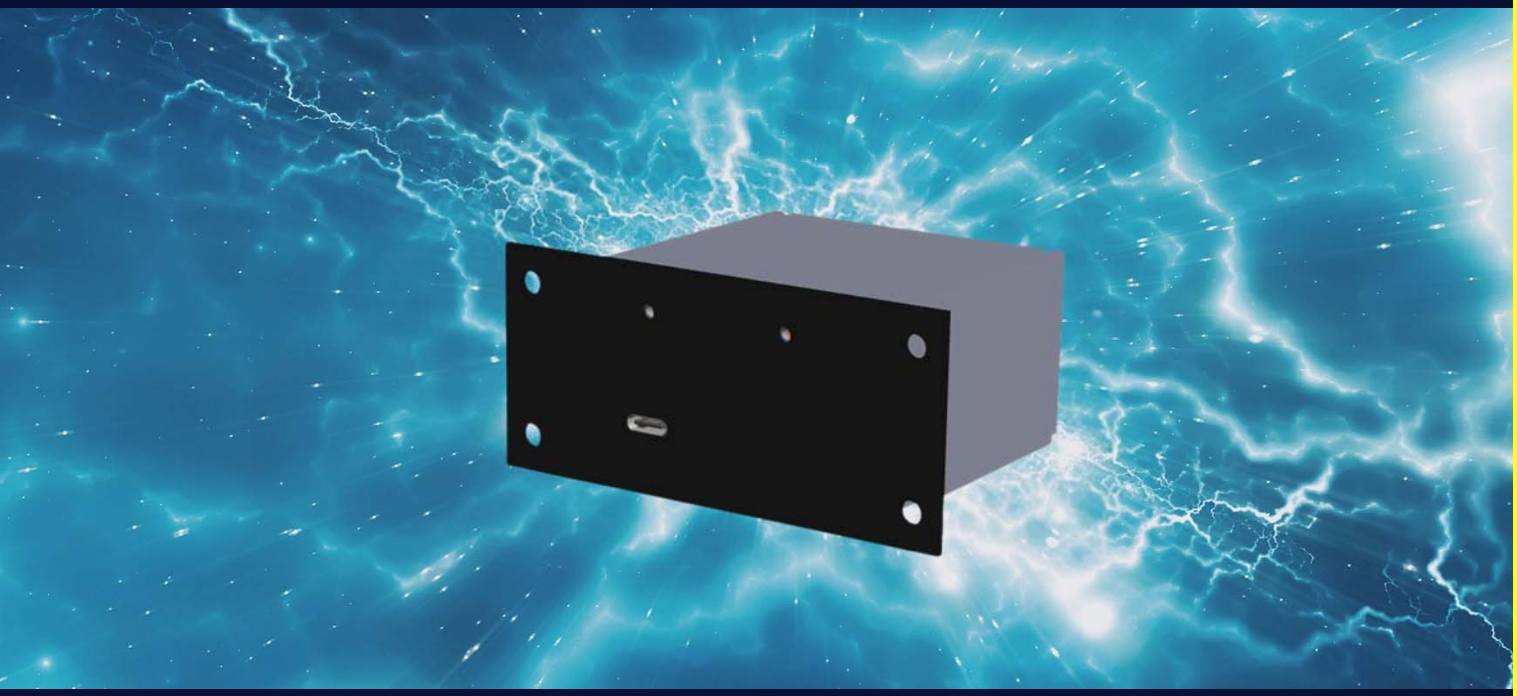
intreXis®

Power Supplies with the X



Datasheet

intreXis USB PD 3.0 Railway Charger
IC354, 60 W Single-Port
90 VAC – 264 VAC input

- Xtra USB-C Socket for charging of latest generation mobile devices.
- Xtra optimal charging profile according to USB Power Delivery (PD) 3.0 ensures shortest charging time.
- Xtra ready for new EU rules valid from 2024.
- Xtra dedicated for railway passenger compartments and driver desk.
- Xtra voltage regulation in USB front-end device.

This datasheet covers the details of the IC354 USB Power Delivery (PD) 3.0 charger with single output port and output power of 60 W.
This AC/DC converter is designed according to EN 50155:2021 and IEC 60571:2012 for railway applications and is ideal for other demanding environments which require the highest performance and reliability.

