



TopCon TC.GSS

MODULAR GRID-TIE SOURCE/SINK
SYSTEMS BY REGATRON

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Abstract

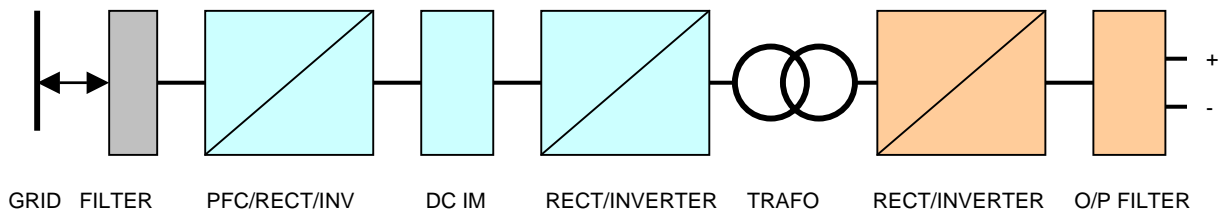
Development, tuning and testing of today's energy technologies call for active source/sink systems. Up to now, most power supply providers either offer split source/sink systems or integrated fixed power supply systems without any modularity.

REGATRON now announces a brand new series of integrated current-bidirectional power sources TopCon.GSS. This series combines the excellent technical data of well-known TopCon DC power supplies with modern grid-tie inverter technology in order to handle both current flows from and towards the load. The modular TopCon concept is still maintained, so a finely graduated variety in terms of voltages and power is on the customer's disposal.

Applications

- Testing and qualifying of battery systems
- Development and testing of automotive power trains
- Simulation of airborne and vehicle onboard power grid
- Test benches for electrical drives, elevators, tower crane drives, cable railways
- Evaluation and testing of hybrid concepts
- Common electrical process engineering
- Energy buffer systems

System topology

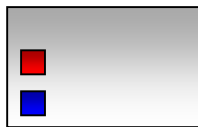


The new concept is based on state-of-the-art circuitry providing an optimum of performance, efficiency and dynamic response. The active grid-tied interface block eliminates the well-known problems created by passive 6-pulse rectifiers. All relevant EN – regulations are met. The medium frequency transformer ensures a complete isolation of the DC bus versus the grid potential.

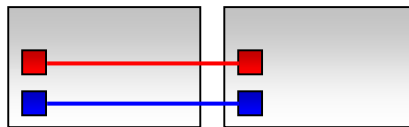
This concept not only offers a very compact cabinet sizing, but also an extended modularity. By this, TopCon.GSS systems can easily be designed to the customers needs in terms of voltage and power. **Please note, that a given system can be upgraded at any time by simply adding further TC.GSS units with an absolute minimum of adaptation work!**

System characteristics at a glance

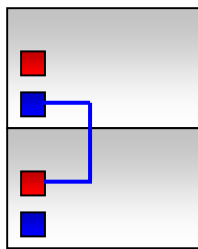
- Excellent matching to grid by PFC-functionality
- Full modular concept, providing easy later system upgrade
- Perfect galvanic isolation towards grid and earth
- Wide range of power (20 – 224 kW) and voltages (400VDC – 1200VDC)
- CE compatible
- High dynamic response in both quadrants, fast quadrant crossover
- Operation in CV, CC, CP and 'internal resistance' modes
- Full digital controllers and peripheral operations
- Proprietary inter-unit bus system for easy master-slave operation
- Parallel-, serial, mixed-mode system configuration allowed



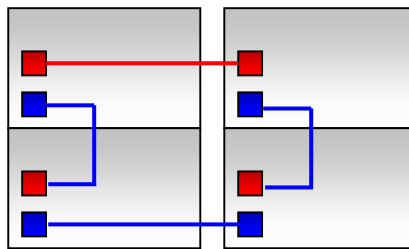
Stand-alone



Parallel connection



Serial connection



Mixed mode connection

Topcon op modes up to a total of 7 units

TopCon.GSS is intended to fit the same 19"-cabinet like the today's TopCon DC power supply family.

The units can easily be assembled in standard 19" racks with an absolute minimum of additional wiring. By this high degree of functionality, even big power systems only need a fractional part of space and wiring compared to conventional solutions.



