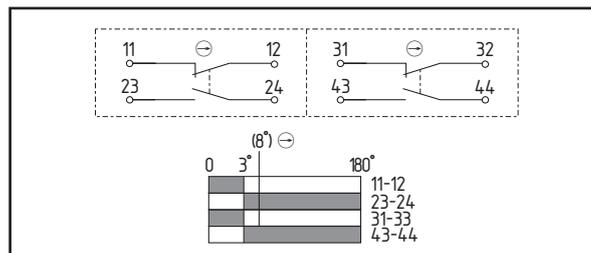


## Hinge monitoring switches



Standard contact complement: 2 NC/2 NO contacts

### Contact complement

The hinge monitoring switch of the TESF type series is supplied as standard with 2 positively opening NC contacts (safety contacts) and 2 NO contacts for signalling purposes. Three connection systems are available (see loc. cit.).

The contacts, with a switching capacity of  $\geq 5 \text{ V}/1 \text{ mA} \dots \leq 250 \text{ VAC}/2.5 \text{ A}$ , are featured in two independent units each with 1 NC/NO combination.

### Control category

With 2-channel signal processing in connection with a suitable sequence-controlled circuit, the contact complement of the TESF devices as interface to the safety-orientated part of the machine control system permits their use in applications up to control category 4 to EN 954-1.

In connection with the special feature of the inherent manipulation protection and the successful principle of action of the Elan hinge monitoring switch, it is not usually necessary to double up on the devices even for "higher" control categories.



Front installation:  
Guard closed

### Opening angle of the rotatable guard: ... 180°

The guard can always be opened up to 180° due to the flat construction of the TESF devices and a recess in the switch housing to accommodate the moving hinge wing.



Front installation:  
Guard opened through 180°

### Safety function

In order to protect people from hazardous machine movements Elan hinge monitoring switches monitor (interlock) the position of rotatable guards such as doors in fencing or as flaps or hoods on machine cladding.

As interlocking devices without guard locking to EN 1088 in combination with the safety-orientated part of a machine control system the devices ensure that

- hazardous machine movements may only be initiated and performed when the guard is closed,
- opening of the guard stops the hazardous machine movements, and
- it is not possible for the machine to restart when the guard is open.
- However, they do not serve to lock guards in the case of hazardous aftertravel movements due to the existing kinetic energy. In this case a locking function is also required or an interlocking device with locking as offered in various designs in the product range of the Schmersal Group.

The tried and tested properties and features of the hinge monitoring switches of the TESF type series have been further refined and the new design of the TESF type series now features numerous additional advantages and possibilities.



Inside installation:  
Guard closed

### Inside installation

In addition to attachment to the front side (refer to figures on page 2), the new housing design permits the TESF devices to also be installed in a concealed position in the gap between the fixed part (door post, door frame) on the one hand and the moving part of a guard (protective door, protective flap) on the other, for example in (Al) profile systems or similar.



Inside installation:  
Guard opened through 180°

### Switching points

The hinge monitoring switches of the TESF type series come as standard with a preset switching point at an opening angle of approximately 3° respectively  $\leq 5^\circ$  with involvement of the positive break cycle, i.e. in a linear movement, the safety contacts open starting from an appropriate actuation lift. Reference point is the closed guard.

There are two versions depending on installed position, i.e. depending on whether a device is to be attached to the front side of a guard

(front installation) or to the inside (see left), i.e. installed in a concealed position in the gap between the moving part and the fixed part of the guard:

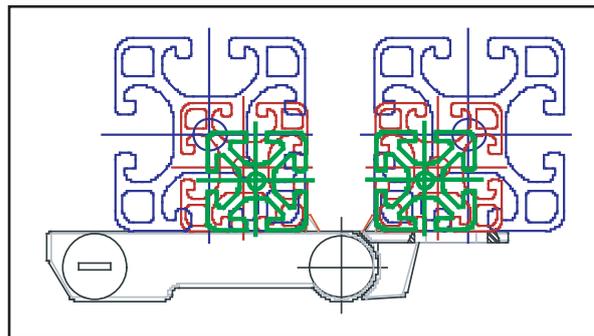
- Opening angle set for front installation\*
- Opening angle set for inside installation\*.

\* With higher shock and vibration impact or for other installation situations devices can also be supplied with a different switching point (>3 opening angle) on request. A distinction must be made here too between front installation and inside installation.



**Warning:** The switching point specified at a 5° opening angle is to be understood for devices in new state with consideration of the positive break cycle. At the end of mechanical lifetime the opening angle is  $\leq 8^\circ$  (including positive break angle).

Particularly with reference to finger and hand protection we recommend that this switching point be considered when considering safety (refer also to “Standards and regulations” as well as the table “Determining the door gap as dependent on opening angle, door width and overlap”).



### Use in Al profile systems etc.

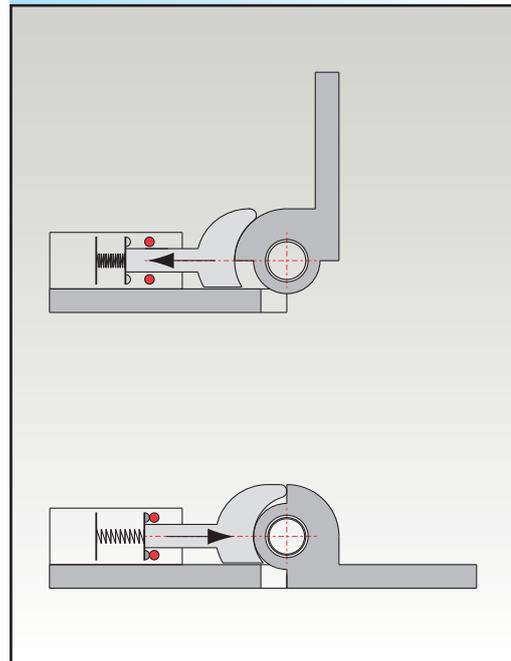
It is not necessary to make a distinction with respect to the different dimensions of commercially available (Al) profile systems. The design of the

fixing bore holes as longitudinal slits permits the use of hinge monitoring switches of the TESF type series for all profile dimensions 30 ... 60 mm (also in cases of “mixed” profile dimensions).

### Design and safety-related advantages

The special advantage – both of the devices of the tried and tested TESZ type series and the new TESF type series – is the simple assembly because the switch for position monitoring of the guard is already integrated into the hinge, i.e. both functions form an advantageous single assembly.

Depending on the rotating movement the switch plunger actuates an appropriately shaped switch cam on the pin of the hinge, thereby positively opening one or several safety contacts against the pressure of the plunger reset spring of the switch blocks. Vice-versa: if a guard is closed again the safety contact(s) close by friction lock and signalise to the sequential circuit the safe state of the guard.



## Inherent protection against manipulation

By comparison with other solutions the principle of action of the Elan hinge monitoring switches at the same time constitutes an inherently safe design against the bypassing of an interlocking device, i.e. additional measures to guard against manipulation of the protective function, as addressed for example in EN 1088 paragraph 5.7, are not necessary in these devices.



## Free setting of switching points

If the switching points cannot be exactly determined in advance TESF switches are also featured in the product range (in a special version) which enable the switching point to be set directly when installing the devices on site.



Setting the switching point with a special tool

For this purpose a freely accessible adjuster is provided in this version which can be set using a special tool (supplied). Turning the adjuster acts on the switch plunger via a self-inhibiting gear (worm gear) with a ratio of 40:1. Turning the tool in a clockwise direction reduces the switching angle continuously up to 9° and vice-versa (refer also to adjustment instructions: loc. cit.).



**Warning:** After setting the desired switching point the opening of the adjuster must be sealed with a plug.

This measure prevents manipulation of the set switching point within the meaning of EN 1088 paragraph 5.7 and therefore prevents any loss of the safety function of the device.

The plug is to be found on the special setting tool with a break-off line.

