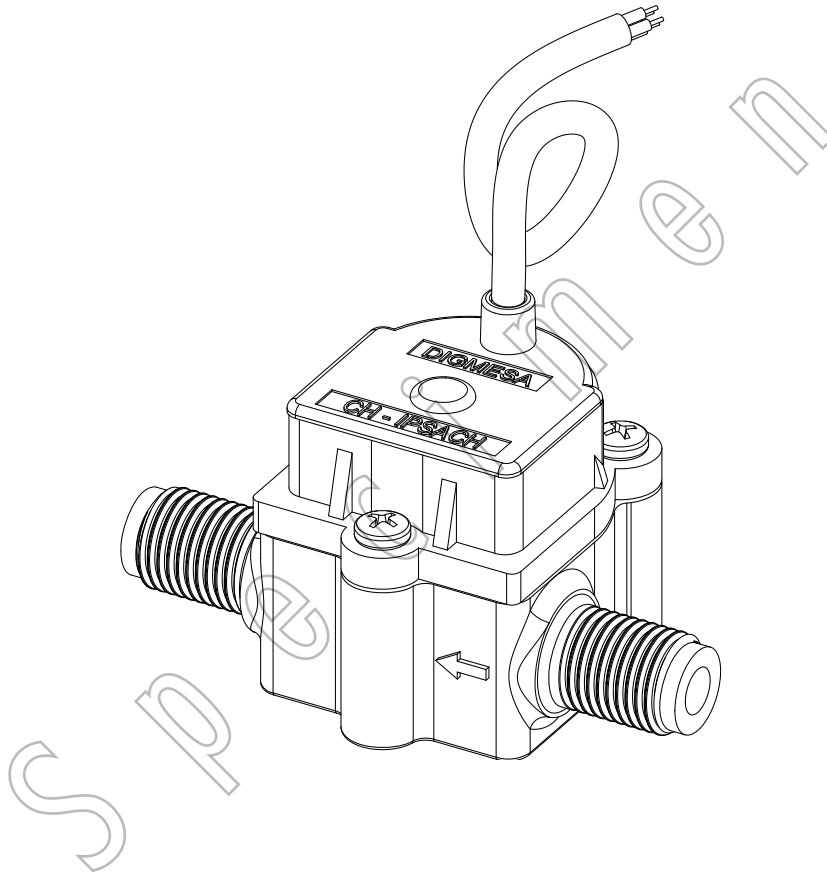


DATA SHEET



DIGIMESA⁺
CHOOSE THE ORIGINAL

FHKU G1/4" CombiSensor digital
Part number: 938-15xx/xTL01x

Digimesa AG, Keltenstrasse 31, CH-2563 Ipsach / Switzerland
Phone +41 (32) 332 77 77, Fax +41 (32) 332 77 88

www.digimesa.com

Version 02 FHKU G1/4" CombiSensor digital 938-15xx/xTL01x GB Seite 1-11

General Description

The CombiSensor has been designed for all applications where Flow, Temperature and Conductivity must be measured, and in a very compact form. The device is therefore adequate for the waterfilter industry (e.g. compact RO equipment) The "CombiSensor digital" comes with a RS-485 Interface (Modbus protocol). The configuration of the CombiSensor can be modified with standard MODBUS functions.

Specific applications: The CombiSensor calculates the temperature compensation of the conductivity value, based on the measured temperature and a compensation factor 2.25% per °C. The conductivity measurement value is therefore "temperature-compensated".

Approvals / Standards

EN55014-1:00+A1:01+A2:02, EN61000-6-3:01+A11:04, IEC61000-6-3:06(ed.2.0), EN61000-3-2:06, IEC61000-3-2:05(ed.3.0), EN61000-3-3:95+A1:01+A2:05, IEC61000-3-3:94+A1:01+A2:05(Cons.ed 1.2), EN55014-2:97+A1:01, EN61000-6-1:01, IEC61000-6-1:05(ed.2)



Material:

Housing:	PBT 35%GF
Bearing pin:	Inox 1.4305
Probes:	Temperature Inox 1.4598 Conductivity Inox 1.4598
Nozzle:	Ø 1.0, 1.2, 2.0, 2.5mm PPS 40%GF
Nozzle:	Ø 3.0, 4.0mm Inox 1.4305
Nozzle:	Ø 5.6mm like housing
O-ring:	MVQ (Silikon) FPM (Viton) / EPDM on request
Turbine:	PVDF 2 Magnets
Magnete:	Ceramic Sr Fe O (in contact with the medium)
Screws:	PT-screws (Phillips cross recessed)

Measurement characteristics:

Flow rate:	0.041 - 15 l/min depending on the nozzle diameter
Nozzle size:	Ø 1.0, 1.2, 2.0, 2.5, 3.0, 4.0, 5.6mm
Continuous operation:	< 500 rpm
Measuring accuracy:	+/- 2.0%
Repetition:	< +/- 0.25%
Conductivity:	0 - 20'000 µS/cm
Measuring accuracy:	± 3% of reading or ± 1 µS/cm
Response time:	0.5 sec.
Temperature:	0 - 65 °C
Measuring accuracy:	± 0.5 °C (under flow condition)
Response time probe:	7 sec.

