User's Manual
WT-WI02 & Easy Control
Version 1.22

KEM

Küppers Elektromechanik GmbH
Quality system certified to DIN ISO 9001

Contents

General Information

1.1 Features

The converters type W*.02 are passive 4-20 mA sensors with carrier-frequency- (WT) or inductive (WI) input stage.

In addition to the analogue output the sensor provides a galvanically isolated open collector output, which can be used either as a switch or frequency output. The frequency output is freely scaleable for a calibration to the volume flow independent of the type of flow meter.

The W*.02 have an interface integrated in the M12 sensor plug. The interface adapter and remote software KEM »EasyControl« allow for programming the operating parameters and to read the input frequency.

The output frequency and current can be linearized with up to 10 points.

The W*.02 is supplied either with standard settings or adjusted to a specific flow meter.

1.2 Safety

1.2.1 General Safety

All statements regarding safety of operation and technical data in this manual will only apply when the unit is operated correctly in accordance with this manual.

The data for Ingress Protection (IPxx) will only apply when all connectors are caped properly with the corresponding counterpart with the same or better IP rating. Cable glands must be populated with cables with the specified diameter and closed properly.

During operation all openings of the housing must be closed unless otherwise noted in this manual.

All connections to the load and to the supply must be made with shielded cables unless otherwise noted in this manual. This unit must be grounded.

This unit must be supplied by a safety approved power supply with outputs which comply with Safety Extra Low Voltage (SELV).

As a protection against fire in the positive supply a fuse with a current rating not higher than the current carrying capacity of the cable used is required.
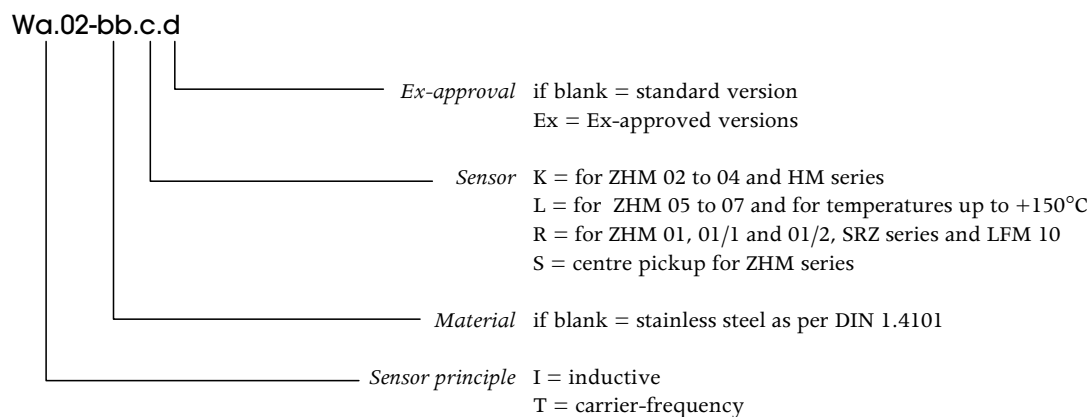
1.2.2   Special requirements for Ex installations

When used in hazardous area a suitable separation amplifier or zener barriers must be used.

When using long cables make sure that the maximum inductances and capacitances for the respective voltage or gas group are not exceeded.

1.3   Ordering Codes and Accessories

1.3.1   Ordering Code

Wa.02-bb.c.d

Ex-approval	if blank = standard version	
	Ex = Ex-approved versions	
Sensor	K = for ZHM 02 to 04 and HM series	
	L = for ZHM 05 to 07 and for temperatures up to +150°C	
	R = for ZHM 01, 01/1 and 01/2, SRZ series and LFM 10	
	S = centre pickup for ZHM series	
Material	if blank = stainless steel as per DIN 1.4101	
Sensor principle	I = inductive	
	T = carrier-frequency	

1.3.2   Accessories

CON.USB.WT: USB-adapter for WT.02 with output plug to loop through the analogue and frequency output. In the remote mode the WT.02 can be powered via the USB interface or via an external power supply.

EasyControl: Remote software for WINDOWS® XP or VISTA.
With WINDOWS® XP SP3 or N.NET framwork is required.

