ASHCROFT®

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High Precision Seals Series

—For Pressure Transmitter

Accountable Connected Inventive

Accountable

Connected

Inventive

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Contents

1 General Information About Diaphragm Seals

The ongoing increasing accuracy of today's (differential) pressure transmitters asks for high accurate sensing diaphragm seal systems. The Ashcroft High Precision Series differ from standard executions on the following:

- Finite element method (FEM) engineered diaphragms
- Convolution differences and variations
- Individual configurated diaphragms
- Selected diaphragm material
- Minimalized displacement volumes
- Superior connection systems
- High tech welding
- Superior filling techniques

In order to take full advantage of the Ashcroft diaphragm seal technology and to ensure a perfect application into your processes, the right design configuration has to be chosen. This handbook will inform you on standards, material executions, measuring limits, connections and so much more.

The diaphragm seal is used to isolate the pressure transmitter from the process media for:

- High temperature applications
- Corrosive service
- Safety- double containment
- Suspended solids in process
- Sanitary connections
- Replacement of wet legs
- Ease of cleaning between batches
- Isolation of the instrument with a capillary line to avoid vibration / pulsation

2 Construction

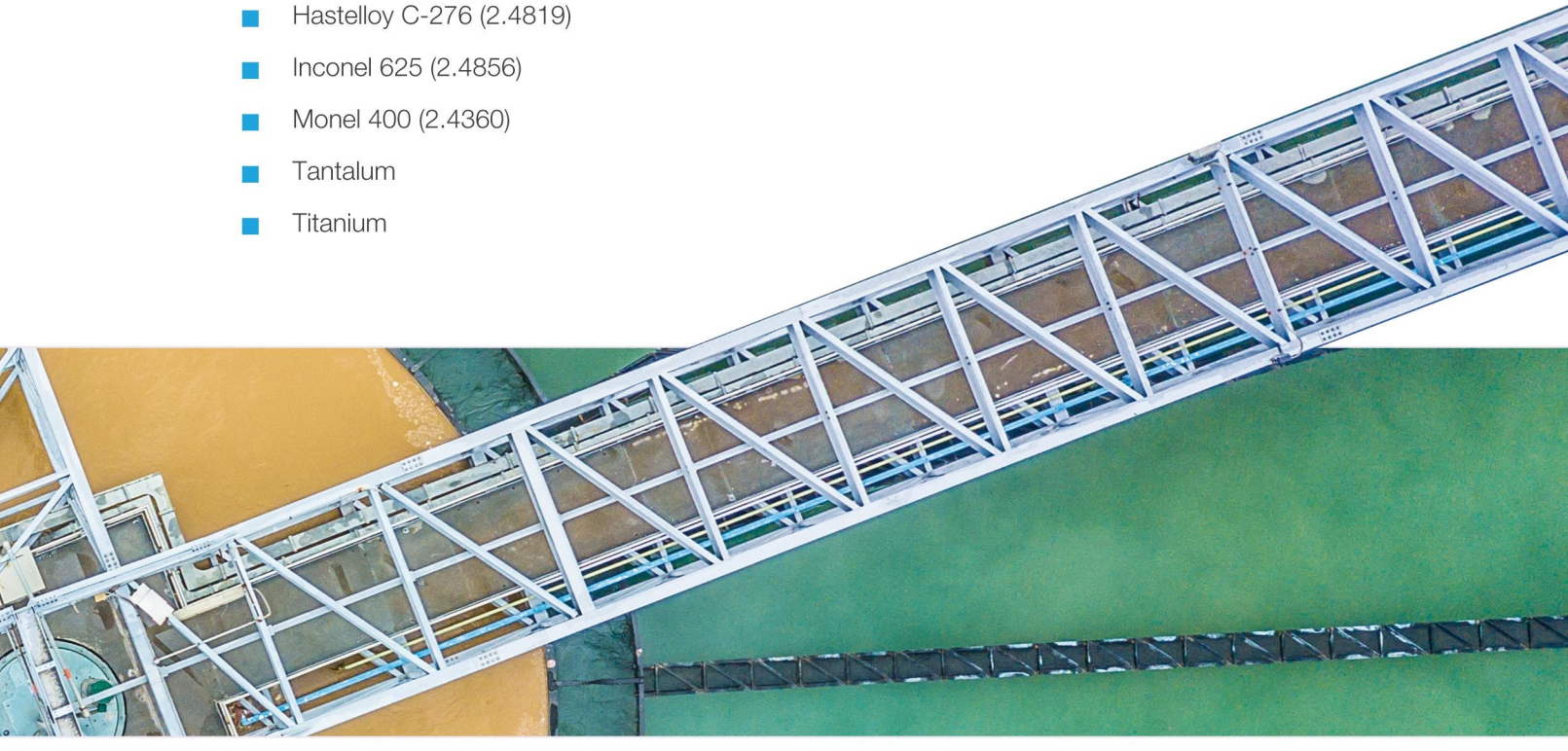
A diaphragm seal is a device mounted on the process side of a pressure measurement instrument and separating the instrument from the process fluid. All wetted parts of the diaphragm seal have to be compatible to the process media. The volume enclosed by the diaphragm, the top section of the diaphragm seal, the (optional) capillary line/cooling element and the measuring component of the measuring device is completely filled with a pressure transmission fluid suitable for the application. A change in pressure at the process connection causes a displacement of the filling fluid due to the deflection of the diaphragm, which transfers the change in pressure to the measuring component of the pressure measurement instrument.

Ashcroft offers different constructions for a perfect solution for your application:

- Flush flanged diaphragm seal type DFC
- Inline seal for flange mounting seal DPC
- Flush flanged extended diaphragm seal type DTC
- Sanitary quick-connect seal 322C
- Removable top and bottom housing flange seal 202C/203C/702E/703E
- Removable top and bottom housing thread seal 200C/201C/740E/741E
- Inline seal for welding seal 205C

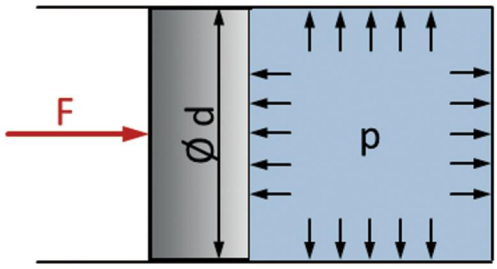
All types are all welded constructions and can be ordered with a large variety of wetted parts materials:

- 316L (1.4404)
- Duplex 2205 (1.4462)
- Super Duplex 2507
- Hastelloy C-276 (2.4819)
- Inconel 625 (2.4856)
- Monel 400 (2.4360)
- Tantalum
- Titanium
- 316L mod (1.4435)
- Gold plated
- PFA coating



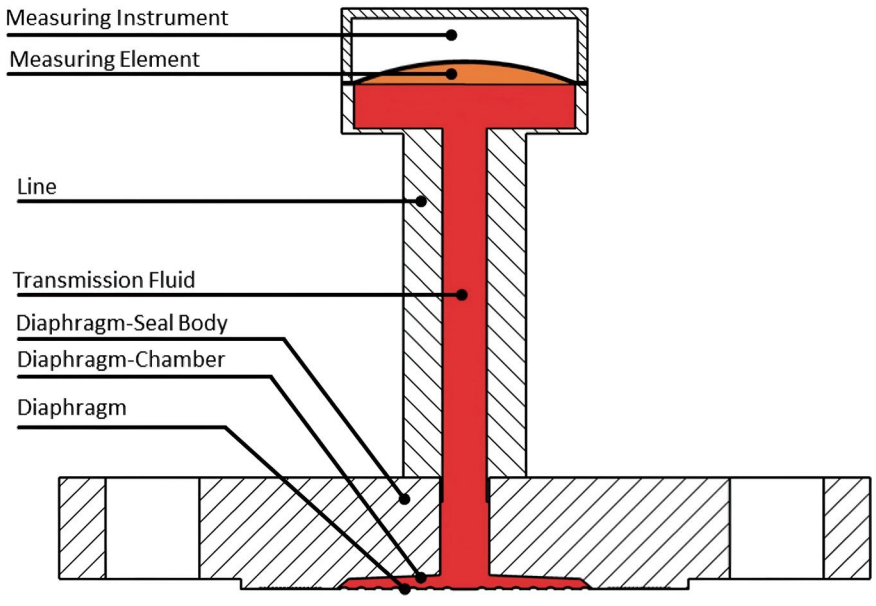
2.1 Principle

Diaphragm seals form together with the measuring instrument one hermetic closed system, close coupled connected to each other or by means of a flexible capillary tube system. This hermetic closed system is vacuum filled with an appropriate non-compressible fluid, called transmission fluid, ensuring the pressure applied by the process medium to the diaphragm of the seal body is proportional transmitted to the pressure sensor element of the transmitter. Newton's law being applied:



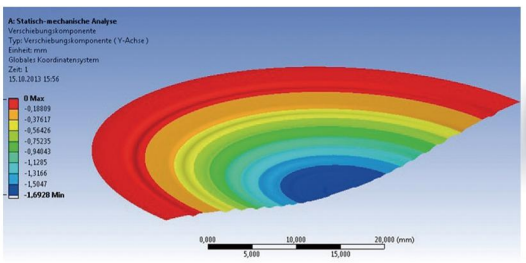
Newton's law being applied: p = F/A

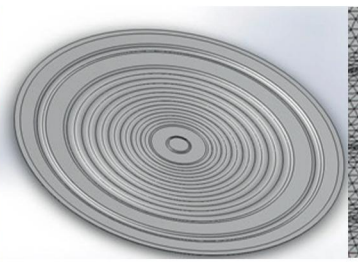
The pressure applied to the diaphragm, which isolates the pressure instrument from the process media, is transmitted by the filling fluid (red) to the pressure measuring element.

