

Hydraulic Units UP40



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General specifications

Experience acquired in designing mini power packs, and a research effort aimed constantly at satisfying the technical specifications of our customers: these assets have provided the principal resource for development of the UP40 power packs:

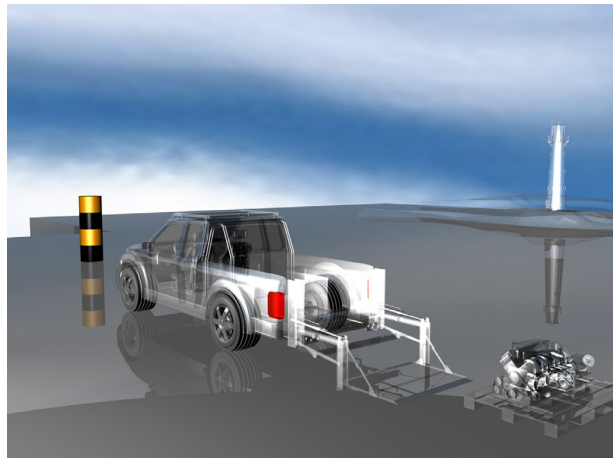
- compact dimensions achieved through detailed analysis of the geometries involved, and the components used;
- economy of the manufactured product, gained by adopting innovative technologies and by standardizing valve cavities with those of the major hydraulic components manufacturers;
- the assurance of constant quality, thanks to comprehensive control on materials and production cycles.

Power packs are widely used in mobile applications.

The UP40 is suitable for applications where short operations and middle-high pressure are required.

Invalid Lift Equipment is a good example, where the compactness of the unit is a particular advantage in view of the limited space available.

The need for fluid power in mobile machines means that power packs can be exploited in the widest variety of applications: lift platforms, and equipment for handling high and bulky loads in general.





WARNING!

Bucher Hydraulics is not responsible for misuse or misapplication of product. Pressure values, type and number of cycles have to be considered before choosing the type of product. For any question about applications, please contact Bucher Hydraulics.

All the installation and maintenance operations of partially completed machinery must be made by technically competent personnel.

The hydraulic power units due to its construction does not perform the function of the safety component.

So the user must insert safety components into the machine to protect against the possibility of breakage during operation.

The hydraulic power units can not function independently and are designed to be integrated into hydraulic systems.

Fluids should be contained and disposed of properly.

Prior to performing any maintenance make sure the equipment is turned off and that any stored energy, for example pressure, is released. Also, extended equipment or cylinders should be lowered and mechanically locked as required.

During the handling of the hydraulics power units, do not lift the unit by the valves mounted on it (see the figure 1, the arrows indicate the points to lift). Always wear appropriate safety gloves and footwear. Wait if the motor is hot.

Always wear eyes protection and protective clothing when working on and around hydraulic systems.

Remove jewellery and objects that might conduct electricity while working on power units.

Hydraulic fluid does pose a fire hazard, can cause burning or skin irritation if not properly handled.

Fluid under pressure can pierce the skin and enter the bloodstream causing death or serious injury.

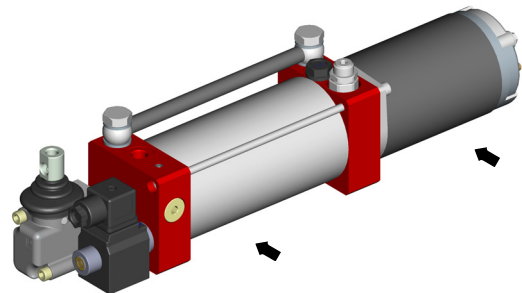
Devices being operated by the hydraulic system should be immobilized so they cannot move and cause injury while being inspected or repaired. Disconnect from electrical source.

The above warnings are to be adhered to in order to reduce the risks resulting from the normal usage of the hydraulic power units for the safety and health of the users.

The product you have purchased is guaranteed for a period according to existing regulations.

The warrant will be void if the product has been installed or used in a manner not in accordance with our instructions, or if it was tampered with, modified, subjected to usage outside those prescribed.

Fig. 1



Directives and standards

- PED (97/23/EC)

The pressure relief valve assembled into the power pack can not to be considered and/or confused with the safety valve when the PED Directive is applied to the hydraulic system.

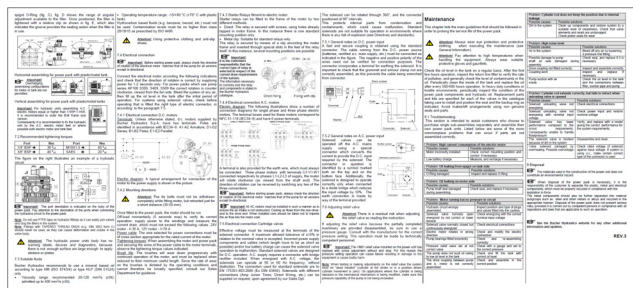
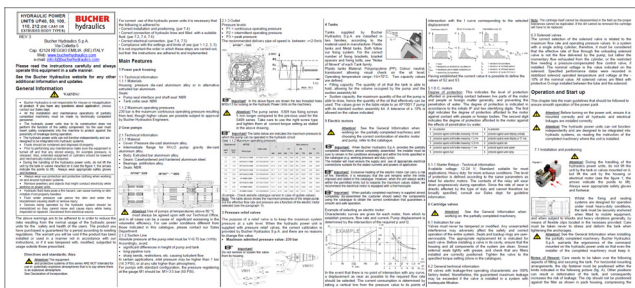
- Atex:

The equipment and protective systems of these catalogue ARE NOT intended for use in potentially explosive atmospheres. Ref: Directive 99/92/EC and Directive 2014/34/UE.

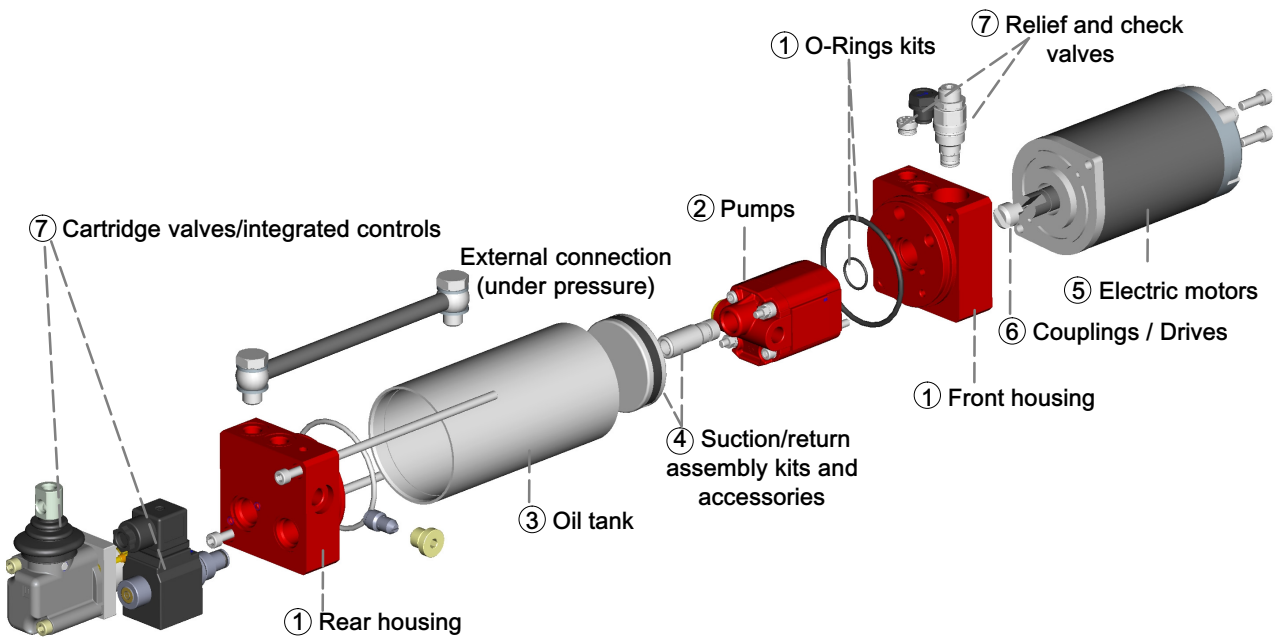
- ISO 9001:2015 / ISO 14001:2015

Bucher Hydraulics S.p.A. is certified for research, development and production of directional control valves, power units, gear pumps and motors, electro pumps, cartridge valves and integrated manifolds for hydraulic applications.

Further information are available in the dedicated documentation according to the Machinery Directive 2006/42/EC



Sub-assembly index



Sub-assemblies making up UP40 power pack

This page serves both as a guide to the contents of the catalogue and as an order form.

Simply fill in the individual sections with the designation codes for the options selected, and send direct to the Bucher Hydraulics S.p.A. Sales Centres.

1	Type of housing	
2	Pump	Series
3	Tank	Fitting Pos.
4	Suction assembly kit	Leave blank when ordering complete power packs.
5	Electric motor	Pos. Relay Pos.
6	Drive	
7	Cavity b	Cavity c
	Cavity d	- -
	Cavity e	Hand lever Lever stick Volt

Customer
Qty. - sample
Qty. - batch

1 Power pack housing

1.1 Technical information

1.1.1 Materials

Housing: aluminium bar.
Seals: Buna N

1.1.2 Maximum operating pressures

210 bar is the maximum intermittent operating pressure resulting from test, though higher values are possible subject to approval by Bucher Hydraulics Engineers Dpt.

1.1.3 Pumps

The body versions are intended for use with:
Single pump AP05 S.439 CCW rotation.
Single pump APR05 439 reversible rotation

1.1.4 Valves cavities

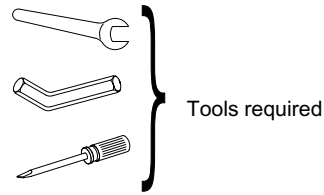
Standard cavities will allow 3/4-16 UNF cartridge valves manufactured by Bucher Hydraulics S.p.A., which are interchangeable with similar components made by major European and US manufacturers.

The only exception are the check valve, the flow regulator and pilot check valve that are realised according to Bucher Hydraulics standard.

A variety of hydraulic circuits can be obtained with the same housing. To facilitate the correct composition of the desired

hydraulic circuit, the position of each cavity is identified by a letter. The combination letter/cavity position remain unchanged for all the various UP40 housings.

1.1.5 Non-standard symbols used in the text



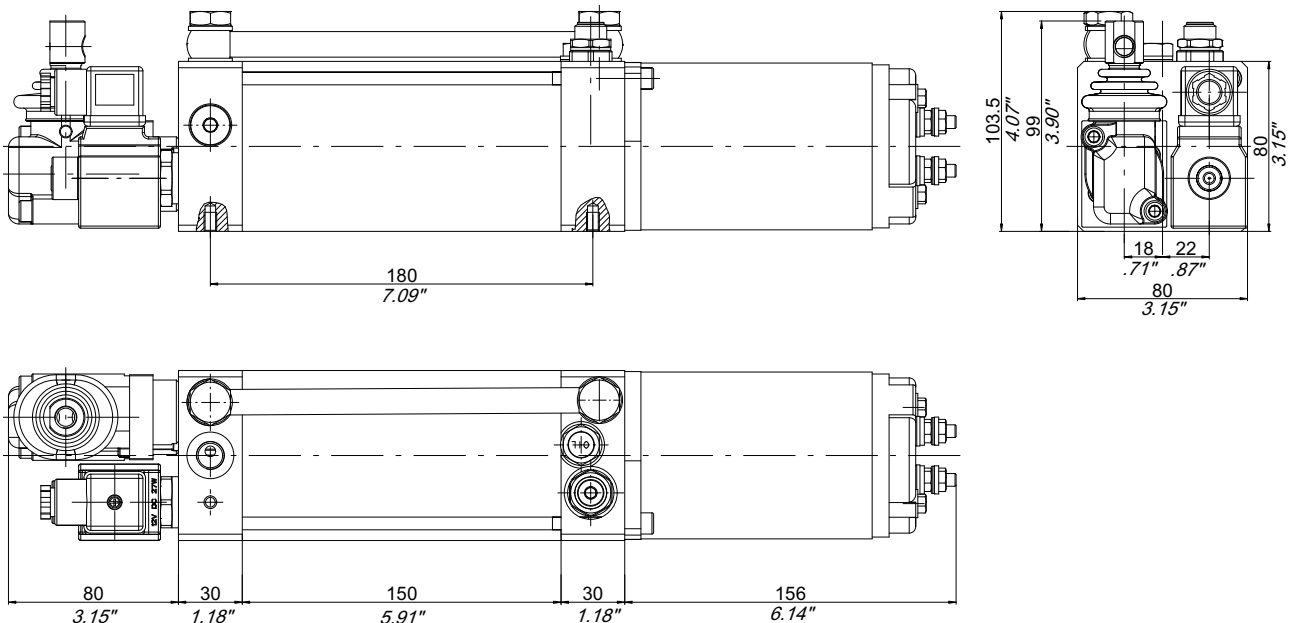
1.1.6 Recommended tightening torques

Port Nm

Standard: 1/4" BSP 30 ⁺⁷/₋₅

Note: other threads on demand

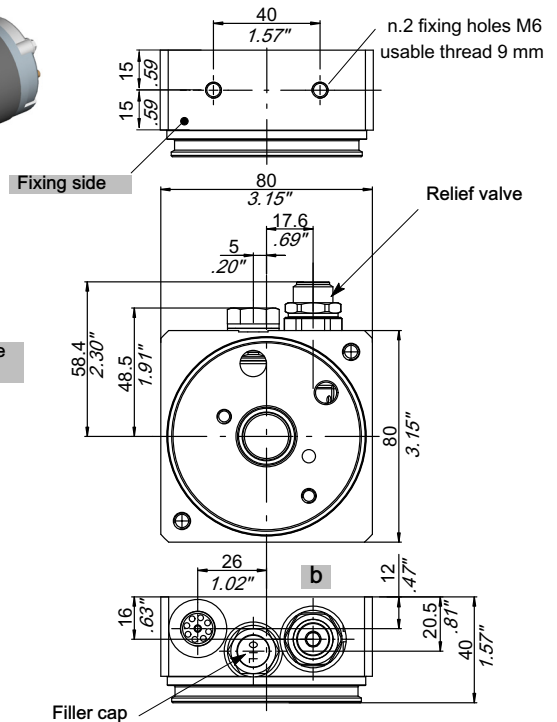
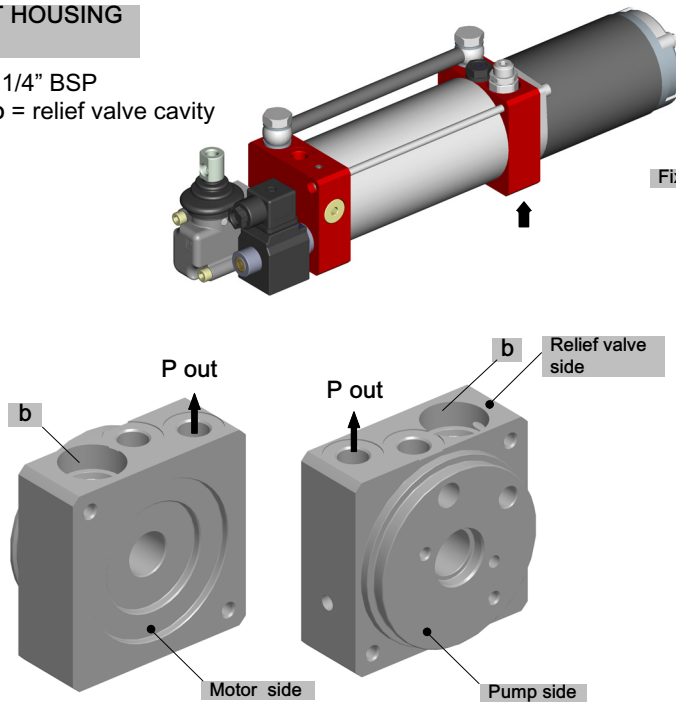
Dimensions example: UP40K1 0.5 l tank capacity



1.2 Housing UP40 K1 (Uni-directional version)

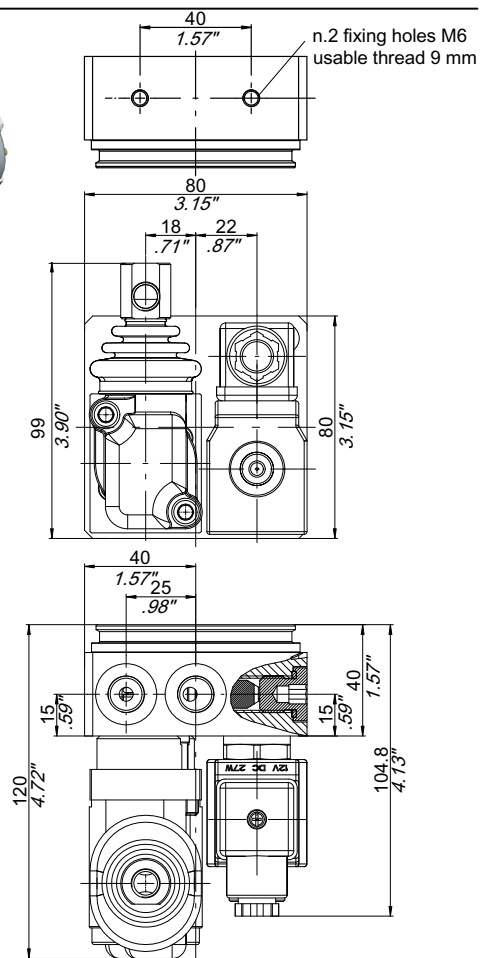
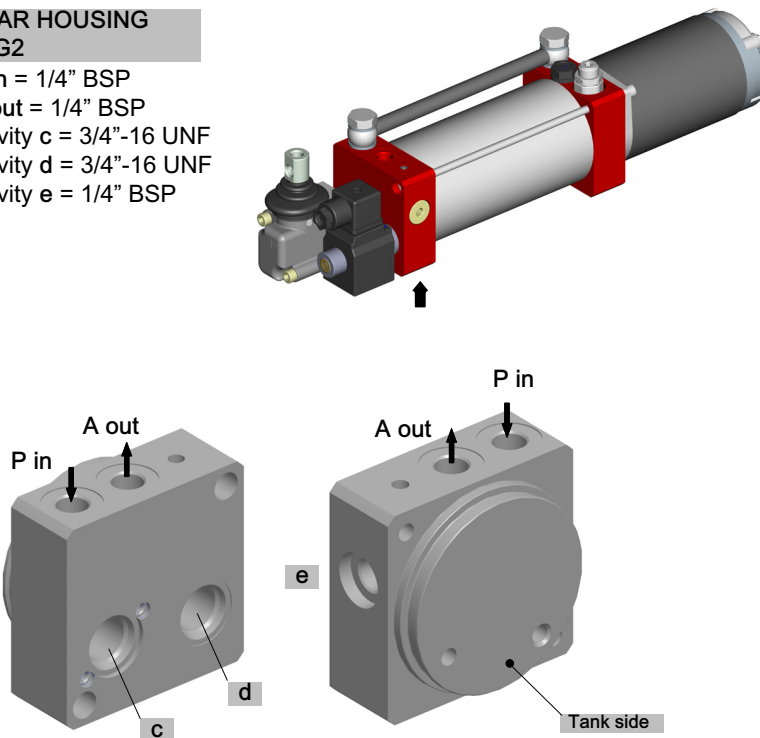
FRONT HOUSING K1

