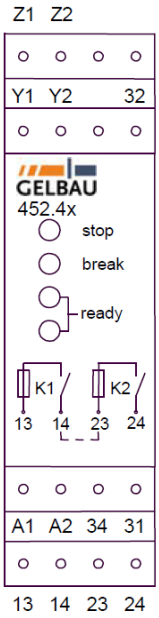
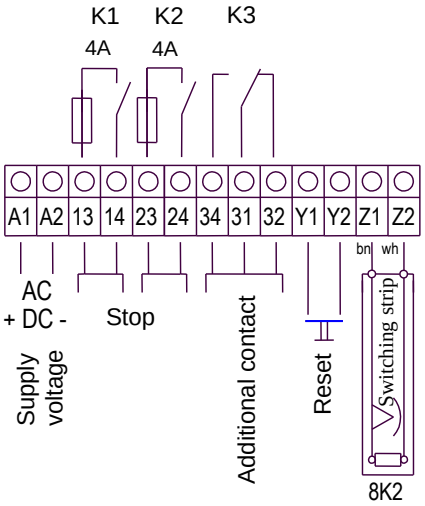
General

The resistance evaluation unit 452.4x is a dual safety relay designed to monitor GELBAU Contact-Duo safety switching strips with a resistance of 8.2 kΩ as an electrical termination. The 452.4x model series has a two-channel configuration and incorporates a control which monitors redundancy.
The stop output (13, 14 / 23, 24) comprises two force guided relays and includes a reset function.
With an additional changeover contact (31, 32, 34), a notification contact or auxiliary contact is available.
The safety system complies with the **EN ISO 13849-1: 2008** standard and the **EN ISO 13856-2: 2013** European standard for pressure-sensitive protective devices as they apply to output switchgear.

Arrangement, connection



Wiring diagram



Bridge across Y1, Y2 = automatic reset

Function

The Contact-Duo switching strip connected to Z1and Z2 is monitored with a quiescent current. To start the device, the reset contact Y1, Y2 must be actuated momentarily. If correctly wired, safety contacts 13, 14 and 23, 24 are closed and the two green LEDs (*ready*) are illuminated in the operating state “Ready”.
When the Contact-Duo switching strip is actuated (compressed), the two safety relays K1 and K2 drop out and safety contacts 13, 14 and 23, 24 are opened. The red LED lights up (*stop*).
If the quiescent current between Z1 and Z2 is interrupted, the red LED (*stop*) lights up and, upon actuation of the reset, the yellow LED (*break*) also lights up. Safety contacts 13, 14 and 23, 24 are opened.
The additional changeover contact 31, 32, 34 switches on simultaneously with STOP contact 13, 14.
An automatic reset can be configured by bridging the terminals Y1, Y2 together.

Note: The additional changeover contact 31, 32, 34 serves only as an auxiliary contact and may not be used in the safety circuit.

Function table (status display)

Status of switching strip	Red LED	Yellow LED	Green LED (2x)	Output 13, 14 / 23, 24
Properly connected; non-actuated status			illuminated	closed
Actuated (compressed)	illuminated			open
Switching strip interrupted	illuminated	illuminated *1		open

*1 = only with reset actuated or automatic reset

Installation, commissioning

1. Designed for electrical cabinet installation, the housing snaps into a 35 mm top hat rail (TS 35) in accordance with DIN 50022. If control panel installation is desired, a 26-mm-wide top hat segment with two mounting holes for screwed fasteners is available.

2. The Gelbau Contact-Duo switching strip(s) with terminating resistor is (are) connected to terminals Z1 and Z2. Note that the brown conductor of the connection cable must be connected to Z1 and the white (blue) conductor of the connection cable must be connected to Z2.
   When multiple Contact-Duo switching strips are connected to resistance evaluation unit 452.4x, the individual switching strips must be connected in series (Note: Wire the conductors brown-to-brown and white-to-white, otherwise malfunctions can occur), whereby the resistor may only be installed as an electrical termination on the last switching strip.

3. The load applied to safety relay output 13, 14 / 23, 24 may not exceed 4 A, because a 4 A slow-blow pre-fuse is installed.
   For changeover contact 31, 32, 34 the specified switching capacities must be observed (see “Technical data”).

4. The supply voltage is connected to A1 and A2. The (+) pole must be attached to A1.

The device may be installed and commissioned only by specialists with the relevant qualifications.

Troubleshooting and corrective measures

1. no LEDs light up
   Is the supply voltage correct?

2. the red and yellow LEDs are continuously illuminated upon reset contact or automatic reset
   Is the switching strip connected correctly? Is there an interruption/break in the supply line? (Test: temporarily connect an 8.2-kΩ resistor across Z1 and Z2. If device is then OK ⇨ interruption/break.)

3. the red LED is continuously illuminated
   Disconnect switching strip and check with ohmmeter (value must be about 8.2 kΩ); possible short circuit in the supply line?

4. both channels display different status
   ⇨ Send device back for inspection.

