



User manual

FLAME AND SPARK DETECTOR LUMEX 4



CONTENTS

1.	INTRODUCTION - GENERAL	4
2.	BASIC TECHNICAL DATA	4
2.1.	GENERAL	4
2.2.	TERMINOLOGY	5
2.3.	TECHNICAL DATA TABLE	6
2.4.	SPECIFIC CONDITION OF USE	7
2.5.	APPLICATION.....	7
3.	ELETRICAL CONNECTION	7
3.1.	SCHEMATIC DIAGRAM OF THE PRINTED CIRCUIT BOARD	8
3.2.	DETECTOR CONNECTION	9
3.3.	CIRCUIT MEASUREMENT.....	9
3.4.	SELECTING THE DETECTOR OPERATING MODE	10
3.4.1	STANDARD DETECTION LINE CONNECTION.....	10
3.4.2	STANDARD DETECTION LINE CONNECTION.....	11
3.5.	RECOMMENDED WIRES FOR CONNECTING THE DETECTION AND ACTIVATION LINES.....	13
3.6.	RECOMMENDED PALACEMENT OF FERRITES	13
4.	ASSEMBLY AND DISMANTLING.....	14
5.	MAINTENANCE	14
6.	SERVICE	14
7.	OPERATION.....	15
8.	FORBIDDEN ACTIVITIES	15
9.	LUMEX CONTROL SOFTWARE.....	16
10.	DETECTION AND MEASUREMENT PARAMETERS.....	17
10.1.	CONTROLLING THE DETECTOR STATUS	17
10.2.	CONFIGURATION OF PARAMETERS	17
10.2.1	MEASUREMENT CHANNEL	17
10.2.2	PLACEMENT DESCRIPTION	18
10.2.3	SERIAL NUMBER.....	18
10.2.4	DETECTION/MEASUREMENT	18
10.3.	CONFIGURATION OF PARAMETERS – TRIGGER VALUES	18
10.4.	DEVICE STATUS	19
10.5.	MEASUREMENT	19
10.6.	STATUS – OUTPUT	20
10.7.	FUNCTIONAL KEYS	21
10.7.1	PROCEDURE FOR SETUP OF THE LUMEX 4 DETECTOR.....	21

1. INTRODUCTION - GENERAL

This documentation is a customer guide for the LUMEX 4 IR (Infrared Optical) detector. It lists the basic technical data, description of operation for the customer as well as the instructions for installation, maintenance and servicing of the IR detector. It also includes prohibited functions and activities that may never be performed by the operator. The documentation is delivered to the customer together with the IR detector and serves as a basis for training when passing the system to another customer.

The documentation can be given to the customer also prior to the delivery of the IR detector in order to allow the customer to get acquainted with its functions, installation method, electrical connection etc.

The IR detector LUMEX 4 is an electronic component supplied by RSBP spol. s r.o. (hereinafter "RSBP" only) and is an integral part of the technological system also supplied by this company, which serves as a protection against explosion or fire (fixed fire extinguishing systems, barriers etc.).

2. BASIC TECHNICAL DATA

2.1. GENERAL

This is a detector operating on the principle of measurement and evaluation of optical infrared radiation in the band of approx. 950nm. The evaluation unit and the detector sensor head are installed in a metal housing. The detector is connected to the control panel or to other detectors on the detection line through a junction box by a multi-core shielded cable (four-wire or six-wire). The detector is set up and parameterized via a communication converter using software from a PC or notebook. All setting and parameterization are performed exclusively by RSBP staff or its authorized representative. For the correct functioning of the detector, detector shall be blown over by compressed air of prescribed parameters (provided by the customer), which ensures cleanliness of the cover glass.

The LumEx 4 detector identifies flames and sparks in closed systems. The triggering of fire extinguishers, process equipment and explosion suppression devices can be triggered from a connected control panel.

The function of the detector is such that when an event that emits infrared radiation has occurred within the detector's range, a positive output pulse will be emitted provided that the radiation intensity has exceeded the detector trigger level. The trigger level is set using the service SW LumEx Control in the range of 1-99 %.

The sensitivity of the detector can be easily lowered by adjusting the trigger limit of IR radiation in the range of 1-99%, with 1% being the highest sensitivity and 99% being the lowest sensitivity.

The standard preset sensitivity is 90%.

The IR detectors are suitable for installation in dark parts of the equipment and no foreign light is expected. Daylight also contains infrared components and could trigger/start the IR detector. To prevent contamination of the detectors by the transported material and thereby reduction of their sensitivity, the components are kept clean by increased ventilation and blowing of rinsing air, which prevents clogging of the detector optics.

