Safety Technique

SAFEMASTER
Emergency Stop Monitor
BH 5922, BL 5922

CANopen®
## Profibus

DOLD ®

BH 5922   BL 5922

- To monitor max. 16 single-channel e-stop buttons or 8 2-channel e-stop buttons
- E-stop button can be connected directly to BH 5922
- Simple wiring of e-stop buttons
- Extendable in steps of 8 e.g. 16 inputs
- No influence on e-stop system
- Adjustable
  - with manual reset (without link X1 / X2)
  - with automatic reset (with link X1 / X2)
- Reset button and remote reset
- LED indicators to show the state of the e-stop buttons
- As option direct connection of 2-channel e-stop buttons to BH 5922 / BL 5922
- As option with BCD output (high or low active) or CANopen
- As option with CANopen according to DS301 version 3.0
- as option with Profibus DP-V0
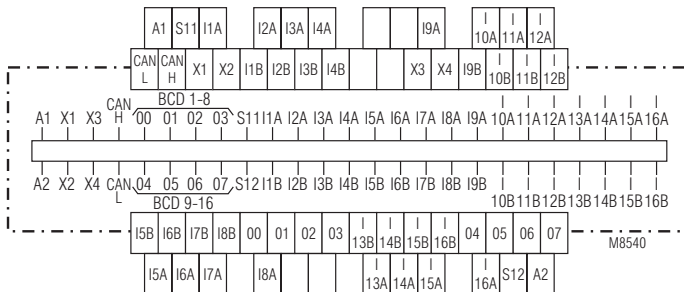- BH 5922: width 45 mm
  BL 5922: width 90 mm

Circuit Diagrams
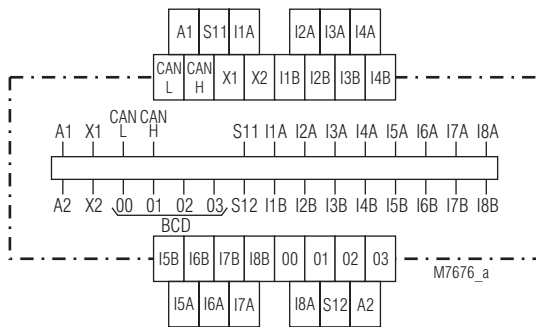
E-stop button single-channel connection (8 inputs)
BH 5922.08, BH 5922.08/00_, BH 5922.08/10_
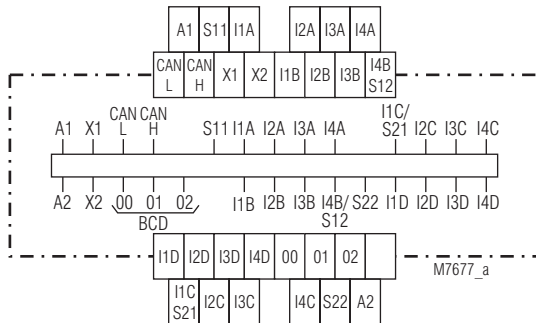
E-stop button 2-channel connection (4 inputs)
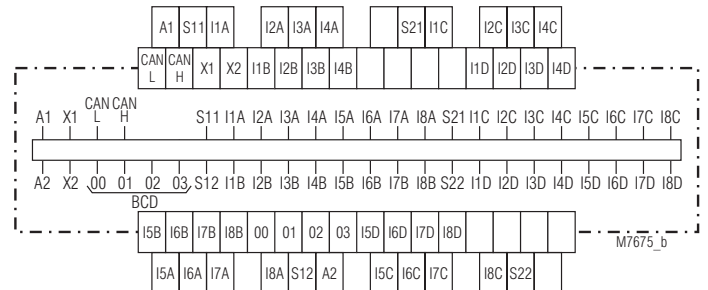BH 5922.04/01_, BH 5922.04/11_

E-stop button single-channel connection (16 inputs)
BL 5922.16/00_, BL 5922.16/10_

Approvals and Markings

CE

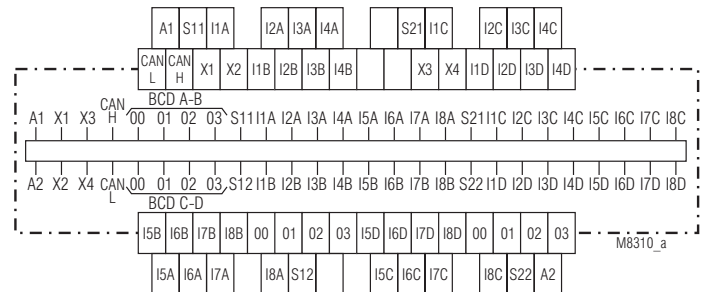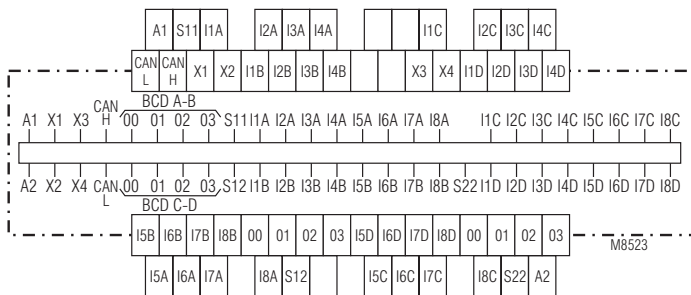### Circuit Diagrams

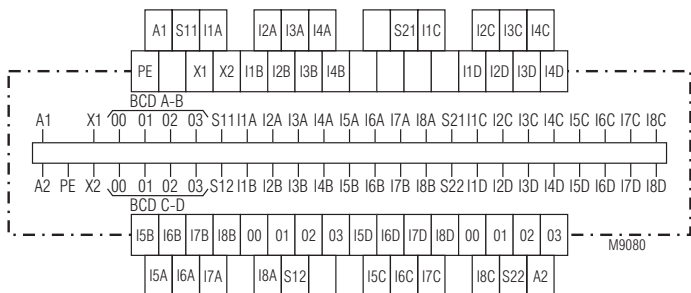**E-stop button 2-channel connection (8 inputs)**
BL 5922.08/01_, BL 5922.08/11_

E-stop button 2-channel connection, 2-channel reset for cross fault monitoring systems (8 inputs)
BL 5922.08/03_, BL 5922.08/13_

All technical data in this list relate to the state at the moment of edition. We reserve the right for technical improvements and changes at any time.
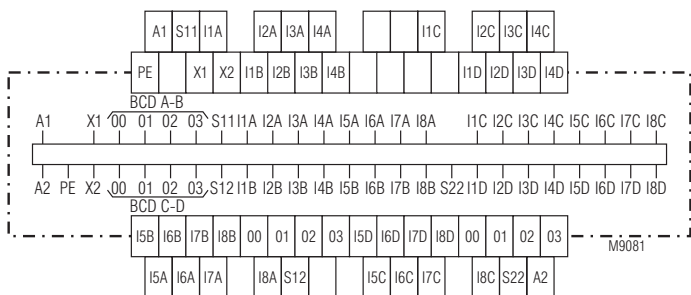
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Circuit Diagrams

E-stop button 2-channel connection, 2-channel reset for systems without cross fault monitoring (8 inputs)
BL 5922.08/02_, BL 5922.08/12

E-stop button 2-channel connection, 2-channel reset for systems without cross fault monitoring (8 inputs)
BL 5922.08/23_

E-stop button 2-channel connection, 2-channel reset for systems without cross fault monitoring (8 inputs)
BL 5922.08/22_

Application

Indication of the status of e-stop buttons in an e-stop chain. We recommend to use the BH 5922 together with DOLD E-stop modules (approval).

Function

If all the e-stop buttons are closed all green LEDs are on. If one button is activated the corresponding LED goes off.

The e-stop buttons are connected in series, therefore only one LED goes off even if several buttons are pressed. Only the first activated button in the row is indicated. When this e-stop button is released again the LED lights up again and the LED of the next activated button in the row goes off.

If the variant B_ 5922/0_2, B_ 5922/0_4, B_ 5922/0_5, B_ 5922/1_2, B_ 5922/1_4, B_5922/1_5 is connected to a IP 5503 in Plug and Play modus the outputs show the state of the E-stop buttons and the LEDs the state of the status LEDs I1 - I8 on the e-stop monitor.