Connector M12; 5 pin, female; 713

Shielded cable

2 Getting started

2.1 Unpacking

Verify that you have received the following items:

When you ordered W*02…:
- W*02…..
- User's manual

When you ordered CON.USB.WT
- CON.USB.WT
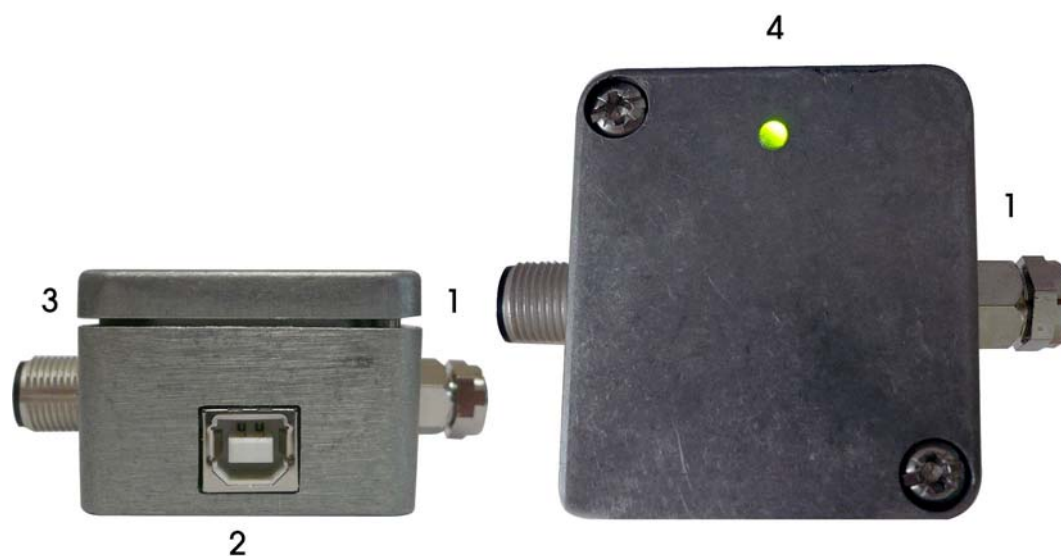- USB-cable
- CD incl. software and drivers
- User's manual

2.2 Operating Elements

2.2.1 W*02

1 = Electrical connector
2 = Lock nut
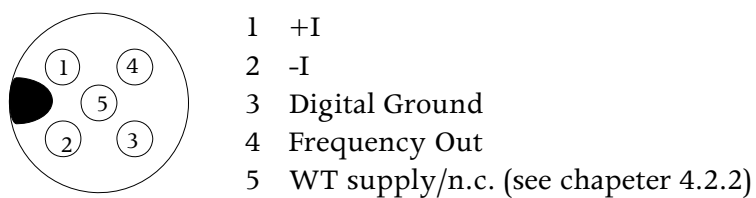3 = Installation thread
4 = Pickup tip

2.2.2   CON.USB.WT

1 = cable to W*02
2 = USB connector
3 = output connector
4 = control LEDp

2.3   Pin Assignments

2.3.1   W*02

1	+I
2	-I
3	Digital Ground
4	WT Frequency Out
5	WT Communication In

2.3.2   CON.USB.WT

1	+I
2	-I
3	Digital Ground
4	Frequency Out
5	WT supply/n.c. (see chapeter 4.2.2)

3 Installation

3.1 Mechanical

Screw the W*02 manually (without tools) into the pickup thread of the flow sensor until you reach the stop.

Turn the W*02 back by 90°

Fix the lock nut.

Note:
Screwing in the W*02 with too much force can damage the pickup tip!

3.2 Electrical

Make sure that the flow meter is grounded.

Note
The housing of the W*02 is connected to the shield of the cable. In bigger systems a separate grounding of the meter might be required for avoiding high currents in the cable shield. In that case the shield might be left open or grounded via a capacitance of e. g. 100nF to avoid ground loops.

Note
Inproper grounding and shielding may lead to bad EMC behaviour or danger to your health!

Connect the W*02 via a shielded cable to the control unit. The W*02 is specified for a supply voltage of 15 V or 24 V and will operate at supply voltages from 12 V up to 30 V.

Note
Make sure that all cable and wires are connected and fixed properly before applying power to the W*02

For the electrical connections refer to the drawings in chapter 4.1

3.3 Ex Installation

The W*02-Ex is intrinsically save when operated with zener barriers.

Mount the W*02 as described in chapter 3.1.

Connect the W*02 to suitable zener barriers.