P out = 1/4" BSP
Cavity b = relief valve cavity



REAR HOUSING K1G2

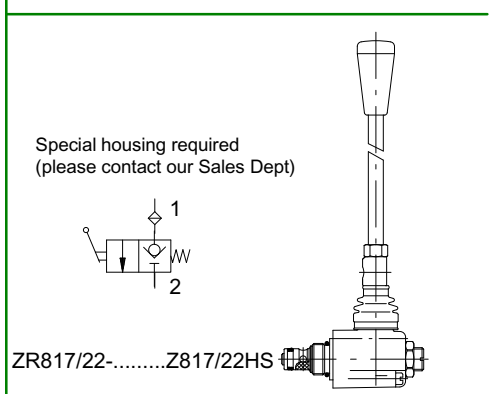
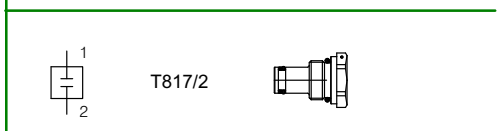
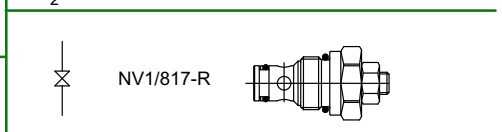
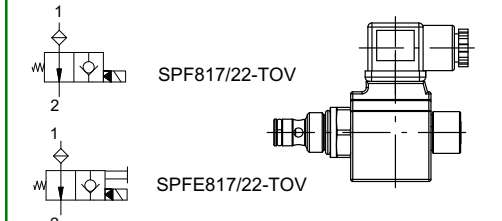
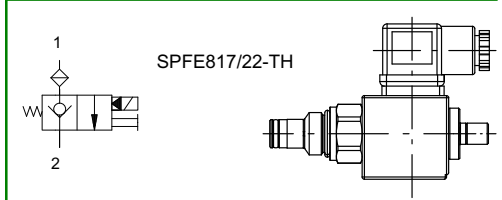
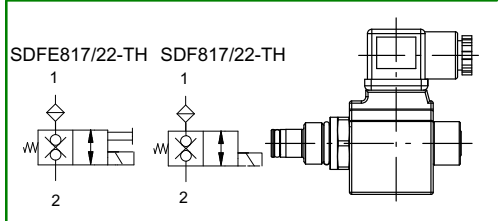
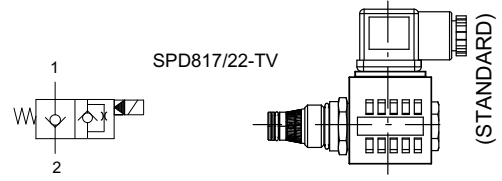
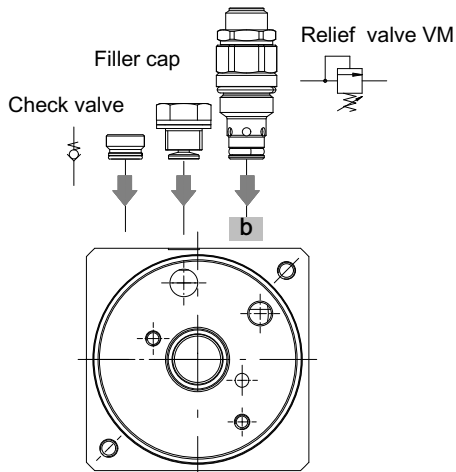
P in = 1/4" BSP
A out = 1/4" BSP
Cavity c = 3/4"-16 UNF
Cavity d = 3/4"-16 UNF
Cavity e = 1/4" BSP



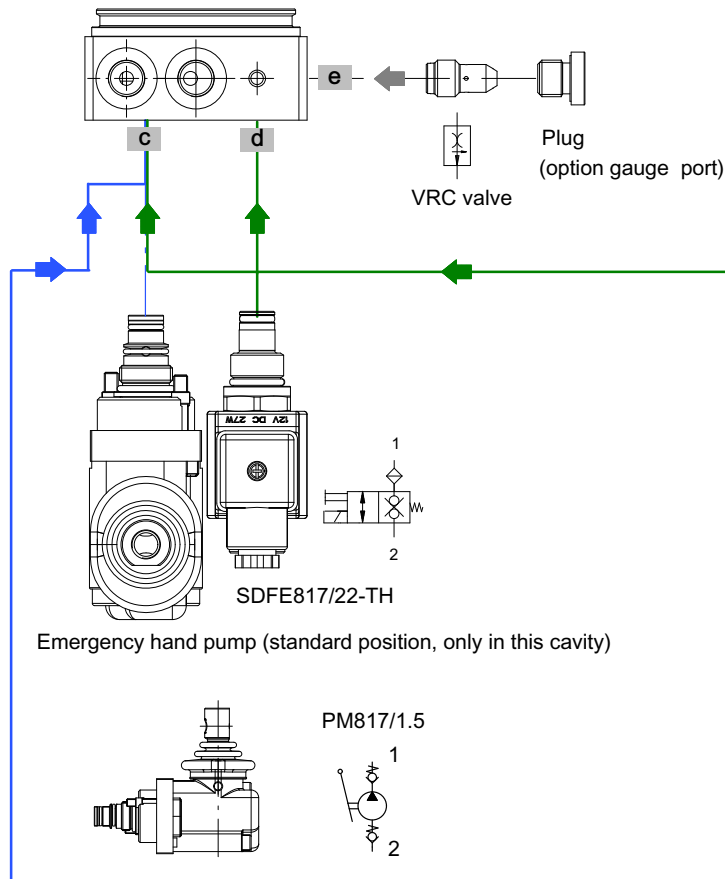
Type	Ports
UP40K1 - K1G2	1/4" BSP

Type of housing											
1	U	P	4	0	K	1	+	K	1	G	2

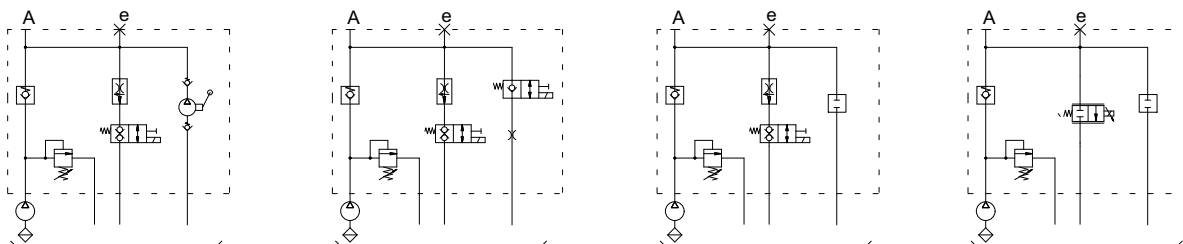
FRONT HOUSING K1 interface



REAR HOUSING K1G2 interface for complete valves circuits



Realizable schemes

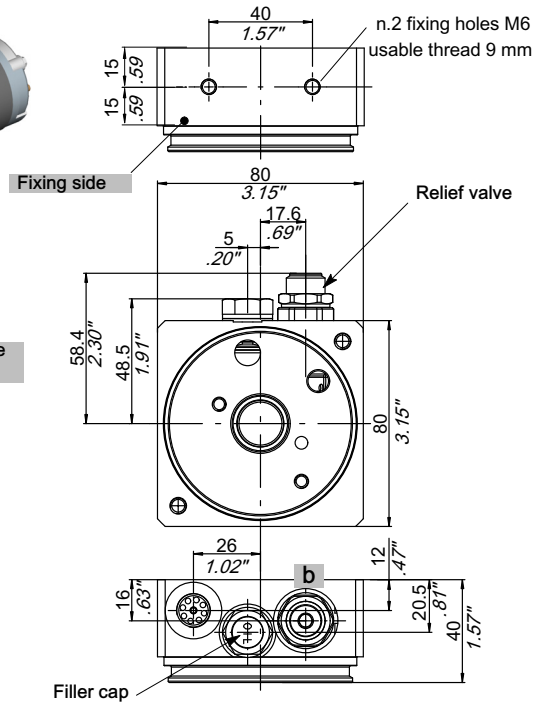
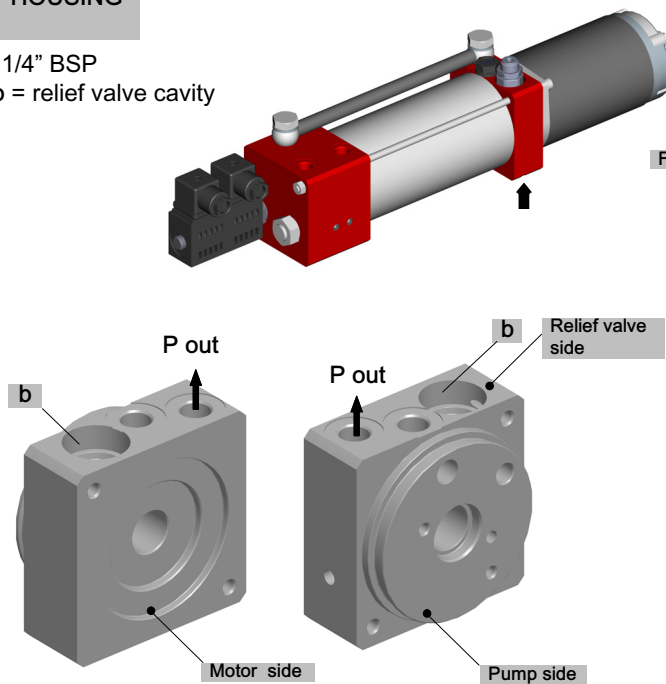


For the availability of new or dedicated hydraulic schemes, please contact our Sales Department.

1.3 Housing UP40 K4 (Uni-directional version)

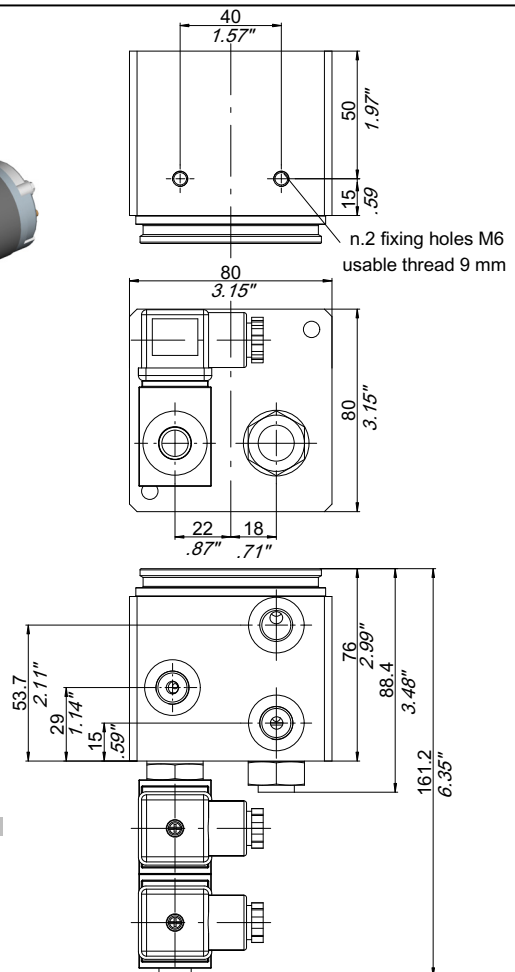
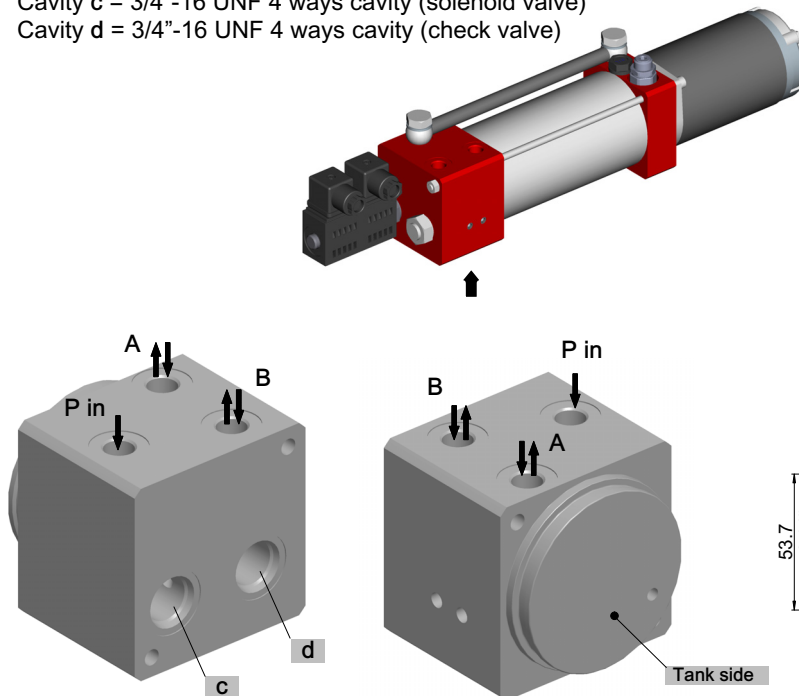
**FRONT HOUSING
K1**

P out = 1/4" BSP
Cavity b = relief valve cavity



**REAR HOUSING
K4G2**

P in = 1/4" BSP
A out = 1/4" BSP
Cavity c = 3/4"-16 UNF 4 ways cavity (solenoid valve)
Cavity d = 3/4"-16 UNF 4 ways cavity (check valve)

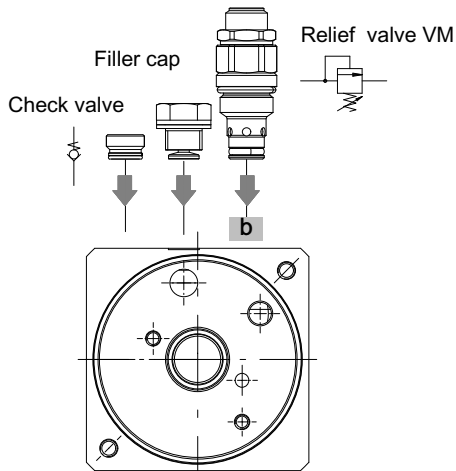


Type	Ports
UP40K1 - K4G2	1/4" BSP

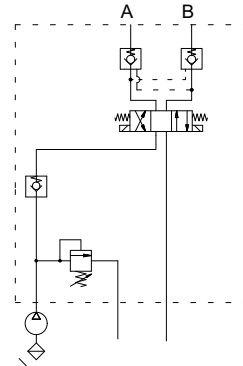
Type of housing

1	U	P	4	0	K	1	+	K	4	G	2								
---	---	---	---	---	---	---	---	---	---	---	---	--	--	--	--	--	--	--	--

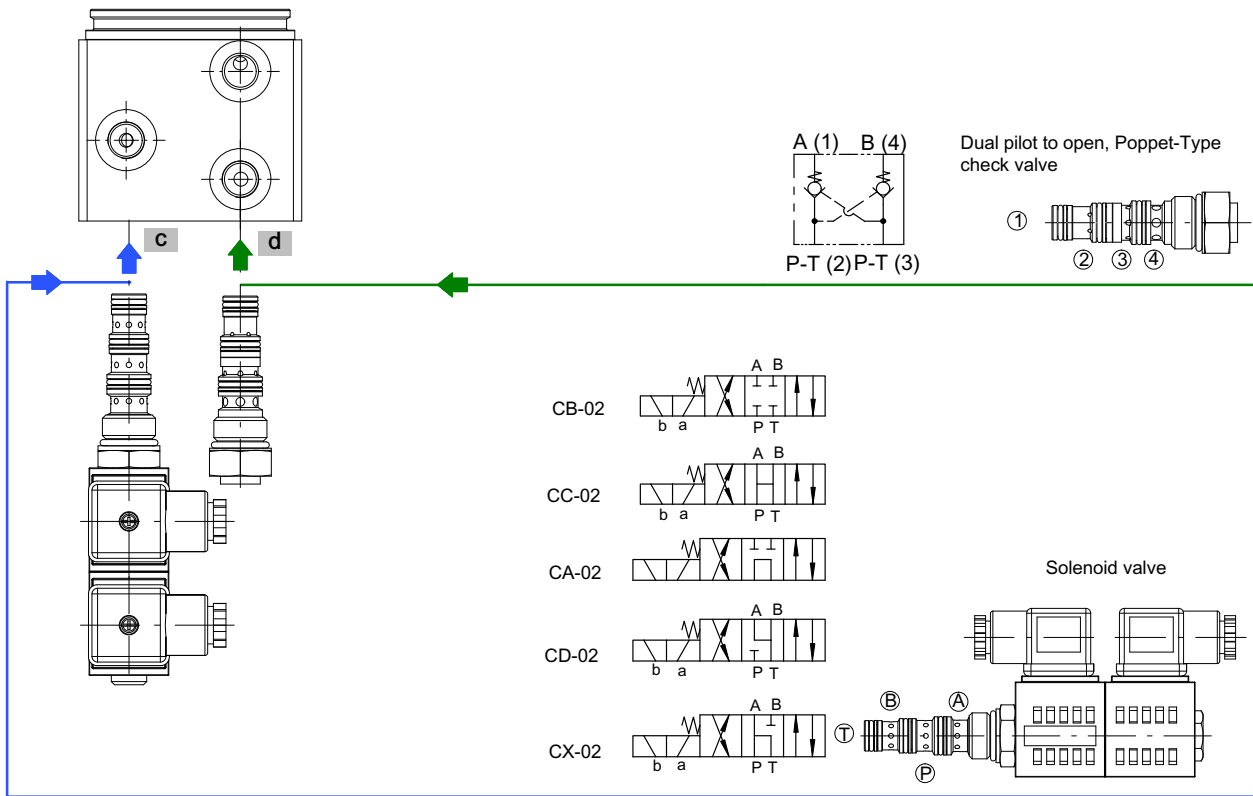
FRONT HOUSING K1 interface



Realizable scheme

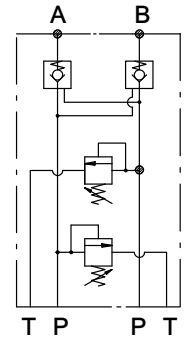
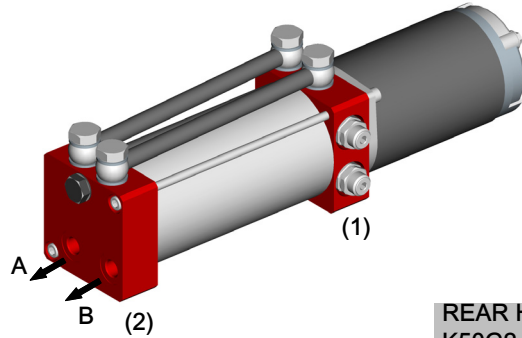


