

## Section Four

### 1.0.0 Measuring Temperature Rise Objective

Learn the steps to properly measure temperature rise on a gas furnace.

**Trade Terms:**

**Temperature Rise:** The certain amount that a furnace is required to heat the air.

Gas furnaces combust natural gas to create flames that heat up the heat exchanger. The furnace heat exchanger must operate at a very high temperature to properly heat the indoor air. As the blower motor is energized, air is circulated from the home, across the heat exchanger where it absorbs heat and then pushed back into the home. Each furnace is designed to heat the air a certain amount. Too much heat and it means the furnace is operating above its design temperature and too little heat and the home will never reach the desired thermostat setpoint. The certain amount that a furnace is required to heat the air is known as the temperature rise.

### 2.0.0 Desired Temperature Rise

The temperature rise on a gas furnace is determined by the manufacturer and it varies by model. It is usually listed as a range (such as 35-65°F). It's the technician's job to measure the actual temperature rise during operation and compare it to the desired range. This range is typically stamped on the furnace data sticker (*image 1*).

It is important that the furnace operates within in this manufacturer recommended range. Operating below the minimum risks not being able to heat the home and could cause condensation of flue gases due to the low temperature of the heat exchanger. Operating above the maximum stresses the furnace heat exchanger and other components. This can cause a shortened life span for the furnace. A two

stage furnace will have a listed temperature rise range for both hi and lo fire.

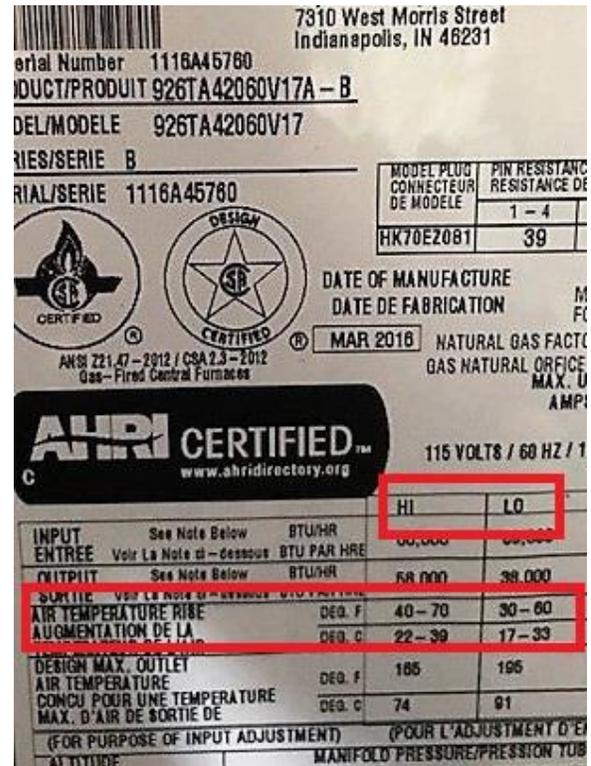


Image 1- Furnace data sticker with Hi and Lo fire temp rise range shown.

### 3.0.0 Measuring Temperature Rise

A technician should measure the temperature rise anytime a service call is being performed on a furnace. Temperature rise is often measure used electronic temp probes It is important that the temperature is measured in a specific location to ensure accuracy of the readings. These readings are taken in the supply and return air at the furnace. The following considerations will ensure an accurate temperature rise reading:

- Ensure the furnace has been running for 10-15 minutes so it has reached steady-state operation.
- The return air reading should be taken in the return air stream near the furnace. This is typically done in the return box or plenum.
- The supply air reading should be taken at least 36-inches from the heat exchanger and out of

the line of sight. This typically means around a bend or corner in the supply plenum or trunk.

- If the system is zoned, ensure all zones are calling and open.

Once the return and supply temperatures have been measured, the temperature rise can be calculated.

$$\text{Supply Air Temp} - \text{Return Air Temp} = \text{Temp Rise}$$

An example of calculating the temperature rise on a furnace and comparing it to the manufacturer recommendation is shown below.

*Example.*

*Supply Air Temp- 121 \*F*

*Return Air Temp- 68 \*F*

$$121 - 68 = 53 \text{ *F. actual temp rise}$$

*Manufacturer Range on Data Sticker = 30-60 \*F*

*System is operating within specs, no adjustments should be made.*

## 4.0.0 Adjusting for Temperature Rise

An incorrect temperature rise could be the indication of a larger problem with the HVAC system. Below are some of the common causes of an incorrect temperature rise.

### High Temperature Rise:

- Low airflow from caused from one or more of the following common problems:
  - Incorrect blower speed setting
  - Incorrectly sized duct work
  - Dirty return air filter
  - Dirty secondary heat exchanger or evaporator coil
  - Dirty blower wheel
- Oversized Furnace
- Excessive manifold gas pressure

### Low Temperature Rise

- Excessive airflow from incorrect blower speed setting
- Low manifold gas pressure setting

When a technician finds a system with an incorrect temperature rise, static pressure should be measured, and a CFM calculation should be made. If adjustments to the airflow are needed, the blower motor speed setting can be changed.

Increasing the blower speed and CFM will decrease the temperature rise. Decreasing the blower speed and CFM will increase the temperature rise.

If an adjustment is going to be made, a technician should carefully inspect the system to ensure the problems listed above are not the root cause for the incorrect temperature rise.

A high temperature rise due to a dirty filter, coil, or secondary heat exchanger is one of the most common problems a technician will see. When the temperature rise reaches above the furnace high limit switch setting, the furnace will automatically cycle the burners off for safety. Once the furnace cools below the high limit setpoint, the burners will fire again. This on/off from the high limit can not only jeopardize the heat exchanger, but also the high limit. If a furnace is constantly cycling on the high limit safety switch, a technician should determine the needed repairs and address them with the homeowner.