DUELCO TWO HAND CONTROL STATIONS



PRB05



TST-4/2



PCB3/SDE/TST-4/2

NORSTAT INC.

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Presentation PCB3®

The Control requires at least a synchronous action by both hands to release and maintain the operation of a machine or machine elements as long as there are dangerous situations, assuring in this way only the protection of this operator.



Description PCB3/P

- Smelted-aluminum cover-part with a protection lid over each pushbutton.
- Available with reserved holes for additional pushbuttons of Ø22,5 mm (see Selection table of references).
- Delivered with an Ø20 mm ergonomic head tube made of polished stainless steel to facilitate the operation of the buttons from different positions.
- Bottom base cast aluminum with central opening of 200x90 mm for cables entries.
- Prepared to be mounted directly on adjustable metal foot PRB05.
- 2 mm thickness rubber sealing between base and cover to protect the terminals against dust, oil and water.
- IP65 protection with supplied pushbuttons.
- Weight: 5Kg.
- Standard paint orange RAL 2003 (other versions on request).



PCB3/S

- **Two-hand control**
  Two black pushbuttons Ø60 mm (mushroom type) with contact block (1NO + 1NC).
- **Emergency Stop device**
  One red pushbutton Ø40 mm (mushroom type) with blocking device, push-turn for unlocking, contact block (2NC), delivered with Ø60 mm Emergency Stop label, yellow and English black letters (others languages under request).
- **Manufactures**
  Rockwell, (others manufactures under request).
- **4 PVC blockages,** black color and Ø22,5 mm with reserved holes option.

Telescopic adjustable height Pedestal PRB05, for PCB3® mounting



Description of PRB05

- Two telescopic tubes of Ø55 and Ø60 mm with a lever to fix the selected height angle and turn position.
- Two cable entries at bottom side and an Ø48 mm PVC cone at the top to retain the cables.
- A plate of 200x90x3 mm on top side prepared to assemble the PCB3®, and lever for the inclination adjustment.
- A robust and stable base plate with two Ø10,5 mm holes to fix the metal foot on the floor.
- The PRB05 base plate is prepared to accept two foot control unit.
- Steel made.
- Standard paint RAL2003 orange textured.
- Weight: 9,2 Kg.



Special Applications

On request is possible to provide units with special characteristics or factory preassembled, for example:

- Special Painted.
- Special heights.
- Assembled additional pushbuttons, as switches, signaling lamps, selectors, etc.
- Safety foot control mounted.
- Units pre-wired.
- Labels with texts in different languages, for example in emergency stop

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duelco SAFETY solutions

Models

Type	Emergency Stop	Control Pushbuttons	Accessories	Order Ref.
 **PCB3/SS**	1 hole of Ø22,5 mm	2 holes of Ø22,5 mm	--	**PCB3/SS**
 **PCB3/S** **PCB3/SDE**	**1 red estop pushbuton Ø40 mm mushroom type Push-turn for unlocking NC + NC** **1 red failsafe monitored estop pushbuton Ø40 mm mushroom type Push-turn for unlocking NC + NC**	2 black pushbuton Ø60 mm mushroom type NC + NA Slow double make and break	--	**PCB3/S** **PCB3/SDE**
 **PCB3/N**	1 hole of Ø22,5 mm	2 holes of Ø22,5 mm	4 holes with rubber plug of Ø22,5 mm	**PCB3/N**
 **PCB3/P**	1 red pushbuton Ø40 mm mushroom type Push-turn for unlocking NC + NC	2 black pushbuton Ø60 mm mushroom type NC + NA Slow double make and break	4 holes with rubber plug of Ø22,5 mm	**PCB3/P**
 **PCB3/S-NE**	1 red pushbuton Ø40 mm mushroom type Push-turn for unlocking NC (npneumatic)	2 black pushbuton Ø60 mm mushroom type NA (pneumatic)	Pneumatic control relay for two hand control EN574 : type IIIA	**PCB3/S-NE**
 **PCB3/P-NE**	1 red pushbuton Ø40 mm mushroom type Push-turn for unlocking NC (npneumatic)	2 black pushbuton Ø60 mm mushroom type NA (pneumatic)	4 holes with rubber plug of Ø22,5 mm Pneumatic control relay for two hand control EN574 : type IIIA	**PCB3/P-NE**
 **PCB3/SD** ***PCB3/SDE/TST4-2**	1 red pushbuton Ø40 mm mushroom type Push-turn for unlocking NC + NC	Equipped with reserved Ø 50 mm holes for Duelco hand sensor actuator Equipped with 2 TST-4 sensors and fail safe Estop button	Duelco hand sensor button TST-4	**PCB3/SD** **PCB3/SDE/TST4-2**

Control Station available with optional Zero Touch buttons TST-4 and Fail Safe E Stop Button (50mm) Part #PCB3/SDE/TST-4-2

Metal foot with adjustable height PRB05, for PCB3® instalation.

