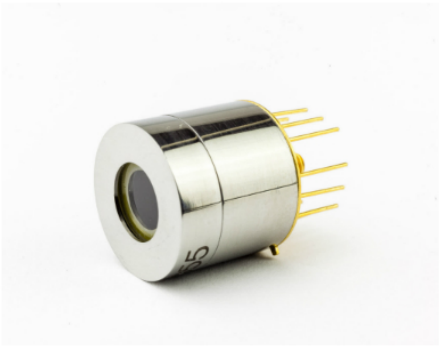
BostonElectronics



VS12 Detector Set

Sensitive, 1x1mm LWIR set for <2 to 11+ microns with TE cooled detector, preamp with 10 Hz to 1 MHz bandwidth and TEC controller and power supply

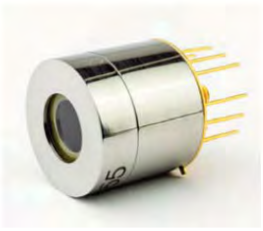
- PC-3TE-10.6-1x1 Detector
- BIP-10-1M Preamplifier
- PTCC-01-BAS TEC Controller/Power Supply

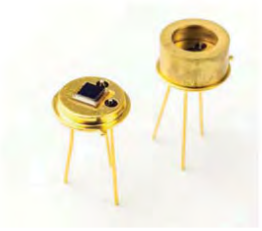
Photoconductive detectors PC

PC series features room temperature and TE cooled IR photoconductive detectors. The devices are optimized for the maximum performance at opt . Cut-on wavelength is limited by GaAs transmittance (~0.9 μm). Bias is needed to operate photocurrent. Performance at low frequencies (<20 kHz) is reduced due to 1/f noise. The highest performance and stability are achieved by application of variable gap HgCdTe semiconductor, optimized doping and sophisticated surface processing.

Detector type	Cooling, operating temperature $T\,[K]$	Optimal wavelengt h*) $\lambda_{opt}\,[\mu m]$	Detectivity**) $D^*\left[\frac{cm\cdot\sqrt{Hz}}{W}\right]$ @λ_{peak}, 20kHz	Detectivity**) $D^*\left[\frac{cm\cdot\sqrt{Hz}}{W}\right]$ @λ_{opt}, 20kHz	Current responsivity length product @λ_{opt} $R_i\cdot L\left[\frac{A\cdot mm}{W}\right]$	Time constant $\tau\,[ns]$	1/f noise corner frequency $f_c\,[kHz]$	Bias voltage length ratio $\frac{V_b}{L}\left[\frac{V}{mm}\right]$	Sheet resistance $R_{sq}\,[\Omega]$	Acceptance angle $\varnothing\,[°]$, $\frac{1}{2NA}$	Optical area***) $[mm\times mm]$	Package	Window****)
PC	uncooled, ~300	4	≥3.2×10⁹	≥2.0×10⁹	≥0.1	≤12000	≤20	≤6.0	≤2000	≥90, 0.71	0.025×0.025 0.05×0.05 0.1×0.1 0.2×0.2 0.25×0.25 0.5×0.5 1×1 2×2 3×3[1] 4×4[1]	BNC, TO39	no window
		5	≥1.5×10⁹	≥1.0×10⁹	≥0.07	≤5000		≤6.0	≤1200				
		6	≥7.0×10⁸	≥3.0×10⁸	≥0.02	≤500		≤6.0	≤600				
		9	≥1.0×10⁸	≥2.0×10⁷	≥0.003	≤10		≤6.0	≤300				
		10.6	≥1.9×10⁷	≥9.0×10⁶	≥0.001	≤3		≤6.0	≤120				
	two-stage TE-cooled (2TE), ~230	4	≥3.2×10¹⁰	≥2.0×10¹⁰	≥0.65	≤30000		≤4.5	≤1500	~70, 0.87		TO8, TO66	wedged Al_2O_3
		5	≥2.0×10¹⁰	≥1.0×10¹⁰	≥0.5	≤20000		≤4.5	≤1200				
		6	≥6.0×10⁹	≥3.0×10⁹	≥0.18	≤4000		≤4.5	≤800				wedged ZnSe AR coated
		9	≥9.0×10⁸	≥4.5×10⁸	≥0.025	≤40		≤3.8	≤400				
		10.6	≥4.0×10⁸	≥1.4×10⁸	≥0.01	≤10		≤3.8	≤300				
		12	≥1.0×10⁸	≥4.5×10⁷	≥0.005	≤3		≤2.5	≤200				
		13	≥4.0×10⁷	≥2.3×10⁷	≥0.002	≤2		≤2.5	≤150				
	three-stage TE-cooled (3TE), ~210	9	≥1.5×10⁹	≥1.0×10⁹	≥0.075	≤60		≤3.0	≤400				wedged ZnSe AR coated
		10.6	≥4.5×10⁸	≥2.5×10⁸	≥0.02	≤20		≤2.25	≤300				
		12	≥1.8×10⁸	≥9.0×10⁷	≥0.01	≤5		≤2.25	≤300				
		13	≥1.2×10⁸	≥6.0×10⁷	≥0.007	≤4		≤2.25	≤300				
	four-stage TE-cooled (4TE), ~195	9	≥2.5×10⁹	≥2.0×10⁹	≥0.1	≤80		≤3.8	≤500				
		10.6	≥5.0×10⁸	≥3.5×10⁸	≥0.03	≤30		≤3.0	≤400				
		12	≥4.0×10⁸	≥2.0×10⁸	≥0.015	≤7		≤3.0	≤400				
		13	≥2.0×10⁸	≥1.0×10⁸	≥0.01	≤6		≤3.0	≤400				
		14	≥1.0×10⁸	≥6.0×10⁷	≥0.007	≤5		≤2.25	≤300				

