S2000-KPB

EXECUTIVE MODULE

ИСО 9001

Version 3.01

[EHC] [TP_BY] [TP]

INSTRUCTION MANUAL

1 TECHNICAL DESCRIPTION

1.1 General

1.1.1 This Instruction Manual describes how to operate and maintain the S2000-KPB Executive Module of version 3.01 (hereinafter referred to as the module).

1.1.2 The module is designed to co-operate with an S2000M console, an S2000-ASPT fire alarm and extinguishing control panel, or a PC as a modular control and indicating equipment in such system as a fire / intrusion / panic alarm system, a voice alarm and evacuation system, an access control system, a CCTV system.

1.1.3 The module is designed to control executive devices (light panels, light alarms, sirens, video cameras, electromagnet locks etc.) as well as clean agent suppression systems and fire-fighting equipment in gas, dry powder, and aerosol fire-fighting systems.

1.1.4 The module is designed to be installed on a vertical surface inside the protected premises closely to the executive devices. The module is designed for round-the-clock operation.

1.1.5 The module must not be used in aggressive medium or dust condition, or in explosion-hazardous premises.

1.2 Specifications

1.2.1 Power Supply	– An external dc power supply with the power voltage between 10.2 V dc and 28.4 V dc (RIP-12, RIP-24)
1.2.2 Power Inputs	– Two
1.2.3 Consumed Current (without executive devices)	– 100 mA max
1.2.4 Outputs:	– Six
– Switching Voltage	– 10.2 dc to 28.4 V dc (from the power supply of the module)
– Switching Current	– 5 mA ÷ 2.5 A;
– Circuit Failure Monitoring Current	– 1.5 mA max
1.2.5 Max Total Switched Current of the Module	– 6 A
1.2.6 Alarm Loops	– Two
1.2.7 Resistance of the alarm loop wires without additional resistances	– 100 Ohm max
1.2.8 Leakage resistance between alarm loop wires or each wire and ground	– At least 50 kOhm
1.2.9 Overall Dimensions	– 156 mm × 107 mm × 39 mm max
1.2.10 Weight	– 0.3 kg max
1.2.11 Operating Temperatures	– Minus 30°C to +55°C
1.2.12 Ingress Protection Rating (if wall mounted)	– IP30
1.2.13 Pre-Operation Time	– 3 s max

1.3 Standard Delivery

1)	S2000-KPB Executive Module	– 1 pc.
2)	Instruction Manual	– 1 pc.
3)	DIN 7982 Flat Head Tapping Screw with Cross Drive 2.2×6.5	– 1 pc.
4)	Woodscrew	– 3 pcs.
5)	Wall Plug 6×30	– 3 pcs.
6)	Load Connection Module	– 6 pcs.
7)	Package	– 1 pc.

2 PERFORMANCE

The module can operate in the following modes:
– Quiescent;
– Power Failed;
– Device Failed.

2.1 Quiescent Mode

The module being in the quiescent mode, its READY LED is lit steady.
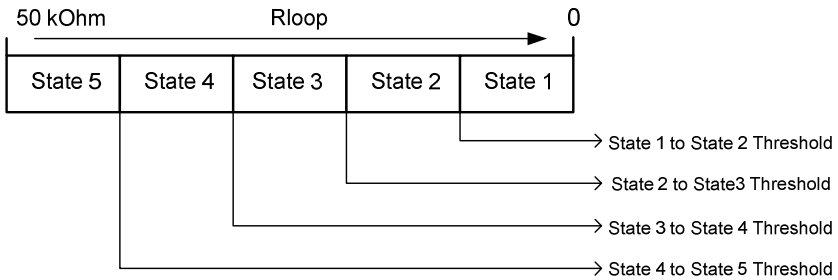
2.1.1 Alarm Loops

The module monitors two auxiliary programmable alarm loops, named as MASS and PRES (PRESSURE).

Each of the loops can be used independently to monitor conditions of equipment of a fixed fire-fighting system (for example, a MASS or PRESSURE output), limit switches, detectors and alarms including those which are not directly related to fire and intrusion alarm systems.

You can bring into the alarm loops detectors or output circuits of other devices with dry contact output.