Indicators

Green LED "On":	on, when supply connected
Green LED "RDY":	on, when ready for operation (only with B_ 5922/2_ _)
Yellow LED:	on, when bus active (only with variants with fieldbus)
rote LED "ERR":	on, when indicating failure (only with B_ 5922/2_ _)
Green status LEDs:	Continuous: when all e-stop buttons are closed

Off:
when corresponding e-stop button is pressed
Flashing of one status LED only when:
- manual reset and
- released e-stop buttons and
- signal not reset
  Reset can be made with button on front
  or with remote reset-button.
Flashing of all status LEDs:
The input S11 of the e-stop monitor is not connected. A reason could be a broken wire between this terminal and S11 of the e-stop module. When several e-stop monitors are connected in series this status also occurs when the previous shows an activated e-stop button.

Notes

When using B_ 5922/00_ or B_ 5922/01_ for single channel monitoring or 2-channel connection of the e-stop chain the e-stop monitor has to be conected to the loop between S11 and S12 of the e-stop module. In this way channel AB is monitored.

In a 2-channel e-stop loop, the e-stop monitor has to be connected to the channel which normally is between the terminals S11 and S12 of the e-stop module. The E-stop monitor and the e-stop module have to be connected to the same DC 24 V power supply. When using an E-stop module with AC-supply the minus-terminal of the e-stop monitor (A2) must be connected to the minus-terminal of the e-stop control voltage (S21 or PE) on the e-stop module.

CANopen mode (B_ 5922 /0_ _, B_ 5922/1_ _)

With switch position "CANopen" the CANopen protocol is active on the interface. The configuration is made with the programming software PN 5501 in conjunction with minimaster IL 5504 / IN 5504 or e.g. with ProCANopen. The corresponding configuration file on CD can be ordered under order no. PN 5501, article no. 0052860

Plug and Play mode (B_ 5922 /0_ _, B_ 5922/1_ _)

With switch position "Plug and Play" a variant of the CANopen protocol is active on the interface. The unit setting is done with a switch on the front, see picture below. If a system is on plug and play mode it can be switched over to CANopen protocol at any time.

Address setting Plug and Play mode

To allow the E-stop monitor to communicate with a corresponding device via the CAN-bus the addresses have to be set with the 2 rotational switches on the front according to the table below. Adresses between 1...49, 51...99 are possible. Adress 0 and 50 cannot be chosen in Plug and Play mode.

E-stop monitor BH/BL 5922 with address	transmits to	output module IP 5503 with address
1	→	51
.		.
.		.
49	→	99

Example of setting: Address 14
left switch 10^1: to position 1 x 10^1
right switch 10^0: to position 4 x 10^0

Notes for Plug and Play mode

On the BL-models with 2-channel monitoring of the e-stop loop 2 addressees and 2 transmission rates can be chosen (channel AB and channel CD). For correct operation the adress settings must be different and the transmisson rate settings must be the same.
The screen of the bus wire has to be connected to A2 of the e-stop monitor.

Set-up procedure

1.) Connect CAN-bus to terminals CAN_L and CAN_H
2.) Terminate the physical end of the bus by connecting a termination resistor of 120 Ω between CAN_L and CAN_H on the first and last module of the bus
3.) Connect screen of bus wire to A2
4.) Select transmission rate (e.g. 20 K bit/sec) using the rotational switch on the front (see drawing)
5.) Select address of the module using rotational switches on the front (see drawing and above example)

Attention:
- To communicate in a system configured for Plug and Play modus it is necessary to connect one BH/BL 5922 with adress 1 to the CAN-bus.
- The device adress, the transmission rate and the change of operating mode between CANopen and Plug and Play will only be accepted when the device is powered up.

M6316
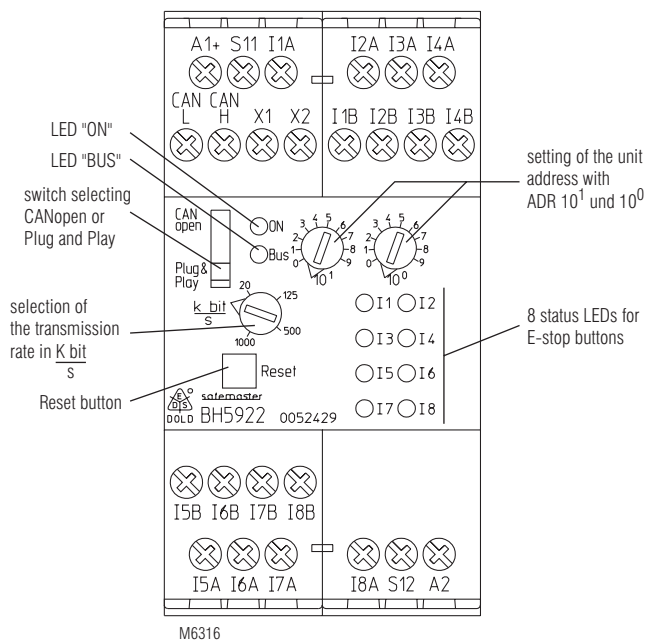
Connection with Profibus (BL 5922 /2_ _)

The connection to Profibus DP is made via a Sub D connector socket on the front of the device. The standard for installation according to the PNO-document "Installation Guideline for Profibus DP/FMS" have to be observed.

Configuration of the device

The address (01 to 99) of the module for the Profibus System is adjusted with the rotary switches ADR10 and ADR1. To configure the network the device configuration file "EDSO8E8.lsd" is necessary. It can be found on the DOLD-CD PN 5501 in the directory Profibus/GSD.
Order number: PN 5501, article number 0052860

M9083
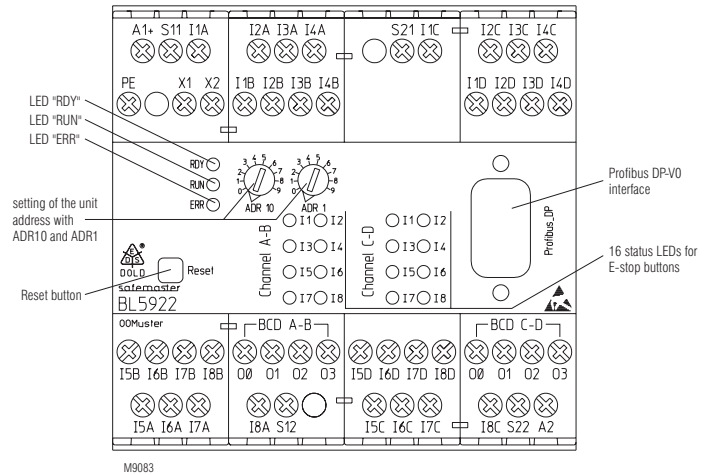
Description of Data Transmission for units with bus interface

a) CANopen
   The transmit PDO has follow structure:

Read8Inputs	Read8Inputs_old	Status8Inputs	Saved8Inputs	Dummy1	Dummy2	Dummy3	Device_ID

b) Profibus

Kanal A - B			Kanal C - D		
Read8Inputs	Status8Inputs	Saved8Inputs	Read8Inputs	Status8Inputs	Saved8Inputs

The bytes in the data string have the following content:

Read8Inputs: State of the e-stop buttons
  Bit x = 0 e-stop button
  Bit x = 1 e-stop button not active

Read8Inputs_old
(only with CANopen): State of e-stop button at time t-1. The designation of the bits is the same as with Read8Inputs

Saved8Inputs: Latched state of the e-stop buttons, if the e-stop monitor is operated in manual reset mode.
  To detect that the manual reset mode is selected bit 1 in byte Status8Inputs can be used.

Status8Inputs: Actual state of e-stop monitor
  Bit 0 = 1 One e-stop button is activated
  Bit 1 = 1 E-stop monitor aperated in manual reset mode
  Bit 2 = 1 The e-stop monitor was acknowledgement (activation of reset button or remote reset)
  Bit 3 = 1 At the beginning of the e-stop loop (terminal S11 or S21) the correct voltage is present. If bit 3 is 0 then the wire between e-stop modul and e-stop monitor is interrupted.

