

## MagCheck In-situ verification

... for electromagnetic flowmeters (EMF)



Variable area flowmeters

Vortex flowmeters

Flow controllers

**Electromagnetic flowmeters**

Ultrasonic flowmeters

Mass flowmeters

Level measuring instruments

Communications technology

Engineering systems & solutions

Switches, counters, displays and recorders

Heat metering

Pressure and temperature

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## **General advice on safety**

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Use of MagCheck on converters, which are not listed as may cause damage to these converters, to MagCheck and, in case of connection to hazardous area versions of these converters damage to protective elements. As a result safety risks in later operation of these converters cannot be excluded.

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## **Product liability and warranty**

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Responsibility for suitability and intended use of this instrument rests solely with the user. Improper installation and operation may lead to loss of warranty. In addition, the general conditions of sale are applicable and are the basis for the purchase contract. If the instrument needs to be returned to KROHNE, please note the information given in the service part of these instructions.

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## **Items included with supply**

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A rugged suitcase containing:

- MagCheck
- Operating and installation instructions (hard copy)
- CD with MagCheck PC program, operating and installation instructions, Excel spreadsheets for data processing
- IFC 010 connecting cable
- IFC 020 connecting cable
- IFC 090 connecting cable
- IFC 110 connecting cable
- PC RS 232 connecting cable
- Power supply adapter 100..230V to 15 V DC
- Power plug adapter for different plug standards

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# 1 MagCheck introduction

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## 1.1 Introduction

MagCheck is an all-round portable testing and verification device for KROHNE electromagnetic flowmeters, enabling a complete functionality and accuracy verification of the EMF without taking the meter out of the pipeline nor interrupting the process. MagCheck measures autonomously and can be used on KROHNE EMF-converters (not on Ex-converters!). MagCheck can be employed either as an automatic verification instrument or as a manual flow signal calibrator, depending on the converter type.

MagCheck is used for precise analysis and verification of magnetic flowmeters. Precision of these meters is not only a function of accuracy of electric data, but also depends on the mechanical installation of flowhead and converter. Faulty installation, both mechanical or electrical, may not be detected by MagCheck.



**Use of MagCheck on converters, which are not listed as compatible may cause damage to these converters, to MagCheck and in case of connection to hazardous area versions of these converters damage to protective elements!**

MagCheck can and must NOT be used on:

- TIV 50, TIV 60
- K300, F200
- SC150
- ALTOFLUX 2W, IFC 040
- IFC 090i
- TIDALFLUX\*
- CAPAFLUX, IFC 090 K / CAP
- NB 900 Power Booster
- Any Ex Zone 1/div 1 versions (hazardous area versions) of ALTOFLUX 2W, IFC 040; SC80A / AS, SC100A / AS; IFC 080, IFC 200, IFC 200 E; IFC 090, IFC 090i; IFC 110; IFC 210 Ex versions!

\*) Verification of the conventional electromagnetic flowmeter part of TIDALFLUX IFM 4110 PF is possible after disabling the level input to IFC 110 PF. This will allow for a statement of flow velocity measurement part, not of total the performance of TIDALFLUX.

## 1.2 MagCheck as automatic vericator for KROHNE IMoCom converters

MagCheck is able to perform a fully automatic verification on magnetic flowmeters in combination with these converters. In this mode accuracy of the converter and all electric data of the primary head are verified which are vital for their function and accuracy. During the fully automatic test run the display will indicate all measured data. MagCheck reads and stores all settings of the IMoCom converter and all measured data of up to 70 meters.

MagCheck can verify KROHNE electromagnetic flowmeters with following IMoCom signal converters:

- IFC 010
- IFC 020
- IFC 090 Non-Ex versions
- IFC 110 Non-Ex and non TIDALFLUX-versions only
- IFC 210 Non-Ex versions

Data may be downloaded onto a PC (Microsoft Windows 95, 98, 2000, NT) using the KROHNE MagCheck PC-program. After downloading data into the PC the related memory areas in the MagCheck are cleared and can be used for further measurements. The KROHNE MagCheck PC-program evaluates the downloaded data. If all data are within their limits, the program will create a final certificate confirming the meter operates with an accuracy deviation of less than 1% related to reference conditions. If the evaluation shows data exceeding their limits, the certificate will state, that the meter is not working properly.

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### 1.3 MagCheck as manual signal calibrator

MagCheck replaces KROHNE Simulators GS8 / GS8A. With its integrated microprocessor, calibrated mA-meter and frequency meter MagCheck allows for verifying the accuracy of converters without the need for any further instruments like calculators, mA- and frequency meters.

MagCheck generates precise adjustable flow signals. The flow signal can be set in steps of 0.1% of full scale. These very precise flow signals will be fed into the signal inputs of the converter. The output signals (mA, frequency) are indicated on the MagCheck display. In this manual flow signal calibrator mode no data will be stored in MagCheck. The measured/indicated data must be noted and evaluated manually (see Appendix 1).

With non-IMoCom converters: In the flow signal calibrator mode with these previous converters data as meter size (DN), GK, full scale setting must be entered into MagCheck manually.

MagCheck may be used as flow signal calibrator for following KROHNE electromagnetic flowmeter signal converters:

- T900
- SC100A, SC 100AS Non-Ex versions only!
- SC80A, SC 80AS Non-Ex versions only!
- AQUAFLUX 070
- IFC 080 Non-Ex versions only!
- IFC 200E, IFC 200. Non-Ex versions only!
- and all IMoCom converters as listed under 1.2

With IMoCom converters MagCheck loads data as meter size (DN), GK, full scale setting, current and pulse output settings automatically down from IMoCom converter through the IMoCom interface.

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## 2 Connecting and operating MagCheck

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### 2.1 Preparation

#### 2.1.1 Initial preparations

Make sure that there is sufficient memory space left for new verifications. Connect MagCheck to a power outlet via its power adapter. MagCheck will start searching for the IMoCom interface. Stop this by pressing F1. Enter Menu 1.1. test MID. Press arrow →. MagCheck will indicate (example):

1.1 test MID

no connection

inputs: 69/70

In this case only one set of data (one verification) can be stored additionally. Download existing data into the PC to clear more memory space (refer to chapter 5) if necessary. Take print-outs of the Excel spreadsheets (Refer to Appendix 1) and results of earlier verifications/ tests on related meters with you.

#### 2.1.2 Document flowmeter data

Read and note all totalisers and counter values before and after verification and document the following (you may note these in the dedicated Excel spreadsheets, refer to chapter 7):

#### 2.1.3 Disconnecting cables

Prior to connecting MagCheck to the magnetic flowmeter, signal-, field-, output cables of the flowmeter must be disconnected by pulling the connectors. All flowmeter outputs are interrupted, related process instrumentation will see open inputs. As a result the meter will not indicate the actual flow during the verification the meter.



**Before changing any connections act according all process related safety and information rules existing in your organisation! Disable all alarms and take all controls to manual, which are dependent on the flowmeter outputs!**

### 2.2 Connecting cables

MagCheck is supplied with connection cables for IFC 010, IFC 020, IFC 090, IFC 110 F and a RS 232 cable (25 pole to 9 pole connector) for connecting MagCheck to PC (download of verification data) and a 100..230 Volt AC power supply, that is only used during download of verification data from MagCheck into PC. There is no need to unscrew any terminal screw with these cables. For manual calibration tests on older Non-IMoCom converters special cables can be supplied on request.

The 25-pin connector must be plugged into the MagCheck. Its securing screws must be fit to avoid contact failures during verification runs, e.g. due to accidental mechanical stress on the cable (see connection diagrams)

The following connections to the signal converter must be established:

- IMoCom (for tests on IMoCom converters only as listed under 1.2.)
- Electrode signal
- Field current
- Outputs (mA and pulse)

Connection to flow head (flow tube) only is necessary for automatic verification with IMoCom converters, not for use of MagCheck as precision flow signal calibrator for converter verifications.

The following connections to the flow head must be established±

- Electrode signal
- Field coil connection



During verification and test of converters as listed above, MagCheck does not need any external power supply or batteries. MagCheck takes all its power from the field current of these signal converters. The external power supply supplied with MagCheck is only needed during download of verification data into a PC.

## 2.3 Connection diagrams

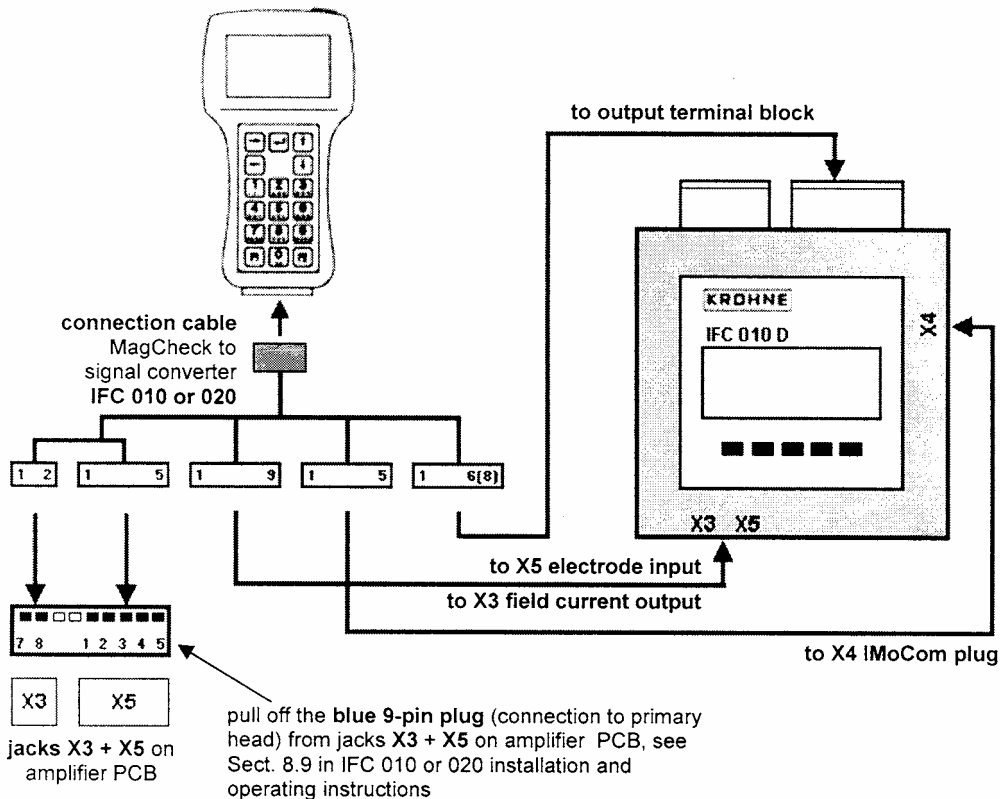


For use of MagCheck as precision flow signal calibrator for detailed manual verification of converters Connections to flow head (field coils and electrodes) are not needed.

