Automation System TROVIS 5400

District Heating Controller TROVIS 5476

On-off or three-step controller designed for wall or panel mounting (dimensions of front frame: 144 mm x 96 mm)

Application

Self-optimizing, weather-sensitive flow temperature control in hot water heating systems and hot water temperature control incorporating two control loops · District heating controller with variable return flow temperature limitation · Allows communication with a management system.

The TROVIS 5476 District Heating Controller is a modern weather-sensitive controller which is capable of calculating the ideal heating curve from the measured room temperature. This means it is no longer necessary to set the heating curve manually. Furthermore, the controller can be used for optimizing the heating in periodically used buildings. It is provided with an adaptive algorithm for determining the building's thermal characteristic from the measured temperatures and calculating the optimum switch-on and switch-off times of the heating system.

Special features:

- Water heating from either the primary circuit or secondary circuit (priority circuit)
- Outdoor temperature can also be applied as 4(0) to 20 mA current signal
- Storage temperature sensor, optionally interchangeable with a storage thermostat
- Variable return flow temperature limitation with respect to the outdoor temperature
- Minimum and maximum flow temperature limitation
- 365-day clock providing three integral schedules and automatic summertime/wintertime changeover
- Optional connection of a room sensor with set point correction option and mode selector switch
- RS-485 interface for communication with a bus system, or RS-232 interface for communication with a modem
- Option: Meter bus-master module for communication with a maximum of three calorimeters

Version

TROVIS 5476 (Fig. 1) · District heating controller with RS-232 or RS-485 interface

Option: Meter bus-master module

TROVIS® Electronics from SAMSON

Fig. 1 · TROVIS 5476 District Heating Controller

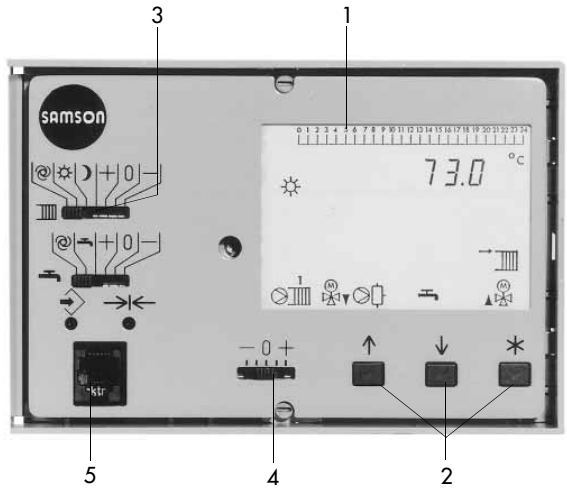

Fig. 2 · Operator controls

1 LC- Display
2 Operator keys
3 Mode selector switch
4 Set point adjuster
5 Connecting socket for memory module

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Data Sheet **T 5476 E**

Inputs and outputs (Fig. 3)

Input and output assignments of the district heating controller are determined by the entered system code number (see Figs. 8 and 9).

The district heating controller has two fixed sensor inputs for flow and outdoor temperature measurement.

In addition, it features 8 configurable inputs which can be configured for both, maximum 7 temperature sensors (PTC and Pt100 or NTC and Pt 100) and binary inputs. A potentiometer, 1 to 2 kΩ, for example, or a room sensor with set point correction option and mode selector switch (e.g. Type 5244) can be connected to one of these inputs.

A calorimeter output signal that is proportional to the measured volume flow rate or quantity of heat may be applied to a pulse-counting or current input, enabling maximum and/or minimum volume flow or maximum heat output limitation.

Calorimeters can be easily connected to the controller by using the meter bus-master module. With this module, it is possible to connect a maximum of three calorimeters according to CEN TC 176 for data transmission. One of these calorimeters – provided that it provides high-resolution measurement – can be used to limit the volume flow rate and/or heat output, as well as creeping amounts of volume flow. In this case, different limits for volume flow and/or heat output are adjustable for each of the services "heating control", "hot water preparation" and "heating control and hot water preparation".

When connected to actuators with a transit time of 15 to 240 s, the district heating controller features PI behaviour according to the adjusted parameters.

In addition, it controls the heating circulation pump, the storage charging pump and the circulation pump. The rotational speed of a correspondingly equipped pump can be controlled when the pump is connected to one of the two transistor outputs.

