

# Safety controller

# Vital



Vital is based on a single channel safety concept where multiple safety sensors can be connected in series and monitored with a single safety controller. A dynamic signal is sent from Vital through all connected sensors, and then returned to Vital which then evaluates the received signal. As each safety sensor inverts the signal, it is possible to detect short circuits or faults in any of the sensors. Vital 2 and Vital 3 are designed for use with ABB Jokab Eden sensors, Tina components and Spot light grids or similar products. Vital 2 and 3 are both safety controllers with two safe input functions and two output groups, the only difference between the two models being in the input configuration.

## Approvals:

TÜV Nord – Vital 1  
TÜV Rheinland – Vital 2 and 3



## Control of:

Entire safety system based on the dynamic safety circuit.

## Features:

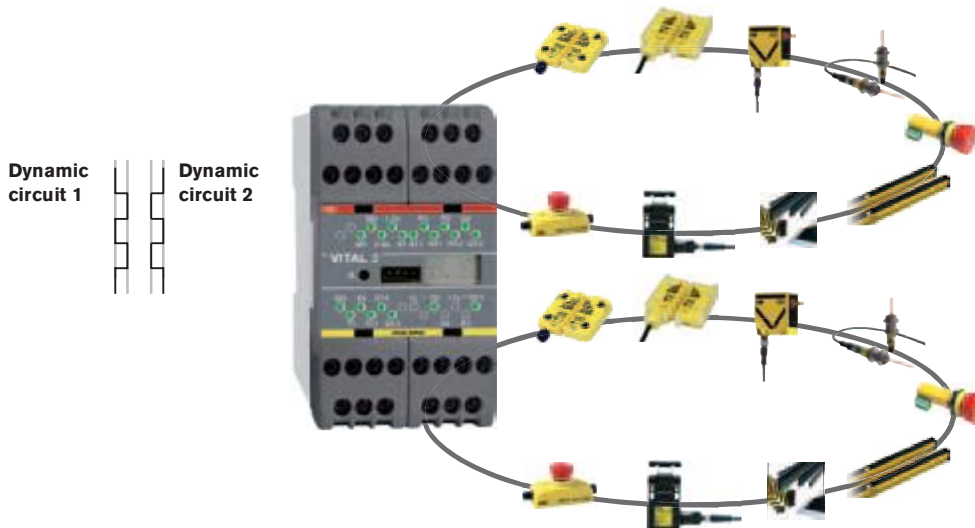
- Easy installation
- Flexible
- Cost effective
- Display for troubleshooting (Vital 2 and 3)
- A wide range of safety sensors can be connected into the circuit
- Several safe outputs
- Information output
- Outputs with time delay (Vital 2 and 3)

## Vital 1 Safety controller



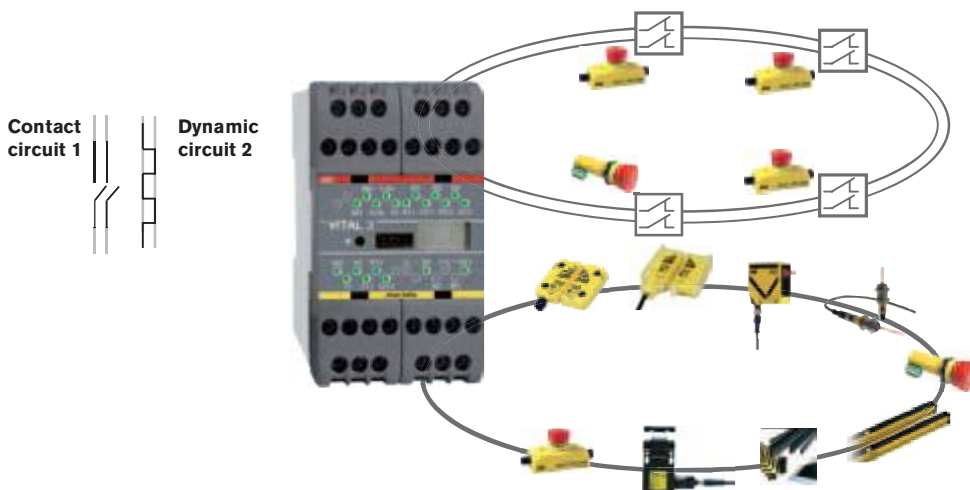
- Up to 30 sensors can be connected to the same dynamic safety circuit