Device_ID
(only with CANopen): Device Id = 0 x 0 C E-stop monitor for connection of 4 e-stop buttons (.04)
         Device Id = 0 X 0 D E-stop monitor for connection of 8 e-stop buttons (.08)

Dummy 1-3
(only with CANopen): not used Bytes

Possible state of the bytes depending on the activation of the e-stop buttons:

Mode	actuation	active			not active			reset		
		E*	ST*	SP	E*	ST*	SP	E*	ST*	SP
auto reset mode	Initial position	FF	0C	FF	FF	0C	FF			
	no S11	FF	04	FF	FF	0C	FF			
	S1 active	FE	0D	FE	FF	0C	FF			
	S2 active	FD	0D	FD	FF	0C	FF			
	S3 active	FB	0D	FB	FF	0C	FF			
	S4 active	F7	0D	F7	FF	0C	FF			
	S5 active	EF	0D	EF	FF	0C	FF			
	S6 active	DF	0D	DF	FF	0C	FF			
	S7 active	BF	0D	BF	FF	0C	FF			
	S8 active	7F	0D	7F	FF	0C	FF			
manual reset mode	Initial position	FF	0E	FF	FF	0E	FF	FF	0E	FF
	no S11	FF	06	FF	FF	0E	FF	FF	0E	FF
	S1 active	FE	0B	FE	FF	0A	FE	FF	0E	FF
	S2 active	FD	0B	FD	FF	0A	FD	FF	0E	FF
	S3 active	FB	0B	FB	FF	0A	FB	FF	0E	FF
	S4 active	F7	0B	F7	FF	0A	F7	FF	0E	FF
	S5 betätigt	EF	0B	EF	FF	0A	EF	FF	0E	FF
	S6 active	DF	0B	DF	FF	0A	DF	FF	0E	FF
	S7 active	BF	0B	BF	FF	0A	BF	FF	0E	FF
	S8 active	7F	0B	7F	FF	0A	7F	FF	0E	FF

*) E = Value for Read8Inputs
 ST = Value for Status8Inputs
 SP = Value for Saved8Inputs

BCD output, high active: (only with B_ 5922/001, B_ 5922/011)

O3	O2	O1	O0	description
0	0	0	0	input S11 without voltage
0	0	0	1	E-stop 1 active
0	0	1	0	E-stop 2 active
0	0	1	1	E-stop 3 active
0	1	0	0	E-stop 4 active
0	1	0	1	E-stop 5 active
0	1	1	0	E-stop 6 active
0	1	1	1	E-stop 7 active
1	0	0	0	E-stop 8 active
1	1	1	1	no E-stop active

BCD output, low active: (only with B_ 5922/003, B_ 5922/013)

O3	O2	O1	O0	description
1	1	1	1	input S11 without voltage
1	1	1	0	E-stop 1 active
1	1	0	1	E-stop 2 active
1	1	0	0	E-stop 3 active
1	0	1	1	E-stop 4 active
1	0	1	0	E-stop 5 active
1	0	0	1	E-stop 6 active
1	0	0	0	E-stop 7 active
0	1	1	1	E-stop 8 active
0	0	0	0	no E-stop active

BCD output, high active: (only with B_ 5922/021, B_ 5922/031)

O7	O6	O5	O4	O3	O2	O1	O0	description
0	0	0	0	0	0	0	0	input S11 without voltage
0	0	0	1	0	0	0	1	E-stop 1 active
0	0	1	0	0	0	1	0	E-stop 2 active
0	0	1	1	0	0	1	1	E-stop 3 active
0	1	0	0	0	1	0	0	E-stop 4 active
0	1	0	1	0	1	0	1	E-stop 5 active
0	1	1	0	0	1	1	0	E-stop 6 active
0	1	1	1	0	1	1	1	E-stop 7 active
1	0	0	0	1	0	0	0	E-stop 8 active
1	1	1	1	1	1	1	1	no E-stop active

BCD output, low active: (only with B_ 5922/023, B_ 5922/033)

O7	O6	O5	O4	O3	O2	O1	O0	description
1	1	1	1	1	1	1	1	input S11 ist without voltage
1	1	1	0	1	1	1	0	E-stop 1 active
1	1	0	1	1	1	0	1	E-stop 2 active
1	1	0	0	1	1	0	0	E-stop 3 active
1	0	1	1	1	0	1	1	E-stop 4 active
1	0	1	0	1	0	1	0	E-stop 5 active
1	0	0	1	1	0	0	1	E-stop 6 active
1	0	0	0	1	0	0	0	E-stop 7 active
0	1	1	1	0	1	1	1	E-stop 8 active
0	0	0	0	0	0	0	0	no E-stop active

0 = voltage on output: 0 V
1 = voltage on output: 24 V

CANopen interface (B_5922/0_ _, B_5922/1_ _)

B_5922/1_ _:	according to ISO 11 898-1, galvanic separation
wiring:	screened twisted pair
transmission rate:	settable 20 K bit/s, 125 K bit/s, 500 K bit/s, 1 M bit/s,
max. length:	20 K bit/s = 2500 m
	125 K bit/s = 500 m
	500 K bit/s = 100 m
	1 M bit/s = 25 m

Plug and Play

transmission rate:	20 K bit / sec (recommended)

Attention:

⚠ Both physical ends of the 2-wire system must be terminated with a 120 Ω resistor between the terminals CAN_L and CAN_H.

Profibus-interface (B_ 5922/2_ _)

Wire:	screened twisted pair IEC 61 158
Protokoll:	Profibus DP-V0
max. lengt:	1200 m at 9,6 Kbit/s ... 45,45 Kbit/s
	1000 m at 93,75 Kbit/s ... 137,5 Kbit/s
	400 m at 500 Kbit/s
	200 m at 1500 Kbit/s
	100 m at 3000 Kbit/s ... 1200 Kbit/s

The installation guidelines according to the PNO-document "Installation Guideline for the Profibus DP/FMS" have to be observed in respect to the max. length of a bus segment. The PE terminal has to be connected to ground.

Input

Nominal voltage U_N (A1/A2):	DC 24 V
Voltage range:	0,8 ... 1,1 U_N
Control voltage on S11/S12:	DC 24 V
Reset input X_1, X_2:	Voltfree contact
BCD interface:	
Output (O0,O1,O2, O3):	Transistor switching +
switched /auxiliary voltage:	DC 24 V
Switching capacity:	40 mA short circuit proof
Residual voltage:	typ. 0,6 V

General Data

Operating mode:	Continuous operation
Temperature range:	- 20 ... + 60 °C
EMC	
Electrostatic discharge:	8 kV (air) IEC/EN 61 000-4-2
Surge proof against wire bound surges, induced by high frequency fields:	10 V class 3, f = 150 kHz - 80 MHzIEC/EN 61 000-4-6
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
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 to UL subject 94
Vibration resistance:	Amplitude 0,35 mm IEC/EN 60 068-2-6 frequency 10 ... 55 Hz
Climate resistance:	20 / 060 / 04 IEC/EN 60 068-1
Terminal designation:	EN 50 005
Wire connection:	1 x 4 mm² solid or
	1 x 2,5 mm² stranded ferruled or
	2 x 1,5 mm² stranded ferruled DIN 46 228-1/-2/-3/-4 or
	2 x 2,5 mm² stranded ferruled DIN 46 228-1/-2/-3
Wire fixing:	Terminal screws M3.5, box terminals with wire protection
Mounting:	DIN rail IEC/EN 60 715
Weight:	approx. 255 g (BH 5922); approx. 470 g (BL 5922)

Dimensions

Width x height x depth:

BH 5922:	45 x 86 x 121 mm
BL 5922:	90 x 86 x 121 mm

Safety Related Data

Info Safety data are available on request

Standard Types

BH 5922.08   DC 24 V
Article number: 0052427
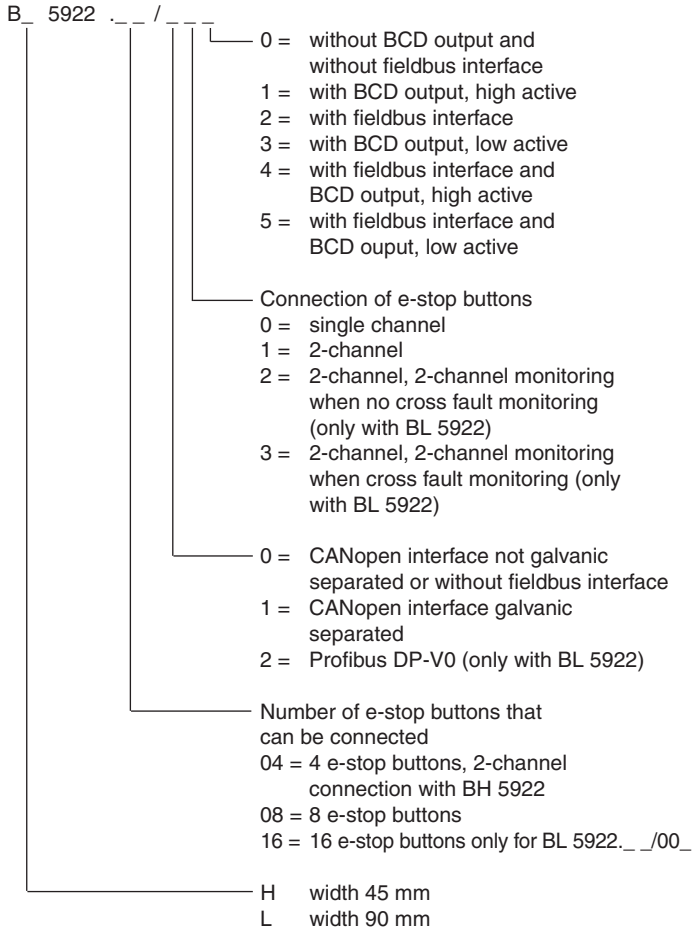- for 8 e-stop-buttons, single channel connection
- Nominal voltage U_N: DC 24 V
- Width: 45 mm
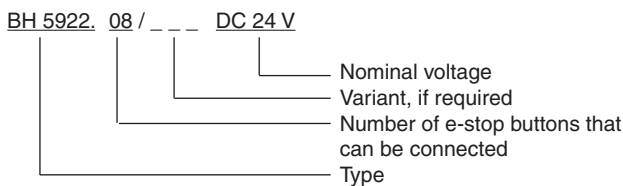
BL 5922.08/010   DC 24 V
Article number: 0052430
- for 8 e-stop buttons, 2-channel connection
- Nominal voltage U_N: DC 24 V
- BH 5922:   45 mm width
 BL 5922:   90 mm width

