

# Benchtop Laser Diode Control Instrumentation

► LDC Series • TED Series • ITC Series • LAB 8000 • LDH Series



## Benchtop Laser Diode Control

The Benchtop Laser Diode Control Instrumentation Set is a controller series for:

- Benchtop laser diode current control (LDC Series) and temperature control (TED Series)
- Combination of both in benchtop instrument (ITC 500 Series)
- Combination of both in OEM cards (ITC 100 Series) of Eurocard size

The ITC Series houses a laser diode current supply and temperature control in one unit. The 300 and 500 Series can be operated remotely via an optional IEEE interface.

All of the laser diode controllers (LDCs and ITCs) share the same circuit design and technology, providing different current ranges for the various laser diode types. The LDC 340 offers two switchable current ranges. The instruments are optimized for very low noise and highly stable laser diode operation. They are equipped with a large variety of protection features with visual and audible alarming to safeguard the laser diode in any circumstance.

All instruments allow modulation of the laser diode current in constant power and constant current mode via an external analog input port.

The various temperature controllers (TEDs and ITCs) handle the demands of different thermal loads, as they occur, for different types of laser diodes or other devices to be cooled (e.g., optical crystals, and sensors). They are all designed in a similar way and feature excellent temperature stabilization to a few mK with the fastest settling times due to independently adjustable set values for the proportional, integral and differential sections of the PID controller.

A sudden 10 °C temperature change in a DIL laser package can be compensated within 2 seconds.

Damage to the thermoelectric cooler is reliably prevented by a limitation of the maximum allowed TEC current via a countersunk potentiometer or via software limits.

The instruments can be operated with all common temperature sensors like Thermistors (10 Ω to 200 kΩ), AD590 or LM335 chips

## ► Features & Benefits

Turnkey Solutions for Laser Diode Control Feature Three Configurations

### LDC Series

- Stand-alone Instrument for Laser Diode Current

### TED Series

- Stand-alone Instrument for Temperature Control

### ITC Series

- Combination Controllers for Laser Diode Current and Temperature Control

Best in Class, Low-noise and Ultra-stable Injection Current Control

Constant Stable Power and Current Operation for LCDs

Extensive Protection Features for No-risk Diode Operation

Temperature Window Protection to Safeguard the Laser Diode

Best in Class Temperature Settling Times to mK Stability

Wide Variety of Laser Diode Mounts to Support Different Test Setups

Rack Mountable Drawer with Eight Integrated Mounts for Quick Laser Diode Exchange

## ► Applications

Laser Diode Control for Benchtop Applications in R&D and Universities

Laser Diode Control for OEM Applications

Universal Temperature Controllers; e.g., for Crystals and Sensors in R&D and Universities

High Volume laser Diode Burn-in

COMPUTING

COMMUNICATIONS

VIDEO

# Benchtop Laser Diode Control Instrumentation

► LDC Series • TED Series • ITC Series • LAB 8000 • LDH Series

(–40 °C to 150 °C) and PT 100 (–40 °C to 150 °C). The temperature will be displayed in °C for all units with an internal processor.

Some instruments feature a special temperature window protection mode, which switches off the laser current of the connected LDC instrument off as soon as the laser temperature leaves an adjustable temperature window.

All temperature controllers have an analog input for applications where a slow temperature modulation or a closed loop feedback is required (optional for ITC 500 Series).

The instruments are easy to operate and to adjust by showing all relevant parameters on a display. The OEM combination controllers of ITC 100 Series can be connected to an external display module for setting and reading the parameters.

The LDH Series laser diode mounts integrate the heatsink and electronic circuitry to run a laser diode, even with modulation. There are mounts for all commercially available laser diode types: LDH DIL, LDH CD TC-B, LDH HHL, LDH BFY-B, LDH BFY-B1, LDH BFY-B2, LDH BFY-10GIG. Together with a current and temperature controller and the appropriate connection cables of the CAB Series, a turnkey system for a safe and high performance laser diode operation can be set up quickly.

The LAB 8000 integrates eight mounts for telecom lasers in a 14-pin butterfly package in a 19-inch rack mountable drawer box. The design enables free access to the laser sockets and pigtailed for quick, no risk, easy replacement of the laser diodes as required in burn-in stations. It ideally complements the 8-channel laser diode controller PRO 8000 equipped with ITC 8000 Series modules.

## Mounts for All Laser Diode and Temperature Controllers

**LDH DIL** – Accepts all lasers in DIL-14 packages. It can optionally be equipped with a Bias-T input for RF modulation from 0.2 to 500 MHz.

**LDH CD TC-B** – Designed for temperature controlled operation of 3- and 4-pin laser diodes in TO18 and TO46 packages. It can optionally be equipped with a Bias-T input for RF modulation from 0.2 to 500 MHz.

**LDH HHL** – Designed for temperature controlled operation of high power lasers in high-heat-load packages which need laser currents up to 5 amps.

**LDH BFY-B** – Can operate all commercially available laser diodes in 14-pin butterfly package. Three configuration mounts with different pinning are available. BFY-1/BFY-2 are for a pump telecom laser pinning while BFY-3 allows the free adaptation to non-standard pinning.

**LDH BFY-B1** – Designed for 14-pin butterfly pump laser diodes up to 5 amp laser current.

**LDH BFY-B2** – Designed for 14-pin butterfly telecom lasers coming with a Bias-T input for RF modulation from 0.2 to 500 MHz.

