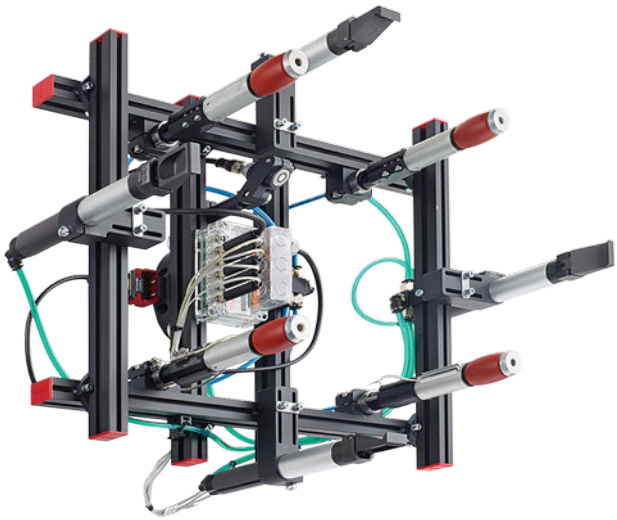
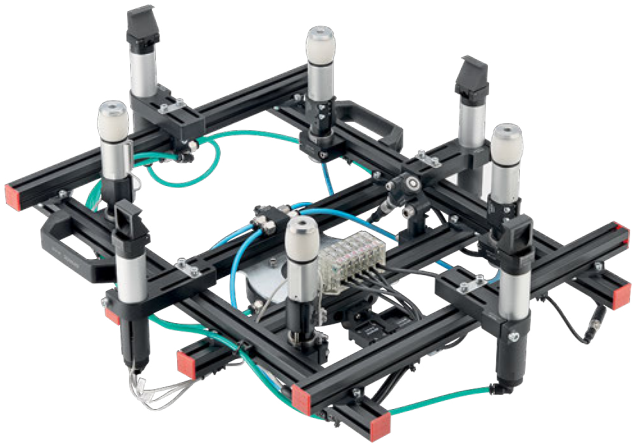
Connection boxes for SB series sensors

The sensor connection box is an interface made to condition sensor signals to condense information and make it suitable for control electronics, such as a programmable logic controller (PLC).

