# HDR20-5-12

*230$V_{ac}$ 20W 5V|9V|12V AC/DC NoElko Power Supply*


**HDR20-5-12:** A 230$V_{ac}$ 20W 5V|9V|12V AC/DC NoElko Power Supply

## Features

- 18mm DIN Rail width
- <50mW Standby Power @ 5 $V_{dc,out}$
- Long life / Electrolytic capacitor free
- Output Voltage selectable by switch:
  - 5 $V_{dc}$ - 4 $A_{dc,max}$
  - 9 $V_{dc}$ - 2.22 $A_{dc,max}$
  - 12 $V_{dc}$ - 1.67 $A_{dc,max}$
- 207 $V_{ac}$ to 253 $V_{ac}$ input voltage range
- Output short circuit proof
- Active output overvoltage Protection
- Green Power LED

## Product description

The HDR20-5-12 is 230$V_{ac}$ power supply for DIN RAIL control cabinets. The output voltage is selectable by switch to 5V@4$A_{max}$, 9V@2.22$A_{max}$ and 12V@1.67$A_{max}$. Thanks to the no-electrolytic-capacitor (NoElko) technology, exceptional reliability is achieved. An active output overvoltage protection discharges the output on overvoltage conditions.

The device is resilient to typical operating failures: Input transient protection, output short circuit, open circuit, moderate input transients and moderate output transients. A green power led indicates stable operation.

The device may be operated at ambient temperatures between -40°C and 50°C. Derating might be required.

## Specification overview

| Description | Value |
|---|---|
| **Input** | |
| Input Voltage Range ($V_{ac}$) | 207 - 253 |
| Input Voltage Frequency (Hz) | 49-61 |
| **Output** | |
| Voltage (V) | 5 / 9 / 12 |
| Current (A) | 4 / 2.22 / 1.67 |
| Power Good Indicator | Green LED |
| Voltage Selection | Switch |
| Peak Efficiency | 84 % |
| **Protection** | |
| Input Fuse | yes |
| Temperature Protection | yes |
| Short circuit protection | yes |
| Input Overvoltage supressor | MOV |
| **Mechanical** | |
| Dimensions LxWxH (mm) | 17.6 x 106 x 60 |

## Ordering information

| Ordercode | Description |
|---|---|
| HDR20-5-12 | 230$V_{ac}$ 20W 5V\|9V\|12V AC/DC NoElko Power Supply |
| 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

The HDR20-5-12 is 230$V_{ac}$ power supply for DIN RAIL control cabinets. The output voltage is selectable by switch to 5V@4$A_{max}$, 9V@2.22$A_{max}$ and 12V@1.67$A_{max}$. Thanks to the no-electrolytic-capacitor (NoElko) technology, exceptional reliability is achieved. An active output overvoltage protection discharges the output on overvoltage conditions.

The device is resilient to typical operating failures: Input transient protection, output short circuit, open circuit, moderate input transients and moderate output transients. A green power led indicates stable operation.

The device may be operated at ambient temperatures between -40°C and 50°C. Derating might be required.

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

## 1.2 Protections

The following output protection mechanisms are implemented to ensure the reliable and safe operation of the HDR20-5-12:

- **Input Overvoltage Protection:** A Metal Oxide Varistor (MOV) safeguards the input against overvoltage conditions.
- **Output Short-Circuit Protection:** The HDR20-5-12 includes an overtemperature shut-down mechanism to prevent damage during short-circuit conditions.
- **Short-Circuit Resilience:** The output can withstand a short circuit indefinitely without adverse effects.
- **Open-Circuit Resilience:** The output can safely operate in an open-circuit condition for an unlimited duration.
- **Output Overvoltage Protection:** The HDR20-5-12 is equipped with active transient voltage protection. A high-power resistor discharges the output under overvoltage conditions.

## 1.3 Safety Advice / Risk of Destruction

This product is intended for professional users with adequate safety training in accordance with local regulations. Always disconnect the input supply voltage before performing any work on the HDR20-5-12. Do not open the device. Keep away from water.

## 1.4 Ordering Information

| Ordercode | Output Voltage | EAN |
|---|---|---|
| HDR20-5-12 | 5 V, 9 V, 12 V | 0735654854197 |
| Customisation available. Contact DPS. | | |

| Similar product | | |
|---|---|---|
| **Ordercode** | **Output Voltage** | **EAN** |
| HDR20-15-30 | 15 V, 24 V, 30 V | 0735654854203 |

## 2 Pinout

The pinout of the converter is depicted in Figure 1.

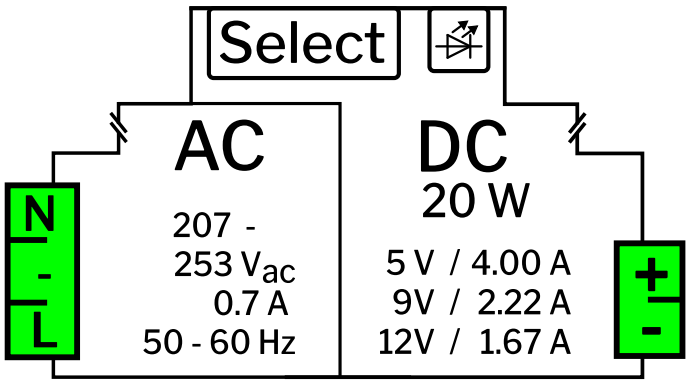


Figure 1: Pinout HDR20-5-12-5-12 1.

| Pin | Functional Description |
|---|---|
| | **Input** |
| N | Neutral, AC input pin. |
| L | Line (Live), AC input pin. |
| | *Note: N and L can be interchanged.* |
| | **Output** |
| SELECT | Output power selection switch |
| + | Positive output terminal 5V. |
| - | Negative output terminal 5V. |
| | **Indicator** |
| LED | A green LED indicates that the output is functioning properly. |

Table 1: Connector Descriptions and Functional Details

# 3 Specification

The specification for HDR20-5-12 is shown in the following table. Unless otherwise specified, the measurement conditions listed in Table 4 apply. All values refer to static conditions unless stated otherwise.