Note
When used in hazardous areas the W*02 must not be connected to any circuitry except suitable zener barriers.
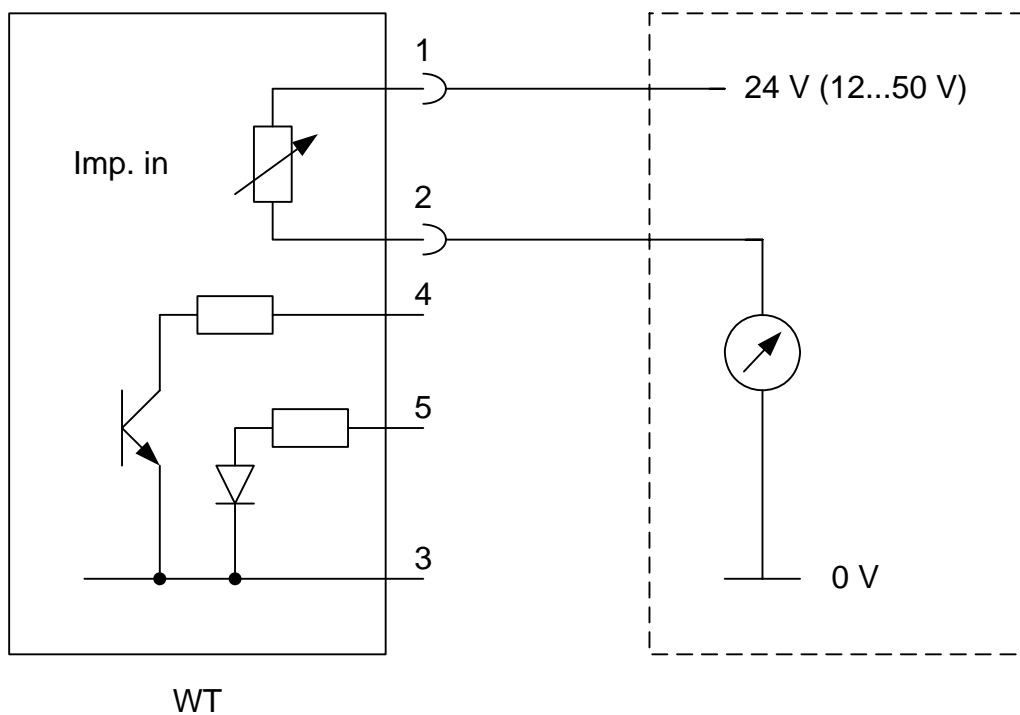
4 Operation

4.1 Normal operation

The W*02 is ready to use and does not require any special settings.

If changes of the K factor for the analogue output or of the operational mode are required, please refer to chapter 4.2.4.

4.1.1 Using the 4 – 20mA loop only

The W*02 operates as a passive $4 - 20mA$ sensor with 2 wire connection.
Connect the W*02 according to the figure below.

Note:
For this mode of operation the analogue mode must be set to "Input Frequency". This is the default setting. The frequency mode can be set to "OFF".

4.1.2   Using the 4 – 20mA loop and the digital output

In this mode the W*02 operates as a passive $4-20mA$ sensor with auxiliary optically isolated open collector output.

Connect the W*02 according to the figure below.

