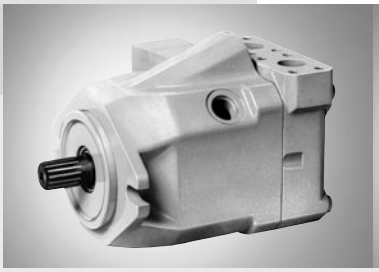
Rexroth
Bosch Group

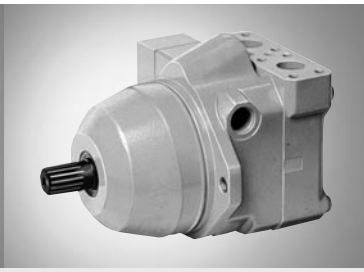
Dual displacement motor A10VM
Plug-in version A10VE

RE 91 703/06.04 1/20
Replaces: 09.99

Technical data sheet



A10VM



A10VE

Size 28...63
Series 5
Nom.pressure 280 bar
Peak pressure 350 bar
open and closed circuit

Contents

Features

- Dual displacement motor, axial piston swashplate design, for hydrostatic transmissions in open and closed circuits
- Output speed directly proportional to inlet flow and inversely proportional to motor displacement
- Output torque increases proportional to the pressure difference between high and low pressure sides and increasing displacement
- Heavy duty bearings for long service life
- High permissible output speed
- Well proven A10 rotary unit technology
- High power/weight ratio – compact size
- cost effective
- low noise
- Control range 1 : 3,75
- External direct control supply possible
- Minimum displacement can be set externally
- SAE 2-bolt mounting flange on A10VM
- Special 2-bolt mounting flange on A10VE

Ordering code - standard program

A10V	M			/	5	2	W		-	V					

Fluids

Mineral oil (without prefix)

Axial piston unit

Swash plate design, variable, nom. press. 280 bar, peak press. 350 bar	**A10V**

Operating mode

Motor	**M**

Size

Displacement V_g in cm³	**28**	**45**	**63**

Control devices

Two-point direct control, external control supply, without pilot valve	DG			●	●	○	**DG**
Two-point control, hydraulically operated	HZ			●	●	●	**HZ**
	HZ		6	●	●	●	**HZ6**
Two-point control ,electrically operated, with solenoid valve, with stroking time orifice — Control voltage 12V	EZ	1		●	●	●	**EZ1**
	EZ		6	●	●	●	**EZ6**
Two-point control ,electrically operated, with solenoid valve, with stroking time orifice — Control voltage 24V	EZ	2		●	●	●	**EZ2**
	EZ		7	●	●	●	**EZ7**

Series

	5

Design index

	2

Direction of rotation

bi-directional	**W**

Min. displacement		**28**	**45**	**63**	
$V_{g\,min}$ (in cm³) infinitely variable	from	8	12	16	**1**
	to	28	25	38	
	from	–	26	40	**2**
Adjustment, please state in clear text	to	–	45	62	

Seal

FKM fluororubber	**V**

Shaft end

SAE splined (for details see unit dimensions)	●	●	●		**R**
SAE splined (for details see unit dimensions)	–	●	●		**W**

Mounting flange

SAE 2-hole	●	●	●		**C**

Ports for service lines

A/B at side-same side; SAE flange,metric fixing screws	●	●	●		**10N00**
A/B at side-same side; metric threaded ports	○	○	●		**16N00**
A/B at rear, SAE flange; metric fixing screws	○	●	○		**11N00**

Valves

without valves	●	●	●		**0**
integrated flushing valve, only with side ports (10N00 und 16N00)	●	●	●		**7**

Speed pickup

without speed pickup (no code)	●	●	●		**-**
prepared for speed pickup(IDR 18/20-L250)	●	●	●		**D**

– = nicht lieferbar ○ = in Vorbereitung ● = lieferbar

Ordering code - standard program

A10V	E			/	5	2	W		-	V					

Fluids

Mineral oil (without prefix)	

Axial piston unit

Swash plate design, variable, nom. press. 280 bar, peak press. 350 bar	**A10V**

Operating mode

Plug-in motor	**E**

Size

Displacement V_g in cm³	**28**	**45**	**63**

Control devices

Two-point direct control, external control supply, without pilot valve	DG			●	●	○	**DG**
Two-point control, hydraulically operated	HZ			●	●	●	**HZ**
	HZ		6	●	●	●	**HZ6**
Two-point control, electrically operated, with solenoid valve; Control voltage 12V	EZ	1		●	●	●	**EZ1**
	EZ		6	●	●	●	**EZ6**
Two-point control, electrically operated, with solenoid valve; Control voltage 24V	EZ	2		●	●	●	**EZ2**
	EZ		7	●	●	●	**EZ7**
with stroking time orifice							

Series

	5

Design index

	2

Direction of rotation

bi-directional	**W**

Min. displacement		**28**	**45**	**63**	
$V_{g\,min}$ (in cm³) infinitely adjustable	from	10	12	16	**1**
	to	28	25	38	
	from	–	26	40	**2**
Adjustment, please state in clear text	to	–	45	62	

Seal

FKM fluororubber	**V**

Shaft end

SAE splined (for details see unit dimensions)	●	●	●	**R**
SAE splined (for details see unit dimensions)	–	●	●	**W**

Mounting flange

Special 2-hole	●	●	●	**F**

Ports for service lines

A/B side-same side; SAE flange, metric fixing screws	●	●	●	**10N00**
A/B side-same side; metric threaded ports	○	○	●	**16N00**
A/B at rear, SAE flange; metric fixing screws	○	●	○	**11N00**

Valves

without valves	●	●	●	**0**
integrated flushing valve, only with side ports (10N00 und 16N00)	●	●	●	**7**

Speed pickup

without speed pickup (no code)	●	●	●	**-**
prepared for speed pickup (IDR 18/20-L250)	○	●	○	**D**

– = not available ○ = in preparation ● = available

Technical data

Fluid

Prior to project design please see our data sheets RE 90220 (mineral oil) and RE 90221 (ecologically acceptable fluids) for detailed information on fluids and application conditions. When operating on ecologically acceptable fluids, limitations to the technical data may be necessary. Please contact us and state the fluid used in clear text when ordering.

Operating viscosity range

For optimum efficiency and service life we recommend an operating viscosity (at operating temperature) in the range

ν_{opt} = opt. operating viscosity 16...36 mm²/s

referred to circuit temperature (closed circuit) or tank temperature (open circuit).

Limits of viscosity range

The following limits are valid for extreme operating conditions:

ν_{min} = 5 mm²/s (closed circuit)
ν_{min} = 10 mm²/s (open circuit)

briefly (t ≤ 1 min) at max. perm. temperature of 115 °C.

Please note, that the max fluid temperature of 115 °C is also not exceeded in certain areas (for instance bearing area) . The temperature in the bearing area is approx. 5° C higher than the average fluid temperature.

ν_{max} = 1600 mm²/s
briefly (t ≤ 1 min)
on cold start (t_{min} = –40 °C, p ≤ 30 bar, n ≤ 1000 min⁻¹).

At temperatures between –25 °C and –40 °C special measures may be required for certain installation positions. Please consult us for further information.

For detailed information on operation at very low temperatures see RE 90300-03-B.

Notes on the selection of the hydraulic fluid

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

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

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

Important: The leakage oil (case drain oil) temperature is influenced by pressure and motor speed and is always higher than the circuit or tank temperature.However, at no point in the circuit may the temperature exceed 115° C.

If it is not possible to comply with the above conditions because of extreme operating parameters or high ambient temperatures please consult us.

Filtration of fluid

The finer the filtration the better the achieved cleanliness of the pressure 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 to ISO 4406 is necessary.

At very high fluid temperatures (90 °C to max. 115 °C) the minimum cleanliness has to be at least

19/17/14 to ISO 4406 .

If the above cleanliness classes cannot be met please consult us.

Operating pressure range

Pressure at port A or B

(Pressure data to DIN 24312)

Nominal pressure p_N _____ 280 bar

Peak pressure p_{max} _____ 350 bar

With motors connected in series please consult us.

Case drain pressure

Max. permissible pressure at leakage port L

$p_{abs\ max}$ operation as motor in open circuit _____ 4 bar abs
$p_{abs\ max}$ operation as motor in closed circuit _____ 4 bar abs
$p_{abs\ max}$ operation as pump/motor in open circuit ___ 2 bar abs

Direction of rotation

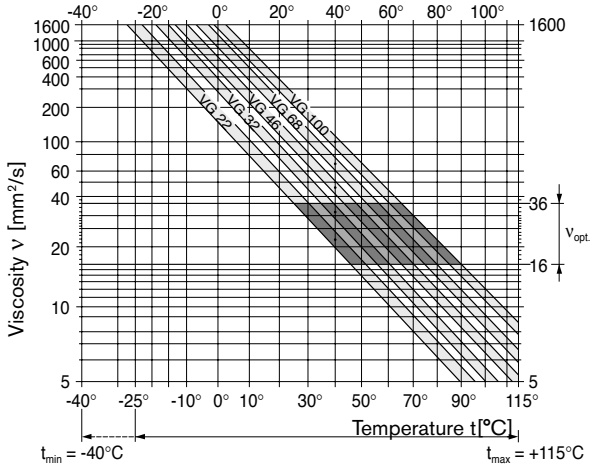
Flow through motor from B to A = clockwise
Flow through motor from A to B = counter clockwise

Adjustment of displacement

The min. displacement is steplessly adjustable within the range of the screw lengths 1 or 2 (see ordering code page 2 or 3).

