TECHNICAL DATA AND OPTIONS

I-TS-3872-1500-300-1000

Rated data AC terminal	
AC mains nominal voltage	3/PE AC 400 / 380 V [1]
AC mains nominal frequency	50 / 60 Hz
AC mains voltage tolerance	± 10 %
Frequency tolerance	± 5 %
Power consumption	320 kVA
Power factor λ at rated power	> 0.99 ind.
Nominal AC current	451 A
AC current max. (at minimum AC voltage and overlaod	591 A
Recommended pre-fuse	3x gL/gG 630 A
Rated conditional short-circuit current I_{cc}	15 kA
Recommended cable cross section [2, 3]	2x 150 mm² per terminal ≥ 150 mm² PE
Connection for cable lug	M12
Implementation of rectifier	Isolation transformer (DC terminals are floating)
Rated data DC terminal	
Nominal power	± 300 kW
Max. power (overload)	115 % for 30 seconds every 5 minutes [4]
Voltage Single operation: Serial operation: Parallel operation:	 2x 5 – 750 V 1x 10 – 1500 V 1x 5 – 750 V
Current Single operation: Serial operation: Parallel operation:	 2x ± 1000 A 1x ± 1000 A 1x ± 2000 A
Internal resistance (single operation) [5]	typical -10 mΩ – +1 000 mΩ
Internal resistance (parallel operation) [5]	Typical -10 mΩ – +100 mΩ
Measurement accuracy / measuring resolution	Voltage: <= 0.1 % fs / 16 Bit [6] Current: <= 0.1 % fs / 16 Bit [6]
Control accuracy	Voltage: 0.1 % fs Current: 0.1 % fs Power: 0.2 % fs of max. DCC power

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[1] At nominal voltage 380 V nominal power and max. power is reduced by 10%

[2] Applies to installation type B1 as per DIN EN 60204, Tu = 25 °C, operating temperature conductor 70 °C, 3 leads simultaneously loaded to 100 %; Declared values are copper conductors; Usage of aluminum and copper conductors possible, Minimum cross-section for protective earth conductor according to DIN EN 61439-1 Tab. 5

[3] A cabinet base may be required for cable entry

[4] I²t calculation

[5] Internal resistance can be set via interface

[6] Improvement possible through calibration and in certain operating points

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Compensation of a voltage drop by use of sense line	Max. 5 % of DC voltage up to maximum nominal voltage
Short circuit performance	Short circuit proof ($I_{CW} < 4{,}5$ kA, short circuit not for longer time)
Overvoltage category at DC terminal [7]	II
Voltage tolerance static (setpoint value)	$\pm$ 0.1 % fs
Current tolerance static (setpoint value)	$\pm$ 0.1 % fs
Voltage tolerance dynamic (0-100 % I_{Nom} in 3 ms)	Simulator mode < 1 % Tester mode < 3 %
Ripple voltage residual [8]	typical 0.1 % fs_{rms}
Ripple current residual [9]	typical 0.1 % fs_{rms}
Recommended cable cross section [2, 3]	4x 150 mm² per terminal $\geq$ 200 mm² PE
Connection for cable lug	M12
DC terminal in operating mode „tester" (current control)	
Current rise time [10]	<= 1.3 ms
Settling time for load step to tolerance 0.5 % fs	<= 3 ms
DC terminal in operating mode „simulator" (voltage control)	
Dynamic voltage tolerance (10-90 % I_{Nom} in 1.3 ms)	typical 1 % fs[11]
Settling time with load step (10-90 % I_{Nom}) • to reach tolerance deviation < 0.5 % fs • to reach tolerance deviation < 0.1 % fs	 <= 1 ms <= 3 ms
Voltage slew rate 10-90 % U_{Nom} [12]	Approx. 100 V/ms
Rated data total system	
Protection type (as per EN 60529)	IP 54 bottom IP 54 [13]
Cabinet dimensions (W x D x H)	2400 x 800 x 2200 mm (including cooling unit)
Cabinet weight	appr. 2600 kg)
Door stop	Hinged door, hinged 180°
Distance to ceiling and wall min.	100 mm
Cooling method	„WF" (forced water cooling)
Power loss max.	Appr. 20 kW

