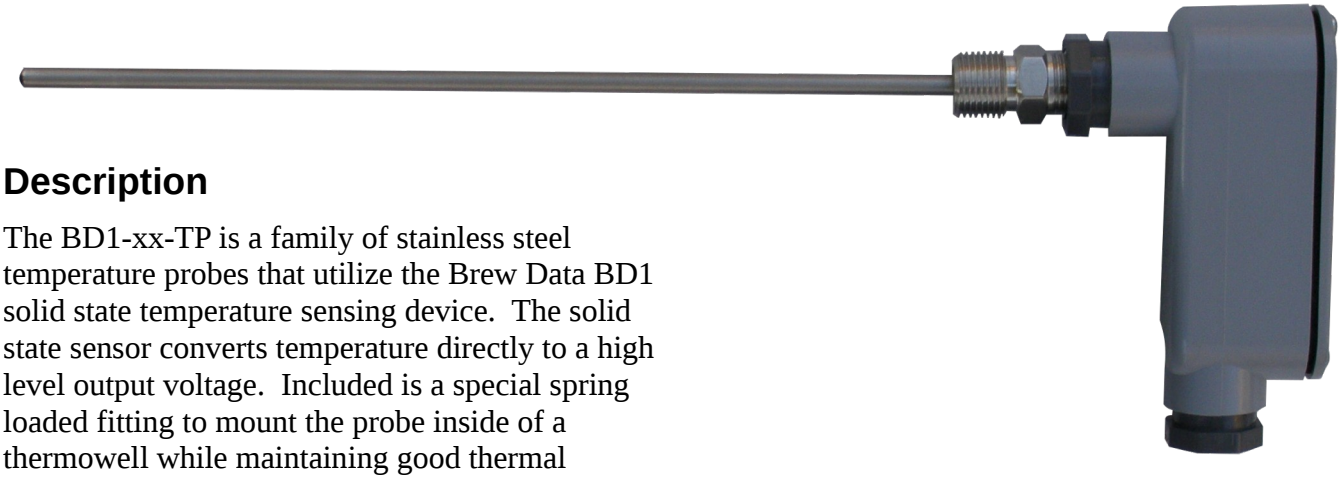
Solid State Temperature Probe with Thermowell Mount and Connection Head BD1-xx-TP



Description

The BD1-xx-TP is a family of stainless steel temperature probes that utilize the Brew Data BD1 solid state temperature sensing device. The solid state sensor converts temperature directly to a high level output voltage. Included is a special spring loaded fitting to mount the probe inside of a thermowell while maintaining good thermal contact. Also includes a watertight PVC connection head.

Key Benefits

- Easy to wire, no special cabling or connection requirements. Wire nuts can be used.
- Easy to interface, can be connected directly to an ADC without special signal conditioning.
- Designed for industrial environments; ESD protected and compensated to drive long cables or capacitive loads.

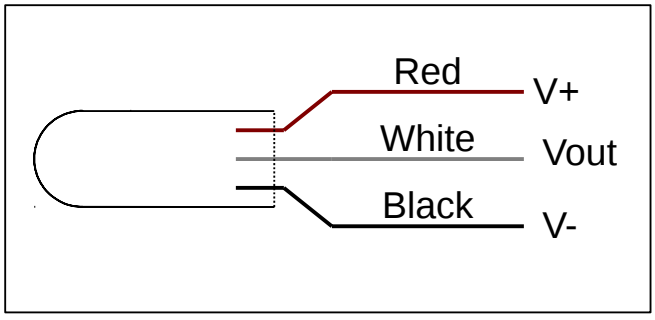
Key Specifications

- -40°C to +125°C (-40°F to 257°F) sensing range
- ±0.5°C accuracy (-20°C to 100°C)
- 0.251V to 1.315V output voltage
- Single 2.7V to 5.5V input voltage
- 316 stainless steel 1/4” diameter probe body
- 1/2” NPS thermowell mount with connection head

