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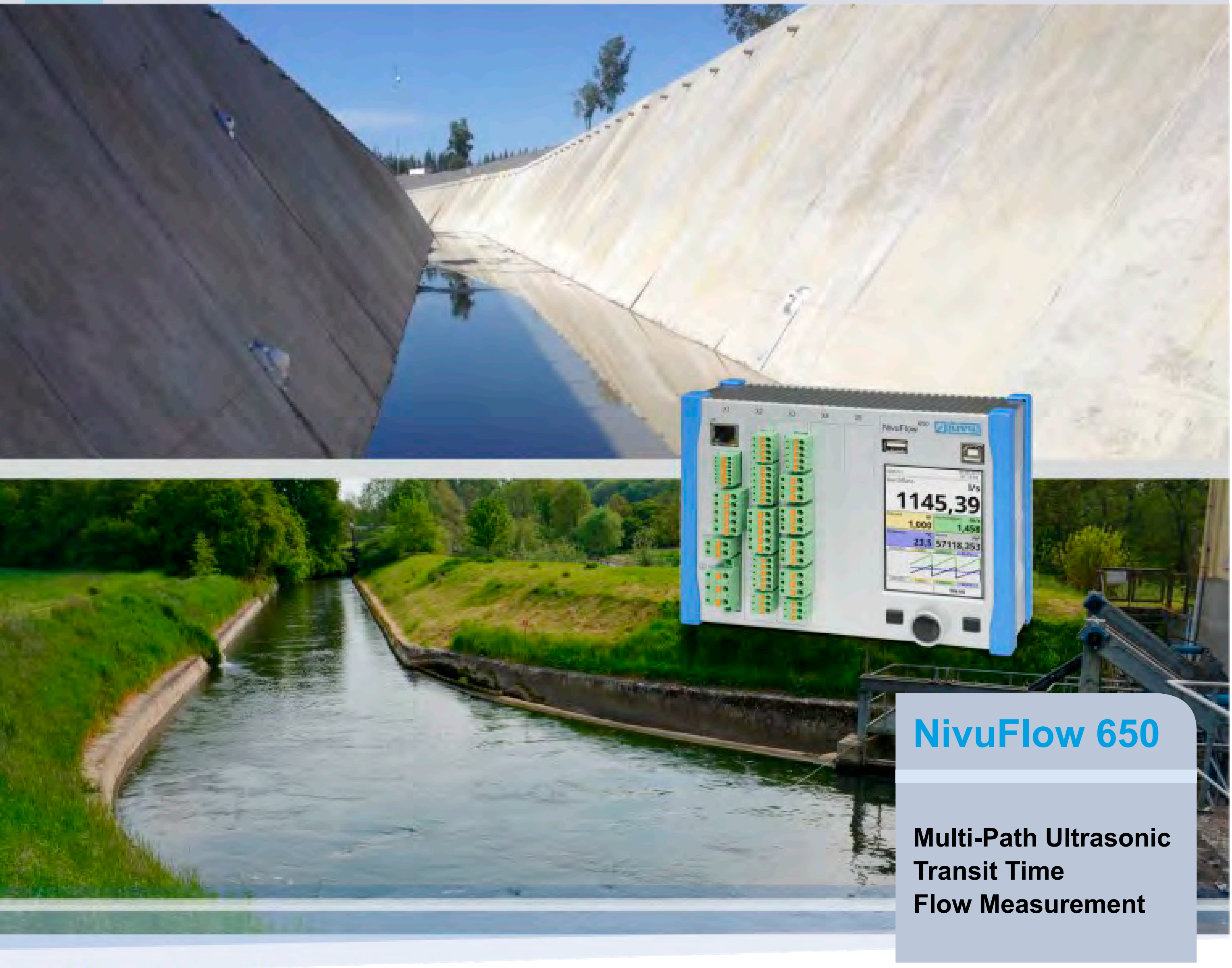


NivuFlow 650

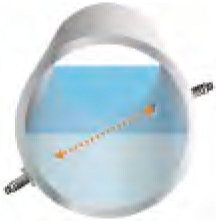
Multi-Path Ultrasonic Transit Time Flow Measurement

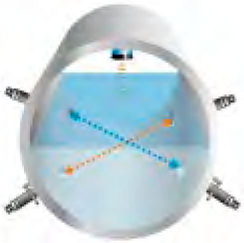
NIVUS - Innovation and high accuracy

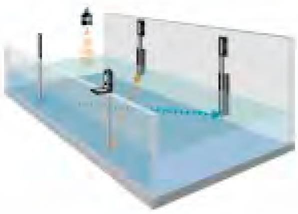
The NivuFlow 650 is compliant with ISO 6416, IEC 60041 as well as ISO 748 and has been developed for accurate flow measurement in open channels, part filled and full pipes and surface water bodies. To meet the highest possible accuracy requirements it is currently possible to utilise the NivuFlow 650 using up to 4 velocity paths, with extension modules up to 32 velocity paths.

