

Fast Switching Valves

Ultra Fast and Highly Repeatable

MH2, MH3 and MH4

- **MH2:** Flow rate of 100 l/min and 2 ms response
- **MH3:** Flow rate of 200 l/min and 3 ms response
- **MH4:** Flow rate of 400 l/min and 3.5 ms response
- Integrated electronic circuit in valve coil



Function and Mounting

- 3/2-way valves (open and closed)
- Repetition accuracy better than 0.2 ms
- In-line, semi in-line and sub-base mounting
- Threaded ports for push-in tubing connections

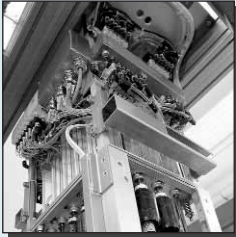


Application

- Sorting, bonding, dosing, packaging
- Reliable, extremely long life
- Simple, flexible solutions
- Boost productivity



MH2, MH3, and MH4 Fast Switching Valves



Features and Benefits

Higher Switch-on Speeds

This family of 3/2 direct acting solenoid valves can achieve response times as short as 2 ... 3.5 ms with an integrated electronic circuit (MS1), for increased productivity.

High Repeatability

Balanced poppets offer consistent switching over the pressure range of the valve, with deviations of less than 0.2 ms - even in continuous use and three-shift operation. This high repeatability minimizes scrap and maximizes profitability.

Compact, Flexible Design

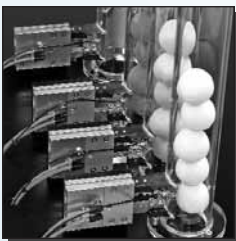
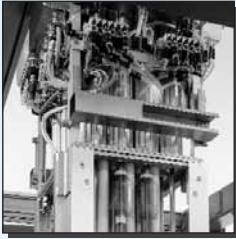
Available range of widths:
MH2: 10 mm, flows up to 100 l/min
MH3: 14 mm, flows up to 200 l/min
MH4: 18 mm, flows up to 400 l/min
Compact, flexible design means high packing density on the various mountings: in-line valve (MHE), semi in-line valve (MHP), and sub-base valve (MHA). Available manifolds can accommodate up to 10 valves.

Typical Applications

Fast switching valves are used for sorting via air jets, in flap control systems, in vacuum applications, for bonding, dosing, and labeling, and for piloting process valves in atomic layer deposition.

Ease of Use

Standard or custom manifolds are easy to order through our searchable online catalog. By integrating an electronic control into the valve coil, Festo can simplify your installation. This can reduce commissioning time, troubleshooting time, and overall system costs by eliminating special driver circuits.



Festo...Your Automation Partner Worldwide

As a global leader in industrial automation components and systems, with over \$1.6 billion sales worldwide, Festo has the resources and application experience to be your long-term partner for cost-effective automation solutions.

- 55 independent subsidiaries worldwide
- Representation in 180 countries
- Worldwide networking for consistent standards of products, consultancy, sales and services.
- Worldwide support provided by over 10,500 team members

Festo Quality Assurance, ISO 9001 Certification

Festo Corporation is committed to provide Festo products and services that will meet or exceed our customers' requirements in product quality, delivery, customer service and satisfaction.



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Online Literature

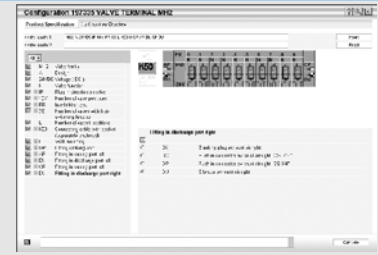
Literature in PDF format is available for download at:
www.festo-usa.com/pdfindex.html

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MH2, MH3, and MH4 Fast Switching Valves

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 Online Product Configurator 6



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MH2 [Flow rates up to 100 l/min. Response times as fast as 2 ms]

In-line Valves
 24 V DC
 MHE2



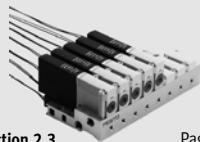
Section 2.1 Page 9

Semi In-line Valves
 5, 12, 24 V DC
 MHP2



Section 2.2 Page 15

Sub-base Valves
 5, 12, 24 V DC
 MHA2




Section 2.3 Page 33

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Page 7


MH3 [Flow rates up to 200 l/min. Response times as fast as 3 ms]

In-line Valves
 24 V DC
 MHE3




Section 3.1 Page 53

Semi In-line Valves
 24 V DC
 MHP3



Section 3.2 Page 59

Sub-base Valves
 24 V DC
 MHA3




Section 3.3 Page 67

3

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MH4 [Flow rates up to 400 l/min. Response times as fast as 3.5 ms]

In-line Valves
 24 V DC
 MHE4




Section 4.1 Page 77

Semi In-line Valves
 24 V DC
 MHP4



Section 4.2 Page 83

Sub-base Valves
 24 V DC
 MHA4




Section 4.3 Page 91

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Accessories

Plug Sockets and Cables
 MH2 Valves
 KMYZ, KMP6, MHAP, KMH




Page 100

Plug Sockets and Cables
 MH3 Valves
 KMYZ, MHAP3



Page 101

Plug Sockets and Cables
 MH4 Valves
 KMEB, MSSD



Page 102

Push-in Fittings
 Inch or Metric Connection
 QS



Page 103

Silencers
 Metric
 UC



Page 104

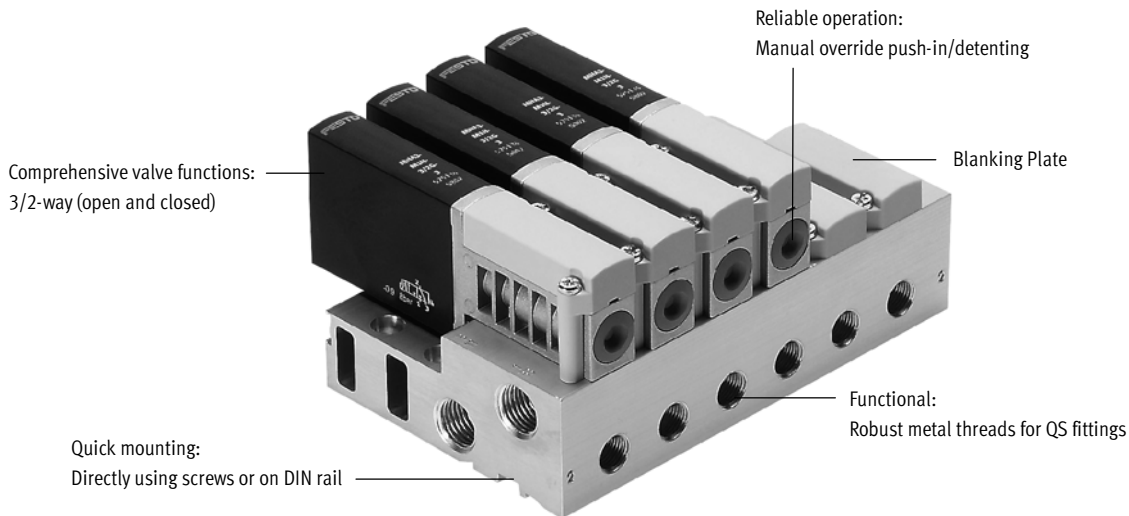
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Overview

MH2, MH3, and MH4 Fast Switching Valves

Overview



Features

- Extremely fast switching times and high flow in a compact size
- Highly repeatable – long life
- Choice of mounting as in-line valves, semi in-line valves, or sub-base valves
- Balanced poppet gives same switching time regardless of operating pressure
- Flow rate up to 0.40 Cv (400 l/min)
- IP40 or IP65 rated depending upon socket connection
- 3/2-way (open and closed) valve functions. Also can be operated as a 2/2-way valve.
- Reliable and Durable
- Fast installation
- Modular and Flexible
- Free of Copper, PTFE and Silicone

Flexible

- Wide operating pressure range, vacuum to 8 bar
- Modular construction

Reliable

- For precise applications, with repetition accuracy better than 0.2 ms
- 100% duty cycle
- Service life of over 250,000,000 cycles

Easy

- The valves are supplied with various end caps to provide a variety of connection interfaces.
- Control via standard PLC interface (24 V DC)
- Integrated electronics eliminate need for special driver circuits

Installation and Maintenance

- Compact valves, for applications where space is limited
- Flexible connection options
 - Pre-assembled cables with IP65 protection
 - Integral pre-molded coil/cables with IP40 protection

Overview

MH2, MH3, and MH4 Fast Switching Valves

1

3/2-way Valves ¹⁾		MH2	MH3	MH4
Size		MH2	MH3	MH4
Flow Rate		100 l/min	200 l/min	400 l/min
Operating Voltage		5, 12, 24 V DC	24 V DC	24 V DC
Pneumatic Connection		M5, M7 thread	G1/8, G1/4 thread	G1/4, G3/8 thread
Response Time (With fast switching electronics)	On	2 ms	3 ms	3.5 ms
	Off	2 ms	2.3 ms	3.5 ms
Response Time (Without fast switching electronics)	On	7 ms	8 ms	9 ms
	Off	7 ms	4.5 ms	5 ms
Mechanical Connection (See indicated pages)	MHE – In-line	Page 9 – Section 2.1	Page 53 – Section 3.1	Page 77 – Section 4.1
	MHP – Semi In-line	Page 15 – Section 2.2	Page 59 – Section 3.2	Page 83 – Section 4.2
	MHA – Sub-base	Page 33 – Section 2.3	Page 67 – Section 3.3	Page 91 – Section 4.3

1) Can be used as a 2/2-way valve by sealing port 1 or 3.

Electrical Connection Type Per Valve Configuration						
	Electrical Connection					
	Plug Vanes —	Molded-in Cable K	Plug – Rear HC	Plug – Top TC	Plug – Underneath PI	
Valve Configuration						
MHE In-line Valve ■ In-line mounting 	✓	✓	—	—	—	
MHP Semi In-line Valve ■ Individual sub-base mounting 	✓	✓	✓ MH2 only	✓ MH2 only	✓ MH2 only	
MHP Semi In-line Valve ■ Manifold mounting 	—	✓	✓ MH2 only	✓ MH2 only	✓ MH2 only	
MHA Sub-base Valve ■ Individual sub-base mounting 	—	✓	✓ MH2 only	✓ MH2 only	✓ MH2 only	
MHA Sub-base Valve ■ Manifold mounting 	—	✓	✓ MH2 only	✓ MH2 only	✓ MH2 only	

✓ = Available
 — = Unavailable

Online Product Configurator

MH2, MH3, and MH4 Fast Switching Valves



FACE Valve Terminal Configurator

Online via Festo's Website – Electronic Catalog

This configurator is available to help you easily configure an MH2 Valve Manifold.

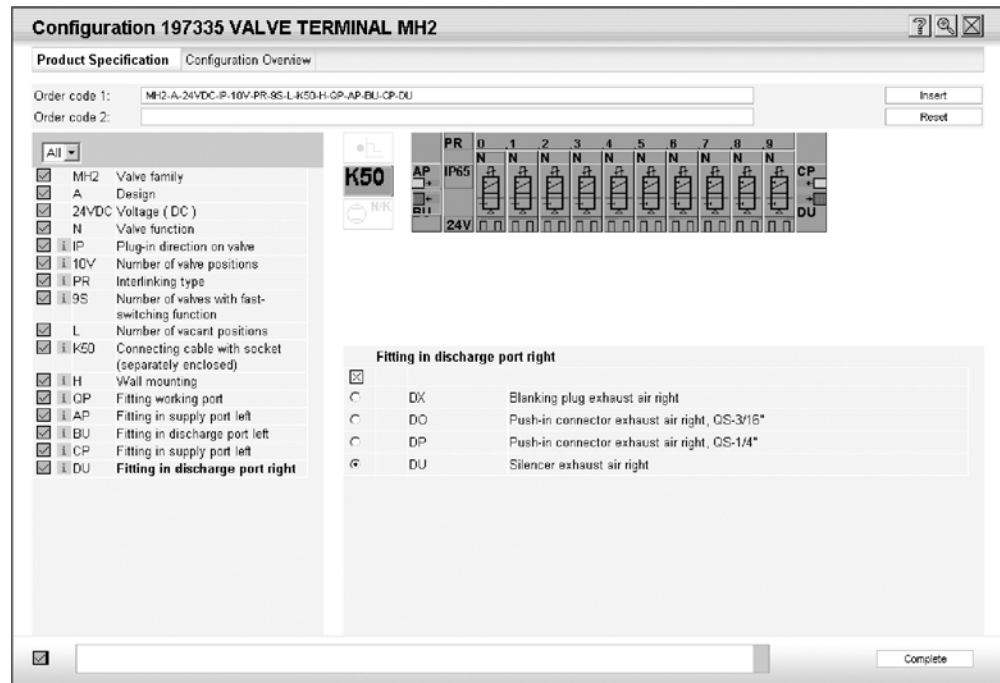
To use this tool, go to the internet address: www.festo.com/us. Then go to the Industrial Automation section of the website and proceed by using the [Catalog](#) link.

Use the **Direct Search** capability and type in the part number for a configurable MH2 Valve Manifold [P/N 197335].

Press Enter on your keyboard, and a new page will appear. Click on the blue shopping basket (gray is not configurable), then click on the [Configurator](#) link.

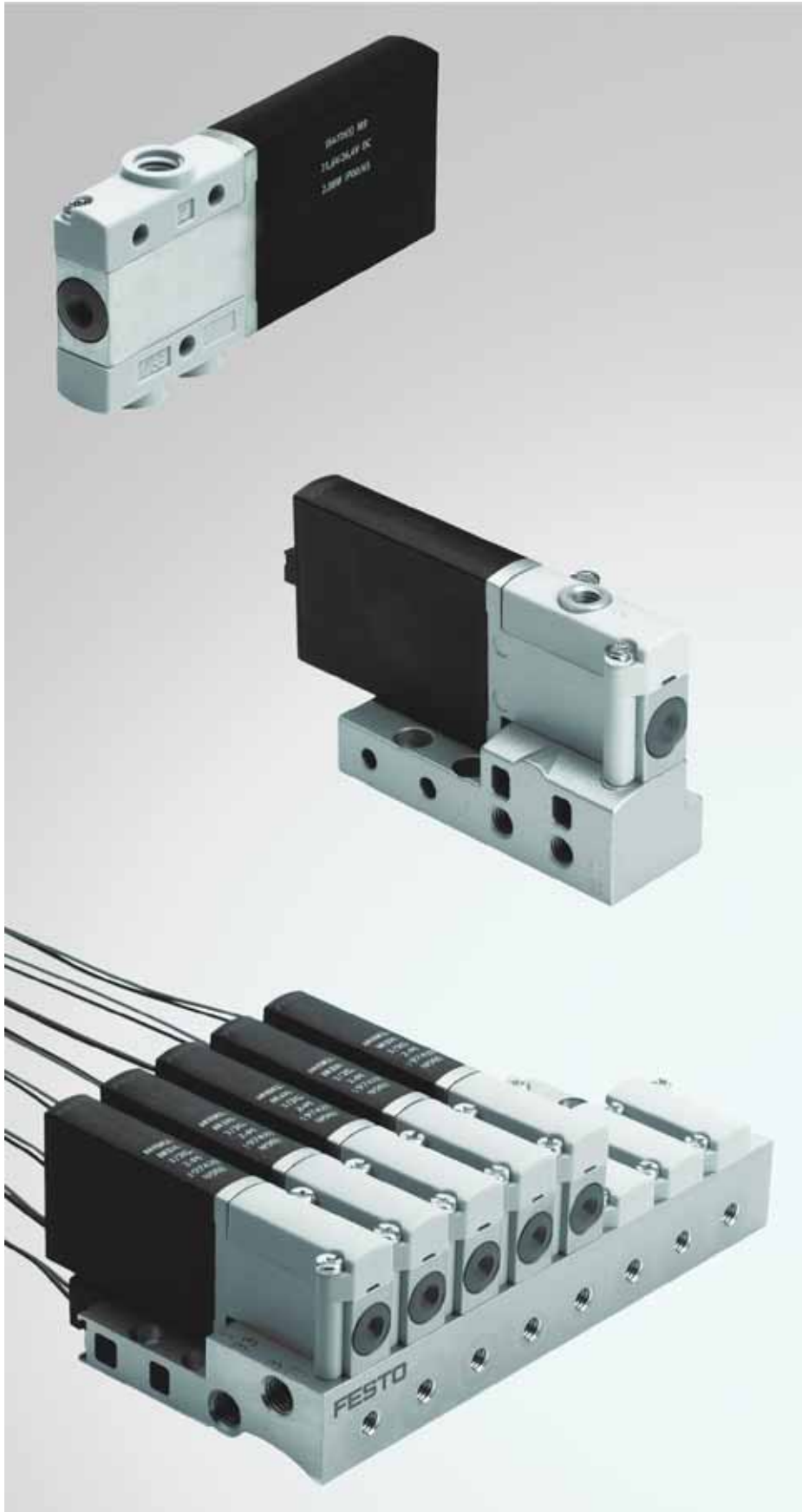
FACE will open, and then you can configure a manifold easily. After you have configured a manifold, click on the Complete button.

Select [OK](#) and it moves you into the shopping basket. You can print the manifold configuration by selecting the [Copy for printout](#) link next. Fax it to 1-800-96-FESTO for a quote.



The illustration above provides an example of an MH2 Fast Switching Valve Terminal configuration using FACE.

MH2 Fast Switching Valves



Flow rate: 100 l/min

Response times
as fast as 2 ms

In-line, Semi In-line,
and Sub-base versions

5, 12 and 24 V DC

Balanced poppet valve

M5 and M7 threaded
connections

MH P 2 – M 5 H – 3/2 – 0 – M5 – TC

Valve Family

MH	Fast-switching valves
----	-----------------------

Design

E	In-line valve
P	Semi in-line valve
A	Sub-base valve

Size

2	Flow rate 100 l/min
---	---------------------

Drive Function

M	Solenoid, switching
---	---------------------

Response Time

	Without electronics, 7 ms (on)
S	With electronics, 2 ms (on)

Operating Voltage

4	5 V DC
5	12 V DC
1	24 V DC

Manual Override

H	Momentary
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Valve Function

3/2	3/2-way valve
-----	---------------

Normal Position

G	Closed
O	Open

Pneumatic Connection

2	Nominal size 2 mm
M5	Thread M5
M7	Thread M7

Electrical Connection

	Plug vanes for plug socket KMYZ-...
K	Molded-in cable, 2.5 m long
HC	Plug connection at rear for plug socket KMH
TC	Plug connection on top for plug socket KMH
PI	Plug connection underneath for push-in connection

Note
 Additional variants and accessories can be configured and ordered for the MH2 modular product.
 →MHP2, see pages 26–31
 →MHA2, see pages 44–49

MHE2 Fast Switching In-line Valves



Flow rate: 100 l/min

Response times
as fast as 2 ms

24 V DC

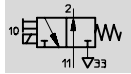
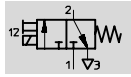
Balanced poppet valve

M7 threaded connections

Technical Data

MHE2 – In-line Valves

Function



Voltage:

24 V DC

Pressure:

-0.9 ... +8 bar

Temperature Range:

-5 ... +40°C



General Technical Data		
Valve function		3/2-way, single solenoid ¹⁾
Design		Balanced poppet valve
Sealing principle		Soft
Actuation type		Electrical
Type of control		Direct
Direction of flow		Reversible
Manual override		Momentary
Assembly position		Any
Grid dimension	[mm]	14
Nominal diameter	[mm]	2
Standard nominal flow rate	[l/min]	100
Type of mounting		Via through-holes
Product weight	[g]	50
Pneumatic Connections		
Pneumatic connection		Via valve
Supply port	1/33	Connecting thread M7
Exhaust port	3/11	Connecting thread M7
Working port	2	Connecting thread M7

1) Can be used as a 2/2-way valve by sealing port 1 or 3.

Operating and Environmental Conditions		
Operating medium		Inert gases, filtered compressed air, lubricated or unlubricated
Grade of filtration		40 μ
Operating pressure range	[bar]	-0.9 ... +8
Ambient temperature	[°C]	-5 ... +40 (100% duty cycle)
Temperature of medium	[°C]	-5 ... +40 (100% duty cycle)

Technical Data

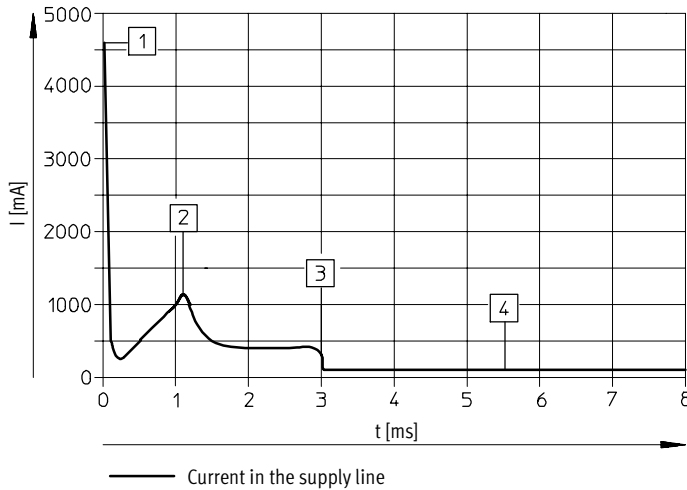
MHE2 – In-line Valves

Electrical Data		
Operating voltage	[V DC]	24 ±10%
Connection type		Plug vanes or molded-in cable
Power Consumption		
Without fast-switching electronics	[W]	2.88
Effective Power ¹⁾		
With fast-switching electronics	[W]	5 for 3 ms, then 1.25 holding
Protection Class to EN 60529		
With molded-in cable		IP65
With plug socket with cable KMYZ-3		IP65
With plug socket with cable KMYZ-3 and plug M8		IP65
With plug socket with cable KMYZ-4		IP40

1) For power supply considerations use current curve below.

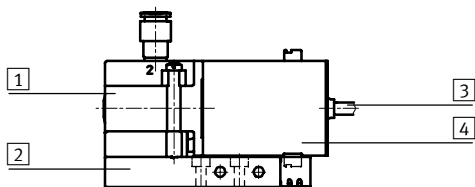
Response Times and Switching Frequencies		
With Fast-switching Electronics		
Response time on/off	[ms]	2 ±10% (from 1 Hz)
Switching frequency	[Hz]	150
Without Fast-switching Electronics		
Response time on/off	[ms]	7 ±10% (from 1 Hz)
Switching frequency	[Hz]	50

Current Curve



- 1) Capacitor charging approx. 4.6 A, lower with higher frequencies
- 2) Controlled coil current approx. 1 A
- 3) Drop to holding current
- 4) Controlled holding current approx. 0.125 A

Materials



Key		
1	Housing	Die-cast zinc
2	Sub-base	Aluminum
3	Cable sheath	Polyamide
4	Coil housing	Polyamide
-	Seals	Nitrile rubber/hydrogenated nitrile rubber
Note on materials		Free of copper, PTFE and silicone

Technical Data – Dimensions

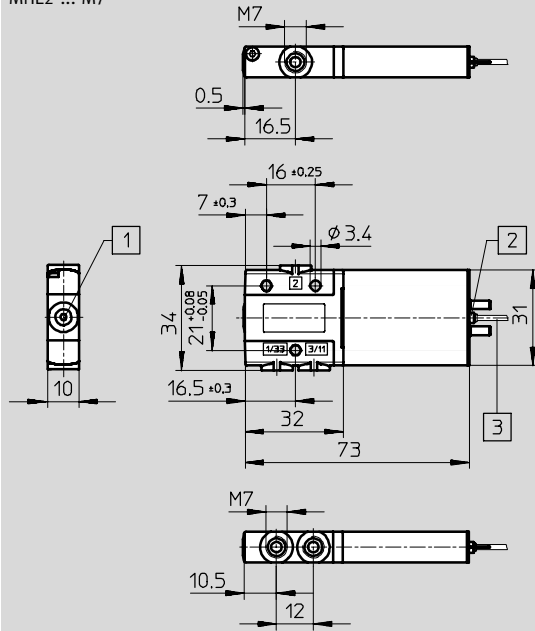
MHE2 – In-line Valves

Dimensions

Download CAD data → www.festo.com/en/engineering

Valve with Plug Vanes or Molded-in Cable

MHE2-...-M7

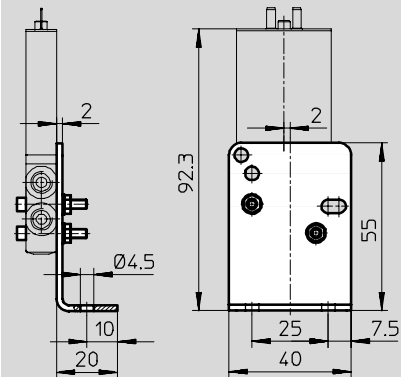


1 Manual override, resetting

2 Plug vanes for plug socket with cable KMYZ-3, KMYZ-4

3 Cable 2.5 m

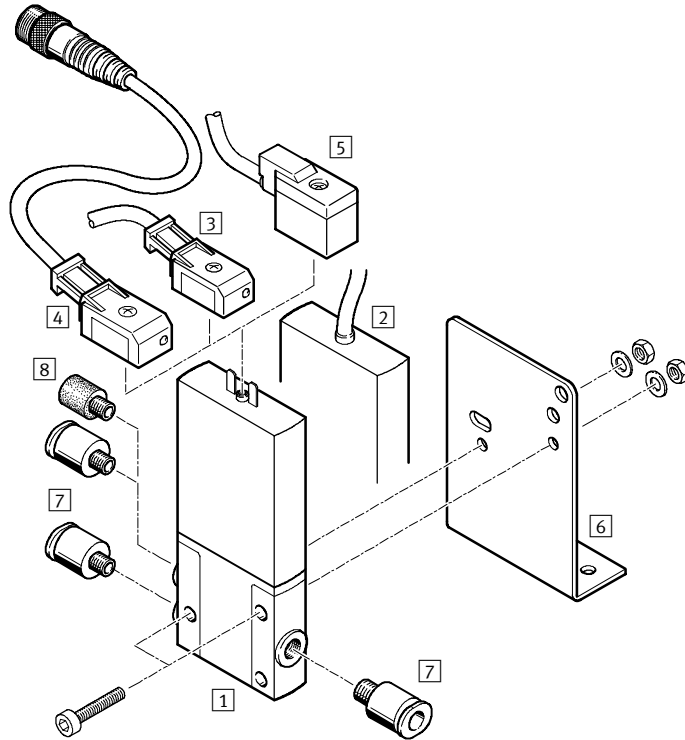
Mounting Bracket MHE2-BG-L



Overview

MHE2 – In-line Valves

Connection via Plug Vanes
 Connection via Molded-in Cable



2

2.1

Valves and Accessories				
	Type	Description	→ See Page	
1	In-line valve	MHE2-...	With plug vanes	14
2	In-line valve	MHE2-...-K	With molded-in cable	14
3	Plug socket with cable	KMYZ-3 (IP65)	With LED and PUR cable	100
4	Plug socket with cable	KMYZ-3 (IP65)	With LED, PUR cable and M8 plug	100
5	Plug socket with cable	KMYZ-4 (IP40)	With PVC cable	100
6	Mounting bracket	MHE2-BG-L	–	14
7	Push-in fitting	QS	For connecting compressed air tubing with standard O.D.	103
8	Silencer	UC	For fitting in exhaust ports	104

Ordering Data

MHE2 – In-line Valves

FESTO

Ordering Data – Valves					
Electrical Connection	Operating Voltage	Normally Closed		Normally Open	
		Part No.	Type	Part No.	Type
Response Time 2 ms					
Connecting Thread M7					
Plug vanes	24 V DC	196131	MHE2-MS1H-3/2G-M7	196151	MHE2-MS1H-3/2O-M7
Cable		196133	MHE2-MS1H-3/2G-M7-K	196153	MHE2-MS1H-3/2O-M7-K
Response Time 7 ms					
Connecting Thread M7					
Plug vanes	24 V DC	196130	MHE2-M1H-3/2G-M7	196150	MHE2-M1H-3/2O-M7
Cable		196132	MHE2-M1H-3/2G-M7-K	196152	MHE2-M1H-3/2O-M7-K

Ordering Data – Product-specific Accessories			
Designation	Part No.	Type	
Mounting bracket	196165	MHE2-BG-L	

2

2.1

MHP2 Fast Switching Semi In-line Valves



Flow rate: 100 l/min

Response times
as fast as 2 ms

5, 12 and 24 V DC

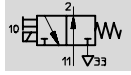
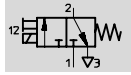
Balanced poppet valve

M5 and M7 threaded
connections

Technical Data

MHP2 – Semi In-line Valves

Function



Voltage:
5, 12, 24 V DC

Pressure:
-0.9 ... +8 bar

Temperature Range:
-5 ... +40°C



General Technical Data		
Valve function		3/2-way, single solenoid ¹⁾
Design		Balanced poppet valve
Sealing principle		Soft
Actuation type		Electrical
Type of control		Direct
Direction of flow		Reversible
Manual override		Momentary
Assembly position		Any
Grid dimension	[mm]	14
Nominal diameter	[mm]	2
Standard nominal flow rate	[l/min]	100
Type of mounting		On sub-base
Product weight	[g]	50
Pneumatic Connections		
Pneumatic connection		Via valve, individual sub-base or manifold sub-base
Supply port	1/33	Connecting thread ■ M5 – on sub-base ■ M7 – on manifold sub-base
Exhaust port	3/11	Connecting thread ■ M5 – on sub-base ■ M7 – on manifold sub-base
Working port	2	Connecting thread M5

1) Can be used as a 2/2-way valve by sealing port 1 or 3.

