Manual

AUTOMATION

WAGO-I/O-SYSTEM 753

LON® FTT Module

753-648

V1.0.0

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.

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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 753-648 (LON FTT Module) of the WAGO-I/O-SYSTEM 750 series.

The I/O module 753-648 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.

The descriptions below require knowledge in the configuration of LON® network components.

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).

⚠ WARNING

Personal injury due to the lack of safety measures in safety-related applications!
Be sure to take appropriate, external and independent measures to prevent personal injury or property damage in respective risky applications.
Please note that additional regulations beyond the general regulations can be derived from the specific application, e.g. for security and life systems.
If the hardware and/or software is used to implement automation solutions, which can cause great personal injury or damage to property in the event of failure, you have to take steps to achieve a safe operating state even in the event of failure. Such measures may include the use of positive opening safety limit switches, which disengage the power supply for machine drive controlled or uncontrolled.

2.3 Requirements

2.3.1 PC Hardware

Table 3: PC hardware requirements

Components	Requirements
Operating system	Windows XP/Vista/Windows 7
Memory	Min. 128 MB
Free hard disk storage	Min. 1.5 MB for the LON® 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 (redistributable included in the delivery), standard Web browser with Java support

2.3.2 PC Software

Table 4: Required software

Components	Source (item No.)
WAGO-I/O-*PRO* (includes LON® configurator Version 2.3.9.35 or higher, Existing customers with older versions are asked to contact Support: support@wago.com)	WAGO 759-333 (manual for WAGO-I/O-*PRO* can be downloaded free at: www.wago.com).
LonMark resource files (Version 13.00)	LonMark® Organization (free download at: http://www.lonmark.org/technical_resources/resource_files/)
	Note **Recommended: Use LMRF Version 13.00!** We recommend that you do not use any beta, but LMRF Version 13.00 to ensure compatibility.
LON_01.lib	WAGO (free download at: www.wago.com) (library description for LON_01.lib free download at: www.wago.com).

Table 5: Optional software

Components	Source
WAGO-I/O-*CHECK*	WAGO (759-302)
WAGO ETHERNET Settings	WAGO (free download at: www.wago.com)

2.3.3 WAGO-I/O-SYSTEM

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

Components	Source (item No.)
Fieldbus controller/PLC WAGO-I/O-SYSTEM 750 (e.g. BACnet/IP Programmable Fieldbus Controller 750-830)	WAGO (750-830, example)
LON® FTT module 753-648	WAGO (753-648)
End module 750-600	WAGO (750-600)

3 Device Description

3.1 Device-specific Information

Note

Number of LON® FTT modules per fieldbus node depends on the application!
Please note the following factors that have a significant effect on utilization and the maximum number of usable LON® FTT modules on one fieldbus node:

- No. and type of NVs
- Use of arrays for NVs of the same type
- Optimized arrangement of the variables
- Type of fieldbus controller and available memory

Resources can be saved by using as few different types of network variables as possible and by creating ARRAYs for network variables or FPTs that are used several times.

Note

Please note the limits and strategies of project planning!
Be sure to note the strategies defined in the manual for the "LON® configurator" software in the "Planning Strategies" and "Restrictions" chapters for project planning and the factors described that affect utilization before planning and executing your own project to ensure optimal function of your project with the LON® FTT module 753-648.

3.2 General Description

The LON® FTT module is used to connect a LON® network to a WAGO fieldbus node with PLCs (programmable fieldbus controllers) and 750/753 Series I/O modules.
These I/O modules can be used in combination with different fieldbus systems (e.g. KNX, DALI, EnOcean).

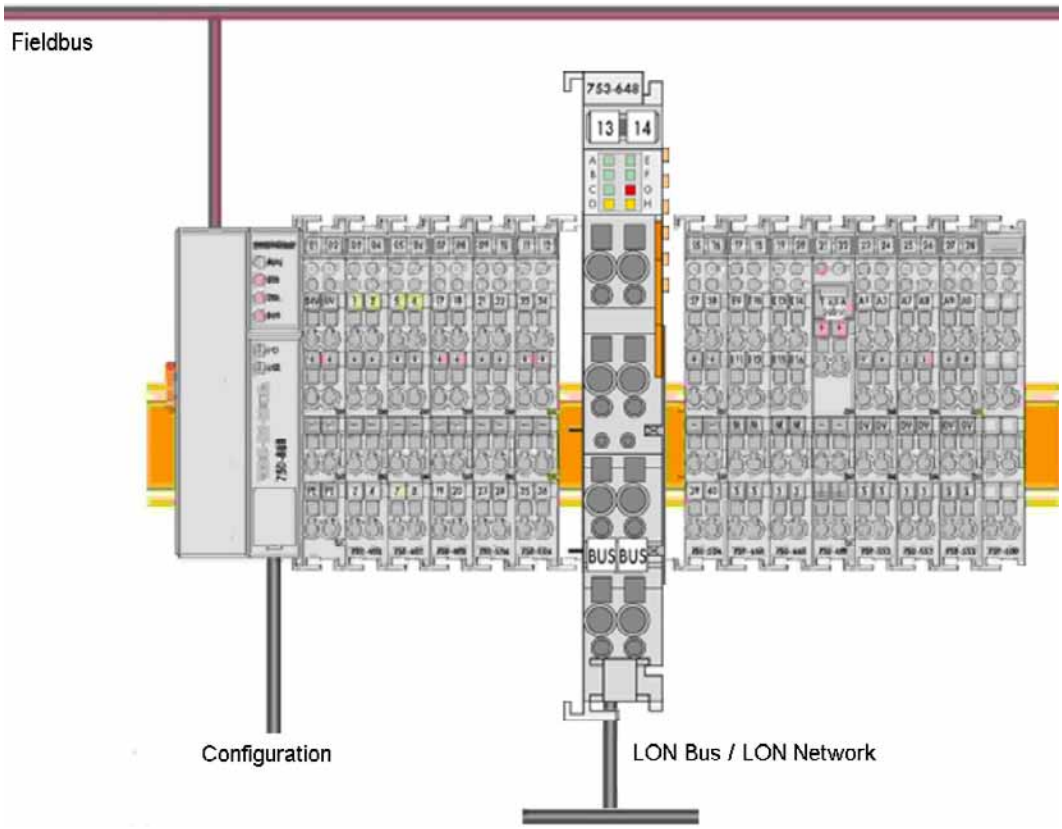


Figure 1: Example circuit diagram of a LON® network on the WAGO-I/O-SYSTEM 750

The LON® FTT module (FTT stands for Free Topology Transceiver) is intended for use in a wide variety of tasks in industrial and building automation and is compliant with ISO/IEC 14908.
In a LonWorks® FT (Free Topology) or LP (Link Power) network, the LON® FTT module is an industrial-scale, fully configurable LON® device.