Type		Height (PCB3® installed)	Accessories	Order Ref.
 **PRB05**	**Base plate** 435 x 360 x 6 mm	750 – 1000 mm	2 safety foot control (optional)	**PRB05**

DUELCO ZERO FORCE TOUCH TWO HAND CONTROL STATION



Complete Zero Force Touch Control Station With Pedestal PCB3/SDE/TST/4/2 + PRB05



Zero Force Two Hand Control Station PCB3/SDE/TST/4/2



TST-4 Zero Force Sensor

Features & Specifications:

* Adjustable Pedestal
* Zero Force Sensor
* Power Supply- 24VDC
* Contact Load - 100mA
* Continuous Signal when activated
* Reverse Polarity Protected
* PhotoMOS-Relay NC/NO)
* Meets EN-60204-1
* Works with Gloves
* Dual LED's

The TST-4 is ergonomically designed to eliminate the hand, wrist, and arm stresses associated with mechanical push buttons. They require absolutely no physical pressure to operate. LED indicators light for "power on" and "output activated". Typical mechanical push buttons require 2lbs of pressure to actuate which could amount to 2 tons per day based on 1000 actuations.

Compatible Two Hand Anti Tie Down Safety Relay HR-2007, as well as other mfrs

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Hand Sensor Actuator TST-4



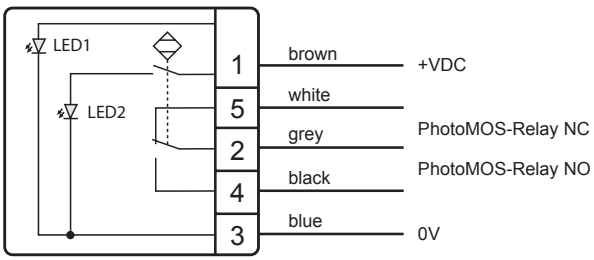
The Duelco hand sensor actuator is an obvious choice
- especially with a high activation frequency

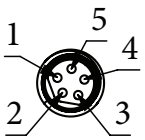
User's advantages

- Ergonomic
- Low activation force
- Reduces the possibility of injuries
- Increases the productivity
- On/Off indication via LEDs
- Outputs are NO/NC contacts

CE

Connection diagram and connector M8, 5-pole

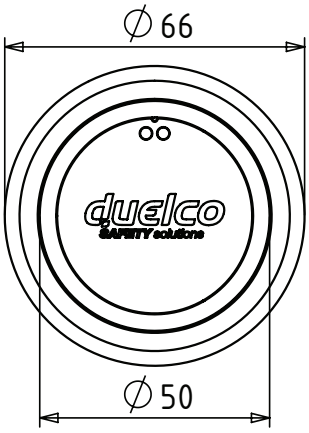


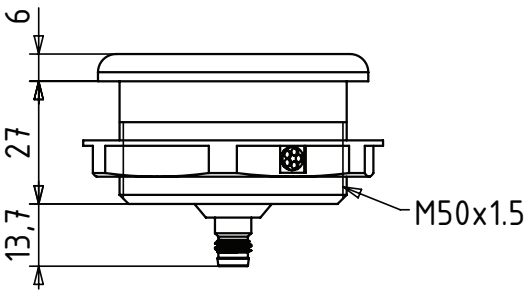


DS/EN ISO 13849-1:
Cat. 4 Performance Level e

The TST-4 has no independent safety function. The safety level is obtained by connecting the two hand control relay Duelco HR-2007.

