

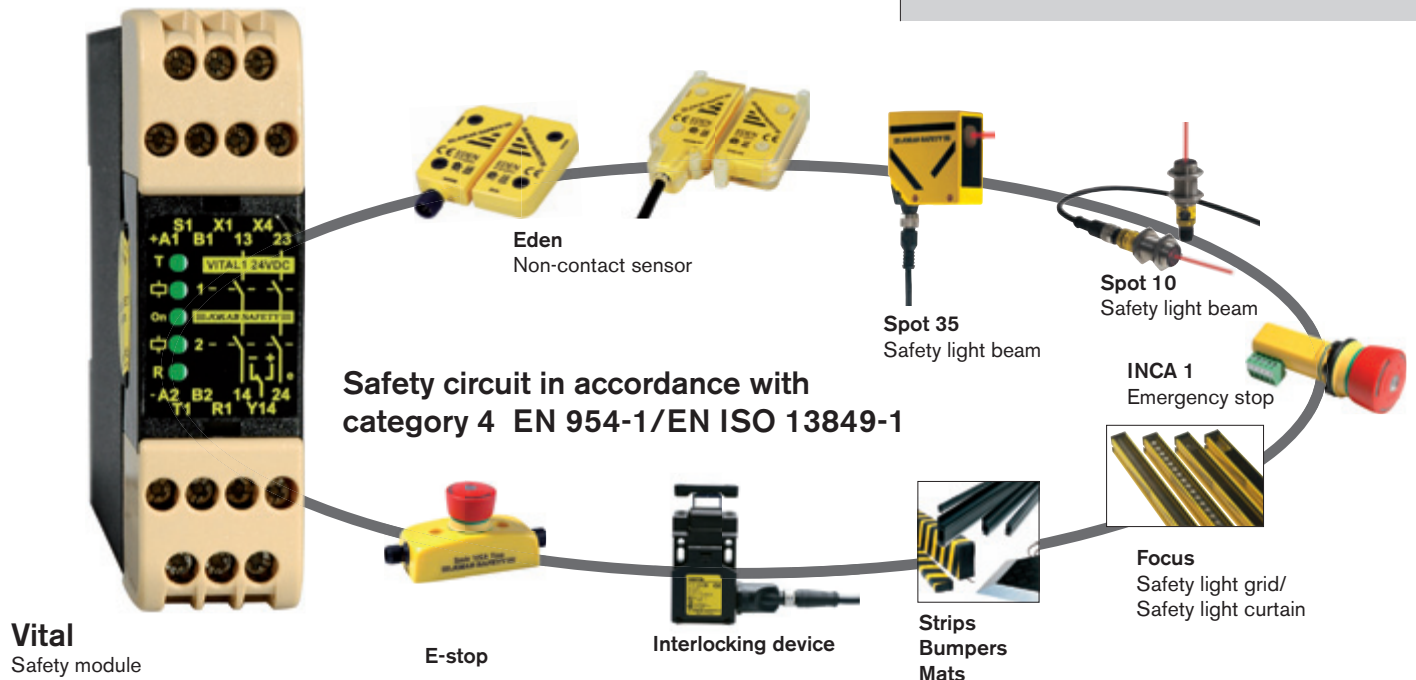
# Why you should use the Vital safety system

## Approvals:



## Features:

Safety solution with different types of safety components in the same safety circuit



## - To be able to connect several safety components in series (at category 4) and supervise them with only one safety module!

Vital is the heart of a new solution which makes it possible to install/connect many different types of safety device in the same safety circuit and still achieve safety category 4 in accordance with EN 954-1/EN ISO 13849-1. The Vital module is based upon a dynamic single-channel concept as opposed to conventional dual-channel safety relays. **Up to 30 dynamic sensors can be connected directly in the safety circuit and be supervised by only one Vital module.** The Vital therefore replaces several safety relays. Safety components with output contacts can be connected to the Vital via low cost Tina adaptors.

The Vital also has automatically or manually supervised reset selection, dual safety outputs, and an information output for reset indication and status information for PLC's.

