

DECKBLATT ZUM ORIGINAL-DOKUMENT DES HERSTELLERS

# 16KW | DATENBLATT GERÄTE

**HERSTELLER** Regatron AG  
**PRODUKTSERIE** TopCon Quadro-Serie [16kW\_52V]

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# TC.P.16.52.400.S

## Programmable DC Power Supply (TopCon Quadro)

- 16 kW
- 52 V
- 400 A

### Features

- Unidirectional power supply
- Proven dynamics
- Cost effective
- TopControl operating SW + API



### Key Values

|                                           |                                                             |                         |
|-------------------------------------------|-------------------------------------------------------------|-------------------------|
| Power                                     |                                                             | 16 kW                   |
| Voltage DC                                | limited by $P_{max}$                                        | 52 V                    |
| Current                                   | limited by $P_{max}$ and ambient temperature                | 400 A                   |
| Autoranging factor                        | $U_{max} \times I_{max} / P_{max}$                          | 1.3                     |
| <i>Figure 1</i>                           |                                                             |                         |
| Master-slave / multi-device configuration |                                                             | parallel, series, mixed |
| Max. number of devices in system          | may be extended by TC.MAC                                   | 16                      |
| Max. number in parallel                   | may be extended by TC.MAC                                   | 16                      |
| Max. number in series                     | with midpoint earthing<br>limited by output isolation to PE | 8                       |
| Case                                      |                                                             | 19" / 6U                |

### AC Lineside Rating

|                                    |                                                                                                                 |                                                                                                                 |
|------------------------------------|-----------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------|
| Mains connection type              | delta                                                                                                           | 3L + PE (no neutral necessary)                                                                                  |
| Rated voltage                      |                                                                                                                 | 3x400 V $\pm 10\%$                                                                                              |
| Rated current                      | @nominal 3x 360 VAC<br>@nominal 3x 380 VAC<br>@nominal 3x 400 VAC<br>@nominal 3x 415 VAC<br>@nominal 3x 440 VAC | 30 A <sub>rms</sub><br>29 A <sub>rms</sub><br>27 A <sub>rms</sub><br>26 A <sub>rms</sub><br>25 A <sub>rms</sub> |
| Rated frequency                    |                                                                                                                 | 50/60 Hz                                                                                                        |
| Power factor                       | @ $P_{max}$                                                                                                     | 0.92                                                                                                            |
| THDi                               | @90% $P_{max}$                                                                                                  | 32%                                                                                                             |
| Input stage                        |                                                                                                                 | 6 pulse bridge rectifier                                                                                        |
| Efficiency                         | $P_{max}$ @ $U_{max}$                                                                                           | 94%                                                                                                             |
| Input insulation test voltage      | line to case/logic                                                                                              | 1670 VDC (1 s)                                                                                                  |
| Protective earth conductor current | According to IEC 60990                                                                                          | <10 mA                                                                                                          |
| Touch current unweighted           |                                                                                                                 | 20 mA                                                                                                           |
| Touch current weighted             |                                                                                                                 | 2 mA                                                                                                            |
| Input filter discharge             | L-PE / L-L                                                                                                      | 6.9s/8.8s                                                                                                       |
| <i>to &lt;60 V</i>                 |                                                                                                                 |                                                                                                                 |
|                                    | with option XCD                                                                                                 | <1 s                                                                                                            |

### DC Operation

|                                                        |              |                    |
|--------------------------------------------------------|--------------|--------------------|
| Operation modes                                        |              | Source             |
| Voltage regulation                                     | CV           | 0...100% $U_{max}$ |
| Current regulation                                     | CC           | 0...100% $I_{max}$ |
| Power regulation                                       | CP           | 5...100% $P_{max}$ |
| Internal resistance simulation                         | programmable | 0...130 mΩ         |
| Load regulation                                        | voltage      | 0.1% FS            |
| <i>0...100% load</i>                                   |              |                    |
| <i>At 25° ambient temperature, constant line input</i> |              |                    |
|                                                        | current      | 0.1% FS            |

