



ALTOSONIC V Technical Datasheet

5 - Beam ultrasonic flowmeter for custody transfer of liquid hydrocarbons

- Custody transfer accuracy and repeatability
- Excellent long-term stability and high reliability
- Multi product
- Wide viscosity range, from LPG to heavy crudes
- No on-site calibration required



KROHNE

5-Beam ultrasonic flowmeter

KROHNE's ALTOSONIC V has established itself as the standard in multibeam custody transfer flowmetering. The absence of obstructions or moving parts in the pipe, ensures no wear or pressure loss. This, in combination with larger meter sizes permits simplified configuration of metering systems. For example no strainers and less parallel lines are required.

Operation is maintenance free. No periodic calibration is required, drastically cutting cost for on-site equipment and procedures. This all results in considerable cost savings in both capital (CAPEX) and operation expenditure (OPEX).

New line extensions make multi beam flow metering a more cost effective and viable alternative for low viscosity applications. There is also a line extension for extremely difficult heavy crudes.



Highlights

- High reliability
- Compliant with OIML R117 and API
- No K-factor shift: no periodic re-calibration required
- No incidents of unscheduled interruption of operation since the introduction in 1996
- Rugged and reliable construction
- Large dynamic range
- Bi-directional flow measurement
- Integrated diagnostics

Industries

- Oil and Gas
- Refineries
- Petrochemical

Applications

- Offshore FPSO and platforms
- Production site / field
- Crude oil pipelines
- Terminal loading and off-loading
- Refineries
- Multi product pipelines

ALTOSONIC: The choice for custody transfer

ALTOSONIC flowmeters are the result of 30 years of experience in ultrasonic technology. They are specially designed for custody transfer metering of hydrocarbon liquids and gasses.

Advantage of ultrasonic metering:

Non-intrusive, no blockage, no moving parts and therefore:

- No wear and tear, no periodic maintenance
- No pressure loss
- No strainers needed

All meters have complete diagnostics as standard



- ① **ALTOSONIC V:** 5-Beam custody transfer flowmeter for crude oil and oil products. The ALTOSONIC V is the only true multiproduct ultrasonic flowmeter in the market.

The first to enter the market, it has the longest experience and the widest installed base.

Superior performance

- Truly viscosity independent
- High dynamic range
- Chosen as master meter

Superior reliability

- Multiple beam ensure redundancy and validation of results
- Extensive diagnostics capabilities
- Consistent long term reliability

- ② **ALTOSONIC IV:** 4-Beam custody transfer flowmeter for gases.

- Compact and robust construction
- Fully encased cabling
- Miniaturised titanium transducers
- Low power consumption

- ③ **ALTOSONIC III:** 3-Beam ultrasonic flowmeter. The economic solution for light liquid hydrocarbons.

- The successor to the standard turbine for single products

Technical data

ALTOSONIC V Ultrasonic flowmeter

The ALTOSONIC V flowmeter consists of a flow sensor (UFS-V) with ultrasonic transducers, a separate electronic converter box (UFC-V) and a flow processor (UFP-V). The ALTOSONIC V is custom designed to optimally suit your application.

Versions

| Viscosity: | Calibration |
|--|---|
| 0,2 to 10 cSt, for measurement of refined products, light crude oils, condensate, and liquid gases | Calibration to standard accuracy is done on water in one of the KROHNE certified and accredited calibration rigs. |
| up to 150 cSt, for measurement of medium crude oils and fuel oil | Calibration to standard accuracy is done on hydrocarbon liquids at a certified and accredited calibration facility. |
| up to 400 cSt, for measurement of heavy crude oils and heavy fuel oil | Calibration to standard accuracy is done on hydrocarbon liquids at a certified and accredited calibration facility. |

Performance

| | |
|---------------------------|---|
| Measurement functionality | Standard actual volume flow rate and totalised volume |
| Measuring range | $v = 0$ to 20 m/s (0 ft/s to 66 ft/s) |
| Accuracy | $< \pm 0.15\%$ of measured value |
| Repeatability | $< \pm 0.02\%$ |
| Uncertainty | $< \pm 0.027\%$ according to API |
| Viscosity range | 0,1 to 400 cSt. Consult KROHNE for higher viscosities |
| Density range | 200 to 1200 kg/m ³ |
| Zero stability | < 1 mm/s |
| Process conditions | Maximum solid particle content $< 5\%$ (by volume) |
| | Maximum gas content $< 2\%$ (by volume) |