## Vital 2 Safety controller

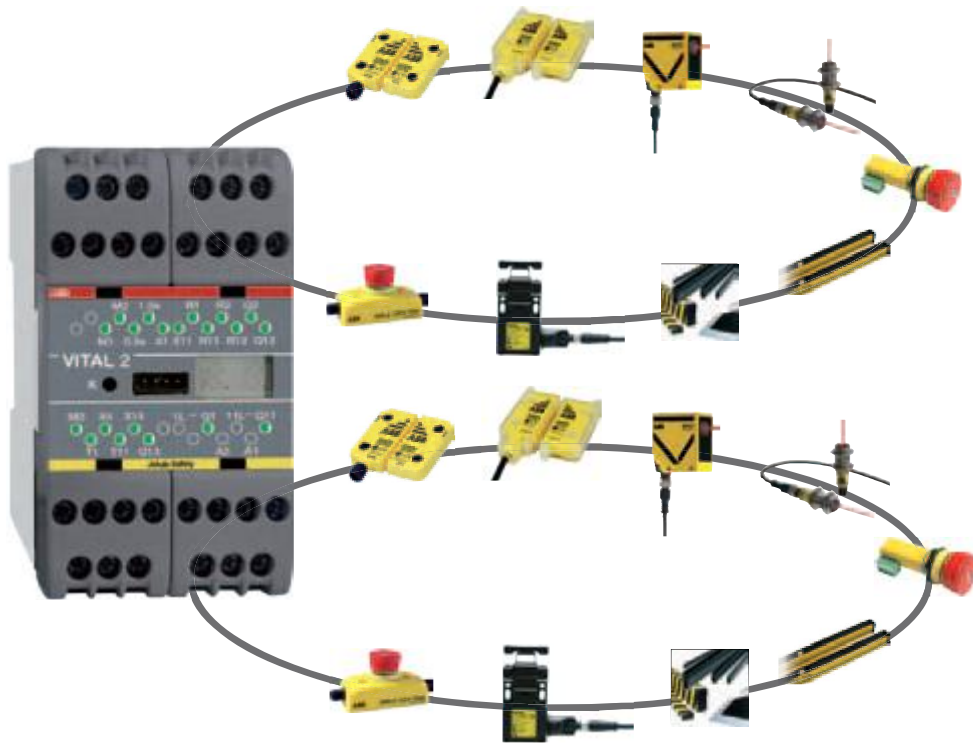


- Two safety circuits are monitored by one module
- Simple system with extensive functionality
- Up to 10 sensors can be connected to each dynamic safety circuit
- Output group 2 can be set for time delay
- Three different modes of operation

## Vital 3 Safety controller



- Two safety circuits are monitored by one module
- Devices with two-channel, opening contacts can be connected to one circuit
- Simple system with extensive functionality
- Output group 2 can be set for time delay
- Three different modes of operation



Vital 2 is a safety controller that combines functionality with the quick and easy installation of safety sensors. With two safe input functions and two different output groups, Vital 2 offers the capability to exclusively control smaller machine safety systems that would otherwise have required a programmable controller or multiple safety relays. How the two output groups are controlled by the input functions depends on which of the three operating modes is selected (see Selection of operating mode).

### **Input function 1:**

A dynamic safety circuit where ABB Jokab Safety's safety sensors such as Eden, Tina and Spot can easily be connected in series. Up to 10 Eden or Tina devices can be connected in series per input function.

### **Input function 2:**

The same function as input function 1.

### **Output group 1:**

A safe relay output in a duplicated series and a safe transistor output with output voltage of -24 VDC.

### **Output group 2:**

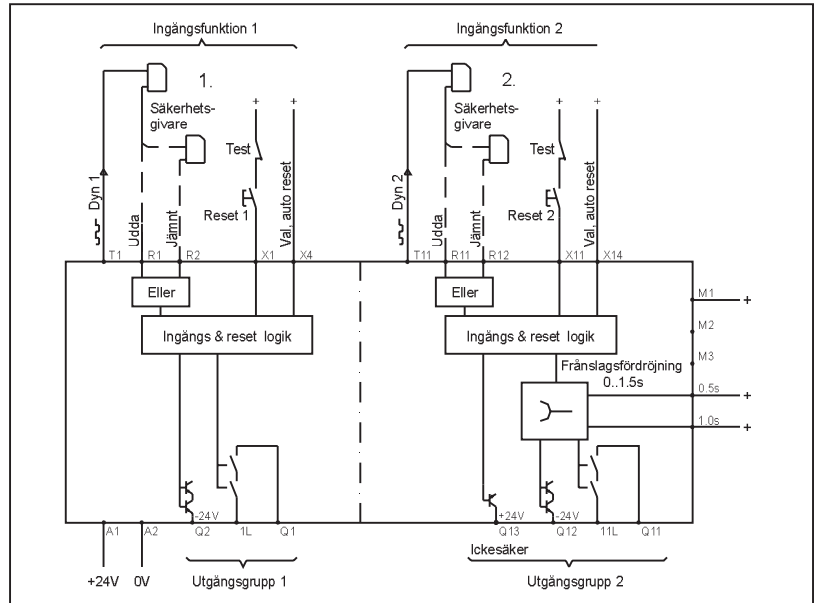
A safe relay output in a duplicated series and a safe transistor output with output voltage of -24 VDC. In addition, output group 2 contains a non-safe transistor output with output voltage of +24 VDC, intended for information. The output group can have time delay from 0 to 1.5 s.

