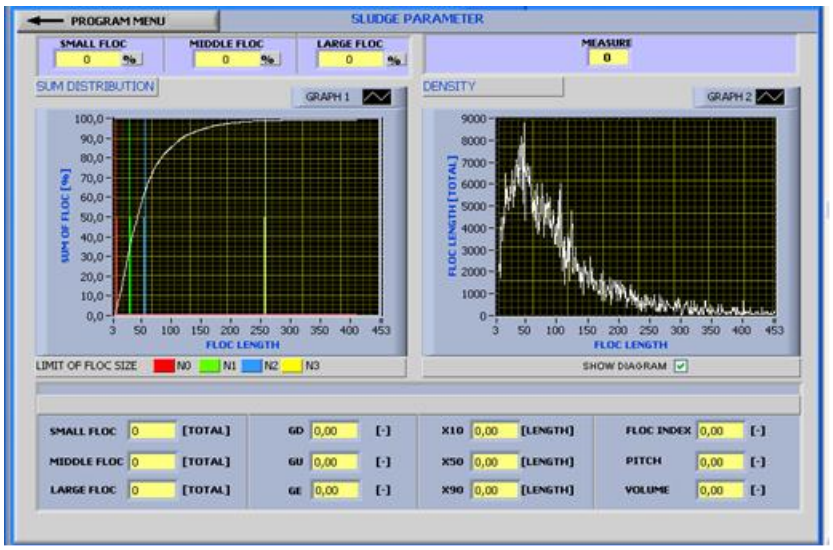
Technical Information

aquen aqua-engineering gmbh

FlocSens® process

Optical flocculation analyzer with two output channels



Rev. 1

Release Date: 2013/03/22

PERFORMANCE FOR SEPARATION PROCESSES

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Application

FlocSens® is an online controller for monitoring and controlling processes in industry and the environmental sector. The photo-optical sensor is an instrument that is used to measure the size and structure characteristics of dispersed and undispersed solid systems. The sensor works in situ, it can be mounted directly into an existing production line and / or bypass.

Furthermore, two 4 to 20 mA analog outputs are available. A cleaning function and controller is on board.

The rugged stainless steel version is tailored to the following non hazardous area applications:

- Water and wastewater
- Chemical industry
- Other industrial applications

Your benefits:

- Quick and reproducible variables of floc or suspension properties
- Control (even closed-loop control) of your process via online measurement system
- Wide range of application due to parameter driven software.
- Reliable characterisation of your process
- Real values for your flocculation

You can measure eg.:

- Floc size distribution and changes of it
- Shear stability of the flocs
- Effectiveness of your flocculation agent
- The estimated dewaterability of the sludge / particle system

Maximum process safety thanks to:

- Simple and transparent program guidance via a graphic display
- Standardized intuitive operating concept

Table of contents

Function and system design

Technology

FlocSens® makes your measuring point safer and more reliable:

Digital signal transmission enables optimum galvanic isolation

- Completely watertight
- Easy touch screen operation
- Sensor in pipe installation

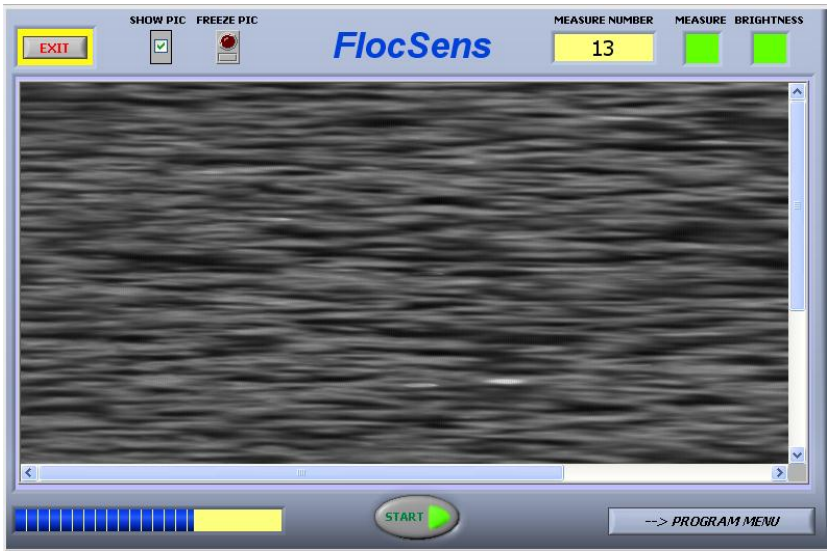
Program

The FlocSens® application scans dispersed and undispersed solid systems online.

The medium (eg. conditioned sludge) is automatically sampled by a CCD-line scan camera fixed transverse to the flow direction. The medium is analysed online. The image processing does not identify isolated structures of the particles but rather special characteristics of

