Rosemount™ DP Level Fill Fluid Specifications

1.0 Fill fluids

- Silicone 200
- Silicone 200 for vacuum applications
- Tri-Therm 300
- Tri-Therm 300 for vacuum applications
- Silicone 704
- Silicone 704 for vacuum applications
- Silicone 705
- Silicone 705 for vacuum applications
- UltraTherm™ 805
- UltraTherm 805 for vacuum applications
- SYLTHERM™ XLT
- Inert (halocarbon)
- Neobee M-20®
- Glycerin and water
- Propylene glycol and water

EMERSON™

1.1 Silicone 200 – fill fluid specifications

Temperature limits:	
At or above atm pressure:	–45 to 205 °C (–49 to 400 °F)
Viscosity at 25 °C (77 °F):	9.5 cST
Specific gravity at 25 °C (77 °F):	0.934
Coefficient of thermal expansion:	0.00108 cc/cc/°C (0.00060 cc/cc/°F)
Chemical name:	Polydimethylsiloxane polymer
Chemical composition:	(CH3)3SiO(SiO[CH3]2)nSi(CH3)3
CAS number:	63148-62-9

Description/applications

Silicone 200 is a general purpose fill fluid for industrial applications and is used in over half of all remote seal assemblies. This fluid has a broad temperature range to cover ambient and process conditions and has a low viscosity for good time response. Silicone fluids have a unique combination of properties that give superior performance in a wide variety of applications. Silicones provide excellent thermal stability and low vapor pressure.

For applications below 14.7 psia (1 bara), use Silicone 200 for vacuum applications found in "Silicone 200 for vacuum applications – fill fluid specifications" on page 3.

1.2 Silicone 200 for vacuum applications – fill fluid specifications

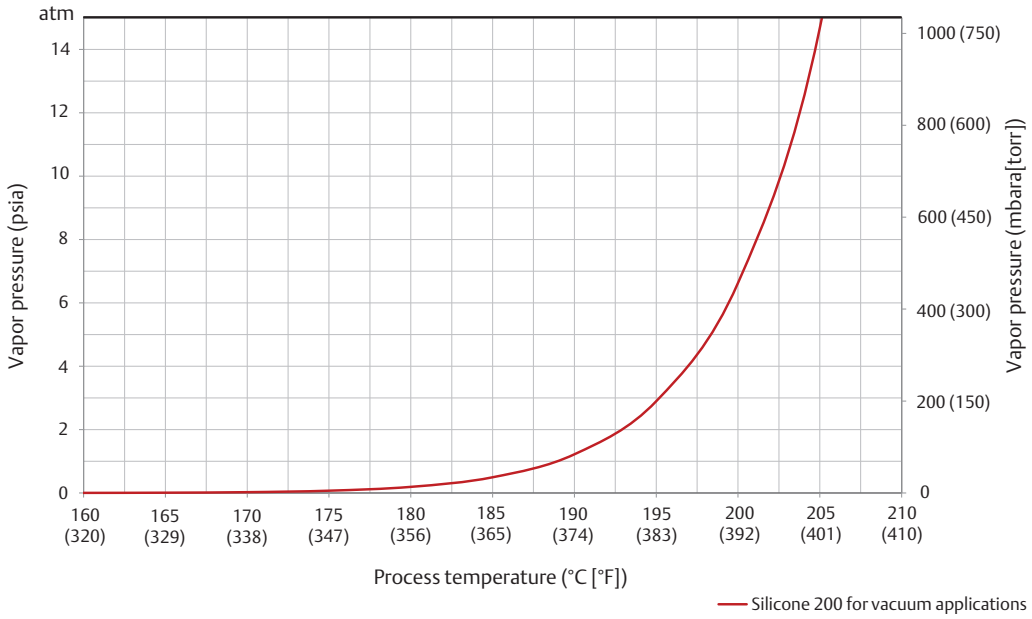
Temperature limits:

Below atm pressure:	See Figure 1-1 for vapor pressure curve
At or above atm pressure:	–45 to 205 °C (–49 to 400 °F)
Viscosity at 25 °C (77 °F):	9.5 cST
Specific gravity at 25 °C (77 °F):	0.934
Coefficient of thermal expansion:	0.00108 cc/cc/°C (0.00060 cc/cc/°F)
Chemical name:	Polydimethylsiloxane polymer
Chemical composition:	(CH3)3SiO[SiO(CH3)2]nSi(CH3)3
CAS number:	63148-62-9

Description/applications

Silicone 200 for vacuum applications is designed for optimal performance in vacuum (< 1 bara). Refer to Figure 1-1 for acceptable operating pressure and temperature limits.