REAR HOUSING K4G2 interface for complete valves circuits



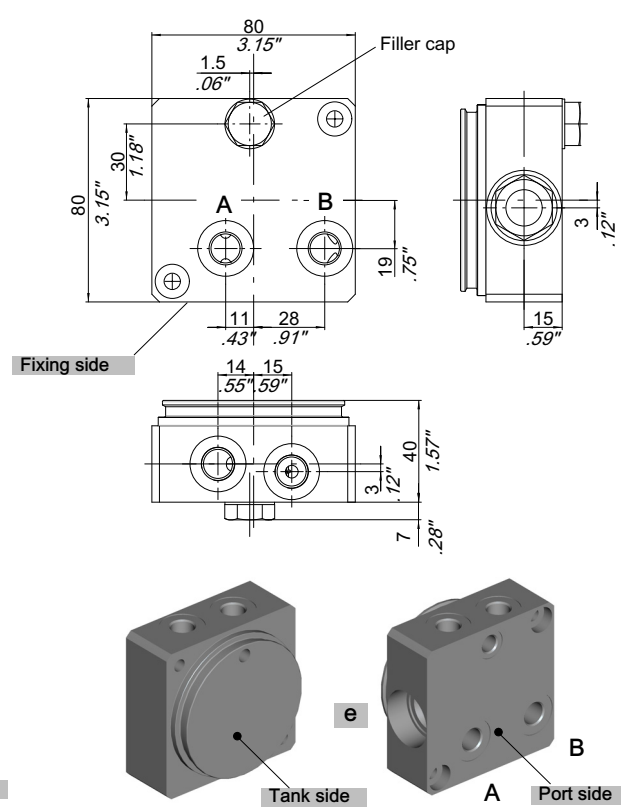
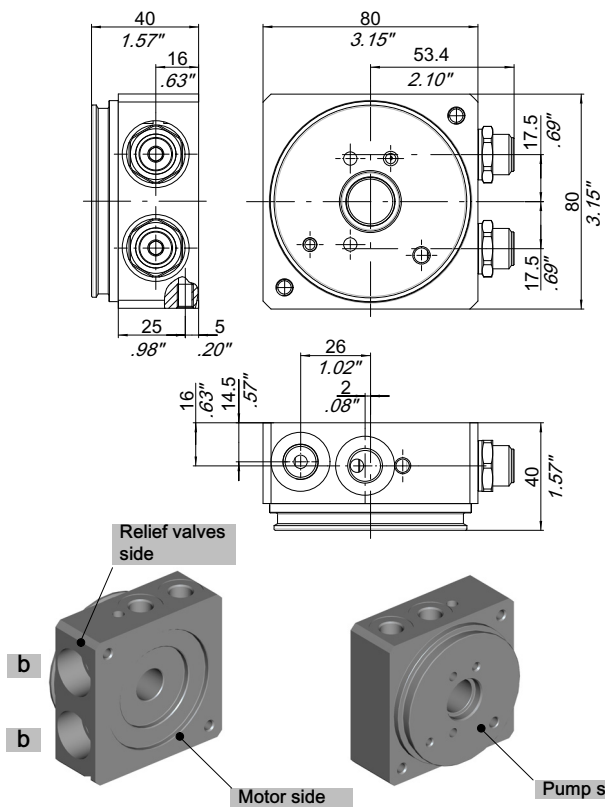
For the availability of new or dedicated hydraulic schemes, please contact our Sales Department.

1.4 Housing UP40 K5 Reversible



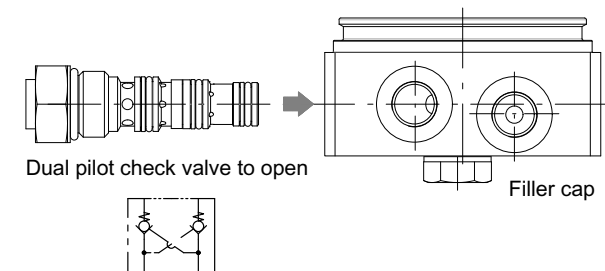
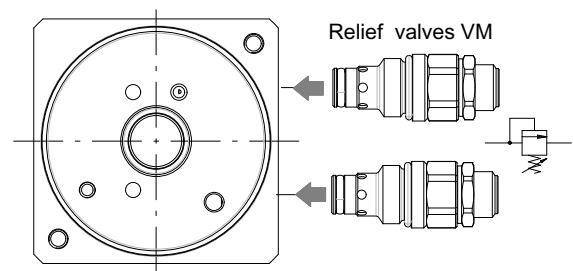
**FRONT HOUSING
K5 (1)**

**REAR HOUSING
K50G2 (2)**



**FRONT HOUSING
K5 (1) interface**

**REAR HOUSING
K50G2 (2) interface**



Type	Ports
UP40K5+K50G2	1/4" BSP

Type of housing																			
1	U	P	4	0	K	5	+	K	5	0	G	2							

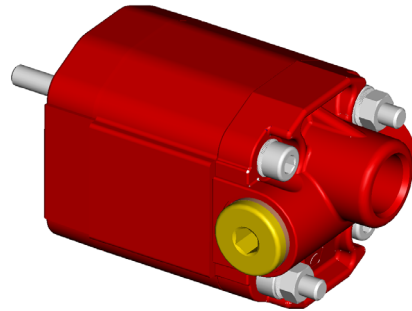
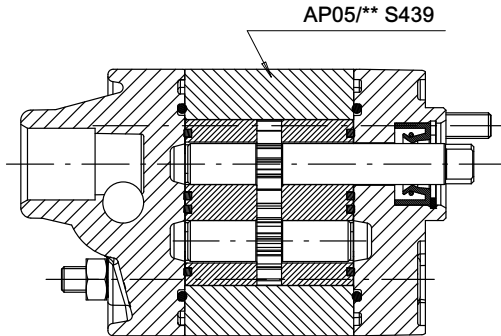
2 Gear pumps

2.1 Technical information

2.1.1 Material

Covers: Pressure diecast aluminium alloy
 Body: Extruded aluminium alloy
 Gears: Casehardened and hardened steel.

Bearings: Aluminium alloy.
 Seals: NBR.



2.1.2 Suitable fluids

Only mineral oil based hydraulic fluids responding to ISO/ DIN standard should be used.

Viscosity range:

recommended 20 - 120 mm²/s (cSt)

admitted up to 700 mm²/s (cSt)

Operating temperature range: -15 +80 °C

For other fluids consult our Sales Department.



ATTENTION! Use of pumps at temperatures above 80°C must always be agreed upon with our Technical Office, and in any case this can cause a significant worsening in the volumetric efficiency. For use under conditions different from those indicated in this catalogue, please contact our Sales Department.

2.1.3 Inlet

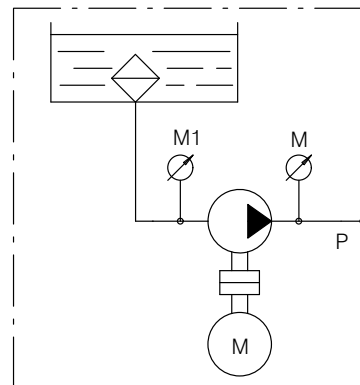
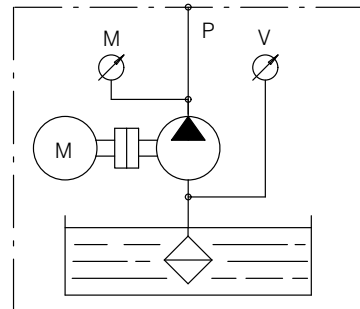
Absolute pressure at the pump inlet must be:

$V > 0.75 \text{ bar (11 PSI)}$

2.1.4 Outlet

The recommended delivery pipe oil speed is between:

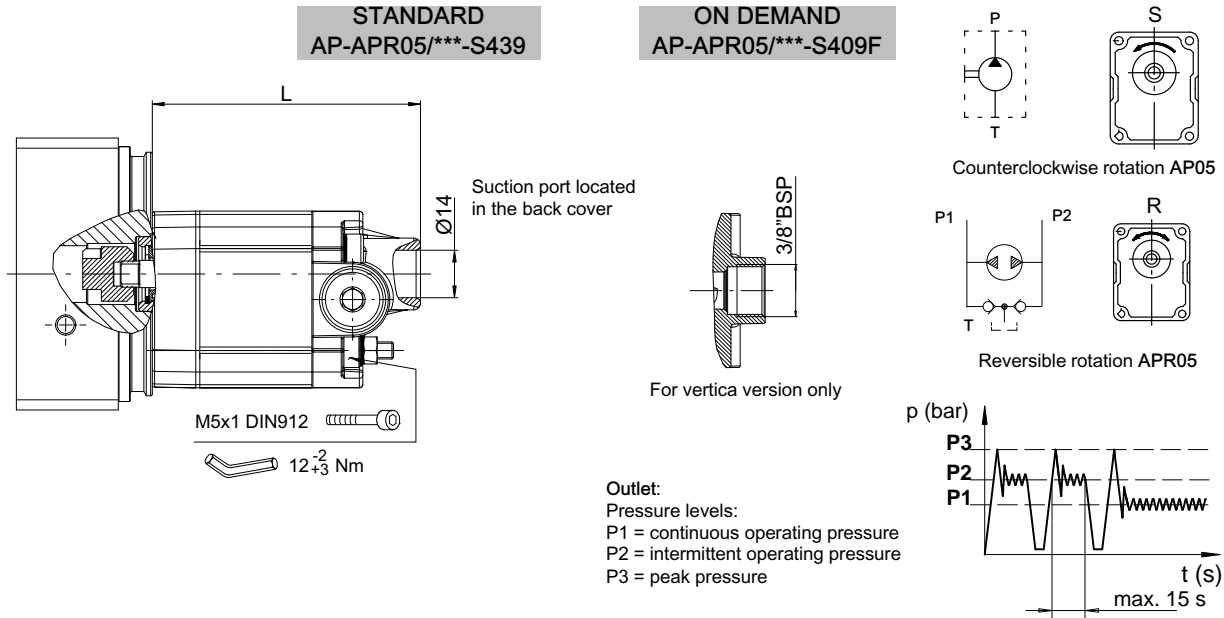
$V = 2 - 5 \text{ m/s.}$



2.2 Gear pumps AP05/** S439 - APR05/** S439

Counterclockwise rotation: in combination with K1 - K1G2 - K4 housings

Reversible: in combination with K5 - K50G2 housings



Example	Pump	Series
2	A P 0 5 / 0 , 2 5	S 4 3 9

AP/APR05	Displacement		L		Max. pressure						n. min.		n. max.
	cm ³ /rev	in ³ /rev			P1		P2		P3		P<100 bar	P>100 bar	P>P1
	mm	in	bar	PSI	bar	PSI	bar	PSI	bar	PSI			
0.25	0.25	.015	77	3.03	170	2460	180	2610	200	2900	800	3000	7000
0.5	0.5	.031	79	3.11	190	2750	210	3040	230	3330	650	3000	7000
0.75	0.75	.046	81	3.19	190	2750	210	3040	230	3330	650	1500	7000
0.9	0.9	.055	82.5	3.25	190	2750	210	3040	230	3330	650	1500	7000

AP05 APR05	Order code			
	AP05 S439	AP05 S439F	APR05 S439	APR05 S439F
0.25	200100294303	-	200100294401	-
0.5	200100394303	-	200100394401	-
0.75	200100494303	-	200100494401	-
0.9	200100594303	-	200100594401	-

3 Tanks

3.1 Technical information

Materials: aluminium.
 Color: Aluminium (Standard)
 Condition of use: Suitable fluids: mineral oil based hydraulic fluids responding to ISO -DIN standards.
 Hydrocarbon based fluids (e.g. benzene, benzol, etc.) must not be used.

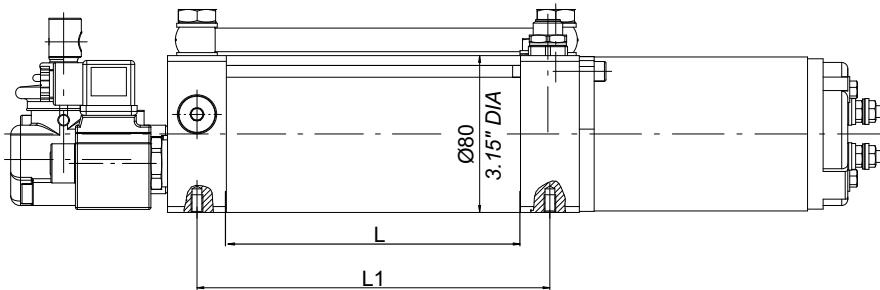
Versions: tanks are available in different capacity, allowing installation of the power pack in horizontal or vertical positions (see note).



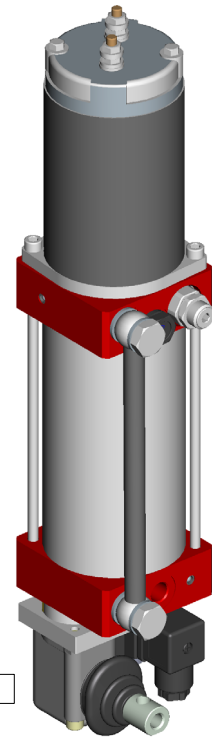
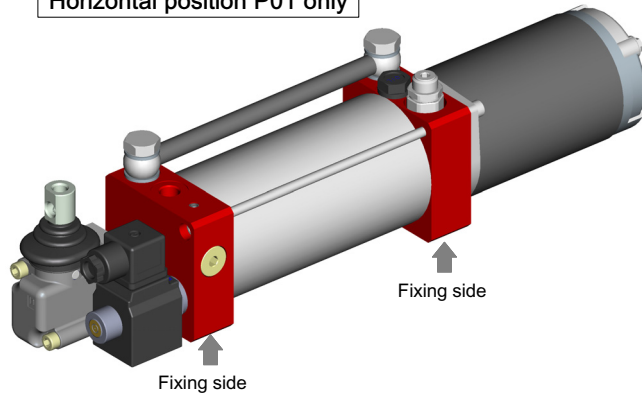
ATTENTION!

Whilst the fixing and sealing systems are designed for operation under the most heavy-duty conditions, the unit must be securely anchored when fitted to mobile equipment.

Bucher suggests to protect the nearest environment toward eventual oil leakage that may occur.



Horizontal position P01 only



Vertical position P15



IMPORTANT! Other horizontal positions are not admitted due to suction filter and filling plug.

The opposite position of P15 is not possible.

For P15 position, before the assembling, might need filling the tank with a proper syringe or similar device.

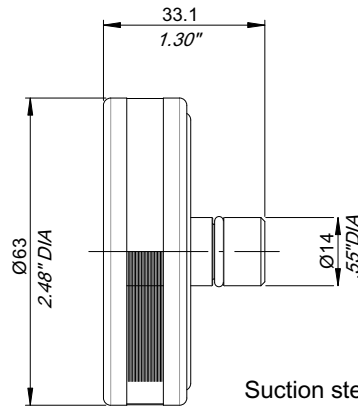
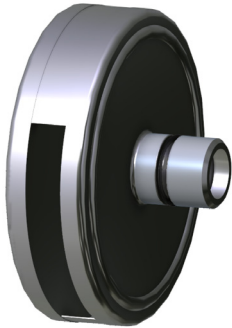
Nominal capacity		Type/Code		L		L1				Suction capacity	
						K1-K4-K50		K5			
I	cu inch	Type/Code		mm	in	mm	in	mm	in	Horizontal	Vertical
0.5	30.5	L-005R	200672010010	150	5.91	180	7.09	190	7.48	0.45	0.45
1.2	83	L-012R	200672090020	325	12.79	355	13.98	365	14.37	1.15	1.15
1.5	91.54	L-015R	-	355	13.98	385	15.16	395	15.55	1.15	1.15

For other types of tanks capacity please contact our Sales Department.

4 Suction assembly

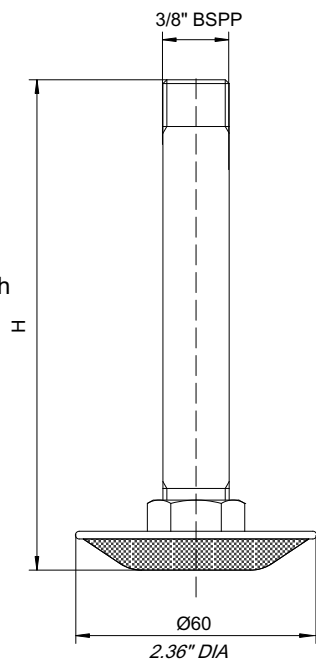
4.1 Version S439 Ø14 for horizontal positions

Code 200757500020



Suction steel filter: 30µm nominal wire mesh

4.2 Version S439F 3/8" BSPP for vertical positions



Suction steel filter:
250µm nominal wire mesh

PUMP	L-005R (H mm)	L-012R (H mm)	L-015R (H mm)
AP05 S439F/0,25	55	256	275
AP05 S439F/0,5	55	256	275
AP05 S439F/0,75	57	258	275
AP05 S439F/0,9	57	258	275

For the combinations of the suction assembly kits for other tanks, horizontal/vertical positions please consult our Sales Department.

5 Electric motors

Electric motor available:

5.1 D.C. motors

Generally used for mobile applications

5.1 D.C. Electric motors

5.1.1 Technical information

Available versions:

Voltage: 12-24 V

Power rating: 0.5 ÷ 0.8 kW.

For different input voltage and power rating, consult our Sales Department.

Direction of rotation:

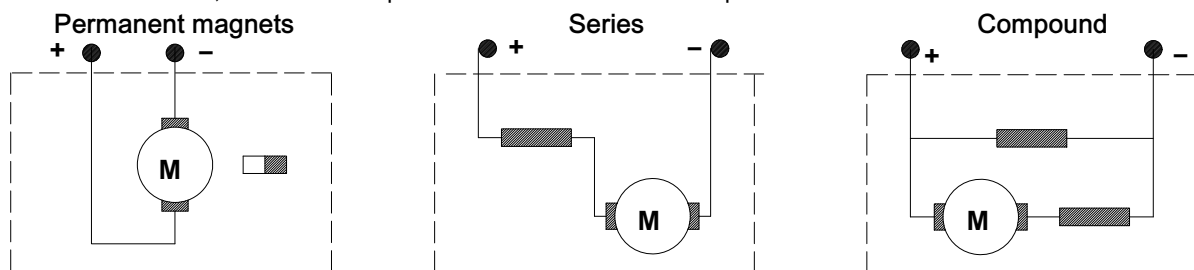
Unless otherwise stated, all motors are specified clockwise

rotation, suitable for driving counterclockwise pump.