**LDH BFY-10GIG** – For 7-pin butterfly lasers with internal 10 Gbps electroabsorption modulators.

**LAB 8000** – 8-channel mount for telecom lasers in 14-pin butterfly package. Convenient 19-inch box-drawer design enables free access to the laser sockets and pigtailed for easy replacement of the laser diodes. It ideally complements the PRO 8000 equipped with eight ITC 8000 Series modules and a single connector for laser current and temperature output (Option ITC 8000-DS15).

## ► Characteristics

	OEM Series Combination Controllers	200 Series	300 Series	500 Series Combination Controller
Name	ITC 102 ITC 110 ITC 133	LDC 201 ULN LDC 202 LDC 210 LDC 220 TED 200	LDC 340 TED 350	ITC 502 ITC 510
Laser Diode Current Range	102: 0 to ±0.2 A 110: 0 to ±1.0 A 133: 0 to ±3.0 A* <sup>1</sup>	201 ULN: 0 to ±0.1 A 202: 0 to ±0.2 A 210: 0 to ±1 A 220: 0 to ±2 A	LDC 340: Switchable 0 to ±1 A/ 0 to ±4 A	502: 0 to ±0.2 A 510: 0 to ±1.0 A
Temperature Control Current Range	ITC 102: –2 to +2 A/12 W ITC 110: –2 to +2 A/12 W ITC 133: –3 to +3 A/18 W	TED 200: –2 to +2 A/12 W	TED 500: –5 to +5 A 40 W	ITC 502: –2 to +2 A/16 W ITC 510: –4 to +4 A/32 W
Control	Remotely Enable/Disable via TTL	N/A	IEEE 488.2 Option with 16-Bit resolution or 18-Bit at lower speed	IEEE 488.2 Option with 16-Bit resolution or 18-Bit at lower speed
LDC Modulation	Analog			
TED Modulation	Analog			Analog IN optional
Protection Features	Interlock, Short Circuit when off, Softstart, Current limit setting, Over temperature; Temperature window protection except for LDC 200 Series; Open circuit detection except for ITC 100 Series			
Display	3.5 LED Option	4.5 LCD	4.5 LED	4.5 LED
Displayed Parameters on LDCs	Laser current, monitor current, laser current limit, output power except for ITC 100 Series, reverse bias voltage and laser voltage except for ITC 100 and LDC 200 Series			
Displayed Parameters on TEDs	Actual temperature, set temperature, TEC current limit; TEC current except for ITC 100 Series, temperature window except for ITC 100 Series and TED 200, TEC voltage only for ITC 500 Series			

\*<sup>1</sup>The ITC 133 allows the variable splitting of maximal laser current and TEC current with the constraint that the sum of both must be ≤3 A.

# Benchtop Laser Diode Control Instrumentation

► LDC Series • TED Series • ITC Series • LAB 8000 • LDH Series

## ► LDC 200 Series

The technical data are valid at 23 ±5 °C and 45 ±15% relative humidity.

	LDC 201 ULN	LDC 202	LDC 210	LDC 220
<b>Current Control</b>				
Control Range (continuous)	0 to ±100 mA	0 to ±200 mA	0 to ±1 A	0 to ±2 A
Compliance Voltage	>2.5 V	>6 V	>4 V	>4 V
Resolution	10 µA	10 µA	100 µA	100 µA
Accuracy	±50 µA	±100 µA	±1 mA	±2 mA
Noise (10 Hz to 10 MHz, RMS), typical	<0.2 µA	<1.5 µA	<5 µA	<15 µA
Ripple (50 Hz, RMS), typical	<0.5 µA	<1.5 µA	<3 µA	<5 µA
Transients, typical	<50 µA	<0.2 mA	<1 mA	<2 mA
Drift (30 min, 0 to 10 Hz), typical	<10 µA	<20 µA	<100 µA	<200 µA
Temperature Coefficient	<50 ppm/°C			
<b>Power Control</b>				
Control Range Photo Current			5 µA to 2 mA	
Resolution Photo Current			0.1 µA	
Accuracy			±2 µA	
<b>Current Limit</b>				
Setting Range	0 to ≥100 mA	0 to ≥200 mA	0 to ≥1 A	0 to ≥2 A
Resolution	10 µA	10 µA	100 µA	100 µA
Accuracy	±0.5 mA	±0.5 mA	±2.5 mA	±5 mA
<b>Modulation, Analog Control Input</b>				
Input Resistance	10 kΩ			
Modulation Coefficient, CC	10 mA/V ±5%	20 mA/V ±5%	100 mA/V ±5%	200 mA/V ±5%
3 dB Bandwidth	DC – 3 kHz	DC – 250 kHz	DC – 100 kHz	DC – 50 kHz
Modulation Coefficient, CP	0.2 mA/V ±5%			
<b>Control Output for Laser Current</b>				
Load Resistance	>10 kΩ			
Transmission Coefficient	100 V/A ±5%	50 V/A ±5%	10 V/A ±5%	5 V/A ±5%
<b>Connectors</b>				
Laser Diode, Photodiode, LASER ON signal, Interlock			9-pin D-sub	
Modulation Input			BNC	
Control Output Laser Current			BNC	
Chassis Ground			4 mm banana	
<b>General Data</b>				
Line Voltage	100 V ±10%, 115 V ±10%, 230 V ±10%			
Line Frequency	50 to 60 Hz			
Maximum Power Consumption	13 W	15 W	30 W	45 W
Operating Temperature	0 to +40 °C			
Storage Temperature	–40 °C to +70 °C			
Warm-up Time for Rated Accuracy	10 min			
Weight	<3 kg			
Dimensions (W x H x D)*2	146 x 66 x 290 mm			

\*2Dimensions of chassis without feet and operating elements.