Part Number Summary

Part Number	Length	Mount	Connection Head
BD1-6-TP	6 in	thermowell	PVC
BD1-9-TP	9 in	thermowell	PVC
BD1-12-TP	12 in	thermowell	PVC

Probe Connections



Brew Data LLC, Cedar Rapids, IA 52403, www.brew-data.com, info@brew-data.com

Output to Temperature Conversions

$$C = \frac{Vout - 0.509}{0.00645} = (155.0388 \times Vout) - 78.915$$

$$F = \frac{Vout - 0.3943}{0.003583} = (279.07 \times Vout) - 110.0465$$

$$Vout = (0.00645 \times C) + 0.509$$

$$Vout = (0.003583 \times F) + 0.3943$$

Mounting

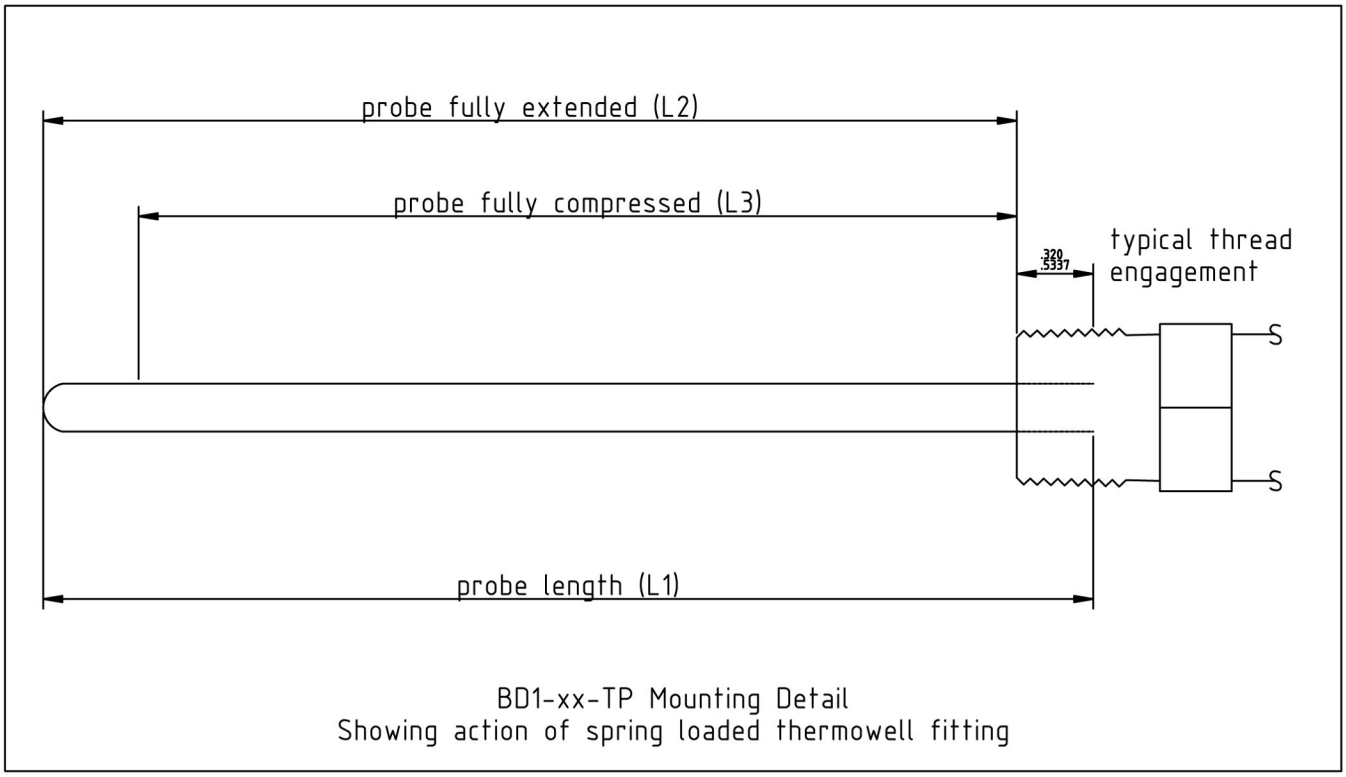
Each of these probes include a spring loaded thermowell fitting and a connection head. The thermowell fitting has a 1/2” NPT thread that screws into the 1/2” NPT thread of the thermowell. The probe is screwed into the thermowell until the spring puts tension on the probe. This keeps the probe in good thermal contact with the end of the thermowell without the use of thermal grease. The connection head is made of PVC and is simple but effective. Wire nuts for the 20AWG wire are included for connection within the head. The connection head has 1/2” NPT output threads. Typically, a 1/2” NPT to flex adapter is used to connect to flexible conduit. Brew Data also makes sanitary and straight probes.