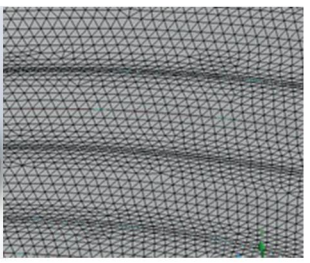


2.2 Diaphragm

All diaphragms are developed in house. They vary in material, diameter, thickness depending on the type of seal and the application. Their typical convolutions guarantee optimal displacement volumes and full deflection through well engineered stiffness and optimal use of the fill fluid volume. The welds are made by laser or are of resistant seam weld type that not distorts the grain structure of the thin material avoiding early corrosion reaction mainly when exotic materials are used.







2.3 Span Performance

With the above, the diaphragm of the seal has to ensure sufficient displacement to secure full reading. A relation between the diaphragm of the seal and the one of the transmitters is to be respected, including the aspects of the overall system construction: diaphragm type and material, capillary length and diameter, transmitter brand and type and seal configuration. Putting too much filling fluid into the system isn´t a good solution either as temperature influences will be more important, the overall accuracy lesser.

Pressure Transmitter Single Seal

Seal Type	Diaphragm Size Mb(mm)	Minimum Recommend Span(kPa)			
		Direct Mount	Capillary Length		
			3m	6m	10m
2” DFC	61	40	50	70	100
3” DFC	88	20	40	40	50
702E/740E	91	20	40	40	50
3” DTC	71	35	45	50	60
4” DTC	91	20	40	40	50

Diff. Transmitter Single Seal

Seal Type	Diaphragm Size Mb(mm)	Minimum Recommend Span(kPa)			
		Direct Mount	Capillary Length		
			3m	6m	10m
2” DFC	61	25	50	75	-
3” DFC	88	15	25	35	50
702E/740E	91	10	20	25	50
3” DTC	71	20	40	50	-
4” DTC	91	10	20	25	50

Diff. Transmitter Double Seal

Seal Type	Diaphragm Size Mb(mm)	Minimum Recommend Span(kPa)		
		Capillary Length		
		3m	6m	10m
2” DFC	61	20	50	-
3” DFC	88	5	10	15
702E/740E	91	5	10	15
3” DTC	71	30	40	-
4” DTC	91	5	10	15

Remark: Diaphragm material is 316L; Filled fluid is Silicone 50 cSt.

Parameters that influence the span (temperature influence, response time):

- Length & inside diameter of capillary
- Diaphragm material
- Diaphragm characteristics: convolutions, stiffness/spring rate, thickness
- Diaphragm size

Ambient temperature variation range (-20/60℃)

Transmitter Seal Type		Max. Temperature Effect	
		Diaphragm Size(61/71mm)	Diaphragm Size (88/91mm)
Pressure Transmitter	Direct Mount	1.0kPa	0.8kPa
Pressure Transmitter	Capillary Length 3m	1.2kPa	1.0kPa
Diff. Transmitter	Capillary Length 3m	0.4kPa	0.15kPa

2.4 Transmission Fluids

As explained, in the operating principle, the measuring system is filled with a fluid that guarantees accurate transmission of the pressure. Ashcroft transmission fluids were selected upon various criteria in order to meet the requirements towards safety, accuracy and reading performance. So, compatibility is the essence and the main reason of the existence of a large choice of filling fluids.

- Compatibility towards safety:

  In the event of a mechanical rupture of the diaphragm, the process can be contaminated by the fluid. Process media containing etc. particles of oxygen, or chlorines in dry, moist, vapor, dioxide or trifluoride conditions, fluorine, hydrogen impose the use of a non-flammable inert fluid. In case of food processing, non-toxic transmission fluids are required like Neobee-M20 or ERVOL® WM to avoid contamination. Paint industries dislike silicone oil based fluids.

- Compatibility towards temperature influence:

  Process and ambient temperature have their influence on the fluid and are responsible for a change in volume in the hermetic closed system, creating an error in the instrument reading. Within our range of technical fluids, we have a variety of synthetic oils covering ranges from -71°C up to 400°C. However, attention is to be taken to the pressure-temperature relation of the medium as the transmission fluid needs to remain at all times in a liquid state. Vacuum process conditions will bring the temperature down in which fluid remains liquid. Consult ourvapor-pressure curves when selecting the fluid.

- Compatibility towards response time:

  The viscosity of the system fluid is of great importance towards applications using long capillaries, as the response time increases with the length of the capillary used. Using capillary with a larger inside diameter can offer significant savings although this might increase the temperature influence on the measurement. Selection of a low viscous filling fluid is than to be considered.

- Compatibility towards pressure/vacuum:

  Vacuum applications have their effect on the thermal resistance of the fluids and reduce their temperature application limits significantly.

  Although already during manufacturing and filling precautions are taken to prevent influence on the measurement system, special care in the selection of a compatible system fluid is also here of great importance. The transmission fluid must withstand the highest temperature applications against the lowest pressure conditions. Vacuum process conditions will bring the temperature limit down in which a fill fluid remains liquid. Consult our vapor-pressure curves when selecting the fluid.

In practice:

- Most common used in general industry are the standard silicone oils Silicone 50 cSt
- Most common used in food & pharma: ERVOL® White Mineral Oil
- Imperative use on oxygen and chlorine media: Halocarbon (also for paint industry and other silicone free environments)
- High process temperatures: Stabilized Heat Transfer Silicone
- Low process temperatures: Syltherm XLT Silicone
- High temperature and high vacuum:704 Silicone
- Higher temperature and high vacuum:705 Silicone

Overview and technical data of common filling fluids:

Code	System filling fluid	Use	Temperature resistance pabs > 1 bar	Density g/cm³	Viscosity cSt	Thermal expansion coefficient cc/cc/℃
CK	Silicone 50	Standard	-40…+205℃	0.95@25℃	50@25℃	0.00108
EJ	Silicone 10	Fast response time	-40…+205℃	0.95@25℃	10@25℃	0.00108
KG	Silicone 704	High temp and high vacuum	0…+315℃	1.07@25℃	39@25℃	0.00095
KJ	Silicone 705	High temp and high vacuum	+20…+370℃	1.09@25℃	175@25℃	0.00077
CF	Halocarbon 4.2	Inert	-56…+160℃	1.85@25℃	5.5@25℃	0.00086
MY	ERVOL® WM Oil	Food	-10…+205℃	0.85@15℃	30@25℃	0.00080
LT	Syltherm XLT	Low temperature	-71…+149℃	0.85@25℃	1.6@25℃	0.00119
ST	Stabilized Heat Transfer Silicone	Super high temperature	-20…+400℃	1.08@25℃	57@25℃	0.00098
CP	Neobee M-20	Food & Pharma	-15…+225℃	0.94@25℃	9.8@25℃	0.00101

Transmission fluid preparation

Before the transmission fluid is put into the diaphragm seal system, it has received a degassing treatment in order to bring the fluid in a non-compressible status. It is one of the reasons why diaphragm seals are never “refilled”, that additionally ruin the expensive filters of the vacuum pumps. It explains also why a filled diaphragm seal may never be disconnected from its measuring instrument.

