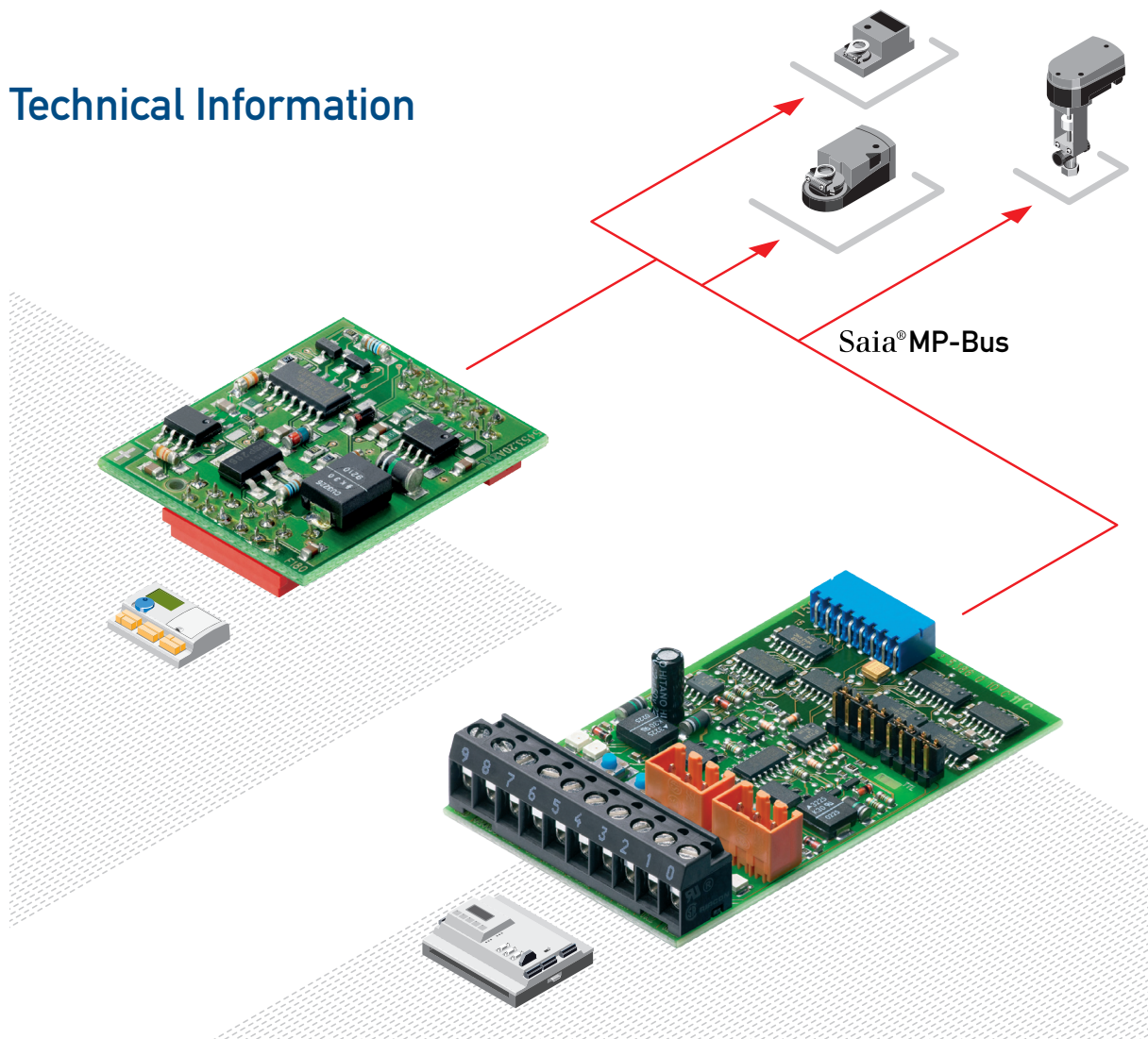


Technical Information



MP-Bus-Interface – for BELIMO® damper actuators

Controls Division

Direct connection of actuators and sensors in network technology

Networking of field devices with Saia® DDC-PLUS...

...not only reduces construction costs, but also gives high functionality and economical operation. This is achieved with, among others, the PCD2.T500 or PCD7.T180 MP-Bus modules, which exchange data between BELIMO® damper actuators and the building management technology

- Software support for setting parameters and triggering the damper actuators.
- Information calling on current valve settings, actuator status, number of movements, etc.
- Higher order networking via Saia® S-Bus (RS 485), EIB, PROFIBUS DP/FMS, LONWORKS® or Ethernet TCP/IP.
- Intervention close to process with one of many Saia® operator terminals.
- Telecommunication via one of the integral analogue or digital modem modules.
- Building management by Saia® ViSi-PLUS or other visual display system.

Characteristics of the MP-Bus protocol

- No special cable or line termination resistors
- Costs saved due to reduced expenditure on cabling and easy handling
- Simple commissioning and maintenance
- Uncomplicated method for integrating and exchanging actuators
- Compatible with BELIMO® actuators using MFT/MFT2 technology

PCD2.T500/PCD7.F180 connection modules

- Interface for a variety of devices and requirements
- Integration of up to 16 actuators and sensors per PCD2.T500 connection module
- Direct service unit coupling for BELIMO® parameter setting device: the MFT-H
- Comprehensive software library for the greatest variety of damper actuator families

MP-Bus design

The field bus was specially developed by BELIMO® for MFT and MFT2 actuators (MFT=multi-functional technology). Saia-Burgess Controls has developed two different connection modules to integrate it within the overall control architecture.



An MP-Bus network (MP=multi-point) consists of a 3-wire cable linking the connection at the automation system or controller to the damper actuators. Up to 8 actuators can be connected to one communications channel. The overall length of each branch of the network depends crucially on the choice of cable type and on

the number and type of actuators connected. Generally, an overall length of approx. 100 m is attained. Since there

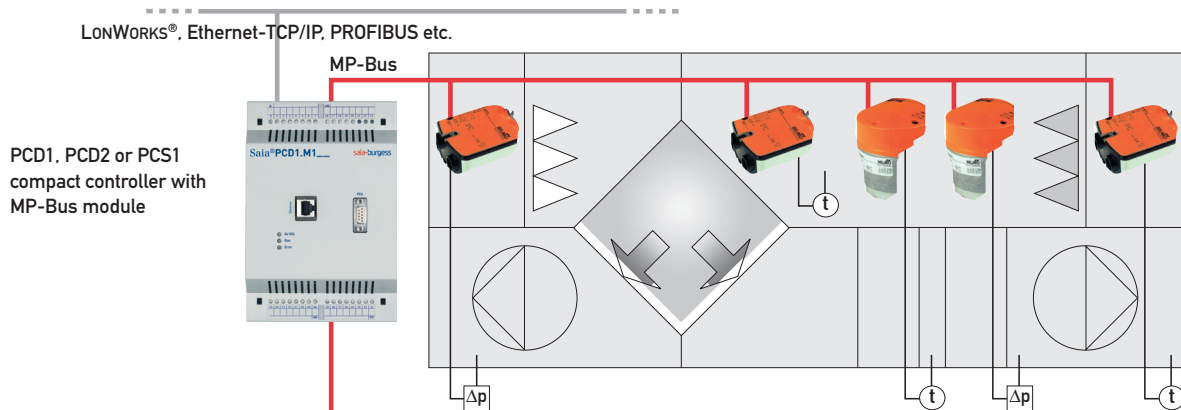
is a limit to the length of the link and the number of actuators, there are no other requirements of bus topology, such as line termination resistors or screened cable.