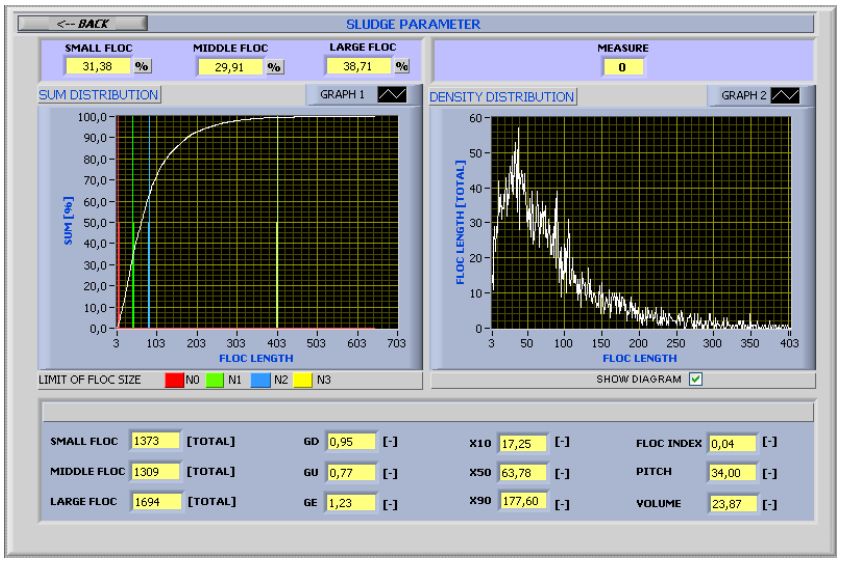
the medium. The particle or floc size distribution in terms of cumulative run length distribution has been calculated by interpretation of spatial extrema distribution of the line scan.

The system measures relative sizes in terms of particle or floc length.



Line scan of sludge picture

User-definable measuring menus mean you can always keep track of the values that are important for your application.



Particle size distributions

For example the following parameters are calculated by the FlocSens:

- Number of small particles (absolute/relative)
- Number of middle size particles (absolute/relative)
- Number of large particles (absolute/relative)

  Due to the application the boundaries of the fraction sizes are adjustable.

- Proportions between small, middle and large particles
- X_{10} value of particles
- X_{50} value of particles
- X_{90} value of particles
- Calculated volume of particles

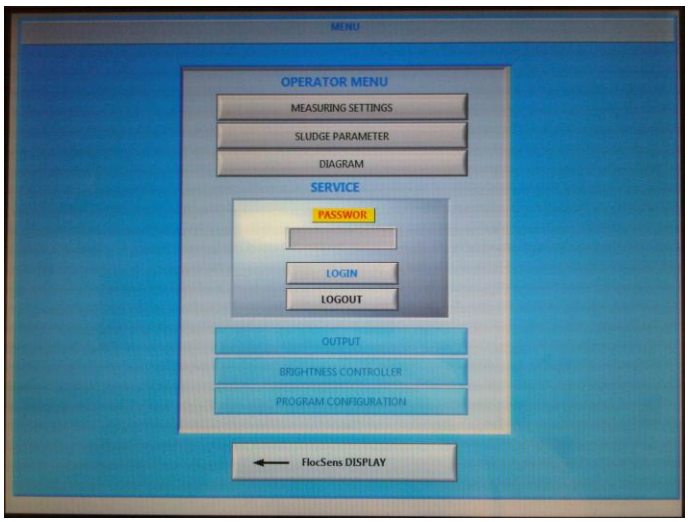
Display

Graphic display:

Back light with screen saver function

Red display background for alarms alerts users to errors

Transflective display technology for maximum contrast even in bright environments



Back light touch screen display

Measuring system

The following overview shows examples of the design and layout of the hardware of measuring system. Other outfits and assemblies can be ordered for conditions specific to your application

A complete measuring system consists of:

1. **FlocSens® controller**

   Fixing brackets (optional)

   Post or rail mounting (optional)

   Weather protection cover (optional)

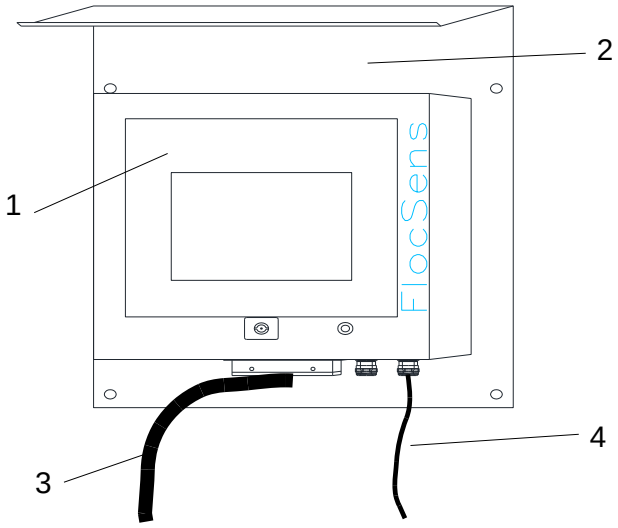
   Foundation board (optional)

2. **FlocSens® sensor**

   Pipe installation

   Stand (optional)