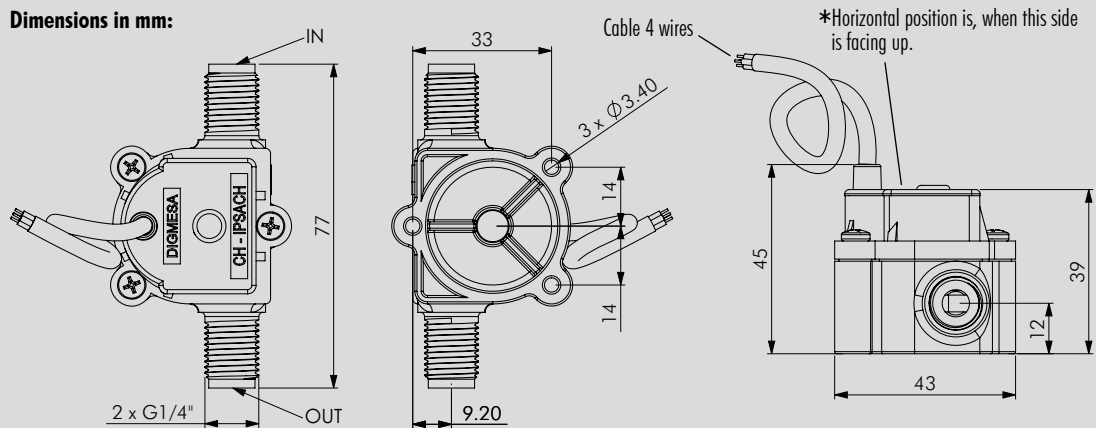
Electrical connection ratings:

Power supply:	+ 10VDC to + 24VDC (+/- 10%)
Consumption:	max. 30mA
Serial port:	RS-485 Half Duplex (2-wire) (9600 baud, no parity, 8 bits binary, 1 stop bit)
Communication protocol:	Modbus RTU
Connections:	4-Pol Cable AWG 24 (open wire) 0.6 meter

Technical data:

Temperature range:	-10°C to +65°C 14°F to 149°F
Pressure range:	20 bar at 20°C 290 psi /68°F
Mounting position:	Horizontal *

Dimensions in mm:



CABLE PINOUT

Cable color	Description
Red	+ 10VDC to + 24VDC
Black	GND (Sensor Ground)
Brown	RS 485A
Orange	RS 485B

MEASUREMENT

The flow measurement may differ depending on medium and installation. We recommend to calibrate the number of pulses per liter in line with the complete installation"

RESISTANCE

Special regulations which must be complied with by the flowmeter manufacturer apply to each country, e.g. CE, NSF, FDA and SK. The various media flowing through the flowmeter differ from application to application. You are advised to enquire with the medium manufacturer as to whether the entire installation and the flowmeter are resistant to the medium itself (see Material)!

DIGMESA

Modbus Register Map

Holding Registers:

Read out corresponding registers with function code 0x03 (Read Holding Registers) and write registers with function code 0x06 (Write Single Register). For detailed information see also "Manual CombiSensor" and official Modbus specifications.

Holding Register	Address	Description	Data type	Ratio	Unit	Read/Write	Remarks	Default
40'001	0x0001	Offset Conductivity	16 Bit Integer	1:1	[μ S/cm]	R/W	---	Product specific
40'002	0x0002	Slope Conductivity	16 Bit Integer	1:1	---	R/W	---	Product specific
40'003	0x0003	Reference Temperature	16 Bit Integer	1:1	[$^{\circ}$ C]	R/W	0: 20 $^{\circ}$ C 1: 25 $^{\circ}$ C	25
40'004	0x0004	Temperature compensation factor	16 Bit Integer	100:1	[%/ $^{\circ}$ C]	R/W	---	225
40'005	0x0005	Temperatur compensation of the Conductivity	16 Bit Integer	1:1	---	R/W	0: Temperature compensation OFF 1: Temperature compensation ON	1
40'006	0x0006	Pulses per liter	16 Bit Integer	1:1	[#/l]	R/W	---	Product specific
40'007	0x0007	Filter depth	16 Bit Integer	1:1	---	R/W	Pulses used for flow calculation 0: 1 Pulse 1: 2 Pulses 2: 4 Pulses 3: 8 Pulses 4: 16 Pulses 5: 32 Pulses	Product specific
40'008	0x0008	Slave ID	16 Bit Integer	1:1	---	R/W	1-247	1

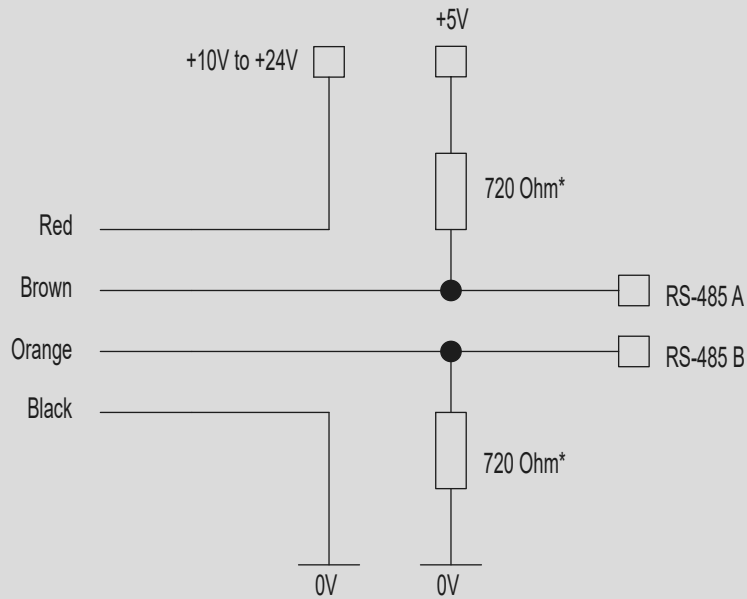
Input Registers:

Read out corresponding registers with function code 0x04 (Read Input Registers). For detailed information see "Manual CombiSensor" and official Modbus specifications.

