Manual

AUTOMATION

WAGO-I/O-SYSTEM 750

DALI Multi-Master Module

753-647

Version 1.0.0

WAGO®
INNOVATIVE CONNECTIONS

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Every conceivable measure has been taken to ensure the accuracy and completeness of this documentation. However, as errors can never be fully excluded, we always appreciate any information or suggestions for improving the documentation.

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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 protected by trademark or patent.

Table of Contents

1 Notes about this Documentation

Note

Keep this documentation!
The operating instructions are part of the product and shall be kept for the entire lifetime of the device. They shall be transferred to each subsequent owner or user of the device. Care must also be taken to ensure that any supplement to these instructions are included, if applicable.

1.1 Validity of this Documentation

This documentation is only applicable to the I/O module 753-647 (DALI Multi-Master Module) of the WAGO-I/O-SYSTEM 750 series.

The I/O module 753-647 shall only be installed and operated according to the instructions in this manual and in the manual for the used fieldbus coupler/controller.

NOTICE

Consider power layout of the WAGO-I/O-SYSTEM 750!
In addition to these operating instructions, you will also need the manual for the used fieldbus coupler/controller, which can be downloaded at www.wago.com. There, you can obtain important information including information on electrical isolation, system power and supply specifications.

1.2 Copyright

1.3 Symbols

DANGER

Personal Injury!
Indicates a high-risk, imminently hazardous situation which, if not avoided, will result in death or serious injury.

DANGER

Personal Injury Caused by Electric Current!
Indicates a high-risk, imminently hazardous situation which, if not avoided, will result in death or serious injury.

WARNING

Personal Injury!
Indicates a moderate-risk, potentially hazardous situation which, if not avoided, could result in death or serious injury.

CAUTION

Personal Injury!
Indicates a low-risk, potentially hazardous situation which, if not avoided, may result in minor or moderate injury.

NOTICE

Damage to Property!
Indicates a potentially hazardous situation which, if not avoided, may result in damage to property.

NOTICE

Damage to Property Caused by Electrostatic Discharge (ESD)!
Indicates a potentially hazardous situation which, if not avoided, may result in damage to property.

Note

Important Note!
Indicates a potential malfunction which, if not avoided, however, will not result in damage to property.

Information

Additional Information:
Refers to additional information which is not an integral part of this documentation (e.g., the Internet).

1.4 Number Notation

Table 1: 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 (.)

1.5 Font Conventions

Table 2: Font Conventions

Font type	Indicates
italic	Names of paths and data files are marked in italic-type. e.g.: *C:\Programme\WAGO-I/O-CHECK*
Menu	Menu items are marked in bold letters. e.g.: **Save**
>	A greater-than sign between two names means the selection of a menu item from a menu. e.g.: **File** > **New**
Input	Designation of input or optional fields are marked in bold letters, e.g.: **Start of measurement range**
“Value”	Input or selective values are marked in inverted commas. e.g.: Enter the value “4 mA” under **Start of measurement range**.
[Button]	Pushbuttons in dialog boxes are marked with bold letters in square brackets. e.g.: **[Input]**
[Key]	Keys are marked with bold letters in square brackets. e.g.: **[F5]**

2 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.

2.1 Legal Bases

2.1.1 Subject to Changes

WAGO Kontakttechnik GmbH & Co. KG reserves the right to provide for any alterations or modifications that serve to increase the efficiency of technical progress. WAGO Kontakttechnik GmbH & Co. KG owns all rights arising from the granting of patents or from the legal protection of utility patents. Third-party products are always mentioned without any reference to patent rights. Thus, the existence of such rights cannot be excluded.

2.1.2 Personnel Qualifications

All sequences implemented on Series 750 devices may only be carried out by electrical specialists with sufficient knowledge in automation. The specialists must be familiar with the current norms and guidelines for the devices and automated environments.

All changes to the coupler or controller should always be carried out by qualified personnel with sufficient skills in PLC programming.

2.1.3 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.

Operating 750 Series components in home applications without further measures is only permitted if they meet the emission limits (emissions of interference) according to EN 61000-6-3. You will find the relevant information in the section on "WAGO-I/O-SYSTEM 750" → "System Description" → "Technical Data" in the manual for the used fieldbus coupler/controller.

Appropriate housing (per 94/9/EG) is required when operating the WAGO-I/O-SYSTEM 750 in hazardous environments. Please note that a prototype test certificate must be obtained that confirms the correct installation of the system in a housing or switch cabinet.

2.1.4 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. 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.

2.2 Safety Advice (Precautions)

For installing and operating purposes of the relevant device to your system the following safety precautions shall be observed:

⚠ DANGER

Do not work on components while energized!
All power sources to the device shall be switched off prior to performing any installation, repair or maintenance work.

⚠ DANGER

Installation only in appropriate housings, cabinets or in electrical operation rooms!
The WAGO-I/O-SYSTEM 750 and its components are an open system. As such, install the system and its components exclusively in appropriate housings, cabinets or in electrical operation rooms. Allow access to such equipment and fixtures to authorized, qualified staff only by means of specific keys or tools.

NOTICE

Replace defective or damaged devices!
Replace defective or damaged device/module (e.g., in the event of deformed contacts), since the long-term functionality of device/module involved can no longer be ensured.

NOTICE

Protect the components against materials having seeping and insulating properties!
The components are not resistant to materials having seeping and insulating properties such as: aerosols, silicones and triglycerides (found in some hand creams). If you cannot exclude that such materials will appear in the component environment, then install the components in an enclosure being resistant to the above-mentioned materials. Clean tools and materials are imperative for handling devices/modules.

NOTICE

Cleaning only with permitted materials!
Clean soiled contacts using oil-free compressed air or with ethyl alcohol and leather cloths.

NOTICE

Do not use any contact spray!
Do not use any contact spray. The spray may impair contact area functionality in connection with contamination.

NOTICE

Do not reverse the polarity of connection lines!
Avoid reverse polarity of data and power supply lines, as this may damage the devices involved.

NOTICE

Avoid electrostatic discharge!
The devices are equipped with electronic components that you may destroy by electrostatic discharge when you touch. Pay attention while handling the devices to good grounding of the environment (persons, job and packing).

2.3 Requirements

2.3.1 PC Hardware

Table 3: Requirements PC Hardware

Component	Requirements
Operating system	Windows XP/Vista/Windows 7
Random access memory (RAM)	Min. 128 MB
Free hard disk storage unit	Min. 1,5 MB for the WAGO DALI Configurator and 280 MB (x86) or 610 MB (x64) for the .NET 4.0 Framework
Processor	Min. 500 MHz
Other	Installed network card, .NET 4.0 Framework (Redistributables are provided), standard web browser with Java support

2.3.2 PC Software

Table 4: Required PC Software

Component	Reference Source (Order number)
WAGO-I/O-*PRO*	WAGO (759-333)
.NET Framework 4.0	Microsoft (free download under: www.microsoft.com)
WAGO DALI Configurator	WAGO (In WAGO-I/O-*CHECK* (Item No.: 759-302) starting from version 03.04.01.09, the WAGO DALI Configurator is integrated) or as Stand Alone Tool free download under: www.wago.com)

Table 5: Optional PC Software

Component	Reference Source (Order number)
WAGO-I/O-*CHECK* (from version 03.04.01.09)	WAGO (759-302)
WAGO Ethernet Settings	WAGO (free download under: www.wago.com)

Note

Recommendation: WAGO-I/O-*CHECK*!
Note, that for an easy installation and configuration of the DALI Multi-Master Module 753-647 the commissioning tool WAGO-I/O-*CHECK* is recommended!

2.3.3 WAGO-I/O-SYSTEM

Table 6: Required Hardware of the WAGO-I/O-SYSTEM

Component	Reference Source (Order number)
Fieldbus controller/PLC WAGO-I/O-SYSTEM 750 e. g. ETHERNET PLC 750-881	WAGO (750-881)
DALI Multi-Master Module 753-647	WAGO (753-647)
End Module 750-600	WAGO (750-600)
Current supply for the indirect supply of the DALI Bus participants via the DALI Multi-Master Module 753-647, e. g.: DC/DC Converter 753-620 or Current supply 787-1007	WAGO (753-620) WAGO (787-1007)

3 Device Description

3.1 Device-Specific Safety Information

Note

Required accessories: Power supply unit for indirect power supply via the DALI-Multi-Master module 753-647, Item No.: 753-620 or 787-1007!
Please note that a suitable power supply is required for the network slaves via the DALI Multi-Master module, such as the power supply unit for the DALI Multi-Master module 753-647, Item No.: 787-1007, or the DC/DC converter 753-620. These power supplies do not provide direct power to the DALI bus, but only indirect power supply via the DALI Multi-Master module. They ensure electrical isolation for this between the DALI bus and the I/O module required for the installation of 230V electrical loads.

NOTICE

DALI slaves can be destroyed on misuse of the 787-1007 power supply unit!
The WAGO power supply (Item No.: 787-1007) may only be connected to the DALI Multi-Master module. Never connect this power supply directly to the DALI network without a DALI Multi-Master module connected between the power supply and the network, as a direct connection to the DALI bus can result in the destruction of the DALI slaves connected to the system!
Power supply for the DALI bus is provided indirectly via the DALI Multi-Master module.

NOTICE

No reverse voltage protection!
The module is not protected against incorrect connection of the connecting leads.

Note

Perform configuration using the WAGO DALI Configurator!
You must use the WAGO DALI Configurator for configuration of the DALI Multi-Master module 753-647 and the DALI Line.
The WAGO DALI Configurator is integrated into the WAGO-I/O-*CHECK* commissioning tool (Item No.: 759-302) starting from Version 03.04.01.09, or you can download the WAGO DALI Configurator free of charge as a stand-alone tool from the WAGO Internet site at:
www.wago.com

Information

More information about the WAGO DALI Configurator!
A detailed description of the WAGO DALI Configurator is given in the manual for the configurator.
You can download this manual free of charge from the WAGO Internet site at: www.wago.com

3.2 Abbreviations and Terms

Table 7: Abbreviations and terms used in this manual

Abbreviation/ Term	Explanation
Control Device	IEC term for the DALI (Multi)-Master (also, active sensors)
Control Gear	IEC term for passive electronic ballast (actuators)
DALI	"Digital Addressable Lighting Interface" (protocol for lighting control)
ECG	Electronic control gear (ballast unit)
PI	Process image of I/O module
PAA	I/O module output process data
PAE	I/O module input process data

Information

More definitions of terms given in the glossary.
Further, detailed explanations and definitions of technical terms used in this manual are given in alphabetical order in the Section "Glossary."

3.3 General Description

The DALI Multi-Master module is used to connect a DALI network (DALI Line) to a WAGO fieldbus node with PLCs and 750/753 Series I/O modules.

This module is used in applications for digital control of lighting actuators, such as control gear (electronic ballasts) in building automation and for evaluation of DALI sensors.
DALI enables complex lighting scenes to be implemented with group functions.

Using the WAGO-I/O-SYSTEM, DALI control devices are seamlessly integrated with all supported BA and fieldbus protocols.

