ИСО 9001

S2000-EM-Ex
Expansion Module

USER'S MANUAL

1 TECHNICAL DATA

1.1 GENERAL

1.1.1 The S2000-EM-Ex Expansion Module (hereinafter referred to as the S2000-EM-Ex or the module) is designed to operate under a polling loop controller S2000-KDL of S2000-KDL-2I of the Orion ISS system and is supplied exclusively by the Bolid Company.

1.1.2 The S2000-EM-Ex operates under a polling loop controller S2000-KDL of S2000-KDL-2I within the Orion ISS system. It is designed to connect non-addressable intrinsically safe detectors such as IPD-Ex, IPT-Ex, IPDL-Ex, IPP-Ex, IPR-Ex, Steklo-Ex, Foton-Sh-Ex, MK-Ex, Shorokh-Ex, STZ-Ex, Foton-18 and other explosion-proof detectors matched in part of intrinsic safety parameters into the polling loop (hereinafter referred to as PL) of a poling loop controller.

1.1.3 The S2000-EM-Ex provides:

- Monitoring conditions of the two intrinsically safe alarm loops (hereinafter referred to as AL) by analyzing their resistance values;
- Powering external devices from two built-in power supplies (hereinafter referred to as PWR);
- Sending alarm conditions with the address of the alarm loop over which the condition was received to the polling loop controller over the polling loop.

1.1.4 The S2000-EM-Ex is equipped with a tamper switch to control unauthorized access.

1.1.5 The S2000-EM-Ex withstands the following operation conditions:

- Ambient temperatures from minus 40°C to +55°C;
- Relative humidity up to 93% at +40°C;
- Sinusoidal vibration with acceleration of 0.1 g in the frequency range of 10 to 55 Hz.

1.1.6 Industrial radio interference produces by the S2000-EM-Ex conform to the norms and standards of Russian ГОСТ Р 50009-2000 for technical facilities used in residential, commercial and industrial areas with low power consumption.

1.1.7 The S2000-EM-Ex withstands the following transportation conditions:

- Transport shaking with acceleration of 30 m/s^2 with a frequency from 10 to 120 impacts per minute or 15,000 impacts with the same acceleration.
- Ambient temperatures from minus 50°C to +50°C;
- Relative humidity up to (93 ± 3)% at +35°C.

1.2 SPECIFICATIONS

1.2.1 Technical data of the S2000-EM-Ex are shown in Table 1.

Table 1

Number of intrinsically safe alarm loops		2
Number of intrinsically safe power supplies(PWR) with full load capacity of 100 mA		2
Explosion protection mark		[Ex ia] IIC X
Max consumed current (short circuit of all AL and PWR and 8 V power voltage)		0.8 A
Consumed current (AL are OK, nothing is connected to PWR, 12 V power voltage)		0.15 A
Max output voltage (U_0)		14 V
Max output current (I_0)	PWR circuits	150 mA
	AL circuits	65 mA
Max total external capacity (C_0)		0.1 μF
Max total external inductance (L_0)		3 mH
Ingress protection rating		IP65
Operation temperature		– 40 to +55°C
Operational power voltage		8 to 28 V
Overall dimensions		290×180×60 mm
Weight		1.5 kg max

1.2.2 Conditions of the alarm loops depending on their resistances are shown in Table 2.

Table 2

Operation with S2000-KDL of ver.2.10+ or S2000-KDL-2I of ver.1.10+		**Alarm Loop Conditions (Fire Alarm Type)**				
		Short Circuit	**Fire**	**Pre-alarm**	**OK**	**Open Circuit**
	Alarm loop resistance, K	0…0.3	0.6…1.5	1.7…2	2.2…10.5	12…∞
		Alarm Loop Conditions (Intrusion Alarm Type)				
		Short Circuit	**Alarm**	**OK**	**Alarm**	**Open Circuit**
		0…1	1.2…3.8	4.2…11	13…19	20…∞
Operation with S2000-KDL of versions below 2.10 or S2000-KDL-2I of versions below 1.10		**Alarm Loop Conditions (Fire Alarm Type)**				
		Short Circuit	**Fire**	**OK**		**Open Circuit**
	Alarm loop resistance, K	0…0.3	0.6…2	2.2…10.5		12…∞
		Alarm Loop Conditions (Intrusion Alarm Type)				
		Short Circuit	**Alarm**	**OK**	**Alarm**	**Open Circuit**
		0…1	1.2…3.8	4.2…11	13…19	20…∞