Using the WAGO-I/O-SYSTEM 750, LON® control devices are seamlessly integrated with all supported BA and fieldbus protocols. Application examples are found, for example, in the integrated room control of lighting, shading, ventilation and climate. Other LON® subsystems such as automatic doors, elevators, escalators and emergency lighting can also be integrated.

The module's network variable interface defines 249 network variables of any type and supports both LonMark® objects and configuration properties.

The LON® FTT modules are supplied via power jumper contacts.

The module is equipped with two connections for the bus line (LON® Bus A and LON® Bus B) for connection of the LON® bus.

In general, LON® guidelines must be adhered to for network installation.

The WAGO-I/O-PRO software is used to program the fieldbus nodes.
For implementation of complex control applications, a comprehensive IEC-61131-3 library with simple modules is available.

The LON® configurator integrated in the WAGO-I/O-*PRO* makes easy setup and configuration of the LON® FTT module possible.
The LON® network interface of the LON® FTT module is defined by the variable configuration using the LON® configurator.

Information

More information about the LON® configurator!
You can download the manual for the LON® configurator free of charge from the WAGO Internet site at:
www.wago.com

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

3.3 View

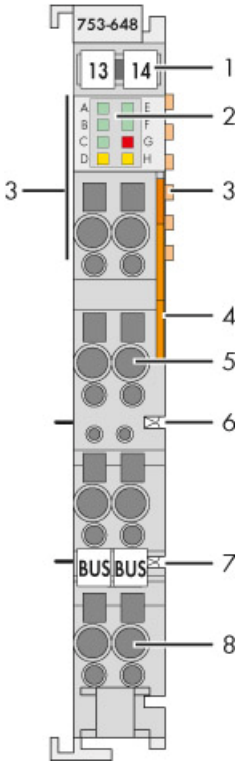


Figure 2: View

Table 7: 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	---	Release tab for bus module and plug	"Mounting" > "Insert and Removing Device"
5	2, 6	CAGE CLAMP® connections Service Pin	„Device Description“ > „Connections“
6	---	Power jumper contacts + 24 V	„Device Description“ > „Connections“
7	---	Power jumper contacts 0 V	„Device Description“ > „Connections“
8	4, 8	CAGE CLAMP® connections LON Bus connections	„Device Description“ > „Connections“

3.4 Connectors

3.4.1 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.

3.4.2 Power Contacts/Field Supply

The I/O module 753-648 has 2 self-cleaning power jumper contacts that supply and transmit power for the field side. The contacts on the left side of the I/O module are designed as male contacts and the contacts on the right side as spring contacts.

Table 8: Power jumper contacts

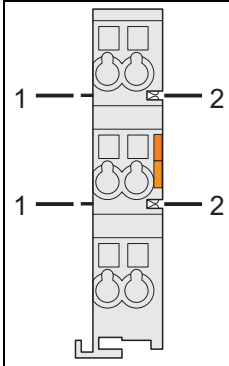


Figure 4: Power jumper contacts

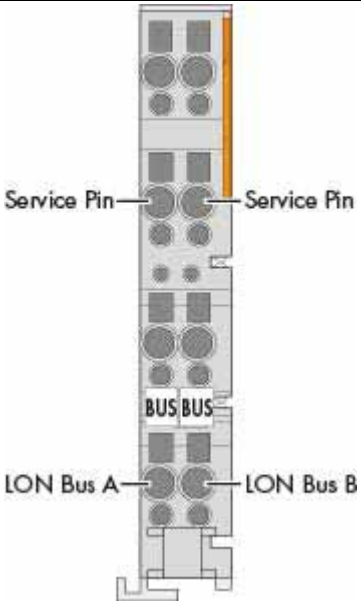
Connection	Type	Number	Function
1	Blade contact	2	Infeed of the field supply voltage (U_V and 0 V)
2	Spring contact	2	Forwarding of the field supply voltage (U_V and 0 V)

NOTICE

Do not exceed maximum current via power contacts!
The maximum current to flow through the power contacts is 10 A.
Greater currents can damage the power contacts.
When configuring the system, ensure that this current is not exceeded. If exceeded, an additional potential feed module must be used.

3.4.3 CAGE CLAMP® Connections

Table 9: Connections



Firgure 5: Connections

Connection	Function
Service Pin	Service Pin connection
Service Pin	Service Pin connection
LON Bus A	LON Bus A connection
LON Bus B	LON Bus B connection

3.5 Display Elements

Table 10: Display elements

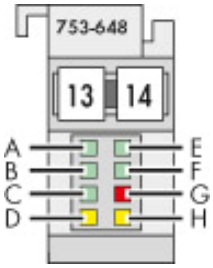


Figure 6: Display elements

LED	Designation	Status	Function
A	User Config	Green	The LON® FTT module contains a valid user-defined configuration of its external interface (network variables, configuration properties, etc.).
		off	No configuration active (initialization still active or initialization failed with error)
		Green flashing	The LON® FTT module is operated with the base configuration.
B	Tx LED (Sending)	Rapid flashing, green	A LonTalk® telegram is being sent.
C	Mailbox	Green	Mailbox communication OK
		off	Mailbox communication interrupted.
		Green flashing	Synchronization phase of Mailbox communication active.
D	Service LED	Yellow	Ready to commission
		off	Commissioned if only green LEDs light up or still unconfigured if LED "G" lights up red.
E	LonWorks® node status	Green	Configured online.
		off	Otherwise:
		Green flashing	Synchronization of CPs active (CP values are transmitted from the module to the controller either after restart or due to receipt of new values via the LON® network.)
F	RxD (Receiving)	Rapid flashing, green	A LonTalk® telegram is being received.
G	Communication/ Initialization phase	Red	Communication between the host controller and ShortStack MicroServer (FT500) has been interrupted.
		off	Otherwise:
		Red flashing	Initialization phase between the host controller and ShortStack MicroServer (FT5000) is active.
H	Service LED	Yellow	Ready to commission
		off	Commissioned if only green LEDs light up or still unconfigured if LED "G" lights up red.

