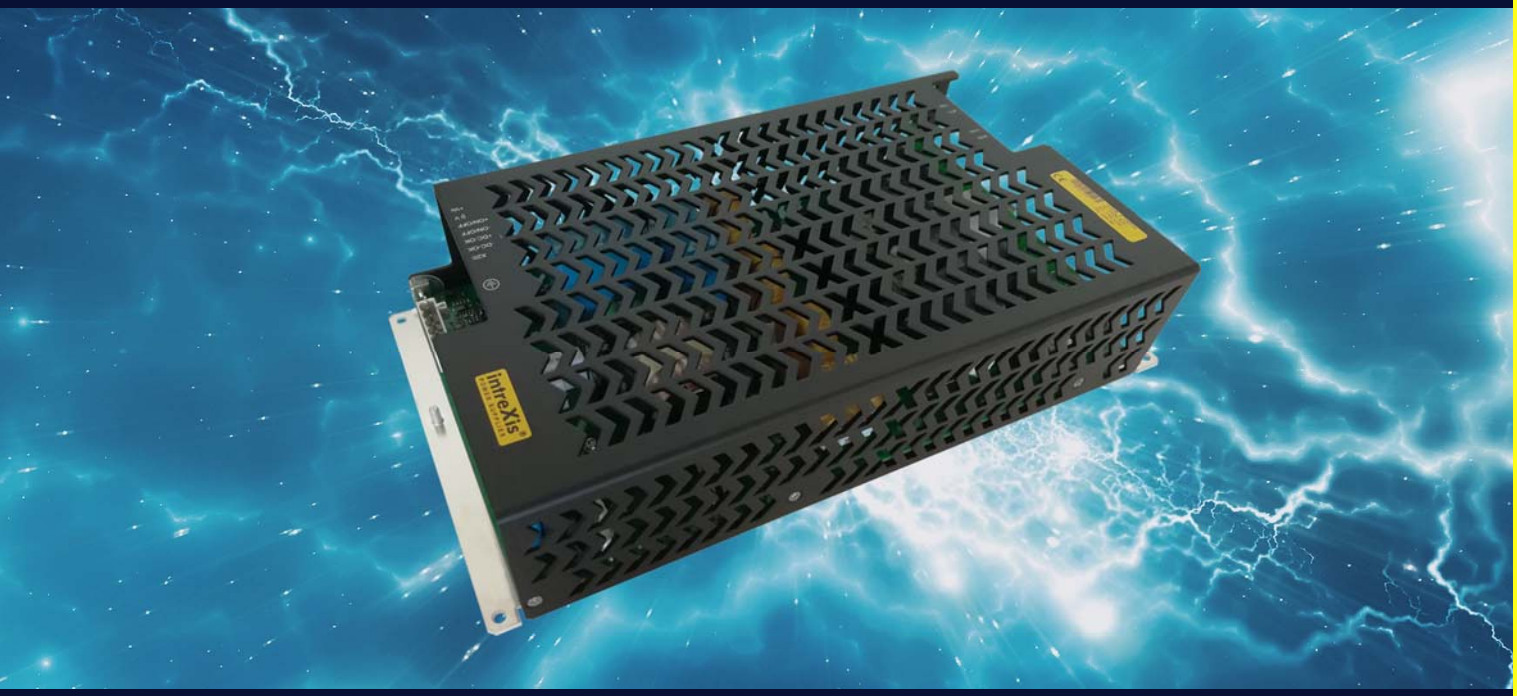
intreXis®

Power Supplies with the X



Datasheet

intreXis Boardnet Converter Platform
IC52X, 250 W Single-Output
1500 Vin

- Xtra wide input voltage range: 900 – 2100 VDC
- Xtra high surge robustness: according to UIC550
  withstands 12 kV for 1 ms, falling to 2.54 kV within 20 ms
- Xtra high power boost: drives contactors up to 400 W / 0.5 s
- Xtra high efficiency: > 89 % over the entire input voltage range
- Xtra low standby power: < 7.0 W over the entire input voltage range

This datasheet covers the details of the IC52X power supplies which can be powered directly by the electric rail traction systems (1500 VDC), with single output voltage and output power of 250 W.
These DC/DC converters are designed according to EN 50155:2021 and IEC 60571:2012 for railway applications and are ideal for other demanding environments which require the highest performance and reliability.

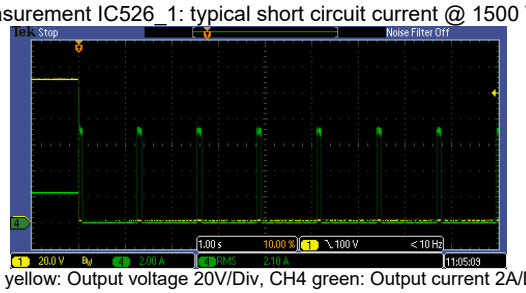
Output voltages: 24 V, 48 V, 72 V, 110 V. Other voltages on request.
Ordering codes: IC521_1, IC523_1, IC524_1, IC526_1, IC526_2, IC526_3.
The differences between the variants are explained in this datasheet.

