# Ultrasonic Level Transmitter

for Liquids and Solids

measuring • monitoring • analyzing

## NUS-4

- Measuring Ranges:
  Liquids: Up to 25 meters (80 feet)
  Solids: Up to 10 meters (32 feet)
- Accuracy:
  ± 0.2 % of Reading
  ± 0.05 % of Full Scale
- $p_{max}$: 25 PSIG
  $t_{max}$: 190 °F
- Connection:
  1½" NPT, 2" NPT
  G 1½, G 2
  3", 5", 6" ANSI-Flange
  DN 80, DN 125, DN 150
- Housing Material: Aluminum
  Sensor Material: PP or PVDF
- Output Options: 4-20 mA, Relay, HART®, and Programming Unit with LCD Display

HART COMMUNICATION FOUNDATION

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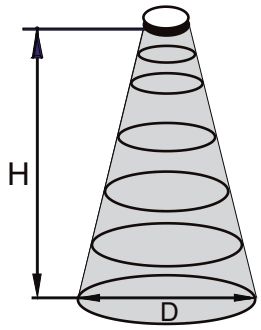
## Description

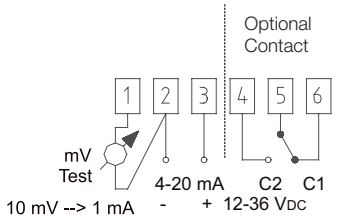
The KOBOLD ultrasonic level sensor, model NUS-4, is used for non-contact, continuous level and volume measurement in tanks or for flow measurement in open channels. Ultrasonic level measurement is especially suited for applications where no physical contact can be established with the media's surface, such as with corrosive, contaminating, or adhesive media. The ultrasonic level sensing technology is based on the principle of measuring the time required for the ultrasound pulses to make a round trip from the sensor to the level to be measured and back. The sensor emits an ultrasonic pulse train and receives the echoes reflected. The compact, integrated electronic evaluates the echo time of the pulses and determines the level. For remote transmission, an analog signal output and for monitoring purposes, a relay contact is available. For programming and local display, an optional plug-in programming unit with LCD display is available. The sensors have a total beam angle of 5°-7° at -3 dB. This ensures a reliable measurement in narrow silos with uneven side walls as well as in process tanks with various protruding objects. As a result of the narrow beam angle, the emitted ultrasonic signals have outstanding focus to penetrate through gases, vapors, and foam**.

### Conical Beam Diameter 'D'




| H | NUS-4x04 | NUS-4x06 | NUS-4x08 | NUS-4x10 | NUS-4x15 | NUS-4x25 |
|---|---|---|---|---|---|---|
| **1 m** | 0.15 m | 0.14 m | 0.18 m | 0.16 m | 0.21 m | 0.27 m |
| **2 m** | 0.25 m | 0.23 m | 0.30 m | 0.25 m | 0.30 m | 0.39 m |
| **4 m** | 0.46 m | 0.40 m | 0.54 m | 0.42 m | 0.47 m | 0.64 m |
| **6 m** | - | 0.58 m | 0.79 m | 0.60 m | 0.65 m | 0.88 m |
| **8 m** | - | - | - | 0.77 m | 0.82 m | 1.13 m |
| **10 m** | - | - | - | 0.95 m | 1.00 m | 1.37 m |
| **15 m** | - | - | - | - | 1.43 m | 1.98 m |
| **25 m** | - | - | - | - | - | 3.21 m |

### Electrical Connection




## Technical Details

**Measuring Principle:** Ultrasonic Principle, Echo Time Measurement
**Frequency:** See Order Table
**Beam Cone:** NUS-4x04: 6°, NUS-4x06, -4x10, -4x15: 5° NUS-4x08, -4x25: 7°
**Delay Time:** 10, 30, 60 Seconds; Programmable
**Accuracy (at 20 °C):** ± 0.2 % of Reading + 0.05 % of Full Scale
**Resolution:** Depending on Measuring Distance <2 m: 1 mm 2 ... 5 m: 2 mm 6 ... 10 m: 5 mm >10 m: 10 mm
**Mounting Position:** Vertical to the Product Surface
**Process Temperature:** -22 ...190 °F
**Ambient Temperature:** -22 ... 158 °F -13 ... 158 °F (with Programming Unit)
**Operating Pressure:** 14.7... 43.5 PSI abs. (<14.7 PSI abs. on Request)
**Materials**
**Housing:** Aluminum, Powder-Coated
**Sensor/Connection:** Polypropylene or PVDF
**Process Connection**
**NUS-4x04:** 1½" NPT, G 1½*
**NUS-4x06, 4x08:** 2" NPT, G 2*
**NUS-4x10:** ANSI 3", DN 80
**NUS-4x15:** ANSI 5", DN 100
**NUS-4x25:** ANSI 6", DN 150
**Electrical Connection:** 2 x M 20 x 1.5 Cable Gland Cable Diameter 6 ... 12 mm and 2 x ½" NPT Wire Cross Section: 0.5 ... 1.5 $mm^2$
**Switching Output:** Relay (SPDT) 30 VDC, 1A
**Analog Output:** 4 ... 20 mA (3.9 ... 20.5 mA) Galvanically Isolated, Protection Against Surge Transients
**Load:** Max. (Us – 11.4 V) / 0.02 A,
**Power Requirement:** 12 - 36 VDC, 2-wire (Reverse Polarity Protected)
**Display (Plug-in):** 6-digit LCD-Display, Symbols and Bar Graph, PBT, Fiberglass Reinforced, Flame Proof
**Protection:** Sensor IP 68, Housing: IP 67
**Weight:** with Thread: approx. 2.5 lbs with Flange: approx. 5.6 lbs