Please state min. displacement in clear text when ordering.

Selection diagram



Fluid temperature range

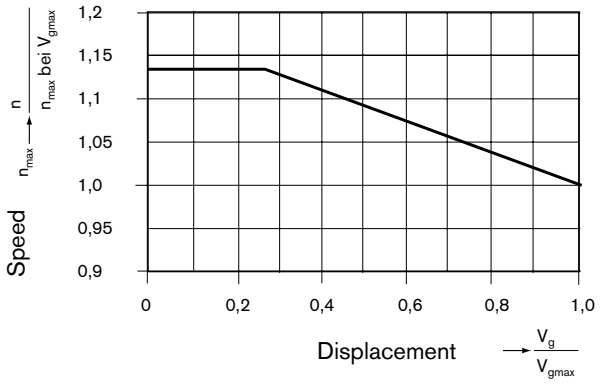
Technical data

Table of values (Theoretical values, without considering η_{mh} and η_v; values rounded)

Size					28	45	63
Motor displacement			$V_{g\,max}$ $V_{g\,min}$	cm^3 cm^3	28 8(VM)/10(VE)	45 12	62 16
Speed maximum[1] at Speed minimum	$V_{g\,max}$ $V_{g\,min}$		$n_{max\,cont.}$ n_{max} n_{min}	rpm rpm rpm	4700 5300 250	4000 4600 250	3300 3800 250
Inlet flow	at $n_{max\,cont.}$ and $V_{g\,max}$		$q_{v\,max}$	L/min	131,6	180	205
Power	at $n_{max\,cont.}$ and $V_{g\,max}$	$\Delta p = 280$ bar	P_{max}	kW	61	84	95
Torque constant at	$V_{g\,max}$		T_c	Nm/bar	0,445	0,716	0,986
Torque	at $V_{g\,max}$	$\Delta p = 280$ bar	T_{max}	Nm	125	200	276
Actual starting torque	at $n = 0$ rpm	$\Delta p = 280$ bar		Nm ca.	92	149	205
Mass moment of inertia	(about output shaft)		J	kgm^2	0,0017	0,0033	0,0056
Angular acceleration	maximum			rad/s^2	5500	4000	3300
Rotational stiffness of	Output shaft	R W		Nm/rad Nm/rad	26000 19800	41000 34400	69400 54000
Filling volume				L	0,6	0,7	0,8
Weight	ca.		m	kg	14	18	26

[1] At max. speed the low pressure side must see at least 18 bar.

Permissible displacement dependent on speed



Calculating size

inlet flow $q_v = \dfrac{Vg \cdot n}{1000 \cdot \eta_v}$ [L/min]

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

or $T = T_K \cdot \Delta p \cdot \eta_{mh}$

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

output speed $n = \dfrac{q_v \cdot 1000 \cdot \eta_v}{V_g}$ [min^{-1}]

V_g = geometric displacement per revolution [cm^3]

Δp = differential pressure [bar]

n = speed [rpm]

η_v = volumetric efficiency

η_{mh} = mechanical-hydraulic efficiency

η_t = total efficiency ($\eta_t = \eta_v \cdot \eta_{mh}$)

Permissible radial and axial force on output shaft

Size					28	45	63
Max. perm. axial force	on output shaft	± Fax	$F_{ax\,max}$	N	1000	1500	2000
Max. perm. radialforce	on output shaft	Fq, X/2, X/2, X	$F_{q\,max}$	N	1200	1500	1700

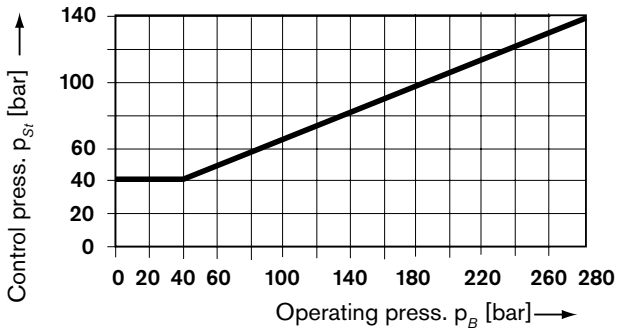
Two-point direct control, DG

Normally the motor is at max. displacement. By applying an external pressure to port G, the control piston is directly pressurized and the motor swivels back to min. displacement

The minimum required control pressure is $p_{St} \geq 40$ bar.

Please note, that this minimum required control pressure depends directly on the operating pressure p_B in port A or B. (Pressure in A or B) see control pressure diagram below. With a control pressure above this minimum required pressure level the motor will destroke properly.

Control pressure diagram



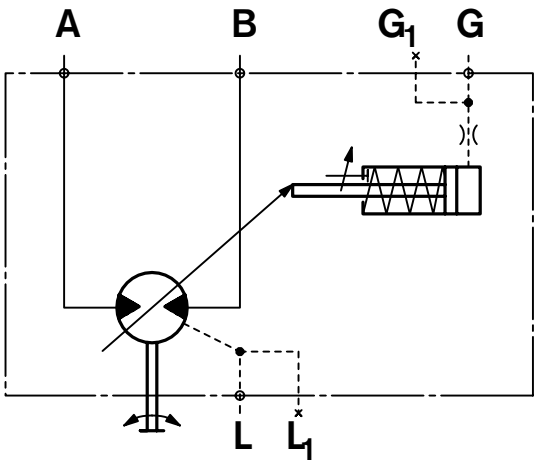
Control press. = 0 bar $\hat{=} V_{g\,max}$

Control press. ≥ 40 bar $\hat{=} V_{g\,min}$ (see control press. diagram)

The max. perm. control pressure is $p_{St} = 280$ bar.

$V_{g\,min}$ - adjustment please state in clear text with order.

Circuit diagram



Ports

A, B	Pressure port
L, L_1	Drain ports
G, G_1	Port for external control pressure

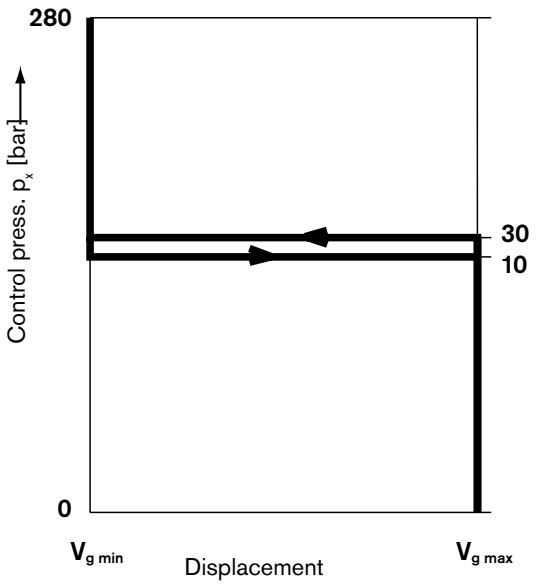
Two-point control, hydraulically operated HZ/HZ6

Normally the motor is at max. displacement. By applying a pilot pressure p_x to port X the pilot valve shifts, and the control piston is pressurized causing the motor to swivel to min. displacement ($p_x \geq 30$bar).

The necessary control pressure is via a shuttle valve taken out of the motor pressure side A or B. A minimum pressure difference of $\Delta p_{A,B} \geq 20$ bar between the motor pressure sides is required.

Only min and max. displacements are possible.

$V_{g\,min}$ - adjustment please state in clear text when ordering.



Control press. $p_x = 0$ bar $\hat{=} V_{g\,max}$

Control press. $p_x \geq 30$ bar $\hat{=} V_{g\,min}$

Techn. data HZ/HZ6	
Control press. min.	30 bar
max.perm.control press.	280 bar

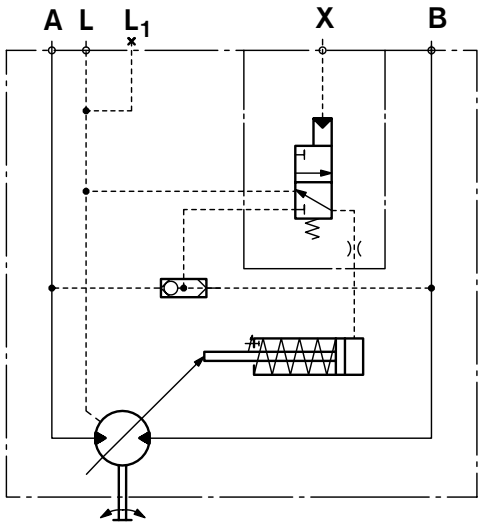
Version HZ6 with stroking time shuttle orifice

Slow down of swivel action by means of shuttle orifice.

This enables a smooth swivel action.

Standard orifice size = 0,21 mm; other sizes on request.