Variants

B_ 5922 ._ _ / _ _ _

- 0 = without BCD output and
      without fieldbus interface
- 1 = with BCD output, high active
- 2 = with fieldbus interface
- 3 = with BCD output, low active
- 4 = with fieldbus interface and
      BCD output, high active
- 5 = with fieldbus interface and
      BCD ouput, low active

Connection of e-stop buttons
- 0 = single channel
- 1 = 2-channel
- 2 = 2-channel, 2-channel monitoring
      when no cross fault monitoring
      (only with BL 5922)
- 3 = 2-channel, 2-channel monitoring
      when cross fault monitoring (only
      with BL 5922)

- 0 = CANopen interface not galvanic
      separated or without fieldbus interface
- 1 = CANopen interface galvanic
      separated
- 2 = Profibus DP-V0 (only with BL 5922)

Number of e-stop buttons that
can be connected
- 04 = 4 e-stop buttons, 2-channel
       connection with BH 5922
- 08 = 8 e-stop buttons
- 16 = 16 e-stop buttons only for BL 5922._ _/00_

- H   width 45 mm
- L   width 90 mm

Ordering example for variants

BH 5922. 08 / _ _ _   DC 24 V

- Nominal voltage
- Variant, if required
- Number of e-stop buttons that
  can be connected
- Type

Acessories

- CANopen PLC IL 5504
- Input / Output Module IN 5509
- Input Module, Digital IP 5502
- Output Module, Digital IP 5503
- Input Module, Analogue IL 5508
- Output Module, Analogue IL 5507
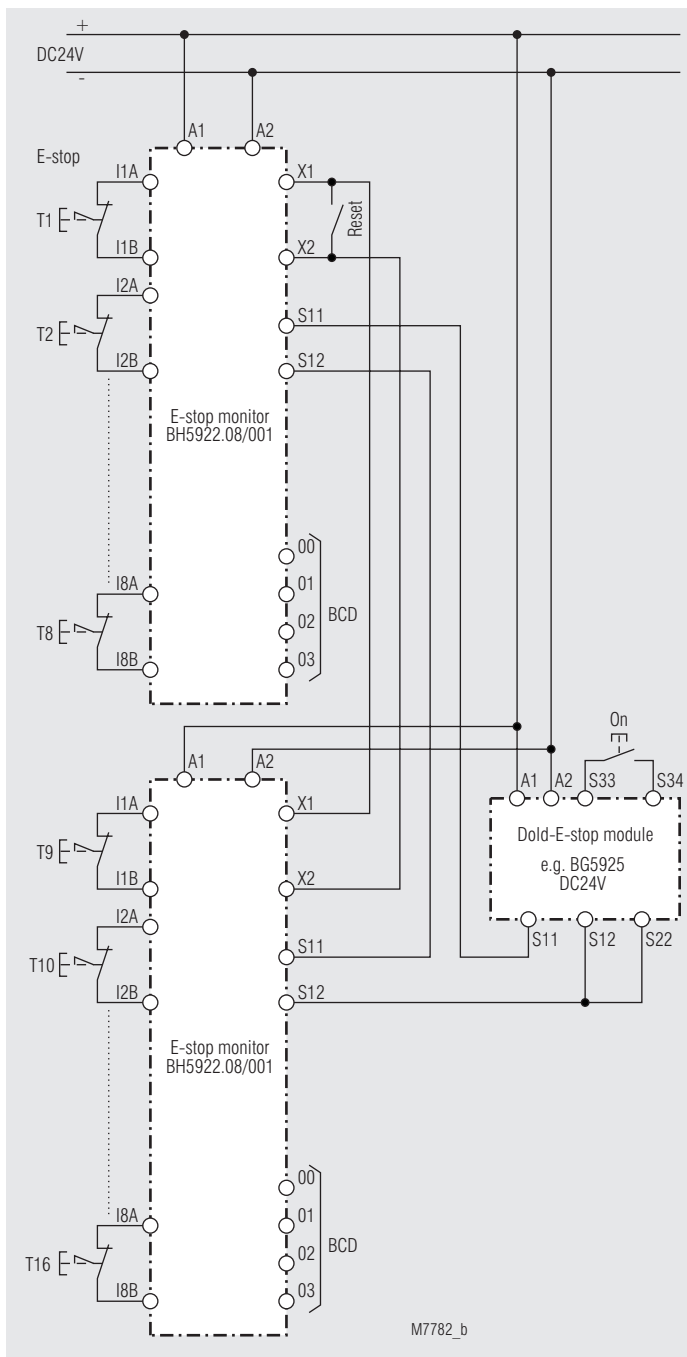
Application Examples
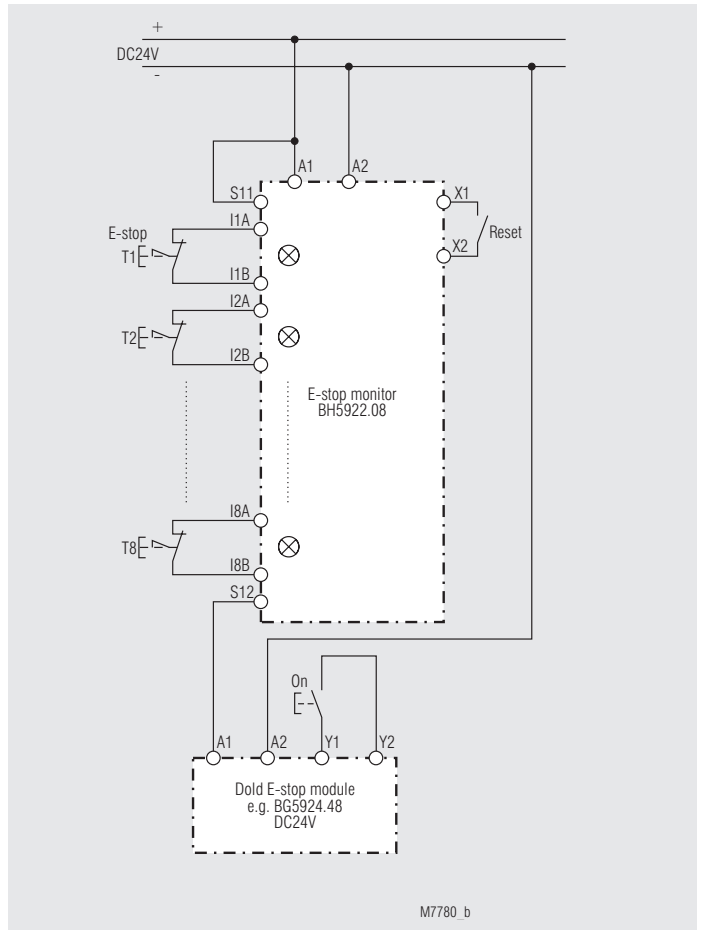
Pic 1: Monitoring of 8 e-stop buttons with e-stop monitor, single-channel connection, e-stop module single channel. Display via 8 LEDs on frontside of the module
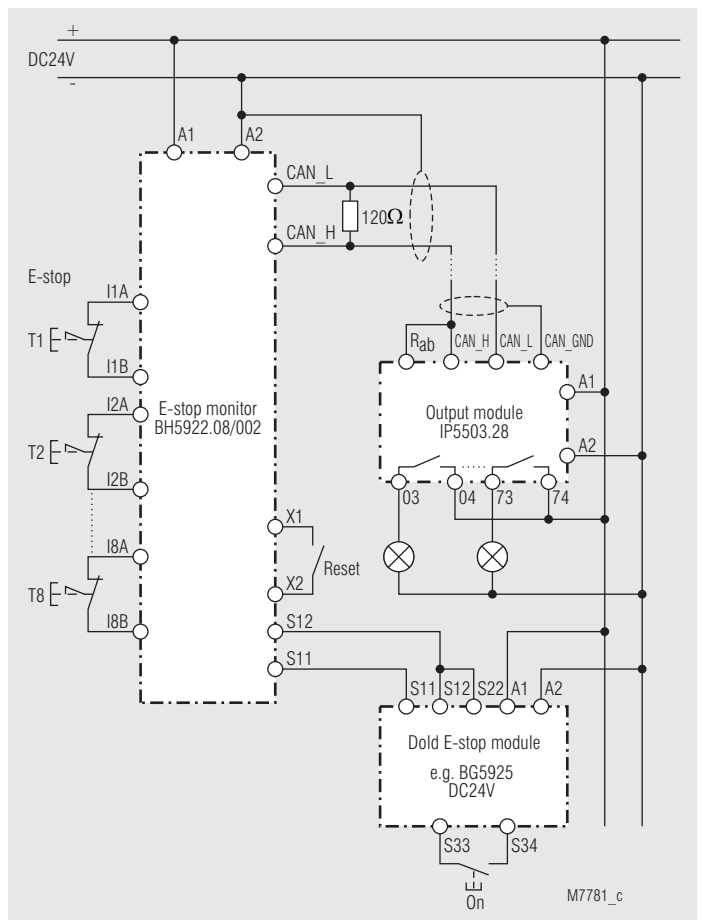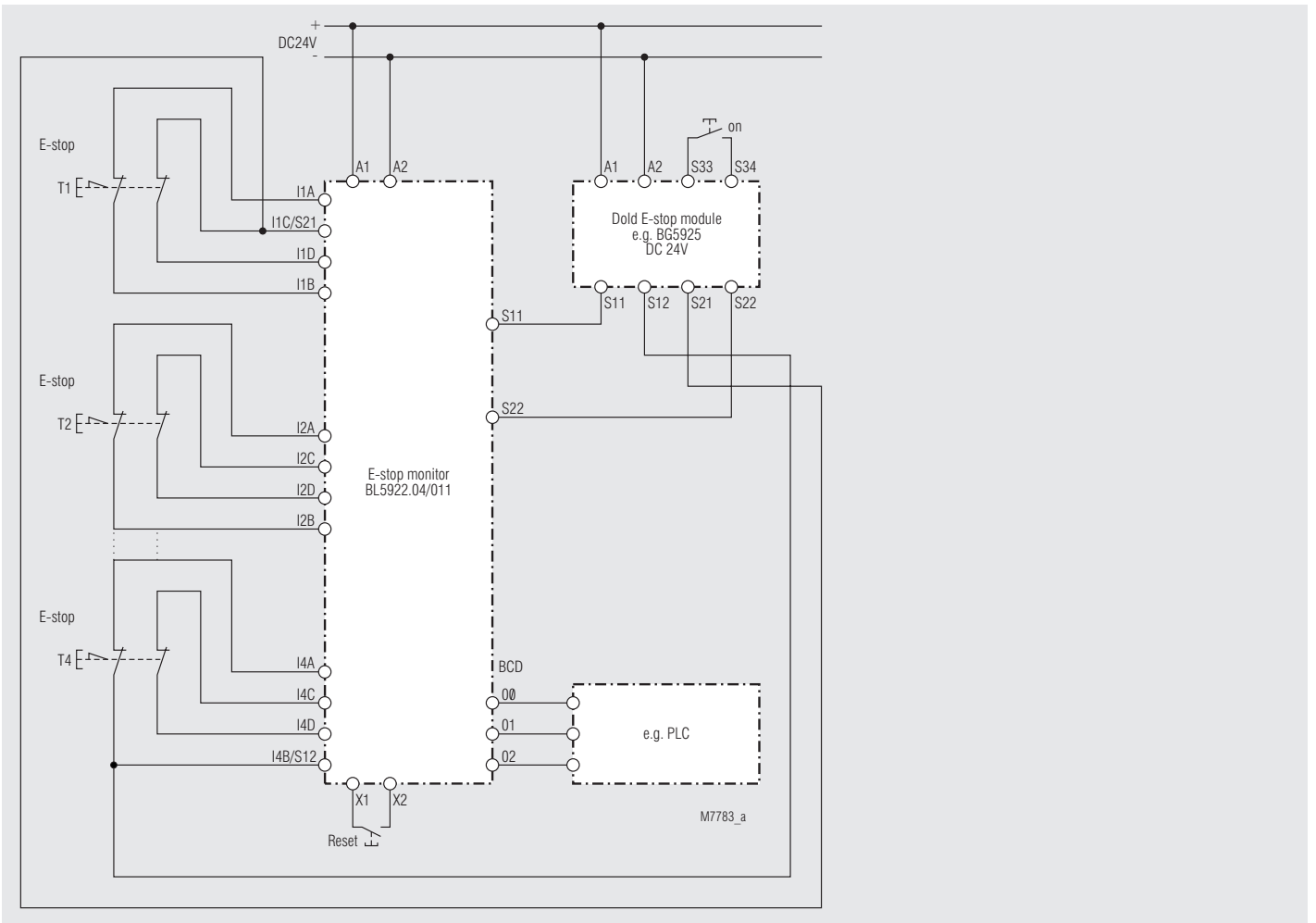

