

MANUAL

Temperature Trip Amplifier KFD2-GU-(Ex)1



With regard to the supply of products, the current issue of the following document is applicable:

The General Terms of Delivery for Products and Services of the Electrical Industry, published by the Central Association of the Electrical Industry (Zentralverband Elektrotechnik und Elektroindustrie (ZVEI) e.V.) in its most recent version as well as the supplementary clause: "Expanded reservation of proprietorship"

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1 Symbols Used in this Document



Warning

*This symbol indicates a warning about a possible danger.
Failure to observe this warning may result in personal injury or death, or property damage or destruction.*



Attention

*This symbol warns of a possible fault.
If the instruction given in this warning is not heeded, the device and any systems or plants connected to it could develop a fault or even fail completely.*



Note

This symbol brings important information to your attention.

2 Overview

2.1 Application

The devices of the K-System from Pepperl+Fuchs are used to transmit signals between field devices and the process control system or control.

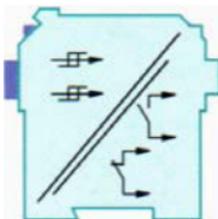
Devices with the "Ex" code in their type identifiers are suitable for connection to field devices in the hazardous area. The field current circuits of these devices are intrinsically safe and are galvanically isolated from the not intrinsically safe circuits. The devices thus represent an electrical isolation between the hazardous area and the safe area within a system.

Devices without an "Ex" code can be used for signal transmission between field devices in the safe area and the process control system or the control.



The temperature trip amplifier KFD2-GU-(Ex)1 of the K-system are used for temperature measurement.

Further information (e. g. certificates, the data sheets for the device and the manual for the K-system) can be found on our Internet page www.pepperl-fuchs.com/pa (under product search, enter "GU").



- You can connect resistance temperature sensors or thermocouples to the input of the device (types: B, E, J, K, L, N, R, S, T). The device can also process a unit current signal or a unit voltage signal.
- Two different limit values of the input signal can be monitored with the aid of the two relay outputs on the device and parameters can be set freely for them.
- You can connect a PC for programming and diagnostics with **PACT^{ware}**™ (see section 6 and section 7) on the device.

2.2 Versions

The following versions of the device are available:

- KFD2-GU-1, device with a power supply 24 V DC for connection of field devices in the safe area
- KFD2-GU-Ex1, device with a power supply 24 V DC for connection of field devices in areas exposed to danger of explosion

3 Safety Instructions



Warning

The device may only be operated by trained personnel in a manner corresponding to this manual.



Warning

Protection of operating personnel and the plant is only guaranteed if the device is used according to their specifications. Any use other than that described in the manual endangers the safety and functionality of the device and the connected systems.



Warning

*The device may only be mounted, connected and adjusted by electrical professionals **outside the explosion hazardous area.***



Warning

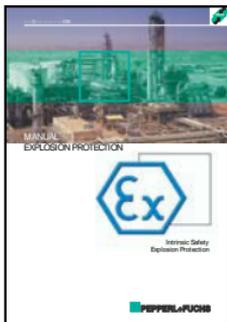
If malfunctions cannot be eliminated, places the device out of service and protect them from accidental use. The device may only be repaired directly by the manufacturer Pepperl+Fuchs. Any opening or change in the device is dangerous and are therefore not to be performed. They void any warranty.



Note

Responsibility for adhering to local safety regulations and directives is held by the operator.

4 Explosion Protection



For primary explosion protection, that is, measures to avoid or restrict the production of a dangerous, explosive atmosphere, please consult the ATEX directive or the corresponding national provisions.

For secondary explosion protection, that is, measures to avoid the ignition of a surrounding explosive atmosphere by electrical equipment, Pepperl+Fuchs will gladly provide you with a copy of the "Ex-protection manual" for a nominal fee.

Please pay particular attention to EN 60079-0, EN 60079-11, and EN 60079-15 or the corresponding national provisions.

Pepperl+Fuchs also provides a seminar on the topic of explosion protection.

