COLD TRAP
and
TEMPERATUR CONTROLLER

KF-24/6B
KF-18/2B
MGK-1B

TR-KF-24
TR-KF-18

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Coldtrap new-3.doc

Heinz Walz GmbH • Eichenring 6 • 91090 Effeltrich • Germany
Phone +49-(0)9133/7765-0 • Fax +49-(0)9133/5395
E-Mail info@walz.com • Internet www.walz.com

CONTENT

1 Safety Instructions

1.1 General Safety Instructions

1. Read the safety instructions and the operating instructions first.
2. Pay attention to all the safety warnings.
3. Keep the device away from water or high moisture areas.
4. Keep the device away from dust, sand and dirt.
5. Always ensure there is sufficient ventilation.
6. Do not put the device anywhere near sources of heat.
7. Connect the device only to the power source indicated in the operating instructions or on the device.
8. Clean the device only according to the manufacturer's recommendations.
9. Ensure that no liquids or other foreign bodies can find their way inside the device.
10. The device should only be repaired by qualified personnel.

1.2 Special Safety Instructions

The Cold Traps and Temperature Controllers are research instruments, which should be used only for purposes, specified in this manual. Please follow the instructions of this manual in order to avoid potential harm to the user and damage to instruments.

2 General

The Cold Traps KF-24/6B or KF-18/2B, or the Measuring Gas Cooler MGK-1B are suitable for cooling gas to a predetermined dew-point, so that excess humidity condenses. In this capacity the devices can be used e.g. in the following applications:

- Input control in gas exchange measuring systems
- Humidity compensation (bypass humidity control) in gas exchange measuring chambers
- Calibration of measuring devices for humidity determination (e.g. dew-point mirror or humidity sensors)

Unlike the cold traps, which have one gas conduit, the measuring gas cooler has two equal gas conduits in parallel for pre-drying a reference and a sample gas in gas analysis.

The cold traps and the measuring gas cooler require a temperature controller for operation.

2.1 Transport

Before transport, any condensate has to be drained from the condensate hose; otherwise some of the liquid may run into the gas conduit of the cold trap, and may be pushed out unintentionally with the gas flow.

Note:	If condensate has entered the gas conduit of the cold trap or measuring gas cooler, the device must be dried, by flushing it with air, for approximately 30 min.

3 Cold Trap KF-24/6B

3.1 Installation

The Temperature Controller TR-KF-24 is required for the operation of the Cold Trap KF-24/6B.

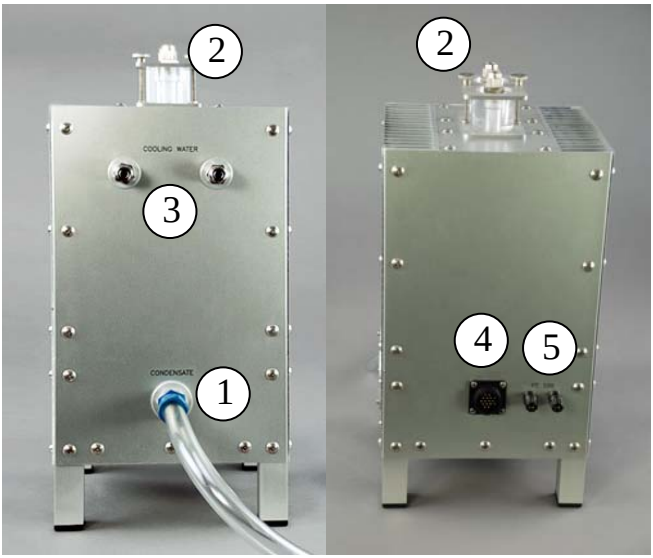


Fig. 1: Cold Trap KF-24/6B; left: Front side; right: Back side

1) Condensate hose with drain cock at the end
2) Gas IN and OUT
3) Connectors for cooling water
4) Connector for Temperature Controller TR-KF-24
5) Pt 100

The Cold Trap KF-24/6B may be operated indoors as well as in the field. In the field, the user has to ensure that the device is sheltered from the effects of the weather.

The cold trap must stand upright to enable the condensate to drain off freely into the hose connected as condensate collector.

Note: The hose must hang free or be arranged so that it can be filled with condensate, without forming air bubbles.

The collected condensate must be emptied in good time, i.e. before the hose is completely filled up, via the water drain cock attached to the end of the hose. If there is some negative pressure in the cold trap, which is the case if the gas is sucked through it by a gas pump, this pump must be switched off before the cock is opened for draining; otherwise, condensate might be sucked into the gas conduit of the cold trap and enter the downstream measuring system. If the cold trap is under slight overpressure, there is no such risk.

The cold trap must be positioned so that its fan can freely ventilate the external heat exchangers. Do not cover the fan inlets and outlets.

In order to avoid over-humidification of the downstream measuring system, the gas flow should only be turned on, after the set dew-point has been reached.

Each cold trap should only be operated with its own matching temperature controller, because calibration values are stored in the temperature controller.

3.2 System Description

3.2.1 Design

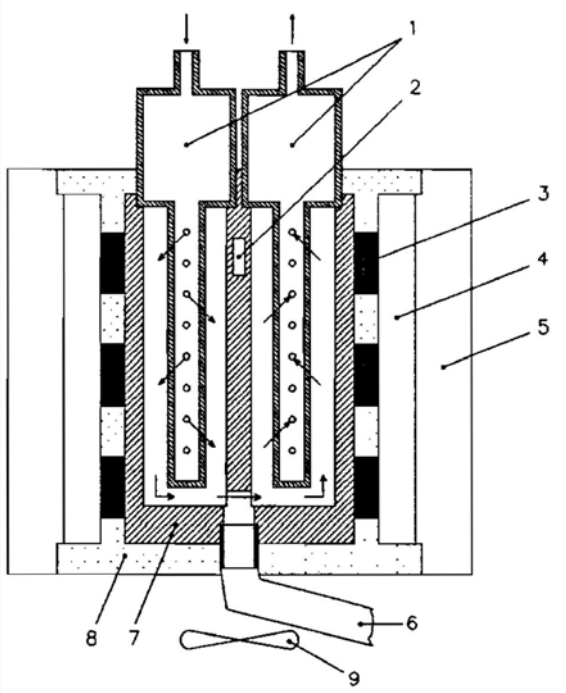


Fig. 2: Cross-section through the Cold Trap KF-24/6B

1) Perspex inserts
2) Platinum temperature sensor Pt 100
3) Peltier elements
4) Heat exchanger for liquid cooling
5) Air heat exchanger
6) Condensate drain
7) Interior part
8) PU-foam
9) Fan

The interior part (7) of the cold trap KF-24/6B is thermostated by the Peltier elements (3). It has two boreholes for the gas conduit. At the lowest point of this gas conduit there is a condensate drain (6). The condensate collects here and runs into the condensate hose.

The interior part consists of aluminum, which is anodized for surface protection. If corrosive gases shall be applied, the inner part can be manufactured of stainless steel on request. Two Perspex inserts reach into the inner part. They serve as gas feeders. The Perspex inserts have inside threads G 1/4", which accommodate hose fittings.

The Peltier elements are in contact with two heat exchangers for liquid cooling (4) and two heat exchangers for air cooling (5). In normal operation, the heat generated at the Peltier elements is dissipated by air cooling. For an extended refrigerating capacity, the heat exchanger (4) can be cooled with water or other cooling liquids.