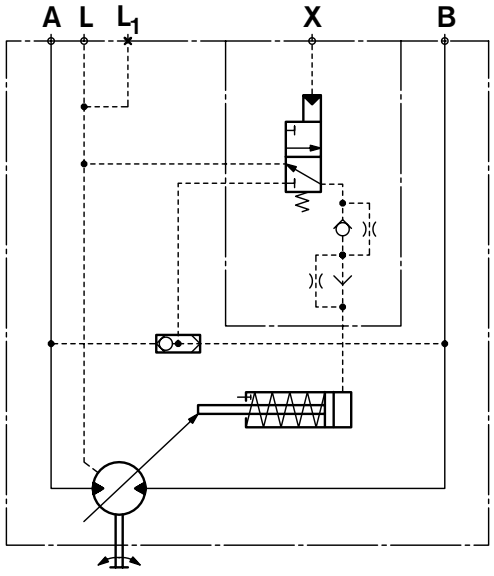
Circuit diagram HZ



Ports

A,B	Pressure port
L, L1	Drain port
X	Pilot press. port

Circuit diagram HZ6



Ports

A,B	Pressure port
L, L1	Drain port
X	Pilot pressure port

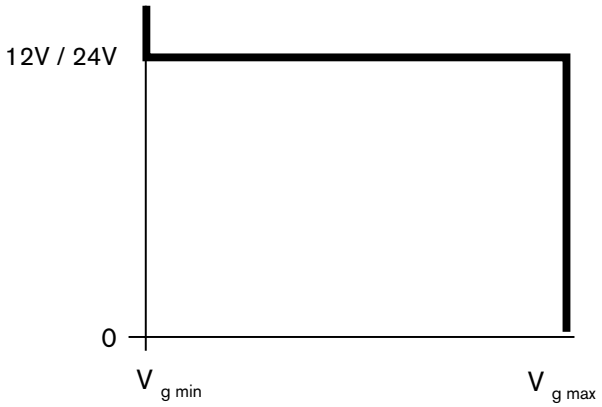
Two-point control, electrically operated EZ

Normally the motor is at max. displacement. By energizing the solenoid of the control valve, the control piston is pressurized, and the motor swivels to min. displacement.

The control pressure is via a shuttle valve taken out of the motor pressure side A or B. A minimum pressure difference of $\Delta p_{A,B} \geq 20$ bar between the motor pressure sides is required.

The motor can only swivel between $V_{g\,max}$ or $V_{g\,min}$.

$V_{g\,min}$-adjustment please state in clear text when ordering.



De-energized ≙ $V_{g\,max}$

Energized ≙ $V_{g\,min}$

Techn. data EZ		
Version	EZ 1/6	EZ 2/7
Supply voltage (DC)	12V	24V
Power consumption	26W	26W
Duty cycle	100%	100%
Protection class	IP 65	IP 65

Features

– with spring return

– Solenoid plug can be turned 4 x 90°

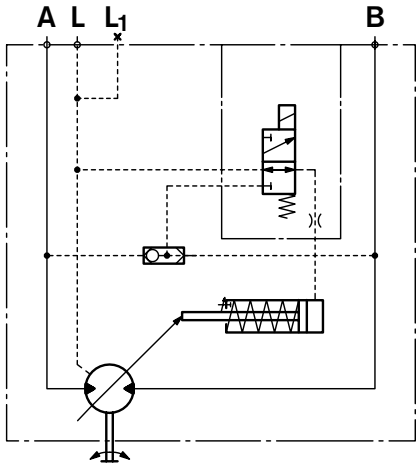
Version EZ6/7 with stroking time shuttle orifice

Slow down of swivel action by means of shuttle orifice.

This enables a smooth swivel action.

Standard orifice size = 0,21 mm; other sizes on request.

Circuit diagram EZ1/2

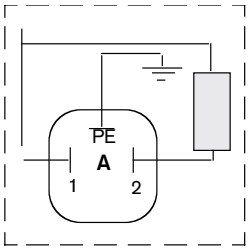


Ports

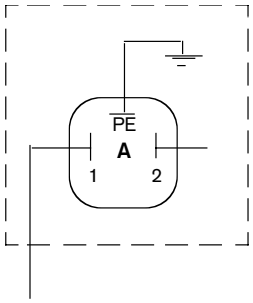
A,B Pressure port

L, L1 Drain port

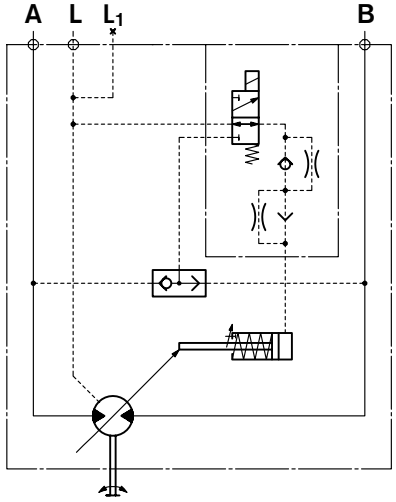
Connection to solenoid



Connection to plug



Circuit diagram EZ6/7



Ports

A,B Pressure port

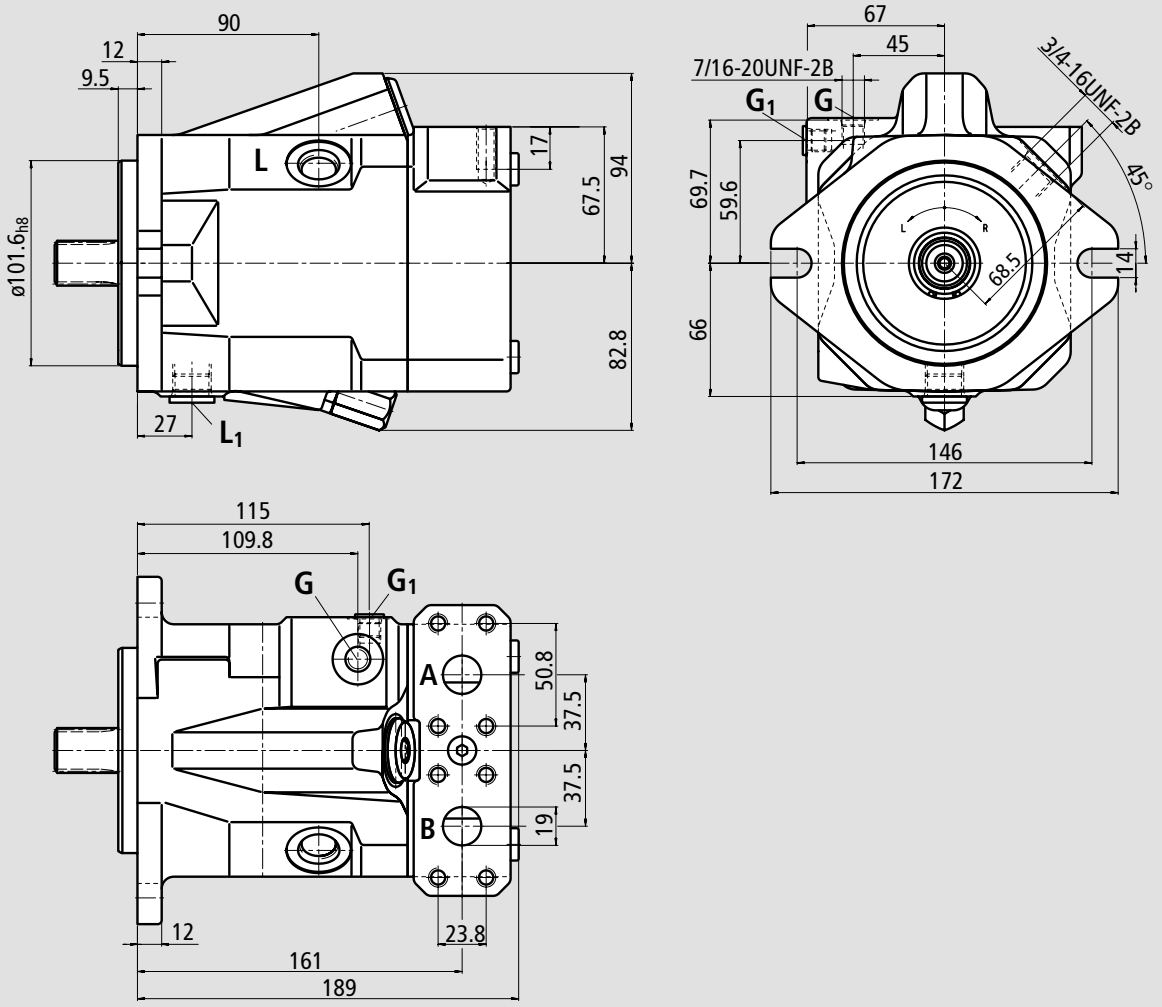
L, L1 Drain port

Unit dimensions A10VM, Size 28

Before finalising your design please request certified installation drawing.

