

4-quadrant power supplies or 4-quadrant amplifiers are electronic modules which generate both positive and negative voltages, and which can also deliver and receive positive and negative currents. They can therefore be used as a source or sink.

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 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 2-quadrant instruments.

All four-quadrant power supplies of the TOE 7621 series are additionally able to absorb power with both polarities corresponding to the delivered powers.

A 4-quadrant power supply of the TOE 7621 series is thus a bipolar voltage and current source as well as a current sink in one instrument. Use as a bipolar power amplifier is also possible.

Equipment functionalities

Selectable input voltage range

The selectable input voltage range allows switching between an input voltage of ± 5 V or ± 10 V. Therefore no further external adaptation of the control voltage is necessary.

Voltage and current mode; CV / CC

CV mode must be selected in order to use the 4-quadrant power supply as a constant voltage source. CC mode must be selected in order to use the 4-quadrant power supply as a constant current source.

Adjustable bandwidth

In CV mode it is possible to preselect a transmission bandwidth of 100 kHz, 10 kHz, 1 kHz or 100 Hz. In CC mode the adjustable cut-off frequencies are 10 kHz, 1 kHz, and 100 Hz.

Variable gain

The range of variation is approx. $\pm 10\%$ of the rated gain, in CV or CC mode.

Variable DC offset

Using the adjustable DC offset it is possible to directly set a basic voltage (up to $\pm V_{\text{rated}}$) or a basic current (up to $\pm I_{\text{rated}}$). This function is particularly suitable for superimposing an externally generated noise signal (e.g. from a function generator) on a constant voltage or current. This enables optimum simulation of the ripple on vehicle electrics or the implementation of charging and discharging processes of batteries.

Adjustable output impedance

The internal impedance of the power output is adjustable in CV mode in a range $(0 - 0.5) \times (V_{\text{rated}} : I_{\text{rated}})$.

Brief load current

All 4-quadrant power supplies of the TOE 7621 series can be equipped with the TOE 7620/113 option. They are then able to deliver three times the rated current for a brief period. This option is activated using a switch on the rear panel.

Maximum sink power

In order to guarantee the maximum sink power, the MAX SINK POWER function must be activated. The working range of this function is from DC to 1 kHz.

Safety functions

The following safety functions are present:

OVP (Over Voltage Protection):
adjustable from 0 V to $\pm 1.02 V_{\text{rated}}$
OCP (Over Current Protection):
adjustable from 0 A to $\pm 1.02 I_{\text{rated}}$

4-Quadrant Power Supply TOE 7621

The limit functions can be set separately in CV or CC mode in both the positive and negative ranges.

OTP (Over Temperature Protection)

A thermostatically controlled switch switches off the instrument when the temperature exceeds a specified value. In the process, the output circuit is interrupted by means of a power relay.

Sensing

A precise sensing circuit not only keeps the power supply 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 using a key on the front panel. The correctable voltage drop is approx. 0.5 V per line.

Interlock / Inhibit

The Interlock and Inhibit functions can be selected using a switch at the rear. The associated control input is also located at the rear.

Monitor output for voltage and current

The respective monitor voltage is:

$$\begin{aligned} & 0 \dots \pm 5 \text{ V for } 0 \dots \pm V_{\text{rated}} \\ \text{or: } & 0 \dots \pm 5 \text{ V for } 0 \dots \pm I_{\text{rated}} \end{aligned}$$

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!

Parallel mode

Up to three TOE 7621 units of the same type can be operated in parallel in order to increase the power. A parallel switching adapter is available as an option.

Bridge connection

Two TOE 7621 units of the same type can be operated in a bridge connection. The respective inputs and outputs are located at the rear. A switching adapter for the bridge connection is available as an option.

