



# Test and Measurement





TOELLNER has been offering electronic test and measuring equipment of maximum quality since 1972.

**Laboratory power supplies**  
**High-performance power supplies**  
**Arbitrary power supplies**

**Function generators**  
**Arbitrary generators**

**Broadband amplifiers**  
**4-quadrant amplifiers**

Special features which will fill you with enthusiasm:  
All instruments exhibit properties which distinguish them from the rest. Technicians will be particularly impressed by the exceptional features.

Ingenuity in detail – finishing and assembly carried out perfectly by hand – unparalleled precision of mechanics and electronics – always abreast with technical developments.

In addition to the world's most prestigious vehicle and aircraft constructors, almost all system suppliers of these sectors use TOELLNER products. Furthermore, our equipment and systems are encountered in the development and research fields of industries and universities and in all IT, automation and general electronics sectors.

With an excellent price/performance ratio, TOELLNER measuring instruments are exported to many countries worldwide. Local representatives provide a direct contact to our customers and thus guarantee the high availability of TOELLNER products.

All TOELLNER products are guaranteed for 24 months. We can provide this extensive guarantee because each instrument is produced to stringent quality and safety standards.

The VDE 0411 and IEC 348 safety regulations are complied with; all devices have of course been assigned the CE symbol.

Our deliveries are based on the "General Terms and Conditions of Sale for Products and Services of the Electronics industry".

Certified according to  
**DIN EN ISO 9001**



Laboratory power supplies  
 High-performance power supplies  
 Arbitrary power supplies



## **Performance in absolute perfection**

The wide range of power supply tasks associated with development, testing or production necessitate specific adaptation of the power supply unit.

The TOELLNER range of power supplies offers numerous different models: single-output, dual-output, triple-output and quintuple-output power supplies with highly different voltage and current values.

Excellent control properties, absolute continuous load capability, and extremely low noise values convincingly document the recognized high functionalities of all power supplies from TOELLNER.

All units feature state-of-the-art technology and sophisticated circuit technology. They satisfy all demands placed nowadays on cutting edge equipment.

Ingenuity in detail – finishing and assembly carried out perfectly by hand – unparalleled precision of mechanics and electronics.

Laboratory power supplies  
High-performance power supplies  
Arbitrary power supplies

Series Page		Number of outputs	Max. W total	Max. V per output	Max. I per output	Interface (partially optional)	Highlights
<b>TOE 8720</b> I-9		1 - 2	216 W	36 V	12 A	—	Compact power supplies with 1 and 2 outputs up to 216 W output power. In-phase regulation.
<b>TOE 8730</b> I-11		2 - 5	150 W	48 V	5 A	Analog	Dual-output, triple-output and quintuple-output power supplies. In-phase regulation. Extremely low residual ripple: 50 µV. Very compact design.
<b>TOE 8840</b> I-15		1 - 2	160 W	130 V	6.5 A	GPIB RS 232 Analog	Single-output and dual-output power supplies, system-compatible, V/A settings using incremental spinwheel. In-phase regulation. Low residual ripple.
<b>TOE 8850</b> I-15		1 - 2	320 W	130 V	20 A	GPIB RS 232 Analog	Single-output and dual-output power supplies, system-compatible, V/A settings using incremental spinwheel. Sensing as standard. In-phase regulation. Low residual ripple.
<b>TOE 8870</b> I-22		1	1,500 W	400 V	100 A	GPIB RS 232 Analog	Autoranging, active PFC, system-compatible, high rise and fall rates, high endurance, even under extreme load conditions. Best EMC characteristics. Arbitrary mode, arbitrary software.
<b>TOE 8950</b> I-30		1 - 2	400 W	80 V	20 A	GPIB RS 232 USB Analog	Automatic setting to existing line voltage 115 V or 230 V, autoranging, outputs at front and rear, sensing, very compact, numerous safety functions. Arbitrary mode, arbitrary software.
<b>TOE 8805 to TOE 88165</b> I-39		1	160 W to 5,200 W	100 V	320 A	GPIB Analog	Very fast arbitrary power supplies, generate any voltage and current characteristics, accept real-time signals, rise and fall rate approx. 2 V/µs, brief load currents up to 1000 A, internal sink up to 16,000 W, AC superimposition up to 70 kHz, user-friendly arbitrary software.



## Compact power supplies up to 150 W

TOE 8721  
TOE 8722



TOE 8721 – single-output power supply

### The low-price compact power supplies of the TOE 8721 series

are suitable for general laboratory purposes as well as for loads with a pulsed current consumption.

The TOE 8721-2, 8721-3 and 8721-4 versions additionally enable a current consumption increased by up to 50 % for approx. 15 minutes. As a result of the delayed current limiting function, current pulses can be drawn from these models up to several times the rated current for several ms.

The output voltage and output current are indicated on highly precise 3½-digit LCDs. The output voltage is set using a high-resolution ten-turn potentiometer.

### The practice-oriented dual-output power supplies of the TOE 8722 series have output powers of 72 W

The outputs are independent of one another; the voltages are adjusted using precision ten-turn potentiometers and the currents using stable single-turn potentiometers.

Two selectable 3½-digit LCDs indicate the output values.

### Special features

- Single-output and dual-output power supplies
- Output power up to 216 W
- Precise 3½-digit LCDs for current and voltage
- Low price, high-quality properties and details
- ½ 19" width, 3 HU design  
→ parallel installation possible
- Can be used as constant voltage and constant current source (CV/CC)
- Measurement of output voltage and output current
- Electrical Insulation of the sources  
→ outputs of the dual-output power supplies can be connected in series or parallel
- Polarity reversal protection, resistant to reverse current
- No switch-on and switch-off peaks, no transients

## Overview

Model	Output 1		Output 2		Power
	Voltage	Current	Voltage	Current	
<b>Single-output power supplies</b>					
TOE 8721-1	0-36 V	0-2 A	–	–	72 W
TOE 8721-2	0-10 V	0-10 A/12 A	–	–	100/120 W
TOE 8721-3	0-18 V	0-8 A/12 A	–	–	144/216 W
TOE 8721-4	0-36 V	0-4 A/6 A	–	–	144/216 W
<b>Dual-output power supplies</b>					
TOE 8722-1	0-18 V	0-2.0 A	0-18 V	0-2.0 A	72 W
TOE 8722-2	0-36 V	0-1.0 A	0-36 V	0-1.0 A	72 W
TOE 8722-4	0-24 V	0-1.5 A	0-24 V	0-1.5 A	72 W



TOE 8722

## Technical specifications

### TOE 8721 to TOE 8722

Model	TOE 8721-1	TOE 8721-2	TOE 8721-3	TOE 8721-4	TOE 8722-1	TOE 8722-2	TOE 8722-4
<b>Output voltage</b>	0 - 36 V	0 - 10 V	0 - 18 V	0 - 36 V	2 x 0 - 18 V	2 x 0 - 36 V	2 x 0 - 24 V
Setting resolution	0.02 %	0.02 %	0.02 %	0.02 %	0.02 %	0.02 %	0.02 %
Setting accuracy	± (0.5 % + 2 digits)	± (0.1 % + 2 digits)	± (0.1 % + 2 digits)	± (0.5 % + 2 digits)	± (0.2 % + 2 digits)	± (0.5 % + 2 digits)	± (0.5 % + 2 digits)
Display resolution	100 mV	10 mV	10 mV	100 mV	10 mV	100 mV	100 mV
<b>Output current</b>	0 - 2 A	0 - 10 A	0 - 8 A	0 - 4 A	2 x 0 - 2 A	2 x 0 - 1 A	2 x 0 - 1.5 A
Setting resolution	0.5 %	0.5 %	0.5 %	0.5 %	0.5 %	0.5 %	0.5 %
Setting accuracy	± (0.5 % + 2 digits)						
Display resolution	10 mA						
Output current for max. 15 minutes	–	0 - 12 A	0 - 12 A	0 - 6 A	–	–	–
Current pulse for a few ms	–	Approx. 20 A	Approx. 16 A	Approx. 8 A	–	–	–
<b>Output power</b>	72 W	100 W	144 W	144 W	72 W	72 W	72 W
<b>Voltage stabilization</b>							
With change in load 0 % to 100 %	0.05 %	0.02 %	0.05 %	0.05 %	0.02 %	0.02 %	0.02 %
With change in line voltage ± 10 %	10 <sup>-4</sup>						
With change in temperature	10 <sup>-4</sup> /K						
Residual ripple V <sub>pp</sub>	0.2 mV						
Drift within 8 hours	0.02 %	0.02 %	0.02 %	0.02 %	0.02 %	0.02 %	0.02 %
Regulation time with change in load from 20 to 100 % and setting to within 0.1 % V <sub>rated</sub>	100 μs	100 μs	100 μs	100 μs	50 μs	50 μs	50 μs
<b>Current stabilization</b>							
With change in load 0 % to 100 %	0.02 %	0.02 %	0.02 %	0.02 %	0.02 %	0.02 %	0.02 %
With change in line voltage ± 10 %	10 <sup>-4</sup>						
With change in temperature	10 <sup>-3</sup> /K						
Residual ripple I <sub>rms</sub>	0.5 mA	3 mA	3 mA	2 mA	0.2 mA	0.2 mA	0.2 mA
Drift within 8 hours	0.2 %	0.2 %	0.2 %	0.2 %	0.2 %	0.2 %	0.2 %
<b>Dimensions</b> (W x H x D) in mm	215 x 147 x 270	215 x 147 x 320	215 x 147 x 320	215 x 147 x 320	215 x 147 x 270	215 x 147 x 270	215 x 147 x 270
<b>Weight</b>	5.5 kg	7.5 kg	7.5 kg	7.5 kg	5.5 kg	5.5 kg	5.5 kg

Line voltage: 115/230 V ± 10 % 47 Hz to 63 Hz, operating temperature: 0 °C to 40 °C, housing: metal

## Options

Ten-turn potentiometer for current setting	TOE 9008	Carrying handle
TOE 8720/201   Single-output power supply	TOE 9502	19" adapter, 3 HU for single installation
TOE 8720/202   Dual-output power supply	TOE 9508	19" adapter, 3 HU, parallel installation set for 2 units

### Supplied accessories

- 1 power cord
- 1 instruction manual

## Ordering data

### Single-output power supplies

TOE 8721-1	Power supply 36 V / 2 A
TOE 8721-2	Power supply 10 V / 10 A
TOE 8721-3	Power supply 18 V / 8 A
TOE 8721-4	Power supply 36 V / 4 A

### Dual-output power supplies

TOE 8722-1	Power supply 2 x 18 V / 2.0 A
TOE 8722-2	Power supply 2 x 36 V / 1.0 A
TOE 8722-4	Power supply 2 x 24 V / 1.5 A

## Multiple-output power supplies

TOE 8732  
TOE 8733  
TOE 8735



TOE 8735

### The dual-output power supplies

of the 8732 series offer two absolutely identical supply units in a single housing. The outputs are electrically isolated from each other and floating. They can be easily connected either in parallel or in series, and are additionally provided with a tracking facility that allows output II to be synchronized by output I. The two power supplies then provide a positive voltage and a negative voltage compared to the common reference point. Current limits for the two outputs can be set independently of each other.

In addition, the power supplies are equipped with three digital displays, and allow external voltage measurement in the ranges 0 to 20 V and 0 to 200 V. The voltages at outputs I and II are measured with autoranging. Up to 19.99 V, the resolution is 10 mV; above 20.0 V, the resolution is 100 mV. The outputs I and II can be optionally adjusted by means of an external control voltage (0 to 10 V) via an analog control input.

### The triple-output power supplies

of the 8733 series have three independent floating outputs. The 16 V, 32 V and 48 V outputs are mainly intended to supply linear circuits. The output voltage and output current are adjustable using ten-turn potentiometers. A tracking facility is provided. The 0 to 7 V output has a current rating of 3 A or 5 A as standard and is chiefly intended for supplying digital circuits.

The power supplies also have three digital displays as standard. The voltages at outputs I and II are automatically displayed with a resolution of 10 mV up to 19.99 V and a resolution of 100 mV above 20.0 V. The current and voltage of outputs I, II and III can be optionally set by an external control voltage (0 to 10 V) via an analog control input.

### The quintuple-output power supplies

The TOE 8735 power supplies have five independent floating outputs. The 16 V and 32 V outputs are mainly used to supply linear circuits, the 7 V output chiefly serves to supply digital systems. The symmetrical fixed voltage output\* can be used to supply bipolar or CMOS components. The 16 V and 32 V outputs are provided with a tracking facility. The output values are displayed on three selectable 3½-digit LCDs; the max. resolution is 10 mV or 1 mA. The current and voltage of outputs I, II and III can be optionally set by an external control voltage (0 to 10 V) via an analog control input. (Option: TOE 8730/253)

\* The fixed voltage output  $\pm 15$  V can be switched internally to  $\pm 12$  V.

### Special features

- Extremely low residual ripple < 50  $\mu$ V
- Electrically decoupled outputs
- Precise digital displays

## Dual-output, triple-output, quintuple-output power supplies up to 150 W

**TOE 8732**  
**TOE 8733**  
**TOE 8735**

### Special features

- Dual-output, triple-output and quintuple-output power supplies
- Electric decoupled outputs
- Extremely low residual ripple < 50 µV
- Analog remote control
- Resolution up to 1 mA
- Precise digital displays

### Overview

Model	Output 1		Output 2		Output 3		Output 4/5	
	Voltage	Current	Voltage	Current	Voltage	Current	Voltage	Current
<b>Dual-output power supplies</b>								
TOE 8732-1	0-16 V	0-2 A	0-16 V	0-2 A				
TOE 8732-2	0-32 V	0-1 A	0-32 V	0-1 A				
TOE 8732-3	0-48 V	0-0.8 A	0-48 V	0-0.8 A				
<b>Triple-output power supplies</b>								
TOE 8733-1	0-16 V	0-2 A	0-16 V	0-2 A	0-7 V	0-5 A		
TOE 8733-2	0-32 V	0-1 A	0-32 V	0-1 A	0-7 V	0-5 A		
TOE 8733-3	0-48 V	0-0.8 A	0-48 V	0-0.8 A	0-7 V	0-3 A		
TOE 8733-4	0-32 V	0-2 A	0-32 V	0-2 A	0-7 V	0-3 A		
<b>Quintuple-output power supplies</b>								
TOE 8735-1	0-16 V	0-2 A	0-16 V	0-2 A	0-7 V	0-5 A	± 15 V	0.5 A
TOE 8735-2	0-32 V	0-1 A	0-32 V	0-1 A	0-7 V	0-5 A	± 15 V	0.5 A
TOE 8735-4	0-16 V	0-2 A	0-16 V	0-2 A	0-7 V	0-5 A	± 5 V	1.5 A
TOE 8735-5	0-32 V	0-1 A	0-32 V	0-1 A	0-7 V	0-5 A	± 5 V	1.5 A

## Technical specifications of the outputs

**TOE 8732**  
**TOE 8733**  
**TOE 8735**

### Outputs

<b>Voltage</b>	0 - 16 V	0 - 32 V	0 - 32 V	0 - 48 V	0 - 7 V	0 - 7 V	± 5 V	± 15 V
<b>Current</b>	0 - 2 A	0 - 1 A	0 - 2 A	0 - 0.8 A	0 - 3 A	0 - 5 A	1.5 A	0.5 A
Digital display, 3½ digits	0	0	0	0	0	0	–	–
Externally programmable 0 to 10 V (option)	0	0	0	0	0	0	–	–
<b>Constant voltage mode</b>								
Setting using ten-turn potentiometer; resolution	0.02 %	0.02 %	0.02 %	0.02 %	0.02 %	0.02 %	–	–
Voltage stabilization with change in load 0 to 100 %	0.01 %	0.01 %	0.01 %	0.01 %	0.1 %	0.1 %	0.05 %	0.05 %
With change in line voltage ± 10 %	10 <sup>-5</sup>							
With change in temperature	10 <sup>-4</sup> /K							
Residual ripple V <sub>pp</sub>	50 µV	50 µV	50 µV	80 µV	50 µV	80 µV	100 µV	100 µV
Drift within 8 hours	0.01 %	0.01 %	0.01 %	0.01 %	0.01 %	0.01 %	0.01 %	0.01 %
Regulation time with change in load from 20 % to 100 % and setting to within 0.1 % V <sub>rated</sub>	10 µs	10 µs	20 µs	20 µs	50 µs	50 µs	50 µs	50 µs
<b>Constant current mode</b>								
Setting using ten-turn potentiometer; resolution	0.04 %	0.04 %	0.04 %	0.04 %	0.04 %	0.04 %	–	–
<b>Current stabilization</b>								
With change in load 0 to 100 %	0.02 %	0.02 %	0.02 %	0.02 %	0.05 %	0.05 %	–	–
With change in line voltage ± 10 %	10 <sup>-4</sup>	–	–					
With change in temperature	10 <sup>-4</sup> /K	–	–					
Residual ripple I <sub>rms</sub>	50 µA	50 µA	50 µA	50 µA	80 µA	80 µA	–	–
Drift within 8 hours	0.01 %	0.01 %	0.01 %	0.01 %	0.01 %	0.01 %	–	–



TOE 8735

## General data/accessories Ordering data/options

**TOE 8732**  
**TOE 8733**  
**TOE 8735**

### Supplied accessories

- 1 power cord
- 1 instruction manual

### General data

<b>Output</b>	Floating and electrically isolated
Insulation	± 250 V against ground
<b>Line voltage</b>	115 V/230 V ± 10 % 47 Hz to 63 Hz
<b>Power consumption</b>	Approx. 230 VA
<b>Protective measures</b>	Protection class 1 in accordance with DIN 57411/VDE 0411 Part 1/IEC 348
<b>Operating temperature</b>	0 °C to 40 °C
<b>Storage temperature</b>	-20 °C to 70 °C
<b>Reference temperature</b>	23 °C
<b>Dimensions</b>	265 x 147 x 330 mm
<b>Weight</b>	Approx. 8.5 kg
<b>Housing</b>	Aluminium

## Ordering data

### Dual-output power supplies

TOE 8732-1	Power supply	2 x 16 V / 2 x 2.0 A
TOE 8732-2	Power supply	2 x 32 V / 2 x 1.0 A
TOE 8732-3	Power supply	2 x 48 V / 2 x 0.8 A

### Triple-output power supplies

TOE 8733-1	Power supply	2 x 16 V / 2 x 2.0 A	7 V / 5 A
TOE 8733-2	Power supply	2 x 32 V / 2 x 1.0 A	7 V / 5 A
TOE 8733-3	Power supply	2 x 48 V / 2 x 0.8 A	7 V / 3 A
TOE 8733-4	Power supply	2 x 32 V / 2 x 2.0 A	7 V / 3 A

### Quintuple-output power supplies

TOE 8735-1	Power supply	2 x 16 V / 2 x 2.0 A	7 V / 5 A	± 15 V / 0.5 A
TOE 8735-2	Power supply	2 x 32 V / 2 x 1.0 A	7 V / 5 A	± 15 V / 0.5 A
TOE 8735-4	Power supply	2 x 16 V / 2 x 2.0 A	7 V / 5 A	± 5 V / 1.5 A
TOE 8735-5	Power supply	2 x 32 V / 2 x 1.0 A	7 V / 5 A	± 5 V / 1.5 A

## Options

TOE 8730/252	External control 2 x U / 2 x I
TOE 8730/253	External control 3 x U / 3 x I
TOE 9008	Carrying handle
TOE 9501	19" adapter, 3 HU

Factory calibration certificate on request  
Factory calibration certificate + test report

## Single-output and dual-output power supplies

TOE 8840 – up to 160 W  
TOE 8850 – up to 320 W  
In-phase regulation



TOE 8852

### A proven concept

has been used for the new, system-compatible single-output and dual-output power supplies of the TOE 8840 and TOE 8850 series. Exceptional specifications are achieved with a total output power of 160 W or 320 W as a result of the classical in-phase control principle. A total of 22 different models deliver voltages up to 130 V and currents up to 20 A. With a resolution of 12 bits in the voltage and current ranges, a simple and convenient user interface, and the excellent specifications, these instruments are suitable for both manual and bus-based modes.

### Integrated measurements

A further significant characteristic is the high-resolution measurement of the voltage and current values; these are output on 4-digit LED displays and can be read at a high rate in bus mode. This means that additional measuring instruments are usually superfluous.

### Adjustment using incremental spinwheels

The output values are adjusted with a selectable sensitivity using wear-free incremental spinwheels, thus permitting reliable and precise adjustment of the output voltage and current even after many years of service.

### Remote control (option)

All instruments can be remote-controlled in analog mode as well as via GPIB and RS 232 interfaces using the SCPI command set (SCPI: Standard Commands for Programmable Instruments). The system interfaces are characterized by a high response and measuring rate. In addition, instrument driver software is available under "LabView".

### Automatic calibration

Fast and convenient calibration of all output parameters is possible externally within a few minutes without any adjustment of trimmers or interventions in the instrument.

This "software calibration" can be carried out simply using the control elements or supported by a computer within a test system. The "software calibration" provides an advantage which should not be underestimated when considering the regular calibration intervals which are becoming increasingly important in quality assurance systems.

### Voltage or current source

Depending on the values set for the voltage and current, each power supply can be operated as a voltage source or a current source depending on the load conditions. All outputs can be connected in parallel or series without problem.

