

MODULAR HYDRAULIC SERVICE MANIFOLD



Rev. -, June 2023

PROVIDING OFF/LOW/HIGH ISOLATION CONTROL
FOR TEST SYSTEMS AND HYDRAULIC ACTUATORS

WHAT MOVES YOUR WORLD

MOOG

Whenever the highest levels of motion control performance and design flexibility are required, you'll find Moog expertise at work. Through collaboration, creativity and world-class technological solutions, we help you overcome your toughest engineering obstacles.

Enhance your machine's performance, achieve greater efficiencies and help take your thinking further than you ever thought possible.

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This catalog is for users with technical knowledge. To ensure that all necessary characteristics for function and safety of the system are given, the user has to check the suitability of the products described herein. The products described herein are subject to change without notice. In case of doubt, please contact Moog.

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PRODUCT OVERVIEW

The Moog Modular Hydraulic Service Manifold (M-HSM) provides an effective hydraulic engagement and isolation control to a test system or individual hydraulic actuator.

Typically, the M-HSM inlet ports are connected to a central Hydraulic Power Unit (HPU). The outlet ports are connected to servo hydraulic systems or actuators. Moog M-HSM is designed to be working under 280 bar system pressure, and the maximum rated flow capacity is ranged from 400 to 1000 l/min. The M-HSM can be connected with up to 4 control stations (more on request) and supply each station with the maximum flow of the size.

The overall flow of the assembly at the same time is limited to the maximum flow of the size.

The M-HSM can provide Off/Low/High controlled hydraulic pressurization to the test system to establish smooth hydraulic engagement which helps avert pressure surges to the test system or damage to the specimen. Moog M-HSM is designed in regards of the Pressure Equipment Directive (PED) and has an optional safety manifold.

The M-HSM is available in a variety of design configurations to be quickly paired to a wide variety of hydraulic test systems. Typical Moog Test System pairings include:

- Moog Hydraulic Simulation Table
- Moog Tire Coupled Simulation System
- Moog Multiple Axis Testing System

Moog offers the option of CE complied M-HSM design:

- A TÜV certificated safety relief valve is provided to protect the operation within a safe pressure level.
- A shut-off valve to isolate the pilot pressure line from the pressure line, in order to avoid any unexpected movement, for example on the actuator.



FEATURES AND BENEFITS

| Features | Benefits |
|---|---|
| "Safety manifold" with redundant valves, with limit switch, with a modular design | High performance level EN ISO 13849-1 possible. Safety function can be equipped later |
| Designed in regards of Machinery Directive (2006/42/EG) and Pressure Equipment Directive (2014/68/EU) | TÜV pressure relieve valves and drain valve for each accumulator |
| Expandable up to 5 low/high functionalities | Flexible and expandable planning of the test station. Additional low/high functionalities can be upgraded |
| High flow on each low/high station | The maximum flow of the size of system can be used on each low/high station |
| "Off/Low/High" pressure control | Low pressure (adjustable) provides a "Safe-Mode" during system installation, commissioning and tuning. High pressure mode provides the full power to the normal test and operation. |
| Soft but fast transition from low to high with low overshoot | Fast switching between low and high pressure without high overshoot |
| Optional pilot oil module | Pilot oil module to supply external pilot operated valves on the axis. Pilot oil can be switched on and off and is equipped with a accumulator. |
| Rapid "Pressure-Unloading" when switching to "Off" mode | Quickly remove pressure from actuator(s). This will bring the system from a "Pressurized-Mode" down to a "Safe-Mode" as soon as possible. |
| 16 µm filter for pressure line 3 µm filter for pilot line | Minimize and eliminate possible contaminations introduced from HPU or piping lines. |
| Accumulator certification to meet various regulations | Accumulator Certification of US, EU, China, etc. available, to meet regulation of different countries/ regions. |

