

**WAGO → I/O → SYSTEM 750**

**Fieldbus Independent  
I/O Modules**

**MP-Bus Master Module  
750-643**



**Manual**

Version 1.3.0

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Every conceivable measure has been taken to ensure the correctness and completeness of this documentation. However, as errors can never be fully excluded, we would appreciate any information or ideas at any time.

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We wish to point out that the software and hardware terms as well as the trademarks of companies used and/or mentioned in the present manual are generally trademark or patent protected.

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# 1 Important Notes

This section includes an overall summary of the most important safety requirements and notes that are mentioned in each individual section. To protect your health and prevent damage to devices as well, it is imperative to read and carefully follow the safety guidelines.

## 1.1 Legal Bases

### 1.1.1 Copyright

This Manual, including all figures and illustrations, is copyright-protected. Any further use of this Manual by third parties that violate pertinent copyright provisions is prohibited. Reproduction, translation, electronic and phototechnical filing/archiving (e.g., photocopying) as well as any amendments require the written consent of WAGO Kontakttechnik GmbH & Co. KG, Minden, Germany. Non-observance will involve the right to assert damage claims.

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### 1.1.2 Personnel Qualifications

The use of the product described in this Manual requires special personnel qualifications, as shown in the following table:

Activity	Electrical specialist	Instructed personnel*)	Specialists**) having qualifications in PLC programming
Assembly	X	X	
Commissioning	X		X
Programming			X
Maintenance	X	X	
Troubleshooting	X		
Disassembly	X	X	

\*) Instructed persons have been trained by qualified personnel or electrical specialists.

\*\*) A specialist is a person, who – thanks to technical training – has the qualification, knowledge and expertise to meet the required specifications of this work and to identify any potential hazardous situation in the above listed fields of activity.

All responsible persons have to familiarize themselves with the underlying legal standards to be applied. WAGO Kontakttechnik GmbH & Co. KG does not assume any liability whatsoever resulting from improper handling and damage incurred to both WAGO's own and third-party products by disregarding detailed information in this Manual.

### **1.1.3 Use of the 750 Series in Compliance with Underlying Provisions**

Couplers, controllers and I/O modules found in the modular WAGO-I/O-SYSTEM 750 receive digital and analog signals from sensors and transmit them to the actuators or higher-level control systems. Using programmable controllers, the signals can also be (pre-)processed.

The components have been developed for use in an environment that meets the IP20 protection class criteria. Protection against finger injury and solid impurities up to 12.5 mm diameter is assured; protection against water damage is not ensured. Unless otherwise specified, operation of the components in wet and dusty environments is prohibited.

### **1.1.4 Technical Condition of Specified Devices**

The components to be supplied Ex Works, are equipped with hardware and software configurations, which meet the individual application requirements. Changes in hardware, software and firmware are permitted exclusively within the framework of the various alternatives that are documented in the specific manuals. WAGO Kontakttechnik GmbH & Co. KG will be exempted from any liability in case of changes in hardware or software as well as to non-compliant usage of components.

Please send your request for modified and new hardware or software configurations directly to WAGO Kontakttechnik GmbH & Co. KG.

## 1.2 Standards and Guidelines for Operating the 750 Series

Please adhere to the standards and guidelines required for the use of your system:

- The data and power lines shall be connected and installed in compliance with the standards required to avoid failures on your system and to substantially minimize any imminently hazardous situations resulting in personal injury.
- For assembly, start-up, maintenance and troubleshooting, adhere to the specific accident prevention provisions which apply to your system (e.g. BGV A 3, "Electrical Installations and Equipment").
- Emergency stop functions and equipment shall not be made ineffective. See relevant standards (e.g. DIN EN 418).
- The equipment of your system shall conform to EMC guidelines so that any electromagnetic interferences will be eliminated.
- Operating 750 Series components in home applications without further measures is permitted only if they meet the emission limits (emissions of interference) in compliance with EN 61000-6-3. You will find the detailed information in section "WAGO-I/O-SYSTEM 750" → "System Description" → "Technical Data".
- Please observe the safety precautions against electrostatic discharge in accordance with DIN EN 61340-5-1/-3. When handling the modules, please ensure that environmental factors (persons, working place and packaging) are well grounded.
- The valid standards and guidelines applicable for the installation of switch cabinets shall be adhered to.

## 1.3 Symbols



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**Danger**

Always observe this information to protect persons from injury.

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**Warning**

Always observe this information to prevent damage to the device.

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**Attention**

Marginal conditions that must always be observed to ensure smooth and efficient operation.

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**ESD (Electrostatic Discharge)**

Warning of damage to the components through electrostatic discharge. Observe the precautionary measure for handling components at risk of electrostatic discharge.

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**Note**

Make important notes that are to be complied with so that a trouble-free and efficient device operation can be guaranteed.

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**Additional Information**

References to additional literature, manuals, data sheets and internet pages.

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## 1.4 Safety Information

When connecting the device to your installation and during operation, the following safety notes must be observed:



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**Danger**

The WAGO-I/O-SYSTEM 750 and its components are an open system. It must only be assembled in housings, cabinets or in electrical operation rooms. Access is only permitted via a key or tool to authorized qualified personnel.

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**Danger**

All power sources to the device must always be switched off before carrying out any installation, repair or maintenance work.