In the middle of the interior part, two temperature sensors (Pt 100) (2) are located. One of them acts as actual value sensor for the temperature controller. It is connected to a measuring transducer, which is mounted under a cylindrical cap at the side of the housing. The measuring transducer supplies a voltage between 0…4.095V, which is proportional to the measured dew-point in the range of -50 to +70 °C. The other Pt 100 is installed for control measurements. It is connected to the two screw terminals located at the back side of the housing.

The cavities between the housing, Peltier elements and the interior part are filled with polyurethane foam (8) to provide thermal insulation.

3.2.2 Function

The Temperature Controller TR-KF-24 is used to set the desired dew-point temperature of the Cold Trap KF-24/6B. It supplies the power to the Peltier elements in such a way that the temperature of the interior part is adjusted to the set dew-point temperature.

Depending on the ambient temperature, the cold trap reaches the set dew-point after a few minutes. Humid gas is passed through the interior part of the cold trap, where it cools to the set dew-point temperature. Condensate falls, collects in the bottom of the cold trap and runs into the condensate hose.

If a dew-point is desired that is higher than the dew-point of the incoming gas, more humidity must be generated by using a gas washing bottle.

If a dew-point is desired that is close to or higher than the ambient temperature, the outgoing hose must be heated. By heating the hose, condensation cannot form inside. Unheated hoses should not be laid on the ground, which is usually markedly colder than the ambient environment, especially outside in the field.

If the cold trap operates continuously at dew-point temperatures below 0 °C, the conduits will freeze depending on the flow rate and humidity of the gas. To defrost the unit, it is sufficient to switch off the controller. Alternatively, the dew-point may be set to 10 °C above ambient temperature. Also the gas flow should be switched off during defrosting.

The diagram below (Fig. 3) shows the cooling time at ambient temperature +40 °C down to -1 °C.

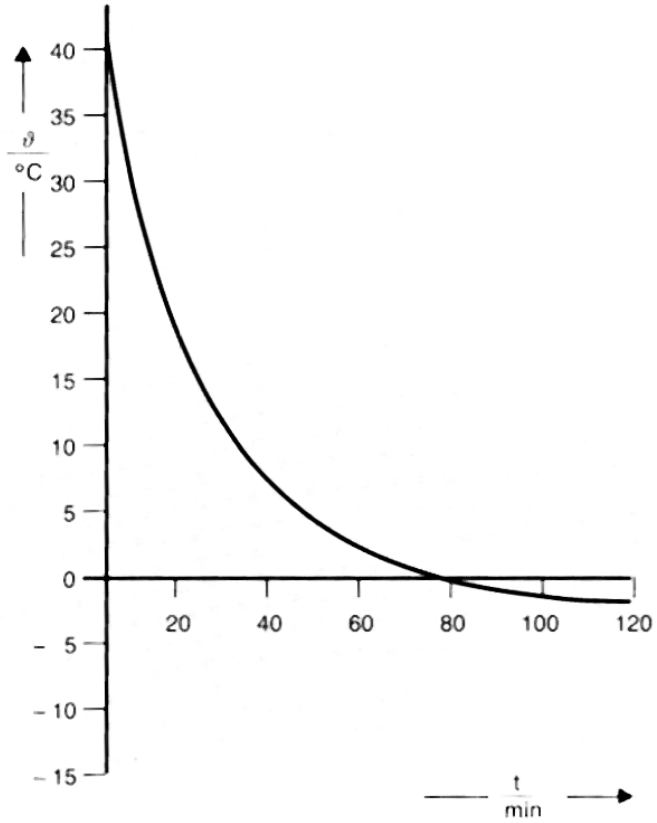


Fig. 3: Cooling time from +40 °C to -1 °C for a gas flow of 20 l/min at 40°C ambient temperature

4 Cold Trap KF-18/2B

4.1 Installation

The Temperature Controller TR-KF-18 and the external AC Power Supply 3020-N are required for the operation of the Cold Trap KF-18/2B.

The Cold Trap KF-18/2B can be operated indoors as well as in the field. In the latter case the user has to ensure that the device is sheltered from the effects of the weather.

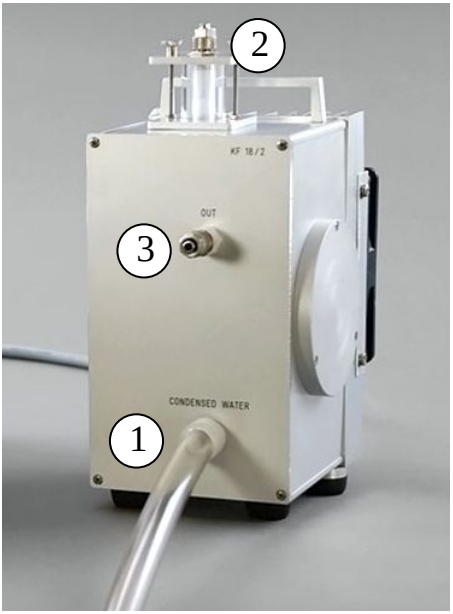


Fig. 4: Cold Trap KF-18/2B

1) Condensate hose with drain cock at the end
2) Gas IN
3) Gas OUT

At the front side of the cold trap is a condensate hose with drain cock connected. Also at the front side is the gas outlet (OUT). The gas inlet is located on the top of the cold trap (Fig. 4).

A 9-pin jack for the connection of the temperature controller is located at the back of the housing beneath the fan.

The cold trap must stand upright to enable the condensate to drain off freely through the condensate drain into hose connected as condensate collector. For this purpose the rear feat are slightly higher than the front ones to enable the condensate to flow forwards into the direction of the condensate hose.

Note: The hose must hang freely or be arranged so that it can be filled with condensate, without forming air bubbles.

The collected condensate must be emptied in good time, i.e. before the hose is completely filled, via the water drain cock attached to the end of the hose. If there is some negative pressure in the cold trap, which is the case if the gas is sucked through it by a gas pump, this pump must be switched off before the cock is opened for draining; otherwise, condensate might be sucked into the gas conduit of the cold trap and enter the downstream measuring system. If the cold trap is under slight overpressure, there is no such risk.

In addition, the cold trap must be positioned such that the fan can ventilate the external heat exchanger. Do not cover the fan.

In order to avoid over-humidification of the downstream measuring system, the gas flow should only be turned on after the set dew-point has been reached.

Each cold trap should only be operated with its own matching temperature controller, because calibration values are stored in the temperature controller.