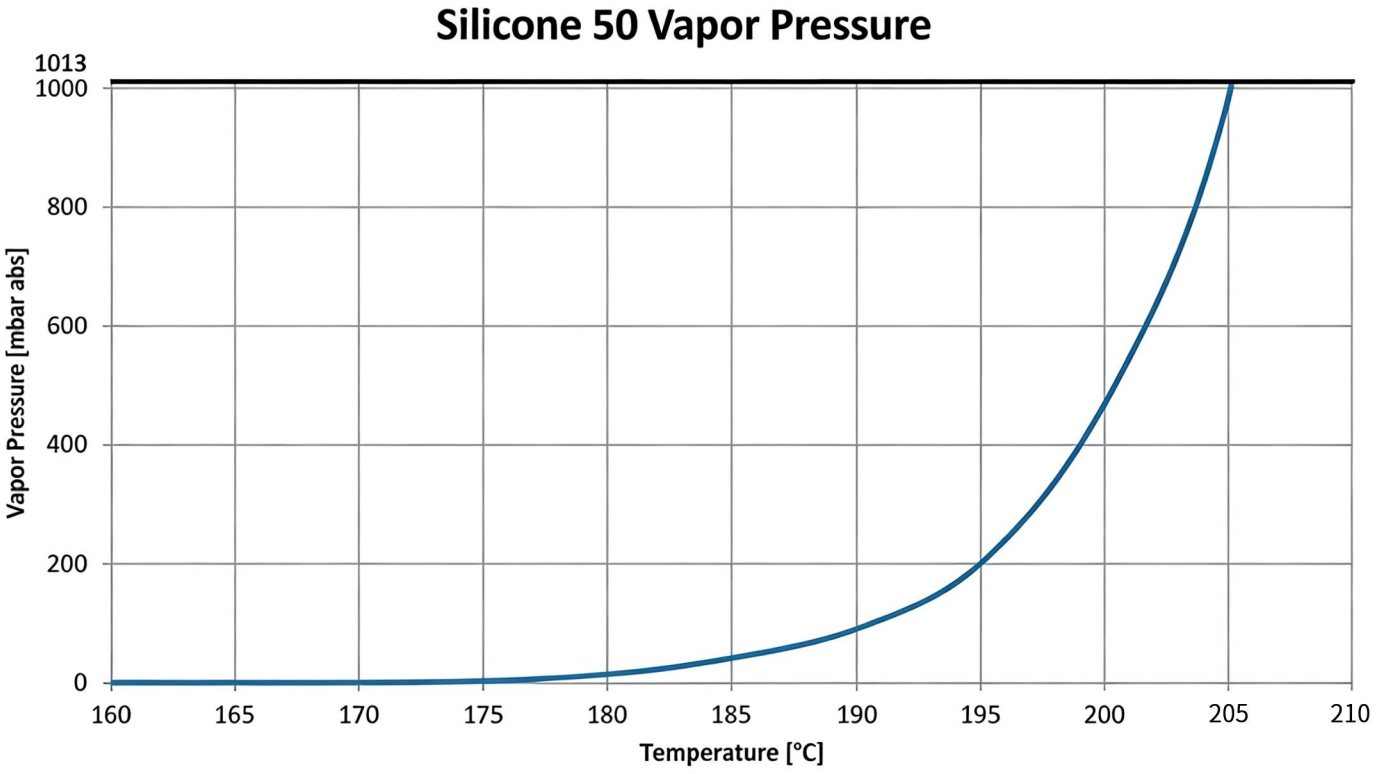
Coefficient of Thermal Expansion

The coefficient of thermal expansion expressed in cc/cc/°C units is equal to the temperature coefficient of density g/cc/°C when density equals 1 g/cc. The coefficient of thermal expansion for liquids is usually much larger than for solids. Expansion must be considered if the liquid will be in a sealed portion of the system. An expansion cavity might be considered. At all times, the filling fluid has to remain in liquid form for accurate pressure measurement.

2.4.1 Silicone 50 (CK)

Silicone fill fluid for general purposes with a viscosity of 50 cs offering good response time.

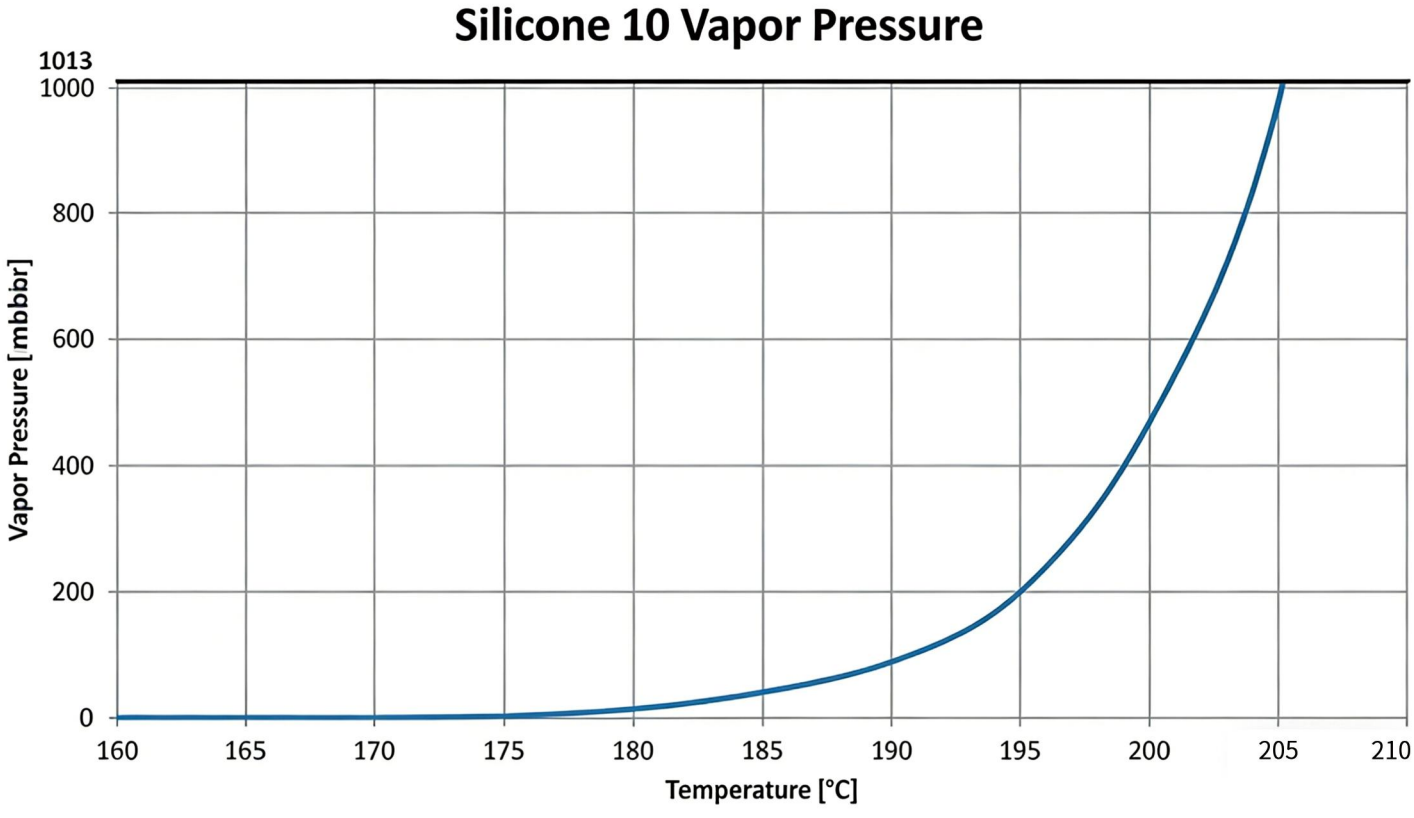
Temperature range at atmospheric pressure :	-40...+205 °C
Viscosity at 25 °C :	50 cSt
Specific gravity at 25 °C :	0.93-0.98 g/cm^3
Coefficient of thermal expansion :	0.00108 cc/cc/°C
CAS Number :	63148-62-9



2.4.2 Silicone 10 (EJ)

This low viscosity silicone oil is used for long capillary lengths to keep the response time down.

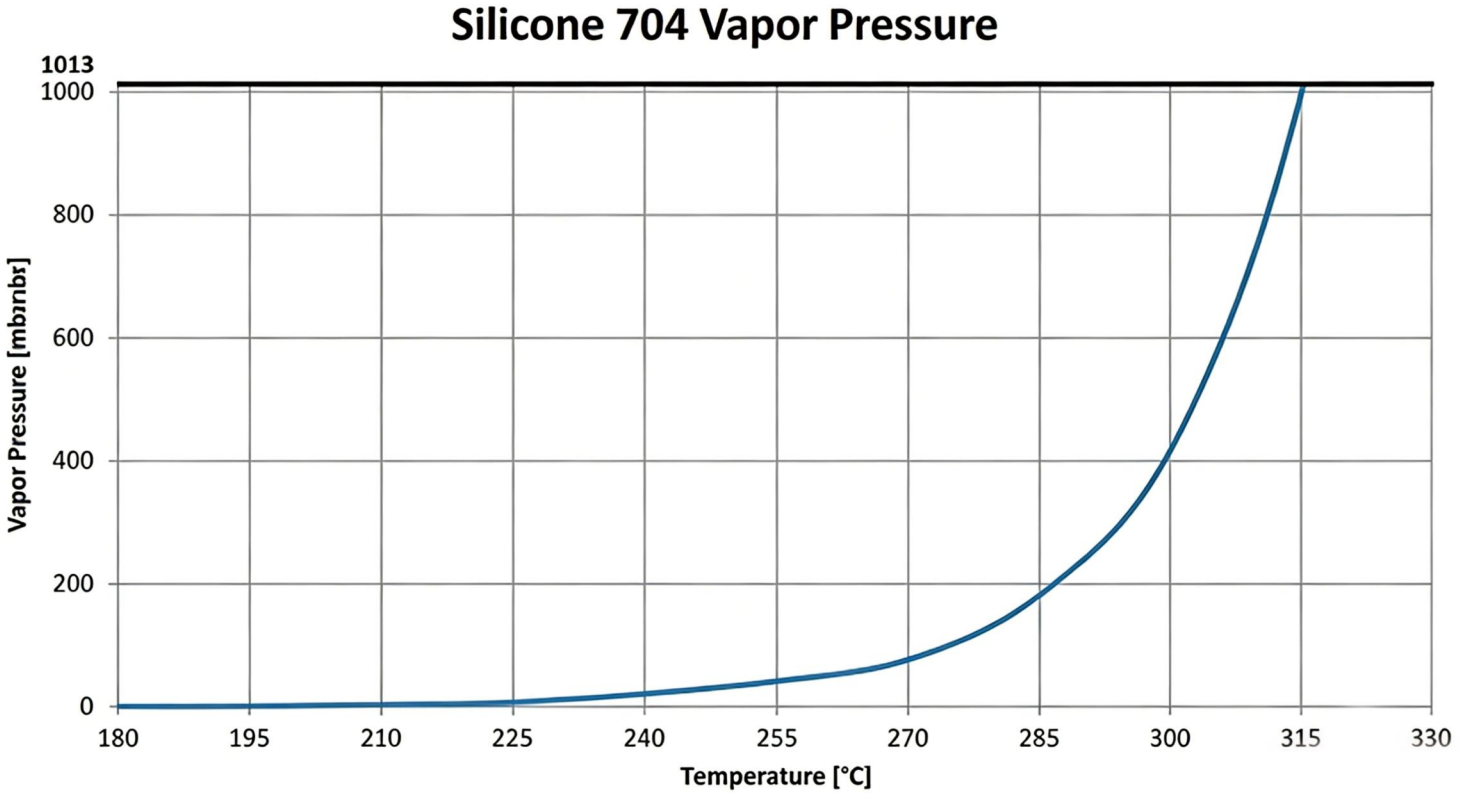
Temperature range at atmospheric pressure :	-40...+205°C
Viscosity at 25 °C :	10 cSt
Specific gravity at 25 °C :	0.93-0.98 g/cm^3
Coefficient of thermal expansion :	0.00108 cc/cc/°C
CAS Number :	63148-62-9



