

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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10 kW / 600 VDC / 20 A

TC.P.10.600.400.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 20 Arms¹⁾
Leakage current L to PE < 10 mA

Output ratings

Output power range0 – 10 kW
Output voltage range0 – 600 VDC
Output current range.....0 – 20 A²⁾
Internal resistance range 0 – 30000 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} ≤ 10 kW; for I_{out} > 17 A --> U_{out} < 600 V).
- 3) The maximum value of the internal resistance is automatically calculated via the DC nominal values (R_i [mΩ] = V_{Load} / I_{Load} = 600 VDC / 20 A) or limited by the maximum Ri-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
 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 communica-
 tion, 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⁾ + 1500 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.10.600.400.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.