Laser Systems LS 400

Operating Manual

mpc

English Edition

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Safety Instructions

The LS 400 is suitable for supplying laser diodes with a constant current and for supplying peltier elements with a constant voltage.
The device is not suitabel for supplying loads which generate a electromotive force of more than 30 V.

The lines for the laser diodes must have a cross-section of 6 mm use ring terminals.
Do not use a crimping tool which does not fit. This increases transition resistance and may cause a cable fire.
In any case of doubtful crimping additional soldering is re uired. Take care that the ring terminals are free of solder at the screws.
Use galvani ed screws M5 8 and galvani ed spring washers M5.

Take care of correct wiring of the laser diodes. rong polarity will damage the diodes.

Never disconnect the output lines for the laser diodes during operating.
This may generate a dangerous electric arc which can lead to skin burns or to fire.

Never connect the diode outputs to the TEC outputs.

The LS 400 is cooled by fans. Air is drawn in at the front panel and is blown out at the rear panel.
In an industrial environment with conductive dust air filtering is re uired.

Put the device out of operation if it has visible damages or if it doesn t work properly.

Description

The Laser systems LS 400 are complete systems for supplying laser diodes and TECs including a fan and a heatsink with milled mounting surface for mounting laser diodes or laser modules and TECs. The heatsink includes a printed circuit board with silver-coated connecting plates and female threads M5 for connecting the laser diodes and with solder pads for connecting TECs temperature sensor and pilot laser.

There are twentyfour different types of devices available simple systems for manually operating and more comple systems for manually and remote operating with currents up to 50 A for the LS 400-50 systems and currents up to 60 A for the LS 400-60 systems.
Several types are also deliverable with an option for fast pulsing with fre uencies up to 5 kH .

All systems include the DT 400 a high-precision laser diode driver and a full bridge TEC driver with temperature controller and control logic utili ing Messtec s patented power switch technology. This technology has a lot of advantages and is particularly suited for driving laser diodes.
It offers high accuracy and current stability a e cellent dynamic performance a high output impedance and low electromagnetic interference.
No current overschoot or ringing arise when altering output current or load impedance abruptly.

Overshooting and ringing is very dangerous for laser diodes and it is the most dreaded thing in operating e pensive laser diodes.

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

Fig. 2 shows the step response of the DT 400 at a current set point step of 0 ... 100 there is no overshoot or ringing the characteristic is nearly perfect.

Fig. 1

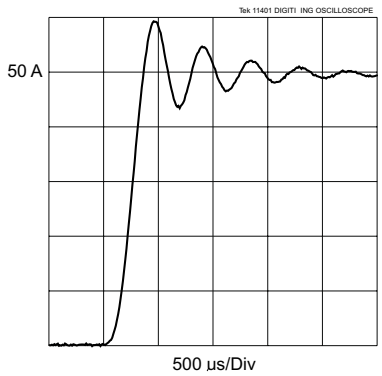
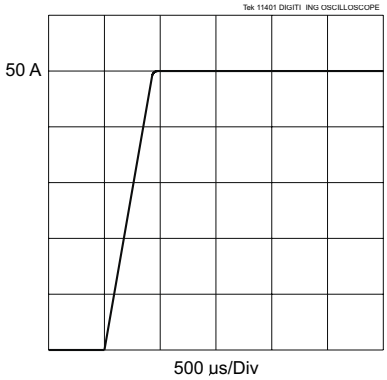


Fig. 2



Description

A further major property is the dynamic output impedance which has significant effects to the diode current if load impedance alters abruptly.

For e ample if there is a loose contact at the output lines and the output is open circuit the drivers output voltage will increase to its ma imum value because of its characteristic to inject current. If the contact will be closed and you have a conventional laser driver with low dynamic output impedance e cessive overcurrent will damage the laser diodes.

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

Different from a convential laser driver the DT 400 responds in this case absolutely reliable and no overcurrent occures.

Fig. 3 shows the response of a convential laser diode driver at a nominal output current of 50 A if load impedance is changed abruptly to lower values.

Fig. 4 shows the response of the DT 400 at the same conditions the diode current keeps constant.

Fig. 3

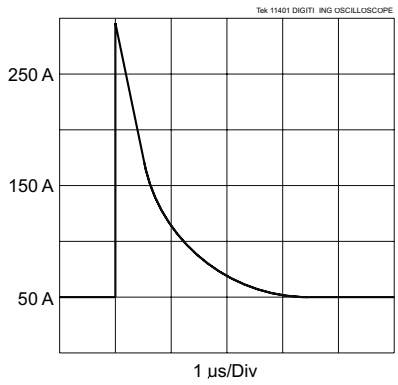
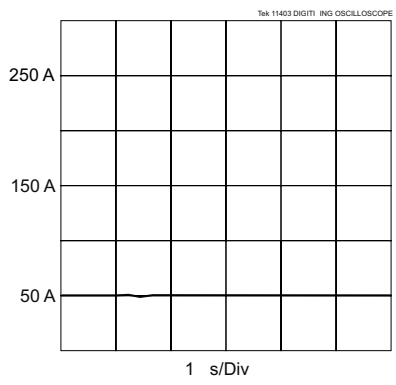


Fig. 4



Overview of deliverable Laser Systems LS 400-50 and LS 400-50 FP

Device	Identification number	C	Fast Pulsing	Manual operation of Current Set Point	Manual operation of Temperature Set Point	Remote Operation	Control Port	RS 232 Port	Safety Interlock	Switch Pilot Laser
LS 400-50	10100050	•		•						
LS 400-50	10100051	•		•	•					
LS 400-50	10100052	•		•		•	•	•		
LS 400-50	10100053	•		•	•	•	•	•		
LS 400-50	10100054	•		•					•	•
LS 400-50	10100055	•		•	•				•	•
LS 400-50	10100056	•		•		•	•	•	•	•
LS 400-50	10100057	•		•	•	•	•	•	•	•
LS 400-50 FP	10100064	•	•	•					•	•
LS 400-50 FP	10100065	•	•	•	•				•	•
LS 400-50 FP	10100066	•	•	•		•	•	•	•	•
LS 400-50 FP	10100067	•	•	•	•	•	•	•	•	•

Overview of deliverable Laser Systems LS 400-60 and LS 400-60 FP

Device	Identification number	C	Fast Pulsing	Manual operation of Current Set Point	Manual operation of Temperature Set Point	Remote Operation	Control Port	RS 232 Port	Safety Interlock	Switch Pilot Laser
LS 400-60	10100080	•		•						
LS 400-60	10100081	•		•	•					
LS 400-60	10100082	•		•		•	•	•		
LS 400-60	10100083	•		•	•	•	•	•		
LS 400-60	10100084	•		•					•	•
LS 400-60	10100085	•		•	•				•	•
LS 400-60	10100086	•		•		•	•	•	•	•
LS 400-60	10100087	•		•	•	•	•	•	•	•
LS 400-60 FP	10100074	•	•	•					•	•
LS 400-60 FP	10100075	•	•	•	•				•	•
LS 400-60 FP	10100076	•	•	•		•	•	•	•	•
LS 400-60 FP	10100077	•	•	•	•	•	•	•	•	•

Specification

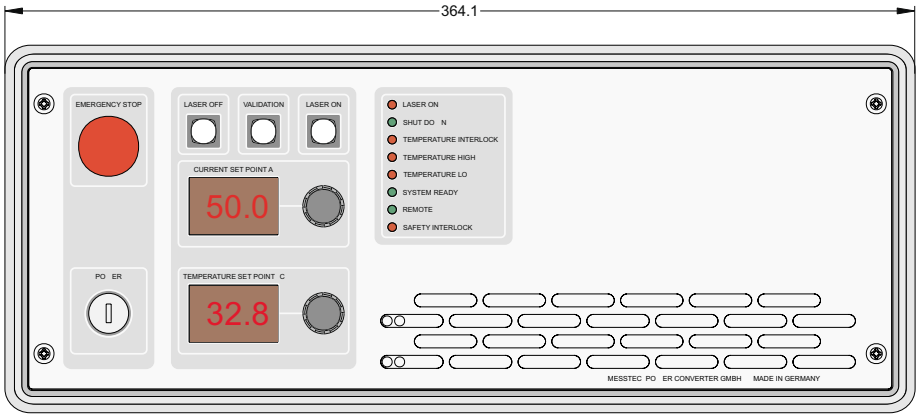
Mains voltage	88 ... 264 V AC	47 ... 63 H 800 VAma
Output Laser Diodes		
Diode current	0 50 A	LS 400-50 and LS 400-50 FP
Diode current	0 60 A	LS 400-60 and LS 400-60 FP
Accuracy	0.1	
Linearity	0.1	
Temperature stability	50 ppm / C	
Rate of change	0.17 A / s	Depends on diode voltage
Ripple current	0.1 pp	
Diode voltage	23 V ma	
Output power	400 ma	1
Current limit	0 50 A	LS 400-50 and LS 400-50 FP
Current limit	0 ... 60 A	LS 400-60 and LS 400-60 FP Adjustable by potentiometer or by control signal or by RS 232 Control or by memory
Accuracy	0.1	
Temperature stability	50 ppm / C	
Current modulation input BNC jack	0 ... 5 V	for 0 ... 50 A LS 400-50
	0 ... 5 V	for 0 ... 60 A LS 400-60
Pulse modulation input BNC jack	TTL or CMOS	
Pulse characteristic		LS 400-50 FP and LS 400-60 FP
Rise time	appro . 500 ns	
Fall time	appro . 7 µs	
Fre uency	5 kH ma	
Output TEC		
Output voltage	0 23.5 V ma	
Output voltage limit	0 23.5 V ma	Adjustable by potentiometer
Output current	15 A ma	
Output power	450 ma	1
Temperature range	0 +50 C	Adjustable by potentiometer or by control signal or by RS 232 Control or by memory
Accuracy	0.1 K	
Temperature sensors	KTY 11-5 or PT 1000	Selectable by jumper
Supply for Pilot Laser	5 V 200 mA ma	

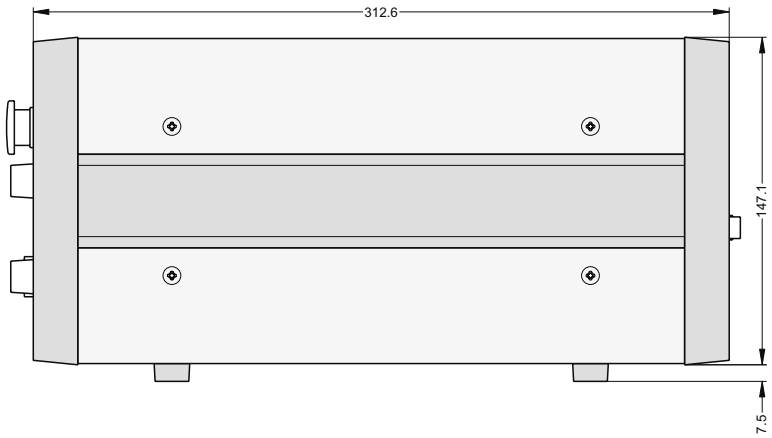
Specification

Interlock voltage	12 V	Contact open
Interlock current	appro . 1 mA	Contact closed
2 pole female socket		Binder 99 0604 00 02
2 pole male cable connector included in delivery		Binder 99 0601 00 02
Shutter output	12 V or 24 V 0.5 A	Selectable by jumper
4 pole female socket		Binder 99 0612 00 04
4 pole male cable connector included in delivery		Binder 99 0609 00 04
Control port	25-pole female plug connector according to DIN 41652 and MIL-C-24308 female thread UNC 4-40.	
RS 232 port	9 pole female plug connector according to DIN 41652 and MIL-C-24308 female thread UNC 4-40.	
Heatsink for Laser diodes and TECs	appro . 0.13 K/	milled mounting surface 172 80 mm
Ma imum allowed height for laser diodes plus TECs		53.75 mm
Operating temperature range	0 ... +45 C	
Dimensions	364.1 147.1 312.6 mm H D	
eight	11.7 Kg	

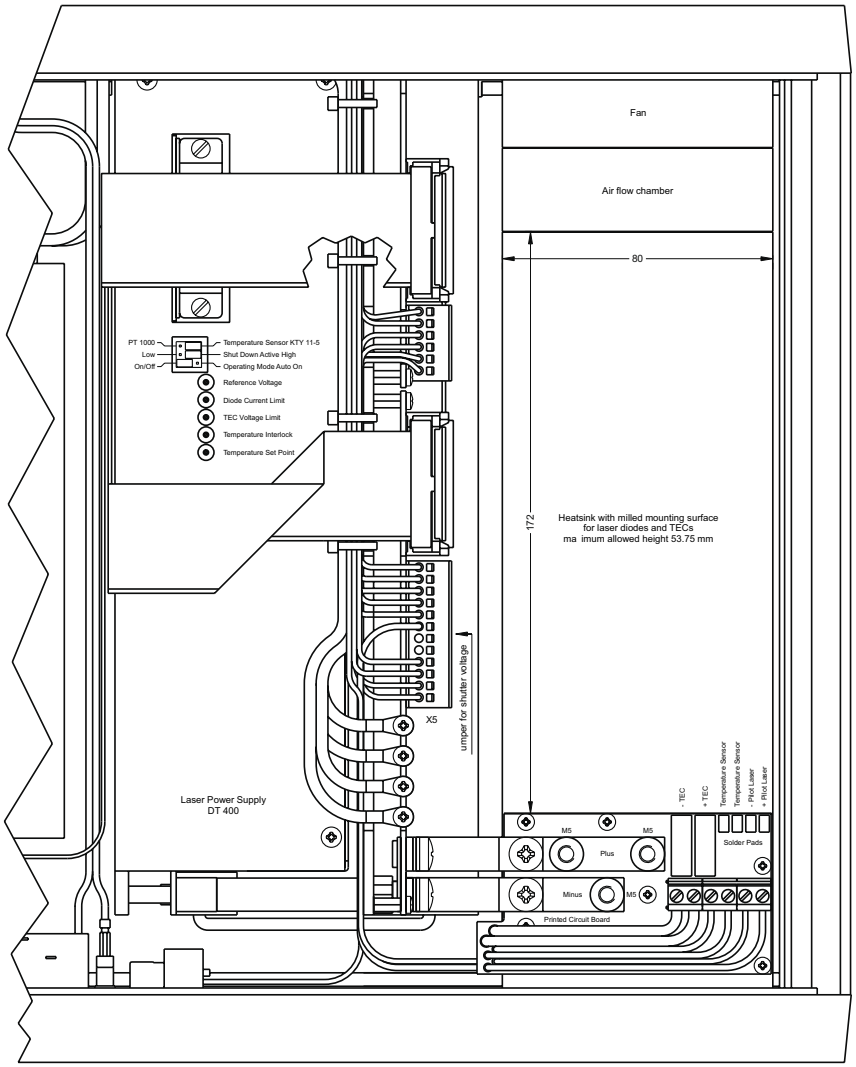
1 The output power for the laser diodes plus the output power for the TECs must not e ceed 400 .

Dimensions


364.1
EMERGENCY STOP
LASER OFF
VALIDATION
LASER ON
CURRENT SET POINT A
50.0
TEMPERATURE SET POINT C
32.8
PO ER
LASER ON
SHUT DO N
TEMPERATURE INTERLOCK
TEMPERATURE HIGH
TEMPERATURE LO
SYSTEM READY
REMOTE
SAFETY INTERLOCK
MESSTEC PO ER CONVERTER GMBH MADE IN GERMANY


312.6
147.1
7.5

Dimensions
Top view (cover removed)



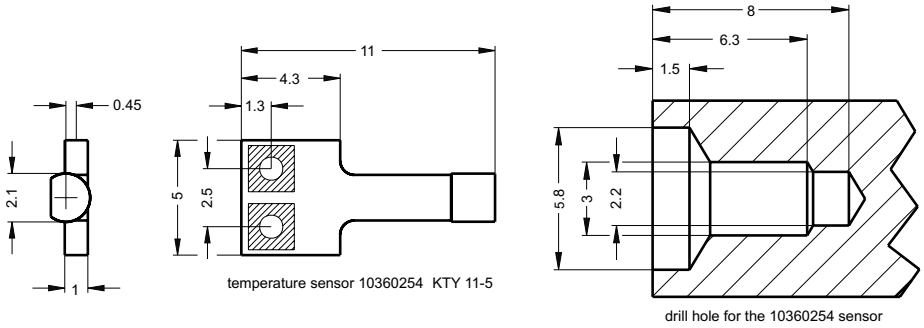
General Instructions

Peltier element, cooling plate and heat sink
Do not operate a peltier element at its ma imum limit or ma imum cooling capacity the electrical power loss will be very high and the efficiency will be very bad.
Operate the peltier element at a voltage of half of the ma imum allowed voltage.
Select a peltier element whose cooling capacity is sufficient at an operating voltage of half of the ma imum allowed operating voltage.

Try to spread the heat dissipation of the laser diodes by an e tensive cooling plate use e tensive peltier elements ore multiple peltier elements instead of a single one.

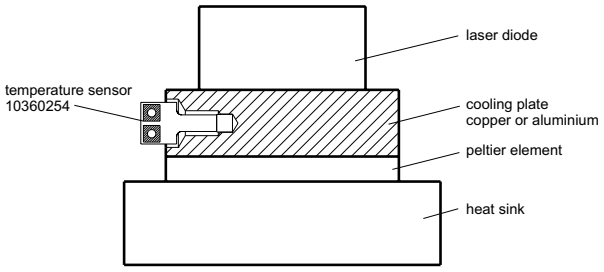
Temperature sensor
Use small temperature sensors with a low thermal mass the sensor must have a good thermal contact to the cooling plate. This is very important for the stability of the closed loop.
Use adhesives with high thermal conductivity for bonding the sensor. Do not use thick wires for connecting this will draw away thermal energy and will degrade performance.
A good solution is Messtec s 10360254 sensor using a KTY 11-5. It has two soldering pads for connecting and it is easy to handle.

The figure shows an application with the 10360254 sensor.



temperature sensor 10360254 KTY 11-5

drill hole for the 10360254 sensor



General Instructions

TEC voltage limit
Adjust the TEC voltage limit before connecting a peltier element.
Connect a temperature sensor either Messtec s 10360254 KTY 11-5 a conventional KTY 11-5 or a PT 1000 at the printed circuit board of the heatsink.
Take care of the proper jumper setting at the DT 400.
You can also take a 1000 Ω resistor instead of a temperature sensor in this case set the jumper to PT 1000.
Connect a voltmeter at the TEC ouput of the printed circuit board and turn the system on.
Adjust TEC voltage to the ma imum allowed value of your peltier element.

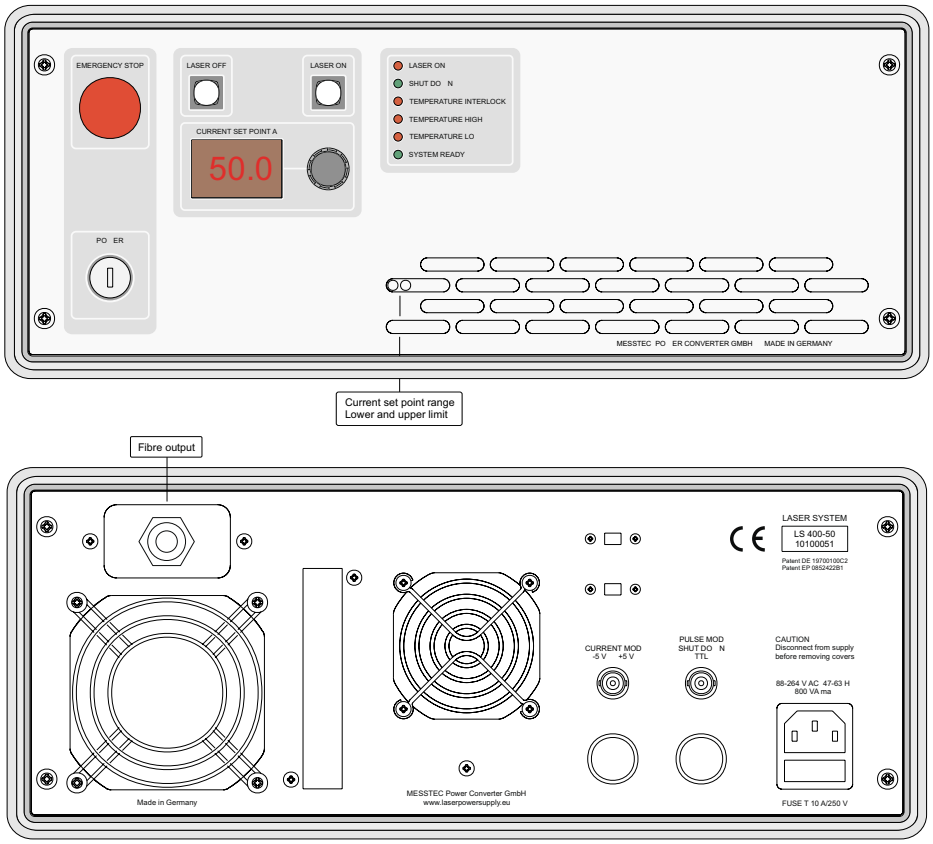
Temperature interlock
Do not adjust the trigger point very close to the operating temperature. Consider that in most cases a thermal overshoot will occur if the system is turned on.

Diode current and diode current limit
Do not connect laser diodes if it is the first time you put a system into operation.
Use a short circuit instead of laser diodes connect the +laser diode output to the -laser diode output.
All settings adjustments and tests can be done with the short circuit.