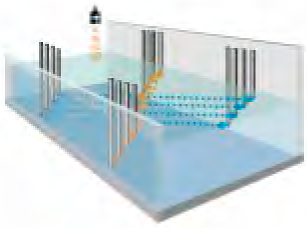
The NivuFlow 650 operates over the full bi-directional flow range without causing obstruction or head loss where the large array of NIVUS transducer models permits flow measurement across the widest possible range of applications.

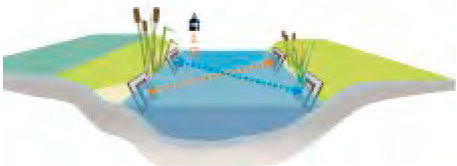
Typical NivuFlow open channel measurement application

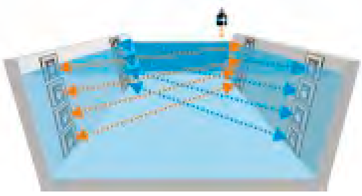












Flow measurement systems at the highest technical level

The compact transmitter design can be easily integrated into instrument cabinets using a DIN rail mounting system and is also available with a field enclosure that provides full protection under harsh environmental operating conditions.

The transmitter's large graphic display allows quick and easy commissioning of the flow metering system.

The NivuFlow 650 provides extensive diagnostic options and allows in-depth analysis of operational function on site. The system has been developed using future-proof protocols complete with versatile choices for communication and I/O connections that open up a wide range of options for operators to integrate the instruments into SCADA or similar operating systems.

Your benefits

- Proven robust ultrasonic transit time technology
- Adjustable accuracy utilizing up to 32 measurement paths
- Quick and easy initial start-up
- Application range from partly-filled pipes to channels and rivers up to 100m width
- Remote datahandling and maintenance
- Easy integration into control systems
- Weatherproof version available
- Compliant with EN ISO 6416, IEC 60041 and EN ISO 748
- Full overvoltage protection equipment available

Extension module

Typical Applications

Measurement in surface water such as rivers, channels, irrigation systems, drainage systems as well as cooling water, process water, hydropower plants, penstock monitoring, turbine efficiency monitoring and many more.

Nivu Flow 650 transmitter

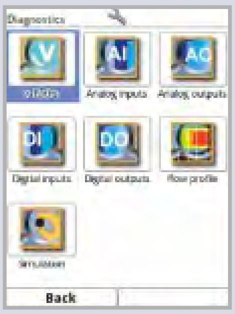
The intuitive single handed operation and the bright colour display allow quick, easy and cost-efficient commissioning on site.
Additional communication devices or software are not required.

Factors influencing the measurement results such as channel shape, varying water levels, skew flow and discharge behaviour are taken into account during flow calculation.

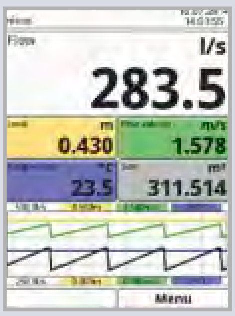
The NivuFlow 650 flow calculations are based on the very latest fluidal dynamic models with enhanced diagnostic options to provide detailed analysis of the flow meter operation both on site and via a remote link from anywhere in the World.
In addition to the DIN rail mounting system the NivuFlow 650 can be provided with a weatherproof field enclosure for outdoor installation.

On site from anywhere

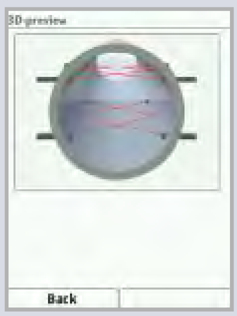
- Integrated data logger for high data security
- Saved data can be recalled at any time
- Online programming and operation (remote access and control)
- Quick and comprehensive remote diagnostics of entire measurement applications