Input Register	Address	Description	Data type	Ratio	Unit	Read/Write	Example
30'001	0x0001	Flow rate	16 Bit Integer	1:1	[ml/min]	R	1000 => 1l/min
30'002	0x0002	Conductivity	16 Bit Integer	1:1	[μ S/cm]	R	2200 => 2.2 mS/cm
30'003	0x0003	Temperature	16 Bit Integer	10:1	[$^{\circ}$ C]	R	276 => 27.6 $^{\circ}$ C
30'100	0x0064	SW Version number	16 Bit Integer	---	---	R	0x0103 => V1.3
30'101	0x0065	SW number low	16 Bit Integer	---	---	R	XXX-XXXX (high-low)
30'102	0x0066	SW number high	16 Bit Integer	---	---	R	XXX-XXXX (high-low)

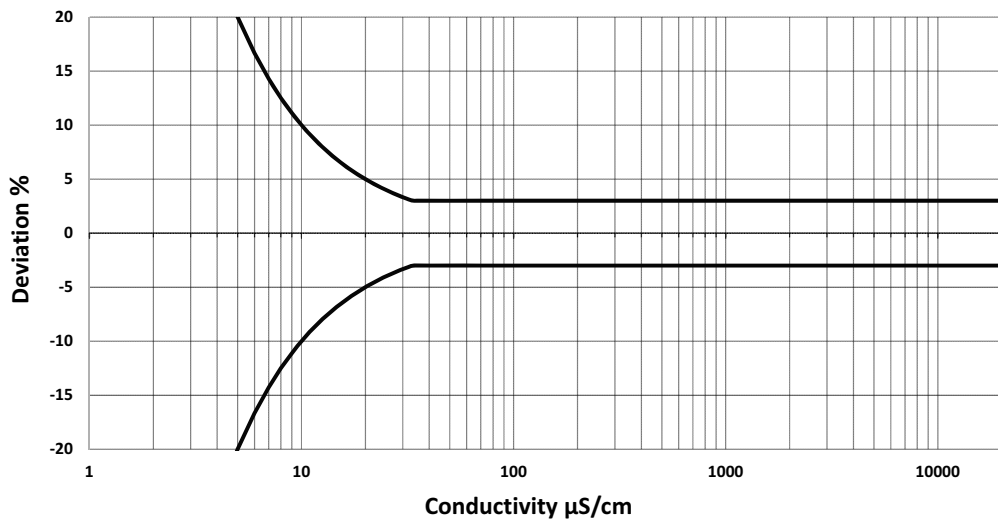
CONNECTION AND MEASUREMENT CURVE

Typical connection diagram



*One pair of pull Up/Down resistors required per net, 120 Ohm termination resistor between RS-485A and RS-485B built in CombiSensor

Measurement curve conductivity



Notes: Linearity is referenced to temperature uncompensated effective conductivity of medium.

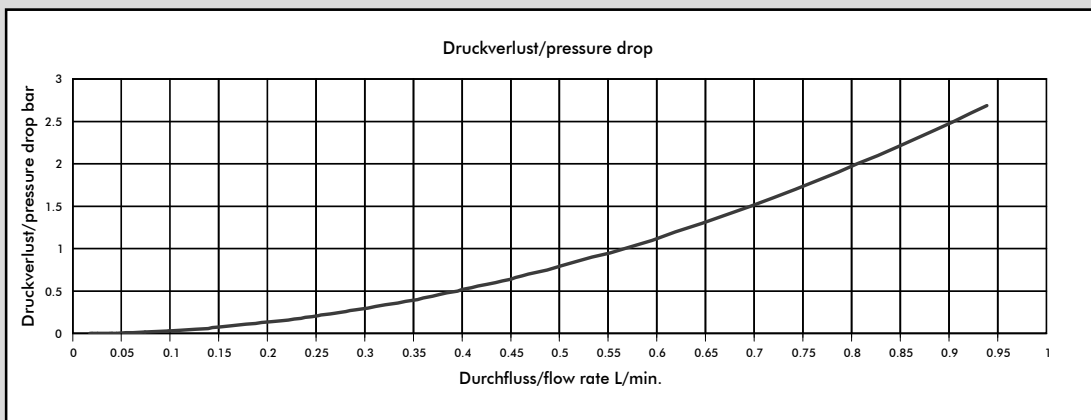
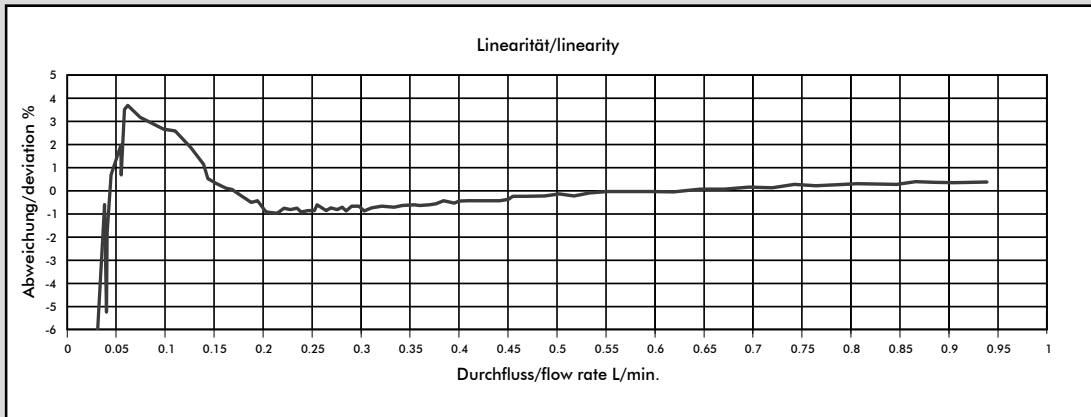
MEASUREMENT TIPS Conductivity:

Air bubbles in the sensor can deteriorate conductivity measurement values. Make sure you did well evacuate the air from the sensor.