Direct sensor connection

In addition, further information can be sent to the connected actuators directly via actuator or add-on modules on the MP-Bus. The following are supported

- passive sensors,
- active sensors and
- 2-point input/output signals.

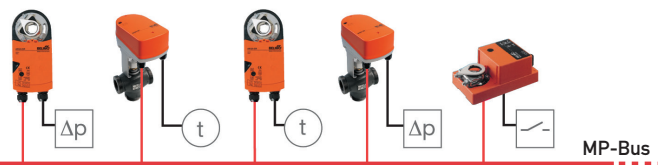
The direct connection to an MFT/MFT2 actuator of conventional sensors for humidity, temperature, etc., and of automatic contactors and switches, gives analogue sensors bus capabilities. This simple solution saves the use of expensive, bus-compatible sensors and significantly reduces cabling.



PCD1, PCD2 or PCS1 compact controller with MP-Bus module

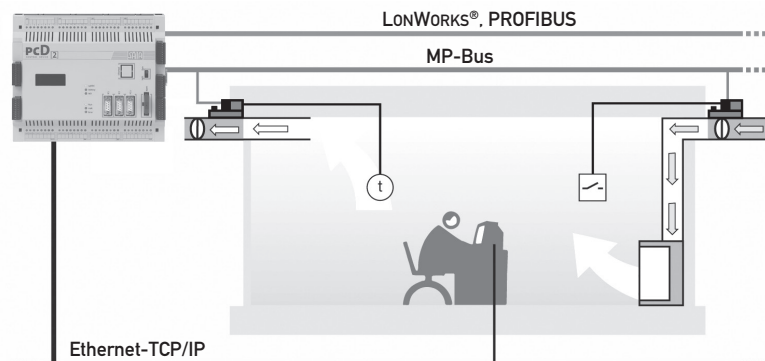
OEM applications

With compact forms of application in particular, the MP-Bus can lead to cost savings. Up to 16 actuators and sensors can be run on one bus segment through the MP-Bus. All accesses to MP-Bus information by higher ranking bus systems, such as LONWORKS® or Ethernet TCP/IP, are thereby ensured.



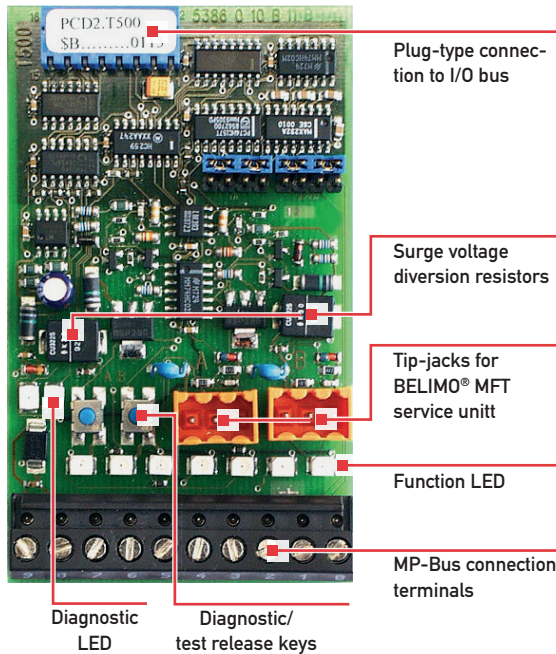
Field applications

Due to the minimal cabling requirements, field actuators can be triggered in areas as individual damper actuators, valves, VAV regulation, fire prevention technology. From planning to commissioning, the efficient MP-Bus network is extremely simple to use.



PCD2.T500 connection module

PCD2.T500 connection module



- Connection module for PCD1/PCD2 automation systems
- Can be plugged onto an I/O module socket
- 2 RS232 or TTL communications channels
- 2 actuator connection channels, each for 8 MFT/MFT2 actuators and sensors
- Connection of very wide variety of sensors: passive and active sensors, 2-point sensor on actuator
- Integral monitoring of actuator function
- Extremely easy service check

Communications signals

The PCD2.T500 module serves as an interface between the automation system (DDC-PLUS) and the MFT/MFT2 damper actuators from BELIMO Automation AG. The module can actuator up to two branches (bus connections) each having eight connected actuators. Each branch can be run asynchronously, independently of each other. To run both branches independently, the automation system will also require two logical communications channels (RS232/TTL). However, if required, both branches can also be run on only one logical communications channel.

Data exchange is asynchronous and runs at 1200 pulses/second. The automation system leads the network as the “master”. The actuators have been designed as “slaves” and only communicate when instructed to do so by the master.

Controls on PCD2.T500

Tip-jacks for MFT parameter setting unit from BELIMO®

When the cover is removed from the controller, branches A and B can be provided with tip-jacks that allow connection of an MFT parameter setting unit from BELIMO®. As soon as the device is plugged in, the communications connection will automatically switch over from the connection module to the parameter setting unit. The controller is simultaneously informed of this fact, to avoid the appearance of a break in communications.

There are the following parameterization devices of BELIMO®:

- Manual Control Unit MFT-H
With its own power supply/
batteries
- PC-Tool MFT-P
With the adapter ZIP-RS232

Diagnostic and test release keys

For each branch a control key has been provided that triggers the start of a test for fault-free communications with all connected actuators.

Diagnostic LED

To the left of these keys are two LEDs (branch A on the left, branch B on the right) which, in association with the keys, indicate the result of a completed diagnosis. If a connected, addressed actuator does not communicate correctly with the PCD master station, the LED flashes. The number of flash signals matches the bus address of the actuator. They are repeated 5 times, with interruption.

Function LED

These LEDs are visible even when the cover is closed and indicate the following states:

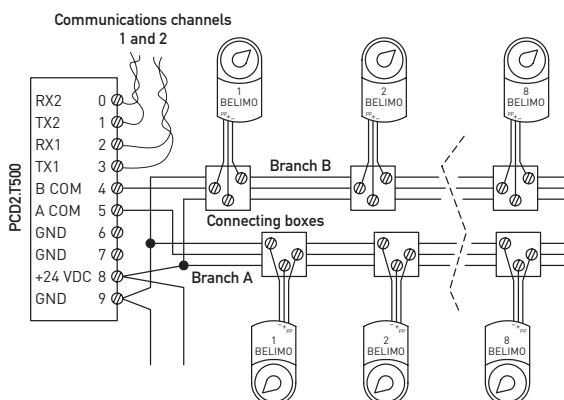
LED	off	on
0	Channel 1 = Branch A Channel 2 = Branch B	Channel 1 = Branch B
1	Branch A is switched on	Branch A is switched off
2		Transmit signals at branch A
3		Transmit or receive signals at branch A
4	Branch B is switched on	Branch B is switched off
5		Transmit signals at branch B
6		Transmit or receive signals at branch B

Base address

The PCD2.T500 module can be slotted into any I/O module socket on the PCD1/PCD2. The base address of the socket is required for software linking in the function boxes. For ease of wiring, it is recommended to choose a socket near to the communications ports.