## - why should you choose Vital?

- Safety category 4, according to EN 954-1/EN ISO 13849-1 dynamic safety circuit
- Width 22,5 mm
- Can accommodate long cable lengths
- Manually supervised or automatic reset
- Two NO safety outputs
- Detachable connector blocks
- LED indication of: power supply, dynamic signal and outputs
- Information output with two functions
- Cost-effective cable routing/connections

## - To supervise safety components!

Most safety components on the market can be connected to the Vital module. Dynamic sensors enable safety category 4 to be achieved in a single-channel system. For example Jokab Safety's dynamic non-contact Eden sensor, Spot light beam and emergency stops (via Tina adaptors) can be used. Even mechanical switches can be connected to Vital with the aid of Jokab Safety's Tina adaptors. Up to 30 components can be connected to a Vital module.

## - For easy installation and assembly of a safety system!

Vital is a small, 22.5 mm in width, electronic safety module that dynamically supervises a number of safety components. Vital's detachable connector blocks simplify the connection, trouble-shooting and exchange of modules. The Vital and other safety components can be connected together using standard cables and with cables having M12 connections.

# Connection of units and cable lengths to Vital

## Three connection alternatives

According to Category 4 (EN-954-1), connection of sensors/adaptor units in the Vital safety circuit **must be made as per the following connection examples.**

### Example 1

Use separate connection cables from each sensor/adaptor unit to the Vital safety module. Interconnections to be made via suitable terminals in the control cabinet.

### Example 2

Use Tina4A/Tina8A connector blocks to simplify the connection of externally mounted sensors/adaptor units. Only Tina4A/Tina8A connector blocks may be used. **Use of any other connector blocks will not meet the safety circuit requirements.**

### Example 3

Use M12-3A and M12-3B 'Y' connectors to connect sensors in series/parallel.

## Cable lengths and number of sensor/adaptor units for the three connection examples.

In order to determine the number of sensor/adaptor units that can be connected to a Vital 1 unit it must be remembered that 1 (one) Spot T/R is equivalent to 5 (five) Eden or Tina units. Units in parallel are equal to one unit. The following examples provide **guidance** as to possible configurations and cable lengths using suitable cables.

### Example 1

Up to 1000 metres (0.75mm<sup>2</sup> or 0.34mm<sup>2</sup> conductors) in total can be connected to the sensors/units in this example. The connection is equivalent to 9 Eden or Tina units.

A maximum of 30 Eden or Tina units can be connected to the Vital 1 unit on a maximum cable length of 500 metres (0.75mm<sup>2</sup> conductors) or 300 metres (0.34mm<sup>2</sup> conductors).

### Example 2

Up to 600 metres (0.75mm<sup>2</sup> conductors) to Tina 8A and 10 metre cables type M12-C1012 (0.34mm<sup>2</sup>) to each sensor/unit connected to the Tina 8A. This connection example is equivalent to 17 Eden or Tina units.

A maximum of 3 Tina 8A units, equivalent to 27 Eden/Tina units (= 3 x 8 connected to Tina 8A + 3 Tina 8A) can be connected to one Vital 1 with a total cable length of 600 metres (0.75mm<sup>2</sup>). Up to 6 Tina 4A units can be connected to one Vital 1 (equivalent to 30 Eden/Tina units) with a total cable length of 600 metres (0.75mm<sup>2</sup>) to Tina 4A.