### **Selection of operating modes**

Vital 2 can be configured to operate in one of three operating modes M1, M2 or M3. The selection of operating modes is done by connecting one of the terminals M1, M2 or M3 to +24 V.

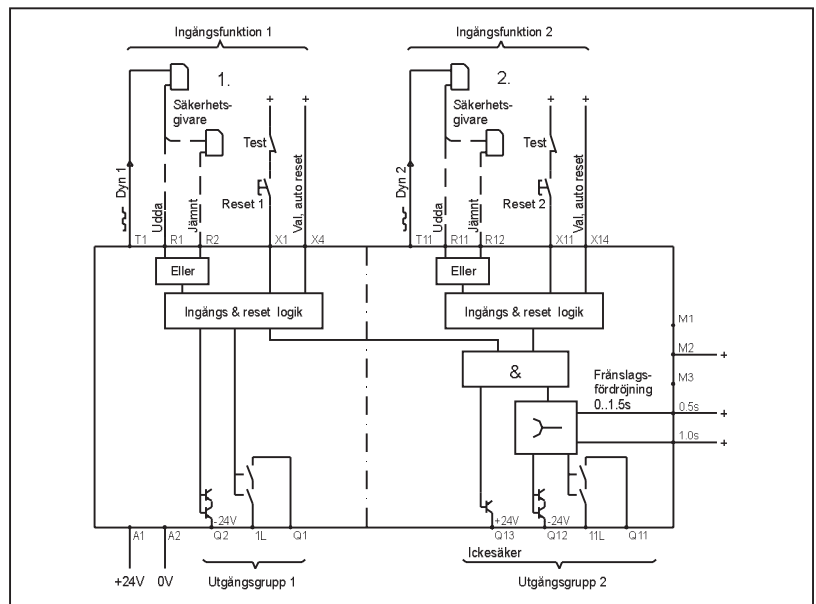
## Operating mode M1 - Separate function Vital 2

Input function 1 controls output group 1, and input function 2 controls output group 2.



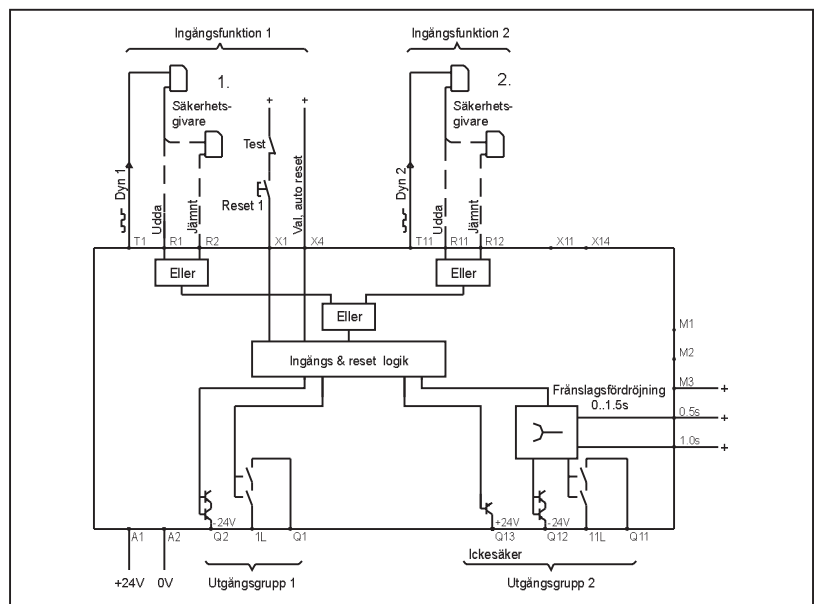
## Operating mode M2 - Input 1, master function Vital 2

Input function 1 stops all outputs, and input function 2 stops output group 2.



## Operating mode M3 - Parallel function Vital 2

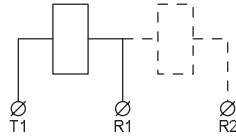
Input function 1 and input function 2 operate in parallel and control all outputs. Reset/Auto reset 1 resets both input functions (Reset/Auto Reset 2 is not used).