4.2 System Description

4.2.1 Design

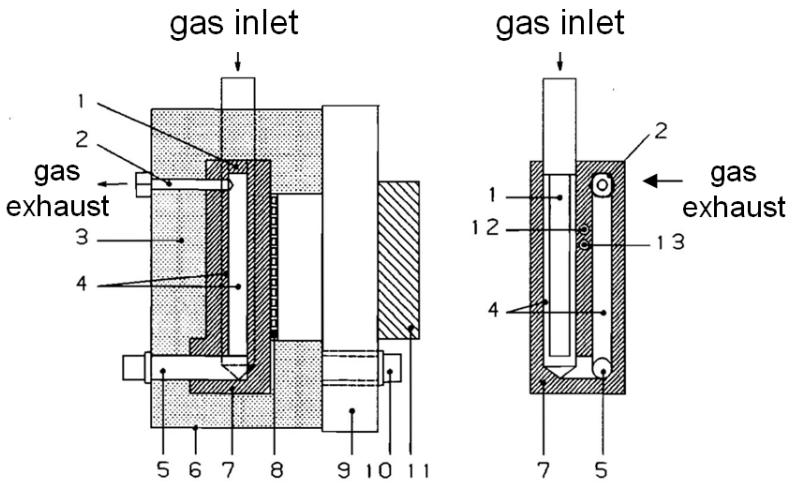


Fig. 5: Cross-section through Cold Trap KF-18/2B

1) Perspex gas connection
2) Gas outlet
3) PU-foam
4) Gas conduit
5) Condensate drain
6) Housing
7) Interior part
8) Peltier elements
9) Heat exchanger
10) Round jack
11) Fan
12) Temperature sensor Pt 100
13) Temperature sensor Pt 100

The interior part (7) of the cold trap KF-18/2 is thermostated by the Peltier elements (8). It has two boreholes for the gas conduit (4). At the lowest point of this gas conduit there is a condensate drain (5). The condensate collects here and runs into the condensate hose.

The interior part consists of aluminum, which is anodized for surface protection. If corrosive gases shall be applied, the inner part can be manufactured of stainless steel on request. A Perspex insert (1) reaches into the inner part serving as gas feeder. It has an inside thread G 1/8" accommodating hose connectors. The gas outlet (2) is located at the front side of the cold trap.

The air cooling system consists of a heat exchanger (9) equipped with a fan (11). It dissipates the heat generated at the Peltier elements.

In the middle of the interior part, two temperature sensors (Pt 100) (12 and 13) are located. One of them (12) acts as actual value sensor for the temperature controller. It is connected to a measuring transducer, which is mounted under the cylindrical protective cap at the side of the housing. The measuring transducer supplies a voltage between 0…4.095V, which is proportional to the measured dew-point in the range of -50 to +70 °C. The other Pt 100 (13) is installed for control measurements. It can be assessed via sockets also located beneath the cylindrical protective cap.

The cavities between the housing, Peltier elements and the interior part are filled with polyurethane foam (8) to provide thermal insulation.

4.2.2 Function

The Temperature Controller TR-KF-18 is used to set the desired dew-point temperature of the Cold Trap KF-18/2B. It controls the supplied power in such a way that the Peltier elements cool the interior part to the set dew-point temperature. Depending on the ambient temperature, the cold trap reaches the set dew-point after a few minutes. For further information, see function of Cold Trap KF-24/2B (chapter 3.2.2).

The diagram below (Fig. 6) shows the cooling time for +30 °C down to -5.5 °C.

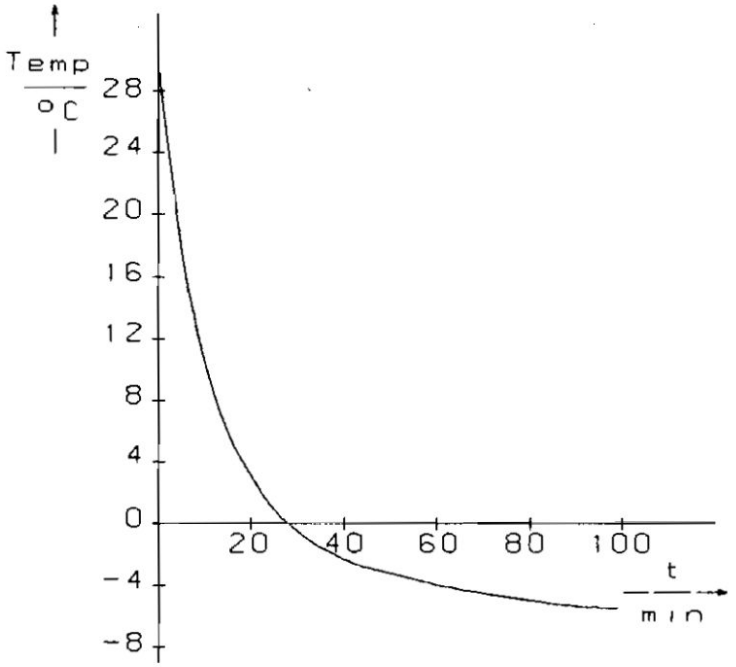


Fig. 6: Cooling time for +30 °C down to -5.5 °C for a gas flow of 4 l/min

If the measuring gas cooler operates continuously at dew-point temperatures below 0 °C, the conduits will freeze depending on the quantity and humidity of the gas. To defrost the unit, it is sufficient to switch off the controller. Alternatively, the dew-point may be set to 10 °C above ambient temperature. Also the gas flow should be switched off during defrosting.

Defrosting can be accelerated by removing the Perspex insert from the interior part. This can be done by loosening the two knurled nuts at the gas inlet and taking the aluminum plate off. With slightly turning movements, the Perspex unit can be withdrawn.

5 Mesuring Gas Cooler MGK-1B

5.1 Installation

The Temperature Controller TR-KF-18 and the external AC Power Supply 3020-N are required for the operation of the Measuring Gas Cooler MGK-1B.

The Measuring Gas Cooler MGK-1B can be operated in indoors as well as in the field. In the field, the user has to ensure that the device is sheltered from the effects of the weather.

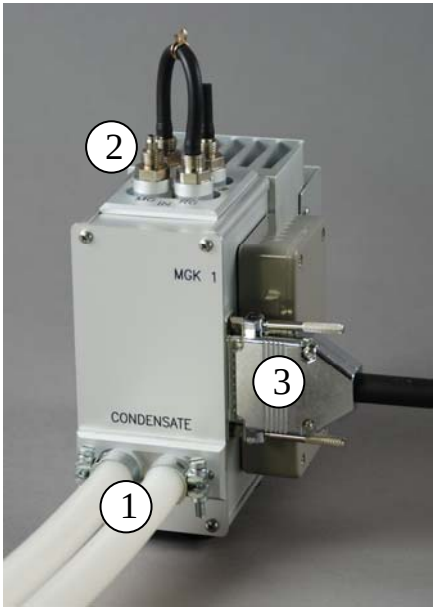


Fig. 7: Measuring Gas Cooler MGK-1B

1) Condensate hoses with drain cocks at the ends
2) Four gas connectors: RG IN, MG IN, RG OUT, MG OUT
3) Connector for Temperature Controller TR-KF-18

The measuring gas cooler must stand upright to enable the condensate to drain off freely into the silicon hoses connected as condensate collectors. For this purpose, the rear feet are slightly higher than the front ones, thus enabling the condensate to flow forwards into the direction of the condensate hose.

Note: The hose must hang freely or be arranged so that it can be filled with condensate, without forming air bubbles.

The collected condensate must be emptied in good time, i.e. before the hoses are completely filled, via the water drain cocks attached to the ends of the hoses. If there is some negative pressure in the measuring gas coolers, which is the case if the gas is sucked through it by a gas pump, this pump must be switched off before the cock is opened for draining; otherwise, condensate might be sucked into the gas conduit of the cold trap and enter the downstream measuring system. If the cold trap is under slight overpressure, there is no such risk.

The measuring gas cooler must be positioned so that the fan can ventilate the external heat exchanger. Do not cover the fan.

In order to avoid over-humidification of the downstream measuring system, the gas flows should only be turned on after the set dewpoint has been reached.