Type of winding:

D.C. motors can be manufactured in different types of field windings:

- Permanent magnets (STANDARD)
- Series
- Compound



Insulation class:

The class of electric insulation reflects the maximum temperature the motor can register during operation without damage to the insulating material internally of the motor itself.

The following table indicates insulation classes to CEI 15-26.

Class	Y	A	E	B	F	H
Temperature (°C)	90	105	120	130	155	180

Type of duty:

To ensure selection of the electric motor best suited to a given set of operating conditions, the duty cycle needs to be verified. Duty cycles S1, S2 and S3 are defined below in accordance with CEI 2-3

Continuous duty S1:

Operation on-load (steady conditions) for a period of indefinite duration, during which the motor reaches thermal equilibrium without exceeding the maximum permissible temperature.

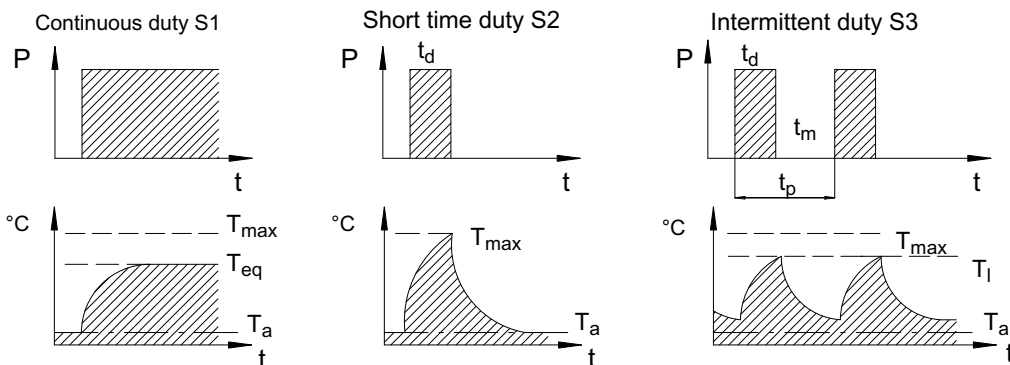
Short time duty S2

Operation on-load (steady conditions) for a period of limited duration, denoted t_d in the diagram, during which maximum permissible temperature is reached, followed by an off-load period of duration sufficient for the temperature of the motor to return to ambient temperature.

Intermittent duty S3

A sequence of identical cycles, each 10 minutes in duration, the single cycle comprises a period of operation on-load t_d , during which the motor may reach its maximum permissible temperature, is reached, followed by an off-load period of limited duration t_m , insufficient for the temperature of the motor to return to ambient temperature.

The value of S3 indicates the duration of the on-load period t_d in relation to the overall cycle time t_p , as a percentage.



$$S3 = \frac{t_d}{t_d + t_m} \times 100$$

P = load
 T_{eq} = temperature at thermal equilibrium
 T_{max} = maximum permissible temperature
 T_l = operating temperature

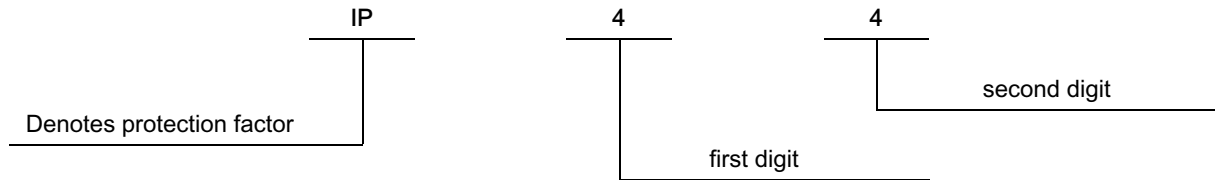
T_a = ambient temperature
 t_d = duration of on-load period
 t_m = duration of off-load period
 t_p = duration of cycle (10 min.)

Degree of protection:

This indicates the level of protection afforded in preventing contact between live parts of the motor and people or foreign matter generally, and preventing the penetration of water.

The degree of protection is indicated in accordance with CEI 2-16 by the initials IP and two identifying digits:

Example:



The first digit indicates the degree of protection afforded to the motor against contact with people or foreign bodies.

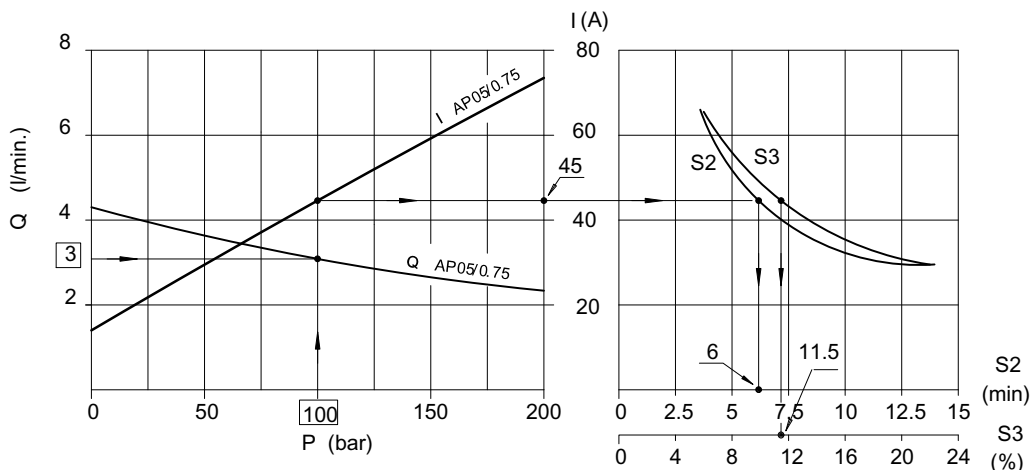
The second digit indicates the degree of protection afforded to the motor against the effects of penetration by water.

0	no protection	0	no protection
1	protection against solid bodies measuring > 50 mm	1	protection against water dripping vertically
2	protection against solid bodies measuring > 12 mm	2	protection against water dripping at 15° max
3	protection against solid bodies measuring > 2.5 mm	3	protection against rain
4	protection against solid bodies measuring > 1 mm	4	protected against water splash
5	protection against dust	5	protected against water spray

5.1.2 Characteristic curves

Characteristic curves are given for each motors, from which to establish pressure, flow rate and current consumption

values, and S2 and S3 duty cycles.



5.1.3 Example of how the graphs are used

Required data

Flow rate $Q = 3 \text{ l/l'}$

Pressure $p = 100 \text{ bar}$

Pump displacement

Determined by the intersection of the required p and Q curves.

In the example indicated, pump AP05/0.75 has the required p and Q specifications.

In the event that there is no point of intersection with any curve, a displacement as near as possible to the required flow rate should be selected.

Current consumption

This is determined by taking a vertical line from the pressure value to its point of intersection with the I curve corresponding to the selected displacement.

In the example illustrated, current consumption is:

$I = 45 \text{ Ampere}$

Type of use

Having established the current, the relationship of the S2 and S3 curves will give the following values:

S2 = 6 min. S3 = 11.5%

Terminals

Unless otherwise stated, d.c. motors supplied by Bucher Hydraulics S.p.A. have two terminals.

Poles are identified in accordance with IEC34-8

A1 - A2 Armature

D1 - D2 Series

B1 - B2 Poles

E1 - E2 Parallel

Electric diagram

A typical arrangement for connection of the motor to the power supply is shown in the diagram.

5.1.4 Mounting directions

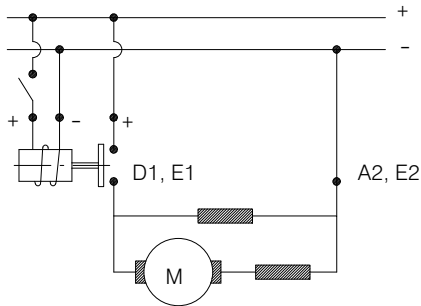


The tie bolts must not be withdrawn completely while fitting motor, but retracted just for a short distance (30-50 mm max).

Once fitted to the power pack, the motor should be run off-load momentarily (5 seconds max) to verify its correct operation: supply power to the windings and measure the current drain, which must not exceed 35 Ampere.

Power cable

The wire selected for power connections must be of cross section appropriate for the rated current of the motor.



Tightening torques

When assembling the motor and power pack and securing the wires of the power cable to the motor terminals, observe the tightening torque values indicated.

Brush life

The brushes will wear down progressively with continued operation of the motor, and must be replaced when reduced to their minimum useful length.

Since the rate of wear on the brushes is dictated by the operating conditions and cannot therefore be broadly specified, consult our Sales Department for guidance.

Bucher Hydraulics S.p.A. is not an electric motors manufacturer so these components come from third part. Bucher Hydraulics S.p.A. reserves the right to change the motor supplier whenever considers it necessary without notice

5.1.5 Starter Relays - Technical information

Versions:

Available voltage: 12-24 V

See relative table for technical data for:

- Electrical insulation class
- Type of duty
- Protection factor:

The level of protection is defined according to the same parameters as listed for electric motors.

Contact life:

The contacts of the relay will wear down progressively during operation.

Since the rate of wear is dedicated by the type of duty and cannot therefore be broadly specified, consult our Sales dept. for guideline information.

Fitment to electric motor

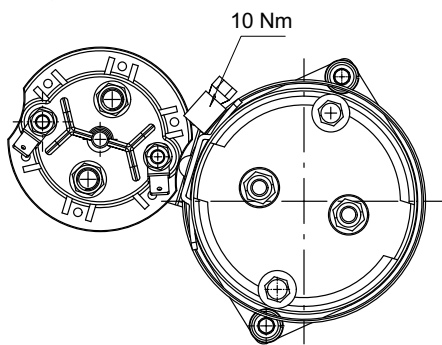
Starter relays can be fitted to the frame of the motor by a metal clip.

The relay is secured by means of a clip encircling the motor frame and inserted through special slots in the feet of the relay itself.

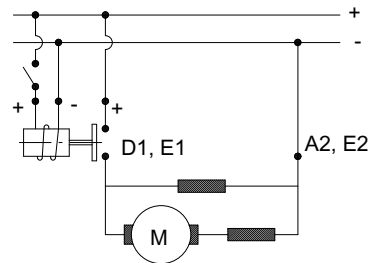
In this instance, several mounting positions are possible.

Electrical diagram

A typical arrangement for connection of the relay to the electric motor is shown in the diagram.

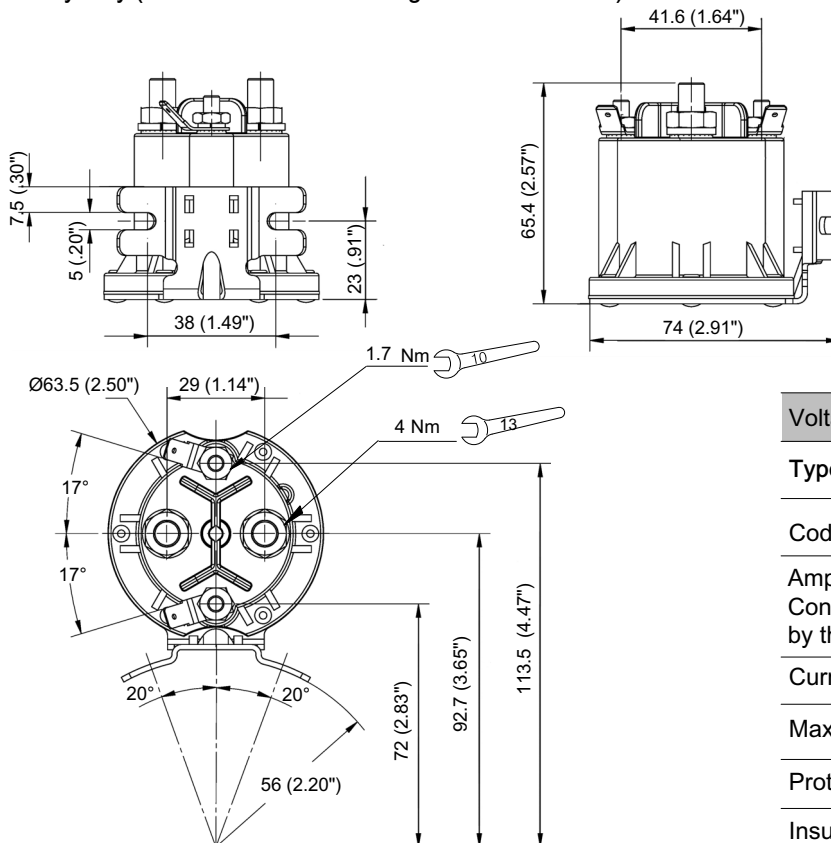


Fixing with clip

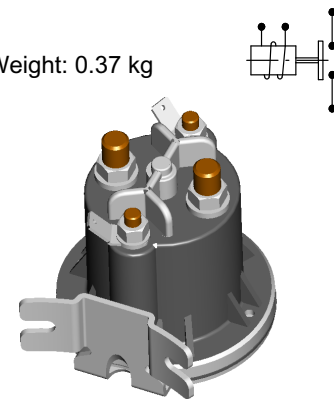


Electric diagram

Heavy duty (STANDARD for wide range of DC el. motors)



Weight: 0.37 kg

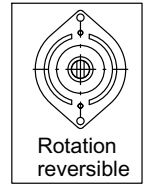
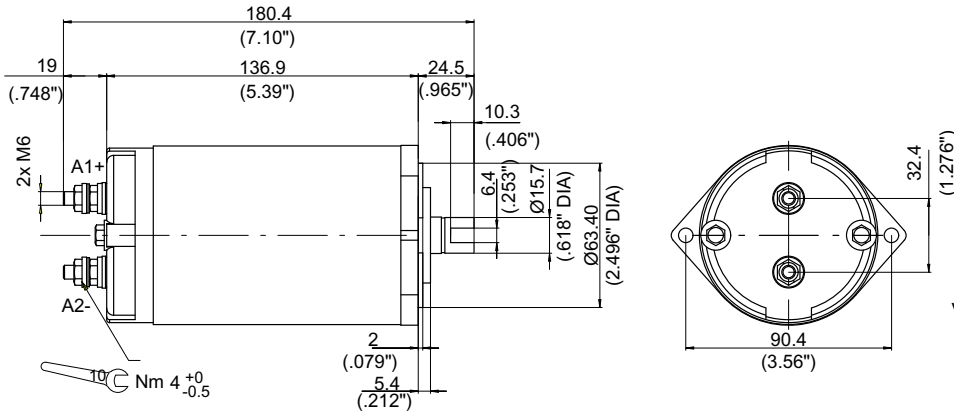


Voltage	12 V	24 V
Type	R109	R215
Code	200544134109	200544134215
Amps Consumption by the coil	2.2 A	1.2 A
Current for continuous duty		150 A
Max. current (5 sec.)		800 A
Protection index		IP66
Insulation class		F


Voltage	Nominal Power
12 V	500 W
24 V	500 W

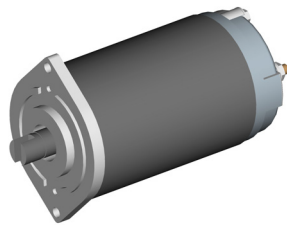
Protection index: IP54
 Insulation class: F
 Type of winding: Permanent magnets
 Rating output power : 500 W
 Character of work: S2 5 min, S3 17%

Weight: 2.50 Kg (4.96 lb)



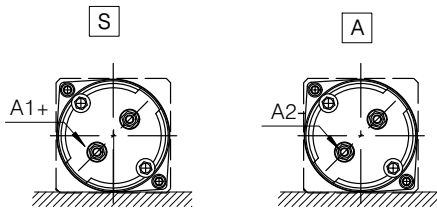
Attention!
 Utilising unidirectional pump,
 verify the electrical connection.
 The motor must rotate
 clockwise (CW)

	Motor		Motor with relay
Rotation Reversible			
Type	C120PD/C0	C220PD/C0	
Code	200543912003	200543922004	
Relay			
Relay type			

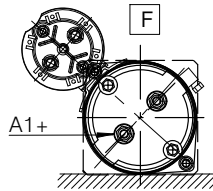


Motor mounting position

Standard positions



Relay standard position

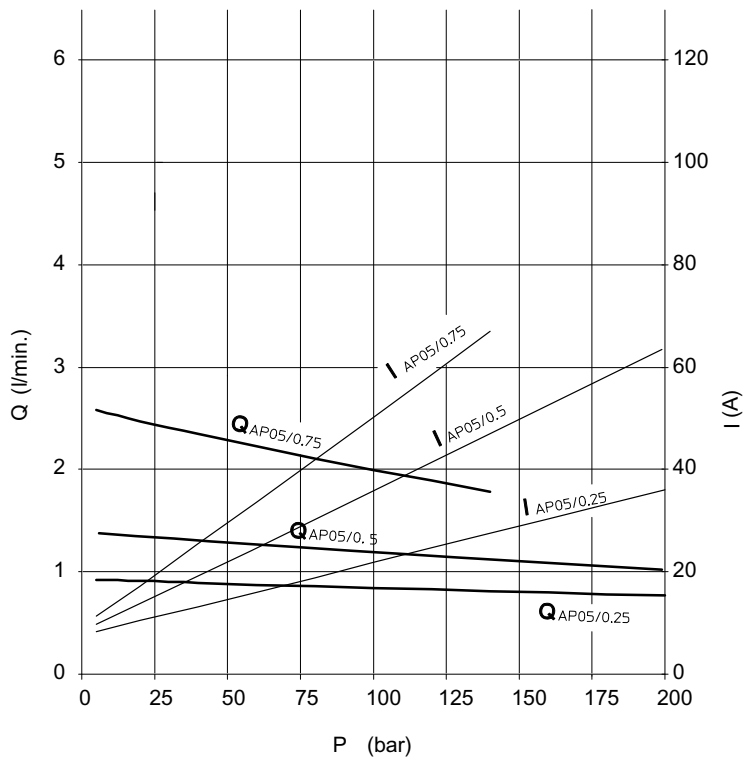


5	Electric motor							Pos.		
	C	1	2	0	P	D	/	C	0	S

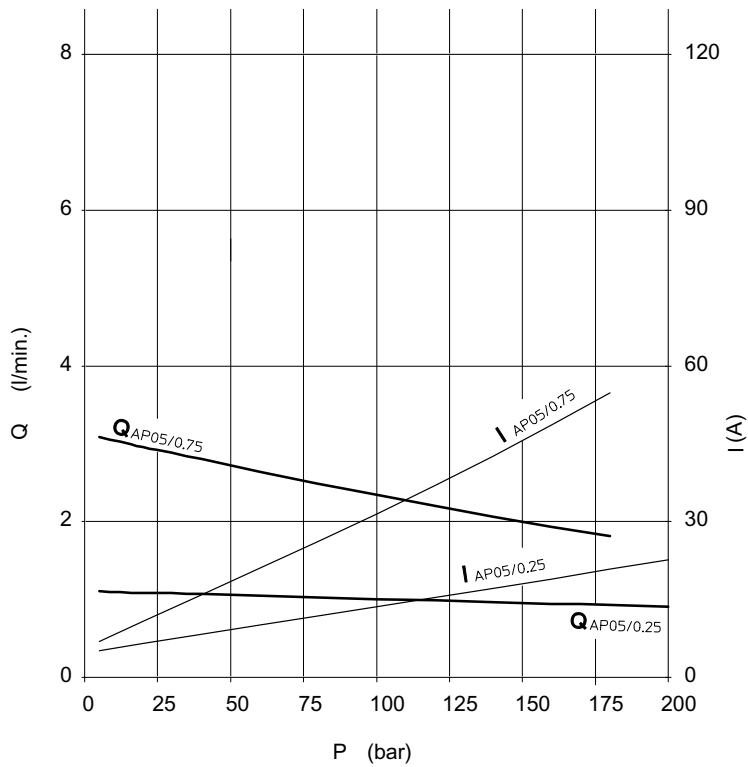
Example

Relay				Pos.