### Example 3

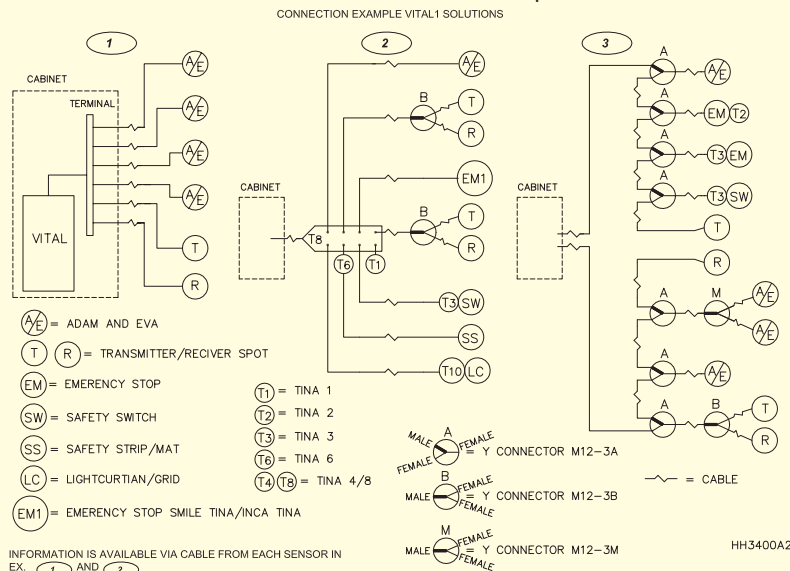
Either 2 x 500 metre cables (0.75mm<sup>2</sup>) from the control cabinet and 10 metre cables (0.34mm<sup>2</sup>) to each sensor/unit or 2 x 10 metre cables (0.75mm<sup>2</sup>) from the control cabinet and 200 metre cables (0.75mm<sup>2</sup>) to each sensor/unit. The connection is equivalent to 16 Eden or Tina units.

A Total of 30 Eden/Tina units can be connected using a maximum cable length of 1000 metres (0.75mm<sup>2</sup>) or 400 metres (0.34mm<sup>2</sup>). If the power supply is only fed from one direction (from one end of the network) the total cable length is reduced to approx 300 metres (0.75mm<sup>2</sup>) and 100 metres (0.34mm<sup>2</sup>).

## Connection advice for dynamic sensors to Pluto and Vital.

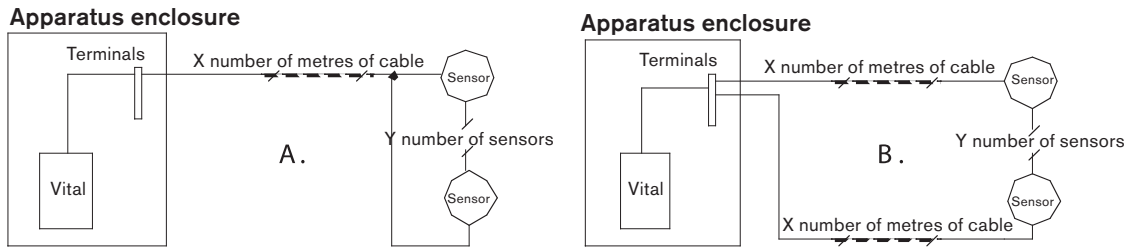
Sensors can be connected in many different ways. Here is some advice that can make connection better and more stable. The advice is general, but particularly applicable to the use of Tina 4A and Tina 8A units.

- Never have more than the recommended number of sensors in the loop.
- If possible use a switched mains power supply that can deliver a stable 24 V DC.
- In the sensor system, use as short cables as possible.
- When connecting a Tina 4A or Tina 8A unit, the supply voltage at the terminal (out at the unit) must not be less than 20 Volts.
- Use screened cable, preferably 0.75 mm<sup>2</sup> or thicker, from the apparatus enclosure and ground it at one end, for example at the apparatus enclosure, not at both ends.
- Do not route the signal wiring close to heavy current cabling or close to equipment that gives off a lot of interference, such as frequency converters for electric motors.
- Never connect "spare" conductors.
- If M12-3B are used for connection of a parallel loop, with supply to the sensors from two directions, the loop must be as short as possible. This is because the conductors that are not being used are also connected, which increases the capacitive load and reduces the stability of the system.

