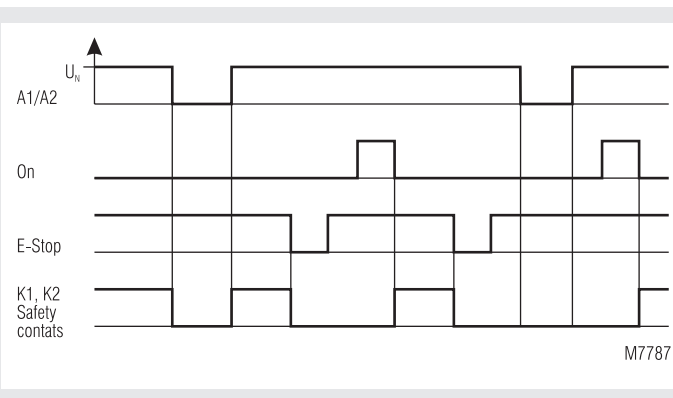


SAFEMASTER Emergency Stop Module with voltage failure detection BH 5903, BL 5903



- According to
 - Performance Level (PL) e and category 4 to EN ISO 13849-1: 2008
 - SIL Claimed Level (SIL CL) 3 to IEC/EN 62061
 - Safety Integrity Level (SIL 3) to IEC/EN 61508
 - Category 4 to EN 954-1
- E-stop with latching function
- Automatic start when voltage returns after phase failure when no E-Stop was operated before phase failure.
- Reset after E-stop with push button
- Output max. 3 NO contacts, see contacts
- B_5903.__/00000: 1 E-stop loop 2-channel operated
- B_5903.__/00020: 2 E-stop loops single channel operated
- Cross fault monitoring
- Feedback loop for external contact reinforcement
- Short circuit and broken wire detection on all inputs
- LED indication for channel 1 and 2 and for diagnostics
- Removable terminal strips
- Wire connection: also 2 x 1.5 mm² stranded ferruled (isolated), DIN 46 228-1/-2/-3/-4 or 2 x 2.5 mm² stranded ferruled DIN 46 228-1/-2/-3
- BH 5903: width 45 mm
BL 5903: width 90 mm

Function Diagram



Approvals and Marking



* see variants

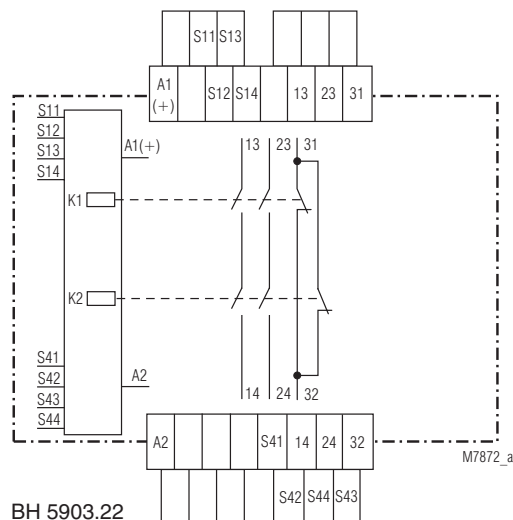
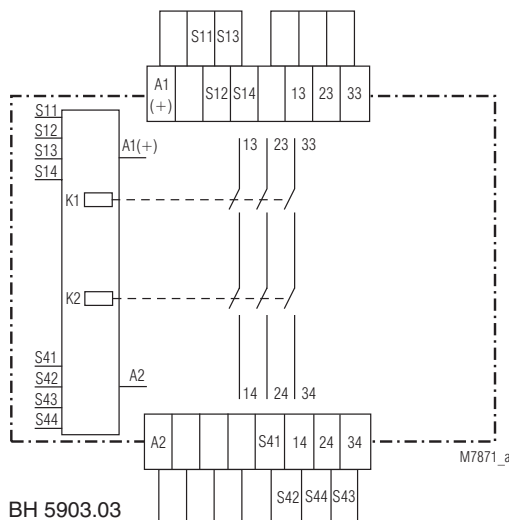
Indication

