PROCESS CONTROL

UNIFLOW-200

MULTIFUNCTION FLOW COMPUTER

DESCRIPTION & SPECIFICATIONS

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**Multi-run & multi-station design:
8 meter runs and 4 station totalizations**

High-performance microprocessor

Galvanically isolated I/O points

Software calibrated I/O channels

Smart transmitter interfaces

No potentiometers or batteries

Multiple RS232/RS485/RS422 serial ports

10/100 Ethernet and USB port

Modbus TCP, Modbus, HART, Honeywell DE, US meter protocols

Configurable display

Reporting and data archiving

CO_2 emission calculation

Calculates all fluid properties according to relevant ISO, AGA, ASTM, GOST standards

Serial interfaces for gas chromatographs, mass and ultrasonic flow meters

Online configuration software

OVERVIEW

UNIFLOW-200 is is an extremely reliable, user-friendly flow computer. A flexible and versatile instrument that satisfies all your flow measurement requirements.

Originally designed for hydrocarbon gas and liquid measurement, it's the perfect tool for fiscal measurements and custody transfers, but also works excellent in process applications where industrial gases, steam, or hot water are measured. UNIFLOW-200 is compatible with virtually all flow meters on the market. Eight meter runs handle up to eight different fluids with different types of flow meters, all in the same multi-run system. Measurements and calculations are based on the most recent international standards.

The expandable modular design provides interfaces for various metering equipments:

- Standard 4–20 mA
- RTD
- Pulse-frequency
- Standard digital communications
- Digital inputs and outputs

UNIFLOW-200 connects to your gas chromatographs, mass and ultrasonic flow meters, and digital transmitters. It works both as a standalone unit and as a system component.

System communication interfaces:

- 3 serial ports SW-selectable RS232/RS485/RS422 (standard or Daniel Modbus protocol)
- 1 LAN port, 10/100 Ethernet (Modbus TCP protocol)
- 1 USB 1.1 port

Free software (UNIFLOW-200 Toolbox, Configurator and Remote Archive Uploader) makes installation, configuration, start-up, and everyday use easy and straightforward.

WHO IS IT FOR?

Metrologists & process engineers
who need undisputable flow measurement data anywhere, anytime

Hydrocarbon producers
who require robust & reliable metering solutions

Industrial producers
who are serious about process optimisation

Flow meter manufacturers
who need a reliable flow computer to integrate their products with

Gas transmission system operators
who want to be sure about their custody transfers and fiscal measurements

Engineering companies
who need to design redundant flow measurement systems at a moderate cost

Flow measurement professionals
who need to work with several types of existing equipment without problems

System integrators
who need heavy-duty solutions with a friendly price tag

Energy professionals
who want to keep tight account of energy consumption and CO_2 emission

See full specifications and try out UNIFLOW-200 at www.processcontrol.hu

UNIFLOW-200 MULTIFUNCTION FLOW COMPUTER

Process Control Kft. has been developing and manufacturing flow computers for more than twenty years. With more than 3000 successful applications, UNIFLOW-200 flow computers enjoy solid reputation among our customers. Our mission has been to develop and manufacture state-of-the-art, user friendly, highly reliable and cost effective flow computers flexible enough for a wide range of applications and to provide additional benefits to the end user as compared to similar products available on the market. Our flow computers are at home in the oil, gas, power generation, chemical, food, pharmaceutical and many other industries.

8 in 1 flow computer

UNIFLOW-200 represents the next generation of flow computers incorporating more than 20 years of experience in development and manufacturing. UNIFLOW-200 incorporates improved hardware and software capabilities to match the large variety of requirements for flow computer functionality in the markets. Whatever the flowing fluid, liquid, gas or steam, whatever the flow meter, orifice, turbine meter, ultrasonic meter or any other, UNIFLOW-200 offers unpaired capabilities and flexibility in flow measurement. It helps to improve process efficiency and to reduce operating costs.

One single UNIFLOW-200 can measure 8 fluid streams simultaneously so that it replaces 8 single stream flow computers in one case. It can remarkably reduce the CAPEX and OPEX costs. Any change in the existing metering applications or any new application can be implemented easily, quickly and cost effectively in UNIFLOW-200.

UNIFLOW-200 provides the total solution for flow measurement as a stand alone flow computer. Versatile communication protocols ensure easy integration with complex SCADA/HMI systems. It also gives you the peace of mind knowing that, whatever your future requirements the UNIFLOW-200 can be adapted quickly, easily and cost-effectively.