An auxiliary programmable alarm loop can have five different states depending on the current values of alarm loop resistance. These states and threshold values of resistance are programmable (see Section 2.1.4 «Programming the Module»). The layout of states and the positions of the threshold values between states relative to alarm loop resistance values are shown in Figure 1.

Figure 1. The States and the Thresholds of Transitions of an Auxiliary Programmable Alarm Loop

Figure 2 shows an example when a single auxiliary programmable alarm loop monitors states of a normally closed and a normally open contact switches as well as operability of the loop circuits (for short and open failures). The diagrams of wiring the contact switches are shown in Figure 3.
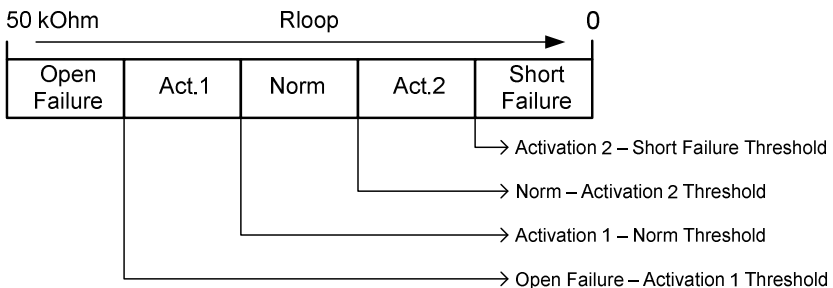
Figure 2. An Example of Adjusting an Auxiliary Programmable Alarm Loop

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Change of states of an alarm loop is defined only by change of its resistance and doesn't depend on other alarm loop parameters and network controller commands. The integration time in case of changing a state is 300 ms.

If an auxiliary programmable alarm loop enters such state as Auxiliary Zone Restored or any "Restored" state then the integration time for this state is equal to the Recovery Time of the alarm loop and is given in the device configuration.

The module provides disabling of a programmable alarm loop by a Disarm command.

Light indication of the module is defined by the current status of the alarm loop in accordance with Table 1.

Table 1. Codes and Indication for Programmable Alarm Loop States

Status	Light Color	Indicator Behavior
AC Power Restored Auxiliary Zone Restored Fire Equipment Restored Normal Level Normal Temperature Tamper Restored Battery Restored	☐	Off
Auxiliary Zone Alarm Gas Pressure Signal	Green	Flashes within 250 ms every 2 s
Low Level Pump On Low Temperature	Green	Flashes once per four seconds
Pump Off High Level High Temperature	Green	Flashes once per two seconds
Auxiliary Zone Alarm 2 Service Required	Green	Flashes twice within 250 ms every 2 s
Fire Equipment Trouble AC Power Failed Too High Level Heat Sensor Failed Tamper Alarm Battery Failed Too Low Level	Yellow	Flashes within 250 ms once per second
Loop Open Failure	Yellow	Two flashes within 250 ms every 2 s
Loop Short Failure	Yellow	Flashes within 250 ms every 2 s
Addressable Loop Parameter Error	Yellow	Four flashes within 125 ms every 2 s
Disarmed	Yellow	Shows solid light

The alarm loop states having been changed, the module sends the relevant messages to the network controller.

2.1.2 Outputs

The module provides switching on (switching off, switching over) of the outputs with the given program in accordance with the control commands received via the RS-485 interface. The module also provides monitoring executive outputs and the monitored circuits connected to the outputs.

The programs for executive outputs are shown in Table 2.

Table 2. Commands to Control Outputs

Program Number	Program Description	Final State
0	Return the output to the initial condition	–
1	Switch ON (until a new command is received)	–
2	Switch OFF (until a new command is received)	–
3	Switch ON for a given time, then switch OFF	Off
4	Switch OFF for a given time, then switch ON	On
5, 6	Switch OVER (until a new command is received)	–
7	Switch OVER for a given time, then switch OFF	Off
8	Switch OVER for a given time, then switch ON	On
11	Discharge extinguishing agent	Off

The output executive commands can comprise the Control Delay parameter. In such case the program starts running after expiration of the specified time period. The Control Delay parameter ranges from 0 to 8192 s (2 hours 16 minutes 32 s) in increments of 0.125 s. If Control Delay is missed or equal to zero, the program starts running just after receiving the command.