- upper yellow LEDs
run 1, run 2: on when unit works correct, fault signal via flashing code
- lower green LEDs
K1, K2: on when K1, K2 energized

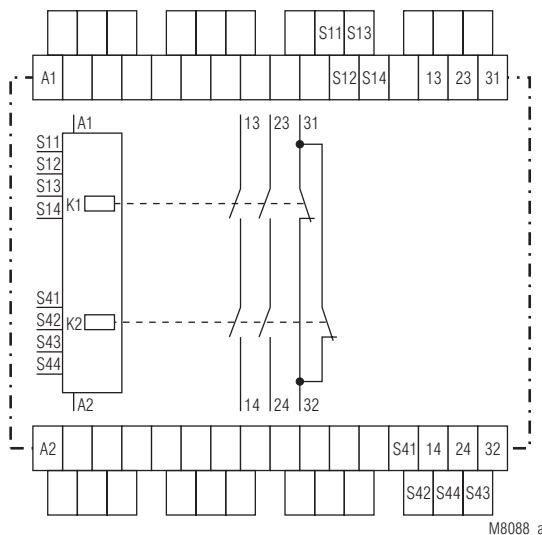
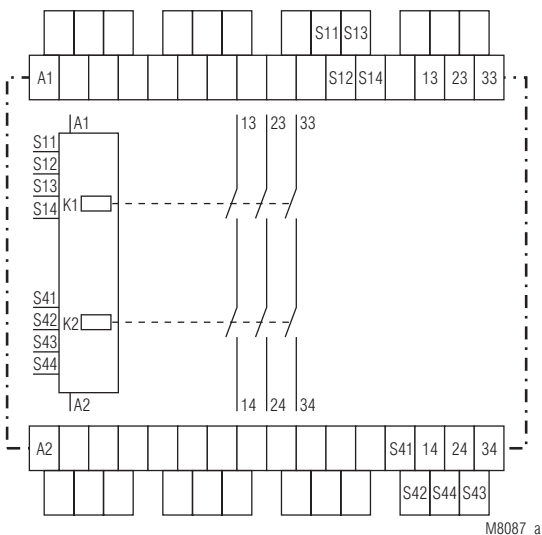
Notes

- The BH5903 e.g. BL 5903 stores the state of emergency stop. After pressing and releasing the e-stop button the unit can only be reset by pressing the button. If the unit switches off because of phase failure it resets automatically when the voltage returns
- The unit monitors how long the on button is pressed. Is the duration longer then 3 sec it does not switch on.
- The NC contact 31-32 (BH 5903.22 e.g. BL 5903.22) is only a monitoring contact.

Circuit Diagrams



Circuit Diagrams



BL 5903.03

BL 5903.22

Technical Data

Input

	BH 5903	BL 5903
Nominal voltage U_N:	DC 24 V	AC 24, 110, 230 V
Voltage range:	-	0.8 ... 1.1 U_N
at max. 5 % residual ripple:	0.85 ... 1.15 U_N	-
Nominal consumption:	max. 170 mA	max. 7 VA
Nennfrequenz:	-	50 / 60 Hz
Control voltage over S11, S13, S41, S43:	pulses max. 23 V at U_N	
Control current over S12, S14, S42, S44:	je 4.5 mA bei U_N	
Min. voltage at terminals S12, S14, S42 S44:	DC 16 V	
Short circuit protection:	internal with PTC	

Output

Contact

BH 5903.03:	3 NO contacts
BH 5903.22:	2 NO, 1 NC contacts (only to be used as monitoring contact)

Operate delay typ. at U_N :

Manual start:	max. 45 ms
Automatic start:	max. 800 ms, if voltage failure > approx. 150 ms max. 7 s, if voltage failure < approx. 150 ms

Release delay typ. at U_N :

Disconnecting the supply:	max. 18 ms
Disconnecting S12, S22:	15 ms

Contact type:

Relay, forcibly guided

Output rated voltage:

AC	250 V
DC:	see continuous limit curve
	≥ 100 mV

Switching of low loads:

Thermal current I_{th} : 5 A

Switching capacity

to AC 15:

NO contact:	AC 3 A / 230 V	IEC/EN 60 947-5-1
NC contact:	AC 2 A / 230 V	IEC/EN 60 947-5-1
to DC 13 at 0.1 Hz:	8 A / DC 24 V	IEC/EN 60 947-5-1

Electrical life

to AC 15 at 2 A, AC 230 V: 10^5 switching cycles IEC/EN 60 947-5-1

Permissible switching frequency:

max. 1 200 switching cycles / h

Short circuit strength

max. fuse rating:	6 A gL	IEC/EN 60 947-5-1
line circuit breaker:	C 8 A	

Mechanical life:

10×10^6 switching cycles

General Data

Operating mode:	Continuous operation	
Temperature range:	operation: $\pm 0 \dots + 50 \text{ }^\circ\text{C}$ storage: $- 25 \dots + 85 \text{ }^\circ\text{C}$	
altitude:	< 2.000 m	
Clearance and creepage distances	rated impuls voltage / pollution degree: 4 kV / 2 (basis insulation) IEC 60 664-1	
EMC	Electrostatic discharge: 8 kV (air) IEC/EN 61 000-4-2 HF-irradiation: 10 V / m IEC/EN 61 000-4-3 Fast transients: 2 kV IEC/EN 61 000-4-4	
Surge voltages between wires for power supply:	1 kV	IEC/EN 61 000-4-5
between wire and ground:	2 kV	IEC/EN 61 000-4-5
HF-wire guided:	10 V	IEC/EN 61 000-4-6
Interference suppression:	Limit value class B EN 55 011	
Degree of protection	Housing: IP 40 IEC/EN 60 529 Terminals: IP 20 IEC/EN 60 529	
Housing:	Thermoplastic with V0 behaviour according to UL subject 94 Amplitude 0.35 mm IEC/EN 60 068-2-6 frequency 10 ... 55 Hz	
Vibration resistance:	Shock resistance: Acceleration: 10 g Duration of impuls: 16 ms Number of shocks: 1000 per axis on all three axes	
Shock resistance:	Climate resistance: 0 / 050 / 04 IEC/EN 60 068-1	
Terminal designation:	EN 50 005	
Wire connection:	1 x 4 mm ² solid or 1 x 2.5 mm ² stranded ferruled (isolated) or 2 x 1.5 mm ² stranded ferruled (isolated) DIN 46 228-1/-2/-3/-4 or 2 x 2.5 mm ² stranded ferruled DIN 46 228-1/-2/-3	
Wire fixing:	Box terminal with wire protection, removable terminal strips	
Mounting:	DIN rail IEC/EN 60 715	
Weight:	320 g	
Dimensions	Width x height x depth BH 5903: 45 x 84 x 121 mm BL 5903: 90 x 84 x 121 mm	

Technical Data

Safety Related Data

Values according to EN ISO 13849-1:

Category:	4	
PL:	e	
MTTF _d :	180.9	a
DC _{avg} :	97.9	%
d _{op} :	365	d/a (days/year)
h _{op} :	24	h/d (hours/day)
t _{Zyklus} :	3600	s/Zyklus
	≅ 1	/h (hour)

Values according to IEC/EN 62061 / IEC/EN 61508:

SIL CL:	3	IEC/EN 62061
SIL	3	IEC/EN 61508
HFT ¹⁾ :	1	
DC _{avg} :	97.9	%
SFF	99.4	%
PFH _D :	5.57E-10	h ⁻¹

¹⁾ HFT = Hardware-Failure Tolerance



The values stated above are valid for the standard type. Safety data for other variants are available on request.

The safety relevant data of the complete system has to be determined by the manufacturer of the system.

