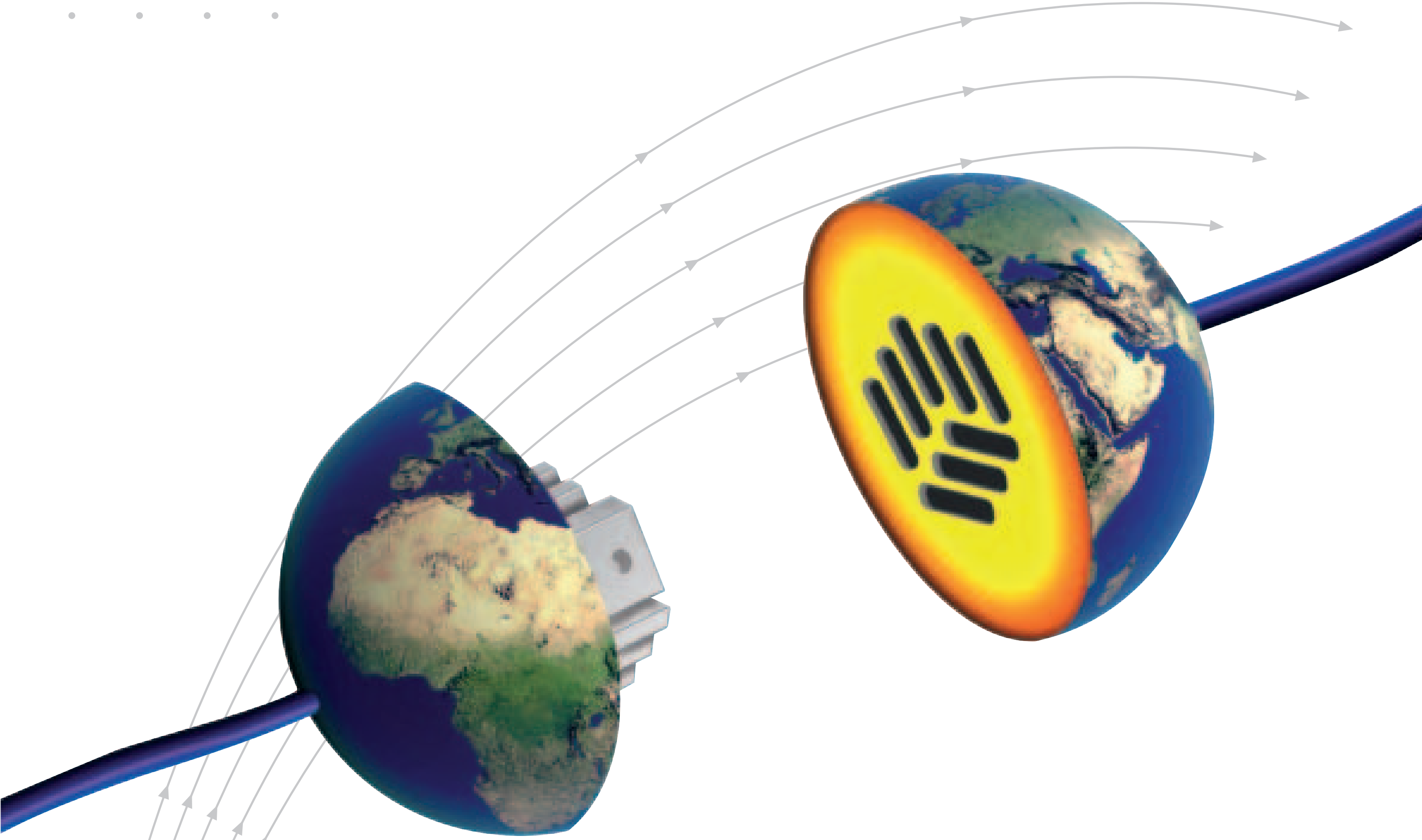
S/LON/EN/1

TROXNETCOM®

Fire protection with LON-Technology



TROX® TECHNIK

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Content

LON® – What is it?

LON® stands for **L**ocal **O**perating **N**etwork and was introduced by the Echelon Corporation (USA) in 1990. Echelon's development goal was to design a micro-processor that simultaneously possessed a standardised communications interface. Each device had to be able to "talk and work" seamlessly with every other device, regardless of manufacturer, and to carry out its specific task as decentralised intelligence within the network. Since 1996, the network protocol has been publicised and made accessible to everyone. The open network technology is now therefore available with the same conditions to all producers world-wide. Approximately 4,000 manufacturers across the globe are producing devices and systems for the LonWorks® technology. (LonWorks® is the the system description for the whole LON®-technology).
An independent standardisation committee (LonMark®) oversees product compatibility by setting standards and determining updates.

High acceptance as formal standard

- LonWorks® is adopted as the standard IEEE P1473.1 (Rail Transit Communication Protocol.
- LonWorks® was standardised by the Intenational Forecourt Standards Forum (IFSF) for applications in petrol station automation.
- LonWorks® is a component of the ASHRAE SPC-135 BACnet specification.
- Das LonTalk® protocol is the official ANSI/EIA 709.1 standard (American National Standard Institute).
- LonWorks® is recognised as a standard in the field and automation layers for buildings according to CEN TC247.

How does LON® differentiate itself from other fieldbus systems?

Conceptually, LON® has taken another route during its development compared to most other fieldbus systems. While most fieldbuses were conceived for a specific area of implementation and were only later incorporated into areas other than those originally foreseen (CAN, Interbus, Profibus), LON® has been conceived from the start for the widest spectrum of implementation possible. The EIB (European Installation Bus) is often called upon for comparison purposes; however, in contrast to LON®, the focus of EIB lies clearly in the area of installation technology with transitions for the functions of home and building automation. The broad implementation spectrum of LON® is one of its main advantages, where the most diverse functions such as HVAC (Heating, Ventilation and Air Conditioning), lighting, blind and access control, fire and burglary alarm technology, among others, can be seamlessly integrated.
LON® is suitable for the construction and operation of efficient and, above all, for widely branching decentralised networks. The so-called topology of LON® networks is free, that means the network is workable in a line with or without branch lines, as a ring, a star etc.. It is possible to build up a network with various trans-port media and to combine the transport via a powerline with the twisted pair network. Over and above this, it is possible to link the LON® network to the Internet or intranet. This offers, for example, the possibility of remote visualisation and remote maintenance via the www (World Wide Web). LON® systems are, as a rule, distributed networks and can contain up to ten thousand nodes (small functional units with individual intelligence). The nodes can be developed for various applications and configured in operation. Application areas for LON®-based systems are, alongside building automation, process automation as well as many other product areas with decentralised measurement, control and regulation concepts.

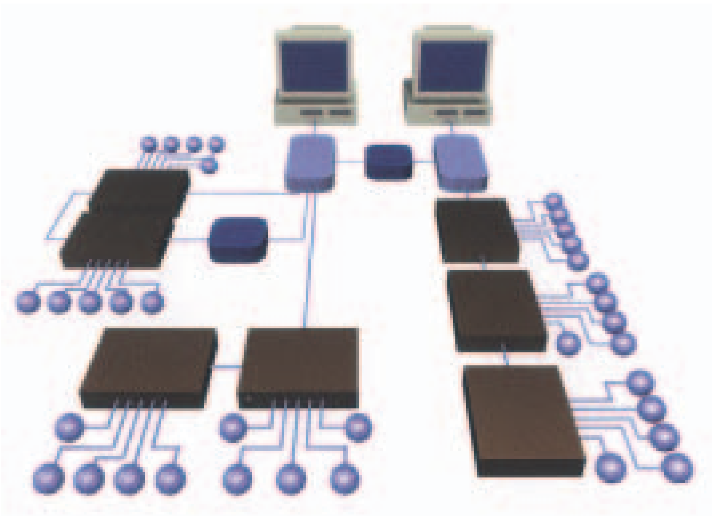
What advantages does LON® offer?

Until now, building functions were carried out with central computers, programmable logic controller in central switch boxes with corresponding distribution stations, and the huge cabling efforts that go with them.

With the help of decentralised automation (LON®), you can achieve the following:

- Sensors and actuators are equipped with their own intelligence and exchange information directly with each other.
- There is no need for a "Central Controller".
- Information processing takes place locally.
- Minimal cabling
- Maximal flexibility to expand

The System



A closed, hierarchical control system

An open, distributed control system

Due to the networking and the distributed intelligence, higher demands for reliability and redundancy can be achieved relatively easily with LON®. An individual node within the system is an equal bus component and thus plays a part, among other things, in the communication. It can also make locally relevant decisions during breakdown of the transport route in order to maintain an emergency operation. *This is also true for a breakdown in the control technology!* The secure transport of news packets that is a feature of LON® is sometimes a very important criteria in the decision to implement this particular communication system.

The integration of security technology is likewise possible with LON®. Redundant system parts are exportable, that means burglary alarm systems, access control equipment, fire alarm systems and, where appropriate, person-emergency signal equipment can be theoretically linked to one system. This follows the general trend of reducing the number of systems, interfaces and service facilities in the control room.

Due to the openness of the LON® system, further functions can be integrated at any time within the building automation and building management system. Such as for example energy management with load reducing modules, amongst other things.
During a building extension or an expansion of the automation area to other parts, the system grows along with it.

Re-think: The building as a system

The automation and the communication capability of the technology in each room requires higher investments with respect to the individual components. These higher investments are greatly compensated by the fact that sensors no longer need to be installed twice. By means of the bus connection of the intelligent sensors and actuators an additional savings potential arises with respect to the cabling when compared with the star cabling to date. In order to implement these technical alterations, a re-think is needed on the part of those who are involved in the planning, installation, commissioning and operation processes.
Planning, configuration and setting into operation is no longer device-oriented, but functional, that is user-oriented.

LONWORKS® presents a financially beneficial solution for operating buildings as a "*system embracing all devices*".

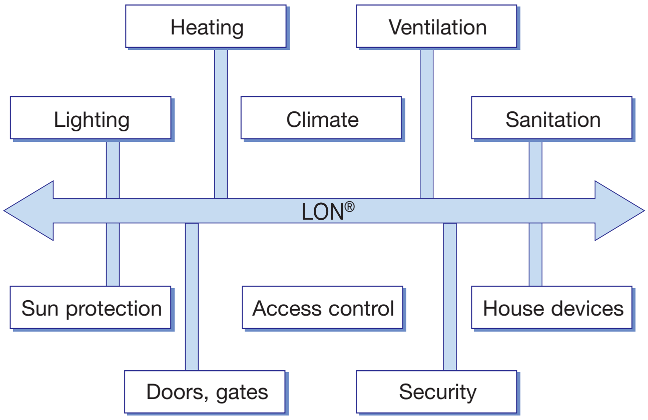
Why a "system embracing all devices"?

In buildings the separation of devices has a tradition, for example in electrical installations, electronic data processing (EDP), sanitation, as well as heating, ventilation and air conditioning, and sun protection.
Control systems have thus in the past developed in a device-oriented way on technically different levels and in different directions.
As a consequence, there have arisen:

- a cabling and cabling management system that was no longer assessable
- many individual sensors for similar or the same tasks
- no possibilities for being able to exchange information between the systems
- a higher co-ordination effort
- higher costs through "island solutions"

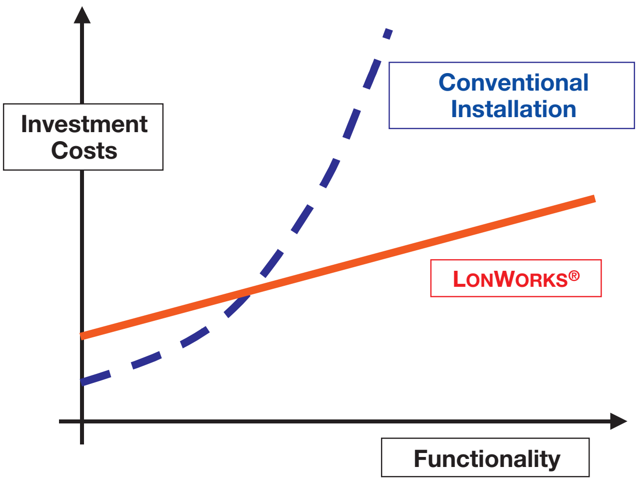
The LON® technology offers help here. It creates the possibility for bringing together all control, regulation and monitoring networks within a building for all the devices involved. It thus reduces costs and encompasses all utilities.

Integration of the devices



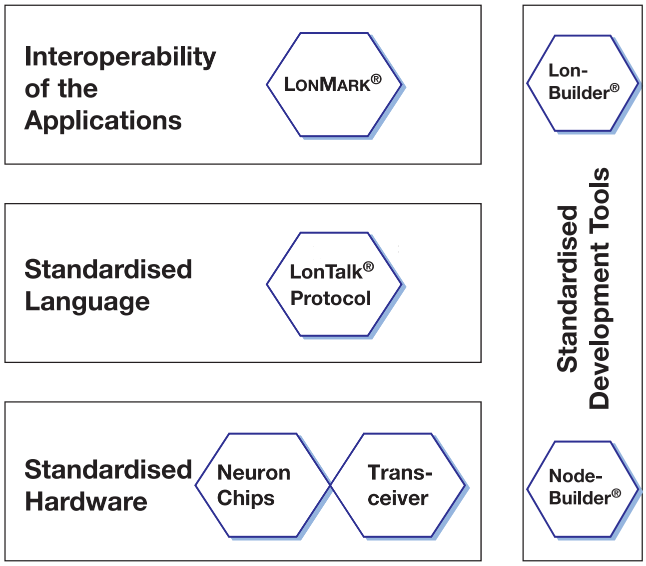
Advantages and benefits for building clients and operators:
- Savings on investment costs
- Savings on operational costs
- Comfort
- Standardised service
- Flexibility for alterations and expansions
- Building transparency (remote monitoring, Internet)
- Multi-vendor

Savings on investment costs



What are the building blocks of LON®?
The LONWORKS® technology encompasses all necessary aids for the design, construction, operation and maintenance of a LON® installation:

Building blocks of LONWORKS®-Technology



– *Neuron Chip and Transceiver*
All devices are based on the so-called Neuron Chips. These are small micro-processors developed by the company Echelon that, alongside a few additional building blocks, form a complete network node. As a LON® network can be built with many different transport media, the connection of a Neuron Chip to the bus cable (transport medium) is achieved via a so-called *transceiver*. Often the so-called FTT10-A transceiver is implemented as standard. This makes the integration with a twisted pair bus cable possible.

