Driesen + Kern GmbH

Bedienungsanleitung / User Manual

DKRF470 Series



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1 Preface and Safety Instructions

This user manual describes the installation and operation of the **DKRF470** series. Should you encounter problems with the operation or installation of the device try to solve them with the help of this manual (refer to **chapter 6**).

If you have questions that are not being answered in the manual or you discover a defect of the product, please read **chapter 6.2** for information on how to contact our support team at Driesen + Kern.

Safety instructions are marked on the margin as follows:



Stop! Most important safety instruction whose non-compliance will potentially cause health risks or damages to the product.



Warning! Warns of installation or configuration errors and incorrect use which can cause data loss or malfunction.



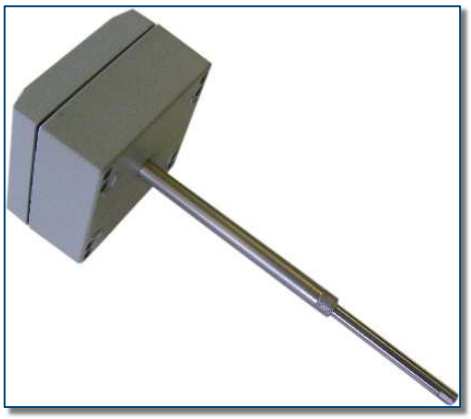
Information Notes describing optimal configuration and operation of the device as well as tips to prevent errors in measurement.

2 Introduction

The **DKRF47X Transmitter Series** consists of five Models.



◄ DKRF471
Transmitter for wall mounting with fixed probe tube.



◄ DKRF472
Transmitter for duct/pipe mounting.



◄ DKRF473
For direct process integration up to max. 90°C.



◄ DKRF473-EXT
Also, for process integration, but with miniaturised probe head up to max. 120°C.



◄ DKRF474
Pressure resistant version of the measuring head.



◄ DKRF47X with LCD
Variant with integrated display (optional)

2.1 Area of Application & Limitations of Use

Information for Measuring Humidity:

When measuring humidity and especially when calibrating a humidity transmitter, the temperature balance between humidity sensor and surrounding environment is of fundamental importance. Even a small temperature difference of only ±1°C at ambient conditions of 20°C and 50% RH can cause measuring errors of ±3% RH. At a humidity level of 90% RH the measuring error can even amount to ±5.4% RH.

Limitations of Use:

A number of factors can complicate the measurement of relative humidity. The following information is to help prolong the sensor's durability and increase the accuracy of measurements. If you have any doubts or questions regarding the limitations of use, we are gladly available to offer you further advice.

2.1.1 Chemicals

The transducers work on the basis of a capacitive humidity sensor in **CMOSens** technology. This technology along with some other protective measures makes the sensor relatively resistant against dust and other pollutants. However, chemicals, in particular detergents, solvents, and acids can affect the measurement or damage the sensor.

Please note that these substances mostly only become dangerous at higher temperatures or reach an increased and damaging concentration through outgassing after a long period of exposure. If and how you can perform measurements in such places, maybe with the help of filters and bypasses, has to be determined case by case.

2.1.2 High Humidity

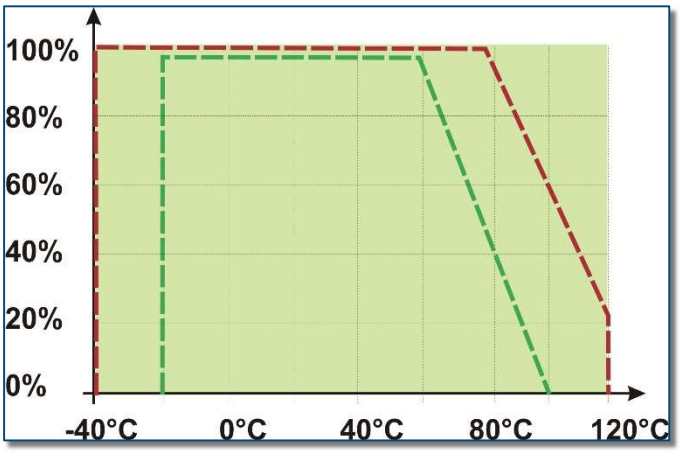
Under conditions with a very high level of humidity, a temperature difference of a few degrees can lead to condensation at the sensor. Short-term condensation on the sensor is permissible. In no case should the sensor permanently or regularly be wetted for hours, since this will lead to corrosion inside the sensor and on the conductors. The following actions can be taken to improve operating conditions.

1. Remove the sensor filter for faster drying.
   Please note that in some circumstances the drying of the sensor in unventilated measuring sites can take up to a few hours.
2. Install a bypass with better manageable conditions. If applicable, convert to absolute humidity or dew point.
3. Build a baffle plate or an immersion pipe in order to prevent the sensor from moistening.

In case of occasional condensation, the sensor works fine after the condensate has dried off. Condensates with contaminant loads (e.g. acid formers, solvents) can cause a reduction of the sensor's durability and an irreversible drift of measured values.

2.1.3 High Humidity and High Temperature

The transducer can be used within range from 0…100% RH under the restrictions mentioned above. The temperature operating range is limited by the electronics, the sensor itself, and the employed material. Furthermore, the sensor may not be used at high humidity and high temperature **at the same time**.



