


MESSTEC Power Converter GmbH			
Operating Manual Diode Driver D1900-80 / D3300-60			
Document: 10100223OM	Revision: 00	Date: 10.04.2018	Page 1/23



air-cooled




water-cooled




Warning!
Risk of exposure of hazardous laser radiation
in combination with laser light emitting devices!

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MESSTEC Power Converter GmbH			
Operating Manual Diode Driver D1900-80 / D3300-60			
Document: 10100223OM	Revision: 00	Date: 10.04.2018	Page 2/23

Index of contents	Page
Safety instructions.....	3
General description.....	4
Cooling device.....	6
Set up elements.....	7
Adjustment element.....	7
Connectors.....	7
Operating modes.....	8
Connection of supply voltage and laser diode.....	9
Control Port X1 Pin assignment.....	10
Signal description.....	11
General instructions.....	14
Application examples.....	17
Terminals.....	20
Dimensions.....	21
Ordering information.....	23

MESSTEC Power Converter GmbH			
Operating Manual Diode Driver D1900-80 / D3300-60			
Document: 10100223OM	Revision: 00	Date: 10.04.2018	Page 3/23

Safety instructions

The D1900-80 / D3300-60 are suitable for supplying laser diodes with continuous current.

The device D1900-80 has a maximum compliance voltage of 26V and is hence not suitable for loads which generate a voltage of more than 26V.

The device D3300-60 has a maximum compliance voltage of 55V and is hence not suitable for loads which generate a voltage of more than 55V.

The supply cables must have a cross-section of $\geq 2.5\text{mm}^2$. Use ring terminals.

The connecting cables to laser diode must have a cross-section of $\geq 6\text{mm}^2$.

Use ring terminals.

Do not use a crimping tool which does not fit. This increases contact resistance and may cause excessive heat.

In any case of insufficient crimping, additional soldering is required. Take care that the ring terminals are free of solder in the area of screws and connection bolts.

Use galvanized screws M5 x 8 and galvanized spring washers M5.

Take care of correct input wiring.

The device has no inverse-polarity protection!

Warning: Wrong polarity may damage the device!

Take care of correct output wiring.

Wrong polarity will damage the diode!

Never disconnect the output wiring for the laser diode during operation.

This may generate a dangerous electric arc which can lead to skin burns or fire.


The diode driver is internally cooled by a fan. Air is drawn from the fan side and is blown out at the front side near the terminals.

In an industrial environment with conductive dust, air filtering is required.



Warning!

**Risk of exposure of hazardous laser radiation
in combination with laser light emitting devices!**

MESSTEC Power Converter GmbH			
Operating Manual Diode Driver D1900-80 / D3300-60			
Document: 10100223OM	Revision: 00	Date: 10.04.2018	Page 4/23

General description

The D1900-80 / D3300-60 are high-precision laser diode drivers with control logic utilizing SMPS (Switch Mode Power Supply) technology.

This technology has a lot of advantages and is particularly suited for driving laser diodes.

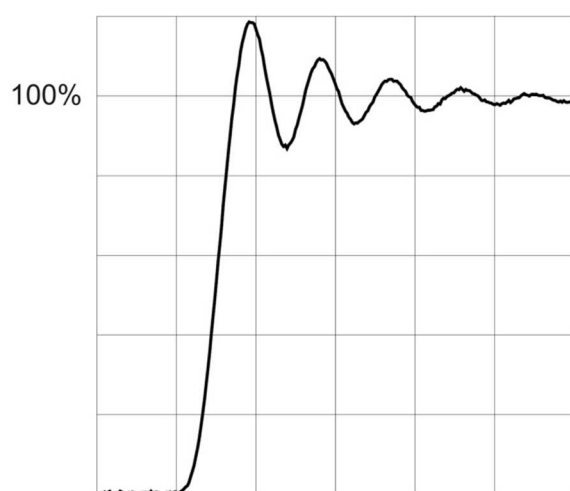
It offers high accuracy and current stability, excellent dynamic performance, high output impedance and low electromagnetic interference.

No current overshoot or ringing arise when altering output current or load impedance abruptly.

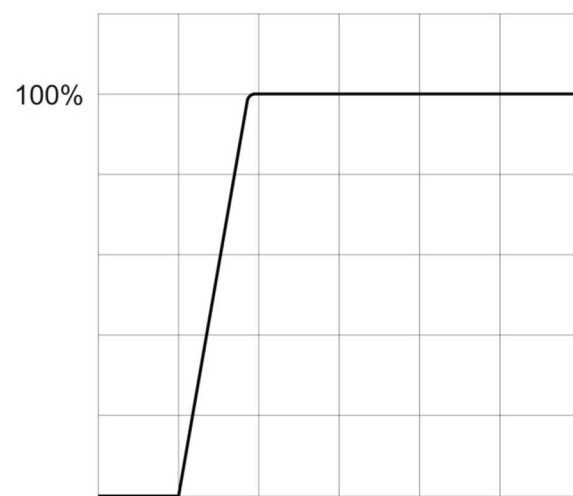
Current overshooting and ringing is very dangerous for laser diodes and it is the most dreaded thing in operating expensive laser diodes.

Fig. 1 shows the step response of a conventional laser driver at a current set point step of 0% ...100%. There is excessive overcurrent and ringing which may damage the laser diodes.


Fig. 2 shows the step response of the D1900-80 / D3300-60 at a current set point step of 0% ...100%. There is no overshoot or ringing. The characteristic is almost perfect.



500µs/Div
Fig.1



500µs/Div
Fig.2

MESSTEC Power Converter GmbH			
Operating Manual Diode Driver D1900-80 / D3300-60			
Document: 10100223OM	Revision: 00	Date: 10.04.2018	Page 5/23

Further, a major feature is the dynamic output impedance which has significant effects to the diode current if load impedance alters abruptly.

For example if there is a loose contact at the output lines and the output is open circuit. The driver's output voltage will increase to its maximum value because of its characteristic to inject current.

