RE 91 703/08.98

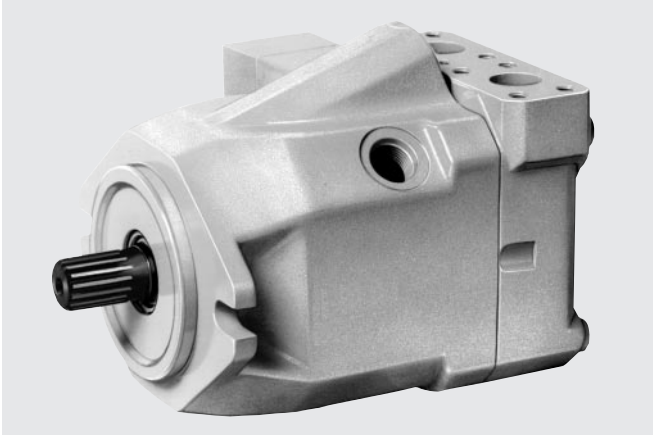
Replaces: 04.95

engineering
mannesmann
Rexroth

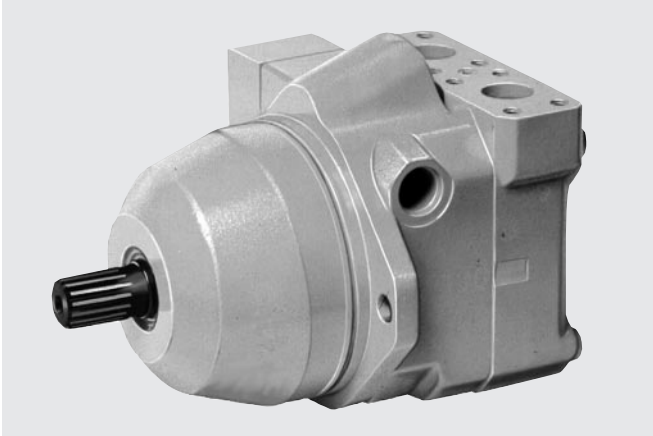
Dual displacement motor A10VM
Plug-in dual displacement motor A10VE

for open and closed circuit applications

Size 28 - 60
Series 5
Nominal pressure 280 bar
Peak pressure 350 bar



A10VM



A10VE

Contents

– Further information:

Dual displacement motor A10VEC for track and wheel drives Size 45 - 80	RE 91 710
Fixed displacement motor A10FSM Size 18	RE 91 180
Fixed displacement motor A10FM Size 23 - 63	RE 91 172

Features

– Dual displacement motor, axial piston in swashplate design for hydrostatic transmissions in open and closed circuit applications
– Output speed directly proportional to the inlet flow rate and inversely proportional to the motor displacement
– Output torque increases with 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 power unit technology
– High power/weight ratio – compact size
– Low noise
– Hydraulic connections to SAE standards
– 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 flange on A10VE

Brueninghaus
Hydromatik

Ordering code / standard range

A10V				/	5	2	W		–	V					

Hydraulic fluid

Mineral oil (without abbreviation)

Axial piston motor

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

Operating mode

Motor	**M**
Plug-in motor	**E**

*** Hint for sizes 28 and 45**
Replacement service for **pressure range 250/315 bar** with previous mounting patterns on request

Size

≙ Motor displacement V_g in cm³	**28***	**45***	**60**	**80**
	●	●	❍	❍

Control devices

Two-point direct control, external control supply, without pilot valve	❍	●	❍	❍	**DG**
Two-point control, hydraulic	❍	●	❍	❍	**HZ**
Two-point control, electrical EZ 1	●	●	❍	❍	**EZ1**
with two-position valve EZ 2	●	●	❍	❍	**EZ2**

Control voltage 12V
Control voltage 24V

Series

	5

Index

	2

Direction of rotation (Viewing onto shaft end)

bi-directional	**W**

Minimum displacement

	28	**45**	**60**	
V_{gmin} (in cm³) infinitely variable	from 8	12	16	to V_{gmax}
Example: 12 cm³ preset by manufacturer – please state in order				**12**

Seal

FPM (fluororubber to DIN ISO 1629)	**V**

Shaft end

	28	**45**	**60**	**80**	
SAE spline shaft	●	●	❍	❍	**R**
SAE spline shaft	❍	❍	❍	❍	**W**
Tapered with key and threaded end	❍	❍	❍	❍	**C**

Mounting flange

SAE 2-hole flange for A10VM	●	●	❍	❍	**C**
Special 2-hole flange for A10VE	●	●	❍	❍	**F**

Ports for service lines

Ports A/B at side - same side; SAE, UNC fixing screws	●	●	❍	❍	**60N00**
Ports A/B at side - same side; SAE, metric fixing screws	❍	❍	❍	❍	**10N00**
Ports A/B at side - same side; metric threaded connection	❍	●	❍	❍	**66N00**
Ports A/B at side - same side; UNF threaded connection	❍	❍	❍	❍	**16N00**
Ports A/B at rear; SAE, UNC fixing screws	❍	❍	❍	❍	**61N00**
Ports A/B at rear; SAE, metric fixing screws	❍	❍	❍	❍	**11N00**
Ports A/B at rear; UNF threaded connection	❍	●	❍	❍	**64N00**

Valves

Without valves	●	**0**
Integrated flushing valve, only with ports at side (60N00, 10N00, 66N00 und 16N00)	❍	**7**

Speed monitoring

Without speed monitoring (no code)	**–**
Prepared for speed monitoring, A10VM only	**D**

❍ = in preparation ● = available

Technical data

Hydraulic fluid

For extensive information on the selection of fluids and for application conditions,please consult our data sheets RE 90220 (mineral oils) or RE 90221 (environmentally accetable hydraulic fluids).