| | Min | Typ | Max | Unit |
|---|---|---|---|---|
| Eingang<br>Input | | | | |
| Eingangsspannung $U_{out}$=5V<br>Input Voltage Range | 207 | | 253 | $V_{dc}$ |
| Eingangskapazität<br>Input Capacitance | | 4.7 | | µF |
| Standby Leistungsverbrauch<br>Standby Power | | 50 | 60 | mW |
| Eingangssicherung<br>Input Fuse | | 750 | | mA |
| Startzeit<br>Startup Time | | 300 | 500 | ms |
| Ausgang<br>Output | | | | |
| Ausgangsspannung $U_{out}$=5 V<br>Output Voltage $U_{out}$=5 V | 4.8 | 5.2 | 5.5 | V |
| Ausgangsstrom $U_{out}$=5 V<br>Output Current $U_{out}$=5 V | 0 | | 4 | A |
| Ausgangsspannung $U_{out}$=9 V<br>Output Voltage $U_{out}$=9 V | 8.5 | 9.2 | 9.8 | V |
| Ausgangsstrom $U_{out}$=9 V<br>Output Current $U_{out}$=9 V | 0 | | 2.22 | A |
| Ausgangsspannung $U_{out}$=12 V<br>Output Voltage $U_{out}$=12 V | 11.5 | 12.2 | 12.8 | V |
| Ausgangsstrom $U_{out}$=12 V<br>Output Current $U_{out}$=12 V | 0 | | 1.67 | A |
| Wandlungeffizienz<br>Conversion Efficiency | | 80 | 84 | % |
| Ausgangsüberspannungsschutz<br>Output overvoltage protection | yes, active discharge with resistor | | | |
| Ausgangsentladewiderstand<br>Output discharge resistor | | 10 | | Ω |

| | Min | Typ | Max | Unit |
|---|---|---|---|---|
| Gehäuse<br>Case | | | | |
| Montageform<br>Mounting Type | | Din Rail | | |
| Teilungseinheiten<br>Modular width units | | 1 | | |
| Montagebreite<br>Mounting Width | | 17.6 | | mm |
| Montagelänge<br>Mounting Length | | 106 | | mm |
| Montagehöhe<br>Mounting Height | | 60 | | mm |
| Montagestil<br>Mounting Style | | Household Installation BOX | | |
| Sicherheitsfeatures<br>Safety Features | | | | |
| Eingangsüberspannungsschutz<br>Input overvoltage protection | | yes | | |
| Übertemperaturschutz<br>Over temperature protection | | 110 | 120 | °C |
| Kurzschlussschutz<br>Short circuit protection | | yes | | |
| Leerlaufschutz<br>Open circuit protection | | yes | | |
| Betriebsbedingungen<br>Operating Conditions | | | | |
| Temperaturbereich<br>Temperature Range | -40 | | 50 | °C |
| Technische Merkmale<br>Technical Characteristics | | | | |
| Elektrolytkondensatoren<br>Electrolytic Capacitors | | No electrolytic capacitors | | |
| Platinen Lackierung<br>PCB conformal coating | | No conformal coating. | | |

# 4 Measurements

## 4.1 Measurement Conditions

The measurement conditions are noted in table 4, if not otherwise noted in the specific measurement.

| | Min | Typ | Max | Unit |
|---|---|---|---|---|
| Eingang<br>Input | | | | |
| Eingangsspannung<br>Input Voltage | 227 | 230 | 233 | $V_{ac}$ |
| Eingangsfrequenz<br>Input Frequency | 49 | 50 | 51 | Hz |
| Umgebungsbedingungen<br>Environment Conditions | | | | |
| Temperatur<br>Temperature | 20 | | 24 | °C |
| Feuchtigkeit<br>Humidity | 30 | | 90 | $\%_{rel}$ |

Table 4: Measurement Conditions, if not otherwise noted.

## 4.2 Output Voltage Stability

The output voltage is measured across the operating range, as illustrated in Figure 2. The voltage levels are set to 5 $V_{dc}$, 9 $V_{dc}$, and 12 $V_{dc}$.

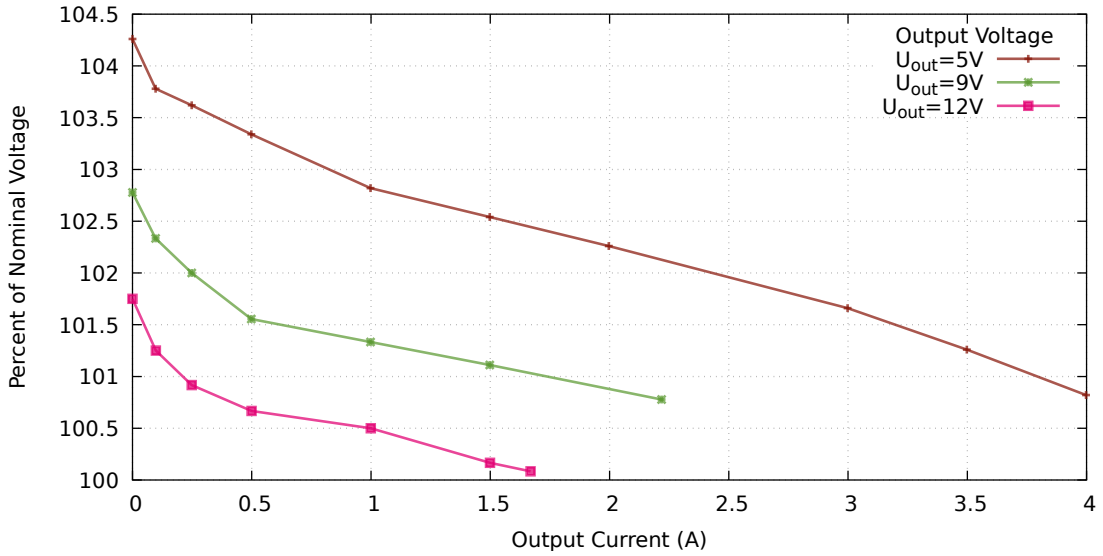


Figure 2: Relative output voltage stability over output current

## 4.3 Output Voltage Ripple

The output voltage ripple is measured across the operating range and presented in Figure 3. The voltage levels are set to 5 $V_{dc}$, 9 $V_{dc}$, and 12 $V_{dc}$.