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[7] According to EN 60664-1
[8] Resistive load, operating mode "simulator" (voltage controled)
[9] 48 V / 96 V starter battery, operating mode "tester" (current controlled)
[10] Measured at 10/90 % with current change from 0 A to 90 % INominal at 378 mF, 20 mOhm; max. 5 % overswing; tester mode; 0.5 UNominal
[11] max 2% fs
[12] At UNom 10-90 % (source operation)
[13] With proper installation

TECHNICAL DATA AND OPTIONS

General technical data

General data	
Protection class (as per EN 61140)	I
Earth conductor current	< 5 % I_{Nom}
Permissible environnemental conditions: Storage as per EN 60721-3-1 Transport as per EN 60721-3-2 Operation as per EN 60721-3-3	1K21 / 1M11 + 5 to +40 °C 2K12 / 2M4 - 25 to +70 °C 3K22 / 3M11 + 5 up to +40 °C • 5 - 85 % rel. humidity, w/o condensation • with cabinet heater up to 95 % rel. humidity without moisture condensation • Degree of pollution 2
Permissible installation height at rated load	1000 m above sea level minimum air pressure 870 hPa
Installation site	• Operating site with restricted access • Installation on non-flammable floor
Cable entry	From below
Connection	Front, bottom, accessible after doors open
Colour	RAL 7035, full tone structured coating
Display	
Technology	TFT
Size	10.1" (screen diagonal)
Resolution	1 280 x 800 pixel (WXGA)
Input element	Resistive single-touch
High voltage test	
Test voltages: primary / secondary primary / body secondary / body secondary / secondary	5,3 kVDC 2,8 kVDC 4,0 kVDC 2,4 kVDC
Applied directives and standards	
Low Voltage Directive	2014/35/EU
EMC Directive	2014/30/EU
RoHS Directive	2011/65/EU
EMC Standards	EN 61000-2-4 Class 3 EN 61000-6-2 EN 61000-6-4
General requirements and safety requirements	EN 62477-1 EN 60529 EN 60721-X
Safety of machinery	EN 60204-1 Exception: • Sec. 11.3 Protection type see techn. data • Sec. 13.2 Identification of conductors

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Safety of machinery - Safety-related parts of control systems	EN ISO 13849-1 EN ISO 13849-2
Data functional safety	
Performance level	PLd [14]
Category	KAT3 [15]
PFH$_D$	Tbd.
Max. switching cycles (DC contactors)	1 000 000
Max. service life	20 years
Safe shutdown time (as per EN ISO13849-1)	5 s
Interface	
Input (stop, emergency stop, operation mode selection, reset operation mode) [16]	
Input voltage	24 V$_{DC}$ pulse signals only (No external input voltage allowed)
Input current	2 mA to 3,28 mA @24V$_{DC}$
Input resistance	Min. 7,33 kΩ
Error detection time	200 ms
Line length between signal source (pulse output) and input	Max. 60 m with unshielded line Max. 400 m with shielded line
Output (feedback signals) [17]	
Switching voltage range	5 to 24 VDC, 5 to 230 VAC
Nominal output current	5 mA to 6 A
Max. inrush current	AC: 50 A for 100 ms, DC: 10 A for 200 ms
Short-circuit proof	Yes, 1000 A (with specified short-circuit/overload protection)
Short-circuit/Overload protection	External 6 A gL/gG fuse (melting fuse), LS automat C characteristic 1.6 A
Insulation voltage between channel and channel	Safe disconnection of 300 VAC per EN 50178
Overvoltage category per EN 60664-1	II
Max. switching capacity AC1 AC15 DC1 DC13 UL 508	 230 VAC / 6 A 230 VAC / 5 A 24 VDC / 6 A 24 VDC / 4 A / 0.1 Hz B300 / R300
Rated data liquid cooling	
Cooling power	typical 30.15kW
Nominal flow temperature	typical 18 °C - 22 °C

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[14] PLe on request

[15] KAT4 on request

[16] For further details refer to B&R datasheet V 2.15 X20(c)SIx1x0 (used module X20SI9100)

[17] For further details refer to B&R datasheet X20(c)SOx530 - Data sheet V2.14 (used module X20SO6530)

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Nominal water flow rate per cooling unit	typical 75 l/min
Permissible operating pressure	typical 3 bar - 8 bar (10 bar max)
Pressure drop	typical 2 bar
Flow connection	G1" male thread
Return connection	G1" male thread
Condensate drain connection	1/2"hose fitting
Technical data and options: Issue 05	

