

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 4 V_{pp}
20 Hz to 70 kHz
- Internal sink function
Brief load sink: 1000 W to
16000 W, depends on model



TOE 8815

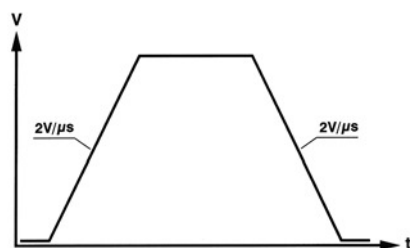
Arbitrary power supplies

**TOE 8805 to
TOE 88165**

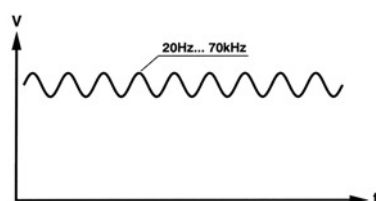
160 W to 5200 W

Special features

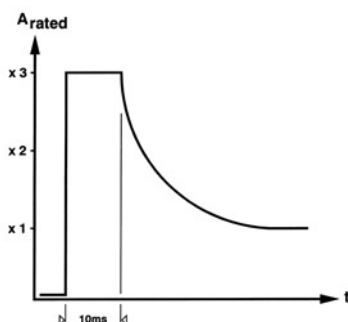
- Extremely high rise and fall rates of the output voltage: approx. $2 \text{ V}/\mu\text{s}$
- GPIB and analog interfaces included as standard
- Vehicle electrics ripple:
AC superimposition 4 V_{pp}
20 Hz to 70 kHz
(TOE 8815 to TOE 8865)
20 Hz to 50 kHz
(TOE 8885 to TOE 88165)
- Brief load current: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



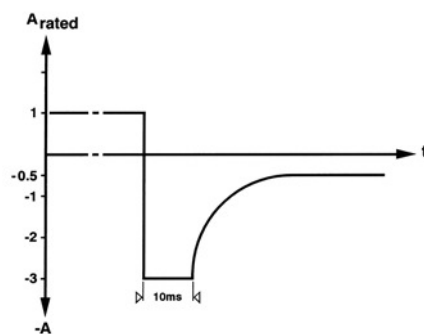
Rise and fall rates with
TOE 8805 to TOE 88165



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



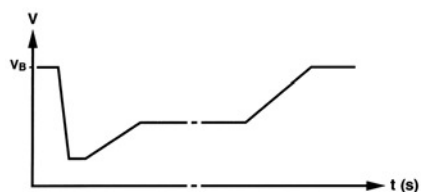
TOE 8885

Overview

□□ □voltage version	Output voltage										□ower
	0 - 16 □	0 - 18 □	0 - 20 □	0 - 24 □	0 - 32 □	0 - 40 □	0 - 48 □	0 - 64 □	0 - 80 □	0 - 100 □	
□□□□□□xx	□-1□□	□-□□	□-□□	□-□□	□-□□	□-□□	□-□□□	□-□□□	□-□□	□-1.□□	1□□W
□□□□1□xx	□-□□□	□-1□□	□-1□□	□-1□□	□-1□□	□-□□	□-□□	□-□□	□-□□	□-□□□	□□□W
□□□□□□xx	□-□□□	□-□□□	□-□□□	□-□□□	□-□□□	□-1□□	□-1□□	□-1□□	□-□□	□-□□□	□□□W
□□□□□□xx	□-□□□	□-□□□	□-□□□	□-□□□	□-□□□	□-□□□	□-1□□	□-1□□	□-1□□	□-1□□	□□□W
□□□□□□xx	□-□□□	□-□□□	□-□□□	□-□□□	□-□□□	□-□□□	□-□□□	□-□□□	□-1□□	□-1□□	1□□□W
□□□□□□xx	□-1□□□	□-□□□	□-□□□	□-□□□	□-□□□	□-□□□	□-□□□	□-□□□	□-□□□	□-1□□	1□□□W
□□□□□□xx	□-1□□□	□-11□□	□-1□□□	□-□□□	□-□□□	□-□□□	□-□□□	□-□□□	□-□□□	□-□□□	1□□□W
□□□□□□xx	□-1□□□	□-1□□□	□-1□□□	□-11□□	□-□□□	□-□□□	□-□□□	□-□□□	□-□□□	□-□□□	□□□□W
□□□□1□□xx	□-□□□□	□-1□□□	□-1□□□	□-1□□□	□-1□□□	□-□□□	□-□□□	□-□□□	□-□□□	□-□□□	□□□□W
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□□□□1□□xx	□-□□□□	□-□□□□	□-□□□□	□-1□□□	□-1□□□	□-11□□	□-□□□	□-□□□	□-□□□	□-□□□	□□□□W
□□□□1□□xx	□-□□□□	□-□□□□	□-□□□□	□-1□□□	□-1□□□	□-1□□□	□-11□□	□-□□□	□-□□□	□-□□□	□□□□W

