VECTOR >

Option Thermodynamic State Charts

Product Information

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Valid for CANape and vSignalyzer as of version 25.0 and for vMeasure as of version 11.0

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1. Overview

1.1 Introduction

During the development and testing of all types of air conditioning and cooling systems, physical variables such as pressure and temperature are recorded at the test bench or test vehicle – usually together with other measured signals and internal controller values. To evaluate the system configuration and the employed components and coolants, engineers working in the field of air conditioning technology need specific ways of visualizing and evaluating thermodynamic data.

With the option Thermodynamic State Charts for CANape, vSignalyzer and vMeasure, you can now analyze thermodynamic data synchronized with other measured data – both online* and offline. Generate highly informative state charts to visualize the cycle, and calculate thermodynamic variables such as enthalpy, density or vapor quality directly as signals using functions from the function library.

* = Online analysis only possible with CANape and vMeasure

1.2 Overview of Advantages

> Many different possible configurations for the individual design of the state chart types that are available for selection.
> Selection of thermophysical properties from the extensive TILMedia materials library from the specialist TLK-Thermo permit the use of both real gases and mixtures.
> Online calculation of the state charts and consequently also individual adaptation of the isolines

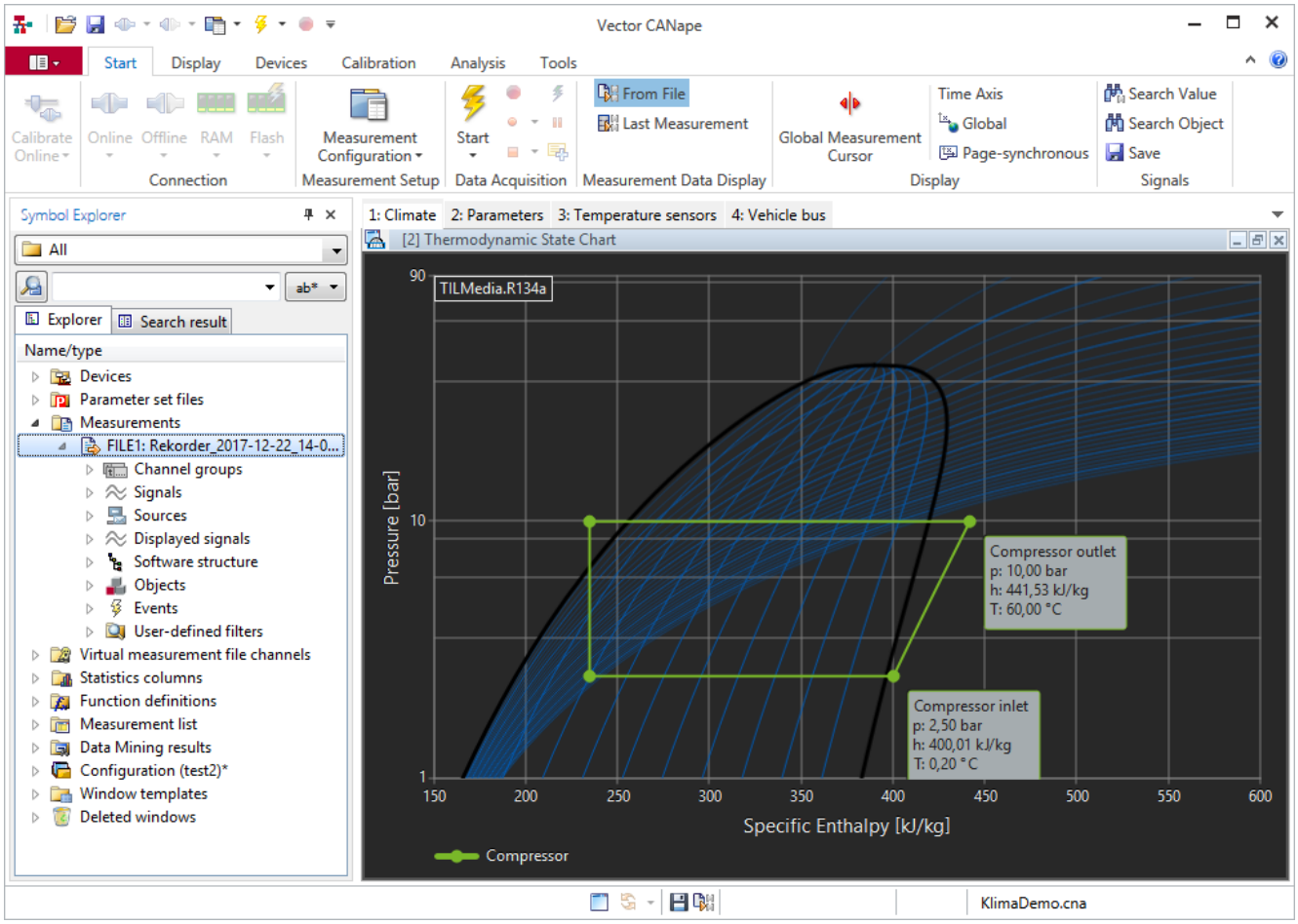


FIGURE 1: Professional display of thermodynamic state charts

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1.3 System Requirements

The option Thermodynamic State Chart is supported as of:

> CANape version 25.0
> vMeasure version 11.0
> vSignalyzer version 25.0

1.4 Further Information

Various documents are available on the web for CANape, vMeasure and vSignalyzer. In addition, you will find further valuable expertise in the form of specialist articles and application notes. For more information, visit the Vector Download Center.

