Pressure Transmission Fluids

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1 General

Pressure transmission fluids are used to transfer the process pressure from the diaphragm to the sensor element and therefore represent a fundamental component of a diaphragm seal system (see also TA_031 General Information on Diaphragm Seals).

The following provides information on the properties and applications of the different pressure transmission fluids.

2 Process conditions

Important factors when selecting a pressure transmission fluid include the process conditions with regard to pressure and temperature. The temperature range is based on the physical properties of the pressure transmission fluid. The process pressure is also important, as a combination of high temperature and vacuum pressure is especially critical. Certain production steps may have to be performed to ensure the suitability of the diaphragm seal system, depending on the critical process point.

LABOM pressure transmission fluids can be used in vacuum conditions up to a process temperature t_1 without special treatment if the diaphragm seal is installed correctly. Special treatment during manufacturing is necessary for higher temperatures. A differentiation is made between negative pressure service and an vacuum service.

The different zones are separated by three straight lines. The range below 30 mbar abs represents a special case, which requires the vacuum service in all cases above the aforementioned t_1 limit temperature.

Consult Technical Support with regard to especially critical process points. Depending on the exact process and installation conditions, often special solutions can be found.

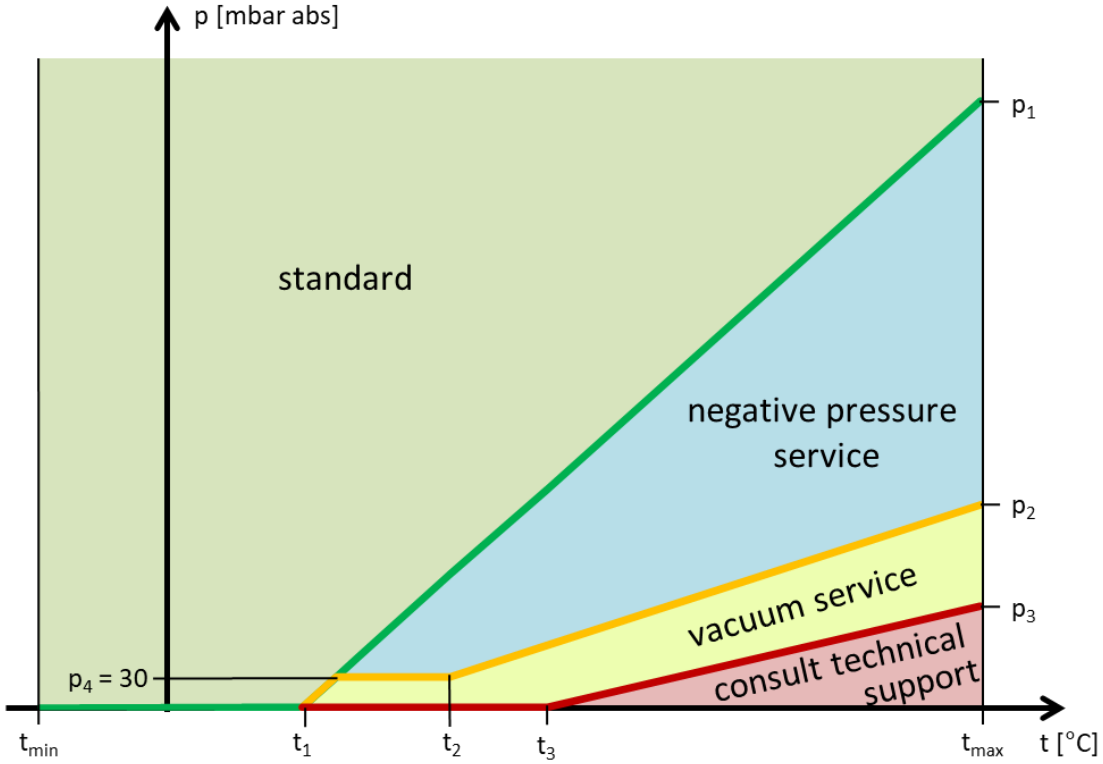


Fig. 1 Zones in the pressure/temperature chart

3 Technical data of fluids

The table below is intended to simplify the selection. The following pages describe the pressure transmission fluids in more detail.

Code	Description/Application	Type	t_{min} [°C]	t_{max} [°C]	density [g/cm³]	kin. viscosity @ 40°C [mm²/s]	Tk [%/10K]	compressibility [%/100 bar]
FD1	silicon-free oil suitable for food stuff applications	polyalphaolefine oil	-40	230	0,82	31	0,76	0,6
FV4	vacuum oil	silicone oil	-25	260	1,06	21,5	0,73	1
FH	high temperature oil	silicone oil	-20	400	1,06	21,5	0,73	1
FC	Halocarbon oil for oxygen applictions	halogenated carbon chains	-50	190	1,87	6,3	0,9	0,73
FM50	silicone oil M50	high viscosity silicone oil	-50	300	0,96	40	0,95	1,02
FM5	low temperature silicone oil M5	low viscosity silicone oil	-90	160	0,92	4	1,08	1,2
FW	white oil for food stuff applications	low viscosity paraffin	-10	170	0,85	43	0,76	0,6
FGW	glycerine/water mixture	glycerine/water 70/30	-30	110	1,18	8	0,57	0,29
FAW	alcohol/water mixuture for the paint industry	isopropanol/water 40/60	-20	75	0,95	1,9	0,52	0,81
FMH1	metal liquid for high temperatures or pressures	low melting alloy	0	350	6,44	1,4	0,126	0,02

3.1 Standard and food-compliant oil FD1

Properties/Applications

Silicone-free, synthetic oil with universal properties, especially suitable for applications in the food and pharmaceutical industry.