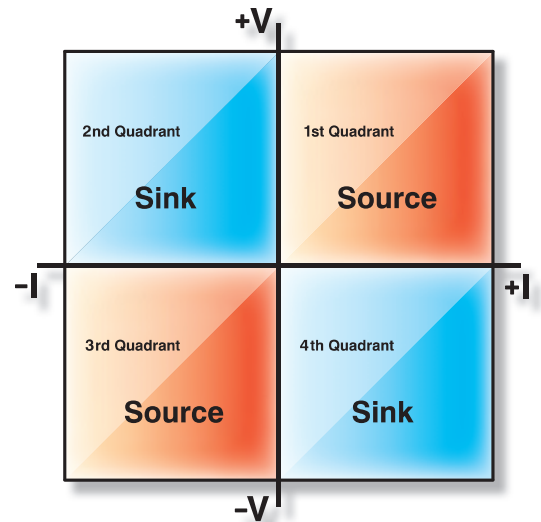


Special features TOE 7621 series

Special features

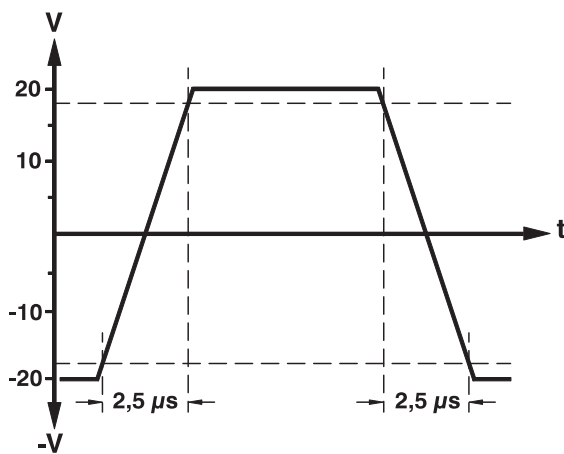
- 320 W source and sink power
- Power increase using parallel operation
- Short term load current $3 \times I_{\text{rated}}$ (optional)
- Analog control input 0 to 5 V or 0 to 10 V
- Rise/fall time $< 2.5 \mu\text{s}$ in CV mode
- Adjustable output impedance in CV mode
- Sensing
- Output at front and rear
- 19" wide, 3 HU
- Optimally suitable for electrical noise testing of components against vehicle electrics ripple

4-quadrant mode

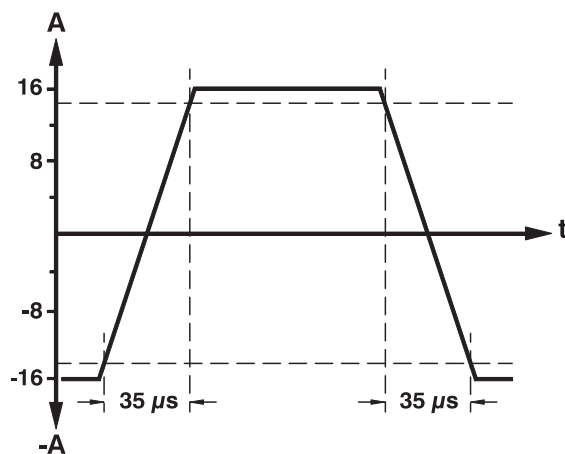


Developed and manufactured in
GERMANY

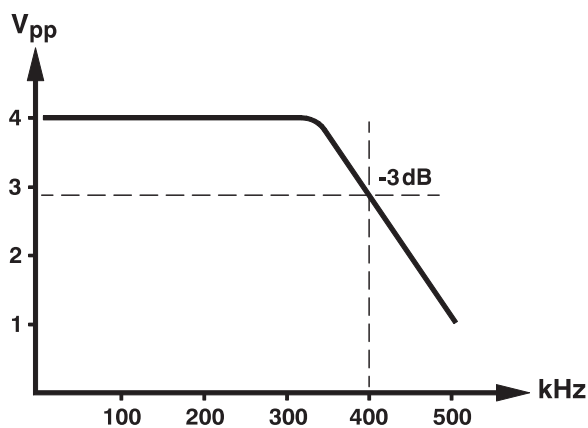
Model	Output voltage	Output current	Output power
TOE 7621- 10	± 10 V	± 30 A	300 W
TOE 7621- 20	± 20 V	± 16 A	320 W
TOE 7621- 40	± 40 V	± 8 A	320 W
TOE 7621- 60	± 60 V	± 5.3 A	320 W
TOE 7621- 80	± 80 V	± 4 A	320 W
TOE 7621-100	± 100 V	± 3.2 A	320 W



