

# DVCH1503-400

## DC/DC converter

galvanically isolated



Abbildung ähnlich / device similar to figure



DVCH1503-400-Derivattabelle

| Type            | Input voltage [VDC] |           | Output voltage [VDC] |        | Output current [A] | Cat. No.      |
|-----------------|---------------------|-----------|----------------------|--------|--------------------|---------------|
|                 | Nom.                | Range     | Nom.                 | Range  | Max.               |               |
| DVCH1503-400-12 | 400                 | 200 - 470 | 12                   | 2 - 15 | 112                | 105193/x/yyy* |
| DVCH1503-400-24 | 400                 | 200 - 470 | 24                   | 2 - 30 | 56                 | 105192/x/yyy* |

\*Order option:

.../x/...: Accessory variant

- .../0/...without accessory
- .../20/... with heatsink (cooling fins in longitudinal direction)
- .../21/... with heatsink (cooling fins in transverse direction)
- .../22/... with cold plate (liquid cooling system)
- More on request

.../yyy: Setting (Standard setting or customized)

- .../000 DC-Standard CAN 2.0A
- .../001 DC-Standard CAN J1939
- Customer-specific parameterization on request

## DC/DC converter

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## 1 Input

|                                  |               |                                                                                                                                                                                                     |
|----------------------------------|---------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Input voltage (Nom.)             | 400 VDC       | Class A*                                                                                                                                                                                            |
| Undervoltage range               | 0 - 200 VDC   | Class C*                                                                                                                                                                                            |
| Lower restricted operation range | 200 - 250 VDC | Continuous operation, class B*                                                                                                                                                                      |
| Unrestricted operation range     | 250 - 450 VDC | Continuous operation, class A*                                                                                                                                                                      |
| Upper restricted operation range | 450 - 470 VDC | Continuous operation, class B*                                                                                                                                                                      |
| Overvoltage range                | 470 - 500 VDC | ≤ 10 s, class C*                                                                                                                                                                                    |
| Max. current consumption         | ≤ 8,5 A       | typ. 8 A @U <sub>IN</sub> = 200VDC, see fig. 9.3                                                                                                                                                    |
| No-load current consumption      | < 65 mA       | with applied HV voltage and active communication via CAN                                                                                                                                            |
| Input capacity                   | < 8 µF        | Attention: No inrush current limitation in the device.<br>Provide a pre-charging section in the application, otherwise there is a risk of a overvoltage damage to the input of the DC/DC converter. |

### \* Evaluation criteria for the operation behavior

The following evaluation criteria describe the functional state of the DC/DC converter as a function of the operation input voltage.

|                |                                            |                                                                                                                                                                   |
|----------------|--------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Class A</b> | Unrestricted operation range               | The DC/DC converter operates as designed in compliance with the tolerances specified in the data sheet.                                                           |
| <b>Class B</b> | Lower and upper restricted operation range | One or more functions may go beyond the specified tolerance. After returning to the unrestricted operation range, the DC/DC converter operates again as designed. |
| <b>Class C</b> | Undervoltage and overvoltage range         | One or more functions do not work as intended. After returning to the unrestricted operation range, the DC/DC converter operates again as designed.               |

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## 2 Output

|                                                            |                      |                                                                                                                |
|------------------------------------------------------------|----------------------|----------------------------------------------------------------------------------------------------------------|
| <b>Output voltage <math>U_{nom}</math></b>                 | 12 VDC<br>24 VDC     | -                                                                                                              |
| <b>Initial tolerance <math>N_{initial}</math></b>          | $\pm 1,0\% U_{nom}$  | -                                                                                                              |
| <b>Ripple &amp; Noise <math>N_{RN}</math></b>              | $< 1,8\% U_{nom}$    | measurement bandwidth 20 MHz                                                                                   |
| <b>Max. continuous output current <math>I_{nom}</math></b> | 112 A<br>56 A        | DVC1503-400-12<br>DVC1503-400-24                                                                               |
| <b>Max. continuous output power <math>P_{nom}</math></b>   | $\leq 1500 W$        | -                                                                                                              |
| <b>Current limiting</b>                                    | $1,1 \times I_{nom}$ | above $1,0 \times I_{nom}$ $U_{out}$ may sink                                                                  |
| <b>Recovery time</b>                                       | $< 3 ms$             | Duration from leaving the tolerance band until the permanently return to the tolerance band after a load step. |
| <b>Slew rate for setpoint change</b>                       | 30 V/s               | -                                                                                                              |