Pic 2: Monitoring of 8 e-stop buttons with e-stop monitor, single-channel connection, e-stop module 2-channel. Remote display of the status of e-stop buttons via CANopen interface.
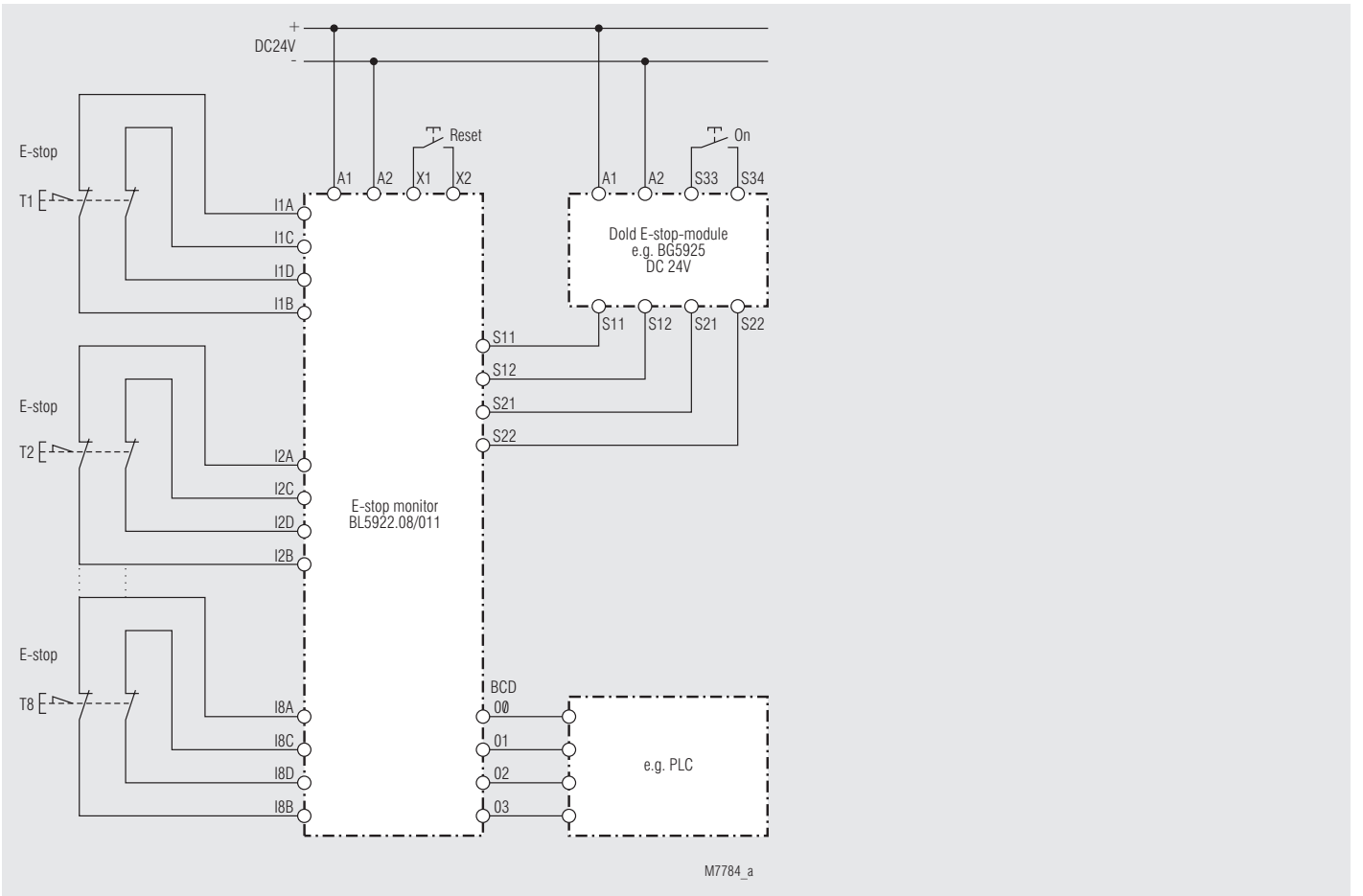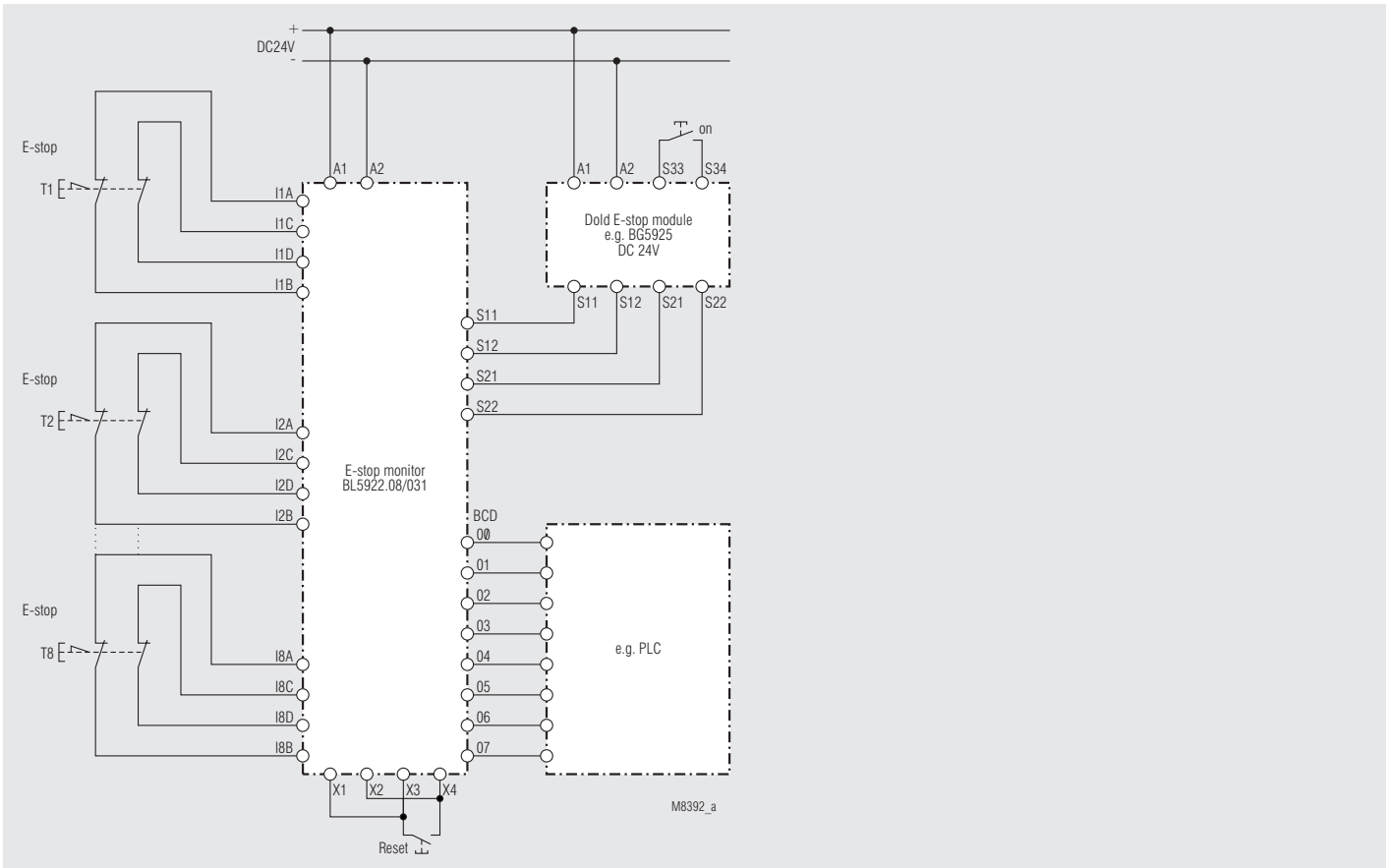
