

Carbon Dioxide / CO₂ (Natural Refrigerant)

Carbon dioxide has a long history in refrigeration, extending well into the 19th century. It is a colourless gas that liquefies under pressure, with a slightly sour odour and taste. Carbon dioxide has no ozone depletion potential (ODP = 0) and negligible direct global warming potential (GWP = 1) when used as a refrigerant in closed cycles. It is non-flammable, chemically inert and heavier than air. Carbon dioxide is only narcotic and harmful to human health at very high concentrations. Because carbon dioxide has a lower critical temperature than other refrigerants, recent research has focused particularly on optimizing plant engineering, and more and more effective refrigeration plants are being developed to close this gap. Carbon dioxide is available in abundance, and there is no need for recycling or waste disposal.

Characteristics:

ODP	0
GWP	1
Appearance	colorless
Odor	slightly sour
Molecular weight	44.01 kg/kmol
State at 20 °C	gaseous
Triple point	-56.6 °C at 5.18 bar
Boiling point	-78.5 °C
Critical temperature	31 °C
Critical pressure	73.8 bar
Explosibility limit (in air)	n.a.
Ignition temperature	n.a.
Density, gaseous (15 °C, 1 bar)	1.85 kg/m ³
Relative density, gaseous (air = 1)	1.53
Density, liquid (-37.22 °C, 11.146 bar)	1,101.1 kg/m ³
Solubility in water (20 °C, 1 bar)	1,500 mg/l