Screen display menu



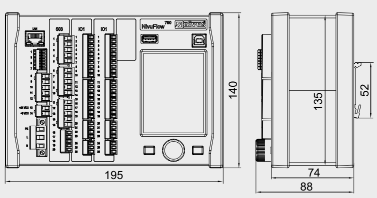
Screen display main screen



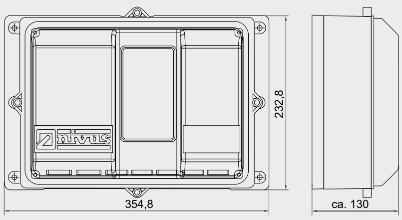
Screen display 3D-preview

Screen display measure place

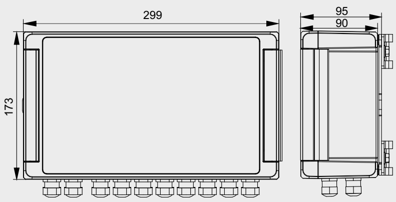
DIN rail enclosure for easy installation in switching cabinet



Field enclosure



Extension module for connection to transmitter



Dimensions in **mm**

NivuFlow 650

Power supply	85 - 260 V AC, 47 to 63 Hz or 10 - 35 V DC
Power consumption	1 relay energised, 230 V AC: (rounded) 14 W up to 8 sensors transit time 1 Mhz / other freq. 200/500 KHz
Enclosure	aluminium, plastic, weight ca. 1150 g
Protection	IP 20 (control cabinet), IP 68 (field enclosure)
Operating temperature	DC: -20°C to +70°C, AC: -20°C to +65°C, max. humidity: 80%, non-condensing
Display	240 x 320 pixel, 65,536 colours
Operation	rotary pushbutton, 2 function keys, menus in English, German, French, Swedish ...
Inputs	2x (Type T2) 4-20 mA, with 12 Bit resolution for storage of data from external units, load 91 Ohm, 2 x (Type T2) digital input
Outputs	2 x (Type T2) 0/4-20 mA, load 500 Ohm, 12 Bit resolution 1x (Type T2) bistable relay SPDT, load up to 230 V AC/2 A (cos φ 0.9), minimum switching current 100 mA 1x (Type T2) relay SPDT, load up to 230 V AC/2 A (cos φ 0.9), min. switching current 100 mA
Data memory	1.0 GB internal memory, readout on faceplate via USB stick
Communication	Modbus TCP via network (LAN/WAN, Internet), Modbus RTU via RS485 or RS232, Ethernet TCP/IP
Measurement uncertainty	flow (Q): ± 0.5 % depending on measurement and margin conditions, offset velocity < ± 5mm/s
Number of paths	1 up to 4 measurement paths, up to 32 measurement paths with extention modules

Extension module

Inputs	Sensor connections
Outputs	connection to transmitter
Power supply	supply by NivuFlow (no separate power supply)
Power consumption	max. 48 VA
Enclosure	Protection: IP68, material: Aluminium die-cast
Operating temperature	-20 °C to +50 °C, max. humidity: 80%, non-condensing
Accessories	Bus cable for connection between extension module NFE and transmitter type: LiYC11Y 2 x 1.5 mm² +1 x 2 x 0.34 mm², outer cable diameter: 8.4 mm ±0.25 mm

You can find the complete specifications in the instruction manual or on **www.nivus.com**

How the NivuFlow 650 measures

Transit time indirectly calculates flow by measuring velocity and the cross sectional area related to the water level.

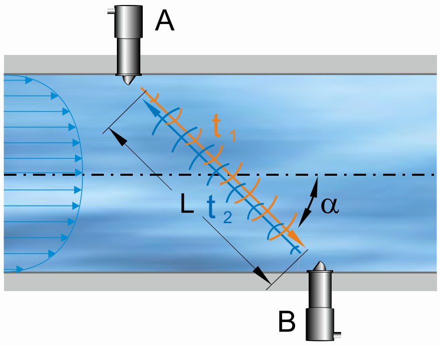
The general measurement equation is:

$$Q = A_{(h)} \bullet v_A$$

$A_{(h)}$ = cross-sectional area (based on centre values)

v_A = average flow velocity in cross-sectional area

NivuFlow 650
field enclosure



The NivuFlow 650 measurement principle is based on detecting the transit time of ultrasonic signals between two sensors (A and B).
The transit time in flow direction t_1 is faster than it is against the flow direction t_2. The time difference between both transit times is proportional to the average velocity along the measurement path v_m.