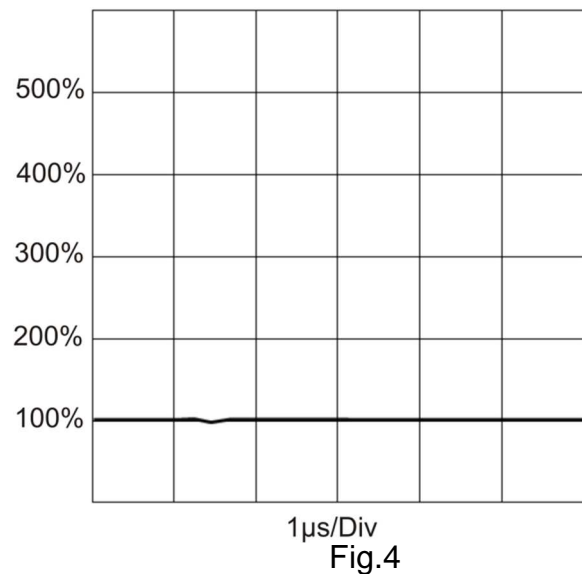
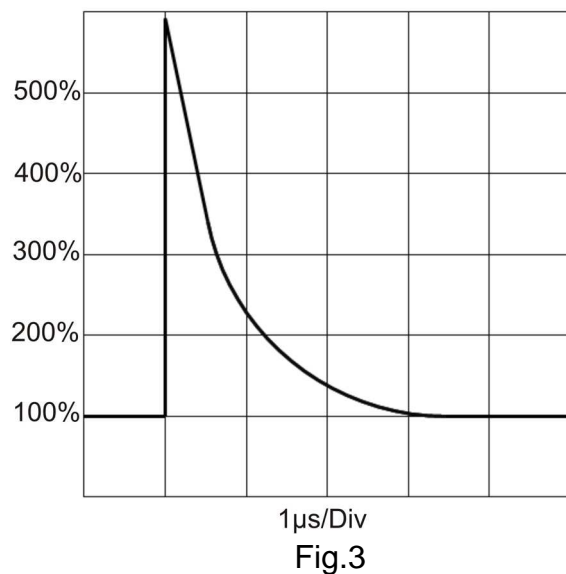
If the contact will be closed again and you have a conventional laser driver with low dynamic output impedance, excessive overcurrent will damage the laser diode.


The same happens if you have stacked diodes and one of its emitters will get short circuit. The load impedance will alter abruptly at this moment and excessive overcurrent will damage the complete stack.

Different from a conventional laser driver, the D1900-80 / D3300-60 responds absolutely reliable and no overcurrent occurs in this case.

Fig. 3 shows the response of a conventional laser diode driver at a nominal output current 100 %, if load impedance is changed abruptly to lower values.

Fig. 4 shows the response of the D1900-80 / D3300-60 at the same conditions. The diode current stays constantly.



MESSTEC Power Converter GmbH			
Operating Manual Diode Driver D1900-80 / D3300-60			
Document: 10100223OM	Revision: 00	Date: 10.04.2018	Page 6/23

The diode driver can be operated by a microcontroller system or completely analog. Two operating modes are possible:

- mode Laser On/Off
- mode Auto On.

The operating mode can be selected by jumper.

For a simple laser system only a few external components are required:

- Two push buttons for Laser On and Laser Off.
- One linear potentiometer for current set point adjustment.


The driver is available in two versions:

- D3300-60: output current up to 60A, diode voltage up to 55V
 supply voltage 28V...60V DC
- D1900-80: output current up to 80A, diode voltage up to 26V,
 supply voltage 15V...29V DC

Cooling device

There are two options for cooling:

- Air-cooled: D1900-80-A or D3300-60-A.
 Fan and heatsink are included
- Water-cooled: D1900-80-W or D3300-60-W.
 The water-cooled version must be mounted on a water cooler (not included).
 Water cooler is available on request.

MESSTEC Power Converter GmbH			
Operating Manual Diode Driver D1900-80 / D3300-60			
Document: 10100223OM	Revision: 00	Date: 10.04.2018	Page 7/23

Set up elements

Jumper for operating mode: Laser On/Off or Auto On.
 Jumper for Shut Down mode: active High or active Low.

Adjustment elements

10 turn potentiometer for reference voltage.
 The potentiometer covers the reference voltage range between 0V and 5V.
 Turn clockwise for increasing voltage.

10 turn potentiometer for diode current limit adjustment.
 The potentiometer covers the current limit range 0A to 60A (D3300-60) and
 0A to 80A (D1900-80) respectively. Turn clockwise for increasing current.

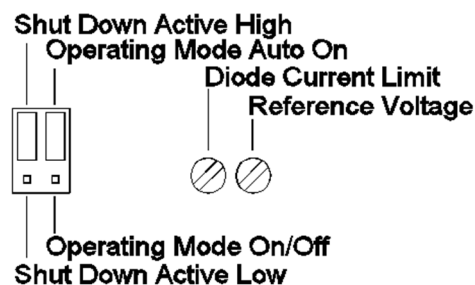


Fig.5


Connectors

2 connection bolts \varnothing 10mm with female thread M5 for power supply:

- 15V...29V DC (D1900-80 A / W).
- 28V...60V DC (D3300-60 A / W).

2 connection bolts \varnothing 10 mm with female thread M5 for the laser diode.

25-pole D-Sub female connector for control signals and status signals.

MESSTEC Power Converter GmbH			
Operating Manual Diode Driver D1900-80 / D3300-60			
Document: 10100223OM	Revision: 00	Date: 10.04.2018	Page 8/23

Operating modes

There are two operating modes:

- mode On/Off
- mode Auto on.

The mode is selected by jumper.

Mode On/Off

This mode is recommended for manually operation or remote-controlled operation.

On/Off control may be done using the CD-DCON input (control port pin 5) and CD-DCOFF input (control port pin 18).

No external logic, no additional components are required.

Mode Auto On

This mode is recommended for a system which is fully controlled by microcontroller system or PLC (Programmable Logic Controller). In this case, the device is permanently in on-status. On/Off control may be done using the shutdown input or simply by controlling the current set point input.

Jumper settings and adjustment elements

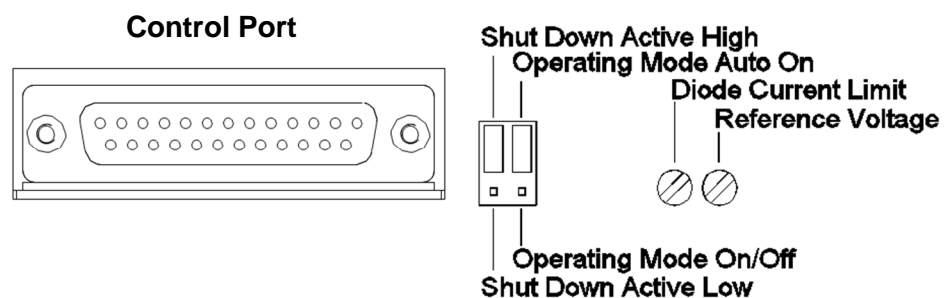



Fig.6

MESSTEC Power Converter GmbH			
Operating Manual Diode Driver D1900-80 / D3300-60			
Document: 10100223OM	Revision: 00	Date: 10.04.2018	Page 9/23

Connection of supply voltage and laser diode

The power supply and Laser Diode are connected via bolts (M5).

