

NST-3

CE Approved:
MD, EMC, LVD

Category 2/3, EN 954-1

(Estimated category by 2-channel operation)

- Inexpensive
- Forced contacts
- Doubling of output contacts
- Internal redundancy
- 22,5 mm slimline relay

Function:

Small and vigorous emergency stop relay for monitoring of emergency stop and other safety arrangements. Furthermore the relay is useful as an inexpensive extension module, when additional output contacts are needed.

Technical facilities regarding safety requirements:

- Forced contacts
- Doubling of output contacts
- Internal redundancy

Approvals:



● Approved

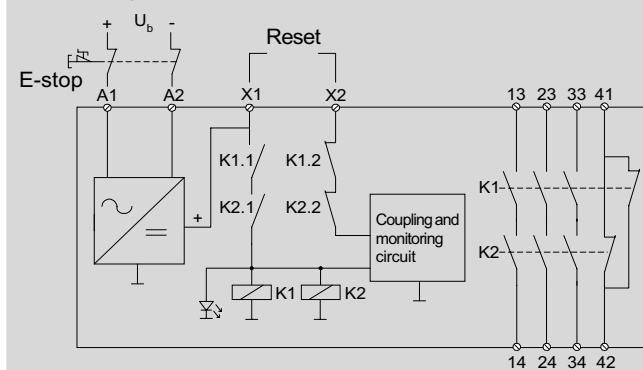
UL-Rating: Pilot Duty, B300; R300

User's advantages:

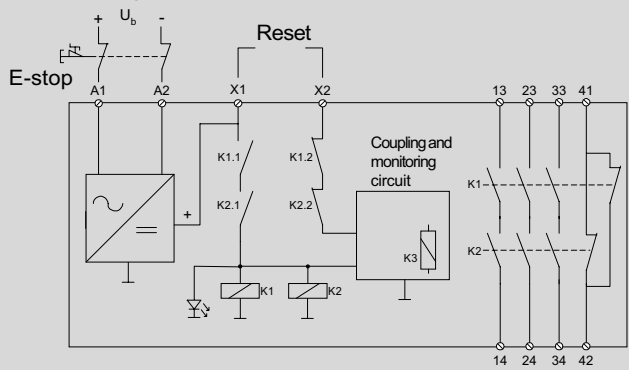
- 3 NO safety outputs
- 1 NC signal output
- Contact load: AC 6 A / DC 6 A
- Various supply voltages; 12VDC, 24VAC/DC og 48VDC
- Manual / automatic reset
- AC / DC supply results in protection against reverse polarity
- Connection of external relays
- LED indication of output status
- 22,5 mm housing for space-saving DIN rail mounting
- Design is based on the European Standard, EN 60204-1
- Complies with MD, EMC, LVD (98/37/EC, 89/336EEC and 93/68EEC)

➔ **Technical specifications and physical dimensions, see page 44-45**

Block diagram, NST-3 (manual, automatic reset):



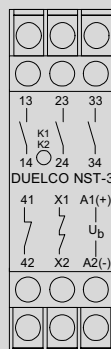
Block diagram, NST-3MR (monitored reset):



Order information

Article name	Article no.	Note: NST-3L and NST-3 12 V DC is in a low housing, D=98,8mm
NST-3, 12 V DC	42041128	
NST-3, 48 V DC	42040248	
NST-3,24 V AC/DC	42041248	
NST-3L, 24 V AC/DC	42041243	
NST-3MR, 24 V AC/DC	42041253	

Front layout:



Terminal description:

- A1(+):** Power supply (+)
- A2(-):** Power supply (-)
- X1*:** Reset, output
- X2*:** Reset, input
- 13-14:** NO safety output
- 23-24:** NO safety output
- 33-34:** NO safety output
- 41-42:** NC signal output

*Must be used by normal and automatic reset

Operation description and connection examples

The power supply is connected to the terminals A1(+) and A2(-). When not activated, the relay's NO contacts 13-14, 23-24 and 33-34 are open and the NC contact 41-42 is closed. If the emergency stop is deactivated and the monitoring circuit detects that the relay function is correct, the relay can be started by activating a reset contact between the terminals X1 and X2. This switches on the NO contacts 13-14, 23-24, 33-34 and the NC contact 41-42 will open. The light-emitting diode for the relay illuminates.

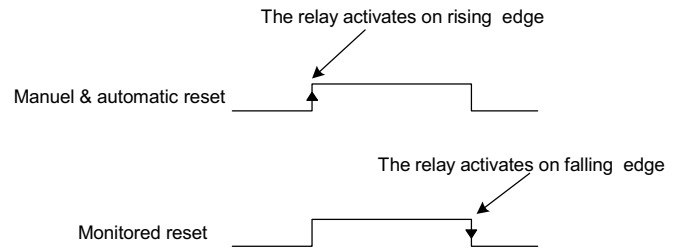
If the emergency stop is activated, the relays K1 and K2 will be deactivated. So the current paths 13-14, 23-24, 33-34 are open and 41-42 is closed.

After resetting of the emergency stop the NST-3 will be ready for activation again, provided that the monitoring circuit not detects any defects.

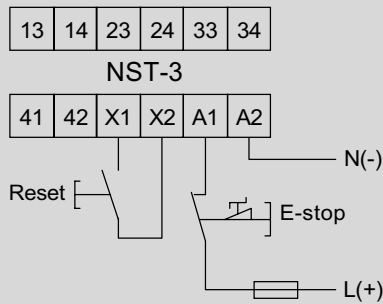
N.B! Automatic reset can be provided by connecting the terminals X1 / X2 permanently.

NST-3 is also available in a version (NST-3MR) which operates with monitored reset. This version can not be used for manual or automatic reset.

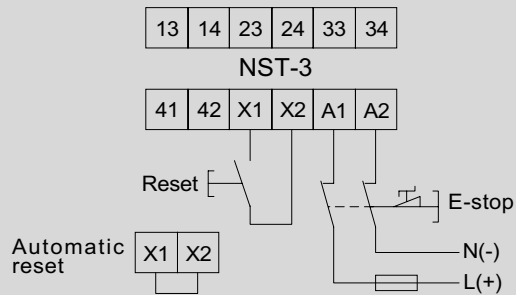
Difference between normal and monitored reset



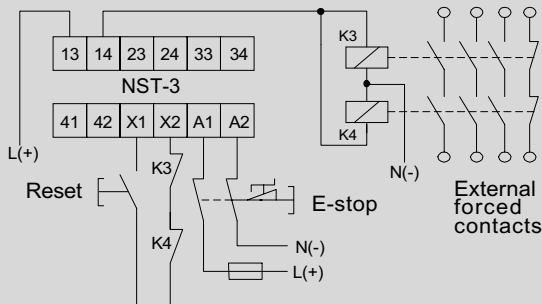
1 1-channel operation



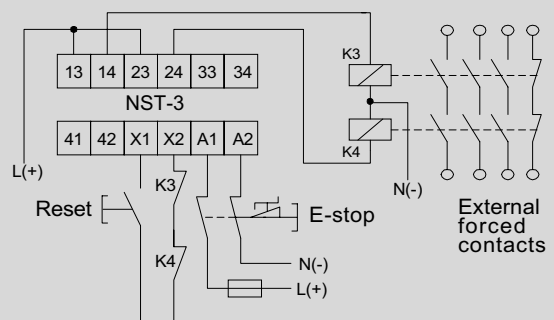
2 2-channel operation (1-channel-)



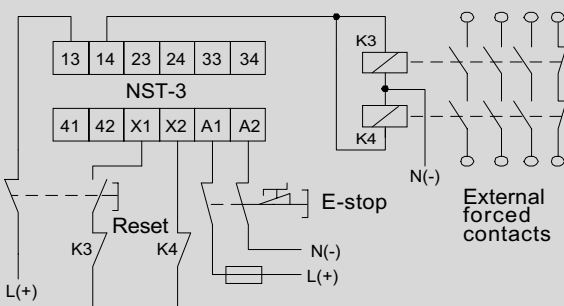
3 Connection of external relays - 1-channel operation



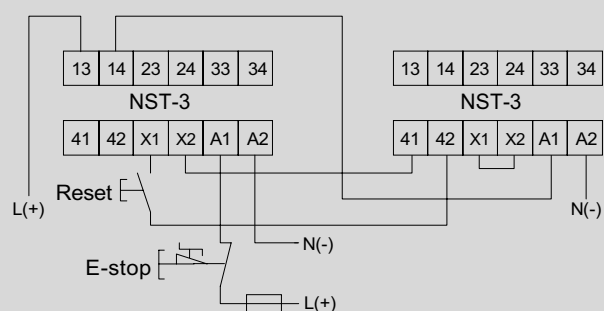
4 Connection of external relays - 2-channel operation



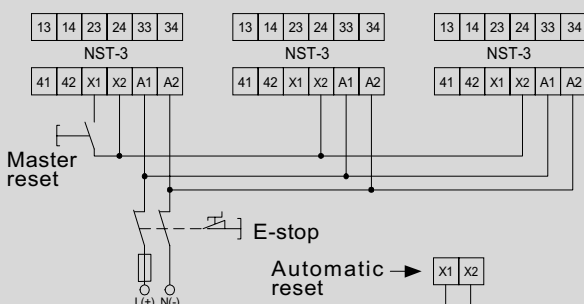
5 Monitoring of reset and external contacts



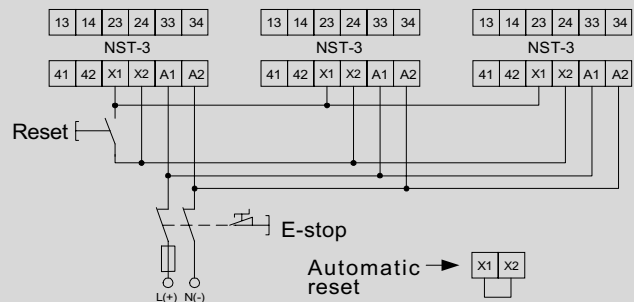
6 NST-3 acting as an extension module (1-channel)

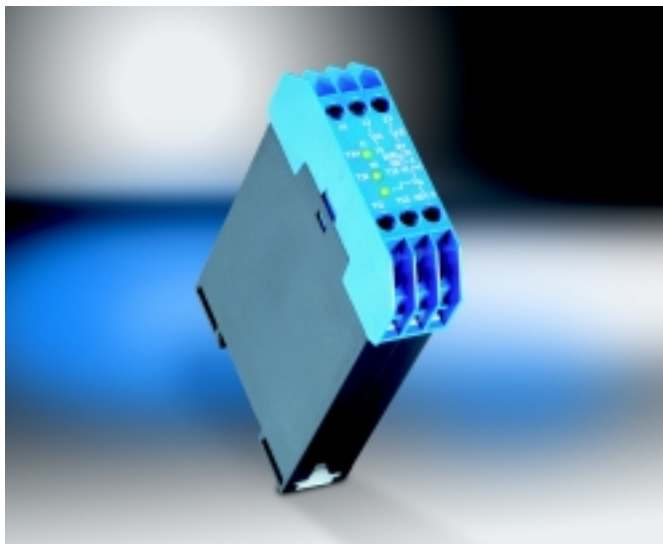


7 NST-3 in a parallel connection with master reset



8 NST-3 in a parallel connection





NST-4

CE Approved:
MD, EMC, LVD

Category 4, EN 954-1

(Estimated category by 2-channel operation)

- 4 input alternatives
- Status indication with dual colour LEDs
- Automatic, monitored or manual reset
- 22,5 mm slimline relay for safety category 4

Function:

Small and flexible universal emergency stop relay for the highest safety category, with a large number of functions. The relay can operate in 1-channel and 2-channel mode with several options.