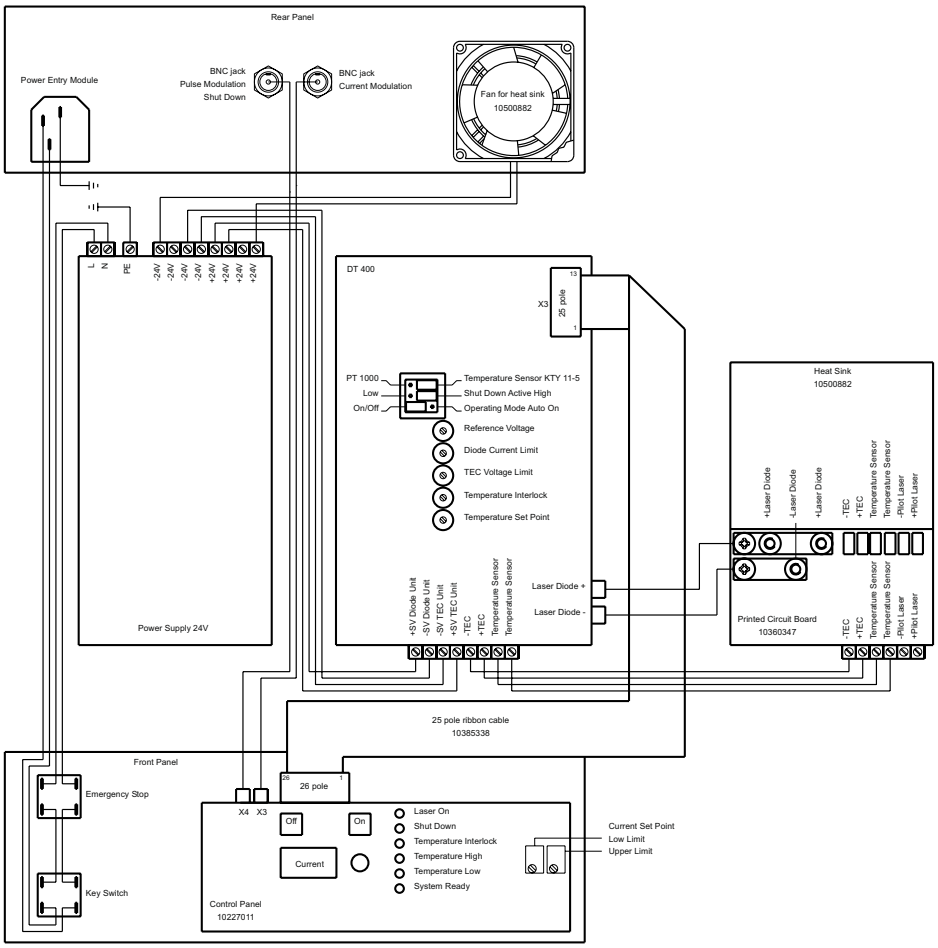
System LS 400-50 (10100050) and LS 400-60 (10100080)
Manually operated systems with diode currents up to 50 A for LS 400-50 and diode currents up to 60 A for LS 400-60.

Front panel
Key-operated switch and emergency stop button for the mains voltage.
Current set point potentiometer two buttons for Laser On and Laser Off a digital display for the current set point and si LEDs for indicating states.

Rear panel
Connector for the mains voltage BNC jack for analog current modulation BNC jack for TTL pulse modulation signal or TTL shut down and a dummy plate for the fibre output.



Block diagram
System LS 400-50 (10100050) and LS 400-60 (10100080)



System LS 400-50 (10100050) and LS 400-60 (10100080)

Adjustments
Diode current set point
Potentiometer at the control panel the range can be adjusted by two potentiometers at the front panel e.g. from 35.6 A to 45.5 A.
Diode current limit
Diode current limit potentiometer at the DT 400. Factory setting ma imum.
TEC voltage limit
TEC voltage limit potentiometer at the DT 400. Factory setting ma imum.
Temperature set point
Temperature set point potentiometer at the DT 400. Factory setting undefined.
Temperature interlock
Temperature interlock potentiometer at the DT 400. Factory setting ma imum.
Reference voltage
Reference voltage potentiometer at the DT 400. Factory setting ma imum 5.000 V do not turn out of position.

Jumper settings at the DT 400
Operating mode
On/Off
Shut Down
Active High or Active Low. Factory setting active High.

Diode current limit
Turn the current set point potentiometer at the control panel clockwise to its ma imum display reading must be 50.0 A or 60.0 A.
Adjust the current limit potentiometer at the DT 400 to the desired value display reading .

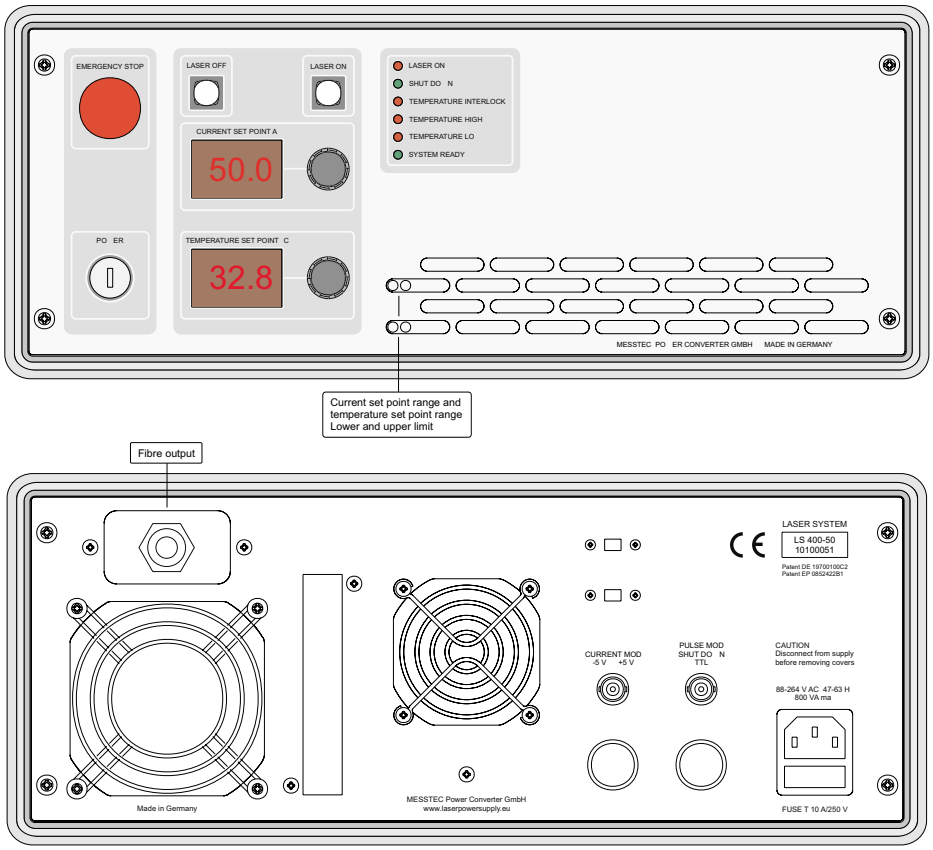
Current set point range
Turn current set point potentiometer clockwise to its ma imum turn the right readout potentiometer to the desired value e.g. 45.5 A display reading .
Turn current set point potentiometer counterclockwise to its minimum turn the left readout potentiometer to the desired value e.g. 20.0 A display reading .

Accessories included in delivery
Key 2 pcs
Power cord
Cable gland PG9 for the dummy plate
Operating manual

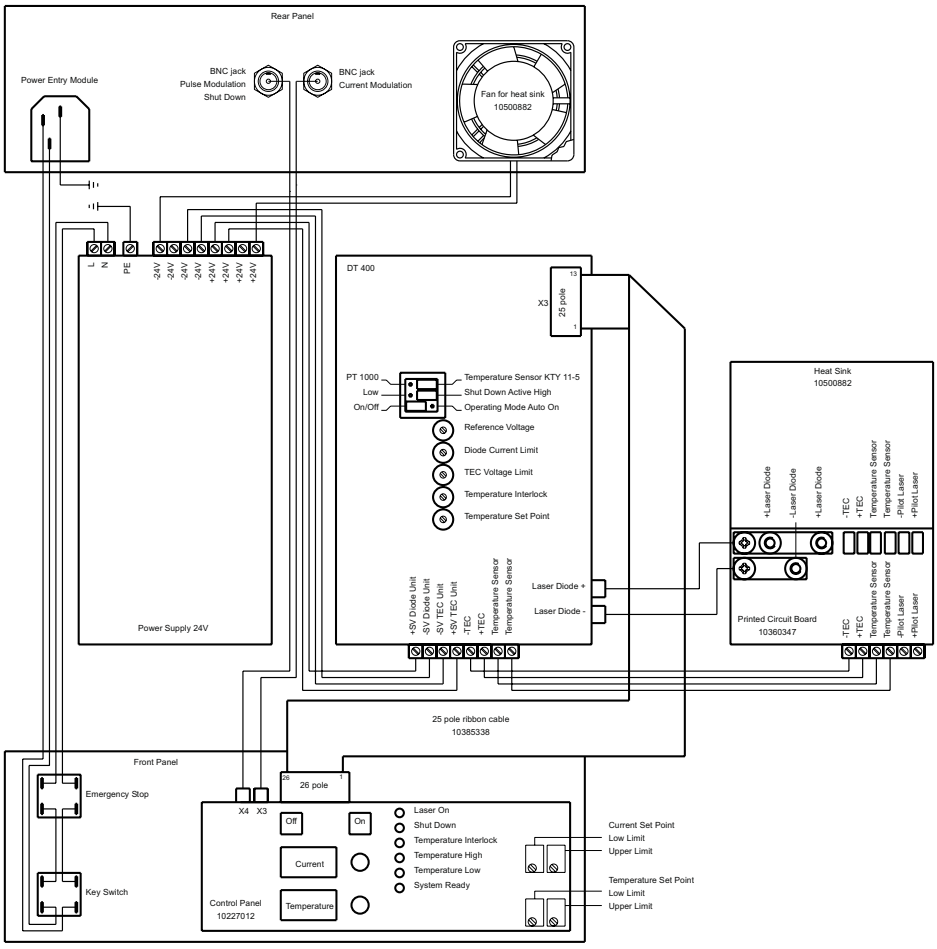
System LS 400-50 (10100051) and LS 400-60 (10100081)
Manually operated systems with diode currents up to 50 A for LS 400-50 and diode currents up to 60 A for LS 400-60.

Front panel
Key-operated switch and emergency stop button for the mains voltage.
Current set point potentiometer temperature set point potentiometer two buttons for Laser On and Laser Off a digital display for the current set point a digital display for the temperature set point and si LEDs for indicating states.

Rear panel
Connector for the mains voltage BNC jack for analog current modulation BNC jack for TTL pulse modulation signal or TTL shut down and a dummy plate for the fibre output.



Block diagram
System LS 400-50 (10100051) and LS 400-60 (10100081)



System LS 400-50 (10100051) and LS 400-60 (10100081)

Adjustments
Diode current set point
Potentiometer at the control panel the range can be adjusted by two potentiometers at the front panel e.g. from 35.6 A to 45.5 A.
Diode current limit
Diode current limit potentiometer at the DT 400. Factory setting ma imum.
TEC voltage limit
TEC voltage limit potentiometer at the DT 400. Factory setting ma imum.
Temperature set point
Potentiometer at the control panel the range can be adjusted by two potentiometers at the front panel e.g. from 15.0 C to 26.5 C.
Temperature set point potentiometer at the DT 400. Factory setting minimum.
Temperature interlock
Temperature interlock potentiometer at the DT 400. Factory setting ma imum.
Reference voltage potentiometer at the DT 400. Factory setting ma imum 5.000 V do not turn out of position.

Jumper settings at the DT 400
Operating mode
On/Off
Shut Down
Active High or Active Low. Factory setting active High.

Diode current limit
Turn the current set point potentiometer at the control panel clockwise to its ma imum display reading must be 50.0 A or 60.0 A.
Adjust the current limit potentiometer at the DT 400 to the desired value display reading .

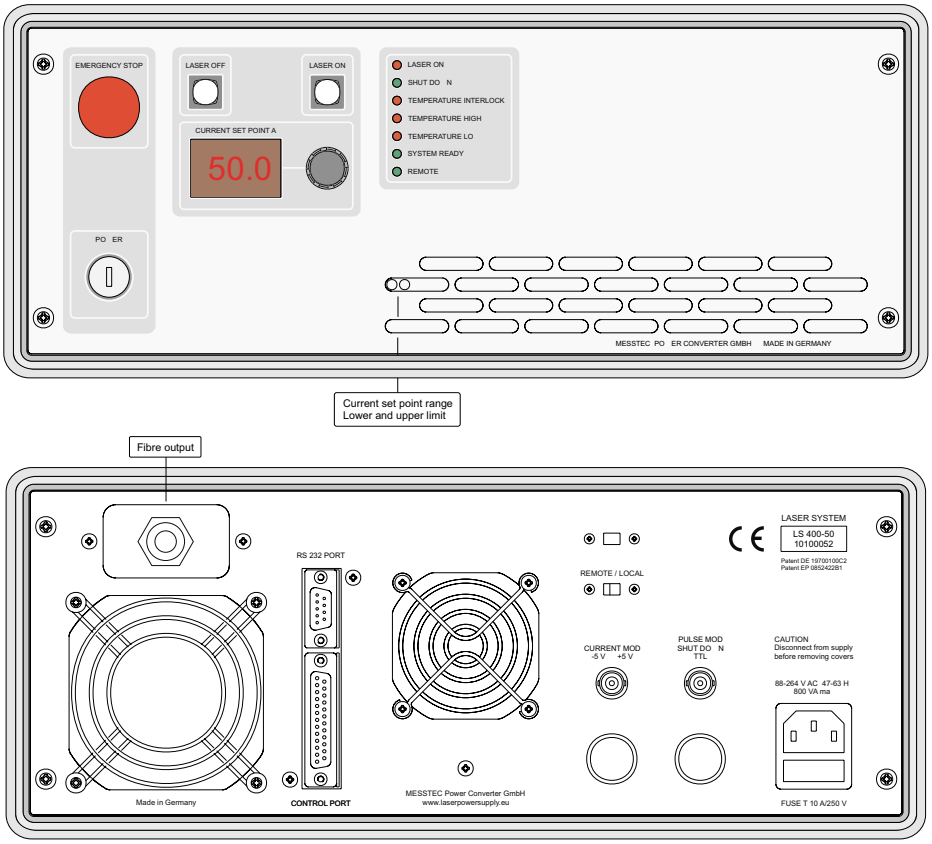
Current set point range
Turn current set point potentiometer clockwise to its ma imum turn the upper right readout potentiometer to the desired value e.g. 45.5 A display reading .
Turn current set point potentiometer counterclockwise to its minimum turn the upper left readout potentiometer to the desired value e.g. 35.6 A display reading .

Temperature set point range
Turn temperature set point potentiometer clockwise to its ma imum turn the lower right readout potentiometer to the desired value e.g. 26.5 C display reading .
Turn temperature set point potentiometer counterclockwise to its minimum turn the lower left readout potentiometer to the desired value e.g. 15.0 C display reading .

Accessories included in delivery
Key 2 pcs
Power cord
Cable gland PG9 for the dummy plate
Operating manual

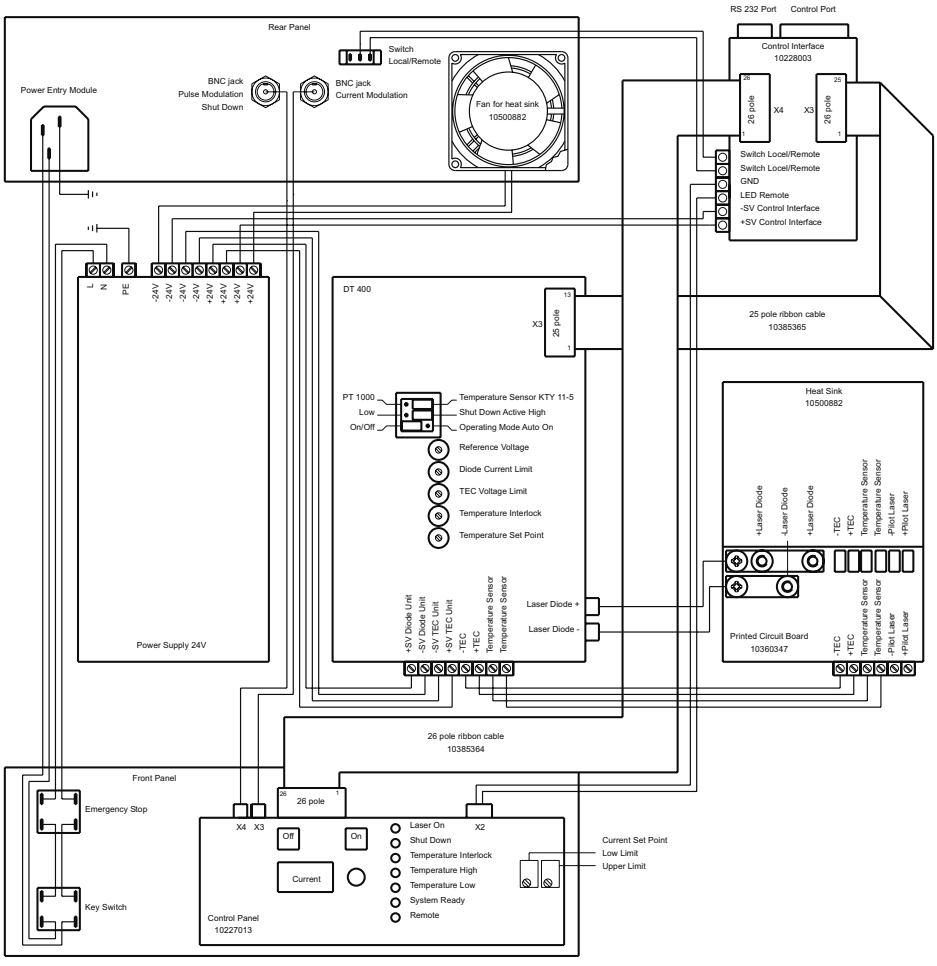
System LS 400-50 (10100052) and LS 400-60 (10100082)
Manually operated and remote-controlled systems with diode currents up to 50 A for LS 400-50 and diode currents up to 60 A for LS 400-60.
The system can be fully configured and controlled via the RS 232 port and fully controlled via the control port.
Signal levels at the control port meet the common industry standard for directly connecting a programmable controller PLC or any other controller.
The option of system configuring via the RS 232 port and set-up software re uires a PC with indows ™ operating system makes the system e ceptionally fle ible. For e ample it is possible to define in both operating modes local or remote where the current set point shall come from from internal nonvolatile memory from control port or from control panel.

Front panel
Key-operated switch and emergency stop button for the mains voltage
current set point potentiometer two buttons for Laser On and Laser Off a digital display for the current set point and seven LEDs for indicating current states.



Rear panel
Connector for the mains voltage BNC jack for analog current modulation BNC jack for TTL pulse modulation signal or TTL shut down switch Local/Remote 9 pole female plug connector of RS 232 port and 25 pole female plug connector of control port.

Block diagram
System LS 400-50 (10100052) and LS 400-60 (10100082)



System LS 400-50 (10100052) and LS 400-60 (10100082)

Adjustments
Diode current set point
Potentiometer at control panel the range can be can be adjusted by two potentiometers e.g. from 35.6 A to 45.5 A by analog signal at the control port by internal memory or by RS 232 control.
Diode current limit
By analog signal at the control port by internal memory or by RS 232 control.
TEC temperature set point
By analog signal at the control port by internal memory or by RS 232 control.
TEC e cess temperature
By internal memory or by RS 232 control.
Shut down polarity
By internal memory.
TEC voltage limit
TEC voltage limit potentiometer at the DT 400.

Potentiometer adjustments at the DT 400
Reference voltage potentiometer clockwise to its ma imum value factory setting .
Diode current limit potentiometer clockwise to its ma imum value factory setting .
Temperature interlock potentiometer clockwise to its ma imum value factory setting .
Temperature set point potentiometer counterclockwise to its minimum value factory setting .

Jumper settings at the DT 400
Operating mode On/Off factory setting .
Shut Down Active High factory setting .

System set up and remote control
Refer to section set up and remote control in this manual for detailed information.

Current set point range in manual mode after performing system set up
Switch to local mode.
Turn current set point potentiometer clockwise to its ma imum turn the right readout potentiometer to the desired value e.g. 45.5 A display reading .
Turn current set point potentiometer counterclockwise to its minimum turn the left readout potentiometer to the desired value e.g. 35.6 A display reading .

Accessories included in delivery
Key 2 pcs
Power cord
Cable gland PG9 for the dummy plate
Set up and control software
Operating manual

System LS 400-50 (10100053) and LS 400-60 (10100083)
Manually operated and remote-controlled systems with diode currents up to 50 A for LS 400-50 and diode currents up to 60 A for LS 400-60.
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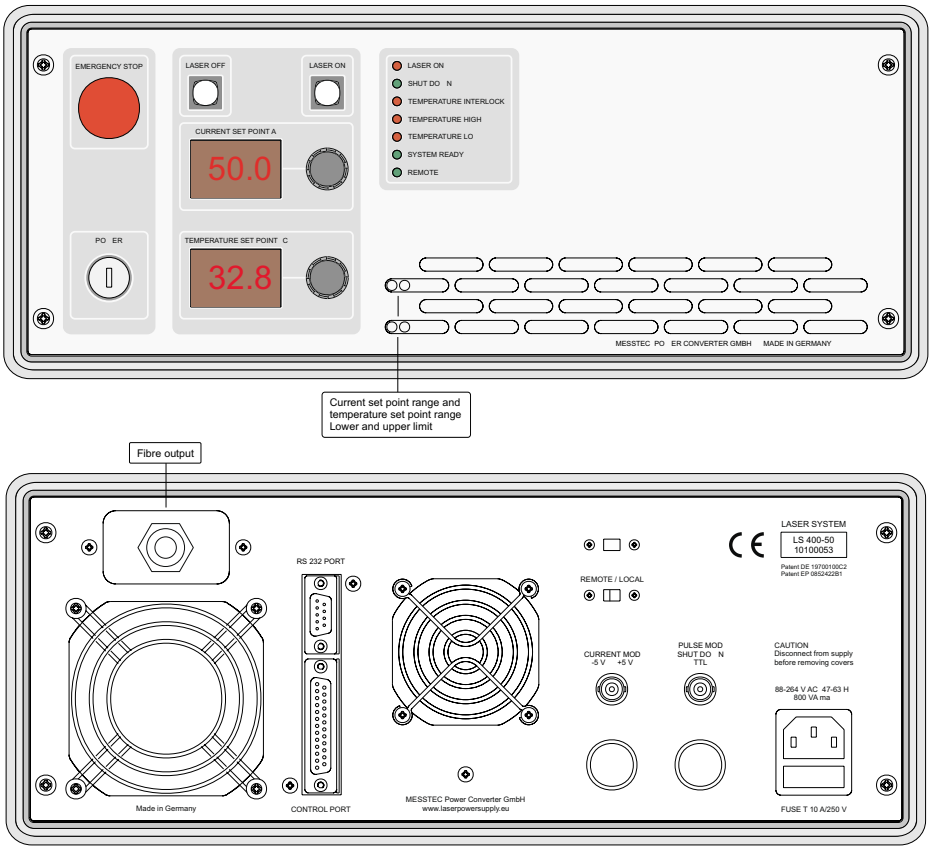
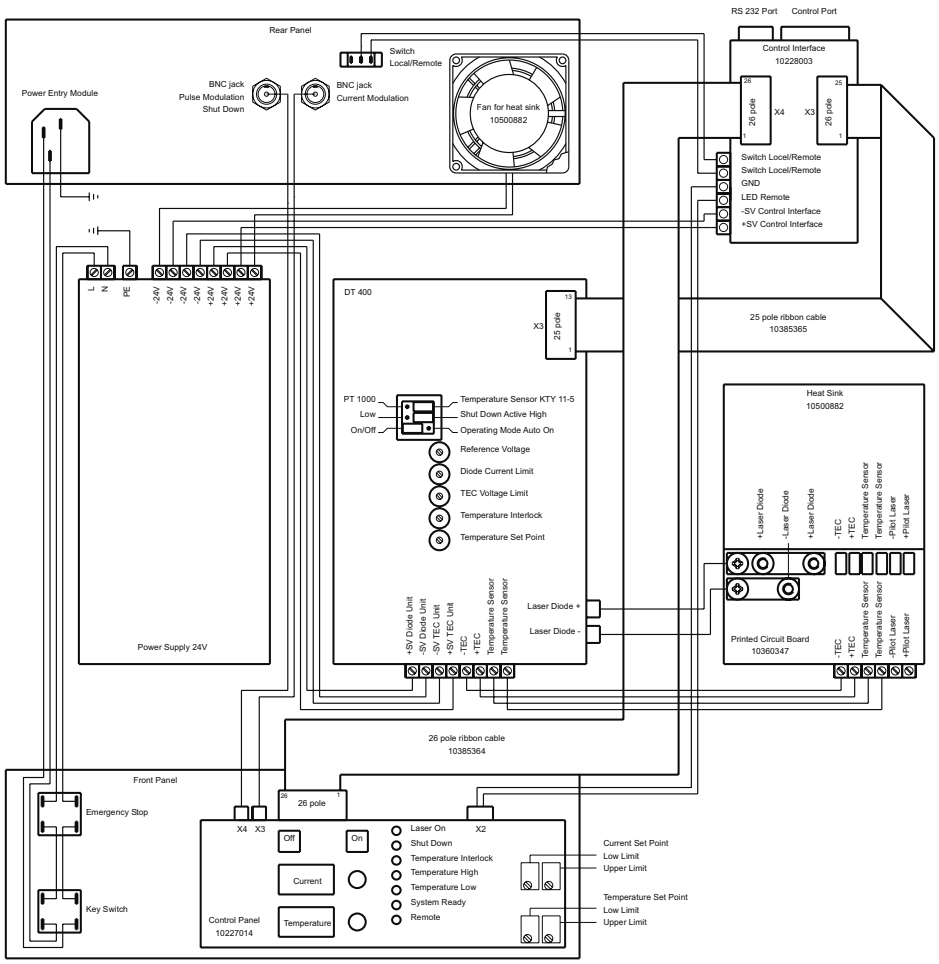
The option of system configuring via the RS 232 port and set-up software re uires a PC with indows ™ operating system makes the system e ceptionally fle ible. For e ample it is possible to define in both operating modes local or remote where the current set point shall come from from internal nonvolatile memory from control port or from control panel.