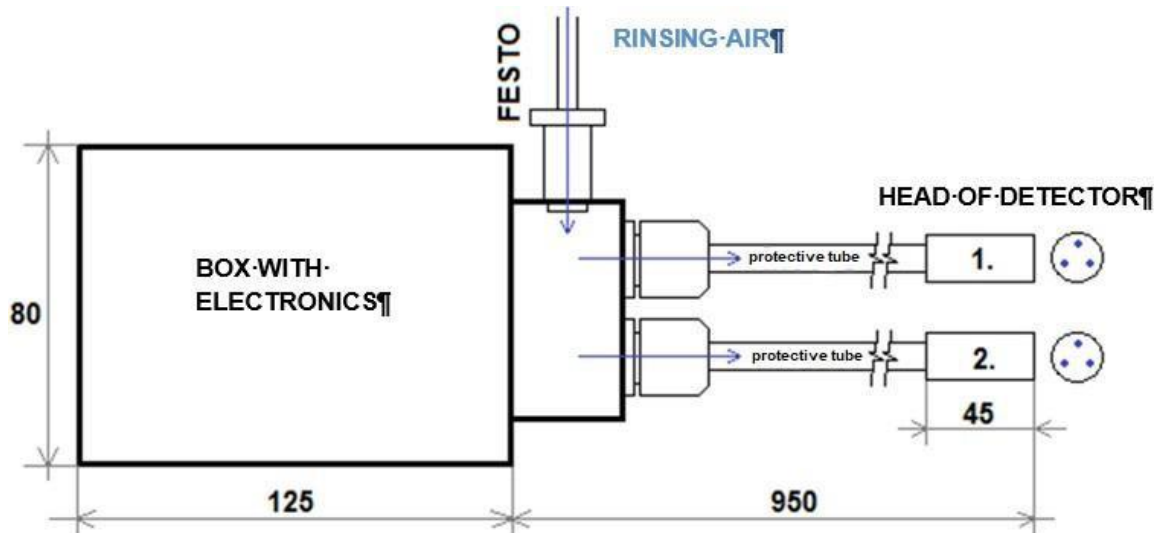


Fig. 1 - Connection of rinsing air to the optical detector





Due to the high sensitivity of the detectors also to sunlight, they must be installed only in closed systems/pipes/ducts, etc. In conveyor systems, one or more optical detectors are installed within the current of a possible ignition source, and any flame barrier is placed at a suitable distance according to the propagation speed.

2.2. TERMINOLOGY

Infrared flame and spark detector - is a sensing device to detect flame and sparks in the monitored technological section and to transform and amplify this stimulus into a signal suitable for further evaluation and processing.

Photo sensor - is a sensing element that can detect flame and sparks in the monitored technological unit, that is to transform this stimulus into a signal suitable for further processing.

2.3. TECHNICAL DATA TABLE

Supply voltage	18 to 27 V DC
Operating voltage	8 to 27 V DC
Power	max. 20 mA
Protection	polyswitch 200 mA, varistor 31V / 8.6J
Power dissipation	< 0.25 W
Operating temperature	-40°C to +80°C – for enclosure with electronics for EPL Gc and Dc -40°C to +75°C – for enclosure with electronics for EPL Db -40°C to +195°C – for sensors for EPL Ga and Da
Sensing IR	450-1100 nm (peak 880nm)
Output switching	relay with associated resistor $U_{max} = 48V_{SS}$, $I_{max} = 0,25mA$
Communication interface	CAN (ISO11898), 250kbps, CANopen (CiA DS 301)
Compressed air supply	push - in fitting for connection of 8 mm hose
Parameters of compressed air for blowing – consumption	200l/min – dry
Explosion-proof design (dust)	 II 2D Ex tb IIIC T85°C Db – enclosure with  electronics II 1D Ex op is T195°C Da – sensors
Explosion-proof design (gas)	 II 3G Ex ec IIB T4 Gc - enclosure with  electronics II 1G Ex op is IIB T3 Ga – sensors
Temperature resistance	-40 to 80 °C
ATEX Certificate number:	FTZÚ 18 ATEX 0089X
IECEX Certificate	IECEX FTZU 19 0009X
Response time	$t = T_s * (C_s + 1) + T_r + T_f (*)$
(*)	C_s – number of samples required to evaluate the trigger event plus the start of sampling T_s – time needed to take one sample, for frequency of 2 kHz = 0.5 ms T_f – filter time constant T_r – time to switch relay C

2.4. SPECIFIC CONDITION OF USE

The product shall be used in the area with a low risk of mechanical damage.

If the enclosure with electronic parts is installed in zone 2, it shall only be used in areas with pollution degree 2 as defined in IEC 60664-1.

If the enclosure with electronics is installed in zone 2, transient overvoltage protection has to be provided that is set to a value not exceeding 140% of the rated voltage peak value on the product power terminals.

2.5. APPLICATION

- spray booths
- spaces with the danger of fire
- do not open in presence of an explosive atmosphere

3. ELECTRICAL CONNECTION

The detector is connected to the control panel or to other sensors or detectors on the detection line via special cables. These cables can be most adversely affected by unwanted effects of the electromagnetic interference (EMC). Therefore, exclusively the HELUKABEL cables are proposed, specifically the type PAAR-TRONIC-CY 2x2x0.75 mm² – for the terminal detector on the detection line (or 3x2x0.75 mm² – for non-terminal detector on the detection line) for detection lines up to 150 m length (the detection line length is the distance between the control panel and the terminal detector on the detection line). It is a special cable highly resistant to unwanted effects of electromagnetic interference (EMC). The cable is shielded with twisted pairs of cores.

The detector is connected as a four-wire unit, two cable cores for the 24V DC supply and other two cable cores for conducting the signal to be evaluated by the control panel (change in the electrical resistance).

The detector is grounded with a yellow/green wire with a 2.5 to 4mm diameter.

A torque of 2.6Nm is used for internal and external ground terminals.

Any unused wire from the wiring harness or cable must be connected to the ground potential. One end of the wire is connected to the metal body of the detector and the other end of the wire is connected to the grounding point of the technology.