Approvals

| | |
|--------------------|--|
| Custody transfer | OIML R-117 Class 0.3. More than 20 national type approvals based on OIML R-117 available |
| | ANSI/API MPMS 5.8-2004 (API MPMS Chapter 5 Section 8, Measurement of Liquid Hydrocarbons by Ultrasonic Flowmeters Using Transit Time Technology) |
| | Gosstandart |
| | Dedicated site approvals by NPD, ANP, DTI |
| EEx zone 1 (ATEX): | |
| - UFS-V/F-EEx | II 2 G EEx d [ib] IIC T6 ...T4 |
| - UFC-V/F-EEx | II 2 G EEx d [ib] IIB T5 |
| FM | FM Class I, Div. 1 & 2, Groups B, C & D |
| | FM Class II, Div. 1, Groups E, F & G and Div. 2, Groups F & G |
| | FM Class III, Div. 1 & 2 |
| CSA | CSA Class I, Div. 1 & 2, Groups A, B, C & D |
| | CSA Class II, Div. 1 & 2, Groups E, F & G |
| | CSA Class III, Div. 1 |

| | °C | | °F | |
|--|------|------|------|------|
| | min. | max. | min. | max. |

Process temperature

| | | | | |
|-----------------------|------|-----|------|-----|
| Standard | -20 | 120 | -4 | 356 |
| HT version (optional) | -170 | 500 | -274 | 932 |

Ambient temperature

| | | | | |
|--------------------|-----|----|-----|-----|
| UFS-V | -40 | 60 | -40 | 140 |
| UFC-V ATEX | -20 | 60 | 4 | 140 |
| UFC-V FM | -40 | 60 | -40 | 140 |
| UFC-V (LT version) | -55 | 60 | 67 | 140 |
| UFP-V | 0 | 40 | 32 | 104 |

| | | | | | | | | | | |
|------------------------------|------------|---|---|----|----|----|----|----|----|----|
| Ultrasonic flow sensor UFS V | | | | | | | | | | |
| | ASME B16.5 | | | | | | | | | |
| Nominal diameter [inch] | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 24 |

Pressure class

| | | | | | | | | | | |
|----------------|--|--|--|--|--|--|--|--|--|--|
| 150 lbs RF | ■ | | | | | | | | | |
| 300 lbs RF | ■ | | | | | | | | | |
| 600 lbs RF/RTJ | ■ | | | | | | | | | |
| 900 lbs RF/RTJ | ■ | | | | | | | | | |
| | Pressure rating according to ASME B16.5 Group 2.3 materials. Other combinations of diameter/pressure class are available on request. | | | | | | | | | |
| | For a detailed overview, see the dimensions and weights tables in this data sheet. | | | | | | | | | |

Versions

| | | | | | | | | | | |
|--|---|--|--|--|--|--|--|--|--|--|
| Ultrasonic flow sensor with 5 parallel acoustic paths with 2 transducers each. | ■ | | | | | | | | | |
|--|---|--|--|--|--|--|--|--|--|--|

Materials

| | | | | | | | | | | |
|---|--|--|--|--|--|--|--|--|--|--|
| Flanges, stainless steel AISI 316 L (1.4404) | ■ | | | | | | | | | |
| Measuring tube, stainless steel AISI 316 L (1.4404) | ■ | | | | | | | | | |
| Housing, stainless steel AISI 316 L (1.4404) | ■ | | | | | | | | | |
| Connection box, stainless steel AISI 316 L (1.4408) | ■ | | | | | | | | | |
| | Others materials, e.g. Duplex available on request | | | | | | | | | |

Calibration

| | | | | | | | | | | |
|----------------------------|---|--|--|--|--|--|--|--|--|--|
| Bi-directional calibration | ■ | | | | | | | | | |
|----------------------------|---|--|--|--|--|--|--|--|--|--|

Verification

| | | | | | | | | | | |
|--|---|--|--|--|--|--|--|--|--|--|
| Water: | | | | | | | | | | |
| acc. to OIML R117 incl. KROHNE certificate | ■ | | | | | | | | | |
| acc. to API incl. KROHNE certificate | ■ | | | | | | | | | |
| Hydrocarbon liquid: | | | | | | | | | | |
| acc. to OIML R117 incl. KROHNE or Cofrac certificate | ■ | | | | | | | | | |
| acc. to API incl. KROHNE or Cofrac certificate | ■ | | | | | | | | | |

