

SAFEMASTER S Speed or Standstill Monitor BH 5932



0223010



- According to
 - Performance Level (PL) e and category 3 to EN ISO 13849-1
 - SIL Claimed Level (SIL CL) 3 to IEC/EN 62061
 - Safety Integrity Level (SIL) 3 to IEC/EN 61508 and IEC/EN 61511
- 2-channel input
- To monitor rotation and linear movement
- PNP proximity sensor inputs
- Optionally inputs for NPN proximity sensors
- Monitoring of connected sensor
- Fixed setting, adjustable as option
- Energized when speed is under setting value
- LED indication
- Feedback circuit X1 - X2 to monitor external contacts
- Forcibly guided contacts
- 2 NO, 1 NC contact
- 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
- Width 45 mm

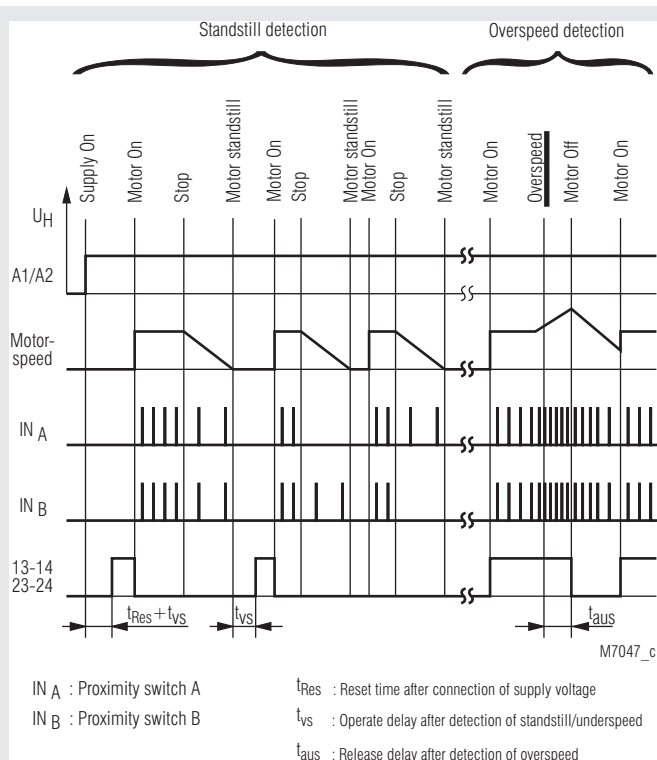
Product Description

The speed monitor BH 5932 provides safe monitoring of motors and rotating equipment. It is used in machines and plants where machine movements or moving parts can be a danger to men and machine.

Approvals and Markings



Function Diagram



Application

Monitoring of speed or standstill also during setup operation

Indication

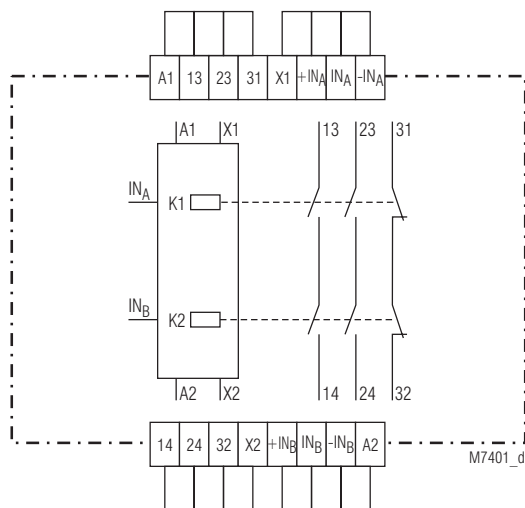
Standstill monitoring:

1. green LED: On, when supply voltage connected
2. green LED: On, when standstill detected on channel 1
3. green LED: On, when standstill detected on channel 2