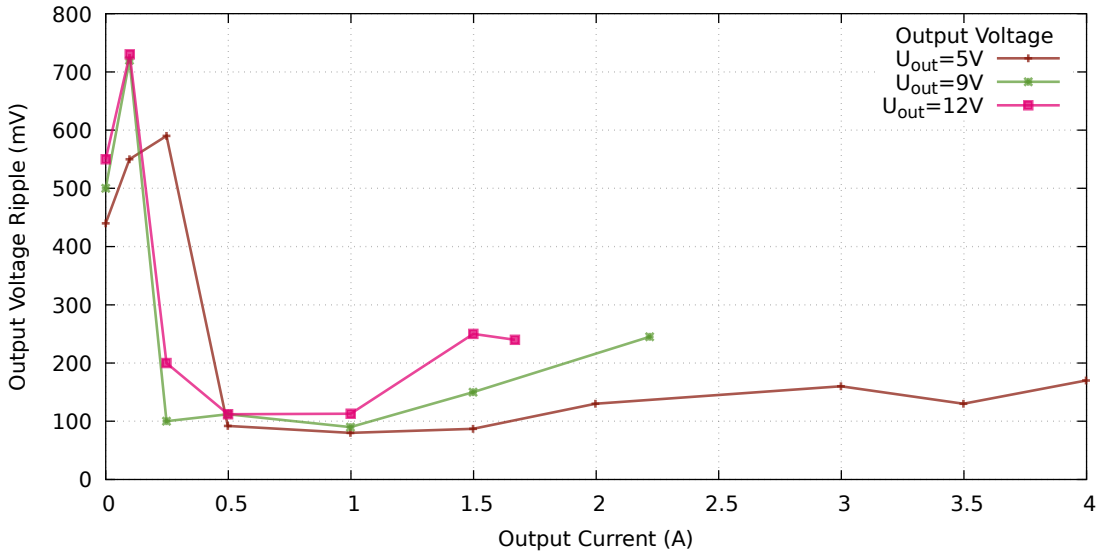


Figure 3: Output voltage ripple over the output current range.

## 4.4 Conversion Efficiency

The conversion efficiency is plotted over the output current range. The voltage levels are set to 5 $V_{dc}$, 9 $V_{dc}$, and 12 $V_{dc}$.

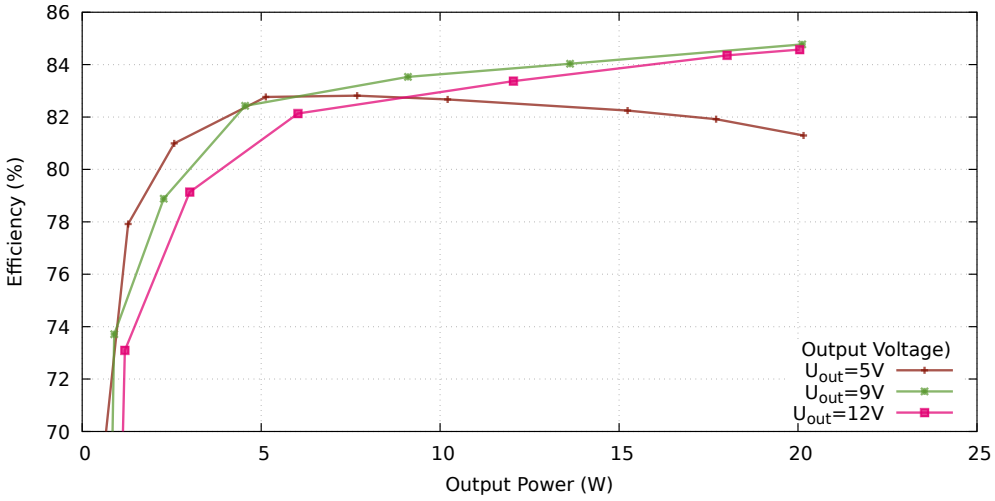


Figure 4: Conversion efficiency versus output current

## 4.5 Input Standby Power

The input standby power at various output voltages is plotted over the input voltage range, as shown in Figure 5.

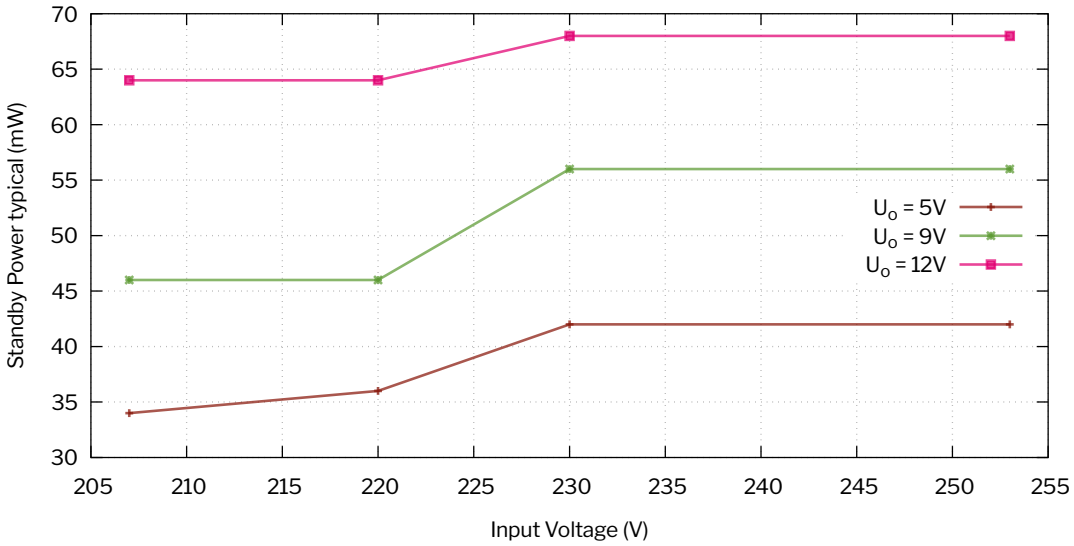


Figure 5: Standby power versus input voltage

## 4.6 Step Response

### 4.6.1 5 V

For the step response measurement at 5 V output voltage, the output current was changed from 0 A to 3 A. The output voltage response is shown in Figure 6. The rise and fall slope of the current was set to 2 A/ms.