eg □□-□□V□-□□□1□□W□□□□□□□□

ISO 7637-2
Pulse 4



Start pulse

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.

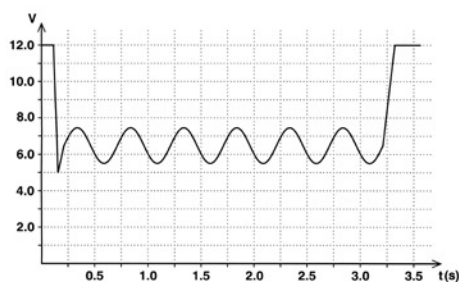
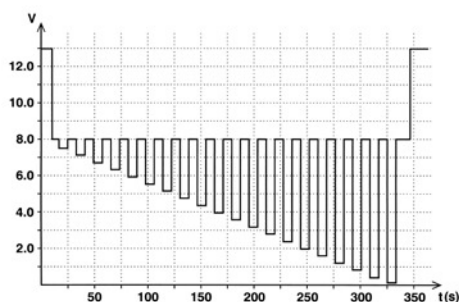
Application examples

- 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

Arbitrary function

TOE 8805 to TOE 88165

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



Technical specifications

Number of steps	1
Step data	Voltage current step time
Step time	100 µs to 100 s
Retriggering	Manual via button or signal
Number of sweeps	1 to 100 or ∞

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.

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.

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.

Technical specifications

TOE 8805 to TOE 88165

Technical specifications

Output voltage	0 - 16 V	0 - 18 V	0 - 20 V	0 - 24 V	0 - 32 V
Resolution	1 mV	1 mV	0.1 mV	0.1 mV	0.1 mV
Setting accuracy	±0.0001 mV	±0.0001 mV	±0.0001 mV	±0.0001 mV	±0.0001 mV
Measuring accuracy	±1.0001 mV	±1.0001 mV	±1.0001 mV	±1.0001 mV	±1.0001 mV
Monitor voltage 0 to 10 V accuracy	1 mV	0.1 mV	0.1 mV	0.1 mV	0.1 mV
Voltage stabilization					
Change in load 0 to 100 Ω	±0.1 mV	±0.1 mV	±0.1 mV	±0.1 mV	±0.1 mV
Change in line voltage ±1 V	±0.1 mV	±0.1 mV	±0.1 mV	±0.1 mV	±0.1 mV
Change in temperature	1 mV	1 mV	1 mV	1 mV	1 mV
Residual ripple V_p (bandwidth 1 MHz)	0.1 mV _{rms}	0.1 mV _{rms}	1.0 mV _{rms}	1.0 mV _{rms}	1.0 mV _{rms}
Drift 0.1 h	1 mV	1 mV	1 mV	1 mV	1 mV
Regulation time with change in load from 0.00 to 1.00 A					
and setting to 0.1 h in 0.00 V _{set}	0.00 μs	0.00 μs	0.00 μs	0.00 μs	0.00 μs
Setting time of output voltage with change in setpoint					
0.00 A					
(no load rate load)					
$V_{to} V_{set}$ (1.0 to 0.0) typ	0.1 μs	0.1 μs	0.1 μs	0.1 μs	0.0 μs
V_{set} to 0 V _{to} (0.0 to 1.0) typ	0.1 μs	0.1 μs	0.1 μs	0.1 μs	0.0 μs
External voltage control					
Control voltage 0 to 10 V					
Accuracy	±1.0001 mV	±1.0001 mV	±1.0001 mV	±1.0001 mV	±1.0001 mV
Out-of-frequency (-0.00) 0.00 A typ	0.00 Hz	0.00 Hz	0.00 Hz	0.00 Hz	0.00 Hz



