

# Technical Data

## Plastics Sensors Construction

### Introduction

The typical plastics industry sensor assembly consists of four components:

- attaching device,
- element,
- element protection,
- cold end termination.

The sensor is further defined by its physical attributes:

- number of elements
- junction style (hot end)
- probe configuration (straight, 45°, 90°)
- length of components

The following paragraphs provide a brief explanation of each component and physical attribute. After reading this section you should have a general, comprehensive understanding of how Barber-Colman sensors for the plastics industry are constructed.

### Components

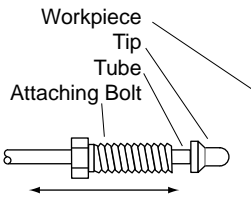
#### Attaching Device

Some sensors are designed for specific applications and have a unique attaching device; others are designed for general application and have a common attaching device.

The attaching device, also called the process mount, is defined by the way it mounts the sensor to the workpiece. The following paragraphs discuss the various devices. For detailed explanation, see "Process Mounting."

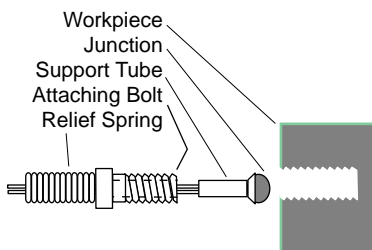
Unique mounts include

- melt bolt
- nozzle melt
- ring or lug



The melt bolt sensor is used on extruders and injection molding machines. A melt bolt "blank" with a hole through its length is welded to the rigid tube.

The nozzle melt sensor is designed for injection molders. Two types are available: immersion type and non-immersion type. The immersion type is a bolt "blank" with a hole through its length on the sensor tube. The sensor tip protrudes through the workpiece and seats in a beveled hole in the work piece. The attaching bolt is threaded into the workpiece and tightly seals the tip to the workpiece.



The non-immersion type is an attaching bolt with a center hole. A short tube seats in the bolt hole and supports the thermocouple junction against the bottom of the hole in the workpiece. Or, if the sensor is an RTD, the tip is potted in the hole in the bolt.

Ring type and lug type sensors measure surface temperature – such as a barrel or a mold. The sensor leads are joined at the ring or lug (hot junction). The sensor attaches to a threaded stud on the workpiece and must be secured with a nut.

Nozzle Melt Sensors

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## Components (continued)

General application sensors are commonly called tube style sensors and are mounted with:

- bayonet lock, or
- threaded bushing.

These devices are secured to the rigid tube portion of the sensor assembly.

Varidepth® sensors have no rigid tube (other than the tip). The element of a Varidepth sensor is protected by either a flexible tube or spring. Both of these components are compressible. Varidepth sensors are equipped with a bayonet style lock cap directly on the tube or spring.

Two types of bayonet locks are available: fixed or adjustable. The fixed bayonet lock is secured to the tube between two rings formed on the tube surface. The adjustable bayonet lock is held on the tube with a compression ring and nut.

Two types of threaded bushing mounts are available: fixed or adjustable. However, the more common, by far, is the adjustable bushing held on the tube with a compression ring and nut. The fixed bushing is brazed to the tube.

Both the Varidepth sensor and the bayonet lock require a mating adapter to mount it to the workpiece. The threaded bushing mounts directly into a tapped hole in the workpiece.

### Element

The thermocouple element is defined by its calibration (type), wire size (gauge), construction (solid, strand, insulation) The resistance temperature detector (RTD) is defined by its resistance coefficient.

### Element Protection

Element protection is defined by its construction: rigid tube, flexible armor (or flexible tube), stainless steel overbraid, spring, or insulation only. Rigid length is identified as dimension "X." Flexible length is identified as dimension "Y."

The depth of the fixed bayonet lock attaching device is identified as dimension "Z." Since the location of the bayonet lock on most assemblies (but not all) is near the transition point (from rigid to flexible), the "Z" dimension is equal to the length of the probe. Therefore, there is no "X" dimension.

### Cold End Termination

Cold end termination is defined by the device with which the sensor leads are terminated: stripped ends, spade lugs, plug, and/or jack. It is further defined by the extended length of the leads – that is, leads in addition to the standard length normally provided with that sensor. Extended lead length is identified as dimension "L."

## Physical Attributes

### Number of Elements

Many sensors can accommodate two elements – called dual element. Dual element construction is restricted by wire size and tube size.

### Junction Style

Junction style specifies whether the tube end is open or closed, and if the element is grounded to the tube.

### Probe Configuration

Specifies the angle of the sensor probe relative to the attaching device. Barber-Colman sensors are available straight in line, or 45° or 90° off the mounting plane.

### Length of Components

Components with meaningful linear dimensions are the rigid tube (or probe), flexible tube,

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## Components (continued)

including stainless steel overbraid and Fiberglass insulation only, and extended lead (considered part of the cold end termination). Code designations for each of these dimensions are as follows:

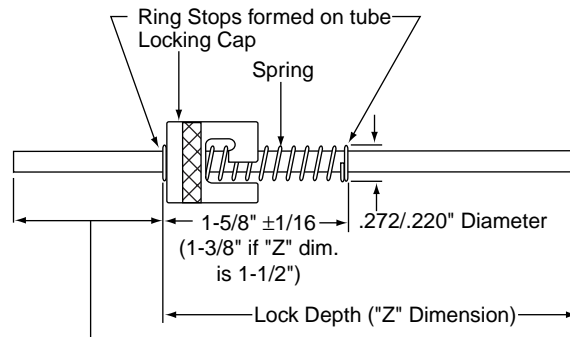
- X = Rigid length (probe). Typically applies to sensor with adjustable attaching device.
- Y = Flexible length (flexible armor, SS overbraid, Fiberglass)
- Z = Locating depth for fixed bayonet lock. Frequently, but not always, replaces X.
- L = Extended lead. In addition to the standard lead length provided on the sensor.