Note: When the S2000-KPB module is connected to the internal interface RS-485-2 of an S2000-ASPT panel, the first one is used to expand the discharge circuits of the last one. In this case the individual outputs of the module cannot be controlled remotely from the S2000M console.

Output control commands with the programs #5, #6, #7, and #8 (Switch OVER) can include detailed data defining a rate and pulse ration of switching the outputs. If these data are missed in a command, the output will be switched over with 1 Hz frequency and pulse ratio of 2.

Output control commands with the programs #3, #4, #7, #8 («Switch for a Given Time») contain the Control Time parameter. The Control Time can have a value from 0 to 8192 s (2 hours 16 minutes and 32 s) in the increments of 0.125 s.

If Control Time is missed in a command then the program will be executed within the time given in the module's configuration parameter Discharge Time.

If Control Time in a command is equal to zero, the output will be switched to the initial status for the received command.

In case of an output control command with the program #11 the module generates a discharge pulse for the relevant output (the output is switched on for a given time and then the output is switched off). If the command contains zero as the number of output, a discharge pulse will be generated for all outputs one-by-one.

If a command contains the Control Delay parameter then the program will start executing after elapsing the time specified by the parameter. If a command contains the Control Time parameter then the output will be activated for the time specified by the parameter. If a command contains no Control Time or no Control Delay, the values for them will be taken from the module configuration.

The value of discharge interval time is given by the relevant configuration parameter.

The module provides monitoring of executive outputs and monitored circuits connected to them. The monitored states of a circuit are defined by the circuit's type specified in the configuration parameters in accordance with Table 3.

Table 3. Types of Monitored Circuits

Circuit Type	Monitored Conditions
1	No circuit condition is monitored
2	The circuit is monitored for open failure
3	The circuit is monitored for short failure
4	The circuit is monitored both for open and short failures

When a control circuit is off its condition is defined by the voltage value on the positive output terminal relative to the «0 V» terminal:
- «Norm»: between minus 0.15 V and minus 1.125 V;
- «Open Failure»: less than minus 1.125 V;
- «Short Failure»: more than minus 0.15 V.

When a control circuit is on its condition is defined by the current carrying through it:
- «Norm»: between 5mA and 2.5 A;
- «Open Failure»: less than 5mA;
- «Short Failure»: more than 2.5A.

When a short or open failure of a monitored circuit is detected the module transmits Loop Short Circuit message or Loop Open Circuit message correspondently over the RS-485 interface. When the monitored circuit has returned from the monitored state to the Norm state, the module sends the relevant recovery message over the RS-485 interface.

Note: If a short circuit failure has been detected while the output is activated then without regard to the circuit monitoring type the executing program will be aborted and will continue running in 10 s.

States of the control outputs and the monitored circuits connected to them in Quiescent Mode are indicated by "1" to 6" LEDs in accordance with Table 4.

Table 4. Indication of States of Outputs

Circuit's Condition	Output's Condition	Indicator Behavior
Norm	On	Lit steady in green
	Off	Off
Open Failure	On	While lighting in green, double flashes in yellow once per two seconds
	Off	Double flashes in yellow once per two seconds
Short Failure	On	Flashes in yellow once per two seconds
	Off	

2.1.3 Communicating Data Over the RS-485 Interface

The module receives commands from and transmits messages to the network controller over the RS-485 interface. The status of communication is indicated by the COM LED as shown in Table 5.

Table 5. Indication of Communication Condition

Communication Condition	Indicator Behavior
1. Data are communicated over the RS-485 interface	Lit steady in green
2. Communication over the RS-485 interface has been lost	Off

The module provides buffering of the events on their transmitting. The capacity of the buffer is 66 events.

2.1.4 Programming the Module

To be adjusted for a specific way to use, the module provides programming the following parameters which are stores in its non-volatile memory.

The configuration parameters are described in Table 6.