WT
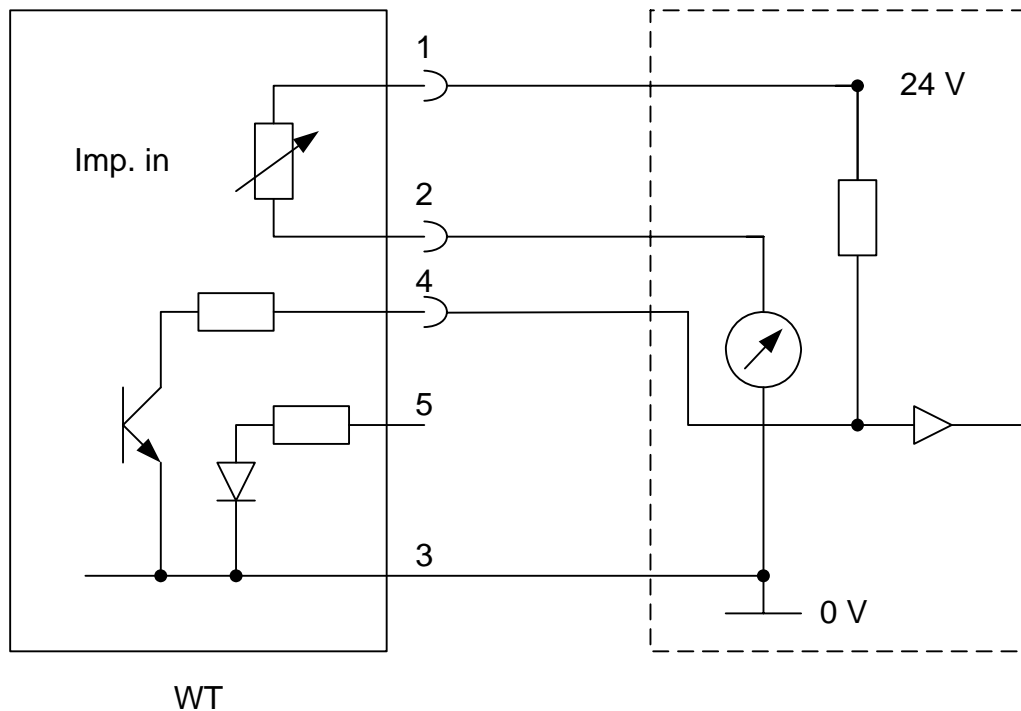
The following modes are possible for the digital output:

Input Frequency:
The input signal is transformed to a square signal and fed to the digital output (pin 4).

Switch Normally open:
The output is high (open) at low frequencies. As the input frequency reaches $f_{th} + f_{hysteresis}$ the transistor becomes conducting and the output goes low.

As soon as the input frequency drops below $f_{th} - f_{hysteresis}$ the output becomes non conducting again and goes high, provided that an external pull up is connected.

Switch Normally closed:
The output is low (conducting) at low frequencies. As the input frequency reaches $f_{th} + f_{hysteresis}$ the transistor becomes non conducting and goes high, provided that an external pull up is connected.

As soon as the input frequency drops below $f_{th} - f_{hysteresis}$ the output becomes conducting again and the output goes low. For changing the mode refer to chapter 4.2.4.

4.1.3   Using the digital output only

If only a digital output is required, connect the W*02 according to the figure below.

For the description of the digital output modes refer to chapter 4.1.2.

For best performance and lowest power requirements, the analogue mode can be set to "4 mA". In that mode the W*02 draws a supply current of 4 mA independent of the input frequency.
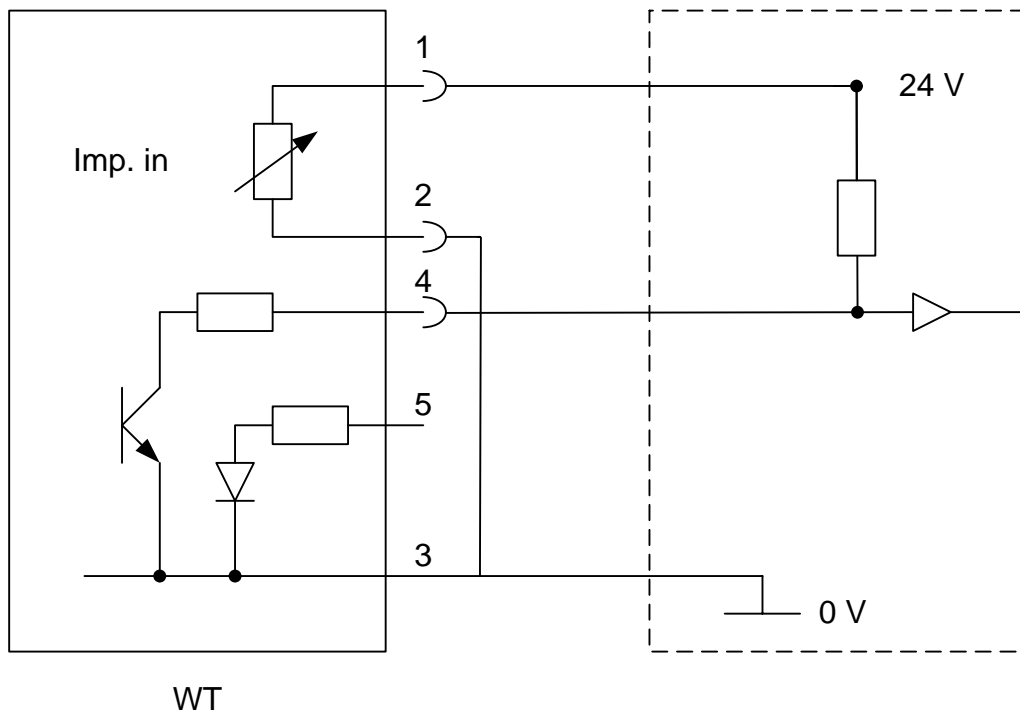
4.2   Remote Control

The W*02 has a built in interface which uses the frequency output and pin 5 of the connector for communication.