Dimensions (mm)





Additional M8, 5 pole cable **TST-4 Cable**

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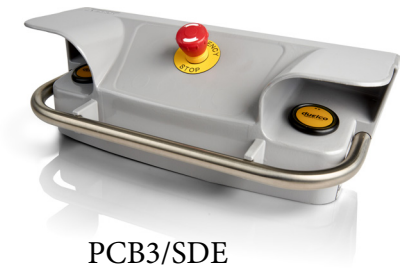
Operation description

Hand sensor keys are indispensable in connection with presses and punching machines for reasons of operator efficiency. The common press buttons already available on the market require a pressure of up to 1 kg and given, for example, a typical 1000 activations per day on a 2-handed relay, this amounts to a daily load on the operator of 2 tons.
Duelcos TST-4 hand sensor key, require only a light pressure and have the added feature of optimal seal which fulfils the requirements of DIN VDE 0470-1.
The hand sensor keys have therefore won a justified foothold where a high level of activating frequency is required, typically on presses and punching machines. By using Duelco's hand sensor keys, a very high level of ergonomically efficient work practice, and hence optimal working conditions for the operator, is achievable.
Duelco's hand sensor keys are based on capacitive circuits with a degree of sensitivity so fine that the operator can activate his hand sensor keys even when using working gloves.
Duelco's hand sensor key TST-4 fulfils the requirements acc. to EN 60204-1 regarding duplication and monitoring.
with use together with the Duelco HR-2007)
CE-marked according to MD, EMC and LVD

Technical data TST-4

Electrical data	
Supply voltage (NB! Common Power Supply)	24V DC
Voltage range	± 10%
Frequency (AC-type)	50 ... 60 Hz
Power consumption	~ 10 mA @ 24 V
Contact data	
Contact-allocation	PhotoMOS-Relay NO / NC
Contact load	100 mA
EMC requirements	EN61000-6-3 EN61000-6-2
Mechanical data + various	
Housing material	Polycarbonate
Dimensions, Surface of contact Built-in dimensions	 Ø 50 mm Ø 50 mm
Operating temperature	-25 - +70° C
Enclosure rating, Surface of contact	IP 65
Mounting	Nut, M50x1,5 mm

Accessories:



PCB3/SDE

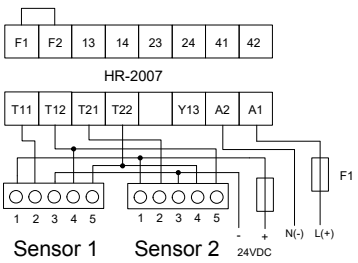


PCB3/SDE + PRB05



HR-2007

TST-4 to HR-2007 Wiring



Order information:

Description	Article no.
TST-4 24V DC	42000010
TST-4 cable, 2 meters	42000011

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Specifications PCB3®

Constructive		
Conformity		EN 574
Materials	Body Bar Seal	Smelted Aluminum Stainless Steel (AISI 304) Rubber 2 mm
Weight		5 kg.
Color		Orange RAL 2003
Dimensions		See page 9
Electrical Shock Protection		IP 65

Electrical pushbuttons (Rockwell 800FP series)		PCB3/S, PCB3/P
Certifications		CE
Conformity		NEMA ICS-5, UL 508, EN ISO 13850, EN 60947-1, EN 60947-5-1, EN 60947-5-4, EN 60947-5-5
Terminal identification		IEC 60947-1
RoHS		Yes
Mechanical durability	EN60947-5-1 (Anexo C)	10.000.000 cycles
Operating forces	Emergency Stop	43N
	Control pushbuttons	13N
Temperature range	Operation Storage	-25…+70°C (-13…158°F) -40…+85°C (-40…185°F)
Humidity		50…95% RH a 25…60°C (77…140°F)
Standard contact block ratings		A600, Q600 600V AC AC 15, DC13 to IEC/EN 60947-5-1 and UL 508,17V, 5 mA min
Thermal current		10 A max (40°C ambiente) to UL508, EN 60947-5-1
Insulation voltage		690V
Wire capacity		0,75..2,5mm² (#18…12 AWG)
Recommended tightening torque		0,7…0,9Nm
External short circuit protection		6 A type gL/gG cartridge fuse to EN 60269-2-1 or gN (Class J to UL 248-8 or Class C to UL 248-4)
Electrical shock protection		IP2X (finger safe conformity)
Contact operation	N.O. N.C.	Slow double make and brake Slow double make and brake – positive opening