Table 6. Configuration Parameters

Parameter	Description	Value	Default Value
Programmable Loop Parameters			
Code of State 1	Defines indication and messages transmitted to the network controller	Any value from Table 1	Loop Short Circuit
Code of State 2			Fire Equipment Failure
Code of State 3			Fire Equipment Restored
Code of State 4			Fire Equipment Failure
Code of State 5			Loop Open Circuit
Threshold 1-2	The resistance values of programmable alarms loops which separates the states	0…50 kOhm	100 Ohm
Threshold 2-3			2 kOhm
Threshold 3-4			6 kOhm
Threshold 4-5			10 kOhm
Restore Time	The integral time for restore conditions	0…255 s	5 s
Parameters of Outputs			
Initial Output Status	The output control program to be started after powering up or resetting the module as well as on receiving a Switch the Output to Initial Status command	1, 2	2 (OFF)
On/Off Events	Generating events on changing states of the output relay	ON / OFF	ON
Monitor For	The value defining monitored conditions of the monitored circuit	1…4	4 (Monitor for Open and Short Failure)
Others			
Discharge Delay	The duration of the discharge delay for Program #11 (if missed in the command)	0…1000 s	2 s
Start Interval	The time between issuing start pulses to adjacent outputs for Program #11	0…1000 s	7 s
Discharge Time	The time for which the output will be activated for Program #11	0…8000 s	5 s
Both Power Inputs Monitoring	Generating events for each power input individually	ON / OFF	ON

If Both Power Inputs Monitoring is switched on, the module generates messages POWER FAILED and POWER RESTORED individually for each power input. In such case a Power Failed message for all the module is generated in state of the first power failure of any input while a Power Restored message for the module as a whole is generated when the power has been restored for both the inputs.

To change configuration parameters of the module, an IBM compatible PC and one of the Bolid manufactured interface converters (such as PI-GR, S2000-PI, S2000-USB etc.) are to be used. The configuration parameters are changed by means of **UProg** Configuration Tool of version 4.1.0.3 or higher.

The last version of UProg Configuration Tool along with some additional information about operating the module can be found in the Internet at the address of **http://bolid.ru**.

2.2 Power Failed Mode

The module enters the Power Failed mode on power voltage's dropping below 10 V at any input (if Both Power Inputs Monitoring is set on) or at both inputs (if Both Power Inputs Monitoring is set off). In such case the module transmits a Power Failed message over the RS-485 interface. READY LED starts switching on for 0.25 s each 2 seconds.

When the power voltage has been restored for both inputs (if Both Power Inputs Monitoring is set on) or for any input (if Both Power Inputs Monitoring is set off) up to 11 V and higher, the module transmits a Power Restored message over the interface. In this case READY LED is lit steady.

The Power Failed mode of the module is indicated by its READY LED as shown in Table 7.

Table 7. Indication of the Power Failed Mode

Operation Mode	Indicator Behavior
1. Power voltage at *any input* has dropped below the normal value (Both Power Inputs Monitoring is set on)	Switches on for 0.25 s each 2 seconds
2. Power voltage at *both inputs* has dropped below the normal value (Both Power Inputs Monitoring is set off)	

2.3 Device Failed Mode

The module switches to the Device Failed mode when it has found a fatal error on calculating the checksum of the program memory of the built-in microprocessor.

In the Device Failed mode READY and COM LEDs flash alternately while other indicators change color from green to yellow synchronously.

If the module enters the Device Failed mode on switching on, update its firmware by means of ORION_PROG (download the last version from the Download section at **http://bolid.ru**) or return the module to the manufacturer.

3   OPERATIONAL DIRECTIVES

3.1   Safety Precautions

3.1.1   The module has no circuits under hazardous voltage.

3.1.2   Do shut off the module's power before mounting, installing, or maintaining this one.

3.1.3   Mounting and maintaining must be performed only by qualified staff.

3.2   Preparations for Use

3.2.1   Before connecting the module to the RS-485 interface, the module must be assigned to a unique network address. This address must not be the same as the address of another device connected to the same interface RS-485.

3.2.2   If necessary, change other configuration parameters of the module to fit the module's functions.

3.2.3   Attach the module at any convenient place (the module can be installed on walls, behind suspended ceilings and on other structures of the protected premises near executive devices at places protected against atmospheric fallouts, mechanical damage, and unauthorized access).