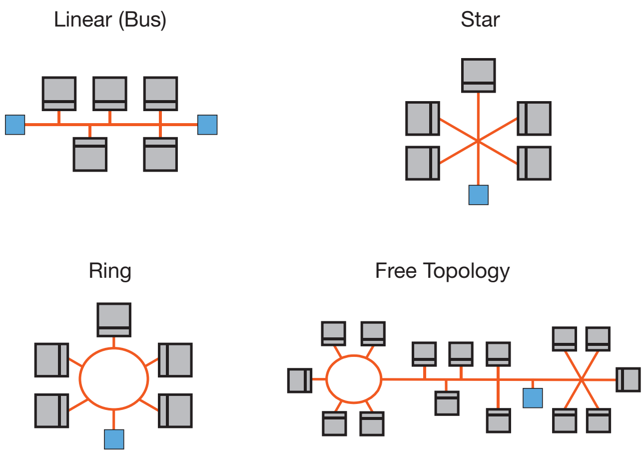
– *LonTalk® Protocol*
The language of LON® is called *LonTalk®-Protocol*. It is already implemented in the Neuron Chip as a standard for all nodes.

– *Development Tools*
For the creation of Neuron programmes in the programming language Neuron C, the integration of individual nodes, as well as whole networks, Echelon offers development tools such as LonBuilder® or NodeBuilder®.

– *Interoperability through LONMARK®*
So that devices from different manufacturers “talk and work” together in a LON® network, there exist so-called rules (Functional Profiles and SNVT Master Lists) that are worked out by the *LONMARK® Interoperability Association*. Devices that were developed according to these rules, achieve a higher degree of interoperability. By interoperability is meant the capability of dealing together with a task in a distributed application. When exchanging a device for a similar one from a different manufacturer, the application must continue to run without the need for adaptation.

The System

The network topologies of LON®



The Structure of a LON® network

A LON® network is divided into Domain, Subnet and Node.
A domain represents an area in which a maximum of 255 subnets may be located. In turn, a subnet may consist of a maximum of 127 nodes (LON® nodes).
In this way, a domain can consist of a maximum of 32385 LON® nodes, that is, LON® participants.
If needed, several domains can be linked together.
In the maximum case, up to 2^{48}.
Principally, however, only nodes within one domain are able to directly communicate with each other.
Every LON® node (participant) possesses a clear, logical address within a LON® network. This is divided into three hierarchical stages:

Domain-ID→Subnet-ID→Node-ID

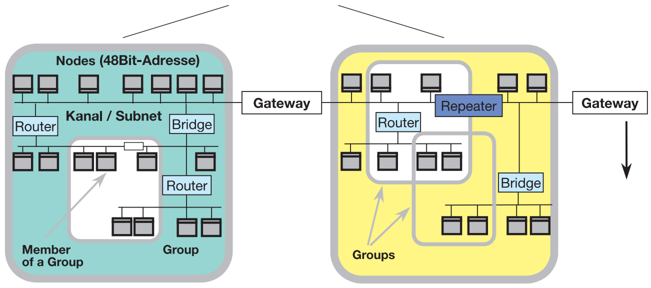
LON Network		Postal Address for comparison
English	Number range	
Domain-ID	1 ... 2^{48}	Area
Subnet-ID	1 ... 255	Street
Node-ID	1 ... 127	House number

If a node wants to send a message to another node, it uses the logical address as the recipient's address.
The allocation of the logical address occurs during the binding of the LON® node in the network, with the aid of the Binding Tool. The binding tool normally produces a free address and allocates it to the node.

For the construction of LON® networks, additional building blocks, such as routers, bridges and repeaters are used.

- *Routers*
  are devices with two bus connections that are implemented for the purpose of connecting two subnets with each other. Telegrams that were received on one side are normally sent away again by the router on the other side - and naturally vice-versa. In this way, the router can also take on the function of a filter, a path finder or post distributor.
- *Bridges*
  form connections between two domains. They carry data from one domain into the other and vice-versa. If a network has only a single domain, the bridge then behaves like a repeater.
- *Repeaters*
  are physical amplifiers without a processing function. They are used to execute larger transport distances or when the maximum number of 64 nodes per twisted pair segment (FTT10-A transceiver) is exceeded.

Domain (max. 255 x 127 = 32.385 Nodes per Domain)



How is data flow carried out in a LON® network?

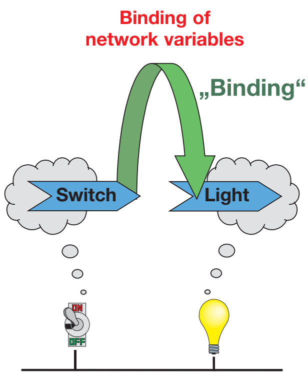
Now you know that a LON® node is, in principle, a small, independent computer that works its own application programme. A LON® network consists of many of these independent computers. Each computer is physically connected via a transceiver to the transport medium (bus cable) and possesses an individual address.
Via the bus cable, the various devices are able to exchange data with each other and thus to form a functional total system (for example, the automation of a building).
How are the connections between the nodes created? How can one inform the concealed cabling sensor node on the light switch, for example, that it should send its information about the status of the switch to the luminaire node of the ceiling lighting?
Alongside the physical connection, there is obviously a further connection to be created – a logical one.

The data exchange between LON® nodes is achieved in a LON® network via so-called network variables that are also labelled with the name **SNVT**, pronounced “Snivit”. SNVT stands for “**S**tandard **N**etwork **V**ariable **T**ype”. These are established by LonMark®, are held in a master list and are available to every LON® developer. An important point for interoperability.

Network variables are of central importance in LON® because:
- during operation information from one node is “transported” to the other exclusively via network variables.
- network variables form the logical interface between nodes.
- the real task of the LON® system integrator lies in the binding of network variables in various nodes.
- network variables form (alongside configuration parameters) the main part of what one sees of a LON® node in a LON® system integration tool on a PC.

How devices “talk” to each other

- Virtual wire produced and altered with a network tool
- can be altered without re-programming the device
- easy additions, deletions and modifications are possible



So that the lighting now really reacts at the operation of the switch, a logical connection between the two nodes must be produced. The sensor node has to be informed that it should send any change to its output variables to the input variable of the luminaire node.

The Binding Tool

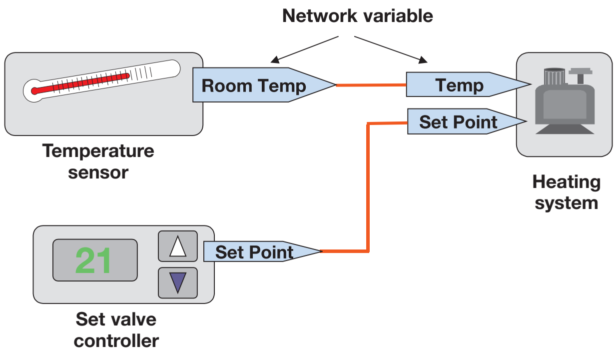
This normally occurs with the aid of a PC and software tool. The software tool is the binding tool that is connected to the LON® network.

The course of events is as follows:
- The user connects on the PC screen the output variable of the sensor with the input variable of the lamp. Depending on which tool is implemented, this occurs in graphical or text form. The programme normally carries out the rest automatically.
- All the bindings within the LON® network are saved onto the PC's hard drive.
- The tool then sends all the bindings to all the nodes. Each node receives the part relevant for itself and saves this information. The LON® node is then described as configured.
- From this point on, the switch node will send all changes to its output variables, nvoSwitch, automatically to the luminary node – or more precisely to its input variable, nviLamp.

Result: the room lighting works!

The binding of input and output variables therefore forms the logical connection between nodes in the network.

How devices “understand” each other



Through binding, the following criteria are met:
- Who is communicating with whom?
- What information is being exchanged?
- How is the information being exchanged?

This introduction can serve as a brief insight into the LON® Technology.
For further information, a range of literature is available, for example:
LON® Technologie by Dietrich, Loy, Schweinzer, published by Hüthig Verlag,
LonWorks® Technologie by F. Tiersch, published by Desotron Verlag,
LonWorks® Installationshandbuch by the LON® Nutzer Organisation e.V. (LON® User Organisation, Germany), published by VDE Verlag or to be found at www.lno.de and www.lonmark.org.
The company TROX GmbH is a Partner member of LonMark®.
If you have any questions, please do not hesitate to contact us.

Planning

On the path to open intelligent buildings

Open integrated systems guarantee an optimal and cost-efficient implementation of all requirements within the area of building technology.
For architects and planners, an open system offers, amongst other things, scope to achieve extraordinary solutions and ideas and thus the possibility to impart the desired profile to every building. The reduction in investment costs and the flexibility involved in the design, according to needs, form the decisive benefits for building owners and investors. To the building administrator and facility manager, open technology brings unlimited possibilities for adaptation to changes in user needs at any time, as well as seamless expansion and completion of its objects.
The operator or user ultimately receives, by means of an open system, the basis for operational optimisation, energy savings and cost control, as well as for a comprehensive facility management.
Decisive is, however, the building itself and in this respect open, integrated systems ensure that the value of the real-estate not only increases considerably, but also that it remains at this level in the future.

The Ideal Situation

The implementation of open, intelligent buildings demands a re-think at the planning stage, away from thoughts of device separation, closed loops, components and node lists, and towards considerations of functionality and relationships between systems.
In this way, the lighting control can be connected to the blind control, that is, dependent on the position of the sun, the blind slats are adjusted automatically and by means of measuring light intensity, the degree of artificial light can be readjusted. Or different lighting scenarios may be foreseen in which the individual systems adjust themselves according to the other. Thus at the push of a button, for example, in a video presentation room, the blind will roll down and the lighting will dim without extensive cabling, controllers or programming being necessary.
In planning practice, that means that, from now on, we are only speaking about functionality and it is here that our main task lies.
Which functions should be implemented in a building?
How should a single room be regulated?
Which connections must be visualised?
What should happen, when, and how?
This is comparable to the creation of an event-oriented computer programme where programming schedules are put together. During this process it is important to know which functional building blocks are needed.
The planning procedure just described is not very widespread at present. It presents, however, the optimal interplay between individual systems in a building to form a comprehensive solution.

The Reality

In the following, possible forms of planning are described whereby the cases a) and b) are still linked to the usual procedure still in use today.

In order to create a call for tenders or to make a correct assessment, various types of systems can be chosen. Which model is most suitable for which equipment, cannot be answered in general terms, but must be examined in each individual case.

Device Separation

Various devices are normally planned, implemented, installed and set into operation by various companies. The following cases are possible:

a) The functions of the individual devices are implemented through independent LON®-equipment and no exchange of information between the equipment is planned.

   Advantages:
   - Logical and physical freedom for retroaction.
   - No coordination necessary during the planning and projecting of LON® equipment.
   - System integration, diagnosis and service independent from other devices, freedom for retroaction and clear allocation of responsibility.
   - Separation today is primarily between electrical, HVAC and security equipment.

   Note:
   In security technology and systems, such as fire protection, dampers) and fire warning equipment, freedom for retroaction is very often a necessary feature.

b) For every device within a piece of LON® equipment, individual segments are planned that are connected to each other by routers and in this way, information exchange is made possible.

   Advantages:
   - Exchange of information between the devices and thus higher functionality than in case a) possible
   - Multiple use of bus devices possible.
   - The exchange of data between the segments is however limited to a minimum by the required functionality.

c) Different devices are operated in a piece of LON® equipment in a common segment (and domain).

   Advantages:
   - Reduced cabling
   - Reduced devices
   - More easily expandable (bus cable usable in the whole building for all devices).

Case c) corresponds to the ideal planning scenario described above, namely of a functional, open and intelligent building.

The System Integrator

In cases b) and c), somebody responsible for the coordination between the devices is necessary in the planning and implementation phase. Following the award of contract for the individual devices, a person responsible for the installation needs to be appointed. This person then serves as contact person for the operator with respect to expansions, service and maintenance, even after completion of the work. This person is also known as a system integrator.
The task of the system integrator is to plan LON® networks (implementation of routers, bridges, repeaters, the backbone, the structure of the LON® network etc.) and to bring the desired functionality into the network and thus into the building. For this purpose, he selects the various LON® components that he then functionally connects to each other with the aid of a binding tool. In order to maintain the openness of the whole LON® system, it is vital that a so-called ”open tool” is used so that no dependence on the particular system integrator is built up.

The Binding Tool

The Interoperability Principle:

1) Devices in an open network are interoperable when devices from various manufacturers can be installed without the need for additional development and adaptation.

2) Tools are interoperable when interoperable devices can be installed, configured and maintained simultaneously or one after the other from any point across the network.

LNS-based tools have the advantage that network and project data are stored in standardised formats and so-called device plug-ins can be used. All this data can likewise be read in by another LNS-based tool.
Due to this fact, the LonMark® Germany recommends using so-called LNS-based tools as the future standard platform.

The Call for tenders

How to create an optimal, integral call for tenders is unfortunately not general knowledge. It would, nevertheless, be a desirable goal to create norm modules for building technology that simplify the call for tenders and thereby the calculation. In what follows, some elements are listed that should be observed.

Standard of Material

Which materials/components will be implemented, where, and how?
The following points need to be defined:
- Design (planned installation, space requirements etc.)
- Inevitable functionality (behaviour during bus cable outage, breaks in the supply voltage etc.)
- Design (above all in the case of visible elements such as sensing devices, temperature sensors, movement sensors etc.)
- Device regulations (mechanical strength durability, IP Protection, temperature etc.)

Object Description

- How will the building be used and which building types are involved?
- What has which priority (security, aesthetic, comfort etc.)?
- What does the installation concept look like? Can the LON® nodes be installed decentrally in the false floor or ceiling, or do they need to be installed centrally? Is a connection between floor and ceiling possible?
- In which areas of the building will the bus be implemented immediately and where at later points in time?
- If the bus devices are to be implemented in a particular area of the building only at a later point in time, the corresponding bus cables should also be laid there too.
- In corridors, a change in the use of space is not to be expected. With respect to the necessary functions, aspects such as emergency lighting need to be given a higher priority than flexibility. In this way, the number of necessary switch groups can be established.
- Should bus devices be planned in outside areas? This can pose problems for bus devices as they are only constructed for a specific temperature range. Such functions can, for example, be implemented by means of connecting conventional devices in the outside area with bus devices for the inside area.

Performance Description

- The functional description relating to the controls/closed loop controls that need to be individually created forms the most central point of a call for tenders. On a particular floor of the building, as few room modules as possible should be created in order to make optimal use of a LON® system.
- The functional description should be formulated in as detailed a way as possible, in order to clearly define performance.
- The simple standard saying: “C-programming according to the specifications of electrical planners” guarantees unnecessary discussions after the award of contract. Unknown functionality features cannot be globalised!
- The quantity structure also always requires a detailed functional description. It encompasses the number of nodes, groups in need of controlling (motors, lighting elements etc.) and provides a quick insight into the whole installation.
- The services to be rendered must be presented in a detailed way. System integration is not to be forgotten!!!

Example of a Description:

Sun Protection (Lamellas, blinds)

Offices East façade / West façade:
In the offices and in the corridor on the east side are small windows with motorised lamella blinds. The motors are controlled in groups via the LON® nodes located within the false floor. In the offices, two sensors are located on the corresponding service modules for the individual control of the blinds. The manual interventions are oversteered by the façade control.

Motor Control:

In order to avoid electricity peaks, the blind motors should be driven up and down in groups and in time-delay.

