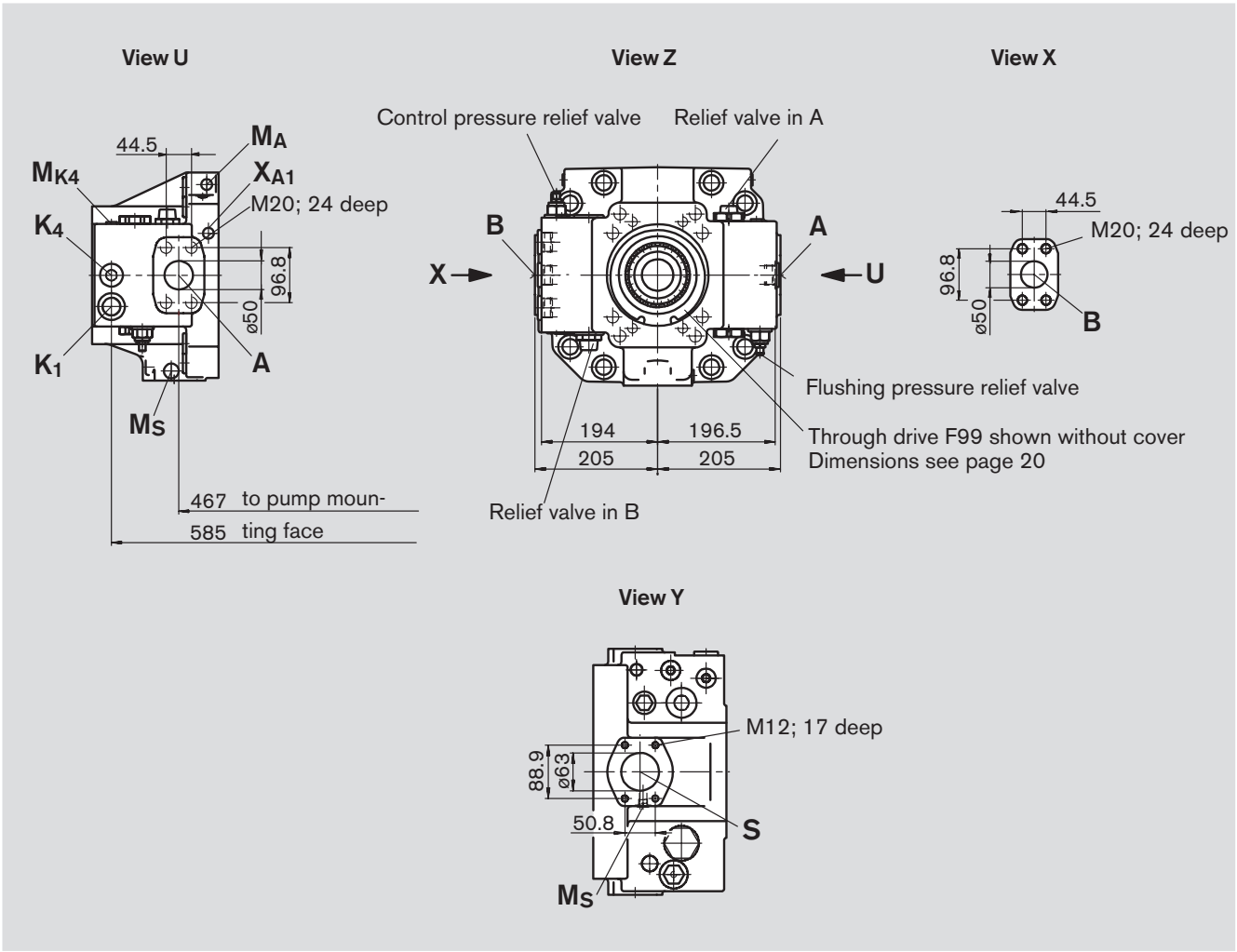
Further views and ports on page 17

Ports					Max. tightening torque [1]
A, B	Pressure ports, high press. range fixing thread	SAE J 518c DIN 13	2 in M20;	24 deep	– see safety instructions
S	Inlet port, standard press. range fixing thread	SAE J518c DIN 13	2 1/2 in M12;	17 deep	– see safety instructions
M_A,M_B,M_{AB}	Test points pressure ports	DIN 3852	M14x1,5;	12 deep (closed)	80 Nm
M_S	Test point inlet pressure	DIN 3852	M14x1,5;	12 deep (closed)	80 Nm
T	Oil drain	DIN 3852	M48x2;	22 deep (closed)	960 Nm
E_1	To filter	DIN 3852	M33x2;	18 deep (closed)	540 Nm
E_2	From filter	DIN 3852	M33x2;	18deep (closed)	540 Nm
K_1	Flushing port	DIN 3852	M33x2;	18 deep	540 Nm

[1]) Follow manufacturer's instructions of used fittings

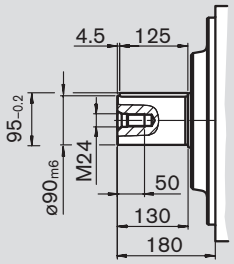
Unit dimensions size 750

Before finalising your design, please request a certified installation drawing

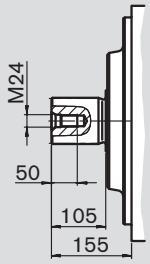


Shaft ends

P Keyed DIN 6885
AS 25x14x125



Z Splined DIN 5480
W90x3x30x28x9g



Ports				Max. tightening torque [1]
K_2, K_3	Flushing port	DIN 3852	M48x2; 22 deep (closed)	960 Nm
R(L)	Oil fill + air bleed	DIN 3852	M48x2; 22 deep	960 Nm
U	Bearing flushing port	DIN 3852	M18x1,5; 12 deep (closed)	140 Nm
E_3	External boost flow port	DIN 3852	M33x2; 18 deep (closed)	540 Nm
M_{E3}	Test point boost pressure	DIN 3852	M14x1,5; 12 deep (closed)	80 Nm
K_4	Accumulator port	DIN 3852	M33x2; 18 deep (closed)	540 Nm
M_{K4}	Test point loop flushing pressure	DIN 3852	M14x1,5; 12 deep (closed)	80 Nm
M_1	Test point control chamber press.	DIN 3852	M22x1,5; 14 deep(closed)	210 Nm
M_2	Test point control chamber press.	DIN 3852	M14x1,5; 12 deep (closed)	80 Nm
X_{A1}	Pilot port relief valve A	DIN 3852	M14x1,5; 12 deep (closed)	80 Nm
X_{B1}	Pilot port relief valve B	DIN 3852	M14x1,5; 12 deep (closed)	80 Nm

Through drive

Although the compact unit A4CSG has a built in boost pump, it can be supplied with a through drive as per the model codes on page 3.
For the various through drive versions see the codes on page 3 (codes 99 – 17).
This code designation is sufficient if no further pump has to be factory mounted.
Included in this case are:
for F/K 31 – 17:
Shaft coupler, mounting screws, seal, and if necessary an adapter flange

for F/K 99:
with through drive shaft, without shaft coupler, without adapter flange; unit closed with oiltight cover.

Combination pumps

Independent circuits are avilable for the user when further pumps are built on.

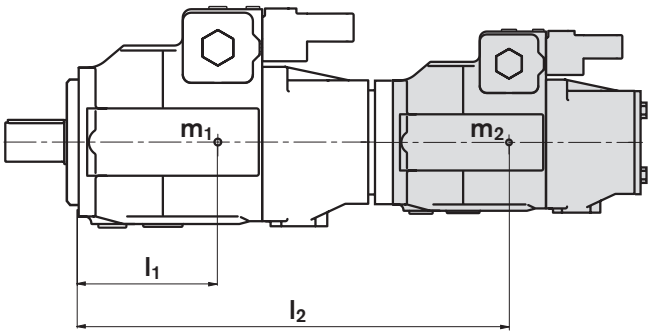
1. If the combination consists of **2 Rexroth axial poston pumps** and if these 2 units have to be **factory assembled together** both pump model codes should be joined by a "**+**".

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

2. If a **gear** pump is to be **factory mounted**, please consult us.

Max. permissible input and through drive torques see page 7.