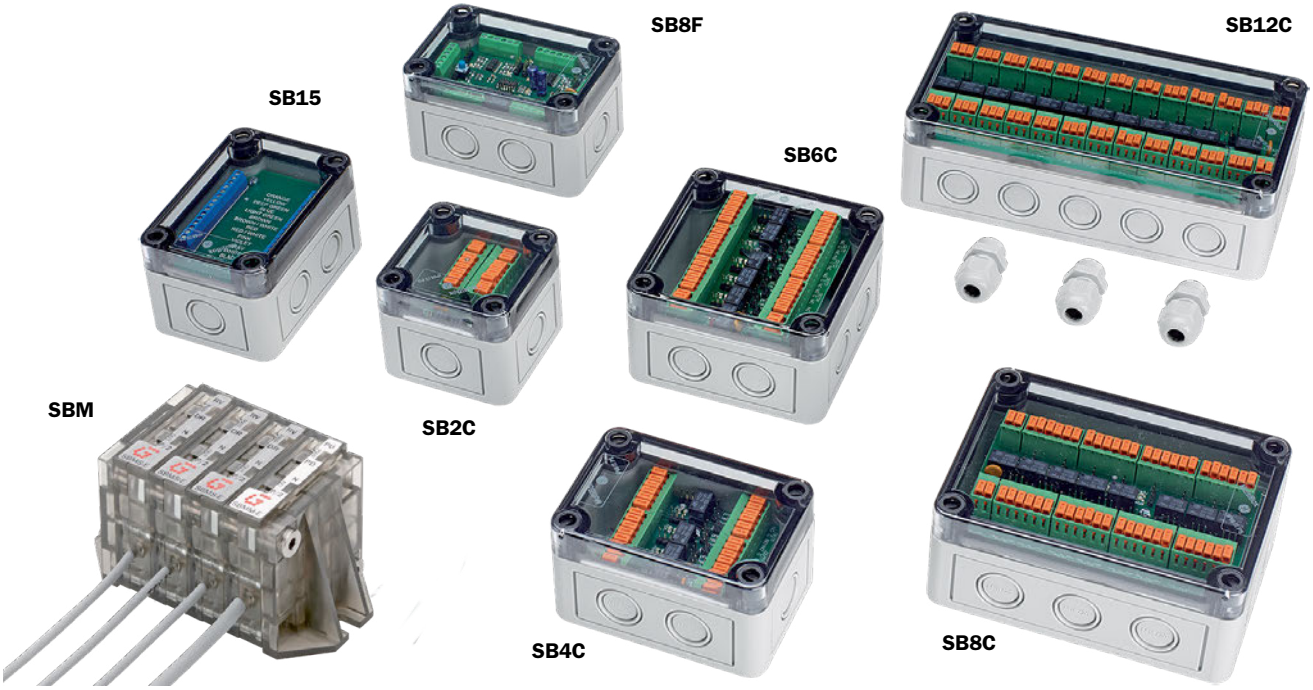
A connection box (or sensor box) has various functions, such as the possibility of connecting different types of sensors in series, converting their signals, troubleshooting, maintaining control circuits, regenerating signals in the case of extensive cabling and maintaining the contacts. Each control box has several areas - a power supply area, an input area for physical sensor connection, an input configuration area (used to set the type of sensor connected), an output configuration area (used to set the type of output and processing logic required), and an output area for collecting the signals generated. Each physical input can be configured on the basis of the type of sensor connected (PNP, NPN, 2-wire NO/NC) using jump wires or selectors. Signals coming from the sensors are conditioned using relay switches or microprocessors (on the basis of the type of control box), to provide one or more outputs depending on operational requirements. Even an individual output can be configured using a jump wire or selector to define the type (PNP or NPN), and normally open (NO) or normally closed (NC) mode of operation.
Sensor boxes consist of a frame, clamps and terminal boards to make installation and wiring the sensors and outputs straightforward and easy. Furthermore, the presence of a resettable fuse protects and safeguards the integrity of the electronic equipment from short circuits. All connection boxes have LED warning lights that are visible through transparent plastic containers, which is convenient for troubleshooting and viewing input/output status. The connection boxes have PG9 cable glands depending on the model, which guarantee an IP65 protection grade for integrated electronic boards (SBxC, SB6B, SBF) rather than a modular structure (SBM). This makes it possible to limit size as much as possible, and secure the box directly to the aluminium profiles that usually form gripper frames.





Connection boxes for series SB sensors

- Used for sensor wiring on EOATs.
- PNP and NPN signals can be converted.
- Is/Os can be current sourcing (PNP), sinking (NPN) or dry contact.
- Several boxes can be connected in series to control more sensors.
- Input signal repetition LED for easy troubleshooting (not for SB15).
- Provided with strain reliefs and kit for fastening to profiles.