2.4.3 Silicone 704 (KG)

Silicone704 is a silicone diffusion pump fluid for vacuum and high temperature industrial applications. This specialty silicone fluid has a much higher molecular weight than Silicone50, which increases its operating temperature and lowers its vapor pressure. Its main limitation is its higher viscosity, and so heat tracing of capillaries is suggested for many outdoor applications.

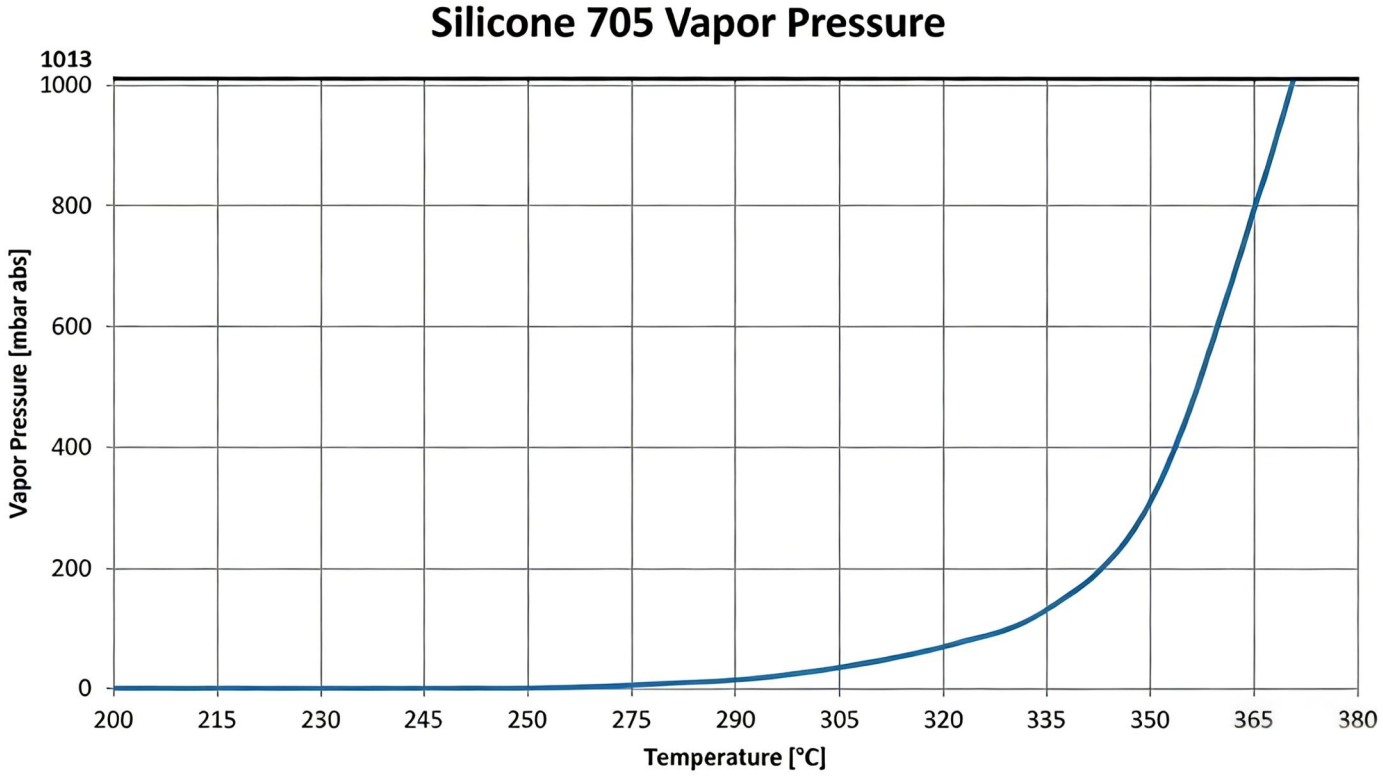
Temperature range at atmospheric pressure :	0...+315°C
Viscosity at 25°C :	39cSt
Specific gravity at 25°C :	1.07g/cm^3
Coefficient of thermal expansion :	0.00095cc/cc/°C
CAS Number :	3982-82-9



2.4.4 Silicone 705 (KJ)

Silicone705 is a silicone diffusion pump fluid for vacuum and high temperature industrial applications. This specialty silicone fluid has a much higher molecular weight than Silicone 50, which increases its operating temperature and lowers its vapor pressure. Its main limitation is its higher viscosity, and so heat tracing of capillaries is suggested for many outdoor applications. Small ID capillary is not allowed for Silicone 705 because of its higher viscosity.

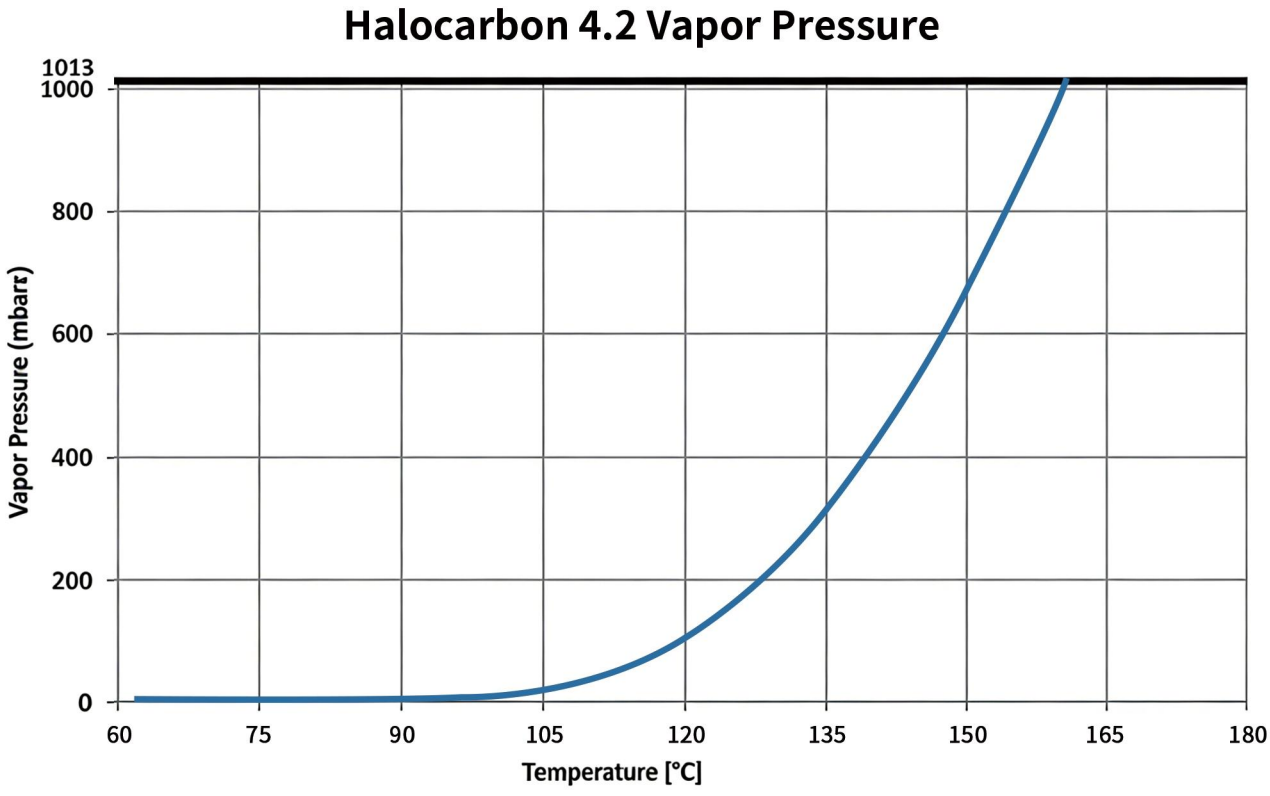
Temperature range at atmospheric pressure :	20...+370°C
Viscosity at 25 °C :	175 cSt
Specific gravity at 25 °C :	1.09g/cm^3
Coefficient of thermal expansion :	0.00077cc/cc/°C
CAS Number :	3390-61-2



2.4.5 Halocarbon 4.2 (CF)

Halocarbon 4.2 oil is a low molecular weight polymer of Chlorotrifluoroethylene (PCTFE). This inert oil is manufactured by a controlled polymerization process and then is stabilized to give it some very unique properties. The oil is safe, chemically inert and non-flammable and is oxygen and chlorine compatible and is an excellent alternative for silicone oils for painting industry applications. It has high thermal stability and low compressibility.