For measuring accurate temperature compensated conductivity, flowing medium guarantees optimal temperature condition for the probe

A calibration can be effectuated by adapting registers 40'001 (Offset) and 40'002 (Slope). See also "Manual CombiSensor"

Measurement Curve FHKU Ø1.00mm (#938-1510/FTL01)



Getestet mit Wasser, max. Druck: 3.3 bar / Tested with water, max. pressure 3.3 bar

Nozzle size	Pulses/litre	g/pulse	min. flow rate in [litres/min] at linear start	max. flow rate in [litres/min]	Pressure loss in [bar]
Ø 1.00 mm	2063	0.48	0.041	0.56	1.0
Ø 1.20 mm	1700	0.59	0.050	0.82	1.0
Ø 2.00 mm	988	1.00	0.091	2.40	1.0
Ø 2.50 mm	760	1.31	0.150	3.74	1.0
Ø 3.00 mm	565	1.76	0.102	5.63	1.0
Ø 4.00 mm	381	2.62	0.123	8.38	0.8
Ø 5.60 mm	236	4.22	0.308	9.26	0.5

MEASUREMENT TIPS

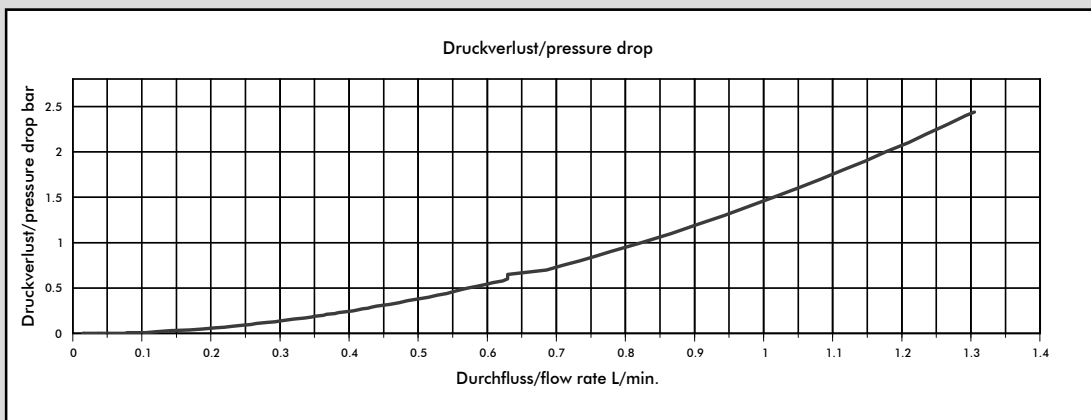
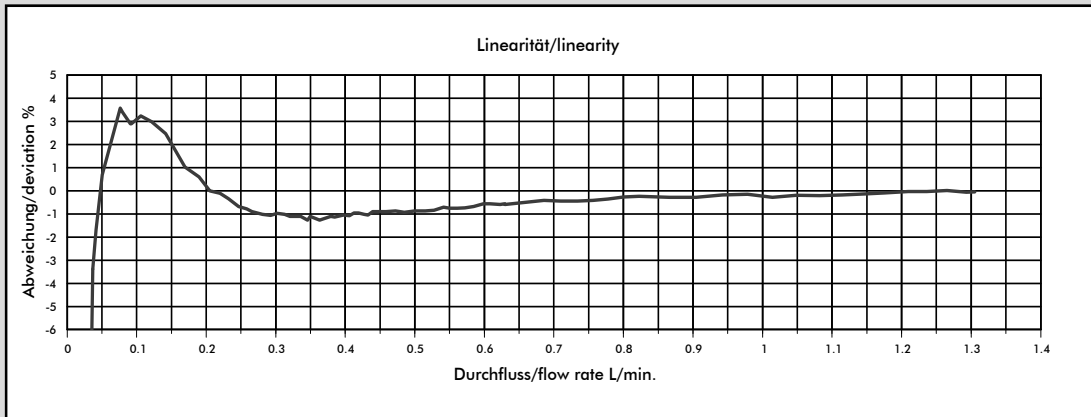
- Ensure that there is no fast-pulsatory movement of the media
- Ensure that there are no reverse pressure surges
- Ensure that there is no air in the system
- Keep the pressure loss as small as possible
- Note the mounting position of the flowmeter
- Min/max flow should be in the linear range of the selected flowmeter
- Clean the system at appropriate intervals
- Avoid electrical current peaks
- Incorrect cabling of power supply +, signal and ground will destroy the flowmeter
- Do not mechanically load electrical contacts
- Avoid moisture on the electrical contacts
- Avoid stray pick-up via the cable (Do not lay cables in parallel with high current loads)

The values specified must be considered as approximate values.

The number of pulses per litre may differ depending on medium and installation.

We recommend to calibrate the number of pulses per litre in line with the complete installation.

Measurement Curve FHKU Ø1.20mm (#938-1512/FTL01)



Getestet mit Wasser, max. Druck: 3.3 bar / Tested with water, max. pressure 3.3 bar

Nozzle size	Pulses/litre	g/pulse	min. flow rate in [litres/min] at linear start	max. flow rate in [litres/min]	Pressure loss in [bar]
Ø 1.00 mm	2063	0.48	0.041	0.56	1.0
Ø 1.20 mm	1700	0.59	0.050	0.82	1.0
Ø 2.00 mm	988	1.00	0.091	2.40	1.0
Ø 2.50 mm	760	1.31	0.150	3.74	1.0
Ø 3.00 mm	565	1.76	0.102	5.63	1.0
Ø 4.00 mm	381	2.62	0.123	8.38	0.8
Ø 5.60 mm	236	4.22	0.308	9.26	0.5

