

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, 1200 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 / 400 VDC / 50 A

TC.P.16.400.400.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 – 400 VDC
Output current range.....0 – 50 A²⁾
Internal resistance range 0 – 8000 mΩ³⁾
Output capacitance 87 µF

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} > 40 A → U_{out} < 400 V). Current derating: max. permanent output current at 320 VDC / 25°C: 50 A, at 320 VDC / 30°C: 45 A, at 320 VDC / 35°C: 40 A, at 320 VDC / 40°C: 40 A. Higher current if CDF < 100%, no derating if unit equipped with optional liquid cooling.
- 3) The maximum value of the internal resistance is automatically calculated via the DC nominal values (R_i [mΩ] = V_{Load} / I_{Load} = 400 VDC / 50 A) or limited by the maximum R_i-value: 32000 [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

Isolation

Line to case/ logic 1670 VDC 1s
 Output to case/ logic 2540 VDC 1s
 Output to case > 10 MΩ
 per DC bar 13.6 nF
 - bar ¹⁶⁾ + 1000 VDC / - 1000 VDC
 + bar ¹⁶⁾ + 1400 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.16.400.400.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

TFEAAP Function Generating Engine
 Time-based and
 parametric programming
 SASControl ¹²⁾ SAS application program
 including TFEAAP
 BatControl ¹²⁾ Battery application program
 BatSim ¹²⁾ Battery simulation program
 CapSim ¹²⁾ Capacitor simulation program
 RS232REAR ¹³⁾ RS-232 on front and rear panel
 USB ¹⁴⁾ USB on rear panel
 RS422 ¹³⁾ RS-422 on rear panel
 ETHERNET ¹⁴⁾ Ethernet on rear panel
 IEEE ¹⁴⁾ GPIB/ IEEE488.2/ SCPI on rear panel
 cannot be combined with CANOPEN nor with USB
 CANOPEN ¹⁴⁾ CAN/ CANOPEN on rear panel
 CANmp CANmp on rear panel
 OptoLink ¹⁴⁾ OptoLink on rear panel
 CANCEABLE Connecting cable
 for Multi-Unit Operation or RCU: 2, 5, 10 m
 PACOB Protection against accidental contact
 LCAL Integrated liquid cooling of the power
 stage, inlet / outlet on rear side, size G 1/2"
 AIRFILTER Front panel airfilter 6 U
 ISR 2 channel Integrated Safety Relay
 NSOV Non-Standard output voltage

11) Ambient temperature or CDF restrictions: refer to output ratings.
 12) Customer-specificly 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.