*Note: G-thread with Counter-Nut and EPDM Gasket

**Note: For dry bulk, high temperature, or applications with vapors or foam, please consult a KOBOLD sales engineer for applicatoin review



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### Analog Output

Output: 4-20 mA, max. 600 Ω, HART® (optional).
The following can be programmed with keys:

- Assignment of the 4 or 20 mA Signals to the Required Levels
- Error Indication by the Current Output (3.8 mA, 22 mA or Hold the Last Value)
- Damping of Analog Output (10, 30, 60 sec.)

Factory Default:

- 4 mA: Assigned to the Maximum Level 0 %
- 20 mA: Assigned to the Minimum Level 100 %
- Error Indication by the Current Output: Hold Last Value
- Damping: 60 sec.

### Relay Output:

The units may be optionally delivered with a relay output. When shipped without a programming unit, the NUS-4 is delivered in a 2-point switching state (tank empty – relay energised, tank full – relay de-energised). The following functions may be programmed with help of programming unit:

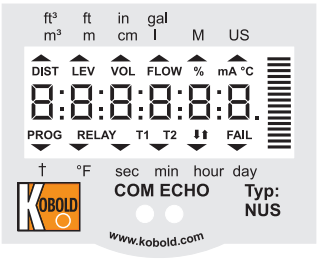
- 2-Point Switching for Monitoring of Level
- Error Signal in Case of Echo Loss
- Pulse Output for Volume Counting when Used as a Flow Meter

### Programming Unit with LCD-Display:

The plug-in programming unit can be used to display the measured values during measurement and to change the program functions during programming. Two individual accessible programming modes may be chosen: quickset for quick programming of important parameters or full programming.

### NUS-4 in Systems with PC:

Using a PC and a HART® modem (e.g. model KM-HART), it is possible to create your own multi-drop HART® network, where the PC displays all NUS-7 measurement data and also allows reprogramming of the units as necessary. The outputs derived from the displayed data can be programmed via the PC, which acts as the master. A maximum of 15 transmitters can be connected to one HART® modem and KOBOLD's NUS-NTB-Soft software can be used for configuration.




### Adjustable Functions with Programming Unit

- Engineering Units for the Display (US or Metric)
- Maximum Measuring Distance
- Value for 4 mA Output Signal
- Value for 20 mA Output Signal
- Error Type Indication of Analog Output
- Damping Time
- Selection: Distance Measurement, Level Measurement, Volume Measurement, Weight (when Density is Known), Flow Measurement in Open Channels
- Optimization of Measurement
- Linearization
- Close-End-Blocking
- Far-End-Blocking
- Direction of Level Change
- Selection of Pre-programmed 11 Tank Forms for Volume Measurement
- Selection of Pre-programmed 21 Measuring Channels for Flow Measurement in Open Channels
- Total Flow Amount Resettable
- Total Flow Amount Non-resettable
- Bar Graph Assigned to Analog Output or Echo
- Keyword Protection
- Simulation Mode