We also recommend that the plug be painted over or glued.

Securing the setting screw by plug is a mandatory requirement placed on the user. Failure to observe this requirement leads to a loss of CE conformity of the devices.



**Warning:** The freely selectable switching point adjustment is possible exclusively for TESF devices for front installation and for inside installation  $\geq 90^\circ$  zero position of the moving part of the guard (otherwise the adjuster is not accessible). Alternatively, the works presetting of the switching point comes into question (refer to \* on page 3).



Securing of the adjuster by means of a plug

### Additional selection aspects

- We recommend the TESF versions “with mounting aid” specially for (Al) profile systems. However, this mounting aid – in the form of small end stops – requires a gap of 22 mm between the fixed and the moving part of a guard.

### Connection systems

The hinge monitoring switches of the TESF type series come with any of the following connection systems:

- Screw terminals for the following wire cross-sections
  - solid 0.14 ... 1.5 mm
  - stranded with wire-end ferrules 0.25 ... 1 mm

### Standards and regulations

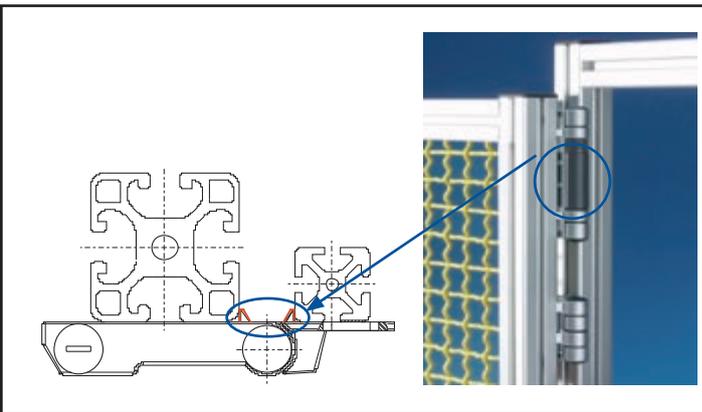
From a safety point of view the devices comply with the requirements of EN 1088 (interlocking devices in connection with isolating protective devices – guiding principles for design and selection), IEC EN 60947-5-1 (low voltage switchgear and control gear) and the test principles GS-ET 15 (positively opening position switches) of the Berufsgenossenschaft der Feinmechanik und Elektrotechnik, Cologne, as well as the requirements of UL 508.

The users must observe the following standards:

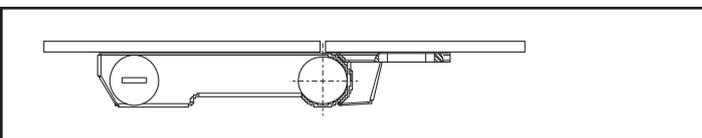
- EN 294: Safety distances against contact of upper limbs with hazardous points
- EN 349: Minimum distances to avoid contact with body parts
- EN 999: Arrangement of protective devices with respect to approach speeds of body parts
- EN 953: Isolating protective devices – general requirements on the design and construction of fixed and moving protective devices

Refer also to:

- Assembly instructions (page 18)
- Table (page 19): “Determining the door gap as dependent on operating angle, door width and overlap”



TESF version with mounting aid



TESF version without mounting aid



In order to facilitate series connections the TESF versions with screw terminals come as standard with two cable outlets (with thread M 16 x 1.5, sealed with blind plugs).

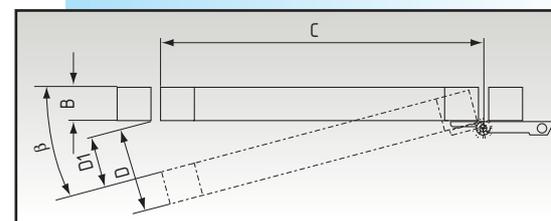
- Cage clamp terminals (WAGO Cage Clamp) with test pick-off for the following wire cross-sections
  - solid 0.25 ... 1 mm
  - stranded with wire-end ferrules 0.25 ... 0.75 mm



A TESF version “with mounting aid” is not recommended if the devices are to be used in applications without a suitably wide door gap (<22 mm), for example, in the case of sheet metal or plexi-glass structures where such a wide gap does not come into question for practical reasons.

- Hinge monitoring switches of the TESF type series are supplied as standard with the corresponding fixing material either including additional hinge or without.

A generously dimensioned connection space is available for wiring.



- Plug connections
  - M12 x 1 for 24 VDC supply voltage (8 pole)\*
  - M16 x 1.5 for 250 VAC supply voltage (10 pole)

With the plug versions a choice can be made between “plug top” and “plug bottom” (versions with two plug connections: on request).

- (on request); with ASi Safety at Work interface.

### Design

The hinge monitoring switches of the TESH type series are suitably tough for their intended industrial use. The hinges are made of die cast zinc and the hinge pins are made of stainless steel 1.4305. The plastic materials used are made of self-extinguishing, hardly flammable polyamide.

The class of protection of the devices is IP 65.

### TESF type key

A type key is provided below for a better understanding of the different versions:

Product range: refer to page 8 et seq.



\* **Warning:** The versions TESH.../ST24... must only be used in PELV circuits according to EN 60204.



### TESF . / . / ..... / ...

**free** = without mounting aid  
**“A”** = with mounting aid

**free** = with additional hinge  
**“S”** = without additional hinge

**TESF/S** = additional hinge without mounting aid  
**TESFA/S** = additional hinge with mounting aid  
**TESF-14** = adjustment tool

**“/0”** = front installation  
**“/180”** = inside installation  
**“/U”** = for customer adjustment including adjustment tool

**“.1”** = plug bottom side  
**“.2”** = plug top side

**free** = screw terminals  
**“CC”** = cage clamp terminals  
**“ST24”** = plug 24 V  
**“ST230”** = plug 230 V

# Hinge monitoring switches

## TESZ series

for 30 mm profiles

### Features

- Simple installation to all popular 30 mm aluminium profiles, square tubes and conventional machine cladding.
- Material:
  - Housing: glass-fibre-reinforced thermoplastic, self-extinguishing to UL 94-V-0
  - Hinge: Al Mg Si 0.5 F25
  - Hinge pin: steel 1.4104

### Cross references

- General description: refer to page 5
- Contact arrangement selectable: see below
- Calculation door angle/door gap: refer to page 30
- Assembly instructions: refer to page 31
- Technical data: refer to page 32

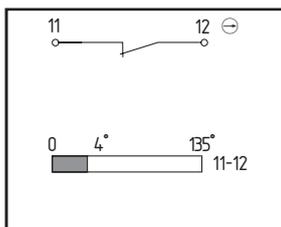
### Options (on request)

- Other switching angles: 5°, 8° (standard: 4°)
- With adapter for AS Interface Safety at Work
- Plug connection

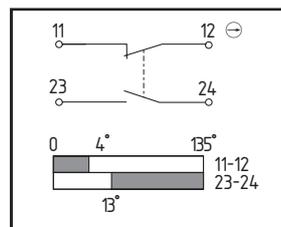


### Contact configurations

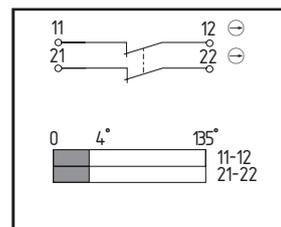
TESZ 10../30



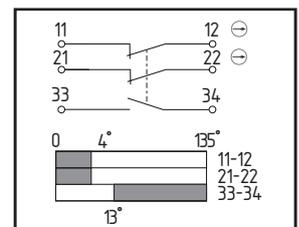
TESZ 102../30



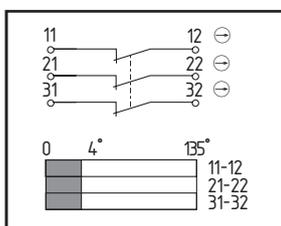
TESZ 110../30



TESZ 1102../30



TESZ 1110../30



Representation of the contacts in non-actuated state (guard closed), switching angle in new state. Tolerance 4°-2.

