Technical Information

Proline Prosonic Flow E 100

Ultrasonic time-of-flight flowmeter

Cost-efficient ultrasonic time-of-flight flowmeter with integrated temperature measurement

Application
- The measuring principle is independent of pressure, density, temperature and conductivity
- Bidirectional measuring of demineralized water for Utilities, e.g. in boiler condensate return lines

Device properties
- Accuracy: up to ±0.5 % (flow) or according to EN 1434 Cl. 2, ±2.0 °C (±3.6 °F) (temperature)
- Process temperatures up to 150 °C (302 °F)
- Entire flowmeter made of stainless steel
- 4-20 mA HART, pulse/frequency output
- Local display for reading and monitoring available
- Robust transmitter housing

Your benefits
- Long-term stability – reliable, robust sensor
- Reducing further measuring point – multivariable device
- Dependable flow measurement – high turndown (200:1)
- Time-saving local operation without additional software and hardware – integrated web server
- Extended calibration intervals – integrated device verification due to Heartbeat Technology
- Easy commissioning – brief parameter explanations
Table of contents

About this document .................................. 3
Symbols .................................................. 3

Function and system design .......................... 4
Measuring principle ................................... 4
Measuring system ...................................... 4
Safety ..................................................... 5

Input ..................................................... 5
Measured variable ..................................... 5
Measuring range ....................................... 5
Operable flow range ................................... 7

Output ................................................... 7
Output signal .......................................... 7
Signal on alarm ........................................ 8
Low flow cut off ........................................ 9
Protocol-specific data .................................. 9

Power supply .......................................... 11
Terminal assignment .................................. 11
Supply voltage ......................................... 12
Current consumption .................................. 12
Power consumption .................................... 12
Power supply failure ................................... 12
Electrical connection ................................... 12
Potential equalization .................................. 14
Terminals ................................................ 14
Cable entries .......................................... 14
Cable specification ..................................... 14

Performance characteristics ......................... 14
reference operating conditions ....................... 14
Maximum measured error .............................. 14
Repeatability ............................................ 16
Influence of ambient temperature .................... 16

Installation ............................................. 16
Mounting location ..................................... 16
Orientation ............................................ 16
Inlet and outlet runs ................................... 17

Environment ........................................... 18
Ambient temperature range ............................ 18
Storage temperature .................................... 18
Degree of protection ................................... 18
Shock resistance ....................................... 18
Vibration resistance .................................... 18
Electromagnetic compatibility (EMC) ................ 18

Process .................................................. 18
Medium temperature range ............................ 18
Sound velocity range ................................... 18
Pressure-temperature ratings ......................... 18
Flow limit ................................................ 21
Pressure loss .......................................... 21
System pressure ........................................ 21
Thermal insulation ...................................... 22

Mechanical construction ............................. 22
Dimensions in SI units ................................ 22
Dimensions in US units ................................ 25
Weight .................................................... 27
Materials ................................................ 28
Process connections .................................... 29

Human interface ........................................ 30
Operating concept ....................................... 30
Local display .......................................... 30
Remote operation ....................................... 30
Service interface ....................................... 31

Certificates and approvals ............................ 31
CE mark .................................................. 31
RCM-tick symbol ........................................ 31
HART certification ....................................... 31
Pressure Equipment Directive ......................... 31
Other standards and guidelines ....................... 32

Ordering information ................................ 32
Application packages .................................. 32
Heartbeat Technology .................................. 33

Accessories ............................................. 33
Communication-specific accessories ................. 33
Service-specific accessories .......................... 34
System components .................................... 34

Supplementary documentation ....................... 35
Standard documentation ............................... 35
Supplementary device-dependent documentation .... 35

Registered trademarks ................................ 36
About this document

Symbols

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>⇨</td>
<td>Direct current</td>
</tr>
<tr>
<td>⇨</td>
<td>Alternating current</td>
</tr>
<tr>
<td>⇨</td>
<td>Direct current and alternating current</td>
</tr>
</tbody>
</table>
| ⇨      | Ground connection  
A grounded terminal which, as far as the operator is concerned, is grounded via a grounding system. |
| ☹      | Protective Earth (PE)  
A terminal which must be connected to ground prior to establishing any other connections.  
The ground terminals are situated inside and outside the device:  
- Inner ground terminal: Connects the protective earth to the mains supply.  
- Outer ground terminal: Connects the device to the plant grounding system. |

Symbols for certain types of information

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
</table>
| ✔️ ✔️  | Permitted  
Procedures, processes or actions that are permitted. |
| ✔️ ✔️ ✔️ | Preferred  
Procedures, processes or actions that are preferred. |
| ❌     | Forbidden  
Procedures, processes or actions that are forbidden. |
| 📖     | Tip  
Indicates additional information. |
| 📜     | Reference to documentation. |
| 📜     | Reference to page. |
| 📜     | Reference to graphic. |
| 🅱️     | Visual inspection. |

Symbols in graphics

<table>
<thead>
<tr>
<th>Symbol</th>
<th>Meaning</th>
</tr>
</thead>
<tbody>
<tr>
<td>1, 2, 3, ...</td>
<td>Item numbers</td>
</tr>
<tr>
<td>1, 2, 3, ...</td>
<td>Series of steps</td>
</tr>
<tr>
<td>A, B, C, ...</td>
<td>Views</td>
</tr>
<tr>
<td>A-A, B-B, C-C, ...</td>
<td>Sections</td>
</tr>
<tr>
<td>🚨</td>
<td>Hazardous area</td>
</tr>
<tr>
<td>📭</td>
<td>Safe area (non-hazardous area)</td>
</tr>
<tr>
<td>➾</td>
<td>Flow direction</td>
</tr>
</tbody>
</table>
Function and system design

**Measuring principle**

The measuring device measures the flow velocity in the measuring tube based on an offset arrangement of ultrasonic sensors downstream. The design does not cause any pressure loss and does not have any moving parts.

The flow signal is established by alternating an acoustic signal between the sensor pairs and measuring the transit time of each transmission. Then utilizing the fact that sound travels faster with the flow versus against the flow, this differential time (ΔT) can be used to determine the fluid's velocity between the sensors.

The volume flow rate is established by combining all the flow velocities determined by the sensor pairs with the cross sectional area of the meter body and extensive knowledge about fluid flow dynamics. The design of the sensors and their position ensures that only a short straight run of pipe upstream of the meter is required after typical flow obstructions such as bends in one or two planes.

Advanced digital signal processing and innovative sensor design facilitate constant flow measurement evaluation and reduce sensitivity to multiphase flow conditions and increase measurement reliability.

![Image](image.png)

**Measuring system**

The device consists of a transmitter and a sensor.

The device is available as a compact version:

The transmitter and sensor form a mechanical unit.

**Transmitter**

- **Proline 100**
  - Device versions and materials:
    - Compact, aluminum, coated:
      - Aluminum, AlSi10Mg, coated
    - Compact, stainless:
      - Stainless steel 1.4301 (304)
  - Configuration:
    - Via operating tools (e.g. FieldCare, DeviceCare)
    - Also for device version with 4-20 mA HART, pulse/frequency/switch output:
      - Via Web browser (e.g. Microsoft Internet Explorer)
Sensor

Prosonic Flow E

Single-path version:
DN 50 to 80 (2 to 3”)

Two-path version:
DN 100 to 150 (4 to 6”)

- Designed exclusively to measure:
  - Water
  - Hot water
- Range of nominal diameter: DN 50 to 150 (2 to 6”)
- Materials:
  - Measuring tube:
    Stainless steel: 1.4301 (F304)
  - Cones:
    Stainless steel: 1.4301 (F304)
  - Ultrasonic sensors:
    Stainless steel: 1.4301 (F304)
  - Smooth flange:
    Stainless steel: 1.4571 (316Ti)
  - Slip-on flange:
    Stainless steel: 1.4404 (F316L)
  - Lap joint flange:
    Steel: 1.0038 (S235JR)
    Stainless steel: 1.4301 (F304), 1.4307 (F304L)
  - Lap joint flange:
    Steel: A105
    Stainless steel: 1.4404 (F316L)
  - Lap joint flange, stamped plate:
    Steel: 1.0038 (S235JR)
    Stainless steel: 1.4301 (F304)

Single-path version:
DN 50 to 80 (2 to 3”)

A0034556

Two-path version:
DN 100 to 150 (4 to 6”)

A0034557

Input

Measured variable

- Direct measured variables
  - Flow velocity
  - Medium temperature
  - Sound velocity