SPECIFICATIONS

| Model | M-HSM 400 | M-HSM 1000 |
|---|---|---|
| Number of station | 1 to 4 | 1 to 4 |
| Rated flow (station 1 to 4) | 400/400/400/400 l/min | 1000/1000/1000/1000 l/min |
| Nominal HPU flow | 400 l/min | 1000 l/min |
| Operating pressure | 280 bar | 280 bar |
| Low pressure setting (factory setting) | 35 to 210 bar | 50 to 210 bar |
| Solenoid control | | |
| Low pressure control | Yes | Yes |
| High pressure control | Yes | Yes |
| Pilot pressure control (optional) | Yes | Yes |
| Supply voltage | 24 VDC | 24 VDC |
| Maximum power | 17/30 W | 17/30 W |
| Solenoid connector | Plug-in connector according to DIN 43650 | |
| Filtration | | |
| Pressure line | 16 µm | 16 µm |
| Pilot line | 3 µm | 3 µm |
| Contamination indicator | Δp 5 bar 24V LED Visual and electrical indication | Δp 5 bar 24V LED Visual and electrical indication |
| Accumulation | | |
| Pressure line (bladder accumulator) | 6 l standard 10 l optional | 10 l standard >10 l optional |
| Return line (bladder accumulator) | 2,5 l standard >4 l optional | 6 l standard >6 l optional |
| Pilot line (diaphragm accumulator) | 1,4 l | 1,4 l |

