ICL16

16 A_{dc} DIN Rail Inrush Current Limiter (ICL) with control input

ICL16 topview.

Feature summary

- Limits inrush current to prevent erratic circuit breaker triggering.
  - Designed for B16 circuit breakers
  - Zero Voltage turn to minimize inrush currents
  - Supports 8000 µF Capacitor load
- 85 - 264 V_{ac} input voltage range
- Control Input for Relay functionality
- NTC Temperature Supervisor
- Thermal Fuse (non-resettable)
- Microcontroller Controlled
- Programmable via MCU Tracer

Product description

The ICL16 is an innovative inrush current limiter developed for 85-230 V_{ac} and 16 A applications, effectively preventing erratic circuit breaker triggering caused by high inrush currents from devices such as switch mode power supplies or PTC loads. This device features an external control input and integrates both softstarter and relay functions into a single unit.

The ICL16 minimizes inrush currents through zero-crossing turn-on technology. The device can tolerate a limited number of short circuits on the load side.

Upon receiving a control signal, the softstart resistors activate during an AC zero-crossing event. After a programmable soft start time, the relay engages, bridging the softstart resistors. A thermal sensor (NTC) prevents overheating of the softstart resistors. A thermal fuse completely disables the softstart function on failure.

Specification overview

Description	Value
General	
Voltage Range	85 - 264 V_{ac}
Output Current	16 A_{ac}
Default Delay time	20 msec
Default Softstart time	114 msec
Control Input	85 - 230 V_{ac}
Max Capacitance	8000 µF
Protection	
Temperature Sensor	yes
Thermal Fuse	yes
Input Fuse (Control)	yes

Ordering information

Ordercode	Description
ICL16	16 A_{dc} DIN Rail Inrush Current Limiter (ICL) with control input
Customisation available. Contact DPS.	

Engineering standards

Applied engineering standards	
IEC 55032	IEC 61000-4-2
IEC 61000-4-3	IEC 61000-4-4
IEC 61000-4-5	IEC 61000-4-6
IEC 61000-4-7	IEC 61000-4-8

1 Functional description

1.1 Overview

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Operating range: -40°C to 50°C. Temperature derating is required.

1.2 Protections

The following protections are in place for ICL16:

- **Control Input Fuse:** The internal self-power supply is fused to prevent fire. The fuse is not replaceable.
- **NTC Temperature Protection:** An NTC supervises the internal softstart-resistors' temperature. If an over temperature is present, the device does not allow soft-start and thereby preventing the thermal fuse to blow.
- **Thermal fuse:** In case of failure, e.g. IGBT short-circuit, the thermal fuse safely disconnects the softstart resistors.

1.3 Power Limits

The power cycles may be constrained by the case's power dissipation. In instances of frequent power cycling, the device may enter a thermal protection state.

1.4 Ordering Information

Ordercode	Description	EAN
ICL16	16 A_{dc} DIN Rail Inrush Current Limiter (ICL) with control input	0735654854135
Customisation available. Contact DPS.		

2 Pinout

The pinout of the ICL16 is depicted in Figure 1.

Figure 1: **ICL16** connection Diagram

2.1 Pin description

Pin	Functional description
	Input
L	Line (Conductor)
C	Control input. See also application examples. 1. Connect to L to activate. 2. Connect to L to deactivate.
N	Neutral
	Output
L	Line (switched)
N	Neutral (internally connected to IN-N)

3 Application Information

3.1 Inrush Current Limiter

The diagram below illustrates the wiring configuration for inrush current limiter operation. Fuse 1F1 must be a B16 fuse. Alternatively a fuse with a lower rating may be used.

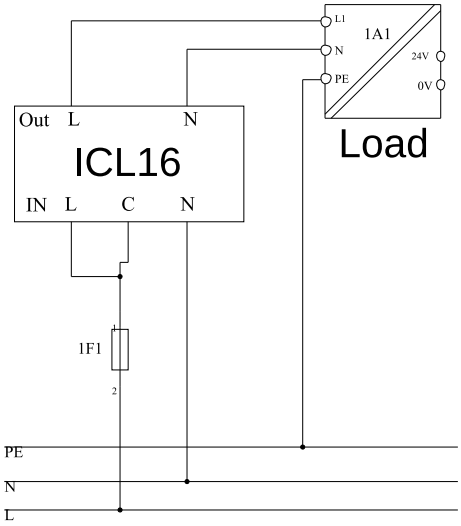

Figure 2: ICL16 operation as an inrush current limiter.