Calculated measured variables

- Volume flow
- Mass flow

Measuring range

Typically \( v = 0 \) to 5 m/s (0 to 16.4 ft/s) with the specified accuracy

Flow characteristic values in SI units

<table>
<thead>
<tr>
<th>Nominal diameter</th>
<th>Recommended flow min./max. full scale value</th>
<th>Factory settings</th>
<th>Low flow cut off ( (v \approx 0.1 \text{ m/s}) )</th>
</tr>
</thead>
<tbody>
<tr>
<td>[mm]</td>
<td>[in]</td>
<td>[dm³/min]</td>
<td>Full scale value current output [dm³/min]</td>
</tr>
<tr>
<td>50</td>
<td>2</td>
<td>0 to 720</td>
<td>720</td>
</tr>
<tr>
<td>65</td>
<td>2 ½</td>
<td>0 to 1200</td>
<td>1200</td>
</tr>
<tr>
<td>80</td>
<td>3</td>
<td>0 to 1680</td>
<td>1680</td>
</tr>
</tbody>
</table>
### Flow characteristic values in SI units

<table>
<thead>
<tr>
<th>Nominal diameter [mm]</th>
<th>Recommended flow min./max. full scale value [dm³/min]</th>
<th>Full scale value current output [dm³/min]</th>
<th>Pulse value [dm³/pulse]</th>
<th>Low flow cut off (v ~ 0.1 m/s) [dm³/min]</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>0 to 2880</td>
<td>2880</td>
<td>10</td>
<td>57.6</td>
</tr>
<tr>
<td>150</td>
<td>0 to 6360</td>
<td>6360</td>
<td>25</td>
<td>127.2</td>
</tr>
</tbody>
</table>

### Flow characteristic values as per EN 1434 Class 2

**Flow characteristic values in SI units**

<table>
<thead>
<tr>
<th>Nominal diameter [mm]</th>
<th>Recommended flow [m³/h]</th>
<th>Factory settings Pulse value [dm³/pulse]</th>
<th>Low flow cut off (v ~ 0.1 m/s) [dm³/min]</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>0.15 15 30</td>
<td>3</td>
<td>0</td>
</tr>
<tr>
<td>65</td>
<td>0.25 25 50</td>
<td>4</td>
<td>0</td>
</tr>
<tr>
<td>80</td>
<td>0.40 40 80</td>
<td>6</td>
<td>0</td>
</tr>
<tr>
<td>100</td>
<td>0.60 60 120</td>
<td>10</td>
<td>0</td>
</tr>
<tr>
<td>150</td>
<td>1.50 150 300</td>
<td>25</td>
<td>0</td>
</tr>
</tbody>
</table>

1) \( q_i \): Minimum flow rate = Lowest flow rate at which the flowmeter operates within the limits of error in legal metrology

2) \( q_p \): Permanent flow rate = Highest flow rate at which the flowmeter operates within the limits of error in legal metrology

3) \( q_s \): Maximum flow rate = Highest flow rate

### Flow characteristic values in US units

<table>
<thead>
<tr>
<th>Nominal diameter [in]</th>
<th>Recommended flow [gal/min]</th>
<th>Factory settings Pulse value [gal/pulse]</th>
<th>Low flow cut off (v ~ 0.1 m/s) [gal/min]</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>50</td>
<td>0.66</td>
<td>0</td>
</tr>
<tr>
<td>2 ½</td>
<td>65</td>
<td>1.10</td>
<td>0</td>
</tr>
<tr>
<td>3</td>
<td>80</td>
<td>1.76</td>
<td>0</td>
</tr>
</tbody>
</table>

1) \( q_i \): Minimum flow rate = Lowest flow rate at which the flowmeter operates within the limits of error in legal metrology

2) \( q_p \): Permanent flow rate = Highest flow rate at which the flowmeter operates within the limits of error in legal metrology

3) \( q_s \): Maximum flow rate = Highest flow rate
### Nominal diameter

<table>
<thead>
<tr>
<th></th>
<th>[in]</th>
<th>[mm]</th>
<th>(q_i)</th>
<th>(q_p)</th>
<th>(q_s)</th>
<th>Pulse value</th>
<th>Low flow cut off ((v \approx 0.1 \text{ m/s}))</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>[gal/min]</td>
<td>[gal/min]</td>
<td>[gal/min]</td>
<td>[gal/pulse]</td>
<td>[gal/min]</td>
</tr>
<tr>
<td>4</td>
<td>100</td>
<td>2.64</td>
<td>264</td>
<td>528</td>
<td>2.6</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>150</td>
<td>6.60</td>
<td>660</td>
<td>1320</td>
<td>6.6</td>
<td>0</td>
<td></td>
</tr>
</tbody>
</table>

To calculate the measuring range, use the Applicator sizing tool → 34

**Recommended measuring range**

Flow limit → 21

**Operable flow range**

Over 200:1

### Output

**Output signal**

**HART current output**

<table>
<thead>
<tr>
<th>Current output</th>
<th>4-20 mA HART (active)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maximum output values</td>
<td>DC 24 V (no flow)</td>
</tr>
<tr>
<td></td>
<td>22.5 mA</td>
</tr>
<tr>
<td>Load</td>
<td>0 to 700 Ω</td>
</tr>
<tr>
<td>Resolution</td>
<td>0.38 µA</td>
</tr>
<tr>
<td>Damping</td>
<td>Configurable: 0.07 to 999 s</td>
</tr>
<tr>
<td>Assignable measured variables</td>
<td>Volume flow</td>
</tr>
<tr>
<td></td>
<td>Mass flow</td>
</tr>
<tr>
<td></td>
<td>Sound velocity</td>
</tr>
<tr>
<td></td>
<td>Flow velocity</td>
</tr>
<tr>
<td></td>
<td>Temperature</td>
</tr>
<tr>
<td></td>
<td>Acceptance rate 1)</td>
</tr>
<tr>
<td></td>
<td>Signal strength 1)</td>
</tr>
<tr>
<td></td>
<td>Signal to noise ratio 1)</td>
</tr>
<tr>
<td></td>
<td>Turbulence 2)</td>
</tr>
<tr>
<td></td>
<td>Signal asymmetry 2)</td>
</tr>
</tbody>
</table>

1) Only with Heartbeat (Monitoring)
2) Only with Heartbeat (Monitoring) and dual path version

**Pulse/frequency/switch output**

<table>
<thead>
<tr>
<th>Function</th>
<th>Can be set to pulse, frequency or switch output</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version</td>
<td>Passive, open collector</td>
</tr>
<tr>
<td>Maximum input values</td>
<td>DC 30 V</td>
</tr>
<tr>
<td></td>
<td>25 mA</td>
</tr>
<tr>
<td>Voltage drop</td>
<td>For 25 mA: ≤ DC 2 V</td>
</tr>
<tr>
<td>Pulse output</td>
<td></td>
</tr>
<tr>
<td>Pulse width</td>
<td>Configurable: 0.05 to 2000 ms</td>
</tr>
</tbody>
</table>
### Maximum pulse rate
10 000 Impulse/s

### Pulse value
Adjustable

###Assignable measured variables
- Volume flow
- Mass flow

### Frequency output

<table>
<thead>
<tr>
<th>Output frequency</th>
<th>Configurable: 0 to 10 000 Hz</th>
</tr>
</thead>
<tbody>
<tr>
<td>Damping</td>
<td>Configurable: 0 to 999 s</td>
</tr>
</tbody>
</table>

### Assignable measured variables
- Volume flow
- Mass flow
- Sound velocity
- Flow velocity
- Temperature
- Acceptance rate
- Signal strength
- Signal to noise ratio
- Turbulence
- Signal asymmetry

### Switch output

<table>
<thead>
<tr>
<th>Assignable functions</th>
</tr>
</thead>
<tbody>
<tr>
<td>Off</td>
</tr>
<tr>
<td>On</td>
</tr>
<tr>
<td>Diagnostic behavior</td>
</tr>
<tr>
<td>Limit value:</td>
</tr>
<tr>
<td>Off</td>
</tr>
<tr>
<td>Volume flow</td>
</tr>
<tr>
<td>Mass flow</td>
</tr>
<tr>
<td>Sound velocity</td>
</tr>
<tr>
<td>Flow velocity</td>
</tr>
<tr>
<td>Totalizer 1-3</td>
</tr>
<tr>
<td>Temperature</td>
</tr>
<tr>
<td>Signal strength</td>
</tr>
<tr>
<td>Signal to noise ratio</td>
</tr>
<tr>
<td>Turbulence</td>
</tr>
<tr>
<td>Signal asymmetry</td>
</tr>
<tr>
<td>Acceptance rate</td>
</tr>
<tr>
<td>Status</td>
</tr>
<tr>
<td>Flow direction monitoring</td>
</tr>
<tr>
<td>Status</td>
</tr>
<tr>
<td>Low flow cut off</td>
</tr>
</tbody>
</table>