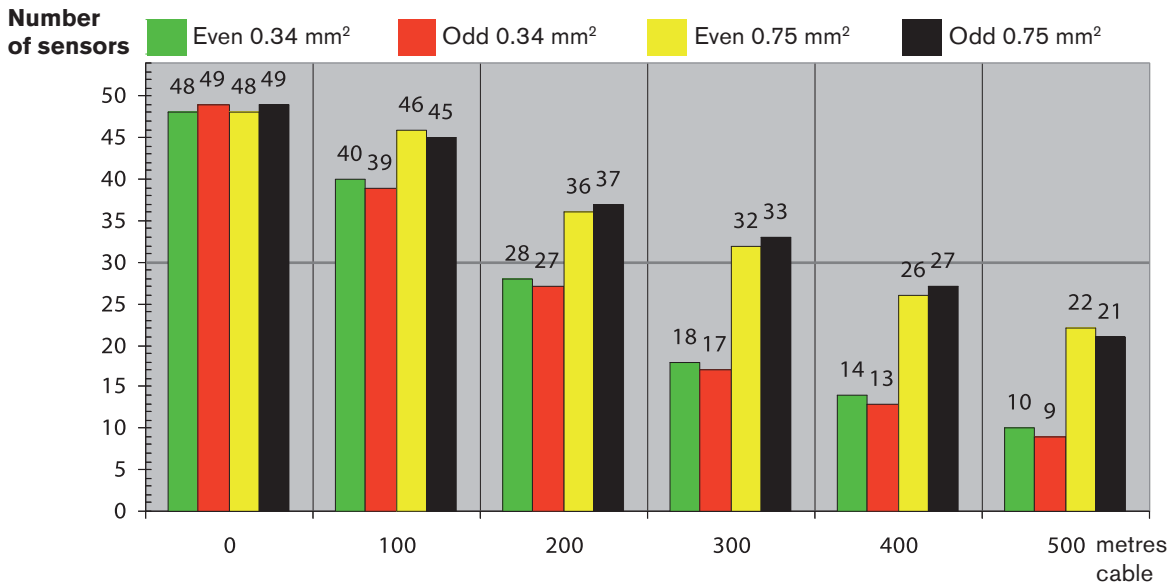


# Number of Edens that can be used with Vital and Pluto

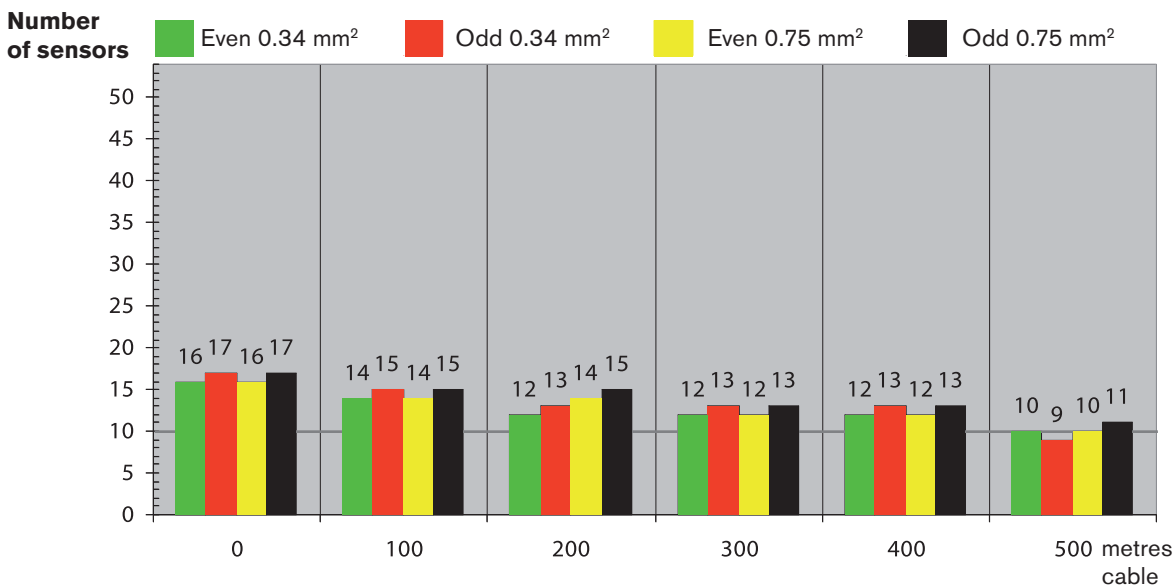
The tables below show the number of Edens that can be connected to Vital and Pluto with the maximum voltage variation. The values have been established in a laboratory environment. The actual possible number of connected Edens may therefore differ from those given in the table. The values should be regarded as guidelines; Jokab Safety recommends a maximum of 30 Edens per Vital and a maximum of 10 Edens per Pluto input. The table was prepared according to measurements with connection example A. If connection example B and 0.34mm<sup>2</sup> cable is used (with feed voltage from two directions), the values for 0.75 mm<sup>2</sup> in the tables are used.