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**Warning**

Replace defective or damaged device/module (e.g. in the event of deformed contacts), as the functionality of field bus station in question can no longer be ensured on a long-term basis.

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**Warning**

The components are not resistant against materials having seeping and insulating properties. Belonging to this group of materials is: e.g. aerosols, silicones, triglycerides (found in some hand creams). If it cannot be ruled out that these materials appear in the component environment, then the components must be installed in an enclosure that is resistant against the above mentioned materials. Clean tools and materials are generally required to operate the device/module.

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**Warning**

Soiled contacts must be cleaned using oil-free compressed air or with ethyl alcohol and leather cloths.

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**Warning**

Do not use contact sprays, which could possibly impair the functioning of the contact area.

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**Warning**

Avoid reverse polarity of data and power lines, as this may damage the devices.

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**ESD (Electrostatic Discharge)**

The devices are equipped with electronic components that may be destroyed by electrostatic discharge when touched.

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**Warning**

For components with ETHERNET/RJ-45 connectors:  
Only for use in LAN, not for connection to telecommunication circuits.

## 1.5 Font Conventions

- italic* Names of paths and data files are marked in italic-type.  
e.g.: *C:\Programs\WAGO-IO-CHECK*
- italic** Menu items are marked in italic-type, bold letters.  
e.g.: ***Save***
- \ A backslash between two names characterizes the selection of a menu point from a menu.  
e.g.: ***File*** \ ***New***
- END** Pushbuttons are marked as bold with small capitals  
e.g.: **ENTER**
- <> Keys are marked bold within angle brackets  
e.g.: **<F5>**
- Courier** The print font for program codes is Courier.  
e.g.: **END\_VAR**

## 1.6 Number Notation

Number code	Example	Note
Decimal	100	Normal notation
Hexadecimal	0x64	C notation
Binary	'100' '0110.0100'	In quotation marks, nibble separated with dots (.)

## 1.7 Scope

This manual describes the Special Module 750-643 MP-Bus Master Module of the modular WAGO-I/O-SYSTEM 750.

Handling, assembly and start-up are described in the manual of the Fieldbus Coupler. Therefore this documentation is valid only in the connection with the appropriate manual.

## 2 I/O Modules

### 2.1 Special Modules

#### 2.1.1 750-643 [MP-Bus Master Module]

MP-Bus master module



#### Attention

The MP-Bus-Master Module is only for the use with the programmable fieldbus controllers 750-8xx (except of the MODBUS programmable fieldbus controllers 750-812/-814/-815/-816). So not use it with the fieldbus couplers 750-3xx!

##### 2.1.1.1 View

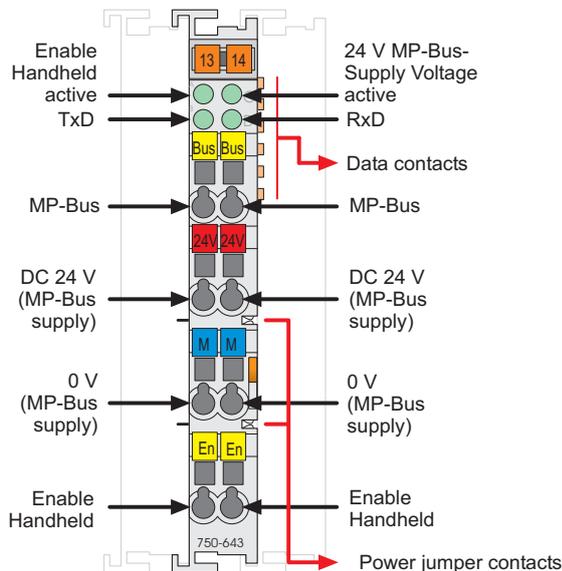


Fig. 2.1.1-1: View

g064300e

##### 2.1.1.2 Description

The MP-Bus master module 750-643 is used for the digital control of actuators for dampers and control valves, as well as VAV volume flow controllers and FLS window ventilation systems via the MP-Bus. The MP-Bus (Multi Point Bus from the Swiss company Belimo) is a master-slave bus, which is mainly used for ventilation systems in the heating and ventilation area.

The I/O module 750-643 module acts as a MP-Bus Master that is integrated into a fieldbus communications controller for local control. The fieldbus network controller communicates from a network, such as Ethernet or LonWords to bridge data to the MP-Bus Master module.

The module has two connectors for connecting the MP-Bus and can manage a total of up to 8 slaves (drives). One sensor can be connected to each slave. The sensor type (active or passive, e.g. for temperature, humidity or ON/OFF switches) is dependent on the type of drive.

The sensor value is detected by the drive and passed to the MP-Bus via an A/D converter. The sensor value is scaled and evaluated in the programmable fieldbus controller or in a higher-level control system.

The MP-Bus can be supplied directly via the 24 V and 0 V connectors. These potentials are supplied via the power contacts of a power supply module.

A Belimo parameterizing unit (manual controller or Belimo PC tool) can be connected to the module, especially for setting the parameters of Belimo drives. The I/O module has two "Enable Handheld" connectors for this purpose. If the external parameterizing unit (or the 24 V supply voltage) is connected to one of these connectors, the module switches off the MP-Bus supply.

