TROVIS 5400 Automation System

TROVIS 5476 Heating and District Heating Controller

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-compensated flow temperature control in heating and domestic hot water systems incorporating two control loops · Incorporation of a solar collector loop possible · Variable return flow temperature limitation · Communication with a control system · Optional meter bus interface

The TROVIS 5476 Heating and District Heating Controller is a modern weather-compensated controller which is capable of calculating the ideal heating characteristic from the measured room temperature. This means it is no longer necessary to set the heating characteristic 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:

- Domestic hot water system from either the primary loop with three-step output or from the secondary loop
- Differential temperature control for solar-supported heating of the hot water storage tank in five systems
- Inputs for connection of maximum seven PTC and Pt 100 sensors, or seven Pt 1000 and Pt 100 sensors, or seven NTC and Pt 100 temperature sensors
- Outdoor temperature can also be applied as current signal: 4(0) to 20 mA = –20 to 50 °C
- Storage tank temperature sensor can be replaced by a storage tank thermostat
- Variable return flow temperature limitation based on the outdoor temperature
- Minimum and maximum flow temperature limitation
- 365-day clock with three time programs and automatic summertime/wintertime changeover
- Optional connection of a room panel with set point correction option and mode selector switch
- Connection to Modbus is possible
- RS-485 interface for communication with a four-wire bus system, or RS-232 interface for communication with a modem
- Option: Meter bus interface for communication with a maximum of three calorimeters

Version

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

Option: Meter bus interface

TROVIS® Electronics from SAMSON

Fig. 1 · TROVIS 5476

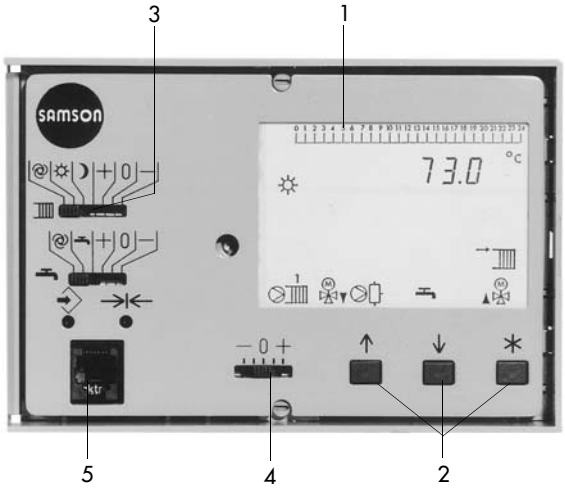


Fig. 2 · Operator controls

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

Edition July 2003

Data Sheet T 5476 EN

Inputs and outputs (Fig. 3)

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

The heating and 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 Pt 100 and Pt 1000 or NTC and Pt 100) and binary inputs. A potentiometer, 1 to 2 kΩ or a room panel (Type 5244/PTC or Type 5257-5/Pt 1000) 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 interface which enaables a maximum of three calorimeters according to EN 1434-3 to be connected 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", "domestic hot water system" and "heating control and domestic hot water system". A variable limitation based on the outdoor temperature is possible in the heating circuit.

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

In addition, it controls the heating circulation pump, the storage tank charging pump, the circulation pump and, if applicable, the heat exchanger charging pump and/or the solar circulation pump. The rotational speed of a correspondingly equipped pump UP1 can be controlled when the pump is connected to the two reed relay outputs (pump management function).

Adaptation of the controller's heating characteristic

This heating and district heating controller provides the option of automatically adapting the heating characteristic 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 dependent on the room temperature. Minimum or maximum flow temperature limitation is supported.

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

The heating characteristic 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 characteristic 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 characteristic. The heating characteristic 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.

As the heating characteristic, the return flow temperature characteristic can also be entered via four coordinates.