Finish

| | | | | | | | | | | |
|--------------------------------------|-------------------------|--|--|--|--|--|--|--|--|--|
| KROHNE standard paint, silver | ■ | | | | | | | | | |
| KROHNE offshore paint system, silver | ■ | | | | | | | | | |
| | Other paints on request | | | | | | | | | |

Protection category

| | | | | | | | | | | |
|--|---|--|--|--|--|--|--|--|--|--|
| IP67 / IP66 eq. NEMA 4/4X/6 to IEC 529 | ■ | | | | | | | | | |
|--|---|--|--|--|--|--|--|--|--|--|

Sensor cable connection

| | | | | | | | | | | |
|-----------|---|--|--|--|--|--|--|--|--|--|
| M20 x 1,5 | ■ | | | | | | | | | |
| 1/2" NPT | ■ | | | | | | | | | |
| PF 1/2 | ■ | | | | | | | | | |

Sensor cable length

| | | | | | | | | | | |
|--|---|--|--|--|--|--|--|--|--|--|
| 5 m (15 ft) | ■ | | | | | | | | | |
| 10 / 15 / 20 / 25 / 30 m (30 / 45 / 60 / 75 / 90 ft) | ■ | | | | | | | | | |
| | ■ | | | | | | | | | |

■ standard ■ optional □ on request

| Installation | |
|-------------------------------|--|
| General | For specific information please consult the operating and installation instructions or contact KROHNE. |
| Position | The flowmeter can be installed in a horizontal or vertical position. In a horizontal pipeline ensure that the acoustic channels are always in an horizontal plane. |
| Completely filled flow sensor | Install the UFS-V ultrasonic flow sensor at a location where it will be completely filled under all circumstances, including at zero flow velocity. |
| Flow conditioning | Inlet: Minimal 10D straight tube with an ISO tube bundle flow conditioner must be installed upstream of the flowmeter. Outlet: Minimal 5D straight tube. |
| Zero checking | Zero setting is not required with KROHNE ultrasonic flowmeters. For zero checking it is advised to install shutoff valves before or after the flow sensor. |
| Cavitation | At operation sufficient backpressure is required to prevent cavitation |

| Inlet flow conditioner and outlet section | | | | | | | | | | |
|---|---|---|---|----|----|----|----|----|----|------------|
| The flow sensor is delivered standard with a 10 D inlet flow conditioner. For optimal performance the flow sensor and inlet flow conditioner must be calibrated together. The flow sensor has to be installed with a straight outlet section with a minimum length of 5D. KROHNE provides a standard range of inlet flowconditioners and outlet sections. Outlet sections are available in either 5D straight length or 7D straight length with connections for temperature and pressure measurement. | | | | | | | | | | |
| | | | | | | | | | | ASME B16.5 |
| Nominal diameter [inch] | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 24 |

Pressure class

| | | | | | | | | | | |
|--|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| 150 lbs RF | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| 300 lbs RF | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| 600 lbs RF/RTJ | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| 900 lbs RF/RTJ | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> | <input type="checkbox"/> |
| Pressure rating according to ASME B16.5 Group 2.3 materials. | | | | | | | | | | |
| For a detailed overview, see the dimensions and weights section of this datasheet. | | | | | | | | | | |

Materials

| | | | | | | | | | | |
|---|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| Flange / tube: | | | | | | | | | | |
| Carbon steel ASTM A105 / Carbon steel ASTM A106 | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Stainless steel AISI 316 L (1.4404) | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Flow conditioner tube bundle: | | | | | | | | | | |
| Stainless steel | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Other materials, e.g. Duplex on request | | | | | | | | | | |

Finish

| | | | | | | | | | | |
|--------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|-------------------------------------|
| KROHNE standard paint, silver | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| KROHNE offshore paint system, silver | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> |
| Other paints on request | | | | | | | | | | |

■ standard ■ optional □ on request

| | |
|--|---|
| Ultrasonic flow converter UFC-V | |
| General | The flow converter is fully digital. Measured values are obtained using DSP (Digital Signal Processing) techniques to ensure accurate and highly repeatable measurements. Measured values are digitally transferred to the flow processor computer (UFP-V). |

