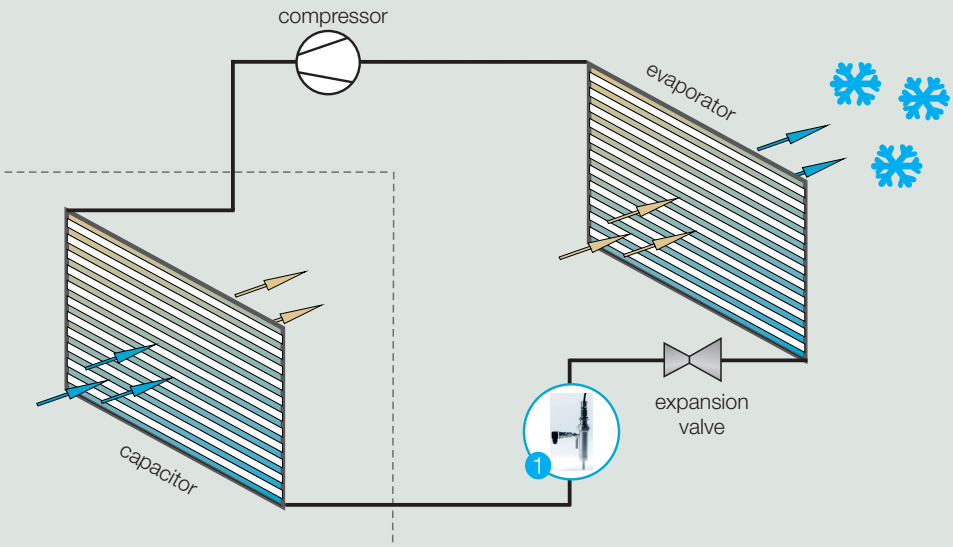
SensoTech
In liquids, we set the measure.



Measuring point	Installation	Measuring task
1	pipeline	monitoring of cooling circuit

Oil circulation ratio

Introduction

Compressor-based cooling systems are often used in air-conditioning. Within these systems, there are circulating refrigerants such as R134a, R1234yf or CO_2 that are ideal as a heat transfer medium due to their thermodynamic properties. In addition, to the refrigerants, refrigerator oils can also be found in the cooling circuit to lubricate the compressor.

Depending on the type and use of the cooling system, there are a variety of combinations of oils and refrigerants. Whereas a high percentage of oil is for a good lubrication, it also reduces the efficiency of the cooling system. Therefore, the aim is a perfect mixture of oil and refrigerant.

The LiquiSonic® measuring technology monitors the concentration of the oil in the cooling circuit. Moreover, the measurement include temperature and pressure to provide a compensated measuring result.

Application

Cooling systems consist of four main components:

- expansion valve
- evaporator
- compressor
- capacitor

In the cooling circuit, the gaseous refrigerant (R134a or R1234yf) is compressed and condensed by a compressor. The pressure and the temperature increase strongly. The heated refrigerant is then passed through the capacitor, where the heat is extracted. The capacitor is outside the passenger compartment.

The expansion valve reduces the high-pressure of the liquid. Thereby, the refrigerant is evaporated completely and releases the cold in the evaporator to the environment. For example, in the car the evaporator is located in the passenger compartment. On the low pressure side, the gaseous refrigerant regresses to the compressor where the circuit starts all over again.

Customer benefits

Based on the sonic velocity measurement, the LiquiSonic® 30 analyzer enables a highly precise determination of the oil concentration in the cooling circuit and of the temperature as well. This affects the following aspects positively:

- optimum heat transfer in the evaporator and capacitor
- maximum enthalpy of vaporization of the refrigerant
- prevention of unintended increase in temperature at the compressor caused by viscosity increasing