Technical specifications

Housing:

Material: Polyamide 6.6
Protection class: **IP20**
Dimensions: 22.5 x 100 x 110 mm (W x H x D)
Snap system for 35-mm TS mounting rail according to DIN EN 50022
Weight: 175 - 250g

AC connection voltages:

Model: **452.40**:

Nominal operating voltage:	230 V/AC	-15% +10%
Nominal frequency:	50 Hz	40 - 60 Hz

Model: **452.41**:

Nominal operating voltage:	115 V/AC	-15% +10%
Nominal frequency:	50 Hz	40 - 60 Hz

Model: **452.44**:

Nominal operating voltage:	24 V/AC	-15% +10%
Nominal frequency:	50 Hz	40 - 60 Hz

Power consumption: max. 3VA
Power supply galvanically isolated acc. to VDE 0551

DC connection voltages:

Model **452.46**:

Nominal operating voltage:	24 V/DC	-15% +10%
Permissible residual ripple:		max. 10%
Power consumption:		max. 3W

Model **452.48**:

Nominal operating voltage:	10-36 V/DC
Power consumption:	max. 2.1 W

Power supply galvanically isolated (DC/DC converter)

AC / DC connection voltages:

Model **452.42**:

Nominal operating voltage:	24-230 V/AC	-30% +10%
	24-110 V/DC	-30% +10%
Power consumption:		max. 4W / 6VA

Power supply galvanically isolated acc. to VDE 0551

DC connection voltages:

Model **452.46U**: (device without galvanic isolation!)

Nominal operating voltage:	24 V/DC	-15% +10%
Permissible residual ripple:		max. 10%
Power consumption:		max. 3W

Warning! Connection voltage must be galvanically isolated (transformer) according to VDE 0551 ("Un-grounded mains!").

Technical details subject to change

Switching strip input (Z1, Z2):

Terminal voltage upon interruption:	8 VDC
Terminal voltage upon actuation:	< 4 VDC
Terminal voltage in non-actuated state:	approx. 5 VDC
Sensor quiescent current:	approx. 0.6 mA
Switch point upon actuation:	< 5.5 kΩ
Switch point upon interruption:	> 11.5 kΩ
Switching strip termination:	8.2 kΩ **resistor**

Safety relay terminals 13, 14 and 23, 24:

Type of contact	2 relays with 1 NOC each -force guided- available separately
Loading capacity	max. 4 A (internal slow-blow 4 A fuses)

Drop out time: Delay between actuation of switching strip and relay signal output: **max. 15 ms**

Relay contact data (13, 14 and 23, 24):

Nominal operating current

NOC	2A DC13 24V
NOC	3A AC15 250V

Relay contact data (31, 32, 34):

Nominal operating current

NCC	1.25A DC13 24V
NOC	1.25A DC13 24V
NCC	2A AC15 250V
NOC	2A AC15 250V

Contact service life, mech.: 3 x 10^7 switch cycles

Contact service life, electr.: 2 x 10^5 switch cycles at max. power

Rated insulation voltage: 250 V

Rated impulse voltage resistance: 4 KV

Contamination degree: 2

Conditional short-circuit current: 100 A

Permissible temperature range: -20° to + 55° C

Acoustic noise: < 35 dB (A)

Category: **3**

Standards:
Electrical safety: **EN60947-5-1:2004+A1:2009**

Accepted according to: **EN ISO 13849-1:2008/AC:2009**
Performance Level: **PL: e**

Accepted according to: **EN 62061:2005+A1:2013**
Safety Integrity Level: **SIL: 3**

EC Conformity Declaration

according to 2006/42/EC, Annex II, no. 1 A

CE

Manufacturer:

Gelbau GmbH & Co. KG
Grandkaule 8 – 10
53859 Niederkassel, Germany

Ms. Yvonne Riem is duly authorised to compile the technical documentation.

Ms. Yvonne Riem
Gelbau GmbH & Co. KG
Grandkaule 8 – 10
53859 Niederkassel

We hereby declare that the type of the following safety relays:

452.4x

serial numbers: 0011 bis 9999….

meets the requirements of Performance Level “e” / Category 3 according to EN ISO 13849-1: 2008 and Safety Integrity Level (SIL) 3 according to EN 62061: 2005 and conforms to all applicable provisions of the **EC Machine Directive 2006/42/EC**.

The type of the safety relays is also in conformance with all applicable provisions of the following EC directives: **EMC Directive 2014/30/EU**

Notified body:

TÜV NORD CERT GmbH
ID number: 0044
Langemarckstr. 20
45141 Essen, Germany

EC type examination certificate no.: 44 205 14059902

The following harmonised standards were applied:

EN ISO 13849-1:2008/ AC:2009	Safety of machinery - Safety-related components of control systems, requirements relative to Performance Level
EN 62061:2005 +A1:2013	Functional safety of safety-related electrically / electronically / programmable requirements relative to SIL
EN ISO 13856-2:2013	“Pressure-sensitive protective devices” in sub-areas, relative to the output switching system
EN 60947-5-1:2004 +A1 :2009	Low-voltage switching devices – part 5-1: Electrical safety
EN61000-3-2:4/2006 +A1:7/2009+A2:7/2009	Electromagnetic Compatibility (EMC)
EN 61000-3-3:9/2008	Electromagnetic Compatibility (EMC)
EN 61000-6-2:2005	Electromagnetic Compatibility (EMC) Part 6-2: Generic standards – Immunity for industrial environments
EN 61000-6-3:1/2007	Electromagnetic Compatibility (EMC) Part 6-2: Generic standards – Emission standard for residential, commercial and light industrial environments

Notes:
The user may opt to interconnect switching strip profiles/evaluation unit combinations by means of a Pepperl & Fuchs model Z965/071859 Zener barrier.

Niederkassel, 14.07.2016

Jürgen Menz
General Manager