The inlets and outlets for measuring gas and reference gas (MG IN, RG IN and MG OUT, RG OUT) are located on the top of the housing. The two gas conduits can be operated separately (e.g. when taking measurements using a differential gas analyzer) or switched in series (e.g. when checking air humidity measuring instruments).

Each measuring gas cooler should only be operated with its own matching temperature controller, because calibration values are stored in the temperature controller.

5.2 System description

5.2.1 Design

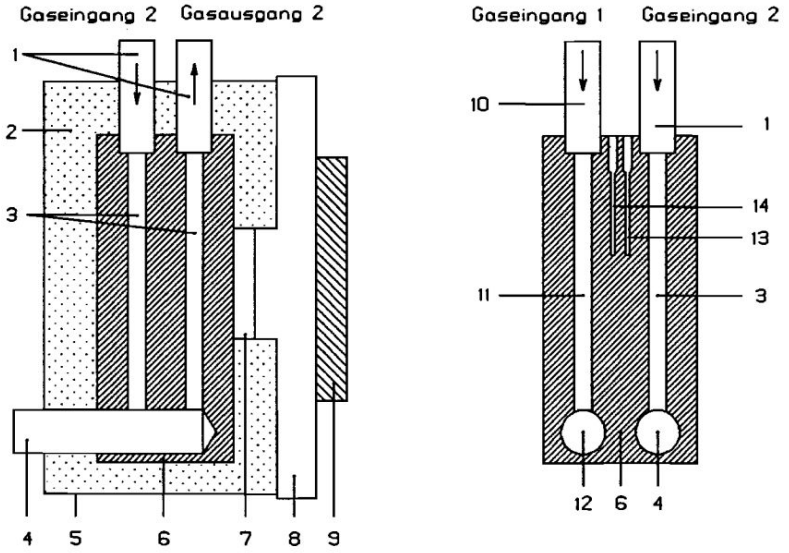


Fig. 8: Cross-section through the measuring gas cooler MGK-lB

1) Gas connector 2
2) PU-foam
3) Gas conduit 2
4) Condensate drain 2
5) Housing
6) Interior part
7) Peltier elements
8) Heat exchanger
9) Fan
10) Gas connector 1
11) Gas conduit 1
12) Condensate drain 1
13) Temperature sensor Pt 100
14) Temperature sensor Pt 100

The temperature of the interior part (6) is controlled by Peltier elements (7). It has four boreholes (3 and 11) for the two gas conduits. Each gas conduit has a condensate drain (4 and 12) at its lowest point, from where the condensate runs into the condensate hoses.

The interior part consists of aluminum, which is anodized for surface protection. If corrosive gases shall be applied, the inner part can be manufactured of stainless steel on request. The gas connections (1 and 10) are made from polyamide and have threaded holes R 1/8" accommodating hose fittings.

The air cooling system consists of a heat exchanger (9) equipped with a fan (11). It dissipates the heat generated at the Peltier elements.

In the middle of the interior part are two Pt 100 temperature sensors (13 and 14), one acts as actual value sensor for the temperature controller. It is connected to a measuring transducer, which is mounted under the protective cap at the side of the housing. The measuring transducer supplies a voltage between 0…4.095V, which is proportional to the measured dew-point in the range of -50 °C to +70 °C. The second temperature sensor (14) is installed for test purposes. It is connected in a four-wire circuit to the sub-D connector.

The cavities between the housing (5), Peltier elements and the interior part are filled with polyurethane foam (2) to provide thermal insulation.

5.2.2 Function

The Temperature Controller TR-KF-18 is used to set the desired dew-point temperature of the Measuring Gas Cooler MGK-1B. It controls the supplied power in such a way that the Peltier elements cool the interior part to the set dew-point temperature. Depending on the ambient temperature, the measuring gas cooler reaches the set dew-point after a few minutes.

For further information, see function of Cold Trap KF-24/2B (chapter 2.2.2).

The following figure (Fig. 9) shows the cooling time for +30°C down to -7°C.

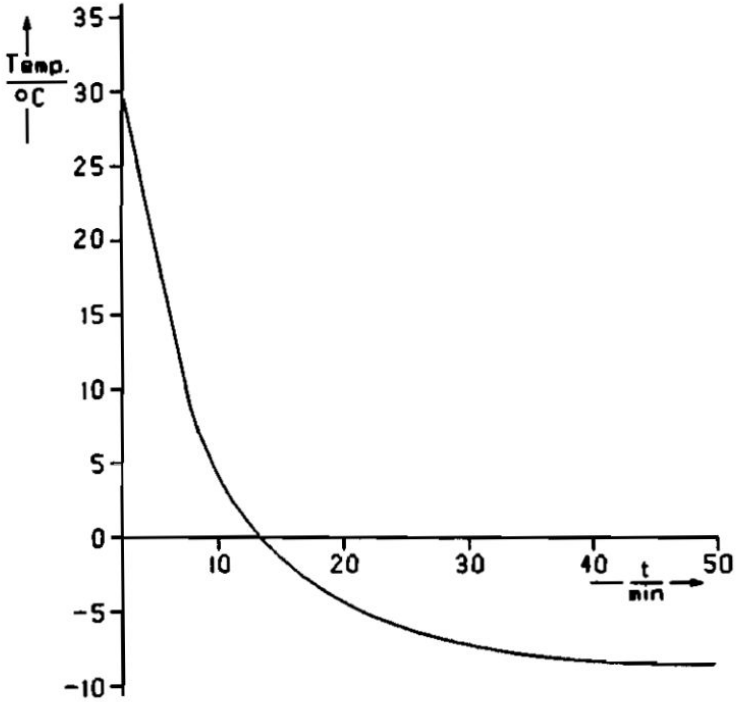


Fig. 9: Cooling time for +30 °C down to -7 °C for a gas flow of 1 l/min per

If the measuring gas cooler operates continuously at dew-point temperatures below 0 °C, the conduits will freeze depending on the flow

rate and humidity of the gas. To defrost the unit it is sufficient to switch off the controller or set a dew-point to 10 °C above ambient temperature. Switch off the flow during defrosting. If the measuring gas cooler is used at the inlet of gas analyzers for pre-drying of measuring and reference gas, the temperature should be set to +2 °C.

6 Temperature Controller TR-KF-24

6.1 System description

Fig. 10: Front side of Temperature Controller TR-KF-24

Fig. 11: Back side of Temperature Controller TR-KF-24

The Temperature Controller TR-KF-24 is designed to control the Cold Trap KF-24/6B. It provides power to the cold trap as required to reach the desired dew-point temperature. It comprises two slide-in modules: The control unit with panel-PC and the power supply unit (Fig. 10).

Note: The Temperature Controller has several fans and air slits for ventilation. It needs to be positioned so that the air can ventilate freely through all the cooling units. It should only be operated indoors.

Fig. 12: Panel-PC of Temperature Controller TR-KF-24 with USB connectors and power button

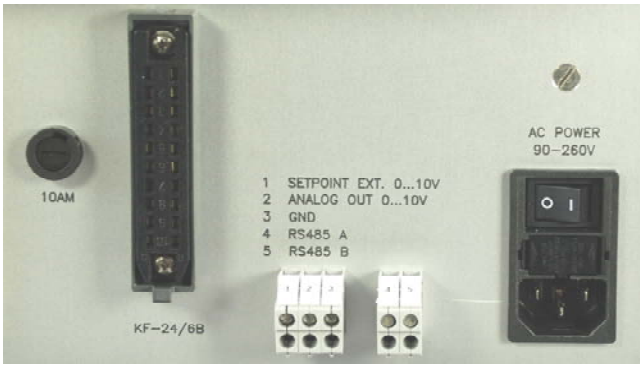


Fig. 13: TR-KF-24: Connectors and power switch at the back-side.

