ULTRASONIC LEVEL METERS

Compact Transmitters: ST, and SB 300 series
Two-Part Systems: SI, SS and SM 300 series

FOR LIQUIDS

DATASHEET
SLI3A1A9

COMPACT TRANSMITTERS

EchoTREK

HART® FIELD COMMUNICATIONS PROTOCOL

MODBUS

TWO-PART MEASURING SYSTEM

NIVOSONAR

- Excellent sensor focusing: 5° total beam angle
- Built-in temperature compensation on full scale
- Built-in secondary lightning protection
- IP 68 versions
- Wide range of transducer materials
- Two decades of experience with ultrasonics

KNOW-HOW IN ULTRASONICS

Nivelco's two decades of experience with ultrasonic level metering is an asset we gladly share with our customers. A specialised team of experts is working day by day to convert this experience obtained by tens of thousands of applications world-wide.
The state-of-the-art, narrow-beam angle sensor and the QUEST+™ (Qualified Echo Suppressing Technique) featuring advanced, process adaptive digital signal processing provide the basis for the solution of the most demanding applications in the process control world.

FIELDS OF APPLICATION

Ultrasonic Level Meters offer excellent tools for liquid level and volume measurements in tanks or reservoirs and for open channel flow measurement.
Level measurement technology based on the non-contacting ultrasonic principle is especially suited for applications where, for any reason, no physical contact can be established with the surface of the material to be measured.
Such reasons may include corrosive attack by the process medium of the measuring device material (acids), possible contamination (sewage) or particles of the process medium adhering to the measuring device (adhesive materials).

PRINCIPLE OF OPERATION

Ultrasonic level metering is based on the principle of measuring the time required for the ultrasound pulses to make a round trip from the sensor to the surface of the liquid and back. An ultrasonic sensor installed above the liquid to be measured emits an ultrasonic pulse train and receives the echoes reflected from the liquid surface. The received signal is processed by selecting the echo reflected by the liquid surface and calculating from the time of flight, the distance to the liquid surface.

The Measuring System

Compact Transmitters
Standalone devices with sensor and transmitter in one unit.

Two-part System
Separate sensor and transmitter control unit

MEASURING RANGE

The measuring range or more exactly the distance the ultrasonic unit can measure depends on the ambient conditions (e.g. closed tank or open vessel). Proper care must be taken for intensive air movements in open-air applications, since wind or storm may "blow away" the ultrasound at high distances, thereby reducing effective range.
There are a few other phenomena such as foam, waves and vapour that can also reduce the maximum distance which can be measured.
Therefore in such applications higher power transducers with a lower frequency (greater penetration) need to be selected for optimum results.

TRANSDUCER MATERIAL

NIVELCO offers a wide range of transducer materials for its ultrasonic units to suit the varied requirements of liquid level metering applications:

- Polypropylene (PP) - Resists most caustics, acids and bases
- Solef (PVDF) - Resists acids and most solvents
- Teflon (PTFE) - Resists acids and most solvents
  Accepted in hygienic application.
- Stainless steel (DIN1.4571, AISI SS316Ti) - Ultimate resistance against solvents
  Accepted in hygienic applications, withstands CIP cleaning up to 120°C

TEMPERATURE

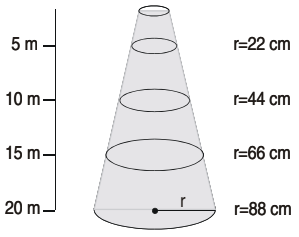
All Nivelco ultrasonic devices have built in temperature compensation over the entire measuring range. For outdoor applications the use of a weather-protect unit is recommended.

PRESSURE

Because of the physical characteristics of ultrasound, ultrasonic measurement is limited in vacuum and high pressure applications. The operating pressure range is between 0.3 bar and 6 bar (Absolute).

SONIC CONE

Most of Nivelco's transducers have a **5°-7° total beam angle** at -3 dB, ensuring a reliable measurement in narrow silos with uneven side walls as well as in process tanks with various protruding objects. Furthermore, as a result of the narrow beam angle the emitted ultrasonic signals ensures outstanding focus and good penetration through gases, vapour and foam.



Diameters corresponding to 5° beam angle.

SELECTION

We offer the widest range of ultrasonic level measurement solutions involving standalone devices and two-part systems, sensors of different materials and with many different working frequencies.
Since the main selection aspects mentioned above (see „Measuring Range") form only part of the application know-how, please **contact your local Nivelco distributor** to assist you in selecting the optimal ultrasonic system for your needs.

COMPACT TRANSMITTERS

Stand-alone devices with a transducer and a transmitter in one unit

EchoTREK - THE NEXT GENERATION

Nivelco's next generation of SMART compact ultrasonic level transmitters, using SenSonic™ transducer technology and Nivelco's latest QUEST+™ software with advanced, process adaptive digital signal processing.
The flexibility of its programming makes the EchoTREK the ideal level metering tool for basic applications requiring only a level proportional output (excl. open reservoirs) as well as for complex applications requiring linearisation, relay action, fixed target suppression (excl. agitated process tanks containing heavily fuming chemicals).
EchoTREK is offered with Polypropylene or PVDF transducers as well as with Teflon (PTFE) and stainless steel flush flange mounting.
Available models are listed on page 10.

Programming options for EchoTREK

Touch-Magnet programming (magnetic key supplied): A cost-effective solution for simple and easy applications.

The plug-in programming module: To access and program all features provided by this smart device

Remote: MODBUS and HART.

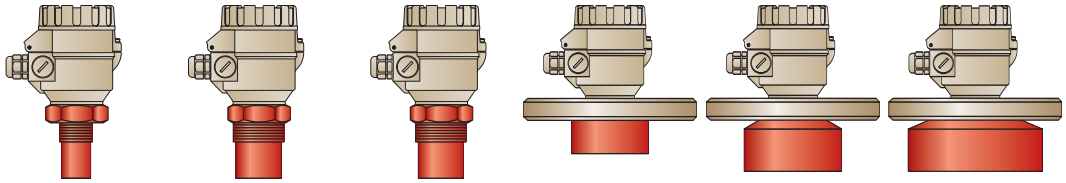
LEVEL - VOLUME - FLOW measurement

EchoTREK in standard form incorporates a current output and a fully programmable power relay that can be used for various alarm and control functions. Over 10 pre-programmed tank shapes for volume calculation as well as 32-point linearisation are also provided.

FLOW metering: EchoTREK can also be used as a smart flow transmitter on open channel applications with more than 20 pre-programmed flume and weir flow formulas. It also has two independent volume flow totalizers and a relay that can be used as a volume flow counter.

