



VS14 Detector Set

Sensitive, fast MWIR set for <3.5 to 6+ microns with user selectable DC or AC coupling, user selectable upper frequency 150kHz, 1.5MHz or 20MHz, and variable gain.

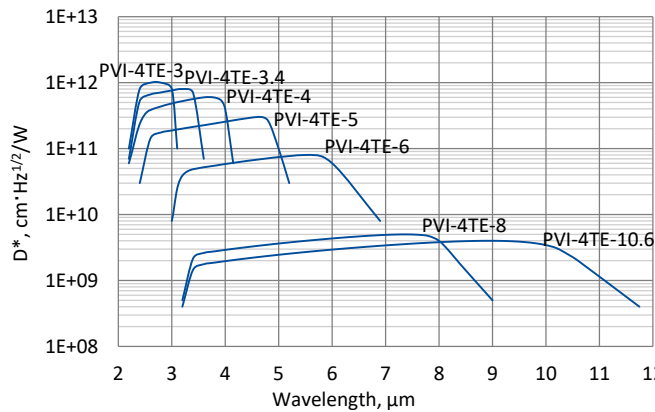
- PVI-4TE-5-1x1
- PIP-DC-20M-F-M8
- PTCC-01-BAS

PVI-4TE series

2 – 12 μm HgCdTe four-stage thermoelectrically cooled, optically immersed photovoltaic detectors

PVI-4TE series features four-stage thermoelectrically cooled IR photovoltaic detectors based on sophisticated HgCdTe heterostructures for the best performance and stability, optically immersed in order to improve parameters of the devices. The detectors are optimized for the maximum performance at λ_{opt} . Cut-on wavelength can be optimized upon request. Reverse bias may significantly increase speed of response and dynamic range. It results also in improved performance at high frequencies, but 1/f noise that appears in biased devices may reduce performance at low frequencies. 3° wedged sapphire (wAl₂O₃) or zinc selenide anti-reflection coated (wZnSeAR) window prevents unwanted interference effects.

Spectral response ($T_a = 20^\circ\text{C}$, $V_b = 0\text{ mV}$)



Exemplary spectral detectivity, the spectral response of delivered devices may differ.

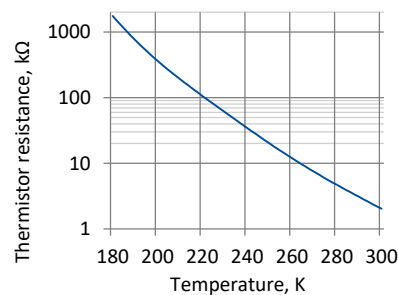
Specification ($T_a = 20^\circ\text{C}$, $V_b = 0\text{ V}$)

Parameter	Detector type						
	PVI-4TE-3	PVI-4TE-3.4	PVI-4TE-4	PVI-4TE-5	PVI-4TE-6	PVI-4TE-8	PVI-4TE-10.6
Active element material	epitaxial HgCdTe heterostructure						
Optimum wavelength λ_{opt} , μm	3.0	3.4	4.0	5.0	6.0	8.0	10.6
Detectivity $D^*(\lambda_{\text{peak}})$, $\text{cm}^2\cdot\text{Hz}^{1/2}/\text{W}$	$\geq 1.0 \times 10^{12}$	$\geq 8.0 \times 10^{11}$	$\geq 6.0 \times 10^{11}$	$\geq 3.0 \times 10^{11}$	$\geq 8.0 \times 10^{10}$	$\geq 5.0 \times 10^9$	$\geq 4.0 \times 10^9$
Detectivity $D^*(\lambda_{\text{opt}})$, $\text{cm}^2\cdot\text{Hz}^{1/2}/\text{W}$	$\geq 8.0 \times 10^{11}$	$\geq 7.0 \times 10^{11}$	$\geq 4.0 \times 10^{11}$	$\geq 1.0 \times 10^{11}$	$\geq 6.0 \times 10^{10}$	$\geq 4.0 \times 10^9$	$\geq 2.0 \times 10^9$
Current responsivity $R_i(\lambda_{\text{opt}})$, A/W	≥ 0.5	≥ 0.8	≥ 1.0	≥ 1.3	≥ 1.5		≥ 0.5
Time constant τ , ns	≤ 280	≤ 200	≤ 100	≤ 80	≤ 50	≤ 45	≤ 25
Resistance-optical area product $R \cdot A_o$, $\Omega \cdot \text{cm}^2$	≥ 30000	≥ 2000	≥ 800	≥ 40	≥ 3	≥ 0.06	≥ 0.05
Active element temperature T_{det} , K	~ 195						
Optical area A_o , mm $\times$ mm	0.5 $\times$ 0.5, 1 $\times$ 1						
Package	T08, T066						
Acceptance angle Φ	$\sim 36^\circ$						
Window	wAl ₂ O ₃				wZnSeAR		