Figure 1-1. Silicone 200 for Vacuum Applications Vapor Pressure Curve



1.3 Tri-Therm 300 - fill fluid specifications

Temperature limits:

At or above atm pressure:	–40 to 300 °C / –40 to 572 °F
Viscosity at 25 °C (77 °F):	8.6 cST
Specific gravity at 25 °C (77 °F):	0.795
Coefficient of thermal expansion:	0.00078 cc/cc/°C (0.00043 cc/cc/°F)

Description/applications

Tri-Therm 300 is an advanced general use and food-grade fill fluid. The expanded operating temperature range, low viscosity, and low thermal expansion allow Tri-Therm 300 to have improved performance and a wider temperature range compared to Silicone 200. Tri-Therm 300 is a non-toxic, food grade fill fluid that is NSF HT1 registered, certifying it acceptable for use where there is possibility of incidental food contact.

For applications below 14.7 psia (1 bara) use Tri-Therm 300 for Vacuum Applications found in "Tri-Therm 300 for vacuum applications – fill fluid specifications" on page 5.

1.4 Tri-Therm 300 for vacuum applications – fill fluid specifications

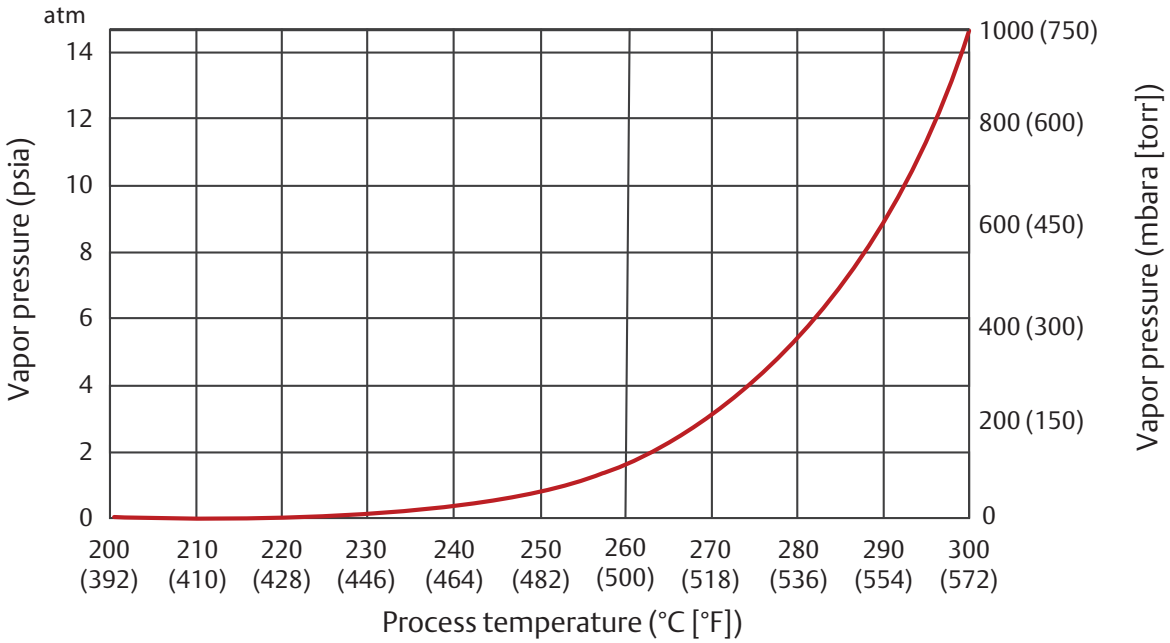
Temperature limits:

Below atm. pressure:	See Figure 1-2 for vapor pressure curve
At or above atm pressure:	–40 to 300 °C / –40 to 572 °F
Viscosity at 25 °C (77 °F):	8.6 cST
Specific gravity at 25 °C (77 °F):	0.795
Coefficient of thermal expansion:	0.00078 cc/cc/°C (0.00053 cc/cc/°F)

Description/applications

Tri-Therm 300 for Vacuum Applications is specifically designed for applications with a large operating temperature range and pressures below 14.7 psia (1 bara). Tri-Therm 300 for Vacuum Applications is an advanced general use and food-grade fill fluid. The expanded operating temperature range, low viscosity, and low thermal expansion allow Tri-Therm 300 to have improved performance and a wider temperature range compared to Silicone 200. Tri-Therm 300 is a non-toxic, food grade fill fluid that is NSF HT1 registered, certifying it acceptable for use where there is possibility of incidental food contact. Refer to the vapor pressure curve below for acceptable operating pressure and temperature limits.