EchoTREK

S-300

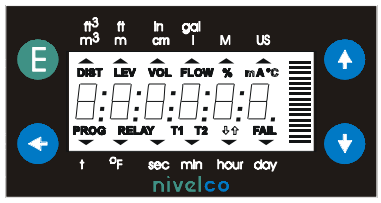


Type	ST/SB-39	ST/SB-38	ST/SB-37	ST/SB-36	ST/SB-34	ST/SB-32
Main application field	Small tanks, where dead band is critical	Small process tanks with 2" process connection		Small process tanks with flanges	Medium process tanks	Medium to large process tanks
Mounting	1 ½" BSP or NPT	2" BSP or NPT		DN80	DN125	DN150
Frequency	80 kHz		50 kHz	60 kHz	40 kHz	20 kHz
Penetration through fumes/vapour, foam	x		xx		xxx	xxxx

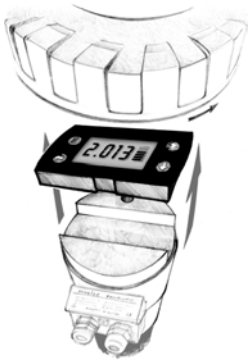
x= weak; xxxx= excellent

PROGRAMMING

SAP-100 programming module/indicator: is used for programming and/or displaying measurement values.
Using the SAP-100 for programming, operators can choose between menu driven "QUICKSET" or full parameter programming to access all features of this smart device, matching performance levels of Two-Part systems.
Acting as a field indicator permanently plugged into the EchoTREK, measurement values are displayed in 6-digits of selected metric or US engineering units as well as on a bargraph.



SAP-100 module



Remote programming: / Digital Communication.

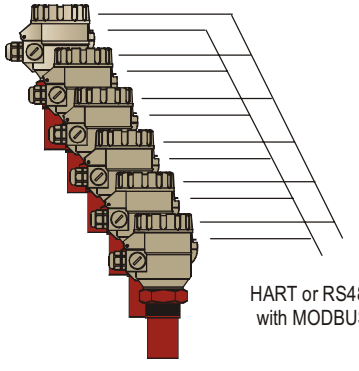
Digital communication makes possible remote programming of and acquiring information from the field devices.

HART

EchoTREK with HART and the configuration software E*view* (running under Windows) enables remote programming of up to 15 field devices and viewing of the primary measurement values on the PC.

RS485 with MODBUS protocol

for remote programming and monitoring of up to 30 field devices and monitoring, data acquisition.



HART or RS485 with MODBUS

Two-Part Measurement Systems

The **Two-Part Measurement System** consists of **SenSonar Sensor(s)** and a **NIVOSONAR Control Unit** for processing of the special signal provided by the sensor, indication and the output of measurement values.

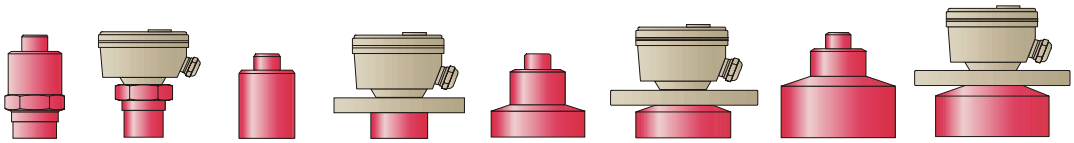
SenSonar Sensors

- Incorporating Nivelco's latest SenSonic™ transducer technology, providing an excellent narrow beam angle and high efficiency for superb signal reproduction.
- SenSonar Sensors are also offered in Ex versions: "EEx ia" - Intrinsically safe (IS) versions requiring [EEx ia] certified Control Units.

See certificates on page 9

Versions	STANDARD Sensors (SI-300 series)	FULL FEATURE Sensors (SS-300 series)
See all available versions on page 10.		
Mechanical Prot.	IP68	IP65
Transducer material	PP, PVDF, PTFE (Teflon), Stainless steel	PP, PVDF
Electrical connection	Direct cable outlet	Plastic or Aluminum housing with Pg16 cable glands or ½" NPT conduit
Heating	Optional	n.a.

SenSonar SI/SS-300



Type	SI-38	SS-38	SI-36	SS-36	SI-34	SS-34	SI-32	SS-32
Main application field	Open channel flow metering, water treatment	Small tanks where the minimum measuring range is critical	Open channel flow metering, water treatment	Non-fuming, non-foaming liquids Small sized tanks	Water/ waste-water applications with foam	Fuming and/or foaming liquids Medium sized tanks	Water/ waste-water applications with heavy foam	Heavy fuming and/or foaming liquids. Medium to tall tanks
Mounting	1" or 2"	2"	1", DN80	DN80	1", DN100	DN125	1", DN150	DN150
Frequency	80 kHz		60 kHz		40 kHz		20 kHz	
Penetration through fumes/vapour, foam	x		xx		xxx		xxxx	

x= weak; xxxx= excellent

NIVOSONAR Control Units

These control units feature Nivelco's QUEST+™ software using advanced, process adaptive digital signal processing.
With the control unit located remotely from the sensor(s), measurement indication and programming via display and full keypad is provided for the convenience of the user/operator. Control Units are offered with various features and mechanical designs:

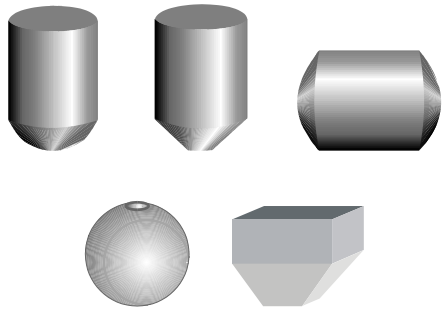
NIVOSONAR SM-300

Type	SMM/SMZ-300	SMW/SMC/SMD/SMH-300
Mounting	Panel mounting	Wall mounting
Mechanical protection	IP40	IP54 or IP65
Measuring channel(s)	1	Up to 2
Current output	1	Up to 2
Relays	Up to 3	Up to 8
RS485	Optional	Optional
Heating	NA	Optional
Differential level meas.	NA	Standard

Features (common to both Compact and Two-part systems)

