Industrial Chemicals
Chlor-Alkali & Chloromethanes

Methyl chloride

Product Application Guide

At ambient temperature and atmospheric pressure Methyl Chloride – monochloromethane - is a colorless inflammable gas heavier than air and with a very weak sweetish odor. In water it is only sparingly soluble but well in organic solvents. It can be liquefied by cooling below -24 °C or by pressurizing to approx. 5 bar at 20 °C, to give a clear, colorless fluid that will vaporize fast under room conditions generating much coldness.

Methyl Chloride forms a solid, snow-like hydrate with water of composition CH_3Cl*6H_2O, which may preferably develop if liquefied Methyl Chloride containing water is vaporized by expansion cooling. This hydrate will decompose above 5 °C.

Delivery Unit

As liquefied gas, methyl chloride is dispatched in containers or in compressed-gas rail tankers holding 20 to 65 t. The rail tankers are fitted with a bottom valve for the liquid phase and additional valves for the gas phase (gas-shuttle pipe).
Emptying of containers can be done by gas displacement method with the aid of pumps for the liquid phase or by pressurizing with dry nitrogen gas.
According to the RID regulation the maximum load being allowed for these containers is 0.81 kg/L.

Pressurized gas containers are subject to special statutory regulations. Be aware to attend to specific local national regulations.

Product Identification

CAS No.
74-87-3

EINECS/ELINCS No.
200-817-4

REACH No.
01-211943708-22

Formula
CH_3Cl

UN Code
1063

Typical Specification

Methyl Chloride	% (m/m)	min 99.9
Methylene Chloride	mg/kg	max 10
Chloroform	mg/kg	max 5
Carbon Tetrachloride	mg/kg	max 5
Dimethylether	mg/kg	max 20
Methanol	mg/kg	max 10
Acid (HCl)	mg/kg	max 10
Water	mg/kg	max 20

Physical Properties

Molecular Mass	g/Mol	50.49
Boiling Temperature at 1013 mbar	°C	- 23.8
Freezing Temperature	°C	- 97.7
Gas Pressure (liquid) at 20 °C (see *Technical Data*)	bar	4.90
Density (liquid) at 20 °C and 4.90 bar (see *Technical Data*)	g/cm³, kg/L	0.921
Density (liquid) at -24 °C and 1013 mbar (see *Technical Data*)	g/cm³, kg/L	1.003
Density (gas) at 0 °C and 1013 mbar	kg/m³	2.307
Dynamic Viscosity η (liquid) at 20 °C	mPa·s	0.18
Surface Tension (liquid) at 20 °C and 4.90 bar	mN/m	16.5
Evaporation Energy at -24 °C	kJ/kg	426
Fusion Energy at -97.7 °C	kJ/kg	127.4
Static Dielectric Constant ε_r (liquid) at -24 °C		12.9
Critical Temperature	°C	143.1
Critical Pressure	bar	66.8
Critical Molar Volume	L/Mol	0.139
Critical Density	g/cm^3, kg/L	0.363
Solubility in Water at 30 °C and 1013 mbar	g/kg	ca 7
Water pick up (liquid) at 25 °C	g/kg	ca 0.7
Flash Point in air at 1013 mbar	°C	- 46
Auto-Ignition Temperature in air at 1013 mbar	°C	ca 625
Explosion Limits in air at 1013 mbar	% (v/v) g/m^3	7.1 - 18.5 450 - 780
Temperature Class (Ignition Class) (DIN VDE 0165)		T 1
Heat of Formation ΔH^O_f at 25 °C and 1013 mbar	kJ/kg	- 1622
Heat of Combustion $\Delta H^O_{c\,(g)}$ at 25 °C and 1013 mbar	kJ/kg	ca - 12790

Production process

Two ways of making Methyl Chloride are technically in use: chlorination of methane with chlorine or reaction of methanol with hydrogen chloride.