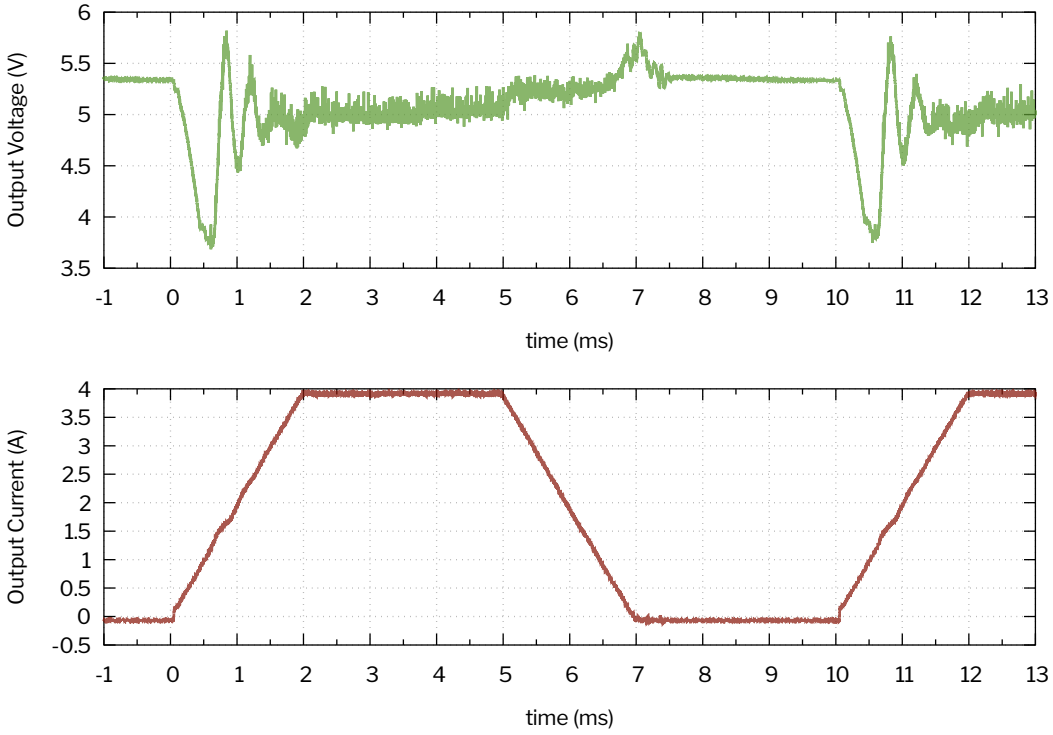


Figure 6: Transient response at $U_{out}$ = 5 V

### 4.6.2 9 V

For the step response measurement at 9 V output voltage, the output current was changed from 0 A to 2.22 A. The output voltage response is shown in Figure 7. The rise and fall slope of the current was set to 2 A/ms.

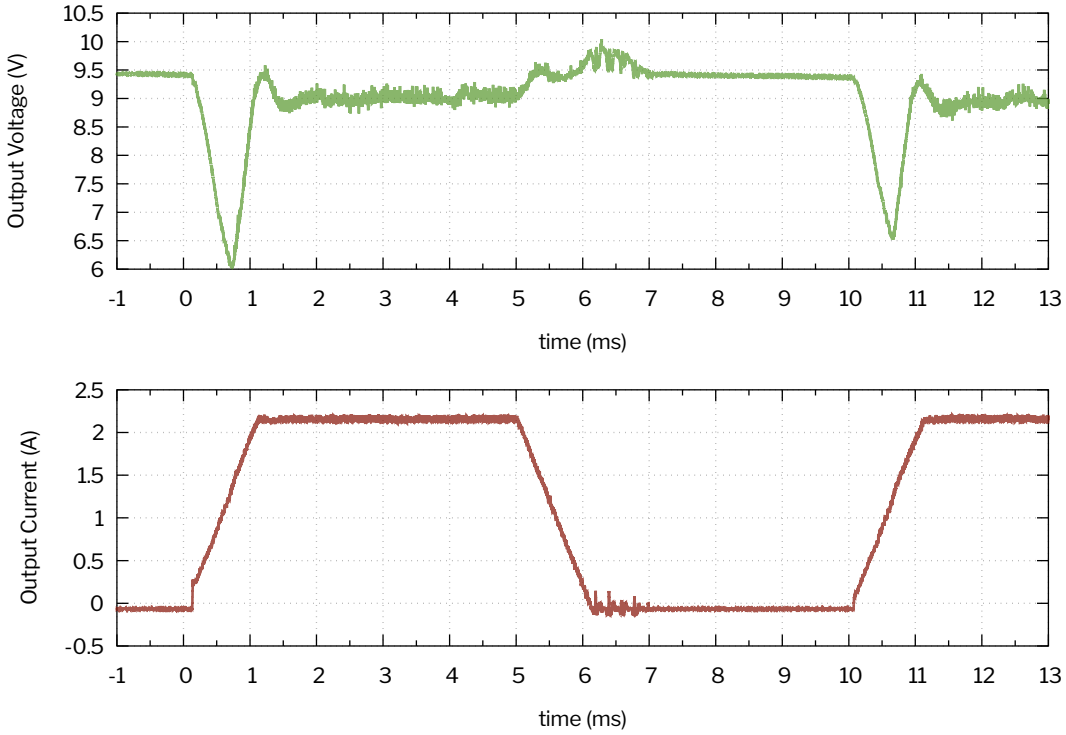


Figure 7: Transient response at $U_{out}$ = 9 V

### 4.6.3 12 V

For the step response measurement at 12 V output voltage, the output current was changed from 0 A to 1.67 A. The output voltage response is shown in Figure 8. The rise and fall slope of the current was set to 2 A/ms.