Output voltages: 5 V / 3 A; 9 V / 3 A; 15 V / 3 A; 20 V / 3 A; or 3.3 V – 21 V / 3 A PPS Outputs
Ordering code: IC354_1.

INPUT CHARACTERISTICS

Continuous Input Voltage Range	90.0 – 264 VAC 50 – 60 Hz		
Inrush Current @ T = +25 °C	An inrush limitation circuit limits the input inrush current at switch-on of the input voltage with a 10 Ω-NTC Inrush Current @ 110 VACin: 11 Apk Inrush Current @ 230 VACin: 23 Apk Inrush Current Integral: I_{inrush}^2t < 10 A^2s @ VACin = 90 – 264 VAC		
Input Undervoltage Lockout	Vin_OFF = 76 VAC ±5 %		
Input Capacitance	112 µF		
Input Current typ. @ full Load	**Vin = 110 VAC**	**Vin = 230 VAC**	
	1.2 Arms	0.5 Arms	
Input Power typ. @ no Load over the input voltage range	**Vin = 110 VDC**	**Vin = 110 VAC**	**Vin = 230 VAC**
	16 mW	30 mW	30 mW
Internal Input Fuse	Fuse included, therefore no external fuse or circuit breaker required. I^2t-fuse = 75 A^2s If you, nevertheless, install an external circuit breaker for any other reason, please select it according to the recommendation below		
External Circuit Breaker recommendation Important: Circuit Breaker must be rated for the maximum AC-input voltage	**Vin = 110 VAC**	**Vin = 230 VAC**	
	2 A, type C	3 A, type C	
Startup time (Time input voltage ON to output voltage ON)	< 600 ms for all input voltages		

OUTPUT CHARACTERISTICS

Output Voltage Nominal	5 V / 3 A; 9 V / 3 A; 15 V / 3 A; 20 V / 3 A; or 3.3 V – 21 V / 3 A PPS Outputs			
Max. Continuous Output Power @ Vin = 90 – 264 VAC (no derating over the entire temperature range)	60 W (charging current depends on device to be charged, USB cables, state of the charge)			
Minimum Load	No minimum load required			
Setpoint Accuracy	< 1.0 %			
Load Regulation @ off-load to full load over the entire temperature range	**Vout = 5 V**	**Vout = 9 V**	**Vout = 15 V**	**Vout = 20 V**
	< 3.2 %	< 1.7 %	< 1.0 %	< 0.7 %
Line Regulation @ full load over the entire temperature range	**Vout = 5 V**	**Vout = 9 V**	**Vout = 15 V**	**Vout = 20 V**
	< 0.8 %	< 0.6 %	< 0.5 %	< 0.5 %
Output Ripple & Noise @ 20 MHz bandwidth, including spikes	**Vout = 5 V**	**Vout = 9 V**	**Vout = 15 V**	**Vout = 20 V**
	< 200 mVpp	< 250 mVpp	< 300 mVpp	< 300 mVpp
Overload and Short-Circuit	The converter is continuous overload and short-circuit proof			
Current Limit, each output (varies due to component tolerances)	3.15 – 3.45 A			
Short-Circuit current	< 2.0 Arms			

EFFICIENCY

Vin	Output Voltage / Load	Efficiency
110 VDC	5.0 VDC / 3.0 A 9.0 VDC / 3.0 A 15.0 VDC / 3.0 A 20.0 VDC / 3.0 A	90.7 % 91.7 % 92.3 % 91.9 %
110 VAC	5.0 VDC / 3.0 A 9.0 VDC / 3.0 A 15.0 VDC / 3.0 A 20.0 VDC / 3.0 A	90.0 % 90.9 % 91.7 % 92.0 %
230 VAC	5.0 VDC / 3.0 A 9.0 VDC / 3.0 A 15.0 VDC / 3.0 A 20.0 VDC / 3.0 A	90.6 % 92.2 % 92.8 % 93.1 %

SIGNALS AND INTERFACES

The IC354_1 charger handles the communication with the USB device under charge, over the signals CC1 or CC2, according to USB Power Delivery (PD) 3.0 and negotiates the charging mode, allowing the fastest charge for the USB device.