Meets the requirements of FDA 21 CFR 178.3570 concerning the use of lubricants with incidental contact with food and is H1 registered.

Technical Data

Density		0.82 g/cm³
Viscosity (at 40 °C)		31 mm²/s
t_{min}	-40 °C	minimum temperature
t_{max}	230 °C	maximum temperature

Data for pressure / temperature chart

t_1	50 °C	max. temperature with vacuum + standard service
t_2	65 °C	Intersection of vacuum and negative pressure service limit at 30 mbar abs
t_3	80 °C	max. temperature with vacuum + vacuum service
p_1	800 mbar abs	min. pressure at t_{max} and standard service
p_2	140 mbar abs	min. pressure at t_{max} and negative pressure service
p_3	100 mbar abs	min. pressure at t_{max} and vacuum service

Data applies only if installed correctly for operation under vacuum (diaphragm seal above measuring instrument)!

3.2 Vacuum oil FV4

Properties/Applications

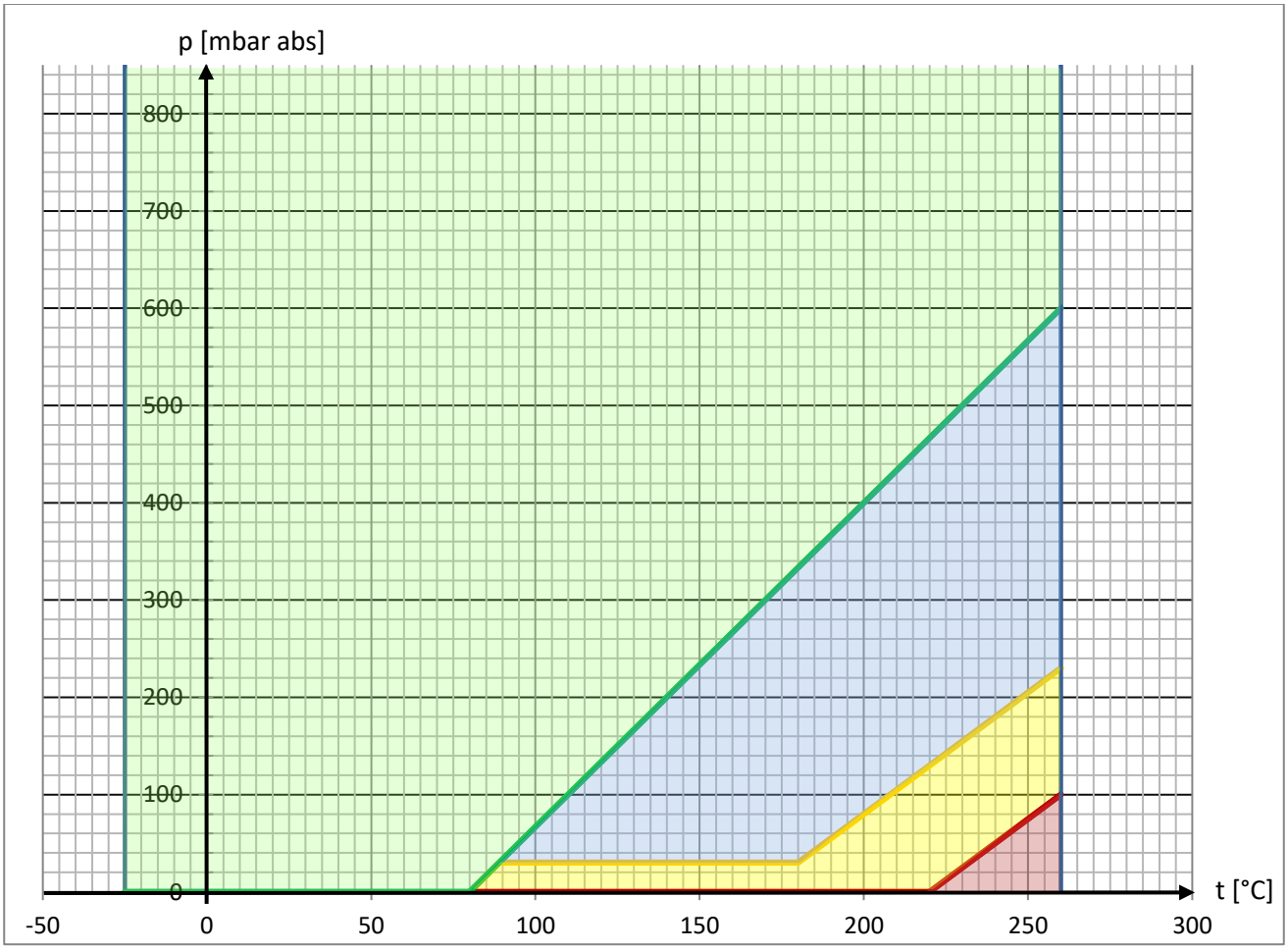
Silicone oil especially suitable for vacuum applications.

Technical Data

Density		1.06 g/cm³
Viscosity (at 40 °C)		21.5 mm²/s
t_{min}	-25 °C	minimum temperature
t_{max}	260 °C	maximum temperature

Data for pressure / temperature chart

t_1	80 °C	max. temperature with vacuum + standard service
t_2	180 °C	Intersection of vacuum and negative pressure service limit at 30 mbar abs
t_3	220 °C	max. temperature with vacuum + vacuum service
p_1	600 mbar abs	min. pressure at t_{max} and standard service
p_2	230 mbar abs	min. pressure at t_{max} and negative pressure service
p_3	100 mbar abs	min. pressure at t_{max} and vacuum service



Data applies only if installed correctly for operation under vacuum (diaphragm seal above measuring instrument)!