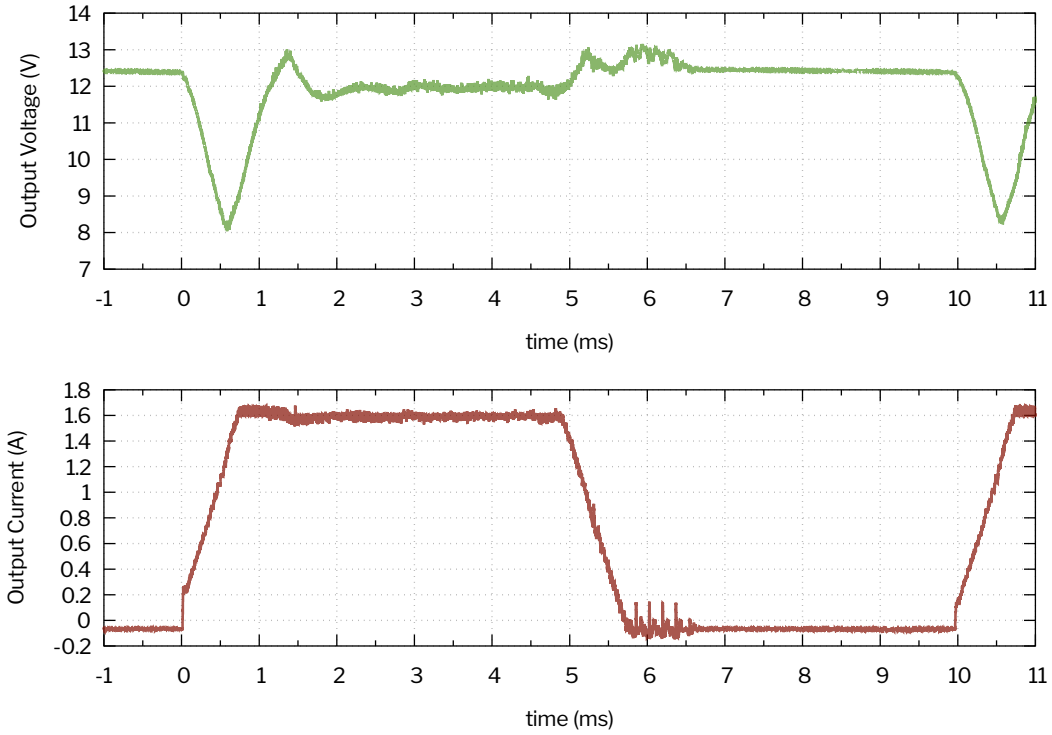


Figure 8: Transient response at $U_{out}$ = 12 V

## 4.7 Power-On Behavior

The power supply is turned on with a target output voltage ($U_{out,set}$) of 5 V, 9 V, and 12 V.

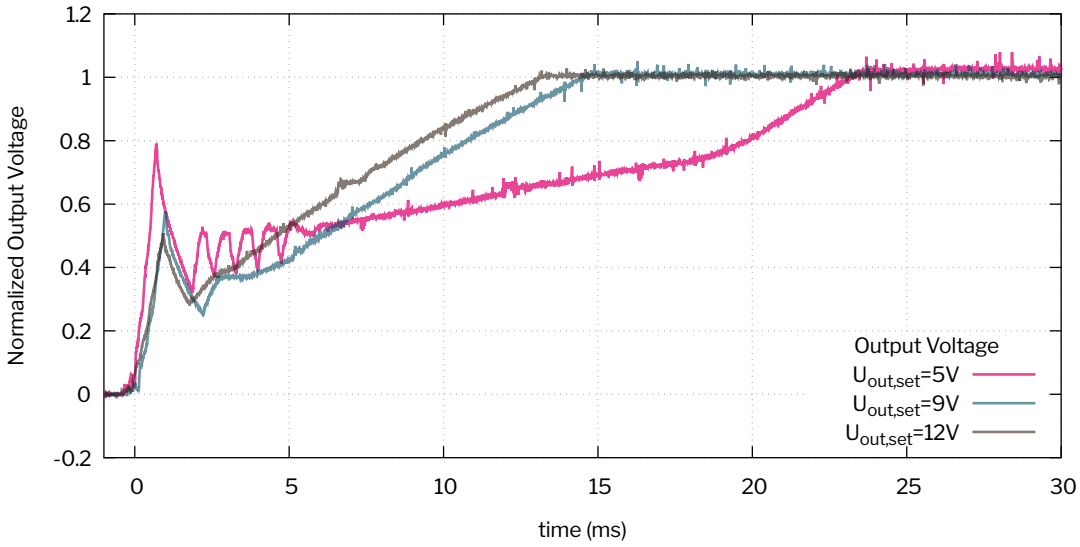


Figure 9: Output voltage of the HDR20-5-12 when the power is turned on.

## 4.8 Startup

The Startup time is defined as the time from the input voltage being present to 90% of the output voltage.

### 4.8.1 5 V

The startup time for $U_{out}$=5 $V_{dc}$ is measured in Figure 10.