## DC Operation (continued)

|                                                                                                                                      |                                                                      |                                                                 |
|--------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------|-----------------------------------------------------------------|
| <b>Line regulation</b><br>-10%...+10% line voltage<br><i>At 25° ambient temperature, constant load</i>                               | voltage                                                              | 0.1% FS                                                         |
|                                                                                                                                      | current                                                              | 0.1% FS                                                         |
| <b>HMI meter resolution</b>                                                                                                          | programming/reading                                                  | 0.1 V                                                           |
|                                                                                                                                      |                                                                      | 0.1 A                                                           |
| <b>Output capacitance</b>                                                                                                            | X-capacitor                                                          | 2906 µF                                                         |
|                                                                                                                                      | Y-capacitor @DC                                                      | 13.6 nF                                                         |
| <b>Ripple, voltage</b>                                                                                                               | output voltage ripple 300 Hz $V_{rms}$                               | ≤0.4% FS                                                        |
|                                                                                                                                      | ohmic load, CV mode                                                  |                                                                 |
|                                                                                                                                      | Typical value at nominal ohmic load,<br>line asymmetry < 1 $V_{rms}$ |                                                                 |
|                                                                                                                                      | output voltage ripple 300 Hz $V_{pp}$                                | ≤1.1% FS                                                        |
|                                                                                                                                      | ohmic load, CV mode                                                  |                                                                 |
|                                                                                                                                      | Typical value at nominal ohmic load,<br>line asymmetry < 1 $V_{rms}$ |                                                                 |
| <b>Noise</b>                                                                                                                         | noise 40 kHz...1 MHz $V_{rms}$                                       | < 0.1 V                                                         |
|                                                                                                                                      | ohmic load, CV mode                                                  |                                                                 |
|                                                                                                                                      | tpical value at nominal ohmic load,<br>line asymmetry < 1 $V_{rms}$  |                                                                 |
|                                                                                                                                      | noise 40 kHz...1 MHz $V_{pp}$                                        | < 1.5 V                                                         |
|                                                                                                                                      | ohmic load, CV mode                                                  |                                                                 |
|                                                                                                                                      | tpical value at nominal ohmic load,<br>line asymmetry < 1 $V_{rms}$  |                                                                 |
| <b>Stability/drift</b><br><i>8h, after 1h warm up time in output on state,<br/>at constant line input, load and temp. conditions</i> | voltage                                                              | ≤0.05% FS                                                       |
|                                                                                                                                      | voltage sense                                                        | ≤0.05% FS                                                       |
|                                                                                                                                      | current                                                              | ≤0.05% FS                                                       |
| <b>Temperature coefficient</b><br><i>At constant line and load conditions</i>                                                        | voltage                                                              | ≤0.02% FS/°C                                                    |
|                                                                                                                                      | current                                                              | ≤0.03% FS/°C                                                    |
| <b>Rise/fall time (10...90% of step)</b><br><i>Voltage set-value step, const. ohmic load</i>                                         | voltage step (10...90% $U_{max}$ / 10...90% $P_{max}$ )              | <2 ms                                                           |
|                                                                                                                                      | can be affected in multi-unit operation                              |                                                                 |
| <b>Rise/fall time (10...90% of step)</b><br><i>Current set-value step, const. ohmic load</i>                                         | current step (10...90% $I_{max}$ )                                   | <2 ms                                                           |
|                                                                                                                                      | 10...90% of step                                                     |                                                                 |
|                                                                                                                                      | can be affected in multi-unit operation                              |                                                                 |
| <b>Transient response time</b><br><i>Load step, ohmic load</i>                                                                       | CV, recovery within 5% set voltage                                   | <2 ms                                                           |
|                                                                                                                                      | 10...90% $P_{max}$                                                   |                                                                 |
|                                                                                                                                      | can be affected in multi-unit operation                              |                                                                 |
| <b>Transient response time</b><br><i>Load step, ohmic load</i>                                                                       | CC, recovery within 5% of set current                                | <2 ms                                                           |
|                                                                                                                                      | 10...90% $P_{max}$                                                   |                                                                 |
|                                                                                                                                      | can be affected in multi-unit operation                              |                                                                 |
| <b>Protection</b>                                                                                                                    | OVP (over voltage protection) programmable                           | 0...110% FS                                                     |
|                                                                                                                                      | OCP (over current protection) programmable                           | 0...110% FS                                                     |
|                                                                                                                                      | OPP (over power protection) programmable                             | 0...110% FS                                                     |
|                                                                                                                                      | OTP (over temperature protection)                                    | ✓                                                               |
| <b>Sense voltage compensation</b>                                                                                                    |                                                                      | Programmable<br>$U_{out} + U_{drop}$ limited by $U_{out_{max}}$ |
| <b>Sense input impedance</b>                                                                                                         |                                                                      | 49 kΩ                                                           |
| <b>Ballast resistor DC power port</b>                                                                                                | @output off                                                          | 25 Ω                                                            |
| <b>Resistance</b>                                                                                                                    | DC+/DC- output to PE                                                 | open                                                            |
|                                                                                                                                      | X109 jumper inserted                                                 |                                                                 |
| <b>Absolute maximum ratings</b>                                                                                                      | Voltage                                                              | 57                                                              |
|                                                                                                                                      | Current                                                              | 440                                                             |
|                                                                                                                                      | DC+ output to PE                                                     | +1052 V / -1000V                                                |
|                                                                                                                                      | DC- output to PE                                                     | +1000 V / -1000V                                                |
| <b>Input insulation test voltage</b>                                                                                                 | line to case/logic                                                   | 1670 VDC (1 s)                                                  |
| <b>Output insulation test voltage</b>                                                                                                | output to case/logic                                                 | 2540 VDC (1 s)                                                  |