The power button underneath the display at the front side, feeds the panel-PC only. The LED beside it, labeled HDD, lights up green, when the panel-PC is switched on and red, if the hard drive of the panel-PC is accessed. The USB connectors underneath the display serve to exchange data with the panel-PC.

The connector for the Cold Trap KF-24/6B and the main switch are located at the back side of the housing. After the cold trap and the temperature controller are set-up and connected, the main switch can be engaged.

Normally, the desired dew-point temperature is set and read-out via the display (see chapter: Operation); but it is also possible to feed in the set-point as external voltage signal (0-10 V corresponding to -30 to +70° C) or to record the actual dew-point temperature at the analog out (0-10 V corresponding to -30 to +70° C) using the screw-terminal connectors at the back side of the housing.

In addition, there is an RS485 interface for the connection of future additional components.

7 Temperature Controller TR-KF-18

7.1 System description

Fig. 14: Temperature Controller TR-KF-18: Front side

Fig. 15: TR-KF-18: Connectors at the back side

The Temperature Controller TR-KF-18 may be used to operate the Cold Trap KF-18/2B or the Measuring Gas Cooler MGK-1B. It controls the power supplied to the cold trap as required to reach the desired dew-point temperature. As user interface serves a panel-PC.

The Temperature Controller TR-KF-18 requires the external AC Power Supply 3020-N (16V DC). It should only be used indoors.

The power button underneath the display, feeds the panel-PC only. The LED beside it, labeled HDD, lights up green, when the panel-PC is switched on and red, if the hard drive of the panel-PC is accessed. The USB connectors underneath the display and at the back side of the housing serve to exchange data with the panel-PC.

The Cold Trap KF-18/2B or the Measuring Gas Cooler MGK-1B shall be connected to the 15-pin sub-D connector labeled "KF-18/2B or MGK-1B", located at the back side of the housing.

The AC Power Supply 3020-N can be connected to one of the two connectors labeled "DC Power 14-17V". There are two homologous DC power connectors in parallel.

Normally, the desired dew-point temperature is set and read-out via the display (see chapter: Operation); but it is also possible to feed in the set-point as external voltage signal (0-10 V corresponding to -30 to +70° C) or to record the actual dew-point temperature at the analog out (0-10 V corresponding to -30 to +70° C) using the screw-terminal connectors at the back side of the housing.

In addition, there is a RS485 interface (labeled COMP) for the connection of additional components developed in future.

8 Operation

8.1 General

The Temperature Controller TR-KF-18 and TR-KF-24 comprise an integrated panel-PC for operation. The panel-PCs of both versions operate in the same way with the TR-KF-Control Program and are therefore described together.

The panel-PC has a graphical display and a convenient touch panel. Self explaining buttons allow fast operation. A slight touch with the finger or a touch pen will trigger the intended action.

Note: Only use the touch panel with the designated touch pen or a finger, otherwise scratching or damages may occur.

The panel-PC uses the operating system Win Embedded POSReady 2009. It is not allowed to make copies or pass the operating system to other parties. Licenses and copyrights must not be infringed.

The PC system merely shall be used for the control of measuring gas coolers and for the evaluation of data. Additional programs shall not be installed or operated on this system to avoid damages e.g. by computer viruses.

The power switch underneath the display, feeds the panel-PC only. If it is pressed for a short moment, the panel-PC is started up or shut down orderly; if it is pressed for a longer period, the panel-PC is forced to switch off immediately without a proper shut-down procedure. If under such circumstances the main power remains connected and engaged, the temperature regulation of the cold trap may continue working without any indication on the display.

Note, that the TR-KF-24 has a main power switch at the back side of the instrument, while the TR-KF-18 has an external power supply.

8.2 Virtual Keyboard

The virtual keyboard serves for the input of number or letters.

Fig. 16: Virtual keyboard

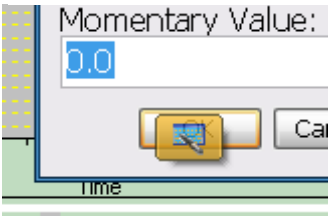


Fig. 17: Keyboard icon

It can be assessed by the keyboard icon that automatically appears, if the curser is close to an input field (Fig. 17).

To change the position of the keyboard, place the touch pen at its upper brim. Now the keyboard can be dragged by sliding the touch pen over the screen and dropped by lifting the touch pen off the screen.

8.3 Main Window

The main window appears after the instrument has been started.

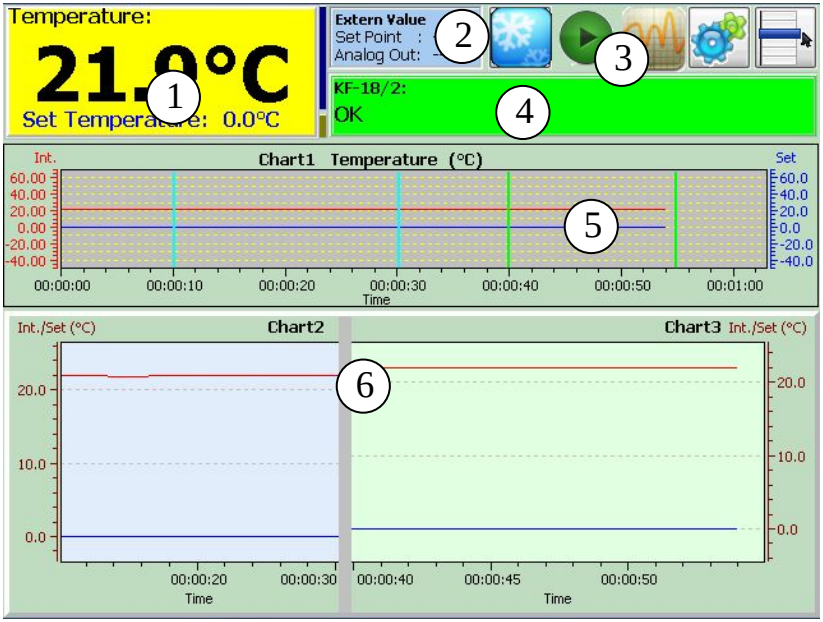


Fig. 18: Main window

1) Yellow field: Internal temperature, and set temperature.

2) Blue field: Values for external control

3) Picture buttons: Set-value, control start/stop, chart settings, settings and menu

4) Status button

5) Chart 1: Overview-chart showing up to 1860 data points with variable sampling rate

6) Chart 2 and 3: Enlarged charts

8.4 Protocol & Status

All important events are displayed in the status button and listed in a protocol. The protocol can be assessed by pressing the status button.