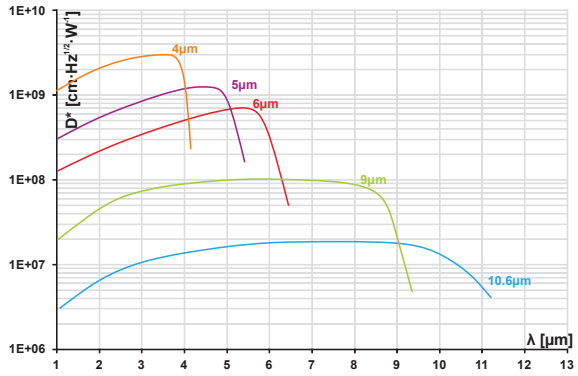
*) *Other optimal wavelengths available upon request.*
**) *Data sheet states minimum guaranteed D* values for each detector model. Higher performance detectors can be provided upon request.*
***) *Other optical areas available upon request.*
****) *Other windows available upon request.*
[1]) *Optical area available only for uncooled detectors*



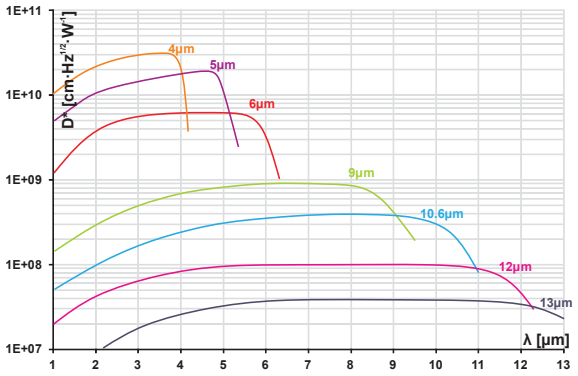



Spectral characteristics*)

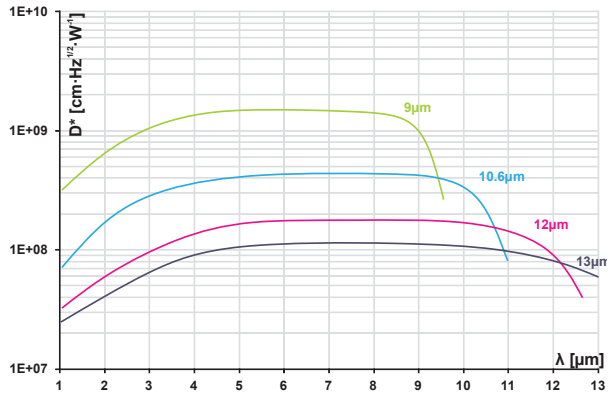
PC



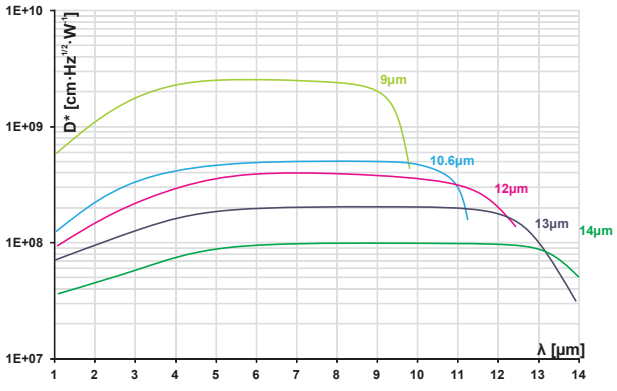
PC-2TE



PC-3TE



PC-4TE



)Example of D vs wavelength for HgCdTe detectors.
Spectral characteristics of individual detectors may vary from those shown on the chart.