Communication with a computer is easily implemented by using the USB converter CON.USB.WT and the remote SW KEM EasyControl.

Note:
In remote mode the digital output is used for communication and does not provide the frequency output or switch functionality!

4.2.1　Installation of EasyControl

Note:

To install EasyControl on the computer administrator rights are required.

Start "setup.exe" on the CD.

The installation will be performed automatically and an icon for starting EasyControl will be created on your desktop.

Note:
If necessary (Windows® XP without SP3) the Microsoft .NET Framework runtime library will be installed on the computer

Start "CDM 2.04.06.exe" on the CD and the driver for the CON.USB.WT will be installed.

4.2.2　Connecting the WT to the PC

The CON.USB.WT provides 3 modes of operation:

POW int:
The WT is powered from the USB interface. No connection at the output connector of the CON.USB.WT is required. The frequency output cannot be used.
The LED lights up when the CON.USB.WT is connected to a PC.
This mode is used for setting up the WT or for simple measurements of the input frequency

POW DAM:
The WT is powered from the USB interface. Between Pin 2 and 5 of the output connector of the CON.USB.WT a DAM must be connected. This DAM shows the $4 - 20mA$ signal of the WT. The frequency output cannot be used.
The LED lights up when the CON.USB.WT is connected to a PC.
This mode is used for setting up the WT, for calibrating the analogue output and for simple measurements of the input frequency

POW off:
The WT is not powered from the USB interface. An external power supply at the output connector of the CON.USB.WT is required.
The LED does not light up.
This mode is used for in line monitoring the WT in a complete installation.

To set the mode proceed as follows:
• Open the CON.USB.WT by removing the 2 screws in the top cover
• Set the rotary switch with a small screwdriver to the desired position (see figure below)
• Close the CON.USB.WT with the 2 screws

Connect the CON.USB.WT via the provided USB cable to your PC

Note:
Pin 3 of the output connector of the CON.USB.WT is connected to the ground potential of the PC!

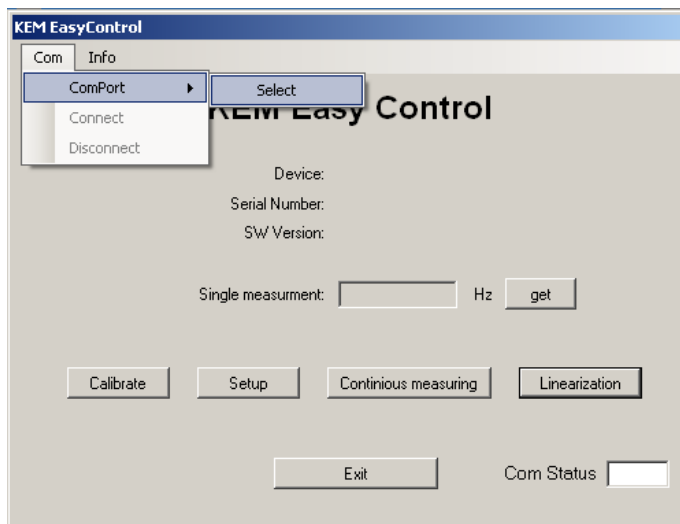Connect the cable of the CON.USB.WT to the WT.