## High performance and exemplary operating characteristics

### Special features

- In-phase regulation
- Adjustment of voltage and current using wear-free incremental spinwheels
- Maximum precision using  $\mu$ P-controlled autocalibration
- System-compatible with GPIB and RS 232 interfaces (option)



TOE 8852

## Single-output and dual-output power supplies

**TOE 8840 – up to 160 W**

**TOE 8850 – up to 320 W**

**In-phase regulation**

### Special features

- In-phase regulation, thus extremely low residual ripple, below  $300 \mu V_{rms}$  (depends on model)
- Sensing as standard with TOE 8850 series  
Correctable voltage: 0.5 V/line
- RS 232, GPIB interface optional
- Analog interface optional, floating also possible
- Free LabView™ driver
- Electrically isolated outputs
- 19" adapter for rack mounting

### Overview

	Output 1		Output 2		Power
	Voltage	Current	Voltage	Current	
<b>Single-output power supplies</b>					
TOE 8841-24	0- 24 V	0- 6.5 A	–	–	160 W
TOE 8841-32	0- 32 V	0- 5 A	–	–	160 W
TOE 8841-40	0- 40 V	0- 4 A	–	–	160 W
TOE 8841-64	0- 64 V	0- 2.5 A	–	–	160 W
TOE 8841-130	0-130 V	0- 1.2 A	–	–	160 W
TOE 8851-16	0- 16 V	0- 20 A	–	–	320 W
TOE 8851-24	0- 24 V	0- 13 A	–	–	320 W
TOE 8851-32	0- 32 V	0- 10 A	–	–	320 W
TOE 8851-40	0- 40 V	0- 8 A	–	–	320 W
TOE 8851-64	0- 64 V	0- 5 A	–	–	320 W
TOE 8851-130	0-130 V	0- 2.5 A	–	–	320 W
<b>Dual-output power supplies</b>					
TOE 8842-24	0- 24 V	0- 3.25 A	0- 24 V	0- 3.25 A	2 x 80 W
TOE 8842-32	0- 32 V	0- 2.5 A	0- 32 V	0- 2.5 A	2 x 80 W
TOE 8842-40	0- 40 V	0- 2.0 A	0- 40 V	0- 2.0 A	2 x 80 W
TOE 8842-64	0- 64 V	0- 1.2 A	0- 64 V	0- 1.2 A	2 x 80 W
TOE 8842-130	0-130 V	0- 0.6 A	0-130 V	0- 0.6 A	2 x 80 W
TOE 8852-16	0- 16 V	0- 10 A	0- 16 V	0- 10 A	2 x 160 W
TOE 8852-24	0- 24 V	0- 6.5 A	0- 24 V	0- 6.5 A	2 x 160 W
TOE 8852-32	0- 32 V	0- 5.0 A	0- 32 V	0- 5.0 A	2 x 160 W
TOE 8852-40	0- 40 V	0- 4.0 A	0- 40 V	0- 4.0 A	2 x 160 W
TOE 8852-64	0- 64 V	0- 2.5 A	0- 64 V	0- 2.5 A	2 x 160 W
TOE 8852-130	0-130 V	0- 1.2 A	0-130 V	0- 1.2 A	2 x 160 W

## Single-output and dual-output power supplies

**TOE 8840 – up to 160 W**  
**TOE 8850 – up to 320 W**  
**In-phase regulation**

### Tracking function

The automatic tracking mode with dual-output power supplies means that it is possible to control the output voltage of output 2 as a function (0 % to 100 %) of output 1 with retention of all control properties.

### Remote control

Command syntax in accordance with IEEE 488.2 with command set switchable between compatible TOELLNER commands and SCPI commands.

### GPIO interface (option)

Interface connection in accordance with IEEE 488.1; electrically isolated from main outputs. The device address can be set as desired per menu.

Setting rate:

approx. 25 settings/s

Measuring rate:

approx. 20 measurements/s

### RS 232 interface (option)

9-pin D-SUB connector; electrically isolated from the main outputs.

Transfer: half-duplex mode, asynchronous; 110 to 19200 baud adjustable per menu.

Setting rate:

approx. 20 settings/s

Measuring rate:

approx. 15 measurements/s

### Additional functions

These modern, proven and exceptionally well equipped power supplies are additionally characterized by supplementary functions such as the saving of 100 instrument settings, the standby circuit for the power outputs, sense and tracking modes.

### Price and performance

In addition to the exceptional specifications and characteristics, all power supplies of the TOE 8840 and TOE 8850 series have a remarkable price/performance ratio.

### Common operating functions

Display of voltage and current: separately on two 4-digit displays for all single instruments; on two selectable 4-digit V/A displays for the dual instruments. Constant voltage or constant current mode is indicated by single LEDs.

Sense mode (only with the TOE 8850 series) can be selected directly. Connection to front or rear of instruments. Non-volatile memory for 100 complete instrument settings and the last setting when switching-off.

### Special features

- In-phase regulation
- Operation possible as voltage source or current source
- Extremely low residual ripple
- Extremely high long-term stability
- Resistant to continuous load
- Extremely quiet
- As desktop unit with adjustable feet or for 19" mounting
- No switch-off peaks and no transients at output
- 100 complete instrument settings can be saved resistant to power failure.

### Outputs

- Floating for all models
- Electrically isolated in the dual-output power supplies → series and parallel connections possible
- Safety sockets at front

## Technical specifications

**TOE 8841 – 160 W**  
**TOE 8842 – 2 x 80 W**

### Special features

- In-phase regulation
- Operation possible as voltage source or as current source
- Extremely low residual ripple
- Extremely high long-term stability
- Resistant to continuous load
- Extremely quiet
- As desktop unit with adjustable feet or for 19" mounting
- No switch-off peaks and no transients at output
- 100 complete instrument settings can be saved resistant to power failure.

### Outputs

- Floating for all models
- Electrically isolated in the dual-output power supplies → series and parallel connections possible
- Safety sockets at front

### Technical specifications TOE 8840 series

#### Single-output power supplies

Model		TOE 8841-24	TOE 8841-32	TOE 8841-64	TOE 8841-130
Output data	Voltage	0 - 24 V	0 - 32 V	0 - 64 V	0 - 130 V
	Current	0 - 6.5 A	0 - 5 A	0 - 2.5 A	0 - 1.2 A
Setting resolution	Voltage	10 mV	10 mV	20 mV	100 mV
	Current	2 mA	2 mA	1 mA	1 mA
Setting accuracy	Voltage	0.1 % + 15 mV	0.1 % + 20 mV	0.1 % + 20 mV	0.1 % + 100 mV
	Current	0.2 % + 10 mA	0.2 % + 4 mA	0.2 % + 2 mA	0.2 % + 2 mA
Deviation in regulation with 100 % change in load	Voltage	$5 \times 10^{-4}$	$5 \times 10^{-4}$	$2 \times 10^{-4}$	$2 \times 10^{-4}$
	Current	$2 \times 10^{-4}$	$2 \times 10^{-4}$	$10^{-3}$	$2 \times 10^{-3}$
With change in line voltage ± 10 %		$5 \times 10^{-5}$	$5 \times 10^{-5}$	$5 \times 10^{-5}$	$5 \times 10^{-5}$
Regulation time with change in load from 20 % to 100 % Tolerance: 0.2 % $V_{rated}$		< 100 $\mu$ s	< 100 $\mu$ s	< 80 $\mu$ s	< 80 $\mu$ s
Residual ripple (10 Hz - 1 MHz)	Voltage	0.4 mV <sub>rms</sub>	0.4 mV <sub>rms</sub>	0.8 mV <sub>rms</sub>	1 mV <sub>rms</sub>
	Current	300 $\mu$ A <sub>rms</sub>	200 $\mu$ A <sub>rms</sub>	100 $\mu$ A <sub>rms</sub>	50 $\mu$ A <sub>rms</sub>
Measuring accuracy	Voltage	0.1 % + 25 mV	0.1 % + 30 mV	0.1 % + 40 mV	0.1 % + 200 mV
	Current	0.2 % + 10 mA	0.2 % + 4 mA	0.2 % + 2 mA	0.2 % + 2 mA
Temperature coefficient	Voltage	$10^{-4}/K$	$10^{-4}/K$	$10^{-4}/K$	$10^{-4}/K$
	Current	$10^{-4}/K$	$10^{-4}/K$	$10^{-4}/K$	$10^{-4}/K$

#### Dual-output power supplies

Model		TOE 8842-24	TOE 8842-32	TOE 8842-64	TOE 8842-130
Output data	Voltage	2 x 0 - 24 V	2 x 0 - 32 V	2 x 0 - 64 V	2 x 0 - 130 V
	Current	2 x 0 - 3.25 A	2 x 0 - 2.5 A	2 x 0 - 1.2 A	2 x 0 - 0.6 A
Setting resolution	Voltage	10 mV	10 mV	20 mV	100 mV
	Current	2 mA	1 mA	1 mA	1 mA
Setting accuracy	Voltage	0.1 % + 15 mV	0.1 % + 20 mV	0.1 % + 20 mV	0.1 % + 100 mV
	Current	0.2 % + 4 mA	0.2 % + 2 mA	0.2 % + 2 mA	0.2 % + 2 mA
Deviation in regulation with 100 % change in load	Voltage	$2 \times 10^{-4}$	$2 \times 10^{-4}$	$10^{-4}$	$10^{-4}$
	Current	$2 \times 10^{-4}$	$5 \times 10^{-4}$	$10^{-3}$	$2 \times 10^{-3}$
With change in line voltage ± 10 %		$5 \times 10^{-5}$	$5 \times 10^{-5}$	$5 \times 10^{-5}$	$5 \times 10^{-5}$
Regulation time with change in load from 20 % to 100 % Tolerance: 0.2 % $V_{rated}$		< 80 $\mu$ s	< 80 $\mu$ s	< 80 $\mu$ s	< 80 $\mu$ s
Residual ripple (10 Hz - 1 MHz)	Voltage	0.4 mV <sub>rms</sub>	0.3 mV <sub>rms</sub>	0.6 mV <sub>rms</sub>	1 mV <sub>rms</sub>
	Current	200 $\mu$ A <sub>rms</sub>	100 $\mu$ A <sub>rms</sub>	50 $\mu$ A <sub>rms</sub>	25 $\mu$ A <sub>rms</sub>
Measuring accuracy	Voltage	0.1 % + 25 mV	0.1 % + 30 mV	0.1 % + 40 mV	0.1 % + 200 mV
	Current	0.2 % + 4 mA	0.2 % + 4 mA	0.2 % + 2 mA	0.2 % + 2 mA
Temperature coefficient	Voltage	$10^{-4}/K$	$10^{-4}/K$	$10^{-4}/K$	$10^{-4}/K$
	Current	$10^{-4}/K$	$10^{-4}/K$	$10^{-4}/K$	$10^{-4}/K$

## Technical specifications

**TOE 8851 – 320 W**  
**TOE 8852 – 2 x 160 W**

### Technical specifications TOE 8850 series

#### Single-output power supplies

Model		TOE 8851-16	TOE 8851-24	TOE 8851-32	TOE 8851-64	TOE 8851-130
Output data	Voltage	0 - 16 V	0 - 24 V	0 - 32 V	0 - 64 V	0 - 130 V
	Current	0 - 20 A	0 - 13 A	0 - 10 A	0 - 5 A	0 - 2.5 A
Setting resolution	Voltage	10 mV	10 mV	10 mV	20 mV	100 mV
	Current	10 mA	10 mA	5 mA	2 mA	1 mA
Setting accuracy	Voltage	0.1 % + 10 mV	0.1 % + 10 mV	0.1 % + 10 mV	0.1 % + 20 mV	0.1 % + 100 mV
	Current	0.2 % + 20 mA	0.2 % + 10 mA	0.2 % + 10 mA	0.2 % + 4 mA	0.2 % + 2 mA
Deviation in regulation with 100 % change in load	Voltage	$5 \times 10^{-5}$	$5 \times 10^{-5}$	$5 \times 10^{-5}$	$5 \times 10^{-5}$	$10^{-4}$
	Current	$5 \times 10^{-5}$	$5 \times 10^{-5}$	$10^{-4}$	$2 \times 10^{-4}$	$5 \times 10^{-4}$
With change in line voltage $\pm 10$ %		$5 \times 10^{-5}$	$5 \times 10^{-5}$	$5 \times 10^{-5}$	$5 \times 10^{-5}$	$5 \times 10^{-5}$
Regulation time with change in load from 20 % to 100 % Tolerance: 0.2 % $V_{rated}$		< 200 $\mu$ s	< 100 $\mu$ s	< 80 $\mu$ s	< 80 $\mu$ s	< 80 $\mu$ s
Residual ripple (10 Hz - 1 MHz)	Voltage	0.5 mV <sub>rms</sub>	0.5 mV <sub>rms</sub>	0.5 mV <sub>rms</sub>	1 mV <sub>rms</sub>	2 mV <sub>rms</sub>
	Current	1 mA <sub>rms</sub>	500 $\mu$ A <sub>rms</sub>	500 $\mu$ A <sub>rms</sub>	200 $\mu$ A <sub>rms</sub>	100 $\mu$ A <sub>rms</sub>
Measuring accuracy	Voltage	0.1 % + 20 mV	0.1 % + 20 mV	0.1 % + 20 mV	0.1 % + 40 mV	0.1 % + 200 mV
	Current	0.2 % + 20 mA	0.2 % + 20 mA	0.2 % + 10 mA	0.2 % + 4 mA	0.2 % + 2 mA
Temperature coefficient	Voltage	$10^{-4}/K$	$10^{-4}/K$	$10^{-4}/K$	$10^{-4}/K$	$10^{-4}/K$
	Current	$10^{-4}/K$	$10^{-4}/K$	$10^{-4}/K$	$10^{-4}/K$	$10^{-4}/K$

#### Dual-output power supplies

Model		TOE 8852-16	TOE 8852-24	TOE 8852-32	TOE 8852-64	TOE 8852-130
Output data	Voltage	2 x 0 - 16 V	2 x 0 - 24 V	2 x 0 - 32 V	2 x 0 - 64 V	2 x 0 - 130 V
	Current	2 x 0 - 10 A	2 x 0 - 6.5 A	2 x 0 - 5 A	2 x 0 - 2.5 A	2 x 0 - 1.2 A
Setting resolution	Voltage	10 mV	10 mV	10 mV	20 mV	100 mV
	Current	5 mA	2 mA	2 mA	1 mA	1 mA
Setting accuracy	Voltage	0.1 % + 10 mV	0.1 % + 10 mV	0.1 % + 10 mV	0.1 % + 20 mV	0.1 % + 100 mV
	Current	0.2 % + 10 mA	0.2 % + 10 mA	0.2 % + 4 mA	0.2 % + 2 mA	0.2 % + 2 mA
Deviation in regulation with 100 % change in load	Voltage	$5 \times 10^{-5}$	$5 \times 10^{-5}$	$5 \times 10^{-5}$	$5 \times 10^{-5}$	$10^{-4}$
	Current	$10^{-4}$	$2 \times 10^{-4}$	$2 \times 10^{-4}$	$5 \times 10^{-4}$	$10^{-3}$
With change in line voltage $\pm 10$ %		$5 \times 10^{-5}$	$5 \times 10^{-5}$	$5 \times 10^{-5}$	$5 \times 10^{-5}$	$5 \times 10^{-5}$
Regulation time with change in load from 20 % to 100 % Tolerance: 0.2 % $V_{rated}$		< 100 $\mu$ s	< 80 $\mu$ s	< 80 $\mu$ s	< 80 $\mu$ s	< 80 $\mu$ s
Residual ripple (10 Hz - 1 MHz)	Voltage	0.5 mV <sub>rms</sub>	0.5 mV <sub>rms</sub>	0.5 mV <sub>rms</sub>	1 mV <sub>rms</sub>	2 mV <sub>rms</sub>
	Current	500 $\mu$ A <sub>rms</sub>	300 $\mu$ A <sub>rms</sub>	200 $\mu$ A <sub>rms</sub>	100 $\mu$ A <sub>rms</sub>	50 $\mu$ A <sub>rms</sub>
Measuring accuracy	Voltage	0.1 % + 20 mV	0.1 % + 20 mV	0.1 % + 20 mV	0.1 % + 40 mV	0.1 % + 200 mV
	Current	0.2 % + 10 mA	0.2 % + 10 mA	0.2 % + 4 mA	0.2 % + 2 mA	0.2 % + 2 mA
Temperature coefficient	Voltage	$10^{-4}/K$	$10^{-4}/K$	$10^{-4}/K$	$10^{-4}/K$	$10^{-4}/K$
	Current	$10^{-4}/K$	$10^{-4}/K$	$10^{-4}/K$	$10^{-4}/K$	$10^{-4}/K$

## General data

### TOE 8840 TOE 8850

#### General data

Main outputs	Floating and electrically isolated from the system interface
Insulation	± 250 V against ground
Output sockets	On front of instrument with TOE 8840 On front of instrument and optionally at rear with TOE 8850. Standby-circuit of power outputs directly selectable.
Line voltage	115 V/230 V ± 10 % 47 Hz to 63 Hz
Power consumption	TOE 8840 approx. 370 VA TOE 8850 approx. 730 VA
Protective measures	Protection class 1 in accordance with DIN 57411/VDE 0411 Part 1/IEC 348
Operating temperature	0 °C to 40 °C
Storage temperature	-20 °C to 70 °C
Reference temperature	23 °C
Warm-up time	30 min
Dimensions (W x H x D)	
TOE 8840	265 x 147 x 330 mm
TOE 8850	265 x 147 x 437 mm
Weight	
TOE 8840	Approx. 8 kg
TOE 8850	Approx. 15 kg
Housing	Aluminium

#### Incremental spinwheel

Advantages:

- Wear-free in contrast to potentiometers
- Selection of digit for coarse/fine adjustment
- No maladjustment of setting when switched off
  - protection of device-under-test when switching on the instrument

#### Safety/protective measures

- Polarity reversal protection
- Resistant to reverse current
- Overtemperature protection
- Keypad locking

## Ordering data/options/accessories

TOE 8840  
TOE 8850



TOE 8852

### Ordering data

#### Single-output power supplies 160 W

TOE 8841-24	Power supply	24 V/ 6.5 A
TOE 8841-32	Power supply	32 V/ 5 A
TOE 8841-40	Power supply	40 V/ 4 A
TOE 8841-64	Power supply	64 V/ 2.5 A
TOE 8841-130	Power supply	130 V/ 1.2 A

#### Single-output power supplies 320 W

TOE 8851-16	Power supply	16 V/ 20 A
TOE 8851-24	Power supply	24 V/ 13 A
TOE 8851-32	Power supply	32 V/ 10 A
TOE 8851-40	Power supply	40 V/ 8 A
TOE 8851-64	Power supply	64 V/ 5 A
TOE 8851-130	Power supply	130 V/ 2,5 A

### Ordering data

#### Dual-output power supplies 2 x 80 W

TOE 8842-24	Power supply	2 x 24 V/ 3.2 A
TOE 8842-32	Power supply	2 x 32 V/ 2.5 A
TOE 8842-40	Power supply	2 x 40 V/ 2 A
TOE 8842-64	Power supply	2 x 64 V/ 1.2 A
TOE 8842-130	Power supply	2 x 130 V/ 0.6 A

#### Dual-output power supplies 2 x 160 W

TOE 8852-16	Power supply	2 x 16 V/ 10 A
TOE 8852-24	Power supply	2 x 24 V/ 6.5 A
TOE 8852-32	Power supply	2 x 32 V/ 5 A
TOE 8852-40	Power supply	2 x 40 V/ 4 A
TOE 8852-64	Power supply	2 x 64 V/ 2.5 A
TOE 8852-130	Power supply	2 x 130 V/ 1.2 A

### Options

#### Single-output power supplies

Interfaces	
TOE 8861/015	Remote control GPIB and RS 232
TOE 8861/016	Analog remote control
TOE 8861/017	Floating analog remote control
TOE 8850/252	Output at rear (only with TOE 8850 series)

### Options

#### Dual-output power supplies

Interfaces	
TOE 8862/015	Remote control GPIB and RS 232
TOE 8862/016	Analog remote control
TOE 8862/017	Floating analog remote control
2 x TOE 8850/252	Output at rear (only with TOE 8850 series)

#### Supplied accessories

- 1 power cord
- 1 instruction manual
- 1 RS 232 interface cable\*

\* (only with TOE 8861/015 or TOE 8862/015 option)

Free basic driver for LabView™  
at [www.TOELLNER.de](http://www.TOELLNER.de)

The instruments of the TOE 8840 series can be equipped either with a GPIB/RS 232 or an analog remote control. Simultaneous fitting of both options is not possible.



TOE 8872-40

## High-performance power supplies

**TOE 8871 – 1000 W**  
**TOE 8872 – 1500 W**

### Special features

- Autoranging
- Active PFC
- High rise and fall rates
- High endurance, even under extreme load conditions
- Best EMC characteristics
- Low noise voltage, optionally approx.  $1 \text{ mV}_{\text{rms}}$
- GPIB, RS 232, analog interfaces
- Arbitrary function (option)
- Brief load current  $1.5 \times I_{\text{rated}}$  for approx. 20 ms (option)

### High performance and easy-to-use

An output power up to 1500 W is provided by the power supplies belonging to the TOE 8871 and TOE 8872 series; at the same time, output voltages can be generated up to 400 V and output currents up to 100 A depending on the model. As a result of state-of-the-art switching controller technology and proven microprocessor control, these devices are suitable for completely universal application. Together with a high efficiency, the power supplies are characterized by permanent load resistance, autoranging and a low weight.

### PFC

A highly effective power factor corrector (PFC) ensures that the TOE 8871 and TOE 8872 power supplies react with respect to the mains source like a resistance without any capacitive, inductive or non-linear components whatsoever. The mains current input is therefore sinusoidal, in-phase with the line voltage, and thus free of reactive current components.

### Easy-to-use

The devices are extremely easy-to-use, and the specifications are exceptional. Superb processing quality together with a large number of special functions mean that the power supplies of the TOE 8871 and TOE 8872 series can be counted among the very best currently available.

### Integrated measurement

A further significant characteristic is the high-resolution measurement of the voltage, current and power values; these are output on 4-digit LED displays and can be read at a high rate in bus mode. This means that additional measuring instruments are usually superfluous.

### Adjustment using incremental spinwheel

The output values are set using a wear-free incremental spinwheel with selectable sensitivity, thus guaranteeing reliable, exact setting of the output voltage, current and power even after many years of use.

### Remote control: GPIB, RS 232 and analog

All devices can be remote-controlled as standard in analog mode, and optionally via GPIB and RS 232 interfaces with the standardized SCPI command set (SCPI: Standard Commands for Programmable Instruments). The system interfaces are characterized by a high setting rate and a high measuring rate. In addition to this, device driver software under "LabView" is also available. Furthermore, all devices can be controlled at high precision via an electrically isolated analog controller (option).

### Automatic calibration

Fast and convenient calibration of all output parameters is possible externally within a few minutes without having to adjust any trimmers or make any interventions in the device. This "Autocalibration" can be carried out simply using the control elements or with computer support within a test system. An autocalibration function provides significant advantages, particularly when considering the increasing importance of regular calibration intervals as a result of quality assurance systems.