Four green LEDs signal that the module is ready for use, the module bus communication is free from faults, and the handheld unit is enabled, as well as transmit, receive and the presence of an external voltage.

The arrangement of the individual output modules can be chosen at will when engineering the fieldbus node. It is not necessary to use a block-by-block arrangement.

The output module gets its 24 V supply for the field level from an up-stream bus module or from a supply module. When the output modules are clipped into place, the supply potential is automatically fed through to further bus modules via the internal power contacts.




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#### Note

The I/O module has no power contacts for accepting and relaying the PE connection. If a PE connection is required by the subsequent I/O modules, a potential supply module must be used.

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#### Warning

The maximum current that is allowed to flow via the power contacts is 10 A. When configuring the system, it must be ensured that this total current is not exceeded. If this should be the case, then an additional supply module must be used.

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The module 750-643 can be used with all WAGO-I/O-SYSTEM 750 controllers, except of the MODBUS programmable controllers 750-812/-814/-815/-816.

2.1.1.3 Indicating devices

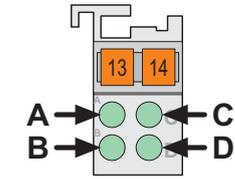


Fig. 2.1.1-2:  
 Indicating devices  
 g063802x

LED	Designation	State	Function
A	Enable Handheld active	off	Enable Handheld not active
		green	Enable Handheld active
B	TxD	off	Transmission signal TxD not present
		green	Transmission signal TxD present
C	24 V MP-Bus supply	off	24 V MP-Bus supply not present
		green	24 V MP-Bus supply present
D	RxD	off	Receive signal RxD not present
		green	Receive signal RxD present

2.1.1.4 Schematic circuit diagram

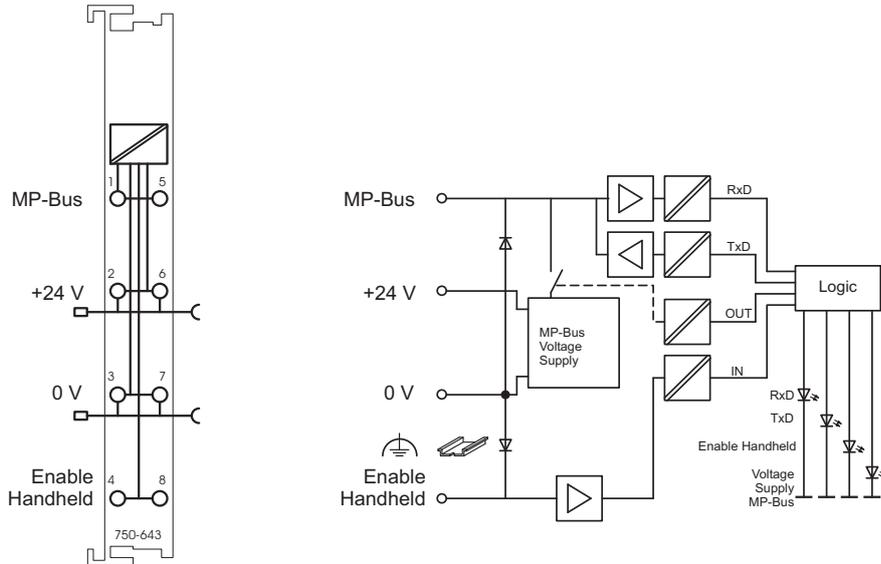


Fig. 2.1.1-3: Schematic circuit diagram

g064301e

### 2.1.1.5 Technical data

Module-specific data	
MP-Bus specification	Belimo PP/MP Specifications V1.21 (valid from 1.10.2002)
Maximum number of slaves	8
Supply voltage (MP-Bus)	DC 24 V via power contacts
Current consumption (MP-Bus)	25 mA without motor current (for MP-Bus) When the motors are supplied from the MP-Bus module, the current values for all motors must be added to this.
Transmission rate	1200 bit/s
Programming	via <b>WAGO-I/O-PRO</b>
Diagnostic information	Error bits in status byte
Error behavior	Automatic restart on return of power
Supply voltage (internal)	via system voltage DC/DC
Current consumption (internal)	15 mA
Potential isolation	500 V System/MP-Bus
Data width internal	1 byte C/S, 7 bytes data
Dimensions W x H <sup>*)</sup> x D <sup>*)</sup> from top edge of mounting rail	12 mm x 64 mm x 100 mm
Weight	55 g
Norms and Directives (cf. Chapter 2.2 in manual for controller)	
EMC CE Immunity	according to EN 61000-6-2 (02), (EN 50082-2)
EMC CE Emissions	according to EN 61000-6-3 (04), (EN 50081-1)
EMC marine applications immunity to interference	according to Germanischer Lloyd (01) <sup>*)</sup>
EMC marine applications emission of interference	according to Germanischer Lloyd (01) <sup>*)</sup>
Approvals (cf. Chapter 2.2 in manual for controller)	
	cUL <sub>US</sub> (UL508)
	Conformity Marking
Accessories	
Mini-WSB fast marking system	



### More Information

Detailed references to the approvals are listed in the document "Overview Approvals WAGO-I/O-SYSTEM 750", which you can find on the CD ROM ELECTRONICC Tools and Docs (Item-No.: 0888-0412) or in the internet under: <http://www.wago.com> → Documentation → WAGO-I/O-SYSTEM 750 → System Description

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## 2.1.1.6 Functional description

The MP-Bus master module is controlled by means of function modules in the higher-level control application. The MP-Bus master module passes MP-Bus commands and messages between the MP-Bus actuator and the function module unchanged (tunneled through). In addition, macros for an expanded command set are provided in the module. Commissioning is also carried out exclusively via the associated function modules.