---- Maximum operating conditions
---- Regular operating conditions

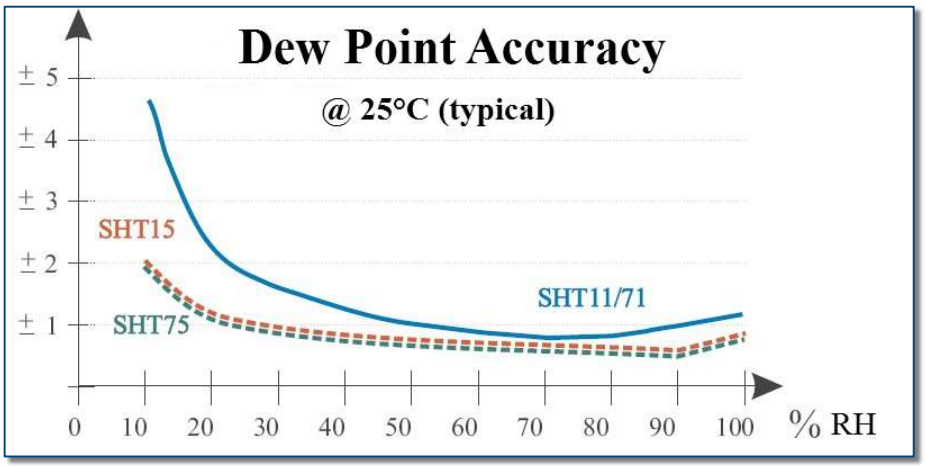
When operating outside the recommended ranges the humidity signal can temporarily increase by up to 3%. After a short period of time the sensor returns to its original calibration. Application beyond the maximum operating range is not recommended.

For operations in high humidity/high temperature range we strongly recommend using the DKTP493 transducer. They are optimised to that effect and offer mechanisms to counteract possible condensation.

2.1.4 Low Humidity

The humidity sensor is less accurate in low operating ranges (close to 0% RH) than in the middle range.

Moreover, the relative error (relating to the actual value) increases enormously at very low measurements.



Attainable Dew Point Accuracy:

You take measurements at 50% RH. The sensor error at this point is approximately of ±1.8% RH. This results in a relative error of 1.8/50=3.6%.

This time you take measurements at 5% RH. The sensor error at this point is approximately ±2.5%. That results in a relative error of 50%.

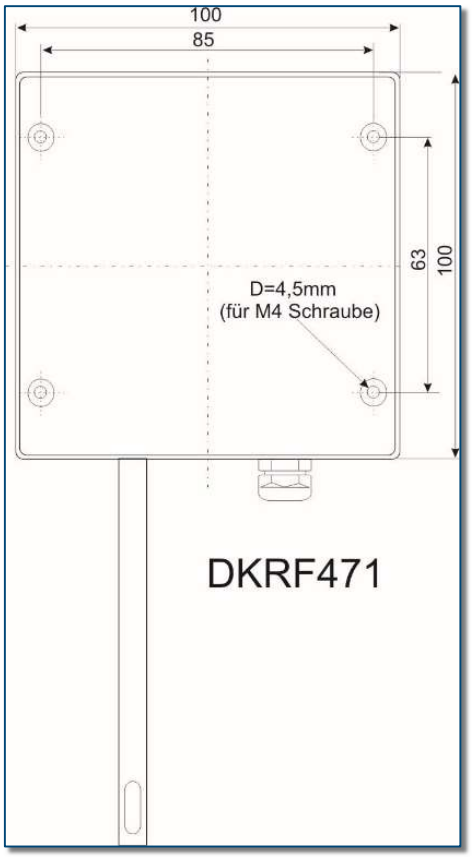
This makes the dew point calculation quite inaccurate at low humidity. If you want to apply a transducer for relative humidity at very low value levels, you can measure with the help of a bypass.

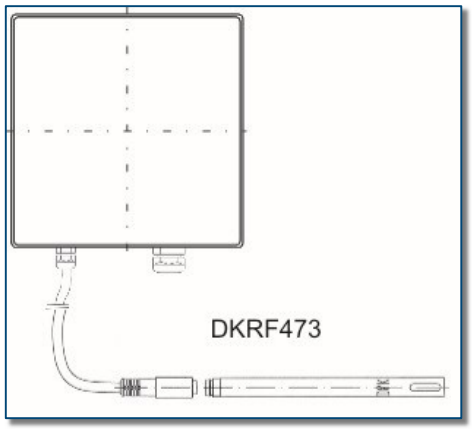
3 Hardware

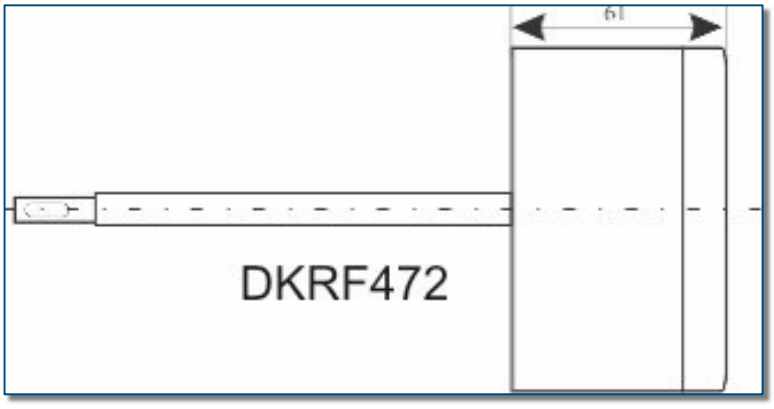
3.1 Installation

Carefully choose the set-up location when installing the transmitter. A continuous airstream ensures fast response times, and the environment should be free of contaminants and dust. Any potential for the creation of condensation ought to be also eliminated. In any case the measuring head of the humidity probe should be mounted vertically or horizontally with a small decline towards the sensor so that potential condensate cannot accumulate on the sensor and is able to drip off. Also take into consideration the alignment of the sensor head when you install the DKRF471.