## Connection of protection/sensors - Vital 2

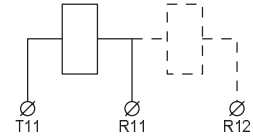
Depending on the input function and the number of sensors connected to the safety circuit (odd or even number), the dynamic signal is connected between different terminals;

### Input function 1:



A dynamic signal is transmitted from T1, and depending on the number of sensors in the safety circuit, the signal connects back to R1 (odd number of sensors) or R2 (even number of sensors).

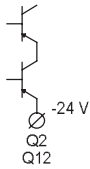
### Input function 2:



A dynamic signal is transmitted from T11, and depending on the number of sensors in the safety circuit, the signal connects back to R11 (odd number of sensors) or R12 (even number of sensors).

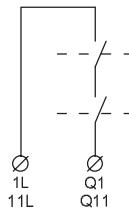
## Connection of outputs - Vital 2

### Connection of safe transistor output (-24 V)



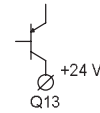
The safe transistor outputs Q2 (output group 1) and Q12 (output group 2) have an output voltage of -24 V.

### Connection of safe relay output



The safe relay outputs that are duplicated in series break between 1L-Q1 (output group 1) and 11L-Q11 (output group 2). The loads that break should be fitted with spark arresters to protect the outputs. The correct selection of VDR circuit, RC circuit or diode is appropriate. Note that the diode extends the disconnection time of the load.

### Connection of information output

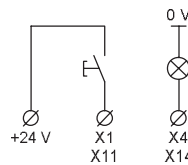


The non-safe transistor output Q13 is high (+24 V) when the outputs from output group 2 are active. The function is therefore dependent on the operating mode selected (see Selection of operating mode).

## Connection of reset - Vital 2

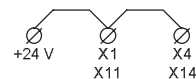
There are two separate reset functions; Reset 1 and Reset 2. The function of these is dependent on the operating mode selected (see Selection of operating mode). Reset 1 and Reset 2 can be configured for manual or automatic reset independently of each other by means of the input's Auto reset 1 and Auto reset 2.

### Manual monitored reset



For manual resetting, a push button must be connected between X1 (Reset 1) or X11 (Reset 2) and +24 V. The monitoring contactors for external devices are to be connected in series with the push button. For manual reset, X4 (for Reset 1) and X14 (for Reset 2) serve as output for resetting the indicator lamps.

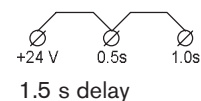
### Automatic reset



For automatic reset, X1 and X4 (Auto reset 1) or X11 and X14 (Auto reset 2) must be connected to +24 V. Monitoring contactors for external devices must be connected between +24 V and X1 (Auto reset 1) or X11 (Auto reset 2). If monitoring contactors are not used, X1 and X11 must be connected to +24 V.

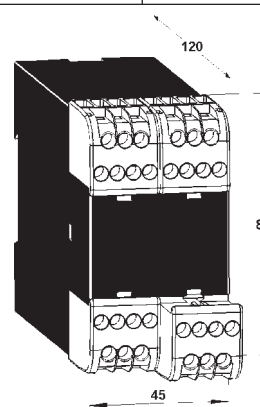
## Time delay - Vital 2

Output group 2 can have disconnection delay by connecting inputs 0.5s and 1.0s being connected to +24 V. The system is binary, which means that the time values of the inputs are added together to give the total delay time.