### Voltage source, current source and automatic power control

Depending on the set values for voltage, current and power, each power supply can be operated, depending on the load conditions, as a constant voltage source, constant current source, or as a source with a constant output power.

## High-performance power supplies

TOE 8871 – 1000 W  
TOE 8872 – 1500 W

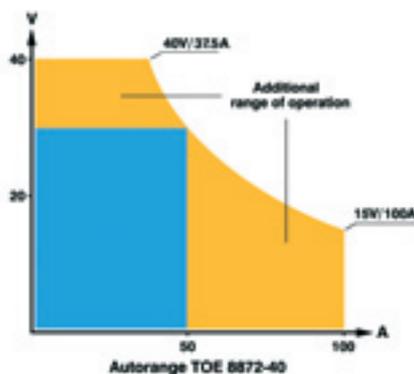
### Overview

1000 W	Voltage	Current	Power
TOE 8871-40	0- 40 V	0- 50 A	1000 W
TOE 8871-60	0- 60 V	0- 35 A	1000 W
TOE 8871-80	0- 80 V	0- 25 A	1000 W
TOE 8871-130	0- 130 V	0- 16 A	1000 W
TOE 8871-200	0- 200 V	0- 10 A	1000 W
TOE 8871-400	0- 400 V	0- 5 A	1000 W

1500 W	Voltage	Current	Power
TOE 8872-40	0- 40 V	0-100 A	1500 W
TOE 8872-60	0- 60 V	0- 65 A	1500 W
TOE 8872-80	0- 80 V	0- 50 A	1500 W
TOE 8872-130	0- 130 V	0- 25 A	1500 W
TOE 8872-200	0- 200 V	0- 15 A	1500 W
TOE 8872-400	0- 400 V	0- 7.5 A	1500 W

#### Autoranging

The TOELLNER TOE 8871 and TOE 8872 series are extremely rugged high-performance power supplies with autoranging up to 1500 W. Just one unit of this series provides what otherwise has to be covered by several powerful power supplies of different voltage/current versions: low voltage range with increased current, extended upper voltage range with low current. This is easy to understand using the example of the TOE 8872-40: the instrument delivers 40 V or 100 A. For a square characteristic, either a 4 kW unit with 3-phase connection or two single units with different voltage/current versions would be required.

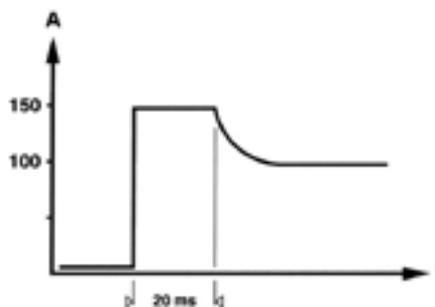


#### Extremely quiet

The intelligent, thermostatically controlled fan technology with integrated, extremely quiet fan means that the units are extremely suitable for laboratory workstations. Optimum cooling of the units is thus provided in addition, resulting in an extension of the service life on the one hand and guaranteeing of a high endurance even under extreme load conditions on the other.

#### Brief load current

With the TOE 8872-40 and TOE 8872-60 models, the TOE 8871/022 option allows a brief increase in the output current by approx. 50 %. Thus approx. 150 A or 100 A can be drawn for 20 ms.



Brief load current with TOE 8872-40 (TOE 8871/022 option)

#### Special features

- Autoranging
- Analog interface as standard
- Floating analog interface with monitor outputs for voltage and current optional
- RS 232, GPIB interfaces optional
- Sensing
- 19" adapter included as standard in scope of delivery
- Free LabView™ driver
- Can be used as constant voltage, constant current and constant power source (CV/CC/CP)
- Extremely quiet thanks to excellent thermostatically controlled fan technology
- Master/slave operation
- High endurance, even under extreme load conditions
- Best EMC characteristics, residual ripple <math>< 5 \text{ mV}\_{\text{rms}}</math> up to 10 MHz, optional 1  $\text{mV}_{\text{rms}}$
- Arbitrary function (option)

## High-performance power supplies

TOE 8871 – 1000 W  
TOE 8872 – 1500 W



Rear view of TOE 8872-40, -60, -80, -130

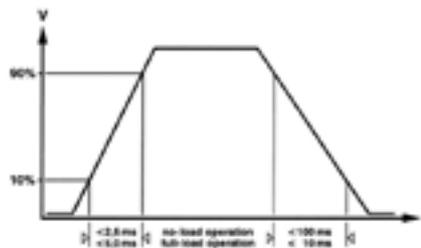
### High regulation rate

The superb regulation rate makes these units the masters in their class.

In contrast to other switched-mode power supplies, the TOE 8870 series permits generation of voltage/current curves at high speed without reducing the output capacitance. This would result in over-voltages and current peaks at the output and destroy the device-under-test. A wide range of curves can therefore be generated via the analog control, e.g. as required in the standards of the automotive industry.

Simulation of the starting curve (cranking) of a vehicle is thus possible without problem.

Extremely short rise and fall times of the output voltage – also at no-load (TOE 8872-40)



Extremely short rise and fall times of the output voltage – also at no-load (TOE 8872-40)

### Master/slave operation

Up to three units from the same series can be operated in parallel to increase the output power without limitations in the regulation rate or other parameters. Optionally available parallel mounting sets take into consideration the appropriate safety standards and also provide simple data linking between the master and the slave units.

### Standby/execute

A convenient detail of the functionality is the output switch-off which allows immediate switching-off of the voltage and current values to 0 V or 0 A at standby. When activating the execute key, the set or programmed values for voltage and current are present without delay. Switching over can be carried out manually, using a remote control command from the PC, by means of an external TTL signal, or via an external switch contact.

### Sensor lines

An innovative sensing circuit not only keeps the power supplied to your load extremely constant, it even protects sensitive loads if there is a break in a sensor line. The sensing inputs are available at the rear and can be activated/deactivated using a key on the front panel.

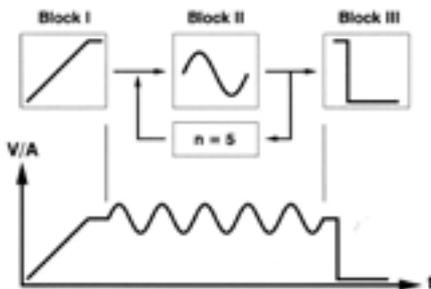
## Arbitrary function (option)

TOE 9671 for TOE 8871 series  
TOE 9672 for TOE 8872 series

### Arbitrary function

The power supplies of these series can be optionally equipped with an arbitrary function (curve memory integrated in the unit). The units execute an entered curve autonomously, even without a PC connection. A burst function defines the number of desired curve sweeps.

In addition, the curve memory can be divided into up to 3 blocks. Each individual block can be used repeatedly. The advantage is to be found in the extremely efficient use of memory space.



### Technical specifications

Number of steps	255
Step data	Voltage, current, step time
Step time	50 ms to 100 s, resolution 10 ms
Curve triggering	
Internal	Manual with key or over bus with remote control command
External	Via TTL signal or switch contact
Number of blocks	3
Max. block sweeps	1 to 65535 or ∞

### Arbitrary function

- 255 interpolation points
- 3 blocks with repeat function
- $50 \text{ ms} < t < 100 \text{ s}$  per interpolation point
- Burst function (also for each individual block)

### Software for arbitrary function

- Graphic and tabular input of curve
- Data input from oscilloscopes
- Library with standard curves for automotive industry

### Curve input options

- Manual
- Via RS 232 or GPIB interface programming
- Convenient TOELLNER software with graphic curve input option

## Technical specifications

### TOE 8871 – 1000 W

		<b>TOE 8871-40</b>	<b>TOE 8871-60</b>	<b>TOE 8871-80</b>	<b>TOE 8871-130</b>	<b>TOE 8871-200</b>	<b>TOE 8871-400</b>
Output							
Voltage		0 - 40 V	0 - 60 V	0 - 80 V	0 - 130 V	0 - 200 V	0 - 400 V
Current		0 - 50 A	0 - 35 A	0 - 25 A	0 - 16 A	0 - 10 A	0 - 5 A
Power adjustable in range		100 - 1000 W	100 - 1000 W	100 - 1000 W	100 - 1040 W	100 - 1000 W	100 - 1000 W
Setting resolution	Voltage Current Power < 1000 W > 1000 W	10 mV 10 mA 0.1 W	20 mV 10 mA 0.1 W	20 mV 10 mA 0.1 W	100 mV 10 mA 0.1 W 1 W	100 mV 5 mA 0.1 W	100 mV 2 mA 0.1 W
Setting accuracy	Voltage Current Power	0.1 % + 20 mV 0.2 % + 40 mA 0.4 % + 1 W	0.1 % + 30 mV 0.2 % + 40 mA 0.4 % + 1 W	0.1 % + 40 mV 0.2 % + 20 mA 0.4 % + 1 W	0.1 % + 100 mV 0.2 % + 20 mA 0.4 % + 1 W	0.1 % + 100 mV 0.2 % + 20 mA 0.4 % + 1 W	0.1 % + 100 mV 0.2 % + 20 mA 0.4 % + 1 W
Deviation in regulation with 100 % change in load	Voltage Current	1 x 10 <sup>-4</sup> + 5 mV 5 x 10 <sup>-4</sup> + 25 mA	1 x 10 <sup>-4</sup> + 5 mV 5 x 10 <sup>-4</sup> + 20 mA	1 x 10 <sup>-4</sup> + 5 mV 5 x 10 <sup>-4</sup> + 12 mA	1 x 10 <sup>-4</sup> + 10 mV 5 x 10 <sup>-4</sup> + 8 mA	1 x 10 <sup>-4</sup> + 10 mV 5 x 10 <sup>-4</sup> + 2.5 mA	1 x 10 <sup>-4</sup> + 10 mV 5 x 10 <sup>-4</sup> + 2.5 mA
With change in line voltage ± 10 %		5 x 10 <sup>-5</sup>	5 x 10 <sup>-5</sup>				
Regulation time with change in load from 20 % to 100 % I <sub>rated</sub> Tolerance: 0.2 % V <sub>rated</sub>		400 µs	400 µs	400 µs	500 µs	500 µs	500 µs
Setting time of output voltage with change in setpoint 0 V to V <sub>rated</sub> no-load/full load V <sub>rated</sub> to 1 V no-load/full load		2.5 ms/5 ms 100 ms/10 ms	5 ms/10 ms 120 ms/12 ms	10 ms/15 ms 200 ms/20 ms	10 ms/15 ms 200 ms/20 ms	10 ms/10 ms < 5 s/20 ms	15 ms/20 ms < 3 s/60 ms
Residual ripple (rms) 10 Hz to 10 MHz	Voltage Current	5 mV 25 mA	8 mV 20 mA	10 mV 20 mA	15 mV 20 mA	15 mV 20 mA	20 mV 15 mA
Measuring accuracy	Voltage Current Power	0.1 % + 30 mV 0.2 % + 60 mA 0.4 % + 1 W	0.1 % + 40 mV 0.2 % + 50 mA 0.4 % + 1 W	0.1 % + 60 mV 0.2 % + 40 mA 0.4 % + 1 W	0.1 % + 100 mV 0.2 % + 40 mA 0.4 % + 1 W	0.1 % + 200 mV 0.2 % + 40 mA 0.4 % + 1 W	0.1 % + 300 mV 0.2 % + 40 mA 0.4 % + 1 W
Temperature coefficient	Voltage Current	10 <sup>-4</sup> /K 10 <sup>-4</sup> /K	10 <sup>-4</sup> /K 10 <sup>-4</sup> /K				
Analog interface Control voltage (reference potential is the negative pole of the output)	0 - 10 V for 0 - 10 V for	0 - 40 V 0 - 50 A	0 - 60 V 0 - 35 A	0 - 80 V 0 - 25 A	0 - 130 V 0 - 16 A	0 - 200 V 0 - 10 A	0 - 400 V 0 - 5 A
Floating analog interface Control voltage	0 - 10 V for 0 - 10 V for	0 - 40 V 0 - 50 A	0 - 60 V 0 - 35 A	0 - 80 V 0 - 25 A	0 - 130 V 0 - 16 A	0 - 200 V 0 - 10 A	0 - 400 V 0 - 5 A
Insulation: 1 kV DC							
Accuracy	Voltage Current	0.2 % + 50 mV 0.3 % + 50 mA	0.2 % + 50 mV 0.3 % + 20 mA	0.2 % + 100 mV 0.3 % + 20 mA	0.2 % + 100 mV 0.3 % + 20 mA	0.2 % + 200 mV 0.3 % + 10 mA	0.2 % + 400 mV 0.3 % + 5 mA

## Technical specifications

### TOE 8872 – 1500 W

Output		TOE 8872-40	TOE 8872-60	TOE 8872-80	TOE 8872-130	TOE 8872-200	TOE 8872-400
Voltage		0 - 40 V	0 - 60 V	0 - 80 V	0 - 130 V	0 - 200 V	0 - 400 V
Current		0 - 100 A	0 - 65 A	0 - 50 A	0 - 25 A	0 - 15 A	0 - 7.5 A
Power adjustable in range		100 - 1500 W	100 - 1500 W				
Setting resolution	Voltage	10 mV	20 mV	20 mV	100 mV	100 mV	100 mV
	Current	50 mA	20 mA	10 mA	10 mA	10 mA	2 mA
	Power						
	< 1000 W	0.1 W	0.1 W	0.1 W	0.1 W	0.1 W	0.1 W
	> 1000 W	1 W	1 W	1 W	1 W	1 W	1 W
Setting accuracy	Voltage	0.1 % + 20 mV	0.1 % + 30 mV	0.1 % + 40 mV	0.1 % + 100 mV	0.1 % + 100 mV	0.1 % + 100 mV
	Current	0.2 % + 50 mA	0.2 % + 50 mA	0.2 % + 30 mA	0.2 % + 20 mA	0.2 % + 20 mA	0.2 % + 20 mA
	Power	0.4 % + 1.5 W	0.4 % + 1 W	0.4 % + 1.5 W			
Deviation in regulation with 100 % change in load	Voltage	$1 \times 10^{-4} + 5 \text{ mV}$	$1 \times 10^{-4} + 5 \text{ mV}$	$1 \times 10^{-4} + 5 \text{ mV}$	$1 \times 10^{-4} + 10 \text{ mV}$	$1 \times 10^{-4} + 10 \text{ mV}$	$1 \times 10^{-4} + 15 \text{ mV}$
	Current	$5 \times 10^{-4} + 50 \text{ mA}$	$5 \times 10^{-4} + 30 \text{ mA}$	$5 \times 10^{-4} + 25 \text{ mA}$	$5 \times 10^{-4} + 12 \text{ mA}$	$5 \times 10^{-4} + 2.5 \text{ mA}$	$5 \times 10^{-4} + 3.5 \text{ mA}$
With change in line voltage $\pm 10 \%$		$5 \times 10^{-5}$	$5 \times 10^{-5}$				
Regulation time with change in load from 20 % to 100 % $I_{\text{rated}}$ Tolerance: 0.2 % $V_{\text{rated}}$		400 $\mu\text{s}$	400 $\mu\text{s}$	400 $\mu\text{s}$	500 $\mu\text{s}$	500 $\mu\text{s}$	500 $\mu\text{s}$
Setting time of output voltage with change in setpoint 0 V to $V_{\text{rated}}$ no-load/full load $V_{\text{rated}}$ to 1 V no-load/full load		2.5 ms/5 ms	5 ms/10 ms	10 ms/15 ms	10 ms/20 ms	15 ms/15 ms	15 ms/20 ms
		150 ms/15 ms	200 ms/20 ms	300 ms/30 ms	400 ms/40 ms	< 5 s/15 ms	< 3 s/40 ms
Residual ripple (rms) 10 Hz to 10 MHz	Voltage	10 mV	12 mV	15 mV	15 mV	15 mV	20 mV
	Current	50 mA	50 mA	40 mA	40 mA	20 mA	20 mA
Measuring accuracy	Voltage	0.1 % + 30 mV	0.1 % + 40 mV	0.1 % + 60 mV	0.1 % + 100 mV	0.1 % + 200 mV	0.1 % + 300 mV
	Current	0.2 % + 100 mA	0.2 % + 80 mA	0.2 % + 60 mA	0.2 % + 40 mA	0.2 % + 40 mA	0.2 % + 40 mA
	Power	0.4 % + 1.5 W	0.4 % + 1.5 W				
Temperature coefficient	Voltage	$10^{-4}/\text{K}$	$10^{-4}/\text{K}$	$10^{-4}/\text{K}$	$10^{-4}/\text{K}$	$10^{-4}/\text{K}$	$10^{-4}/\text{K}$
	Current	$10^{-4}/\text{K}$	$10^{-4}/\text{K}$	$10^{-4}/\text{K}$	$10^{-4}/\text{K}$	$10^{-4}/\text{K}$	$10^{-4}/\text{K}$
Analog interface Control voltage (reference potential is the negative pole of the output)	0 - 10 V for	0 - 40 V	0 - 60 V	0 - 80 V	0 - 130 V	0 - 200 V	0 - 400 V
	0 - 10 V for	0 - 100 A	0 - 65 A	0 - 50 A	0 - 25 A	0 - 15 A	0 - 7.5 A
Floating analog interface Control voltage	0 - 10 V for	0 - 40 V	0 - 60 V	0 - 80 V	0 - 130 V	0 - 200 V	0 - 400 V
	0 - 10 V for	0 - 100 A	0 - 65 A	0 - 50 A	0 - 25 A	0 - 15 A	0 - 7.5 A
Insulation: 1 kV DC							
Accuracy	Voltage	0.2 % + 50 mV	0.2 % + 50 mV	0.2 % + 100 mV	0.2 % + 100 mV	0.2 % + 200 mV	0.2 % + 400 mV
	Current	0.3 % + 100 mA	0.3 % + 50 mA	0.3 % + 50 mA	0.3 % + 20 mA	0.3 % + 15 mA	0.3 % + 7.5 mA

## General data

### TOE 8871 TOE 8872

#### General data

##### Output

Output terminals

Floating and electrically isolated

Insulation

At rear; optionally at front

± 250 V against ground

##### Overvoltage protection

3 V to  $1.25 \times U_{MAX}$

Resolution

100 mV

##### Overcurrent protection

10 ms to 100 s switch-off delay

Resolution

10 ms/100 ms/1 s

##### Line voltage

230 V ± 10 %, 47 to 63 Hz

##### Power consumption

TOE 8871

Approx. 1250 W/1250 VA at rated load

TOE 8872

Approx. 1900 W/1900 VA at rated load

##### Protective measures

Protection class 1 in accordance with  
DIN VDE 0411, Part 1

##### EMC

DIN VDE 0871 Class B  
DIN VDE 0843 T2, IEC 801-2

##### Operating temperature

0 °C to 40 °C

##### Storage temperature

-20 °C to 70 °C

##### Reference temperature

23 °C ± 1 °C

##### Cooling

By thermostatically controlled fan

##### Warm-up time

Approx. 30 min

##### Dimensions (W x H x D)

445 x 134 x 515 mm

With handles and feet

445 x 147 x 557 mm

##### Weight

Approx. 15 kg

##### Housing

Aluminium

## Ordering data/options

### TOE 8870



TOE 8872

## Ordering data

### 1000 W output power

TOE 8871-40	Power supply	40 V / 50 A
TOE 8871-60	Power supply	60 V / 35 A
TOE 8871-80	Power supply	80 V / 25 A
TOE 8871-130	Power supply	130 V / 16 A
TOE 8871-200	Power supply	200 V / 10 A
TOE 8871-400	Power supply	400 V / 5 A

### 1500 W output power

TOE 8872-40	Power supply	40 V / 100 A
TOE 8872-60	Power supply	60 V / 65 A
TOE 8872-80	Power supply	80 V / 50 A
TOE 8872-130	Power supply	130 V / 25 A
TOE 8872-200	Power supply	200 V / 15 A
TOE 8872-400	Power supply	400 V / 7.5 A

## Options

### Interfaces

TOE 8871/015	GPIB/RS 232 interfaces
TOE 8871/016	Floating analog remote control with monitor outputs for U/I
TOE 8871/017 <sup>1)</sup>	Output at front
TOE 8871/018 <sup>1)</sup>	Low noise output
TOE 8871/019	Correctable voltage drop 3 V per line
TOE 8871/022 <sup>2)</sup>	Brief load current approx. 1.5 x I <sub>rated</sub>

### Arbitrary function in the unit

TOE 9171	For TOE 8871-xx
TOE 9172	For TOE 8872-xx

### PC software for curve generation

TOE 9671 <sup>3)</sup>	For TOE 8871-xx
TOE 9672 <sup>3)</sup>	For TOE 8872-xx

### Cables and adapters

TOE 8870/102	Parallel switching adapter 2 x TOE 8871 / TOE 8872
TOE 8870/103	Parallel switching adapter 3 x TOE 8871 / TOE 8872
TOE 9101	GPIB controller for USB
TOE 9104	GPIB controller for Ethernet
TOE 9009	GPIB cable, 2 m

<sup>1)</sup> Only 40 V / 60 V / 80 V / 130 V devices

<sup>2)</sup> Only TOE 8872-40 and TOE 8872-60

<sup>3)</sup> TOE 8871/015 option and TOE 9171 or TOE 9172 required



TOE 8951-40

## Single-output and dual-output power supplies up to 400 W output power

**TOE 8951**  
**TOE 8952**

### Special features

- Automatic setting to the existing line voltage: 115 V or 230 V, 47 to 63 Hz
- Autoranging
- RS 232 and analog interfaces included as standard
- USB and GPIB interfaces optional
- Outputs at front and rear as standard
- On/off switching of the outputs
- ½ 19" width, 2 HU design → parallel installation possible
- Sensing
- Free LabView™ driver
- Can be used as constant voltage, constant current and constant power source (CV/CC/CP)

## Performance in absolute perfection

### Convenient performance for your applications

The power supplies from the TOE 8950 range are suitable for applications associated with:

Research / development  
Laboratory / testing / experiments  
Production / test bays  
Quality assurance  
Service / training

### 400 W in compact design

The single-output and dual-output power supplies from the TOE 8950 range have an extremely compact design. As a result of the high efficiency of all units, the complete output power of 400 W is available without problem over wide voltage and current ranges at the front via safety sockets and at the rear via a screw-type terminal block.

