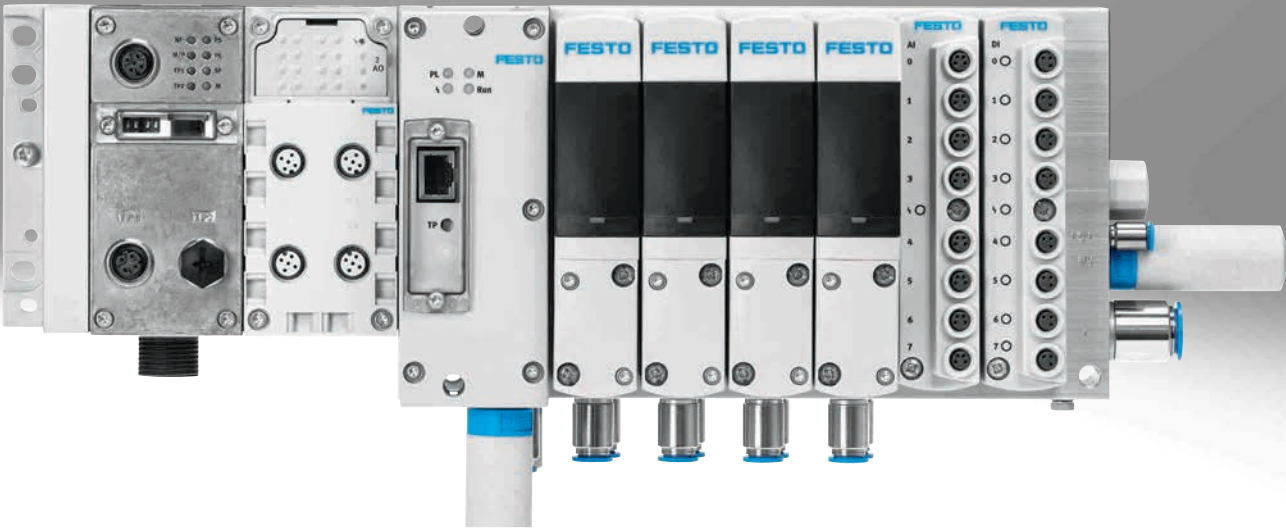


# Motion Terminal VTEM



★

Worldwide:  
Simply good:  
Fast:

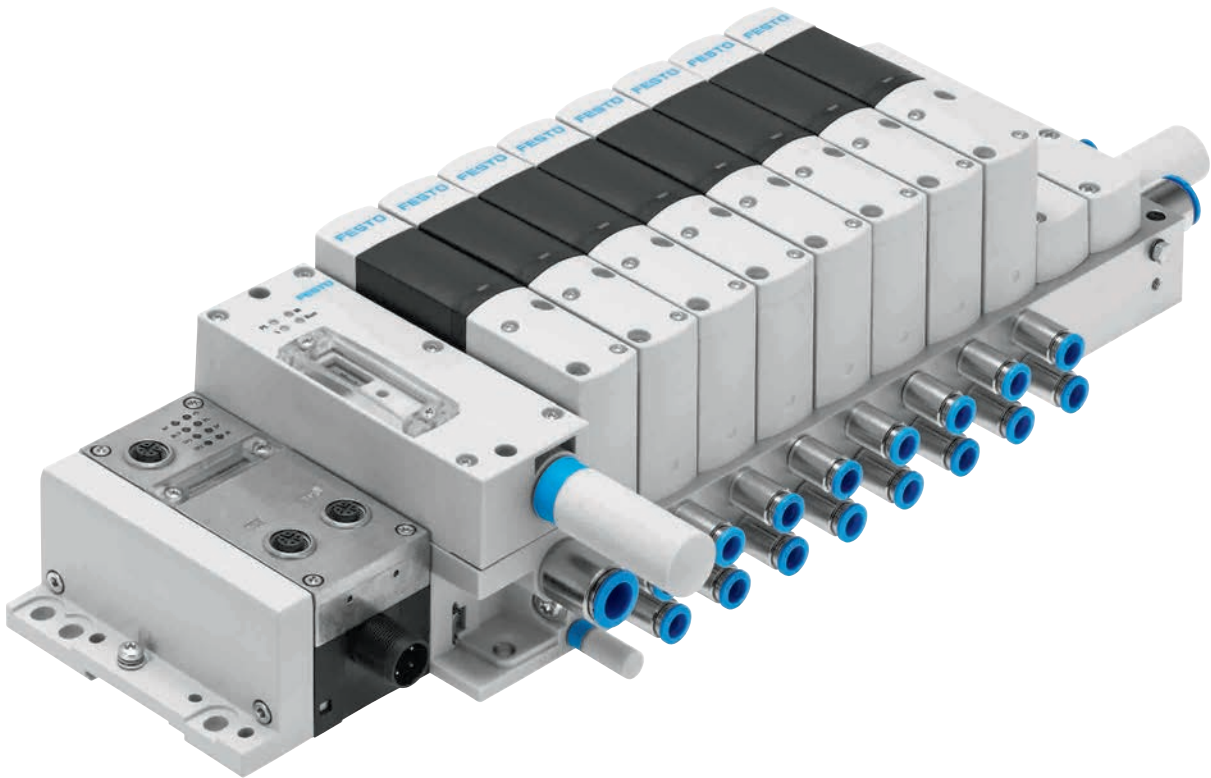
Festo Core Range  
Solves the majority of your automation tasks

Quickest delivery – wherever, whenever  
Expected high Festo quality  
Easy and fast to select

With the Festo Core Range, we have selected the most important products and functions from our broad product catalogue, and added the quickest delivery.  
The Core Range offers you the best value for your automation tasks.

Just look for the star!

Key features



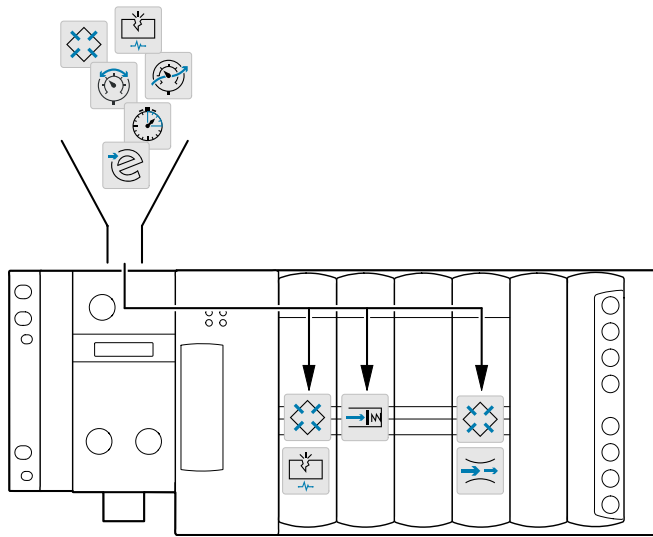
Innovative	Flexible	Reliable	Easy to install
<p>Benefits of piezo valves for pilot control:</p> <ul style="list-style-type: none"><li>• Pressure regulation function</li><li>• Very long service life</li><li>• Minimum energy requirement</li><li>• Low leakage when acting as a proportional pressure regulator</li></ul> <p>Integrated controller permits:</p> <ul style="list-style-type: none"><li>• Cyclical changes to the valve function</li><li>• Function integration via Motion Apps</li></ul>	<p>The valves are connected and form a bridge circuit within the valve body; this enables a wide range of directional control valve functions to be realised at one valve position.</p> <p>These functions are assigned to the valve by the controller and can be changed during operation.</p> <p>The pressure regulator functionality of the valves together with the integrated pilot control enables the Motion Terminal VTEM to autonomously perform precision positioning tasks.</p>	<p>Integrated sensors monitor the switching status of the valves and the pressure in ports 1, 3, 2 and 4.</p> <p>The connected actuators can be monitored using optional input modules. This information is evaluated in the Motion Terminal VTEM itself and also transferred to a higher-order controller.</p>	<ul style="list-style-type: none"><li>• No need to change the valve, as the valve function is assigned using software</li><li>• Reduced storage space since only one valve is required for all functions</li><li>• Integrated mounting points for wall and H-rail mounting</li><li>• Integrated flow control functionality, no manual adjustment required</li><li>• Thanks to the Motion Apps, the functions of 50 individual components can be performed by each valve</li></ul>

Ordering data – Product options			
	<p>Configurable product</p> <p>This product and all its product options can be ordered using the configurator.</p>	<p>The configurator can be found under Products on the DVD or at</p> <p>→ <a href="http://www.festo.com/catalogue/...">www.festo.com/catalogue/...</a></p>	<p>Part no. 8047502    Type VTEM</p>

## Key features

### Flexibility

#### Motion Apps



The Motion Terminal VTEM comprises four 2/2-way valves with piezo pilot control that form a bridge circuit and are monitored by sensors.

This creates a number of special features compared with a valve terminal that has conventional piston spool valves.

The valves can perform the functions of a:

- 2x 2/2-way valve
- 2x 3/2-way valve
- 4/2-way valve
- 4/3-way valve
- Proportional pressure regulator
- Proportional directional control valve

Other functions that are usually associated with separate components, such as flow control or pressure regulation, can also be performed by the valves. Procurement is much reduced while manual adjustment and maintenance are no longer needed as all tasks are assigned and controlled centrally via the software.

Which function a valve assumes and which tasks the controller can fulfil are determined by Motion Apps.

#### Licences

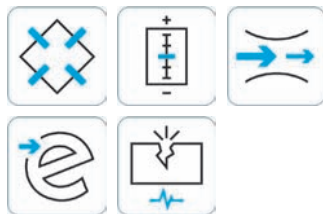
The Motion Terminal VTEM must have the corresponding licences for each app in order to be able to use it. The basic package includes the licences for certain Motion Apps. This can be extended at any time; however, it is not possible to transfer licences from one Motion Terminal VTEM to another.

The valve functions that are available within the Motion Terminal can be freely assigned to each individual valve wherever and whenever necessary.

All valve functions can be comprehensively monitored with the integrated sensors.

The controller of the Motion Terminal can use this information to perform more complex pressure regulation tasks or to switch connected actuators.

#### Basic package (basic Motion Apps)

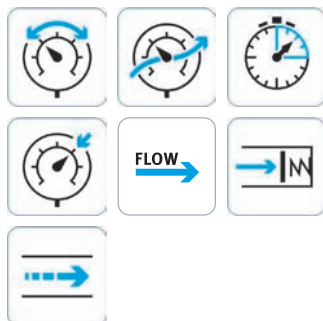


- Directional control valve functions
- Proportional directional control valve
- Supply and exhaust air flow control
- ECO drive
- Leakage diagnostics

These Motion Apps are a fundamental component of the Motion Terminal and included with every Motion Terminal.

The Motion Apps can be used at the same time on all valve positions of the Motion Terminal.

#### Additional apps



- Proportional pressure regulation
- Model-based proportional pressure regulation
- Presetting of travel time
- Selectable pressure level
- Flow control
- Soft Stop
- Positioning

To expand the basic package, other Motion Apps can be ordered individually for the Motion Terminal.

These Motion Apps must be ordered in the number required so they can be used simultaneously. Individual Motion Apps are subject to restrictions in terms of the number of instances that can be used simultaneously.

## Key features

### Integrated sensors

#### Monitoring functions

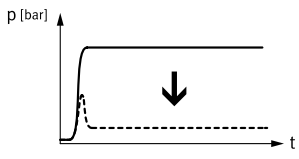
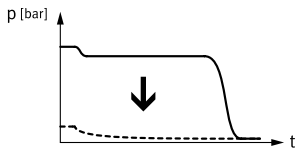
Integrated sensors monitor:	Monitoring is carried out:	This generates the following diagnostic information:
<ul style="list-style-type: none"> <li>Degree of opening of the valve (flow rate for supply air and exhaust air)</li> <li>Pressure</li> </ul>	<ul style="list-style-type: none"> <li>For each individual valve</li> <li>For each individual valve port</li> </ul>	<ul style="list-style-type: none"> <li>System leakage</li> </ul>

#### Controlled movement

By adapting the pressure and flow rate, in combination with the integrated sensors, the cylinder movement can be controlled.	<p>This means that a wide range of requirements can be met:</p> <ul style="list-style-type: none"> <li>Independent, proportional regulation of the supply and exhaust air for each cylinder chamber</li> </ul>	<ul style="list-style-type: none"> <li>Soft start</li> <li>Fast start</li> <li>Noise reduction</li> <li>Reduced vibrations</li> </ul>	<ul style="list-style-type: none"> <li>No need for exhaust air flow control valves</li> <li>No need for shock absorbers</li> </ul>
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### Energy efficiency

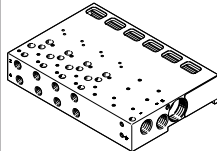
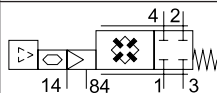
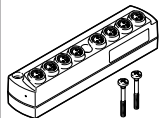

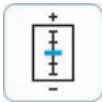



#### Energy-saving movement

<p>Pressure at port 2</p> 	<p>Movement with reduced force</p> <p>Advantages:</p> <ul style="list-style-type: none"> <li>High energy efficiency, particularly energy-saving return stroke</li> <li>Reduced number of components</li> </ul> <p>Objective:</p> <p>Reduction in costs as less compressed air is needed than when the drive is fully pressurised. In turn, this reduces operating costs and improves overall economic efficiency.</p>	<p>Principle:</p> <p>Pressure is built up on the pressurisation side purely to create the differential pressure required to maintain movement (pre-exhausted). This means that less compressed air is needed for each cycle.</p> <p>At the end of the movement, the Motion Terminal VTEM closes the valve so that only the minimum static pressure sufficient to hold the cylinder in position is applied. If there is a pressure drop, the position is re-adjusted automatically thanks to monitoring by the sensors</p>	<p>Application:</p> <ul style="list-style-type: none"> <li>Typically for fast running production machines (e.g. packaging, assembly or processing machines)</li> <li>Linear or rotary movement with a medium-sized stroke and/or high number of cycles</li> </ul>
<p>Pressure at port 4</p> 			