A third route is naturally occurring: Methyl Chloride is formed by biomass burning and volcano eruptions, as well as by biochemical activities by wood-rotting fungi and certain algae and seaweed in the oceans. Globally huge amounts of natural Methyl Chloride (approx. 4 million tons per year) are released by these sources into the atmosphere.

Application possibilities

Chemical and Pharmaceutical Industry

Methyl chloride is used chiefly as methylation agent for the manufacturing of quarternary ammonium salts (quats), N-methylamino compounds and methyl ethers which are used for surfactants, pharmaceuticals, agricultural agents, dyestuffs, colorants, flocculants for water treatment, cationic detergents in laundry antistatics, flotation agents, disinfectants, phase transfer catalysts, special strong basic anion exchange resins, etc.
Also it is used for the preparation of organometallic methyl compounds like methyllithium, methylmagnesium chloride (grignard reagent) methyl stannanes, etc. which are used as intermediates in chemical synthesis.

Pulp (Methyl Cellulose) and Glue Industry

Methylation of cellulose on a large scale gives methyl celluloses and derivatives thereof (with the exception of carboxy methylcellulose, CMC) and are used in many different applications, e.g. as paste and wallpaper glue, additive for construction materials, thickening agent in foodstuffs and cosmetics and pharmaceutical formulations, emulsifying and disperging agent, protective colloid, etc.

Refrigeration Engineering (historic)

Formerly used as refrigerant (R 40) in refrigerators. Due to its flammability and toxic properties it has been substituted for a long time and therefore this application is strongly not recommended by Nouryon.

Silicone Polymers

Methyl chloride is used predominantly for the production of methyl chlorosilanes on a large industrial scale as precursors of silicones (i.e.silicon rubbers, oils and paints).

Rubber Industry

Solvent for the production of butyl rubber by the slurry process.

Materials for Tanks and containers

Carbon steel, stainless steel (alloyed steel, e.g. “V4A"), copper, brass, nickel, and titanium are suited materials for dry Methyl Chloride; sealing may be made of graphite, PTFE or PCTFE.

Improper materials are aluminium, magnesium, zinc and alloys thereof which may undergo chemical reactions with Methyl Chloride even in dry condition.