You might have to consider reduced operating data with environmentally accetable hydraulic fluids. Please contact our technical department (please indicate type of the hydraulic fluid used for your application on the order sheet).

Operating viscosity range

In order to obtain optimum efficiency and service life, we recommend that the operating viscosity (at operating temperature) be selected from within the range:

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

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

Viscosity limits

The limiting values for viscosity are as follows:

ν_{min} = 5 mm²/s

short term at a max. permissible temperature of t_{max} = 115 °C.

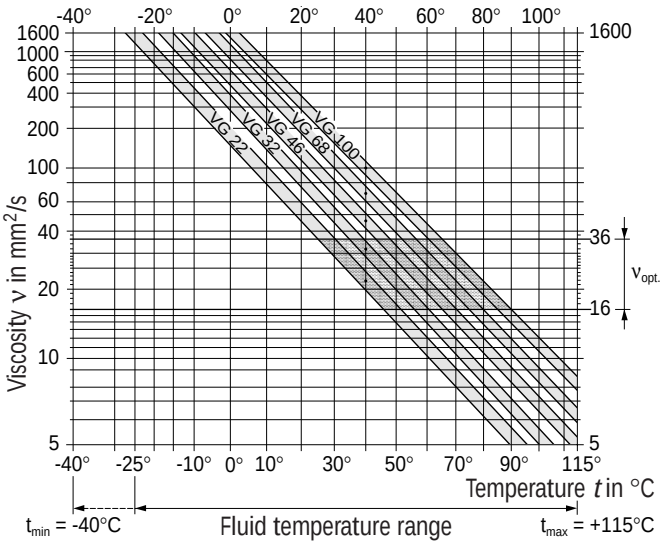
Please note that the maximum fluid temperature must also not exceed 115 °C in certain areas (e.g. bearing area).

ν_{max} = 1600 mm²/s

short term on cold start (t_{min} = -40 °C).

Special precautions are required at temperatures between -25 °C and -40 °C, depending on the installation conditions. Please consult our technical department.

Selection diagram



Notes on the selecting of the hydraulic fluid

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

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

Example: At an ambient temperature of X °C the operating temperature (closed circuit: loop temperature; open circuit: tank temperature) is 60°C. Within the operating viscosity range (ν_{opt}; shaded area), this corresponds to viscosity ranges VG 46 or 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 purity grade of the pressure fluid and the longer the life of the axial piston unit.

To ensure the functioning of the axial piston unit a minimum purity grade of: 9 to NAS 1638

18/15 to ISO/DIS 4406.

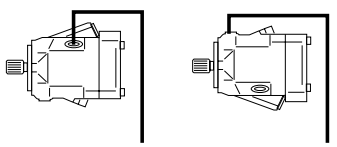
Please consult us, if it is not possible to comply with the above conditions.

Mounting position

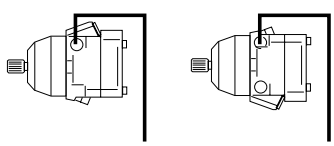
Any. The motor housing must be filled with hydraulic fluid when starting up and during operation. The leakage fluid line must be routed so that the housing is not drained when the motor stops. The end of the line must enter the tank below the minimum oil level.

The highest leakage oil port must be used in all installation positions to fill the housing and to connect the drain line.

A10VM



A10VE



Please consult Brueninghaus Hydromatik if the motor is to be installed vertically.

Technical data

Service 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

Sum of the pressure at ports A and B must not exceed 560 bar.

Case drain pressure

Maximum permissible case pressure at ports L and L_1

$p_{abs\ max}$ ____ 2 bar abs.

Direction of rotation

Pressure in A = Right-hand rotation
Pressure in B = Left-hand rotation

Displacement

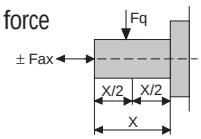
The minimum displacement is set by the manufacturer in accordance with the ordering code.