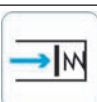


### Piezo technology

<p>The Motion Terminal VTEM uses piezo technology, which is characterised by low energy consumption.</p> <p>Advantages:</p> <ul style="list-style-type: none"> <li>Low-energy power supply units</li> <li>Small cable diameters</li> <li>Minimal self-heating</li> </ul>	<p>The degree of opening of the piezo valves can be freely controlled. This enables the flow rate through the valves to be controlled:</p> <ul style="list-style-type: none"> <li>Without additional components</li> <li>Time-controlled</li> <li>By sensors</li> <li>For each individual valve</li> <li>For each individual valve port</li> </ul>	<p>As the integrated pressure sensors monitor the degree of opening of the valves, the pressure can be adjusted:</p> <ul style="list-style-type: none"> <li>For each individual cylinder chamber</li> <li>For each individual valve</li> <li>For each individual valve port</li> </ul>	<p>Advantages:</p> <ul style="list-style-type: none"> <li>Lower air consumption thanks to partial pressurisation</li> <li>Variable contact pressure in the end position or when clamping a workpiece</li> <li>Variable independent pressure for forward/return stroke</li> </ul>
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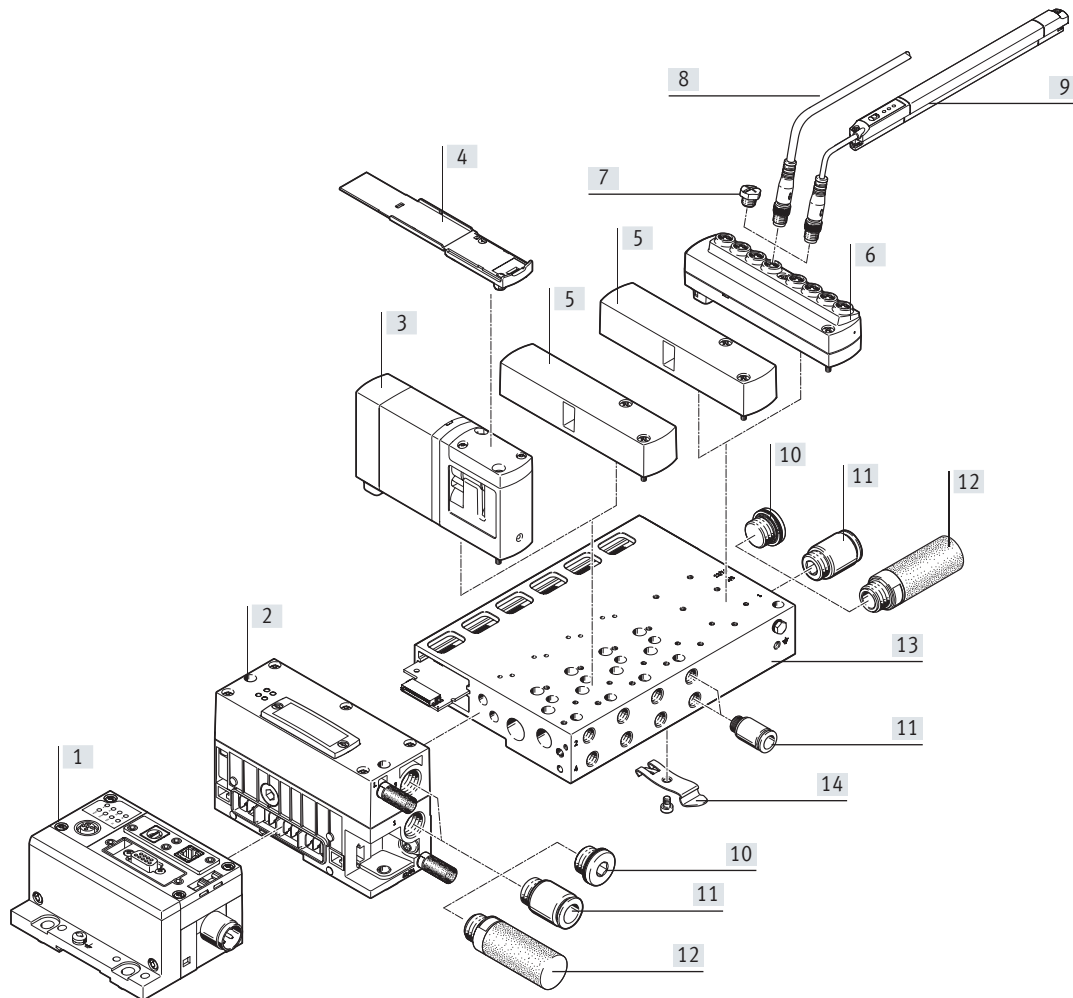
## Product range overview

Function	Design	Type/code	Description	→ Page
Pneumatic/ mechanical	<b>Pneumatic linking</b> 	Fixed grid	VTEM <ul style="list-style-type: none"><li>• 2, 4 or 8 valve positions</li><li>• 0 or 1 position for input modules for 2 valve positions</li><li>• 0 or 2 positions for input modules for more than 2 valve positions</li><li>• With electrical interface for terminal CPX</li><li>• Supply/exhaust ports and working ports for the valves</li><li>• Pilot air supply for the valves</li><li>• Electrical actuation for the valves</li></ul>	14
	<b>Valve</b> 	4x 2/2-way valve	VEVM <ul style="list-style-type: none"><li>• Default position if the power supply/signalling fails – all ports closed</li><li>• Connected in series to form a bridge circuit</li><li>• Proportional pilot control by piezo valves</li><li>• Degree of valve opening monitored by sensor</li><li>• Pressure sensors in ports 2 and 4</li></ul>	19
Electronic	<b>Input module</b> 	Analogue	CTMM-A <ul style="list-style-type: none"><li>• 8 analogue inputs</li><li>• M8, 4-pin</li><li>• Exclusively for regulating the functions provided via the Motion Apps</li><li>• Data can be transferred to a higher-order controller by the Motion Apps</li></ul>	21
		Digital	CTMM-D <ul style="list-style-type: none"><li>• 8 digital inputs</li><li>• M8, 3-pin</li><li>• Exclusively for controlling the functions provided via the Motion Apps</li><li>• Data can be transferred to a higher-order controller by the Motion Apps</li></ul>	21
Motion Apps	<b>Basic Motion Apps</b>			
		Directional control valve functions	BMA <ul style="list-style-type: none"><li>Valve type and switching status can be cyclically assigned to a:<ul style="list-style-type: none"><li>• 2x 2/2-way valve, normally closed</li><li>• 2x 3/2-way valve, normally open</li><li>• 2x 3/2-way valve, normally closed</li><li>• 2x 3/2-way valve, 1x normally closed, 1x normally open</li><li>• 4/2-way valve, monostable</li><li>• 4/2-way valve, bistable</li><li>• 4/3-way valve, normally pressurised</li><li>• 4/3-way valve, normally closed</li><li>• 4/3-way valve, normally exhausted</li></ul></li></ul>	24
		Proportional directional control valve	<ul style="list-style-type: none"><li>Valve type, switching status and a continuous valve opening can be cyclically assigned to a:<ul style="list-style-type: none"><li>• 4/3-way valve, normally closed</li><li>• 2x 3/3-way valve, normally closed</li></ul></li></ul>	26
		Supply and exhaust air flow control	<ul style="list-style-type: none"><li>Flow control function:<ul style="list-style-type: none"><li>• Supply air flow control</li><li>• Exhaust air flow control</li><li>• Comprises 4/4-way valve (corresponding to valve plus flow control)</li></ul></li></ul>	29
		ECO drive	<ul style="list-style-type: none"><li>For applications with low loads or slow travel movement:<ul style="list-style-type: none"><li>• Energy-saving cylinder movement through supply air flow control</li><li>• Adjustable supply air flow control value</li><li>• Blocks the supply air on reaching the end position</li><li>• Sensors and digital input module required</li></ul></li></ul>	30
		Leakage diagnostics	<ul style="list-style-type: none"><li>Air consumption monitoring:<ul style="list-style-type: none"><li>• Teaching the system</li><li>• Diagnostic message using specified parameters</li></ul></li></ul>	35
These Motion Apps can be used at the same time on all valve positions of the Motion Terminal.				

## Product range overview

Function	Design	Type/code	Description	→ Page	
Motion Apps	Additional apps				
		Proportional pressure regulation	PD	Regulation of the two valve output pressures independently of one another: <ul style="list-style-type: none"><li>• 2x proportional pressure regulator</li></ul>	27
		Model-based proportional pressure regulation	PF	Regulation of the two valve output pressures independently of one another: <ul style="list-style-type: none"><li>• 2x proportional pressure regulator</li><li>• More dynamic regulation by taking the pressure drop in the tubing into consideration</li></ul>	28
		ECO drive	ED	For applications with low loads or slow travel movement: <ul style="list-style-type: none"><li>• Energy-saving cylinder movement through supply air flow control</li><li>• Adjustable supply air flow control value</li><li>• Blocks the supply air on reaching the end position</li><li>• Sensors and digital input module required</li></ul>	30
		Presetting of travel time	TT	Presetting the travel time for retracting and advancing: <ul style="list-style-type: none"><li>• Pre-calculation of the travel profile using set parameters</li><li>• Teaching the system</li><li>• Automatic readjustment of the system</li><li>• Sensors and digital input module required</li></ul>	31
		Selectable pressure level	STP	Energy-saving cylinder movement using a reduced pressure level: <ul style="list-style-type: none"><li>• Pressure regulation for supply air</li><li>• Flow control function for exhaust air</li></ul>	32
		Flow control	FC	Control of the volumetric flow rates at the two valve outputs independently of one another: <ul style="list-style-type: none"><li>• Open-loop and closed-loop operation possible</li><li>• Control characteristics can be adjusted</li><li>• Different media can be set</li><li>• Sensors and analogue input module required for closed-loop operation</li></ul>	33
		Soft Stop	SP	Control of cylinder behaviour near the end positions: <ul style="list-style-type: none"><li>• Controlled acceleration</li><li>• Gentle braking</li><li>• Teaching the system</li><li>• Automatic readjustment of the system</li><li>• Sensors and analogue input module required</li></ul>	34
		Leakage diagnostics	DLP	Air consumption monitoring: <ul style="list-style-type: none"><li>• Teaching the system</li><li>• Diagnostic message using specified parameters</li></ul>	35
		Positioning	BB	Free positioning across the movement range: <ul style="list-style-type: none"><li>• Controlled movement profile can be configured using parameters (e.g. high dynamism)</li><li>• Energy-saving cylinder movement possible by lowering the pressure level via parameterisation</li><li>• Stable in response to changes caused by wear</li><li>• Teaching the system</li><li>• Sensors and analogue input module required</li></ul>	36
For these Motion Apps, licences are required for the number of simultaneous usages					

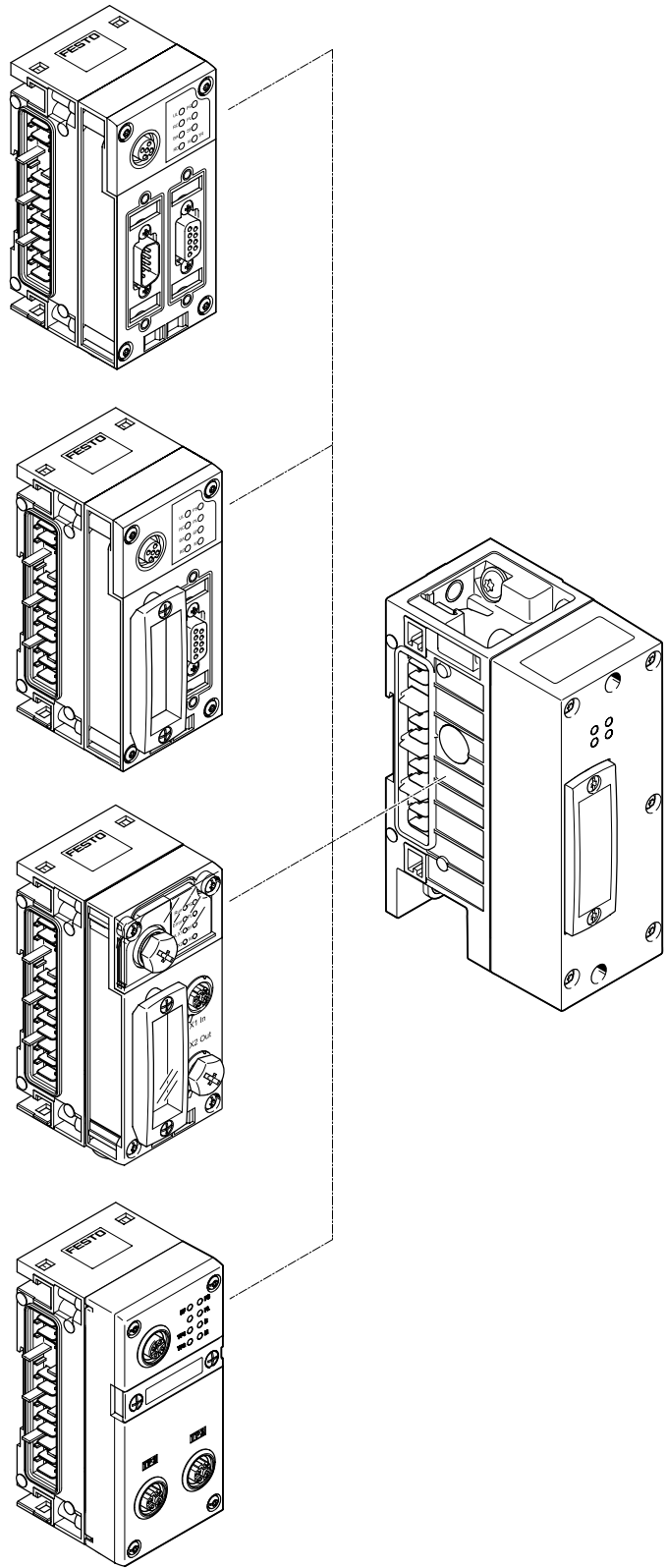
## Peripherals overview



Designation	Brief description		→ Page/Internet
[1] CPX modules	CPX	Bus node, control block, input and output modules	cpx
[2] Controllers	CTMM	For VTEM and pneumatic interface to the terminal CPX	14
[3] Valve body	VEVM	Contains 4 interconnected poppet valves with piezo pilot control	19
[4] Identification holder	ASCF	For one valve	37
[5] Cover plate	VABB	For unoccupied valve position (vacant position) or input module position	37
[6] Input module	CTMM	For connecting sensors to the VTEM	21
[7] Cover cap	ISK	For sealing unused connections	37
[8] Connecting cable	NEBU	For connecting sensors	38
[9] Position sensor	SDAP	Analogue displacement sensor for VTEM input module CTMM	37
[10] Blanking plugs	B	For sealing unused connections	39
[11] Fittings	QS	For connecting compressed air tubing	38
[12] Silencers	U	For exhaust ports	39
[13] Manifold rail	VABM	For pneumatic and electrical connections	37
[14] H-rail mounting	VAME	For CPX and VTEM	37