3.1. SCHEMATIC DIAGRAM OF THE PRINTED CIRCUIT BOARD

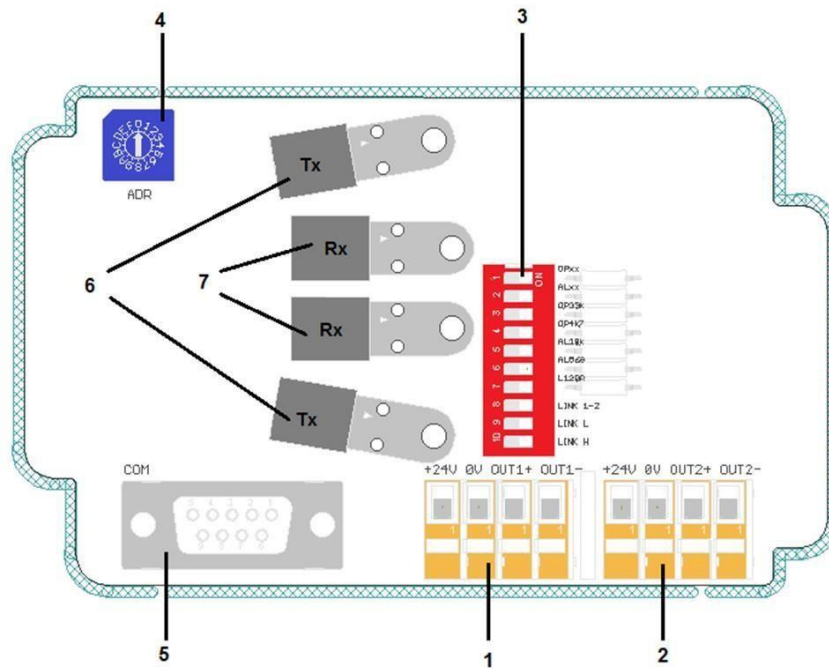


Fig. 2 - Printed circuit board

Legend to Fig. 2:

1 – Output terminals OUT1

2 – Output terminals OUT2

3 – DIP switch (setting of the detector operating mode)

4 – BCD switch (setting the detector CAN address)

5. – CAN connector (service connector for communication with a PC)

6. – IR radiation emitter

7. – IR radiation receiver

(detailed description of the DIP switch and output terminals in Ch. 3.4)

3.2. DETECTOR CONNECTION

Eight internal terminals:

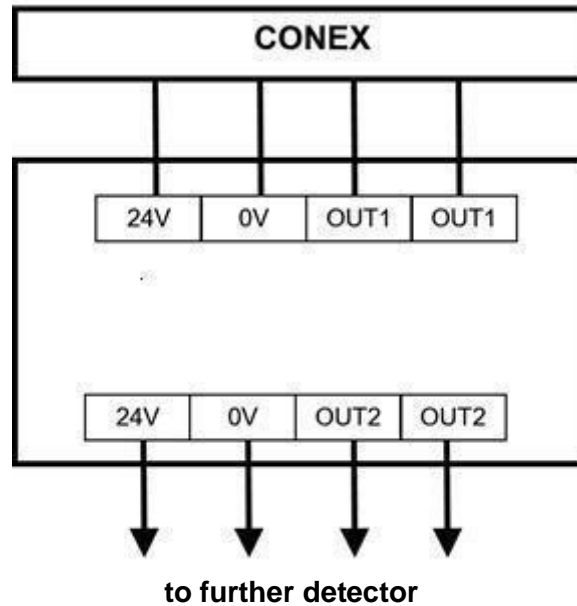
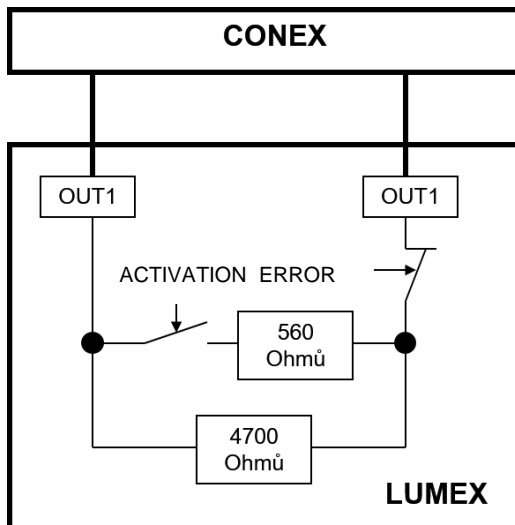


Fig. 3 - Detector connection

3.3. CIRCUIT MEASUREMENT



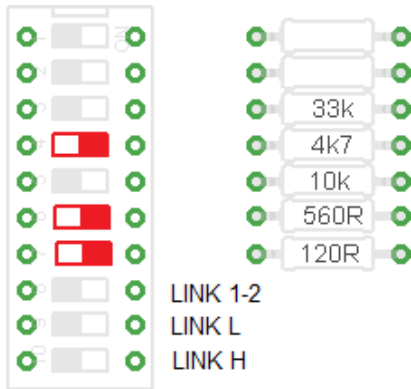
The CONEX control panel measures the circuit resistance continuously.

- Infinite resistance (disconnected circuit) – the detector is in the failure mode
- The resistance is about 4700 Ohms – detector is in the operating mode
- The resistance is about 500 Ohms (parallel combination of 4700 Ohms and 560 Ohms) - detector is in the ALARM mode

3.4. SELECTING THE DETECTOR OPERATING MODE

The LumEx 4 optical detector can be incorporated in the system in two operating modes. The mode is selected with the DIP switch setting.

