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Advanced performance products
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Datasheet - Laser Diode Driver LDD-1301



Support / First steps

Meerstetter Engineering provides technical support for all products and helps you to integrate a product into your solution. Most of your questions should be solved by reading the provided [user manuals](#) of the corresponding product or the [FAQ](#) (frequently asked questions).
For further help or if you have any other questions, please do not hesitate to contact us. We are happy to help you. You can contact us by email support@meerstetter.ch or by downloading the Meerstetter Engineering [TeamViewer](#) remote support tool.

Meerstetter's product family compatibility

The Meerstetter LDD and TEC-Family have been developed to work along with each other. They share the same platform bus, communication protocol and hardware architecture. See Table for an Overview over the LDD- and TEC-Families.

LDD-Family		
LDD-1321	0-1.5 A / 0-14 V	CW, Add on TEC Controller available
LDD-1301	0-20 A / 0.5-45 V	1 ms - CW
LDD-1303	0-20 A / 1-120 V	1 ms - CW
LDD-1137	0-75 A / 0-70 V	0.5 μ s - CW, modulated, QCW and pulsed modes
LDD-1124-SV	0-1.5 A / 0-15 V	1 μ s - CW, modulated, QCW and pulsed modes
LDD-1121-SV	0-15 A / 0-15 V	1 μ s - CW, modulated, QCW and pulsed modes
LDD-1125-HV	0-30 A / 0-27 V	1 μ s - CW, modulated, QCW and pulsed modes
TEC-Family		
TEC-1092	± 1.2 A / ± 9.6 V	Micro, single channel
TEC-1091	± 4 A / ± 21 V	Small, single channel
TEC-1089-SV	± 10 A / ± 21 V	Medium, single channel
TEC-1162	± 5 A / ± 56 V	Medium-high, single channel
TEC-1090-HV	± 16 A / ± 30 V	Large, single channel
TEC-1163	± 25 A / ± 56 V	Extra-large, single channel
TEC-1161-4A	2 x (± 4 A / ± 21 V)	Small, dual channel
TEC-1161-10A	2 x (± 10 A / ± 21 V)	Medium, dual channel
TEC-1122-SV	2 x (± 10 A / ± 21 V)	Medium, dual channel
TEC-1166	2 x (± 5 A / ± 56 V)	Medium-high, dual channel
TEC-1123-HV	2 x (± 16 A / ± 30 V)	Large, dual channel
TEC-1167	2 x (± 25 A / ± 56 V)	Extra-large, dual channel

Advanced OEM CW Laser Diode Driver



Description:

The LDD-1301 is a current source designed to precision-drive laser diodes in continuous wave applications. Its power converter topology allows for an output voltage smaller than the input voltage. This enables the LDD to drive laser diodes with up to 44 V compliance voltage from a single 48 V power supply.

The LDD-1301 offers various safety features, including two inputs for laser diode temperature monitoring.

The device can be fully digitally controlled, the firmware is upgradeable and various digital communications interfaces are available.

A 0 - 10 V analog Input as well as a 0 - 10 V analog output are integrated. Additionally, Laser Power Control using a photodiode is possible using the on-board photodiode amplifier (optional).

Laser Diode Driver:

- Output Current: 0 - 20 A, < 0.5% Ripple
- Compliance Voltage: 0.5 - 46 V

Input Characteristics:

- DC Input Voltage: 10.5 to 60 V

Main Features:

- Internal Generators: Nominal Current
- Error: Ultra-Fast Switch-off for optimal LD protection
- Configuration / Diagnosis: via USB / RS485 / RS232 TTL
- Dimensions (L x W x H): 100 mm x 70 mm x 20 mm
- Efficiency: > 95 % (@ > 50 % Load)
- Cooling: Over Base Plate

Communication Interfaces:

- USB 2.0
- RS485
- RS232 TTL
- CANopen CiA 301

Other Features:

- 2 Temperature Sensor Inputs for NTC Thermistors
- Light Measurement Input for Photodiode (LPC Option)
- 0-10 V Analog Input
- 0-10 V Analog Output
- Interlock Input

Digital I/O Configurable Features:

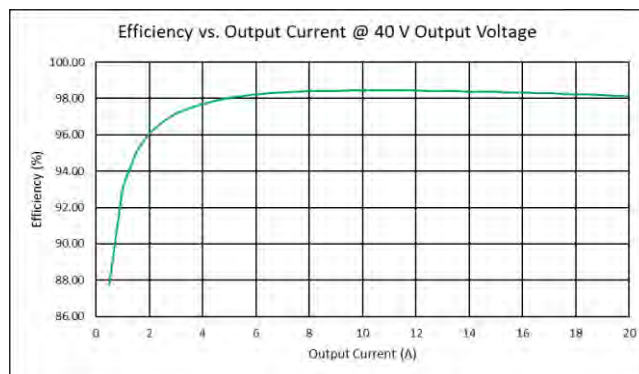
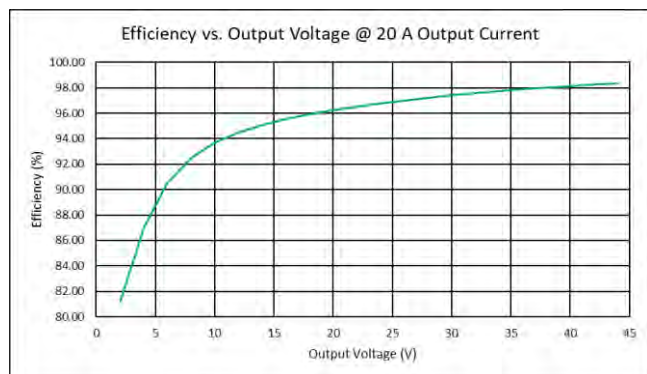
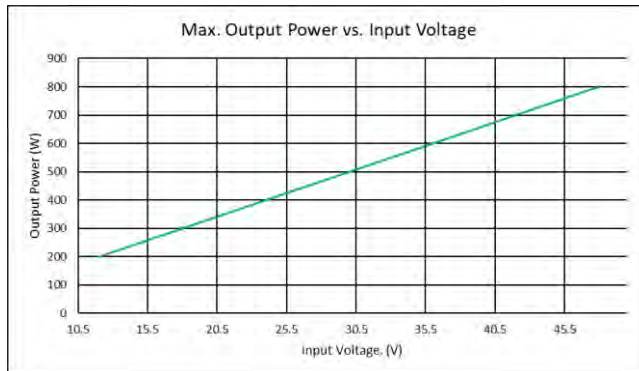
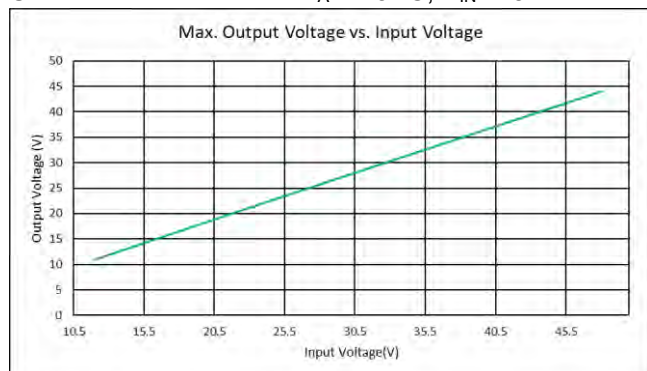
- Enable
- LDD Run Output
- More configurable functions

Absolute Maximum Ratings ¹	
Supply voltage (DC)	63 V
Supply current (DC)	20 A
Output current	25 A
Output voltage	63V

Operating Ratings	
System base plate	< 50 °C
Operation temperature	0 – 50 °C
Storage	-40 – 80 °C
Humidity	5 – 95 %, non-condensing

Operating Characteristics

Unless otherwise noted: $T_A = 25\text{ °C}$, $V_{IN} = 48\text{ V}$



¹ Exceeding the Absolute Maximum Ratings may permanently damage the device.