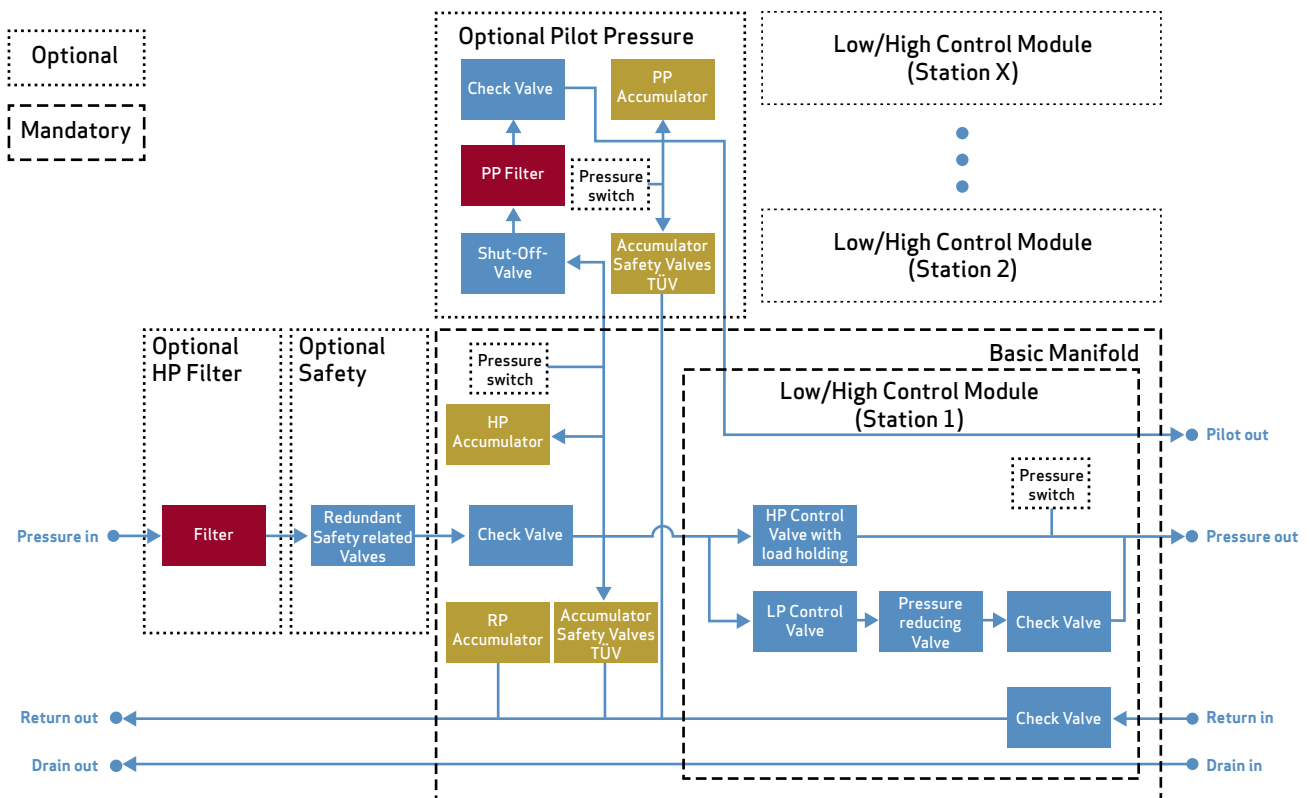
ADDITIONAL SPECIFICATIONS

| | |
|--|--|
| Hydraulic oil temperature | -30 to +80 °C |
| System fluid | Hydraulic oil as per DIN 51524 parts 1 to 3 and ISO VG 32, 46 or equivalent |
| Cleanliness level | Functional safety: ISO 4406: 20/18/15 long service life: ISO 4406: 17/14/11 |
| Seal material | NBR |
| Ambient temperature range | -25 to +50 °C |
| Viscosity | Recommended: 15 - 46 cst Maximum: 2.8 - 380 cst |
| Safety relief valve (factory setting) | 315 bar |

CONTROL MODULE CONFIGURATION

| Model | 1 station | 2 stations | 3 stations | 4 stations | Max. flow at the same time |
|------------|----------------------|----------------------|----------------------|----------------------|----------------------------|
| M-HSM 400 | 1x 400 l/min module | 2x 400 l/min module | 3x 400 l/min module | 4x 400 l/min module | 400 l/min |
| M-HSM 1000 | 1x 1000 l/min module | 2x 1000 l/min module | 3x 1000 l/min module | 4x 1000 l/min module | 1000 l/min |