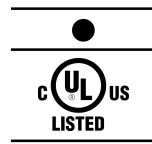
Technical facilities regarding safety requirements:

- Forced contacts
- Doubling of output contacts by use of terminal 13-14 and 23-24
- Internal redundancy
- Monitored reset

User's advantages:

- 2 NO contacts, 250 VAC / 1000 VA
- Contact load: 4 A AC, 3 A DC
- 2-channel operation with/without short circuit protection
- 2-channel operation via a NO and a NC forced button
- 2-channel door monitoring with 2 sets NO/NC contacts
- 1-channel operation
- Manual / automatic / monitored reset
- Supply voltage 24 VDC, $\pm 10\%$
- LED indication of supply + wire-/output status for K1, K2
- 22,5 mm housing for space-saving DIN rail mounting
- Design is based on the European Standard, EN 60204-1
- Complies with MD, EMC, LVD (98/37/EEC, 89/336 og 93/68)

Approvals:



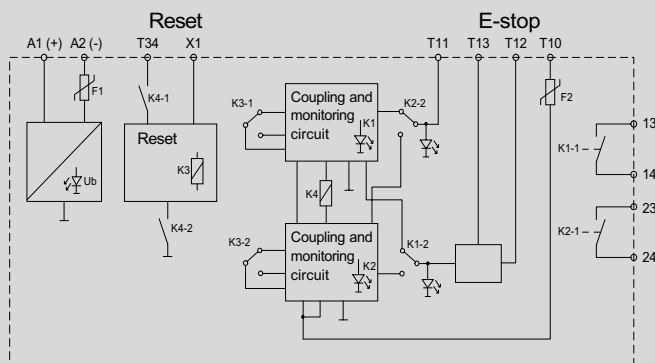
● Approved UL-Rating: Pilot Duty, C300

Status table, LEDs

LED K1	LED K2	Interpretation / Possible fault causes
OFF	OFF	Error at wire or ES-button to T11 & T12 (possibly error at T10).
OFF	Yellow	Error at wire or ES-button to T11 (possibly error at T10). ES-button to T12 welded / defect. NB ! Emergency Stop may be activated = no error!
Yellow	OFF	Error at wire or ES-button to T12 (possibly error at T10). ES-button to T11 or T13 welded / defect.
Yellow	Yellow	Wire, Channel 1 OK; Wire, Channel 2 OK. (If the relay can not be activated = error on wire to T10).
Yellow	Green	Error at wire / ES-button to T10 or T12. ES-button to T11 welded / defect. Error at wire / ES-button to T13 and ES-button to T11 or T12 welded / defect. K2 may be welded / defect.
Green	Yellow	Error at wire / ES-button to T11. ES-button to T10 or T12 welded / defect. K1 may be welded / defect.
Green	Green	Relay outputs activated = Status OK

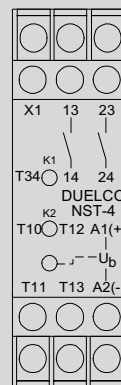
LED U _b	Interpretation
OFF	No power supply or bad connection
ON	Power supply OK

Block diagram:



Note: Both output contacts 13-14 and 23-24 must be used to achieve doubling of the stop signal.

Front layout:



Terminal description:

- A1(+):** Power supply (+)
- A2(-):** Power supply (-)
- X1:** Reset input (control)
- T34:** Reset input (24 VDC)
- T10:** Input terminal (emergency stop)
- T11:** Input terminal (emergency stop)
- T12:** Input terminal (emergency stop)
- T13:** Input terminal (emergency stop)
- 13-14:** NO output contact, K1
- 23-24:** NO output contact, K2

Order information

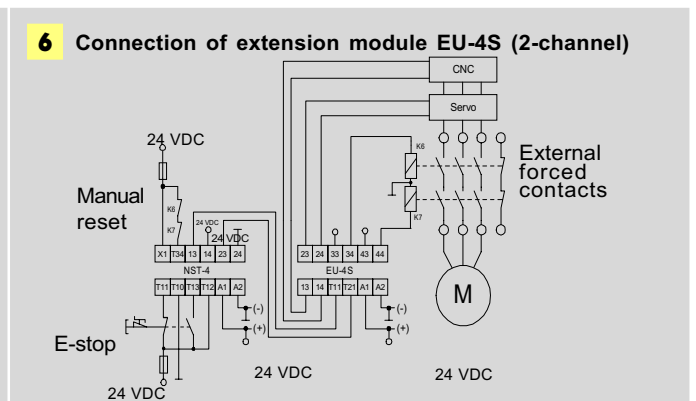
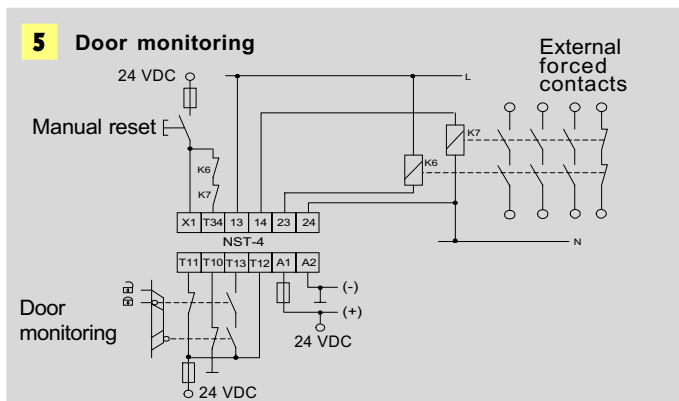
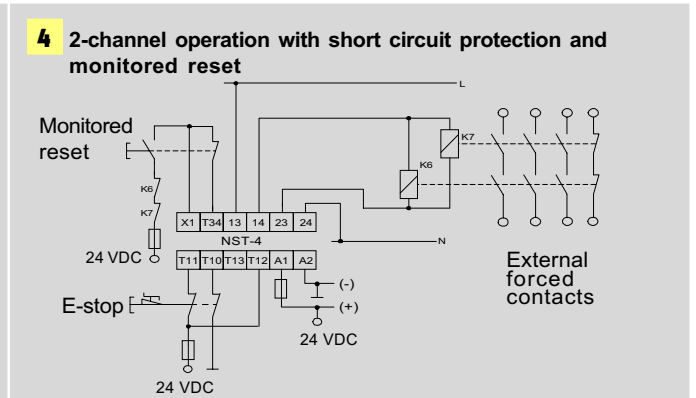
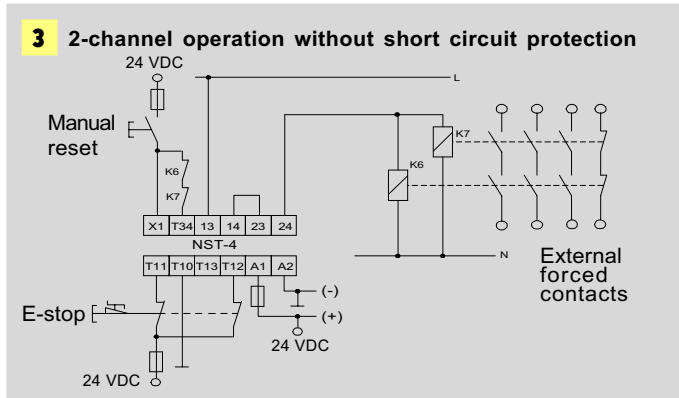
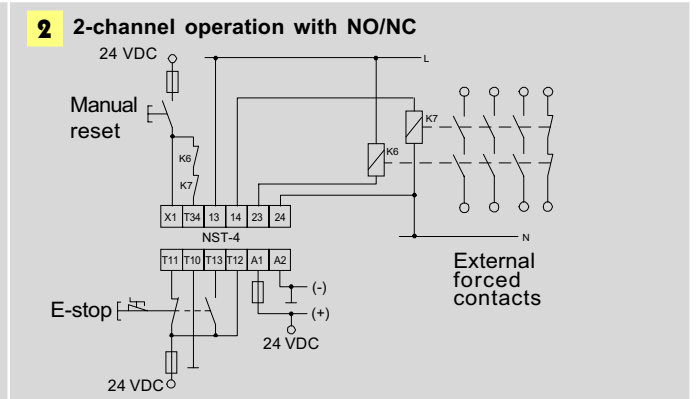
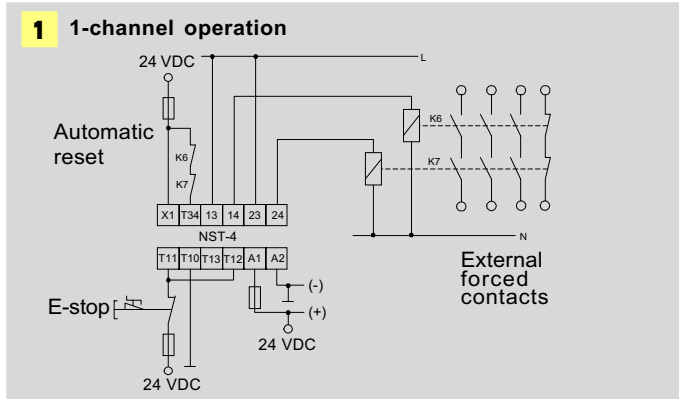
Article name	Article no.
NST-4, 24 V DC	42051244
NST-4T, 24 V DC	42061244

➔ **Technical specifications and physical dimensions, see page 44-45**

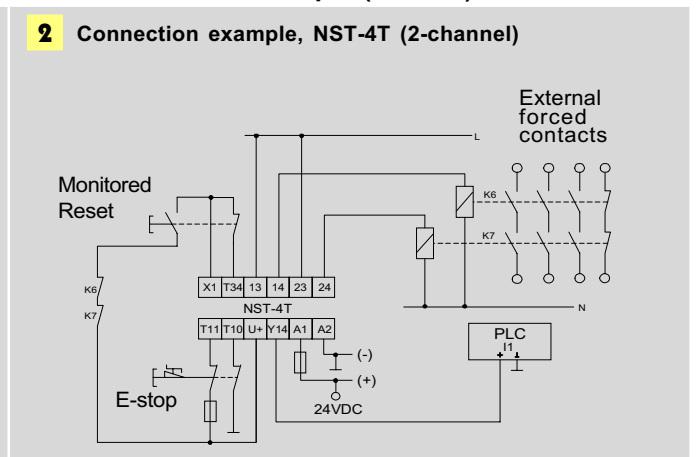
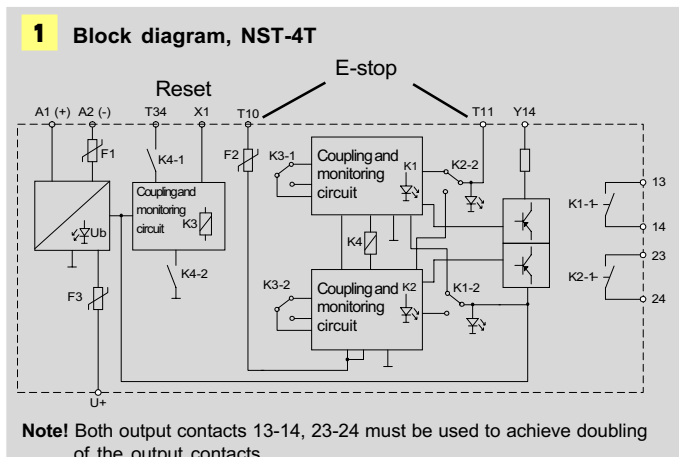
Operation description and connection examples

The power supply is applied across terminals A1(+) / A2(-). Provided no internal faults are detected, all wiring is correct and the emergency stop button is deactivated, the power supply LED will illuminate and the LEDs K1/K2 will illuminate yellow (see the LED status table)! The relay is activated by applying a reset signal at terminal X1 and T34. This will activate the relay, the NO safety contacts will close and the LEDs K1/K2 will illuminate green. Activation of the emergency stop button will deactivate the relay, the NO safety contacts will open and LEDs K1/K2 will be extinguished (connection examples 4 the LEDs K1/K2 = off / yellow!). Deactivating the emergency stop button will cause the LEDs K1/K2 to illuminate yellow again, assuming no faults are detected.