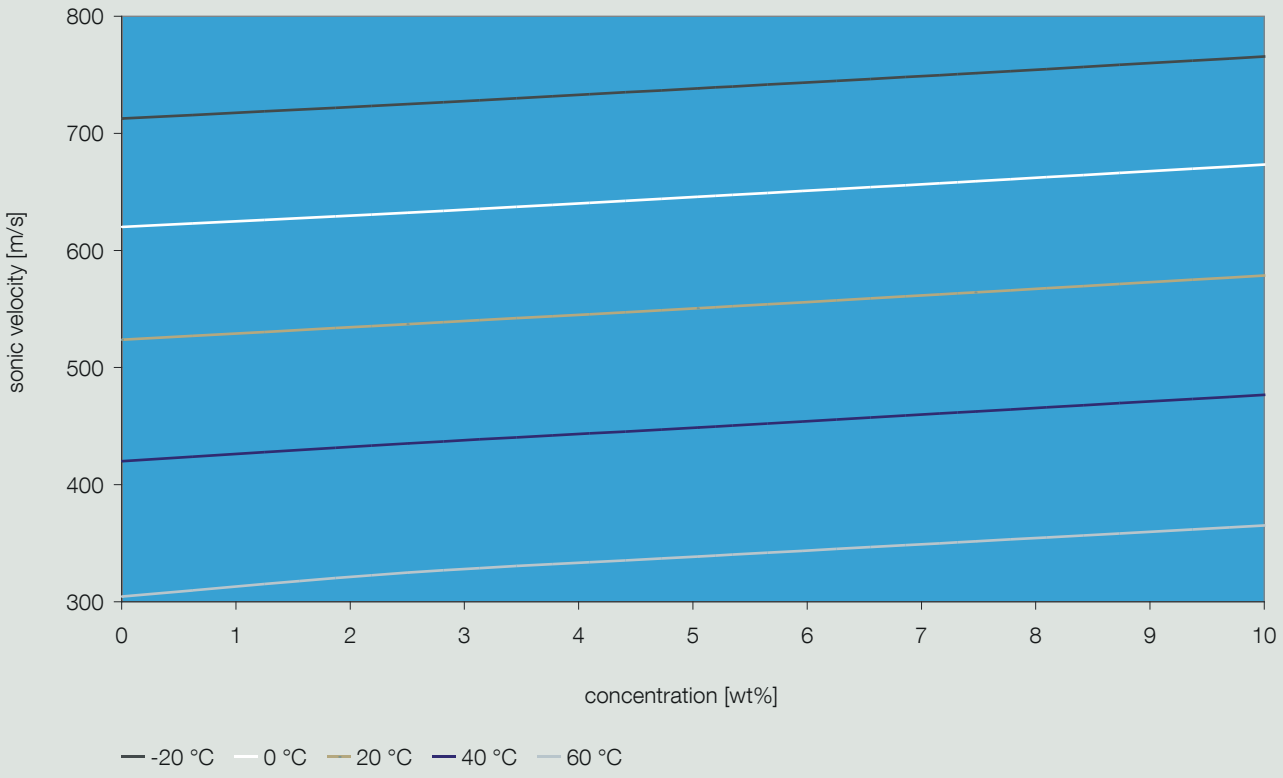
The continuous monitoring of the oil content in the refrigerant places high demands on the analysis. Since the refrigerant is gaseous at ambient pressure gaseous, manual sampling and offline analysis is almost impossible.

The inline measurement of temperature-compensated and pressure-compensated oil concentration guarantuees process safety and makes an resource-efficient handling of the expensive refrigerant oil and a high qualtity assurance with complete documentation of the measuring results possible.

Specifications

concentration range of refrigerant	0 to 20 wt%
temperature range	-30 to 90 °C
sensor installation	in a DN10 pipeline upstream of the expansion valve
refrigerator oil	Plantelf PAG 244 ND8, ND11, ND12, PAG, POE, RB74, RFL-100x, DH-PS, HD100, 4GS
refrigerant	R22 R32 R125 R134a R143 R245fa R407C R410A R744 (CO_2) R1234yf

Oil (ND11) in refrigerant R134a



LiquiSonic® 30 OCR analyzer

	21001311 LiquiSonic® Controller 30 V10
BUS	21004435 BUS connection: Profibus DP
	21010139 Immersion sensor V10 24-08, NPT 1“, PN40, V150, separated housing
	21004725 pressure transmitter 0 - 25 bar abs.
	21004704 T-adapter for refrigerant measurement NPT 1“ PN40
	21004202 bus cable indoor (100 m)
	21004449 Network integration
	21007841 Calibration certificate

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