## Various

|                         |                                            |                          |
|-------------------------|--------------------------------------------|--------------------------|
| Case dimensions         | H × W × D                                  | 265 × 483 × 450 mm       |
| Figure 3                | without terminals                          | 10 1/2" × 19" × 17 3/4"  |
| Weight                  |                                            | 44 kg / 97 lbs           |
| AC terminals            | screw terminals                            | 10 mm <sup>2</sup>       |
| DC terminals            |                                            | Output bars for M8 bolts |
| Enclosure               | rating                                     | IP20                     |
|                         | current bars on rear side excluded         |                          |
| Communication interface |                                            | RS232 (38400 baud)       |
|                         | isolation to electronics and case          | 125 V                    |
|                         | resolution, programming and readback U, I  | 0.025% FS                |
|                         | resolution, programming and readback P, Ri | 0.1% FS                  |
| Option cards            | # of free slots                            | 1                        |

## Analog Inputs

|                              |                                                                |                  |
|------------------------------|----------------------------------------------------------------|------------------|
| Number of inputs             | setvalues for voltage, current, power, and internal resistance | 4                |
| Resolution                   |                                                                | 12 Bit           |
| Sampling rate                |                                                                | 20 kHz           |
| Input voltage range          | 0...100% FS                                                    | 0...10 V         |
| Isolation                    | to electronics and case                                        | 125 V            |
| Input impedance              |                                                                | 20 kΩ (typ.)     |
| Absolut max. input voltage   |                                                                | 30 VDC           |
| Input filter                 | bandwidth programmable                                         | OFF, 0.1...400Hz |
| Delay analog in to power out | can be affected in multi-unit operation                        | 200 μs (typ.)    |

## Analog Outputs

|                               |                                         |                  |
|-------------------------------|-----------------------------------------|------------------|
| Number of outputs             | voltage, current readback               | 2                |
| Resolution                    |                                         | 12 Bit           |
| Update rate                   |                                         | 10 kHz           |
| output filter                 | bandwidth programmable                  | OFF, 0.1...400Hz |
| Output voltage range          | 0...100% FS                             | 0...10 V         |
| Isolation                     | to electronics and case                 | 125 V            |
| Output impedance              |                                         | 535 Ω (typ.)     |
| Max. output current           | short-circuit proof                     | 28 mA            |
| Delay power out to analog out | can be affected in multi-unit operation | 200 μs (typ.)    |