If at any time LEDs K1/K2 illuminate in a different colour, a fault has been detected. Please refer to the LED status table for full diagnosis. The relay can be reset manually without monitoring, manually with monitoring or automatically.



Note: NST-4 is also available in a version with a transistor output (NST-4T)





NST-8

CE Approved:
MD, EMC, LVD

Category 4, EN 954-1

(Estimated category by 2-channel operation)

- 1 or 2 channel operation
- 3 safety outputs
- 1 signal output
- Safety category 4
- PTC-fuse against short circuit of wires

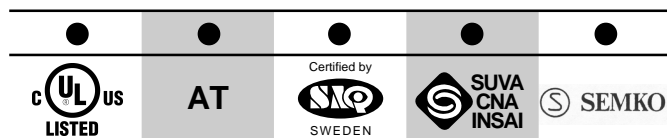
Function:

Emergency stop relay which can be used with advantage for special dangerous machines, where full doubling and monitoring of the emergency stop function is necessary. Can be used in most applications for monitoring of the emergency stop or sliding lids.

Technical facilities regarding safety requirements:

- Forced contacts
- Doubling of output contacts
- Internal / external redundancy (for two pole E-stop)
- Short circuit monitoring

Approvals:



● Approved

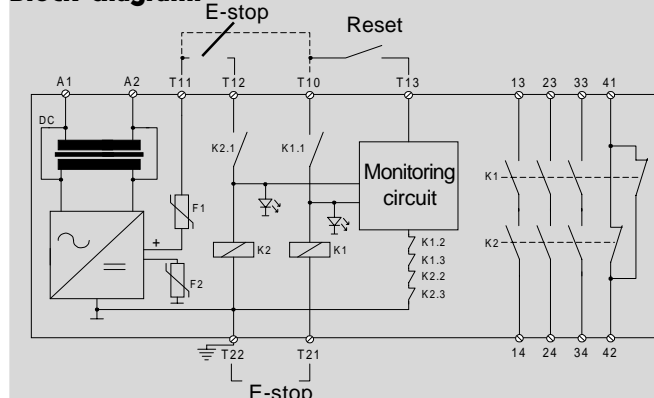
UL-Rating: Pilot Duty, B300; R300

User's advantages:

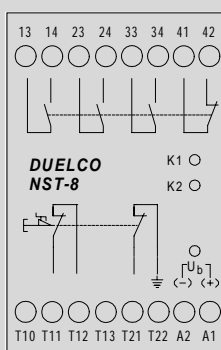
- 3 NO safety outputs
- 1 NC signal output
- Contact load: AC 6 A / DC 6 A
- 2-channel operation with/without short circuit protection
- 1-channel operation
- Manual / automatic reset
- Protection against short circuit of cables by PTC-fuse
- Short circuit protected transformer in the 230 VAC version
- Supply voltage: 5 voltage versions
- LED indication of supply and output status for K1, K2
- 45 mm housing for space saving DIN rail mounting
- Design is based on the European Standard, EN 60204-1
- Complies with MD, EMC, LVD (98/37/EC, 89/336/EEC og 93/68/EEC)

➔ **Technical specifications and physical dimensions, see page 44-45**

Block diagram:



Front layout:



Terminal description:

- A1:** Power supply (+)
- A2:** Power supply (-)
- T10:** Maintenance voltage K1 (E-stop)
- T11:** + out to reset (E-stop)
- T12:** Maintenance voltage K2 (E-stop)
- T13:** Reset input
- T21:** Earth K1 (E-stop)
- T22:** Earth K2 (E-stop)
- 13-14:** NO safety output
- 23-24:** NO safety output
- 33-34:** NO safety output
- 41-42:** NC signal output

Order information

Article name	Article no.
NST-8, 24 V DC	42031248
NST-8, 24 V AC	42030248
NST-8, 24 V AC/DC	42032248
NST-8, 115 V AC	42031158
NST-8, 230 V AC	42032308

Status table, LEDs

LED K1	LED K2	Interpretation
ON	ON	K1 and K2 activated / E-stop OK
OFF	OFF	Relay K1 and K2 is deactivated
ON	OFF	K1 activated and K2 deactivated; error in E-stop on T21, T22 *
OFF	ON	K1 deactivated and K2 activated; error in E-stop on T11, T12 *

* Fault indication when relay is activated

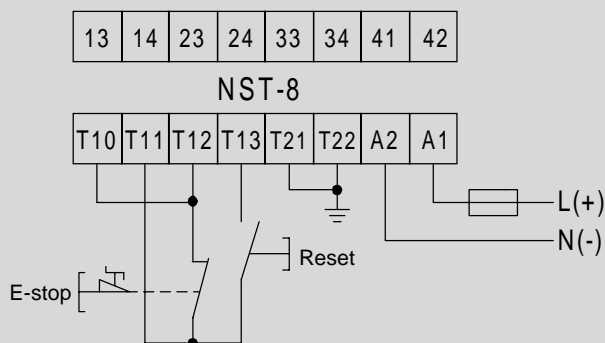
Operation description and connection examples

The power supply is connected to the terminals A1(+) and A2(-). When not activated, the relay's NO safety contacts 13-14, 23-24 and 33-34 are open and the NC signal contact 41-42 is closed. If the emergency stop is deactivated and the monitoring circuit finds the relay functioning correctly, the relay may be started by activating a reset contact between terminals T10 and T13. This will activate the NO safety contacts 13-14, 23-24 and 33-34, the NC signal contact 41-42 opens and the LED's K1 and K2 illuminates. If the emergency stop button is activated, the relays K1 and K2 will deactivate. The NO safety contacts 13-14, 23-24 and 33-34 open

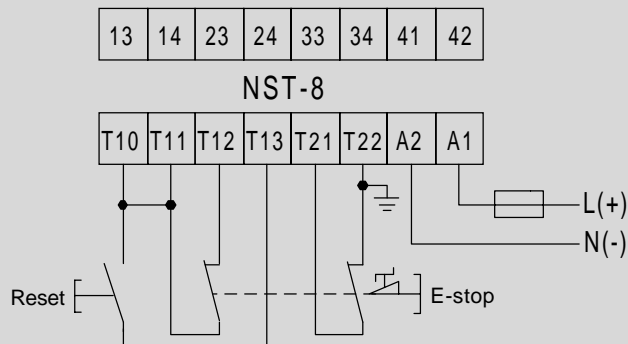
and the NC signal contact 41-42 closes. After resetting of the emergency stop, NST-8 will be ready for activation again, provided that the monitoring circuit detects that the relay is functioning correctly. The reset between the terminals T10 (T11) and T13 is monitored. Therefore an automatic reactivation of the relay is impossible (only 1/2-channel operation). A short-circuited or defective reset contact will therefore not be able to activate the relay, before the error is rectified.

Note 1 (Three position devices):
 Activation: Channel A-B, C-D + F-G or
 activation: Channel A-B, C-D + external contact H-J

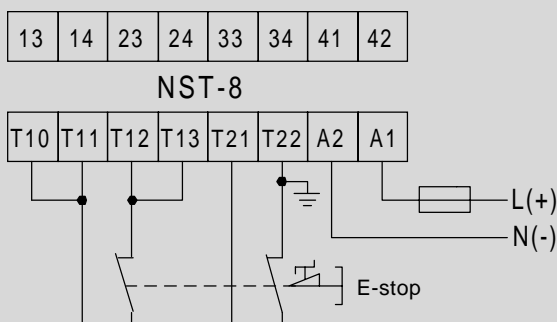
1 1-channel operation



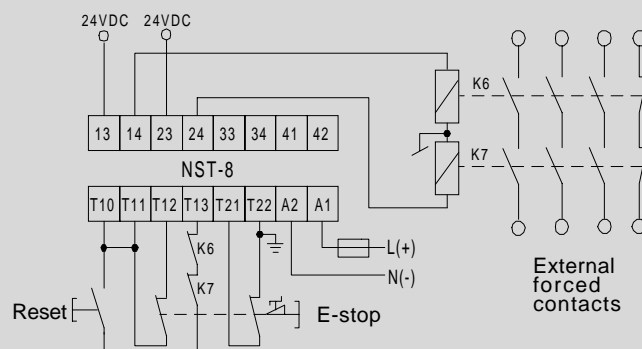
2 2-channel operation



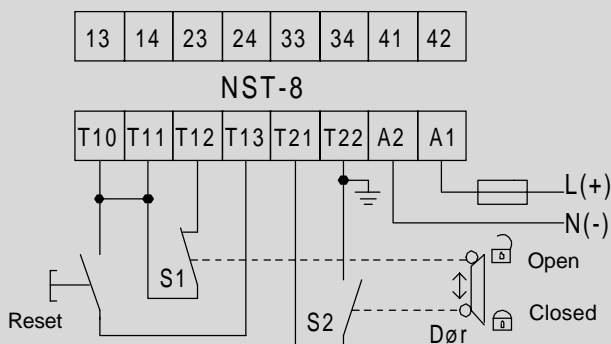
3 2-channel operation with automatic reset