3.2 Drill Pattern & Dimensions







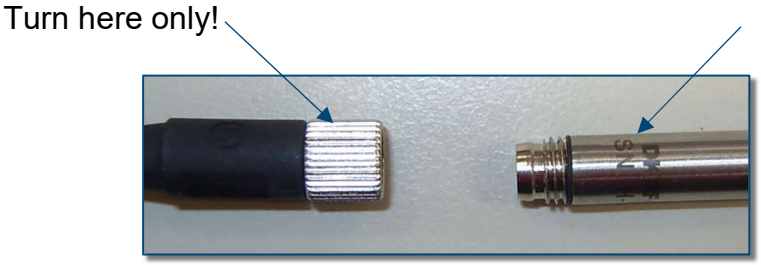
3.3 Probe Connection

The measuring head can connect to the transmitter with a connection cable.



The connection cable has a fitting connector (female) and is equipped with a knurled nut.

- **Connecting probe and cable:**
  Please first plug in the probe, then thread the knurled nut onto the probe. **Hold on to the probe!**



3.4 Mounting with optional Accessories

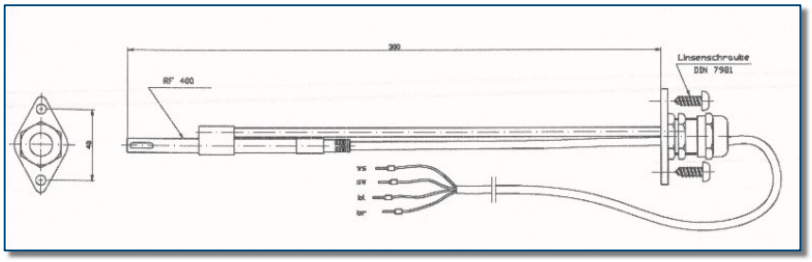
3.4.1 Mounting with Flange 400

With the help of the flange model **Flange400** you can carry out an installation inside the duct.

▼ Mounting with Mounting Flange



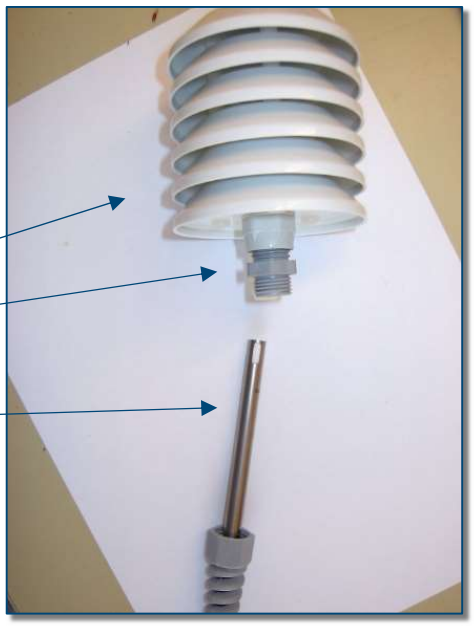
▼ DKRF400 with mounting flange, technical drawing



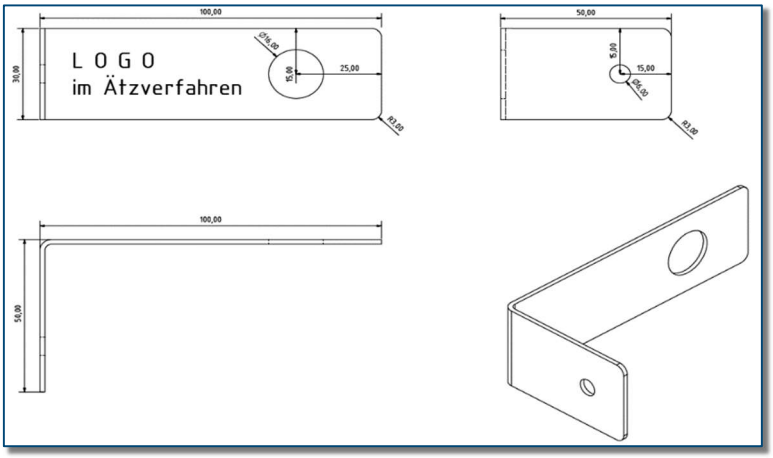
3.4.2 Mounting with Holding Bracket

With the help of the **holding bracket** you can fasten the probe especially easily and metrologically correct to a wall etc. Always use **radiation protection** when measuring outdoors.