Note:
When you connect for the first time a CON.USB.WT to your PC, you need administrator rights on the PC as the drivers must be installed on the PC!
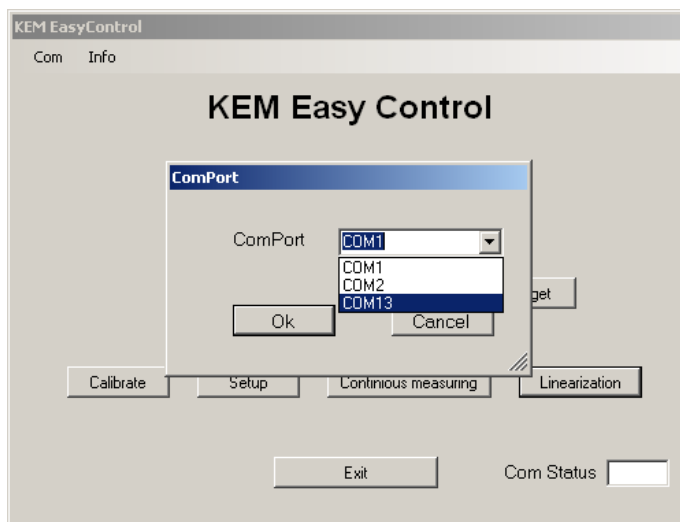
If necessary connect the DAM or the power supply / control unit to the output of the CON.USB.WT

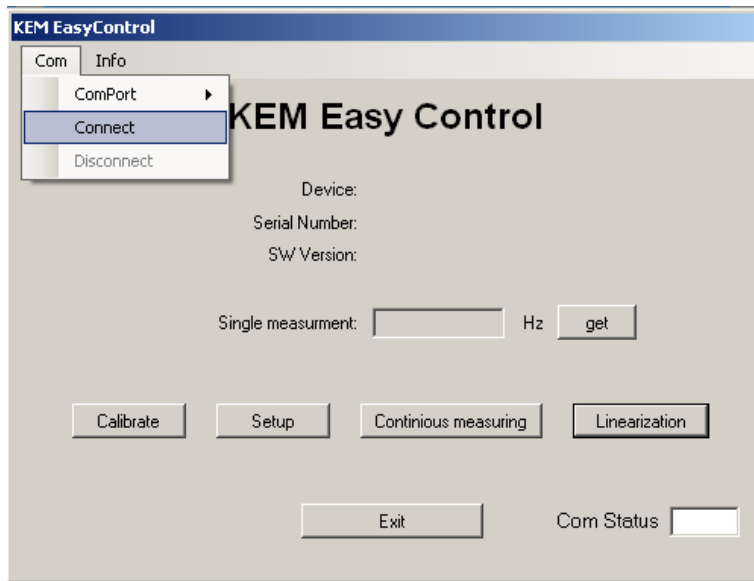Start EasyControl by double clicking on the icon.

Click "COM", "ComPort", "SELECT".

Select the right com port (normally that with the highest number) and confirm with "OK".

Click "COM", "Connect"

The main menu now shows device name, serial number and SW version of the WT and EasyControl is ready to be used.

For ending the remote control of the WT click "COM", "Disconnect".

For finishing EasyControl click "EXIT".

4.2.3 Reading the input frequency

During normal operation it is possible to read the input frequency without disturbing the analogue $4 - 20mA$ signal.

In the main menu a single frequency measurement can be performed by clicking „Single measurement''.

In the menu "Continuous measuring" the actual input frequency is displayed continuously with 1 measurement per second.
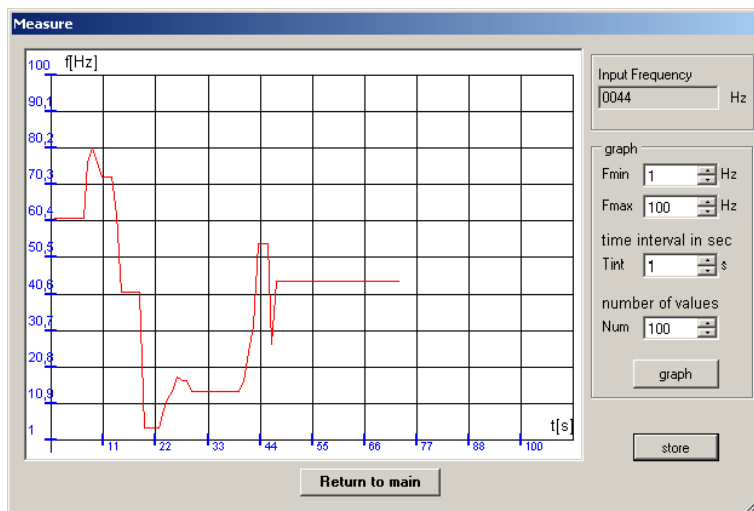
The frequency over time can be displayed as a graph:
Set the 4 parameter for the graph and start the measurement by clicking "graph".