3.2.4   Mount and wire the module as shown in Figure 3 in accordance with your applicable local standards, codes, regulations, and ordinances.

If a single power supply is in use (the configuration parameter Both Power Inputs Monitoring is set off), this one can be connected to any power input of the module.

If the module and the network controller are connected to different power supplies, their 0 V circuits should be coupled.

Unless the module is the end (the first or the last) device in the interface bus, remove the jumper which is near the contacts "RS-485A" and "RS-485B".

S2000-KPB
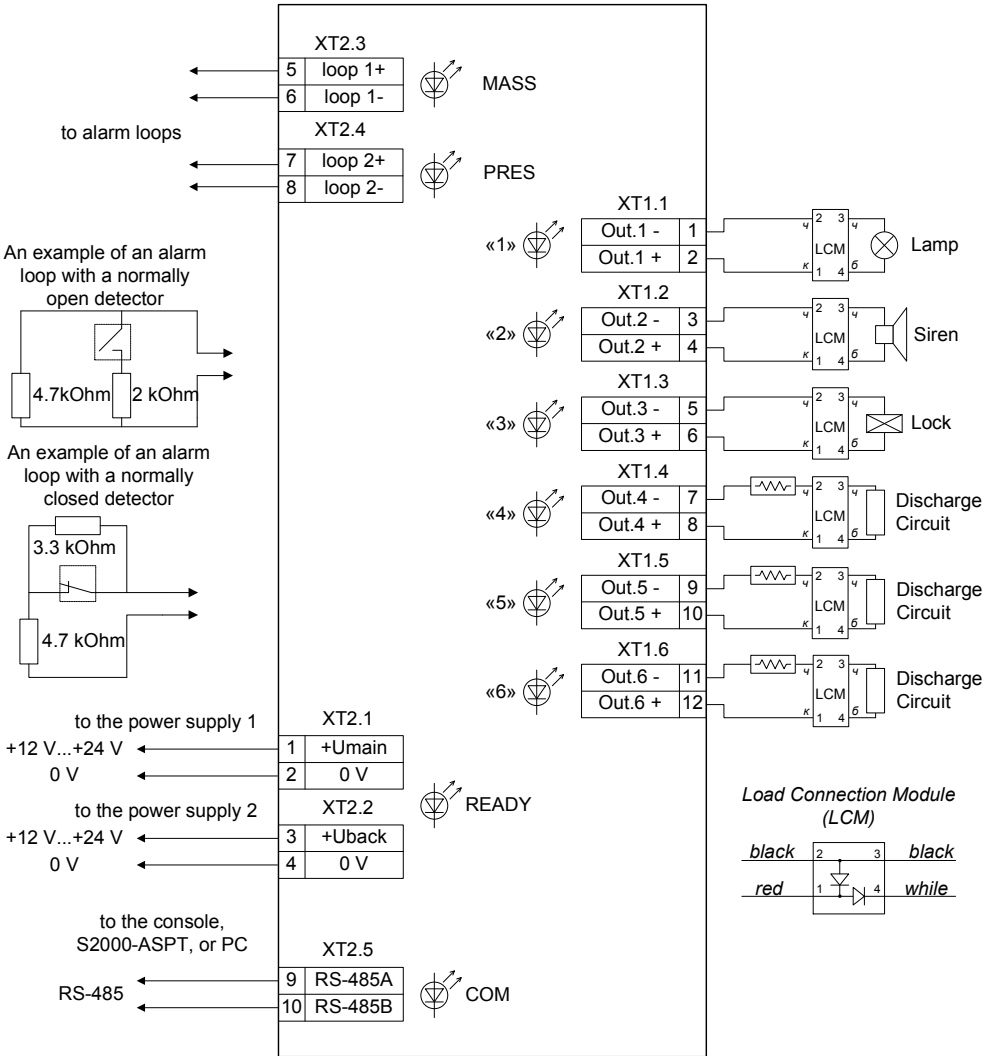
Notes:
1. The type of executive devices to be connected to the outputs is to be defined by user and can differ from the shown devices.
2. The load connection modules should be installed in proximity to the executive devices.
3. If an output is not in use, a 1kOhm - 0.5 W resistor can be used instead of the load connection module.
4. Normally open and normally closed detectors can be combined and brought into the same circuit if only one detector can be in activated status.

