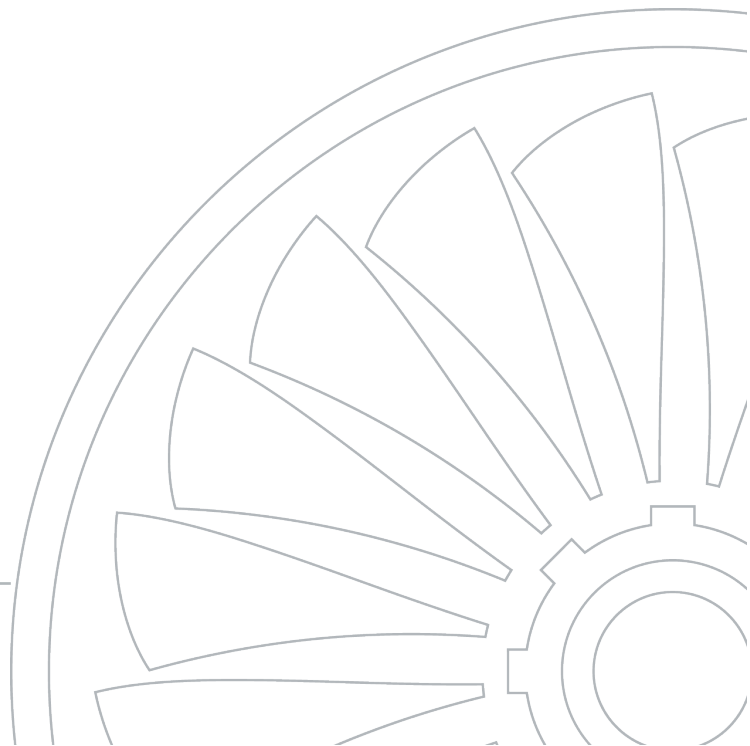


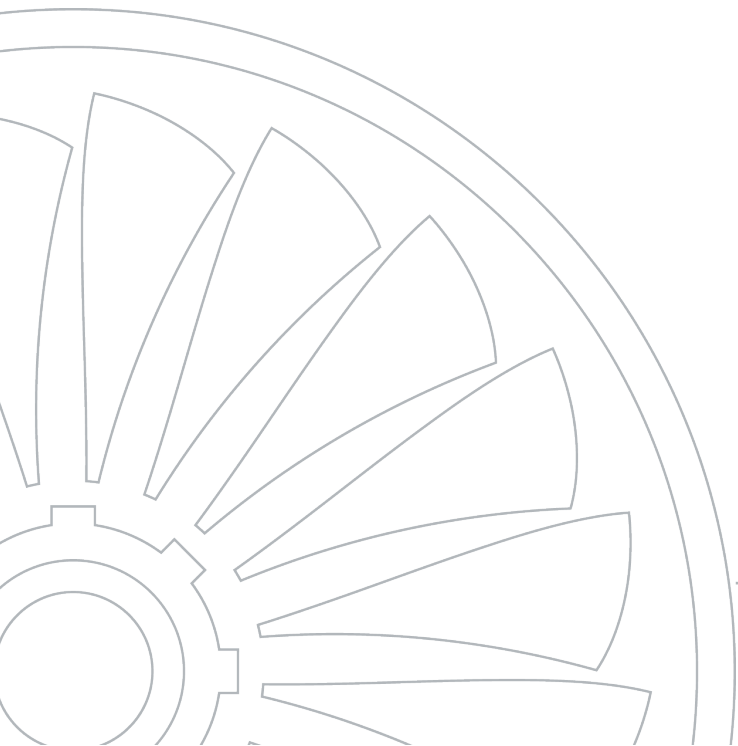
# Hydraulic Components



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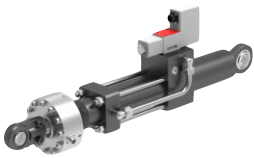


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# Servo Hydraulics Actuators