**Order Details** (Example: **NUS-4004 N8 340**)

| Model | Sensor Material | Measuring Range | Frequency (kHz) | Connection | Power Supply | Output/ Display |
|---|---|---|---|---|---|---|
| **NUS-4..** | **..0..** = Polypropylene<br>**..9..** = PVDF | **..04..** = 0.2...4 m (Liquids)<br>0.2...1.6m (Solids) | 80 | **..N8..** = 1½" NPT<br>**..R8..** = G 1½ | **..3..** = 12 - 36 VDC | **..40** = 4 - 20 mA<br>**..R0** = 4 - 20 mA and Relay<br>**..4H** = 4-20 mA and HART®<br>**..RH** = 4-20 mA, HART®, and Relay<br>**..4P** = Plug-in Programming Unit with LCD-Display, 4 - 20 mA<br>**..RP** = Plug-in Programming Unit with LCD-Display, 4 - 20 mA, Relay |
| | | **..06..** = 0.25...6m (Liquids)<br>0.25...2.4m (Solids) | 80 | **..N9..** = 2" NPT<br>**..R9..** = G 2 | | |
| | | **..08..** = 0.35...8m (Liquids)<br>0.35...3.2m (Solids) | 60 | | | |
| | | **..10..** = 0.35...10m (Liquids)<br>0.35...4m (Solids) | 60 | **..AB..** = ANSI Flange 3"<br>**..FB..** = DN 80 Flange | | |
| | | **..15..** = 0.45...15m (Liquids)<br>0.45...6m (Solids) | 40 | **..AD..** = ANSI Flange 5"<br>**..FD..** = DN 125 Flange | | |
| | | **..25..** = 0.6...25m (Liquids)<br>0.6...10m (Solids) | 20 | **..AE..** = ANSI Flange 6"<br>**..FE..** = DN 150 Flange | | |
| **Optional Accessory** | | | | | | |
| **NUS-400P** = Plug-in Programming Unit with LCD-Display | | | | | | |
| **KM-HART** = HART® Modem | | | | | | |

**HART® Modem**

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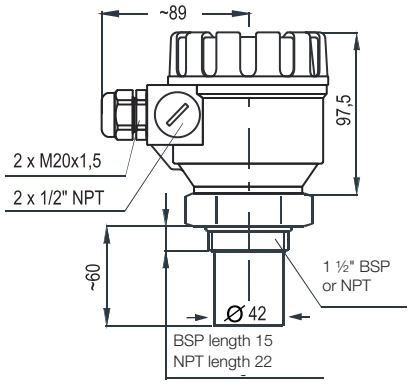
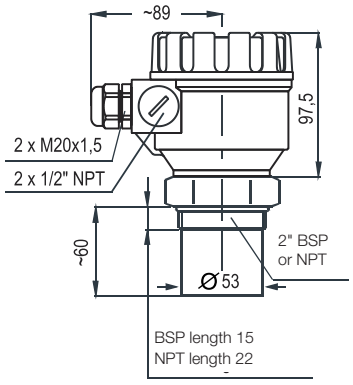
## Dimensions (mm)

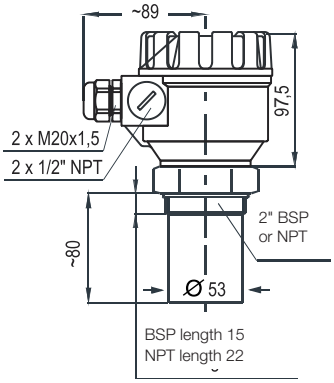
### NUS-4x04..



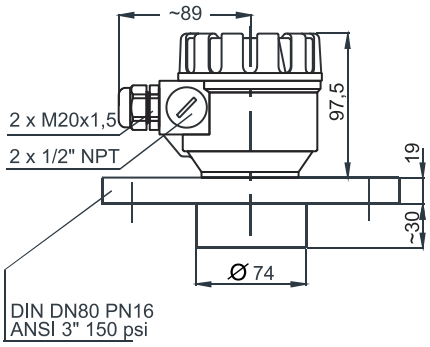

### NUS-4x06..



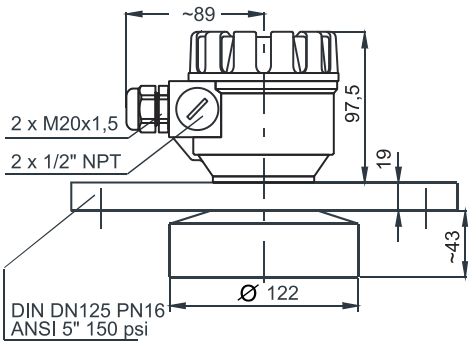

### NUS-4x08..

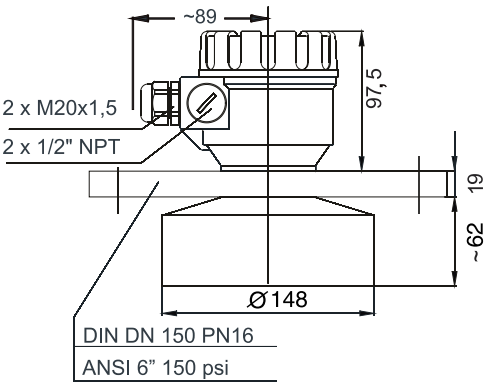



### NUS-4x10..




### NUS-4x15..




### NUS-4x25..