Figure 1-2. Tri-Therm 300 for Vacuum Applications Vapor Pressure Curve



1.5 Silicone 704 – fill fluid specifications

Temperature limits:	
Below atm pressure:	See Figure 1-3 for vapor pressure curve
Viscosity at 25 °C (77 °F):	39 cST
Specific gravity at 25 °C (77 °F):	1.07
Coefficient of thermal expansion:	0.00095 cc/cc/°C (0.00053 cc/cc/°F)
Chemical name:	Tetramethyltetraphenyltrisiloxane
CAS number:	3982-82-9

Description/applications

Silicone 704 is a fill fluid intended for use in applications with higher operating temperatures beyond the maximum limit of Silicone 200.This specialty silicone fluid has a much higher molecular weight than Silicone 200, which increases its operating temperature. Its main limitation is its higher viscosity, so heat tracing of capillaries or use of the Rosemount 3051S Thermal Range Expander is suggested for many outdoor applications. The 0.03-in. (0.7 mm) ID capillary is not allowed for Silicone 704 because of its higher viscosity.

For applications below 14.7 psia (1 bara) use Silicone 704 for vacuum applications found in "Silicone 704 for vacuum applications – fill fluid specifications" on page 7".

1.6 Silicone 704 for vacuum applications – fill fluid specifications

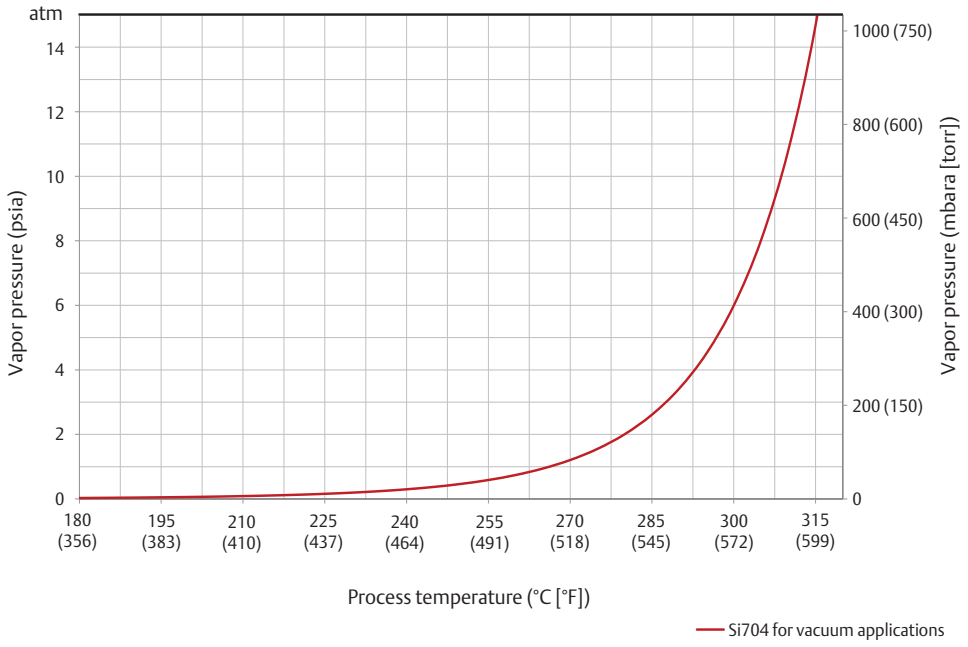
Temperature limits:

Below atm pressure:	See Figure 1-3 for vapor pressure curve
At or above atm pressure:	0 to 315 °C (32 to 600 °F)
Viscosity at 25 °C (77 °F):	39 cST
Specific gravity at 25 °C (77 °F):	1.07
Coefficient of thermal expansion:	0.00095 cc/cc/°C (0.00053 cc/cc/°F)
Chemical name:	Tetramethyltetraphenyltrisiloxane
CAS number:	3982-82-9

Description/applications

Silicone 704 for vacuum applications is specifically designed for applications below 14.7 psia (1 bara) that have higher operating temperatures than Silicone 200 for vacuum applications can support. This specialty silicone fluid has a much higher molecular weight than Silicone 200, which increases its operating temperature and lowers its vapor pressure. Its primary limitation is its higher viscosity, so heat tracing of capillaries or use of the Rosemount 3051S Thermal Range Expander is suggested for many outdoor applications. The 0.03-in. (0.7 mm) ID capillary is not allowed for Silicone 704 for vacuum applications because of its higher viscosity. Refer to Figure 1-3 for acceptable operating pressure and temperature limits.