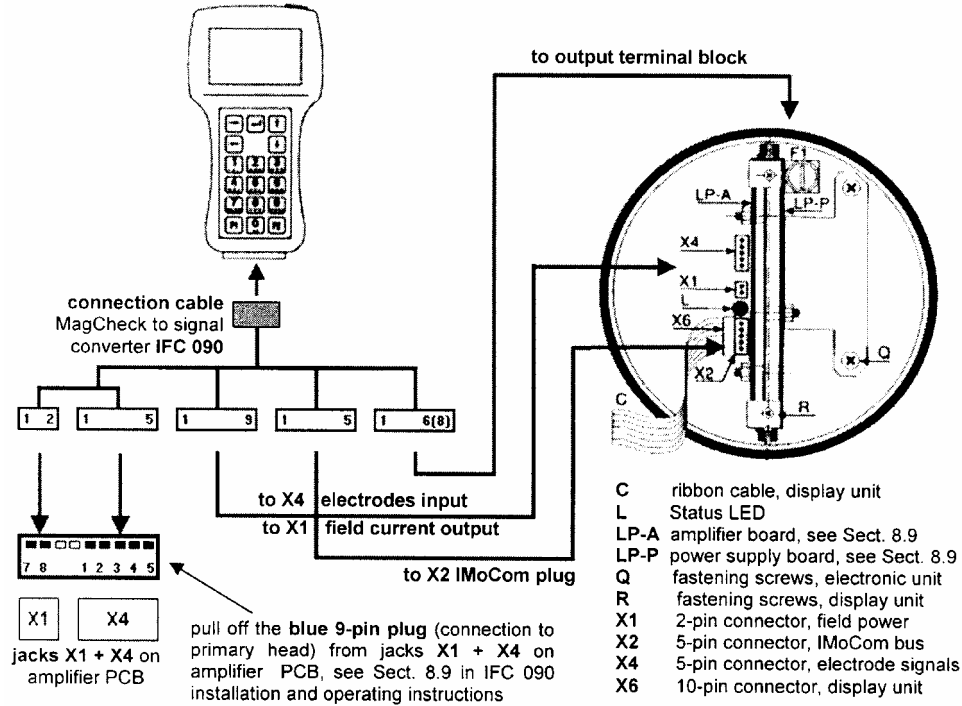
### Please note!

In the drawing of IFC 010 manual in Sect. 7.5 the jacks X1 and X4 were named wrong: X1 must be X3 and X4 must be X5!

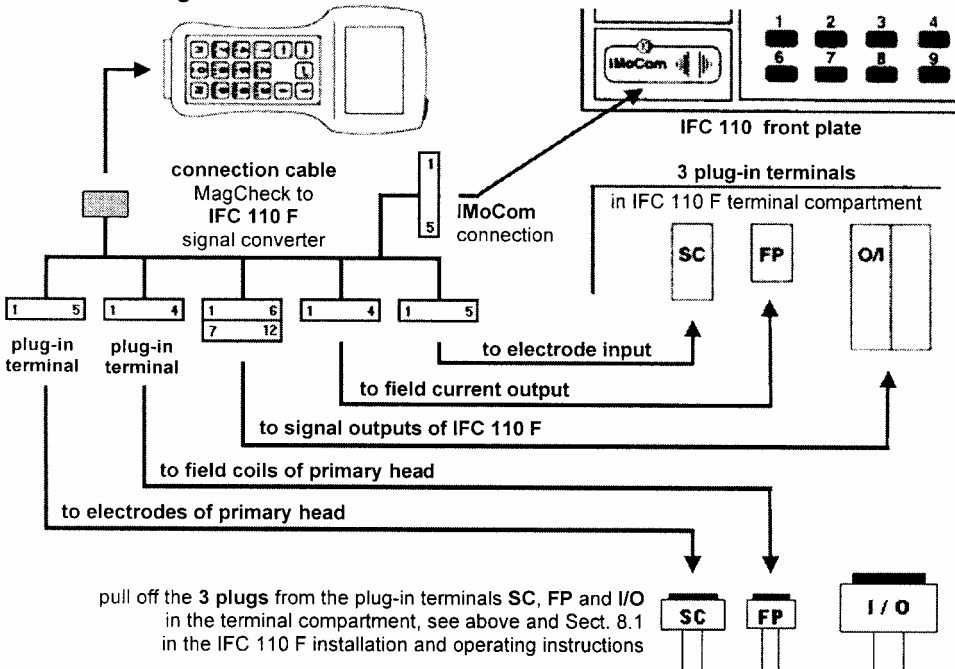
### Connection MagCheck IFC 010 or IFC 020



## Connection MagCheck IFC 090

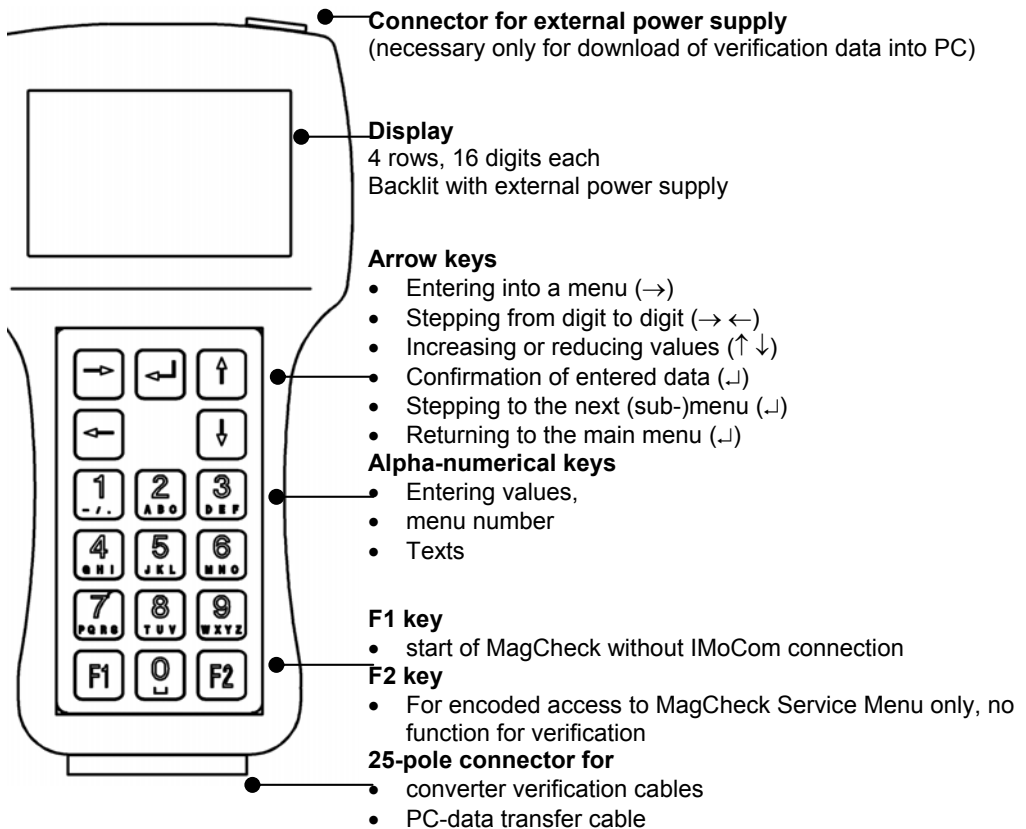


## Connection MagCheck IFC 110 F





## 2.4 User interfaces



## 2.5 Starting phase

After connection to converter and after power supply of the converter has been switched on MagCheck will start a self test, checking all its EEPROM data for their validity. After it will signal "OK" (in case of an error it will indicate "ERROR"), for approximately 5 seconds.

### 2.5.1 With IMoCom converters (IMoCom interface connected)

Next step is automatic start of communication with the IMoCom Bus of the IFC. After indicating: "Test of communication", MagCheck locks in onto the IMoCom Bus of the IFC. It will read the settings of the IFC and start to simulate a 100% signal.

### 2.5.2 With Non-IMoCom Converters or IMoCom-interface not connected

If there is no communication MagCheck will ask you to press "F1". and will stay in Menu 1.0 until settings are entered (see below). All meter parameters data in menu 1.2 must be entered manually.

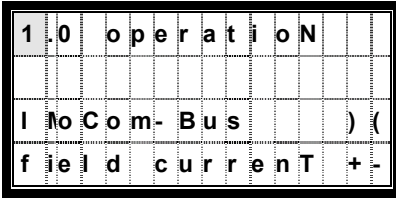
If energy (field current level) received by MagCheck is too low, MagCheck display will flicker and MagCheck will not start. This can be caused by:

- poor connection or defective cable / connector connecting field current to MagCheck
- a defective field current supply of the converter
- You have connected to an IFC040 converter

## 2.6 How to operate the menu

### 2.6.1 Display in main menu

There are three main menus indicated with x.0.



Menu line

Indication line

Status line for IMoCom connection

Status line for field current

In the main menu display, the two last lines represent status lines.