Peripherals overview

Connecting the Motion Terminal VTEM to a higher-order controller		
Overview	Bus protocol/bus node	Special features
	CODESYS	
	CPX-CEC-C1-V3 CPX-CEC-S1-V3 CPX-CEC-M1-V3	<ul style="list-style-type: none"><li>• Programming with CODESYS</li><li>• Ethernet interface</li><li>• Modbus/TCP</li><li>• EasyIP</li><li>• CANopen master</li><li>• Up to 512 digital inputs/outputs</li><li>• 32 analogue inputs</li><li>• 18 analogue outputs</li></ul>
	DeviceNet	
	CPX-FB11	<ul style="list-style-type: none"><li>• Up to 512 digital inputs/outputs</li><li>• 18 analogue inputs/outputs</li></ul>
	PROFIBUS DP	
	CPX-FB13	<ul style="list-style-type: none"><li>• Up to 512 digital inputs/outputs</li><li>• 32 analogue inputs</li><li>• 18 analogue outputs</li></ul>
	CC-Link	
	CPX-FB23-24	<ul style="list-style-type: none"><li>• Up to 512 digital inputs/outputs</li><li>• 32 analogue inputs/outputs</li></ul>
	PROFINET	
	CPX-FB33 CPX-M-FB34 CPX-FB43 CPX-M-FB44	<ul style="list-style-type: none"><li>• Up to 512 digital inputs/outputs</li><li>• 32 analogue inputs</li><li>• 18 analogue outputs</li></ul>
	EtherNet/IP	
	CPX-FB36	<ul style="list-style-type: none"><li>• Up to 512 digital inputs/outputs</li><li>• 32 analogue inputs</li><li>• 18 analogue outputs</li></ul>
	EtherCAT	
	CPX-FB37	<ul style="list-style-type: none"><li>• Up to 512 digital inputs/outputs</li><li>• 32 analogue inputs</li><li>• 18 analogue outputs</li></ul>
	Sercos III	
	CPX-FB39	<ul style="list-style-type: none"><li>• Up to 512 digital inputs/outputs</li><li>• 32 analogue inputs/outputs</li></ul>
	POWERLINK	
	CPX-FB40	<ul style="list-style-type: none"><li>• Up to 512 digital inputs/outputs</li><li>• 32 analogue inputs/outputs</li></ul>

The precise technical data and specifications for CPX can be found online at:

→ Internet: [cpx](http://cpx)



## Key features – Pneumatic components

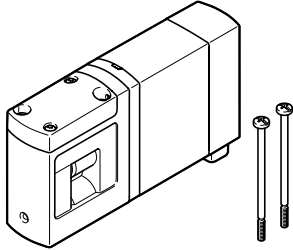
### Pneumatics of the Motion Terminal

The Motion Terminal VTEM is operated exclusively with the electric terminal CPX. A Motion Terminal VTEM comprises 2, 4 or 8 valve positions.

The pneumatic and electrical connections are in a fixed grid. Subsequent extension is not possible.

One or two positions for input modules with 8 digital or 8 analogue inputs can be integrated into the Motion Terminal.

#### Sub-base valve



VTEM offers a comprehensive range of programmable valve functions. The valves comprise four 2/2-way proportional valves connected to form a bridge circuit. Each 2/2-way proportional valve is pilot controlled by two piezo valves.

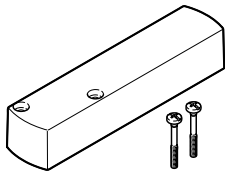
The pilot air for all valves is supplied jointly via port 14 (branched internally from port 1 or supplied externally).

Sensors monitor the degree of opening of the valves as well as the pressure in ports 2 and 4.

#### 4x 2/2-way proportional valve

Circuit symbol	Code	Description
	Position function 1-8: C	<ul style="list-style-type: none"> <li>• Bridge circuit</li> <li>• Monostable</li> <li>• Mechanical spring return</li> <li>• Operating pressure 0 ... 8 bar</li> <li>• Vacuum operation at port 3 only</li> </ul>

#### Cover plate



Vacant position (code L) without valve function, for reserving valve positions or unused input module positions (seal).

#### Compressed air supply and exhaust

The Motion Terminal is supplied with compressed air via:

- Manifold rail
- Controller/pneumatic interface

Exhausting (port 3) takes place via:

- Manifold rail
- Controller/pneumatic interface

The pilot air exhaust (port 84) is completely separate from port 3. The connection is on the controller (pneumatic interface to CPX terminal) together with the connections for port 1 and 3.

The pressure at port 1 is monitored to ensure operation. If the pressure is below 3 bar or above 10 bar, any applications in progress are stopped and an error message is output.

All valves on the Motion Terminal have a common pilot air supply.

They can be supplied as follows:

- Internal (from port 1 of the manifold rail) or
- External (from port 14)

Pressure zone separation (port 1) is not required, as each valve can control the output pressure separately.

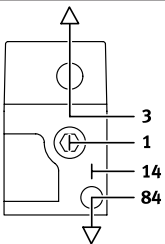
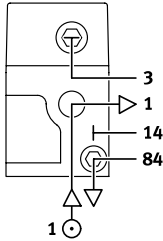
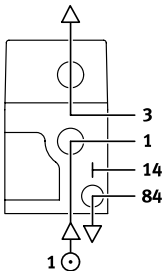
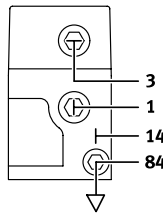
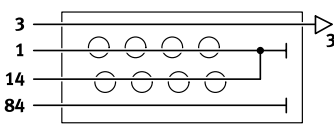
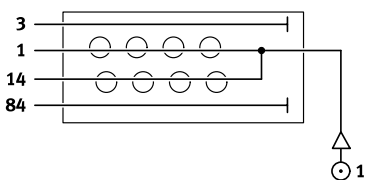
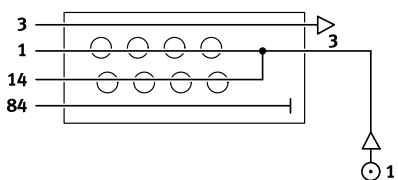
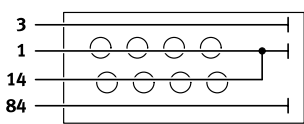
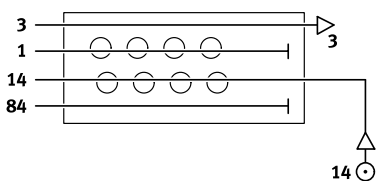
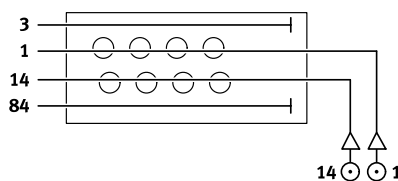
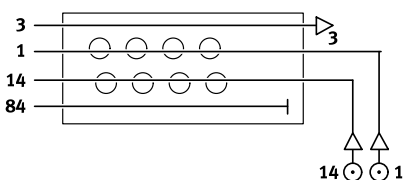
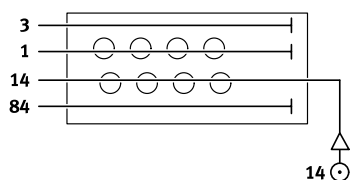
For vacuum applications, a vacuum is connected to port 3 and pressure for the ejector pulse is connected to port 1.



#### Note

A filter must be installed upstream of valves operated in vacuum mode. This prevents any foreign matter in the intake air getting into the valve (e.g. when operating a suction cup).

## Key features – Pneumatic components

Compressed air supply and pilot air supply			
Graphical illustration	Description	Graphical illustration	Description
<b>Controllers</b>			
	<ul style="list-style-type: none"> <li>Exhaust via the controller</li> <li>Compressed air is supplied via the manifold rail</li> <li>Exhaust can also take place via the manifold rail</li> </ul>		<ul style="list-style-type: none"> <li>Compressed air supply via the controller</li> <li>Exhaust takes place via the manifold rail</li> <li>Compressed air can also be supplied via the manifold rail</li> </ul>
	<ul style="list-style-type: none"> <li>Exhaust and compressed air supply via the controller</li> <li>Compressed air supply and exhaust also possible via the manifold rail</li> </ul>		<ul style="list-style-type: none"> <li>Connections on the controller sealed</li> <li>Compressed air supply and exhaust via the manifold rail</li> </ul>
<b>Manifold rail with internal pilot air supply</b>			
	<ul style="list-style-type: none"> <li>Exhaust via the manifold rail</li> <li>Compressed air supply via the controller</li> <li>Exhaust can also take place via the controller</li> </ul>		<ul style="list-style-type: none"> <li>Compressed air supply via the manifold rail</li> <li>Exhaust takes place via the controller</li> <li>Compressed air can also be supplied via the controller</li> </ul>
	<ul style="list-style-type: none"> <li>Exhaust and compressed air supply via the manifold rail</li> <li>Compressed air supply and exhaust also possible via the controller</li> </ul>		<ul style="list-style-type: none"> <li>Connections on the manifold rail sealed</li> <li>Compressed air supply and exhaust via the controller</li> </ul>
<b>Manifold rail with external pilot air supply</b>			
	<ul style="list-style-type: none"> <li>Exhaust via the manifold rail</li> <li>Compressed air supply via the controller</li> <li>Exhaust can also take place via the controller</li> </ul>		<ul style="list-style-type: none"> <li>Compressed air supply via the manifold rail</li> <li>Exhaust takes place via the controller</li> <li>Compressed air can also be supplied via the controller</li> </ul>
	<ul style="list-style-type: none"> <li>Exhaust and compressed air supply via the manifold rail</li> <li>Compressed air supply and exhaust also possible via the controller</li> </ul>		<ul style="list-style-type: none"> <li>Connections on the manifold rail sealed</li> <li>Compressed air supply and exhaust via the controller</li> </ul>

## Key features – Pneumatic components

## Vacuum operation

## Basic principles

The Motion Terminal VTEM can be operated with vacuum.  
In this case, the vacuum is connected to port 3. Pressure for an ejector pulse can be connected at port 1.

When using internal pilot air supply, the necessary minimum pressure (3 bar) in port 1 must be maintained.

Internal pressure sensors in port 2 and port 4 detect the pressure/vacuum and enable the degree of opening and the pressure level of the valve to be controlled.  
The sensors are designed so they are protected against contamination.

**Note**

A filter must be installed upstream of valves operated in vacuum mode. This prevents any foreign matter in the intake air getting into the valve (e.g. when operating a suction cup).

## Fittings

Ports 1, 2, 3, 4, 14 and 84

The outlet orientation of the pneumatic connections in the manifold rail is specified.

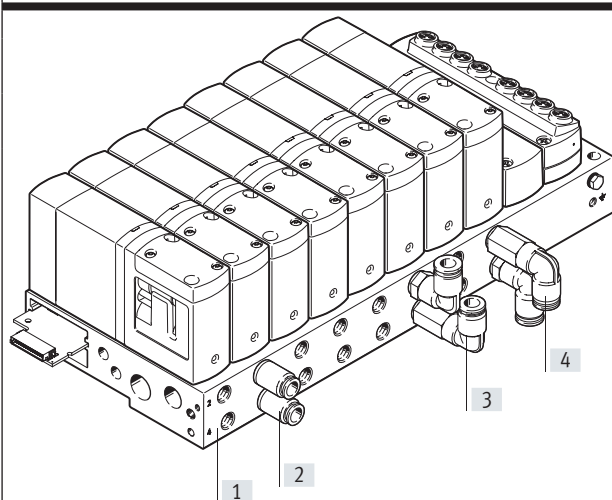
The outlet orientation of the connected tubing can be varied widely by choosing appropriate fittings.