Pneumatic pushbuttons (Parker PXB)		PCB3/S-NE, PCB3/P-NE
Certifications		**CE**
Conformity	Two-hand controller (Included)	EN 574: type IIIA
Working pressure		1 to 8 bar
Temperature range	Operation Storage	-15…+60°C (5…140°F) -40…+85°C (-40…185°F)
Flow	ISO 6358	Qmax = 60 l/min Qn = 30 l/min
Connections		Ø4 mm straight Push-in
Activation force (at 6 bar)	Emergency Stop	49N
Activation force (at 6 bar)	Control pushbuttons	8,5N

Relevant aspects of security		
EN954-1		**Cat. 4** **(properly connected to a safety relay)**
ISO 13849-1, ISO 13849-2:2003 **IEC 62061**	Emergency Stop Circuit	B10d=100000, nop=365* PL e, SIL 3, DCavg=99%, MTTFd=100 (High) PFH [1/h]=2,47E-8 (properly connected to a safety relay)
	Two hands control circuit	B10d=100000, nop=10512* PL e, SIL 3, DCavg=99%, MTTFd=100 (High) PFH [1/h]=4,93E-8 (properly connected to a safety relay)

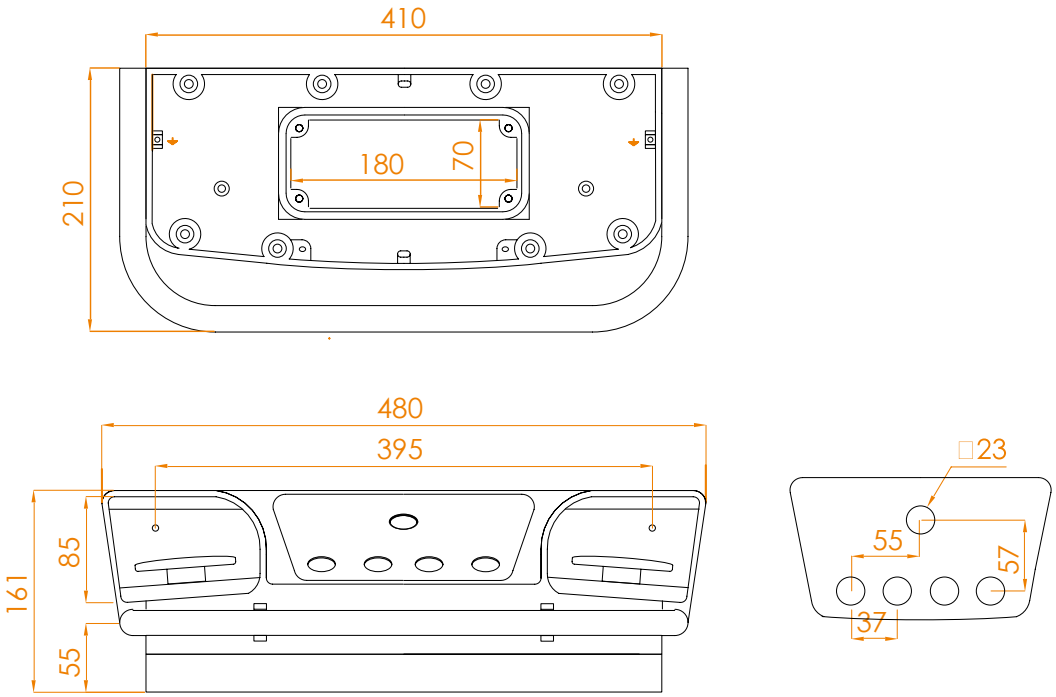
* Data is based in the following numbers of operations: 1op/24 hrs, 24hrs/day, 365 days/year (Emergency Stop)
1op/50min., 24hrs/day, 365 days/year (Two hands control)