## Number of Edens that can be used with Vital

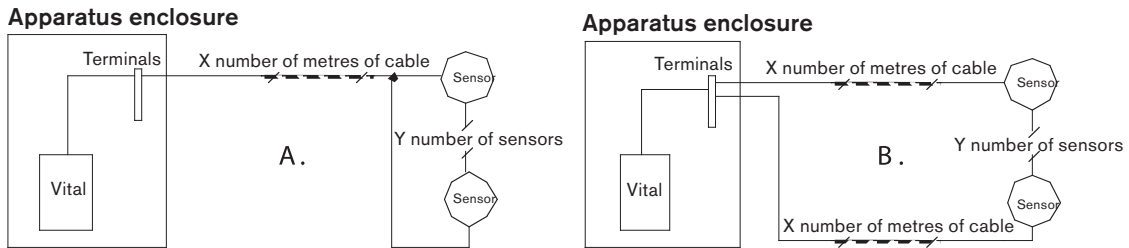


## Number of Edens that can be used with Pluto

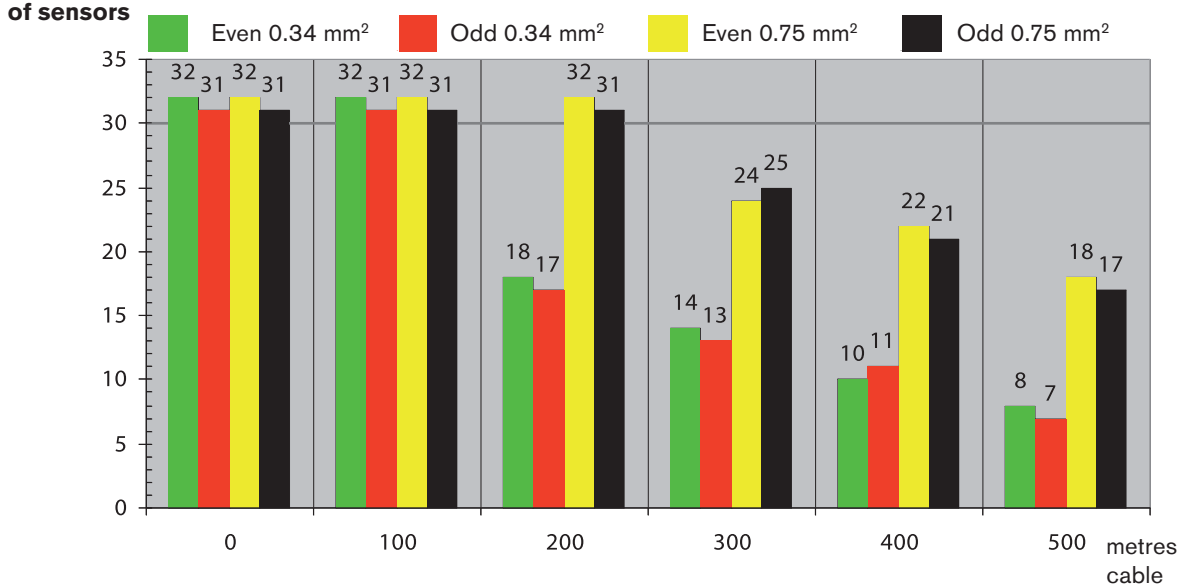


# Number of Tinas that can be used with Vital and Pluto

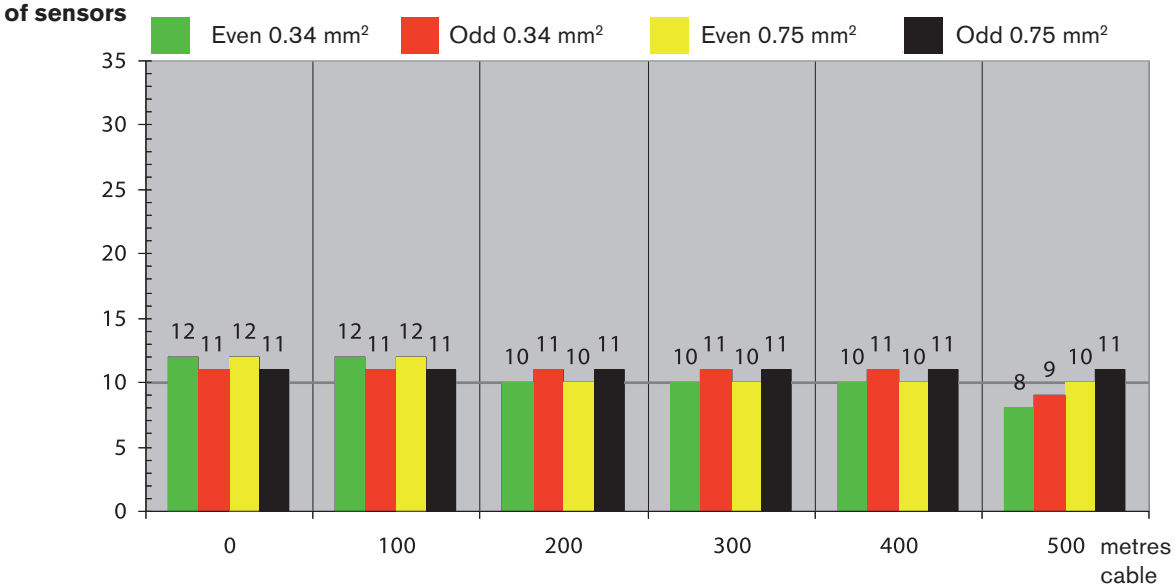
The following tables show the numbers of Tina-3A, Tina-6A, Tina-7A and SmileTina that can be connected to Vital and Pluto with the max voltage variation. The values have been established in a laboratory environment. The actual possible number of connected units may therefore differ from those given in the table. The values should be regarded as guidelines; Jokab Safety recommends a maximum of 30 units per Vital and a maximum of 10 units per Pluto input. The table was prepared according to measurements with connection example A. If connection example B and 0.34mm<sup>2</sup> cable is used, the values for 0.75mm<sup>2</sup> in the tables are used.



**Number of Tina-3A, 6A, 7A and Smile Tinas that can be used with Vital**

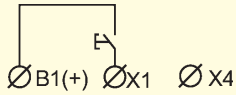


**Number of Tina-3A, 6A, 7A and Smile Tinas that can be used with Pluto**



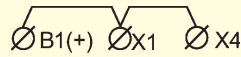
# Reset connections – Vital 1

## Manually supervised reset



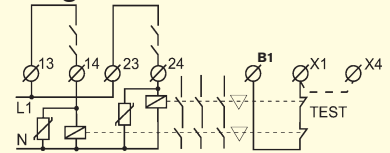
The manually supervised reset contact connected to input X1 must be closed and opened in order to activate the relay outputs.

## Automatic reset



Automatic reset is selected when B1, X1 and X4 are connected. The relay outputs are then activated at the same time as the inputs.

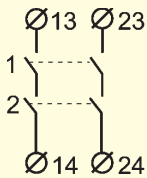
## Testing external contactor status



Contactors, relays and valves can be supervised by connecting 'test' contacts between B1 and X1. Both manually supervised and automatic reset can be used.