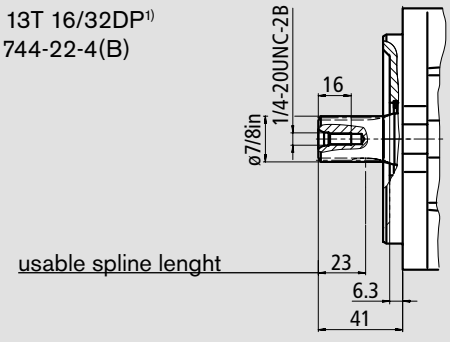
Two-point direct control DG, port plate 10

Flange SAE J744 101-2(B)



Shaft end

R splined, 7/8in 13T 16/32DP[1)]
(similar to SAE J744-22-4(B)



Ports

				Tightening torques max.[2)]	
A, B	Pressure port (high press. series, code 62)	SAEJ518C	3/4in	M10; 17 deep	60 Nm
L, L_1	Drain port (L_1 plugged)	ISO 11926	3/4-16 UNF-2B		160 Nm
G, G_1	Port f. ext. control press. (G_1 plugged)	ISO 11926	7/16-20 UNF-2B		40 Nm

[1)] ANSI B92.1a-1976, 30° pressure angle, flat base, flank centering, fit class 5

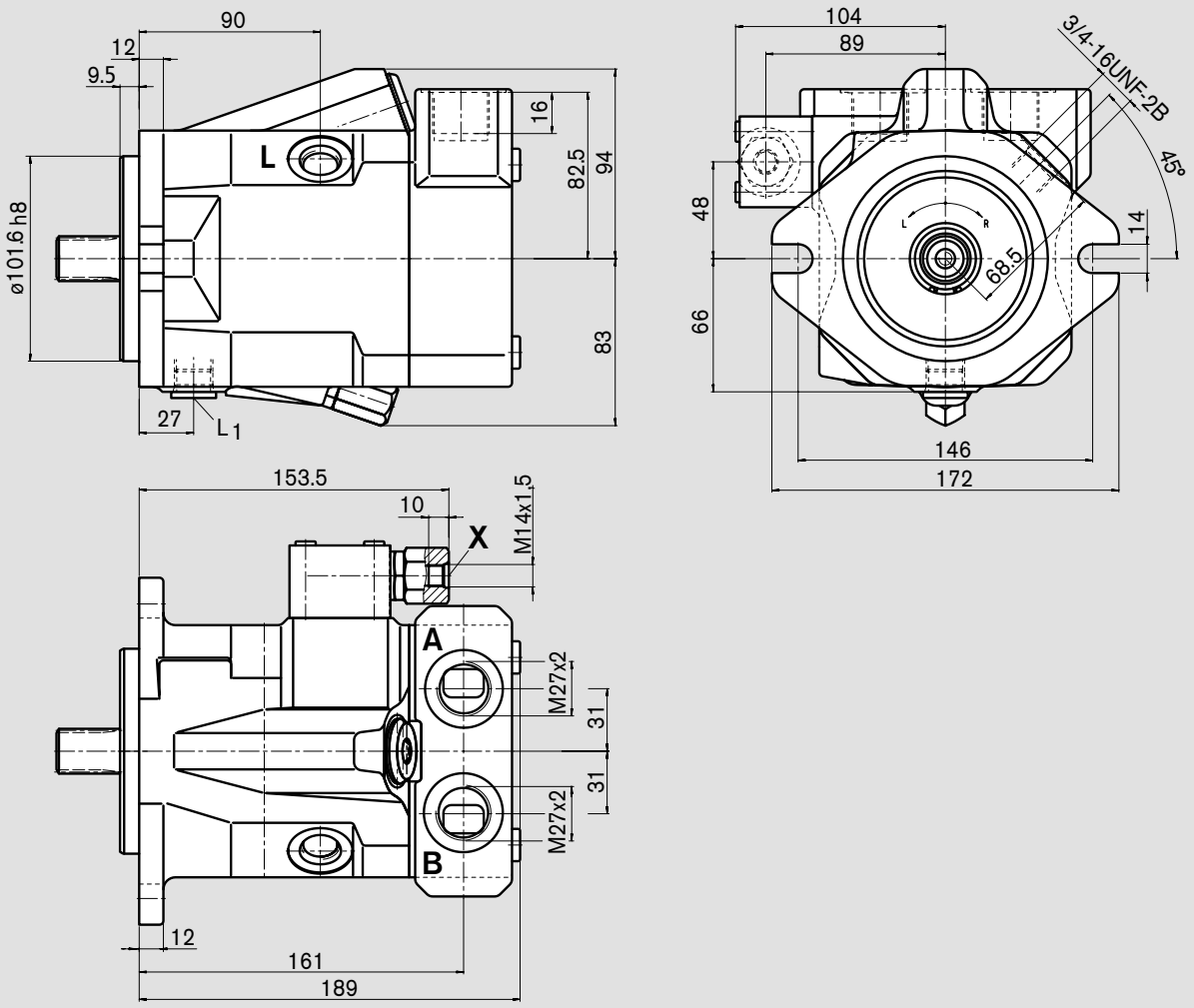
[2)] See safety information

Unit dimensions A10VM,Size 28

Before finalising your design please request certified installation drawing.

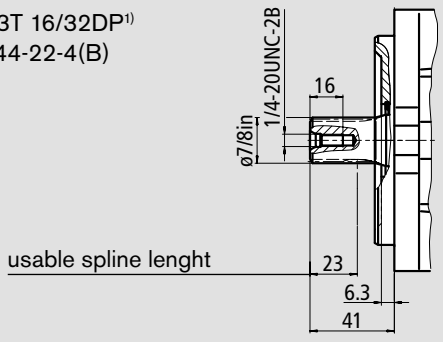
Two-point control, hydraulically operated HZ, port plate 16

Flange SAE J744 101-2(B)



Shaft end

R splined, 7/8in 13T 16/32DP[1)]
(similar to SAE J744-22-4(B)



Ports

				Tightening torque max.[2)]
A, B	Pressure port	DIN 3852-1	M27x2; 16 deep	330 Nm
L, L_1	Drain port (L_1 plugged)	ISO 11926	3/4-16 UNF-2B	160 Nm
X	Pilot press. port	DIN 3852-1	M14x1,5; 10 deep	80 Nm

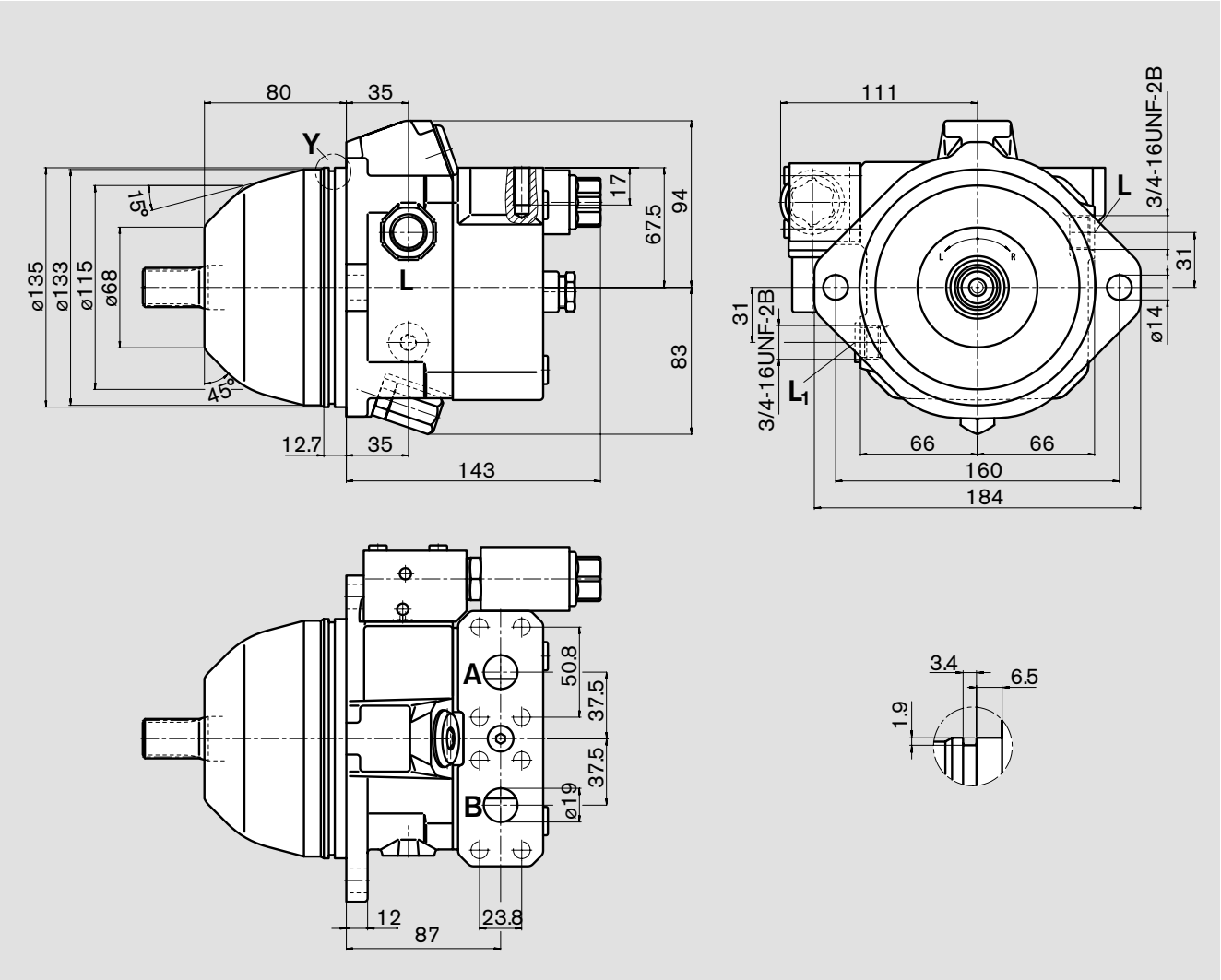
[1)] ANSI B92.1a-1976, 30° pressure angle, flat base, flank centering, fit class 5

[2)] See safety information

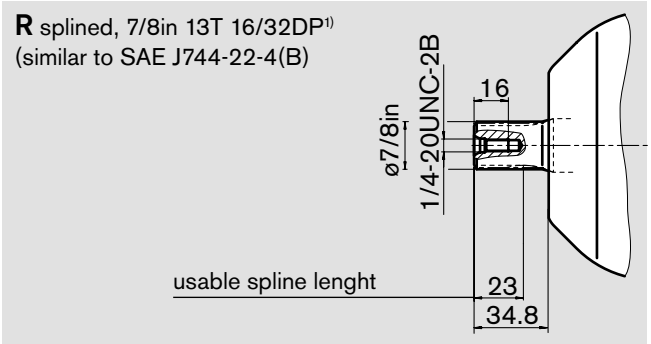
Unit dimensions A10VE, Size 28

Before finalising your design please request certified installation drawing.