Operating and Environmental Conditions		
Operating medium		Inert gases, filtered compressed air, lubricated or unlubricated
Grade of filtration		40 μ
Operating pressure range	[bar]	-0.9 ... +8
Ambient temperature	[°C]	-5 ... +40 (100% duty cycle)
Temperature of medium	[°C]	-5 ... +40 (100% duty cycle)

Technical Data

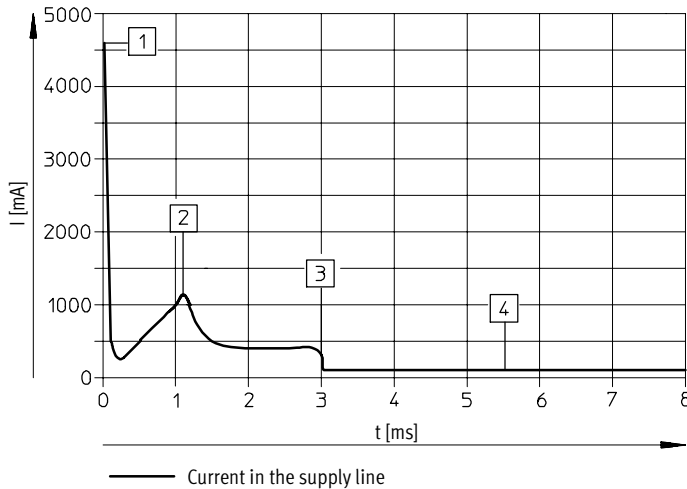
MHP2 – Semi In-line Valves

Electrical Data		
Operating voltage	[V DC]	5 ±10%, 12 ±10% or 24 ±10%
Connection type		Plug vanes, molded-in cable or plug connection
Power Consumption		
Without fast-switching electronics	[W]	2.88
Effective Power ¹⁾		
With fast-switching electronics	[W]	5 for 3 ms, then 1.25 holding
Protection Class to EN 60529		
With moulded-in cable		IP65
With plug socket with cable KMH		IP40
With plug socket with cable KMYZ-3		IP65
With plug socket with cable KMYZ-3 and plug M8		IP65
With plug socket with cable KMYZ-4		IP40
With plug base MHAP-PI		IP40
With Sub-D connector plug		IP40

1) For power supply considerations use current curve below.

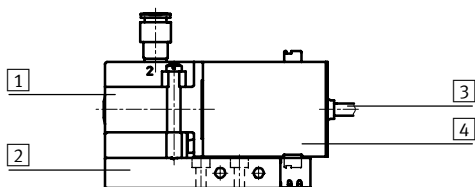
Response Times and Switching Frequencies		
With Fast-switching Electronics		
Response time on/off	[ms]	2 ±10% (from 1 Hz)
Switching frequency	[Hz]	150
Without Fast-switching Electronics		
Response time on/off	[ms]	7 ±10% (from 1 Hz)
Switching frequency	[Hz]	50

Current Curve



- 1 Capacitor charging approx. 4.6 A, lower with higher frequencies
- 2 Controlled coil current approx. 1 A
- 3 Drop to holding current
- 4 Controlled holding current approx. 0.125 A

Materials



Key	
1	Housing Die-cast zinc
2	Sub-base Aluminum
3	Cable sheath Polyamide
4	Coil housing Polyamide
-	Seals Nitrile rubber/hydrogenated nitrile rubber
Note on materials Free of copper, PTFE and silicone	

Technical Data – Dimensions

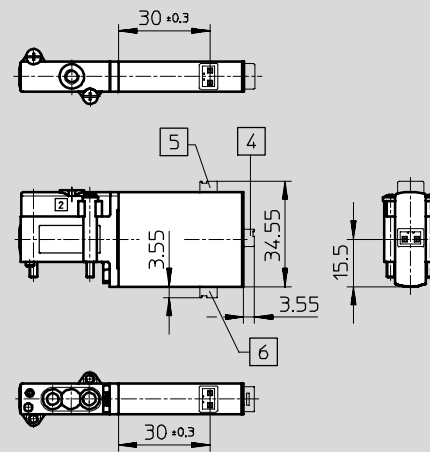
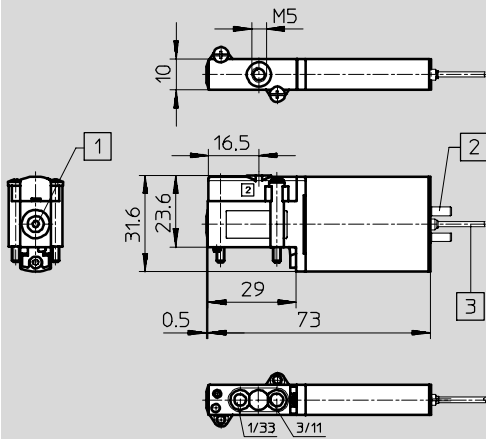
MHP2 – Semi In-line Valves

Dimensions

Download CAD data → www.festo.com/en/engineering

Valve with Plug Vanes or Molded-in Cable ...-K

Valve with Plug Connection ...-TC/HC/PI



1 Manual override, resetting

2 Plug vanes for plug socket with cable KMYZ-3, KMYZ-4

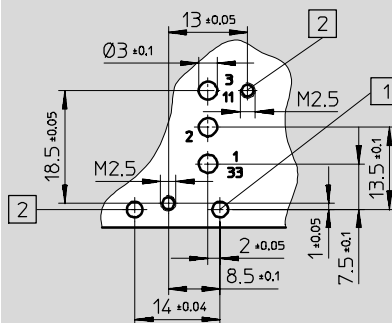
3 Cable 2.5 m

4 Plug connection HC

5 Plug connection TC

6 Plug connection PI

Port Pattern on Sub-bases



1 Hole for coding pin, 1.7^{+0.2} mm deep

2 Mounting thread, 4.6⁺¹ mm deep

Note

Semi in-line valves have no port 2 in sub-base. If used as a 2/2-way valve, normally closed, port 3/11 is not applicable. If used as a 2/2-way valve, normally open, port 1/33 is not applicable.

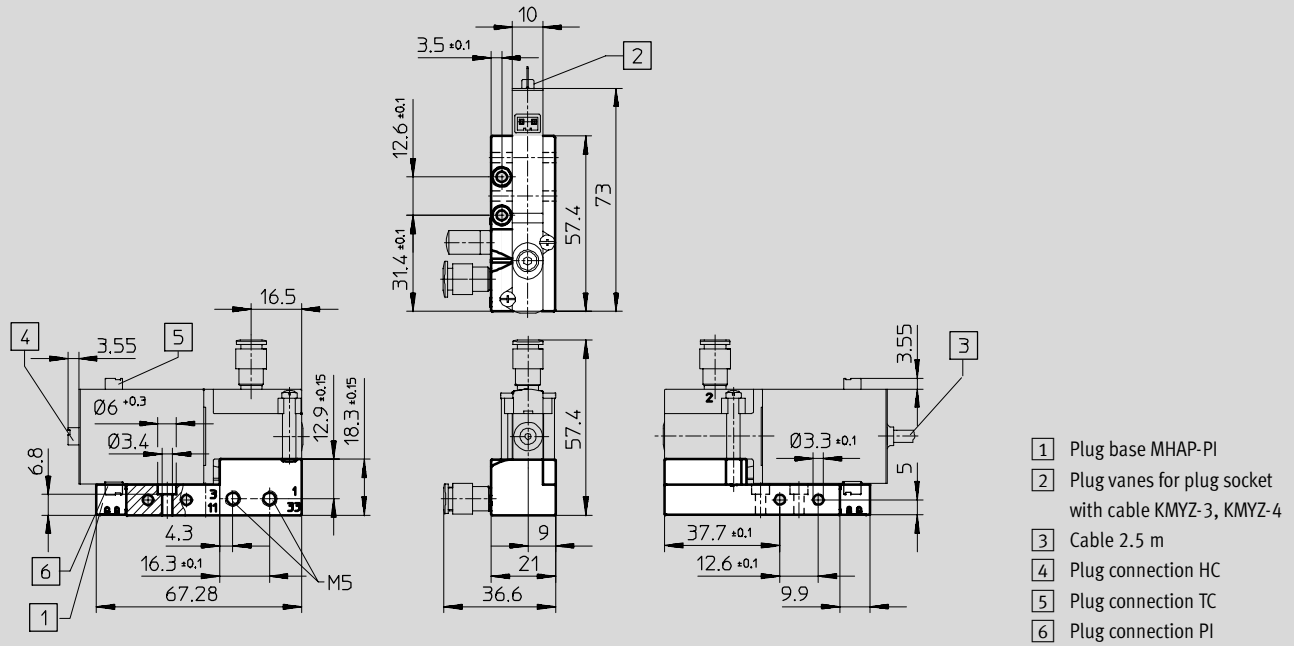
Technical Data – Dimensions

MHP2 – Semi In-line Valves

Dimensions

Download CAD data → www.festo.com/en/engineering

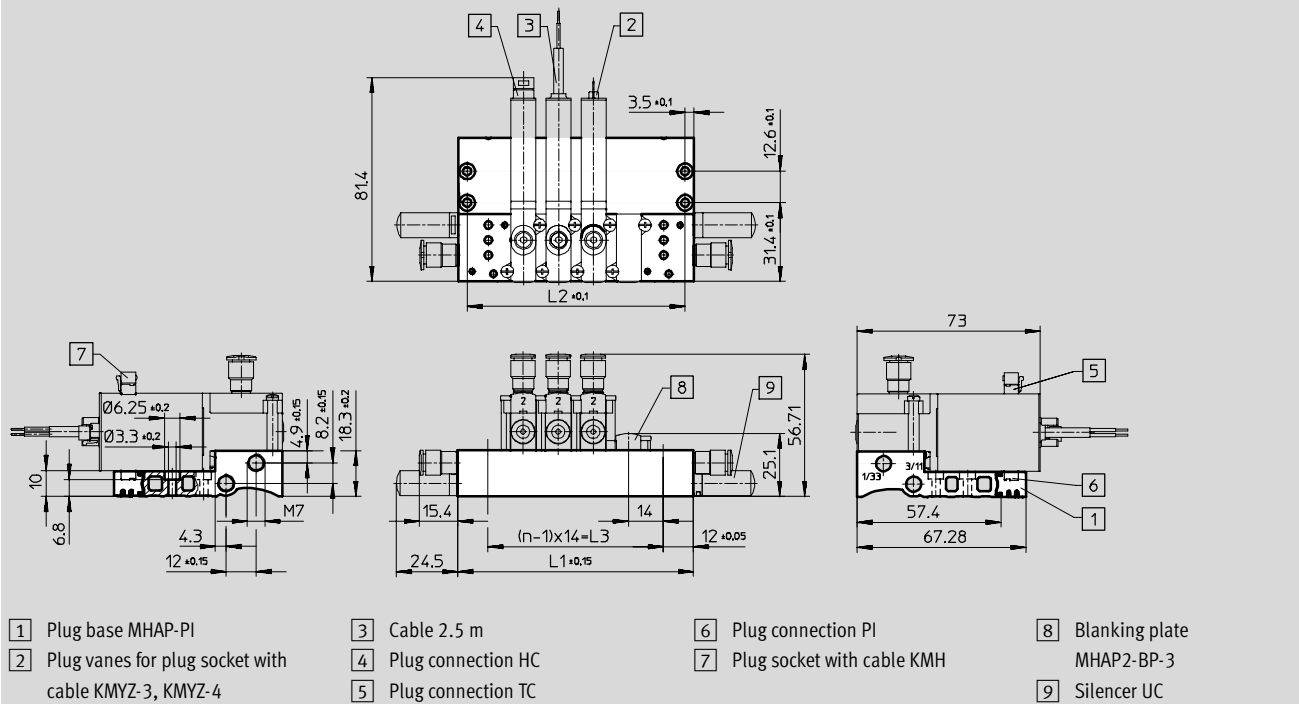
Individual Sub-base



2

2.2

Manifold Mounting



Number of valves	L1	L2	L3
2	38	31	14
3	52	45	18
4	66	59	42

Number of valves n	L1	L2	L3
5	80	73	56
6	94	87	70
7	108	101	84

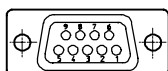
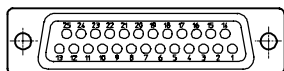
Number of valves n	L1	L2	L3
8	122	115	98
9	136	129	112
10	150	143	126

Technical Data – Pin Arrangement (Viewed From Plug-in Direction)

MHP2 – Semi In-line Valves

25-pin Sub-D Plug with 25-conductor Cable		
Contact number	Color code	Valve position
1	White	1
2	Brown	2
3	Green	3
4	Yellow	4
5	Gray	5
6	Pink	6
7	Blue	7
8	Red	8
9	Black	9
10	Purple	10
11	Gray-Pink	11
12	Red-Blue	12
13	White-Green	13
14	Brown-Green	14
15	White-Yellow	15
16	Yellow-Brown	16
17	White-Gray	17
18	Gray-Brown	18
19	White-Pink	19
20	Pink-Brown	20
21	White-Blue	21
22	Brown-Blue	22
23	White-Red	23
24	Brown-Red	24
25	White-Black	common

9-pin Sub-D Plug with 9-conductor Cable		
Contact number	Color code	Valve position
1	White	1
2	Brown	2
3	Green	3
4	Yellow	4
5	Gray	5
6	Pink	6
7	Blue	7
8	Red	8
9	Black	common



Part No.	Type
530046	KMP6-25P-20-2.5
530047	KMP6-25P-20-5
530048	KMP6-25P-20-10

Part No.	Type
531184	KMP6-09P-8-2.5
531185	KMP6-09P-8-5
531186	KMP6-09P-8-10

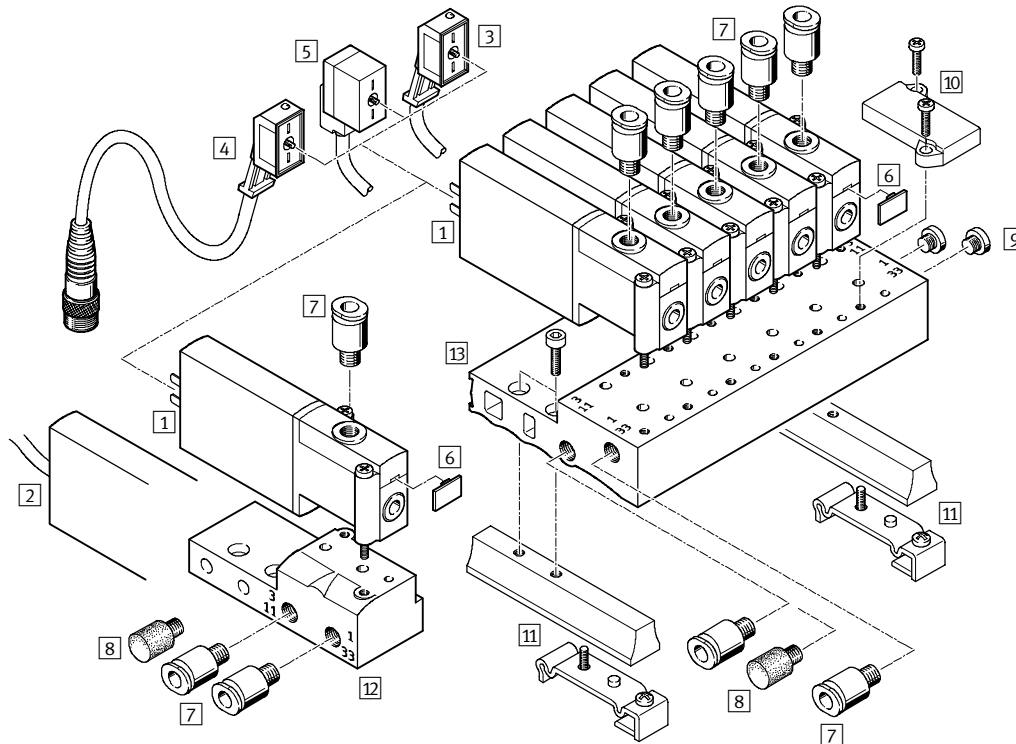
Each common point must be connected. Use 0 V at common for positive switching signals.
Use appropriate voltage (24 V DC) at common for negative switching signals.

Overview

MHP2 – Semi In-line Valves

Connection Via Plug Vanes

Connection Via Molded-in Cable ...-K



2

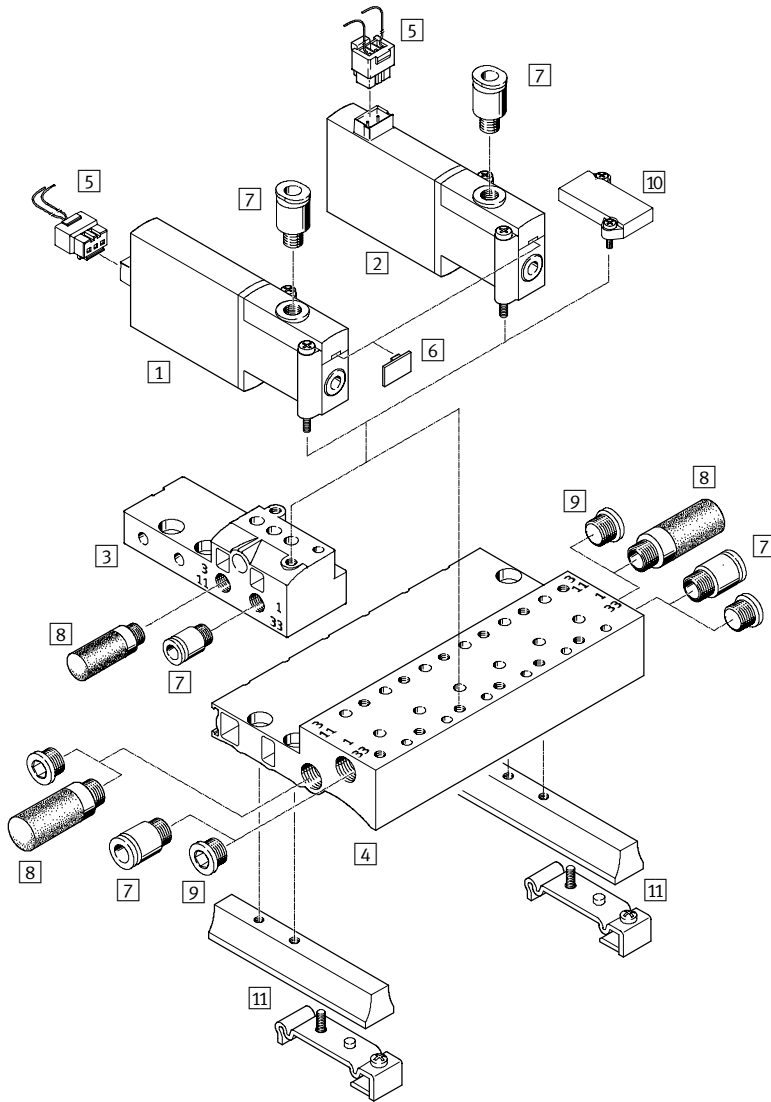
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Valves and Accessories				
	Type	Description	→ See Page	
1	Semi in-line valve	MHP2-...	With plug vanes	25
2	Semi in-line valve	MHP2...-K	With molded-in cable	25
3	Plug socket with cable	KMYZ-3 (IP65)	With LED and PUR cable	100
4	Plug socket with cable	KMYZ-3 (IP65)	With LED, PUR cable and M8 plug	100
5	Plug socket with cable	KMYZ-4 (IP40)	With PVC cable	100
6	Label	MH-BZ-80X	For identifying the valves	100
7	Push-in fitting	QS	For connecting compressed air tubing with standard O.D.	103
8	Silencer	UC	For fitting in exhaust ports	104
9	Blanking plug	B	For sealing unused ports	100
10	Blanking plate	MHAP2-BP-3	For sealing vacant positions	100
11	DIN rail mounting	MHAP2-BG-NRH-35	-	100
12	Individual sub-base	MHP2-AS-3-M5	For semi in-line valve	25
13	Manifold block	MHP2-PR...-3	For semi in-line valve	25

Overview

MHP2 – Semi In-line Valves

Plug Connection at Rear ...-HC
 Plug Connection on Top ...-TC



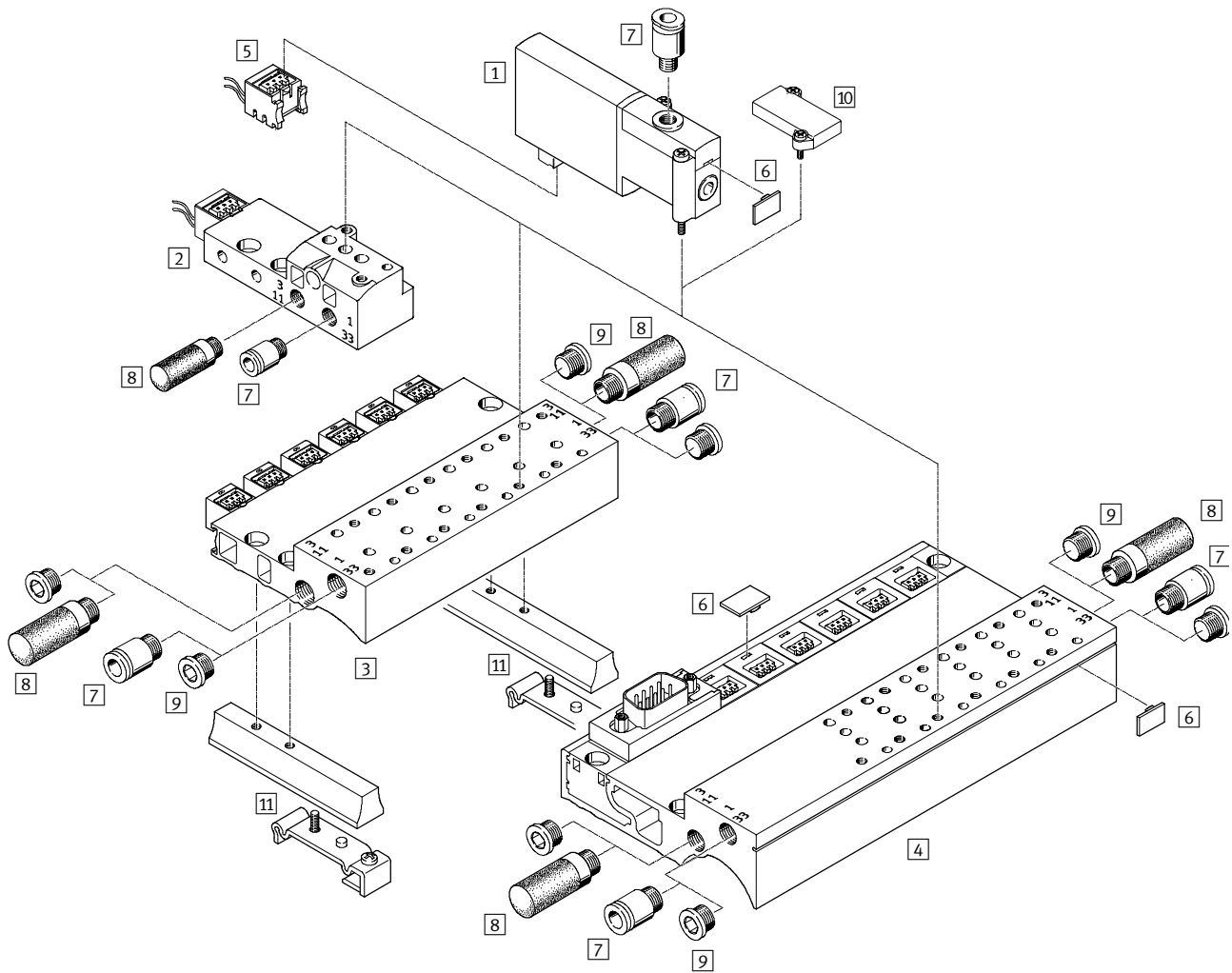
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Valves and Accessories				
	Type	Description	→ See Page	
1	Semi in-line valve	MHP2-...-HC	Plug connection at rear	25
2	Semi in-line valve	MHP2-...-TC	Plug connection on top	25
3	Individual sub-base	MHP2-AS-3-M5	For semi in-line valve	25
4	Manifold block	MHP2-PR...-3	For semi in-line valve	25
5	Plug socket	KMH (IP40)	With cable	100
6	Label	MH-BZ-80X	For identifying the valves	100
7	Push-in fitting	QS	For connecting compressed air tubing with standard O.D.	103
8	Silencer	UC	For fitting in exhaust ports	104
9	Blanking plug	B	For sealing unused ports	100
10	Blanking plate	MHAP2-BP-3	For sealing vacant positions	100
11	DIN rail mounting	MHAP2-BG-NRH-35	–	100

Overview

MHP2 – Semi In-line Valves

Plug Connection Underneath ...-PI



Valves and Accessories				
	Type	Description	→ See Page	
1	Semi in-line valve	MHP2-...-PI	Plug connection underneath	25
2	Individual sub-base	MHP2-AS-3-M5-PI	For semi in-line valve	25
3	Manifold block	MHP2-PR...-3-PI	With plug bases	25
4	Manifold block	MHP2-PR...-3-PI-D...	With plug bases and electrical multi-pin connection	25
5	Plug base	MHAP-PI (IP40)	-	100
6	Label	MH-BZ-80X	For identifying the valves	100
7	Push-in fitting	QS	For connecting compressed air tubing with standard O.D.	103
8	Silencer	UC	For fitting in exhaust ports	104
9	Blanking plug	B	For sealing unused ports	100
10	Blanking plate	MHAP2-BP-3-PI	For sealing vacant positions	100
11	DIN rail mounting	MHAP2-BG-NRH-35	-	100

Ordering Data

MHP2 – Semi In-line Valves

Ordering Data – Valves					
Electrical Connection	Operating Voltage	Normally Closed		Normally Open	
		Part No.	Type	Part No.	Type
Response Time 2 ms					
Connecting Thread M5					
Plug vanes	24 V DC	196123	MHP2-MS1H-3/2G-M5	196143	MHP2-MS1H-3/2O-M5
Cable	24 V DC	196125	MHP2-MS1H-3/2G-M5-K	196145	MHP2-MS1H-3/2O-M5-K
Response Time 7 ms					
Connecting Thread M5					
Plug vanes	24 V DC	196122	MHP2-M1H-3/2G-M5	196142	MHP2-M1H-3/2O-M5
Cable	24 V DC	196124	MHP2-M1H-3/2G-M5-K	196144	MHP2-M1H-3/2O-M5-K
Plug connection at rear	5 V DC	197429	MHP2-M4H-3/2G-M5-HC	197411	MHP2-M4H-3/2O-M5-HC
	12 V DC	197430	MHP2-M5H-3/2G-M5-HC	197412	MHP2-M5H-3/2O-M5-HC
	24 V DC	197431	MHP2-M1H-3/2G-M5-HC	197413	MHP2-M1H-3/2O-M5-HC
Plug connection on top	5 V DC	197432	MHP2-M4H-3/2G-M5-TC	197414	MHP2-M4H-3/2O-M5-TC
	12 V DC	197433	MHP2-M5H-3/2G-M5-TC	197415	MHP2-M5H-3/2O-M5-TC
	24 V DC	197434	MHP2-M1H-3/2G-M5-TC	197416	MHP2-M1H-3/2O-M5-TC
Plug connection underneath	5 V DC	197435	MHP2-M4H-3/2G-M5-PI	197417	MHP2-M4H-3/2O-M5-PI
	12 V DC	197436	MHP2-M5H-3/2G-M5-PI	197418	MHP2-M5H-3/2O-M5-PI
	24 V DC	197437	MHP2-M1H-3/2G-M5-PI	197419	MHP2-M1H-3/2O-M5-PI

Note

Type 3/2NC and 3/2NO valves cannot be mixed on a standard manifold block.

Ordering Data – Individual Sub-base and Manifold Block			
Designation		Part No.	Type
Valves with Plug Vanes, Cable, Plug Connection at Rear or On Top			
Individual sub-base		197439	MHP2-AS-3-M5
Manifold block for ...	2 valves	197442	MHP2-PR2-3
	4 valves	197443	MHP2-PR4-3
	6 valves	197444	MHP2-PR6-3
	8 valves	197445	MHP2-PR8-3
	10 valves	197446	MHP2-PR10-3
Valves with Plug Connection Underneath			
Individual sub-base		197441	MHP2-AS-3-M5-PI
Manifold block with plug bases for ...	2 valves	197452	MHP2-PR2-3-PI
	4 valves	197453	MHP2-PR4-3-PI
	6 valves	197454	MHP2-PR6-3-PI
	8 valves	197455	MHP2-PR8-3-PI
	10 valves	197456	MHP2-PR10-3-PI
Manifold block with plug bases and electrical multi-pin connection for ...	6 valves	197463	MHP2-PR6-3-PI-D9
	8 valves	197464	MHP2-PR8-3-PI-D9
	10 valves	197465	MHP2-PR10-3-PI-D25

Note

Additional variants and accessories can be configured and ordered for the MH2 modular product.

➔ See pages 26–31.

Ordering Data – Individual Sub-base

MHP2 – Semi In-line Valves



M Mandatory Data →

Module No.	Valve family	Design	Operating voltage	Valve function	Plug-in direction on valve	Number of valve positions	Link type
197335	MH2	P	5 V DC 12 V DC 24 V DC	C N	TC HC PI K IP	1V	PS
Ordering Example							
197335	MH2	- P	- 24 V DC	- C	- IP	- 1V	- PS

Ordering Table		Conditions	Code	Enter Code
Size	2			
M Module No.	197335		197335	197335
Valve family	Fast Switching Valve – Size 2		MH2	MH2
Design	Semi in-line valve		-P	-P
Operating voltage [V DC]	5, 12, 24		-...VDC	
Valve function	3/2-way valve, normally closed		-C	
	3/2-way valve, normally open		-N	
Plug-in direction on valve	Plug connection on top for connecting cable with socket IP40 (KMH)		-TC	
	Plug connection at rear for connecting cable with socket IP40 (KMH)		-HC	
	Plug connection underneath via electrical link		-PI	
	Connection with cable end	1	-K	
	Plug connection at rear for connecting cable with socket IP65 (KMYZ)	1	-IP	
Number of valve positions	1		-1V	1V
Link type	individual sub-base		-PS	-PS

1 Only with operating voltage 24VDC.

Transfer Order Code
 197335 - MH2 - P - - - - 1V - PS

2
2.2

Ordering Data – Individual Sub-base

MHP2 – Semi In-line Valves

Options				
Number of valve positions with fast switching function	Connecting cable with socket	Fitting for working port	Fitting in supply port	Fitting in exhaust port
1S	K05 K01 K25 K50 K10 K105 K125	QB QC QL QM QO QP	AB AC AO AP	BB BC BO BP BU
- 1S	- K25	- QC	- AP	- BU

Ordering Table				
Size	2	Conditions	Code	Enter code
0	Number of valve positions with fast switching function	1	2	-1S
	Connecting cable with socket (supplied separately)	0.5 m, with socket IP40 (KMH-0.5)	3	-K05
		1 m, with socket IP40 (KMH-1)	3	-K01
		2.5 m, with socket IP65 (KMYZ-3-24DC-2.5-LED-PUR-B)	4	-K25
		5 m, with socket IP65 (KMYZ-3-24DC-5-LED-PUR-B)	4	-K50
		10 m, with socket IP65 (KMYZ-3-24DC-10-LED-PUR-B)	4	-K10
		0.5 m, with socket IP40 (KMYZ-4-24DC-0.5-B)	4	-K105
		2.5 m, with socket IP40 (KMYZ-4-24DC-2.5-B)	4	-K125
Fitting for working port	Metric	QS fitting for working port, tubing O.D. 3 mm		-QB
		QS fitting for working port, tubing O.D. 4 mm		-QC
	Inch	QS fitting for working port, tubing O.D. 1/8"		-QL
		QS fitting for working port, tubing O.D. 5/32"		-QM
		QS fitting for working port, tubing O.D. 3/16"		-QO
		QS fitting for working port, tubing O.D. 1/4"		-QP
Fitting in supply port	Metric	QS fitting for supply, tubing O.D. 3 mm	5	-AB
		QS fitting for supply, tubing O.D. 4 mm		-AC
	Inch	QS fitting for supply, tubing O.D. 3/16"	6	-AO
		QS fitting for supply, tubing O.D. 1/4"		-AP
Fitting in exhaust port	Metric	QS fitting for exhaust, tubing O.D. 3 mm	7	-BB
		QS fitting for exhaust, tubing O.D. 4 mm		-BC
	Inch	QS fitting for exhaust, tubing O.D. 3/16"	8	-BO
		QS fitting for exhaust, tubing O.D. 1/4"		-BP
	Silencer for exhaust		-BU	

- 2 Only with plug-in direction on valve K, IP.
- 3 Not with plug-in direction on HC, TC valve.