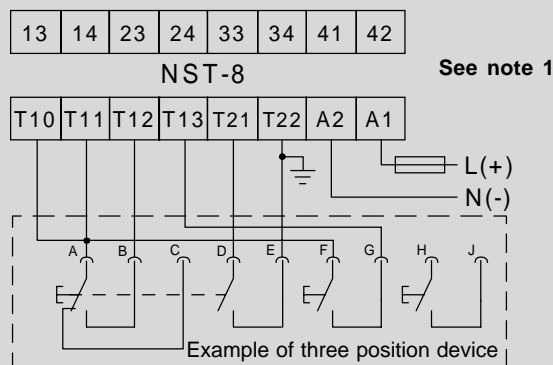
4 Connection of external relays



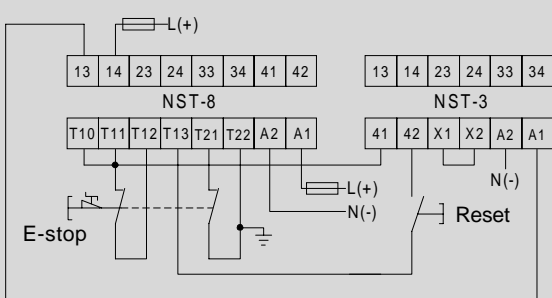
5 2-channel door monitoring



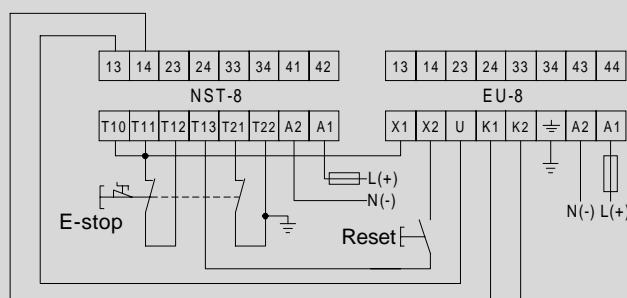
6 Connection of three position device



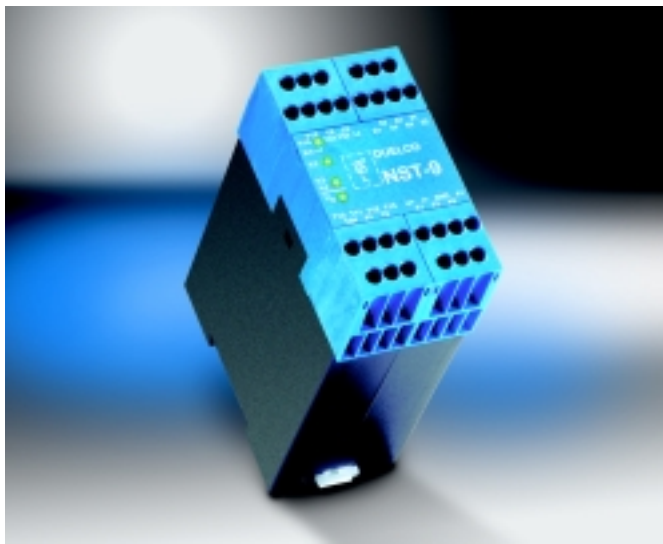
7 Connection of NST-3 as an extension module (1-channel)



8 Connection of EU-8 extension contact block (1-channel)



Note: All examples stated are supplied with 230 VAC and earth. Connection to 24 V AC/DC does NOT require earth connection.



NST-9

CE Approved:
MD, EMC, LVD

Category 3/4, EN 954-1

(Estimated category by 2-channel operation)

- 4 input alternatives
- 2 NO safety outputs + 1 NC signal output
- 2 NO time delayed outputs (0 - 6 sec.)
- 3 transistor outputs for PLC-monitoring
- Status indication with LEDs
- Possibility for delayed coupling (0 - 16 sec.)
- Detachable terminals

Function:

Universal usable emergency stop relay, that among other things is suitable for operation with a PLC & CNC / Servo mechanism, contact mat/-list, light curtains and for door monitoring.

Technical facilities regarding safety requirements:

- Positive guided forced contacts
- Doubling of output contacts
- Internal / external redundancy (for two pole E-stop)
- Monitored reset

User's advantages:

- 4 NO safety outputs, of which 2 outputs can be delayed 0 - 6 sec.
- 1 NC signal output
- Contact load: 6 A (delayed safety contacts 4 A)
- 1-channel and 2-channel operation
- Manual / automatic / monitored reset
- Output with current limitation for use with a contact mat (max. 60 mA)
- Possibility for delayed coupling of the relay (0 - 16 sec.)
- Supply voltage: 24 VDC, 110 - 240 VAC ± 10%
- 45 mm housing with detachable terminals
- DIN rail mounting
- LED indication of supply + wire- /output condition for K1, K2 and K3/K4
- Design is based on the European Standard, EN 60204-1
- Complies with MD, EMC, LVD (98/37/EC, 89/336/EEC og 93/68/EEC)

Approvals:

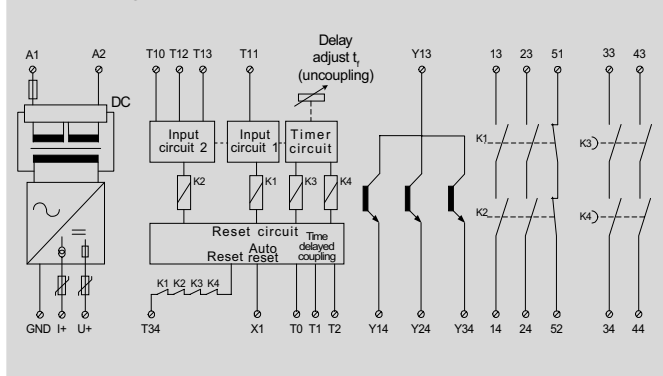


● Approved UL-Rating: Pilot Duty, B300; R300

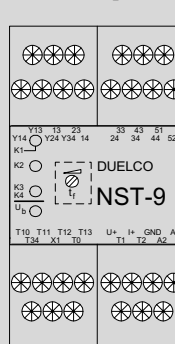
Status table, LEDs

LED U _b	LED K1	LED K2	LED K3/K4	Interpretation / Possible fault causes
Green				Main supply is OK
Flashing				Main supply is too low or I+ has been short circuited Note! U _b is also flashing when the contact mat is activated
OFF				No main supply
	OFF	OFF		Emergency stop contact is active Error on input terminals T10, T11, T12 and/or T13 Error on terminal U+ or I+ Short circuit between T10, T12 and T11 or U+ (I+)
	Yellow	OFF		Error on emergency stop contact to T12, T10 or T13 Short circuit between T12 and T13 or T10 and T12 Error on line to T12, T13 or T10
	OFF	Yellow		Error on emergency stop contact to T11 Short circuit between T11 and T10 Error on line to T11
	Yellow	Yellow		Power on all inputs and all lines OK
	Green	Green		Relay K1 and K2 are active
	Green	Yellow		K2 has not been activated, when reset was done Error - too low main voltage or K2 welded
	Yellow	Green		K1 has not been activated, when reset was done Error - too low main voltage or K1 welded
	Green	OFF		Error on terminal T12, T13 or T10 from active state
	OFF	Green		Error on terminal T11 from active state
			Green	Delay time relay K3 / K4 is activated
			OFF	Delay time relay K3 / K4 is deactivated
	Green	Green	OFF	Internal failure on delay time relays K3/K4

Block diagram:



Front layout:



Terminal description:

- A1 / A2:** Power supply (+) / Power supply (-)
- X1:** Control input (reset)
- T34:** 24VDC input (reset)
- Y13:** DC-input for Y14, Y24 og Y34
- Y14, Y24 and Y34:** NPN-transistor status outputs
- 13-14, 23-24:** NO output contacts
- 33-34, 43-44:** Delayed NO output contacts
- 51-52:** NC signal contact
- T10, T11, T12 and T13:** E-stop inputs
- T0, T1 og T2:** Programming of the reset time delay
- U+ / GND:** +24VDC output / earth
- I+:** Current limited output (60 mA)

Order information

Article name	Article no.
NST-9, 24 V DC	42091249
NST-9, 110-240 V AC	42092659

➔ **Technical specifications and physical dimensions, see page 44-45**

Operation description and connection examples

The power supply is applied across the terminals A1(+) - A2(-). Assuming no internal faults are detected, all wiring is correct and the emergency stop button is deactivated, the power supply LED U_b will illuminate green and the LEDs K1 to K2 will illuminate yellow. The yellow lights give status about the wiring and the emergency stop button on the input. A flashing light from the LED for U_b indicates that the supply voltage is too low (see LED status table)! When the input condition is ready the transistor output Y13 - Y14 is active.

By activation of the reset button connected to U^+ , T34 and possibly X1, the NO safety contacts 13-14, 23-24, 33-34, 43-44 will close and the NC contact 51-52 will open. At the same time the LED's K1, K2, K3 / K4 will illuminate green. The transistor outputs Y13 - Y24 and Y13 - Y34 will be active.

Activation of the emergency stop button will deactivate the relay. The NO safety contacts 13 - 14 and 23 - 24 will open, the NC contact 51-52 will close and the LEDs for K1 and K2 will be extinguished. The transistor outputs Y13 - Y14 and Y13 - Y24 will deactivate.

After a delay, controlled by the adjustment of the potentiometer t_r , (Hidden under the front plate) the NO 33-34 and 43-44 safety contacts will open and the LEDs for K3 and K4 will be turned off. The transistor output Y13 - Y34 will deactivate. Just 200 ms after the safety contacts for K3 and K4 have opened again and the emergency stop button is deactivated, a reactivation of the relay is possible.

Provided that the LEDs for K1, K2, K3 / K4 illuminate in a different colour or switch off, an error in the current circuit or a defect emergency stop can have occurred (only the LED for the faultless channel will illuminate yellow - see LED status table).

DELAYED COUPLING

RESET TIME DELAY TABLE

Reset time delay	T0	T1	T2
0 Sec.	-	W	-
0,25 Sec.	W	W	-
0,50 Sec.	-	-	-
1 Sec.	W	-	-
2 Sec.	-	-	W
4 Sec.	W	-	W
8 Sec.	-	W	W
16 Sec.	W	W	W

W = must be connected to U^+

DELAYED CUT-OUT ADJUSTMENT

1 1-channel operation

2 2-channel operation without short circuit protection

3 2-channel operation with NO/NC

4 2-channel operation with short circuit protection and monitored reset

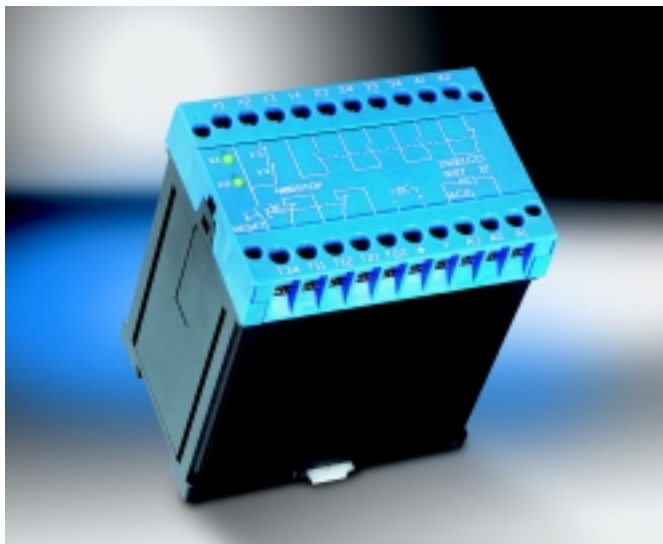
5 Door monitoring

6 Connection to contact mat/list or light curtain

7 Reset types

8 PLC monitoring

9 Operation with a PLC & CNC / servo mechanism



NST-12

CE Approved:
MD, EMC, LVD

Category 4, EN 954-1

(Estimated category by 2-channel operation)

- 10 A contact load
- 1 or 2 channel operation
- Multi voltage
- 3 NO safety outputs
- 1 NC signal contact
- PTC-fuse against short circuit of wires
- Detachable terminals

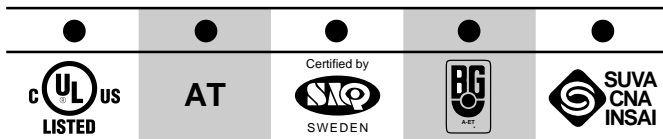
Function:

The big brother of NST-8 is especially suitable for very dangerous machines and where a high contact load is necessary. NST-12 has multi voltage which results in high flexibility.