Pic 3: Monitoring of 16 e-stop buttons with e-stop monitor, single-channel connection, e-stop module 2-channel. BCD-output for remote display of the status of the e-stop buttons
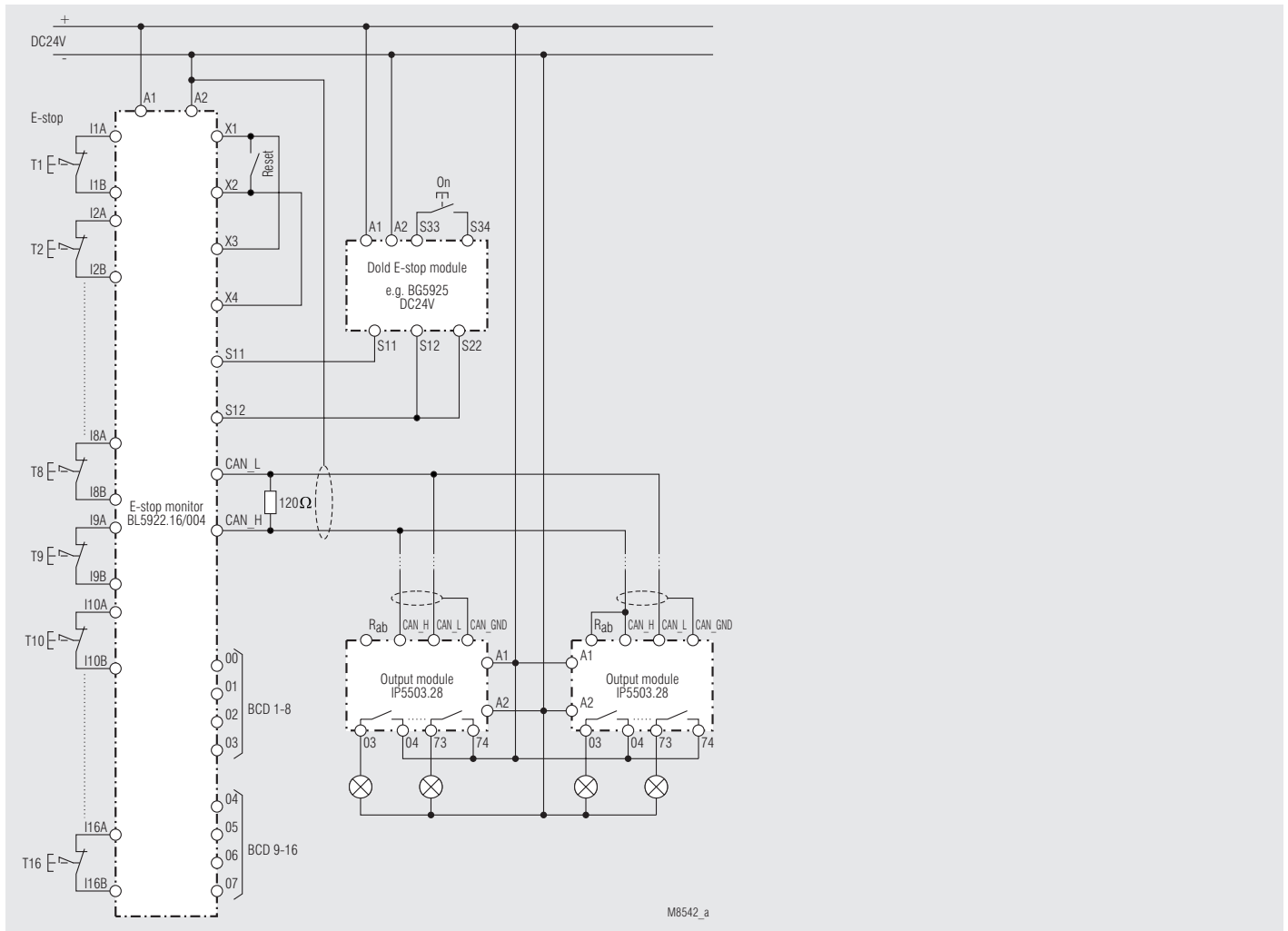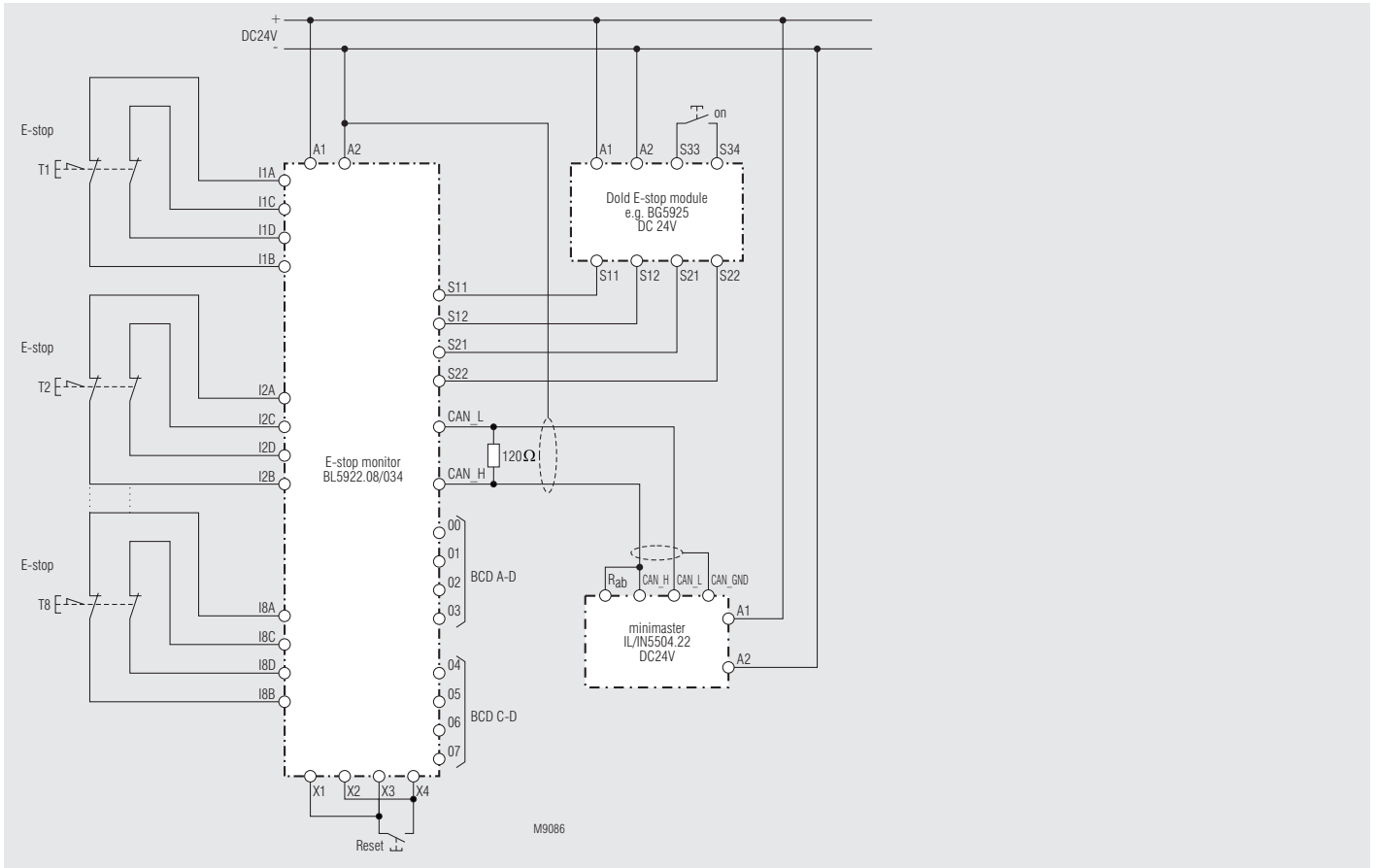
Application Examples