3.4.1 Standard detection line connection



- Selection of resistance in the RUN mode: 4k7 or 33k
- Selection of resistance in the Alarm mode: 560R or 10k
- DIP switch at the 120R resistor is set to ON
- The other DIP switches are set to OFF

Meaning of output terminals OUT1 and OUT2



- X1 – operating voltage 18 – 27 V DC (+)
- X2 – 0 V DC (-)
- X3 – resistance output
- X4 – resistance output

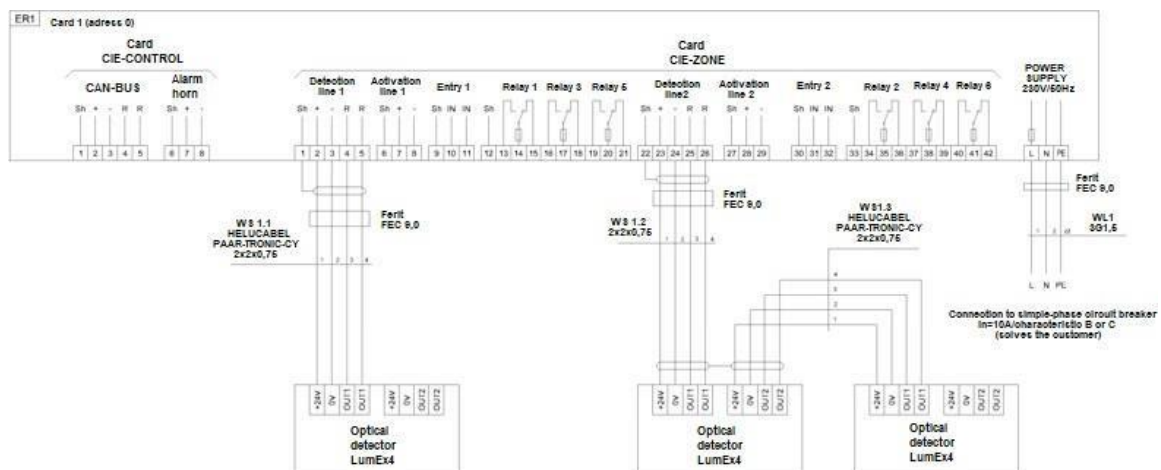


Fig. 4 - Wiring diagram

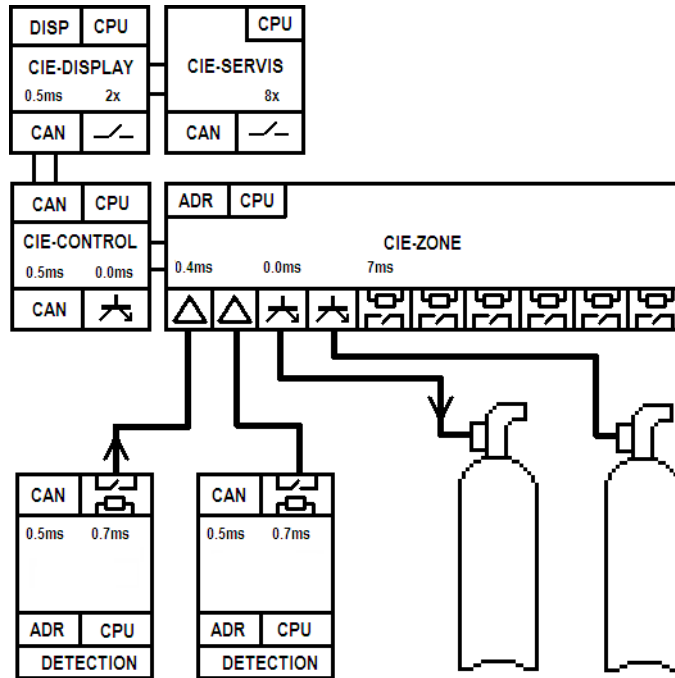
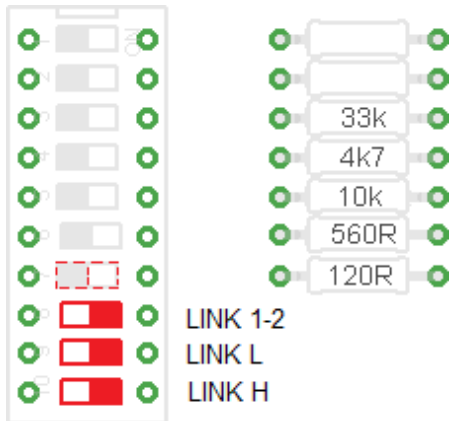


Fig. 5 - Block diagram

3.4.2 Standard detection line connection



DIP switches LINK 1-2, LINK L and LINK H set to ON

For the very last detector on the CAN line, the DIP switch at the 120R resistor is also ON – dashed in the picture

The other DIP switches are set to OFF.

Meaning of output terminals OUT1 and OUT2



X1 – operating voltage 18 – 27 V DC (+)

X2 – 0 V DC (-)

X3 – CAN Line L

X4 – CAN Line H

The detector CAN address is set on the BCD switch. The CAN address must be unique within the system. The detector communicates with the control panel and with the PC application using this number.