Permissible moment of inertia



m_1, m_2, m_3 Weight of pumps in kg
l_1, l_2, l_3 Distance to center of gravity in mm

$$T_m = (m_1 \cdot l_1 + m_2 \cdot l_2 + m_3 \cdot l_3) \cdot \frac{1}{102} \text{ in Nm}$$

Size			250	355	500	750
Perm. moment of inertia	T_m	Nm	9300	9300	15600	19500
Perm. moment of inertia with dyn. mass acc. of 10g ≙ 98,1 m/sec²	T_m	Nm	930	930	1560	1950
Weight	m_1	kg	214	237	350	500
Dist. to center of gravity	l_1	mm	210	220	230	260

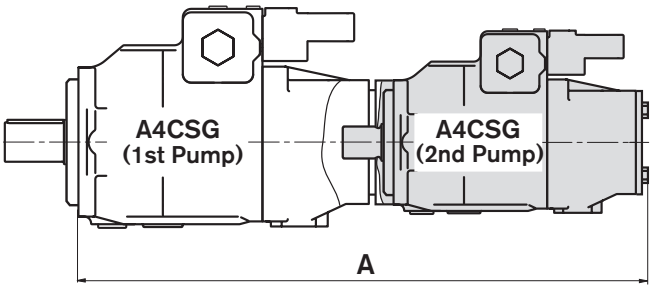
Overview mounting options onto A4CSG

Through drive - A4CSG			Suitable for 2. Pumptype					Available
Flange	Shaft coupler	Short code	A4CSG Size (shaft)	A4VSO/(H)G Size (shaft)	A10V(S)O/31 Size (shaft)	A10V(S)O/52 Size (shaft)	Ext./internal gear pump	for pump-size
Flange ISO 3019-2 (metric)								
80, 2-hole	19-4 (3/4in, 11T) [3]	**F/KB2**	–	–	18 (S, R)	10 (S)	–	in prep.
100, 2-hole	22-4 (7/8in, 13T) [3]	**F/KB3**	–	–	28 (S, R)	–	–	in prep.
	25-4 (1in, 15T) [3]	**F/KB4**	–	–	45 (S, R)	–	–	in prep.
125, 2-hole	32-4 (1 1/4in, 14T) [3]	**F/KB5**	–	–	71 (S, R)	–	–	in prep.
	38-4 (1 1/2in, 17T) [3]	**F/KB6**	–	–	100 (S)	–	–	in prep.
125, 4-hole	W 32x2x30x14x9g [2]	**F/K31**	–	40 (Z)	–	–	–	in prep.
140, 4-hole	W 40x2x30x18x9g [2]	**F/K33**	–	71 (Z)	–	–	–	in prep.
160, 4-hole	W 50x2x30x24x9g [2]	**F/K34**	–	125, 180 (Z)	–	–	–	250, 355
180, 4-hole	44-4 (1 3/4in, 13T) [3]	**F/KB7**	–	–	140 (S)	–	–	in prep.
224, 4-hole	W 60x2x30x28x9g [2]	**F/K35**	250 (Z)	250 (Z)	–	–	–	250
	W 70x3x30x22x9g [2]	**F/K77**	355 (Z)	355 (Z)	–	–	–	355
315, 8-hole	W 80x3x30x25x9g [2]	**F/K43**	500 (Z)	500 (Z)	–	–	–	500
400, 8-hole	W 90x3x30x28x9g [2]	**F/K76**	750 (Z)	750 (Z)	–	–	–	in prep.
Flange SAE J 744 (ISO 3019-1)								
82-2 (A) [1]	16-4 (5/8in, 9T) [3]	**F/K01**	–	–	–	–	AZPF [4]/PGF2	250...500
	19-4 (3/4in, 11T) [3]	**F/K52**	–	–	18 (S, R)	10 (S)	–	in prep.
101-2 (B) [1]	22-4 (7/8in, 13T) [3]	**F/K02**	–	–	–	–	AZPN/G [4]	250, 500
		F/K68	–	–	28 (S)	28 (S)	PGF3	250...500
	25-4 (1in, 15T) [3]	**F/K04**	–	–	45 (S)	45 (S)	PGH4	500
127-2 (C) [1]	32-4 (1 1/4in, 14T) [3]	**F/K07**	–	–	71 (S)	–	–	250...500
	38-4 (1 1/2in, 17T) [3]	**F/K24**	–	–	100 (S)	85 (S)	PGH5	in prep.
152-4 (D) [1]	44-4 (1 3/4in, 13T) [3]	**F/K17**	–	–	140 (S)	–	–	250...500

[1]) 2 = 2-hole, 4 = 4-hole [2]) to DIN 5480 [3]) Drive shafts acc. to SAE J744 OCT83
[4]) Rexroth recommends special versions for the gear pumps. Please consult us.

Dimensions pump combinations and through drive F/K99

Pump combinations A4CSG + A4CSG



Overall lenght A

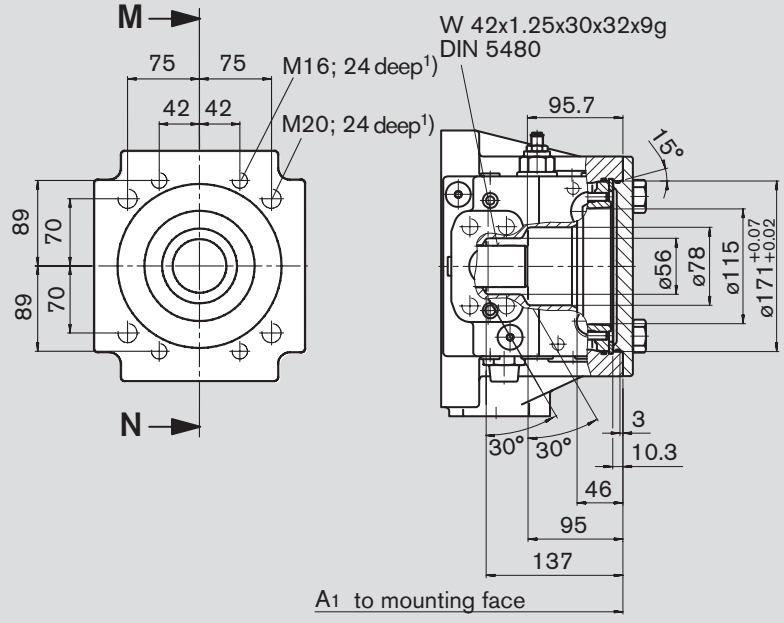
A4CSG (1st Pump)	A4CSG (2nd Pump with through drive F/K99)			
	250	355	500	750
250	1041	–	–	–
355	1048	1055	–	–
500	1084	1091	1127	–
750	1151	1158	1194	1261

F/K99 **with through drive shaft,** without shaft coupler, without adapter flange, closed with cover

Size 250 and 355

shown without cover

Section M-N



Size	A_1
250	509
355	516

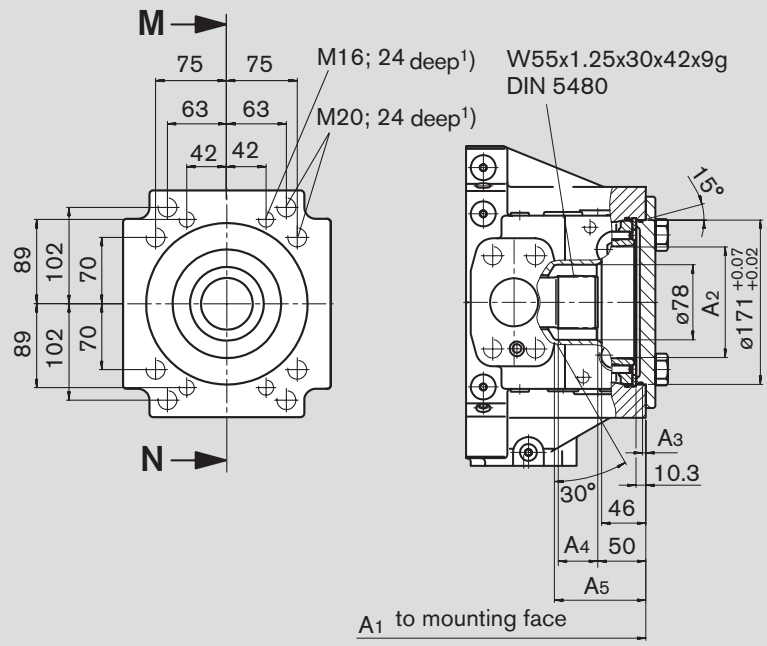
Sizes 500 and 750 see page 20

1) DIN 13, Tightening torque see safety instructions

Dimensions through drive F/K99 and F/K34

F/K99 **with through drive shaft,without shaft coupler, without adapter flange, closed with cover**