Standard Type

BL 5903.03/00000 AC 230 V

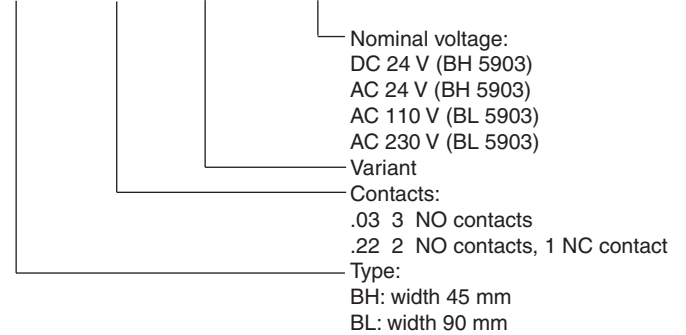
Article number:	0053510
• Output:	3 NO contacts
• for 1 E-stop loop, 2 channel operated	
• Nominal voltage U _N :	AC 230 V
• Width:	45 mm

Variants

B_ 5903._./00000:	for 1 E-stop loop 2- channel operated
B_ 5903._./00020:	for 2 E-Stop loops singel channel operated
BH 5903._./_____/61:	with UL-approval

Ordering example for variant

B_ 5903. _ / _ _ _ _ _ V



UL-Data

The safety functions were not evaluated by UL. Listing is accomplished according to requirements of Standard UL 508, "general use applications"

Nominal voltage U_N: DC 24 V

Ambient temperature: 0 ... +50°C

Switching capacity:

Ambient temperature 50°C: Pilot duty B300
5A 250Vac G.P.
5A 24Vdc

Semiconductor outputs: 24Vdc, 100 mA

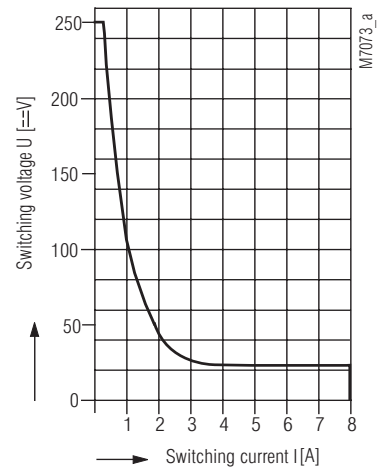
Wire connection:

60°C / 75°C copper conductors only
AWG 20 - 12 Sol Torque 0.8 Nm
AWG 20 - 14 Str Torque 0.8 Nm



Technical data that is not stated in the UL-Data, can be found in the technical data section.

Characteristics



safe breaking, no continuous arcing
under the curve, max. 1 switching cycle/s

Continuous limit curve

Fault Indication by flashing code

The failure codes are displayed by a flashing sequence of the upper yellow LEDs run 1, run 2. Flashing frequency: env. 0.5 s on, 0.05 s off, end of the sequence: env. 2 s off. It is possible that the two processors show different failure codes. If a failure is displayed, the relays K1 and K2 are switched off.

The module BH 5904 shows 2 types of failure codes:

1. FAILURE type 1:

These failures are serious and do not allow further operation of the module. The module can only be reset by switching the power supply off and on again.

2. FAILURE type 2:

This failure is concerning the function faults in conjunction with the safety controller. The module can be reset by pressing the reset button.

Failure type 1

N°*)	Description	Mesures et conseils
0	Internal module failure (LEDs are continuously off)	If both LEDs stay off, the module is defective and has to be repaired.
6	Undervoltage detection or Overvoltage detection	1) Left LED is flashing: The supply voltage dropped below the permitted value (< approx. 0.85 U _N) 2) Right LED is flashing: The supply voltage went over the permitted value (> approx. 1.15 U _N + 5 % residual ripple)
7	Input failure	A short circuit has been detected on the inputs of the unit or the 2 signals of a 2-channel sensor (feedback circuit, start signal of controller, valve) do not correspond (short circuit, broken wire or other fault)
8	Failure on relay output	Output relay defective 1) Check circuit and current. 2) The relay service life is crossing
9	Internal module failure	Please try to evaluate the circumstances that lead to this fault and check with the supplier or manufacturer.
10		
11	Internal module failure	The module has to be repaired
12		
13		
14		