- 4 Only with plug-in direction on valve IP.
- 5 Not with fitting QC, QD.

- 6 Not with fitting QP.
- 7 Not with fitting AC.

- 8 Not with fitting AP.

Transfer Order Code

- - - - -

Ordering Data – Manifold with Individual Electrical Connection

MHP2 – Semi In-line Valves

M Mandatory Data →

Module No.	Valve family	Design	Operating voltage	Valve function	Plug-in direction on valve	Number of valve positions	Link type
197335	MH2	P	5 V DC 12 V DC 24 V DC	C N	TC HC K IP	2V ... 10V	PR
Ordering Example 197335	MH2	- P	- 24 V DC	- C	- IP	- 8V	- PR

Ordering Table		Size	Conditions	Code	Enter code
M	Module No.	197335		197335	197335
	Valve family	Fast Switching Valve – Size 2		MH2	MH2
	Design	Semi in-line valve		-P	-P
	Operating voltage [V DC]	5, 12, 24		-...VDC	
	Valve function	3/2-way valve, normally closed		-C	
		3/2-way valve, normally open		-N	
	Plug-in direction on valve	Plug connection on top for connecting cable with socket IP40 (KMH)		-TC	
		Plug connection at rear for connecting cable with socket IP40 (KMH)		-HC	
		Connection with cable end	1	-K	
		Plug connection at rear for connecting cable with socket IP65 (KMYZ)	1	-IP	
	Number of valve positions	2 ... 10		-...V	
	Link type	Block without electrical link		-PR	-PR

1 Only with operating voltage 24 V DC.

Transfer Order Code

197335 MH2 - P - - - - - PR -

2

2.2

Ordering Data – Manifold with Individual Electrical Connection

MHP2 – Semi In-line Valves

Options														
Number of valves with fast switching function	Number of vacant positions	Connecting cable with socket		Wall mounting (DIN Rail)	Fitting for working port		Fitting in supply port (left)		Fitting in exhaust port (left)		Fitting in supply port (right)		Fitting in exhaust port (right)	
2S ... 10S	2L ... 10L	K05	K10	H	QB	QL	AX	AO	BX	BO	CX	CO	DX	DO
		K01	KI05		QC	QM	AC	AP	BC	BP	CC	CP	DC	DP
		K25	KI2		QD	QO	AD		BD	BU	CD		DD	DU
		K50				QP								
4S	-	K25	-	H	-	QC	-	AX	-	BD	-	CD	-	DX

Ordering Table					
Size	2		Conditions	Code	Enter code
Number of valves with fast switching function	2 ... 10		[2]	-...S	
Number of vacant positions	2 ... 10			-...L	
Connecting cable with socket (supplied separately)	0.5 m, with socket IP40 (KMH-0,5)		[3]	-K05	
	1 m, with socket IP40 (KMH-1)		[3]	-K01	
	2.5 m, with socket IP65 (KMYZ-3-24DC-2.5-LED-PUR-B)		[4]	-K25	
	5 m, with socket IP65 (KMYZ-3-24DC-5-LED-PUR-B)		[4]	-K50	
	10 m, with socket IP65 (KMYZ-3-24DC-10-LED-PUR-B)		[4]	-K10	
	0.5 m, with socket IP40 (KMYZ-4-24DC-0.5-B)		[4]	-KI05	
	2.5 m, with socket IP40 (KMYZ-4-24DC-2.5-B)		[4]	-KI25	
Wall mounting	DIN rail mounting			-H	
Fitting for working port	Metric	QS fitting for working port, tubing O.D. 3 mm		-QB	
		QS fitting for working port, tubing O.D. 4 mm		-QC	
		QS fitting for working port, tubing O.D. 6 mm		-QD	
	Inch	QS fitting for working port, tubing O.D. 1/8"		-QL	
		QS fitting for working port, tubing O.D. 5/32"		-QM	
		QS fitting for working port, tubing O.D. 3/16"		-QO	
		QS fitting for working port, tubing O.D. 1/4"		-QP	
Fitting in supply port (left)	Blanking plug for supply on left		[5]	-AX	
	Metric	QS fitting for supply, tubing O.D. 4 mm	[6]	-AC	
		QS fitting for supply, tubing O.D. 6 mm		-AD	
	Inch	QS fitting for supply, tubing O.D. 3/16"	[10]	-AO	
		QS fitting for supply, tubing O.D. 1/4"		-AP	
Fitting in exhaust port (left)	Blanking plug for exhaust on left		[7]	-BX	
	Metric	QS fitting for exhaust, tubing O.D. 4 mm	[8]	-BC	
		QS fitting for exhaust, tubing O.D. 6 mm	[9]	-BD	
	Inch	QS fitting for exhaust, tubing O.D. 3/16"	[11]	-BO	
		QS fitting for exhaust, tubing O.D. 1/4"	[12]	-BP	
	Silencer for exhaust			-BU	
Fitting in supply port (right)	Blanking plug for supply on right			-CX	
	Metric	QS fitting for supply, tubing O.D. 4 mm	[6]	-CC	
		QS fitting for supply, tubing O.D. 6 mm		-CD	
	Inch	QS fitting for supply, tubing O.D. 3/16"		-CO	
		QS fitting for supply, tubing O.D. 1/4"		-CP	
Fitting in exhaust port (right)	Blanking plug for exhaust on right			-DX	
	Metric	QS fitting for exhaust, tubing O.D. 4 mm	[8]	-DC	
		QS fitting for exhaust, tubing O.D. 6 mm		-DD	
	Inch	QS fitting for exhaust, tubing O.D. 3/16"	[11]	-DO	
		QS fitting for exhaust, tubing O.D. 1/4"		-DP	
	Silencer for exhaust			-DU	

- [2] Only with plug-in direction on valve K, IP. [5] Not with fitting CX. [8] Not with fitting AD, CD. [11] Not with fitting AP, CP.
- [3] Not with plug-in direction HC, TC. [6] Not with fitting QD. [9] Not with fitting DC. [12] Not with fitting DO.
- [4] Only with plug-in direction IP. [7] Not with fitting DX. [10] Not with fitting QP.

Transfer Order Code

- - - - - - - - -



Ordering Data – Manifold with Electrical Multi-pin Connection

MHP2 – Semi In-line Valves

M Mandatory Data →

Module No.	Valve family	Design	Operating voltage	Valve function	Plug-in direction on valve	Number of valve positions	Link type
197335	MH2	P	5 V DC 12 V DC 24 V DC	C N	PI	2V ... 10V	PRA
Ordering Example							
197335	MH2	- P	- 24 V DC	- C	- PI	- 8V	- PRA

Ordering Table			
Size	2	Code	Enter code
M Module No.	197335	197335	197335
Valve family	Fast Switching Valve – Size 2	MH2	MH2
Design	Semi in-line valve	-P	-P
Operating voltage [V DC]	5, 12, 24	-...VDC	
Valve function	3/2-way valve, normally closed	-C	
	3/2-way valve, normally open	-N	
Plug-in direction on valve	Plug connection underneath via electrical link	-PI	-PI
Number of valve positions	2, 4, 6, 8, 10	-...V	
Link type	Manifold block with Sub-D plug	-PRA	-PRA

2

2.2

Transfer Order Code

197335	MH2	- P	-	-	- PI	-	- PRA	-
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Ordering Data – Manifold with Electrical Multi-pin Connection

MHP2 – Semi In-line Valves

Options									
Number of vacant positions	Plug-in direction, Sub-D plug	Connecting cable with socket	Wall mounting	Fitting for working port	Fitting in supply port (left)	Fitting in exhaust port (left)	Fitting in supply port (right)	Fitting in exhaust port (right)	
2L ... 10L	SP ST SE	S25 M25 S50 M50 S10 M10	H	QB QL QC QM QD QO QP	AX AO AC AP AD	BX BO BC BP BD BU	CX CO CC CP CD	DX DO DC DP DD DU	
8L	SE	S25	H	QC	AX	BD	CD	DX	

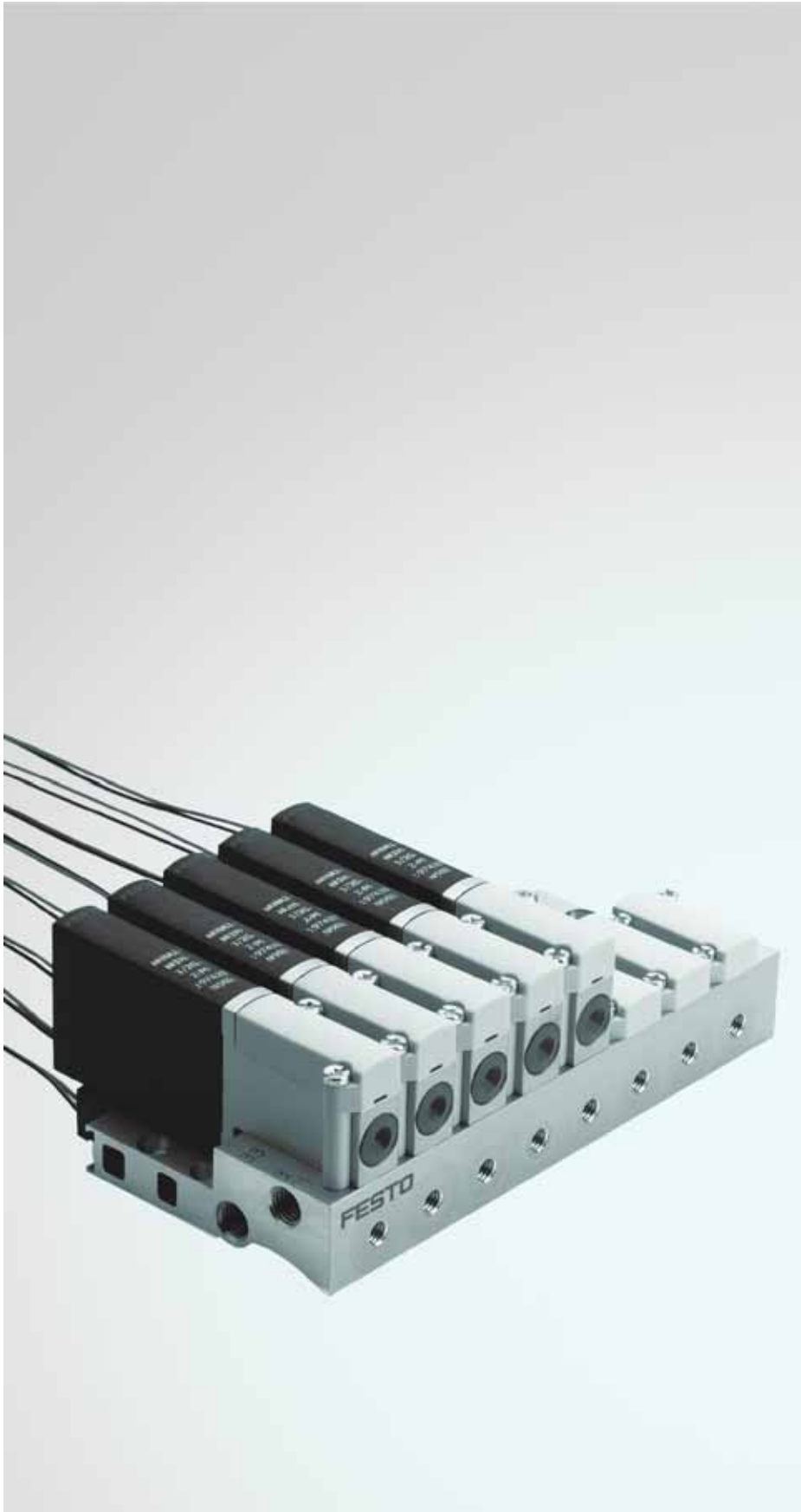
Ordering Table									
Size	2		Conditions	Code	Enter code				
Number of vacant positions	2, 4, 6, 8, 10			-...L					
Plug-in direction, Sub-D plug	To pneumatic side			-SP					
	To top			-ST					
	To electrical side			-SE					
Connecting cable with socket (supplied separately)	2.5 m, Sub-D 9-pin, 9 conductors		1	-S25					
	5 m, Sub-D 9-pin, 9 conductors		1 2	-S50					
	10 m, Sub-D 9-pin, 9 conductors		1 2	-S10					
	2.5 m, Sub-D 25-pin, 25 conductors		3	-M25					
	5 m, Sub-D 25-pin, 25 conductors		2 3	-M50					
	10 m, Sub-D 25-pin, 25 conductors		2 3	-M10					
Wall mounting	DIN rail mounting			-H					
Fitting for working port	Metric	QS fitting for working port, tubing O.D. 3 mm		-QB					
		QS fitting for working port, tubing O.D. 4 mm		-QC					
		QS fitting for working port, tubing O.D. 6 mm		-QD					
	Inch	QS fitting for working port, tubing O.D. 1/8"		-QL					
		QS fitting for working port, tubing O.D. 5/32"		-QM					
		QS fitting for working port, tubing O.D. 3/16"		-QO					
QS fitting for working port, tubing O.D. 1/4"		-QP							
Fitting in supply port (left)	Blanking plug for supply on left		4	-AX					
	Metric	QS fitting for supply, tubing O.D. 4 mm	5	-AC					
		QS fitting for supply, tubing O.D. 6 mm		-AD					
	Inch	QS fitting for supply, tubing O.D. 3/16"	9	-AO					
		QS fitting for supply, tubing O.D. 1/4"		-AP					
Fitting in exhaust port (left)	Blanking plug for exhaust on left		6	-BX					
	Metric	QS fitting for exhaust, tubing O.D. 4 mm	7	-BC					
		QS fitting for exhaust, tubing O.D. 6 mm	8	-BD					
	Inch	QS fitting for exhaust, tubing O.D. 3/16"	10	-BO					
		QS fitting for exhaust, tubing O.D. 1/4"	11	-BP					
	Silencer for exhaust			-BU					
Fitting in supply port (right)	Blanking plug for supply on right			-CX					
	Metric	QS fitting for supply, tubing O.D. 4 mm	5	-CC					
		QS fitting for supply, tubing O.D. 6 mm		-CD					
	Inch	QS fitting for supply, tubing O.D. 3/16"		-CO					
		QS fitting for supply, tubing O.D. 1/4"		-CP					
Fitting in exhaust port (right)	Blanking plug for exhaust on right			-DX					
	Metric	QS fitting for exhaust, tubing O.D. 4 mm	7	-DC					
		QS fitting for exhaust, tubing O.D. 6 mm		-DD					
	Inch	QS fitting for exhaust, tubing O.D. 3/16"	10	-DO					
		QS fitting for exhaust, tubing O.D. 1/4"		-DP					
	Silencer for exhaust			-DU					

- 1 Max. 8 valve positions. 3 Only with 10 valve positions. 5 Not with fitting QD. 7 Not with fitting AD, CD. 9 Not with fitting QP. 11 Not with fitting DO.
- 2 Not with solenoid voltage 5VDC. 4 Not with fitting CX. 6 Not with fitting DX. 8 Not with fitting DC. 10 Not with fitting AP, CP.

Transfer Order Code

- - - - - - - - -

MHA2 Fast Switching Sub-base Valves



Flow rate: 100 l/min

Response times
as fast as 2 ms

5, 12 and 24 V DC

Balanced poppet valve

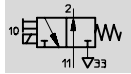
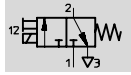
M5 and M7 threaded
connections

Technical Data

MHA2 – Sub-base Valves

FESTO

Function



Voltage:

5, 12, 24 V DC

Pressure:

-0.9 ... +8 bar

Temperature Range:

-5 ... +40°C



General Technical Data		
Valve function		3/2-way, single solenoid ¹⁾
Design		Balanced poppet valve
Sealing principle		Soft
Actuation type		Electrical
Type of control		Direct
Direction of flow		Reversible
Manual override		Momentary
Assembly position		Any
Grid dimension	[mm]	14
Nominal diameter	[mm]	2
Standard nominal flow rate	[l/min]	100
Type of mounting		On sub-base
Product weight	[g]	50
Pneumatic Connections		
Pneumatic connection		Via valve, individual sub-base or manifold sub-base
Supply port	1/33	Connecting thread <ul style="list-style-type: none"> ■ M5 – on sub-base ■ M7 – on manifold sub-base
Exhaust port	3/11	Connecting thread <ul style="list-style-type: none"> ■ M5 – on sub-base ■ M7 – on manifold sub-base
Working port	2	Connecting thread M5

1) Can be used as a 2/2-way valve by sealing port 1 or 3.

Operating and Environmental Conditions		
Operating medium		Inert gases, filtered compressed air, lubricated or unlubricated
Grade of filtration		40 μ
Operating pressure range	[bar]	-0.9 ... +8
Ambient temperature	[°C]	-5 ... +40 (100% duty cycle)
Temperature of medium	[°C]	-5 ... +40 (100% duty cycle)

2

2.3

Technical Data

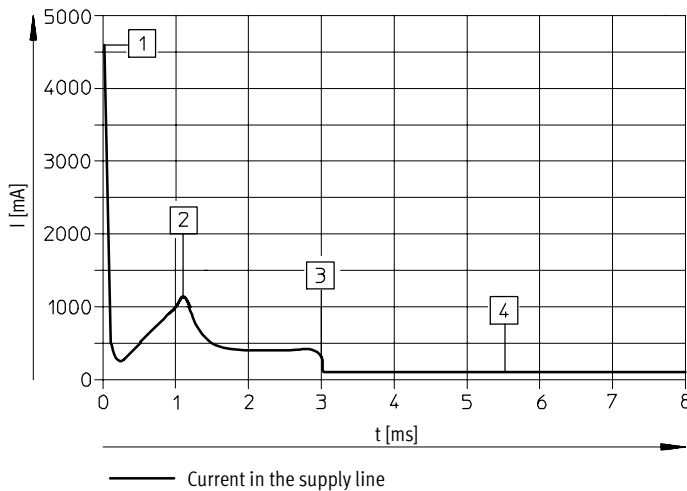
MHA2 – Sub-base Valves

Electrical Data		
Operating voltage	[V DC]	5 ±10%, 12 ±10% or 24 ±10%
Connection type		Plug vanes, molded-in cable or plug connection
Power Consumption		
Without fast-switching electronics	[W]	2.88
Effective Power ¹⁾		
With fast-switching electronics	[W]	5 for 3 ms, then 1.25 holding
Protection Class to EN 60529		
With molded-in cable		IP65
With plug socket with cable KMH		IP40
With plug socket with cable KMYZ-3		IP65
With plug socket with cable KMYZ-3 and plug M8		IP65
With plug socket with cable KMYZ-4		IP40
With plug base MHAP-PI		IP40
With Sub-D connector plug		IP40

1) For power supply considerations use current curve below.

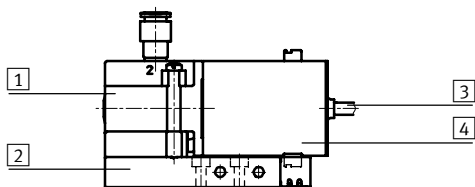
Response Times and Switching Frequencies		
With Fast-switching Electronics		
Response time on/off	[ms]	2 ±10% (from 1 Hz)
Switching frequency	[Hz]	150
Without Fast-switching Electronics		
Response time on/off	[ms]	7 ±10% (from 1 Hz)
Switching frequency	[Hz]	50

Current Curve



- 1 Capacitor charging approx. 4.6 A, lower with higher frequencies
- 2 Controlled coil current approx. 1 A
- 3 Drop to holding current
- 4 Controlled holding current approx. 0.125 A

Materials



Key		
1	Housing	Die-cast zinc
2	Sub-base	Aluminum
3	Cable sheath	Polyamide
4	Coil housing	Polyamide
-	Seals	Nitrile rubber/hydrogenated nitrile rubber
Note on materials		Free of copper, PTFE and silicone

Technical Data – Dimensions

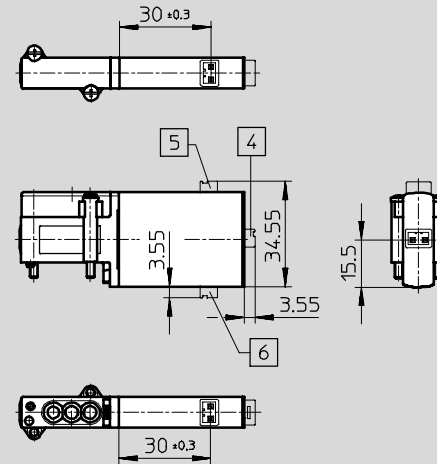
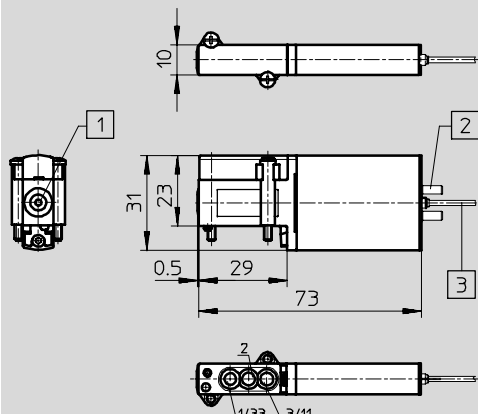
MHA2 – Sub-base Valves

Dimensions

Download CAD data → www.festo.com/en/engineering

Valve with Plug Vanes or Molded-in Cable ...-K

Valve with Plug Connection ...-TC/HC/PI



1 Manual override, resetting

2 Plug vanes for plug socket with cable KMYZ-3, KMYZ-4

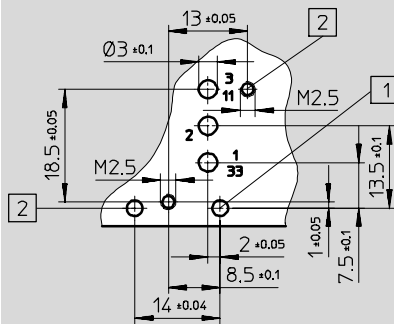
3 Cable 2.5 m

4 Plug connection HC

5 Plug connection TC

6 Plug connection PI

Port Pattern on Sub-bases



1 Hole for coding pin, 1.7^{+0.2} mm deep

2 Mounting thread, 4.6⁺¹ mm deep

Note

Semi in-line valves have no port 2 in sub-base. If used as a 2/2-way valve, normally closed, port 3/11 is not applicable. If used as a 2/2-way valve, normally open, port 1/33 is not applicable.

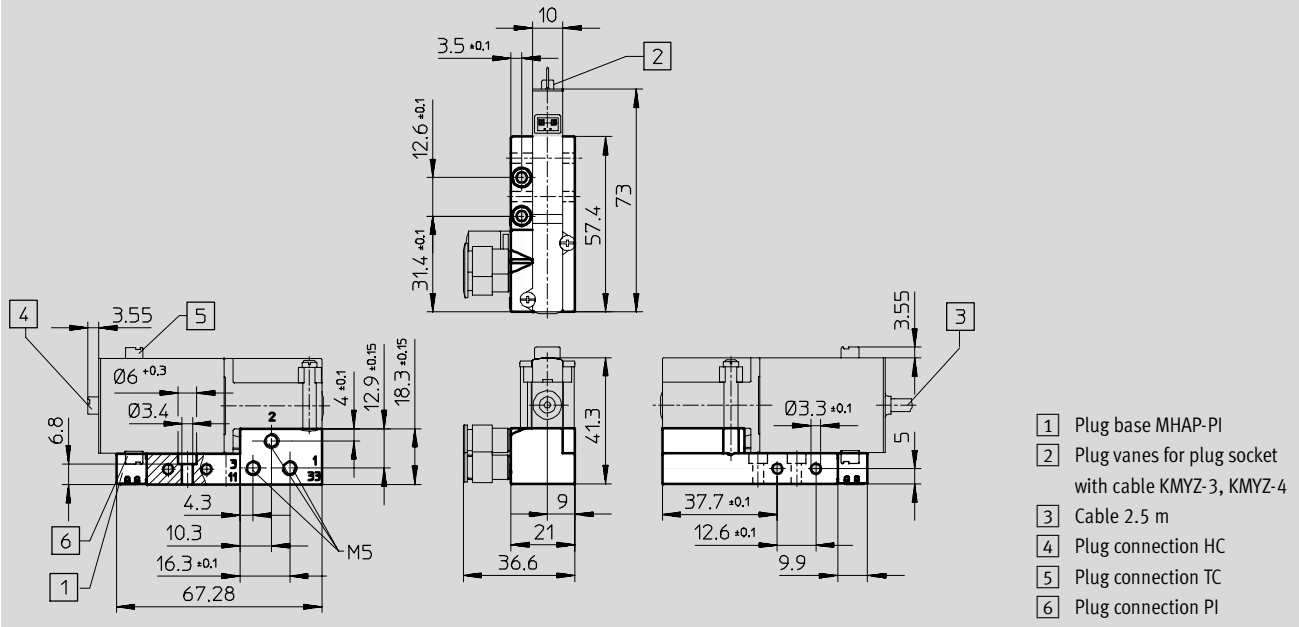
Technical Data – Dimensions

MHA2 – Sub-base Valves

Dimensions

Download CAD data → www.festo.com/en/engineering

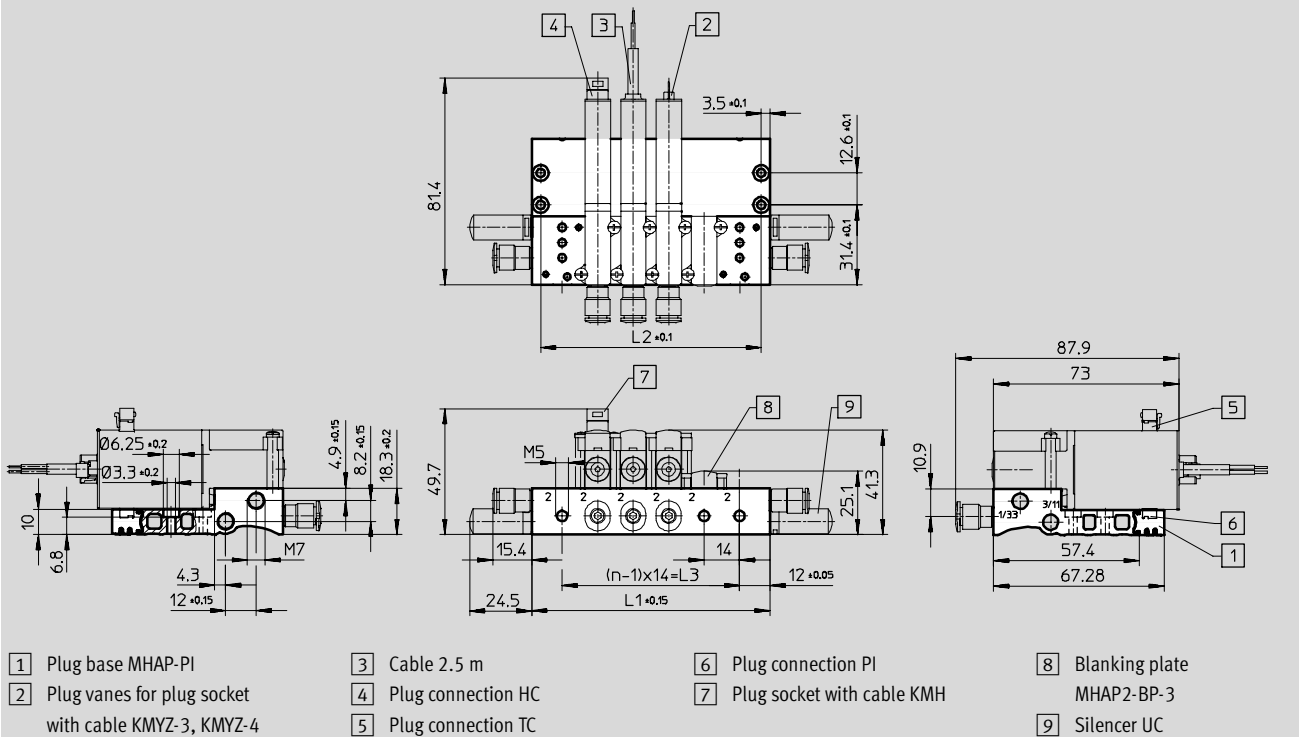
Individual Sub-base



2

2.3

Manifold Mounting



Number of valves n	L1	L2	L3
2	38	31	14
3	52	45	18
4	66	59	42

Number of valves n	L1	L2	L3
5	80	73	56
6	94	87	70
7	108	101	84

Number of valves n	L1	L2	L3
8	122	115	98
9	136	129	112
10	150	143	126

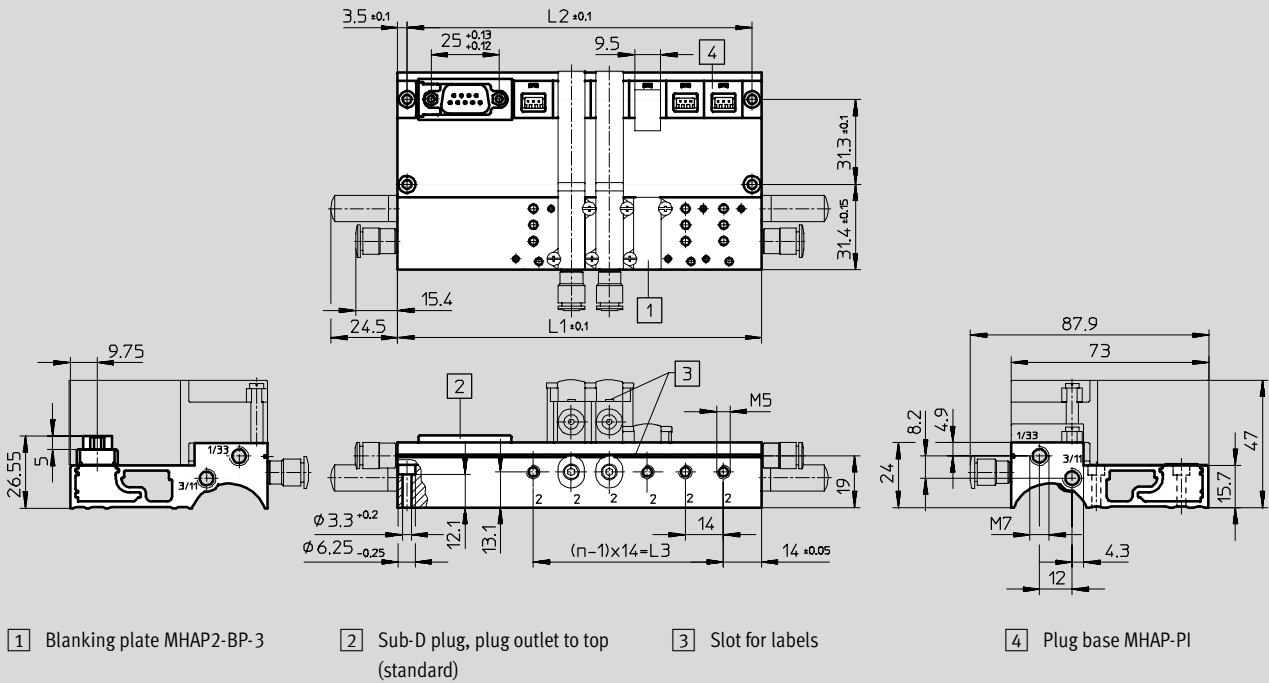
Technical Data – Dimensions

MHA2 – Sub-base Valves

Dimensions

Download CAD data → www.festo.com/en/engineering

Manifold Mounting with Electrical Multi-pin Connection

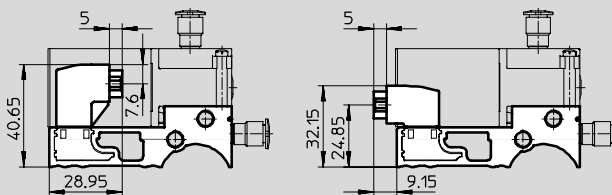


Number of valves n	L1	L2	L3
2	78	71	14
4	106	99	42
6	134	127	70
8	162	155	98
10	212	205	126

