

# 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.

## 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 type .....3L+PE (no neutral)  
Input current..... 3 x 32 Arms<sup>1)</sup>  
Leakage current L to PE ..... < 10 mA

### Output ratings

Output power range .....0 – 16 kW  
Output voltage range .....0 – 400 VDC  
Output current range.....0 – 50 A<sup>2)</sup>  
Internal resistance range ..... 0 – 8000 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,  
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<sub>out</sub> \* I<sub>out</sub> ≤ 16 kW; for I<sub>out</sub> > 40 A --> U<sub>out</sub> < 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<sub>i</sub> [mΩ] = V<sub>Load</sub> / I<sub>Load</sub> = 400 VDC / 50 A) or limited by the maximum R<sub>i</sub>-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<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 <sup>11)</sup>  
 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, 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 <sup>16)</sup> ..... + 1000 VDC / - 1000 VDC  
 + bar <sup>16)</sup> ..... + 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 <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.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<sup>®</sup> 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 <sup>12)</sup> ..... SAS application program  
 including TFEAAP  
 BatControl <sup>12)</sup> ..... Battery application program  
 BatSim <sup>12)</sup> ..... Battery simulation program  
 CapSim <sup>12)</sup> ..... Capacitor simulation program  
 RS232REAR <sup>13)</sup> ..... RS-232 on front and rear panel  
 USB <sup>14)</sup> ..... USB on rear panel  
 RS422 <sup>13)</sup> ..... RS-422 on rear panel  
 ETHERNET <sup>14)</sup> ..... Ethernet on rear panel  
 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  
 CANmp ..... CANmp on rear panel  
 OptoLink <sup>14)</sup> ..... 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.