Adaptation of the controller's characteristic heating curve

This district heating controller provides the option of automatically adapting the heating curve to the required system conditions, provided that a room temperature sensor is connected. The program determines the correlation between flow temperature and measured outdoor temperature with respect to the room temperature. Minimum or maximum flow temperature limitation is supported.

Manual setting of the characteristic heating curve (Figs. 4 and 5)

The heating curve may also be set manually. In this case, the relationship between flow temperature and measured outdoor temperature is to be determined first by entering a corresponding gradient value (see Fig. 4). Then, the minimum and maximum flow temperature limits are to be entered. If required, a parallel displacement of the heating curve is possible. In this case, the flow temperature limit values are not changed.

The return flow temperature characteristic (Fig. 5) is also determined by entering the following: a corresponding gradient value, the maximum and minimum limits and, if necessary, a parallel displacement of the curve.

The heating curve may also be set manually via four coordinates. In this case, any four flow temperature values t_V in the range from 20 to 120 °C, as well as outdoor temperature values t_A in the –20 to 50 °C range are to be entered. In addition, a maximum and minimum flow temperature limit value may be entered.

The return flow temperature characteristic can also be entered via four coordinates as the heating curve.

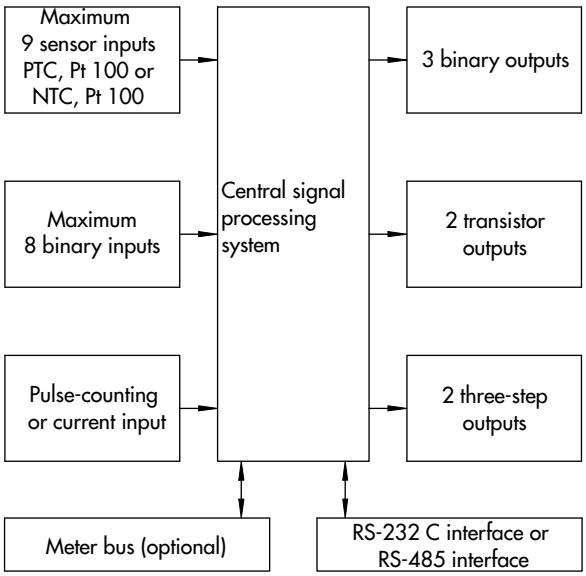


Fig. 3 · Hardware design

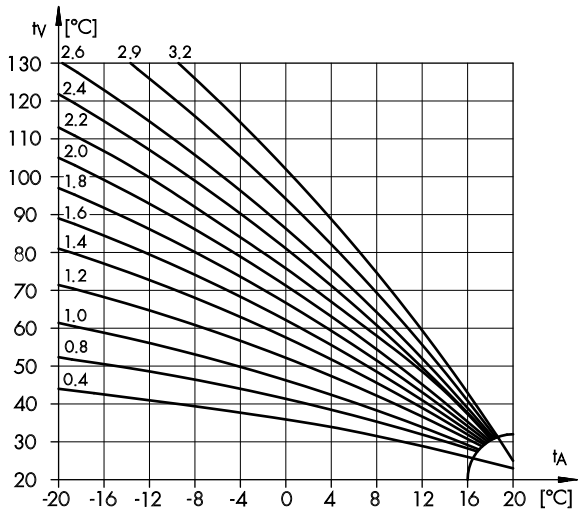


Fig. 4 · Family of characteristic heating curves

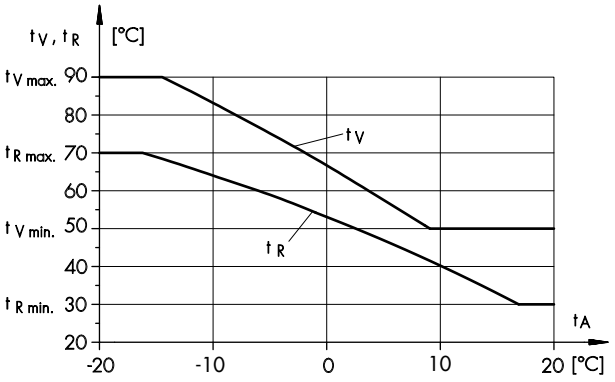


Fig. 5 · Weather-sensitive flow temperature control with variable return flow temperature limitation

Optimizing switch-on and switch-off times (Figs. 6 and 7)

The district heating controller implements a program for optimizing the switch-on and switch-off times of the heating system in periodically used buildings.