Two-point control, electrically operated EZ with solenoid valve, port plate 10



Shaft end



Ports

					Tightening torque max.2)
A, B	Press. port (high press. series, code 62)	SAE J518C	3/4in	M10; 17 deep	60 Nm
L, L_1	Drain port (L_1 plugged)	ISO 11926	3/4-16 UNF-2B		160 Nm

1) ANSI B92.1a-1976, 30° pressure angle, flat base, flank centering, fit class 5

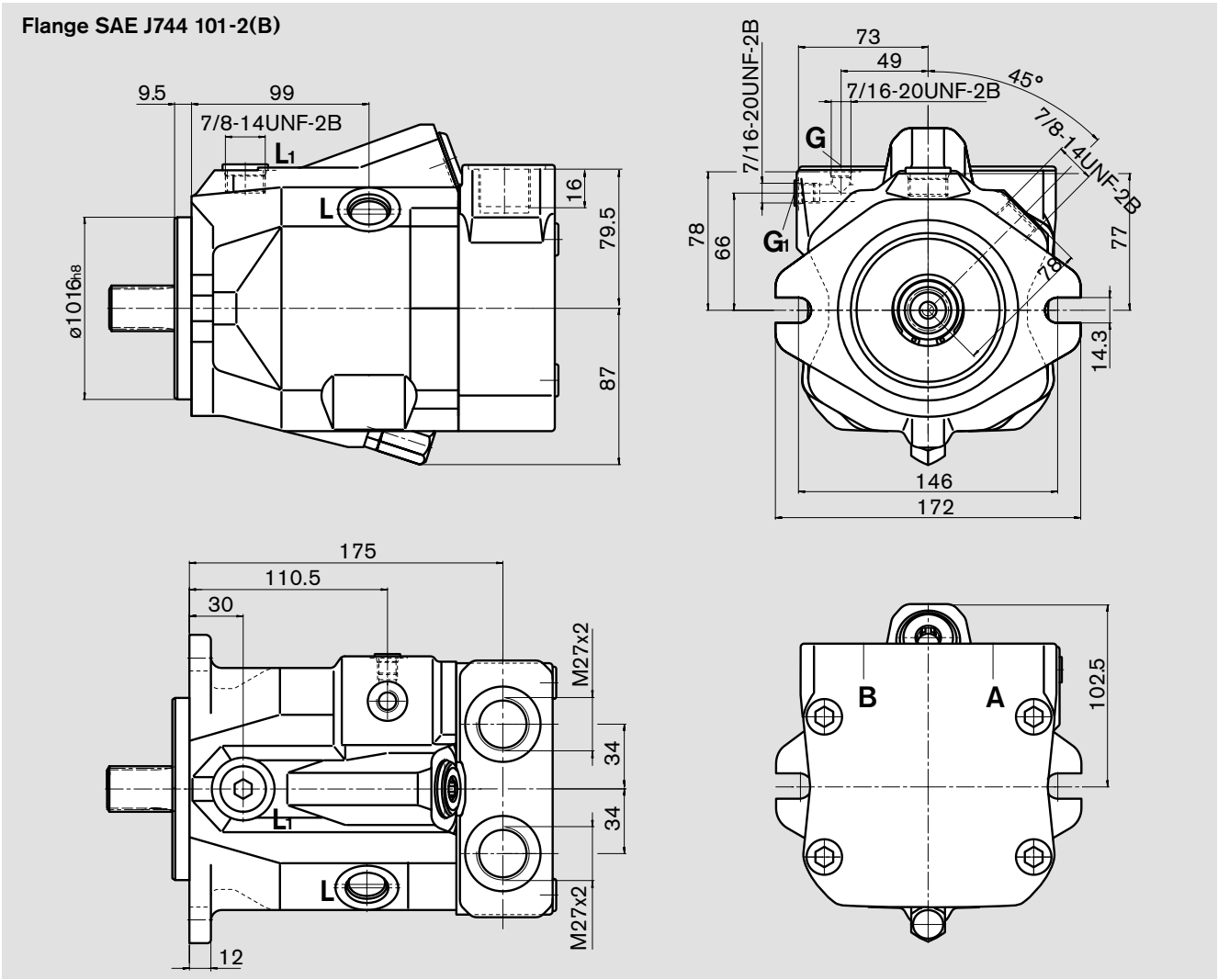
2) See safety information

Unit dimensions A10VM, size 45

Before finalizing your design please request a certified installation drawing.

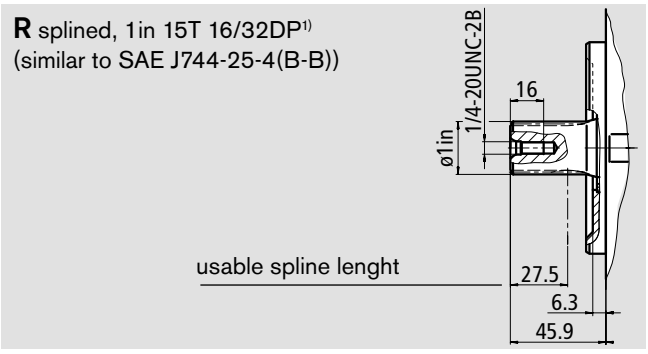
Two-point direct control DG, port plate 16

Flange SAE J744 101-2(B)

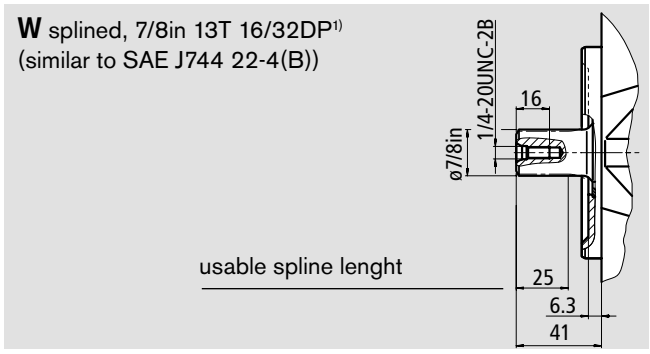


Shaft end

R splined, 1in 15T 16/32DP[1)]
(similar to SAE J744-25-4(B-B))



W splined, 7/8in 13T 16/32DP[1)]
(similar to SAE J744 22-4(B))



Ports

				Tightening torque max.[2)]
A, B	Pressure port	DIN 3852-1	M27x2; 16 deep	330 Nm
L, L_1	Drain port (L_1 plugged)	ISO 11926	7/8 UNF-2B	240 Nm
G, G_1	Port f. ext. control press. (G_1 plugged)	ISO 11926	7/16-20 UNF-2B	40 Nm

[1)] ANSI B92.1a-1976, 30° pressure angle, flat base, flank centering, fit class 5

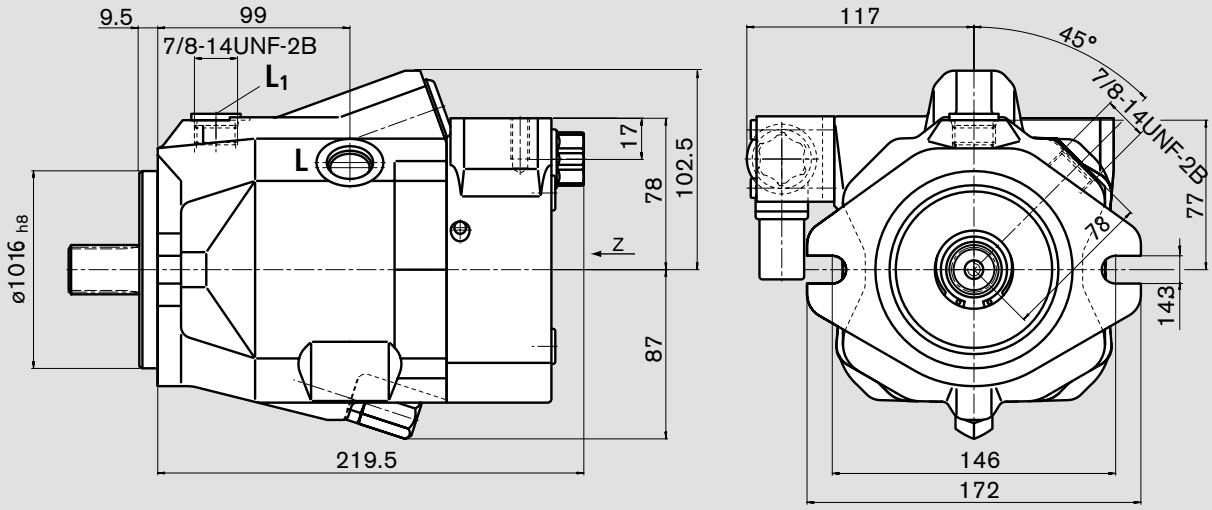
[2)] See safety information

Unit dimensions A10VM, size 45

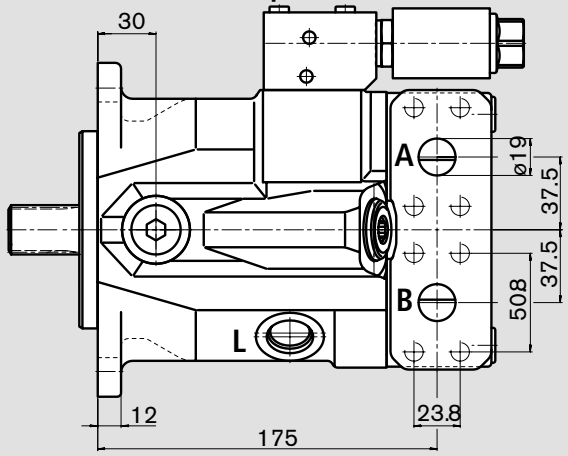
Before finalising your design please request a certified installation drawing.