3.6 Operating Elements

The I/O module 753-648 does not have any electro-mechanical operating elements.

Two CAGE CLAMP® connections are available for the "Service Pin" function. The two service pin connections are labeled "2" and "6" on the LON® FTT module.

To trigger the "Service Pin" function, an electrical connection is briefly established between these two service pins (e.g. via jumper) and the Neuron® ID transmitted that serves as a unique 48-bit number for unique addressing in the network.

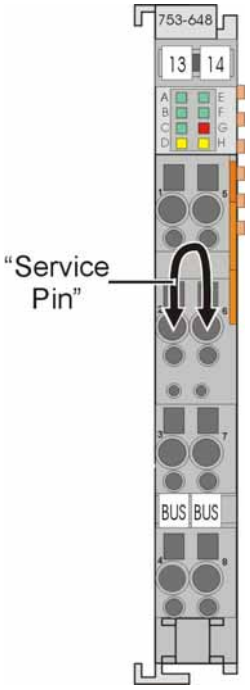


Figure 7: „Service Pin“ function by bridging the service pin connections.

The higher-level controller (e.g. WAGO-I/O-*PRO*, item No. 759-333) is used to make configuration and parameter changes.

The comprehensive, easy-to-use software tool, the LON® configurator integrated in WAGO-I/O-*PRO* (version 2.3.9.34 or higher), is used to define the LON® network interface within the LON® FTT module 753-648.
This forms the communication link between the WAGO-I/O-SYSTEM and the "IEC-61131-World" and the LonWorks® network.

The interface of the LON® FTT module 753-648 to the LonWorks® network is not restricted to specific network variables.
The LON® configurator can be used to configure the LON® FTT module 753-648 and from the module, create a LON® device with various functions.

3.7 Schematic Diagram

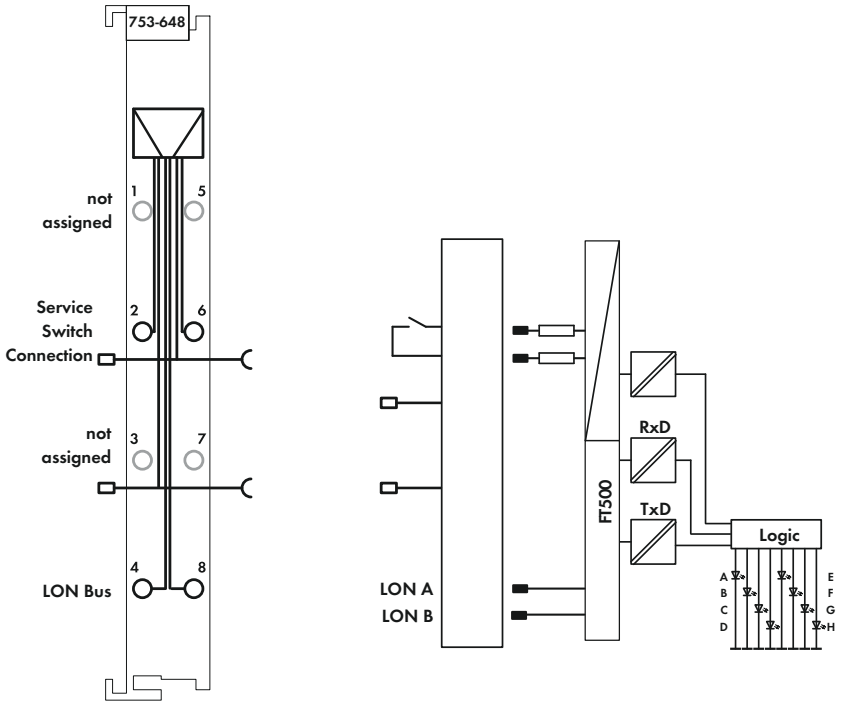


Figure 8: Schematic Diagram

3.8 Technical Data

3.8.1 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

3.8.2 Supply

Table 12: Technical Data - Supply

Power supply	via system voltage(+ 5 V DC)
Current consumption (internal)	30 mA
Isolation	500 V system/supply

3.8.3 Communication

Table 13: Technical Data - Communication

Transmission medium	Twisted Pair – FTT
Max. length of fieldbus segment	500 m (free topology); 2700 m (bus topology)
Topology	acc. To LON specification
Baud rate	78 kbps
Transmission channel	1
Internal bit width	23-byte data
Commissioning	via WAGO-I/O-*CHECK*
Programming	via WAGO-I/O-*PRO*
Interface to LON network	programmable via WAGO-I/O-*PRO*
Configuration	with the LON Configurator
Number of network variables	max. 254 (249 for application)
Number of aliases	max. 127
ISI (Interoperable self installation)	no
DMF (Direct memory files)	no
Processor	FT5000
Transceiver	FTX2

3.9 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 753-648 I/O modules:

CE	Conformity Marking	
cULus	cULus	UL508

3.10 Standards and Guidelines

753-648 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
EMC marine applications-Immunity to interference	acc. to Germanischer Lloyd (2003)
EMC marine applications-Emission of interference	acc. to Germanischer Lloyd (2003)

4 Mounting

4.1 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.

4.2 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.

4.2.1 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.