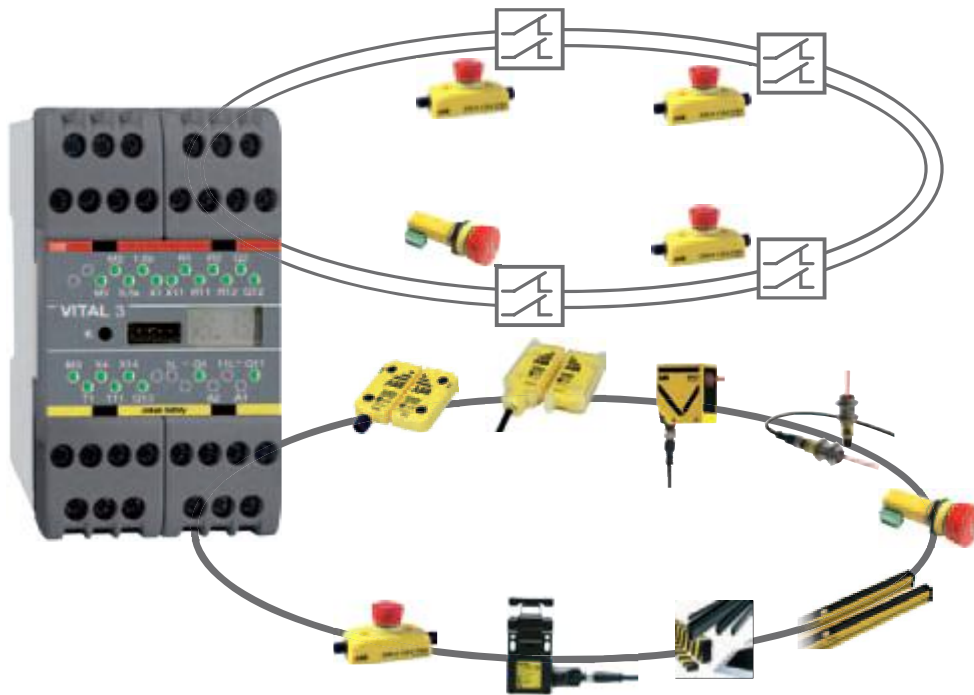


Technical data – Vital 2	
<b>Manufacturer</b>	ABB AB/Jokab Safety, Sweden
<b>Article number/ Ordering data</b> Vital 2	2TLA020070R4300
<b>Level of safety</b> EN ISO 13849-1 EN 62061 IEC/EN 61508-1...7 EN 954-1	PL e, category 4 SIL 3 SIL 3 Category 4
<b>PFH<sub>d</sub></b> Relay output Transistor output	2,00×10 <sup>-9</sup> 1,50×10 <sup>-9</sup>
<b>Colour</b>	Grey
<b>Weight</b>	390 g
<b>Power supply</b>	24 VDC ±15%
<b>Fuse</b> An external fuse must be connected in series with the supply voltage to A1	6 A
<b>Max line resistance</b> at nominal voltage to X1	150 Ohm
<b>Power consumption</b> Total current consumption	300 mA
<b>Input function 1 (dynamic safety circuit)</b> Dynamic output signal Dynamic input signal	T1 R1 (odd number of sensors in a circuit) R2 (even number of sensors in a circuit)
<b>Input function 2 (dynamic safety circuit)</b> Dynamic output signal Dynamic input signal	T11 R11 (odd number of sensors in a circuit) R12 (even number of sensors in a circuit)
<b>Reset input X1/X11</b> Voltage at X1/X11 when reset Reset current  Minimum contact closure time for reset	+24VDC 30 mA (300 mA peak during contact closure)  80 ms
<b>Number of sensors</b> Max. number of Eden or Tina units per input function Total max. cable length (depending on the number of Eden/Tina units) Max. number of light beams (Spot T/R) per input function Spot 10 Spot 35 Total max. cable length (depending on the number of Spot T/R)	10 500 m 1 3 100 m
Maximum number of units varies depending on the installation and cable size. For more information, see the examples in this chapter.	
<b>Response time</b> Relay output (Q1, Q11) Safe transistor outputs (Q2, Q12) Non-safe transistor output (Q2, Q12)	15 – 24 ms 11 – 20 ms 11 – 20 ms

<b>Relay outputs</b> Number of outputs Max. load capacity, res. load Max. load capacity, ind. load	2 NO 6A/250 VAC AC-1: 250 V/1,5 A AC-15: 250 V/1,5 A DC-1: 50 V/1,5 A DC-13: 24 V/1,5 A
<b>Safe transistor outputs</b> Number of outputs Output voltage (rated) Output voltage (at load)  Max. load	2 –24V > 22V at 800 mA/24V supply voltage 23,3V at 150 mA/24V supply voltage 800 mA
<b>Short circuit protection</b> Output – 0V Output – +24V	Yes Normal (not guaranteed)
<b>Non-safe transistor output (information)</b> Output voltage (rated) Max. load	+24 VDC 1 A
<b>Mounting</b> DIN rail	35 mm DIN rail
<b>Operating temperature range</b>	-10°C to + 55°C
<b>Connection blocks (detachable)</b> Max screw torque Max connection area: Solid conductors Conductor with socket contact Air and creep distance	1 Nm 1x4 mm <sup>2</sup> /2x1,5 mm <sup>2</sup> /12AWG 1x2,5 mm <sup>2</sup> /2x1 mm <sup>2</sup> 4kV/2 DIN VDE 0110
<b>Protection class</b> Enclosure Connection blocks	IP 40 IEC 60529 IP 20 IEC 60529
<b>Approved standards</b>	EN ISO 13849-1/ EN 954-1, EN ISO 13849-2, EN 62061, EN 61496-1, EN 574, EN 692, EN 60204-1, EN 50178, EN 61000-6-2, EN 61000-6-4, EN 61000-4- IEC/EN 61508-1...7



Connector blocks are detachable  
(without cables having to be disconnected)



Vital 3 is a safety controller that combines functionality with the quick and easy installation of safety sensors. With two safe input functions and two different output groups, Vital 3 offers the capability to exclusively control smaller machine safety systems that would otherwise have required a programmable controller or multiple safety relays. How the two output groups are controlled by the input functions depends on which of the three operating modes is selected (see Selection of operating mode).