### Autoranging

Power supplies with autoranging can output their rated power over a wide and stepless range of voltage and current combinations.

Autoranging power supplies from TOELLNER have a significantly larger operating range than standard power supplies with the same output power.

### Adjustment using incremental spinwheels

The output values are adjusted with a selectable resolution using wear-free incremental spinwheels, guaranteeing reliable and precise setting of all output parameters and operating functions even after many years of use.

### Display

The set and measured values for voltage, current and power as well as the menu control functions are output on a 2-row LCD with 20 characters/row.

### Highest degree of safety

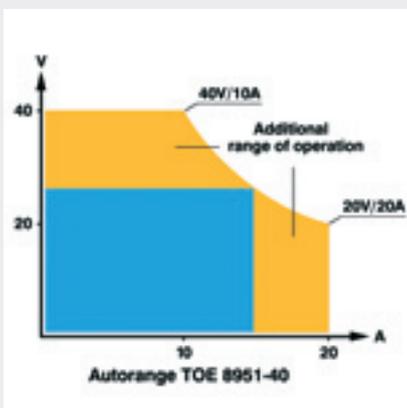
is guaranteed for your applications by comprehensive protective measures: adjustable overvoltage protection, limit function, fast power OFF switching, polarity reversal protection, resistance to reverse current, various internal electronic monitoring functions.

### Innovative sensing circuit

An innovative sensing circuit not only keeps the power supply to your load extremely constant, it even protects sensitive loads if there is a break in the sensor line. The sensing inputs are available at the rear.

### Adjustable output power

The possibility for directly setting the power is a further exceptional feature of this series. The output power of 400 W with single-output power supplies or 2 x 200 W with dual-output power supplies can then be reduced down to 5 % of the maximum output power.



Example: TOE 8951-40 (40 V / 20 A) compared to a standard power supply with 400 W output power.

## Single-output and dual-output power supplies up to 400 W output power

TOE 8951  
TOE 8952



TOE 8952-40

### Tracking mode

With dual-output power supplies, automatic tracking permits control of the output voltage of part 2 as a function (0 – 100 %) of part 1 with retention of all control properties.

### Digital and analog interfaces

#### Digital: RS 232 / GPIB / USB

RS 232 and GPIB/USB (option) interfaces with the following scope of functions are available for communication between PC and power supply:

- Adjustment of output values: voltage, current and power
- OVP and limit adjustment, autocal function, display, store and recall settings
- Switching on/off of output voltage
- Reading of actual values as well as warning/fault states

The command syntax complies with the IEEE 488.2 standard. Standardized SCPI commands are processed.

#### Fast analog control

The power supplies can be controlled in analog mode; i.e. the output voltage and current can be adjusted independent of one another using externally applied control voltages.

Short adjustment times for the output voltage are implemented using balanced circuitry.

It is therefore possible to generate powerful and fast output signals without problem; up to approx. 700 Hz at 2 V<sub>pp</sub>.

#### Interlock

By interrupting the interlock circuit, e.g. by an external emergency stop switch, the power supply output becomes de-energized directly.

### Output ON/OFF

A convenient feature is the output switch-off function which at standby permits immediate reduction of the voltage and current values to 0 V and 0 A. When the output key is activated, the set or programmed values for voltage and current are present immediately. The switchover can be carried out manually, via a remote control command from the PC, via an external TTL signal<sup>1)</sup>, or via an external switching contact<sup>1)</sup>.

<sup>1)</sup> Interlock or inhibit option required

### Autocal function

The power supplies are equipped with a self-calibration function protected by a "security code". This function can be manually executed from a menu or also remote-controlled.

### Price and performance

The exceptional specifications, extraordinary features, and best possible processing quality provide the power supplies of the TOE 8950 series with an excellent price/performance ratio.

## Options

- GPIB and USB interfaces
- Arbitrary function
- Interlock
- Inhibit



TOE 8951-40

## Single-output and dual-output power supplies

TOE 8951 – 400 W  
TOE 8952 – 2 x 200 W

### Special features

- Autoranging
- RS 232 and analog interfaces included as standard
- USB and GPIB interfaces optional
- Outputs at front and rear as standard
- On/off switching of the outputs
- ½ 19" width, 2 HU design  
→ parallel installation possible
- Sensing
- Free LabView™ driver
- Can be used as constant voltage, constant current and constant power source (CV/CC/CP)

### Outputs

- Floating for all models
- Electrically isolated in the dual-output power supplies  
→ series and parallel connections possible
- Safety sockets at front
- Available at rear on screw terminal block

## Overview

Model	Output 1		Output 2		Power
	Voltage	Current	Voltage	Current	
<b>Single-output power supplies</b>					
TOE 8951-20	0 - 20 V	0 - 40 A	—	—	400 W
TOE 8951-40	0 - 40 V	0 - 20 A	—	—	400 W
TOE 8951-60	0 - 60 V	0 - 14 A	—	—	400 W
TOE 8951-80	0 - 80 V	0 - 10 A	—	—	400 W
TOE 8951-130	0 - 130 V	0 - 6 A	—	—	400 W
<b>Dual-output power supplies</b>					
TOE 8952-20	0 - 20 V	0 - 20 A	0 - 20 V	0 - 20 A	2 x 200 W
TOE 8952-40	0 - 40 V	0 - 10 A	0 - 40 V	0 - 10 A	2 x 200 W
TOE 8952-60	0 - 60 V	0 - 7 A	0 - 60 V	0 - 7 A	2 x 200 W
TOE 8952-80	0 - 80 V	0 - 5 A	0 - 80 V	0 - 5 A	2 x 200 W
TOE 8952-130	0 - 130 V	0 - 3 A	0 - 130 V	0 - 3 A	2 x 200 W

## Arbitrary function (option)

TOE 8951  
TOE 8952

### Arbitrary function

The power supplies of these series can be optionally equipped with an arbitrary function (curve memory integrated in the unit). The units execute an entered curve autonomously, even without a PC connection. Dual-output power supplies of the TOE 8952 series have a separate curve memory per output. Two signals can then be output synchronous to one another. A burst function defines the number of desired curve sweeps.

In addition, the curve memory can be divided into up to 10 blocks. Each individual block can be used repeatedly. The advantage is to be found in the extremely efficient use of memory space.

The new and powerful software from TOELLNER permits fast and convenient input of curves using a graphic curve editor. Oscilloscope signals recorded in a vehicle can be read in directly and subsequently simulated. Voltage dips, starting processes in the vehicle, and noise voltages on the vehicle electrics can thus be simulated rapidly and without problem. Standardized test pulses in accordance with DIN 16750 or ISO 7637, such as load dump test pulses (also clipped), jump starts and reset response, or specific and standardized test curves from many different vehicle manufacturers, can be simulated and are included in the scope of delivery. New and future versions from manufacturers, as well as new test versions, are implemented can be entered in next to no time.

TOE 9151 or TOE 9152 option required (arbitrary function in the unit) if curves are to be output via internal memories.

### Technical specifications

Number of steps	1000
Step data	Voltage, current, step time
Step time	10 ms to 100 s, resolution 5 ms
Curve triggering	
Internal	Manual with key or over bus with remote control command
External	Via TTL signal or switch contact
Number of blocks	10
Max. block sweeps	1 to 65535 or ∞

### Arbitrary function

- 1000 interpolation points
- 10 blocks with repeat function
- 10 ms < t < 100 s per interpolation point
- Burst function (also for each individual block)

### Software for arbitrary function

- Graphic and tabular input of curve
- Data input from oscilloscopes
- Library with standard curves for automotive industry

### Curve input options

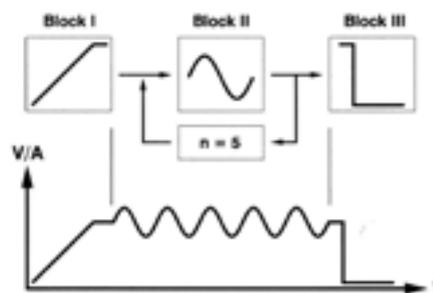
- Manual
- Via RS 232, GPIB or USB interface
- Convenient TOELLNER software with graphic curve input option

## Application examples Arbitrary function

TOE 8951  
TOE 8952

### Application example

Example of a sinusoidal signal with start block for initialization process, repetition block with a sinusoidal signal and 5 sweeps, and an end block for switching off a consumer.



Display of sequence with output of current block, currently executed step, and number of busts of the current block.

## Technical specifications Single-output power supplies

### TOE 8951



TOE 8951-40

Output		TOE 8951-20	TOE 8951-40	TOE 8951-60	TOE 8951-80	TOE 8951-130
Voltage		0 - 20 V	0 - 40 V	0 - 60 V	0 - 80 V	0 - 130 V
Current		0 - 40 A	0 - 20 A	0 - 14 A	0 - 10 A	0 - 6 A
Power adjustable in range		20 - 400 W	20 - 400 W	20 - 400 W	20 - 400 W	20 - 400 W
Setting resolution	Voltage	5 mV	10 mV	10 mV	20 mV	20 mV
	Current	10 mA	5 mA	2 mA	2 mA	1 mA
	Power	0,1 W	0.1 W	0.1 W	0.1 W	0,1 W
Setting accuracy	Voltage	0,1 % + 10 mV	0.1 % + 20 mV	0.1 % + 30 mV	0.1 % + 40 mV	0,1 % + 60 mV
	Current	0,2 % + 40 mA	0.2 % + 20 mA	0.2 % + 15 mA	0.2 % + 10 mA	0,2 % + 5 mA
	Power	0,4 % + 1 W	0.4 % + 1 W	0.4 % + 1 W	0.4 % + 1 W	0,4 % + 1 W
Deviation in regulation with 100 % change in load	Voltage	10 <sup>-4</sup> + 5 mV	10 <sup>-4</sup> + 5 mV	10 <sup>-4</sup> + 5 mV	10 <sup>-4</sup> + 5 mV	10 <sup>-4</sup> + 5 mV
	Current	5 x 10 <sup>-4</sup> + 20 mA	5 x 10 <sup>-4</sup> + 10 mA	5 x 10 <sup>-4</sup> + 7 mA	5 x 10 <sup>-4</sup> + 5 mA	5 x 10 <sup>-4</sup> + 2 mA
With change in line voltage ± 10 %		5 x 10 <sup>-5</sup>	5 x 10 <sup>-5</sup>	5 x 10 <sup>-5</sup>	5 x 10 <sup>-5</sup>	5 x 10 <sup>-5</sup>
Regulation time with change in load from 20 % to 100 % I <sub>rated</sub> Tolerance: 0.2 % V <sub>rated</sub>		100 µs	100 µs	100 µs	100 µs	100 µs
Setting time of output voltage with change in setpoint 0 V to V <sub>rated</sub> no-load/full load V <sub>rated</sub> to 1 V no-load/full load		6 ms/10 ms 30 ms/8 ms	8 ms/10 ms 50 ms/10 ms	10 ms/15 ms 100 ms/25 ms	15 ms/20 ms 200 ms/50 ms	50 ms/60 ms 1,5 s/400 ms
Residual ripple (rms) 10 Hz to 10 MHz	Voltage	3 mV	3 mV	6 mV	10 mV	12 mV
	Current	12 mA	10 mA	7 mA	5 mA	2 mA
Measuring accuracy	Voltage	0,1 % + 20 mV	0.1 % + 30 mV	0.1 % + 45 mV	0.1 % + 60 mV	0,1 % + 80 mV
	Current	0,2 % + 60 mA	0.2 % + 30 mA	0.2 % + 20 mA	0.2 % + 15 mA	0,2 % + 10 mA
	Power	0,4 % + 1 W	0.4 % + 1 W	0.4 % + 1 W	0.4 % + 1 W	0,4 % + 1 W
Temperature coefficient	Voltage	10 <sup>-4</sup> /K	10 <sup>-4</sup> /K	10 <sup>-4</sup> /K	10 <sup>-4</sup> /K	10 <sup>-4</sup> /K
	Current	10 <sup>-4</sup> /K	10 <sup>-4</sup> /K	10 <sup>-4</sup> /K	10 <sup>-4</sup> /K	10 <sup>-4</sup> /K
Analog interface Control voltage (reference potential is the negative pole of the output)		0 - 5 V for 0 - 5 V for	0 - 20 V 0 - 20 A	0 - 60 V 0 - 14 A	0 - 80 V 0 - 10 A	0 - 130 V 0 - 6 A
Protection functions Adjustment range for OVP Adjustment range for limit		3 - 22 V 0 - 20 V	3 - 44 V 0 - 40 V	3 - 66 V 0 - 60 V	3 - 88 V 0 - 80 V	3 - 143 V 0 - 130 V
Resistant to feedback	Voltage	100 V	100 V	100 V	100 V	160 V
	Current	40 A	20 A	14 A	10 A	6 A



TOE 8952-40

## Technical specifications Dual-output power supplies

### TOE 8952

Output		TOE 8952-20	TOE 8952-40	TOE 8952-60	TOE 8952-80	TOE 8952-130
Voltage		2 x 0 - 20 V	2 x 0 - 40 V	2 x 0 - 60 V	2 x 0 - 80 V	2 x 0 - 130 V
Current		2 x 0 - 20 A	2 x 0 - 10 A	2 x 0 - 7 A	2 x 0 - 5 A	2 x 0 - 3 A
Power adjustable in range		2 x 10 - 200 W	2 x 10 - 200 W	2 x 10 - 200 W	2 x 10 - 200 W	2 x 10 - 200 W
Setting resolution	Voltage	5 mV	10 mV	10 mV	20 mV	20 mV
	Current	5 mA	2 mA	1 mA	1 mA	1 mA
	Power	0,1 W	0.1 W	0.1 W	0.1 W	0,1 W
Setting accuracy	Voltage	0,1 % + 10 mV	0.1 % + 20 mV	0.1 % + 30 mV	0.1 % + 40 mV	0,1 % + 60 mV
	Current	0,2 % + 20 mA	0.2 % + 10 mA	0.2 % + 7 mA	0.2 % + 5 mA	0,2 % + 3 mA
	Power	0,4 % + 1 W	0.4 % + 1 W	0.4 % + 1 W	0.4 % + 1 W	0,4 % + 1 W
Deviation in regulation with 100 % change in load	Voltage	10 <sup>-4</sup> + 5 mV	10 <sup>-4</sup> + 5 mV	10 <sup>-4</sup> + 5 mV	10 <sup>-4</sup> + 5 mV	10 <sup>-4</sup> + 5 mV
	Current	5 x 10 <sup>-4</sup> + 10 mA	5 x 10 <sup>-4</sup> + 5 mA	5 x 10 <sup>-4</sup> + 3 mA	5 x 10 <sup>-4</sup> + 2 mA	5 x 10 <sup>-4</sup> + 1,5 mA
With change in line voltage ± 10 %		5 x 10 <sup>-5</sup>	5 x 10 <sup>-5</sup>	5 x 10 <sup>-5</sup>	5 x 10 <sup>-5</sup>	5 x 10 <sup>-5</sup>
Regulation time with change in load from 20 % to 100 % I <sub>rated</sub> Tolerance: 0.2 % V <sub>rated</sub>		100 µs	100 µs	100 µs	100 µs	100 µs
Setting time of output voltage with change in setpoint 0 V to V <sub>rated</sub> no-load/full load V <sub>rated</sub> to 1 V no-load/full load		6 ms/10 ms 30 ms/8 ms	8 ms/10 ms 50 ms/10 ms	10 ms/15 ms 100 ms/25 ms	15 ms/20 ms 200 ms/50 ms	50 ms/60 ms 1,5 s/400 ms
Residual ripple (rms) 10 Hz to 10 MHz	Voltage	3 mV	3 mV	6 mV	10 mV	10 mV
	Current	10 mA	5 mA	3 mA	2 mA	1,5 mA
Measuring accuracy	Voltage	0,1 % + 20 mV	0.1 % + 30 mV	0.1 % + 45 mV	0.1 % + 60 mV	0,1 % + 80 mV
	Current	0,2 % + 30 mA	0.2 % + 10 mA	0.2 % + 7 mA	0.2 % + 5 mA	0,2 % + 5 mA
	Power	0,4 % + 1 W	0.4 % + 1 W	0.4 % + 1 W	0.4 % + 1 W	0,4 % + 1 W
Temperature coefficient	Voltage	10 <sup>-4</sup> /K	10 <sup>-4</sup> /K	10 <sup>-4</sup> /K	10 <sup>-4</sup> /K	10 <sup>-4</sup> /K
	Current	10 <sup>-4</sup> /K	10 <sup>-4</sup> /K	10 <sup>-4</sup> /K	10 <sup>-4</sup> /K	10 <sup>-4</sup> /K
Analog interface Control voltage (reference potential is the negative pole of the output)	0 - 5 V for	0 - 20 V	0 - 40 V	0 - 60 V	0 - 80 V	0 - 130 V
	0 - 5 V for	0 - 20 A	0 - 10 A	0 - 7 A	0 - 5 A	0 - 3 A
Protection functions Adjustment range for OVP Adjustment range for limit		3 - 22 V	3 - 44 V	3 - 66 V	3 - 88 V	3 - 143 V
		0 - 20 V	0 - 40 V	0 - 60 V	0 - 80 V	0 - 130 V
Resistant to feedback	Voltage	100 V	100 V	100 V	100 V	160 V
	Current	20 A	10 A	7 A	5 A	3 A

## General data

TOE 8951  
TOE 8952

### General data

<b>Output</b> Insulation	Floating and electrically isolated ± 250 V against ground
<b>RS 232 interface</b> Interface	9-pin D-SUB connector, electrically isolated from main output
Transfer rate	110 to 57,600 baud
Setting rate	Approx. 20 settings/s
Measuring rate	Approx. 15 measurements/s
Software	Command sequence in accordance with IEEE 488.2; SCPI
<b>Analog interface</b> Control voltage	0 - 5 V each for 0 - $V_{max}$ and 0 - $I_{max}$
Input impedance	Approx. 10 kOhm
<b>Line voltage</b>	115 V or 230 V ± 10 %, 47 - 63 Hz, the unit sets itself automatically to the existing line voltage
<b>Power consumption</b>	Approx. 680 VA
<b>Protective measures</b>	Protection class 1 in accordance with DIN EN 61010-1
<b>EMC</b>	EN 61326
<b>Operating temperature</b>	0 °C to 40 °C
<b>Storage temperature</b>	- 20 °C to 70 °C
<b>Reference temperature</b>	23 °C ± 1 °C
<b>Dimensions</b> with feet	224 x 88 x 405 mm (W x H x D) 224 x 103 x 405 mm (W x H x D)
<b>19" system</b>	½ 19", 2 HU
<b>Weight</b>	Approx. 5 kg
<b>Housing</b>	Aluminium/steel



Rear of unit  
Dual-output power supply with USB interface  
TOE 8952 series



TOE 8952-40

## Supplied accessories

- 1 power cord
- 1 instruction manual
- 1 RS 232 interface cable

Free driver for LabView™  
at [www.TOELLNER.de](http://www.TOELLNER.de)

## Ordering data/options

**TOE 8951**  
**TOE 8952**

## Ordering data

### Single-output power supplies

TOE 8951-20	Power supply	20 V / 40 A
TOE 8951-40	Power supply	40 V / 20 A
TOE 8951-60	Power supply	60 V / 14 A
TOE 8951-80	Power supply	80 V / 10 A
TOE 8951-130	Power supply	130 V / 6 A

### Dual-output power supplies

TOE 8952-20	Power supply	2 x 20 V / 20 A
TOE 8952-40	Power supply	2 x 40 V / 10 A
TOE 8952-60	Power supply	2 x 60 V / 7 A
TOE 8952-80	Power supply	2 x 80 V / 5 A
TOE 8952-130	Power supply	2 x 130 V / 3 A

### Interlock/inhibit options

The interlock and inhibit control options permit external enabling or OFF/ON switching of the main output by means of a switch or a TTL signal.

#### Interlock option TOE 8950/101

Control via contact	Control via TTL signal	Power supply output
Close	Low	<b>On</b>
Open	High	<b>Off</b>

#### Inhibit option TOE 8950/102

Control via contact	Control via TTL signal	Power supply output
Close	Low	<b>Off</b>
Open	High	<b>On</b>

## Options

### GPIB interface

TOE 8951/015	For TOE 8951-xx
TOE 8952/015	For TOE 8952-xx

### USB interface

TOE 8951/025	For TOE 8951-xx
TOE 8952/025	For TOE 8952-xx

### Arbitrary function in the unit

TOE 9151	For TOE 8951-xx
TOE 9152	For TOE 8952-xx

### PC software for curve generation

TOE 9751	For TOE 8951-xx
TOE 9752	For TOE 8952-xx

### Cables and adapters

TOE 9101	USB/GPIB adapter
TOE 9009	IEEE-488 cable, 2 m
TOE 9521	19" adapter, 2 HU asymmetric for single installation
TOE 9522	19" adapter, 2 HU parallel installation set for 2 units



19" adapter, TOE 9522  
2 HU, parallel installation set for 2 units of the TOE 8950 series

## Arbitrary power supplies





## Arbitrary power supplies

TOE 8805 to  
TOE 88165

160 W to 5200 W



TOE 8815

Arbitrary power supplies for generation of any voltage and current characteristics with an output power from 160 W to 5200 W. With exceptionally versatile and user-friendly software.

In addition to many predefined standard impulses for the automotive and avionics industries, the arbitrary power supplies of the TOE 8805 to TOE 88165 series additionally offer the option for generating completely optional waveforms. You can thus generate test voltages which perhaps may only be defined in the future.

They also provide dips and drops, load dump impulses, and many versions of complex voltages.

A comprehensive library of curves typical in vehicles provide the user with a reliable and versatile test instrument.

A further operating mode of these extremely universal arbitrary units is the simulation of wiring system ripple as encountered in vehicles or aircraft.

Ripples with frequencies from 20 Hz up to more than 70 kHz can be superimposed on the test curves or on a pure DC voltage.

All models starting with the TOE 8825 are of modular design and consist of an intelligent control unit and boosters connected in parallel.

In these extremely universal units, the major features of a high-speed power supply have been optimally combined with those of an arbitrary function generator.