Energy consumption depends on four factors:

1) period of energy supply,
2) difference between room and outdoor temperature,
3) building's thermal characteristic, and
4) the properties of the heating of the building.

The controller determines the building's thermal characteristic and dynamic behaviour of the heating system from the succession of room and outdoor temperature measurement over a certain period of time. This data is used to calculate the latest possible switch-on time T_E in order to achieve minimum energy consumption.

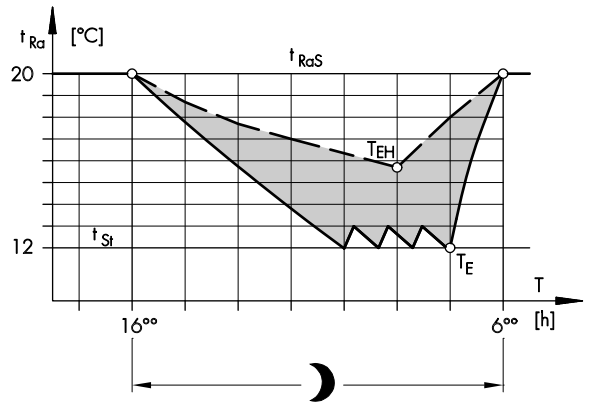


Fig. 6

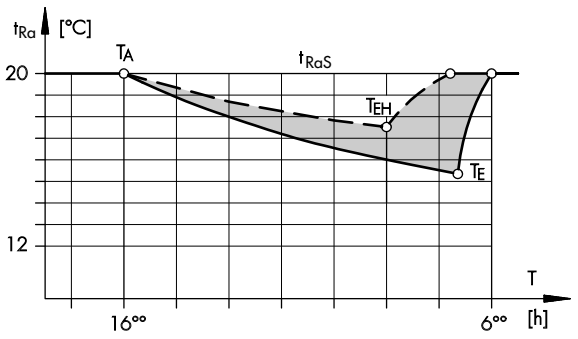


Fig. 7

– – – Without optimization program
—— With optimization program

Figs. 6 and 7
Temperature characteristic of heating controllers with and without optimization program
Fig. 6 · With high heat demand (low outdoor temperature)
Fig. 7 · With average heat demand (average outdoor temperature)

During unoccupied periods, the controller monitors the system and switches on the heating whenever the temperature falls below the sustaining temperature t_{St} (stand-by operation).

Operation (Fig. 2)

Data input and interrogation is to be carried out via three keys. This is supported by symbols displayed on the LCD panel.

To select the parameterizing mode, press ➔ button. Subsequently, the ↑ and ↓ key must be pressed simultaneously to select the configuration mode. The district heating controller is controlled by a program which has to be adapted to the actual system in which the controller is used by entering a system code number. The code number selected should correspond to one of the standard system configuration diagrams documented in the "Mounting and operating instructions". Any further sensors and/or functions that are not contained in the standard system configuration must be chosen later by setting certain function blocks.

All data such as time, date, heating curve, set points, time intervals for occupied periods are to be entered when the controller is in the parameterizing mode. By pressing the ⇥⇤ button, all parameters are reset to their default values.

To prevent parameters for return flow temperature and, if necessary volume flow rate and heat output from being changed, these are protected against unauthorized users by means of a code number.

A switch with five switch positions (4) is used to correct a set point.

The mode selector switch (3) is used to select the operating mode and to switch to manual operation of the control valve. Optional switch positions are:

Heating circuit:

⟲	Time-based operation with changeover between nominal and reduced or stand-by operation
☼	Nominal operation
☽	Reduced or stand-by operation

Hot water circuit:

⟲	Time-based operation with disconnection of the hot water circuit
▬	Nominal mode; heating circuit switched off

Manual operation:

+	Valve opens
0	Valve stationary
–	Valve closes

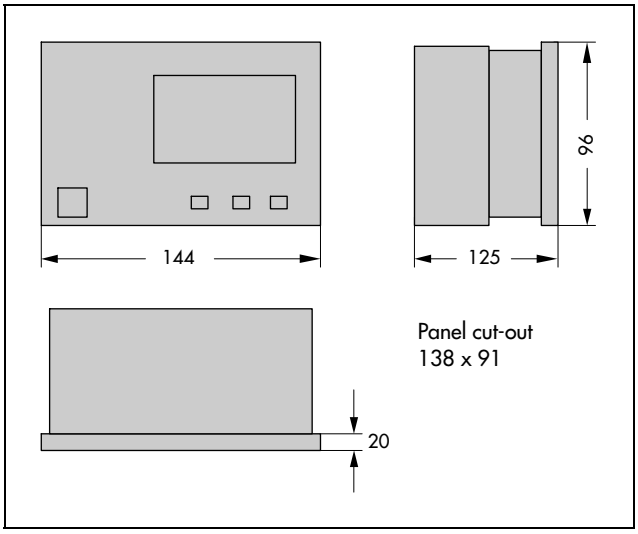
Legend to Figs. 4 to 7

t_V	Flow temperature
t_A	Outdoor temperature
t_R	Return flow temperature
…min	Minimum t_A or t_R
…max	Maximum t_A or t_R
t_{Ra}	Room temperature
t_{RaS}	Room temperature set point
t_{st}	Sustaining temperature
T	Time
T_{EH}	Changeover time without optimization program
T_A, T_E	Switch-off and switch-on time with optimization program

Technical data

Inputs	Depending on the system code number selected 1 outdoor temperature sensor (on option also 4(0) to 20 mA) 1 flow temperature sensor 8 configurable inputs for either: – Maximum 7 temperature sensors (PTC and Pt100 sensors or NTC and Pt 100) –1 potentiometer, 1 to 2 kΩ, or room sensor with set point correction option and mode selector switch – Maximum 8 binary inputs (1 for storage thermostat instead of storage sensors) 1 pulse-counting or current input 4(0) to 20 mA for limitation of the volume flow rate or heat output
Outputs	Depending on the system code number selected
Output signal y	Three-step signals: Max. load 250 V~, 3 A On-off signal: Max. load 250 V~, 3 A
Binary outputs	3 outputs for pump control; max. load 250 V~ 3 A; 2 transistor outputs for controlling the rotational speed of circulation pumps
Interfaces	RS-485 interface for connection to a four-wire bus or RS-232 C interface for connection to a PC or modem Modbus RTU protocol, data format 8N1 (8 data bits, 1 stop bit, no parity bit), AT-instruction set for communication via modem Connection via Modular Plug and Modular Jack
Optional	Interface for meter bus
Control parameters	K_p = 0.1 to 50; T_n = 1 to 999 s Transit time 15 to 240 s
Power supply	230 V, 48 to 62 Hz, power 3 VA
Ambient temperature	Permissible: 0 to 50 °C
Degree of protection	IP 40
Interference-suppressed	According to VDE 0875 with connection of SAMSON Type 5821/5822 and Type 5801/5802 Actuators
Weight approx. kg	0.6

Dimensions in mm



Electrical connection and mounting

The controller consists of a controller housing containing the electronic components and a separate terminal board used for the electric connection. Two wires of max. 1.5 mm^2 can be connected to each terminal. The sensor connection lines must be installed separated from the output relay lines. For wall mounting, the terminal board must be fastened to the wall using screws. After having made all electrical connections, the controller housing must be plugged onto the terminal board and secured with one screw. For panel mounting, two mounting straps which can be swung-out using a screw driver are available for securing the controller.