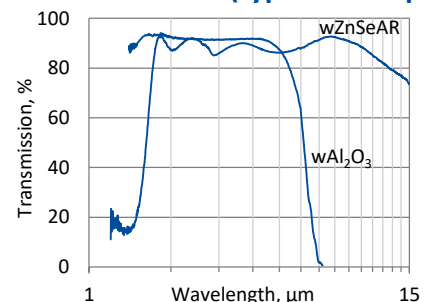
Four-stage thermoelectric cooler parameters

Parameter	Value
T_{det} , K	~ 195
V_{max} , V	8.3
I_{max} , A	0.4
Q_{max} , W	0.28

Thermistor characteristics

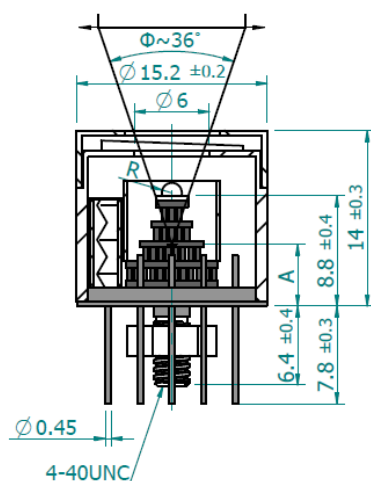


Spectral transmission of wAl₂O₃ and wZnSeAR windows (typical example)



Mechanical layout, mm

4TE-T08 package



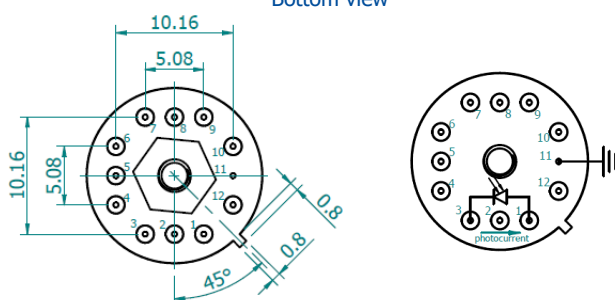
Parameter	Value	
Immersion microlens shape	hyperhemisphere	
Optical area A ₀ , mm×mm	0.5×0.5	1×1
R, mm	0.5	0.8
A, mm	7.3±0.4	6.4±0.4

 Φ – acceptance angle

R – hyperhemisphere microlens radius

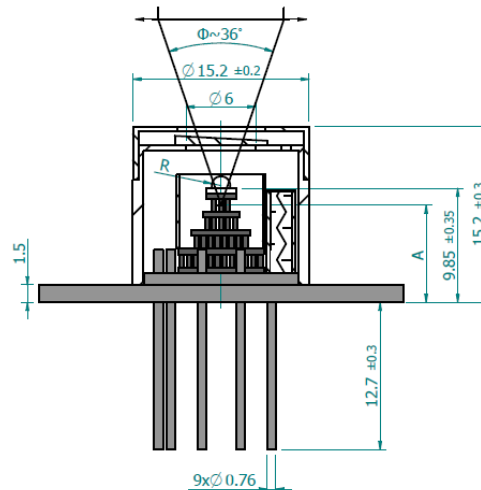
A – distance from the bottom of 4TE-TO8 header to the focal plane

Bottom view



Function	Pin number
Detector	1, 3
Reverse bias (optional)	1(-), 3(+)
Thermistor	7, 9
TE cooler supply	2(+), 8(-)
Chassis ground	11
Not used	4, 5, 6, 10, 12