Figure 1-3. Silicone 704 for Vacuum Applications Vapor Pressure Curve



1.7 Silicone 705 – fill fluid specifications

Temperature limits:	
At or above atm pressure:	20 to 370 °C (68 to 698 °F)
Viscosity at 25 °C (77 °F):	175 cST
Specific gravity at 25 °C (77 °F):	1.09
Coefficient of thermal expansion:	0.00077 cc/cc/°C (0.00043 cc/cc/°F)
Chemical name:	Trimethylpentaphenyl trisiloxane
CAS number:	3390-61-2

Description/applications

Silicone 705 is a specialty silicone fill fluid intended for use in applications with higher operating temperatures beyond the maximum limit of Silicone 704. Silicone 705 has a higher molecular weight than Silicone 704, which extends seal operating temperatures. Its primary limitation is high viscosity, so heat tracing of capillaries or use of the Rosemount 3051S Thermal Range Expander is often needed for acceptable response time. The 0.03-in. (0.711 mm) or 0.04-in. (1.092 mm) ID capillary are not allowed for Silicone 705 because of its higher viscosity.

For applications below 14.7 psia (1 bara) use Silicone 705 for vacuum applications found in "Silicone 705 for vacuum applications – fill fluid specifications" on page 9.

1.8 Silicone 705 for vacuum applications – fill fluid specifications

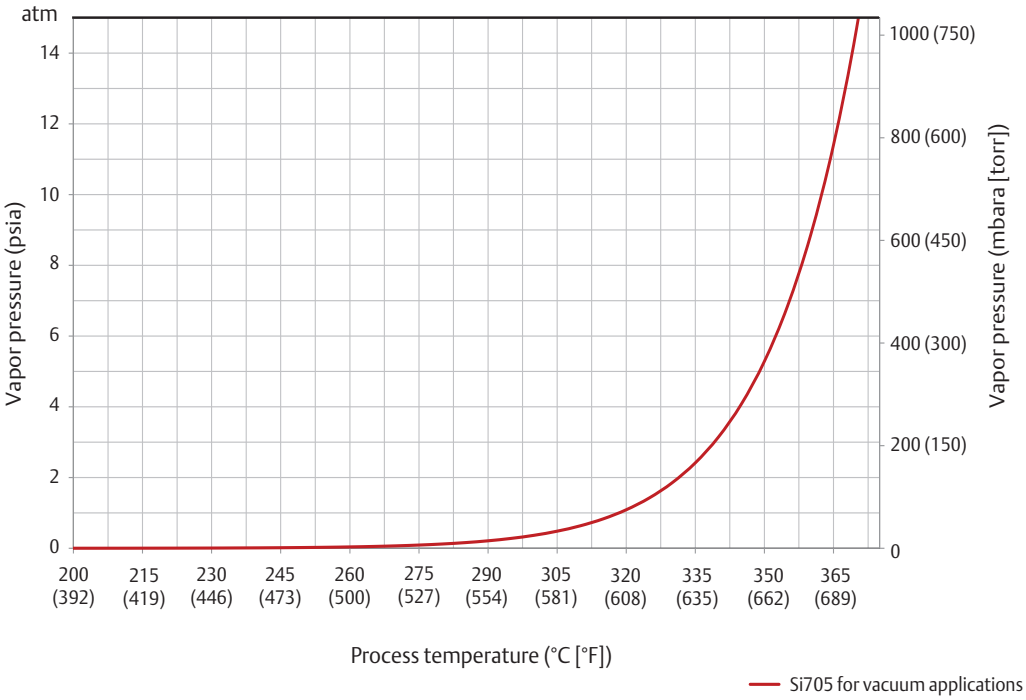
Temperature limits:

Below atm pressure:	See Figure 1-4 for vapor pressure curve
At or above atm pressure:	20 to 370 °C (68 to 698 °F)
Viscosity at 25 °C (77 °F):	175 cST
Specific gravity at 25 °C (77 °F):	1.09
Coefficient of thermal expansion:	0.00077 cc/cc/°C (0.00043 cc/cc/°F)
Chemical name:	Trimethylpentaphenyl trisiloxane
CAS number:	3390-61-2

Description/applications

Silicone 705 for vacuum applications is specifically designed for applications below 14.7 psia (1 bara) that has higher operating temperature than Silicone 704 for vacuum applications can support. This specialty silicone fluid has a higher molecular weight than Silicone 704, which increases its operating temperature and lowers its vapor pressure. Its primary limitation is its higher viscosity, so heat tracing of capillaries or use of the Rosemount 3051S Thermal Range Expander is suggested for many outdoor applications. The 0.03-in. (0.711 mm) or 0.04-in. (1.092 mm) ID capillary are not allowed for Silicone 705 because of its higher viscosity. Refer to Figure 1-4 for acceptable operating pressure and temperature limits.