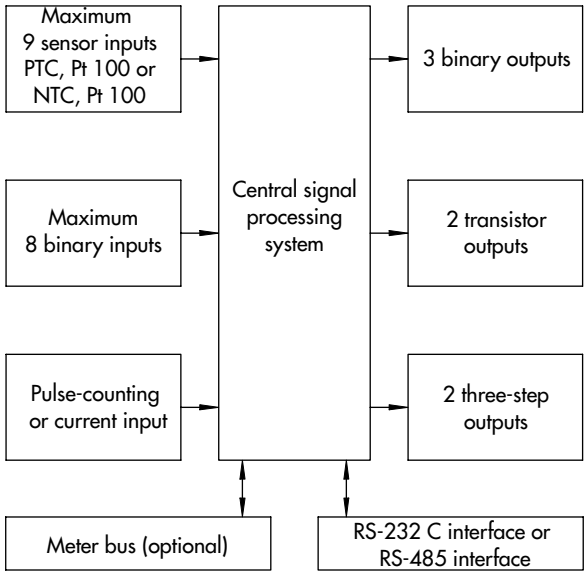


Fig. 3 · Hardware design

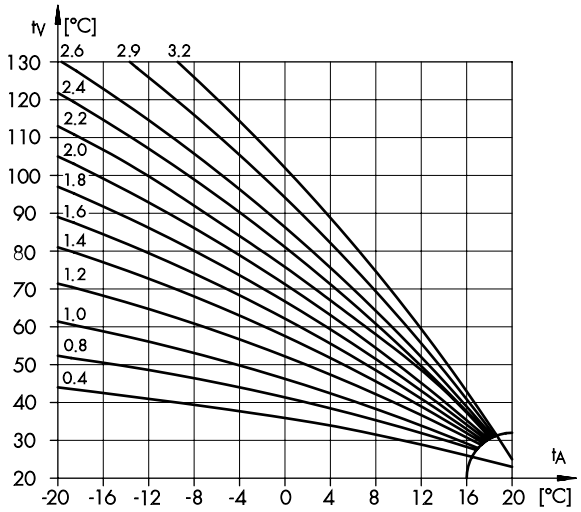


Fig. 4 · Family of heating characteristics

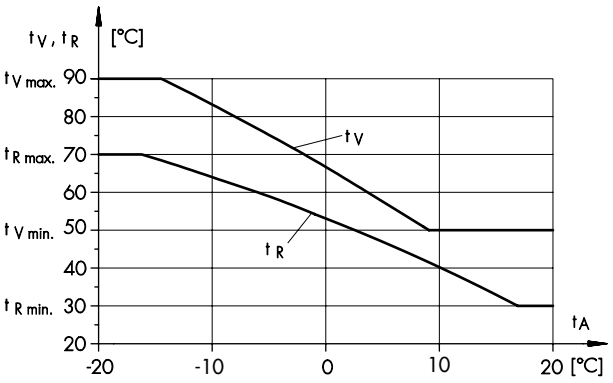


Fig. 5 · Weather-compensated flow temperature control with variable return flow temperature limitation

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

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

Energy requirement depends on the period of energy supply, the difference between room and outdoor temperature, the building's thermal characteristic, and the properties of the heating of the building. The controller determines the building's thermal characteristic and dynamic behavior 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 precise switch-on time T_E required to achieve the room temperature required.

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).

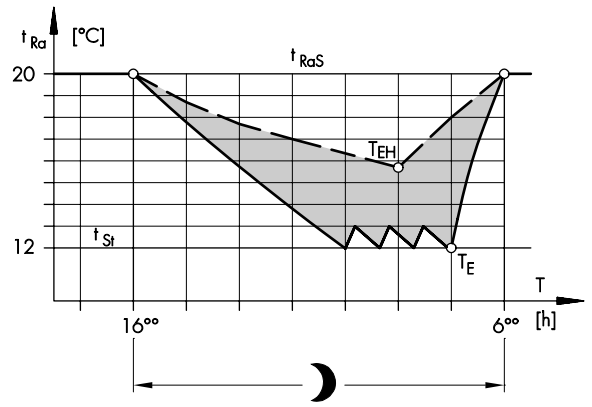


Fig. 6

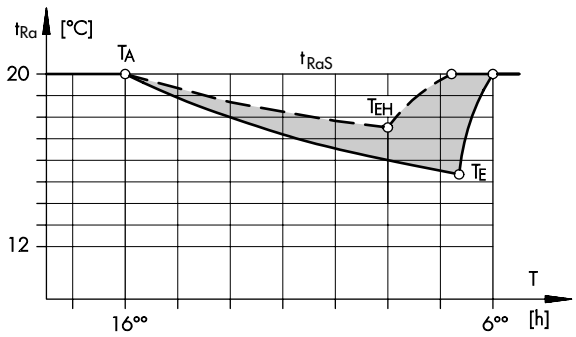


Fig. 7

– – – 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)

Operation (Fig. 2)

Three keys are used to input as well as retrieve data. Symbols displayed on the LCD support the user.