Figure 3. S2000-KPB Wiring Diagram

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4   PERFORMANCE INSTRUCTIONS

4.1   When you select a power supply be sure it can provide the electric current enough to power all the executive devices connected to the module.

4.2   The power supply should be located at such distance from the module that the resistance R_1 of the wires between the power supply and the module (see Figure 4) meets the following requirements:

– While powered by a **12 V** power supply, R1 $\leq$ 0.25 Ohm;
– While powered by a **24 V** power supply, R1 $\leq$ 0.34 Ohm.

The dependence between the resistance of a wire and its length for various cross sections is shown in Table 8.

Table 8. The Dependence between the Resistance of the Wire and its Length & Cross Section

Cross Section, mm^2	Wire Resistance, Ω					
	L = 1 m	L = 2 m	L = 4 m	L = 6 m	L = 8 m	L = 10 m
0.2	0.0875	0.1750	0.3500	0.5250	0.7000	0.8750
0.5	0.0350	0.0700	0.1400	0.2100	0.2800	0.3500
0.75	0.0233	0.0467	0.0933	0.1400	0.1867	0.2333
1.0	0.0175	0.0350	0.0700	0.1050	0.1400	0.1750
1.5	0.0117	0.0233	0.0467	0.0700	0.0933	0.1167
2.0	0.0088	0.0175	0.0350	0.0525	0.0700	0.0875
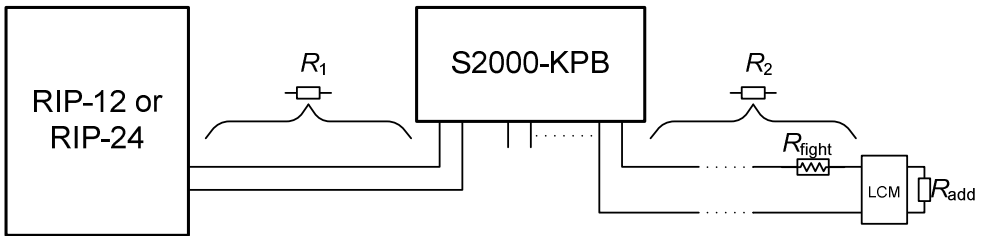
Figure 4

4.3   The length and cross section of the wires used to connect executive devices to the module must provide the current load for executive devices.

4.4   Connect the fire-fighting system as shown in Figure 4. The length of wires used to connect the fire-fighting system and the resistance of the additional resistor must have the values which provide the required current of activation of the electric activator.

4.5   The required value of the additional resistance R_{add} is estimated using the formula below:

$$R_{add} = \frac{U\min - 2}{I} - (R_2 + R_1 + R_{fight}), \quad \text{where:}$$

$U_{\min}$ is for the minimum voltage of the power supply (10 V for a RIP-12 or 20 V for a RIP-24);
I is for the required current of activation, [A];
R_1 is for the resistance of wires between the power supply and the module, [Ohm] (see Clause 4.2);
R_2 is for the resistance of wires between the S2000-KPB and the fixed fire-fighting system, [Ohm] (see Clause 4.2);
R_{fight} is for the effective resistance of the exploder (bridgewire), [Ohm].

4.6   The standard resistance for R_{add} is to be selected from the E24 series as the nearest smaller value relative to the estimated value above.

4.7   The R_{add} resistor must have enough power, especially if the activation time exceeds one second.

4.8   For example, if the module is powered by a 24 V power supply, the resistance of the connected wires doesn't exceed 0.3 Ohm, the resistance of the exploder is 6 Ohm, and the estimated current of the activation of the exploder is 0.1A, then the resistance value of the additional resistance should be 160 Ohm.

4.9   If the circuit connected to an output is monitored neither for open circuit failure nor for short circuit failure (the first type of monitored circuits), no load connection module is necessary to install.

4.10 The conditions of the outputs #1 to#6 and the circuits connected to them can be monitored using the LEDs "1" to "6".