1) Only with Heartbeat (Monitoring)
2) Only with Heartbeat (Monitoring) and dual path version

### Signal on alarm

Depending on the interface, failure information is displayed as follows:

### Current output 4 to 20 mA

4 to 20 mA

<table>
<thead>
<tr>
<th>Failure mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Choose from:</td>
</tr>
<tr>
<td>4 to 20 mA in accordance with NAMUR recommendation NE 43</td>
</tr>
<tr>
<td>4 to 20 mA in accordance with US</td>
</tr>
<tr>
<td>Min. value: 3.59 mA</td>
</tr>
<tr>
<td>Max. value: 22.5 mA</td>
</tr>
<tr>
<td>Freely definable value between: 3.59 to 22.5 mA</td>
</tr>
<tr>
<td>Actual value</td>
</tr>
<tr>
<td>Last valid value</td>
</tr>
</tbody>
</table>
Pulse/frequency/switch output

### Pulse output

<table>
<thead>
<tr>
<th>Failure mode</th>
<th>Choose from:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual value</td>
<td></td>
</tr>
<tr>
<td>No pulses</td>
<td></td>
</tr>
</tbody>
</table>

### Frequency output

<table>
<thead>
<tr>
<th>Failure mode</th>
<th>Choose from:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Actual value</td>
<td></td>
</tr>
<tr>
<td>0 Hz</td>
<td></td>
</tr>
<tr>
<td>Defined value: 0 to 12 500 Hz</td>
<td></td>
</tr>
</tbody>
</table>

### Switch output

<table>
<thead>
<tr>
<th>Failure mode</th>
<th>Choose from:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Current status</td>
<td></td>
</tr>
<tr>
<td>Open</td>
<td></td>
</tr>
<tr>
<td>Closed</td>
<td></td>
</tr>
</tbody>
</table>

Local display

<table>
<thead>
<tr>
<th>Plain text display</th>
<th>With information on cause and remedial measures</th>
</tr>
</thead>
<tbody>
<tr>
<td>Backlight</td>
<td>Red backlighting indicates a device error.</td>
</tr>
</tbody>
</table>

![Status signal as per NAMUR recommendation NE 107](image)

**Interface/protocol**

- Via digital communication:
  - HART protocol
- Via service interface
  - CDI-RJ45 service interface

<table>
<thead>
<tr>
<th>Plain text display</th>
<th>With information on cause and remedial measures</th>
</tr>
</thead>
</table>

![Additional information on remote operation](image)

Web browser

<table>
<thead>
<tr>
<th>Plain text display</th>
<th>With information on cause and remedial measures</th>
</tr>
</thead>
</table>

**Low flow cut off**

The switch points for low flow cut off are user-selectable.

**Protocol-specific data**

<table>
<thead>
<tr>
<th>Manufacturer ID</th>
<th>0x11</th>
</tr>
</thead>
<tbody>
<tr>
<td>Device type ID</td>
<td>115C</td>
</tr>
<tr>
<td>HART protocol revision</td>
<td>7.5</td>
</tr>
<tr>
<td>Device description files (DTM, DD)</td>
<td>Information and files under: <a href="http://www.endress.com">www.endress.com</a></td>
</tr>
<tr>
<td>HART load</td>
<td>Min. 250 Ω</td>
</tr>
</tbody>
</table>
## Dynamic variables

Read out the dynamic variables: HART command 3
The measured variables can be freely assigned to the dynamic variables.

**Measured variables for PV** (primary dynamic variable)
- Volume flow
- Mass flow
- Sound velocity
- Flow velocity
- Temperature
- Acceptance rate 1)  
- Signal strength 1)  
- Signal to noise ratio 1)  
- Turbulence 1)  
- Signal asymmetry 2)

**Measured variables for SV, TV, QV** (secondary, tertiary and quaternary dynamic variable)
- Volume flow
- Mass flow
- Sound velocity
- Flow velocity
- Temperature
- Acceptance rate 1)  
- Signal strength 1)  
- Signal to noise ratio 1)  
- Turbulence 1)  
- Signal asymmetry 2)  
- Totalizer 1
- Totalizer 2
- Totalizer 3

The range of options increases if the measuring device has one or more application packages.

## Device variables

Read out the device variables: HART command 9
The device variables are permanently assigned.

A maximum of 8 device variables can be transmitted:
- 0 = volume flow
- 1 = mass flow
- 2 = sound velocity
- 3 = flow velocity
- 4 = temperature
- 5 = totalizer 1
- 6 = totalizer 2
- 7 = totalizer 3
- 8 = acceptance rate
- 9 = turbulence
- 10 = signal to noise ratio
- 11 = signal asymmetry
- 12 = signal strength

1) Only with Heartbeat (Monitoring)
2) Only with Heartbeat (Monitoring) and dual path version
Power supply

Terminal assignment

Overview: housing version and connection versions

A  Housing version: compact, aluminum coated
B  Housing version: compact, stainless
1  Connection version: 4-20 mA HART, pulse/frequency/switch output
   1.1  Signal transmission: pulse/frequency/switch output
   1.2  Signal transmission: 4-20 mA HART
   1.3  Supply voltage

Transmitter

Connection version 4-20 mA HART with pulse/frequency/switch output

Order code for "Output", option B

| Order code "Housing" | Connection methods available | Power supply | Possible options for order code "Electrical connection"
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Options A, D</td>
<td>Terminals</td>
<td>Terminals</td>
<td>• Option A: coupling M20x1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Option B: thread M20x1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Option C: thread G ½&quot;</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>• Option D: thread NPT ½&quot;</td>
</tr>
</tbody>
</table>

Order code for "Housing":
- Option A: compact, coated aluminum
- Option D: compact, stainless

Terminal assignment 4-20 mA HART with pulse/frequency/switch output

1  Power supply: DC 24 V
2  Output 1: 4-20 mA HART (active)
3  Output 2: pulse/frequency/switch output (passive)
### Supply voltage

The power unit must be tested to ensure it meets safety requirements (e.g. PELV, SELV).

### Transmitter

For device version with HART communication type: DC 19.2 to 28.8 V

### Power consumption

<table>
<thead>
<tr>
<th>Order code for &quot;Output&quot;</th>
<th>Power supply</th>
<th>Terminal number</th>
<th>Output 1</th>
<th>Output 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option B: 4-20 mA HART with pulse/frequency/switch output</td>
<td>DC 24 V</td>
<td>2 (L-)</td>
<td>1 (L+)</td>
<td>27 (-)</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Order code for &quot;Output&quot;:</th>
<th>Maximum Power consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option B: 4-20 mA HART with pulse/frequency/switch output</td>
<td>3.0 W</td>
</tr>
</tbody>
</table>

### Current consumption

<table>
<thead>
<tr>
<th>Order code for &quot;Output&quot;</th>
<th>Maximum Current consumption</th>
<th>Maximum switch-on current</th>
</tr>
</thead>
<tbody>
<tr>
<td>Option B: 4-20mA HART, pul./freq./switch output</td>
<td>200 mA</td>
<td>30 A (&lt; 0.275 ms)</td>
</tr>
</tbody>
</table>

### Power supply failure

- Totalizers stop at the last value measured.
- Depending on the device version, the configuration is retained in the device memory or in the pluggable data memory (HistoROM DAT).
- Error messages (incl. total operated hours) are stored.

### Electrical connection

#### Connecting the transmitter

![Diagram of electrical connection](image)

- **A** Housing version: compact, coated, aluminum
- **B** Housing version: compact, stainless
- **1** Cable entry for signal transmission
- **2** Cable entry for supply voltage

*(Terminal assignment ➔ 11)*
Connection examples

Current output 4 to 20 mA HART

1. Automation system with current input (e.g. PLC)
2. Cable shield provided at one end. The cable shield must be grounded at both ends to comply with EMC requirements; observe cable specifications → 14
3. Connection for HART operating devices → 30
4. Resistor for HART communication (≥ 250 Ω): observe maximum load
5. Analog display unit: observe maximum load
6. Transmitter

Pulse/frequency output

1. Automation system with pulse/frequency input (e.g. PLC)
2. Power supply
3. Transmitter: Observe input values → 7
**Switch output**

![Connection example for switch output (passive)](image)

1. Automation system with switch input (e.g. PLC)
2. Power supply
3. Transmitter: Observe input values

### Potential equalization

**Requirements**

No special measures for potential equalization are required.

### Terminals

**Transmitter**

Spring terminals for wire cross-sections 0.5 to 2.5 mm² (20 to 14 AWG)

### Cable entries

- Cable gland: M20 × 1.5 with cable Ø 6 to 12 mm (0.24 to 0.47 in)
- Thread for cable entry:
  - M20
  - G ½"
  - NPT ½"

### Cable specification

**Permitted temperature range**

- The installation guidelines that apply in the country of installation must be observed.
- The cables must be suitable for the minimum and maximum temperatures to be expected.