3. **Sensor cable**



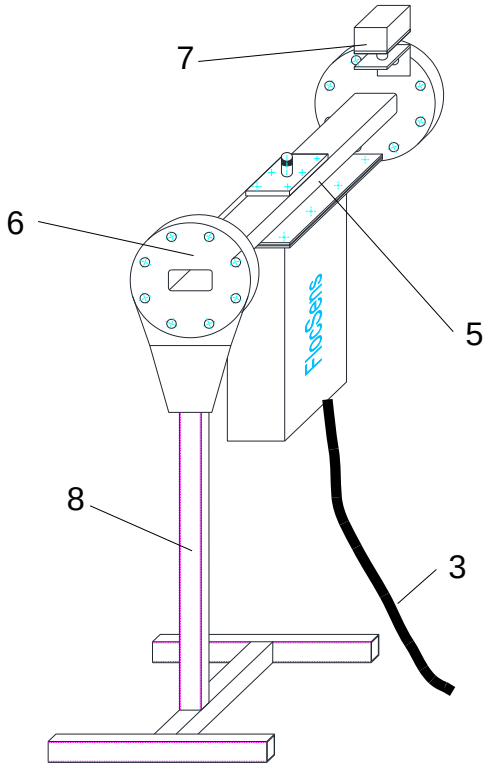
Measuring system

1 FlocSens® controller

2 Weather protection cover (optional)

3 Sensor cable

4 Power supply cable (to be provided by the customer, not part of the scope of supply)



5 FlocSens® sensor

6 Housing and flange fixture

7 Flushing system with hose

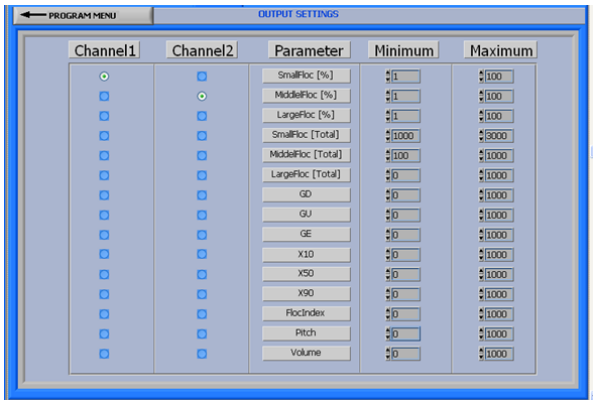
8 Stand (optional)

If mounting outdoors, always use the weather protection cover (see "Accessories") to protect the controller against weather conditions.

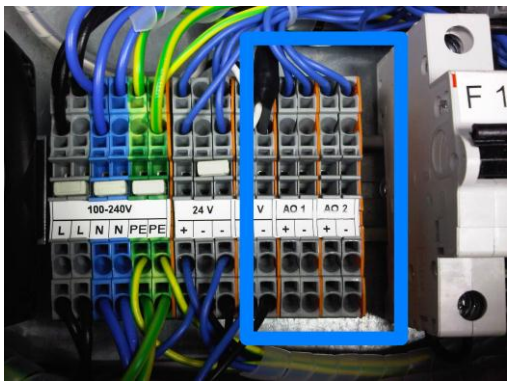
Measuring range	50µ - 1200 µm
Flow velocity	0.1 – 0.5 m/sec 4 – 20 in./sec
Pressure	max. 6 bar / 87 PSI

Data output

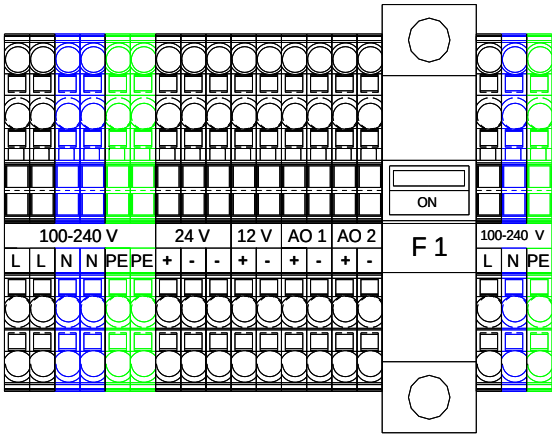
Slot and port assignment



Slot and port assignment and how it appears on the graphical display



Slot and port assignment on the clamps



Slot and port scheme

The electronic components are

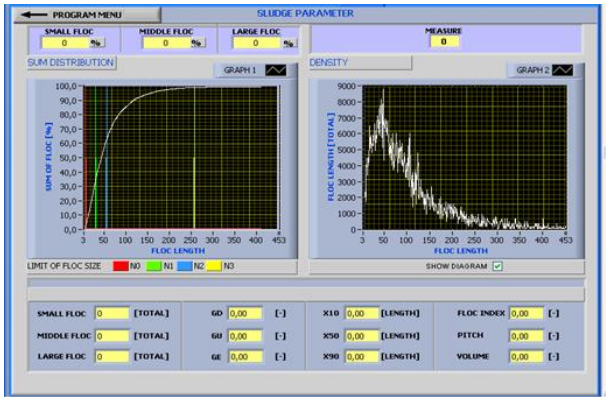
Current output module 1 (AO1) - channel 1

Current output module 2 (AO2) - channel 2

USB 2.0 slot for memory sticks

Logging

Complete floc size distribution of every single measurement



Floc size distribution: Graphic display

Data logger function

Adjustable settings

Data logbook:

Logbook per day

Graphic display load curves

Data logbook: Graphic display

Complete logbooks can be downloaded in CSV format.

Reliability	**Process Check System (PCS)**
	The process check system (PCS) checks the measuring signal for stagnation. An alarm is triggered if the measuring signal does not change over a specific period (several measured values).
	The main causes of stagnating measured values are: • Contaminated sensor, or sensor in air • Sensor failure • Process error (e.g. through control system)
	Self-monitoring functions
	Current outputs
	The current outputs are read to check if the value corresponds to the setpoint.
	Board monitoring
	Board voltages and board temperature are monitored.