The IC354_1 charger supports the following profiles:

- PDO1: 5 V/3 A (Fixed Supply)
- PDO2: 9 V/3 A (Fixed Supply)
- PDO3: 15 V/3 A (Fixed Supply)
- PDO4: 20 V/3 A (Fixed Supply)
- PDO5: 3.3 V – 21 V / 3 A (Programmable Power Supply)

ELECTROMAGNETIC COMPATIBILITY (EMC)

Test	Standard	Test severity levels	Performance Criteria
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	

ENVIRONMENTAL CHARACTERISTICS

Operating Temperature	-25 °C – +70 °C Class OT1: -25 – +55 °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 (> 1400 m) according to EN 50125-1:2014: 5000 m above sea level max.
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 K/s +10 °C to +40 °C / 60 %RH, ±3 K/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

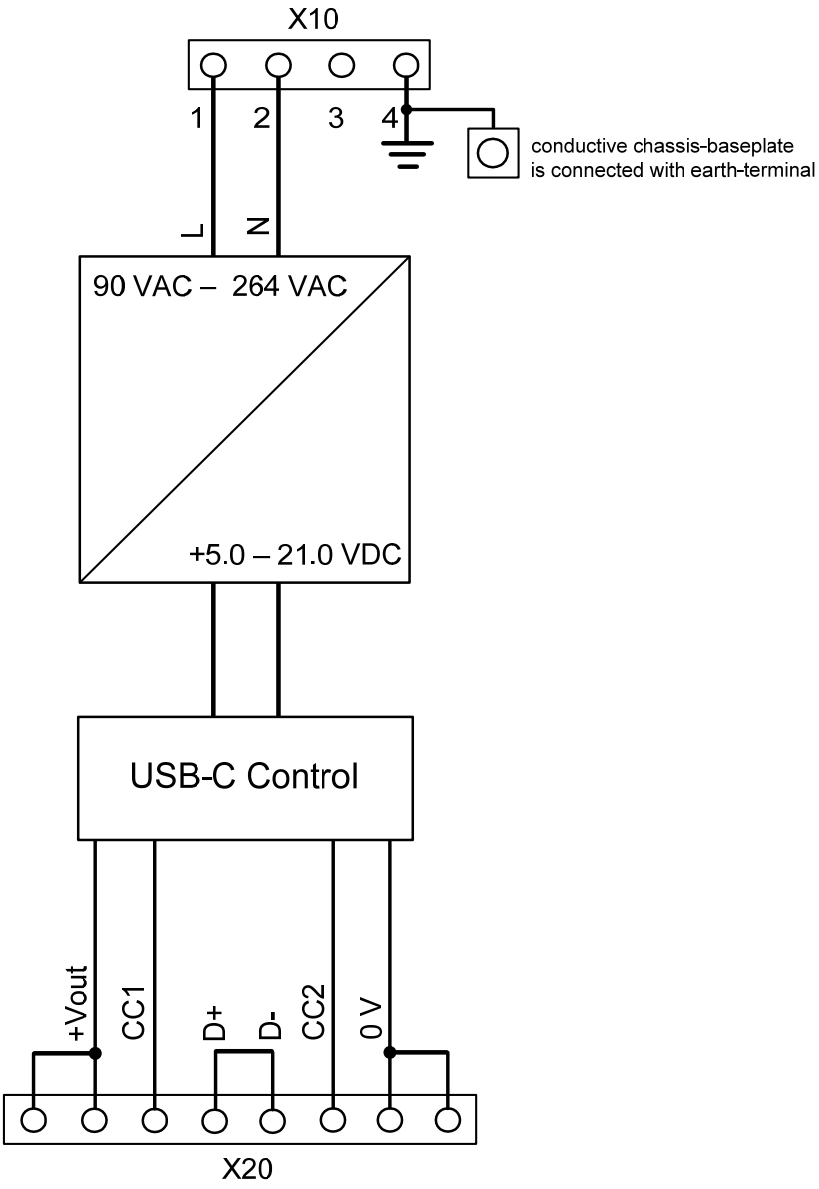
GENERAL CHARACTERISTICS

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**
	35 212 500 h	24 395 000 h	5 535 000 h	2 612 500 h
Connector identification	Printings on PCB to identify input connector and pin-number			