Table of values (theoretical values, ignoring η_{mh} and η_v: values rounded)

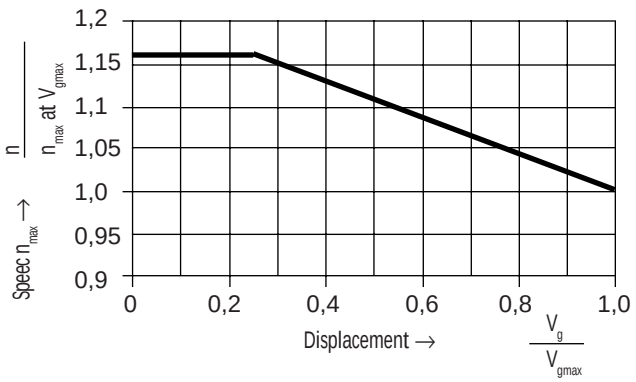
Size					28	45	60
Motor displacement			$V_{g\ max}$	cm^3	28	45	62
			$V_{g\ min}$	cm^3	8	12	16
Max. speed [1])	at $V_{g\ max}$		n_{max}	rpm	4700	4000	3300
	at $V_{g\ min}$		n_{max}	rpm	5300	4600	3800
Max. inlet flow	at n_{max} and $V_{g\ max}$		$q_{v\ max}$	L/min	131.6	180	205
Max. output power	at n_{max} and $V_{g\ max}$	Δp = 280 bar	P_{max}	kW	61	84	95
Max. torque	at $V_{g\ max}$	Δp = 280 bar	T_{max}	Nm	125	200	276
Mass moment of inertia (about the output shaft)			J	kgm^2	0.0017	0.0033	0.0056
Filling volume, approx.				L	0.6	0.7	0.8
Weight, approx.			m	kg	14	18	26
Permissible load on output shaft, max. perm. axial force			$F_{ax\ max}$	N	1000	1500	2000
Max. perm. radial force			$F_{q\ max}$	N	1200	1500	1700
Actual starting toque at n = 0 rpm		Δp = 280 bar	$F_{q\ max}$	Nm(aprox.)	85	138	182

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

Applied force



Determination of n_{max}



Calculating size

Inlet flow rate $q_v = \dfrac{V_g \cdot n}{1000 \cdot \eta_v}$ in L/min

Torque $T = \dfrac{1.59 \cdot V_g \cdot \Delta p \cdot \eta_{mh}}{100}$ in Nm

Output power $P = \dfrac{T \cdot n}{9549} = \dfrac{q_v \cdot \Delta p \cdot \eta_t}{600}$ in kW

Output speed $n = \dfrac{q_v \cdot 1000 \cdot \eta_v}{V_g}$ in rpm

V_g = geometric motor displacement per revolution in cm^3
Δp = pressure differential in bar
n = speed in rpm
η_v = volumetric efficiency
η_{mh} = mechanical-hydraulic efficiency
η_t = total efficiency ($\eta_t = \eta_v \cdot \eta_{mh}$)

Direct control pressure DG

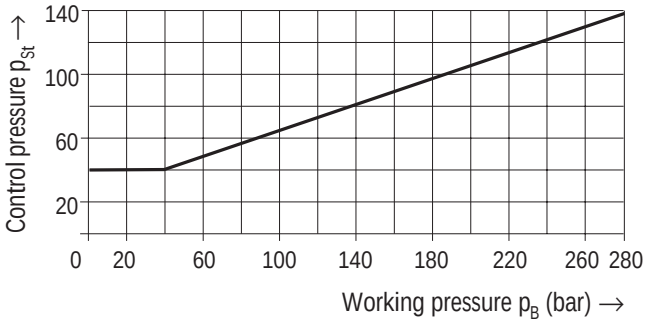
Normally, the motor is at max. displacement. By applying a external pressure to port G, the destroking piston is directly pressurized and the motor switches to minimum displacement.

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

This control pressure depends directly on the working pressure p_B in port 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

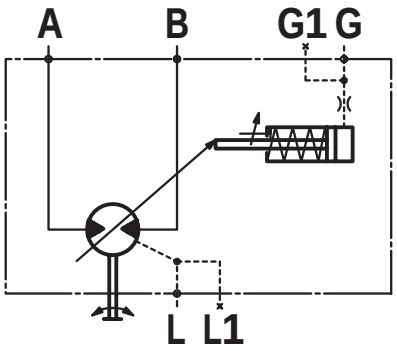


Control pressure = 0 bar = $V_{g\,max}$

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

The maximum permissible control pressure p_{St} = 280 bar.

Circuit diagram



Ports

A, B	Pressure ports
L, L_1	Drain ports
G, G1	External control pressure ports

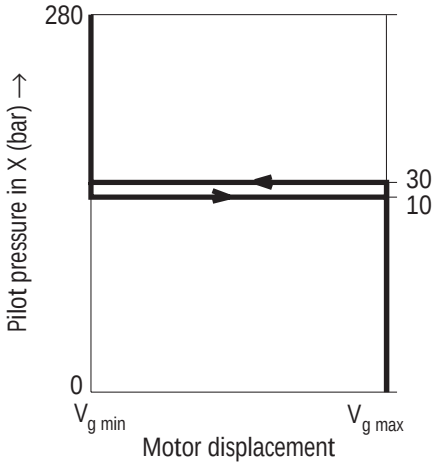
Hydraulic two-point control HZ

Normally, the motor is at max. displacement. By applying a pilot pressure to port X, the destroking piston is pressurized and the motor switches to minimum displacement.

The necessary control pressure is via a shuttle valve, taken out of the port A or B.

A minimum operating pressure difference of $\Delta p_{A,B} \geq 20$ bar is required.

Only max. and min. displacements are possible.