3.2 Relay

The diagram below illustrates the wiring configuration for relay operation. Closing switch 1S1 turns on the load, while releasing the switch turns it off.

The switch can be substituted with a low switching power relay.

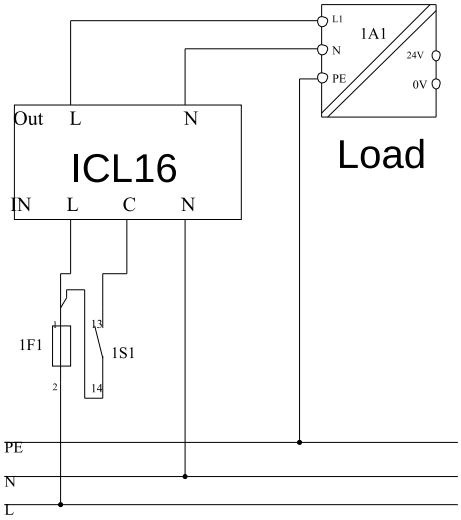

Figure 3: ICL16 operation as a relay and inrush current limiter.

3.3 Feed Forward Delay

To minimize inrush currents in the electrical system, multiple inrush current limiters can be configured in a feed forward arrangement.

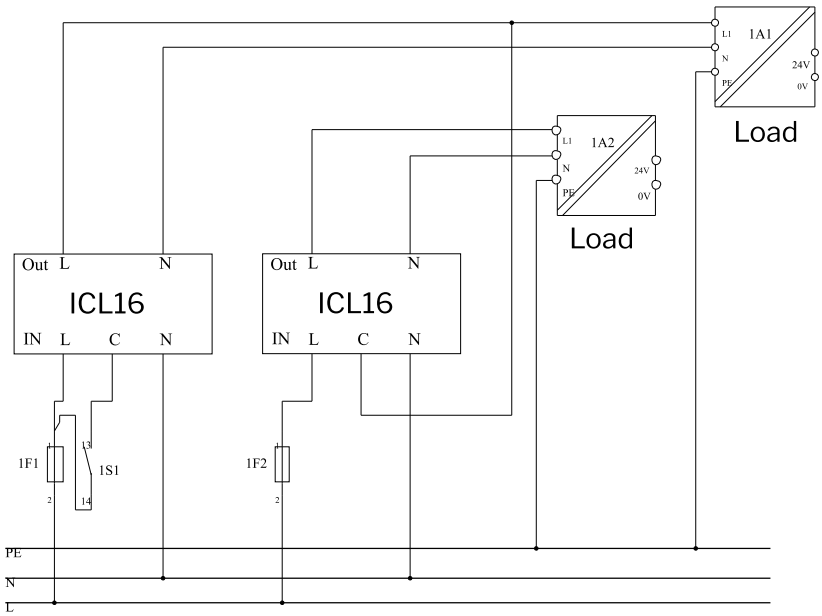

Figure 4: ICL16 in feed forward operation.

4 Specification

The specification for ICL16 is shown in the following table. If not otherwise specified the following parameters have been used: T_{amb}=25°C and U_{in}=230 $V_{ac,rms}$.

	Min	Typ	Max	Unit
Eingang Input				
Versorgungsspannung Supply Voltage	85		264	V_{ac}
Steuerspannung Control Voltage	85		264	V_{ac}
Benötigte Sicherung Eingang Required Input Fuse	B16			
Ausgang Output				
Output Current Effektivwert Current Output	0		16	A_{ac}
Lastkapzität Load Capacity	0		8000	µF
Gehäuse Case				
Montageform Mounting Type	Din Rail			
Breiteneinheiten Mounting Width	36.5			mm
Montagehöhe Mounting Height	58.7			mm
Programmierbarkeit Programmability				
Interface Interface	3.3V RS232 with mcu_tracer protocol			
Sicherheitsfeatures Safety Features				
Eingangssicherung Steuerung Input Fuse Control	yes			
Temperaturüberwachung Temperature Supervisor	yes, NTC			
Thermische Sicherung Thermal Fuse	yes			
Technische Merkmale Technical Characteristics				
Temperaturbereich Temperature Range	-40		50	°C
Elektrolytkondensatoren Electrolytic Capacitors	No electrolytic capacitors			

5 Programming

The ICL16 can be programmed in factory or by the user. For detailed instructions please contact DPS support.