5 Mounting and Connection

5.1 Mounting



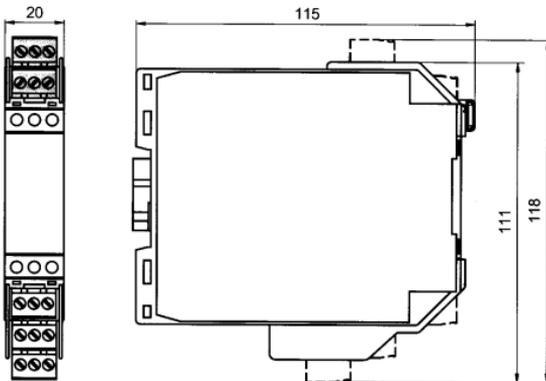
The temperature trip amplifier KFD2-GU-(Ex)1 are constructed in protection class IP20 and must therefore be protected from undesirable environmental conditions (water, dust, small foreign objects).



The devices of the K-System from Pepperl+Fuchs can be mounted on a 35 mm top-hat rail corresponding to EN 60715. The devices must be snapped onto the rail **vertically**, and never slanted or tipped to the side.

Further mounting alternatives, e. g. using the Power Rail, can be found in the operating instructions for the K-System on our internet page www.pepperl-fuchs.com/pa (under product search, enter "GU").

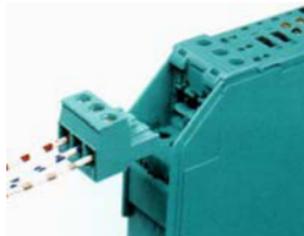
Dimensions of the
Table of contents in mm



5.2 Connection

The KF series' slip-off terminals significantly simplify connection and construction of switching cabinets. They allow quick and error-free exchange of the unit when service is needed.

The terminals can be screwed on, are self-opening, and have generous connection room for a wire diameter of up to 2.5 mm² and coded plugs, so that leads cannot be confused.

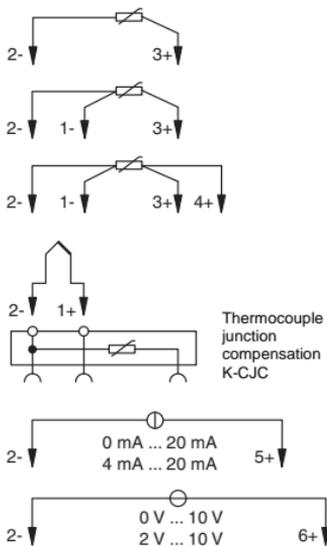


The intrinsically safe field circuit is connected to the **blue** terminals 1 to 6 of the KFD2-GU-Ex1. The circuit can be directed with interface cable based on EN 60079-14 into the area subject to the danger of explosion.

The non-intrinsically safe field circuit is connected to the **green** terminals 1 to 6 of the KFD2-GU-1.

In both cases you can connect:

- a resistance temperature sensor Pt100 or Ni100
 - in 2-wire design (terminals 2 and 3)
 - in 3-wire design (terminals 1 to 3)
 - in 4-wire design (terminals 1 to 4)
- a thermocouple of type B, E, J, K, L, N, R, S, or T (terminals 1 and 2). For an internal cold junction compensation, you will need terminal K-CJC as an accessory instead of the normal terminal 1 to 3.
- a source for a unit current signal of 0 mA ... 20 mA or 4 mA ... 20 mA (terminals 2 and 5)
- a source for a unit voltage signal 0 V ... 10 V (terminals 2 and 6)

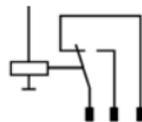


The function of the **green** terminals 7 to 15 is as follows:

- terminals 7 to 9: relay 1
- terminals 10 to 12: relay 2
- terminals 14(+)/15(-): 24 V DC power supply (13 free)

For power supply via Power Rail, please refer to the "Interface Technology" catalog of Pepperl+Fuchs.