Electrical Characteristics

Unless otherwise noted: $T_A = 25\text{ °C}$, $V_{IN} = 48\text{ V}$, $V_{LD} = 44\text{ V}$

Symbol	Parameter	Conditions	Min	Typ	Max	Units
DC Power Supply Input:						
V_{IN}	Supply voltage		10.5	48	60	V
V_{IN_RIPPLE}	Ripple tolerance ²			300		mV _{PP}

Output Characteristics

Unless otherwise noted: $T_A = 25\text{ °C}$, $V_{IN} = 48\text{ V}$, $V_{LD} = 44\text{ V}$

Symbol	Parameter	Conditions	Min	Typ	Max	Units
Output CW:						
I_{OUT}	Current range		0		20	A
$T_{coefficient}$	Temp. coefficient	$I_{out} = 20\text{ A}$, $T_A = 10\text{ °C to }50\text{ °C}$		155		ppm/K
I_{OUT_RES}	Current resolution			2		mA
I_{OUT_RIPPLE}	Current ripple pp	$I_{out} > 2\text{ A}$		0.5 ³		%
I_{OUT_ACC}	Current accuracy	Calibrated		14.8		mA
V_{OUT_LIMIT}	Output voltage limit	$V_{IN} = 60\text{ V}$	53			V
		$V_{IN} = 24\text{ V}$	20			V
		$V_{IN} = 12\text{ V}$	10			V
V_{OUT_ACC}	Voltage accuracy	Calibrated, $I_{out} < 1\text{ A}$		100		mV
P_{OUT}	Output power	$V_{LD} = 40\text{ V}$			800	W
I_{OUT_Rise}	Output current rise time	10% to 90%, PID Optimized, $L_{Load} < 500\text{ nH}$, $I_{OUT} = 20\text{ A}$			250	μs

Safety Characteristics

Unless otherwise noted: $T_A = 25\text{ °C}$, $V_{IN} = 48\text{ V}$, $V_{LD} = 40\text{ V}$

Symbol	Parameter	Comments	Min	Typ	Max	Units
I/O Ports:						
$t_{OFF_CURRENT}$	Overcurrent				50	μs
t_{OFF_OPVAL}	Operating Values	Voltages, currents			100	μs
t_{OFF_SFAIL}	System failure	System status			250	μs

External Temperature Measurement (NTC only)

$T_A = 25\text{ °C}$, measurement configuration = 12 bit / 2-wire / unshielded cable < 50 mm, °T probe = NTC B_{25/100} 3988K R₂₅ 10k

Symbol	Parameter	Test Conditions / Hints	Min	Typ	Max	Units
$R_{LR, RANGE}$	Range	Corresponding temperature range	295	130 to -21	106400	Ω °C

² Input ripple voltage can directly influence the ripple current at the output

³ Measured at $I_{OUT} = 20\text{ A}$ and $V_{LD} = 40\text{ V}$

General Purpose Digital I/O Characteristics (GPIO1 ... GPIO10)

Unless otherwise noted: $T_A = 25\text{ }^{\circ}\text{C}$

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Input Characteristics:						
U_{IH}	Logic high input threshold		2			V
U_{IL}	Logic low input threshold				1	V
U_{IMAX}	Maximum input voltage		-0.3		5.5	V
Output Characteristics:						
U_{OH}	Logic high output voltage	Output current 8mA	2.8			V
U_{OL}	Logic low output voltage	Input current 8mA			0.4	V
Z_{OUT}	Output Impedance		110	120	150	Ω
I_{OUT}	Output Sink or Source Current			± 8	± 20	mA
ESD Protection:						
UPP	ESD discharge	IEC61000-4-2		18		kV

Analog Input and Output Characteristics

Unless otherwise noted: $T_A = 25\text{ }^{\circ}\text{C}$. Voltages referenced to X2 (GND)

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Input Characteristics:						
U_{I+}	Voltage at the Analog In + Pin		-1		11	V
U_{I-}	Voltage at the Analog In - Pin		-1		11	V
U_{IN}	Nominal Input Voltage (difference between In + and In -)		0		10	V
Output Characteristics:						
U_o	Analog Output Voltage		0		10	V
I_{OUT}	Analog Output Current				20	mA

Interlock Input Characteristics

Unless otherwise noted: $T_A = 25\text{ }^{\circ}\text{C}$.

Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Input Characteristics:						
V_{IAct}	Interlock active input voltage range	Voltage range which is detected as active input	3		30	V
V_{IORM}	Maximum Working Insulation Voltage				120	V

Photodiode Input Characteristics (only available with LPC Option)

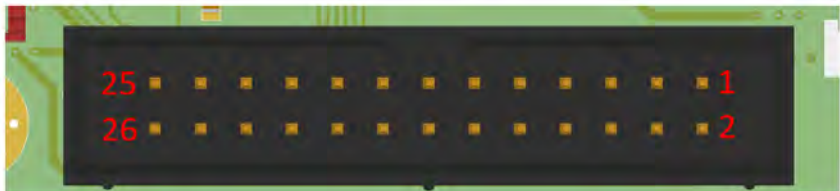
Unless otherwise noted: $T_A = 25\text{ }^{\circ}\text{C}$.