3.3 High temperature oil FH

Properties/Applications

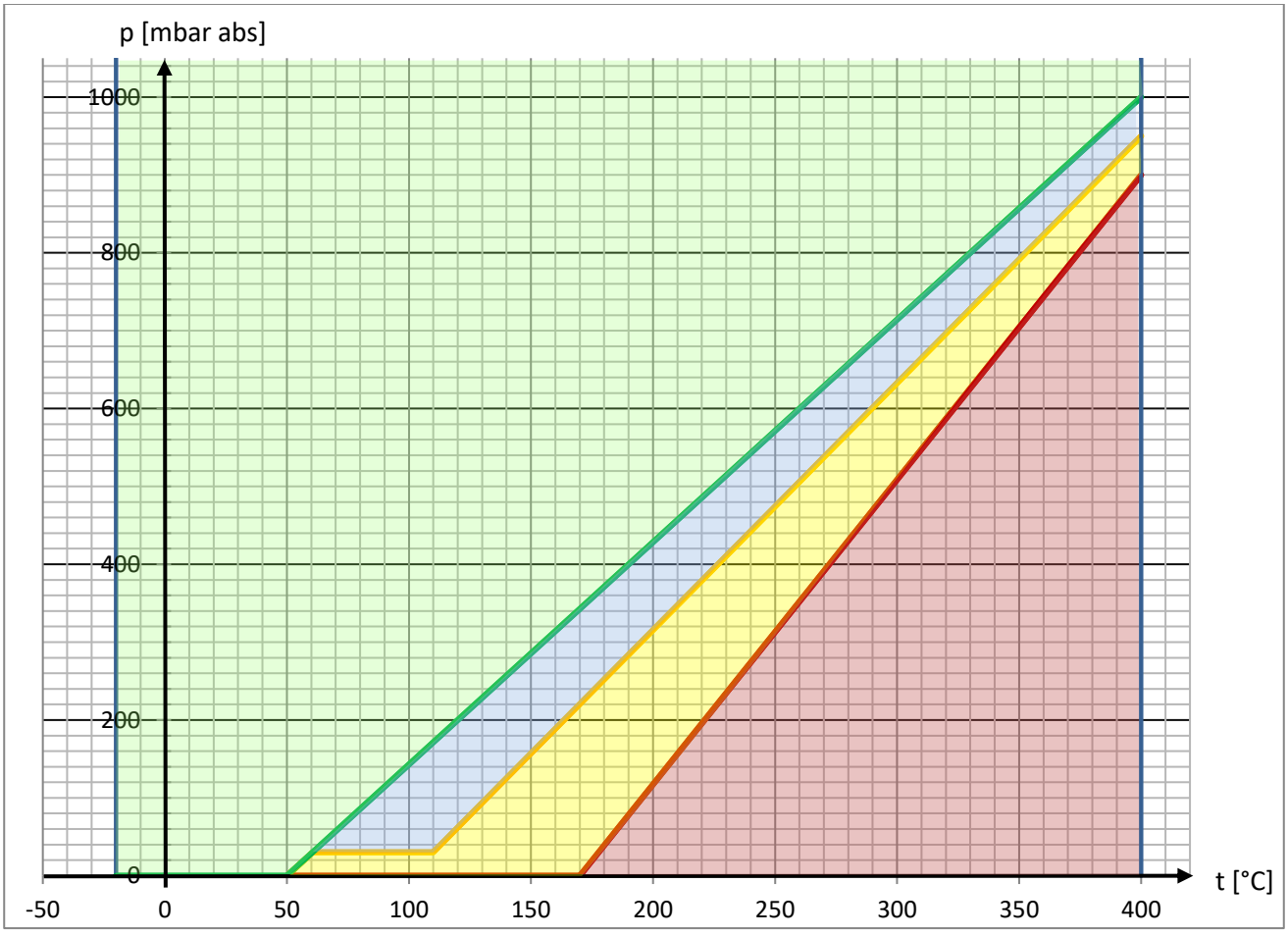
Silicone oil especially suitable for high temperature applications.

Technical Data

Density		1.06 g/cm³
Viscosity (at 40 °C)		21.5 mm²/s
t_{min}	-20 °C	minimum temperature
t_{max}	400 °C	maximum temperature

Data for pressure / temperature chart

t_1	50 °C	max. temperature with vacuum + standard service
t_2	110 °C	Intersection of vacuum and negative pressure service limit at 30 mbar abs
t_3	170 °C	max. temperature with vacuum + vacuum service
p_1	1000 mbar abs	min. pressure at t_{max} and standard service
p_2	950 mbar abs	min. pressure at t_{max} and negative pressure service
p_3	900 mbar abs	min. pressure at t_{max} and vacuum service



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3.4 Halocarbon oil FC

Properties/Applications

Inert, silicone-free halocarbon oil, especially suitable for applications that use oxygen.

