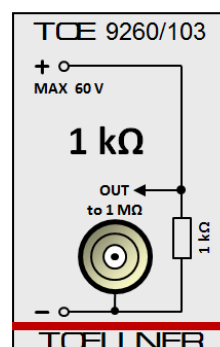
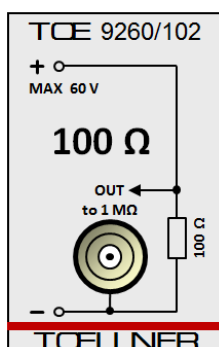
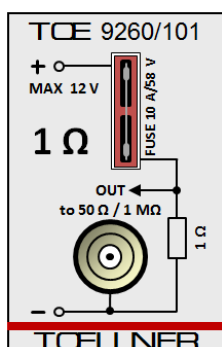


Instruction Manual
Reference Resistor Kit 1 Ω , 100 Ω , 1 k Ω
for TOE 9260 Electronic Switch

TOE 9260/100

9260E-Opt100-Manual-Rev01.doc



TOELLNER[®]

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Subject to technical changes

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1. Introduction

The **TOE 9260/100** Reference Resistor Kit for the **TOE 9260** Electronic Switch is intended for performing reference measurements according to the automotive test standard LV 124 – 2013. It consists of three units **TOE 9260/101**, **TOE 9260/102**, and **TOE 9260/103**.

The **TOE 9260/101** is a low-inductive power resistor 1 Ω / 144 W for short-term operation at a voltage of up to 12 V.

The **TOE 9260/102** is a low-inductive power resistor 100 Ω / 36 W for operation at a voltage of up to 60 V.

The **TOE 9260/103** is a low-inductive resistor 1 k Ω / 3.6 W for operation at a voltage of up to 60 V.

1.1 Features

- Low series inductance
- 5% resistance tolerance
- Thermal overload protection and overcurrent lead fuse for the 1 Ω resistor
- Thermal overload protection for the 100 Ω resistor
- Dedicated input plugs matching the output sockets of the power switch of the **TOE 9260** Electronic Switch
- BNC output for connection to measurement equipment

2. Operation

2.1 Startup

Warning

Safe operation of these devices presumes that they have been placed in service properly by qualified personnel in compliance with the warnings in this manual.

In particular the general installation and safety regulations (e.g. DIN/EN and VDE) must be observed. Non-observance may result in personal injury or damage to equipment.

Ensure that only fuses of the specified type and specified current are used as replacements (→ 3.1 TOE 9260/101, TOE 9260/102, and TOE 9260/103 Technical Specifications, → rating plates). The use of repaired fuses or short-circuiting the fuse holder is not permitted.

If it is apparent that non-hazardous operation is no longer possible, the devices must be taken out of service and secured against unintended operation.

2.1.1 Installation and ventilation

There are no problems associated with installation of these devices.

The **TOE 9260/101** and **TOE 9260/102** use vents in the housing for heat dissipation. Provide sufficient ventilation distance so that the vents can work effectively. Otherwise it can happen that under high load conditions the unit will heat up to a point where it is automatically shut off (→ 2.4.1 Excessive temperature protection).

For the **TOE 9260/103**, no ventilation is needed because of the small power dissipation.

2.2 Description of the controls

At the end of the manual you will find the operating elements for the **TOE 9260/101**, **TOE 9260/102**, and **TOE 9260/103** numbered with front panel and rear views. The individual operating elements are explained in detail below.

2.2.1 TOE 9260/101, TOE 9260/102, and TOE 9260/103 front panel controls

[1]



TOE 9260/101 only: Lead TAC blade fuse 10 A / 58 V. Suitable replacement part is Littelfuse, type TAC ATO style blade fuse, rated 58 V.

This fuse prevents damage from the power resistor of the **TOE 9260/101** unit in case of an excessive operating voltage, i.e. when the thermal protection inside the **TOE 9260/101** cannot be triggered fast enough anymore. The 58 V rating is necessary for the breaking capability at excessive operating voltages.

The 10 A rated current value is the suitable value for short-term operation at up to at least 12 A, which is the resulting current when the **TOE 9260/101** is operated at its rated voltage. To retain protection of the power resistor, a fuse of higher rated current value **must not** be inserted.

[2]



BNC output for measuring the voltage across the reference resistor during switching operation. This socket is internally connected to the reference resistor via a 50 Ω series resistance.