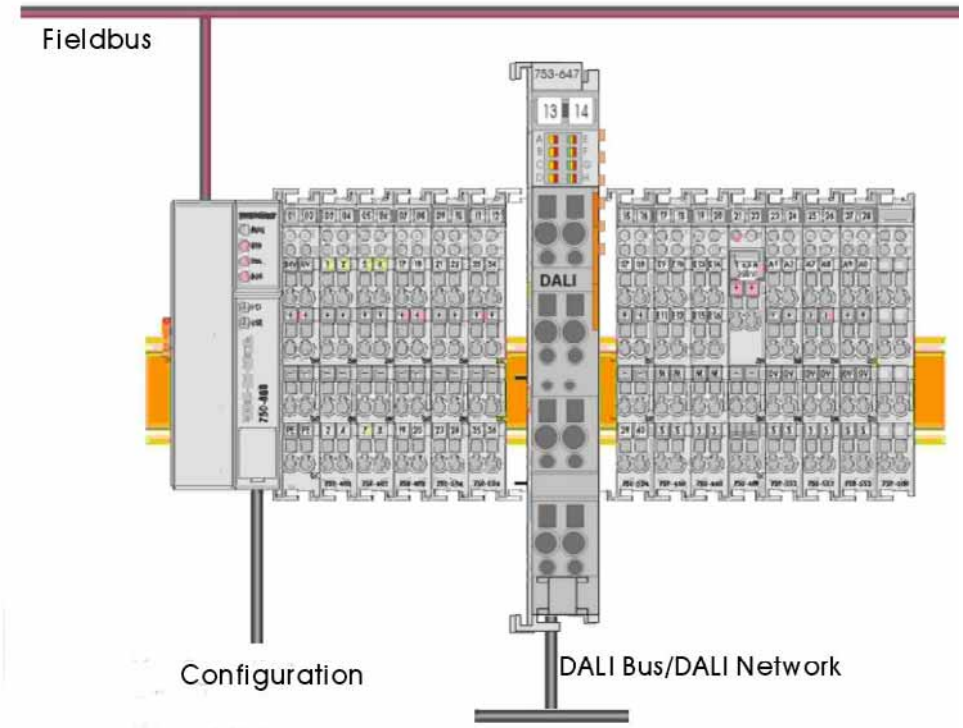


Figure 1: Overview of DALI network with a WAGO I/O SYSTEM 750

The 753-647 DALI Multi-Master module complies with the DALI standard according to IEC 62386. This manufacturer-independent protocol ensures interoperability of DALI devices in lighting applications.

This module is designed so as to allow future-oriented adaptation to the current DALI standard by simple updating using a firmware update via the ETHERNET fieldbus and PC software.

Two options are available for power supply for the DALI Multi-Master module; via the 753-620 DC/DC converter, which provides power for one DALI Multi-Master module from the 24 V system power supply, or via the 787-1007 230 V primary switch mode power supply unit for parallel supply of several DALI Multi-Master modes (see Section "Power Supply").

The DALI Multi-Master module supplies bus power of 200 mA for power supply of any number of DAL bus slaves per line.
The maximum number of bus slaves depends on the sum current consumption of the specific devices and the address range for the actuators and sensors.

The module is equipped with two connections for the bus line (+DALI and -DALI) for connection of the DALI bus (DALI line).

The bus line is installed in free topology. Ring-shaped links are prohibited.
As the length of the line of a bus line is limited and as the maximum line lengths between the bus devices may not be exceeded, general DALI guidelines must be observed (see Section "Installation Notes").

The module supports a total of 64 addresses for control gear (ECGs) and 64 addresses for control devices (DALI sensors). You can select from several addressing methods for this.
After successful address allocation, 16 groups and 16 scenes can be assigned to each of the DAL ECGs. A further 16 virtual groups can also be configured on the DALI bus.

The WAGO-I/O-*PRO* programming software is used to program the fieldbus nodes.
An extensive IEC-61131-3 library is available with simple modules for implementing complex lighting applications.

The WAGO-I/O-*CHECK* commissioning tool can be used for configuration of the fieldbus nodes.

The free WAGO-DALI Configurator can be used for simple commissioning and maintenance and for easy configuration of the DALI Multi-Master module and the interconnected DALI line.
You can call up the Configurator directly from WAGO-I/O-*CHECK* when the commissioning tool is available. The WAGO-DALI Configurator can also be used as a stand-alone tool.

Information

More information about the WAGO DALI Configurator!
The WAGO-DALI Configurator is integrated into the WAGO-I/O-*CHECK* commissioning tool (Item No.: 759-302) starting from Version 03.04.01.09, or you can download the WAGO-DALI Configurator free of charge as a stand-alone tool from the WAGO Internet site at:
www.wago.com.

Information

More information about WAGO-I/O-*PRO* and WAGO-I/O-*CHECK*!
You can order the WAGO software under the following item numbers:
- WAGO-I/O-*PRO* programming tool (Item No.: 759-333) and
- WAGO-I/O-*CHECK* commissioning tool (Item No.: 759-302;
with the WAGO-DALI Configurator integrated starting from Version 03.04.01.09).
You can download the manuals for these software tools free of charge from the WAGO Internet site at:
www.wago.com

The DALI Multi-Master module can be operated in two different modes.

- Full Mode
- Easy Mode

In the Full mode, acyclic data transfer with the PLC is implemented using a mailbox interface via a acyclic transmission channels (see Section "Process Image" / "Full Mode").

As mentioned above, an Easy mode is also available which enables lighting control using simple binary signals without any complicated PLC programming (see Section "Process Image" / "Easy Mode").

The Easy mode is the standard state for the DALI Multi-Master module. The Full mode can be activated via PLC modules, or using the WAGO-I/O-*CHECK* software.

Eight colored LEDs on the I/O module enclosure signal active and inactive operating modes, data transfer via DAL and the data bus, application of DALI bus power and internal statuses or errors of the I/O module (see Section "Display Elements").

Multi-color LEDs indicate the operating status and the trouble-free internal bus communication as well as the status of the signal transmission.
The I/O module 753-647 can be used with fieldbus couplers and fieldbus controllers of the WAGO-I/O-SYSTEM 750.

3.4 View

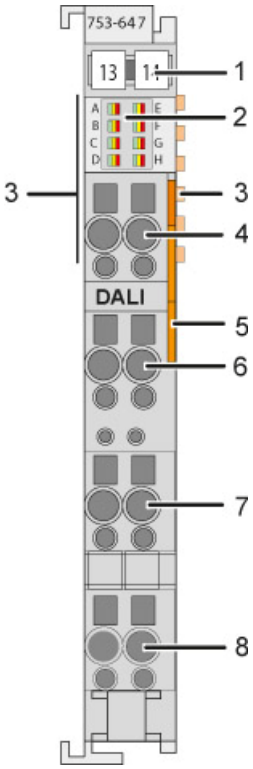


Figure 2: View

Table 8: Legend for „View“ figure

Pos.	Marking	Meaning	For details see Section
1	---	Marking options using the Mini-WSB	---
2	A … H	Status LEDs	„Device Description“ > „Display Elements“
3	---	Data contacts	„Device Description“ > „Connections“
4	1, 5	CAGE CLAMP® Connections DALI +	„Device Description“ > „Connections“
5	---	Release tab for bus module and plug	"Mounting" > "Insert and Removing Device"
6	2, 6	CAGE CLAMP® Connections DALI -	„Device Description“ > „Connections“
7	3, 7	CAGE CLAMP® Connections DC 18 V DALI supply	„Device Description“ > „Connections“
8	4, 8	CAGE CLAMP® Connections ground DALI supply	„Device Description“ > „Connections“

3.5 Connectors

3.5.1 Data Contacts/Internal Bus

Communication between the coupler/controller and the bus modules as well as the system supply of the bus modules is carried out via the internal bus. It is comprised of 6 data contacts, which are available as self-cleaning gold spring contacts.

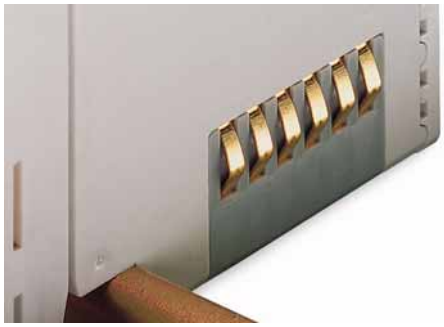


Figure 3: Data contacts

NOTICE

Do not place the I/O modules on the gold spring contacts!
Do not place the I/O modules on the gold spring contacts in order to avoid soiling or scratching!

NOTICE

Ensure that the environment is well grounded!
The modules are equipped with electronic components that may be destroyed by electrostatic discharge. When handling the modules, ensure that the environment (persons, workplace and packing) is well grounded. Avoid touching conductive components, e.g. data contacts.

3.5.2 Power Contacts/Field Supply

The I/O module 753-647 has no power jumper contacts.

Note

Use a supply module!
Use a supply module for field-side power supply of downstream I/O modules.

3.5.3 CAGE CLAMP® Connections

Table 9: Connections

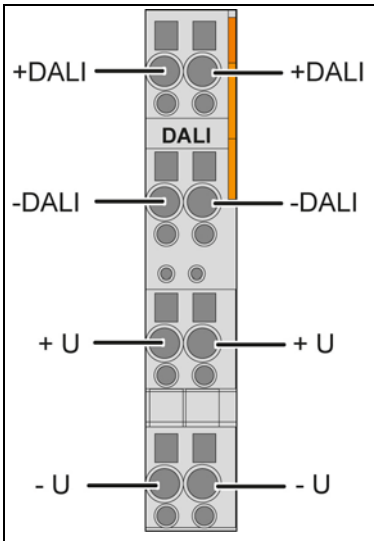


Figure 4: Connections

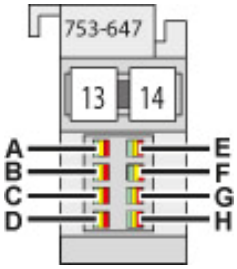
Connection	Function
+ DALI	DALI Bus connection +
- DALI	DALI Bus connection -
+ U	Supply +
- U	Supply -

Information

Configuration diagram for connections!
The power supply configuration for the I/O module and the configuration for the DALI network are shown in the figures given in the sub-sections "Power Supply Configuration for 753-620" and "Power Supply Configuration for 787-1007". You can also refer to the main section "Installation Notes" → "I/O Module Power Supply."

3.6 Display Elements

Table 10: Display Elements



LED	Designation	Status	Function
A	Easy Mode	Green	Easy mode is active.
		Green flashing	Easy mode being initialized.
		Yellow flashing	No addressed devices found, current configuration being read.
		Green-yellow flashing	No addressed devices found, configuration from the internal database was not read (I/O module has no current configuration; function may therefore be limited.).
		Yellow	Addressed device found, no current configuration read.
B	TxD (transmit)	Green flashing	Signal transmission TxD
		Red flashing	Could not transmit telegrams.
		Off	No signal transmission TxD
C	Function	Red	Not ready for operation, or no or disrupted internal bus communication.
		Green	Ready for operation and undisturbed internal bus communication.
D	1- or 2-button mode (Easy Mode)	Off	1-button mode (only in Easy Mode).
		Green	2-button mode (only in Easy Mode).
	Firmware Update	Yellow flashing	Firmware update being performed.
E	Full-Modus	Green	Full mode activated.
		Green flashing	Full mode being initialized.
		Yellow flashing	No addressed devices found.
		Yellow	No addressed devices found, configuration from the internal database was not read (I/O module has no current configuration; function may therefore be limited.).

	F	RxD (Receiving)	Green flashing	Signal transmission RxD.
			Yellow flashing	TxD signal transmission present, but some of the received frames are faulty (data frame error/collision occurred).
	G	Voltage check for the DALI line	Green	Voltage present, power supply for DALI line activated via the I/O module.
			Yellow	Voltage present, power supply for DALI line via I/O module de-activated.
			Red	No voltage detected within 500 ms.
	H	Latching relay function	Off	Latching relay function Off.
			Green	Latching relay function On.
		Firmware update	Yellow flashing	Firmware update being performed.