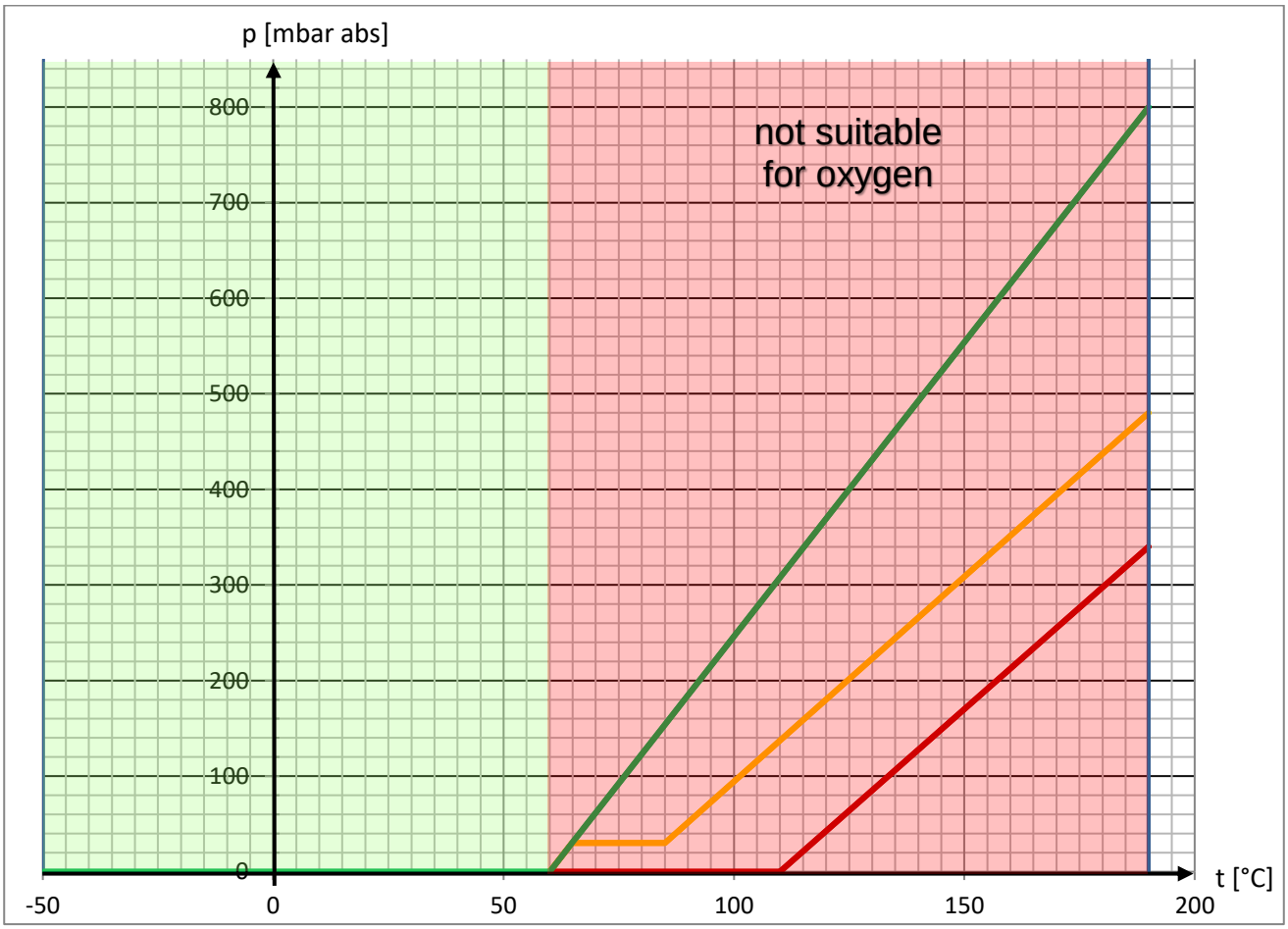
BAM approval up to 60°C at 80 bar.

Technical Data

Density		1.87 g/cm³
Viscosity (at 40 °C)		6.3 mm²/s
t_{min}	-50 °C	minimum temperature
t_{max}	60 °C	maximum temperature for applications that use oxygen
t_{max}	190 °C	maximum temperature for other applications

Data for pressure / temperature chart

t_1	60 °C	max. temperature with vacuum + standard service
t_2	85 °C	Intersection of vacuum and negative pressure service limit at 30 mbar abs
t_3	110 °C	max. temperature with vacuum + vacuum service
p_1	800 mbar abs	min. pressure at t_{max} and standard service
p_2	480 mbar abs	min. pressure at t_{max} and negative pressure service
p_3	340 mbar abs	min. pressure at t_{max} and vacuum service



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3.5 Silicone oil FM50

Properties/Applications

All-purpose silicone oil. Alternative to FD1 if extended temperature range is required.

Technical Data

Density		0.96 g/cm³
Viscosity (at 25 °C)		50 mm²/s
t_{min}	-50 °C	minimum temperature
t_{max}	300 °C	maximum temperature

Data for pressure / temperature chart

t_1	50 °C	max. temperature with vacuum + standard service
t_2	100 °C	Intersection of vacuum and negative pressure service limit at 30 mbar abs
t_3	150 °C	max. temperature with vacuum + vacuum service
p_1	800 mbar abs	min. pressure at t_{max} and standard service
p_2	240 mbar abs	min. pressure at t_{max} and negative pressure service
p_3	160 mbar abs	min. pressure at t_{max} and vacuum service

Data applies only if installed correctly for operation under vacuum (diaphragm seal above measuring instrument)!

3.6 Low temperature oil FM5

Properties/Applications

Low-viscosity silicone oil, especially suitable for low temperatures down to -90 °C.