Front panel
Key-operated switch and emergency stop button for the mains voltage current set point potentiometer temperature set point potentiometer two buttons for Laser On and Laser Off a digital display for the current set point a digital display for the temperature set point and seven LEDs for indicating current states.



Rear panel
Connector for the mains voltage BNC jack for analog current modulation BNC jack for TTL pulse modulation signal or TTL shut down switch Local/Remote 9 pole female plug connector of RS 232 port and 25 pole female plug connector of control port.

Block diagram
System LS 400-50 (10100053) and LS 400-60 (10100083)



System LS 400-50 (10100053) and LS 400-60 (10100083)
Adjustments
Diode current set point
Potentiometer at control panel the range can be adjusted by two potentiometers at the front panel e.g. from 35.6 A to 45.5 A by analog signal at the control port by internal memory or by RS 232 control.
Diode current limit
By analog signal at the control port by internal memory or by RS 232 control.
TEC temperature set point
Potentiometer at control panel the range can be adjusted by two potentiometers at the front panel e.g. from 15.0 C to 26.5 C by analog signal at the control port by internal memory or by RS 232 control.
TEC e cess temperature
By internal memory or by RS 232 control.
Shut down polarity
By internal memory.
TEC voltage limit
TEC voltage limit potentiometer at the DT 400.

Potentiometer adjustments at the DT 400
Reference voltage potentiometer clockwise to its ma imum value factory setting .
Diode current limit potentiometer clockwise to its ma imum value factory setting .
Temperature interlock potentiometer clockwise to its ma imum value factory setting .
Temperature set point potentiometer counterclockwise to its minimum value factory setting .

Jumper settings at the DT 400
Operating mode On/Off factory setting .
Shut Down Active High factory setting .

System set up and remote control
Refer to section set up and remote control in this manual for detailed information.

Current set point range in manual mode after performing system set up
Switch to local mode.
Turn current set point potentiometer clockwise to its ma imum turn the upper right readout potentiometer to the desired value e.g. 45.5 A display reading .
Turn current set point potentiometer counterclockwise to its minimum turn the upper left readout potentiometer to the desired value e.g. 35.6 A display reading .

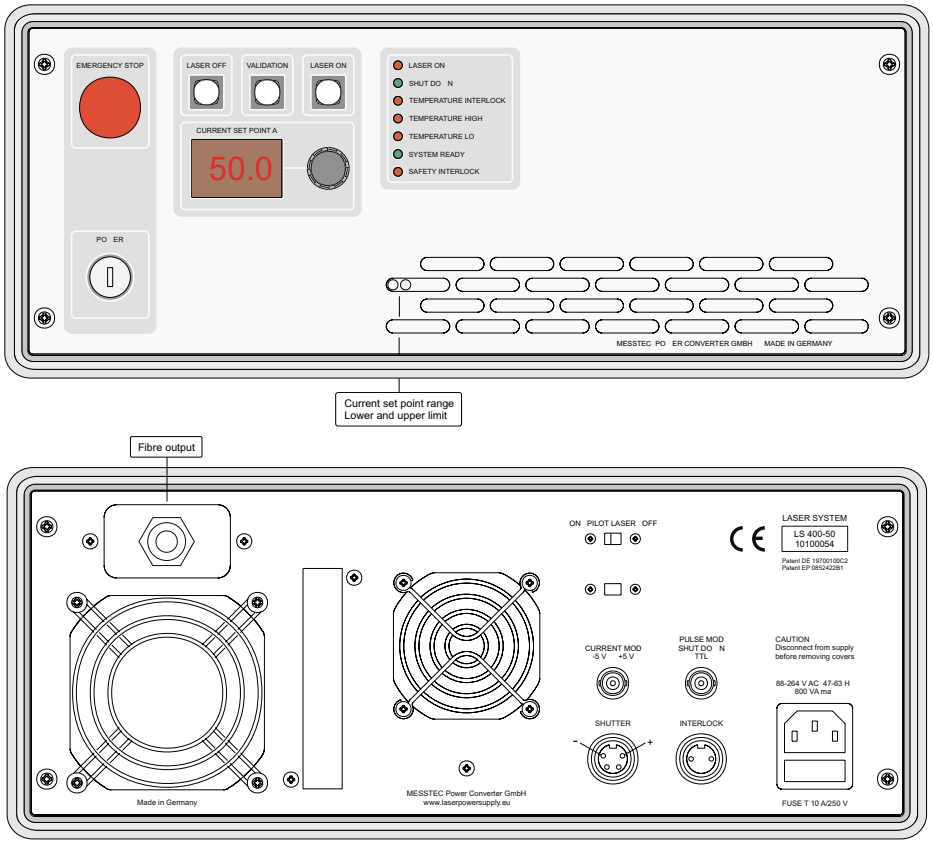
Temperature set point range in manual mode after performing system set up
Switch to local mode.
Turn temperature set point potentiometer clockwise to its ma imum turn the lower right readout potentiometer to the desired value e.g. 26.5 C display reading .
Turn temperature set point potentiometer counterclockwise to its minimum turn the lower left readout potentiometer to the desired value e.g. 15.0 C display reading .

Accessories included in delivery
Key 2 pcs power cord
Cable gland PG9 for the dummy plate
Set up and control software
Operating manual

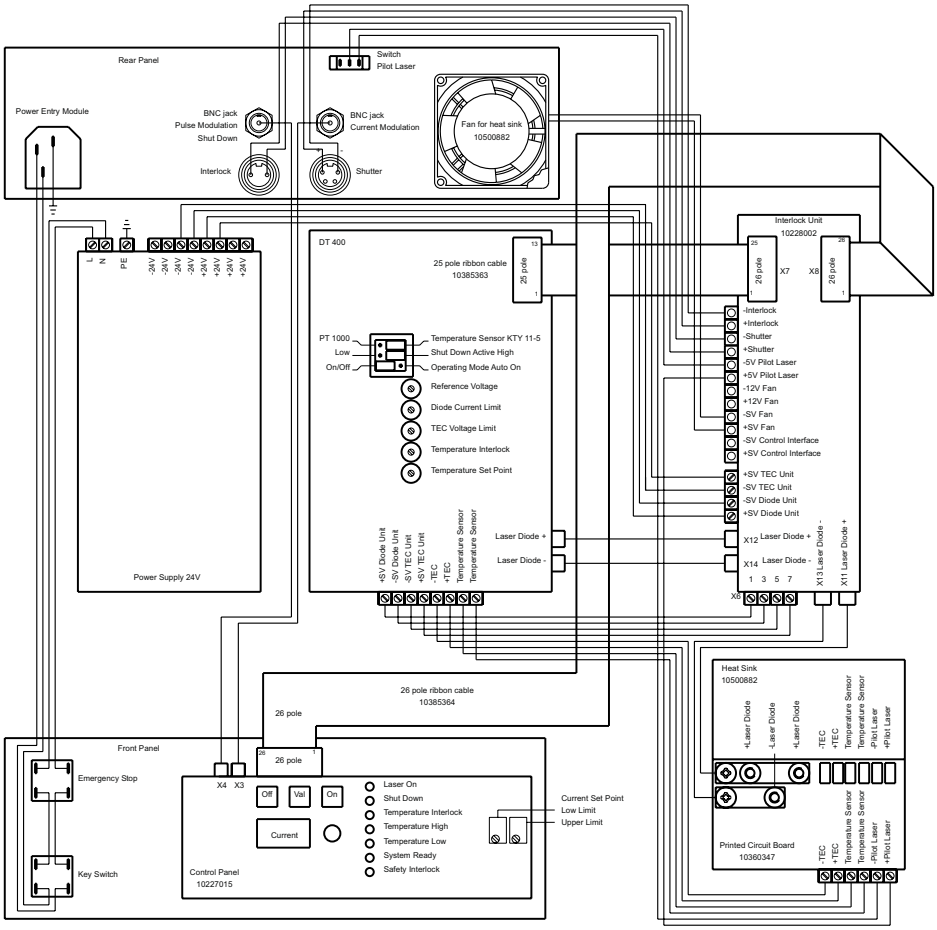
Systems LS 400-50 (10100054), LS 400-60 (10100084), LS 400-50 FP (10100064) and LS 400-60 FP (10100074)
Manually operated systems with safety interlock and with diode currents up to 50 A for LS 400-50 and LS 400-50 FP and diode currents up to 60 A for LS 400-60 and LS 400-60 FP.

Front panel
Key-operated switch and emergency stop button for the mains voltage.
Current set point potentiometer three buttons for Laser On Validation and Laser Off a digital display for the current set point and seven LEDs for indicating states.

Rear panel
Connector for the mains voltage BNC jack for analog current modulation BNC jack for TTL pulse modulation signal or TTL shut down a 2 pole female socket for the interlock contact a 4 pole female socket for a shutter a switch for a pilot laser and a dummy plate for the fibre output.



Block diagram
Systems LS 400-50 (10100054), LS 400-60 (10100084), LS 400-50 FP (10100064) and LS 400-60 FP (10100074)



Systems LS 400-50 (10100054), LS 400-60 (10100084), LS 400-50 FP (10100064) and LS 400-60 FP (10100074)

Description Safety Interlock

A safety interlock is re uired e.g. if a laser operates in a machine where parts will be inserted or removed manually. In this case laser radiation has to be interrupted immediately and the system must be keep in a safe off-state.
A safe off-state may be achieved by a safety beam shutter but in most cases there is less space in the optical path.
A better and cost saving way is to switch off the laser power supply and keep it in a safe off-state. Safe off-state means that the laser power supply must be electrically disconnected switching off by a digital signal like a shut down or a disable signal is forbidden for a safe operating.
It is regulation that disconnection must be happen by a relay or a switch the use of semiconductors or electronic switches for disconnecting is not allowed. The properly function of the relay must be supervised in a manner that malfunction does not lead to an unsafe state.

The safety interlock of the LS 400 complies with regulation and has a lot of additional features for achieving a safe off-state within a very short time.
There are two relays connected in series a working relay and an emergency relay. The emergency relay is always closed the working relay acts if an interlock occures. The normally open contact and the normally closed contact of both relays are supervised.
If the working relays does not work properly or if there is a failure in the interlock unit the emergency relays will be de-energi ed and turns the system in a steady off-state.
Every time the mains voltage is turned on the function of the emergency relays is checked to ensure correct operation. If there is a failure the system cannot be turned on.
Both relays are working currentless for achieving ma imum life time.

If an interlock occures the output for the laser diodes will be short circuited immediately by a semiconductor to ensure that laser radiation will be stopped within a few microseconds.
Simultaneously the laser power supply will be turned off and the working relay will be de-energi ed. At the same time the input capacitors of the laser power supply will be discharged to ensure that no stored energy will cause laser radiation if there is any malfunction.
Also the semiconductor and the circuit for discharging are supervised.
Additionally the interlock unit has an output for a beam shutter. The output is also supervised.

It is regulation that every time an interlock has occured the operator has to confirm system safety by a keystroke to the validation button before continuing operation.
The validation button can be disabled by a jumper this simplifies operating because the button must not be pressed every time an interlock occures. Check country-specific regulations before disabling the validation button.
Ask our support how to disable the validation button.

Interlock input
2 pole female socket manufacturer Binder 99 0604 00 02.

Interlock voltage	12 V	Contact open
Interlock current	appro . 1 mA	Contact closed

An interlock occures if the contact is open.

Systems LS 400-50 (10100054), LS 400-60 (10100084), LS 400-50 FP (10100064) and LS 400-60 FP (10100074)

Shutter output
4 pole female socket manufacturer Binder 99 0612 00 04.
If an interlock occures the shutter output voltage is turned off.
The shutter output voltage is 12 V/0.5 A ma or 24 V/0.5 A ma selectable by a jumper.
Factory setting 12 V.
The jumper is beneath connector X5 of the interlock unit it is difficult to access dismounting of the heatsink is re uired.

Adjustments
Diode current set point
Potentiometer at the control panel the range can be adjusted by two potentiometers at the front panel e.g. from 35.6 A to 45.5 A.
Diode current limit
Diode current limit potentiometer at the DT 400. Factory setting ma imum.
TEC voltage limit
TEC voltage limit potentiometer at the DT 400. Factory setting ma imum.
Temperature set point
Temperature set point potentiometer at the DT 400. Factory setting undefined.
Temperature interlock
Temperature interlock potentiometer at the DT 400. Factory setting ma imum.
Reference voltage
Reference voltage potentiometer at the DT 400. Factory setting ma imum 5.000 V do not turn out of position.

Jumper settings at the DT 400
Operating mode
On/Off
Shut Down
Active High or Active Low. Factory setting active High.

Diode current limit
Turn the current set point potentiometer at the control panel clockwise to its ma imum display reading must be 50.0 A or 60.0 A.
Adjust the current limit potentiometer at the DT 400 to the desired value display reading .

Current set point range
Turn current set point potentiometer clockwise to its ma imum turn the right readout potentiometer to the desired value e.g. 45.5 A display reading .
Turn current set point potentiometer counterclockwise to its minimum turn the left readout potentiometer to the desired value e.g. 20.0 A display reading .

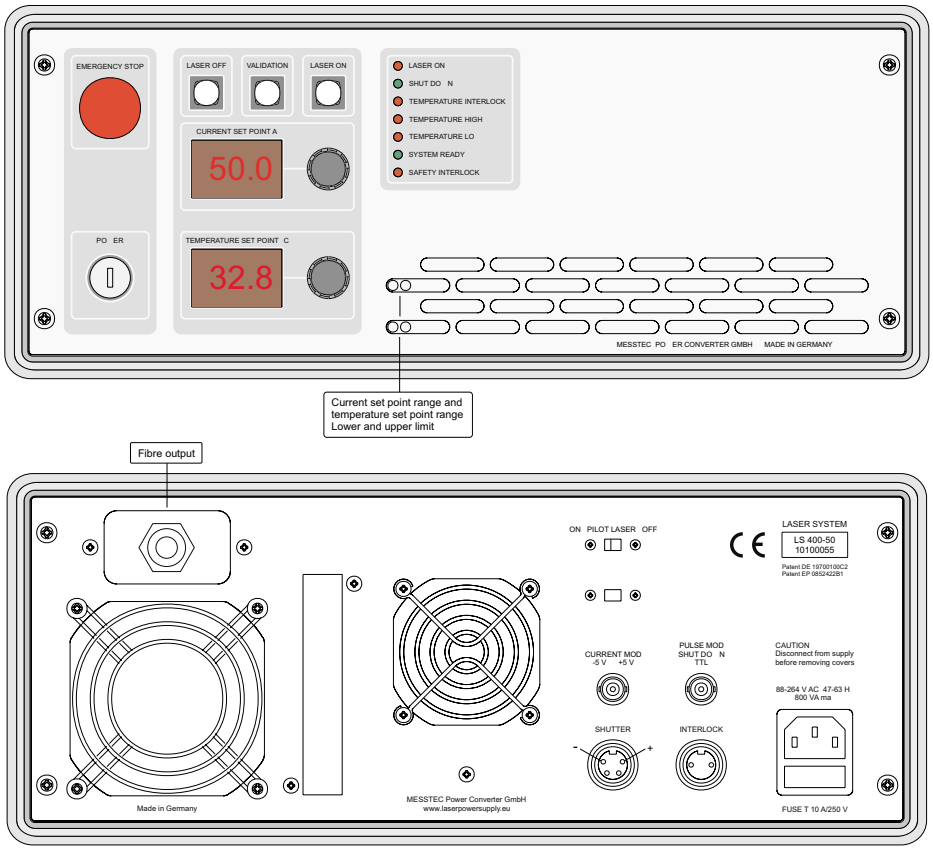
Accessories included in delivery
Key 2 pcs
Power cord
2 pole male cable connector manufacturer Binder 99 0601 00 02 for the interlock input
4 pole male cable connector manufacturer Binder 99 0609 00 04 for the shutter output
Cable gland PG9 for the dummy plate
Operating manual

Systems LS 400-50 FP (10100064) and LS 400-60 FP (10100074)
This systems are the same like the LS 400-50 and the LS 400-60 the difference is that FP systems can be pulsed faster.
Rise time is appro . 500 ns and fall time is appro . 7 s ma imum allowed pulse fre uency is 5 kH .

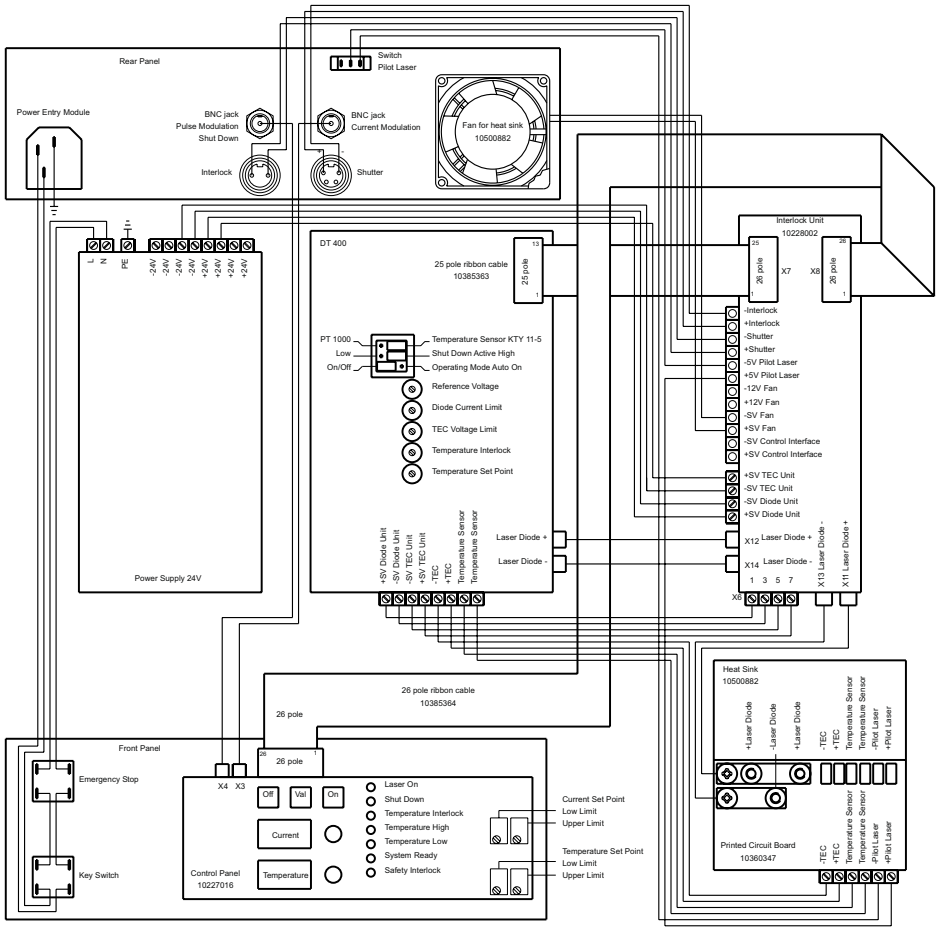
Systems LS 400-50 (10100055), LS 400-60 (10100085), LS 400-50 FP (10100065) and LS 400-60 FP (10100075)
Manually operated systems with safety interlock and with diode currents up to 50 A for LS 400-50 and LS 400-50 FP and diode currents up to 60 A for LS 400-60 and LS 400-60 FP.

Front panel
Key-operated switch and emergency stop button for the mains voltage.
Current set point potentiometer temperature set point potentiometer two buttons for Laser On and Laser Off a digital display for the current set point a digital display for the temperature set point and seven LEDs for indicating states.

Rear panel
Connector for the mains voltage BNC jack for analog current modulation BNC jack for TTL pulse modulation signal or TTL shut down a 2 pole female socket for the interlock contact a 4 pole female socket for a shutter a switch for a pilot laser and a dummy plate for the fibre output.