For a detailed account of the terminal assignments, please refer to the data sheet.

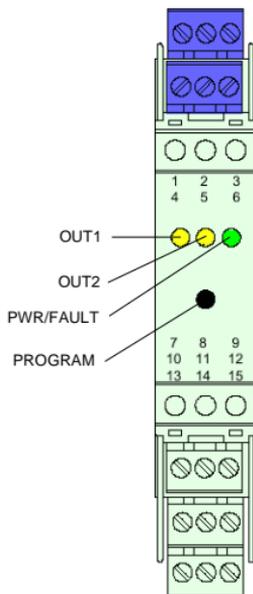


Relay 1: 7 8 9
Relay 2: 10 11 12

5.3 Operating and Indicating Elements

On the front of the GU you will find:

- LED OUT1 (yellow) for displaying relay 1 active
- LED OUT2 (yellow) for displaying relay 2 active
- LED PWR/FAULT (green/red) for displaying supply voltage present/malfunction
- Interface for connecting a computer for parameterization and diagnostics of the device with the **PACT^{ware}**™ operating software, using the K-ADP-USB adapter



6 Device Configuration via Software

The device is parameterised using the **PACTware™** operating software.

The **PACTware™** operating software and the necessary device and communication DTMs can be downloaded from our internet page www.pepperl-fuchs.com (product search, enter PACTware).

The manual "Installation and Configuration DTM Collection Conventional Interface Introduction" guides you through the installation steps necessary to install the software. The manual can be found on our Internet page www.pepperl-fuchs.com (product search, enter PACTware).

In the following, you will find the device-specific information for the device.

6.1 Connection Between Device and Computer

Connect the device and the computer using the K-ADP-USB adapter. This adapter can be ordered as an accessory.

Connecting the device to the computer via the USB interface

1. Mount the device as described in the system description.
2. Connect the device to the power supply as described in the system description.
3. Connect the device to the PC via the adapter with USB interface K-ADP-USB.
 - Connection on the device: front programming socket
 - Connection on the PC: USB interface

> The hardware wizard is displayed. Read the note.
4. Follow the installation instructions and confirm the installation steps.
 - > The installation completion window is displayed.
5. Confirm the end of the installation with **Finish**.
 - > The interface driver is installed.



Note

The hardware wizard is displayed only on initial installation or for an update.

6.2 Communication Driver

In a **PACT^{next}**™ project, communication with the device is only possible via a communication driver. If your project does not yet contain such a driver, please add it to the project from the device catalogue (see manual).

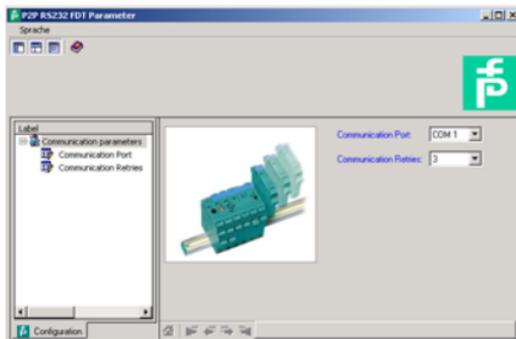
The parameters of the communication DTM is the used PC interface and the number of retries. The parameter is set as follows:

- Double-click the communication driver with the mouse
- Select the *Communication Port*
- *Communication Retries*: number of retries the COM DTM attempts to establish communication to the connected device.

To add a device to a project, select a communication driver of the project. Then add the device from the device catalogue.

Further information on the individual steps can be found in the manual.

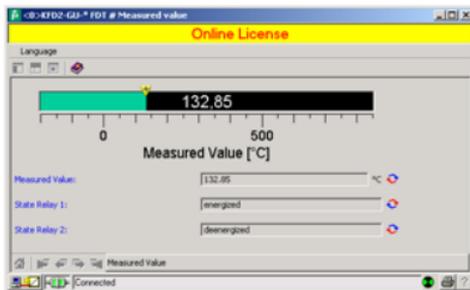
The description in the following chapters assume that a device has been selected in the project.