**Input function 1:**

A two-channel safety circuit designed for opening contacts, e.g. two-channel emergency stop or ABB Jokab Safety's safety switch JSNY5. One channel is fed with the dynamic signal and the other with static +24 VDC.

**Input function 2:**

A dynamic safety circuit where ABB Jokab Safety's safety sensors Eden, Tina and Spot can easily be connected in series. Up to 12 Eden or Tina devices can be connected in series per input function.

**Output group 1:**

A safe relay output in a duplicated series and a safe transistor output with output voltage of -24 VDC.

**Output group 2:**

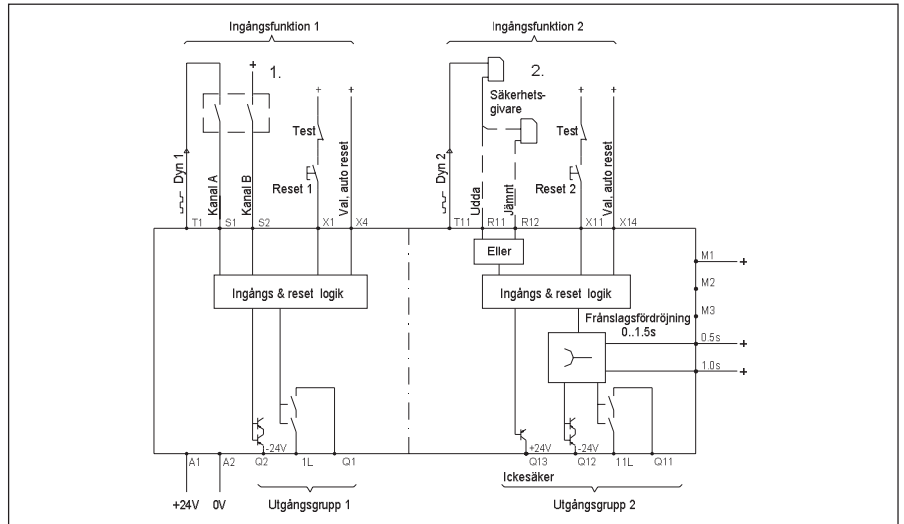
A safe relay output in a duplicated series and a safe transistor output with output voltage of -24 VDC. In addition, output group 2 contains a non-safe transistor output with output voltage of +24 VDC, intended for information. The output group can have time delay from 0 to 1.5 s.

**Selection of operating modes**

Vital 3 can be configured to operate in one of three operating modes M1, M2 or M3. The selection of operating modes is done by connecting one of the terminals M1, M2 or M3 to +24 V.

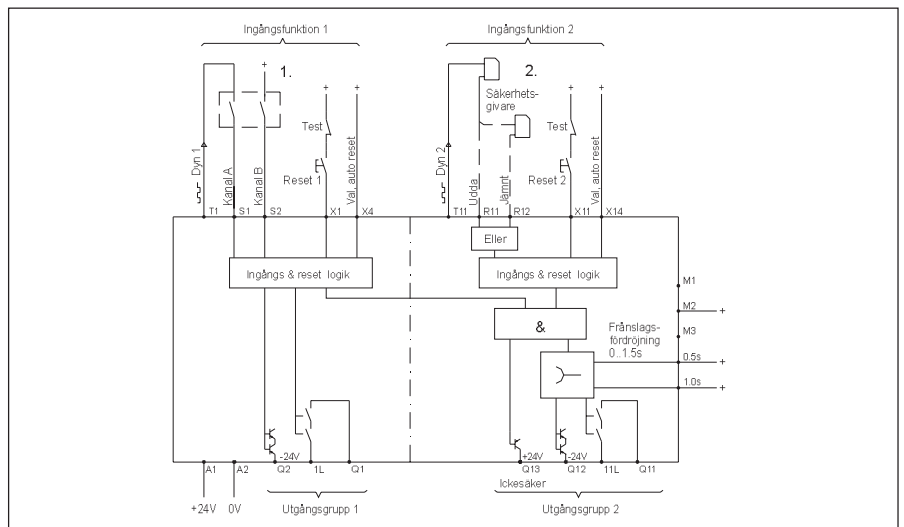
## Operating mode M1 - Separate function Vital 3

Input function 1 controls output group 1, and input function 2 controls output group 2.