Versions

| | |
|--|----------|
| UFC V flow converter electronics fitted in an Ex-d box | Standard |
|--|----------|

Materials

| | |
|---|----------|
| Copper free Aluminium, AISI 12 according to ISO 3522-81 | Standard |
| Stainless steel 316 cover for converter housing | Optional |

Finish

| | |
|-------------------------------|----------|
| KROHNE standard paint, silver | Standard |
| KROHNE offshore paint | Optional |

Protection category

| | |
|--|----------|
| IP67 / IP66 eq. NEMA 4/4X/6 to IEC 529 | Standard |
|--|----------|

Overall functionality

| | |
|---|----------|
| Measurement of all necessary primary flow data, status and diagnostic information | Standard |
|---|----------|

Galvanic isolation

| | |
|--------------------------|----------|
| RS 485 output (to UFP-V) | Standard |
|--------------------------|----------|

Power supply

| | |
|-------------------------------|--|
| Power consumption | Power consumption max. 85 VA (AC) or 85 W (DC), with heater (LT version) max. 255 VA/W |
| Mains supply (standard) | Mains supply 100 – 240 V AC (48-63 Hz) +10% / -15% |
| Low voltage supply (optional) | Low voltage supply 24 V (AC or DC), AC: -10% / +15%, DC: 18 - 35 V |

Cable connection

| | |
|-----------|------------------------------------|
| M20 x 1,5 | Standard |
| 1/2" NPT | Optional |
| PF 1/2 | Optional |
| | for power supply and signal cables |

| Ultrasonic flow processor UFP-V | |
|---------------------------------|--|
| General | The flow processor receives the raw measurement values from the UFC-V flow converter and converts the data in gross volume flow and totalised gross volume. Optionally volume flow and totalised volume can be calculated to standard conditions. Also the flow processor provides a range of diagnostics functions. The flow processor consist of an industrial PC with I/O rack to connect the necessary input and output signals. |

Overall functionality

| | |
|---------------------|--|
| Primary functions | Calculation of gross volumetric flow based on flow measurements from the UFC-V |
| | Calculation of standard volumetric flow (e.g. 15 °C, 1.01325 bar) and mass flow (optional) |
| | Totalise gross and standard flow as measured volumes and mass in resettable and non resettable totalisers |
| | Measurement of flow profile and swirl components |
| | Data acquisition: logging of data from the UFC-V and optional data such as temperatures, pressures, densities and status information |
| | Flow weighted averages on batching (temperature, pressure, density etc). |
| | Ticket printing |
| | Real time monitoring of all data on screen |
| Secondary functions | Calculation of Reynolds number and indication of viscosity |
| | Body temperature expansion correction on the measured flow |
| | Statistics |
| | Back-up history such as totalisers, averages and alarms. |
| | On screen real-time monitoring of all data |

Secondary inputs

| | |
|---|---|
| Volume correction, to standard conditions | Temperature Process (optional) |
| | Temperature densitometer (optional) |
| | Pressure Process (optional) |
| | Pressure densitometer (optional) |
| | Densitometer density (optional) |
| | Temperature body |
| Mass flow calculation | Density measured by a densitometer (optional) |
| Other | External kinematic viscosity (optional) |

Versions

| | |
|-------------------------|--|
| Industrial work station | PC-based industrial work station with an industrial grade 12.1" color TFT LCD display and integrated keypad. 19" Housing for rack mounting or front panel mouting (standard) |
| Compact industrial PC | Compact industrial PC for panel / ground plate mounting. Separate display and keyboard (optional) |

Protection category

| | |
|-------------------------|---------------------------|
| Industrial work station | IP65/NEMA12 (front panel) |
| Compact industrial PC | NA |
| | to IEC 529 |