6.3 Monitor Functions

If you have started the communication between **PACT_{ware}**TM and the device (e. g. via Device data *Establish connection*), you can open the Measured value window via Device data *Measured value*. The following information is displayed:

- Measured value at the input as numerical value and bar graph, displayed in the selected unit.
- the status off both relays



6.4 Simulation Function

If you have started the communication between **PACT_{ware}**TM and the device (e. g. via Device data *Establish connection*), you can open the Simulation window via Device data *Simulation*.



Warning

*Simulation interrupts normal functionality of the device!
Before starting the simulation, make certain that this cannot result in any dangerous state for the system.*

The simulation mode is started with the check box *Simulation* *Active*.



You can assign the status for the two relays for test purposes:
de-energised = , energised =

Use the check box *Simulation* *Active* to end the simulation. The device returns to normal operation. If the power supply is interrupted, the device ends the simulation.

- The relays assume the assigned status.
- During the simulation, the red LED on the front of the device flashes.
- Devices in simulation mode are highlighted in **PACT_{ware}**TM.



Note

*You can close the simulation window with the Close button or by clicking on the Windows-standard button at the top right. The device will **remain** in simulation mode, however, until the check box *Simulation* is deactivated.*

6.5 Diagnosis

If you have started the communication between **PACTware™** and the device (e. g. via *Device data* → *Establish connection*), you can open the Diagnosis window via *Device data* → *Diagnosis*. It shows the following information:



Explanations:

- *Sensor breakage*: see section 7.2
- *Sensor short circuit*: only RTD type of sensor; see section 7.2
- *Overrange*, *Underrange*: measured variable outside the maximum measuring range of the selected sensor (see section 7.2)
- *CJC Error*: if the cold junction compensation has been selected (see section 7.2) and a breakage or short circuit occurs within the K-CJC terminal
- *Simulation mode*: see section 6.4

7 Working with Device Data

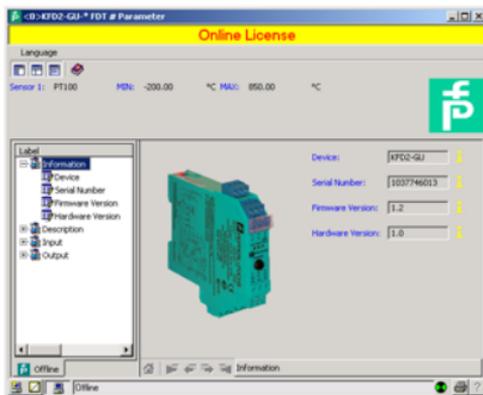


Warning

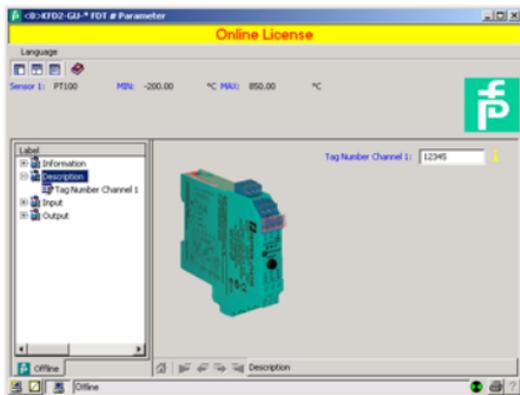
*Any change made to the device date will change the functionality of the device!
Before transferring new data into the device, make certain that this cannot result in any danger for the system.*

If you select the PC-programming function for a device in **PACTware™** (see manual), a window with menus for parameterization appears, these menus will be described as follows.

7.1 Menu Information and Description



The information on the *Device info* menu is generated automatically or is read from the device. This information cannot be changed on the menu.



You can edit the text on the *Description* menu as you see fit and save it in the project file.
Tag Number Channel 1: freely selectable identification

7.2 Menu Parameter Input

The screenshot shows the 'Online License' window for the KFD2-GU-1 PDI. The interface includes a tree view on the left for navigating through device parameters, a central 3D model of the device with a blue callout line pointing to the sensor location, and a right-hand panel for configuring various settings. The status bar at the bottom indicates the device is 'Offline'.

