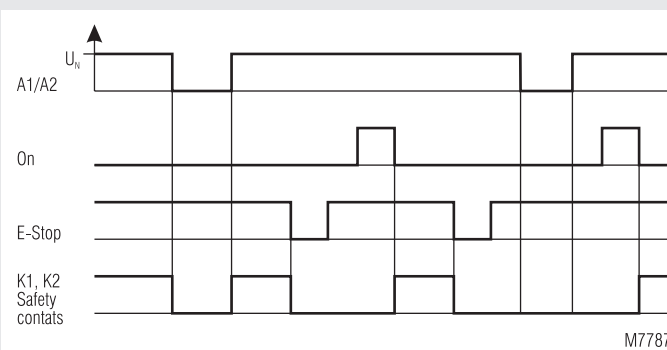


## SAFEMASTER Emergency Stop Module with voltage failure detection BH 5903, BL 5903



- 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 mm<sup>2</sup> stranded ferruled (isolated), DIN 46 228-1/-2/-3/-4 or 2 x 2.5 mm<sup>2</sup> stranded ferruled DIN 46 228-1/-2/-3
- BH 5903: width 45 mm  
BL 5903: width 90 mm

### Function Diagram



M7787

### Approvals and Marking



\* see variants

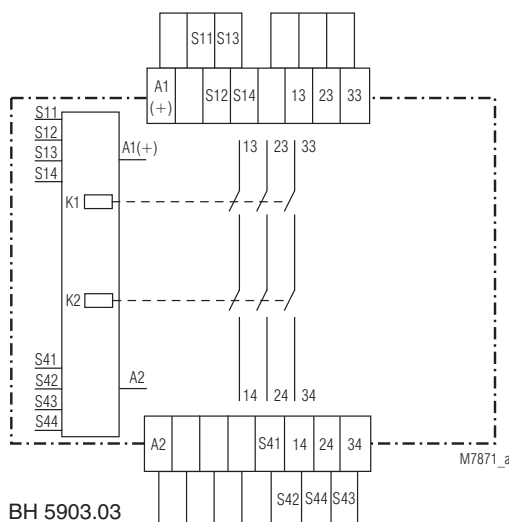
### Indication

- 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

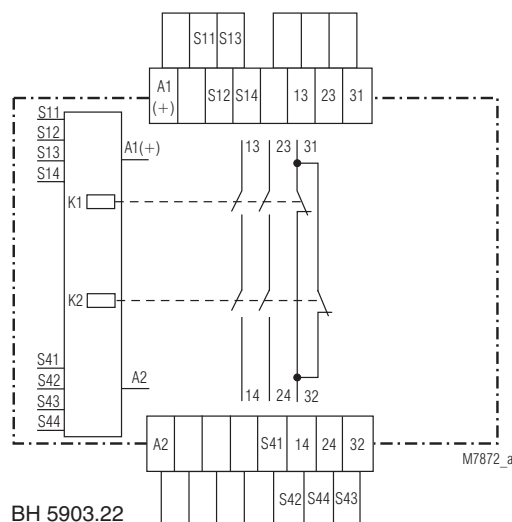
### Notes

- 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

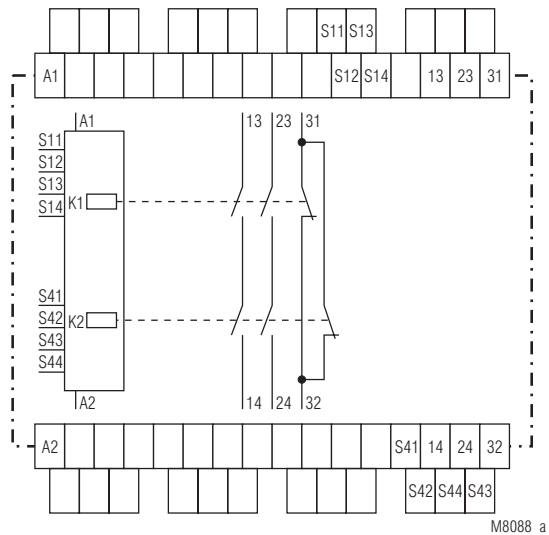
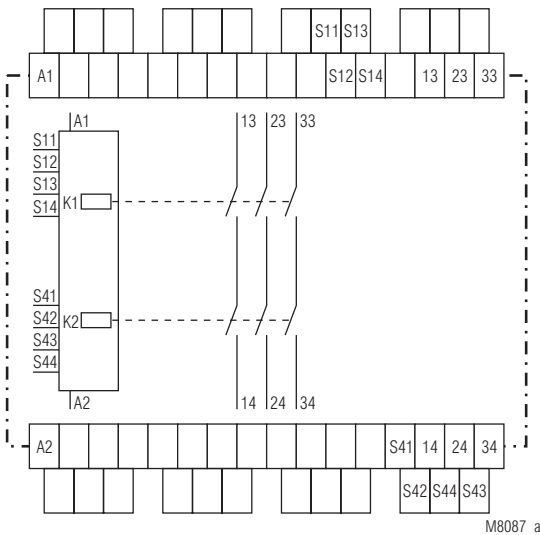