Modular multi-run & multi-station design

- 8 meter runs
- 4 station totalizations
- User configurable meter runs

The UNIFLOW-200 was specifically designed for hydrocarbon gas and liquid flow measurement. The standard features of the instrument make it ideal for fiscal measurement and custody transfer. However, it is cost effectively applicable for process applications as well. The accurate flow calculation helps in process optimization.

The UNIFLOW-200 can be used for single or multi-run applications up to eight meter runs. In a multi-run system different types of fluids can be assigned to different meter runs. For example the operator can configure two runs for gas and three runs for liquid process media. In addition four virtual meter runs can be configured, as station totalizators. They can for example summarize flows in parallel meter runs, or can subtract one meter run flow from the other. Based on the input and output flows, calculation of efficiency for a given part of the technology can be implemented.

Set up of material and energy balance calculations is equally easy. UNIFLOW-200 is ideal for example for a gas engine CHP plant efficiency calculation as it can measure not only the gas, steam and water flows but the electrical power as well. Every meter run can be configured with different types of flow meters.
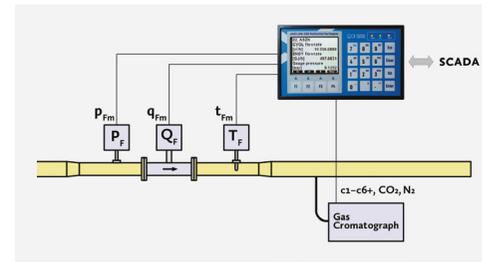
Natural gas flow measurement with ultrasonic meter

The entire configuration can be done using the instrument display and keypad, or by means of a PC based parameter configuration software (UNIFLOW-200 ToolBox). The configuration is simple and straightforward: no special programming skill or knowledge of a programming language is required. The operator simply selects the built-in features required for the particular application.

Supported fluids

Hydrocarbons
natural gas, coke oven gas, blast furnace gas, crude oil, refined products, lubricating oil, UGC, SLH, WFLH, NGL & LPG
Industrial gases
air, nitrogen, oxygen, hydrogen, argon, carbon-dioxide, carbon-monoxide, ethylene, ammonium, propane, general gases
Liquids other than water
ethanol, MTBE, ETBE, general liquids, two components liquid mixture
Water
water, water steam, water-glycol mixture - energy flow (heat transfer) calculation

Supported flow meters

Orifice, Compact Orifice, Venturi Tube, Nozzle, V-Cone, Annubar, Vortex, Turbine, Positive Displacement, Ultrasonic, Coriolis, Electromagnetic, Rotameter

Wide range of flow calculation standards

- ISO, AGA, EN, GOST, ASTM

The UNIFLOW-200 software includes most of the standards widely used in the flow measurements in different countries. For differential pressure devices the operator can select:

- ISO 5167 (edition 1991, 1998 and 2003),
- GOST 8.563-97, GOST 8.586-2005,
- AGA 3-1990, AGA3-2012 or
- V-Cone meter, Annubar meter according to the manufacturer's method

Natural gas properties calculation includes compression factor calc. according to AGA8 (edition 1985 and 1992) detailed and gross methods, AGA NX19, GOST 30319 (GERG91mod, NX19mod, VNIC SMV), heating value, relative density and base density calculation according to ISO 6976 (edition 1995 and 2015), AGA 5, GPA 2172, GOST 30319, dynamic viscosity, isentropic exponent and speed of sound calculation according to GOST 30319, ISO 20765-1, ISO TR 9464.

The gas composition for the natural gas properties calculation can be:

- Read on-line from a gas chromatograph
- Downloaded from a supervisory system
- Or set as fixed value

Properties calculation for most popular industrial gases (air, nitrogen, oxygen, argon, carbon-dioxide, carbon-monoxide, hydrogen, propane, ammonium, ethylene, other gases) are also included.