Warning: correct connect polarity must be considered!

Minimum wire cross section:

- Power supply: wire cross section min. 2,5mm².
- Laser diode: wire cross section min. 6mm²

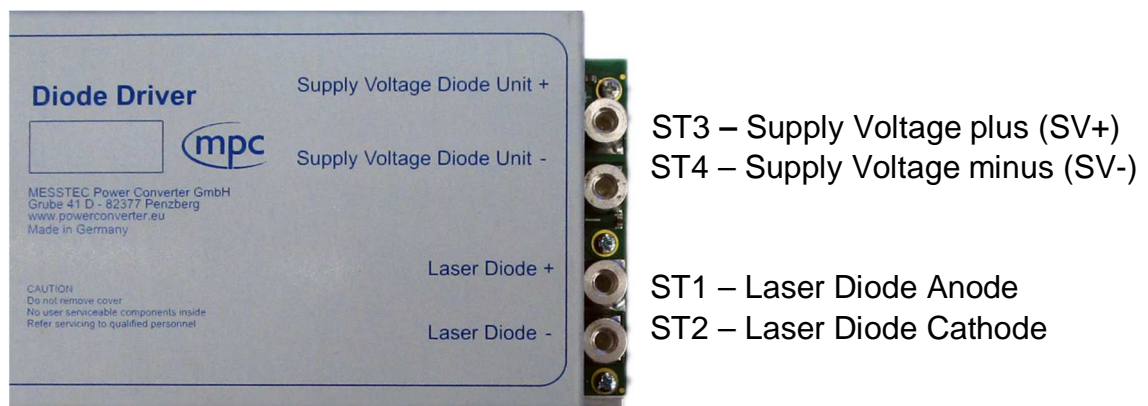



Fig.7

Important

**The laser diode has to be mounted and operated electrically floating.
Neither the cathode nor the anode must be connected to ground!
Supply Voltage minus (SV-) and signal ground (Control Port X1) are galvanically insulated and must not be connected together!**

MESSTEC Power Converter GmbH			
Operating Manual Diode Driver D1900-80 / D3300-60			
Document: 10100223OM	Revision: 00	Date: 10.04.2018	Page 10/23

Control Port X1

25-pole female plug connector according to DIN 41652 and MIL-C-24308, female thread UNC 4-40.


CA = Control Data Analog

CD = Control Data Digital

SA = Status Data Analog

SD = Status Data Digital

Inputs		
Pin	Name	Function
15	CA-DCSP1	Diode current set point 1
3	CA-DCSP2	Diode current set point 2
2	CA-DCL	Diode current limit
5	CD-DCON	Diode current on
18	CD-DCOFF	Diode current off
6	CD-DCSD	Diode current shut down
1/14	GND	Signal ground
Outputs		
Pin	Name	Function
4	SA-DCACT	Diode current actual
16	SA-DCSPLIM	Diode current set point limit
17	SA-DVACT	Diode voltage actual
24	REF	Reference voltage
11	REFVAR	Reference voltage adjustable
12	AUX+5V	Auxiliary voltage +5V
25	AUX+15V	Auxiliary voltage +15V
13	AUX-15V	Auxiliary voltage -15V
23	SD-READY	Ready
19	SD-DCON	Diode current on
7	SD-DCSD	Diode current shut down
8		Not connected
9		Not connected
10		Not connected
20		Not connected
21		Not connected
22		Not connected

MESSTEC Power Converter GmbH			
Operating Manual Diode Driver D1900-80 / D3300-60			
Document: 10100223OM	Revision: 00	Date: 10.04.2018	Page 11/23

Signal description

CA-DCSP1

Control Analog - Diode Current Set Point 1

Analog input 0V... +5V, corresponds to a diode current of:

0.0A ... 60.0A (D3300-60 W / A)

0.0A ... 80.0A (D1900-80 W / A)

CA-DCSP2

Control Analog - Diode Current Set Point 2

Analog input 0V... +5V, corresponds to a diode current of:

0.0A ... 60.0A (D3300-60 W / A)

0.0A ... 80.0A (D1900-80 W / A)

Diode Current Set Point 1 and Diode Current Set Point 2 will be added internally for the effective current set point.

A current set point with negative sign acts subtracting.

CA-DCL

Control Analog - Diode Current Limit

Analog input 0V... +5V, corresponds to a diode current limit of:

0.0A ... 60.0A (D3300-60 W / A)

0.0A ... 80.0A (D1900-80 W / A)

SA-DCACT

Status Analog - Diode Current Actual

Analog output 0V... +5V, corresponds to a diode current of:

0.0A ... 60.0A (D3300-60 W / A)

0.0A ... 80.0A (D1900-80 W / A)

SA-DVACT


Status Analog - Diode Voltage Actual

Analog output 0 V... +5 V, corresponds to a diode current of:

0.0V ... 55.0V (D3300-60 W / A)

0.0V ... 26.0V (D1900-80 W / A)

Reflects the actual diode voltage.

MESSTEC Power Converter GmbH			
Operating Manual Diode Driver D1900-80 / D3300-60			
Document: 10100223OM	Revision: 00	Date: 10.04.2018	Page 12/23

REF

Analog output +5.00V
Maximum current: 2mA.

REFVAR

Analog output 0.0V... +5.0V, adjustable by the reference voltage potentiometer.
Maximum current: 2mA.

AUX+5V

Output +5.1V, for supplying external components.
Maximum current: 200mA.

AUX+15V

Output +15V, for supplying external components.
Maximum current: 100mA.

AUX-15V

Output -15V, for supplying external components.
Maximum current: 100mA.

CD-DCON


Control Digital - Diode Current On

TTL-compatible input. High if left open.

In operating mode On/Off the input acts in the following way:

If the input is pulled to GND momentary (> 1ms), the diode current will be switched on. The diode current remains ON until a CD-DCOFF signal turns off.

In operating mode Auto On, this input is without effect.

MESSTEC Power Converter GmbH			
Operating Manual Diode Driver D1900-80 / D3300-60			
Document: 10100223OM	Revision: 00	Date: 10.04.2018	Page 13/23

CD-DCOFF

Control Digital - Diode Current Off

TTL-compatible input. High if left open.

In operating mode On/Off the input acts in the following way:

If diode current is ON and if the input is pulled to GND momentary (>1ms), diode current will be turned off.

The diode current remains in an off-status until a CD-DCON signal turns the output current on again.

In both operating modes CD-DCOFF input also acts as a system reset if an error has occurred. In this case the system will be reset if the input is pulled to GND momentary (>1ms).

CD-DCSD

Control Digital - Diode Current Shut Down

TTL-compatible input. Active high or active low (selectable by jumper).

Disables or enables diode current.