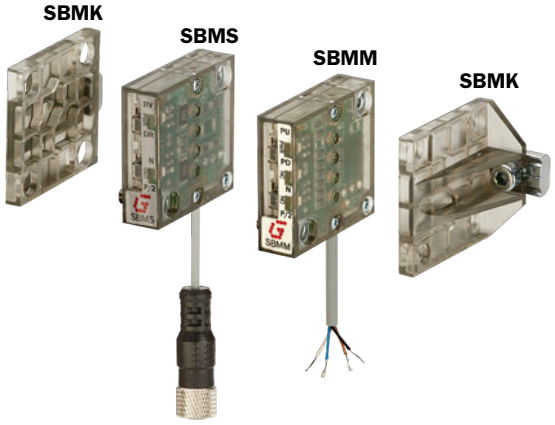


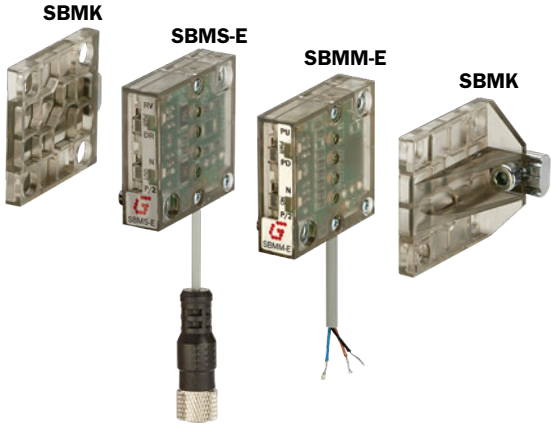
	SB2C.. ..SB12C	SB8F	SBMM	SBMS	SBMM-E	SBMS-E
Power supply unit (Vdc)	24 (± 10%)		12 ÷ 24 (± 10%)			
Maximum output current (A)	1	0.2	0.35			
Programming method	jump wire	microprocessor and pushbutton panel	selectors			
Structure	rigid (fixed number of inputs/outputs)		modular			
Number of inputs	2÷12	8	-	1	-	1
Number of outputs	2÷12	1	2 (1NO, 1NC)	-	1 (NO)	-
Protection rating	IP65		IP40			
Overall dimensions (mm)	65÷180x94x57	94x65x57	10x36x34 (single module)			

Modular sensor box

The SBM modular sensor box consists of one or more master modules (SBMM), one or more slave modules (SBMS) and one termination and fixing unit (SBMK).
Master and slave modules can be connected in series by creating specific applications and a fully customizable system.

- Modular, extra compact and scalable.
- Easy manual configuration using selectors.
- Each sensor can be configured as NO or NC.
- In the SBMM-E version, the master module updates a single digital output (NO contact series).
- In the SBMM version, the master module simultaneously updates two digital outputs (i.e. NO contact series and NC contact series).
- Wide power supply range.
- Series connection of up to 20 slave modules (sensors).
- Orientable cable output and flexible cables.
- Cable/extensions are available for connections to sensors (codes CM800303CF8003P; CM800305CF8003P; CM800312CF8003P; CFGM800325PSB...).
- Direct fixing on standard aluminum profiles.





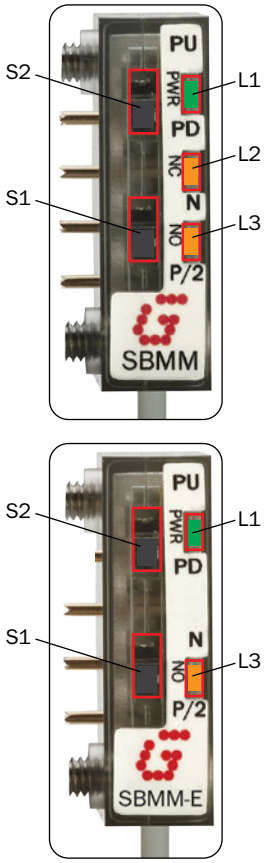
	SBMM	SBMM-E	SBMS	SBMS-E
Case material	Durethan T 40			
Module case dimensions	36 mm x 34 mm x 10 mm			
Weight	50 g			
Protection rating	IP40			
Power supply voltage	from 12 Vdc to 24 Vdc (+10%)			
Current input per module	30 mA			
Operating temperature	-30 °C ÷ +80°C			
Electrical connections	4 wires without connector	3 wires without connector	1 M8 3-pole female connector	
Cable length	1 m		150 mm	
Inputs	2 power wires (Blue: GND, Brown: Vdc)		1 input type PNP/NPN/REED	
Outputs	2 PNP or NPN configurable	1 PNP or NPN configurable	none	

SBMM / SBMM-E - Master module

This is always the first module of a generic SBM and acts as a power supply for other modules connected in series.
The SBMM version generates two simultaneous outputs that are updated with the output status of the successive slave modules (one as NO series of slave outputs and the other as NC series of slave outputs).
Consequently, one sensor box can simultaneously recognise the status of all active and non-active actuators (with standard sensor, boxes 2 would be required).
The SBMM-E version generates a single output (as NO series of slave outputs).
The master module outputs can be set as PNP or NPN by means of a dedicated selector, and the corresponding PULL-UP and PULL-DOWN resistors can be set with a separate selector.
The module features two LED indicators for rapid diagnostics.
It can also be used as an intermediate module of a generic SBM when the logical separation (or logical grouping) of slave signals is required.
The status of the master module outputs is however always related to the signal status of all successive slave modules, up to the end of the SBM or the next master module (for further information, see application examples below).