MEASUREMENT TIPS

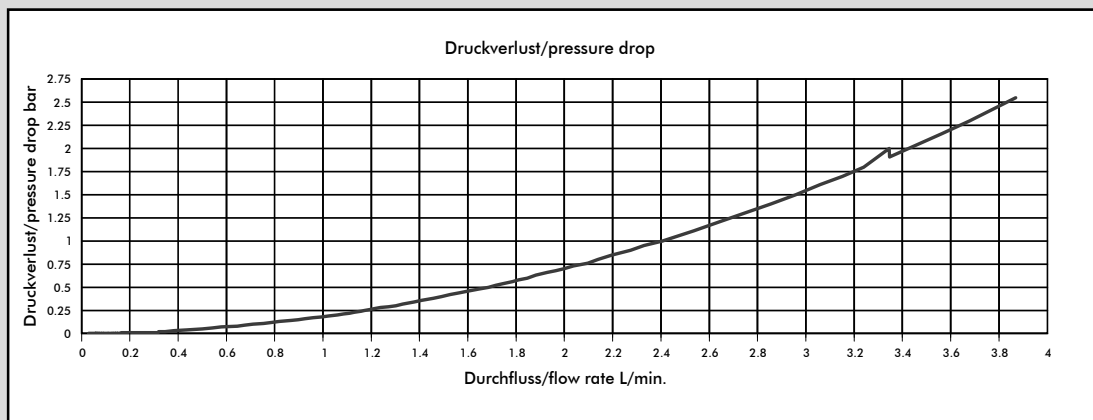
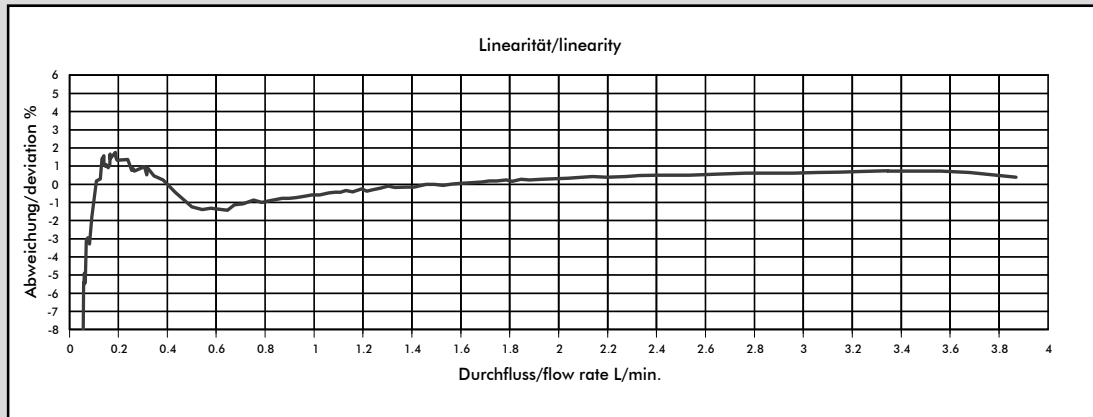
- Ensure that there is no fast-pulsatory movement of the media
- Ensure that there are no reverse pressure surges
- Ensure that there is no air in the system
- Keep the pressure loss as small as possible
- Note the mounting position of the flowmeter
- Min/max flow should be in the linear range of the selected flowmeter
- Clean the system at appropriate intervals
- Avoid electrical current peaks
- Incorrect cabling of power supply +, signal and ground will destroy the flowmeter
- Do not mechanically load electrical contacts
- Avoid moisture on the electrical contacts
- Avoid stray pick-up via the cable (Do not lay cables in parallel with high current loads)

The values specified must be considered as approximate values.

The number of pulses per litre may differ depending on medium and installation.

We recommend to calibrate the number of pulses per litre in line with the complete installation.

Measurement Curve FHKU Ø2.00mm (#938-1520/FTL01)



Getestet mit Wasser, max. Druck: 3.3 bar / Tested with water, max. pressure 3.3

Nozzle size	Pulses/litre	g/pulse	min. flow rate in [litres/min] at linear start	max. flow rate in [litres/min]	Pressure loss in [bar]
Ø 1.00 mm	2063	0.48	0.041	0.56	1.0
Ø 1.20 mm	1700	0.59	0.050	0.82	1.0
Ø 2.00 mm	988	1.00	0.091	2.40	1.0
Ø 2.50 mm	760	1.31	0.150	3.74	1.0
Ø 3.00 mm	565	1.76	0.102	5.63	1.0
Ø 4.00 mm	381	2.62	0.123	8.38	0.8
Ø 5.60 mm	236	4.22	0.308	9.26	0.5