SD-READY

Status Digital – Ready

TTL-compatible output; open emitter. High if there are no errors.

SD-DCON


Status Digital – Diode Current On

TTL-compatible output; open emitter. High, if the diode driver is on.

SD-DCSD

Status Digital – Diode Current Shut Down

TTL-compatible output; open emitter. High, if diode current shut down is active.

MESSTEC Power Converter GmbH			
Operating Manual Diode Driver D1900-80 / D3300-60			
Document: 10100223OM	Revision: 00	Date: 10.04.2018	Page 14/23

General Instructions

Diode current and diode current limit

If you are using a D 1900 / D3300 for the first time, we recommend that you use for commissioning a short circuit instead of a laser diode (connect ST1 and ST2).

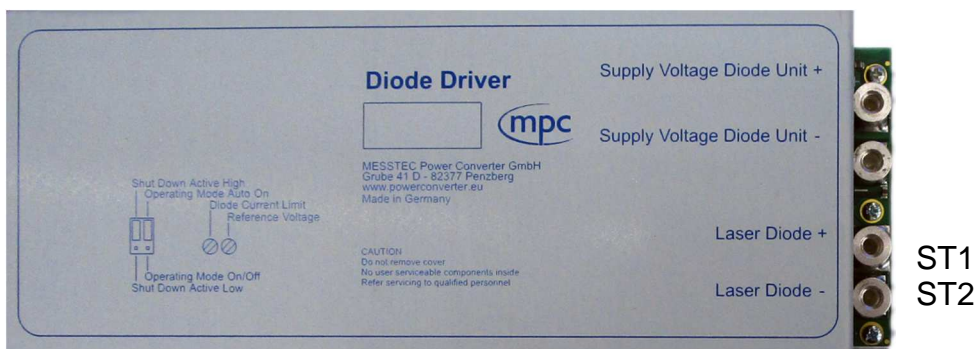


Fig.8

Connect a voltmeter to SA-DCACT output (Diode Current Actual) and to GND of the control port. Turn on the D1900 / D3300 and adjust a current set point voltage of 0V... 5 V at the CA-DCSP1 input.

Watch the voltmeter, it reflects the diode current, in this case it reflects the current which flows through the short circuit. The voltage value must be identical to the current set point.

Example:

A D3300-60 is operated with a current set point of 1V.

The voltage at SA-DCACT must be 1V, reflecting a current of 12A through the short circuit.

Adjust the diode current limit potentiometer.

Example:

A D3300-60 should be operated with a current limit of 55A. Apply a current set point voltage of 5V on CA-DCSP1 or CA DCSP2. Voltage at SA-SDCACT is now 5V, reflecting an output current of 60A.

Now turn down the current limit potentiometer (counterclockwise) to a voltage reading at SA-DCACT of 4.58V, corresponding to an output current of 55A.

The voltage at SA-DCACT can be calculated with the formula:

- for D3300-60: $U_{SA-DCACT} = I_{diode} / 12$ (83,33 mV \triangleq 1A)
- for D1900-80: $U_{SA-DCACT} = I_{diode} / 16$ (62,5mV \triangleq 1A)

A typical characteristic curve - feedback voltage ($U_{SA-DCACT}$) versus output current (I_{diode}) (see fig. 9).

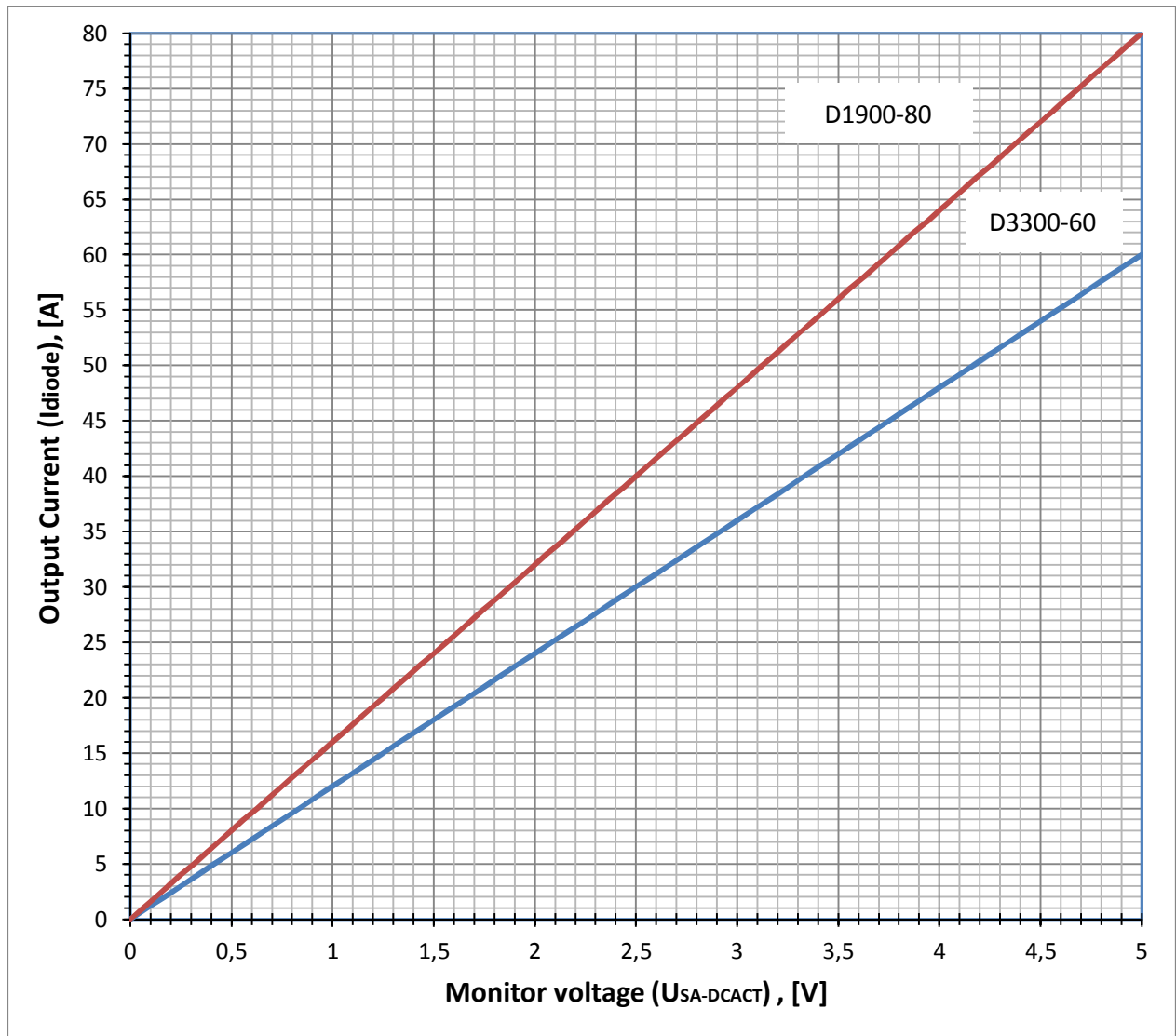


Fig. 9: Diode current monitor characteristic

The voltage at SA-DVACT can be calculated with the formula:

- for D3300-60: $U_{SA-DVACT} = U_{output} \times 0.091$ (91mV \triangleq 1V_{output})
- for D1900-80: $U_{SA-DVACT} = U_{output} \times 0.192$ (192mV \triangleq 1V_{output})

A typical characteristic curve - diode voltage monitor ($U_{SA-DVACT}$) versus output voltage (see fig. 10).

