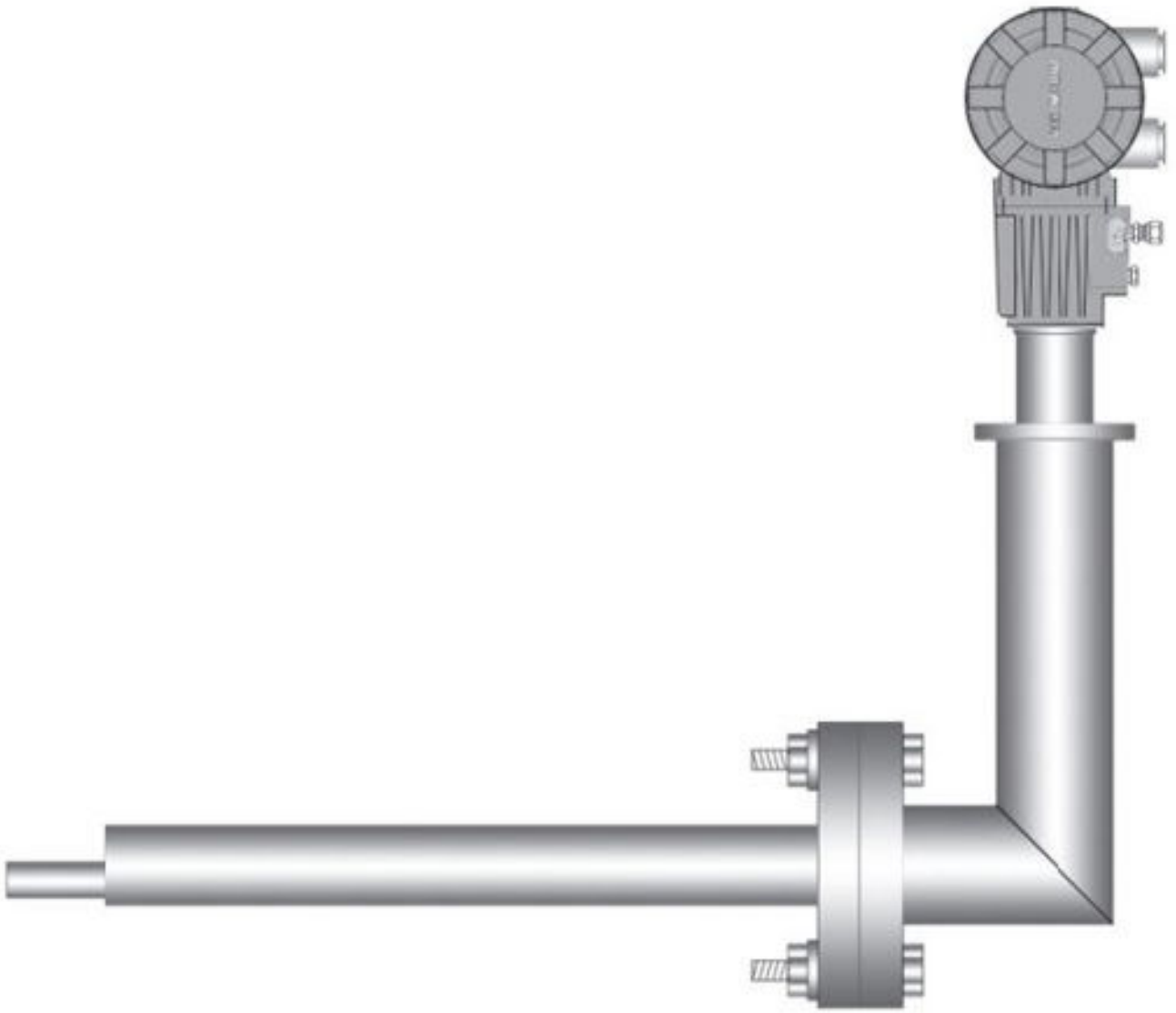
Technical Note
MS-00840-0100-4340, Rev AA
September 2024