**Test symbol (with respect to the basic design)**



BIA 994005

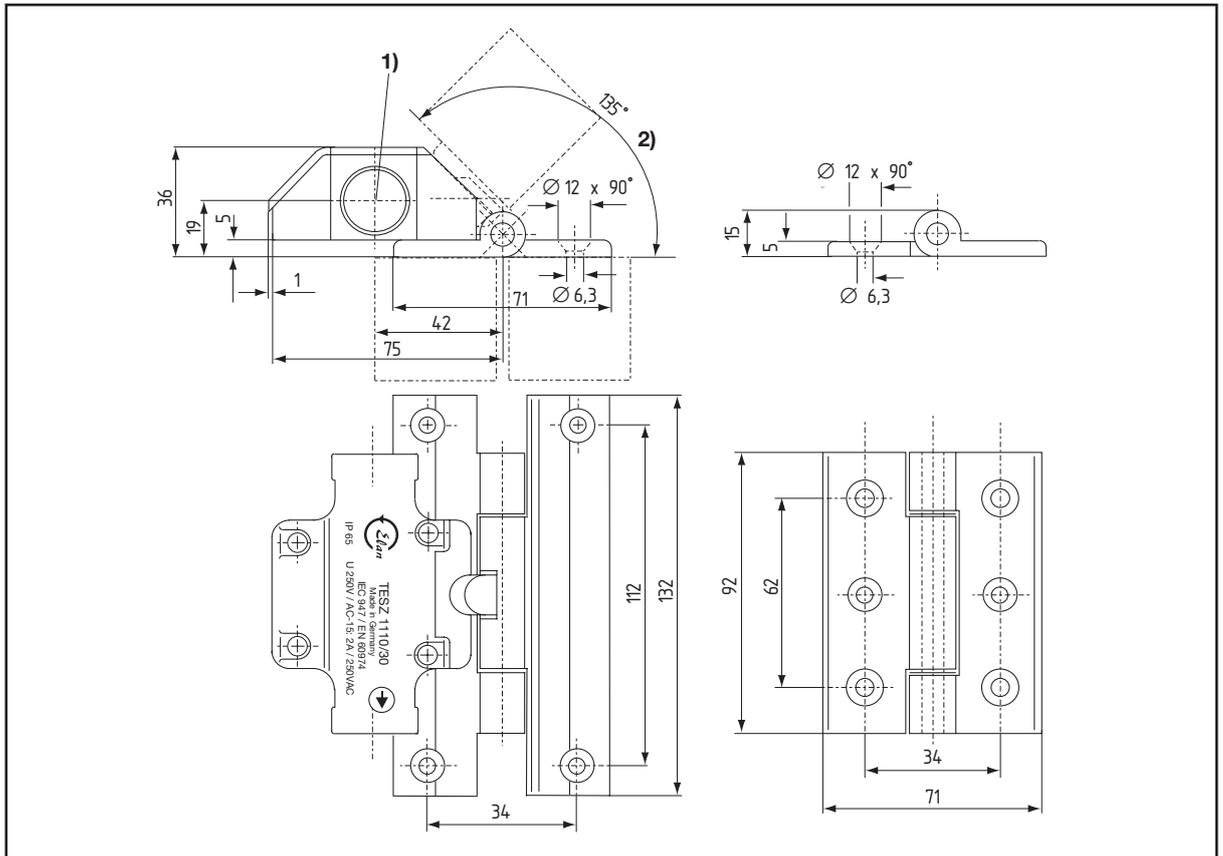
**Scope of delivery**

Hinge switch with or without additional hinge, fixing material

**Product table**

Type	Version	Part number
<b>With additional hinge</b>		
TESZ 10/30	1 NC	1348710
TESZ 102/30	1 NC/1 NO	1348713
TESZ 110/30	2 NC	1348722
TESZ 1102/30	2 NC/1 NO	1348716
TESZ 1110/30	3 NC	1348719
<b>Without additional hinge</b>		
TESZ 10/S/30	1 NC	1348711
TESZ 102/S/30	1 NC/1 NO	1348714
TESZ 110/S/30	2 NC	1348723
TESZ 1102/S/30	2 NC/1 NO	1348717
TESZ 1110/S/30	3 NC	1348720
<b>Additional hinge</b>		
TESZ/S/30		1348821

Dimensions TESZ .../30



- 1) Punch-out bore hole M20 x 1.5
- 2) Maximum opening angle 135°

# Hinge monitoring switches

## TESZ series

for 35 mm profiles

### Features

- Simple installation to all popular 35 mm aluminium profiles, square tubes and conventional machine cladding.
- Material:
  - Housing: glass-fibre-reinforced thermoplastic, self-extinguishing to UL 94-V-0
  - Hinge: Al Mg Si 0.5 F25
  - Hinge pin: steel 1.4104

### Cross references

- General description: refer to page 5
- Contact arrangement selectable: see below
- Calculation door angle/door gap: refer to page 30
- Assembly instructions: refer to page 31
- Technical data: refer to page 32

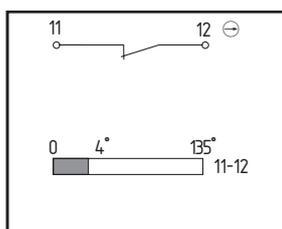
### Options (on request)

- Other switching angles: 5°, 8° (standard: 4°)
- With adapter for AS Interface Safety at Work
- Plug connection

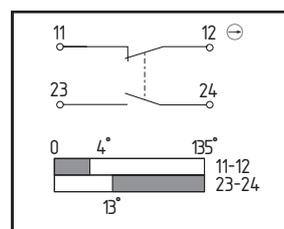


### Contact configurations

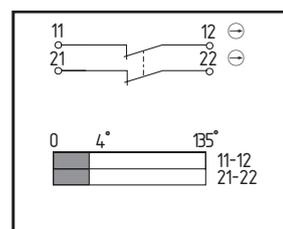
TESZ 10../35



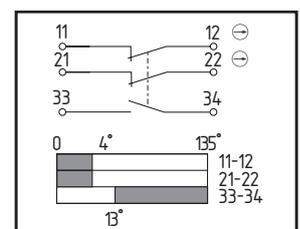
TESZ 102../35



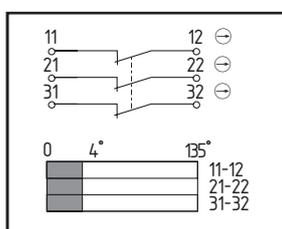
TESZ 110../35



TESZ 1102../35



TESZ 1110../35



Representation of the contacts in non-actuated state (guard closed), switching angle in new state. Tolerance 4°-2.