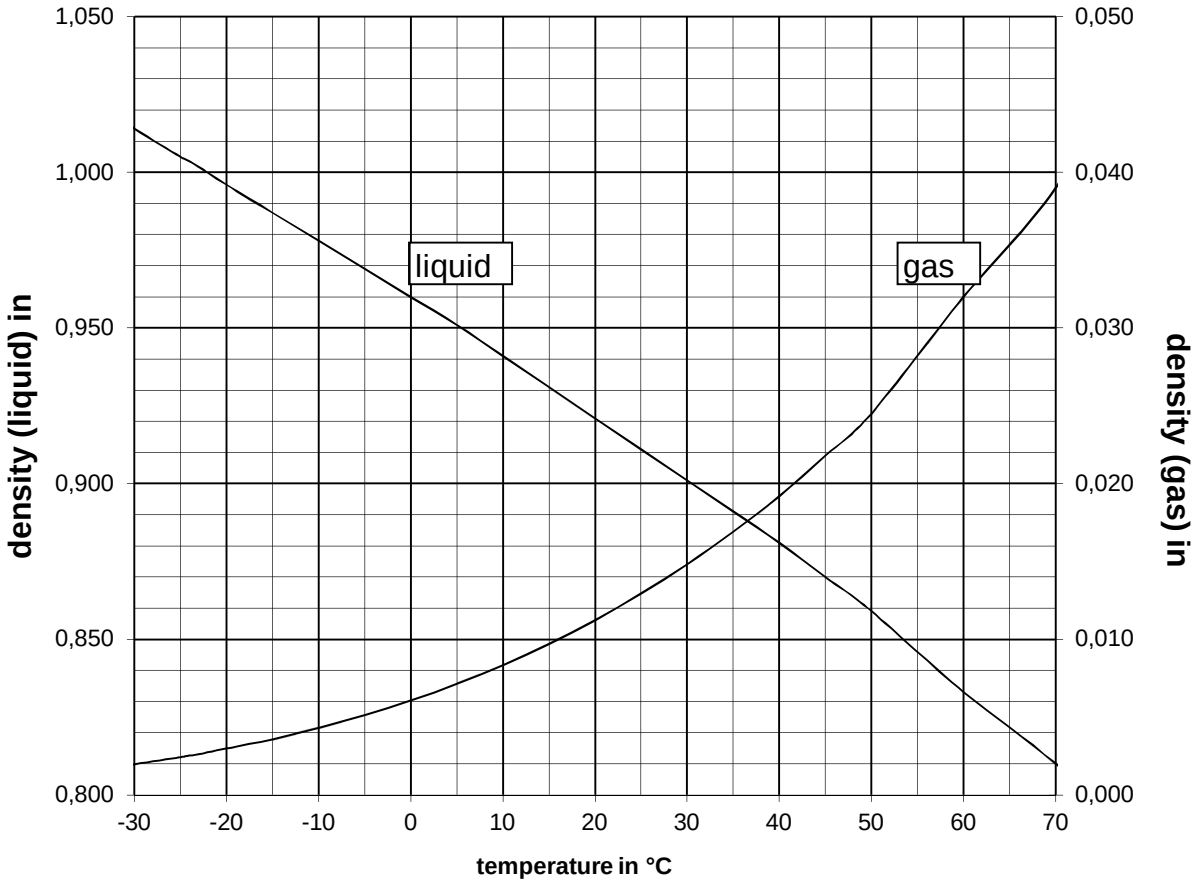
Storage Conditions

Vessels and tanks containing Methyl Chloride have to be stored well tight in a dry, cool and ventilated place. Keep away from sunlight and heating devices (heaters, radiators, steam pipes) to prevent warming and pressure build-up inside the containers.
With respect to these recommendations Methyl Chloride will be stable during storage for at least 6 months.

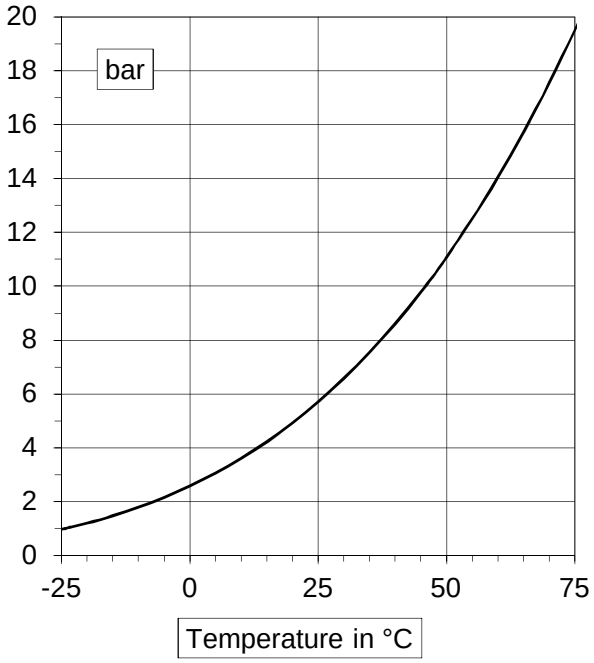
Filling levels of tanks and devices for storing pressure liquefied gases must not be filled above 95 % of the maximum tank volume at the highest temperature being allowed.