2 OPERATION GUIDELINES

2.1 PROVIDING INTRINSIC SAFETY

2.1.1 S2000-EM-Ex is an associated electrical apparatus with the type of protection “i” (in accordance with Russian Standard ГОСТ 30852.10-2002 (МЭК 60079-11:1999)), with explosion-proof marking and intrinsically safe parameters in accordance with Table 1. It meets the requirements of ГОСТ 30852.10-2002 (МЭК 60079-11:1999) and is intended for installation **in non-hazardous areas of premises. The S2000-EM-Ex receives messages over two intrinsically safe alarm loops and sends alarm messages with the address of the alarm loop over which the messages were received to the S2000-KDL and then to the S2000M panel of the Orion ISS.**

2.1.2 Intrinsic safety of the S2000-EM-Ex is provided by:

- Galvanic isolation and selecting adequate values of external-clearance distances and creepage distances between intrinsically safe and connected non-intrinsically safe circuits;
- Limiting the voltage and the current to intrinsically safe values in output circuits due to compound filled safety barriers with built-in zener diodes and current limiting devices;
- Providing external-clearance distances, creepage distances and infallibility of safety components due to filling them with a compound;
- Triplicating safety elements (level of protection “ia”);
- A ground terminal on the enclosure;
- Marking specifying permissible characteristics of the intrinsically safe circuits.

2.1.3 Providing intrinsic safety while mounting

2.1.3.1 The detector must be installed in accordance with the requirements of Clause 7.3 of Russian Electric Installation Codes (ПУЭ), Operating and Maintenance Rules, Industrial Safety Standards, and Russian National State Standard ГОСТ 30852-13-2002 (МЭК 60079-14:1996).

2.1.3.2 Only insulated cables shall be used in intrinsically safe circuits. The insulation voltage of the cables shall be at least 500 V.

2.1.3.3 If multi-stranded conductors are used in the hazardous area, the ends of the conductor shall be protected against separation of individual strands, for example by means of core-end sleeves.

2.1.3.4 The diameter of individual conductors within the area subject to explosion hazards shall not be less than 0.1 mm. This applies also to the individual wires of a finely stranded conductor.

2.1.3.5 The maximum resistance of an alarm loop without regards to an EOL resistor shall be 100 ohms.

2.1.3.6 The minimum leakage resistance between alarm loop wires and between each wire and the earth shall be 50 K.

2.1.3.7 The total capacity ($C_i + C_c$) and the total inductance ($L_i + L_c$) of the detectors to be connected to the intrinsically safe alarm loops of the S2000-EM-Ex shall not exceed the values of maximum total external capacity C_0 (0.1 μF) and maximum total external inductance L_0 (3 mH).

$(C_i + C_c) \le C_0$ $(L_i + L_c) \le L_0$ $U_i \ge U_0$ $I_i \ge I_0$

Where

C_i stands for a sum of maximum internal capacities of all the detectors connected into the alarm loop;

L_i stands for a sum of maximum internal inductances of all the detectors connected into the alarm loop;

C_c; L_c stand for a capacity and inductance of conductors respectively;

U_i stands for the maximum permissible input voltage of the detectors;

U_0 stands for the maximum output voltage at intrinsically safe outputs of the S2000-EM-Ex;

I_i stands for the maximum permitted input current of the detectors;

I_0 stands for the maximum output current at intrinsically safe outputs of the S2000-EM-Ex.

Example:

Let three Foton-18 detectors and two МК-Ex detectors are supposed to be connected to the S2000-EM-Ex.

The maximum internal capacity of each the detector specified by marking on it is 1 nF, so that the total capacity is 5 nF.

The maximum internal inductance of each the detector specified on its marking is 0.01 mH, that is the total L_i will be 0.05 mH.

The detectors are connected by wires with total length of 100 meters. The electric capacity of wires is 80 nF/km while the electric inductance of the wires is 0.95 mH/km. For 100 meters of the wires C_c = 8 nF and L_c = 0.095 mH.