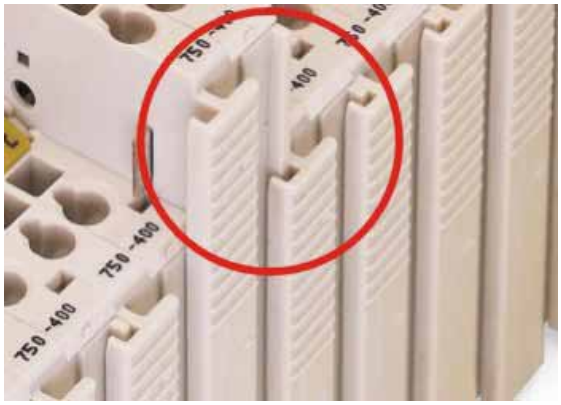


Figure 9: Insert I/O module

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

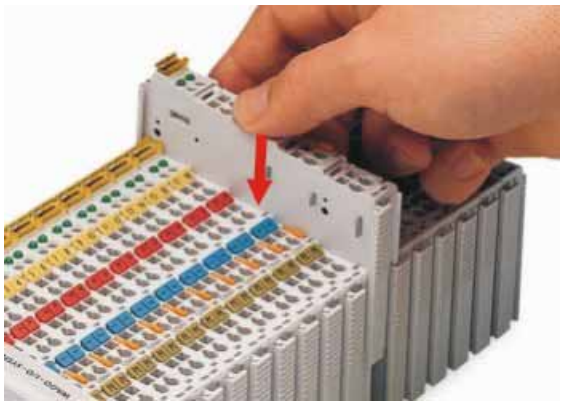


Figure 10: Snap the I/O module into place

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.

4.2.2 Removing the I/O Module

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

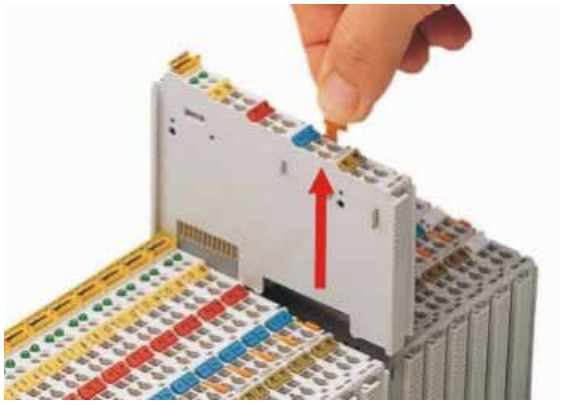


Figure 11: Removing the I/O module

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

4.3 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 12: Connector and module

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

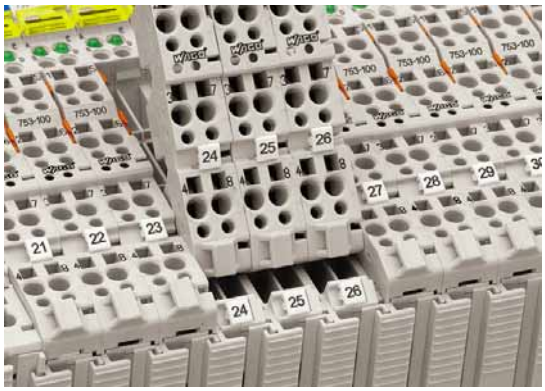


Figure 13: Assignment of module to connector using Mini-WSB tags

This connector provides an option for attaching cable binders.

Figure 14: Attachment of cable binders

4.3.1 Coding

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

1. Insert the pin into the socket.

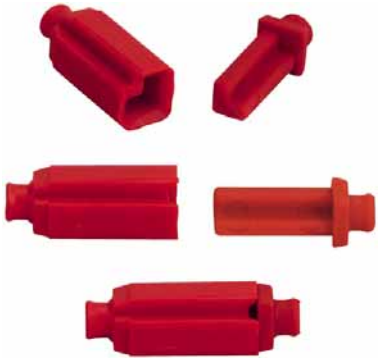


Figure 15: Assembling the coding pins

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).

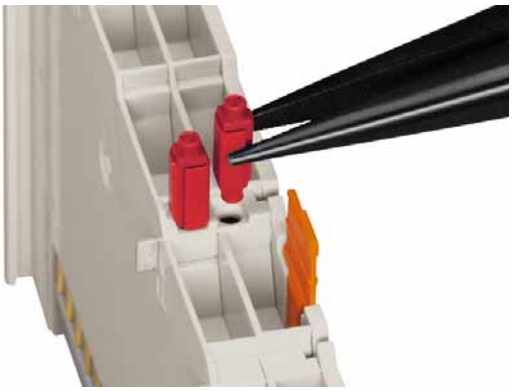


Figure 16: Inserting the coding pins

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

Figure 17: 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).

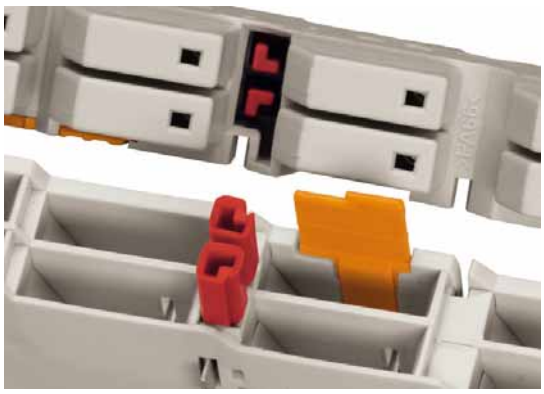


Figure 18: "Sure match" coding pins

4.3.2 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.

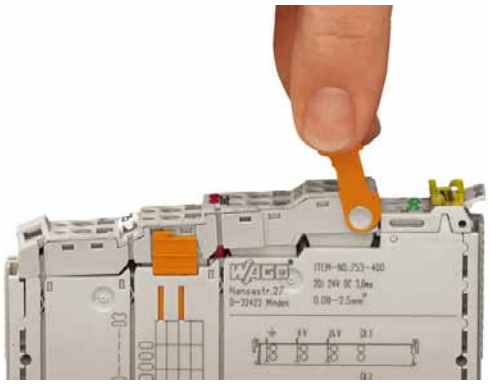


Figure 19: Pulling the pull tab

The connector detaches from the module.

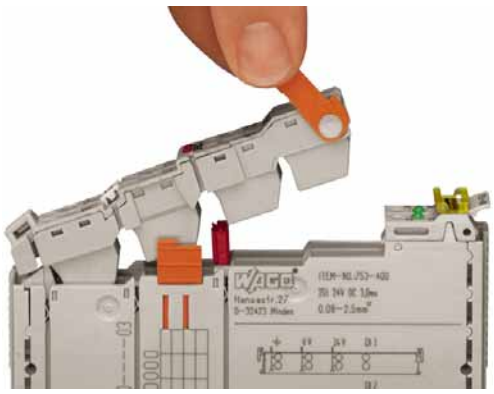


Figure 20: Removing the connector without tools

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

Figure 21: Removing the connector using a screwdriver

5 Connect Devices

5.1 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.

