Programmable Regenerative DC Sink

TC.GXS Series unit with optional Human Machine Interface (HMI)

Features

TC.GXS Series (regenerative)

- TopCon Grid-tie Sink technology enables a Q4 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 V_{DC}, 130 V_{DC}, 400 V_{DC}, 500 V_{DC}, 600 V_{DC}, higher voltages with series connection up to 1500 V_{DC}.
  Power categories of 20 kW 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 multiload 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.

Technical Data

AC lineside ratings

Line voltage / Line current relationship
3 x 380 V_{AC} ± 10 % / 34 Arms [1) 13)]
3 x 400 V_{AC} ± 10 % / 32 Arms [1)]
3 x 415 V_{AC} ± 10 % / 31 Arms [1)]
3 x 440 V_{AC} ± 10 % / 29 Arms [1)]
3 x 460 V_{AC} ± 10 % / 28 Arms [1)]
3 x 480 V_{AC} ± 10 % / 27 Arms [1)]

Line frequency ..... 48 – 62 Hz
Mains connection type ..... 3L + PE (no neutral)
Protective conductor current @ 50 Hz ..... < 20 mA [2)]
Touch current unweighted ..... < 20 mA [2)]
Touch current weighted ..... < 2 mA [2)]
Powerfactor Q4-mode @ Pnom ..... ≥ 0.99

DC loadside ratings

Power range ..... 0 kW – - 20 kW [3)]
Voltage range ..... 0 VDC – 400 VDC
Current range ..... 0 A – - 63 A [3)]
Internal resistance range ..... 0 mΩ – 6350 mΩ [4)]
Switchable output capacitance ..... 0.09 mF / 0.9 mF

Static accuracy

Load regulation CV, CC ..... < ± 0.1 % FS [5)]
Line regulation CV, CC ..... < ± 0.1 % FS [6)]

Transient response time

Load regulation CV ..... < 1.1 ms [7)]
Set value tracking CV ..... < 1.1 ms [8) 11)]
Set value tracking CC:
-With quadrant change ..... < 3 ms [8)]
-Without quadrant change ..... < 2 ms [8)]
Efficiency at nominal power Q4 ..... 92 % [9)]

Stability

Voltage regulation (CV) ..... < ± 0.05 % FS [10)]
Current regulation (CC) ..... < ± 0.05 % FS [10)]

Ripple Q4 Mode

≤ 300 Hz Vpp ..... < 0.5 % FS [11)]
≤ 300 Hz Vrms ..... < 0.1 % FS [11)]

Noise Q4 Mode

40 kHz – 1 MHz Vpp ..... < 1 V [11)]
40 kHz – 1 MHz Vrms ..... < 0.2 V [11)]

Temperature coefficient

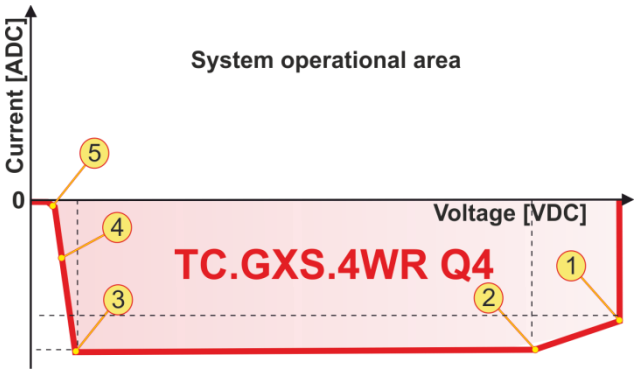
Voltage regulation (CV) ..... < 0.02 % FS / K [12)]
Current regulation (CC) ..... < 0.03 % FS / K [12)]