Output

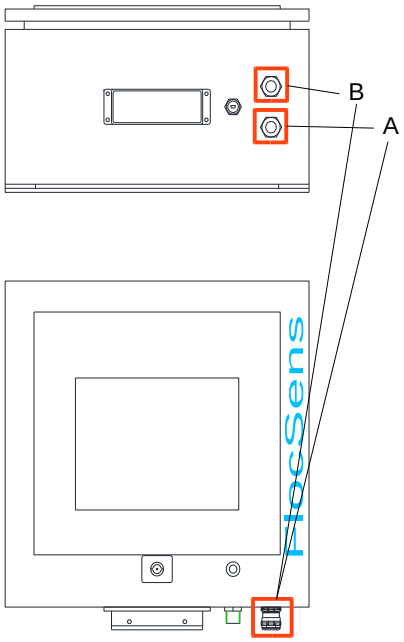
	Two outputs 4 to 20 mA, active, potentially isolated from one another and from the sensor circuits
Type	Current outputs, active
Span	0 to 23 mA
Signal characteristic:	Linear
Electrical specification	Output voltage
	Max. 24 V
	Test voltage
	500 V

Cable specification	Cable type Recommended: shielded cable Cross-section Max. 2.5 mm2 (14 AWG)

Power supply

Supply voltage	International version: 100 to 230 V AC ± 15 %, 50/60 Hz The device does not have a mains switch. The customer must provide a protected circuit breaker in the vicinity of the device. This must be a switch or a power-circuit breaker and must be labeled as the circuit breaker for the device.
Power consumption	Depending on supplied voltage 100 to 230 V AC: Max. 55 VA
Fuse	Automatic fuse 4.0 A, slow-blow Electronic circuit breaker in the internal power supplies

Cable entry

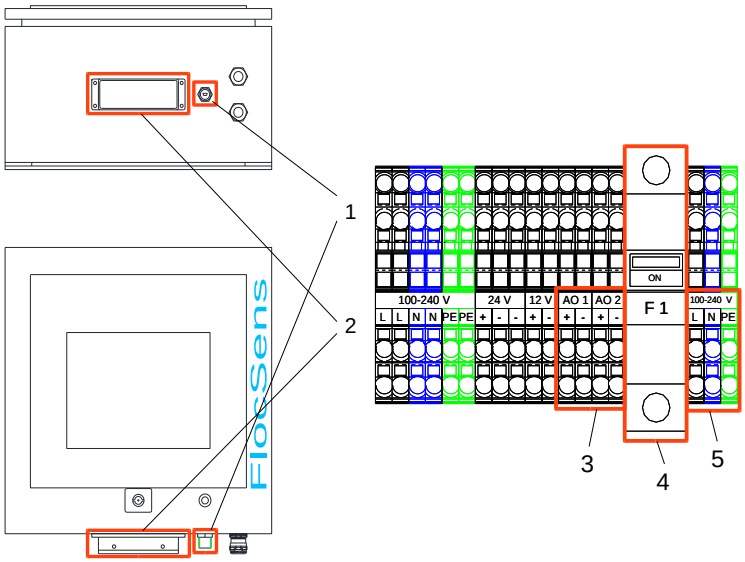


Position of cable entries on controller

Cable entry on housing base	Suitable gland
A	M20x1.5 mm/NPT1/2"/G1/2
B	M20x1.5 mm/NPT1/2"/G1/2

Cable specification	Cable gland	Permitted cable diameter
	M20x1.5 mm	4 to 8 6 to 12 mm (0.24 to 0.48")

Electrical connection



Position of electrical connections on controller

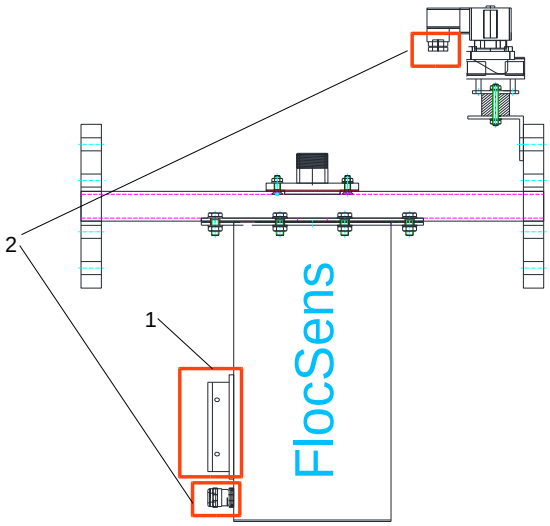
1 Mini-USB slot

2 Connections for FlocSens sensor

3 Current outputs

4 Fuse

5 Power connection



Position of electrical connections on sensor

1 Connections for FlocSens controller

2 Connection for flushing valve (internal)

Performance characteristics

Response time

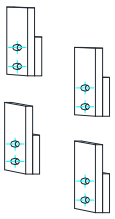
Current outputs t90 = max. 500 ms for an increase from 4 to 20 mA

Reference temperature 25 °C (77 °F)

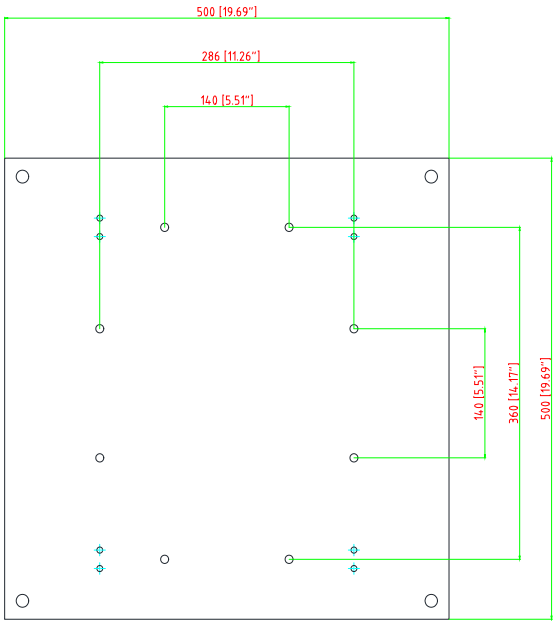
Additional measured error depending on the temperature: < 1.5 µA/K