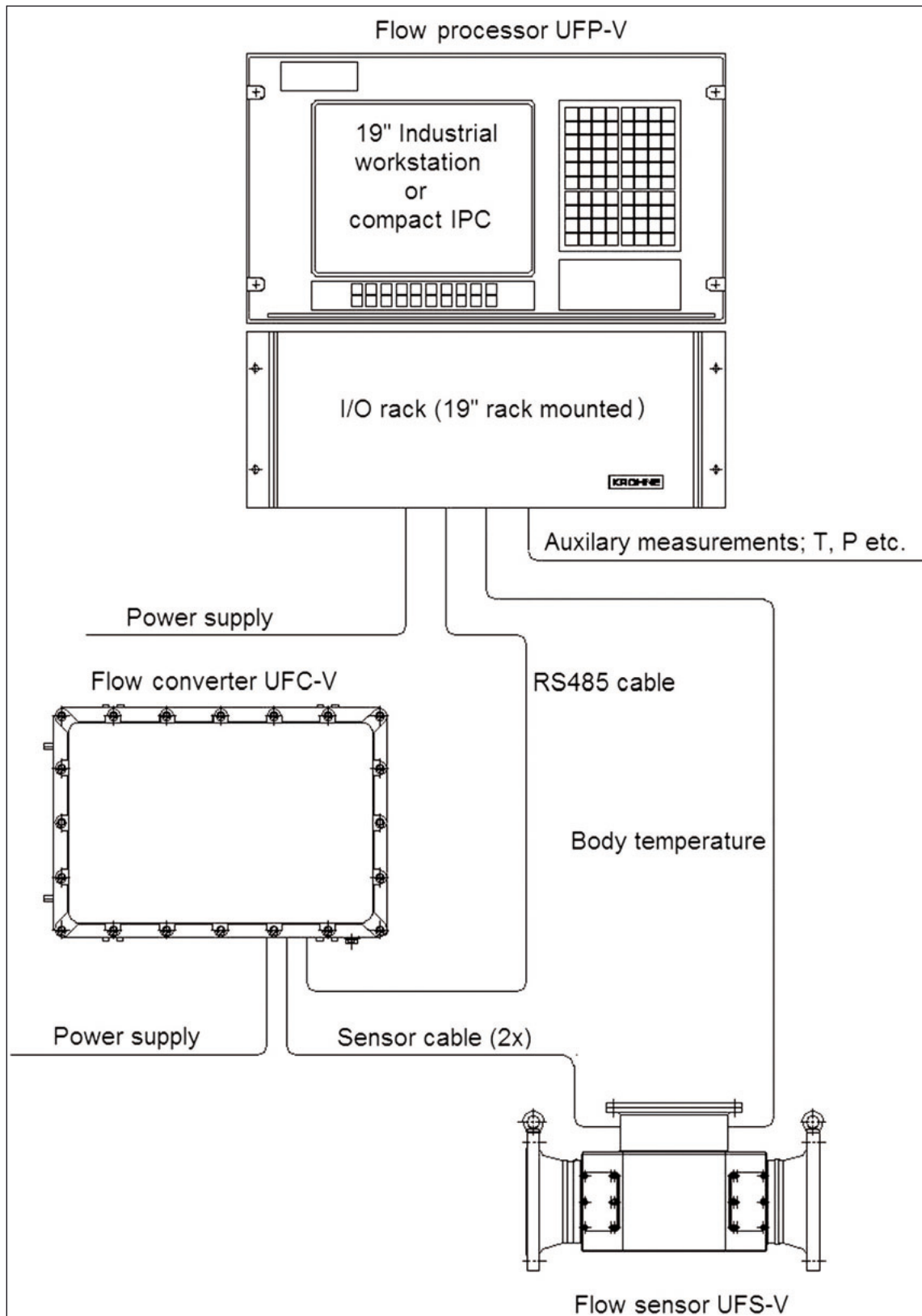
Power supply

| | |
|-------------------------|--|
| Industrial workstation: | |
| Mains supply | Input 90...135 Vac or 180...265 Vac, switchable, 250 W |
| Low voltage supply | 24 Vdc (19...32 Vdc), 250 W |
| Compact Industrial PC | 100...240 Vac, 300 W |

Sizing

Choosing the correct meter size is easy due to the wide flow range. Typical flow rates for 0,5 m/s (1,65 ft/sec) and 10 m/s (33 ft/sec) are specified in the table below. Depending on the application the ALTOSONIC V has a virtually unlimited flow velocity range.