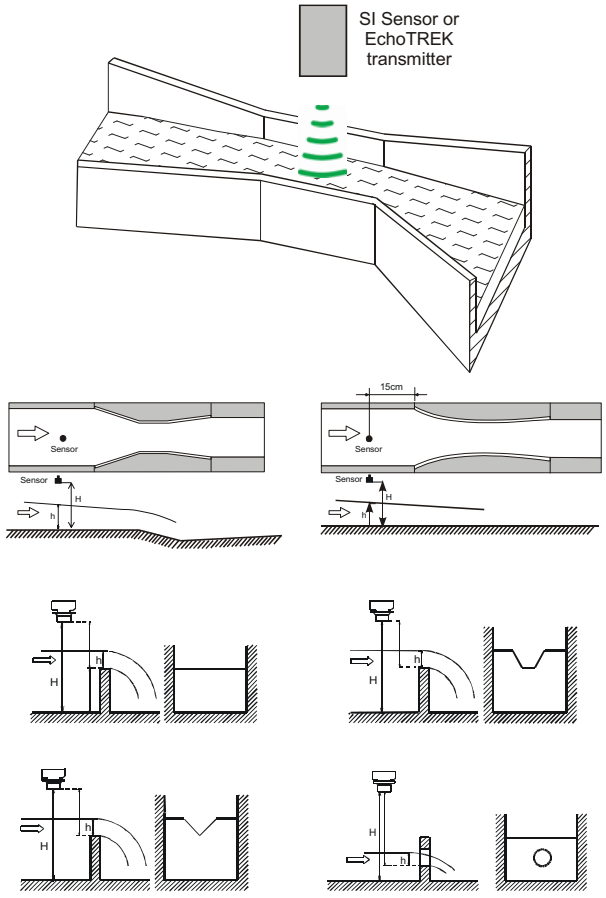
LEVEL / VOLUME MEASUREMENT

- Using over 10 pre-programmed tank shapes or 32-point linearisation



OPEN CHANNEL FLOW METERING PACKAGE

- Standard in all Nivelco ultrasonic devices
- Flow calculation based on:
  - 9 preset Parshall Flumes (Flumes supplied by NIVELCO)
  - General Parshall flume
  - Venturi flume
  - Weirs
  - General flow formula
  - 32-point linearisation



- Two independent (one resettable) volume flow totalisers
- Relay output as volume flow counter

OTHER CALCULATIONS / FEATURES

- Differential level metering (rake/screen control)
- Trend monitoring and level changing rate calculation
- Temperature monitoring

ANALOGUE OUTPUT

- Can be assigned to all measured or calculated values
- Other programmable features:
  - 0 to 20mA or 4 to 20mA
  - Normal or inverted mode
  - Failure indication modes: Hold, below 4 mA, above 20 mA

RELAY OUTPUTS

- The relays can be assigned to over 30 different functions.
- Some of the relay functions
  HIGH/LOW FAILSAFE ALARM
  DIFFERENTIAL LEVEL SWITCHING (Hysteresis control)
  WINDOW SWITCHING
  ALTERNATING PUMP CONTROL
  VOLUME FLOW COUNTER
  FAILURE INDICATION (Errors of Self Diagnostic System)
  VOLUME/FLOW TOTALISER
  LEVEL CHANGING RATE ALARM
  TEMPERATURE ALARM
  etc.
- Other user selectable features:
  - energised or de-energised relay action
  - adjustable time delay for relay action

32-POINT LINEARISATION CURVE

- Level to level, level to volume and level to flow calibration

FIXED TARGET SUPPRESSION

- Up to two disturbing objects can be blocked out at fix levels (with EchoTREK only)

AUTOMATIC SIGNAL PROCESSING FEATURES (QUEST™)

- Agitator/stirrer filtering
- Automatic floating average curve
- Automatic dead band control

ACCESS LOCK BY SECRET CODE

- A 4-digit secret code to prevent unauthorised access

FULLY SELF-DIAGNOSTIC SYSTEM with individual error messages

- Errors, depending on their nature, are assigned to different codes for customer information and further processing

DEVICE HISTORY

- User can read out data relating to the device history, such as total operating hours, operation after last switch-on, number of switching actions for each relay, min. and max. registered temperatures etc.

SERVICE & TEST PARAMETERS

- Read-out data, reporting on operating conditions such as sensor gain, echo amplitude, noise level etc. to facilitate the commissioning or troubleshooting of the system.

DIGITAL SIGNAL INPUT (For SM-300 control units only)

- This input can be used for various synchronising functions such as remote calibration of the output signal by a level switch

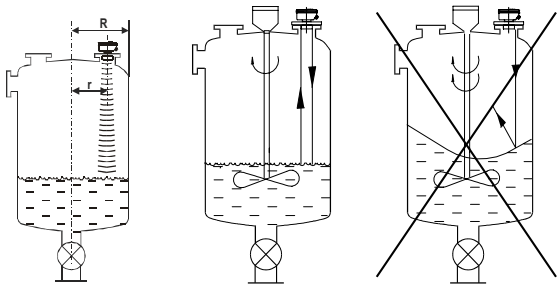
DIGITAL COMMUNICATION

- RS485 (Special Nivelco protocol) with the Two-Part system
- RS485 (MODBUS protocol) and HART (Eview configuration software) with the Compact transmitter.

INSTALLATION

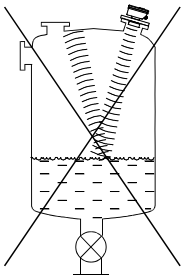
POSITION

The optimal position of the EchoTREK transmitter and the SenSonar sensor is between r = 0,3 R and 0,5 R of the cylindrical tank/silo. The sonic cone on page 1 has also to be taken into consideration



SENSOR ALIGNMENT

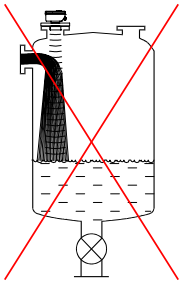
The sensor face must be parallel to the surface of the liquid within ± 2-3°.



OBSTACLES

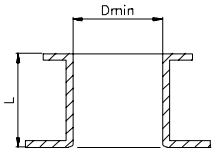
Make sure that no in-flow path or objects (e.g. cooling pipes, ladders, bracing strut, thermometers, etc) or no uneven tank wall surfaces (welding seam) protrude into the sensing cone of the ultrasonic beam.

One fixed object in the tank / silo that disturb the measurement can be blocked out by. appropriate programming of the EchoTREK



STAND-OFF PIPE FOR SENSONAR (Two-part system)

The structure of the stand off pipe should be rigid, the inner rim where the ultrasonic beam leaves the pipe should be rounded.



L [mm]	D_{min}[mm]			
	S-38	S-36	S-34	S-32
500	125	150	200	300
300	100	125	175	200
200	85	100	150	175

FOAM

In cases where there is foam above the liquid, exceeding 1-2 cm, ultrasonic devices with lower measuring frequency (40, 20 kHz) are recommended. Ideally a location should be found, where only minimal foaming occurs. Locate unit as far as possible from liquid inflow or install in a stilling pipe.

FUMES/VAPOUR

In case of closed tanks containing chemicals or other liquids creating fumes/gases above the liquid surface, especially outdoor tanks exposed to the sun, a strong reduction of the nominal measuring range of the unit must be taken into consideration.

Units with lower measuring frequency (40, 20 kHz) are recommended depending on the range.

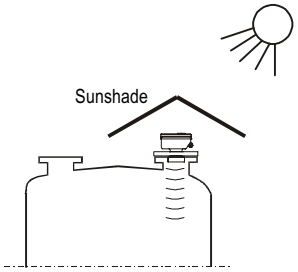
WIND/STORM

An intensive movement of air (gas) in the vicinity of the ultrasonic cone is to be avoided. A strong wind or storm may "blow away" the ultrasound.