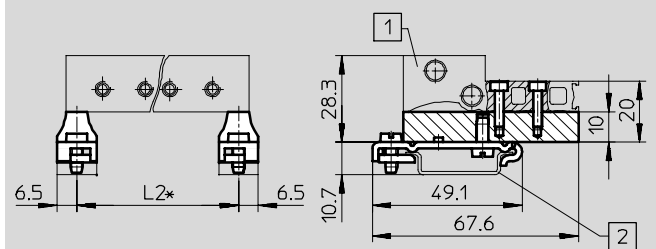
Electrical Multi-pin Connection – Plug Directions

to pneumatic side

to electrical side



DIN Rail Mounting MHAP-BG-NRH-35



- 1 Manifold block
- 2 Mounting rail NRH-35-2000

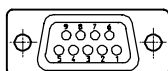
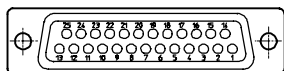
* See dimensions table for manifold block used

Technical Data – Pin Arrangement (Viewed From Plug-in Direction)

MHA2 – Sub-base Valves

25-pin Sub-D Plug with 25-conductor Cable		
Contact number	Color code	Valve position
1	White	1
2	Brown	2
3	Green	3
4	Yellow	4
5	Gray	5
6	Pink	6
7	Blue	7
8	Red	8
9	Black	9
10	Purple	10
11	Gray-Pink	11
12	Red-Blue	12
13	White-Green	13
14	Brown-Green	14
15	White-Yellow	15
16	Yellow-Brown	16
17	White-Gray	17
18	Gray-Brown	18
19	White-Pink	19
20	Pink-Brown	20
21	White-Blue	21
22	Brown-Blue	22
23	White-Red	23
24	Brown-Red	24
25	White-Black	common

9-pin Sub-D Plug with 9-conductor Cable		
Contact number	Color code	Valve position
1	White	1
2	Brown	2
3	Green	3
4	Yellow	4
5	Gray	5
6	Pink	6
7	Blue	7
8	Red	8
9	Black	common



Part No.	Type
530046	KMP6-25P-20-2.5
530047	KMP6-25P-20-5
530048	KMP6-25P-20-10

Part No.	Type
531184	KMP6-09P-8-2.5
531185	KMP6-09P-8-5
531186	KMP6-09P-8-10

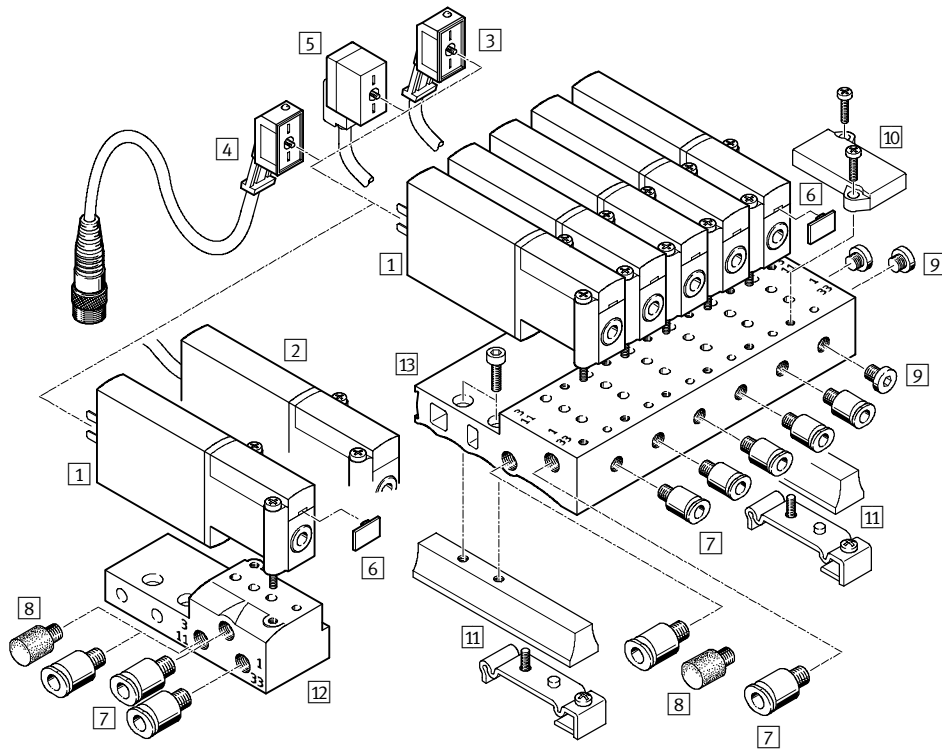
Each common point must be connected. Use 0 V at common for positive switching signals.
Use appropriate voltage (24 V DC) at common for negative switching signals.

2
2.3

Overview

MHA2 – Sub-base Valves

Connection Via Plug Vanes
 Connection Via Molded-in Cable ...-K

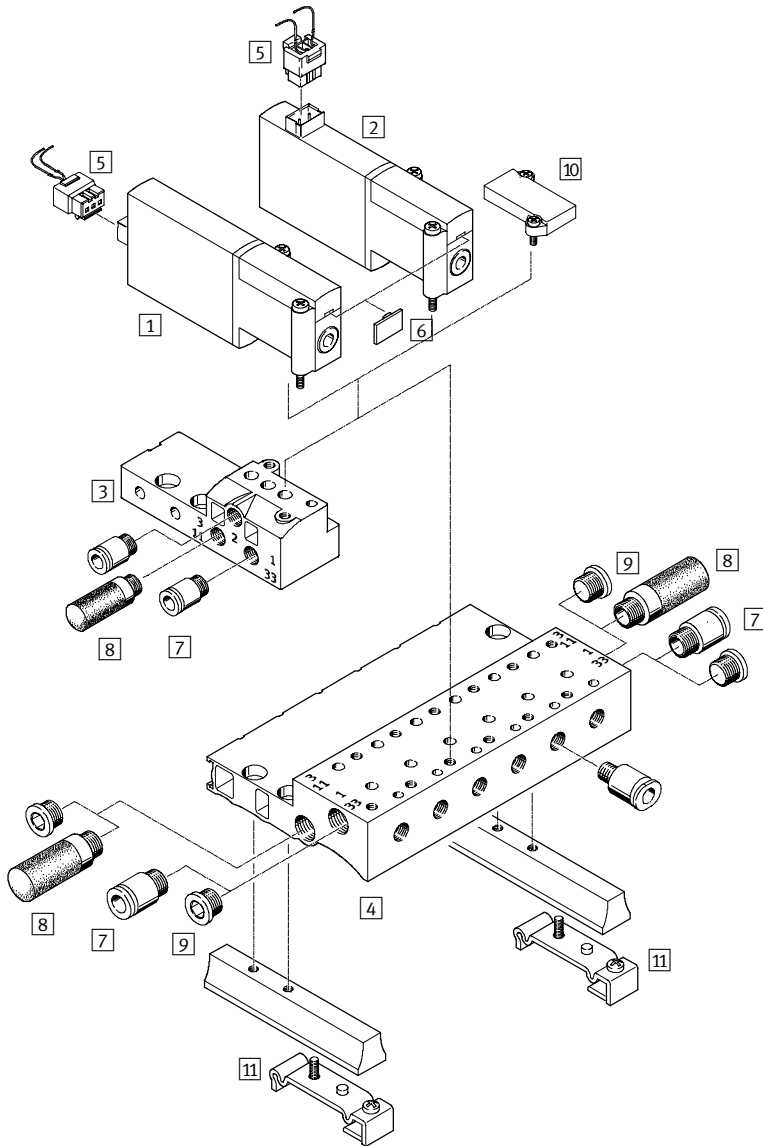


Valves and Accessories		Type	Description	→ See Page
1	Sub-base valve	MHA2-...	With plug vanes	43
2	Sub-base valve	MHA2-...-K	With molded-in cable	43
3	Plug socket	KMYZ-3 (IP65)	With LED and PUR cable	100
4	Plug socket	KMYZ-3 (IP65)	With LED, PUR cable and M8 plug	100
5	Plug socket	KMYZ-4 (IP40)	With PVC cable	100
6	Label	MH-BZ-80X	For identifying the valves	100
7	Push-in fitting	QS	For connecting compressed air tubing with standard O.D.	103
8	Silencer	UC	For fitting in exhaust ports	104
9	Blanking plug	B	For sealing unused ports	100
10	Blanking plate	MHAP2-BP-3	For sealing vacant positions	100
11	DIN rail mounting	MHAP2-BG-NRH-35	-	100
12	Individual sub-base	MHA2-AS-3-M5	For sub-base valve	43
13	Manifold block	MHA2-PR...-3-M5	For sub-base valve	43

Overview

MHA2 – Sub-base Valves

Plug Connection at Rear ...-HC
 Plug Connection on Top ...-TC



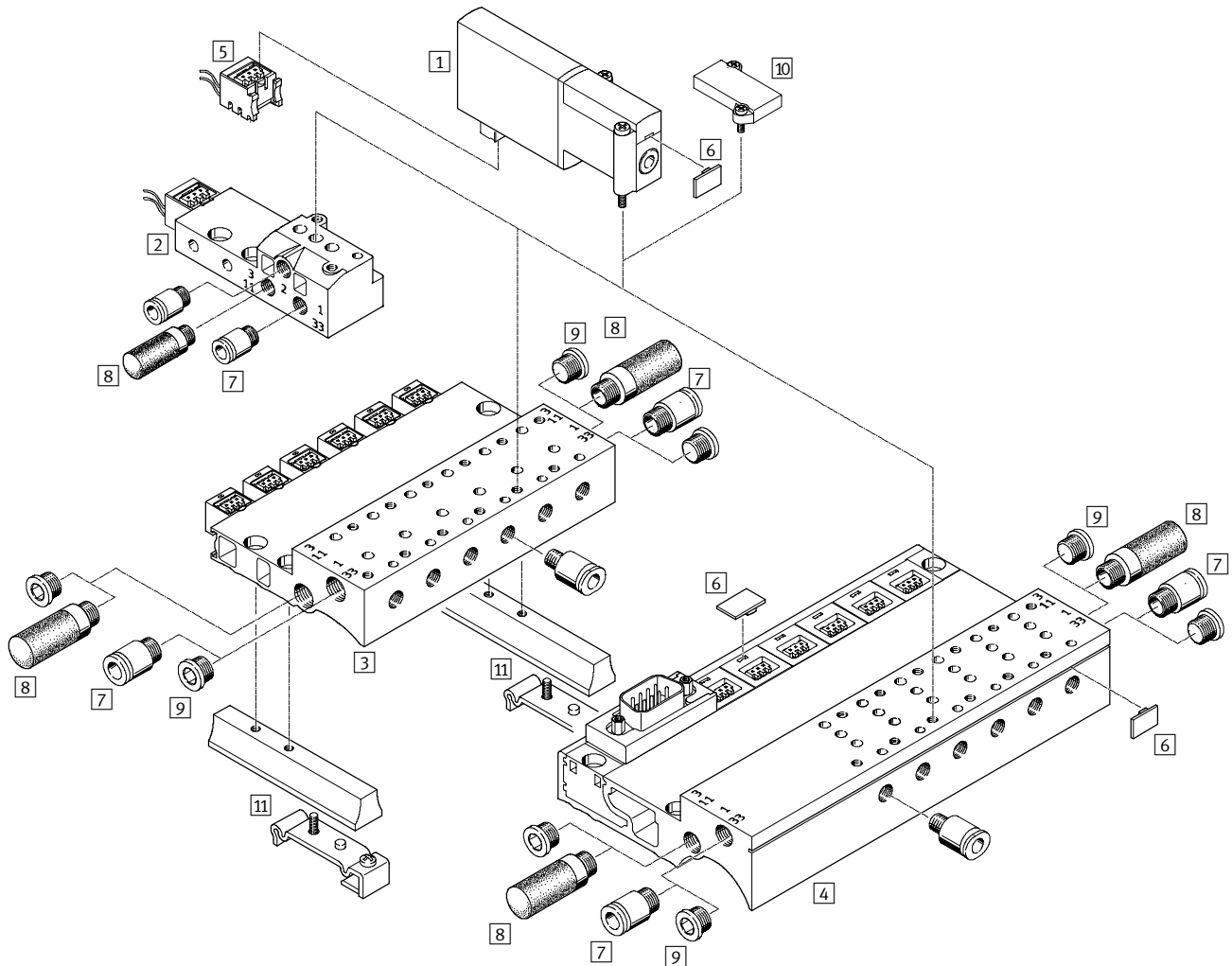
2
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Valves and Accessories			
	Type	Description	→ See Page
1	MHA2-...-HC	Sub-base valve Plug connection at rear	43
2	MHA2-...-TC	Sub-base valve Plug connection on top	43
3	MHA2-AS-3-M5	Individual sub-base For sub-base valve	43
4	MHA2-PR...-3	Manifold block For sub-base valve	43
5	KMH (IP40)	Plug socket With cable	100
6	MH-BZ-80X	Label For identifying the valves	100
7	QS	Push-in fitting For connecting compressed air tubing with standard O.D.	103
8	UC	Silencer For fitting in exhaust ports	104
9	B	Blanking plug For sealing unused ports	100
10	MHAP2-BP-3	Blanking plate For sealing vacant positions	100
11	MHAP2-BG-NRH-35	DIN rail mounting	100

Overview

MHA2 – Sub-base Valves

Plug Connection Underneath ...-PI



Valves and Accessories				
	Type	Description	→ See Page	
1	Sub-base valve	MHA2-...-PI	Plug connection underneath	43
2	Individual sub-base	MHA2-AS-3-M5-PI	With plug base	43
3	Manifold block	MHA2-PR...-3-M5-PI	With plug bases	43
4	Manifold block	MHA2-PR...-3-M5-PI-D...	With plug bases and electrical multi-pin connection	43
5	Plug base	MHAP-PI (IP40)	-	100
6	Label	MH-BZ-80X	For identifying the valves	100
7	Push-in fitting	QS	For connecting compressed air tubing with standard O.D.	103
8	Silencer	UC	For fitting in exhaust ports	104
9	Blanking plug	B	For sealing unused ports	100
10	Blanking plate	MHAP2-BP-3-PI	For sealing vacant positions	100
11	DIN rail mounting	MHAP2-BG-NRH-35	-	100

Ordering Data

MHA2 – Sub-base Valves

Ordering Data – Valves					
Electrical Connection	Operating Voltage	Normally Closed		Normally Open	
		Part No.	Type	Part No.	Type
Response Time 2 ms					
Plug vanes	24 V DC	196119	MHA2-MS1H-3/2G-2	196139	MHA2-MS1H-3/2O-2
Cable	24 V DC	196121	MHA2-MS1H-3/2G-2-K	196141	MHA2-MS1H-3/2O-2-K
Response Time 7 ms					
Plug vanes	24 V DC	196118	MHA2-M1H-3/2G-2	196138	MHA2-M1H-3/2O-2
Cable	24 V DC	196120	MHA2-M1H-3/2G-2-K	196140	MHA2-M1H-3/2O-2-K
Plug connection at rear	5 V DC	197420	MHA2-M4H-3/2G-2-HC	197402	MHA2-M4H-3/2O-2-HC
	12 V DC	197421	MHA2-M5H-3/2G-2-HC	197403	MHA2-M5H-3/2O-2-HC
	24 V DC	197422	MHA2-M1H-3/2G-2-HC	197404	MHA2-M1H-3/2O-2-HC
Plug connection on top	5 V DC	197423	MHA2-M4H-3/2G-2-TC	197405	MHA2-M4H-3/2O-2-TC
	12 V DC	197424	MHA2-M5H-3/2G-2-TC	197406	MHA2-M5H-3/2O-2-TC
	24 V DC	197425	MHA2-M1H-3/2G-2-TC	197407	MHA2-M1H-3/2O-2-TC
Plug connection underneath	5 V DC	197426	MHA2-M4H-3/2G-2-PI	197408	MHA2-M4H-3/2O-2-PI
	12 V DC	197427	MHA2-M5H-3/2G-2-PI	197409	MHA2-M5H-3/2O-2-PI
	24 V DC	197428	MHA2-M1H-3/2G-2-PI	197410	MHA2-M1H-3/2O-2-PI

Note

Type 3/2NC and 3/2NO valves must not be mixed on a manifold block.

Ordering Data – Individual Sub-bases and Manifold Blocks			
Designation		Part No.	Type
Valves with Plug Vanes, Cable, Plug Connection at Rear or On Top			
Individual sub-base		197438	MHA2-AS-3-M5
Manifold block for ...	2 valves	197447	MHA2-PR2-3-M5
	4 valves	197448	MHA2-PR4-3-M5
	6 valves	197449	MHA2-PR6-3-M5
	8 valves	197450	MHA2-PR8-3-M5
	10 valves	197451	MHA2-PR10-3-M5
Valves with Plug Connection Underneath			
Individual sub-base		197440	MHA2-AS-3-M5-PI
Manifold block with plug bases for ...	2 valves	197457	MHA2-PR2-3-PI-M5
	4 valves	197458	MHA2-PR4-3-PI-M5
	6 valves	197459	MHA2-PR6-3-PI-M5
	8 valves	197460	MHA2-PR8-3-PI-M5
	10 valves	197461	MHA2-PR10-3-PI-M5
Manifold block with plug bases and electrical multi-pin connection for ...	6 valves	197467	MHA2-PR6-3-PI-D9
	8 valves	197468	MHA2-PR8-3-PI-D9
	10 valves	197469	MHA2-PR10-3-PI-D25

Note

Additional variants and accessories can be configured and ordered for the MH2 modular product.
 → See pages 44–49.

Ordering Data – Individual Sub-base

MHA2 – Sub-base Valves

M Mandatory Data →

Module No.	Valve family	Design	Operating voltage	Valve function	Plug-in direction on valve	Number of valve positions	Link type
197335	MH2	A	5 V DC 12 V DC 24 V DC	C N	TC HC PI K IP	1V	PS
Ordering Example 197335	MH2	- A	- 24 V DC	- C	- IP	- 1V	- PS

Ordering Table		Size	Conditions	Code	Enter Code
		2			
M	Module No.	197335		197335	197335
	Valve family	Fast Switching Valve – Size 2		MH2	MH2
	Design	Sub-base valve		-A	-A
	Operating voltage [V DC]	5, 12, 24		-...VDC	
	Valve function	3/2-way valve, normally closed		-C	
		3/2-way valve, normally open		-N	
	Plug-in direction on valve	Plug connection on top for connecting cable with socket IP40 (KMH)		-TC	
		Plug connection at rear for connecting cable with socket IP40 (KMH)		-HC	
		Plug connection underneath via electrical link		-PI	
		Connection with cable end	1	-K	
		Plug connection at rear for connecting cable with socket IP65 (KMYZ)	1	-IP	
	Number of valve positions	1		-1V	1V
↓	Link type	individual sub-base		-PS	-PS

1 Only with operating voltage 24VDC.

Transfer Order Code

2

2.3

Ordering Data – Individual Sub-base

MHA2 – Sub-base Valves

0 Options

Number of valve positions with fast switching function	Connecting cable with socket	Fitting for working port	Fitting in supply port	Fitting in exhaust port
1S	K05 K01 K25 K50 K10 K105 K125	QB QC QL QM QO QP	AB AC AO AP	BB BC BO BP BU
- 1S	- K25	- QC	- AP	- BU

2
2.3

Ordering Table

Size	2	Conditions	Code	Enter code
0 Number of valve positions with fast switching function	1	2	-1S	
Connecting cable with socket (supplied separately)	0.5 m, with socket IP40 (KMH-0.5)	3	-K05	
	1 m, with socket IP40 (KMH-1)	3	-K01	
	2.5 m, with socket IP65 (KMYZ-3-24DC-2.5-LED-PUR-B)	4	-K25	
	5 m, with socket IP65 (KMYZ-3-24DC-5-LED-PUR-B)	4	-K50	
	10 m, with socket IP65 (KMYZ-3-24DC-10-LED-PUR-B)	4	-K10	
	0.5 m, with socket IP40 (KMYZ-4-24DC-0.5-B)	4	-K105	
	2.5 m, with socket IP40 (KMYZ-4-24DC-2.5-B)	4	-K125	
Fitting for working port	Metric	QS fitting for working port, tubing O.D. 3 mm	-QB	
		QS fitting for working port, tubing O.D. 4 mm	-QC	
	Inch	QS fitting for working port, tubing O.D. 1/8"	-QL	
		QS fitting for working port, tubing O.D. 5/32"	-QM	
		QS fitting for working port, tubing O.D. 3/16"	-QO	
		QS fitting for working port, tubing O.D. 1/4"	-QP	
Fitting in supply port	Metric	QS fitting for supply, tubing O.D. 3 mm	5 -AB	
		QS fitting for supply, tubing O.D. 4 mm	-AC	
	Inch	QS fitting for supply, tubing O.D. 3/16"	6 -AO	
		QS fitting for supply, tubing O.D. 1/4"	-AP	
Fitting in exhaust port	Metric	QS fitting for exhaust, tubing O.D. 3 mm	7 -BB	
		QS fitting for exhaust, tubing O.D. 4 mm	-BC	
	Inch	QS fitting for exhaust, tubing O.D. 3/16"	8 -BO	
		QS fitting for exhaust, tubing O.D. 1/4"	-BP	
	Silencer for exhaust	-BU		

- 2 Only with plug-in direction on valve K, IP.
- 3 Not with plug-in direction on HC, TC valve.
- 4 Only with plug-in direction on valve IP.
- 5 Not with fitting QC, QD.
- 6 Not with fitting QP.
- 7 Not with fitting AC.
- 8 Not with fitting AP.

Transfer Order Code

- - - - -

Ordering Data – Manifold with Individual Electrical Connection

MHA2 – Sub-base Valves

M Mandatory Data →

Module No.	Valve family	Design	Operating voltage	Valve function	Plug-in direction on valve	Number of valve positions	Link type
197335	MH2	A	5 V DC 12 V DC 24 V DC	C N	TC HC K IP	2V ... 10V	PR
Ordering Example 197335	MH2	- A	- 24 V DC	- C	- IP	- 8V	- PR

Ordering Table		Size	Conditions	Code	Enter code
M	Module No.	197335		197335	197335
	Valve family	Fast Switching Valve – Size 2		MH2	MH2
	Design	Sub-base valve		-A	A
	Operating voltage [V DC]	5, 12, 24		-...VDC	
	Valve function	3/2-way valve, normally closed		-C	
		3/2-way valve, normally open		-N	
	Plug-in direction on valve	Plug connection on top for connecting cable with socket IP40 (KMH)		-TC	
		Plug connection at rear for connecting cable with socket IP40 (KMH)		-HC	
		Connection with cable end	1	-K	
		Plug connection at rear for connecting cable with socket IP65 (KMYZ)	1	-IP	
	Number of valve positions	2 ... 10		-...V	
	Link type	Block without electrical link		-PR	-PR

1 Only with operating voltage 24 V DC.

Transfer Order Code

197335 MH2 - A - - - - - PR -

2

2.3

Ordering Data – Manifold with Individual Electrical Connection

MHA2 – Sub-base Valves

Options														
Number of valves with fast switching function	Number of vacant positions	Connecting cable with socket		Wall mounting (DIN Rail)	Fitting for working port		Fitting in supply port (left)		Fitting in exhaust port (left)		Fitting in supply port (right)		Fitting in exhaust port (right)	
2S ... 10S	2L ... 10L	K05	K10	H	QB	QL	AX	AO	BX	BO	CX	CO	DX	DO
		K01	KI05		QC	QM	AC	AP	BC	BP	CC	CP	DC	DP
		K25	KI2		QD	QO	AD		BD	BU	CD		DD	DU
		K50				QP								
4S	-	K25	-	H	-	QC	-	AX	-	BD	-	CD	-	DX

Ordering Table					
Size		2	Conditions	Code	Enter code
0	Number of valves with fast switching function	2 ... 10	[2]	-...S	
↓	Number of vacant positions	2 ... 10		-...L	
	Connecting cable with socket (supplied separately)	0.5 m, with socket IP40 (KMH-0,5)	[3]	-K05	
		1 m, with socket IP40 (KMH-1)	[3]	-K01	
		2.5 m, with socket IP65 (KMYZ-3-24DC-2.5-LED-PUR-B)	[4]	-K25	
		5 m, with socket IP65 (KMYZ-3-24DC-5-LED-PUR-B)	[4]	-K50	
		10 m, with socket IP65 (KMYZ-3-24DC-10-LED-PUR-B)	[4]	-K10	
		0.5 m, with socket IP40 (KMYZ-4-24DC-0.5-B)	[4]	-KI05	
		2.5 m, with socket IP40 (KMYZ-4-24DC-2.5-B)	[4]	-KI25	
	Wall mounting	DIN rail mounting		-H	
	Fitting for working port	Metric	QS fitting for working port, tubing O.D. 3 mm	-QB	
			QS fitting for working port, tubing O.D. 4 mm	-QC	
			QS fitting for working port, tubing O.D. 6 mm	-QD	
		Inch	QS fitting for working port, tubing O.D. 1/8"	-QL	
			QS fitting for working port, tubing O.D. 5/32"	-QM	
			QS fitting for working port, tubing O.D. 3/16"	-QO	
			QS fitting for working port, tubing O.D. 1/4"	-QP	
	Fitting in supply port (left)	Metric	Blanking plug for supply on left	[5]	-AX
			QS fitting for supply, tubing O.D. 4 mm	[6]	-AC
		Inch	QS fitting for supply, tubing O.D. 6 mm		-AD
			QS fitting for supply, tubing O.D. 3/16"	[10]	-AO
			QS fitting for supply, tubing O.D. 1/4"		-AP
	Fitting in exhaust port (left)	Metric	Blanking plug for exhaust on left	[7]	-BX
			QS fitting for exhaust, tubing O.D. 4 mm	[8]	-BC
		Inch	QS fitting for exhaust, tubing O.D. 6 mm	[9]	-BD
			QS fitting for exhaust, tubing O.D. 3/16"	[11]	-BO
			QS fitting for exhaust, tubing O.D. 1/4"	[12]	-BP
			Silencer for exhaust		-BU
	Fitting in supply port (right)	Metric	Blanking plug for supply on right		-CX
			QS fitting for supply, tubing O.D. 4 mm	[6]	-CC
		Inch	QS fitting for supply, tubing O.D. 6 mm		-CD
			QS fitting for supply, tubing O.D. 3/16"		-CO
			QS fitting for supply, tubing O.D. 1/4"		-CP
	Fitting in exhaust port (right)	Metric	Blanking plug for exhaust on right		-DX
			QS fitting for exhaust, tubing O.D. 4 mm	[8]	-DC
		Inch	QS fitting for exhaust, tubing O.D. 6 mm		-DD
			QS fitting for exhaust, tubing O.D. 3/16"	[11]	-DO
			QS fitting for exhaust, tubing O.D. 1/4"		-DP
			Silencer for exhaust		-DU

- [2] Only with plug-in direction on valve K, IP. [5] Not with fitting CX. [8] Not with fitting AD, CD. [11] Not with fitting AP, CP.
- [3] Not with plug-in direction HC, TC. [6] Not with fitting QD. [9] Not with fitting DC. [12] Not with fitting DO.
- [4] Only with plug-in direction IP. [7] Not with fitting DX. [10] Not with fitting QP.