Installation Controller

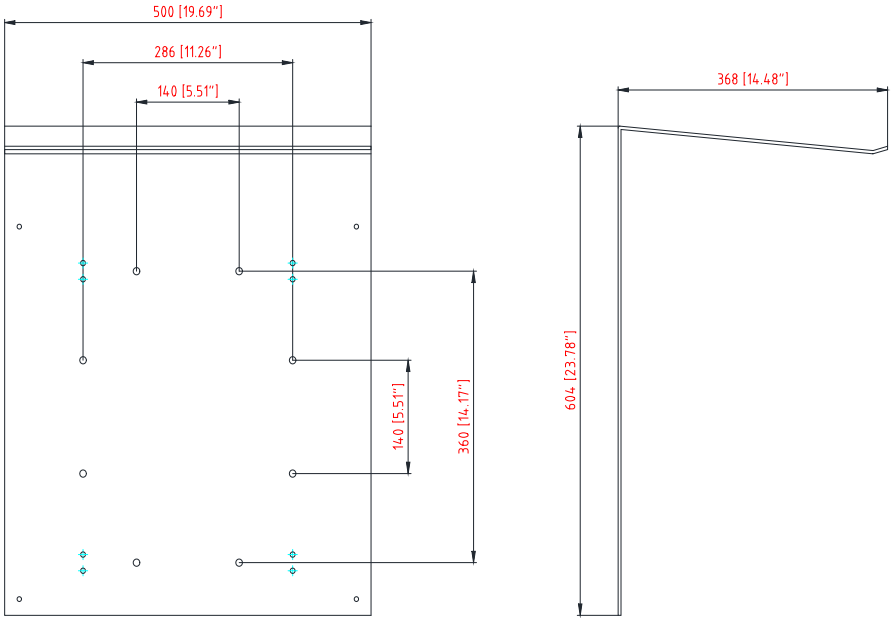
Fixing brackets



Foundation board

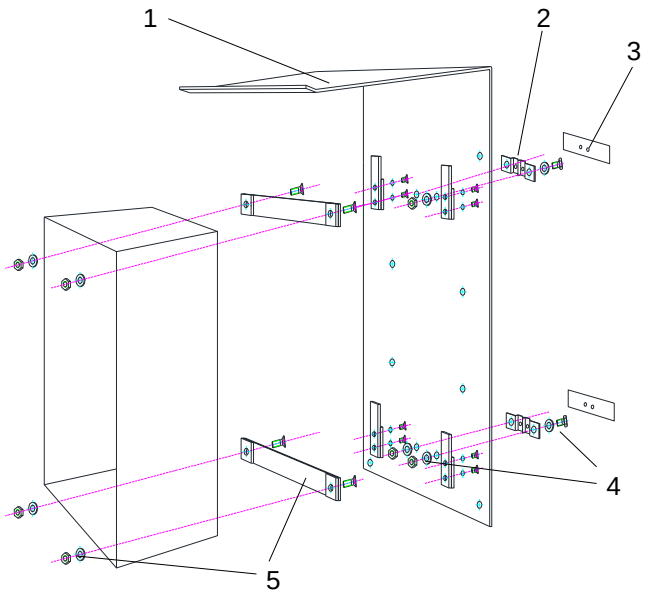


Weather protection cover



Installation instructions You require the post mounting kit (optional) to mount the unit on a pipe, post or railing (square or circular, span range 20 to 61 mm (0.79 to 2.40")).

Post mounting



Post mounting (exploded view)

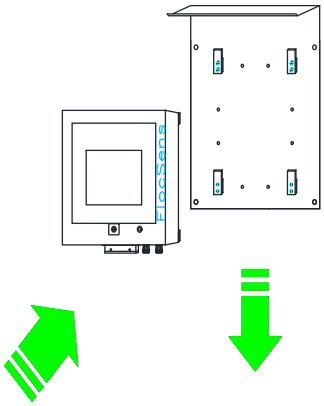
1 *Weather protection cover (optional)*

2 *Post mounting plate (post mounting kit)*

3 *Pipe clamps (post mounting kit)*

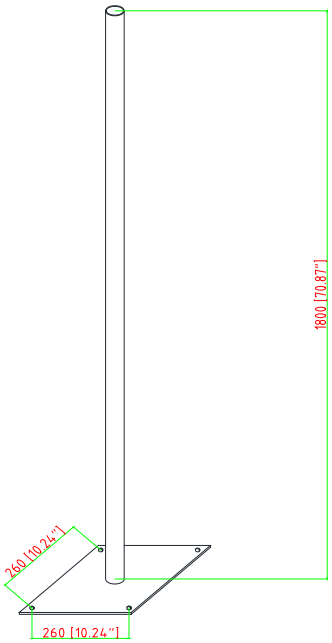
4 *Spring washers, nuts (post mounting kit)*