PCD2.T500 connection and wiring

Connection and wiring



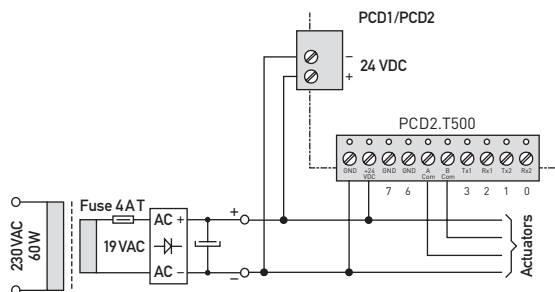
Terminal	Designation	Description
0	RX2	Receive line Communications channel 2
1	TX2	Transmit line Communications channel 2
2	RX1	Receive line Communications channel 1
3	TX1	Transmit line Communications channel 1
4	B Com	Communication branch B
5	A Com	Communication branch A
6	-	Earth connection for actuators, branches A and B
7	-	Earth connection for actuators, actuators branches A and B
8	+24 VDC	Module supply +
9	GND	Module supply - and earth connection

The supply voltage of the PCD1/PCD2 automation system is generally used to supply the PCD2.T500 module. However, if preferred an external power source can also be used to supply the module and/or actuators. The following demands are placed on the supply voltage:

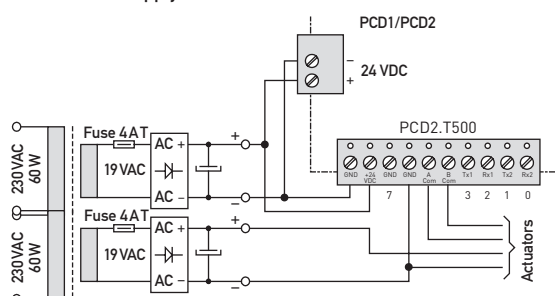
- 24 VDC $\pm 20\%$ smoothed or
- 19 VAC $\pm 15\%$ with full-wave rectifier and smoothing capacitor 10000 μ F/40V

Supply possibilities

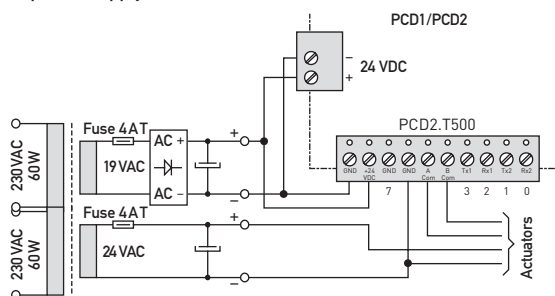
Common supply for controller and actuators



Individual DC supply for controller and actuators



Separate supply of actuators with 24 VAC



BELIMO® actuators available for MP-Bus

Drive family	MFT	MFT2	Function box	Drive function
NM..	X	X	Air	Damper actuator, dampers to approx. 1.5 m ²
AM..	X	X	Air	Damper actuator, dampers to approx. 3.5 m ²
GM..	X	X	Air	Damper actuator, dampers to approx. 6 m ²
LF..	X	X	Air	Damper actuator with spring return, dampers to approx. 0.8 m ²
AF..	X	X	Air	Damper actuator with spring return, dampers to approx. 3 m ²
BF24TL	from summer 02		FS	Safety actuator for fire prevention dampers, 90° rotation
NMV-D2M	X		VAV	Compact air volume flow regulator
NV..	X	from summer 02	Linear	Vertical lift valve actuators
NVF..	X	from summer 02	Linear	Vertical lift valve actuators with safety function
AV..	from summer 02	from summer 02	Linear	Vertical lift valves from nominal diameter DN 65

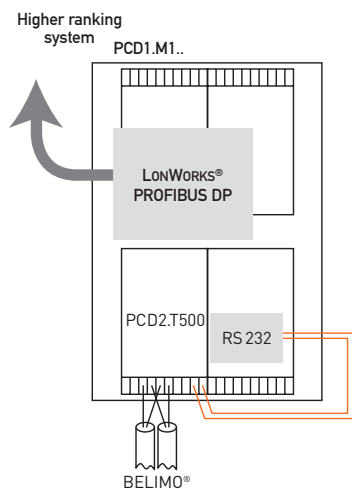
Difference between MFT and MFT2 actuators

MFT actuators allow the direct connection of active 0..32VDC sensors or digital 0/1 signals.
MFT2 actuators allow the additional connection of passive 100 Ω ...60k Ω sensors.

PCD2.T500 configuration possibilities

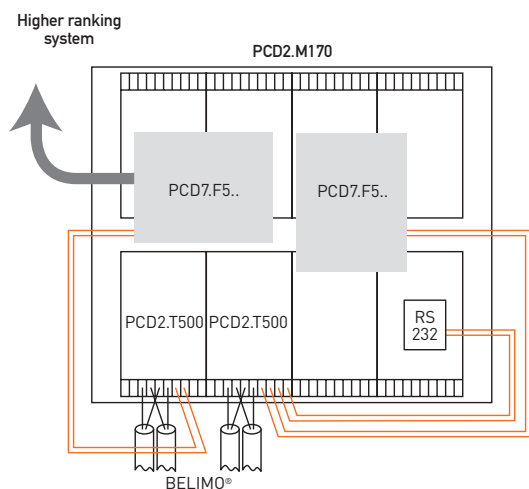
Data exchange with DDC-PLUS systems

Configuration example 1 with PCD1.M1..



- PCD1.M1.. base unit
- Connection module assigned 1×RS232 communications interface (PCD7.F120 at space A) and 2 MP-Bus branches
- Gateway to other, higher ranking networks

Configuration example 2 with PCD2.M170



- PCD2.M170 base unit
- Connection module A assigned 1×RS232 communications interface and 2 MP-Bus branches
- Connection module B assigned 2×RS232 communications interfaces and 2 MP-Bus branches
- Gateway to other, higher ranking networks

Data exchange with DDC-PLUS systems

Every connection module (PCD2.T500 or PCD7.F180) needs an RS 232 serial port for communication with the master station. On the PCD2.T500 connection module, this port must be wired manually from the chosen PCD communications interface.

The PCD2.T500 connection module has two actuator branches (channel A and channel B) that can run both on one or two RS232 transmission interfaces. The RS232 interface connection at port 1 (terminals 2 and 3) will be for the first actuator branch and the RS232 interface at port 2 (terminals 0 and 1) will be for the second actuator branch.

In projects that only have one RS232 transmission interface within the PCD, both actuator branches (max. 16 actuators) can run on it. This involves a multiplexing process that switches between the two actuator branches. The fundamental rule applies that the more actuators are operated on one RS232 serial transmission interface, the greater the load per branch.

Caution! In multiplex operation the communications times of all actuators on both branches must be added together to obtain the overall cycle time. See also the examples below.

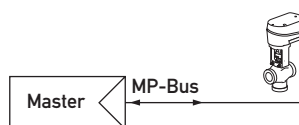
Communications times for MP-Bus

For each instruction transmitted via the bus, an average communications time of approx. 150 milliseconds is required (a command always consists of an instruction and an answer). The following values are identical for both damper and valve actuators.

1. Example with one MFT(2) actuator

- The master sends a setpoint to the MFT(2) actuator (1st command).
- The master reads the actual value from the MFT(2) actuator (2nd command).

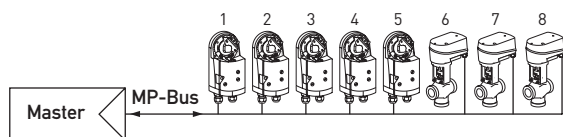
The entire communications process therefore comprises 2 commands of 150 ms = approx. 300 ms.