Rosemount™ High Temperature Bypass Accessory

Installing, Inspecting, and Maintaining



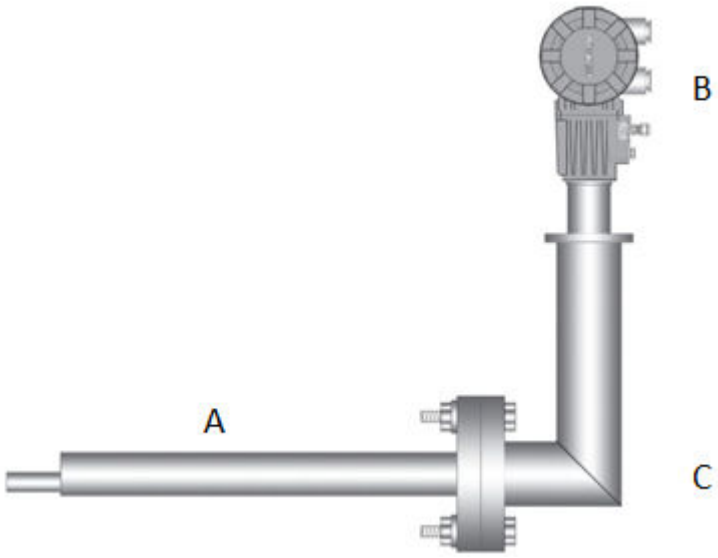
ROSEMOUNT™

EMERSON™

Introduction

High Temperature Bypasses are used when flue gas temperatures can exceed the 1300 °F (700 °C) temperature limit of the in-situ combustion O2 probe. The external pipe elbow and probe support sections are made of stainless steel and is external to the process. The pick-up assembly is made of Inconel and is inserted into the flue gas stream. The flue gas flow in the duct causes some flue gas to travel through the pick-up assembly's inner pipe to the elbow of the bypass where an in situ O2 probe measures the O2 content.

Figure 1: High Temperature Bypass



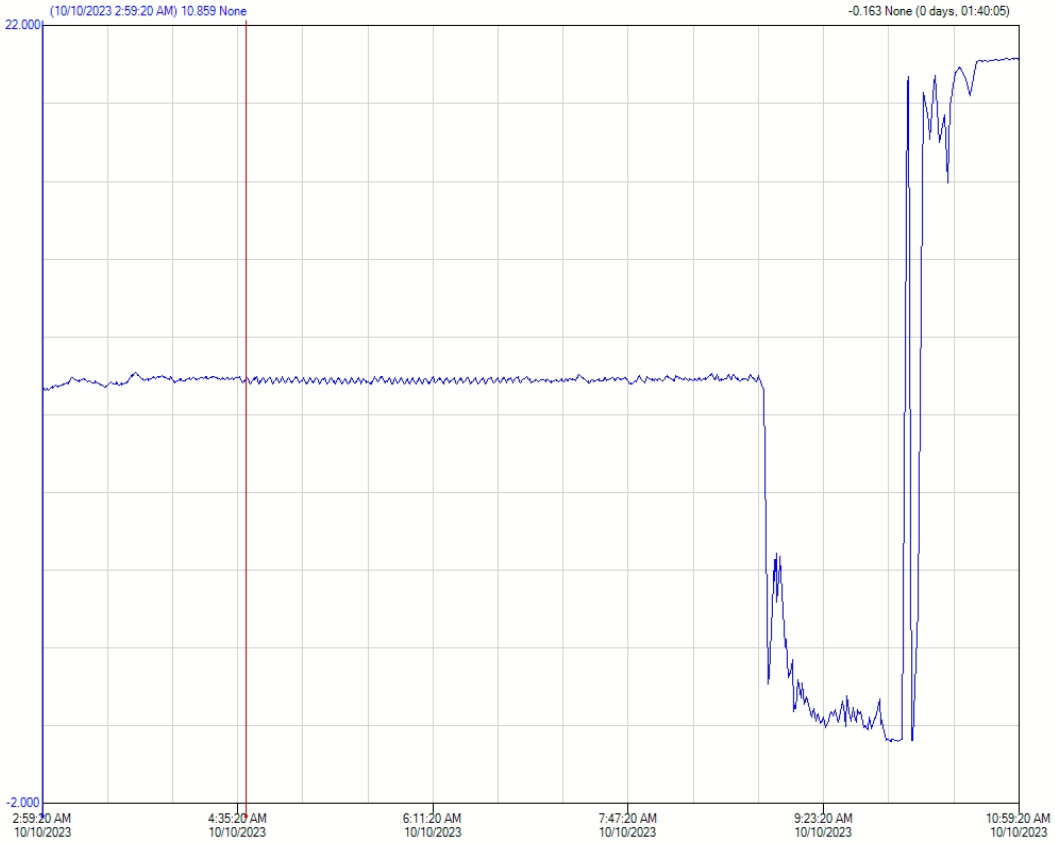
A. Pick-Up Assembly
B. O2 Probe
C. Elbow Section

When installing the High Temperature Bypass, it is necessary to insulate the external pipe between the elbow and the probe to avoid condensation. Maintaining the external elbow wall temperature above 180 °F (82 °C) is sufficient to avoid water dew point. If water condensation does occur, O2 readings may drop to zero periodically because the water collects at the elbow and eventually flashes to steam displacing the flue gas sample. This issue is typically noticed in cold or wet weather, or early mornings. If the process gas is relatively low, for example 1,500 °F (816 °C), then it may even be necessary to insulate the horizontal section from the elbow to the duct flange. The insulating requirements are documented in the Rosemount Bypass Oxygen Analyzer dimension drawing.