Radiation Protection TR351
►



▼ Holding Bracket WM400

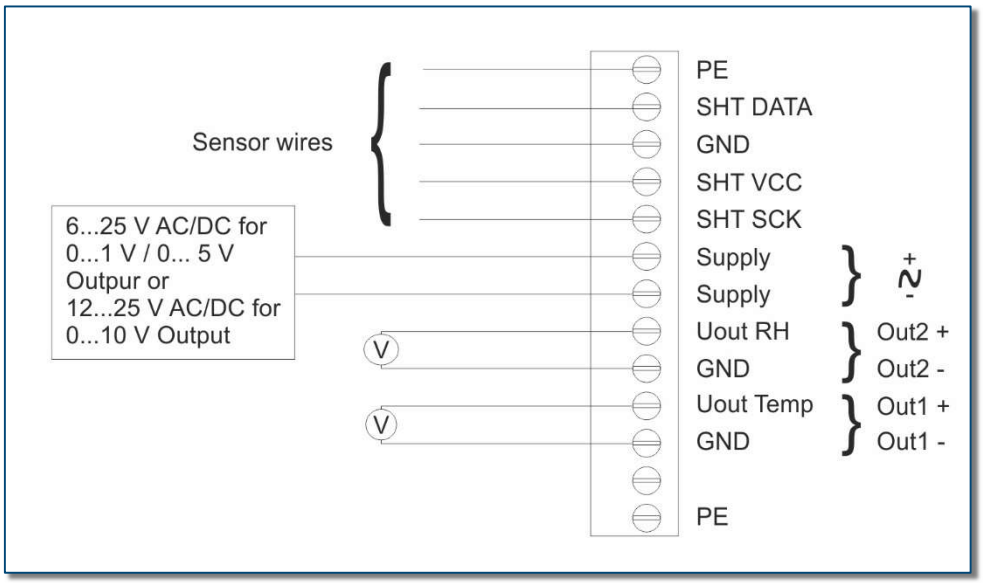


3.5 Electrical Installation

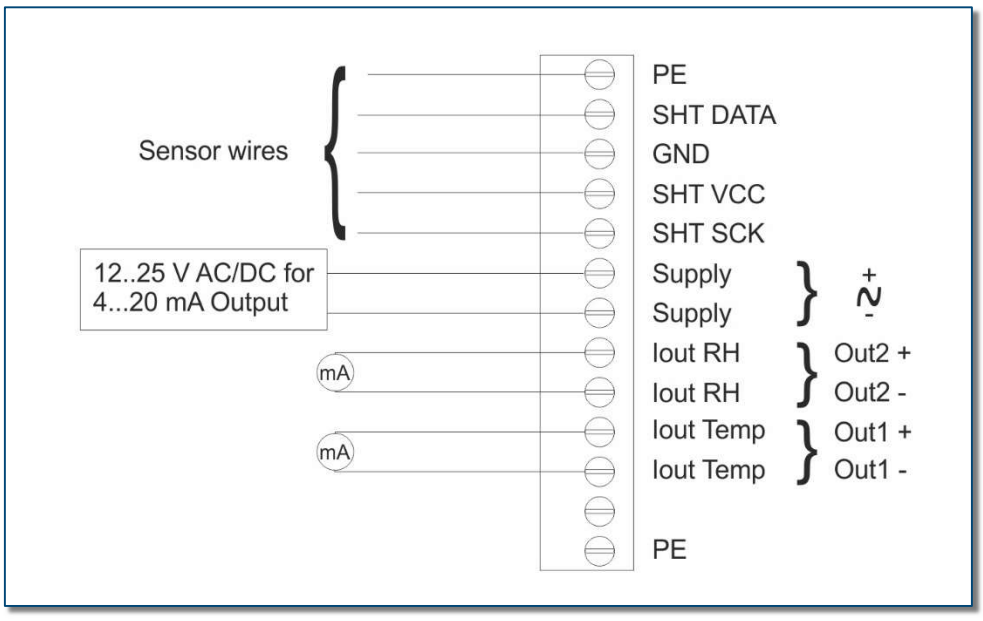
▼ **Wire Colors**

Assigned	Standard Models (up to 80°C)	EXT Models (up to 120°C)	Models with cable longer than 10 m
Shield		**Yellow/Green**	
DATA	**Blue**	**Green**	**Brown**
GND	**Black**	**Yellow**	**Black**
VCC	White	**Brown**	**Red**
SCK	**Brown**	White	**Orange**

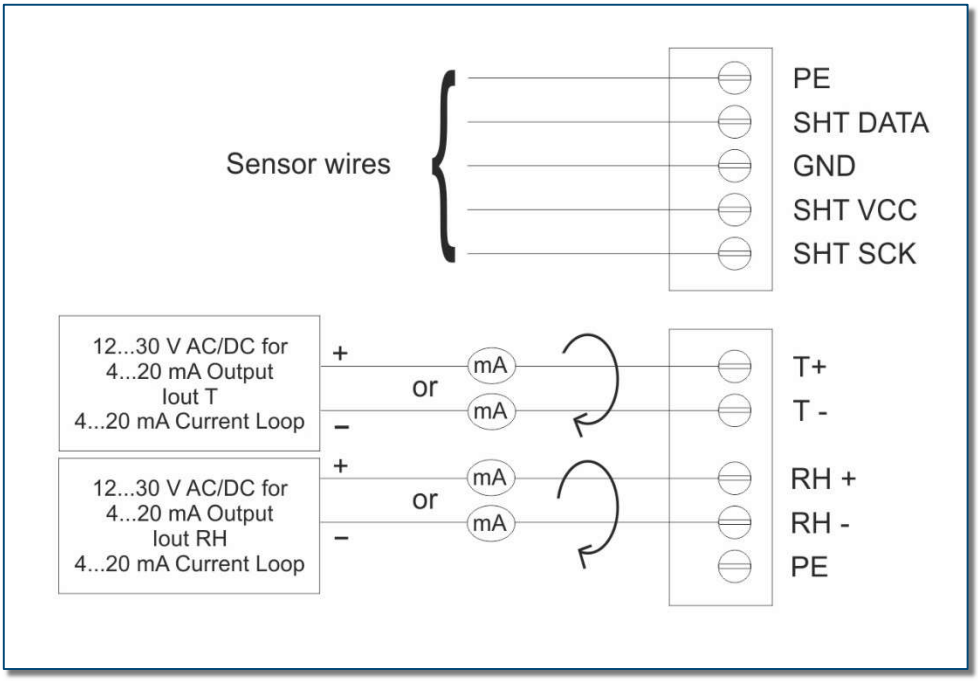
▼ Assignment of voltage outputs **with three wire connection**