Facade Control:

The information necessary for blind control is sent by the weather station to the LON®. From there, the blinds are controlled façade by façade. In order to still direct enough light in the offices and corridors when the blinds are being lowered, the lamellas are driven into a working position mode. Aim: More than 150 Lux illumination, without lighting.

Visualisation:
The sun protection control of the outer façades can be manually oversteered by means of visualisation. Manual intervention has second priority.

Interface Analysis

- Who is delivering to whom, when, what and to where?
- How the interfaces are defined is secondary. Important is that they are defined.
- Delivery of material and system integration should stem from the same company (the guarantee question comes into play when the switchgear constructor buys modules and an integrator must programme these/carry out their parameter setting).
- Will the components be pre-programmed and delivered ready for implementation to the building site? (This is preferable, even if the component prices are a little higher, as the effort at the building site and the incalculable costs involved with this can be minimised).
- Does the installer know where which device must be installed?

Example of an interface definition:

In every case, the following are valid:

- Agree upon room functions in good time with the building owner, architects, planners and companies.
- In the functional specifications, the general and detailed functions should be described.
- **Security systems should still be treated, at the moment, as “island solutions”. Connections to whole systems are, however, advisable.**
- A strategy for reliability cannot be avoided in large objects.

Note:
To plan only a few or even only one device with LON® technology within a building does not make sense. Rather, a complete approach needs to be categorically chosen.

The LONMARK® Organisation and the LON®-Tech Associations regularly hold events for planners during which these points are discussed in detail. In addition, the LONMARK® Germany issues a handbook for planners in which the fundamentals of planning an intelligent building with LON® are described. For further information, please visit: www.lno.de, or contact one of our expert advisors.

Controlling of Fire-/Smoke Damper

LON-WA1/B2, .../B2-AD, .../B2-AD230

Field of application

The LON-WA1/B2 is a function module specially designed for monitoring motorised fire dampers/smoke extraction dampers fitted with plug-in 24 V actuators (e.g. those manufactured by Belimo).
This makes assembly considerably easier.

Two motorised fire dampers or one smoke extraction damper may be controlled with one LON-WA1/B2. This is done by mounting the module on a fire damper or smoke extraction damper and connecting it to the 24 V actuator by means of plugged contacts (e.g. those manufactured by Belimo).

The plug-in 24 V actuator for the second fire damper is connected through a LON-WA1/B2-AD or LON-WA1/B2-AD230 junction box.

Where the LON-WA1/B2 is combined with a LON-WA1/B2-AD, a 24 V AC power supply and a separate LON® lead are required.
The LON-WA1/B2-AD junction box is connected to the LON-WA1/B2 module using a 6-pin lead. Numbered terminals make wiring easier.

Where the LON-WA1/B2 is combined with a LON-WA1/B2-AD230, a 230 V AC power supply and a separate LON lead are required.
The LON-WA1/B2-AD230 junction box includes a transformer which provides the 24 V power supply to the actuators and the LON-WA1/B2.
The LON-WA1/B2-AD230 junction box is connected to the LON-WA1/B2 module using an 8-pin lead. Numbered terminals make wiring easier.

Standard Network Variable Types (SNVT) only are used to implement the functionalities so that the LON-WA1/B2 can be linked flexibly and easily into host systems.
The LONMARK® “Fire and Smoke Damper Actuator Functional Profile 100.01”
has been implemented in full.
The device is LONMARK®-certified.

Technical Data

LON-WA1/B2

Power supply:
20.0 – 28.0 volts AC/DC 50/60 Hz
Double terminals for through connections

Power consumption:
3.12 VA or 1.32 W without actuators

Inputs:
4 digital inputs for potential-free switch contacts

Outputs:
3 digital outputs via relays
Damper 1 (fire damper or smoke extraction damper) centre-zero relay: maximum switch capacity at 24 V AC: 120 VA (5 A ohmic load)
Damper 2 (second fire damper) NO relay: maximum switch capacity at 24 V AC: 144 VA (6 A ohmic load)
FireChain NO relay: maximum AC switch capacity: 1500 VA (250 V AC; 6 A ohmic load)

LON® interface:
4 LON connection terminals
FTT10 free topology

Degree of protection:
IP54

Operating temperature
+10 °C...+60 °C

Humidity:
20...95 % non-condensing relative humidity

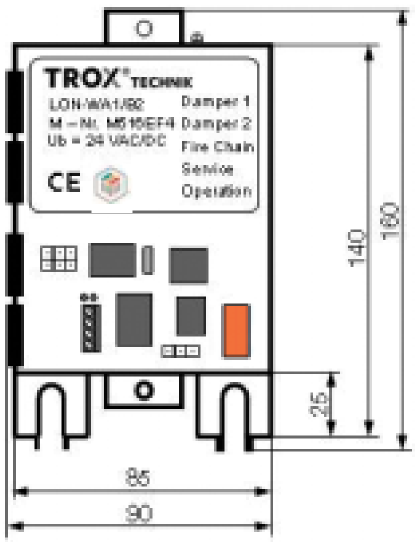
Connection terminals:
Actuator control,
MATE-N_LOK 3-pin AMP socket
Actuator end positions,
MATE-N_LOK 6-pin AMP socket

LON, LON-WA1/B2-ADxxx supply voltage:
90° plug-in terminals for 0.08 mm² – 2.5 mm²

FireChain signal
90° plug-in terminals for 0.08 mm² – 1.5 mm²

Software application:
The applications available for the LON-WA1/B2 (xif/apb-file) may be downloaded from the Internet at www.troxtechnik.com.

Casing:



General operating information

A maximum of *two fire dampers* or *one smoke extraction damper* may be managed using the LON-WA1/B2. The LON-WA1/B2-AD or LON-WA1/B2-AD230 junction boxes must be used to connect the second fire damper.

If only one fire damper is connected, a jumper must be set between terminals 5 and 6 (OPEN end position) on the 8-pin terminal block provided for the connection of the second damper. This prevents an alarm message for the non-existent second damper being generated.

The fire damper or the smoke extraction damper is controlled using the ActuDrive input variable.

The ActuPosn output variable indicates the current position of the damper.

The assignment is as follows:

Normal = fire damper in the open position
Fire = fire damper in the closed position
Normal = smoke extraction damper in closed position
Fire = smoke extraction damper in open position

Once a voltage is applied to the LON-WA1/B2 module, the connected dampers move automatically to their normal position.

The test button in the module may be used to move the dampers connected to the fire position and back to the normal position after expiry of the OffTime + 10 seconds.

The following is specified in the event of a fault in accordance with VDMA standard 24200-1 “Automated Fire Protection and Smoke Extraction Systems”:

Safe positions
Fire damper = closed position
Smoke extraction damper = remains in the last position

Where the LON-WA1/B2 is incorporated in a fire protection system, the heartbeat function should be switched on for safety reasons.
Setting the MacRcvTime parameter for the ActuDrive variable and the MaxSendTime parameter for the ActuPosn variable ensures that the LON-WA1/B2 sends its information and receives information at regular intervals.
This ensures that the transmission paths are monitored. In the event of a fault, the dampers will be moved to the safe position and an alarm will be generated.

A damper function test can be triggered over a control system using the FT_Test input variable. This moves the dampers to the fire position.
The FT_Test output variable is used to determine whether a test run has been activated.
The test condition is maintained for the duration of the TestHoldTime. The damper remains in the fire position until it receives a new command through ActuDrive.
The test is automatically aborted if ActuDrive switches to fire during the course of a test.

The FireChain variables can pass a signal from the first to the last damper, but do not trigger it if the dampers are chained. The corresponding FireChain relay in the LON-WA1/B2 module is controlled and can be used as a collective fault message or to shut down systems.
This function is only available for fire dampers.

The pulse variables are used to monitor a LON® network. If the input variable is set, the LON-WA1/B2 module changes the output variable after a period of 1 second. Thus a trigger pulse is generated where the modules are chained. This pulse can then be read at the end of the chain after a period of N x 1 seconds (N = number of LON-WA1/B2 modules).

Field of application

LON-WA1/B2-AD

The LON-WA1/B2-AD junction box is used to connect a second fire damper equipped with a plug-in 24 V actuator.
The junction box is connected to the LON-WA1/B2 module using a 6-pin lead. Numbered terminals make wiring easier.

Technical Data

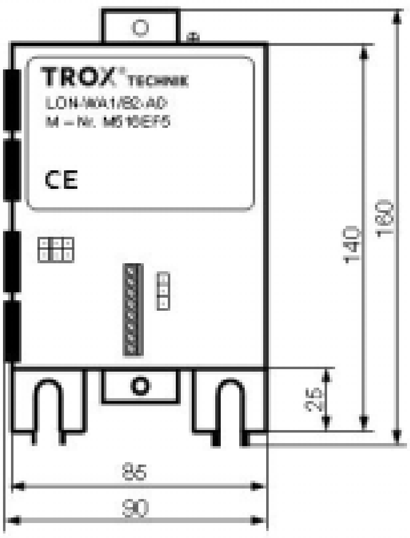
LON-WA1/B2-AD

Connection terminals:
Actuator control,
MATE-N_LOK 3-pin AMP socket
Actuator end positions,
MATE-N_LOK 6-pin AMP socket

LON-WA1/B2 connector lead:
90° plug-in terminals for 0.08 mm² – 2.5 mm²

Degree of protection:
IP54

Casing:



Field of application

LON-WA1/B2-AD230

The LON-WA1/B2-AD230 junction box is used to connect a second fire damper equipped with a plug-in 24 V actuator.
The junction box includes a transformer which provides the 24 V power supply to the actuators and the LON-WA1/B2.
The junction box is connected to the LON-WA1/B2 module using an 8-pin lead. Numbered terminals make wiring easier.

Technical Data

LON-WA1/B2-AD230

Input supply voltage:
200 – 240 V AC/DC 50/60 Hz
Double terminals for through connections

Output voltage:
24 V AC

Output current:
750 mA

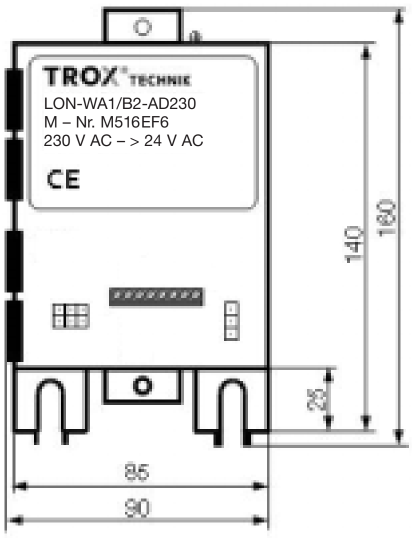
Operating temperature:
–10 °C…+60 °C

Connection terminals:
Actuator control,
MATE-N_LOK 3-pin AMP socket
Actuator end positions,
MATE-N_LOK 6-pin AMP socket

LON-WA1/B2 connector lead:
90° plug-in terminals for 0.08 mm² – 2.5 mm²

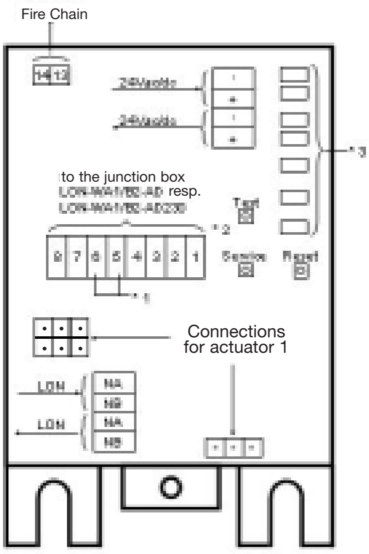
Degree of protection:
IP54

Casing:



Wiring diagrams

LON-WA1/B2



*1 If only one fire damper is connected, a jumper must be set between terminals 5 and 6 (OPEN end position) on the 8-pin terminal block provided for the connection of the second damper.

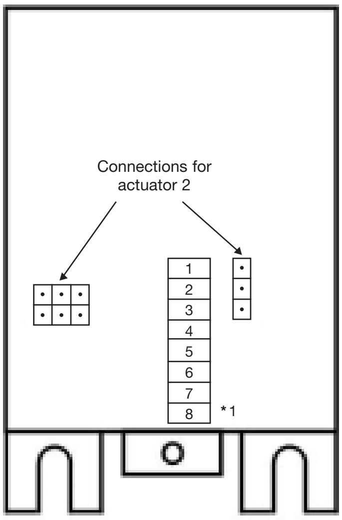
*2 Assignment of terminals

- 1, 2 } Control of BSK 2
- 3, 4 } CLOSED end position BSK 2
- 5, 6 } OPEN end position BSK 2
- 7 +, 8 – } 24 VAC/DC

*3 Description LED

- Damper 1 (red/green)
- Damper 2 (red/green)
- Fire Chain (yellow)
- Service (yellow)
- Operation (green)

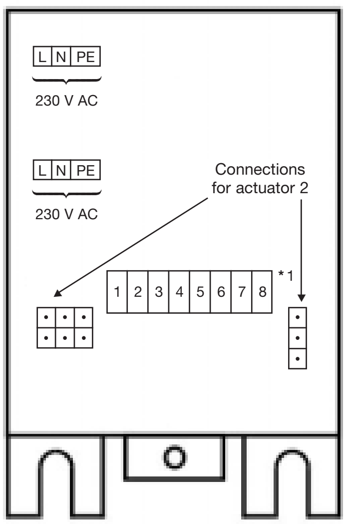
LON-WA1/B2-AD



*1 Assignment of terminals

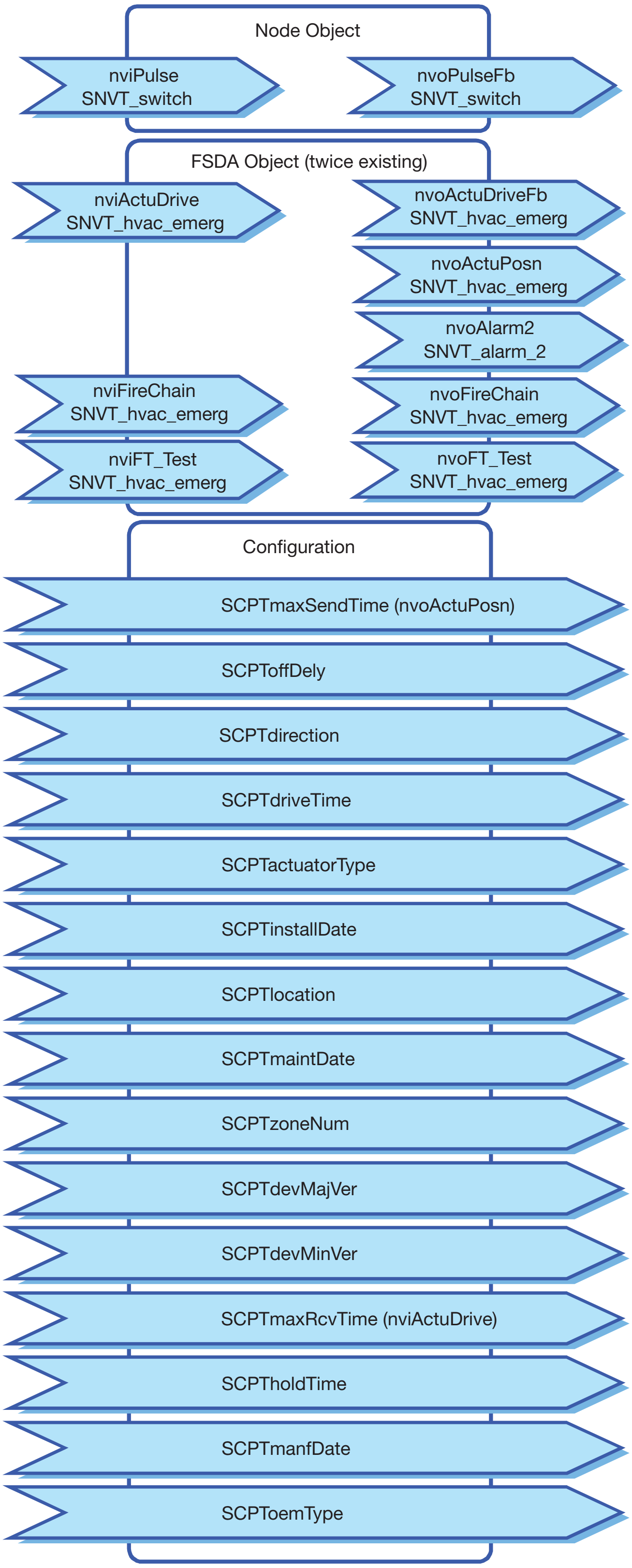
- 1, 2 } Control of BSK 2
- 3, 4 } CLOSED end position BSK 2
- 5, 6 } OPEN end position BSK 2
- 7 +, 8 – } 24 VAC/DC <u>not</u> required