Figure 1-4. Silicone 705 for Vacuum Applications Vapor Pressure Curve



1.9 UltraTherm 805 – fill fluid specifications

Temperature limits:

At or above atm pressure:	410 °C (770 °F) for continuous operation 427 °C (800 °F) for up to 24 hours
Minimum atm pressure:	50 °C (122 °F) or 60 °C (140 °F)
Viscosity at 25 °C (77 °F):	1000 cST
Specific Gravity at 25 °C (77 °F):	1.20
Coefficient of Thermal Expansion:	0.0008 cc/cc/°C (0.0004 cc/cc/°F)

Description/applications

UltraTherm 805 fill fluid is a high-temperature non-silicone fluid with exceptionally low volatility, high thermal stability, and is a halogen-free, clear, colorless fluid. It is extremely resistant to degradation from heat. UltraTherm 805 is designed for applications where extreme high temperature and adverse environments are expected. Because of its high viscosity, it cannot be used in a single-filled capillary system and is only available with the Rosemount 3051S Thermal Range Expander. UltraTherm 805 fill fluid is not chemically inert.

For applications below 14.7 psia (1 bara) use UltraTherm 805 for vacuum applications.

1.10 UltraTherm 805 for vacuum applications – fill fluid specifications

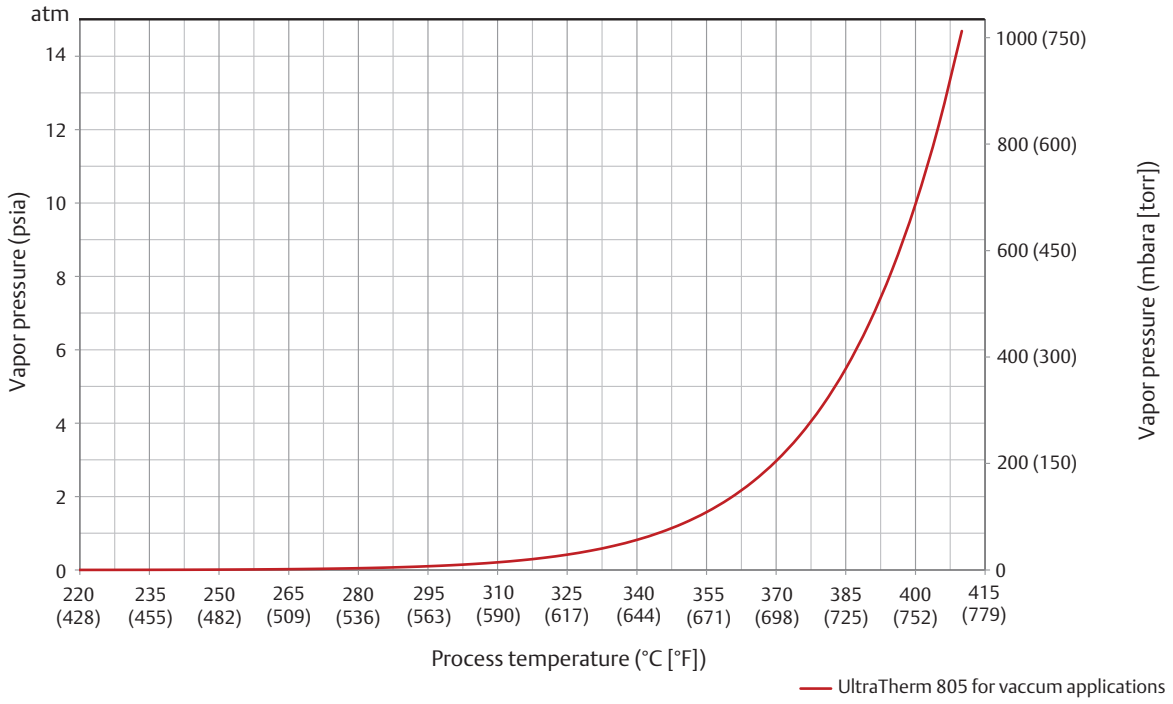
Temperature limits:

Below atm pressure:	See Figure 1-5 for vapor pressure curve
At or above atm pressure:	410 °C (770 °F) for continuous operation 427 °C (800 °F) for up to 24 hours
Minimum atm pressure:	50 °C (122 °F) or 60 °C (140 °F)
Viscosity at 25 °C (77 °F):	1000 cST
Specific gravity at 25 °C (77 °F):	1.20
Coefficient of thermal expansion:	0.0008 cc/cc/°C (0.0004 cc/cc/°F)

Description/applications

UltraTherm 805 for vacuum applications is specifically designed for applications below 14.7 psia (1 bara) that have a higher operating temperature than Silicone 705 for vacuum applications can support. This specialty fluid is silicone free and has a higher molecular weight than Silicone 705, which increases its operating temperature and lowers its vapor pressure. Because of its high viscosity, it cannot be used in single-filed capillary system and is only available with Rosemount 3051S Thermal Range Expander. Refer to Figure 1-5 for acceptable operating pressure and temperature limits. UltraTherm 805 is not chemically inert.