Connections	SBMM	SBMM-E
Type	4 wires without connector	3 wires without connector
Formation	4x0.14 mm²	3x0.14 mm²
Material	PUR	
Length	1 m	
Blue	GND	
Brown	Vcc	
Black	OUT1: series of NO contracts (depending on configuration)	
White	OUT2: series of NC contacts (depending on configuration)	/

Current limitations	SBMM	SBMM-E
Maximum current for NO output	1 A	
Maximum current for NC output	150 mA	/
Maximum power supply current	2 A	

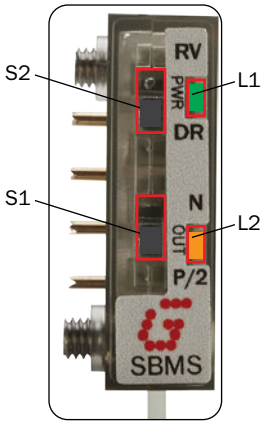


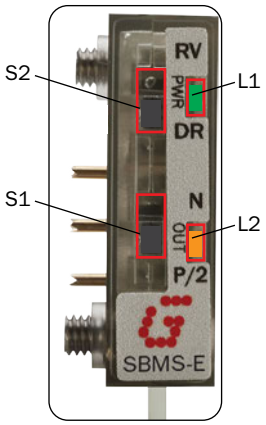
Configurations and indicators

- S1: enables the selection of the type of output signal, PNP (P/2) or NPN (N).
- S2: enables the selection of internal PULL-UP (PU) or PULL-DOWN (PD) resistors depending on the NPN or PNP selection (via S1), respectively.
- L1: green when powered.
- L2: amber when the NC series output is switched (e.g. all contacts open).
- L3: amber when the NO series is switched (e.g. all contacts closed).

SBMS / SBMS-E - Slave module

Each individual slave module enables the connection of a single sensor.
It is powered from the internal bus connection (provided by the master module) and triggers the commutation of two solid state relays: a NO contact and a NC contact based on sensor output.
Two selectors are available to configure sensor signal output (PNP/2 wires or NPN) and logic (direct or reverse).
The module also has two LED indicators for diagnostics.





Connections	SBMS / SBMS-E
Type	M8 3-pole female connector
Formation	3x0.096 mm²
Material	PUR
Length	150 mm
Blue	GND
Brown	Vcc
Black	Sensor output signal (input for the slave module)

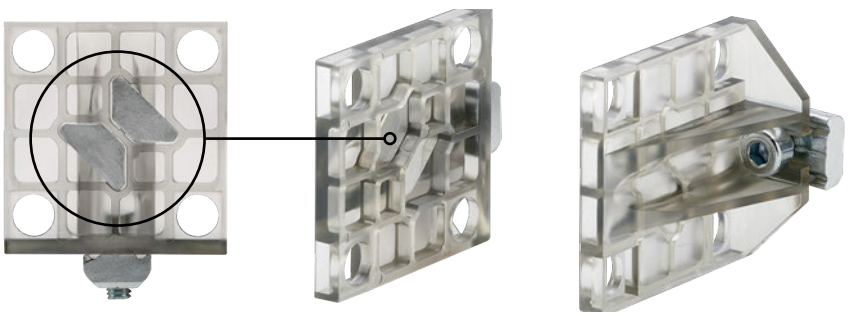
Current limitations	SBMS / SBMS-E
Maximum power supply to sensor	200 mA

Configurations and indicators

- S1: enables the selection of the type of output signal, PNP (P/2), NPN (N) or NPN (N).
- S2: enables the selection of sensor output logic as DIRECT (DR) or REVERSE (RV), respectively.
- L1: green when powered (from internal bus).
- L2: amber when the NC series output is switched (output enabling or disabling depends on both the type of sensor output and module configuration).

SBMK - Termination and fastening module

This module acts as a mechanical and electrical termination unit for connecting other modules in series (thanks to two contacts). It enables fastening to standard aluminium profiles and output cable orientation (straight or rotated by 90°).