Contact:

support (ät) digitalpowersystems (döt) de

6 Measurements

6.1 Capacitor Bank Turn on

The ICL16 is turned on 9mF capacitor bank[1]. The input and the output voltages are deplicted over time.

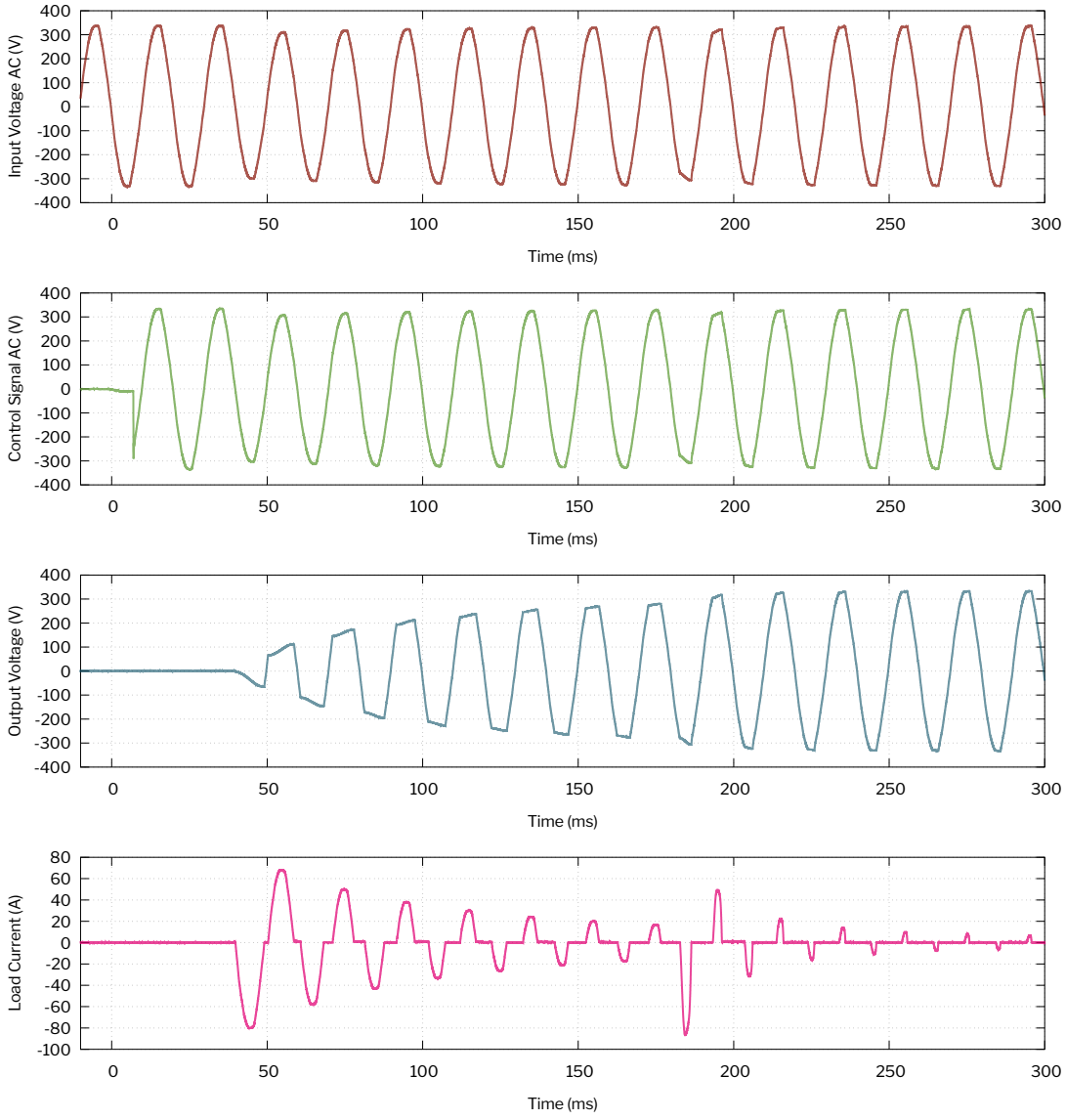

Figure 5: The ICL16 is tested with 9mF Capacitor bank at U_{in}=230V_{ac}. At t=5msec the control input is enabled. At t = 40msec, the output voltage is enabled at a zero crossing, and at t = 180msec the relay closes to provide full output power.