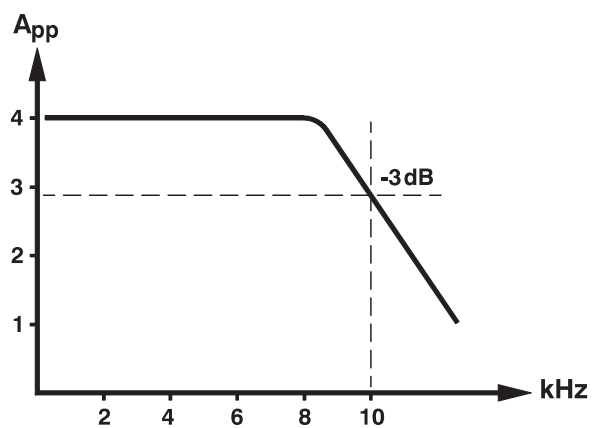
Rise/fall time (CV) with TOE 7621-20



Rise/fall time (CC) with TOE 7621-20



Small signal bandwidth (CV) with TOE 7621-20



Small signal bandwidth (CC) with TOE 7621-20

Technical specifications TOE 7621

	TOE 7621-10	TOE 7621-20	TOE 7621-40	TOE 7621-60	TOE 7621-80	TOE 7621-100
Output voltage	± 10 V	± 20 V	± 40 V	± 60 V	± 80 V	± 100 V
Output current	± 30 A	± 16 A	± 8 A	± 5.3 A	± 4 A	± 3.2 A
Power (continuous at I _{max})						
Source mode	300 W			320 W		
Sink mode	300 W			320 W		
Input impedance	100 kΩ					
Max. input voltage (continuous)	12 V _{rms}					
CV mode						
Frequency range						
DC input coupling	0 Hz - 100 kHz					
Unlimited bandwidth	0 Hz - 100 Hz / 1 kHz / 10 kHz					
Limited bandwidth						
AC input coupling	2 Hz - 100 kHz					
Unlimited bandwidth	2 Hz - 100 Hz / 1 kHz / 10 kHz					
Limited bandwidth						
Amplifier						
Input voltage ±5 V	2 V/V	4 V/V	8 V/V	12 V/V	16 V/V	20 V/V
Input voltage ±10 V	1 V/V	2 V/V	4 V/V	6 V/V	8 V/V	10 V/V
Adjustable	± 10 %	± 10 %	± 10 %	± 10 %	± 10 %	± 10 %
Rise/fall time (10% – 90%) typ.	2.5 μs	2.5 μs	2.5 μs	3.5 μs	5 μs	5 μs
Harmonic distortion						
Up to 1 kHz	< 0.25 %			< 0.1 %		
Up to 100 kHz	< 1.00 %			< 0.8 %		
CC mode						
Frequency range						
DC input coupling	0 Hz - 100 Hz / 1 kHz / 10 kHz					
Bandwidth	2 Hz - 100 Hz / 1 kHz / 10 kHz					
AC input coupling						
Bandwidth						
Amplifier						
Input voltage ±5 V	6 A/V	3.2 A/V	1.6 A/V	1.06 A/V	0.8 A/V	0.64 A/V
Input voltage ±10 V	3 A/V	1.6 A/V	0.8 A/V	0.53 A/V	0.4 A/V	0.32 A/V
Adjustable	± 10 %	± 10 %	± 10 %	± 10 %	± 10 %	± 10 %
Rise/fall time (10% – 90%) typ.	35 μs	35 μs	35 μs	35 μs	35 μs	35 μs
Harmonic distortion						
Up to 1 kHz	< 0.25 %			< 0.10 %		
Up to 100 kHz	< 1.00 %			< 0.80 %		

General data / accessories

Output	Floating; insulation ± 260 V against ground
Line voltage	115 V/230 V $\pm 10\%$; 47 Hz to 63 Hz
Line fuse	115 V: T8L 230 V: T4L in accordance with IEC 127-2/III, DIN 41662
Power consumption	Max. approx. 750 VA
Protective measures	Protection class I in accordance with DIN EN 61010-1
Operating temperature	0 °C to 40 °C
Storage temperature	-20 °C to 70 °C
Reference temperature	23 °C ± 1 °C
Cooling	Thermostatically-controlled fan
Dimensions (W x H x D) with feet	434 x 132 x 429 mm 434 x 147 x 429 mm
19" system	System-compatible with 19", 3 HU
Weight	Approx. 20 kg
Housing	Aluminium

Ordering data

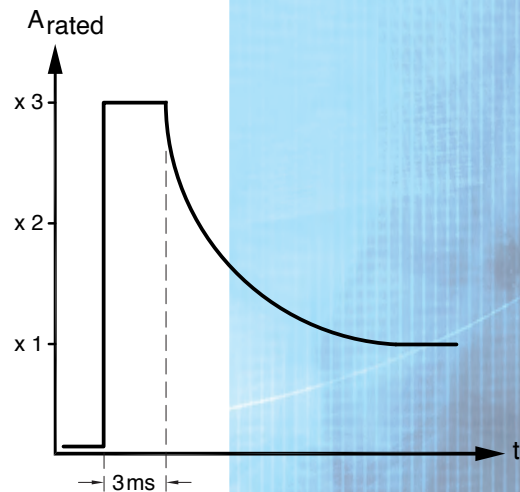
TOE 7621 - 10	DC - 100 kHz,	± 10 V / ± 30 A
TOE 7621 - 20	DC - 100 kHz,	± 20 V / ± 16 A
TOE 7621 - 40	DC - 100 kHz,	± 40 V / ± 8 A
TOE 7621 - 60	DC - 100 kHz,	± 60 V / ± 5.3 A
TOE 7621 - 80	DC - 100 kHz,	± 80 V / ± 4 A
TOE 7621 - 100	DC - 100 kHz,	± 100 V / ± 3.2 A