MEASUREMENT TIPS

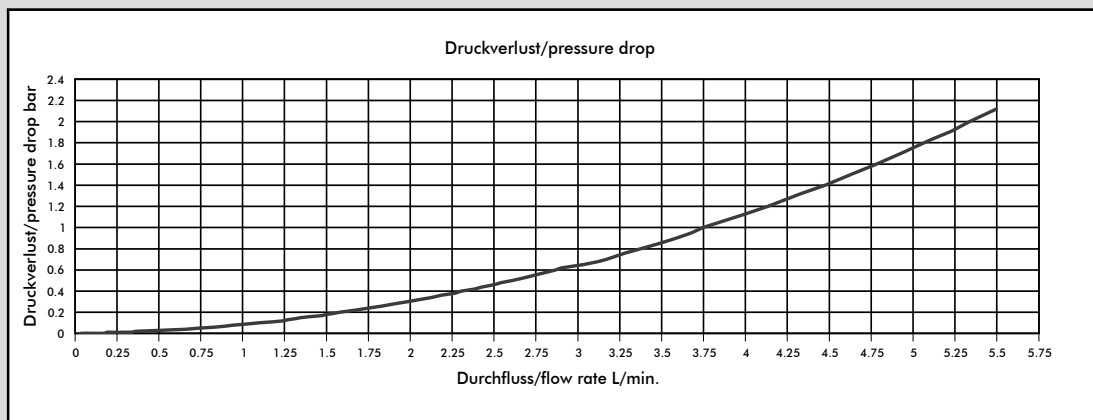
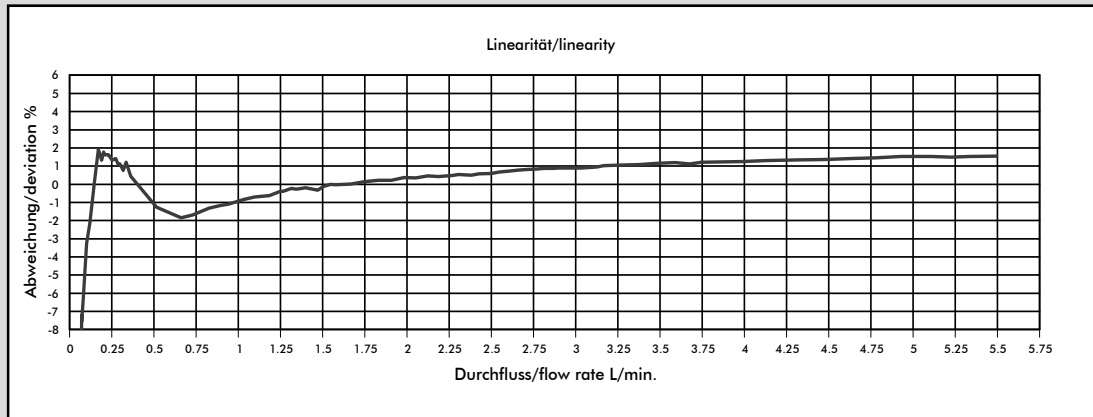
- Ensure that there is no fast-pulsatory movement of the media
- Ensure that there are no reverse pressure surges
- Ensure that there is no air in the system
- Keep the pressure loss as small as possible
- Note the mounting position of the flowmeter
- Min/max flow should be in the linear range of the selected flowmeter
- Clean the system at appropriate intervals
- Avoid electrical current peaks
- Incorrect cabling of power supply +, signal and ground will destroy the flowmeter
- Do not mechanically load electrical contacts
- Avoid moisture on the electrical contacts
- Avoid stray pick-up via the cable (Do not lay cables in parallel with high current loads)

The values specified must be considered as approximate values.

The number of pulses per litre may differ depending on medium and installation.

We recommend to calibrate the number of pulses per litre in line with the complete installation.

Measurement Curve FHKU Ø2.50mm (#938-1525/FTL01)



Getestet mit Wasser, max. Druck: 3.3 bar / Tested with water, max. pressure 3.3 bar

Nozzle size	Pulses/litre	g/pulse	min. flow rate in [litres/min] at linear start	max. flow rate in [litres/min]	Pressure loss in [bar]
Ø 1.00 mm	2063	0.48	0.041	0.56	1.0
Ø 1.20 mm	1700	0.59	0.050	0.82	1.0
Ø 2.00 mm	988	1.00	0.091	2.40	1.0
Ø 2.50 mm	760	1.31	0.150	3.74	1.0
Ø 3.00 mm	565	1.76	0.102	5.63	1.0
Ø 4.00 mm	381	2.62	0.123	8.38	0.8
Ø 5.60 mm	236	4.22	0.308	9.26	0.5

MEASUREMENT TIPS

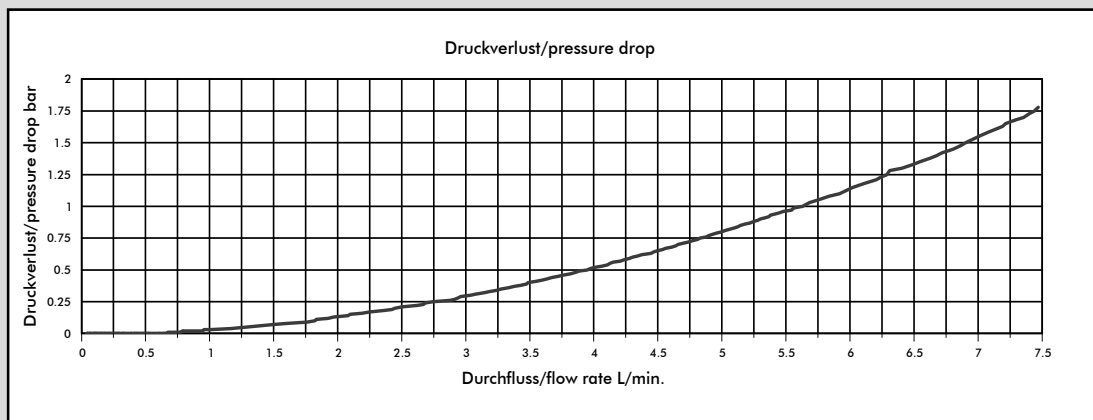
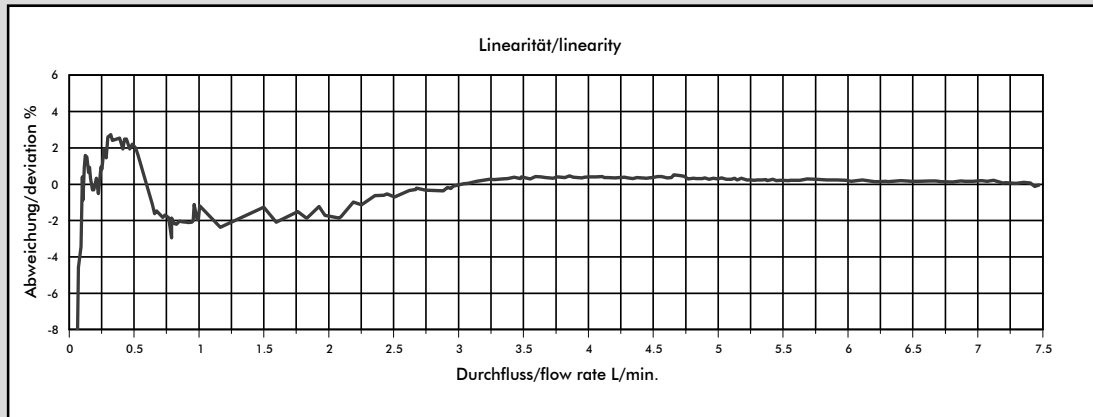
- Ensure that there is no fast-pulsatory movement of the media
- Ensure that there are no reverse pressure surges
- Ensure that there is no air in the system
- Keep the pressure loss as small as possible
- Note the mounting position of the flowmeter
- Min/max flow should be in the linear range of the selected flowmeter
- Clean the system at appropriate intervals
- Avoid electrical current peaks
- Incorrect cabling of power supply +, signal and ground will destroy the flowmeter
- Do not mechanically load electrical contacts
- Avoid moisture on the electrical contacts
- Avoid stray pick-up via the cable (Do not lay cables in parallel with high current loads)

The values specified must be considered as approximate values.

