



# Explosion-proof Fire and Security System «Ladoga-Ex» Modules



## LINEAR SMOKE DETECTOR

«IPDL-Ex»



### Installation Guide

#### 1 General Information

Linear smoke detector «IPDL-Ex» (hereinafter, the IPDL-Ex) refers to intrinsically safe electric equipment with «ia» level «intrinsically safe electric circuit» explosion protection. IPDL-Ex is intended for detecting ignitions accompanied with smoke in the protected hazardous premise, generating an alarm message by relay contacts closing and transmitting the message to zone extension module BRSS-Ex (hereinafter, the BRSS-Ex).

#### 2 Features of the IPDL-Ex

- The intrinsically safe parameters of the IPDL-Ex match those of BRSS-Ex.
- Detects combustion products in a monitored zone created by an optical beam between the infrared radiation transmitter and receiver.
- Generates «Fire» alarm messages if threshold concentration of combustion products level is exceeded;
- Generates «Fault» messages in case of service trouble;
- Transmits «Fire» and «Fault» alarm messages via alarm loops AL1 and AL2 correspondently;
- Diagnoses faults and transmits the results to an optical alarm external device (hereinafter, OAED).

#### 3 Specifications

- 3.1 IPDL-Ex intrinsically safe electric circuits have the following valid parameters:
- maximum input voltage ( $U_i$ ) – 16 V;
  - maximum input current ( $I_i$ ) – 150 mA;
  - maximum internal capacitance ( $C_i$ ) – 1000 pF;
  - maximum internal inductance ( $L_i$ ) – 0.01 mH.
- 3.2 IPDL-Ex operation threshold (intensity reduction of a beam passed through the monitored environment, at which IPDL-Ex generates a «Fire» message) fall inside the limits of 20 % ... 50 %.
- 3.3 The time period during which IPDL-Ex generates a «Fire» alarm message, with ambient optical density increasing at the rate of  $(0.52 \pm 0.05)$  dB/s does not exceed 10 s.
- 3.4 IPDL-Ex generates three types of messages:

Table 1

Message	AL1 (Fire) Relay Contacts	AL2 (Fault) Relay Contacts		Transmitting Module (TM) LED Indicator and OAED LED Indicator
		DIP «2» RM - «ON»	DIP «2» RM - «OFF»	
«Norm»	Open	Open	Closed	Blinking at freq. 0,25 Hz
«Fire»	Closed	Open	Closed	Continuous lighting
«Fault»	-	Closed	Open	Blinking at freq. 1 Hz

3.5 IPDL-Ex remains in a standby mode in case the transmitter radiation is interrupted for the time period less than 1 s.

3.6 The positioner adjusts the optical beam level tilt. Permissible vertical tilt angle of the optical beam is not less than  $\pm 5^\circ$ , tilt angle in horizontal plane is not less than  $\pm 10^\circ$ .

3.7 Permissible optical path length is 8 to 150 m.

3.8 Structurally, IPDL-Ex consists of a transmitting module (hereinafter, the TM) generating a directed infrared radiation flow and a receiving module (hereinafter, the RM) receiving the radiation and generating an output signal.

3.9 The maximum current consumption of IPDL-Ex TM is 10 mA. The maximum current consumption of IPDL-Ex RM is:

- 10 mA in a standby mode;
- 20 mA in «Fault» and «Fire» modes.

3.10 The IPDL-Ex provides IP41 rating.

3.11 Dimensions of IPDL-Ex TM and RM – 120 x 120 x 80 mm.

3.12 IPDL-Ex weight – maximum 0,8 kg.

3.13 IPDL-Ex ensures safe operation at:

- ambient temperature from minus 25 to +55 °C;
- relative air humidity 93 % at an ambient temperature +40 °C.
- background natural and/or artificial illumination with of 12 000 lx or more intensity.
- DC voltage variations at power supply terminals within the range from 8 to 14 V.
- impact of sinusoidal vibration with acceleration of 0.5 g within the frequency range 10 ... 150 Hz;
- impact of the straight mechanical blow delivered with the energy 1.9 J.

#### 4 Scope of Delivery

Each IPDL-Ex unit package contains items listed in Table 2.

