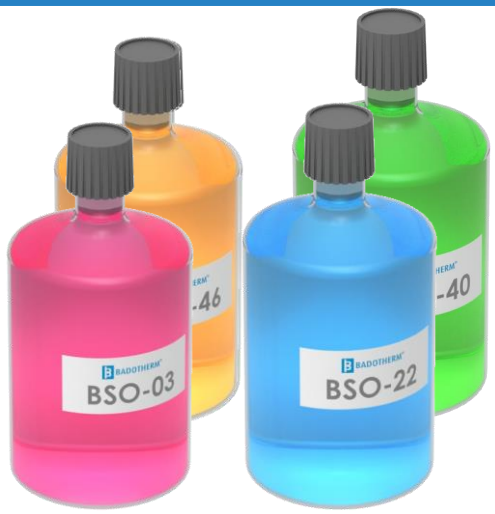
BSO fluids – General information

Design description

The selection of a fill fluid for a diaphragm seal application requires a careful review of the application conditions. The fill fluid characteristics determine to a large extent the diaphragm seal system performance in terms of response time and temperature effect. Several fill fluid characteristics need to be taken into account to make the appropriate selection of the fill fluid.

At first the type of fill fluid is important as it should be compatible with the process medium. The most commonly used are Silicone or Inert based fluids, but also other specific types are used; all with specifications and characteristics to match different conditions. The operating temperature of the fill fluid is the second important factor for selection. The application temperature should remain between the limits to guarantee proper functioning of the application. All fill fluids expand or contract with changes in temperature and this is referred to as the diaphragm seal temperature effect.



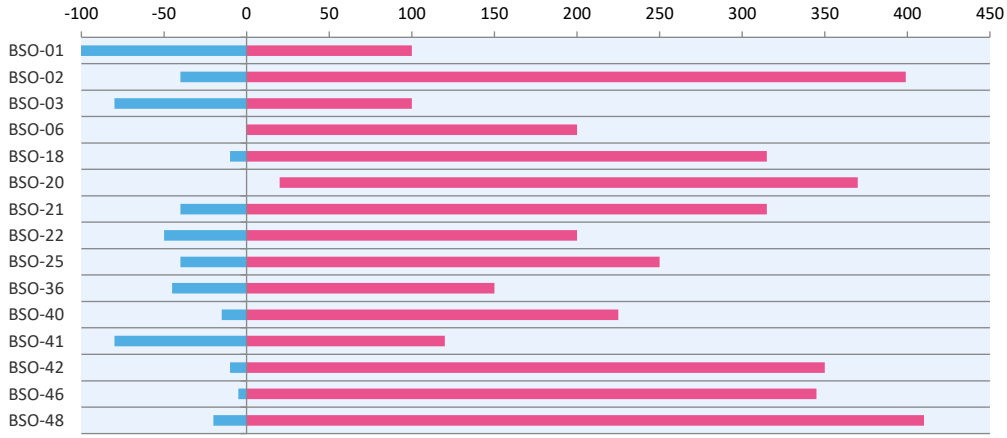
The fluid characteristics have an effect on the response time of the application. Viscosity, density, and bulk modulus are a few that determine the response time in process conditions. The vapour pressure curve shows if the selected fill fluid is suitable for the minimal process pressures in combination with the desired process temperatures. This is especially important for vacuum applications

Specification overview

name	type	operating temperature (°C)*1	design temperature (°C) *2	viscosity (cSt)	density (kg/dm3)
BSO-01	Inert	-110/+100	-120/+110	0.8	1.71
BSO-02*3	Silicone	-40/+399	-50/+400	9.1	0.93
BSO-03	Inert	-80/+100	-90/+110	1.8	1.82
BSO-06	Inert	0/+200	-10/+210	27.0	1.92
BSO-18*3	Silicone	-10/+315	-15/+325	37.0	1.07
BSO-20	Silicone	+20/+350	+10/+355	160.0	1.09
BSO-21*3	Silicone	-40/+315	-50/+320	125.0	1.07
BSO-22	Silicone	-50/+225	-84/+235	20.0	0.95
BSO-25	Inert	-40/+250	-50/+300	38.0	1.87
BSO-36	Silicone	-45/+170	-70/+210	10.0	0.93
BSO-40*4	Propylene Glycol Di	-15/+225	-19/+230	9.5	0.94
BSO-41	Silicone	-80/+120	-100/+135	5.0	0.92
BSO-42*3	Silicone	-20/+350	-15/+370	57.6	1.07
BSO-46	Hydrogenated terphenyl	-5/+345	-30/+360	29.6	1.01
BSO-48	Silicone	-20/+420	-32/+425	57.6	1.08