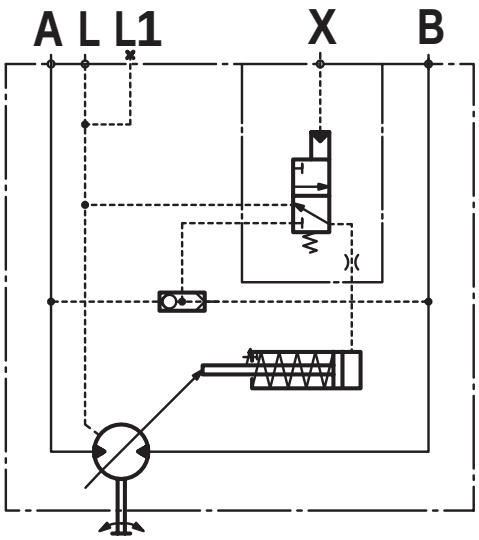
Pilot pressure in X = 0 bar = $V_{g\,max}$

Pilot pressure in X ≥ 30 bar = $V_{g\,min}$

Technical data HZ

Minimum pilot pressure	30 bar
Max. permissible pilot pressure	280 bar

Circuit diagram



Ports

A,B	Pressure ports
L, L_1	Drain ports
X	Pilot pressure port

Electrical two-point control EZ

Normally, the motor is at max. displacement. By energizing the solenoid of the control valve, the destroking piston is pressured, and the motor switches to minimum displacement.

The necessary control pressure is via a shuttle valve, taken out of the port A or B.

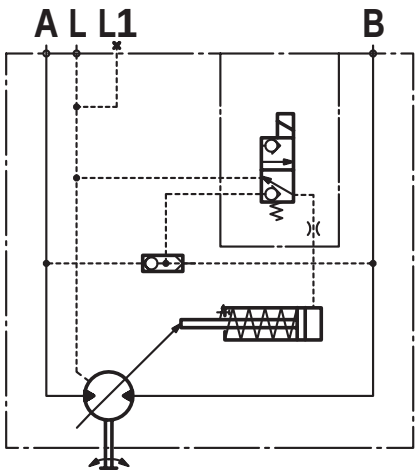
A minimum operating pressure difference of $\Delta p_{A,B} \geq 20$ bar is required.

Only max. and min. displacements are possible.

De-energized = 0 mA = $V_{g\,max}$

Energized ≥ 220 mA = $V_{g\,min}$

Circuit diagram



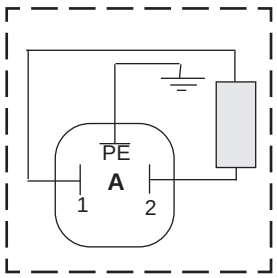
Ports

A,B	Pressure ports
L, L_1	Drain ports

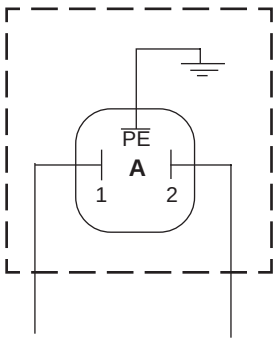
Technical data EZ

Type	EZ1	EZ2
Supply voltage (DC)	12 V	24 V
Power consumption	26 W	26 W
Duty cycle	100%	100%
Type of protection	IP 65	IP 65

Connection to solenoid



Connection to plug



Features:

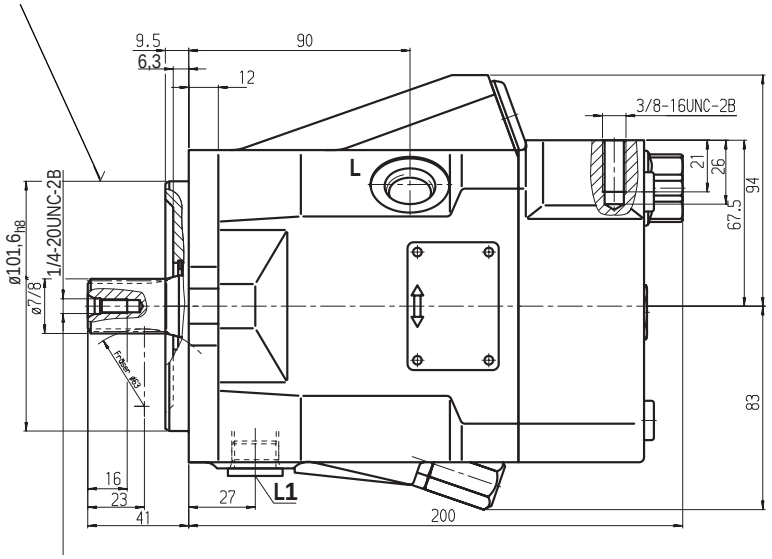
- With spring return
- Solenoid plug can be turned 4 x 90°