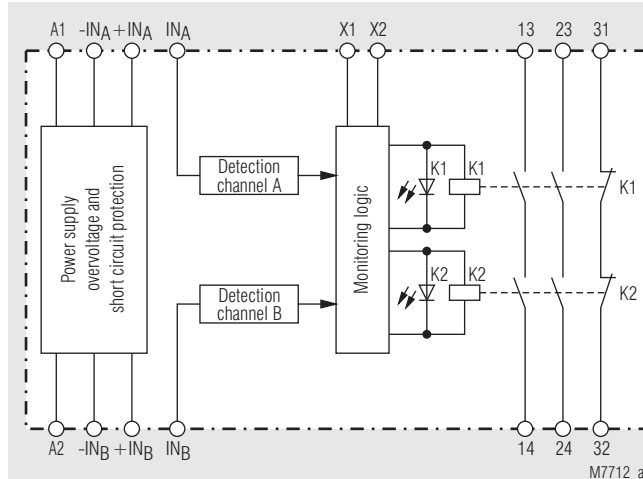
Overspeed monitoring:

1. green LED: On, when supply voltage connected
2. green LED: On, when no overspeed detected on channel 1
3. green LED: On, when no overspeed detected on channel 2

Circuit Diagram



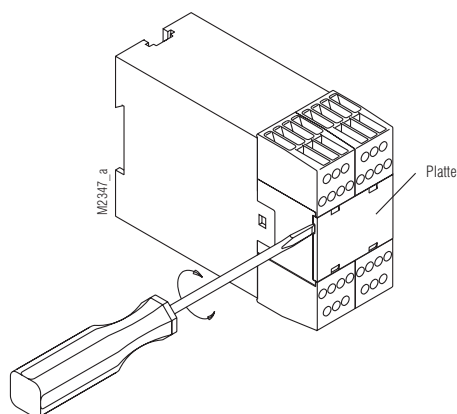
Block Diagram



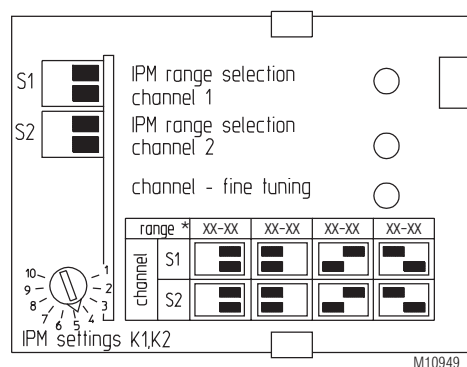
Connection Terminals

Terminal designation	Signal description
A1 (+)	+ / L
A2	- / N
X1, X2	Feedback circuit
+ IN _A , + IN _B	+ Power supply for proximity sensor 1 or 2
- IN _A , - IN _B	- Power supply for proximity sensor 1 or 2
IN _A , IN _B	Measuring output of proximity sensor 1 or 2
13, 14, 23, 24	NO contact forcibly guided for enabling circuit
31, 32	Monitoring output forcibly guided

Unit Programming



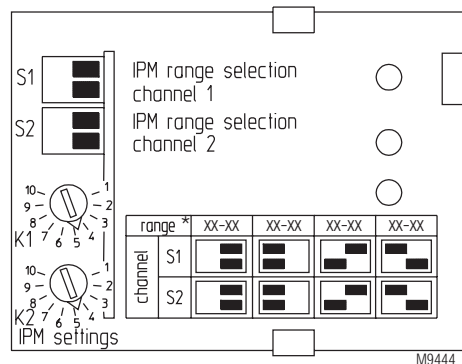
Model with common setting for both input channels



range* : 8-60 / 60-450 / 450-3600 / 1800-14000 lpm
or 7-90 / 60-700 / 470-5500 / 1800-21000 lpm

Only operate switches while unit is disconnected

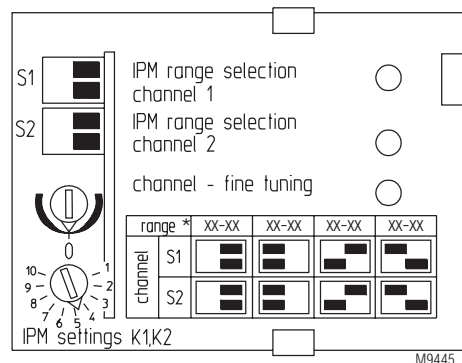
Model with separate adjustable channels



range* : 8-60 / 60-450 / 450-3600 / 1800-14000 lpm
or 20-110 / 120-900 / 950-7000 / 3700-26000 lpm

Only operate switches while unit is disconnected

Model with common setting for both input channels and fine tuning to synchronise both channels



range* : 5-40 / 35-340 / 300-2700 / 1200-10500 lpm
or 10-80 / 80-650 / 600-5300 / 2400-20000 lpm

Only operate switches while unit is disconnected

Notes

The device can be used for standstill and speed monitoring. All units have 2 sensing channels.