# Benchtop Laser Diode Control Instrumentation

► LDC Series • TED Series • ITC Series • LAB 8000 • LDH Series

## ► LDC 340

The technical data are valid at 23 ±5 °C and 45 ±15% relative humidity.

LDC 340	
<b>Current Control</b>	
Control Range (continuous) (switchable)	0 to ±1 A/0 to ±4 A
Compliance Voltage	>6 V
Resolution	1 mA
Accuracy	±4 mA
Noise (10 Hz to 10 MHz, RMS), typical	<30 µA
Ripple (50 Hz, RMS), typical	<6 µA
Transients, typical	<4 mA
Drift (30 min, 0 to 10 Hz), typical	<300 µA
Temperature Coefficient	<50 ppm/°C
<b>Power Control</b>	
Control Ranges Photo Current 1 (switchable)	50 µA to 2 mA/50 µA to 10 mA
Resolution Photo Current 1	0.1 µA/1 µA
Accuracy Photo Current 1	±2 µA/20 µA
Bias Voltage Photodiode 1	0 to 10 V
Control Range Photo Current 2	50 µA to 2 mA
Resolution Photo Current 2	0.1 µA
Accuracy Photo Current 2	±2 µA
Bias Voltage Photodiode 2	N/A
<b>Current Limit</b>	
Setting Range	0 to ≥4 A
Resolution	1 mA
Accuracy	±10 mA
<b>Power Limit</b>	
Setting Range	0 to 2 mA/0 to 10 mA
Resolution	0.1 µA/1 µA
Accuracy	±20 µA/200 µA
<b>Modulation, Analog Control Input</b>	
Input Resistance	10 kΩ
Modulation Coefficient in Constant Current Mode	400 mA/V ±5%
3 dB-bandwidth in Constant Current Mode	DC – 50 kHz
Modulation Coefficient in Constant Power Mode	0.2 mA/V ±5%/2 mA/V ±5%

## ► LDC 340 (continued)

The technical data are valid at 23 ±5 °C and 45 ±15% relative humidity.

### LDC 340

#### Laser Voltage Measurement

Measurement Principle	4-wire
Measurement Range	0 to 10 V
Resolution	1 mV
Accuracy	±10 mV

#### Control Output for Laser Current

Load Resistance	10 kΩ
Transmission Coefficient	2.5 V/A ±5%

#### Computer Interface (optional)

Setting Resolution	16-Bit
Measurement Resolution	16-Bit/18-Bit* <sup>3</sup>

#### Connectors

Laser Diode, Photodiode, LASER ON Signal, Interlock	9-pin D-sub
Modulation Input	BNC
Control Output for Laser Current	BNC
Laser Temperature-protection For TED 350 (rear of unit)	BNC
IEEE 488.2 Interface (option)	24-pin IEEE 488 jack
Chassis Ground	4 mm banana jack

#### General Data

Line Voltage	100 V ±10%, 115 V ±10%, 230 V ±10%
Line Frequency	50 to 60 Hz
Maximum Power Consumption	90 W
Operating Temperature	0 to +40 °C
Storage Temperature	-40 °C to +70 °C
Warm-up Time for Rated Accuracy	10 min
Weight	<7 kg
Dimensions (W x H x D)* <sup>4</sup>	220 x 110 x 351 mm

\*<sup>3</sup>In Hi-res mode.

\*<sup>4</sup>Dimensions of chassis without feet and operating elements.

# Benchtop Laser Diode Control Instrumentation

► LDC Series • TED Series • ITC Series • LAB 8000 • LDH Series

## Laser Diode Instrumentation

### ► TED 200 and TED 350

The technical data are valid at 23 ±5 °C and 45 ±15% relative humidity.

	TED 200	TED 350
<b>TEC Output</b>		
Control Range of TEC Current	-2 A to +2 A	-5 A to +5 A
Compliance Voltage	>6 V	>8 V
Maximum Output Power	12 W	40 W
Measurement Resolution TEC Current	1 mA	
Measurement Accuracy TEC Current	±25 mA	±50 mA
Measurement Resolution TEC Voltage	N/A	1 mV
Measurement Accuracy TEC Voltage	N/A	±40 mV
Noise and Ripple, typical	<1 mA	<2 mA
<b>Temperature Sensors</b>		
<b>Thermistor</b>		
Control Ranges (switchable)	10 Ω to 19.99 kΩ/100 Ω to 199.90 kΩ	
Resolution	1 Ω/10 Ω	
Accuracy	±10 Ω/±100 Ω	±5 Ω/±50 Ω
Stability	<0.5 Ω/5 Ω	<0.5 Ω/5 Ω
<b>IC-sensors (AD590/AD592/LM335)</b>		
Control Range	-40 °C to +150 °C	
Resolution	0.01 °C	
Accuracy	±0.1 °C	
Stability	<0.002 °C	
<b>PT 100*5</b>		
Control Range	N/A	-40 °C to +150 °C
Resolution	N/A	0.01 °C
Accuracy	N/A	±1 °C
Stability	N/A	<0.005 °C
<b>TEC Current Limit</b>		
Setting Range	0 to ≥2 A	0 to ≥5 A
Resolution	1 mA	
Setting Accuracy	±0.02 mA	±0.05 mA

\*5Only TED 350.