**Test symbol (with respect to the basic design)**

BIA 994006

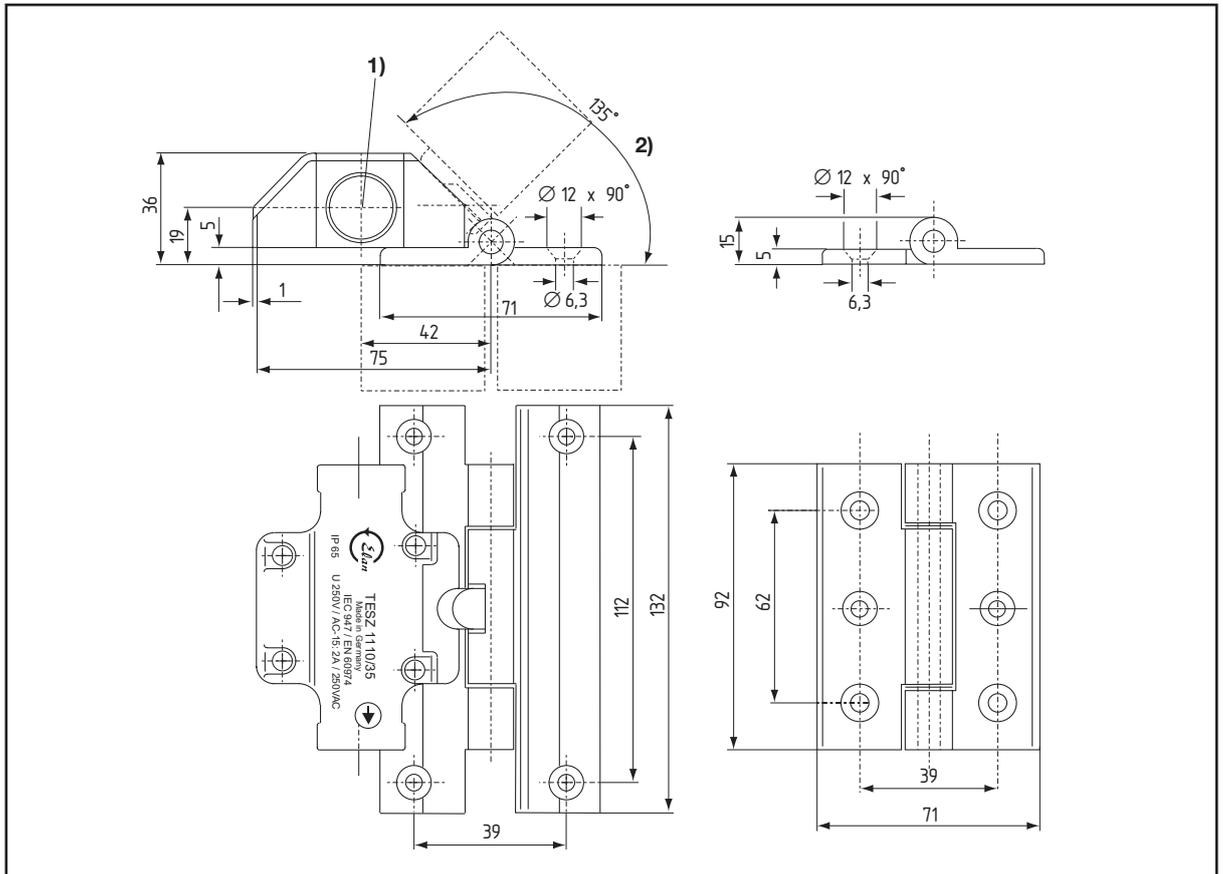
**Scope of delivery**

Hinge switch with or without additional hinge, fixing material

**Product table**

Type	Version	Part number
<b>With additional hinge</b>		
TESZ 10/35	1 NC	1348730
TESZ 102/35	1 NC/1 NO	1348733
TESZ 110/35	2 NC	1348742
TESZ 1102/35	2 NC/1 NO	1348736
TESZ 1110/35	3 NC	1348739
<b>Without additional hinge</b>		
TESZ 10/S/35	1 NC	1348731
TESZ 102/S/35	1 NC/1 NO	1348734
TESZ 110/S/35	2 NC	1348743
TESZ 1102/S/35	2 NC/1 NO	1348737
TESZ 1110/S/35	3 NC	1348740
<b>Additional hinge</b>		
TESZ/S/35		1348822

Dimensions TESZ .../35



- 1) Punch-out bore hole M20 x 1.5
- 2) Maximum opening angle 135°

# Hinge monitoring switches

## TESZ series

for 40 mm profiles

### Features

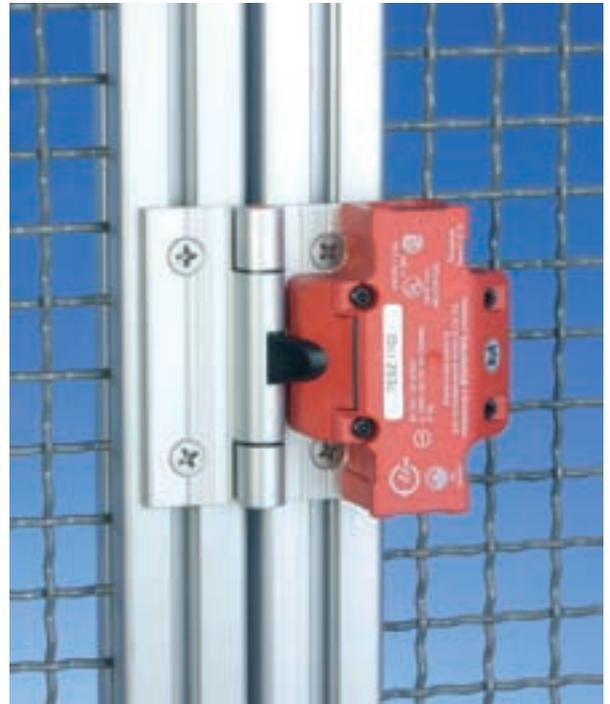
- Simple installation to all popular 40 mm aluminium profiles, square tubes and conventional machine cladding.
- Material:
  - Housing: glass-fibre-reinforced thermoplastic, self-extinguishing to UL 94-V-0
  - Hinge: Al Mg Si 0.5 F25
  - Hinge pin: steel 1.4104

### Cross references

- General description: refer to page 5
- Contact arrangement selectable: see below
- Calculation door angle/door gap: refer to page 30
- Assembly instructions: refer to page 31
- Technical data: refer to page 32

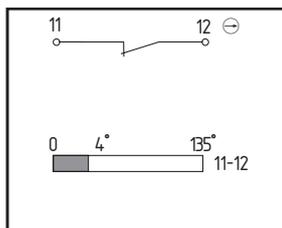
### Options (on request)

- Other switching angles: 5°, 8° (standard: 4°)
- With adapter for AS Interface Safety at Work
- Plug connection

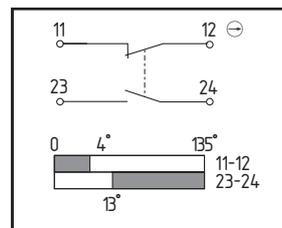


### Contact configurations

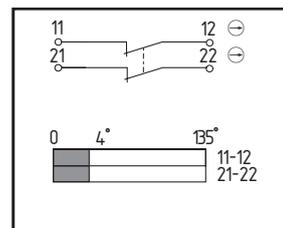
TESZ 10..



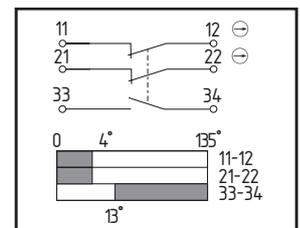
TESZ 102..



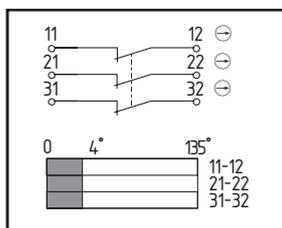
TESZ 110..



TESZ 1102..



TESZ 1110..



Representation of the contacts in non-actuated state (guard closed), switching angle in new state. Tolerance 4°±2.