Crude oil, refined product, NGL and LPG temperature and pressure volume correction factor calculation is implemented according to :

- ASTM D1250/API 2540 (1980)
- API Chapter 11.1 (2004)
- GPA TP-27
- STO Gazprom 5.9 B1, B2, B3

Liquids other then water includes ethanol, MTBE, ETBE and general liquid. Water and water steam properties are accurately calculated according to:

- **IAPWS-IF97 publication**

Approvals

- The UNIFLOW-200 is a Gas-volume electronic conversion device complying with **EN 12405** and **OIML R140**.
- The UNIFLOW-200 is approved as Calculator for Dynamic measuring system for liquids other then water according to **OIML R 117-1**.
- The UNIFLOW-200 calculates the CO_2 emission for gaseous and liquid fuels according to **601/2012/EU** and **IPCC 1996**. The CO_2 emission reporting is simplified to the reading of the appropriate counters from the flow computer at the end of a reporting period.
- The flow computer has the **EC-type examination certificate** from the **Hungarian Trade Licensing Office** (MKEH) according to the **Directive 2004/22/EC** (MID) as a gas volume conversion device.
- The flow computer is **OIML R117 compliant**. It is certified for custody transfer

measurement of liquids, like crude oil and refined products. IT has been **registered in the** state register of metering equipment of **Russian Federation**: **its number is 58182-14**.

Any type of flow meter is welcome

- **Pressure differential devices**
- **Ultrasonic meters**
- **Turbine and Vortex meters**
- **Mass flow meters**
- **& many more**

The UNIFLOW-200 can be configured to perform the flow calculation for a very wide range of flow meters: besides the standard differential pressure devices (orifice plate, nozzle, Venturi tube according to **ISO 5167**) other devices such as **Annubar**, **V-Cone**, segmental orifice plate, or a flow meter with power characteristics (e.g. Parshall flumes) can also be configured.

The flow calibration data (**flow coefficient vs. flow rate**) can be entered for non-standard devices. For gas flow metering devices with pulse output (turbine meter, Vortex meter) dual pulse input is provided. The continuous comparison of the main & check pulse trains allows instant detection of turbine meter blade damage.

Pulse integrity check according to **ISO 6551 level B** is provided for liquid turbine meters. Ultrasonic meters can be connected to the flow computer via pulse input like a turbine meter. It is also possible to use the serial

link to acquire the flow information from ultrasonic meters. The ultrasonic meter is inherently bidirectional and therefore the UNIFLOW-200 distinguishes the forward and reverse flows and displays and totalizes them in separate runs.

Error curve correction is available for the flow calibrated flow meters. The **error correction method** can be:

- **Linear interpolation with up to 16 error curve points**
- **Polynomial interpolation with up to 6th power**

The log (flow rate/viscosity) vs. K-factor error curve correction is also available for liquid turbine meters.

Flexible process connections

- **Galvanically isolated I/O points**
- **No potentiometers, no batteries**
- **Input and output software calibration**

The UNIFLOW-200 can accommodate up to **5 I/O boards**. Different combinations of **analog**, **RTD**, **pulse** and **digital inputs**, **analog**, **pulse** and **digital outputs** make the UNIFLOW-200 suitable to solve any flow measurement problem.

The input and output channel assignment is freely configurable. Different meter runs can share the signal output of the same transmitter. Several output channels can be assigned to the same variable (e.g. flow rate), if different interfacing systems require independent output channels.

All input and output channels are galvanically isolated and protected against overvoltage and mis-wiring (short circuit and overload). No earthing problem in the current input loops.

Resistance thermometers are connected to **RTD inputs** using the **4-wire connection method**. In
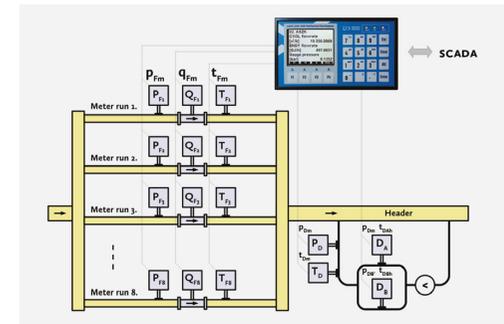
*Measuring system for custody transfer crude oil or refined products*

case of individually calibrated sensors the flow computer converts the measured resistance to temperature using the **Calendar Van Dusen A**, **B**, **C** and **Ro** constants.

High frequency inputs can receive pulse or frequency signals from flow meters. They can be configured for density transducers, too. The input signal level is software selectable from **NAMUR**, active **5 V**, active **15 V** or **open collector**.

Digital inputs can be used to signal the status of any dual state device, e.g. on/off valves. It also accepts low frequency (max. 100 Hz) pulse signals from flow meters (e.g. positive displacement meters).