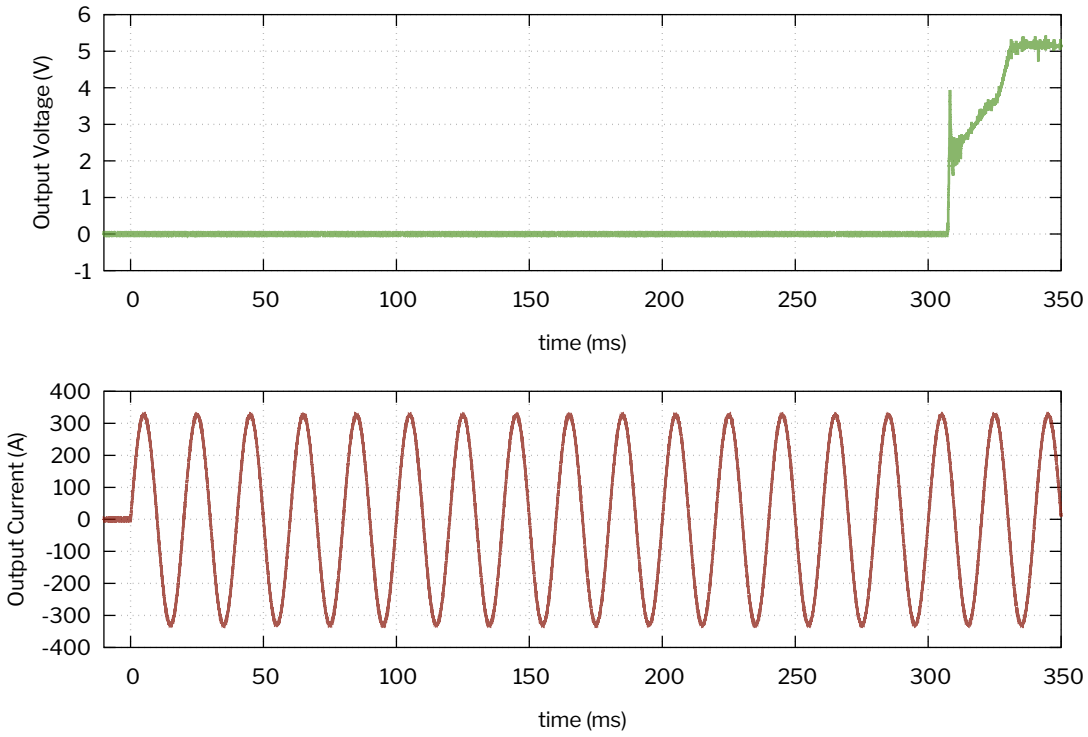


Figure 10: Startup time measurement for $U_{out}$=5 V.

### 4.8.2 9 V

The startup time for $U_{out}$=9 $V_{dc}$ is measured in Figure 11.

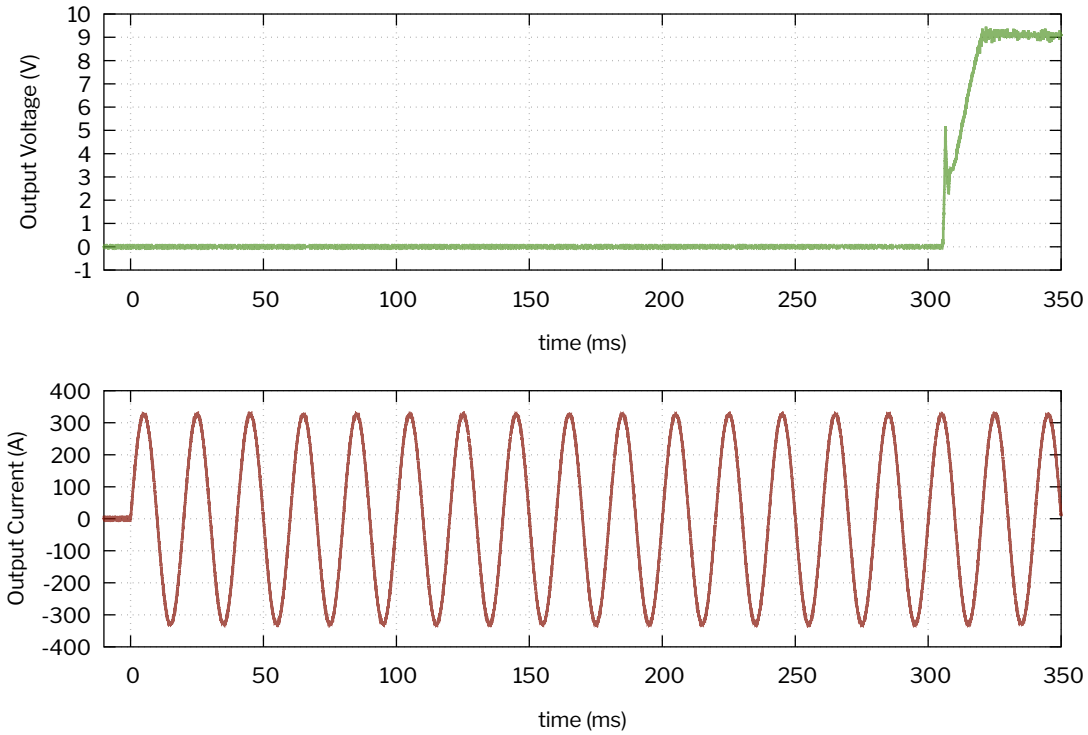


Figure 11: Startup time measurement for $U_{out}$=9 V.

### 4.8.3 12 V

The startup time for for $U_{out}$=12 $V_{dc}$ is measured in Figure 12.