**Test symbol (with respect to the basic design)**

BIA 994006

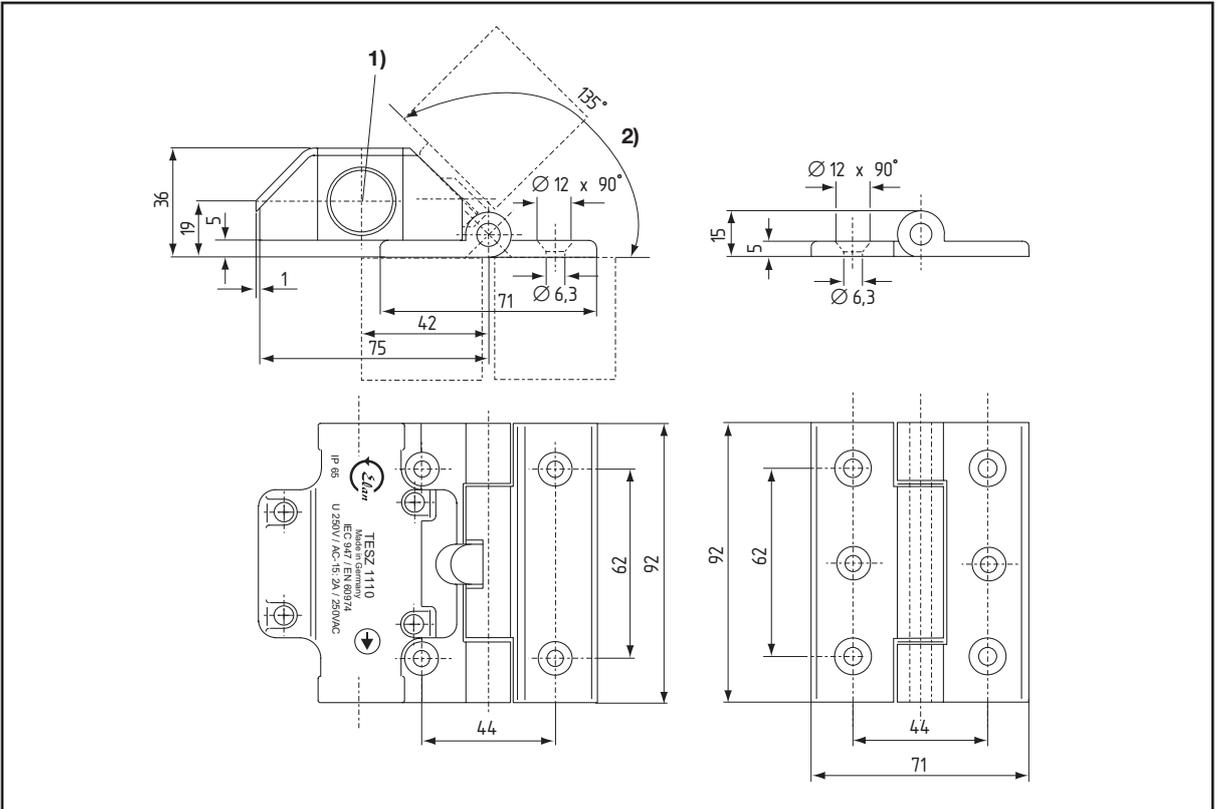
**Scope of delivery**

Hinge switch with or without additional hinge, fixing material

**Product table**

Type	Version	Part number
<b>With additional hinge</b>		
TESZ 10	1 NC	1348760
TESZ 102	1 NC/1 NO	1348764
TESZ 110	2 NC	1348776
TESZ 1102	2 NC/1 NO	1348768
TESZ 1110	3 NC	1348772
<b>Without additional hinge</b>		
TESZ 10/S	1 NC	1348761
TESZ 102/S	1 NC/1 NO	1348765
TESZ 110/S	2 NC	1348777
TESZ 1102/S	2 NC/1 NO	1348769
TESZ 1110/S	3 NC	1348773
<b>Additional hinge</b>		
TES/S		1348819

Dimensions TESZ ...



- 1) Punch-out bore hole M20 x 1.5
- 2) Maximum opening angle 135°

# Hinge monitoring switches

## TESZ series

for 45 mm profiles

### Features

- Simple installation to all popular 45 mm aluminium profiles, square tubes and conventional machine cladding.
- Material:
  - Housing: glass-fibre-reinforced thermoplastic, self-extinguishing to UL 94-V-0
  - Hinge: Al Mg Si 0.5 F25
  - Hinge pin: steel 1.4104

### Cross references

- General description: refer to page 5
- Contact arrangement selectable: see below
- Calculation door angle/door gap: refer to page 30
- Assembly instructions: refer to page 31
- Technical data: refer to page 32

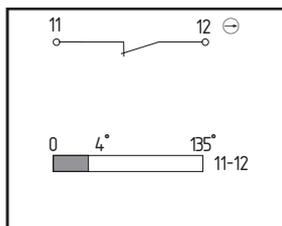
### Options (on request)

- Other switching angles: 5°, 8° (standard: 4°)
- With adapter for AS Interface Safety at Work
- Plug connection

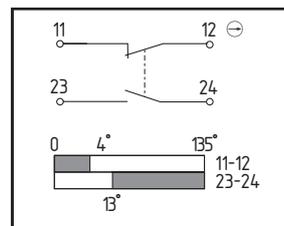


### Contact configurations

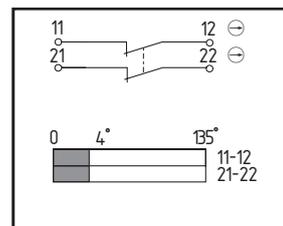
TESZ 10../45



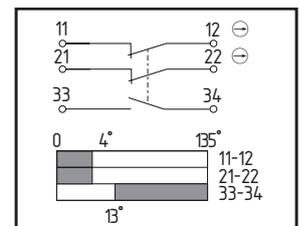
TESZ 102../45



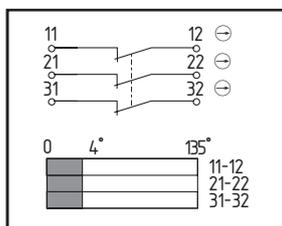
TESZ 110../45



TESZ 1102../45



TESZ 1110../45



Representation of the contacts in non-actuated state (guard closed), switching angle in new state. Tolerance 4°-2.