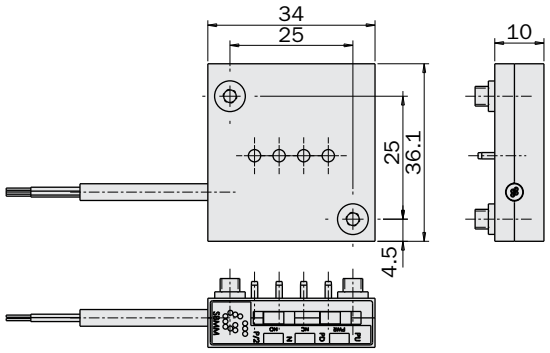


Operating principle

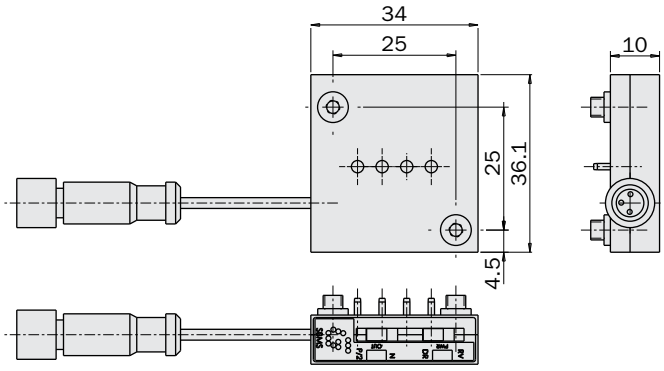
The main system application is industrial component automation.
For this purpose a robot is normally used with several EOATs (End Of Arm Tools) equipped with sensors and actuators.
It is often not necessary for the robot to know the status of all sensor outputs, one acknowledgement (ACK) signal obtained as the logical processing of all sensor outputs is sufficient (simple logical AND processing is usually required).
In a minimum configuration, one SBM unit can be assembled with several slave modules (1 per sensor) and a single master module whose outputs (or even just one) can be used as ACK signals from the robot.

Dimensions (mm)

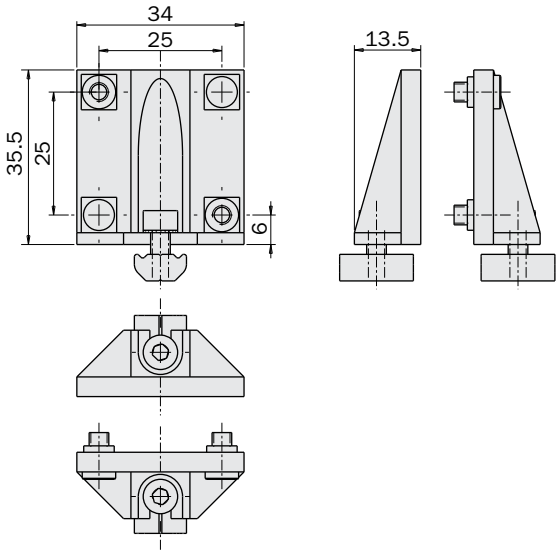
SBMM



SBMS



SBMK



SBM application examples

Figures 1 and 2 show a typical application where only 1 master module (SBMM) is used in combination with 6 slave modules (SBMS) and 1 termination module (SBMK).
The square shape of the modules allows the user to customise cable outputs while keeping the same fastening on an external structure.

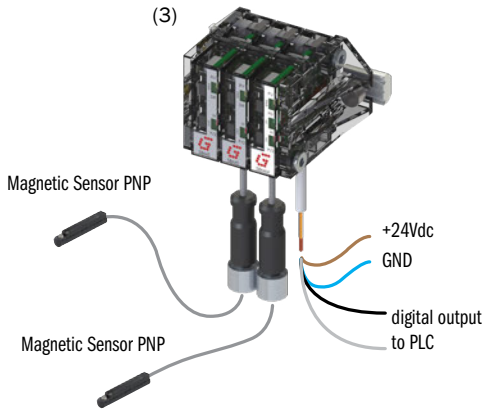
(1)

(2)

