# LABOR – ASTER

**INDUSTRIAL AUTOMATION**

Certyfikat nr QS/14/07

AC 083
QMS

## BISTATE SEPARATOR type SB-4

- **Four independent measurement channels in one housing (TS35, width 22,5mm),**
- **Inputs: NAMUR proximity sensor, contact, Hall sensor, transistor switch etc.,**
- **Outputs: relay or opto-relay contacts with one common terminal,**
- **Indication of short and open connection of the input sensor,**
- **Outputs phase and ALARM activation selected with switches,**
- **Full galvanic separation of inputs, outputs and power supply circuits.**


### Application:

The Separator can be used to transfer a state of a contact or OC type transistor to galvanically separated side. It is designed to operate with NAMUR proximity sensors which switch current 1.2 / 2.1 mA (DIN 19234). It can be also used as resistor values comparator.
There is a voltage of 8,2V on the input terminals. In case of using OC transistors terminals “in1+”, “in2+”, “in3+”, “in4+” should be connected to the collector.
On request it is possible to change the input current or resistance threshold levels and the width of the hysteresis.
Switches SW1, SW2, SW3, SW4 (accessible after opening the housing) are used to set the phase of output relays. “ON” position means inversive operation of the output contact in the corresponding channel.
If the switches SW5, SW6, SW7, SW8 (accessible after opening the housing) are set to “ON” it means activation of the input connection line damage. “OFF” position means disabling alarm in the corresponding channel.
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### Technical data:

One, two, three or four channels with the following parameters.

| | |
|---|---|
| Input signal type | - contact, transistor switch or NAMUR proximity sensor e.g. PCIN by SELS |
| standard switching thresholds | - 1,45 / 1.85 mA |
| sensor supply voltage | - 3 ÷15V, typically 8,2 V |
| input resistance | - 1,2 kΩ |
| Opening in connection line signalization threshold | - opened I < 0.25mA<br>not opened I > 0.35mA |
| Shorting in connection line signalization threshold | - shorted I > 4.4mA<br>not shorted I < 3.9mA |
| Output – potential-free contact of relay PK1, PK2, PK3, PK4 | |
| - switching time | - 20 max 20 ms |
| - switching frequency | - max 50 Hz |
| - mechanical durability | - $10^7$ (for 1Hz ⇒ 4 months) |
| - switched power | - max 5A / 250Vac or 30Vdc |
| On request - optorelay | 350V, 0,1A, 200 Hz, r=30Ω |
| All outputs have common terminals marked as “Pk”. | |
| Output ALARM – PKA | |
| - opto-relay | - 350V, 0,1A, 200 Hz, r=30Ω |
| Power supply voltage | - 20 ÷ 27V DC<br>75mA for four channels<br>55mA for one channel |
| Galvanic separation: | - isolation test voltage |
| between inputs | 2 kV |
| inputs/outputs/supply | 2 kV |
| Connections | - cables 0.5 ÷ 2.5 mm$^2$ |
| TS35 rail housing | - housing and terminals IP20 |
| housing material | - self-extinguishing poliamid PA 6.6 |
| compliance with directive EMC 2004/108/WE | - PN-EN 61000-6-4, PN-EN 61000-6-2 |

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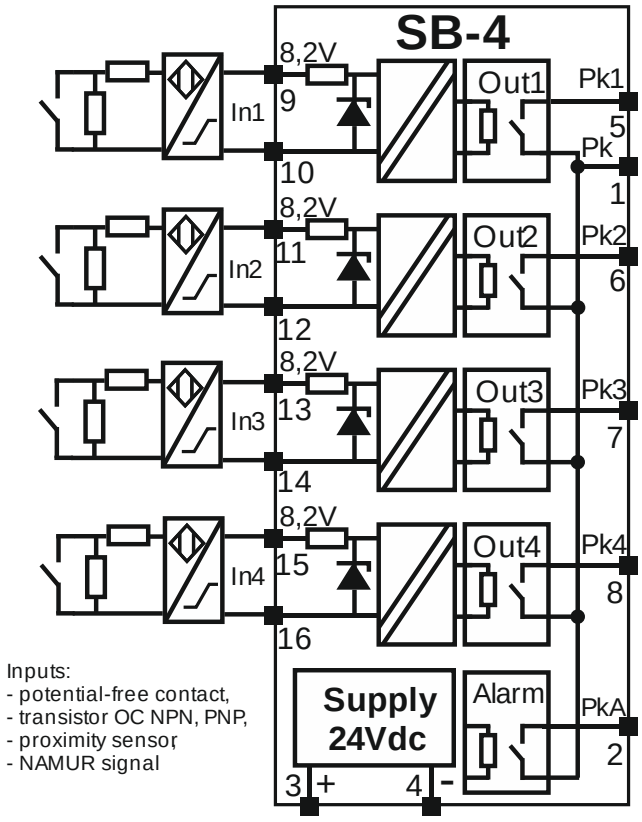
Note: While the power is turned off output relay's contacts "Pk1 ; Pk", "Pk2 ; Pk", "Pk3 ; Pk", "Pk4 ; Pk" and alarm contacts "PkA ; Pk" are opened.