Specifications PRB05

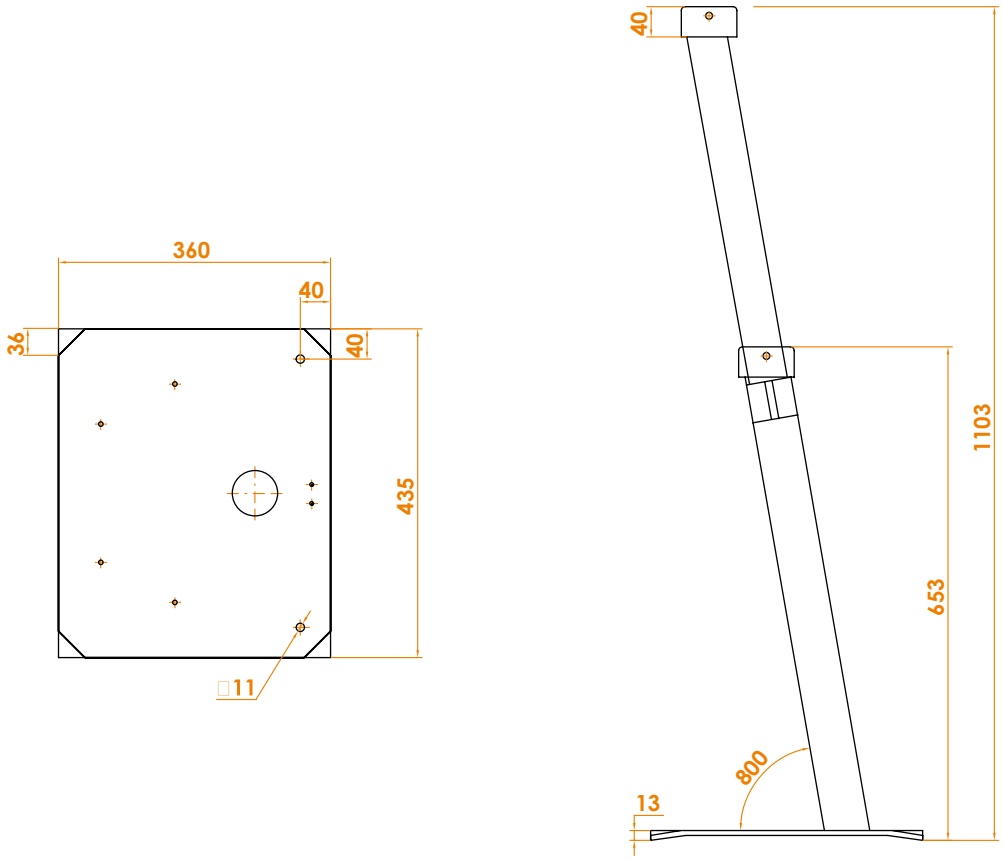
Construction		
Certifications		CE
Materials	Body	Steel
Weight		9,2 kg.
Color		RAL 2003 Orange textured
Dimensions		See page 9

Dimensions

PCB3/...



PRB05



Definitions and installation-instructions

Important

All related installation-instructions are to be carefully followed and fully complied with in the way to obtain the accordance to EN574.
Following relevant safety standard are to be taken into consideration by the installation of a two-hand control unit:
EN60204; EN292-1; EN292-2; EN574; EN954-1,EN954-2; prEN999.
The two-hand control desk must be connected to a certified safety device in accordance to EN574 chap. 3 and from type IIIC – categorie 4 in accordance to EN954-1 –2 (the logik block authorize the start of the machine cycle only if both pushbuttons are actuated within a delay inferior or equal to 0,5 s).

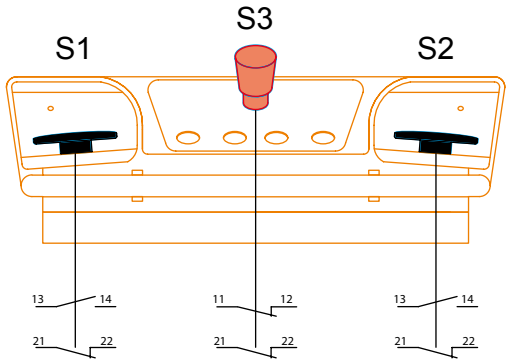
- In the case of movable two-hand control desks it is necessary to take measures against movement of the desk during the operation.
- The minimum safety distance “S” is to be taken into consideration and must be calculated using the following general formula according to EN999:

General formula: $S = (K \times T) + C$ where:
S = minimum safety distance in mm,
K = aproach speed of the body or a body limb (1.600 mm./s according to EN999),
T = (T1 + T2) Total reponse time (machine stop time) in sekonds,
T1 = output Relay Release Time (Delay-on Energisation to EN574).
T2 = delay-time for machine stop or interruption of dangerous mouvement after delay time from safety module.