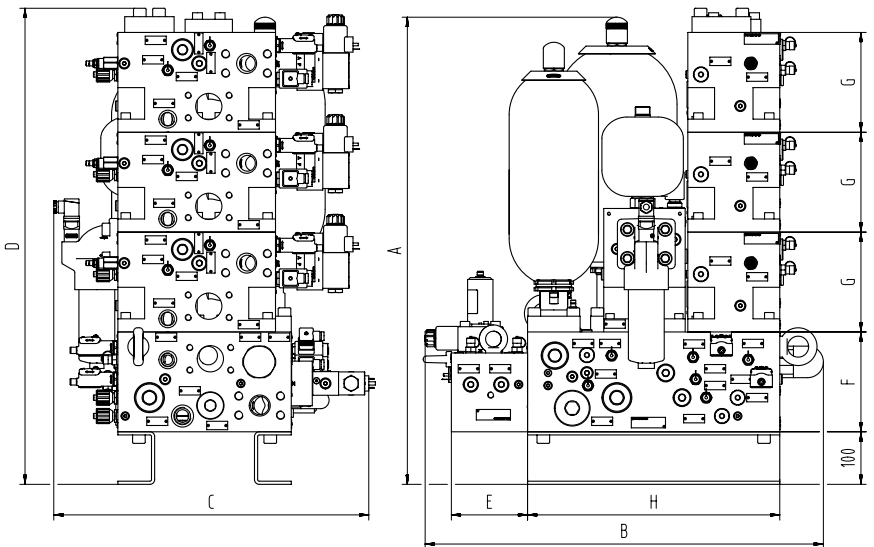
HYDRAULIC SCHEMATIC



DIMENSIONS

Assembly Dimension

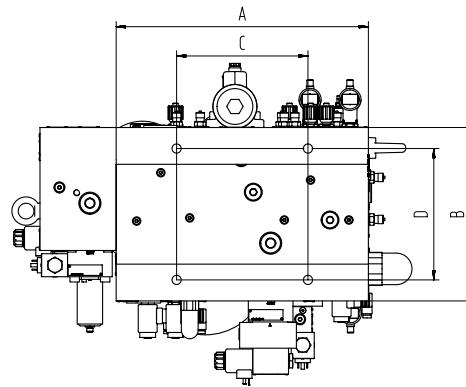
| | M-HSM 400 | M-HSM 1000 |
|---|-----------|------------|
| A | 890 mm | 960 mm |
| B | 760 mm | 885 mm |
| C | 600 mm | 680 mm |
| D | 910 mm | 1,170 mm |
| E | 145 mm | 170 mm |
| F | 190 mm | 240 mm |
| G | 190 mm | 260 mm |
| H | 480 mm | 645 mm |



Bracket mounting dimensions

Mounting interface of the brackets to the customer floor

| | M-HSM 400 | M-HSM 1000 |
|---|-----------|------------|
| A | 480 mm | 645 mm |
| B | 300 mm | 330 mm |
| C | 250 mm | 250 mm |
| D | 250 mm | 250 mm |



Bracket interface hole diameter (Ø 17,5 mm)

HYDRAULIC FITTING SPECIFICATION

| Model | Port Designation ⁽¹⁾ | Port Designation ⁽¹⁾ | Port Type ⁽²⁾ |
|------------|---------------------------------|---------------------------------|--------------------------|
| | | | CE Compliance |
| M-HSM 400 | P1.1 / P2.1 | P_sys | SAE 1 ½" 6000PSI |
| | R1.1 / R2.1 | R_sys | SAE 2" 3000PSI |
| | D1.1 / D2.1 | D_sys | G 1" |
| M-HSM 1000 | | PP_sys | G ¾" |
| | P1.1 / P2.1 | P_sys | SAE 2" 6000PSI |
| | R1.1 / R2.1 | R_sys | SAE 2 ½" 3000PSI |
| | D1.1 / D2.1 | D_sys | G 1" |
| | | PP_sys | G ¾" |