INPUT CHARACTERISTICS

Continuous Input Voltage Range	900 – 2100 VDC
Temporary Input Voltage Range according to EN 50163:2004 / A2:2020	2540 VDC for 20 ms
Input Overvoltage Protection: Medium-term Overvoltages	10 kV for 20 ms, According to UIC 550: 12 kV for 1 ms, falling to 2.54 kV within 20 ms Performance criterion A according to EN 50121-1:2017. *EN 50124-2:2017 requires only 4.2 kV for 2 ms.* *EN 50124-2:2017 defines that the equipment shall withstand a voltage pulse of trapezoidal shape, lasting 2 milliseconds with an amplitude equal to 70 % of the reference voltage Up. It is applied to the equipment without considering the presence of its metal-oxide arrester.* *Up=6 kV for a 1500 V network according to EN 50163:2004 / A2:2020*
Input Overvoltage Protection: Short-term Overvoltages	According to EN 50124-2:2017 Performance criterion A according to EN 50121-1:2017. *EN 50124-2:2017 defines that the equipment shall withstand the 4/10 current pulse defined in EN 60099-4:2014. Its amplitude value is 100 kA. It is applied to the equipment including the arrester, where the metal-oxide arrester is replaced by a theoretical one the characteristic of which, in log(current in kA) versus log(voltage in kV), is a straight line which includes the two points: (log(10), log(Up)) and (log(100), log(1,5 Up)).*
Input Voltage Reverse Polarity Protection	Active reverse polarity protection: Iin_reverse < 500 µA @ Vin = -2540 VDC (with reverse polarity of Vin, the converter remains off without being damaged. Only a small reverse current Iin_reverse flows. With correct polarity of Vin, the converter works correctly)
Inrush Current over the entire operating temperature range	Inrush-Current-Integral: I_{inrush}^2t < 0.60 A^2s @ Vin = 900 – 2100 VDC 68 Apeak @ 1500 Vin 95 Apeak @ 2100 Vin

Input Capacitance	4.7 µF		
Input Current typ. @ full Load	**900 Vin**	**1500 Vin**	**2100 Vin**
	0.31 A	0.18 A	0.13 A
Input Power typ. @ no Load over the input voltage range	1.9 – 6.8 W		
Input Power typ. @ no Load External ON/OFF-Signal active, output = OFF	1.0 – 5.2 W		
Internal Input Fuse	Fuse included, therefore no external fuse or circuit breaker required. I^2t-fuse = 24 A^2s		
Interruptions of Input Voltage Supply (Hold-up time)	Class S2 (10 ms) according to EN 50155:2021 The converter continues to operate as intended during and after the interruption, with no degradation of performance or loss of function (Performance criterion A).		
Startup time typ. (Time input voltage ON to output voltage ON)	**900 Vin**	**1500 Vin**	**2100 Vin**
	6.5 s	4.1 s	2.7 s
Startup time typ. (IC526_2 only) (Time input voltage ON to output voltage ON)	**900 Vin**	**1500 Vin**	**2100 Vin**
	13.5 s	8.5 s	5.6 s

OUTPUT CHARACTERISTICS

Output Voltage Nominal	**IC521_1**	**IC523_1**	**IC524_1**	**IC526_1-3**
	+24.0 VDC	+48.0 VDC	+72.0 VDC	+108.6 VDC
Max. Continuous Output Power @ Vin = 900 – 2100 V, 2540 V for 20 ms (no derating over the entire temperature range)	250 W			
Max. Peak Output Power @ Vin = 900 – 2100 V	Power Boost feature allows to drive contactors up to 400 W for 0.5 s			
Minimum Load	No minimum load required.			
Setpoint Accuracy	< 1.0 %			
Load Regulation @ off-load to full load over the entire temperature range	< 0.5 %			
Line Regulation @ full load over the entire temperature range	< 0.1 %			
Output Ripple & Noise @ 20 MHz bandwidth, including spikes	**IC521_1**	**IC523_1**	**IC524_1**	**IC526_1-3**
	< 120 mV @ -20 – +85 °C < 250 mV @ -40 – -20 °C		< 120 mV @ -20 – +85 °C < 2.0 V @ -40 – -20 °C	
Overload and Short-Circuit	The converter is continuous overload and short-circuit proof. **Output overloaded:** The output voltage is reduced and the output current limited (constant current). **Output short-circuited:** When the output is shorted, the converter switches off and tries periodically to switch on again, every 1 – 2 seconds for 100 ms: Measurement IC526_1: typical short circuit current @ 1500 Vin  CH1 yellow: Output voltage 20V/Div, CH4 green: Output current 2A/Div, Timebase: 1 s/Div If the short-circuit is still present, the converter switches off again and tries again periodically. If the short-circuit is removed, the converter switches on at the next switch-on attempt (hiccup).			
Current Limit (varies due to component tolerances)	**IC521_1**	**IC523_1**	**IC524_1**	**IC526_1-3**
	10.8 – 13.9 A	5.4 – 7.0 A	3.6 – 4.6 A	2.4 – 3.1 A
Short-Circuit current	**IC521_1**	**IC523_1**	**IC524_1**	**IC526_1-3**
	< 10.4 Arms	< 5.2 Arms	< 3.5 Arms	< 2.3 Arms