Size 500 and 750

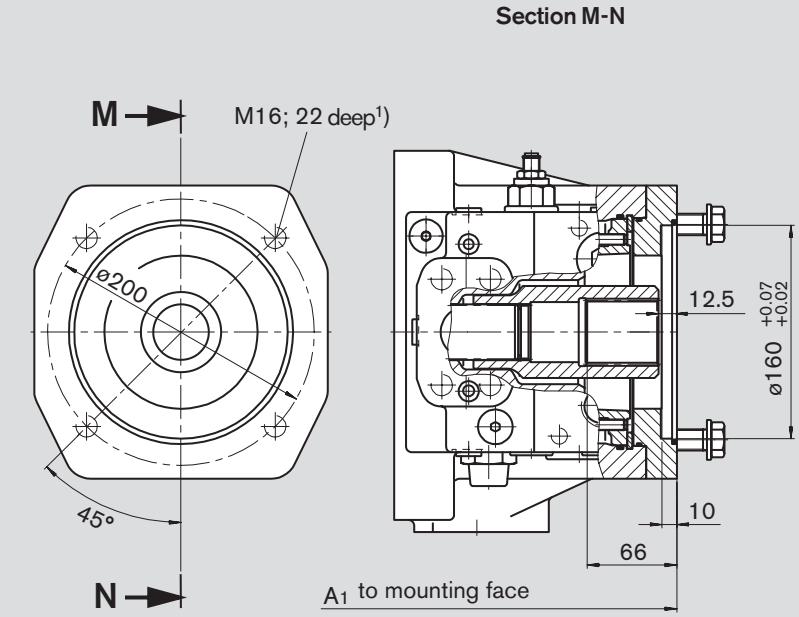


Size	A_1	A_2	A_3	A_4	A_5
500	552	ø115	3.4	41	95
750	619	ø115	3.4	45	116.6

F/K 34 **Flange** ISO 3019-2 160 4-hole

Shaft coupler for shaft to DIN 5480 N 50x2x30x24x8H
for mounting of A4VSO/H/G (shaft Z, see RE 92 050, 92 110 resp. 92 100)

Size 250 and 355



Size	A_1
250	531
355	538

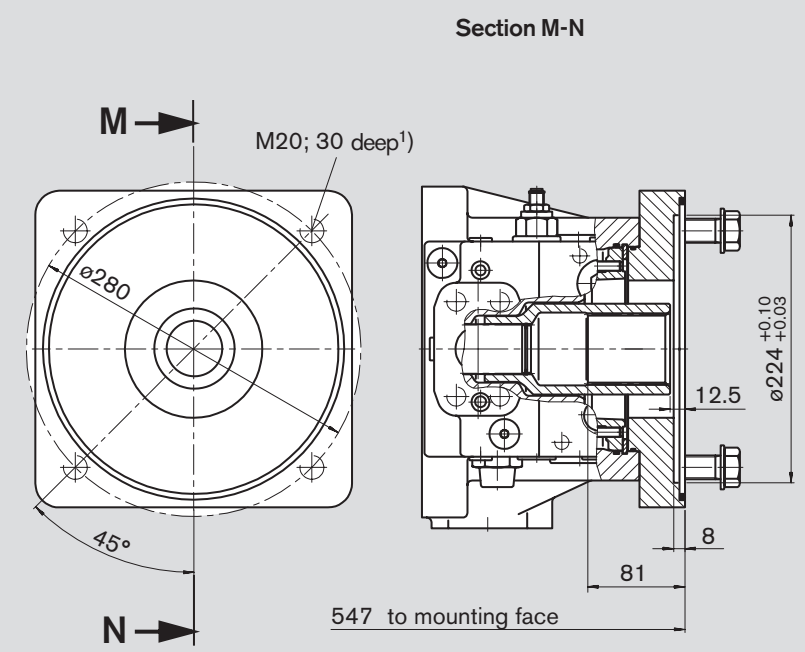
[1]) DIN 13, Tightening torque see safety instructions

Dimensions through drive F/K35 and F/K77

F/K35 **Flange** ISO 3019-2 224 4-hole

Shaft coupler for shaft to DIN 5480 N 60x2x30x28x8H
for mounting of A4CSG 250 or an A4VSO/H/G 250 (shaft Z, see RE 92 050, 92 110 resp. 92 100)

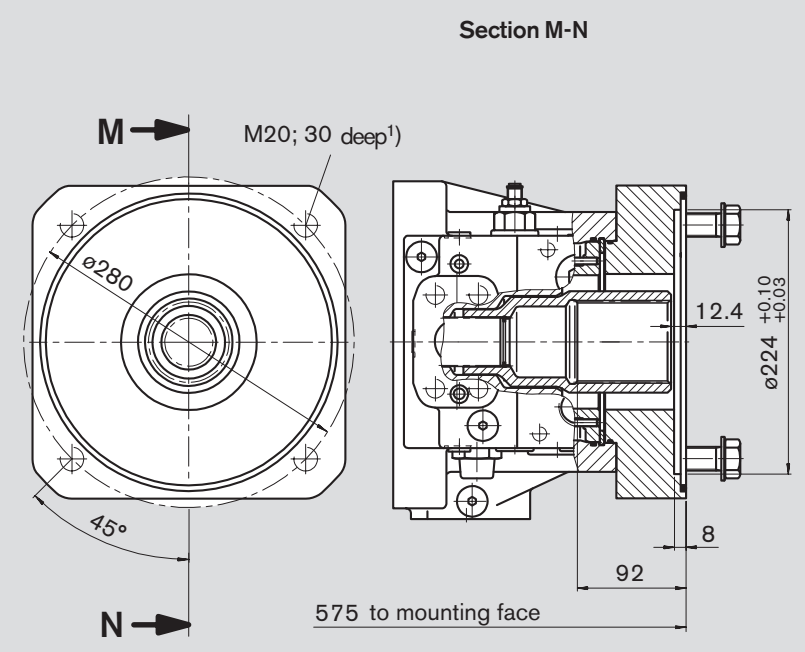
Size 250



F/K77 **Flange** ISO 3019-2 224 4-hole

Shaft coupler for shaft to DIN 5480 N 70x3x30x22x8H
for mounting of A4CSG 355 or an A4VSO/G 355 (shaft Z see RE 92 050 resp. 92 100)

Size 355



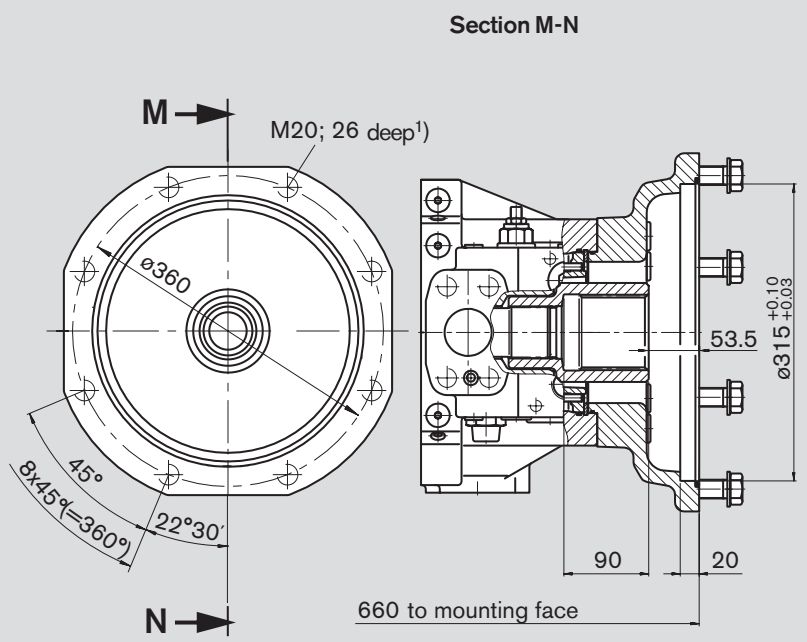
[1]) DIN 13, tightening torque see safety instructions