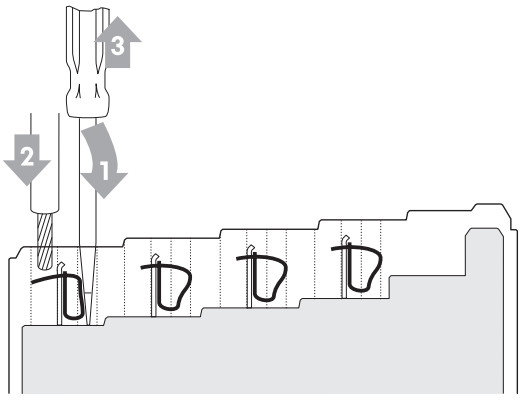


Figure 22: Connecting a conductor to a CAGE CLAMP®

6 Commissioning

6.1 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 LON® network on the LON® FTT module and that these items all function properly.

The LON® FTT modules are supplied in the fieldbus node via the system voltage.

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

Table 14: Example hardware for a fieldbus node setup

Item Number	Designation
750-830	BACnet/IP programmable fieldbus controller
753-648	LON® FTT module
750-600	End module

A two-wire conductor connects the LON® bus to both LON® bus A and LON® bus B connections.

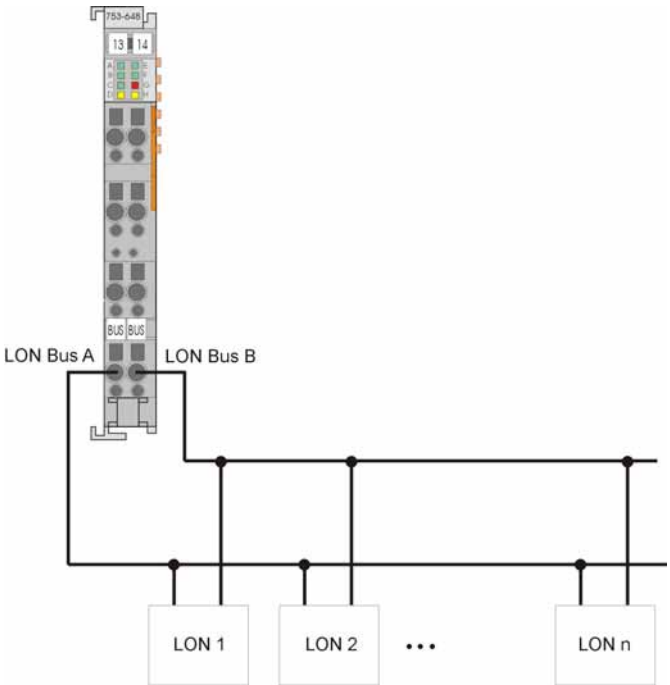


Figure 23: Configuration diagram of a LON® bus to the LON® FTT module

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.

A 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.

NOTICE

Do not connect 750-920 Communication Cable when energized!
To prevent damage to the communications interface, do not connect or disconnect 750-920 Communication Cable when energized! The fieldbus controller must be de-energized!

6.2 Creating a Project and Launching the LON® Configurator

If the hardware is set up, you can now start creating a new WAGO-I/O-*PRO* project.

First, create your required project in WAGO-I/O-*PRO* and configure the hardware of your fieldbus node in the control configuration.

Then launch the LON® configurator from WAGO-I/O-*PRO* directly, which you use to configure your LON® FTT module.

In the dialog view of the LON® configurator, you can change any settings to configure the interface to the LON® network for the LON® FTT module and thus define a device template for the LON® FTT module.
The appropriate function blocks are automatically generated in the LON® configurator from the interface definition created. The WAGO-I/O-*PRO* can then be used to integrate the function blocks in your IEC user application.

An example configuration of the LON® FTT module is described as a process in the manual for the LON® configurator.

Information

More information about WAGO-IO-*PRO* and LON® configurator!
A detailed description of WAGO-I/O-*PRO* and the LON® configurator software is available in the respective documentation.
You can download this documentation free of charge from the WAGO Internet site at:
www.wago.com.

6.3 Note about Offline Configurations

The LON® configurator can be used without limitation for offline configurations. The required input and output data of LON® nodes is first created and defined virtually, then later output or queried when logging in online.

A complete configuration can also be saved by exporting the XIF file and imported using a network management tool (e.g. LonMaker® from Echelon®) to integrate the configured LON® FTT module in an existing LON® network.

7 Diagnostics

Diagnosis of the I/O module is performed via the evaluation of the display elements (see Section "Display Elements").

8 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.

8.1 Marking Configuration Examples

8.1.1 Marking for Europe according to CENELEC and IEC

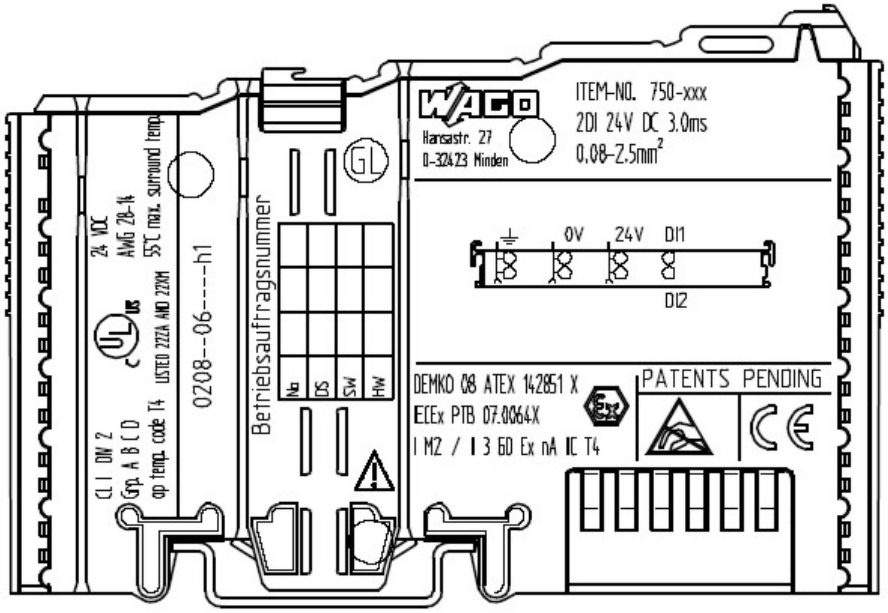


Figure 24: Side marking example for ATEX and IEC Ex approved I/O modules according to CENELEC and IEC