Overvoltage Protection (OVP) (output voltage is limited, if main regulation loop fails)	**IC521_1**	**IC523_1**	**IC524_1**	**IC526_1-3**
	< 35 VDC	< 65 VDC	< 100 VDC	< 150 VDC
Paralleling of Outputs	Paralleling can be optionally included. Please contact intreXis for advice			
Active Decoupling Diode for redundant Systems	A FET on the output, acting as a decoupling diode, is included for redundant systems with two or more power supply sources driving a load. Allows paralleling with battery.			
Maximum load-capacitance	**IC521_1**	**IC523_1**	**IC524_1**	**IC526_1-3**
	10’000 µF	tbd µF	tbd µF	IC526_1, IC526_3: 700 µF IC526_2: 1100 µF

EFFICIENCY

IC521_1:

Conditions	900 Vin	1500 Vin	2100 Vin
Efficiency typ. @ 100 % Load	90.0 %	90.3 %	89.1 %
Efficiency typ. @ 66 % Load	91.5 %	90.2 %	88.0 %.
Efficiency typ. @ 33 % Load	91.1 %	88.2 %	83.3 %

IC523_1:

Conditions	900 Vin	1500 Vin	2100 Vin
Efficiency typ. @ 100 % Load	tbd.	tbd.	tbd.
Efficiency typ. @ 66 % Load	tbd.	tbd.	tbd.
Efficiency typ. @ 33 % Load	tbd.	tbd.	tbd.

IC524_1:

Conditions	900 Vin	1500 Vin	2100 Vin
Efficiency typ. @ 100 % Load	tbd.	tbd.	tbd.
Efficiency typ. @ 66 % Load	tbd.	tbd.	tbd.
Efficiency typ. @ 33 % Load	tbd.	tbd.	tbd.

IC526_1-3:

Conditions	900 Vin	1500 Vin	2100 Vin
Efficiency typ. @ 100 % Load	91.4 %	91.7 %	90.8 %
Efficiency typ. @ 66 % Load	92.0 %	91.1 %	89.4 %.
Efficiency typ. @ 33 % Load	91.1 %	88.5 %	84.6 %

SIGNALS AND INTERFACES

DC-OK Signal	Isolated Open-collector transistor (between connector X20/pin5-6, see block diagram)			
DC-OK transistor switch on threshold	**IC521_1**	**IC523_1**		
	Vout > +22.8 VDC ±2 %	Vout > +45.7 VDC ±2 %		
	IC524_1	**IC526_1-3**		
	Vout > +67.4 VDC ±2 %	Vout > +105.0 VDC ±2 %		
DC-OK transistor switch off threshold	**IC521_1**	**IC523_1**		
	Vout < +22.3 VDC ±2 %	Vout < +44.8 VDC ±2 %		
	IC524_1	**IC526_1-3**		
	Vout < +66.2 VDC ±2 %	Vout < +103.0 VDC ±2 %		
DC-OK max. transistor current, when on	50 mA max.			
DC-OK max. transistor voltage-drop, when on	< 2.5 VDC @ 50 mA (between connector X20/pin5-6, see block diagram)			
DC-OK max. transistor voltage, when off (max voltage which can be applied externally between connector X20/pin5-6, see block diagram)	+154 VDC			
External ON/OFF Signal (Isolated optocoupler input)	**Output voltage is ON if:** - no connection between +ON/OFF and -ON/OFF (X20/pin3-4) (high impedance > 500 kΩ) or - external voltage applied between +ON/OFF and -ON/OFF (X20/pin3-4) is < External ON threshold:			
	IC521_1	**IC523_1**	**IC524_1**	**IC526_1-3**
	< 8.0 VDC	< 19.0 VDC	tbd	IC526_1: < 60.0 VDC IC526_2: < 84.0 VDC IC526_3: < 8.0 VDC
	Output voltage is OFF if: - external voltage applied between +ON/OFF and -ON/OFF (X20/pin3-4) is > External OFF threshold:			
	IC521_1	**IC523_1**	**IC524_1**	**IC526_1-3**
	> 13.0 VDC	> 30.0 VDC	tbd	IC526_1: > 85.0 VDC IC526_2: > 88.0 VDC IC526_3: > 13.0 VDC
External ON/OFF max. voltage which can be applied externally (between connector X20/pin3-4, see block diagram)	**IC521_1**	**IC523_1**	**IC524_1**	**IC526_1-3**
	+34 VDC	+70 VDC	+154 VDC	IC526_1,2: 154 VDC

				IC526_3: 34 VDC
Current into +ON/OFF-Pin (X20/pin3) is internally limited to:	**IC521_1**	**IC523_1**	**IC524_1**	**IC526_1-3**
	15 mA max.	9 mA max.	8 mA max.	IC526_1: 6.0 mA max. IC526_2: 3.2 mA max. IC526_3: 15 mA max.