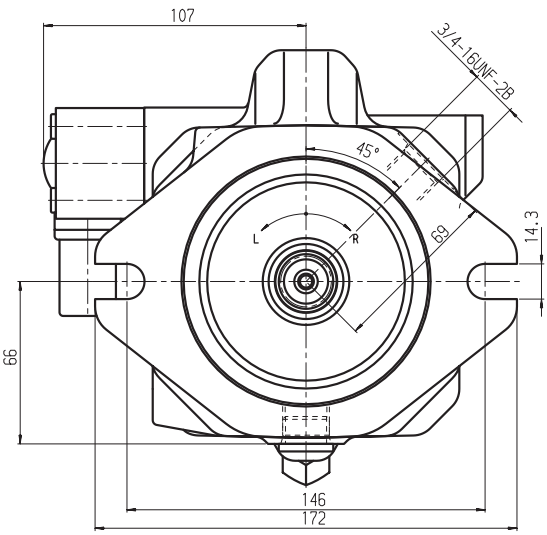
Unit dimensions A10VM; size 28

Two-point electrical control EZ
with two-position valve, port plate 60

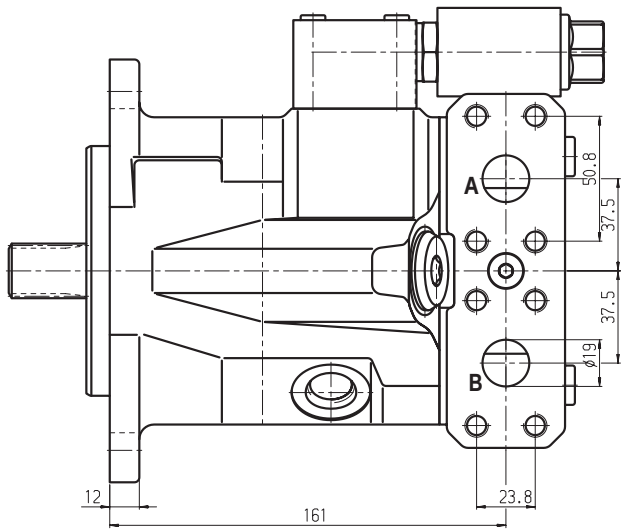
Before finalising your design, please request certified assembly drawing.

Flange 101-2
SAE J744 OCT 83





Shaft **R** 22-4; SAE J744 OCT 83
7/8" dia. splined shaft; 30° pressure angle; 13 teeth;
16/32 pitch; flat base; flank centering;
fit class 5; ANSI B92. 1a-1976



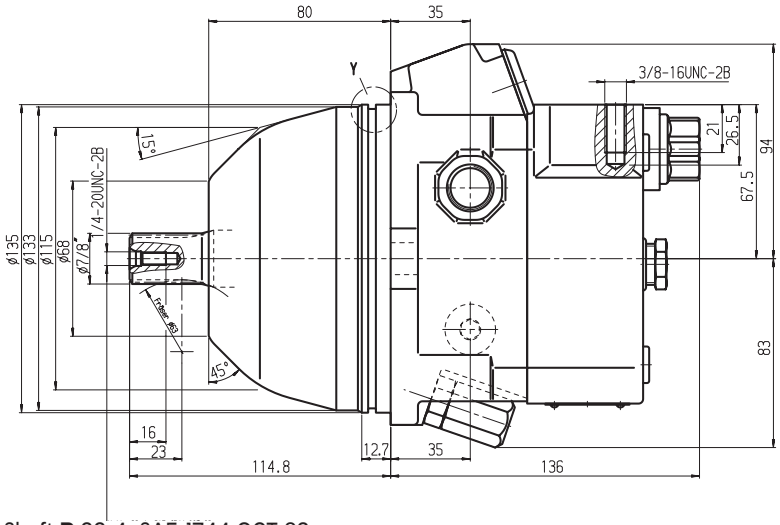
Ports

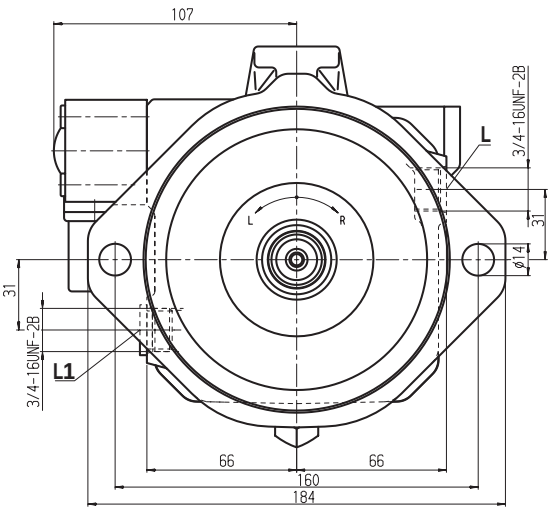
A,B	Pressure ports	SAE 3/4 ", high-pressure series
L, L_1	Drain ports	3/4 - 16 UNF - 2B

Unit dimensions A10VE; size 28

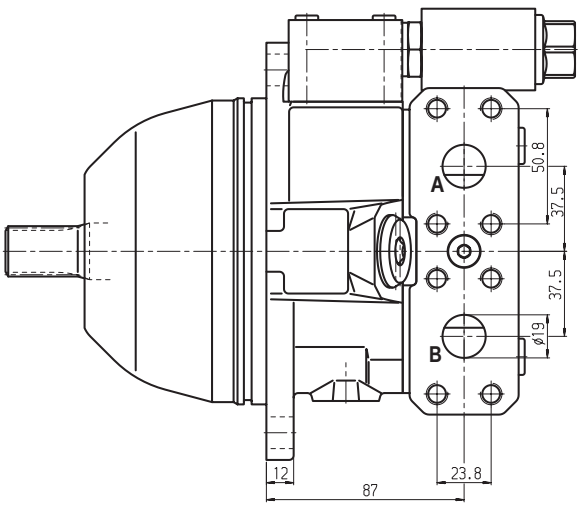
Two-point electrical control EZ
with two-position valve, port plate 60

Before finalising your design, please request certified assembly drawing.