Two-point control, electrically operated EZ with solenoid valve, port plate 10 and 11

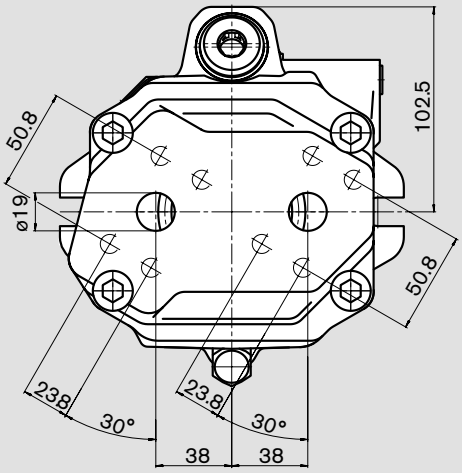
Flange SAE J744 101-2(B)



Port plate 10

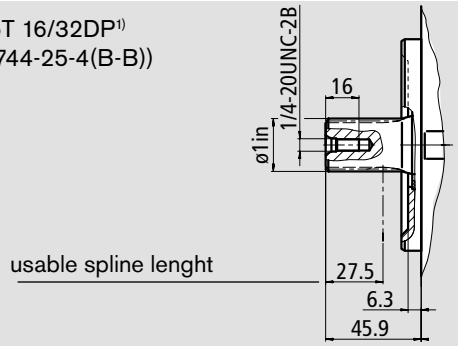


Port plate 11, view Z

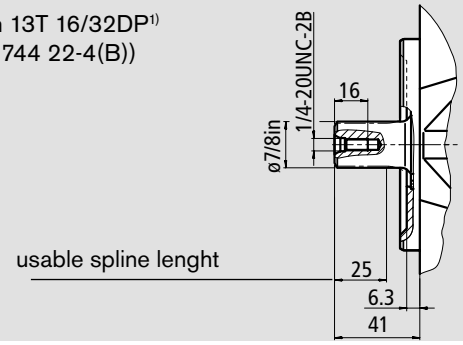


Shaft end

R splined, 1in 15T 16/32DP[1)]
(similar to SAE J744-25-4(B-B))



W splined, 7/8in 13T 16/32DP[1)]
(similar to SAE J744 22-4(B))



Ports

					Tightening torque max.[2)]
A, B	Press. port (high press. series, code 62)	SAE J518C	3/4in	M10; 17 deep	60 Nm
L, L_1	Drain port (L_1 plugged)	ISO 11926	7/8 UNF-2B		240 Nm

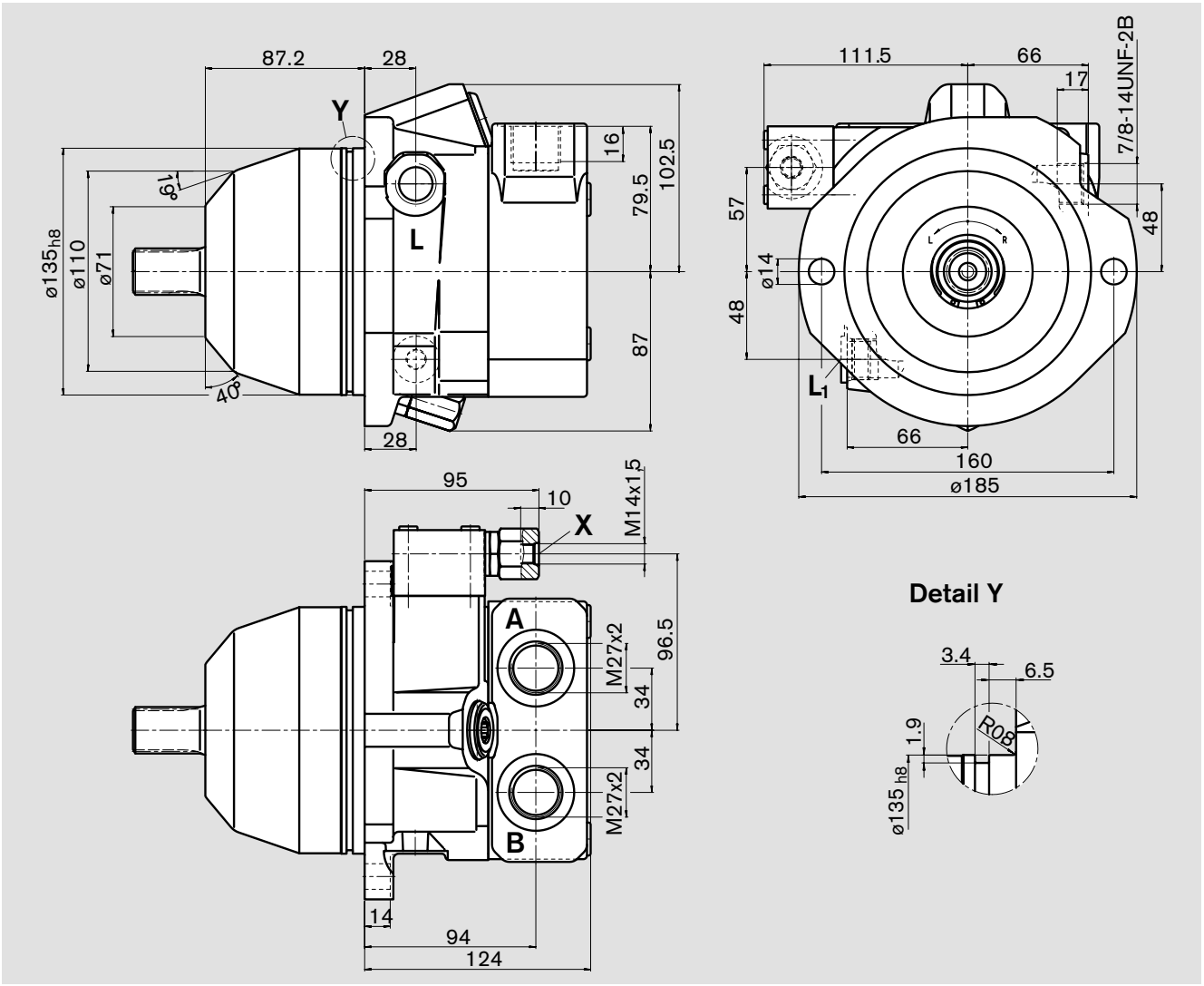
[1)] ANSI B92.1a-1976, 30° pressure angle, flat base, flank centering, fit class 5

[2)] See safety information

Unit dimensions A10VE, size 45

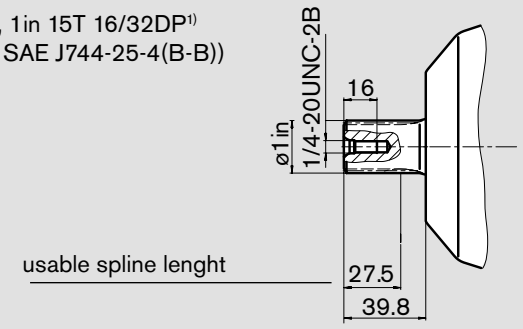
Before finalising your design please request a certified installation drawing.