In order to maintain measurement accuracy it is very important for the end of the probe to be in direct contact with the bottom of the thermowell. The addition of thermal grease is not a substitute for direct mechanical contact. The BD1-xx-TP probes are equipped with a spring loaded fitting to press the end of the probe against the bottom of the thermowell, thus assuring good thermal contact.

One of the greatest challenges when installing a temperature probe in a thermowell is to make sure that the probe is actually bottomed out in the well. Further complicating the problem is the lack of standardization when it comes to the dimensions of the thermowell themselves. A 12” thermowell isn't necessarily designed to fit a 12” probe. By far the best technique is to either examine a dimensioned drawing of the thermowell or by simply measuring the depth of the well itself using, for example, a stiff wire inserted into the well. See the drawing below showing the dimensions of the BD1-xx-TP probes. If necessary, a small extension can be added to the probe to make sure it fits, or the probe can be carefully trimmed to fit. Custom lengths are also available. Please contact the engineering department at Brew Data for more information.

Probe mounting length details (see drawing)
L2 and L3 tolerances approximately ±0.1”

Part Number	L1	L2	L3
BD1-6-TP	6”	5.4”	4.4”
BD1-9-TP	9”	8.4”	7.4”
BD1-12-TP	12”	11.4”	10.4”



BD1-xx-TP Mounting Detail
Showing action of spring loaded thermowell fitting

Application Information

Please see the Brew Data application note “Using the Brew Data Solid State Temperature Sensor”. This application note includes important information about wiring and contains additional information such as thermal response and considerations when connecting to a measurement device.

Additional Brew Data Probes

Part Number	Length	Mount	Connection Head
BD1-6-N	6”	none	none
BD1-9-N	9”	none	none
BD1-12-N	12”	none	none
BD1-6-TP	6”	thermowell	PVC
BD1-9-TP	9”	thermowell	PVC
BD1-12-TP	12”	thermowell	PVC
BD1-S6M-P	6”	1.5” sanitary	PVC
BD1-S6F-EZ	6”	1.5” sanitary	M12

Characteristics

(V+ = 2.7V to 5.5V, V- = ground, Sense temperature = -40°C to 125°C,
Protection head temperature = 20°C, unless otherwise noted)

Parameter	Condition	Min	Typ	Max	Units
Temperature Range	probe	-40		125	°C
		-40		257	°F
	protection head*	-20		50	°C
		-4		122	°F
Thermometer Error	-20°C to 100°C			±0.5	°C
	-40°C to 125°C			±0.75	°C
Nonlinearity				±0.2	°C
Supply Voltage	V+ to V-	2.7		5.5	V
Supply Current				145	µA
Output Gain			6.45		mV/°C
Output DC offset	0°C			509	mV
Output Impedance		990	1000	1110	Ω
Thermal Response Time	0°C to 100°C		40		sec
Construction	probe body	316 Stainless Steel, 1/4” diameter			
	lead wires	PTFE or TFE, 20AWG			
	thermowell fitting	300 series stainless steel, 1/2” NPT threads			
	connection head	PVC, 1/2” NPT conduit connection			
Country of Origin		USA			

*Note that the connection head may be used at temperatures below the specified range but as the temperature decreases the material will become brittle and lose impact strength.