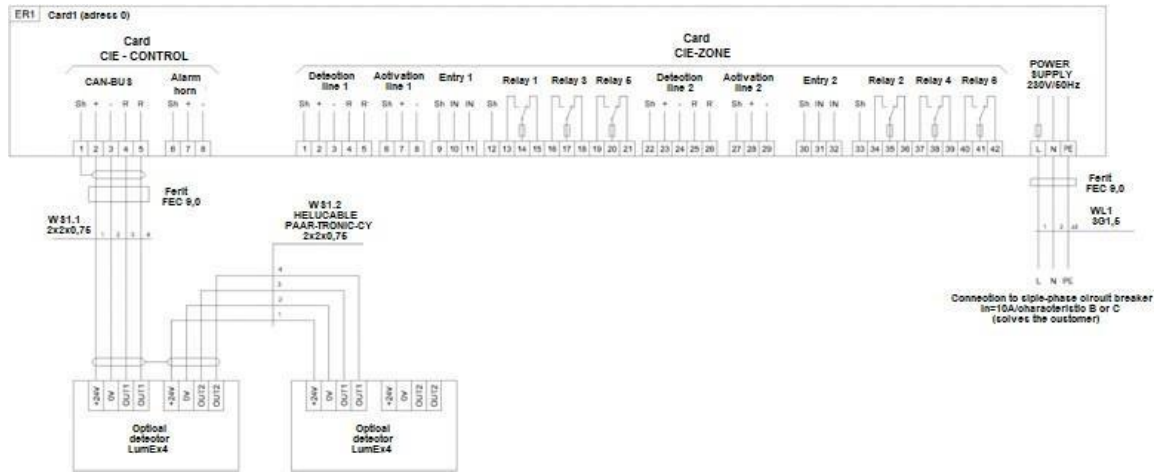


Fig. 6 - Wiring diagram

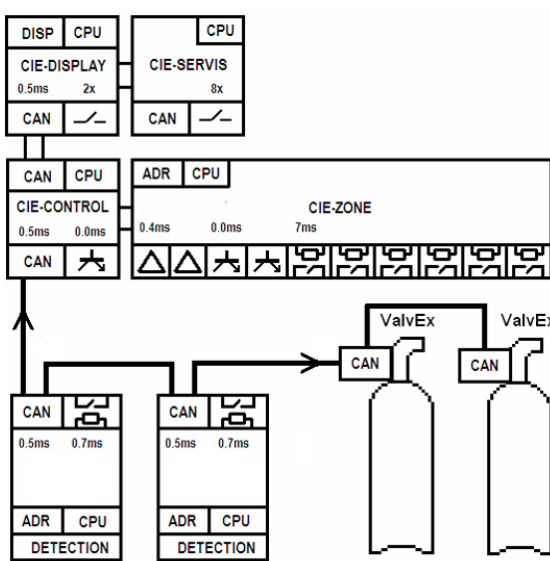


Fig. 7 – Block diagram only CAN-BUS

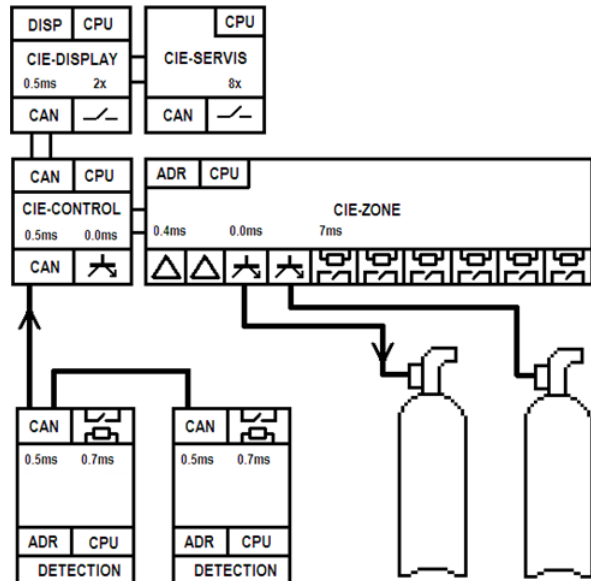


Fig. 8 - Block diagram only CAN-BUS+Analog

3.5. RECOMMENDED WIRES FOR CONNECTING THE DETECTION AND ACTIVATION LINES

Recommended wire for the detection line*		
length	wire	ferrite
up to 150m	PAAR-TRONIC-CY 2 x 2 x 0.75	FEC 9.0 (GES)

* a shielded conductor with twisted pairs recommended

The cable length is the sum of the partial lengths connected to one channel of the control panel

3.6. RECOMMENDED PALACEMENT OF FERRITES

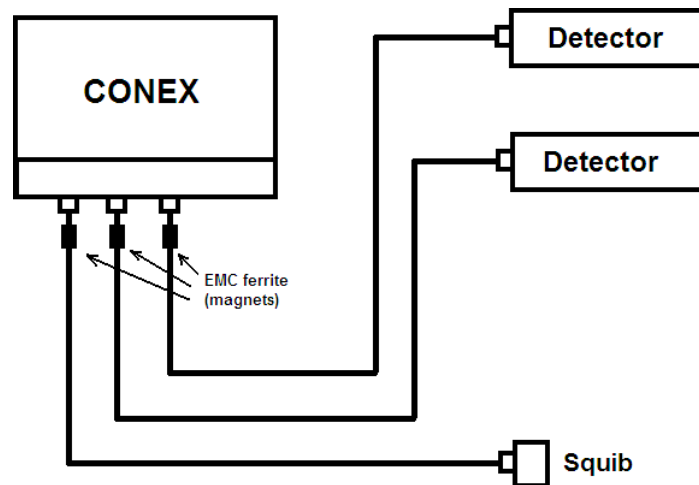


Fig. 9 - Recommended placement of ferrites



Fig. 10 - Example of an EMC ferrite

Before commissioning, the following must be re-inspected:

- body / cover close before commissioning
- correct and meaningful application
- cabling / connection of the control panel with the detectors
- proper setup
- grounding, shielding
- cleaning of the detector optics

4. ASSEMBLY AND DISMANTLING

All assembly (mechanical and electrical preparation, custom installation, parameterization, setting) associated with the detector is performed exclusively by RSBP or its authorized representative.