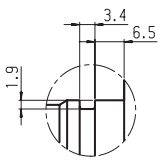




Shaft **R** 22-4; SAE J744 OCT 83
7/8" dia. splined shaft; 30° pressure angle; 13 teeth;
16/32 pitch; flat base; flank centering;
fit class 5; ANSI B92. 1a-1976



Detail Y



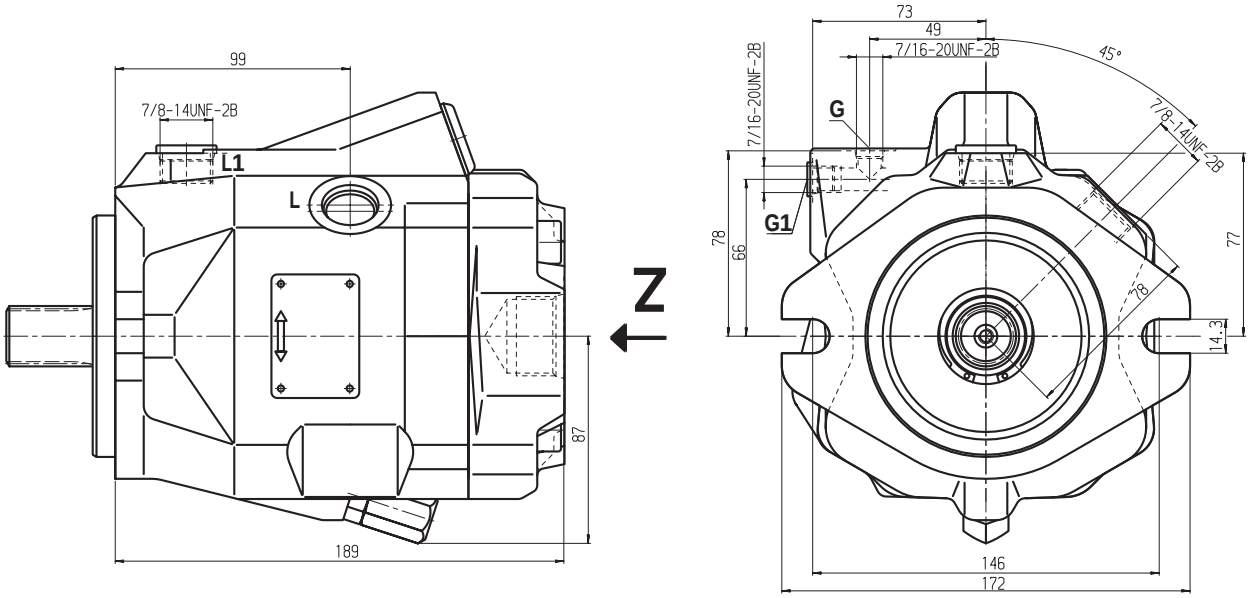
Ports

A,B	Pressure ports	SAE 3/4 ", high-pressure series
L, L_1	Drain ports	3/4 - 16 UNF - 2B

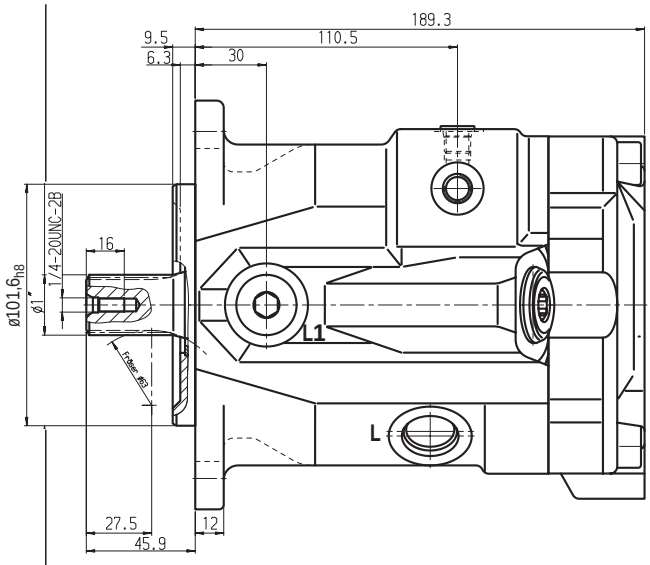
Unit dimensions A10VM; size 45

Two-point control, direct control pressure DG, port plate 64

Before finalising your design, please request certified assembly drawing.