Contents

Introduction..... 2
Emerson recommendations..... 4
Ordering information..... 7

Figure 2: Example of O_2 Signals Dropped Due To Condensation



A. O2 Reading

Figure 3: High Temperature Bypass in Moderate Temperature Application

Note
Insulation covers both the vertical and the horizontal sections of the external elbow.

If sulfur compounds are present in the flue gas, H2SO4 may also condense. The dew point is much higher around 370 °F (188 °C). H2SO4 can also accumulate at the elbow and flash off but normally, the sulfur concentrations are very small and will not cause issues with O2 readings. However, H2SO4 may shorten the bypass or O2 sensor life.

Because the bypass is exposed to high temperature flue gases, it is important for customers to periodically inspect the bypass for degradation or damage. Flue gas temperatures, corrosives and length of the bypass are key factors in how long a bypass may last. While Emerson expects the bypass to last many years in a typical natural gas or fuel oil fired application, Emerson still recommends routine inspection. The interval of inspection can then be extended based on the condition of the bypass and operating history. In corrosive or fuel rich environments, more frequent inspections will likely be needed. The bypass can experience surface scaling, embrittlement, and thermal creep. The bypass should still function with the surface scaling, but it's recommended to remove the scale when inspecting to prevent a buildup that can obstruct flow and to allow for improved inspection of the material thickness. Thermal creep (sagging) is more likely for longer bypasses that operate above 560 °F (850 °C) for an extended period of time. High Temperature Bypasses are available in 9 ft, 6 ft, 3 ft and 18-inch lengths.

Emerson recommendations

Procedure

1. Inspect the bypass at least after 12 months for any bypass over 3 ft and over 1,560 °F (849 °C). For all other applications, inspect after 24 months. Inspect at soonest opportunity anytime the flue gas temperature exceeds the 1,950 °F (1,066 °C) bypass temperature limit. Inspection intervals can be adjusted based on findings.
2. Inspections should note the surface quality, pick-up assembly pipe wastage and any creep or sagging. Also inspect the external elbow section and welds for cracks and corrosion. Keeping records can help with planning when to replace the pick-up assembly or entire bypass.

   Keeping records can help with planning when to replace the pick-up assembly or entire bypass.
3. Replace the pick-up assembly when sagging exceeds 1 inch per foot, 50% wall wastage or cracking has occurred. Repair or replace the bypass if weld cracks are observed.

   Examples of bypass degradation:

   Figure 4: Severe Heat Degradation and Embrittlement at Nozzle End

Figure 5: Bypass 2 inches wastage Effecting Sample Flow Rate

Figure 6: Thermal Creep Causing a Sag of 2 inches per ft

Note
The probe was installed horizontally with gas flow vertically upwards as noted by the direction of sag and the exhaust opening located on the top.

Figure 7: Bypass Nozzle Corroded Away Preventing Sample Flow

Ordering information

New bypass pickup assemblies are available as replacement parts. The part numbers for both ordinary and hazardous area locations are the same and are listed in the below

Part number	Description
4507C26G11	By-pass pick-up Assembly (Inconel) 18-inch long, for ANSI flange
4507C26G01	By-pass pick-up Assembly (Inconel) 3 foot long, for ANSI flange
4507C26G02	By-pass pick-up Assembly (Inconel) 6 foot long, for ANSI flange
4507C26G03	By-pass pick-up Assembly (Inconel) 9 foot long, for ANSI flange
4507C26G10	By-pass pick-up Assembly (Inconel) 18-inch long, for DIN flange
4507C26G07	By-pass pick-up Assembly (Inconel) 3 foot long, for DIN flange
4507C26G08	By-pass pick-up Assembly (Inconel) 6 foot long, for DIN flange
4507C26G09	By-pass pick-up Assembly (Inconel) 9 foot long, for DIN flange

For sales or technical support, please contact your local Emerson Analytical salesperson or Rosemount Customer Care.

MS-00840-0100-4340
Rev. AA
September 2024

For more information: **Emerson.com/global**

ROSEMOUNT™

EMERSON™