Basic equipment of I-TS 3872

- Main switch (switch disconnector at AC terminal; lockable in Off-Position)
- Safety control for Performance Level d (PL$_d$)
- 1x Connection terminals for external "Emergency Stop" (2-channel with cross circuit detection)
- 2x Connection terminals for external "Stop" (for each output channel, 2-channel with cross circuit detection)
- 1x Connection terminals for external "Operation mode selection" (2-channel with cross circuit detection)
- 2x DC contactors per output
- Voltmeter and ready indicator light in cabinet door
- Connection terminals for external DC voltage measurement (sense line)
- 2x Insulation monitoring devices (can be switched separately)
- Display with touch operation 10,1"
- "Battery tester" version
- Interface Ethernet for Modbus TCP and VNC
- Interface CAN-bus
- Plug and play parallelization of two I-TS 3872 with same technical data
- Preparation for upgrade to 600 kW nominal power (second identical I-TS 3872 needed)

Optional equipment of I-TS 3872

- 2x Fieldbus interfaces EtherCAT or Profinet IO or Profibus DP (one per channel)
- Door guard locking
- Fail safe feedback: Emergency Stop, Stop, DC-Contactor open (single choice not possible)

TECHNICAL DATA AND OPTIONS

Operational modes in single mode

Single Mode: DCC1, DCC2
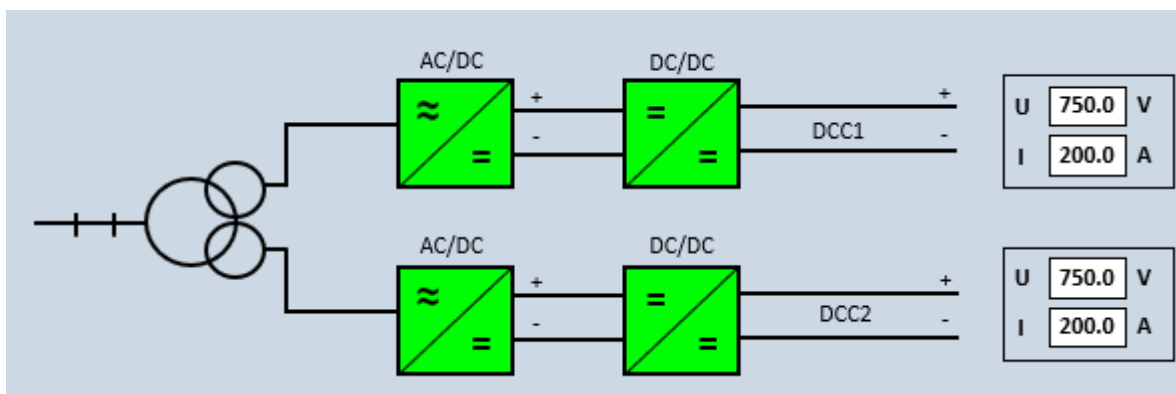(DCC1 and DCC2 are operated separately)
(It is possible to activate different input values for each DCC)

Performance values:
UDC = 5 – 750 VDC

IDC = -1000 A up to 1000 A

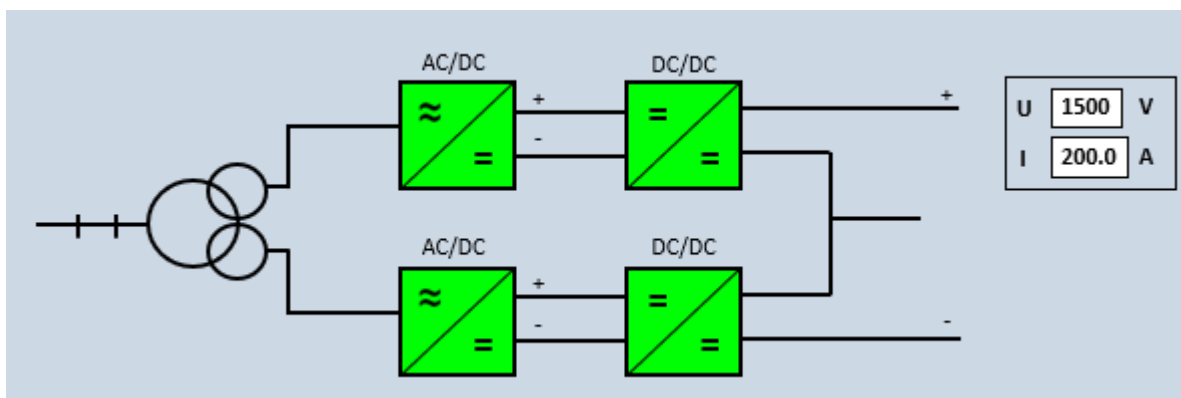PDC = -150 kW up to 150 kW per DCC

Serial Mode DCC1 – DCC2:
(DCC1 and DCC2 are connected in serie)