2.2.2 TOE 9260/101, TOE 9260/102, and TOE 9260/103 rear panel controls

[3]



These plugs are used to connect the unit to the output socket pair of the **TOE 9260** Electronic Switch. The polarity is indicated by plus and minus signs in the housing of the unit.

2.3 Device operation

The **TOE 9260/101**, **TOE 9260/102**, and **TOE 9260/103** units are intended for performing reference measurements according to the LV 124 – 2013 standard by use of the power switch of the **TOE 9260** Electronic Switch.

Applicable LV 124 – 2013 tests are as follows:

- E-10, Short Interruptions
- E-13, Pin Interruption

To perform a reference measurement, the input of the **TOE 9260** must be connected to a DC voltage of 11 V in the case of test E-10 or 12 V in the case of test E-13. This voltage can be supplied by a power supply or by a specific control device which is intended for use as the signal generator for an E-13 test. The polarity and current flow direction of the power switch of the **TOE 9260** must be observed. If applicable, the input buffer capacitor of the **TOE 9260** can be activated by setting the appropriate DIL switch to the ON position. Without such buffering of the input, the input cable inductance must meet a value of max. 250 nH, which can be achieved by a reduced cable length of max. 300 mm and twisted laying of the cable. The reference resistor **TOE 9260/101**, **TOE 9260/102**, or **TOE 9260/103** is connected to the output of the **TOE 9260**. A suitable pulse waveform must be applied to the control input of the **TOE 9260**.

For evaluation of the rise and fall times of the switching operations, the BNC output of the reference resistor unit must be connected to an oscilloscope by a 50 Ω BNC cable as follows:

In the case of the **TOE 9260/101**, the connection may be established either with or without a terminating resistor of 50 Ω at the input of the oscilloscope.

In the case of the **TOE 9260/102** or **TOE 9260/103**, the connection must only be established without a 50 Ω termination at the end of the BNC cable, i.e. the cable must be connected to a high impedance input of an oscilloscope, usually 1 MΩ.

Note A 50 Ω terminating resistor at the BNC cable or the input of the oscilloscope **must not** be applied in the case of the **TOE 9260/102** or **TOE 9260/103**, because otherwise the reference resistor would be reduced by a parallel resistance, and the measurement would not be in line with the LV 124 standard anymore.

Please note that the power dissipation of the **TOE 9260/101** depends on the high/low time ratio of the applied waveform. When operated continuously at 12 V, short-term operation of approx. 25 s is possible. This is a rough guidance value only, because the reachable operation time depends both on the initial temperature of the **TOE 9260/101** and the ambient temperature. When the maximum permissible operation temperature is reached, the **TOE 9260/101** interrupts the current flow by triggering an internal reversible circuit breaker. The unit can be restarted after a sufficient cooling down time.

The **TOE 9260/102** is thermally protected in the same way, but operation at even up to 60 V is much less time-critical because of the much lower power dissipation of the 100 Ω reference resistor.

The **TOE 9260/103** has no thermal protection because it can be operated continuously at up to 60 V due to the small power dissipation.

The lead fuse of the **TOE 9260/101** is triggered only when an excessive overvoltage is applied to the unit, so that the thermal protection inside the **TOE 9260/101** cannot be triggered fast enough anymore to prevent damage from the power resistor. A suitable replacement part is Littelfuse, type TAC ATO style blade fuse, rated 58 V. The 58 V rating is necessary for the breaking capability at excessive operating voltages.

Note The 10 A rated current value of the lead fuse is the suitable value for short-term operation at up to at least 12 A, which is the resulting current when the **TOE 9260/101** is operated at its rated voltage. To retain protection of the power resistor, a fuse of higher rated current value **must not** be inserted.

2.4 Protection

2.4.1 Excessive temperature protection

The **TOE 9260/101** and **TOE 9260/102** are protected against excessive temperatures by a reversible thermal circuit breaker. In the case of triggering of this protection device, the unit can be restarted after a sufficient cooling down time.

The **TOE 9260/103** does not need a thermal protection because of its small power dissipation.

For further details please refer to the operation section (→ 2.3 Device operation).

2.4.2 Overvoltage and overcurrent protection

The **TOE 9260/101** is protected against an overvoltage leading to a high operation current by a lead fuse. This protection covers overvoltages of up to 58 V.

The **TOE 9260/102** and **TOE 9260/103** have no overvoltage protection because operation at up to 60 V is permissible.