There are different ways of accessing and evaluating the process data depending on whether the module is used in a fieldbus node with a programmable fieldbus controller.

When a programmable fieldbus controller is used, several IEC 61131-3 function blocks are required for the MP-Bus master functions. The task of the function blocks is to make access to the management and monitoring of MP-Bus devices quick and convenient for the user. All function blocks are available in the form of a function library.

The header bytes, the start byte and command byte, and the parameter content to be transmitted must be made available to the module. The generation and monitoring of the checksums is handled by the module. The module is therefore independent of application-specific MP-Bus commands and does not need to be modified on the software side when a new MP-Bus device with new commands appears on the market.

Viewed from the module bus, the module can be looked upon as a pure slave, exactly like an MP-Bus device. A response is initiated for every request to the module received via the module bus. Whether this takes place immediately after receipt or with a time delay depends on the transmitted request. The exact requirement or task for the module is represented by the message code (MSG\_CODE).

Differentiation is made between two types of MP-Bus communication. One type of communication is used purely for sending broadcast messages, and the other type controls and monitors the communication using a request-response process. As the command that has been sent is not contained in the response to a telegram from an MP-Bus device, the module makes two different request-response processes available. In the advanced process (MSG\_CODE K2F\_COM\_T2), the MP-Bus command sent is returned by the module in the module bus response. This makes it easier for the function block to monitor and assign the response.

### 2.1.1.7 Process data

The bus module 750-643 makes an 8-byte process image available to the fieldbus controller via 1 logical channel. The data to be sent and received are stored in 6 output bytes (D0 ...D5) and 6 input bytes (D0 ...D5). Two control bytes (C0, C1) and two status bytes (S0, S1) are used to control the data flow. The bytes C1 and S1 are transferred as data bytes but are used as extended status and control bytes.

Input data		Output data	
S0	Status byte	C0	Control byte
S1	Extended status byte	C1	Extended control byte
D0	Data byte 0	D0	Data byte 0
D1	Data byte 1	D1	Data byte 1
D2	Data byte 2	D2	Data byte 2
D3	Data byte 3	D3	Data byte 3
D4	Data byte 4	D4	Data byte 4
D5	Data byte 5	D5	Data byte 5

Status byte (S0)							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
REG	GEN ERR	0	DPID	XMASTER ER	X24V	TXD	RXD

RXD A receive action has been executed within the last 30 seconds.  
 TXD A transmit action has been executed within the last 30 seconds.  
 X24V 0 = External supply voltage detected / 1 = Supply missing.  
 XMASTER External MP-Bus master detected.  
 DPID Partial packet ID, 0 = first partial packet, 1 = second partial packet.  
 GENERR General module error (e.g. flash checksum error).  
 REG 0 = Process data exchange / 1 = Register communication.  
 0 not used

Extended status byte (S1)							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
MC3	MC2	MC1	MC0	ERR	FMA	DR	DA

DA Data Acknowledge (toggle mode). Confirmation that the new output data have been accepted.  
 DR Data Request (toggle mode). New input data are ready for acceptance.  
 FMA Function macro active.  
 ERR The returned message code has an error. In this case, the data D0-D9 are structured differently depending on the error.  
 MC0, MC1, MC2, MC3 Message code (MSG\_CODE).

Control byte (C0)							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
REG	0	0	DPID	0	0	0	0

DPID Partial packet ID, 0 = first partial packet, 1 = second partial packet.  
 REG 0 = Process data exchange / 1 = Register communication.  
 0 Reserved

Extended control byte (C1)							
Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
MC3	MC2	MC1	MC0	0	0	DA	DR

DR Data Request (toggle mode). New output data are ready for acceptance.  
 DA Data Acknowledge (toggle mode). Confirmation that the new input data have been accepted.  
 MC0, MC1, MC2, MC3 Message code (MSG\_CODE).  
 0 Reserved

The data from the individual sensors are not mapped in the process image of the connected controller, but are packed in the MP-Bus telegrams and tunneled through to a function module in the application. This function module decodes the telegrams so that the analogue or digital sensor data can be subsequently evaluated and processed at application level.

The IEC application can be implemented in the connected programmable fieldbus controller (PFC) of the fieldbus node with the WAGO-I/O-PRO or WAGO-CAA programming tool.

### 2.1.1.8 Data transfer

The serial MP-Bus module allows devices with MP-Bus and PP-interfaces to be connected. The MP-Bus telegrams are transmitted to the MP-Bus completely transparently. Other application-specific information can also be transmitted.

The byte length of pure MP/PP telegrams varies between min. 4 bytes and max. 10 bytes. The typical length is 7 bytes. The module bus communication of all WAGO-I/O-SYSTEM 750 fieldbus controllers provides a maximum of 8 bytes, including control and status bytes, in each module bus telegram. MP-Bus messages must therefore be split. They are divided between two consecutive module bus telegrams. This applies both for the direction from the fieldbus controller to the MP-Bus module and vice versa. The splitting process is controlled by Bit 4 of the control or status bytes (DPID). The first partial data packet is transferred when DPID = 0 and the second partial data packet when DPID = 1.