**Test symbol (with respect to the basic design)**



BIA 994006

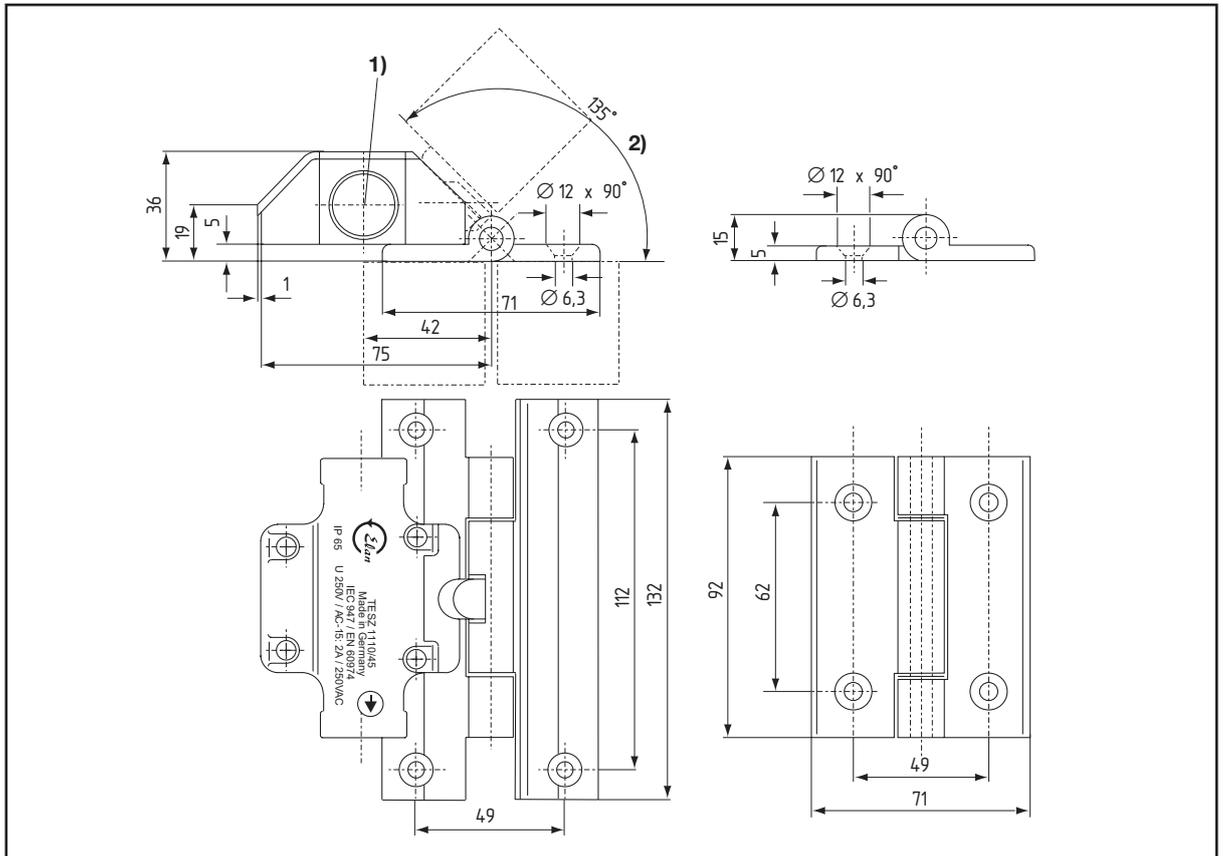
**Scope of delivery**

Hinge switch with or without additional hinge, fixing material

**Product table**

Type	Version	Part number
<b>With additional hinge</b>		
TESZ 10/45	1 NC	1348600
TESZ 102/45	1 NC/1 NO	1348601
TESZ 110/45	2 NC	1348602
TESZ 1102/45	2 NC/1 NO	1348603
TESZ 1110/45	3 NC	1348604
<b>Without additional hinge</b>		
TESZ 10/S/45	1 NC	1348610
TESZ 102/S/45	1 NC/1 NO	1348611
TESZ 110/S/45	2 NC	1348612
TESZ 1102/S/45	2 NC/1 NO	1348613
TESZ 1110/S/45	3 NC	1348614
<b>Additional hinge</b>		
TESZ/S/45		1348818

Dimensions TESZ .../45



- 1) Punch-out bore hole M20 x 1.5
- 2) Maximum opening angle 135°

# Hinge monitoring switches

## TESZR series

for 40 mm profiles with restart inhibit

### Features

- Simple installation to all popular 40 mm aluminium profiles, square tubes and conventional machine cladding.
- With restart inhibit
- Material:
  - Housing: glass-fibre-reinforced thermoplastic, self-extinguishing to UL 94-V-0
  - Hinge: Al Mg Si 0.5 F25
  - Hinge pin: steel 1.4104

### Cross references

- General description: refer to page 5
- Contact arrangement selectable: see below
- Calculation door angle/door gap: refer to page 30
- Assembly instructions: refer to page 31
- Technical data: refer to page 32

### Options (on request)

- Other switching angles: 5°, 8° (standard: 4°)
- Other hinge versions
- With adapter for AS Interface Safety at Work
- Plug connection



### Restart inhibit

The restart inhibit prevents an unintentional restart of the hazardous movement when the guard is closed. Reset by pressing a restart button.



Picture to the left: The restart inhibit latches in when the guard is opened; safety contacts are open.

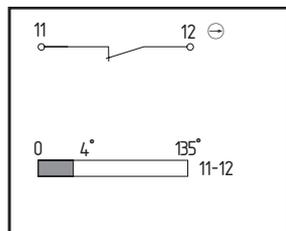
Picture to the right: After closing (1) the guard the safety contacts are held in open state by the restart inhibit. Only once the reset button (2) is pressed do the safety contacts close again.



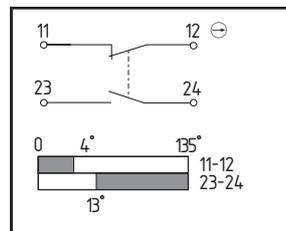
**Attention:** If reset of restart inhibit is used exclusively to initiate dangerous movements, switch must be replaced after max. 100,000 switching cycles.

### Contact configurations

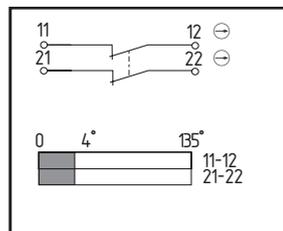
TESZR 10..



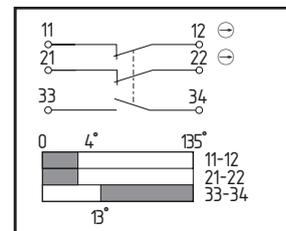
TESZR 102..



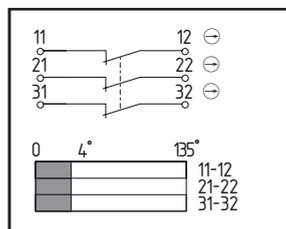
TESZR 110..



TESZR 1102..



TESZR 1110..



Representation of the contacts in non-actuated state (guard closed), switching angle in new state. Tolerance 4°±2.

**Test symbol (with respect to the basic design)**



in preparation

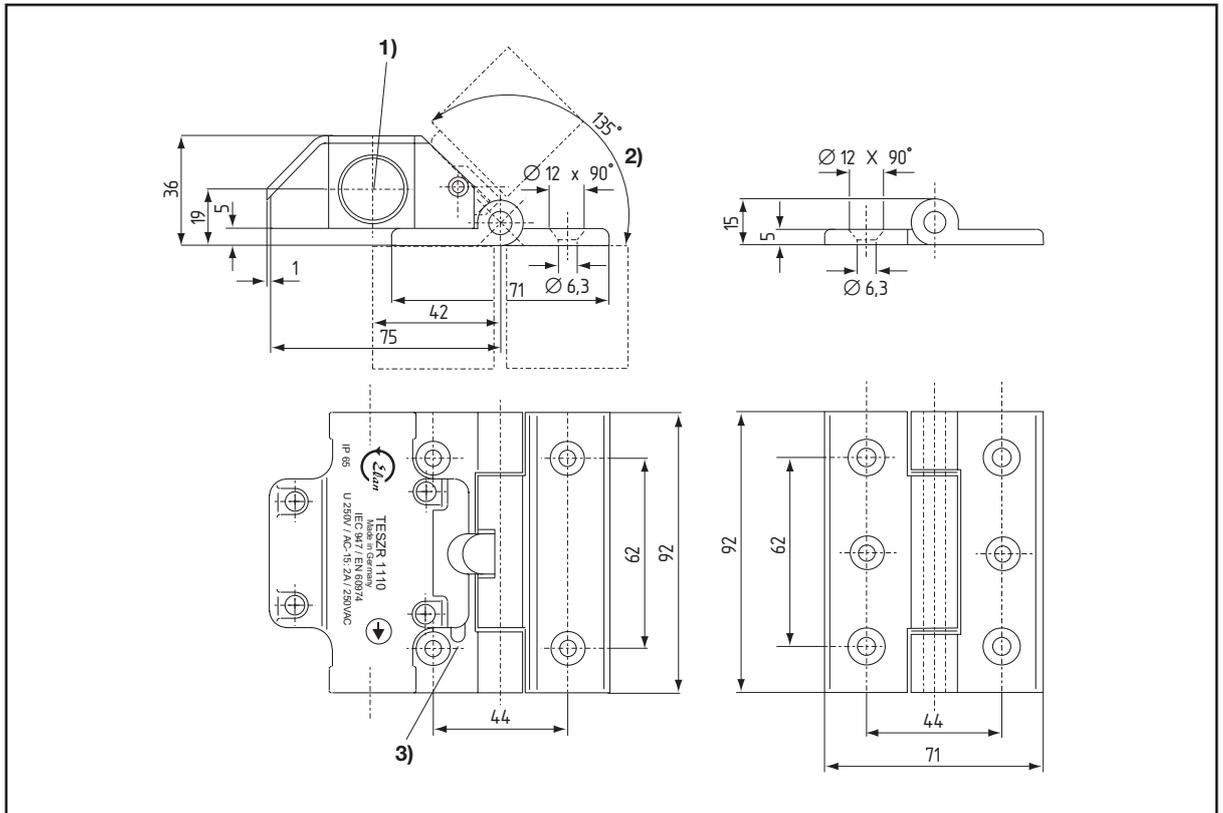
**Scope of delivery**

Hinge switch with or without additional hinge, fixing material

**Product table**

Type	Version	Part number
<b>With additional hinge</b>		
TESZR 10	1 NC	1348660
TESZR 102	1 NC/1 NO	1348665
TESZR 110	2 NC	1348670
TESZR 1102	2 NC/1 NO	1348675
TESZR 1110	3 NC	1348680
<b>Without additional hinge</b>		
TESZR 10/S	1 NC	1348661
TESZR 102/S	1 NC/1 NO	1348666
TESZR 110/S	2 NC	1348671
TESZR 1102/S	2 NC/1 NO	1348676
TESZR 1110/S	3 NC	1348681
<b>Additional hinge</b>		
TES/S		1348819

Dimensions TESZR ...



