

# Control box

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## Control box

The Control box is the starting-point of the X85 Pallet control system. It has a small physical size beneficially placed under the conveyor system, clearing the process area above the conveyor.

Basic features:

- Controller with fieldbus master
- Power bus distribution ( $V_{AC}$ )
- $24V_{DC}$  distribution

The Control box exists for two geographical areas, Europe and US, and for two performance levels, performance level 0 and 1.

The performance levels refers mainly to the performance of the Controller.

All external I/Os are connected to the controller through fieldbus.

No operator interface is included although discrete communication with one Maneuver box is included.



*Control box*

# Control box

## Control box assortment overview

The Control box comes in different types and for different geographical areas.

PL = Performance Level of controller

### Europe

Single safety zone, Power bus 400V



5059416 PL0

5059417 PL1  
(incl. Profibus)

AS-i



5059592 PL0

5059593 PL1

Profibus

Triple safety zone, Power bus 400V



5110948 PL1

Asi+Profibus

### US

Single safety zone, Power bus 480V



5059609 PL0

5059610 PL1

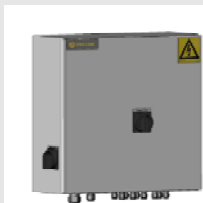
AS-i



5059607 PL0

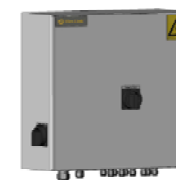
5059608 PL1

DeviceNet



5059614 PL1

AS-i + EthernetIP



5059613 PL1

DeviceNet + EthernetIP

# Control box

## Incoming power supply

### Power supply connection

Rated cable area connection: 16 mm<sup>2</sup>

Terminal group X301-1 connections:

Europe: L1/L2/L3 + N + PE

US: L1/L2/L3 + PE

Supplementary power supply X301-3 connections (US only):

L1/L2/L3 + PE

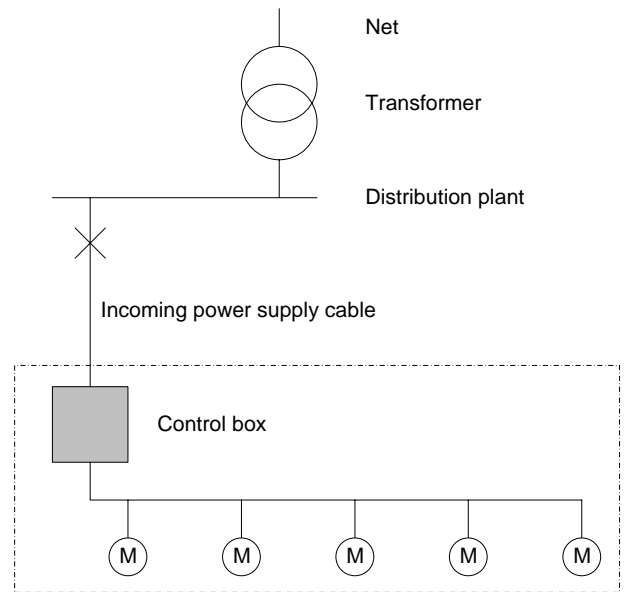
(Rated cable area connection: 4 mm<sup>2</sup>)

### Main switch

The main switch disconnects all power supply to the box and can be locked with padlocks in off-position.

Important: Load, i.e. motors, must be turned off before disconnection.

Rated uninterrupted current: 25 A



*Incoming power supply*

# Control box

## Power bus

The Power bus is used for powering the AC-loads of the system, i.e. motors.

The Power bus cable is connected to terminals in the Control box and daisy-chained through the system's external loads.

The Power bus distribution of the Control box is limited to 16 Ampere and safety protected to safety category 3 according to EN954-1.

The safety system of Power bus is the same protecting the 24V<sub>DC</sub> distribution.

Power bus voltage:

- Europe: 400 V<sub>AC</sub>
- US: 480 V<sub>AC</sub>

## Power bus protection

The Control box is equipped with an advanced circuit breaker designed to protect power cables. In addition to the adjustable overload setting the circuit breaker has an adjustable short-circuit current setting in order to detect also low short-circuit currents occurring in systems with long Power bus cables (definition "long": distance > 45 meters).

## Maintenance switch

The Power bus maintenance switch provides a cost-efficient maintenance disconnection.

As for the main switch, the maintenance switch for safe power distribution can be locked with up to 3 padlocks in off-position. Motors/load must be turned off before disconnection.