Transfer Order Code

- - - - - - - - -



Ordering Data – Manifold with Electrical Multi-pin Connection

MHA2 – Sub-base Valves

M Mandatory Data →

Module No.	Valve family	Design	Operating voltage	Valve function	Plug-in direction on valve	Number of valve positions	Link type
197335	MH2	A	5 V DC 12 V DC 24 V DC	C N	PI	2V ... 10V	PRA
Ordering Example							
197335	MH2	- A	- 24 V DC	- C	- PI	- 8V	- PRA

Ordering Table			
Size	2	Code	Enter code
M Module No.	197335	197335	197335
Valve family	Fast Switching Valve – Size 2	MH2	MH2
Design	Sub-base valve	-A	-A
Operating voltage [V DC]	5, 12, 24	-...VDC	
Valve function	3/2-way valve, normally closed	-C	
	3/2-way valve, normally open	-N	
Plug-in direction on valve	Plug connection underneath via electrical link	-PI	-PI
Number of valve positions	2, 4, 6, 8, 10	-...V	
Link type	Manifold block with Sub-D plug	-PRA	-PRA

Transfer Order Code

197335	MH2	- A	-	-	- PI	-	-	- PRA	-
---------------	------------	------------	---	---	-------------	---	---	--------------	---

2

2.3

Ordering Data – Manifold with Electrical Multi-pin Connection

MHA2 – Sub-base Valves

Options

Number of vacant positions	Plug-in direction, Sub-D plug	Connecting cable with socket	Wall mounting	Fitting for working port	Fitting in supply port (left)	Fitting in exhaust port (left)	Fitting in supply port (right)	Fitting in exhaust port (right)
2L ... 10L	SP ST SE	S25 M25 S50 M50 S10 M10	H	QB QL QC QM QD QO QP	AX AO AC AP AD	BX BO BC BP BD BU	CX CO CC CP CD	DX DO DC DP DD DU
8L	SE	S25	H	QC	AX	BD	CD	DX

Ordering Table

Size	2	Conditions	Code	Enter code
Number of vacant positions	2, 4, 6, 8, 10		-...L	
Plug-in direction, Sub-D plug	To pneumatic side		-SP	
	To top		-ST	
	To electrical side		-SE	
Connecting cable with socket (supplied separately)	2.5 m, Sub-D 9-pin, 9 conductors	[1]	-S25	
	5 m, Sub-D 9-pin, 9 conductors	[1] [2]	-S50	
	10 m, Sub-D 9-pin, 9 conductors	[1] [2]	-S10	
	2.5 m, Sub-D 25-pin, 25 conductors	[3]	-M25	
	5 m, Sub-D 25-pin, 25 conductors	[2] [3]	-M50	
	10 m, Sub-D 25-pin, 25 conductors	[2] [3]	-M10	
Wall mounting	DIN rail mounting		-H	
Fitting for working port	Metric	QS fitting for working port, tubing O.D. 3 mm	-QB	
		QS fitting for working port, tubing O.D. 4 mm	-QC	
		QS fitting for working port, tubing O.D. 6 mm	-QD	
	Inch	QS fitting for working port, tubing O.D. 1/8"	-QL	
		QS fitting for working port, tubing O.D. 5/32"	-QM	
		QS fitting for working port, tubing O.D. 3/16"	-QO	
QS fitting for working port, tubing O.D. 1/4"	-QP			
Fitting in supply port (left)	Metric	Blanking plug for supply on left	[4] -AX	
		QS fitting for supply, tubing O.D. 4 mm	[5] -AC	
	QS fitting for supply, tubing O.D. 6 mm	-AD		
	Inch	QS fitting for supply, tubing O.D. 3/16"	[9] -AO	
		QS fitting for supply, tubing O.D. 1/4"	-AP	
Fitting in exhaust port (left)	Metric	Blanking plug for exhaust on left	[6] -BX	
		QS fitting for exhaust, tubing O.D. 4 mm	[7] -BC	
		QS fitting for exhaust, tubing O.D. 6 mm	[8] -BD	
	Inch	QS fitting for exhaust, tubing O.D. 3/16"	[10] -BO	
		QS fitting for exhaust, tubing O.D. 1/4"	[11] -BP	
	Silencer for exhaust	-BU		
Fitting in supply port (right)	Metric	Blanking plug for supply on right	-CX	
		QS fitting for supply, tubing O.D. 4 mm	[5] -CC	
	QS fitting for supply, tubing O.D. 6 mm	-CD		
	Inch	QS fitting for supply, tubing O.D. 3/16"	-CO	
		QS fitting for supply, tubing O.D. 1/4"	-CP	
Fitting in exhaust port (right)	Metric	Blanking plug for exhaust on right	-DX	
		QS fitting for exhaust, tubing O.D. 4 mm	[7] -DC	
		QS fitting for exhaust, tubing O.D. 6 mm	-DD	
	Inch	QS fitting for exhaust, tubing O.D. 3/16"	[10] -DO	
		QS fitting for exhaust, tubing O.D. 1/4"	-DP	
	Silencer for exhaust	-DU		

- [1] Max. 8 valve positions. [3] Only with 10 valve positions. [5] Not with fitting QD. [7] Not with fitting AD, CD. [9] Not with fitting QP. [11] Not with fitting DO.
- [2] Not with solenoid voltage 5VDC. [4] Not with fitting CX. [6] Not with fitting DX. [8] Not with fitting DC. [10] Not with fitting AP, CP.

Transfer Order Code

- - - - - - - - -

MH3 Fast Switching Valves



Flow rate: 200 l/min

Response times
as fast as 3 ms

In-line, Semi In-line,
and Sub-base versions

24 V DC

Balanced poppet valve

G1/8 and G1/4
threaded connections

3

3.0

Type Code – MH3 Valves

MH P 3 – M 1 H – 3/2 – 0 – G1/8

Valve Family

MH	Fast-switching valves
----	-----------------------

Design

E	In-line valve
P	Semi in-line valve
A	Sub-base valve

Size

3	Flow rate 200 l/min
---	---------------------

Drive Function

M	Solenoid, switching
---	---------------------

Response Time

	Without electronics, 8 ms (on)
S	With electronics 3 ms (on)

Operating Voltage

1	24 V DC
---	---------

Manual Override

H	Momentary
---	-----------

Valve Function

3/2	3/2-way valve
-----	---------------

Normal Position

G	Closed
O	Open

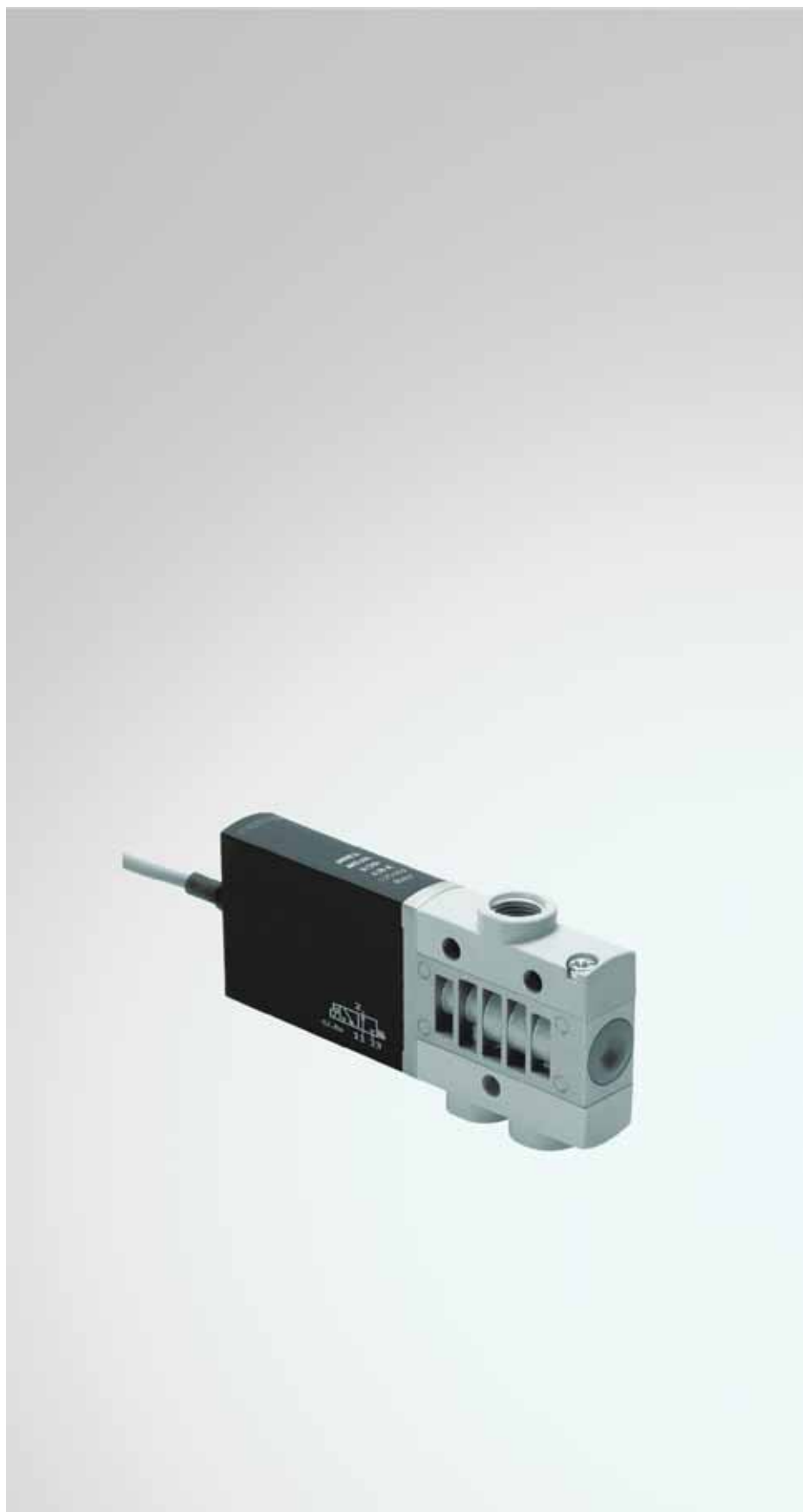
Pneumatic Connection

3	Nominal size 3 mm
1/8	Thread G1/8
1/4	Thread G1/4

Electrical Connection

	Plug vanes for plug socket KMYZ-...
K	Molded-in cable, 2.5 m long

MHE3 Fast Switching In-line Valves



Flow rate: 200 l/min

Response times
as fast as 3 ms

24 V DC

Balanced poppet valve

G1/8 threaded connections

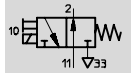
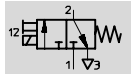
3

3.1

Technical Data

MHE3 – In-line Valves

Function



Voltage:

24 V DC

Pressure:

-0.9 ... +8 bar

Temperature Range:

-5 ... +40°C



General Technical Data			
Valve function	3/2-way, single solenoid ¹⁾		
Design	Balanced poppet valve		
Sealing principle	Soft		
Actuation type	Electrical		
Type of control	Direct		
Direction of flow	Reversible		
Manual override	Momentary		
Assembly position	Any		
Grid dimension	[mm]	19	
Nominal diameter	[mm]	3	
Standard nominal flow rate	[l/min]	200	
Type of mounting	Via through-holes		
Product weight	[g]	120	
Pneumatic Connections			
Pneumatic connection	Via valve		
Supply port	1/33	Connecting thread G1/8	
Exhaust port	3/11	Connecting thread G1/8	
Working port	2	Connecting thread G1/8	

1) Can be used as a 2/2-way valve by sealing port 1 or 3.

Operating and Environmental Conditions			
Operating medium	Inert gases, filtered compressed air, lubricated or unlubricated		
Grade of filtration	40 μ		
Operating pressure range	[bar]	-0.9 ... +8	
Ambient temperature	[°C]	-5 ... +40	
Temperature of medium	[°C]	-5 ... +40	

Technical Data

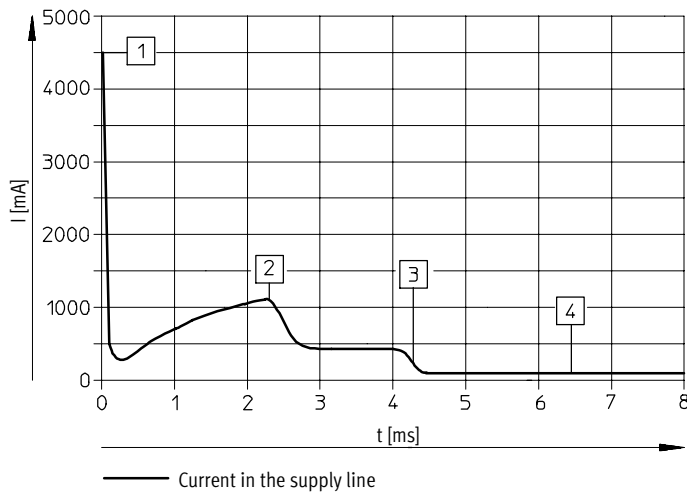
MHE3 – In-line Valves

Electrical Data		
Operating voltage	[V DC]	24 ±10%
Connection type		Plug vanes or molded-in cable
Power Consumption		
Without fast-switching electronics	[W]	3.7
Effective Power ¹⁾		
With fast-switching electronics	[W]	Pull: 6.5 Hold: 1.6
Protection Class to EN 60529		
With moulded-in cable		IP65
With plug socket with cable KMYZ-3		IP65
With plug socket with cable KMYZ-3 and plug M8		IP65
With plug socket with cable KMYZ-4		IP40

1) For power supply considerations use current curve below.

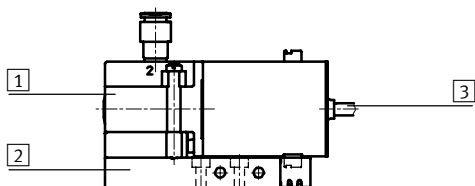
Response Times and Switching Frequencies		
With Fast-switching Electronics		
Response time on/off	[ms]	3/2.3
Max. switching frequency	[Hz]	280
Without Fast-switching Electronics		
Response time on/off	[ms]	8/4.5
Max. switching frequency	[Hz]	130

Current Curve



- 1) Capacitor charging approx. 4.5 A, lower with higher frequencies
- 2) Controlled coil current approx. 1 A
- 3) Drop to holding current
- 4) Controlled holding current approx. 0.125 A

Materials



Key		
1	Housing	Die-cast zinc
2	Sub-base	Polyamide
3	Cable sheath	Polyurethane
-	Screws	Steel
-	Seals	Nitrile rubber
Note on materials		Free of copper, PTFE and silicone

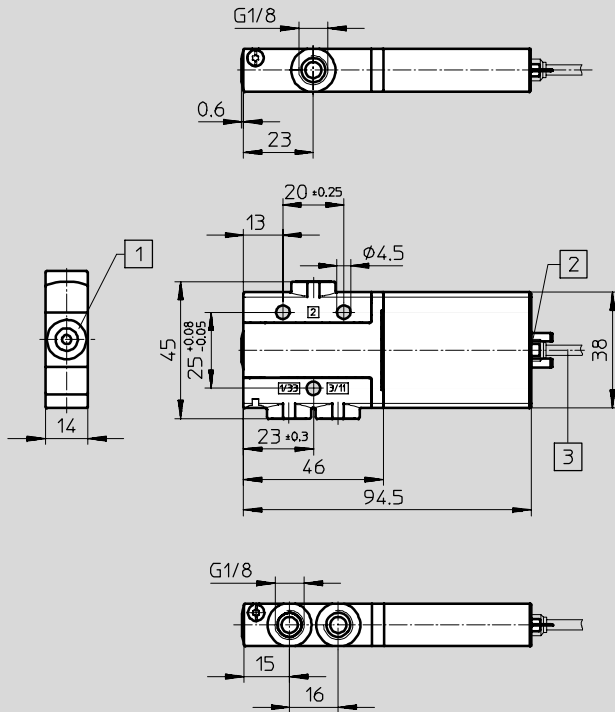
Technical Data – Dimensions

MHE3 – In-line Valves

Dimensions

Download CAD data → www.festo.com/en/engineering

Valve with Connecting Thread G1/8



1 Manual override, resetting

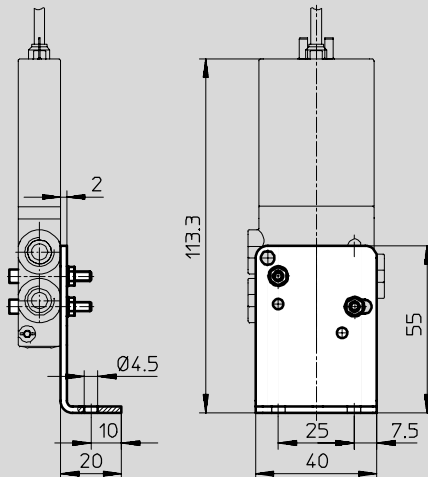
2 Plug vanes for plug socket with cable KMYZ-3, KMYZ-4

3 Cable 2.5 m

3

3.1

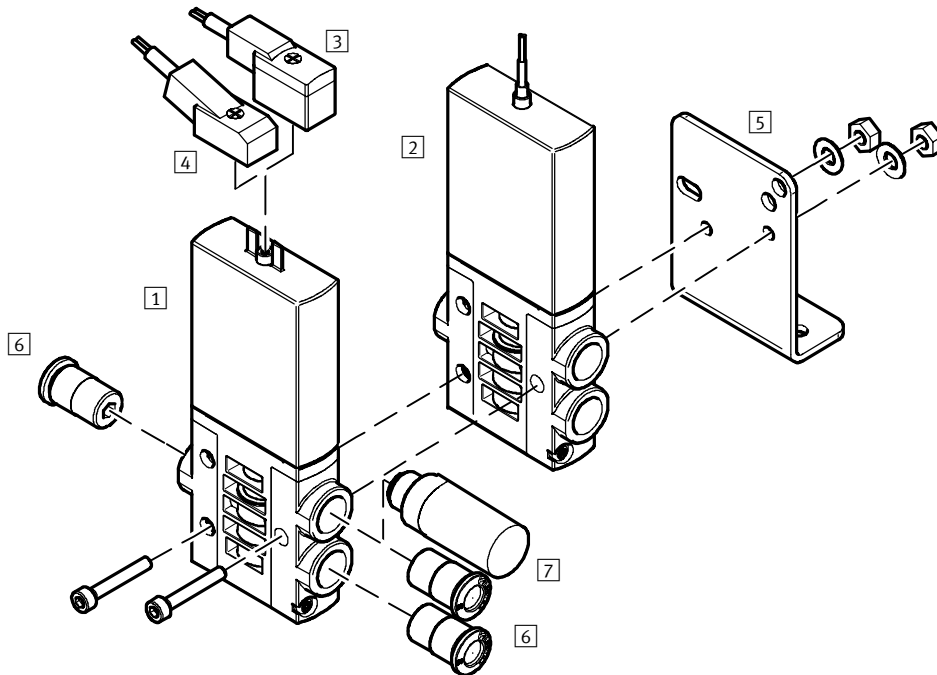
Mounting Bracket MHE2-BG-L



Overview

MHE3 – In-line Valves

Connection via Plug Vanes
 Connection via Molded-in Cable



3
 3.1

Valves and Accessories				
	Type	Description	→ See Page	
1	In-line valve	MHE3-...	With plug vanes	58
2	In-line valve	MHE3-...-K	With cable	58
3	Plug socket with cable	KMYZ-4 (IP40)	With PVC cable	101
4	Plug socket with cable	KMYZ-3 (IP65)	With LED, PUR cable, with M8 plug or open end	101
5	Mounting bracket	MHE2-BG-L	-	58
6	Push-in fitting	QS	For connecting compressed air tubing with standard O.D.	103
7	Silencer	UC	For fitting in exhaust ports	104

Ordering Data

MHE3 – In-line Valves

FESTO

Ordering Data – Valves					
Electrical Connection	Operating Voltage	Normally Closed		Normally Open	
		Part No.	Type	Part No.	Type
Response Time 3/2.3 ms					
Connecting Thread G $\frac{1}{8}$					
Plug vanes	24 V DC	525147	MHE3-MS1H-3/2G- $\frac{1}{8}$	525167	MHE3-MS1H-3/2O- $\frac{1}{8}$
Cable	24 V DC	525149	MHE3-MS1H-3/2G- $\frac{1}{8}$ -K	525169	MHE3-MS1H-3/2O- $\frac{1}{8}$ -K
Response Time 8/4.5 ms					
Connecting Thread G $\frac{1}{8}$					
Plug vanes	24 V DC	525146	MHE3-M1H-3/2G- $\frac{1}{8}$	525166	MHE3-M1H-3/2O- $\frac{1}{8}$
Cable	24 V DC	525148	MHE3-M1H-3/2G- $\frac{1}{8}$ -K	525168	MHE3-M1H-3/2O- $\frac{1}{8}$ -K

Ordering Data – Product-specific Accessories					
Designation	Weight [g]	CRC	Part No.	Type	
Mounting bracket	55	2	196165	MHE2-BG-L	

3

3.1

MHP3 Fast Switching Semi In-line Valves



Flow rate: 200 l/min

Response times
as fast as 3 ms

24 V DC

Balanced poppet valve

G1/8 and G1/4
threaded connections

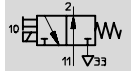
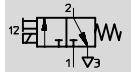
3

3.2

Technical Data

MHP3 – Semi In-line Valves

Function



Voltage:

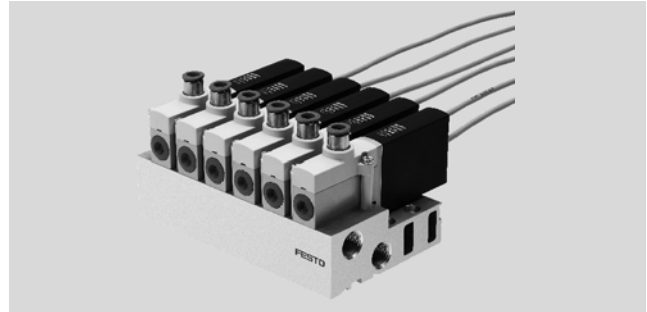
24 V DC

Pressure:

-0.9 ... +8 bar

Temperature Range:

-5 ... +40°C



General Technical Data			
Valve function	3/2-way, single solenoid ¹⁾		
Design	Balanced poppet valve		
Sealing principle	Soft		
Actuation type	Electrical		
Type of control	Direct		
Direction of flow	Reversible		
Manual override	Momentary		
Assembly position	Any		
Grid dimension	[mm]	19	
Nominal diameter	[mm]	3	
Standard nominal flow rate	[l/min]	200	
Type of mounting	On sub-base, via through-hole		
Product weight	[g]	120	
Pneumatic Connections			
Pneumatic connection	Via valve, individual sub-base or manifold sub-base		
Supply port	1/33	Connecting thread	<ul style="list-style-type: none"> ■ G1/8 – on sub-base ■ G1/4 – on manifold sub-base
Exhaust port	3/11	Connecting thread	<ul style="list-style-type: none"> ■ G1/8 – on sub-base ■ G1/4 – on manifold sub-base
Working port	2	Connecting thread	G1/8

1) Can be used as a 2/2-way valve by sealing port 1 or 3.

Operating and Environmental Conditions			
Operating medium	Inert gases, filtered compressed air, lubricated or unlubricated		
Grade of filtration	40 μ		
Operating pressure range	[bar]	-0.9 ... +8	
Ambient temperature	[°C]	-5 ... +40	
Temperature of medium	[°C]	-5 ... +40	

Technical Data

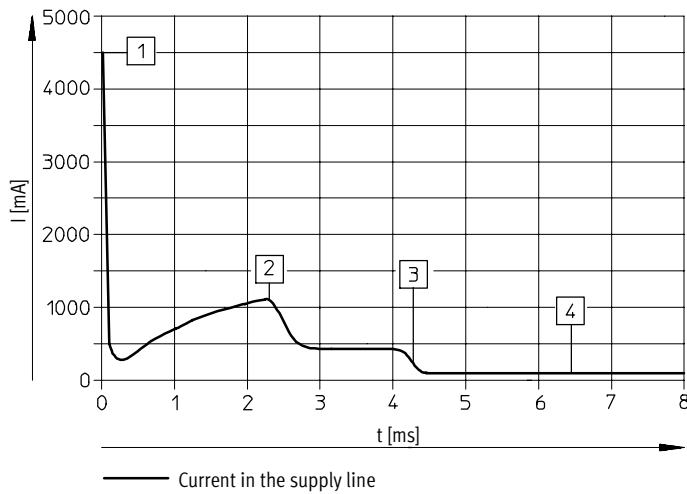
MHP3 – Semi In-line Valves

Electrical Data		
Operating voltage	[V DC]	24 ±10%
Connection type		Plug vanes or molded-in cable
Power Consumption		
Without fast-switching electronics	[W]	3.7
Effective Power ¹⁾		
With fast-switching electronics	[W]	Pull: 6.5 Hold: 1.6
Protection Class to EN 60529		
With moulded-in cable		IP65
With plug socket with cable KMYZ-3		IP65
With plug socket with cable KMYZ-3 and plug M8		IP65
With plug socket with cable KMYZ-4		IP40

1) For power supply considerations use current curve below.

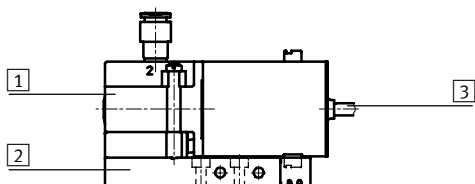
Response Times and Switching Frequencies		
With Fast-switching Electronics		
Response time on/off	[ms]	3/2.3
Max. switching frequency	[Hz]	280
Without Fast-switching Electronics		
Response time on/off	[ms]	8/4.5
Max. switching frequency	[Hz]	130

Current Curve



- 1) Capacitor charging approx. 4.5 A, lower with higher frequencies
- 2) Controlled coil current approx. 1 A
- 3) Drop to holding current
- 4) Controlled holding current approx. 0.125 A

Materials



Key		
1	Housing	Die-cast zinc
2	Sub-base	Polyamide
3	Cable sheath	Polyurethane
-	Screws	Steel
-	Seals	Nitrile rubber
Note on materials		Free of copper, PTFE and silicone