SAFETY AND INSULATION

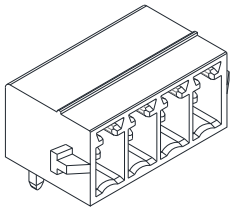
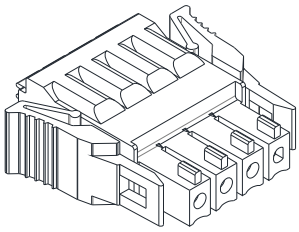
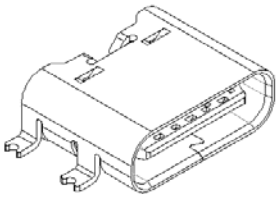
Safety Standards	IEC 60950-1:2005+A1:2009+A2:2013 CSV EN 62368-1:2020+A11:2020 IEC 62368-1:2023
Insulation Coordination	According to EN 50124-1:2017
Input, Output, Chassis	The input is galvanically isolated to the output. Input, output are galvanically isolated to the chassis.
Input to Output	Isolation Voltage: 3300 Vrms at 2000 m altitude, 60 s 2500 Vrms at 5000 m altitude, 60 s Clearance: 6.4 mm Creepage: 6.4 mm For the routine test according to EN 50124-1:2017 of Input to Output and Input to Chassis, intreXis AG recommends the following procedure: connect Output to Chassis, apply a test-voltage of 2125 VDC or 1500 VAC with trigger threshold ≥10 mA, 10 s between Input and Chassis. For this test, the Y-capacitors must not be removed. Please refer to the intreXis whitepaper “Insulation Test” for detailed information.
Input to Chassis	Isolation Voltage: 1500 Vrms, 60 s Clearance: 2.5 mm Creepage: 2.5 mm For the routine test, see above.
Output to Chassis	Not applicable
Insulation Resistance	Input – Output: > 550 MΩ Test-voltage: 500 VDC