Digital outputs can be configured as:

- **Pulse output representing flow totals**
- **Alarm output signaling high or low limit of any input channel or flow rate,**
- **Control output to open or close valves for example**
- **Repeat the change of state of any digital input, or time base.**
- **NO or NC state of the digital output is selectable.**
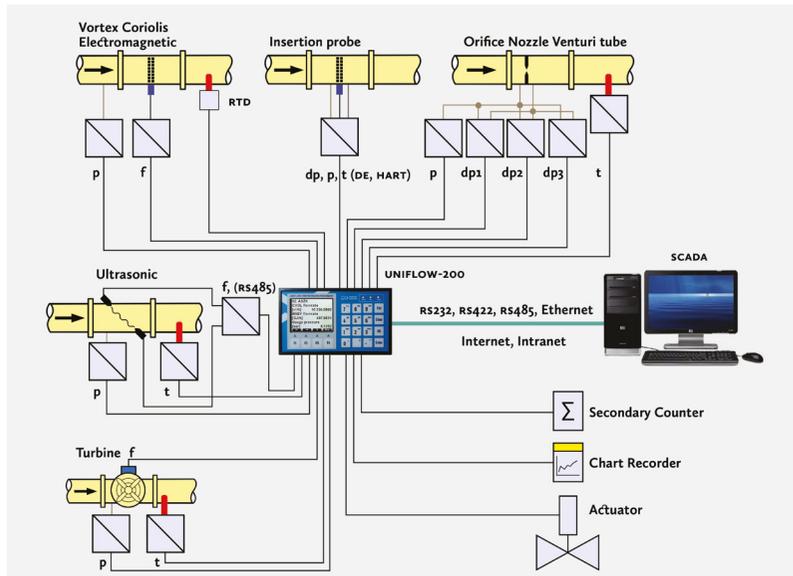
Smart interfaces for smart instruments

- **HART & Honeywell DE transmitter protocols**
- **Serial interfaces for gas chromatographs and ultrasonic flow meters**
- **Modbus, Instromet Uniform protocols**

The UNIFLOW-200 is capable to receive flow rate, pressure, differential pressure and temperature signals from smart transmitters according to HART and Honeywell DE protocols, eliminating this way the uncertainty related to D/A and A/D conversion in the transmitter and in the flow computer.

The UNIFLOW-200 is prepared to poll process gas chromatographs (**Daniel**, **ABB**, **Yamatake**, **Yokogawa**) for on-line gas composition data. It is also prepared for the on-line gas properties calculation, further improving the accuracy of the flow and energy content calculation.

The UNIFLOW-200 is able to interface with flow metering devices (e.g. ultrasonic meter) via serial link. It allows not only the acquisition of flow information (uncorrected volume flow rate) digitally, but makes it possible to read and display the diagnostic information from the flow meters as well. There is no need to run special service software to check the ultrasonic meter; its correct operation (its "health status") can be checked any time using the display of the flow computer.

The UNIFLOW-200 has built-in protocol for **Sick**, **Instromet**, **Daniel**, **Siemens**, **Flexim**, **Panametrics**, **Krohne** and **Caldon** ultrasonic meters.

Excellent communications

- **Multiple RS232/RS485/RS422 serial ports**
- **10/100 Ethernet port**
- **USB 1.1 port**

The UNIFLOW-200 offers three serial ports. Each of them can be independently configured for point to point or for multi-drop communication (**RS232** or **RS422** or **RS485**). The selectable protocols include standard Modbus and Daniel/Enron/Omni Modbus versions as well. Serial ports are galvanically isolated and protected against overvoltage and miswiring.

The **Ethernet 10BaseT** interface makes use of the **Modbus/TCP protocol** for flexibility and network connectivity. The built-in web server makes the remote access to the flow computer data very convenient from any point of the LAN or WAN.

The **USB port** allows the operator to transfer the archive data file into a pen drive within seconds and to analyze the data using the office PC.

User friendly operator interface

- **Configurable 3.5-inch QVGA display**
- **Foil protected membrane keyboard**
- **Configuration software**

The UNIFLOW-200 keypad contains 12 numeric keys, 4 keys for data editing and 4 multifunctional navigation keys. Visibility of the bright 320×240 dot QVGA display is excellent in any light conditions. The color display can show the trend of any measured or calculated variable.

The tree structured menu allows the operator to display any parameter by onyl a few keystrokes. The most important calculated parameters and totals are grouped together in summary displays. The summary displays are editable. The operator can create his/her own summary displays showing the most important data of the particular application.