Dimensions through drive F/K43 and F/K01

F/K43 **Flange** ISO 3019-2 315 8-hole

Shaft coupler for shaft to DIN 5480 N 80x3x30x25x8H
for mounting of A4CSG 500 or an A4VSO/G 500 (shaft Z, see RE 92 050 resp. 92 100)

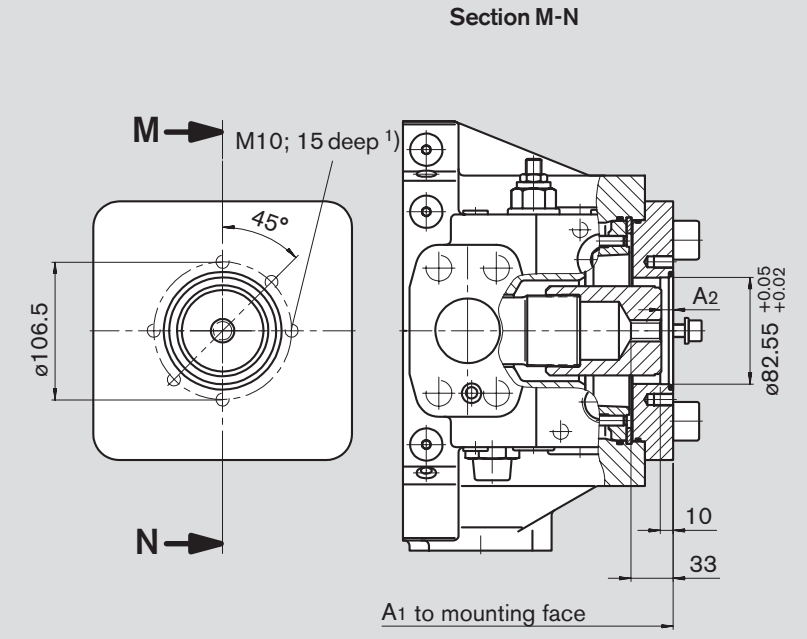
Size 500



F/K01 **Flange** SAE J744 – 82-2 (SAE A-2-hole)

Shaft coupler for shaft to SAE J744 16-4 (A) 5/8in 9T 16/32 DP [2])
for mounting of AZPF or PGF2 (shaft J, flange U2, see RE10 213)

Size 250, 355 and 500



Size	A_1	A_2
250	531	10,5
355	538	10,5
500	574	9,3

[1]) DIN 13, tightening torque see safety instructions

[2]) 30° pressure angle, flat root, side fit, class 5

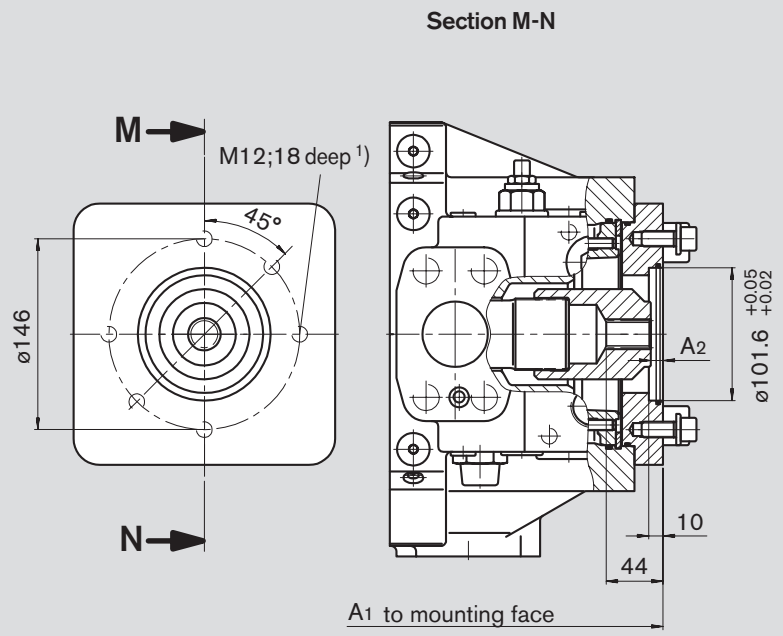
Dimensions through drive F/K02 and F/K68

F/K02

Flange SAE J744 – 101-2 (SAE B-2-hole)

Shaft coupler for shaft to SAE J 744 22-4 (B) 7/8in 13T 16/32 DP [2])
for mounting of AZPN/G

Size 250 and 500



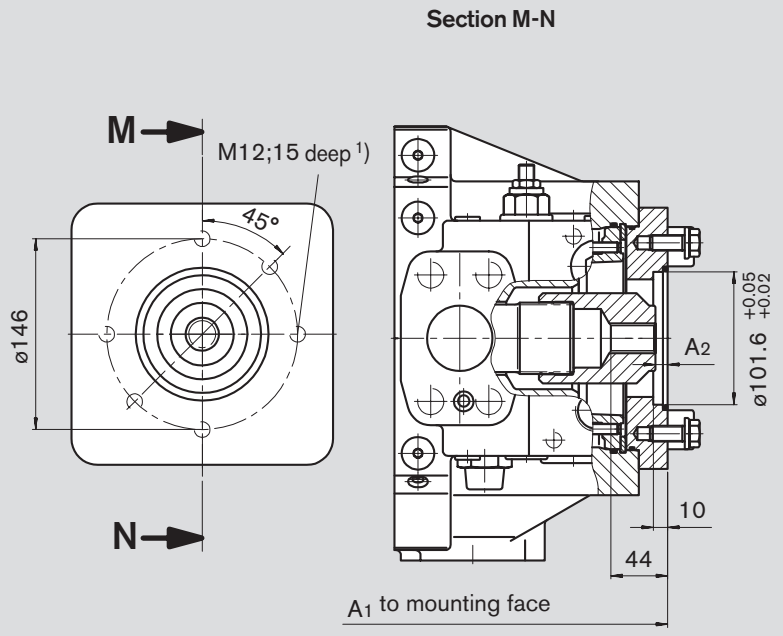
Size	A_1	A_2
250	531	10,3
500	574	9,3

F/K68

Flange SAE J744 – 101-2 (SAE B-2-hole)

Shaft coupler for shaft to SAE J 744 22-4 (B) 7/8in 13T 16/32 DP [2])
for mounting of A10VO 28 (shaft S, see RE 92 701) or internal gear pump PGF3 (shaft J, flange U2, see RE 10 213)

Size 250, 355 and 500



Size	A_1	A_2
250	531	10,3
355	538	10,3
500	574	9,3

[1]) DIN 13, tightening torque see safety instructions

[2]) 30° pressure angle, flat root, side fit, class 5

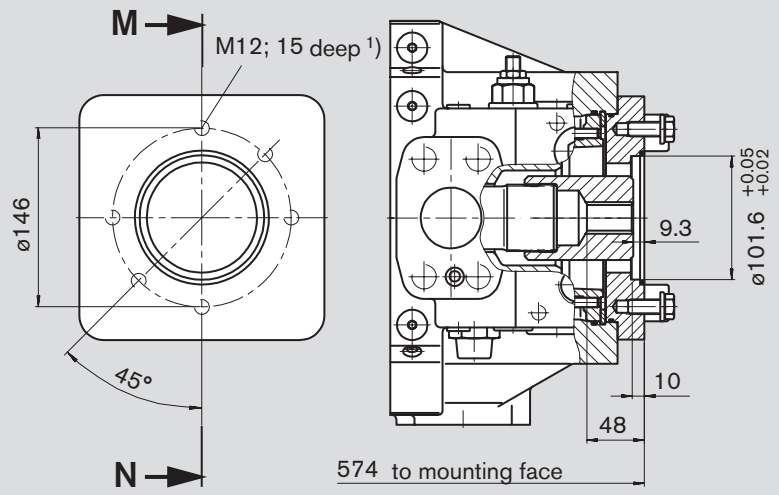
Dimensions through drive F/K04 and F/K07