The connection type and outlet orientation are selected:

- For all ports 2 and 4
- For all compressed air supply connections
- For all exhaust connections

- For each individual port 2, as a deviation from the general specification
- For each individual port 4, as a deviation from the general specification

## Connection on the valve (port 2/4)

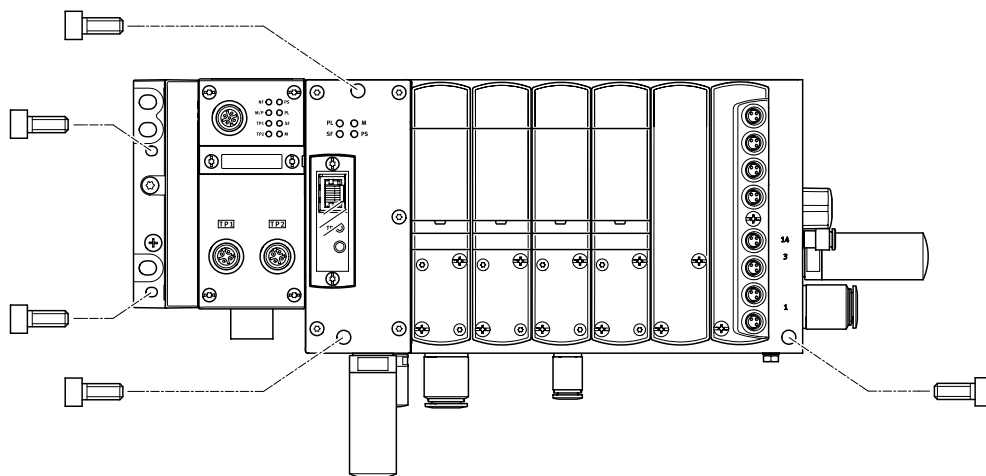


	Code	Description
[1]	G18	Threaded connection G1/8
[2]	Q...	Valve connection: push-in connector ... Valve connection type: straight
[3]	Q... FA	Valve connection: push-in connector ... Valve connection type: angled upwards
[4]	Q... FC	Valve connection: push-in connector ... Valve connection type: angled downwards

## Key features – Mounting

### Mounting the Motion Terminal

#### Wall mounting

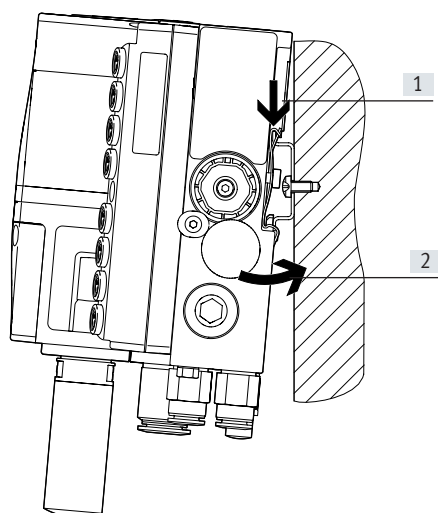


The Motion Terminal VTEM is screwed to the mounting surface using five M4 or M6 screws.

The mounting holes are located:

- On the left end plate (CPX)
- On the right side of the manifold rail
- On the VTEM controller

#### H-rail mounting



[1] The Motion Terminal is hooked onto the H-rail.

[2] The Motion Terminal is then pivoted onto the H-rail and latched in place

## Key features – Display and operation

## Display and operation

## CPX terminal

The modules of the CPX terminal have a row of LEDs. These provide information about:

- Status of bus communication
- System status
- Module status

## VTEM controller

The VTEM controller has LEDs for displaying:

- Operating voltages
- Status of communication to the higher-order controller
- Ethernet data traffic

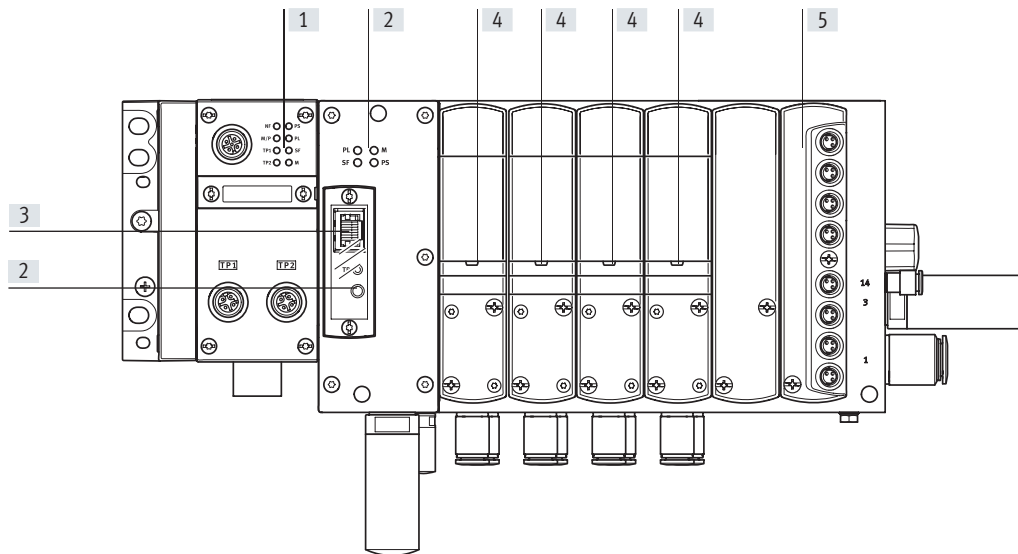
## VTEM valve

Each VTEM valve has an indicator which indicates whether the valve is ready for operation or whether there is a malfunction.  
The valves do not have a mechanical manual override.

## VTEM input module

The input modules are equipped with one central ready status indicator per module.  
The digital input module displays the input status for each port.

## Display and operating components



- [1] LED indicators on the bus node of the CPX terminal
- [2] LED indicators on the VTEM controller
- [3] Ethernet interface to the VTEM controller
- [4] LED indicator on the VTEM valve
- [5] VTEM input module

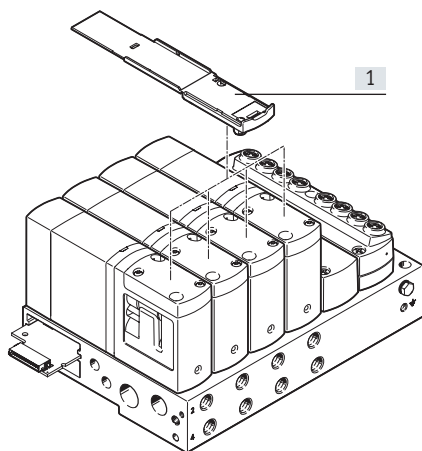
## Diagnostics

Detailed diagnostic functions are needed in order to quickly locate the causes of errors in the electrical installation and therefore reduce downtimes in the production plant.

A basic distinction is made between on-the-spot diagnostics using LEDs or an operator unit and diagnostics using a bus interface.

The Motion Terminal VTEM supports on-the-spot diagnostics using LEDs as well as diagnostics via bus interface and Ethernet interface.




## Labelling

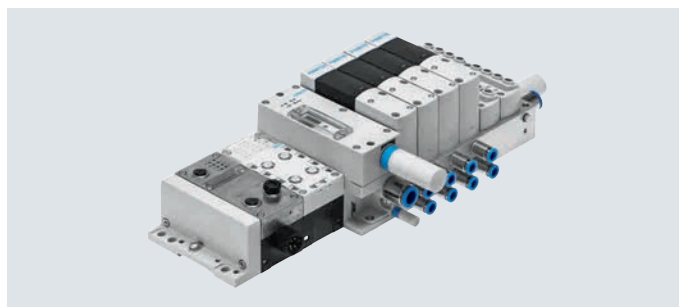


- [1] Identification holder

Identification holders are available for labelling the Motion Terminal. These are clipped onto the valves.

## Data sheet – Motion Terminal VTEM

-  - Flow rate  
up to 450 l/min
-  - Valve width  
27 mm
-  - Voltage  
24 V DC



### General technical data

Valve terminal design			Fixed grid
Motion Apps			Directional control valve functions
			Proportional directional control valve
			Proportional pressure regulation
			Model-based proportional pressure regulation
			Supply and exhaust air flow control
			ECO drive
			Presetting of travel time
			Selectable pressure level
			Flow control
			Leakage diagnostics
			Soft Stop
			Positioning
Maximum number of valve positions			8
Valve size	[mm]		27
Grid dimension	[mm]		28
Nominal width	[mm]		4.2
Design			Poppet
Sealing principle			Soft
Actuation type			Electrical
Type of control			Piloted
Valve function			To be assigned via Motion App
Standard nominal flow rate 6 → 5 bar	Pressurisation	[l/min]	450
	Exhaust port	[l/min]	480
Suitability for vacuum			Yes
Exhaust function			Cannot be throttled
Pilot air supply			Internal or external
Flow direction			Not reversible
Electric I/O system			Yes
Degree of protection			IP65

## Data sheet – Motion Terminal VTEM

Operating and environmental conditions		
Operating medium		Compressed air to ISO 8573-1:2010 [7:4:4]
		Inert gases
Pilot medium		Compressed air to ISO 8573-1:2010 [7:4:4]
		Inert gases
Note on the operating/pilot medium		Lubricated operation not possible
Operating pressure	[bar]	3 ... 8
Pilot pressure	[bar]	3 ... 8
Note on operating/pilot pressure		0 ... 8 bar for external pilot air supply Vacuum operation at port 3 only
Ambient temperature	[°C]	+5 ... +50
Temperature of medium	[°C]	+5 ... +50
Storage temperature	[°C]	–20 ... +40
Relative humidity	[%]	0 ... 90
Corrosion resistance class CRC <sup>1)</sup>		2
CE marking (see declaration of conformity)		To EU EMC Directive <sup>2)</sup>
KC mark		KC EMC
Certification		c UL us listed (OL)
Material fire test		UL94 HB
Food-safe		See supplementary material information
Vibration resistance		Transport application test with severity level 2 to FN 942017-4 and EN 60068-2-6
Shock resistance		Shock test with severity level 2 to FN 942017-5 and EN 60068-2-27
Note on shock resistance		Only static installation permitted when mounting with H-rail.

1) Corrosion resistance class CRC 2 to Festo standard FN 940070

Moderate corrosion stress. Indoor applications in which condensation can occur. External visible parts with primarily decorative surface requirements which are in direct contact with a normal industrial environment.

2) For information about the area of use, see the EC declaration of conformity at: [www.festo.com/catalogue/VTEM](http://www.festo.com/catalogue/VTEM) → Support/Downloads.

If the devices are subject to usage restrictions in residential, commercial or light-industrial environments, further measures for the reduction of the emitted interference may be necessary.

Electrical data		
Nominal operating voltage	[V DC]	24
Permissible voltage fluctuations	[%]	±25
Max. current consumption	[mA]	500
Protection against direct and indirect contact		PELV

Current consumption/power				Controllers	Valve	Digital input module	Analogue input module
Intrinsic current consumption	At nominal operating voltage, electronics/sensors	[mA]		115	37	12	12
	At nominal operating voltage, load	[mA]		85	24	0	0
Power	At nominal operating voltage, electronics/sensors	[W]		2.76	0.89	0.29	0.29
	At nominal operating voltage, load	[W]		2.04	0.58	0	0

Pneumatic connections		
Supply	1	G3/8 thread
Exhaust port	3	G3/8 thread
Pilot air supply	14	M5 thread
Pilot exhaust air	84	M7 thread
Venting hole		M7 thread
Working ports	2	G1/8 thread
	4	G1/8 thread

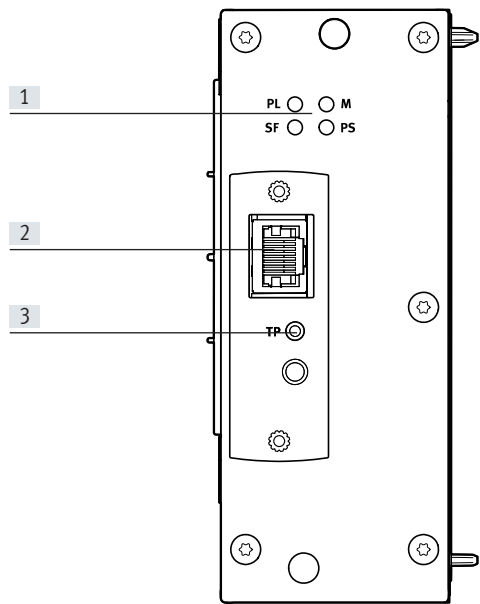
Materials	
Seals	TPE-U(PU), NBR
Note on materials	RoHS-compliant
	Contains paint-wetting impairment substances



Data sheet – Motion Terminal VTEM

Product weight	Approx. weight [g]
Controllers	290
Manifold rail, 2 valve positions	550
	780 (with 1 vacant position for input module)
Manifold rail, 4 valve positions	990
	1460 (with 2 vacant positions for input modules)
Manifold rail, 8 valve positions	1875
	2340 (with 2 vacant positions for input modules)
Cover plate	75
Valve body	200
Input module	75

Connection and display components



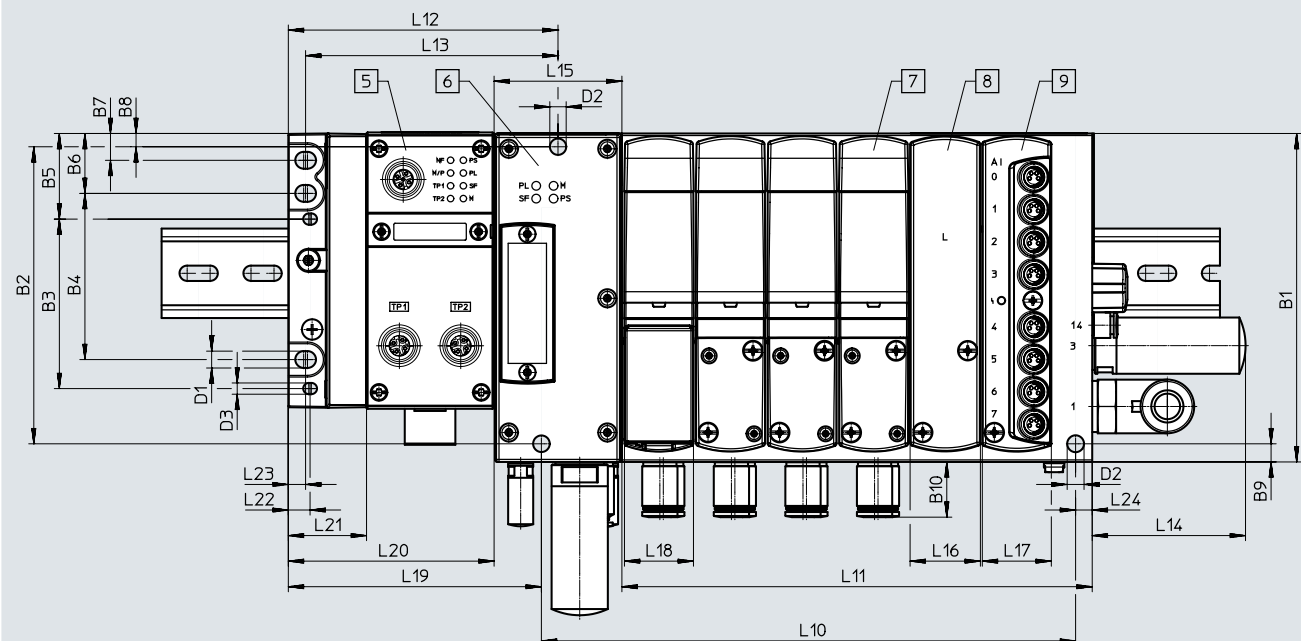
- [1] Diagnostics LED
- [2] Ethernet interface for system configuration
- [3] Status LED for Ethernet interface