Table 2

Name	QNT
Linear smoke detector «IPDL-Ex»:	
Transmitting module	1 pc.
Receiving module	1 pc.
Optical alarm external device	1 pc.*
Screw 3-3x40.016	4 pcs.
Wall plug NAT 5x25 SORMAT	4 pcs.
Linear smoke detector «IPDL-Ex». Installation Guide	1 copy

\*) supplied optionally

#### 5 Design of the IPDL-Ex

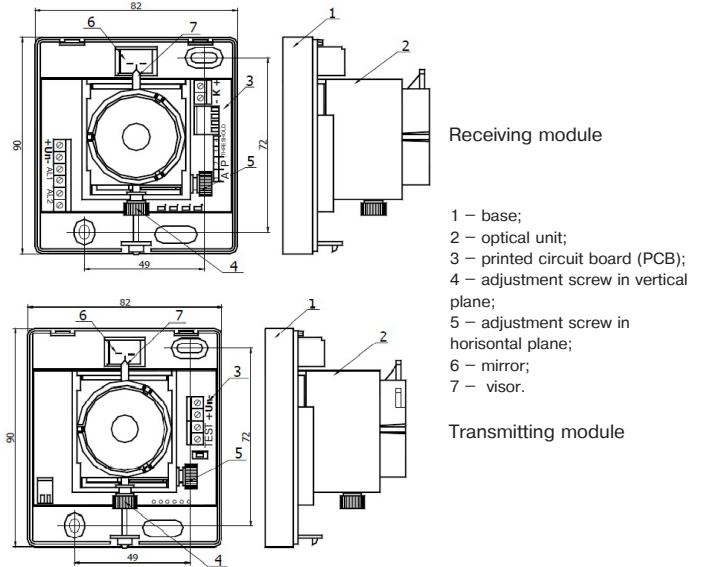


Figure 1

5.1 The principal structural elements of the transmitting module (TM) and the receiving module (RM) (See Figure 1) are as follows: 1 – base with a positioner mirror; 2 – case; 3 – optical unit with an adjuster; cover with a light filter (not shown).

5.2 The bases of the TM and the RM have openings for fastening on the place of installation by means of screws.

5.3 The base of the RM comprises openings for a HL1 LED indicator, entries for power cables, AL and optical alarm external device OAED.

5.4 The cover is fastened to the base with the help of a latch.

5.5 The TM includes case, PCB and TM optical unit.

5.6 The following elements are installed on the TM PCB:

- a transmitter installed in the focus of the TM optical unit;
- DIP-switch 1, 2 of transmission power level as per Table 3;

Table 3

Distance between the TM and the RM, m	RM «P» Switch Arms Positions
150	1 - ON, 2 - OFF
60	1 - OFF, 2 - ON
20	1 - OFF, 2 - OFF

- a terminal block «+U-» for power supply connection;
- a terminal block and a «TEST» key button intended for self-test mode engagement.

5.7 The RM includes:

- case;
- the PCB installed on the base in the focal plate of the RM optical unit ensures analog and digital signal processing, external circuits switching, provides information display at OAED;
- the RM optical unit.

5.8 The following elements are installed in the RM circuit board:

- «+Un-» terminal block for power supply connection;
- «AL1» and «AL2» terminal blocks for connecting AL1 (Fire) and AL2 (Fault) alarm loops;

- «+K-» terminal block for connecting an external optical device (ED) in a standby mode or a voltmeter for signal level measurement during adjustment;

- «A» DIP-switch 1 in the ON position changes the RM to an adjustment mode;

- «P» DIP-switch 2 determines the polarity of AL2 signal (Fault):

- ON – AL2 normally opened contact;
- OFF – normally closed AL2 contact;

- operating threshold adjustment is carried out by means of DIP-switches 3, 4 «THRESHOLD» in compliance with Table 4.

- RM LED indicator HL1 of RM displays the current status of IPDL-Ex («Norm», «Fire», «Fault») and indicates the delivery or non-delivery of a signal in an adjustment mode;

- HL2 – HL5 LEDs display signal level in an adjustment mode.

Table 4

«THRESHOLD» (% of Signal Strength Loss as Compared to the Set Level)	«THRESHOLD» Position of DIP-switch 3	«THRESHOLD» Position of DIP-switch 4
20	OFF	OFF
30	OFF	ON
40	ON	OFF
50	ON	ON

#### 6 IPDL-Ex Installation

6.1 Safety Rules for Operation of Customers' Electrical Installations and Customers' Electrical Installations Operation Rules, the recommendations of local fire department should be observed to in the process of IPDL-Ex installation and operation.