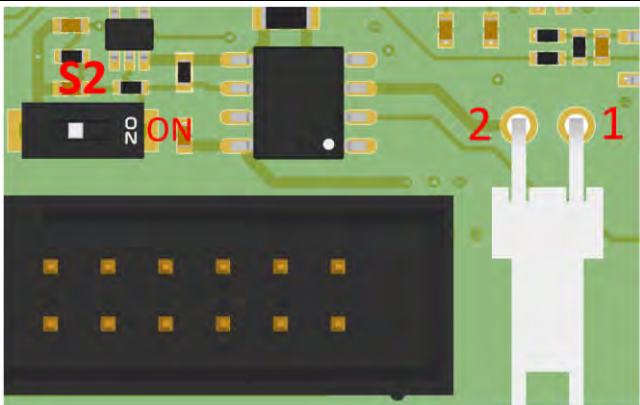
Symbol	Parameter	Test Conditions	Min	Typ	Max	Units
Input Characteristics:						
I_{in}	Photodiode current	-LPC-4mA	0		4	mA
		-LPC-2mA	0		2	
		-LPC-1mA	0		1	
		-LPC-0.5mA	0		0.5	

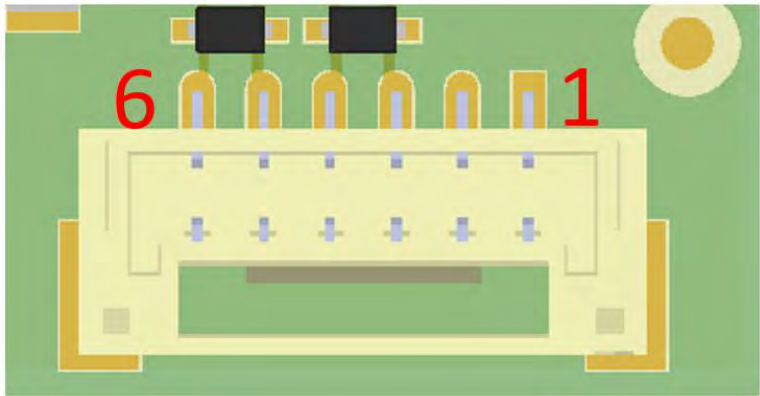
Device Connectors Overview

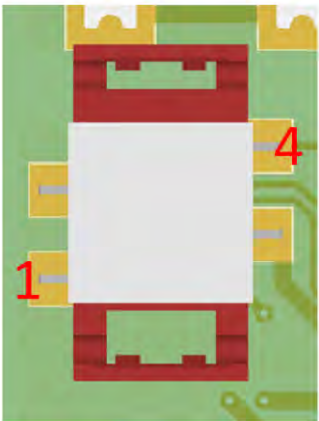


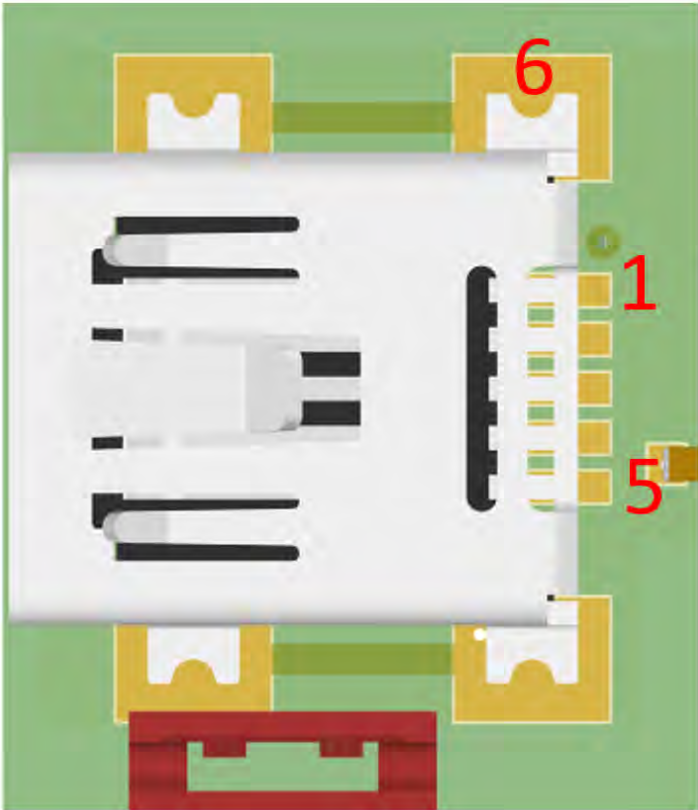
Interface Connector X7

		Mating Connector: Würth 61202623021	
Pin		Pin	
1	+5V	14	GPIO4
2	GND	15	GPIO5
3	+3.3V	16	GPIO6
4	RS485 1 A/D+	17	GPIO7
5	RS485 1 B/D-	18	GPIO8
6	RS232 TTL RX	19	GPIO9
7	RS232 TTL TX	20	GPIO10
8	GND	21	Not Connected/Reserved
9	CAN H	22	Not Connected/Reserved
10	CAN L	23	Analog GND
11	GPIO1	24	0-10V Analog Out