Variants

Three main variants are available:

- BH 5932.22/_ _0: Devices with fixed tripping value
- BH 5932.22/_ _2: Devices with separate adjustment for both channels
- BH 5932.22/_ _1: Devices with common adjustment for both channels
- BH 5932.22/_ _3: Devices with common adjustment for both channels and fine tuning to synchronise both channels

Setting ranges

On adjustable units the total range is split up in 4 sub ranges that can be selected with 2 DIP-switches per channel. To adjust the setting value in the selected range the potentiometers are used.

Adjustment of setting range

The number of pulses [lpm] to be adjusted can be calculated using the following formula:

$$\text{Rpm} \times \text{number of sensing spots} = \text{lpm}$$

$$\text{e.g. } 7.5 \text{ Rpm} \times 2 \text{ sensing spots} = 15 \text{ lpm}$$

Operation as standstill monitor

Both channels must be adjusted so that they switch simultaneously. The maximum time after standstill detection until switching of the output relays is depending on the adjusted lpm value. This delay can be calculated as follows:

$$\frac{60 \text{ s}}{\text{adjusted lpm-value}} + 2.5 \text{ s} = t_{\text{vs}}$$

$t_{\text{vs}} \hat{=}$ operate delay after standstill detection

e.g. at a setting of 15 lpm

$$\frac{60 \text{ s}}{15} + 2.5 \text{ s} = 6.5 \text{ s}$$

Operation as overspeed monitor

Especially on overspeed monitoring it is necessary to adjust both channels precisely on simultaneous switching. If the two channels switch not at the same time the disconnection of the drive is only made with the faster channel. The speed can drop immediately so that the slower channel does not detect overspeed and remains switched on. A new start is then disabled and the relay does not switch on again. A restart is only possible by disconnecting the power supply. To achieve an accurate setting the lpm setting value should be in the middle part of the setting range. The adjustment of simultaneous switching is easier on units with separate setting for each channel as on units with fine tuning potentiometer.

Notes

Proximity sensors

For safe operation the proximity sensors should be mounted vibration free. The position of the sensors should be chosen in a way that both sensors are operated simultaneously. Care must be taken that the sensors do not influence each other. The connection of the sensors to the supply is monitored. If there is an interruption in the sensor supply the corresponding output relay cannot be switched on, or if it is already on, it will switch off immediately. To achieve a fault free operation, the sensor must have draw at least 3 mA in off state. If sensors with lower consumption are used only devices without sensor detection can be operated. According to EN ISO 13849-1, the sensors must be checked for correct function in reasonable time intervals.

Feedback circuit, reset, LEDs and timing

The reset circuit X1 - X2 must be closed before connecting the power supply. The unit is ready for operation after typically 1.5 sec after the supply is connected.

The LEDs channel 1 and channel 2 are on when the corresponding relay is energized. The output contacts of the relays will only be activated if both input channels reach the enabling condition within a time span of approx. 2 sec. If the response value is not reached on both channels within this time, e.g. because of a defective sensor or because the sensors do not simultaneously switch the output contacts are not enabled.

Technical Data

Input

Nominal voltage U_N:	AC/DC 24 V AC 110, 230 V
Voltage range	
AC:	0.85 ... 1.1 U_N
DC:	0.9 ... 1.1 U_N
Nominal consumption:	Approx. 4 VA, 2.5 W
Nominal frequency	50 / 60 Hz
Frequency range:	45 ... 65 Hz
Start up reset time t_{Res}:	1.5 s
Hysteresis:	Typ. 6 %

Inputs for NPN- or optional PNP Proximity Sensors

Input voltage:	DC 24 V
Input current:	max. 25 mA (per channel)
Min. current of sensor	3 mA
Min. pulse time:	1 ms On, 1 ms Off
Max. lpm at inputs	
IN_A und IN_B:	30000 lpm

Speed Ranges [lpm]

Devices with fixed tripping value

BH 5932.22/_ _0:	15 / 30 / 60 / 120 lpm, fixed others on request (the output contacts close, when the speed is under the fixed lpm values)
Operate delay at standstill:	See formula
Release delay on overspeed:	t_{aus} = typ. 700 ms