Units with lower measuring frequency (40, 20 kHz) are recommended.

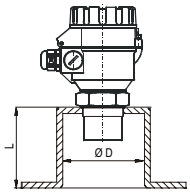
TEMPERATURE

Make sure that the transmitter will be protected against overheating by direct sunshine.

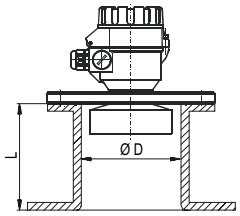


STAND-OFF PIPE FOR THE ECHOTREK

The structure of the stand off pipe should be rigid, the inner rim where the ultrasonic beam leaves the pipe should be rounded.

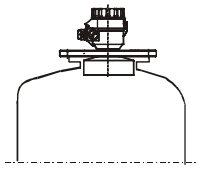


L (mm)	D_{min}		
	S□□ -39□	S□□ -38□	S□□ -37□
150	50	60	60
200	50	60	75
250	65	65	90
300	80	75	105
350	95	85	120

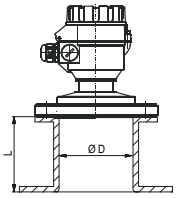


L (mm)	D_{min}	
	S□□ -36□	S□□ -34□
90	80	*
200	80	*
350	85	*
500	90	*

* For values consult your distributor



S-32 models with plastic transducer must not be installed in stand-off pipes since the transducer face has to protrude into the tank.



L (mm)	D_{min}		
	S□S -36□	S□S -34□	S□S -32□
320	80	-	-
440	-	125	-
800	-	-	150

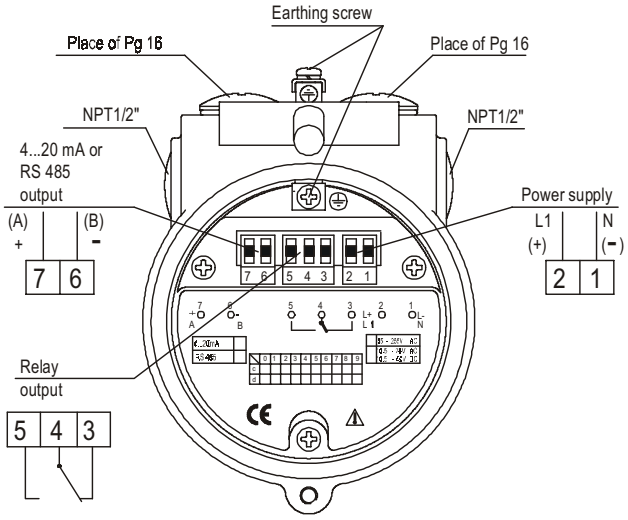
Electrical Connections for the EchoTREK Compact Transmitters

EchoTREK ST/SB-300

- Wiring can be carried out by using one or two cables. Wires in group A must not be led in the same cable as wires in group B or C

Group A	Group B	Group C
Low voltage power supply	4 … 20 mA.	RS485 (shielded twisted pair)
	SELV power supply	
Low voltage for the relay	SELV power or logic signal for the relay	

- Devices with metal housing must be grounded at the internal or external grounding screw terminal. Plastic housing versions have not to be grounded; (use negative pole of the power supply for connecting to PLC grounding).
- Three-wire installation is also possible for the 24VDC versions by connecting terminals 1 and 6.
  In this case the galvanic isolation is not provided.



Electrical Connections Two-Part Measurement Systems

SENSONAR SI/SS-300 SENSORS SM-300 CONTROL UNITS

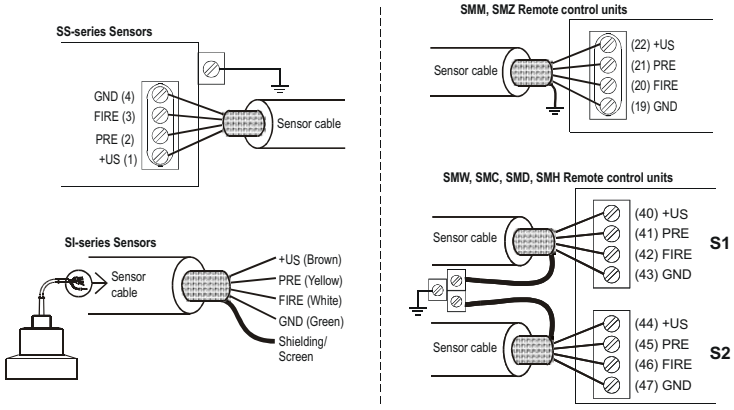
- For connecting sensors to control units, use type of cable described in the "Technical Data Table"
- Signal cables must not be run in common with high voltage cables
- If signal cables of more than one sensor are run in a common duct, ensure that they are individually shielded/screened
- For safe grounding of the metal housing of SS-300 sensors, use earth / ground screw terminal in housing
- The SYNC input of the Control Units is TTL compatible.

  The SYNC input is not available for Ex certified Control Units.

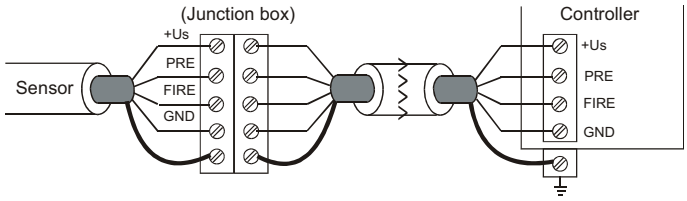
  Active state: when the SYNC input is connected to earth/ground or the voltage on it is lower than 0.4V.

  Inactive state: when the SYNC input is left open/free or voltage on it is higher than 2.4V (U_{MAX}= 12 V).