# Benchtop Laser Diode Control Instrumentation

► LDC Series • TED Series • ITC Series • LAB 8000 • LDH Series

## ► TED 200 and TED 350 (continued)

The technical data are valid at 23 ±5 °C and 45 ±15% relative humidity.

	TED 200	TED 350
<b>Temperature Control Input</b>		
Input Resistance	10 kΩ	
Control Voltage	0 to 10 V	
Transmission Coefficient IC-sensors	2 °C/V ±5%	
Transmission Coefficient Thermistor 20 kΩ/200 kΩ Range	0.2 kΩ/V 2.0 kΩ/V ±5%	
<b>Control Output</b>		
Load Resistance	>10 kΩ	
Transmission Coefficient IC-sensors	50 mV/°C ±5%	10 V/T <sub>WIN</sub> ±5%
Transmission Coefficient Thermistor 20 kΩ/200 kΩ Range	500 mV or 50 mV/kΩ ±5%	10 V/R <sub>WIN</sub> ±5%
<b>Temperature-window Protection</b>		
Setting Range T <sub>WIN</sub>	N/A	0.5 °C to +20 °C
Setting Range R <sub>WIN</sub> 20 kΩ/200 kΩ Range	N/A	50 Ω to 2 kΩ 500 Ω to 20 kΩ
<b>Connectors</b>		
Sensor, TE Cooler, TEC ON Signal	9-pin D-sub plug	15-pin D-sub jack
Control Input/Output	BNC/BNC	
Temperature-window Protection* <sup>6</sup>	N/A	BNC
Chassis Ground	4 mm banana jack	
IEEE 488.2 Interface (option)	N/A	24-pin IEEE 488 jack
<b>General Data</b>		
Line Voltage	100 V ±10%, 115 V ±10%, 230 V ±10%	
Line Frequency	50 to 60 Hz	
Maximum Power Consumption	43 W	105 W
Operating Temperature	0 to +40 °C	
Storage Temperature	-40 °C to +70 °C	
Warm-up Time for Rated Accuracy	10 min	
Weight	<3.5 kg	<7 kg
Dimensions (W x H x D)* <sup>7</sup>	146 x 66 x 290 mm	220 x 110 x 351 mm

\*<sup>6</sup>Only TED 350.

\*<sup>7</sup>Dimensions of chassis without feet and operating elements.

# Benchtop Laser Diode Control Instrumentation

► LDC Series • TED Series • ITC Series • LAB 8000 • LDH Series

## ► ITC Combi Controllers ITC 500

The technical data are valid at 23 ±5 °C and 45 ±15% relative humidity.

	ITC 502	ITC 510
<b>Laser Diode Current Control</b>		
Control Range (continuous)	0 to ±200 mA	0 to ±1 A
Compliance Voltage		>6 V
Resolution	0.01 mA	0.1 mA
Accuracy	±0.1 mA	±1 mA
Noise (10 Hz to 10 MHz, RMS), typical	<1.5 µA	<5 µA
Ripple (50 Hz, RMS), typical	<1.5 µA	<3 µA
Transients (typical)	<0.2 mA	<1 mA
Drift (30 min, at constant ambient temperature), typical	<20 µA	<100 µA
Temperature Coefficient	<50 ppm/°C	<50 ppm/°C
<b>Power Control</b>		
Control Range Photo Current		5 µA to 2 mA
Resolution Photo Current		0.1 µA
Accuracy		±2 µA
Reverse Bias Voltage Photodiode		0 to 10 V
<b>Current Limit</b>		
Setting Range	0 to ≥200 mA	0 to ≥1 A
Resolution	0.01 mA	0.1 mA
Setting Accuracy	±0.5 mA	±2.5 mA
<b>Modulation, Analog Control Input</b>		
Input Resistance		10 kΩ
Modulation Coefficient, CC	20 mA/V ±5%	100 mA/V ±5%
3 dB-bandwidth, CC	DC – 500 kHz	DC – 200 kHz
Modulation Coefficient, CP		0.2 mA/V ±5%
<b>Control Output</b>		
Load Resistance		10 kΩ
Transmission Coefficient	50 V/A ±5%	10 V/A ±5%
<b>Laser Voltage Measurement</b>		
Measurement Principle		4-wire
Measurement Range		0 to 10 V
Resolution		1 mV
Accuracy		±20 mV
<b>Temperature Control</b>		
Control Range of TEC Current	-2 A to +2 A	-4 A to +4 A
Compliance Voltage		>8 V
Maximum Output Power	16 W	32 W
Measurement Resolution TEC Current		1 mA
Measurement Accuracy TEC Current		±40 mA
Measurement Resolution TEC Voltage		1 mV
Measurement Accuracy TEC Voltage		±40 mV
Noise and Ripple (typical)	<1 mA	<2 mA



# Benchtop Laser Diode Control Instrumentation

► LDC Series • TED Series • ITC Series • LAB 8000 • LDH Series

## ► ITC Combi Controllers ITC 500 (continued)

The technical data are valid at 23 ±5 °C and 45 ±15% relative humidity.