The detectors are inserted and fixed in mounting adapters that are installed on the respective technology (tank, piping, etc.). Fastening is carried out with the union nut supplied with the detector. Then it is necessary to connect a pipe or a hose with compressed air supply to the terminal of the mounting adapter.

The evaluation unit is electrically interconnected with the above special cables to the control panel or to other detectors in the detection line with a connection cable and a junction box with a terminal block.

If the detector works properly, it does not pollute the environment, does not produce harmful substances or electromagnetic radiation higher than the permissible limits. From an environmental point of view it is harmless.

Only RSBP or its authorized representative is solely responsible for dismantling and disposing of the detector. In doing so, individual parts and components are ecologically disposed of or recycled in accordance with the Electrical Waste Act.

5. MAINTENANCE

The maintenance of the detector carried out by the customer includes exclusively optical and visual inspection of cleanliness, mechanical damage and integrity of the detector, cabling and inspection of the compressed air connection for the blowing. In case of any damage and loss of integrity of the detector and cabling, RSBP or its authorized representative must be contacted. It is not possible for the customer or other persons to carry out a different way of maintaining the detector outside of the above items. The supply of compressed blowing air with the relevant parameters is provided by the customer; in case of a defect the maintenance, repair and service are provided by the customer.

The customer must be provably trained for the maintenance of the detector by RSBP or its authorized representative. It is explicitly forbidden for non-trained persons to carry out maintenance of the detector.

6. SERVICE

All servicing of the detector with the exception of servicing of the compressed air supply is performed exclusively by RSBP or its authorized representative, at regular six-month intervals. It is not possible for the customer or other subjects to carry out any servicing, with the exception of servicing of the compressed air supply. The supply of compressed blowing air with the relevant parameters is provided by the customer; in case of a defect the maintenance, repair and service are provided by the customer.

7. OPERATION

The detector connected within the complete fire suppression or prevention system is able to run unattended - automatically without human intervention. The operator does not have the option or authority to change the detector parameters set by RSBP or its authorized representative. Individual operation of the detector is not performed, the detector is integrated into the complete master system.

The operator must be provably trained for the operation of the complete master system by RSBP or its authorized representative. It is explicitly forbidden for non-trained persons to operate the superior complete system.

8. FORBIDDEN ACTIVITIES

The detector can only be maintained by a person who is provably trained for these activities. When performing these activities, the person must be physically and mentally able and must not be under the influence of alcohol or other addictive substances.

The operator, other personnel of the customer or other persons may not perform the following prohibited activities in connection with the detector:

- mechanically damage the detector in any way
- mechanically damage electrical cables leading out of the detector in any way
- remove the sensor from the mounting adapters

The sensor works on the principle of a continuous temperature sensing and evaluating of the optical spectrum level. It identifies sparks and flames that manifest themselves as infrared radiation. It is installed in areas where it is dark (containers, pipes, etc.) and must not be exposed to any light (natural daylight or artificial). All these types of light can contain infrared components of the optical spectrum level and can be evaluated by the detector as a possible fire, and the system can react to suppress or prevent it. This undesirable reaction can cause severe injuries with potential permanent or fatal consequences.