**Power supply cable (incl. conductor for the inner ground terminal)**

Standard installation cable is sufficient.

**Signal cable**

- Current output 4 to 20 mA HART
  - A shielded cable is recommended. Observe grounding concept of the plant.
- Pulse/frequency/switch output
  - Standard installation cable is sufficient.

### Performance characteristics

**reference operating conditions**

- Error limits following DIN EN 29104, in future ISO 20456
- Water with +15 to +45 °C (+59 to +113 °F) at 2 to 6 bar (29 to 87 psi)
- Data as indicated in the calibration protocol
- Accuracy based on accredited calibration rigs according to ISO 17025

**Maximum measured error**

- Fluctuations in the supply voltage do not have any effect within the specified range.
- Temperature accuracy: ±2 °C (±3.8 °F)
Volume flow (standard)

Order code for "Calibration flow":
- Option A "0.5%"
- Option D "0.5%, 3-point, traceable to ISO/IEC 17025"
- Option M "0.5%, 3-point"

Measured error
- \( v > 0.5 \text{ m/s} (1.64 \text{ ft/s}) \): ±0.5 % o.r. ±0.02 % o.f.s.
- \( v \leq 0.5 \text{ m/s} (1.64 \text{ ft/s}) \): ±0.07 % o.f.s.
- of full scale value: 5 m/s (16.4 ft/s)

o.r. = of reading; o.f.s. = of full scale value

![Graph](image)

6 Maximum measured error in % o.r.

Volume flow (EN 1434)

Order code for "Calibration flow":
Option Q "2.0% as per EN 1434"

Measured error as per EN 1434 Class 2 [%]
±(2 + 0.02* \( q_p/q \)), limited to ±5 %

\( q_p \) = specified continuous flow rate dependent on nominal diameter → 5; \( q \) = current flow rate

![Graph](image)

7 Error curve as per EN 1434

\( q_i \) Minimum flow rate
\( q_p \) Permanent flow rate
\( q_i \) Maximum flow rate

Accuracy of outputs

- The output accuracy must be factored into the measured error if analog outputs are used.

The outputs have the following base accuracy specifications.
### Current output

| Accuracy | Max. ±5 µA |

### Pulse/frequency output

**o.r. = of reading**

| Accuracy | Max. ±50 ppm o.r. (over the entire ambient temperature range) |

### Repeatability

**o.r. = of reading**

### Volume flow

| ±0.1 % o.r. |

### Influence of ambient temperature

**Current output**

| o.r. = of reading |

| Temperature coefficient | Max. ±0.005 % o.r./°C |

### Pulse/frequency output

| Temperature coefficient | No additional effect. Included in accuracy. |

### Installation

#### Mounting location

![Diagram showing proper mounting location.](image)

#### Orientation

The direction of the arrow on the nameplate helps you to install the sensor according to the flow direction (direction of medium flow through the piping).

- Install the measuring device in a parallel plane free of external mechanical stress.
- The internal diameter of the pipe must match the internal diameter of the sensor.
### Orientation

<table>
<thead>
<tr>
<th></th>
<th>Orientation</th>
<th>Compact version</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Vertical orientation</td>
<td>![Diagram]</td>
</tr>
<tr>
<td>B</td>
<td>Horizontal orientation, transmitter head up</td>
<td>![Diagram]</td>
</tr>
<tr>
<td>C</td>
<td>Horizontal orientation, transmitter head down</td>
<td>![Diagram]</td>
</tr>
<tr>
<td>D</td>
<td>Horizontal orientation, transmitter head at side</td>
<td>![Diagram]</td>
</tr>
</tbody>
</table>

### Inlet and outlet runs

If possible, the sensor should be installed downstream from valves, T-pieces, pumps etc. To attain the specified level of accuracy of the measuring device, the below mentioned inlet and outlet runs must be maintained at minimum. If there are several flow disturbances present, the longest specified inlet run must be maintained.

![Diagram]

- **1** 10 × DN 3 × DN
- **2** 15 × DN 3 × DN
- **3** 10 × DN 3 × DN
- **4** 15 × DN 3 × DN

### Outlet runs when installing external devices

If installing an external device, observe the specified distance.

![Diagram]

**PT** Pressure measuring device
Environment

<table>
<thead>
<tr>
<th>Environment</th>
<th>Transmitter</th>
<th>Local display</th>
<th>Sensor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temperature range</td>
<td>-25 to +60 °C (−13 to +140 °F)</td>
<td>-20 to +60 °C (−4 to +140 °F), the readability of the display may be impaired at temperatures outside the temperature range.</td>
<td>-25 to +60 °C (−13 to +140 °F)</td>
</tr>
</tbody>
</table>

- If operating outdoors:
  Avoid direct sunlight, particularly in warm climatic regions.

Storage temperature

All components apart from display modules:
-50 to +80 °C (−58 to +176 °F), preferably at +20 °C (+68 °F)

Degree of protection

- **Transmitter and sensor**
  - As standard: IP66/67, type 4X enclosure
  - When housing is open: IP20, type 1 enclosure

Shock resistance

Shock due to rough handling following IEC 60068-2-31

Vibration resistance

- Oscillation, sinusoidal, following IEC 60068-2-6
- 2 to 8.4 Hz, 3.5 mm peak
- 8.4 to 500 Hz, 1 g peak
- Oscillation, broadband noise following IEC 60068-2-64
  - 10 to 200 Hz, 0.003 g²/Hz
  - 200 to 2,000 Hz, 0.001 g²/Hz
  - Total: 1.54 g rms

Electromagnetic compatibility (EMC)

- As per IEC/EN 61326-1, IEC/EN 61326-2-3 and NAMUR Recommendation 21 (NE 21)
- Complies with emission limits for industry as per EN 55011 (Class A)
  Details are provided in the Declaration of Conformity.

Process

Medium temperature range

Sensor
+0 to +150 °C (+32 to +302 °F)

Sound velocity range
1,200 to 2,000 m/s (3,937 to 6,562 ft/s)

Pressure-temperature ratings

The following pressure/temperature diagrams apply to all pressure-bearing parts of the device and not just the process connection. The diagrams show the maximum permissible medium pressure depending on the specific medium temperature.

- Process connections with carbon steel flange material are subject to the following minimum process temperatures:
  - As per EN 1092: −10 °C (+14 °F)
  - As per ASME: −29 °C (−20 °F)
Smooth flange DIN EN 1092-1Type 01Shape B1, PN 16/25/40

9  With flange material 1.4571 (316Ti)

Slip-on flange following ASME B16.5, class 150

10  With flange material 1.4404 (F316L)

Lap joint flange DIN EN 1092-1Type 02Shape A, PN 16

11  With flange material 1.0038 (S235JR); minimum process temperature → 18
With flange material 1.4306 (F304L) and 1.4307 (F304L)

Lap joint flange following ASME B16.5, class 150

With flange material A105; minimum process temperature → 18

With flange material 1.4404 (F316L)
Lap joint flange, stamped plate following EN 1092-1 (DIN 2501), PN 10

Flow limit

Select the nominal diameter by optimizing between the required flow range and permissible pressure loss.

For an overview of the full scale values for the measuring range, see the “Measuring range” section → 5

- The minimum recommended full scale value is approx. 1/20 of the maximum full scale value.
- In most applications, 10 to 50% of the maximum full scale value can be considered ideal.

Pressure loss

To calculate the pressure loss, use the Applicator sizing tool → 34

System pressure

It is important that cavitation does not occur, or that gases entrained in the liquids do not outgas. This is prevented by means of a sufficiently high system pressure.

For this reason, the following mounting locations are recommended:

- At the lowest point in a vertical pipe
- Downstream from pumps (no danger of vacuum)
Thermal insulation

In the case of some fluids, it is important to keep the heat radiated from the sensor to the transmitter to a low level. A wide range of materials can be used for the required insulation.