12 V - 500 W

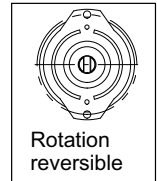
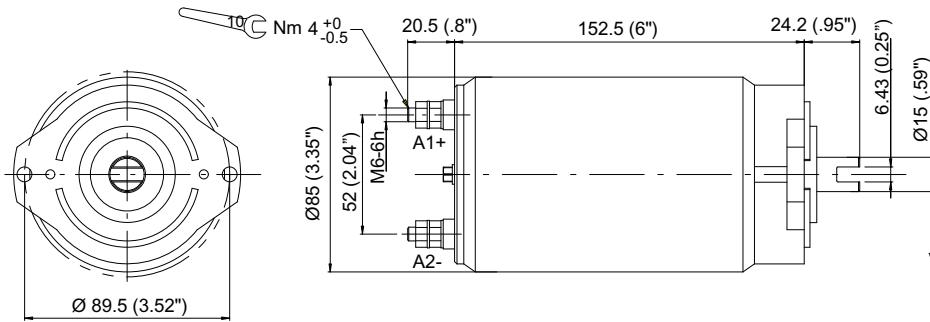


24 V - 500 W



Voltage	Nominal Power
12 V	800 W
24 V	800 W

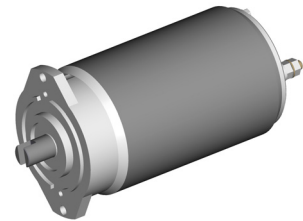
Protection index: IP54
 Insulation class: F
 Type of winding: Permanent magnets
 Relay fixing kit 200709000090
 Minimum brushes length: 5 mm (0.2 inches)



Attention!
 Utilising unidirectional pump,
 verify the electrical connection.
 The motor must rotate
 clockwise

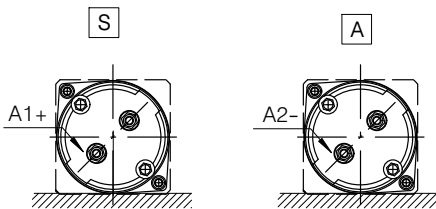
Weight: 3.70 Kg (8.15 lb)

Rotation reversible	Motor		Motor with relay	
	12V-800W	24V-800W	12V-800W	24V-800W
Type	C128PK/A0	C228PK/A0	C128PK/A0 + R109	C228PK/A0 + R215
Code	200543912809	200543922801	200763310270	200763320300
Relay			Standard	
Relay type			R109	R215

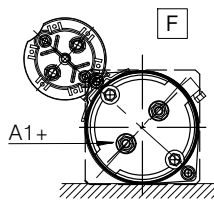


Motor mounting position

Standard positions



Relay standard position

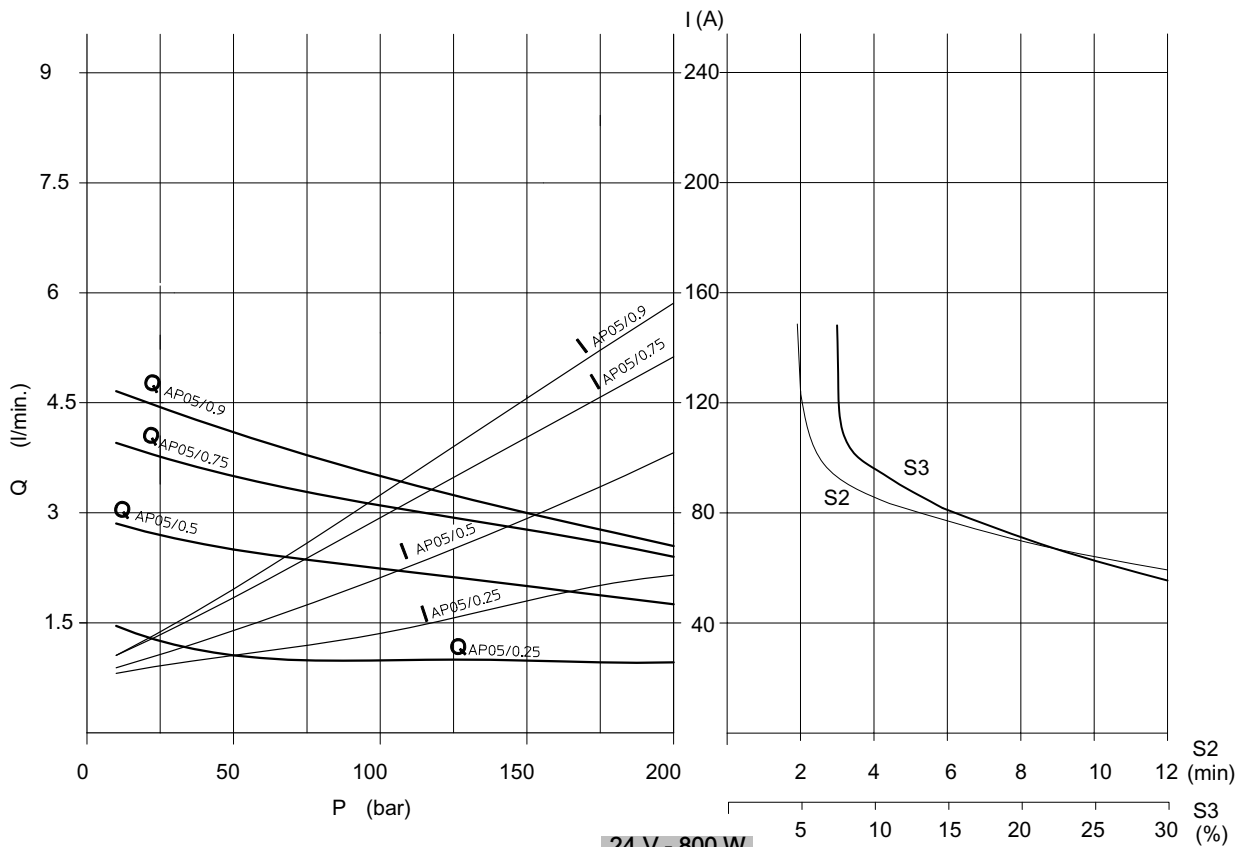


	Electric motor							Pos.		
5	C	2	2	8	P	K	/	A	0	S

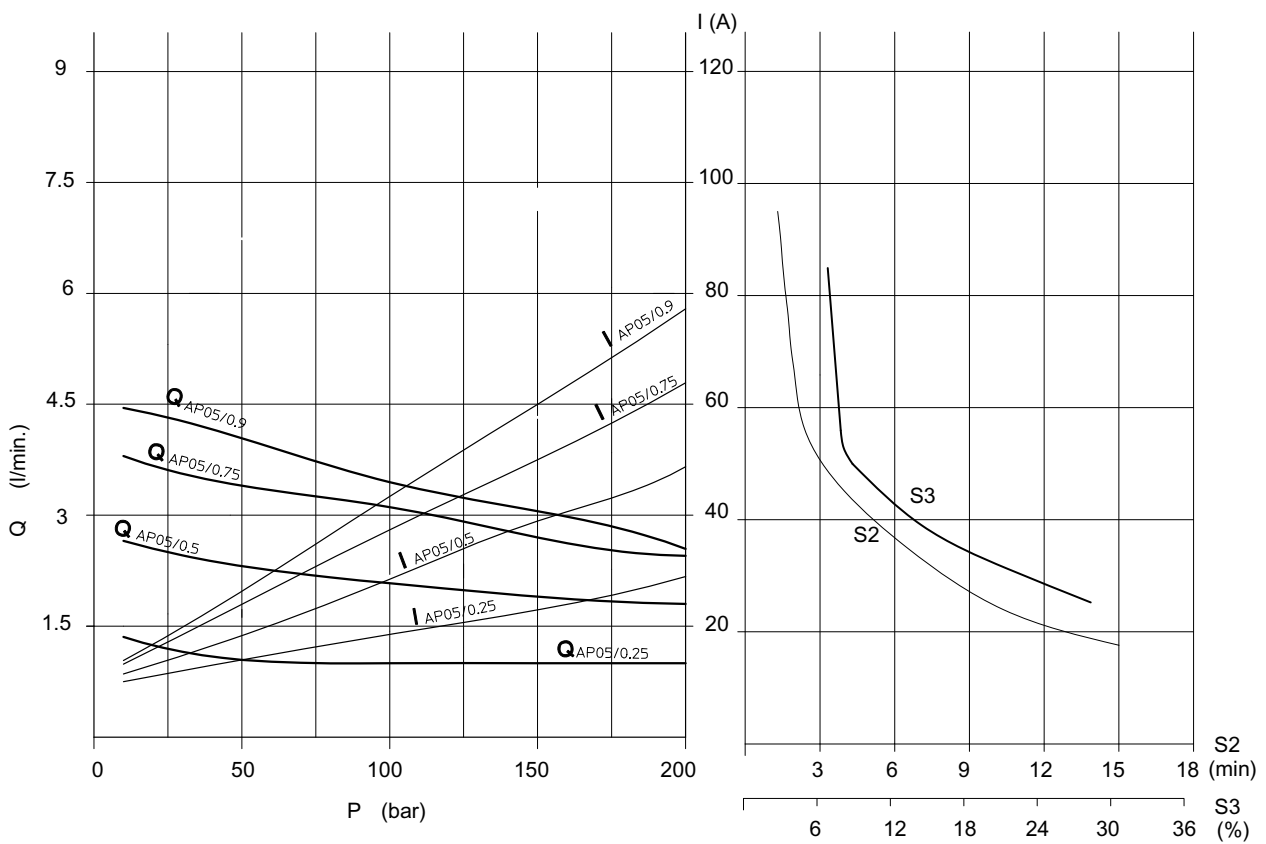
Example

	Relay				Pos.
	R	2	1	5	F

12 V - 800 W

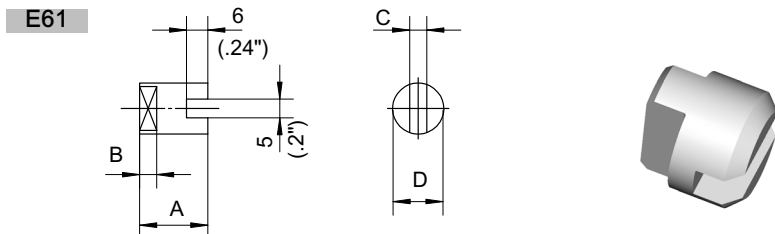


24 V - 800 W



6 Drives

6.1 Couplings



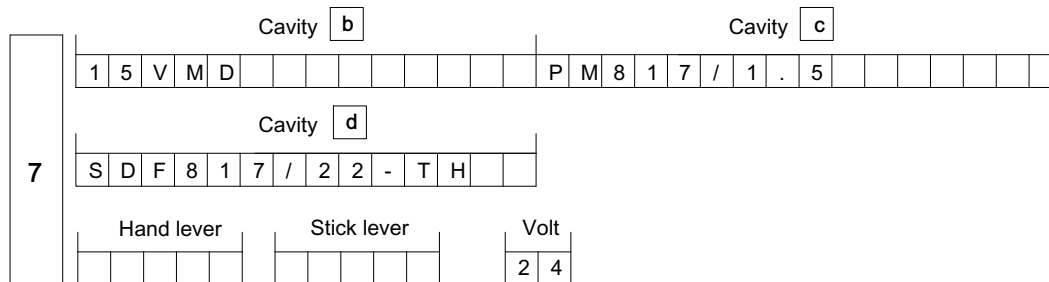
Motor type	Drive system	Coupling code	Dimensions			
			A	B	C	D
C120PD C220PD C128PK C228PK	E61	200659600110	15 .6"	5.5 .22"	6.4 .26"	16 .63"

7 Cartridge valves

7.1 Introduction

This chapter includes all technical information relating to valves for use in conjunction with the housings described in section 1.

Complete the designation codes for the selected valves according to the technical information and guidelines given for each component.



Illustrated here by way of example is a correct and complete compilation for section 7 of the hydraulic power pack designation form.

7.1.1 Materials

Bucher Hydraulics cartridge valves are manufactured using steel of high mechanical strength. Friction and potential wear are minimized by special heat treatments. Surface heat treatments protect parts exposed to the external environment. Standard seals are NBR (Buna N), with backup ring in PTFE. For application requiring special compound FPM (Viton) etc. consult Bucher Hydraulics.

7.1.2 Indication for use

Use mineral oil based hydraulic fluids to ISO/DIN standard, only. Recommended viscosity range: 20-120 mm²/s (cSt) maximum viscosity 700 mm²/s (cSt).

For different fluids and operating conditions, consult our Sales Dpt.

All valves showed in the present catalogue are marked with correct flow direction, please observe it always. Valves must never be tampered with or modified.

Any unwarranted interference may adversely affect the safety and correct operation of the entire system.

External seals and backup rings are user-serviceable.

The appropriate replacement kit is indicated for each valve. Before installing a valve in its cavity, ensure that the body and all components of the system are clean.

Smear external seals lightly with grease, and check that any filters installed are correctly positioned.

Tighten the valve to the specified torque setting.

7.1.3 General technical information

All valves with leakage-free operating characteristic are 100% factory tested.

Nonetheless, the guaranteed maximum leakage may be exceeded if the valve is installed in a system with inadequate filtration.

Pressure, drops and other general performance indicated in the catalogue are referred exclusively to the component.

In the case of valves subject to adjustable setting, such as the pressure relief and if not specified in the order, we set them according to standard setting values indicated at section 7.2.1 .

7.1.4 Solenoid valves

The correct selection of the solenoid valve is related to the maximum flow rate and operating pressure values.

In a system with a single acting cylinder, therefore, it must be considered that the effective rate of flow through the unloading solenoid valve is not the flow delivered by the pump, but rather the momentary flow exhausted from the cylinder, or the restricted flow needing a pressure-compensated flow control valve, if installed.

The nominal voltage is the value indicated on the solenoid. Effective voltage must be measured at the terminals of the solenoid connector.

A maximum allowed voltage tolerance of ±10% in relation to the nominal value is accepted.

Incorrectly power supply components and cables (which length has to be as shorter as possible) and/or low battery charge can cause not correct solenoid valve operation.

Standard solenoids valves are designed for D.C. operation. A.C. supply requires a connector with bridge rectifier included. When energized with A.C. voltage, the solenoids can operate at 50 or 60 Hz frequency, without distinction. The connection used for standard solenoids are to EN 175301-803 (ex DIN 43650).

For solenoid with different connections (Amp Junior Timer, Direct Wiring, etc.) can be supplied on request, after agreement with Bucher Hydraulics, please contact our Sales Department.

The solenoid can be rotated through 360°, and the connector EN 175301-803 (ex DIN 43650) positioned at 90° intervals.

Specified performance datas were recorded in stabilized solenoid operated temperature and voltage at the -10% of the nominal value.

All solenoid valves are fitted with protective O-rings installed between the tube and the solenoid.

This protects internal parts from condensation and contaminants, which could cause malfunction.

Standard solenoids are not suitable for operation in environments where there is any risk of explosion (see Directives and standards)

7.1.5 General notes on D.C. power input

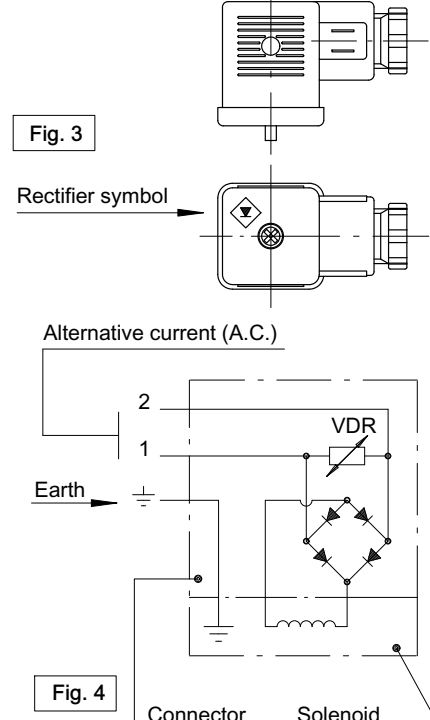
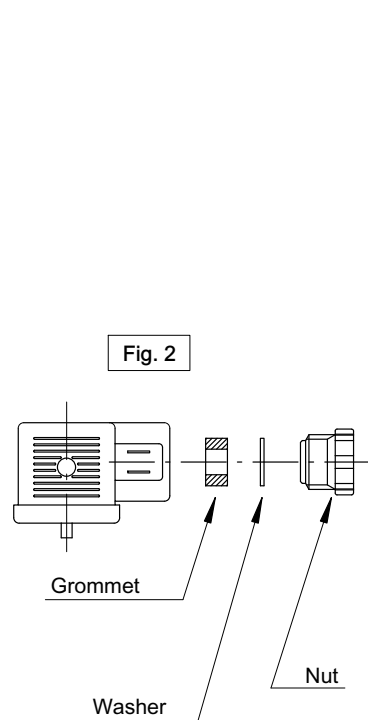
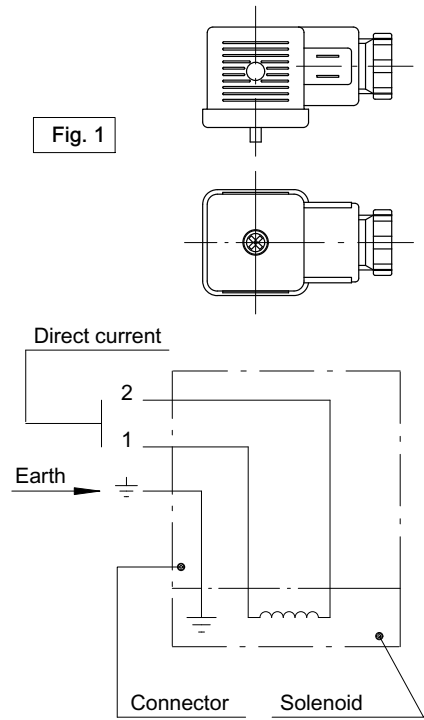
A swift and secure coupling is obtained using the special connector (type 200544110009).