12	GPIO2	25	0-10V Analog In +
13	GPIO3	26	0-10V Analog In -

Interlock Connector X8			
		Pin	To enable the LDD apply a voltage between the Interlock + and Interlock – Pins. The Interlock Pins are galvanically isolated from the LDD. The DIP-Switch S2 can be switched ON to disable the Interlock functionality.
		1	Interlock +
		2	Interlock –
		Mating connector	Molex 0022013027

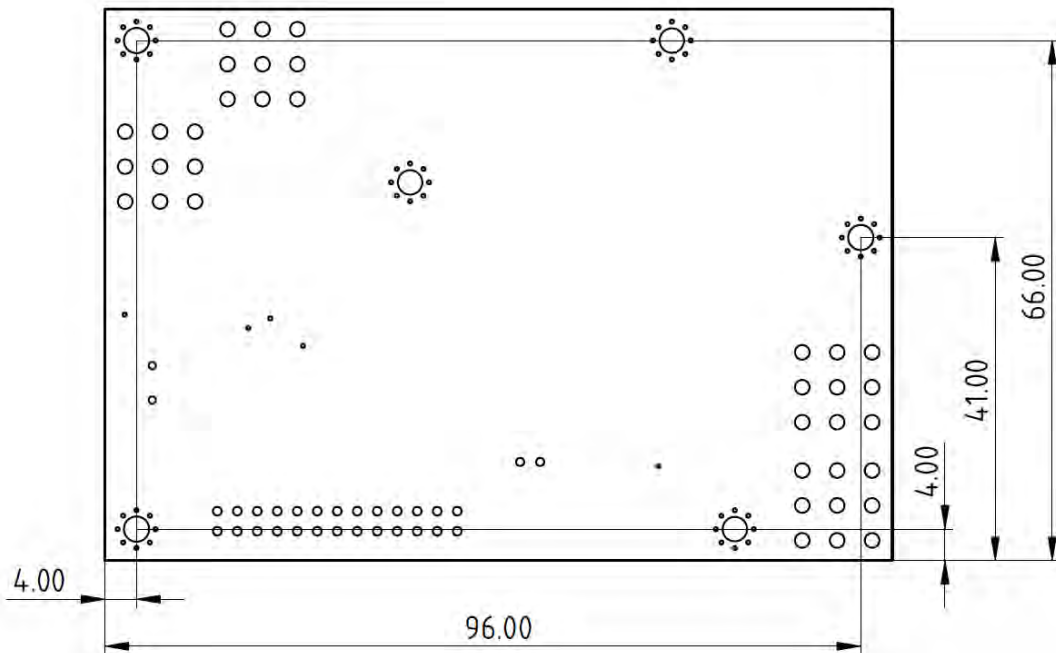
Temperature and Light Measurement Connector X9			
		Mating Connector: JST GHR-06V-S	
		Pin	
		1	Photo Diode Anode
		2	Photo Diode Cathode
		3	NTC 2 A
		4	NTC 2 B
		5	NTC 1 A
		6	NTC 1 B

AUX Connector X6			
		Mating Connector: Würth 690157000472	
		Pin	
		1	+5V
		2	GND
		3	CAN H
		4	CAN L