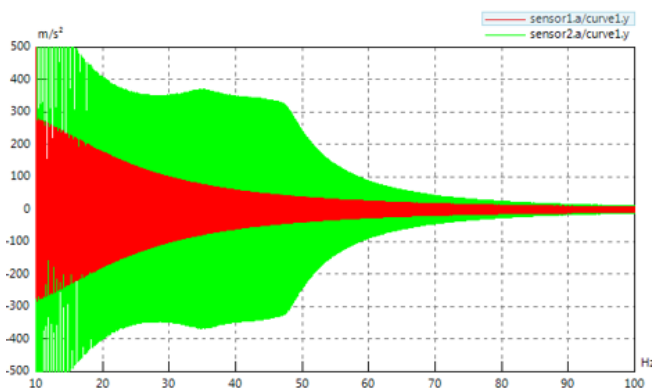
Servo hydraulics actuators are solutions based on linear hydraulic actuators for reproducing the static and dynamic loading modes in testing of units and assemblies of various industries. Servo valve with feedback enables precision control of rod force and displacement.

	Actuators for static testing	Actuators for dynamic testing	Actuators for vibration testing
<b>Parameter</b>			
Rated pressure, bar	315	315	315
Service fluid	Mineral oil	Mineral oil	Mineral oil
Service fluid temperature °C	-20 ... +70	-20 ... +70	-20 ... +70
Ambient temperature, °C	+15 ... +40	+15 ... +40	+15 ... +40
Service fluid viscosity, cSt	from 10 to 360	from 10 to 360	from 10 to 90
Frequency, Hz	<b>Up to 3 Hz</b>	<b>Up to 40 Hz</b>	<b>Up to 600 Hz</b>
Maximum acceleration, m/s <sup>2</sup>	-	Up to 5	Up to 5
Valve	Hydraulic servo valve	Hydraulic servo valve	<b>Multicircuit hydraulic servo valve</b>
Design	Single-rod Double-rod	Double-rod with polymer/hydrostatic bearings	Double-rod with hydrostatic bearings

<b>Optionally:</b>	
Brackets	Hinged brackets on cylinder and rod

- Double-side rod design improves performance with the matching compression and extension force as a result of the same chamber areas
- Dampers on both actuator ends eliminate the possibility of the oil box hitting against a high-speed piston
- With built-in feedback systems, servo actuators for static testing may be used in loading systems with precision control of force and positioning
- The design of actuators for dynamic testing features high-speed components allowing the hydraulic drive rod displacement at a speed of 5 m/s
- With built-in feedback systems, actuator may be used in dynamic loading systems requiring high positioning precision at high rod loads
- Polymer seals

### Actuators for vibration testing



**Multicircuit hydraulic servo valve enables precision control of the actuator rod speed with eliminating the self-oscillation effect occurring at high acceleration**

- – actuator with a multicircuit hydraulic servo valve,
- – actuator with a standard servo valve

The feedback is provided for:



**Pressure**

A compact pressure transducer for enabling the pressure feedback for control. May be used as an additional circuit for eliminating emergencies during testing.



**Force**

Strain gauge sensor for force feedback for closed circuit control.



**Displacement**

Linear displacement transducer ensures displacement feedback for the controller. It responds for the actuator rod positioning precision.



**Vibration acceleration**

Low-noise accelerometers are used as a loading feedback of object vibration acceleration testing.

# Servo Valves

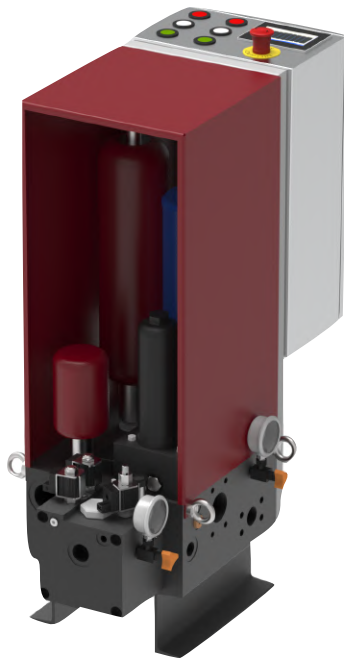
- Multi-spool and proportional servo valves
- Control of position, speed and pressure