Access to the parameters is performed on three different password levels. The Guest level allows looking at everything but no change in parameters is possible. The Operator level allows

changing some of the parameters (e.g. limits, transmitter ranges). The Engineer level has full access to any parameter of the flow computer.

The UNIFLOW-200 PC based parameter **configuration software** (UNIFLOW-200 ToolBox) allows the user to prepare the configuration off-line and download it into the flow computer in few seconds.

Reporting and data archiving

- **Stored reports**
- **Extensive data archiving**
- **Remote archive uploader**
- **Alarm and event logging**

The UNIFLOW-200's extensive reporting system keeps track of the measurement history organized in different reporting periods. Hourly, shift, daily, multi-day and monthly reports are stored in the non volatile memory. Besides the periodic

totals, average, minimum and maximum values of the inputs and calculated parameters are stored in the reports.

Archived data can be called up on the display, can be printed out using the serial link, can be copied to the pendrive via USB port and can be transferred by means of the UNIFLOW-200 ToolBox software.

Alarms are stored with time stamps in the alarm file. Any modification of the flow computer parameters is recorded in the event file. Gas composition data downloaded from a supervisory system or read from a gas chromatograph are recorded as well. The alarm, event and download archives can be called up on the display, can be copied to the pendrive and can be uploaded to a PC for further investigation. The storage capacity (**500 MB**) **allows archiving** metering data, alarms and event log **for 400 days**.
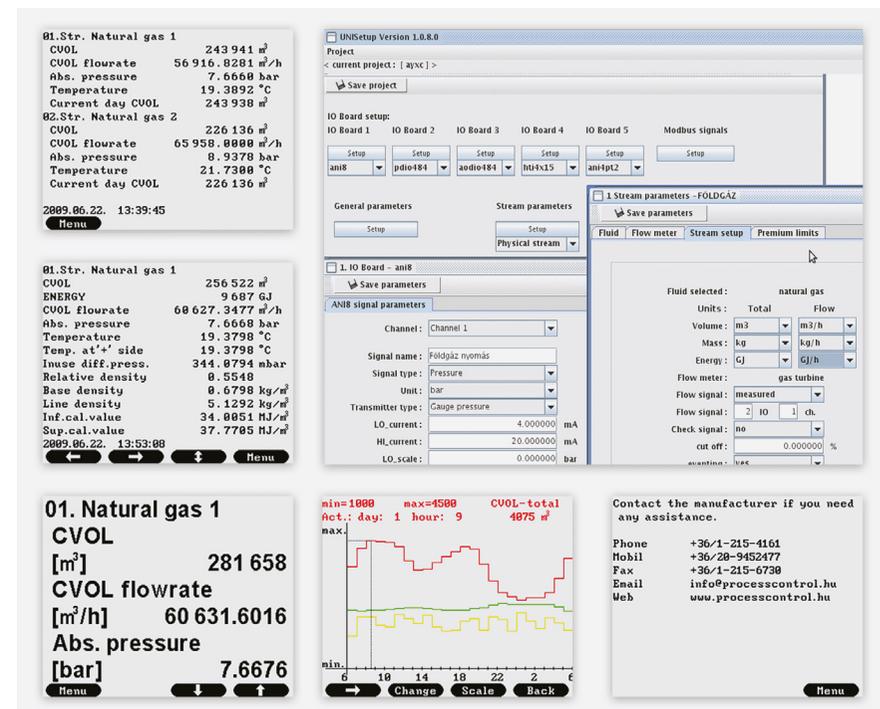
SPECIFICATIONS

Analog inputs
Symmetrical inputs with galvanic isolation.

Input range	0/4–20 mA *
Accuracy	+/- 0.02 %
Input voltage drop	5.4 V max.
Potential diff. among inputs	50 V max.

4-wire RTD inputs

Sensor type	PT100 **
Accuracy	+/- 0.03 °C
Wiring resist. incl. safety barriers	3 kΩ max.

Pulse-frequency input (incl. NAMUR)

Signal processing	without loss of pulses
Frequency range	0–10000 Hz
Input signal level	2 V–15 V
Signal form	square, unipolar
Inaccuracy of freq. meas.	0.001 % max.

Digital inputs
Potential-free contacts, open collector (transistor) and 24 V DC inputs can be accepted and used as static inputs, or pulse inputs (frequency: 100 Hz max.) without any further activity required from the user. Potential-free inputs are supplied with power from the circuit board (12 V DC, 6,8 kΩ).