BH 5903.03



BH 5903.22

## Circuit Diagrams



BL 5903.03

BL 5903.22

## Technical Data

### Input

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

<b>Output rated voltage:</b>	Relay, forcibly guided
	AC 250 V
	DC: see continuous limit curve
	$\geq 100$ mV

#### Switching of low loads:

<b>Thermal current <math>I_{th}</math>:</b>	5 A
<b>Switching capacity to AC 15:</b>	
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 <sup>5</sup> 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 x 10 <sup>6</sup> switching cycles
--	---------------------------------------

### General Data

<b>Operating mode:</b>	Continuous operation	
<b>Temperature range operation:</b>	$\pm 0$ ... + 50 °C	
<b>storage :</b>	- 25 ... + 85 °C	
<b>altitude:</b>	< 2.000 m	
<b>Clearance and creepage distances</b>		
rated impuls voltage / pollution degree:	4 kV / 2 (basis insulation) IEC 60 664-1	
<b>EMC</b>		
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
<b>Surge voltages between</b>		
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	
<b>Degree of protection</b>		
Housing:	IP 40	IEC/EN 60 529
Terminals:	IP 20	IEC/EN 60 529
<b>Housing:</b>	Thermoplastic with V0 behaviour according to UL subject 94	
<b>Vibration resistance:</b>	Amplitude 0.35 mm IEC/EN 60 068-2-6 frequency 10 ... 55 Hz	
<b>Shock resistance:</b>		
Acceleration:	10 g	
Duration of impuls:	16 ms	
Number of shocks:	1000 per axis on all three axes	
<b>Climate resistance:</b>	0 / 050 / 04 IEC/EN 60 068-1	
<b>Terminal designation:</b>	EN 50 005	
<b>Wire connection:</b>	1 x 4 mm <sup>2</sup> solid or 1 x 2.5 mm <sup>2</sup> stranded ferruled (isolated) or 2 x 1.5 mm <sup>2</sup> stranded ferruled (isolated) DIN 46 228-1/-2/-3/-4 or 2 x 2.5 mm <sup>2</sup> stranded ferruled DIN 46 228-1/-2/-3	
<b>Wire fixing:</b>	Box terminal with wire protection, removable terminal strips	
<b>Mounting:</b>	DIN rail IEC/EN 60 715	
<b>Weight:</b>	320 g	
<b>Dimensions</b>		
<b>Width x height x depth</b>		
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 <sub>d</sub> :	180.9	a
DC <sub>avg</sub> :	97.9	%
d <sub>op</sub> :	365	d/a (days/year)
h <sub>op</sub> :	24	h/d (hours/day)
t <sub>Zyklus</sub> :	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 <sup>1)</sup> :	1	
DC <sub>avg</sub> :	97.9	%
SFF	99.4	%
PFH <sub>D</sub> :	5.57E-10	h <sup>-1</sup>

<sup>1)</sup> 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

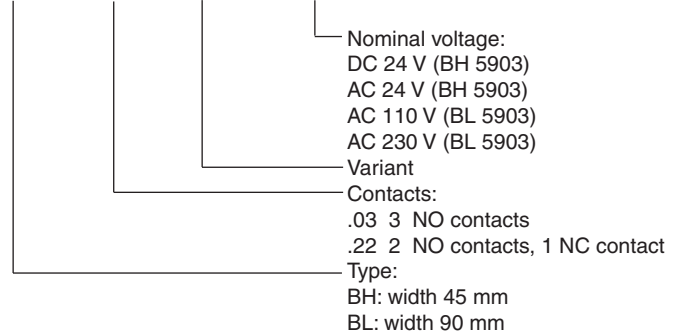
Article number:	0053510
• Output:	3 NO contacts
• for 1 E-stop loop, 2 channel operated	
• Nominal voltage U <sub>N</sub> :	AC 230 V
• Width:	45 mm

## 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<sub>N</sub>: 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