The sum $C_i + C_c$ is 13 nF which is less than the maximum permissible value marked on the S2000-EM-Ex and equal to 0.1 μF (100 nF).

The sum $L_i + L_c$ is 0.145 mH which is less than the maximum permissible value marked on the S2000-EM-Ex and equal to 3 mH.

The maximum input voltage of the detectors U_i (14 V) does not exceed (is equal to) the maximum output voltage at the S2000-EM-Ex output U_0 (14 V), so such connection is permissible.

The maximum input current of the detectors I_i (150 mA) doesn't exceed the maximum output current at the S2000-EM-Ex output I_0 (150 mA), so such connection is permissible.

Based on the above stated, these five detectors can be brought into a single alarm loop of 100 m length.

2.1.3.8 Intrinsically safe circuits should be commutated by means of a UK-Ex commutation device.

2.1.3.9 Intrinsically safe circuits and non-intrinsically safe circuits shall be installed with separate cables and wires.

2.1.3.10 Intrinsically safe circuits and non-intrinsically safe circuits shall be output via separate cable inputs of the S2000-EM-Ex.

2.1.3.11 Only explosion-proof electrical apparatus with the type of protection "Intrinsic safety" with the level "ia / ib" which is certificated for use in ex-hazardous areas where gas atmospheres of types IIC / IIB may be expected and simply apparatus compatible with the intrinsic safety of the circuit in accordance with Clause 5.4 of ГОСТ 30852.10-2002 (МЭК 60079-11:1999) can be connected to the output terminals of the S2000-EM-Ex with the marking "intrinsically safe circuits".

2.1.3.12 Industry-standard general purpose switches, switching keys, terminal blocks can be brought into the intrinsically safe circuits if the following requirements are met:

- Non-intrinsically safe circuits are not connected to the devices in question;
- The devices are closed by a lid and are sealed ;
- The isolation is intended to withstand triple rated voltage of the intrinsically safe circuit but no less than 500 V.

2.1.3.13 Electrical characteristics of intrinsically safe devices connected to the terminals of the S2000-EM-Ex marked as "Intrinsically safe circuits" shall comply with intrinsic safety parameters shown in Table 1.

2.1.3.14 The character "X" after explosion-proof marking means that only explosion-proof equipment with the type of protection "intrinsically safe circuit i" approved by a conformity certificate and permitted for use in ex-hazardous areas by Russian Federal Service for Ecological, Technological and Nuclear Supervision can be connected to the terminals of the S2000-EM-Ex marked as "Intrinsically safe circuits".

2.2 CONNECTION DIAGRAM

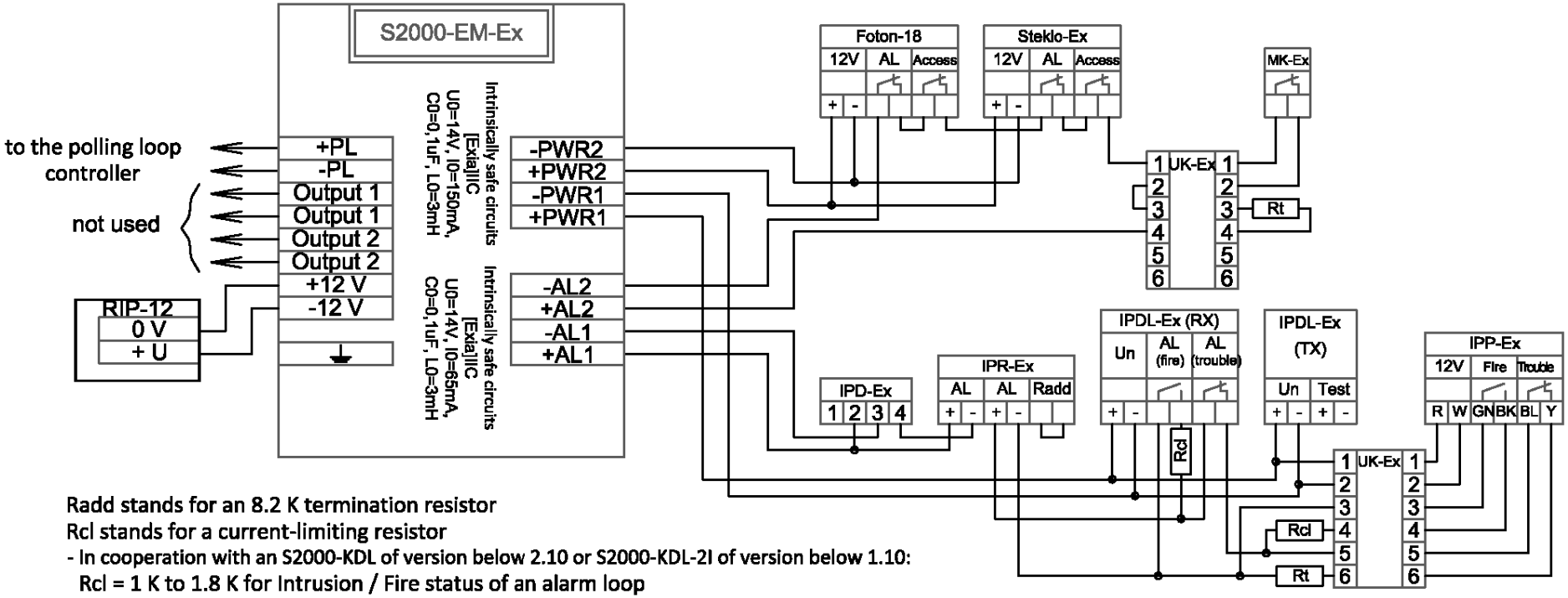
A schematic for connecting the S2000-EM-Ex to a polling loop controller and standards variants of connecting detectors are shown in Figure 1.