4TE-TO66 package



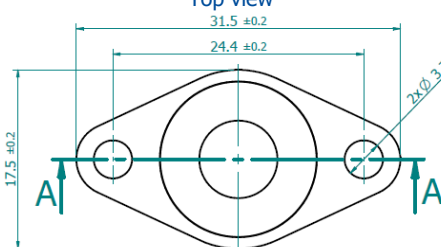
Parameter	Value	
Immersion microlens shape	hyperhemisphere	
Optical area A_o , mm $\times$ mm	0.5 $\times$ 0.5	1 $\times$ 1
R, mm	0.5	0.8
A, mm	8.35 $\pm$ 0.40	7.45 $\pm$ 0.40

Φ – acceptance angle

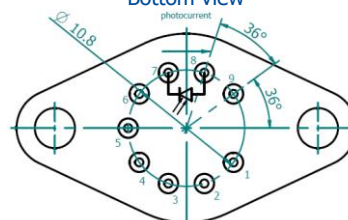
R – hyperhemisphere microlens radius

A – distance from the bottom of 4TE-TO66 header to the focal plane

Top view



Bottom view



Function	Pin number
Detector	7, 8
Reverse bias (optional)	7(+), 8(-)
Thermistor	5, 6
TE cooler supply	1(+), 9(-)
Not used	2, 3, 4

Dedicated preamplifiers



„all-in-one” AIP



programmable PIP



standard MIP



small SIP-T08



fast FIP

PIP series

PIP is a series of programmable "smart" preamplifiers. Due to the modern internal configuration, it offers extreme flexibility combined with superior signal parameters and high reliability. Built-in voltage monitor allows to check and optimize the working conditions (supply voltages, detector bias voltage, first and last stage output voltage offset etc.).

There is also possible to change the gain, coupling (AC/DC), optimize the first stage transimpedance and manually or automatically suppress the voltage offset.

Optimized parameters are stored into the internal EEPROM memory and automatically loaded after the power is on. Reset to default settings is available at any time. For detection module safety detector bias adjusting is blocked by default. User can request to enable this option while ordering.

For proper operation PTCC-01 TEC controller is required.



Specification ($T_a = 20^\circ\text{C}$)

Parameter	Typical value	Conditions, remarks
Low cut-off frequency f_{lo} , Hz	DC/10	user configurable by software
High cut-off frequency f_{hi} , Hz	150k/1.5M/20M 1.5M/15M/200M	user configurable by software
Transimpedance K_i , V/A	2.5k – 150k 0.5k – 30k	digitally adjustable first stage transimpedance = 1 k Ω first stage transimpedance = 5 k Ω
Output impedance R_{out} , Ω	50	
Output voltage swing V_{out} , V	± 1	$R_L = 50 \Omega^*)$
Output voltage offset V_{off} , mV	max $\pm 20^{**})$	
Ambient operating temperature T_a , $^\circ\text{C}$	10 to 30	
Signal output socket	SMA	
Power supply and TEC control socket	LEMO (female)	ECG.0B.309.CLN
Mounting hole	M4	
Fan	yes	

^{*)} R_L – load resistance

^{**)} Measured with equivalent resistor at the input instead of the detector, it is to avoid the environmental thermal radiation impact.

Parameters configurable by the user

- Output voltage offset
- Gain (in 40 dB range)
- Bandwidth
150 kHz/1.5 MHz/20 MHz
1.5 MHz/15 MHz/100 MHz
- Coupling AC/DC
- Detector's parameters (temperature, reverse bias etc.)

Types of VIGO detectors that can be integrated with PIP preamplifier

- Photoconductive**
PC-2TE, PC-3TE, PC-4TE
- Photoconductive optically immersed**
PCI-2TE, PCI-3TE, PCI-4TE
- Photovoltaic**
PV-2TE, PVA-2TE, PV-3TE, PV-4TE
- Photovoltaic optically immersed**
PVI-2TE, PVIA-2TE, PVI-3TE, PVI-4TE
- Photovoltaic multiple junction**
PVM-2TE
- Photovoltaic multiple junction optically immersed**
PVMI-2TE, PVMI-3TE, PVMI-4TE