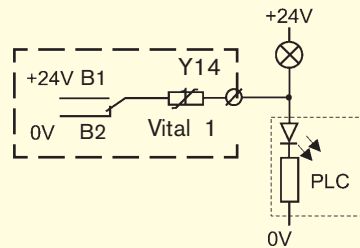
# Output connection – Vital 1

## Relay outputs



The Vital 1 has two (2 NO) safety outputs. In order to protect the output contacts it is recommended that loads (inductive) are suppressed by fitting correctly chosen VDR's, diodes etc. Diodes are the best arc suppressors, but will increase the switch-off time of the load.

## Information outputs



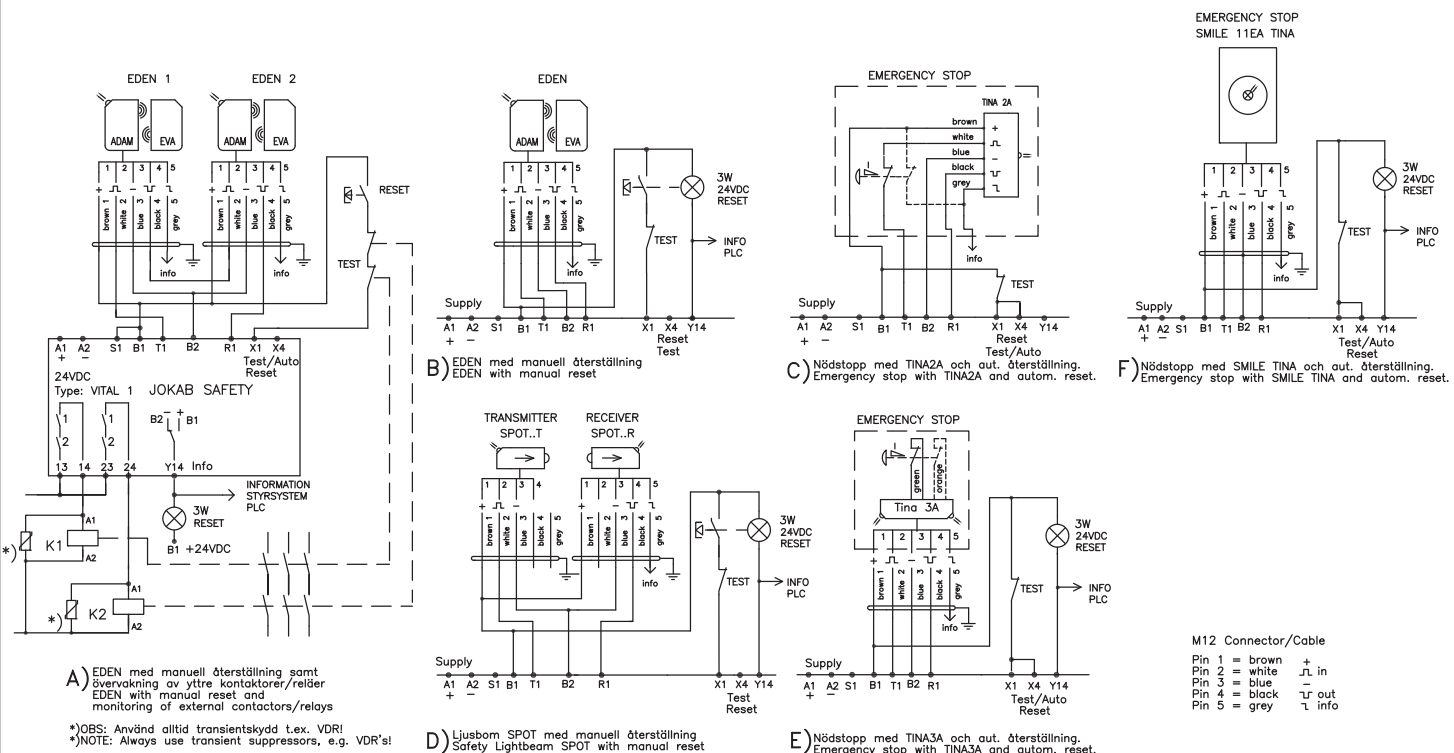
The Vital 1 has a single changeover contact information relay output. The relay output Y14 is connected internally to 0V and 24V in the following way:

- Y14 is internally closed to 0V B2 when the Vital 1 is not reset.
- Y14 is internally closed to +24V B1 when the Vital 1 is reset.