Detector code

Different information such as detector type, optical immersion, number of stages TE-cooler, wavelength a detector is optimized for, dimensions of optical area, package type, window type and FOV combine, to create VIGO detector code.

Code description of uncooled detector

PC	-	10 6	-	1x1	-	BNC	-	NoWindow	-	102
VIGO detector type		Optimal wavelength		Optical area		Detector package		Window (without window)		FOV

Code sescription of cooled detector

PVI	-	2TE	-	5	-	1x1	-	TO8	-	wAl2O3	-	35
VIGO detector type (I - optical immersion)		Cooling		Optimal wavelength		Optical area		Detector package		Window		FOV

Please see data sheets to get possibile option of each type detector.

BIP Series — OEM PREAMPLIFIER

Description

BIP is a transimpedance, AC or DC coupled preamplifier. It is dedicated for OEM applications and typically requires an additional external heat sink for waste heat from the cooler of the integrated detector.
BIP preamplifier is designed for operation with either biased or unbiased TE cooled detectors.

Features

- Compact size
- High signal-to-noise ratio
- Bandwidth up to 250 MHz
- Dedicated to operate with 2-, 3- and 4-stage TE cooled detectors
- Custom modifications upon request
- Additional accessories available

Applications

- Contactless temperature measurement
- Free space optical communication
- Laser radiation detection
- Gas analysis
- Fourier spectroscopy
- Fire, flame and human body detection
- Pyrometers, scanners
- Nondestructive material testing
- OEM applications

Preamplifier Specifications

Parameter	Symbol	Unit	Typical Value	Conditions, Remarks
Input Noise Voltage Density	e_n	$\frac{nV}{\sqrt{Hz}}$	0.97 – 8.0[1)]	f_o = 10 kHz[2)]
Input Noise Current Density	i_n	$\frac{pA}{\sqrt{Hz}}$	0.02 – 3.5[1)]	f_o = 10 kHz[2)]
Low Cut-Off Frequency	f_{lo}	**Hz**	DC 10 to 10k	DC coupling set AC coupling set
High Cut-Off Frequency	f_{hi}	**Hz**	100k to 250M	
Transimpedance	K_i	$\frac{V}{A}$	up to 2×10^5	
Output Impedance	R_{out}	**Ω**	50	
Output Voltage Swing	V_{out}	**V**	±10 ±2 ±1	$f_{hi} \le 1$ MHz, R_L = 1 MΩ[3)] 1 MHz < $f_{hi} \le 20$ MHz, R_L = 1 MΩ[3)] 20 MHz < $f_{hi} \le 250$ MHz, R_L = 50 Ω[3)]
Output Voltage Offset	V_{off}	**mV**	max ±20[4)]	
Power Supply Voltage	V_{sup}	**V**	±15 ±9	$f_{hi} \le 1$ MHz $f_{hi} > 1$ MHz
Power Supply Current	I_{sup}	**mA**	max ±50	no detector Low noise DC bias ing
Dimensions	-	**mm×mm×mm**	45×80.5×25	width×depth×height - with 2TE, 3TE, 4TE

Electrical characteristics @ T_a = 20 °C.

[1)] The preamplifier noise may significantly reduce the system performance in some situations. This happens for large capacitance detectors operating at high frequencies.
[2)] f_0 – noise measurement frequency
[3)] R_L – load resistance
[4)] Measured with equivalent resistor at the input instead of the detector. It's to avoid the environmental thermal radiation's impact.