The IMoCom-Bus status line displays the actual status of the IMoCom connection as follows:

- ( ) Two moving brackets IMoCom present, IMoCom data transfer operating
- ( ) Two static brackets IMoCom present, no data transmission window present
- no No IMoCom connected

The field current status line displays the actual status of the field current as follows:

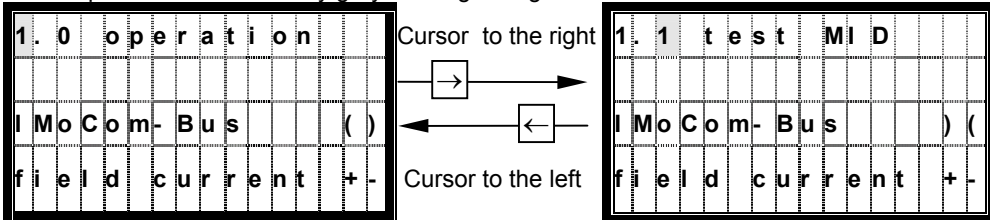
- + - Plus, minus Correct (field current is switching from positive to negative current and vice versa)
- + Plus Positive DC or pulsating DC (defective converter, negative half wave missing)
- Minus Negative DC or pulsating DC (defective converter, positive half wave missing)
- No indication No current (defective converter, no field current)

The indication lines are used to show error messages.

### 2.6.2 Selecting menus and changing data

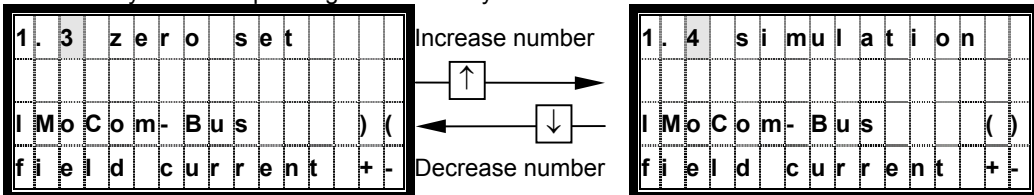
#### Moving the cursor

Cursor position is indicated by grey blinking background



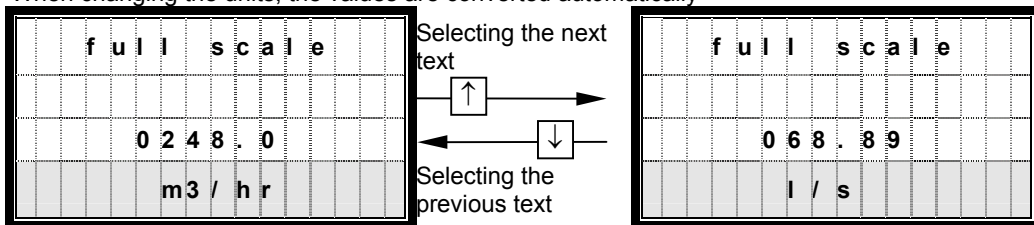
#### Changing the numbers

Alternatively the corresponding numerical key can be used

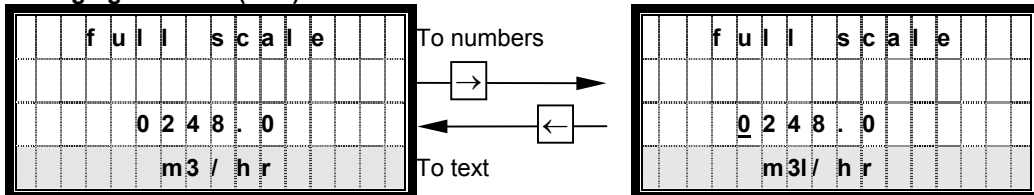


## Changing the Texts (Units)

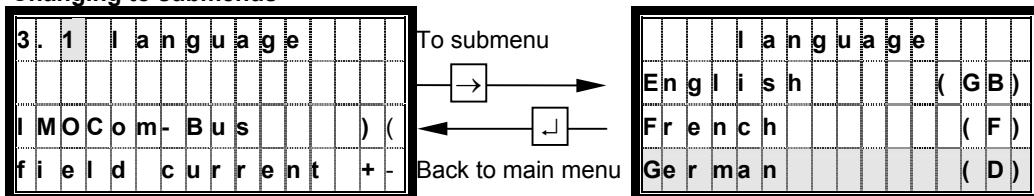
When changing the units, the values are converted automatically



## Changing from text (Unit) to numbers



## Changing to submenus



### 2.6.3 Initial settings of MagCheck

The only necessary initial setting is selection of the user language. Connect MagCheck to an IFC XX0 or connect to a power outlet using its power adapter. In the latter case

- Press F1 to stop MagCheck's search for an IMoCom interface
- Select Menu 3.1
- Press button → and select language English, German or French by the ↑↓ buttons
- Confirm selection by ↵

### 3 Description of MagCheck menu functions

#### 3.1 Menu structure

The menu of MagCheck has the following functional parts.

Menu	Text	Description
<b>1.0</b>	<b>Operation</b>	<b>Operation menu, main menu</b>
1.1	Test MID	Automatic verification menu for electromagnetic flowmeters with IMoCom- converters
..1.2 – 1.8		Menu for manual calibration test of converters
1.2	Parameter	Calibration test menu, entering meter data
	→ Diameter	DN 2.5 – 3000 mm/0.1 – 120 inch
	→ Full scale	Full scale value for flow Q=100% (available display values: m3/hr, Liter/hr, USGal/min, l/s)
	→ Primary constant	See EMF tag plate
	→ FCS nominal	Nominal field current value
1.3	Zero set	Zero setting
1.4	Simulation	Generation of flow signals, adjustable in 0.1%-steps of full scale value
1.5	Curr. output	Display of true value (IMoCom converters only) and actual value
1.6	Pulse output	Display of true value (IMoCom converters only) and actual value
1.7	Field current	Indication of field current, displaying <ul style="list-style-type: none"><li>• Positive current</li><li>• Negative current</li><li>• Sum of positive and negative current</li><li>• Field frequency</li></ul>
1.8	Hardw. Info	Display of: <ul style="list-style-type: none"><li>• Software ID of the respective modules</li><li>• Actual status information (IMoCom converters only)</li></ul>
1.9	Reset	Reset menu (On IMoCom converters only)
<b>2.0</b>	<b>Test</b>	<b>Information menu</b>
2.1	Device Info	Display of MagCheck Serial number, software version and calibration date
<b>3.0</b>	<b>Install</b>	<b>Installation menu (main menu)</b>
3.1	Language	Language setting. English, French, German
3.2	Data transf.	Data transfer menu from MagCheck to PC

## 3.2 Automatic verification with KROHNE IMoCom converters

### 3.2.1 How to start verification

Menu	Explanation	Display	Details		
1.0 Operation				→	
<b>1.1 Test MID</b>	Next screen	1.1 Test MID	Starts automatic verification of flowmeter with KROHNE IMoCom. All data will be verified and stored in MagCheck.	→	
	Next screen	inputs	xx/70: Number of stored verification files (e.g. 11/70), not transferred to the PC before. A total of 70 files can be stored. In this example 59 verifications can be made before memory is full.		
		date	Enter actual date (DD/MM/YY). This will allow PC program to correctly assort verifications in trend analysis. Attention: No plausibility check! Check carefully!	↵	
		tag number	All signs on the MagCheck keyboard may be used for entering the tag number. Method is the same as typing an SMS on a cell phone. Entered Tag Number will be used as identifier at download into PC. You may use up to 16 characters.	↵	
	Next screen (Select acc. to test / process conditions using ↑↓. This will allow MagCheck to select the correct verification program)	measurement	Test conditions must be defined		
		pipe full	<b>filled</b> with liquid Electrode resistance will be tested via liquid. With empty pipe the measured electrode resistance will not comply with full pipe specs. Result: Error statement in verification certificate		
		pipe empty	<b>empty, clean, dry pipe</b> Electrodes will be tested for insulation. With a full, wet or contaminated pipe, the measured electrode resistance will not comply with empty pipe specifications. Result: Error Message in verification certificate		↵
		no pipe	<b>Converter verification only</b> No verification of flow tube.		
	Next screen (Select by ↑↓)	Process liquid	Enter type, other data		
		name user	Enter name of MagCheck operator		↵
		start?	Select "back" or "yes"		
		back	Will allow you to step back and check and correct all data as entered above.		↵
		yes	Selecting yes and pressing ↵ will start automatic verification run.		

### 3.2.2 Explanation of the automatic verification run (verified data)

Converter data	Data indicated and stored
Measurement of the field current	Calibrated and actual value [mA]
Measurement of field frequency	Act frequency [Hz]
ADC linearity and accuracy test at 25% of full scale <sup>1)</sup>	Output of input amplifier and analogue to digital converter: True and act. value [% of full scale]
ADC linearity and accuracy test at 50% of full scale <sup>1)</sup>	
ADC linearity and accuracy test at 75% of full scale <sup>1)</sup>	
ADC linearity and accuracy test at 100 % of full scale <sup>1)</sup>	
Testing of the 1st calibration point P04 for current output <sup>2)</sup>	Calibrated and actual value [mA]
Testing of the 2nd calibration point P20 for current output <sup>2)</sup>	
Testing of the 1st pulse output with $f = 500 \text{ Hz}$ <sup>3)</sup>	True and actual value [Hz] for $f_{100\%} = 1000\text{Hz}$
<b>If flowhead is tested as well</b>	
Measurement of field coil resistance	Coil resistance (Ohms)
Measurement of resistance of electrode 1 <sup>4)</sup>	Resistance values are measured. Display of subsequent voltage levels and resistance values
Measurement of resistance of electrode 2 <sup>4)</sup>	
Measurement of isolation resistance of field coils	

Following the measurement, the measured data are stored in the MagCheck.

- 1) ADC test verifies accuracy of input amplifier and analogue to digital conversion of flow signal. During this test the GK of the converter is temporarily set to factory test conditions  $GK = 2.500$ . At end of verification the GK will be reprogrammed automatically by MagCheck to original data.
- 2) mA output tests verify compliance of mA output with factory calibration settings. Time constant T settings via IMoCom is reduced by MagCheck to allow for sufficiently fast settling of mA output and pulse output. At the end of the verification, the time constant will be reprogrammed automatically by MagCheck to original data.
- 3) For test of frequency / pulse output setting of this output will be temporarily programmed by MagCheck to 1000 Hz at full scale flow. At end of verification frequency / pulse output will be reprogrammed automatically by MagCheck to original data.
- 4) If mode "Empty pipe" has been selected under MagCheck Function 1.1 electrode insulation data are measured, displayed and stored.