5 *Fixings, spring washers, nuts (incld. controller package)*



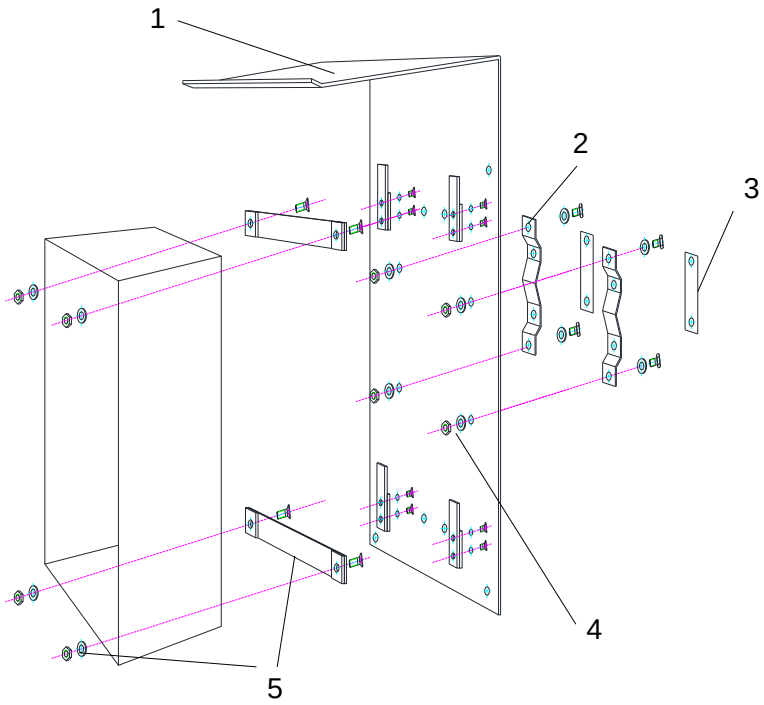
Controller Stand

Stand alone support for the controller unit with with post mounting installation



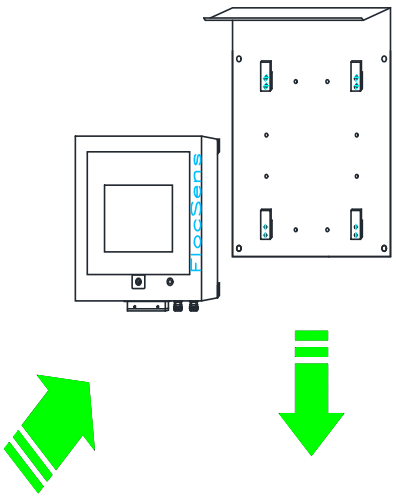
Controller stand (optional)

Rail mounting



Rail mounting (exploded view)

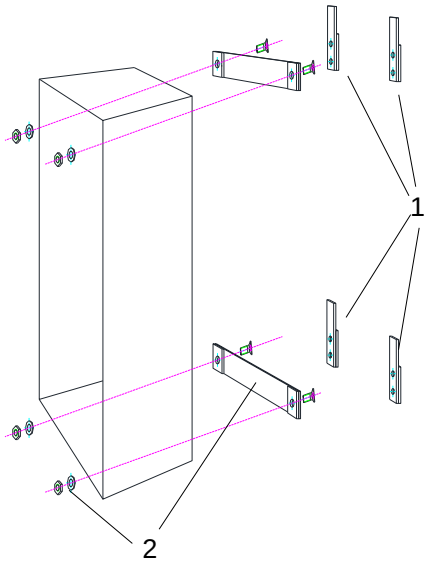
1	*Weather protection cover (optional)*
2	*Post mounting plate (post mounting kit)*
3	*Pipe clamps (post mounting kit)*
4	*Spring washers, nuts (post mounting kit)*
5	*Fixings, spring washers, nuts (incld. controller package)*



Wall mounting

Mount the controller in such a way that the wall support surface is at least the size of the rear housing panel.

Fixing brackets

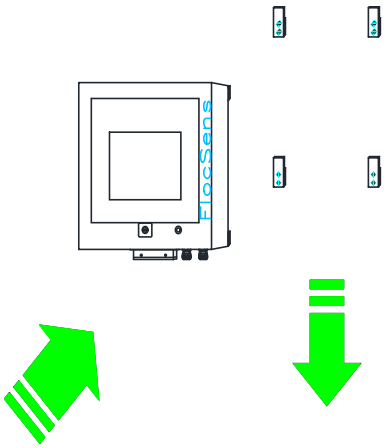


Wall mounting

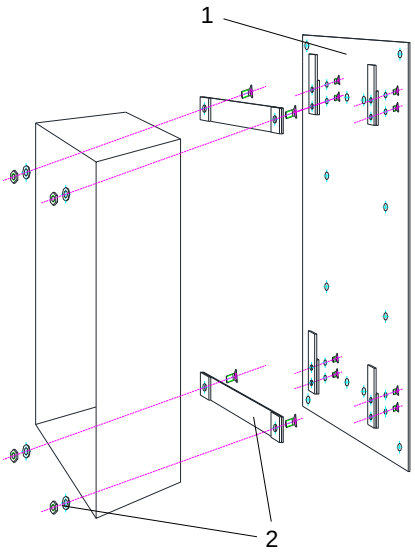
1 *Brackets*

2 *Fixings, spring washers, nuts (incld. controller package)*

Screws Ø 6 mm (not part of Minimum spacing required for mounting scope of supply). 4 drill holes*.



Foundation board

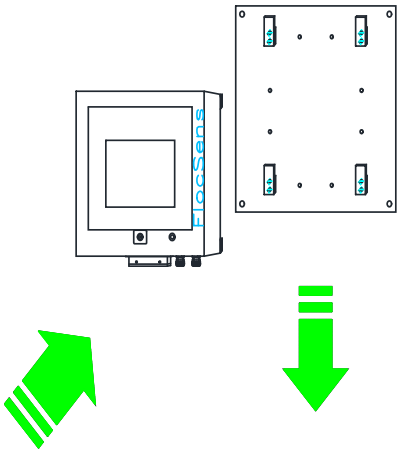


Wall mounting

1 *Foundation board*

2 *Fixings, spring washers, nuts (incld. controller package)*

Screws Ø 6 mm (not part of Minimum spacing required for mounting scope of supply). 4 drill holes*.



