

1 Introduction

Flexpipe spoolable products can operate under a wide range of operating conditions. The low temperature operating and pressure testing limits are primarily dictated by the seal design. A recent review and follow-up testing of the operating envelope by Flexpipe has resulted in some recommended changes to the low temperature operating and hydrotest limits of Flexpipe, Flexpipe HT, and Flexcord spoolable products.

2 Minimum Allowable Operating Temperature

The minimum allowable operating temperature, as specified in the Flexpipe spoolable products Technical Manual (06-1876 R4.4 Section 5.2.1), is being replaced by the information in this bulletin. Flexpipe has standard Viton O-rings which have been reviewed and tested to API 15S 2016. Flexpipe has also qualified and introduced an enhanced Viton O-ring with improved performance at low temperatures. These enhanced O-rings will be referred to as “Low Temp” or “LT” O-rings. The Flexpipe spoolable pipeline’s minimum allowable operating temperature is determined by the O-ring used in the fitting. All spoolable pipes and fittings supplied by Flexpipe are qualified for the lower temperatures when equipped with the required LT O-ring.

Minimum Allowable Operating Temperature		
Product	LT O-Rings	Standard O-Rings
Flexcord	-29°C (-20°F)	-10°C (14°F)
Flexpipe	-29°C (-20°F)	-10°C (14°F)
Flexpipe HT	-29°C (-20°F)	-5°C (23°F)

3 Maximum Allowable Temperature Differential

It is recommended to limit the amplitude of the temperature differential between the maximum and minimum operating temperatures to the values in the table below.

Maximum Allowable Temperature Differential (Max T – Min T)		
Product	LT O-Rings	Standard O-Rings
Flexcord	89°C or 160°F	70°C or 126°F
Flexpipe	89°C or 160°F	70°C or 126°F
Flexpipe HT	111°C or 200°F	87°C or 157°F

4 Identifying O-Rings and Minimum Operating Temperature

Fittings equipped with LT O-rings will be identifiable through two different methods:

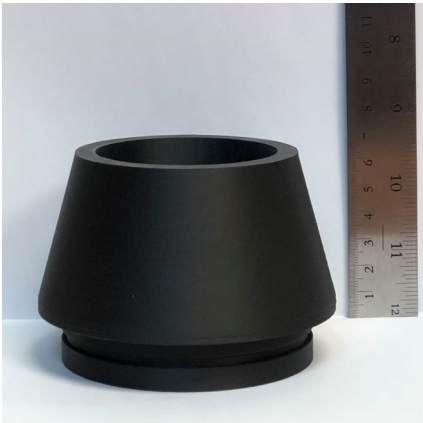
1. Appearance: Standard O-rings are orange in color. LT O-rings are black.
2. Fitting part number: Fittings that contain LT O-rings have part numbers that end in LT. For example, a 4” FP301 coupling with standard O-rings has the part number 74038. The same fitting equipped with LT O-rings will have the part number 74038LT.

5 Availability of LT O-Rings and Fittings

Fittings equipped with LT O-rings will be the default for all installations located in Canada. For other regions they are available by request. Contact a Flexpipe Project Coordinator for more information.

6 Installation of LT O-Rings

Both the standard O-ring and the LT O-ring may be installed onto a fitting; it is also possible to replace standard O-rings with LT O-rings. With the LT O-ring installed on the fitting, it will be rated for -29°C. There is a specific method to install an LT O-ring. For 3” and 4” fittings, a mandrel nose cone is required to install the O-ring over the mandrel nose and into the O-ring groove. Please refer to the Flexpipe LT Viton O-ring Installation bulletin 14-4192. Extra O-rings and mandrel nose cones are available in the fitting installation kit.



Mandrel Nose Cone



Mandrel Nose Cone Temporarily Attached to a Fitting

7 Minimum Allowable Fitting Temperature During Installation

Flexpipe’s spoolable products can be installed at temperatures down to -25°C (-13°F). For pipe and fitting temperatures below -25°C, heating of the product is required. This is described in the Installation Guide 14-1096.

8 Minimum Allowable Fitting Temperature During Hydrotesting

Care should be taken during a hydrotest to ensure that fitting temperatures do not go below the minimum allowable operating temperature. An infrared temperature gun (or other method) to measure the temperature of the Flexpipe spoolable pipe next to the crimp fitting can be used to approximate the temperature of the crimp fitting.

Minimum Allowable Fitting Temperature During Hydrotest		
Product	LT O-Rings	Standard O-Rings
Flexcord	-29°C (-20°F)	-10°C (14°F)
Flexpipe	-29°C (-20°F)	-10°C (14°F)
Flexpipe HT	-29°C (-20°F)	-5°C (23°F)

Three methods of maintaining fitting and O-ring temperatures warmer than the minimum allowable fitting temperature are discussed below:

A. Buried Fittings

Buried fittings covered with at least three feet of fill on all sides has been shown to maintain enough warmth from the earth to keep the fitting above the minimum allowable operating temperature.

B. Warm Hydrotest Fluid

Burying the pipeline (with at least three feet of fill) prior to the addition of hydrotest fluid (which is warmer than 0°C) is expected to keep any exposed (unburied) fittings warmer than the minimum allowable fitting temperature for an undetermined period of time. A fluid heater may be necessary to warm the hydrotest fluid prior to the fluid entering the pipeline. The hydrotest conditioning pressure (per the Installation Guide Section 12.2) must be applied with the fittings warmer than the minimum allowable fitting temperature in order to sufficiently energize the seal. Once the seal is energized, continue with the conditioning and hydrotesting as is typical.

C. Warming of Exposed Fittings Using a Heated Shelter

Keeping any exposed (unburied) fittings warmer than the minimum allowable fitting temperature can be accomplished by indirect heating of any unburied fitting connection. An adequate heated shelter arrangement and documented procedure must be utilized.

Unburied fittings within the pipeline section to be tested may be enclosed (e.g., shrouded) with a frame and a tarp enclosure with a dedicated portable heater generating enough heat output to keep the pipe and fitting connection warmer than the minimum allowable fitting temperature. Do not apply direct heat onto the pipe and fitting; instead, apply indirect heat inside the enclosure and allow the heat to circulate around the pipe and fitting. Alternatively, a heat tape wrapping with insulation may be applied to the fitting connection.

Heating should begin prior to filling the pipeline with hydrotest fluid and continue at least until the full hydrotest pressure is achieved. Adequate monitoring of the pipe and fitting surface temperature during hydrotesting is required. No portion of the line shall exceed the maximum operating temperature of the product.

Notes:

- The overnight low ambient temperature is typically used as a guideline for how cold any unburied fitting connection will be at the start of the day, as it normally takes several hours or more for the fitting to warm up with increasing ambient temperatures.
- With the hydrotest pressure applied and the seal energized at the minimum allowable fitting temperature, even if the sealing area cools below the minimum allowable fitting temperature it is possible that the fitting will maintain its seal at slightly colder temperatures.
- LT O-rings should also be used for high pressure CO₂ applications. Please contact your Flexpipe Account Manager for clarification.
- LT weldneck fittings must not have O-rings in place during welding or during coating application. These fittings will have the LT O-rings shipped in a package attached to, or in the same container as, the weldneck fitting. The LT O-rings shall be installed as per the Flexpipe LT Viton O-ring Installation bulletin 14-4192 after welding has been completed.