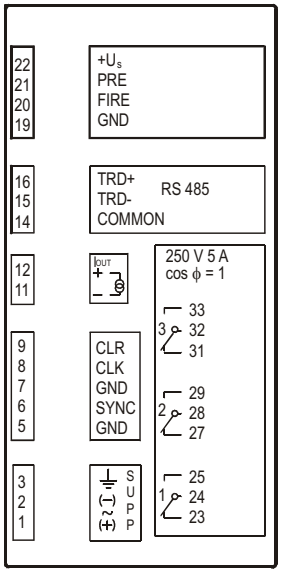
WIRING BETWEEN SENSOR AND CONTROL UNIT



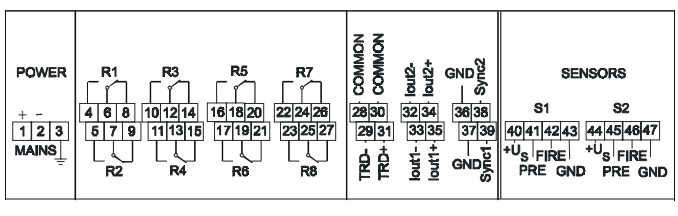
WIRING, WITH EXTENDED SENSOR SIGNAL CABLE

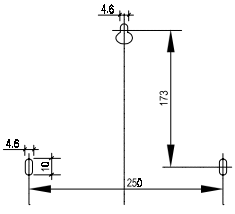


SMM, SMZ PANEL MOUNTING CONTROL UNITS

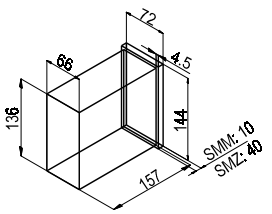


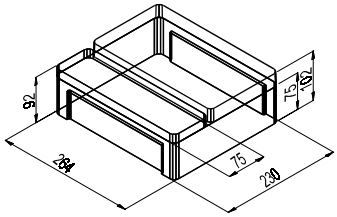
SMW, SMC, SMD, SMH AND SW-300 WALL MOUNTING CONTROL UNITS





Cut-out dimensions: $68^{+0.7}$ x $138^{+1.0}$





TECHNICAL DATA, STAND-ALONE UNITS

ECHOTREK COMPACT TRANSMITTERS

GENERAL SPECIFICATIONS

Product name	EchoTREK ST/SB-300 series
Product description	Compact type ultrasonic level transmitter
Transducer materials	Polypropylene (PP) Kynar (PVDF) Teflon (PTFE) Stainless Steel (DIN 1.4571, AISI SS316Ti)
Housing material	Plastic: PBT fibre-glass reinforced, flame-retardant (DuPont®) Aluminium: Powder paint coated
Process temperature	PP, PVDF and PTFE versions: -30 °C … +90 °C Stainless steel versions : -30°C … +100°C (CIP 120°C for max. 2 hours)
Ambient temperature	-30 … +60 °C with SAP-100 progr. module –25 …+60 °C (if necessary protect the device from over heating by direct sunshine!)
Pressure (Absolute.)	0.3 … 3 bar (0.03 … 0.3MPa) Stainless steel versions 0.9… 1.1 bar (0.090 … 0.11 MPa)
Seals	PP transducer: EPDM All other transducer versions: FKM (Viton)
Ingress protection	Sensor: IP68 (submersible) Housing: IP67 (NEMA 6)
Power supply / Consumption	High voltage version: 85 … 255 V AC (50-60 Hz) / 6 VA Low voltage version: 10.5 … 28 V AC (50-60 Hz) / 4 VA, 10.5 … 40 V DC / 3.6 W
Accuracy*	±(0.2% of the measured distance +0.05% of range)
Resolution	Depending on distance to be measured < 2 m: 1 mm, 2...5 m: 2 mm, 5...10 m: 5 mm, > 10 m: 10 mm
Outputs	Analogue: 4/20 mA, 600 Ohm, galvanically isolated, overvoltage protection
	Contact: SPDT; 250 V AC, 3 A
	Display (SAP-100): 6 digits, icons and bargraph, Custom LCD
Digital communication	HART RS 485 with MODBUS
Electrical connections	2 x Pg16 or 2 x ½" NPT Wire cross section: 0.5 ... 2.5 mm²
Electrical protection	Class I. with aluminium housing and Class II with plastic housing

**Under optimal conditions of reflection and stabilised transducer temperature.*

SPECIAL DATA OF ECHOTREK FOR LIQUIDS WITH PP AND PVDF TRANSDUCERS

Type	ST□ - 39□-□ SB□- 39□-□	ST□-38□-□ SB□-38□-□	ST□-37□-□ SB□-37□-□	ST□-36□-□ SB□-36□-□	ST□-34□-□ SB□-34□-□	ST□-32□-□ SB□-32□-□
Transducer material	PP or PVDF	PP or PVDF	PP or PVDF	PP or PVDF	PP or PVDF	PP or PVDF
Max. measuring distance * [m / ft]	4 / 13	6 / 20	8 / 26	10 / 33	15 / 49	25 / 82
Min. measuring distance* (Dead band) [m / ft]	0.2 / 0.65	0.25 / 0.82	0.35 / 1.2	0.35 / 1.2	0.45 / 1.5	0.6 / 2
Total beam angle (-3 dB)	6°	5°	7°	5°	5°	7°
Measuring frequency	80 kHz	80 kHz	50 kHz	60 kHz	40 kHz	20 kHz
Process connection	1 ½" thread	2" thread	2" thread	Flange	Flange	Flange

* (from transducer face)

SPECIAL DATA OF ECHOTREK FOR LIQUIDS WITH PTFE AND STAINLESS STEEL TRANSDUCERS

Type	STT-39□-□ SBT-39□-□	STT-38□-□ SBT-38□-□	STT-37□-□ SBT-37□-□	STS-36□-□ SBS-36□-□	STS-34□-□ SBS-34□-□	STS-32□-□ SBS-32□-□
Transducer material	PTFE	PTFE	PTFE	St. St.	St. St.	St. St.
Maximum measuring distance * [m/ft]	3 / 10	5 / 16	6 / 20	7 / 23	12 / 39	15 / 49
Min. measuring distance* (Dead band) [m/ft]	0.2 / 0.65	0.25 / 0.82	0.35 / 1.2	0.4 / 1.3	0.55 / 1.8	0.65 / 2.2
Total beam angle (-3 dB)	6°	5°	7°	5°	5°	7°
Measuring frequency	80 kHz	80 kHz	50 kHz	60 kHz	40 kHz	20 kHz
Process connection	1 ½" thread	2" thread	2" thread	Flush flange	Flush flange	Flush flange

* (from transducer face)

SAP-100 PROGRAMMING MODULE

Field indication	6 digits, icons and bargraph, Custom LCD
Ambient temperature	-25 … +60°C
Housing material	PBT fibre-glass reinforced plastic, flame-retardant (DuPont®)