Technical facilities regarding safety requirements:

- Forced contacts
- Doubling of output contacts
- Internal / external redundancy
- Monitored reset
- Short circuit monitored

Approvals:



● Approved

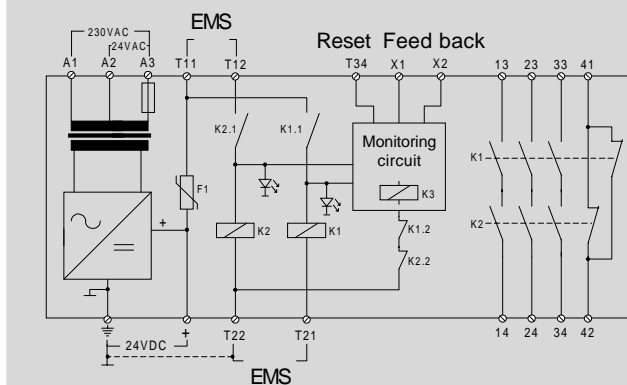
UL-Rating: Pilot Duty, B300

User's advantages:

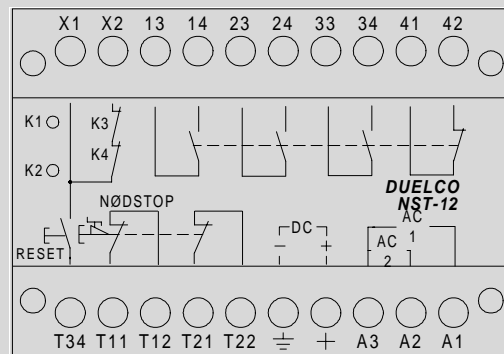
- 3 NO safety outputs
- 1 NC signal output
- Contact load: AC 10 A / DC 5 A
- 1- and 2 channel operation with / without short circuit protection
- Manual / automatic / monitored reset
- Short circuit safe trafo
- Protection against short circuit of cables via PTC-fuse
- Multi voltage => reduced stock
- Detachable terminals
- LED indication
- DIN rail mounting
- Design is based on the European Standard, EN 60204-1
- Complies with MD, EMC, LVD (98/37/EEC, 89/336 og 93/68)

➔ **Technical specifications and physical dimensions, see page 44-45**

Block diagram



Frontlayout



Status table, LEDs

LED K1	LED K2	Interpretation
ON	ON	K1 and K2 activated / EMS OK
OFF	OFF	Relay K1 and K2 are deactivated
ON	OFF	K1 activated and K2 deactivated; error on EMS by T21, T22 *
OFF	ON	K1 deactivated and K2 activated; error on EMS by T11, T12 *

* Error indication from activated state

Order information

Article name	Article no.
NST-12, 24/230 V AC / 24 V DC	42022012
NST-12, 48/120 V AC / 24 V DC	42012012

Terminal description:

- A3:** Common power supply (AC)
- A2/A1:** 24/48 VAC input / 230/120 VAC input
- +**: AC supply: 24 V output; DC supply: 24 V input
- ⊥:** Earth
- T11:** + out (EMS)
- T12:** Voltage K2
- T21:** Earth K1
- T22:** Earth (EMS)
- T34:** + voltage input for reset
- X1/X2:** Monitored reset / Reset input
- 13-14,** NO safety output contact
- 23-24,** NO safety output contact
- 33-34:** NO safety output contact
- 41-42:** NC signal output contact

Operation description and connection examples

Power supply (AC-voltage) is connected to terminals A1-A3 or A2-A3. If a DC voltage wants to be used, the power supply is connected to positive (+) and earth (\perp) (see figure 7).

Assuming the emergency stop is deactivated and no internal faults are detected, the relay is activated by activating the reset button, which is connected to terminal X1 and T34. In this way the feedback terminals X1-X2 and the reset terminals are connected. If the emergency stop is now activated, relays K1 and K2 will open and circuits 13-14, 23-24 and 33-34 will break, while circuit 41-42 will close. Furthermore the LEDs K1 and K2 will illuminate.

If the emergency stop is now activated, relays K1 and K2 will open and circuits 13-14, 23-24 and 33-34 will break, while circuit 41-42 will close. If X1-X2 and X1-T34 are permanently connected (automatic reset), circuits 13-14, 23-24 and 33-34 will close and circuit 41-42 will break when the emergency stop is released.

To achieve a monitoring of the reset button, a forced NO contact must be placed between X1-X2. The NO contact must be connected between T34 and X1.

(Note that the reset button must be constructed using forced relays).

1 1-channel operation

2 2-channel operation

3 2-channel operation with monitored reset

4 Connection of external relays

5 2-channel door monitoring

6 Master / slave application

7 Connection of supply voltages

Description for connection of supply voltages

- (1): 24 VDC supply
- (2): 230 VAC supply (120 VAC)
- (3): 24 VAC supply (48 VAC)

Voltages in brackets are referring to NST-12 48/120 VAC

Note: All examples stated are supplied with 230 VAC and earth. Connection to 24 V AC/DC does NOT require earth connection.

17



NST-2003

CE Approved:
MD, EMC, LVD

Category 2/3, EN 954-1

(By 2-channel operation)

- 22,5 mm slim line emergency stop relay
- Transistor output for PLC monitoring
- New house types
- Choice between fixed and detachable terminals
- New voltage versions
- Same number of contacts as bigger and more space demanding relays

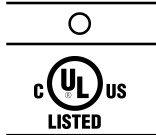
Function:

Small and powerful emergency stop relay for monitoring of emergency stop and other safety arrangements, with the same applications as NST-3, but with transistor output for PLC monitoring and separate voltage output. Now also available in a 48-240 VAC version.

Technical facilities regarding safety requirements:

- Forced contacts
- Doubling of output contacts
- Redundancy of emergency stop
- Manual / automatic reset

Approvals:



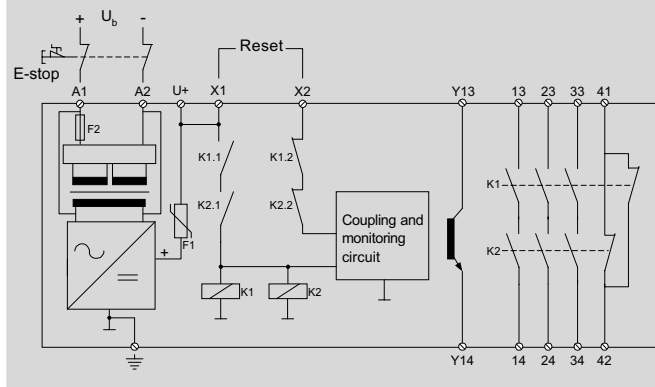
○ Awaiting approval

User's advantages:

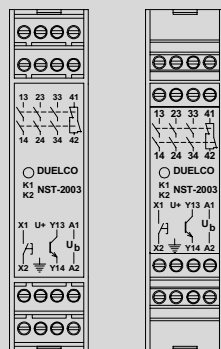
- 3 NO contacts, 250 VAC / 6 A / 1500 VA
- 1 NC contact, 250 VAC / 6 A / 1500 VA
- 1 transistor output for PLC monitoring
- Supply voltages: 24 V AC/DC, 48 - 240 VAC ± 10%
- Terminal X2 current limited (max. 150 mA)
- 22,5 mm housing with or without detachable terminals
- LED indication of output status for K1 and K2
- Separate 24 VDC output for e.g. PLC monitoring or indication of supply voltage
- AC/DC supply results in protection against wrong polarization
- Connection of external relays
- Design is based on the European Standard, EN 60204-1
- Complies with MD, EMC, LVD (98/37/EC, 89/336/EEC and 93/68/EEC)

➔ **Technical specifications and physical dimensions, see page 44-45**

Block diagram



Front layout



Terminal description:

- A1(+):** Power supply (+)
- A2(-):** Power supply (-)
- X1*:** Reset, output (+24V)
- X2*:** Reset, input
- 13-14,** NO safety output
- 23-24,** NO safety output
- 33-34:** NO safety output
- 41-42:** NC signal output
- Y13-Y14:** Transistor output
- U+:** +24 VDC output
- ⊥:** Earth

* Used for normal and automatic reset

Order information

Article name	Article no.
NST-2003D / 24 V AC/DC	42042306
NST-2003F / 24 V AC/DC	42042307
NST-2003D / 48-240 V AC	42042308
NST-2003F / 48-240 V AC	42042309

Note: D = detachable terminals
F = fixed terminals



HR-8

CE Approved:
MD, EMC, LVD

Category 4, EN 954-1
Type III C, EN 574

- Compact two hand control relay
- Safety category 4 acc. to EN 954-1 Type III C (EN 574)
- Short circuit protection via PTC-fuse

Function:

Two hand control relay for dangerous work processes such as punching or pressing.
Can be used by contact loads up to 6 A AC.

Technical facilities regarding safety requirements:

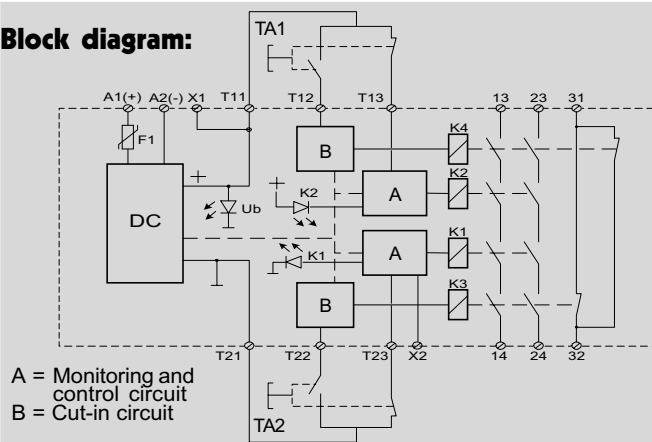
- Forced contacts
- Two-pole input terminals for activation contacts, monitored for short circuit by PTC-fuse
- 2 NO contacts
- 1 NC contact

User's advantages:

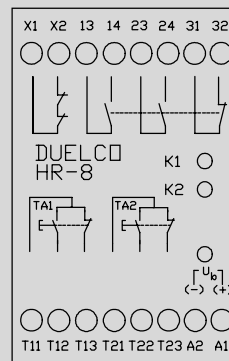
- 2 NO safety outputs
- 1 NC signal output
- Contact load: AC 6 A / DC 3 A
- Monitoring of external contacts
- LED indication of output status for K1 / K2 and supply
- 45 mm housing for space-saving DIN rail mounting
- Design is based on the European Standard, EN 60204-1/EN 574
- Complies with MD, EMC, LVD (98/37/EC, 89/336/EEC and 93/68/EEC)

➔ **Technical specifications and physical dimensions, see page 44-45**

Block diagram:



Front layout:



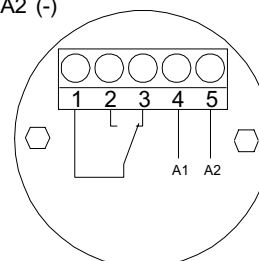
Terminal description, HR-8:

- A1/A2:** Power supply (+) / Power supply (-)
T11: TA1 button (common)
T12: TA1 NO input
T13: TA1 NC input
T21: TA2 button (common)
T22: TA2 NO input
T23: TA2 NC input
X1: + output for external monitoring
X2: + input for external monitoring
13-14, 23-24: NO safety output contacts
31-32: NC signal output contact

Terminal description, Duelco hand sensor actuator

TST-2:

- 1: Common connection
- 2: NO contact
- 3: NC contact
- 4: Power supply A1 (+)
- 5: Power supply A2 (-)



Order information

Article name	Article no.
HR-8, 24 V DC	42401248

Operation description and connection examples

Operating voltage must be connected to the terminals A1(+) and A2(-). With terminals X1 and X2 short-circuited, the monitoring and control circuit will be activated. In this condition the output contacts 13-14 and 23-24 is open and 31-32 closed.

