

## 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, 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.

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## 32 kW / 52 VDC / 700 A

TC.P.32.52.400.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 60 Arms <sup>1)</sup> |
| Leakage current L to PE | < 20 mA                   |

#### Output ratings

|                           |                           |
|---------------------------|---------------------------|
| Output power range        | 0 – 32 kW                 |
| Output voltage range      | 0 – 52 VDC                |
| Output current range      | 0 – 700 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 | 95 %   |
| Weight                      | 68 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 <sup>2</sup> (terminal block)                            |
| Output terminals:           | nickel-plated copper bars, length: 40 mm, 1 hole 9 mmØ 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 > 615 A: U < 52 V (P = U \* I ≤ 32 kW). Current derating: max. permanent output current at 45 VDC / 25°C: 660 A, at 45 VDC / 30°C: 650 A, at 45 VDC / 35°C: 640 A, at 45 VDC / 40°C: 615 A. (700 A < 30 min at 25°C.) Higher current, if CDF < 100%; no derating, if unit equipped with optional liquid cooling.
- 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<sub>rms</sub>.

Non-ohmic loads can lead to deviations in the technical data. All product specifications are subject to change without notification.

|   |  |
|---|--|
| <b>Ambient conditions</b>   |  |
| Operating temperature   | 5 – 40°C <sup>11)</sup>                    |
| Storage temperature   | –25 – 70°C                                 |
| Relative air humidity   | 0 – 95 % (non-condensing)                  |
| <b>Cooling</b>  |  |
| 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"   |  |
| <b>Safety</b>   |  |
| <b>Built-in protection</b>  |  |
| 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  | 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 |  |
| <b>Type of protection (IEC 529)</b>   |  |
| Basic construction  | IP 20 (current bars on rear side excluded) |
| Mounted in cabinet  | IP 43                                      |
| <b>Standards</b>  |  |
| EMC emission  | EN 50081-2, EN 55011                       |
| EMC immunity  | EN 50082-2                                 |
| Safety  | EN 60204, IEC204-1 mod.                    |
| Interlock circuit   | EN 60204-1995                              |
| <b>Isolation</b>  |  |
| Line to output  | 4000 Vrms                                  |
| Line to case  | 2500 Vrms                                  |
| Output to case:   | ± 1000 VDC, > 10 MΩ / 2 x 6.8 nF           |
| <b>Standard programming interfaces</b>  |  |
| <b>Control port</b>   |  |
| Isolation to electronics and earth: 125 Vrms  |  |
| 25 pin D-sub connector, female, on rear panel   |  |
| <b>Control port input functions</b>   |  |
| 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 – 10 V                                   |
| Power setting 0 – 100 %   | 10 – 0 V                                   |
| Int. resistance setting 0 – 1000 mΩ <sup>3)</sup>   | 0 – 10 V                                   |
| <b>Control port output functions</b>  |  |
| 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 <sup>13)</sup>**

|   |                  |
|---|------------------|
| 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 <sup>13)</sup>**

|   |  |
|---|--|
| 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 <sup>3)</sup> | 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.32.52.400.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-specific programmable

13) This option and RS232: time-shared mode required, if used together