In case of power interruption during flow meter verification e.g. by interruption of wiring, field current supply etc. the setting of GK, pulse output and time constant must be checked and eventually reprogrammed manually. Such an interruption is indicated by MagCheck after its restart with the warning message: Last meter not re-programmed.

## 3.3 MagCheck as manual flow signal calibrator

### 3.3.1 Menu for manual calibration with IMoCom connection to IMoCom converters

MagCheck IMoCom connector must be connected to the IMoCom connector of the converter.

Note down all data settings and readings in a paper print of the Excel spreadsheet

"MagCheck\_Verification\_Listing.XLS" (see Appendix 1). After transfer of these data into this file, error calculations and a protocol will be created automatically. Main menus must be selected manually.

Menu	Explanation	Display	Details, recommended actions	
<b>1.2 Parameter</b>	Menu for meter data. With MagCheck connected to IMoCom, MagCheck will automatically read these data from the converter.	1.2 Parameter		→
		Diameter	Note the value displayed.	↵
		Full scale Q100%	Note the values displayed.	↵
		Primary constant GK Value	Note the value displayed.	↵
		FCS nominal	Note the value displayed.	↵
<b>1.3 Zero set</b>	Shows actual zero setting as stored in IMoCom converter.	1.3 Zero set		→
		Zero value (units as full scale)	No changes possible. Read and note.	↵
<b>1.4 Simulation</b>	Verifies calibration and linearity of ADC, current (1.5), pulse output (1.6) by a precision flow signal in 0.1% steps of Full scale (see 1.2)	1.4 Simulation		→
		True value (% + physical units)	Enter desired flow value (%). Note % setting carefully. Note true value [%].	↵
		Actual value (% + physical units) Act. value is ADC value.	Note act. value [%].	
<b>1.5 Current output</b>	Shows current output at flow as entered under 1.4	1.5 Current output		→
		True value [mA] Actual value [mA]	Note true value [mA]. Note act. value [mA].	↵
<b>1.6 Pulse output</b>	Shows pulse output at flow as entered under 1.4	1.6 Pulse output		→
		True value [Hz] Actual value [Hz]	Note true value [Hz]. Note act. value [Hz].	↵
<b>1.7 Field current</b>	Shows field current peak to peak (FCS), pos., neg.	1.7 Field current		→
		True value [mA] Actual value [mA]	Note true value [mA]. Note act. value [mA].	↵
<b>1.8 Hardw. info</b>	Shows software versions + status information according to Function 2.2 of IMoCom converters	1.8 hardw. Info		→
		ADC X.XXXXXX Texts as "Warning" YYYYYYYYYYY	Note data. Eventual warning relates to status info (numbers in 4th row) (default no warning 0000000000).	↵
		Next module X.XXXXXX.XX Texts as "Warning" YYYYYYYYYYY	Continue to step through by ↵ until last device has been shown.	↵
<b>1.9 Reset</b>	Resets MagCheck and re-starts communication to IMoCom converter	1.9 Reset		→
		no yes Select using ↑↓.	New start, if you suspect a system hang-up.  On "yes + ↵" system will re-start and return to Menu 1.9. All data entered manually will be replaced by default settings.	

### 3.3.2 Menu for manual calibration of converters without IMoCom connection

Note down all set and measured data in a copy of "MagCheck\_Converter\_Cal\_Prot.XLS" (see Appendix 1). Main menus must be selected manually. Connect MagCheck and press F1.

Menu	Explanation	Display	Details, recommended actions	
<b>1.2 Parameter</b>	MagCheck starts with KROHNE standard converter default settings Actual parameters listed right acc. to meter setting must be entered manually acc. to flow meter type plate.	1.2 Parameter	Menu for entering meter data.	→
		Diameter	DN 2.5 – 3000 mm / 0.1 – 120 inch Select using ↑↓.	↕
		Full scale	Select physical unit using ↑↓. (m <sup>3</sup> /hr, Liter/hr, USGal/min, l/s) Enter full scale value for Q100% acc. type plate or actual setting. In case of data outside of meter range max / min values are shown.	→
		Primary constant	Enter GK / GKL acc. type plate. Take care, no plausibility check.	↕
		FCS nominal	Enter nominal field current [mA]:	
		IFC 010 IFC 020, 090, 110, 210: SC80, IFC 080, 200 T900	125 250 125 000	↕
<b>1.3 Zero set</b>	Allows MagCheck zero adjustment Physical unit as set under 1.2	1.3 Zero set		→
		Default 000.000	For standard tests use default. For precision tests follow 3.4.2.	
<b>1.4 Simulation</b>	Verifies calibration and linearity of ADC, current (1.5), pulse output (1.6) by a precision flow signal of Full scale as under 1.2	1.4 Simulation		→
		True value in % + phys. units)	Enter desired flow value (%).in 0.1% steps Read converter display, note % and flowrate.	↕
<b>1.5 Current output</b>	Shows current output value at flow rate (%) as entered under 1.4	1.5 Current output		→
		Actual value [mA]	Read, note mA values.	↕
<b>1.6 Pulse output</b>	Shows pulse output value at flow rate (%) as entered under 1.4	1.6 Pulse output		→
		Actual value [Hz]	Read, note indicated pulse [Hz] rate.	↕
<b>1.7 Field current</b>	Shows field current peak to peak (FCS), pos., neg.	1.7 Field current		→
		Act. value [mA]	Note act. values [mA].	↕
<b>1.8 Hardw. info</b>	<ul style="list-style-type: none"> <li>In this operation mode menus 1.8 and 1.9 have no function.</li> </ul>			
<b>1.9 Reset</b>				



### 3.4 MagCheck Menu functions for manual calibration test

With IMoCom converters and IMoCom connected to MagCheck, MagCheck reads all parameters (as under Function 1.2 and 1.3 of the converter). So accuracy data of the converters will be tested under original setting conditions. If test shall be done using deviating parameters IMoCom connection must be disconnected, MagCheck must be restarted (e.g. by shortly pulling cable connector off and plugging in again). Descriptions below, how to enter data into Function 1.2 and 1.3 mainly refer to non-IMoCom converters.

#### 3.4.1 Function 1.2 Parameters

Select with keys ↑ and ↓. Go to subfunction „Full scale value” with key → or ←.

##### Full scale value $Q_{100\%}$

For test under conditions as installed, enter the actual setting of full scale  $Q_{100\%}$  as shown on type plate of the converter or in the documentation of this site. If different full scale values are entered into the converter and into the MagCheck mark the maximum and minimum flow velocity limits for full scale settings.

Min- /max-values of  $Q_{100\%}$ : The maximum and minimum full scale values are subject to nominal diameter (DN) and the flow velocity (v). These limits are given in KROHNE documentation, e.g. Installation and Operating Instructions of related converters. If these should not be accessible, the minimum and maximum flow rates dependant on meter size with metric units may be calculated in m<sup>3</sup>/hr as:

$$Q_{100\%_{\min}} [\text{m}^3/\text{hr}] = \frac{\pi}{4} \times \text{DN} [\text{mm}]^2 \times v_{100\%_{\min}} [\text{m/s}] \times 3.6 \div 1000$$

$$Q_{100\%_{\max}} [\text{m}^3/\text{hr}] = \frac{\pi}{4} \times \text{DN} [\text{mm}]^2 \times v_{100\%_{\max}} [\text{m/s}] \times 3.6 \div 1000$$

All IMoCom converters and AQF 070, SC80A, SC80 AS, IFC 200, IFC 200E, SC100A , SC100AS:  $V_{100\%_{\min}}$ :0.3 m/s and  $V_{100\%_{\max}}$ :12 m/s. For T900:  $V_{100\%_{\min}}$ :0.5 m/s and  $V_{100\%_{\max}}$ :9.999 m/s

Change to subfunction „Primary constant” with key ↓.

##### Primary constant GK

Enter Primary Constant GK / GKL acc. to type plate of signal converter or flowhead. Limits: 1.000 to 9.999.

Go to subfunction „FCS nominal” with key ↓.

##### Field Current Supply nominal

Enter nominal field current [mA]:

IFC 010	125
IFC 020, 090, 110, 210, SC 100	250
SC80, IFC 080, AQF 070, IFC 200	125
T900	000

Back to menu 1.2 Parameter by pressing ↓.

#### 3.4.2 Function 1.3 Zero set

Press → key.

Enter the zero point: Minimal zero point: -10% of the full scale value; Maximal zero point: +10% of the full scale value, e.g. Full scale is 100 m<sup>3</sup>/h. Minimum zero point is -10m<sup>3</sup>/h and maximum zero

point is +10m3/h.

With Non-IMoCom converters zero must be entered manually. Set function 1.3 Zero set to 000.000 with unit acc. setting of converter. To find a correct zero setting for the calibration test, step to Menu 1.4 Simulation. Set simulation value to 000.0%. Read indication from converter display. If indication is too noisy, increase time constant of converter to 10s.. 30s. Wait 10 time constants, until indication is stable. Read indication on converter display, enter read value with inverted sign into menu Function 1.3 Zero Set.

Example:

Indication is -0.13 m3/hr.

Enter + 0.13 m3/hr (select sign by using  $\uparrow\downarrow$ ) into Function 1.3 Zero Set.

Back to menu 1.3 Zero setting by pressing  $\downarrow$ .

### 3.4.3 Function 1.4 Simulation

Press  $\rightarrow$  key.

Entering a value here will simulate flow by creating a precise calibrated flow signal as input signal for the converter. The outputs of the converter follow this calibrated flow signal level.

The simulated flow value may be set between -999.9% and +999.9% of the full scale as set or read under "Function 1.2 Full Scale Value". For normal tests, setting shall be within  $\pm 100.0\%$ .

If the maximum signal level of MagCheck is exceeded, the warning "error message: simulation parameters, check" is shown on the MagCheck display.

Back to menu 1.4 Simulation by pressing  $\downarrow$ .

### 3.4.4 Function 1.5 Curr. Output

Press  $\rightarrow$  key.

Display according to setting of Function 1.4 Simulation.