## Process Mounting

The sensor probe can be mounted to the workpiece with any of the following attaching devices. All attaching devices are not applicable to all sensors. Each of the sensor illustrations on the following pages lists only the attaching devices appropriate for that sensor.

### Fixed Bayonet

A spring loaded locking cap held in a fixed position on the probe tube between two rings formed ("popped") on the tube surface. The locking cap attaches to an adapter that is mounted to the workpiece. Various adapters are illustrated under "Accessories" at the end of this section.

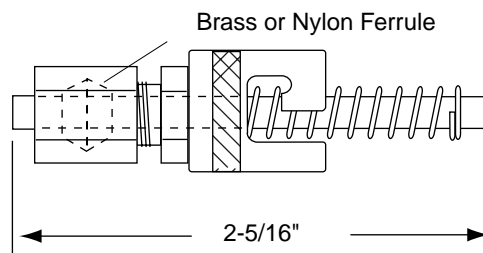


1" for straight probes; 2-3/4" for 45° and 90° probes  
(angles bent at final assembly)

### Adjustable Bayonet

This device can be fitted over any 1/8" o.d. plain end thermocouple and adjusted to the selected immersion depth by tightening the compression fitting. With a suitable adapter, any immersion depth over 1/2" can be selected.

The fitting is shipped with both a nylon and brass ferrule. Nylon permits readjustment, but should not be exposed to temperature over 250°F. The brass ferrule cannot be adjusted after it is set. It is suitable for temperatures up to 900°F.

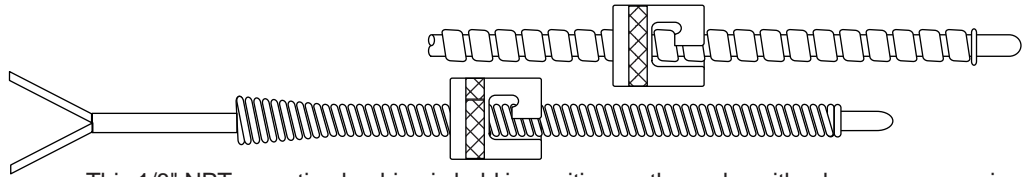


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## Process Mounting (continued)

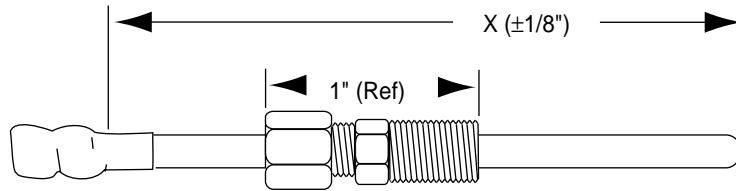
### Varidepth®, and Spring Style Varidepth

Varidepth is a Barber-Colman trade marked mounting device that uses a bayonet type locking cap, and which is applicable to two different styles of thermocouples; flexible armor clad, and spring clad. Each of these protection clads is compressible and therefore provides the pressure needed to hold the thermocouple tip snugly in the workpiece.



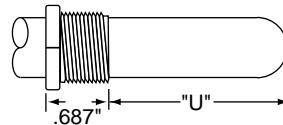
### Adjustable Bushing

This 1/8" NPT mounting bushing is held in position on the probe with a brass compression ring secured with a compression nut. Once installed, the compression ring cannot be relocated. The mounting bushing and compression nut are available in nickel plated brass, or stainless steel.



### Brazed Bushing

This 1/8" NPT mounting bushing is brazed to the sensor probe at the "U" dimension specified on the order.



## Determining Adapter Length

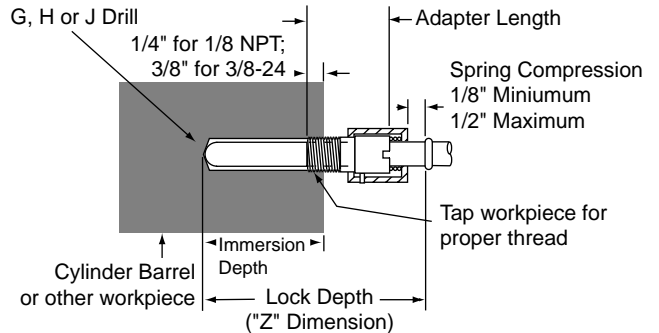
### Threaded Adapter

To determine the nominal adapter length, proceed as follows:

Adapters with 1/8 NPT: "Z" dimension minus hole depth, minus 3/8"

Adapters with 3/8-24 thread: "Z" dimension minus hole depth minus 1/4"

Round the adapter length up to the nearest 1/8".



### Pipe Clamp Adapter

This adapter can be used with thermocouples with bayonet lock to measure tube or pipe surface temperatures. The thermocouple is in direct contact with the pipe.

The adapter is available with the "L" dimension in 1/2" increments beginning with 1-1/2". The "L" dimension of the adapter should be approximately 9/16" shorter than the "Z" dimension of the probe.