2. Example with two MFT(2) actuators

- The master sends one setpoint each to MFT(2) actuators 1...8 (total commands: 8).
- The master reads actual values from the MFT(2) actuators (total commands: 8).

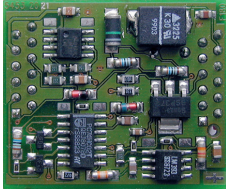
The entire communications process therefore comprises 16 commands of 150 ms = approx. 2.4 s



PCD7.F180 connection module

Number of actuators and interfaces

PCD7.F180 connection module



Utilization is possible on the following automation systems:

- PCS1 compact controller
- System PCD1 at space A (without PCD1.M110)
- System PCD2 at space A (without PCD2.M110)
- System PCD4 at space A1/A2/A3 of PCD4.C340 bus module (without PCD4.M110)
- System PCD6 at space A0/A1/A2/A3 of ..M500 processor module

This module has the possibility of connecting an MP-Bus branch with 8 actuators and sensors.

In contrast to the PCD2.T500, this module does not offer any operator, diagnostic or service capabilities. The module was designed for use with the compact controller. Due to the smaller number of connectable actuators and the lack of additional functions, Saia recommends use mainly with the PCS1 compact controller.

The functional connection to the software library is across the “single master box”. This carries out interface configuration and initialization.

PCD7.F180 connection and wiring

Connection to PCD1/PCD2 via port 1

Terminal	Symbol	Description
0	–	GND (Branch A–)
1	A COM	MP-Bus signal line (18V in/out)
2	.MFT	MFT programming unit (MP-Bus internal)
3	.IN	MFT programming unit detection (input 10 kΩ, Z5V1)
4	GND	Earth connection, MFT programming unit
5	–	GND
6...9		not used

Connection to PCS1 compact controller via the X4 interface (port 1)

Terminal	Symbol	Description
0	–	GND (Branch A–)
1	A COM	MP-Bus signal line (18V in/out)
2	.MFT	MFT programming unit (MP-Bus internal)
3	.IN	MFT programming unit detection (input 10 kΩ, Z5V1)
4	GND	Earth connection, MFT programming unit

Additional information regarding use with the PCS1 compact controller can be obtained from Technical Information 26/545.

Supply of actuators with PCD7.F180 module

The internally supplied interface card can make an additional supply necessary for the actuators. When actuators have a separate supply with DC or AC voltage, particular care should be taken to link the PCD control unit’s earth connection to the actuator supply’s earth (negative pole). The earth serves as a common base during communication.

Supply of the PCD control unit

When the PCD7.F180 connection module is used, a minimum requirement of 24 VDC ±5% applies for the PCD control unit’s supply voltage, rather than the standard tolerance of ±20%.

Possible number of actuators and interfaces

Series	Type	RS 232 interfaces available	MP-Bus branches ¹⁾	Actuators ¹⁾
PCS1	–	–	– / 1	– / 8
PCD1	..M110	1	2 / 1	16 / 8
	..M120/..M130	1	2 / 1	16 / 8
PCD2	..M110	1	2 / 1	16 / 8
	..M120/..M150	3	6 / 1	48 / 8
	..M250	3	6 / 1	48 / 8
	..M170	5	10 / 1	80 / 8
PCD4	..M110	–	–	–
	..M125 ²⁾	1	– / 1	– / 8
	..M145/..M445 ²⁾	3	– / 3	– / 24
	..M170 ²⁾	3	– / 3	– / 24
PCD6	..M300	4	– / 4	– / 32

¹⁾ max. number with PCD2.T500 / max. number with PCD7.F180

²⁾ together with the PCD4.C340 combined CPU bus module

Function blocks for BELIMO® MP-Bus

Saia-Burgess Controls provides an appropriate function box (FBox) for all actuator types available from BELIMO®. To enable the actuator to be correctly initialized and addressed by the master, the FBox necessary for that actuator family must be used.

Depending on the choice of module, the appropriate master box can be selected with the driver information. The “BELIMO Duplex Master” master box supports the PCD2.T500 module with 2 output channels for MP-Bus branches A and B. The “BELIMO Single Master” master box is used for the PCD7.F180 module. It supports up to 8 actuators and sensors.

Within a PCD system several ..T500 modules can be used, but always depending on the available communications channels.

Each actuator needs the FBox that has been provided for its own product family. This FBox will be given the corresponding MP-Bus number (1...8) of the actuator, thereby identifying individual stations on the bus.

Initialization of communication

Each time the controller starts up, connections to individual actuators are checked. If an individual actuator does not respond, it is declared “off-line” and the corresponding FBox announces the error message.

In the “BELIMO Duplex Master” and “BELIMO Single Master” FBoxes, a preselected “new initialization time” defines in seconds the time interval for connection checking in branches A and B.

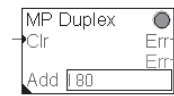
Library of “BELIMO® MP-Bus” function blocks for the PG5/PG4 programming tool

The FBox (function block) library for MP-Bus connection modules can be downloaded free of charge from the Saia-Burgess Controls homepage:

www.sbc-support.ch

Master FBoxes

Duplex Master Box



Can be used for the PCD2.T500 connection module. The FBox is addressed with the base address entered in address field “Add”, according to the module socket on the PCD (e.g. 180).

Single Master Box



Can be used for the PCD7.F180 connection module. No additional addressing is required. Initialization of the interface takes place directly through space A.

The “Clr” (Clear) input allows all errors to be deleted, as long as they are no longer current, and acknowledges the binary error signal .

The first “Err” output (error output binary) indicates a fault within an MP-Bus branch that is connected to the connection module.

The second “Err” output (error output numeric) indicates the error code that has been determined by the FBox.

For each FUPLA file, only one master box may be used. If more PCD2.T500 connection modules are used on a PCD, each should have its own FUPLA file created.

Description of error codes for master FBoxes

Error code output	Representation within the FBox	Description
0	OK	No error present
1	SASI	SASI error: it has not been possible to initialize the serial port
2	Diagnostic	Diagnostic error in firmware
3	Overflow	Telegram buffer overflow
11	CRC	Telegram checksum error
12	Cross parity	Cross-parity control error
13	Start byte	Invalid start byte received
21	No card echo	Module not recognized
22	No response	No telegram activity on the MP-Bus
23	Timeout	No telegram response within the defined timeout

Parameter adjustment for master FBoxes

Channel definition of available branches

- Definable physical communications channels for actuator branches A and B
- Timeout for receipt of actuator telegrams
- Initialization of communications with each actuator (new initialization time)
- Time to wait until actuator identification is received during actuator commissioning (keypress maximum time)

On-line addressing

Preset actuator address (1...8 per branch). After identification, communication takes place using this number. Bus station address numbers correspond to the FBox numbers of individual actuators.

Adaption function

The "start adaption function" gives the actuator the instruction to approach final positions and to remember them. When the function is complete, the actuator recognizes its precise position.

If these positions are not reached or are overshoot during normal operation, the appropriate actuator function box will announce the fact with an alarm message.

Automatic addressing

Automatic addressing of an MP-Bus station is triggered with the "Set Keypress" instruction (see also "Keypress maximum time"). The waiting time can be cancelled with "Abort".