F/K04 **Flange** SAE J744 – 101-2 (SAE B-2-hole)

Shaft coupler for shaft to SAE J 744 25-4 (C) 1 in 15T 16/32 DP [2])
for mounting of A10VO 45 (shaft S, see RE 92 701) or of an internal gear pump PGH4 (shaft R, flange U2, see RE 10 223)

Size NG 500

Section M-N

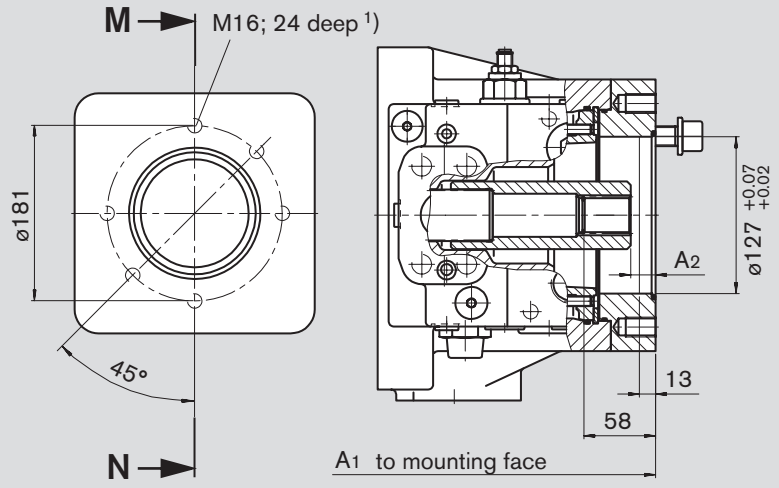


F/K07 **Flange** SAE J744 – 127-2 (SAE C-2-hole)

Shaft coupler for shaft to SAE J 744 32-4 (C) 1 1/4in 14T 12/24 DP [2])
for mounting of A10VO 71 (shaft S, see RE 92 701)

Size 250, 355 and 500

Section M-N



Size	A_1	A_2
250	545	19,9
355	552	19,9
500	588	10,3

[1]) DIN 13, tightening torque see safety instructions

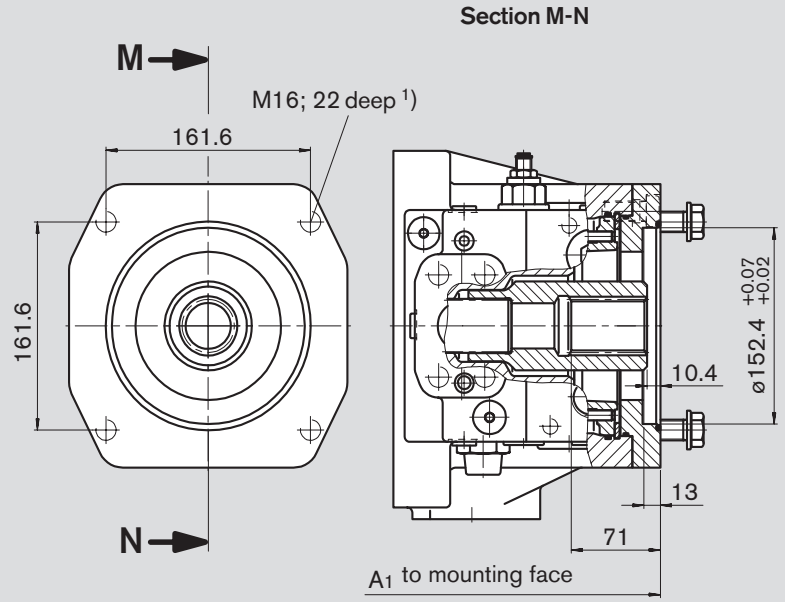
[2]) 30° pressure angle, flat root, side fit, class 5.

Dimensions through drive F/K17

F/K17 **Flange** SAE J744 – 152-4 (SAE D-4-hole)

Shaft coupler for shaft to SAE J 744 – 44-4 (D) 1 3/4in 13T 8/16 DP [2])
for mounting of A10VO 140 (shaft S, see RE 92 701)

Size 250, 355 and 500



Size	A_1
250	531
355	538
500	600

1) DIN 13, tightening torque see safety instructions

2) 30° pressure angle, flat root, side fit, class 5

Types of filtration

Version N - without filter in boost circuit

The ports E_1 and E_2 are closed with a pressure tight cover and internally connected (see circuit drawing page 26).

If needed, a boost line filter can still be mounted later on at these ports.

In this case, the internal connection between E_1 and E_2 must be plugged (please consult us).

Version M - with built on filter in the boost circuit

In this case a filter is factory mounted into the boostpump pressure line.

Filter version: with bypass and electrical-optical dirt indicator

Filtermodel for pump sizes 250...500:

DFBN/HC330QE10D1.X/V-L24

For further information see pages 28 and 29.

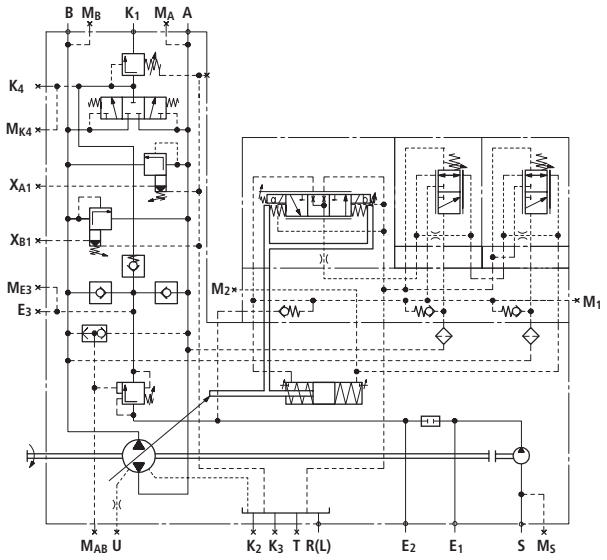
Version D - Threaded ports for external mounting of filter in boost pump outlet

Ports E_1 and E_2 are provided to mount a filter externally .

These ports are open, and only temporarily closed with plastic plugs for transport.

The internal passage between E_1 and E_2 is plugged.