4.11 The conditions of the alarm loops can be monitored using "MASS" and "PRES" indication.

5   MAINTENANCE

5.1 General

Scheduled-preventive maintenance of the S2000-KPB module has to be conducted annually by a service employee. Such maintenance includes procedures as follows:
– Inspecting conditions of structural elements of the module, case's fastening, and external wire connections (Maintenance Procedure 1);
– Inspection of module's operability in according with the way it is used; see Clause 1.1.2 (Maintenance Procedure 2).

Perform Maintenance Procedure 1 as required by your regulatory documentation, at least monthly.

Perform Maintenance Procedure 2 as required by your regulatory documentation, at least annually.

Connecting external circuits to the terminals of the module use a screwdriver with a tip of PHILLIPS PH1 type; a screw torque must not exceed 0.25 Nm.

5.2 Maintenance Procedure 1

5.2.1   Inspect the module visually for mechanical damage.

5.2.2   Remove dust, debris, moisture (condensation) from the module's surface.

5.2.3   Remove the module's cover (removing the tamper label if necessary).

5.2.4   Switch off the battery backed power supplies connected to the module or detach power circuits from the contacts "+Umain" and "+Uback".

5.2.5   Remove dust, dirt, and corrosion from the surface of terminals and fuses.

5.2.6   Ensure the module case and wire terminals are fastened properly.

5.2.7   Tighten screws when they are loosened.

5.2.8   Switch on the battery backed power supplies connected to the module or connect the power circuits to the terminals "+Umain" and "+Uback".

5.2.9   Put the module's cover on the place, close it and seal if necessary.

5.3   Maintenance Procedure 2

5.3.1   In accordance with the engineering documentation, decide upon:
–   The type of the system where the module is used,
–   Designation of the module,
–   Which network address is assigned to the module in the system,
–   Which power supply is connected to the module,
–   Which circuits and which devices the module monitors via "loop1" and "loop2" inputs,
–   Which devices are connected to the outputs "1", "2", "3", "4", "5", and '6' of the module,
–   Which network controller or device controls the module over the RS-485 interface,
–   Which control programs are assigned to each output in the configuration chart of the module,
–   Which events (or commands of the network controller) correspond to activation of the control program at each used module's output,
–   How to generate the command or call the event to activate the control command for each used output.

5.3.2   Open the cover of the S2000-KPB module removing the tamper label if necessary.

5.3.3   **WARNING:** If the module is connected to clean agent suppression modules or other executive devices which must not be activated during the inspection, carry out the steps 5.3.4 – 5.3.7.

5.3.4   Switch off the battery backed power supplies connected to the module or disconnect the power circuits from the "+Umain" and "+Uback" contacts.

5.3.5   Disconnect discharge circuits from the "+" and "−" contacts of used outputs of the module.

5.3.6   Connect discharge circuit simulators to the outputs as shown in Figure 5.
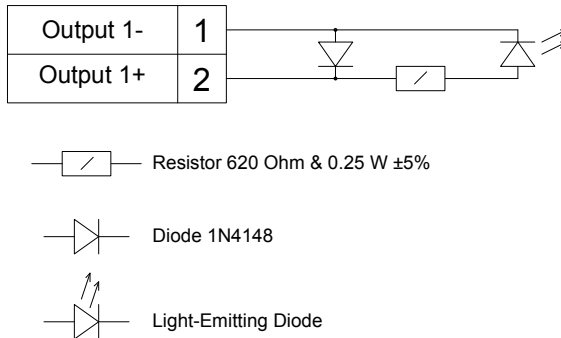
Figure 5. The schematic of a Discharge Circuit Simulator

5.3.7   Switch on the battery backed power supplies connected to the module or connect power circuits to the contacts "+Umain" and "+Uback".

5.3.8   Ensure the module is in Quiescent Mode as the indicator shows. READY LED shall be lit steady, COM LED shall be lit steady or flash, indicators of outputs shall indicate the initial status of their control programs (see Table 2), MASS and PRESS LEDs shall operate in accordance with the programmed configuration of the alarm loops (see Table 1).

5.3.9   Generate a command or event to activate control programs for each executive output.

5.3.10 Ensure the executive devices connected to the module respond (or light diodes of the simulators turns on in accordance with the given programs).