▼ Assignment of **current outputs with three wire connection**



▼Assignment of **current outputs with two wire connection**
(Current loop for RH & T)



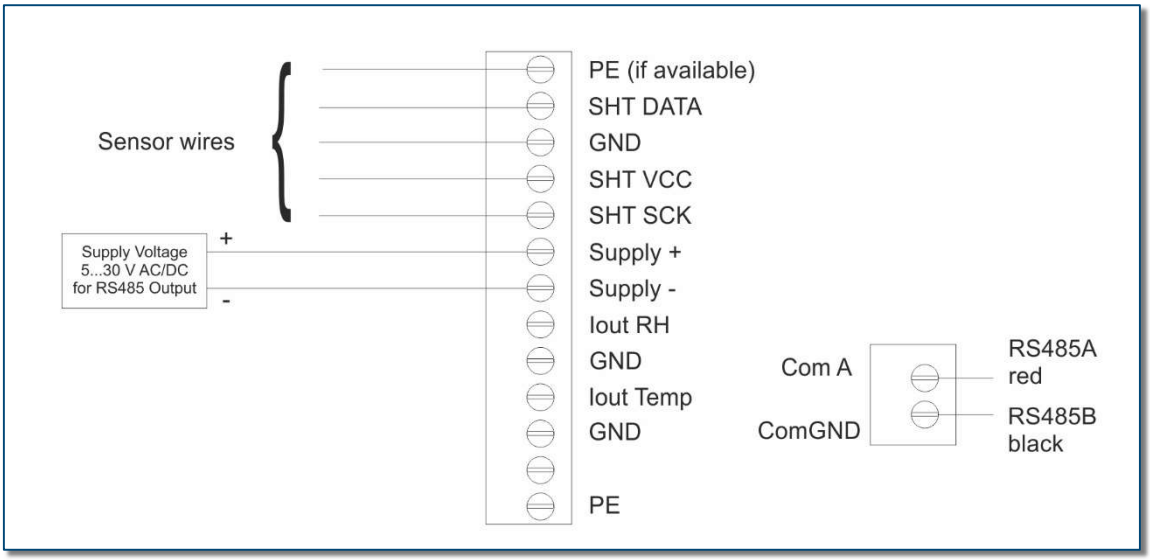
When you only need the humidity output, the temperature output still needs to be supplied with voltage (12...30 V).

3.6 Digital Interfaces

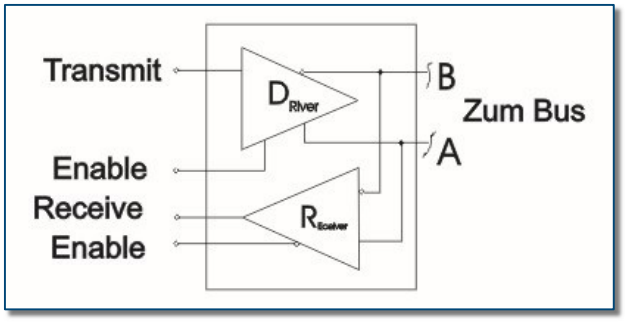
3.6.1 Connection via RS485 Interface

DKRF47X Transmitter are available with a RS485 interface. This cable features open ends, allowing for the best possible system integration. Because of the inner electrical design of the RS485 interface at least 56 probes of the same type and one master without additional electronics can be connected to each other.

▼ Connection Assignment of the **RS485 Interface**



▼ Typical Design of the RS485 Interface



Bus Specification:
Standard RS485, 2 wire technology, half duplex,
-7V to +10V Common-Mode Input Voltage Range

Baud:	9600
Data bits:	8
Parity:	none
Stop bits:	1
Coding:	ASCII character set
Probe echo:	on

3.6.2 Connection via USB Interface

The **DKRF47X** transmitter with RS485 interface can connect to any common computer with a USB adapter cable. The transmitter is directly supplied through the USB port and needs no further configurations.
However, operating system drivers must be installed.
You can find them for download on our website:

www.driesen-kern.com ► Support ► Software & Updates

Please first install the USB driver before you connect the device with the USB interface of your computer. You communicate with the probe via a virtual COM-Port which is assigned automatically by the operating system after identification of the probe.

After plugging in the USB adapter cable, you will find in the operating system Windows 10 under **Start\Settings\Bluetooth and other Devices** the entry: **Silicon Labs CP210x USB to UART Bridge (COMx)**.
COMx is your COM Port with which you can access, using the corresponding terminal program.

The device enters the so-called **MeterMode** as soon as you connect it. In this operating mode, a serial data stream is emitted every 2 seconds. You can find the command list for controlling the probe in **chapter 4.2**.

4 Operation

Provided you connected the transmitter correctly with the connection cable, installed it at the measuring site, and connected it to your interface you can now put it into operation.