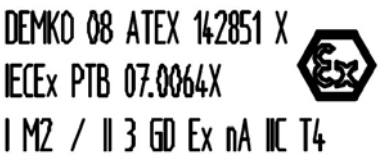


Figure 25: Printing Text detail – Marking example for ATEX and IEC Ex approved I/O modules according to CENELEC and IEC

Table 15: 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

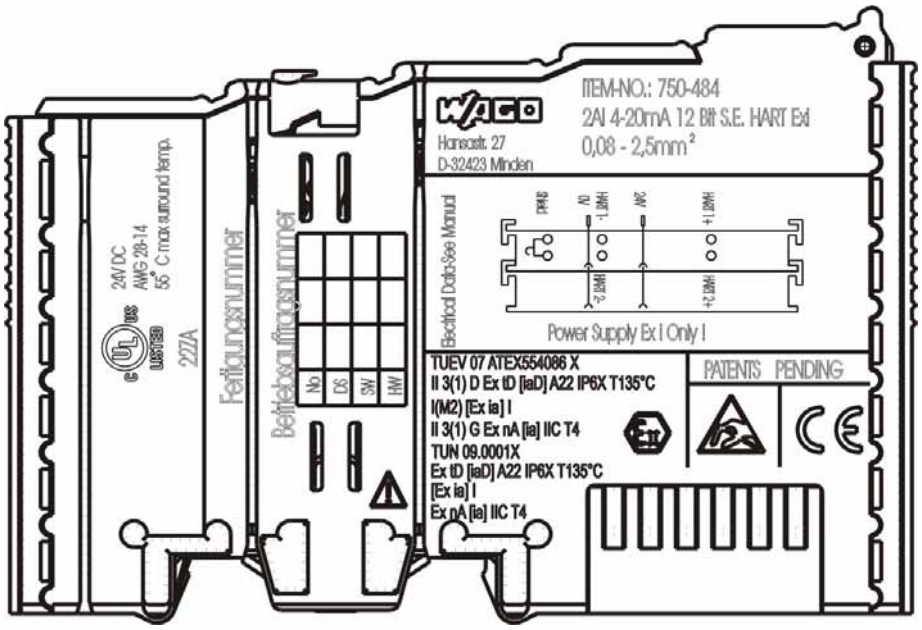


Figure 26: Side marking example for Ex i and IEC Ex i approved I/O modules according to CENELEC and IEC

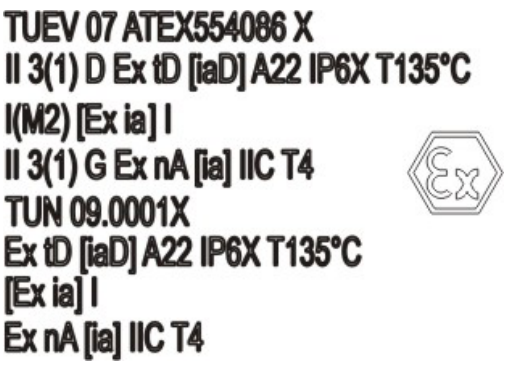


Figure 27: Text detail – Marking example for Ex i and IEC Ex i approved I/O modules according to CENELEC and IEC

Table 16: 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

8.1.2 Marking for America according to NEC 500

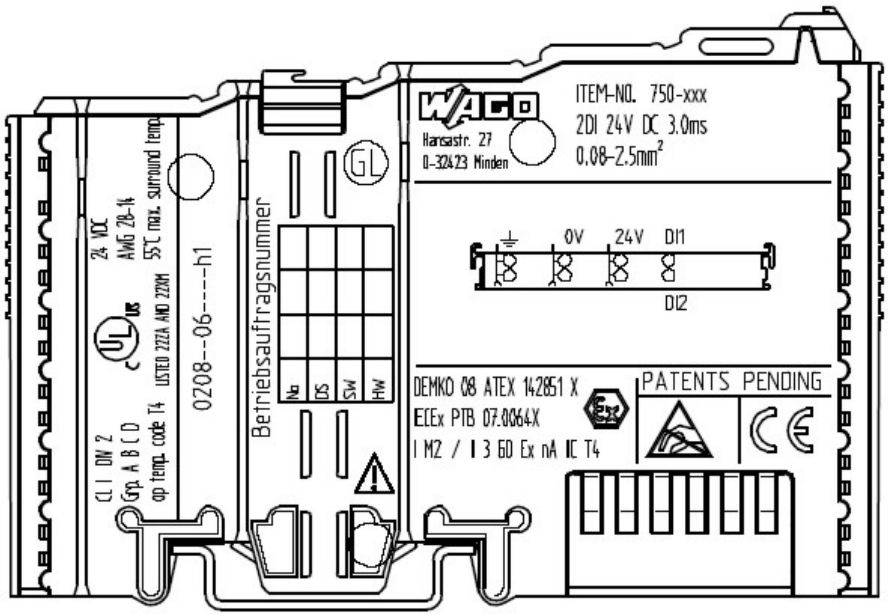


Figure 28: Side marking example for I/O modules according to NEC 500

Figure 29: Text detail – Marking example for I/O modules according to NEC 500

Table 17: 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

8.2 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 18: 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 19: 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:

8.2.1 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.

8.2.2 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!

8.2.3 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!

8.2.4 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.

9 Glossary

Information

More information about LON® technical terms!
Detailed information about LON®-specific terms and technologies is available on the Internet on the LonMark® organization website at:
www.Lonmark.org.