1) At nominal output power and nominal line voltage. Soft-start to limit turn-on surge currents.
2) According to IEC60990: Protective conductor current: 50 Hz component @400 VAC/50Hz/P_{nom}
For weighted touch current: Measured for perception/reaction
Protection with earth leakage circuit breaker possible. An additional PE connection is necessary.
3) Current according to the given power limit of the corresponding units.
($P = V_{Load} * I_{Load} \leq 20$ kW; for $I_{Load} > 50$ A --> $V_{Load} < 400$ V).
4) The maximum value of the internal resistance is automatically calculated via the DC nominal values
(Ri [mΩ] = V_{Load} / I_{Load} = 400 VDC / 63 A) or limited by the maximum Ri-value: 32000 [mΩ].
5) Typical value for 0 – 100 % load variation, at constant line input and temperature conditions.
6) Typical value for input voltage variation within 380 VAC ± 10 % – 480 VAC ± 10 %, at constant load and temperature conditions.
7) 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.
8) Rise/ fall time for 10%-90% of a set step.
9) At 15kHz switching frequency line side inverter.
10) Maximum drift over 8 hours after 30 minute warm-up time, at constant line input, load and temperature conditions.
11) Typical value at nominal ohmic load, line asymmetry < 1 Vrms.
12) Typical change of output values versus ambient temperature, at constant line input and load conditions
13) Information about derating see section Deratings on page 2.

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

Technical Data

Operating modes
Q1 mode .....regenerative / sink mode
Voltage regulation (CV) ..... 0 – 100 % Vnom
Current regulation (CC) .....0 – - 100 % Inom
Power regulation (CP) ..... - 5 – - 100 % Pnom



Q4 range of device TC.GXS.20.400.4WR.S.

Quadrant Q4 :
-1- .....400 V / -50 A
-2- : .....317.5 V / -63 A
-3-: .....50 V / -63 A
-4-: .....30 V / -21 A
-5- ..... 20 V / 0 A

Remote sensing
Line voltage drop compensation
Terminal on rear side X104

Deratings

Power derating
None.

Current derating
None.

Isolation
Line to case/logic .....1670 VDC 1 s
Output to case/logic .....2540 VDC 1 s
Transformer.....4800 VAC
Output to case..... 10.8 MΩ / high impedance (X109 open)
per DC bar.....13.6 nF
- bar [1].....+1000 VDC / -1000 VDC
+ bar [1].....+1000 VDC / -1000 VDC

Technical Data

Protection
Built-in protection
Overtemperature
Overvoltage (programmable) .....0 – 110 % Vnom
Response time.....50 µs – 1600 ms

Overcurrent (programmable) ..... 0 – 110 % Inom
Response time.....50 µs – 1600 ms

Max. reactive load voltage .....≤ 110 % Vnom
Short circuit protection ..... Cont. short circuit allowed
Islanding, 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 54

Conformity CE-Marking
EMC Directive 2014/30/EN
Generic standards – Emission standard for industrial environments ..... EN 61000-6-4
Generic standards – Immunity standard for industrial environments ..... EN 61000-6-2

Low Voltage Directive 2014/35/EU
Electronic equipment
for use in power installations..... EN 50178

RoHS Directive 2011/65/EU
Technical documentation for the assessment of electrical and electronic products with respect to the restriction of hazardous substances..... EN 50581

Ambient conditions
Operation
Operating temperature..... 5 – 40 °C
Relative air humidity (non-condensing)..... 0 – 95 %

Storage
Storage temperature (with coolant)..... -18 – 70 °C
Relative air humidity (non-condensing)..... 0 – 95 %

Installation altitude ..... 0 - 2000 m above sea level
Operating orientation .....upside
Storage, transport orientation .....upside

Utilization category
Protection class I
Overvoltage category..... III
Degree of pollution..... 2

Cooling
Internal liquid to air heat-exchange system using temperature-controlled fans.
Coolant ..... Antifrogen® N Clariant

1) Maximum working voltage including DC output voltage.

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Standard Interfaces

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):
V, I..... 0.025 % FS
P, Ri ..... 0.1 % FS

I/O Interface X105 (analog / digital)
25 pin D-sub connector, female ..... on rear panel
Isolation to electronics and earth..... 125 Vrms

Control port input functions
Output voltage off / on..... 0 / 24 VAC / DC
2 digital application inputs ..... 0 / 24 VAC / DC [1)]
Interlock circuit ..... 0 / 24 VDC
Voltage setting 0 % – 100 % ..... 0 V – 10 V
Current setting -100 % – 0 % ..... - 10 V – 0 V
Power setting - 100 % – 0 % ..... - 10 V – 0 V [2)]
Int. resistance setting 0 % – 100% ..... 0 V – 10 V
Input impedance analog inputs ..... 20 kΩ

Control port output functions
Unit ready / error ..... Relay contact
Output voltage on..... Relay contact
Warnings..... Relay contact
Actual voltage readback 0 % – 100 %..... 0 V – 10 V
Actual current readback -100 % – 0 %..... -10 V – 0 V

Resolution (programming and readback):
V, I, P, Ri..... 0.2 % FS

User Software

Software TopControl
The user-friendly operating and service program TopControl is included in the scope of delivery.