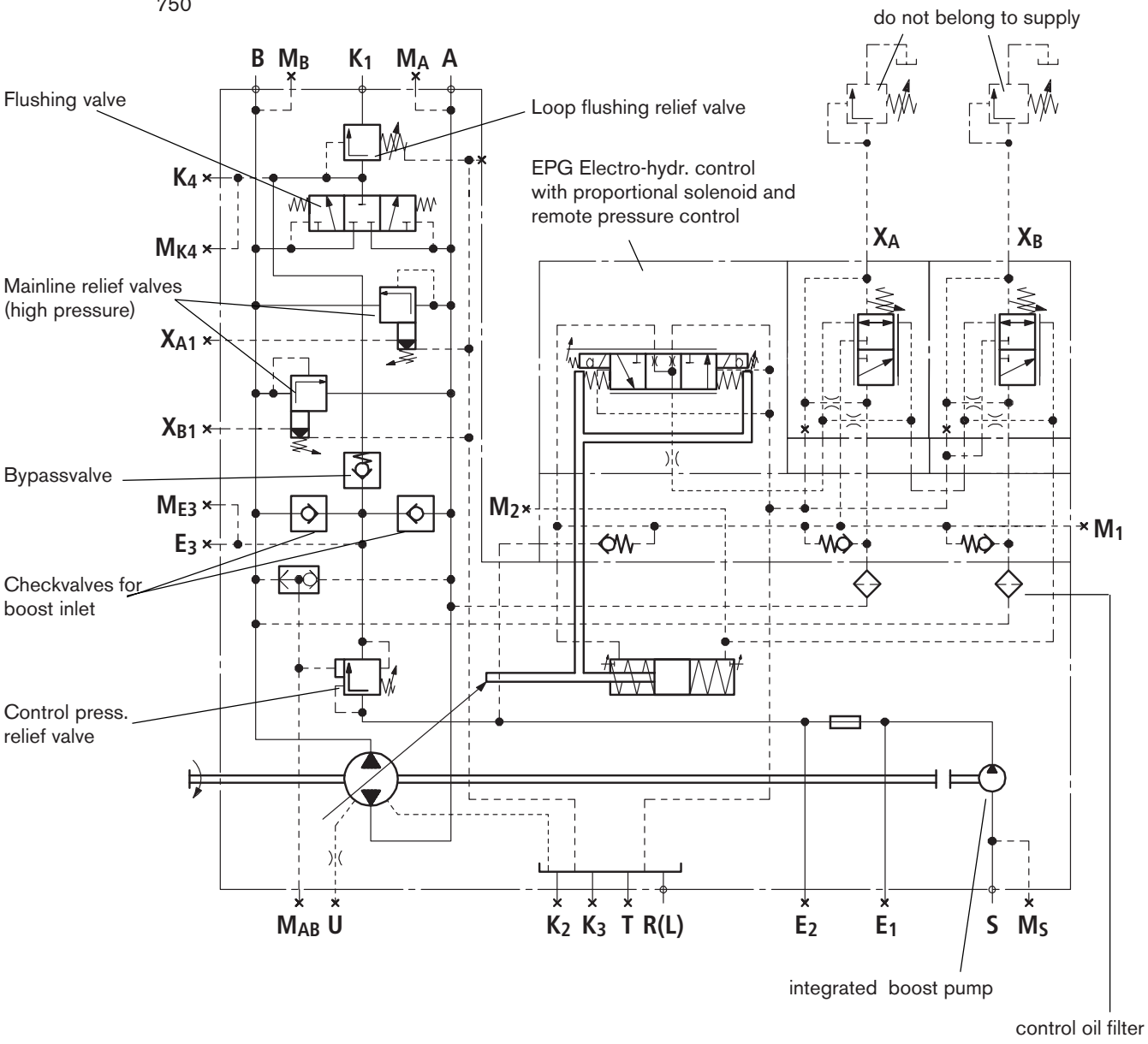
Circuit drawing version D (example size 500/750)



Integrated boost pump and control valves (Version F..)

Circuit drawing

Example A4CSG$^{500}_{750}$ EPG/30R-XXB35**F**994N



Circuit drawing NG 500/750 with EPD-control and filter see page 29; without integrated boostpump see page 30.

Ports

A, B	Pressure ports	
S	Inlet port	
M_A,M_B,M_{AB}	Test points pressure port	(closed)
M_S	Test point inlet port	(closed)
T	Oil drain	(closed)
E1	To filter	(closed)
E2	From filter	(closed)
K_1	Flushing port	
K_2, K_3	Flushing port	(closed)
R(L)	Oil fill + air bleed	
U	Bearing flushing port	(closed)
E_3	External boost flow port	(closed)
M_{E3}	Test point boost pressure	(closed)
K_4	Accumulator port	(closed)
M_{K4}	Test point loop flushing pressure	(closed)
M_1,M_2	Test point control pressure	(closed)
X_{A1}	Pilot port relief valve in A	(closed)
X_{B1}	Pilot port relief valve in B	(closed)
X_A, X_B	Pilot port for remote pressure control	

Integrated boost pump and -control valves (Version F..)

High press. mainline reliefs (crossover relief valves)

The 2 pilot operated crossover reliefs have pilot ports for remote control.

The valves limit the max. pressure spikes to an acceptable safe level, and prevent damage to the main pump.

Each pressure side has its own relief valve, which is vented to the low pressure side of the loop.

The valves can be hooked up to pilot reliefs for remote setting of pressure at ports XA1, XB1.

The valves are normally set to a pressure level of 350 bar.

If another setting is required, please state that in clear text.

Flushing pressure relief valve

direct operated

Adjustment range Δp_{Sp} 10...20 bar

Standard setting: 16 bar absolute

Integrated boost pump

Standard sizes

Size	250	355	500	750
cm^3	63	80	98	143

Control pressure filter

Controls HD and EP in the size 500 and 750 with internal supply of control pressure out of one of the high pressure sides have always a 0,2 mm filter insert for coarse particles (regardless of the model code for filtration).

Control pressure relief valve (for EP and HD)

Direct operated, piloted open by circuit operating pressure.

Adjustment range Δp_{St} 10 - 20 bar

Standard setting: $\Delta p_{Sp} + \Delta p_{St} = 32$ bar

At low operating pressure (i.e. main pump in center position) the auxiliary pump pressure is limited to 32 bar. This pressure level is required to make sure that the pump will stroke when using an HD or EP control. This feature eliminates the use of another pump for control pressure.

As soon as the pressure level in one of the circuit pressure sides exceeds the 32 bar, the control pressure is taken from this source via the check valves.At the same time, the relief valve is piloted open.

This brings the boost pump pressure to the level set at the flushing relief valve, i.e. 16 bar.

This function enables saving of energy, and improves the overall efficiency of the system.

With the controls EO1 and HM1 the necessary control enrgy can always be taken out of the boost circuit (Port M_{E3}).

Recommended setting: 25 bar

With all other control options, the control pressure relief valve is not mounted, and the valve cavity is plugged.

Subplate mounted filter in boost circuit (Version M..)

The filter is mounted in the auxiliary pump's pressure line directly onto the pump

Filter model DFBN/HC330QE10D1.X/V–L24

Filter with bypass and electrical-optical dirt indicator.