3.7 Operating Elements

The 753-647 I/O module does not have any electro-mechanical operating elements.

Changes to the configuration and parameters are made via the higher-order control, or using the special WAGO-DALI Configurator.

3.8 Schematic Diagram

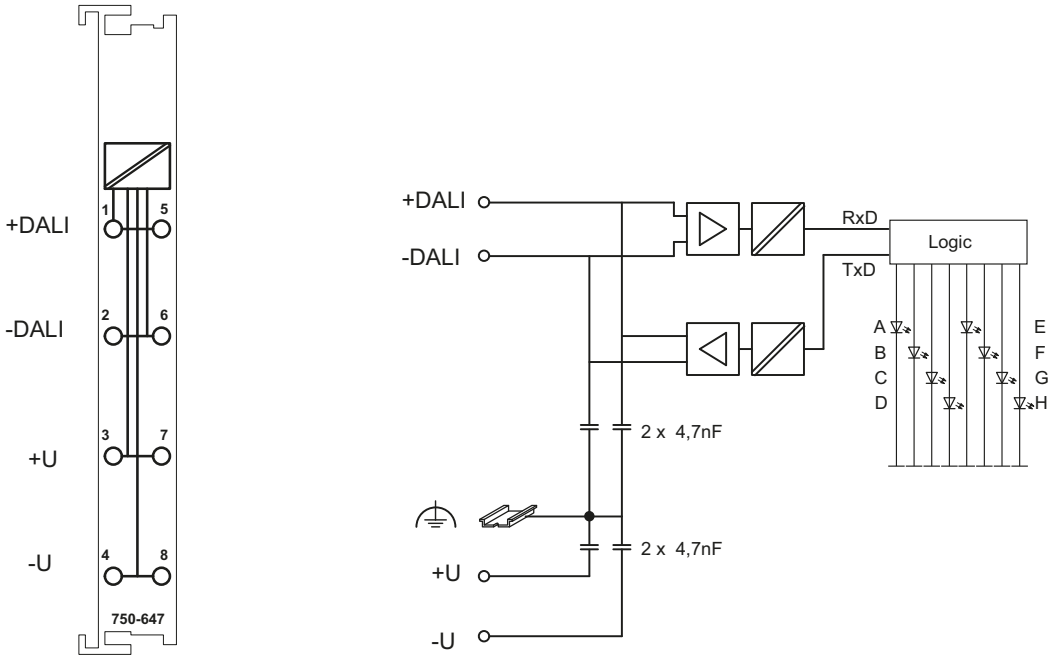


Figure 5: Schematic Diagram

3.9 Technical Data

3.9.1 Device Data

Table 11: Technical Data - Device

Width	12 mm
Height (from upper edge of DIN 35 rail)	64 mm
Length	100 mm
Weight	55 g

3.9.2 Supply

Table 12: Technical Data - Supply

Power supply	via system voltage (+ 5 V DC)
Current consumption (internal)	30 mA
Module power supply at +U and -U	18 V via 753-620 or 787-1007 Power Supplies
Guaranteed supply current (acc. to DALI specification)	200 mA
Isolation	DC 1500 V DALI Bus/Internal Bus

3.9.3 Communication

Table 13: Technical Data - Communication

DALI specification	DIN IEC 62386
Max. number of addressable slaves (DALI addresses)	addressable: 64 Control Devices + 64 Control Gears
Transmission channel	1
Internal bit width	24-byte data
Commissioning and parameterization Configuration	via WAGO-I/O-*CHECK* and/or via WAGO-I/O-PRO with WAGO DALI Configurator

3.10 Approvals

Information

More Information about Approvals
Detailed references to the approvals are listed in the document "Overview Approvals **WAGO-I/O-SYSTEM 750**", which you can find on the DVD "AUTOMATION Tools and Docs" (order no. 0888-0412) or via the internet under: www.wago.com → Documentation → WAGO-I/O-SYSTEM 750 → System Description.

The following approvals have been granted to 753-647 I/O modules:

CE Conformity Marking

cULus (UL508) pending

The following Ex approvals are pending for 753-647 I/O modules:

ATEX guideline	acc. to EN 60079-0: 2006 and acc. to EN 60079-15: 2005
	acc. to EN 61241-0: 2006 and acc. to EN 61241-1: 2004

3.11 Standards and Guidelines

753-647 I/O modules meet the following requirements on emission and immunity of interference:

EMC CE-Immunity to interference	acc. to EN 61000-6-2: 2005
EMC CE-Emission of interference	acc. to EN 61000-6-3: 2007

Note

EMC CE Immunity to interference and transmission provided only in conjunction with the 753-620 or 787-1007 power supply unit!
Compliance with the indicated EMC standards for CE immunity to interference and transmission can only be reliably maintained when power to the DALI Multi-Master module is provided via the 753-620 or 787-1007 power supply units!

EMC marine applications-Immunity to interference	acc. to Germanischer Lloyd (2003)
EMC marine applications-Emission of interference	acc. to Germanischer Lloyd (2003)

4 Process Image

The DALI-Multi-Master module always has a 24-byte process image.

This enables the I/O module to be addressed and configured either via a dedicated IEC application, or using the WAGO-DALI Configurator.

If the WAGO-DALI Configurator is used, the DALI-Multi-Master module is operated in the "Full" mode, as a special DALI master module is employed. The DALI master module switches the DALI-Multi-Master module to this operating mode.

There is no difference between the "Full" and "Easy" mode when representing the the I/O modules in the process images for the fieldbuses and software tools (except for the control configuration in WAGO-I/O-*PRO*).

The "Easy" mode is the set default. This mode must also be used if no program is being used that has a DALI master module.

The mode setting is not permanently stored in the DALI-Multi-Master module, meaning it always reverts to the "Easy" mode when the module is reset.

4.1 Dedicated IEC Application

In principle, the DALI-Multi-Master module can directly access the ECGs, groups and scenes in the "Easy" mode without any further configuration of the module being necessary (as long as the DALI network has already been addressed).

The WAGO-I/O-*PRO* library "WagoLibDALI_01.lib" can be integrated into the application for programming of a dedicated IEC application. This library contains the special DALI master module for processing the data that switches the DALI-Multi-Master module to the "Full" mode.
The DALI Multi-Master module is operated in the "Full" mode for this for creating own programs with the DALI master module.

Note

Download the WAGO-I/O-*PRO* library free of charge!
To use and create your own IEC applications you can download the special WAGO-I/O-*PRO* library "WagoLibDALI_01.lib" free of charge from the WAGO Internet site at:
www.wago.com

4.2 Full Mode

In the "Full" mode, the 24 bytes for the process image is used (as for other complex WAGO I/O modules, such as KNX, MP bus, etc.) for tunneling of a protocol via a mailbox interface.

In the "Full" mode the process image for the DALI-Multi-Master module consists of the following 24 bytes: 1 byte for Control/Status and 23 bytes for acyclic data.

The advantage for the user is that no further programming is required to easily perform all settings and data evaluation via the WAGO-DALI Configurator user interface.

The I/O module can query and control the status of the interconnected devices in the DALI line by systematic polling. Systematic polling can also be configured to enable polling of the active devices to be conducted more rapidly per cycle than the inactive devices.

Some selected settings for the electronic control gear (such as status information for the ECGs) are stored in a permanently updated, internal database of the module when configured. The operating hours of the devices (active times of the lights) are also recorded.

When a defective electronic ballast (ECG) must be replaced, the replacement ECG can be reconfigured automatically using the "Replace" function (**[Restore]** button).

4.3 Easy Mode

The "Easy" mode can be run as an alternative when no DALI master module is used. The Easy mode provides lighting control using simple binary signals, without complicated PLC programming.
In the Easy mode, changes to individual bits of the process image are converted directly into DALI commands for a pre-configured DALI network.

23 bytes of the 24-byte process image can be used directly for switching of ECGs, groups or scenes in the Easy mode.

The structure of the process data is described in detail in the following tables.

Depending on the switching action, short or long, either "ON/OFF" or "Dim brighter/darker" is entered in the output process map. "ON/OFF" switching is implemented via the "Latching relay" function, while "Dim brighter/darker" is realized via the "Dim in 1- and 2-button mode" function. These functions are described briefly in the directly ensuing sections.

4.4 Latching Relay Function

Each time a button is pressed for a latching relay an electrical pulse is transmitted to the latching relay and alters the circuit state. This status is stored until a new pulse results in a further status change.

4.4.1 Dim in 1- and 2-Button Mode

A short press of the button in the 1-button mode switches the lighting on and off.

A long press of the button (e.g., 500 ms) dims the lighting to the various lighting intensities.

If the lighting is off, the "ON" rocker switch is used to switch on the lighting and slowly increase the lighting intensity.
The "OFF" rocker switch is used to dim the lighting.
If the minimum dimming level is reached, the lighting is switched off.

Table 14: Control of lighting via buttons

Buttons	Press	Description
"ON" rocker switch	short	Switch lighting ON
	long	Dim lighting (brighter)
"OFF" rocker switch	short	Switch lighting OFF
	long	Dim lighting (darker)

Dimming in the 2-button mode functions in the same manner, except that in this case one button is used to switch on and increase the intensity of the lighting and the second one for dimming and switching off of the lighting.

4.4.2 Process Image Overview in the "Easy" Mode

Table 15: Overview of the output process image in the "Easy" mode

Byte	0	1	2 ... 17	18 ... 21	22 ... 23
Output process image	Broadcast On/Off and activate Broadcast	0	Switch short addresses, dimming brighter/darker	Switch group addresses, dimming brighter/darker	Call up scene

Table 16: Overview of input process image in the "Easy" mode

Byte	0	1	2 ... 17	18 ... 21	22 ... 23
Input process image	Status Activate Broadcast	Reserved	Status, Activate short addresses	Status Activate group addresses	Not in use

4.4.3 Activating/De-activating 64 DALI Actuators, Dimming

Table 17: Output and input process image for the DALI-Multi-Master module in the "Easy" mode

Byte 0 – 3	**DALI Adr. (DA)**	**Output Process Image**	**Input Process Image**
Byte 0	Broadcasts	Broadcast ON	1-/2-Button Mode
		Broadcast OFF	-
		Broadcast ON/OFF Dimming	Broadcast: Status ON/OFF
		Broadcast short ON/OFF	-
		Reserved	-
		Reserved	-
		Reserved	-
		Reserved	-
Byte 1		Reserved	Reserved
Byte 2	DA0 – DA15	DA0: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA1: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA2: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA3: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
Byte 3		DA4: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA5: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA6: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA7: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error

Byte 4 – 7	DALI Adr. (DA)	Output Process Image	Input Process Image
Byte 4		DA8: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA9: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA10: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA11: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
Byte 5		DA12: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA13: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA14: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA15: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
Byte 6	DA16 – DA31	DA16: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA17: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA18: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA19: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
Byte 7		DA20: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA21: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA22: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA23: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error

Byte 8 – 11	DALI Adr. (DA)	Output Process Image	Input Process Image
Byte 8		DA24: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA25: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA26: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA27: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
Byte 9		DA28: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA29: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA30: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA31: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
Byte 10	DA32 – DA47	DA32: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA33: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA34: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA35: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
Byte 11		DA36: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA37: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA38: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA39: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error