The cable coming from the D.C. power source (batteries, rectified a.c. main supply, etc.) must be connected as indicated in the diagram (figure 1).

The negative and positive polarity of the wire need not be verified for connection purposes.

The connector incorporates a terminal for earthing the solenoid.

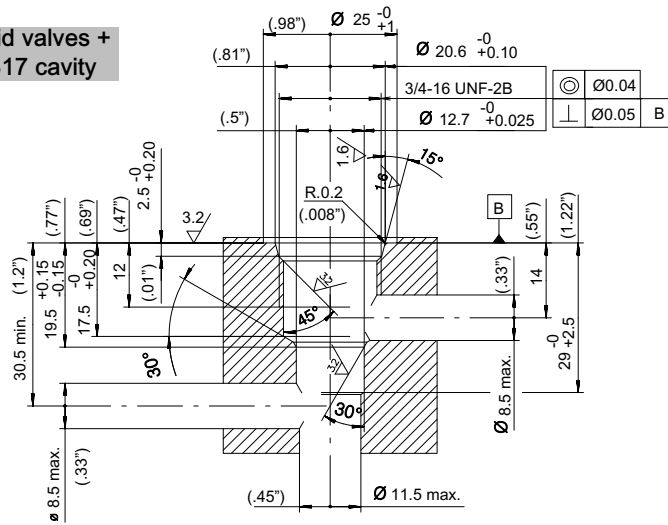
It is important to check that the grommet and armour clamp nut are correctly assembled (figure 2), as this prevents the cable being wrenched from connector.



For users wishing to make up special circuits and blocks with Bucher Hydraulics S.p.A. cartridge valves, it is

important to observe the indications given below when machining the valve cavities.

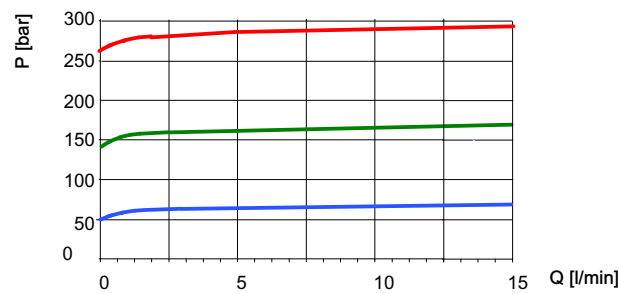
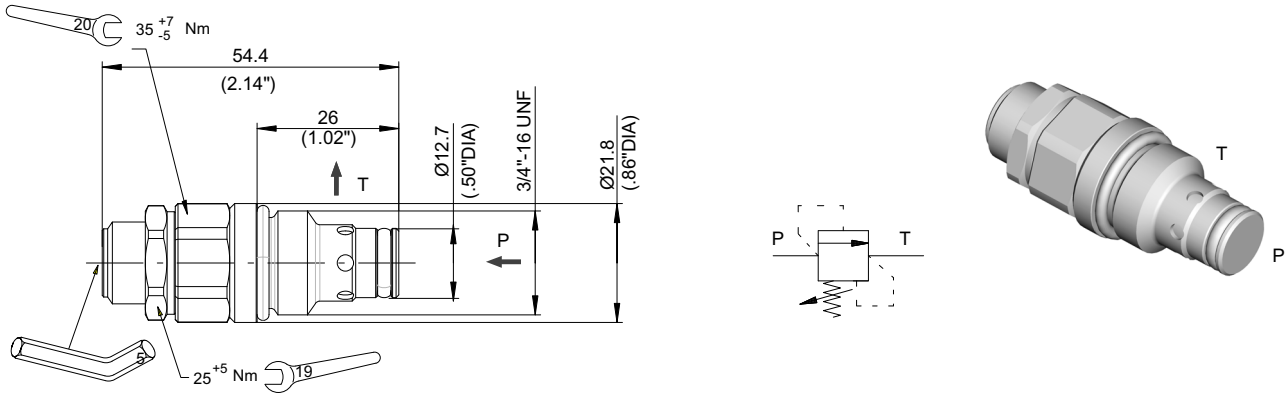
Relief and solenoid valves + hand pump PM817 cavity



7.2 Pressure relief valves

7.2.1 Pressure relief valve: VMD

Direct acting
Balanced piston
Adjustable setting
Three pressure setting ranges



The purpose of a relief valve is to keep the maximum system pressure at a safe level. When the hydraulic power unit is supplied with pressure relief valves, the correct calibration is provided by Bucher Hydraulics S.p.A. and there are no reasons to change this value.

* Max pressure admitted as single valve inside UP40 power: 190 bar (peak 230 bar, see section 2.2).

Pressure setting

For preset values other than those indicated, replace the first two digits of the designation with the setting required. For example, required setting 150 bar: designation type 15VMD. Always check that the required value falls within the standard ranges of adjustment.

Performances	
Max. Flow rate	15 l/min.
Max. Pressure	290 bar *
Weight	0.100 kg
Oil temperature	-20 to 90 °C
Recomanded filtration	21/19/16 (10 NAS 1638)

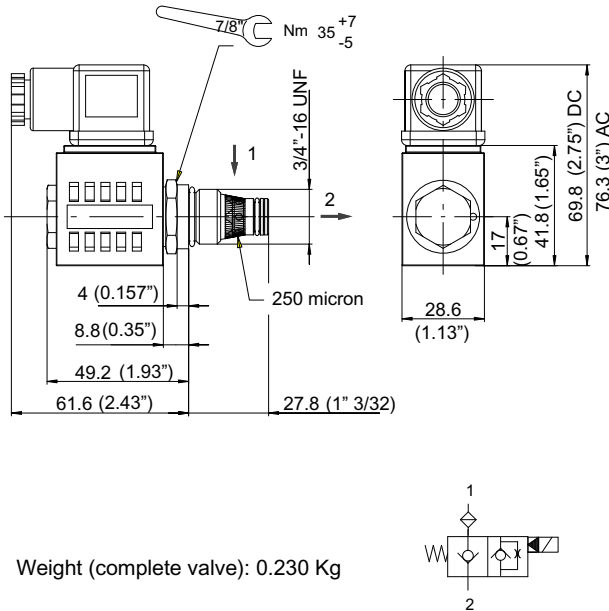
Spring	Type	Setting range	Code
00	T817/2	Plugged	200778800020
Y	05VMD	20-70 bar	200533930480
N	15VMD	50 - 180 bar	200533930481
B	20VMD	100 - 290 bar (*)	200533930142

7.3 Solenoid operated directional valves

Circuit	Solenoid	Override	Type	Power	Description	Page	
Normally closed	On-Off	Without manual override	Standard version				
			Piloted	standard (16 Watt)	SPD817/22-TV	Page 29	
			Direct acting	heavy duty (27 Watt)	SDF817/22-TH	Page 30	
			With manual override				
			Piloted	standard (27 Watt)	SPFE817/22-TV	Page 31	
			Direct acting	heavy duty (27 Watt)	SDFE817/22-TH	Page 30	
	Proportional	Without manual override					
			Piloted	standard (20-26 Watt)	PPF817/TV-03	Page 35	
	Normally open	On-Off	Without manual override	Standard version			
				Piloted	standard (27 Watt)	SPF817/22-TOV	Page 32
		With manual override					
			Piloted	standard (27 Watt)	SPFE817/22-TOV	Page 32	

7.3.1 Solenoid operated directional valve: SPD817/22-TV

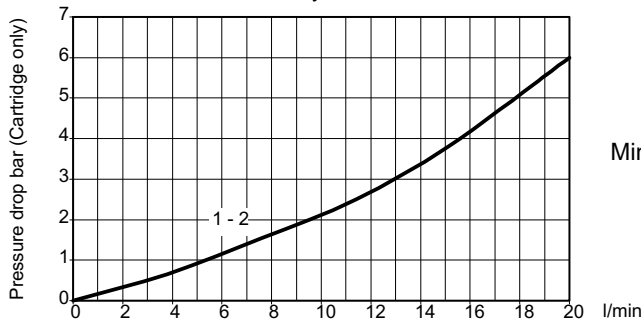
Normally closed
Piloted - 16 W
Poppet type
Flow from 1 to 2



Weight (complete valve): 0.230 Kg

Performances	
Max. pressure	270 bar
Max. recommended pressure	See 2.2
Max. flow	20 l/min.
Rated power	16 Watt
Intermittence	ED= 100%
Voltage tolerance	± 10%
Internal leakage	0-5 drops/min.
Temperature range	-20/+90 °C
Connector type	DIN 43650
Time to open 12 V 20 l/min 80% of final change of state	16 ms.
Time to close 12 V - 20 l/min 80% of final change of state	18 ms.
O-Ring replacement kit	200974200480

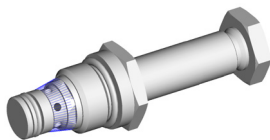
Oil: Viscosity 32Cst at 38°C



Minimum suggested working pressure = 5 bar

Directional valve without coil and connector

Type	Code
SPD817/22-TV P.M.	200533910019



Complete solenoid valve for D.C. current

Type	Code
SPD817/22-TV-13-HC	200957010084
SPD817/22-TV-23-HC	200957020076

Coil voltage - A.C. supply requires a connector with bridge rectifier included.

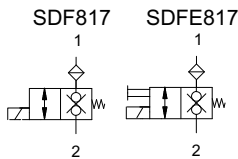
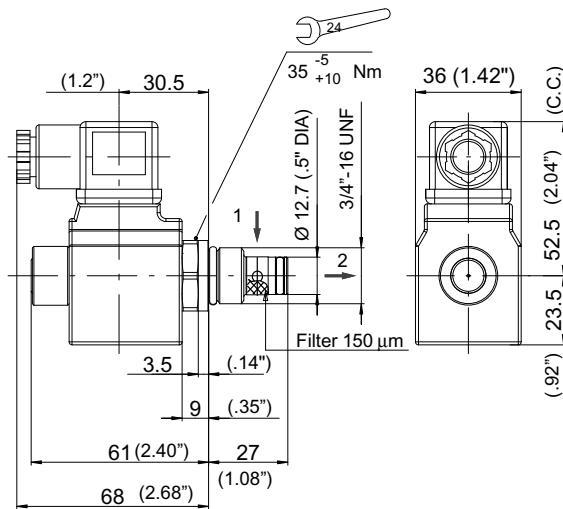
18 Watt	D.C.		A.C.		
	12 V.	24 V.	24 V.	110 V.	220 V.
Type	13	23	21	41	51

Complete solenoid valve for A.C. current

Type	Code
SPD817/22-TV-21-HC	200956920052
SPD817/22-TV-41-HC	200956940047
SPD817/22-TV-51-HC	200956960053

7.3.2 Solenoid operated directional valve: SDF817/22-TH - SDFE817/22-TH

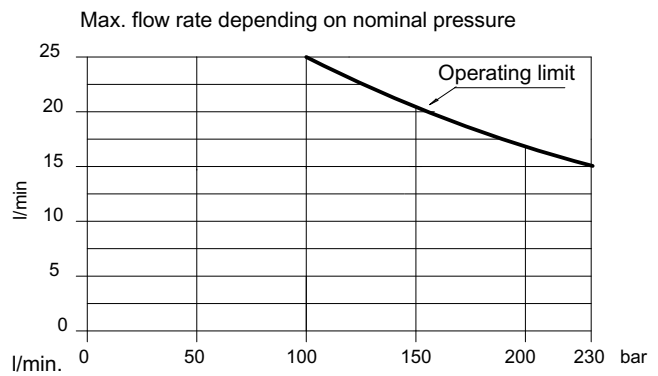
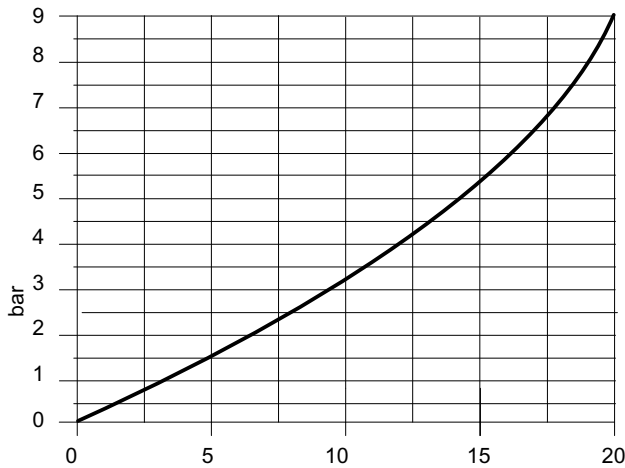
Normally closed
Poppet type
Direct acting - 27 Watt
Flow from 1 to 2
With (SDFE) or without (SDF) manual override
Manual override = push to open



Weight (mechanical part only): 0.121 Kg

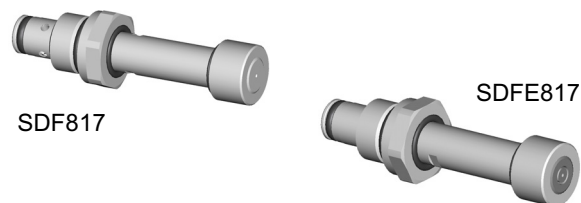
Performances	
Max. pressure	230 bar
Max recommended pressure	See 2.2
Max. flow	15 l/min. 230 bar
Rated power	27 Watt
Intermittence	ED= 100%
Voltage tolerance	± 10%
Internal leakage	0-5 drops/min.
Temperature range	-20/+90 °C
Connector type	DIN 43650
Time to open (50-210 bar)	15-50 ms.
Time to close (50-210 bar)	10-50 ms.

Oil: Viscosity 37 mm²/s at 40°C Pressure drops



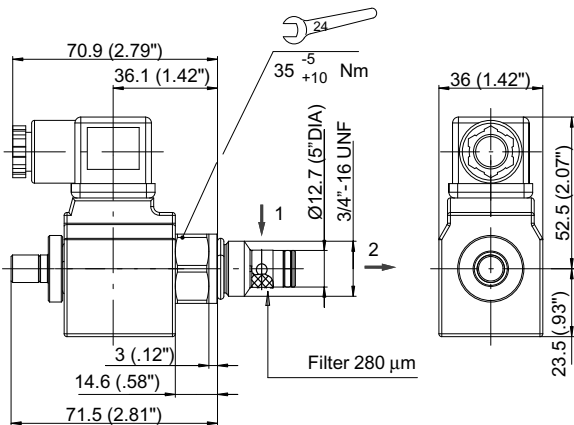
Type	Code*
ELVAL SDF817/22-TH P.M.	200757200940
ELVAL SDFE817/22-TH P.M.	200757200970

* Mechanical part code only. For connector and coil see section: 7.3.5 - 7.3.6

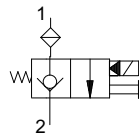


7.3.3 Solenoid operated directional valve: SPFE817/22-TV

Normally closed
Poppet type
Piloted (27 W)
Flow from 1 to 2
With manual override (screw type)
Manual override = unscrew to open

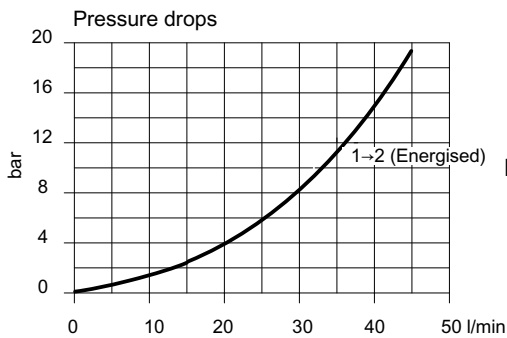


Performances	
Max. pressure	350 bar
Max. recommended pressure	See 2.2
Max. flow	40 l/min.
Rated power	27 Watt
Intermittence	ED= 100%
Voltage tolerance	± 10% / -15%
Internal leakage	0.25 cm ³ /min.
Temperature range	-20/+90 °C
Connector type	DIN 43650
Time to open	<= 30 ms.
Time to close	<= 50 ms.



Weight (mechanical part only): 0.118 Kg

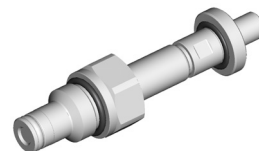
Oil: Viscosity 46 cSt at 40°C



Minimum suggested working pressure = 5 bar

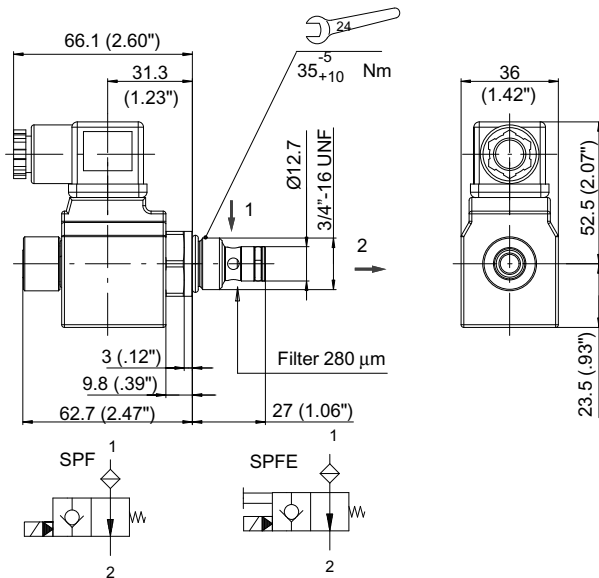
Type	Code*
ELVAL SPFE817/22-TV P.M.	200757200960

* Mechanical part code only. For connector and coil see section: 7.3.5 - 7.3.6



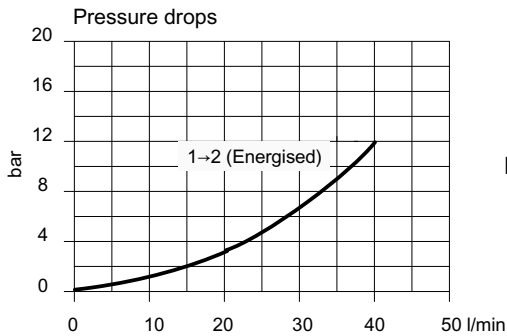
7.3.4 Solenoid operated directional valve: SPF817/22-TOV - SPFE817/22-TOV

Normally open
Poppet type
Piloted (27 W)
Flow from 1 to 2
With (SPFE) or without (SPF) manual override (pin type)
Manual override = push to open



Weight (mechanical part only): 0.120 Kg

Oil: Viscosity 46 cSt at 40°C

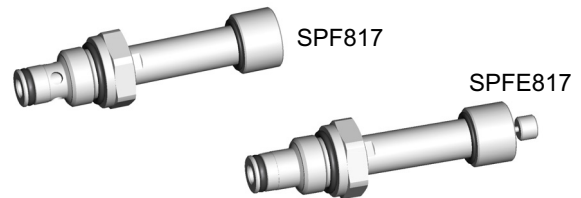


Minimum suggested working pressure = 5 bar

Performances	
Max. pressure	300 bar
Max. recommended pressure	See 2.2
Max. flow	40 l/min.
Rated power	27 Watt
Intermittence	ED= 100%
Voltage tolerance	± 10% / -15%
Internal leakage	0.25 cm ³ /min.
Temperature range	-20/+90 °C
Connector type	DIN 43650
Time to open	<= 30 ms.
Time to close	<= 50 ms.