ELECTROMAGNETIC COMPATIBILITY (EMC)

Test	Standard	Test severity levels	Performance Criteria
Surges	EN 50155:2021 EN 50121-3-2:2016/ A1:2019 IEC60571:2012 IEC 62236-3-2:2018	1.2/50 µs 42 Ω, 0.5 µF DC power supply port ±2 kV line to ground ±1 kV line to line	Criterion B required, but compliant with more strict criterion A
Electrostatic discharge	EN 50155:2021 EN 50121-3-2:2016/ A1:2019 IEC60571:2012 IEC 62236-3-2:2018	±6 kV contact discharge ±8 kV air discharge	Criterion B required, but compliant with more strict criterion A
Fast transients	EN 50155:2021 EN 50121-3-2:2016/ A1:2019 IEC60571:2012 IEC 62236-3-2:2018	±2 kV 5/50 ns tr/th 5 kHz repetition frequency	Criterion A
Radio-frequency common mode	EN 50155:2021 EN 50121-3-2:2016/ A1:2019 IEC60571:2012 IEC 62236-3-2:2018	150 kHz – 80 MHz 10 Vrms (carrier voltage) 80 % AM, 1 kHz Source impedance 150 Ω	Criterion A
Radio-frequency electromagnetic field	EN 50155:2021 EN 50121-3-2:2016/ A1:2019 IEC60571:2012 IEC 62236-3-2:2018	80 MHz – 1000 MHz 20 Vrms/m 80 % AM, 1 kHz unmodulated carrier; 1400 MHz – 2000 MHz 10 Vrms/m 80 % AM, 1 kHz unmodulated carrier; 2000 MHz – 2700 MHz 5 Vrms/m 80 % AM, 1 kHz unmodulated carrier; 5100 MHz – 6000 MHz 3 Vrms/m 80 % AM, 1 kHz unmodulated carrier	Criterion A
Conducted emissions	EN 50155:2021 EN 50121-3-2:2016/ A1:2019 IEC60571:2012 IEC 62236-3-2:2018	150 kHz – 500 kHz: 99 dBµV quasi-peak 500 kHz – 30 MHz: 93 dBµV quasi-peak	
Radiated emissions	EN 50155:2021 EN 50121-3-2:2016/ A1:2019 IEC60571:2012 IEC 62236-3-2:2018	30 MHz – 230 MHz: 40 dBµV/m quasi-peak at 10 m 230 MHz – 1000 MHz: 47 dBµV/m quasi-peak at 10 m	

ENVIRONMENATAL CHARACTERISTICS

General Standard	EN 50125-1:2014: Railway applications - Environmental conditions for equipment - Part 1: Rolling stock and on-board equipment
Operating Temperature	-40 °C – +85 °C Class OT4: -40 – +70 °C and class ST1,ST2: +15 °C according to EN 50155:2021
Cooling	Natural convection
Storage Temperature Range	-50 °C – +100 °C
Altitude Class	Class Ax according to EN 50125-1:2014: 3000 m above sea level max. For higher altitudes, please contact intreXis for advice
Pollution Degree	PD2 according to EN 50124-1:2017
Shock and Vibration	According to EN 61373:2010, category 1, class B
Rapid Temperature Variation	Class H2 according to EN 50155:2021: -25 °C to +15 °C / 95 %RH, ±3 °C/s +10 °C to 40 °C / 60 %RH, ±3 °C/s
Protective Coating	Class PC2 according to EN 50155:2021 The board is protected on both sides with a protective transparent fluorescent-pigment coating to prevent deterioration or damage due to moisture and atmospheric contaminants. The coating is compliant with class 2, according to IPC-A-610H.
Prohibited Substances	No substances defined as Prohibited according to the RoHS, REACH, UNIFE (RISL), or Prohibited for the Project, are present. No substances defined as Declarable according to RoHS, REACH, UNIFE (RISL), or Declarable for the Project, are present.
Fire behaviour	EN 45545-2:2020+A1:2023 compliant with all Hazard Levels HL1-HL3 NFPA 130: 2023