Code	Description	Pressure, bar	Flow rate, l/min	Service fluid
E40	Proportional servo valve 4/3	350	5-40	-20...+70; 10-360 cSt
E40V	Proportional servo valve 4/3	350	5-40	-20...+150; 10-360 cSt
E100	Proportional servo valve 4/3	350	5-40	-20...+70; 10-360 cSt
T25	Pilot servo valve 4/3	315 (350 bar s.i.)	5-40	-20...+90; 20-360 cSt
T100	Pilot servo valve 4/3	315 (350 bar s.i.)	5-40	-20...+90; 20-380 cSt
T120	Pilot servo valve 4/3	315	5-40	-20...+90; 20-380 cSt
T300	Pilot servo valve 4/3	315 (350 bar s.i.)	5-40	-20...+90; 20-380 cSt
ET6	Reducing servo valve	40-350 (420 s.i.)	5-40	-20...+90; 20-380 cSt
ET11	Reducing servo valve	40-350 (420 s.i.)	5-40	-20...+90; 20-380 cSt
TF6Ex	Plate valve 3/2 4/2 Explosion-proof design	350	5-40	

Шифр	Описание	Входной сигнал	Напряжение питания
AE-1	Control unit for T25, T100, ET6, ET11, E40V	±10VDC, 0...10VDC, 4...20mA, +/10mA	24 DC
AE-2	Control unit for T120, T300, E40T	±10VDC, 0...10VDC, 4...20mA, +/10mA	24 DC
AE-1D	Control unit for T25, T100, ET6, ET11, E40V USB interface	±10VDC, 4...20mA, +/- 10mA	24 DC
AE-2D	Control unit for T120, T300, E40T USB interface	±10VDC, 4...20mA, +/- 10mA	24 DC
AE-PQ	Regulator for E40, E100	Pressure sensor	24 DC

# Hydraulic Service Manifold



Hydraulic Service Manifold (HSM) is installed in the pump station delivery and discharge line upstream the consumer for the service fluid treatment purpose. Service fluid treatment comprises filtration, pressure surge control and hydraulic impact relief.

The HSM control system is standalone. The HSM is controlled via Ethernet or locally in the manual mode. The control system will automatically turn off the HSM and interrupt the service fluid delivery in case of failure in the consumer hydraulic lines or pump station. The real-time monitoring functions allow determining the routine maintenance requirement and ensure annunciation in case of accident.

- **Smooth pressure increase and decrease**
- **Service fluid filtration**
- **Surge and hydraulic impact relief**
- **Hydraulic line disconnection in case of breakage**
- **Pilot pressure control circuit**

Parameter	Value
Working fluid	Any mineral and synthetic oils
Working fluid viscosity, cSt	6...250
Number of channels	1 / 2
Pressure, bar	315
Flow rate per channel at $\Delta P=6$ bar, l/min	150
Battery	Yes
Filtration fineness in delivery line, $\mu\text{m}$	10
Filtration fineness in pilot line, $\mu\text{m}$	3
Power supply, V	220 AC
Working fluid temperature $^{\circ}\text{C}$	-30...+80
Ambient temperature, $^{\circ}\text{C}$	-10...+ 40

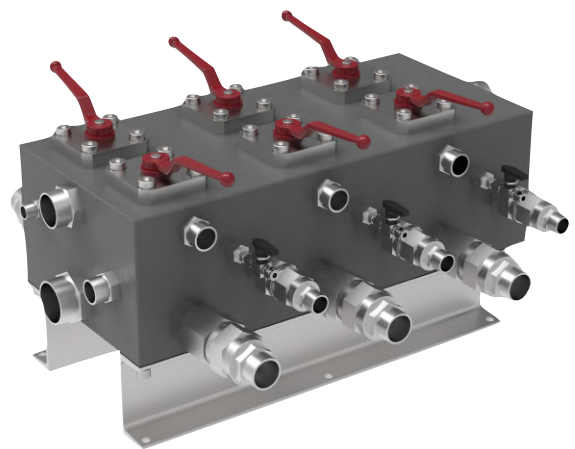
Optionally:	
Delivery line filtration, $\mu\text{m}$	<b>Standart - 10</b> <b>F3 - 3</b> <b>F5 - 5</b>

# Hydraulic Distribution Manifold

Hydraulic Distribution Manifold (HDM) is used in hydraulic systems with distributed structure. The HDM manifold is intended for distributing service fluid supplied from the power unit or hydraulic service manifold between consumers. The manifold design allows engaging the required number of channels. The capability of disconnecting particular channels allows consumer service without the need to shutdown the power unit.