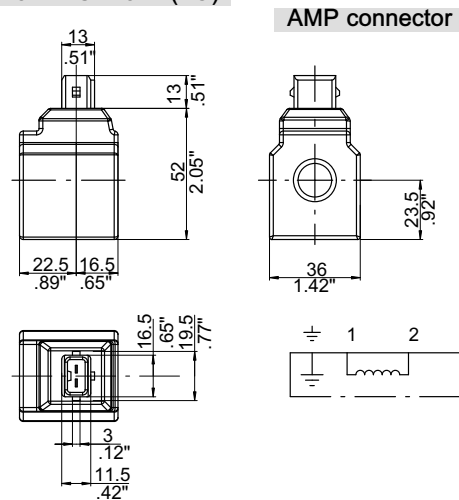
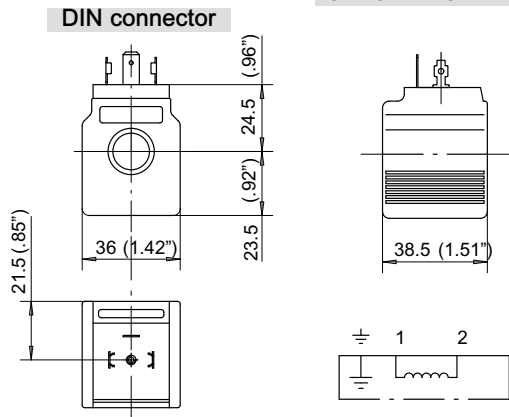
Type	Code*
ELVAL SPF817/22-TOV P.M.	200757200980
ELVAL SPFE817/22-TOV P.M.	200757200990

* Mechanical part code only. For connector and coil see section: 7.3.5 - 7.3.6

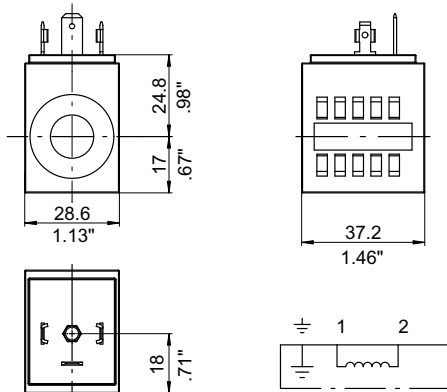


7.3.5 Directional valve solenoids

SDF817 - SPFE817 (TV-TO) - SDFE817 - SPF817 (TO)



SPD817 DIN connector

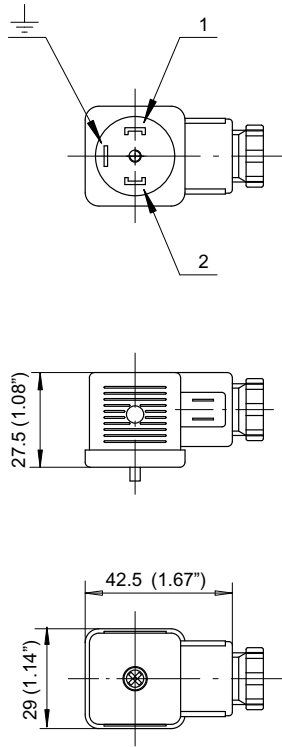


For solenoid valve series	SDF817 SDR817	SPE817 SDRE817	SPD
Wire class	H (VDE0580)		
Protection	IP65 (DIN40050)		
Coil insulation	F		
Duty rating	ED 100%		
Connector style	DIN 43650 or AMP84-9419		DIN 43650
Stabilized temperature	70°C		95°C (DC vers.)
Voltage tolerance	± 10%		

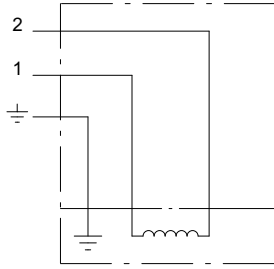
Connector style	Supply Voltage	Nominal Coil voltage	Power (Watt)	Resistance (Ohm)		Current (Ampere)		Coil code	
				Ambient temp.	Stabil. temp.	Ambient temp.	Stabil. temp.		
SDF - SPFE - SDFE - SPF	DIN	12 V. DC.	12 V. DC.	27.2	5.3	8	2.2	1.5	200674910100
		24 V. DC.	24 V. DC.	27	21.3	32	1.12	0.75	200674920080
		48 V. DC.	48 V. DC.	27	85.3	130	0.56	0.37	200674930030
		24 V. AC.	21.6 V. DC.	27.1	17.2	26	1.25	0.83	200674820050
		110 V. AC.	98 V. DC.	27	355	530	0.27	0.18	200674840050
		220 V. AC.	198 V. DC.	27.6	1422	2130	0.14	0.10	200674860060
	AMP	12 V. DC.	12 V. DC.	27.2	5.3	8	2.2	1.5	200674910250
		24 V. DC.	24 V. DC.	27	21.3	32	1.12	0.75	200674920200
SPD	DIN	12 V. DC.	12 V. DC.	16	9	11.4	1.35	1.09	200541210039
		24 V. DC.	24 V. DC.	16	36	46.2	0.667	0.53	200541220037
		24 V. AC.	21.6 V. DC.	16	27.7	34.4	0.713	0.592	200541120015
		110 V. AC.	108 V. DC.	16	843	1053	0.15	0.1	200541140014
		220 V. AC.	216 V. DC.	16	3364	4168	0.624	0.498	200541160016

A.C. Supply requires a connector with bridge rectifier included.

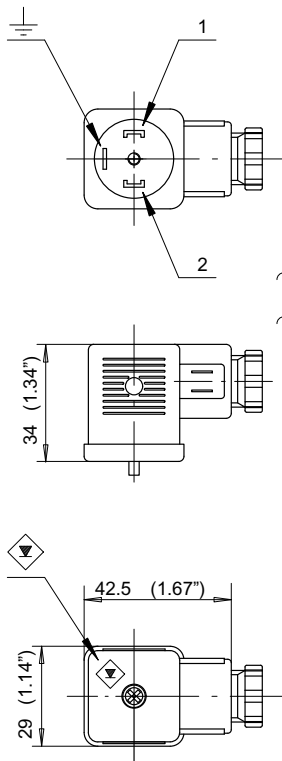
7.3.6 Connector for solenoid directional valves



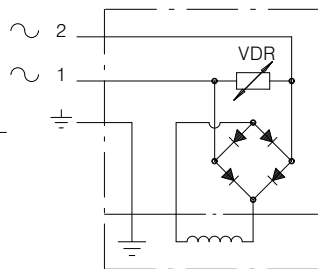
Part number:
2005441.10009



For power input	D.C.
Connector type	DIN 43650
Number of poles	2 + \perp
Supply voltage	max. 220 V.
Nom. capacity at contacts	10 A.
Max capacity at contacts	16 A.
Resistance at contacts	≥ 4 mOhm
Max section of cable	1.5 mm ²
Outer material	Glass fibre reinforced Nylon
Contact mount material	
Color	Black
Armour clamp	Pg 9
Ø cable	6-8 mm.
Protection factor	IP65 (DIN40050)
Insulation class	C (VDE0110)
Temperature range	-40 / +90 °C



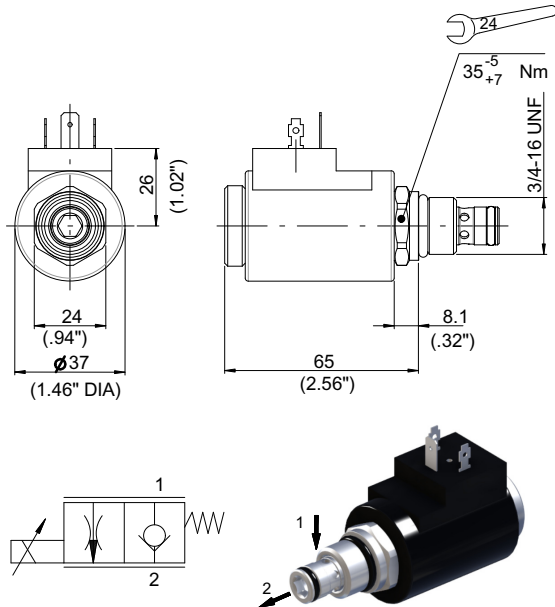
Part number:
2005441.10012



For power input	A.C.
Connector type	DIN 43650
Number of poles	2 + \perp
Supply voltage	max. 220 V.
Nominal capacity at contacts	10 A.
Max. capacity at contacts	16 A.
Resistance at contacts	≥ 4 mOhm
Max. section of cable	1.5 mm ²
Outer material	Glass fibre reinforced Nylon
Contact mount material	
Color	Black
Diodes	1N 4007 GP
Overvoltage protection	VDR
Armour clamp	Pg 9
Ø cable	6-8 mm.
Protection factor	IP65 (DIN40050)
Insulation class	C (VDE0110)
Temperature range	-40 / +90 °C

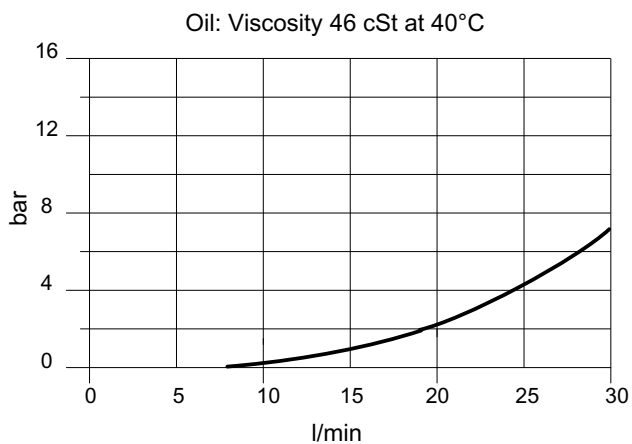
7.3.7 Proportional solenoid valve: PPF817/TV-03

Normally closed
 Poppet type
 Flow from 1 to 2

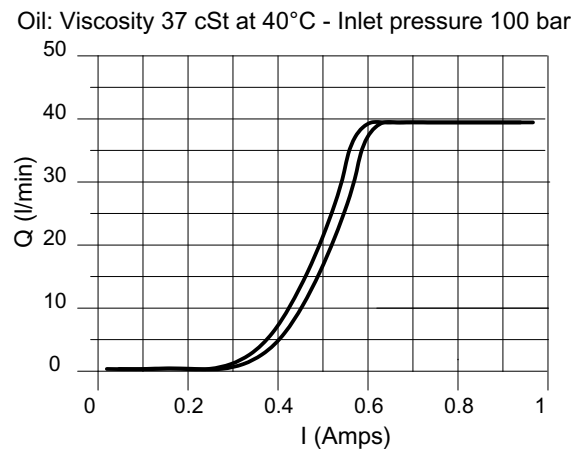


Electric performances 24 V	
Max. pressure	250 bar
Max. flow	30 l/min
Max internal leakage	5 drops/min
Voltage type	12 VDC
Voltage tolerance	+10% / -15%
Coil power	26 w
ED	100%
Fluids	Mineral based or synthetics with lubricating properties
Oil viscosity	7.4 to 420 cSt
Oil temperature range	-30° to 110°C
Recommended filtration	20/18/15 ISO 4406 (9NAS 1638)

Pressure drops



Typical hysteresis



Type	Code*
ELVAL PPF817/TV-03 P.M.	200533960022
COIL 24 V. DC.	200674920020

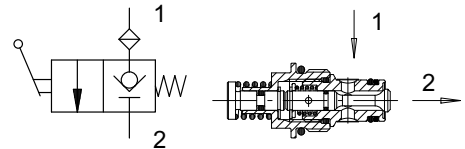
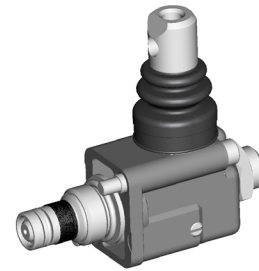
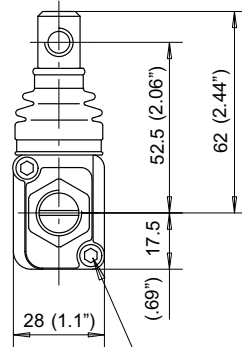
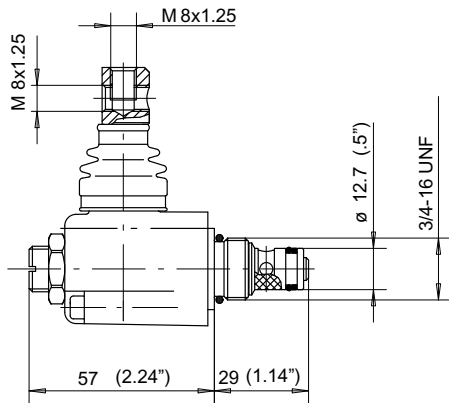
7.4 Manual lowering valve

7.4.1 Manual lowering valve: ZR817/22-TV (dedicated housing is requested)

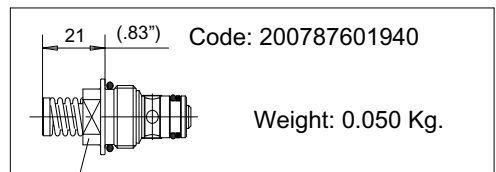
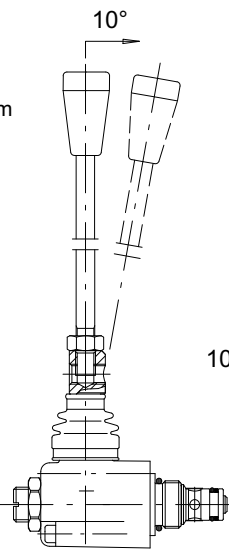
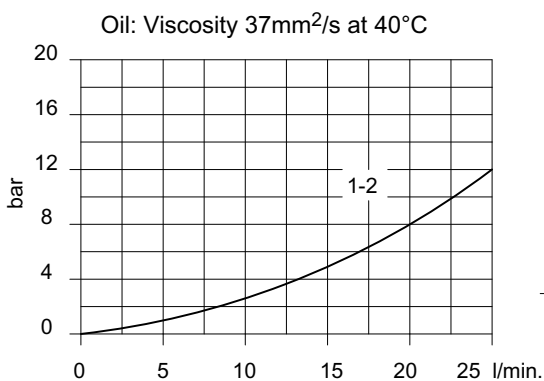
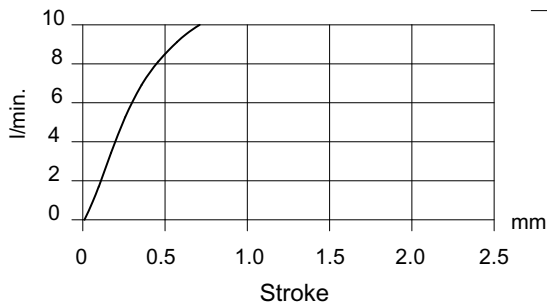
Normally closed

Code 200987601960
 Max. pressure 230 bar
 Max. recommended pressure 210 bar

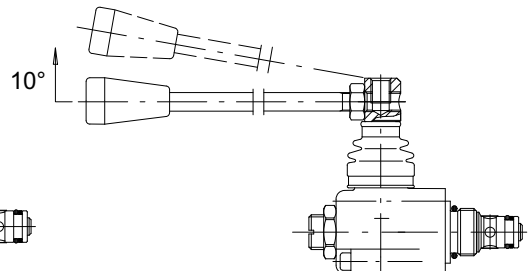
Max flow 25 l/min.
 Internal leakage 0-5 drops/min.
 Temperature range -20/+90 °C
 O-Ring replacement kit 200974200160



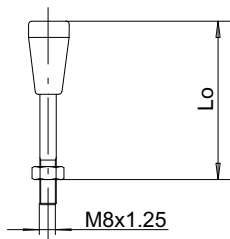
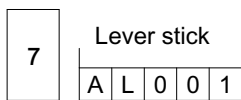
Metering performance.



The connecting end of the lever allows the handle to be mounted in two different positions.