After operation of the two contact sets TA1 and TA2 (see "Requirements to the contacts" and page 35) - each consisting of one set of forced make and break contacts in channel 1 (T11, T12, T13) and channel 2 (T21, T22, T23), HR-8 activates. I.e. the current paths 13-14 and 23-24 are closed while 31-32 are open.

The LEDs K1 and K2 illuminates. The time period between operation of TA1 and TA2 is max. 500 ms. This period is a requirement of the present standards.

Contact sets TA1 and TA2 ensure that faults such as a welded contact or a short circuit in or between contact sets will be registered by the monitoring circuit. This makes restart impossible

until the fault is rectified and the two hand relay HR-8 is back in its dwell position.

Requirements to the contacts:

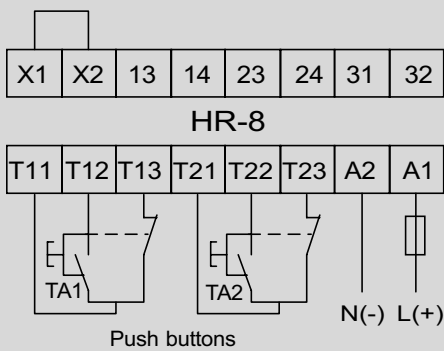
The contacts for the inputs TA1 and TA2 can be of the capacitive type, like Duelco's TST-2 or of the mechanical type with one forced and one break contact function which are physically independent of each other (see connecting examples).

The forcing and the breaking contacts function must function parallel and must not be mutual forced.

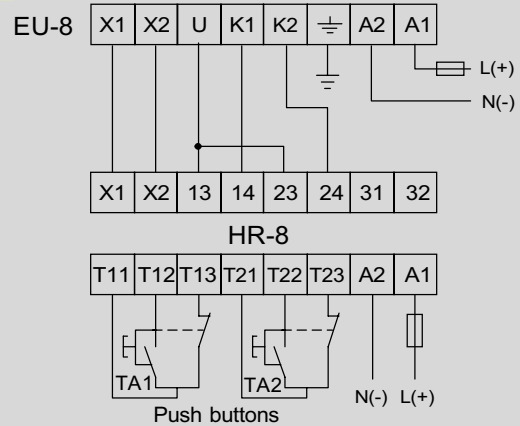
NOTE!

Use of any such mutually forced switch can possibly - due to a welded contact - lead to a situation where the HR-8 will not receive a stop signal even though the actuator has been deactivated. The described occurrence is only possible, if the defective actuator is released first!

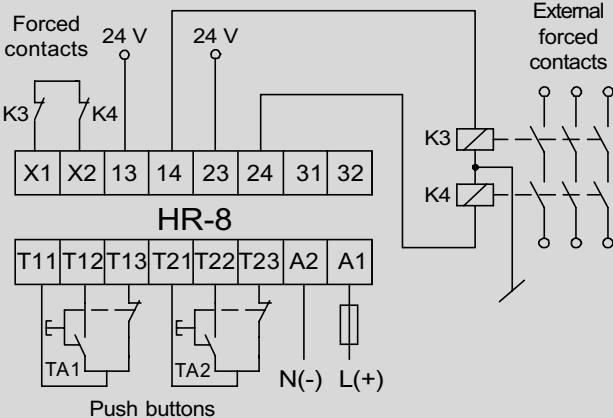
1 General application



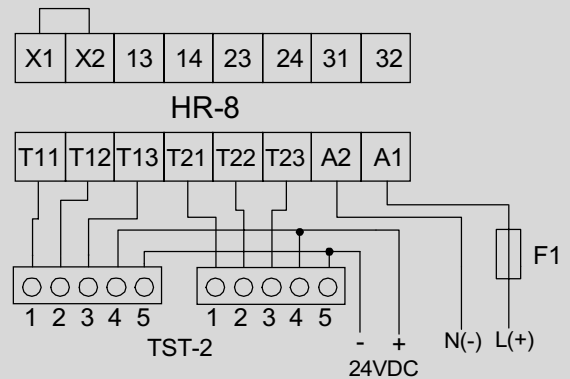
2 Connection of extension contact block EU-8



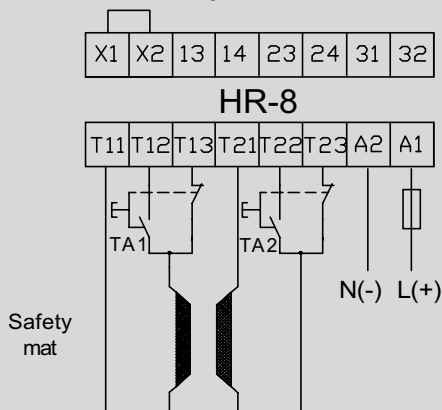
3 Connection of external contacts



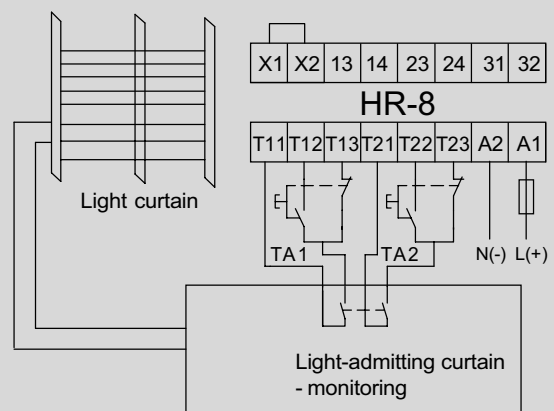
4 Connection of hand sensor actuator TST-2



5 Connection of safety mat



6 Connection of light-admitting curtain





HR-20

CE Approved:
MD, EMC, LVD

Category 4, EN 954-1
Type III C, EN 574

- Self retaining function
- Safety category 4 / Type IIIC
- Short circuit protection via PTC-fuse
- Detachable terminals
- External voltage supply for Duelco hand sensor actuator TST-2

Function:

Two hand control relay for dangerous work processes such as punching or pressing. Equipped with LEDs for status indication of the push buttons. Can be used in applications with a self retaining function.

Technical facilities regarding safety requirements:

- Forced contacts
- Two-pole input terminals for activation contacts, monitored for short circuit by PTC-fuse
- Two channel self retaining function for output contacts
- Short circuit protected transformer in the 230 V AC version

Approvals:



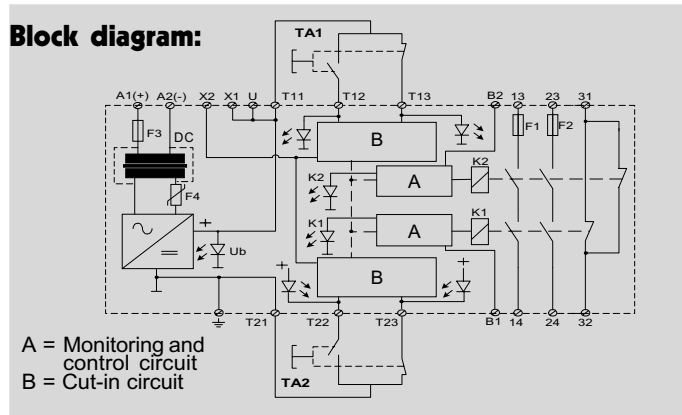
● Approved

User's advantages:

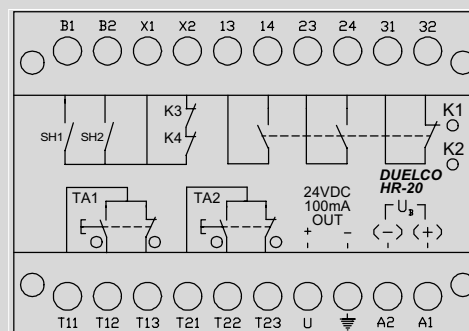
- 2 NO safety outputs
- 1 NC signal output
- Contact load: AC 3 A / DC 3 A
- Monitoring of external contacts
- Possibility for connection of doormat / photoswitch
- LED indication of input and output status
- External voltage supply for Duelco hand sensor actuator, TST-2
- Detachable terminals
- DIN rail mount
- Design is based on the European Standard, EN 60204-1 / EN 574
- Complies with MD, EMC, LVD (98/37/EC, 89/336/EEC and 93/68/EEC)
- EU type-examination at SAQ, Sweden

➔ **Technical specifications and physical dimensions, see page 44-45**

Block diagram:



Front layout:

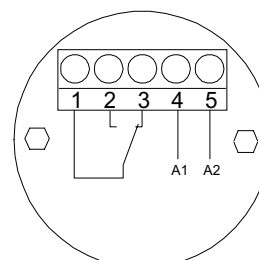


Terminal description:

- A1/A2:** Power supply (+) / Power supply (-)
- T11:** TA1 button (common)
- T12/T13:** TA1 NO input / TA1 NC input
- T21:** TA2 button (common)
- T22/T23:** TA2 NO input / TA2 NC input
- X1:** + output for external monitoring
- X2:** + input for external monitoring
- B1/B2:** Input for self retaining K1 / Input for self retaining K2
- 13-14, 23-24:** NO safety output contacts
- 31-32:** NC signal output contact
- U:** +24V output (for TST-2)
- ⊥:** Earth

Terminal description, Duelco hand sensor actuator TST-2:

- 1: Common connection
- 2: NO contact
- 3: NC contact
- 4: Power supply A1 (+)
- 5: Power supply A2 (-)



Order information

Article name	Article no.
HR-20, 24 V DC	42200241
HR-20, 24 V AC	42200240
HR-20, 120 V AC	42201200
HR-20, 230 V AC	42202300

Operation description and connection examples

Operating voltage must be connected to the terminals A1(+) and A2(-). With terminals X1 and X2 short-circuited, the monitoring and control circuit will be activated. In this condition the output contacts 13-14 and 23-24 are open and 31-32 is closed.

After operation of the two contact sets TA1 and TA2 (see "Requirements for the contacts" and page 35) - each consisting of one set of forced make and break contacts in channel 1 (T11, T12, T13) and channel 2 (T21, T22, T23), HR-20 activates. I.e. the current paths 13-14 and 23-24 are closed while 31-32 is open.

The LEDs at the terminals T12, T22 and at the relays K1 and K2 illuminate. The time period between operation of TA1 and TA2 is max. 500 ms. This period is a requirement of the present standards.

Contact sets TA1 and TA2 ensure that faults such as a welded contact or a short circuit in or between contact sets, will be registered by the monitoring circuit. This makes restart impossible

until the fault is rectified and the two hand relay HR-20 is back in its dwell position.