Block diagram
Systems LS 400-50 (10100055), LS 400-60 (10100085), LS 400-50 FP (10100065) and LS 400-60 FP (10100075)



Systems LS 400-50 (10100055), LS 400-60 (10100085), LS 400-50 FP (10100065) and LS 400-60 FP (10100075)

Description Safety Interlock

A safety interlock is re uired e.g. if a laser operates in a machine where parts will be inserted or removed manually. In this case laser radiation has to be interrupted immediately and the system must be keep in a safe off-state.
A safe off-state may be achieved by a safety beam shutter but in most cases there is less space in the optical path.
A better and cost saving way is to switch off the laser power supply and keep it in a safe off-state.
Safe off-state means that the laser power supply must be electrically disconnected switching off by a digital signal like a shut down or a disable signal is forbidden for a safe operating.
It is regulation that disconnection must be happen by a relay or a switch the use of semiconductors or electronic switches for disconnecting is not allowed. The properly function of the relay must be supervised in a manner that malfunction does not lead to an unsafe state.

The safety interlock of the LS 400 complies with regulation and has a lot of additional features for achieving a safe off-state within a very short time.
There are two relays connected in series a working relay and an emergency relay. The emergency relay is always closed the working relay acts if an interlock occures. The normally open contact and the normally closed contact of both relays are supervised.
If the working relays does not work properly or if there is a failure in the interlock unit the emergency relays will be de-energi ed and turns the system in a steady off-state.
Every time the mains voltage is turned on the function of the emergency relays is checked to ensure correct operation. If there is a failure the system cannot be turned on.
Both relays are working currentless for achieving ma imum life time.

If an interlock occures the output for the laser diodes will be short circuited immediately by a semiconductor to ensure that laser radiation will be stopped within a few microseconds.
Simultaneously the laser power supply will be turned off and the working relay will be de-energi ed. At the same time the input capacitors of the laser power supply will be discharged to ensure that no stored energy will cause laser radiation if there is any malfunction.
Also the semiconductor and the circuit for discharging are supervised.
Additionally the interlock unit has an output for a beam shutter. The output is also supervised.

It is regulation that every time an interlock has occured the operator has to confirm system safety by a keystroke to the validation button before continuing operation.
The validation button can be disabled by a jumper this simplifies operating because the button must not be pressed every time an interlock occures. Check country-specific regulations before disabling the validation button.
Ask our support how to disable the validation button.

Interlock input
2 pole female socket manufacturer Binder 99 0604 00 02.

Interlock voltage	12 V	Contact open
Interlock current	appro . 1 mA	Contact closed

An interlock occures if the contact is open.

Systems LS 400-50 (10100055), LS 400-60 (10100085), LS 400-50 FP (10100065) and LS 400-60 FP (10100075)

Shutter output
4 pole female socket manufacturer Binder 99 0612 00 04.
If an interlock occures the shutter output voltage is turned off.
The shutter output voltage is 12 V/0.5 A ma or 24 V/0.5 A ma selectable by a jumper.
Factory setting 12 V.
The jumper is beneath connector X5 of the interlock unit it is difficult to access dismounting of the heatsink is re uired.

Adjustments
Diode current set point
Potentiometer at the control panel the range can be adjusted by two potentiometers at the front panel e.g. from 35.6 A to 45.5 A.
Diode current limit
Diode current limit potentiometer at the DT 400. Factory setting ma imum.
TEC voltage limit
TEC voltage limit potentiometer at the DT 400. Factory setting ma imum.
Temperature set point
Potentiometer at the control panel the range can be adjusted by two potentiometers at the front panel e.g. from 15.0 C to 26.5 C.
Temperature set point potentiometer at the DT 400. Factory setting minimum.
Temperature interlock
Temperature interlock potentiometer at the DT 400. Factory setting ma imum.
Reference voltage potentiometer at the DT 400. Factory setting ma imum 5.000 V do not turn out of position.

Jumper settings at the DT 400
Operating mode
On/Off
Shut Down
Active High or Active Low. Factory setting active High.

Diode current limit
Turn the current set point potentiometer at the control panel clockwise to its ma imum display reading must be 50.0 A or 60.0 A.
Adjust the current limit potentiometer at the DT 400 to the desired value display reading .

Current set point range
Turn current set point potentiometer clockwise to its ma imum turn the upper right readout potentiometer to the desired value e.g. 45.5 A display reading .
Turn current set point potentiometer counterclockwise to its minimum turn the upper left readout potentiometer to the desired value e.g. 20.0 A display reading .

Temperature set point range
Turn temperature set point potentiometer clockwise to its ma imum turn the lower right readout potentiometer to the desired value e.g. 26.5 C display reading .
Turn temperature set point potentiometer counterclockwise to its minimum turn the lower left readout potentiometer to the desired value e.g. 15.0 C display reading .

Accessories included in delivery
Key 2 pcs
Power cord
2 pole male cable connector manufacturer Binder 99 0601 00 02 for the interlock input
4 pole male cable connector manufacturer Binder 99 0609 00 04 for the shutter output
Cable gland PG9 for the dummy plate
Operating manual

Systems LS 400-50 FP (10100065) and LS 400-60 FP (10100075)
This systems are the same like the LS 400-50 and the LS 400-60 the difference is that FP systems can be pulsed faster.
Rise time is appro . 500 ns and fall time is appro . 7 s ma imum allowed pulse fre uency is 5 kH .

Systems LS 400-50 (10100056), LS 400-60 (10100086), LS 400-50 FP (10100066) and LS 400-60 FP (10100076)

Manually operated and remote-controlled systems with safety interlock and with diode currents up to 50 A for LS 400-50 and diode currents up to 60 A for LS 400-60.

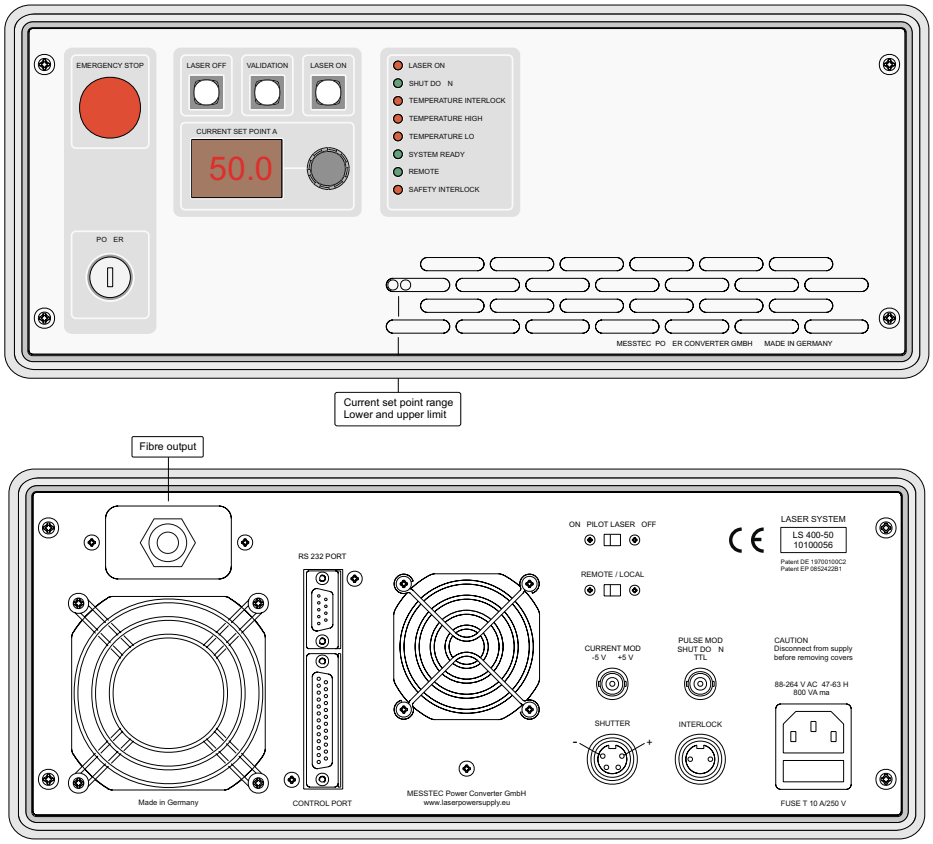
The system can be fully configured and controlled via the RS 232 port and fully controlled via the control port.

Signal levels at the control port meet the common industry standard for directly connecting a programmable controller PLC or any other controller.

The option of system configuring via the RS 232 port and set-up software re uires a PC with indows ™ operating system makes the system e ceptionally fle ible. For e ample it is possible to define in both operating modes local or remote where the current set point shall come from from internal nonvolatile memory from control port or from control panel.

Front panel

Key-operated switch and emergency stop button for the mains voltage current set point potentiometer three buttons for Laser On Validation and Laser Off a digital display for the current set point and eight LEDs for indicating current states.



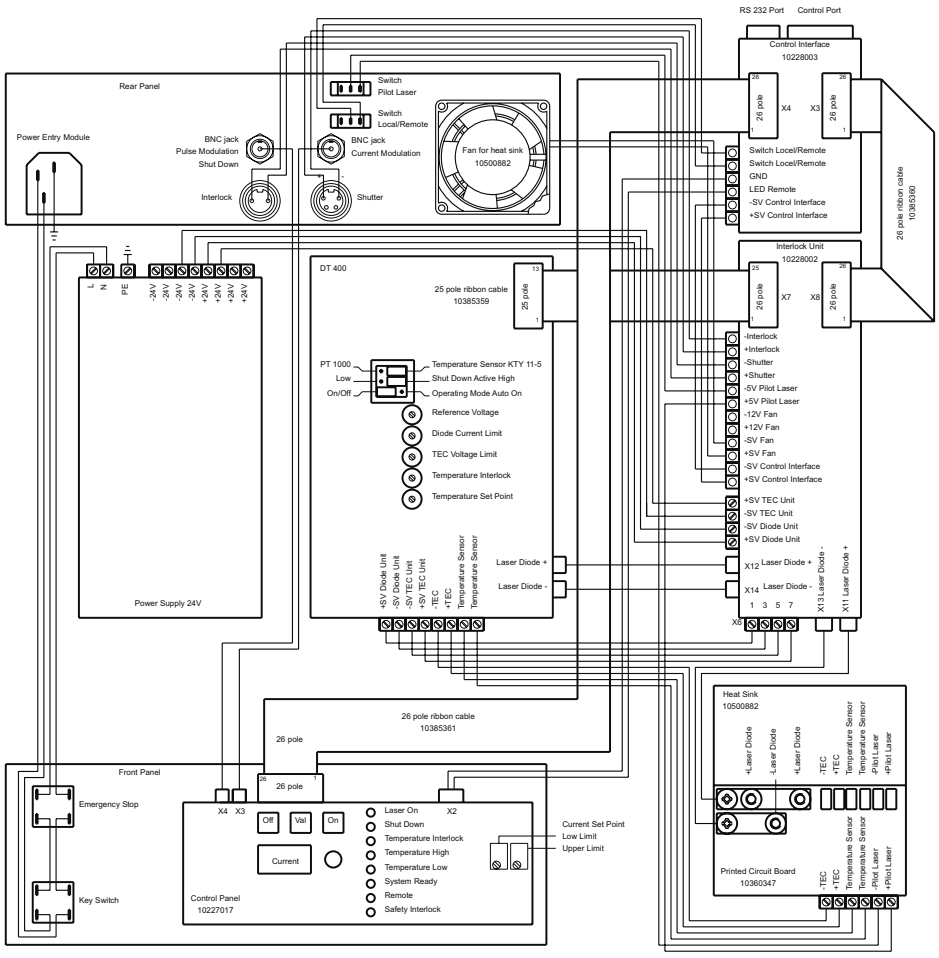
Systems LS 400-50 (10100056), LS 400-60 (10100086), LS 400-50 FP (10100066) and LS 400-60 FP (10100076)

Rear panel

Connector for the mains voltage BNC jack for analog current modulation BNC jack for TTL pulse modulation signal or TTL shut down switch Local/Remote switch pilot laser 9 pole female plug connector of RS 232 port and 25 pole female plug connector of control port.

Block diagram

Systems LS 400-50 (10100056), LS 400-60 (10100086), LS 400-50 FP (10100066) and LS 400-60 FP (10100076)



Systems LS 400-50 (10100056), LS 400-60 (10100086), LS 400-50 FP (10100066) and LS 400-60 FP (10100076)

Description Safety Interlock

A safety interlock is re uired e.g. if a laser operates in a machine where parts will be inserted or removed manually. In this case laser radiation has to be interrupted immediately and the system must be keep in a safe off-state.
A safe off-state may be achieved by a safety beam shutter but in most cases there is less space in the optical path.
A better and cost saving way is to switch off the laser power supply and keep it in a safe off-state.
Safe off-state means that the laser power supply must be electrically disconnected switching off by a digital signal like a shut down or a disable signal is forbidden for a safe operating.
It is regulation that disconnection must be happen by a relay or a switch the use of semiconductors or electronic switches for disconnecting is not allowed. The properly function of the relay must be supervised in a manner that malfunction does not lead to an unsafe state.

The safety interlock of the LS 400 complies with regulation and has a lot of additional features for achieving a safe off-state within a very short time.
There are two relays connected in series a working relay and an emergency relay. The emergency relay is always closed the working relay acts if an interlock occures. The normally open contact and the normally closed contact of both relays are supervised.
If the working relays does not work properly or if there is a failure in the interlock unit the emergency relays will be de-energi ed and turns the system in a steady off-state.
Every time the mains voltage is turned on the function of the emergency relays is checked to ensure correct operation. If there is a failure the system cannot be turned on.
Both relays are working currentless for achieving ma imum life time.

If an interlock occures the output for the laser diodes will be short circuited immediately by a semiconductor to ensure that laser radiation will be stopped within a few microseconds.
Simultaneously the laser power supply will be turned off and the working relay will be de-energi ed. At the same time the input capacitors of the laser power supply will be discharged to ensure that no stored energy will cause laser radiation if there is any malfunction.
Also the semiconductor and the circuit for discharging are supervised.
Additionally the interlock unit has an output for a beam shutter. The output is also supervised.

It is regulation that every time an interlock has occured the operator has to confirm system safety by a keystroke to the validation button before continuing operation.
The validation button can be disabled by a jumper this simplifies operating because the button must not be pressed every time an interlock occures. Check country-specific regulations before disabling the validation button.
Ask our support how to disable the validation button.

Interlock input
2 pole female socket manufacturer Binder 99 0604 00 02.

Interlock voltage	12 V	Contact open
Interlock current	appro . 1 mA	Contact closed

An interlock occures if the contact is open.

Systems LS 400-50 (10100056), LS 400-60 (10100086), LS 400-50 FP (10100066) and LS 400-60 FP (10100076)

Shutter output
4 pole female socket manufacturer Binder 99 0612 00 04.
If an interlock occures the shutter output voltage is turned off.
The shutter output voltage is 12 V/0.5 A ma or 24 V/0.5 A ma selectable by a jumper.
Factory setting 12 V.
The jumper is beneath connector X5 of the interlock unit it is difficult to access dismounting of the heatsink is re uired.

Adjustments
Diode current set point
Potentiometer at control panel the range can be can be adjusted by two potentiometers e.g. from 35.6 A to 45.5 A by analog signal at the control port by internal memory or by RS 232 control.
Diode current limit
By analog signal at the control port by internal memory or by RS 232 control.
TEC temperature set point
By analog signal at the control port by internal memory or by RS 232 control.
TEC e cess temperature
By internal memory or by RS 232 control.
Shut down polarity
By internal memory.
TEC voltage limit
TEC voltage limit potentiometer at the DT 400.

Potentiometer adjustments at the DT 400
Reference voltage potentiometer clockwise to its ma imum value factory setting .
Diode current limit potentiometer clockwise to its ma imum value factory setting .
Temperature interlock potentiometer clockwise to its ma imum value factory setting .
Temperature set point potentiometer counterclockwise to its minimum value factory setting .

Jumper settings at the DT 400
Operating mode On/Off factory setting .
Shut Down Active High factory setting .

System set up and remote control
Refer to section set up and remote control in this manual for detailed information.

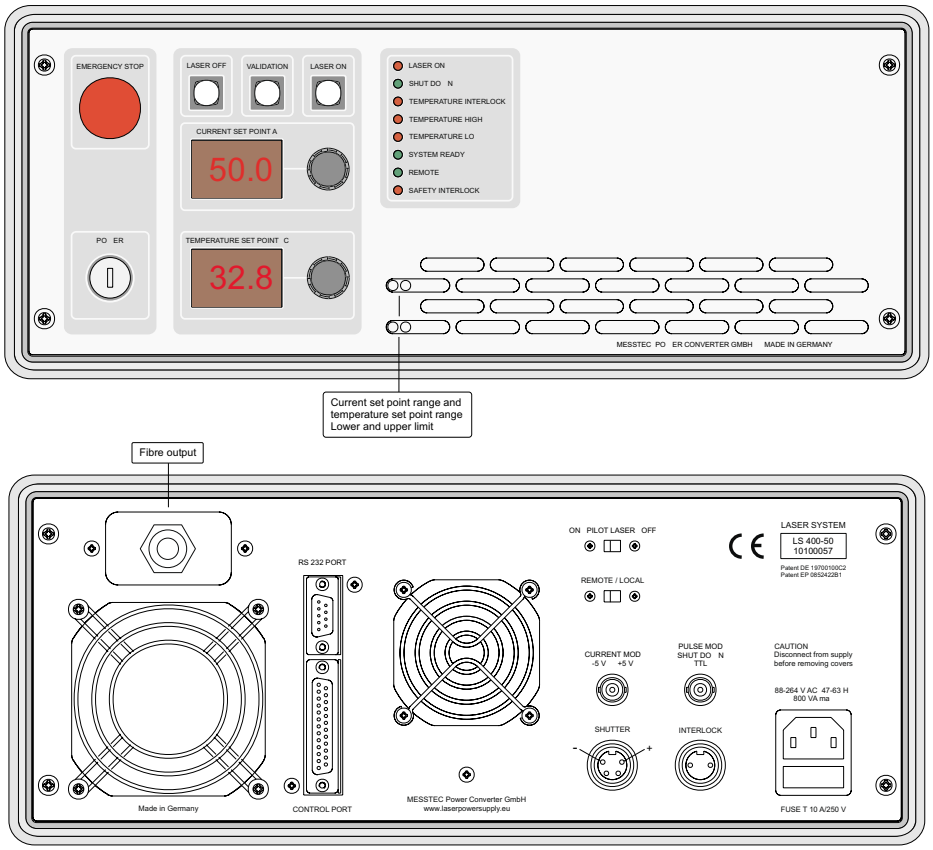
Current set point range in manual mode after performing system set up
Switch to local mode.
Turn current set point potentiometer clockwise to its ma imum turn the right readout potentiometer to the desired value e.g. 45.5 A display reading .
Turn current set point potentiometer counterclockwise to its minimum turn the left readout potentiometer to the desired value e.g. 35.6 A display reading .

Systems LS 400-50 (10100056), LS 400-60 (10100086), LS 400-50 FP (10100066) and LS 400-60 FP (10100076)

Accessories included in delivery
Key 2 pcs
Power cord
2 pole male cable connector manufacturer Binder 99 0601 00 02 for the interlock input
4 pole male cable connector manufacturer Binder 99 0609 00 04 for the shutter output
Cable gland PG9 for the dummy plate
Set up and control software
Operating manual

Systems LS 400-50 FP (10100066) and LS 400-60 FP (10100076)
This systems are the same like the LS 400-50 and the LS 400-60 the difference is that FP systems can be pulsed faster.
Rise time is appro . 500 ns and fall time is appro . 7 s ma imum allowed pulse fre uency is 5 kH .

Systems LS 400-50 (10100057), LS 400-60 (10100087), LS 400-50 FP (10100067) and LS 400-60 FP (10100077)
Manually operated and remote-controlled systems with safety interlock and with diode currents up to 50 A for LS 400-50 and diode currents up to 60 A for LS 400-60.
The system can be fully configured and controlled via the RS 232 port and fully controlled via the control port.
Signal levels at the control port meet the common industry standard for directly connecting a programmable controller PLC or any other controller.
The option of system configuring via the RS 232 port and set-up software re uires a PC with indows ™ operating system makes the system e ceptionally fle ible. For e ample it is possible to define in both operating modes local or remote where the current set point shall come from from internal nonvolatile memory from control port or from control panel.
Front panel Key-operated switch and emergency stop button for the mains voltage current set point potentiometer temperature set point potentiometer three buttons for Laser On Validation and Laser Off a digital display for the current set point a digital display for the temperature set point and eight LEDs for indicating current states.



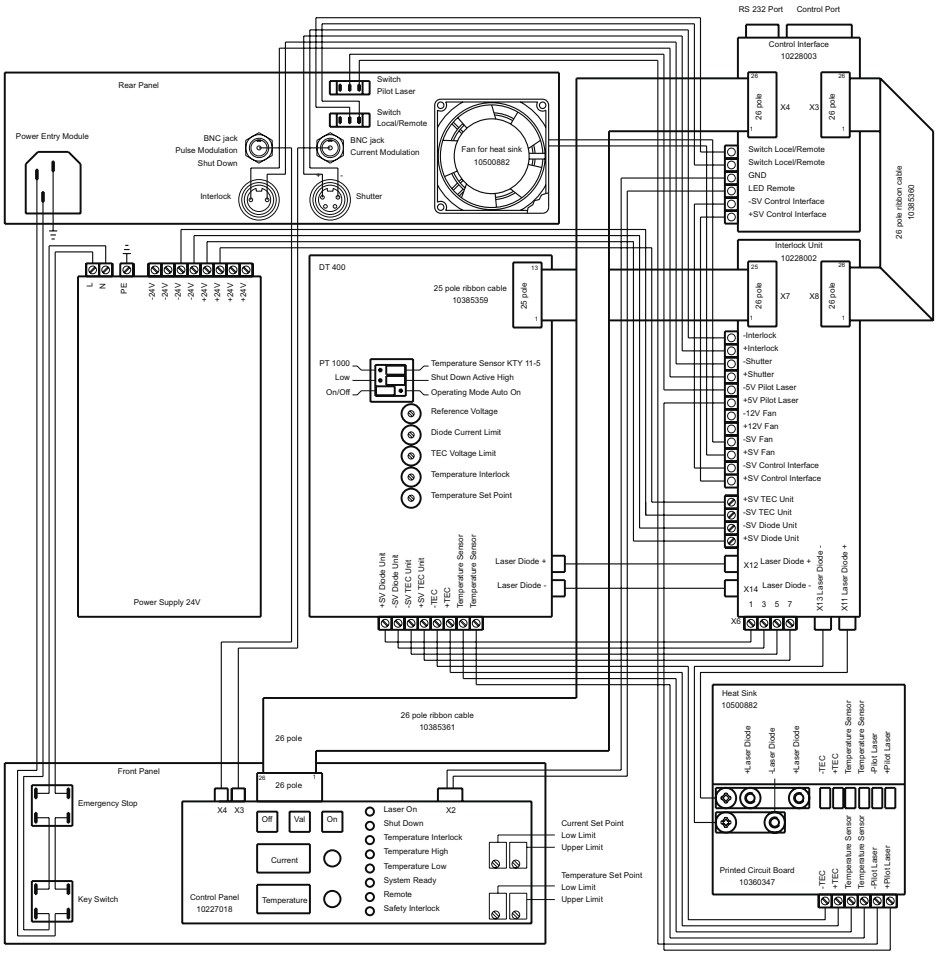
Systems LS 400-50 (10100057), LS 400-60 (10100087), LS 400-50 FP (10100067) and LS 400-60 FP (10100077)

Rear panel

Connector for the mains voltage BNC jack for analog current modulation BNC jack for TTL pulse modulation signal or TTL shut down switch Local/Remote switch pilot laser 9 pole female plug connector of RS 232 port and 25 pole female plug connector of control port.