Pilot and pressure lines are fitted with ball valves for consumer disconnection during idle time or maintenance. All the discharge and drainage lines are fitted with non-return valves. Channels are provided with fittings for BSP thread high-pressure hose connection.

- **Local connection /disconnection of channels**
- **Installation simplicity**
- **Structural reliability**
- **Service maintenance comfort**
- **Low hydraulic losses at maximum service fluid flow rate**



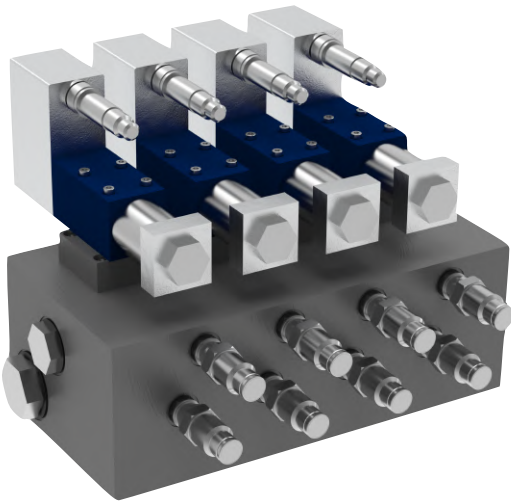
Parameter	Value
Service fluid	Any types of mineral and synthetic oils/fuel
Service fluid viscosity, cSt	1...250
Rated diameter of pressure line, mm	15...40
Rated diameter of discharge line, mm	19...50
Number of channels (ports)	2...6
Operating pressure, bar	350
Working fluid temperature, °C	-30 ... 120

# Hydraulic Control Manifold

Hydraulic Control Manifold is installed in hydraulic loading systems and ensures the necessary control of loading parameters over a long time period using the direct-acting servo control valves. This approach allows regulating pressure and service fluid delivery to hydraulic actuator in proportion to the control signal. The manifold structure allows ensuring the decreased hysteresis and a high stability.

If pressure feedback is needed to be implemented, pressure sensors with standardized output signal 4...20 mA are installed in the HSM.

Servo control valves are controlled by the external control signal  $\pm 10$  V.



- **Installation simplicity**
- **Structural reliability**
- **Service maintenance comfort**
- **Accurate pressure or flow rate adjustment**

Parameter	Value
Working fluid	Mineral and synthetic oil
Working fluid viscosity, cSt	6..80
Operating pressure, bar	350
Number of channels	4
Distributor type	4/3
Flow rate per channel at ( $\Delta P=70$ bar) l/min	Up to 40
Control signal, V	$\pm 10$
Feedback sensor signal, mA	4...20
Service fluid temperature	-20...80 °C

Optionally:	
Installation of pressure sensors with a standardized output signal 4...20	Yes/No
Number of channels	1 / 2 / 3 / 4

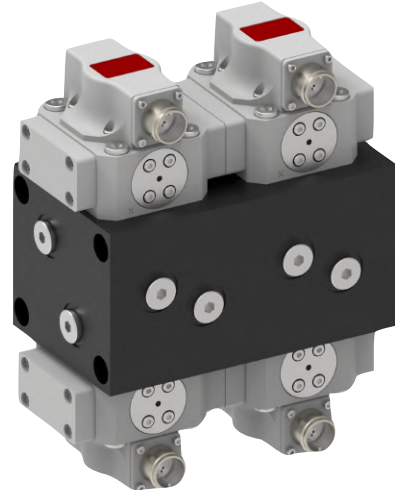


# Servo Valve Manifold

Servo Valve Manifold is used in hydraulic loading system and is directly installed on the **cylinder**. Its design provides for a surge damping valve as well as an opportunity of connecting pressure transducers. Service fluid flow to the actuating device is directly proportional to the control signal.

Servo Valve Manifold allows high-frequency loading.