Devices with separate adjustment for both channels

BH 5932.22/_ _2	
Range 8 ... 14000 lpm:	Adjustable in 4 subranges 8 ... 60, 60 ... 450, 450 ... 3600, 1800 ... 14000 lpm
or	
range 20 ... 26000 lpm:	Adjustable in 4 subranges 20 ... 110, 120 ... 900, 950 ... 7000, 3700 ... 26000 lpm
Operate delay at standstill:	See formula
Release delay on overspeed	
Range 8 ... 14000:	t_{off} = typ. 700 ms
Range 20 ... 26000:	t_{off} = typ. 350 ms

Devices with common adjustment for both channels

BH 5932.22/_ _1	
Range 8 ... 14000 lpm:	Adjustable in 4 subranges 8 ... 60, 60 ... 450, 450 ... 3600, 1800 ... 14000 lpm oder
Range 7 ... 21000 lpm:	Adjustable in 4 subranges 7 ... 90, 60 ... 700, 470 ... 5500, 1800 ... 21000 lpm
Operate delay at standstill:	See formula
Release delay on overspeed	
Range 8 ... 14000:	t_{aus} = typ. 700 ms
Range 7 ... 21000:	t_{aus} = typ. 350 ms

Devices with common adjustment for both channels and fine tuning to synchronise both channels

BH 5932.22/_ _3	
Range 5 ... 10500 lpm:	Adjustable in 4 subranges 5 ... 40, 35 ... 340, 300 ... 2700, 1200 ... 10500 lpm
or	
range 10 ... 20000 lpm:	Adjustable in 4 subranges 10 ... 80, 80 ... 650, 600 ... 5300, 2400 ... 20000 lpm
Operate delay at standstill:	See formula
Release delay on overspeed	
Range 5 ... 10500:	t_{off} = typ. 700 ms
Range 10 ... 20000:	t_{off} = typ. 350 ms

Technical Data

Output

Contacts:	2 NO, 1 NC
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The NO contacts are safety contacts.

ATTENTION! The NC contacts 31-32 can only be used for monitoring.

Contact type:	forcibly guided
Thermal current I_{th}:	4 A
Switching current:	AC: 8 A cos φ 1 ... 0.7
Switching capacity according to AC 15	
NO contact:	3 A / AC 230 V IEC/EN 60947-5-1
NC contact:	1 A / AC 230 V IEC/EN 60947-5-1
according to DC 13	
NO contact:	1 A / DC 24 V IEC/EN 60947-5-1
NC contact:	1 A / DC 24 V IEC/EN 60947-5-1
according to DC 13	
NO contact:	4 A / DC 24 V at 0.1 Hz
NC contact:	4 A / DC 24 V at 0.1 Hz
Elektrical life at 5 A, AC 230 V cos φ = 1:	IEC/EN 60947-5-1 $\geq 2 \times 10^5$ switching cycles
Short-circuit strength	
max. fuse rating:	4 A gG / gL IEC/EN 60947-5-1
Mechanical life:	$\geq 50 \times 10^6$ switching cycles

General Data

Operating mode:	Continuous operation
Temperature range operation:	- 25 ... + 60 °C
storage :	- 25 ... + 85 °C
altitude:	≤ 2000 m
Clearance and creepage distances rated impulse voltage / pollution degree	IEC 60664-1
Input / output	4 kV / 2
EMC Interference suppression	IEC/EN 61326-3-1, IEC/EN 62061
Auxiliary voltage	
AC 110 V, AC 230 V:	Limit value class B EN 55011
AC/DC 24V:	Limit value class A*) EN 55011
*) The device is designed for the usage under industrial conditions (Class A, EN 55011). When connected to a low voltage public system (Class B, EN 55011) radio interference can be generated. To avoid this, appropriate measures have to be taken.	