Requirements for the contacts:

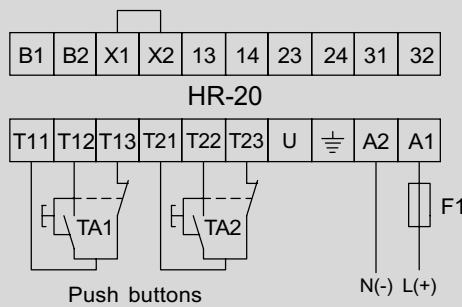
The contacts for the inputs TA1 and TA2 can be of the capacitive type, like Duelco's TST-2 or of the mechanical type with one forced and one break contact function which are physically independent of each other (see connecting examples).

The forcing and the breaking contact function must function parallel and must not be mutually forced.

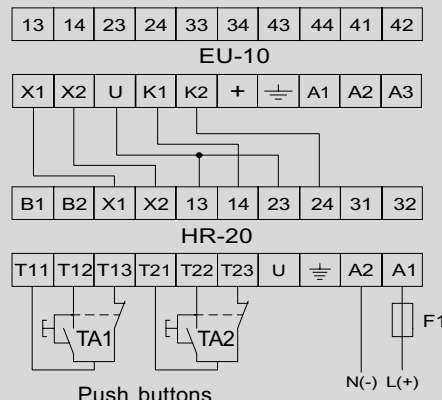
NOTE!

Use of any such mutually forced switch can possibly - due to a welded contact - lead to a situation where the HR-20 will not receive a stop signal even though the actuator has been deactivated. The described occurrence is only possible, if the defective actuator is released first!

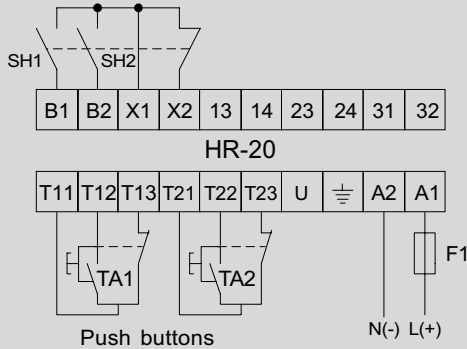
1 General application



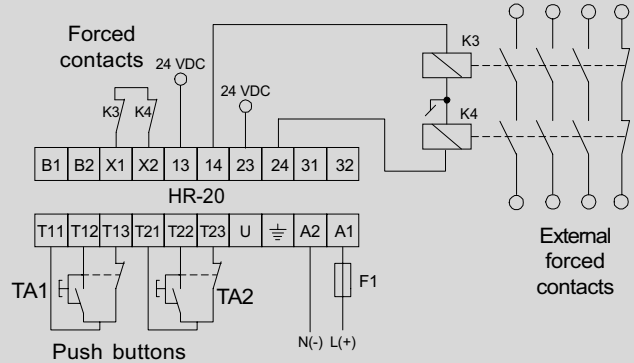
2 Connection of extension contact block EU-10



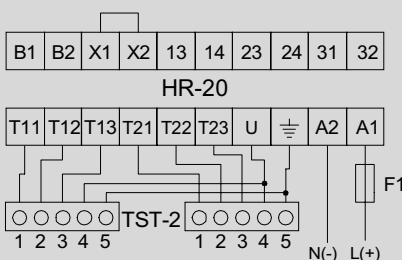
3 Self retaining function



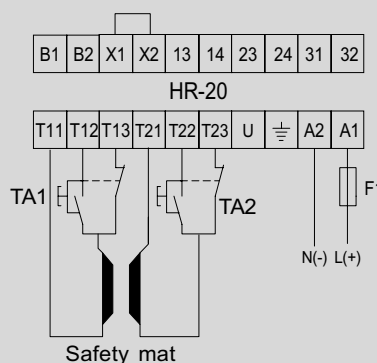
4 Connection of external contacts



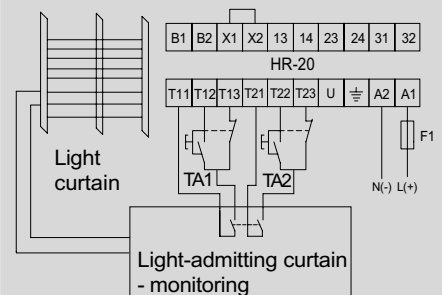
5 Connection of hand sensor actuator TST-2



6 Connection of safety mat



7 Connection of light-admitting curtain



Note: All examples stated are supplied with 230 VAC and earth. Connection to 24 V AC/DC does NOT require earth connection.



TL-4

 Approved:
MD, EMC, LVD

- Fulfills the requirements in EN 574
- Efficient screening of the operators hands
- Robust construction / material
- Delivered with mechanical push buttons

Function:

The two hand panel TL-4 is a safety actuator panel for efficient screening of the operator's hands.

Combined with the two hand control relay HR-8 or HR-20, an increased degree of safety for the operator is achieved in connection with work processes such as punching or pressing.

Technical facilities regarding safety requirements:

- Two (serial-coupled) contact units with 2 NC and 2 NO functions (forced) for double safety
- Screened push buttons acc. to the European standard
- Extra safety by means of a built-in two-pole emergency stop button
- Safe design of the push button return spring ensures that the contacts are always released
- Numbered and colour coded push button terminals

User's advantages:

- Easier operation of the push buttons than common push buttons
- Panel is detachable
- Solid construction and material
- Easy installation and implementation
- Meets the requirements of the Machinery Directive (98/37/EC)

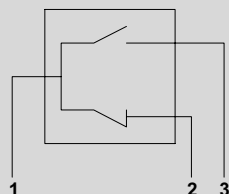
Description:

- Two hand panel with mechanical push buttons
- Emergency stop is installed

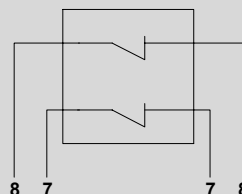
➔ **Technical specifications, see page 44-45**

Connection diagram

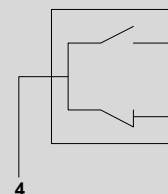
Left push button



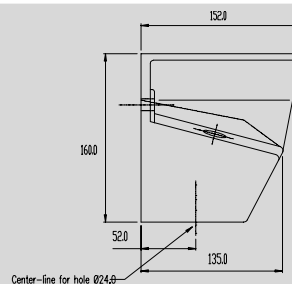
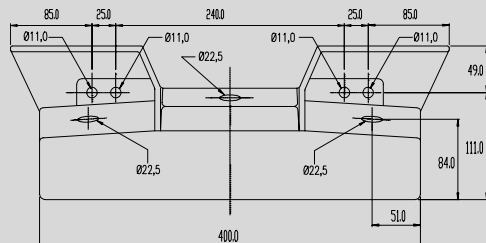
Emergency stop



Right push button



Physical dimensions

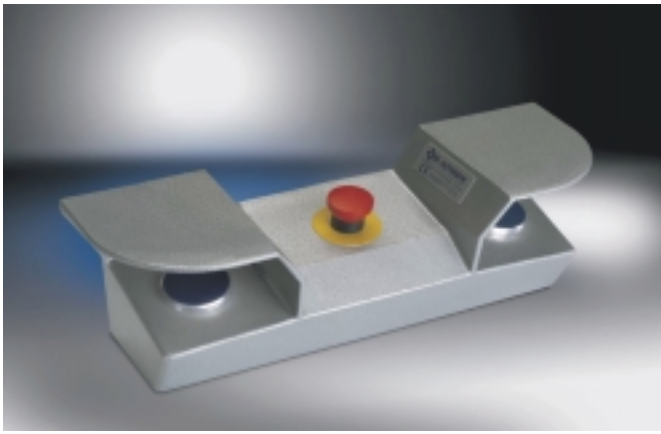


Technical data

Contact equipment:	2 BACO push buttons and 1 BACO emergency stop button with a contact block
Max. contact load:	16A 250 VAC
Mechanical lifetime:	> 10 ⁶
Consumption:	-
Casing:	IP 65
Weight:	3,7 kg

Order information

Article name	Article no.
TL-4	42800004
TLS (stand for TL-4)	42800024 (Height: 1100 mm)



TL-4C

CE Approvals:
MD, EMC, LVD

- Fulfils the requirements in EN 574
- Efficient screening of the operators hands
- Robust construction / material
- Prepared for installation of hand sensor actuator, TST-2

Function:

The two hand panel TL-4C is a safety actuator panel for efficient screening of the operator's hands. Combined with the two hand control relay HR-8 or HR-20, an increased degree of safety for the operator is achieved in connection with work processes such as punching or pressing. Combined with Duelco TST-2, TL-4C is especially useful for work processes with a high activation frequency.

Technical facilities regarding safety requirements:

- Duelco's hand sensor actuator TST-2 fulfils the requirements of doubling and monitoring (Note: TST-2 must be ordered separately)
- Screened push buttons acc. to the European standard
- Extra safety by means of a built-in two-pole emergency stop button
- Ready for mounting of Duelco hand sensor actuator TST-2
- Numbered and colour coded terminals

User's advantages:

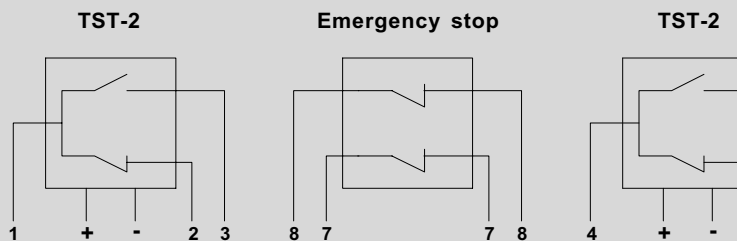
- Easier operation of the hand sensor actuators than common push buttons
- Panel is detachable
- Solid construction and material
- Easy installation and implementation
- Meets the requirements of the Machinery Directive (98/37/EC)

Description:

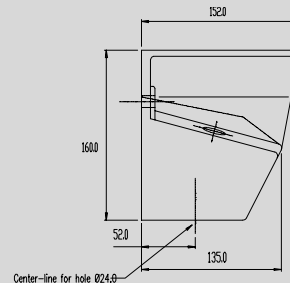
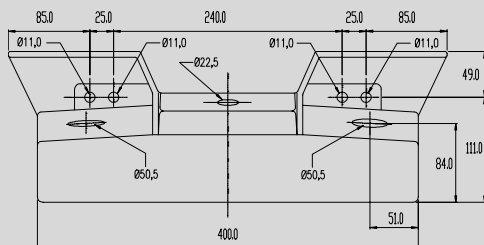
- Two hand panel with possibility for mounting Duelco TST-2
- Emergency stop is installed

➔ **Technical specifications, see page 44-45**

Connection diagram



Physical dimensions



Order information

Article name	Article no.
TL-4C (exclusive TST-2)	42800014
TST-2 (actuator)	42000002
TLS (stand for TL-4C)	42800024 (Height: 1100 mm)

Technical data

Contact equipment:	Two capacitive hand sensor actuators Duelco TST-2 have to be mounted. One BACO emergency stop button with a contact block is mounted.
Max. contact load:	TST-2, 0,5A 24VDC
Contact block:	16A 250VAC
Mechanical lifetime:	> 1 million
Consumption:	Ca. 6 VA
Casing:	IP 54
Weight:	3,7 kg



SSO-10

CE Approved:
MD, EMC, LVD

Category 3/4, EN 954-1

(By 2-channel operation of 23-24, 33-34, 41-42)

- Designed for 1- and 3-phase motors
- Can be used in applications with frequency converters
- Microprocessor controlled
- 2 NO safety outputs and 1 NC signal contact
- 10 A contact load
- Status indication with LEDs
- Detachable terminals

Function:

Relay for standstill monitoring of 1- and 3-phase motors. SSO-10 is designed for applications as centrifugal, mixing and chopping machines, where the run-down time is not a constant value due to the varying load of the machine.