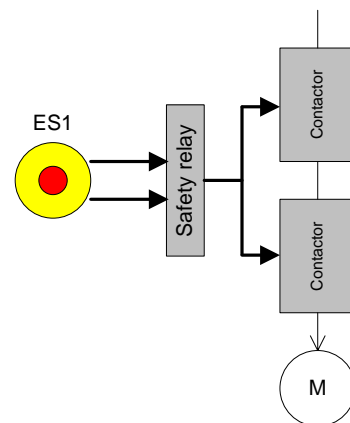
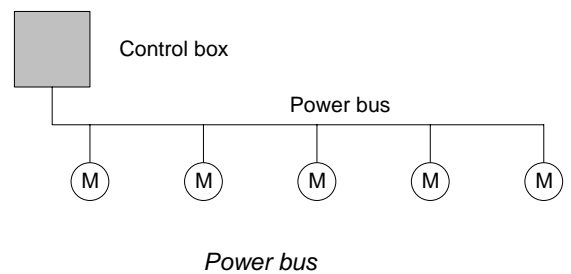
## Power bus connection

Rated cable area connection: 4 mm<sup>2</sup>

Terminal group X310-1 connections:

Europe: T1/T2/T3 + N + PE

US: T1/T2/T3 + PE



Safety system category 3 according to EN954-1

# Control box

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## DC power supply

### 24 V<sub>DC</sub> power distribution

The Control box includes a switched 24V<sub>DC</sub>-power supply of 10 A nominal current for general distribution. The distribution is divided in two groups of 4A max, each protected by a miniature circuit breaker.

Each group contains two power conductors of which one is safety protected to safety category 3 according to EN 954-1 and the second provides continuous power independent of safety stop.

The safety system of 24V<sub>DC</sub> distribution is the same protecting the Power bus .

### 24 V<sub>DC</sub> distribution connection

Rated cable area connection: 2.5 mm<sup>2</sup>

Terminal groups X310-2/X310-3 connections:

0L+: +24 V<sub>DC</sub> Safe (safety protected)

1L+: +24 V<sub>DC</sub> (Permanent)

0L- : 0 V<sub>DC</sub>

PE

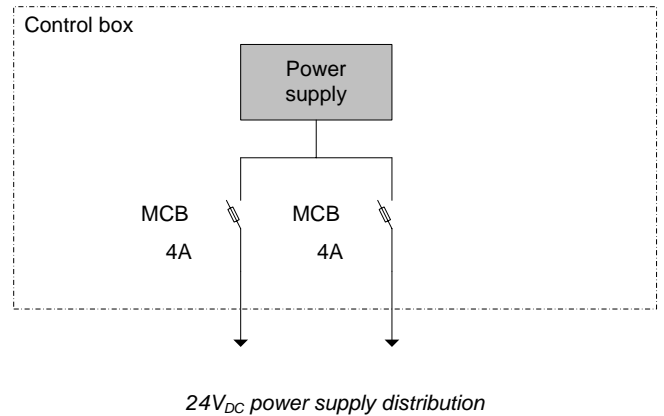
The distribution includes two terminal groups of the above specified.

### Asi power supply

Control boxes with AS-i communication includes a 30 V<sub>DC</sub> power supply (2.4A).

### Asi connection

Asi-cable with a length of approximately half a meter is connected to the Control box.



# Control box

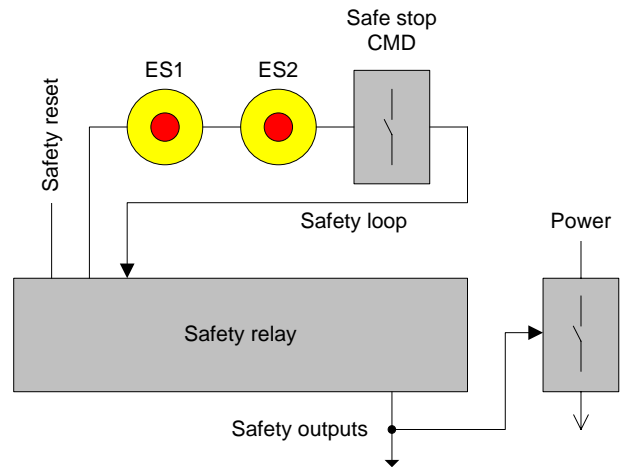
## Safety relay

The safety relay is part of the safety system protecting the Power bus.

Signals used for communicating with the relay:

- Input "Safety OK": Indicates safe status, that the relay is in order and the safe power distribution is activated.
- Output "Safety reset" : Allows reset from outside the Control box, for example from an operator panel.
- Output "Safe stop CMD": Provides the functionality to safe stop from within the software.

Certain standards demand that the "Stopped"-state of the machine should be safe. The output "Safe stop CMD" breaks up the safety loop with a relay. Default is the relay installed but its terminal group not connected. It is easily connected to the safety loop terminal group with two short bridges.



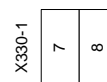
Safety relay communication

## Safety inputs and outputs

The safety inputs/outputs are used when Power boxes are used for adding effect to a safety zone.

The safety outputs of the box to which the emergency/ safety switches are connected, are connected to the safety inputs of the added Power boxes, creating a Master-Slave relationship where the added Power boxes automatically follow the status of the Master box.

Up to three safety inputs can be connected to the safety outputs.