2. Functions

The option Thermodynamic State Charts makes it possible to generate individually designed thermodynamic state charts in just a few clicks. These simplify the online analysis of automotive cooling cycles, for example.

You can choose between the following types of charts:

> Pressure-enthalpy (ph)
> Pressure-specific volumes (pv)
> Pressure-temperature (pT)
> Temperature-enthalpy (Th)
> Temperature-entropy (Ts)

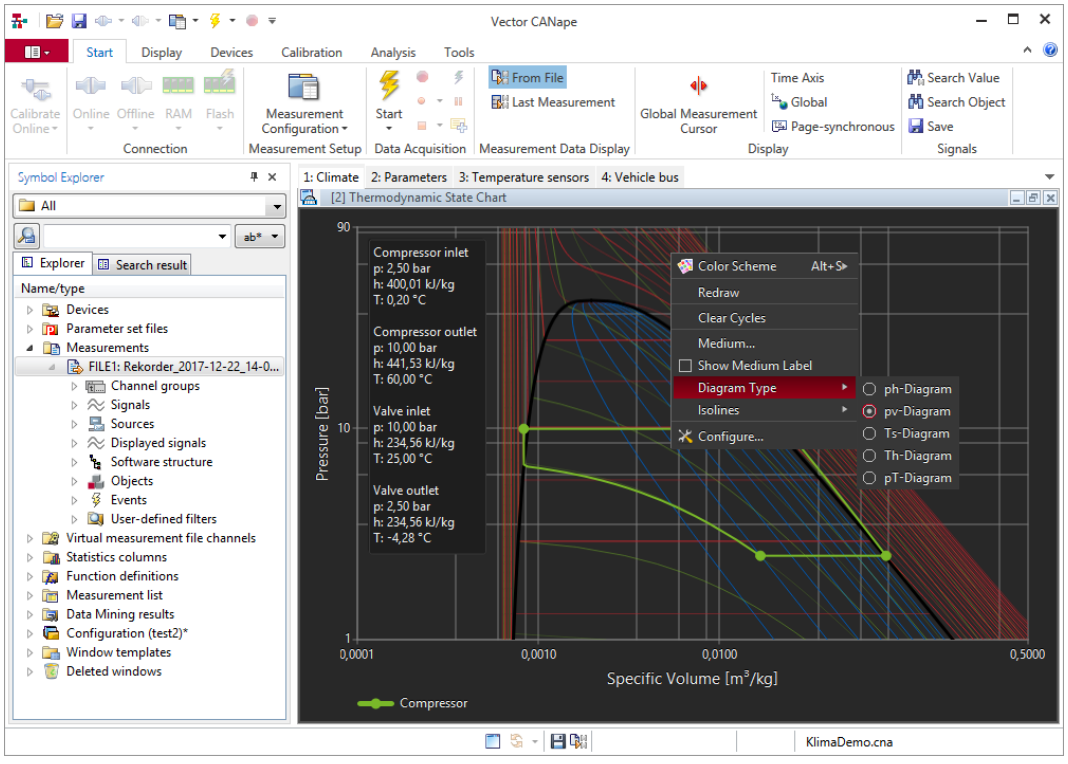


FIGURE 2: Switch between different chart types at a single click

When configuring your chart, you can choose from a wide range of materials and even mixed materials are possible. The variables that are relevant for the displayed state chart are calculated from the measured signals, for example for temperature and pressure, based on the material data. It is possible to determine missing cycle reference points.

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3. Calculating Thermodynamic Variables

In addition to the graphical display in state charts, thermodynamic variables can also be calculated directly as signals. For this purpose, the function library provides a set of predefined functions in the folder Thermodynamics. Based on the selected material data, these functions calculate the desired variables from measured signals such as pressure and temperature.

The results are available as virtual signals. They can be displayed in any measurement window, analyzed together with other measured data and used as input for further calculations.

The following functions are available:

- **Density**: Density of the medium
- **Enthalpy**: Specific enthalpy of the medium
- **Entropy**: Specific entropy of the medium
- **MoistAirDensity**: Density of moist air
- **MoistAirDewTemperature**: Dew point temperature of moist air
- **MoistAirEnthalpy**: Specific enthalpy of moist air
- **MoistAirEnthalpyByHumidityRatio**: Specific enthalpy of moist air based on the humidity ratio
- **MoistAirHumidityRatio**: Humidity ratio (water content) of moist air
- **PhaseTransition**: Properties of the medium at the phase transition
- **SaturationTemperatureDifference**: Difference between the current temperature and the saturation temperature, e.g. to determine superheating or subcooling
- **Temperature**: Temperature of the medium
- **VaporQuality**: Vapor quality in the two-phase region

4. Training

Our training program includes various training courses and workshops for CANape and vSignalyzer, both in our seminar rooms and on-site at the customer's premises.

You will find more information on the individual training events and dates on the web at: www.vector-academy.com

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