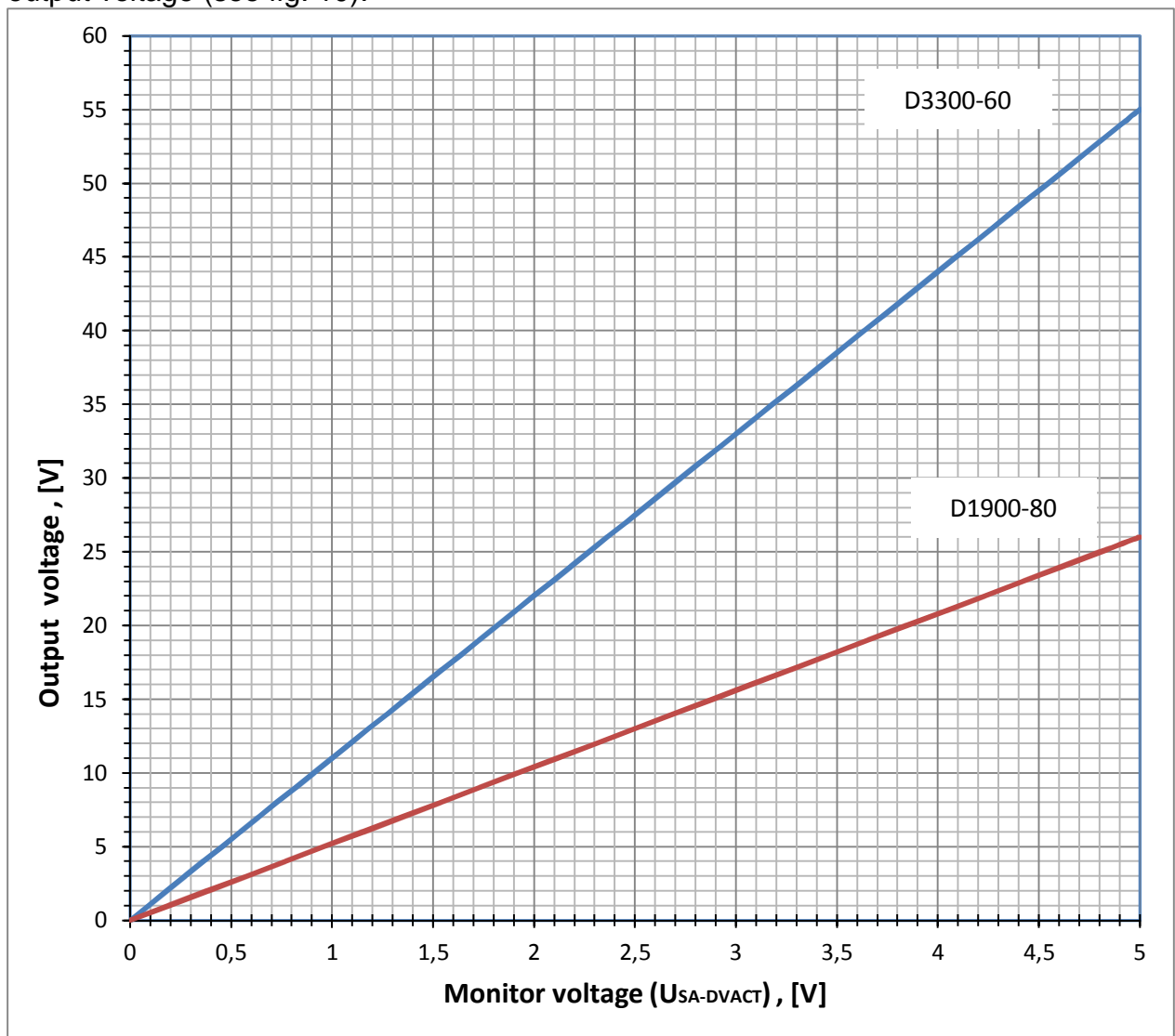



Fig. 10: Diode voltage monitor characteristic

MESSTEC Power Converter GmbH			
Operating Manual Diode Driver D1900-80 / D3300-60			
Document: 10100223OM	Revision: 00	Date: 10.04.2018	Page 17/23

Application example 1

Elementary laser system. Only a switch for Laser On is required.

Adjustments

Diode current: reference voltage potentiometer at D1900-80 / D3300-60.
 Diode current limit: diode current limit potentiometer at D1900-80 / D3300-60.

Jumper settings

Operating mode: Auto On
 Shut Down: Active Low

Note: Inputs CA-DCSP1 and CA-DCL must be necessarily connected (see fig. 11).