The number of pulses per litre may differ depending on medium and installation.

We recommend to calibrate the number of pulses per litre in line with the complete installation.

Measurement Curve FHKU Ø3.00mm (#938-1530/TL01)



Getestet mit Wasser, max. Druck: 3.3 bar / Tested with water, max. pressure 3.3 bar

Nozzle size	Pulses/litre	g/pulse	min. flow rate in [litres/min] at linear start	max. flow rate in [litres/min]	Pressure loss in [bar]
Ø 1.00 mm	2063	0.48	0.041	0.56	1.0
Ø 1.20 mm	1700	0.59	0.050	0.82	1.0
Ø 2.00 mm	988	1.00	0.091	2.40	1.0
Ø 2.50 mm	760	1.31	0.150	3.74	1.0
Ø 3.00 mm	565	1.76	0.102	5.63	1.0
Ø 4.00 mm	381	2.62	0.123	8.38	0.8
Ø 5.60 mm	236	4.22	0.308	9.26	0.5

MEASUREMENT TIPS

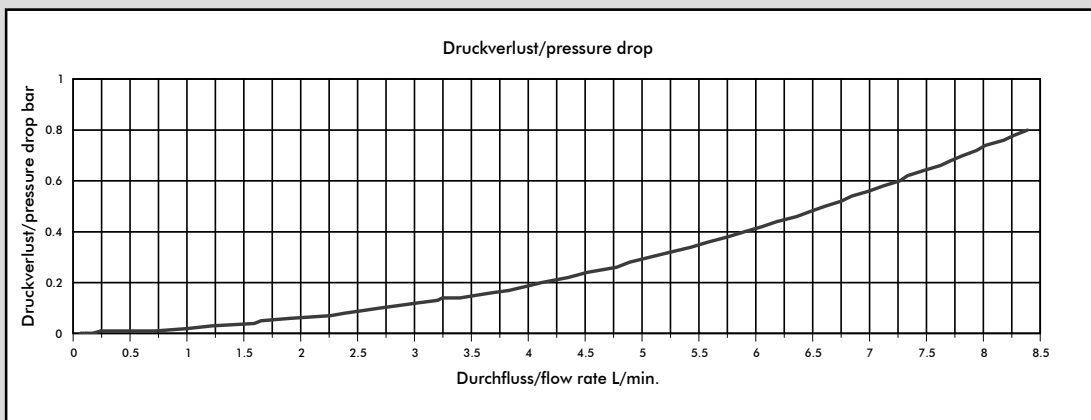
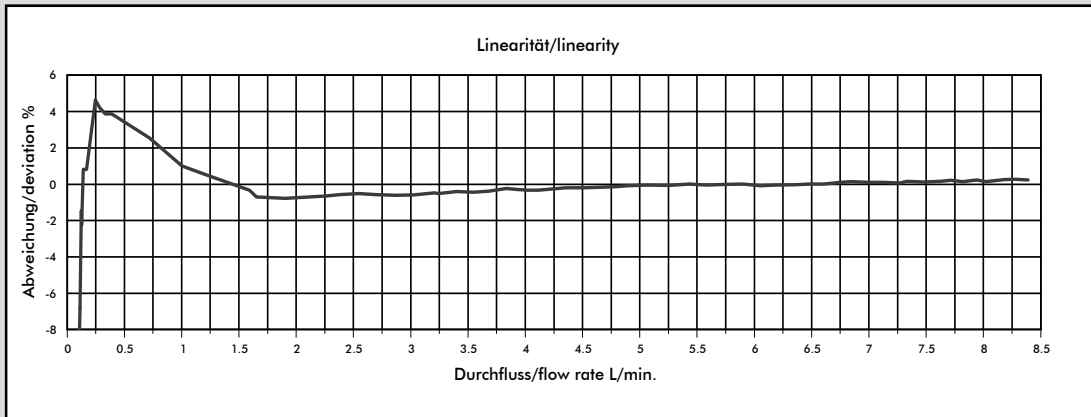
- Ensure that there is no fast-pulsatory movement of the media
- Ensure that there are no reverse pressure surges
- Ensure that there is no air in the system
- Keep the pressure loss as small as possible
- Note the mounting position of the flowmeter
- Min/max flow should be in the linear range of the selected flowmeter
- Clean the system at appropriate intervals
- Avoid electrical current peaks
- Incorrect cabling of power supply +, signal and ground will destroy the flowmeter
- Do not mechanically load electrical contacts
- Avoid moisture on the electrical contacts
- Avoid stray pick-up via the cable (Do not lay cables in parallel with high current loads)

The values specified must be considered as approximate values.

The number of pulses per litre may differ depending on medium and installation.

We recommend to calibrate the number of pulses per litre in line with the complete installation.