For SW1, SW2, SW3, SW4 ⇒ OFF and
for SW5, SW6, SW7, SW8 ⇒ ON output contacts and LED signalization is as follows:
- increase of input signal above value
switching level + 0.5 • hysteresis
causes shorting of output relay's contact (terminals "Pk1; Pk", "Pk2; Pk", "Pk3; Pk", "Pk4; Pk") and lighting up green LED ("Pk1", "Pk2", "Pk3", "Pk4"). Lighting up red LED and shorting of ALARM contact ("PkA; Pk") means a break in connection line (I<0.25mA). Lighting up orange LED and shorting of ALARM contact ("PkA; Pk") means shorting in connection line (I>5mA). Contacts of alarm "PkA, Pk" are common signalization for all channels – the user should check which channel is damaged by looking at LEDs.

Note: to allow proper signalization of shorting/opening in sensor connection line in case of operating with contact or transistor, to the terminals of the sensor (near the sensor) should be connected a parallel resistor 10÷13kΩ and a serial resistor 910÷1000Ω. It is shown on the block figure to the right.

**Ordering code:**

| | |
|---|---|
| SB-4- | binary separator, 1,2,3 or 4 channels |
| SB-4-1- | one channel |
| SB-4-2- | two channels |
| SB-4-3- | three channels |
| SB-4-4- | four channels |
| - PK | PK1, PK2, PK3, PK4 relay outputs |
| - OPTO | OP1, OP2, OP3, OP4 optorelay outputs |

**Order example for standard version:**

Binary separator, two channels, opto-relay outputs:
type SBEx-4-2-OP1/OP2
For atypical application switching resistance or current thresholds and hysteresis should be described.

**Configuration:**

Below table describes logic of output relays and respectively LEDs on the example of one channel.

| state of relays and LEDs / current (state of the input contact) | state of output contacts in channels 1, 2, 3, 4 respectively for SW1, SW2, SW3, SW4 in OFF state | state of output contacts in channels 1, 2, 3, 4 respectively for SW1, SW2, SW3, SW4 in ON state | LED in channel with active alarm SW5 or SW6 or SW7 or SW8 in ON state | LED in channel with inactive alarm SW5 or SW6 or SW7 or SW8 in OFF state | state of "PkA; Pk" ALARM contact with active alarm in channel SW5 or SW6 or SW7 or SW8 in ON state | state of "PkA; Pk" ALARM contact with inactive alarm in channel SW5 or SW6 or SW7 or SW8 in OFF state |
|---|---|---|---|---|---|---|
| I > 5 mA ALARM (shorted line $R_L$<300Ω) | shorted | opened | orange | green | shorted | opened if no alarms on other channels |
| I > 1.85 mA (shorting contact) | | | green | | opened if no alarms on other channels | |
| I < 1.45 mA (opening contact) | opened | shorted | off | off | | |
| I < 0.25 mA ALARM (opened line $R_L$>40kΩ) | | | red | | shorted | |

All output contacts "Pk1; Pk", "Pk2; Pk", "Pk3; Pk", "Pk4; Pk" and alarm contact "PkA; Pk" have one common terminal "Pk". It means that output terminals are not galvanically separated from each other.

Configuration – additional information:

Phase activation selection of output relays (does not concern alarm relay) and activation of connection line breaking detection alarm is made by switches SW1, SW2, SW3, SW4 accessible after opening the housing.