## Digital I/O

|                                         |                     |                                                           |
|-----------------------------------------|---------------------|-----------------------------------------------------------|
| Number of digital inputs                |                     | 6<br>(4 inputs programmable,<br>+ voltage on, +interlock) |
| Output voltage supplied for digital I/O |                     | 24 VDC (-15% / +20%)                                      |
| Input impedance                         |                     | 4.7 kΩ                                                    |
| Max. voltage digital inputs             |                     | 30 VDC                                                    |
| Sampling rate digital inputs            |                     | 1 kHz                                                     |
| Max total output current all channels   |                     | 200 mA                                                    |
| Max output current per channel          | short-circuit proof | 200 mA                                                    |
| Update rate digital outputs             |                     | 10 kHz                                                    |

## Relay Outputs

|                         |                                                   |                             |
|-------------------------|---------------------------------------------------|-----------------------------|
| Number of relay outputs | Error: SPST(NO)<br>Run: SPST(NO)<br>Warn: 1× SPDT | 3                           |
| Load type               |                                                   | ohmic, inductive, lamp load |
| Max. switching voltage  |                                                   | 30 VDC                      |
| Max. switching current  |                                                   | 1 A                         |
| Switching time          |                                                   | 20 ms (typ.)                |

## Ambient

|                                                              |                                                                                                                                      |                                                                                              |
|--------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------|
| <b>Operating altitude</b>                                    | above sea level<br>above 1000 m / 3280 ft, slight temp. derating possible                                                            | ≤2000 m / ≤6562 ft                                                                           |
| <b>Operating temperature</b>                                 |                                                                                                                                      | 5...40 °C<br>with airfilter<br>-10 °C                                                        |
| <b>Current derating</b>                                      | max. continuous output current @ temperature:<br>higher current if CDF <100%<br>no derating if equipped with optional liquid cooling | 25°C: 365 A (400 A < 30 <sub>min</sub> at 25°C)<br>30°C: 330 A<br>35°C: 295 A<br>40°C: 260 A |
| <b>Storage temperature</b>                                   |                                                                                                                                      | -25...+70 °C                                                                                 |
| <b>Installation</b>                                          | IEC 60721-3-3                                                                                                                        | indoor, air-conditioned<br>in protected 19" switch cabinet                                   |
| <b>Orientation</b>                                           | storage, installation, operation                                                                                                     | upright                                                                                      |
| <b>Relative humidity</b>                                     | non-condensing                                                                                                                       | 0...95%                                                                                      |
| <b>Vibration</b>                                             | IEC 60068-2-6                                                                                                                        | Test Fc                                                                                      |
| <b>Cooling</b>                                               |                                                                                                                                      | direct forced air, front to back<br>optional liquid cooling (85%), AC100 (Al-Ti-alloy)       |
| <b>Acoustic noise level</b><br><i>1 m dist. front (typ.)</i> | 90% P <sub>max</sub> , 90% I <sub>max</sub><br>@25 °C ambient                                                                        | 63 dB(A)                                                                                     |