[1]The converter is derated to 8mF due to capacitor tollerances.

6.2 Incandescent Lamp Turn on

The ICL16 is conntected to 3200W incandescent lamps. The input, control and the output voltages and the output current are deplicted over time.

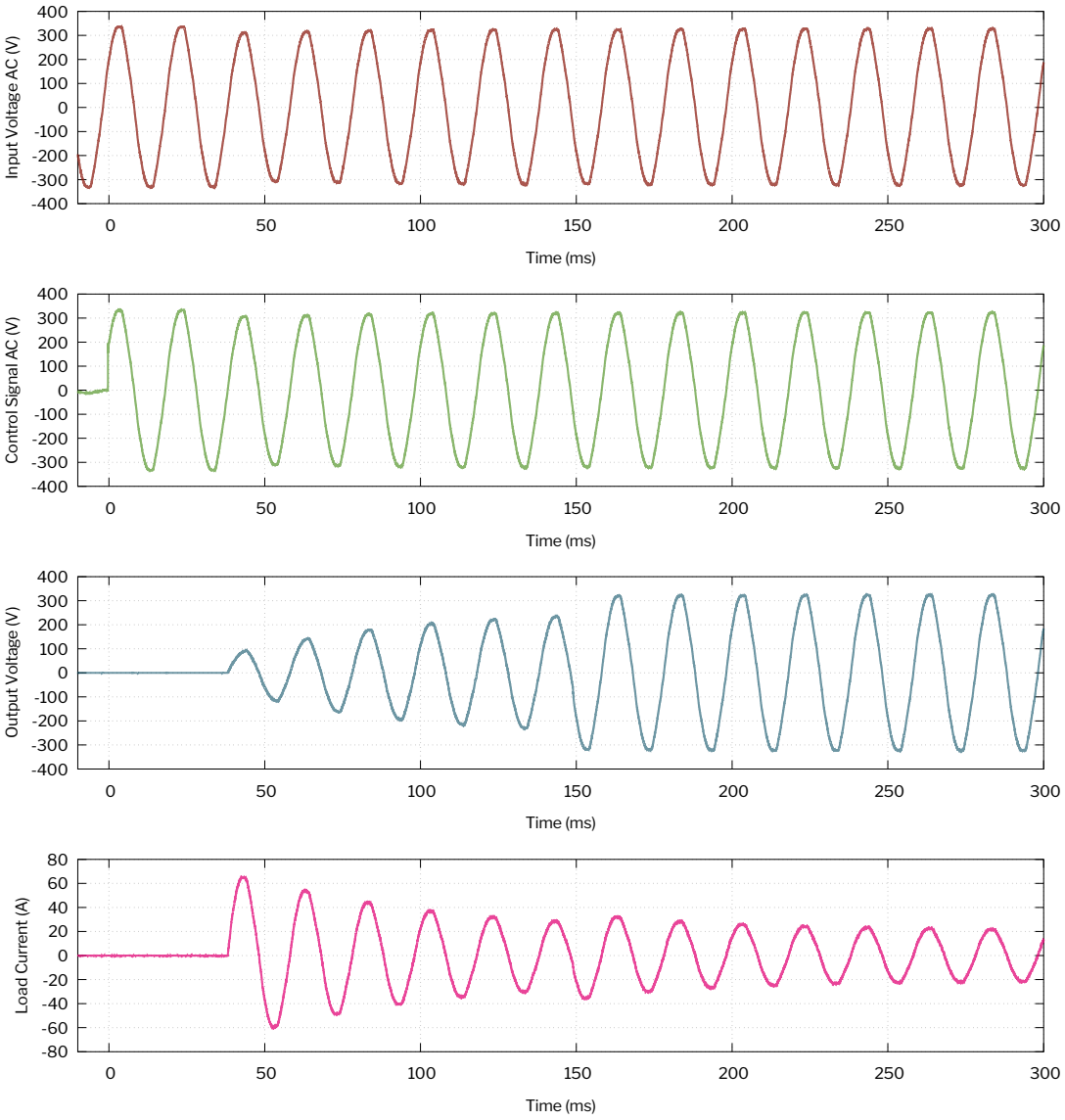

Figure 6: The ICL16 is tested with 3200W incandescent lamp. At t = 5msec the control input is enabled. At t = 30msec, the output voltage is enabled at a zero crossing, and at t = 150msec the relay closes too provide full output power.