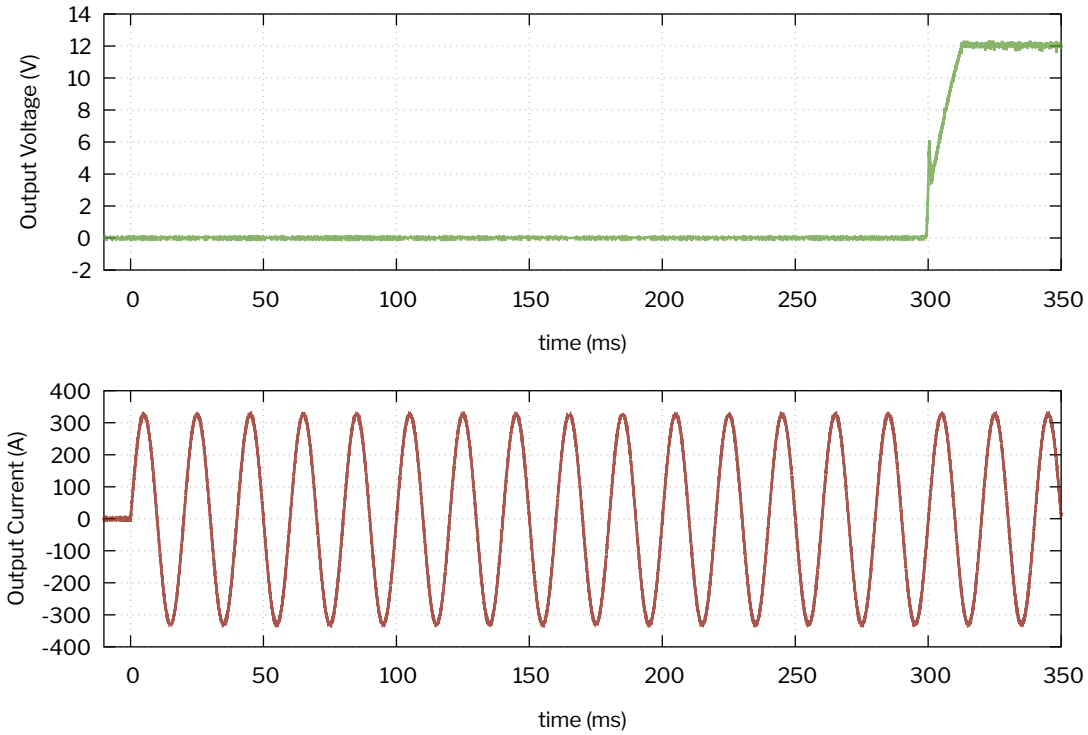


Figure 12: Startup time measurement for $U_{out}$=12 V.

# 5 EMC Measurements

## 5.1 AC Input

The average and quasipeak input EMC conducted line emission of HDR20-5-12 are depicted in 13.

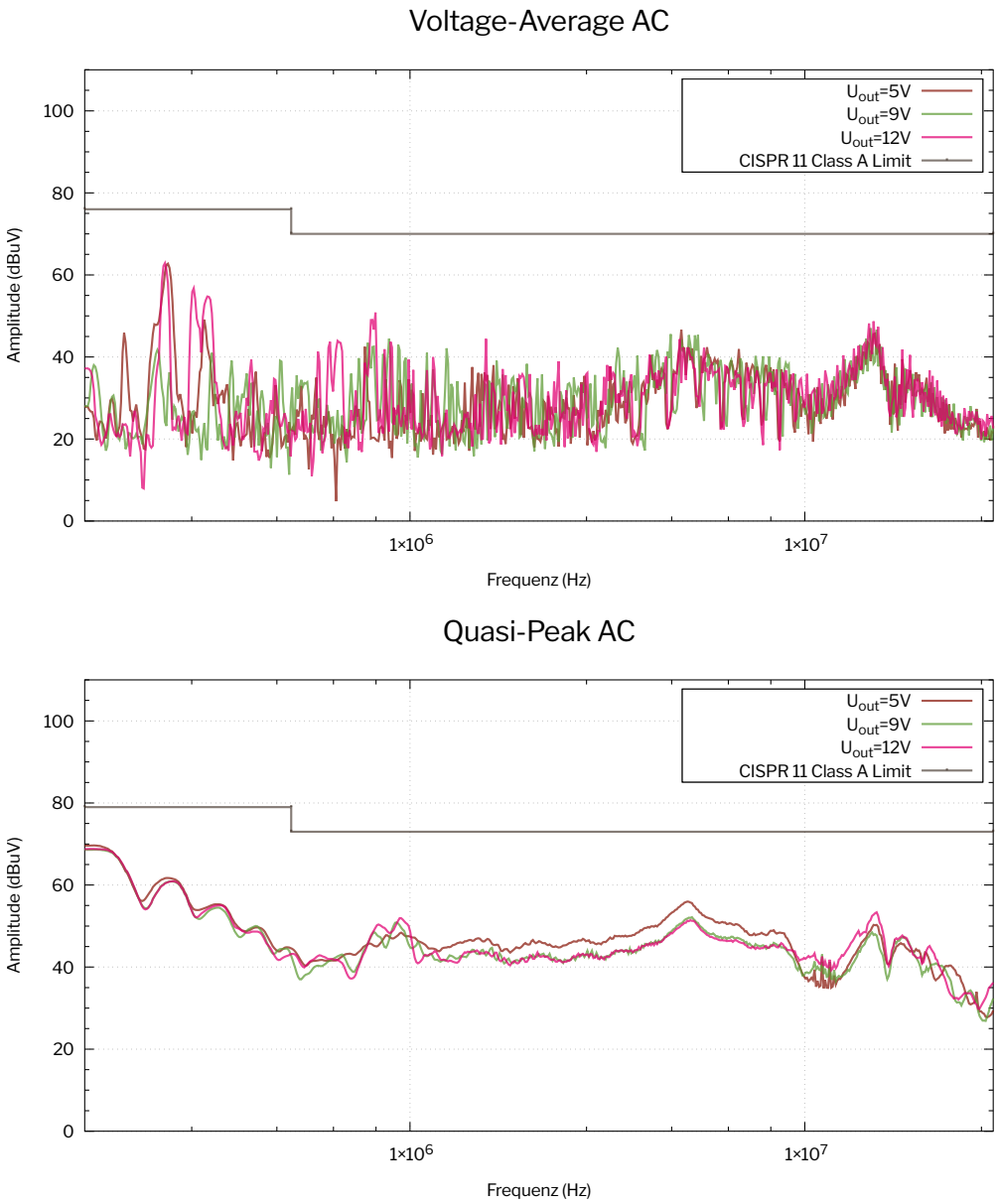


Figure 13: Input EMC Emission HDR20-5-12.

## 5.2 DC Output

The conducted line output emissions of HDR20-5-12 are depicted in Figure 14.