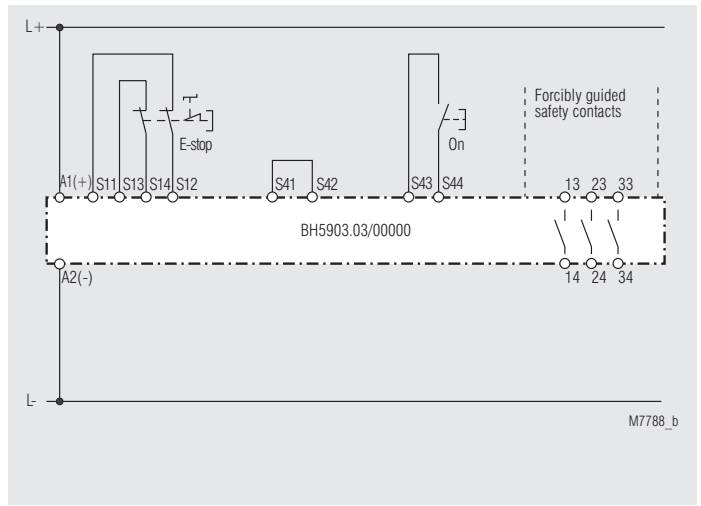
*) No.: Number of flash pulses in a series

Failure type 2

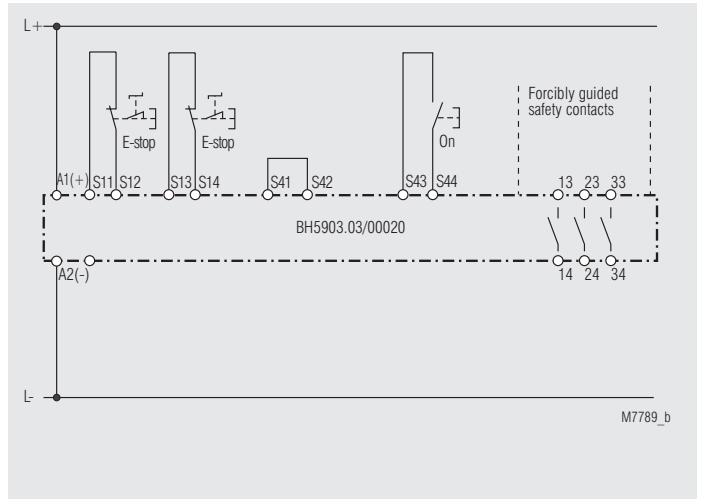
N°*)	Description	Mesures et conseils
1	E-stop activated	
2	Fault on reset button	1) The start button must not be pressed longer than 3 sec. 2) During start up of the unit and initialising the start button must not be pressed
4	Switch off fault	The unit showed already a fault before switching off
6	Feedback failure	Both LED are flashing Feedback on S41/S42 not closed

*) No.: Number of flash pulses in a series

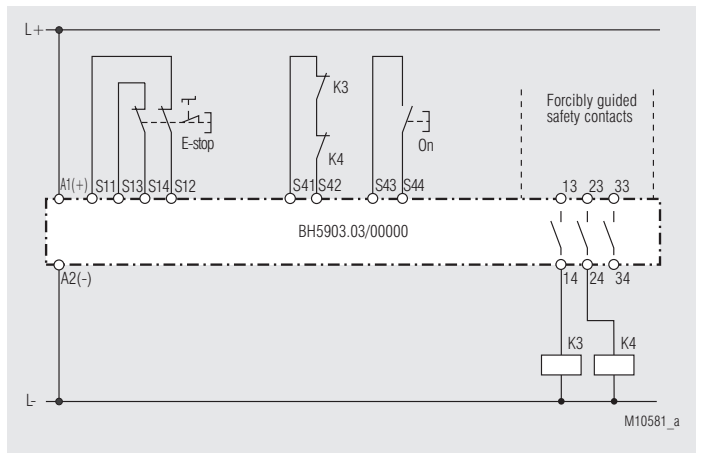
Application Examples



BH 5903.03/00000 with one E-Stop loop (2-channel), automatic restart after phase failure and manual restart after E-stop. Automatic reset is only active when no E-Stop was operated before phase failure.



BH 5903.03/00020 with two E-Stop loops (single-channel), automatic restart after phase failure and manual restart after E-stop. Automatic reset is only active when no E-Stop was operated before phase failure. Max. Cat. 3, PL d because of fault exclusion in the wiring.



BH 5903 with external contact reinforcement