

TopCon Quadro Power Supply

Programmable High-Power DC Supply



TopCon Quadro Power Supply unit with optional front panel control unit HMI

- Constant voltage (0 – 100 %), constant current (0 – 100 %) and constant power operation (5 – 100%) with automatic and fast crossover and mode indication. Internal resistance simulation.
- Finely graduated product line: 52, 65, 100, 130, 200, 400, 500, 600, 800, 1000 VDC. Power categories of 10, 16, 20 and 32 kW are available for each nominal output voltage.
- Optional extras and accessories complete the product line of power supply units.
- Modular concept for easy power increase: Parallel, series or multiloading master-slave-operation for up to eight power supply units.
- High efficiency at a low cost, resulting from the application of innovative IGBT and transformer technology. Primary switched. Galvanic isolated. Full digital control and regulation.
- A user-friendly PC program, the operating and service software TopControl, enables the user to communicate with the power supply.
- TopControl installation file, LabVIEW[®] and C/C++ API (DLL file) are included in the scope of delivery.
- CE conformity
- Swiss made: Further developed, manufactured and tested in Switzerland by Regatron AG.

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16 kW / 500 VDC / 40 A

TC.P.16.500.400.S

Mains requirements and output specifications

AC line input

Line voltage.....3 x 360 – 440 VAC
Line frequency 48 – 62 Hz
Mains connection type3L+PE (no neutral)
Input current..... 3 x 32 Arms¹⁾
Leakage current L to PE < 10 mA

Output ratings

Output power range0 – 16 kW
Output voltage range0 – 500 VDC
Output current range0 – 40 A²⁾
Internal resistance range 0 – 1000 mΩ³⁾

Operating modes

Voltage regulation (CV).....0 – 100 % U_{max}
Current regulation (CC)..... 0 – 100 % I_{max}
Power regulation (CP).....5 – 100 % P_{max}

Static accuracy

Load regulation CV, CC< ± 0.1 % FS⁴⁾
Line regulation CV, CC< ± 0.1 % FS⁵⁾

Transient response time

Load regulation CV, CC< 2 ms⁶⁾
Set value tracking CV, CC< 2 ms⁷⁾

Stability

CV, CC.....< ± 0.05 % FS⁸⁾

Temperature coefficient

CV.....< 0.02 % FS / °C⁹⁾
CC.....< 0.03 % FS / °C⁹⁾

Output ripple

300 Hz V_{pp}< 1.1 % FS¹⁰⁾
300 Hz V_{rms}< 0.4 % FS¹⁰⁾

Output noise

40 kHz – 1 MHz V_{pp}< 1.5 V¹⁰⁾
40 kHz – 1 MHz V_{rms}< 0.1 V¹⁰⁾

Remote sensing

Terminals on rear side Line voltage drop compensation

General specifications

Efficiency at nominal power 92 %
Weight.....44 kg
Width front panel.....483 mm
Width housing (19") 444 mm
Height front panel.....265 mm
Height housing (6 U) 262 mm
Depth with output terminals.....495 mm
Depth housing.....450 mm
Line input connections:terminal block 4 x 10 mm²
Output terminals: nickel-plated copper bars, length: 40 mm, 1 hole 9 mm Ø in each bar

- 1) At nominal output power and line input voltage 3 x 390 VAC / 50 Hz. Soft-start to limit turn-on surge currents.
- 2) Current according to the given power limit of the corresponding units. (P=U_{out} * I_{out} ≤ 16 kW; for I_{out} > 32 A → U_{out} < 500 V). Current derating: max. permanent output current at 400 VDC / 25°C: 40 A, at 400 VDC / 30°C: 40 A, at 400 VDC / 35°C: 40 A, at 400 VDC / 40°C: 32 A. Higher current if CDF < 100%, no derating if unit equipped with optional liquid cooling.
- 3) Optionally extendable to a maximum of 12000 mΩ
- 4) Typical value for 0 – 100 % load variation, at constant line input and temperature conditions.
- 5) Typical value for input voltage variation within 360 – 440 VAC, at constant load and temperature conditions.
- 6) Typical recovery time to within < ± 5 % band of set value for a load step 10 – 90 %, ohmic load, at constant line input and temperature conditions. Transient response time can be slightly affected by multi-unit operation.
- 7) Typical recovery time to within < ± 5 % band of set value for a set value step 10 – 90 %, ohmic load, at constant line input and temperature conditions. Transient response time can be slightly affected by multi-unit operation.
- 8) Maximum drift over 8 hours after 30 minute warm-up time, at constant line input, load and temperature conditions.
- 9) Typical change of output values versus ambient temperature, at constant line input and load conditions.
- 10) Typical value at nominal ohmic load, line asymmetry < 1 V_{rms}.

Non-ohmic loads can lead to deviations in the technical data. All product specifications are subject to change without notification.