Online License

Language: [Icons]

Sensor 1: PT100 Min: -200.00 °C Max: 850.00 °C

Label

- Information
- Description
- Input
 - Sensor
 - Connection Mode
 - Unit
 - Cold Junction Compensation
 - Ext. Ref. Temp.
 - Lead Resistance
 - Detect Sensor Breakage
 - Detect Sensor Short Circuit
 - Detect CJC Sensor Defect
 - Detect Overrange
 - Detect Underrange
 - Firmware Version
- Output

Parameters:

- Sensor: PT100
- Connection Mode: 4-wire
- Unit: °C
- Cold Junction Compensation: External (ref. temp.)
- Ext. Ref. Temp.: -273.00
- Lead Resistance: 0.00 Ohm
- 2-Wire Calibration: [Button]
- Detect Sensor Breakage: Active
- Detect Sensor Short Circuit: Active
- Detect CJC Sensor Defect: Active
- Detect Overrange: Active
- Detect Underrange: Active
- Firmware Version: Versions < 1.5

Offline Offline Input

The following parameters can be set:

- **Sensor:**
 - Resistance temperature measurement sensor: *Pt100, Ni 00*
 - Thermocouples: *T/C type B, T/C type E, T/C type J, T/C type K, T/C type L, T/C type N, T/C type R, T/C type S, T/C type T*
 - other: *0...10 V, 0...20 mA, 4...20 mA (NE43)*
- **Connection mode** (for resistance temperature detectors only, see section 5.2):
 - *2-wire*
 - *3-wire*
 - *4-wire*
- **Unit:**
 - for resistance temperature measurement sensors and thermocouples: *°C or K*
 - with selection of *0...10 V* under sensor: *fixed V*
 - with selection of *0...20 mA* or *4...20 mA (NE43)* under sensor: *fixed mA*

The unit selected at this point will be used for **all** corresponding settings and displays in **PACT_{wire}**TM.

- **Cold junction compensation** (for thermocouples only):
 - external (Reference temperature)
 - internal (K-CJC)

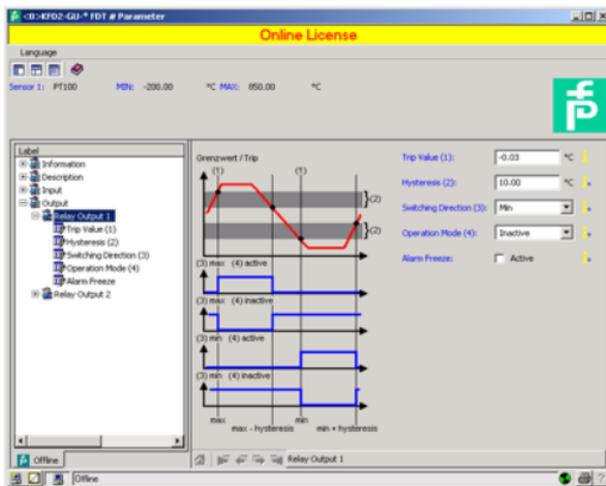
If you have selected *Ext. ref. temp.*, you can enter the *external reference temperature* (range of values: *-100 °C to 100 °C*)

For a *internal Cold junction compensation*, you require the K-CJC terminal block as an accessory instead of the normal terminal 1 to 3 or 4 to 6 (see section 5.2).