- Remote connection via PC interfaces: E.g. RS-232 or USB interface (Option) and further interface options.
- System operation (parallel or serial mode)
- Q1 (source) and Q4 (sink) operation modes.
- TopControl is the user interface software and environment for the additional software option like TFEAAP (FUNGEN) or CANmp.

Options Unit

Displays
Human maschine interface 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:
Desktop W x H x D ..... 355 x 100 x 290 mm
19“ Rack-Mount W x H x D ..... 483 x 88 (2 U) x 290 mm

Interfaces
On rear panel
USB .....
ETHERNET .....
TC.LXI .....
IEEE 488.2 / GPIB / SCPI.....
cannot be combined with CANOPEN nor with USB
CANmp ..... Fast multi-protocol CAN
CANOPEN .....
RS232REAR [3)] .....
OptoLink ..... fibre optic interface
OptoLink / RS232 [3)] ..... fibre optic interface incl. RS232
RS422 [3)].....

Software
TFEAAP [1)]..... TopCon Function Generating Engine
Time-based and parametric programming
PV curves or user defined curves (csv files)
SASControl [1)]..... SAS application program including TFEAAP
BatControl [1)]..... Battery testing program
BatSim [1)]..... Battery simulation program
CapSim [1)]..... Capacitor simulation program

Safety
ISR [4)]..... 2 channel Integrated Safety Relay
VLI ..... Voltage Level Indicator
RPP [4)] ..... Reverse Polarity Protection
PACOB DC..... Protection against accidental contact
PACOB AC ..... Protection against accidental contact

1) Customer-specific programmable
2) For the Q4 range only power settings -10 V … 0 V possible.
3) This option and RS232: time-shared mode required, if use together.
4) Retrofitting on request

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Options Unit

AIRFILTER
Front panel airfilter 9 U

Derating
None.

LC (Liquid Cooling) [1)]
Integrated liquid cooling system of the power stage with completely integrated liquid to liquid heat-exchange system.

Internal Heat exchanger
Material [2)] ..... Stainless steel
Inlet/outlet on rear side size ..... G ½“
Liquid temperature ..... 15 [3)] – 35 °C
Flow ..... ≥ 3 l / min
Recommended flow ..... 4 - 6 l / min
Pressure max. ..... 8 bar
Pressure drop ..... 50 mbar@3 l/min

Miscellaneous
NSOV ..... Non-Standard output voltage (if possible)
NSOC ..... Non-Standard output current (if possible)
NSOP ..... Non-Standard output power (if possible)

Options System

System operation
CANCABLE
Connecting cable for Multi-Unit Systems or RCU
Cable length ..... 2, 5, 10, max. 40 m

TC.MAC (Master Array Controller)
Required for Multi-Unit Systems with more than 16 power supplies. Controls several subsystems of up to 16 power supplies to reach MW range.
MACInterface ..... Interface for using TC.MAC
MACCABLE ..... To connect Subsystem to TC.MAC
Cable length ..... 2, 5, 10, max. 40 m

General Data

Weight & Dimension
Weight ..... 97 kg
Width front panel ..... (19") 483 mm
Width housing ..... 444 mm
Height front panel ..... (9U) 399 mm
Height housing ..... 394 mm
Depth with output terminals ..... 634 mm
Depth housing ..... 594 mm

Terminals
AC
Terminal block ..... 4 x 25 mm^2

DC
Material ..... nickel–plated copper bars
Dimensions ..... 40 mm, 1 hole 9 mm ∅ in each bar

Scope of delivery
RS232 cable ..... 1.8 m
Dummy plugs ..... X101 and X105
Operating manual ..... English or German
Installation disc ..... TopControl
DLL files ..... LabVIEW® and C /C++ / C# / .NET API

Ordering code
TC.GXS.20.400.4WR.S (.Option)

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1) Retrofitting on request
2) Ni brazed, ready to use with deionized water
3) 20 °C ambient temperature and ≤ 70 % relative air humidity

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