Technical Data and physical properties

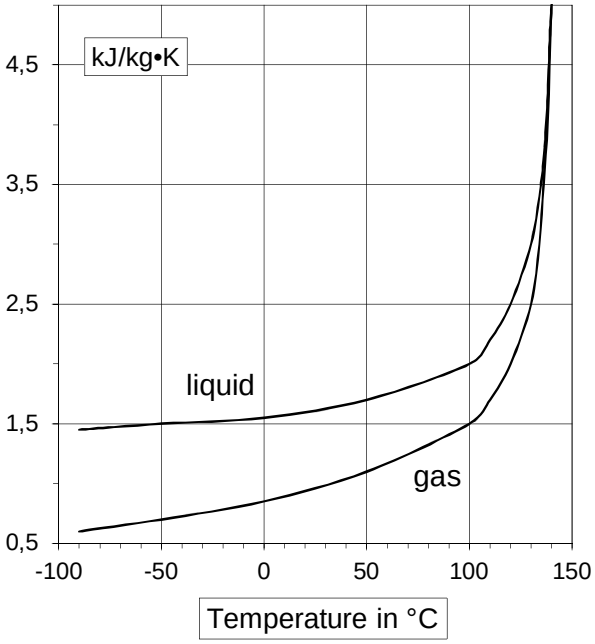
Density of liquid and gaseous methyl chloride at equilibrium vapour pressure



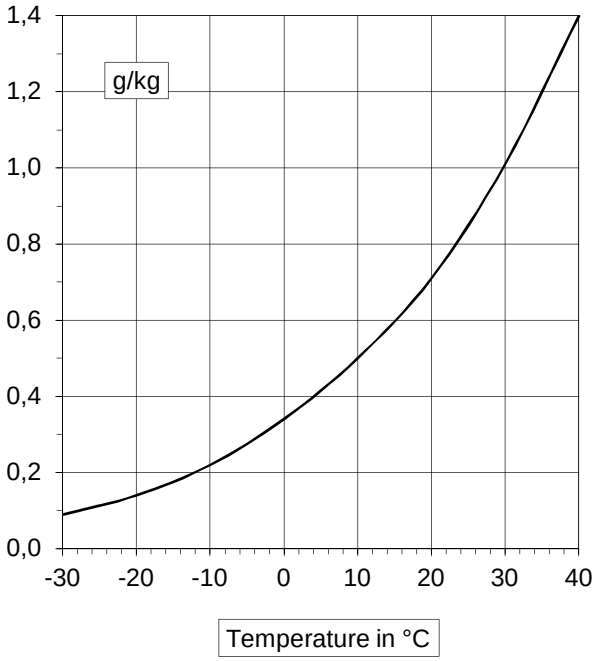
Gas pressure



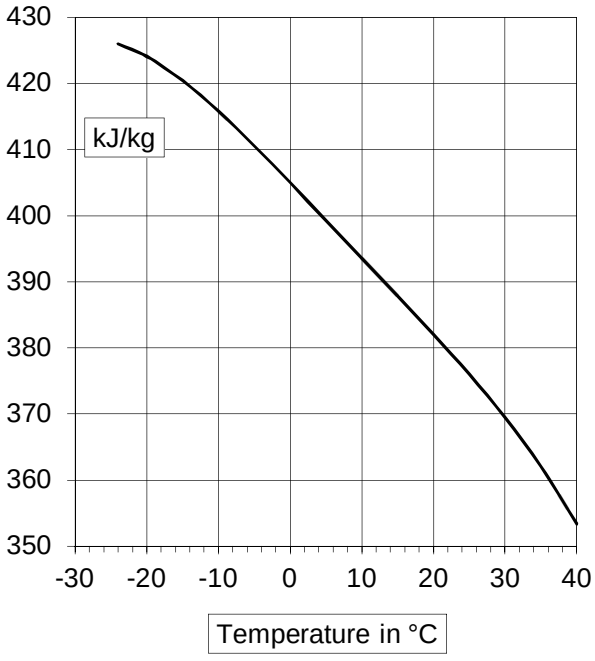
Heat capacity of gas and liquid



Solubility of water in liquid methyl chloride



Heat of evaporation



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