The message code is identical for both partial data packets. This also applies to the error bit ERR in the status byte for the direction to the fieldbus controller.

In order to safeguard the sequence of data packets, a transaction number (TNO) is assigned for each set of associated partial data packets. This transaction number occupies the last byte of a module bus telegram and must be incremented for each subsequent pair of partial data packets. The range of values for the transaction numbers is thus 1 to 255 (255 is followed by 1 again). The transaction numbers are independent of the direction of communication between fieldbus controller and MP-Bus master module. When the MP-Bus module has received the data from the module bus for a complete MP-Bus telegram, then this is signaled on the MP-Bus.

Error-free and erroneous MP-Bus communications are reported to the fieldbus controller in different module bus telegrams. The messages are distinguished by a Message ID, the message code (MSG\_CODE). The message code is part of the first data byte after the control or status byte. In all, there are 16 message codes available for both directions, ranging in value from 0 to 15. Furthermore, four extended control bits or status bits are defined in the first data byte along with the message code.

The remaining extended control and status bits are used for controlling or confirming active module bus telegrams.

### 2.1.1.8.1 Message codes for the extended control byte

MSG_CODE	DPID	DATA	Description	
F2K_NULL	0		Null message	
		0	D0-4	not used
		0	D5	TNO
		1	D0-4	not used
		1	D5	TNO
F2K_INIT	1		MP-Bus driver request for initialization	
		0	D0-4	not used
		0	D5	TNO
		1	D0-4	not used
		1	D5	TNO
F2K_TEST	2		Module test (transparent communication). Number of data from D1 are transmitted and received again, and reported back via K2F TEST.	
		0	D0	Number of data to be sent max. 9 (0D1-5 and 1D0-3)
		0	D1-4	Transmission data (any byte stream)
		0	D5	TNO
		1	D0-3	Transmission data (any byte stream)
		1	D4	not used
		1	D5	TNO
F2K_COM_T0	3		Transmission request. MP-Bus communication for broadcast telegrams. The module returns the message code K2F COM T0 as a reply.	
		0	D0-4	MP-Bus telegram according to specification without length and cross parity.
		0	D5	TNO
		1	D0-4	MP-Bus telegram according to specification without length and cross parity.
		1	D5	TNO
F2K_COM_T1	4		Communications request for request-response telegrams.	
		0	D0-4	MP-Bus telegram according to specification without length and cross parity.
		0	D5	TNO
		1	D0-4	MP-Bus telegram according to specification without length and cross parity.
		1	D5	TNO
F2K_COM_T2	5		Communications request for request-response telegrams. The module returns the transmitted MP-Bus command byte with the reply.	
		0	D0-4	MP-Bus telegram according to specification without length and cross parity.
		0	D5	TNO
		1	D0-4	MP-Bus telegram according to specification without length and cross parity.
		1	D5	TNO
F2K_FM	6		Call function macro.	
		0	D0	Function macro ID.
		0	D1-4	Function macro parameters.
		0	D5	TNO
		1	D0-4	Function macro parameters.
		1	D5	TNO

2.1.1.8.2 Message codes for the extended status byte

MSG_CODE	DPID	DATA	Description	
K2F_NULL	0		Null message	
		0	D0-4	not used
		0	D5	TNO
		1	D0-4	not used
		1	D5	TNO
K2F_INIT	1	ERR=0	MP-Bus driver initialization has been carried out.	
		0	D0-4	not used
		0	D5	TNO
		1	D0-4	not used
		1	D5	TNO
		ERR=1		
		0	D0	Error number
		0	D1	Extended error status
		0	D2-D4	not used
		0	D5	TNO
		1	D0-D4	not used
1	D5	TNO		
K2F_TEST	2	ERR=0	Module test (transparent MP-Bus communication).	
		0	D0	Number of data received max. 9 (0D1-5 and 1D0-3)
		0	D1-4	Data received
		0	D5	TNO
		1	D0-D3	Data received
		1	D4	not used
		1	D5	TNO
		ERR=1		
		0	D0	Error number
		0	D1	Extended error status
		0	D2-D4	not used
		0	D5	TNO
		1	D0-D4	not used
		1	D4	TNO
K2F_COM_T0	3	ERR=0	Transmission confirmation. MP-Bus communication for broadcast telegrams.	
		0	D0-4	not used
		0	D5	TNO
		1	D0-4	not used
		1	D5	TNO
		ERR=1		
		0	D0	Error number
		0	D1	Extended error status
		0	D2-D4	not used
		0	D5	TNO
		1	D0-D4	not used
		1	D5	TNO
		K2F_COM_T1	4	ERR=0
0	D0-4			MP-Bus telegram according to specification including length and cross parity.
0	D5			TNO
1	D0-4			MP-Bus telegram according to specification including length and cross parity.
1	D5			TNO
ERR=1				
0	D0			Error number
0	D1			Extended error status
0	D2-D4			not used
0	D5			TNO
1	D0-D4			not used
1	D5			TNO