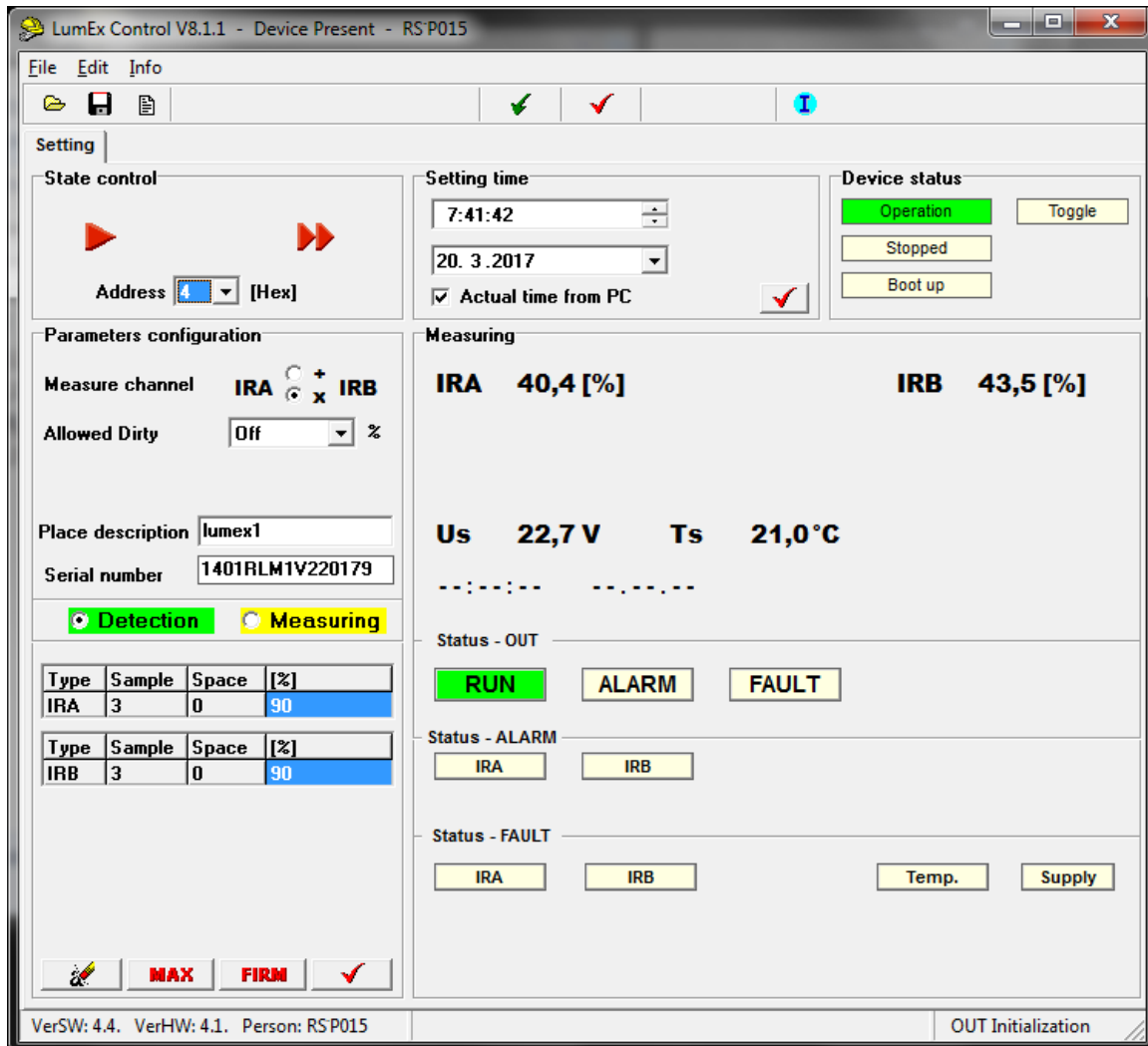
The customer has to ensure that the detectors are not exposed to unwanted natural daylight or artificial light. This may occur, for example, during cleaning, mechanical work or repairs (opening covers, barriers). The detector must also not be removed from the mounting adapter and exposed to unwanted natural daylight or artificial light. The personnel of the customer carrying out these activities (this applies to other subjects as well) must be demonstrably instructed on the above principles by the customer and follow them.

If the customer wants to perform the above activities (cleaning, mechanical work, repairs, removing the detector from the mounting adaptor), it is necessary for the technological unit (zone) to be put into the "service mode", which is done by the operator through the control panel. This procedure is fully described in the Operating Instructions for the CONEX control panel.

All of the above activities should be provably recorded in the Operational Logbook of the technological unit including the date, name and signature.

9. LUMEX CONTROL SOFTWARE

The software is designated to control the LumEx 4 flame and spark detector. It sets the trigger limits for IR radiation. The SW can be used to configure the measurement operational parameters. The software allows reading and displaying the maximum IR radiation records.





The software is installed on a computer with Windows XP or Windows Vista and is connected to the detector via a communication converter with a unique number.



10. DETECTION AND MEASUREMENT PARAMETERS

10.1. CONTROLLING THE DETECTOR STATUS

 Device function start

 Device RESET

These functions (buttons) are not widely used in practice.



Device function start button

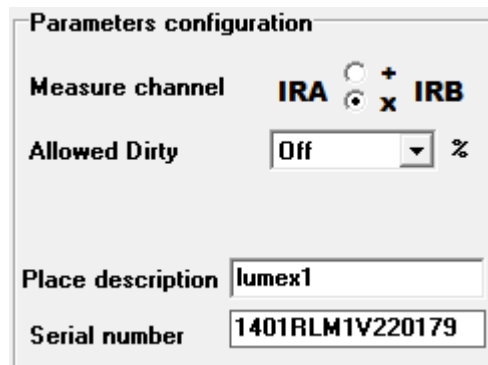


Clicking on this button will put the device into operation. Putting into operation is connected only with stopping of the device function by means of the "Device function stop" button.

Device RESET



10.2. CONFIGURATION OF PARAMETERS



Parameters configuration

Measure channel **IRA** + **IRB**
 x

Allowed Dirty %

Place description

Serial number

10.2.1 Measurement channel

The LumEx 4 flame and spark detector is equipped with 2 IR sensors. The sensors may operate as logical AND or logical OR. Connection of 2 sensors is designed to minimize false triggers.

The optional function **+/x** means logical dependence of CH1 and CH2.

Option **+** will trigger the alarm based on signal of any of both the sensors. This is a logical disjunction, or OR function.

Option **x** will trigger the alarm if it is detected by both the connected sensors (for example when both sensors detect IR radiation value above the set threshold). This is a logical conjunction, or AND function.

The logical dependence of the signals only applies to the Alarm signal, in case of a fault the detector will always go into the fault state regardless of the logical dependence.

10.2.2 Placement description

The detector placement description helps for better orientation with placement of detector within the application. This description is stored in the detector, making it possible to determine unambiguously where the detector was located (e.g. during bulk dismantling or when detectors are replaced).

10.2.3 Serial number

The detector serial number that was stored in the detector during production.

10.2.4 Detection/measurement

Switch DETECTION or MEASUREMENT toggles the detector between its 2 modes.



Detection mode means that the alarm is triggered when the set trigger values are reached. During normal operation, the detector in this mode signals the **normal state** (*idle state*) on the signal line, i.e. an electrical resistance value of 4.7 kΩ or 33kΩ.

The measurement mode means that the set trigger values are ignored. A detector switched on in this mode indicates a fault continuously.