TECHNICAL DATA, TWO-PART SYSTEMS

SenSonar Sensors

GENERAL SPECIFICATIONS

Product name	SenSonar SI/SS-300 series	
Product description	Sensor for Two-Part Ultrasonic Level Metering System	
Transducer materials	**SIA/SSA**: Polypropylene (PP) **SIB/SSB**: Kynar (PVDF) **SIT**: Teflon (PTFE) **SIS**: Stainless Steel (DIN 1.4571, AISI SS316Ti)	
Housing material	**SI**: Same as transducer material; **SS**: Paint coated Aluminium; **SIT-380** and **SIS-3☐☐**: PP	
Process temperature	**SIA/SIB/SSA**: -30 ... +80 °C **SSB**: -30 ... +90 °C **SIS/SIT**: -30 ... +100 °C (CIP 120° for max. 2 hours)	*Ex versions*: **SSA, SIA:** -20 ... +70 °C **SSB:** -20 ... +80 °C **SIB:** -20 ... +75 °C
Ambient temperature	**SSA, SSB,SIT,SIS** -30 ... + 60 °C **SIA, SIB: -**30 ... +80 °C	Ex: **SSA, SSB:** -20 ... +60 °C **SIA, SIB:** -20 ... +70 °C
Pressure (Absolute.)	0.3 ... 6 bar (0.03 ... 0.6 MPa) with or without suitable flange. Ex versions at atmospheric pressure only!	
Seals	PP version: EPDM All other versions: FKM (Viton)	
Ingress protection	**SI**: IP68 (NEMA 6X), submersible; **SS**: Sensor: IP68 (NEMA 6X), submersible, Housing: IP65 (NEMA 4)	
Electrical connections	**SI**: Direct cable outlet; **SS**: screw terminals in housing with 2 x Pg16	
Signal cable	4-wire shielded cable; wire cross section: 0.5 ... 2.5 mm²; max. 50nF, max. 20 Ohm	
Length of signal cable	Recommended max. cable length: 300 m; recommended type: LIYCY 4 x 0.75 mm²	
Electrical protection	Class III with surge protection	

PP AND PVDF SENSORS

Type	SI☐-38☐ / SS☐-38☐	SI☐-36☐ / SS☐-36☐	SI☐-34☐ / SS☐-34☐	SI☐-32☐ / SS☐-32☐
Transducer material	PP or PVDF	PP or PVDF	PP or PVDF	PP or PVDF
Max. measuring distance [m/ft]	6 / 20 EEx ia: 4 / 13	10 / 33 EEx ia: 7 / 23	15 / 45 EEx ia: 10 / 33	20 / 66 EEx ia: 20 / 65
Min. meas. dist. [m/ft]	0.25 / 0.65	0.35 / 1.2	0.45 / 1.5	0.6 / 2
Total beam angle	5°	5°	5°	6°
Measuring frequency	80 kHz	60 kHz	40 kHz	20 kHz
Process connection	2" thread	Flange	Flange	Flange

PTFE AND STAINLESS STEEL SENSORS

Type	SIT-38☐	SIS-36☐	SIS-34☐	SIS-32☐
Transducer material	PTFE	St. St.	St. St.	St. St.
Max. meas. dist. [m/ft]	4 / 13	7 / 23	12 / 39	25 / 80
Min. meas. dist. [m/ft]	0.3 / 1	0.35 / 1.2	0.55 / 1.8	0.65 / 2.2
Total beam angle	5°	5°	5°	7°
Measuring frequency	80 kHz	60 kHz	40 kHz	20 kHz
Process connection	2" thread	Flush flange	Flush flange	Flush flange

NIVOSONAR CONTROL UNITS

Product name	Nivosonar SM-300 series
Product description	Control unit for Two-Part Ultrasonic Level Metering System
Mounting	**SMM**, **SMZ**: Panel Mounting **SMW**, **SMC**, **SMD**, **SMH**: Wall Mounting
Measuring channel	**SMM**, **SMZ**: 1 channel /1 sensor **SMW**, **SMC**, **SMD**, **SMH**: with 1 or 2 channel/sensor (processing the special signals of 2 sensors)
Resolution	Depending on distance to be measured < 2 m: 1 mm, 2 ... 5 m: 2 mm, 5 ... 10 m: 5 mm, > 10 m: 10 mm
Accuracy*	±(0.25% of measured distance +0.1% of range)
Ambient temperature	**SMM**, **SMZ**: 0 ... +50 °C **SMW**, **SMC**, **SMD**: -20 ... +50 °C **SMH**: -30 ... +50 °C
Analogue output	Galvanically isolated; 0/4 ... 20 mA; max. 500 Ohm with surge protection
Relay output	SPDT (NO/NC); 250 V AC, 5 A
Electrical protection	Class II with surge protection
Mechanical protection	**SMM:** Front: IP40; rear: IP20 **SMZ**: Front: IP54; rear: IP20 **SMW**: IP54 **SMC**, **SMD**, **SMH**: IP65
Supply voltage	230 or 110 or 24 V AC, 50 ... 60 Hz; or 24 V DC (specify when ordering)
Power consumption	**SMM**, **SMZ**: max. 10 VA **SMW**, **SMC**, **SMD**: max. 12 VA **SMH**: max. 25 VA

*Under optimal conditions of reflection and stabilised transducer temperature.

APPROVALS

CE All NIVELCO ultrasonic devices are designed and manufactured to conform to the following EC directives:

Directive 89/336 (for Electromagnetic Compatibility)
Directive 73/23 (93/68) (for Low Voltage Equipment)

The devices have been tested according to the following standards:

EN50081-1, EN50081-2, EN50082-1 EN50082-2, EN55022:1987
IEC 801-2, IEC 801-3, IEC 801-4, CEI/IEC 61326-1, CEI/IEC 1000-4-5

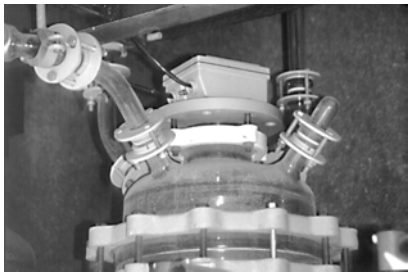
HAZARDOUS AREA APPROVALS OF INTRINSICALLY SAFE SENSONAR SENSORS:

• SIA/SIB-300 series	CENELEC certificate: EEx ia IIB T6 ATEX Group II. 1G (ZONE 0) prEN50284 / Entwurf1997)	No.: Ex 98.D.007X	Issued by: TÜV, Austria
• SS-300 series	CENELEC certificate: EEx ia IIB T6	No.: Ex 98.D.008X	Issued by: TÜV, Austria
• SI/SS-300 series	Class I, Div. 2, Gr. A, B, C and D, Class II, Gr. E, F and G	No.: LR114131-1	Issued by: CSA, Canada

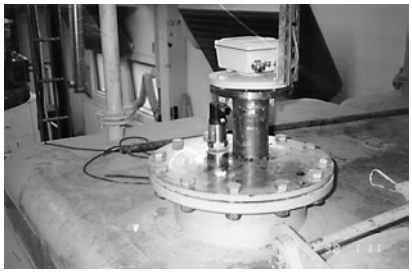
HAZARDOUS AREA APPROVALS FOR NIVOSONAR CONTROL UNITS FOR USE WITH EEX IA APPROVED SENSONAR SENSORS:

• SMM/SMZ-300 series	CENELEC certificate: [EEx ia]	No.: Ex 98.D.006X	Issued by: TÜV, Austria
• SMW/SMD- 300 series	CENELEC certificate: [EEx ia]	No.: Ex 98.D.004X	Issued by: TÜV, Austria
• SM-300 series:	Class II, Groups E, F and G	No.: LR114131-1	Issued by: CSA, Canada