*1) At or above ATM pressure.
*2) total exposure time cumulative <12hr
*3) maximum operating temperature is at pressure >1000 mbar (see vapour pressure curve)
*4) FDA approved

Temperature ranges BSO fluids



Vapour Pressure

The vapour pressure is one of the most important characteristics for fill fluids of diaphragm seals. As diaphragm seals are used in a broad spectrum of pressure in combination with a range of temperatures it is important to have an indication of this relation. For this purpose the vapour pressure curve is presented. Vapour pressure can be defined as: "*the pressure exerted by a vapour in thermodynamic equilibrium with its condensed phases at a given temperature in a closed system. The equilibrium vapour pressure is an indication of a liquid's evaporation rate. It relates to the tendency of particles to escape from the liquid.*"

Each fluid has its own relation between (abs) pressure and temperature. The curves shown are an estimated value based on tests and experience.

Viscosity

Viscosity is an expression of "thickness" of a fluid. The viscosity is defined in high or low viscosity. A low viscosity is a fluid like water, a high viscosity fluid can be like honey. At a molecular level, viscosity is a result the interaction between the different molecules in a fluid. This can be also understood as friction between the molecules in the fluid. Just like in the case of friction between moving solids, viscosity will determine the energy required to make a fluid flow. Knowing this makes the relation between function in a diaphragm seal system more easy. Viscosity has an effect on the system when used in cold or warm environments both ambient as process related. The response times are influenced as well. Transmitter seal application less than a pressure gauge seal application due to the difference in displacement inside the diaphragm seal system.

Temperature range

The temperature range of fill fluids are split up in two different value. The operating temperature and the design temperature.

Operating Temperature

This temperature range is a safe range wherein the fill fluid can operate under or above atmospheric conditions depending on the fill fluid type.

Design Temperature

This temperature range is a buffer for extreme conditions that are not harmful for the diaphragm seal system but is limiting the lifetime of the fluid.

Density

Density is the expression of mass per unit volume. BSO fluids are expressed in a unit kg/dm^3. This is a common unit of measure to express the density. Density is an important factor when it comes to fill fluids. The mass of the fluid is a component in the calculation of mounting effect of diaphragm seals. Density is not a fix value, but a value given at a certain temperature. When the temperature fluctuates, the density fluctuations along with it. Therefore Basecal is calculating the temperature based mounting effect compared to the basic density at filling conditions.

Vapour pressure results

Process Temp.	01	02	03	06	18	20	21	22	25	36	40	41	42	45	46	48
°C	mbara	mbara	mbara	mbara	mbara	mbara	mbara	mbara	mbara	mbara	mbara	mbara	mbara	mbara	mbara	mbara
-100	1															
-80	1		1									1				
-70	1		1									1				
-60	1		1									1				
-45	1		1					1		1		1				
-40	1	1	1				1	1	1	1		1		1		
-20	1	1	1				1	1	1	1		1		1		1
-15	1	1	1				1	1	1	1	1	1		1		1
-10	1	1	1		1		1	1	1	1	1	1	1	1		1
-5	1	1	1		1		1	1	1	1	1	1	1	1	1	1
0	2	1	1	10	1		1	1	1	1	1	1	1	1	1	1
10	11	1	1	10	1		1	1	1	1	1	1	1	1	1	1
20	19	1	1	10	1	1	1	1	1	1	1	1	1	1	1	1
40	52	1	4	10	1	1	1	1	1	1	1	1	1	1	1	1
60	133	1	12	10	1	1	1	1	1	1	1	50	1	1	1	1
80	266	10	28	10	1	1	1	1	2	50	2	150	1	1	1	1
100	731	40	105	10	1	1	1	1	5	150	2	300	1	1	2	1
120 1		85		10	1	1	1	7	9	243	6	500	1	2	4	1
150		260		10	1	1	1	140	23	500	30		1	5	10	1
180		600		30	1	1	1	300	47		500		10	15	20	1
200		950		1000	10	1	20	500	74		875		20	50	40	1
225								1000			1120					
230		1720			20	1	30		133				50	200	60	3
250		2420			50	1	500		195				100	250	100	6
260		2840			100	5	600						200		150	8
280		3800			200	15	1000						500		250	14
300		4960			500	30	2000						1000		400	28
315		6310			3000	150	3000						1200		600	46
345															900	
350		8710				1000							1500			140
380		11600														380
399		13700														
400																700
420																1022

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