To access the parameterization level, press ➔ button. Subsequently, the ↑ and ↓ keys must be pressed simultaneously to select the configuration level. The heating and district heating controller is controlled by a program which is 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 characteristic, set points, time intervals for occupied periods are to be entered when the controller is in the parameterization level. 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, they are protected by 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 or to switch to manual operating mode of the control valve. Optional switch positions are:

Heating circuit:

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

Hot water circuit:

⟲	Time-based operation of the hot water circuit
🚿	Time-based operation of the hot water circuit, 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 Pt 1000 and Pt 100 or NTC and Pt 100) –1 potentiometer, 1 to 2 kΩ, or room panel – 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~, 2 A; min. 250 V~, 10 mA On-off signal: Max. load 250 V~, 2 A; min. 250 V~, 10 mA
Binary outputs	3 outputs for pump control; max. load 250 V~ 2 A; min. 250 V~, 10 mA 2 reed relay outputs for UP1 pump management function; max. load 24 V, 100 mA
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 connector/plug
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~ (+10 %, -15 %), power 3 VA
Ambient temperature	Operation: 0 to 40 °C Storage: -20 to 60 °C
Degree of protection	IP 40 according to IEC 529
Class of protection	II according to VDE 0106
Degree of contamination	2 according to VDE 0110
Overvoltage category	II according to VDE 0110
Humidity rating	F according to VDE 40040
Noise immunity	According to Part 1 EN 50082
Noise emission	According to Part 1 EN 50081
Weight approx. kg	0.6

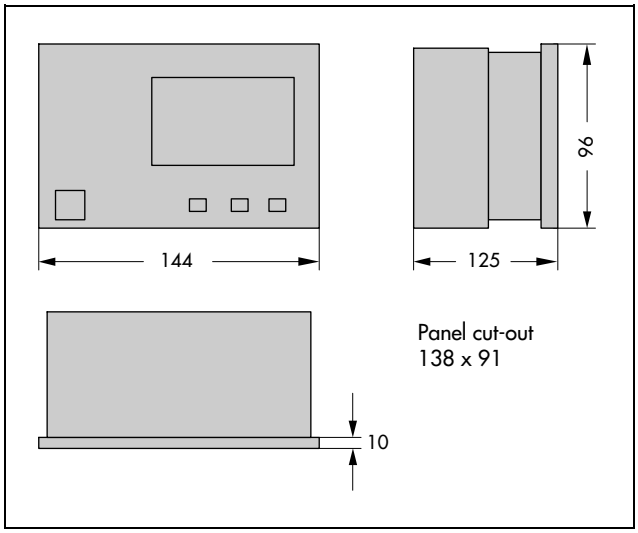
Electrical connection and mounting

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

TROVIS 5476 Heating and District Heating Controller
with RS-232 or RS-485 interface
Option: Meter bus interface