### Software

The software included in the scope of delivery is extremely versatile, allows intuitive use, and permits generation of almost any waveforms within a very short time. Direct data importing from digital oscilloscopes and data recording equipment is also possible without problem.

Furthermore, the software has a library with standard curves from global vehicle manufacturers which is continuously updated.

### Output voltage

0 -16 V to 0 -100 V

### Output current

0 to 1.6 A to 0 to 320 A

### Output power

160 W to 5200 W

### Special features

- Generates any voltage and current characteristics
- Imports real-time signals from digital storage oscilloscopes or data recording systems
- Very high rise and fall rates of the output voltage: approx. 2 V/μs
- Brief load currents up to 1000 A
- User-friendly software
- GPIB and analog interfaces included as standard
- Vehicle electrics ripple:  
AC superimposition 6 V<sub>pp</sub>  
11 Hz to 70 kHz
- Internal sink function  
Brief load sink: 1000 W to  
16000 W, depends on model

## Arbitrary power supplies

TOE 8805 to  
TOE 88165

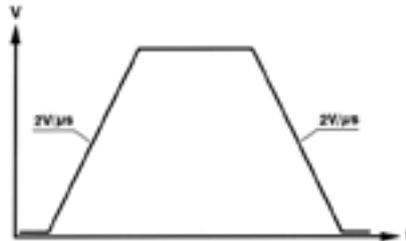
160 W to 5200 W



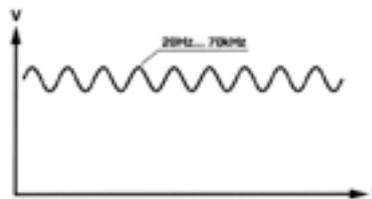
TOE 8815

### Special features

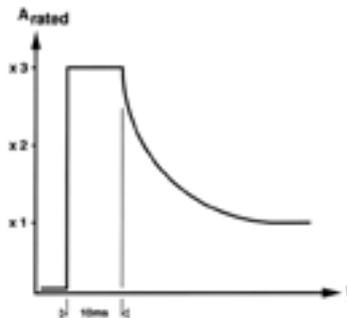
- Extremely high rise and fall rates of the output voltage: approx.  $2 \text{ V}/\mu\text{s}$
- GPIB and analog interfaces included as standard
- Vehicle electrics ripple:  
AC superimposition  $4 \text{ V}_{\text{pp}}$   
20 Hz to 70 kHz  
(TOE 8815 to TOE 8865)  
20 Hz to 50 kHz  
(TOE 8885 to TOE 88165)
- Brief load current:  
 $3 \times I_{\text{rated}}$  for approx. 10 ms  
(max. 1000 A)
- Internal sink function  
Brief load sink:  
1000 W to 16000 W,  
depends on model



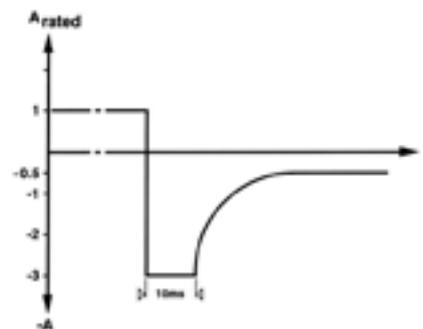
Rise and fall rates with  
TOE 8815 to TOE 88165



Vehicle electrics ripple with  
TOE 8810/107 option



Brief load current  $3 \times I_{\text{rated}}$   
TOE 8810/103 option



Brief load sink  
TOE 8810/107 option

Arbitrary power supplies

TOE 8805 to  
TOE 88165

160 W to 5200 W



TOE 8885

Overview

Output voltage

XX = voltage version	0 - 16 V	0 - 18 V	0 - 20 V	0 - 24 V	0 - 32 V	0 - 40 V	0 - 48 V	0 - 64 V	0 - 80 V	0 - 100 V	Power
TOE 8805-xx	0 - 10 A	0 - 9 A	0 - 8 A	0 - 7 A	0 - 5 A	0 - 4 A	0 - 3.5 A	0 - 2.5 A	0 - 2 A	0 - 1.6 A	160 W
TOE 8815-xx	0 - 20 A	0 - 18 A	0 - 16 A	0 - 14 A	0 - 10 A	0 - 8 A	0 - 7 A	0 - 5 A	0 - 4 A	0 - 3.2 A	320 W
TOE 8825-xx	0 - 40 A	0 - 36 A	0 - 32 A	0 - 27 A	0 - 20 A	0 - 16 A	0 - 14 A	0 - 10 A	0 - 8 A	0 - 6.4 A	640 W
TOE 8835-xx	0 - 60 A	0 - 54 A	0 - 48 A	0 - 42 A	0 - 30 A	0 - 24 A	0 - 21 A	0 - 15 A	0 - 12 A	0 - 10 A	960 W
TOE 8845-xx	0 - 80 A	0 - 72 A	0 - 64 A	0 - 56 A	0 - 40 A	0 - 32 A	0 - 28 A	0 - 20 A	0 - 16 A	0 - 13 A	1280 W
TOE 8855-xx	0 - 100 A	0 - 90 A	0 - 80 A	0 - 70 A	0 - 50 A	0 - 40 A	0 - 35 A	0 - 25 A	0 - 20 A	0 - 16 A	1600 W
TOE 8865-xx	0 - 120 A	0 - 110 A	0 - 100 A	0 - 80 A	0 - 60 A	0 - 50 A	0 - 40 A	0 - 30 A	0 - 25 A	0 - 20 A	1920 W
TOE 8885-xx	0 - 160 A	0 - 145 A	0 - 130 A	0 - 110 A	0 - 80 A	0 - 65 A	0 - 55 A	0 - 40 A	0 - 32 A	0 - 26 A	2560 W
TOE 88105-xx	0 - 200 A	0 - 180 A	0 - 160 A	0 - 135 A	0 - 100 A	0 - 80 A	0 - 70 A	0 - 50 A	0 - 40 A	0 - 32 A	3200 W
TOE 88115-xx	0 - 220 A	0 - 200 A	0 - 180 A	0 - 150 A	0 - 110 A	0 - 90 A	0 - 77 A	0 - 55 A	0 - 45 A	0 - 36 A	3600 W
TOE 88125-xx	0 - 240 A	0 - 215 A	0 - 195 A	0 - 160 A	0 - 120 A	0 - 96 A	0 - 80 A	0 - 60 A	0 - 48 A	0 - 40 A	3840 W
TOE 88145-xx	0 - 280 A	0 - 250 A	0 - 225 A	0 - 190 A	0 - 140 A	0 - 115 A	0 - 95 A	0 - 70 A	0 - 56 A	0 - 45 A	4480 W
TOE 88165-xx	0 - 320 A	0 - 285 A	0 - 260 A	0 - 215 A	0 - 160 A	0 - 130 A	0 - 110 A	0 - 80 A	0 - 64 A	0 - 52 A	5200 W

e.g.: 0 - 24 V, 0 - 56 A, 1280 W: TOE 8845-24

ISO 7637-2  
Pulse 4



Start pulse

## Arbitrary function

### TOE 8805 to TOE 88165

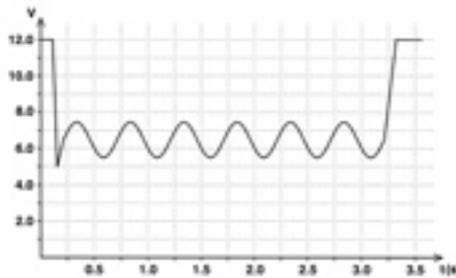
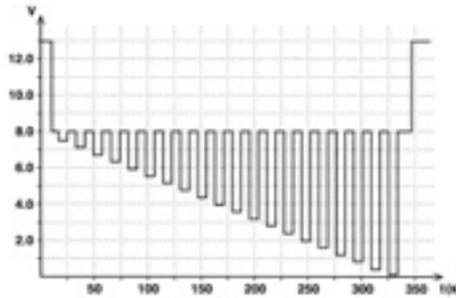
#### Arbitrary function

The arbitrary power supplies are equipped with an integral curve memory. They are thus able to execute entered curves autonomously, even without a PC connection. A burst function defines the number of desired curve sweeps.

#### Application examples

- Simulation of standard test pulses in accordance with ISO 7637-2, ISO 16750, DIN 40839
- Starting processes in vehicles (cranking)
- Simulation of real starting processes recorded in vehicles
- Troubleshooting with real recorded signals
- Line voltage ripple
- Dips and reset response
- Ramp-type rise and fall
- Determination and development of own specifications for developments
- Defined charging processes for batteries

Curve is loaded via GPIB interface into the device-internal arbitrary memory.



#### Technical specifications

Number of steps	1000
Step data	Voltage, current, step time
Step time	200 $\mu$ s to 100 s
Curve triggering	Manual, via GPIB or TTL signal
Number of sweeps	1 to 255 or $\infty$

## Software for curve generation

### TOE 8805 to TOE 88165



TOE 8815

The new and extremely powerful software is used to generate freely-selectable waveforms. Both voltage and current waveforms can be generated.

Oscilloscope signals recorded in a vehicle can be read in directly and subsequently simulated. It is then possible to simulate, for example, voltage dips during the starting process and also noise voltages on the vehicle electrics rapidly and without problem.

Standardized test pulses from DIN 16750 or ISO 7637, such as load dump test pulses (also clipped), jump starts, reset response, and manufacture-specific test curves, can be simulated. These are included in the scope of delivery.

New and future versions of manufacturer-specific test curves can be generated rapidly and without problem.

#### Curve input

Curves can be generated within a short time using an easy-to-use GUI. No programming knowledge is required. Linear rise/fall as well as signal superimpositions such as sine, triangle, square and e-functions are possible. A table with numerical values is simultaneously generated parallel to the graphic input. Curve values can also be adapted and entered here in a convenient manner.

#### Data import

ASCII files can be read in using the import function. In this manner, oscilloscope signals from all well-known manufacturers can be imported without data adaptation.

It is thus also possible to import Excel tables which have been saved as CSV files. These real curves can be additionally varied using drag-and-drop. It is then possible e.g. to simulate the statuses of batteries.

#### Standard test pulses

A comprehensive library of waveforms with predefined standard curves from ISO 7637-2, ISO 16750 as well as manufacturer standards are included in the scope of delivery. These include the most important manufacturer pulses from Daimler, BMW, VW, Peugeot, Renault, etc. All components of these pulses can be changed as desired, without requiring an update liable to charges. You can therefore have new and future manufacturer versions available immediately without any waiting period. Your own modifications and adaptations are thus possible.

## Technical specifications

### TOE 8805 to TOE 88165

#### Technical specifications

<b>Output voltage</b>	<b>0 - 16 V</b>	<b>0 - 18 V</b>	<b>0 - 20 V</b>	<b>0 - 24 V</b>	<b>0 - 32 V</b>
Resolution	1 mV	1 mV	2 mV	2 mV	2 mV
Setting accuracy	0.025 % + 10 mV				
Measuring accuracy	0.1 % + 10 mV				
Monitor voltage 0 to 10 V, accuracy 0.1 % +	10 mV	20 mV	20 mV	20 mV	20 mV
<b>Voltage stabilization</b>					
Change in load 0 to 100 %	$2 \times 10^{-5} + 2 \text{ mV}$				
Change in line voltage $\pm 10\%$	$5 \times 10^{-5}$				
Change in temperature	$10^{-4}/\text{K}$	$10^{-4}/\text{K}$	$10^{-4}/\text{K}$	$10^{-4}/\text{K}$	$10^{-4}/\text{K}$
Residual ripple $V_{pp}$ (bandwidth 1 MHz)	$2.0 \text{ mV}_{\text{rms}}$	$2.0 \text{ mV}_{\text{rms}}$	$1.0 \text{ mV}_{\text{rms}}$	$1.0 \text{ mV}_{\text{rms}}$	$1.0 \text{ mV}_{\text{rms}}$
Drift within 8 hours	$10^{-4}$	$10^{-4}$	$10^{-4}$	$10^{-4}$	$10^{-4}$
Regulation time with change in load from 20 % to 100 % and setting to within 0.2 % $V_{\text{rated}}$	< 600 $\mu\text{s}$	< 600 $\mu\text{s}$	< 300 $\mu\text{s}$	< 300 $\mu\text{s}$	< 300 $\mu\text{s}$
Setting time of output voltage with change in setpoint, C = off (no-load/rated load)					
0 V to $V_{\text{rated}}$ , $t_r$ (10 to 90 %) typ.	< 10 $\mu\text{s}$	< 11 $\mu\text{s}$	< 12 $\mu\text{s}$	< 15 $\mu\text{s}$	< 20 $\mu\text{s}$
$V_{\text{rated}}$ to 0 V, $t_f$ (90 to 10 %) typ.	< 10 $\mu\text{s}$	< 11 $\mu\text{s}$	< 12 $\mu\text{s}$	< 15 $\mu\text{s}$	< 20 $\mu\text{s}$
<b>External voltage control</b>					
Control voltage 0 to 10 V	0 - 16 V	0 - 18 V	0 - 20 V	0 - 24 V	0 - 32 V
Accuracy	0.1 % + 10 mV	0.1 % + 20 mV			
Cut-off frequency (-3 dB), C = off, typ.	3.5 kHz				



TOE 8815

0 - 40 V	0 - 48 V	0 - 64 V	0 - 80 V	0 - 100 V
5 mV 0.025 % + 10 mV 0.1 % + 10 mV 30 mV	5 mV 0.025 % + 20 mV 0.1 % + 20 mV 30 mV	5 mV 0.025 % + 20 mV 0.1 % + 20 mV 30 mV	5 mV 0.025 % + 20 mV 0.1 % + 20 mV 30 mV	10 mV 0.025 % + 20 mV 0.1 % + 20 mV 40 mV
$2 \times 10^{-5} + 2 \text{ mV}$ $5 \times 10^{-5}$ $10^{-4}/K$ $1.0 \text{ mV}_{\text{rms}}$ $10^{-4}$	$2 \times 10^{-5} + 2 \text{ mV}$ $5 \times 10^{-5}$ $10^{-4}/K$ $1.0 \text{ mV}_{\text{rms}}$ $10^{-4}$	$2 \times 10^{-5} + 2 \text{ mV}$ $5 \times 10^{-5}$ $10^{-4}/K$ $1.0 \text{ mV}_{\text{rms}}$ $10^{-4}$	$2 \times 10^{-5} + 2 \text{ mV}$ $5 \times 10^{-5}$ $10^{-4}/K$ $1.0 \text{ mV}_{\text{rms}}$ $10^{-4}$	$2 \times 10^{-5} + 2 \text{ mV}$ $5 \times 10^{-5}$ $10^{-4}/K$ $1.0 \text{ mV}_{\text{rms}}$ $10^{-4}$
< 200 $\mu\text{s}$				
< 25 $\mu\text{s}$ < 25 $\mu\text{s}$	< 30 $\mu\text{s}$ < 30 $\mu\text{s}$	< 40 $\mu\text{s}$ < 40 $\mu\text{s}$	< 50 $\mu\text{s}$ < 50 $\mu\text{s}$	< 60 $\mu\text{s}$ < 60 $\mu\text{s}$
0 - 40 V 0.1 % + 30 mV 3.5 kHz	0 - 48 V 0.1 % + 30 mV 1.5 kHz	0 - 64 V 0.1 % + 30 mV 1.5 kHz	0 - 80 V 0.1 % + 30 mV 1.5 kHz	0 - 100 V 0.1 % + 30 mV 1.5 kHz

## Technical specifications

### TOE 8805 to TOE 88165

#### Technical specifications

<b>Output current</b>	<b>Up to ≤ 5 A</b>	<b>Up to ≤ 10 A</b>	<b>Up to ≤ 20 A</b>	<b>Up to ≤ 40 A</b>	<b>Up to ≤ 80 A</b>
Resolution	1 mA	1 mA	2 mA	2 mA	5 mA
Setting accuracy	0.1 % + 10 mA	0.1 % + 10 mA	0.1 % + 20 mA	0.1 % + 40 mA	0.1 % + 80 mA
Measuring accuracy	0.1 % + 10 mA	0.1 % + 10 mA	0.1 % + 20 mA	0.1 % + 40 mA	0.1 % + 80 mA
Monitor voltage 0 to 10 V	0 - $I_{rated}$	0 - $I_{rated}$	0 - $I_{rated}$	0 - $I_{rated}$	0 - $I_{rated}$
Accuracy	0.1 % + 10 mA	0.1 % + 10 mA	0.1 % + 20 mA	0.1 % + 40 mA	0.1 % + 80 mA
<b>Current stabilization</b>					
Change in load 0 to 100 %	$2 \times 10^{-4}$	$2 \times 10^{-4}$	$2 \times 10^{-4}$	$2 \times 10^{-4}$	$2 \times 10^{-4}$
Change in line voltage ± 10 %	$10^{-4}$	$10^{-4}$	$10^{-4}$	$10^{-4}$	$10^{-4}$
Change in temperature	$2 \times 10^{-4}/K$	$2 \times 10^{-4}/K$	$2 \times 10^{-4}/K$	$2 \times 10^{-4}/K$	$2 \times 10^{-4}/K$
Residual ripple $I_{rms}$ (bandwidth 1 MHz)	0.5 mA <sub>rms</sub>	1 mA <sub>rms</sub>	1 mA <sub>rms</sub>	1 mA <sub>rms</sub>	1 mA <sub>rms</sub>
Drift within 8 hours	$5 \times 10^{-4}$	$5 \times 10^{-4}$	$5 \times 10^{-4}$	$5 \times 10^{-4}$	$5 \times 10^{-4}$
Setting time of output current with change in setpoint, C = off (no-load/rated load)					
0 A to $I_{rated}$ , $t_r$ (10 - 90 %) typ.	< 0.2 ms	< 0.2 ms	< 0.2 ms	< 0.2 ms	< 0.2 ms
$I_{rated}$ to 0 A, $t_f$ (90 - 10 %) typ.	< 0.2 ms	< 0.2 ms	< 0.2 ms	< 0.2 ms	< 0.2 ms
<b>External current control</b>					
Control voltage 0 to 10 V	0 - $I_{rated}$	0 - $I_{rated}$	0 - $I_{rated}$	0 - $I_{rated}$	0 - $I_{rated}$
Accuracy	0.4 % + 10 mA	0.4 % + 10 mA	0.4 % + 20 mA	0.4 % + 40 mA	0.4 % + 80 mA
Cut-off frequency (-3 dB), C = off, typ.	3.5 kHz	3.5 kHz	3.5 kHz	3.5 kHz	3.5 kHz



TOE 8815

Up to ≤ 120 A	Up to ≤ 160 A	Up to ≤ 200 A	Up to ≤ 260 A	Up to ≤ 320 A
10 mA	10 mA	20 mA	20 mA	20 mA
0.1 % + 100 mA	0.1 % + 100 mA	0.1 % + 120 mA	0.1 % + 130 mA	0.1 % + 160 mA
0.1 % + 100 mA	0.1 % + 100 mA	0.1 % + 120 mA	0.1 % + 130 mA	0.1 % + 160 mA
0 - I <sub>rated</sub>				
0.1 % + 100 mA	0.1 % + 100 mA	0.1 % + 120 mA	0.1 % + 130 mA	0.1 % + 160 mA
2 x 10 <sup>-4</sup>				
10 <sup>-4</sup>				
2 x 10 <sup>-4</sup> /K				
1 mA <sub>rms</sub>	2 mA <sub>rms</sub>	2 mA <sub>rms</sub>	2 mA <sub>rms</sub>	2 mA <sub>rms</sub>
5 x 10 <sup>-4</sup>				
< 0.2 ms				
< 0.2 ms				
0 - I <sub>rated</sub>				
0.4 % + 100 mA	0.4 % + 100 mA	0.4 % + 120 mA	0.4 % + 150 mA	0.4 % + 160 mA
2.0 kHz				

## General data

### TOE 8805 to TOE 88165

#### Display

Voltage/current Separately on two 5-digit displays

Address IEEE device address or memory address

#### Memory for instrument settings

Memory locations 100 complete instrument settings for power supply mode and one setting in the non-volatile memory for the instrument status when switching off

#### Arbitrary function

Interpolation points 2 to 1000

Interpolation point data Voltage, current and step size

Step size 200  $\mu$ s to 100 s and  $\infty$ , separately adjustable for each interpolation point

Sequence mode Continuous or burst with 1 to 255 sweeps

Triggering Manually on keypad, remote-controlled by bus command, or external trigger (TTL)

Saving 1 complete function sequence with the data for 1000 interpolation points is saved in the internal non-volatile memory; external saving of function sequences on SRAM memory card according to JEIDA 4.0 standard with max. capacity of 2 MB

#### IEEE bus control

Interface standard Electrically isolated; in accordance with IEEE 488.1

Software standard In accordance with IEEE 488.2

Device address 0 to 30

Measuring rate > 8 measurements/s for voltage and current, > 12 measurements/s for voltage or current

#### Setting times

Voltage/current < 50 ms

Capacitor < 2 s (because of charging and discharging)

Power supply memory < 150 ms for storage; < 50 ms (< 2 s with capacitor switching) for recalling

Relay matrix < 30 ms

Arbitrary function < 30 ms for start < 30 ms for stop < 5 s for linear curve calculation, dependent on number of interpolation points < 200 ms for direct interpolation point storage < 50 ms for direct interpolation point recalling

Memory card < 5 s for storage; < 5 s for recalling

Other < 60 ms

#### Relay matrix

Trigger Manually on keypad or remote-controlled by IEEE bus command

Number of relays 4 relays with one NO contact each

Contact rating  $\leq 10$  W;  $\leq 200$  V and  $\leq 0.5$  A

## Options

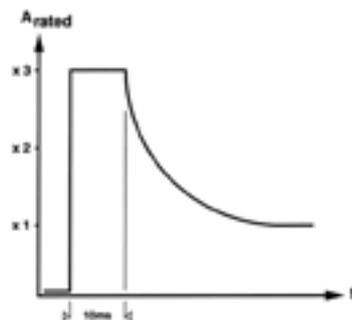
### TOE 8805 to TOE 88165

Various options available for the TOE 8805 to 88165 arbitrary power supplies.

All options are used for specific adaptation of the arbitrary power supplies to the respective task. They can be fitted individually, and sometimes together.