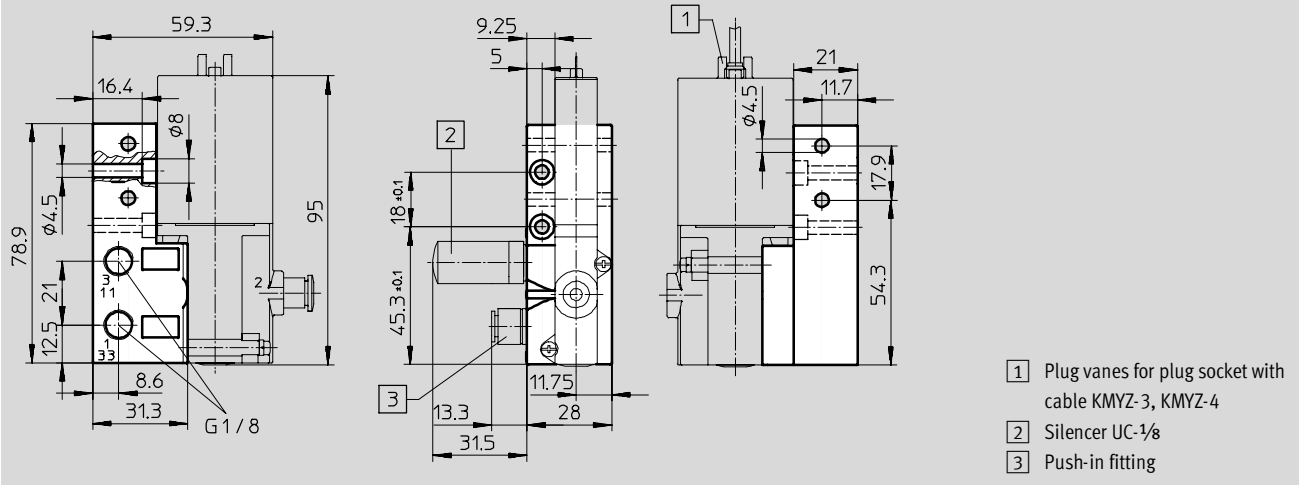
Technical Data – Dimensions

MHP3 – Semi In-line Valves

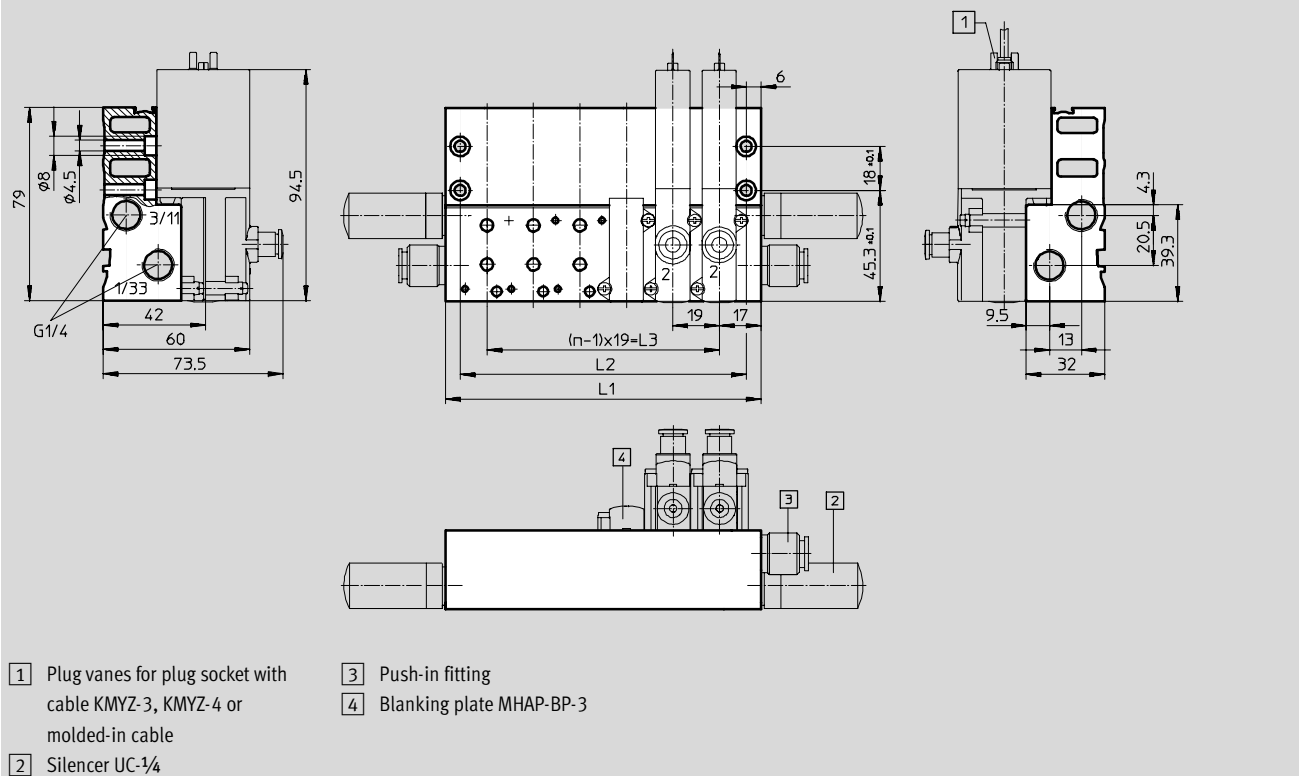
Dimensions

Download CAD data → www.festo.com/en/engineering

Individual Sub-base



Manifold Mounting



Number of valves n	L1	L2	L3
2	53	41	19
4	91	79	57
6	129	117	95

Number of valves n	L1	L2	L3
8	167	155	133
10	205	193	171

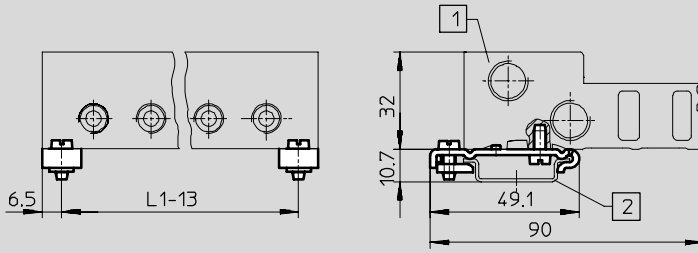
Technical Data – Dimensions

MHP3 – Semi In-line Valves

Dimensions

Download CAD data → www.festo.com/en/engineering

DIN Rail Mounting CPV10/14-VI-BG-NRH-35



- 1 Manifold block
- 2 Mounting rail NRH-35

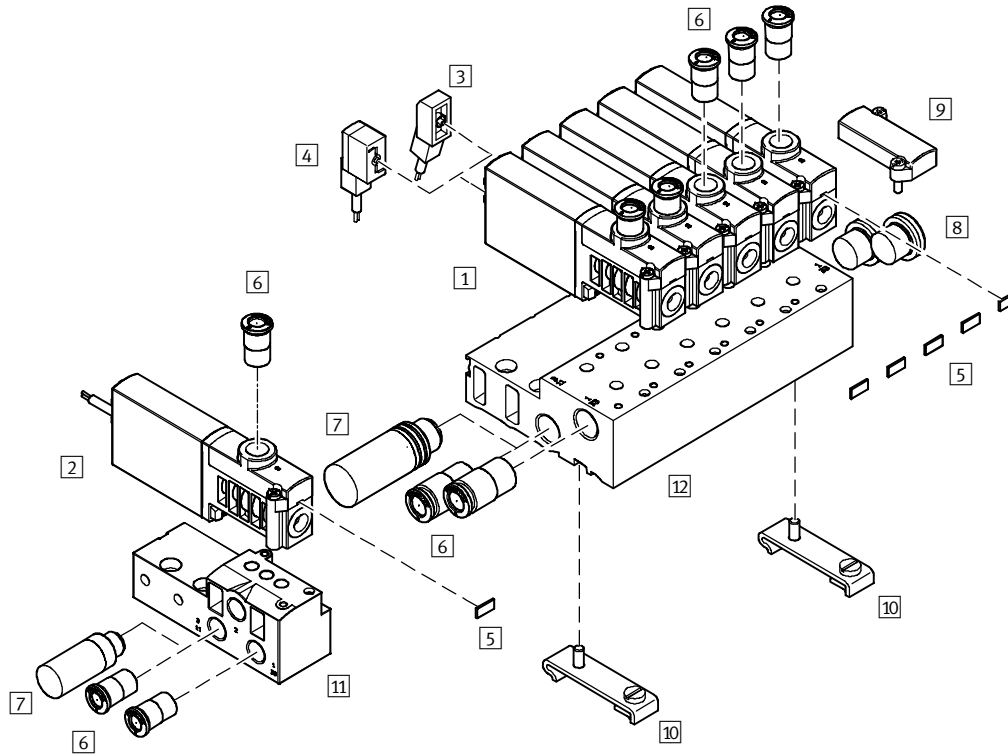
Type	Number of valves n	L1
MHAP3-PR2-3	2	53
MHAP3-PR4-3	4	91
MHAP3-PR6-3	6	129

Type	Number of valves n	L1
MHAP3-PR8-3	8	167
MHAP3-PR10-3	10	205

Overview

MHP3 – Semi In-line Valves

Connection via Plug Vanes
 Connection via Molded-in Cable



Valves and Accessories			
	Type	Description	→ See Page
1	MHP3-...	With plug vanes	66
2	MHP3-...-K	With cable	66
3	KMYZ-4 (IP40)	With PVC cable	101
4	KMYZ-3 (IP65)	With LED, PUR cable, with M8 plug or open end	101
5	MH-BZ-80X	For identifying the valves	101
6	QS	For connecting compressed air tubing with standard O.D.	103
7	UC	For fitting in exhaust ports	104
8	B	For sealing unused ports	101
9	MHAP3-BP-3	For sealing vacant positions	101
10	CPV10/14-VI-BG-NRH-35	-	101
11	MHP3-AS-3-1/8	For semi in-line valve	66
12	MHP3-PR...-3	For semi in-line valve	66

Ordering Data

MHP3 – Semi In-line Valves

FESTO

Ordering Data – Valves					
Electrical Connection	Operating Voltage	Normally Closed		Normally Open	
		Part No.	Type	Part No.	Type
Response Time 3/2.3 ms					
Connecting thread G $\frac{1}{8}$					
Plug vanes	24 V DC	525139	MHP3-MS1H-3/2G- $\frac{1}{8}$	525159	MHP3-MS1H-3/2O- $\frac{1}{8}$
Cable	24 V DC	525141	MHP3-MS1H-3/2G- $\frac{1}{8}$ -K	525161	MHP3-MS1H-3/2O- $\frac{1}{8}$ -K
Response Time 8/4.5 ms					
Connecting thread G $\frac{1}{8}$					
Plug vanes	24 V DC	525138	MHP3-M1H-3/2G- $\frac{1}{8}$	525158	MHP3-M1H-3/2O- $\frac{1}{8}$
Cable	24 V DC	525140	MHP3-M1H-3/2G- $\frac{1}{8}$ -K	525160	MHP3-M1H-3/2O- $\frac{1}{8}$ -K

Note

Type 3/2NC and type 3/2NO valves must not be mixed on a manifold block.

Ordering Data – Individual Sub-base and Manifold Blocks			
Designation	Part No.	Type	
Individual Sub-base			
For semi in-line valve	525215	MHP3-AS-3- $\frac{1}{8}$	
Manifold Block			
For semi in-line valve	2 valves	525216	MHP3-PR2- $\frac{1}{8}$
	4 valves	525217	MHP3-PR4- $\frac{1}{8}$
	6 valves	525218	MHP3-PR6- $\frac{1}{8}$
	8 valves	525219	MHP3-PR8- $\frac{1}{8}$
	10 valves	525220	MHP3-PR10- $\frac{1}{8}$

3

3.2

MHA3 Fast Switching Sub-base Valves



Flow rate: 200 l/min

Response times
as fast as 3 ms

24 V DC

Balanced poppet valve

G1/8 and G1/4
threaded connections

3

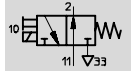
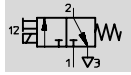
3.3

Technical Data

MHA3 – Sub-base Valves

FESTO

Function



Voltage:

24 V DC

Pressure:

-0.9 ... +8 bar

Temperature Range:

-5 ... +40°C



General Technical Data			
Valve function	3/2-way, single solenoid ¹⁾		
Design	Balanced poppet valve		
Sealing principle	Soft		
Actuation type	Electrical		
Type of control	Direct		
Direction of flow	Reversible		
Manual override	Momentary		
Assembly position	Any		
Grid dimension	[mm]	19	
Nominal diameter	[mm]	3	
Standard nominal flow rate	[l/min]	200	
Type of mounting	On sub-base, via through-hole		
Product weight	[g]	120	
Pneumatic Connections			
Pneumatic connection	Via individual sub-base or manifold sub-base		
Supply port	1/33	Connecting thread ■ G1/8 – on sub-base ■ G1/4 – on manifold sub-base	
Exhaust port	3/11	Connecting thread ■ G1/8 – on sub-base ■ G1/4 – on manifold sub-base	
Working port	2	Connecting thread G1/8	

1) Can be used as a 2/2-way valve by sealing port 1 or 3.

Operating and Environmental Conditions			
Operating medium	Inert gases, filtered compressed air, lubricated or unlubricated		
Grade of filtration	40 μ		
Operating pressure range	[bar]	-0.9 ... +8	
Ambient temperature	[°C]	-5 ... +40	
Temperature of medium	[°C]	-5 ... +40	

3

3.3

Technical Data

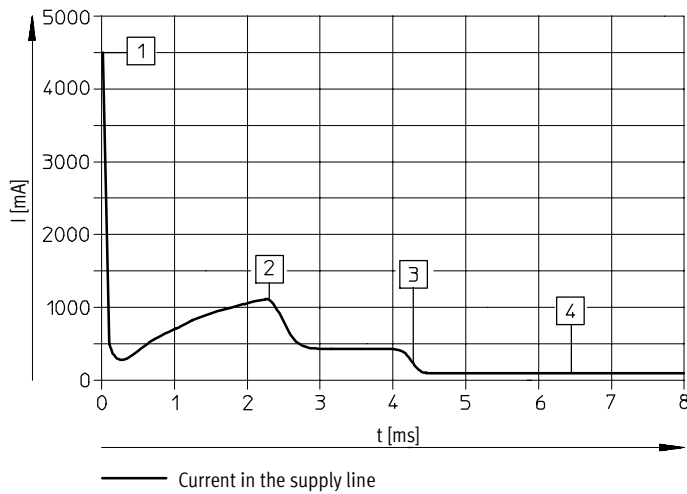
MHA3 – Sub-base Valves

Electrical Data		
Operating voltage	[V DC]	24 ±10%
Connection type		Plug vanes or molded-in cable
Power Consumption		
Without fast-switching electronics	[W]	3.7
Effective Power ¹⁾		
With fast-switching electronics	[W]	Pull: 6.5 Hold: 1.6
Protection Class to EN 60529		
With molded-in cable		IP65
With plug socket with cable KMYZ-3		IP65
With plug socket with cable KMYZ-3 and plug M8		IP65
With plug socket with cable KMYZ-4		IP40

1) For power supply considerations use current curve below.

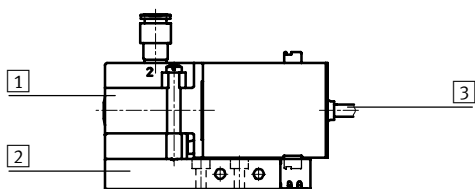
Response Times and Switching Frequencies		
With Fast-switching Electronics		
Response time on/off	[ms]	3/2.3
Max. switching frequency	[Hz]	280
Without Fast-switching Electronics		
Response time on/off	[ms]	8/4.5
Max. switching frequency	[Hz]	130

Current Curve



- 1 Capacitor charging approx. 4.6 A, lower with higher frequencies
- 2 Controlled coil current approx. 1 A
- 3 Drop to holding current
- 4 Controlled holding current approx. 0.125 A

Materials



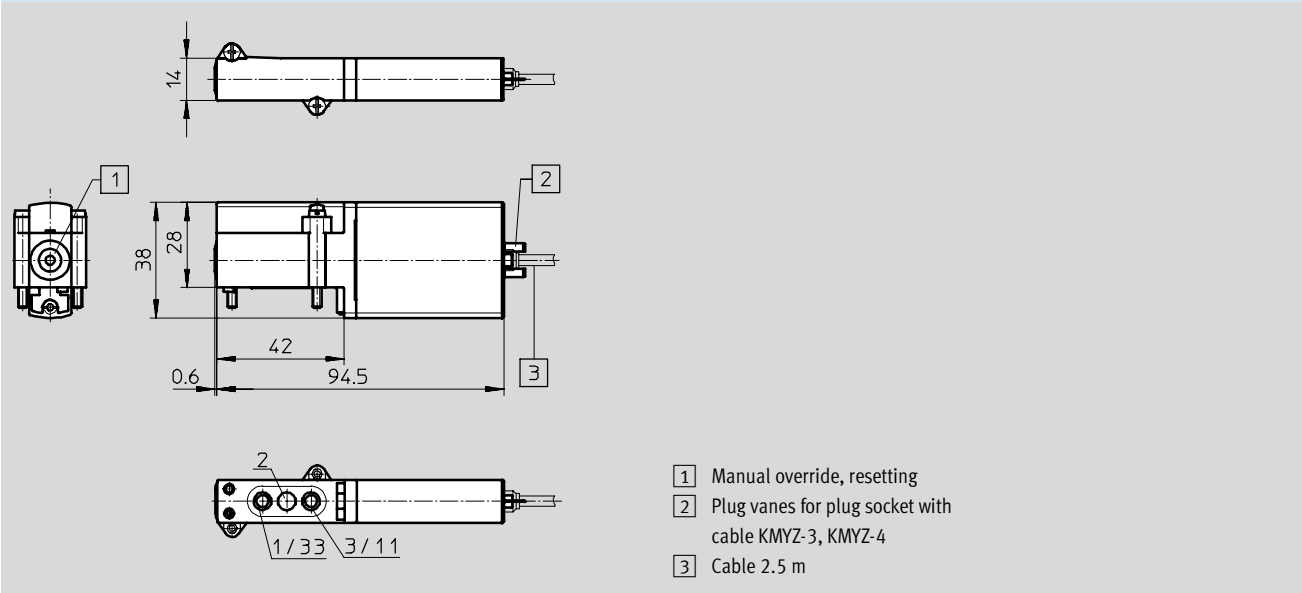
Key		
1	Housing	Die-cast zinc
2	Sub-base	Polyamide
3	Cable sheath	Polyurethane
-	Screws	Steel
-	Seals	Nitrile rubber
Note on materials		Free of copper, PTFE and silicone

Technical Data – Dimensions

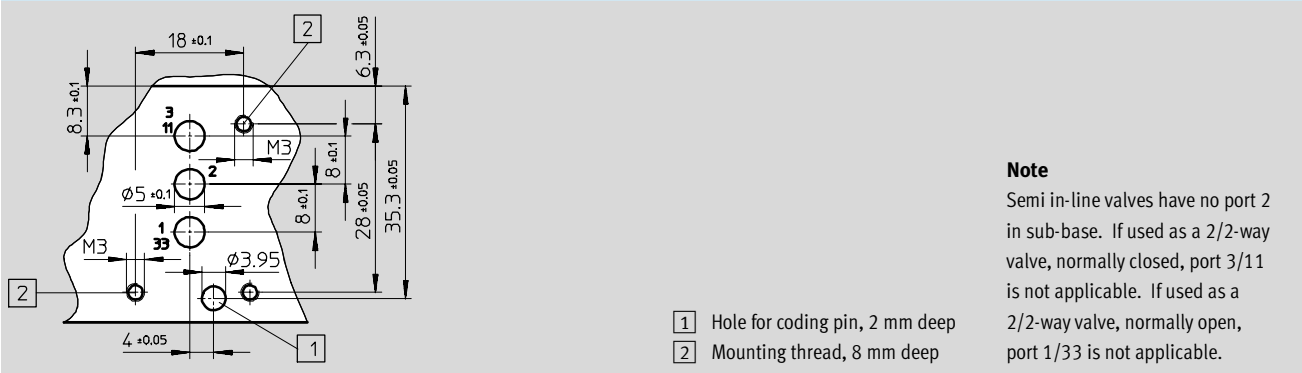
MHA3 – Sub-base Valves

Dimensions

Valve



Port Pattern on Sub-bases



3

3.3

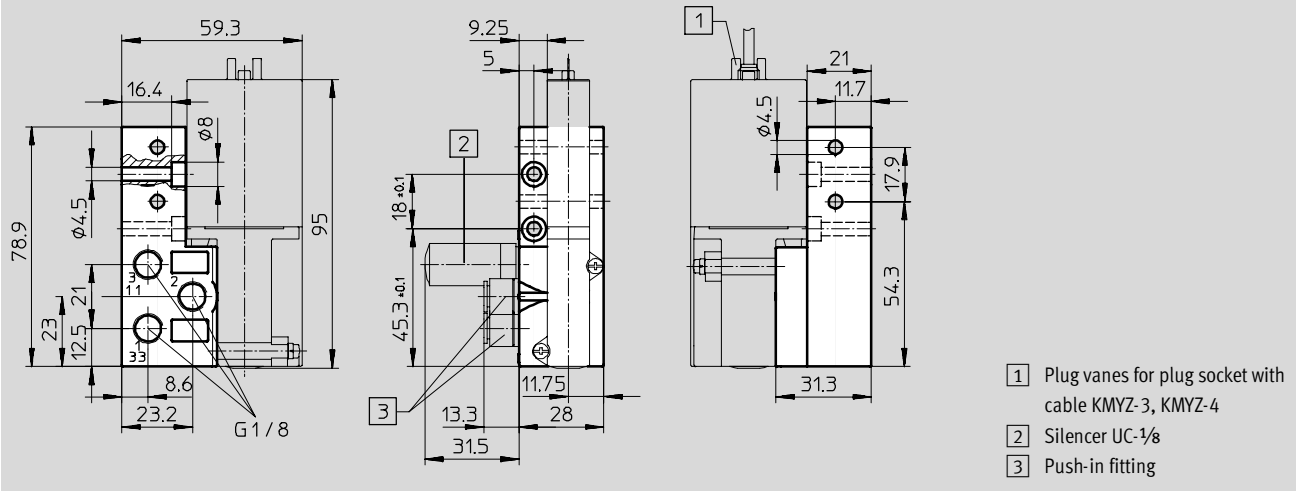
Technical Data – Dimensions

MHA3 – Sub-base Valves

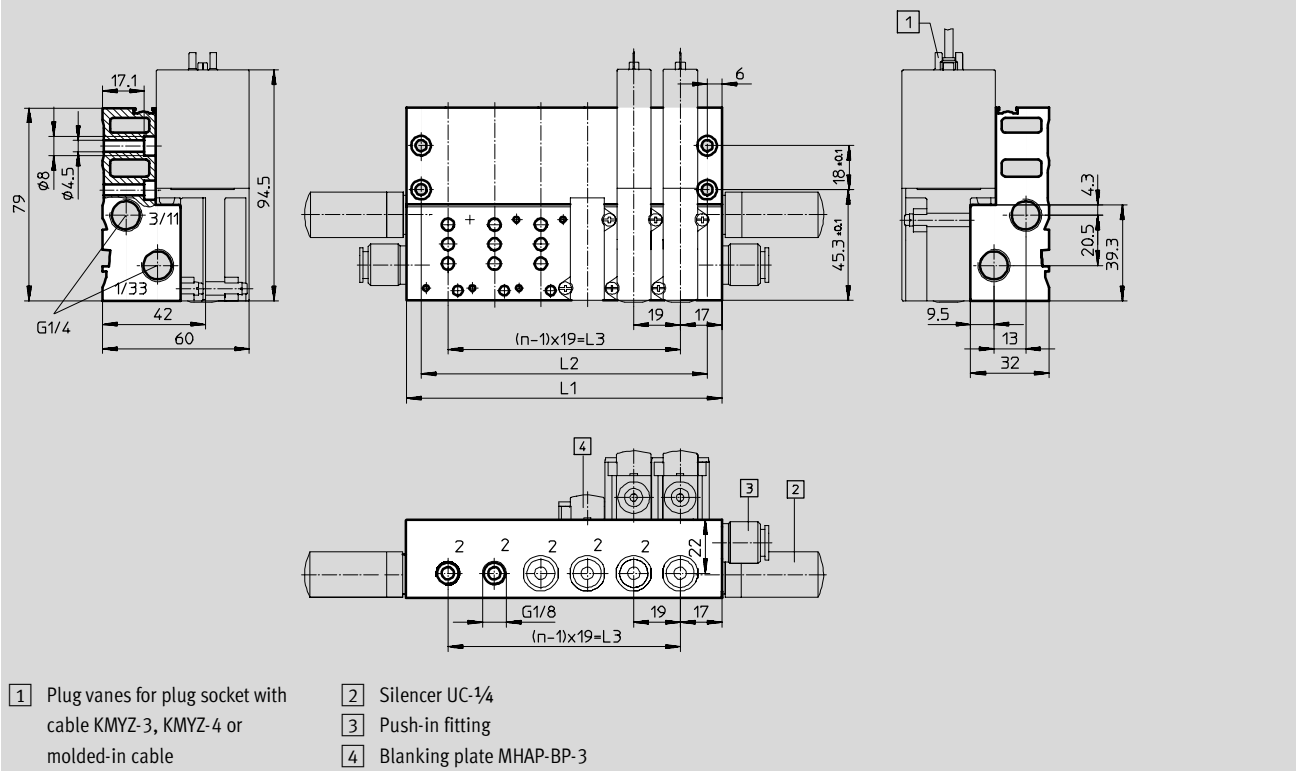
Dimensions

Download CAD data → www.festo.com/en/engineering

Individual Sub-base



Manifold Mounting



Number of valves n	L1	L2	L3
2	53	41	19
4	91	79	57
6	129	117	95

Number of valves n	L1	L2	L3
8	167	155	133
10	205	193	171

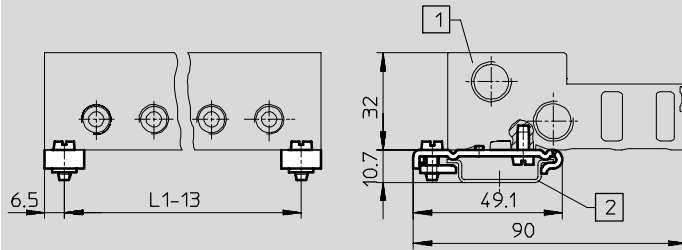
Technical Data – Dimensions

MHA3 – Sub-base Valves

Dimensions

Download CAD data → www.festo.com/en/engineering

DIN Rail Mounting CPV10/14-VI-BG-NRH-35



- 1 Manifold block
- 2 Mounting rail NRH-35

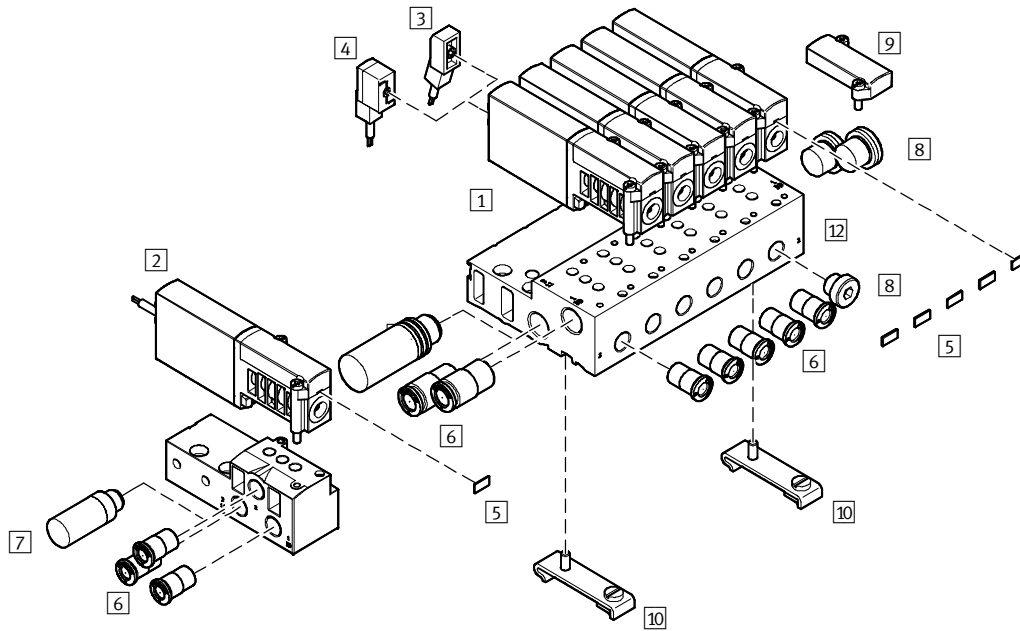
Type	Number of valves n	L1
MHAP3-PR2-3	2	53
MHAP3-PR4-3	4	91
MHAP3-PR6-3	6	129

Type	Number of valves n	L1
MHAP3-PR8-3	8	167
MHAP3-PR10-3	10	205

Overview

MHA3 – Sub-base Valves

Connection via Plug Vanes
 Connection via Molded-in Cable



Valves and Accessories				
	Type	Description	→ See Page	
1	Sub-base valve	MHA3-...	With plug vanes	74
2	Sub-base valve	MHA3-...-K	With cable	74
3	Plug socket with cable	KMYZ-4 (IP40)	With PVC cable	101
4	Plug socket with cable	KMYZ-3 (IP65)	With LED, PUR cable, with M8 plug or open end	101
5	Label	MH-BZ-80X	For identifying the valves	101
6	Push-in fitting	QS	For connecting compressed air tubing with standard O.D.	103
7	Silencer	UC	For fitting in exhaust ports	104
8	Blanking plug	B	For sealing unused ports	101
9	Blanking plate	MHAP3-BP-3	For sealing vacant positions	101
10	DIN rail mounting	CPV10/14-VI-BG-NRH-35	-	101
11	Individual sub-base	MHA3-AS-3-1/8	For sub-base valve	74
12	Manifold block	MHA3-PR...-3-1/8	For sub-base valve	74

Ordering Data

MHA3 – Sub-base Valves

FESTO

Ordering Data – Valves					
Electrical Connection	Operating Voltage	Normally Closed		Normally Open	
		Part No.	Type	Part No.	Type
Response Time 3/2.3 ms					
Plug vanes	24 V DC	525135	MHA3-MS1H-3/2G-3	525155	MHA3-MS1H-3/2O-3
Cable	24 V DC	525137	MHA3-MS1H-3/2G-3-K	525157	MHA3-MS1H-3/2O-3-K
Response Time 8/4.5 ms					
Plug vanes	24 V DC	525134	MHA3-M1H-3/2G-3	525154	MHA3-M1H-3/2O-3
Cable	24 V DC	525136	MHA3-M1H-3/2G-3-K	525156	MHA3-M1H-3/2O-3-K

Note

Type 3/2NC and 3/2NO valves must not be mixed on a manifold block.

Ordering Data – Individual Sub-base and Manifold Blocks			
Designation		Part No.	Type
Individual Sub-base			
For sub-base valve		525214	MHA3-AS-3-1/8
Manifold Block			
For sub-base valve	2 valves	525221	MHA3-PR2-1/8
	4 valves	525222	MHA3-PR4-1/8
	6 valves	525223	MHA3-PR6-1/8
	8 valves	525224	MHA3-PR8-1/8
	10 valves	525225	MHA3-PR10-1/8

3

3.3

MH4 Fast Switching Valves



Flow rate: 400 l/min

Response times
as fast as 3.5 ms

In-line, Semi In-line,
and Sub-base versions

24 V DC

Balanced poppet valve

G1/4 and G3/8
threaded connections

4

4.0

Type Code – MH4 Valves

MH P 4 – M 1 H – 3/2 – 0 – G¼

Valve Family

MH	Fast-switching valves
----	-----------------------

Design

E	In-line valve
P	Semi in-line valve
A	Sub-base valve

Size

4	Flow rate 400 l/min
---	---------------------

Drive Function

M	Solenoid, switching
---	---------------------

Response Time

	Without electronics, 9 ms (on)
S	With electronics, 3.5 ms (on)

Operating Voltage

1	24 V DC
---	---------

Manual Override

H	Momentary
---	-----------

Valve Function

3/2	3/2-way valve
-----	---------------

Normal Position

G	Closed
O	Open

Pneumatic Connection

4	Nominal size 4 mm
¼	Thread G¼
⅜	Thread G⅜

Electrical Connection

	Plug vanes for plug socket KMEB-...
K	Molded-in cable, 2.5 m long

MHE4 Fast Switching In-line Valves



Flow rate: 400 l/min

Response times
as fast as 3.5 ms

24 V DC

Balanced poppet valve

G1/4 threaded connections

4

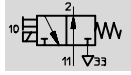
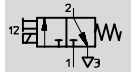
4.1

Technical Data

MHE4 – In-line Valves

FESTO

Function



Voltage:

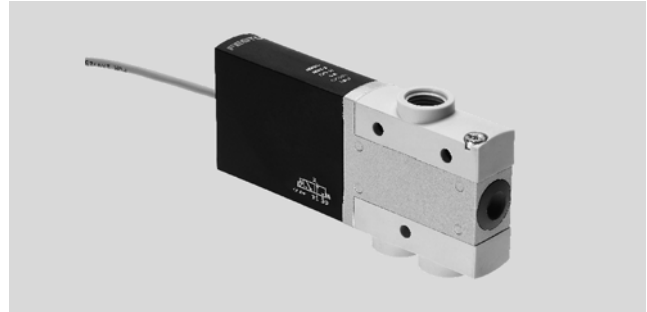
24 V DC

Pressure:

-0.9 ... +8 bar

Temperature Range:

-5 ... +40°C



General Technical Data		
Valve function		3/2-way, single solenoid ¹⁾
Design		Balanced poppet valve
Sealing principle		Soft
Actuation type		Electrical
Type of control		Direct
Direction of flow		Reversible
Manual override		Momentary
Assembly position		Any
Grid dimension	[mm]	24
Nominal diameter	[mm]	4
Standard nominal flow rate	[l/min]	400
Type of mounting		Via through-holes
Product weight	[g]	270
Pneumatic Connections		
Pneumatic connection		Via valve
Supply port	1/33	Connecting thread G1/4
Exhaust port	3/11	Connecting thread G1/4
Working port	2	Connecting thread G1/4

1) Can be used as a 2/2-way valve by sealing port 1 or 3.