The measurement system calculates the average cross sectional area velocity v_A, the average path velocity v_m and the results are indicated directly on the transmitter display.

$$v_m = \frac{t_2 - t_1}{t_2 \cdot t_1} \cdot \left(\frac{L}{2 \cos \alpha} \right)$$

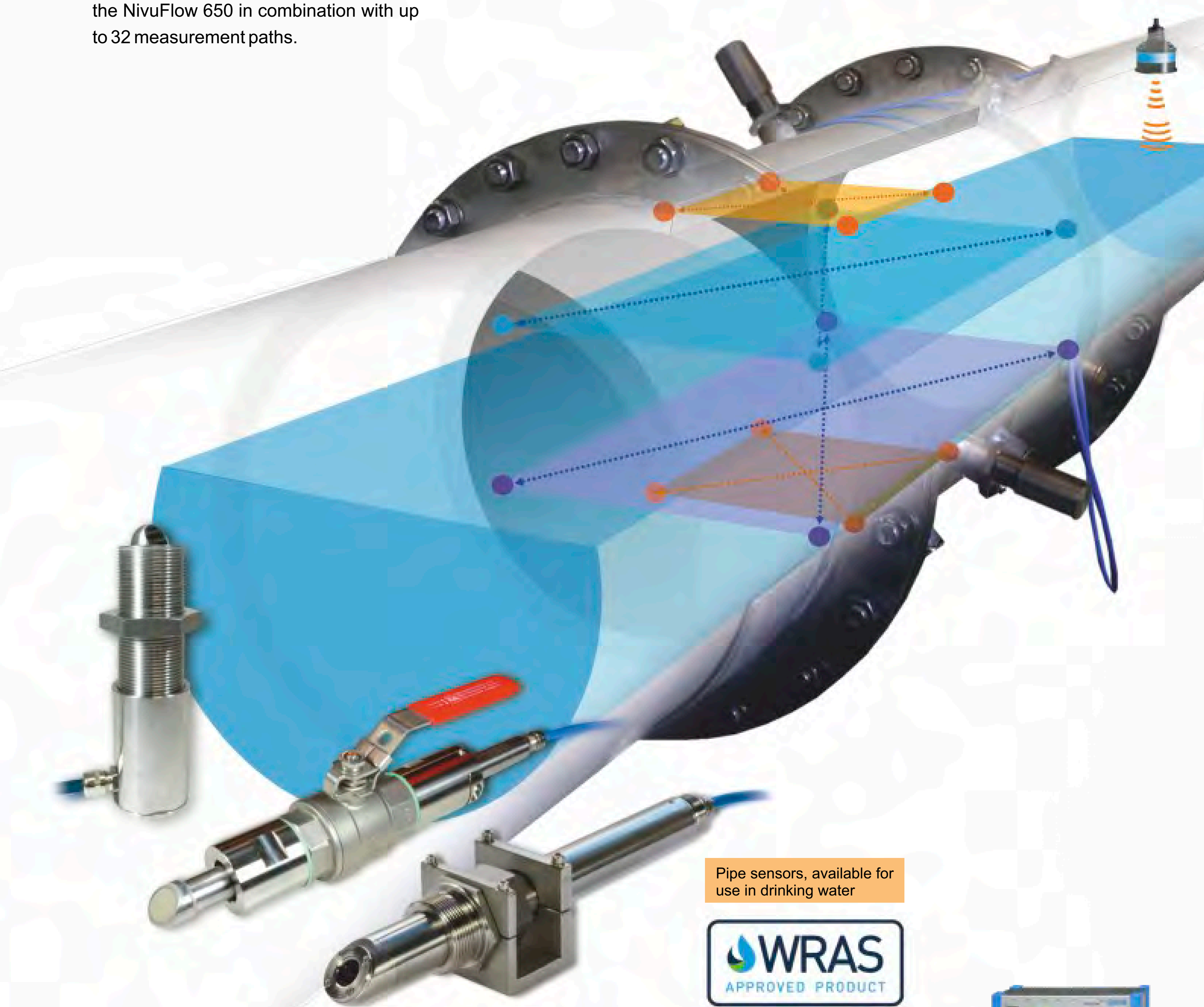
c = velocity of sound
t_1 = time from A to B, t_2 = time from B to A

The discharge measurement computation is based on international standard EN ISO 6416 using the mean-section or mid-section methods.

Measurements in pipes

For full pipe measurement applications with a fully developed velocity profile it is normally sufficient to use a single velocity path measurement (1E1P).
However, normally there are distorted flow profiles which have negative effects on the measurement accuracy. Such influences can be compensated by using the NivuFlow 650 in combination with up to 32 measurement paths.

The NivuFlow 650 utilises various transducer models depending on the application. For measurement in part full and full pipes special screw-in sensors ensure simple a installation solution.