Example: Function 1.4 Simulation value set to 50.0%, Converter settings I0% = 4 mA, I100%= 20 mA).

Display Function 1.5:

MagCheck Display Head Line	Current output	
No IMoCom connection to converter	Act.	11.998 mA
With IMoCom-converter and IMoCom connection from MagCheck to converter	True	12.000 mA
	Act.	11.998 mA

Back to menu 1.5 Field current by pressing  $\downarrow$ .

### 3.4.5 Function 1.6 Pulse output

Press  $\rightarrow$  key.

Display of the measured output frequency from the pulse output in pulses/second.

Example: Function 1.4 Simulation value set to 50.0%, f100%= 800 Pulses / second)

Display Function 1.6.

MagCheck Display Indication Headline:	Pulse output	
No IMoCom connection	Act.	399,8 Hz
With IMoCom-converter and IMoCom connection from MagCheck to converter	True	400,0 Hz
	Act.	399,8 Hz

---

Attention: With low pulse frequency settings MagCheck will change to measuring pulse period.  
Example: Full Scale of converter  $Q_{100\%}$  is 100 m<sup>3</sup>/hour, Pulse Rate of converter is set to 1 pulse/m<sup>3</sup>. Accordingly the converter will send 1 pulse every 36 seconds, if Function 1.4 Simulation has been set to 100%.

With setting of Function 1.4 Simulation to 10% it will last very long until a value can be indicated. In such cases it will be better to increase pulse rate setting of the converter by a factor of 10, 100 or to 1000 Hz for this test. Make sure to restore the original settings after completion of the test!

Back to menu 1.6 Pulse output by pressing ↵.

### 3.4.6 Function 1.7 Field Current

Press → key.

Display of the measured field current (all values in mA):

FCS = peak to peak field current

pos. = the positive half wave

neg: = the negative half wave

Frequency = actual value of field frequency

Back to menu 1.7 Field current by pressing ↵.

### 3.4.7 Function 1.8 Hardw. info

Press → key.

This menu may be used on IMoCom Converters only after IMoCom connection has been established. Hardware Information and Status Information acc to menu 2.2 of IFC 010, 020, 090, 110 are shown.

Display of Software I.D.-no. and status message of the connected module: In this menu, an 8-position software number and a 10-position status code are stored. These status codes enable a quick and simple diagnosis of your flow meter. The number of modules indicated depends on the number of modules present in the flow meter. Should one module report a fatal error or a warning, this will be shown in the fourth line of the display.

Change to next status report by pressing ↵.

Back to menu 1.8 Hardware Info by pressing ↵.

### 3.4.8 Function 1.9 Reset

Reset Function with IMoCom converters only! Press → key.

In some cases, it can be useful to perform a restart of a device. To perform a restart, the "Reset"-function can be chosen in this menu. Only possible with IMoCom-connection between MagCheck and IFC. Should a restart be performed without the MagCheck connected to the mains supply, the MagCheck will also be restarted and the main menu will be shown again

### 3.4.9 Function 2.1 Device Info

Press → key.

Following information is displayed:

Device Info

SN (Serial Number): XXXXXXXX

SV (Software Version): XX.XXX.XXX.X

CalDate (calibration Date): XX.XX.XX

Back to menu 2.1 Software by pressing ↵.

---

### 3.4.10 Function 3.1 Language

Press → key.

Select language of MagCheck display texts: English (GB), French (F) or German (D). The selected language appears in flashing text.

- Select with ↑ and ↓
- Confirm with ↵ (Data change accept)
- Select choice with ↑ and ↓, confirm with ↵
- Back to menu 3.1 Language by pressing ↵

### 3.4.11 Function 3.2 Data transfer from MagCheck to the PC

Connect MagCheck to PC. The external power supply must be connected to MagCheck. The 25-pin PC connector of the RS 232 cable (supplied with MagCheck) must be connected to the MagCheck connector, the 9-pole connector to RS232 COM port of the PC COM port. On the PC, the MagCheck PC program must be active. During transfer of the data from MagCheck to PC, the message "Data transfer" is shown on the MagCheck display.

Press → key.

The display will show, that MagCheck is now ready for data transfer. Data Transfer to the PC will be started by clicking "Read verification data from MagCheck" on the PC screen.

Back to menu 3.2 Data transfer by pressing ↵.



**After data transfer the according memory areas in the MagCheck will be released for overwriting by new files, this means all downloaded data are erased from MagCheck.**

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## 4 Using MagCheck with a PC

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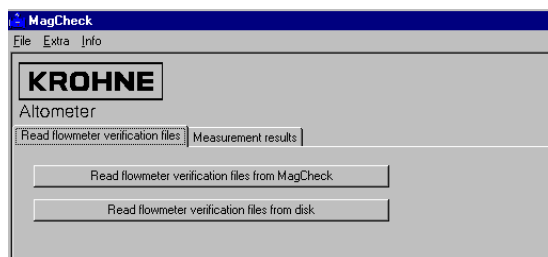
### 4.1 System specifications

To be able to install the MagCheck system on to your PC, the following specifications apply:

- MS Windows® -PC
- MS Windows® 95, 98, 2000, NT, XP
- > 32 MB memory, >32 MB free space on hard disk,
- CD-ROM drive
- Free Com Port: RS 232
- Mouse, keyboard, monitor, printer

### 4.2 Installation PC software

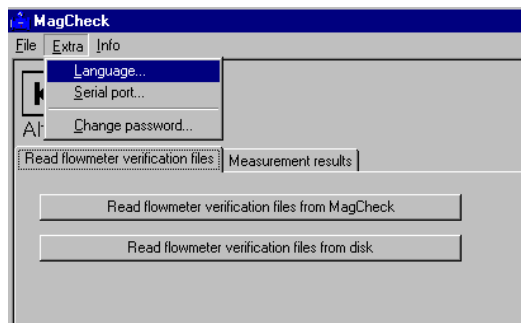
Insert the CD into the CD drive of your PC and follow the instructions of the Set-up-program. During installation you will be asked for a password. To work without password leave the field blank and click ok. There is no way to recover a lost password. After installation and clicking on the MagCheck icon on the desktop the main screen of the MagCheck main menu will appear:



### 4.3 Settings of MagCheck PC software

#### 4.3.1 Selection of the PC program language

Enter Menu Extra. Select Language, select: English, Français, Deutsch or Nederlands. After selection the program must be closed and restarted.



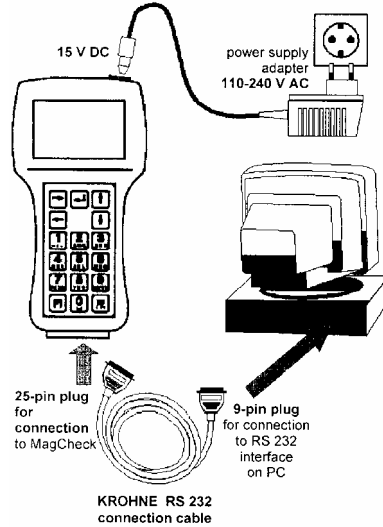
#### 4.3.2 Selection of the MagCheck Com-Port for download of verification data

Enter Menu Extra. Select "Serial port."

MagCheck PC- program checks the port of your computer and offers an appropriate selection. Confirm.

#### 4.4 Connecting MagCheck to PC

- The 25-pin PC connector of the RS 232 cable (supplied with MagCheck) must be connected to the MagCheck connector, the 9-pole connector to RS232 COM port of the PC COM port as configured above.
- The external power supply must be connected to MagCheck.
- Any power adapter used with MagCheck must meet safe separation regulations (IEC 950, SELV, safe electrical low voltage regulations)
- The power supply adapter (FRIWO 7238/15) supplied by KROHNE has been certified for safe separation under office ambient conditions (dry rooms).



**Do not use this power supply adapter in wet environments. Risk of personal hazards!**

#### 4.5 Downloading and storing MagCheck verification data onto PC

- Start MagCheck PC-program. Connect MagCheck to PC.
- MagCheck will start searching for communication to an IMoCom interface. Press F1.
- Select MagCheck Menu 3.2. After pressing arrow → MagCheck will indicate "Ready for data transfer".
- Click on MagCheck PC main menu, button: "Read flowmeter verification files from MagCheck".
- MagCheck PC program will ask : "Number of new flowmeter verification files: X (e.g. 1-70). Do you want to download these flowmeter files?"
- Click "OK" and the following screen appears:

Reading verification data 8

Device identification: FH1  
Medium: A  
Converter type: IFC010  
Number: 00039011  
Order number: 92124 0102  
Full scale range: 3 m<sup>3</sup>/h  
Current output: 4 - 20  
Frequency output: 10 P/s  
Diameter: 25 mm / 1 inch  
PC: 4  
Field frequency: 1/6  
Triggering: AC  
Empty pipe: Yes

Date: 25-11-2002

Operator: FH

Select a flowmeter:

This flowmeter is known in the program under identification: 001188756

This flowmeter is not known in the program. Identification should be: RhineWater\_Bld1\_FIC02111

OK

Cancel this flowmeter verification file

Abort reading flowmeter verification files

- If the meter has been verified for the first time, select the lower radio button ("..flowmeter not known.."). Enter a file name under which the flowmeter data will be stored. Recommended e.g.: Customer Company (abbrev) + Location + Tagname, e.g. WaterSWW\_Kingsville\_FIC107
- If the related flowmeter has been verified before and the actual verification data should be added to its history, select the upper radio button and select the correct device identification from the pull-down menu, to which this new verification file should be added. The downloaded data will now become part of the selected meter history!
- With the button "Cancel..." data sets may be excluded from download.
- Button "Abort reading...." will stop downloading of verification data.

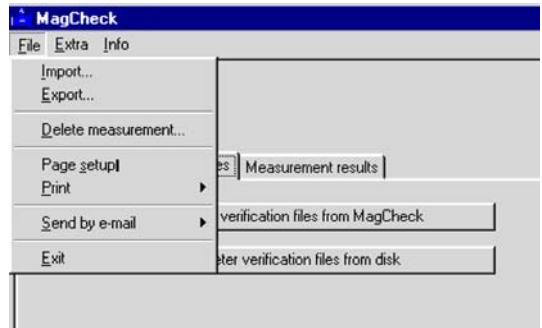
Verification files which not have been downloaded will remain in MagCheck memory.