6.2 The IPDL-Ex should be installed in closed or semi-closed premises at most probable smoke accumulation points in case of a fire (above fire hazard locations, far away from exhaust ventilation and air draughts).

6.3 The bases for the TM and the RM installation should be rigid and should have level surfaces (a load-bearing wall or a timber).

6.4 The IPDL-Ex should be installed at the location accessible for maintenance in line-of-sight zone on a side of the premise passages.

6.5 The distance between the TM and the RM must not exceed 150 m, whereupon there should be no overcovering objects in the monitored zone and the possibility of their emergence should be excluded.

6.6 The receiver optical unit exposure to direct sunlight, powerful light sources or other infrared radiation sources should be excluded.

6.7 Several IPDL-Ex with parallel monitored zones may be installed in a single premise, opposite operation of neighboring receivers and transmitters is permitted. Whereupon distances between two neighboring IPDL-Ex must be maximum 9 m and minimum:

- a) 5 m – if the distance between the TM and the RM is 50 to 150 m;
- b) 2.5 m – if the distance between the TM and the RM is 8 to 50 m.

6.8 The IPDL-Ex should be installed at 0.3 to 0.6 m distance from ceilings. In case the premise height is greater than 12 m, the IPDL-Ex should be installed in two tiers.

6.9 IPDL-Ex Installation Procedure:

- mark out the TM and the RM installation points at the same distances from the ceiling and the nearest wall or beam (the angle between the TM and the RM base planes must not exceed 6.5 degrees);
- remove covers from modules by pressing the latches with a screwdrivers through an opening near the LED indicator and simultaneously pulling the cover away;
- fasten the TM and the RM bases tightly to the wall or timber without changing positions of optical units;
- connect power supply lines and AI1 and AI2 alarm loops to the TM and the RM terminal blocks;
- if necessary, connect the OAED to the TM («+K» connect to «+OAED», «-K» – to «-OAED»).

6.10 Depending on the alarm loop power supply circuit, set the switch «P» located on the TM PCB in the following positions:

- DIP-switch 2 «P» in ON position – normally opened AI2;
- DIP-switch 2 «P» in OFF position – normally closed AI2.

6.11 Adjust the operating threshold needed for the premise by means of 3, 4 DIP-switches «THRESHOLD» as per Table 4. In case IPDL-Ex is installed in premises with gassed air (in garages, hot shops, etc.), the threshold value should be increased, and vice versa, in the gas free premises where low concentration of smoke is an attribute of a fire the threshold should be reduced.

## 7 IPDL-Ex Adjustment

7.1 The IPDL-Ex constancy of performance largely depends on it's adjustment, therefore, it should be performed especially thoroughly.

7.2 Firstly, the TM and the RM EI optical units axes should be aligned as close as possible by means of their adjustment.

7.3 Adjust the RM optical unit in the following way:

- put 1 and 2 DIP-switches on the RM PCB in the positions corresponding to the distance between the TM and the RM (the positions of DIP-switches depending on the distance are listed in Table 3);
- look in the mirror located at the top of the TM base and change the sight angle until the cross (the point on the mirror) is superimposed onto the image of the RM;
- superimpose the sight of the TM optical unit onto the cross without changing the vertical and the horizontal sight angles with adjustment screws;
- the optical diagram of adjustment is shown in Figure 2.

7.4 Execute the RM adjustment:

- look in the mirror located at the top of the RM base and change the sight angle until the cross (the point on the mirror) is superimposed onto the image of the TM;
- superimpose the sight of the RM optical unit onto the cross without changing the vertical and the horizontal sight angles with adjustment screws;
- any foreign objects and IR radiation sources (space heaters, welding units, etc.) emergence in the IPDL-Ex operation zone during adjustment procedure IS PROHIBITED;
- energize the IPDL-Ex;
- set «A» DIP-switch 1 in the ON position - the RM turns to adjustment mode;
- monitor the signal level by HL1 – HL5 LED indicator:
- red HL1 LED indicator lighting means no signal;
- green HL2 – HL5 LED indicators lighting display signal level (the stronger the signal, the more indicators are lighting);
- frequent blinking of all HL2 – HL5 indicators means that the signal is above normal at minimum gain level – it is possible in case the TM transmission power is incorrectly chosen or the distance between the TM and the RM is too small;
- achieve the maximum signal level (indicated by the number of lit HL2 – HL5 indicators) by means of adjusting screws;