1) Port designations please refer to hydraulic schematic

2) SAE flange (code 61 flange) adopted is conformed to ISO 6162-1 standard

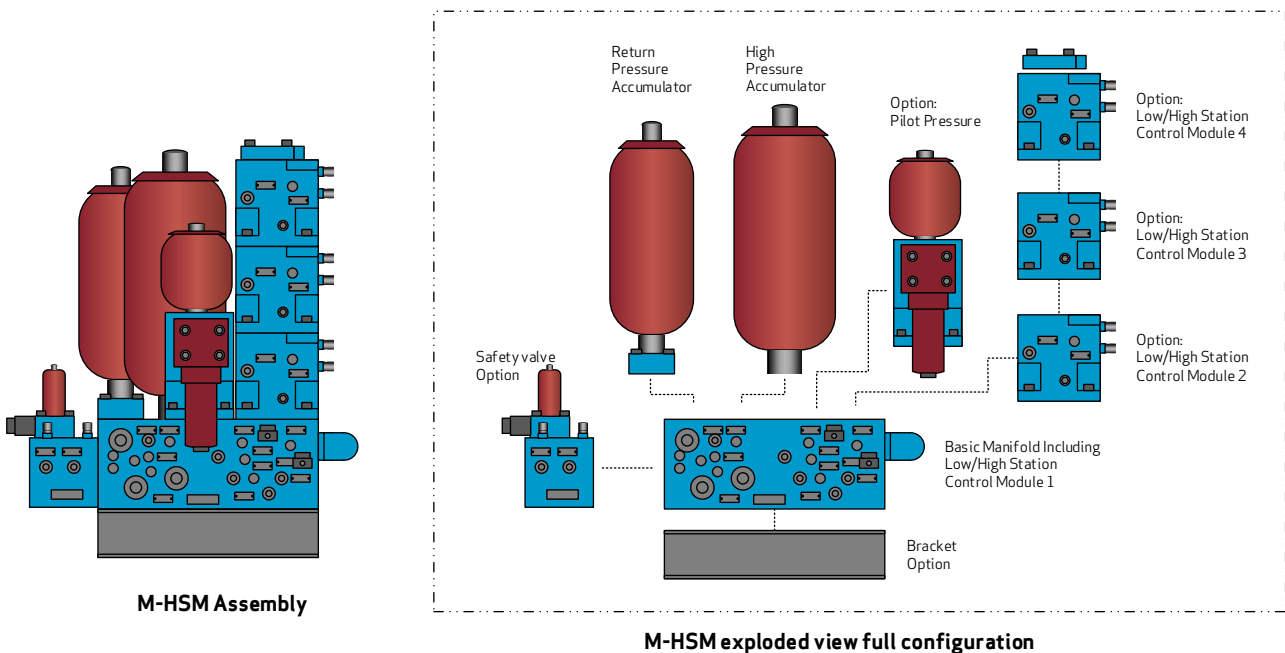
CONFIGURATION TO MEET YOU NEEDS

OPTIONS

A variety of building blocks are available to configure the M-HSM to the specific needs of your application. In combination with the available options, the M-HSM can be configured out of standardized modules.

The M-HSM is offered in 2 sizes, 400 l/min and 1000 l/min. It also can be configured to become a single station or up to 4 control stations. In addition to the size and number of control stations there are also other options such as a safety valve option and pilot pressure option. Application engineers can choose from the most appropriate configuration to meet their requirements.

- Pilot pressure (PP) and Shut-off valve - A pilot pressure block, if selected, supplies the system with an additional pilot pressure to supply valves with external pilot pressure supply.
- Safety Manifold to add redundant safety related valves (MTTF_d 150 years) in front of the M-HSM to reach a high performance level
- Many choices of accumulator certification to meet regulations of different countries/regions. CE is standard.
- Additional high pressure in line filter: The system can be equipped with an additional high pressure filter which needs to be integrated into the piping.
- Pressure switch option: Available are different signal options on the pressure switch, regarding of the switching point and output signal



Options of M-HSM Assembly

ELECTRONICS

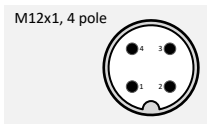
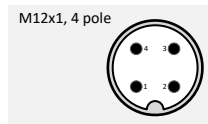
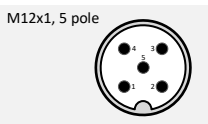
Pressure Switch Options

The Modular Hydraulic Service Manifold can be equipped with pressure switch sensors.

The functionality of the pressure switch sensor is to monitor the different pressures in the system and communicate these as a switching and/or an analog signal to the attached controller.

The sensors on the actuator are able to provide pressure information about the following pressures:

- pressure in the accumulators (S2.1)
- pressure in the pilot accumulator (S3.1)
- system pressure (P_{sys}) on the low/high stations.