Included accessories

- SMA-BNC, LEMO-DB9** cables

Dedicated accessories

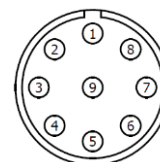
- PTCC-01-BAS** TEC controller + **USB: TypeA-MicroB** cable + **AC adaptor**
- PTCC-01-ADV** TEC controller + **USB: TypeA-MicroB** cable + **AC adaptor**
- PTCC-01-OEM** TEC controller + **USB: TypeA-MicroB**, **KK2-POWER** cables
- OTA** optical threaded adapter
- DRB-2** base mounting system

Code description

Type	f_{lo}	f_{hi}
PIP	UC* (DC/10 Hz)	LS* (150 kHz/1.5 MHz/20 MHz) HS* (1.5 MHz/15 MHz/200 MHz)

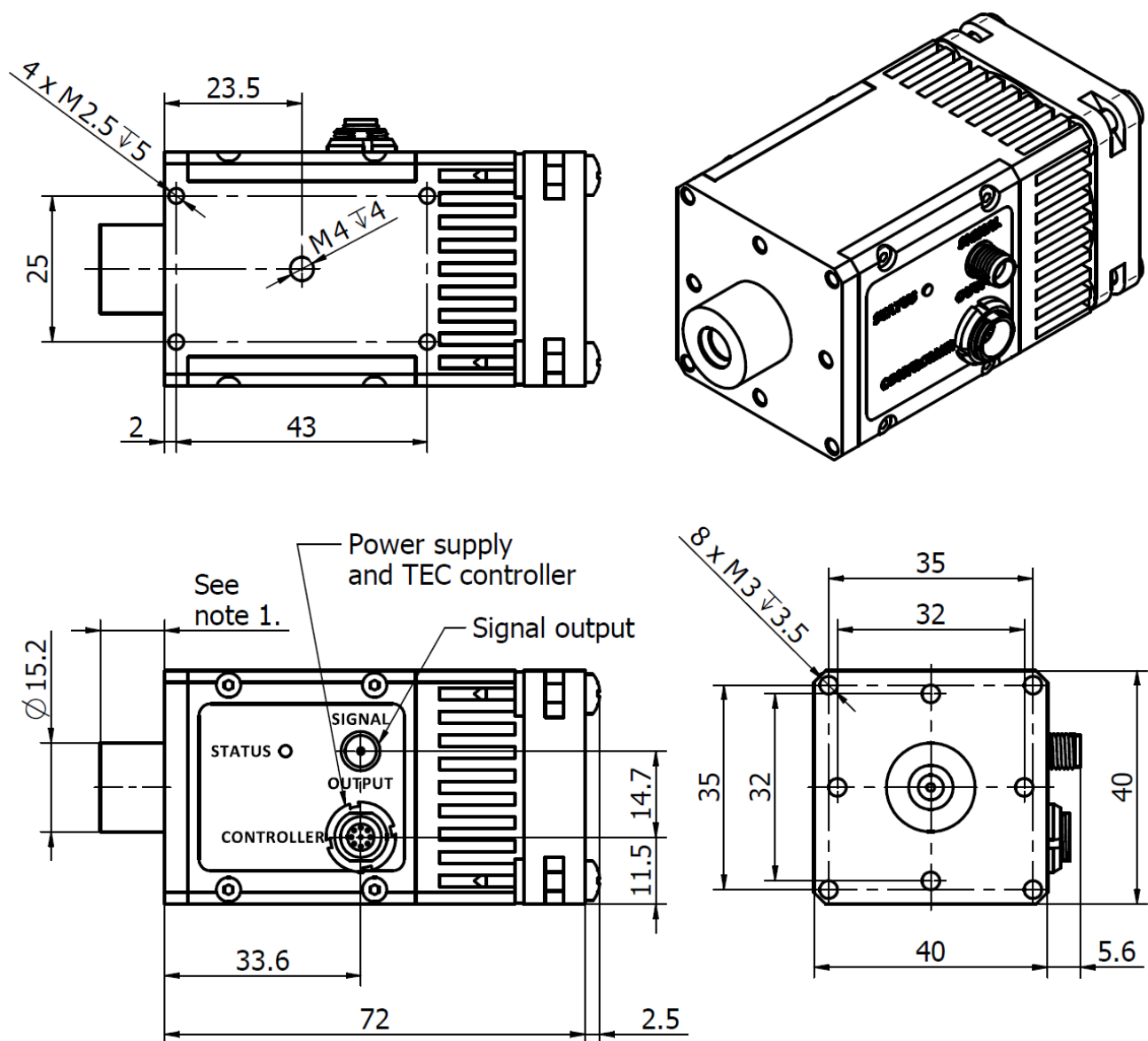
^{*)} User configurable by software.