Byte 12 – 15	DALI Adr. (DA)	Output Process Image	Input Process Image
Byte 12		DA40: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA41: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA42: short: ON/OFF long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA43: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
Byte 13		DA44: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA45: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA46: short: ON/OFF long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA47: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
Byte 14	DA48 – DA63	DA48: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA49: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA50: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA51: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
Byte 15		DA52: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA53: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA54: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA55: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error

Byte 16 – 19	DALI Adr. (DA)	Output Process Image	Input Process Image
Byte 16		DA56: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA57: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA58: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA59 short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
Byte 17		DA60: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA61: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA62 short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		DA63 short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
Byte 18	GA0 – GA15	GA0: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		GA1: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		GA2: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		GA3: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
Byte 19		GA4: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		GA5: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		GA6: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		GA7: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error

4.4.4 Activating/De-activating 16 Groups, Dimming

Byte 20 – 23	Group adr. (GA)	Output Process Image	Input Process Image
Byte 20		GA8: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		GA9: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		GA10: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		GA11 short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
Byte 21		GA12: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		GA13: short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		GA14 short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error
		GA15 short: ON/OFF, long: Brighter/Darker dimming ON/OFF	Status ON/OFF Status No error / Error

4.4.5 Activating/De-activating 16 Scenes

Byte 22 – 23	Scenes	Output Process Image	Input Process Image
Byte 22	Scenes 0 – 15	Switch to scene 0	-
		Switch to scene 1	-
		Switch to scene 2	-
		Switch to scene 3	-
		Switch to scene 4	-
		Switch to scene 5	-
		Switch to scene 6	-
		Switch to scene 7	-
Byte 23		Switch to scene 8	-
		Switch to scene 9	-
		Switch to scene 10	-
		Switch to scene 11	-
		Switch to scene 12	-
		Switch to scene 13	-
		Switch to scene 14	-
		Switch to scene 15	-

5 Assembly

5.1 Assembly Sequence

All system components can be snapped directly on a carrier rail in accordance with the European standard EN 50022 (DIN 35).

The reliable positioning and connection is made using a tongue and groove system. Due to the automatic locking, the individual components are securely seated on the rail after installation.

Starting with the coupler/controller, the bus modules are assembled adjacent to each other according to the project design. Errors in the design of the node in terms of the potential groups (connection via the power contacts) are recognized, as the bus modules with power contacts (male contacts) cannot be linked to bus modules with fewer power contacts.

⚠ CAUTION

Risk of injury due to sharp-edged male contacts!
The male contacts are sharp-edged. Handle the module carefully to prevent injury.

NOTICE

Connect the I/O modules in the required order!
Never plug bus modules from the direction of the end terminal. A ground wire power contact, which is inserted into a terminal without contacts, e.g. a 4-channel digital input module, has a decreased air and creepage distance to the neighboring contact in the example DI4.

NOTICE

Assemble the I/O modules in rows only if the grooves are open!
Please take into consideration that some bus modules have no or only a few power jumper contacts. The design of some modules does not allow them to be physically assembled in rows, as the grooves for the male contacts are closed at the top.

Note

Don't forget the bus end module!
Always plug a bus end module 750-600 onto the end of the fieldbus node! You must always use a bus end module at all fieldbus nodes with the WAGO I/O System 750 fieldbus couplers/controllers to guarantee proper data transfer.

5.2 Inserting and Removing Devices

DANGER

Use caution when interrupting the PE!
Make sure that people or equipment are not placed at risk when removing an I/O module and the associated PE interruption. To prevent interruptions, provide ring feeding of the ground conductor, see section "Grounding/Ground Conductor" in manual "System Description WAGO-I/O-SYSTEM 750".

NOTICE

Perform work on devices only if the system is de-energized!
Working on devices when the system is energized can damage the devices. Therefore, turn off the power supply before working on the devices.

5.2.1 Inserting I/O Module

1. Position the I/O module so that the tongue and groove joints to the fieldbus coupler/controller or to the previous or possibly subsequent I/O module are engaged.

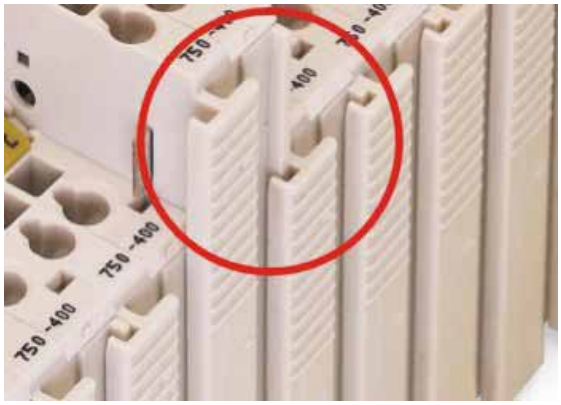


Figure 6: Insert I/O module

2. Press the I/O module into the assembly until the I/O module snaps into the carrier rail.

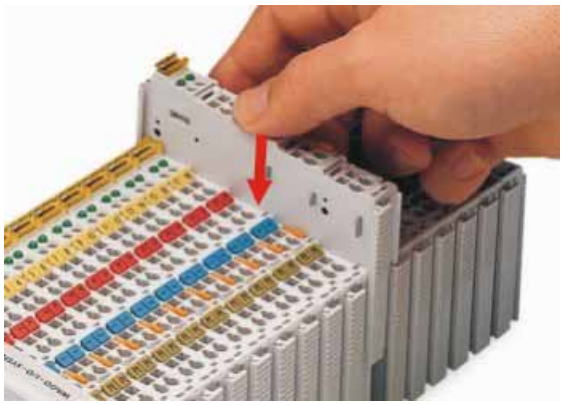


Figure 7: Snap the I/O module into place

With the I/O module snapped in place, the electrical connections for the data contacts and power contacts (if any) to the fieldbus coupler/controller or to the previous or possibly subsequent I/O module are established.

5.2.2 Removing the I/O Module

1. Remove the I/O module from the assembly by pulling the release tab.

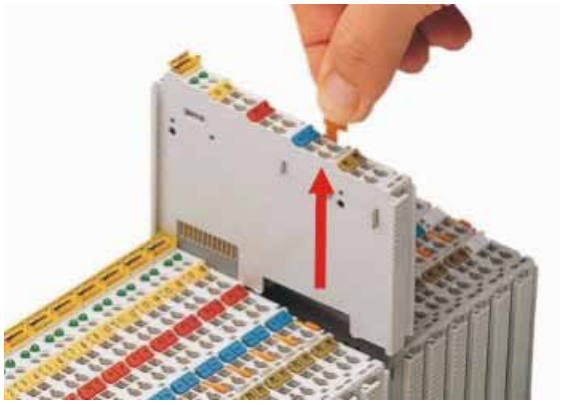


Figure 8: Removing the I/O module

Electrical connections for data or power contacts are disconnected when removing the I/O module.

5.3 I/O Modules with Pluggable Wiring Level (Series 753)

Series 753 I/O modules feature a pluggable connector for I/O wiring. This connector is simply plugged into the bottom of the module.
The connector can be completely removed together with the wiring, simplifying replacement of defective modules from the assembly.

Figure 9: Connector and module

Miniature WSB marking tags ensure that the right connector is matched up with the right I/O module (see figure below).

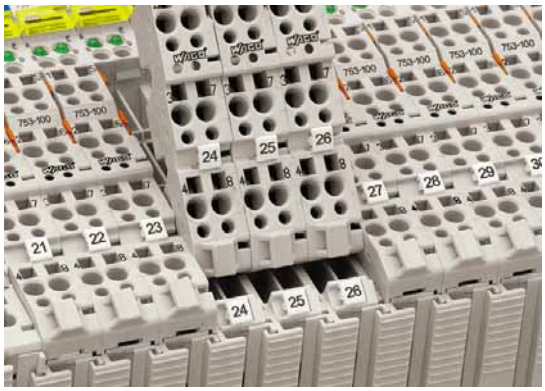


Figure 10: Assignment of module to connector using Mini-WSB tags

This connector provides an option for attaching cable binders.

Figure 11: Attachment of cable binders

5.3.1 Coding

Coding using small plastic pins and sockets facilitates mating of the module with the appropriate connector.

1. Insert the pin into the socket.

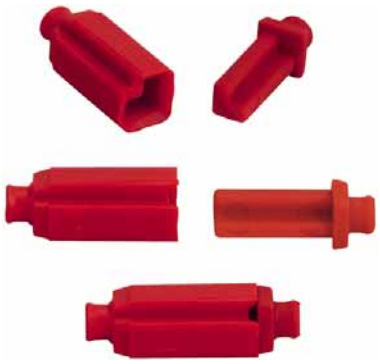


Figure 12: Assembling the coding pins

2. Position the assembled coding pins in the I/O module. Due to its design, each pin allows four different coding options (i.e.; 16 different options using two pins).

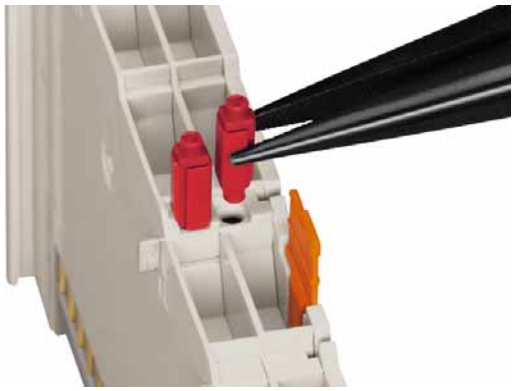


Figure 13: Inserting the coding pins

3. Place the connector onto the I/O module.

Figure 14: Plugging the connector into place

4. When the connector is removed the sockets remain in the I/O module. The coded connector can only fit in the corresponding coded I/O module (see figures below).

Figure 15: "Sure match" coding pins

5.3.2 Connector Removal

1. Remove the connector from the I/O module by pulling the orange pull tab on the connector toward the top of the module.

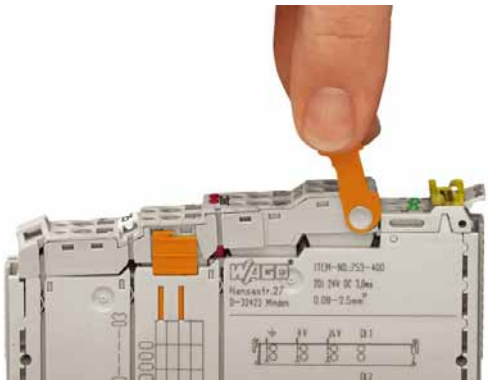


Figure 16: Pulling the pull tab

The connector detaches from the module.

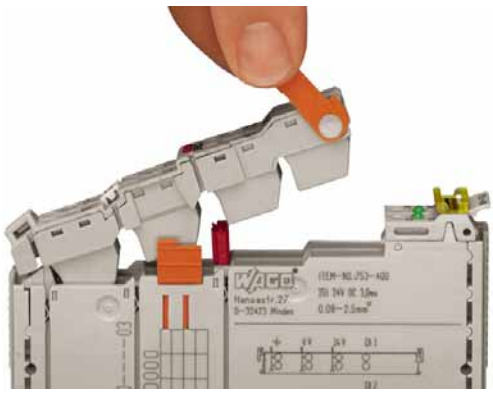


Figure 17: Removing the connector without tools

2. Alternatively, you can also use a standard screwdriver at the position shown (in the figure below) to remove the connector.

Figure 18: Removing the connector using a screwdriver

6 Connect Devices

6.1 Connecting a conductor to the CAGE CLAMP®

The WAGO CAGE CLAMP® connection is appropriate for solid, stranded and finely stranded conductors.

