

# TopCon Quadro Power Supply

Programmable High-Power DC Supply

# 10 kW / 1000 VDC / 13 A

TC.P.10.1000.400.S



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.

## Mains requirements and output specifications

### AC line input

Line voltage.....3 x 360 – 440 VAC  
 Line frequency ..... 48 – 62 Hz  
 Mains connection type .....3L+PE (no neutral)  
 Input current..... 3 x 20 Arms<sup>1)</sup>  
 Leakage current L to PE ..... < 10 mA

### Output ratings

Output power range ..... 0 – 10 kW  
 Output voltage range .....0 – 1000 VDC  
 Output current range.....0 – 13 A<sup>2)</sup>  
 Internal resistance range ..... 0 – 1000 mΩ<sup>3)</sup>

### Operating modes

Voltage regulation (CV).....0 – 100 % U<sub>max</sub>  
 Current regulation (CC).....0 – 100 % I<sub>max</sub>  
 Power regulation (CP).....5 – 100 % P<sub>max</sub>

### Static accuracy

Load regulation CV, CC ..... < ± 0.1 % FS<sup>4)</sup>  
 Line regulation CV, CC ..... < ± 0.1 % FS<sup>5)</sup>

### Transient response time

Load regulation CV, CC ..... < 2 ms<sup>6)</sup>  
 Set value tracking CV, CC ..... < 2 ms<sup>7)</sup>

### Stability

CV, CC ..... < ± 0.05 % FS<sup>8)</sup>

### Temperature coefficient

CV ..... < 0.02 % FS / °C<sup>9)</sup>  
 CC ..... < 0.03 % FS / °C<sup>9)</sup>

### Output ripple

300 Hz V<sub>pp</sub> ..... < 1.1 % FS<sup>10)</sup>  
 300 Hz V<sub>rms</sub> ..... < 0.4 % FS<sup>10)</sup>

### Output noise

40 kHz – 1 MHz V<sub>pp</sub> ..... < 1.5 V<sup>10)</sup>  
 40 kHz – 1 MHz V<sub>rms</sub> ..... < 0.1 V<sup>10)</sup>

### 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 mm<sup>2</sup>  
 Output terminals: ..... nickel-plated copper bars

- 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<sub>out</sub> \* I<sub>out</sub> ≤ 10 kW; for I<sub>out</sub> > 10 A --> U<sub>out</sub> < 1000 V).
- 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<sub>rms</sub>.

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<sub>max</sub>  
 Overcurrent protection  
 (programmable)..... 0 – 110 % I<sub>max</sub>  
 Max. reactive load voltage..... ≤ 110 % U<sub>max</sub>  
 Short circuit protection..... Cont. short circuit allowed  
 Internal diagnostics: line input conditions, trans-  
 former primary current, temperature conditions,  
 processor idle time, system configuration, system  
 communication, sensor signals, power semiconduc-  
 tors

**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 output..... 4000 Vrms  
 Line to case ..... 2500 Vrms  
 Output to case ..... > 10 MΩ / 2 x 6.8 nF  
 - bar <sup>16)</sup> ..... + 1000 VDC / - 1000 VDC  
 + bar <sup>16)</sup> ..... + 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 <sup>12)</sup>  
 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 <sup>3)</sup> ..... 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.10.1000.400.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**

TFEAPControl ..... Function Generating Engine  
 Time-based and Parametric Pr.  
 SASControl ..... SAS Application Program  
 including TFEAAP  
 AccuControl ..... Battery Application Program  
 RS232REAR <sup>13)</sup> ..... RS232 On Front and Rear Panel  
 USB <sup>14)</sup> ..... Interface USB on Rear Panel  
 RS422 <sup>13)</sup> ..... RS422 on Rear Panel  
 ETHERNET <sup>15)</sup> ..... Ethernet to RS232 Converter  
 ..... External converter unit,  
 IEEE <sup>14)</sup> ..... GPIB/ IEEE488.2/ SCPI on Rear Panel  
 ..... cannot be combined  
 ..... with CANOPEN nor with USB  
 CANOPEN <sup>14)</sup> ..... CAN/ CANOPEN on Rear Panel  
 PROFIBUS <sup>15)</sup> ... Profibus DP 485 to RS232 Converter  
 ..... external unit  
 CANCEABLE ..... Connecting Cable  
 ..... for Multi-Unit Operation or RCU: 2, 5, 10 m  
 PACOB ..... Protection against Accidental contact  
 IRXTS <sup>3)</sup> ..... 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-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.