Ordering text

District Heating Controller TROVIS 5476
with RS-232 or RS-485 interface

Option: Meter bus-master module

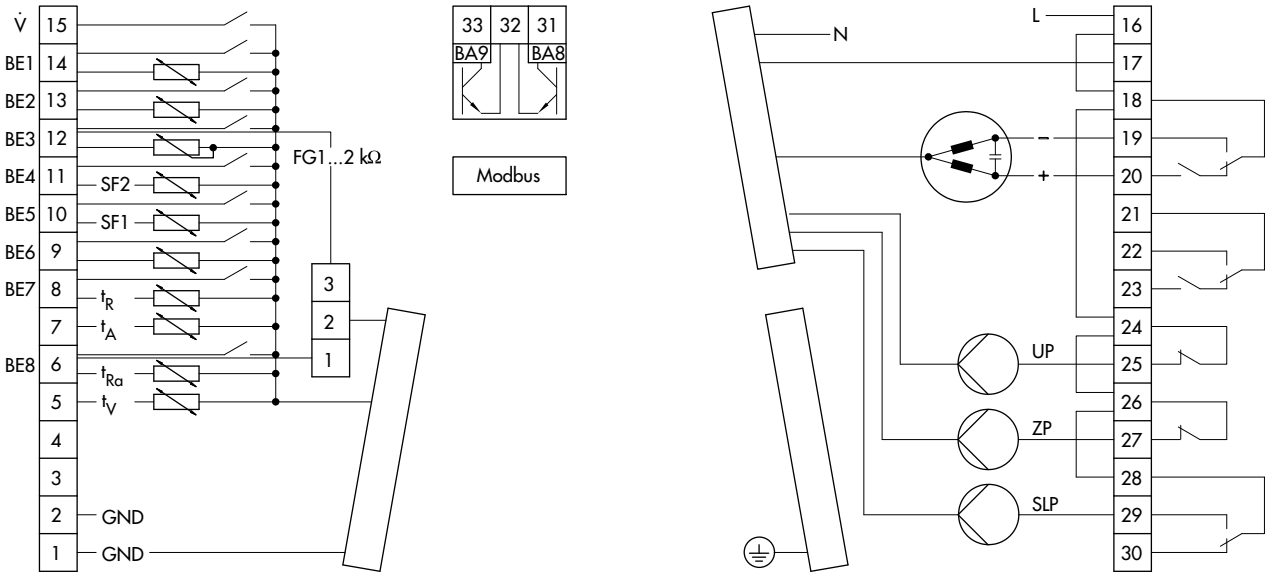


Fig. 8 · Terminal assignment corresponding to system code no. 2

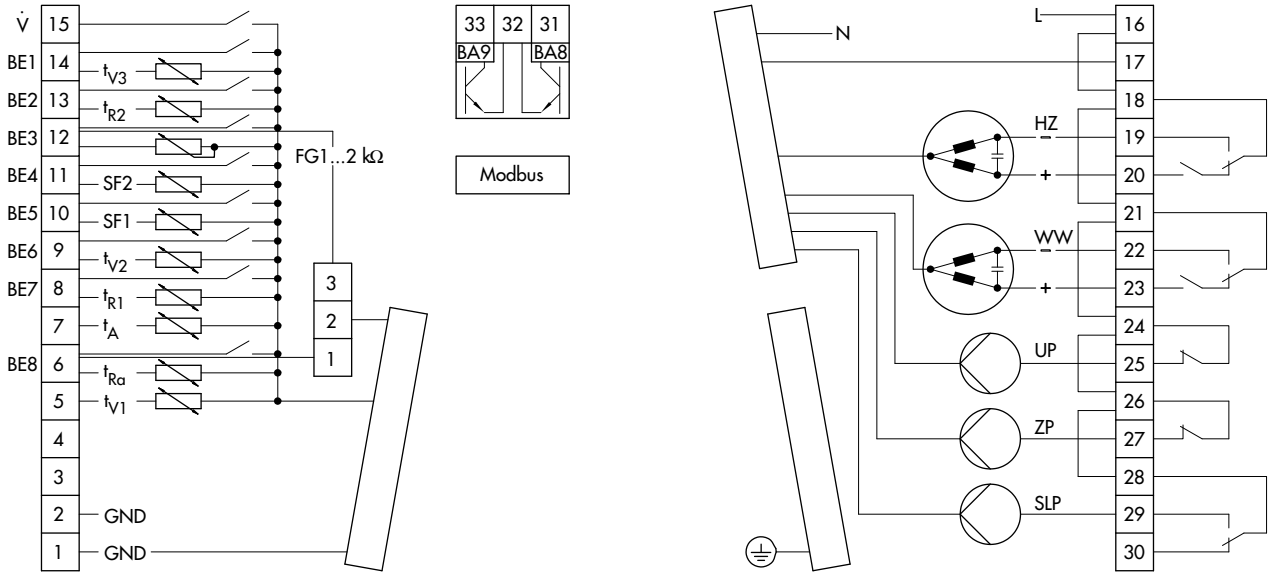


Fig. 9 · Terminal assignment corresponding to system code no. 5

V̇	Volume flow rate/heat output limitation
BE	Binary input
SF	Storage sensor
t_R	Return flow temperature sensor
t_A	Outdoor temperature sensor
t_{Ra}	Room temperature sensor
t_V	Flow temperature sensor
HZ	Heating circuit
WW	Hot water circuit
UP	Heating pump
SLP	Storage charging pump
ZP	Circulation pump
FG	Remote sensor

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