TOE 8815

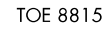
0 - 40 □	0 - 48 □	0 - 64 □	0 - 80 □	0 - 100 □
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Technical specifications

TOE 8805 to
TOE 88165

Technical specifications

Output voltage	I _o ≤ 5 A	I _o ≤ 10 A	I _o ≤ 20 A	I _o ≤ 40 A	I _o ≤ 80 A
Resolution	1 mV	1 mV	1 mV	1 mV	1 mV
Setting accuracy	±0.0010 mV	±0.0010 mV	±0.0001 mV	±0.0001 mV	±0.0001 mV
Measuring accuracy	±0.0010 mV	±0.0010 mV	±0.0001 mV	±0.0001 mV	±0.0001 mV
Monitor voltage to 10 V	±I _{rate}	±I _{rate}	±I _{rate}	±I _{rate}	±I _{rate}
Accuracy	±0.0010 mV	±0.0010 mV	±0.0001 mV	±0.0001 mV	±0.0001 mV
Current stabilization					
Change in load to 100%	±10 ⁻⁵	±10 ⁻⁵	±10 ⁻⁵	±10 ⁻⁵	±10 ⁻⁵
Change in line voltage ±10%	10 ⁻⁵	10 ⁻⁵	10 ⁻⁵	10 ⁻⁵	10 ⁻⁵
Change in temperature	±10 ⁻⁵	±10 ⁻⁵	±10 ⁻⁵	±10 ⁻⁵	±10 ⁻⁵
Residual ripple I _{rms} (bandwidth 1 MHz)	±0.1 mV _{rms}	1 mV _{rms}	1 mV _{rms}	1 mV _{rms}	1 mV _{rms}
Drift within 1 hour	±10 ⁻⁵	±10 ⁻⁵	±10 ⁻⁵	±10 ⁻⁵	±10 ⁻⁵
Setting time of output current with change in setpoint 100% off (no load to load)					
±I _{rate} (100-1000) typ.	±0.000 ms	±0.000 ms	±0.000 ms	±0.000 ms	±0.000 ms
V _{ref} to 0.001% (100-1000) typ.	±0.000 ms	±0.000 ms	±0.000 ms	±0.000 ms	±0.000 ms
External current control					
Control voltage to 10 V	±I _{rate}	±I _{rate}	±I _{rate}	±I _{rate}	±I _{rate}
Accuracy	±0.00010 mV	±0.00010 mV	±0.000001 mV	±0.000001 mV	±0.000001 mV
Set-off frequency (-100%) 100% off typ.	100 Hz	100 Hz	100 Hz	100 Hz	100 Hz



General data

TOE 8805 to TOE 88165

Display		Setting times	
Voltage current	separately on two digit displays	Voltage current	With a measurement taking place extension of setting times by up to 100 ms
Address	1000 device address or memory address	Capacitor	100 ms
Device or instrument settings		Power supply memory	100 s (because of charging and discharging)
Memory locations	100 complete instrument settings for power supply measurement setting in the non-volatile memory for the instrument status when switching off	Delay matrix	100 ms for storage
Arbitrary function		Arbitrary function	100 ms (100 s with capacitor switching) for recalling
Interpolation points	to 1000		100 ms for start
Interpolation point data	Voltage current and stepsize		100 ms for stop
Stepsize	1000 to 1000000 separately adjustable for each interpolation point		100 s for linear curve calculation
Measurement mode	Continuous or burst with 1 to 1000 steps	Memory card	dependent on number of interpolation points
Triggering	Manually on display remote control by bus command or external trigger (NCT)	Other	1000 ms for direct interpolation point storage
Timing	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 MM memory card according to IEC 61010 standard with max capacity of 1 MB	Relay matrix	1000 ms for direct interpolation point recalling
IEEE 485 control		Trigger	100 s for storage
Interface standard	Electrically isolated in accordance with IEC 61010-1		100 s for recalling
Optical standard	In accordance with IEC 61010-1	Number of relays	100 ms
Device address	to 1000	Contact rating	Manually on display or remote control by IEC bus command
Measuring rate	100 measurements for voltage current 100 measurements for voltage current		10 relays with one NCT contact each