## 4.6 Exporting and importing verification files from / to floppy or hard disk

### 4.6.1 Menu "File"

File format of all verification export- and import-files is \*.MCK.

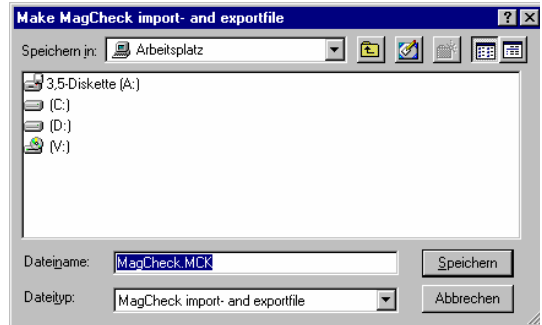
For exporting verification files which have been downloaded from MagCheck into PC select menu File, Export.



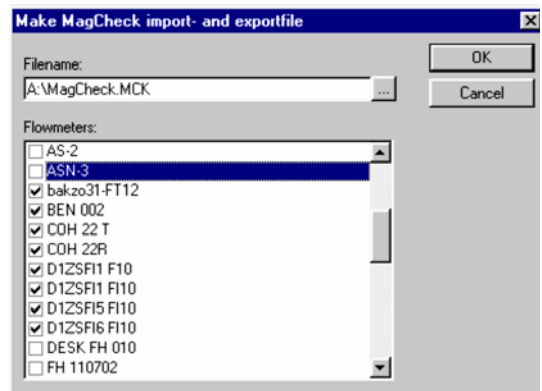
### 4.6.2 Exporting MagCheck verification files

After clicking on "Export..." a screen appears, which allows selecting a directory where to store the export file and entering a file name.

The upper pull-down list "Store in:" allows for selecting an appropriate directory for storing the export file. The lower box allows for entering an appropriate file name (e.g. MagCh\_Date\_All\_UserComp.MCK).



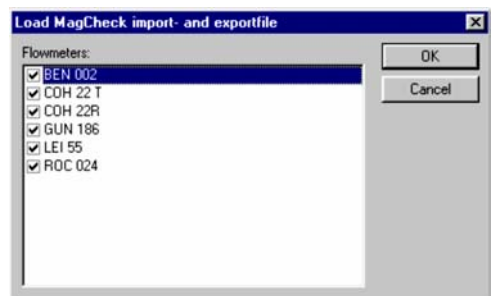
The list below shows all verification data files stored in file MagCheck.MCK in the MagCheck data base. Deselect files which should not be exported by clicking on the marker field. Click on OK, the marked data sets will be exported to the file.



### 4.6.3 Importing MagCheck verification files

Select: Menu File, Import. Select drive / directory, \*.MCK file, Click on "Open". Window "Load MagCheck Import-and export file" (see right) will open. Selected data sets will be imported in to the meter data bank of the MagCheck program.

If one of these flowmeter data sets already exists in the MagCheck PC data bank, a warning will appear. If the existing flowmeter data set is to be replaced by the import file, click "yes".



## 4.7 Trend analysis

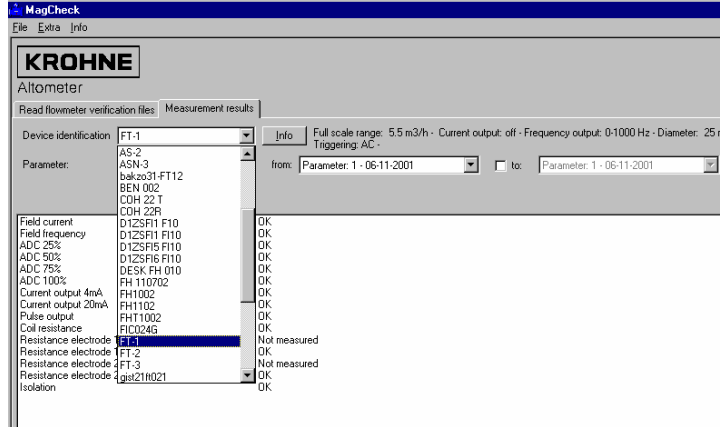
The trend analysis shows all measured data in detail. Its graphic presentation of all data and the related error limits allows for easy checking of stability, drifts of all measured parameters.

Click on tab "Measurement results" on MagCheck PC program main screen.

Select meter to be shown on pull-down list "Device identification"

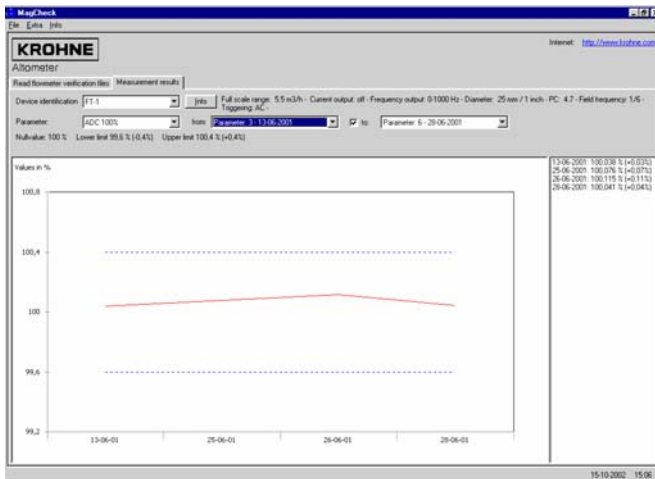
(example: FT-1)

Tab "Info" will show a listing of meter data incl. order number, converter number and all settings as read by MagCheck.



Pull-down lists will allow selection of a sequence of meter verifications in the meter history.

As an example the following view shows meter FT-1, parameter "ADC 100%" for verifications 3 to 6 out of a sequence 1 to 7. Any other parameter may be presented in the same way.



Numerical data for the related parameter are shown at the right side. Dotted lines indicate the error limits for the related parameter. These limit data are listed just above the diagram, too.

In case of the first verification (no history) or selection of one verification only (e.g. from "Parameter 6" to "Parameter 6") results are shown as numerical values.



#### 4.7.1 Information "Flowmeter has been changed..."

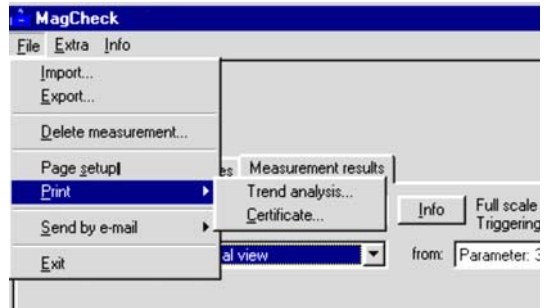
This information will appear if, compared to the first verification, one of the following parameters has been changed: GK, nominal diameter , Full scale, 10%, 1100%, settings of pulse output.

#### 4.7.2 Printing the Trend Analysis

Open the specific flowmeter file.

On Main Menu Bar select "File", "Print", "Page setup". Adjust page settings.

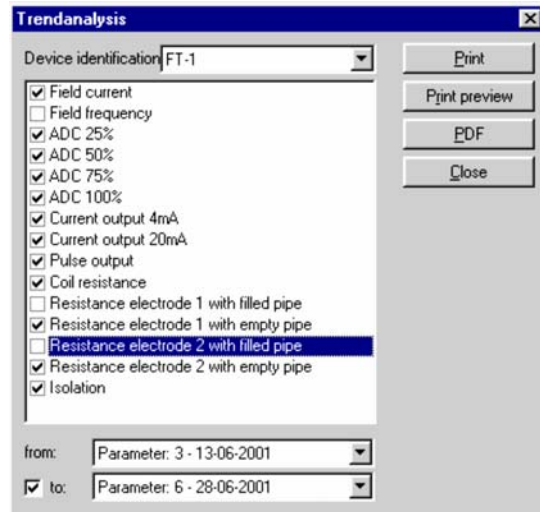
Select: "File", "Print", "Trend analysis".



#### 4.7.3 Trend Analysis Print selection menu

This menu allows for selection of:

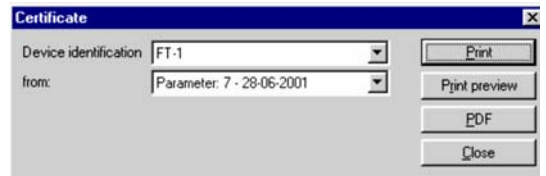
- the device
- the parameter sequence to be printed
- print preview on the monitor,
- printing as Adobe Acrobat-Reader .PDF-file, which may be stored or sent by e-mail
- or print on any printer connected to the PC.



#### 4.7.4 Printing verification certificates

On Main Menu Bar select: "File", "Print", "Page setup". Adjust page settings.

Select : "File", "Print", "Certificate".



This menu allows for selection of the device, the parameter set (verification) to be printed, print preview on the monitor, printing as Adobe Acrobat-Reader \*.PDF-file, which may be stored, sent by e-mail or printed on any printer connected to the PC.

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## 5 Interpretation of verification results

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Check in the trend analysis which parameters are exceeding their limits. Most common causes are outlined below.

### 5.1 Accuracy data ADC, field current, mA or frequency output

ADC is the primary signal processing. It includes input instrumentation amplifier and analogue to digital conversion of the flow signal voltage. Accuracy of ADC and field current directly influence accuracy of any output of the electromagnetic flowmeter. If accuracy of ADC, mA or frequency output, or field current is wrong: exchange converter electronics.

### 5.2 Coil resistance

Coil resistance value is dependent of coil temperature during verification. Coil temperature again is dependent on ambient temperature and on medium temperature in the flow tube of the magnetic flowmeter. Temperature coefficient is 0.4% per °C (0.2% per °F). Two failure modes can be detected:

- Resistance is zero or far below plausible value: Check cabling, connectors, terminals to field coils on short circuits.
- Resistance is high: Check cabling, connectors, terminals to field coils on interruptions or poor contact.