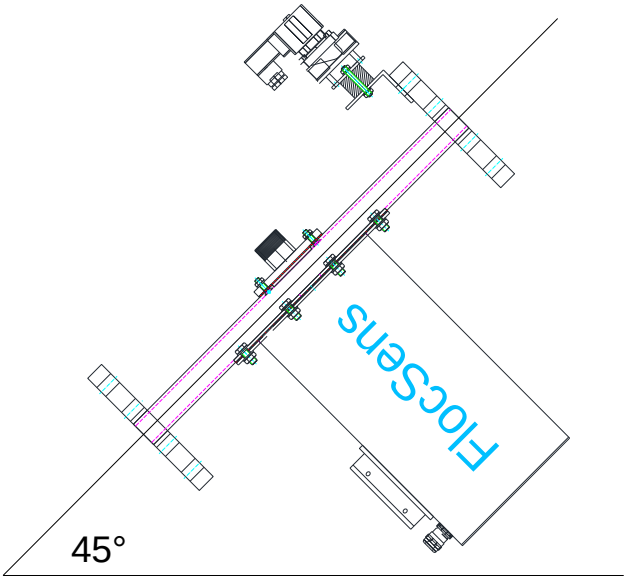
* The size of the drill holes depends on the wall plugs used. The wall plugs and screws must be provided by the customer.

Installation Sensor

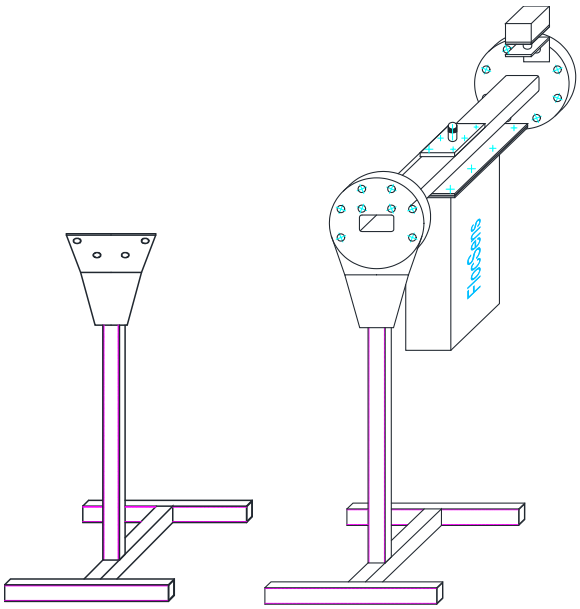
Pipe installation

To avoid sedimentation the recommended angle of installation is 45°

Tension-free mounting of sensor (mounting on the foundation). Any unevenness must be corrected by appropriate supports like the stand (optional) for the device.



Stand installation



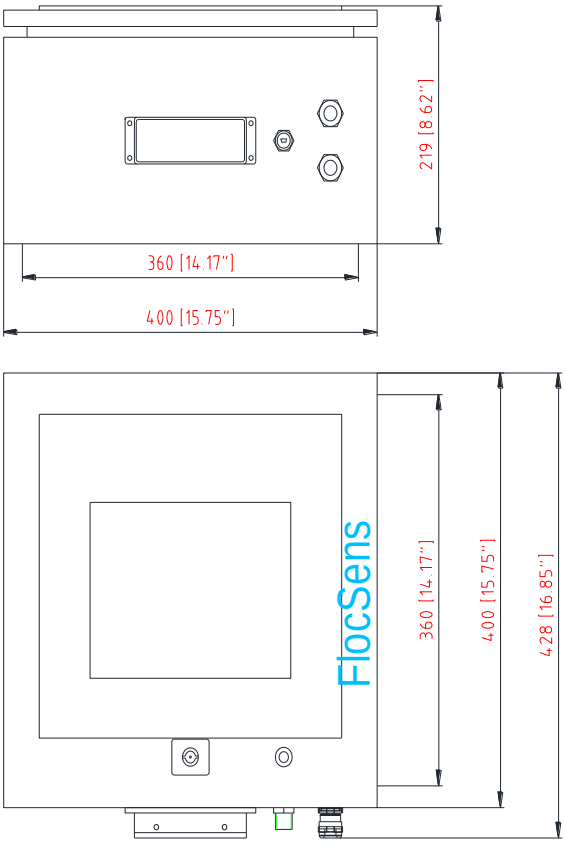
Environment

Controller	
ambient temperature range	–20 to 55 °C (0 to 130 °F)
Sensor	
ambient temperature range	–20 to 55 °C (0 to 130 °F)
Storage temperature	–40 to 80 °C (–40 to 175 °F)
Electromagnetic compatibility	Interference emission and interference immunity as per EN 61326-1: 2006, class A for industry
Degree of protection	IP 65, leak-tightness and corrosion resistance in accordance with NEMA TYPE 4X
Relative humidity	10 to 95%, not condensing
Pollution degree	The product is suitable for pollution degree 4.