Preamplifier Code Description

BIP-f_{lo}-f_{hi}

f_{hi} – high cut-off frequency in Hz:
100k, 300k, 1M, 5M, 10M, 20M, 50M, 100M, 250M

f_{lo} – low cut-off frequency in Hz:
DC, 10, 100, 1k, 10k

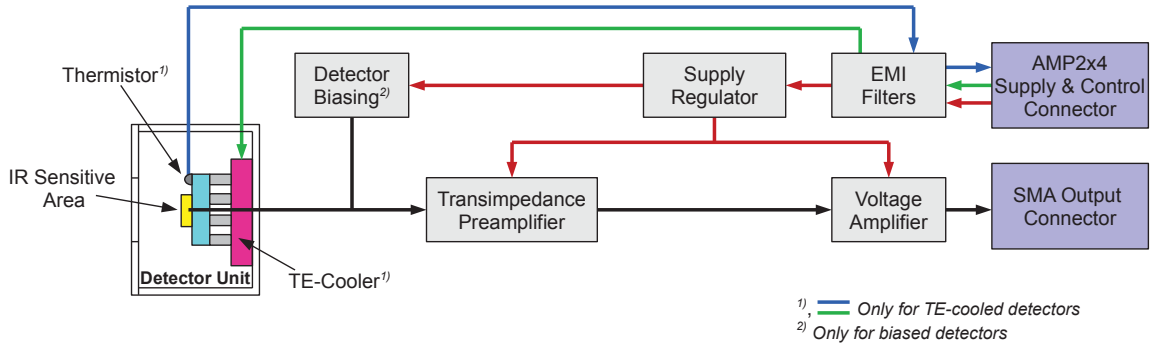
BIP – preamplifier series:
B- Version, I – Current Input, P – Preamplifier

The preamplifier can be integrated with following types IR detectors:

Detector Type	Description
PC-2TE, PC-3TE, PC-4TE	photoconductive
PCI-2TE, PCI-3TE, PCI-4TE	photoconductive, optically immersed
PV-2TE, PV-3TE, PV-4TE	photovoltaic
PVI-2TE, PVI-3TE, PVI-4TE	photovoltaic, optically immersed
PVM-2TE, PVM-3TE, PVM-4TE	multiple heterojunction photovoltaic
PVMI-2TE, PVMI-3TE, PVMI-4TE	multiple heterojunction photovoltaic, optically immersed

Symbol -2TE, -3TE, -4TE means 2, 3 or 4-stage TEC integrated with detector.