- Maximum insulation thickness: 2 cm (0.79 in)
- Minimum distance from transmitter to insulation

Mechanical construction

Dimensions in SI units

Compact version

Order code for "Housing", options A "Compact, aluminum, coated"

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>136</td>
<td>82</td>
<td>54</td>
<td>82.5</td>
<td>233.5</td>
<td>316</td>
<td>136</td>
<td>35</td>
<td></td>
<td>61.5</td>
</tr>
<tr>
<td>65</td>
<td>136</td>
<td>82</td>
<td>54</td>
<td>92.5</td>
<td>238</td>
<td>330.5</td>
<td>136</td>
<td>43.8</td>
<td></td>
<td>71</td>
</tr>
<tr>
<td>80</td>
<td>136</td>
<td>82</td>
<td>54</td>
<td>100</td>
<td>241</td>
<td>341</td>
<td>136</td>
<td>49.3</td>
<td></td>
<td>76.5</td>
</tr>
<tr>
<td>100</td>
<td>136</td>
<td>82</td>
<td>54</td>
<td>117.5</td>
<td>258.5</td>
<td>376</td>
<td>136</td>
<td>75</td>
<td></td>
<td>110</td>
</tr>
<tr>
<td>150</td>
<td>136</td>
<td>82</td>
<td>54</td>
<td>150</td>
<td>276.5</td>
<td>426.5</td>
<td>136</td>
<td>110.3</td>
<td></td>
<td>145</td>
</tr>
</tbody>
</table>

1) When using a display (order code for "Display; operation", option B): Values +28 mm
2) Tolerance: ±2 mm
3) Dependent on respective process connection
**Order code for 'Housing', Option D 'Compact, stainless'**

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>137</td>
<td>77</td>
<td>60</td>
<td>82.5</td>
<td>228.5</td>
<td>311</td>
<td>133.5</td>
<td>35</td>
<td>61.5</td>
<td></td>
</tr>
<tr>
<td>65</td>
<td>137</td>
<td>77</td>
<td>60</td>
<td>92.5</td>
<td>233</td>
<td>325.5</td>
<td>133.5</td>
<td>43.8</td>
<td>71</td>
<td></td>
</tr>
<tr>
<td>80</td>
<td>137</td>
<td>77</td>
<td>60</td>
<td>100</td>
<td>236</td>
<td>336</td>
<td>133.5</td>
<td>49.3</td>
<td>76.5</td>
<td></td>
</tr>
<tr>
<td>100</td>
<td>137</td>
<td>77</td>
<td>60</td>
<td>117.5</td>
<td>253.5</td>
<td>371</td>
<td>133.5</td>
<td>75</td>
<td>110</td>
<td></td>
</tr>
<tr>
<td>150</td>
<td>137</td>
<td>77</td>
<td>60</td>
<td>150</td>
<td>271.5</td>
<td>421.5</td>
<td>133.5</td>
<td>110.3</td>
<td>145</td>
<td></td>
</tr>
</tbody>
</table>

1) When using a display (order code for 'Display; operation', option B): Values +15.5 mm
2) Tolerance: ±2 mm
3) Depends on the process connection in question

**Flange connections**

*Fixed flange*

**Smooth flange DIN EN 1092-1 Type 01 Form B1, PN 16/25/40**

1.4571 (316Ti): order code for 'Process connection', option D51, D52, D53

<table>
<thead>
<tr>
<th>DN [mm]</th>
<th>Pressure rating PN</th>
<th>A [mm]</th>
<th>B [mm]</th>
<th>C [mm]</th>
<th>D [mm]</th>
<th>E [mm]</th>
<th>L [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>40</td>
<td>165</td>
<td>125</td>
<td>4 x 18</td>
<td>20</td>
<td>56.3</td>
<td>300</td>
</tr>
<tr>
<td>65</td>
<td>16/25</td>
<td>185</td>
<td>145</td>
<td>8 x 18</td>
<td>20/22</td>
<td>72.1</td>
<td>300</td>
</tr>
<tr>
<td>80</td>
<td>16/25</td>
<td>200</td>
<td>160</td>
<td>8 x 18</td>
<td>20/24</td>
<td>84.5</td>
<td>350</td>
</tr>
<tr>
<td>100</td>
<td>16/25</td>
<td>220/235</td>
<td>180/190</td>
<td>8 x 18/22</td>
<td>22/26</td>
<td>110.3</td>
<td>350</td>
</tr>
<tr>
<td>150</td>
<td>16/25</td>
<td>285/300</td>
<td>240/250</td>
<td>8 x 22/26</td>
<td>24/30</td>
<td>164.3</td>
<td>500</td>
</tr>
</tbody>
</table>

1) Tolerance: ±2 mm
2) Tolerance: 0/-2 mm
3) Tolerance: 0/-3 mm

**Slip-on flange following ASME B16.5: Class 150**

1.4404 (F316L): order code for 'Process connection', option A1S

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>152.4</td>
<td>120.7</td>
<td>4 x 19.1</td>
<td>25.4</td>
<td>56.3</td>
<td>300</td>
</tr>
<tr>
<td>80</td>
<td>190.5</td>
<td>152.4</td>
<td>4 x 19.1</td>
<td>30.2</td>
<td>84.5</td>
<td>350</td>
</tr>
</tbody>
</table>
### Slip-on flange following ASME B16.5: Class 150

1.4404 (F316L): order code for "Process connection", option A15

<table>
<thead>
<tr>
<th>DN [mm]</th>
<th>A [mm]</th>
<th>B [mm]</th>
<th>C [mm]</th>
<th>D [mm]</th>
<th>E&lt;sup&gt;1)&lt;/sup&gt; [mm]</th>
<th>L [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>228.6</td>
<td>190.5</td>
<td>8 × 19.1</td>
<td>33.3</td>
<td>110.3</td>
<td>350&lt;sup&gt;3)&lt;/sup&gt;</td>
</tr>
<tr>
<td>150</td>
<td>279.4</td>
<td>241.3</td>
<td>8 × 22.4</td>
<td>39.6</td>
<td>164.3</td>
<td>500&lt;sup&gt;3)&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

1) Tolerance: ±2 mm
2) Tolerance: 0/-2 mm
3) Tolerance: 0/-3 mm

### Lap joint flange

![Lap joint flange diagram](image)

### Lap joint flange DIN EN 1092-1 Type 02 Form A: PN 16

1.0038 (S235JR): order code for "Process connection", option D32
1.4306 (F304L), 1.4307 (F304L): order code for "Process connection", option D34

<table>
<thead>
<tr>
<th>DN [mm]</th>
<th>A [mm]</th>
<th>B [mm]</th>
<th>C [mm]</th>
<th>D [mm]</th>
<th>L [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>165</td>
<td>125</td>
<td>20</td>
<td>4 × 18</td>
<td>300&lt;sup&gt;1)&lt;/sup&gt;</td>
</tr>
<tr>
<td>65</td>
<td>185</td>
<td>145</td>
<td>20</td>
<td>8 × 18</td>
<td>300&lt;sup&gt;1)&lt;/sup&gt;</td>
</tr>
<tr>
<td>80</td>
<td>200</td>
<td>160</td>
<td>20</td>
<td>8 × 18</td>
<td>350&lt;sup&gt;2)&lt;/sup&gt;</td>
</tr>
<tr>
<td>100</td>
<td>220</td>
<td>180</td>
<td>22</td>
<td>8 × 18</td>
<td>350&lt;sup&gt;2)&lt;/sup&gt;</td>
</tr>
<tr>
<td>150</td>
<td>285</td>
<td>240</td>
<td>24</td>
<td>8 × 22</td>
<td>500&lt;sup&gt;2)&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

1) Tolerance: 0/-2 mm
2) Tolerance: 0/-3 mm

### Lap joint flange following ASME B16.5: Class 150

A105: order code for "Process connection", option A12
1.4404 (F316L): order code for "Process connection", option A14

<table>
<thead>
<tr>
<th>DN [mm]</th>
<th>A [mm]</th>
<th>B [mm]</th>
<th>C [mm]</th>
<th>D [mm]</th>
<th>L [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>152.4</td>
<td>120.7</td>
<td>25.4</td>
<td>4 × 19.1</td>
<td>300&lt;sup&gt;1)&lt;/sup&gt;</td>
</tr>
<tr>
<td>80</td>
<td>190.5</td>
<td>152.4</td>
<td>30.2</td>
<td>4 × 19.1</td>
<td>350&lt;sup&gt;1)&lt;/sup&gt;</td>
</tr>
<tr>
<td>100</td>
<td>228.6</td>
<td>190.5</td>
<td>33.3</td>
<td>8 × 19.1</td>
<td>350&lt;sup&gt;1)&lt;/sup&gt;</td>
</tr>
<tr>
<td>150</td>
<td>279.4</td>
<td>241.3</td>
<td>39.6</td>
<td>8 × 22.4</td>
<td>500&lt;sup&gt;1)&lt;/sup&gt;</td>
</tr>
</tbody>
</table>