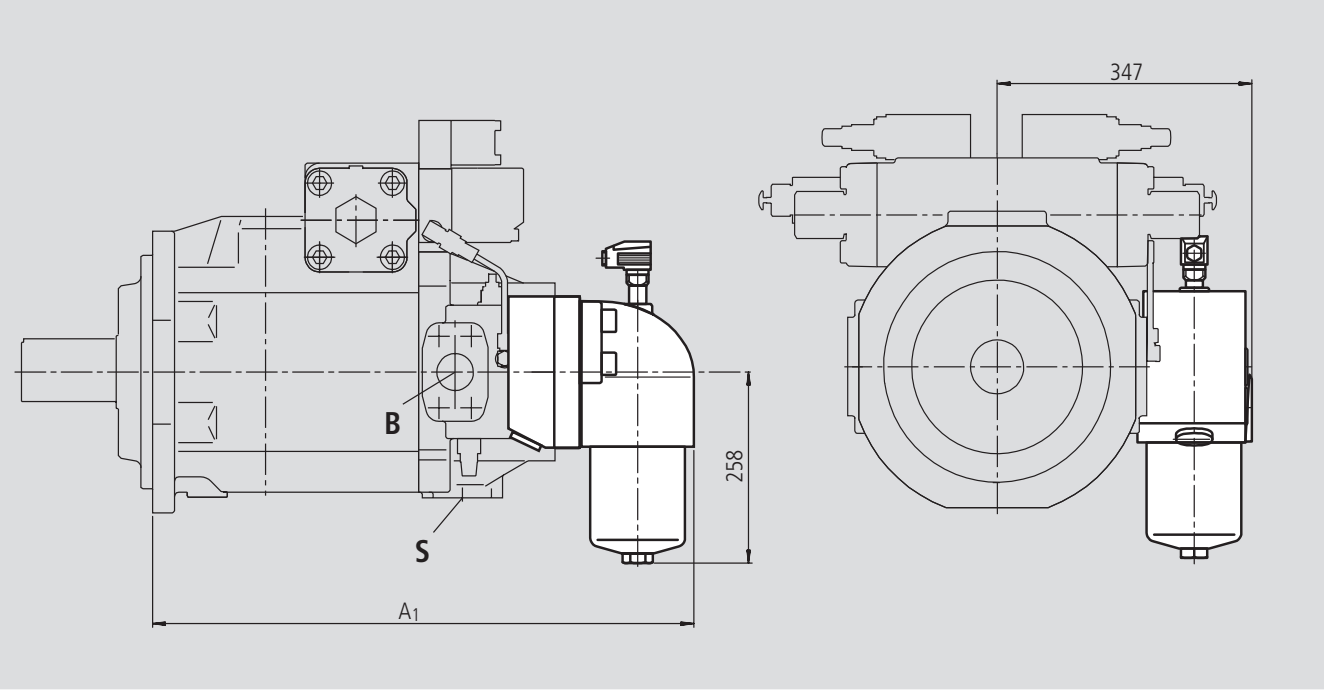
Pickup pressure of dirt indicator

$\Delta p_a = 5$ bar $^{-0,5 \text{ bar}}$

Opening pressure of bypass valve

$\Delta p_{ö} = 6$ bar $^{+0,6 \text{ bar}}$

Dimensions size 250...500

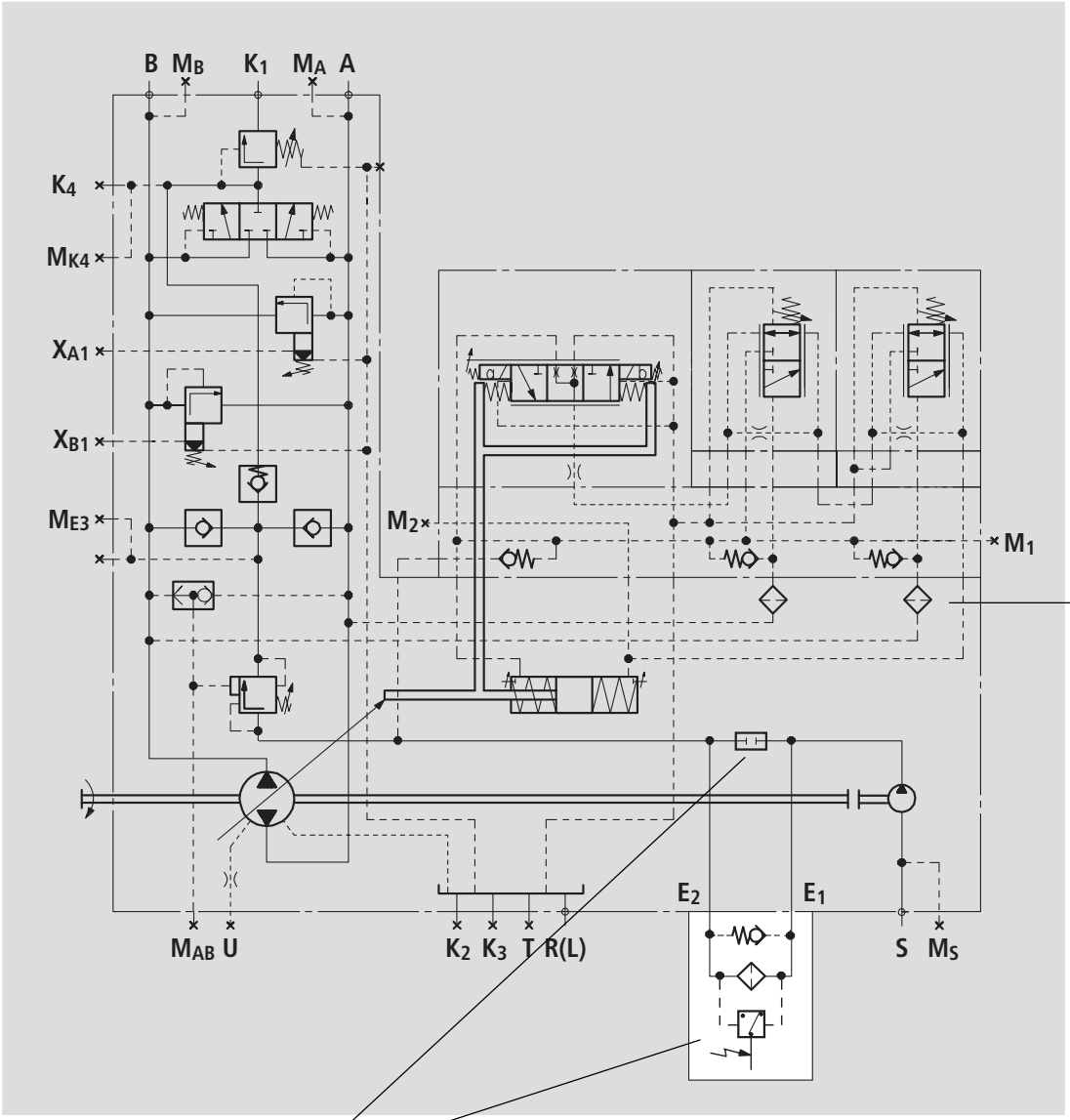


Size	A1
250	699,5
355	706,5
500	742,5

Subplate mounted filter in boost circuit (Version M..)

Circuit diagram

Example A4CSG$^{500}_{750}$ EPD/30R-XXH35F994**M**



Mounting of filter onto size 250...500
DFBN/HC330QE10D1.X/V-L24
with electrical-optical dirt indicator
internal connection between E_1 and E_2 plugged
model code M

Control oil filter
Controls HD and EP in the size 500 and 750 with internal supply of control pressure out of one of the high pressure sides have always a 0,2 mm filter insert for coarse particles (regardless of the model code for filtration).

Ports

A, B	Pressure port	
S	Inlet port	
M_A,M_B,M_{AB}	Test points pressure port	(closed)
M_S	Test point inlet pressure	(closed)
T	Oil drain	(closed)
K_1	Flushing port	
K_2, K_3	Flushing port	(closed)
R(L)	Oil fill + air bleed	

U	Bearing flushing port	(closed)
M_{E3}	Test point boost pressure	(closed)
K_4	Accumulator port	(closed)
M_{K4}	Test point loop flushing pressure	(closed)
M_1,M_2	Test point control pressure	(closed)
X_{A1}	Pilot port relief valve in A	(closed)
X_{B1}	Pilot port relief valve in B	(closed)

External supply of boost flow - without integrated boostpump (Version K..)

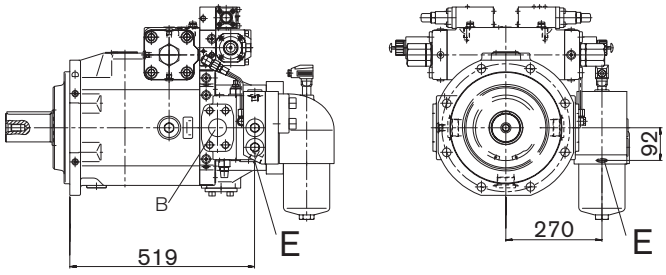
This variation is used without the integrated boost pump.

Port E* is used for the connection of the external boost.

In order to guarantee a reliable function it is necessary to maintain a boost flow with a cleanliness class as described on page 4