MSG_CODE	DPID	DATA	Description	
K2F_COM_T2	5	ERR=0	Communications request for request-response telegrams. The module returns the transmitted MP-Bus command byte with the reply.	
		0	D0	Master command sent.
		0	D1-4	MP-Bus telegram according to specification without length and cross parity.
		0	D5	TNO
		1	D0-D4	MP-Bus telegram according to specification without length and cross parity.
		1	D5	TNO
		ERR=1		
		0	D0	Error number
		0	D1	Extended error status
		0	D2-D4	not used
		0	D5	TNO
		1	D0-D4	not used
		1	D5	TNO
		K2F_FM	6	ERR=0
0	D0			Function macro ID.
0	D1-4			Macro-specific result parameters.
0	D5			TNO
1	D0-D4			Macro-specific result parameters.
1	D5			TNO
ERR=1				
0	D0			Error number
0	D1			Extended error status
0	D2			Function macro ID.
0	D3-D4			not used
0	D5			TNO
1	D0-D4			not used
1	D5			TNO

### 2.1.1.8.3 Use of the module 750-643 with programmable fieldbus controllers

Appropriate IEC 61131-3 function blocks and libraries are available for WAGO-I/O-PRO 32 and WAGO-I/O-PRO CAA in order to read out the process data of the MP-Bus Master Module with a programmable fieldbus controller (PFC).

In the WAGO-I/O-PRO application, the "FbMpBusMaster" function module accepts the data packets from several module bus cycles (module bus communication).

After the packets have been assembled to form a telegram, this module checks the telegram for errors (protocol security).

In order that the master can communicate with the slaves, each slave must be assigned a unique address. The nodes are addressed with the "FbMpBusAddressing" module.

Further function modules subsequently undertake the evaluation and processing of the telegram content.



**Further information**

The function blocks and libraries for WAGO-I/O-PRO can be downloaded free of charge from the internet. You will find these at <http://www.wago.com> under the heading Building Automation Portal → Downloads.

**2.1.1.8.3.1 Compatibility**

If the MP-Bus Master Module is operated in a fieldbus node with a programmable fieldbus controller (PFC), the programming of the PFC with functional blocks and libraries demands to pay attention to the compatibility between assigned hardware and software.



**Attention**

As from version SW/HW 0301, the WAGO-/IO-SYSTEM MP-Bus-Master Module 750-643 requires the use of the WAGO-I/O-PRO Library MpBus.lib Version 1.6 or later.  
No function can be guaranteed if the versions do not match!

**2.1.1.8.3.2 Overview of function blocks**

Further device-specific function blocks are available as well as the "master module" and the "addressing module". The following MP-Bus devices are addressed as slaves: MFT(2) damper drives, MFT(2) valve drives, the VAV compact controller NMV-D2M, and the BELIMO FLS window ventilation system.

Function module	Task
FbMpBusMaster	MP-Bus communication: Protocol security Module bus communication
FbMpBusAddressing	MP-Bus configuration: Addressing the MP-Bus devices
FbMpBusDamperAndLinaerActuator	MFT(2) damper drives: NM24-MFT(2) AM24-MFT(2) GM24-MFT(2) LF24-MFT AF24-MFT(2)
FbMpBusVav	Volume flow controller: VAV compact controller NMV-D2M
FbMpBusSmokeDamper	MFT(2) valve drives: NV24-MFT(2) AV24-MFT(2) NVS24-MFT(2) AVS24-MFT(2)
FbMpBusWindow	FLS window ventilation system
FuRaw2Temp_NI000	Conversion Ni 1000

FuRaw2Temp_Ni1000_LuS	Conversion Ni 1000 (Landis & Staefa)
FuRaw2Temp_NTC5K	Conversion NTC 5 KΩ
FuRaw2Temp_PT1000	Conversion PT 1000

#### 2.1.1.8.4 Function macros

Function macros are instances, which carry out stand-alone or multiple MP-Bus communications. They are responsible for the sequential flow (transmit/receive) of MP-Bus telegrams. On completion of the evaluation of slave responses, function macros decide independently on how to proceed.

Function macros return compact information as a response, and thus relieve the burden on the module bus and the function blocks.

Appropriate function macros are available for Type 1 and Type 2 MP-Bus addressing. These macros are used by the function block "FbMpBusAddressing".

##### 2.1.1.8.4.1 Function macro output process data

MSG_CODE	FM ID	DPI D	DAT A	Description
F2K_FM	1			MP-Bus addressing Type 1
		0	D0	1
		0	D1	Address to be programmed under serial number
		0	D2-3	max. waiting time for OnEvent serial number of an MP device
		0	D4	not used
		0	D5	TNO
		1	D0-4	not used
		1	D5	TNO
F2K_FM	2			MP-Bus addressing Type 2
		0	D0	2
		0	D1	Address to be programmed under serial number
		0	D2-4	Serial number of the MP-Bus device to be programmed
		0	D5	TNO
		1	D0-1	Serial number of the MP-Bus device to be programmed
		1	D2-4	not used
		1	D5	TNO

2.1.1.8.4.2 Function macro input process data

MSG_CODE	FM ID	DPI D	DAT A	Description
K2F_FM	1			MP-Bus addressing Type 1
		0	D0	1
		0	D1	Start byte for the programmed device after requesting the serial number
		0	D2-4	Serial number of the programmed MP-Bus device
		0	D5	TNO
		1	D0-3	Serial number of the programmed MP-Bus device
		1	D4	not used
		1	D5	TNO
K2F_FM	2			MP-Bus addressing Type 2
		0	D0	2
		0	D1	Start byte for the programmed device after requesting the serial number
		0	D2-4	Serial number of the programmed MP-Bus device
		0	D5	TNO
		1	D0-3	Serial number of the programmed MP-Bus device
		1	D4	not used
		1	D5	TNO

## 2.1.1.9 Network structure

### 2.1.1.9.1 Bus cable

The MP-Bus consists of three wires. Two wires are used for the supply voltage for the drives (AC or DC 24 V and 0 V), and one wire for communication on the bus between the MP master and the drives.