Figure 1-5. UltraTherm 805 for Vacuum Applications Vapor Pressure Curve



1.11 SYLTHERM XLT – fill fluid specifications

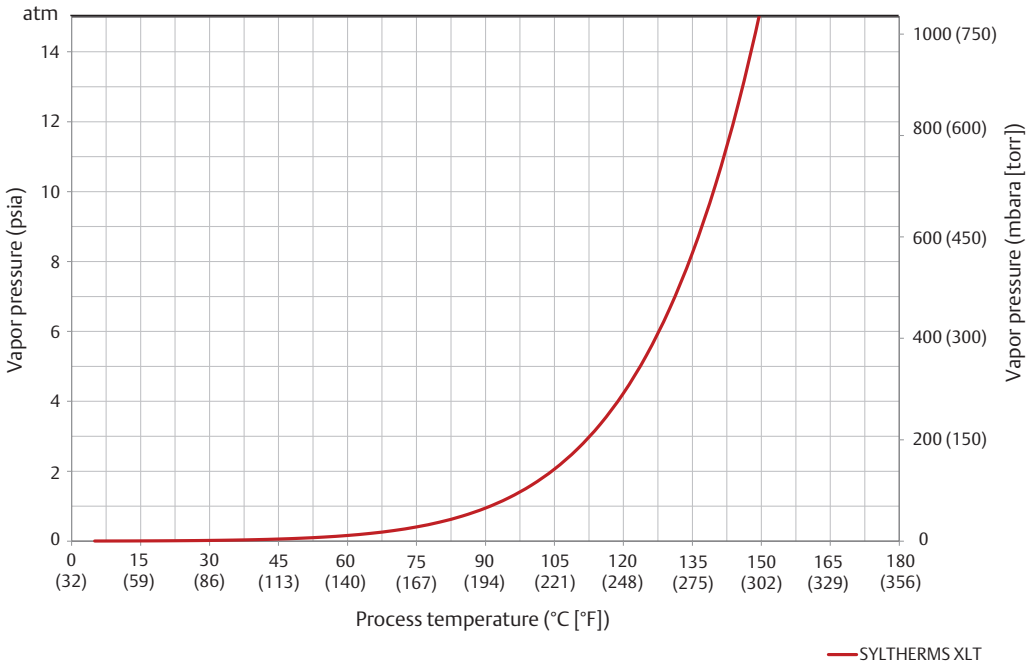
Temperature limits:

At or above atm pressure:	–105 to 145 °C (–157 to 293 °F)
Viscosity at 25 °C (77 °F):	1.6 cST
Specific gravity at 25 °C (77 °F):	0.85
Coefficient of thermal expansion:	0.001198 cc/cc/°C (0.00066 cc/cc/°F)
Chemical name:	Dimethyl Polysiloxane
CAS number:	063148-62-9

Description/applications

SYLTHERM XLT is a low viscosity silicone fluid used specifically for cold temperature applications.

Figure 1-6. SYLTHERM XLT Vapor Pressure Curve



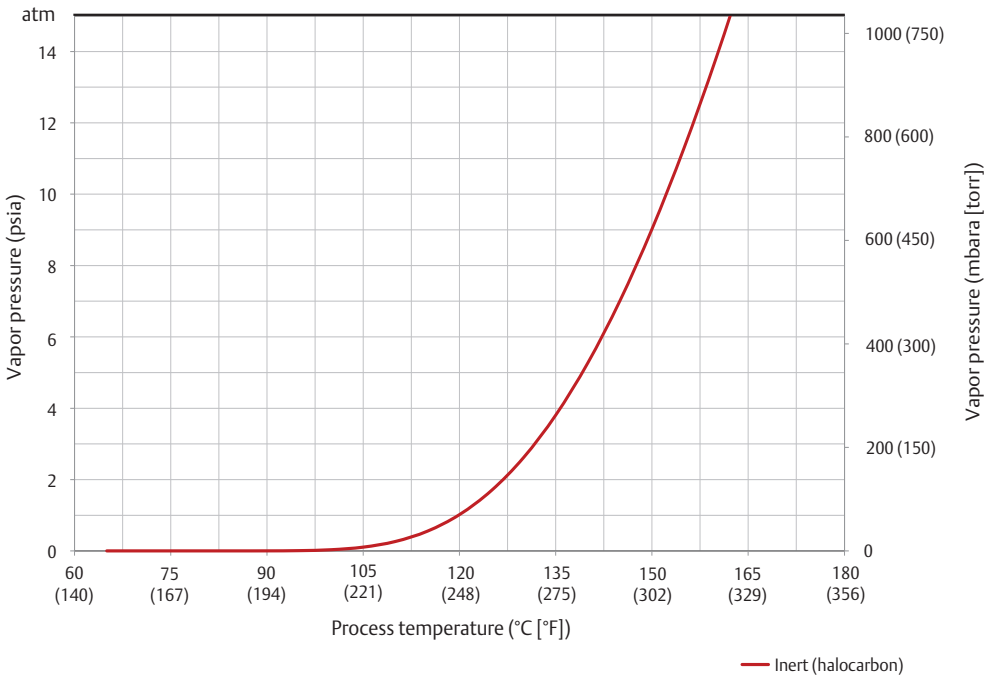
1.12 Inert (halocarbon) – fill fluid specifications