Temperature range at atmospheric pressure :	-56...+160°C
Viscosity at 25 °C :	5.5 cSt
Specific gravity at 25 °C :	1.85g/cm^3
Coefficient of thermal expansion :	0.00086 cc/cc/°C
CAS Number :	9002-83-9



2.4.6 ERVOL® WM Oil (MY)

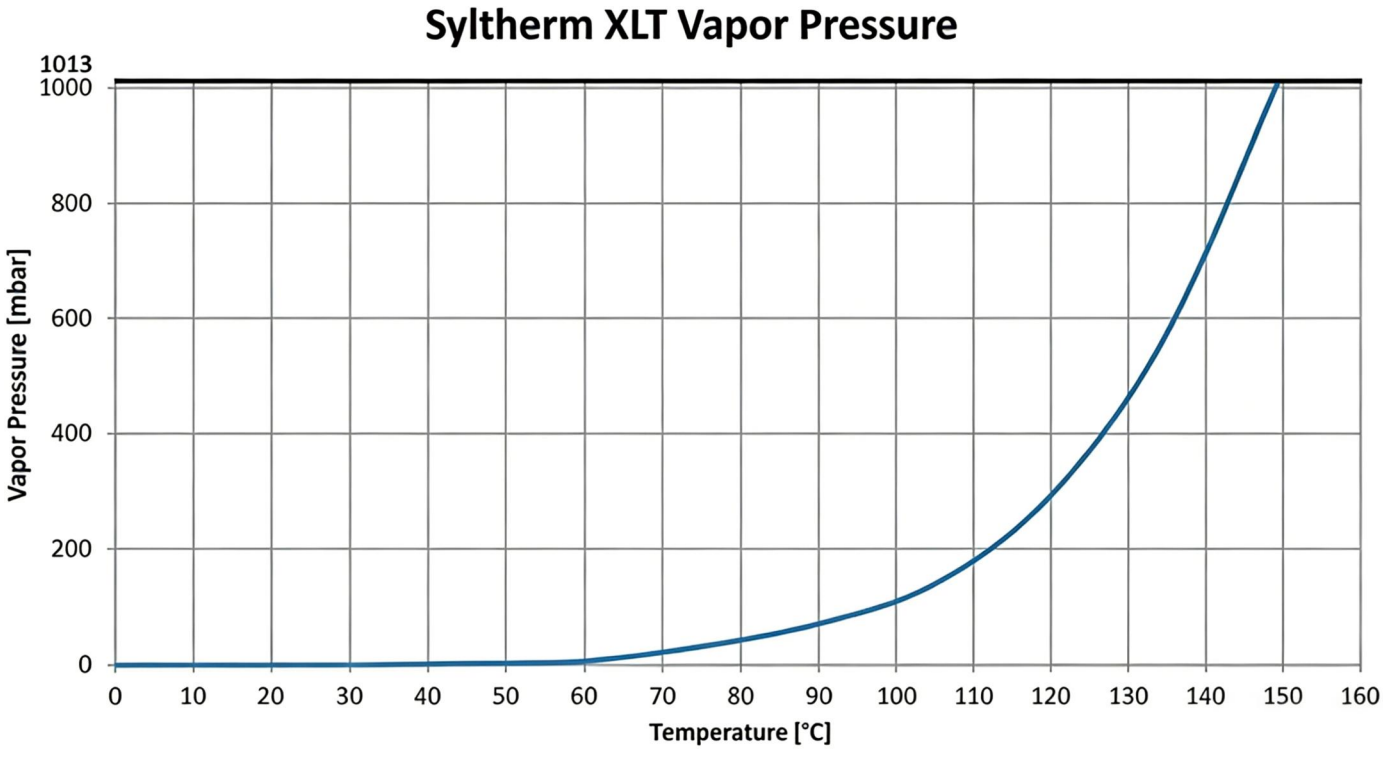
ERVOL® WM oil meets the purity requirements of British Pharmacopeia and conform to the purity specifications given in the Minerals Hydrocarbons in Food regulations 1966.

Temperature range at atmospheric pressure:	-10...+205°C
Viscosity at 25 °C:	30 cSt
Specific gravity at 25 °C:	0.85g/cm^3
CAS Number:	8042-47-5
FDA Regulation No:	21 CFR 172.878/178.3620(A)
Vapor Pressure:	<0.1kPa@20°C
Coefficient of thermal expansion:	0.00080 cc/cc/°C

2.4.7 Silicone Syltherm XLT (LT)

Silicone Syltherm fill fluid for low temperature application.

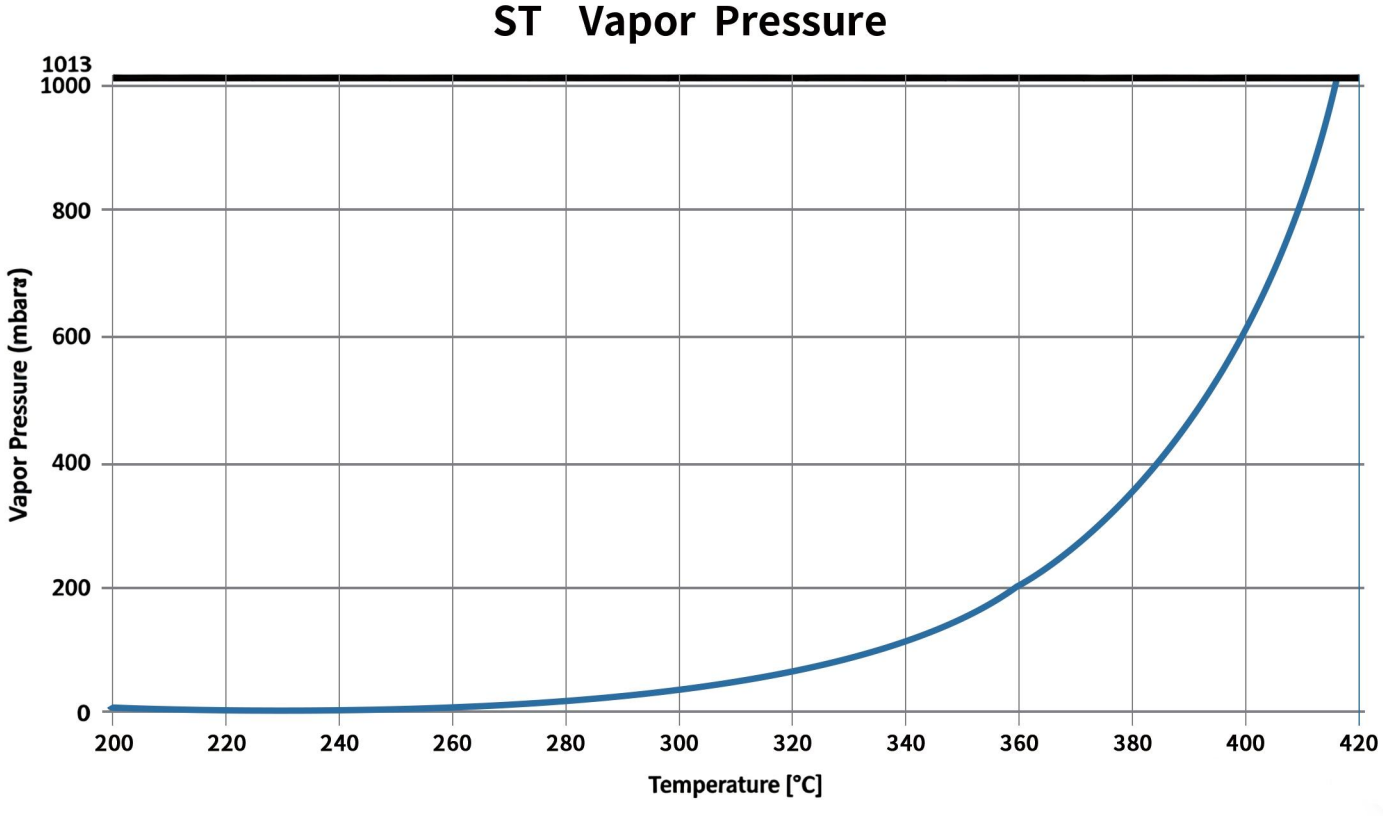
Temperature range at atmospheric pressure:	-71...+149°C
Viscosity at 25°C:	1.6cSt
Specific gravity at 25°C:	0.85g/cm^3
Coefficient of thermal expansion:	0.00119cc/cc/°C
CAS Number:	063148-62-9



2.4.8 Stabilized Heat Transfer Silicone (ST)

Stabilized Heat Transfer Silicone fill fluid for super high temperature application.