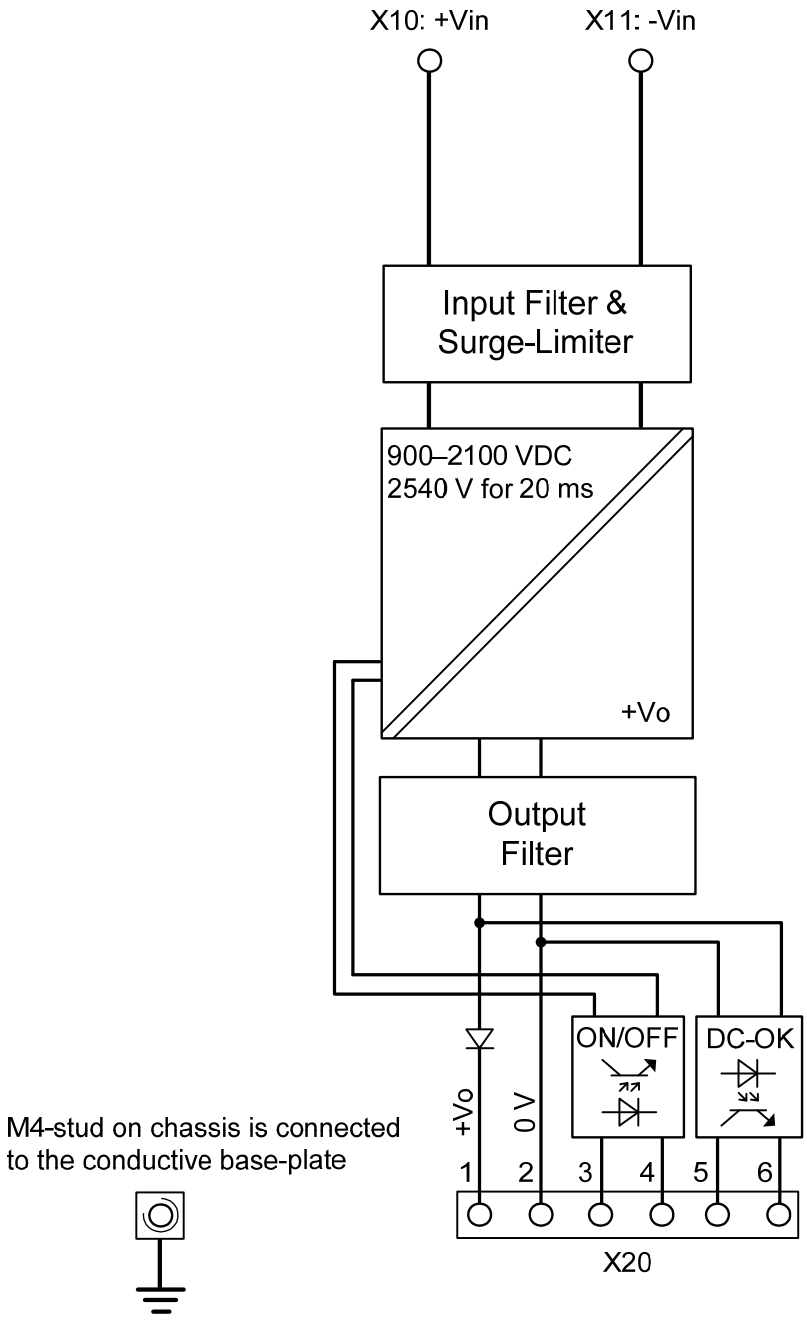
GENERAL CHARACTERISTICS

General Standard	EN 50155:2021 Railway applications - Rolling stock - Electronic equipment IEC 60571:2012 Railway applications - Electronic equipment used on rolling stock			
Useful Life Class	Class L4 (20 years) according to EN 50155:2021			
MTBF Calculation method: MIL-HDBK-217-F2 Using demonstrated Failure Rates of components	**Ground Benign (GB), +25 °C**	**Ground Benign (GB), +40 °C**	**Ground Fixed (GF), +40°C**	**Ground Mobile (GM), +40 °C**
	4 982 000 h	3 446 000 h	633 500 h	342 500 h
MTBF Calculation method: SN 29500 (IEC 61709)	1 044 000 h @ +50 °C			
Marking	Label with following information: - part number, input voltage, output voltage, output power - unique serial number for identification and traceability (printed in text format and as barcode) - revision index			
Connector identification	Printings on chassis to identify connectors and pin-functions			

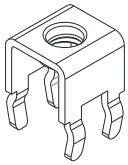
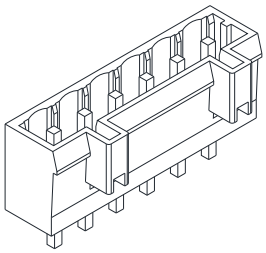
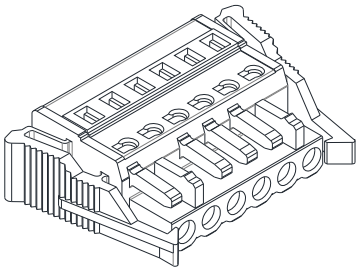
SAFETY AND INSULATION