	ITC 502	ITC 510
<b>Temperature Sensors</b>		
<b>Thermistor</b>		
Control Ranges	10 Ω to 19.999 kΩ/100 Ω to 199.90 kΩ	
Resolution	1 Ω/10 Ω	
Accuracy	±5 Ω/50 Ω	
Temperature Stability	≥0.5 Ω/5 Ω	
<b>IC-sensors (AD590/AD592/LM335)</b>		
Control Ranges	-50 °C to +140 °C	
Resolution	0.01 °C	
Accuracy	±0.1 °C	
Temperature Stability	<0.002 °C	
<b>TEC Current Limit</b>		
Setting Range	0 to >2 A	0 to ≥4 A
Resolution	1 mA	
Accuracy	±50 mA	
<b>Analog Control Output</b>		
Load Resistance	10 kΩ	
Transmission Coefficient Thermistor	500 or 50 mV/kΩ ±5%	
Transmission Coefficient IC-sensors	50 mV/°C ±5%	
<b>IEEE 488.2 Interface</b>		
Setting Resolution	16-Bit	
Measurement Resolution	16-Bit/18-Bit* <sup>8</sup>	
<b>Connectors</b>		
Laser Diode, Photodiode, LASER ON Signal, Interlock	9-pin D-sub jack	
TE Cooler, Temperature Sensor	15-pin D-sub jack	
Modulation Input	BNC	
Control Output Laser Current	BNC	
Control Output Temperature	BNC	
IEEE 488.2 Interface (option)	24-pin IEEE 488 jack	
Chassis Ground	4 banana jack	
Line Voltage	100 V ±10%, 115 V ±10%, 230 V ±10%	
Line Frequency	50 to 60 Hz	
Maximum Power Consumption	65 W	130 W
Operating Temperature	0 to +40 °C	
Storage Temperature	-40 °C to +70 °C	
Warm-up Time For Rated Accuracy	10 min	
Weight	<7 kg	
Dimensions (W x H x D)* <sup>9</sup>	220 x 110 x 351 mm	

\*<sup>8</sup>In Hi-res mode.

\*<sup>9</sup>Dimensions of chassis without feet and operating elements.

# Benchtop Laser Diode Control Instrumentation

► LDC Series • TED Series • ITC Series • LAB 8000 • LDH Series

## ► ITC Combi Controllers ITC 100 Series

The technical data are valid at 23 ±5 °C and 45 ±15% relative humidity.

### Laser Diode Current Control of ITC 100 Series

	ITC 102	ITC 110	ITC 133*10
<b>Current Control</b>			
Display Laser Current ON		LED	
Trim Potentiometers (15-turn)		$I_{LD}$ , $I_{PD}$ resp. $P_{LD}$ , $I_{LD LIM}$	
Injection Current Range	0 to ±200 mA	0 to ±1 A	0 to ±3 A*11
Compliance Range		>4 V	
Setting Accuracy (f.s.)		±2%	
Noise (10 Hz to 10 MHz, RMS), typical	<2 µA	<6 µA	<25 µA
Drift (30 min), typical	<20 µA	<100 µA	<300 µA
Temperature Coefficient		<50 ppm/°C	
<b>Power Control</b>			
Photo Current Range		5 µA to 2 mA*12	
Photo Current Accuracy (f.s.)		±2%	
<b>Current Limit</b>			
Setting Range	0 to >200 mA	0 to >1 A	0 to >3 A
Accuracy (f.s.)		±2%	
<b>Analog Modulation Input</b>			
Input Resistance		10 kΩ	
Modulation Coefficient, CC	40 mA/V ±5%	200 mA/V ±5%	600 mA/V ±5%
3 dB-bandwidth, CC	DC – 200 kHz	DC – 50 kHz	DC – 20 kHz
Modulation Coefficient, CP		0.4 mA/V ±5%	
<b>TTL Modulation Input</b>			
Rise/Fall Time	<10 µs	<50 µs	<100 µs
<b>Measurement and Control Outputs</b>			
Analog Measurement Values		$I_{LD}$ , $I_{PD}$ , $I_{LD LIM}$	
Measurement Outputs		0 to ±5 V	
Measurement Accuracy (f.s.)		±2%	
TTL Control Outputs		LD ON, LIMIT	
<b>Temperature Control of ITC 100 Series</b>			
Display TEC Current ON		LED	
Trim Potentiometers (15-turn)		$I_{TEC LIM}$ , $T_{SET}/R_{SET}$	
Trim Potentiometers (1-turn)		P-, I- and D-share	
<b>TEC Output</b>			
TEC Current Range	-2 A to +2 A	-2 A to +2 A	-3 A to +3 A*13
Maximum Output Power	12 W	12 W	18 W
Noise and Ripple	<1 mA	<1 mA	<3 mA
Compliance Voltage		>6 V	

## ► ITC Combi Controllers ITC 100 Series (continued)

The technical data are valid at 23 ±5 °C and 45 ±15% relative humidity.