Mechanical construction

Controller

Dimensions



Dimensions of field housing

Weight

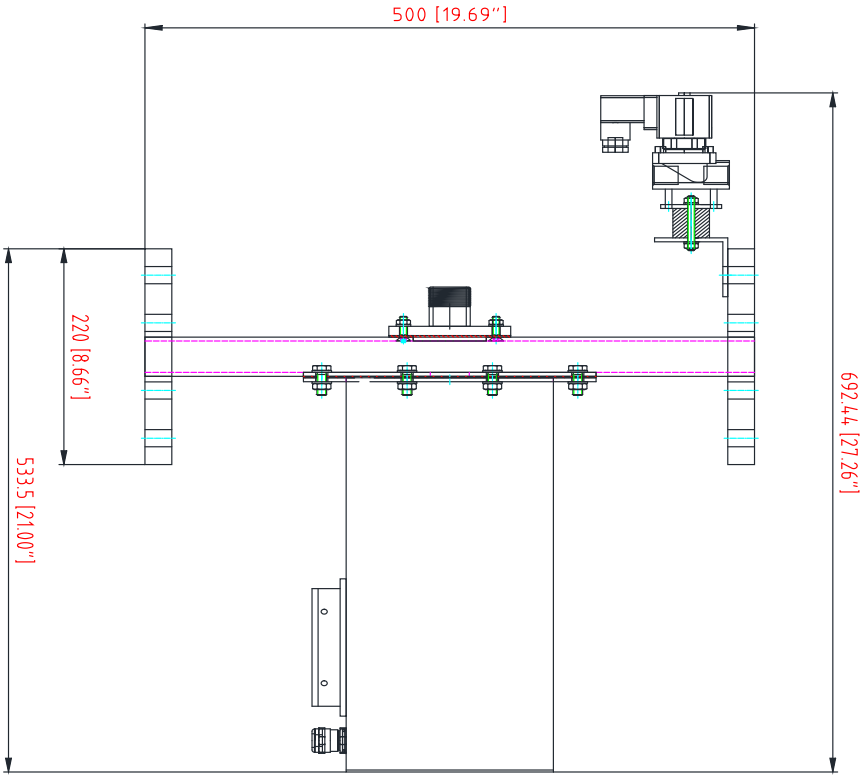
Approx. 18.0 kg (39,7 lbs)

Material

Housing	Stainless steel 1.4301 (AISI304)
Display cover	PC-FR
Display film and soft keys	PE
Housing seal	EPDM
Screws	Stainless steel 1.4301 (AISI304)

Sensor

Dimensions



Dimensions of pipe sensor

Flanges

DN 100 ND16 DIN 2527 **/** 4" 316ss ANSI 150 lb

Weight

Approx. 27,8 kg (61,3 lbs), depending on flange section

Material

Housing	Stainless steel 1.4301 (AISI304)
Pipe	Stainless steel 1.4301 (AISI304)
Flanges	Stainless steel 1.4301 (AISI304)

Operability

Operating concept

Full featured simple and structured operating concept

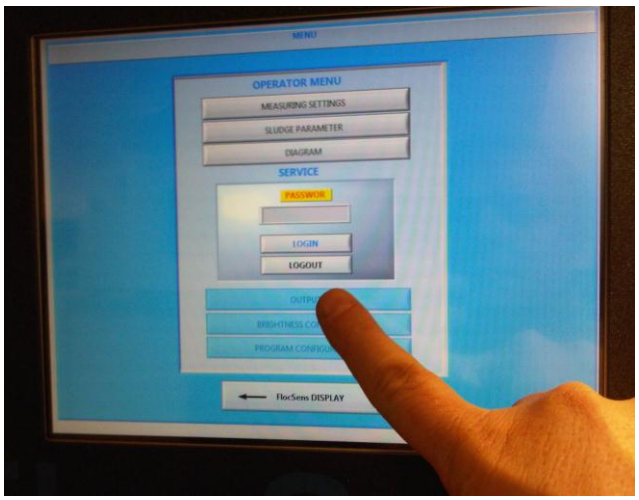
Intuitive touch screen operation

Fast configuration of application-specific measurement options

Easy configuration and diagnosis thanks to plain-text display

All languages that can be provided are available in every device

Easy operation Plain-text menu



Touch screen operation

Language groups

The language selected in the product structure is the operating language preset at the factory. All other languages can be selected using the menu.

English (US)

German

French

Certificates and approvals

C€ mark

Declaration of Conformity

The product meets the requirements of the harmonized European standards.

As such, it complies with the legal specifications of the EC directives.

The manufacturer confirms successful testing of the product by affixing to it the **CE** mark.

Ordering information

Scope of delivery

- 1 controller
- 1 sensor
- 1 sensor cable 5 m / 16.4 ft
- 1 CD with Operating Instructions

Order No. FS_00001

Accessories

The most important accessories that could be delivered at the time this document went to print are listed below.

For information on accessories that are not listed here, please contact your local service or sales representation.

Fixing brackets	Minimal required fixing material for controller • Material: stainless steel 1.4031 (AISI 304) • Order No. FS_00011
Foundation board	Back board if operating the unit indoors • Material: stainless steel 1.4031 (AISI 304) • Order No. FS_00012
Weather protection cover	Weather protection cover for field devices, absolutely essential if operating the unit outdoors • Material: stainless steel 1.4031 (AISI 304) • Order No. FS_00013
Post mounting kit	Post mounting kit for securing the field housing to horizontal and vertical posts and pipes • Order no. FS_00014

Sensor cable	FlocSens® data cable 2 m. Order No. FS_00021 FlocSens® data cable 4 m. Order No. FS_00022 FlocSens® data cable 6 m. Order No. FS_00023 FlocSens® data cable 8 m. Order No. FS_00024 FlocSens® data cable 10 m. Order No. FS_00025 Customized cable length. Order No.: FS_0002xx
FlocSens® sensor stand	Stand for the FlocSens® sensor Order No. FS_00031
FlocSens® controller stand	Stand for the FlocSens® controller. Material: stainless steel 1.4031 (AISI 304) •Order No. FS_00041

This technical information includes important safety information and instructions for installation, commissioning, operating and maintenance of the aquen application.

It is essential therefore, that the responsible specialist refers to it before starting any work on the machinery as well as prior to commissioning. Futhermore, this technical information must always be available on site.

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