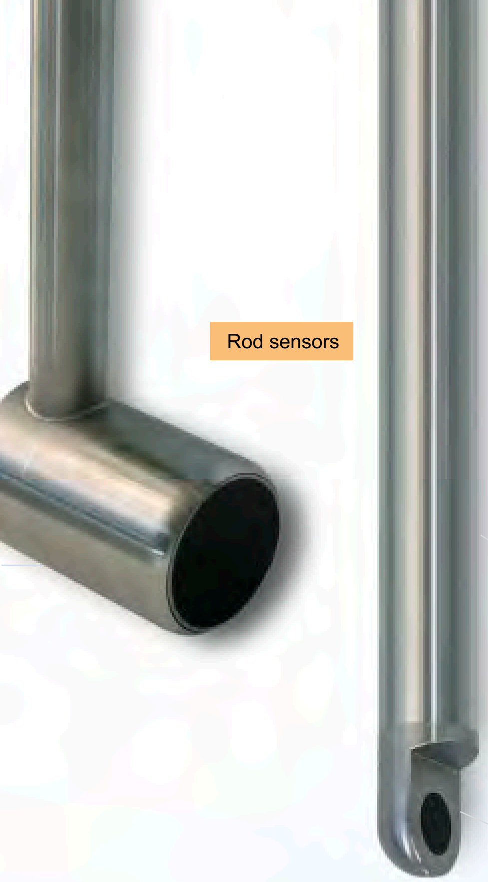
Pipe sensors, available for use in drinking water

WRAS APPROVED PRODUCT

Measurement in open channels

Transit time is a well understood and established method for flow measurement in demanding applications without requirement for the construction of a measurement structure such as weir or flume.
The NivuFlow 650 has been specifically developed to overcome the inherent problems associated with complex channel shapes, varying water levels and skew flow through our highly flexible velocity path configuration options.

Example application using 2 velocity paths (4 transducers) installed underneath a road bridge using rod style sensors.