Dimensions in mm



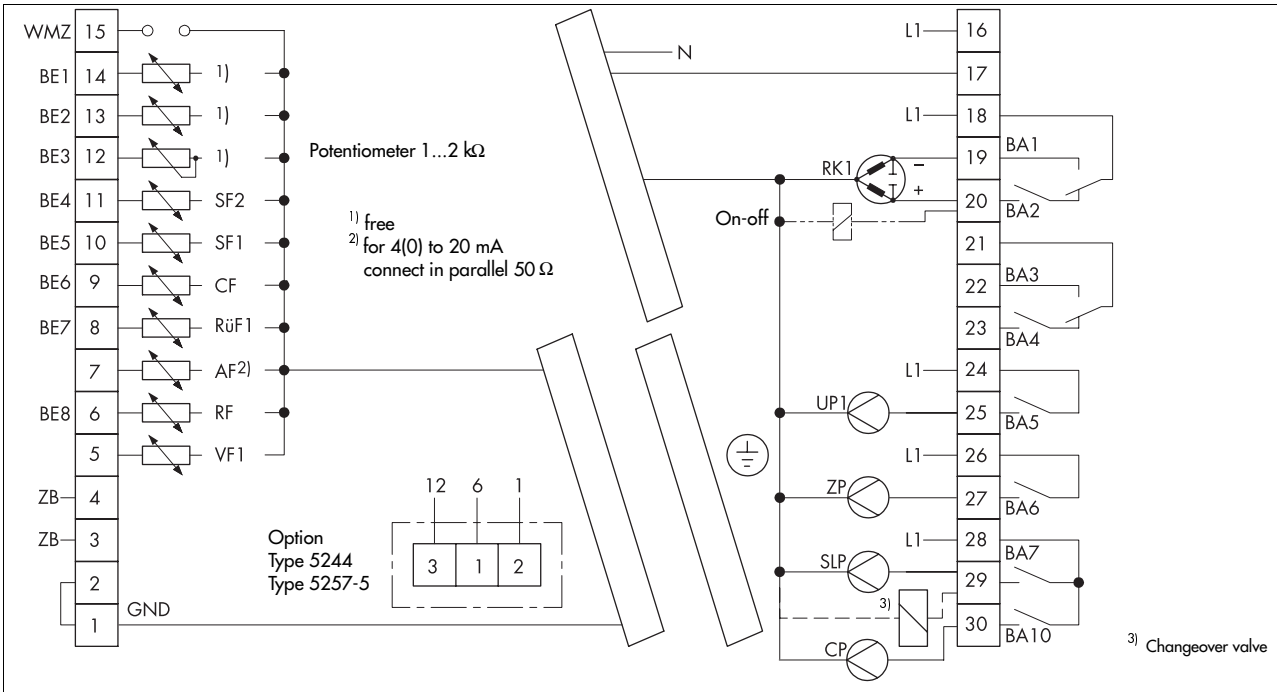


Fig. 8 · Terminal assignment for system code no. 2

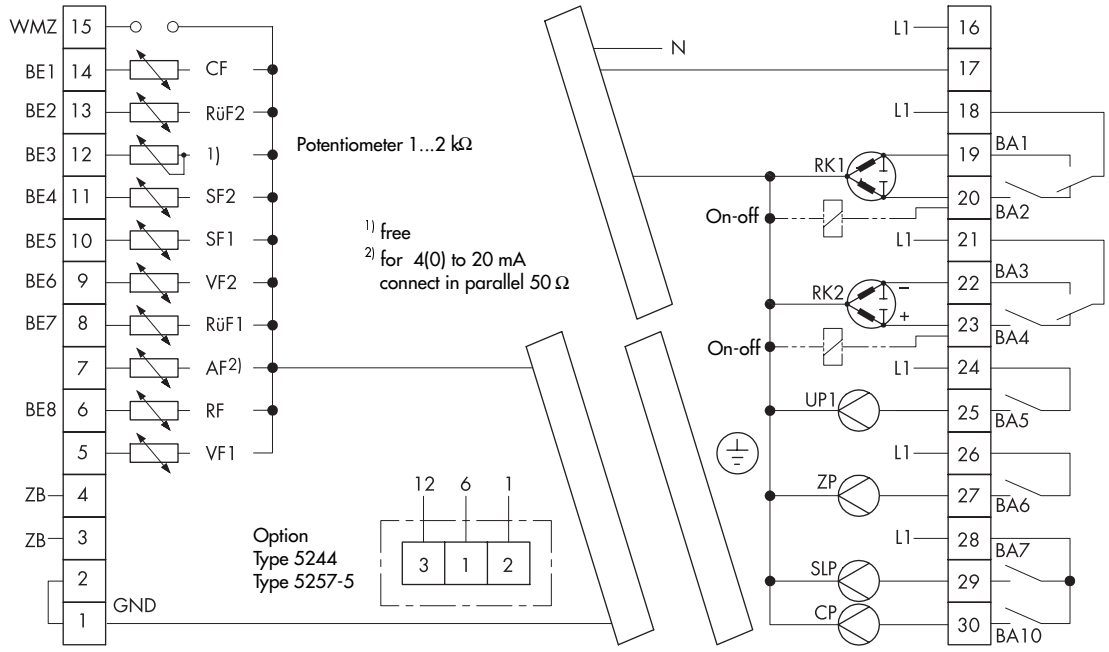


Fig. 9 · Terminal assignment for system code no. 5

AF	Outdoor temperature sensor	RK	Control loop	UP	Heating circulation pump
BE	Binary input	RüF	Return flow temperature sensor	VF	Flow temperature sensor
CF	Collector sensor for solar loop	SF	Storage sensor	WMZ	Calorimeter connection
CP	Solar circulating pump	SLP	Storage charging pump	ZB	Meter bus-master module (Option)
GND	Ground input signals	TLP	Heat exchanger charging pump	ZP	Circulation pump
L + N	Power supply	TWF	Hot water circuit sensor		
RF	Room temperature sensor				

SAMSON AG · MESS- UND REGELTECHNIK
Weismüllerstraße 3 · 60314 Frankfurt am Main · Germany
Phone: +49 69 4009-0 · Fax: +49 69 4009-1507
Internet: http://www.samson.de