Identification number

Actuator identification comprises 4 parts (see details below). These can be read on-line from the actuator with the "Set Keypress" instruction, or by manual entry (acknowledge with "Set Address"). Prior to newly addressing an actuator, the correct or desired bus address (module address) must be set.

Meaning of actuator serial numbers (identification numbers)

Example: 09939-31234-064-008

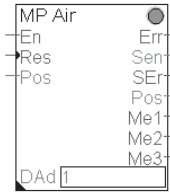
Part 1	09939	Year and week of manufacture (3 digits for year / 2 for week YYYY/WW)
Part 2	31234	Day and serial number (2 digits for day / 3 for serial number DDNNN)
Part 3	064	Identification of device family (FFF)
Part 4	008	Testing station (BELIMO® control number / CCC)

Error counter and description

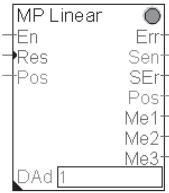
- Information on error frequency in branch A and B
- Error type for most recent event

Drive FBoxes

Parameters of Air and Linear FBoxes for actuators



For rotary damper actuators



For linear valves

Inputs

- En** Enables the box. The FBox is polled cyclically with input value 1.
- Res** Deletes all error messages.
- Pos** Input for desired position (0 = 0 % / 1000 = 100 %)

Outputs

- Err** Binary output for communications errors
- Sen** Sensor value. As a pre-scaled °C value, ohmic resistance, 0...32V or switch signal (Switch). Selectable by FBox menu.
- Pos** Actual position reading of actuator as 0...100% (value 0...1000). Does not act on manual adjustment of actuator!

Error or service messages

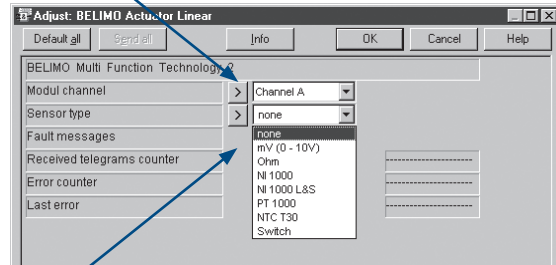
- SER** Sensor Error: The passive sensor selected via menu functions has not been recognized (sensor faulty).
- ME1** Stop and Go: Indicates pendulum-type operation (erratic control behaviour).
- ME2** Control Range Increased: The control range has been massively increased or a stored value has been massively overshoot.
- ME3** Position Not Reached: Desired position not reached (e.g. due to mechanical influence).

Address

- DAd** Address number of station on bus (1...8)

Parameter description of Air and Linear FBoxes for actuators

Choice of branches (A or B) on which the actuator is used.



Choice of sensor for output in °C, purely as resistance value, switch or signal 0...32000 for 0...32VDC sensor

Telegram information

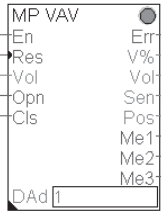
- Counter for telegrams received
- Error counter
- Display of error type

Description of error codes for actuator FBoxes

Display within FBox	Error description
OK	No errors present
Timeout	No response telegram received within defined timeout
Module type	Type of actuator connected does not match the chosen FBox
Sensor type	Sensor connected does not match the chosen sensor type
Unknown telegram	An unrecognized telegram has been received from an actuator.

Drive FBoxes

Parameters of FBox VAV for compact air volume flow regulator (NMV-D2M)



Inputs

- En** Enables the box. The FBox is polled cyclically with input value 1.
- Res** Deletes all error messages.
- Vol** Setpoint for volume
Input as signal 0...1000. The signal corresponds to triggering between the threshold values Vmin and Vmax. Vmax represents the upper limit and corresponds to input signal 1000.
- Opn** Forced control open
The actuator, s desired position set at input "Vol" is overshoot. The actuator goes to the open position.
- Cls** Forced control closed
The actuator, s desired position set at input "Vol" is overshoot. The actuator goes to the closed position.

Outputs:

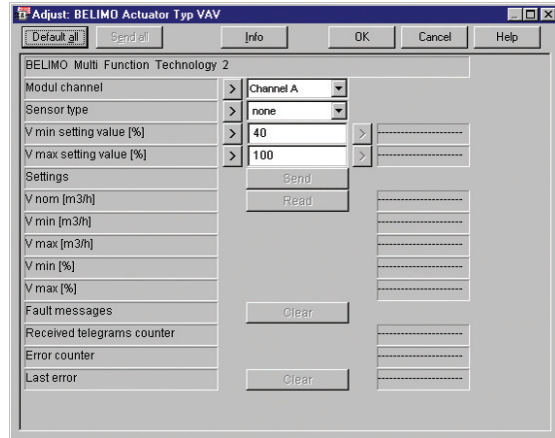
- Err** Binary output for communications error
- V%** Actual value of the air volume as % of the air volume regulator's nominal volume.
- Vol** Air volume flow display in m³/h
For further use by displays or visual display systems.
- Sen** Sensor value. As a pre-scaled °C value, ohmic resistance, 0...52V or switch signal (Switch). Selectable by FBox menu.
- Pos** Actual position reading of actuator as 0...100 % (value 0...1000). Does not act on manual adjustment of actuator!

Error or service messages

- ME1** Stop and Go: Indicates pendulum-type operation (erratic control behaviour).
- ME2** Control Range Increased: The control range has been massively increased or a stored value has been massively overshoot.
- ME3** Position Not Reached: Desired position not reached (e. g. due to mechanical influence).

Address

- DAd** Address number of station on bus (1...8)



Parameter description of FBox VAV

By using the "Read" function in this FBox, volume values that have been programmed in the volume flow regulator can be read as percentages of nominal volume. If necessary, the operating values (Vmin and Vmax) of the air volume flow regulator can also be reprogrammed via the FBox. This is achieved by entering the values required, confirming with a mouse click on the right-arrow button > and using the "Send" instruction.

Important: Both values (Vmin and Vmax) will always be transmitted.

The following limits should be noted during any reprogramming: Vmax = 30...100 %, Vmin = 0...80 %

The following additional important operational data can be read from the FBox at any time as on-line values:

- Vnom in m³/h** Maximum possible air volume flow for which volume flow regulator is designed
- Vmin in m³/h** Currently programmed lower rating
- Vmax in m³/h** Currently programmed upper rating
- Vmin %** Currently programmed lower rating as percentage of Vmax.
- Vmax %** Currently programmed lower rating as percentage of Vnom.

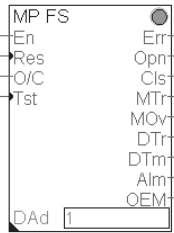
Special FBoxes

FS FBox for fire protection actuators ¹⁾

This function box (Fire and Smoke) is used for BF24TL fire protection actuators. The actuators can be addressed in the same way as any of the installation's normal dampers: within the MP network, via the master box.

For safety reasons it is generally recommended to run fire protection valves on a dedicated actuator branch!

¹⁾ Please consider your local regulations for fire protection before use.



No additional sensors or transmissible signals may be integrated on fire protection actuators. The exception to this rule is an optional smoke alarm. Further information about connection and wiring possibilities can be obtained from the relevant BELIMO® documentation.

Test function

The functioning of fire protection dampers can be tested by the controller using the “Tst” input or the internal test button. A test comprises opening the damper, during which the damper runs through its entire angle range to both end stops. When the upper end stop is reached (open) the overriding “Open/Close” instruction applies once again. At the beginning of the test run, any pending error messages, such as “Increase regulating distance” (MTr), “Overload” (MOv) or “Damper direction” (DTr) will be checked and deleted. If anything prevents the actuator from reaching the required end position, the “Overload” (MOv) error message will be set once the nominal running time has been exceeded.