| | No pressure switch (0) | 2 switching points (2) | 1 switching point, 1 analog output (3) | 2 switching point, 1 analog output (5) | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
|-----------------------|------------------------|--|--|--|---|-----|---|-----|---|----|---|-----|--|-----|--|---|-----|---|----------|---|----|---|-----|--|-----|--|---|-----|---|----------|---|----|---|-----|---|-----|
| Mechanical connection | G1/4 A ISO 1179-2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pin connection | |  <table border="1"> <thead> <tr> <th>Pin</th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>+Us</td> </tr> <tr> <td>2</td> <td>SP2</td> </tr> <tr> <td>3</td> <td>0V</td> </tr> <tr> <td>4</td> <td>SP1</td> </tr> </tbody> </table> | Pin | | 1 | +Us | 2 | SP2 | 3 | 0V | 4 | SP1 |  <table border="1"> <thead> <tr> <th>Pin</th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>+Us</td> </tr> <tr> <td>2</td> <td>Analogue</td> </tr> <tr> <td>3</td> <td>0V</td> </tr> <tr> <td>4</td> <td>SP1</td> </tr> </tbody> </table> | Pin | | 1 | +Us | 2 | Analogue | 3 | 0V | 4 | SP1 |  <table border="1"> <thead> <tr> <th>Pin</th> <th></th> </tr> </thead> <tbody> <tr> <td>1</td> <td>+Us</td> </tr> <tr> <td>2</td> <td>Analogue</td> </tr> <tr> <td>3</td> <td>0V</td> </tr> <tr> <td>4</td> <td>SP1</td> </tr> <tr> <td>5</td> <td>SP2</td> </tr> </tbody> </table> | Pin | | 1 | +Us | 2 | Analogue | 3 | 0V | 4 | SP1 | 5 | SP2 |
| Pin | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | +Us | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | SP2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 0V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | SP1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pin | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | +Us | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Analogue | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 0V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | SP1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pin | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 1 | +Us | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 2 | Analogue | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 3 | 0V | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 4 | SP1 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| 5 | SP2 | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Pressure ranges | | 400 bar | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Switching outputs | | 1 or 2 PNP transistor outputs Switching current: max. 1.2 A per output | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Analog outputs | | | Selectable: 4 .. 20 mA load resist. max. 500 [°] 0 .. 10 V load resist. min. 1 k [°] | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Supply voltage | | 9 .. 35 V DC | 18 .. 35 V DC | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |
| Display | 4-digit, LED | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | | |

HIGH PRESSURE FILTER

Filter Option Element in Supply Line

| M-HSM 400 | | | | | | | | | | M-HSM 1000 | | | | | | | | | | | | | | | |
|---|-------|------|-----|------|----|------------|-----|-----|---------|--|--------------|---|----|--------|----|----|--|------------|--|--|--|----|--|--|--|
| X998-04578 HD790-158 - DG023-02 M $\Delta p = 0,5\text{bar}$ | | | | | | | | | | X998-04579 HD990-158 - DG023-02 M $\Delta p = 1,6\text{bar}^*$ | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | |
| | | | | | | | | | | | | | | | | | | | | | | | | | |
| Type | A/B | C | D | E | F | G | H | I | K mm | L | M Ø/depth | N Ø/depth | O | P | Q | R | | | | | | | | | |
| HD 790 | SAE 2 | 44.4 | 495 | 96.6 | 96 | 184 | 140 | 430 | AF 36 | 36 | M20/32 | M12/20 | 58 | 91 | 89 | 95 | | | | | | | | | |
| HD 990 | SAE 2 | 44.4 | 700 | 96.6 | 95 | 184 | 140 | 640 | AF 36 | 36 | M20/32 | M12/20 | 58 | 91 | 89 | 95 | | | | | | | | | |
| Type | S | T | U | V | | | | | | | | | | | | | | | | | | | | | |
| HD 790 | 93 | 122 | 102 | 13 | | | | | | | | | | | | | | | | | | | | | |
| HD 990 | 93 | 122 | 102 | 13 | | | | | | | | | | | | | | | | | | | | | |
| Nominal flow rate: | | | | | | 750 L/min | | | | | | Nominal flow rate: | | | | | | 1000 L/min | | | | | | | |
| Weight: | | | | | | 46 kg | | | | | | Weight: | | | | | | 55 kg | | | | | | | |
| Cracking pressure of by-pass: | | | | | | 7 bar | | | | | | Cracking pressure of by-pass: | | | | | | 7 bar | | | | | | | |
| Filter fineness | | | | | | 16 µm | | | | | | Filter fineness | | | | | | 16 µm | | | | | | | |
| Filter Element: | | | | | | V3.1040-08 | | | | | | Filter Element: | | | | | | V3.1060-08 | | | | | | | |
| Dirt-holding capacity: | | | | | | 89 g | | | | | | Dirt-holding capacity: | | | | | | 140 g | | | | | | | |
| Clogging sensor: optical and electrical | | | | | | | | | | | | | | | | | | | | | | | | | |
| DG 023 - Electrical differential pressure switch with temperature suppression (change over) | | | | | | | | | | | | Function: The built-in Reed switch changes over when the preset differential pressure is exceeded. If the temperature drops below 32 °C / 90 °F, a temperature switch opens and suppresses the signal of the differential pressure switch. The transport socket with 2 built-in LEDs makes it possible to have an additional optical indication of the filter contamination. | | | | | | | | | | | | | |
| Part no. | | | | | | | | | | DG 023-02 | | | | | | | | | | | | | | | |
| Optical indicator | | | | | | | | | | • | | | | | | | | | | | | | | | |
| Electrical switch | | | | | | | | | | • | | | | | | | | | | | | | | | |
| Temperature suppression <+32 °C / +90 °F S ₁ | | | | | | | | | | • | | | | | | | | | | | | | | | |
| Responses / switching pressure S ₂ / S ₃ | | | | | | | | | | bar | | | | 5.0 | | | | psi | | | | 73 | | | |
| Type of contact | | | | | | | | | | change-over | | | | | | | | | | | | | | | |
| Switching voltage U | | | | | | | | | | V AC/DC | | | | -/30 | | | | | | | | | | | |
| Switching current I | | | | | | | | | | V AC/DC | | | | -/0.25 | | | | | | | | | | | |
| Switching power P | | | | | | | | | | VA/W AC/DC | | | | -/3.0 | | | | | | | | | | | |
| Symbol | | | | | | | | | | 4 | | | | | | | | | | | | | | | |
| Weight | | | | | | | | | | 0.34 kg / 0.75 lbs | | | | | | | | | | | | | | | |
| Remarks | | | | | | | | | | with socket | | | | | | | | | | | | | | | |