When the graph is finished, the total set of values can be stored in a file:
Click "store". If required, name and location of the file can be set individually.

4.2.4 Changing the settings

Setup
In the setup mode the following settings can be done:
- Setting the input full scale (i. E. the frequency giving 20mA)
- Setting the analogue mode:
  "Input Frequency"   The input frequency is converted in $4 - 20mA$
  "4 mA"   The W*02 draws constant 4 mA
- Setting the frequency mode:
  "Off"   Digital output not used
  "Input Frequency"   The output frequency equals the input frequency
  "Switch nc"   Switch normally closed
  "Switch no"   Switch normally open
  "Corrected frequency"   The output frequency is calculated according to the specified parameters.
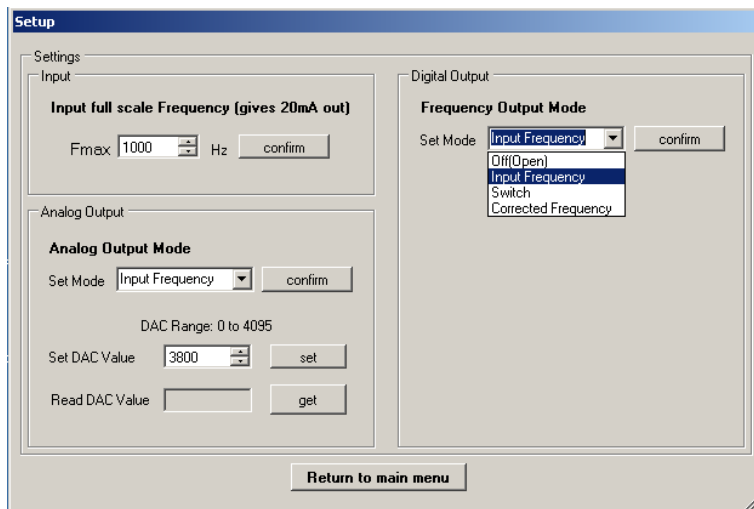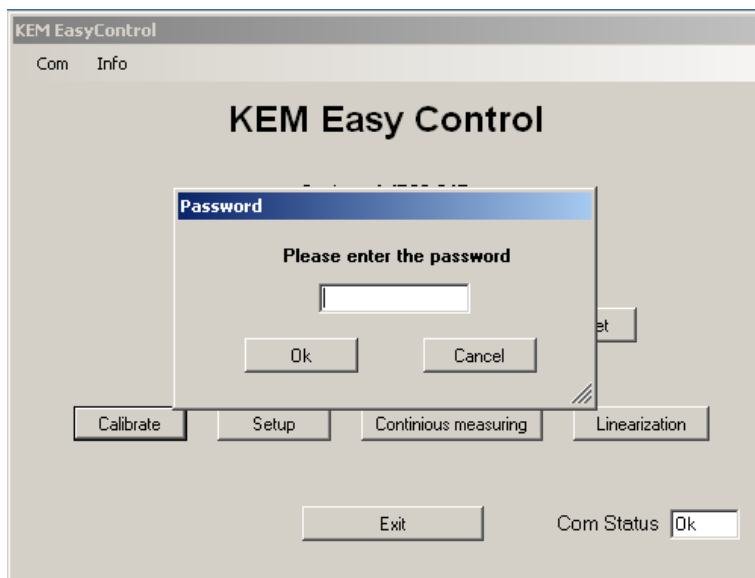

Note:
In the Setup Mode also the analogue output is disabled. The last value is maintained until the setup is finished. Changes in flow will not alter the current!
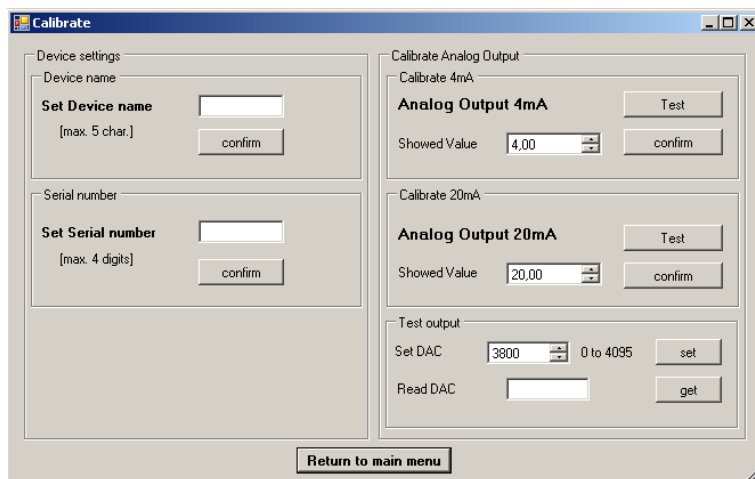
4.2.5 Calibration

The calibration of the W*02 is protected by a password.