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**Note**

The module 750-643 supplies the connected bus nodes exclusively with a DC voltage of 24 V DC.

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Neither a special cable nor a termination resistor is required. The MP-Bus network can therefore be made up using commercially available installation cable.



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**Note**

To simplify the wiring, special ribbon cables with adapters for connecting MFT drives and sensors to the MP-Bus are obtainable from Woertz (you will find more information at: [www.woertz.ch](http://www.woertz.ch)).

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### 2.1.1.9.2 Cable lengths

The length of the MP-Bus cable is limited by three factors:

- The total connected power of the MFT(2) drives
- The type of supply (AC via the bus or local AC, DC via the bus)
- The cross section of the cable.

The following diagram shows the dependence of the bus length on the total active power for a 24 V DC supply [Source: BELIMO, "Introduction to MP-Bus Technology"]. The maximum bus length can be read off for the respective cable cross section used.

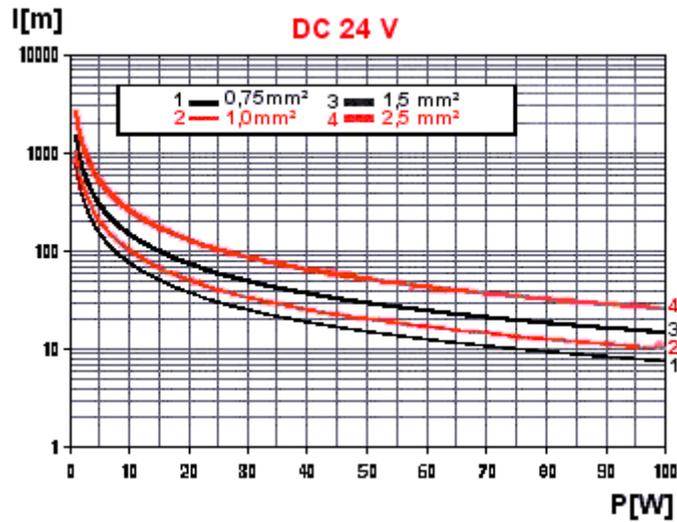


Fig. 2.1.1-4: MP-Bus length as a function of the active power of all drives

p064305x

**Example:**

Total active power of all drives:  $W_{tot.} = 10 \text{ W}$ .

Diagram curve	Core cross section	Bus length
1	0.75 mm <sup>2</sup>	70 m
2	1.0 mm <sup>2</sup>	100 m
3	1.5 mm <sup>2</sup>	150 m
4	2.5 mm <sup>2</sup>	280 m