Two -point control, hydraulically operated HZ, port plate 16

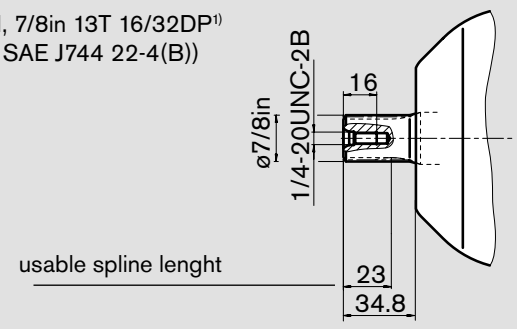


Shaft end

R splined, 1in 15T 16/32DP[1)]
(similar to SAE J744-25-4(B-B))



W splined, 7/8in 13T 16/32DP[1)]
(similar to SAE J744 22-4(B))



Ports

				Tightening torque max.[2)]
A, B	Pressure port	DIN 3852-1	M27x2-16 deep	330 Nm
L, L_1	Drain port (L_1 plugged)	ISO 11926	7/8 UNF-2B	240 Nm
X	Pilot pressure port	DIN 3852-1	M14x1,5-10 deep	80 Nm

[1)] ANSI B92.1a-1976, 30° pressure angle, flat base, flank centering, fit class 5

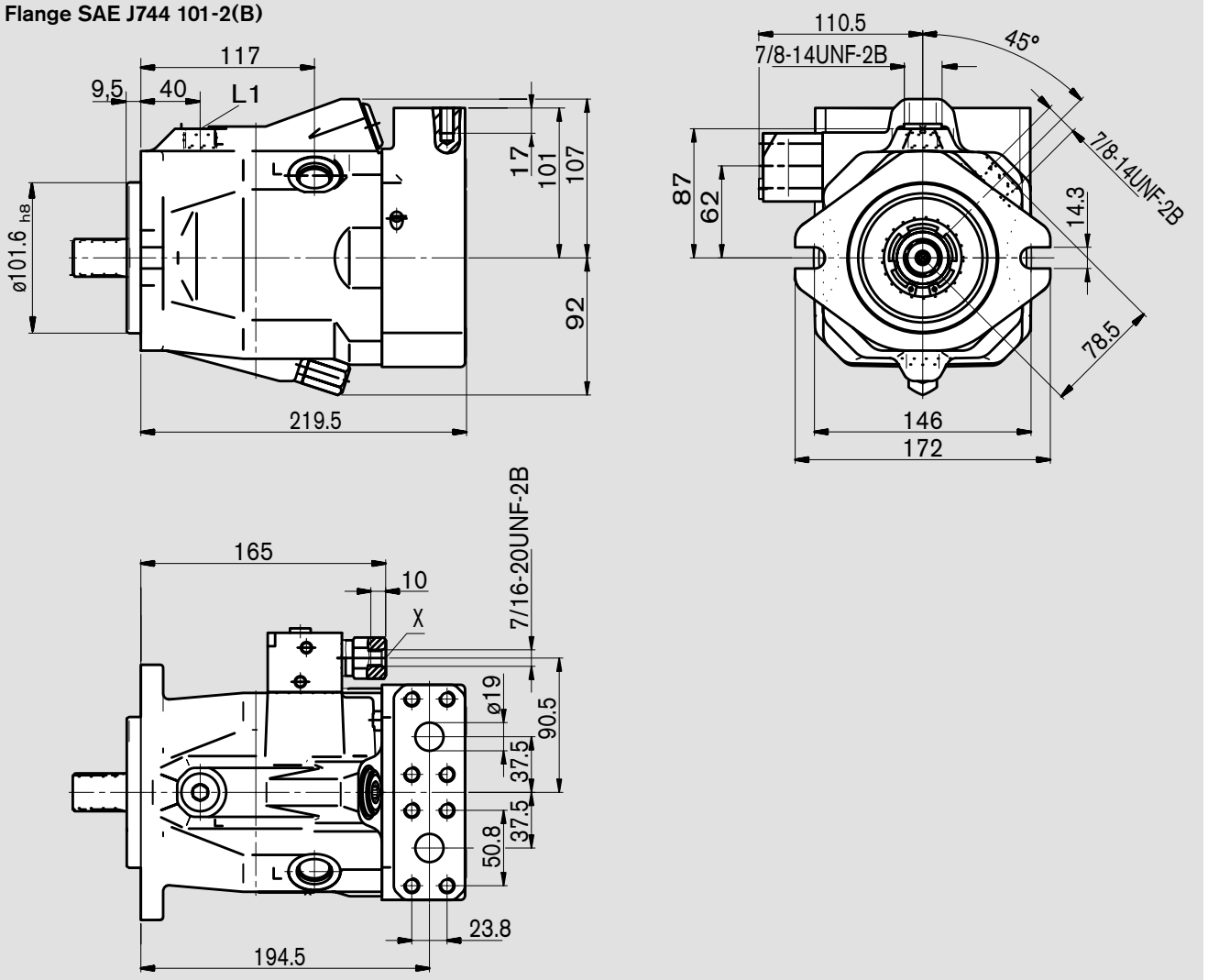
[2)] See safety information

Unit dimensions A10VM, size 63

Before finalising your design please request a certified installation drawing.

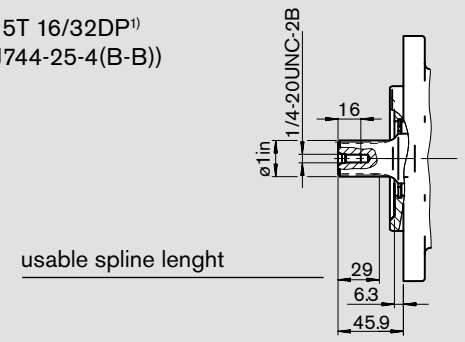
Two-point control, hydraulically operated HZ6 with stroking time orifice, port plate 10

Flange SAE J744 101-2(B)



Shaft end

W splined, 1in 15T 16/32DP[1)]
(similar to SAE J744-25-4(B-B))



Ports

					Tightening torque max.[2)]
A, B	Press. port (high press. series, code 62)	SAE J518C	3/4in	M10; 17 deep	60 Nm
L, L_1	Drain port (L_1 plugged)	ISO 11926	7/8 UNF-2B		240 Nm
X	Pilot pressure port	ISO 11926	7/16-20UNF-2B		40 Nm

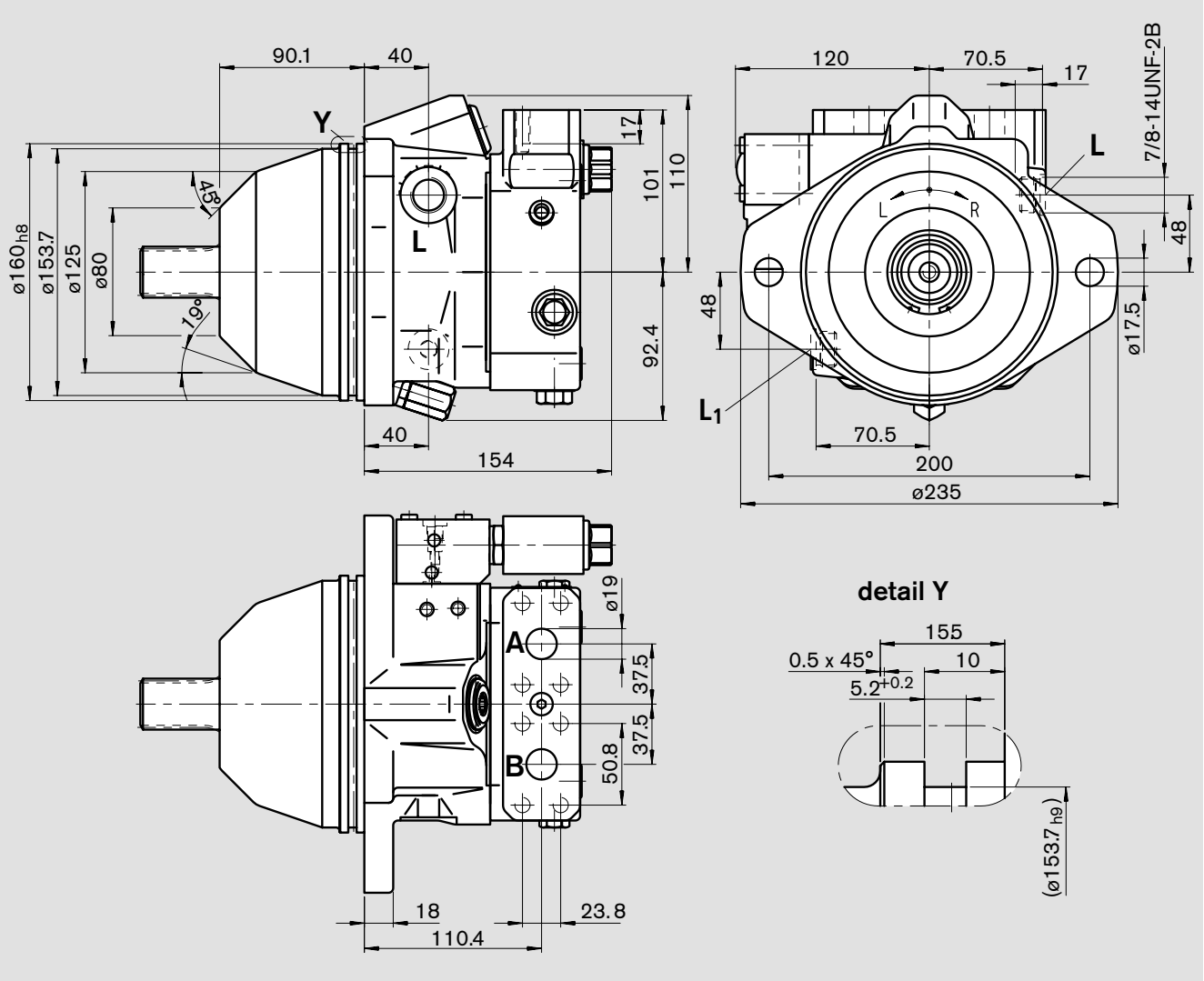
[1)] ANSI B92.1a-1976, 30° pressure angle, flat base, flank centering, fit class 5

[2)] See safety information

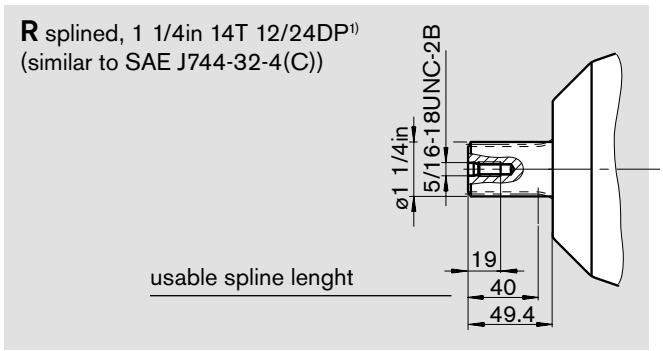
Unit dimensions A10VE, size 63

Before finalising your design please request a certified installation drawing.