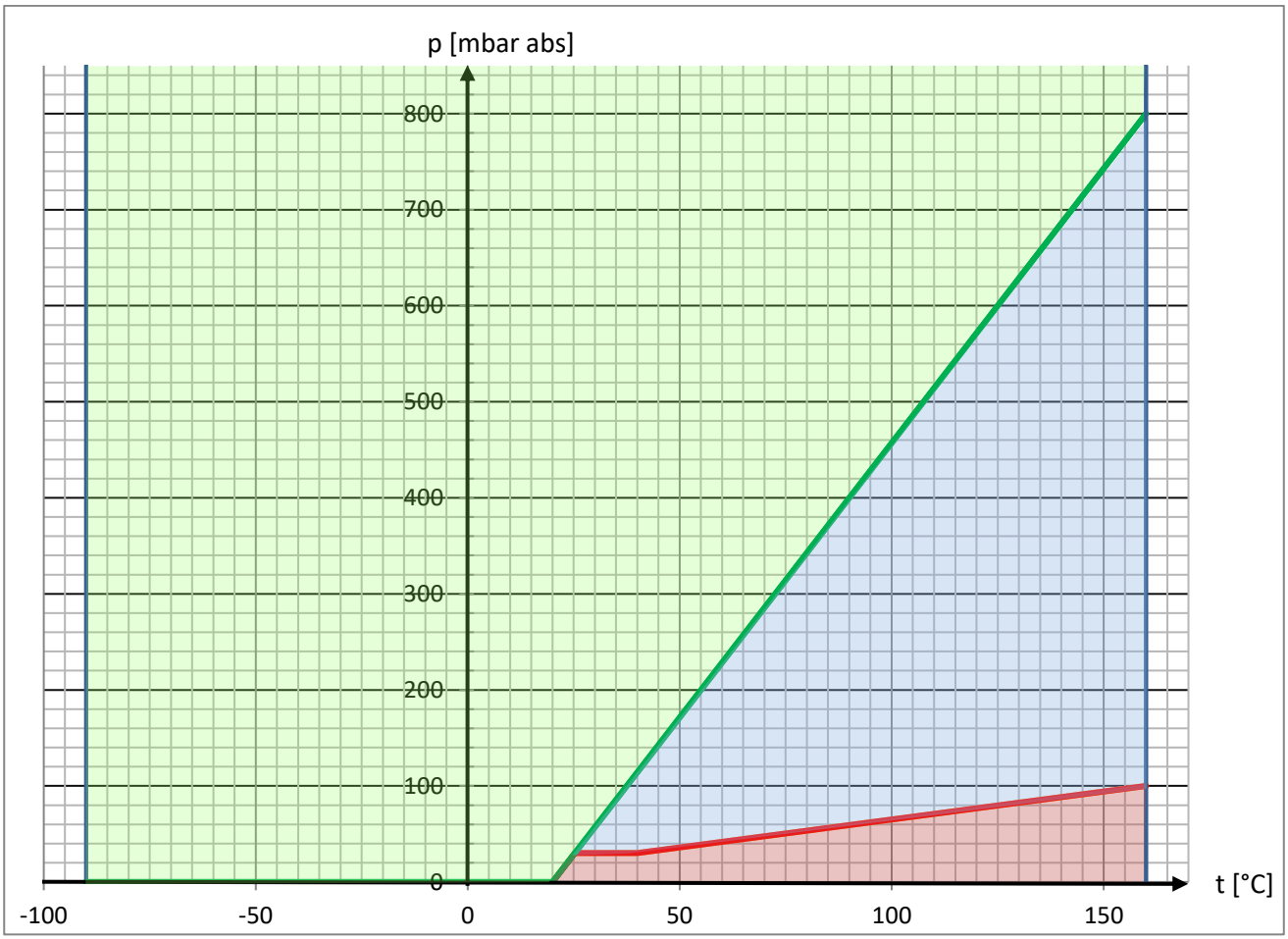
No vacuum service is offered for this oil.

Technical Data

Density		0.92 g/cm³
Viscosity (at 25 °C)		5 mm²/s
t_{min}	-90 °C	minimum temperature
t_{max}	160 °C	maximum temperature

Data for pressure / temperature chart

t_1	20 °C	max. temperature with vacuum + standard service
t_2	40 °C	Intersection of vacuum and negative pressure service limit at 30 mbar abs
t_3		n/a
p_1	800 mbar abs	min. pressure at t_{max} and standard service
p_2	100 mbar abs	min. pressure at t_{max} and negative pressure service
p_3		n/a