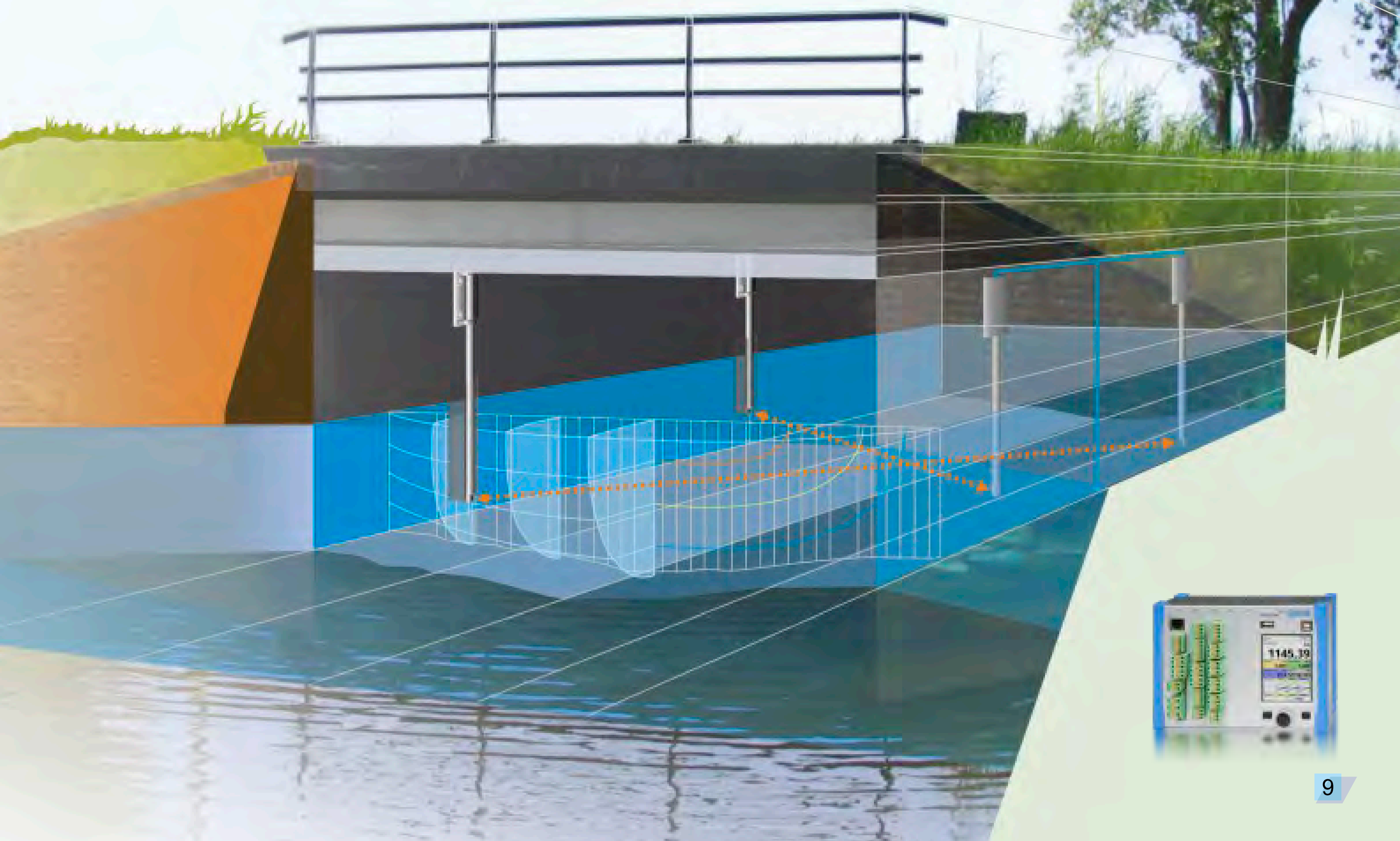


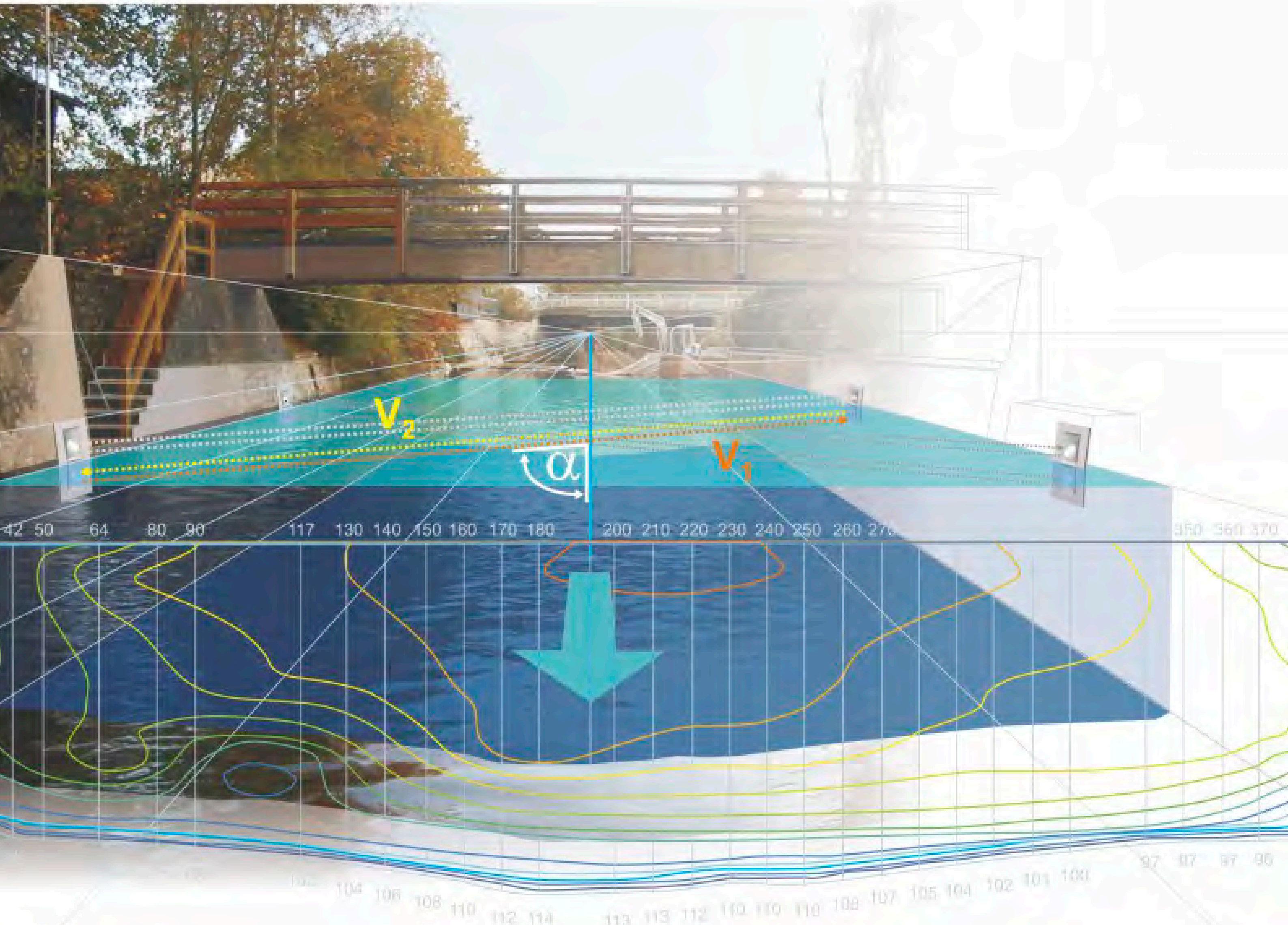
Rod sensors

To meet the highest possible accuracy requirements for both open channel and pipe measurement applications it is currently possible to utilise the NivuFlow 650 using up to 4 velocity paths. With extension modules up to 32 velocity paths are possible.