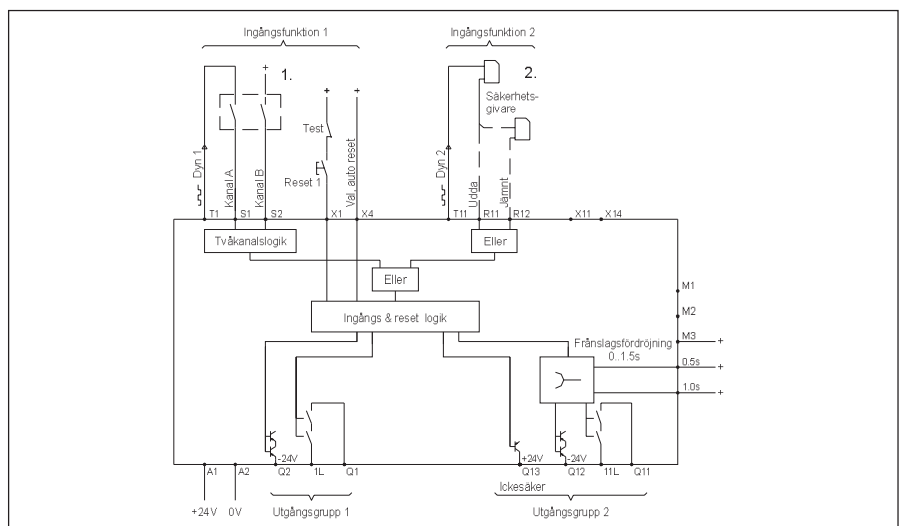
## Operating mode M2 - Input 1, master function Vital 3

Input function 1 stops all outputs, and input function 2 stops output group 2.



## Operating mode M3 - Parallel function Vital 3

Input function 1 and input function 2 operate in parallel and control all outputs. Reset/Auto reset 1 resets both input functions (Reset/Auto Reset 2 is not used).

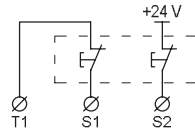




## Connection of protection/sensors - Vital 3

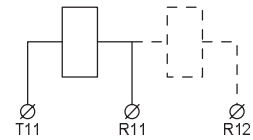
Depending on the input function and the number of sensors connected to the safety loop (odd or even number), the dynamic signal is connected between different terminals;

### Input function 1:



One of the two opening contacts is connected between T1 and S1 (dynamic signal). The second opening contact is connected between +24 V and S2 (static signal).

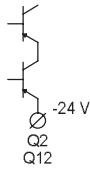
### Input function 2:



A dynamic signal is transmitted from T11, and depending on the number of sensors in the safety loop, the signal connects back to R11 (odd number of sensors) or R12 (even number of sensors).

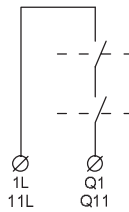
## Connection of outputs - Vital 3

### Connection of safe transistor output (-24 V)



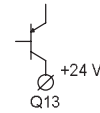
The safe transistor outputs Q2 (output group 1) and Q12 (output group 2) have an output voltage of -24 V.

### Connection of safe relay output



The safe relay outputs that are duplicated in series break between 1L-Q1 (output group 1) and 11L-Q11 (output group 2). The loads that break should be fitted with spark arresters to protect the outputs. The correct selection of VDR-circuit, RC circuit or diode is appropriate. Note that the diode extends the disconnection time of the load.

### Connection of information output

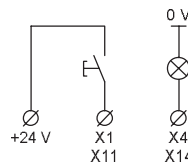


The non-safe transistor output Q13 is high (+24 V) when the outputs from output group 2 are active. The function is therefore dependent on the operating mode selected (see Selection of operating mode).

## Connection of reset - Vital 3

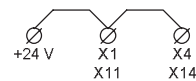
There are two separate reset functions; Reset 1 and Reset 2. The function of these is dependent on the operating mode selected (see Selection of operating mode). Reset 1 and Reset 2 can be configured for manual or automatic reset independently of each other by means of the input's Auto reset 1 and Auto reset 2.

### Manual monitored reset



For manual resetting, a push button must be connected between X1 (Reset 1) or X11 (Reset 2) and +24 V. The monitoring contactors for external devices are to be connected in series with the push button. For manual reset, X4 (for Reset 1) and X14 (for Reset 2) serve as output for resetting the indicator lamps.

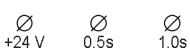
### Automatic reset



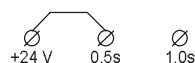
For automatic reset, X1 and X4 (Auto reset 1) or X11 and X14 (Auto reset 2) must be connected to +24 V. Monitoring contactors for external devices must be connected between +24 V and X1 (Auto reset 1) or X11 (Auto reset 2). If monitoring contactors are not used, X1 and X11 must be connected to +24 V.