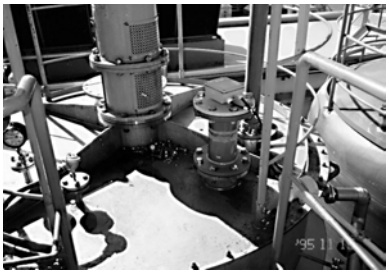
APPLICATION EXAMPLES



Measurement of various chemical ingredients with Compact Transmitter in a pharmaceutical plant



Measurement of paint with EEx ia system in a paint manufacturing plant



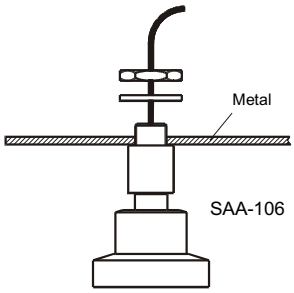
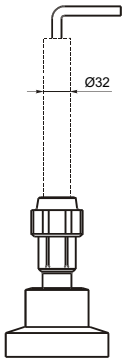
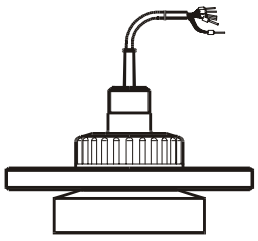
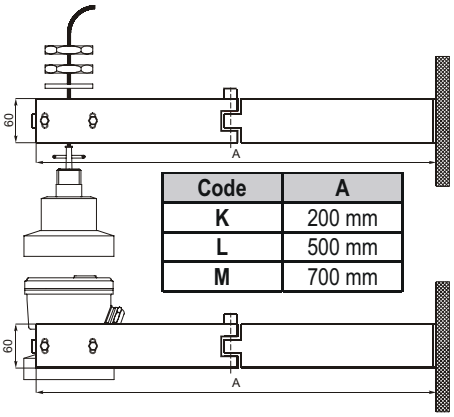
Measurement of an outdoor Sulphuric Acid tank with Compact Transmitter in a chemical plant

Open channel flow measurement with Two-Part system

Level measurement in open reservoir with Two-Part System in a sewage treatment plant

Measurement of 22 m high liquid fertiliser tanks with Compact Transmitters

MOUNTING ACCESSORIES

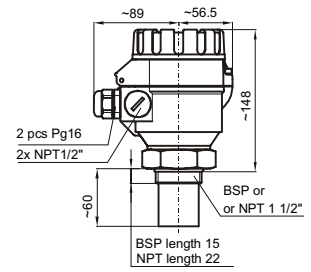
Damping Gland	Fast Connecting Gland	Flanges for SIA/SIB	Mounting Brackets
			
Recommended for mounting SIA/SIB sensors on a thin resonating plate	For easy mounting to pipes	SIA/SIB sensors are factory equipped with a suitable flange for appropriate mounting on flanged tanks	

Code	A
K	200 mm
L	500 mm
M	700 mm

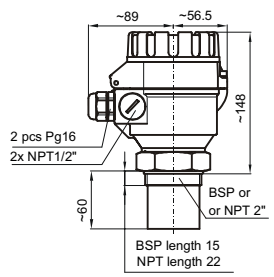
DIMENSIONS

ECHOTREK COMPACT TRANSMITTERS

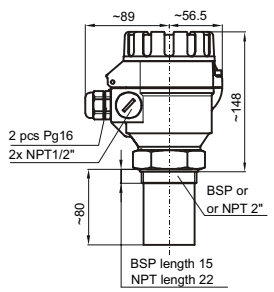
EchoTREK S□□-39□-□ / PP, PVDF, PTFE



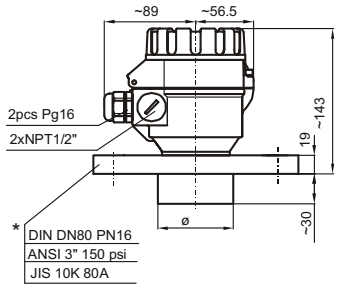
EchoTREK S□□-38□-□ / PP, PVDF, PTFE



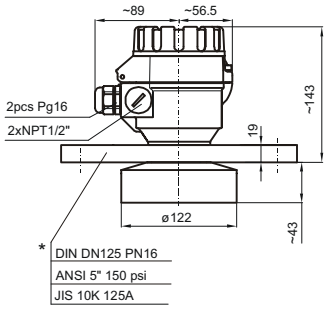
EchoTREK S□□-37□-□ / PP, PVDF, PTFE



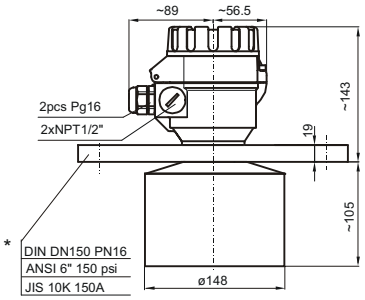
EchoTREK S□□-36□-□ / PP, PVDF



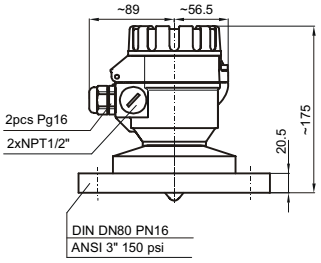
EchoTREK S□□-34□-□ / PP, PVDF



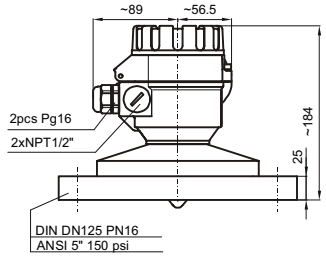
EchoTREK S□□-32□-□ / PP, PVDF



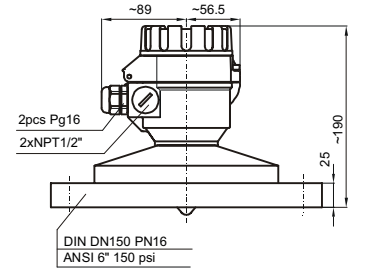
EchoTREK S□S-36□-□ / St. St.



EchoTREK S□S-34□-□ / St. St.



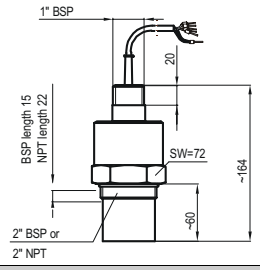
EchoTREK S□S-32□-□ / St. St.