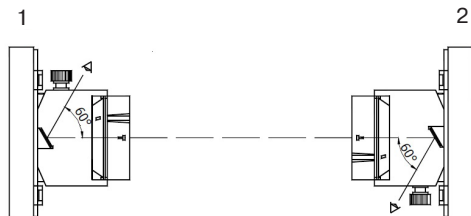


Figure 2 – Adjustment Optical Arrangement

- the signal level may be evaluated more precisely by readings of a voltmeter connected to the «-K+» terminal block, whereupon the readings should be as close to IPDL-Ex power supply voltage as possible;

- for fine adjustment after performing the two previous steps, the TM adjustment should be repeated and the maximum signal level obtained with the help of adjusting screws;

- close the TM cover and return to the RM adjustment;

- put DIP-switch 1 «A» into the OFF position, whereupon the IPDL-Ex is finishing adjustment and assigns the time for installing the cover and fine adjustment with regard for signal loss with the light filter;

- the time allowed for the cover installation is displayed by means of the HL1 LED indicator: for 35 s, HL1 blinks at 4 Hz frequency, then for 15 s, at 10 Hz, during this time, the IPDL-Ex cover should be installed;

- upon expiry of the time allowed, the RM completes adjustment and switches to a standby mode displayed by HL1 LED blinking at 5 s intervals;

- it is prohibited to de-energize IPDL-Ex and to cover the transmitter and the receiver lenses during the period of time from the moment of the cover installation till the IPDL-Ex changes to a standby mode. Presence of foreign objects into the IPDL-Ex operation zone should be excluded as well;

- after IPDL-Ex changes to a standby mode, it's adjustment is considered to be completed.

## 8 Functional Check

8.1 IPDL-Ex parameters in a «Fire» message generation mode are tested at the factory or at specialized laboratories with the application of special technical facilities during fire tests. IPDL-Ex functional check in the «Fire» message generation mode should be performed after IPDL-Ex adjustment. under the TM cover removed. Press and hold down the «TEST» key button on the TM PCB or press and hold down a «TEST» key button on the TM «TEST» terminal block (in this case, the TM lid may stay in it's position). The key button should be held down for at least 5 s, whereupon the TM HL1 LED indicator should light continuously. BRSS-Ex should receive a «Fire» alarm message.

8.2 Functional check of IPDL-Ex in a «Fault» message generation mode is performed as follows.

In case the TM «TEST» key button is held down for more than 10 s, the TM switches to the fault simulation mode. The TM HL1 indicator blinks at 1 s intervals, whereupon the RM HL1 indicator also should start blinking at 1 s intervals. A control panel should receive a «Fault» message. After the TM «TEST» key button is released, the IPDL-Ex returns to standby mode.

## 9 Manufacturer's Guarantees

9.1 The manufacturer guarantees conformity of the IPDL-Ex to the specifications provided the transportation, storage, installation and operation conditions are observed.

9.2 The guaranteed shelf life of an IPDL-Ex is 24 months since the date of manufacture. The guaranteed useful life is 18 months since the day of putting into operation within the guaranteed shelf life.

9.3 An IPDL-Ex that is found non-conforming to the requirements of specifications should be repaired by the manufacturer, provided the transportation, storage conditions, as well as installation and operation rules have been complied with.

## 10 Transportation and Storage

10.1 An IPDL-Ex in original transportation package may be transported by any means of transportation in closed vehicles (railway wagons, closed motor vehicles, sealed and heated airplane compartments, vessel holds, etc.) over all distances.

When transporting IPDL-Ex, the rules and regulations applicable to various means of transportation must be adhered.

10.2 Storage premises must not contain any current-conducting dust, acid and alkali fumes, as well as corrosive gases or those destroying insulation.

## 11 Packing Certificate

Linear smoke detector «IPDL-Ex» has been manufactured in compliance with the active technical documentation and classified as fit for operation and packed by «RIELTA» JSC.

Packing date \_\_\_\_\_  
month, year

## 12 Claims

In case an IPDL-Ex is found non-complying to the specifications, or in case of a breakdown during the guarantee period, the IPDL-Ex must be returned to the manufacturer with the datasheet attached.