Supplied accessories

- 1 power cord
- 1 instruction manual

Options / accessories

TOE 7620/101	Circuitry for bridge connection
TOE 7620/102	Parallel switching adapter 2 x TOE 7621
TOE 7620/103	Parallel switching adapter 3 x TOE 7621
TOE 7620/113	Short term load current $3 \times I_{\text{rated}}$
TOE 7620/016	Floating input DC - 50 kHz
TOE 7620/017	Floating input DC - 100 kHz
TOE 9513	19" adapter, 3 HU



Brief load current at $3 \times I_{\text{rated}}$ (option 7620/113)

Our customers

AEG
A.M.S. Software GmbH
Alps Electric GmbH
artesy
ASKON
Atlas Elektronik
Audi

BASF AG
Bayer AG
Behr Hella Thermocontrol
Beiersdorf AG
BENDER
Beru AG
BIOMET
Blaupunkt
Boehringer Ingelheim KG
Boambardier
Robert Bosch GmbH
B. Braun Melsungen AG
Brose Fahrzeugteile
Bugatti Engineering GmbH
Busch-Jäger GmbH
Bühler Motor

CERN
Continental AG

Daimler AG
John Deere
Degussa Hanau
DELPHI
DeltaTech Controls
DESY
Deutsche Lufthansa AG
Diehl Avionik Systeme
Diehl GmbH & Co.
DLR
DMT
Dornier Luftfahrt GmbH
Dräger
dSpace GmbH
Du pont
EADS
ebm-papst Gruppe

ELMOS
elster
Endress+Hauser
e-on
Eurocopter GmbH

FH Braunschweig/Wolfenbüttel
Fachhochschule Dortmund
Ferrari
FESTO
Fiat Automobile AG
Ford-Werke AG
Fraunhofer Gesellschaft
Karl Freudenberg
fuba
Fujitsu GmbH

Gidemeister Automation GmbH
GÖPEL electronic
Gossen-Metrawatt
Gould
GSI

Haas Laser GmbH
Hahn-Meitner-Institut
HARMAN/BECKER
Hauni Werke, Körber
Hella KG Hueck & Co.
Heraeus Sepateck GmbH
HIMA
HIRSCHMANN
Hochschule Fürthwangen
Hoechst AG
Hoffmann-La Roche AG
Hüls AG

IAV GmbH
IBM Deutschland GmbH
iC Haus
Infineon AG
Iskratel

Jena-Optronik GmbH

Kabelmetal electro GmbH

Kathrein-Werke KG
KES
KMW
Knorr Bremse AG
KOSTAL
Krupp GmbH
KUHNIKE

labom
Leica Camera GmbH
Ernst Leitz Wetzlar GmbH
Lenze
Linde
Lucas Automotive GmbH
Lufthansa Technik AG

MAN technologie
Maserati
MAXIMATOR
Max-Planck-Institute
Mercedes-Benz AG
E.Merck
Motorola
mtu

NOKIA

Opel AG
Osram GmbH

Pepperl + Fuchs GmbH
Philips GmbH
Phoenix Contact
PHOENIX TESTLAB
Pierburg GmbH
Dr. Ing. h.c.F. Porsche AG
preh
PTB

RAFI
Rank Xerox GmbH
Reis Robotics GmbH
Rexroth Boschgroup
Rheinmetall GmbH
Rockwell Automotive

Rohde & Schwarz
RUAG
RUB LEMS

H.-J. Schleißheimer
S&K Prüftechnik
SENNHEISER
SIEMENS
Skoda
ST Microelectronics GmbH
Stocko

Takati Petri AG
TU Darmstadt
Tektronix GmbH
theben
Thomas
Thyssen AG
TRW Automotive
TT electronics
TÜV-Rheinland
Tyco Electronics

Valeo GmbH
VDE
Vickers System GmbH
Voith Sulzer GmbH
Voith Turbo GmbH
Volkswagen AG

WACHENDORFF
Wacker Chemie GmbH
WAGO
Webasto
WEBER
Weidmüller
YAZAKI

ZF Antriebs- und
Fahrwerktechnik
Carl Zeiss
ZOLLNER