Pic 4: Monitoring of 4 e-stop buttons with e-stop monitor, 2-channel connection, BCD output, single-channel monitoring

Pic 5: Monitoring of 8 e-stop buttons with e-stop monitor, 2-channel connection, BCD output, single-channel monitoring
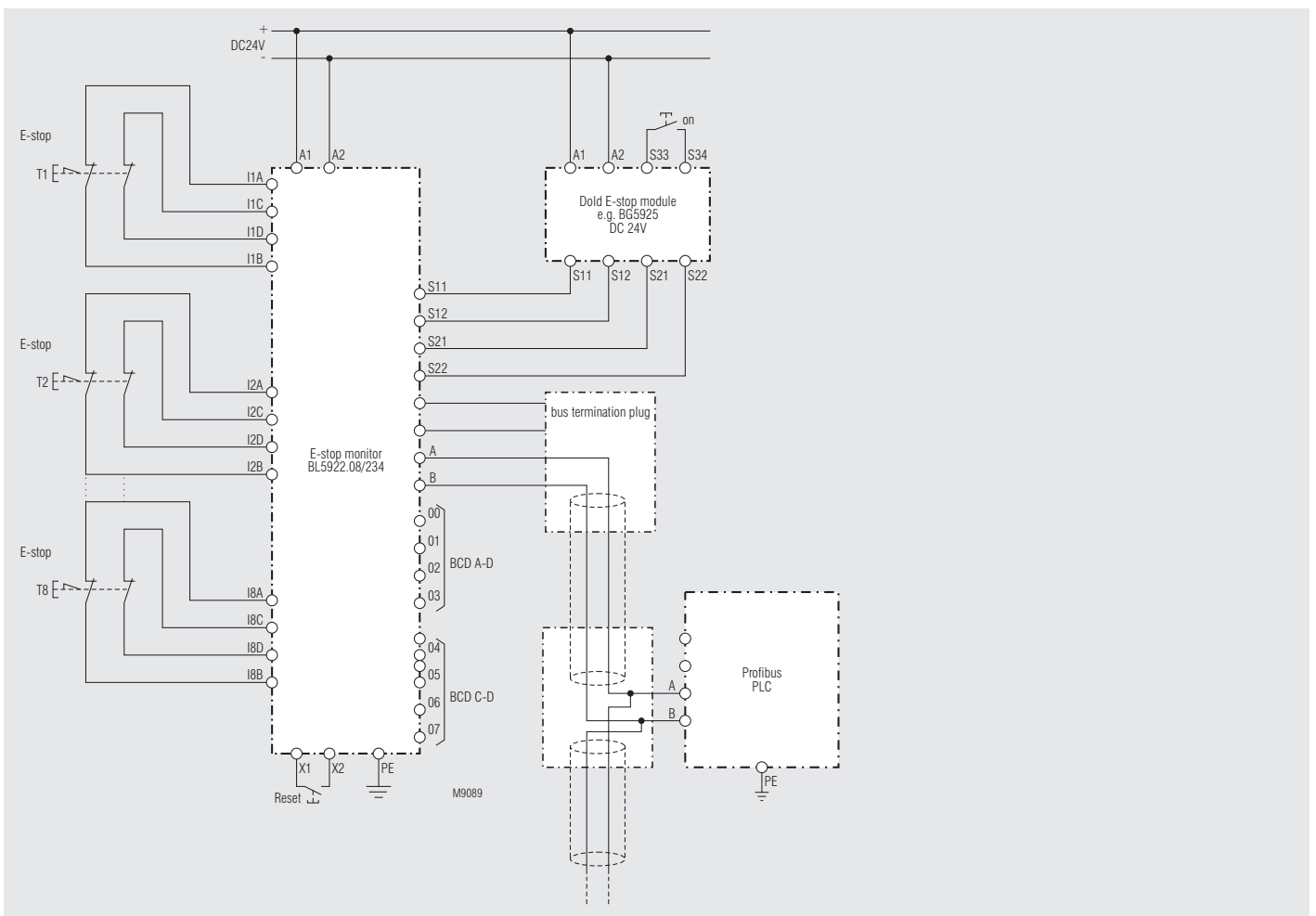
Pic 6: Monitoring of 8 e-stop buttons with e-stop monitor, 2-channel connection, 2-channel monitoring (2. channel with cross fault monitoring), BCD output