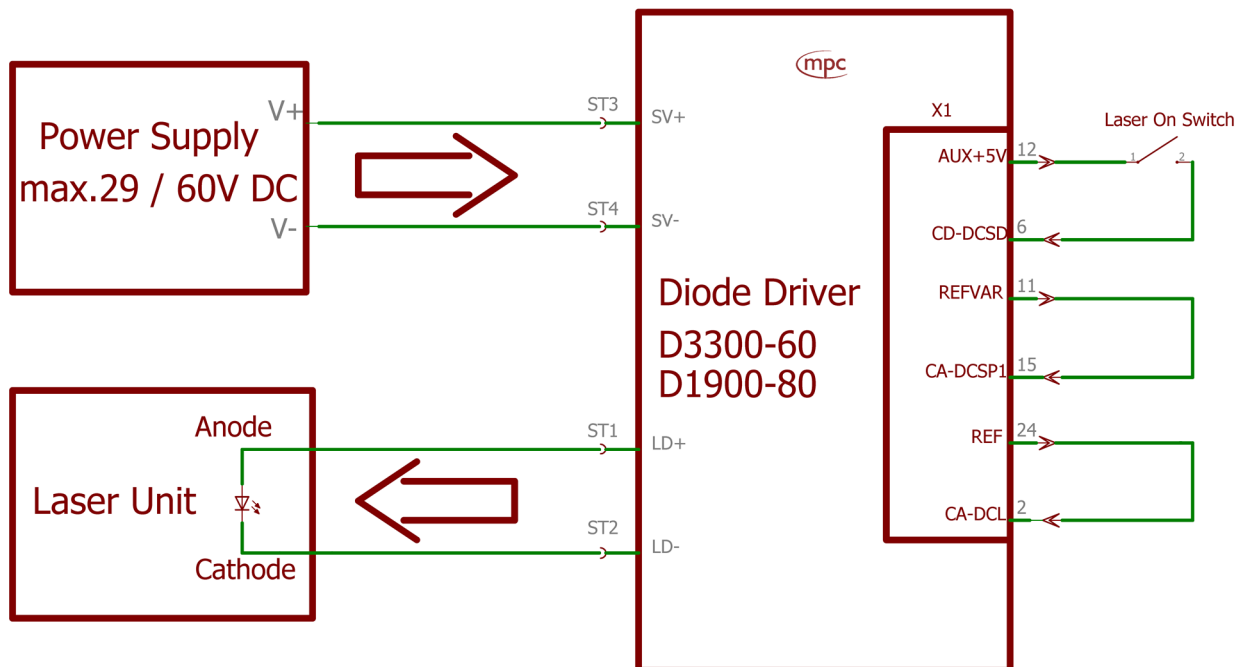


Fig. 11: Application example 1

Application example 2

Manually operated laser system.

Required components:

- 1 potentiometer 10K linear for the current set point
- 2 Push buttons for Laser On and Laser Off
- DVM (Digital Volt Meter) for indicating current set point
- 3 LEDs and 3 resistors for indicating states

Adjustments

Diode current:	external potentiometer.
Diode current range, upper limit:	reference voltage potentiometer (internal)
Diode current limit:	diode current limit potentiometer (internal)

Jumper settings

Operating mode:	On / Off
Shut Down:	Active High

Important:

Diode current limit input must be connected to reference voltage output.

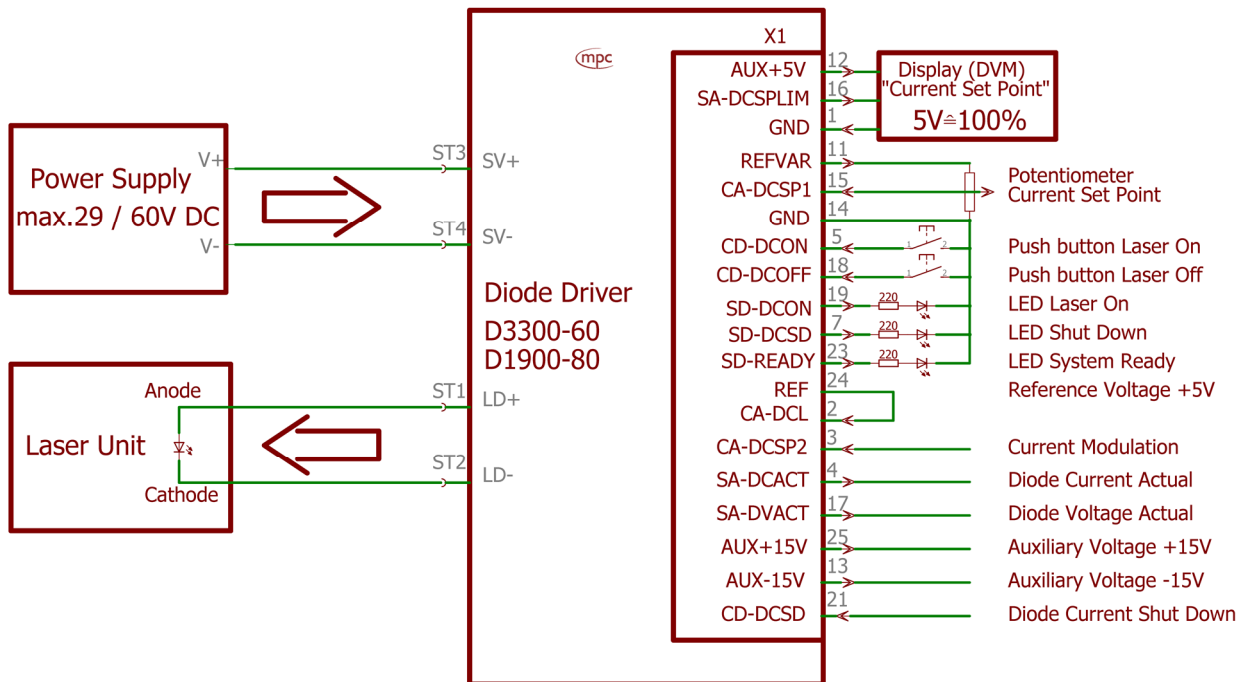


Fig. 12: Application example 2

Application example 3

Fully microcontroller controlled laser system.
No additional power supply is required.

Adjustments

Adjust built in diode current limit potentiometer clockwise to its maximum value.

Jumper settings

Operating mode: dependent on microcontroller system logic (Auto On or On/Off)
Shut Down: active Low or active High