## Standards

|                                                                     |                                                                                                                          |                   |
|---------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------|-------------------|
| <b>Protection class</b>                                             | EN 62477-1                                                                                                               | 1                 |
| <b>Degree of pollution</b>                                          | EN 60664-1                                                                                                               | 2                 |
| <b>Overvoltage category</b>                                         | mains input, EN 60664-1 / EN 62477-1<br>other interfaces                                                                 | III<br>II         |
| <b>Area of application</b>                                          |                                                                                                                          | industrial        |
| <b>Approval</b>                                                     |                                                                                                                          | CE marking, UKCA  |
| <b>EN 62477-1:2012</b><br><i>+ A11:2014 + A1:2017 + A12:2021</i>    | Low Voltage Directive 2014/35/EU                                                                                         | ✓                 |
| <b>BS EN 62477-1:2012</b><br><i>+ A11:2014 + A1:2017 + A12:2021</i> | Electrical Equipment (Safety) Regulations 2016                                                                           | ✓                 |
| <b>EN ISO 13849-1:2015</b>                                          | w/o ISR<br>with ISR 2-channel<br>with ISR 2-channel and<br>external safety relay                                         | -<br>PL c<br>PL e |
| <b>EN 61000-6-4:2007 A1:2011 / EN61000-6-4:2019</b>                 | Directive 2014/30/EU<br>EMC emission (industrial)                                                                        | ✓                 |
| <b>BS EN 61000-6-4:2007 A1:2011 /</b><br><i>BS EN61000-6-4:2019</i> | Electromagnetic Compatibility Regulations 2016<br>EMC emission (industrial)                                              | ✓                 |
| <b>EN 61000-6-2:2005 / EN 61000-6-2:2019</b>                        | Directive 2014/30/EU<br>EMC immunity (industrial)                                                                        | ✓                 |
| <b>BS EN 61000-6-2:2005 / BS EN 61000-6-2:2019</b>                  | Electromagnetic Compatibility Regulations 2016<br>EMC immunity (industrial)                                              | ✓                 |
| <b>EN IEC 63000:2018</b>                                            | RoHS Directive                                                                                                           | ✓                 |
| <b>BS EN IEC 63000:2018</b>                                         | The Restriction of the Use of Certain Hazardous<br>Substances in Electrical and Electronic Equipment<br>Regulations 2012 | ✓                 |

## Operating area

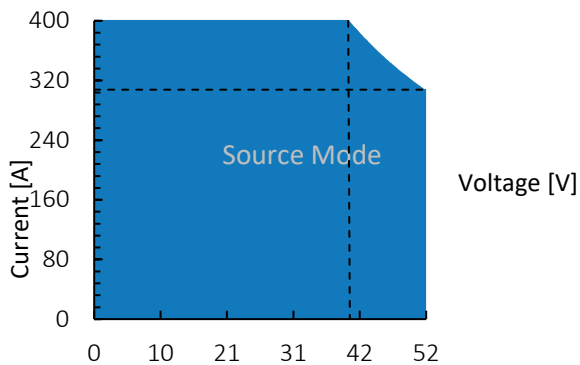


Figure 1: TC.P.16.52.400.S, voltage / current operating area.

Max.current up to 40 V

Max.Voltage up to 308 A

## Dimensions

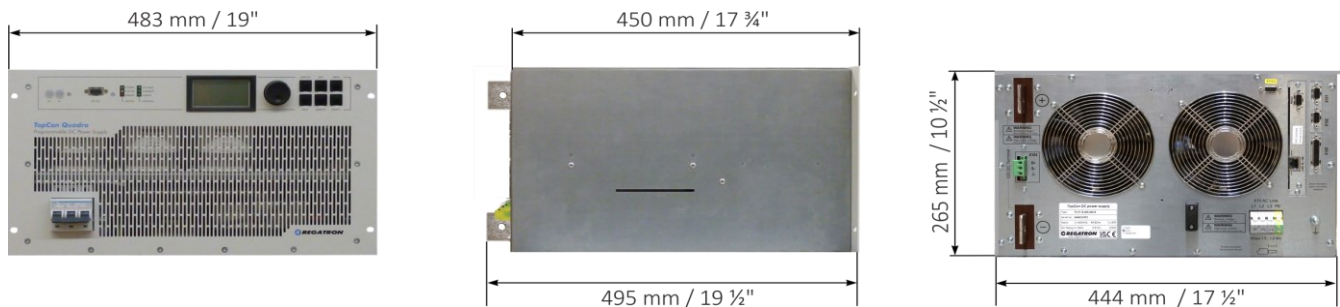


Figure 3: Front, side, and rear view. 19-inch module with 4 units in height.

This product is developed, produced and tested according to ISO 9001 by REGATRON.

For detailed technical information, contact REGATRON or your local sales partner.

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All product specifications and information contained herein are subject to change without notice.

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