Block diagram

Systems LS 400-50 (10100057), LS 400-60 (10100087), LS 400-50 FP (10100067) and LS 400-60 FP (10100077)



Systems LS 400-50 (10100057), LS 400-60 (10100087), LS 400-50 FP (10100067) and LS 400-60 FP (10100077)

Description Safety Interlock

A safety interlock is re uired e.g. if a laser operates in a machine where parts will be inserted or removed manually. In this case laser radiation has to be interrupted immediately and the system must be keep in a safe off-state.
A safe off-state may be achieved by a safety beam shutter but in most cases there is less space in the optical path.
A better and cost saving way is to switch off the laser power supply and keep it in a safe off-state.
Safe off-state means that the laser power supply must be electrically disconnected switching off by a digital signal like a shut down or a disable signal is forbidden for a safe operating.
It is regulation that disconnection must be happen by a relay or a switch the use of semiconductors or electronic switches for disconnecting is not allowed. The properly function of the relay must be supervised in a manner that malfunction does not lead to an unsafe state.

The safety interlock of the LS 400 complies with regulation and has a lot of additional features for achieving a safe off-state within a very short time.
There are two relays connected in series a working relay and an emergency relay. The emergency relay is always closed the working relay acts if an interlock occures. The normally open contact and the normally closed contact of both relays are supervised.
If the working relays does not work properly or if there is a failure in the interlock unit the emergency relays will be de-energi ed and turns the system in a steady off-state.
Every time the mains voltage is turned on the function of the emergency relays is checked to ensure correct operation. If there is a failure the system cannot be turned on.
Both relays are working currentless for achieving ma imum life time.

If an interlock occures the output for the laser diodes will be short circuited immediately by a semiconductor to ensure that laser radiation will be stopped within a few microseconds.
Simultaneously the laser power supply will be turned off and the working relay will be de-energi ed. At the same time the input capacitors of the laser power supply will be discharged to ensure that no stored energy will cause laser radiation if there is any malfunction.
Also the semiconductor and the circuit for discharging are supervised.
Additionally the interlock unit has an output for a beam shutter. The output is also supervised.

It is regulation that every time an interlock has occured the operator has to confirm system safety by a keystroke to the validation button before continuing operation.
The validation button can be disabled by a jumper this simplifies operating because the button must not be pressed every time an interlock occures. Check country-specific regulations before disabling the validation button.
Ask our support how to disable the validation button.

Interlock input
2 pole female socket manufacturer Binder 99 0604 00 02.

Interlock voltage	12 V	Contact open
Interlock current	appro . 1 mA	Contact closed

An interlock occures if the contact is open.

Systems LS 400-50 (10100057), LS 400-60 (10100087), LS 400-50 FP (10100067) and LS 400-60 FP (10100077)

Shutter output
4 pole female socket manufacturer Binder 99 0612 00 04.
If an interlock occures the shutter output voltage is turned off.
The shutter output voltage is 12 V/0.5 A ma or 24 V/0.5 A ma selectable by a jumper.
Factory setting 12 V.
The jumper is beneath connector X5 of the interlock unit it is difficult to access dismounting of the heatsink is re uired.

Adjustments
Diode current set point
Potentiometer at control panel the range can be can be adjusted by two potentiometers at the front panel e.g. from 35.6 A to 45.5 A by analog signal at the control port by internal memory or by RS 232 control.
Diode current limit
By analog signal at the control port by internal memory or by RS 232 control.
TEC temperature set point
Potentiometer at control panel the range can be adjusted by two potentiometers at the front panel e.g. from 15.0 C to 26.5 C by analog signal at the control port by internal memory or by RS 232 control.
TEC e cess temperature
By internal memory or by RS 232 control.
Shut down polarity
By internal memory.
TEC voltage limit
TEC voltage limit potentiometer at the DT 400.

Potentiometer adjustments at the DT 400
Reference voltage potentiometer clockwise to its ma imum value factory setting .
Diode current limit potentiometer clockwise to its ma imum value factory setting .
Temperature interlock potentiometer clockwise to its ma imum value factory setting .
Temperature set point potentiometer counterclockwise to its minimum value factory setting .

Jumper settings at the DT 400
Operating mode On/Off factory setting .
Shut Down Active High factory setting .

System set up and remote control
Refer to section set up and remote control in this manual for detailed information.

Current set point range in manual mode after performing system set up
Switch to local mode.
Turn current set point potentiometer clockwise to its ma imum turn the upper right readout potentiometer to the desired value e.g. 45.5 A display reading .
Turn current set point potentiometer counterclockwise to its minimum turn the upper left readout potentiometer to the desired value e.g. 35.6 A display reading .

Systems LS 400-50 (10100057), LS 400-60 (10100087), LS 400-50 FP (10100067) and LS 400-60 FP (10100077)

Temperature set point range in manual mode after performing system set up
Switch to local mode.
Turn temperature set point potentiometer clockwise to its ma imum turn the lower right readout potentiometer to the desired value e.g. 26.5 C display reading .
Turn temperature set point potentiometer counterclockwise to its minimum turn the lower left readout potentiometer to the desired value e.g. 15.0 C display reading .

Accessories included in delivery
Key 2 pcs
Power cord
2 pole male cable connector manufacturer Binder 99 0601 00 02 for the interlock input
4 pole male cable connector manufacturer Binder 99 0609 00 04 for the shutter output
Cable gland PG9 for the dummy plate
Set up and control software
Operating manual

Systems LS 400-50 FP (10100067) and LS 400-60 FP (10100077)
This systems are the same like the LS 400-50 and the LS 400-60 the difference is that FP systems can be pulsed faster.
Rise time is appro . 500 ns and fall time is appro . 7 s ma imum allowed pulse fre uency is 5 kH .

Control port and RS 232 port
Systems LS 400-50 10100052 10100053 10100056 10100057
Systems LS 400-60 10100082 10100083 10100086 10100087
Systems LS 400-50 FP 10100066 10100067
Systems LS 400-60 FP 10100076 10100077

The control port and the RS 232 port are microprocessor controlled.
Signal levels at the control port meet the common industry standard such as analog levels of 0 ... 10 V for inputs and outputs and digital levels up to 30 V for directly connecting a programmable controller PLC or any other controller.

The systems can be fully controlled via the control port and fully configured and controlled via the RS 232 port.
The option of system configuring via the RS 232 port and set-up software re uires a PC with indows ™ operating system makes the system e ceptionally fle ible.
It is possible to define in both operating modes local or remote where the current set point and the temperature set point shall come from from internal nonvolatile memory from control port or from a control panel and it is possible to define where the current limit shall come from from internal nonvolatile memory ore from control port.

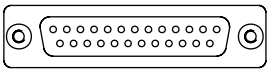
E ample 1
You can configure a remote controlled system in such a way that it is controlled by a PLC at the control port but nevertheless the current set point can be adjusted manually at the control panel. The current limit value and the temperature set point is given via the control port or by the internal nonvolatile memory.
This allows remote operating with the possibility of manually correcting manufacturing results.

E ample 2
You can configure a local controlled system in such a way that it is manually controlled by the buttons at the control panel but the current set point or the temperature set point cannot be adjusted manually. This values are given by the internal nonvolatile memory.

Refer to section set up and remote control in this manual for detailed information.

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

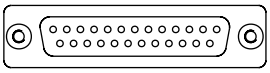
Control Port



CA Control Data Analog
CD Control Data Digital
SA Status Data Analog
SD Status Data Digital

Inputs		
Pin	Name	Function
15	CA-DCSP	Diode Current Set Point
2	CA-DCL	Diode Current Limit
3	CA-PTSP	Peltier Temperature Set Point
6	CD-DCON	Diode Current On
19	CD-DCSD	Diode Current Shut Down
7	CD-PSD	Peltier Voltage Shut Down
1	GND	Signal Ground
14	GND	Signal Ground
Outputs		
Pin	Name	Function
4	SA-DCACT	Diode Current Actual
16	SA-DCSPLIM	Diode Current Set Point Limited
17	SA-DVACT	Diode Voltage Actual
5	SA-DPEACT	Diode Power Electrically Actual
18	SA-PTACT	Peltier Temperature Actual
24	REF	Reference Voltage
12	AUX+5V	Au iliary Voltage +5 V
25	AUX+15V	Au iliary Voltage +15 V
13	AUX-15V	Au iliary Voltage -15 V
23	SD-READY	Ready
8	SD-DCON	Diode Current On
20	SD-DCSD	Diode Current Shut Down
21	SD-PTL	Peltier Temperature Low
9	SD-PTH	Peltier Temperature High
22	SD-PTI	Peltier Temperature Interlock
10	SD-SIL	Safety Interlock
11	SD-REM	Remote
1	GND	Signal Ground
14	GND	Signal Ground

Control Port



Control Port

Signal Description

CA-DCSP
Control Analog - Diode Current Set Point
Analog input 0 ... +10.000 V for the current set point.
+10.000 V corresponds to the ma imum output current of the system 50 A or 60 A .

CA-DCL
Control Analog - Diode Current Limit
Analog input 0 .... +10.000 V for the diode current limit.
+10.000 V corresponds to the ma imum output current of the system.
The diode current limit value is defined either by the value of the CA-DCL signal the value of the nonvolatile memory setup software the value of the RS 232 software or by the setting of the diode current limit potentiometer at the DT 400.
Turn current limit potentiometer at the DT 400 clockwise to it s ma imum value if you would like to define the current limit value by the CA-DCL signal by memory or by RS 232.

CA-PTSP
Control Analog - Peltier Temperature Set Point
Analog input 0 .... +10.000 V for a peltier temperature of 0 ... +50 C.
The peltier temperature set point is defined either by the value of the CA-PTSP signal the value of the nonvolatile memory setup software the value of the RS 232 software or by the setting of the temperature set point potentiometer at the DT 400.
Turn temperature set point potentiometer at the DT 400 counterclockwise to it s minimum value if you would like to define the temperature set point by the CA-DCL signal by memory or by RS 232.

CD-DCON
Control Digital - Diode Current On
Digital input active high. High turns diode current on low turns off.

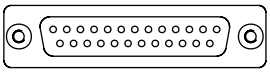
CD-DCSD
Control Digital - Diode Current Shut Down
Digital input active high or active low depends on configuration by setup software.
Disables diode current.

CD-PSD
Control Digital - Peltier Voltage Shut Down
Digital input active high. High turns the peltier voltage off.

SA-DCACT
Status Analog - Diode Current Actual
Analog output 0 ... +10.000 V reflects the actual diode current.

SA-DCSPLIM
Status Analog - Diode Current Set Point Limited
Analog output 0 ... +10.000 V reflects the actual diode current set point limited by the diode current limit value. The diode current limit value may be the CA-DCL signal the value of the nonvolatile memory setup software or the setting of the diode current limit potentiometer at the DT 400.

Control Port



Control Port

SA-DVACT
Status Analog - Diode Voltage Actual
Analog output 0 ... +10.000 V reflects the actual diode voltage.
+10.000 V corresponds to a diode voltage of +25.000 V.

SA-DPEACT
Status Analog - Diode Power Electrically Actual
Analog output 0 ... +10.000 V reflects the actual electrically diode power.
+10.000 V corresponds to a diode power of 500 .

SA-PTACT
Status Analog - Peltier Temperature Actual
Analog output 0 ... +10.000 V reflects the actual peltier temperature.
0 ...+10.000 V corresponds to a peltier temperature of 0 ... +50 C.

REF
Analog output +5.000 V ±0.1 output impedance is 100 Ω.

AUX+5V
Au iliary voltage +5.1 V ma imum allowed current is 200 mA.

AUX+15V
Au iliary voltage appro . +15 V ma imum allowed current is 100 mA.

AUX-15V
Au iliary voltage appro . -15 V ma imum allowed current is 100 mA.

SD-READY
Status Digital - Ready
Digital output open collector active low. Low if there are no errors and if the system is ready.

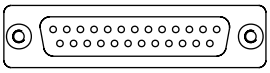
SD-DCON
Status Digital - Diode Current On
Digital output open collector active low. Low if the diode current is turned on.

SD-DCSD
Status Digital - Diode Current Shut Down
Digital output open collector active low. Low if the diode current shut down is active.

SD-PTL
Status Digital - Peltier Temperature Low
Digital output open collector active low. Low if the peltier temperature is too low.

SD-PTH
Status Digital - Peltier Temperature High
Digital output open collector active low. Low if the peltier temperature is too high.

Control Port



Control Port

SD-PTI
Status Digital - Peltier Temperature Interlock
Digital output open collector active low. Low if there is a peltier temperature interlock.
A peltier temperature interlock means that the peltier temperature has e ceeded
the temperature supervision value due to e cessive temperature.
The temperature supervision value is defined either by the value of the nonvolatile memory setup software or by the setting of the temperature interlock potentiometer at the DT 400.
Turn temperature interlock potentiometer at the DT 400 clockwise to it s ma imum value if you would like to define the supervision value by the setup software.

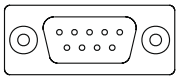
SD-SIL
Status Digital - Safety Interlock
Digital output open collector active low. Low if an interlock occured.

SD-REM
Status Digital - Remote
Digital output open collector active low. Low if the system works in the remote operating mode.

Digital signal levels
All digital inputs can be operated by TTL CMOS or any other logic levels up to +30 V.
All digital outputs can drive up to 20 mA the ma imum permitted voltage is +30 V.

RS 232 Port

RS 232 Port



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

The serial interface meets the re uirement of the RS 232C standard.
It is configured as a data terminal e uipmnet DEE .
The port sends data at pin 2 TX and receives data at pin 3 RX signal ground is at pin 5.
A hardware handshake is not used. The RTS/CTS signal can be looped through by a jumper or a fi ed state 0 or 1 can be assigned to RTS.
The logic states correspond to the CCiTT recommendation V.28.

Permitted baud rates are 1200 2400 4800 9600 19200 38400 57600 and 115200.

The data format is 8 data bits no parity one stop bit.
No software hand shake XON XOFF is used.
The interface is full duple capable.

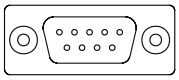
The interface can interact directly with a PC via a 9 pole cable it receives control data and sends status data and measurements of the complete system.
Status data and measurements will be permanently sent independently of the operating mode manually operated operated by control port operated by RS 232 port .

The option of system configuring and saving configuring data in the nonvolatile memory of the control interface makes the system e ceptionally fle ible.
For e ample it is possible to define in both operating modes local or remote where the current set point shall come from from internal memory from control port or from control panel.

System configuring and controlling may be done by customer software or by the LS 400 system software which is included in delivery.
This software is very comfortable and easy to handle. It allows system configuring system controlling and system monitoring.
Customer-specific modification of the LS 400 software is possible for instance putting your logos at the screen or suchlike.
Ask our support for customer-specific software.

System software Set Up

RS 232 Port

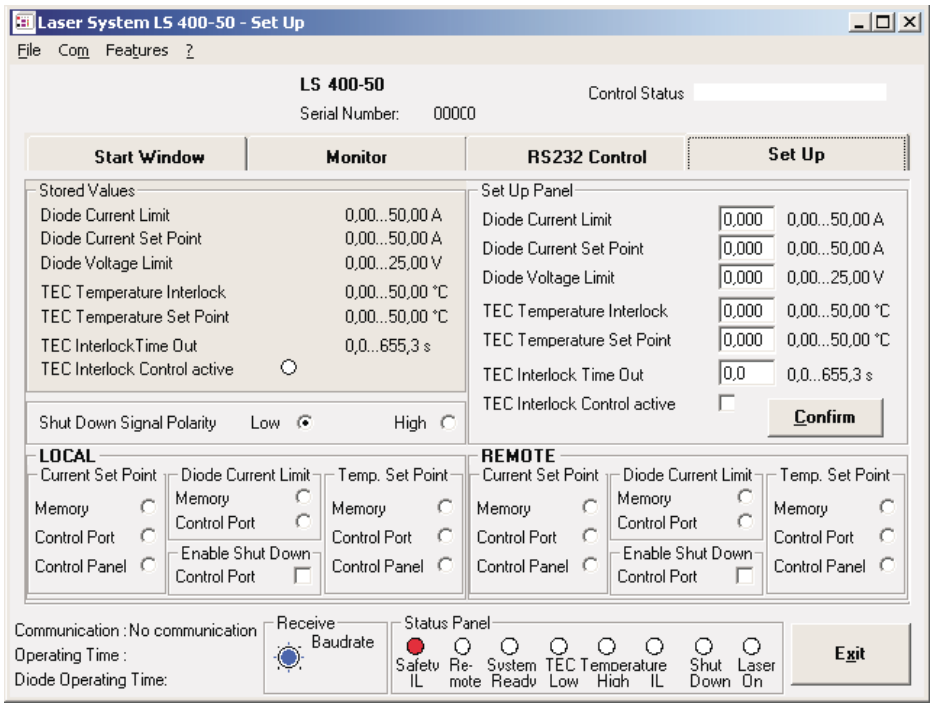


Install the system software and connect a PC at the RS 232 port.
Turn on your system start the program and select Set Up for configuring your system.
Enter the re uired values at the Set Up panel this values will be stored in the nonvolatile memory of the system and will be relevant if memory is selected as a data source in the local or remote mode.
The Diode Voltage Limit value does not really affect the output voltage of the system it is a supervision value which leads to a warning if e ceeded. This is useful for detecting bad laser diodes or bad contacts at the output lines.

For the TEC Temperature Interlock and the TEC Interlock Time Out do not select low values. Consider that in most cases a thermal overshoot will occur if the system is turned on.
Select whether the TEC Interlock Control shall be active or not. If you select active the system will be turned off after the TEC interlock time if there is e cessive TEC temperature.

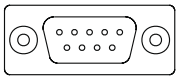
Select Shut Down Signal Polarity Low or High. If you select High the diode current will be shut down if the shut down signal is High.

Press the Confirm button the values will be stored in the memory of the system.



System software Set Up

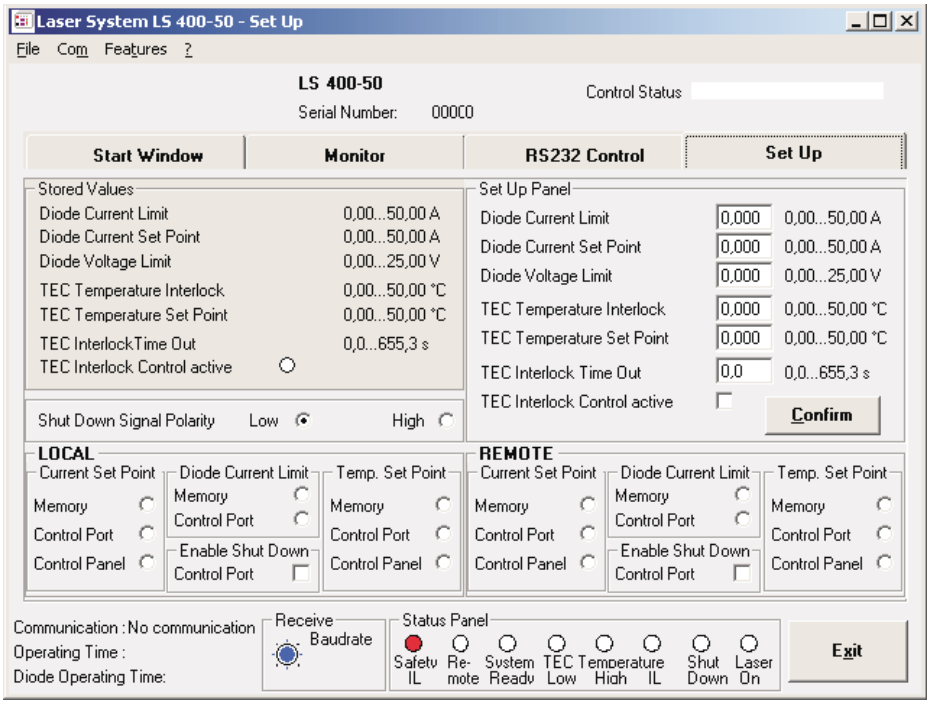
RS 232 Port



Fill out the LOCAL form at the left side for the data sources in the local operating mode.
Select the data source for current set point diode current limit and temperature set point.
Select whether a shut down signal at the control port shall be effective or not.

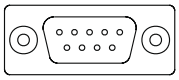
Fill out the REMOTE form at the right side for the data sources in the remote operating mode.
Select the data source for current set point diode current limit and temperature set point.
Select whether a shut down signal at the control port shall be effective or not.

Press the Confirm button the settings will be stored in the memory of the control interface.



System software Set Up

RS 232 Port



E ample for a Set Up
You plan a laser system which shall be operated manually and
remote controlled.
For the remote operating mode there is a programmable logic controller PLC at the control port which does nt have analog outputs. Your laser has one diode the diode current shall be 45 00 A diode current limit shall be 46 50 A and temperature set point shall be 24 30 C.

In the local operating mode the current set point and the temperature set point shall be adjusted manually for e perimentation a High shut down signal from the PLC shall be effective and shall turn off the diode current.

Turn on your system start the program and select Set Up for configuring your system.
At the Set Up panel enter 46 50 A for the diode current limit
enter 45 00 A for the diode current
enter 2 50 V for the diode voltage limit.

Enter 30 00 C for the TEC temperature interlock
enter 24 30 C for the temperature set point
enter 10 0 s for the TEC interlock time out.
Select TEC interlock control active.

Select Shut Down Signal Polarity High at the left side.

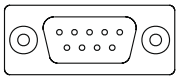
Fill out the LOCAL form at the left side for the data sources in the local operating mode.
Select Control Panel for the current set point
select Memory for the diode current limit
select Control Panel for the temperature set point.
Select Enable Shut Down Control Port.