1) Tolerance: 0/-2 mm
2) Tolerance: 0/-3 mm
Lap joint flange, stamped plate

**Lap joint flange, stamped plate following EN 1092-1 (DIN 2501): PN 10**

1.0038 (S235JR): order code for ‘Process connection’, option D21

1.4301 (F304): order code for ‘Process connection’, option D23

<table>
<thead>
<tr>
<th>DN [mm]</th>
<th>A [mm]</th>
<th>B [mm]</th>
<th>C [mm]</th>
<th>D [mm]</th>
<th>L [mm]</th>
</tr>
</thead>
<tbody>
<tr>
<td>50</td>
<td>165</td>
<td>125</td>
<td>18.5</td>
<td>4 × 17.5</td>
<td>300 1)</td>
</tr>
<tr>
<td>65</td>
<td>185</td>
<td>145</td>
<td>20.0</td>
<td>4 × 17.5</td>
<td>300 1)</td>
</tr>
<tr>
<td>80</td>
<td>200</td>
<td>160</td>
<td>23.5</td>
<td>8 × 17.5</td>
<td>350 2)</td>
</tr>
<tr>
<td>100</td>
<td>220</td>
<td>180</td>
<td>24.5</td>
<td>8 × 17.5</td>
<td>350 2)</td>
</tr>
<tr>
<td>150</td>
<td>285</td>
<td>240</td>
<td>25.0</td>
<td>8 × 21.5</td>
<td>500 2)</td>
</tr>
</tbody>
</table>

1) Tolerance: 0/-2 mm
2) Tolerance: 0/-3 mm

**Dimensions in US units**

**Compact version**

Order code for ‘Housing’, options A ‘Compact, aluminum, coated’

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>5.35</td>
<td>3.23</td>
<td>2.13</td>
<td>3.25</td>
<td>9.19</td>
<td>12.4</td>
<td>5.35</td>
<td>1.38</td>
<td>3)</td>
<td>2.42</td>
</tr>
<tr>
<td>2 ½</td>
<td>5.35</td>
<td>3.23</td>
<td>2.13</td>
<td>3.64</td>
<td>9.37</td>
<td>13.0</td>
<td>5.35</td>
<td>1.72</td>
<td>3)</td>
<td>2.80</td>
</tr>
<tr>
<td>3</td>
<td>5.35</td>
<td>3.23</td>
<td>2.13</td>
<td>3.94</td>
<td>9.49</td>
<td>13.4</td>
<td>5.35</td>
<td>1.94</td>
<td>3)</td>
<td>3.01</td>
</tr>
</tbody>
</table>
### Proline Prosonic Flow E 100

| 4  | 5.35 | 3.23 | 2.13 | 4.63 | 10.2 | 14.8 | 5.35 | 2.95 | 4.33 |
| 6  | 5.35 | 3.23 | 2.13 | 5.91 | 10.9 | 16.8 | 5.35 | 4.34 | 5.71 |

1) When using a display (order code for "Display; operation", option B): Values +0.60 in
2) Tolerance: ±0.08 in
3) Depends on the process connection in question

#### Order code for 'Housing', Option D 'Compact, stainless'

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>5.4</td>
<td>3.03</td>
<td>2.36</td>
<td>3.25</td>
<td>8.98</td>
<td>12.24</td>
<td>5.24</td>
<td>1.38</td>
<td>2.42</td>
<td></td>
</tr>
<tr>
<td>2 ½</td>
<td>5.4</td>
<td>3.03</td>
<td>2.36</td>
<td>3.64</td>
<td>9.17</td>
<td>12.80</td>
<td>5.24</td>
<td>1.72</td>
<td>2.80</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>5.4</td>
<td>3.03</td>
<td>2.36</td>
<td>3.94</td>
<td>9.30</td>
<td>13.22</td>
<td>5.24</td>
<td>1.94</td>
<td>3.01</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>5.4</td>
<td>3.03</td>
<td>2.36</td>
<td>4.63</td>
<td>9.96</td>
<td>14.60</td>
<td>5.24</td>
<td>2.95</td>
<td>4.33</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>5.4</td>
<td>3.03</td>
<td>2.36</td>
<td>5.91</td>
<td>10.67</td>
<td>16.57</td>
<td>5.24</td>
<td>4.34</td>
<td>5.71</td>
<td></td>
</tr>
</tbody>
</table>

1) When using a display (order code for "Display; operation", option B): Values +0.06 in
2) Tolerance: ±0.08 in
3) Depends on the process connection in question

#### Flange connections

**Fixed flange**

![Fixed Flange Diagram](image)

**Slip-on flange following ASME B16.5: Class 150**

1.4404 (F316L): order code for 'Process connection', option A1S

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>6.00</td>
<td>4.75</td>
<td>4 × 0.75</td>
<td>1.00</td>
<td>2.22</td>
<td>11.8</td>
</tr>
<tr>
<td>3</td>
<td>7.50</td>
<td>6.00</td>
<td>4 × 0.75</td>
<td>1.19</td>
<td>3.33</td>
<td>13.8</td>
</tr>
<tr>
<td>4</td>
<td>9.00</td>
<td>7.50</td>
<td>8 × 0.75</td>
<td>1.31</td>
<td>4.34</td>
<td>13.8</td>
</tr>
<tr>
<td>6</td>
<td>11.0</td>
<td>9.50</td>
<td>8 × 0.88</td>
<td>1.56</td>
<td>6.47</td>
<td>19.7</td>
</tr>
</tbody>
</table>

1) Tolerance: ±0.08 in
2) Tolerance: 0/-0.08 in
3) Tolerance: 0/-0.12 in
Lap joint flange

Lap joint flange following ASME B16.5: Class 150
A105: order code for "Process connection", option A12
1.4404 (F316L): order code for "Process connection", option A14

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>6.00</td>
<td>4.75</td>
<td>1.00</td>
<td>4 × 0.75</td>
<td>11.8</td>
</tr>
<tr>
<td>3</td>
<td>7.50</td>
<td>6.00</td>
<td>1.19</td>
<td>4 × 0.75</td>
<td>13.8</td>
</tr>
<tr>
<td>4</td>
<td>9.00</td>
<td>7.50</td>
<td>1.31</td>
<td>8 × 0.75</td>
<td>13.8</td>
</tr>
<tr>
<td>6</td>
<td>11.0</td>
<td>9.50</td>
<td>1.56</td>
<td>8 × 0.88</td>
<td>19.7</td>
</tr>
</tbody>
</table>

1) Tolerance: 0/-0.08 in
2) Tolerance: 0/-0.12 in

Weight

Weight in SI units

Compact version

Order code for "Housing", option A "Compact, aluminum, coated"

<table>
<thead>
<tr>
<th>Nominal diameter [mm]</th>
<th>Version</th>
<th>Fixed flange</th>
<th>Lap joint flange</th>
<th>Lap joint flange, stamped plate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>EN 1092-1 (DIN 2501) ¹</td>
<td>ASME B16.5 ²</td>
<td>EN 1092-1 (DIN 2501) ³</td>
</tr>
<tr>
<td></td>
<td></td>
<td>[kg]</td>
<td>[kg]</td>
<td>[kg]</td>
</tr>
<tr>
<td>50</td>
<td>Single-path</td>
<td>9.63</td>
<td>8.43</td>
<td>9.35</td>
</tr>
<tr>
<td>65</td>
<td>Single-path</td>
<td>11.26</td>
<td>–</td>
<td>11.18</td>
</tr>
<tr>
<td>100</td>
<td>Two-path</td>
<td>16.55</td>
<td>18.55</td>
<td>16.40</td>
</tr>
<tr>
<td>150</td>
<td>Two-path</td>
<td>25.85</td>
<td>26.85</td>
<td>22.45</td>
</tr>
</tbody>
</table>

1) Pressure rating PN 40 (DN 50), PN 16 (DN 65 to 150)
2) Pressure rating, class 150
3) Pressure rating PN 10/16
4) Pressure rating PN 10
### Order code for ‘Housing’, Option D ‘Compact, stainless’

<table>
<thead>
<tr>
<th>Nominal diameter [mm]</th>
<th>Version</th>
<th>Fixed flange</th>
<th>Lap joint flange</th>
<th>Lap joint flange, stamped plate</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>EN 1092-1 (DIN 2501)¹</td>
<td>ASME B16.5² [kg]</td>
<td>EN 1092-1 (DIN 2501)³</td>
</tr>
<tr>
<td>50</td>
<td>Single-path</td>
<td>9.44</td>
<td>8.24</td>
<td>9.16</td>
</tr>
<tr>
<td>100</td>
<td>Two-path</td>
<td>16.36</td>
<td>18.36</td>
<td>16.22</td>
</tr>
<tr>
<td>150</td>
<td>Two-path</td>
<td>25.66</td>
<td>26.66</td>
<td>22.26</td>
</tr>
</tbody>
</table>

¹) Pressure rating PN 40 (DN 50), PN 16 (DN 65 to 150)
²) Pressure rating, class 150
³) Pressure rating PN 10/16
⁴) Pressure rating PN 10