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3.7 Medical white oil FW

Properties/Applications

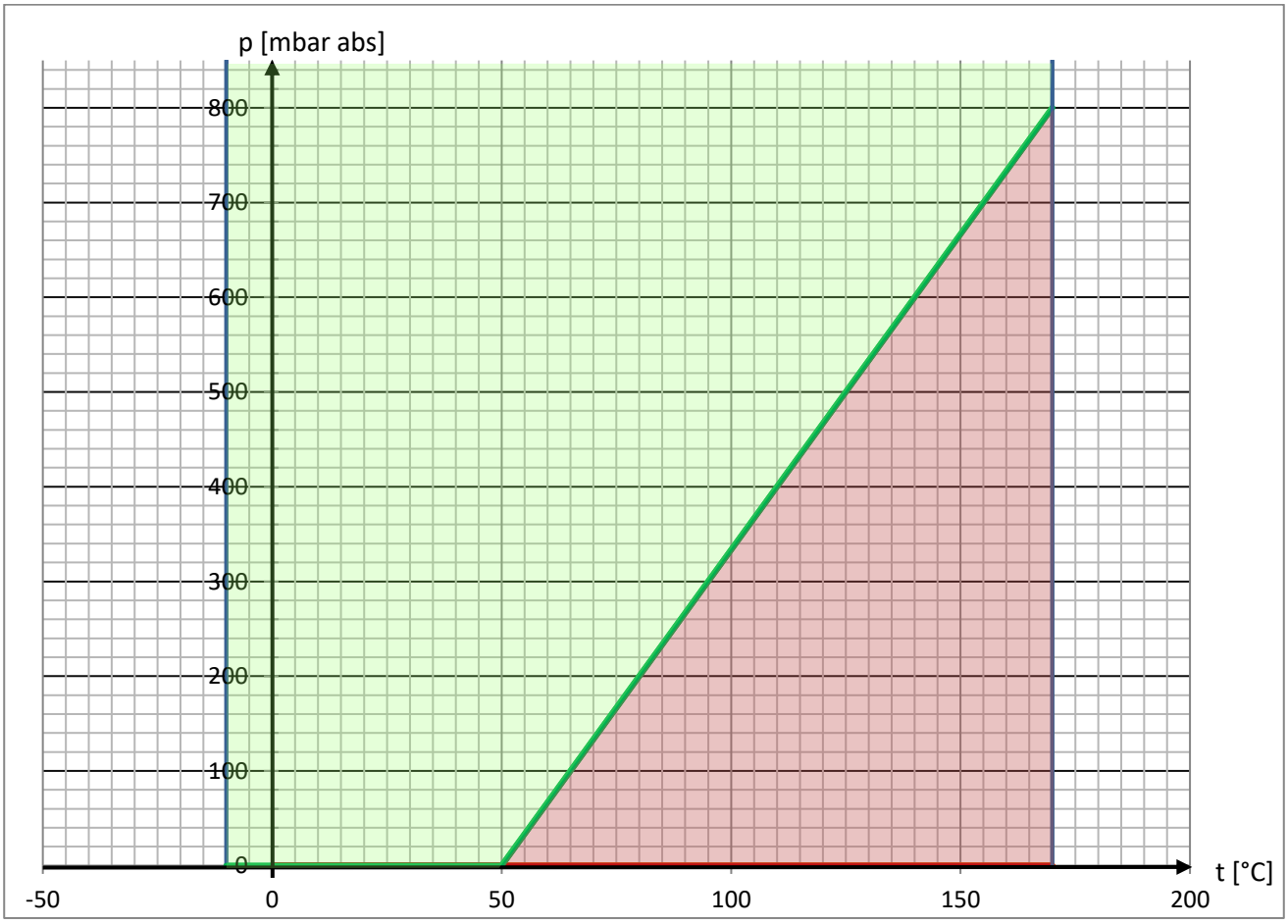
Medical white oil (highly liquid paraffin) can be used as an alternative to FD1. However, the temperature limits are worse than with FD1. No negative pressure or vacuum service is available either.

Technical Data

Density		0.85 g/cm^3
Viscosity (at 40 °C)		43 mm^2/s
t_{min}	-10 °C	minimum temperature
t_{max}	170 °C	maximum temperature

Data for pressure / temperature chart

t_1	50 °C	max. temperature with vacuum + standard service
t_2		n/a
t_3		n/a
p_1	800 mbar abs	min. pressure at t_{max} and standard service
p_2		n/a
p_3		n/a



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3.8 Glycerine/water mixture FGW

Properties/Applications

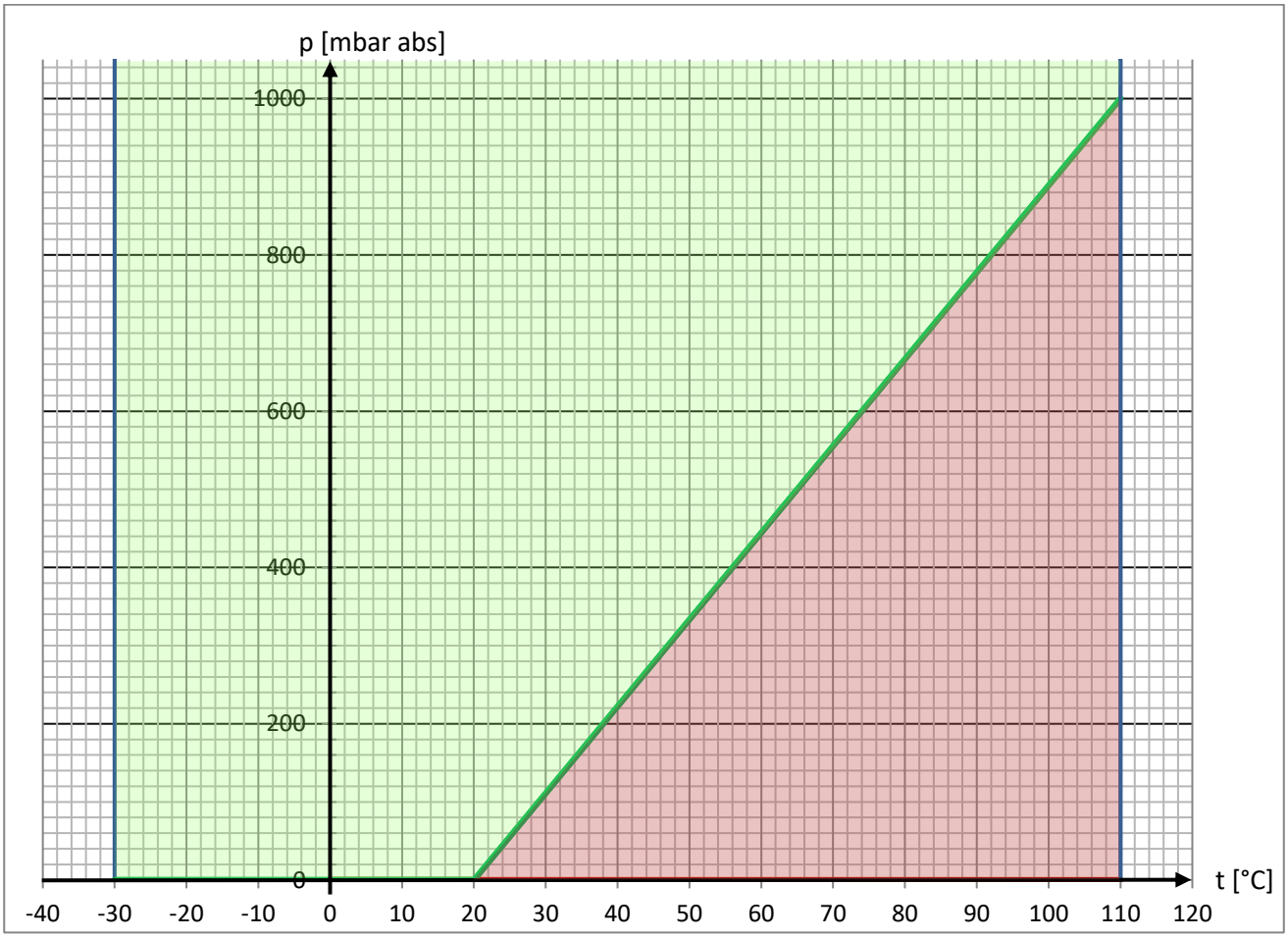
Glycerine/water mixtures have good physical properties (very low compressibility, low thermal expansion and viscosity). However, the temperature range ends at 110 °C.