When you connect a probe to your computer the transmitter automatically starts in the **MeterMode** and provides measured values every ca. 2 seconds.
When issuing for the RS485 interface the transmitter **cannot** automatically enter the **MeterMode** because it needs to get an address first.

The transmission specifications for the ASCII-Mode are:

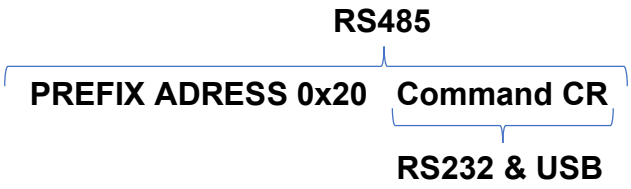
Transmission specifications in ASCII-Mode

Baud:	9600
Data bits:	8
Parity:	none
Stop bits:	1
Coding:	ASCII character set, 1 Byte per character
Probe echo:	off

4.1 Command Syntax for Digital Interfaces

A command comprises a data command of multiple ASCII characters with a CarriageReturn as terminator – a prefix as well as an address are put first for the RS485 interface. The address also comprises multiple ASCII characters in plain text format. (Addresses in the range 0...255 can be freely assigned. The address 0 is set by default at delivery.
Separate command and address using SPACE (ASCII-Code 32dez or 0x20hex). There is no checksum calculation.

Command Syntax:



The PREFIX is optional and serves the synchronisation of the bus. It is comprised out of 3 Byte and has the following format:

?#: = ASCIICode 0x3Fhex 0x23hex 0x3Ahex

The address must follow directly behind the PREFIX (without SPACE).

When using the probe in RS232 Mode the same commands are valid as in the RS485 Mode but without address! When the probe is delivered with active analogue outputs the device is always in RS232 Mode.

4.2 Commands

Command	Description
Meter	One-time transmission of the sensor data
MeterMode	Cyclical transmission of the sensor data every 2 seconds
s	Ends MeterMode
uscal	Initiates sensor calibration
refacscal	Carrying out a reset to factory calibration
config	Changes the RS485 address

The commands are described as follows and the condition at delivery of a standard address 0 assumed. It applies:

[SPACE]	=	ASCIICode 32dez / 0x20hex
[CR]	=	ASCIICode 13dez / 0x0dhex
[TAB]	=	ASCIICode 09dez / 0x09hex

The output syntax of the sensor data string is set as follows:

Sensor Value [SPACE]°C[TAB]**Sensor Value** [SPACE]% [CR]

The sensor value **always has a constant** length of 8 characters, 2 decimal places, a decimal separator and places before the decimal point. The prefix, only –, is only put out if necessary, the string is otherwise filled with SPACE.

4.3 Commands in Detail

The CarriageReturn at the end of a command sequence must be activated through Enter during manual operation via a terminal program.

One-time call up of the sensor values @ RS232

Command sequence	Meter[CR]
Answer	23.82 °C[TAB]43.25 %[CR]

One-time call up of the sensor values @ RS485

Command sequence	0[SPACE]Meter[CR]
Answer	23.82 °C[TAB]43.25 %[CR]

Changing the RS485Adress

Command sequence	0[SPACE]config[CR]
Answer	TransmitMode[CR][LF]
	(1)..analogue[mV][CR][LF]
	(2)..RS485[CR][LF]
	(8)..RS232[CR][LF]
	1 >
Transmitter is waiting for input.	
	Send a 2[CR] for RS485-mode.
Transmitter sending:	
	RS485Address 0 >
Transmitter is waiting for input.	
	Send number between 0...255:
	12[CR]
Transmitter sending:	
	[CR][LF]12[CR][LF]StartupInfo 1 >
Transmitter is waiting for input.	
	Send 0 (for hidden) or 1 (for displayed):
	1[CR]
Transmitter sending:	
	[CR][LF]...wait for RESET!

After 10 seconds the device executes and is ready for use with new address 12.

Calibration

Command sequence	0[SPACE]uscal[CR]

When the probe is delivered from the factory it is calibration locked. You will be asked to enter a code: Use: **tf45ghfx5**

Follow the instructions of the probe.



Warning: If values are being transmitted, which do not meet the value range of the respective parameters, the transmitter answers with: [CR][LF]…out of range![CR][LF]>. The answer must be repeated.



Warning: If values are being transmitted, which cannot be interpreted as numbers, the transmitter answers with: [CR][LF]…incorrect![CR][LF]>
The answer must be repeated.

4.4 Information for the RS485 Interface

When you connect a probe to your computer the transmitter automatically starts in the **MeterMode** and provides measured values every ca. 2 seconds.

When issuing for the RS485 interface the transmitter **cannot** automatically enter the **MeterMode**. The device must be activated manually.

At the time of the POR (PowerOnReset or power supply on) the probe carries out an internal systems check and puts out key parameters via the RS485 interface. The current RS485 address can be taken from this data. The start screen (Startupinfo) looks as follows:

```
RESET
-MTAA-DKrF470
Enhanced Architecture HW.V. 2.0
SW.V. 2.01 build May 01 2005 13:24:14C 412A-2809
(c) Driesen+Kern GmbH Bad Bramstedt Germany
SNr: F1134
Range: -40.0 -  120.0      0.0 -  100.0
status: 0240     02       00       00       01       00       80       25
```



Current RS485 adress, here 0

To change the RS485 adress use a terminal program under Windows and a RS485 to RS232 converter. It can be obtained from Driesen + Kern GmbH. The command sequence is depicted in the previous **Chapter 4.3 Commands in Detail**.