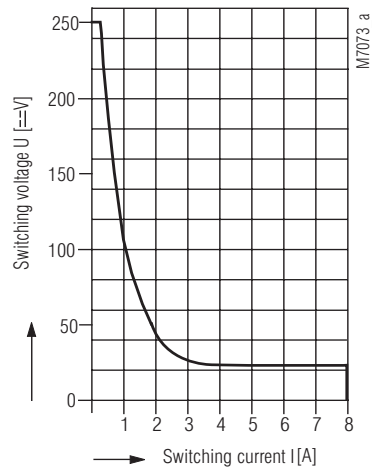
#### Wire connection:

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 <sup>o</sup> *)	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 <sub>N</sub> ) 2) Right LED is flashing: The supply voltage went over the permitted value (> approx. 1.15 U <sub>N</sub> + 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		
10	Internal module failure	Please try to evaluate the circumstances that lead to this fault and check with the supplier or manufacturer.
11		
12		
13	Internal module failure	The module has to be repaired
14		

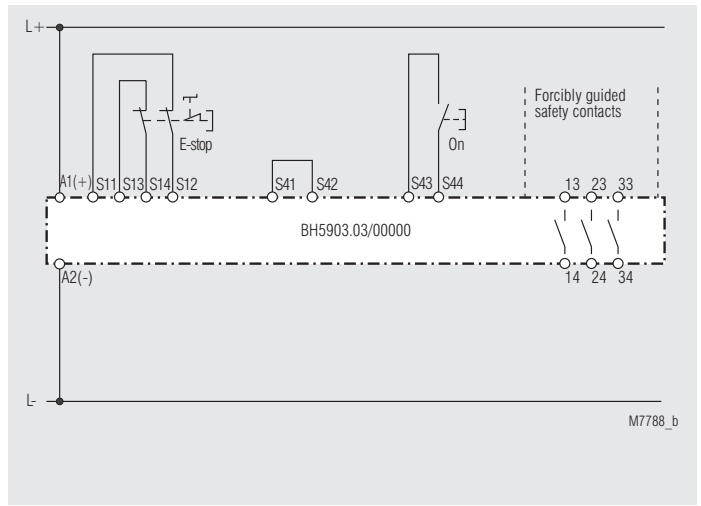
\*) No.: Number of flash pulses in a series

### Failure type 2

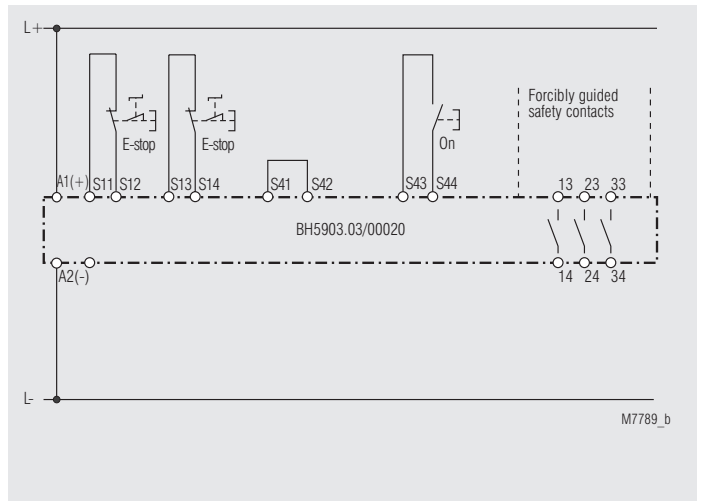
N <sup>o</sup> *)	Description	Mesures et conseils
1	E-stop activated	
2	Fault on reset button	1) The start button must not be pressed longer than 3 sec. 2) During start up of the unit and initialising the start button must not be pressed
4	Switch off fault	The unit showed already a fault before switching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

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

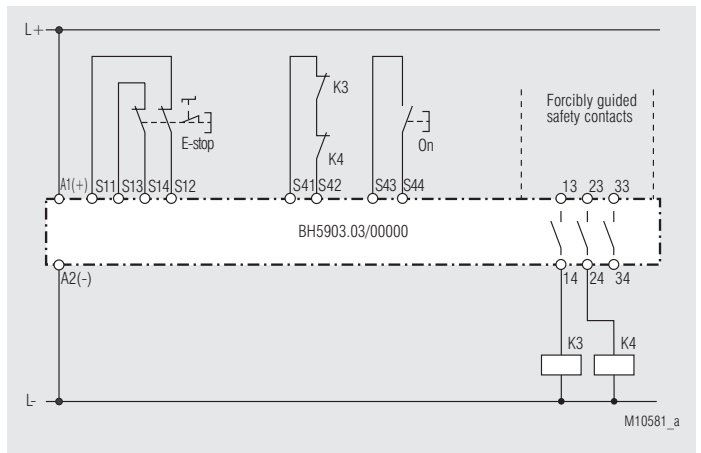
## Application Examples



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