Power supply and TEC control socket LEMO (female) ECG.0B.309.CLN



Function	Symbol	Pin number
Fan and programmable preamp internal logic auxiliary supply	FAN+	1
Thermistor output (2)	TH2	2
TEC supply input (-)	TEC-	3
Power supply input (-)	$-V_{sup}$	4
Ground	GND	5
Power supply input (+)	$+V_{sup}$	6
TEC supply input (+)	TEC+	7
Thermistor output (1)	TH1	8
Bidirectional data pin	DATA	9

Mechanical layout, mm



Notes:

1. TO8 detector dimensions in the "TO8 technical drawing".

PTCC-01 series

PTCC-01 is a series of programmable, precision low-noise thermoelectric cooler controllers. They are designed to operate with VIGO IR detection modules: LabM-6, LabM-I-16.6 and containing TE cooled detectors and preamplifiers: PIP, MIP, FIP, SIP-T08.



PTCC-01-ADV



PTCC-01-BAS



PTCC-01-OEM

Available options

PTCC-01-ADV (advanced)

- TEC controller and preamplifier power supply encapsulated in a small size package.
- Configurable by built-in function keys or PC software available on VIGO website.
- Status LCD indicator.

PTCC-01-BAS (basic)

- TEC controller and preamplifier power supply encapsulated in a small size package.
- Configurable by PC software available on VIGO website.
- Status LED indicator.

PTCC-01-OEM (oem)

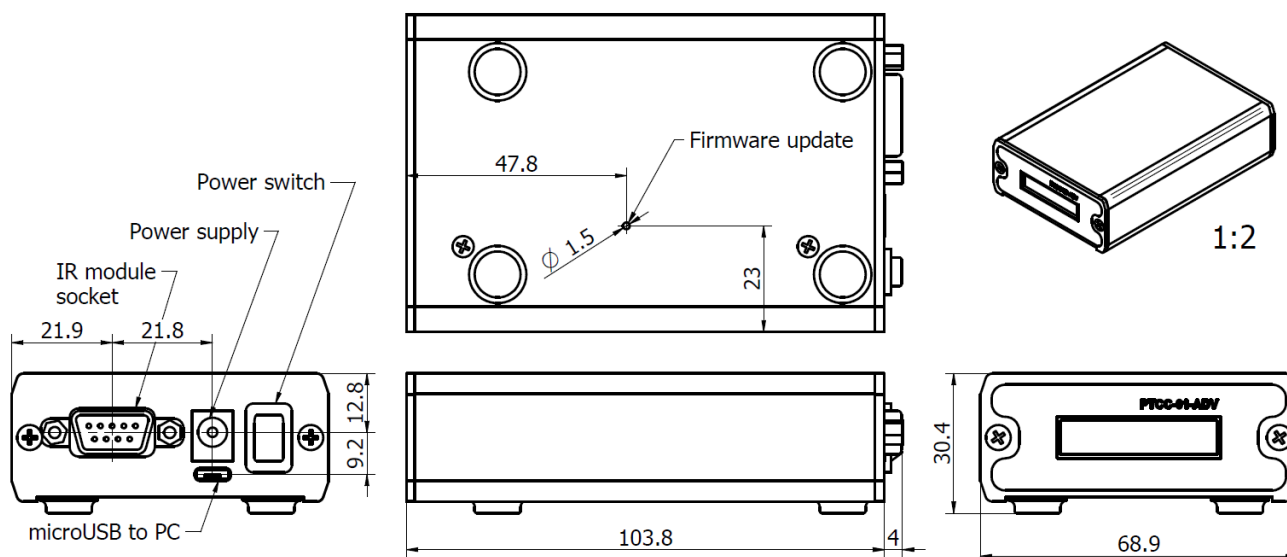
- TEC controller and preamplifier power supply without package.
- Configurable by PC software available on VIGO website.
- Status LED indicator and status/data connector.