C

CPs

Abbreviation for "Configuration Properties". The "Configuration Properties" are variables that specify the configuration for specific LonWorks® devices.
(see also *SCPT*)

CSMA

CSMA stands for "Carrier Sense Multiple Access" and is a special bus access method. With CSMA the node first "listens" to the network before becoming active. LonWorks® operates with a special CSMA method, which permits a short reaction time with a high throughput rate even in large networks.

D

Device template

Device templates provide the profile of a node in the network.
They are available in the form of XIF files (External Interface Files) and contain all network-relevant data. This data as a whole determines the interface to the network. For the integration of a node in a system, the network interface (e.g. transceiver parameter and detailed information about the network variable used) must be known.

Domains

The largest addressing units are domains. These are used to build complete independent sub-systems, e.g. lighting systems, access control (in as much as these must not communicate with each other). Thus domains form a virtual network within the physical network structure. Each LON® unit can be addressed over two domain addresses. One domain can be allocated a maximum of 255 Subnets each with 27 units (together comprising of 32,385 units).

Driver

Software code that communicates with a hardware device. This communication is normally performed by internal device registers.

E

Echelon®

The company Echelon® is the technology provider for LonWorks® technology.
Information about Echelon® is available on the Internet at: http://www.Echelon.com.

F

FPT (Functional Profile Template)

FPTs consist of combined LMOs and thereby form functional units (functional profiles) that are defined across manufacturers.
FPTs are parts of LMRFs (LonMark® Resource Files).
(see also *LMO* and *LMRF*)

Free Topology

The Free Topology is a network topology, which was possible for the first time with the FTT-10 Transceiver. In free topology, it is possible to mix line, star or ring structures together. However, in this case the maximum transmission spacings are dependent upon the cable quality. Due to the use of routers or repeaters, the transmission spacing limits can be overcome.

Function

Module that always returns the same results (as a function value), It has no local variables that store values beyond an invoke.

Function block

Module that returns one more or more values when executed. It can be saved as a local variable ("memory").

I

IEC 61131-3

International standard for modern systems with PLC functionality created in 1993. Based on a structured software model, it defines a series of powerful programming languages to be utilized for different automation tasks.

Interoperability

Interoperability means that means that the cooperation between different systems is ensured by adherence to common standards. To ensure interoperability with LON®, over a hundred defined *SNVT* and *SCPT network variables* are combined into objects that precisely describe and represent the meaning, value and range of sensors, actuators and controller functions.

L

LAN

Abbreviation for Local Area Network.

Library

Collection of modules available to the programmer in the WAGO-I/O-PRO 32 programming tool for creating control programs in accordance with IEC 61131-3.

LMO (LonMark® Object)

Various network variables are combined into object with LON® that logically represent sensors, actuators and controller functions.
LMOs combined into specific functions form a FPT (Functional Profile Template).
(see also *FPT* and *LMRF*)

LMRF (LonMark® Resource Files)

The LonMark® resource files contain all available variables from which the required functionality can be selected and compiled into LMOs. In addition to standard network variable types (SNVTs) and standard configuration property types (SCPTs), user-defined types (UNVTs/UCPTs) as well as LonMark® functional profiles (FPTs) are also supported (see also *FPT* and *LMO*).

LNO®

The LNO® – Lonmark Deutschland e.V. – is the association for companies, institutions and distributors using the LonWorks® technology in the German speaking territories. Current information concerning the LNO and the member list can be found on the Internet at: http://www.lno.de.

LNS

Abbreviation for "LonWorks® Network Service".
LNS is a network operating system for LonWorks® networks.

LNS database

In the LNS database, all configuration settings are saved and administered by an LNS server.

LON®

LON® is the abbreviation for "Local Operating Network" and is a multi-master capable communication network developed for distributed industrial applications with requirements that are not time critical. LON® was specially developed for building automation. With LON®, the central tasks are subdivided into small distributed tasks to be performed, so that in each distributed intelligence (node), applications can to a large extent be processed locally without placing a burden on other bus nodes.

LonWorks®

LonWorks® is one of the uniform communication standard in building automation. This standard was developed by an independent technological institution, the US based Echelon, supported by the semi-conductor manufacturers Cypress and Toshiba.. It is backed by a comprehensively documented technology open to everybody who wants to use it. It includes, for example, the Neuron® chips, bus link modules (transceivers), development tools, software packages, support. With LonWorks®, decentralized information processing structures are possible that function without centralized control (e.g. PLC). In this respect, LonWorks® differs from various other fieldbus solutions.

LPT-10

Abbreviation for "Link Power Transceiver".
This transmission medium is a twisted pair variant. Technically, it corresponds to the "Free topology FTT-10" variant, except that it has the advantage that the unit supply voltage can be jointly transmitted via the bus line. In this manner, a conductor pair is saved in the cable and the chances of a mistake when connecting is reduced. However, LPT-10 requires an additional supply voltage level, namely a special link power supply (input voltage e.g. 48 - 56 V, output voltage approx. 42 V/1.5A).
There are also limitations with regard to loading capacity - only a limited number of units can be supplied with power by a link power pack (important is, for example, units with light diodes or relays, which often have higher current requirements). Installation advantages include above all buildings in which wiring of push-buttons and switches are to be found.Link power signals can also be switched on TP/FT-10 units, if these contain the corresponding block capacitors, which blocks off the supply voltage.
Note:
Consideration of the economics may be necessary prior to using LPT-10. Ensure that the power supply is of a suitable level with reserve capacity in accordance with the worst case for all units in the segment!
In addition, also check the LPT-10 compatibility of TP/FT-10 units.

M

Module

Modules in general consist of functions, function blocks and programs. Every module is made up of a declaration part and a body. The body is written in one of the IEC programming languages AWL (statement list - STL), ST (structured text), AS (process structure), FUP (function plan) or KOP (coupling plan).

N

Network interface

The network interface describes the interface of a *node* to the network.

It is comprised of a number of objects where an object is defined for each individual task in a node. These objects again consist of a set of network variables (*NVs*) and a set of configuration properties (*CPs*).

Network management tool software

A network management tool is software, in which network devices (*nodes*) can be integrated, addressed and maintained, as well as network variables be binded. The basis of a network management tool should be LNS. Then the configuration plug-ins of different manufactures can be launched from the tool.