6.3 Output short circuit

The ICL16is tested with a 1.1 Ohm short circuit on the output. The Supply voltage is 230 V_{ac}.

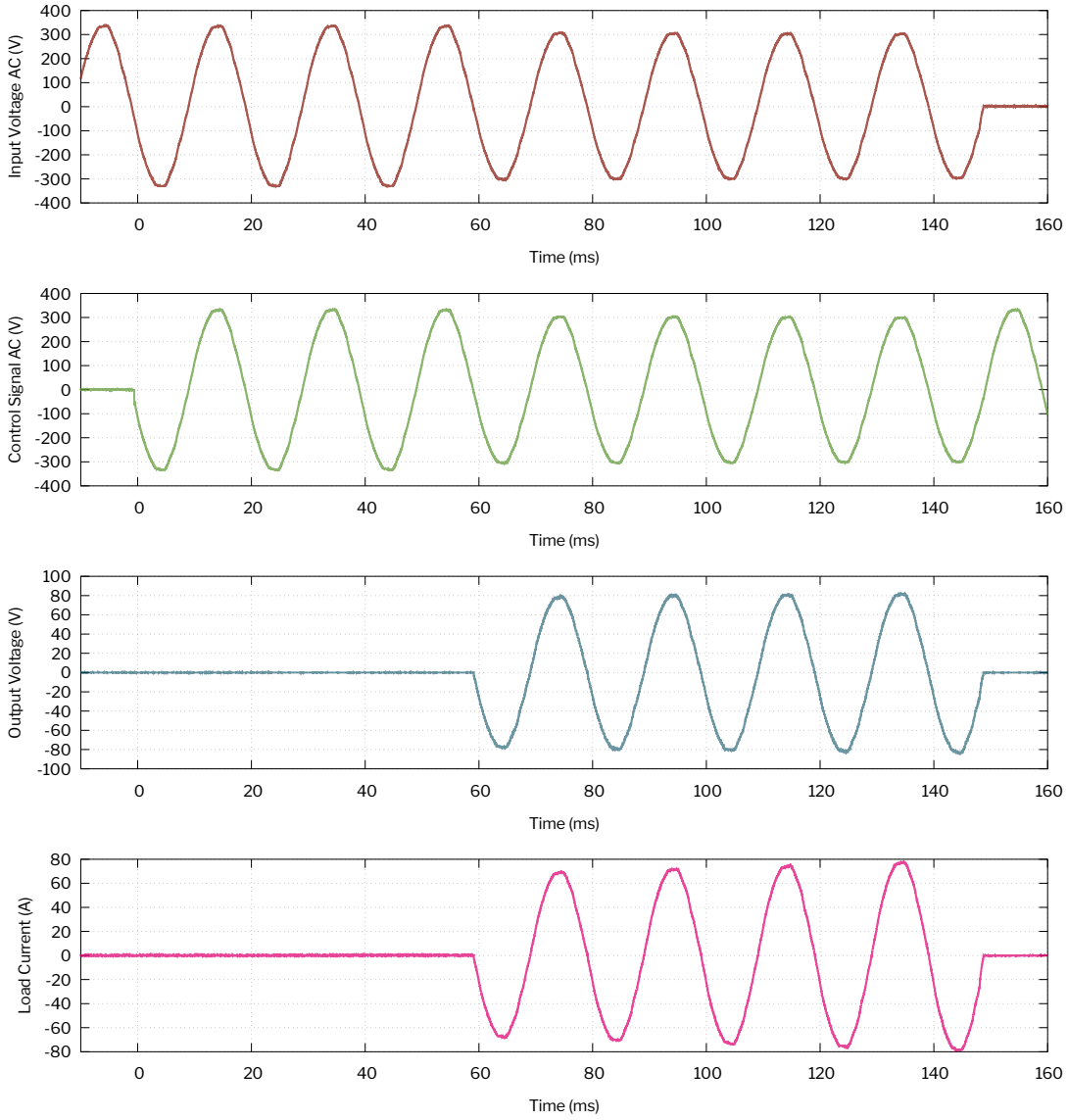

Figure 7: The ICL16is tested with a 1.1 Ohm short circuit. The Supply voltage is 230 V_{ac}.