Operating and Environmental Conditions		
Operating medium		Inert gases, filtered compressed air, lubricated or unlubricated
Grade of filtration		40 μ
Operating pressure range	[bar]	-0.9 ... +8
Ambient temperature	[°C]	-5 ... +40
Temperature of medium	[°C]	-5 ... +40

4

4.1

Technical Data

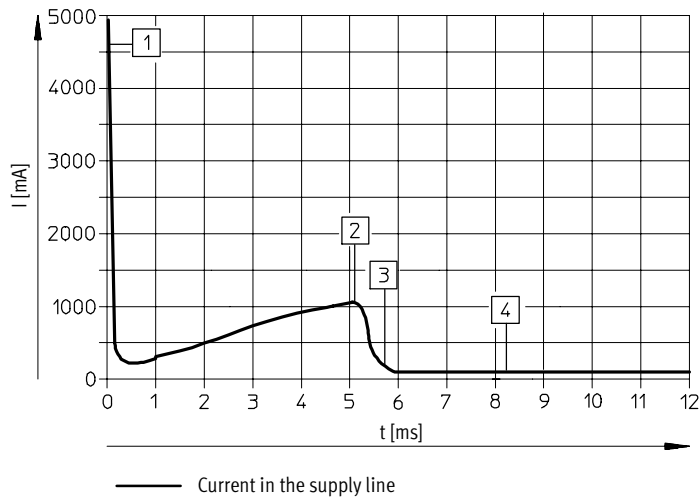
MHE4 – In-line Valves

Electrical Data		
Operating voltage	[V DC]	24 ±10%
Connection type		Plug vanes or molded-in cable
Power Consumption		
Without fast-switching electronics	[W]	5.6
Effective Power ¹⁾		
With fast-switching electronics	[W]	Pull: 8.5 Hold: 2.125
Protection Class to EN 60529		
With molded-in cable		IP65
With plug socket with cable KMEB		IP65

1) For power supply considerations use current curve below.

Response Times and Switching Frequencies		
With Fast-switching Electronics		
Response time on/off	[ms]	3.5/3.5
Max. switching frequency	[Hz]	280
Without Fast-switching Electronics		
Response time on/off	[ms]	9/5
Max. switching frequency	[Hz]	120

Current Curve

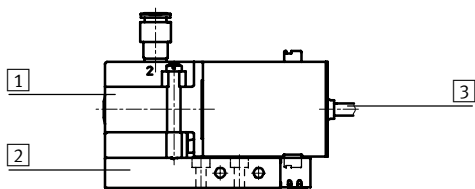


- 1 Capacitor charging approx. 4.9 A, lower with higher frequencies
- 2 Controlled coil current approx. 1 A
- 3 Drop to holding current
- 4 Controlled holding current approx. 0.125 A

4

4.1

Materials



Key		
1	Housing	Die-cast zinc
2	Sub-base	Polyamide
3	Cable sheath	Polyurethane
-	Screws	Steel
-	Seals	Nitrile rubber
Note on materials		Free of copper, PTFE and silicone

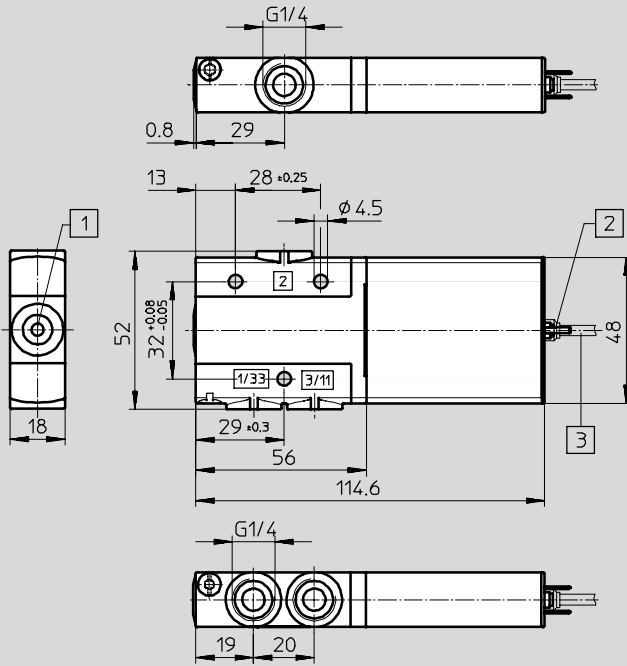
Technical Data – Dimensions

MHE4 – In-line Valves

Dimensions

Download CAD data → www.festo.com/en/engineering

Valve with Connecting Thread G $\frac{1}{4}$

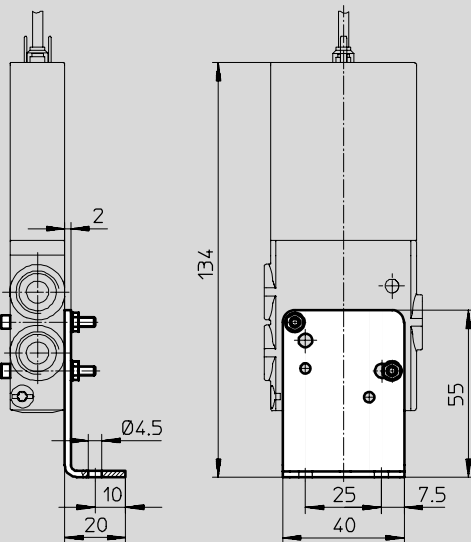


1 Manual override, resetting

2 Plug vanes for plug socket with cable KMEB

3 Cable 2.5 m

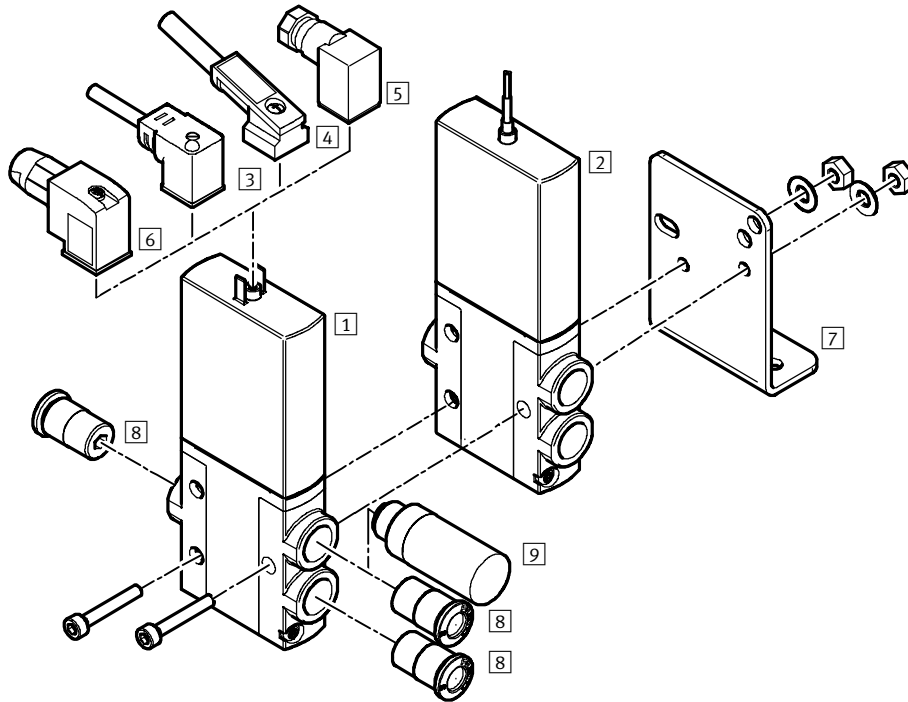
Mounting Bracket MHE2-BG-L



Overview

MHE4 – In-line Valves

Connection via Plug Vanes
 Connection via Molded-in Cable



Valves and Accessories				
	Type	Description	→ See Page	
1	In-line valve	MHE4-...	With plug vanes	82
2	In-line valve	MHE4-...-K	With cable	82
3	Plug socket with cable	KMEB-1 (IP65)	PVC cable, with or without LED	102
4	Plug socket with cable	KMEB-2 (IP65)	With LED, without LED; PUR cable, with or without LED	102
5	Plug socket	MSSD-EB (IP65)	With clamping screw	102
6	Plug socket	MSSD-EB (IP65)	With insulation displacement connector	102
7	Mounting bracket	MHE2-BG-L	-	82
8	Push-in fitting	QS	For connecting compressed air tubing with standard O.D.	103
9	Silencer	UC	For fitting in exhaust ports	104

Ordering Data

MHE4 – In-line Valves

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Ordering Data – Valves					
Electrical Connection	Operating Voltage	Normally Closed		Normally Open	
		Part No.	Type	Part No.	Type
Response Time 3.5/3.5 ms					
Connecting Thread G $\frac{1}{4}$					
Plug vanes	24 V DC	525187	MHE4-MS1H-3/2G- $\frac{1}{4}$	525207	MHE4-MS1H-3/2O- $\frac{1}{4}$
Cable	24 V DC	525189	MHE4-MS1H-3/2G- $\frac{1}{4}$ -K	525209	MHE4-MS1H-3/2O- $\frac{1}{4}$ -K
Response Time 9/5 ms					
Connecting Thread G $\frac{1}{4}$					
Plug vanes	24 V DC	525186	MHE4-M1H-3/2G- $\frac{1}{4}$	525206	MHE4-M1H-3/2O- $\frac{1}{4}$
Cable	24 V DC	525188	MHE4-M1H-3/2G- $\frac{1}{4}$ -K	525208	MHE4-M1H-3/2O- $\frac{1}{4}$ -K

Ordering Data – Product-specific Accessories					
Designation	Weight [g]	CRC	Part No.	Type	
Mounting bracket	55	2	196165	MHE2-BG-L	

MHP4 Fast Switching Semi In-line Valves



Flow rate: 400 l/min

Response times
as fast as 3.5 ms

24 V DC

Balanced poppet valve

G1/4 and G3/8
threaded connections

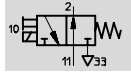
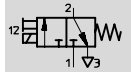
4

4.2

Technical Data

MHP4 – Semi In-line Valves

Function



Voltage:

24 V DC

Pressure:

-0.9 ... +8 bar

Temperature Range:

-5 ... +40°C



General Technical Data		
Valve function		3/2-way, single solenoid ¹⁾
Design		Balanced poppet valve
Sealing principle		Soft
Actuation type		Electrical
Type of control		Direct
Direction of flow		Reversible
Manual override		Momentary
Assembly position		Any
Grid dimension	[mm]	24
Nominal diameter	[mm]	4
Standard nominal flow rate	[l/min]	400
Type of mounting		On sub-base, via through-hole
Product weight	[g]	270
Pneumatic Connections		
Pneumatic connection		Via individual sub-base or manifold sub-base
Supply port	1/33	Connecting thread <ul style="list-style-type: none"> ■ G$\frac{1}{4}$ – on sub-base ■ G$\frac{3}{8}$ – on manifold sub-base
Exhaust port	3/11	Connecting thread <ul style="list-style-type: none"> ■ G$\frac{1}{4}$ – on sub-base ■ G$\frac{3}{8}$ – on manifold sub-base
Working port	2	Connecting thread G $\frac{1}{4}$

1) Can be used as a 2/2-way valve by sealing port 1 or 3.

Operating and Environmental Conditions		
Operating medium		Inert gases, filtered compressed air, lubricated or unlubricated
Grade of filtration		40 μ
Operating pressure range	[bar]	-0.9 ... +8
Ambient temperature	[°C]	-5 ... +40
Temperature of medium	[°C]	-5 ... +40

Technical Data

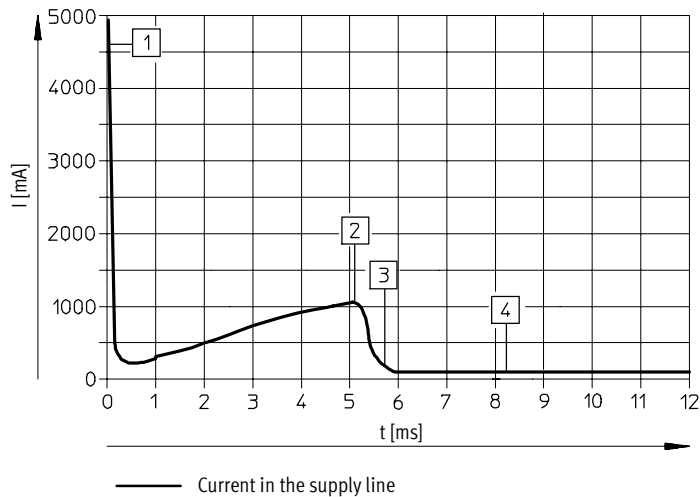
MHP4 – Semi In-line Valves

Electrical Data		
Operating voltage	[V DC]	24 ±10%
Connection type		Plug vanes or molded-in cable
Power Consumption		
Without fast-switching electronics	[W]	5.6
Effective Power ¹⁾		
With fast-switching electronics	[W]	Pull: 8.5 Hold: 2.125
Protection Class to EN 60529		
With molded-in cable		IP65
With plug socket with cable KMEB		IP65

1) For power supply considerations use current curve below.

Response Times and Switching Frequencies		
With Fast-switching Electronics		
Response time on/off	[ms]	3.5/3.5
Max. switching frequency	[Hz]	210
Without Fast-switching Electronics		
Response time on/off	[ms]	9/5
Max. switching frequency	[Hz]	120

Current Curve

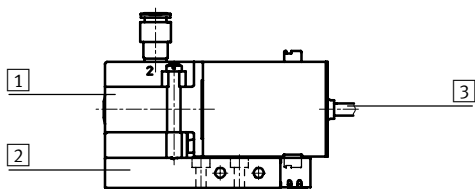


- 1 Capacitor charging approx. 4.9 A, lower with higher frequencies
- 2 Controlled coil current approx. 1 A
- 3 Drop to holding current
- 4 Controlled holding current approx. 0.125 A

4

4.2

Materials



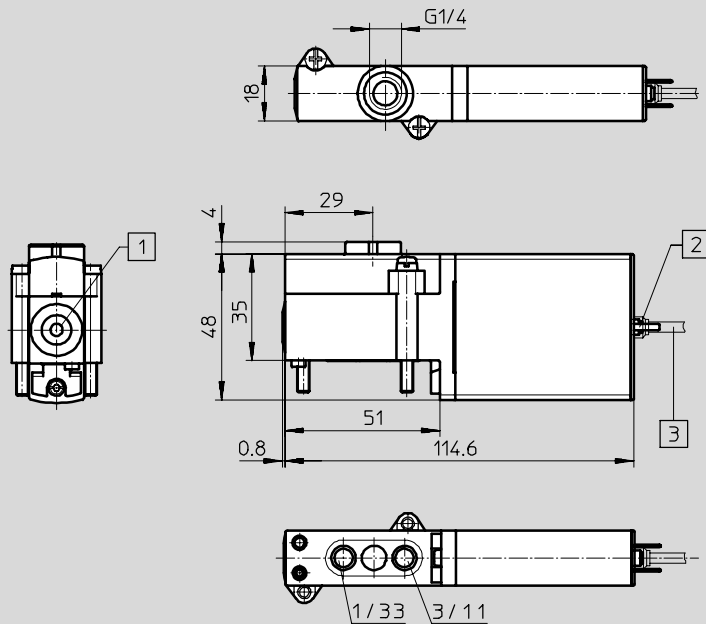
Key		
1	Housing	Die-cast zinc
2	Sub-base	Polyamide
3	Cable sheath	Polyurethane
-	Screws	Steel
-	Seals	Nitrile rubber
Note on materials		Free of copper, PTFE and silicone

Technical Data – Dimensions

MHP4 – Semi In-line Valves

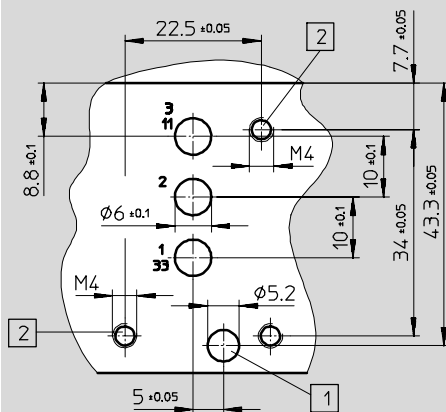
Dimensions Download CAD data → www.festo.com/en/engineering

Valve with Connecting Thread G $\frac{1}{4}$



- 1 Manual override, resetting
- 2 Plug vanes for plug socket with cable KMEB
- 3 Cable 2.5 m

Port Pattern on Sub-bases



- 1 Hole for coding pin, 2.5 mm deep
- 2 Mounting thread, 13 mm deep

Note

Semi in-line valves have no port 2 in sub-base. If used as a 2/2-way valve, normally closed, port 3/11 is not applicable. If used as a 2/2-way valve, normally open, port 1/33 is not applicable.

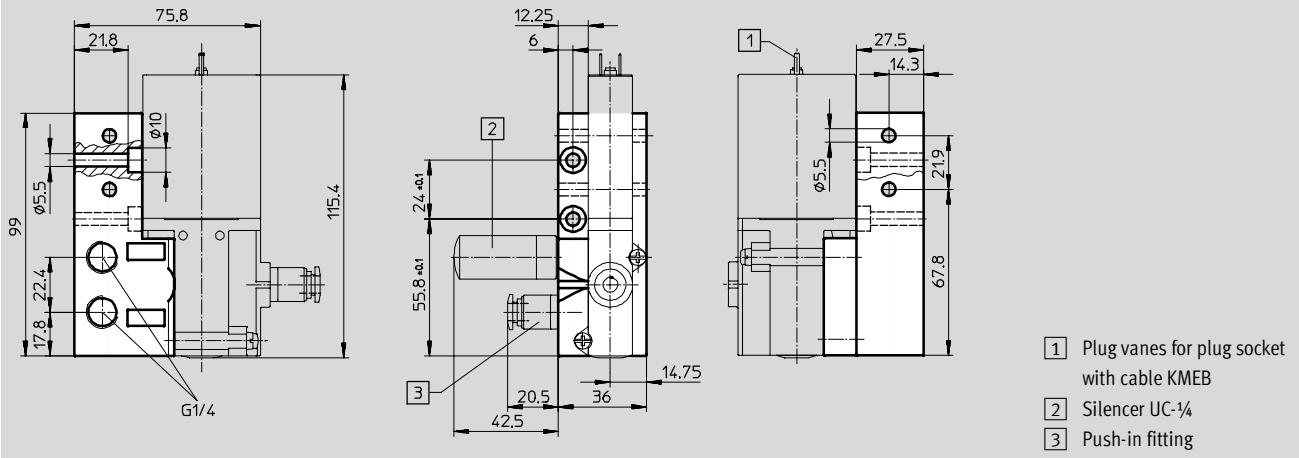
Technical Data – Dimensions

MHP4 – Semi In-line Valves

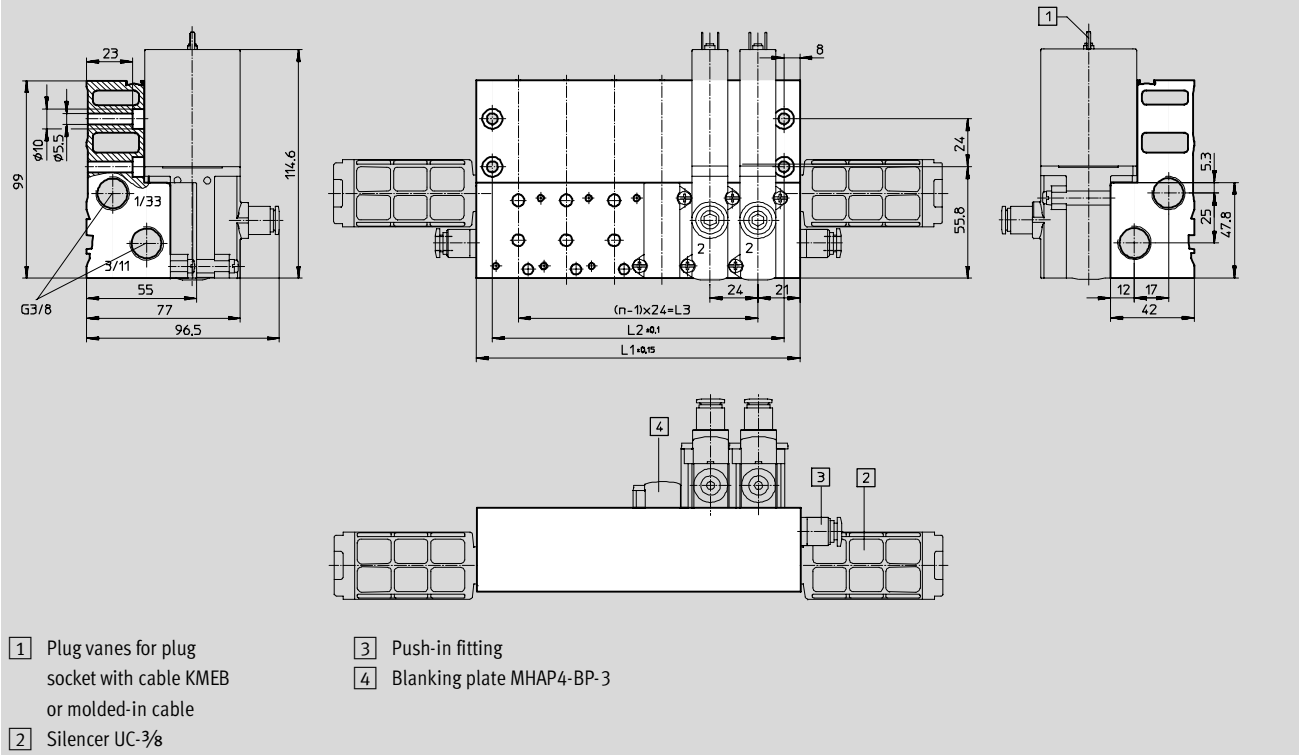
Dimensions

Download CAD data → www.festo.com/en/engineering

Individual Sub-base



Manifold Mounting



Number of valves n	L1	L2	L3
2	66	50	24
4	114	98	72
6	162	146	120

Number of valves n	L1	L2	L3
8	210	194	168
10	258	242	216

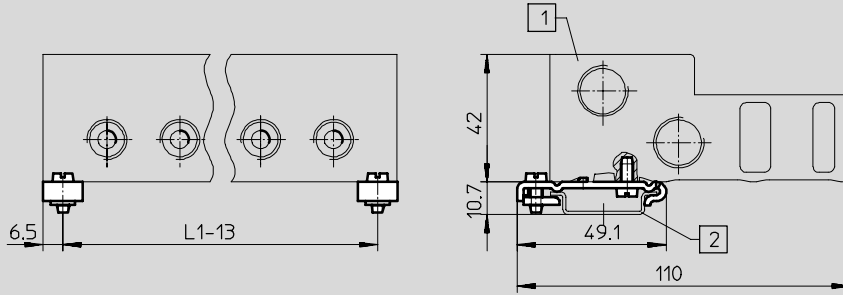
Technical Data – Dimensions

MHP4 – Semi In-line Valves

Dimensions

Download CAD data → www.festo.com/en/engineering

DIN Rail Mounting CPV10/14-VI-BG-NRH-35



- 1 Manifold block
- 2 Mounting rail NRH-35

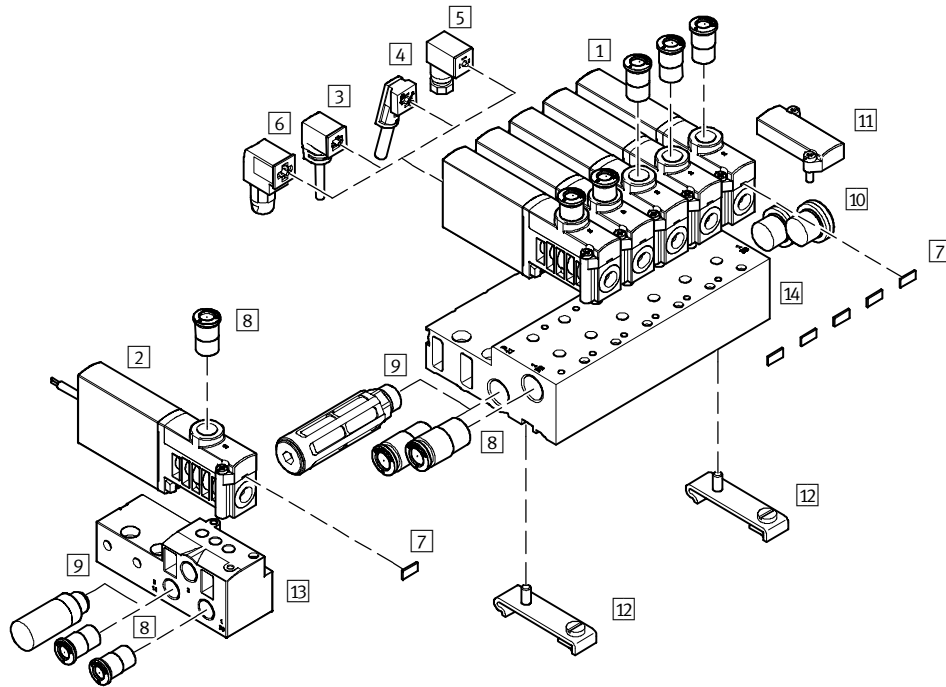
Type	Number of valves n	L1
MHA4/MHP4-PR2-3	2	66
MHA4/MHP4-PR4-3	4	114
MHA4/MHP4-PR6-3	6	162

Type	Number of valves n	L1
MHA4/MHP4-PR8-3	8	210
MHA4/MHP4-PR10-3	10	258

Overview

MHP4 – Semi In-line Valves

Connection via Plug Vanes
 Connection via Molded-in Cable



Valves and Accessories

	Type	Description	→ See Page
1	MHP4-...	With plug vanes	90
2	MHP4-...-K	With cable	90
3	MSSD-EB (IP65)	With clamping screws	102
4	MSSD-EB (IP65)	With insulation displacement connectors	102
5	KMEB-1 (IP65)	PVC cable, with or without LED	102
6	KMEB-2 (IP65)	PUR cable, with or without LED	102
7	MH-BZ-80X	For identifying the valves	102
8	QS	For connecting compressed air tubing with standard O.D.	103
9	UC	For fitting in exhaust ports	104
10	B	For sealing unused ports	102
11	MHAP4-BP-3	For sealing vacant positions	102
12	CPV10/14-VI-BG-NRH-35	-	102
13	MHP4-AS-3-1/4	For semi in-line valve	90
14	MHP4-PR...-3	For semi in-line valve	90

Ordering Data

MHP4 – Semi In-line Valves

FESTO

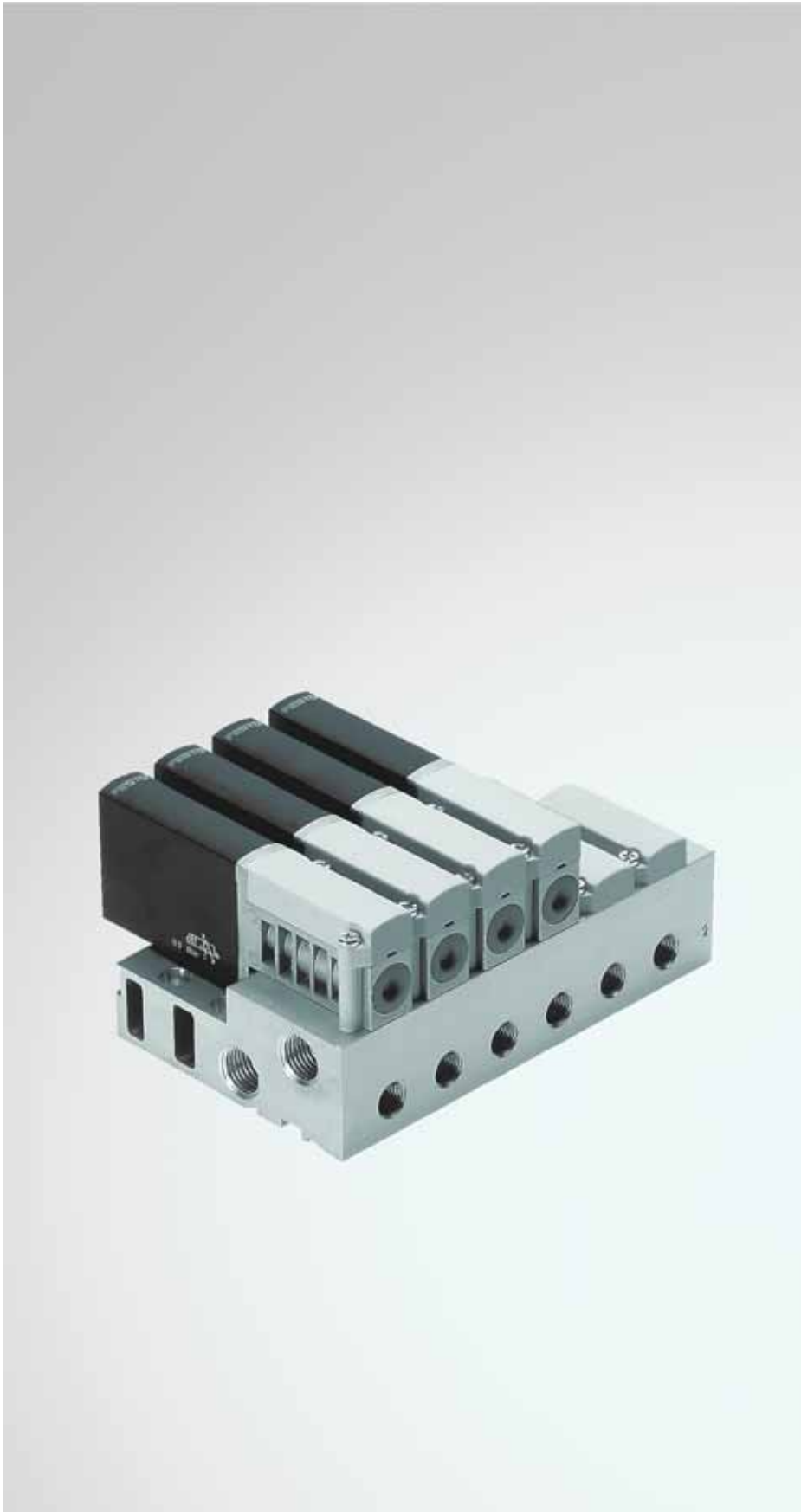
Ordering Data – Valves					
Electrical Connection	Operating Voltage	Normally Closed		Normally Open	
		Part No.	Type	Part No.	Type
Response Time 3.5/3.5 ms					
Connecting Thread G $\frac{1}{4}$					
Plug vanes	24 V DC	525179	MHP4-MS1H-3/2G- $\frac{1}{4}$	525199	MHP4-MS1H-3/2O- $\frac{1}{4}$
Cable	24 V DC	525181	MHP4-MS1H-3/2G- $\frac{1}{4}$ -K	525201	MHP4-MS1H-3/2O- $\frac{1}{4}$ -K
Response Time 9/5 ms					
Connecting Thread G $\frac{1}{4}$					
Plug vanes	24 V DC	525178	MHP4-M1H-3/2G- $\frac{1}{4}$	525198	MHP4-M1H-3/2O- $\frac{1}{4}$
Cable	24 V DC	525180	MHP4-M1H-3/2G- $\frac{1}{4}$ -K	525200	MHP4-M1H-3/2O- $\frac{1}{4}$ -K

Note

Type 3/2NC and type 3/2NO valves must not be mixed on a manifold block.