## Data sheet – Motion Terminal VTEM

## Dimensions

Download CAD data → [www.festo.com](http://www.festo.com)

Front view



[5] Bus node CPX

[7] Valve VEVM

[8] Cover plate

[9] Input module CTMM

[6] Controller

Type	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	D1	D2	D3
VTEM	128.5	116.2	66.3	65	33.5	23.5	10.5	5.2	7.1	21.6	6.6	6.6	4.4

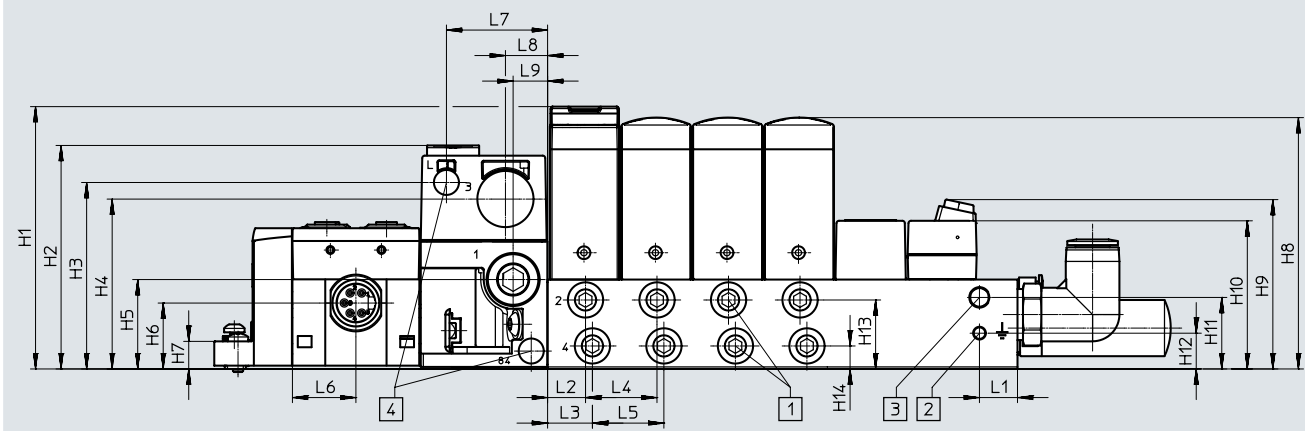
Type	Number of valve positions	Number of input modules	L10	L11	L12	L13	L14	L15	L16	L17	L18	L19
VTEM	2	0	97	72	105.5	98.8	60	50	27.5	27	27	99
	2	1	125	100								
	4	0	153	128								
	4	2	209	184								
	8	0	265	240								
	8	2	321	296								

Type	L20	L21	L22	L23	L24
VTEM	80.5	30.6	8.5	6.8	6.5

Data sheet – Motion Terminal VTEM

Dimensions Download CAD data → [www.festo.com](http://www.festo.com)

Horizontal view

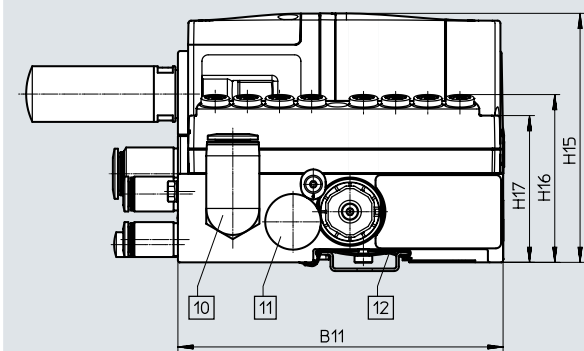


[1] Port 2 and 4      [2] Earth terminal      [3] Port 14, external pilot air supply      [4] Port L and 84

Type	H1	H2	H3	H4	H5	H6	H7	H8	H9	H10	H11	H12	H13	H14
VTEM	102.7	87.5	73	66.5	35	25.8	10.8	98.4	66.3	58	28	14	27	9

Type	L1	L2	L3	L4	L5	L6	L7	L8	L9
VTEM	14.9	14.9	17.6	28	28	24.9	39.6	16.5	13.5


Side view



[10] Port 1  
[11] Port 3  
[12] H-rail mounting

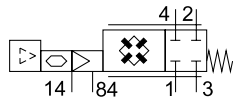
Type	B11	H15	H16	H17
VTEM	128.5	98.4	66.3	58

## Data sheet – Valves VEVM

-  - Flow rate  
450 l/min

-  - Valve width  
27 mm

-  - Voltage  
24 V DC

**General technical data**

Valve function			To be assigned via Motion App	
Reset method			Mechanical spring	
Design			Poppet	
Sealing principle			Soft	
Actuation type			Electrical	
Type of control			Piloted	
Pilot air supply			External	
Flow direction			Not reversible	
Suitability for vacuum			Yes	
Exhaust function			Cannot be throttled	
Mounting position			Any	
Status indication			Blue LED = normal status	
			Red LED = malfunction	
Nominal width		[mm]	4.2	
Standard nominal flow rate 6 → 5 bar	Pressurisation	[l/min]	450	
	Exhaust port	[l/min]	480	
C value		[l/sbar]	2	
Valve size		[mm]	27	
Grid dimension		[mm]	28	
Product weight		[g]	200	
Degree of protection			IP65	

**Switching times**

Switching time	On	[ms]	8.5
	Off	[ms]	8.5

## Data sheet – Valves VEVN

Operating and environmental conditions		
Operating medium		Compressed air to ISO 8573-1:2010 [7:4:4]
		Inert gases
Pilot medium		Compressed air to ISO 8573-1:2010 [7:4:4]
		Inert gases
Note on the operating/pilot medium		Lubricated operation not possible
Operating pressure	[bar]	3 ... 8
Pilot pressure	[bar]	3 ... 8
Note on operating/pilot pressure		0 ... 8 bar for external pilot air supply
		Vacuum operation at port 3 only
Ambient temperature	[°C]	+5 ... +50
Temperature of medium	[°C]	+5 ... +50
Storage temperature	[°C]	–20 ... +40
Relative humidity	[%]	0 ... 90 (non-condensing)
Corrosion resistance class CRC <sup>1)</sup>		2
Material fire test		UL94 HB
Food-safe		See supplementary material information

- 1) Corrosion resistance class CRC 2 to Festo standard FN 940070  
Moderate corrosion stress. Indoor applications in which condensation can occur. External visible parts with primarily decorative surface requirements which are in direct contact with a normal industrial environment.
- 2) For information about the area of use, see the EC declaration of conformity at: [www.festo.com/catalogue/VEVM](http://www.festo.com/catalogue/VEVM) → Support/Downloads.  
If the devices are subject to usage restrictions in residential, commercial or light-industrial environments, further measures for the reduction of the emitted interference may be necessary.
- 3) Additional information: [www.festo.com/sp](http://www.festo.com/sp) → Certificates.

Electrical data		
Nominal operating voltage	[V DC]	24
Permissible voltage fluctuations	[%]	±25
Electrical power consumption	[W]	1.5
Duty cycle ED	[%]	100

Pneumatic connections		
Supply	1	G3/8 thread
Exhaust port	3	G3/8 thread
Pilot air supply	14	M5 thread
Pilot exhaust air	84	M7 thread
Venting hole		M7 thread
Working ports	2	G1/8 thread
	4	G1/8 thread

Materials	
Housing	PA
Seals	TPE-U(PU), NBR
Note on materials	RoHS-compliant
	Contains paint-wetting impairment substances

## Data sheet – Input modules

### Function

Input modules enable analogue and digital sensors to be connected to the Motion Terminal.

The input signals are used for motion tasks, but can also be looped through from a Motion App to the higher-order controller.

### Area of application

- Input modules for 24 V DC sensor supply voltage
- Digital module with PNP logic
- Analogue module for 4 ... 20 mA



### General technical data

		Digital input module	Analogue input module
Electrical connection	Function	Digital input	Analogue input
	Connection type	8x socket	8x socket
	Connection technology	M8x1, A-coded to EN 61076-2-104	M8x1, A-coded to EN 61076-2-104
	Number of pins/wires	3	4
Number of inputs		8	8
Number of outputs		0	0
Input characteristics		To IEC 61131-2, type 3	–
Signal range		–	4 ... 20 mA
Switching level		Signal 0: ≤ 5 V	–
		Signal 1: ≥ 11 V	–
Input debounce time	[ms]	0.1	–
Switching logic at inputs		PNP (positive switching)	–
Measured variable		–	Current
Fuse protection		Internal electronic fuse	Internal electronic fuse
Electrical isolation	Channel – internal bus	No	No
	Channel – channel	No	No
Diagnostics via LED		Errors per module	Errors per module
		Status per channel	–
Nominal operating voltage	[V DC]	24	
Permissible voltage fluctuations	[%]	±25	
Intrinsic current consumption at nominal operating voltage	[mA]	Typically 12	
Dimensions	W x L x H	27 x 123 x 40	
Grid dimension	[mm]	28	
Product weight	[g]	75	
Degree of protection		IP65/IP67	

### Materials

Housing	PA
Note on materials	RoHS-compliant

### Operating and environmental conditions

Ambient temperature	[°C]	–5 ... +50
Temperature of medium	[°C]	–5 ... +50
Storage temperature	[°C]	–20 ... +40
Corrosion resistance class CRC <sup>1)</sup>		2
CE marking (see declaration of conformity)		To EU EMC Directive <sup>2)</sup>

1) Corrosion resistance class CRC 2 to Festo standard FN 940070

Moderate corrosion stress. Indoor applications in which condensation can occur. External visible parts with primarily decorative surface requirements which are in direct contact with a normal industrial environment.

2) For information about the area of use, see the EC declaration of conformity at: [www.festo.com/catalogue/VTEM](http://www.festo.com/catalogue/VTEM) → Support/Downloads.

If the devices are subject to usage restrictions in residential, commercial or light-industrial environments, further measures for the reduction of the emitted interference may be necessary.

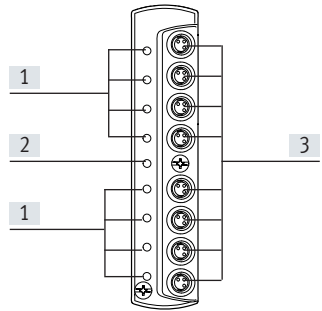
Data sheet – Input modules

Safety characteristics	
CE marking (see declaration of conformity)	To EU EMC Directive <sup>1)</sup>
Shock resistance	Shock test with severity level 2 to FN 942017-5 and EN 60068-2-27
Vibration resistance	Transport application test with severity level 2 to FN 942017-4 and EN 60068-2-6

1) For information about the area of use, see the EC declaration of conformity at: [www.festo.com/catalogue/VTEM](http://www.festo.com/catalogue/VTEM) → Support/Downloads.  
If the devices are subject to usage restrictions in residential, commercial or light-industrial environments, further measures for the reduction of the emitted interference may be necessary.

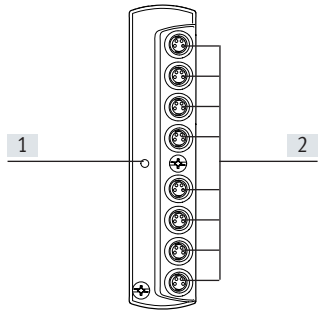
Connection and display components

Input module with digital inputs

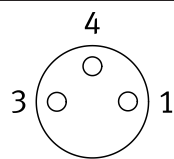
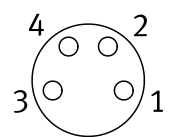


- [1] Status LEDs for inputs (status indication, green)
- [2] Status LED (module) for short circuit/overload of sensor supply (red)
- [3] Sensor connections

Input module with analogue inputs



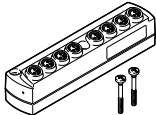
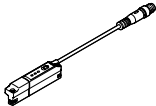
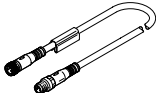

- [1] Status LED (module) for short circuit/overload of sensor supply (red)
- [2] Sensor connections

Pin allocation for sensor connections									
Terminal allocation		Pin	Signal	Designation	Terminal allocation		Pin	Signal	Designation
Input module with digital inputs				Input module with analogue inputs					
		1	24 V	Operating voltage 24 V			1	24 V	Operating voltage 24 V
		3	0 V	Operating voltage 0 V			2	Ix*	Sensor signal
		4	Ix*	Sensor signal			3	0 V	Operating voltage 0 V
							4	n.c	Not connected

\* Ix = Input x



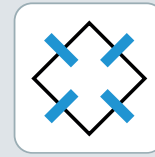
## Data sheet – Input modules

Ordering data			Part no.	Type	PU <sup>1)</sup>
Input module					
	Module with 8 inputs	Digital inputs	8047505	CTMM-S1-D-8E-M8-3	1
		Analogue inputs	8047506	CTMM-S1-A-8E-A-M8-4	1
Position sensor					
	Analogue sensor for VTEM input module	Sensing range 0 ... 50 mm	8050120	SDAP-MHS-M50-1L-A-E-0.3-M8	1
		Sensing range 0 ... 100 mm	8050121	SDAP-MHS-M100-1L-A-E-0.3-M8	1
		Sensing range 0 ... 160 mm	8050122	SDAP-MHS-M160-1L-A-E-0.3-M8	1
Connecting cable			Data sheets → Internet: nebu		
	Modular system for a choice of connecting cables	Cable length 0.1 ... 30 m	539052	NEBU-... → Internet: nebu	–
	<ul style="list-style-type: none"><li>• Straight plug, 4-pin</li><li>• Straight socket, M8x1, 4-pin</li></ul>	Cable length 2.5 m	554035	NEBU-M8G4-K-2.5-M8G4	1
Cover cap					
	Cover cap for sealing unused connections	For M8 connections	177672	ISK-M8	10

1) Packaging unit

## Data sheet – Motion App "Directional control valve functions"

- 2x 2/2-way valve
- 2x 3/2-way valve
- 4/2-way valve
- 4/3-way valve
- Part of the basic package

**Description****Mode of operation**

The directional control valve function allows the characteristics of a conventional pneumatic valve to be assigned to a valve position.