Safety outputs

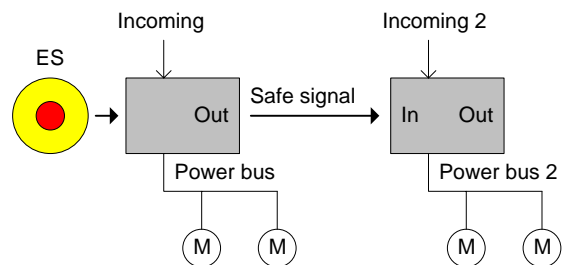
## Safety relay connections

### Safety outputs

Rated cable area connection: 2.5 mm<sup>2</sup>

Terminal group X330-1 connections:

- 7: Safety output 1
- 8: Safety output 2
- PE



Adding effect to a safety zone

# Control box

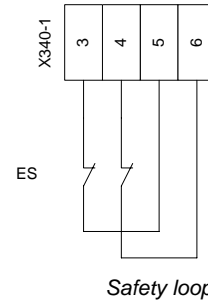
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## Safety loop

Rated cable area connection: 1.5 mm<sup>2</sup>

Terminal group X340-1 connections:

- 3: Channel 1 out
- 4: Channel 2 out
- 5: Channel 1 in
- 6: Channel 2 in
- PE

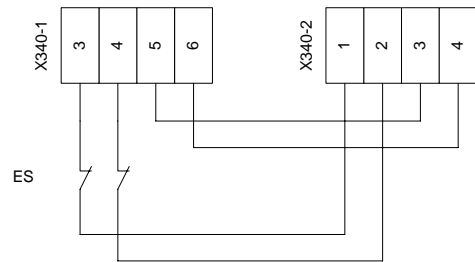


## Safe stop CMD

Rated cable area connection: 1.5 mm<sup>2</sup>

Terminal group X340-2 connections:

- 1: Channel 1 in
- 2: Channel 2 in
- 3: Channel 1 out
- 4: Channel 2 out
- PE



# Control box

## Maneuver box communication

The Control box do not include any operator interface such as pushbuttons, lamp or displays.

The standard placing of the Control box is below the conveyor which is a position that is unsuitable for operator interfaces.

The Control box contains a terminal group for hardwired, discrete communication with one set of pushbuttons and lamps, called Maneuver unit.

Additional communication is done using fieldbus.

## Maneuver unit connections

Rated cable area connection: 2.5 mm<sup>2</sup>

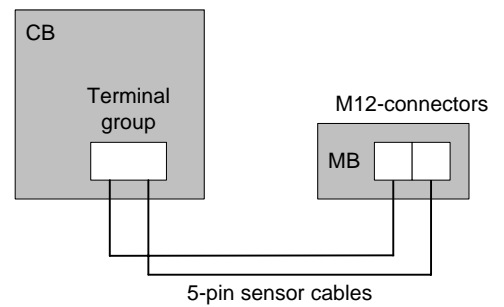
Terminal group X400-2 connections:

- 1: +24 VDC (Sensor cable 1, pin 1)
- 2: 0 VDC (Sensor cable 2, pin 1)
- 3: Start (Sensor cable 1, pin 2)
- 4: Stop (Sensor cable 1, pin 3)
- 5: Reset (Sensor cable 1, pin 4)
- 6: Start lamp (Sensor cable 2, pin 2)
- 7: Alarm lamp (Sensor cable 2, pin 3)
- 8: Reset lamp (Sensor cable 2, pin 4)
- PE (Sensor cables, pin 5)

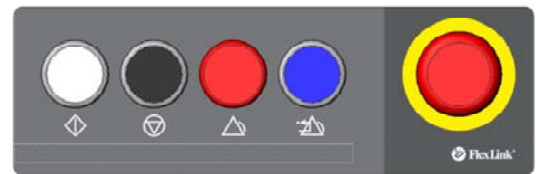
Note: The connection at the Maneuver box are two 5-pin M12-connectors. Use standard 5-pin M12-sensor cables for the connection.

## HMI connections

HMIs in Maneuver boxes communicate through fieldbus with the Controller.



Connecting a Maneuver unit to the Control box hardwired



Maneuver unit



# Control box

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## Pneumatics

The Control box is prepared for one Manometer (Air pressure) connection. Additional connections must go through fieldbus.

Safety stopped pneumatic power supply valves (part of Air preparation unit) should be powered by the safe +24 VDC (0L+) of the 24 VDC distribution which is disconnected at safety stop.

## Pneumatics connections

### Manometer (Air pressure)

Rated cable area connection: 2.5 mm<sup>2</sup>

Terminal group X400-1 connections:

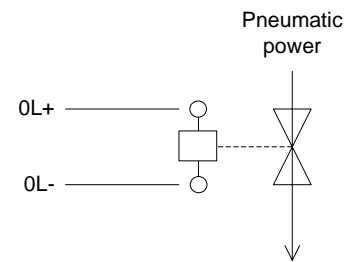
- 1: +24 VDC
- 2: Signal
- PE

### Pneumatic power supply valve

Reference to 24VDC-distribution.

Connections:

- 0L+: +24 V<sub>DC</sub> Safe (safety protected)
- 0L- : 0 V<sub>DC</sub>
- PE



*Pneumatic power supply valve control*

# Control box

## Terminal overview

Note: Blue terminals only exist in european boxes (Neutral).