Inputs

- En** Activates the box. The FBox is polled cyclically at Input value 1.
- Res** Deletes all error messages.
- O/C** Opens or closes the actuator to the adapted end positions of the angle of swing.
- Tst** Triggering this input initiates a fire protection test run (see also description of test function).

Application concept (emergency shut instruction via MP-Bus)

- Actuators must be the same for all fire prevention dampers connected on any one branch (8 actuators).
- Remote 230 VAC supply (advantage: possibility of querying status via MP-Bus after an emergency shut)

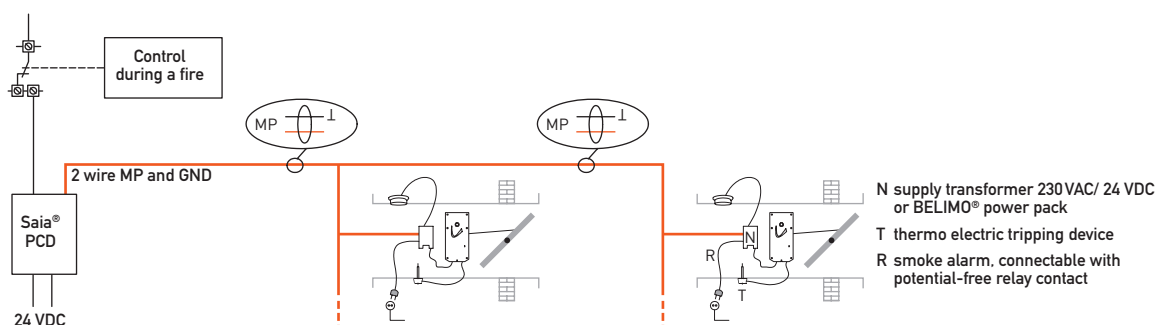
Outputs

- Err** Binary output for errors in communication.
- Opn** The actuator is in the open position.
- Cls** The actuator is in the closed position.
- MTr** Regulating angle exceeded. The actuator's angle of swing has been exceeded by more than 10° compared with the stored position for the angle of swing (adaption). Possible causes: broken rod assembly or loose connection between actuator and mechanical parts.
- MOv** Overload. The actuator's angle of swing has been massively reduced compared with the stored position for the angle of swing (adaption). The actuator fails to reach the desired position set for it. Possible cause: foreign body in air channel. This error also occurs when the actuator's mechanical limit stop fails to switch in the closed position.
- DTr** Damper direction error. If the damper is in the open position, the actuator runs the damper once every 24h slowly with spring power and the motor brake back for 7s and then opens it again using motor power. If the angle of swing travelled by the actuator during this time is less than 5° an error message occurs.
- DTm** Internal channel temperature too high. The “BAE” thermoelectric trip in the air channel has been triggered. This means that the temperature of the channel has exceeded 72°C.
- Alm** Smoke alarm. The optionally connected smoke alarm has responded.
- OEM** This fault has safety relevance. It includes the following events: ambient temperature above 72°C or motor temperature above 85°C. Both events trigger error signalling. The actuator goes into the closed position using spring power. This message cannot be reset. The actuator must be replaced!

Safety watch dog

As soon as the PCD/PCS1 control station sends the actuator an adjustment instruction, bus monitoring will be activated in the actuator. When monitoring has been activated, the actuator requires an adjustment instruction within 60s. If no commands have been received by the operating actuator after more than 60s, the damper closes.

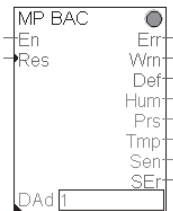
- Each actuator is supplied in situ with 24 VAC from a BELIMO® power pack, i.e. the MP-Bus here comprises 2 wires only.
- The lengths of MP-Bus lines can be ignored.



Special FBoxes

BAC FBox for digital sensors, types B-DP-T and B-DP-T-H

These sensors can be used in air treatment equipment: type B-DP-T for measuring temperature and differential pressure; type B-DP-T-H for measuring temperature, differential pressure and relative humidity.



Inputs

- En** Activates the box. The FBox is polled cyclically at Input value 1.
- Res** Deletes all error messages.

Outputs

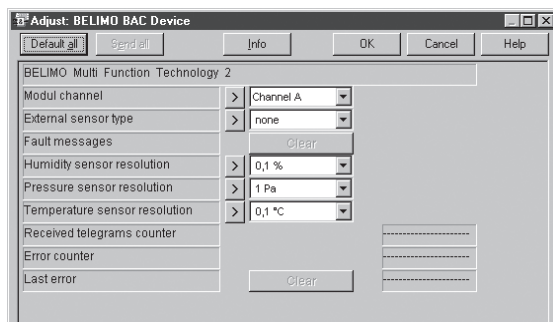
- Err** Binary output for errors in communication.
- Wrn** Warning. This signal indicates that one of the sensor values is outside normal parameters. Verification or clearing is necessary.
- Def** The device is faulty and must be replaced.
- Hum** Humidity value. Relative humidity is indicated between 0...100 %. Signal resolution is selectable in the FBox.
- Prs** Differential pressure measurement. The range of measurement is 0...3200 Pa. Signal resolution is selectable in the FBox.
- Tmp** Temperature measurement. The range of measurement is -50...+50°C, with display directly in °C. Signal resolution is selectable in the FBox.
- Sen** Sensor value. As prescaled °C value, ohmic resistance, 0...10V or switch signal. Selectable by FBox menu.

Error or service messages

- SEr** Sensor error: The sensor selected via menu functions has not been recognized (sensor faulty).

Address

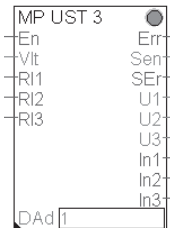
- DAd** Address number of drive on bus (1...8)



Adjust window for the BAC FBox

Description FBox UST

This FBox is used in association with the UST-5 device from BA Consulting. The UST-5 can be used to send additional analogue or digital signals from or to field devices on the MP-Bus. The FBox enables the device's physical inputs to be configured directly.



The following outputs and inputs are available for hardware components:

- 3 potential-free relay switching outputs for breaking capacities up to 230VAC/3A
- 1 analogue output, 0...11VDC
- 2 analogue inputs, 0...11VDC, one of which can be alternatively configured for direct resistance measurement in the range 0...262 kW (FBox configuration "Sensor type input 2")
- 3 digital inputs for potential-free contacts, one of which can be alternatively configured as an additional 0...11VDC analogue input (FBox configuration "Sensor type input 3")

For device commissioning and function, see also manufacturer's documentation.

Inputs

- En** Activates the box. The FBox is polled cyclically at Input value 1.
- Vlt** Drive voltage 0...11V (value 0...1100) for output U_a

RI1/2/3 Relay switching outputs

Outputs

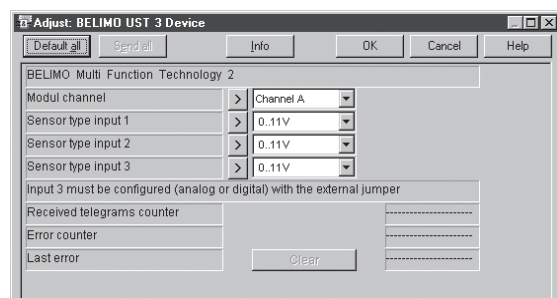
- Err** Binary output for errors in communication
- Sen** Sensor value. Ohmic resistance or 0...11V. Selectable by FBox menu.
- U1/2/3** Voltage signal of analogue inputs for the appropriate configuration (0...1100 corresponds to 0...11V)
- In1/2/3** Binary signal for digital inputs S1, S2 and S3 (S3 only when configured accordingly)

Error or service messages

- SEr** Sensor error: The sensor selected via menu functions has not been recognized (sensor faulty).