Sensors

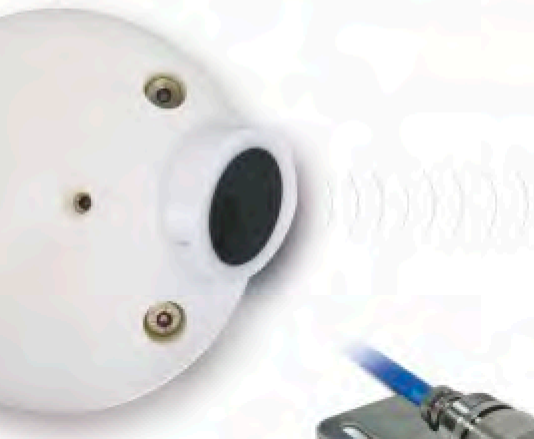
NIVUS have developed a range of highly accurate acoustic transducers, with both standard and bespoke mounting systems available to ensure the best and most flexible installation options are available for any measurement application





NIVUS - setting exemplary standards

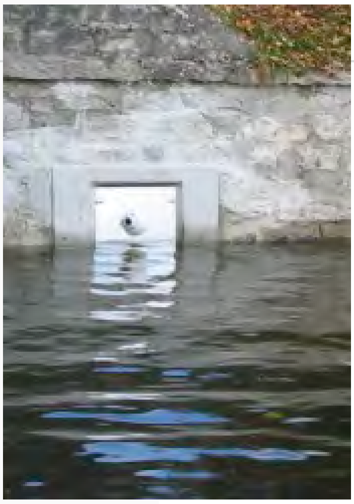
With a significant and wide ranging installed base of transit time systems, and utilising the decades of experience amassed by our engineers, technicians and expert staff, NIVUS provide a full range of services starting with initial site assessment, through to design, commissioning, installation and maintenance.



Hemisphere sensor

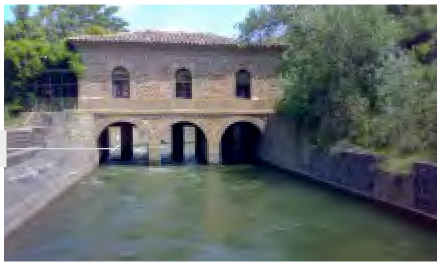
Wedge sensor

Ballhead sensor

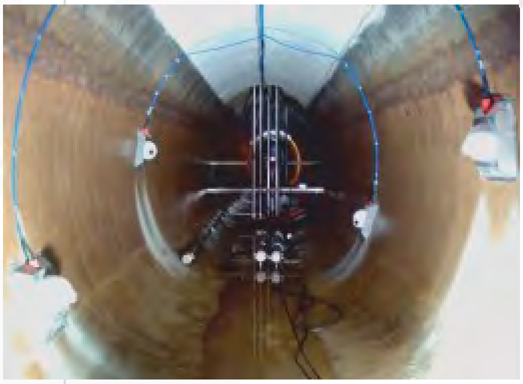


Flow measurement using the hemisphere sensors

Taking into account the measurement location, variable water levels and channel profile, the hemisphere sensors were configured within the rectangular channel to provide accurate flow measurement over the full range of flow rates.



There are 8 hemisphere sensors installed in a crossed path configuration utilising 4 velocity paths, with the upper velocity paths deployed when the water levels exceed the set transducer heights. The transducers are installed using bespoke stainless steel mounting plates set into pre-formed slots cut in the concrete channel walls.