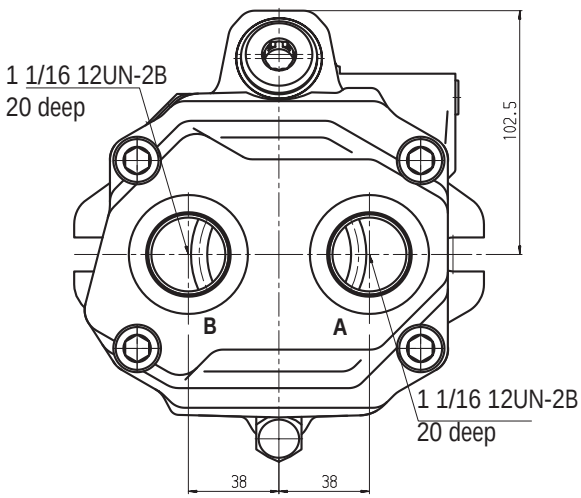


Shaft **R** 25-4; SAE J744 OCT 83
1" dia. splined shaft; 30° pressure angle; 15 teeth;
16/32 pitch; flat base; flank centering;
fit class 5; ANSI B92. 1a-1976



Flange 101-2
SAE J744 OCT 83

View Z



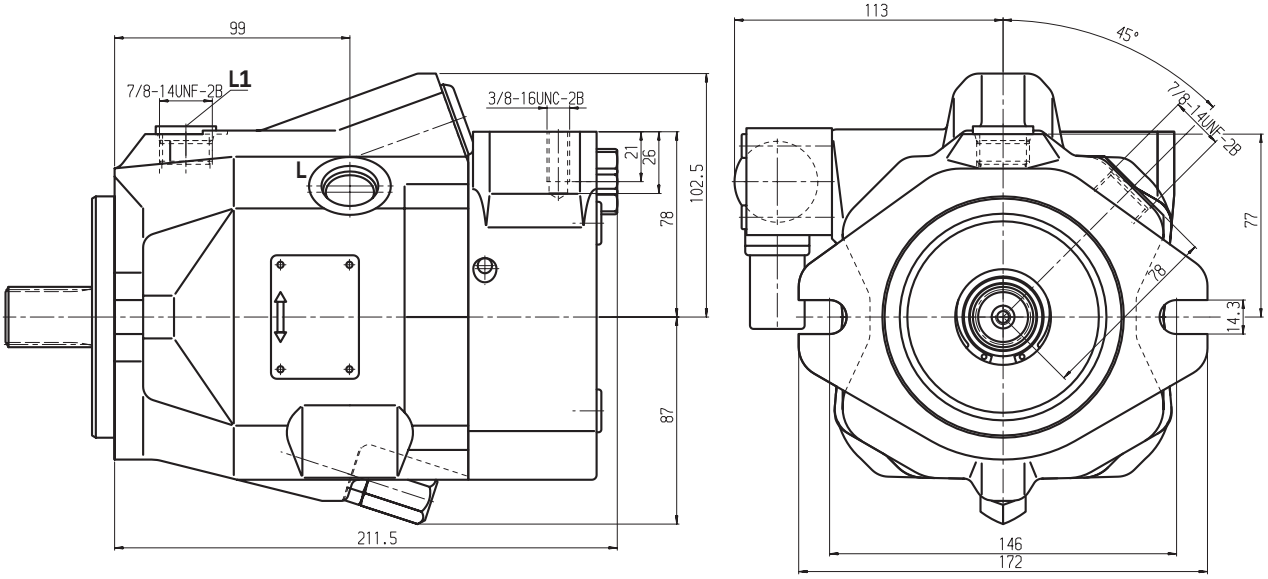
Ports

A,B	Pressure ports	1 1/16 12UN-2B
L, L_1	Drain ports	7/8-14UNF-2B
G, G1	External control pressure ports	7/16-20UNF-2B

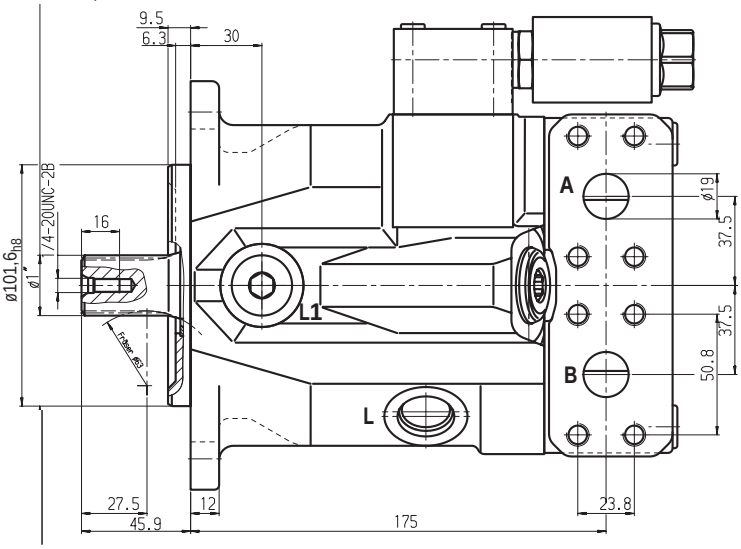
Unit dimensions A10VM; size 45

Two-point electrical control EZ
with two-position valve, port plate 60

Before finalising your design, please request certified assembly drawing.