### Laser Diode Current Control of ITC 100 Series

	ITC 102	ITC 110	ITC 133*9
<b>Temperature Sensors</b>			
<b>Thermistor</b>			
Control Range	0.1 Ω to 80 kΩ		
Accuracy (f.s.)	±2%		
Reproducibility	±0.1%		
Temperature Stability, typical	<2 Ω		
<b>IC-sensors (AD590/AD592/LM335)</b>			
Control Range	-20 °C to +80 °C		
Accuracy (f.s.)	±2%		
Reproducibility	±0.1 °C		
Temperature Stability, typical	<0.004 °C		
<b>TEC Current Limits</b>			
Setting Range	0 to >2 A	0 to >2 A	0 to >3 A
Accuracy (f.s.)	±5%		
<b>Temperature Control Inputs</b>			
TTL Control Input	TEC ON		
Analog Control Input	$T_{SET}/R_{SET}$		
Input Resistance	10 kΩ		
Input Coefficient Thermistor	10 kΩ/V		
Input Coefficient IC-sensor	20 °C/V		
<b>Measurement and Control Outputs</b>			
Analog Measurement Values	$I_{TEC}^{*14}$ , $I_{TEC LM}$ , $T_{ACT}/R_{ACT}$ , $T_{SET}/R_{SET}$ , $\Delta T/\Delta R^{*14}$		
Measurement Outputs	0 to ±5 V		
Measurement Accuracy (f.s.)	±2%		
TTL Control Outputs	TEC ON, TEMP ok.		
<b>Connectors</b>			
Laser Diode, Photodiode, LD ON Signal, Interlock, Temperature Sensor, TE Cooler	15-pin D-sub and 64-pin DIN 41612		
Digital Control Inputs and Outputs, Analog Measurement Outputs	64-pin DIN 41612		
Laser Modulation Input, Temperature Control Input	SMB and 64-pin DIN 41612		
Supply Voltage*15, *16	±12 to 15 V/2.3 A	±12 to 15 V/3.1 A	±12 to 15 V/3.1 A
Operating Temperature	0 to +40 °C		
Storage Temperature	-40 °C to +70 °C		
Warm-up Time For Rated Accuracy	10 min		
Weight	<0.7 kg		
Dimensions (W x H x D)*17	Eurocard: 100 x 42 x 160 mm: heatsink removable for mounting		

\*10 Combi-controller with variable splitting of maximum laser current and TEC current, sum of output currents ≤3 A.

\*11 At 3 A laser current temperature control is not possible with the same board.

\*12 Other ranges on request.

\*13 At 3 A TEC current laser diode control is not possible with the same board.

\*14 Cannot be displayed with module DISP 100.

\*15 Other supply voltages on request.

\*16 The required current depends on the set laser polarity and current and the set laser temperature.

\*17 Without connectors.

## Benchtop Laser Diode Control Instrumentation

► LDC Series • TED Series • ITC Series • LAB 8000 • LDH Series

### ► ITC Combi Controllers ITC 100 Series (continued)

Display Module	DISP 100
Display Module	$I_{PD}$ , $I_{LD}$ , $I_{LD\ LIM}$ , $T_{SET}/R_{SET}$ , $T_{ACT}/R_{ACT}$ , $I_{TEC\ LIM}$
Resolution	3.5 LED
Accuracy	± 1 digit
Operating Temperature	0 to +40 °C
Storage Temperature	-40 °C to +70 °C
Warm-up Time For Rated Accuracy	10 min
Weight	0.1 kg
Dimensions (W x H x D)	Eurocard: 70 x 100 x 45 mm: heatsink removable for mounting

### ► LAB 8000 Laser Diode Mount Drawer Box

Laser Package	14-pin butterfly
Pin Configuration	freely configurable
Maximum Laser Current Allowed	≤ 500 mA <sup>*18</sup>
Laser Sockets	ZIF (Zero Insertion Force)
Fiber Connectors <sup>*19</sup>	FC/APC
Electrical Connectors <sup>*20</sup>	15-pin D-sub
Dimensions (W x H x D)	449 <sup>*21</sup> x 44 x 425 mm
Operating Temperature	0 to +30 °C <sup>*22</sup>
Storage Temperature	-40 °C to +70 °C

<sup>\*18</sup> If mounted below a PRO 8000 for ventilation.

<sup>\*19</sup> Other connectors on request.

<sup>\*20</sup> At the rear panel.

<sup>\*21</sup> Dimensions without handles.

<sup>\*22</sup> +40 °C with diode current < 200 mA.

## ► LDH Series

The technical data are valid at 23 ±5 °C and 45 ±15% relative humidity

Laser Diode Mount	LDH CD TC-B	LDH DIL	LDH HHL
Laser Diode Package	T018 (5.6 and 9 mm) <sup>*23</sup>	DIL-14	HHL
Maximum Laser Current <sup>*24</sup>	1 A		5 A
DC Input Resistance (without/with Bias-T) <sup>*25</sup>	0.5 Ω/1 Ω		0 Ω/N/A
Polarity of Laser Diode	Selectable		AG
Polarity of Monitor Diode	Selectable		Floating
Maximum RF Power <sup>*26</sup>	200 mW		N/A
Modulation Frequency (Bias-T) <sup>*26</sup>	0.2 to 500 MHz		N/A
RF Input Resistance/Bias-T <sup>*26</sup>	50 Ω		N/A
Maximum TEC Current	5 A <sup>*27</sup>	5 A <sup>*27, *28</sup>	5 A <sup>*27, *28</sup>
Temperature Sensor	Thermistor/AD590	Thermistor <sup>*29</sup>	Thermistor <sup>*29</sup>
Temperature Range (at 25 °C with 2 A TEC Current)	+5 to 70 °C	-10 to 70 °C <sup>*30</sup>	+5 to 70 °C
Heatsink Temperature Coefficient	2 °C/W	3 °C/W	2 °C/W
Control LEDs	LD ON, TEC ON	LD ON	LD ON, TEC ON