- 1) Punch-out bore hole M20 x 1.5
- 2) Maximum opening angle 135°
- 3) Reset button

# Hinge monitoring switches

## TESZX series

with stainless steel hinge

### Features

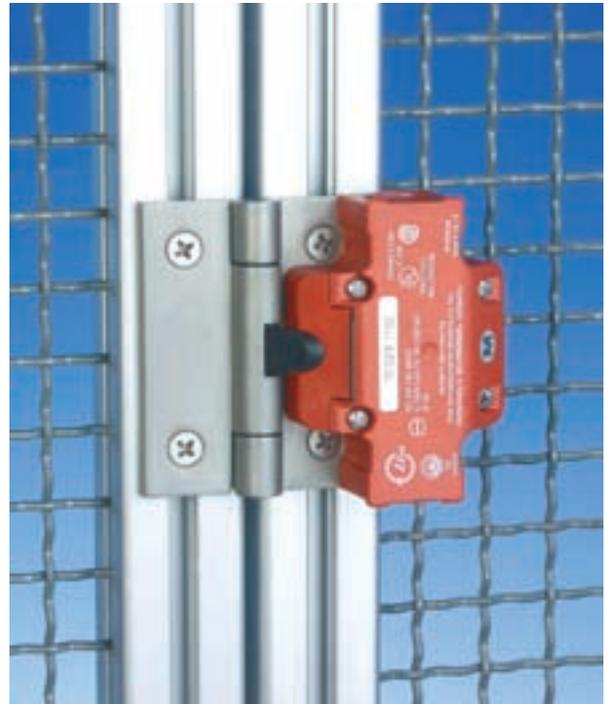
- Simple installation to all popular 40 mm aluminium profiles, square tubes and conventional machine cladding.
- Housing: glass-fibre-reinforced thermoplastic, self-extinguishing to UL 94-V-0
- All outside metallic parts are made of stainless steel:
  - Hinge 1.4404
  - Hinge pin 1.4301
  - Bolts, nuts and washers 1.4303

### Cross references

- General description: refer to page 5
- Contact arrangement selectable: see below
- Calculation door angle/door gap: refer to page 30
- Assembly instructions: refer to page 31
- Technical data: refer to page 32

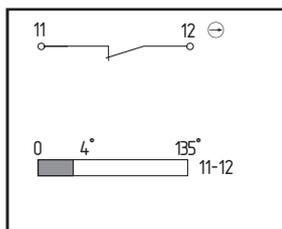
### Options (on request)

- Other switching angles: 5°, 8° (standard: 4°)
- With restart inhibit
- With adapter for AS Interface Safety at Work
- Plug connection

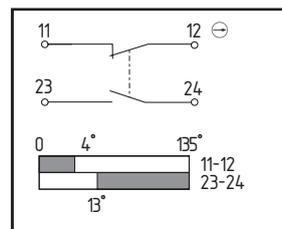


### Contact configurations

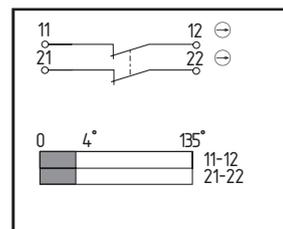
TESZX 10..



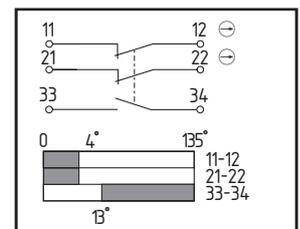
TESZX 102..



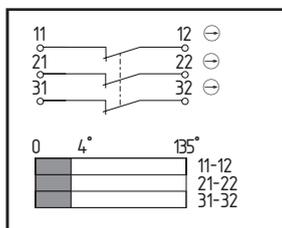
TESZX 110..



TESZX 1102..



TESZX 1110..



Representation of the contacts in non-actuated state (guard closed), switching angle in new state. Tolerance 4°-2.

#### Test symbol (with respect to the basic design)



BIA 994006

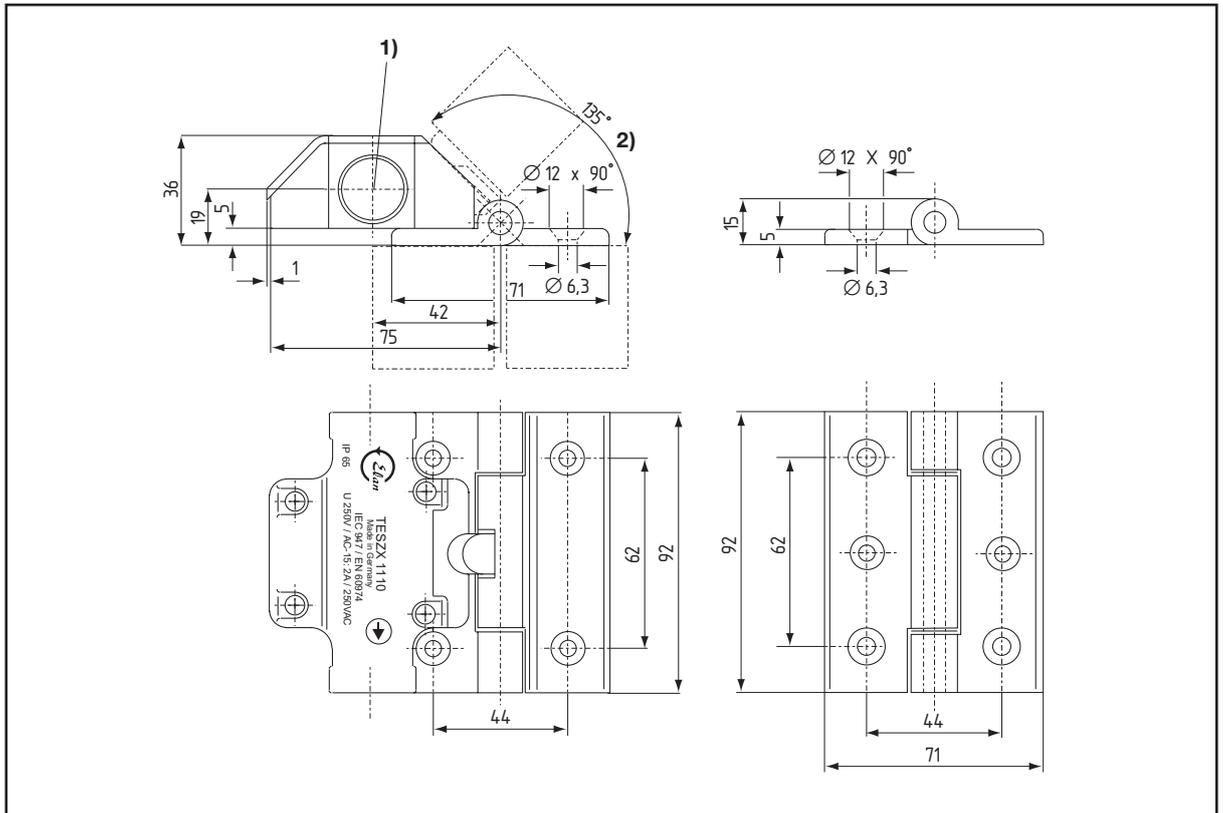
#### Scope of delivery

Hinge switch with or without additional hinge, fixing material

#### Product table

Type	Version	Part number
<b>With additional hinge</b>		
TESZX 10	1 NC	134 8620
TESZX 102	1 NC/1 NO	134 8621
TESZX 110	2 NC	134 8622
TESZX 1102	2 NC/1 NO	134 8623
TESZX 1110	3 NC	134 8624
<b>Without additional hinge</b>		
TESZX 10/S	1 NC	134 8625
TESZX 102/S	1 NC/1 NO	134 8626
TESZX 110/S	2 NC	134 8627
TESZX 1102/S	2 NC/1 NO	134 8628
TESZX 1110/S	3 NC	134 8629
<b>Additional hinge</b>		
TESZX/S		134 8690

Dimensions TESZX ...