10.3. CONFIGURATION OF PARAMETERS – TRIGGER VALUES

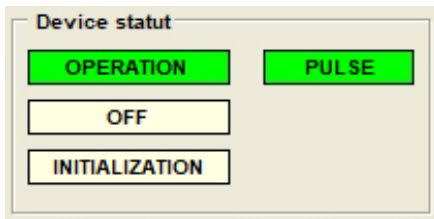
Type	Sample	Space	[%]
IRA	3	0	90
Type	Sample	Space	[%]
IRB	3	0	90

Use this table to set the trigger values for detection of explosion/fire.

The trigger value of IR radiation is entered in lines *IRA* and *IRB* in %.

Column *Sample* indicates the number of samples from which the alarm/fire is evaluated (default 3).

10.4. DEVICE STATUS



This is a graphical representation of the detector states.

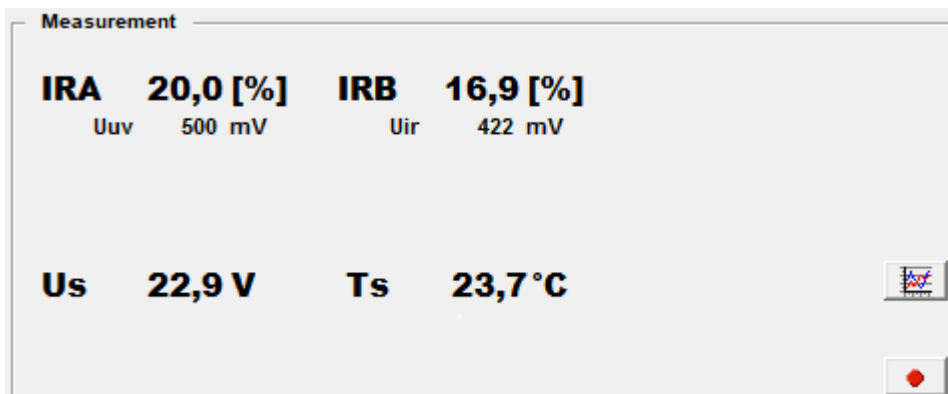
Operation – green in normal operation

Off – red if there is a power failure/drop in the powered device

Initialization – green when power is applied or at reset before all functions are put into operation and fully verified (approx. 5 s)

Pulse - indicated the communication status if the communication converter is connected (if flashing red, the communication is OK).

10.5. MEASUREMENT



First line

IRA – shows the currently measured IR radiation value in % at the 1st optical sensor

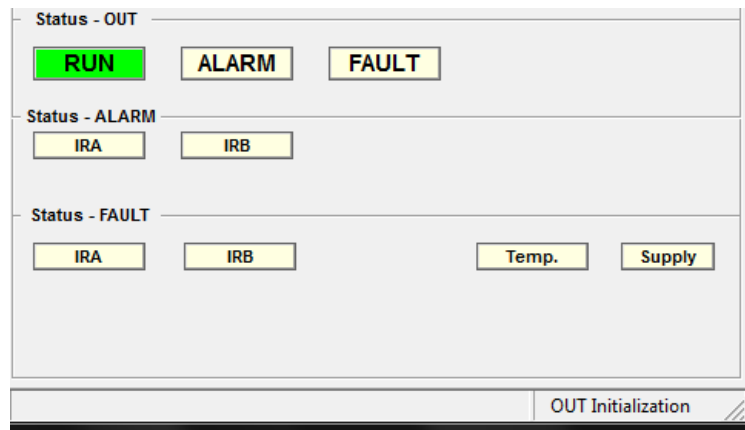
IRB – shows the currently measured IR radiation value in % at the 2nd optical sensor

Second line

Us – shows the current voltage on the evaluation unit output

Ts – shows the current measured temperature at the evaluation unit face

10.6. STATUS – OUTPUT



Status –OUT (OUTPUT)

RUN – detector function indication

ALARM – indicates that the detector is in alarm

Status – ALARM

IRA – illuminates when the set IR radiation threshold at the first sensor has been exceeded

IRB – illuminates when the set IR radiation threshold at the second sensor has been exceeded

Temperature - illuminates in case of temperature-triggered alarm

Status – ERROR

IRA – Illuminated when dirt on the detector face is detected




IRB – Illuminated when dirt on the detector face is detected

Temperature - Illuminated if the measured temperature is out of measurement range.

Power – Illuminated if the detector power is out of operating range.

10.7. FUNCTIONAL KEYS







-  *open device configuration*
-  *save device configuration*
-  *open event log*




In the read file you can view the currently read data as well as data from past readings. The current configuration is also stored in this file.

You can search through the file with Ctrl+F, for instance by entering the detector serial number or name, and find various configuration applied to the respective detector or technology depending on the search purpose.



-  The button clears the maximum values from the detector record
-  After clicking on this button, the maximums are read. The currently read maximums can be also read on the Records tab.
-  The FIRM button set the default (factory) values of the detector
-  Click on the displayed button to write configuration parameters to the detector.

10.7.1 Procedure for setup of the LumEx 4 detector

- 1 Plug the communication converter into the computer USB port
- 2 Start the LumEx Control software
- 3 Read the maximum values from the measurement  mode
- 4 Measurement check
- 5 Status check
- 6 Detector configuration settings (if necessary)
- 7 Storing the set parameters by clicking the button 
- 8 Re-reading of maximums  to store the current configuration
- 9 Disconnect the communication convertor from the detector