Temperature limits:	
At or above atm pressure:	–45 to 160 °C (–49 to 320 °F)
Viscosity at 25 °C (77 °F):	6.5 cST (4.2 cST at 100 °F)
Specific gravity at 25 °C (77 °F):	1.85
Coefficient of thermal expansion:	0.000864 cc/cc/°C (0.00048 cc/cc/°F)
Chemical composition:	Chlorotrifluoroethylene polymer (CTFE)
CAS number:	9002-83-9

Description/applications

Halocarbon 4.2 is the standard inert fluid offering with Rosemount remote seals. 4.2 fill fluid refers to the viscosity in centistokes at 100 °F. Inert fill fluids are essentially non-reactive to a wide range of chemicals, including halogens, oxygen, and other specialty gas applications. Other applications to consider using inert fluid include those where silicone fluids are banned due to product contamination concerns (i.e. paint manufacturing). Inert fluid has a higher vapor pressure than standard Silicone 200 and restricts applications, especially in vacuum service. Inert fluid should not be used for food grade applications.

Figure 1-7. Inert (Halocarbon) Vapor Pressure Curve



1.13 Neobee M-20 – fill fluid specifications

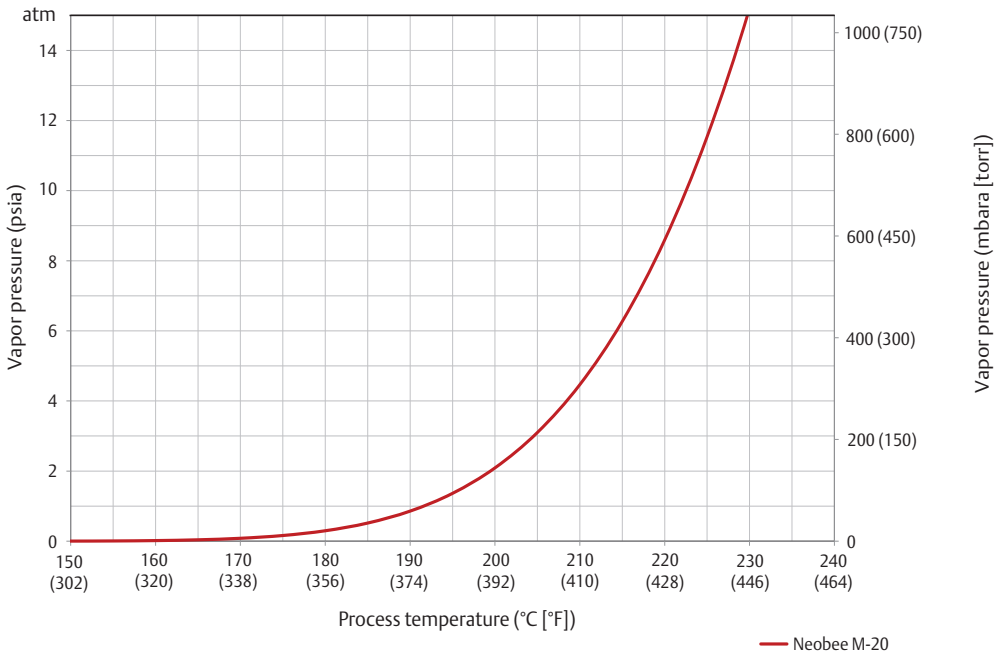
Temperature limits:

At or above atm pressure:	–15 to 225 °C (5 to 437 °F)
Viscosity at 25 °C (77 °F):	9.8 cST
Specific gravity at 25 °C (77 °F):	0.94
Coefficient of thermal expansion:	0.001008 cc/cc/°C (0.00056 cc/cc/°F)
Chemical composition:	Derived from coconut oil and propylene glycol: Dicaprylate/dicaprate
CAS number:	68583-51-7

Description/applications

Neobee M-20 is the most commonly used fill fluid for hygienic applications because of its low viscosity and thermal stability. Neobee is approved under 21CFR 172.856 as a direct food additive and under 21CFR 174.5 as an indirect food additive. It is soluble in alcohol containing up to 20 percent water, has a smooth non-oily feel and unusually low viscosity, similar to Silicone 200. Neobee properties make it a suitable all purpose fill fluid. On colder applications, the response time should be evaluated due to increased viscosity.