2.3 MOUNTING

WARNING: It is strictly prohibited to use the S2000-EM-Ex in explosion-hazardous areas and premises.

WARNING: Shut off power prior to connecting the device.

WARNING: DO NOT operate the S2000-EM-Ex without protective grounding.



Radd stands for an 8.2 K termination resistor
Rcl stands for a current-limiting resistor
- In cooperation with an S2000-KDL of version below 2.10 or S2000-KDL-2I of version below 1.10:
  Rcl = 1 K to 1.8 K for Intrusion / Fire status of an alarm loop
- In cooperation with an S2000-KDL of version 2.10 + or S2000-KDL-2I of version 1.10+:
  Rcl = 1 K for switching the alarm loop to Fire status
  Rcl = 1.8 K for switching the alarm loop firstly to Fire Pre-alarm status
  (if two fire detectors are used in an alarm loop, a response of a single detector switches the alarm loop to Fire Pre-alarm status while activation of both detectors switches the alarm loop to Fire status)

Figure 1. Connection Diagram

2.3.1 The S2000-EM-Ex shall be installed in a place suitable for to provide facility of connection for alarm loops.

2.3.2 The S2000-EM-Ex shall be attached to a wall at a convenient location using two screws. The cover is fixed with six screws.

2.3.3 The cables are connected using cable glands. A cable gland is fixed by tightening its dome clockwise.

WARNING: Intrinsically safe circuits and non-intrinsically safe circuits shall be installed with separate cables and wires. Also use separate cable glands of the S2000-EM-Ex to connect intrinsically safe circuits and non-intrinsically safe circuits.

2.4 CONNECTING

2.4.1 Connect the relevant terminals depending on the type of required output signals and the number of alarm loops and power circuits in use. The destination of the terminals is shown in Table 3.

Table 3

Terminal	Destination
+AL1-, +AL2-	Connecting intrinsically safe alarm loops
+PWR1-, +PWR2-	Connecting power circuits of electric devices in ex-hazardous areas
+12V-	Connecting external power
+PL-	Connecting the S2000-EM-Ex to a polling loop controller
OUTPUT1	The output for transmission of the value of resistance measured in the alarm loop 1
OUTPUT2	The output for transmission of the value of resistance measured in the alarm loop 2

2.4.2 Connect ground to the ground terminal of the S2000-EM-Ex. The grounding conductor shall be:

- Either two or more separate wires each of which can pass the maximum possible continuous current and which conductivity corresponds to conductivity of a copper wire with cross section of at least 1.5 mm^2; or
- One or more wires which conductivity complies with the conductivity of a copper wire with cross section of 4 mm^2 min.