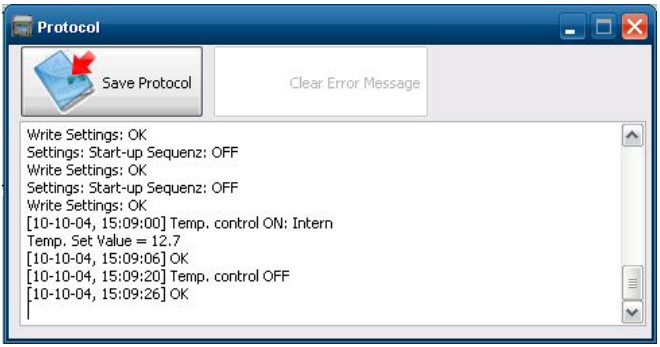


Fig. 19: Protocol Window

The system constantly performs function checks. If an error occurs, the green status button turns yellow and displays a message; also the button "Clear Error Message" will be active in the protocol window. Pressing the button "Clear Error Message", may trigger a system check, depending on the recognized error. If there is no fault, the error message will disappear.

With "Save Protocol", all listed messages can be saved as a text file.

8.5 Temperature Set Value

With the frost symbol, the set-value for the desired dew-point temperature can be entered. The temperature control is started or stopped with a separate button.

8.6 Control Start / Stop

The green start-button and the red stop-button serve to start or stop the temperature control, respectively.

8.7 Chart Settings

The chart button leads to the chart settings.

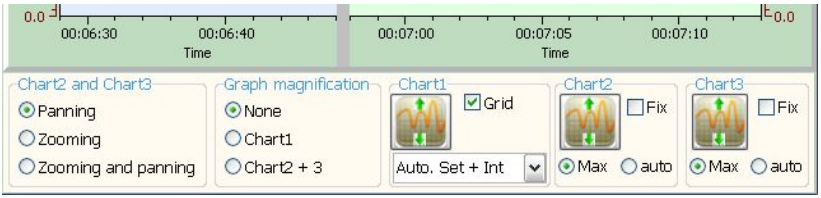


Fig. 20: Chart Settings

Chart 1, 2 and 3 show the set-value with a blue line (labeled: Set) and the actual internal temperature with a red line (labeled: Int.).

Chart 1 is an overview-chart, which shows up to 1860 data points. Chart 2 and 3 show each a cut-out depending on the chosen time range. The time scale for chart 2 and 3 can easily be changed with their respective auxiliary lines, displayed in chart 1 (turquoise and lime green).

The grey division bar between chart 2 and 3 can be shifted to modify the dispartment of the two graphs.

8.7.1 Touch Pen Options: Chart 2 and Chart 3

The scales of chart 2 and chart 3 can be changed by moving the touch pen over the chart area. The chosen option determines the function of the movement:

- Panning: Movement up/down or left/right will shift the respective scale.
- Zooming: Touch pen can be used to cut out and magnify a distinct area.
- Zooming and Panning: Movement up/down or right/left will enlarge/diminish the scaling.

8.7.2 Graph Magnification

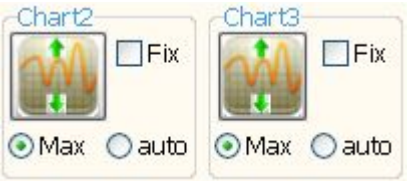
The graph magnification has three options: Display all three charts (no magnification), enlarged display of chart 1, or enlarged display of chart 2 and 3 (Fig. 21)

Fig. 21: Magnification, Chart 2 + 3 activated

8.7.3 Scale: Chart 1

The temperature scale of chart 1 can be changed individually for the set-value (Set) and the measured temperature value (Int.). By choosing "Auto" the temperature will be scaled automatically, so that all measured data are shown in chart 1. By choosing "Max. ", the scale will be fixed to the maximal temperature range. Pressing the picture-button will refresh the display of the chart.

8.7.4 Scale: Chart 2 and Chart 3



The setting "Fix" concerns the time scale. If "Fix" is activated, chart 2 and 3 will not be updated, so that the data can be inspected without moving out of the screen. "Max" and "auto" concern the temperature scale of chart 2 and 3. Complete temperature range or automatic scaling. The option is only performed after the picture-button has been pressed.

8.8 Settings

The gear button leads to the settings window (Fig. 22).

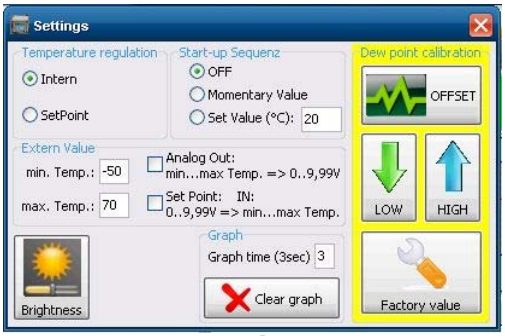
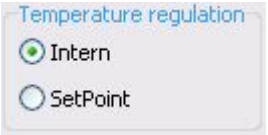


Fig. 22: Settings window

8.8.1 Screen Brightness

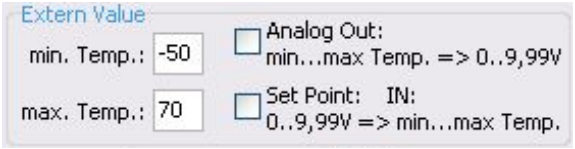
With the sun button the brightness of the display can be adjusted.

8.8.2 Temperature Regulation



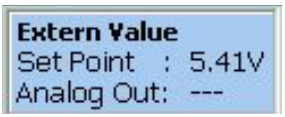
Usually the option "Intern" is chosen, meaning that the temperature shall be regulated to the internal set-value, entered by the user via the software. If the set-value shall be fed in via the connector "Set Point Ext.", the option "Set Point" has to be chosen.

8.8.3 Extern Value

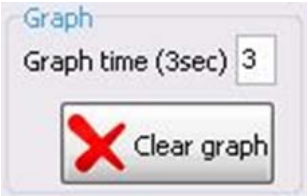


The settings "Extern Value" concern the signals (voltages) at the screw terminals at the back-side of the housing (chapter 11.4 and 11.5). The values for "min. Temp" or "max. Temp" are the temperature values (°C) that corresponds to 0 V or 9.99 V respectively.

If "Set Point" or "Analog Out" is activated, its voltage is indicated in the main window.



8.8.4 Graph



The sampling rate can be adjusted with "Graph time (s) ". The larger the graph time, the longer the time period indicated in chart 1.

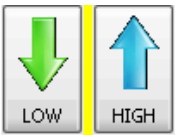
8.8.5 Dew-Point Calibration

Each cold trap or measuring gas cooler should only be operated with its own matching temperature controller, because the individual calibration values are stored in the temperature controller. The menu for dew-point calibration has three functions: Entering an offset, performing a calibration or overwriting the calibration values with factory settings.
A calibration reference for humidity determination (e.g. a dew-point mirror) is required. You may send the device to the Heinz Walz GmbH for recalibration.

8.8.5.1 Offset

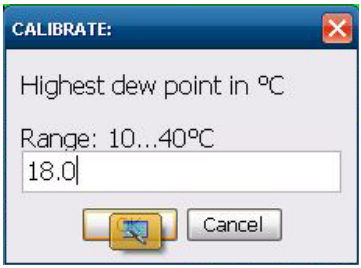
The offset button can be used for a simple adjustment of the indicated temperature. This can be useful, if the cold trap is operated at only one temperature. The offset is usually zero. It should be set to zero before performing a calibration.

8.8.5.2 Calibration



Note: Calibration should only be done by experienced users.