TopCon.GSS Grid-tie source/sink unit 32 kW

TopCon TC.GSS

Programmable Grid-tie Source – Sink
Bidirectional High-Power DC Supply



TopCon GSS Power Supply unit with optional front panel control unit HMI

- TopCon Grid-tie Source Sink technology enables full bidirectional operation
- Compact design with integrated EMI - and Sine filters
- 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.
- Graduated product line: 65, 130, 200, 400, 500, 600V DC, higher Voltages with series connection up to 1500V_{DC}. Power categories of 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, matrix or multiloading master-slave-operation.
- 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++ C#/ .NET API (DLL file) are included in the scope of delivery.
- CE conformity
- Swiss made: Developed, manufactured and tested in Switzerland by Regatron AG.

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32 kW / 500 VDC / 80 A

Mains requirements and output specifications

AC line

Line voltage.....3 x 360 – 440 VAC
Line frequency 48 – 62 Hz
Mains connection type3L+PE (no neutral)
Input current Q1 active mode..... 3 x 51 Arms¹⁾
Leakage current L to PE < 20 mA
Powerfactor Q1 active- / Q4-mode.....≥ 0.99
(At nominal power)

DC-side ratings

Power range.....0 – +/- 32 kW
Voltage range.....0 – 500 VDC
Current range.....0 – +/- 80 A²⁾
Internal resistance range 0 – 1000 mΩ³⁾

Operating modes

Q1 active mode..... source mode
Q4 mode regenerative/sink mode
Voltage regulation (CV).....0 – 100 % U_{max}
Current regulation (CC).....0 – ± 100 % I_{max}
Power regulation (CP)..... 0 – ± 100 % P_{max}

Static accuracy

Load regulation CV, CC< ± 0.1% FS⁴⁾
Line regulation CV, CC< ± 0.1% FS⁵⁾

Transient response time

Load regulation< 2 ms⁶⁾
Set value tracking with quadrant change< 4 ms⁷⁾
Set value tracking without quadrant change< 2 ms⁷⁾
Quadrant change time< 3 ms⁹⁾

Stability

CV, CC.....< ± 0.05% FS⁸⁾

Temperature coefficient

CV< 0.02 % FS / °C¹⁰⁾
CC.....< 0.03 % FS / °C¹⁰⁾

DC-side ripple Q1 / Q4 Mode

≤ 300 Hz V_{pp}< 0.5% FS¹¹⁾
≤ 300 Hz V_{rms}< 0.1% FS¹¹⁾

DC-side noise Q1 / Q4 Mode

40 kHz – 1 MHz V_{pp}< 1 V¹¹⁾
40 kHz – 1 MHz V_{rms}< 0.2 V¹¹⁾

Remote sensing

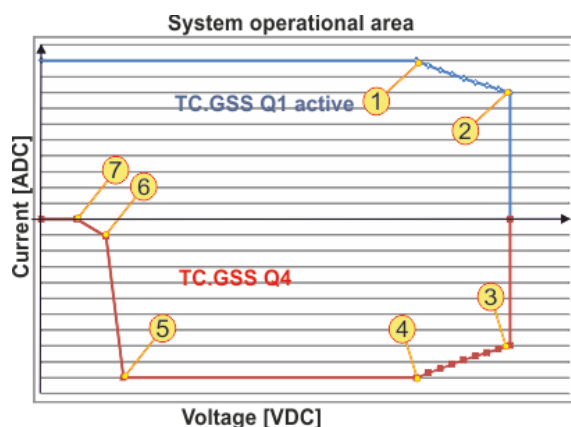
Terminals on rear side Load voltage drop
Compensation

- 1) At nominal output power and line input voltage 3 x 400 VAC / 50 Hz. Soft-start to limit turn-on surge currents.
- 2) Current according to the given power limit of the corresponding units. ($P = U_{out} \cdot I_{out} \leq 32 \text{ kW}$; for $I_{out} > 64 \text{ A} \rightarrow U_{out} < 500 \text{ V}$). No current derating.
- 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 $\pm 5 \%$ 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) Rise/ fall time for 10%-90% of a set step.
- 8) Maximum drift over 8 hours after 30 minute warm-up time, at constant line input, load and temperature conditions.
- 9) Quadrant change time for small currents : Time from 5% to -5% I_{NOM} and vice versa with a battery load.
- 10) Typical change of output values versus ambient temperature, at constant line input and load conditions.
- 11) 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.