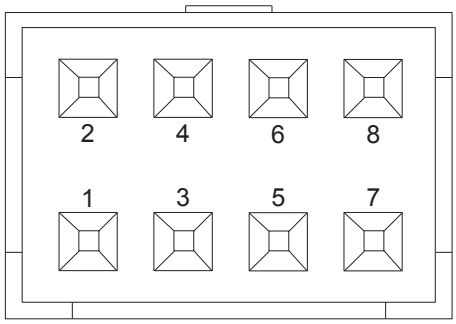
Schematic Diagram



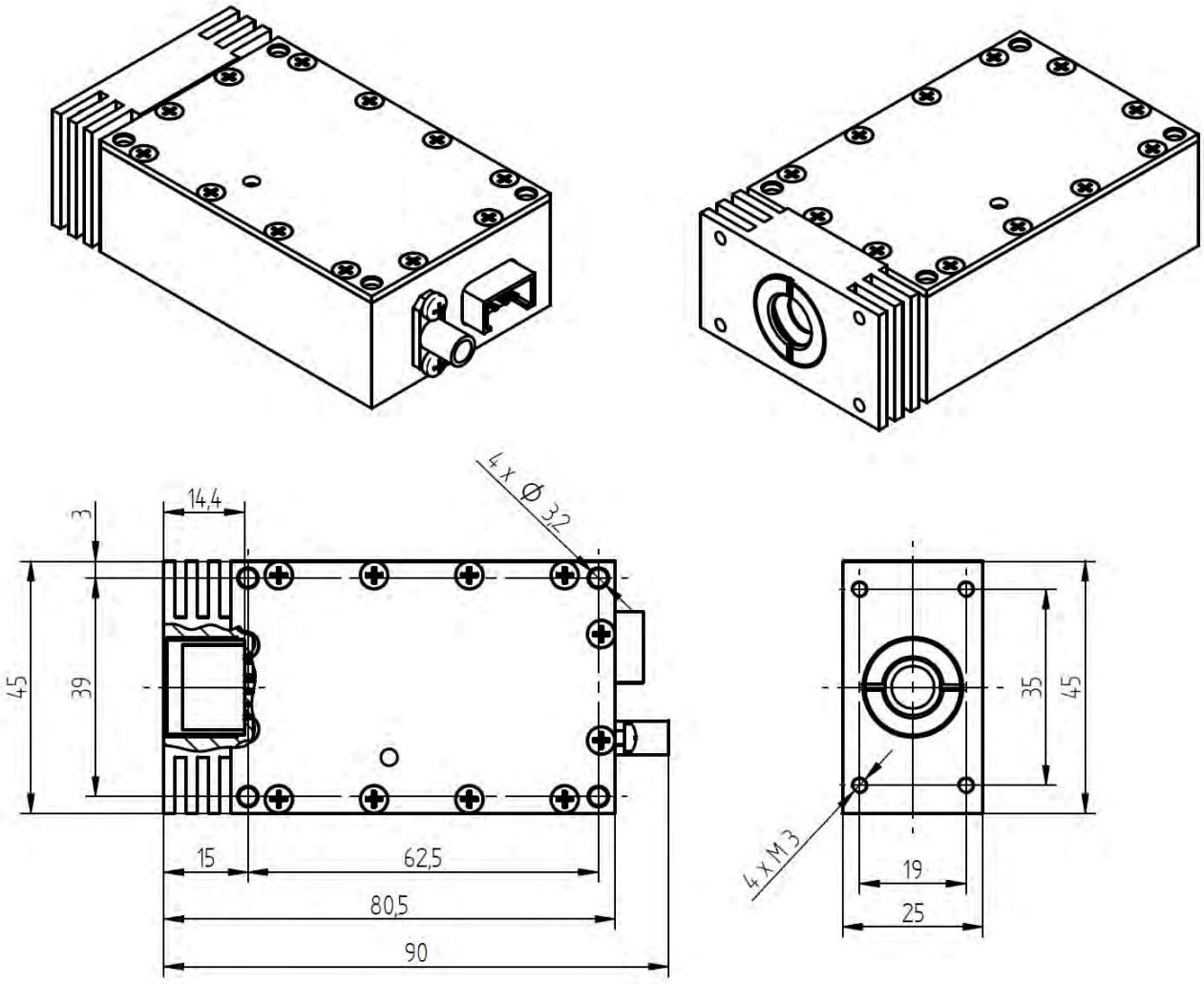
Power Supply and TEC Control Connector

Pin Number	Symbol	Function
1	$-V_{sup}$	**power supply input (–)**
2	TH2	**thermistor output (2)**
3	GND	**power ground**
4	TEC–	**TEC supply input (–)**
5	GND	**power ground**
6	TH1	**thermistor output (1)**
7	$+V_{sup}$	**power supply input (+)**
8	TEC+	**TEC supply input (+)**

AMP2x4 Connector Male



Physical Dimensions [mm]



Four through mounting holes 3.2 mm dia on the large surface and four tapped M3 mounting holes on front face

4

PTCC-01 – Programmable "smart" TEC controller

PTCC-01 is the programmable, precision, low noise, thermoelectric cooler controller, intended to operate with VIGO IR detection modules. It is compatible with both classic (MIP, SIP, FIP) and new, programmable PIP preamplifiers.

Available options:

PTCC-01-OEM

- TE C controller with built-in power supply, without housing
- configurable by PC software
- status LED indicator and status/data connector

PTCC-01-BAS

- TEC controller with built-in power supply, encapsulated in a small package
- configurable by PC software
- status LED indicator

PTCC-01-ADV

- TEC controller with built-in power supply, encapsulated in a small package
- configurable by built-in function keys or PC software
- user interface: LCD and buttons

Specification

Parameter	Value
Temperature stability [K]	±0.01 (T_{det}=233K (-40°C), T_{det}=0.1K)
Temperature readout stability [mK]	max 1 (T_{det}=233K (-60°C), T_{det}=0.1K)
Detector temperature settling time [s]	25 (T_{det}=233K (-40°C), T_{det}=0.1K) 45 (T_{det}=233K (-60°C), T_{det}=0.1K) 60 (T_{det}=233K (-80°C), T_{det}=0.1K)
Maximum TEC current [A]	1.2 (2TE) 0.45 (3TE) 0.45 (4TE)
Output voltage range [V]	min 3, max 14.5
Output current of the built-in power supply [mA]	±200 (output voltage: 3…14.5V)
Power supply voltage V_{sup} [V]	min 9, max 16 (wider range available upon request)
Power supply current I_{sup} [mA]	500 (I_{TEC}=0.45A, U_{TEC}=7.5V)
Series resistance of the connecting cable [mΩ]	1000 (total resistance of the wires supplying TEC element)
Storage temperature [°C]	from -20 to +70
Ambient temperature [°C]	from +5 to +45
Relative humidity [%]	from 10 to 90 (from +5°C to +35°C) from 10 to 50 (>+35°C)

