5 Standard Accessories

5.1 Laser Frequency Modulation

By applying an analog voltage signal in the range −10 V to +10 V to the modulation input labeled "Temperature Laser Crystal", using the BNC connector at the rear panel of the master oscillator control electronics unit (see Figure 2.3), the temperature of the laser crystal can be changed by +1 K / V, corresponding to a frequency change of about −3 GHz / V at 1064 nm. Due to the large time constants of the thermal tuning, the response bandwidth is limited to fractions of a Hertz.

5.2 Output Power Modulation

By applying an analog voltage signal in the range −10 V to +10 V to the modulation input labeled "Current Laser Diode", using the BNC connector at the rear panel of the control electronics unit (see Figure 2.3), the injection current of the master oscillator diode laser used to pump the laser crystal can be modulated by 0.1 A / V. The response bandwidth of this modulation input is limited to about 5 kHz.
Because of a nonlinear amplification factor it is not recommended to use this option for modulating the overall output power.

5.3 Temperature Guard

Failure to regulate the temperature of the diode lasers will result in diminished performance and lifetime. Hence, to ensure long term operation of the diode lasers, the **Mephisto MOPA** laser system is equipped with an integrated *Temperature Guard* that monitors deviations between the *Set temperature* and the *Actual temperature* of the *Laser Diode Driver*. It protects the laser diode against failure by switching the driver into inactive mode in case of any deviation between the two values for more than 1 minute. This is indicated by the *Guard* LED at the front panel of the master oscillator control electronics unit (see Figure 2.2).

5.4 Safety Interlock

If your laboratory environment features an interlock switch that remains off under unsafe conditions, connect it to the left two pins of the three-pole screw-type connector at the rear of the master oscillator control electronics unit. For activating the diode laser driver, these pins have to be shorted. The **Mephisto MOPA** master oscillator control electronics unit is shipped with a jumper installed, while the amplifier control electronics unit has to be connected to the alarm interlock of the applied water-cooling system or any other device, controlling the operation of the water-cooling system. The present status is indicated by a yellow LED at the front panel of the master oscillator control electronics unit (see Figure 2.2) or the yellow LED at the front panel of the Amplifier control electronics unit (see Figure 2.4), respectively. If the *Safety Interlock* is activated, e.g. by disconnecting the two pins, the LED glows and the *Laser Diode Drivers* will switch into inactive mode.

6 Pin Configurations

6.1 Master Oscillator Connector

The two units of the **Mephisto MOPA** laser system, the laser head and the master oscillator control electronics unit, are to be connected only with suitable cables, shipped with the laser system. The following Figure 6.1 illustrates the 37 pin D-Sub connector at the rear panel of the master oscillator control electronics unit:

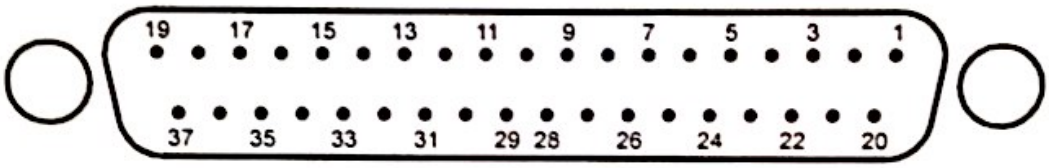

Figure 6.1: Master Oscillator (37 pin D-Sub) at the rear panel of the control electronics unit

The description of the individual pins of the laser connector is given in the following Table 6.1:

Pin	Description
1	Diode laser cathode
2	Diode laser 1, TEC anode
3	Diode laser 1, TEC cathode
4	Diode laser 2, TEC anode
5	Diode laser 2, TEC cathode
6	Laser crystal, TEC anode
7	Laser crystal, TEC cathode
8	nc
9	nc
10	Diode laser 1, monitor diode, cathode
11	Diode laser 1, monitor diode, anode
12	Laser crystal, NTC reference voltage 6.85 V
13	Laser crystal, NTC ground
14	nc
15	Diode laser 1, NTC reference voltage 6.85 V
16	Diode laser 1, NTC ground
17	Diode laser 2, NTC ground
18	nc
19	nc
20	Diode laser anode
21	Supply voltage +12 V
22	Relay, negative supply voltage
23	GND
24	Relay, positive supply voltage
25	Supply voltage -12 V
26	Noise Eater, monitor
27	Noise Eater, switch
28	nc
29	Diode laser 2, monitor diode, cathode

Pin	Description
30	Diode laser 2, monitor diode, anode
31	nc
32	Interlock
33	GND
34	Diode laser 2, NTC reference voltage 6.85 V
35	nc
36	nc
37	nc

Table 6.1: Pin description of the laser connector

6.2 Master Oscillator Diagnostics Connector

All vital information about the status of the **Mephisto MOPA** laser system can be monitored without opening the control electronics units, using the diagnostics connectors. The following Figure 6.2 illustrates the 25 pin D-Sub connector at the rear panel of the master oscillator electronics unit:

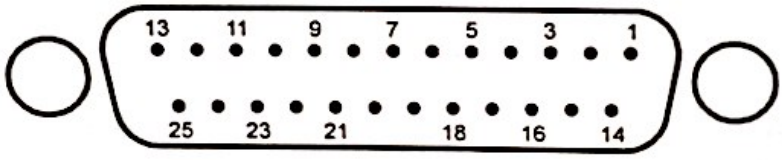

Figure 6.2: Diagnostics connector (25 pin D-Sub) at the rear panel of the master oscillator control electronics unit

A description of the individual pins of the diagnostics connector for the master oscillator control electronics is given in Table 6.2:

Pin	Description
1	Diode laser 1, power monitor, 1 V/W
2	Diode laser 2, power monitor, 1 V/W
3	Laser crystal, TEC error signal, 10 V/°C
4	Nc
5	Nc
6	Diode laser 1, TEC error signal, 10 V/°C
7	Diode laser 2, TEC error signal, 10 V/°C
8	Diode laser 1, temperature guard
9	Diode laser 2, temperature guard
10	nc
11	nc
12	Noise Eater, monitor
13	Interlock
14-25	GND

Table 6.2: Pin description of the diagnostics connector of the master oscillator control electronics

6.3 Master Oscillator Supply Voltage Indicators

In order to quickly check the presence of all supply voltages required for reliable operation of the **Mephisto** master oscillator system without opening the master oscillator control electronics unit, they are indicated by a set of eight LEDs at the rear panel of the master oscillator control electronics unit (see Figure 2.3). The description of the indicators is given in the following Table 6.3:

LED	Description
L1	Negative supply voltage, temperature controllers
L2	Positive supply voltage, laser crystal temperature controller
L3	Positive supply voltage, diode laser 2 temperature controller
L4	Positive supply voltage, diode laser 1 temperature controller
L5	Supply voltage, diode lasers
L6	Supply voltage, noise eater
L7	Negative supply voltage, electronics
L8	Positive supply voltage, electronics

Table 6.3: Description of the supply voltage indicators at the rear panel of the master oscillator control electronics unit

6.4 Amplifier Connector

The two units of the MOPA laser system, the laser head and the amplifier control electronics unit are to be connected only with the suitable cables, shipped with the laser system. The following illustrates the 5 pin D-Sub connector at the rear panel of the amplifier control electronics unit:

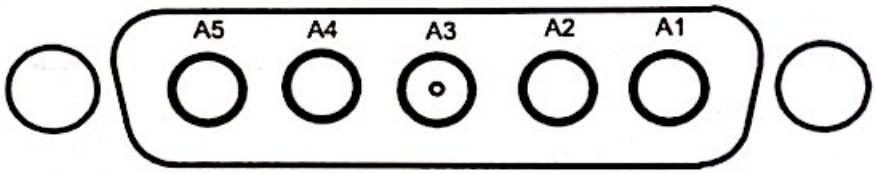

Figure 6.3: Control unit connector (5 pin D-Sub) at the rear panel of the amplifier control electronics unit

The description of the individual pins of the amplifier control unit connector is given in the following Table 6.5:

Pin	Description
A1	Diode laser cathode, 40 A contact
A2	Diode laser cathode, 40A contact
A3	Safety relay control, coax
A4	Diode laser anode, 40 A contact
A5	Diode laser anode, 40 A contact

Table 6.5: Pin description of the amplifier control unit connector

6.5 Amplifier Control Connector

The following Figure 6.5 illustrates the 25 pin D-Sub connector at the rear panel of the Laser unit:

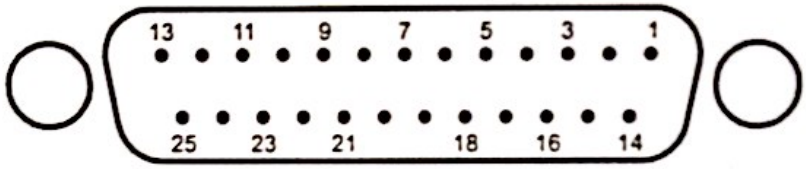

Figure 6.4: Control connector (25 pin D-Sub) at the rear panel the amplifier control electronics unit

A description of the individual pins of the control connector for the Laser unit is given in Table 6.7:

Pin	Description
1	Diode laser 1, TEC anode
2	Diode laser 1, TEC anode
3	nc
4	PT100, negative supply
5	PT100, diode laser 1
6	Shield
7	GND
8	Thermostatic Switch
9	PT100, diode laser 2
10	PT100, diode laser 2
11	nc
12	Diode laser 2, TEC anode
13	Diode laser 2, TEC anode
14	Diode laser 1, TEC cathode
15	Diode laser 1, TEC cathode
16	Nc
17	PT100, diode laser 1
18	PT100, diode laser 1
19	GND
20	nc
21	PT100, positive supply
22	PT100, diode laser 2
23	nc
24	Diode laser 2, TEC cathode
25	Diode laser 2, TEC cathode

Table 6.7: Pin description of the control connector of the amplifier control electronics unit

6.6 Amplifier Diagnostics Connector

The following Figure 6.4 illustrates the 25 pin D-Sub connector at the rear panel of the amplifier control electronics unit:

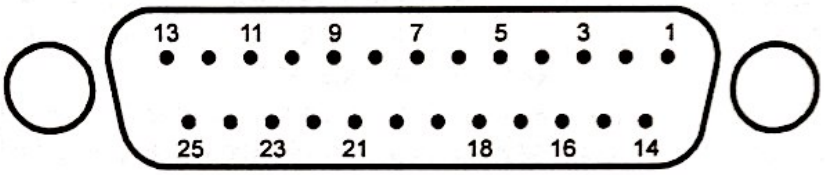

Figure 6.5: Diagnostics connector (25 pin D-Sub) at the rear panel of the amplifier control electronics unit

A description of the individual pins of the control connector for the amplifier control unit is given in Table 6.6:

Pin	Description
1	nc
2	Diode laser 1, TEC error signal
3	Diode laser 1, temperature guard
4	Diode laser 1, range error temperature
5	Diode laser 2, TEC error signal
6	Diode laser 2, temperature guard
7	Diode laser 2, range error temperature
8	Temperature heat sink >50 °C
9	Interlock
10	nc
11	nc
12	nc
13	nc
14-25	GND

Table 6.6: Pin description of the control connector of the amplifier control electronics unit