Address

- DAd** Address number of actuator on bus (1...8)



Adjust window for the UST FBox

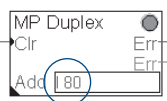
Commissioning procedure

Requirements prior to commissioning

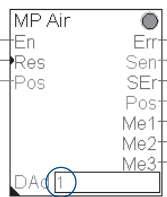
- The connection module must be installed and correctly wired.
- The actuators and any sensors must be installed according to BELIMO® specifications.
- The program structure must be present and ready for operation; the controller must be in “RUN” mode.

Software commissioning

1. Master FBox selection (duplex or single, depending on the connection module), at “Duplex Master Box” enter module base address in the “Add” address field, e.g. 180 (definition as input or output is not significant).



2. Selection of the appropriate actuator FBoxes. To determine the correct FBox for each actuator, see table “BELIMO® actuators available for MP-Bus” on page 4.
3. Assignment of MP address within the actuator FBox in the “DAd” field (1...8 addresses allowed per branch, duplicate addressing not possible).



4. Adjustment of parameters in the master FBox:

Serial channel A:

Choice of PCD communications interface for the channel A actuator branch

Serial channel B:

Choice of PCD communications interface for the channel B actuator branch. If only one RS 232 interface is available for both branches the setting will be “As channel A”. If only one channel is required, the setting will be “Disabled”.

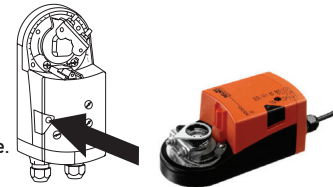
5. MP addressing of actuators (semi-automatic or manual) can only take place on-line, on the MP-Bus. After the software has been successfully downloaded, actuators can be commissioned either semi-automatically or manually.

Semi-automatic addressing of actuators

1. Set desired MP address 1...8 at bus master (master FBox).
2. Put bus master on standby by engaging the “Set Keypress” button.
5. Trigger release of signal to actuator within the “Keypress maximum time” period (default value 120 s) by one of the following actions:

Signal triggering for ventilation damper actuators, type NM../AM../GM..

Procedure:
Press manual button once.



Signal triggering for ventilation damper actuators with spring return, type LF../AF..

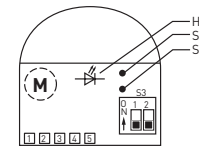
Procedure:
Turn “L/R” direction switch to both positions once within 5 seconds.



Signal triggering for valves, type NV../NVF. (-E)/AV..

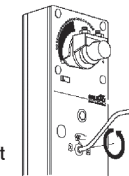
Procedure:
Press S2 once (located beneath cover).

Additional note:
Blinker H1 (alternating red/green) requests acknowledgement with S2.



Signal triggering for fire prevention damper actuators, type BF24TL

Procedure:
Short movement of manual lifting crank to left and right.



Manual addressing of actuators

It may be necessary to replace an actuator or exchange it for another actuator type in MP-Bus networks that are already operational. The procedure for manual addressing is identical in both cases.

Every actuator is supplied on delivery with an adhesive label that can be used for updating project documentation. This label also indicates the series number (identification number).

1. Adjust the “Channel address” in the master FBox under the heading “BELIMO modules Online Addressing”, then confirm by clicking the mouse on the right-arrow field >.
2. Enter the module address under “Module address” (e.g. 5), then confirm by clicking the mouse on the right-arrow field >.
3. Enter individual segments of the series number under the heading “Construction of series number” (Part 1/2/3/4), then confirm by clicking the mouse on the right-arrow field >.
4. Transfer address by clicking the mouse on the “Set Address” field.

Calculation of line length

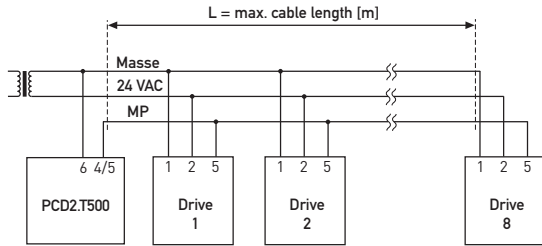
Connection of MP-Bus

- The network consists of a 3-wire connection (MP communication and 24V supply).
- Special cable or line termination resistors are not required.

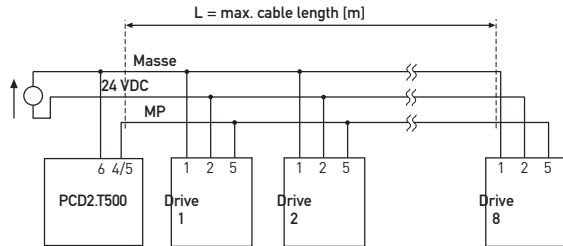
Line lengths are limited

- by the total power rating for all connected MFT/MFT2 actuators,
- by the type of supply (24 VAC or 24 VDC via the bus)
- and by the conductor cross-section.

Maximum line length for 24 VAC supply

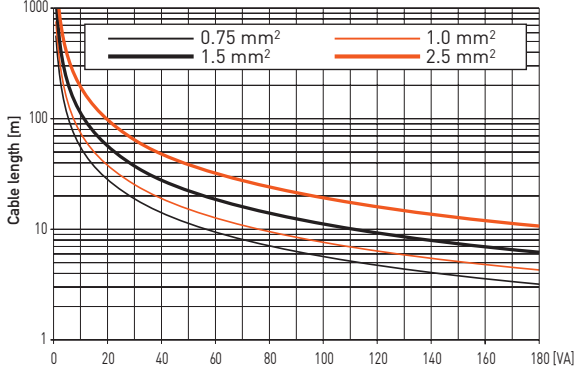


Maximum line length for 24 VDC supply



Overall dimensional output of MFT2 actuators [VA]

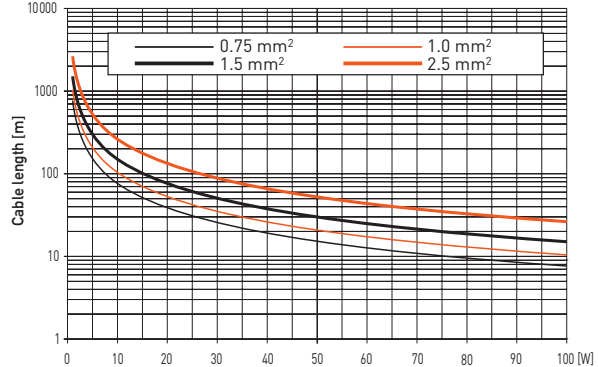
Cable length vs dimensional output applies to AC supply (minimum transformer voltage 21.6 VAC)



Important: For the NVF24-MFT2, dimensional output must be multiplied by a factor of 2.