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### 3 Environment

|                                                             |                                      |                                                                                                                                                                                                                 |
|-------------------------------------------------------------|--------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Working temperature (environment)</b>                    | -40 °C ... +70 °C                    | -                                                                                                                                                                                                               |
| <b>Max. permissible temperature of the mounting surface</b> | < 50 °C                              | -                                                                                                                                                                                                               |
| <b>Cooling</b>                                              | Contact cooling via mounting surface | An effective thermal connection between the mounting surface and the heat sink of the application is a requirement for safe and long-term operation.                                                            |
| <b>Overtemperature protection</b>                           | -                                    | Linear derating between 70°C* and 90°C*. When 90°C* is reached, the device switches off.<br><br>* internal device temperature                                                                                   |
| <b>Storage temperature</b>                                  | -40 °C ... +85 °C                    | -                                                                                                                                                                                                               |
| <b>Humidity</b>                                             | 100 %                                | -                                                                                                                                                                                                               |
| <b>Dewing</b>                                               | allowed                              | -                                                                                                                                                                                                               |
| <b>Shock test acc. to DIN EN 60068-2-27</b>                 | -                                    | half sinusoidal (excitation)<br>250m/s <sup>2</sup> (peak acceleration)<br>6ms (duration)<br>1.000 shocks to each axis (quantity)<br>±X, ±Y, ±Z (axis)                                                          |
| <b>Vibration test acc. to DIN EN 60068-2-6</b>              | -                                    | sinusoidal (excitation)<br>30m/s <sup>2</sup> (acceleration)<br>5 - 100Hz (frequency, floating)<br>5g (acceleration)<br>10 - 500Hz (frequency, floating)<br>9h per axis (duration), 1 Oct/min<br>X, Y, Z (axis) |
| <b>Degree of protection acc. to EN 60529</b>                | IP65, IP67, IP6K9K                   | Using the appropriate mating connectors;<br>except M12 screw connection points at the output                                                                                                                    |

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## 4 General data

|                                                          |                                |                                                                                                                                       |
|----------------------------------------------------------|--------------------------------|---------------------------------------------------------------------------------------------------------------------------------------|
| <b>Insulation strength</b>                               | 500 VDC<br>4,25 kVDC<br>1 kVDC | Output / Enclosure<br>Input / Output + Enclosure + CAN<br>Output / CAN                                                                |
| <b>Insulation resistance</b>                             | ≥ 30 MΩ at 500 VDC             | Input / Output + Enclosure + CAN                                                                                                      |
| <b>Max. Efficiency</b>                                   | typ. 94 %                      | see fig. 9.4                                                                                                                          |
| <b>Average efficiency</b>                                | typ. 93,2 %                    | Averaging of the efficiency values at 25%, 50%, 75% und 100% of the nominal output power. see fig. 9.4                                |
| <b>Current consumption auxiliary and control circuit</b> | ≤ 51 mA                        | Current consumption pin 3 (KL15) / pin 4 (KL30) without HV voltage applied to input with active communication via CAN<br>see fig. 9.5 |
| <b>Dimensions (LxWxH)</b>                                | 295 x 233 x 68,5 mm            | without connections, see fig. 8.1                                                                                                     |
| <b>Enclosure</b>                                         | Aluminium                      | -                                                                                                                                     |
| <b>Weight</b>                                            | approx. 5 kg                   | -                                                                                                                                     |