- **Not depending on the pressure drop**
- **Minimal hysteresis**
- **High stability**



Parameter	Value
Service fluid	Mineral and synthetic oil
Service fluid viscosity cSt	6...80
Operating pressure	315
Flow rate per channel at ( $\Delta P=70$ bar) l/min	Up to 63
Control signal, V	$\pm 10$
Service fluid temperature	-30...200 °C

Optionally:	
Service fluid flow rate	4/ 10/ 19/ 38/ 63

# Hydraulic Power Unit

Hydraulic Power Unit is a device with self-diagnostic features and is intended for the service fluid delivery to hydraulic systems at a set flow rate and pressure.

Hydraulic power unit control, accident reporting and monitoring are in line with the industrial Ethernet standards.

- modular structure
- low noise
- independent cooling and filtering circuit
- optional use of various pressure and flow rate regulators
- hydraulic impact dampener
- pressure snubber
- smooth electric motor startup / frequency controlled drive
- smooth pressure increase
- real-time controller and control panel
- remote control and monitoring via Ethernet
- service fluid quality monitoring system

Depending on the hydraulic power unit capacity, 2 arrangement types are available

**Up to 37 kW**

Single Hydraulic Power Unit



**45 kW ... 1.6 MW**

Hydraulic Power Unit. Each module is 45 – 315 kW. Integration up to 1.6 MW



Parameter name	Value
Service fluid	Mineral and synthetic oils, fuel
Service fluid viscosity, cSt	5...100
Operating pressure, bar	Up to 350
Maximum short-time pressure, bar	420
High-pressure circuit, bar	Up to 1040
Flow rate, l/min	From 18.5 to 3150
Rated filtration fineness, µm	10
Ambient temperature, °C	+15...+40
Maximum permissible oil heating in the tank, °C	85

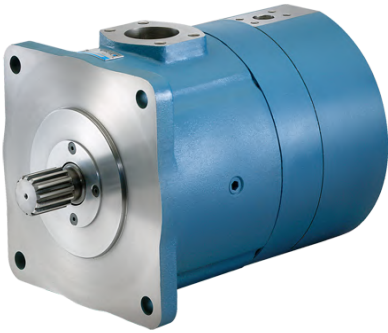
The Automated Hydraulic Power Unit may be configured with various pressure and flow rate regulators:

- Pressure regulator**                      pressure control at constant volume (proportional)
- Proportional regulator of pump operating volume**      allows regulating the pump delivery (system flow rate) using the electric control signal
- Pressure compensator**                      regulates the pump displacement in line with the actual system demand for constant pressure maintenance
- Power regulator**                              combines functions of pressure regulation and limitation of input power takeoff by the pump. This regulator allows high flow rate at a lower pressure and low flow rate at a high pressure. The proportional pump displacement and pressure regulator allows regulating the pump delivery and pressure with the electrical control signal

<b>Optionally:</b>	
High pressure unit, bar	420 / 500 / 700 / 1000
Vibration monitoring system	Yes/No
Passive noise damping	Yes/No
Service fluid degradation monitoring	Yes/No

# Hydraulic pumps

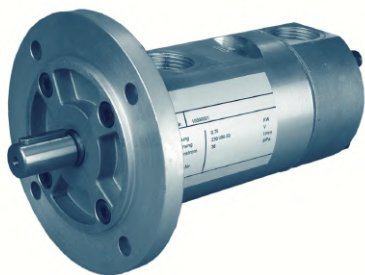
## Axial Piston Constant Delivery Pumps



The pumps operate with fluid viscosities above 1.5 cSt. Bidirectional rotation ensures constant flow direction irrespective of the shaft rotation direction. The pumps are compatible with various service fluid types including those with low lubricating capacity. The pumps may supply **multiple independent flows** from one pump. Multiple flows are obtained with adding the capacities of separate pistons in different combinations (to one piston outlet).

Parameter	Value
Operating pressure, bar	Up to 1040
Delivery, l/min	From 0.6 to 204
Rotation speed, rpm	Up to 3000
Service fluid type	Mineral and synthetic oils, fuel, glycol, special aircraft fluids
Shaft	SAE/ISO
Ports	SAE/ISO/BSPP

## Screw Pumps



Three-spindle self-priming screw pump is suitable for pumping most fluid types, including special-purpose ones, for example Skydrol-LD4.