General specifications

Efficiency at nominal power	92 % ¹⁶⁾
Weight	90 kg
Width front panel	483 mm
Width housing	(19") 444 mm
Height front panel	399 mm
Height housing	(9U) 394 mm
Depth with output terminals	634 mm
Depth housing	594 mm
Input connections:	terminal block 4 x 25 mm ²
DC terminals:	nickel-plated copper bars, length: 40 mm, 1 hole 9 mm Ø in each bar
Operating orientation	upside
Storage, transport orientation	upside

Operating range

Q1 and Q4 range of device TC.GSS.32.500.400.S

-1- :	400 V / 80 A	-4- :	400 V / -80 A
-2- :	500 V / 64 A	-5- :	80 V / -80 A
-3- :	500 V / -64 A	-6- :	68 V / -8 A
.....		-7- :	35 V / 0 A

Ambient conditions

Operating temperature	5 – 40 °C
Storage temperature	-18 – 70 °C
Relative air humidity (non-condensing)	0 – 95 %

Cooling

Standard: Internal liquid cooling with completely integrated liquid to air heat-exchange system using temperature-controlled fans.

Optional: Integrated liquid cooling system of the power stage with completely integrated liquid to liquid heat-exchange system.

Heat exchanger

Material	Stainless steel
Inlet/outlet on rear side size:	G ½"
Liquid temperature	15 ¹⁸⁾ – 35 °C
Flow	≥ 3 l/min
Pressure max.	≤ 10 bar
Pressure drop	50 mbar@3 l/min

Protection**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	Cont. short circuit allowed
Islandig, grid off, requirements for the connection of micro-generators in public grid according VDE 0126/EN 50438.	

Internal diagnostics

line input conditions, transformer primary current, temperature conditions, processor idle time, system configuration, system communication, sensor signals, power semiconductor temperatures.

Type of protection (according EN 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
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Isolation

Line to output	4000 Vrms
Line to case	2500 Vrms
Output to case	> 10 MΩ
per DC output	13.6 nF
- bar ¹⁵⁾	+1000 VDC / -1000 VDC
+ bar ¹⁵⁾	+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 off / on	0 / 24 VAC / DC
2 digital application inputs	0 / 24 VAC / DC ¹¹⁾
Interlock circuit	0 / 24 VDC
Voltage setting 0 – 100 %	0 – 10 V
Current setting -100% – 100 %	-10 – 10 V
Power setting -100% – 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
Warnings	Relay contact
Actual voltage readback 0 – 100 %	0 – 10 V
Actual current readback -100% – 100 %	-10 V – 10 V
Resolution (programming and readback): U, I, P, Ri	0.2 % FS

3) Optionally extendable to a maximum of 12000 mΩ.
11) Customer-specifically programmable.
15) Peak Voltage including DC-Output Voltage.
16) At 8kHz switching frequency line side inverter.
17) Ni brazed, ready to use with deionized water.
18) 20 °C ambient and ≤ 70 % relative air humidity.

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.GSS.32.500.400.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++; C#/ .NET 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 88 (2 U) x 290 mm

Further options

TFEAAPControl Function Generating Engine
 Time-based and
 parametric programming
 SASControl SAS application program
 including TFEAAP
 BatControl Battery application program
 BatSim Battery simulation program
 RS232REAR¹²⁾ RS232 on front and rear panel
 USB¹³⁾ Interface USB on rear panel
 RS422¹²⁾ RS422 on rear panel
 TCEthernet¹⁴⁾ Ethernet to RS232 on rear panel
 IEEE¹³⁾ GPIB/ IEEE488.2/ SCPI on rear panel
 cannot be combined with CANOPEN nor with USB
 CANOPEN¹³⁾ CAN/ CANOPEN on rear panel
 CANCEABLE Connecting cable
 for Multi-Unit Operation or RCU: 2, 5, 10 m
 PACOB Protection against accidental contact
 IRXTS³⁾ 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)

TC.GSS 系列双向电源

20kW	32kW
TC.GSS.20.65.4WR.S	TC.GSS.32.65.4WR.S
TC.GSS.20.130.4WR.S	TC.GSS.32.130.4WR.S
TC.GSS.20.200.4WR.S	TC.GSS.32.200.4WR.S
TC.GSS.20.400.400.S	TC.GSS.32.400.400.S
TC.GSS.20.500.400.S	TC.GSS.32.500.400.S
TC.GSS.20.600.400.S	TC.GSS.32.600.400.S

- 3) Optionally extendable to a maximum of 12000 mΩ
 11) Customer-specificly programmable.
 12) This option and RS232: time-shared mode required, if used together.
 13) RS232 only on Rear Panel.
 14) Please order option RS232REAR separately.

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