Note

Only connect one conductor to each CAGE CLAMP® connection!
Only one conductor may be connected to each CAGE CLAMP® connection.
Do not connect more than one conductor at one single connection!

If more than one conductor must be routed to one connection, these must be connected in an up-circuit wiring assembly, for example using WAGO feed-through terminals.

Exception:
If it is unavoidable to jointly connect 2 conductors, then you must use a ferrule to join the wires together. The following ferrules can be used:

Length	8 mm
Nominal cross section $_{max.}$	1 mm^2 for 2 conductors with 0.5 mm^2 each
WAGO Product	216-103 or products with comparable properties.

1. To open the CAGE CLAMP® insert the actuating tool into the opening above the connection.
2. Insert the conductor into the corresponding connection opening.
3. To close the CAGE CLAMP® simply remove the tool - the conductor is then clamped firmly in place.

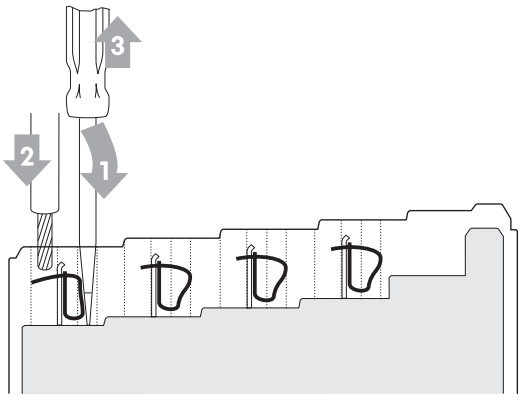


Figure 19: Connecting a conductor to a CAGE CLAMP®

6.2 Installation Notes

NOTICE

Only perform work on the components when the system is de-energized!
Working on the devices when the system is energized can damage the devices. Therefore, turn off the power supply before working on the devices.

Note

Observe IEC 62386!
Always observe the validity of IEC 62386!
The information given below on setting up a DALI network should be seen as recommendations only.

6.2.1 Module Assembly

Note

Supply module is required!
The DALI Multi-Master Module has no power jumper contacts. The field supply potential of the adjacent I/O modules in the node will not be passed to the following modules. A supply module is therefore required to provide any additional I/O modules.

6.2.2 Module Supply

Note

Required accessories: DC/DC converter, Item No.: 753-620 or power supply unit for DALI-Multi-Master module, Item No.: 787-1007!
A suitable DALI power supply unit is required for the 18V power supply to the DALI network via the DALI Multi-Master module which is compliant with the DALI guideline, such as the DC/DC converter, Item No. 753-620, or the power supply unit with the Item No. 787-1007.
These items provide for reliable electrical isolation between the DALI bus and the data bus that is required for installation of 230V electrical loads.

Note

EMC regulations comply by DIN rail grounding!
In order to meet the EMC regulations, the DC/DC converter must be connected to ground using the appropriate FE-connection (S) on the rail.

The length of the power supply cable between the DC/DC converter and the DALI Multi-Master Module must not exceed 1 meter.

6.2.2.1 Power Supply Configuration for 753-620

If you use a 753-620 DC/DC converter for power supply, exactly one DALI Multi-Master module can be supplied with power.

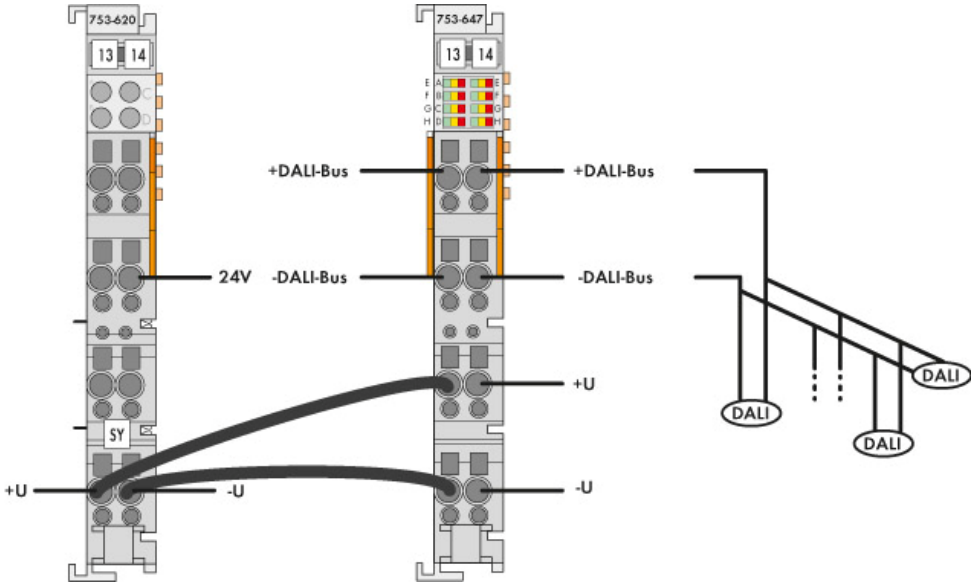


Figure 20: Configuration diagram for the 753-620 DC/DC converter with one DALI-Multi-Master module

Power must be supplied by a second, or by a maximum of a third 753-620 DC/DC converter to provide proper power supply to further DALI-Multi-Master modules at the fieldbus node.

In this configuration ensure that the DC/DC converters are initially installed adjacently in groups, as they pass on potential via power jumper contacts. Each of the DALI Multi-Master modules are then wired individually to the power supply terminals (see figure below).

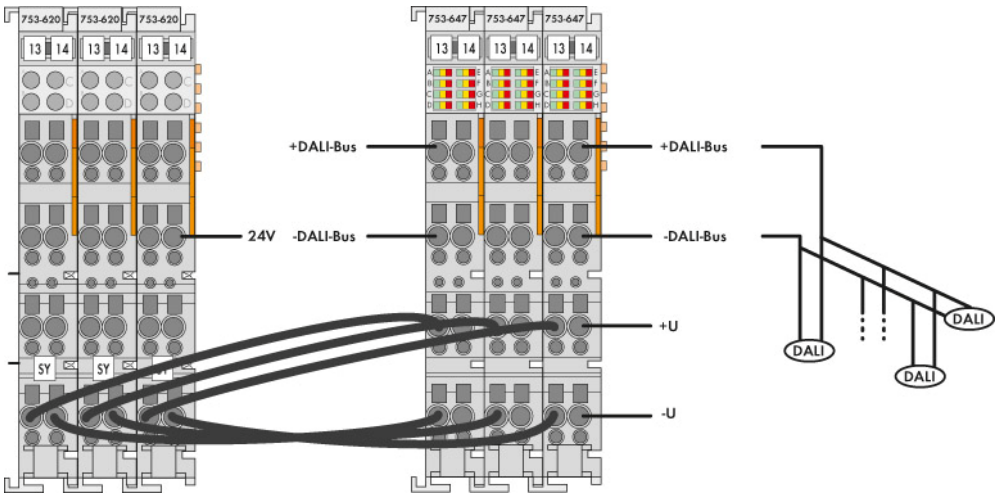


Figure 21: Configuration diagram for three 753-620 DC/DC converters with three DALI-Multi-Master modules

The 787-1007 power supply unit can be used when more than three DALI-Multi-Master modules are installed at one fieldbus node.

6.2.2.2 Power Supply Configuration for 787-1007

If power supply is provided using a 787-1007 power supply unit, up to five DALI-Multi-Master modules can be powered in a fully equipped system (DALI bus slaves with total power consumption of max. 200 mA).

Note

230 V power supply required!
Note that the 787-1007 power supply unit required 230 V power supply.

Connection of power supply is made at the first DALI Multi-Master module. Power must be passed on via cable bridges for supply of the other I/O modules.

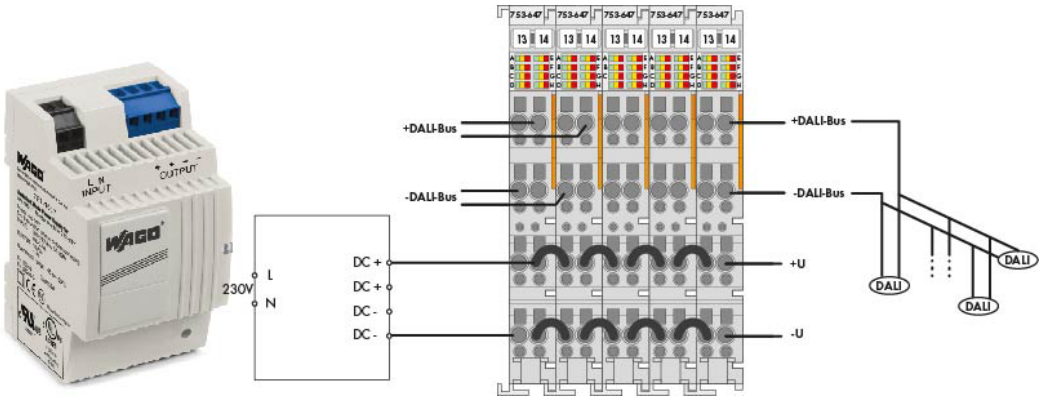


Abbildung 22: Anschaltprinzip Stromversorgung 787-1007 mit fünf DALI-Multi-Master-Klemmen

6.2.3 DALI Bus Line

The DALI bus control line consists of one pair of conductors which can be run together with the 230 V installation.
For example, a 5-conductor cable can be used combining both the voltage supply and the DALI control line.

The minimum cross section of the conductors depends on the cable length.

Table 18: Conductor cross section depending on the cable length

Cable length	Conductor cross section (min.)
< 100 m	0.5 mm²
100 m – 150 m	0.75 mm²
> 150 m	1.5 mm²

Note

Maximum cable lenght 300 m!
The maximum voltage drop of the DALI line should not exceed 2 V. Therefore, the maximum cable length between the more distant components is depending on the conductor cross-section limited to 300 m.

6.2.4 DALI Bus Topology

A DALI Master can control a line with a maximum of 64 slaves consumming 2 mA each. 16 separate groups and 16 separate scenes can be allocated to each slave.

64 addresses for DALI sensors can also be allocated. The number of sensors that can actually be installed is yielded from calculating the total power consumption and from the number of addresses for each sensor.

The topology of the DALI bus is not defined. Line, tree, star or mixed structures are possible. However, ring structures should be avoided.

The same installation regulations apply for both lighting equipments and power supply cables.
This also applies to the installation of special rooms (“harmonized installation regulations“).

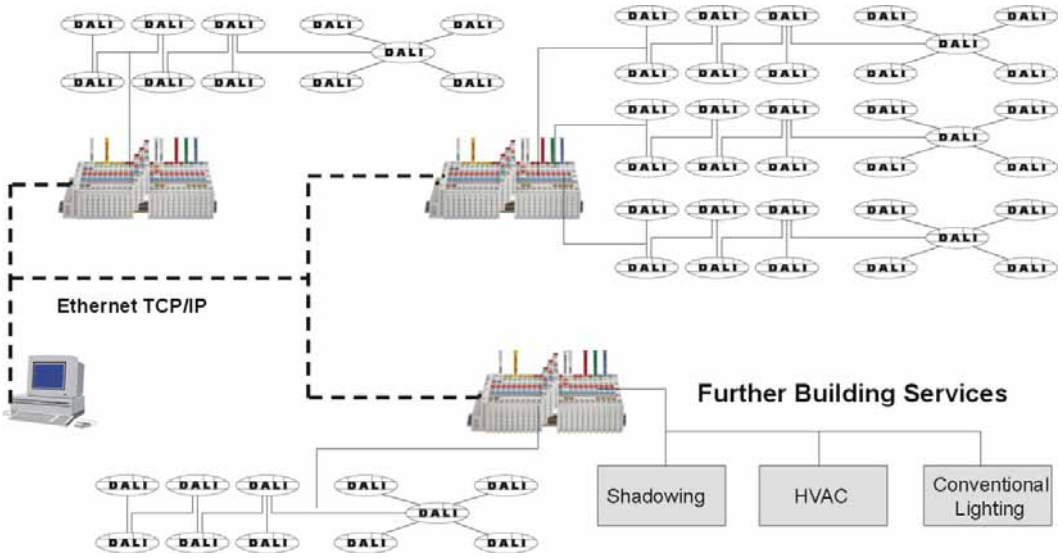


Figure 23: Example of DALI topology

7 Commissioning

7.1 Preparation

A prerequisite for the commissioning example described below is that you have correctly installed and set up the hardware for your fieldbus node and the DALI network and that these items all function properly.