Click "Calibrate".

Enter "user" as password and confirm with Ok.

For calibrating the 4 mA point click on "Test" in the field "Calibrate 4 mA".

Set the value in the field "Showed value" with the arrows up and down to the measured current.

Click "Confirm".

The 20 mA point is calibrated the same way.

Note
Changing the device settings is only possible with the KEM master password.

Linearisation

In the linearization menu a linearization of the analogue output and the corrected frequency output can be defined.

Starting at "frequency 1" up to 10 couples of input frequency and frequency error can be specified. Each couple has to be confirmed by clicking "confirm".

The value "error" is defined as the deviation of the input frequency from the ideal input frequency.

Note:
Starting at "frequency 1" the frequency value for each couple must be higher than the value of the previous one. The remaining, non used couples are specified by "0" as frequency value!

5 Service and Maintenance

5.1 Maintenance

The W*02 does not require regular maintenance.

For best performance, however, we recommend checking the calibration of the analogue output every 5 years, in harsh environments even more frequent.

A recalibration can be performed by using the CON.USB.WT plus KEM EasyControl or at KEM.

5.2 Trouble shooting

In case the W*02 does not work properly, first check the following items:

No output signal
All cables properly connected?
➔ connect the missing cables
W*02 properly mounted?
➔ Check mounting position and, if necessary, mount the W*02 properly

Output frequency too low
All cables properly connected?
➔reconnect the loose cables
Meter working properly?
➔ Check and, if necessary, replace the meter

Output frequency too high or unstable
Most probably EMC problems
Shield and ground properly connected?
➔ Connect shield properly. If necessary, try additional means of grounding and shielding

5.3 Service

The W*02 does not contain any user serviceable parts.

In case of malfunction, please contact your nearest dealer or directly KEM.
For the addresses see chapter 6.5

6 Listings

6.1 Warranty

KEM warrants material and production for a period of 18 months after installation and start up, max. 24 months from delivery date.

6.2 Declaration of conformity

See separate sheet.

6.3 Technical Data

Analogue signal

Type	4–20 mA, 2-wire (passive)
Resolution:	5 µA
Supply voltage:	12–30 V, regulated
Allowable load:	(UB–12V) / 20 mA, max. 800 Ω
Operating modes:	ON (frequency proportional current)
	OFF (supply current 4 mA independent of frequency)

Digital output

Type:	open collector, potential free
Protective resistor:	1,600 Ω
Frequency range	1–3,000 Hz
Operating modes	OFF (frequency output disabled)
	1 : 1 (output frequency = input frequency)
	CORR (scaleable output frequency)
	SW (switch output)

Further specifications

Measuring frequency	1–3,000 Hz
	(actually usable frequency depends on flow meter)
Response time	250ms (for input frequencies > 5Hz)
Temperature drift	< 100 ppm / K
Connector:	M12, 5-pin
	1 = +I
	2 = −I
	3 = emitter (digital ground)
	4 = collector (frequency output)
	5 = remote input
Ambient temperature:	−20 ... + 50°C
Medium temperature:	−20 to +120 °C with a distance of at least 25 mm between flow meter and electronic housing
Dimensions:	see drawing (show K or R version)
Material:	stainless steel
Protection class:	IP65
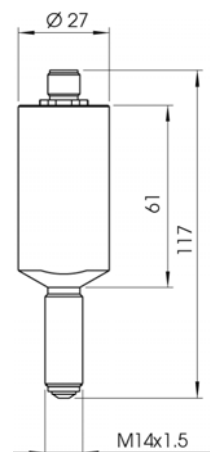
6.4   WEEE and RoHS

The unit described herein is not subject to the WEEE directive and the corresponding national laws. At the end of life forward the unit to a specialised recycling company and do not dispoes it of f as domestic waste.

The unit described herein fully complies with the RoHS directive.

6.5   Addresses

Main office
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