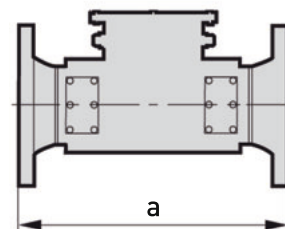
| | 0,5 m/s | 10 m/s | 0,5 m/s | 10 m/s | 0,5 m/s | 10 m/s |
|------------------|---------------------|---------------------|-----------|---------|---------------------|---------|
| Nominal diameter | 1,65 ft/s | 33 ft/s | 1,65 ft/s | 33 ft/s | 1,65 ft/s | 33 ft/s |
| | (m ³ /h) | (m ³ /h) | (GPM) | (GPM) | (m ³ /h) | (BBL/h) |
| 4" | 15 | 280 | 66 | 1230 | 94 | 1760 |
| 6" | 33 | 630 | 145 | 2770 | 207 | 3960 |
| 8" | 58 | 1130 | 255 | 4980 | 364 | 7120 |
| 10" | 91 | 1800 | 400 | 7900 | 573 | 11300 |
| 12" | 131 | 2500 | 580 | 11000 | 825 | 15700 |
| 14" | 179 | 3500 | 790 | 15400 | 1130 | 22000 |
| 16" | 233 | 4500 | 1030 | 19800 | 1470 | 28300 |
| 18" | 296 | 5700 | 1300 | 25100 | 1860 | 35900 |
| 20" | 365 | 7000 | 1600 | 30800 | 2300 | 44000 |
| 24" | 525 | 10000 | 2310 | 44000 | 3300 | 63000 |



Dimensions and weights

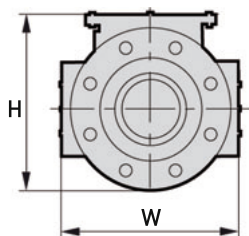
| Nominal diameter | Dimensions [mm] | | | |
|------------------|-----------------|-----|--------|-----|
| ASME 150 lbs | a | Di | H | W |
| 4" | 500 | 102 | 289,3 | 220 |
| 6" | 600 | 154 | 339,7 | 270 |
| 8" | 900 | 203 | 396,45 | 370 |
| 10" | 1000 | 255 | 453,2 | 420 |
| 12" | 1100 | 304 | 501,3 | 470 |
| 14" | 1200 | 337 | 566,7 | 500 |
| 16" | 1300 | 387 | 623,45 | 550 |
| 18" | 1400 | 438 | 667,5 | 600 |
| 20" | 1500 | 489 | 729,25 | 650 |
| 24" | 1800 | 575 | 812,8 | 750 |

Frontview ALTOSONIC V



| Nominal diameter | Dimensions [inch] | | | |
|------------------|-------------------|------|------|------|
| ASME 150 lbs | a | Di | H | W |
| 4" | 19,7 | 4,02 | 11,4 | 8,7 |
| 6" | 23,6 | 6,06 | 13,4 | 10,6 |
| 8" | 35,4 | 7,99 | 15,6 | 14,6 |
| 10" | 39,4 | 10 | 17,8 | 16,5 |
| 12" | 43,3 | 12 | 19,7 | 18,5 |
| 14" | 47,2 | 13,3 | 22,3 | 19,7 |
| 16" | 51,2 | 15,2 | 24,5 | 21,7 |
| 18" | 55,1 | 17,2 | 26,3 | 23,6 |
| 20" | 59,1 | 19,3 | 28,7 | 25,6 |
| 24" | 70,9 | 22,6 | 32 | 29,5 |

Sideview ALTOSONIC V

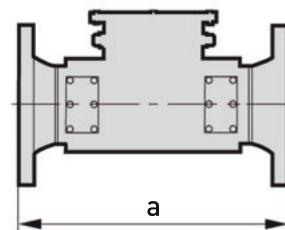


| Nominal diameter | 10 D inlet spoolpiece | | | 5 D inlet spoolpiece | | |
|------------------|-----------------------|--------|---------|----------------------|--------|---------|
| | ASME 150 lbs | a [mm] | Di [mm] | Approx. weight [kg] | a [mm] | Di [mm] |
| 4" | 1016 | 105 | 32 | 508 | 105 | 18 |
| 6" | 1524 | 159 | 65 | 762 | 159 | 31 |
| 8" | 2032 | 206 | 125 | 1016 | 206 | 60 |
| 10" | 2540 | 260 | 190 | 1270 | 260 | 89 |
| 12" | 3048 | 310 | 325 | 1524 | 310 | 141 |
| 14" | 3556 | 340 | 490 | 1778 | 340 | 197 |
| 16" | 4064 | 391 | 560 | 2032 | 391 | 255 |
| 18" | 4572 | 441 | 700 | 2286 | 441 | 307 |
| 20" | 5080 | 489 | 1080 | 2540 | 489 | 431 |
| 24" | 6096 | 591 | 1425 | 3048 | 591 | 615 |