Either the 753-620 DC/DC converter or the 787-1007 external power supply unit can be used for power supply for the DALI-Multi-Master module at the fieldbus node. Connection of the power supply is made as explained in the installation instructions (see Section "Installation Notes").

In the example given here, the fieldbus node consists of the following WAGO-I/O-SYSTEM components:

Table 19: Example of a fieldbus node setup

Item number	Designation
750-881	Programmable Fieldbus Controller ETHERNET (PLC)
753-620	DC/DC converter
753-647	DALI Multi-Master Module
750-600	End module

The DALI bus has been connected to the +/- DALI terminals of the DALI-Multi-Master module and has at least one DALI ECG as a bus slave.

The PC is linked to the fieldbus node via an RJ-45 network cable.
The PC's network card must be set based on the address range for the fieldbus node.

As an alternative, connection can also be made via the fieldbus controller serial interface. Use the WAGO communication cable to set up a physical connection via the serial service port. This cable is supplied with the WAGO-I/O-*PRO* (Item No.: 759-333) programming software, or can be obtained as an accessory under Item No.: 750-920.

You can open the **WAGO-DALI Configurator** directly via the **WAGO-I/O-*CHECK*** software to start up the DALI-Multi-Master module and then configure the DALI network linked to the module.

Information

Get WAGO-I/O-*CHECK*!
You can obtain the WAGO-I/O-*CHECK* software on a CD under Item No. 759-302. This CD contains all the application program files.

Information

Get the WAGO-DALI Configurator; integrated into WAGO-I/O-*CHECK*, or as a free download!
The WAGO-DALI Configurator is integrated into the WAGO-I/O-*CHECK* commissioning tool (Item No.: 759-302) starting from Version 03.04.01.09, or you can download the WAGO-DALI Configurator free of charge as a stand-alone tool from the WAGO Internet site at:
www.wago.com.

Information

More information about WAGO-I/O-*CHECK* and the WAGO-DALI Configurator!
A detailed description of the WAGO-I/O-*CHECK* software and the WAGO-DALI Configurator is given in the manuals for these products.
You can download these manuals free of charge from the WAGO Internet site at:
http://www.wago.com.

7.2 Accessing the DALI-Multi-Master Module

You can access the DALI-Multi-Master module via the WAGO-DALI Configurator.

A communication link must be set up via the IP address of the WAGO PLC connected at the fieldbus node to ensure proper data exchange with the DALI-Multi-Master module via the WAGO-DALI Configurator. You can set up this link using WAGO-I/O-*CHECK*.

7.3 Module Configuration Notes

You can make general settings for the DALI-Multi-Master module in the dialog window view of the WAGO-DALI Configurator for module configuration.
You can open the module configuration dialog window by clicking the **[Module]** button in the WAGO-DALI Configurator toolbar.

In this dialog window you can, for example, define special settings for the Easy mode and Full mode, along with network options such as device polling (bus scan) and the response in the case of erroneous telegrams.
In this window you can also de-activate the internal DALI network power supply in the DALI-Multi-Master module to connect an external DALI network power supply.

The displayed buttons can be used to export the DALI-Multi-Master module settings and to write defined settings to the DALI-Multi-Master module.

7.4 Data Management Notes

If online access to the devices on the bus is not possible, you can define virtual DALI devices as an initial step and match these to the actual installation online at a later time. Offline configuration of the entire DALI network, including control gear and sensors, can be performed in a limited scope using the WAGO-DALI Configurator. Device configurations can also be saved and restored, enabling a replaced device to be reconstructed using the values valid in the database. This enables you to copy device settings to a different device or to several ones.

7.5 Configuring the DALI Network Using the WAGO-DALI Configurator (Basic Procedure)

Perform the following steps to configure the DALI-Multi-Master module and the DALI network linked with the module using the WAGO-DALI Configurator:

1. **Define addresses for the DALI devices**
   Open the dialog window for addressing the DALI devices using the **[Network]→[Addressing]** buttons in the WAGO-DALI Configurator toolbar.

2. **Add DALI devices to the tree structure**
   Before beginning configuration you must add devices from the device list to the tree structure (left dialog window view) in the configuration window (right dialog window view) by simple "drag&drop".
   Multiple selections are possible.

3. **Configure DALI devices**
   You can open the dialog window for configuring the DALI devices using the **[Network]→[Configuration]** button in the WAGO-DALI Configurator toolbar.

4. **Define DALI groups and scenes**
   Allocation of the devices to groups and scenes is performed simply by dragging them to the corresponding group/scene using the mouse.
   You can open the dialog window for scene settings using the **[Network]→[Scenes]** button in the WAGO-DALI Configurator toolbar.
   You can configure up to 16 standard groups (0 ... 15) and an additional 16 virtual groups (16 ... 31) for 64 devices, with a maximum of 8 devices being assigned to one virtual group.

5. **Perform diagnosis**
   Diagnosis of the DALI-Multi-Master module is performed via the evaluation of the display elements (see Section "Display Elements").
   You can perform a diagnosis of the DALI network using the WAGO-DALI Configurator by clicking the **[Diagnostics]** button in the toolbar.

Information

More information about configuration using the WAGO-DALI Configurator!

A detailed description of the software and the individual configuration steps using the WAGO-DALI Configurator is given in the corresponding manual.
You can download the WAGO-DALI Configurator manual free of charge from the WAGO Internet site at:
http://www.wago.com.

8 Diagnostics

Diagnosis of the DALI-Multi-Master module is performed via the evaluation of the display elements (see Section "Display Elements").

You can also perform diagnostics for all DALI network subscribers located in the connected DALI line using the WAGO-DALI Configurator configuration software.

A list of devices is generated for this in the diagnostics dialog window with the individual device status by clicking the **[Query status]** button.
Any errors are indicated in the corresponding table column by a red square with an exclamation mark.

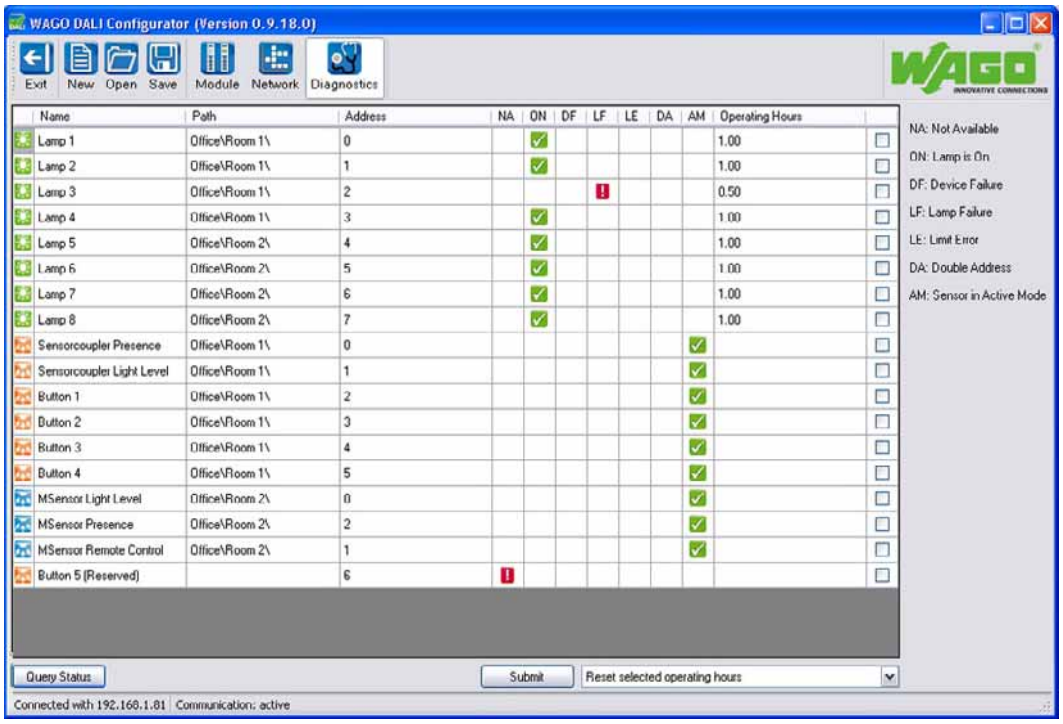


Figure 24: Diagnostics using the WAGO-DALI Configurator – Example

A selection list containing different functions, some of which can be executed to eliminate device errors (such as a duplicate address) is also displayed (on the right, below the device list).

The status for the following queries is displayed in the table entries:

Table 20: Diagnostics - Status display for the DALI network in the WAGO-DALI Configurator and solutions

Table Columns		Explanation	Solution
NA	- N**ot available**	Device not available	Check the device, the connection and the address. If required, re-assign the address for the device (see Section "Addressing").
ON	- **Lamp is on**	The lamp is switched on	Status indication
DF	- **Device fault (error)**	Error or failure of device	Check the failed device and replace it if defective. If required, perform data import using the Replace function (**[Restore]** function) (see Section "Configuration").
LD	- **Lamp defect**	Lamp is defective	Replace the defective lamp.
LE	- **Limit error**	Violation of upper/lower limit	Check the limit settings in the configuration for the device concerned.
DA	- **Duplicate address**	Duplicate address detected	To delete duplicate addresses, select the devices with the identical addresses and then point to the function **"Delete selected duplicate addresses"** in the selection list on the right below the table. Then, click the button **[Submit]**.
AM	- Sensor in the active mode	Sensor is in the active mode; sensor transmitting data	Status indication
Operating Hours		Operating Hours	Display of operating hours. On a device replacement, for example, you can reset the operating hours to 0. To do this, select the corresponding device and point to the function **"Reset selected operating hours"** in the selection list on the right below the table. Then, click the button **[Submit]**.

You can reset the logged operating hours in the last column of the table to 0 (e.g., for replacing a device).

You can replace single, defective devices easily and quickly. The WAGO-DALI Configurator supports a "Replace" function for this. Using the **[Restore]** button, the old short address of the previous device is assigned to the new device and the device settings are then reconstructed using the data stored in the module database.

9 Use in Hazardous Environments

The **WAGO-I/O-SYSTEM 750** (electrical equipment) is designed for use in Zone 2 hazardous areas.

The following sections include both the general identification of components (devices) and the installation regulations to be observed. The individual subsections of the "Installation Regulations" section must be taken into account if the I/O module has the required approval or is subject to the range of application of the ATEX directive.