Safety Standards	IEC 60950-1:2005+A1:2009+A2:2013 CSV, EN 62368-1:2014+A11:2017 IEC 62368-1:2023
Insulation Coordination	According to EN 50124-1:2017 OV3, PD2, U_{Nm} = 1.8 kV, U_{Ni} = 10 kV Compliant to EN 60077-1:2017: U_{Nm} = 1.8 kV (no Y-capacitors are used between input-earth and output-earth)
Input, Output, Chassis	The input is galvanically isolated to the output. Input, output and signals are galvanically isolated to the chassis.
Partial discharge	Inception voltage: > 2.70 kV Extinction voltage: > 2.16 kV @ 10 pC threshold
Input to Output	Isolation Voltage: 8300 Vrms, 60 s Clearance: 22.2 mm Creepage Material group I (600 ≤ CTI): 22.2 mm
Input to Chassis	Isolation Voltage: 6031 Vrms, 60 s Clearance: 12.6 mm Creepage Material group I (600 ≤ CTI): 12.6 mm
Output to Chassis DC-OK Signal to Chassis External ON/OFF Signal to Chassis	Isolation Voltage: 1500 Vrms, 60 s Clearance: 2.50 mm Creepage Material group I, II, IIIa: 2.50 mm
Output to DC-OK Signal Output to External ON/OFF Signal DC-OK Signal to External ON/OFF	Isolation Voltage: 1000 Vrms, 60 s Clearance: 1.50 mm Creepage Material group I, II, IIIa: 1.50 mm
Insulation Resistance	Input-Chassis: > 550 MΩ Input-Output: > 550 MΩ Output-Chassis: > 550 MΩ DC-OK Signal-Chassis: > 550 MΩ DC-OK Signal-Output: > 550 MΩ External ON/OFF Signal to Output: > 550 MΩ External ON/OFF Signal to Chassis: > 550 MΩ Test-voltage: 500 VDC