Two-point control, electrically operated EZ with solenoid valve, port plate 10 and integated flushing and boost press. relief valve N007



Shaft end



Ports

					Tightening torque max.[2]
A, B	Press. port (high press. series, code 62)	SAE J518C	3/4in	M10; 17 deep	60 Nm
L, L_1	Drain port(L_1 plugged)	ISO 11926	7/8 UNF-2B		240 Nm

[1] ANSI B92.1a-1976, 30° pressure angle, flat base, flank centering, fit class 5

[2] See safety information

Integrated flushing and boost press. relief valve, N007

This valve assembly is used to flush an unacceptable heat load out of the closed circuit and to maintain the necessary minimun boost pressure (16 bar, fixed setting). The valve is integrated into the port plate.

A built-in fixed orifice determines the flushing flow, which is taken out of the low pressure side of the loop and directed into the motor housing. It leaves the housing together with the case drain flow. This combined flow must be replenished with fresh oil by means of the boost pump.

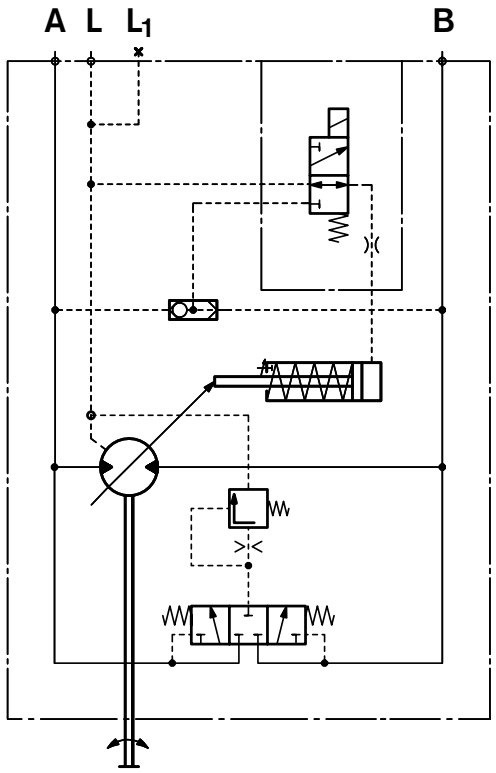
Standard flushing flow

With low pressure side p_{ND} = 20 bar and an orifice dia. of 1,6 mm : 5,5 L/min (sizes 28 - 63). Other orifice diameters are available, please state in clear text.

Further flushing flows for sizes 28 - 63 see table:

Flushing flow (L/min)	Orifice dia. in mm
3,5	1,2
5,5	1,6
9	2

Circuit drawing



Speed pickup

Before finalising your design please request a certified installation drawing.

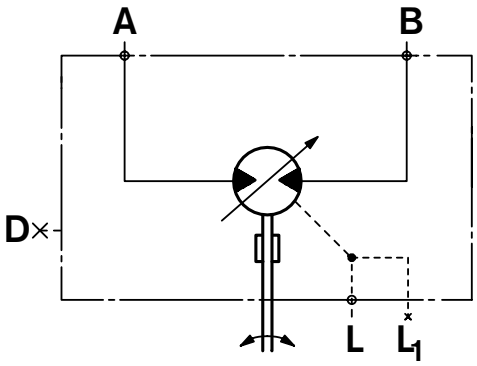
The version A10VM/E...D comprises gearing around the rotary unit(„prepared for speed pickup“).

In this case, the rotating cylinder barrel can provide a speed dependent signal, which can be picked up by a suitable sensor and processed for further evaluation. The sensor port will be closed for delivery.
For completion of the actual speed pickup function the necessary working parts must be ordered separately.

Inductive speed sensor ID R 18/20-L250 (see RE 95130) and mounting parts (spacer and 2 seals per kit) can be ordered separately with the following part numbers:

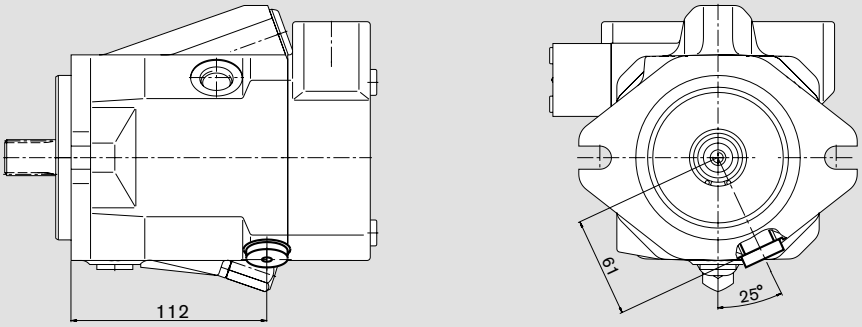
Size	Partslist nr.	Number of teeth
28	R902428802	48
45	R902437557	48
63	R902428802	56

Circuit diagram

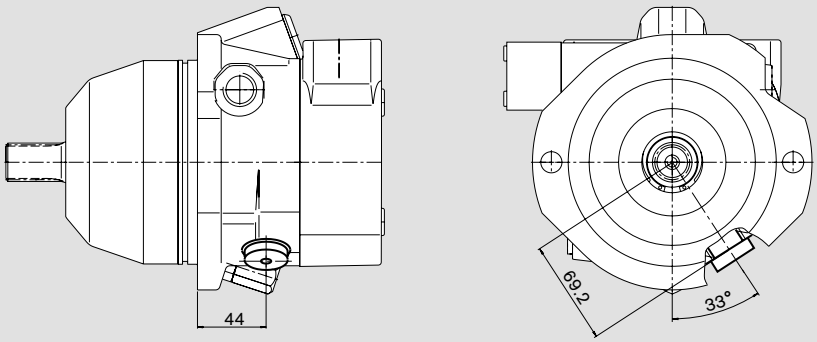


Dimensions port D

A10VM 28...

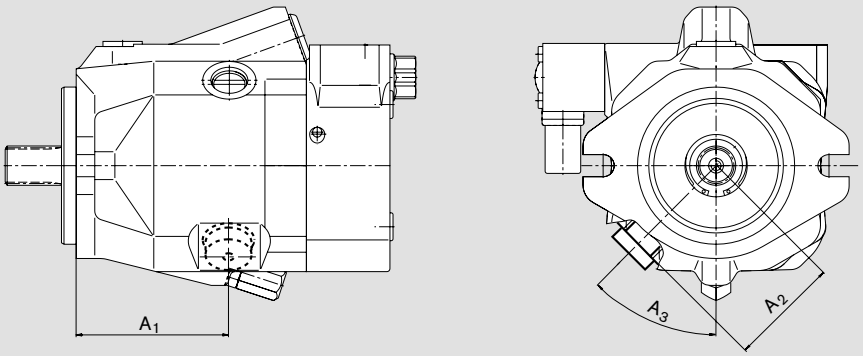


A10VE 45...



A10VM 45... and A10VM63

NG	A1	A2	A3
45	96	69,2	45°
63	140,5	71	57,5°



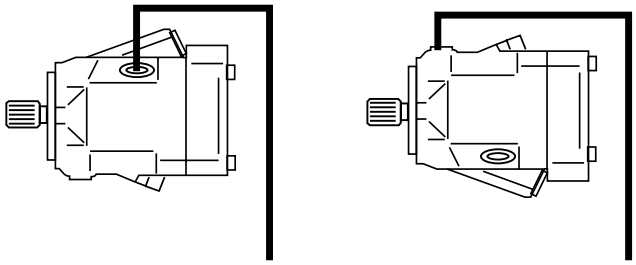
Installation position

Optional. the motor housing must be filled with hydraulic fluid when starting up and during operation. The drain line must be arranged so that the housing cannot empty itself when the motor is stationary. The end of the line must enter the tank below the minimum fluid level.

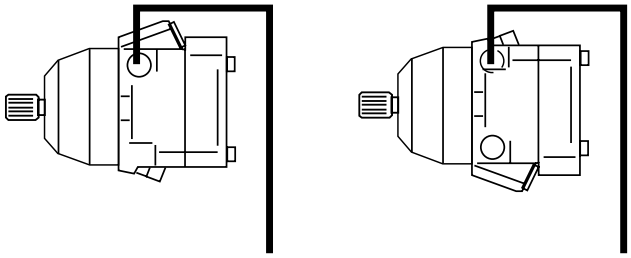
The port, located at the highest point must be used in all installation positions to fill the housing and to connect the drain line.

In case of vertical installation please consult us.

A10VM



A10VE



Safety information

- The motor A10VM/VE was designed for operation in open and closed circuits.
- Systems design, installation and commissioning requires trained technicians and tradesmen.
- All hydraulic ports can only be used for the fastening of hydraulic service lines.
- Tightening torques: The tightening torques, given in this data sheet represent max. values and may not be exceeded (max. values for the female threads in the motor castings). 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, issue 2003.
- During and shortly after operation of a motor the housing and especially a solenoid can be extremely hot, avoid being burned.
- All given data, information or instructions must be adhered to!

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