9.1 Marking Configuration Examples

9.1.1 Marking for Europe according to CENELEC and IEC

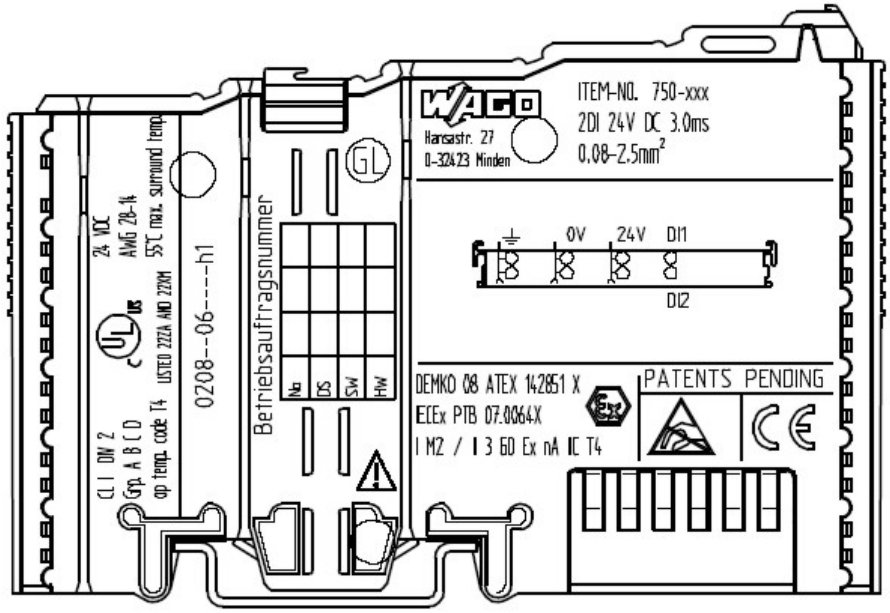


Figure 25: Side marking example for ATEX and IEC Ex approved I/O modules according to CENELEC and IEC

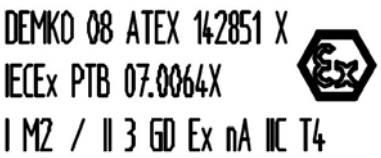


Figure 26: Printing Text detail – Marking example for ATEX and IEC Ex approved I/O modules according to CENELEC and IEC

Table 21: Description of marking example for ATEX and IEC Ex approved I/O modules according to CENELEC and IEC

Printing on Text	Description
DEMKO 08 ATEX 142851 X IECEx PTB 07.0064X	Approval body and/or number of the examination certificate
I M2 / II 3 GD	Explosion protection group and Unit category
Ex nA	Type of ignition and extended identification
IIC	Explosion protection group
T4	Temperature class

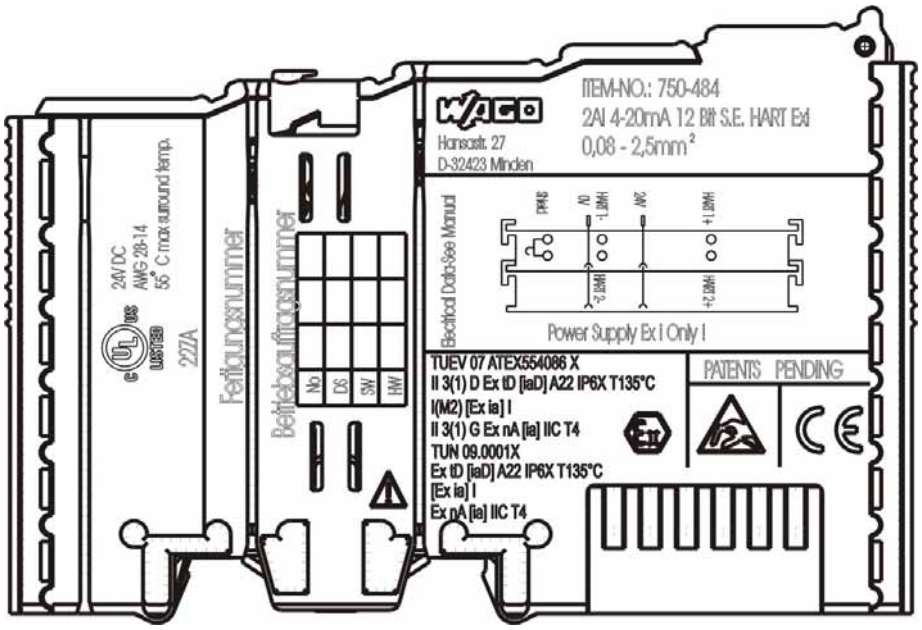


Figure 27: Side marking example for Ex i and IEC Ex i approved I/O modules according to CENELEC and IEC

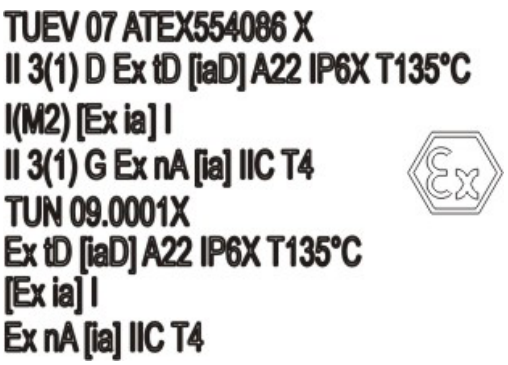


Figure 28: Text detail – Marking example for Ex i and IEC Ex i approved I/O modules according to CENELEC and IEC

Table 22: Description of marking example for Ex i and IEC Ex i approved I/O modules according to CENELEC and IEC

Inscription text	Description
TÜV 07 ATEX 554086 X TUN 09.0001X	Approving authority or certificate numbers
Dust	
II	Device group: All except mining
3(1)D	Device category: Zone 22 device (Zone 20 subunit)
Ex	Explosion protection mark
tD	Protection by enclosure
[iaD]	Approved in accordance with "Dust intrinsic safety" standard
A22	Surface temperature determined according to Procedure A, use in Zone 22
IP6X	Dust-tight (totally protected against dust)
T 135°C	Max. surface temp. of the enclosure (no dust bin)
Mining	
I	Device group: Mining
(M2)	Device category: High degree of safety
[Ex ia]	Explosion protection: Mark with category of type of protection intrinsic safety: Even safe when two errors occur
I	Device group: Mining
Gases	
II	Device group: All except mining
3(1)G	Device category: Zone 2 device (Zone 0 subunit)
Ex	Explosion protection mark
nA	Type of protection: Non-sparking operating equipment
[ia]	Category of type of protection intrinsic safety: Even safe when two errors occur
IIC	Explosion Group
T4	Temperature class: Max. surface temperature 135°C

9.1.2 Marking for America according to NEC 500

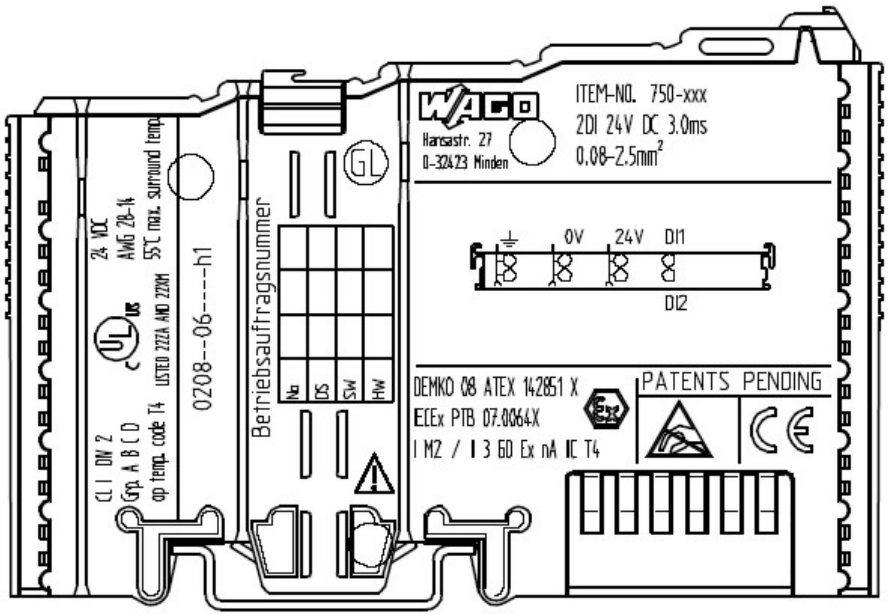


Figure 29: Side marking example for I/O modules according to NEC 500

Figure 30: Text detail – Marking example for I/O modules according to NEC 500

Table 23: Description of marking example for I/O modules according to NEC 500

Printing on Text	Description
CL 1	Explosion protection group (condition of use category)
DIV 2	Area of application (zone)
Grp. ABCD	Explosion group (gas group)
Optemp code T4	Temperature class

9.2 Installation Regulations

In the **Federal Republic of Germany**, various national regulations for the installation in explosive areas must be taken into consideration. The basis for this forms the working reliability regulation, which is the national conversion of the European guideline 99/92/E6. They are complemented by the installation regulation EN 60079-14. The following are excerpts from additional VDE regulations:

Table 24: VDE Installation Regulations in Germany

DIN VDE 0100	Installation in power plants with rated voltages up to 1000 V
DIN VDE 0101	Installation in power plants with rated voltages above 1 kV
DIN VDE 0800	Installation and operation in telecommunication plants including information processing equipment
DIN VDE 0185	lightning protection systems

The **USA** and **Canada** have their own regulations. The following are excerpts from these regulations:

Table 25: Installation Regulations in USA and Canada

NFPA 70	National Electrical Code Art. 500 Hazardous Locations
ANSI/ISA-RP 12.6-1987	Recommended Practice
C22.1	Canadian Electrical Code

NOTICE

Notice the following points

When using the **WAGO-I/O SYSTEM 750** (electrical operation) with Ex approval, the following points are mandatory:

9.2.1 Special Conditions for Safe Operation of the ATEX and IEC Ex (acc. DEMKO 08 ATEX 142851X and IECEx PTB 07.0064)

The fieldbus-independent I/O modules of the WAGO-I/O-SYSTEM 750-.../...-... must be installed in an environment with degree of pollution 2 or better. In the final application, the I/O modules must be mounted in an enclosure with IP 54 degree of protection at a minimum with the following exceptions:

- I/O modules 750-440, 750-609 and 750-611 must be installed in an IP 64 minimum enclosure.
- I/O module 750-540 must be installed in an IP 64 minimum enclosure for 230 V AC applications.
- I/O module 750-440 may be used up to max. 120 V AC.

When used in the presence of combustible dust, all devices and the enclosure shall be fully tested and assessed in compliance with the requirements of IEC 61241-0:2004 and IEC 61241-1:2004.

When used in mining applications the equipment shall be installed in a suitable enclosure according to EN 60079-0:2006 and EN 60079-1:2007.

I/O modules fieldbus plugs or fuses may only be installed, added, removed or replaced when the system and field supply is switched off or the area exhibits no explosive atmosphere.

DIP switches, coding switches and potentiometers that are connected to the I/O module may only be operated if an explosive atmosphere can be ruled out.

I/O module 750-642 may only be used in conjunction with antenna 758-910 with a max. cable length of 2.5 m.

To exceed the rated voltage no more than 40%, the supply connections must have transient protection.

The permissible ambient temperature range is 0 °C to +55 °C.