Fill out the REMOTE form at the right side for the data sources in the remote operating mode.
Select Memory for the current set point
select Memory for the diode current limit
select Memory for the temperature set point.
Select Enable Shut Down Control Port.

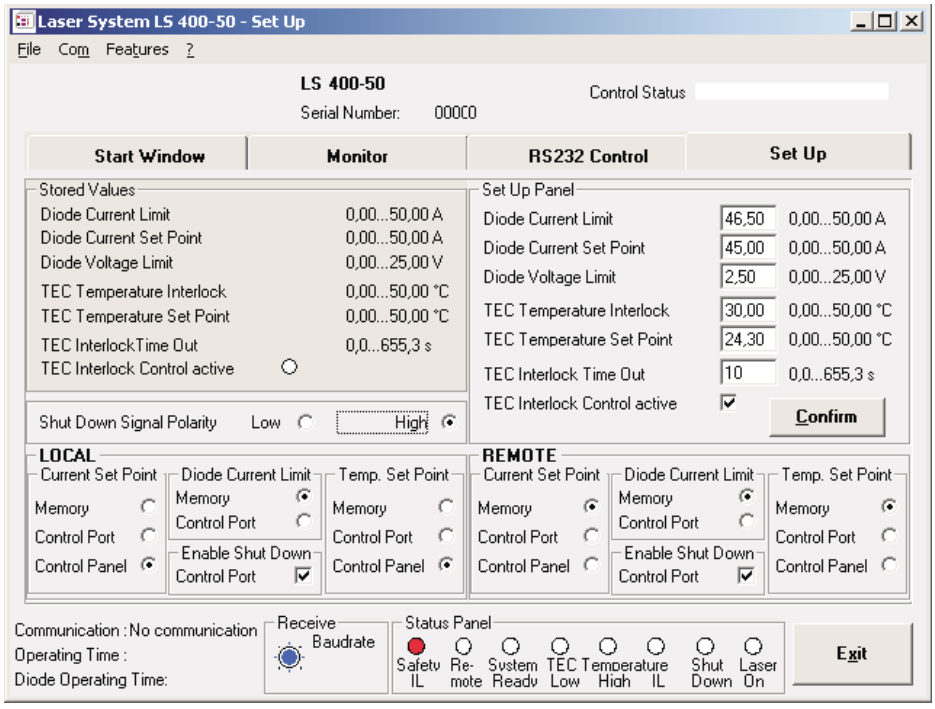
Press the Confirm button the settings will be stored in the memory and the system is ready for operating.

System software Set Up

RS 232 Port

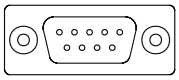


E ample for a Set Up



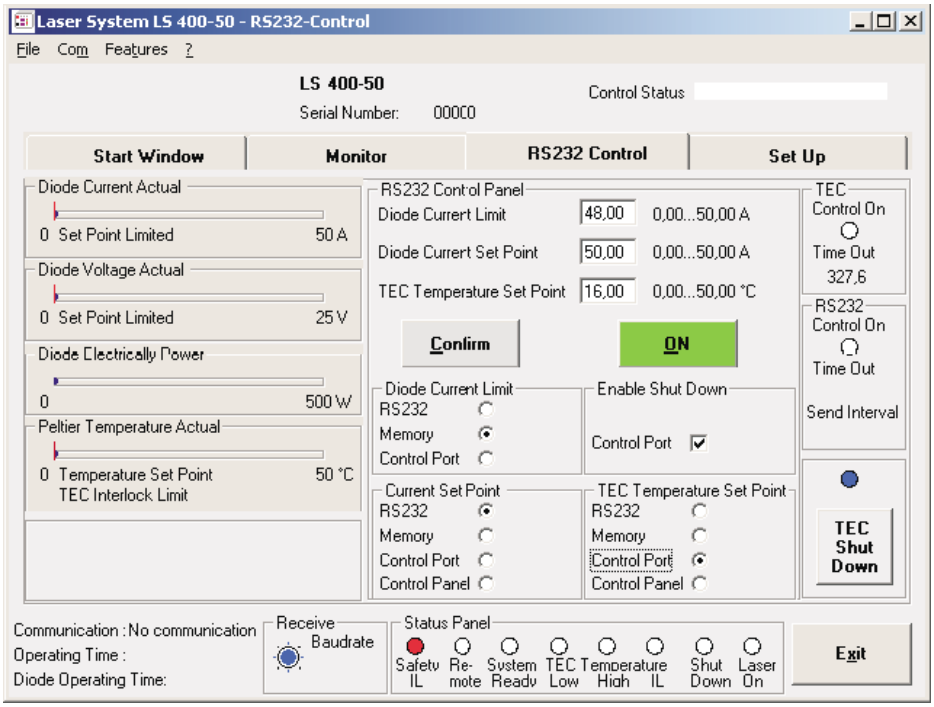
System software RS 232 Control

RS 232 Port



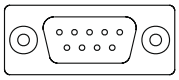
Select RS 232 Control for controlling the system by your PC.
Enter the re uired values for diode current limit diode current set point and TEC temperature set point at the RS 232 Control Panel.
Select the data source for diode current limit diode current set point and TEC temperature set point. Select whether a shut down signal at the control port shall be effective or not.
If you select RS 232 for diode current limit diode current set point and TEC temperature set point the registered values at the RS 232 Control Panel will be relevant at operating.
In other cases this values will be ignored.
If you select Memory as a data source the value registered in the memory set up will be relevant at operating.
If you select Control Panel as a data source the setting of the potentiometer at the control panel will be relevant at operating.
If you select Control Port as a data source the analog set point signal fed in at the control port will be relevant at operating e.g. the diode current set point signal CA-DCSP.
Every time you alter a value or a setting you have to press the Confirm button.

There are three buttons for operating button ON button OFF and TEC Shut Down.
Button ON turns the laser on button OFF turns the laser off.
The button TEC Shut Down turns the TEC voltage off this is useful for e uipment testing.



RS 232 Port
Software Protocol

RS 232 Port



Status Data
Status data are splitted in three packets.

Packet P1 informs about measured values current operating states and working hours.
Packet P2 informs about data from control port and control panel.
Packet P3 informs about stored data.

The short name of the data contains a data source number according to its origin.

Data source	**data source number**
DT 400	1
Control Port	2
Control Panel	3
Memory	4
RS232 Port	5
Control Interface	6

Control Byte SD6CON
Status Digital 6 Control
Packet P1 Packet P2 and Packet P3 respectively Byte 3.
Reflects the current state of the control byte CD6CON.
Contains the following status bits

Reset Diode Working Hours SB6RDWH
Status Bit 6 Reset Diode orking Hours
Byte 3 Bit 1
Reflects that the counter for the operating hours will be resetted. Reset will be done by control bit CB5RD H with data source number 5.

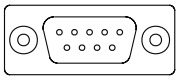
Power Supply On SB6PSON
Status Bit 6 Power Supply On
Byte 3 Bit 2
Reflects that the system is in an on-state. On will be done by control bit CB5PSON of the RS 232 port and /or by a CD-DCON signal at the control port or in the manual mode by a ON keystroke at the control panel.

TEC Shut Down SB6TSD
Status Bit 6 TEC Shut Down
Byte 3 Bit 4
Reflects that the TEC output is shut down. A TEC shut down will be done by control bit CB5TSD of RS 232 port or by a CD-PSD signal at the control port.

Reboot Firmware SB6REBOOT
Status Bit 6 Reboot
Byte 3 Bit 5
Reflects that a restart of the control interface was activated. A restart will be done by

RS 232 Port
Software Protocol

RS 232 Port



control bit CB5REBOOT of the RS 232 port.
A restart is re uired if the system will be new configured.

Data Store SB6STORE
Status Bit 6 Store
Byte 3 Bit 6
Reflects that the data will be saved. Control bit CB5STORE must be set in the configuration data set for saving data.

CD-DCON signal at the control port SB6CPPSON
Status Bit 6 Control Port Power Supply On
Byte 3 Bit 7
Reflects that the CD-DCON signal at the control port is High for turning on the system.

Operating mode SD6OM
Status Digital 6 Operating Mode
Packet P1 Packet P2 und Packet P3 respectively Byte 4.
Reflects the current state of control.

Operating Mode RS 232 SB6OMRS
Status Bit 6 Operating Mode RS 232
Byte 4 Bit 1
Reflects that the system is controlled by RS232.

Remote Mode Active SB6REM
Status Bit 6 Remote Mode
Byte 4 Bit 2
Reflects that the remote mode is active.

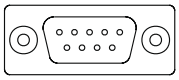
TEC Shut Down Active SB6TSDA
Status Bit 6 TEC Shut Down Active
Byte 4 Bit 4
Reflects that the TEC shut down is active.

Receive RS 232 SB6RRS
Status Bit 6 Receive RS 232
Byte 4 Bit 6
Reflects that the system has received a byte from the RS 232 port.

Data Source Decoder SD6DEC
Status Digital 6 Data Source Decoder
Packet P1 Packet P2 und Packet P3 respectively Byte 5.
Reflects the current assignments of the data sources.

RS 232 Port
Software Protocol

RS 232 Port



Data Source Decoder Local Mode SD4DECLOC
Status Digital 4 Data Source Decoder Local
Packet P3 Byte 23
Reflects the settings of the decoder which were configured with configuration byte CF5DECLOC and were stored.
The settings of the decoder will be loaded from memory during local mode starting procedure.

Data Source Decoder Remote Mode SD4DECREM
Status Digital 4 Data Source Decoder Remote
Packet P2 Byte 23
Reflects the settings of the decoder which were configured with configuration byte CF5DECREM and were stored.
The settings of the decoder will be loaded from memory during remote mode starting procedure.

In Out Control SD6IOC
Status Digital 6 In Out Control
Packet P1 Packet P2 und Packet P3 respectively Byte 6.
Reflects the settings of bits and contains the code of status data sets transmit and control data sets receive . The code is mandatorily re uired.

Control Port Shut Down Enable SB6CPSDE
Status Bit 6 Control Port Shut Down Enable
Byte 6 Bit 0
Reflects whether the shut down signal CD-DCSD at the control port is effective or not.

Shut Down Polarity Positive SB6SDPOLP
Status Bit 6 Shut Down Polarity Positive
Byte 6 Bit 2
Reflects whether a High shut down signal or a Low shut down signal results in a shut down.
If bit 2 is 0 a Low signal results in a shut down if bit 2 is 1 a High signal results in a shut down.
This bit is effective in all control modes.

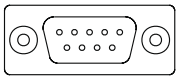
Temperature Control On SB6TCON
Status Bit 6 Temperature Control On
Byte 6 Bit 3
Reflects whether a temperature interlock is effective or not. If temperature interlock is active and an e cessive temperature occures the diode current will be turned off and error bit EB6TF will be set. This bit is effective in all control modes.

Code of received data sets

Byte 6	Bit 5	Bit 4	Data set name
	0	0	Control data set
	0	1	Configuration data set
	1	0	Unused
	1	1	Short control data set

RS 232 Port
Software Protocol

RS 232 Port



Code of transmitted data sets

Byte 6	Bit 7	Bit 6	Data set name
	0	0	Status data set packet 1
	0	1	Status data set packet 2
	1	0	Status data set packet 3
	1	1	Unused

In Out Control Local SD4IOCLOC
Status Digital 4 In Out Control Local
Packet P3 Byte 24.
Reflects whether the shut down signal CD-DCSD at the control port is effective in the local mode or not. The setting is stored in SD4CPSDEL. The other bits aren t significant.

In Out Control Remote Mode SD4IOCREM
Status Digital 4 In Out Control Remote
Packet P2 Byte 24.
Reflects whether the shut down signal CD-DCSD at the control port is effective in the remote mode or not. The setting is stored in bit SD4CPSDER. The other bits aren t significant.

Error bits
Packet P1 in byte 8 and in byte10 respectively in the upper half byte.

Temperature Limit EB6TL
Error Bit 6 Temperature Limit
Packet P1 Byte 8 Bit 4
Bit 4 will be set if theTEC temperature interlock value will be e ceeded. The diode current will be turned off.

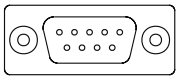
RS 232 Data Fail EB6DFAIL
Error Bit 6 Data Fail
Packet P1 Byte 8 Bit 5
Bit 5 will be set if there is a data transfer error at the RS 232 port.

RS 232 Time Out EB6TOUT
Error Bit 6 Time Out
Packet P1 Byte 8 Bit 6
Bit 6 will be set if the RS 232 port doesn t receive data within the Time Out time. The diode current will be switched off. Bit 6 will be resetted if data will be received again however the diode current remains in an off-state.

RS232 Wrong Sign EB6WS
Error Bit 6 rong Sign
Packet P1 Byte 8 Bit 7
Bit 7 will be set if a wrong character will be received. Bit 7 will be resetted if valid characters will be received again.

RS 232 Port
Software Protocol

RS 232 Port



Hardware Fault EB6HFAIL
Error Bit 6 Hardware Fault
Packet P1 Byte 10 Bit 4
Bit 4 will be set if there is a hardware fault.

Voltage Limit EB6VL
Error Bit 6 Voltage Limit
Packet P1 Byte 10 Bit 6
Bit 6 will be set if the diode voltage e ceeds the diode voltage supervision value.
Bit 6 will be resetted if the diode voltage is lower than the diode voltage supervision value.

Decoder Fail EB6DECF
Error Bit 6 Data Source Decoder Fail
Packet P1 Byte 10 Bit 7
Bit 7 will be set if the data source decoder gets an invalid value. In this case the diode current cannot be turned on.

Operating mode bits
Packet P1 in byte 8 and in byte10 respectively in the upper half byte.

TEC Temperature Low SB6PTL
Status Bit 6 Peltier Temperature Low
Packet P1 Byte 12 Bit 4
Bit 4 will be set if the current TEC temperature is lower than the temperature set point.

TEC Temperature High SB6PTH
Status Bit 6 Peltier Temperature High
Packet P1 Byte 12 Bit 5
Bit 5 will be set if the current TEC temperature is higher than the temperature set point.

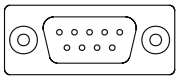
Shut Down Active SB6SDA
Status Bit 6 Shut Down Active
Packet P1 Byte 12 Bit 6
Bit 6 will be set if a shut down is active.

Power Supply On SB6PSONA
Status Bit 6 Power Supply On
Packet P1 Byte 12 Bit 7
Bit 7 will be set if the system is turned on.

Power Supply Ready SB6PSR
Status Bit 6 Power Supply Ready
Packet P1 Byte 14 Bit 4
Bit 4 will be set if the system is ready for operating.

RS 232 Port
Software Protocol

RS 232 Port



Interlock Active SB6ILA
Status Bit 6 Interlock Active
Packet P1 Byte 14 Bit 5
Bit 5 will be set if the safety interlock is active.

Local Mode SB6LOCAL
Status Bit 6 Local Mode
Packet P1 Byte 14 Bit 6
Bit 6 will be set if the system operates in the local mode.

Temperature Interlock Active SB6TILA
Status Bit 6 Temperature Interlock Active
Packet P1 Byte 14 Bit 7
Bit 7 will be set if a TEC temperature interlock is active.

Baud Rate SD6BR
Status Digital 6 Baud Rate
Packet P1 Byte 16 upper half byte
Reflects a numerical value corresponding to the baud rate.

Numerical value	baud rate
1	1200
2	2400
3	4800
4	9600
5	19200
6	38400
7	57600
8	115200

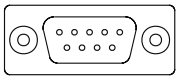
Working Hours SD6WH
Status Digital 6 orking Hours
Packet P1 Byte 17 18 19 und 20
Reflects the operating hours of the system.

Diode working Hours SD6DWH
Status Digital 6 Diode orking Hours
Packet P1 Byte 21 22 23 und 24
Reflects the diode operating hours. The counter reading can be resetted by control bit CB5RD H.

Revision Number SD6REV
Status Digital 6 Revision Number of firmware
Packet P2 Byte 8 upper half byte first digit is SD6REV1
Packet P2 Byte 10 upper half byte second digit is SD6REV2
Packet P2 Byte 12 upper half byte third digit is SD6REV3
Packet P2 Byte 14 upper half byte fourth digit is SD6REV4
For the half bytes only values of 0 to 9 are permitted.

RS 232 Port
Software Protocol

RS 232 Port



The revision number of the firmware results of
SD6REV SD6REV4 + SD6REV3 + SD6REV2 + SD6REV1
E ample for a revision number 0109

Last Fault SD6LF
Status Digital 6 Last Fault
Packet P2 Byte 16 upper half byte
Reflects the error number of the last fault.

Error number	Error
1	Temperature interlock
2	Decoder error
3	Communication error
4	RS232 port data fail
5	RS232 port wrong sign
6	Hardware fail
7	Voltage supervision value e ceeded

Serial number SD6SN
Status Digital 6 Serial Number
Packet P3 Byte 7 and 8
Reflects the serial number of the system.

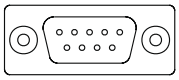
Time Out RS 232 port SD4TOUT
Status Digital 4 Time Out RS232 Port
Packet P3 Byte 9 and 10
Reflects the Time Out value of the RS 232 port.
The Time Out value is determined by the configuration word CFT5TOUT the value is stored in the memory.

Time Out Temperature Control SD4TOTC
Status Digital 4 Time Out Temperature Control
Packet P3 Byte 21 and 22
Reflects the Time Out value of the temperature control.
The Time Out value is determined by the configuration word CFT5TOTC the value is stored in the memory.

Diode Current Set Point Limited SA1DCSPL
Status Analog 1 Diode Current Set Point Limited
Packet P1 Byte 7 and lower half byte of byte 8
Reflects the actual diode current set point limited by the diode current limit value. The diode current limit value may be the CA-DCL signal of the control port the value of the nonvolatile memory setup software or the setting of the diode current limit potentiometer at the DT 400.

RS 232 Port
Software Protocol

RS 232 Port



Diode Current Actual SA1DCACT
Status Analog 1 Diode Current Actual
Packet P1 Byte 9 and lower half byte of byte10
Reflects the actual diode current.

Diode Voltage Actual SA1DVACT
Status Analog 1 Diode Voltage Actual
Packet P1 Byte 11 and lower half byte of byte12
Reflects the actual diode voltage.

Diode Current Set Point 2 SA3DCSP2
Status Analog 3 Diode Current Set Point 2
Packet P1 Byte 13 and lower half byte of byte14
Reflects the diode current modulation signal of the BNC jack at the rear panel.
Not implemented.

TEC Temperature Actual SA1PTACT
Status Analog 1 Peltier Temperature Actual
Packet P1 Byte 15 and lower half byte of byte16
Reflects the actual TEC temperature.

Diode Current Limit SA2DCL
Status Analog 2 Diode Current Limit
Packet P2 Byte 7 and lower half byte of byte 8
Reflects the diode current limit signal CA-DCL at the control port.

Diode Current Set Point SA2DCSP
Status Analog 2 Diode Current Set Point
Packet P2 Byte 11 and lower half byte of byte 12
Reflects the diode current set point signal CA-DCSP at the control port.

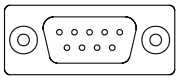
TEC Temperature Set Point SA2PTSP
Status Analog 2 Peltier Temperature Set Point
Packet P2 Byte 17 and lower half byte of byte 18
Reflects the Peltier temperature set point signal CA-PTSP at the control port.

Diode Current Set Point SA3DCSP
Status Analog 3 Diode Current Set Point Control Panel
Packet P2 Byte 13 and lower half byte of byte 14
Reflects the diode current set point of the control panel.

TEC Temperature Set Point SA3PTSP
Status Analog 3 Peltier Temperature Set Point Control Panel
Packet P2 Byte 19 and lower half byte of byte 20
Reflects the Peltier temperature set point of the control panel.

RS 232 Port
Software Protocol

RS 232 Port



Diode Current Set Point SD4DCSP
Status Digital 4 Diode Current Set Point Memory
Packet P2 Byte 15 and lower half byte of byte 16
Packet P3 Byte 11 and lower half byte of byte 12
Reflects the diode current set point stored in the memory.

Diode Current Limit SD4DCL
Status Digital 4 Diode Current Limit Memory
Packet P2 Byte 9 and lower half byte of byte 10
Packet P3 Byte 13 and lower half byte of byte 14
Reflects the diode current limit stored in the memory.

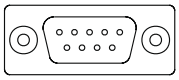
TEC Temperature Set Point SD4PTSP
Status Digital 4 Peltier Temperature Set Point Memory
Packet P2 Byte 21 and lower half byte of byte 22
Packet P3 Byte 15 and lower half byte of byte 16
Reflects the Peltier temperature set point stored in the memory.

TEC Temperature Interlock CD4PTL
Control Digital 4 Peltier Temperature Interlock
Packet P3 Byte 17 and lower half byte of byte 18
Reflects the Peltier temperature interlock value stored in the memory.

Diode Voltage Limit CD4DVL
Control Digital 4 Diode Voltage Limit Memory
Packet P3 Byte 19 and lower half byte of byte 20
Reflects the diode voltage limit value stored in the memory.

RS 232 Port
Software Protocol

RS 232 Port



Transmitted data

Independently of configuration operating mode and interface status data will be transmitted cyclically at the RS 232 port. For a better data management the status data are packed into 3 data packets. Each of these packets consists of 26 bytes.
Packet P1 contains measurements current operating states and operating hours.
Packet P2 contains data of the control port and data of the control panel.
Packet P3 contains data stored in the memory.
The separation of data packets offers the possibility for transmitting only packets whose contents have changed resulting in a shorter cycle time.
The basic version however doesn t have this feature.

A packet consists of

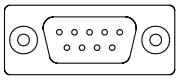
Start of data set	2 Byte
Status data bytes	22 Byte
End of data set	2 Byte

Status data packet overview

	Packet P1	**Packet P2**	**Packet P3**
Byte 1	Start byte	Start byte	Start byte
Byte 2	Start byte	Start byte	Start byte
Byte 3	SD6CON	SD6CON	SD6CON
Byte 4	SD6OM	SD6OM	SD6OM
Byte 5	SD6DEC	SD6DEC	SD6DEC
Byte 6	SD6IOC	SD6IOC	SD6IOC
Byte 7	SA1DCSPL	SA2DCL	SD6SN
Byte 8	Error Bits	SD6REV1	SD6SN
Byte 9	SA1DCACT	SD4DCL	SD4TOUT
Byte 10	Error Bits	SD6REV2	
Byte 11	SA1DVACT	SA2DCSP	SD4DCSP
Byte 12	Operating mode bits	SD6REV3	
Byte 13	SA3DCSP2	SA3DCSP	SD4DCL
Byte 14	Operating mode bits		SD6REV4
Byte 15	SA1PTACT	SD4DCSP	SD4PTSP
Byte 16	SD6BR	SD6LF	
Byte 17	SD6 H	SA2PTSP	SD4PTL
Byte 18	SD6 H		
Byte 19	SD6 H	SA3PTSP	SD4DVL
Byte 20	SD6 H		
Byte 21	SD6D H	SD4PTSP	SD4TOTC
Byte 22	SD6D H		
Byte 23	SD6D H	SD4DECREM	SD4DECLOC
Byte 24	SD6D H	SD4IOCREM	SD4IOCLOC
Byte 25	Stop byte	Stop byte	Stop byte
Byte 26	Stop byte	Stop byte	Stop byte

RS 232 Port
Software Protocol

RS 232 Port



Description packet P1
Packet P1 contains measurements current operating states and operating hours.