Ordering Data – Individual Sub-base and Manifold Blocks			
Designation	Part No.	Type	
Individual Sub-base			
For semi in-line valve	525228	MHP4-AS-3- $\frac{1}{4}$	
Manifold Block			
For semi in-line valve	2 valves	525229	MHP4-PR2-3
	4 valves	525230	MHP4-PR4-3
	6 valves	525231	MHP4-PR6-3
	8 valves	525232	MHP4-PR8-3
	10 valves	525233	MHP4-PR10-3

MHA4 Fast Switching Sub-base Valves



Flow rate: 400 l/min

Response times
as fast as 3.5 ms

24 V DC

Balanced poppet valve

G1/4 and G3/8
threaded connections

4

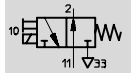
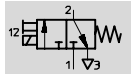
4.3

Technical Data

MHA4 – Sub-base Valves

FESTO

Function



Voltage:

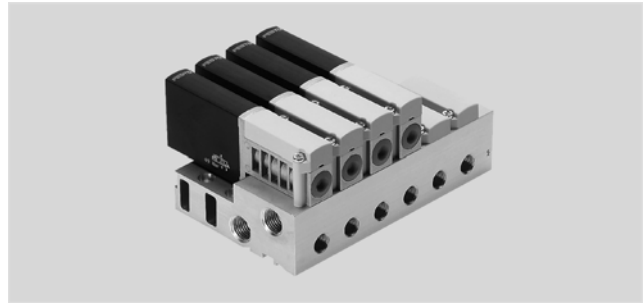
24 V DC

Pressure:

-0.9 ... +8 bar

Temperature Range:

-5 ... +40°C



General Technical Data		
Valve function		3/2-way, single solenoid ¹⁾
Design		Balanced poppet valve
Sealing principle		Soft
Actuation type		Electrical
Type of control		Direct
Direction of flow		Reversible
Manual override		Momentary
Assembly position		Any
Grid dimension	[mm]	24
Nominal diameter	[mm]	4
Standard nominal flow rate	[l/min]	400
Type of mounting		On sub-base, via through-hole
Product weight	[g]	270
Pneumatic Connections		
Pneumatic connection		Via individual sub-base or manifold sub-base
Supply port	1/33	Connecting thread <ul style="list-style-type: none"> ■ G$\frac{1}{4}$ – on sub-base ■ G$\frac{3}{8}$ – on manifold sub-base
Exhaust port	3/11	Connecting thread <ul style="list-style-type: none"> ■ G$\frac{1}{4}$ – on sub-base ■ G$\frac{3}{8}$ – on manifold sub-base
Working port	2	Connecting thread G $\frac{1}{4}$

1) Can be used as a 2/2-way valve by sealing port 1 or 3.

Operating and Environmental Conditions		
Operating medium		Inert gases, filtered compressed air, lubricated or unlubricated
Grade of filtration		40 μ
Operating pressure range	[bar]	-0.9 ... +8
Ambient temperature	[°C]	-5 ... +40
Temperature of medium	[°C]	-5 ... +40

4

4.3

Technical Data

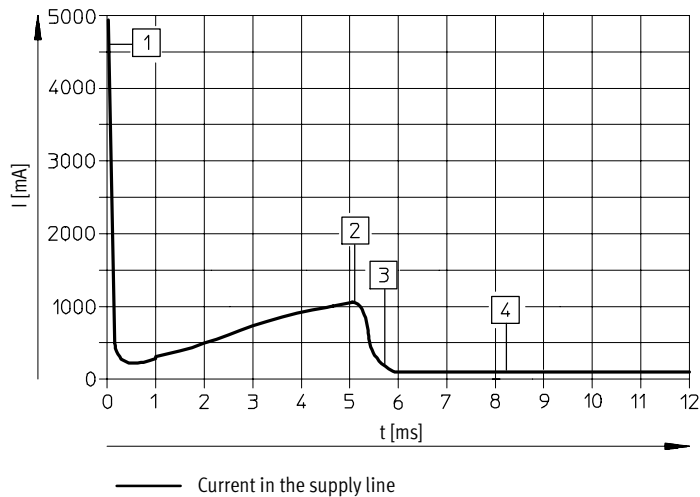
MHA4 – Sub-base Valves

Electrical Data		
Operating voltage	[V DC]	24 ±10%
Connection type		Plug vanes or molded-in cable
Power Consumption		
Without fast-switching electronics	[W]	5.6
Effective Power ¹⁾		
With fast-switching electronics	[W]	Pull: 8.5 Hold: 2.125
Protection Class to EN 60529		
With molded-in cable		IP65
With plug socket with cable KMEB		IP65

1) For power supply considerations use current curve below.

Response Times and Switching Frequencies		
With Fast-switching Electronics		
Response time on/off	[ms]	3.5/3.5
Max. switching frequency	[Hz]	210
Without Fast-switching Electronics		
Response time on/off	[ms]	9/5
Max. switching frequency	[Hz]	120

Current Curve

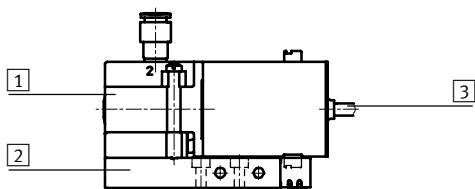


- 1 Capacitor charging approx. 4.9 A, lower with higher frequencies
- 2 Controlled coil current approx. 1 A
- 3 Drop to holding current
- 4 Controlled holding current approx. 0.125 A

4

4.3

Materials



Key		
1	Housing	Die-cast zinc
2	Sub-base	Polyamide
3	Cable sheath	Polyurethane
-	Screws	Steel
-	Seals	Nitrile rubber
Note on materials		Free of copper, PTFE and silicone

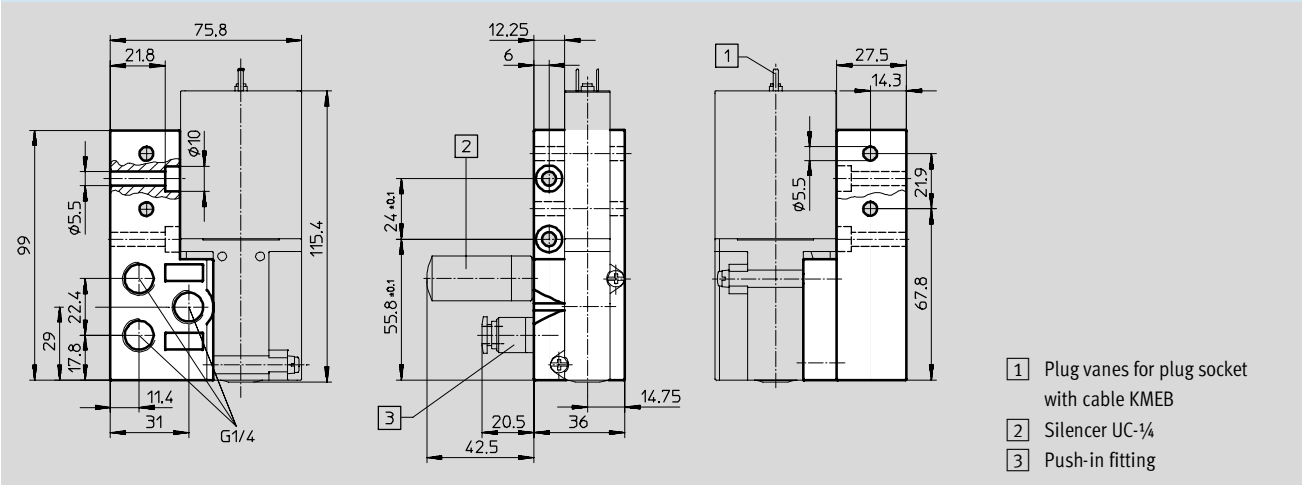
Technical Data – Dimensions

MHA4 – Sub-base Valves

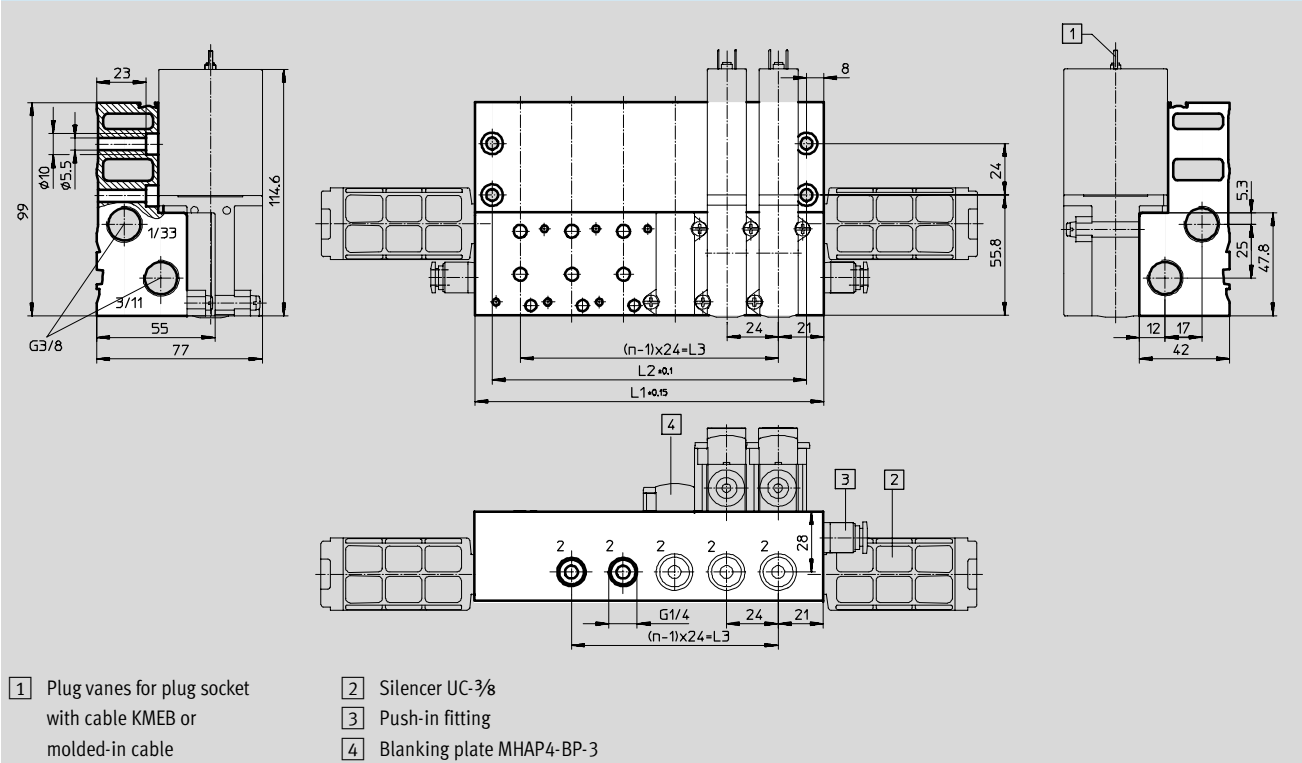
Dimensions

Download CAD data → www.festo.com/en/engineering

Individual Sub-base



Manifold Mounting



Number of valves n	L1	L2	L3
2	66	50	24
4	114	98	72
6	162	146	120

Number of valves n	L1	L2	L3
8	210	194	168
10	258	242	216

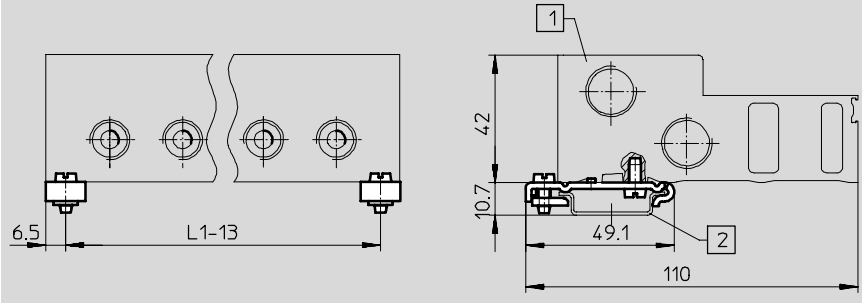
Technical Data – Dimensions

MHA4 – Sub-base Valves

Dimensions

Download CAD data → www.festo.com/en/engineering

DIN Rail mounting CPV10/14-VI-BG-NRH-35



- 1 Manifold block
- 2 Mounting rail NRH-35

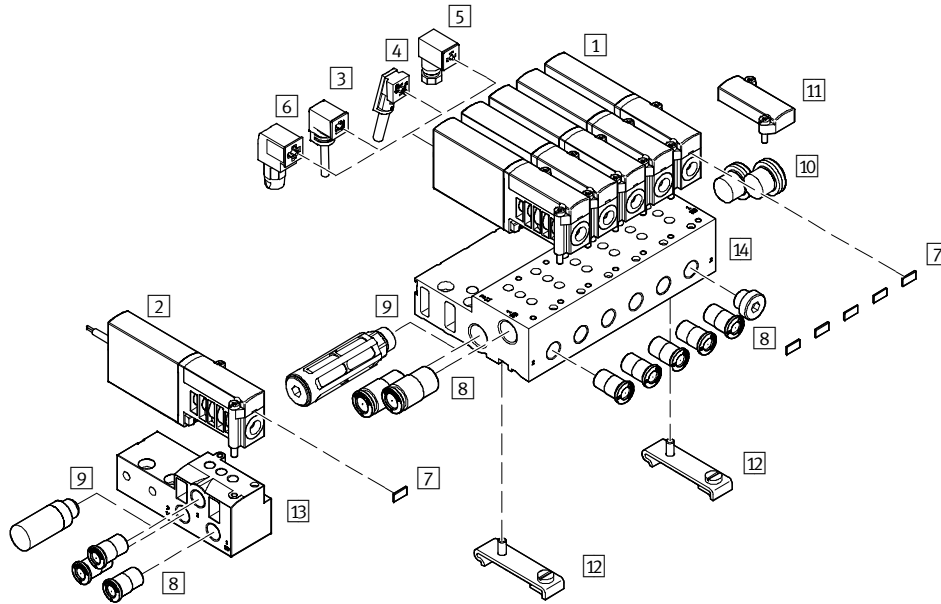
Type	Number of valves n	L1
MHA4/MHP4-PR2-3	2	66
MHA4/MHP4-PR4-3	4	114
MHA4/MHP4-PR6-3	6	162

Type	Number of valves n	L1
MHA4/MHP3-PR8-3	8	210
MHA4/MHP4-PR10-3	10	258

Overview

MHA4 – Sub-base Valves

Connection via Plug Vanes
 Connection via Molded-in Cable



Valves and Accessories			
	Type	Description	→ See Page
1	MHA4-...	With plug vanes	98
2	MHA4-...-K	With cable	98
3	KMEB-1 (IP65)	PVC cable, with or without LED	102
4	KMEB-2 (IP65)	PUR cable, with or without LED	102
5	MSSD-EB (IP65)	With clamping screws	102
6	MSSD-EB (IP65)	With insulation displacement connectors	102
7	MH-BZ-80X	For identifying the valves	102
8	QS	For connecting compressed air tubing with standard O.D.	103
9	UC	For fitting in exhaust ports	104
10	B	For sealing unused ports	102
11	MHAP4-BP-3	For sealing vacant positions	102
12	CPV10/14-VI-BG-NRH-35	-	102
13	MHA4-AS-3-1/4	For sub-base valves	98
14	MHA4-PR...-3	For sub-base valves	98

Technical Data – Ordering Data

MHA4 – Sub-base Valves

FESTO

Ordering Data – Valves					
Electrical Connection	Operating Voltage	Normally Closed		Normally Open	
		Part No.	Type	Part No.	Type
Response Time 3.5/3.5 ms					
Plug vanes	24 V DC	525175	MHA4-MS1H-3/2G-4	525195	MHA4-MS1H-3/2O-4
Cable	24 V DC	525177	MHA4-MS1H-3/2G-4-K	525197	MHA4-MS1H-3/2O-4-K
Response Time 9/5 ms					
Plug vanes	24 V DC	525174	MHA4-M1H-3/2G-4	525194	MHA4-M1H-3/2O-4
Cable	24 V DC	525176	MHA4-M1H-3/2G-4-K	525196	MHA4-M1H-3/2O-4-K

Note

Type 3/2NC and 3/2NO valves must not be mixed on a manifold block.

Ordering Data – Individual Sub-base and Manifold Blocks			
Designation		Part No.	Type
Individual Sub-base			
For sub-base valve		525227	MHA4-AS-3-1/4
Manifold Block			
For sub-base valve	2 valves	525234	MHA4-PR2-1/4
	4 valves	525235	MHA4-PR4-1/4
	6 valves	525236	MHA4-PR6-1/4
	8 valves	525237	MHA4-PR8-1/4
	10 valves	525238	MHA4-PR10-1/4

Accessories – Fast Switching Valves



Plug sockets and cables

DIN rail mounting
components

Push-in tube fittings
and silencers




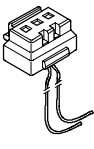



Blanking plates and plugs







Labels

Plug Sockets and Cables for MH2 Valves

Accessories

FESTO

Ordering Data				Technical data → www.festo.com/us			
		Part No.	Type			Part No.	Type
Plug Socket with Cable (IP65) with LED and PUR Cable				Plug Socket with Cable (IP40) with PVC Cable			
	2.5 m	193693	KMYZ-3-24DC-2.5-LED-PUR-B		0.5 m	193690	KMYZ-4-24DC-0.5-B
	5 m	193695	KMYZ-3-24DC-5-LED-PUR-B		2.5 m	193691	KMYZ-4-24DC-2.5-B
	10 m	196066	KMYZ-3-24DC-10-LED-PUR-B				
Plug Socket with Cable (IP65) with LED, PUR Cable and M8 Plug				Plug Socket with Cable (IP40)			
	0.5 m	525654	KMYZ-3-24-M8-0.5-LED-PUR		0.5 m	197263	KMH-0.5
	2.5 m	525655	KMYZ-3-24-M8-2.5-LED-PUR		1 m	197264	KMH-1
Connecting Cable KMP6 (up to 8 valves)				Connecting Cable KMP6 (up to 12 valves)			
	2.5 m	531184	KMP6-09P-8-2.5		2.5 m	530049	KMP6-25P-12-2.5
	5 m	531185	KMP6-09P-8-5		5 m	530050	KMP6-25P-12-5
	10 m	531186	KMP6-09P-8-10		10 m	530051	KMP6-25P-12-10
Connecting Cable KMP6 (up to 22 valves)							
	2.5 m	530046	KMP6-25P-22-2.5				
	5 m	530047	KMP6-25P-22-5				
	10 m	530048	KMP6-25P-22-10				





Ordering Data				Technical data → www.festo.com/us			
		Part No.	Type			Part No.	Type
Plug Base (IP40)				Labels			
		197260	MHAP-PI			197289	MH-BZ-80X ¹⁾
	DIN Rail Mounting				DIN Rail		
		525053	MHAP2-BG-NRH-35		2 m	35430	NRH-35-2000
	Blanking Plug B				Blanking Plate		
	M5	3843	B-M5 ²⁾		Plug connection	197470	MHAP-BP-3
	M7	174309	B-M7 ²⁾		Plug base	197471	MHAP-BP-3-PI

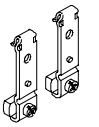



1) Delivered in packages of 80

2) Delivered in packages of 10

Plug Sockets and Cables for MH3 Valves

Accessories

Ordering Data				Technical data → www.festo.com/us			
		Part No.	Type			Part No.	Type
Plug Socket with Cable (IP65) with LED and PUR cable				Plug socket with cable (IP40) with PVC cable			
	2.5 m	193693	KMYZ-3-24-2.5-LED-PUR-B		0.5 m	193690	KMYZ-4-24-0.5-B
	5 m	193695	KMYZ-3-24-5-LED-PUR-B		2.5 m	193691	KMYZ-4-24-2.5-B
	10 m	196066	KMYZ-3-24-10-LED-PUR-B	Label			
Plug Socket with Cable (IP65) with LED, PUR Cable and M8 Plug				Label			
	0.5 m	525654	KMYZ-3-24-M8-0.5-LED-PUR			197259	MH-BZ-80X ¹⁾
	2.5 m	525655	KMYZ-3-24-M8-2.5-LED-PUR				

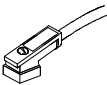
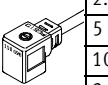


Ordering Data				Technical data → www.festo.com/us			
		Part No.	Type			Part No.	Type
DIN Rail Mounting				DIN Rail			
		162556	CPV10/14-VI-BG-NRH-35		2 m	35430	NRH-35-2000
	Blanking Plug B				Blanking Plate		
	G1/8	3569	B-1/8 ²⁾			525226	MHAP3-BP-3
	G1/4	3568	B-1/4 ²⁾				

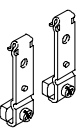
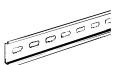



- 1) Delivered in packages of 80
- 2) Delivered in packages of 10

Plug Sockets and Cables for MH4 Valves

Accessories

FESTO

Ordering Data				Technical data → www.festo.com/us			
		Part No.	Type			Part No.	Type
Plug Socket with Cable (IP65) with PUR Cable				Plug Socket with Cable (IP65) with PUR Cable			
	2.5 m	174844	KMEB-2-24-2.5-LED		2.5 m	151688	KMEB-1-24-2.5-LED
	5 m	174845	KMEB-2-24-5-LED		5 m	151689	KMEB-1-24-5-LED
	2.5 m	174846	KMEB-2-230AC-2.5		10 m	193457	KMEB-1-24-10-LED
	5 m	174847	KMEB-2-230AC-5		2.5 m	151690	KMEB-1-230AC-2.5
			5 m		151691	KMEB-1-230AC-5	
Plug Socket with Screw Terminal				Plug Sockets with Insulation Displacement Connector			
		151687	MSSD-EB			192745	MSSD-EB-S-M14






Ordering Data				Technical data → www.festo.com/us			
		Part No.	Type			Part No.	Type
DIN Rail Mounting				DIN Rail			
		162556	CPV10/14-VI-BG-NRH-35		2 m	35430	NRH-35-2000
Blanking Plug B				Blanking Plate			
	G1/4	3568	B-1/4 ²⁾			525239	MHAP4-BP-3
	G3/8	3570	B-3/8 ²⁾				
Label							
		197259	MH-BZ-80X ¹⁾				

- 1) Delivered in packages of 80
- 2) Delivered in packages of 10

Note
The shortest possible switching time is achieved with a plug socket with cable without LED.

Push-in Fittings

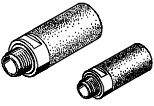

Metric and Hybrid Series

Ordering Data				Technical data → www.festo.com/us
Designation	Connecting Thread	For Tubing O.D.	Part No.	Type
	M5	3 mm	153313	QSM-M5-3-I*
		4 mm	153315	QSM-M5-4-I*
		6 mm	153317	QSM-M5-6-I*
		1/8"	183749	QSM-M5-1/8-I-U-M
		5/32"	130593	QSM-M5-5/32-I-U-M
		3/16"	183750	QSM-M5-3/16-I-U-M
		1/4"	130591	QSM-M5-1/4-I-U-M
	M7	4 mm	153319	QSM-M7-4-I*
		6 mm	153321	QSM-M7-6-I*
		3/16"	183739	QSM-M7-3/16-I-U-M
		1/4"	183740	QSM-M7-1/4-I-U-M
	G1/8	6 mm	186107	QS-G1/8-6-I*
		8 mm	186109	QS-G1/8-8-I*
		1/4"	183741	QS-1/8-1/4-I-U-M
		5/16"	183742	QS-1/8-5/16-I-U-M
	G1/4	8 mm	186110	QS-G1/4-8-I*
		10 mm	186112	QS-G1/4-10-I*
		5/16"	183743	QS-1/4-5/16-I-U-M
		3/8"	183744	QS-1/4-3/8-I-U-M
	G3/8	8 mm	186111	QS-G3/8-8-I*
		10 mm	186113	QS-G3/8-10-I*
		5/16"	183745	QS-3/8-5/16-I-U-M
		3/8"	183746	QS-3/8-3/8-I-U-M

* Sold in quantities of 10. Order in multiples of 10.

Silencers

Accessories

Ordering Data				
Designation	Connecting Thread	Push-in Sleeve – For Tubing O.D.	Part No.	Type
	M5	—	165003	UC-M5
	M7	—	161418	UC-M7
	G $\frac{1}{4}$	—	165004	UC- $\frac{1}{4}$
	G $\frac{1}{8}$	—	161419	UC- $\frac{1}{8}$
	—	3 mm	165005	UC-QS-3H
	—	4 mm	165006	UC-QS-4H
	—	6 mm	165007	UC-QS-6H
	—	8 mm	175611	UC-QS-8H
	—	10 mm	526475	UC-QS-10H

Operating Recommendations

MH2, MH3, and MH4 Fast Switching Valves

Compressed Air

Operate your equipment with unlubricated compressed air if possible. Festo valves and cylinders are designed for operation under normal use without any additional lubrication, yet still have a long service life. The quality of compressed air downstream of the compressor must correspond to that of unlubricated compressed air. If possible, do not operate all of your equipment with lubricated compressed air. The lubricators should, where possible, always be located downstream of the valves, directly upstream of the cylinders used.

Incorrect additional oil and too high an oil content in the compressed air reduces the service life of the valve manifold. Use Festo special oil OFSW-32, P/N 152811 (1 liter) (as specified in DIN 51524-HLP32; basic oil viscosity 32 cSt at 40°C).

Biodegradable Oils

When using bio-oils (oils which are based upon synthetic or native ester, e.g. rapeseed oil methyl ester), the maximum residual oil content of 0.1 mg/m³ must not be exceeded (see ISO 8573-1 Class 4).

Mineral Oils

When using mineral oils (e.g. HLP oils to DIN 51524, parts 1 to 3) or similar oils based on poly-alpha-olefins (PAO), the maximum residual oil content of 5 mg/m³ must not be exceeded (see ISO 8573-1 Class 4). A higher residual oil content irrespective of the compressor oil cannot be permitted, as the basic lubricant would be washed away over time.

Festo Product Range

Integrated Systems



- Design, documentation, assembly/testing
- Single and multi-axis linear and rotary systems
- Stepper controls, servo pneumatic and servo electric systems

Control Systems



- Design, documentation, assembly/testing
- Cabinets are designed, manufactured, assembled, and tested per NEMA, UL, and IEC standards
- Standard and stainless steel enclosures

Pneumatic actuator and Grippers



- ISO and NFPA cylinders
- Linear and rotary actuator
- Standard, precision, and micro grippers plus accessories

Electromechanical actuator



- Belt and ball screw driven linear actuator
- High accuracy and repeatability
- High rigidity and speed

Pneumatic Valves and Valve Manifolds



- Valves**
- In-line/sub-base directional control valves
- OSHA compliant lockout valves
- Proportional valves
- Valve Manifolds**
- Direct, multi-pin, and fieldbus manifolds

Sensors and Control Technology



- Inductive, optical, mechanical, pressure and vacuum sensors
- PLCs and IPCs
- Remote access panels [HMI]
- Counters, timers and gauges

Air Preparation



- Filters
- Regulators
- Lubricators
- Dryers
- Combination units

Vacuum Components



- Vacuum generators
- Suction cups and suction grippers
- A variety of suction cup types and materials are available

Fittings and Tubing



- Inch/metric fittings, hybrid fittings, and flow controls
- Inch/metric tubing (various materials and colors)

Industry Specific Solutions



- Cylinders, manifolds, tubing and fittings for use in washdown environments
- Linear/rotary actuator with and without a process valve; diaphragm valves, Namur valves

For more information about the entire Festo product range, including technical specifications, CAD models, product selection software, and access to our on-line store, visit us at www.festo.com/us.

Conversion Factors

The conversion table below includes the most commonly used for designing a system. They are given to enable the user to make necessary calculations.

Length or Distance

$$\text{m} \rightarrow \text{ft} = \times 3.281$$

$$\text{mm} \rightarrow \text{inch} = \div 25.4$$

Volume

$$\text{cm}^3 \rightarrow \text{in}^3 = \times 0.061$$

Mass

$$\text{g} \rightarrow \text{lb} = \times 0.002$$

$$\text{kg} \rightarrow \text{lb} = \times 2.2046$$

Pressure

$$\text{bar} \rightarrow \text{psi} = \times 14.7$$

Temperature

$$\text{C}^\circ \rightarrow \text{F}^\circ = \times [1.8] + 32$$

Flow

$$\text{l/min} \rightarrow \text{Cv} = \times 0.001$$

$$\text{l/min} \rightarrow \text{scfm} = \times 0.0353$$

Force

$$\text{N} \rightarrow \text{lbf} = \times 0.2248$$

$$\text{kgf} \rightarrow \text{N} = \times 9.80665$$

Moment

$$\text{Nm} \rightarrow \text{in-lb} = \times 8.8507$$

$$\text{Nm} \rightarrow \text{ft-lb} = \times 0.7376$$

Moment of Inertia

$$\text{kg}\cdot\text{cm}^2 \rightarrow \text{lb}\cdot\text{in}^2 = \times 0.3417$$

$$\text{kg}\cdot\text{m} \rightarrow \text{lb}\cdot\text{ft} = \times 7.233$$

$$\text{kg}\cdot\text{m}^2 \rightarrow \text{oz}\cdot\text{in}^2 = \times 5.4675$$

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