Figure 1-8. Neobee M-20 Vapor Pressure Curve



1.14 Glycerin and water – fill fluid specifications

Temperature limits:	
At or above atm pressure:	–15 to 95 °C (5 to 203 °F)
Viscosity at 25 °C (77 °F):	12.5 cST
Specific gravity at 25 °C (77 °F):	1.13
Coefficient of thermal expansion:	0.000342 cc/cc/°C (0.00019 cc/cc/°F)
Chemical composition:	45 percent glycerin and 55 percent water (by volume)

Description/applications

Glycerin is commonly used in many food, pharmaceutical, and cosmetic products. Glycerin is mixed with water in order to decrease its viscosity. Being a Generally Recognized As Safe (GRAS) substance, it may be used as a fill fluid in food, beverage, dairy, and pharmaceutical applications. Since it has a low coefficient of thermal expansion, it is also a good choice in applications requiring high performance as long as the temperature limits are not exceeded. FDA Code of Federal Regulations reference number: 21CFR 182.1320.

United States Pharmacopeia (USP) grade

These chemicals are manufactured under current Good Manufacturing Practices (GMP). These materials meet the requirements listed in the USP. The USP lists each chemical along with certain specifications the product must meet in order to be considered a USP product.

Food Chemicals Codex (FCC) grade

These products meet the specifications listed in the FCC. This is a book of specifications written by the Food and Nutrition Board, the Institute of Medicine, and the National Academy of Sciences. The chemicals that carry the FCC name are considered “Food Grade”.

Glycerin and water should not be used in vacuum applications below 14.7 psia (1 bara).

1.15 Propylene glycol and water – fill fluid specifications

Temperature limits:

At or above atm pressure:	–15 to 95 °C (5 to 203 °F)
Viscosity at 25 °C (77 °F):	2.85 cST
Specific gravity at 25 °C (77 °F):	1.02
Coefficient of thermal expansion:	0.00034 cc/cc/°C (0.00019 cc/cc/°F)
Chemical composition:	30 percent USP and FCC grade propylene glycol and 70 percent water (by volume)

Description/applications

Propylene glycol is commonly used as a raw material for paints and polyester and alkyd resins, a basic component of brake fluids, an ingredient for deicing / antifreeze fluids, and a heat transfer fluid. The food grade versions are also used as a solvent for flavors, extracts and drugs, as food antioxidants, lubricants and mold inhibitors. Being a Generally Recognized As Safe (GRAS) substance, it may be used as a fill fluid in food, beverage, dairy, and pharmaceutical applications. Since it has a low coefficient of thermal expansion, it is also a good choice in applications requiring high performance as long as the temperature limits are not exceeded. FDA Code of Federal Regulations reference number: 21CFR 184.1666.

USP grade

These chemicals are manufactured under current GMP. These materials meet the requirements listed in the USP. The USP lists each chemical along with certain specifications the product must meet in order to be considered a USP product.

FCC grade

These products meet the specifications listed in the FCC. This is a book of specifications written by the Food and Nutrition Board, the Institute of Medicine, and the National Academy of Sciences. The chemicals that carry the FCC name are considered “Food Grade”.

Propylene glycol and water should not be used in vacuum applications below 14.7 psia (1 bara).

Global Headquarters
Emerson Automation Solutions
6021 Innovation Blvd.
Shakopee, MN 55379, USA
+1 800 999 9307 or +1 952 906 8888
+1 952 949 7001
RFQ.RMD-RCC@Emerson.com

North America Regional Office
Emerson Automation Solutions
8200 Market Blvd.
Chanhassen, MN 55317, USA
+1 800 999 9307 or +1 952 906 8888
+1 952 949 7001
RMT-NA.RCCRFQ@Emerson.com

Latin America Regional Office
Emerson Automation Solutions
1300 Concord Terrace, Suite 400
Sunrise, FL 33323, USA
+1 954 846 5030
+1 954 846 5121
RFQ.RMD-RCC@Emerson.com

Europe Regional Office
Emerson Automation Solutions Europe GmbH
Neuhofstrasse 19a P.O. Box 1046
CH 6340 Baar
Switzerland
+41 (0) 41 768 6111
+41 (0) 41 768 6300
RFQ.RMD-RCC@Emerson.com

Asia Pacific Regional Office
Emerson Automation Solutions Asia Pacific Pte Ltd
1 Pandan Crescent
Singapore 128461
+65 6777 8211
+65 6777 0947
Enquiries@AP.Emerson.com

Middle East and Africa Regional Office
Emerson Automation Solutions
Emerson FZE P.O. Box 17033
Jebel Ali Free Zone - South 2
Dubai, United Arab Emirates
+971 4 8118100
+971 4 8865465
RFQ.RMTMEA@Emerson.com

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