Performance values (nominal):
UDC = 10 – 1500 VDC

IDC = -1000 up to 1000 A

PDC = -300 kW up to 300 kW
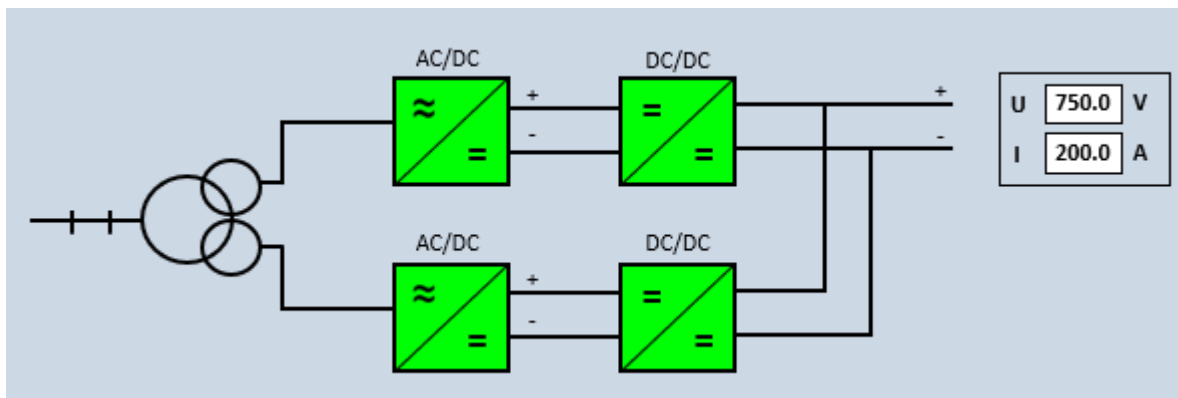
TECHNICAL DATA AND OPTIONS

Parallel Mode: DCC1 II DCC2
(DCC1 and DCC2 are connected in parallel)

Performance values (nominal):
UDC = 5 – 750 VDC

IDC = -2000 A up to 2000 A

PDC = -300 kW up to 300 kW

Operational modes as a combination of two systems

Clarification:
Two systems can be connected to each other. The resulting combined system operates as a Master/Slave cluster and with the selected operational mode.

Single combination: DCC1, DCC2, DCC3, DCC4
(DCC1, DCC2, DCC3, DCC4 are operated separatelly).
(It is possible to activate different input values for each DCC)

Each system can be activated or deactivated independently from the other.

Performance values (nominal):
UDC = 5 – 750 VDC

IDC = -1000A up to 1000A

PDC = 150 kW per DCC

TECHNICAL DATA AND OPTIONS

Parallel combination: DCC1 II DCC2 II DCC3 II DCC4
(DCC1, DCC2, DCC3, DCC4 are connected in parallel)

Performance values (nominal):
UDC = 5 – 750 VDC

IDC = -4000 up to 4000A

PDC = 600 kW

Serial combination: (DCC1 – DCC2), (DCC3 – DCC4):
(DCC1 and DCC2 are connected in serie, DCC3 and DCC4 are also connected in serie)
(It is possible to activate different input values for each system)

Performance values (nominal):
UDC = 10 – 1500 VDC

IDC = -1000A up to 1000A

PDC = 300 kW for DCC1-DCC2 and DCC3-DCC4

Serial-Parallel combination: DCC1 - DCC2 II DCC3 - DCC4
(DCC1 and DCC2 are connected in serie, and DCC3 and DCC4 are connected in serie)
(The DCCs connected in serie are connected in parallel with each other in order to provide higher power)

Performance values (nominal):
UDC = 10 – 1500 VDC

IDC = -2000A up to 2000 A

PDC = 600 kW

TECHNICAL DATA AND OPTIONS

Cabinet Layout

AC

DC

Water

1600

800

2002

200

803