- **Low noise**
- **Viscosity range from 4 to 2000 cSt**
- **Compact design and lightweight**

Parameter	Value
Operating pressure, bar	Up to 80
Delivery, l/min	From 8 to 1200
Service fluid type	Mineral and synthetic oils, fuel, glycol, special aircraft fluids
Shaft	SAE/ISO
Ports	SAE/ISO/BSPP

# Manual pumps

Manual pumps are intended for building up the pressure in closed hydraulic systems. The pump multifunctionality is suitable for pressure testing of hydraulic systems and connections, calibration of pressure sensors and pressure gauges, setting of safety valves and other verifications requiring pressure build-up and maintenance without the service fluid flow. The HP1600 series working chamber volume switch allows speeding up the process of hydraulic system filling with the service fluid.

- **Reaching the maximum pressure with minimum efforts**
  - **Pressure cutoff adjustment**
  - **Operating modes for adapting to necessary applications**
  - **Operating volume regulation**
  - **Safe pressure relief**
- Manual pumps are produced in two modifications:
- HP400 manual pump built in the hydraulic system;
  - HP1600 independent manual pump with the control system.

Parameter	HP400	HP1600
		
Maximum pressure, bar	420	1600
Volume regulator	Mechanical 2 ranges	Mechanical 2 ranges
Service fluid	Any mineral and synthetic oils	Any mineral and synthetic oils
Service fluid viscosity, cSt	10...250	10...250
Service fluid temperature, °C	-30...+30	-30...+30
Drive	Manual	Manual
Control system	-	3 modes

HP1600 is fitted with the service fluid tank, non-return valve, pressure sensor and control system. For transportation convenience, HP1600 may be installed on a mobile frame.

The HP1600 control system is fitted with mono display and standalone power supply (3xAAA batteries)

Control system functions:

- pressure gauge and pressure sensor calibration mode – the system annunciation of reaching the pressure value to the setpoint;
- safety valve setting mode – recording of the maximum pressure value by the system before discharge by the safety valve;
- pressure testing mode – recording of the pressure decrease time down to the permissible setpoint.

# Filters

The laminated installation pattern of the filters allows using them in modular assemblies at a temperature of -60°C to +130°C.

- **Reduced overall dimensions**
- **Filter element contamination sensor**
- **Application with aircraft service fluids**
- **Restorable non-disposable filter element**



Code	Filtration fineness, $\mu\text{m}$	Service fluid flow rate ( $\Delta\text{P}=1.5$ bar) l/min
F5	5	80
F10	10	350
<b>Optionally</b>		
PR	Contamination sensor with discrete output	
PS	Pressure sensor with analog output	

# Heat Exchangers

## Oil to Air Heat Exchanger

- Compatibility with any service fluids
- Compact size



Parameter	Value
Thermal capacity, kW	Up to 150
Testing/Operating pressure, bar	40/16
Maximum operating temperature of service fluid, °C	120
Service fluid type	Any mineral and synthetic oils, fuel, special fluids, water, brine
Radiator material	Aluminum / Stainless steel
Fan drive	Electric motor 400V AC, 12V DC, 24V DC; hydraulic motor
Ports	1/2...2"

Optionally:	
CF	Fan speed control
TC	Thermostat with PID regulator
PF	Radiator protection filter

## Hybrid Heat Exchangers

Hybrid heat exchanger combines the advantages of shell-and-tube and plate exchangers. Due to its hybrid structure, a higher cooling area of the heat exchanger allows combining smaller size with better cooling capacity.



Parameter	Value
Thermal capacity, kW	Up to 5000
Pressure service fluid/coolant, bar	35/16
Temperature range, °C	5...95
Service fluid type	Any mineral and synthetic oils, fuel, special fluids
Coolant type	Water, brine, water with dissolved glycols
Shell material	Steel / stainless steel / nickel plated steel
Tube material	Copper-Nickel alloy (90/10) / Stainless steel/copper/ titanium
Radiator material	Aluminum/titanium
Ports	SAE/ISO/BSPP/NPT

Optionally:	
CV	Coolant feed control valve
TV	Thermostat with PID regulator (CV valve control)



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