Packet P1 status byte 1 **start byte**
Packet P1 status byte 2 **start byte**
For starting the se uence a start byte will be send twice.
The start byte must have a he adecimal value of 0A or a binary value of 0000 1010 .

Packet P1 status byte 3 **control byte SD6CON**
8 bit word binary output reflects the current operating state.

Bit 0			Unused.
Bit 1	1	SB6RD H	Counter for diode operating hours is resetted.
Bit 2	1	SB6PSON	System is in on-state.
Bit 3			Unused.
Bit 4	1	SB6TSD	TEC shut down is active.
Bit 5	1	SB6REBOOT	System reboot was triggered.
Bit 6	1	SB6STORE	Data are saved.
Bit 7	1	SB6CPPSON	System is turned on by CD-DCON-signal at the control port.

Packet P1 status byte 4 **operating state byte SD6OM**
8 bit word binary output reflects the current operating mode.

Bit 0			Unused.
Bit 1	1	SB6OMRS	RS232 port is used for control.
Bit 2			Unused.
Bit 3	1	SB6REM	Remote mode is active.
Bit 4	1	SB6TSDA	TEC shut down is active.
Bit 5			Unused.
Bit 6	1	SB6RRS	Data were received of RS 232 port.
Bit 7			Unused.

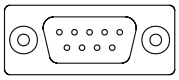
Packet P1 status byte 5 **data source decoder SD6DEC**
8 bit word binary output reflects the data source assignments.

Bit 1	Bit 0	
0	0	The diode current limit value is given by RS 232 port.
0	1	The diode current limit value is given by memory.
1	0	The diode current limit value is given by control port.

Bit 4	Bit 3	Bit 2	
0	0	0	The diode current set point is given by RS 232 port.
0	0	1	The diode current set point is given by memory.
0	1	0	The diode current set point is given control port.
1	0	0	The diode current set point is given by control panel.

RS 232 Port
Software Protocol

RS 232 Port



Bit 7	Bit 6	Bit 5	
0	0	0	The TEC temperature set point is given by RS 232 port.
0	0	1	The TEC temperature set point is given by memory.
0	1	0	The TEC temperature set point is given by control port.
1	0	0	The TEC temperature set point is given by control panel.

Other settings lead to a decoder fault error bit EB6DECF will be set.

Packet P1 status byte 6 in out control SD6IOC
8 bit word binary output reflects the settings of the status bits and defines the packet assignments with bit 6 and bit 7.

Bit 0	1	SB6CPSDE	Shut down signal of control port approved.
Bit 1			Unused.
Bit 2	1	SB6SDPOLP	Shut down signal polarity is positive.
Bit 3	1	SB6TCON	Temperature interlock control is active.
Bit 4			Unused.
Bit 5			Unused.
Bit 6	0		Must be 0.
Bit 7	0		Must be 0.

Packet P1 status byte 7 diode current set point limited SA1DCSPL
Packet P1 status byte 8 Error bits
SA1DCSPL 1 1 1 1 1 1 1 1 1 1 1 1
12 bit value resolution 4095 steps range 0 to 50 A for LS 400-50 increment 12 21 mA
range 0 to 60 A for LS 400-60 increment 14 65 mA.
Reflects the actual diode current set point limited by a diode current limit value. A diode current limit value may be the CA-DCL signal of the control port the value of the nonvolatile memory setup software or the setting of the diode current limit potentiometer at the DT 400.
The lower half byte of status byte 8 is the high-order part of the 12 bit value.

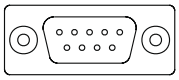
Error bits 1 1 1 1
4 bit value reflects faults.
The upper half byte of status byte 8 contains the following error bits.

Bit 4	EB6TL	Error bit temperature error.
Bit 5	EB6DFAIL	Error bit RS 232 port data fail.
Bit 6	EB6TOUT	Error bit RS 232 port time out.
Bit 7	EB6 S	Error bit RS 232 port wrong character received.

Packet P1 status byte 9 diode current actual SA1DCACT
Packet P1 status byte 10 Error bits
SA1DCACT 1 1 1 1 1 1 1 1 1 1 1 1
12 bit value resolution 4095 steps range 0 to 50 A for LS 400-50 increment 12 21 mA
range 0 to 60 A for LS 400-60 increment 14 65 mA.
Reflects the actual diode current.

RS 232 Port
Software Protocol

RS 232 Port



The lower half byte of status byte 10 is the high-order part of the 12 bit value.

Error bits 1 1 1 1
4 bit value reflects faults.
The upper half byte of status byte 10 contains the following error bits.

Bit 4	EB6HFAIL	Error bit hardware.
Bit 5		Unused.
Bit 6	EB6VL	Error bit diode voltage limit e ceeded.
Bit 7	EB6DECF	Error bit data source decoder error.

Packet P1 status byte 11 **diode voltage SA1DVACT**
Packet P1 status byte 12 **operating state bits**
SA1DVACT 1 1 1 1 1 1 1 1 1 1 1 1
12 bit value resolution 4095 steps range 0 to 25 V increment 6 10501 mV.
Reflects the diode voltage.
The lower half byte of status byte 12 is the high-order part of the 12 bit value.

Operating state bits 1 1 1 1
4 bit value reflects operating states.
The upper half byte of status byte 12 contains the following operating state bits.

Bit 4	SB6PTL	TEC temperature is low.
Bit 5	SB6PTH	TEC temperature is high.
Bit 6	SB6SDA	Shut down is active.
Bit 7	SB6PSONA	System is in on-state.

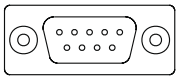
Packet P1 status byte 13 **Current Set Point SA3DCSP2**
Packet P1 status byte 14 **Operating State bits**
SA3DCSP2 1 1 1 1 1 1 1 1 1 1 1 1
12 bit value resolution 4095 steps range 0 to 50 A for LS 400-50 increment 12 21 mA
range 0 to 60 A for LS 400-60 increment 14 65 mA.
Reflects the diode current set point signal at X3 of a control panel.
The lower half byte of status byte 14 is the high-order part of the 12 bit value.
Not implemented.

Operating state bits 1 1 1 1
4 bit value reflects operating states.
The upper half byte of status byte 14 contains the following operating states bits.

Bit 4	SB6PSR	Control interface is ready.
Bit 5	SB6ILA	Safety interlock is active.
Bit 6	SB6LOCAL	Local mode is active.
Bit 7	SB6TILA	TEC temperature interlock is active.

RS 232 Port
Software Protocol

RS 232 Port



Packet P1 status byte 15 **TEC Temperature Actual SA1PTACT**
Packet P1 status byte 16 **Baud rate SD6BR**
SA1PTACT 1 1 1 1 1 1 1 1 1 1 1 1
12 bit value resolution 4095 steps range 0 to 50 C increment 0 01221 C.
Reflect the actual TEC temperature.
The lower half byte of status byte 16 is the high-order part of the 12 bit value.

Baud rate 1 1 1 1
4 bit value binary output range 0 bis 15 reflects the defined baud rate.
The upper half byte of status byte 16 contains the following baud rates.

Number	Baud rate
1	1200
2	2400
3	4800
4	9600
5	19200
6	38400
7	57600
8	115200

Packet P1 status byte 17 **Counter Operating Hours SD6WH**
Packet P1 status byte 18
Packet P1 status byte 19
Packet P1 status byte 20
32 bit value resolution 4294967295 steps increment 1 second.
Reflects the operating time of the system.
Operating time in seconds $P1SB20_{de} \quad 256^3 + P1SB19_{de} \quad 256^2 + P1SB18_{de} \quad 256 + P1SB17_{de}$

Packet P1 status byte 21 **Counter Operating Hours SD6DWH**
Packet P1 status byte 22
Packet P1 status byte 23
Packet P1 status byte 24
32 bit value resolution 4294967295 steps increment 1 second.
Reflects the operating time of the diodes.
Operating time in seconds $P1SB24_{de} \quad 256^3 + P1SB23_{de} \quad 256^2 + P1SB22_{de} \quad 256 + P1SB21_{de}$

Packet P1 status byte 25 **Stop byte**
Packet P1 status byte 26 **Stop byte**
For the end of the se uence a stop byte will be send twice.
The stop byte must have a he adecimal value of 0B or a binary value of 0000 1011 .

RS 232 Port
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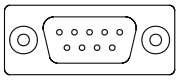
RS 232 Port



Description of Packet P2
Packet P2 reflects data from control port and from control panel.

Packet P2 status byte 1 **Start byte**
Packet P2 status byte 2 **Start byte**
For starting the se uence a start byte will be send twice.
The start byte must have a he adecimal value of 0A or a binary value of 0000 1010 .

Packet P2 status byte 3 **Control byte SD6CON**
8 bit word binary output reflects the current operating state.

Bit 0			Unused.
Bit 1	1	SB6RD H	Counter for diode operating hours is reset.
Bit 2	1	SB6PSON	System is in on-state.
Bit 3			Unused.
Bit 4	1	SB6TSD	TEC shut down is active.
Bit 5	1	SB6REBOOT	System reboot was triggered.
Bit 6	1	SB6STORE	Data are saved.
Bit 7	1	SB6CPPSON	System is turned on by CD-DCON-signal at the control port.

Packet P2 status byte 4 **operating state byte SD6OM**
8 bit word binary output reflects the current operating mode.

Bit 0			Unused.
Bit 1	1	SB6OMRS	RS232 port is used for control.
Bit 2			Unused.
Bit 3	1	SB6REM	Remote mode is active.
Bit 4	1	SB6TSDA	TEC shut down is active.
Bit 5			Unused.
Bit 6	1	SB6RRS	Data were received at RS 232 port.
Bit 7			Unused.

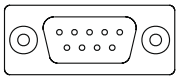
Packet P2 status byte 5 **data source decoder SD6DEC**
8 bit word binary output reflects the data source assignments.

Bit 1	Bit 0	
0	0	The diode current limit value is given by RS 232 port.
0	1	The diode current limit value is given by memory.
1	0	The diode current limit value is given by control port.

Bit 4	Bit 3	Bit 2	
0	0	0	The diode current set point is given by RS 232 port.
0	0	1	The diode current set point is given by memory.
0	1	0	The diode current set point is given by control port.
1	0	0	The diode current set point is given by control panel.

RS 232 Port
Software Protocol

RS 232 Port



Bit 7	Bit 6	Bit 5	
0	0	0	The TEC temperature set point is given by RS 232 port.
0	0	1	The TEC temperature set point is given by memory.
0	1	0	The TEC temperature set point is given by control port.
1	0	0	The TEC temperature set point is given by control panel.

Different settings lead to a decoder fault error bit EB6DECF will be set.

Packet P2 status byte 6 in out control SD6IOC
8 bit word binary output reflects the settings of the status bits and defines the packet assignments with bit 6 and bit 7.

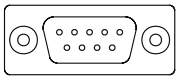
Bit 0	1	SB6CPSDE	Shut down signal of control port approved.
Bit 1			Unused.
Bit 2	1	SB6SDPOLP	Shut down signal polarity is positive.
Bit 3	1	SB6TCON	Temperature interlock control is active.
Bit 4			Unused.
Bit 5			Unused.
Bit 6	1		Must be 1.
Bit 7	0		Must be 0.

Packet P2 status byte 7 Diode Current Limit SA2DCL
Packet P2 status byte 8 Revision number of firmware, first digit SD6REV1
SA2DCL 1 1 1 1 1 1 1 1 1 1 1 1
12 bit value resolution 4095 steps range 0 to 50 A for LS 400-50 increment 12 21 mA
range 0 to 60 A for LS 400-60 increment 14 65 mA.
Reflects the diode current limit value CA-DCL at the control port.
The lower half byte of status byte 8 is the high-order part of the 12 bit value.
SD6REV1 1 0 0 1
4 bit value range 0 to 9.
Reflects the first digit of the revision number of the control interface firmware.
The revision number of the firmware results of
SD6REV SD6REV4 + SD6REV3 + SD6REV2 + SD6REV1
The upper half byte of status byte 8 is the least significant digit of the revision number.
E ample for a revision number 01.0 **9**

Packet P2 status byte 9 Diode Current Limit SD4DCL
Packet P2 status byte 10 Revision number of firmware, second digit SD6REV2
SD4DCL 1 1 1 1 1 1 1 1 1 1 1 1
12 bit value resolution 4095 steps range 0 to 50 A for LS 400-50 increment 12 21 mA
range 0 to 60 A for LS 400-60 increment 14 65 mA.
Reflects the diode current limit value from the memory.
The lower half byte of status byte 10 is the high-order part of the 12 bit value.

RS 232 Port
Software Protocol

RS 232 Port



SD6REV2 0 0 0 0
4 bit value range 0 to 9.
Reflects the second digit of the revision number of the control interface firmware.
The revision number of the firmware results of
SD6REV SD6REV4 + SD6REV3 + SD6REV2 + SD6REV1
The upper half byte of status byte 10 is the most significant digit after the dot.
E ample for a revision number 01. **0**9

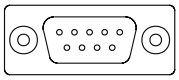
Packet P2 status byte 11 Diode Current Set Point SD2DCSP
Packet P2 status byte 12 Revision number of firmware, third digit SD6REV3
SD2DCSP 1 1 1 1 1 1 1 1 1 1 1 1
12 bit value resolution 4095 steps range 0 to 50 A for LS 400-50 increment 12 21 mA
range 0 to 60 A for LS 400-60 increment 14 65 mA.
Reflects the diode current set point CA-DCSP at the control port.
The lower half byte of status byte 12 is the high-order part of the 12 bit value.
SD6REV3 0 0 0 1
4 bit value range 0 to 9.
Reflects the third digit of the revision number of the control interface firmware.
The revision number of the firmware results of
SD6REV SD6REV4 + SD6REV3 + SD6REV2 + SD6REV1
The upper half byte of status byte 12 is the least significant digit left of the dot.
E ample for a revision number 0 **1**.09

Packet P2 status byte 13 Diode Current Set Point SA3DCSP
Packet P2 status byte 14 Revision number of firmware, fourth digit SD6REV4
SA3DCSP 1 1 1 1 1 1 1 1 1 1 1 1
12 bit value resolution 4095 steps range 0 to 50 A for LS 400-50 increment 12 21 mA
range 0 to 60 A for LS 400-60 increment 14 65 mA.
Reflects the diode current set point at the control panel.
The lower half byte of status byte 14 is the high-order part of the 12 bit value.
SD6REV4 0 0 0 0
4 bit value range 0 to 9.
Reflects the fourth digit of the revision number of the control interface firmware.
The revision number of the firmware results of
SD6REV SD6REV4 + SD6REV3 + SD6REV2 + SD6REV1
The upper half byte of status byte 14 is the most significant digit left of the dot.
E ample for a revision number **0**1.09

Packet P2 status byte 15 Diode Current Set Point in memory SD4DCSP
Packet P2 status byte 16 Number of last faults SD6LF
SD4DCSP 1 1 1 1 1 1 1 1 1 1 1 1
12 bit value resolution 4095 steps range 0 to 50 A for LS 400-50 increment 12 21 mA
range 0 to 60 A for LS 400-60 increment 14 65 mA.
Reflects the diode current set point of the memory.
The lower half byte of status byte 16 is the high-order part of the 12 bit value.

RS 232 Port
Software Protocol

RS 232 Port



SD6LF 1 1 1 1
4 bit value range 0 to15.
The upper half byte of status byte 16 contains the number of the last faults.

Fault number	Fault name
1	TEC temperature fault.
2	Decoder error.
3	Communication error.
4	RS 232 port data fail.
5	RS 232 port wrong character received.
6	Hardware fail.
7	Diode voltage limit e ceeded.

Packet P2 status byte 17 **TEC Temperature Set Point SA2PTSP**
Packet P2 status byte 18
SA2PTSP 1 1 1 1 1 1 1 1 1 1 1 1
12 bit value resolution 4095 steps range 0 to 50 C increment 0 01221 C.
Reflects the TEC temperature set point CA-PTSP at the control port.
The lower half byte of status byte 18 is the high-order part of the 12 bit value.
The high-order half byte of status byte 18 is unused.

Packet P2 status byte 19 **TEC Temperature Set Point SA3PTSP**
Packet P2 status byte 20
SA3PTSP 1 1 1 1 1 1 1 1 1 1 1 1
12 bit value resolution 4095 steps range 0 to 50 C increment 0 01221 C.
Reflects the TEC temperature set point of the control panel.
The lower half byte of status byte 20 is the high-order part of the 12 bit value.
The high-order half byte of status byte 20 is unused.

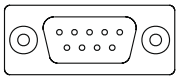
Packet P2 status byte 21 **TEC Temperature Set Point SD4PTSP**
Packet P2 status byte 22
SD4PTSP 1 1 1 1 1 1 1 1 1 1 1 1
12 bit value resolution 4095 steps range 0 to 50 C increment 0 01221 C.
Reflects the TEC temperature set point stored in the memory.
The lower half byte of status byte 22 is the high-order part of the 12 bit value.
The high-order half byte of status byte 22 is unused.

Packet P2 status byte 23 **Data Source Decoder Remote SD4DECREM**
8 bit word binary output reflects the data source assignments for the remote mode.

Bit 1	Bit 0	
0	0	The diode current limit value is given by RS 232 port.
0	1	The diode current limit value is given by memory.
1	0	The diode current limit value is given by control port.

RS 232 Port
Software Protocol

RS 232 Port



Packet P2 status byte 23 Data Source Decoder Remote SD4DECREM

Bit 4	Bit 3	Bit 2	
0	0	0	The diode current set point is given by RS 232 port.
0	0	1	The diode current set point is given by memory.
0	1	0	The diode current set point is given by control port.
1	0	0	The diode current set point is given by control panel.

Bit 7	Bit 6	Bit 5	
0	0	0	The TEC temperature set point is given by RS 232 port.
0	0	1	The TEC temperature set point is given by memory.
0	1	0	The TEC temperature set point is given by control port.
1	0	0	The TEC temperature set point is given by control panel.

Different settings lead to a decoder fault error bit EB6DECF will be set.

Packet P2 status byte 24 In Out Control Remote SD4IOCREM
8 bit value binary output reflects assignments for the remote mode.

Bit 0	1	SB4SDCPER	Shut Down signal of control port approved.
Bit 1			Unused
Bit 2	X		Irrelevant.
Bit 3	X		Irrelevant.
Bit 4	X		Irrelevant.
Bit 5	X		Irrelevant.
Bit 6	X		Irrelevant.
Bit 7	X		Irrelevant.

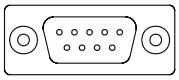
Packet P2 status byte 25 Stop byte
Packet P2 status byte 26 Stop byte
For the end of the se uence a stop byte will be send twice.
The stop byte must have a he adecimal value of 0B or a binary value of 0000 1011 .

Description of the packet P3
The packet P3 contains the data stored in the memory of the control interface.

Packet P3 status byte 1 Start byte
Packet P3 status byte 2 Start byte
For starting the se uence a start byte will be send twice.
The start byte must have a he adecimal value of 0A or a binary value of 0000 1010 .

RS 232 Port
Software Protocol

RS 232 Port



Packet P3 status byte 3 **Control Byte SD6CON**
8 bit word binary output reflects the operating state.

Bit 0			Unused.
Bit 1	1	SB6RD H	Counter for diode operating hours is resetted.
Bit 2	1	SB6PSON	System is in on-state.
Bit 3			Unused.
Bit 4	1	SB6TSD	TEC shut down is active.
Bit 5	1	SB6REBOOT	System reboot was triggered.
Bit 6	1	SB6STORE	Data are saved.
Bit 7	1	SB6CPPSON	System is turned on by CD-DCON-signal at the control port.

Packet P4 status byte 4 **Operating State Byte SD6OM**
8 bit word binary output reflects the current operating mode.

Bit 0			Unused.
Bit 1	1	SB6OMRS	RS232 port is used for control.
Bit 2			Unused.
Bit 3	1	SB6REM	Remote mode is active.
Bit 4	1	SB6TSDA	TEC shut down is active.
Bit 5			Unused.
Bit 6	1	SB6RRS	Data were received at RS 232 port.
Bit 7			Unused.

Packet P3 status byte 5 **Data Source Decoder SD6DEC**
8 bit word binary output reflects the data source assignments.

Bit 1	Bit 0	
0	0	The diode current limit value is given by RS 232 port.
0	1	The diode current limit value is given by memory.
1	0	The diode current limit value is given by control port.

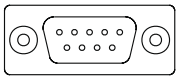
Bit 4	Bit 3	Bit 2	
0	0	0	The diode current set point is given by RS 232 port.
0	0	1	The diode current set point is given by memory.
0	1	0	The diode current set point is given by control port.
1	0	0	The diode current set point is given by control panel.

Bit 7	Bit 6	Bit 5	
0	0	0	The TEC temperature set point is given by RS 232 port.
0	0	1	The TEC temperature set point is given by memory.
0	1	0	The TEC temperature set point is given by control port.
1	0	0	The TEC temperature set point is given by control panel.

Different settings lead to a decoder fault error bit EB6DECF will be set.

RS 232 Port
Software Protocol

RS 232 Port



Packet P3 status byte 6 **In Out Control SD6IOC**
8 bit word binary output reflects the settings of the status bits and defines the packet assignments with bit 6 and bit 7.

Bit 0	1	SB6CPSDE	Shut down signal of control port approved.
Bit 1			Unused.
Bit 2	1	SB6SDPOLP	Shut down signal polarity is positive.
Bit 3	1	SB6TCON	Temperature interlock control is active.
Bit 4			Unused.
Bit 5			Unused.
Bit 6	0		Must be 0.
Bit 7	1		Must be 1.

Packet P3 status byte 7 **Serial Number SD6SN**
Packet P3 status byte 8
16 bit value resolution 65535 steps binary number.
Reflects the serial number of the system.
Status byte 8 is the high-order part of the 16 bit value.

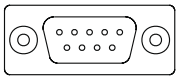
Packet P3 status byte 9 **Time Out RS 232 Port SD4TOUT**
Packet P3 status byte 10
16 bit value resolution 65535 steps range 0 to 655 3 s increment 100 ms.
Reflects the time which may pass till receiving the ne t data. An overrun leads to a time out error error bit EB6TOUT will be set and the diode current will be turned off.
The time out control is only active if control by RS 232 port is active.
Status byte 10 is the high-order part of the 16 bit value.