## 5 Standards

### EMC (Electromagnetic Compatibility)

| Title                       | Standard                           | Data                                                                                             |
|-----------------------------|------------------------------------|--------------------------------------------------------------------------------------------------|
| <b>Emitted interference</b> | ECE R10.5<br>EN12895<br>EN 61204-3 | -<br>-<br>acc. to 6.4.2, table H.3, for industrial environment<br>(class A, cable length < 3 m)  |
| <b>Immunity</b>             | ECE R10.5<br>EN12895<br>EN 61204-3 | -<br>-<br>acc. to 7.2.3, Noise immunity level for industrial environment<br>(cable length < 3 m) |

### Electrical safety

| Title                                                                  | Standard                              | Data |
|------------------------------------------------------------------------|---------------------------------------|------|
| <b>Low-voltage switch mode power supplies</b><br>- Safety requirements | DIN EN 61204-7                        | -    |
| <b>Safety of industrial trucks</b><br>- Electrical requirements        | designed according<br>to DIN EN 1175* | -    |
| <b>Electrically powered road vehicles</b>                              | ISO 6469-3                            | -    |

\* The system integrator is responsible for compliance of all product-specific requirements in the final application.

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## 6 Installation and safety instructions

In addition to the general installation and safety instructions for DC/DC converters, the following values and supplements apply:

|                                                      |          |                                                                                                                                                      |
|------------------------------------------------------|----------|------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Mounting points</b>                               | -        | 4x Mounting holes (Ø9 mm)<br>see fig. 8.1                                                                                                            |
| <b>Installation orientation</b>                      | -        | any                                                                                                                                                  |
| <b>Cooling</b>                                       | -        | A sufficient cooling must be ensured externally in the customer application via the mounting surface.                                                |
| <b>Connection input / output</b>                     | -        | see chapter 7                                                                                                                                        |
| <b>Interlock-function</b>                            | -        | realized by HV-connector plugs. Guide via signal connection plug, see chapter 7.<br>Attention: Max. ampacity of the HV interlock line $\leq 300$ mA. |
| <b>Input fuse</b>                                    | -        | No integrated input fuse. A fuse must be provided externally by the customer application.                                                            |
| <b>Input discharge duration</b>                      | < 5 s    | Time from disconnecting the input voltage to $U_{in} < 60$ VDC                                                                                       |
| <b>Reverse polarity protection input</b>             | -        | reverse polarity protection through connection plug                                                                                                  |
| <b>Reverse polarity protection output</b>            | < 30 VDC | Note: DVCH1503 self-protection, does not protect the application from reverse polarity.                                                              |
| <b>Parallel operation for increased output power</b> | possible | see Functional description                                                                                                                           |

The general installation and safety instructions for DC/DC converters can be found at: [www.deutronic.com](http://www.deutronic.com)

## 7 Connections

### Input

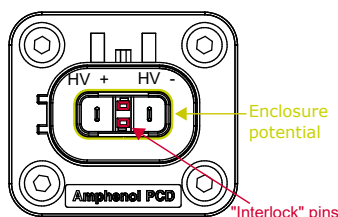


Figure 7.1: Connection input

AMPHENOL, Excel Mate Eco HVSL282 02 2 A:

- 2 pole HV connector with interlock contacts.
- Matching mating connector: AMPHENOL, Excel Mate Eco HVSL282 06 2 A 104
- Contacts for mating connector: AMPHENOL, Excel Mate Eco, socket contact, crimp connection: C310003612
- HV-cable: Huber+Suhner, FHRL91XC13X (4mm<sup>2</sup>, shielded single conductors)

### Output

threaded bolt:

- M12 [max. torque 35Nm]

### Enclosure potential

Thread:

- M8 (below the output connections, see fig. 8.1)

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## Signal (CAN)

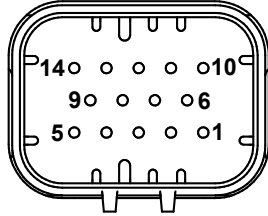


Figure 7.2: Connection CAN

### TE connectivity AMPSEAL, 14-pins:

- 14-pin automotive connector (TE-Nr.: 776267-1)
- Matching mating connector: TE-connectivity AMPSEAL 14-pin, socket housing (TE-Nr.: 776273-1)
- Contacts for mating connector: TE-connectivity AMPSEAL socket contact, crimp connection (TE-Nr.: 770854-1)

### PIN "1" / PIN "2": Interlock

- If the HV connector is properly connected to the input, PIN "1" and PIN "2" are connected via the HV connector.
- If the HV connector is disconnected from the device, the internal connection between PIN "1" and PIN "2" is also disconnected.