Example

The mininum safety distance between the dangerous zone and the closest pushbutton must be calculated using the following formula.
S = (1.600 mm./s. + T) + 250 mm.
In case that the risk of moving the body or a body limb towards the dangerous zone is limited while the protective devices is actuated, e.g. by means of an adequate screen, the value of C can be 0 with an acceptable mininum value of S = 100 mm.

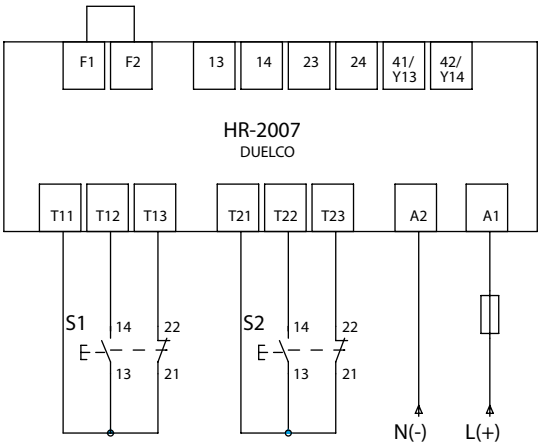
Wiring



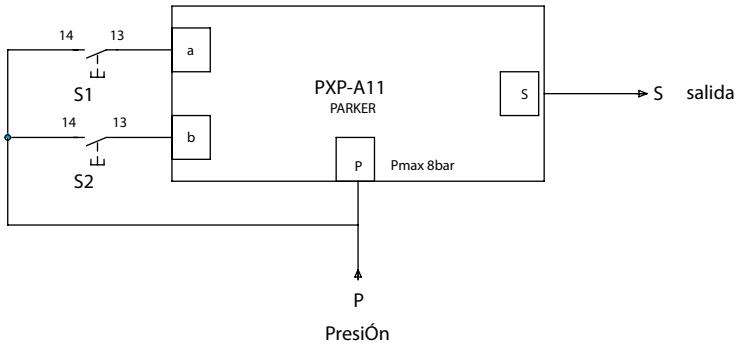
- The two-hand control unit and connection cables with a certified safety device are to be installed in a way to avoid influences from the severe mechanical loads. The system have to comply with EN954-1-2 and other specifications concerning environment conditions. We recommend multi-conductor cable with shield.
- The shield must be connected to earth with one of his extremities. Connect the earth-terminal from the two-hand unit with the earth-terminal from electrical cabinet.
- In the case of two-hand control unit with emergency-stop button it is necessary to dissociate the electrical connection from emergency-stop and the electrical connection from the two-hand pushbuttons in passing them through different cables.
- Foresee cable glands at the cable entries to obtain a correct efficacy of the anti-twist protection.
- It is imperative to mount the certified safety control device in the control cupboard to avoid a false function (their outputs are not controled).
- There are to install so many two-hand control desk as control places from the machine.

Example of “two-hand” control wiring

The following diagram shows the basic wiring of the activation pushbuttons S1 and S2 to a specific safety relay for control of the two-hands system. It is recommended to follow the manufacturer’s safety relay for proper wiring.



* Example of electrical wiring with a Duelco two-hand control relay HR-2007, to reach a category IIIC according to EN574, Cat.4 according to EN954-1 or PL e according to ISO 13849-1.

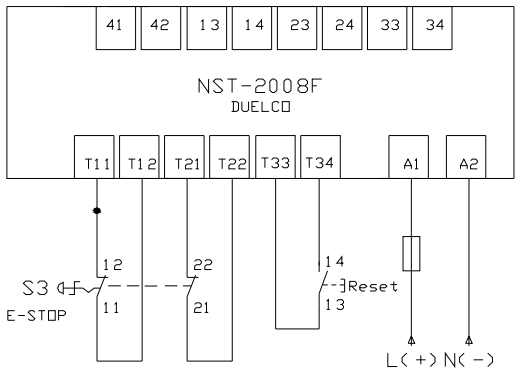


* Example of pneumatic wiring with a Parker two-hands control relay PXP-A11, where it can get a category IIIA according to EN574, Cat.a according to EN954-1 or PL c according to ISO 13849-1.