Pic 7: Monitoring of 16 e-stop buttons with e-stop monitor, single-channel connection, single-channel monitoring
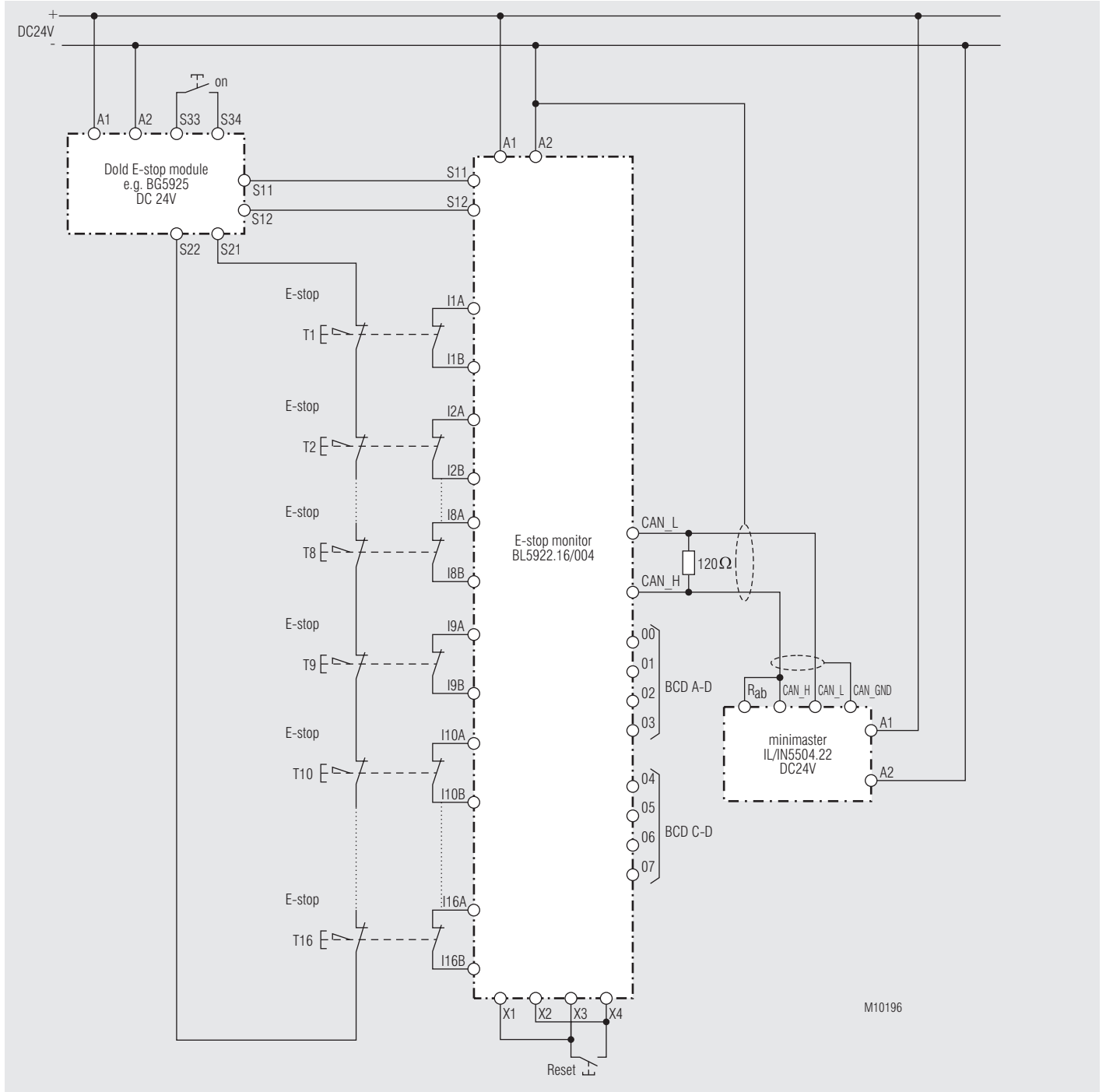
Pic 8: Monitoring of 8 e-stop buttons with e-stop monitor, 2-channel connection, 2-channel monitoring cross fault monitoring with CANopen minimaster IL 5504, IN 5504
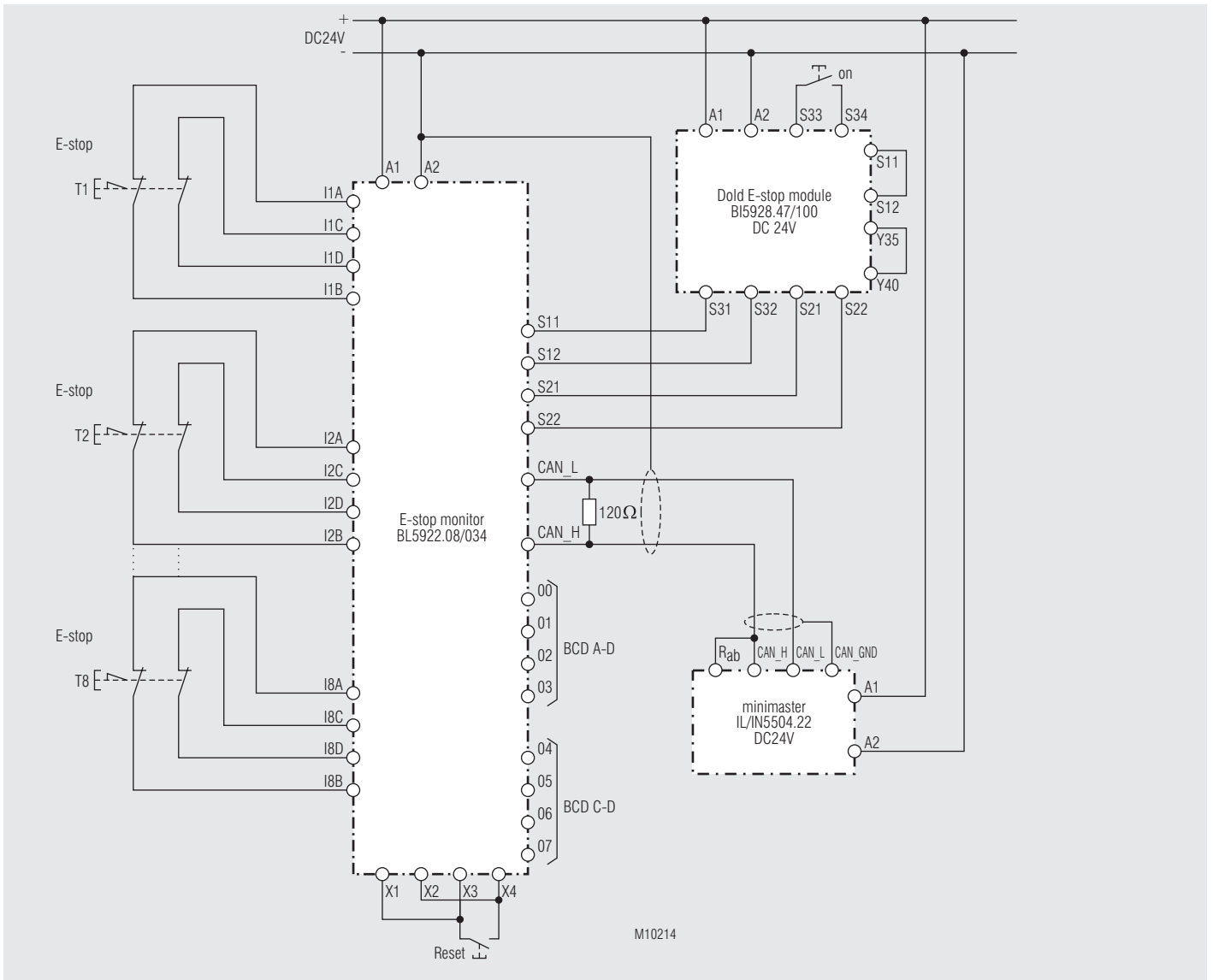

Pic 9: Monitoring of 8 e-stop buttons with e-stop monitor, 2-channel connection, 2-channel monitoring cross fault monitoring with Profibus DP-PLC

Pic 10: Monitoring of 16 e-stop buttons with e-stop monitor, single-channel connection, e-stop-module 2-channel, cross fault monitoring. BCD-output for remote display of the status of the e-stop buttons.

Pic 11: Monitoring of 8 e-stop buttons, dual channel connection, in conjunction with BI5928 2-channel with crossfault monitoring.
An application corresponding to above wiring diagram has performance level (PL) e according to DIN EN ISO 13849-1.
When more than one e-stop button is used in series the wiring of the e-stop loop must be done failsafe or the individual e-stop buttons have to be tested regularly.