- 1) Punch-out bore hole M20 x 1.5
- 2) Maximum opening angle 135°

## Technical data for TESZ type series

Device type	TESZ
Regulations	IEC 60947, EN 60947, DIN VDE 0660, EN 1088
Type of switch	Interlocking device without guard locking
Rated operating voltage $U_g$ max.	250 V
Utilisation category to DIN VDE 0660 Teil 200	AC-15, DC-13
Rated operating current $I_e^*$	AC-15: 2 A/250 VAC, DC-13: 1 A/24 VDC
Thermal rated current $I_{th}$	2.5 A
Short-circuit protection	gG 2 A
Air clearance and creepage to DIN VDE 0110	Pollution degree 3, overvoltage category III
Proof of positive opening	2.5 kV peak voltage
Positive opening angle (after switching point)	Form Zb; approx. 5° (equal to 2 x 0.5 mm contact aperture)
Contact system	cross-point system
Contact material	AgNi 10, gold plated
Contact force	0.5 N per contact point = 1 N per contact
Switching of small loads	min. 5 VDC/1 mA
Switching frequency (recommended)	120 s/h
Chatter time	<2 ms at 100 mm/s
Climatic resistance	to DIN EN 60068-2-78
Temperature range	-25 ... +65°C
Installed position	random
Mechanical life	min. $1 \times 10^6$ switching cycles, restart-inhibit TESZR max. $1 \times 10^5$ switching cycles
Shock resistance to DIN EN 60068-2-27	30 g/18 ms
Vibration resistance to DIN EN 60068-2-6	20 g, 10 ... 200 Hz
Terminal designation to DIN EN 50005 and DIN EN 50013	refer to contact diagrams
Mechanical loading capacity	max. torque 3 kN/m at 1 m distance of the hinges
Housing material	Plastic, glass-fibre-reinforced, self-extinguishing, highly inflammable
Connection system	Screwed connection up to $2 \times 0.5 \dots 2.5 \text{ mm}^2$ (with wire-end ferrules TESZ..10, TESZ..110, TESZ..102: solid up to $0.75 \text{ mm}^2$ , litz wire up to $1.5 \text{ mm}^2$ with wire-end ferrule)
Switching points	New state: NC max. 4°, NO approx. 13° Attainment of the serviceable life limit: NC approx. 6°, NO approx. 15°
Rated insulation voltage $U_i$	250 V, test voltage 2,000 V
Class of protection of the housing to DIN EN 60529	IP 65
Sealing	Flat seals, V rings
Approvals	CSA, UL, BIA
Cable entry	2 x M20 x 1.5

\* Depending on utilisation category and test voltage

## Hinge monitoring switches

### TESF type series

Determining the door gap as dependent on opening angle, door width and overlap

Opening angle "β" of the door	3°	4°	5°	6°	7°	8°	9°	10°
Door width "C" in mm	Door gap "D" in millimetres with overlap "B" = 0 mm							
100	5.2	7.0	8.7	10.4	12.2	13.9	15.6	17.4
150	7.8	10.5	13.1	15.7	18.3	20.9	23.5	26.0
200	10.5	13.9	17.4	20.9	24.4	27.8	31.3	34.7
250	13.1	17.4	21.8	26.1	30.5	34.8	39.1	43.3
300	15.7	20.9	26.1	31.3	36.5	41.7	46.9	52.1
350	18.3	24.4	30.5	36.6	42.6	48.7	54.7	60.7
400	20.9	27.9	34.8	41.8	48.7	55.6	62.5	69.4
450	23.5	31.4	39.2	47.0	54.8	62.6	70.4	78.1
500	26.2	34.9	43.6	52.2	60.9	69.6	78.2	86.8
550	28.8	38.3	47.9	57.5	67.0	76.5	86.0	95.5
600	31.4	41.8	52.3	62.7	73.1	83.5	93.8	104.1
650	34.0	45.3	56.6	67.9	79.2	90.4	101.6	112.8
700	36.6	48.8	61.0	73.1	85.3	97.4	109.4	121.5
750	39.2	52.3	65.3	78.4	91.4	104.3	117.3	130.2
800	41.8	55.8	69.7	83.6	97.4	111.3	125.1	138.8
850	44.5	59.3	74.0	88.8	103.5	118.2	132.9	147.5
900	47.1	62.7	78.4	94.0	109.6	125.2	140.7	156.2
950	49.7	66.2	82.8	99.3	115.7	132.1	148.5	164.9
1,000	52.3	69.7	87.1	104.5	121.8	139.1	156.4	173.6
1,050	54.9	73.2	91.5	109.7	127.9	146.1	164.2	182.2
1,100	57.5	76.7	95.8	114.9	134.0	153.0	172.0	190.9
1,150	60.2	80.2	100.2	120.1	140.1	160.0	179.8	199.6
1,200	62.8	83.7	104.5	125.4	146.2	166.9	187.6	208.3
1,250	65.4	87.2	108.9	130.6	152.3	173.9	195.4	217.0
1,300	68.0	90.6	113.2	135.8	158.4	180.8	203.3	225.6
1,350	70.6	94.1	117.6	141.0	164.4	187.8	211.1	234.3
1,400	73.2	97.6	122.0	146.3	170.5	194.7	218.9	243.0
1,450	75.8	101.1	126.3	151.5	176.6	201.7	226.7	251.7
1,500	78.5	104.6	130.7	156.7	182.7	208.7	234.5	260.3

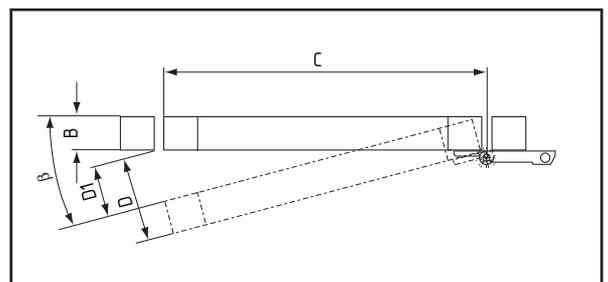
#### Calculation example

The actual door gap "D1" is calculated from the door gap "D" calculated according to the above table less the overlap of door and frame "B":

$$D1 = D - B$$

Example: A door made of 40 mm aluminium profile with a length of 950 mm is to be secured with a TESH. According to the technical data sheet the safety contact of the TESH opens at 3° in new state (5° at end of useful life). In new state a door gap of approx. 49.7 mm is derived from the above table.

The actual door gap, calculated using the above formula  $D1 = D - B$  produces  $(49.7 - 40 = 9.7)$ ; **D1 = 9.7 mm**. At the end of useful life there is a door gap of approx. 82.8 mm and an actual door gap of  $(82.8 - 40 = 42.8)$ ; **D1 = 42.8 mm**.



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