Example of “Emergency Stop” control wiring

The following diagram shows the basic wiring of the Emergency Stop pushbutton S3 to a specific safety relay for control of the Emergency Stop system. It is recommended to follow the manufacturer's safety relay for proper wiring.

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- Example of electrical wiring with a Duelco emergency Stop control relay NST-2008F, where it can get a Cat.4 according to EN954-1 or PL e according to ISO 13849-1.

Maintenance and Inspection

All security devices for persons shall be carefully tested and checked during the life cycle. The functions/elements to be tested are:

- Connecting cable between two-hand control desk an security device.
- Function of pushbuttons and contacts.
- Test and inspections of the protective device shall be carried out according to the current laws and regulations by qualified and trained persons.

Overview of the European Standard EN 574: 1996

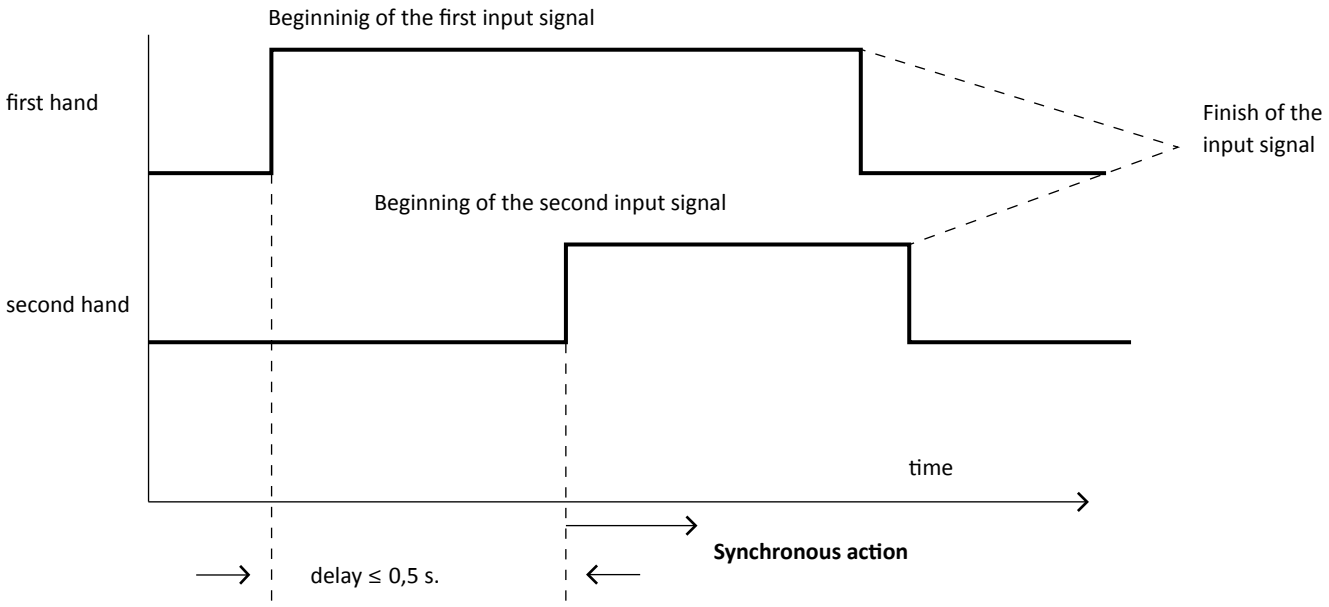
Extracts: DIFFERENT KINDS OF TWO-HAND UNITS AND SELECTION

The following Table shows the three types of two-hand units, their funtions-features and the fundamental health & safety requirements from each type. The compliance with EN292 and the correspondig parts from EN60204-1 has to be achieved with the two-hand control units.

PRESCRIPTIONS	TYPE				
	I	II	III		
			A	B	C
Use of both hands (simultaneous action)	x	x	x	x	x
Link between input and output signal	x	x	x	x	x
Inhibiting the output signal	x	x	x	x	x
Prevention of accidental operation	x	x	x	x	x
Tamper-proof	x	x	x	x	x
Reinitialization of the output signal		x	x	x	x
Synchronous action			x	x	x
Use of category 1 conforming to EN 954-1	x		x		
Use of category 3 conforming to EN 954-1		x		x	
Use of category 4 conforming to EN 954-1					x

Extracts: Synchronous action

The output signal is only generated if both pushbuttons are activing within a delay lower or equal to 0,5 s.