2.4.3 A single alarm loop of the S2000-EM-Ex can include detectors with the total current consumption of 1 mA max, for example ten current-consuming fire detectors with current consumption of 100 μA max in quiescent mode (such as IPD-Ex or IPR-Ex). In such case additional current limiting resistors for these detectors are not required.

2.5 INDICATION

The module is equipped with the following LEDs:

12 V LED — Is on when power is applied to the module

LOOP LED — Flashes once per second when data are communicated over the polling loop between the module and the poling loop controller

AL1 and **AL2** LEDs — Indicate conditions of the relevant intrinsically safe alarm loops depending on their resistance as shown in Table 2:

OK: Solid green light;

Alarm: Solid red light;

In cooperation with the S2000-KDL of version below 2.10 or S2000-KDL-2I of version below 1.10:

Fire (600Ω to 1.5K): Solid red light;

Fire (1.7K to 2 K): Flashes with green;

In cooperation with the S2000-KDL of version 2.10 and higher or S2000-KDL-2I of version 1.10 and higher:

Prealarm: Flashes with green;

Fire (600Ω to 1.5K): Solid red light;

Short Circuit: Flashes with red;

Open Circuit (or Power-on Reset): Flashes with red and green alternately

Power-on Reset: Off

2.6 DIP SWITCHES

2.6.1 Table 4 describes the functions of the DIP switches SA2 of the S2000-EM-Ex.

Table 4

DIP Switches SA2			Operation Mode
Switch	**Position**		
1	AL2	Active	Voltage at the AL2 terminals is automatically shut off when the voltage at OUTPUT2 terminals drops below 1 V while working in standalone mode
		Passive (on)	Voltage at the AL2 terminals is not shut off
2		Intrusion	AL2 circuit operates in accordance with intrusion alarm loop tactics
		Fire (on)	AL2 circuit operates in accordance with fire alarm loop tactics
3	AL1	Active	Voltage at the AL1 terminals is automatically shut off when the voltage at OUTPUT1 terminals drops below 1 V while working in standalone mode
		Passive (on)	Voltage at the AL1 terminals is not shut off
4		Intrusion	AL1 circuit operates as an intrusion alarm loop with a termination resistor
		Fire (on)	AL1 circuit operates in accordance with fire alarm loop tactics

2.6.2 If fire alarm loop tactics is selected then only the detectors can be connected with open relay contacts in quiescent mode (for example, IPDL-Ex or IPP-Ex) or which consume current over the loop and indicate alarms by an increase of current consumption (for example, IPD-Ex or IPR-Ex).

2.7 OPERATION WITH THE POLLING LOOP

2.7.1 The S2000-EM-Ex provides power-on reset for detectors powered via its alarm loops (for example IPD-Ex). For this purpose the relevant DIP switch SA2 of the S2000-EM-Ex shall be set to "Active" position (see Table 4). The system shall automatically add a new virtual relay output.

In the configuration of the polling loop controller for the relevant output the *Control Program* parameter shall be set to the value "Switch Off for a Time before Arming", the *Activation Delay* parameter shall be set to zero, and the *Activation Time* shall be set to a value in the range of 0 to 60 s. For the alarm loop the *Arming Delay* parameter shall be set to a value which is not less than the sum of the activation time of the relay and the restore time of the detectors after applying power (2 s to 63 s depending on the detector type) plus 6 additional seconds (6 s is the time for the polling loop controller to poll its 127 addressable points). When a command for power-on reset has been received the S2000-EM-Ex powers off both the alarm loops (AL1 and AL2).

The power circuits PWR1 and PWR2 are switched on continuously and cannot be switched off.

2.7.2 The S2000-EM-Ex stores its polling loop addresses in its non-volatile memory. The first address of the S2000-EM-Ex is the address of its first alarm loop (AL1) and can be assigned in the range of 1 to 125. The second address of the module is the address of its second alarm loop (AL2) and is automatically assigned to a value which is greater by one than the address of AL1. In the factory configuration the alarm loop 1 is assigned to the polling loop address of 125 while the second alarm loop is assigned to the polling loop address of 126. If at least one DIP-switch SA2 is set to Active position (see Clause 2.6.1) than the virtual relay output will have the address greater by two than the first alarm loop of the module (to the address of 127 in factory configuration).