BLOCK DIAGRAM



CONNECTOR TYPES

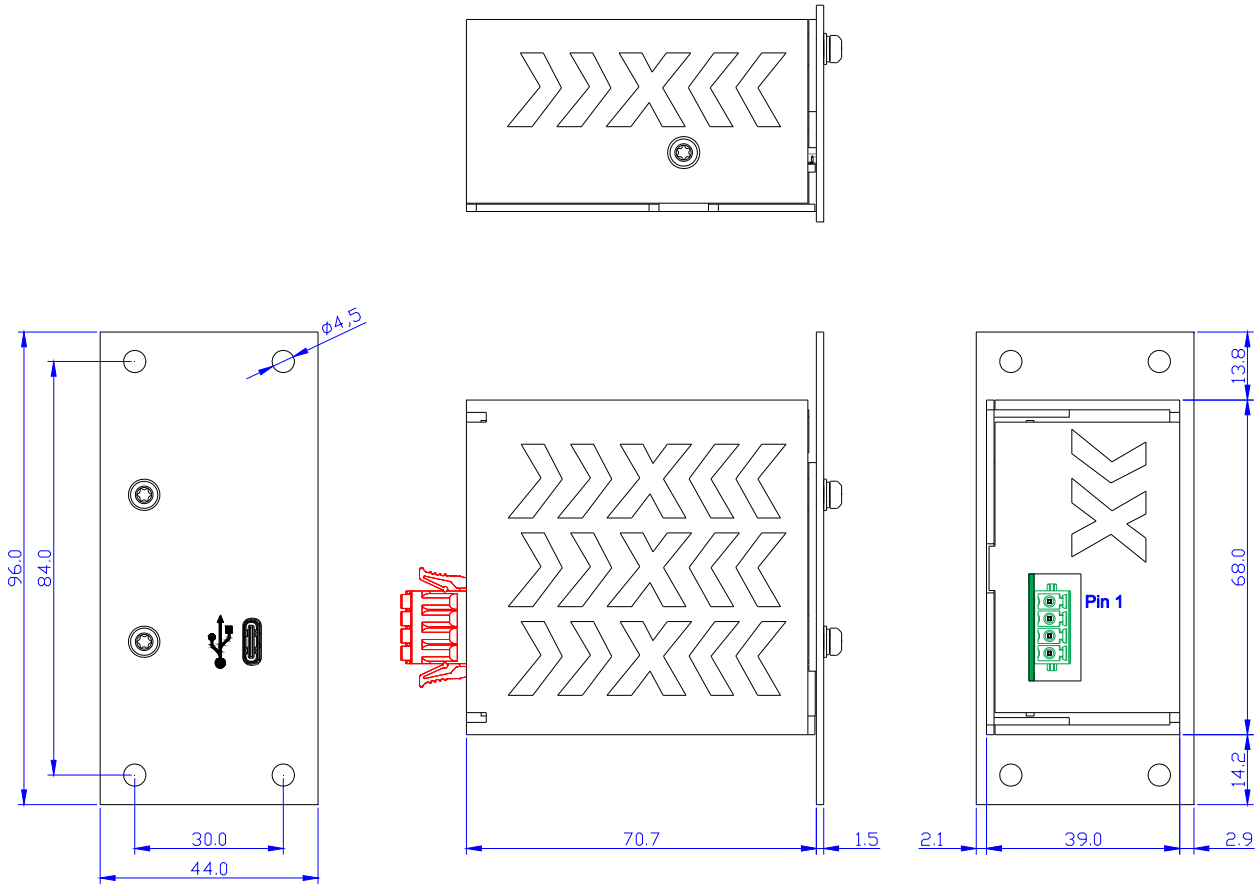
IC354_1

Input connector X10	Phoenix MC 1,5/ 4-G-3,5-RN or equivalent Pitch: 3.5 mm Number of pins: 4  Mating part: Phoenix FMC 1,5/ 4-ST-3,5-RF, Ordering code: 1952047 
Output connector X20	USB type C, horizontal Pitch: according to USB C Durability: 10 000 cycles min. of insertion/extraction  Mating part: USB C plugs

MECHANICAL CHARACTERISTICS

Overall dimensions	According to the drawing (millimetres, unless otherwise specified)
Weight	IC354_1: tbd
IP code	IP20 in general IP40 D on front-panel
Mounting	Mounting in any position is allowed

Mechanical drawings:



The part colored in red is a mating connector, that is not provided and is shown for illustration purpose only.

Output connector X20:

USB C

Input connector X10:

Pin 1: VAC-Line
Pin 2: VAC-Neutral
Pin 3: Not Connected
Pin 4: Earth

The unit must be secured using four screws (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: 110 VAC and 230 VAC Supply voltage range: 90 – 230 VAC (static)	Criterion A	Test report
DC Power supply test Supply overvoltages	EN 50155:2021 IEC60571:2012	Supply voltage: 90 – 264 VAC	According to design specification	Test report
Insulation test	EN 50155:2021 IEC60571:2012	Input – Output 500 VDC Repeated after Voltage withstand test Voltage withstand test: Input – Output 3300 Vrms 60 s	Resistance > 20 MΩ (measured >550 MΩ, exceeding the requirement) No disruptive discharge	Test report
Low temperature test	EN 50155:2021 IEC60571:2012	T = -25 °C	Criterion A	Test report
Dry heat test	EN 50155:2021 IEC60571:2012	T = +55 °C (cycle A)	Criterion A	Test report
Low temperature storage test	EN 50155:2021 IEC60571:2012	T = -50 °C	Criterion A after recovery period	Test report
Cyclic damp heat test	EN 50155:2021 IEC60571:2012	T = +55 °C and +25 °C (2 cycles)	Criterion A	Test report
Electromagnetic compatibility test	EN 50155:2021 EN 50121-3-2:2016/ A1:2019 IEC60571:2012 IEC 62236-3-2:2018	See section 'Electromagnetic Compatibility (EMC)'		Compliant
Shock and vibration 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_IC354

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, 20.09.2025

Thomas Schiegg
intreXis AG

EU DECLARATION OF CONFORMITY (DoC)

CE

Product Models	IC354_1	
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.		
IC354_1 		
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, 20.09.2025	
Name, Function, Signature	Thomas Schiegg, Managing Director: 	

UK DECLARATION OF CONFORMITY (DoC)

Product Models	IC354_1	
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.		
IC354_1 		
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, 20.09.2025	
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.
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 current specifications. Prepare the cables according to the specifications of the particular connector used.
Operation of the Unit	Once the input power is applied and a device is attached to the USB connector, the charging profile is negotiated with the device. Then, the output voltage at the USB connector is enabled and charging starts.