BLOCK DIAGRAM



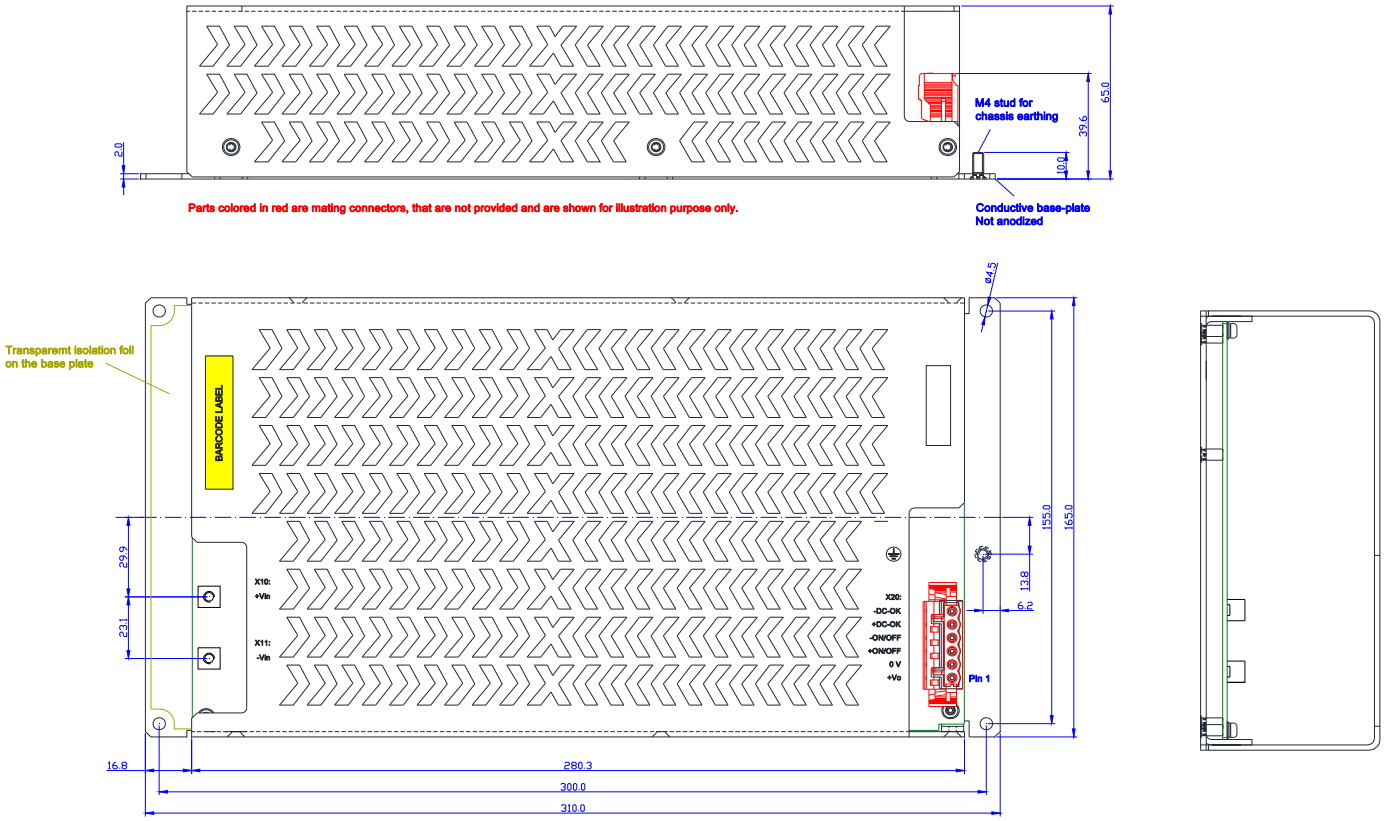
CONNECTOR TYPES

Input connectors X10, X11	Keystone 7795, M4-thread  Mating part: M4 ring-terminal with washer and screw.
Output connector X20	Wago 721-166/001-000 Pitch: 5.0 mm Number of pins: 6  Mating part: Wago 721-106/037-000 
M4-stud for chassis-earthing	M4-stud Height: 10 mm from base (8 mm out of aluminium base-plate)

MECHANICAL CHARACTERISTICS

Chassis	Aluminium: EN AW 5052 - AL5052 - AlMg2.5 or EN AW 5754 - AL5754 - AlMg3 Baseplate: blank Cover: black anodized
Overall dimensions	According to the drawing (millimetres, unless otherwise specified)
Weight	1663 g
IP code	IP00
Mounting	Mounting in any position is allowed

Mechanical drawings:



Input connector X10:
+Vin
Input connector X11:

Output connector X20:
1. +Vo
2. 0 V
3. +ON/OFF
4. -ON/OFF
5. +DC-OK
6. -DC-OK

Parts coloured in red are mating connectors that are not provided and are shown for illustration purpose only.

The unit must be secured using four M4 screws or bolts (not supplied) in the mounting holes.

TEST COMPLIANCE SUMMARY (CERTIFICATE OF CONFORMITY)

Performed Test	Standard	Test conditions	Performance level	Reference document
Visual inspection	EN 50155:2021 IEC60571:2012	Aspect, dimensions, weight, markings	According to design specification	Test report
Performance test	EN 50155:2021 IEC60571:2012	Ambient temperature. Nominal supply voltage: 1500 VDC Supply voltage range: 900 – 2100 VDC (static)	Criterion A	Test report
Power supply test Supply overvoltages	EN 50155:2021 IEC60571:2012	Supply voltage: 900 – 2540 VDC 20 ms	Criterion A	Test report
Insulation test	EN 50155:2021 IEC60571:2012	Input – Chassis 500 VDC Input – Output 500 VDC Output – Chassis 500 VDC Signals – Output 500 VDC Signals – Chassis 500 DC Repeated after Voltage withstand test Voltage withstand test: Input – Chassis 6031 Vrms 60 s Input – Output 8300 Vrms 60 s Output – Chassis 1500 Vrms 60 s Signals – Chassis 1500 Vrms 60 s	Resistance > 20 MΩ (measured >550 MΩ, exceeding the requirement) No disruptive discharge	Test report
Low temperature start-up test Cold start test	EN 50155:2021 IEC60571:2012	T = -40 °C	Criterion A	Test report
Dry heat test	EN 50155:2021 IEC60571:2012	T = +70 °C (cycle A) T = +85 °C (cycles B and C)	Criterion A	Test report
Cyclic damp heat test	EN 50155:2021 IEC60571:2012	T = +55 °C and +25 °C (2 cycles)	Criterion A	Test report
EMC test	EN 50155:2021 EN 50121-3-2:2016/ A1:2019 IEC60571:2012 IEC 62236-3-2:2018	See section 'Electromagnetic Compatibility (EMC)'		Compliant
Vibration and shock test	EN 50155:2021 IEC60571:2012	EN 61373:2010, Category 1, class B		Compliant

Additional tests:

Performed Test	Standard	Test conditions	Performance level	Reference document
Fire behaviour	EN 45545-2:2020	PCB: R25 (EN 60695-2-11, T16: No ignition at T=850 °C)	PASSED (HL1-HL2-HL3)	Fire_Certificate_IC52x

Furthermore, the product is compliant with the requirements of:

- EC 1907/2006 (December, 18th 2006) REACH regulation: Registration, Evaluation, Authorisation and Restriction of Chemicals.