5.3.11 Ensure that indicators "1" to "6" double operation of the control program for each output.

5.3.12 One-by-one simulate a short circuit failure of the circuit of the used output "1", "2", "3", "4", "5", "6" of the module for which the module's configuration specifies the function of monitoring short circuit failures.

5.3.13 Ensure that on closing the circuit the relevant output status indicator flashes in yellow once per two seconds.

5.3.14 Ensure that the control device (the network controller) displays the event of short circuit failure for the relevant address.

5.3.15 One-by-one, simulate open circuit failures for the used outputs "1", "2", "3", "4", "5', "6" of the module for which the module's configuration specifies the function of monitoring open circuit failures.

5.3.16 Ensure that on opening the circuit the status indicator of the relevant output double flashes in yellow once per two seconds.

5.3.17 Ensure that the control device (the network controller) displays the event of open circuit failure for the relevant address.

5.3.18 One-by-one, connect to the "loop 1" and "loop 2" terminals the resistors nominal values of which are defined in the configuration of the S2000-KPB.

5.3.19 Ensure that the control device (the network controller) displays the events which correspond to each resistance value and MASS and PRES indicators operate as shown in Table 1.

5.3.20 Switch off the battery backed power supplies connected to the module or disconnect the power circuits from the contacts "+Umain" and "+Uback".
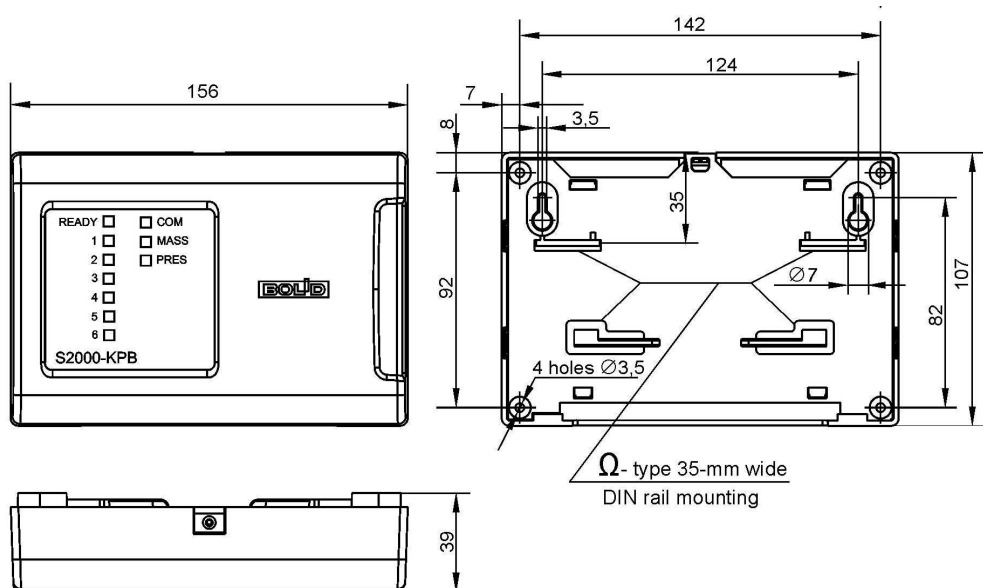
5.3.21 Connect the circuits at the outputs of the S2000-KDL module as specified by the design documentation.

5.3.22 Switch on the battery backed power supplies connected to the module or connect the power circuits to the contacts «+Umain» and «+Uback».

5.3.23 Close the cover of the module and seal if necessary.

5.3.24 Ensure the module LEDs indicates the module's being in Quiescent Mode. READY LED shall be lit steady, COM LED shall be lit steady or flash, indicators of outputs shall indicate the initial status of the control program (Table 2), MASS and PRESS LEDs shall operate in accordance with the programmed configuration of the alarm loops (Table 1).

6 OVERALL AND MOUNTING DIMENSIONS

156

142

124

7

8

3,5

35

92

⌀7

107

82

READY ☐   ☐ COM
1 ☐   ☐ MASS
2 ☐   ☐ PRES
3 ☐
4 ☐
5 ☐
6 ☐

BOLID

S2000-KPB

4 holes ⌀3,5

Ω- type 35-mm wide
DIN rail mounting

39