Technical Data

Density		1.18 g/cm^3
Viscosity (at 40 °C)		8 mm^2/s
t_{min}	-30 °C	minimum temperature
t_{max}	110 °C	maximum temperature

Data for pressure / temperature chart

t_1	20 °C	max. temperature with vacuum + standard service
t_2		n/a
t_3		n/a
p_1	1000 mbar abs	min. pressure at t_{max} and standard service
p_2		n/a
p_3		n/a



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3.9 Alcohol/water mixture FAW

Properties/Applications

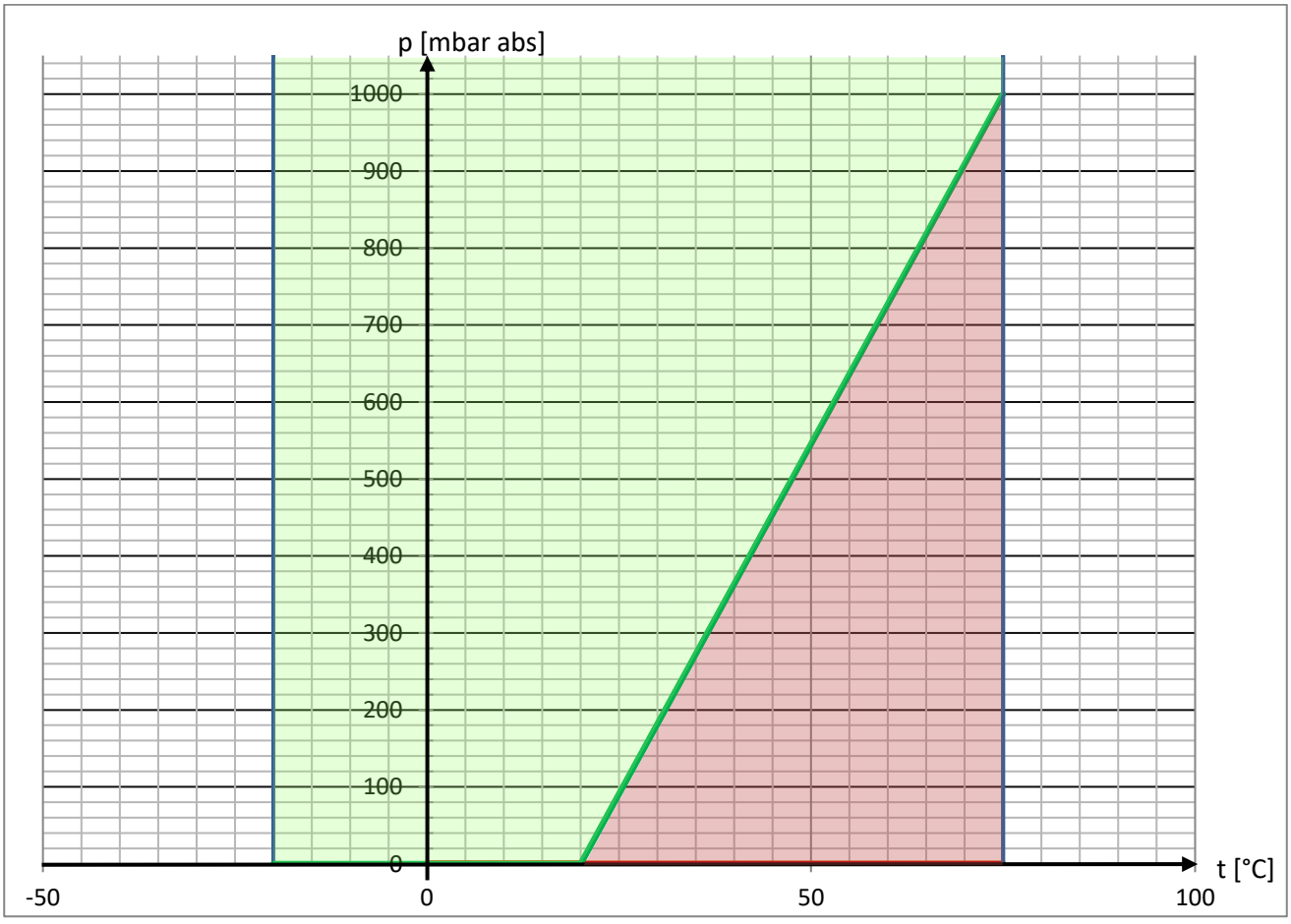
Alcohol/water mixtures are mainly used in the paint industry, as, in the event of a malfunction, paint wetting problems can be ruled out. Adding alcohol improves the lower temperature limit.