LON-WA1/B2-AD230

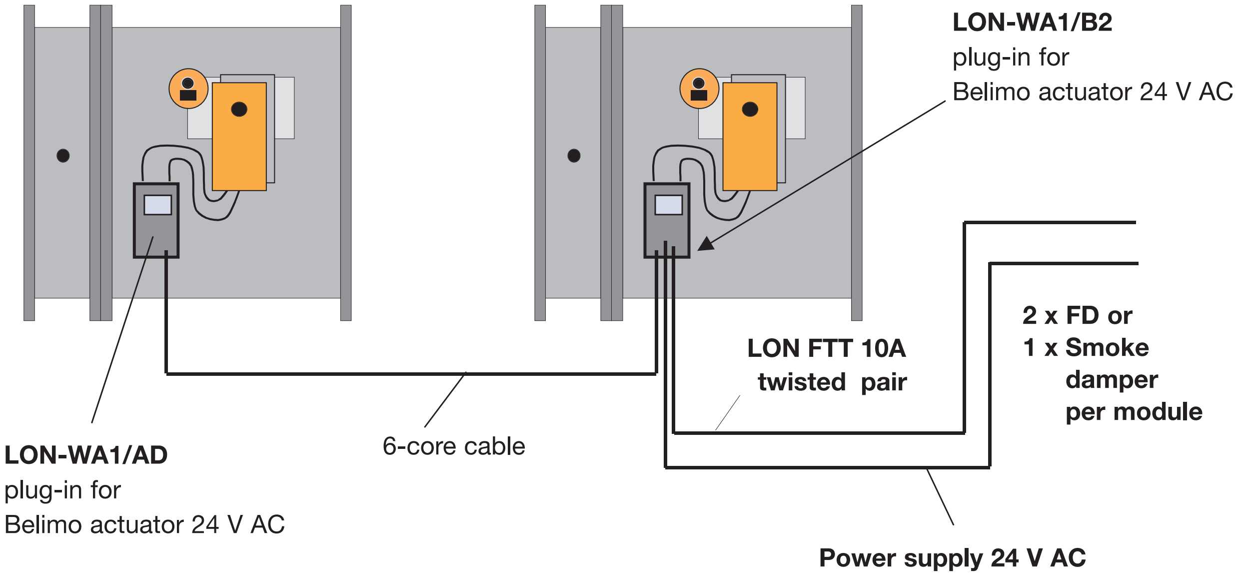


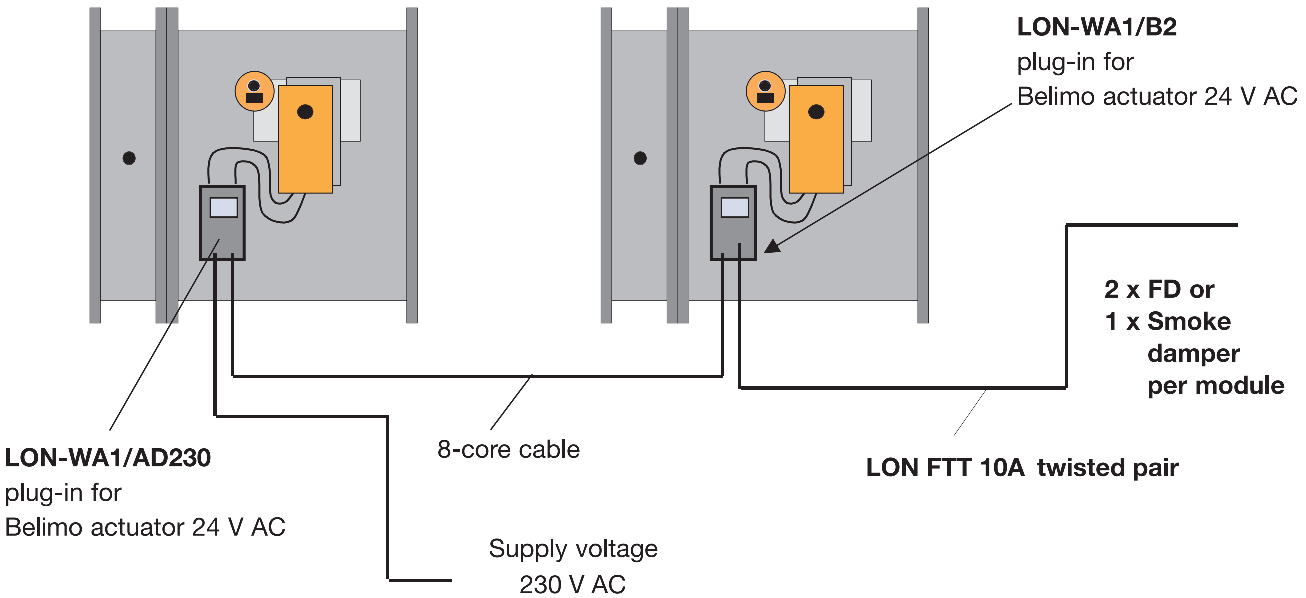
*1 Assignment of terminals

- 1, 2 } Control of BSK 2
- 3, 4 } CLOSED end position BSK 2
- 5, 6 } OPEN end position BSK 2
- 7 +, 8 – } 24 VAC/DC



Controlling of Fire-/Smoke Damper





Specification text

LON-WA1/B2

LON® module for the control of up to two motorised 24 V fire dampers or one motorised 24 V smoke extraction damper.
Damper actuators connected via AMP Mate-N-LOK connectors.
Suitable for direct mounting on the manufacturer's fire damper or smoke extraction damper using a bracket.
Drive control and detection of the OPEN and CLOSED end positions.
Transmission of all signals and control of the motorised dampers using Standard Network Variable Types over a LON® fieldbus to host systems; transmission of the system status; integrated watchdog and heartbeat units: Compliance with LonMark® specification 110.01 "Fire and Smoke Damper Actuator".
LonMark® certificate.

The second motorised fire damper is connected using accessory: LON-WA1/B2-AD or LON-WA1/B2-AD230.

The following parameters may be defined:

- maximum data send time interval
- minimum data receive time interval
- maximum system status send time interval
- compartment number
- damper identification
- date and time of installation
- date and time of last inspection
- maximum time to position damper in the CLOSED position
- maximum time to position damper in the OPEN position
- maximum time for test run

Connections:

- 4 digital inputs, 2 of which by way of AMP Mate-N-LOK socket
- 3 digital outputs by relay contacts, one of which is a centre-zero relay using an AMP Mate-N-LOK socket
- 8-pin plug-in terminal strip for connection to the LON-WA1/B2-AD or AD230
- 3-pin AMP Mate-N-LOK socket
- 6-pin AMP Mate-N-LOK socket
- 24 V AC/DC supply voltage
- bus connection to LON® using FTT10A Transceiver
- degree of protection IP54

Manufacturer: TROX
Type: LON-WA1/B2

LON-WA1/B2-AD

Junction box for the connection of the second motorised 24 V fire damper to the LON-WA1/B2.
Damper actuator connected via AMP Mate-N-LOK connector.
Suitable for direct mounting on the manufacturer's fire damper using a bracket.
The LON-WA1/B2-AD junction box is connected to the LON-WA1/B2 module on site using a 6-pin lead.
The 24 V power supply for the actuator is provided from the LON-WA1/B2.

Connections:

- 8-pin plug-in terminal strip for connection to the LON-WA1/B2
- 3-pin AMP Mate-N-LOK socket
- 6-pin AMP Mate-N-LOK socket
- degree of protection IP54

Manufacturer: TROX
Type: LON-WA1/B2-AD

LON-WA1/B2-AD230

Junction box with integrated 230/24 V PSU for the connection of the second motorised 24 V fire damper to the LON-WA1/B2.
24 V supply voltage for the actuators and the LON-WA1/B2 is provided by the integrated PSU.
Damper actuator connected via AMP Mate-N-LOK connector.
Suitable for direct mounting on the manufacturer's fire damper using a bracket.
The LON-WA1/B2-AD230 junction box is connected to the LON-WA1/B2 module on site using an 8-pin lead.

Connections:

- 8-pin plug-in terminal strip for connection to the LON-WA1/B2
- 3-pin AMP Mate-N-LOK socket
- 6-pin AMP Mate-N-LOK socket
- 6-pin plug terminal for 230 V supply
- 230 V AC power supply
- degree of protection IP54

Manufacturer: TROX
Type: LON-WA1/B2-AD230

Field of Application

The LON-WA1/FT2 and LON-WA1/PL2 are functional modules specially designed for monitoring motorised fire/smoke dampers.

Up to four motorised fire/smoke dampers can be operated with a single LON-WA1/FT2 or LON-WA1/PL2. The connections for the fire and smoke drives are designed for 230 V.

An FTT10A transceiver is used as the LON® interface with the LON-WA1/FT2.
A separate bus line using the LON® standard must be used for the communication line.

Powerline technology is used in the LON-WA1/PL2, i.e. by using the Powerline transceiver, the LON® data are modulated to the 230 V AC power supply line and transmitted. No separate bus line is required.

Suitable routers, e.g. from the Sysmik and WHO companies, are available for conversion to other communication lines.
When functions were being implemented, only standard network variables (SNVT) were used. This enables the LON-WA1/FT2 and LON-WA1/PL2 to be flexibly and easily integrated into higher-order systems.

The Functional Profile 100.01 Fire and Smoke Damper Actuator from LonMark® was used to the fullest extent possible.

The unit is certified by LonMark®.

Technical Data

LON-WA1/FT2 or PL2

Power supply:
230 V AC ±10 %, 50/60 Hz
Double terminals for looping through

Power consumption:
Approx. 3.5 VA without actuators

Inputs:
8 digital inputs for potential-free switch contacts

Outputs:
5 digital outputs via relays
Changeover relay

LON-WA1/FT2 LON® interface:
4-pole 90° plug-in terminals for 0.3 mm^2 – 1.3 mm^2
FTT10 free topology

LON-WA1/PL2 LON® interface:
Powerline

Type of protection:
IP54

Operating temperature:
+10 °C to +60 °C

Humidity:
20 to 95 % relative humidity, non-condensing

Connection terminals:
Actuator control, 3-pole 90° plug-in terminals for 0.3 mm^2 – 1.5 mm^2
Actuator end positions, 4-pole 90° plug-in terminals for 0.3 mm^2 – 1.5 mm^2

Distribution voltage, LON-WA1/FT2/PL2:
2 x 3-pole 90° terminals for 0.08 mm^2 – 2.5 mm^2

FireChain signal:
3-pole 90° plug-in terminals for 0.3 mm^2 – 1.5 mm^2

Housing:
Synthetic, 254 mm x 180 mm x 90 mm

Software application:
The available applications (xif/apb file) can be downloaded for the LON-WA1/FT2 and LON-WA1/PL2 from the Internet under www.trox.de.

Controlling of Fire-/Smoke Damper

LON-WA1/FT2, .../PL2

General Information on Functionality

In principle, up to four *fire dampers* or *smoke dampers* can be administered via the LON-WA1/FT2 or LON-WA1/PL2.

If fewer than four fire/smoke dampers are connected, a jumper is to be put in place between the terminals (E1, E3, E5 and E7) with end position OPEN on the 4-pole terminal blocks. This prevents alarm indications being generated for non-existent dampers.

The fire damper or smoke damper is operated via the ActuDrive input variable.

The output variable ActuPosn signals the current position of the damper.

The following allocation applies:

Normal = fire damper open
Fire = fire damper closed
Normal = smoke damper closed
Fire = smoke damper open

When voltage is applied to the LON-WA1/FT2 or LON-WA1/PL2 module, the connected dampers move to the normal position automatically.

If the test button in the module is pressed, the connected dampers are moved to the fire position and then back to the normal position once the OffTime +10 sec. passes.

If a fault occurs, the following provisions have been made in accordance with VDMA standard sheet 24200-1 “Automated Fire and Smoke Systems”.