Shaft **R** 25-4; SAE J744 OCT 83
1" dia. splined shaft; 30° pressure angle; 15 teeth;
16/32 pitch; flat base; flank centering;
fit class 5; ANSI B92. 1a-1976



Flange 101-2
SAE J744 OCT 83

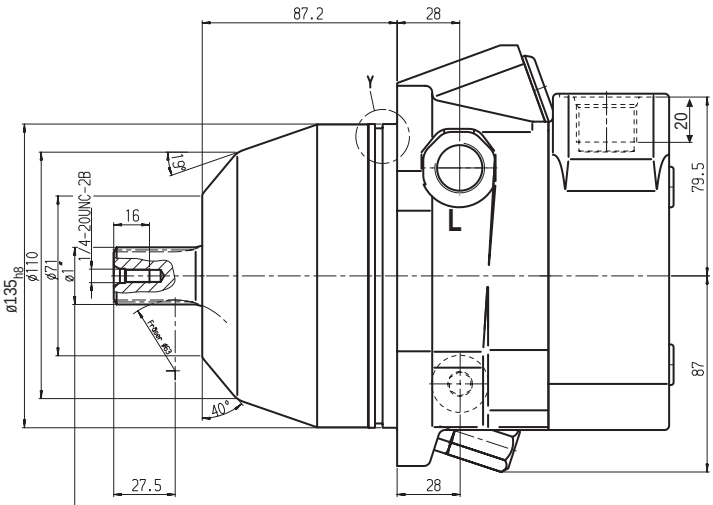
Ports

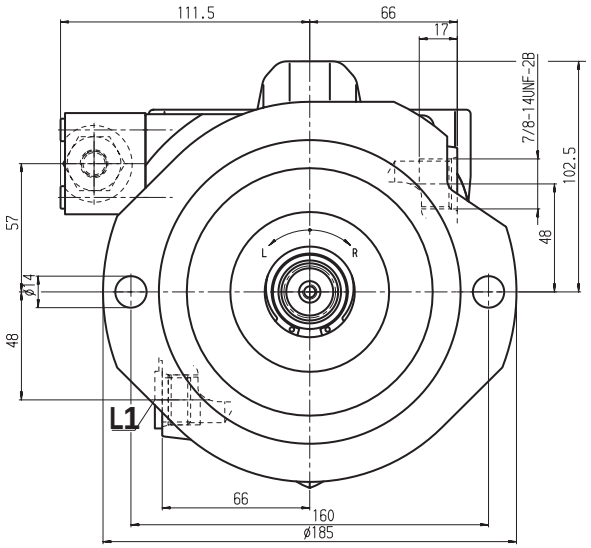
A,B	Pressure ports	SAE 3/4 ", high-pressure series
L, L_1	Drain ports	7/8-14UNF-2B

Unit dimensions A10VE; size 45

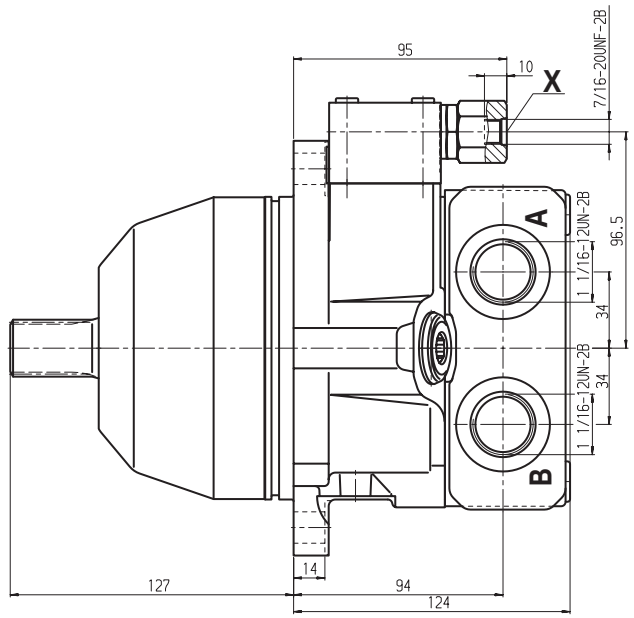
Two-point hydraulic control HZ
port plate 66

Before finalising your design, please request certified assembly drawing.

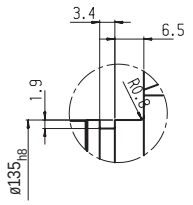




Shaft **R** 25-4; SAE J744 OCT 83
1" dia. splined shaft; 30° pressure angle; 15 teeth;
16/32 pitch; flat base; flank centering;
fit class 5; ANSI B92. 1a-1976



Detail Y



Ports

A,B	Pressure ports	1 1/16 12UN-2B
L, L_1	Drain ports	7/8-14UNF-2B
X	Pilot pressure port	7/16-20UNF-2B

Brueninghaus Hydromatik GmbH

Werk Horb
An den Kelterwiesen 14 • D–72160 Horb
Telefon +49 (0) 74 51 / 92-0
Telefax +49 (0) 74 51 / 82 21