Ambient conditions

Operating temperature	5 – 40°C ¹¹⁾
Storage temperature.....	-25 – 70°C
Relative air humidity (non-condensing)	0 – 95 %

Cooling

Standard: internal temperature-controlled fans
 Optional: integrated liquid cooling of the power stage,
 heat exchanger material: AC100 (Al-Ti-alloy),
 inlet / outlet on rear side, size: G 1/2"

Protection**Built-in protection**

Overvoltage protection (programmable)	0 – 110 % U _{max}
Overcurrent protection (programmable)	0 – 110 % I _{max}
Max. reactive load voltage	≤ 110 % U _{max}
Short circuit protection	Cont. short circuit allowed
Internal diagnostics: line input conditions, transformer primary current, temperature conditions, processor idle time, system configuration, system communication, sensor signals, power semiconductors	

Type of protection (IEC 60529)

Basic construction	IP 20 (current bars on rear side excluded)
Mounted in cabinet	Up to IP 53

Conformity CE-Marking**EMC Directive**

EMC emission	EN 61000-6-4
EMC immunity	EN 61000-6-2

Low Voltage Directive

Electronic equipment for use in power installations	EN 50178
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Isolation

Line to output	4000 Vrms
Line to case	2500 Vrms
Output to case	> 10 MΩ / 2 x 6.8 nF
- bar ¹⁶⁾	+ 1000 VDC / - 1000 VDC
+ bar ¹⁶⁾	+ 1000 VDC / - 1000 VDC

Standard programming interfaces**Control port**

Isolation to electronics and earth: 125 Vrms
 25 pin D-sub connector, female, on rear panel

Control port input functions

Output voltage on / off	0 / 24 VAC / DC
2 digital application inputs	0 / 24 VAC / DC ¹²⁾
Interlock circuit	0 / 24 VDC
Voltage setting 0 – 100 %	0 – 10 V
Current setting 0 – 100 %	0 – 0 V
Power setting 0 – 100 %	10 – 0 V
Int. resistance setting 0 – 1000 mΩ ³⁾	0 – 10 V

Control port output functions

Unit ready / error	Relay contact
Output voltage on	Relay contact
Temperature warning	Relay contact
Actual voltage readback 0 – 100 %	0 – 10 V
Actual current readback 0 – 100 %	0 – 10 V
Resolution (programming and readback): U, I, P, Ri	0.2 % FS

Standard programming interfaces (continued)**RS232**

9 pin D-sub connector, female, on front panel	
Isolation to electronics and earth	125 Vrms
Baud rate	38400 baud
Resolution (programming and readback):	
U, I	0.025 % FS
P, Ri	0.1 % FS

Ordering Information**Ordering code**

TC.P.16.500.400.S(.Option)

Standard Scope of delivery

TopCon power supply unit ready to install, including:	
..... Operating manual (English or German)	
..... RS232 cable 1.8 m	
..... Installation disc TopControl,	
..... LabVIEW [®] and C/C++ API (DLL file)	

Options**Front panel control unit HMI**

Integrated control, programming and display unit with graphic LC-Display, select wheel, push buttons and interactive text menus	
Languages (switchable)	English, German
Display resolution:	
U	4 digits
I	3 digits
P	Kilowatt + 1 decimal digit
Ri	1 mΩ

Remote control unit RCU

Specifications same as HMI, available in 2 versions:	
..... desk top and 19" rackmount	
max. cable length	40 m
Desk top W x H x D	355 x 100 x 290 mm
19" rackmount W x H x D ..	483 x 133 (3 U) x 290 mm

Further options

TFEAAPControl	Function Generating Engine Time-based and Parametric Pr.
SASControl	SAS Application Program including TFEAAP
AccuControl	Battery Application Program
RS232REAR ¹³⁾	RS232 On Front and Rear Panel
USB ¹⁴⁾	Interface USB on Rear Panel
RS422 ¹³⁾	RS422 on Rear Panel
ETHERNET ¹⁵⁾	Ethernet to RS232 Converter
.....	External converter unit,
IEEE ¹⁴⁾	GPIOB/ IEEE488.2/ SCPI on Rear Panel
.....	cannot be combined
.....	with CANOPEN nor with USB
CANOPEN ¹⁴⁾	CAN/ CANOPEN on Rear Panel
PROFIBUS ¹⁵⁾ ..	Profibus DP 485 to RS232 Converter
.....	external unit
CANCABLE	Connecting Cable
.....	for Multi-Unit Operation or RCU: 2, 5, 10 m
PACOB	Protection against Accidental contact
IRXTS ³⁾	Internal resistance range extension
LCAL	Integrated liquid cooling of the power stage, inlet / outlet on rear side, size G 1/2"
AIRFILTER	Front Panel Airfilter 6 U / 9 U
ISR	Integrated Safety Relay
NSOV	Non-Standard Output Voltage (if possible)

11) Ambient temperature or CDF restrictions: refer to output ratings.

12) Customer-specifically programmable.

13) This option and RS232: time-shared mode required, if used together.

14) RS232 only on Rear Panel.

15) Please order option RS232REAR separately.

16) Peak Voltage including DC-Output Voltage.