PIN "3": KL15 (10 - 30 VDC) switched plus of ignition starter switch

PIN "4": KL30 (10 - 30 VDC) continuous plus of the battery

PIN "5": Common GND

PIN "6": Digital Input

PIN "7": Digital Input: Inhibit-function\* (10 - 30 VDC)

- Control of DCDC converter (output On / Off) via digital input possible

PIN "8": Digital Output

PIN "9": Digital Output: Power-Good function\*

- Output of the current device status (output On / Off) possible via digital output
- At supply over KL30 the output voltage corresponds to the voltage on KL30
- If there is no supply via KL30 and high voltage is switched on, the voltage is 12V

PIN "10": n.C.

PIN "11": CAN<sub>Hi</sub> (CAN High)

PIN "12": CAN<sub>Lo</sub> (CAN Low)

PIN "13" / PIN "14": CAN<sub>R</sub>

- To terminate the CAN bus with a 120Ω resistor, the CAN<sub>R</sub> Pin "13" must be connected to the CAN<sub>R</sub> Pin "14".

**PIN "1" to PIN "14" are galvanically isolated from the input and output circuit.**

\* The Inhibit and Power-Good functions can be activated via setting, further information can be found in the DC-CAN documentation.

## 8 Dimensions

All dimensions are given in millimeters and have a general tolerance according to DIN ISO 2768 - m.