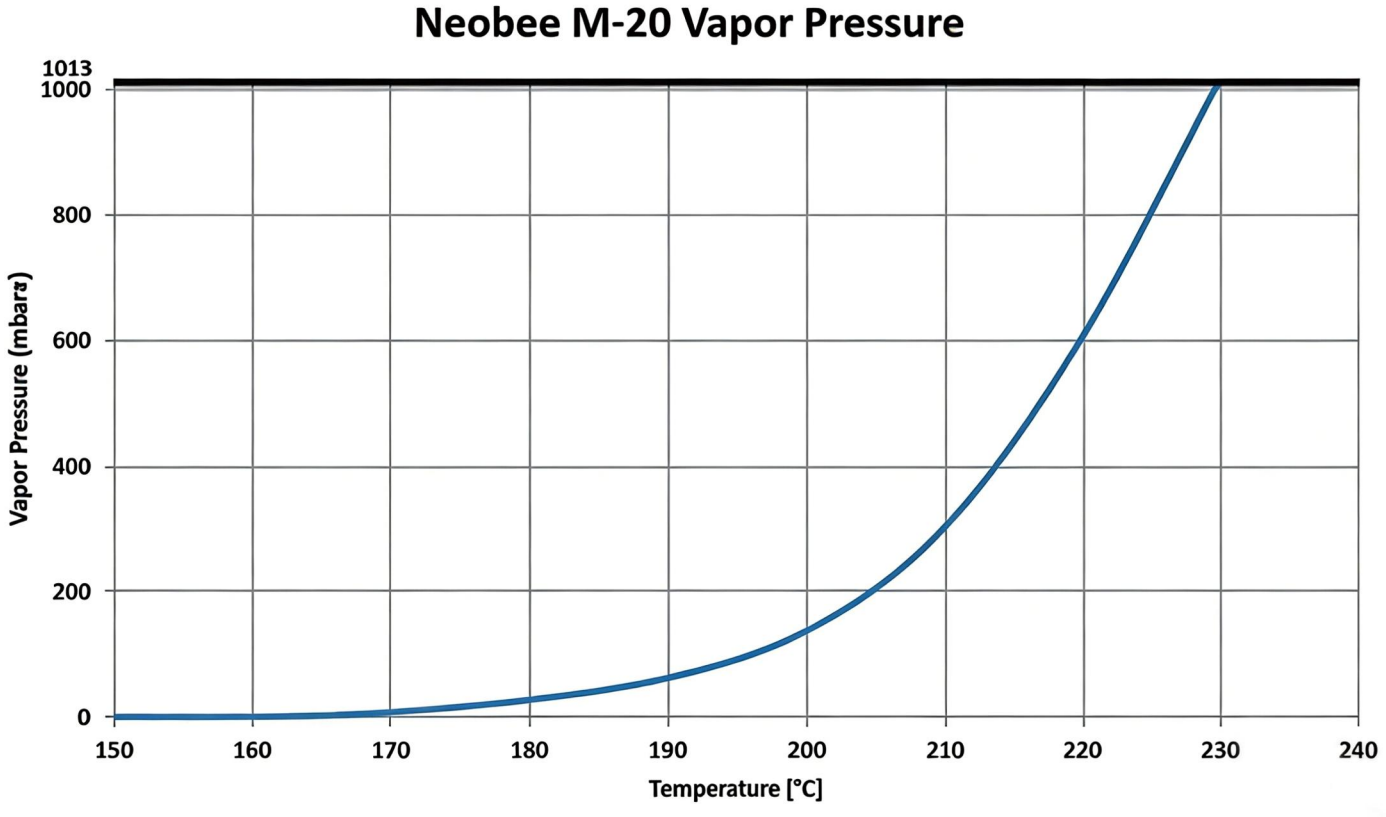
Temperature range at atmospheric pressure:	-20...+400°C
Viscosity at 25 °C:	57.0 cSt
Specific gravity at 25 °C:	1.08g/cm^3
Coefficient of thermal expansion:	0.00098 cc/cc°C



2.4.9 Neobee M-20 (CP)

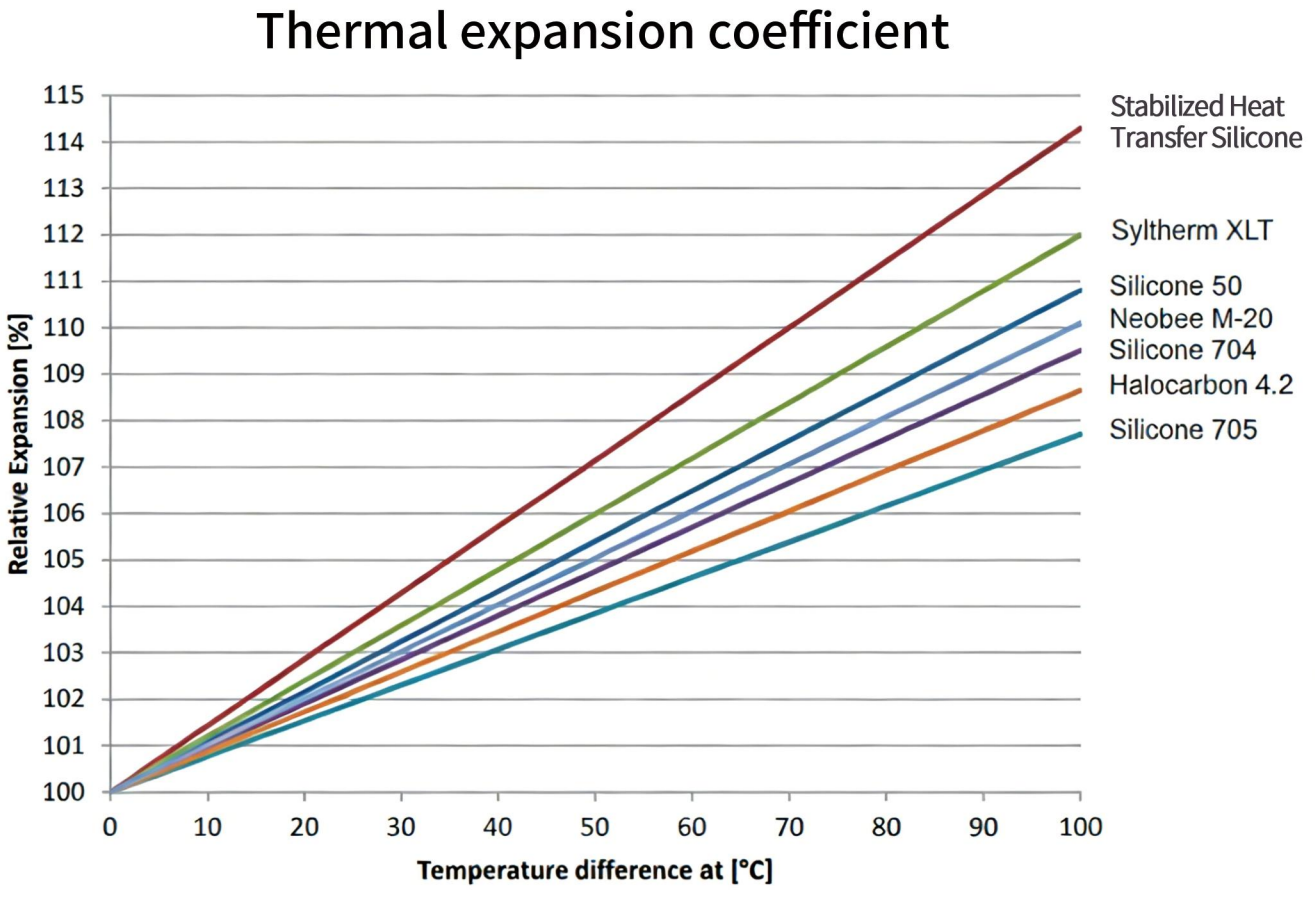
Used as filling fluid for instruments used for food-, beverage- and pharmaceutical applications. Excellent thermal stability and low viscosity. A coconut extract.

Temperature range at atmospheric pressure:	-15...+225°C
Viscosity at 25°C:	9.8cSt
Specific gravity at 25°C:	0.94g/cm^3
CAS Number:	68583-51-7
FDA Regulation No.:	21CFR172.856 (direct food additive) 21CFR174 (indirect food additive)
Coefficient of thermal expansion:	0.00101cc/cc°C



2.5 Temperature Influence

The process and ambient temperatures can play a significant role in the accuracy of the measurement as the transmission fluids have a thermal expansion coefficient creating volume variation as the resulting in pressure change into the system and a shift of the reading.
Keeping the filling fluid volume minimalized together with the selection of the most appropriate type of filling fluid will keep the temperature influence to a minimum



2.6 Materials

All types are all welded constructions and can be ordered with a large variety of wetted parts materials.

2.6.1 Stainless Steel 316L (1.4404)

Stainless steel 316L is the standard flange and diaphragm material for Ashcroft diaphragm seals and belongs to the 300 Series defined by the SAE which encompasses a range of austenitic chrome-nickel alloys. Stainless steel 316L features a general corrosion resistance, good cryogenic toughness and excellent formability and weldability.

Material Numbers and Names	
Material Number (EN)	1.4404
Material Name (EN)	X2CrNiMo17-12-2 X2CrNiMo17-13-2
AISI	316L
UNS	S31603

Physical Specifications	
Density	8.0 kg/dm³
Thermal conductivity	15 W/mK (at 20°C)
Thermal expansion	16.0×10^{-6} / k
Coefficient	200 GPa (at 20°C)
Modulus Elasticity Material group	Astenitic

Chemical Specifications		
Carbon	C	≤ 0.08 %
Silicium	Si	≤ 1.0 %
Manganese	Mn	≤ 2.0 %
Phosphorus	P	≤ 0.045 %
Sulfur	S	≤ 0.015 %
Chrome	Cr	17.0 - 19.0 %
Molybdenum	Mo	2.0 - 2.5 %
Nickel	Ni	10.0 - 13.0 %
Nitrogen	N	≤ 0.11 %

2.6.2 Duplex 2205 (1.4462)

Duplex 2205 belong to the group of Duplex steels and can be compared with stainless steel 316L. It has the same corrosion resistance, but a 150% higher strength. Because of this high strength Duplex becomes more important for the constructional industry. Duplex have a mixed microstructure of austenite and ferrite.