Packet P3 status byte 11 **Diode Current Set Point SD4DCSP**
Packet P3 status byte 12
SD4DCSP 1 1 1 1 1 1 1 1 1 1 1 1
12 bit value resolution 4095 steps range 0 to 50 A for LS 400-50 increment 12 21 mA
range 0 to 60 A for LS 400-60 increment 14 65 mA.
Reflects the diode current set point stored in the memory.
The lower half byte of status byte 12 is the high-order part of 12 bit value.
The upper half byte of status byte 12 is unused.

Packet P3 status byte 13 **Diode Current Limit SD4DCL**
Packet P3 status byte 14
SD4DCL 1 1 1 1 1 1 1 1 1 1 1 1
12 bit value resolution 4095 steps range 0 to 50 A for LS 400-50 increment 12 21 mA
range 0 to 60 A for LS 400-60 increment 14 65 mA.
Reflects the diode current limit value stored in the memory.
The lower half byte of status byte 14 is the high-order part of the 12 bit value.
The upper half byte of status byte 14 is unused.

RS 232 Port
Software Protocol

RS 232 Port



Packet P3 status byte 15 **TEC Temperature Set Point SD4PTSP**
Packet P3 status byte 16
SD4PTSP 1 1 1 1 1 1 1 1 1 1 1 1
12 bit value resolution 4095 steps range 0 to 50 C increment 0 01221 C.
Reflects the TEC temperature set point stored in the memory.
The lower half byte of status byte 16 is the high-order part of the 12 bit value.
The upper half byte of status byte 16 is unused.

Packet P3 status byte 17 **TEC Temperature Interlock SD4PTL**
Packet P3 status byte 18
SD4PTL 1 1 1 1 1 1 1 1 1 1 1 1
12 bit value resolution 4095 steps range 0 to 50 C increment 0 01221 C.
Reflects the TEC temperature interlock value stored in the memory.
The lower half byte of status byte 18 is the high-order part of the 12 bit value.
The upper half byte of status byte 18 is unused.

Packet P3 status byte 19 **Diode Voltage Limit SD4DVL**
Packet P3 status byte 20
SD4DVL 1 1 1 1 1 1 1 1 1 1 1 1
12 bit value resolution 4095 steps range 0 to 25 V increment 6 10501 mV.
Reflects the diode voltage limit value stored in the memory.
The lower half byte of status byte 20 is the high-order part of the 12 bit value.
The upper half byte of status byte 20 is unused.

Packet P3 status byte 21 **Time Out Temperature Control SD4TOTC**
Packet P3 Status byte 22
SD4TOTC 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
16 bit word resolution 65535 steps range 0 to 655 3 s increment 100 ms.
Reflects the time which may pass till a temperature interlock event leads to an error. An overrun leads to a time out error error bit EB6TOTC will be set and the diode current will be turned off.
Status byte 22 is the high-order part of the 16 bit word.

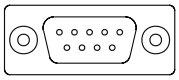
Packet P3 status byte 23 **Data Source Decoder Local SD6DECLOC**
8 bit word binary output reflects the data source assignments in the local mode.

Bit 1	Bit 0	
0	0	The diode current limit value is given by RS 232 port.
0	1	The diode current limit value is given by memory.
1	0	The diode current limit value is given by control port.

Bit 4	Bit 3	Bit 2	
0	0	0	The diode current set point is given by RS 232 port.
0	0	1	The diode current set point is given by memory.
0	1	0	The diode current set point is given by control port.
1	0	0	The diode current set point is given by control panel.

RS 232 Port
Software Protocol

RS 232 Port



Packet P3 status byte 23 Data Source Decoder Local SD6DECLOC

Bit 7	Bit 6	Bit 5	
0	0	0	The TEC temperature set point is given by RS 232 port.
0	0	1	The TEC temperature set point is given by memory.
0	1	0	The TEC temperature set point is given by control port.
1	0	0	The TEC temperature set point is given by control panel.

Different settings lead to a decoder fault error bit EB6DECF will be set.

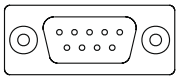
Packet P2 status byte 24 In Out Control Remote SD4IOCLOC
8 bit value binary output reflects assignments for the local mode.

Bit 0	1	SB4SDCPER	Shut Down signal of control port approved.
Bit 1			Unused
Bit 2			Unused.
Bit 3			Unused.
Bit 4			Unused.
Bit 5			Unused.
Bit 6			Unused.
Bit 7			Unused.

Packet P3 status byte 25 Stop byte
Packet P3 status byte 26 Stop byte
For the end of the se uence a stop byte will be send twice.
The stop byte must have a he adecimal value of 0B or a binary value of 0000 1011 .

RS 232 Port
Software Protocol

RS 232 Port



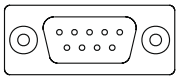
Received data
The system will be controlled by the control data set.
For safety reasons a connection supervision is implemented.
If the control interface doesn t receive data within a specific time error bit EB6TOUT is set and the diode current is turned off.
For the connection supervision it is sufficient to generate the re uired data traffic by using a short control data set instead of the normal control data set. The short data set can be used if the fully functional range is not re uired.
For configuring the control interface the configuration data set is used.

Overview

	Control data set	**Short control data set**	**Configuration data set**
Byte 1	Start byte	Start byte	Start byte
Byte 2	Start byte	Start byte	Start byte
Byte 3	CD5CON	CD5CON	CD5CON
Byte 4	SD6OM	SD6OM	SD6COM
Byte 5	CD5DEC	CD5DEC	CD5DEC
Byte 6	CD5IOC	CD5IOC	CD5IOC
Byte 7	CD5TOUT	Stop byte	CF5TOTC
Byte 8		Stop byte	
Byte 9	CD5DCL		CF5DCSP
Byte 10			
Byte 11	CD5DCSP		CF5DCL
Byte 12			
Byte 13	CD5PTSP		CF5PTSP
Byte 14			
Byte 15	Stop byte		CF5PTL
Byte 16	Stop byte		
Byte 17			CF5DVL
Byte 18			
Byte 19			CF5DECLOC
Byte 20			CF5IOCLOC
Byte 21			CF5DECREM
Byte 22			CF5IOCREM
Byte 23			Stop byte
Byte 24			Stop byte

RS 232 Port
Software Protocol

RS 232 Port



Control data set
A control data set consists of

Start of data set	2 byte
Control data	12 byte
End of data set	2 byte

Byte 1 **Start byte**
Byte 2 **Start byte**
For starting the se uence a start byte must be send twice.
The start byte must have a he adecimal value of 0A or a binary value of 0000 1010 .

Byte 3 **Control Byte CD5CON**
8 bit word binary input.

Bit 0			Unused.
Bit 1	1	CB5RD H	Resets the counter for the diode operating hours.
Bit 2	1	CB5PSON	Turns the system on.
Bit 3			Unused.
Bit 4	1	CB5TSD	Activates TEC shut down.
Bit 5	1	CB5REBOOT	Reboots system.
Bit 6	0	CB5STORE	Must be 0.
Bit 7	1	SB6CPPSON	Unused.

Byte 4 **Operating State SD6OM**
8 bit word binary input unused.

Byte 5 **Data Source Decoder CD5DEC**
8 bit word binary input defines the data source assignments for the RS 232 mode.

Bit 1	Bit 0	
0	0	The diode current limit value is given by RS 232 port.
0	1	The diode current limit value is given by memory.
1	0	The diode current limit value is given by control port.

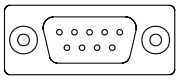
Bit 4	Bit 3	Bit 2	
0	0	0	The diode current set point is given by RS 232 port.
0	0	1	The diode current set point is given by memory.
0	1	0	The diode current set point is given by control port.
1	0	0	The diode current set point is given by control panel.

Bit 7	Bit 6	Bit 5	
0	0	0	The TEC temperature set point is given by RS 232 port.
0	0	1	The TEC temperature set point is given by memory.
0	1	0	The TEC temperature set point is given by control port.
1	0	0	The TEC temperature set point is given by control panel.

Different settings lead to a decoder fault error bit EB6DECF will be set.

RS 232 Port
Software Protocol

RS 232 Port



Byte 6 **In Out Control CD5IOC**
8 bit word binary input defines settings.

Bit 0	1	CB5SDCPE	Enables CD-DCSD signal of Control Port for shut downing.
Bit 1			Unused.
Bit 2			Unused.
Bit 3			Unused.
Bit 4	0		Must be 0.
Bit 5	0		Must be 0.
Bit 6			Unused.
Bit 7			Unused.

Byte 7 **Time Out RS 232 Port CD5TOUT**
Byte 8
16 bit value resolution 65535 steps range 0 to 655 3 s increment 100 ms.
Defines the time which may pass till receiving the ne t data. An overrun leads to a time out error error bit EB6TOUT will be set and the diode current will be turned off.
The time out control is only active if control by RS 232 port is active.
Byte 8 is the high-order part of the 16 bit value.

Byte 9 **Diode Current Limit CD5DCL**
Byte 10
12 bit value resolution 4095 steps range 0 to 50 A for LS 400-50 increment 12 21 mA
range 0 to 60 A for LS 400-60 increment 14 65 mA.
Defines the diode current limit value for the RS 232 control mode.
The value is valid if RS 232 is selected as a data source for the diode current limit value.

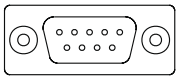
Byte 11 **Diode Current Set Point CD5DCSP**
Byte 12
12 bit value resolution 4095 steps range 0 to 50 A for LS 400-50 increment 12 21 mA
range 0 to 60 A for LS 400-60 increment 14 65 mA.
Defines the diode current set point for the RS 232 control mode.
The value is valid if RS 232 is selected as a data source for the diode current set point.

Byte 13 **TEC Temperature Set Point CD5PTSP**
Byte 14
12 bit value resolution 4095 steps range 0 to 50 C increment 0 01221 C.
Defines the TEC temperature set point for the RS 232 control mode.
The value is valid if RS 232 is selected as a data source for the TEC temperature set point.

Byte 15 **Stop byte**
Byte 16 **Stop byte**
For the end of the se uence a stop byte must be send twice.
The stop byte must have a he adecimal value of 0B or a binary value of 0000 1011 .

RS 232 Port
Software Protocol

RS 232 Port



Short Control data set
A short control data set consists of

Start of data set	2 byte
Control data	4 byte
End of data set	2 byte

Byte 1 **Start byte**
Byte 2 **Start byte**
For starting the se uence a start byte must be send twice.
The start byte must have a he adecimal value of 0A or a binary value of 0000 1010 .

Byte 3 **Control Byte CD5CON**
8 bit word binary input.

Bit 0			Unused.
Bit 1	1	CB5RD H	Resets the counter for the diode operating hours.
Bit 2	0	CB5PSON	Turns the system on.
Bit 3			Unused.
Bit 4	1	CB5TSD	Activates TEC shut down.
Bit 5	1	CB5REBOOT	Reboots system.
Bit 6	0	CB5STORE	Must be 0.
Bit 7			Unused.

Byte 4 **Operating State SD6OM**
8 bit word binary input unused.

Byte 5 **Data Source Decoder CD5DEC**
8 bit word binary input unused.

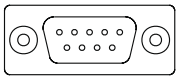
Byte 6 **In Out Control CD5IOC**
8 bit word binary input defines settings.

Bit 0		Unused.
Bit 1		Unused.
Bit 2		Unused.
Bit 3		Unused.
Bit 4	1	Must be 1.
Bit 5	1	Must be 1.
Bit 6		Unused.
Bit 7		Unused.

Byte 7 **Stop byte**
Byte 8 **Stop byte**
For the end of the se uence a stop byte must be send twice.
The stop byte must have a he adecimal value of 0B or a binary value of 0000 1011 .

RS 232 Port
Software Protocol

RS 232 Port



Configuration Data Set

A configuration data set consists of

Start of data set	2 byte
Configuration data	20 byte
End of data set	2 byte

Byte 1 **Start Byte**
Byte 2 **Start Byte**
For the opening of the se uence a start byte must be send twice.
The start byte must have a he adecimal value of 0A or a binary value of 0000 1010 .

Byte 3 **Control Byte CD5CON**
8 bit word binary input.

Bit 0			Unused.
Bit 1			Unused.
Bit 2	0	CB5PSON	Must be 0.
Bit 3			Unused.
Bit 4			Unused.
Bit 5			Unused.
Bit 6	1	CB5STORE	Must be 1.
Bit 7			Unused.

Byte 4 **Operating State SD6OM**
8 bit word binary input unused.

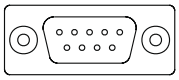
Byte 5 **Data Source Decoder CD5DEC**
8 bit word binary input unused.

Byte 6 **In Out Control CD5IOC**
8 bit word binary input defines settings.

Bit 0		Unused.
Bit 1		Unused.
Bit 2		Unused.
Bit 3		Unused.
Bit 4	1	Must be 1.
Bit 5	0	Must be 0.
Bit 6		Unused.
Bit 7		Unused.

RS 232 Port
Software Protocol

RS 232 Port



Byte 7 **Time Out Temperature Control CF5TOTC**
Byte 8
CF5TOTC 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1 1
16 bit word resolution 65535 steps range 0 to 655 3 s increment 100 ms.
Defines the time which may pass till a temperature interlock event leads to an error. An overrun leads to a time out error error bit EB6TOTC will be set and the diode current will be turned off.
Status byte 22 is the high-order part of the 16 bit word.

Byte 9 **Diode Current Set Point CF5DCSP**
Byte 10
CF5DCSP 1 1 1 1 1 1 1 1 1 1 1 1
12 bit value resolution 4095 steps range 0 to 50 A for LS 400-50 increment 12 21 mA
range 0 to 60 A for LS 400-60 increment 14 65 mA.
Defines the diode current set point which will be stored in the memory.
The value is valid if memory is selected as a data source for the diode current set point.
The lower half byte of byte 10 is the high-order part of the 12 bit value.
The upper half byte of byte 10 is unused.

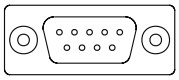
Byte 11 **Diode Current Limit CF5DCL**
Byte 12
CF5DCL 1 1 1 1 1 1 1 1 1 1 1 1
12 bit value resolution 4095 steps range 0 to 50 A for LS 400-50 increment 12 21 mA
range 0 to 60 A for LS 400-60 increment 14 65 mA.
Defines the diode current limit value which will be stored in the memory.
The value is valid if memory is selected as a data source for the diode current limit value.
The lower half byte of byte 12 is the high-order part of the 12 bit value.
The upper half byte of byte 12 is unused.

Byte 13 **TEC Temperature Set Point CF5PTSP**
Byte 14
CF5PTSP 1 1 1 1 1 1 1 1 1 1 1 1
12 bit value resolution 4095 steps range 0 to 50 C increment 0 01221 C.
Defines the TEC temperature set point which will be stored in the memory.
The value is valid if memory is selected as a data source for the TEC temperature set point.
The lower half byte of byte 14 is the high-order part of the 12 bit value.
The upper half byte of byte 14 is unused.

Byte 15 **TEC Temperature Interlock Limit CF5PTL**
Byte 16
CF5PTL 1 1 1 1 1 1 1 1 1 1 1 1
12 bit value resolution 4095 steps range 0 to 50 C increment 0 01221 C .
Defines the TEC temperature interlock limit value which will be stored in the memory.
The lower half byte of byte 16 is the high-order part of the 12 bit value.
The upper half byte of byte 16 is unused.

RS 232 Port
Software Protocol

RS 232 Port



Byte 17 **Diode Voltage Limit CF5DVL**
Byte 18
CF5DVL 1 1 1 1 1 1 1 1 1 1 1 1
12 bit value resolution 4095 steps range 0 to 25 V increment 6 105 01 mV.
Defines the diode voltage limit value which will be stored in the memory.
The lower half byte of byte 18 is the high-order part of the 12 bit value.
The upper half byte of byte 18 is unused.

Byte 19 **Data Source Decoder Local Mode CF5DECLOC**
8 bit word binary input defines the data source assignments for the local mode.

Bit 1	Bit 0	
0	0	The diode current limit value is given by RS 232 port.
0	1	The diode current limit value is given by memory.
1	0	The diode current limit value is given by control port.

Bit 4	Bit 3	Bit 2	
0	0	0	The diode current set point is given by RS 232 port.
0	0	1	The diode current set point is given by memory.
0	1	0	The diode current set point is given by control port.
1	0	0	The diode current set point is given by control panel.

Bit 7	Bit 6	Bit 5	
0	0	0	The TEC temperature set point is given by RS 232 port.
0	0	1	The TEC temperature set point is given by memory.
0	1	0	The TEC temperature set point is given by control port.
1	0	0	The TEC temperature set point is given by control panel.

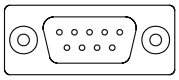
Different settings lead to a decoder fault error bit EB6DECF will be set.

Byte 20 **In Out Control Local Mode CF5IOCLOC**
8 bit word binary input defines settings for the local mode.

Bit 0	1	CB6SDCPEL	Shut down signal of control port approved.
Bit 1			Unused.
Bit 2			Unused.
Bit 3			Unused.
Bit 4			Unused.
Bit 5			Unused.
Bit 6			Unused.
Bit 7			Unused.

RS 232 Port
Software Protocol

RS 232 Port



Byte 21 **Data Source Decoder Remote Mode CF5DECREM**
8 bit word binary input defines the data source assignments for the remote mode.

Bit 1	Bit 0	
0	0	The diode current limit value is given by RS 232 port.
0	1	The diode current limit value is given by memory.
1	0	The diode current limit value is given by control port.

Bit 4	Bit 3	Bit 2	
0	0	0	The diode current set point is given by RS 232 port.
0	0	1	The diode current set point is given by memory.
0	1	0	The diode current set point is given by control port.
1	0	0	The diode current set point is given by control panel.

Bit 7	Bit 6	Bit 5	
0	0	0	The TEC temperature set point is given by RS 232 port.
0	0	1	The TEC temperature set point is given by memory.
0	1	0	The TEC temperature set point is given by control port.
1	0	0	The TEC temperature set point is given by control panel.

Different settings lead to a decoder fault error bit EB6DECF will be set.

Byte 22 **In Out Control Remote Mode CF5IOCREM**
8 bit word binary input defines settings for the remote mode.

Bit 0	1	CB6SDCPER	Shut down signal of control port approved.
Bit 1			Unused.
Bit 2			Unused.
Bit 3			Unused.
Bit 4			Unused.
Bit 5			Unused.
Bit 6			Unused.
Bit 7			Unused.

Byte 23 **Stop Byte**
Byte 24 **Stop Byte**
For the end of the se uence a stop byte must be send twice.
The stop byte must have a he adecimal value of 0B or a binary value of 0000 1011 .

Ordering information

Device	Current	Identification number

LS 400-50 0 ... 50 A 10100050
C manually operated potentiometer and display for current set point.

LS 400-50 0 ... 50 A 10100051
C manually operated potentiometer and display for current set point and temperature set point.

LS 400-50 0 ... 50 A 10100052
C manually and remote operated potentiometer and display for current set point control port RS 232 port system software.

LS 400-50 0 ... 50 A 10100053
C manually and remote operated potentiometer and display for current set point and temperature set point control port RS 232 port system software.

LS 400-50 0 ... 50 A 10100054
C manually operated potentiometer and display for current set point safety interlock pilot laser.

LS 400-50 0 ... 50 A 10100055
C manually operated potentiometer and display for current set point and temperature set point safety interlock pilot laser.

LS 400-50 0 ... 50 A 10100056
C manually and remote operated potentiometer and display for current set point control port RS 232 port system software safety interlock pilot laser.

LS 400-50 0 ... 50 A 10100057
C manually and remote operated potentiometer and display for current set point and temperature set point control port RS 232 port system software safety interlock pilot laser.

LS 400-50 FP 0 ... 50 A 10100064
C and fast pulsed manually operated potentiometer and display for current set point safety interlock pilot laser.

LS 400-50 FP 0 ... 50 A 10100065
C and fast pulsed manually operated potentiometer and display for current set point and temperature set point safety interlock pilot laser.

LS 400-50 FP 0 ... 50 A 10100066
C and fast pulsed manually and remote operated potentiometer and display for current set point control port RS 232 port system software safety interlock pilot laser.

LS 400-50 FP 0 ... 50 A 10100067
C and fast pulsed manually and remote operated potentiometer and display for current set point and temperature set point control port RS 232 port system software safety interlock pilot laser.

Ordering information

Device	Current	Identification number

LS 400-60 0 ... 60 A 10100080
C manually operated potentiometer and display for current set point.

LS 400-60 0 ... 60 A 10100081
C manually operated potentiometer and display for current set point and temperature set point.

LS 400-60 0 ... 60 A 10100082
C manually and remote operated potentiometer and display for current set point control port RS 232 port system software.

LS 400-60 0 ... 60 A 10100083
C manually and remote operated potentiometer and display for current set point and temperature set point control port RS 232 port system software.

LS 400-60 0 ... 60 A 10100084
C manually operated potentiometer and display for current set point safety interlock pilot laser.

LS 400-60 0 ... 60 A 10100085
C manually operated potentiometer and display for current set point and temperature set point safety interlock pilot laser.

LS 400-60 0 ... 60 A 10100086
C manually and remote operated potentiometer and display for current set point control port RS 232 port system software safety interlock pilot laser.

LS 400-60 0 ... 60 A 10100087
C manually and remote operated potentiometer and display for current set point and temperature set point control port RS 232 port system software safety interlock pilot laser.

LS 400-60 FP 0 ... 60 A 10100074
C and fast pulsed manually operated potentiometer and display for current set point safety interlock pilot laser.

LS 400-60 FP 0 ... 60 A 10100075
C and fast pulsed manually operated potentiometer and display for current set point and temperature set point safety interlock pilot laser.

LS 400-60 FP 0 ... 60 A 10100076
C and fast pulsed manually and remote operated potentiometer and display for current set point control port RS 232 port system software safety interlock pilot laser.

LS 400-60 FP 0 ... 60 A 10100077
C and fast pulsed manually and remote operated potentiometer and display for current set point and temperature set point control port RS 232 port system software safety interlock pilot laser.

Ordering information

Device	Identification number
Temperature Sensor	10360254
2 pole male cable connector interlock input manufacturer Binder 99 0601 00 02	10884986
4 pole male cable connector shutter output manufacturer Binder 99 0609 00 04	10884987

The laser systems LS 400 are also deliverable with customer-specific serigraphy and software.
It is also possible to install the components in a customer-specific enclosure like a 19 plug-in or suchlike.
According to your re uirements we also can machine the dummy plate for the fibre and the heatsink.
Please ask our support.

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