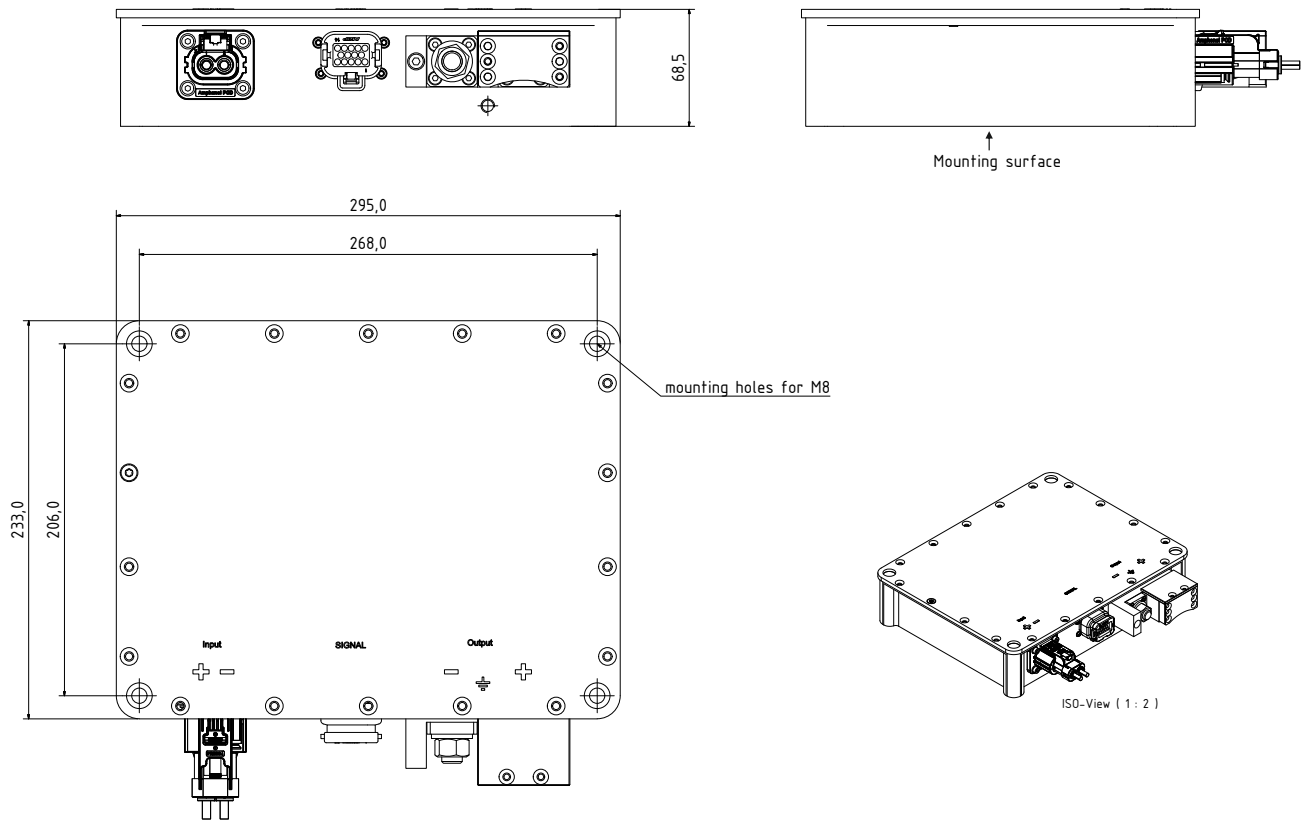


Figure 8.1: Dimensions

## DC/DC converter

## DVCH1503-400

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## 9 Characteristics

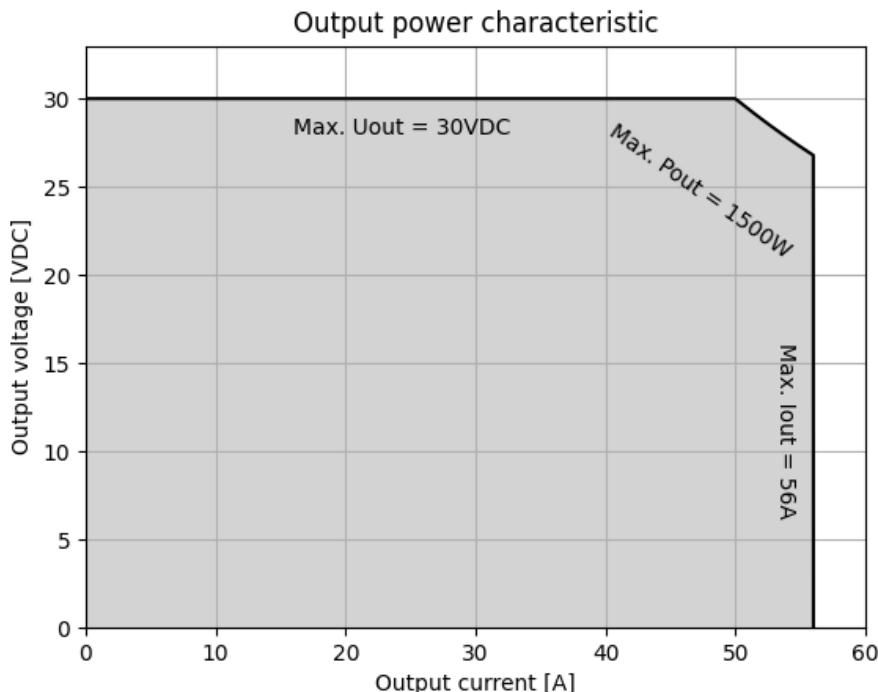