Safe positions
Fire damper = closed position
Smoke extraction damper = remains in the last position

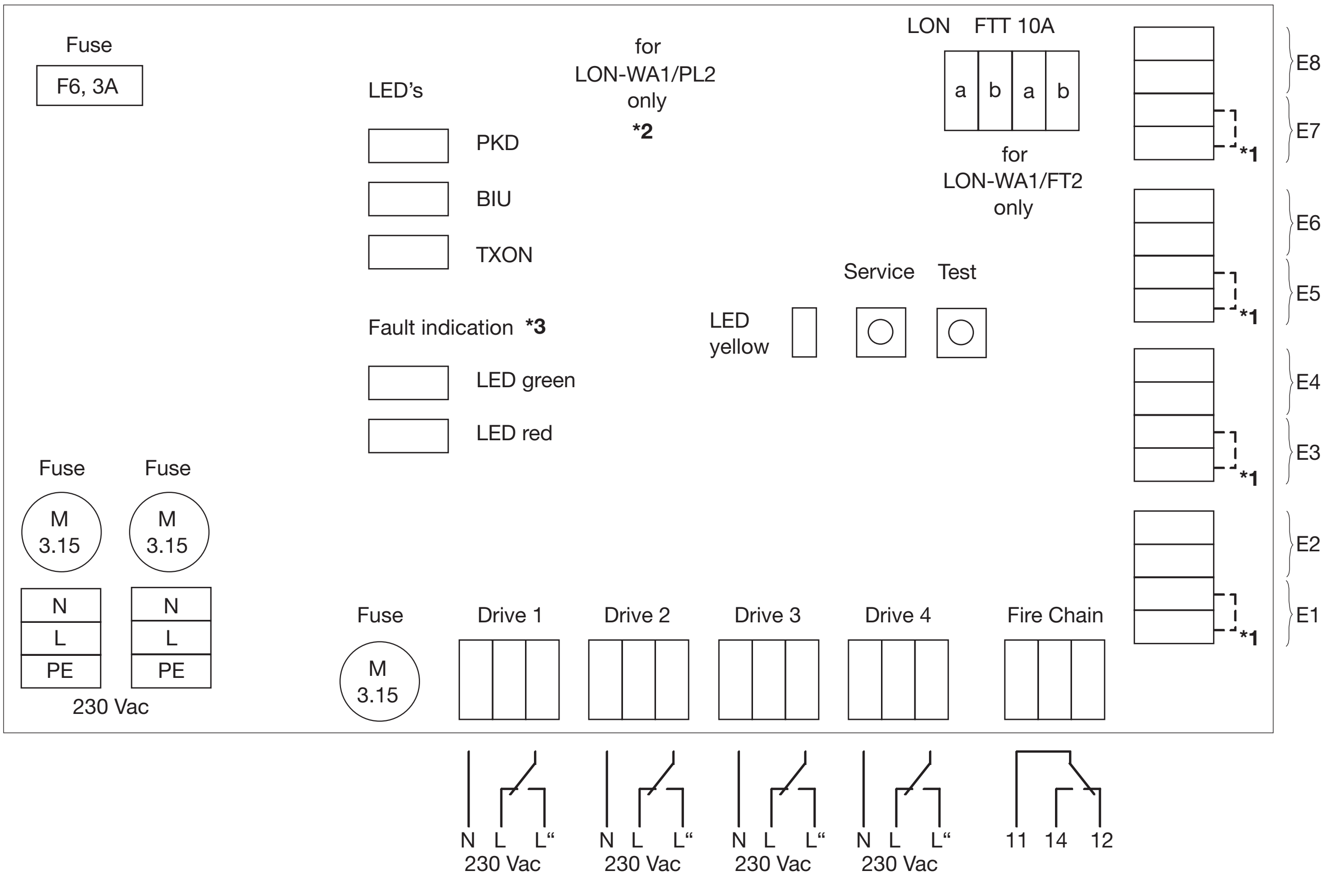
Where the LON-WA1/FT2 or LON-WA1/PL2 is incorporated in a fire protection system, the heartbeat function should be switched on for safety reasons. Setting the MacRcvTime parameter for the ActuDrive variable and the MaxSendTime parameter for the ActuPosn variable ensures that the LON-WA1/FT2 or LON-WA1/PL2 sends its information and receives information at regular intervals.
This ensures that the transmission paths are monitored. In the event of a fault, the dampers will be moved to the safe position and an alarm will be generated.

A damper function test can be triggered over a control system using the FT_Test input variable. This moves the dampers to the fire position.
The FT_Test output variable is used to determine whether a test run has been activated.
The test condition is maintained for the duration of the TestHoldTime. The damper remains in the fire position until it receives a new command through ActuDrive.
The test is automatically aborted if ActuDrive switches to fire during the course of a test.

The FireChain variables can pass a signal from the first to the last damper, but do not trigger it if the dampers are chained. The corresponding FireChain relay in the LON-WA1/FT2 or LON-WA1/PL2 module is controlled and can be used as a collective fault message or to shut down systems. This function is only available for fire dampers.

The pulse variables are used to monitor a LON network. If the input variable is set, the LON-WA1/FT2 or LON-WA1/PL2 module changes the output variable after a period of 1 second. Thus a trigger pulse is generated where the modules are chained. This pulse can then be read at the end of the chain after a period of N x 1 seconds (N = number of LON-WA1/FT2 or LON-WA1/PL2 modules).

Wiring Diagrams



Legend
E1 = Drive 1 end position OPEN
E2 = Drive 1 end position CLOSED
E3 = Drive 2 end position OPEN
E4 = Drive 2 end position CLOSED
E5 = Drive 3 end position OPEN
E6 = Drive 3 end position CLOSED
E7 = Drive 4 end position OPEN
E8 = Drive 4 end position CLOSED

Designation of the Belimo drives:
Position of cable designation CLOSED S1 + S2
Position of cable designation OPEN S4 + S6

N = neutral conductor
L = phase
L" = phase connected

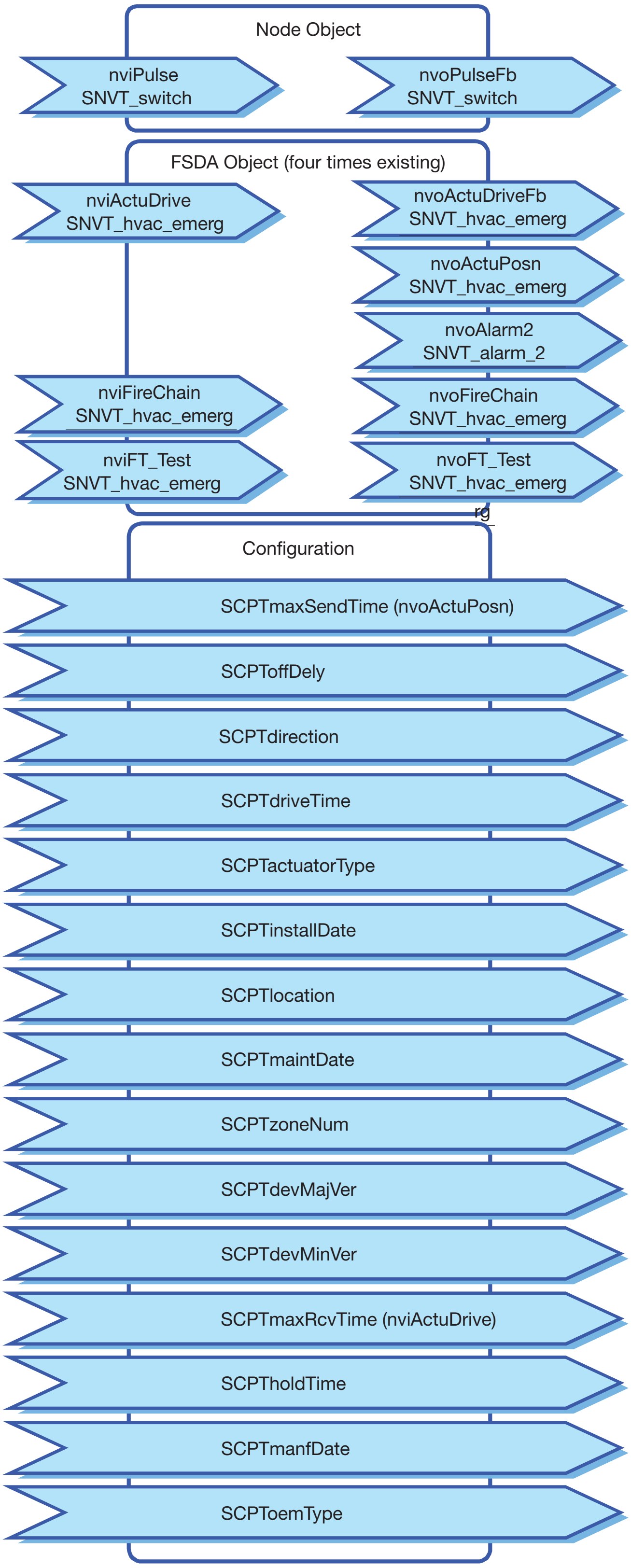
11 = common contact
12 = normally closed contact
14 = normally open contact

Connection 230 V fire damper – spring return drive to N and L"
Connection 230 V smoke damper – reversible actuator to N, L and L"

*1 Set a jumper (Damper OPEN) at not used the inputs

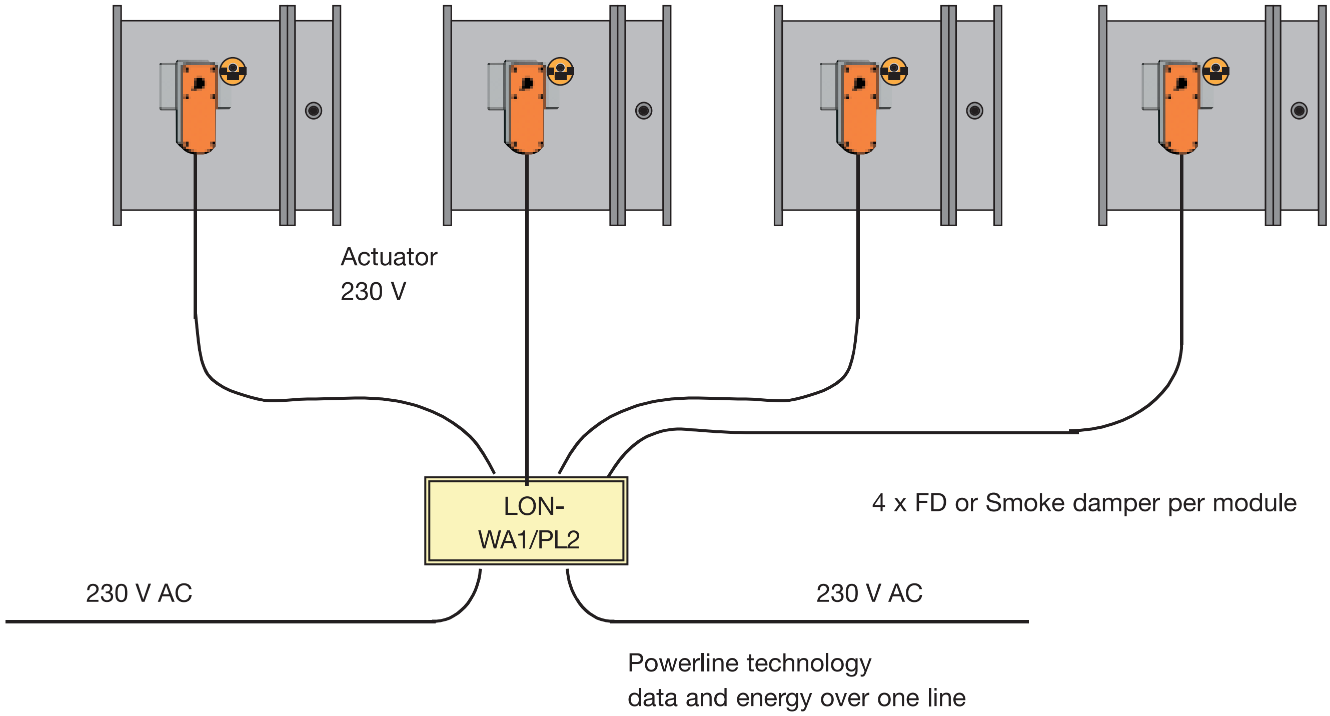
*2 Transmission-LED's Powerline
PKD = Packet detect (Detection)
BIU = Band in use (Waveband covered)
TXON = Data send

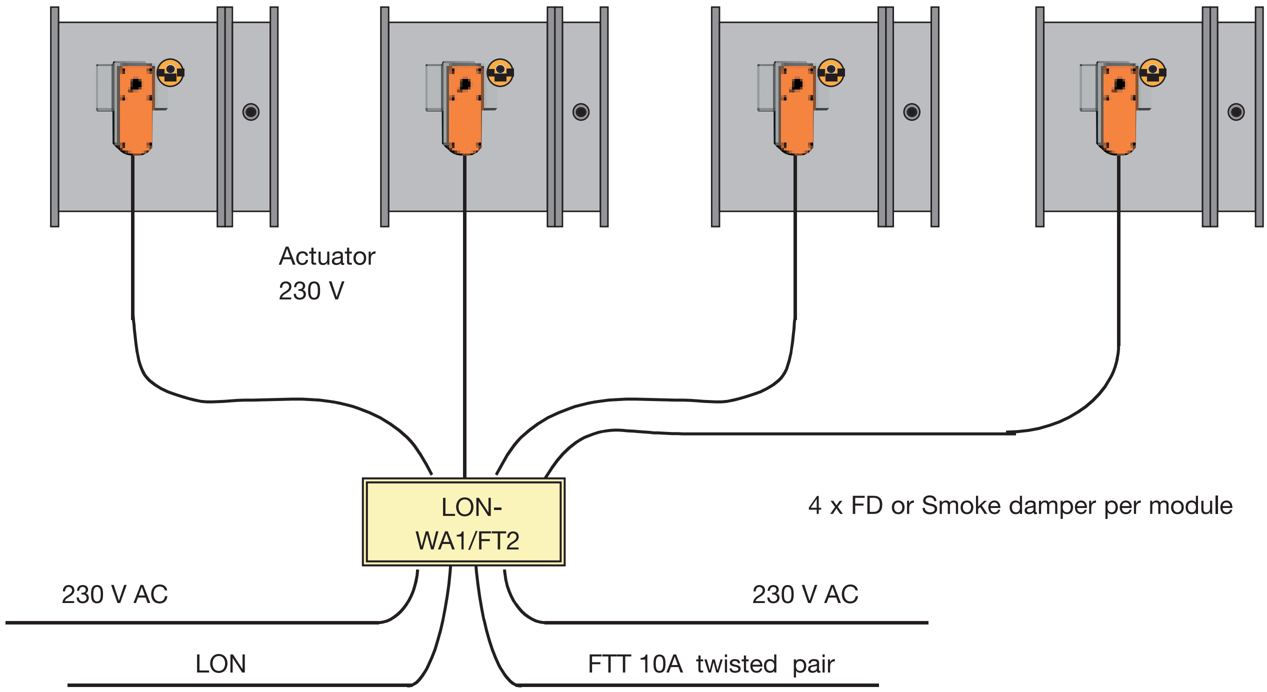
*3 Error indication of the module
green = all okay
red = error in the module/application



Node Object
nviPulse
SNVT_switch
nvoPulseFb
SNVT_switch
FSDA Object (four times existing)
nviActuDrive
SNVT_hvac_emerg
nvoActuDriveFb
SNVT_hvac_emerg
nvoActuPosn
SNVT_hvac_emerg
nvoAlarm2
SNVT_alarm_2
nviFireChain
SNVT_hvac_emerg
nvoFireChain
SNVT_hvac_emerg
nviFT_Test
SNVT_hvac_emerg
nvoFT_Test
SNVT_hvac_emerg
Configuration
SCPTmaxSendTime (nvoActuPosn)
SCPToffDely
SCPTdirection
SCPTdriveTime
SCPTactuatorType
SCPTinstallDate
SCPTlocation
SCPTmaintDate
SCPTzoneNum
SCPTdevMajVer
SCPTdevMinVer
SCPTmaxRcvTime (nviActuDrive)
SCPTholdTime
SCPTmanfDate
SCPToemType

Controlling of Fire-/Smoke Damper





Comments regarding the Powerline technology

In the case of the Powerline technology, the 230 V AC supply line is also used for data communication, whereby the data is modulated to 230 V AC.