Analog outputs
Output channels with individual galvanic isolation.

Output range	0/4–20 mA *
Resolution	12 bits
Load	500 Ω max.

Digital outputs
Galvanically isolated open collector (transistor), overvoltage- and overcurrent-protected outputs.

Load	100 mA, 40 V max.

Field bus inputs

HART	point to point or multidrop connections, 24 V DC power supply
Honeywell DE	single or multivariable transmitters, 24 V DC power supply

Digital communication

RS232/RS422/RS485 *	
Baud rate	1200–38400 bps
Protocol	Modbus (RTU, ASCII)
10/100 Ethernet	RJ45 (Modbus TCP)
USB port	1.1

Operator panel

3.5-inch QVGA 320×240 pixel backlit TFT color LCD display
Foil protected membrane keyboard

EU conformity

EC-type examination certificate	CE marked

Uncertainty, MPE
- Maximum permissible error (MPE) of the separate calculator on the calculation of quantities of gas, applicable to electronic calculators without uncertainty of the input channels: (OIML R 140:2007) +/-0.05 %.
- Maximum permissible error (MPE) of the separate calculator of gas volume conversion device including the uncertainty of the input channels: (EN 12405-1:2005) +/-0.2 %.
- Max. permissible error (MPE) of the separate calculator on the calculation of quantities of liquid (OIML R 117-1:2007) +/-0.03 %.

Environment

Operating temperature	-10–+60 °C
Operating humidity	10–90 % (non-condensing)
Storage temperature	-25–+70 °C

Power requirements

Dual power input	automatic switchover
Power inputs	
230 V AC +10 %, -15 %, 50–60 Hz	
24 V DC (20–35 V)	
Power consumption	25 W max.
Transmitter power	1×24 V DC, 200 mA max.

Dimensions

Panel cut-out	186×91 mm
Case/min. cabinet depth	260/320 mm
Front panel	195×110 mm
Weight	4.3 kg

Compliances & certificates
EN 12405, OIML R117, OIML R140, EC-type certificate, available with European CE mark. Registered in the state register of metering equipment of the **Russian Federation**. **Registration number**: **58182–14**.

Standards in calculations

Flow meters
ISO 5167 (1991, 1998, 2003); EN 12405 (2005); AGA 3 (1990, 2012); AGA 7 (1996); AGA 9 (1998); GOST 8.563 (1997); GOST 8.586 (2005).

Gas
ISO 6976 (1995, 2015); ISO 20765-1 (2005); ISO TR 9464 (2008); AGA 5 (2009); AGA 8 (1985, 1992); AGA 10 (2003); GPA 2172 (2009); GOST 30319 (1996, 2015).

Oil
ASTM D 1250/API 2540/IP 200 (1980); MPMS Chapter 11.1 (2004); GPA TP-27 (2007); STO Gazprom 5.9 B1, B2, B3 (2007).

Water, steam
IAPWS-IF97

I/O modules ***

ANI8	8 ch. 4–20 mA
PT4	4 ch. PT100 **
ANI4PT2	4 ch 4–20 mA, 2 ch. PT100 **
PDIO484	4 ch. pulse input / 8 ch. digital input / 4 ch. digital output
AODIO484	4 ch. 4–20 mA output / 8 ch. digital input / 4 ch. digital output
HTI4×15	4 loops to scan 15 HART PV/loop (multidrop) or 4 PCS HART transmitters (point to point) using HART protocol
DE4	2 PCS multivariable or 4 PCS single transmitters using DE protocol

Supported flow meters

Orifice, Compact Orifice, Venturi Tube, Nozzle, V-Cone, Annubar, Vortex, Turbine, Positive Displacement, Ultrasonic, Coriolis, Electromagnetic, Rotameter

Supported fluids

Hydrocarbons
natural gas, coke oven gas, blast furnace gas, crude oil, refined products, lubricating oil, UGC, SLH, WFLH, NGL & LPG

Industrial gases
air, nitrogen, oxygen, hydrogen, argon, carbon-dioxide, carbon-monoxide, ethylene, ammonium, propane, general gases

Liquids other than water
ethanol, MTBE, ETBE, general liquids, two components liquid mixture

Water
water, water steam, water-glycol mixture - energy flow (heat transfer) calculation

* Software selectable.
** PT500 or PT1000 are also available.
*** One UNIFLOW-200 can accommodate up to 5 I/O boards in any combination.