- **Lead Resistance:** When connecting an RTD with 2 wire connection the lead resistance of the cabling can be entered numerically if known.
- **2-Wire Calibration:** When connecting an RTD with 2 wire connection the lead resistance of the cabling can be calibrated if the resistance is unknown. For calibration the sensor must be jumpered.
- **Sensor-breakage monitoring** (for all types of sensors)
- **Sensor-short-circuit monitoring** (for resistance temperature detectors only)
- **Cold junction sensor defective** (for thermocouples)
- **Range exceeded** (for *0...10 V* and *0...20 mA*)

- *Value short of range lower limit* (for 0...10 V)
You activate or deactivate monitoring by clicking the respective checkbox (= selected, = deselected).
- *Firmware Version*: Here the Firmware Version of the device can be preselected. Depending on Firmware Version some options and functions can differ. If the Firmware Version is unknown, this can be entered automatically through an upload.

7.3 Menu Parameter Output



The following parameters can be set:

- *Switching point and hysteresis* for relay 1 and relay 2; the unit is displayed according to the selection for *Parameter Input* (see section 7.2). The hysteresis should be selected as $> 1\%$ of the measurement range to avoid causing the relay to flutter.
- *Switching direction (MAX or MIN) and mode of operation (energised or de-energised)* for relay 1 and relay 2
- The *Error Output* function for relay 2 is not available until firmware version 3.0.
- *Alarm Freeze*: when Alarm Freeze is selected, the Relay State is kept after trip or Fault Alarm until the device is restarted (Power Off-On)

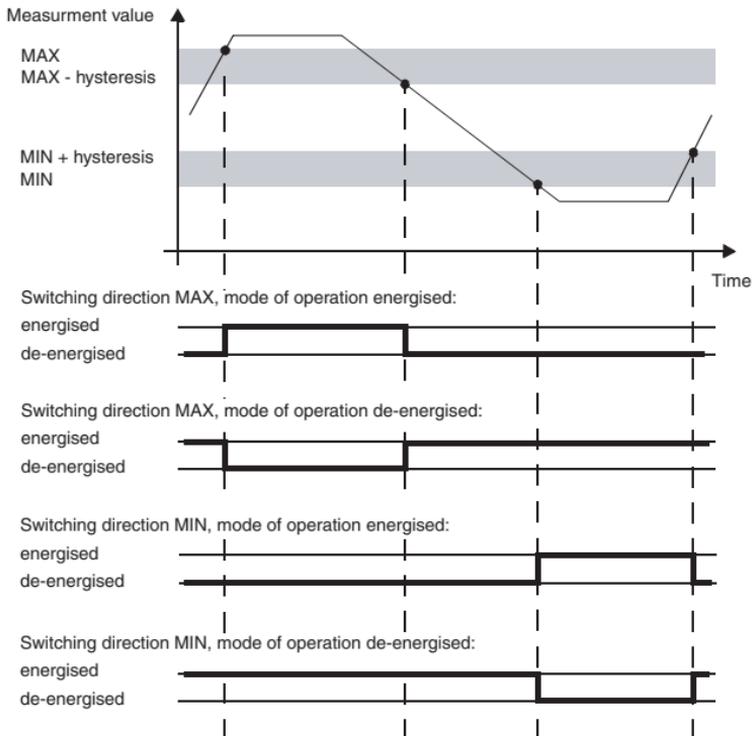
7.4 Switching Behaviour of the Relays

Available settings for the switching direction are *MIN* and *MAX*; available settings for the mode of operation are *energised* and *de-energised*.

Range of application (see also figure on page 20):

- Switching direction *MAX*, mode of operation *energised*:
 - Alarm when limit value is exceeded, for example horn on
 - Protection against overheating, for example cooling on
- Switching direction *MAX*, mode of operation *de-energised*:
 - Protection against overheating, for example heater off;
 - with large hysteresis *MIN-MAX* operation, for example heater on/off
- Switching direction *MIN*, mode of operation *energised*:
 - Alarm when value falls short of lower limit, for example horn on
 - Protection against cooling too cold, for example heater on
- Switching direction *MIN*, mode of operation *de-energised*:
 - Protection against cooling off too cold, for example cooling off;
 - with large hysteresis *MIN-MAX* operation, for example cooling on/off

Overview of switching behaviour of the relays:





PROCESS AUTOMATION – PROTECTING YOUR PROCESS



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