Check connectors / connections below the terminal board. If these are ok and coil resistance remains infinite or zero, interruption or short-circuit of an internal connection is possible (but extremely rare). In that case, the flowhead must be exchanged.

### 5.3 Electrode resistance with full pipe

In general: Electrode resistance with full pipe depends on conductivity ( $\sigma$ ) of the liquid. Conductivity depends on liquid type, concentration, temperature. Change of electrode resistance between two verifications only is significant as long as precisely the same liquid with same concentration and temperature will flow through the flowmeter without creating any deposits. Electrode resistance values may be estimated from electrode diameter "d" and conductivity ( $\sigma$ ) according to following formula:

$$R [k\Omega] = \frac{1000}{d_{Electrode} [cm] \times \sigma [\mu S / cm]} \quad \text{Tot.: } -50\% / +100\%$$

This formula may be used for approximate plausibility checks if the results of electrode resistance measurements are outside of the measuring range of MagCheck. The results of this formula may show a deviation to true value of electrode resistance as indicated by the tolerance data.

Electrode resistance with full pipe very high: Check cabling to electrodes (signal cable, connector in remote flowhead connection box) on interruption. Remove meter from line, clean electrodes and grounding rings.

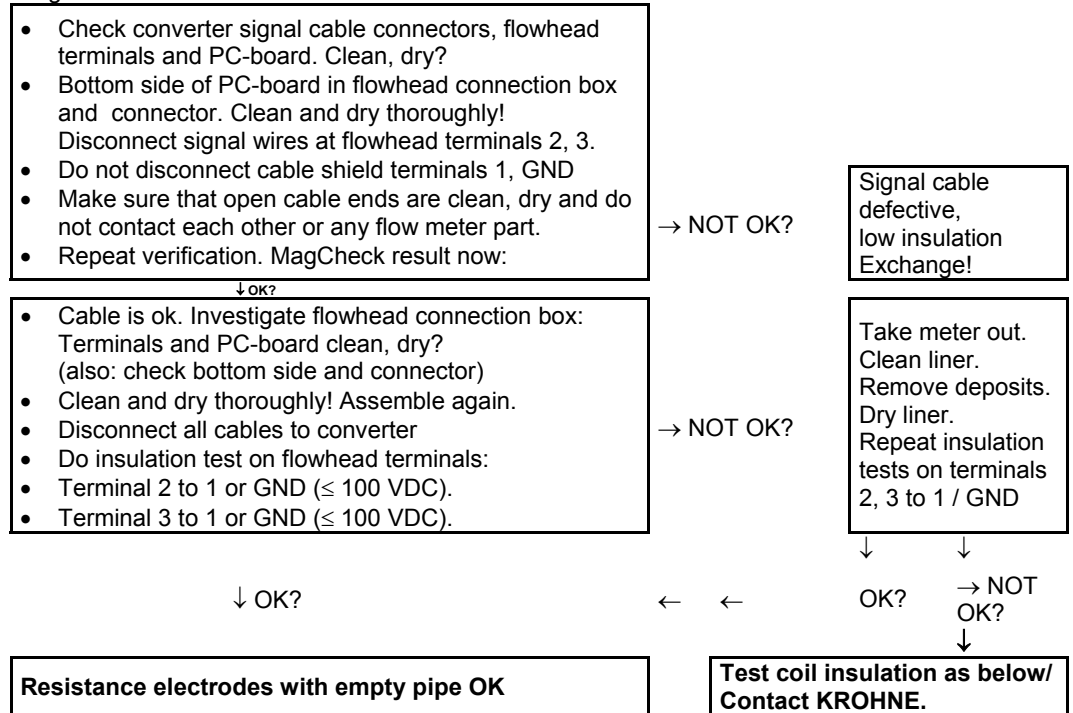
Asymmetric electrode resistance: Differences in electrode 1- and 2 resistance values by more than  $\pm 50\%$  may be caused by:

- Heavy coating (contamination) on one of the electrodes (Countermeasure: Clean electrodes)
- Beginning short circuit of one electrode, e.g. by contamination with highly conductive matter (Action: Clean electrodes and liner carefully) or by electrode leakage.

Electrode leakage and conductive deposits can be confirmed by verification with empty pipe. Select "Pipe Empty" in Menu 1.1.

## 5.4 Electrode resistance with empty pipe

Low resistance of electrodes with empty pipe may influence accuracy. This may be caused by humidity on terminal boards in converter and flowhead, defective signal cables at separate meters or electrode leakage. With empty, clean and dry pipe the electrode resistance must be > 10 MOhms. The MagCheck limit of > 6 MOhms considers minor insulation degradation on signal cable and lining.



## 5.5 Coil insulation

Coil insulation is a vital parameter for accurate function of a magnetic flowmeter. Causes for poor insulation may be found in wet or defective field current cable, wet or dirty terminals and connectors or liquid entrained in the meter body. What to do if result "Coil insulation" is "NOT OK":

- Check converter field current cable connectors, flowhead terminals and PC-board. Clean, dry?
- Bottom side of PC-board and connector in flowhead connection box. Clean and dry thoroughly! Disconnect field current wires at flowhead terminals 7,8.
- Do not disconnect cable shield terminals 1, GND
- Make sure that open cable ends are clean, dry and do not contact each other or any flow meter part.
- Repeat verification. Does MagCheck indicate insulation > 10 MOhm? Now?

→ NOT OK?

Field current cable defective, low insulation  
Exchange!

↓ OK?

- Cable is ok. Investigate flowhead connection box: Terminals and PC-board clean, dry? (also Bottom side and connector). Clean and dry thoroughly! Re-assemble the cable connections.
- Disconnect all cables to converter
- Do an insulation test ( $\leq 100$  VDC) on flowhead terminals 7 or 8 to 1 or GND > 10 MOhm?

→ NOT OK?

Contact KROHNE

↓ OK?

**Field coil insulation OK**

## 5.6 Limitations of accuracy statement

MagCheck is verifying all vital electrical data of the flowmeter and converter. The verification result does not include factors as: deposits in flowtube, installation not according to installation rules, gases in the liquid.

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## 6 Service and recalibration

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### 6.1 Recalibration

MagCheck must be recalibrated annually. The calibration menu is indicated in Function 2.1 Device Info.

For recalibration and/or repair please contact your local KROHNE representative.

### 6.2 Software

If there are any problems regarding the MagCheck software, please have the following information ready and contact your local KROHNE representative.

- System: Microsoft Windows® 98 / 2000 / NT4 / XP
- Type of processor
- Com port in use
- Type of flowhead (A-number)
- Type of signal converter (serial number)
- Description of error(s)
- MagCheck Export file (\*.MCK) with statement, which device looks wrong
- Trend analysis (Adobe Acrobat reader \*.PDFfile)

### 6.3 Spare parts

The following spare parts are available for MagCheck:

Spare part	BaaN ordering number
MagCheck (in suitcase) complete replacement!	XN00121100
Power supply adapter 100..230V to 15 V DC with plug adapter for different plug standards	XN00121200
IFC 010 connecting cable	XN00121300
IFC 020 connecting cable	XN00121400
IFC 090 connecting cable	XN00121500
IFC 110 connecting cable	XN00121600
PC RS 232 connecting cable	XN00121900
MagCheck CD (incl. MagCheck PC program, installation and operating instructions, Excel spreadsheets for data processing)	XN00122000
Installation and operating instructions UK English (printed)	XN00122100
Installation and operating instructions German (printed)	XN00122200
Installation and operating instructions French (printed)	XN00122300

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## Appendix 1

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MS Excel spreadsheets, available on the KROHNE MagCheck CD, allow for easier documentation and evaluation of manual and automatic verifications of flowmeters. Keep printouts ready for use on site.

## Documentation of automatic verification files

To make sure that verification files are documented and can be correlated to customer or tag number even years after first evaluation, use the Excel spreadsheet

MagCheck\_Verification\_Listing.XLS. Take some print-outs with you whenever you leave for verifications and document local situation and file names immediately on site. This will enable you to add verification files adequately to previous taken verification data and to create a clear history.

### Documentation of Automatic MagCheck Flowmeter Verifications (MagCheck Menu 1.1)

Company (user):	Company:			
	Location:			
	Contact Name:			
	Department:			
Meter identity	Flowmeter type:			
	Converter type:			
	Location:			
	<b>TAG Number:</b>			
	KROHNE No.:			
Process data:	Liquid type, name:			
	Temperature:			
	Flowrate (+phys. unit):			
Meter ambient / status:	Straight upstr. [DN]:			
	Straight downstr. [DN]:			
	Installation position?			
	Full pipe assured ?			
	Grounding ok? Rings?			
Notes, remarks:				
<b>Verification date</b>				
<b>Verifier name / company</b>				
Read, note data before:	Internal Totaliser + :			
	Internal Totaliser - :			
	Internal Totaliser $\Sigma$ :			
	External Totaliser:			
	GK setting:			
	Pulse output setting:			
	Time constant setting:			
<b>Actual Verification: TAG Nr. entered into in MagCheck Menu 1.1</b>			Use same name, if not enter new	Use same name, if not enter new
Finishing	All connectors correct?			
	Pulse, T, GK back on original?			
	Converter cover, gaskets OK?			
Totaliser values after:	Display Totaliser + :			
	Display Totaliser - :			
	Display Totaliser <b>Sum</b> :			
	<b>External Totaliser:</b>			
Verification file names:	Meter name in PC data base:		Use same name, if not enter new	Use same name, if not enter new
	Export file name (*.mck):			
	Verification result: OK?			
	If not: Reason:			

**Documentation of data of manual converter calibration test**

Data and readings in menu 1.2 to 1.7 during manual calibration test may be noted in a print-out of spreadsheet MagCheck\_Manual\_Test\_Report.XLS. These data may be easily transferred into the Excel spreadsheet, which automatically calculates errors.