### 2.1.1.9.3 Bus circuit

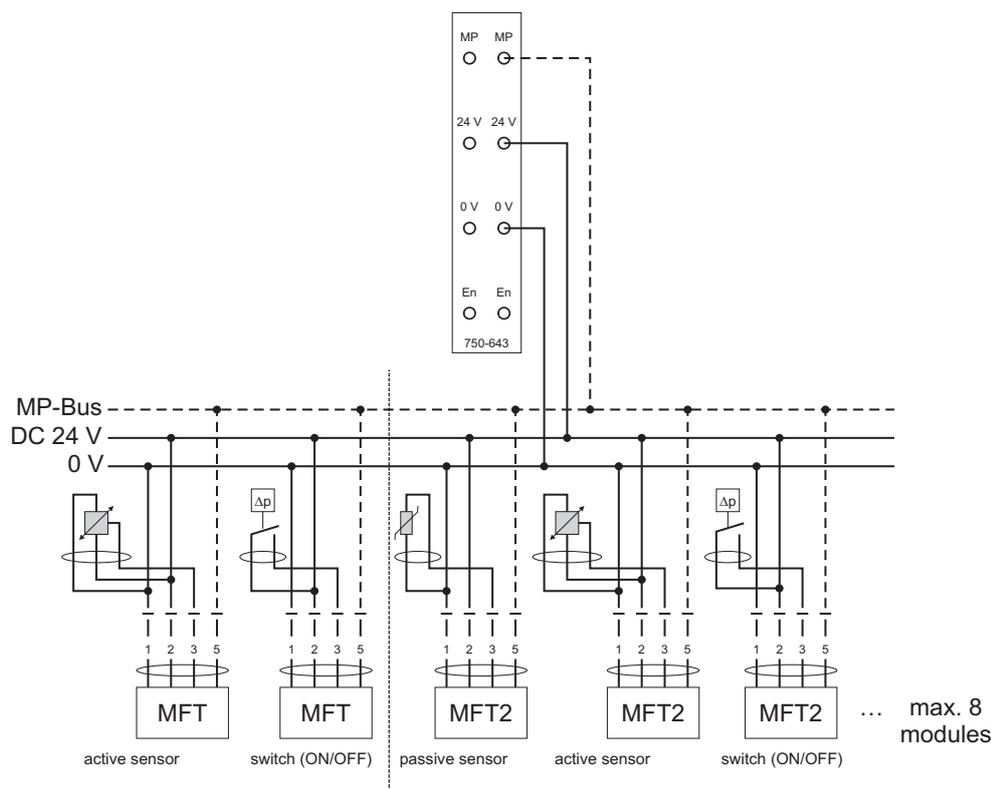


Fig. 2.1.1-5: MP-Bus circuit

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Up to 8 slaves can be connected to one master.

MP-Bus-enabled actuators are designed using MFT (Multi Function Technology). Damper drives, MFT(2) valve drives, MFT fire prevention damper drives and VAV compact controllers, as well as the Belimo FLS window ventilation system are available.



#### Further information

You will find further information on the drives and other products with MP-Bus connectors on the Internet at: <http://www.belimo.de>.

One sensor can be connected per MFT(2) drive. This can be a passive resistive sensor (NTC, Pt1000, Ni1000 or Ni1000 Landis & Staefa), an active sensor (e.g. with 0 ... 32 V DC output), or a switch contact (on/off). The analogue signal from the sensor is digitized with the drive and passed on to the MP-Bus master module via the MP-Bus.

### 2.1.1.9.4 Topology

There are no restrictions with regard to the network topology. Star, ring and tree structures are possible as well as mixed forms.

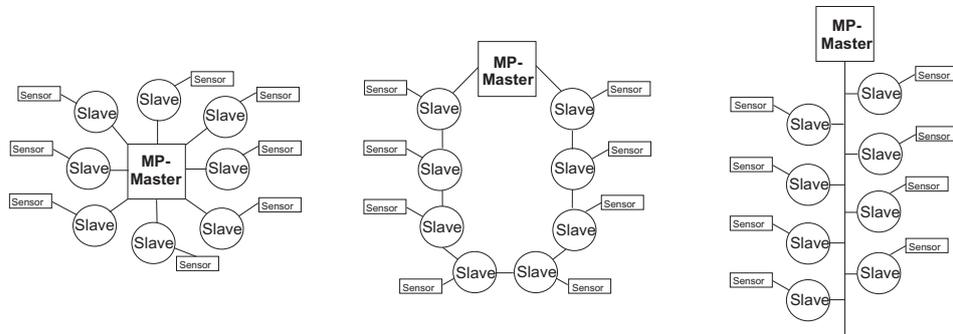


Fig. 2.1.1-6: MP-Bus topologies

g064306x

One sensor can be connected per drive.

Drive	Connectable sensor
MFT	Active sensor (Output DC 0-32 V), Switch ON/OFF
MFT2	Active sensor (Output DC 0-32 V), Passive resistive sensor (e.g. PT1000), Switch ON/OFF

### 2.1.1.9.5 External MP-Bus Master (hand held)

The module detects whether an external MP-Bus master has been connected by means of the "Enable Handheld" input. The Belimo MFT parameterizing unit MFT-H and the MFT-PC tool are external MP-Bus masters for the module.

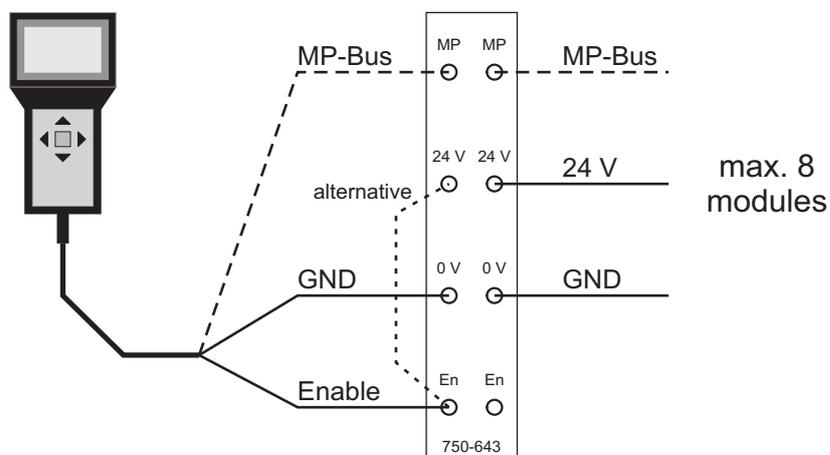


Fig. 2.1.1-7: Connecting an external MP-Bus master (e.g. hand held)

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If an external master is detected by the module, the MP-Bus module switches off its own master functionality, as long as the external master is active and is sending telegrams. This condition is signaled to the fieldbus controller by means of the associated status bit in the extended status byte via the module bus.

The module also switches off its master functionality when the 24 V supply voltage is applied to the "Enable Handheld" input.

The system does not exit this state until it detects that the external master is no longer sending telegrams or the 24 V supply voltage has been removed from the "Enable Handheld" input. After this change of state, the MP-Bus carries out an unsolicited initialization of the driver and switches to waiting mode with the receiver active.





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