#### TOE 8810/103

Brief load current  $3 \times I_{rated}$ . Units equipped with this option deliver three times the rated current for approx. 10 ms.



Brief load current with TOE 8810/103 option

#### Vehicle electrics ripple / AC superimposition

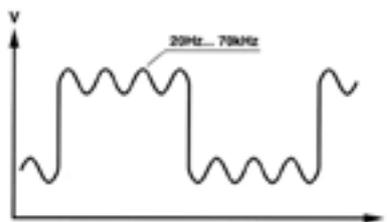
The TOE 8810/107 option permits simulation of vehicle electrics ripple in the frequency range from 20 Hz to 70 kHz with an amplitude of  $4 V_{pp}$ . Since this AC voltage is fed from an external signal generator, you can superimpose sine, triangle or square signals on the saved test curves or also on a pure DC voltage.

#### TOE 8810/107 M (only TOE 8815 to 88165)

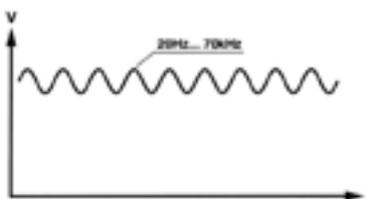
Permits vehicle electrics ripple / AC superimposition in the frequency range from 20 Hz to 70 kHz and is simultaneously a brief load sink of 1 kW (for master device).

#### TOE 8810/107 B

Like TOE 8810/107 M, but for booster devices. The brief load sink power per booster is approx. 1 kW.



Vehicle electrics ripple with TOE 8810/107 option

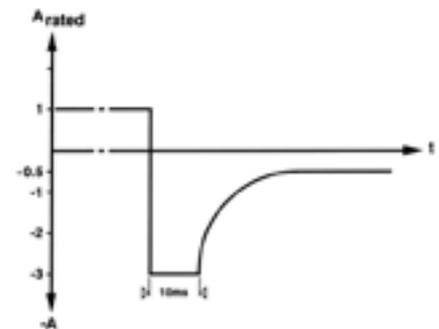


Vehicle electrics ripple with TOE 8810/107 option

#### Sink mode

The TOE 8810/107 option is able in sink mode to rapidly discharge large capacitances. A sink current is briefly reached in the process which corresponds to three times the source current of the arbitrary power supply.

The TOE 8815-32 model, for example, provides a continuous output power of 320 W. A maximum brief load sink power of approx. 1000 W is achieved with the TOE 8810/107 option; a capacitance of 10000  $\mu\text{F}$  can be discharged in this case from 14 V to 4 V in 3 ms.



Brief load sink TOE 8810/107 option

## Mechanical designs

### TOE 8805 to TOE 8825



#### TOE 8805

160 W output power

Dimensions:

½ 19" x 3 HU x 400 mm (W x H x D)

Weight: approx. 9 kg



#### TOE 8815

320 W output power

Dimensions:

19" x 3 HU x 400 mm (W x H x D)

Weight: approx. 18 kg



#### TOE 8825

640 W output power

Dimensions:

19" x 6 HU x 400 mm (W x H x D)

Weight: approx. 36 kg

## Mechanical designs

### TOE 8835 to TOE 88125 TOE 88145 to TOE 88165



TOE 8885

#### TOE 8835 to TOE 88125

960 W to 3840 W output power

These units are supplied in a mobile 19" rack (LabMobil); 15 HU to 37 HU. Weight 110 kg to 320 kg. The models starting at TOE 8845 have a power-on module to limit the inrush current.



TOE 88145

#### TOE 88145 to TOE 88165

4480 W to 5200 W output power

These units are supplied in two mobile 19" racks (LabMobil); 2 x 26 HU. Weight 2 x 210 kg to 2 x 230 kg. These units have a power-on module to limit the inrush current.

## General data/accessories/options

### TOE 8805 to TOE 88165

#### Supplied accessories

- 1 power cord
- 1 instruction manual
- 1 memory card 128 KB
- Arbitrary software
- Software driver LabView

#### General data

<b>Power output</b>	Floating and electrically isolated, standby/execute directly switchable
<b>Output terminals</b>	TOE 8805, TOE 8815: at front, and parallel at rear TOE 8825, TOE 8835, TOE 8845, TOE 8855, TOE 8865, TOE 8885, TOE 88105, TOE 88125, TOE 88145, TOE 88165: at rear
<b>Insulation</b>	± 250 V against ground
<b>Line voltage</b>	115 V/230 V ± 10 %, 47 Hz to 63 Hz
<b>Power consumption</b>	TOE 8805: approx. 360 VA TOE 8815: approx. 750 VA TOE 8825: approx. 1500 VA TOE 8835: approx. 2250 VA TOE 8845: approx. 3000 VA
<b>Line voltage</b>	400 V ± 10 %, 47 Hz to 63 Hz, 3-phase
<b>Power consumption</b>	TOE 8855: approx. 3750 VA TOE 8865: approx. 4500 VA TOE 8885: approx. 6000 VA TOE 88105: approx. 7500 VA TOE 88115: approx. 8250 VA TOE 88125: approx. 9000 VA TOE 88145: approx. 10500 VA TOE 88165: approx. 12000 VA
<b>Protective measures</b>	Protection class 1 in accordance with DIN 57411/VDE 0411 Part 1
<b>Line fuse</b>	115 V: T 4 L; 230 V: T 2.5 L for TOE 8805 115 V: T 8 L; 230 V: T 4 L for each 320 W of output power in accordance with IEC 127-2/III, DIN 41662
<b>Operating temperature</b>	0 °C to 40 °C
<b>Reference temperature</b>	23 °C
<b>Storage temperature</b>	-20 °C to 70 °C
<b>Warm-up time</b>	Approx. 30 min

#### Dimensions in mm

TOE 8805 216 x 132 x 437 mm (W x H x D), height with feet 147  
TOE 8815 to TOE 8865 434 x 134.5 x 437 mm (W x H x D)  
for each 320 W of output power  
TOE 8805: 19" system: system-compatible with ½ 19", 3 HU  
TOE 8815 - TOE 88165; system-compatible with 19", 3 HU for each 320 W of output power

#### Housing

Aluminium

#### Weight

TOE 8805: approx. 9 kg  
TOE 8815 to TOE 88165: approx. 18 kg for each 320 W of output power

## Options

TOE 8810/103

Brief load current  $3 \times I_{rated}$

TOE 8810/107 M (only TOE 8815 to TOE 88165)

External superimposition and brief load sink (master)

TOE 8810/107 B

External superimposition and brief load sink (booster)

TOE 9101

USB GPIB controller

TOE 9009

GPIB 488 cable, 2 m

TOE 9502

19" adapter, 3 HU for single installation, TOE 8805-xx

TOE 9508

19" adapter, 3 HU parallel installation set for 2 x 8805-xx

TOE 9512

19" adapter, 3 HU for TOE 8815-xx to TOE 8825-xx



TOE 9101 USB GPIB controller

Ordering data

TOE 8805 to  
TOE 88165



TOE 8885

Ordering data

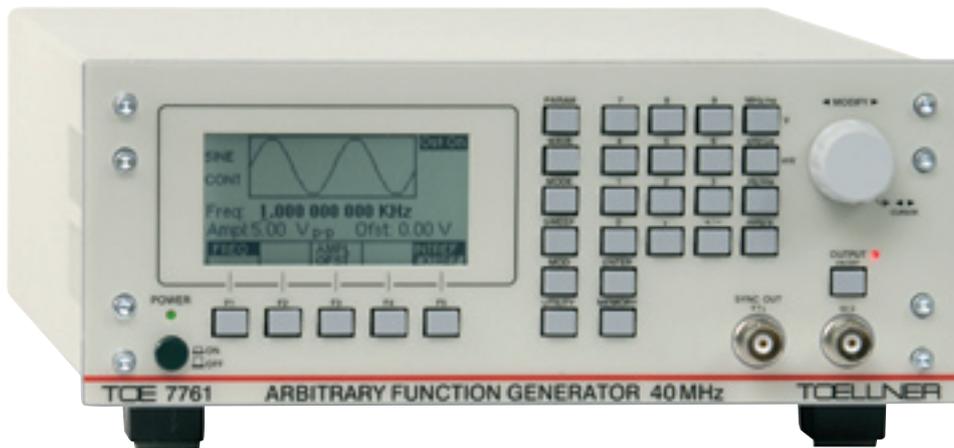
Voltage version	16 V	18 V	20 V	24 V	32 V	40 V	48 V	64 V	80 V	100 V	Output power
TOE 8805	-16	-18	-20	-24	-32	-40	-48	-64	-80	-100	160 W
TOE 8815	-16	-18	-20	-24	-32	-40	-48	-64	-80	-100	320 W
TOE 8825	-16	-18	-20	-24	-32	-40	-48	-64	-80	-100	640 W
TOE 8835	-16	-18	-20	-24	-32	-40	-48	-64	-80	-100	960 W
TOE 8845	-16	-18	-20	-24	-32	-40	-48	-64	-80	-100	1280 W
TOE 8855	-16	-18	-20	-24	-32	-40	-48	-64	-80	-100	1600 W
TOE 8865	-16	-18	-20	-24	-32	-40	-48	-64	-80	-100	1920 W
TOE 8885	-16	-18	-20	-24	-32	-40	-48	-64	-80	-100	2560 W
TOE 88105	-16	-18	-20	-24	-32	-40	-48	-64	-80	-100	3200 W
TOE 88115	-16	-18	-20	-24	-32	-40	-48	-64	-80	-100	3600 W
TOE 88125	-16	-18	-20	-24	-32	-40	-48	-64	-80	-100	3840 W
TOE 88145	-16	-18	-20	-24	-32	-40	-48	-64	-80	-100	4480 W
TOE 88165	-16	-18	-20	-24	-32	-40	-48	-64	-80	-100	5200 W

Ordering example

TOE 8865-32 | 0 - 32 V, 0 - 60 A, 1920 W



Function generators  
Arbitrary generators



## Function generators Arbitrary generators

### Special features

- Function generators up to 44 MHz
- Power function generator with up to 63 W output power
- Arbitrary generator up to 40 MHz

Function generators and arbitrary generators represent the most interesting and versatile group of measuring instruments in the LF range nowadays.

Irrespective of the frequency range in which you are working, whether you require high or extremely low output voltages, whether you apply sweep functions or generate defined pulse sequences or audio surges, the TOELLNER range of function generators provides everything – with a convincing quality.

Function generators for standard functions, for sawtooth, pulses or other asymmetric functions – low-distortion function generators with high output voltage and maximum output power – function generators which can be used triggered, pulsed, phase-coupled, with internal or external sweep-frequency control, and as broadband – function generators with integral frequency counter, digital display for various operating functions and crystal-controlled frequency setting. Exceptionally clear in concept, rugged, and practice-oriented.

The quality can be recognized in laboratory comparisons.

## Function generators Arbitrary generators

Series Page		Frequency		Max. V	Max. W	Interface	Highlights
		Min.	Max.				
<b>TOE 7401</b> II - 4		0.2 Hz	2 MHz	20 V <sub>pp</sub>	0.5 W	—	Low-price signal source for schools and training. Rugged and simple to use.
<b>TOE 7402/ 7404</b> II - 5		50 mHz	5 MHz	30 V <sub>pp</sub>	1.1 W	—	Low-price signal source with integral feedback voltage protection and frequency counter. Extremely rugged and simple to use.
<b>TOE 7704... 7711A</b> II - 6		1 mHz	44 MHz	30 V <sub>pp</sub>	1.1 W	—	Precise signal sources with sweep, trigger, PLL, AM and frequency counter. Universal laboratory devices with excellent properties.
<b>TOE 7741</b> II - 12		1 mHz	100 kHz	45 V <sub>pp</sub>	63 W	—	Power function generator with 63 W output power, feedback voltage protection and frequency counter. Extremely rugged.
<b>TOE 7761</b> II - 13		1 μHz	40 MHz	20 V <sub>pp</sub>	0.5 W	GPIB	Arbitrary function generators with 1,000,000 sampling points, 80 MS/s sampling rate and 14 bit resolution.



TOE 7401

## Function generator, 2 MHz

### TOE 7401

#### Special features

- Frequency range 0.2 Hz to 2 MHz
- External sweep-frequency control up to 100:1
- 3 signal waveforms
- 20 V output voltage
- 3 outputs: HI, LO, TTL

The TOE 7401 function generator is a universal, general-purpose signal source at affordable cost. Its design concept makes it equally suitable for use in education, servicing, test departments and laboratories.

All inputs and outputs are on the front panel and are no-load and short-circuit proof. The generator produces AC voltages with sine, triangle and square signal shapes over a frequency range from 0.2 Hz to 2 MHz. A TTL-compatible output is provided. The function generator can be controlled by an external sweep-frequency control signal fed into the VCO input.

External voltage protection can be provided as an option to protect the output amplifier against dangerous feedback.

#### Technical specifications

##### Functions and operating modes

Functions	Sine, triangle, square
Operating modes	Free-running, external sweep-frequency control

##### Frequency characteristics

Frequency range	0.2 Hz to 2 MHz in 6 decadic subranges
Frequency offset	± 5 %
Frequency error	2 % of full-scale value, 5 % of full-scale value in the range x 1 MHz

##### Drift

1 × 10 <sup>-3</sup> /K up to 200 kHz
5 × 10 <sup>-3</sup> /K up to 2 MHz
5 × 10 <sup>-3</sup> in 8 hours, in each case following 30 min warm-up time

##### Function output

Output amplitude	$V_{pp} = 7 \text{ mV to } 20 \text{ V}$
Output impedance	50 Ohm. The output is short-circuit and no-load proof

##### Feedback voltage protection

Up to ≤ 120 V (option)

DC offset	0 to ± 10 V
Output attenuator	40 dB continuously adjustable plus 30 dB fixed; via LO output (-30 dB)
Frequency response (sine, triangle)	0.8 dB up to 2 MHz

#### Function specification

At max. output voltage and 50 Ohm load

##### Sine

Distortion factor	< 0.5 % up to 50 kHz < 5 % up to 2 MHz
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##### Triangle

Linearity error	< 1 % up to 100 kHz
Symmetry error	< 1 % up to 100 kHz

##### Square

Transition time	< 50 ns
Overshoots	< 5 %

#### Other signal inputs and outputs

Synchronizing signal output	TTL-compatible Source impedance: 50 Ohm, 5 fan out
VCO modulation input	Approx. 5 V for a frequency variation ratio of 100:1

#### General data

Line voltage	115 V or 230 V ± 10 %, 47 Hz to 63 Hz
Power consumption	20 VA
Operating temperature	0 °C to 45 °C
Dimensions (W x H x D)	216 x 88.5 x 272 mm
Weight	Approx. 2.8 kg
Housing	Aluminium

## Options

TOE 7400/101	Feedback voltage protection
TOE 9008	Carrying handle
TOE 9507	1.9" adapter, 2 HU
TOE 9509	Parallel installation set 272, 2 HU

## Ordering data

Function generator | TOE 7401

# Function generators, 5 MHz with integral feedback voltage protection

TOE 7402  
TOE 7404



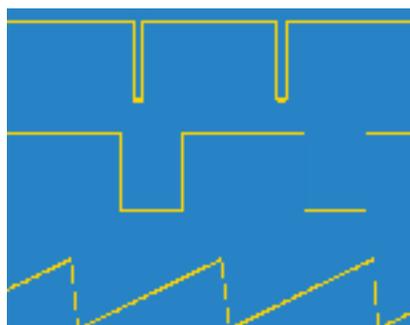
TOE 7404

The TOE 7402 and TOE 7404 function generators are compact, rugged and low-cost signal sources designed to meet everyday practical requirements.

The outstanding feature of these instruments is the frequency counter with LED for measuring both internal and external signal frequencies. The high output voltage of max.  $V_{pp} = 30\text{ V}$  will satisfy the requirements of most general-purpose laboratory or service tasks as well as the needs of applications in production plants or educational institutions. All inputs and outputs are absolutely no-load and short-circuit proof. The output amplifiers are guarded against dangerous feedback by an integral external voltage protection feature.

These generators have a frequency range of 0.5 Hz to 5 MHz and generate the following output functions: sine, triangle, square, pulse, amplifier and bipolar DC voltage. When in amplifier mode, the instruments perform as a broadband amplifier from DC up to approx. 5 MHz. All front panel input and output sockets are floating.

The TOE 7404 function generator corresponds to the standard TOE 7402 unit. In addition, it has an extended frequency range down to 50 mHz and a variable symmetry adjustment. The latter facility allows the generation of positive and negative pulses as well as rising or falling sawtooth functions in addition to the fundamental sine, triangle and square functions.



Variable symmetry with triangle and square

## Technical specifications

### Functions and operating modes

Functions	Sine, triangle, square, pulse, amplifier, DC, variable symmetry (TOE 7404)
Operating modes	Free-running, external sweep-frequency control, amplifier mode, frequency counter

### Frequency characteristics

Frequency range	TOE 7402 0.5 Hz to 5 MHz TOE 7404 0.05 Hz to 5 MHz in 6 decadic subranges
Frequency offset	$\pm 2\%$

### Frequency error

$\pm 2$  digits,  $< 5\%$  of full-scale value when using the scale

### Drift

$1 \times 10^{-3}/K$  up to 500 kHz  
 $3 \times 10^{-3}/K$  to 5 MHz  
 $5 \times 10^{-3}$  in 8 hours, in each case following 30 min warm-up time

### Function output

Output amplitude	$V_{pp} = 10\text{ mV}$ to 30 V, 15 V in pulse mode
Output impedance	50 Ohm. The output is no-load and short-circuit proof
Feedback voltage protection	Up to $\leq 120\text{ V}$
DC offset	0 to $\pm 10\text{ V}$
Output attenuator	30 dB continuously adjustable plus 20 or 40 dB steps, frequency response (sine, triangle): 0.03 dB, or 0.5 dB above 1 MHz

### Function specification

at max. output voltage and 50 Ohm load

#### Sine

Distortion factor	$< 0.5\%$ up to 100 kHz $< 5\%$ up to 5 MHz
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#### Triangle

Linearity error	$< 1\%$ to 100 kHz
Symmetry error	$< 1\%$ to 100 kHz

#### Square

Transition time	$< 28\text{ ns}$
Overshoots	$< 5\%$

#### Pulse

See square

#### Symmetry variation

10 % to 90 %  
500 kHz (TOE 7404)

#### $f_{max}$

#### Amplifier

Approx. 17 dB gain, DC up to approx. 5 MHz  
 $< 0.2\%$  up to 100 kHz,  $R_i = 10\text{ kOhm}$

#### Distortion factor

## Other signal inputs and outputs

Synchronizing signal output	TTL-compatible, source impedance: 50 Ohm, 5 fan out
VCO modulation input	Approx. 5 V for a frequency variation ratio of 1000:1
OCV output	0 to 5 V output voltage for a frequency change 1:1000
EXT IN	Amplifier input, max. input voltage 15 $V_{rms}$ , frequency counter input

## Frequency counter mode

Frequency range	$< 1\text{ Hz}$ to 30 MHz
Resolution	4 or 5 digits with autoranging
Accuracy	$\pm 2$ digits
Sensitivity	150 $mV_{rms}$ $< 10\text{ MHz}$ 250 $mV_{rms}$ $> 10\text{ MHz}$
Input impedance	1 MOhm    120 pF
Input protection	Up to 15 $V_{rms}$

## General data

<b>Line voltage</b>	115 V/230 V $\pm 10\%$ 47 Hz to 63 Hz
<b>Power consumption</b>	30 VA
<b>Operating temperature</b>	0 °C to 50 °C
<b>Dimensions</b> (W x H x D)	265 x 147 x 280 mm
<b>Weight</b>	Approx. 3.5 kg
<b>Housing</b>	Aluminium

## Options

TOE 9008	Carrying handle
TOE 9501	19" adapter, 3 HU
TOE 9503	19" rack module, 4 HU

## Ordering data

Function generator	TOE 7402
Function generator	TOE 7404



TOE 7711 A

## Synthesizers/function generators with sweep, trigger, AM and frequency counter

### TOE 7704 to TOE 7711 A

#### Special features

- Frequency range 1 mHz to 44 MHz
- Sweep, trigger, gate
- Variable symmetry
- Digital display of frequency, sweep, AC, DC
- Amplitude modulation
- Frequency counter up to 50 MHz

#### The function generators of the TOE 7700 range represent a series of completely novel design.

In addition to the usual standard signal shapes including variable signal symmetry, this range is equipped with a lin/log sweep oscillator which should satisfy the most demanding users.

Continuous or triggered sweeping is selectable, the lower and upper sweep limits are of course separately adjustable, and the sweep frequencies are precisely displayed by an integral frequency counter.

Many details reflect the latest advances in circuit technology: a wear-free spin-wheel for adjusting the output frequency and sweep time, an internally or externally usable frequency counter that employs a reciprocal counting method, and sophisticated new switching techniques allow signal qualities that were previously unattainable.

All inputs and outputs are floating, with the most important ones arranged on the front panel for ease of operation. A wide frequency range, an outstanding processing quality, and the clear and balanced design of the control panel round off the concept of these function generators.

The TOE 7706, TOE 7708 A and TOE 7711/7711 A models also offer signal triggering and gate mode.

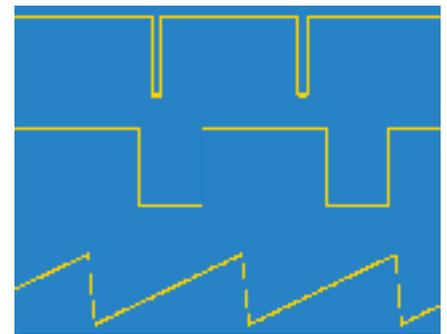
The TOE 7708 A and TOE 7711 A models are additionally able to work in amplitude modulation mode, resulting in a significantly wider range of application.

The TOE 7711/7711 A microprocessor-controlled synthesizers/function generators combine the variety of functions that characterize universal function generators with the stability of modern synthesizers. In PLL mode, the output frequency is controlled with crystal accuracy in the 10 Hz to 44 MHz range. The basic accuracy is  $2 \times 10^{-6}$  of the full-scale value, and the aging rate is only 2 ppm/year.