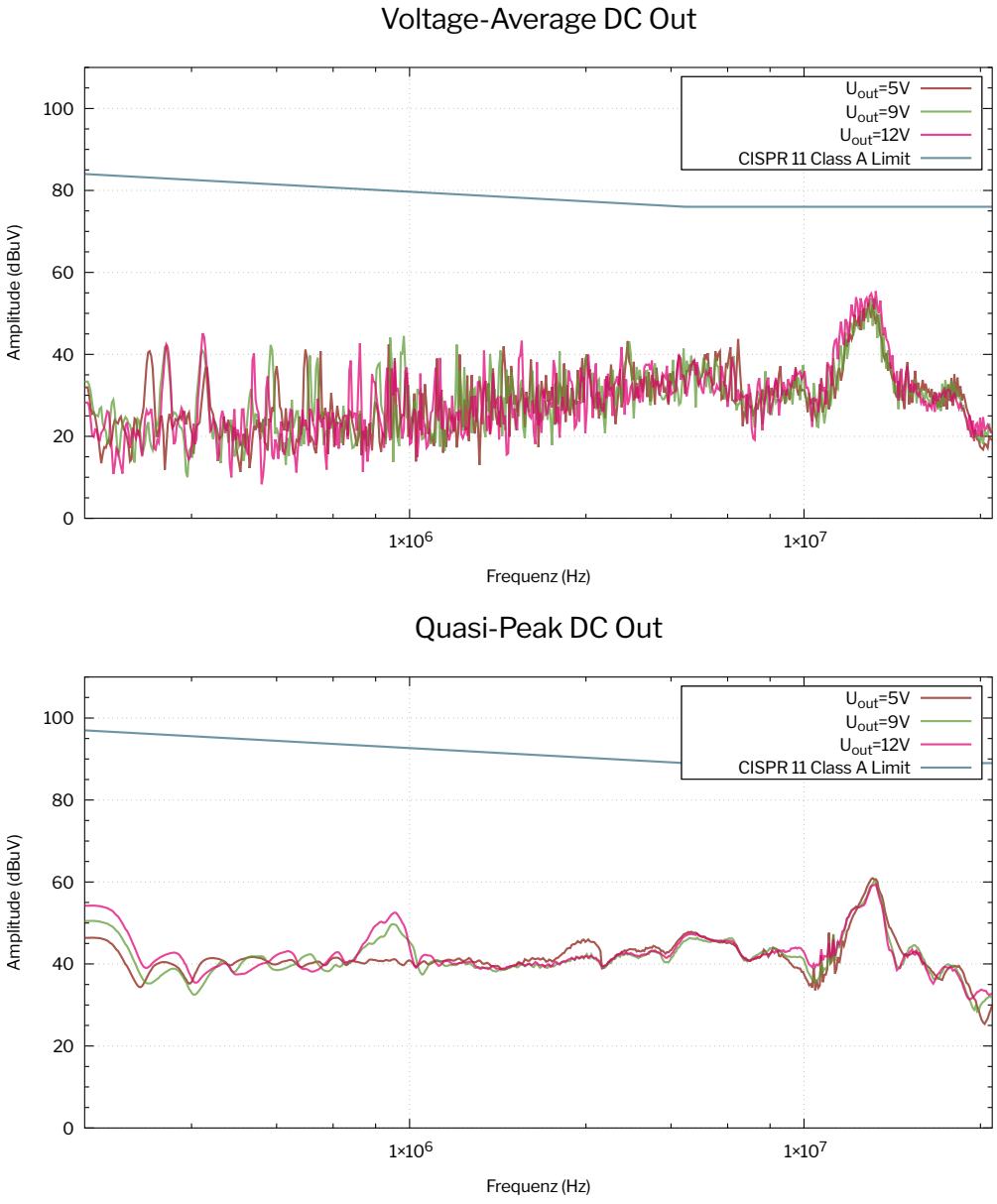


Figure 14: Output EMC Emission HDR20-5-12.

## 6 Case

The case drawing of the HDR20-5-12 is shown in Figure 15.

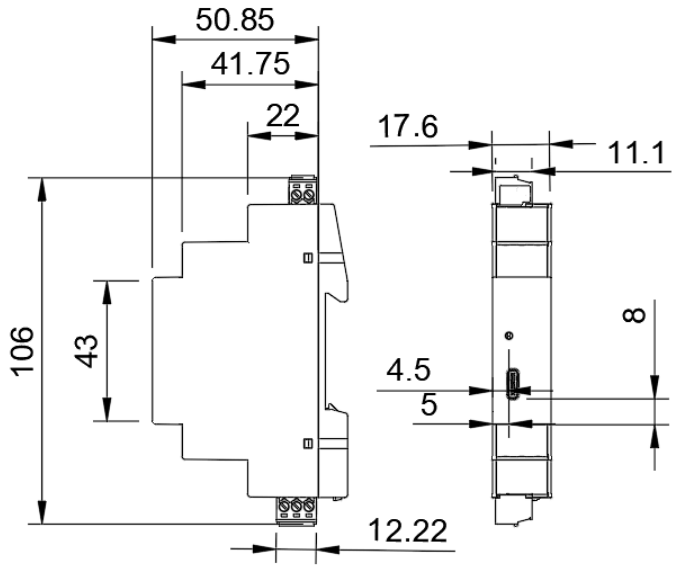


Figure 15: HDR20-5-12 Product drawing with dimensions.

## 7 Product label

The product label of the HDR20-5-12is depicted in the following Figure 16. The magenta cutouts show the position of the USB-C connector (large) and the LED (small).

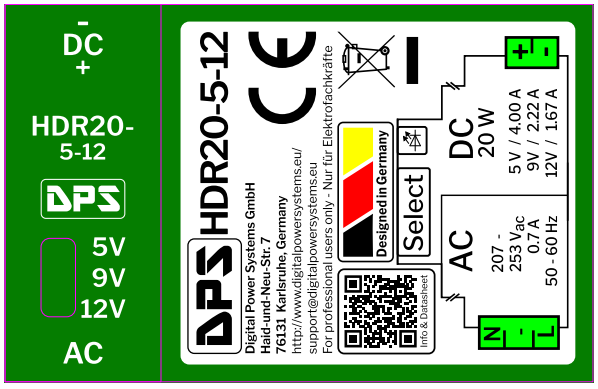


Figure 16: The product label HDR20-5-12(Revision 1).

# 8 Document

## 8.1 Latest Document Revision

The latest document revision can be downloaded here:

https://digitalpowersystems.eu/hdr20/

## 8.2 Datasheet Quality

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

`datasheet (ät) digitalpowersystems (döt) eu`

## 8.3 Revision History

The revision history is depicted in the following table.

| Date | Changes in Revision |
|---|---|
| 28.04.2025 | Initial release |

## 8.4 Contact Information

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

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