- UNIFE Railway Industry Substance List

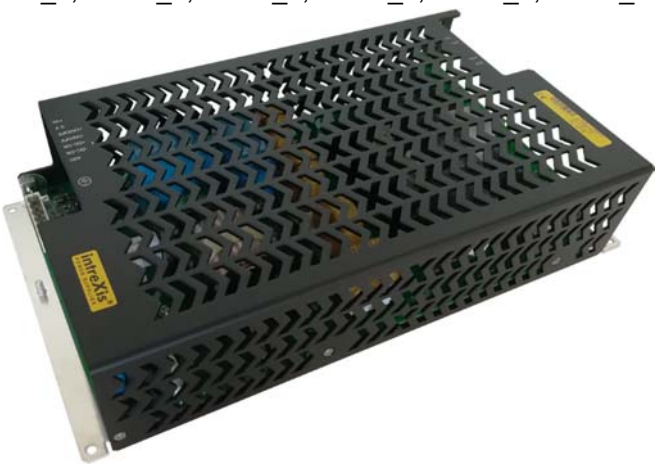
Neuhausen am Rheinfall, 04.03.2023

Thomas Schiegg
intreXis AG

EU DECLARATION OF CONFORMITY (DoC)

Product Models	IC521_1, IC523_1, IC524_1, IC526_1, IC526_2, IC526_3	
Name and address of the manufacturer	intreXis AG Tobelraastrasse 4 CH-8212 Neuhausen am Rheinfall Switzerland	
This declaration of conformity is issued under the sole responsibility of the manufacturer.		
IC521_1, IC523_1, IC524_1, IC526_1, IC526_2, IC526_3 		
The object of the declaration described above is in conformity with the relevant Union harmonisation legislation:	Low Voltage Directive: RoHS Directive: EMC Directive:	2014/35/EU 2011/65/EU, (EU) 2015/863 2014/30/EU
References to the relevant harmonised standards used or references to the other technical specifications in relation to which conformity is declared:	Low Voltage Directive: RoHS Directive: EMC Directive: Railway Applications:	EN 62368-1:2020/A11:2020 IEC 63000:2016+AMD1:2022 CSV EN 50121-3-2:2016/ A1:2019 EN 50155:2021
Signed for and on behalf of:	intreXis AG Tobelraastrasse 4 CH-8212 Neuhausen am Rheinfall Switzerland	
Place, Date of issue	Neuhausen am Rheinfall, 04.03.2023	
Name, Function, Signature	Thomas Schiegg, Managing Director:	

UK DECLARATION OF CONFORMITY (DoC)

Product Models	IC521_1, IC523_1, IC524_1, IC526_1, IC526_2, IC526_3	
Name and address of the manufacturer	intreXis AG Tobelraastrasse 4 CH-8212 Neuhausen am Rheinfall Switzerland	
This declaration of conformity is issued under the sole responsibility of the manufacturer.		
IC521_1, IC523_1, IC524_1, IC526_1, IC526_2, IC526_3 		
The object of the declaration described above is in conformity with the relevant UK legislation:	UK SI 2016 No. 1101: UK SI 2012 No. 3032: UK SI 2016 No. 1091:	Electrical Equipment (Safety) Regulations 2016 The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012 Electromagnetic Compatibility Regulations 2016
References to the relevant standards used or references to the other technical specifications in relation to which conformity is declared:	Low Voltage Directive: RoHS Directive: EMC Directive: Railway Applications:	BS EN 62368-1:2020/A11:2020 BS EN IEC 63000:2018 BS EN 50121-3-2:2016/A1:2019 BS EN 50155:2021
Signed for and on behalf of:	intreXis AG Tobelraastrasse 4 CH-8212 Neuhausen am Rheinfall Switzerland	
Place, Date of issue	Neuhausen am Rheinfall, 04.03.2023	
Name, Function, Signature	Thomas Schiegg, Managing Director:	

INSTALLATION AND OPERATION

Safety	Warning / Caution! The power supplies should be installed and put into operation only by qualified personnel. Before installing or removing the unit, disconnect the power from the system. The main protective earthing terminal (M4-stud on chassis), must be permanently connected.
Servicing	In case of failures, malfunctions or defects, the converter must be returned to intreXis for analysis and repair. In particular, the converter should be sent to intreXis for analysis if any damage has occurred to the unit (e.g. the unit dropped). Any attempts to open and repair the unit could void the warranty and could expose the operator to hazardous voltages.
Spare Parts	List and drawings of spare parts are not provided, since the failed units have to be returned to intreXis for analysis and repair.
Disposal	Disused units must be collected separately and disposed at a suitable recycling facility.
Connecting the Cables	Ensure that proper wires are used according to the input and output current specifications. Prepare the cables according to the specifications of the particular connector used. The input cables must be connected to the screw terminals with suitable hardware (2x M4 ring-terminals, washers and screws, not provided).
Operation of the Unit	Once the input power is applied, the output voltage is enabled, unless the External ON/OFF signal is disabling the converter (OFF-state).