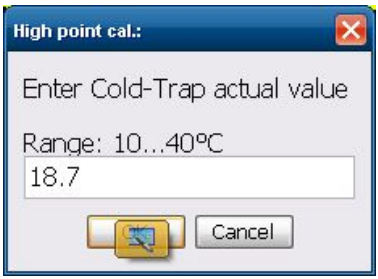
The calibration is performed at two temperatures far apart from each other; for example a lower one at 2 °C and a higher one at 18 °C.



The higher temperature should be at least be 2 K below the ambient temperature. The lower and the higher temperature values can be calibrated in any order. The calibration needs to be checked afterwards.

When the calibration temperature has been entered, the temperature regulation starts automatically, whereby the entered calibration temperature is used as set-value.

When the set-value is reached and stable and also the reference instrument indicates a stable value, the calibration is continued by pressing the yellow status button.



Now the exact dew-point temperature obtained from the reference instrument can be entered.

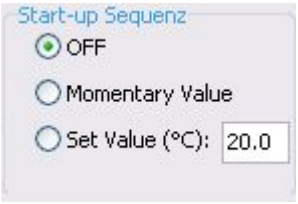
Cancelling of the calibration is possible with the red stop button.

8.8.5.3 Factory Value

In case of a faulty calibration, the calibration values can be set back to the factory settings.

Note: Using this function will overwrite all previous calibration values

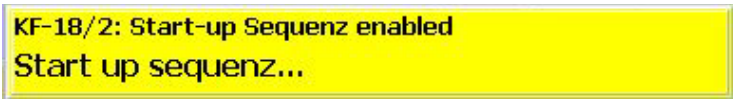
8.8.6 Start-up Sequence



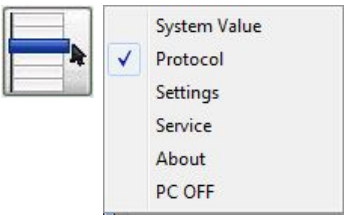
The start-up sequence, determines how the temperature controller resumes operation after an interruption of power supply.

With the option off, the temperature control will remain in standby modus. If the option "Momentary Value" is chosen, the last set-value will be used for the resumption of temperature control. With the option "Set value (°C)", a distinct set-value can be determined.

Since the start-up sequence is an autonomous function of the temperature controller, it will be started even if the panel-PC remains off. If the start-up sequence is enabled and executed and the panel-PC is running, a corresponding message appears on the yellow status button.



8.9 Menu



The menu button leads to a choice of windows.

8.9.1 System Value

In the window "System value" internal parameters of the temperature controller are shown, like the system temperature, voltage and current.

8.9.2 Protocol

The protocol window can also be accessed with the status button and has been explained above.

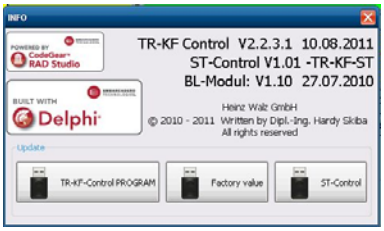
8.9.3 Settings

The settings window can also be accessed with a picture button and has been explained above.

8.9.4 Service

The service window is for factory use only.

8.9.5 About



"About" gives information on the actual software versions.

"TR-KF Control" is the program itself running on the panel-PC; "ST-Control" is the firmware; "BL-Modul" is the boot loader.

8.9.5.1 Program Update

The button "TR-KF-Control Program" allows fast and easy updating of the program via an external USB stick that carries the exe-file of the software. Just touch the button and chose the correct update-file.

8.9.5.2 Load Factory Values

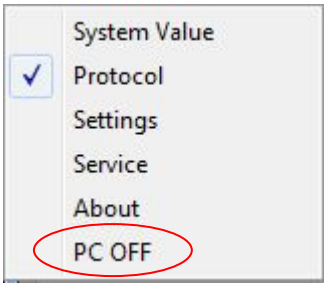
The button "Factory value" allows loading given factory settings from an external USB stick. The factory settings contain calibration data for the connected cold-trap or measuring gas cooler and settings for the intended application.

After pressing the button "Factory value" an additional window will open. Chose the filename with the extension ".fac" and then press "open" to load the file.

8.9.5.3 ST-Control Update

The button "ST-Control" allows an update of the firmware via an external USB stick. After pressing this button an additional window will open. Touch the button "update file" and chose the correct file. Then press "update".

8.9.6 PC OFF



Touching the button "PC OFF" will stop the temperature control, cease the TR-KF program and automatically shut down the panel-PC. Alternatively also the power switch on the fore front can be used to shut down the panel-PC.

Note for TR-KF-24:

The system is still in standby modus. Complete switching off via the AC power switch "OFF" on the reverse side of the housing. Do not switch main power off, before the panel-PC has shut down orderly.

Note for TR-KF-18:

The system is still in standby modus. Complete switching off via disconnecting the mains power. Do not disconnect power, before the panel-PC has shut down orderly.

9 Accessories

9.1 WLAN-USB Adapter for Remote Control

The temperature controllers can be controlled remotely with an adequate WLAN-USB-Adapter (type: EDIMAX EW7711Uxx) via the "Remote Desktop Connection" function of the external PC (Start / Programs / Accessories / Communications).

Fig. 23: **left:** External PC with log on dialog; **right:** External PC running remote control.

After successful connection the external PC will show the log-on dialog (Fig. 23). A username and password needs to be entered, before the TR-KF Control Program will appear on the screen of the external PC (Fig. 23). For further information, see the instructions provided with the WLAN-USB-Adapter.

10 Maintenance

Additional maintenance work is normally not necessary.

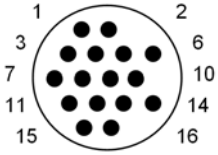
For maintaining and cleaning of the housings a mild cleaning agent can be used.

A suitable non-aggressive cleaning agent (e.g. 50% ethanol) can be pumped through the gas conduits for cleaning. The gas conduit must be dried afterwards.

11 Pin Assignment and Fuses

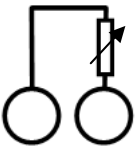
11.1 Connectors of KF-24/6B

"TR-KF-24"



1: Shielding
2: Peltier +
3: Peltier –
6: Fan +
7: Fan –
12: Temp Int. 0- 4095 mV
13: + 5V
14: GND
15: Peltier +
16: Peltier –

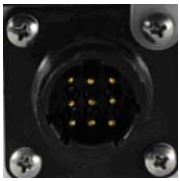
"Pt 100"

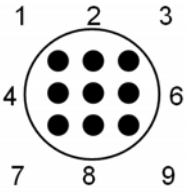


Pt 100

11.2 Connectors of KF-18/2B

"TR-KF-18"

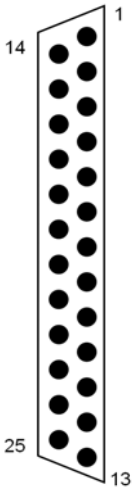




1: Shielding
2: Peltier +
3: Peltier –
4: GND
5: Fan +12V
7: Fan –
8: Temp Int. 0.. 4095 mV
9: + 5 V

11.3 Connectors of MGK-1B

"TR-KF-18"



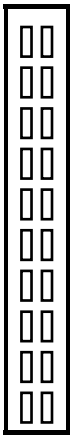
14 / 1: Shielding
15 / 2: Peltier +
16 / 3: Peltier –
4: Fan +12V
17 / 5: Fan –
19 / 7: Pt 100
20 / 8: Pt 100
10: Temp Int. 0 to 4095 mV
12: GND
13: + 5V

11.4 Fuses and Connectors of TR-KF-24

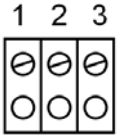
The housing of the TR-KF-24 bears one fuse:

"10AM": Medium blow 10 A.