## Connection of S1

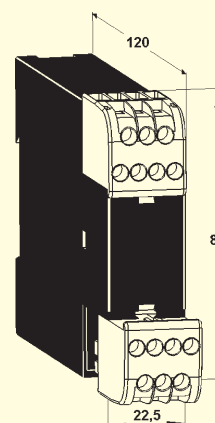
Even numbers of sensors (Eden, Spot, Tina) requires a connection between B1 and S1. S1 is not to be connected for odd numbers of sensors. See connection examples below fig. A.

# Connection examples of safety devices to Vital 1



Technical data – Vital 1	
Manufacturer	JOKAB SAFETY AB, Sweden
Article number/Ordering data:	20-052-00 Vital 1
Safety category (according to EN 954-1/EN ISO 13849-1)	4
Colour	Black and beige
Weight	220 g
Power supply Vital, A1-A2 From Vital to sensors/units, B1-B2	24 VDC +/- 15% 24 VDC
Fuse An external fuse should be fitted in the supply to A1	3 AT
Power consumption DC supply, nominal voltage (without load) DC supply, nominal voltage (with max load)	3 W 48 W
Dynamic safety circuit T 1 R 1	Output signal Input signal
Reset input X1 Supply for reset input Reset current  Minimum contact closure time for reset	+24VDC 30 mA max. (inrush current 300 mA during contact closure)  80 ms
Connection of S1 Even numbers of sensors (Eden + Spot T/R + Tina) require a connection between B1 and S1. S1 is not connected for odd numbers of sensors. Odd number, no connection between B1 and S1.	
Number of sensors Max. number of Eden/Tina to Vital 1 Total max. cable length to Eden/Tina Max. number of Spot T/R to Vital Total max. cable length to Spot T/R	30 1000 m 6 pairs 600 m
The above limits vary depending on cable size and application. See the connection example on pages 3:5, 3:6 and 3:7 in the section: Connection of units and lengths of cabling to Vital 1 and the number of Tina/Eden units to Vital or Pluto.	
Response time At Power on When activating (input-output) When deactivating (input-output) At Power loss	< 65 ms < 40 ms < 38 ms < 45 ms
Relay outputs NO Max switching capacity, resistive load Minimum load Contact material Mechanical life External fuse (EN 60947-5-1)	2 6A/250 VAC/1500 VA/150W 10 mA/10V AgCdO >10 <sup>7</sup> operations 6.3A or 4A slow
Relay information output (changeover contact) Y14 –(0V) +(24V) Max. load on Y14	Indicates Vital is not reset Indicates Vital is reset 200 mA (Internal automatic fuse)

LED indication  On ●  T ● R ● ☑ ● 1 ☑ ● 2	Fixed light: supply voltage OK, Flashing light: under-voltage or overload. T: Signal out OK. R: Signal in OK. Indicates that the output relays have been activated
Mounting DIN rail Operating temperature range	35 mm DIN rail -10°C to + 55°C
Connection blocks (detachable) Max screw torque Max connection area: Solid conductors Conductor with socket contact Air and creep distance	1 Nm 1x4mm <sup>2</sup> /2x1,5mm <sup>2</sup> /12AWG 1x2,5mm <sup>2</sup> /2x1mm <sup>2</sup> 4kV/2 DIN VDE 0110
Protection class Enclosure Connection blocks	IP 40 IEC 60529 IP 20 IEC 60529
<b>This equipment is intended for (CSA/UL Requirement):</b>	
<ul style="list-style-type: none"> <li>• indoor use</li> <li>• altitude max 2000 m</li> <li>• maximum relative humidity 80% at max 31°C and decreasing linearly to 50% at 40°C.</li> <li>• pollution degree 2</li> <li>• installation category (overvoltage category) II:Local level, appliances,portable equipment, etc. with smaller transient overvoltage than installation category (overvoltage category) III. This equipment is <b>not</b> to be used in <b>any</b> other way than stated in technical description.</li> </ul>	



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