## Connectors

Current/Temperature Control	9-pin D-sub jack/plug		
Modulation		SMA	N/A
Weight	<0.4 kg	<0.25 kg	<0.5 kg
Dimensions (W x H x D)	80 x 91 x 50 mm	54 x 65 x 87 mm	80 x 86 x 52 mm

<sup>\*23</sup> For example Hitachi G-type, Mitsubishi 9 mm, Sharp S- and D-type, Sony U- and V-type, one clamp ring each for 9 mm and 5.6 mm included in delivery.

<sup>\*24</sup> Other ranges on request.

<sup>\*25</sup> Protective resistor in series to the laser diode.

<sup>\*26</sup> With Option Bias-T.

<sup>\*27</sup> The maximum allowed TEC current in continuous operation is limited in convection cooling by the increase in temperature at the heatsink.

<sup>\*28</sup> With DIL14 and BFY-14 and also with some HHL laser diodes the TE cooler is integrated into the package, i.e., for the maximum allowed TEC current in continuous operation please refer to the data sheet of the laser diode.

<sup>\*29</sup> Integrated into the laser diode package.

<sup>\*30</sup> Depending on the laser diode used.

# Benchtop Laser Diode Control Instrumentation

► LDC Series • TED Series • ITC Series • LAB 8000 • LDH Series

## ► LDH Series (continued)

The technical data are valid at 23 ±5 °C and 45 ±15% relative humidity

Laser Diode Mount	LDH BFY-B	LDH BFY-B1	LDH BFY-B2	LDH-BFY-10GIG
Laser Diode Package	BFY-14 <sup>*31</sup>	BFY-14, type 1	BFY-14, type 2	BFY-7, 10GIG
Maximum Laser Current <sup>*32</sup>	1 A	5 A	1 A	1 A
DC Input Resistance (without/with Bias-T) <sup>*33</sup>	0.5 Ω/NA	0 Ω/NA	NA/0.5 Ω	0.5 Ω/NA
Polarity of Laser Diode	Selectable	AG	AG	CG
Polarity of Monitor Diode	Floating			
Maximum RF Power <sup>*34</sup>	N/A	N/A	200 mW	N/A
Modulation Frequency (Bias-T) <sup>*34</sup>	N/A	N/A	0.2 to 500 MHz	<sup>*37</sup>
RF Input Resistance (Bias-T) <sup>*34</sup>	N/A	N/A	50 Ω	<sup>*37</sup>
Maximum TEC Current <sup>*35, *36</sup>	2 A	5 A	2 A	2 A
Temperature Sensor	Thermistor			
Temperature Range	-10 to 70 °C (at 25 °C with 2 A TEC current and no load)			
Heatsink Temperature Coefficient	3 °C/W			
Control LEDs	LD ON, TEC ON			
<b>Connectors</b>				
Current/Temperature Control	9-pin D-sub jack/9-pin D-sub plug			
Modulation	N/A	N/A	SMA	<sup>*37</sup>
Weight	<0.25 kg			
Dimensions (H x W x D)	45 x 72 x 108 mm			

<sup>\*31</sup> Type 1, Type 2 and user configurable.

<sup>\*32</sup> Other ranges on request.

<sup>\*33</sup> Protective resistor in series to the laser diode.

<sup>\*34</sup> With Option Bias-T.

<sup>\*35</sup> With DIL14 and BFY-14 and also with some HHL laser diodes the TE cooler is integrated into the package, i.e., for the maximum allowed TEC current in continuous operation please refer to the data sheet of the laser diode.

<sup>\*36</sup> The maximum allowed TEC current in continuous operation is limited in convection cooling by the increase in temperature at the heatsink.

<sup>\*37</sup> Depending on the laser diode used.

## ► Ordering Information

### Benchtop/OEM Laser Diode Controllers

**ITC 102**– OEM Board level combination controller, laser current range 0 to  $\pm 200$  mA and  $\pm 2$  A/12 W temperature control.

**ITC 110**– OEM Board level combination controller, laser current range 0 to  $\pm 1$  A and  $\pm 2$  A/12 W temperature control.

**ITC 133**– OEM Board level combination controller, variable setting ranges for maximum laser current and maximum TEC current, maximum output current  $\geq 3$  A (sum of laser and TEC current).

**DISP 100**– 3.5 digit display module with connection cable for a board of the ITC 100 Series, LED display with an accuracy of  $\pm 1$  digit.