Lever stick



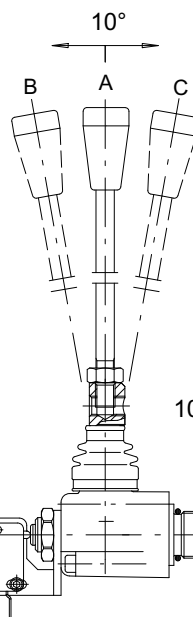
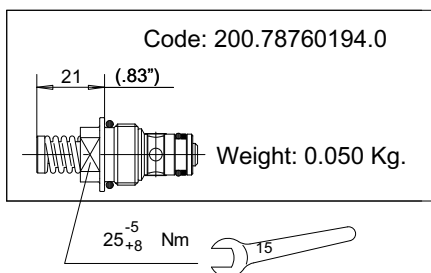
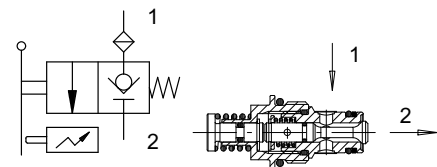
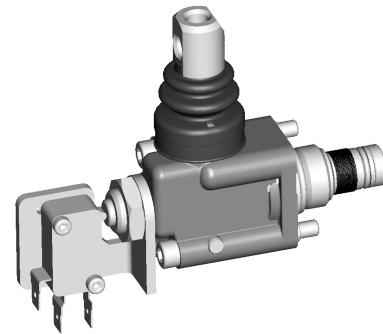
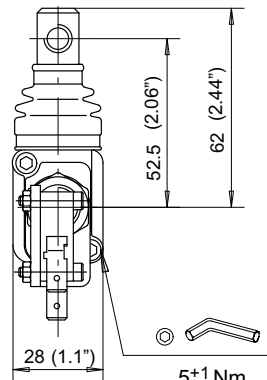
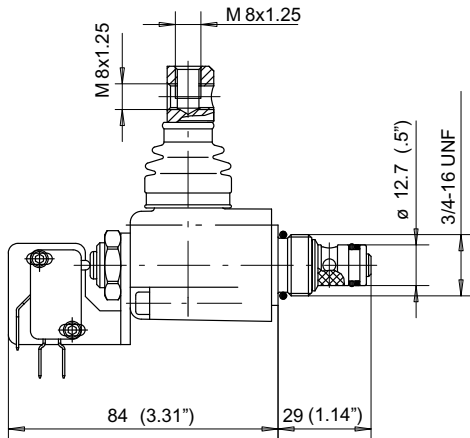
Lo Length	Type	Code
150 mm - 5.90 inches	AL001	200702210190
200 mm - 7.87 inches	AL002	200702210030
250 mm - 9.84 inches	AL003	200702210050
300 mm - 11.80 inches	AL004	200702210060

7.4.2 Manual lowering valve with microswitch: ZR817/22-TVM (dedicated housing is requested)

Normally closed

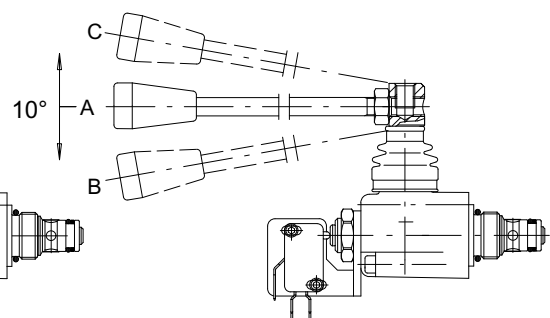
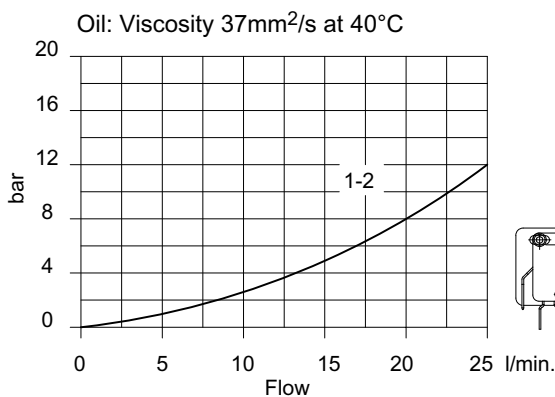
Code 200987601950
 Max. pressure 230 bar
 Max. recommended pressure 210 bar

Max flow 25 l/min.
 Internal leakage 0-5 drops/min.
 Temperature range -20/+90 °C
 O-Ring replacement kit 200974200160

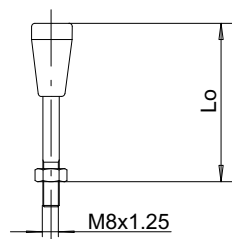
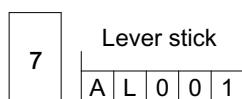


A → B = Microswitch operated
 A → C = Hydraulically operated

The connecting end of the lever allows the handle to be mounted in two different positions.



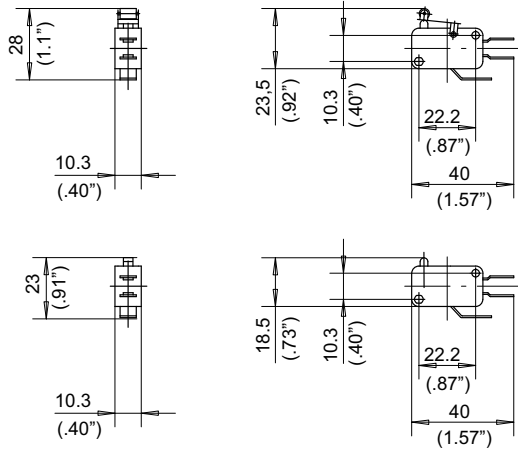
Lever stick



Lo Length	Type	Code
150 mm - 5.90 inches	AL001	200702210190
200 mm - 7.87 inches	AL002	200702210030
250 mm - 9.84 inches	AL003	200702210050
300 mm - 11.80 inches	AL004	200702210060

7.4.3 Microswitch

Code 200544124013



Code 200544124014

Code (micro only)	200544124013	200544124014
Complete code (micro+fixing kit)	200762500060	200762500050
Voltage	250 V.	
Index protection	IP00	
Nominal current	16 A.	
Max. current	20 A.	
Temperature range	-20/+125°C	
Max total stroke	2.6 mm.	
Working stroke	1.2 mm.	
Mechanical life	2x10 ⁷ cycles	

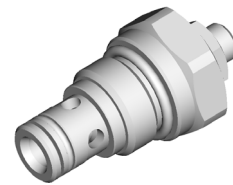
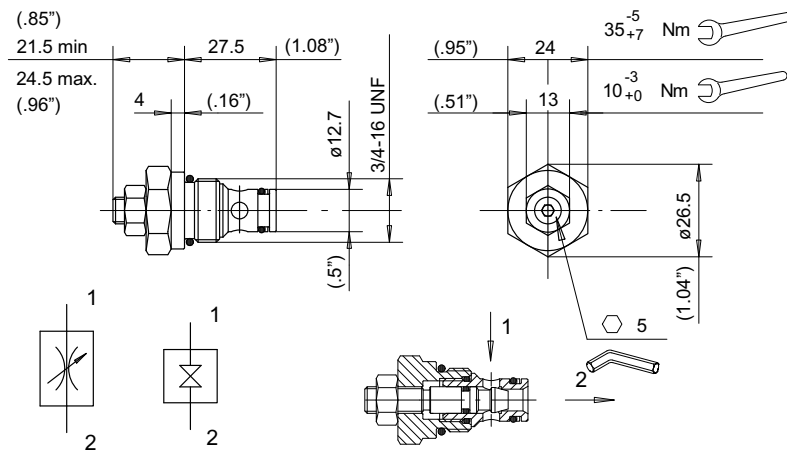
7.5 Manual override valves

7.5.1 Manual override valve: NV1/817-R

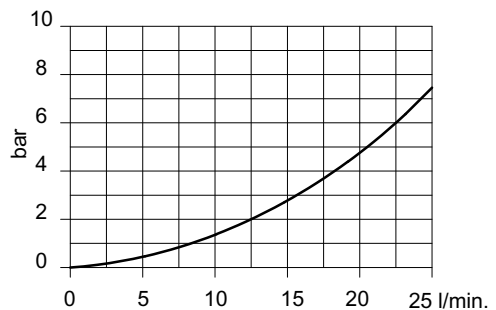
Manual override
Flow restrictor
Poppet type
Flow from 1 to 2
Code

200787601601

Max. pressure 230 bar
Max flow 25 l/min.
Internal leakage 0-5 drops/min.
Temperature range -20/+90 °C
O-Ring replacement kit 200974200160
Weight 0.110 Kg.



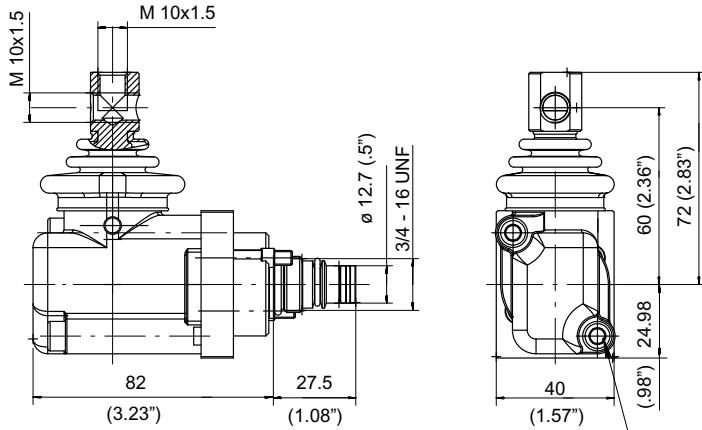
Oil: Viscosity 37mm²/s at 40°C
Pressure drops with restrictor open



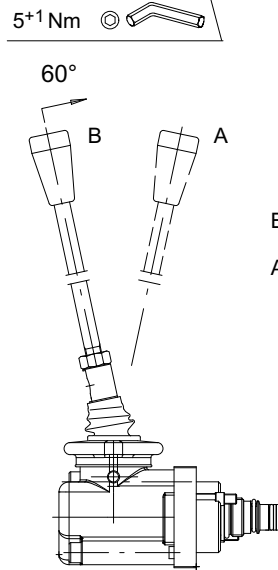
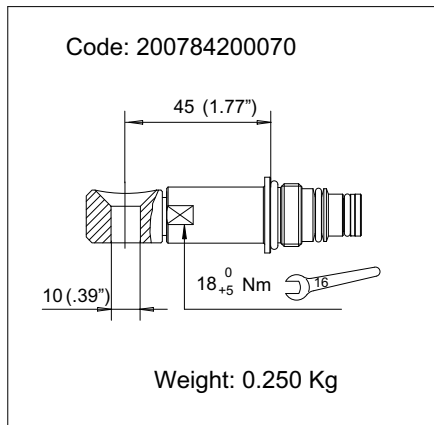
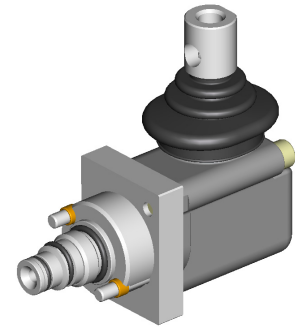
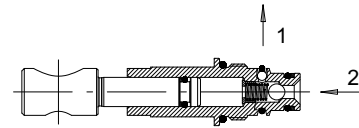
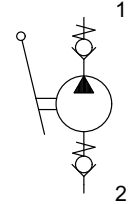
7.6 Emergency hand pump: PM817/1.5

Inlet check
 Outlet check
 Ball type
 Code 200948200080

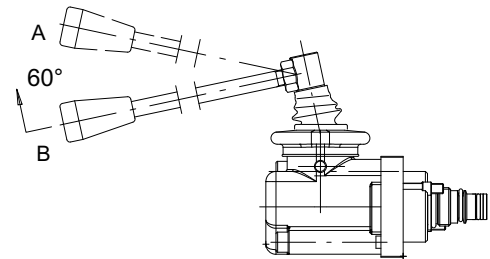
Max recommended pressure 210 bar
 Displacement 1.5 cm³
 Internal leakage 0-5 drops/min.
 Temperature range -20/+90 °C
 O-Ring replacement kit 200974200340



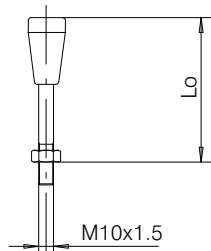
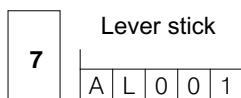
The connecting end of the lever allows the handle to be mounted in two different positions.



B → A = Inlet
 A → B = Outlet



Lever stick



L ₀ Length	Type	Code
190 mm - 7.48 inches	AL001	200702220010
255 mm - 10.04 inches	AL002	200702220030
300 mm - 11.81 inches	AL003	200702220040
350 mm - 13.78 inches	AL004	200702220050

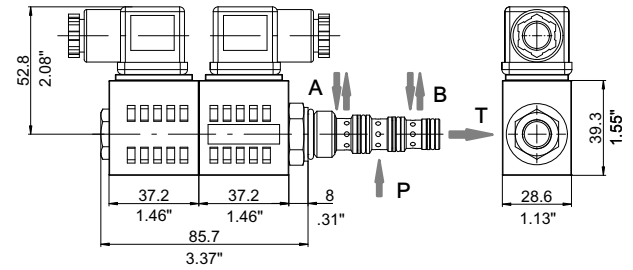
7.7 Solenoid valves

(For availability please consult our Sales Organisation)

Circuit	Type
	CB-02
	CC-02
	CA-02
	CD-02
	CX-02

4 ways, two positions solenoid valves also available, please contact our Sales Department.

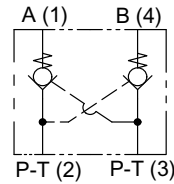
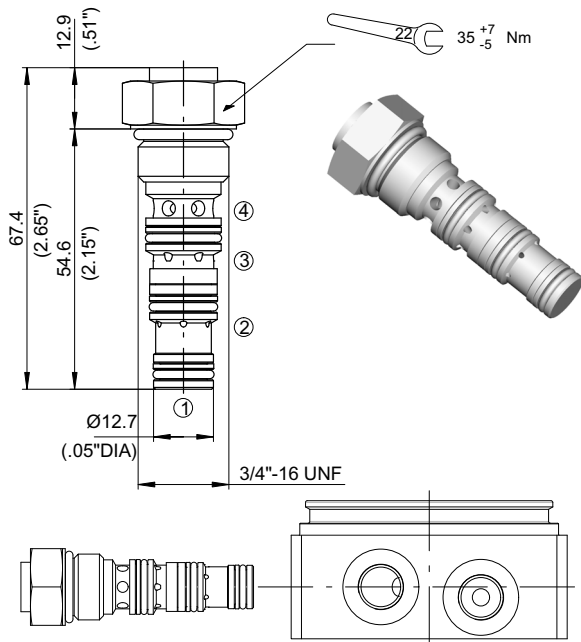
4 ways, three positions



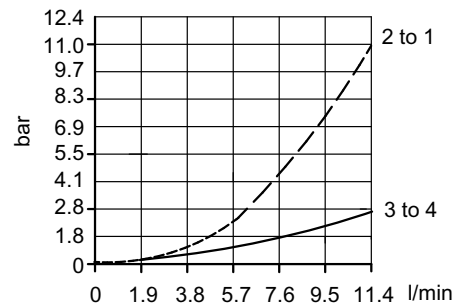
Std. Voltage	Type	
12 V D.C.	13	Coil and connector features: see section 7.3.5 (SPD type) and 7.3.6
24 V D.C.	23	
24 V A.C.	21	
110 V A.C.	41	
220 V A.C.	51	

7.8 Other valves

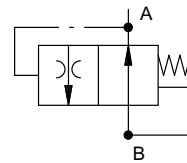
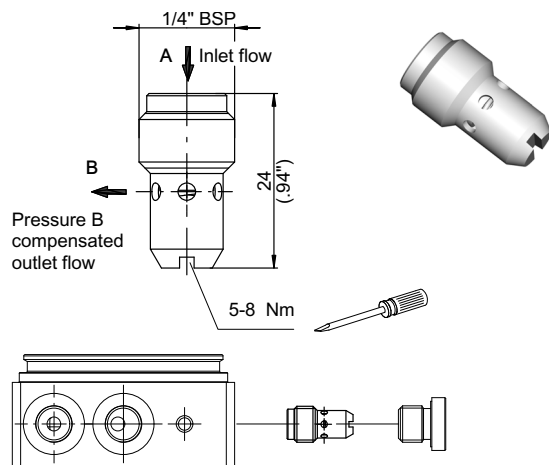
7.8.1 Dual pilot to open, Poppet-Type check valve



Pressure drop vs. flow



7.8.2 Throttle compensated flow control valve: VRC05



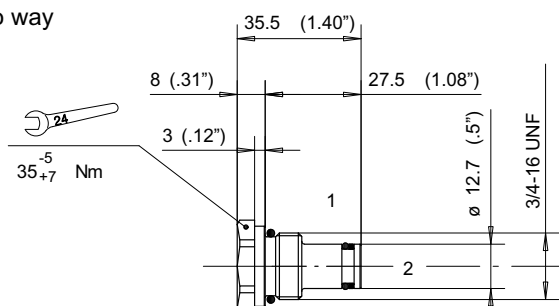
Type	Regulated flow Q	Code
	l/min	
VRC05/0.35	0.35	200787202141
VRC05/0.7	0.7	200787202130
VRC05/1	1	200787202500
VRC05/1.6	1.6	200787202510
VRC05/2.5	2.5	200787202520

Flow tolerance = ±15%

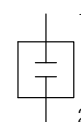
7.9 Valve cavity plugs

7.9.1 Valve cavity plug T817/2

Two way

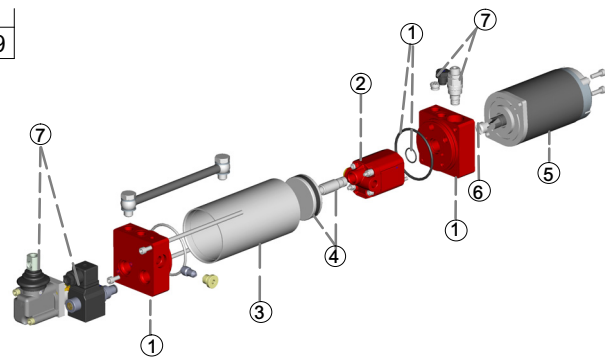


Code	200778800020
Seal kit code	200974200160
Weight	0.070 Kg.



7.10 Example of hydraulic power pack ordering code

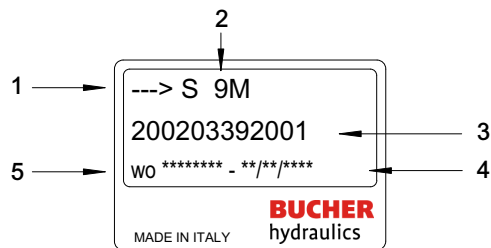
1	Type of housing	UP40 / K1 + K1 G2
2	Pump	Hi-Lo Series
	AP05 / 0.75	S439
3	Tank	Fitting
	L-012R	P15
4	Suction assembly kit	
5	Electric motor	Pos. Relay Pos.
	C128PK / A0	A
6	Drive	
	E61	
7	Cavity b	Cavity c
	15VMD	PM817 / 1.5
	Cavity d	
	SDF817 / 22-TH	
	Cavity e	Hand lever
	VRC05 / 1	Lever stick
		Volt



Composition of product code

UP40/K1G2.... • AP05/0.75 • S439 L-003R • P15 • C128PK/A0 • A • E61 • b) 15VMD • c) PM817/1.5 • d) SDF817/22-TH -23 • e) VRC05/1

Product identification plate example:



- 1 : Rotation (S= Counterclockwise rotation)
- 2 : Manufacturing year and month
- 3 : Bucher Hydraulics S.p.A. product code
- 4 : Date
- 5 : Work order number

Manufacturing month	Manufacturing year						
	2017	2018	2019	2020	2021	2022	2023
January	7A	8M	9M	0M	1M	2M	3M
February	7B	8N	9N	0N	1N	2N	3N
March	7C	8P	9P	0P	1P	2P	3P
April	7D	8Q	9Q	0Q	1Q	2Q	3Q
May	7E	8R	9R	0R	1R	2R	3R
June	7F	8S	9S	0S	1S	2S	3S
July	7G	8T	9T	0T	1T	2T	3T
August	7H	8U	9U	0U	1U	2U	3U
September	7I	8V	9V	0V	1V	2V	3V
October	7J	8Z	9Z	0Z	1Z	2Z	3Z
November	7K	8X	9X	0X	1X	2X	3X
December	7L	8Y	9Y	0Y	1Y	2Y	3Y

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Classification: 440.405.000