## Time delay - Vital 3

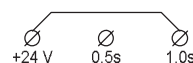
Output group 2 can have disconnection delay by connecting inputs 0.5s and 1.0s being connected to +24 V. The system is binary, which means that the time values of the inputs are added together to give the total delay time.



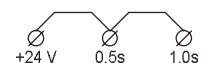
No delay



0.5 s delay



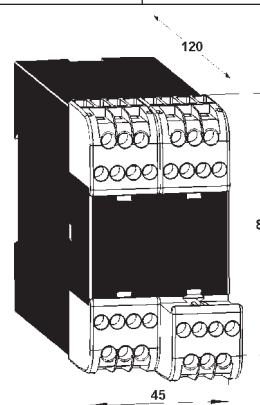
1.0 s delay



1.5 s delay

Technical data – Vital 3	
<b>Manufacturer</b>	ABB AB/Jokab Safety, Sweden
<b>Article number/ Ordering data</b> Vital 3	2TLA020070R4400
<b>Level of safety</b> EN ISO 13849-1 EN 62061 IEC/EN 61508-1...7 EN 954-1	PL e, category 4 SIL 3 SIL 3 Category 4
<b>PFH<sub>d</sub></b> Relay output Transistor output	2,00×10 <sup>-9</sup> 1,50×10 <sup>-9</sup>
<b>Colour</b>	Grey
<b>Weight</b>	390 g
<b>Power supply</b>	24 VDC ±15%
<b>Fuse</b> An external fuse must be connected in series with the supply voltage to A1	6 A
<b>Max line resistance</b> at nominal voltage to X1	150 Ohm
<b>Power consumption</b> Total current consumption	300 mA
<b>Input function 1 (two channel, normally closed circuit)</b> Dynamic output signal Dynamic input signal Static input signal (+24 V)	T1 S1 S2
<b>Input function 2 (dynamic safety circuit)</b> Dynamic output signal Dynamic input signal	T11 R11 (odd number of sensors in a circuit) R12 (even number of sensors in a circuit)
<b>Reset input X1/X11</b> Voltage at X1/X11 when reset Reset current  Minimum contact closure time for reset	+24VDC 30 mA (300 mA peak during contact closure)  80 ms
<b>Number of sensors</b> Max. number of Eden or Tina units per input function 2 Total max. cable length (depending on the number of Eden/Tina units) Max. number of light beams (Spot T/R) per input function 2 Spot 10 Spot 35 Total max. cable length (depending on the number of Spot T/R)	10 500 m 1 3 100 m
Maximum number of units varies depending on the installation and cable size. For more information, see the examples in this chapter.	
<b>Response time</b> Relay output (Q1, Q11) Safe transistor outputs (Q2, Q12) Non-safe transistor output (Q2, Q12)	15 – 24 ms 11 – 20 ms 11 – 20 ms

<b>Relay outputs</b> Number of outputs Max. load capacity, res. load Max. load capacity, ind. load	2 NO 6A/250 VAC AC-1: 250 V/1,5 A AC-15: 250 V/1,5 A DC-1: 50 V/1,5 A DC-13: 24 V/1,5 A
<b>Safe transistor outputs</b> Number of outputs Output voltage (rated) Output voltage (at load)  Max. load	2 –24V > 22V at 800 mA/24V supply voltage 23,3V at 150 mA/24V supply voltage 800 mA
<b>Short circuit protection</b> Output – 0V Output – +24V	Yes Normal (not guaranteed)
<b>Non-safe transistor output (information)</b> Output voltage (rated) Max. load	+24 VDC 1 A
<b>Mounting</b> DIN rail	35 mm DIN rail
<b>Operating temperature range</b>	-10°C to + 55°C
<b>Connection blocks (detachable)</b> Max screw torque Max connection area: Solid conductors Conductor with socket contact Air and creep distance	1 Nm 1x4 mm <sup>2</sup> /2x1,5 mm <sup>2</sup> /12AWG 1x2,5 mm <sup>2</sup> /2x1 mm <sup>2</sup> 4kV/2 DIN VDE 0110
<b>Protection class</b> Enclosure Connection blocks	IP 40 IEC 60529 IP 20 IEC 60529
<b>Approved standards</b>	EN ISO 13849-1/EN 954-1, EN ISO 13849-2, EN 62061, EN 61496-1, EN 574, EN 692, EN 60204-1, EN 50178, EN 61000-6-2, EN 61000-6-4, EN 61000-4-, IEC/EN 61508-1...7



Connector blocks are detachable  
(without cables having to be disconnected)