* 46 cSt, Clean Filter Element

ORDERING CODE

N - M-HSM - A A - XXXX X X X - 28 D X / X - X 1

Sealing Material

NBR N

Product Name

Modular Hydraulic Service Manifold M-HSM

Modul Name

Assembly A

Series

Serie A A

Size

M-HSM 400 0400
M-HSM 1000 1000

Station Number

1 1
2 2
3 3
4 4

Pilot Pressure (PP) Option

Without PP Manifold 0
With PP Manifold 1

Safety option

Without Safety Manifold 0
With Safety Manifold 1

Working Pressure

280 bar 28

Accumulator Certification Code

EU Member States D

Accumulation Volume (Pressure)

61 Pressure (Standard M-HSM 400) 6
101 Pressure (M-HSM 1000) 10
201 Pressure 20
501 Pressure (only for M-HSM 1000) 50

Accumulation Volume (Return)

2,5 l Return (Standard M-HSM 400) 2,5
6 l Return (Standard M-HSM 400) 6
10 l Return 10
20 l Return 20

Pressure Switch Option for Pilot & low/high Module

No Pressure Switch, just minimess (Standard) 0
Pressure Switch with 2 switching points 2
Pressure Switch with 1 switching point & 1 analog output 3
Pressure Switch with 2 switching points & 1 analog output 5

Bracket

With bracket (Standard) 1

Special

Special XXXX

MOOG TEST PRODUCTS-FOR EVERY TESTING NEED

Moog engineers are always ready to meet your unique application needs with building blocks or complete turnkey systems that include hydraulic or electric test actuators, Moog servo valves, hydraulic service manifolds, test controllers, software and more.

TEST CONTROLLERS AND SOFTWARE

The Moog Test Controller is a real-time modular control system that can control or collect data from any hydraulic or electromechanical test system. The robust and compact modules have a wide range of transducer inputs and control outputs that can be easily configured for optimum use. The Moog test software allows the end user to control and record all of these signals in an easy to use format providing maximum value for many years of reliable usage.