*** resp. E_2 for version K...N/D without filter**

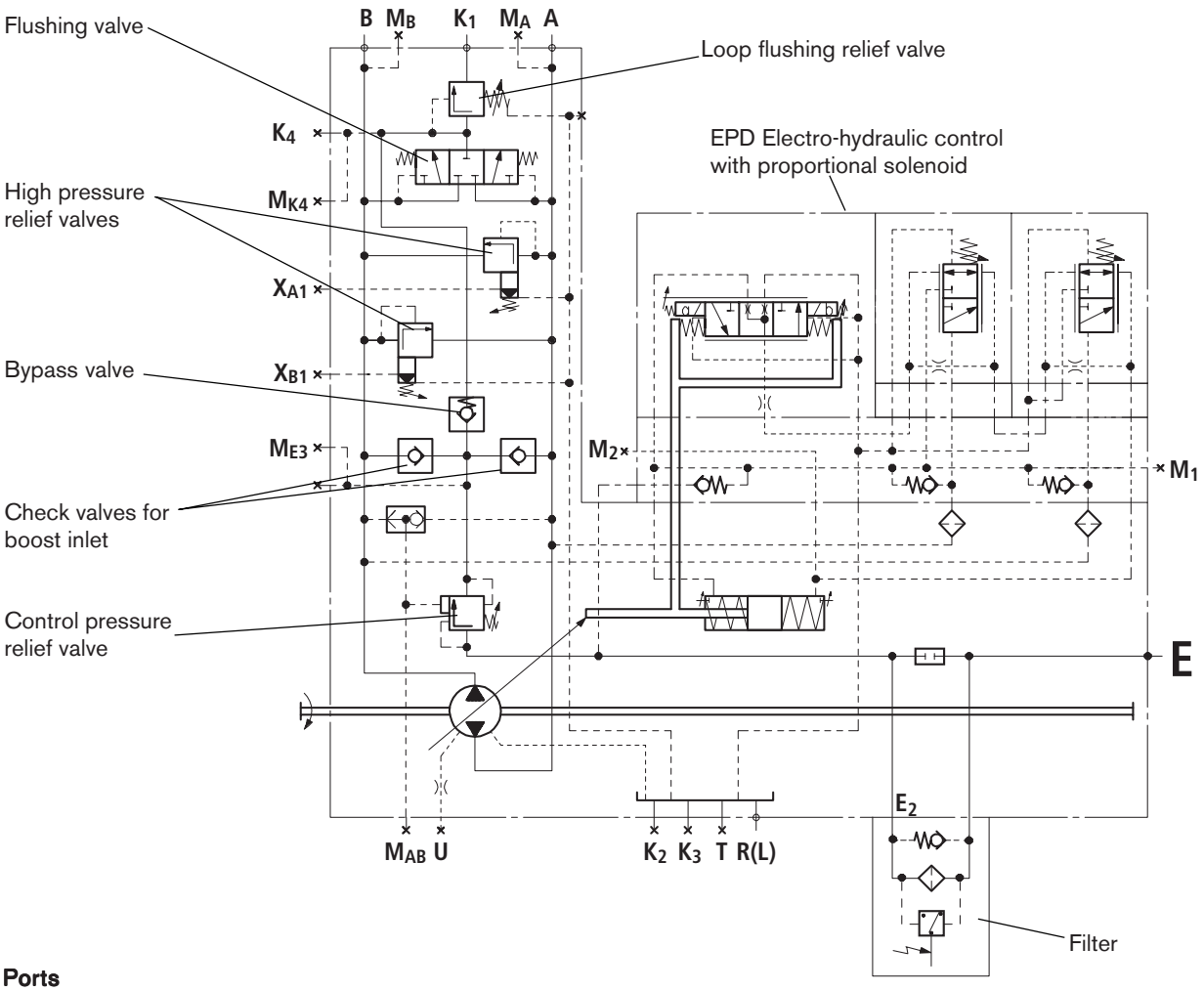
Size 500



Position of port E_2 see page 14

Circuit diagram

Example A4CSG $\frac{500}{750}$ EPD/30R-XXB35**K**174M



Ports

E resp. E_2	**Boost inlet** DIN 3852 M33x2; 18 deep 540 Nm max. tightening torque	R(L)	Oil fill + air bleed
E_2	Boost inlet for version without filter	U	Port for bearing flushing
A, B	Pressure port	K_4	Accumulator port
M_A,M_B,M_{AB}	Test points pressure ports	M_{E3}	Test point for boost pressure
T	Oil drain	M_{K4}	Test point loop flushing pressure
K_1	Flushing port	M_1,M_2	Test point control pressure
K_2, K_3	Flushing port	X_{A1}	Pilot port relief valve in A
		X_{B1}	Pilot port relief valve in B

Installation and commissioning instructions

During commissioning and during operation the pump housing must be filled with oil. The commissioning must be carried out with low speeds, and without load, until the system is completely deairated

During prolonged periods of standstill the housing can loose its oil via the service lines. At renewed start up, the pump housing must be refilled.

The inlet pressure at the suction port S may not fall below 0,8 bar absolute

Mounting position:

Optional.

In order to achieve a low noise level, all hydraulic lines (suction, pressure, and drain lines)should be connected via flexible members to the reservoir

A check valve in the pump drain line should be avoided. If desirable, please contact us.

1. Vertical installation

With vertical installation and the shaft pointing upwards (fig. 1 and 2) bearing flushing is necessary, in order to provide lubrication for the front bearing and the shaft seal, see page 7.

1.1 Mounting below the reservoir - flooded suction

Prior to mounting fill pump housing (pump in horizontal position). Connect port T to reservoir , R/L closed.

Option for filling in installed condition with shaft pointing upwards: fill through port R and bleed via port T, afterwards close port R.

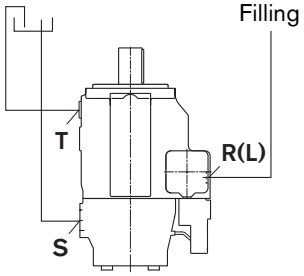


Fig. 1

1.2 Mounting above reservoir - tanktop mounted

Prior to mounting fill pump housing(pump in horizontal position. Connect port T to reservoir, R/L closed.
Option for filling in installed condition with shaft pointing upwards: fill through R/L and bleed viaT, afterwards close R(L) .

Important: Suction(inlet) pressure at port S may never fall below 0,8 bar absolute

Avoid mounting above reservoir if low noise levels are important.

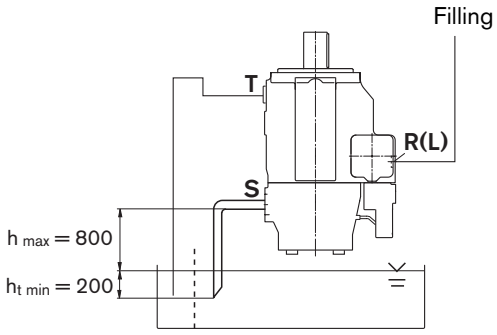


Fig. 2

2. Horizontal mounting

The highest of the ports T, K1, K2 , K3 resp.R/L must be used to fill/bleed the pump and afterwards be piped as case drain.

Prior to start up fill the pump housing.

2.1 Mounting below the reservoir - flooded suction

Case drain and inlet port S to be piped acc. to fig. 3 or4.

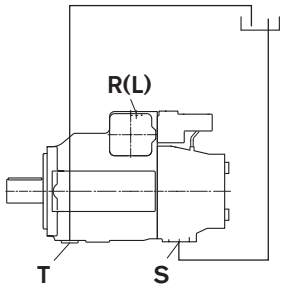


Fig. 3

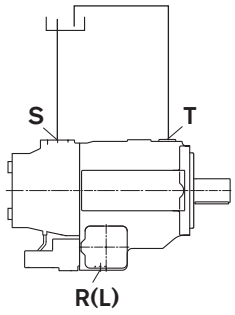


Fig. 4

2.2Mounting above reservoir - tanktop mounted

Case drain and inlet port S to be piped acc. to fig. 5 .

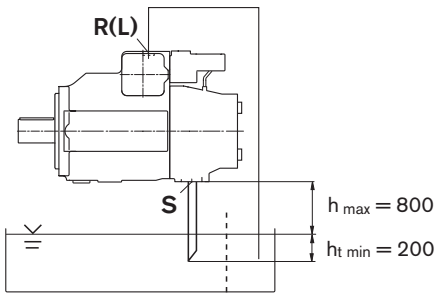


Fig. 5

Safety instructions

- The pump A4CSG was designed for operation in closed circuits.
- Systems design, installation and commissioning requires trained technicians or tradesmen.
- All hydraulic ports can only be used for the fastening of hydraulic service lines .
- Tightening torques: please comply with the manufacturer's information regarding the max. permissible tightening torques for the used fittings.
  For fastening screws to DIN 13 we recommend to check the permissible tightening torques in each individual case acc. to VDI 2230 dated 2003.
- During and shortly after operation of a pump the housing and especially a solenoid can be extremely hot, avoid being burned!

Bosch Rexroth AG
Mobile Hydraulics
Product Segment Axial Piston Units
Plant Horb
An den Kelterwiesen 14
72160 Horb, Germany
Telefon +49 (0) 74 51 92-0
Telefax +49 (0) 74 51 82 21
info.brm-ak@boschrexroth.de
www.boschrexroth.com