| Nominal diameter | 10 D inlet spoolpiece | | | 5 D inlet spoolpiece | | |
|------------------|-----------------------|----------|-----------|----------------------|----------|-----------|
| | ASME 150 lbs | a [inch] | Di [inch] | Approx. weight [lbs] | a [inch] | Di [inch] |
| 4" | 40 | 4,12 | 71 | 20 | 4,12 | 40 |
| 6" | 60 | 6,25 | 143 | 30 | 6,25 | 68 |
| 8" | 80 | 8,12 | 276 | 40 | 8,12 | 132 |
| 10" | 100 | 10,24 | 419 | 50 | 10,24 | 196 |
| 12" | 120 | 12,19 | 717 | 60 | 12,19 | 311 |
| 14" | 140 | 13,38 | 1080 | 70 | 13,38 | 434 |
| 16" | 160 | 15,38 | 1235 | 80 | 15,38 | 562 |
| 18" | 180 | 17,38 | 1543 | 90 | 17,38 | 677 |
| 20" | 200 | 19,25 | 2381 | 100 | 19,25 | 950 |
| 24" | 240 | 23,25 | 3142 | 120 | 23,25 | 1356 |

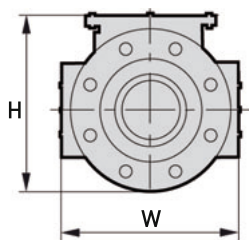
| Nominal diameter | Dimensions [mm] | | | |
|------------------|-----------------|-----|--------|-------|
| ASME 300 lbs | a | Di | H | W |
| 4" | 500 | 102 | 302 | 330 |
| 6" | 600 | 154 | 358,75 | 380 |
| 8" | 900 | 203 | 415,5 | 381 |
| 10" | 1000 | 255 | 472,25 | 444,5 |
| 12" | 1100 | 305 | 520,7 | 540 |
| 14" | 1200 | 330 | 592,1 | 600 |
| 16" | 1300 | 381 | 648,85 | 650 |
| 18" | 1400 | 428 | 711,2 | 711,2 |
| 20" | 1500 | 478 | 774,7 | 774,7 |
| 24" | 1800 | 575 | 914,4 | 914,4 |

Frontview ALTOSONIC V



| Nominal diameter | Dimensions [inch] | | | |
|------------------|-------------------|------|------|------|
| ASME 300 lbs | a | Di | H | W |
| 4" | 19,7 | 4,02 | 11,9 | 13 |
| 6" | 23,6 | 6,06 | 14,1 | 15 |
| 8" | 35,4 | 7,99 | 16,4 | 15 |
| 10" | 39,4 | 10 | 18,6 | 17,5 |
| 12" | 43,3 | 12 | 20,5 | 21,3 |
| 14" | 47,2 | 13 | 23,3 | 23,6 |
| 16" | 51,2 | 15 | 25,5 | 25,6 |
| 18" | 55,1 | 16,9 | 28 | 28 |
| 20" | 59,1 | 18,8 | 30,5 | 30,5 |
| 24" | 70,9 | 22,6 | 36 | 36 |

Sideview ALTOSONIC V



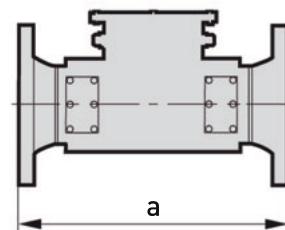
| Nominal diameter | 10 D inlet spoolpiece | | | 5 D inlet spoolpiece | | |
|------------------|-----------------------|--------|---------|----------------------|--------|---------|
| | ASME 300 lbs | a [mm] | Di [mm] | Approx. weight [kg] | a [mm] | Di [mm] |
| 4" | 1016 | 105 | 40 | 508 | 105 | 26 |
| 6" | 1524 | 154 | 95 | 762 | 154 | 54 |
| 8" | 2032 | 206 | 150 | 1016 | 206 | 84 |
| 10" | 2540 | 257 | 250 | 1270 | 257 | 137 |
| 12" | 3048 | 307 | 390 | 1524 | 307 | 204 |
| 14" | 3556 | 340 | 500 | 1778 | 340 | 270 |
| 16" | 4064 | 387 | 710 | 2032 | 387 | 376 |
| 18" | 4572 | 435 | 1000 | 2286 | 435 | 509 |
| 20" | 5080 | 483 | 1280 | 2540 | 483 | 672 |
| 24" | 6096 | 581 | 2065 | 3048 | 581 | 1047 |