9.2.2 Special conditions for safe use (ATEX Certificate TÜV 07 ATEX 554086 X)

1. For use as Gc- or Dc-apparatus (in zone 2 or 22) the field bus independent I/O modules WAGO-I/O-SYSTEM 750-*** shall be erected in an enclosure that fulfils the requirements of the applicable standards (see the marking) EN 60079-0, EN 60079-11, EN 60079-15, EN 61241-0 and EN 61241-1. For use as group I, electrical apparatus M2, the apparatus shall be erected in an enclosure that ensures a sufficient protection according to EN 60079-0 and EN 60079-1 and the degree of protection IP64. The compliance of these requirements and the correct installation into an enclosure or a control cabinet of the devices shall be certified by an ExNB.

2. If the interface circuits are operated without the field bus coupler station type 750-3../…-… (DEMKO 08 ATEX 142851 X), measures must be taken outside of the device so that the rating voltage is not being exceeded of more than 40% because of transient disturbances.

3. DIP-switches, binary-switches and potentiometers, connected to the module may only be actuated when explosive atmosphere can be excluded.

4. The connecting and disconnecting of the non-intrinsically safe circuits is only permitted during installation, for maintenance or for repair purposes. The temporal coincidence of explosion hazardous atmosphere and installation, maintenance resp. repair purposes shall be excluded. This is although and in particular valid for the interfaces “CF-Card”, “USB”, “Fieldbus connection“, “Configuration and programming interface“, “antenna socket“, “D-Sub“ and the “Ethernet interface“. These interfaces are not energy limited or intrinsically safe circuits. An operating of those circuits is in the behalf of the operator.

5. For the types 750-606, 750-625/000-001, 750-487/003-000, 750-484 and 750-633 the following shall be considered: The interface circuits shall be limited to overvoltage category I/II/III (non mains/mains circuits) as defined in EN 60664-1.

6. For the type 750-601 the following shall be considered: Do not remove or replace the fuse when the apparatus is energized.

7. The ambient temperature range is: $0°C \leq T_a \leq +55°C$ (for extended details please note certificate).

8. The following warnings shall be placed nearby the unit:

⚠ WARNING

Do not remove or replace fuse when energized!
If the module is energized do not remove or replace the fuse.

⚠ WARNING

Do not separate when energized!
Do not separate the module when energized!

⚠ WARNING

Separate only in a non-hazardous area!
Separate the module only in a non-hazardous area!

9.2.3 Special conditions for safe use (IEC-Ex Certificate TUN 09.0001 X)

1. For use as Dc- or Gc-apparatus (in zone 2 or 22) the fieldbus independent I/O modules WAGO-I/O-SYSTEM 750-*** shall be erected in an enclosure that fulfils the requirements of the applicable standards (see the marking) IEC 60079-0, IEC 60079-11, IEC 60079-15, IEC 61241-0 and IEC 61241-1. For use as group I, electrical apparatus M2, the apparatus shall be erected in an enclosure that ensures a sufficient protection according to IEC 60079-0 and IEC 60079-1 and the degree of protection IP64. The compliance of these requirements and the correct installation into an enclosure or a control cabinet of the devices shall be certified by an ExCB.

2. Measures have to be taken outside of the device that the rating voltage is not being exceeded of more than 40% because of transient disturbances.

3. DIP-switches, binary-switches and potentiometers, connected to the module may only be actuated when explosive atmosphere can be excluded.

4. The connecting and disconnecting of the non-intrinsically safe circuits is only permitted during installation, for maintenance or for repair purposes. The temporal coincidence of explosion hazardous atmosphere and installation, maintenance resp. repair purposes shall be excluded. This is although and in particular valid for the interfaces “CF-Card”, “USB”, “Fieldbus connection“, “Configuration and programming interface“, “antenna socket“, “D-Sub“ and the “Ethernet interface“. These interfaces are not energy limited or intrinsically safe circuits. An operating of those circuits is in the behalf of the operator.

5. For the types 750-606, 750-625/000-001, 750-487/003-000, 750-484 and 750-633 the following shall be considered: The interface circuits shall be limited to overvoltage category I/II/III (non mains/mains circuits) as defined in IEC 60664-1.

6. For the type 750-601 the following shall be considered: Do not remove or replace the fuse when the apparatus is energized.

7. The ambient temperature range is: $0°C \leq T_a \leq +55°C$ (For extensions please see the certificate).

8. The following warnings shall be placed nearby the unit:

⚠ WARNING

Do not remove or replace fuse when energized!
If the module is energized do not remove or replace the fuse.

⚠ WARNING

Do not separate when energized!
Do not separate the module when energized!

⚠ WARNING

Separate only in a non-hazardous area!
Separate the module only in a non-hazardous area!

9.2.4 ANSI/ISA 12.12.01

This equipment is suitable for use in Class I, Division 2, Groups A, B, C, D or non-hazardous locations only.

This equipment is to be fitted within tool-secured enclosures only.

⚠ WARNING

Explosion hazard!
Explosion hazard - substitution of components may impair suitability for Class I, Div. 2.

⚠ WARNING

Disconnect device when power is off and only in a non-hazardous area!
Do not disconnect equipment unless power has been switched off or the area is known to be non-hazardous near each operator accessible connector and fuse holder." When a fuse is provided, the following information shall be provided: “A switch suitable for the location where the equipment is installed shall be provided to remove the power from the fuse.”

For devices with Ethernet connectors:
”Only for use in LAN, not for connection to telecommunication circuits”.

⚠ WARNING

Use only with antenna module 758-910!
Use Module 750-642 only with antenna module 758-910.

For Couplers/Controllers and Economy bus modules only: "The configuration Interface Service connector is for temporary connection only. Do not connect or disconnect unless the area is known to be nonhazardous. Connection or disconnection in an explosive atmosphere could result in an explosion.

⚠ WARNING

Devices containing fuses must not be fitted into circuits subject to over loads!
Devices containing fuses must not be fitted into circuits subject to over loads, e.g. motor circuits!

⚠ WARNING

Do not connect or disconnect SD-Card unless the area known to be free of ignitable concentrations of flammable gases or vapors!
Do not connect or disconnect SD-Card while circuit is live unless the area is known to be free of ignitable concentrations of flammable gases or vapors.

Information

Additional Information
Proof of certification is available on request. Also take note of the information given on the module technical information sheet. The Instruction Manual, containing these special conditions for safe use, must be readily available to the user.

10 Glossary

C

Control Gear (electronic ballast, ECG)

"Control Gear" is the short designation for "electronic control gear" (ECC). In DALI networks, control gear is implemented as one or more components between the network power supply and one or more lamps.
The control gear is used for power supply for the lighting and for communication with DALI. The control gear provide the switch-on voltage and warm-up current for the lamps to prevent a cold start, thus enhancing the power factor and reducing electromagnetic interference.

Control Device

"Control Device" is the IEC designation for the DALI-(Multi)-Master. This term also denotes the active sensors.

D

DALI

"DALI" is the acronym for "Digital Addressable Lighting Interface", a protocol for control of lighting devices and equipment in building automation, such as switched-mode power supply units ("electronic transformers"), electronic control gear (ECG) or electronic dimmers. Specific definitions are elucidated in the IEC 62386 series of standards.

→ Refer also to "IEC 62386".

DALI Short Address

Each device with a DALI interface is addressed in the network using a DALI short address. For some multifunction devices, such as the multisensors, each individual function (brightness, presence, remote control) can be assigned a dedicated DALI short address, enabling the function to be specifically addressed.

E

Easy Mode

In the "Easy" mode, DALI devices linked to the system are represented in binary form the process image with two bits each. These two bits correspond to the button functions (ON/OFF, DIMMING) and are implemented in the DALI-Multi-Master module. The status is queried in cycles.

→ See also "Full Mode."

F

Full Mode

In the "Full" mode, switching commands are specified by a higher-order control system via a PLC application. Transmission with the module takes place via the internal mailbox. Querying of process data is acyclic.

→ See also "Easy Mode."

I

IEC 62386

The "IEC 62386" "Digitally addressable interface for lighting" is a series of standards which defines details specific to DALI. This series of standards is reviewed by the IEC subcommittee SC 34C and consists of different sections (date, Sept. 2010):

- 101: "System",
- 102: "Operating Devices",
- 201 to -210: "Device Types 0-9":
  - 201: Device Type 0: Fluorescent Lamps
  - 202: Device Type 1: Independent Emergency Lighting
  - 203: Device Type 2: Discharge Lamps
  - 204: Device Type 3: Low-Voltage Halogen Lamps,
  - 205: Device Type 4: Incandescent Lamps
  - 206: Device Type 5: Conversion of Digital Signals to DC Voltage
  - 207: Device Type 6: LED Modules
  - 208: Device Type 7: Switching Function
  - 209*): Device Type 8: Color/Color Temperature Control
  - 210*): Device Type 9: Sequencers

(*) Device Type 8 and 9 are not supported by the WAGO-DALI-Multi-Master module 753-647).

Note

IEC-62386 series of standards has not yet been given final approval!
Please note that other sections of the DALI standard, which define the DALI Master, are still under discussion and have not yet been granted final approval.

M

Multi-Master

In a "Multi-Master", control of the intelligent measuring and automation devices on the fieldbus is performed locally, in contrast to a Master-Slave system.

The WAGO 753-647 DALI-Multi-Master module is a Multi-Master, which supports the DALI interface and can utilize this interface together with other master devices.

R

Random Address

The "Random address" (or "Search Address") is a 24-bit address generated by an ECG during initialization.

Replace Function

In the event that exactly one control gear item (ECG) is defective and is replaced by a non-addressed ECG, the "Replace" function can be used to automatically assign the old short address of the previous control gear to the new control gear and subsequently restore the settings for that control gear using the data stored in the module database.

S

Single Master

In contrast to a Multi-Master, a "Single Master" does not support collision detection and is not suitable for connection at the same interface with other masters.

Settling Time

The "Settling Time" is the minimum time period between two frames.

V

Virtual Group

A DALI group is a logical combination of devices to which a common group address is assigned so that these devices execute a common function synchronously. These devices do not necessarily have to be physically linked (e.g., the group for all emergency lighting systems, all hallway lights, etc.).

In the event that the 16 group addresses available for this (0 ... 15) are not sufficient, as further groups are required, an additional 16 virtual groups (with group addresses 17 .... 31) can also be created. These groups cannot, however, be addressed via a DALI group command, but only one after the other by individual commands from the DALI-Multi-Master module. A maximum of 8 devices may be assigned to each virtual group in order not slow down or impede DALI data exchange on the bus.

11 Appendix

11.1 Table Device Types in the Standard

The following Device Types are supported by the DALI Multi-Master Module:

Table 26: Digital Addressable Lighting Interface - Product Family Standard IEC 62386 (Sept. 2010)

Digital Addressable Lighting Interface – Part 100 General Requirements			
62386-101: System	PUB	1. Ed. published: 06/09	
62386-102: Control Gear	PUB	1. Ed. published: 06/09	936/DC for Amdt. 1: commenting date 29.10.2010
Digital Addressable Lighting Interface – Part 200 Particular Requirements for Control Gear			
62386-201: Fluorescent Lamps	PUB	1. Ed. published: 06/09	Device Type 0
62386-202: Emergency Lighting	PUB	1. Ed. published: 06/09	Device Type 1
62386-203: HID Lamps	PUB	1. Ed. published: 06/09	Device Type 2
62386-204: Low Voltage Halogen Lamps	PUB	1. Ed. published: 06/09	Device Type 3
62386-205: Incandescent Lamps	PUB	1. Ed. published: 06/09	Device Type 4
62386-206: Conversion into D.C. Voltage	PUB	1. Ed. published: 06/09	Device Type 5
62386-207: LED Modules	PUB	1. Ed. published: 08/09	Device Type 6
62386-208: Switching Function	PUB	1. Ed. published: 06/09	Device Type 7

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