3. Technical Specifications

Remark | The technical specifications are based on constant conditions and a reference temperature of 23°C ±1°C.

3.1 TOE 9260/101, TOE 9260/102, and TOE 9260/103 technical specifications

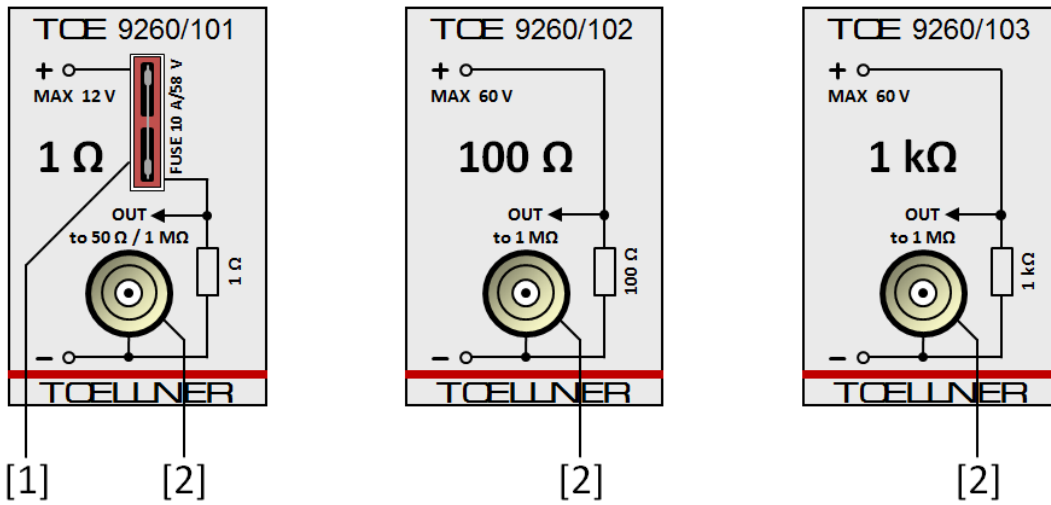
| Device | TOE 9260/101 | TOE 9260/102 | TOE 9260/103 |
|-----------------------------|--|--|--------------|
| Characteristics | | | |
| Reference resistor value | 1 Ω | 100 Ω | 1 kΩ |
| Resistance tolerance | ± 5% | ± 5% | ± 5% |
| Rated voltage | 12 V | 60 V | 60 V |
| Rated power | 144 W short-term operation, approx. 25 s | 36 W | 3.6 W |
| Protection functions | | | |
| Excessive temperature | Reversible thermal circuit breaker | | -- |
| Overvoltage | 10 A / 58 V lead TAC blade fuse. Suitable replacement part is Littelfuse, type TAC ATO style blade fuse, rated 58 V. For details on current and voltage rating of this fuse, please refer to the operation section (→ 2.3 Device operation) | | -- |
| Connections | | | |
| Input connector | Dedicated plug pair for connection to output of TOE 9260 Electronic Switch | | |
| Measurement output | BNC output for use with or without 50 Ω termination | BNC output for use without termination | |
| General | | | |
| Degree of protection | IP20 according to IEC 60529 | | |
| Operating temperature | 0 – 40 °C | | |
| Storage temperature | –20 – 70 °C | | |
| Reference temperature | 23 °C ±1 °C | | |
| Cooling | Vents | | |
| Dimensions (W x H x D) | 48 mm x 64 mm x 129 mm | | |
| Weight | Approx. 300 g | | |
| Housing | Aluminium | | |

3.2 General data

Ordering options TOE 9260/100

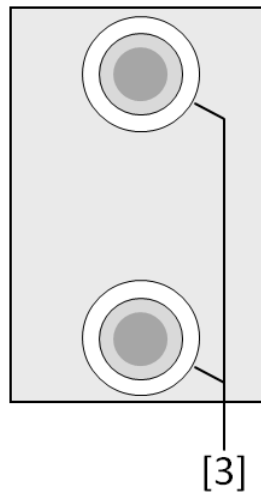
Included accessories 1 Instruction Manual

4. Views



Front panel view of TOE 9260/101, TOE 9260/102, TOE 9260/103

- [1] Fuse 10 A
- [2] BNC output



Rear view of TOE 9260/101, TOE 9260/102, TOE 9260/103

- [3] Input plug pair