Specification ($T_a = 20^{\circ}\text{C}$)

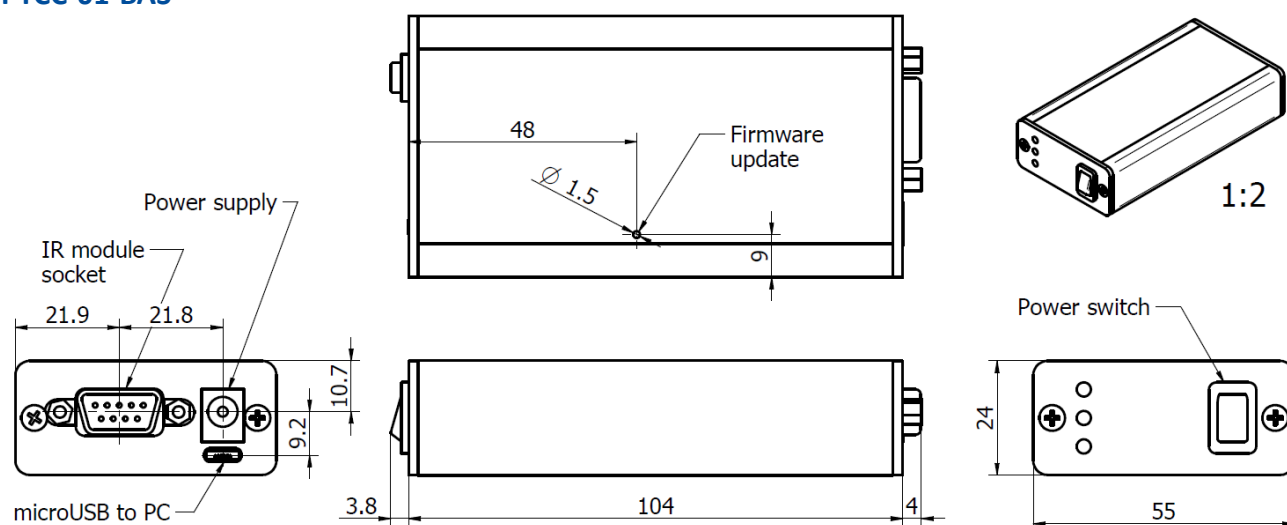
Parameter	Typical value	Conditions, remarks
Temperature stability, K	± 0.01	
Temperature readout stability, mK	max 1.0	
Detector temperature settling time, s	25	2TE
	45	3TE
	60	4TE
Maximum TEC output current, A	1.20	2TE
	0.45	3TE
	0.40	4TE
Output voltage range, V	min 3.0	
	max 14.5	
Power supply voltage V_{sup} , V_{DC}	min 9.0 max 16.0	
Power supply current I_{sup} , mA	500	$I_{TEC} = 0.45 \text{ A}$, $U_{TEC} = 7.5 \text{ V}$
Series resistance of the connecting cable, Ω	1	total resistance of the wires supplying TEC element
Ambient operating temperature, $^{\circ}\text{C}$	5 to 45	
Storage temperature, $^{\circ}\text{C}$	-20 to 70	
IR module socket	DB9 (female) DUBOX2x5 (male)	D-sub 9 pin (PTCC-01-ADV, PTCC-01-BAS) PTCC-01-OEM
Power supply socket	DC 2.1/5.5 KK2	PTCC-01-ADV, PTCC-01-BAS PTCC-01-OEM
Weight, g	51 $\pm$ 5	PTCC-01-OEM
	155 $\pm$ 5	PTCC-01-BAS
	190 $\pm$ 5	PTCC-01-ADV