### Weight in US units

**Compact version**

#### Order code for ‘Housing’, option A ‘Compact, aluminum, coated’

<table>
<thead>
<tr>
<th>Nominal diameter [in]</th>
<th>Version</th>
<th>Fixed flange ASME B16.5 ¹</th>
<th>Lap joint flange ASME B16.5 ¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Single-path</td>
<td>17.64</td>
<td>17.63</td>
</tr>
<tr>
<td>3</td>
<td>Single-path</td>
<td>28.66</td>
<td>28.66</td>
</tr>
<tr>
<td>4</td>
<td>Two-path</td>
<td>39.68</td>
<td>39.68</td>
</tr>
<tr>
<td>6</td>
<td>Two-path</td>
<td>57.32</td>
<td>57.32</td>
</tr>
</tbody>
</table>

¹) Pressure rating, class 150

#### Order code for ‘Housing’, Option D ‘Compact, stainless’

<table>
<thead>
<tr>
<th>Nominal diameter [in]</th>
<th>Version</th>
<th>Fixed flange ASME B16.5 ¹</th>
<th>Lap joint flange ASME B16.5 ¹</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td>Single-path</td>
<td>17.63</td>
<td>17.63</td>
</tr>
<tr>
<td>3</td>
<td>Single-path</td>
<td>28.66</td>
<td>28.66</td>
</tr>
<tr>
<td>4</td>
<td>Two-path</td>
<td>39.68</td>
<td>39.68</td>
</tr>
<tr>
<td>6</td>
<td>Two-path</td>
<td>57.32</td>
<td>57.32</td>
</tr>
</tbody>
</table>

¹) Pressure rating, class 150

### Materials

**Transmitter housing**

- Order code for ‘Housing’, option A ‘Compact, aluminum coated’:
  - Aluminum, AlSi10Mg, coated
- Order code for ‘Housing’, option D ‘Compact, stainless’:
  - Stainless steel 1.4301 (304)
- Window material for optional local display (→ 30):
  - Order code for ‘Display; Operation’, option B: glass
Cable entries/cable glands

1. Female thread M20 × 1.5
2. Cable gland M20 × 1.5
3. Adapter for cable entry with female thread G ½" or NPT ½"

Order code for "Housing", option A "Compact, aluminum, coated"

<table>
<thead>
<tr>
<th>Cable entry/cable gland</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable gland M20 × 1.5</td>
<td></td>
</tr>
<tr>
<td>Adapter for cable entry with female thread G ½&quot;</td>
<td>Nickel-plated brass</td>
</tr>
<tr>
<td>Adapter for cable entry with female thread NPT ½&quot;</td>
<td></td>
</tr>
</tbody>
</table>

Order code for "Housing", option D "Compact, stainless"

<table>
<thead>
<tr>
<th>Cable entry/cable gland</th>
<th>Material</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable gland M20 × 1.5</td>
<td></td>
</tr>
<tr>
<td>Adapter for cable entry with female thread G ½&quot;</td>
<td>Stainless steel, 1.4404 (316L)</td>
</tr>
<tr>
<td>Adapter for cable entry with female thread NPT ½&quot;</td>
<td></td>
</tr>
</tbody>
</table>

Sensor housing

Stainless steel (cold worked):
- 1.4301 (304)
- 1.4301 (304)

Process connections

- Stainless steel:
  - 1.4301 (304)
  - 1.4306 (304L)
  - 1.4404 (316L)
  - 1.4571 (316Ti)
  - Steel S235JR (1.0038)
  - Carbon steel A105

Available process connections → 29

Process connections

Flanges:
- EN 1092-1 (DIN 2501)
- ASME B16.5

For information on the different materials used in the process connections → 29
Human interface

Operating concept
- Operator-oriented menu structure for user-specific tasks
  - Commissioning
  - Operation
  - Diagnostics
  - Expert level

Quick and safe commissioning
- Individual menus for applications
- Menu guidance with brief explanations of the individual parameter functions

Reliable operation
- Operation in the following languages:
  - Via 'FieldCare', 'DeviceCare' operating tool:
    - English, German, French, Spanish, Italian, Chinese, Japanese
  - Via integrated Web browser:
    - English, German, French, Spanish, Italian, Dutch, Portuguese, Polish, Russian, Turkish, Chinese, Japanese, Bahasa (Indonesian), Vietnamese, Czech, Swedish, Korean
- Uniform operating philosophy applied to operating tools and Web browser
- If replacing the electronic module, transfer the device configuration via the plug-in memory (HistoROM DAT) which contains the process and measuring device data and the event logbook. No need to reconfigure.

Efficient diagnostics increase measurement availability
- Troubleshooting measures can be called up via the operating tools
- Diverse simulation options
- Status indicated by several light emitting diodes (LEDs) on the electronic module in the housing compartment

Local display
The local display is only available with the following device order code:
Order code for 'Display; operation', option B: 4-line; illuminated, via communication

Display element
- 4-line liquid crystal display with 16 characters per line.
- White background lighting; switches to red in event of device errors.
- Format for displaying measured variables and status variables can be individually configured.
- Permitted ambient temperature for the display: –20 to +60 °C (–4 to +140 °F). The readability of the display may be impaired at temperatures outside the temperature range.

Remote operation
Via HART protocol

![Diagram showing remote operation options via HART protocol](image)

18 Options for remote operation via HART protocol
1 Control system (e.g. PLC)
2 Field Communicator 475
3 Computer with operating tool (e.g. FieldCare, AMS Device Manager, SIMATIC PDM)
4 Commubox FXA195 (USB)
5 Field Xpert SFX350 or SFX370
6 Field Xpert SMT70
7 VIATOR Bluetooth modem with connecting cable
8 Transmitter
Service interface  
Via service interface (CDI-RJ45)  

![Diagram](image_url)  

Connection for the order code for "Output", option B: 4-20 mA HART, pulse/frequency/switch output

1. Service interface (CDI-RJ45) of the measuring device with access to the integrated Web server
2. Computer with Web browser (e.g. Internet Explorer) for accessing the integrated device Web server or with 'FieldCare' operating tool with COM DTM 'CDI Communication TCP/IP'
3. Standard Ethernet connecting cable with RJ45 plug

Certificates and approvals

Currently available certificates and approvals can be called up via the product configurator.

CE mark

The device meets the legal requirements of the applicable EU Directives. These are listed in the corresponding EU Declaration of Conformity along with the standards applied. Endress+Hauser confirms successful testing of the device by affixing to it the CE mark.

RCM-tick symbol

The measuring system meets the EMC requirements of the 'Australian Communications and Media Authority (ACMA)'.

HART certification

HART interface

The measuring device is certified and registered by the FieldComm Group. The measuring system meets all the requirements of the following specifications:
- Certified according to HART 7.5
- The device can also be operated with certified devices of other manufacturers (interoperability)

Pressure Equipment Directive

The devices can be ordered with or without a PED approval. If a device with a PED approval is required, this must be explicitly stated in the order.
- With the identification PED/G1/x (x = category) on the sensor nameplate, Endress+Hauser confirms conformity with the 'Essential Safety Requirements' specified in Appendix I of the Pressure Equipment Directive 2014/68/EU.
- Devices bearing this marking (PED) are suitable for the following types of medium: Media in Group 1 and 2 with a vapor pressure greater than, or smaller and equal to 0.5 bar (7.3 psi)
- Devices not bearing this marking (PED) are designed and manufactured according to good engineering practice. They meet the requirements of Article 4 paragraph 3 of the Pressure Equipment Directive 2014/68/EU. The range of application is indicated in tables 6 to 9 in Annex II of the Pressure Equipment Directive 2014/68/EU.
Other standards and guidelines

- EN 60529
  Degrees of protection provided by enclosures (IP code)
- EN 61010-1
  Safety requirements for electrical equipment for measurement, control and laboratory use - general requirements
- IEC/EN 61326
  Emission in accordance with Class A requirements. Electromagnetic compatibility (EMC requirements).
- NAMUR NE 21
  Electromagnetic compatibility (EMC) of industrial process and laboratory control equipment
- NAMUR NE 32
  Data retention in the event of a power failure in field and control instruments with microprocessors
- NAMUR NE 43
  Standardization of the signal level for the breakdown information of digital transmitters with analog output signal.
- NAMUR NE 53
  Software of field devices and signal-processing devices with digital electronics
- NAMUR NE 80
  The application of the pressure equipment directive to process control devices
- NAMUR NE 105
  Specifications for integrating fieldbus devices in engineering tools for field devices
- NAMUR NE 107
  Self-monitoring and diagnosis of field devices
- NAMUR NE 131
  Requirements for field devices for standard applications

Ordering information

Detailed ordering information is available as follows:
- In the Product Configurator on the Endress+Hauser website: www.endress.com -> Click "Corporate" -> Select your country -> Click "Products" -> Select the product using the filters and search field -> Open product page -> The "Configure" button to the right of the product image opens the Product Configurator.
- From your Endress+Hauser Sales Center: www.addresses.endress.com

Product Configurator - the tool for individual product configuration
- Up-to-the-minute configuration data
- Depending on the device: Direct input of measuring point-specific information such as measuring range or operating language
- Automatic verification of exclusion criteria
- Automatic creation of the order code and its breakdown in PDF or Excel output format
- Ability to order directly in the Endress+Hauser Online Shop

Application packages

Many different application packages are available to enhance the functionality of the device. Such packages might be needed to address safety aspects or specific application requirements.