Table 1.

| Channel / output / input | 1<br>output contact "Pk1; Pk" | 2<br>output contact "Pk2; Pk" | 3<br>output contact "Pk3; Pk" | 4<br>output contact "Pk4; Pk" |
|---|---|---|---|---|
| input **opened**<br>I < 1.45 mA | contact **opened**<br>when SW1 **OFF** | contact **opened**<br>when SW2 **OFF** | contact **opened**<br>when SW3 **OFF** | contact **opened**<br>when SW4 **OFF** |
| input **opened**<br>I < 1.45 mA | contact **closed**<br>when SW1 **ON** | contact **closed**<br>when SW2 **ON** | contact **closed**<br>when SW3 **ON** | contact **closed**<br>when SW4 **ON** |
| input **closed**<br>I > 1.85 mA | contact **closed**<br>when SW1 **OFF** | contact **closed**<br>when SW2 **OFF** | contact **closed**<br>when SW3 **OFF** | contact **closed**<br>when SW4 **OFF** |
| input **closed**<br>I > 1.85 mA | contact **opened**<br>when SW1 **ON** | contact **opened**<br>when SW2 **ON** | contact **opened**<br>when SW3 **ON** | contact **opened**<br>when SW4 **ON** |

Choosing of a channel from which detection of connection line damage is summed to the result of detection from other channels is selected with switches SW5, SW6, SW7, SW8 accessible after removing the housing.

Table 2.

| Channel / detection of connection line damage | 1 | 2 | 3 | 4 |
|---|---|---|---|---|
| alarm off | when SW5 **OFF** | when SW6 **OFF** | when SW7 **OFF** | when SW8 **OFF** |
| alarm on | when SW5 **ON** | when SW6 **ON** | when SW7 **ON** | when SW8 **ON** |

Table 3 describes function of switches for setting output relays phase: "inversion" or "no inversion".

State "no inversion": Iin>1.85mA

input contact closed ⇒ output contact closed

State "inversion": Iin>1,85mA

input contact closed ⇒ output contact opened.

Switchers SW1, SW2, SW3, SW4 refers respectively to phase inversion of output relays' contacts PK1, PK2, PK3, PK4.

Table 3.

| **switchers state** / **relays** | SW1, SW2, SW3, SW4<br>ON | <br>OFF |
|---|---|---|
| PK1 channel 1 relay<br>PK2 channel 2 relay<br>PK3 channel 3 relay<br>PK4 channel 4 relay | inversion | no inversion |

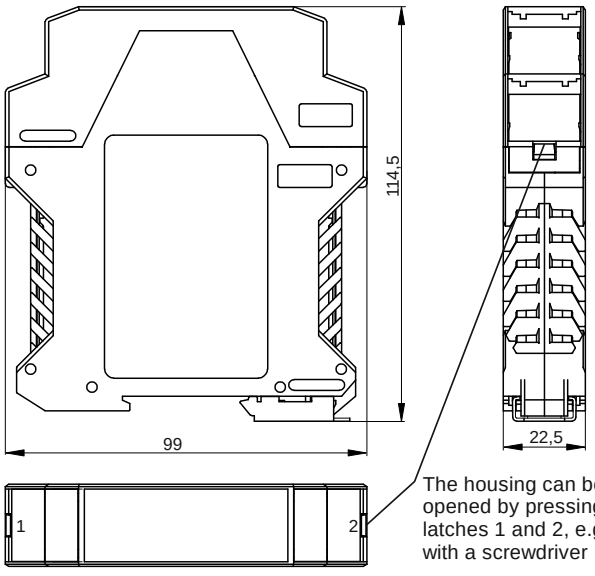



Table 4 describes function of switcher for activation or blockade "ALARM" function for each channel. There is one common output terminal "PkA; Pk" for "ALARM" function. It operates as a logical sum – it is enough if alarm appears on only one of channels activated for alarm.

Switchers SW5, SW6, SW7, SW8 refers respectively for activation of detection of alarm states I<0.25mA or I>5mA in channels 1, 2, 3, 4. Contacts "PkA; Pk" us closed when I<0.25mA or I>5mA on at least one of channels activated for alarm.

Table 4.

| **switchers state** / **LEDs "status/alarm" and ALARM relay** | SW5, SW6, SW7, SW8<br>ON | <br>OFF |
|---|---|---|
| LEDs "Pk1", "Pk2", "Pk3", "Pk4" | - red<br>I < 0.2 mA<br>- orange<br>I > 5.5 mA | - off<br>I < 0.2 mA<br>- green<br>I > 5.5 mA |
| contacts "PkA; Pk" of ALARM relay | - closed<br>When in one of channels activated for alarm<br>I<0.25mA or I>5mA | - opened<br>All = OFF or in all channels activated for alarm<br>0.35<I<4mA |