- Note: in case that two or more two-hand control units are used to operate a machine, the synchronous action is only required for each two-hand control unit, but not between the control units.

Extract: Protection against accidental operation and tampering

The pushbuttons of a two-hand control unit must be designed and positioned in a way that it is difficult to "tamper" with the protection offered by the two-hand control unit and to minimize the probability of accidental operation ,conforming to the estimatio of risk in the particular application.

The use of a single hand, the combination of one hand and/or other parts of the body, the use of simple auxiliary means that allow a tampering have to be taken into consideration in a way that it is impossible to reach the dangerous zone during a dangerous situation. An accidental operation (e.g. by the operator's clothes) has to be taken into account in the same way.

- **Tampering with a single hand**

It is necessary to take measures against tempering with a single hand. Here below you will find examples of appropiate measures:

- Distance between the pushbuttons (internal dimension) of at least 260 mm.
- One or more screens designed in a way that the distance between the puschbuttons including obstacle of at least 260 mm.

- **Tampering with one hand and the elbow of the same arm**

It is necessary to take measures against tampering with one hand and the elbow of the same arm. Here below you will find examples of appropiate measures:

- One or more screens designed in a way that the pushbuttons cannot be actuated with the elbow and the finger of the hand of the same arm.
- Cover designed in a way that the pushbuttons cannot be actuated with the elbow.

- **Tampering with one hand and other parts of the body (e.g. knee, hip)**

It is necessary to take measures against tampering with one hand and other parts of the body. Here below you will find examples of appropiate measures:

- Positioning of the two-hand control unit on a horizontal or almost horizontal surface situated at least 1100 mm above the ground or the access platform. This arrangement prevents the operaton with the hip.
- In case of installation on a vertical or almost vertical surface, mounting of a protetive collar around the pushbuttons.
- Covers and/or screnns designed in a way that the pushbuttons cannot be actuated with one hand an another part of the body.

Indication:

The two-hand control units PCB3 meet these requirements for protection against accidental operation and tampering. For them it is necessary that all instructions about installation and use are carefully followed and fully complited with.

ANNEX B (informative) of EN 574

DIFFERENT TYPES OF TWO-HAND CONTROL UNITS AND THEIR CORRESPONDENCE WITH THE CATEGORIES ACCORDING TO 954-1

TABLE B.1

Category	Requirements	Type of two-hand control unit
B	Safety-related parts of machine controls and/or their safety equipment and components must be designed, selected, assembled and combined to state-of-the-art technological standards if they are to stand up to the influence which can be expected to effect them. Safety related parts of category B controls can be affected by loss of safety function when an error occurs. Some errors remain unidentified	
1	The requirements under category B apply initially. An additional requirement is the utilization of components and principles which have proven themselves in terms of safety-related technical performance. This leads to greater safety-related reliability. However, the occurrence of an error can lead to the loss of the safety function. Some errors remain unidentified.	I and IIIA
2	The requirements under category B apply, along with the utilization of principles which have proven themselves in terms of safety-related technical performance. Moreover, the safety functions should be checked at “suitable“ intervals. Testing can be conducted automatically or manually. „Suitable“ depends on the application and type of machine. Errors in the safety-related parts of category 2 controls are identified during testing, and a new cycle is then not enabled. However, the occurrence of an error between tests can lead to the loss of the safety function.	
3	The requirements under category B apply, along with the utilization of principles which have proven themselves in terms of safety-related technical performance, also apply here. Controls should also be designed so that a single error does not cause a general loss of safety function(s), and that the single error be identified by suitable means conforming with state-of-the-art technological standards (whenever this can be conducted in a suitable manner). The safety function in the safety-related parts of the category 3 controls are always retained if a single error occurs. Some, but not all, errors are identified. A build-up of unidentified errors can lead to a loss of safety function.	I and IIIB
4	Controls must be designed so that a single error does not cause a general loss of safety function(s). A single error must be identified during or prior to the next requirement (when ever possible). If this is not possible, a build-up of errors should not lead to a loss of safety function. Errors are identified on time in the safety-related parts of the category 4 control, thus preventing a loss of safety function, or the safety function is retained despite errors occurring.	IIIC



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