Measurement Curve FHKU Ø4.00mm (#938-1540/TL01)



Getestet mit Wasser, max. Druck: 3.3 bar / Tested with water, max. pressure 3.3 bar

Nozzle size	Pulses/litre	g/pulse	min. flow rate in [litres/min] at linear start	max. flow rate in [litres/min]	Pressure loss in [bar]
Ø 1.00 mm	2063	0.48	0.041	0.56	1.0
Ø 1.20 mm	1700	0.59	0.050	0.82	1.0
Ø 2.00 mm	988	1.00	0.091	2.40	1.0
Ø 2.50 mm	760	1.31	0.150	3.74	1.0
Ø 3.00 mm	565	1.76	0.102	5.63	1.0
Ø 4.00 mm	381	2.62	0.123	8.38	0.8
Ø 5.60 mm	236	4.22	0.308	9.26	0.5

MEASUREMENT TIPS

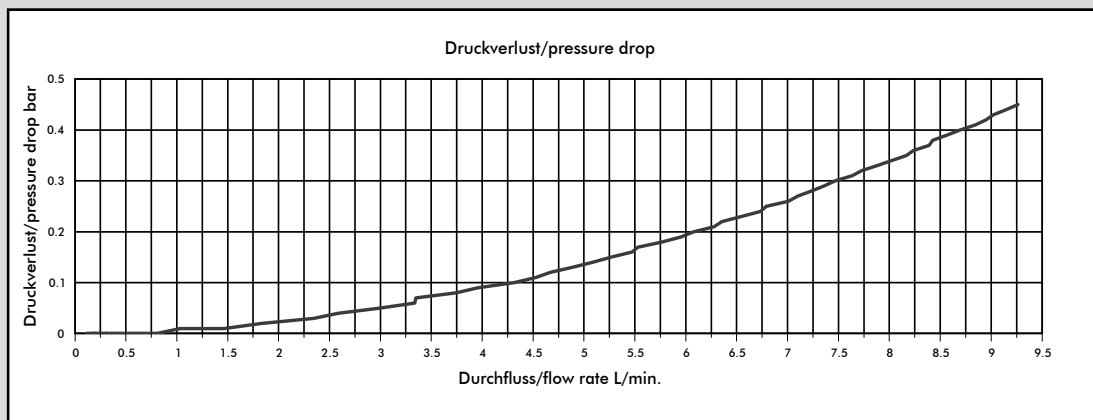
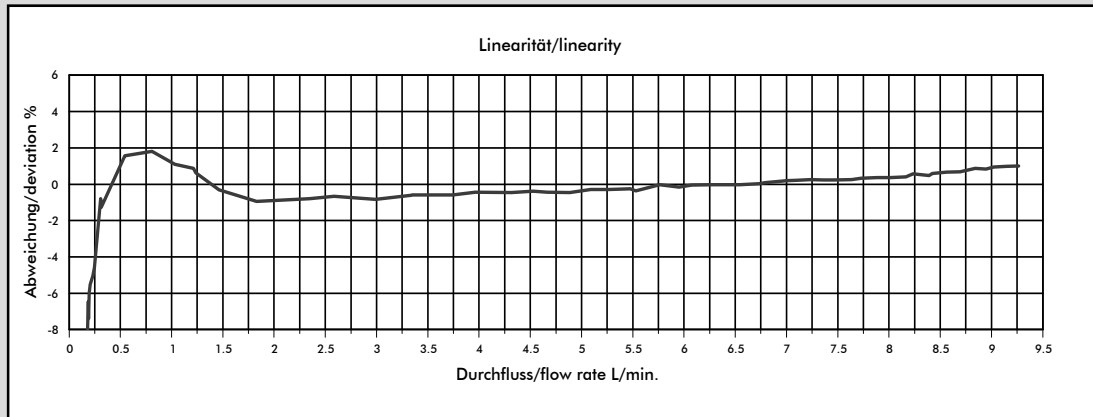
- Ensure that there is no fast-pulsatory movement of the media
- Ensure that there are no reverse pressure surges
- Ensure that there is no air in the system
- Keep the pressure loss as small as possible
- Note the mounting position of the flowmeter
- Min/max flow should be in the linear range of the selected flowmeter
- Clean the system at appropriate intervals
- Avoid electrical current peaks
- Incorrect cabling of power supply +, signal and ground will destroy the flowmeter
- Do not mechanically load electrical contacts
- Avoid moisture on the electrical contacts
- Avoid stray pick-up via the cable (Do not lay cables in parallel with high current loads)

The values specified must be considered as approximate values.

The number of pulses per litre may differ depending on medium and installation.

We recommend to calibrate the number of pulses per litre in line with the complete installation.

Measurement Curve FHKU Ø5.60mm (#938-1556/TL01)



Getestet mit Wasser, max. Druck: 3.3 bar / Tested with water, max. pressure 3.3 bar

Nozzle size	Pulses/litre	g/pulse	min. flow rate in [litres/min] at linear start	max. flow rate in [litres/min]	Pressure loss in [bar]
Ø 1.00 mm	2063	0.48	0.041	0.56	1.0
Ø 1.20 mm	1700	0.59	0.050	0.82	1.0
Ø 2.00 mm	988	1.00	0.091	2.40	1.0
Ø 2.50 mm	760	1.31	0.150	3.74	1.0
Ø 3.00 mm	565	1.76	0.102	5.63	1.0
Ø 4.00 mm	381	2.62	0.123	8.38	0.8
Ø 5.60 mm	236	4.22	0.308	9.26	0.5

The values specified must be considered as approximate values.

The number of pulses per litre may differ depending on medium and installation.

We recommend to calibrate the number of pulses per litre in line with the complete installation.

MEASUREMENT TIPS

- Ensure that there is no fast-pulsatory movement of the media
- Ensure that there are no reverse pressure surges
- Ensure that there is no air in the system
- Keep the pressure loss as small as possible
- Note the mounting position of the flowmeter
- Min/max flow should be in the linear range of the selected flowmeter
- Clean the system at appropriate intervals
- Avoid electrical current peaks
- Incorrect cabling of power supply +, signal and ground will destroy the flowmeter
- Do not mechanically load electrical contacts
- Avoid moisture on the electrical contacts
- Avoid stray pick-up via the cable (Do not lay cables in parallel with high current loads)