7 EMC Measurements

7.1 Conducted Emissions

The average EMC conducted line emission are depicted in 8. The QP EMC Emissions are depicted in 9. The parameter are measured at an input voltage of U_{in} = 230 $V_{AC,rms}$.

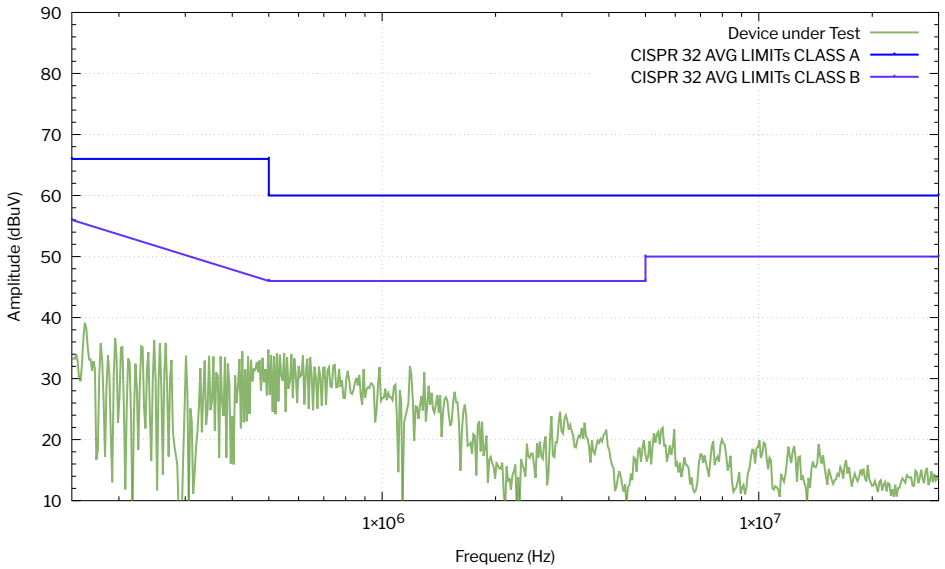

Figure 8: AVG EMC Emssions

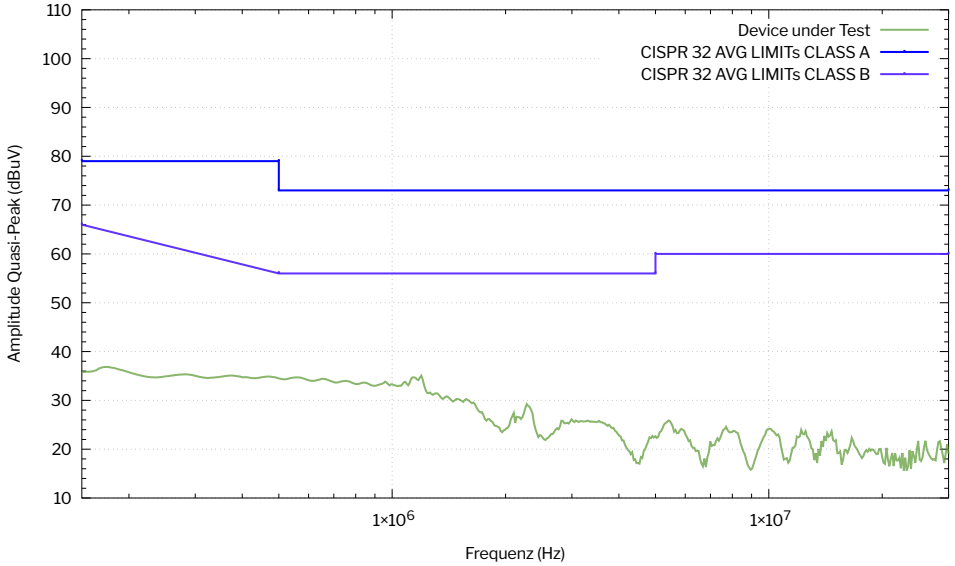

Figure 9: QP EMC Emssions

8 Case

The case drawing is shown in Figure 10.