The integrated sensors enable the switching position to be monitored. All ports are blocked if the pilot pressure or power supply is interrupted.

**Benefits**

The ability to assign the directional control valve function significantly reduces component variety. This in turn reduces the initial design costs. If a replacement is required, it is no longer necessary to identify the specific valve; the controller assigns the function to the new valve. As valve functions are assigned cyclically, a series of valve functions can be realised on one valve position at staggered intervals.

When maintenance and commissioning need to be carried out, the valves can be stopped as required via the controller and can exhaust the system.

- One valve position with 9 valve functions
- No need to change the valve for a different valve function
- Virtual manual override via software, access via Ethernet interface

**Scope**

- For the entire Motion Terminal
- For each individual valve position in a Motion Terminal, depending on the assignment
- Cyclical assignment

**Data**

Controller to the valve

- Directional control valve function
- Switching position to be assumed

Valve to the controller

- Switching position
- Pressure at port 2
- Pressure at port 4

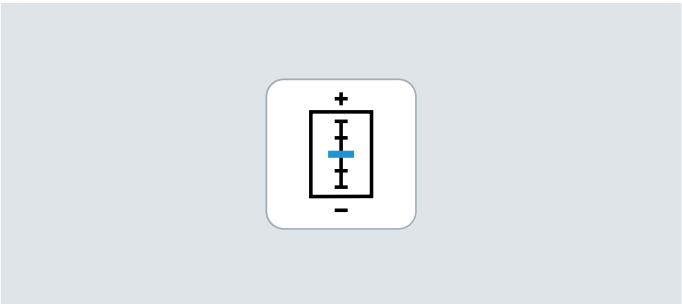
Valve functions			
Circuit symbol	Description	Circuit symbol	Description
<b>2x 3/2-way valve</b>		<b>4/3-way valve</b>	
	<ul style="list-style-type: none"> <li>• Bistable</li> <li>• Normally open</li> <li>• Not reversible</li> </ul>		<ul style="list-style-type: none"> <li>• Mid-position pressurised</li> <li>• Not reversible</li> </ul>
	<ul style="list-style-type: none"> <li>• Bistable</li> <li>• Normally closed</li> <li>• Not reversible</li> </ul>		<ul style="list-style-type: none"> <li>• Mid-position closed</li> <li>• Not reversible</li> </ul>
	<ul style="list-style-type: none"> <li>• Bistable</li> <li>• Normal position               <ul style="list-style-type: none"> <li>– 1x closed</li> <li>– 1x open</li> </ul> </li> <li>• Not reversible</li> </ul>		<ul style="list-style-type: none"> <li>• Mid-position exhausted</li> <li>• Not reversible</li> </ul>
<b>4/2-way valve</b>		<b>2x 2/2-way valve</b>	
	<ul style="list-style-type: none"> <li>• Monostable</li> <li>• Pneumatic reset</li> <li>• Not reversible</li> </ul>		<ul style="list-style-type: none"> <li>• Bistable</li> <li>• Normally closed</li> <li>• Not reversible</li> </ul>
	<ul style="list-style-type: none"> <li>• Bistable</li> <li>• Not reversible</li> </ul>		

## Data sheet – Motion App "Directional control valve functions"

Technical data			
Switching time	On	[ms]	8.5
	Off	[ms]	8.5
Standard nominal flow rate for pressurisation		[l/min]	450
Standard nominal flow rate for exhaust		[l/min]	480

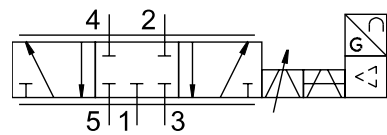
Data sheet – Motion App "Proportional directional control valve"

- 4/3-way proportional valve
- 2x 3/3-way proportional valve
- Part of the basic package



Description

Mode of operation



The proportional directional control valve function is assigned to a valve position in the same way as the directional control valve function.

The switching position and degree of opening of the valves can be monitored via the integrated sensors.

Benefits

- Minimal leakage (poppet valves)
- Low current consumption
- Two independently controlled connections at one valve position
- Different control characteristics can be set

Scope

- For the entire Motion Terminal
- For each individual valve position in a Motion Terminal, depending on the assignment
- Cyclical assignment

Data

Controller to the valve

- Directional control valve function
- Switching position to be assumed
- Control characteristics
- Valve position (–100 ... +100%)
- Port blocking

Valve to the controller

- Measured valve position (–100 ... +100%)

Valve functions

Circuit symbol	Description	Circuit symbol	Description
<b>2x 3/3-way proportional valve</b>		<b>4/3-way proportional valve</b>	
A schematic diagram of a 2x 3/3-way proportional valve. It shows a rectangular body with four ports labeled 1, 2, 3, and 4. Port 1 is at the bottom left, port 2 at the top left, port 3 at the bottom right, and port 4 at the top right. Inside the body, there are two solenoid coils, one on the left and one on the right, each with a diagonal line through it.	<ul style="list-style-type: none"><li>• Mid-position closed</li><li>• Not reversible</li></ul>	A schematic diagram of a 4/3-way proportional valve. It shows a rectangular body with four ports labeled 1, 2, 3, and 4. Port 1 is at the bottom left, port 2 at the top left, port 3 at the bottom right, and port 4 at the top right. Inside the body, there are two solenoid coils, one on the left and one on the right, each with a diagonal line through it.	<ul style="list-style-type: none"><li>• Mid-position closed</li><li>• Not reversible</li></ul>

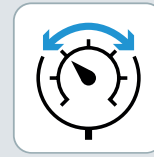
Technical data

Linearity error	[%]	±2 FS, 5 ... 70% setpoint value
	[%]	Typically ±3 FS, 70 ... 95% setpoint value relative to the ideal characteristic curve
Repetition accuracy in ± % FS	[%]	±1.5 FS
Hysteresis	[%]	1.5 FS, 5 ... 70% setpoint value
	[%]	Typically 3 FS, 70 ... 95% setpoint value
Overall accuracy	[%]	Typically 3 FS
Response sensitivity	[%]	1.5 FS

## Data sheet – Motion App "Proportional pressure regulation"

 Pressure -0.9 ... +7 bar

- Pressure regulation in port 2
- Pressure regulation in port 4
- Licences required for the number of simultaneous usages



## Description

## Mode of operation

With the proportional pressure regulation function the pressure can be regulated at ports 2 and 4 independently

Thanks to the integrated sensors, the pressure can be precisely monitored.

The following control characteristics are available:

- Small volume
- Medium volume
- Large volume
- Self-configured setting

For vacuum applications, a vacuum is connected at port 3. Pressure, for an ejector pulse for example, can be connected at port 1 at the same time.

## Benefits

- Two pressure regulators per valve position
- Easy parameterisation
- Vacuum regulation

## Scope

- For the entire Motion Terminal
- For each individual valve position in a Motion Terminal, depending on the assignment
- Cyclical assignment

## Data

Controller to the valve

- Pressure at port 2 (setpoint value)
- Pressure at port 4 (setpoint value)

Valve to the controller

- Pressure at port 2 (actual value)
- Pressure at port 4 (actual value)

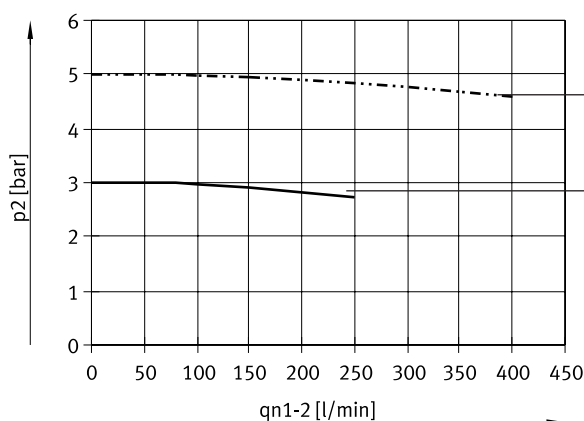
## Range of application

- Control of force with known effective area
- Regulating contact pressure
- Actuating process valves
- Vacuum control with ejector pulse

## Technical data


Linearity error	[mbar]	<80, within a range of -0.9 ... 7 bar, relative to the ideal characteristic curve	Conditions: • Valid within a range of 5 ... 95% of the setpoint value • Supply pressure 8 bar • Volume 0.1 l • Control characteristic C1 • Only one pressure regulator active within the valve terminal
Repetition accuracy	[mbar]	<40, within a range of -0.9 ... 7 bar	
Hysteresis	[mbar]	<40, within a range of -0.9 ... 7 bar	
Overall accuracy	[mbar]	<90, within a range of -0.9 ... 7 bar	

## Pressure as a function of the flow rate



- [1] Characteristic pressure curve with a specified setpoint value of 5 bar
- [2] Characteristic pressure curve with a specified setpoint value of 3 bar

Data sheet – Motion App "Model-based proportional pressure regulation"

 Pressure -0.9 ... +7 bar

- Pressure regulation in port 2
- Pressure regulation in port 4
- Pressure drop compensation
- Licences required for the number of simultaneous usages



Description

Mode of operation

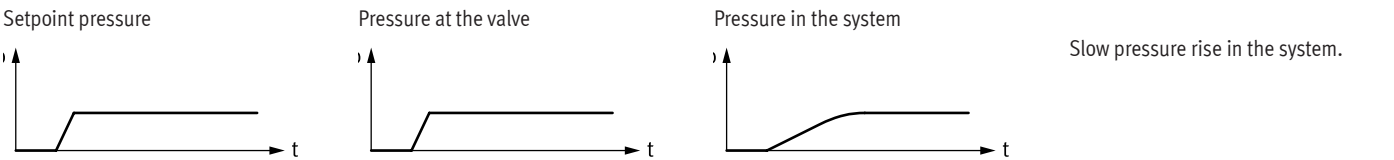
The model-based proportional pressure regulation function enables the pressure at ports 2 and 4 to be regulated independently. Thanks to the integrated sensors, the pressure can be precisely monitored.

With the model-based proportional pressure regulation, any pressure drop caused by a change in the pressure in the tubing and connected drive is calculated and compensated for.

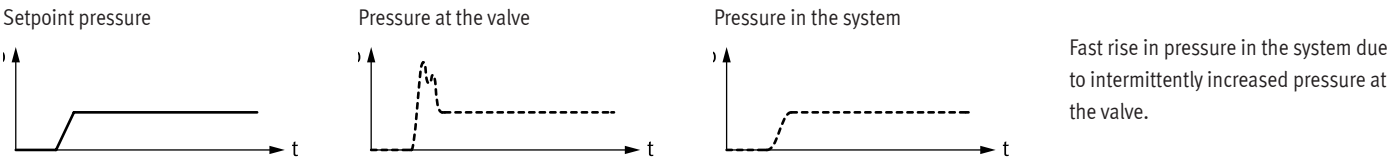
As a result, filling times and following errors are reduced and there is no need for an external pressure sensor on the consuming device.

For vacuum applications, a vacuum is connected at port 3. Pressure, for an ejector pulse for example, can be connected at port 1 at the same time.

Characteristic pressure curve of simple pressure regulators



Characteristic pressure curve of the Motion Terminal with model-based proportional pressure regulation

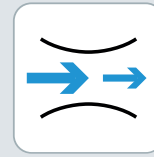


Benefits	Scope	Data	Range of application
<ul style="list-style-type: none"><li>• Two pressure regulators per valve position</li><li>• Reduced filling time</li><li>• Vacuum regulation</li><li>• No external pressure sensor is required</li></ul>	<ul style="list-style-type: none"><li>• For the entire Motion Terminal</li><li>• For each individual valve position in a Motion Terminal, depending on the assignment</li><li>• Cyclical assignment</li></ul>	<p>Controller to the valve</p> <ul style="list-style-type: none"><li>• Pressure at port 2</li><li>• Pressure at port 4</li></ul> <p>Valve to the controller</p> <ul style="list-style-type: none"><li>• Pressure at port 2</li><li>• Pressure at port 4</li></ul>	<ul style="list-style-type: none"><li>• Control of force with known effective area</li><li>• Regulating contact pressure</li><li>• Actuating process valves</li><li>• Vacuum control with ejector pulse</li></ul>

Technical data			
Linearity error	[mbar]	Typically 170, within a range of -0.9 ... 7 bar, relative to the ideal characteristic curve	<p>Conditions:</p> <ul style="list-style-type: none"><li>• Valid within a range of 5 ... 95% of the setpoint value</li><li>• Supply pressure 8 bar</li><li>• Volume 0.1 l</li><li>• Only one pressure regulator active within the valve terminal</li></ul>
Repetition accuracy	[mbar]	Typically 80, within a range of -0.9 ... 7 bar	
Hysteresis	[mbar]	Typically 80, within a range of -0.9 ... 7 bar	

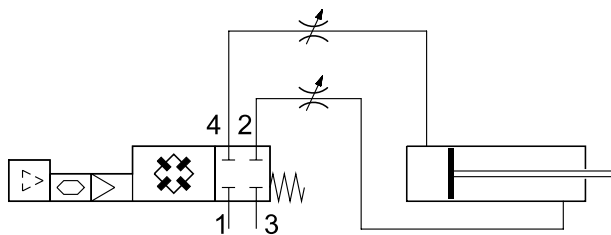
## Data sheet – Motion App "Supply and exhaust air flow control"

- Supply air flow control
- Exhaust air flow control
- Part of the basic package



### Description

#### Mode of operation



The flow rate can be individually adjusted for each port; the supply air and exhaust air flow control are adjusted independently of one another.