Figure 9.1: Output power DVCH1503-400-24

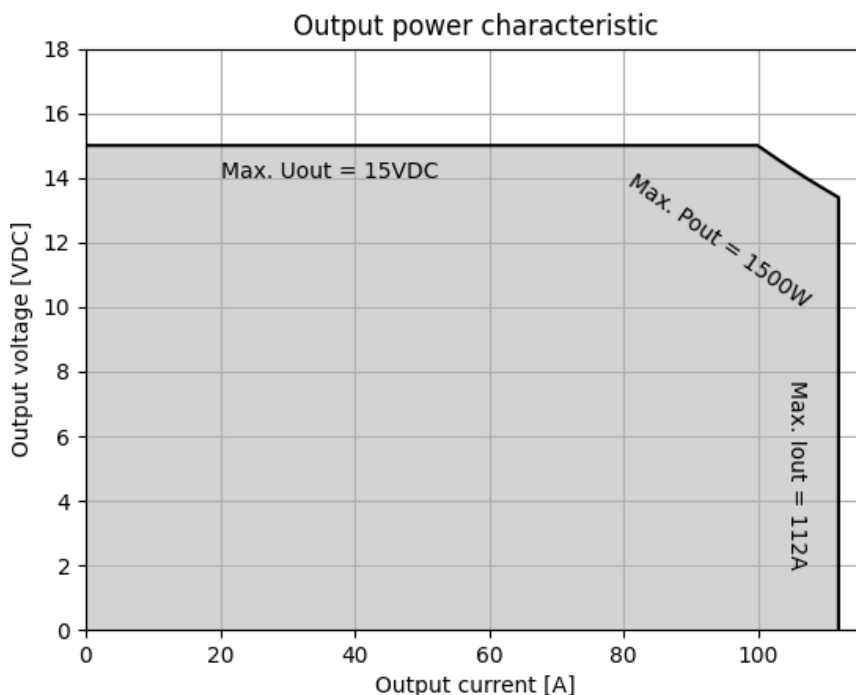


Figure 9.2: Output power DVCH1503-400-12

## DC/DC converter

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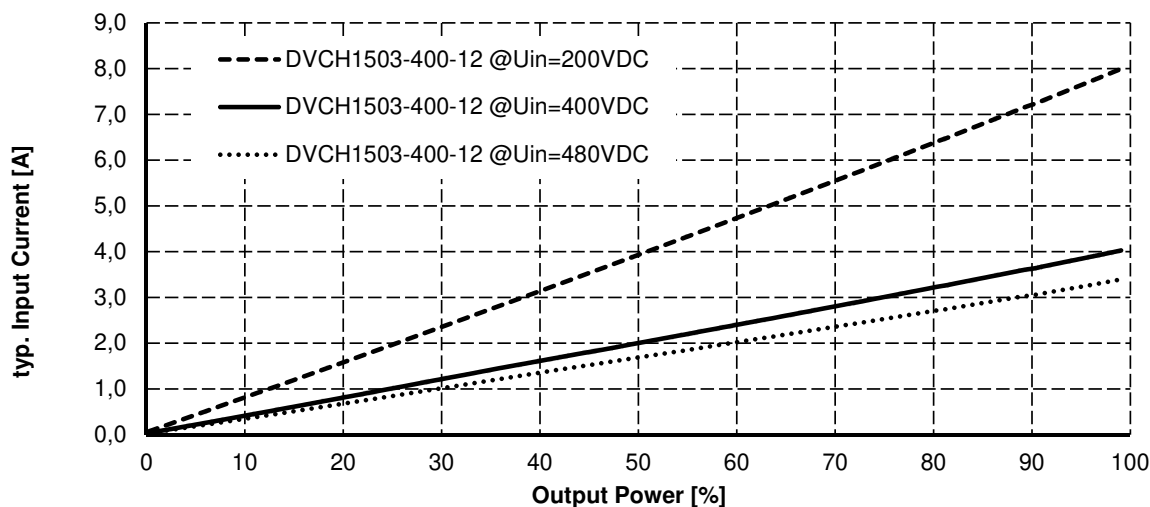