Mechanical layout, mm

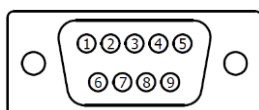
PTCC-01-ADV



PTCC-01-BAS



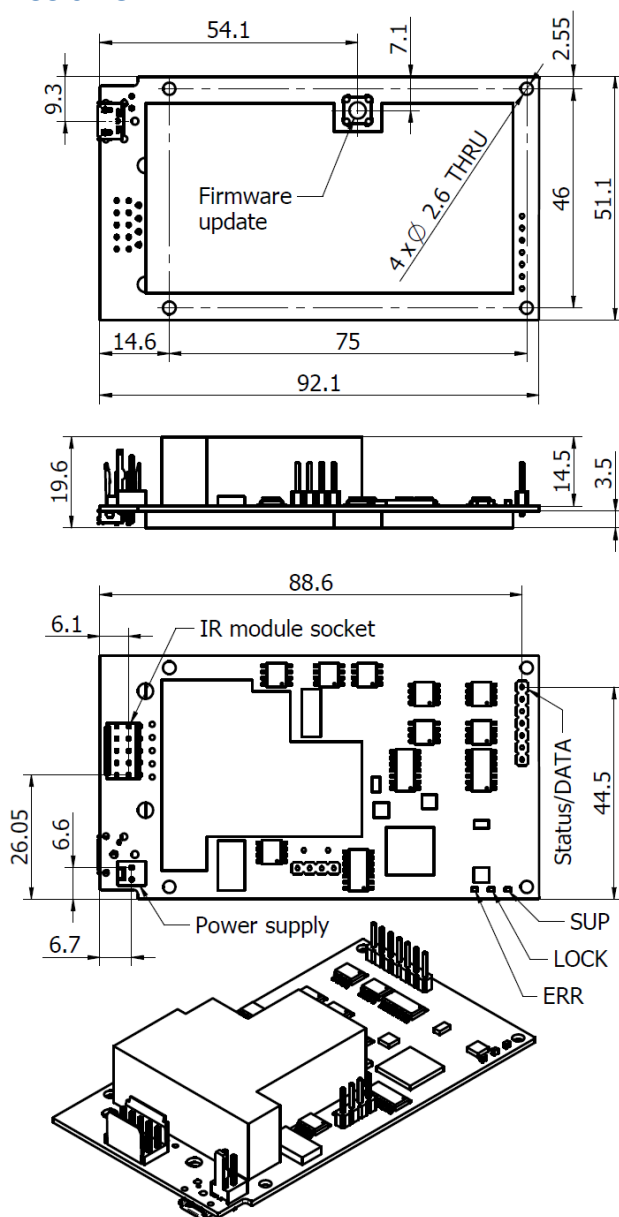
IR module socket D-sub 9 pin (male)



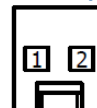
Function	Symbol	Pin number
TEC supply output (+)	TEC+	1
TEC supply output (-)	TEC-	2
Ground	GND	3
Thermistor input (1)	TH1	4
Thermistor input (2)	TH2	5
Power supply output (-)	-V _{sup}	6
FAN and programmable preamp internal logic auxiliary supply	+5V	7
Bidirectional data port	DATA	8
Power supply output (+)	+V _{sup}	9
Shield	GND-SH	metal cover

Mechanical layout, mm

PTCC-01-OEM

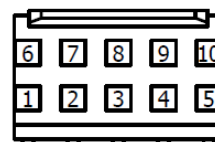


Power supply socket KK2 (male)



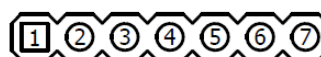
Function	Symbol	Pin number
TEC controller supply input (+)	TECC+	1
TEC controller ground	TEC GND	2

IR module socket DUBOX2×5 (male)



Function	Symbol	Pin number
TEC supply output (+)	TEC+	1
TEC supply output (-)	TEC-	2
Ground	GND	3
Thermistor input (1)	TH1	4
Thermistor input (2)	TH2	5
Power supply output (-)	-V _{sup}	6
FAN and programmable preamp internal logic auxiliary supply	+5V	7
Bidirectional data port	DATA	8
Power supply output (+)	+V _{sup}	9
Shield	GND-SH	10

Status/DATA socket Pin-header 1×7



Function	Symbol	Pin number
Error indicator	ERR – LED	1
Temperature control loop lock indicator	LOCK – LED	2
Module power supply on indicator	SUP – LED	3
Auxiliary supply	3.3 V	4
Transmitted data (RS-232)	TXD	5
Common (signal) ground (RS-232)	GND	6
Received data (RS-232)	RXD	7

Included accessories for PTCC-01-ADV and PTCC-01-BAS

- **USB: TypeA-MicroB** cable + **AC adaptor**
- **Smart Manager** software

Included accessories for PTCC-01-OEM

- **USB: TypeA-MicroB, KK2-POWER** cables + **AC adaptor**
- **Smart Manager** software