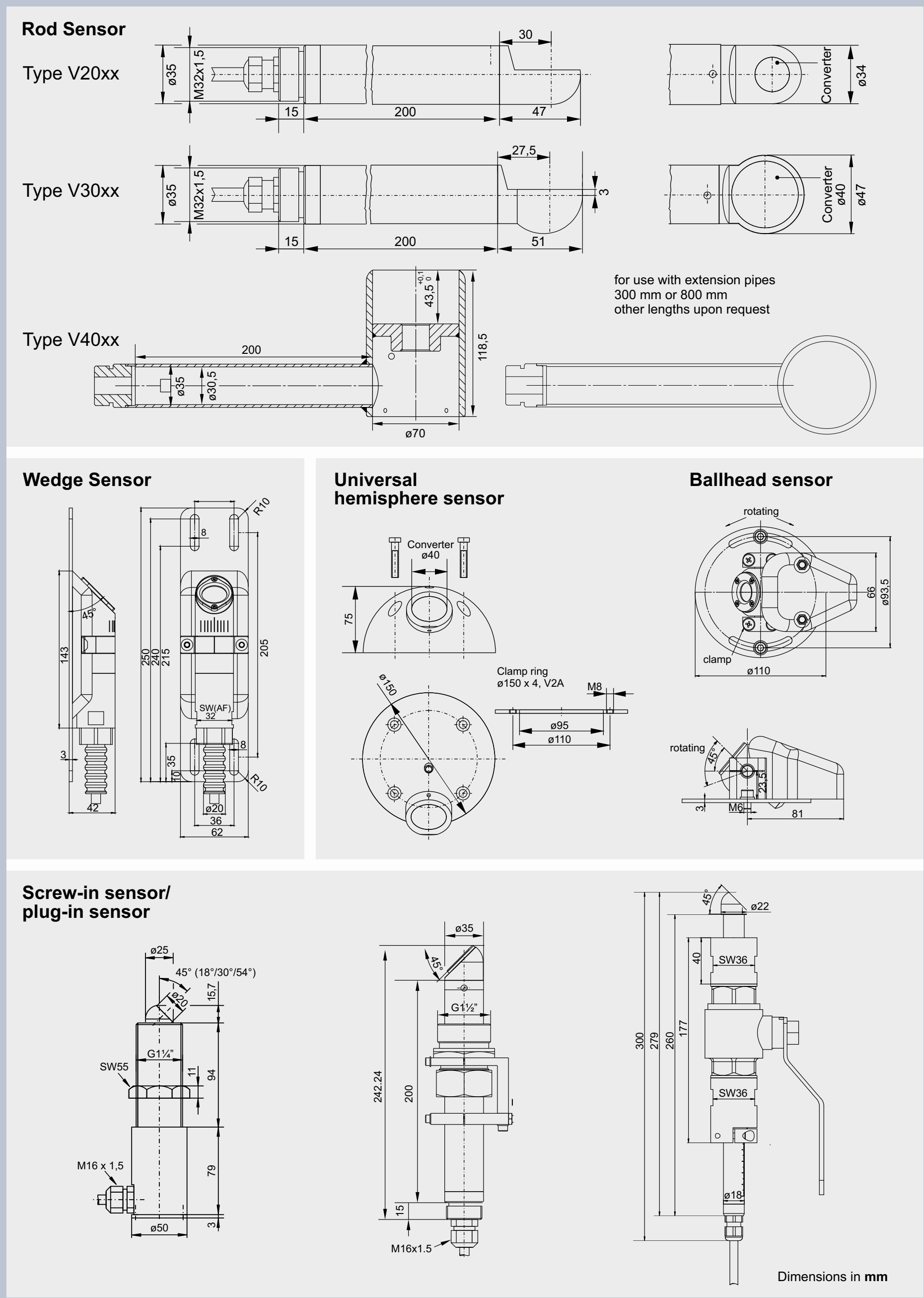
Installation of hemisphere sensors in a part filled channel.

For all of your individual and bespoke measurement solutions please contact NIVUS

Talk to us.

Screen display 3D-preview

Technical Information Sensors



Sensors

Measurement	**ultrasonic transit time principle**
Measurement range	flow velocity ±20 m/s
Channel widths	0.5 m to 40 m; other widths upon request
Measurement uncertainty	flow velocity ($v_{average}$) ±0.1 % of measurement value within path
Measurement frequency	1 MHz; 500 KHz, 200 KHz, (other frequencies depending on path length)
Protection	IP 68
Operating temperature	-40 °C bis +50 °C
Cable length	max. 300 m
Cable type	• uninterrupted pre-configured cable • pre-configured cable with underwater plug and socket
Medium contacting materials	• Screw-in sensor/plug-in sensor and rod sensor: stainless steel 1.4571, CFK (Carbon),Viton® • Hemisphere: stainless steel 1.4571, CFK (Carbon), POM, PUR, (plug and socket made of Neoprene) • Ballhead: stainless steel. 1.4571, POM

You can find the complete specifications in the instruction manual or on **www.nivus.com**

Specifications subject to change. 12.2020