**LDC 201ULN**– Current Controller for Laser Diodes 0 to 100 mA/2.5 V Ultra Low Noise.

**LDC 202**– Current Controller for Laser Diodes 0 to 200 mA/6 V.

**LDC 210**– Current Controller for Laser Diodes 0 to 1 A/4 V.

**LDC 220**– Current Controller for Laser Diodes 0 to 2 A/4 V.

**TED 200**– Temperature Controller 12 W Cooling Power at 2 A/6 V.

**LDC 340**– Current Controller for Laser Diodes (2 Current Ranges) Current Ranges 0 to 1 A/6 V and 0 to 4 A/6 V.

**TED 350**– Temperature Controller 40 W Cooling power at 5 A/8 V.

**IEEE488-300**– Optional IEEE 488.2 interface; LabView and LabWindows drivers included.

**ITC 502**– Current and Temperature Controller, current range 0 to 200 mA/6 V, 16 W cooling power at 2 A/8 V.

**ITC 510**– Current and Temperature Controller, current range 0 to 1 A/6 V, 32 W cooling power at 4 A/8 V.

**IEEE488-500**– Optional IEEE 488.2 interface; LabView and LabWindows drivers included.

**TUNE-T500**– Optional analog control input for the Temperature Controller.

## ► To Connect a Laser Diode Controller to a Laser Diode Mount

Current and Temperature Controller	Cable	Mount
LDC 200 Series, LDC 340	CAB 400	LDH (all types)
TED 200	CAB 420	LDH (all types)
TED 350	CAB 420-15	LDH (all types)
ITC 502, ITC 510	CAB 400 and CAB 420-15	LDH (all types)
ITC 102, ITC 110, ITC 133	CAB 430	LDH (all types)

### Service Options

**CAL LDC 200**– Recalibration of a Series 200 Benchtop Device.

**CAL TED 200**– Recalibration of a TED 200.

**CAL LDC 300**– Recalibration of a Series 300 Benchtop Device.

**CAL TED 350**– Recalibration of a TED 350.

**CAL ITC 500**– Recalibration of a Series 500 Benchtop Device.

### Laser Diode Mounts

**LDH BFY B**– Laser Diode Mount for 14-pin butterfly packages Type 1, Type 2 and programmable pinning.

**LDH BFY B1**– Laser Diode Mount for pump lasers up to 5 A in 14-pin butterfly packages (Type 1).

**LDH BFY B2**– Laser Diode Mount for 14-pin butterfly packages (Type 2) including Bias-T.

**LDH BFY-10GIG**– Laser Diode Mount for 7-pin butterfly packages (Telecom Lasers) with integrated 10 Gbps EA-Modulator.

**LDH HHL**– Laser Diode Mount for high heat load packages.

**LDH CD TC-B**– Laser Diode Mount for TO-18 and TO-46 packages.

**LDH DIL**– Laser Diode Mount for DIL-14 packages.

**LDH Bias-T**– 0.2 to 500 MHz Bias-T.

**LAB 8000**– 8-fold 14-pin butterfly mount in 19 in. drawer box.

### Cables

**CAB 400**– Cable for a Current Controller with 9-pin D-sub Connector, 1.5 m.

**CAB 420**– Cable for a Temperature Controller with 9-pin D-sub connector, 1.5 m.

**CAB 420-15**– Cable for a Temperature Controller with 15-pin D-sub Connector, 1.5 m.

**CAB 430**– Cable to connect a board of the ITC 100 Series to a laser diode mount of the LDH Series.

**CAB 450**– Cable for one channel of the LAB 8000 to be connected to one ITC 8000 Module (Option ITC 8000-DS15 required), 1.5 m.

# Benchtop Laser Diode Control Instrumentation

► LDC Series • TED Series • ITC Series • LAB 8000 • LDH Series

## Contact Tektronix:

**ASEAN / Australasia / Pakistan** (65) 6356 3900

**Austria** +43 2236 8092 262

**Belgium** +32 (2) 715 89 70

**Brazil & South America** 55 (11) 3741-8360

**Canada** 1 (800) 661-5625

**Central Europe & Greece** +43 2236 8092 301

**Denmark** +45 44 850 700

**Finland** +358 (9) 4783 400

**France & North Africa** +33 (0) 1 69 86 80 34

**Germany** +49 (221) 94 77 400

**Hong Kong** (852) 2585-6688

**India** (91) 80-2275577

**Italy** +39 (02) 25086 1

**Japan** 81 (3) 3448-3010

**Mexico, Central America & Caribbean** 52 (55) 56666-333

**The Netherlands** +31 (0) 23 569 5555

**Norway** +47 22 07 07 00

**People's Republic of China** 86 (10) 6235 1230

**Poland** +48 (0) 22 521 53 40

**Republic of Korea** 82 (2) 528-5299

**Russia, CIS & The Baltics** +358 (9) 4783 400

**South Africa** +27 11 254 8360

**Spain** +34 (91) 372 6055

**Sweden** +46 8 477 6503/4

**Taiwan** 886 (2) 2722-9622

**United Kingdom & Eire** +44 (0) 1344 392400

**USA** 1 (800) 426-2200

**USA (Export Sales)** 1 (503) 627-1916

For other areas contact Tektronix, Inc. at: 1 (503) 627-7111

Updated 20 September 2002

Our most up-to-date product information is available at:

[www.tektronix.com](http://www.tektronix.com)

Products are manufactured in  
ISO registered facilities.



Copyright © 2002, Tektronix, Inc. All rights reserved. Tektronix products are covered by U.S. and foreign patents, issued and pending. Information in this publication supersedes that in all previously published material. Specification and price change privileges reserved. TEKTRONIX and TEK are registered trademarks of Tektronix, Inc. All other trade names referenced are the service marks, trademarks or registered trademarks of their respective companies.

12/02 HB/XBS

30W-15957-1