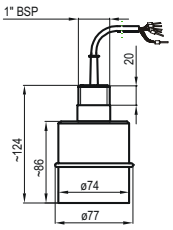
* minimum flange size

SENSONAR SENSORS

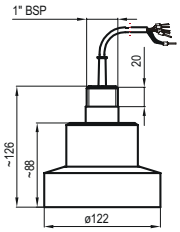
SenSonar SI□-38□ / PP, PVDF



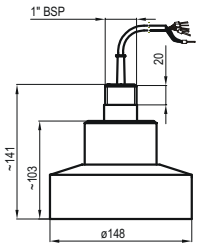
SenSonar SI□-36□/ PP, PVDF



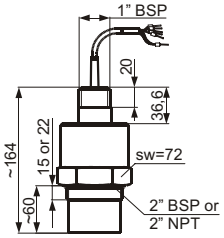
SenSonar SI□-34□ / PP, PVDF



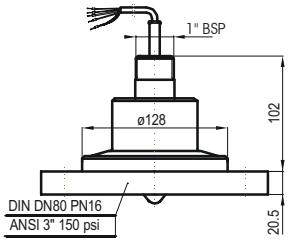
SenSonar SI□-32□ / PP, PVDF



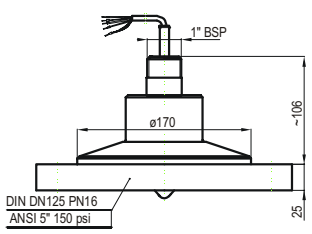
SenSonar SIT-38□ PTFE



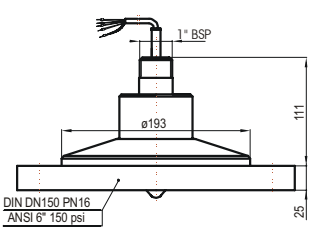
SenSonar SIS-36□ / St.St.,



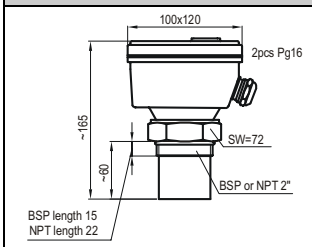
SenSonar SIS-34□/ St.St.,



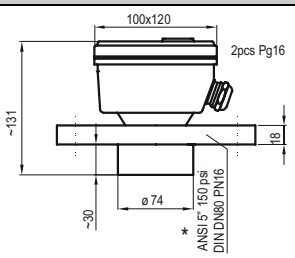
SenSonar SIS-32□ / St.St.,



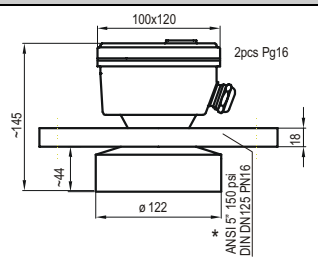
SenSonar SS□-38□/ PP, PVDF



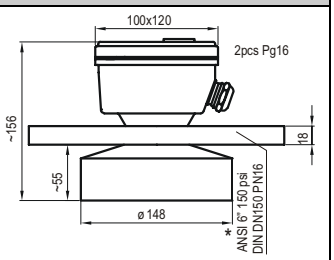
SenSonar SS□-36□ / PP, PVDF



SenSonar SS□-34□/ PP, PVDF



SenSonar SS□-32□/ PP, PVDF



* minimum flange size

ORDER CODES

ECHOTREK COMPACT TRANSMITTERS

Note: not all combinations of order numbers are possible

S □□ - 3 □□ - □

TYPE	CODE
Transmitter	T
Transmitter with local indicator	B

TRAMSDUCER / HOUSING	CODE
PP/Aluminium	A
PVDF / Aluminium	B
PTFE / Aluminium	T
St. St. / Aluminium	S
PP / Plastic	P
PVDF / Plastic	V
PTFE / Plastic	F
St. St. / Plastic	M

RANGE*	CODE
25 m	2
15 m	4
10 m	6
8 m	7
6 m	8
4 m	9

MOUNTING**	CODE
BSP thread	0
NPT thread	N
DN 80	2
DN 100	3
DN 125	4
DN 150	5
DN 200	6
200 mm bracket	K
500 mm bracket	L
700 mm bracket	M

SUPPLY / OUTPUT	CODE
85 to 255 V AC	
4 / 20 mA + Relay	1
4 / 20 mA + Relay + HART	3
RS 485 + Relay	5
10,5 to 40 V DC 10,5 to 28 V AC	
4 / 20 mA + Relay	2
4 / 20 mA + Relay + HART	4
RS 485 (MODBUS) + Relay	6

* for measuring ranges of PTFE (teflon) and St.St. (stainless steel) versions, see Technical Data table
** S…-39, 38 or 37 with thread, all other models with flange or bracket
Note: for relevant ANSI & JIS flanges consult your Nivelco distributor

ECHOTREK SAP-100 Plug-in Programming Module

SENSONAR SENSORS (Two-Part System)

S □□ - 3 □□ - □

TYPE	CODE
Standard (IP68)*	I
Full feature (IP 65)	S

TRANSDUCER	CODE
PP	A
PVDF	B
PTFE	T
Stainless steel	S

RANGE**	CODE
25 m	2
15 m	4
10 m	6
6 m	8

MOUNTING	CODE
BSP thread	0
NPT d	N
DN 80	2
DN 100	3
DN 125	4
DN 150	5
DN 200	6
200 mm bracket	K
500 mm t	L
700 mm t	M
Fast conn. gland	F

APPROVAL	CODE
None	0
EEx ia IIB T6	9

* SI-300 sensors are delivered with 3 m cable unless otherwise specified (max. order length: 30 m; further extension possible).
** For measuring ranges of PTFE, St.St. and Ex versions, see Technical Data table
*** 1" for all St. versions, 2" for SI/SS-38.

NIVOSONAR CONTROL UNITS (Two-Part System)

S M □ - 3 □□ - □

TYPE	CODE
Panel mount	M
Panel mount, lockable cover	Z
Wall mount IP 54	W
Wall mount IP 65 screw cover	C
Wall mount IP 65 locable cover	D
Wall mount IP 65 heated	H

CURRENT OUTPUT / RS 485			
Single channel version		Dual channel version	
None	1	None	5
1x 4 … 20 mA	2	2x 4 … 20 mA	6
RS 485	3	RS 485	7
1x 4 … 20 mA + RS 485	4	2x 4 … 20 mA + RS 485	8

RELAY OUTPUT	CODE
0 Relay	0
1 Relay	1
2 Relays	2
3 Relays	3
4 Relays	4
5 Relays	5
6 Relays	6
7 Relays	7
8 Relays	8

POWER SUPPLY / APPROVAL	CODE
230 V AC /Standard	1
110 V AC /Standard	2
24 V AC / Standard	3
24 V DC / Standard	4
230 V AC / [EEx ia]	5
110 V AC / [EEx ia]	6
24 V AC / [EEx ia]	7
24 V DC / [EEx ia]	8

Technical specification may be changed without notice

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