Technical facilities regarding safety requirements:

- Forced contacts
- Doubling of output contacts
- Internal / external redundancy

LED status table

LED K1	LED K2	Status/Error
OFF	OFF	Relay detects that the motor is running
Green	Green	Relay detects that the motor has stopped
Red	Red	Constant, flashing or changing green/red light. Signal/control error. Relay may be defective

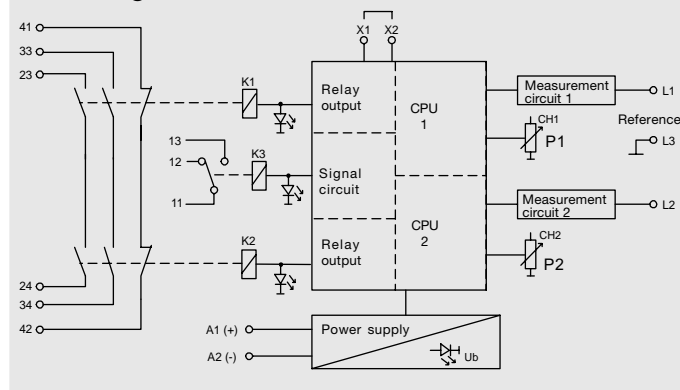
LED U _b	Status/Error
OFF	Power supply not present / bad connection
ON	Power supply OK

User's advantages:

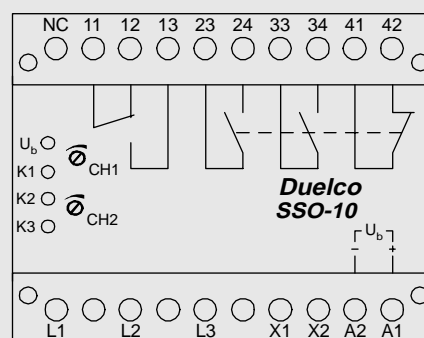
- 2 NO safety contacts 10 A AC, 5 A DC
- 1 NC signal contact 10 A AC, 5 A DC
- 1 CO signal contact 4 A AC, 3 A DC
- Monitoring of external relays through terminals X1-X2
- LED indication of supply + output status for K1, K2 and K3
- Power supply: 24 VDC, ± 10%
- DIN rail mounting
- Two separate and independent microprocessors working with two different and independent software codes acc. to the principles for diversity and monitoring
- Approved by Demko acc. to the Machinery- and the Low Voltage Directive
- Complies with MD, EMC, LVD (98/37/EC, 89/336/EEC and 93/68/EEC)
- Design is based on the European Standard, EN 60204-1

➔ **Technical specifications and physical dimensions, see page 44-45**

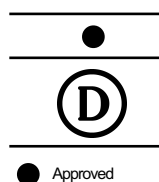
Block diagram:



Front layout:



Approvals:



Approved by DEMKO acc. to:
The Machinery Directive: MD-DK 97-02639
The Low Voltage Directive: CCA Certificate no. DK 97-02985

● Approved

Terminal description:

- A1/A2:** Power supply (+) / Power supply (-)
 - L1/L2:** Measure input, channel 1 / Measure input, channel 2
 - L3:** Reference input
 - X1*/X2*:** Output / Input control of K1's driver step
 - NC:** Option: 24V supply for the shortest possible measurement setting (only build on request)
 - 11**/12**/13**:** Common / NC / NO signal output
 - 23-24, 33-34:** NO safety outputs
 - 41-42:** NC signal output
 - CH1/CH2:** Potentiometers (P1, P2) for adjustment of the voltage level (standstill level)
- * Maintain voltage for K1's driver step. Possibility for use of external monitoring of contacts.
** Signal contact for status of the output

Order information

Article name: SSO-10, 24 V DC
Article no.: 42501240

Operation description and connection examples

The supply voltage is connected to A1(+) and A2(-) and the LED Ub illuminates green. The terminals X1-X2 are used to monitor any external relays and the motor is connected to L1, L2 and L3, the monitoring circuit. Upon connection of supply voltage, SSO-10 performs an internal self test which checks for:

- Detection of cable-break in channel 1 (L1-L3) and channel 2 (L2-L3).
- Detection of incorrect supply voltage.
- Control of the level (Motor versus Settings).
- Cyclic test of feedback from safety- / signalling contacts and relays.
- Cyclic test of the controlling device.

During the self-test, the LEDs for K1/K2 illuminate both green and red. If no errors are detected and the input voltages connected to L1, L2, and L3 are below the threshold voltage, then the output relays will be activated, i.e. the safety contacts 23-24, 33-34 close and the signalling contact 41-42 opens. The CO switch changes position from 11-12 to 11-13.

The LEDs K1, K2, and K3 illuminate, and the Power On LED illuminates. The relay functions internally with 2 measuring channels (L1-L3 / L2-L3 with L3 as the reference point) each monitoring its own relay. The relays for the measurement channels must be activated within a time interval less than 2 seconds or the output relay will lock out. If the time interval exceeds 2 seconds, then the LEDs for K1/K2 change colour from green to red and the LED for K3 will remain off. This condition remains until the supply voltage is removed.

The colour of LEDs K1 and K2 is green if the voltage of the input L1-L3 or L2-L3 is below the threshold voltage. If an error occurs, they change to red. LED K3 is illuminated only if both the output relays K1 and K2 are correctly activated within the interval time of 2 seconds. If a breakage in the cables is detected or the voltage of L1-L3 / L2-L3 is greater than the level of the threshold voltage, then the LED of the channel in question will turn off and the output relay will lock itself into a safe position. The relay can only be reset by removing the supply voltage.

*) The threshold voltage is regulated by CH1/CH2. When the monitored voltage is below the regulated threshold point, the relay is activated. The threshold voltage can be adjusted between 0,02 - 0,5 VDC or 0,04 - 1 VAC (see fig. 6).

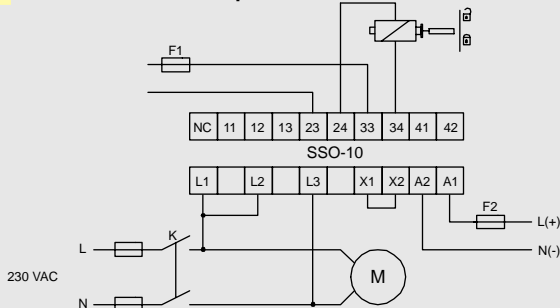
Function test: The SSO-10 can be function tested by the following procedure. Connect a short circuit between L1 - L2 - L3 and a short circuit between X1 - X2. Connect 24 VDC across A1 and A2 and if the relay is functioning correctly, then all of the outputs will be activated and all of the LEDs will illuminate green!

Note: SSO-10 is tested with the following frequency converters:

- Danfoss VLT 2030
- Danfoss VLT 5001
- Danfoss VLT 5003
- Danfoss VLT 5004
- Danfoss VLT 5005
- Telemecanique ATV-18U29N4

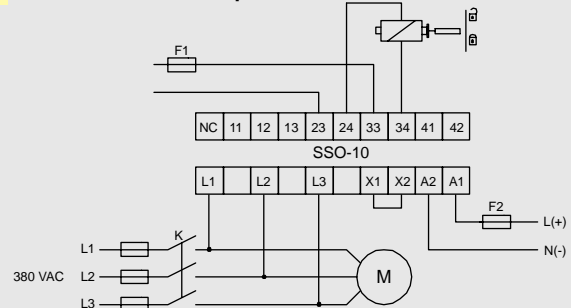
Contact Duelco or your local distributor for further information.

1 Connection of a 1 phase motor



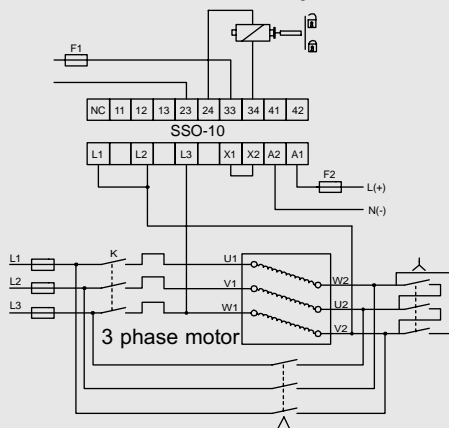
Motor running: Relay deactivated, magnetic catch is locked
By standstill: Relay activates, magnetic catch can be opened

2 Connection of a 3 phase motor

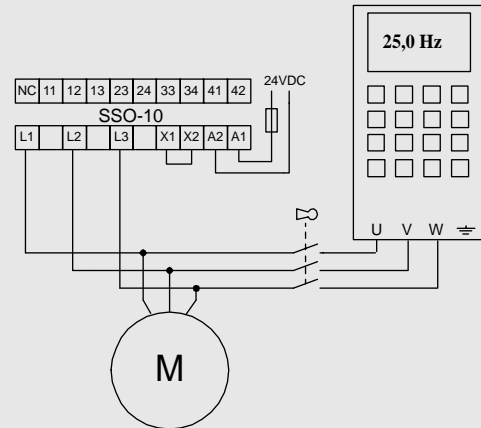


Motor running: Relay deactivated, magnetic catch is locked
By standstill: Relay activates, magnetic catch can be opened

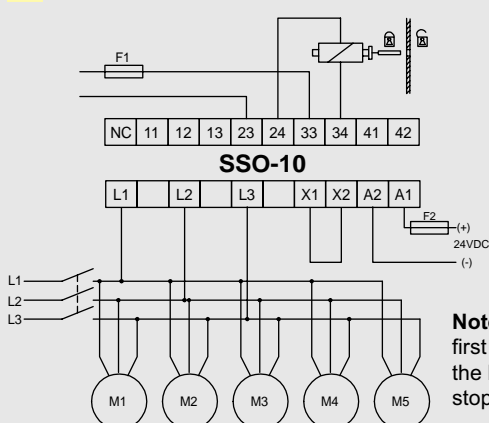
3 Connection of a star/delta system



4 Connection of a frequency converter

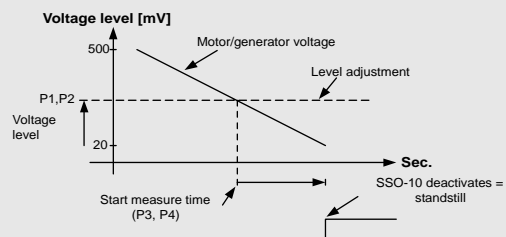


5 Connection of several 3 phase motors



Note: SSO-10 will first detect stop, when the last motor has stopped.

6 Description of the potentiometers



The measure time is the time interval where SSO-10 must measure, if the generator voltage is less than the chosen level adjustment (voltage level), before the standstill of the motor will be accepted. P1(CH1), P2(CH2) => potentiometers for adjustment of the level. P1 and P2 are placed on the front. P3(CH1), P4(CH2) => potentiometers for adjustment of the measure time. P3 and P4 is placed under the terminal block with the outputs contacts.