| Nominal diameter | 10 D inlet spoolpiece | | | 5 D inlet spoolpiece | | |
|------------------|-----------------------|----------|-----------|-----------------------|----------|-----------|
| | ASME 300 lbs | a [inch] | Di [inch] | Approx. weight [inch] | a [inch] | Di [inch] |
| 4" | 40 | 4,12 | 88 | 20 | 4,12 | 57 |
| 6" | 60 | 6,07 | 209 | 30 | 6,07 | 119 |
| 8" | 80 | 8,13 | 331 | 40 | 8,13 | 185 |
| 10" | 100 | 10,13 | 551 | 50 | 10,13 | 302 |
| 12" | 120 | 12,09 | 860 | 60 | 12,09 | 450 |
| 14" | 140 | 13,38 | 1102 | 70 | 13,38 | 595 |
| 16" | 160 | 15,25 | 1565 | 80 | 15,25 | 829 |
| 18" | 180 | 17,12 | 2205 | 90 | 17,12 | 1122 |
| 20" | 200 | 19 | 2822 | 100 | 19 | 1482 |
| 24" | 240 | 22,88 | 4553 | 120 | 22,88 | 2308 |

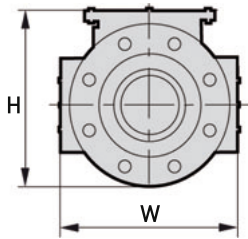
| Nominal diameter | Dimensions [mm] | | | |
|------------------|-----------------|-----|--------|-------|
| ASME 600 lbs | a | Di | H | W |
| 4" | 550 | 102 | 311,55 | 330 |
| 6" | 650 | 146 | 377,8 | 380 |
| 8" | 950 | 194 | 434,55 | 419,1 |
| 10" | 1100 | 243 | 508 | 508 |
| 12" | 1100 | 289 | 558,8 | 558,8 |
| 14" | 1200 | 320 | 603,3 | 603,3 |
| 16" | 1300 | 366 | 685,8 | 685,8 |

| Nominal diameter | Dimensions [inch] | | | |
|------------------|-------------------|-------|-------|-------|
| ASME 600 lbs | a | Di | H | W |
| 4" | 21,65 | 4,02 | 12,27 | 12,99 |
| 6" | 25,59 | 5,75 | 14,87 | 14,96 |
| 8" | 37,4 | 7,64 | 17,11 | 16,5 |
| 10" | 43,31 | 9,57 | 20 | 20 |
| 12" | 43,31 | 11,38 | 22 | 22 |
| 14" | 47,24 | 12,6 | 23,75 | 23,75 |
| 16" | 51,18 | 14,41 | 27 | 27 |

Frontview ALTOSONIC V



Sideview ALTOSONIC V



| Nominal diameter | Dimensions [mm] | | | |
|------------------|-----------------|-----|--------|-------|
| ASME 600 lbs | a | Di | H | W |
| 4" | 550 | 102 | 311,55 | 330 |
| 6" | 650 | 146 | 377,8 | 380 |
| 8" | 950 | 194 | 434,55 | 419,1 |
| 10" | 1100 | 243 | 508 | 508 |
| 12" | 1100 | 289 | 558,8 | 558,8 |
| 14" | 1200 | 320 | 603,3 | 603,3 |
| 16" | 1300 | 366 | 685,8 | 685,8 |

| Nominal diameter | Dimensions [inch] | | | |
|------------------|-------------------|-------|-------|-------|
| ASME 600 lbs | a | Di | H | W |
| 4" | 21,65 | 4,02 | 12,27 | 12,99 |
| 6" | 25,59 | 5,75 | 14,87 | 14,96 |
| 8" | 37,4 | 7,64 | 17,11 | 16,5 |
| 10" | 43,31 | 9,57 | 20 | 20 |
| 12" | 43,31 | 11,38 | 22 | 22 |
| 14" | 47,24 | 12,6 | 23,75 | 23,75 |
| 16" | 51,18 | 14,41 | 27 | 27 |





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