Material Numbers and Names	
Material Number (EN)	1.4462
Material Number (EN)	X2CrNiMoN22-5-3
AISI	318L
UNS	S31803

Physical Specifications	
Density	7.8 kg/dm³
Thermal conductivity	14 W/mK (at 20°C)
Thermal expansion	12.8×10^{-6} / k
Coefficient	190 GPa (at 20°C)
Modulus Elasticity Material group	Austenite / Ferrite

Chemical Specifications		
Carbon	C	≤ 0.03 %
Silicium	Si	≤ 1.0 %
Manganese	Mn	≤ 2.0 %
Phosphorus	P	≤ 0.035 %
Sulfur	S	≤ 0.015 %
Chrome	Cr	21.0 - 23.0 %
Molybdenum	Mo	2.5 - 3.5 %
Nickel	Ni	4.5 - 6.5 %
Nitrogen	N	0.1 - 0.22 %

2.6.3 Hastelloy C-276 (2.4819)

Hastelloy C-276 is a nickel-molybdenum-chromium alloy which has a perfect resistance to many media in chemical processes, including acids, wet chlorine gas and chlorine solutions. 2.4819 features good resistance against sulfide stress cracking, stress corrosion and pitting.

Material Numbers and Names	
Material Number (EN)	2.4819
Material Name (EN)	NiMo16Cr15W
AISI	Alloy 276
UNS	N10276

Physical Specifications	
Density	8.9 kg/dm³
Thermal conductivity	9.2 W/mK(at 20°C)
Thermal expansion coefficient	11.2×10^{-6}/ k
Modulus Elasticity	205 GPa(at 20°C)

Chemical Specifications		
Carbon	C	≤ 0.01 %
Silicium	Si	≤ 0.08 %
Manganese	Mn	≤ 1.0 %
Phosphorus	P	≤ 0.015 %
Sulfur	S	≤ 0.01 %
Chrome	Cr	≤ 15.0 %
Molybdenum	Mo	≤ 15.0 %
Nickel	Ni	≥ 62.08 %
Wolfram	W	3.0 - 4.0 %
Cobalt	Co	≤ 2.5 %
Vanadium	V	0.1 - 0.3 %

2.6.4 Inconel 625 (2.4856)

Inconel is a nickel-chromium alloy and is used for high strength and outstanding corrosion resistance. The outstanding and versatile corrosion resistance of Inconel 625 under a wide range of temperatures is a reason for chemical process applications.

Material Numbers and Names	
Material Number (EN)	2.4856
Material Name (EN)	NiCr22Mo9Nb
AISI	-
UNS	N06625

Physical Specifications	
Density	8.4 kg/dm³
Thermal conductivity	9.4 W/mK(at 20°C)
Thermal expansion coefficient	12.3×10^{-6}/ k
Modulus Elasticity	209 GPa(at 20°C)

Chemical Specifications		
Carbon	C	0.03 - 0.1 %
Silicium	Si	≤ 0.5 %
Manganese	Mn	≤ 0.5 %
Phosphorus	P	≤ 0.02 %
Sulfur	S	≤ 0.015 %
Chromium	Cr	20.0 - 23.0 %
Molybdenum	Mo	8.0 - 10.0 %
Nickel	Ni	≥ 58.0 %
Cobalt	Co	≤ 1.0 %
Iron	Fe	≤ 5.0 %
Aluminum	Al	≤ 0.4 %
Titanium	Ti	≤ 0.4 %
Copper	Cu	≤ 0.5 %
Niobium (plus Tantalum)	Nb	3.15 - 4.15 %
Nitrogen	N	0.1 - 0.22 %

2.6.5 Monel 400 (2.4360)

Monel 400, known as Alloy 400, is a solution for many corrosive environments over a large temperature range. Also, it can be used in contact with fluorine, hydraulic acids, hydrogen fluoride, sulfuric and hydrochloric acid. Monel 400 will be used in sea-water applications and chemical processing.

Material Numbers and Names	
Material Number (EN)	2.436
Material Name (EN)	NiCu30Fe
AISI	-
UNS	N04400

Physical Specifications	
Density	8.8 kg/dm³
Thermal conductivity	23 W/mK(at 20°C)
Thermal expansion coefficient	13.0×10^{-6} / k
Modulus Elasticity	180 GPa(at 20°C)

Chemical Specifications		
Carbon	C	≤ 0.3 %
Silicium	Si	≤ 0.5 %
Manganese	Mn	≤ 2.0 %
Sulfur	S	≤ 0.024 %
Nickel	Ni	≥ 63.0 %
Iron	Fe	≤ 2.5 %
Copper	Cu	28.0 - 34.0 %
Aluminum	Al	≤ 0.02 %
Phosphorus	P	≤ 0.005 %

2.6.6 Tantalum

Tantalum is a transition metal and belongs to the group of vanadium alloys. The surface of Tantalum creates in contact with air a thin oxide layer which features a good chemical resistance for many acids. The maximum process temperature is limited to 300°C.

Physical Specifications	
Density	16.65 kg/dm³
Thermal conductivity	57.7 W/mK(at 20°C)
Thermal expansion coefficient	6.5×10^{-6} / k
Modulus Elasticity	185.7 GPa(at 20°C)

2.6.7 Titanium

Excellent heat resistance (melting point: 1668°C max), resistant to most strong acids. The maximum process temperature is limited to 300°C.

Physical Specifications	
Density	4.51 g/cm³ (ASTM B348)
Thermal conductivity	16.4 W/(m·K)(at 20°C)
Thermal expansion coefficient	8.6×10^{-6}/ k
Modulus Elasticity	106 GPa(at 20°C)

2.6.8 316L mod (1.4435)

Excellent welding hot cracking and intergranular corrosion resistance; suitable for all media of urea, ammonium carbamate and 316L (superior to 316L in performance).

Material Numbers and Names	
Material Number (EN)	1.4435/1.4432
Material Name (EN)	X2CrNiMo18-14-3Mod
AISI	316L Mod
UNS	S31603
Common Names	724L、Urea steel

Physical Specifications	
Density	7.93 kg/dm³
Thermal conductivity	16.3 W/(m·K)(at 20°C)
Thermal expansion coefficient	16.0 × 10^{-6}/ K
Modulus Elasticity	193 GPa (at 20°C)

Chemical Specifications		
Carbon	C	≤ 0.03
Silicium	Si	≤ 1.0 (≤0.5 Better)
Manganese	Mn	≤ 2.0
Phosphorus	P	≤ 0.045
Sulfur	S	≤ 0.03
Chromium	Cr	17.0 - 18.5
Nickel	Ni	13.0 - 15.0
Molybdenum	Mo	2.0 - 3.0 (2.2-3.0 Better)
Nitrogen	N	0.10 - 0.22
Iron	Fe	Rest

2.6.9 Stainless Steel Gold plated

Ashcroft supplies 20~25μm thick gold plated wetted parts that prevent hydrogen H+-ion diffusion. Also, gold belongs to the group of noble metals and features a minor response addiction. The maximum process temperature is limited to 300°C.

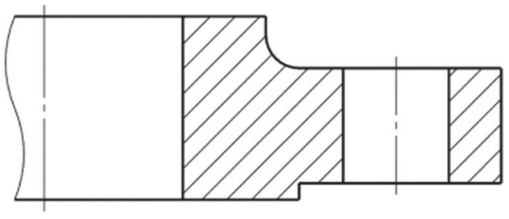
2.6.10 PFA coating

PFA is chemically inert and solvent resistant to virtually all chemicals, except molten alkali metals, gaseous fluorine, and certain complex halogenated compounds at elevated temperatures and pressures. The maximum temperature is 260°C.

2.7 Flange facing

2.7.1 Form B (EN 1092-1)

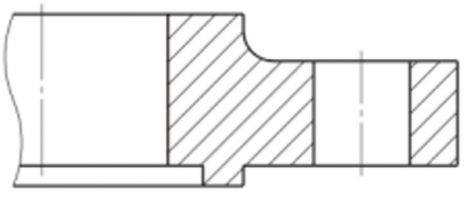
Flange facing types B1 and B2 are raised face (type B) flanges with different specified surface roughness values. The diameters of the flange facings are mentioned in the standard EN 1092-1, table 8.
B1: Standard flange facing for all PN numbers. Ra [µm]:3.2-12.5; Rz [µm]:12.5-50.0
B2: Only if agreed between the purchaser and the flange manufacturer Ra [µm]:0.8-3.2; Rz [µm]:3.2-12.5
Notice: Ra and Rz are defined in EN ISO 4287



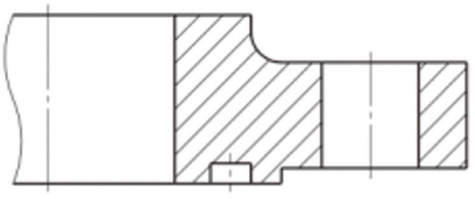
2.7.2 Raised face form C and D (EN 1092-1)

Form C and D faces of these flanges must be matched. Form C has a raised ring (Tongue) machined onto the flange face while the mating flange form D has a matching depression (Groove) machined into it´s face. Form C & D joints also have an advantage in that they are self-aligning and act as a reservoir for the adhesive. The scarf joint keeps the axis of loading in line with the joint and does not require a major machining operation.