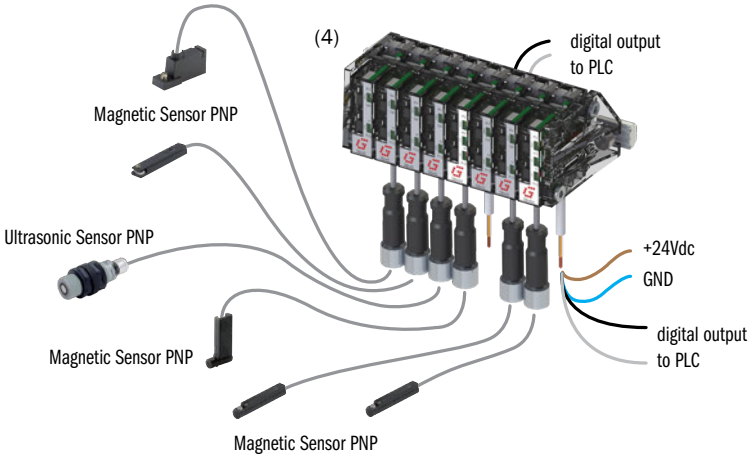
Figure (3) shows the minimum configuration of an SBM, consisting of 1 master module (SBMM) and 2 slave modules (SMBS) connected to two different types of magnetic sensors.

Figure (4) shows an extended configuration with 4 additional slave modules and 1 additional master module inserted in-between, thus generating an output signal relating to the last 4 slave modules only.
The first master module processes the signals of the 2 first slave modules only.
It is worth noticing that the power wires of the central master are not used in this example (the power connections of the first master supply power to the entire system using an internal BUS).

(3)



(4)



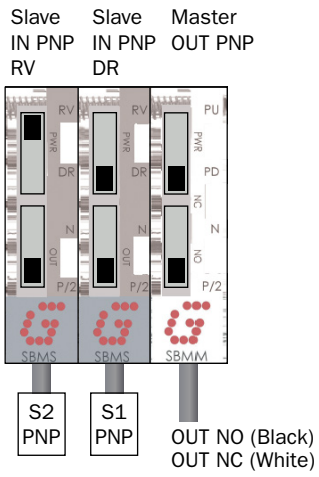
Application example

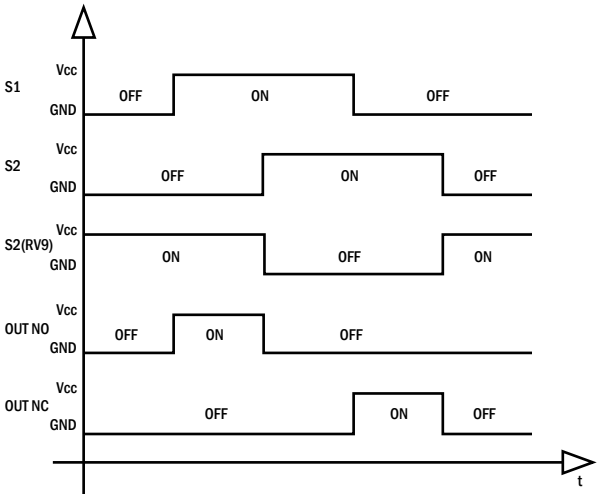
SBMM + 2 SBMS model

Inputs
1 PNP (DR)
1 PNP (DR)

Number of outputs
2

Output type
1 PNP NO (S1*S2 (RV))
1 PNP NC (S1+S2 (RV))(RV)





OUT NO = S1 * S2(RV)
OUT NC = (S1+S2(RV))(RV)