You can use Open Source or Freeware terminal programs like Putty with Windows 7 or higher. This Startupinfo can be hidden with the command **config** (see there).

The command **config** should not be used during RS485 operation and serves a one-time parametrisation of the probe with a terminal program.

4.5 Alarm Function

4.5.1 Description & Hardware Configuration

The DKRF47X series can optionally be equipped with an alarm function. Please indicate the alarm threshold value as well as the alarm mode and hysteresis when you order (compare. **Chapter 4.5.2**)

Alternatively, you can program the switching value yourself.
The switching contact is able to cleanly separate voltages up to 60 Volt and currents up to 1 A.

The contacts are fed on the top side of the circuit board and marked with Alarm A und Alarm B. Be mindful to connect the higher potential to contact A not contact B.

Please connect the wires as follows.

RED	**-**	**COM A**
BLACK	**-**	**COM B**
BROWN	**-**	**COM GND**
YELLOW/GREEN	**-**	**SCREEN**

Connect the 9-pin SUB-D plug with a free COM-Port of your PC. Possibly use a USB RS232 converter if your PC has no serial interface.

4.5.2 Exceeding or Falling Below of Threshold Value with Hysteresis

All channels available on the transmitter can be used for triggering. All channels not meant for alarm detection can be hidden. The different channel arms can be offset against with an AND but also with an OR-function and transferred to the switch contact.
Only the channels put on analogue outputs can be included.

An alarm in a logical sense always means the closing of the contact. Recreate a two-point controller with hysteresis with the help of the following alarm modii (http://en.wikipedia.org/wiki/Hysteresis).

Every available channel can be set up independently with two threshold values, hysteresis, and mode. These settings are put non-volatile into the transmitter.

Alarm-Mode 0:

No alarm is activated for the selected channel.

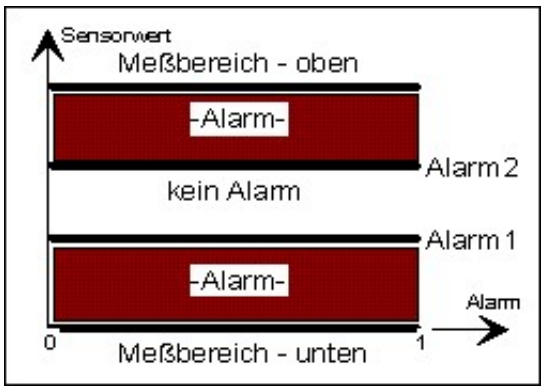


Alarm-Mode 1:

There are two alarm ranges for the selected channel:

If the sensor value is higher than alarm threshold1 ± hysteresis and smaller than alarm threshold2 ± hysteresis, there is no alarm.

If this is not so, there is an alarm.

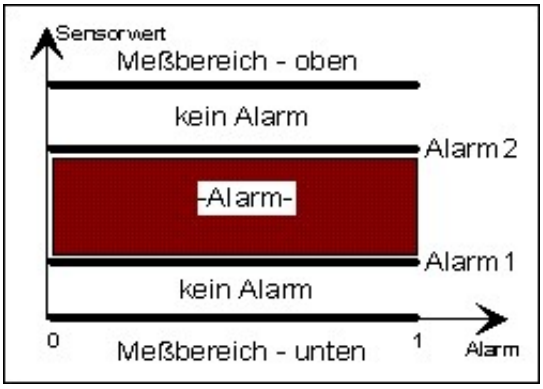


Alarm-Mode 2:

There is only one alarm range for the selected channel:

If the sensor value is higher than alarm threshold1 ± hysteresis and smaller than alarm threshold2 ± hysteresis, there is an alarm.

If this is not so, there is no alarm.



4.5.3 Alarm Setting

If the option alarm is integrated in the device, you can activate and change the alarm setting with the help of the commands.

Setalarm <cr>
You can set the alarm values for both output channels. These values are threshold1, threshold2 and hysteresis. Both channels can be used with logical AND / OR gates for calculation. Alarm status TRUE means the circuit is being closed.

Setup alarm parameters for:
(1)..Temperature [°C]
(2)..relative Humidity [%]
(3)..other
? >1
Alarm mode for Temperature [°C]:
(1).. deactivated
No alarm calculation on this output channel.
(2).. ONE ALARM-ON Area
Alarm is true, if actual transducer value is greater threshold1 and smaller threshold2.
(3).. TWO ALARM-ON Areas
Alarm is true, if actual transducer value is smaller threshold1 or greater threshold2.
? >2
Threshold1 [°C] (-20.. +80) ? >20
Threshold2 [°C] (-20.. +80) ? >50
Hysteresis [°C] ? >5
Logical channel alarm linkage of output ch1 and output ch2:

(1).. OR linkage
If alarm on outputch1 **OR** on outputch2 true, then close alarm switch.
(2).. AND linkage
If alarm on outputch1 **AND** on outputc2 true, then close alarm switch.
? >1 Configuration change successfully finished

5 Maintenance and Care

The DKRF470 transmitters are very low maintenance due to their design.

5.1 Calibration

The transmitters are based on combined humidity and temperature sensors. You can send in the whole transmitter (without cable) for calibration or order a calibrated measuring head to calibrate your original measuring head, alternately.