Degree of protection

Housing:	IP 40 IEC/EN 60529
Terminals:	IP 20 IEC/EN 60529
Housing:	Thermoplastic with V0 behaviour according to UL subject 94

Vibration resistance:

Climate resistance:

Terminal designation:	Amplitude 0.35 mm frequency 10 ... 55 Hz IEC/EN 60068-2-6 25 / 060 / 04 IEC/EN 60068-1
Wire fixing:	EN 50005 Plus-minus terminal screws M3.5 box terminals with wire protection
Mounting:	DIN rail IEC/EN 60715
Weight:	410 g

Dimensions

Width x height x depth:	45 x 85 x 121 mm
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UL-Data

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

Switching capacity:

Ambient temperature 60°C: Pilot duty B300
4A 250Vac G.P.
4A 24Vdc

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.

Standard Type

BH 5932.22/112/61 AC/DC 24 V 20 ... 26000 lpm

Article number: 0059482

BH 5932.22/112/61 AC/DC 24 V 8 ... 14000 lpm

Article number: 0065009

• Output: 2 NO, 1 NC contacts

• Nominal voltage U_N : DC 24 V

• Input: For pnp-sensors and with sensor detection

• Width: 45 mm

Accessories

NA 5001, NA 5002¹⁾,
NA 5005¹⁾, NA 5010: Proximity Sensors, inductive

¹⁾ Proximity sensors NA 5002 and NA 5005 can only be used for devices without proximity sensor presence detection!



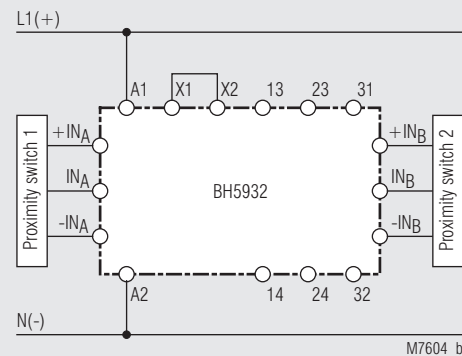
For further information on the proximity sensors, please refer to the associated NA 5001 data sheet at www.dold.com.

Ordering example for variants

BH 5932 .22 / / /61 AC 230 V 50/60 Hz 60 lpm

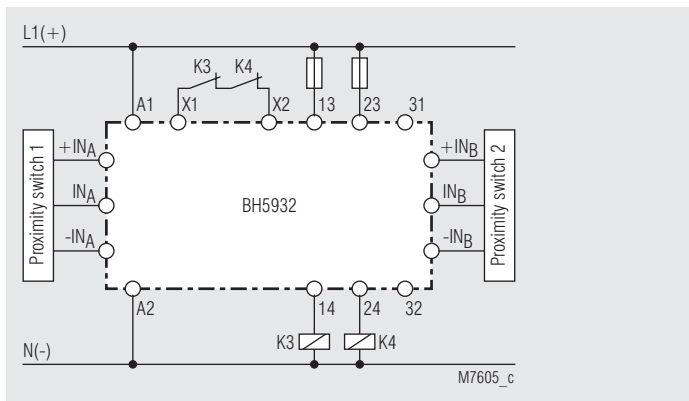
Setting value
Nominal frequency
Nominal voltage
UL approval
Variants, if required
0 = Fixed response value
1 = Adjustable setting value channel 1 and 2 together adjustable
2 = Adjustable setting value channel 1 and 2 separated adjustable
3 = Adjustable setting value channel 1 and 2 together adjustable with fine tuning to synchronise both channels
0 = npn-input
1 = npn-input
0 = Without sensor detection
1 = With sensor detection
Contacts
Type