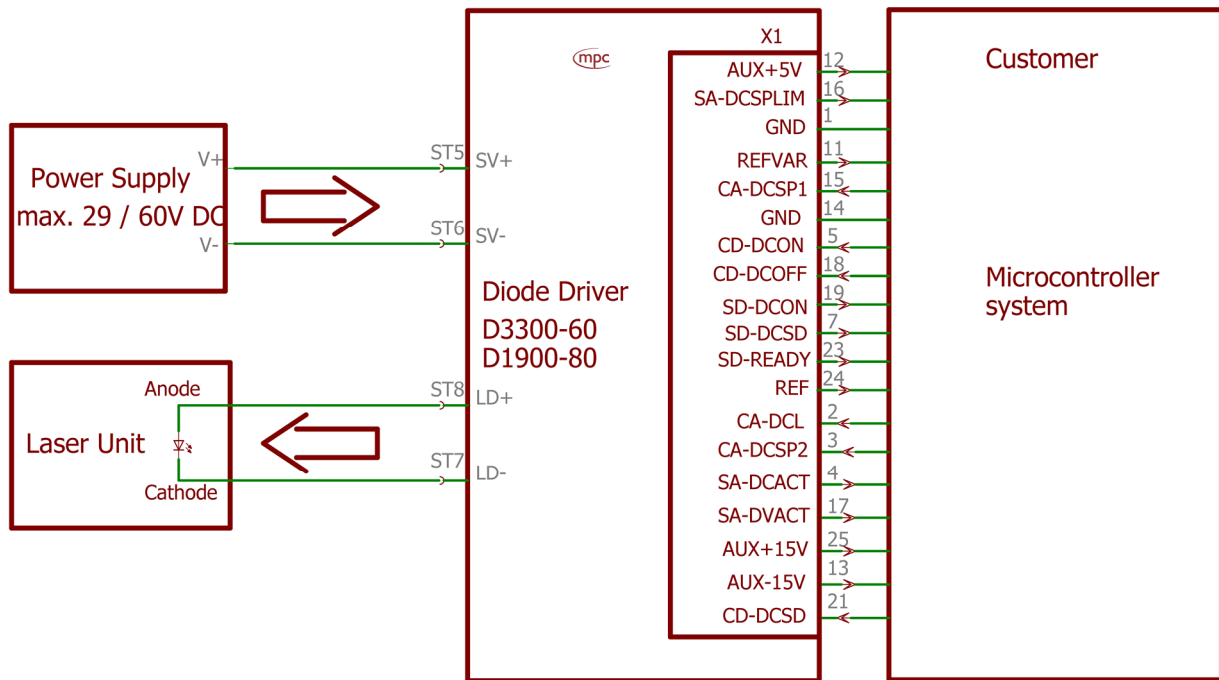
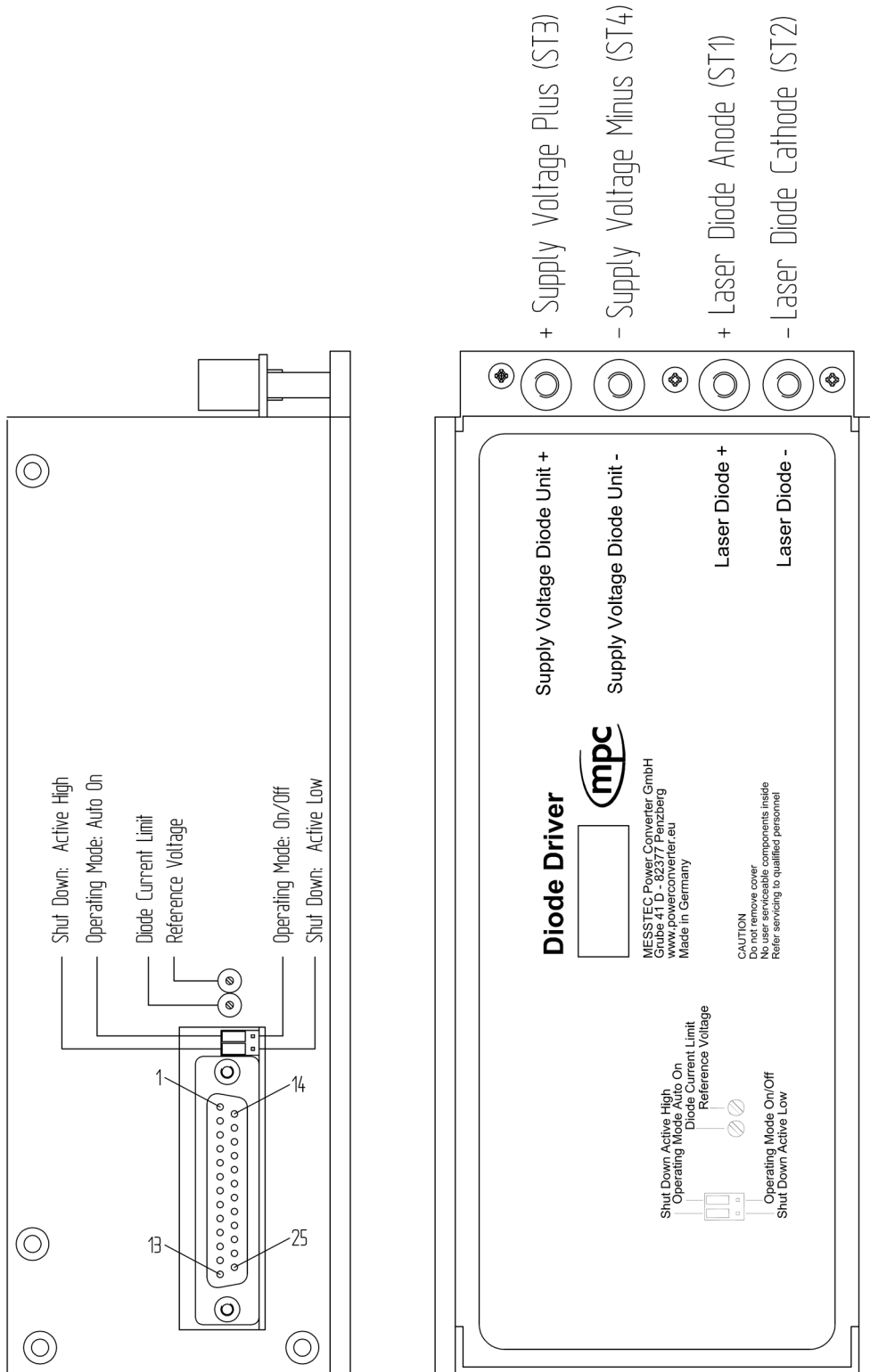