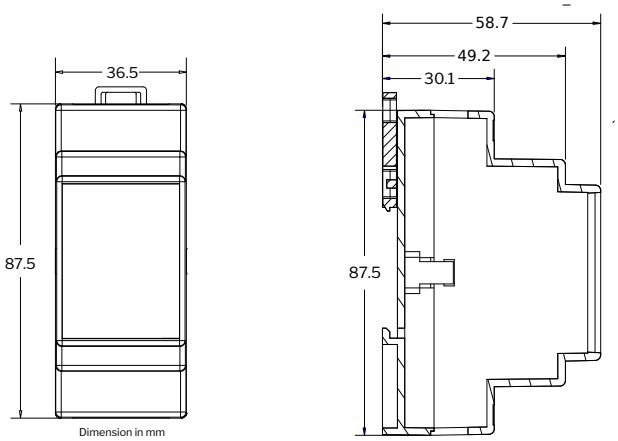

Figure 10: ICL16 case drawing.

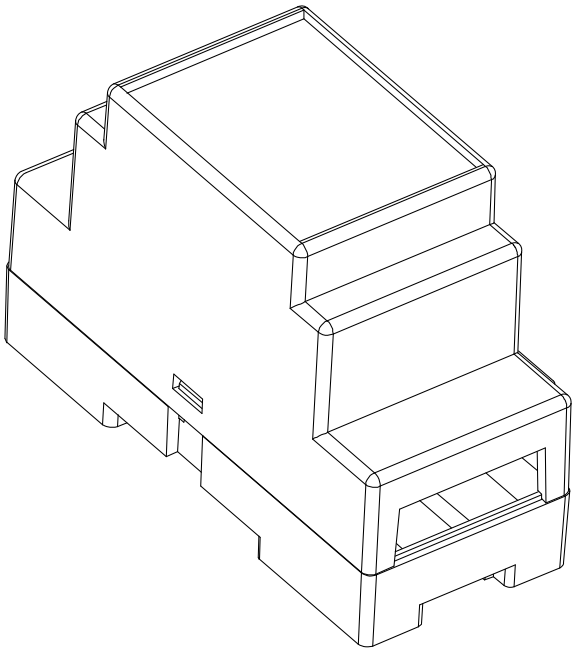

Figure 11: ICL16's 3D View.

9 Product label

The Label for the ICL16 is depicted in the following Figure 12.

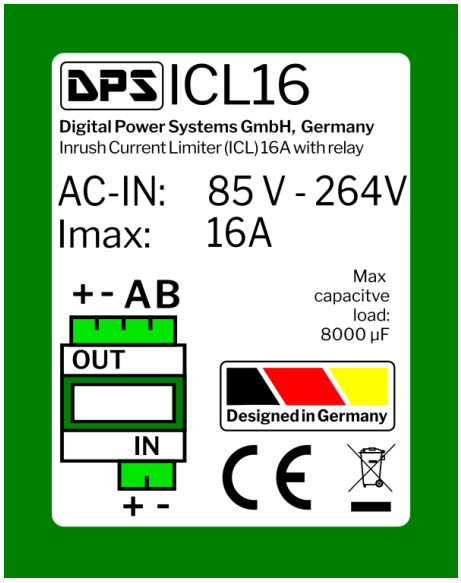

Figure 12: ICL16's label

10 Document

10.1 Latest Document Revision

The latest document revision can be downloaded here:

https://digitalpowersystems.eu/icl16-inrush-current-limiter-16a/

10.2 Datasheet Quality

Digital Power Systems aims for the highest datasheet quality. We value your feedback to improve this document. Please email:

`datasheet (ät) digitalpowersystems (döt) eu`

10.3 Revision History

The revision history is depicted in the following table.

Date	Changes in Revision
25.7.2024	Initial release
29.7.2024	URLs added to document

10.4 Contact Information

This is a product of the Digital Power Systems GmbH (DPS).

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