Moog Integrated Test Suite



Moog Replication



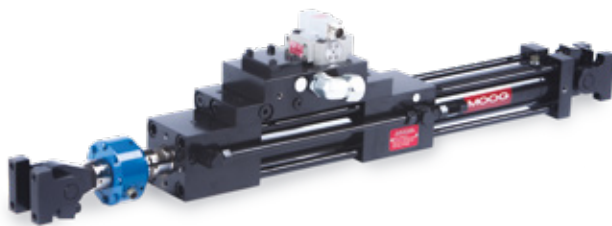
Moog Runner



Moog Sinesweep



Moog Vibration



POLYMER BEARING ACTUATOR

Fatigue rated actuators are the heart of high performance test systems. For years, test engineers have been looking for actuators that deliver dependability, less maintenance and high performance, yet are available at an affordable price.

MOOG SERVO VALVES

Moog Servo Valves are recognized as the world standard in performance and durability. When used as part of a complete solution, you're assured of an efficient and reliable system tailored to your exacting requirements.





HYDROSTATIC BEARING TEST ACTUATOR

Used in the Standard Hydraulic Simulation Table

- Innovative 8 pocket hydrostatic bearing increases side load capacity to 60% of stall output and reduces energy requirements
- Higher level of dynamic performance, reliability, and longevity
- Advanced coating used on the rod significantly improves wear for long life and less maintenance
- Fully integrated manifold eliminates the need for any external piping

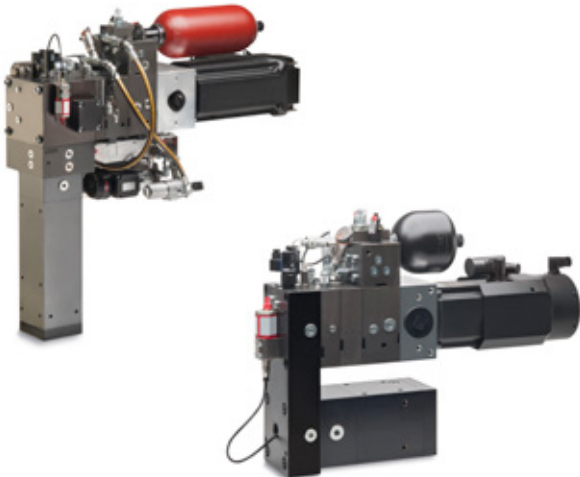
C086A3 SINGLE ENDED ACTUATOR

The Moog Single-Ended Hydraulic Test Actuator delivers higher reliability, less maintenance and cost-effective performance to meet critical needs of test engineers. A wide array of sizes and variety of options of features are available providing a high adaptability to users' need.



COMPACT EAS

The Compact Electrohydrostatic Actuation System (Compact EAS) effectively controls linear motion for all industrial applications requiring high density and high dynamics. Like all Moog EAS actuation systems, the Compact EAS provides an attractive alternative to traditional electrohydraulic (EH) or electromechanical (EM) systems.



- High force capability and force density that provides an attractive alternative to EH and EM actuation
- Low noise emission for quiet machine operation
- Environmentally clean due to a lower oil requirement compared to the standard systems
- High energy efficiency
- Reduced components for easy maintenance and increased reliability



Moog Global Support

Moog Global Support is our promise to offer world-class Repair and Maintenance Services delivered expertly by our trained technicians. With facilities around the world, Moog offers you service and expertise you can count on to keep your equipment operating as it should.

This promise offers many benefits to our customers including:

- Reduce your downtime by keeping critical machines running in peak performance
- Protect your investment by ensuring reliability, versatility and long-life of products
- Better plan your maintenance activities and make systematic upgrades
- Leverage our flexible programs to meet the unique service requirements of your facility

Look to Moog for global support including:

- Repair services using OEM parts are performed by trained technicians to the latest specifications
- Stock management of spare parts and products to prevent unplanned downtime
- Flexible programs, tailored to your needs such as upgrades, preventative maintenance and annual/multi-year contracts
- On-site services bring the expertise to you, providing quicker commissioning, set-up and diagnostics
- Access to reliable services that are guaranteed to offer consistent quality anywhere in the world

For more information on Moog Global Support visit www.moog.com.



TAKE A CLOSER LOOK.

Moog designs a range of products that complement the performance of those featured in this catalog. Visit our website for more information or contact the Moog facility nearest you.

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