It is no longer necessary to have a technician on site to change the flow control.

#### Benefits

- Flow control remotely adjustable during operation (adjustment via controller)
- Reproducible flow control cross sections adjustable via controller
- Reduced component variety since there is no mechanical flow control valve
- Flow control setting can be called up during operation
- Tamper-proof

#### Scope

- For the entire Motion Terminal
- For each individual valve position in a Motion Terminal, depending on the assignment
- Cyclical assignment
- Control precision  $\pm 3\%$

#### Data

##### Controller to the valve

- Supply air flow control setting  
0 ... 100%  
(recommended values: 5 ... 100%)
- Exhaust air flow control setting  
0 ... 100%  
(recommended values: 5 ... 100%)
- Increments 0.01%

##### Valve to the controller

- Supply air flow control setting
- Exhaust air flow control setting

#### Soft-start function

If, on starting the Motion App, the pressure at ports 2 and 4 is more than 50% below the current pressure in port 1, it is steadily increased until the specified value has been reached. The actual motion task then starts.

This function prevents advancing to the end position in an uncontrolled manner.

#### Technical data

Overall accuracy	[%]	Typically $\pm 3$
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Data sheet – Motion App "ECO drive"

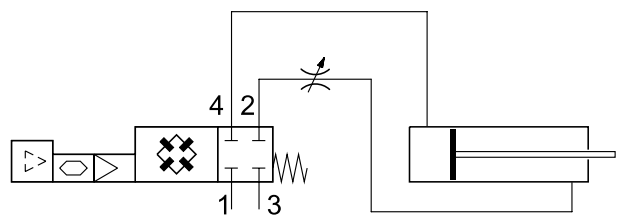
- Supply air flow control with end-position switch-off
  - Can be used to save energy when advancing and retracting the cylinder
  - Part of the basic package
- Also required:

  - A digital input module CTMM
  - Two digital sensors (PNP, N/O contact) for determining the end position of the drive



Description

Mode of operation

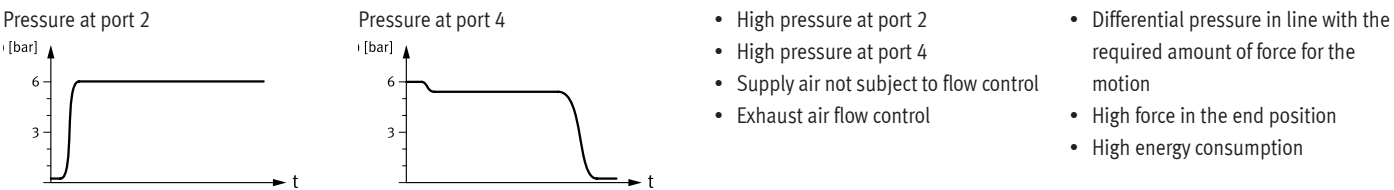


To save energy during cylinder movement, the supply air flow is controlled when advancing the cylinder while the exhaust air flow is not controlled. The supply air side is blocked when the end position is reached so the pressure level and cylinder position can be maintained.

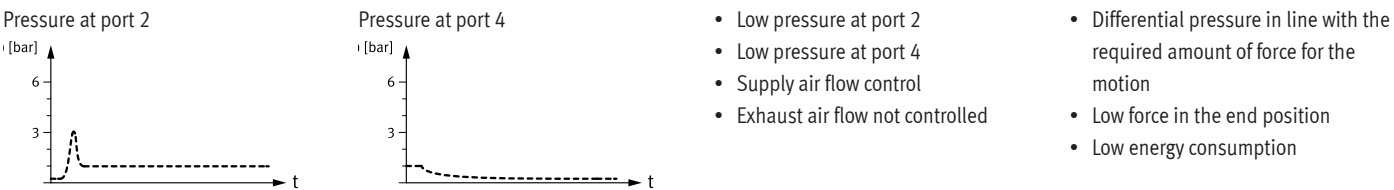
For this function, the cylinder position is sensed via two end-position switches.

For safe operation, a horizontal travel movement/mounting position is recommended. The acceleration and speed of the movement are significantly increased by a force acting in the same direction.

Characteristic pressure curve without ECO drive



Pressure curve with ECO drive



Benefits

- Supply air flow control and pressure switch-off in the end position considerably increase energy efficiency
- Energy/pressure consumption is automatically adapted to the load
- Readjustment in case of deviation from the end position
- Suitable for moving low loads at low speed

Scope

- For the entire Motion Terminal
- For each individual valve position in a Motion Terminal, depending on the assignment
- Cyclical assignment

Data

- Controller to the valve

  - Supply air flow control setting 5 ... 100%
- Valve to the controller

  - Pressure at port 2
  - Pressure at port 4
  - End position reached

Technical data		
Overall accuracy	[%]	Typically ±3

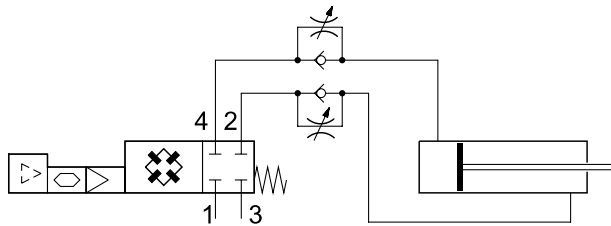
## Data sheet – Motion App "Presetting of travel time"

- Self-learning exhaust air flow control for regulating the travel time
  - Part of the basic package
- Also required:
- A digital input module CTMM
  - Two digital sensors (PNP, N/O contact) for determining the end position of the drive



### Description

#### Mode of operation



The travel time for retracting and advancing is preset in the Motion Terminal VTEM.

The real travel time is autonomously determined using the sensor data from the end-position switches and the exhaust air flow control is adjusted until the specified travel time is achieved. Continuous monitoring and adjustment compensate for changes to the system.

Significant deviations in the parameters (deviating idle times, rapid change in external forces/friction forces) can cause deviations in travel time. End-position cushioning must be implemented separately.

### Benefits

- Adaptive and self-adjusting
- Constant cycle times
- Travel time can be changed via the controller
- Variations in the supply or exhaust air pressure are automatically sensed and taken into consideration
- Password-protected access
- Simple proximity switches are used

### Scope

- For the entire Motion Terminal
- For each individual valve position in a Motion Terminal, depending on the assignment
- Cyclical assignment
- In combination with limit switch

### Data

#### Controller to the valve

- Advancing
- Retracting
- Exhausting both chambers
- Blocking both chambers

#### Valve to the controller

- Measured travel time
- End position reached

### Soft-start function

If, on starting the Motion App, the pressure at ports 2 and 4 is more than 20% below the current pressure in port 1, it is steadily increased until the specified value has been reached. The actual motion task then starts.

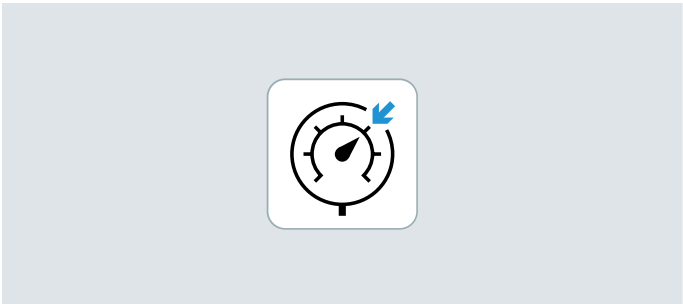
This function prevents advancing to the end position in an uncontrolled manner.

### Technical data

Repetition accuracy	Standard deviation $\pm 3\%$ , but in any case not more accurate than $\pm 20$ ms	Conditions: <ul style="list-style-type: none"> <li>• Cylinder diameter 25 ... 63</li> <li>• Cylinder stroke 50 ... 500 mm</li> <li>• Tube length <math>\leq 5 \times</math> cylinder stroke</li> <li>• Speed <math>\geq 0.2</math> m/s</li> <li>• Mass [kg] <math>\leq 0.004 \times</math> supply pressure [bar] <math>\times</math> cylinder diameter [mm] <math>\times</math> cylinder diameter [mm]</li> </ul>
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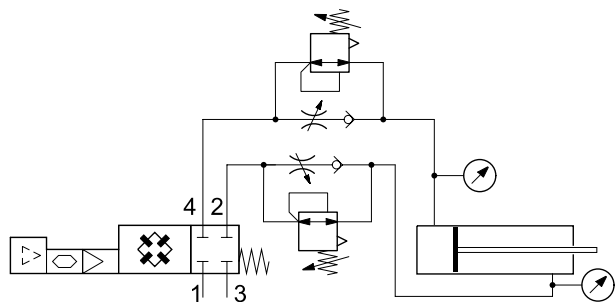
Data sheet – Motion App "Selectable pressure level"

- Pressure regulation at port 2 and flow rate at port 4
- Pressure regulation at port 4 and flow rate at port 2
- Licences required for the number of simultaneous usages



Description

Mode of operation



Benefits

- Energy-saving movement with reduced pressure
- Pressure regulation in the end position
- Pressure can be changed remotely and individually preset for each drive and direction of movement

Data

Controller to the valve

- Pressure at port 2 and flow control opening at port 4
- Pressure at port 4 and flow control opening at port 2
- Stopping
- Advancing
- Retracting
- Exhausting both chambers

Valve to the controller

- Pressure at port 2 and port 4

Scope

- For the entire Motion Terminal
- For each individual valve position in a Motion Terminal, depending on the assignment
- Cyclical assignment
- For cylinders with pneumatic cushioning

Soft-start function

If, on starting the Motion App, the pressure at ports 2 and 4 is below 2 bar, it is increased steadily until the specified value has been reached. The actual motion task then starts.

This function prevents advancing to the end position in an uncontrolled manner.

Technical data

Repetition accuracy	[mbar]	Typically 8 (pressure regulation)
Overall accuracy	[mbar]	Typically ±250 (pressure regulation)
	[%]	Typically ±3 (opening cross section)

## Data sheet – Motion App "Flow control"

- Specification of mutually independent flow rates for ports 2 and 4
- Open-loop operation without additional sensors
- Closed-loop operation with external flow sensors for increased accuracy
- Licences required for the number of simultaneous usages

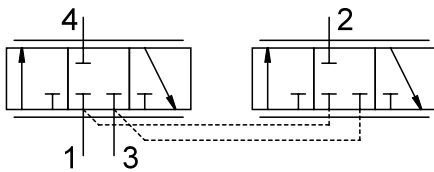
Also required for closed-loop operation:

- An analogue input module CTMM
- A flow sensor (e.g. SFAB or SFAH) for each port

**FLOW** →

### Description

#### Mode of operation



The required flow rate can be independently preset for ports 2 and 4. The Motion Terminal VTEM autonomously regulates the flow rate and signals the actual pressure in ports 2 and 4 and to the higher-order controller.

The following control characteristics are available:

- Fast
- Medium
- Universal
- Self-configured setting

#### Benefits

- Two flow controllers per valve position
- Different media can be selected
- Increased accuracy through closed-loop operation when using external flow sensors
- Different control characteristics can be set

#### Scope

- For each individual valve position in a Motion Terminal, depending on the assignment
- Cyclical assignment

#### Data

Controller to the valve	Valve to the controller
• Setpoint flow rate at port 2	• Flow rate at port 2
• Setpoint flow rate at port 4	• Flow rate at port 4
• Ports can be activated individually and independently	• Status information

#### Media

- CDA (dried air)
- Ar (argon)
- N<sub>2</sub> (nitrogen)
- CO<sub>2</sub> (carbon dioxide)
- O<sub>2</sub> (oxygen), on request

### Technical data

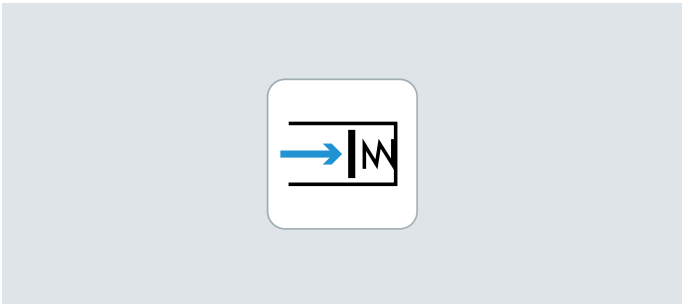
Accuracy of flow rate (max. stationary control precision)	[l/min]	Closed-loop: $\pm 4$ l/min <sup>1)</sup> Open-loop: not specified
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1) Filtered sensor valve for setpoint value and corresponding control characteristics

Data sheet – Motion App "Soft Stop"

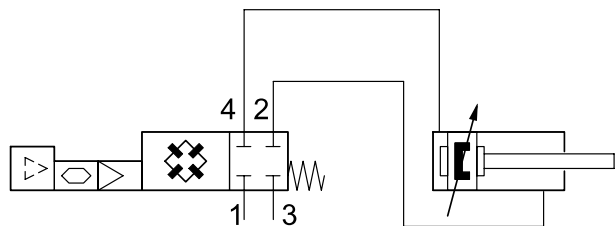
- The algorithm moves the piston from one cylinder end position to the other in an optimum amount of time
  - Licences required for the number of simultaneous usages
- Also required:

  - An analogue input module CTMM
  - Two sensors SDAP for determining the position of the drive



Description

Mode of operation



During a teach-in process, the Motion Terminal VTEM automatically determines the necessary parameters for accelerating the connected drive in a controlled manner and decelerating it gently.