The advantages of this technology lie in the savings in cable since no separate data line is required and in the possible available line lengths.
In the case of the Powerline technology, the available line length only depends on the attenuation of the signals on the line.
In case of proper laying, line lengths > 5 km can be achieved.

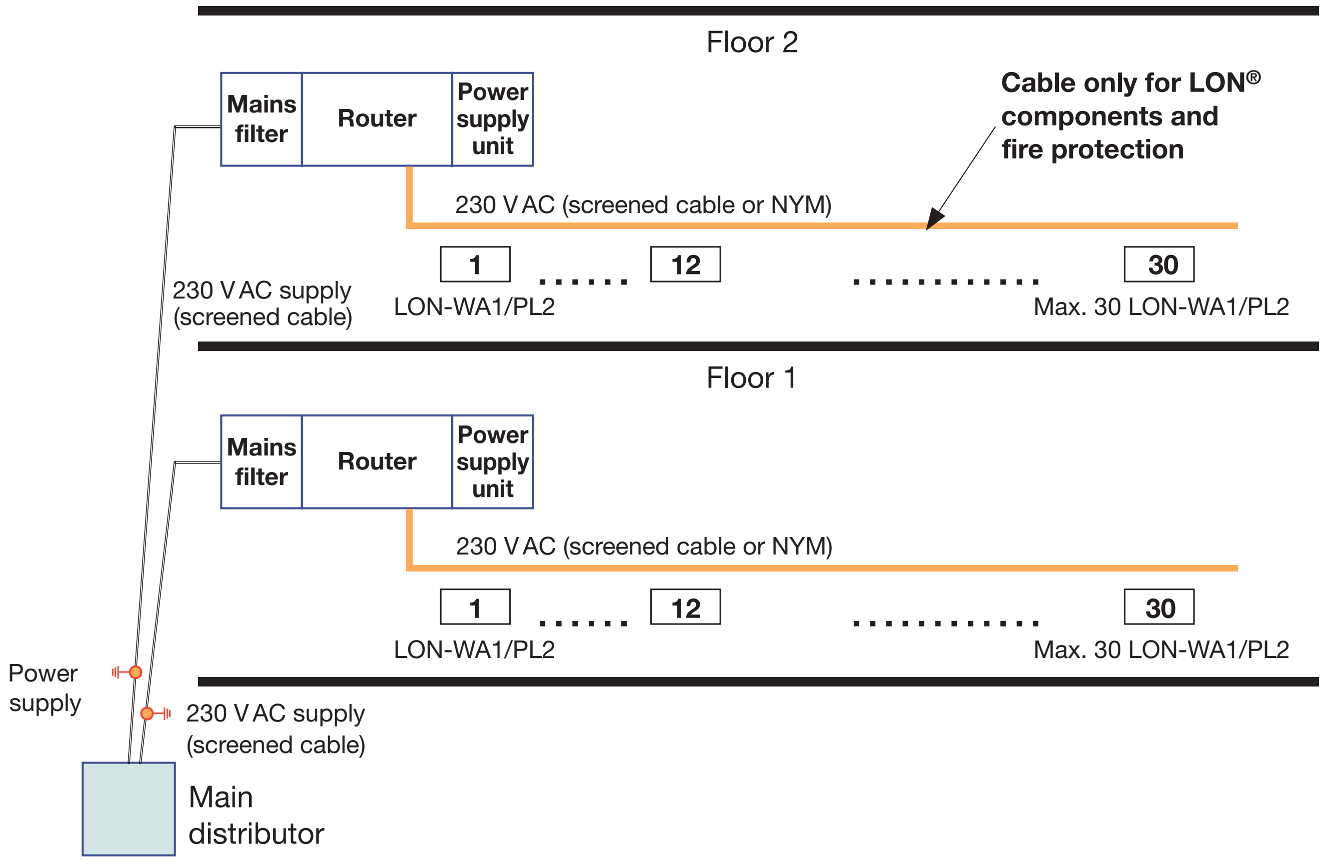
The disadvantage of this technology lies in the lower transmission speed.
While the transmission speed amounts to 78 kbps for a LON® network with FTT10A transceiver, the transmission speed decreases to about 5 kbps in the case of the Powerline technology.
The Powerline technology is thus not suited for every application.
In the area of fire protection, relatively few data is transferred and cyclical time intervals of about 10 sec suffice; this corresponds to an ideal application.

During the development of a Powerline network for the area of fire protection, the following development guidelines are to be observed (see Fig.):

- Use of separate, screened lines for the 230 V AC supply from the main distributor of the power supply to the Powerline switch cabinet on the respective floor of the building.
- Make the Powerline switch cabinet out of metal and earth it.
- The Powerline switch cabinet contains the following:
  Mains filter
  Power supply unit
  Router (Powerline to FTT10A or other transmission medium) (for the ordering of components, e.g. from the company WHO)
- The 230 V AC line is laid from the router to the LON® components in the field. This line can be designed in a screened manner; a normal NYM line can also be used.
  Only the LON® components and the respective fire/smoke extraction dampers are connected to this line.
- Due to the amount of data, no more than 30 LON-WA1/PL2 devices should be connected to one Powerline segment. This corresponds to a maximum of 120 fire/smoke extraction dampers.
- Make sure all subscribers are earthed. Disturbance signals, e.g. due to frequency converters or fluorescent lamps increase the attenuation of the line and thus reduce the maximum achievable line length.

This list represents only the most important information obtained from previously designed systems.
This information has no guarantee of completeness and is subject to change.

Development of Powerline networks for the area of fire protection



Specification Texts

LON-WA1/FT2

LON® module for operating up to four motorised 230 V fire or smoke dampers.
Control of the drives and detection of the end positions "Open" and "Closed".
Transmission of all signals to higher-order systems and operation of the motorised dampers via "Standard Network Variable Types" using LON® field bus FTT10A; transmission of the system status; integrated watchdog and heartbeat circuit.
Compliance with LONMARK® specification 110.01 "Fire and Smoke Damper Actuator".
LONMARK® certificate.

The following parameters can be defined:
- max. time interval for sending data
- min. time interval for receiving data
- max. time interval for sending system status
- zone numbers
- damper name
- date and time of installation
- date and time of the last inspection, max. time to move the damper to the CLOSED position
- max. time to move the damper to the OPEN position
- max. time for test run

Connections:
- 8 digital inputs
- 5 digital outputs via relays, changeover contact 250 V / 5 A
- 230 V AC voltage supply
- bus connection to LON® via FTT10A transceiver
- type of protection: IP54

Make: TROX
Type: LON-WA1/FT2

LON-WA1/PL2

LON® module for operating up to four motorised 230 V fire or smoke dampers.
Control of the drives and detection of the end positions "Open" and "Closed".
Transmission of all signals to higher-order systems and operation of the motorised dampers via "Standard Network Variable Types" using Powerline technology via the 230 V AC supply line; transmission of the system status; integrated watchdog and heartbeat circuit.
Compliance with LONMARK® specification 110.01 "Fire and Smoke Damper Actuator".
LONMARK® certificate.

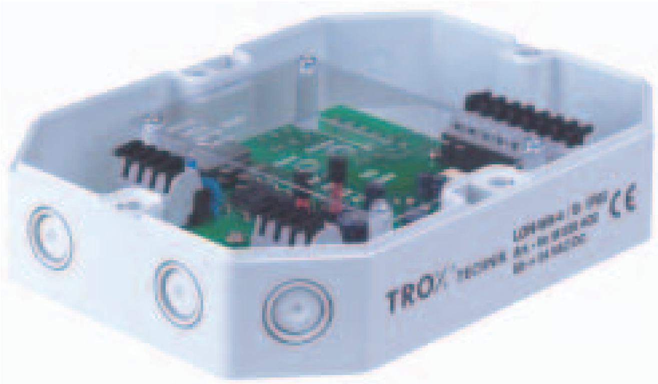
The following parameters can be defined:
- max. time interval for sending data
- min. time interval for receiving data
- max. time interval for sending system status
- zone numbers
- damper name
- date and time of installation
- date and time of the last inspection, max. time to move the damper to the CLOSED position
- max. time to move the damper to the OPEN position
- max. time for test run

Connections:
- 8 digital inputs
- 5 digital outputs via relays, changeover contact 250 V / 5 A
- 230 V AC voltage supply
- Powerline transceiver, no separate bus line
- type of protection: IP54

Make: TROX
Type: LON-WA1/PL2

End position detection

IO module with 4 digital inputs. Suitable for determining the status of potential-free switches.
Specially adapted to monitoring fire dampers with electronic limit switches by means of additional combination options and passing on alarms.



Technical Data

Output:
LON® interface, data format Standard Network Variables (SNVT)

Inputs:
4 digital inputs for potential-free switch contacts or voltage inputs with triggering after A1 (24 V AC/DC) or after A2 (GND) depending on the jumper J position

Enclosure:
ASA (LURAN S KR 2867 C WU)
159 mm x 120 mm x 41,5 mm, Protection type IP65

Assembly:
Enclosure can be fixed with two bolts

Cable Entry Point:
8 x M12 or M16 connection

Power Supply:
20 – 28 V AC/DC

Power Consumption:
Ca. 45mA / 24 V DC

Neuron:
3120, 3K EEPROM downloadable

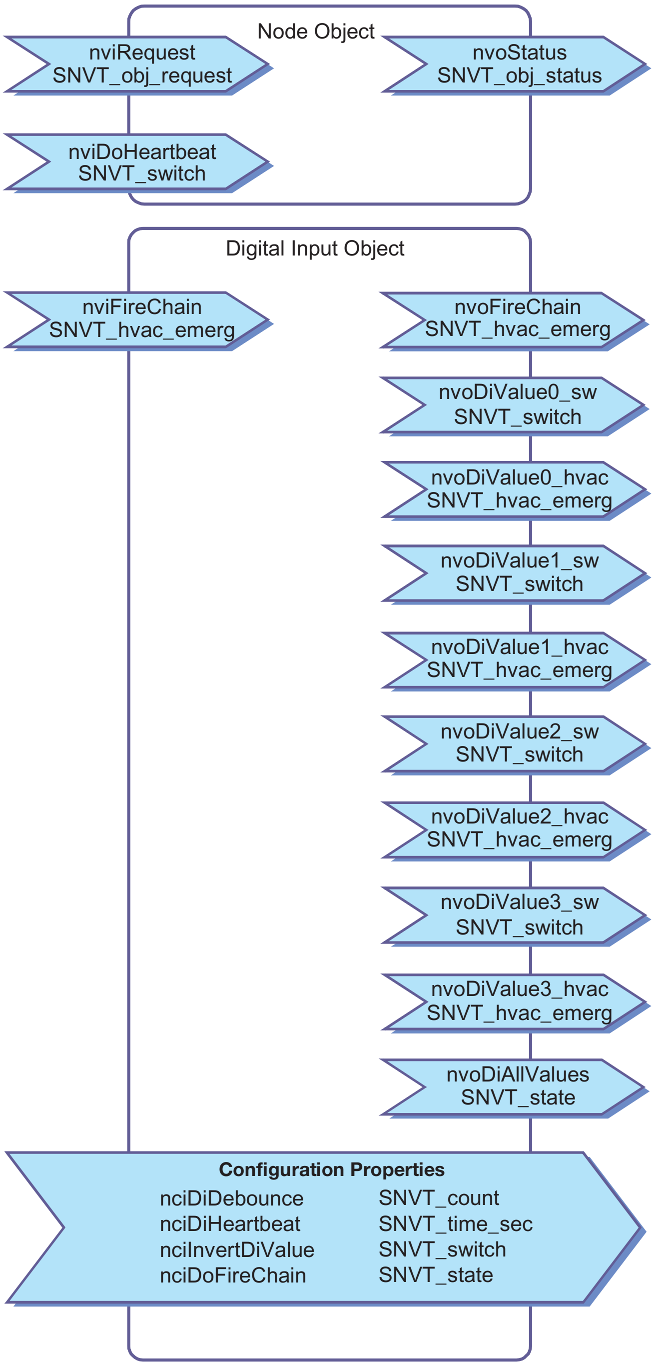
Transceiver:
FTT10A free topology

Connection Clamps:
Spring terminals for nominal area
1.5 mm² single-core
1.0 mm² highly flexible
AWG 16

Operating Temperature:
-5 °C...+55 °C

Available Software Application:
LON-WA4/B Plug-In files, xif/xfb files and nxe/apb files can be downloaded from the Internet under www.trox.de

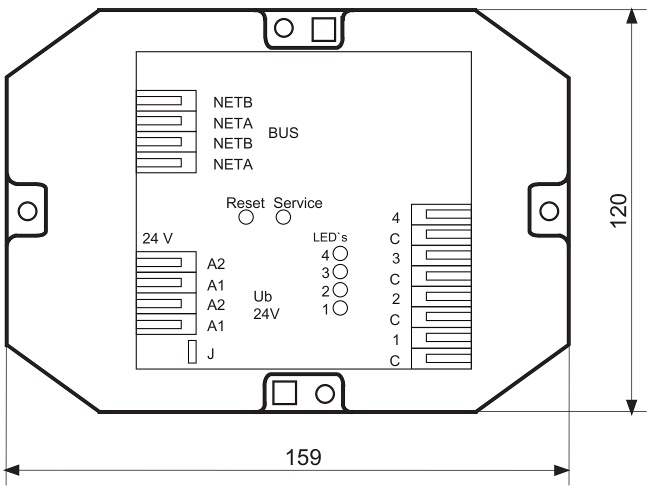
LON-WA4/B



SNVT-List LON-WA4/B

Name	SNVT Type	Unit	Description
Application			
nviFireChain	SNVT_hvac_emerg		Interlinking of damper nodes
nvoFireChain	SNVT_hvac_emerg		Interlinking of damper nodes
nvoDiValue_sw[0...3]	SNVT_switch		Status of the individual digital inputs
nvoDiValue_hvac[0...3]	SNVT_hvac_emerg		Status of the individual digital inputs
nvoDiAllValues	SNVT_state		Status of all digital inputs
Configuration			
nciDiDebounce	SNVT_count	ms	Debouncing time for digital inputs
nciDiHeartbeat	SNVT_time_sec	s	Heartbeat interval
nciInvertDiValue	SNVT_switch		Inverting of the output values
nciDoFireChain	SNVT_state		Configuration of nvo FireChain

Connection scheme LON-WA4/B



Ordering Key

LON-WA4/B

Call for Tenders Text

LON-WA4/B

LON® module with 4 digital inputs, suitable for state-sampling of potential-free switches, equipped with additional combination options and passing on alarms for monitoring fire dampers with electrical limit switches.