Connection Example

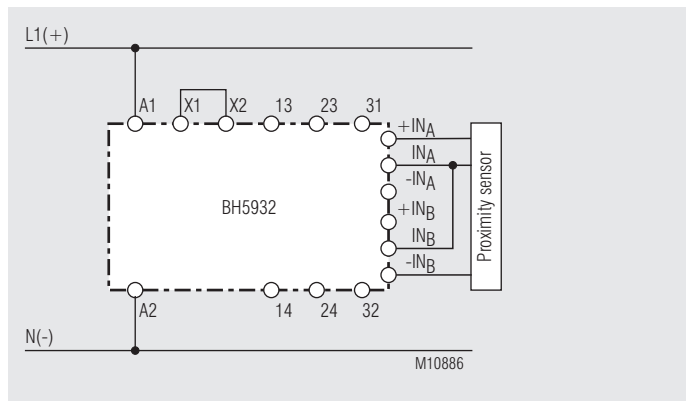


Standard connection
suited up to SIL3, Performance Level e, Cat. 3

Connection Examples

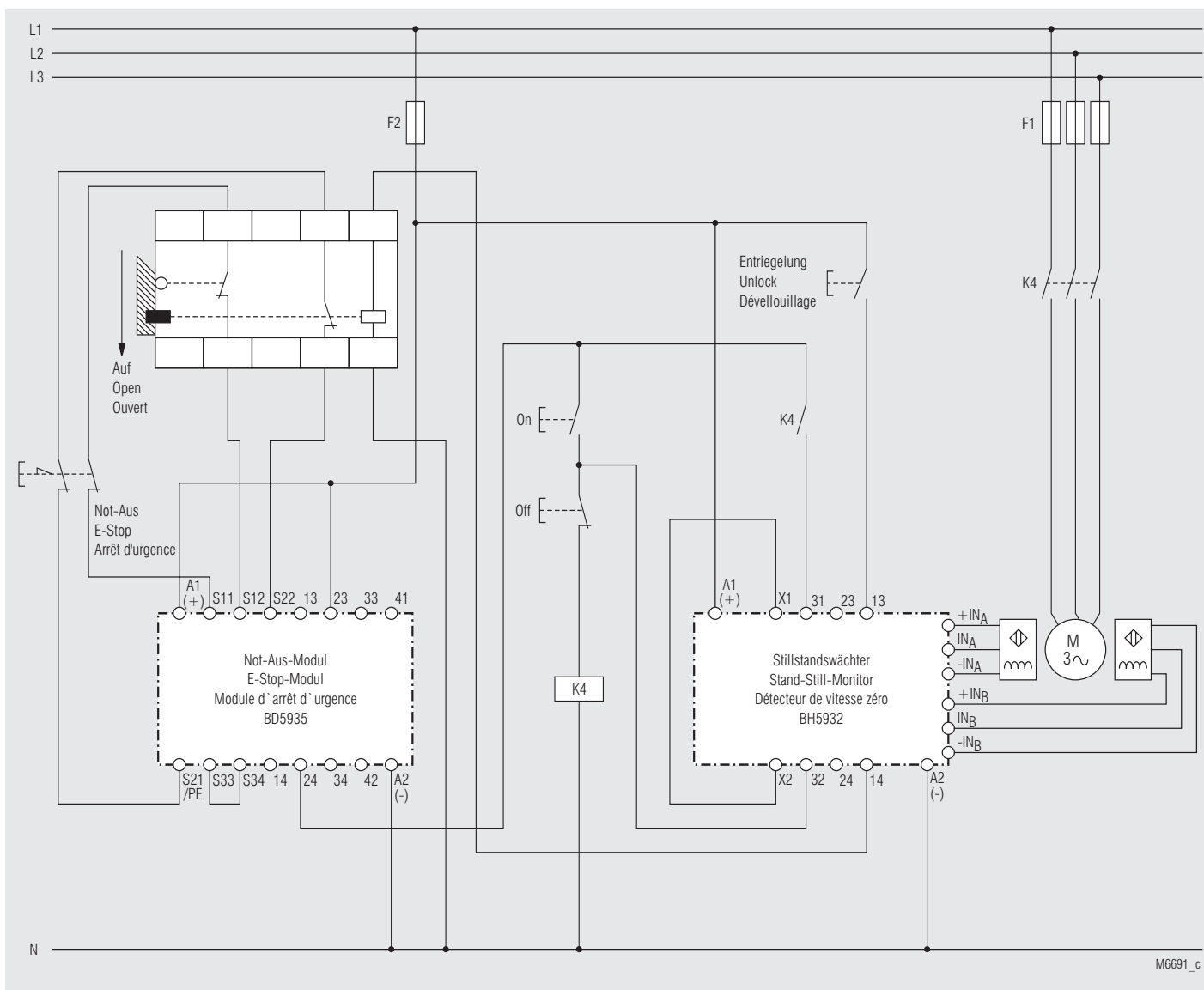


Connection with external contactors,
suited up to SIL3, Performance Level e, Cat. 3



Connection with proximity sensors
suited up to SIL2, Performance Level c, Cat. 2
(to achieve Cat. 2 the safety function has to be tested on a regular base.)

Application Example



Suited up to SIL3, Performance Level e, Cat. 3