Total power consumption of MFT2 actuators [W]

Cable length vs true watts applies to DC supply (minimum supply voltage 24.0 VDC)



Determining maximum line lengths

The dimensional outputs [VA] of all MFT (2) actuators used must be added together and the corresponding line lengths read from the diagram.

Example: 1×NM., 1×AM., 1×AF.. and 1×NV.. are connected to the MP-Bus.

Total dimensional output:

$$3\text{ VA} + 5\text{ VA} + 10\text{ VA} + 5\text{ VA} = 23\text{ VA}$$

The following can be read from the family of curves:

- Cable with conductor Ø 0.75 mm² gives: Cable length 25 m
- Cable with conductor Ø 1.0 mm² gives: Cable length 33 m
- Cable with conductor Ø 1.5 mm² gives: Cable length 50 m
- Cable with conductor Ø 2.5 mm² gives: Cable length 85 m

Determining maximum line lengths

The power consumption values [W] of all MFT/MFT2 actuators used must be added together and the corresponding line lengths read from the diagram.

Example: 1×NM., 1×AM., 1 x AF.. and 1×NV.. are connected to the MP-Bus.

Total power consumption:

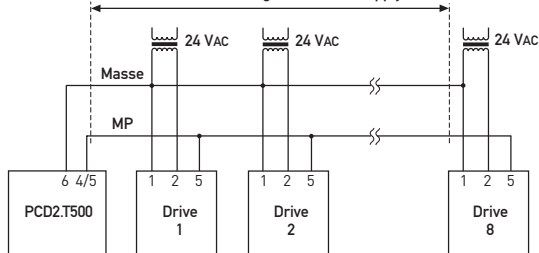
$$1.3\text{ W} + 2.5\text{ W} + 6.0\text{ W} + 3.0\text{ W} = 12.8\text{ W}$$

The following can be read from the family of curves:

- Cable with conductor Ø 0.75 mm² gives: Cable length 60 m
- Cable with conductor Ø 1.0 mm² gives: Cable length 80 m
- Cable with conductor Ø 1.5 mm² gives: Cable length 115 m
- Cable with conductor Ø 2.5 mm² gives: Cable length 200 m

Maximum line length for 24 VAC supply (in situ)

Maximum line length for 24 VDC supply



If the actuators are supplied locally with 24 VAC via a separate transformer, line lengths can be much increased. Regardless of the power ratings for the actuators connected, the line lengths will be according to the following table.

Conductor Ø	L = max. line length
0.75 mm ²	800 m
1.0 mm ²	800 m
1.5 mm ²	800 m
2.5 mm ²	800 m

Connection of sensors

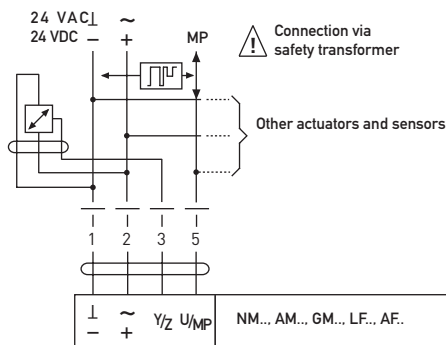
Connection of sensors for MP-Bus operation (applies to damper and valve actuators)

- 1 sensor (passive/active sensor or switching contact) can be connected per MFT/MFT2 actuator.
- The MFT/MFT2 actuator acts as an analogue/digital converter for transferring the sensor signal via the MP-Bus to the higher ranking system.
- The higher ranking system must know the physical address (which sensor belongs to which actuator) before it can interpret the corresponding sensor signal.
- Whenever possible, sensors should be connected via a separate cable, or at least the sensor's earth wire should be as far apart as possible from the earth wire of the supply.
- The largest possible conductor cross-section (1...1.5 mm²) should be chosen for passive sensors, because ohmic line resistance has a bearing on the accuracy of measurement.

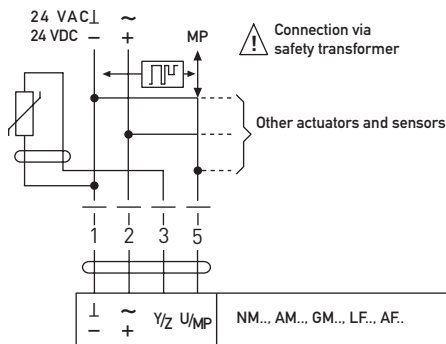
Description of active sensors

Sensors (temperature, humidity, etc.) with output 0...52VDC, typical resolution 50 mV

Connection diagram, active sensors on damper actuators



Connection diagram, passive sensors on damper actuators



Connectable passive sensors

Sensor type	Measurable temperature ranges
Ni 1000	-28 °C...98 °C
Pt 1000	-35 °C...155 °C
NTC (1...10 kΩ each at 25 °C)	depending on type -10 °C...160 °C

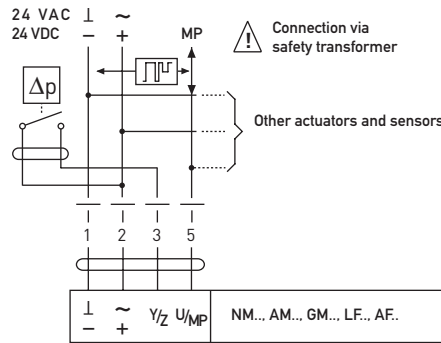
Measurement range of sensor input (3) when measuring resistance values

Sensor type	Measurement range
Ni 1000	850...1600 Ω
Pt 1000	850...1600 Ω
NTC-Sensors	100 Ω...50 kΩ

Requirements of the switching contact

The switching contact must be capable of cleanly switching current of 16 mA at 24 V. Note that the starting point parameter of the operative range must be set to ≥0.6 V on the MFT/MFT2 actuator.

Connection diagram of external switching contact on damper actuator



Measurement ranges and accuracy of the measuring system when passive sensors are connected to the sensor input (3)

Pt 1000 or Ni 1000, measurement range 850...1600 Ω

Abs. tolerance [%]	Resolution (integers)
±0.3%	1 Ω
Example: Pt1000 at 0 °C = 1000 Ω	
Measurement tolerance = ±3 Ω or ±0.5 °K	

NTC, measurement range 100 Ω...50 kΩ

Absolute tolerance [%] according to Ω measurement range	Resolution	Example: NTC 2.2 kΩ temperature measurement
100...300 Ω ±5	1 Ω	±2 °K at 85 °C
301...600 Ω ±2	1 Ω	±0.6 °K at 60 °C
601...1700 Ω ±1	1 Ω	±0.25 °K at 32 °C
1701...5000 Ω ±2	1 Ω	±0.5 °K at 5 °C
5001...10000 Ω ±5	1 Ω	±1 °K at -10 °C
10001...20000 Ω ±10	1 Ω	±1.5 °K at -25 °C
20001...50000 Ω ±25	1 Ω	±4 °K at -40 °C

Ordering information

Type	Description	Weight
PCD2.T500	MP-Bus connection module to plug into I/O module socket	100 g
PCD7.F180	MP-Bus connection module to plug into space A	8 g

For MP-Bus compatible sensors, contact your local agent.

Contact

Switzerland and international

Saia-Burgess Controls Ltd
Bahnhofstrasse 18
CH-3280 Murten / Schweiz
T +41 (0)26 / 672 72 72
F +41 (0)26 / 672 74 99
pcd@saia-burgess.com
www.saia-pcd.com

This brochure was received from:

Product Support,
Technical reference website:

www.sbc-support.ch