Input:	4 inputs digital max. load 5mA/10V or potential-free
Output:	via SNVT_switch and SNVT_hvac_emerg
Transmitter:	FTT10A
Protection Type:	IP65
Power Supply:	20 – 28 V AC/DC
Make:	TROX
Type:	LON-WA4/B

Smoke detection

Applications

The smoke detector RM-O-VS-D/LON is used for control of

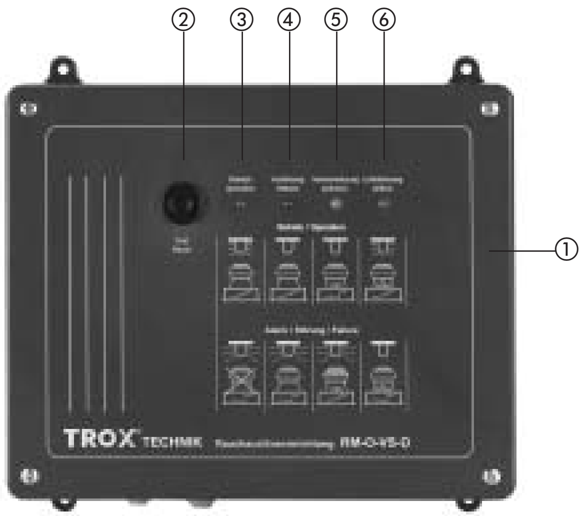
- Fire dampers with electric or electro-pneumatic release mechanisms (power off to operate/close principle) and
- Smoke dampers with electric spring return actuators

which are equipped with LON®-Modules as the TROX LON-WA1/B. Due to the LONWORKS® Technology the smoke detector can be connected to several dampers without any increased effort for wiring and let the dampers close in case of fire. Thereby the transfer of smoke by the ventilation ducting of the room air conditioning systems (RLT-systems) shall be prevented.

The LON®-interface enables the integration of the smoke detectors into primary systems (BMS), so the smoke detectors can be simply operated and monitored from a central location.

The external inspection of the basic device, as stipulated by law, is carried out by VdS Schadenverhütung GmbH, Cologne.

① Smoke detector with mains adapter, sensor electronics, smoke sensor and air flow monitor unit
② "Reset / Test" button
③ Signal lamp - green - "System monitoring"
④ Signal lamp - red - "Alarm condition"
⑤ Signal lamp - yellow - "Contamination indicator"
⑥ Signal lamp - blue - "Air flow monitoring"



Technical Data

Supply voltage:
230 VAC, 50/60 Hz

Power consumption:
max. 6 VA

Protection class:
IP 42

Ambient temperature range:
0 °C to + 60 °C

Permissible air velocity range:
1 m/s to 20 m/s

Permissible humidity range:
0 to 90 % relative humidity (condensation and induction of steam can lead to false alarms)

Warning limit for increased contamination:
> 70 %

Warning limit for airflow:
< 2 m/s

System monitoring:
Smoke sensor head missing
Data transmission smoke sensor head defective

EMC:
Interference protection to EN 50081-1 and EN 50130-4

Weight:
approx. 1.5 kg

Software-application:
The available applications (XIF/APB-file) for the RM-O-VS-D/LON can be downloaded from the Internet under www.trox.de

Functional description

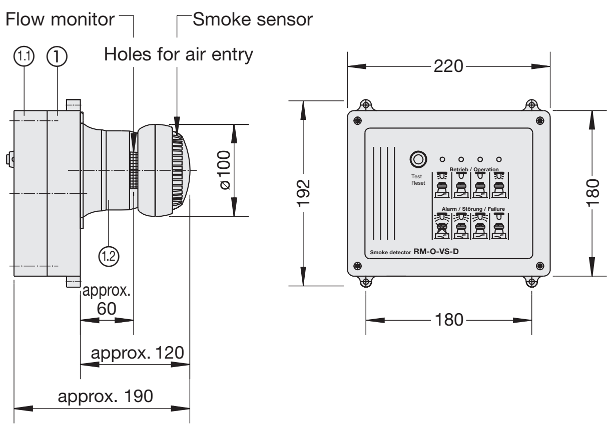
The device consists of the basic device RM-O-VS-D with German test certificate (general building approval) Z-78.6-67, as well as integrated signal lamps, a smoke-sensor and flow monitor unit.
The smoke sensor head of the smoke detector is equipped with an intelligent bus-controlled sensor, which is operating by using the optical light scatter principle. It is possible to inquire multiple parameters by LON®, e.g. contamination grade or general condition of the sensor. Also the smoke detector can be switched into a test-mode from a central location to inspect the functionality of the smoke detector and fire-/smoke damper.

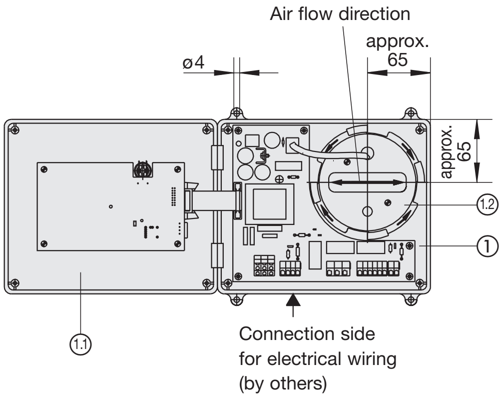
Additionally an air flow monitor is built in, which is monitoring the airflow. If the air velocity is below 2 m/s, a warning is send by LON® and the signal lamp of the device extinguishes. But the smoke detection in the ventilation ducting is also functioning at velocities below 2 m/s, as the sensor can detect smoke also on low velocities. The airflow control can be inquired by a LON®-network-variable and directly checked on the device on site by a signal lamp.

Casing RM-O-VS-D/LON:

① Smoke detector with mains adapter, sensor electronics, smoke sensor and air flow monitor unit
⑪ Sealed cover connected to casing with hinges
⑫ Smoke sensor / air flow monitoring unit

Dimensions





The following should be noted

- If a set response threshold for the smoke is exceeded, the smoke detector signals a smoke alarm. The related fire or smoke damper closes. Fresh air or recirculation fans must be shut down if their continued operation will result in the further spread of smoke.
- “Regulations on fire protection requirements for ventilation plants” all applicable National Codes must be observed.
- The smoke detector may not be used to send an alarm to the fire service.
- Before commissioning the ventilation plant, the sensor heads must be protected against contamination by dirt (dirt particles can result in false alarms).
- “General and special provisions” of the National Building Codes must be observed.
- Installation and maintenance instructions can be found in the leaflet enclosed with the delivery.

Functional overview RM-O-VS-D/LON

In the illustrated overview below the functions of the existing signal lamps (LED) on the device are shown.

Depending on the operating-mode also the respective status (open/closed) of the connected fire-/smoke damper is shown.

Fire or smoke damper OPEN	Fire or smoke damper CLOSED	Operational status / Event	Signal	**Alarm relay** LED lamp - red - Terminal block - L3 -	**Signal relay** LED lamp - yellow - Contamination (Terminal block - L4 -)	**Signal relay** LED lamp - green - System (Terminal block - L4 -)	LED lamp - blue - Air flow > 2 m/s 2)
		Mains turned on **- Functional status -**	LED	LED off!	LED off!	LED lit	LED lit
			Contact	2 1 3	5 4 6		2 1 3
		Mains not turned on	LED	LED off!	LED off!	LED off!	LED off!
			Contact	2 1 3	5 4 6		2 1 3
		Mains turned on 3) • Electronics defective, • No/defective smoke sensor **- Alarm situation, immediate release signal -**	LED	LED flashing	LED off!	LED flashing	LED off!
			Contact	2 1 3	5 4 6		2 1 3
		Dust / Contamination 1) > 70 % < 90 %	LED	LED off!	LED flashing	LED lit	LED lit
			Contact	2 1 3	5 4 6		2 1 3
		Test / Reset **- Inspection -**	LED	LED flashing	LED off!	LED flashing	LED off!
			Contact	2 1 3	5 4 6		2 1 3
		Contamination 1) > 90 % 3) **- Alarm situation, immediate release signal -**	LED	LED flashing	LED flashing	LED off!	LED off!
			Contact	2 1 3	5 4 6		2 1 3
		Smoke **- Alarm situation, immediate release signal -**	LED	LED flashing	LED off!	LED off!	LED off!
			Contact	2 1 3	5 4 6		2 1 3
		Manual release can only be cancelled using "Reset"	LED	LED flashing	LED off!	LED off!	LED off!
			Contact	2 1 3	5 4 6		2 1 3

1) Contamination indicator
up to 70 % - Normal range
> 70 % - 90 % - Warning range
> 90 % - Alarm range

2) The blue LED goes out at air velocity < 2 m/s or after the fire or smoke damper closes.

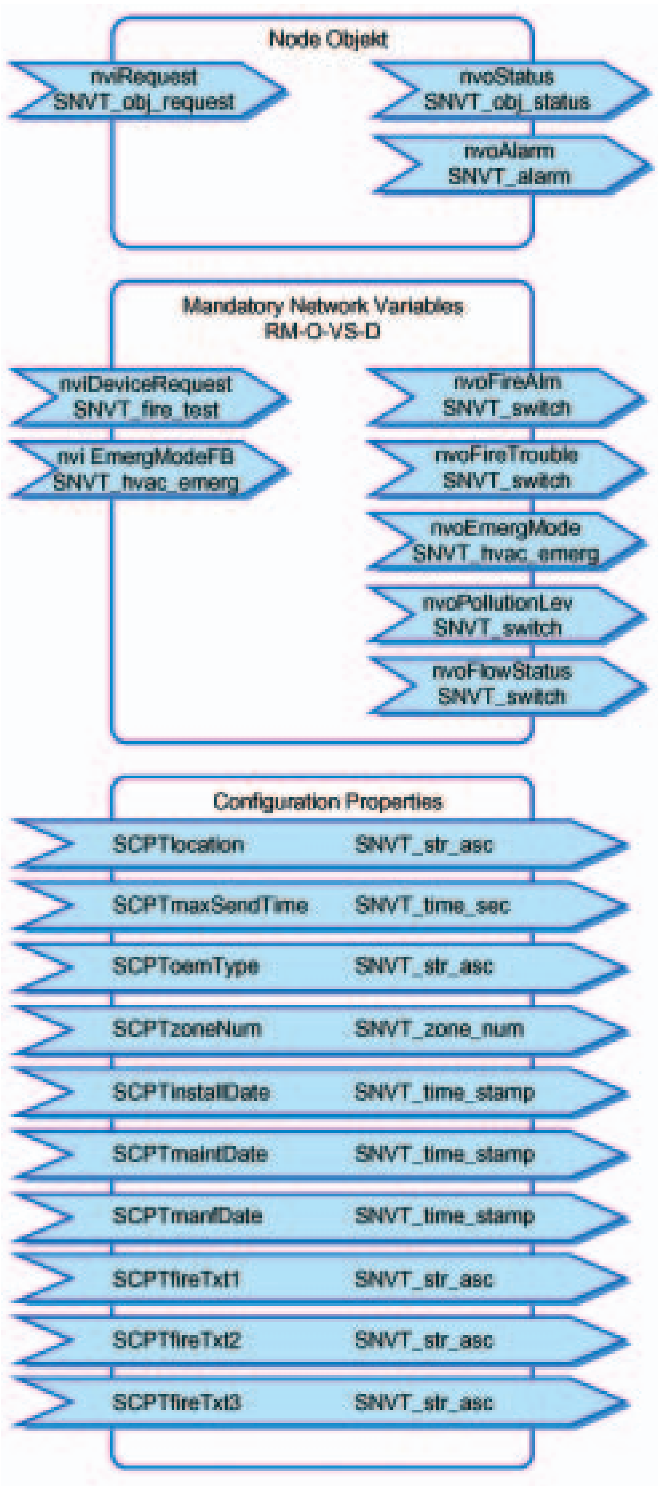
3) The alarm situation, triggered by smoke (event or maintenance), can only be cancelled by pressing the button after the smoke sensor head is again free of smoke.

LED lit   LED flashing   LED off!

Description Function object

The LON® node consists of the node object and the functional block RM-O-VS-D. The functional block consists of network variables and configuration parameters. All variables and parameters are based on standard network variables (SNVT), whereby a simple integration of the smoke detector in a LONWORKS® network is guaranteed.
The specification is oriented as far as possible by the LONMARK®-Profile 11003 "Smoke (Conventional) Fire Initiator" and has been extended for the special functions of the RM-O-VS-D/LON.

RM-O-VS-D/LON



Connection diagram

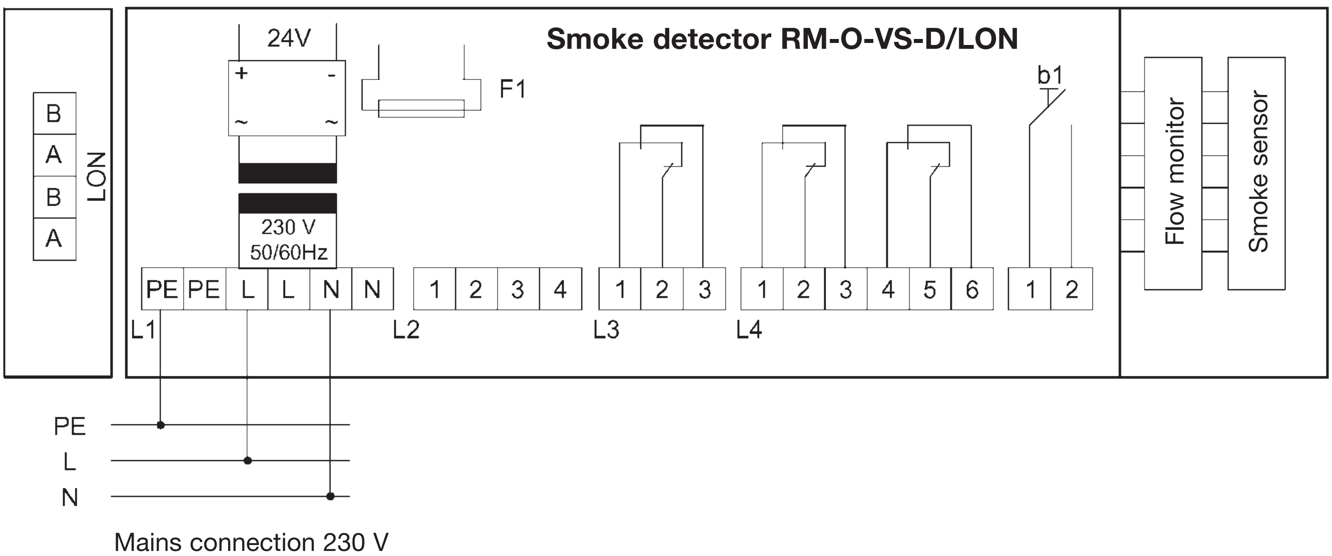
The smoke detector RM-O-VS-D/LON is to be wired by the connection diagram shown below.
Through the LON® connection terminals the smoke detector is integrated into the LONWORKS® network and can exchange the necessary information with the LON®-modules e.g. LON-WA1/B2, the fire- or smoke-dampers, as well as to primary systems.