Technical Data

Density		0.95 g/cm^3
Viscosity (at 40 °C)		1.8 mm^2/s
t_{min}	-20 °C	minimum temperature
t_{max}	75 °C	maximum temperature

Data for pressure / temperature chart

t_1	20 °C	max. temperature with vacuum + standard service
t_2		n/a
t_3		n/a
p_1	1000 mbar abs	min. pressure at t_{max} and standard service
p_2		n/a
p_3		n/a



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3.10 Liquid metal FMH1

Properties/Applications

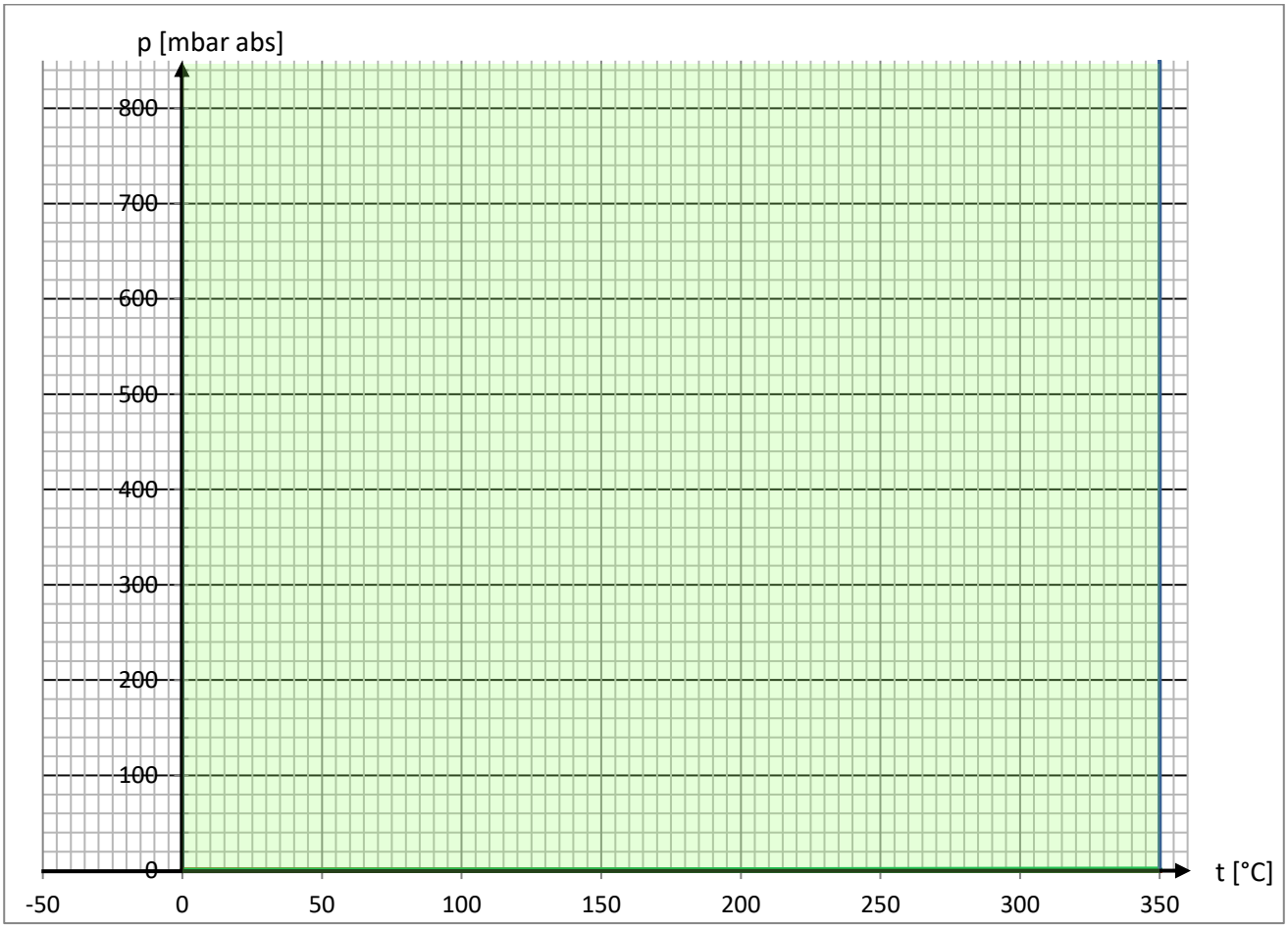
This special metal alloy is liquid at room temperature. Thermal expansion and compressibility are minimal. This liquid is vacuum-resistant without special treatment up to a maximum temperature, although the measuring instrument can be destroyed below 0 °C.

Technical Data

Density		6.44 g/cm³
Viscosity (at 40 °C)		1.8 mm²/s
t_{min}	0 °C	minimum temperature
t_{max}	350 °C	maximum temperature

Data for pressure / temperature chart

t_1	350 °C	max. temperature with vacuum + standard service
t_2		n/a
t_3		n/a
p_1	0 mbar abs	min. pressure at t_{max} and standard service
p_2		n/a
p_3		n/a



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