**Electromagnetic Flowmeter - Signal Converter Test Data**



<b>Test Date:</b>	<b>Tested by:</b>
-------------------	-------------------

<b>User:</b>	Company:
	Company Location:
	Contact:

<b>Meter identity:</b>	<b>TAG Number:</b>	Comm. No.:
	Meter Location:	
	Flowmeter type:	DN[mm]:
	GK / GKL:	Converter type:
	Power:	Conv. Serial Number:

<b>Totaliser data before calibration test:</b>	<b>Value +</b>	<b>Value -</b>	<b>Value Σ</b>	<b>Volume unit</b>

<b>Data entered into MagCheck Menu 1.2 (acc. to actual converter settings):</b>			<b>Converter Output Settings during test</b>	
DN [mm]:	DN [inches]:	--	I 0% [mA]:	I 100%:
Full scale value:	Flow Unit:	Undefined!	P100% [Hz]:	Flow direction:
GK / GKL:	Nom Field Curr.:		Low Flow Cut Off, Upper Value:	
			<b>True field current [mA]:</b>	

**Set Flow unit in Converter Display to same unit as under MagCheck 1.2 Full scale!**

<b>MagCheck Menu 1.3 Zero Set: Only if no IMoCom-connection has been established!</b>	<b>MagCheck Fct. 1.3 : Recomm. setting:</b>	<b>Converter Display reading</b>	<b>±Max limit of converter zero indication</b>	<b>OK? Action:</b>
<b>Flow Unit:</b>	Undefined!	Undefined!	Undefined!	
Step 1	0,0000		--	---
Step 2	--		--	---
Step 3	--		--	---

**Test of Signal converter, Enter data as indicated by MagCheck!**

<b>MagCheck Setting Fct. 1.4 [%]</b>	<b>Flow Indication Converter Display Undefined!</b>	<b>mA-Output MagCheck Reading Fct. 1.5 [mA]</b>	<b>f-Output MagCheck Reading Fct. 1.6 [Hz]</b>	<b>Actual field current (MagCheck Fct 1.7) [mA Total]</b>	<b>True field current as above [mA Total]</b>
					--

<b>Totaliser data after calibration test:</b>	<b>Value +</b>	<b>Value -</b>	<b>Value Σ</b>	<b>Volume unit</b>

**Remarks, additional findings:**

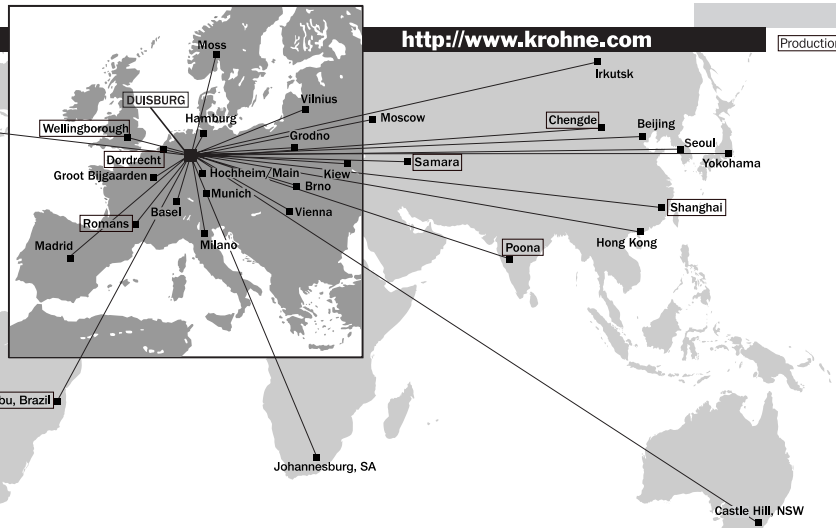
.....

.....

.....

<b>MagCheck Serial No.:</b>	<b>MagCheck calibration date:</b>

# KROHNE



### Australia

KROHNE Australia Pty Ltd.  
Unit 19 No. 9, Hudson Ave.  
Castle Hill 2154, NSW  
TEL: +61(0)2-98948711  
FAX: +61(0)2-9894855  
e-mail: [krohne@krohne.com.au](mailto:krohne@krohne.com.au)

### Austria

KROHNE Ges.m.b.H. Austria  
Modecertraße 14  
A-1030 Wien  
TEL: +43(0)1-2 03 45 32  
FAX: +43(0)1-2 03 47 78  
e-mail: [info@krohne.at](mailto:info@krohne.at)

### Belgium

KROHNE Belgium N.V.  
Brusselstraat 320  
B-1702 Groot Bilgaarden  
TEL: +32(0)2-4 66 00 10  
FAX: +32(0)2-4 66 08 00  
e-mail: [krohne@krohne.be](mailto:krohne@krohne.be)

### Brazil

KROHNE Conaut  
Centrolas Automaticas Ltda.  
Estrada Das Águas Espraiadas, 230 C.P. 56  
06835 - 080 EMBU - SP  
TEL: +55(0)11-4785-2700  
FAX: +55(0)11-4785-2768  
e-mail: [conaut@conaut.com.br](mailto:conaut@conaut.com.br)

### China

KROHNE Measurement Instruments Co. Ltd.  
Room 7E, Yi Dian Mansion  
746 Zhao Jia Bang Road  
Shanghai 200030  
TEL: +86(0)21-64677163  
FAX: +86(0)21-64677166  
Cellphone: +86(0)139 1885890  
e-mail: [ksh@hw.com.cn](mailto:ksh@hw.com.cn)

### CIS

Kanex KROHNE Engineering AG  
Business-Centre Planeta, Office 403  
ul. Manistakaja 3  
109147 Moscow/Russia  
TEL: +7(0)095-9117165  
FAX: +7(0)095-9117231  
e-mail: [krohne@doi.ru](mailto:krohne@doi.ru)

### Czech Republic

KROHNE CZ, spol. s r.o.  
Soběšická 156  
CZ-63800 Brno  
TEL: +420(0)5-45 53 21 11  
FAX: +420(0)5-45 522 00 93  
e-mail: [brno@krohne.cz](mailto:brno@krohne.cz)

### France

KROHNE S.A.  
Usine des Ors  
B.P. 98  
F-26 103 Romans Cedex  
TEL: +33(0)4-75 05 44 00  
FAX: +33(0)4-75 05 00 48  
e-mail: [info@krohne.fr](mailto:info@krohne.fr)

### Germany

KROHNE Messtechnik  
GmbH & Co. KG  
Ludwig-Krohne-Straße  
D-47058 Duisburg  
TEL: +49(0)203-301-0  
FAX: +49(0)203-301 389  
e-mail: [krohne@krohne.de](mailto:krohne@krohne.de)

### India

KROHNE Marshall Ltd.  
A-34/35, M.I.D.C.  
Industrial Area, H-Block,  
Pimpri Poona 411018  
TEL: +91(0)20-744 20 20  
FAX: +91(0)20-744 20 40  
e-mail: [pcu@snl.net](mailto:pcu@snl.net)

### Italy

KROHNE Italia Srl.  
Via V. Monti 75  
I-20145 Milano  
TEL: +39(0)2-4 30 06 61  
FAX: +39(0)2-43 00 66 66  
e-mail: [krohne@krohne.it](mailto:krohne@krohne.it)

### Korea

Hankuk KROHNE  
2 F. 599-1  
Banghwa-2-Dong  
Kangseo-Ku  
Seoul  
TEL: +82(0)2665-85 23-4  
FAX: +82(0)2665-85 25  
e-mail: [flowtech@unitel.co.kr](mailto:flowtech@unitel.co.kr)

### Netherlands

KROHNE Altimeter  
Kerkeplaat 12  
NL-3313 LC Dordrecht  
TEL: +31(0)78-6306300  
FAX: +31(0)78-6306390  
e-mail: [postmaster@krohne-altimeter.nl](mailto:postmaster@krohne-altimeter.nl)

### Norway

KROHNE Nederland B.V.  
Kerkeplaat 12  
NL-3313 LC Dordrecht  
TEL: +31(0)78-6306200  
FAX: +31(0)78-6306405  
Service Direkt: +31(0)78-6306222  
e-mail: [info@krohne.nl](mailto:info@krohne.nl)

### Norway

KROHNE Instrumentation A.S.  
Ekholtheien 114  
NO-1526 Moss  
P.O. Box 2178, NO-1521 Moss  
TEL: +47(0)69-264860  
FAX: +47(0)69-267333  
e-mail: [postmaster@krohne.no](mailto:postmaster@krohne.no)  
Internet: [www.krohne.no](http://www.krohne.no)

### South Africa

KROHNE Pty. Ltd.  
163 New Road  
Halfway House Ext. 13  
Midrand  
TEL: +27(0)11-315-2685  
FAX: +27(0)11-805-0531  
e-mail: [midrand@krohne.co.za](mailto:midrand@krohne.co.za)

### Spain

I.L. KROHNE Iberia, S.r.L.  
Poligono Industrial Nilo  
Calle Brasil, n.º 5  
E-28806 Alcalá de Henares-Madrid  
TEL: +34(0)91-8 83 21 52  
FAX: +34(0)91-8 83 48 54  
e-mail: [krohne@krohne.es](mailto:krohne@krohne.es)

### Switzerland

KROHNE AG  
Ludwig-Krohne-Str.  
D-47058 Duisburg  
TEL: +49(0)203-301 309  
FAX: +49(0)203-301 389  
e-mail: [export@krohne.de](mailto:export@krohne.de)

### United Kingdom

KROHNE Ltd.  
Rutherford Drive  
Park Farm Industrial Estate  
Wellingsborough,  
Northants NN8 6AE, UK  
TEL: +44(0)19 33-408 500  
FAX: +44(0)19 33-408 501  
e-mail: [info@krohne.co.uk](mailto:info@krohne.co.uk)

### USA

KROHNE Inc.  
7 Dearborn Road  
Peabody, MA 01960  
TEL: +1-978 535-60 60  
FAX: +1-978 535-17 20  
e-mail: [krohne@krohne.com](mailto:krohne@krohne.com)

### Overseas Representatives

- Algeria
- Argentina
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- Tunisia
- Venezuela
- Yugoslavia

### Other Countries:

KROHNE Messtechnik  
GmbH & Co. KG  
Ludwig-Krohne-Str.  
D-47058 Duisburg  
TEL: +49(0)203-301 309  
FAX: +49(0)203-301 389  
e-mail: [export@krohne.de](mailto:export@krohne.de)