Figure 9.3: Current consumption depending on the output power

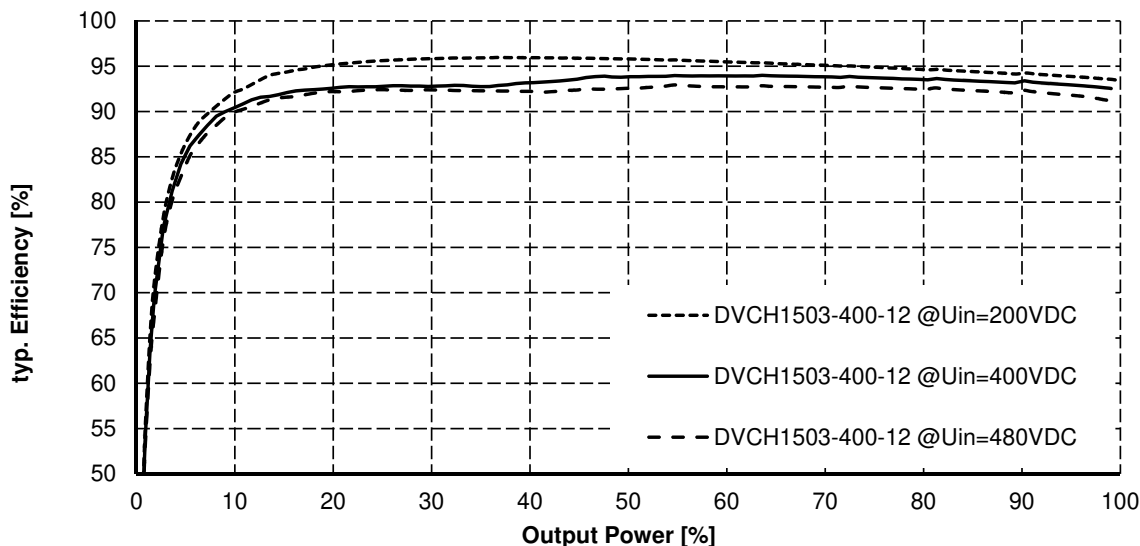


Figure 9.4: Efficiency as a function of output power

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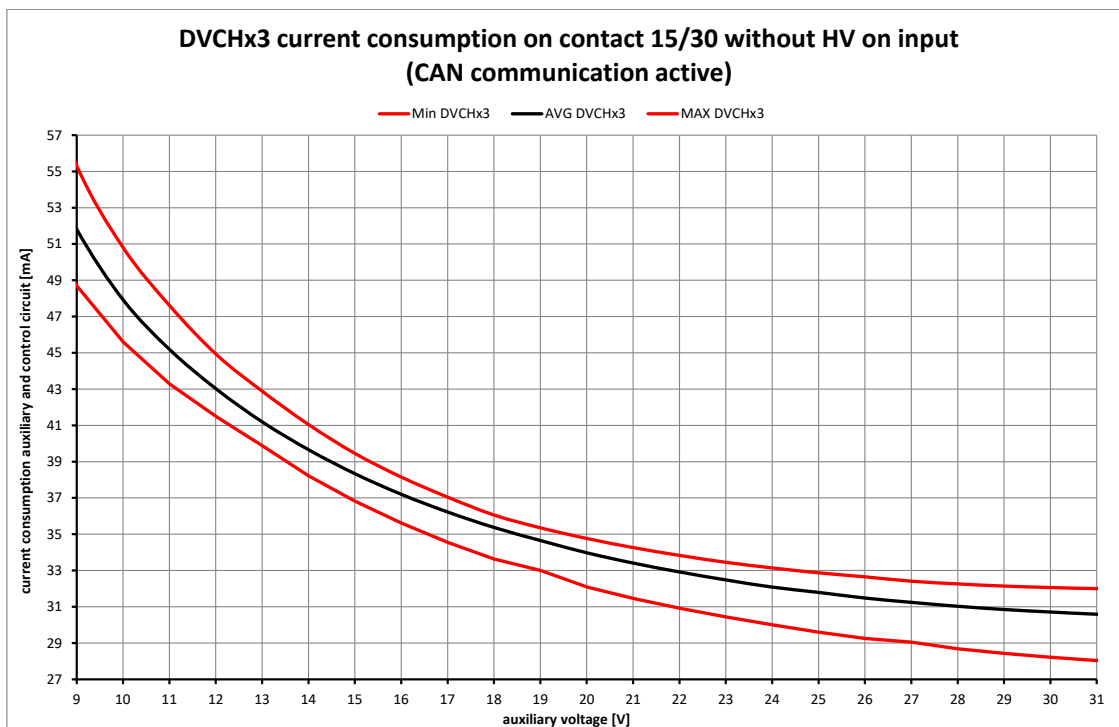


Figure 9.5: Current consumption auxiliary and control circuit

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