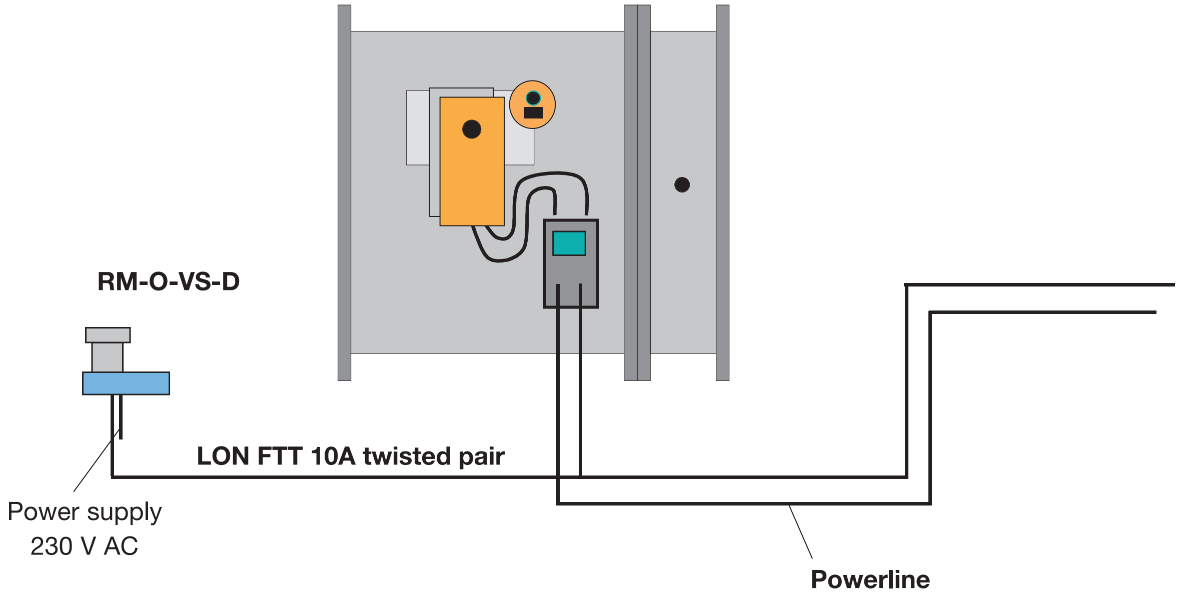
The smoke detector can on demand supply the signals for the release mechanism, airflow monitoring and can supply the degree of pollution also by the relay contacts.

Further fundamental descriptions about this as well as for the installation and maintenance can be found in the product leaflet 4/6.2/EN/1 “smoke detector type RM-O-VS-D” respectively the German test certificate (general building approval) Z-78.6-67.

The entire electrical system must be installed in accordance with VDE (or National equivalent) and the local Energy Supply Company regulations.

Also current National Legal Standards related to the “Regulations on fire protection requirements for ventilation plants” must be complied with.





Specification text

Smoke detector (smoke sensing using optical light scatter principle) to prevent transfer of smoke via the ventilation ducting in air conditioning systems. Suitable for control and release of fire and smoke dampers with General Building Approval equipped with electric or electro-pneumatic release mechanisms and working on the principle of power off to close.

Essential characteristics

- Can be used for air velocities of 1 m/s to 20 m/s
- With integral mains adapter (supply voltage 230 V, 50/60 Hz)
- Zero potential signal relay
- Integral signal lamps
- Sealed cover connected to casing with hinges
- Choice of four flow directions by rotation through 90°
- Easy to remove smoke sensor head (simple functional check)
- With contamination level indicator and "tracking" of sensitivity threshold (long service life)
- Air flow monitor (warning limit set at air velocity < 2 m/s)
- Annual maintenance
- Granted General Building Approval Z-78.6-67 by the German Institute for Structural Engineering, Berlin
- Compatible with any product and manufacturer
- Integrated bus connection via LON® via FTT10A Transceiver

Manufacturer: Trox
Type: RM-O-VS-D/LON

Appendix – Explanations – Glossary

BACNET is a standardised protocol of ASHRAE (American Society of Heating, Refrigerating and Air Conditioning Engineering, Inc.). BACNET uses, among others LON® as a transport medium, whereby however important beneficial qualities of LON® (especially network variables) disappear.

Bridges transmit messages as appropriate to the other side if the originating domain of a message tallies with one of the domains of the bridge, irrespective of the destination of the message. A bridge is used for the linking of domains, for example, for forwarding global system messages.

Channels Via routers and repeaters, networks are physically structured –they divide the network into several channels. Channels describe a physical network segment, for example a bus segment in TP/FT-10. Any number of nodes can belong to a channel, naturally taking heed of the physical limits for the basis medium.

Configured Routers transmit a valid message to the other side, as appropriate, if the originating domain tallies with one of the domains of the router. Each side of the configured router possesses for this purpose an individual transmission table. In this table, the senders of a message that need to be conveyed are labelled with a transmission flag for each one of the 255 possible subnets and each of the 255 groups within a domain. These tables are generated by a network management tool and permanently saved in the EEPROM of the router.
The implementation of a configured router is to be recommended if the network traffic needs to be specifically separated. In this way, islands arise with relatively high internal network traffic and relatively little external communication. The whole network is thereby not encumbered with messages that are only of ”local” character.

CSMA is an access procedure from the area of LAN and stands for **C**arrier **S**ense **M**ultiple **A**ccess. In the case of CSMA, the node ”listens” firstly to the network before becoming active. With CSMA/CD (**Co**llision **D**etect), collisions are reckoned with from the start and, where possible, are met with various processes. LONWORKS® uses predictive p-persistent CSMA procedures that allow short reaction times during high throughput rates, even in large networks.

Domains represent the largest addressing entities. They are used to bring together subsystems that are normally completely independent of each other, for example, the lighting system, access control etc. (in as far as these need to communicate with each other). In this way, domains form virtual networks within the physical network construction. Each LON® device can be addressed via two domain addresses. A maximum of 255 subnets with 127 devices each (equivalent to 32, 385 devices altogether) can be allocated to a domain.

Echelon is the technology provider of LONWORKS® technology. In December 1990, Echelon announced its developments internationally for the first time. Venture capitalists in the USA, including the semi-conductor manufacturers Motorola and Toshiba provided capital for this innovative and highly risky development.
For further information, please visit: www.echelon.com.

Groups make up a further form of addressing that is independent from the domain-subnet-node-addressing. Up to 255 groups can be formed per domain whose members are able to be addressed together via group addressing. In each group, any number of devices can be a member, although each device can, in turn, only be a member in a maximum of 15 groups.

Interoperability is the goal and the defining quality of LONWORKS® technology. LONWORKS® nodes should be able to “talk” and “work” with each other independently of the chosen transport media, network topologies, hardware details or operating system functions.

ISO-OSI Model is a model developed by the ISO (International Organisation for Standardization) for the communication between nodes in networks. This model was named OSI (Open System Interconnection) and is based on the following 7 layers for the communication:

Layer	Description	Functionality
7	Application Layer	Communications services for the application
6	Presentation Layer	Language and character adaptation
5	Session Layer	Construction and closing of meetings, Participant identification
4	Transport Layer	Construction and closing of End-to-End connections, flow regulation
3	Network Layer	Routing
2	Data Link Layer	Frame formation, Point-to-Point data protection, medium access control
1	Physikal Layer	Establishment of all physical and mechanical parameters

Learning Routers are a special form of the configured router. By means of them, all messages are transported with group addressing. At the same time, a learning process is active. After a reset, all transmission flags are put in place and, in this way, all messages are transported. The learning router checks the subnet number every time a message comes in, and deletes the corresponding transmission flag on the other side so that gradually two transmission tables arise, just as with the configured router. These tables are, however, only held in the RAM and are thus lost after the reset. The tables created can nevertheless be read with an appropriate tool and further processed so that the router can, in the end, be operated as a configured router. Learning routers are not as efficient as configured routers; however an installation without knowledge of the network topology and the communication structures is possible.

LNS/LCA "LONWORKS® Networks Services Architecture" / "LONWORKS® Component Architecture". A software platform developed by Echelon with functional and data interfaces for the implementation of tools for LON®, for example for hand terminals, service stations, for PC visualisations and PC implementation tools.

LonBuilder® is the high-end development system from Echelon. One can emulate hardware with it, compile application software and test it after downloading.

LONMARK® Association is an international association of more than 300 companies that deal with the standardisation of LON® for specific task areas and devices, with the aim of guaranteeing interoperability. In the LONMARK® Task Groups, the textual work is achieved. Thus there are standards (Functional Profiles), among other things, for blind control, lighting, sensors, actuators. For more information, please visit: www.lonmark.org.

LonTalk® is the protocol through which Echelon's system solution is specified. LonTalk® defines how LON® nodes communicate with each other on the individual layers of the ISO-OSI model. LonTalk® describes hardware functions, operating system functions and compiler functions precisely, whereby the implementation remains concealed.

LONWORKS® is the system description for the whole technology. Within it are included, for example, the Neuron Chips, the transceivers, the development tools, software packets, support. With LONWORKS®, decentralised information processing structures are made possible that function without central control (for example PLCs). In this respect, LONWORKS® distinguishes itself from conventional fieldbus solutions.

LPT-10 Link Power
This transport medium is also a twisted pair variant. It corresponds technically to the variant "free topology FTT10" with the added advantage that the power supply to the devices can be transported via the bus cable. LPT-10 requires the use of special link power electricity supply (input voltage, for example, 48-56 V, output voltage ca. 42V / 1.5 A) that are mostly very expensive. Besides, there are limits with respect to load capability – a link power network part can only supply a limited number of devices. Link power signals can also be switched to TP/FT-10 devices, if these contain the corresponding blocking capacitors that close off the supply voltage.

Neuron C is the programming language according to the ANSI-C standard for the application programming of Neuron Chips. Neuron C contains additional operating system functions for event-oriented programming and for network variables for process-related programming, as well as for more complex objects for I/O interfaces.

Node is the term for a device or a module with a Neuron Chip as a micro-controller. Nodes are the smallest addressing unit.

NodeBuilder® is a low-end development system from Echelon (see LonBuilder®).

Powerline represents the data transmission via the 230 V network according to CENELEC.

Prog-ID Every LON® device contains a special software that implements the application. Fundamentally, a LON® device can be delivered with different software (functional variants). In order to differentiate them, the PROG-ID is used. This is a chain of characters that is saved in a special place in the memory. Implementation tools use the PROG-ID to differentiate between devices with the same hardware, but nevertheless differing functions. LONMARK® has defined specifications as to how the PROG-ID is to be coded and used.

Repeaters are the physical amplifiers without their own processing functions. They are used to achieve larger transmission distances, or when the maximum number of nodes of 64 devices per twisted pair segment is exceeded. The repeater counts as a node, meaning that per segment 63 nodes + 1 repeater can be used. In TP/FT-10 networks, only one physical repeater is allowed to be located between two nodes. It is also possible to implement the router as a repeater. In this way, the limitations experienced with physical repeaters are inapplicable and a change of media is also possible.

Routers combine neighbouring subnets where the router works with addresses and protocols from layer 3. This layer is independent of the hardware so that routers are able to undertake the transition into another transport medium. Routers can be operated in the operational types: repeaters, bridges, learning routers and configured routers.

Service Pin is a special input/output of the node for service purposes. As a rule, this pin is fed outward by the module manufacturer to a sensing device and an LED. Upon activating the service sensor, the Neuron Chip sends a broadcast message that contains the Neuron ID and the programme ID. In this way, a node, for example, a tool, can be registered (allocation of a physical node to a logical node in the project). As an output, the service pin signalises the current status of the Neuron (application and configuration) and thus enables a fundamental diagnosis.

SNVTs (Standard Network Variable Types) are type-bound network variables in the Neuron-C programming language, standardised by LONMARK®, for the implementation of logical communication channels between LON® nodes.

Subnets are the next smallest addressing unit after the domain. By means of subnet addressing, certain groups of devices (for example, in a room or in a manufacturing cell) can be addressed. Subnets can contain a maximum of 127 devices.

Terminators serve the correct termination of a network with respect to impedance on the basis of twisted pair technology. Independent of the transceivers and the topology used (bus or free topology), various terminators from Echelon may be used according to the specification. Terminators are also partly integrated into LON® devices and are then, as a rule, able to be activated via a switch or jumper. Missing or incorrect termination of a network does not have to immediately have an ostensible effect, but can be the cause of irregularly occurring communications problems.

TP/XT-78 Twisted Pair 78 kBit/sec
This transport medium with a transport connection was very widespread in the first years of LON®. In the form of a linear bus topology, up to 64 devices can be switched to a segment. The length of the bus cable of a segment can amount to up to 2000 m. TP/XF-78 is LONMARK® certified, but should not, however, be used for new developments.

TP/XT-1250 Twisted Pair 1250 kBit/sec
Parallel to TP/XT-78, TP/XP-1250 was introduced. This is also a linear bus with a transport connection of up to 64 devices per segment, nevertheless limited to a length of 130....400 m. The considerably higher physical transmission rate brings only little profit in data throughput and reaction speeds. Applications therefore remain limited to a few exceptions (for example in time-critical backbone buses in control cabinets or for special transmission tasks with large data packets), especially as particular requirements are placed on the topology in detail.
TP/XF-1250 is not LONMARK® certified, observe wiring guidelines exactly.

TP/RS-485 Twisted Pair RS-485
Various device manufacturers tried in the start phase of LON® to absolutely minimise the transceiver costs through implementation of RS-485. In reality, problems arise with RS-485, such as during galvanic separation and during management of mass-related potential between various devices. If one wishes to implement RS-485 interfaces in a CE-conformant way, efforts need to be made that are comparable to those in the case of other twisted pair variants. RS-485 is, therefore, no longer supported by Echelon.

TP/FT-10 Twisted Pair free Topology TP/FT-10
This is, without doubt, the most widespread transport medium today. The TP/FT-10 channel allows both linear bus topologies, as well as free topologies. As a linear bus, 64 participants can again be connected to a segment of up to 2700 m long. The transmission rate is 78 kBit/sec. In free topology, an expansion of the network of up to 500 m can be achieved with 64 devices. TP/FT-10 facilitates the greatest degree of freedom in the spatial configuration.
TP/FT-10 is LONMARK® certified.

Transceivers are the bus building blocks between the Neuron Chip and the transport medium. Important representatives are: TP/XF-78, TP/XF1250, TP/FT-10, LPT-10 and PLT-21. Furthermore, transceivers are available for radio transmission or for the connection with fibre-optic cable systems.

Wink is the possibility of the node to make itself noticeable in various ways (optically, acoustically etc.) after it has received a wink message. Thus an installation tool can search for unconfigured nodes in the network and send a wink message to the node that reports itself first. This node then makes itself noticeable in a defined way, if it is prescribed in its application, so that the technician can create the allocation to the physical node.

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