Form C (Tongue)

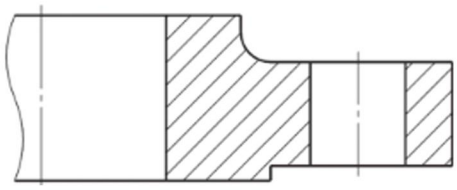


Form D (Groove)



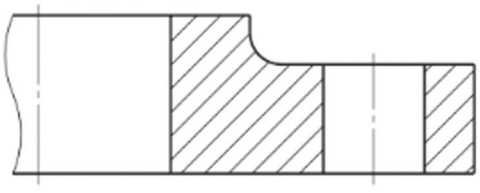
2.7.3 Raised face RF (ASME B16.5)

The Raised Face flange is the most common type used in process plant applications, and easy to identify. It is referred to as a raised face because the gasket surface is raised above the bolting circle face. This face type allows the use of a wide combination of gasket designs.



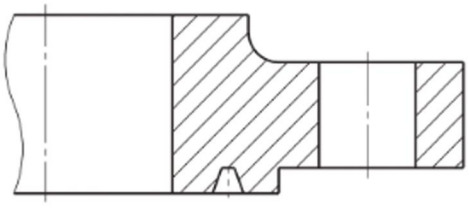
2.7.4 Flat face FF (ASME B16.5)

The Flat Face flange has a gasket surface in the same plane as the bolting circle face. Applications using flat face flanges are frequently those in which the mating flange or flanged fitting is made from a casting.



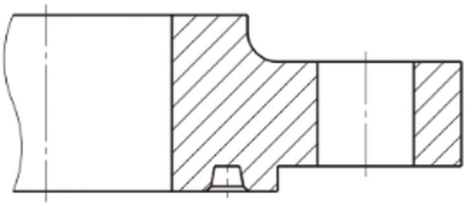
2.7.5 Ring (type) joint RTJ (ASME B16.5)

The Ring Type Joint flanges are typically used in high pressure (Class 600 and higher) and/or high temperature services above 400°C. They have a groove cut into their faces for a metal ring gasket. The flange seals when tightened bolts compress the gasket between the flanges into the grooves, deforming the gasket to make intimate contact inside the grooves, creating a metal to metal seal.



2.7.6 API Type 6B / 6BX (API 6A)

6B flanges are designed as the ring joint type, optionally with a raised face. They have a groove cut into their faces for steel ring gaskets. The flanges seal when tightened bolts compress the gasket between the flanges into the grooves, deforming the gasket to make intimate contact inside the grooves, creating a metal to metal seal.



3 Ashcroft Diaphragm Seal

Ashcroft diaphragm seals are designed according to ASME B40.100 Section 3 Diaphragm Seals.

Flush flanged diaphragm seal DFC series

Wetted Material	
Diaphragm	Flange Seal Face
316L SS	316L SS
Hastelloy® C-276	316L SS
Hastelloy® C-276	Hastelloy® C-276
Monel® 400	Monel® 400
Tantalum	316L SS

Diaphragm Size	Flange Size	Flange Pressure Rate
61mm	2”	ANSI Class 150,300,600,900,1500
88mm	3"	
61mm	DN50	DIN-PN40/63/100
88mm	DN80	

Bland flanged diaphragm seal DPC series

Wetted Material	
Diaphragm	Cell
316L SS	316L SS
Hastelloy® C-276	316L SS
Hastelloy® C-276	Hastelloy® C-276
Tantalum	Tantalum
Tantalum	316L SS

Diaphragm Size	Flange Size	Cell Diameter	Flange Pressure Rate
71mm	3”	76mm	ANSI Class 150,300,600,900,1500
88mm	4"	94mm	
61mm	DN50	76mm	DIN-PN40/63/100
88mm	DN80	94mm	

Truncated type flanged diaphragm seal DTC series

Wetted Material	
Diaphragm	Extension Tube and Flange Seal Face
316L SS	316L SS
Hastelloy® C-276	316L SS
Hastelloy® C-276	Hastelloy® C-276
Monel® 400	Monel® 400
Tantalum	316L SS

Diaphragm Size	Flange Size	Extension Tube Diameter	Flange Pressure Rate
44mm	2" DN50	48.3mm	ANSI Class 150,300,600,900,1500 DIN-PN40/63/100
71mm	3" DN80	76mm	
88mm	4" DN100	94mm	

Sanitary quick connect diaphragm seal 322C series

Wetted Material	
Diaphragm	Top Housing
316L SS	316L SS
Hastelloy® C-276	Hastelloy® C-276

Diaphragm Size	Process Connection Size	Pressure Rate
46mm	2”	Mar. 4.2MPa
61mm	2½"	
70mm	3"	
88mm	4"	

Product Application Guide

Removable top and bottom housing flange seal

202C/203C Series
Diaphragm Size 58mm

702E/703E Series
Diaphragm Size 91mm

Wetted Material	
Diaphragm	Lower Housing
316L SS	316L SS
Hastelloy® C-276	316L SS
Hastelloy® C-276	Hastelloy® C-276
Monel® 400	Monel® 400
Tantalum	316L SS
Tantalum	Hastelloy® C-276

Diaphragm Size	Flange Size	Flange Pressure Rate
58mm	1/2" DN 15	ANSI Class 150,300,600,900,1500 DIN-PN40/63/100
	3/4" DN 20	
	1" DN 25	
	2" DN 50	
91mm	1/2" DN 15	ANSI Class 150,300,600 DIN-PN40
	3/4" DN 20	
	1" DN 25	
	2" DN 50	

Removable top and bottom housing thread seal

200C/201C Series
Diaphragm Size 58mm

740E/741E Series
Diaphragm Size 91mm

Wetted Material	
Diaphragm	Lower Housing
316L SS	316L SS
Hastelloy® C-276	316L SS
Hastelloy® C-276	Hastelloy® C-276
Monel® 400	Monel® 400
Tantalum	316L SS

Diaphragm Size	Pressure Rate		Thread Size
	Bolts 316L	Bolts Caborn	
58mm	8.75MPa	17.5MPa	1/2" NPT 3/4" NPT 1" NPT
91mm	5.25MPa		

Inline seal for welding seal 205C Series

Wetted Material		Diaphragm Size	Pressure Rate		Pipe Size
Diaphragm	Lower Housing		Bolts 316L	Bolts Caborn	
316L SS	316L SS	58mm	5.25MPa	17.5MPa	3"or 4" and larger
Hastelloy® C-276	316L SS				
Hastelloy® C-276	Hastelloy® C-276				
316L SS	No				
Hastelloy® C-276	No				

For reference only. Please consult the factory for specific details;
Housing seal gasket:Teflon, Graph-lock®3123 (High Temperature)

4 Accessories

Various accessories for use with diaphragm seals.

4.1 Capillary line

When instruments need to be removed from direct contact with the installation point due to elevated process temperature, pressure spikes, vibration or design specifications. Added between the measuring instrument and diaphragm seal.

■ Key Features:

All-welded stainless steel construction
1 m length (standard); alternate lengths in 100 mm increments
Available capillary lengths: over 0,3 m, the maximum capillary length shall be determined based on the specific measuring range and diaphragm size.

Specifications:
Armored capillary (standard)
Armored capillary with PVC sheath (optional); corrosion resistance
Maximum working pressure: 689 bar
Temperature limits: -185°C to 400°C

4.2 Flushing ring

The Ashcroft® Flushing ring are mainly used for cleaning of flanged diaphragm seal. This enables consistent readings from sensing instruments, and serves to extend service life. An ideal solution for satisfying applications with challenging requirements. Additionally they offer sampling and calibration service.

■ Key Features:

Two flushing ports

Specifications:
Standard according to DIN or ASME
Size 2” ... 4” or DN50 ... DN100
Pressure Ratings: 2500 lbs or PN100

4.3 Ball valve and nipple for flushing ring

The Ashcroft ball valve is a perfect add-on for the lushing rings. The ball valves allow continuous flushing connection.

■ Key Features:

Stainless steel construction, other materials on request

Various selection of sealings and connection sizes

Configurable nipple with flush ring connection (Standard length 100 mm)

4.4 Cooling device

The Ashcroft® finned cooling device protects pressure instruments from the effects of elevated temperatures. A reduced orifice decreases the volume of the fill fluid in the finned cooling device allowing efficient heat transfer.The cooling device metallic fins maximize exposure to the ambient temperature for effective dissipation.

■ Key Features:

Temperature reduction approx. 100 °C

Effectively protects instruments from elevated temperatures

Cooling device and sensing instrument mount directly to the process

Compatible with many process media

Specifications:

Max. pressure rate: 1,000 bar/15,000psi

Material: Stainless steel 316L, others on request

Since 1852
A Tradition of Excellence

Building 1, 1188 Fenghua Road, Chengnan Subdistrict, Economic and Technological Development Zone, Jiaxing City, Zhejiang Province, China

www.ashcroft.com.cn

400 187 6586

0573 8360 9998

sales@ashcroft.com.cn