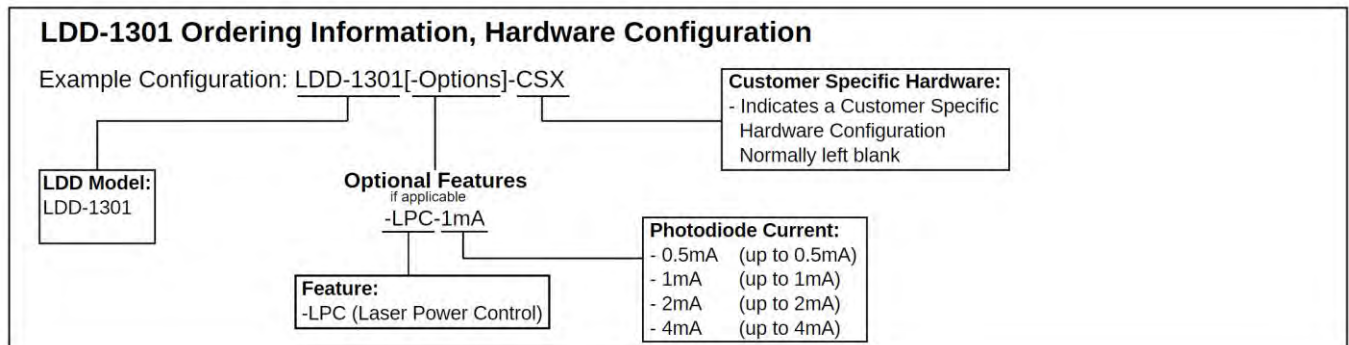
USB Connector X5			
		Mating Connector: USB Mini B Type	
Pin		Pin	
1	+5V	4	ID (not used)
2	DATA-	5	GND
3	DATA+	6	SHIELD

Dimensions and Mounting Holes

The three holes can be used to mount the device onto a heatsink. Hole diameter = 3.2 mm. All measurements are in mm. A 3D model of the device is available on our website.



Vertical height: 20 mm.



Laser diode, temperature probes, power supply and connectors not included.

Current-Controlled Operation-Modes and Communication Option

The LDD-1301 is an OEM high performance current source that is primarily designed to operate in CW mode. It is configured over an industry-standard RS485, RS232 TTL or a USB connection, either GUI-driven using the included LDD Service Software, or by direct parameter control using the predefined communication protocol. Basic system status is visually indicated by on-board LEDs, more detailed status information can be polled at any time. The LDD-1301 can operate in a stand-alone configuration as well as in a remotely controlled manner, with parameters adjusted on the fly. The laser diode driver is current-PID-controlled.

Configuration parameters further include: Control source selection, maximum current limits, nominal current ramping, PID controller settings, NTC temperature sensor modeling coefficients, measurement circuitry calibration, error thresholds, etc. Please refer to the user manual for further information.

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Meerstetter Engineering GmbH (ME) reserves the right to make changes without further notice to the product described herein. Information furnished by ME is believed to be accurate and reliable. However typical parameters can vary depending on the application and actual performance may vary over time. All operating parameters must be validated by the customer under actual application conditions.

Change History

Date of change	Doc/Version	Changed / Approved	Change / Reason
1 March 2022	B	ME/ME	Preliminary information
21 April 2022	C	HS/PV	Add Change History Add Connector Drawings and Pinout Add Ripple and Rise Time Values Update max compliance voltage to 45V
		RS/CU	Edit compliance/output voltage text for clarity
		CU/HS	Change current ripple unit Add ripple current footnote to clarify
		HS/RS	Remove redundant efficiency figures
19 July 2022	D	RS/CU	LPC option now defined in product string, new configurations available Photodiode input is only available with the LPC Option Temperature coefficient added
19 July 2022	E	CU/RS	Hardware version increased to 1.20 Formatting
23 September 2022	F	ML/CU	Add CANopen feature and Pin definition
26 October 2022		CU/HS	Input Characteristics and Absolute Maximum Ratings adapted, new device connector overview and second CAN pin definition added
20 March 2023		CU/RS	Absolute maximum input voltage modified
11 December 2023	G	CU/RS	Absolute maximum output voltage modified Pictures of the device connectors updated Pin assignment of the USB device connector added
		RS/HS	Specify maximum output voltage as of HWv1.20 with FWv1.41
15 August 2024	H	RS/HS	Add current accuracy and update voltage limit specifications Update Hardware version