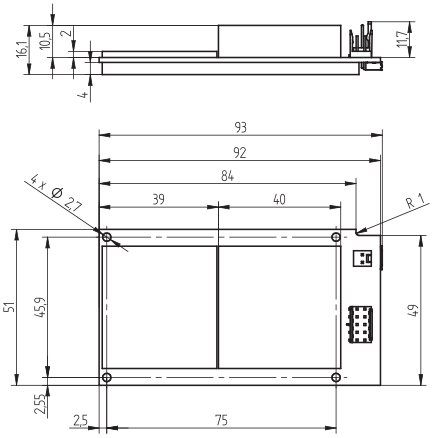
Code description

PTCC-01-BAS

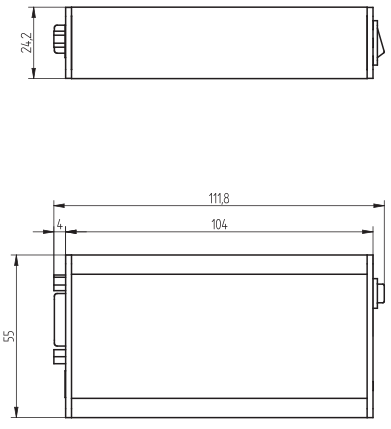
- VIGO thermoelectric cooler controller
- Version:
  - OEM - without package
  - BAS - Basic - with package
  - ADV - Advanced - with package, function buttons and LCD

Dimensions [mm]

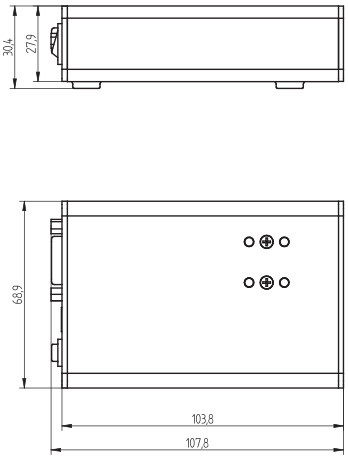
PTCC-01-OEM



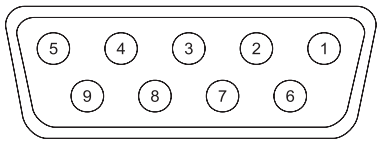
PTCC-01-BAS



PTCC-01-ADV

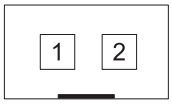


Power supply and control connector (PTCC-01-BAS and PTCC-01-ADV) - DB9 connector female



Pin number	Symbol	Function
1	TEC+	TEC supply output (+)
2	TEC–	TEC supply output (–)
3	GND	power ground
4	TH1	thermistor input (1)
5	TH2	thermistor input (2)
6	$-V_{sup}$	power supply output (–)
7	+5V	FAN and programmable preamp internal logic auxiliary supply
8	DATA	bidirectional data port
9	$+V_{sup}$	power supply output (+)
metal cover	GND-SH	shield

Power supply connector (PTCC-01-OEM) - KK2 connector male

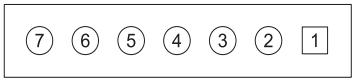


Pin number	Symbol	Function
1	TECC+	TEC controller supply input (+)
2	TECC GND	TEC controller power ground

Control connector (PTCC-01-OEM) - DUBOX2x5 connector male

Pin number	Symbol	Function
1	TEC+	TEC supply output (+)
2	TEC–	TEC supply output (–)
3	GND	power ground
4	TH1	thermistor input (1)
5	TH2	thermistor input (2)
6	$-V_{sup}$	tower supply output (–)
7	+5V	FAN and PIP preamp internal logic auxiliary supply
8	DATA	bidirectional data port
9	$+V_{sup}$	power supply output (+)
10	GND-SH	shield

Status/DATA connector (PTCC-01-OEM) - Pin Header 1x7



Pin number	Symbol	Function
1	ERR – LED	error indicator
2	LOCK – LED	temperature control loop lock indicator
3	SUP – LED	module power supply on indicator
4	3.3 V	auxiliary supply
5	TXD	transmitted data (RS-232)
6	GND	common (signal) ground (RS-232)
7	RXD	received data (RS-232)