The application packages can be ordered with the device or subsequently from Endress+Hauser. Detailed information on the order code in question is available from your local Endress+Hauser sales center or on the product page of the Endress+Hauser website: www.endress.com.

Detailed information on the application packages:
Heartbeat Technology

<table>
<thead>
<tr>
<th>Package</th>
<th>Description</th>
</tr>
</thead>
</table>
| Heartbeat Verification +Monitoring | **Heartbeat Verification**  
Meets the requirement for traceable verification to DIN ISO 9001:2008  
Chapter 7.6 a) “Control of monitoring and measuring equipment”  
• Functional testing in the installed state without interrupting the process.  
• Traceable verification results on request, including a report.  
• Simple testing process via local operation or other operating interfaces.  
• Clear measuring point assessment (pass/fail) with high test coverage within the framework of manufacturer specifications.  
• Extension of calibration intervals according to operator's risk assessment.  
**Heartbeat Monitoring**  
Continuously supplies data, which are characteristic of the measuring principle, to an external condition monitoring system for the purpose of preventive maintenance or process analysis. These data enable the operator to:  
• Draw conclusions - using these data and other information - about the impact the measuring application has on the measuring performance over time.  
• Schedule servicing in time.  
• Monitor the process or product quality, e.g. gas pockets. |

Accessories

Various accessories, which can be ordered with the device or subsequently from Endress+Hauser, are available for the device. Detailed information on the order code in question is available from your local Endress+Hauser sales center or on the product page of the Endress+Hauser website: www.endress.com.

<table>
<thead>
<tr>
<th>Communication-specific accessories</th>
<th>Accessories</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Commubox FXA195 HART</td>
<td>For intrinsically safe HART communication with FieldCare via the USB interface. Technical Information TI00404F</td>
</tr>
<tr>
<td></td>
<td>Commubox FXA291</td>
<td>Connects Endress+Hauser field devices with a CDI interface (= Endress+Hauser Common Data Interface) and the USB port of a computer or laptop. Technical Information TI405C/07</td>
</tr>
<tr>
<td></td>
<td>HART Loop Converter HMX50</td>
<td>Is used to evaluate and convert dynamic HART process variables to analog current signals or limit values. Technical Information TI00429F, Operating Instructions BA00371F</td>
</tr>
<tr>
<td></td>
<td>Wireless HART adapter SWA70</td>
<td>Is used for the wireless connection of field devices. The WirelessHART adapter can be easily integrated into field devices and existing infrastructures, offers data protection and transmission safety and can be operated in parallel with other wireless networks with minimum cabling complexity. Operating Instructions BA00061S</td>
</tr>
<tr>
<td></td>
<td>Fieldgate FXA42</td>
<td>Is used to transmit the measured values of connected 4 to 20 mA analog measuring devices, as well as digital measuring devices Technical Information TI01297S, Operating Instructions BA01778S, Product page: <a href="http://www.endress.com/fxa42">www.endress.com/fxa42</a></td>
</tr>
</tbody>
</table>
The Field Xpert SMT70 tablet PC for device configuration enables mobile plant asset management in hazardous and non-hazardous areas. It is suitable for commissioning and maintenance staff to manage field instruments with a digital communication interface and to record progress. This tablet PC is designed as an all-in-one solution with a preinstalled driver library and is an easy-to-use, touch-sensitive tool which can be used to manage field instruments throughout their entire life cycle.

- Technical Information TI01342S
- Operating Instructions BA01709S
- Product page: [www.endress.com/smt70](http://www.endress.com/smt70)

The Field Xpert SMT77 tablet PC for device configuration enables mobile plant asset management in areas categorized as Ex Zone 1.

- Technical Information TI01418S
- Operating Instructions BA01923S
- Product page: [www.endress.com/smt77](http://www.endress.com/smt77)

## Service-specific accessories

<table>
<thead>
<tr>
<th>Accessories</th>
<th>Description</th>
</tr>
</thead>
</table>
| Applicator  | Software for selecting and sizing Endress+Hauser measuring devices:  
  - Choice of measuring devices for industrial requirements  
  - Calculation of all the necessary data for identifying the optimum flowmeter: e.g. nominal diameter, pressure loss, flow velocity and accuracy.  
  - Graphic illustration of the calculation results  
  - Determination of the partial order code, administration, documentation and access to all project-related data and parameters over the entire life cycle of a project.  
  Applicator is available:  
  - Via the Internet: [https://portal.endress.com/webapp/applicator](https://portal.endress.com/webapp/applicator)  
  - As a downloadable DVD for local PC installation. |
| W@M         | W@M Life Cycle Management  
  Improved productivity with information at your fingertips. Data relevant to a plant and its components is generated from the first stages of planning and during the asset’s complete life cycle.  
  W@M Life Cycle Management is an open and flexible information platform with online and on-site tools. Instant access for your staff to current, in-depth data shortens your plant’s engineering time, speeds up procurement processes and increases plant uptime.  
  Combined with the right services, W@M Life Cycle Management boosts productivity in every phase. For more information, visit [www.endress.com/lifecyclemanagement](http://www.endress.com/lifecyclemanagement) |
| FieldCare   | FDT-based plant asset management tool from Endress+Hauser. It can configure all smart field units in your system and helps you manage them. By using the status information, it is also a simple but effective way of checking their status and condition.  
  Operating Instructions BA00027S and BA00059S |
| DeviceCare  | Tool to connect and configure Endress+Hauser field devices.  
  Innovation brochure IN01047S |

## System components

<table>
<thead>
<tr>
<th>Accessories</th>
<th>Description</th>
</tr>
</thead>
</table>
| Memograph M graphic data manager | The Memograph M graphic data manager provides information on all the relevant measured variables. Measured values are recorded correctly, limit values are monitored and measuring points analyzed. The data are stored in the 256 MB internal memory and also on a SD card or USB stick.  
  - Technical Information TI00133R  
  - Operating Instructions BA00247R |
## Supplementary documentation

For an overview of the scope of the associated Technical Documentation, refer to the following:
- **W@M Device Viewer** (www.endress.com/deviceviewer): Enter the serial number from the nameplate
- **Endress+Hauser Operations App**: Enter the serial number from the nameplate or scan the 2D matrix code (QR code) on the nameplate

### Standard documentation

**Brief Operating Instructions**

**Brief Operating Instructions for the sensor**

<table>
<thead>
<tr>
<th>Measuring device</th>
<th>Documentation code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proline Prosonic Flow E</td>
<td>KA01329D</td>
</tr>
</tbody>
</table>

**Brief Operating Instructions for transmitter**

<table>
<thead>
<tr>
<th>Measuring device</th>
<th>Documentation code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Proline 100</td>
<td>KA01330D</td>
</tr>
</tbody>
</table>

**Operating Instructions**

<table>
<thead>
<tr>
<th>Measuring device</th>
<th>Documentation code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prosonic Flow E 100</td>
<td>BA01769D</td>
</tr>
</tbody>
</table>

**Description of Device Parameters**

<table>
<thead>
<tr>
<th>Measuring device</th>
<th>Documentation code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Prosonic Flow 100</td>
<td>GP01124D</td>
</tr>
</tbody>
</table>

### Supplementary device-dependent documentation

**Special documentation**

<table>
<thead>
<tr>
<th>Contents</th>
<th>Documentation code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Information on the Pressure Equipment Directive</td>
<td>SD01614D</td>
</tr>
<tr>
<td>RFID TAG</td>
<td>SD01565D</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Contents</th>
<th>Documentation code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heartbeat Technology</td>
<td>SD02079D</td>
</tr>
</tbody>
</table>

**Installation Instructions**

<table>
<thead>
<tr>
<th>Contents</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Installation instructions for spare part sets and accessories</td>
<td>Documentation code: specified for each individual accessory.</td>
</tr>
</tbody>
</table>
Registered trademarks

HART®
Registered trademark of the FieldComm Group, Austin, Texas, USA

www.addresses.endress.com