	TOE 7704	TOE 7706	TOE 7707	TOE 7708 A	TOE 7711	TOE 7711 A
<b>Frequency</b> Min (mHz)	1	1	1	1	1	1
Max (MHz)	12	12	22	22	44	44
Synthesizer					•	•
Frequency counter	•	•	•	•	•	•
<b>Signal waveforms</b>						
~ ~ ~ □, TTL, ECL	•	•	•	•	•	•
Pos./neg. pulse	•	•	•	•	•	•
Variable symmetry	•	•	•	•	•	•
Output ( $V_{pp}$ )	> 30 V	> 30 V	> 20 V	> 20 V	> 20 V	> 20 V
<b>Operating modes</b>						
Trigger/gate		•		•	•	•
Lin/log sweep	•	•	•	•	•	•
VCO, external	•	•	•	•	•	•
Amplitude modulation				•		•

## Technical specifications

### TOE 7704 to TOE 7711 A



Variable symmetry with triangle and square

#### Technical specifications

##### Functions and operating modes

Functions	Sine, triangle, square, pos./neg. pulse, TTL, ECL, variable symmetry, DC
Operating modes	Continuous, internal and external sweep-frequency control, amplifier mode, frequency counter
Trigger and gate modes	TOE 7706, TOE 7708 A, TOE 7711, TOE 7711 A
Amplitude modulation	TOE 7708 A, TOE 7711 A
Synthesizer mode (PLL)	TOE 7711, TOE 7711 A

##### Frequency characteristics

Frequency range TOE 7704, TOE 7706	1 MHz to 12 MHz (sine, triangle, square, pulse, TTL, ECL)
TOE 7707, TOE 7708 A	1 MHz to 22 MHz (sine, triangle, square, pulse, TTL, ECL)
TOE 7711, TOE 7711 A	1 MHz to 44 MHz (pulse, TTL, ECL) 1 MHz to 22 MHz (sine, triangle, square)
Resolution	3 ½ digits, 4 ½ digits in PLL-mode
Frequency error	± 1 LSD 2 x 10 <sup>-6</sup> in PLL-mode 5 % of full-scale value 1 MHz to 10 Hz
Drift	5 x 10 <sup>-8</sup> /K, 2 ppm/year in PLL mode 10 <sup>-3</sup> /K < 1 MHz, 3 x 10 <sup>-3</sup> /K > 1 MHz, 5 x 10 <sup>-3</sup> /8 h free-running; in each case following 30 min warm-up time

##### Function output at

##### OUTPUT Output amplitude

TOE 7704, TOE 7706	10 mV <sub>pp</sub> to 30 V <sub>pp</sub> , 5 mV <sub>pp</sub> to 15 V <sub>pp</sub> in pulse mode (open output)
TOE 7707, TOE 7708 A, TOE 7711, TOE 7711 A	7 mV <sub>pp</sub> to 20 V <sub>pp</sub> , 3 mV <sub>pp</sub> to 10 V <sub>pp</sub> in pulse mode (open output)

Impedance  
Z<sub>o</sub> = 50 Ohm/600 Ohm (switchable), the output is short-circuit and no-load proof

Feedback voltage protection  
Up to ≤ 120 V (optional)

DC offset  
0 V to ± 10 V

Output attenuator  
30 dB continuously adjustable plus 20 dB, 40 dB fixed attenuator (max. 70 dB)

Accuracy  
± 5 % (at max. amplitude; at 1 kHz for sine and triangle)

Drift  
± 0.05 % of full-scale value within 10 min ± 0.3 % of full-scale value within 8 hours

##### Frequency response

Sine	± 0.5 dB, ± 2 dB above 1 MHz
Triangle	± 0.5 % dB, ± 2.5 dB above 1 MHz

##### Display

Reference temperature

##### Sine

Distortion factor

##### Triangle

##### Square

Pulse

##### TTL OUT

Output level

t<sub>r</sub>/t<sub>f</sub>

##### ECL OUT

Output level

t<sub>r</sub>/t<sub>f</sub>

##### Variable symmetry

All functions

f<sub>max</sub>

f<sub>max</sub>

##### DC voltage

##### Operating modes

TOE 7704, TOE 7707

TOE 7706, TOE 7708 A,

TOE 7711, TOE 7711 A

Sweep

Range

TOE 7704, TOE 7706

TOE 7707, TOE 7708 A,

TOE 7711, TOE 7711 A

The output voltage is displayed in V<sub>pp</sub> or in ± V (for DC).  
The max. error is ± 5 % of full-scale

Function specification at max. output voltage and Z<sub>o</sub> = Z<sub>L</sub> = 50 Ohm

23 °C ± 1 °C

≤ 0.5 % up to 100 kHz, all harmonics are 26 dB below the fundamental wave up to 12 MHz (TOE 7704, TOE 7706), or up to 22 MHz (TOE 7707, TOE 7708 A, TOE 7711, TOE 7711 A)

Linearity and symmetry error ≤ 1 % up to 100 kHz

Transition time (10 % to 90 %) typ. 10 ns

Overshoots < 5 %

See square

0 V/5 V (typ.)

≤ 5 ns, Z<sub>o</sub> = 50 Ohm, Z<sub>L</sub> ≥ 50 Ohm

-0.9 V/-1.8 V (typ.)

≤ 2 ns, Z<sub>o</sub> = 50 Ohm, Z<sub>L</sub> ≥ 50 Ohm

Continuously adjustable from 10 % to 90 %

1.2 MHz

(TOE 7704, TOE 7706)

2.2 MHz

(TOE 7707, TOE 7708 A, TOE 7711, TOE 7711 A)

3 ranges with Z<sub>o</sub> = 50 Ohm/600 Ohm

0 to ± 0.1 V, 0 to ± 1 V, 0 to ± 10 V

Sweep, amplifier mode, frequency counter, VCO

Sweep, amplifier mode, trigger and gate modes, AM internal and external (only TOE 7708 A, TOE 7711 A), synthesizer mode (PLL with TOE 7711, TOE 7711 A), frequency counter

All functions, lin/log, rising, falling, continuously adjustable for internal and external trigger, hold, reset

1 MHz to 12 MHz

1 MHz to 22 MHz

## Technical specifications

### TOE 7704 to TOE 7711 A

<b>Sweep time</b>	1 ms to 1000 s
<b>Resolution</b>	2 digits
<b>Error</b>	$5 \times 10^{-5}$
<b>Sweep range</b>	3 decades (log), 2 decades (lin)
<b>Frequency output voltage</b>	Approx. 0 V (start frequency) to +5 V (stop frequency)
<b>Pen lift output</b>	TTL level, 0 V (return)
<b>Amplifier mode</b>	
Amplifier TOE 7704, TOE 7706	Approx. 17 dB, DC up to $\geq 12$ MHz
TOE 7707, TOE 7708 A, TOE 7711, TOE 7711 A	Approx. 14 dB, DC up to $\geq 12$ MHz Distortion factor < 0.2 % up to 100 kHz, input via "EXT IN"
Trigger and gate modes	(TOE 7706, TOE 7708 A, TOE 7711, TOE 7711 A)
Individual triggering	Manual, externally via "EXT IN" or internally with aid of integral sweep oscillator. Max. signal frequency approx. 12 MHz (TOE 7706), approx. 20 MHz (TOE 7708 A, TOE 7711, TOE 7711 A)
Tripping voltage	TTL level
Start phase	-90 ° to +90 °, continuously adjustable
Gate mode	Manual, externally via "EXT IN" or internally with aid of integral sweep oscillator. In/out ratio 50 %. Max. signal frequency approx. 12 MHz (TOE 7706), approx. 20 MHz (TOE 7708 A, TOE 7711, TOE 7711 A)
Tripping voltage	TTL level
Start phase	-90 ° to +90 °, continuously adjustable
Amplitude modulation	(only TOE 7708 A, TOE 7711 A) internal AM
Frequency range	1 mHz to 22 MHz carrier frequency (TOE 7708A, TOE 7711A) All functions except pulse, TTL, ECL
Modulation frequency	1 kHz
Modulation factor	0 % to 100 %
External AM	
Frequency range	1 mHz to 22 MHz carrier frequency All functions except pulse, TTL, ECL
Modulation frequency	DC up to 500 kHz
Modulation factor	0 % to 200 %
Modulation voltage	2.5 V <sub>pp</sub> for 50 % AM

## Sweep modes



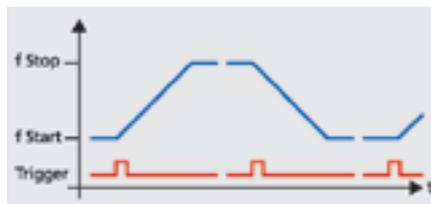
Continuous sweep with reset after the start pulse



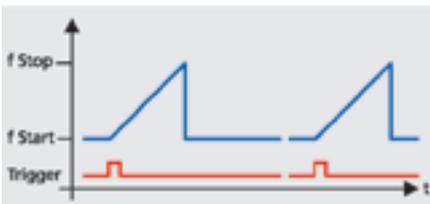
Triggered sweep with hold and triggered reset



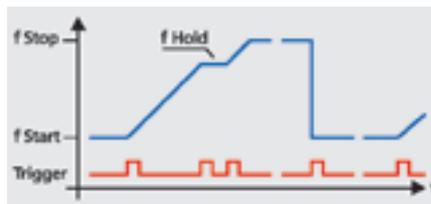
Continuous sweep with reverse after the start pulse



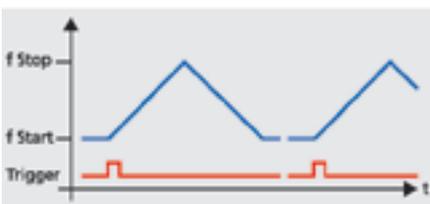
Triggered sweep with hold and triggered reverse



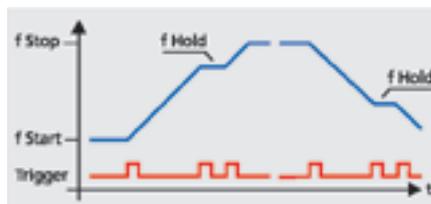
Triggered sweep with reset



Triggered sweep with triggered hold and triggered reset



Triggered sweep with reverse



Triggered sweep with triggered hold and triggered reverse

## Trigger, gate, AM

### Individual triggering

Manual, externally via "EXT IN" or internally with aid of integral sweep oscillator. Max. signal frequency approx. 12 MHz (TOE 7706), approx. 20 MHz (TOE 7708 A, TOE 7711, TOE 7711 A)

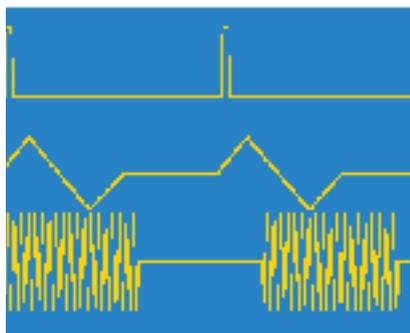
### Tripping voltage

TTL level

Start phase:  $-90^\circ$  to  $+90^\circ$ , continuously adjustable.

### Gate mode

Manual, externally via "EXT IN" or internally with aid of integral sweep oscillator. In/out ratio 50 %. Max. signal frequency approx. 12 MHz (TOE 7706), approx. 20 MHz (TOE 7708 A, TOE 7711, TOE 7711 A).



Output signals in trigger and gate modes

### Tripping voltage

TTL level

Start phase:  $-90^\circ$  to  $+90^\circ$ , continuously adjustable.

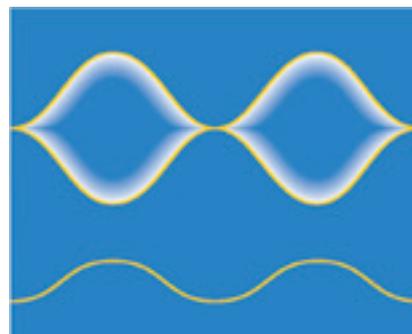
### Amplitude modulation

Internal AM

1 mHz to 22 MHz carrier frequency (TOE 7708A, TOE 7711A), all functions except pulse, TTL, ECL

Modulation frequency: 1 kHz

Modulation factor: 0 to 100 %



Amplitude modulation

External AM

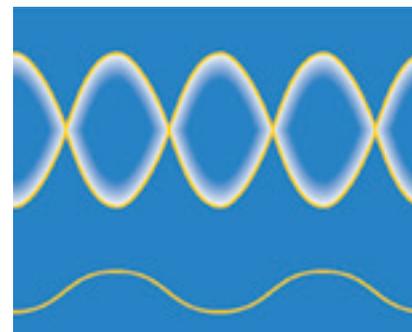
1 mHz to 22 MHz carrier frequency (TOE 7708A, TOE 7711A), all functions except pulse, TTL, ECL

Modulation frequency:

DC up to 500 kHz

Modulation factor: 0 to 200 %

Modulation voltage:  $2.5 V_{pp}$  for 50 % AM



Amplitude modulation with suppressed carrier

## General data/ordering data/options

### TOE 7704 to TOE 7711 A



TOE 7711 A

#### Synthesizer mode (PLL)

(only TOE 7711, TOE 7711 A).

In PLL mode, the output frequency is controlled with crystal accuracy. Short-term and long-term errors are negligibly small compared to the display resolution.

Frequency range	10 Hz to 44 MHz
Resolution	4½ digits, autoranging
Frequency error	< 2 ppm
Drift	5 x 10 <sup>-8</sup> /K
Aging	≤ 2 ppm/year

#### Frequency counter mode

Frequency range	10 Hz to 50 MHz, reciprocal counting method
Resolution	4½ digits, autoranging
Input voltage	TTL level
Gate time	0.5 s
Time base error	< 10 <sup>-5</sup>
Aging	< 5 ppm/year
Input impedance	10 kOhm
Input protection	Up to 15 V <sub>rms</sub>

#### General data

Line voltage	115/230 V ± 10 % 47 Hz to 63 Hz
Power consumption	40 VA
Operating temperature	0 °C to 50 °C
Reference temperature	23 °C ± 1 °C
Storage temperature	- 20 °C to + 70 °C
Dimensions (WxHxD)	265 x 147 x 330 mm
Weight	5 kg
Housing	Aluminium

#### Ordering data

Function generator	TOE 7704
Function generator	TOE 7706
Function generator	TOE 7707
Function generator	TOE 7708 A
Function generator	TOE 7711
Function generator	TOE 7711 A

#### Options

TOE 7700/101	Feedback voltage protection
TOE 9008	Carrying handle
TOE 9501	19" adapter, 3 HU
TOE 9503	19" rack module, 4 HU



TOE 7741

## Power function generator with integral feedback voltage protection

### TOE 7741 – 63 W

#### Special features

- Frequency range 1 MHz to 100 kHz
- High output power > 63 W into 8 Ohm
- Max. output amplitude > 45 V<sub>pp</sub>
- Output with feedback voltage protection
- Frequency counter up to 30 MHz

#### TOE 7741 power function generator with 63 W output power and integral frequency counter

The outstanding feature of the TOE 7741 power function generator is its high power output of over 63 W (with rectangular waveforms).

This power is achieved at an output amplitude of 45 V<sub>pp</sub> into 8 Ohm load. Since the output amplifier has an internal resistance of approx. 0 Ohm and is shielded by feedback voltage protection, any external voltages of up to 120 V will not destroy its output stage. Furthermore, all front-panel inputs and outputs are no-load and short-circuit proof. The frequency settings are made using a decade switch, the frequency dial and the frequency offset potentiometer. The latter allows frequency settings with a reproducibility of < 0.1 %.

The outstanding feature of this instrument is its frequency counter that can measure both internal and external signal frequencies. The counter has an LED display. Besides the basic sine, triangle and square functions, the instrument generates positive and negative pulses and bipolar DC voltage, and can also be used as a broadband power amplifier for the range DC up to 100 kHz.

#### Technical specifications

##### Functions and operating modes

Functions	Sine, triangle, square, positive and negative pulses, broadband power amplifier, DC, variable symmetry
Operating modes	Free-running, external sweep-frequency control, amplifier mode, frequency counter

##### Frequency characteristics

Frequency range	1 MHz to 100 kHz in 6 decadic subranges
Frequency offset	± 2 %
Frequency error	± 2 digits, 2 % of full-scale value when using the scale
Drift	1 × 10 <sup>-3</sup> /K, 5 × 10 <sup>-3</sup> in 8 hours, in each case following 30 min warm-up time

##### Function output

Output amplitude	V <sub>pp</sub> = 45 mV to 45 V, 22.5 mV to 22.5 V in pulse mode
Output impedance	Approx. 0 Ohm. The output is no-load and short-circuit proof
Feedback voltage protection	< 120 V
DC offset	0 to ± 15 V
Output attenuator	30 dB continuously adjustable plus 20 dB or 30 dB steps
Frequency response (sine, triangle)	0.5 dB up to 100 kHz

##### Function specification

at max. output voltage into 8 Ohm load	
<b>Sine</b>	
Distortion factor	< 0.5 % up to 50 kHz, < 1 % up to 100 kHz

##### Triangle

Linearity error	< 1 % up to 100 kHz
Symmetry error	< 1 % up to 100 kHz

##### Square

Transition time	< 0.8 μs
Overshoots	≤ 5 %

##### Pulse

Symmetry variation	10 % to 90 %, f <sub>max</sub> : 10 kHz
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##### Amplifier

Approx. 20 dB gain, DC to approx. 100 kHz, distortion factor < 0.2 % up to 100 kHz, input impedance = 10 kOhm	
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#### Other signal inputs and outputs

Synchronization signal output	TTL-compatible, source impedance: 50 Ohm
Modulation input (VCO)	Approx. 5 V for a frequency variation ratio of 1000:1, R <sub>i</sub> = 10 kOhm
OCV output	0 to 5 V output voltage for a frequency change 1:1000
EXT IN	Amplifier input, max. input voltage 15 V <sub>rms</sub> , R <sub>i</sub> = 10 kOhm

#### Frequency counter mode

Frequency range	< 1 Hz to 30 MHz
Resolution	4 or 5 digits with autoranging
Accuracy	± 2 digits
Sensitivity	150 mV <sub>rms</sub> < 10 MHz 250 mV <sub>rms</sub> > 10 MHz
Input impedance	1 MOhm    120 pF
Input protection	Up to 15 V <sub>rms</sub>

#### General data

Line voltage	115/230 V ± 10 % 47 Hz to 63 Hz
Power consumption	140 VA
Operating temperature	0 °C to 40 °C
<b>Dimensions</b>	
(W x H x D)	265 x 147 x 480 mm
Weight	Approx. 7 kg
Housing	Aluminium

## Ordering data

Power function generator	TOE 7741
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## Options

TOE 9501	19" adapter, 3 HU
TOE 9503	19" rack module, 4 HU
TOE 9008	Carrying handle

# Arbitrary function generator

## TOE 7761 – 40 MHz



TOE 7761

The TOE 7761 arbitrary function generator uses the direct digital synthesis (DDS) technique to create sine waves of high quality and accuracy. Square waveforms are provided with fast rise and fall times. The sampling rate of up to 80 MS/s can be controlled by an external clock.

Arbitrary signals can have up to 1 000 000 sampling points with a resolution of 14 bits, thus allowing a very good simulation of natural signals. A wide range of integral standard waveforms, such as sine, triangle, square, ramp, etc., simplifies the creation of new arbitrary waveforms.

The output amplitude can be set to a maximum of 20 V<sub>pp</sub> (10 V<sub>pp</sub> into 50 Ω) with offsets of up to ±10 V (±5 V into 50 Ω). Various triggered modes with an internal or external trigger source allow generation of an exact number of user-defined cycles. Various modulation and sweep options round off the instrument functions.

A 10 MHz external clock reference lets you synchronize the unit for precise phase adjustment.

Operation is easy and convenient with the graphic LCD and a multifunction spin-wheel. All functions can be configured with just a few inputs. It is additionally possible to save up to 50 instrument configurations in a non-volatile memory.

The included PC software Arbsoft allows easy creation, editing and downloading of complex waveforms. Multiple waveforms can be stored in the flash memory of the instrument ready for execution.