Options

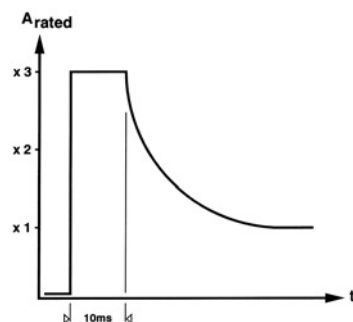
TOE 8805 to TOE 88165

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 $3 \times I_{\text{rated}}$. 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

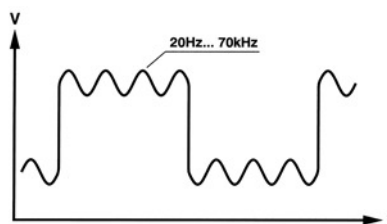
The TOE 8810/107 option permits simulation of vehicle electrics ripple in the frequency range from 20 Hz to 70 kHz with an amplitude of $4 V_{\text{pp}}$. Since this AC voltage is fed from an external signal generator, you can superimpose sine, triangle or square signals on the saved test curves or also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

TOE 88107/107 M (only TOE 8815 to 88165)

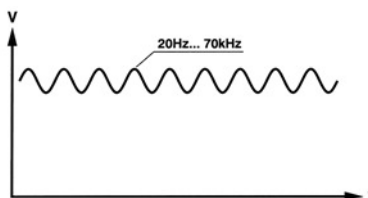
Permits vehicle electrics ripple / AC superimposition in the frequency range from 20 Hz to 70 kHz and is simultaneously a brief load sink of 1 kW (for master device).

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

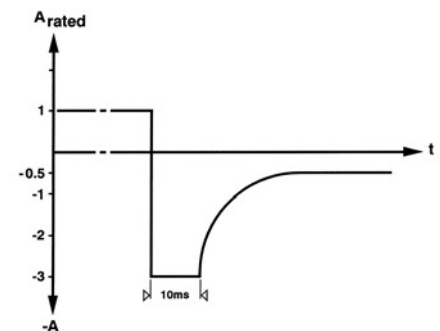


Vehicle electrics ripple with
TOE 8810/107 option

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 μF 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

Power output	floating and electrically isolated standby, execute directly, it is stable
Output terminals	at front and parallel at rear at rear
Insulation	± 100 V against ground
Line voltage	110 V, 220 V ± 10% 110 V to 220 V
Power consumption	approx. 100 W approx. 100 W approx. 100 W approx. 100 W approx. 100 W
Line voltage	± 10% V 110 V to 220 V, phase
Power consumption	approx. 100 W approx. 100 W approx. 100 W approx. 100 W approx. 100 W approx. 100 W approx. 100 W approx. 100 W
Protective measures	Protection class 1 in accordance with DIN EN 60950-1 at 1
Line fuse	110 V, 10 A 110 V, 10 A for 100 W 110 V, 10 A for 100 W for each 100 W of output power in accordance with IEC 60950-1
Operating temperature	0 °C to 40 °C
Reference temperature	20 °C
Storage temperature	-20 °C to 60 °C
Start-up time	approx. 10 min

Dimensions in mm

100 mm x 100 mm x 100 mm
 (W x H x D) height with feet 100 mm
 100 mm to 100 mm
 100 mm x 100 mm x 100 mm
 (W x H x D)
 for each 100 W of output power
 100 mm x 100 mm system system
 compatible with 1/2 1" x 1" H
 100 mm x 100 mm system system
 compatible with 1" x 1" H
 for each 100 W of output power

Casing	Aluminium
Weight	approx. 100 g 100 mm to 100 mm approx. 100 g for each 100 W of output power

Options

100 mm x 100 mm	Brief local current 10 A rate
100 mm x 100 mm M (only 100 mm to 100 mm)	External superimposition and brief local sin (master)
100 mm x 100 mm	External superimposition and brief local sin (booster)
100 mm x 100 mm	100 mm controller
100 mm x 100 mm	100 mm cable 10 m
100 mm x 100 mm	1" a after 100 mm for single installation 100 mm x 100 mm
100 mm x 100 mm	1" a after 100 mm parallel installation set for 100 mm x 100 mm
100 mm x 100 mm	1" a after 100 mm for 100 mm x 100 mm to 100 mm x 100 mm



TOE 9101 USB GPIB controller

Ordering data

**TOE 8805 to
TOE 88165**



TOE 8885

Ordering data

[illegible]

Ordering example

- **V**-**I**W