



Thermocouple Installation & Guidelines

Thermocouple Types

- 1/8" Fast Response Closed Tip Thermocouple - Suitable for liquids (antifreeze, oil, etc.) & exhaust gases. Can accurately read temperatures from -99 degree F to 2000 degrees F.
- 3/16" Closed Tip Thermocouple - Suitable for liquids (antifreeze, oil, etc.) & exhaust gases. Can accurately read temperatures from -99 degree F to 2000 degrees F.
- 3/16" Ultra Fast Response, Exposed Tip Thermocouple - Suitable for exhaust gases. Has a quicker response time due to the exposed tip (less thermal mass). Can accurately read temperatures from -99 degree F to 2000 degree F.

Thermocouple Placement

Both 1/8" and 3/16" thermocouples measure temperatures at their tip. Therefore, it is important to place the tip in the center of the exhaust stream to accurately measure the hottest point. The exhaust gases exit the cylinder in a conical shape. Imagine the flame of a butane torch inside the header tube. The center of the conical shape is the hottest temperature in the flame. There can easily be as much as 200 degree F differences from the center flame point to the edge. For this reason, care must be taken to locate the thermocouple tips exactly in the same location from cylinder to cylinder. If you wish to minimize restriction, the thermocouple should be placed no less than 1/4" into the exhaust flow. Again, it is important to make sure the insertion depth is in the exact same location from cylinder to cylinder for accurate comparison.

It is generally recommended to locate the thermocouples:

- 2" to 4" from the Exhaust Outlet on 4 stroke engines
- 2" to 8" from the Piston Face on 2 stroke engines.

Consult with your engine / header / pipe manufacturers for recommendations on best location.

Thermocouple Mounting Methods

Redline Gauges offers three different style SS compression fittings:

1. Clamp-On.
2. Compression X 1/8" NPT Fitting with or without a Weld-On Bung.
3. New Weld-On Style.

When using the clamp-on or weld-on fittings, it is suggested to drill the hole 1/32" larger than the thermocouple. For 1/8" diameter thermocouples, drill the hole 5/32". For 3/16" diameter thermocouples drill the hole 7/32". This allows for easy removal if coated with carbon deposits. Do not over tighten the clamp or it will restrict the expansion of the clamp as the pipe gets hot and damage will likely occur. Use only a screwdriver or 5/16" hand driver when tightening.

If a cast manifold of sufficient thickness is used, it can be drilled and tapped to accept our 1/8" NPT threaded compression fitting(s). Some owners have applied grease to the drill bits to help reduce cuttings from entering the exhaust manifold. This also works on the tap while tapping out the manifold. Reaching in with a magnetic pick-up tool will help get the remainder of cuttings. Other owners have allowed the engine to run while drilling and tapping. The exhaust gas will discharge the cuttings as they occur.

NOTE: Redline Gauges Inc. cannot endorse any installation method due to liability. It is recommended that you have a certified professional install these products if you are unsure of how to install safely.



Even though the SS compression threads are silver plated to prevent galling, we recommend applying an anti-seize compound to the threads on the compression & 1/8" NPT threads for easy removal, if desired. Resist the urge to over-tighten the compression fittings; after the nut is hand tight, an additional 1/4 to 1/2 turn is sufficient.

We recommend that you NOT use brass fittings in exhaust manifolds or anything that becomes 300 degree F (135 degree C) or hotter due to the different expansion characteristics. Brass fittings have a tendency to loosen / leak at these higher temperatures.

Bending

Avoid bending the thermocouple sheath if possible. If bending is necessary due to clearance problems, the bend should have a radius not less than 1/2" (12mm). Bend with your fingers when possible. Clamping in a vise to bend will only crimp and damage the thermocouple thus voiding the warranty.

Wire Routing

Remove the battery and place away from the vehicle or, at the very least, securely cover the positive lead and any other potential contact with the battery source. The outer SS braid is very conductive. Turning your thermocouple into a bulb filament will instantly destroy it! We have experienced this and urge you to take this precaution.

The outer braid is constructed from a durable stainless steel and the thermocouple wires are coated with Dupont Kapton insulation that is good to 500 degrees F. Even though the outer braid does protect the thermocouple wire from a reasonable amount of EMI, you should still route the wires away from any ignition components. Avoid any contact with hot components such as exhaust manifolds, turbo chargers, etc. The braided cable is very flexible but we discourage bending with a radius less than a 1/4" (6mm).

We have designed the thermocouples with small contacts to allow for easy routing. Since they are small, they are also relatively fragile, so take care while routing thru the firewall, etc. These are special Alumel / Chromel contacts. Using anything else will impair the thermocouple MV signal and cannot be used. If the contacts are damaged, the thermocouple must be sent back to Redline Gauges for repair.

Custom Length Thermocouples & Extensions

Our thermocouples can be ordered with either 76" or 96" length leads. These lengths are sufficient for most installations; however, if inadequate for your particular application, we can custom make any length. You will find that these are reasonably priced. We can also provide custom length extensions. If you run into this situation during installation, simply call or email us with your needs.

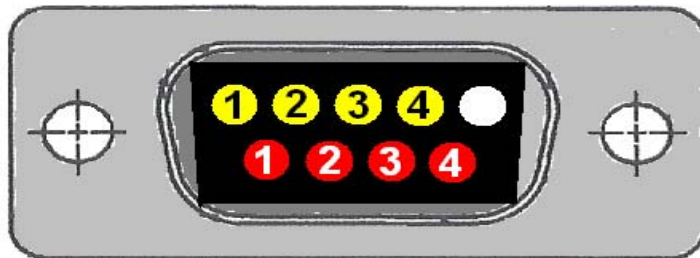
After routing the thermocouples the contacts are inserted into the D-Sub connector per the following diagram (shown next page).

Caution: Make sure you have the contacts located in the proper position in the D-Sub connector before fully inserting. Once inserted, they cannot be removed. If you make a mistake, DO NOT damage the thermocouple contacts by trying to pull them back out. Doing so will likely result in the thermocouple being sent back to Redline Gauges for repair.

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If you have made a mistake or want to change the installation configuration, carefully dismantle the D-Sub connector by bending off mounting tabs or drilling out the two mounting holes with a 3/16" bit. Slide the contacts safely through and away from the plastic insert. Carefully break apart the plastic insert with pliers to remove the thermocouples. We supply you with extra D-Sub connectors in the event that you make a mistake or just want to change the thermocouple arrangement. Also, the 9 Position D-Sub connectors are readily available at any electronic supply store such as Radio Shack.

Insertion/Back side



Last But Not Least

There is a misconception of tuning your engine using exhaust gas temperature alone. This could result in a common and costly mistake. The tuning should be accomplished through analyzing spark plug color, exhaust manifold color, piston wash, etc. Once you have achieved the desired results, make note of the air temperature, barometric pressure, & humidity or Relative Air Density (RAD). The EGT readings at this point is your baseline temperature. The baseline temperature will change due to weather conditions and can be corrected with jetting/fuel changes for optimum performance.

Due to the wide variety of engines and thermocouple placement, the exhaust gas temperatures in perfectly tuned engines can have a broad range of temperature differences! So DO NOT tune to a pre-determined exhaust gas temperature that you think it should be or that a friend told you about. Do your homework and learn how to establish the baseline for your particular application. This is not Rocket Science; it makes perfect sense that *air density changes affect what happens in the combustion chamber* thereby changing the EGT & engine performance.

Having a precision digital EGT gauge is a HUGE tactical advantage. It will continually keep you informed about the quality of your engine's tuning, allow you to extract more usable horsepower, and help avoid expensive engine meltdowns!