2.7.3 In order to assign a first polling loop address to the module, send one of the following commands from the S2000M panel or the connected personal computer to the polling loop controller:

Change the Device Address

Use the *Change Device Address* command if the addresses of the S2000-EM-Ex are known (for example, for factory set addresses). Send the command from the panel or PC specifying the old address and the new address of the alarm loop 1 as the parameters (the address of the second alarm loop will automatically be greater by one). The network controller will display the messages about disconnecting the devices with the old addresses and then detecting the devices with newly programmed addresses.

Program the Device Address

If the S2000-EM-Ex addresses are unknown or two devices have the same addresses then use the *Program Device Address* command. Send the command from the panel or PC specifying a required address as the parameter. This address is to be assigned to the first alarm loop of the module. Remove the S2000-EM-Ex cover and ensure that LOOP LED flashes four times every four seconds indicating module's entering to the mode of address programming. Then press the module's tamper switch down three times for a long time (between 0.5 s and a second) and once for a short time (shorter than for a hail of a second). A pause between presses should not exceed a second. (You can make sure that a press is "long" if after the press LOOP LED starts showing solid light.) If the address has been changed successfully, LOOP LED will indicate communications with the polling loop controller by flashing once every second. Also you will observe messages about connecting the devices with the programmed address and succeeding addresses. If the press sequence was wrong, wait for 20 seconds and try again.

Refer to the operational documents for the polling loop controller, S2000M panel and Orion ISS system to get more information about programming polling loop addresses.

2.7.4 If an address point of the S2000-EM-Ex is configured as an intrusion input then the module considers activation of an alarm loop for the time of 0.5 s and longer as an intrusion alarm and activation the alarm loop for a time of 0.2 s and shorter as being OK.

2.7.5 On receiving a request for ATD value of the addressable device the S2000-EM-Ex responds with a measured value of the resistance of the relevant alarm loop. One unit of an ATD value corresponds to 100 ohms. That is, if the received digital value is 102 then the resistance of the relevant alarm loop is 10.2 K.

2.7.6 If the addressable point of the polling loop controller should operate as a fire input then it should be programmed with the type of input "2: Combined Fire" in the configuration of the polling loop controller.

3 MANUFACTURER'S WARRANTY

3.1. The average lifetime of the S2000-EM-Ex is 8 years minimum.
3.2. The mean time to failure is 60,000 hours minimum.
3.3. The guaranteed storage life is 63 months since manufacturing data.
3.4. The guaranteed service live is 60 months since putting into operation within the guaranteed storage life.
3.5. When the module is sent for repair, a malfunction report shall be attached to it which describes the failure.

4 CERTIFICATES

GOST R Certificate of Conformity	The S2000-EM-Ex expansion module meets the requirements of norms and standards of the Russian Federation. Certificate number: РОСС RU.ME61.A03164
EAC Certificate of Conformity according to TR CU 012/2011	The S2000-EM-Ex expansion module meets the requirements of Technical Reglament of Custom Union TR CU 012/2011. Certificate number: ТС RU C-RU.ГБ05.В.00768
TR Conformity Certificate	The S2000-EM-Ex expansion module meets the requirements of Federal Law of the Russian Federation of July 22, 2008 No.123-FZ. Certificate number: C-RU.ПБ01.В.02353
Certificate GOST ISO 9001-2011	The Bolid Company has established and applies a Quality Management System which meets the requirements of ГОСТ ISO 9001-2011 (ISO 9001:2008) for design, development, production and supply of instruments and apparatus for automatic fire suppression systems, fire alarm, access control systems etc.. Certificate number: РОСС RU.ИСО9.К01492

ZAO Rielta,
17 Chapaeva, 197101, Saint Petersburg, Russia
Phone/fax: +7 812 233-0302, +7 812 703-1363
Email: rielta@rielta.ru, http://www.rielta.ru,
Technical Support: Phone: +7 812 233-2953, +7 812 703-1357, support@rielta.ru

ZAO NVP Bolid,

4 Pionerskaya Str., Korolev 141070, Moscow Region, Russia
Phone/fax: +7 495 775-7155
Email: info@bolid.ru
Technical Support: support@bolid.ru
Web: http://bolid.ru