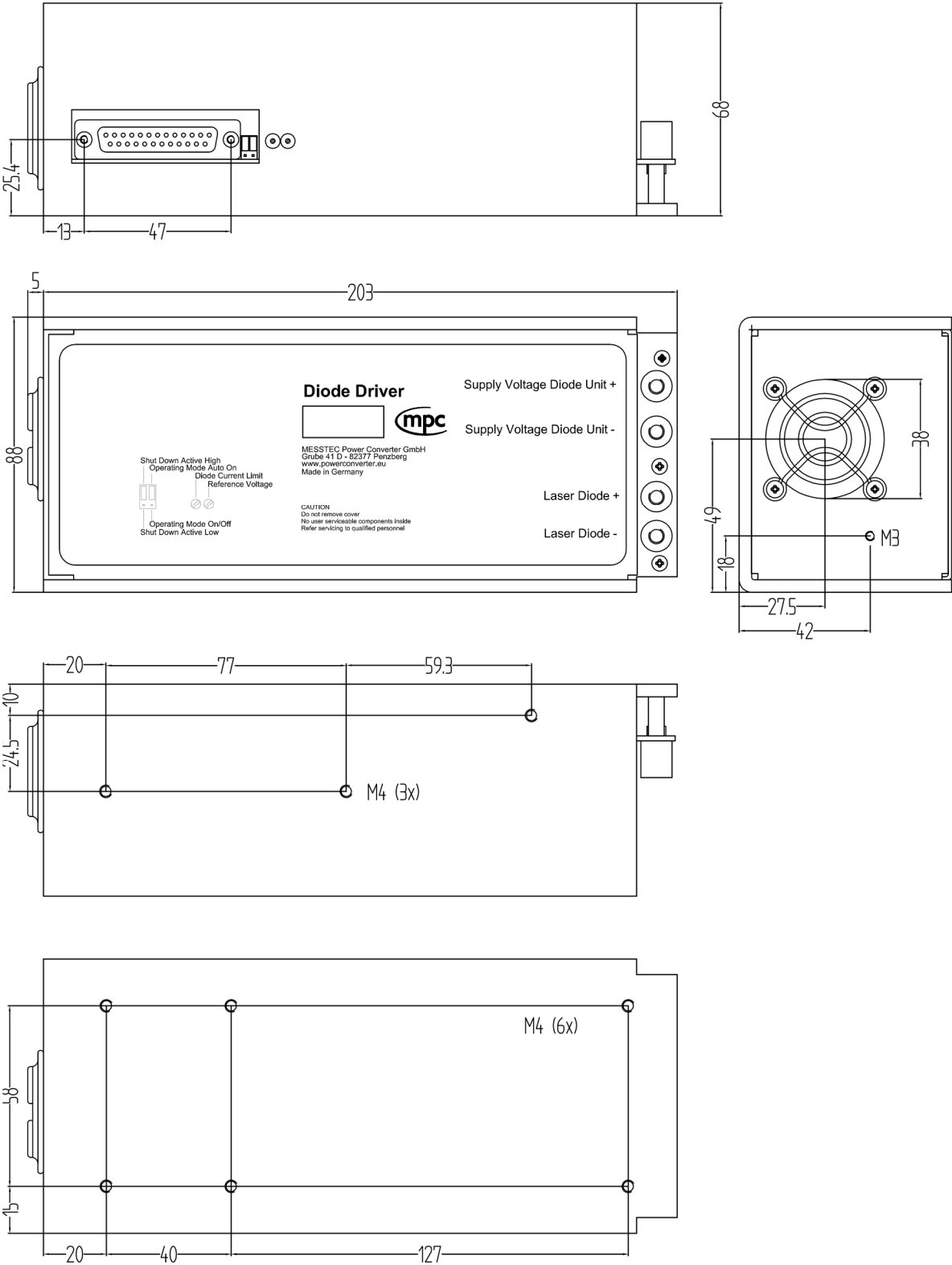
Fig. 13: Application example 3

Terminals

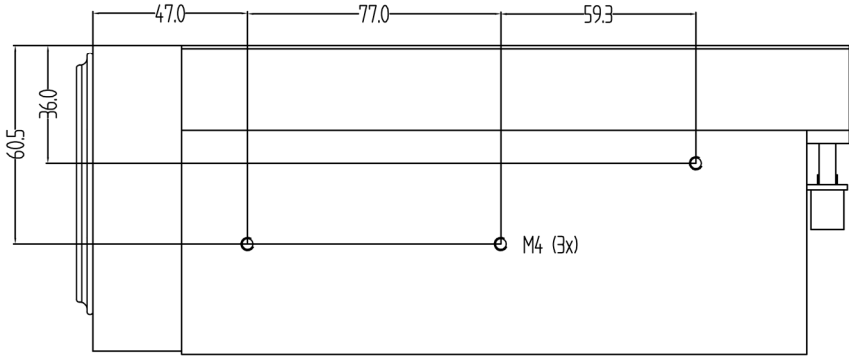
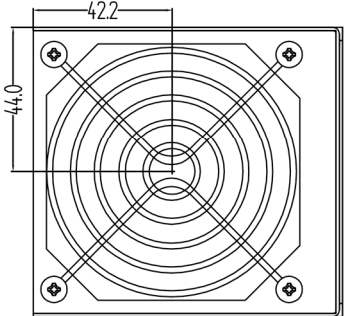
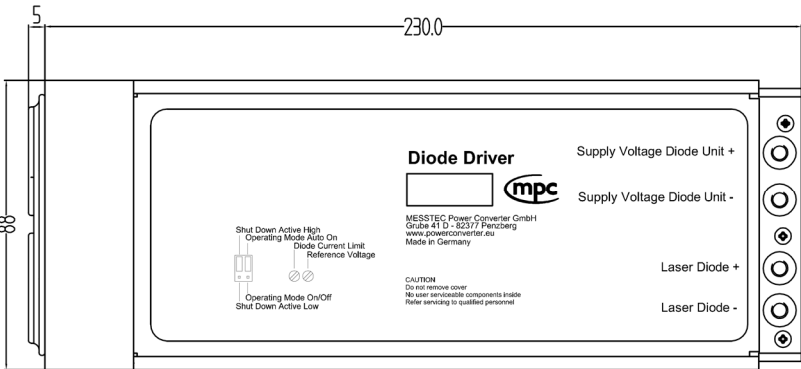
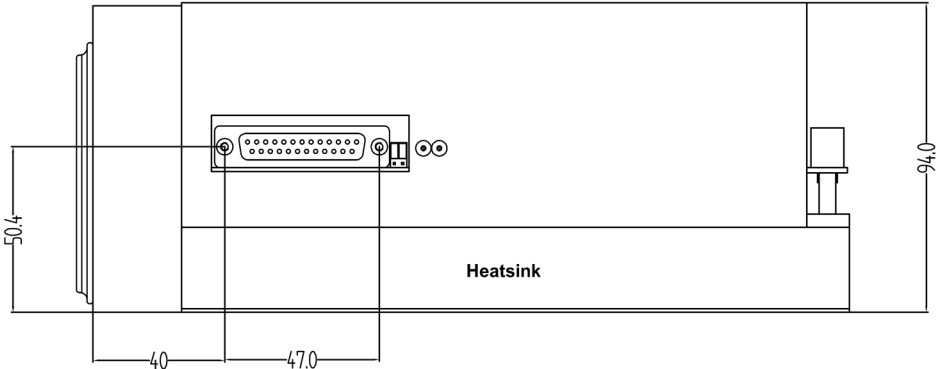



+ Supply Voltage Plus (ST3)
 - Supply Voltage Minus (ST4)
 + Laser Diode Anode (ST1)
 - Laser Diode Cathode (ST2)

Dimensions (Model: water-cooled)



Dimensions (Model: air- cooled)



MESSTEC Power Converter GmbH			
Operating Manual Diode Driver D1900-80 / D3300-60			
Document: 10100223OM	Revision: 00	Date: 10.04.2018	Page 23/23

Ordering information

Type name	Order number	Note
D1900-80-A	10100223	Air cooled
D1900-80-W	10100224	Water cooled
D3300-60-A	10100225	Air cooled
D3300-60-W	10100226	Water cooled

Contact Data

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