### Technical specifications

#### Frequency characteristics

Sine	1 μHz to 40 MHz
Square	1 μHz to 40 MHz
Triangle	1 μHz to 5 MHz
Pulse	0.5 MHz to 10 MHz
Accuracy	0.002 % (20 ppm)
Resolution	12 digits or 1 μHz

#### Waveform characteristics

<b>Sine</b>	
Harmonic distortion	DC to 20 kHz -65 dBc 20 kHz to 100 kHz -60 dBc 100 kHz to 5 MHz -45 dBc 5 MHz to 40 MHz -30 dBc
Signal distortion (non-harmonic)	DC to 1 MHz < -65 dBc
<b>Triangle</b>	
Variable symmetry	10 % to 90 %
<b>Square</b>	
Transition times	< 8 ns at full amplitude into 50 Ω
Duty cycle	< 10 MHz: 20 % to 80 %, ±1 % max. < 30 MHz: 40 % to 60 %, ±5 % max. < 40 MHz: 50 % fixed
Symmetry error	< 0.5 % at 50 % duty cycle
Overshoots	Typ. < 3% of output amplitude ± 50 mV
<b>Pulse</b>	
Pulse width	> 50 ns or 0.0001 % of repetition rate
Overshoots	Typ. < 3 % of output amplitude ± 50 mV

#### Arbitrary characteristics

<b>Resolution</b>	
Horizontal	Up to 1 000 000 points
Vertical	14 bits (-8191 to +8191)
Sampling	12.5 ns/point to 100 s/point (80 MS/s max.) with 4 digits or 0.1 ns resolution
Accuracy	0.002 % (20 ppm)
Predefined waveforms	Sine, triangle, square, noise, ramp up and down, Sin(x)/x, exponential rise and fall, Gaussian pulse

### Special features

- 1 μHz to 40 MHz sine and square waveforms
- Output amplitude up to 20 V<sub>pp</sub>
- 80 MS/s sampling rate with arbitrary waveforms with 14 bit resolution and up to 1 000 000 sampling points
- Flash memory for 1 000 000 sampling points
- Many standard waveforms assist in creating arbitrary waveforms
- Various modulation and sweep options
- 50 instrument configurations can be stored
- Remote control via USB<sup>1)</sup>, GPIB and RS-232 interface

<sup>1)</sup> USB via supplied RS-232 adapter

## Arbitrary function generator

### TOE 7761 – 40 MHz



TOE 7761

#### Output characteristics

<b>Amplitude</b>	
Range	20 mV <sub>pp</sub> to 20 V <sub>pp</sub> max., 10 mV <sub>pp</sub> to 10 V <sub>pp</sub> into 50 Ω
Resolution	3 digits or 10 mV
Units	V <sub>pp</sub> , V <sub>rms</sub> , dBm
Accuracy	±1% ± 20 mV of the set value at 1 V to 10 V
Linearity	0.1 dB up to 10 MHz, 1 dB up to 40 MHz

<b>Offset</b>	
Range	Up to ±9.99 V max., up to ±4.99 V into 50 Ω, depending on the set amplitude
Resolution	3 digits or 10 mV
Accuracy	±1% ± 10 mV into 50 Ω

<b>Main output</b>	
Impedance	50 Ω
Filter	9 <sup>th</sup> order elliptic filter and 5 <sup>th</sup> order Bessel filter
Output protection	Short-circuit proof and resistant to external voltage up to ±15 V. The output is automatically disconnected in event of overload

<b>Operating modes</b>	
Continuous	Continuous output signal with the set parameters
Trigger	Output retains last value of last waveform until a trigger event arrives, and exactly one complete waveform is subsequently output with the programmed parameters
Gate	Like trigger mode except that the output signal is generated for the duration of the gate signal. The last started cycle is completed
Burst	Like trigger mode except with a programmed number of 2 to 999 999 cycles

<b>Trigger characteristics</b>	
Source	Internal, external, manual or remote-controlled interface
Start phase	-360° to +360° with 0.1° resolution
Repetition rate	0.01 Hz to 1 MHz, accuracy ± 0.002 %
External	< 10 MHz (DDS signal), < 20 MHz (arbitrary)
Pulse width	> 20 ns, (TTL)

#### Modulation characteristics

<b>Amplitude modulation</b>	
Internal	0.01 Hz to 20 kHz sine, square or triangle, variable modulation from 0 % to 100 %
External	5 V <sub>pp</sub> for 100 % modulation

<b>Frequency modulation</b>	
Internal	0.01 Hz to 20 kHz sine, square or triangle, variable modulation from 0 % to 100 %
External	5 V <sub>pp</sub> for 100 % change in frequency

<b>FSK</b>	
Clock rate	0.01 Hz to 1 MHz
External <sup>2)</sup>	TTL signal, max. 1 MHz

#### Sweep characteristics

Characteristic	Linear or logarithmic, up or down
Sweep time	10 ms to 500 s
Trigger	Internal or external, all trigger modes

<b>Inputs and outputs</b>	
Summing In Modulation In	The analog input signal can be added to the output signal 5 V <sub>pp</sub> for full-scale output, bandwidth: DC to > 10 MHz, impedance 500 Ω 5 V <sub>pp</sub> for 100 % modulation, bandwidth: DC to > 50 kHz, impedance 10 kΩ
Trigger In	TTL compatible, max. 20 MHz, pulse width > 20 ns, impedance 10 kΩ
Reference In	10 MHz square signal for device synchronization, TTL compatible, input impedance 1 kΩ
Reference Out	10 MHz square signal or arbitrary clock for device synchronization, TTL compatible, impedance 50 Ω
Marker Out	Positive TTL pulse as marker for arbitrary signals, freely-programmable, impedance 50 Ω
Sync Out	Positive TTL pulses synchronous with the output frequency, impedance 50 Ω

#### General data

<b>Configuration memory</b>	50 instrument settings, including last setting
<b>Arbitrary memory</b>	1 000 000 points in internal flash memory
<b>Remote-controlled interfaces</b>	IEEE 488.2 (GPIB), RS 232 (115 KB max.), USB <sup>1)</sup> , SCPI compatible
<b>Dimensions (W x H x D)</b>	224 x 88 x 357 mm
With feet	224 x 104 x 357 mm
<b>Weight</b>	3.2 kg
<b>Power supply</b>	90 V to 264 V, 47 to 63 Hz, < 40 VA max.
<b>Humidity</b>	Up to 95 %, 0 °C to 30 °C
<b>Operating temperature</b>	0 °C to +50 °C
<b>Storage temperature</b>	-20 °C to +70 °C
<b>Emitted noise</b>	In accordance with EN 55011, Class B
<b>Noise immunity</b>	In accordance with EN 55082-2
<b>Device safety</b>	In accordance with EN 61010-1, CE labeled

## Ordering data

Arbitrary function generator | TOE 7761

<sup>1)</sup> USB via supplied RS-232 adapter

<sup>2)</sup> External FSK modulation uses Trigger In. Specifications subject to change without notice

**Broadband amplifiers  
4-quadrant amplifiers**



## **Broadband amplifiers 4-quadrant amplifiers**

Signal conditioning and amplification are required in many technical areas whether it be mechanical or control engineering, medical technology or testing procedures.

The broadband and 4-quadrant amplifiers from TOELLNER are capable of solving many tasks in the frequency range from DC to 5 MHz.

Protection functions present at the input and output provides all units with a high degree of operational safety. Furthermore, the units feature state-of-the-art technology and sophisticated circuitry.

Exceptionally clear in concept, rugged, and practice-oriented.

The quality can be recognized in laboratory comparisons.

## Broadband amplifiers 4-quadrant amplifiers

Series Page	Image	Frequency		Max. W	Max. V	Max. I	Highlights
		Min.	Max.				
<b>TOE 7607</b> III - 4		DC	5 MHz	8 W	40 V <sub>pp</sub>	0.8 A <sub>pp</sub>	Broadband amplifiers DC to 5 MHz with 8 W output power and integral feedback voltage protection.
<b>TOE 7608</b> III - 5		DC	500 kHz	63 W	45 V <sub>pp</sub>	5.6 A <sub>pp</sub>	Broadband amplifiers DC to 500 kHz with 63 W output power and integral feedback voltage protection. Very rugged.
<b>TOE 7608S</b> III - 5		15 Hz	20 kHz	33 W	115 V <sub>rms</sub>	0.29 A <sub>rms</sub>	Broadband amplifiers 15 Hz to 20 kHz with high output voltage up to 115 V <sub>rms</sub> .
<b>TOE 7610</b> III - 6		DC	100 kHz	± 150 W	± 60 V	± 15 A	4-quadrant amplifiers with 150 W source and sink power. High rise rate up to 25 V/μs. Power bandwidth: 100 kHz. Small signal width (4 V <sub>pp</sub> ): 400 kHz.



TOE 7607

## Broadband amplifiers DC to 5 MHz with integral feedback voltage protection 8 W output power

### TOE 7607

#### Special features

- High output voltage of up to 40 V<sub>pp</sub> into 50 Ohm
- Wide frequency range from DC to 5 MHz
- Gain of up to 26 dB
- Small distortion factor
- Feedback voltage protection

Signal conditioning and amplification are required in many technical areas whether it be mechanical or control engineering, medical technology or testing procedures.

The TOE 7607 broadband amplifier is capable of supplying the necessary features for a frequency range from DC to 5 MHz and output voltages of up to 40 V<sub>pp</sub> into 50 Ohm.

The outstanding features of the TOE 7607 broadband amplifier are its high output voltage of up to 40 V<sub>pp</sub> into 50 Ohm and its low distortion factor.

The amplifier gain is continuously adjustable up to max. 26 dB over a frequency range from DC to 5 MHz.

Besides general-purpose laboratory tasks, application areas include electrical and electronic engineering, process control, machine construction, medical technology, and educational institutions where the amplifier is used as a training aid.

#### Technical specifications

Amplifier characteristics

<b>Frequency range</b>	DC to 5 MHz (-3 dB)
<b>Gain</b>	0 to 26 dB continuously adjustable
<b>Distortion factor</b>	< 0.2 % to 100 kHz
<b>Rise or fall time</b>	< 60 ns
<b>Input, output</b>	
Input voltage	Max. 42 V <sub>rms</sub>
Input impedance	1 MOhm / 50 Ohm
Output voltage	0 V to 40 V <sub>pp</sub> into 50 Ohm
	The output is no-load and short-circuit proof and is protected against feedback voltages up to approx. 120 V
<b>Output impedance</b>	Approx. 10 Ohm

#### General data

<b>Line voltage</b>	115 V/230 V, ± 10 % 47 Hz to 63 Hz
<b>Power consumption</b>	40 VA
<b>Dimensions (W x H x D)</b>	265 x 147 x 280 mm
<b>Weight</b>	Approx. 3.5 kg
<b>Housing</b>	Aluminium

## Ordering data

Broadband amplifier | TOE 7607

## Options

TOE 9008	Carrying handle
TOE 9501	19" adapter, 3 HU
TOE 9503	19" rack module, 4 HU

## Broadband amplifiers DC to 500 kHz with integral feedback voltage protection 63 W output power

TOE 7608  
TOE 7608 S



TOE 7608

Function/signal generators generally provide signals with a small amplitude into 50-Ohm systems.

Signal conditioning and amplification are therefore required in many technical areas.

The TOE 7608 broadband amplifier is suitable as a non-inverting power output stage for the amplification of such signal sources. Each generator with an output voltage of  $20 V_{pp}$  is able to cover the full operating range of the TOE 7608 amplifier; the power is 63 W into 8 Ohm at a max. output amplitude of  $45 V_{pp}$ . The bandwidth is DC to 500 kHz.

Overcurrent protection at the output, protection against feedback voltages, and overtemperature protection provide the amplifier with a high degree of operational safety.

The TOE 7608 S is a special version and provides higher output voltages in a limited frequency range.

Voltages up to  $115 V_{rms}$  into 400 Ohm can be generated in this case at an output power of  $> 30 W$  and in a frequency range from 15 Hz to 20 kHz. Other output voltages (e.g.  $230 V_{rms}$ ) or frequency ranges are available on request.

### Special features

- Frequency range DC to 500 kHz
- Short-circuit and no-load proof
- Feedback voltage protection up to 120 V
- $115 V_{rms}$  output voltage with TOE 7608 S

### Technical specifications

Amplifier data **TOE 7608**

<b>Frequency range</b>	0 to 500 kHz (-3 dB)
<b>AC coupling</b>	Approx. 3 Hz to 500 kHz (-3 dB)
<b>Gain</b>	Non-inverting, fixed at +7 dB with input impedance $> 10 k\Omega$ , +13 dB with input impedance 50 Ohm
<b>Input impedance</b>	
AC coupling	$> 10 k\Omega$ (pass band)
DC coupling	$> 10 k\Omega$ or 50 Ohm, selectable
Permissible input voltage	Max. $10 V_{rms}$ , continuous
<b>Output impedance</b>	Approx. 0.2 Ohm, short-circuit proof
<b>Output voltage</b>	Max. $\pm 22.5 V$ into 8 Ohm load Response times: $t_r, t_f < 0.8 \mu s$
<b>Output noise</b>	$< 1 mV_{rms}$ with short-circuited input
<b>Distortion</b>	$< 0.1 \%$ up to 50 kHz, $< 0.2 \%$ up to 100 kHz
<b>Feedback voltage protection</b>	Up to 120 V, fused by F4AC in accordance with DIN 41661, IEC 127-2/11

### Technical specifications

Amplifier data **TOE 7608 S**

<b>Frequency range</b>	15 Hz to 20 kHz (-3 dB)
<b>Gain</b>	Non-inverting, fixed at +25.6 dB with input impedance $> 10 k\Omega$ , +31.6 dB with input impedance 50 Ohm
<b>Input impedance</b>	
AC coupling	$> 10 k\Omega$ (pass band)
DC coupling	$> 10 k\Omega$ or 50 Ohm, selectable
Permissible input voltage	Max. $10 V_{rms}$ , continuous
<b>Output impedance</b>	Approx. 70 Ohm, short-circuit proof
<b>Output voltage</b>	Max. $115 V_{rms}$ into 400 Ohm load
<b>Output noise</b>	$< 5 mV_{rms}$ with short-circuited input
<b>Distortion factor</b>	$< 0.5 \%$ at $V_{out} < 100 V_{rms}$ into 400 Ohm load in frequency range 50 Hz to 20 kHz
<b>Feedback voltage protection</b>	Fused by F 0.5 AC in accordance with DIN 41661, IEC 127-2/11

### General data

<b>Line voltage</b>	115V/230 V $\pm 10 \%$ , 47 Hz to 63 Hz
<b>Amplifier fusing</b>	115 V: T4AC, 230 V: T2AC in accordance with DIN 41662, IEC 127-2/11
<b>Power consumption</b>	Max. 180 VA
<b>Operating temperature</b>	0 °C to 50 °C
<b>Dimensions</b> (W x H x D)	265 x 147 x 375 mm
<b>Weight</b>	Approx. 8.2 kg
<b>Housing</b>	Aluminium

## Ordering data

Broadband amplifier	TOE 7608
Broadband amplifier	TOE 7608 S

## Options

TOE 9008	Carrying handle
TOE 9501	19" adapter, 3 HU
TOE 9503	19" rack module, 4 HU



TOE 7610

## 4-quadrant amplifiers DC to 100 kHz 150 W source and sink power

### TOE 7610

#### Special features

- 150 W source and sink power
- Brief load current  $3 \times I_{\text{rated}}$
- Analog control input 0 to 5 V or 0 to 10 V
- $\frac{1}{2}$  19" width, 3 HU  
→ parallel installation possible
- Slew (rise) rate approx.  $6 \text{ V}/\mu\text{s}$  to  $25 \text{ V}/\mu\text{s}$  (depends on model)
- Sensing
- Output at front, optional at rear
- Optimally suitable for electrical noise testing of components against vehicle electrics ripple

#### General

Power supplies for laboratory use are mostly only power sources. They are only able to deliver power with one single polarity, i.e. these instruments only work in one quadrant of the output voltage/current diagram. Common amplifiers deliver voltages with both polarities, but are generally unable to absorb power values in a range comparable to that which they are able to deliver. They therefore mainly work as two-quadrant devices. The TOE 7610 series of four-quadrant amplifiers is able to work as a power sink as well as a power source with equal values of delivered or absorbed power.

The **TOE 7610 series** is thus a voltage amplifier, bipolar voltage and current source, and current sink in one instrument. Having to combine different instruments, where problems frequently occur with the coordination of individual components and the tendency to oscillate, now belongs to the past.

#### Features of the standard delivery

##### Power Manager

A selectable Power Manager enables the maximum output power  $P_{\text{max}}$  to also be processed as a continuous sink power. Numerous setting options of the 4-quadrant amplifier allow optimum connection of the amplifier with the series-connected driving equipment, whether this is a laboratory power supply, a calibrator, a function generator or a signal source from a PC in the form of a D/A converter card.

##### Selectable input impedance

The input impedance can be switched between 50 Ohm and 100 kOhm and allows convenient selection of a function generator to be controlled and a signal source in the form of a D/A card in the PC without the need for external adaptation.

##### Selectable input voltage range

The adjustable input voltage range allows switching between an input voltage of  $\pm 5 \text{ V}$  or  $\pm 10 \text{ V}$ . Therefore no further external adaptation of the control voltage is necessary.

##### Variable DC offset

Using the adjustable DC offset it is possible to directly set a basic voltage (up to  $\pm V_{\text{rated}}$ ) on the 4-quadrant amplifier. This function is particularly suitable for superimposing an externally generated noise signal (e.g. from a function generator) on a constant voltage. This enables optimum simulation of the ripple on vehicle electrics.

##### Brief load current

All 4-quadrant amplifiers of the TOE 7610 series can be equipped with the TOE 7610/103 option. They are then able to deliver three times the rated current for approx. 3 ms.

##### Output ON/OFF

A convenient detail of the functionality is the output switch-off which allows immediate switching-off of the voltage and current when in the "Output OFF" position. The output signal path is then electrically interrupted!

# 150 W source and sink power

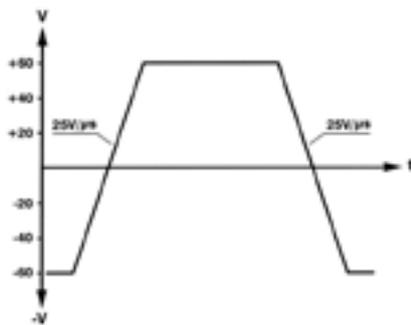
## TOE 7610



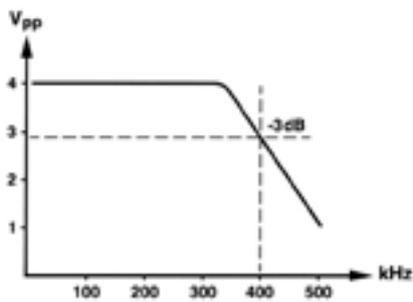
TOE 7610

### Overview

Model	Output voltage	Output current	Output power
TOE 7610-10	± 10 V	± 15 A	150 W
TOE 7610-20	± 20 V	± 7.5 A	150 W
TOE 7610-40	± 40 V	± 4 A	160 W
TOE 7610-60	± 60 V	± 2.5 A	150 W



Rise/fall rate with TOE 7610-60



Small signal bandwidth with TOE 7610



TOE 7610

## 4-quadrant amplifiers DC to 100 kHz 150 W source and sink power

### TOE 7610

#### Technical specifications

	TOE 7610-10	TOE 7610-20	TOE 7610-40	TOE 7610-60
<b>Output voltage</b>	± 10 V	± 20 V	± 40 V	± 60 V
<b>Output current</b>	± 15 A	± 7.5 A	± 4 A	± 2.5 A
Current limiting (Slow mode only)				
CURREN LIMIT POS	0 - +15 A	0 - +7.5 A	0 - +4 A	0 - +2.5 A
CURREN LIMIT NEG	0 - -15 A	0 - -7.5 A	0 - -4 A	0 - -2.5 A
<b>Power</b> (continuously at $I_{max}$ )				
Source mode		150 W	160 W	150 W
Sink mode with Power Manager on		150 W	160 W	150 W
<b>Frequency range</b>				
DC input coupling				
Speed slow			0 Hz - 30 kHz	
Speed fast			0 Hz - 100 kHz	
AC input coupling				
Speed slow			2 Hz - 30 kHz	
Speed fast			2 Hz - 100 kHz	
<b>Amplifier</b>				
Input V range ± 5 V				
var gain Off	6 dB	12 dB	18 dB	21.6 dB
var gain On	6 dB ± 1 dB	12 dB ± 1 dB	18 dB ± 1 dB	21.6 dB ± 1 dB
Input V range ± 10 V				
var gain Off	0 dB	6 dB	12 dB	15.6 dB
var gain On	0 dB ± 1 dB	6 dB ± 1 dB	12 dB ± 1 dB	15.6 dB ± 1 dB
<b>Input impedance</b>				
DC input coupling				
Input impedance 50 Ω			50 Ω	
Input impedance 100 kΩ			100 kΩ	
AC input coupling				
Input impedance 50 Ω			50 Ω	
Input impedance 100 kΩ			100 kΩ	
Max. input voltage (continuous)			12 V <sub>rms</sub>	
<b>Rise rate</b> (Fast mode only)	Approx. 6 V/μs	Approx. 10 V/μs	Approx. 16 V/μs	Approx. 25 V/μs
<b>Noise</b>				
Up to 1 kHz			< 0.1 mV <sub>rms</sub>	
Up to 10 MHz			< 1 mV <sub>rms</sub>	
<b>Harmonic distortion</b>				
Speed Slow				
Up to 1 kHz	< 0.25 %		< 0.10 %	
Up to 7 kHz	< 0.80 %		< 0.30 %	
Up to 10 kHz	< 1.00 %		< 0.50 %	
Speed Fast				
Up to 20 kHz	< 0.20 %		< 0.10 %	
Up to 40 kHz	< 0.30 %		< 0.30 %	
Up to 60 kHz	< 0.50 %		< 0.50 %	

# 4-quadrant amplifiers DC to 100 kHz 150 W source and sink power

## TOE 7610



TOE 7610

### General data

<b>Amplifier output</b>	Floating, insulation $\pm 260$ V against ground
<b>Line voltage</b>	115 V / 230 V $\pm 10$ %, 47 to 63 Hz
<b>Line fuse</b>	115 V: T4L; 230 V: T2L; in accordance with IEC 127-2/III, DIN 41662
<b>Power consumption</b>	Max. approx. 400 VA
<b>Protective measures</b>	Protection class I in accordance with DIN EN 61010-1
<b>Operating temperature</b>	0 °C to 40 °C
<b>Storage temperature</b>	-20 °C to 70 °C
<b>Reference temperature</b>	23 °C $\pm 1$ °C
<b>Cooling</b>	With thermostatically controlled fan
<b>Dimensions (W x H x D)</b>	216 x 132 x 429 mm
<b>With feet</b>	216 x 147 x 429 mm
<b>19" system</b>	Compatible with 1/2 19", 3 HU
<b>Weight</b>	Approx. 9 kg
<b>Housing</b>	Aluminium

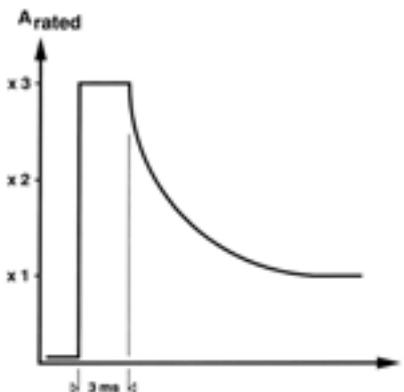
### Ordering data

#### Four-quadrant amplifier

TOE 7610-10	DC - 100 kHz, $\pm 10$ V / $\pm 15$ A
TOE 7610-20	DC - 100 kHz, $\pm 20$ V / $\pm 7.5$ A
TOE 7610-40	DC - 100 kHz, $\pm 40$ V / $\pm 4$ A
TOE 7610-60	DC - 100 kHz, $\pm 60$ V / $\pm 2.5$ A

### Options

TOE 9008	Carrying handle
TOE 9502	19" adapter, 3 HU for single installation
TOE 9508	19" adapter, 3 HU, parallel installation set for 2 units
TOE 7610/103	Brief load current $3 \times I_{rated}$ for approx. 3 ms



Brief load current  $3 \times I_{rated}$  for TOE 7610 (option TOE 7610/103)

### Supplied accessories

- 1 power cord
- 1 instruction manual

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