"KF-24/6B"

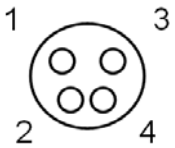


a1: PE
a2: Peltier +
a3: Peltier –
a6: Fan +
a7: Fan –
b4: Temp intern 0 to 4095 mV
b5: + 5V
b6: GND
b7: Peltier +
b8: Peltier –



1: Ext. Set Point 0.. 9.99 V
2: Analog Out 0.. 9.99 V
3: GND

"COMP"



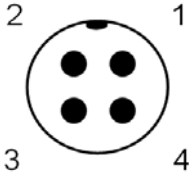
1: RS485/A
2: output +14 ..16V
3: RS485/B
4: GND

11.5 Fuses and Connectors of TR-KF-18

The housing of the TR-KF-18 bears three fuses:

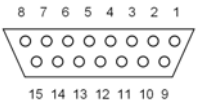
"F1:8AT": Slow blow 8 A
"F2:8AT": Slow blow 8 A
"F3:4AM": Medium blow 4 A

"DC Power 14-17V"
1 or 2

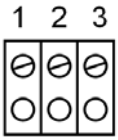


1: +14..17 V
2: GND
3: +14..17 V
4: GND

"KF-18/2B or
MGK-1B"

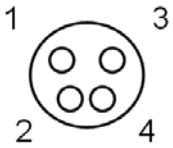


2: Peltier +
3: Peltier +
4: Peltier –
5: Peltier –
6: GND
7: Fan + 12V
9: Fan 0
10: Temp Int. 0.. 4095 mV
11: + 5V



1: Ext. Setpoint 0.. 9.99 V
2: Analog Out 0.. 9.99 V
3: GND

"COMP"



1: RS485/A
2: output +14 ..16V
3: RS485/B
4: GND

12 Technical Data

12.1 Cold Trap KF-24/6B

One gas path

Maximal gas flow rate:	25 l/min
Material of gas conduit:	aluminum anodized, Perspex, PVC and nickel-plated brass
Air volume of gas cooler:	256 ml (w/o condensate drain)
Temperature range:	-50 to 70°C
Accuracy:	±0.1 °C
Cooling:	Peltier cooling
Maximal temperature difference to environment:	35 K (without gas flow: 54 K)

Liquid cooling circuit existent

Temperature sensor:	Pt 100
Hose connections:	Hose fittings for 9/12 mm tubing
Operating temperature:	-20...+50 °C
Dimensions:	21 x 46 x 25 cm (W x H x D)
Weight:	10.4 kg

Required temperature controller: TR-KF-24

Subject to change without prior notice.

12.2 Cold Trap KF-18/2B

One gas path

Maximal flow rate:	6 l/min
Material of gas conduit:	aluminum anodized, Perspex, PVC and nickel-plated brass
Air volume of gas cooler:	55 ml (w/o condensate drain)
Temperature range:	-50 to +70 °C
Accuracy:	±0.1 °C
Cooling:	Peltier cooling
Maximal temperature difference to environment:	35 K (without gas flow: 49 K)
Temperature sensor:	Pt 100
Hose connections:	Hose fittings for 6/8 mm dia. tubing
Operating temperature:	-20 to +50 °C
Dimensions:	12 x 27 x 22 cm (W x H x D)
Weight:	3.5 kg

Required temperature controller: TR-KF-18

Subject to change without prior notice.

12.3 Measuring Gas Cooler MGK-1B

Gas paths	two, pneumatically separated
Maximal flow rate:	1.5 l/min per path
Material of gas conduit:	aluminum anodized, PA6, silicone and nickel-plated brass
Air volume of gas cooler:	20 ml (w/o condensate drain)
Temperature range:	-30 to +70 °C
Accuracy:	±0.15 °C
Cooling:	Peltier cooling
Maximal temperature difference to environment:	35 K (without gas flow: 46 K)
Temperature sensor:	Pt 100
Hose connections:	Hose fittings for 4/6 mm dia. tubing
Operating temperature:	-20 to +50 °C
Dimensions:	7 x 17 x 19 cm (W x H x D)
Weight:	1.2 kg

Required temperature controller: TR-KF-18

Subject to change without prior notice.

12.4 Temperature Controller TR-KF-24

Controller:	Panel-PC
Display:	SVGA graphics display (640 x 480) with touch panel
Ext. analog input:	0V to 10V => -50°C to 70°C
Ext. analog output:	0V to 10V => -50°C to 70°C
Panel-PC connectors:	2 x USB, RS485
Operating temperature:	-20°C to 50°C
Power consumption:	Maximal: 400 W, standby: 17 W
Dimension:	50 cm x 15 cm x 30 cm (W x H x D)
Weight:	11.0 kg

12.5 Temperature Controller TR-KF-18

Controller:	Panel-PC
Display:	SVGA graphics display (640 x 480) with touch panel
Ext. analog input:	0 V to 10 V => -50 °C to 70 °C
Ext. analog output:	0 V to 10 V => -50 °C to 70 °C
Panel-PC connectors:	3 x USB, COMP (RS485)
Power-supply:	2 x DC 14 V to 17 V / max. 7 A
Operating temperature:	-20 °C to 50 °C
Power consumption:	Maximal: 68 W, standby: 2 W
Dimension:	50 cm x 15 cm x 30 cm (W x H x D)
Weight:	3.7 kg

Subject to change without prior notice.

13 Warranty Conditions

All products supplied by the Heinz Walz GmbH, Germany, are warranted by Heinz Walz GmbH, Germany to be free from defects in material and workmanship for one (1) year from the shipping date (date on invoice).

The warranty is subject to the following conditions:

1. This warranty applies if the defects are called to the attention of Heinz Walz GmbH, Germany, in writing within one year (1) of the shipping date of the product.
2. This warranty shall not apply to any defects or damage directly or indirectly caused by or resulting from the use of unauthorized replacement parts and/or service performed by unauthorized personnel.
3. This warranty shall not apply to any product supplied by the Heinz Walz GmbH, Germany which has been subjected to misuse, abuse, abnormal use, negligence, alteration or accident.
4. This warranty does not apply to damage caused from improper packaging during shipment or any natural acts of God.
5. This warranty does not apply to underwater cables, connectors, batteries, fiber optics, cables, lamps, gas filters, thermocouples, fuses or calibrations.

To obtain warranty service, please follow the instructions below:

1. The Warranty Registration form must be completed and returned to Heinz Walz GmbH, Germany.
2. The product must be returned to Heinz Walz GmbH, Germany, within 30 days after Heinz Walz GmbH, Germany has received written notice of the defect. Postage, insurance, custom duties,

and/or shipping costs incurred in returning equipment for warranty service are at customer expense.

3. All products being returned for warranty service must be carefully packed and sent freight prepaid.

4. Heinz Walz GmbH, Germany is not responsible or liable, for missing components or damage to the unit caused by handling during shipping. All claims or damage should be directed to the shipping carrier.