5.2 Submission for Recommended Annual Calibration

The recommended calibration interval typical of the industry is one year.
To ensure a quick completion of your calibration order please download the form **Service & Support Request** from our website and fill in all necessary information. You can find the form under support:

www.driesen-kern.com ► Support ► Support Form

For the regular calibration of the probe please send it to:

Driesen + Kern GmbH
Abt. Service
Am Hasselt 25
D-24576 Bad Bramstedt

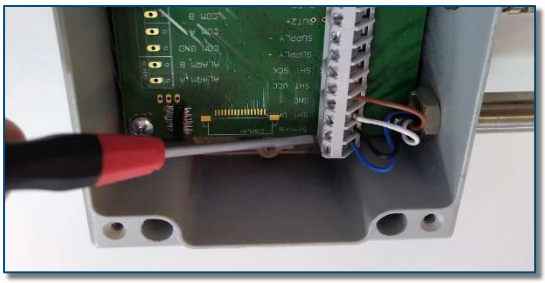
5.3 Sensor and Filter Change

Only do a sensor change if the sensor is defect and shows no reliable values.
Trained personnel should carry out the sensor change.
Exchange the fragile sensor at your own risk!

The transmitter from the DKRF470 series is based on the new combined humidity and temperature sensor Sensor400. Through the low costs of the sensor element and calibrated replacement measuring head type SK473 it is typically not necessary to perform a calibration or adjustment on site.

Simply order the replacement measuring head SK473 or SK473-CC (-CC so a certificate is included in delivery). With the DKRF473, pull the measuring head off the cable and plug in the new sensor head onto the measuring cable. They are ready for operation! The accuracy after the switch of the replacement measuring head is at ±1.8% RH / ±0.3°C.

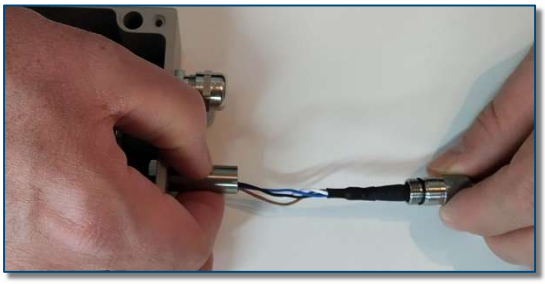
Only the replacement measuring cable MK473-2000 (2 meter sensor cable) or MK473-5000 (5 meter sensor cable) needs to be ordered in case of a damaged sensor cable.



1. Disconnect the supply voltage
2. Disconnect the connection cable



3. Unscrew the probe head



4. Remove the probe head



5. Remove the connecting plug



6. Unscrew the SK470 measuring head



7. Pull out the SK470 measuring head

   Note:
   Insert the new measuring head in reverse order.

6 Troubleshooting

Should you encounter problems when using the transmitter, please try to solve them with the help of this manual first. If you are not able to solve your problem with the help of this troubleshooting guide, please use the support of Driesen + Kern.
For more information on our support team refer to **Chapter 6.2**.

6.1 Causes & Solutions

Symptom	Potential Cause	Solution
No Function	Cable connection wrongly wired.	Watch the cable routing when you wire the connection cable. Refer to **Chapter 3.5**.
	No DC voltage applied	Mind the specifications of your transmitter!
	Defective cable/wrong cable	Use the correct cable. Check for cable break.
Implausible Values	Dirty filter	Check and clean the filter. Temporarily measure in an unproblematic medium without a filter to determine whether the values without filter are plausible. If this is the case, replace the filter. Refer to **Chapter 5.3**.
	Error in the measuring system downstream	Check the outputs with a digital voltmeter. If the values are correct, there is an error with the input amplifier of the following measuring system (very rare!). A serial 100 ohm resistance at the output of the probe can solve this problem.
Permanent Lower/Upper Range	Defective cable	Exchange the cable.
	Defective sensor	The sensor needs to be exchanged.
Humidity Value too High	Filter cap saturated with humidity	During installation, make sure the transmitter is mounted in a way that no or only a little bit of moisture can collect on the device and drip off if possible. A vertically downwards directed mounting is recommended. Measure without the filter to determine it as problem cause. If the filter is indeed too moist take appropriate measures to dry it at your own risk. ONLY dry the filter, not the sensor!

6.2 Open a Support Ticket (online)

Not every problem can be solved with the help of this troubleshooting guide. Both for support tickets as well as for calibration or repair orders Driesen + Kern offers online forms which help speed up the process.

Please find the forms here:

www.driesen-kern.com ► Support ► Support Form

The forms can be filled out on your computer and quickly emailed back to us at support@driesen-kern.de – or just include the filled-out form in your calibration or repair delivery.

Attachement – Certificate of Conformity

Driesen + Kern GmbH

Certificate of Conformity

Driesen + Kern GmbH
Physikalisch-Technische-Messgeräte

Product: **Humidity Transducers**
DKRF400, DKRF400-EXT, DKRF415, DKRF417
DKRF410, DKRF420, DKRF300, SK470, SK673,
DKRF470, DKRF4050/4060, DKRF4001/4002

This is to certify that above products are calibrated using dedicated equipment which is calibrated according to ISO/IEC 17025 and calibrated by comparison against natural standards, natural physical constants, consensus standards, or by ratio type measurements using self-calibrating techniques.
The specification given in datasheets are met by the above products.

Certificate of conformity V.18

Driesen + Kern GmbH

(Oliver Driesen, Managing Director)

Bad Bramstedt, 12.10.2017

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