Gradual changes over the course of continuous operation are automatically compensated for.

Benefits

- Optimised cycle times (typical travel time 0.5 s for a piston rod cylinder with a 32 mm piston rod diameter, 500 mm stroke and 11 kg moving mass)
- Automatic cushioning resulting in considerably less wear, vibrations or impacts
  - Optimal for heavy moving masses and long travel paths
  - Selectable contact pressure in end position

Scope

- For each individual valve position in a Motion Terminal, depending on the assignment
  - Cyclical assignment
  - In combination with partial stroke sensor
- For drives with self-adjusting pneumatic cushioning (PPS) on both sides

Data

- Controller to the valve

  - Advancing
  - Retracting
  - Exhausting
  - Blocking
- Valve to the controller

  - End position reached
  - Contact pressure reached

Soft-start function

When the Motion App is started, the piston position and pressure conditions are checked.

If the piston is in the end position:

- The pressure of the port to be exhausted will be adjusted to the preset contact pressure
- The port to be pressurised will be completely exhausted

If the piston is not in the end position, the cylinder will be moved gently into the end position of the specified direction.

The actual motion task then starts. This function prevents advancing to the end position in an uncontrolled manner.

Technical data

Repetition accuracy	[ms]	Expanded measurement uncertainty (95%) <70 ms with periodic advancing and retracting
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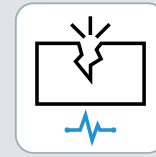
## Data sheet – Motion App "Leakage diagnostics"



Flow rate

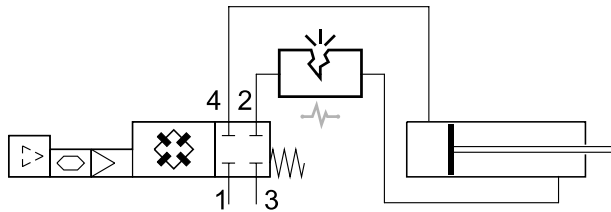
Measuring range: 2 ... 50 l/h

- Part of the basic package



## Description

## Mode of operation



To calculate the leakage, the pressure drop at a valve (drive in end position) is determined.

To be able to evaluate this value, a reference value is determined using a measurement taken at the start of the observation period.

The Motion Terminal VTEM compares the value of further measurements against this reference value.

This comparison provides the basis for an evaluation using adjustable limits. The evaluation and the difference between the measured value and the reference value are fed back.

During the diagnostics, the motion task independently advances and retracts the cylinder.

Leakage testing is not performed during operation; it is started separately as a test cycle.

## Benefits

Increased leakage can be caused by a critical fault (damaged tubing) or by wear and ageing of the connected components.

Regular leakage testing can therefore:

- Determine a sudden leak
- Detect wear to cylinders and valves in good time

## Scope

- For all valve positions of a Motion Terminal
- Requires a calibration run

- Not for vacuum applications
- For all types of pneumatic consumers

## Data

## Controller to the valve

- Starting diagnostics
- Terminating diagnostics
- Starting reference measurement
- Terminating reference measurement
- Exhausting

## Valve to the controller

- Detecting the status
- Change in leakage for port 2
- Change in leakage for port 4
- Evaluation of leakage at port 2
- Evaluation of leakage at port 4

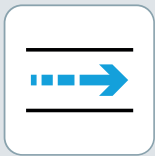
## Technical data

Repetition accuracy	[l/h]	$\pm(2+0.15 \times \text{actual leakage})$	Conditions: <ul style="list-style-type: none"> <li>• Total volume of the connected pneumatic system including tubing 0.08 ... 5 l</li> <li>• Supply pressure 0.5 ... 8 bar</li> <li>• Leakage range 0 ... 50 l/h</li> <li>• A force acting on the connected drive can amount to max. 75% of the effective pneumatic force.</li> </ul>
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Data sheet – Motion App "Positioning"

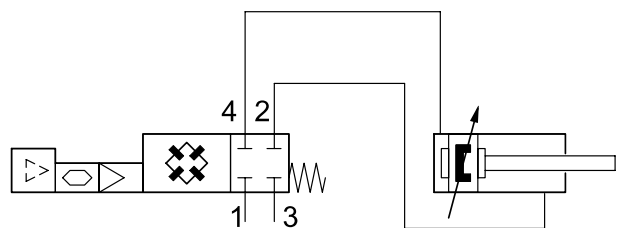
- The control algorithm moves the piston to the desired setpoint position using the parameterised dynamics
  - Licences required for the number of simultaneous usages (max. 2 licences per valve terminal)
  - Can be used on Motion Terminals with up to 4 valve slices
- Also required:

  - An analogue input module CTMM
  - Depending on the stroke, up to two displacement encoders for determining the position of the drive (the encoder(s) must be able to detect the entire range of motion of the drive)



Description

Mode of operation



Benefits

- High-speed pre-positioning
  - Controlled movement profile can be configured using parameters (e.g. high dynamic response or fast motion with gentle end stop)
- Energy-saving cylinder movement possible by lowering the pressure level via parameterisation
  - Stable in response to changes caused by wear
  - Option of presetting a final speed for tasks involving contact
- With the Motion App "Positioning" pneumatic drives can be freely positioned. Using analogue sensors to measure the piston position means that the algorithm always knows the precise position of the drive.
- Dynamic setpoints for position and maximum speed enable pneumatic positioning tasks to be highly customised. The initial teach-in run helps to ensure fast commissioning.

Data

- Controller to the valve

  - Target position
  - Max. speed
  - Move to target position
  - Stop in a controlled manner
  - Blocking
  - Exhausting
- Valve to the controller

  - Actual position
  - Drive force
  - End position reached
  - Target position reached
  - Overshooting of target position in planned path
  - Controlled stopping due to end-position violation
- Scope

  - For each individual valve position in a Motion Terminal, depending on the assignment
  - Cyclical assignment
  - In combination with position measurement of the entire range of motion
- Soft-start function

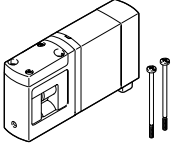
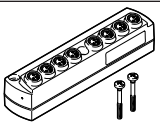

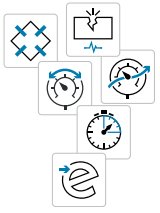
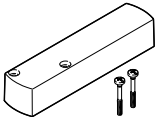
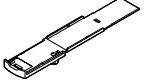
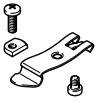
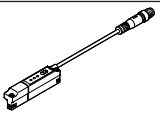
On starting the Motion App, the pressure level at the working ports is checked. If the measured pressure level is outside the specified midpressure tolerance level of  $\pm 1$  bar, the pressure level is first of all built up and the positioning movement is started once the tolerance level is reached.

If the measured pressure level is within the specified tolerance, the movement is started immediately.

Technical data			
Positioning accuracy	[mm]	Typically $\pm 1.5$	
Overshoot relative to setpoint position	[mm]	$< \pm 2.5$	
Response sensitivity (smallest set-point value change, the latest time at which the closed-loop controller responds)	[mm]	10	
		Conditions:	
		<ul style="list-style-type: none"><li>• Precision specifications are based on the measurement system (for displacement encoder requirements, see user documentation for Motion App)</li><li>• Mounting position: horizontal or vertical</li><li>• Drives supported: DSBC-...</li><li>• Cylinder lengths: 30 ... 500 mm</li><li>• Cylinder diameter: 32, 40 and 50 mm</li><li>• Tubing lengths: 1 ... 3 m</li><li>• Tubing types: PUN-8... / PAN-8...</li><li>• Supply pressure: 6 ... 8 bar(rel)</li><li>• Mid-pressure<ul style="list-style-type: none"><li>– Max. mid-pressure &lt; supply pressure (rel) – 2 bar</li><li>– Min. mid-pressure &gt; exhaust pressure (rel) + 2.5 bar</li></ul></li><li>• Cylinder diameter [mm] - Minimum mass [kg]</li></ul>	
		32	1
		40	2
		50	3

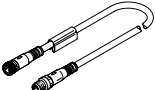


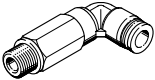


## Accessories

Ordering data			Part no.	Type	PU <sup>1)</sup>
<b>Valve</b>					
	Valve for one valve position		8047503	VEVM-S1-27-B-C-F-1T1L	1
<b>Input module</b>					
	Module with 8 inputs	Digital inputs	8047505	CTMM-S1-D-8E-M8-3	1
		Analogue inputs	8047506	CTMM-S1-A-8E-A-M8-4	1
	Cover cap for sealing unused connections	For M8 connections	177672	ISK-M8	10
<b>Motion App</b>					
	Basic package (basic Motion Apps)	<ul style="list-style-type: none"> <li>• Directional control valve functions</li> <li>• Proportional directional control valve</li> <li>• Supply and exhaust air flow control</li> <li>• ECO drive</li> <li>• Leakage diagnostics</li> </ul>	–	–	–
	Directional control valve functions		8070377	GAMM-A1	1
	Proportional directional control valve		8070378	GAMM-A2	1
	Proportional pressure regulation		8072609	GAMM-A3	1
	Model-based proportional pressure regulation		8087394	GAMM-A4	1
	Supply and exhaust air flow control		8072611	GAMM-A5	1
	ECO drive		8072612	GAMM-A6	1
	Presetting of travel time		8072613	GAMM-A7	1
	Selectable pressure level		8072614	GAMM-A8	1
	Flow control		8143568	GAMM-A10	1
	Soft Stop		8072615	GAMM-A11	1
	Leakage diagnostics		8072616	GAMM-A12	1
	Positioning		8116173	GAMM-A33	1
<b>Accessories</b>					
	Cover plate for a valve position or input module position		8047504	VABB-P11-27-T	1
	Identification holder for a valve		8047501	ASCF-H-P11	4
	H-rail mounting		8047542	VAME-P11-MK	1
<b>Position sensor</b>					
	Analogue sensor for VTEM input module	Sensing range 0 ... 50 mm	8050120	SDAP-MHS-M50-1L-A-E-0.3-M8	1
		Sensing range 0 ... 100 mm	8050121	SDAP-MHS-M100-1L-A-E-0.3-M8	1
		Sensing range 0 ... 160 mm	8050122	SDAP-MHS-M160-1L-A-E-0.3-M8	1

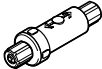


1) Packaging unit

## Accessories

Ordering data			Part no.	Type	PU <sup>1)</sup>
Connecting cable			Data sheets → Internet: nebu		
	Modular system for a choice of connecting cables	Cable length 0.1 ... 30 m	539052	NEBU-... → Internet: nebu	–
	<ul style="list-style-type: none"><li>Straight plug, 4-pin</li><li>Straight socket, M8x1, 4-pin</li></ul>	Cable length 2.5 m	554035	NEBU-M8G4-K-2.5-M8G4	1
Push-in fitting, straight			Data sheets → Internet: qsm		
	Connecting thread M5 for tubing O.D.	4 mm	★ 153315	QSM-M5-4-I	10
	Connecting thread M7 for tubing O.D.	6 mm	★ 153321	QSM-M7-6-I	10
	Connecting thread G1/8 for tubing O.D.	4 mm	★ 186095	QS-G1/8-4	10
			132036	QS-G1/8-4-100	100
		6 mm	★ 186096	QS-G1/8-6	10
			132037	QS-G1/8-6-100	100
		8 mm	★ 186098	QS-G1/8-8	10
			132038	QS-G1/8-8-50	50
	Connecting thread G3/8 for tubing O.D.	10 mm	★ 132999	QS-G1/8-10-I	10
		8 mm	★ 186111	QS-G3/8-8-I	10
		10 mm	★ 186113	QS-G3/8-10-I	10
		12 mm	★ 186114	QS-G3/8-12-I	10
16 mm		★ 186347	QS-G3/8-16	1	
Push-in fitting, angled			Data sheets → Internet: qsl		
	Connecting thread M5 for tubing O.D.	4 mm	130831	QSMV-M5-4-I	10
	Connecting thread M7 for tubing O.D.	6 mm	★ 186353	QSMV-M7-6	10
	Connecting thread G1/8 for tubing O.D.	4 mm	★ 186116	QSL-G1/8-4	10
			132048	QSL-G1/8-4-100	100
		6 mm	★ 186117	QSL-G1/8-6	10
			132049	QSL-G1/8-6-100	100
		8 mm	★ 186119	QSL-G1/8-8	10
			132050	QSL-G1/8-8-50	50
	Connecting thread G3/8 for tubing O.D.	8 mm	★ 186121	QSL-G3/8-8	10
		10 mm	★ 186123	QSL-G3/8-10	10
12 mm		★ 186124	QSL-G3/8-12	10	
Push-in fitting, angled, long			Data sheets → Internet: qsl		
	Connecting thread G1/8 for tubing O.D.	4 mm	186127	QSL-G1/8-4	10
			133015	QSL-G1/8-4-100	100
		6 mm	186128	QSL-G1/8-6	10
			133016	QSL-G1/8-6-100	100
		8 mm	186130	QSL-G1/8-8	10
			133017	QSL-G1/8-8-100	100
	Connecting thread G3/8 for tubing O.D.	8 mm	186132	QSL-G3/8-8	10
		10 mm	186134	QSL-G3/8-10	10
		12 mm	186135	QSL-G3/8-12	10

1) Packaging unit

## Accessories

Ordering data			Part no.	Type	PU <sup>1)</sup>
Vacuum filter					
	Inline filter inserted in tubing line for tubing O.D.	4 mm	535883	VAF-PK-3	1
		6 mm	15889	VAF-PK-4	1
		8 mm	160239	VAF-PK-6	1
Blanking plug					
	For sealing unused connections	M5 thread	★ 3843	B-M5	10
		G1/8 thread	★ 3568	B-1/8	10
		G3/8 thread	★ 3570	B-3/8	10
Silencer					
	For M7 thread	161418	UC-M7	1	
	For thread G3/8	★ 6843	U-3/8-B	1	

1) Packaging unit

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