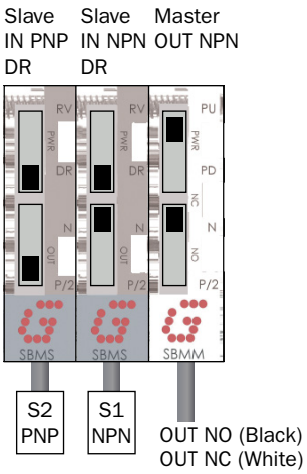
Application example

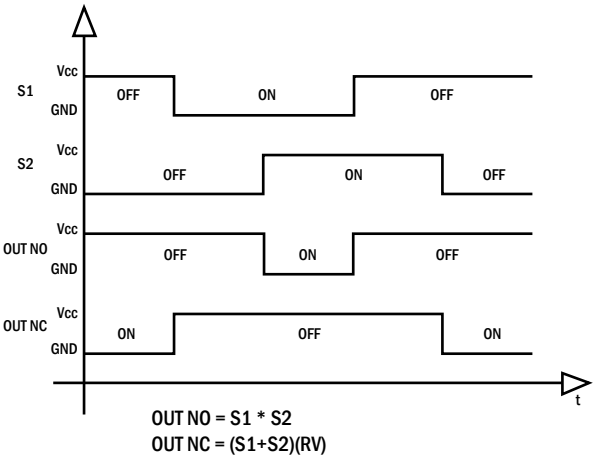
SBMM + 2 SBMS model

Inputs
1 PNP (DR)
1 PNP (RV)

Number of Outputs
2

Output type
1 NPN NO (S1*S2)
1 NPN NC (S1+S2)(RV)

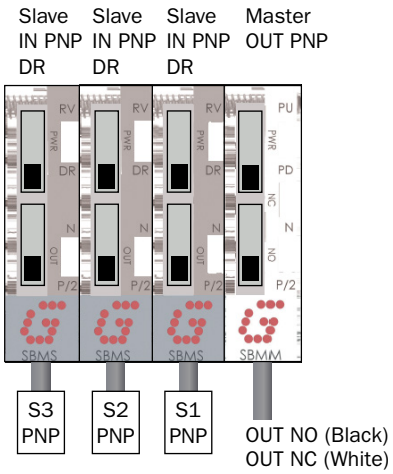


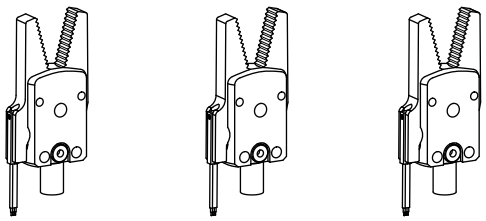


OUT NO = S1 * S2
OUT NC = (S1+S2)(RV)

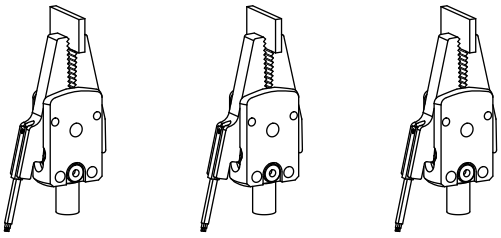
SBM application examples

The following example demonstrates how in a system consisting of three PB grippers, used to simultaneously grip sprue pieces, an abnormal situation - such as failure to release a piece - can be detected. Three SSY sensors with PNP output are used, set to activate when the piece is gripped. The NO output of the master is active when all three sensors are active (piece gripped), the NC output is active when all three sensors are inactive (grippers open or closed with no grip). If, therefore, the system is operating correctly, the two NO and NC outputs of the master will always be active alternately. If both outputs are simultaneously inactive there is a system fault, such as a failure to grip or release the piece.

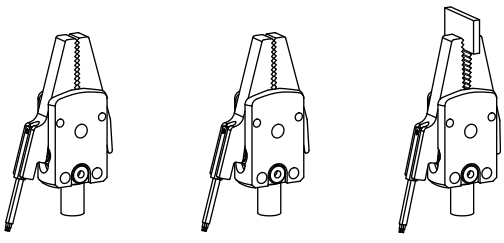




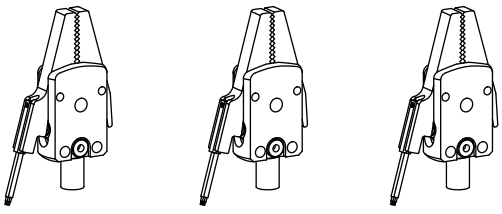
S1	OFF
S2	OFF
S3	OFF
OUT NO (PNP)	OFF
OUT NC (PNP)	ON



S1	ON
S2	ON
S3	ON
OUT NO (PNP)	ON
OUT NC (PNP)	OFF



S1	OFF
S2	OFF
S3	ON
OUT NO (PNP)	OFF
OUT NC (PNP)	OFF



S1	OFF
S2	OFF
S3	OFF
OUT NO (PNP)	OFF
OUT NC (PNP)	ON