Network variable

A network variable (*NV*) is a type-related variable in the Neuron® C programming language for implementation of logical communication channels between LON® nodes.
It can be associated with one or more network variables of one or more network nodes. With standardized network variable types (*SNVTs*), interoperable (independent of the manufacturer) communication of the LON® node in a network is possible. If data is transmitted from a node to the network, it occurs via the network output variable (**nvo**). If data is transmitted from the network to the node, it occurs via the network input variable (**nvi**).

Neuron® C

Neuron® C is a programming language based on the ANSI C standard for application programming on a Neuron® chip, the microcontroller in a LON® node.

Neuron® ID

Each microcontroller in a LON® node, Neuron® chip, has its own identification number, the Neuron® ID.

Node

A node is a unit or a device or module equipped with a *Neuron® chip* as a microcontroller, possibly supplemented by an external memory and I/O function. The smallest addressing units are nodes.

NVs, NVI, NVO

Abbreviation for *Network Variable*.
(NVI = Network Input Variable, NVO=Network Output Variable)

P

Power-Line

"Power-Line" is data transmission via the 230V network.

R

Repeater

"Repeater" are physical amplifiers without their own processing function.

They refresh data without detecting damaged data and forward all signals. Repeaters are used for longer transmission distances or when the maximum number of nodes of 64 devices per twisted pair segment is exceeded.
Note:
In TP/FT-10 networks, only one physical repeater is permitted between two nodes. Otherwise, routers configured as repeaters have to be used. Such a router also allows a media change.
The repeater always counts as a node. This means that for each segment, 63 nodes + 1 repeater can be used.

Reset

"Reset" means switching off or failure of the power supply. After switching on the power supply again, the device is restarted and initialized again.

Request

A "request" is a service request from a client that requests a service from a server.

Response

A "response" is a replay from a server to the request from a client.

Router

A router is used to connect neighboring *subnets* with the router operating with addresses and protocols of the third ISO/OSI layer. As this layer is hardware independent, the routers allow transition to another transmission medium.
To transmit a message the router evaluates the logical address (source and destination address) and finds the best path if there are several possibilities.
Routers can be operated in the Repeater or *Bridge* modes.

S

SCPT

Abbreviation for **S**tandard **C**onfiguration **P**roperty **T**ypes.
SCPTs [pronounced scipits] are predefined standardized *configuration variables*.
There are a number of SCPTs that make *interoperability* easier by providing a well-defined, compact mechanism for handling large volumes of configuration data on one device.
(See also *Configuration variable*)

Segment

Typically, a network is divided up into different physical network segments by way of *routers* or *repeaters*.

Server

Device providing services within a client/server system. The service is requested by the *Client*.

Service Pin

The Service-Pin is a special input/output of the *node* for service purposes.

It is let to the outside on a pushbutton and and LED and sends broadcast news with the *Neuron® ID* and *Program ID* of the *Neuron® chip* when the pushbutton is actuated.

SNVT

Abbreviation for **S**tandard **N**etwork **V**ariable **T**ypes.
SNVTs [pronounced snivits] are predefined standardized *network variables*. There are a number of SNVTs, e.g. SNVT_lux for brightness, SNVT_temp for temperatures, SNVT_switch for switching signals, etc.
(See also *Network variables*)

Structured cabling

The structured cabling specifies rules for site, building and floor cabling. The maximum permissible cable lengths are defined (EIA/TIA 568, IS 11801) with recommendations for topologies.

Subnet

Subnets are partial nets and the next smallest addressing unit after the *Domain*. Due to subnet addressing, certain groups of units (e.g. a room or a production cell) are triggered. Subnets may contain a maximum of 127 units.

S-UTP

Abbreviation for "Screened Unshielded *Twisted-Pair*", which has only one external shield. However, the twisted pair cables are not shielded from each other.

T

Terminators

"Terminators" serve for the impedance based correct connection of a network on the basis of the *Twisted-Pair* technology.
In accordance with the *transceivers* used and the topology used (bus or *free topology*), varying terminators are to be used per the *Echelon®* specification. Terminators are also sometimes integrated in *LON®* devices and can then generally be activated by switches or jumpers.
Note:
Missing or incorrect terminations of a network must not have an immediate effect, but may be the cause of irregularly occurring communication problems.

Timeout

Each network input variable, for which a timeout is specified must, must have been updated after the time set .
If the value of the *NVI* is not updated after the time set, the associated output is then set to the defined preferred position.

TP/FT-10

Abbreviation for "Transceiver Twisted Pair Free Topology" TP/FT-10, which is the most common transmission medium. The TP/FT-10 channel permits both the line bus topology, as well as free topology.

As a line bus, again 64 subscribers can be connected to a segment up to a length of 2700 m. The transmission rate amounts to 78 kBit/sec. In a free topology,
the network can be extended to up to 400 m with 64 units. TP/FT-10 allows the greatest degree of freedom in terms of space.

Transceiver

Transceivers are bus coupler modules between *Neuron® chip* and transmission medium. The most important representatives are *TP/FT-10* and *LPT-10*. In addition, transceiver are available for radio transmission or for coupling with LWL systems.

Twisted Pair

Twisted pair cables (abbreviation: TP).

V

VFB (Virtual Functional Block)

To connect variables with a network interface, a virtual module, the "Virtual Functional Block" must be created for the interface.
When first opening the LON® configurator, two objects have already been created in the tree structure for the LON® network interface that cannot be deleted or modified, namely the "Node Object" and the "Virtual Functional Block" (VFB).
The "Virtual Functional Block" contains the NVs and CPs that can be assigned to the LON® FTT module directly and no other LonMark® object of the LON® FTT module.

W

Wink task

With a wink task, a user can search for an non-configured *node*. This makes sense when intended in the application noticeable in a defined way, e.g. by flashing STATUS LEDs, so that it is possible to create an allocation to physical *nodes*.

X

XIF file

A file with the "*.xif" ending is an export file that contains the description of the interface from a LON® device as a minimum variant. However, the XIF file normally contains more information such as manufacturer, version and more. This XIF file can be read from a LON® device and read into a LON® network for integration.

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