

Regatron Power Supplies

Programmable High-Power DC Supplies



TopCon power supply unit with optional front panel control unit HMI

- Constant voltage (0-100%), constant current (0-100%) and constant power (5-100%) operation with automatic and fast crossover and mode indication. Internal resistance simulation.
- Finely graduated product line: 52, 65, 100, 200, 400, 500, 600, 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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20 kW / 52 VDC / 500 A

TC.P.20.52.400.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 40 Arms ¹⁾ |
| Leakage current L to PE | < 20 mA |

Output ratings

| | |
|---------------------------|---------------------------|
| Output power range | 0 – 20 kW |
| Output voltage range | 0 – 52 VDC |
| Output current range | 0 – 500 A ²⁾ |
| Internal resistance range | 0 – 1000 mΩ ³⁾ |

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 % FS ⁴⁾ |
| Line regulation CV, CC | < ± 0.1 % FS ⁵⁾ |

Transient response time

| | |
|---------------------------|----------------------|
| Load regulation CV, CC | < 2 ms ⁶⁾ |
| Set value tracking CV, CC | < 2 ms ⁷⁾ |

Stability

| | |
|--------|-----------------------------|
| CV, CC | < ± 0.05 % FS ⁸⁾ |
|--------|-----------------------------|

Temperature coefficient

| | |
|----|--------------------------------|
| CV | < 0.02 % FS / °C ⁹⁾ |
| CC | < 0.03 % FS / °C ⁹⁾ |

Output ripple

| | |
|-------------------------|---------------------------|
| 300 Hz V _{pp} | < 1.1 % FS ¹⁰⁾ |
| 300 Hz V _{rms} | < 0.4 % FS ¹⁰⁾ |

Output noise

| | |
|---------------------------------|------------------------|
| 40 kHz – 1 MHz V _{pp} | < 1.5 V ¹⁰⁾ |
| 40 kHz – 1 MHz V _{rms} | < 0.1 V ¹⁰⁾ |

Remote sensing

| | |
|------------------------|--------------------------------|
| Terminals on rear side | Line voltage drop compensation |
|------------------------|--------------------------------|

General specifications

| | |
|-----------------------------|---|
| Efficiency at nominal power | 93 % |
| Weight | 64 kg |
| Width front panel | 483 mm |
| Width housing | 444 mm (19") |
| Height front panel | 399 mm |
| Height housing | 394 mm (9 U) |
| Depth with output terminals | 590 mm |
| Depth housing | 525 mm |
| Line input connections: | 4 x 25 mm ² (terminal block) |
| 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) For output current > 384 A: U < 52 V (P = U * I ≤ 20 kW). Max. permanent output current: at 40 VDC / 25°C: 500 A, at 40 VDC / 30°C: 500 A, at 40 VDC / 35°C: 500 A, at 40 VDC / 40°C: 500 A.
- 3) Optionally extendable to a maximum of 12'000 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 | 0 – 95 % (non-condensing) |

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: R 1/4"

Safety**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 | Continuous 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 529)

| | |
|--------------------|--|
| Basic construction | IP 20 (current bars on rear side excluded) |
| Mounted in cabinet | IP 43 |

Standards

| | |
|-------------------|-------------------------|
| EMC emission | EN 50081-2, EN 55011 |
| EMC immunity | EN 50082-2 |
| Safety | EN 60204, IEC204-1 mod. |
| Interlock circuit | EN 60204-1995 |

Isolation

| | |
|--|-----------|
| Line to output | 4000 Vrms |
| Line to case | 2500 Vrms |
| Output to case: ± 1000 VDC, > 10 MΩ / 2 x 6.8 nF | |

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 – 10 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**

| | |
|---|------------|
| Isolation to electronics and earth: 125 Vrms | |
| 9 pin D-sub connector, female, on front panel | |
| Baud rate | 9600 baud |
| Resolution (programming and readback): | |
| U, I | 0.025 % FS |
| P, Ri | 0.1 % FS |

Optional programming interfaces**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 |

IEEE 488.2 ¹³⁾

GPIB (IEEE 488.2) to RS232 converter unit, connected to power supply unit via RS232 interface
 Dimensions W x H x D 120 x 30 x 80 mm
 Converter AC line input 1 x 230 VAC

RS422 ¹³⁾

9 pin D-sub connector, male, on rear panel
 Isolation, resolution and Baud rate same as RS232

Ordering information**Options**

| | |
|---------------------|--|
| HMI | Front panel control unit HMI |
| RS422 | Differential serial interface RS422 |
| IRXTS ³⁾ | Internal resistance range extension |
| LC | Integrated liquid cooling of the power stage, heat exchanger material: AC100 (Al-Ti-alloy), inlet / outlet on rear side, size R 1/4" |

Accessories

| | |
|--------------|---|
| TC.RCU | Remote control unit RCU |
| TC.IEEE | Parallel interface IEEE488.2 (GPIB) |
| TC.CANCABLE | Connecting cable for multi-unit operation |
| TC.CANOPEN | Field bus interface |
| TC.INTERBUS | Field bus interface |
| TC.PROFIBUS | Field bus interface |
| TC.DEVICENET | Field bus interface |

Contact factory for optional accelerated down programming and voltage overshoot clipping.

Ordering code

TC.P.20.52.400.S(.Option)

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)

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