Instruction Manual for
i-Series Intelligent Sensors

(Original Instruction Manual – English)

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Translation

If the device is sold to a country in the European Economic Area (EEA) this instruction handbook must be translated into the language of the country in which the device is to be used.

Should the translated text be unclear, the original instruction handbook (German) must be consulted or the manufacturer contacted for clarification.

Names

The use of general descriptive names, trade names, trademarks and the like in this handbook does not entitle the reader to assume they may be used freely by everyone. They are often protected registered trademarks even if not marked as such.

1   Contents

1.1   Table of Contents

1.2 Ex-Approval sensors (option)

TRaC
testing regulatory and compliance

1 EC TYPE EXAMINATION CERTIFICATE

2 Equipment or protective system intended for use in potentially explosive atmospheres – Directive 94/9/EC – Annex III

3 EC Type Examination Certificate No.: **TRAC12ATEX0031X**

4 Equipment: **Ultrasonic Transducers, i-Series Intelligent Sensors**

5 Manufacturer: **Nivus GmbH,**

6 Address: **Im Täle 2, 75031 Eppingen, Germany**

7 This equipment and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

8 TRaC Global Ltd, Notified Body number 0891 in accordance with Article 9 of the Council Directive 94/9/EC of 23 March 1994, certifies that this equipment has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of equipment or protective system intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in the confidential report **TRA-008917-33-02A.**

9 Compliance with the Essential Health and Safety Requirements with the exception of those listed in section 18 of the schedule to this certificate, has been assured by compliance with:

EN60079-0:2009   **EN60079-18:2009**

10 If the sign "X" is placed after the certificate number, then this indicates that the equipment or protective system is subject to special conditions of safe use specified in the schedule to this certificate.

11 This EC-Type Examination certificate relates only to the design and construction of the specified equipment in accordance with Directive 94/9/EC. Further requirements of this Directive apply to the manufacture and supply of this equipment.

12 The marking of this equipment or protective system shall include the following:

⟨Ex⟩ **II 2 G Ex mb IIC T4 Gb** T_{amb} = -40°C to +80°C

II 2 D Ex mb IIIC T135°C Db

This certificate and its schedules may only be reproduced in its entirety and without change. This certificate is issued in accordance with the TRaC Ex Certification Scheme.

S.P. Winsor
S P Winsor Certification Officer

Issue date: 2012-09-06
Copy No.:   1e
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TRaC
testing regulatory and compliance

1 **EC TYPE EXAMINATION CERTIFICATE**

2 Equipment or protective system intended for use in potentially explosive atmospheres – Directive 94/9/EC – Annex III

3 EC Type Examination Certificate No.: **TRAC12ATEX0030X**

4 Equipment: **Ultrasonic Transducers, i-Series Intelligent Sensors**

5 Manufacturer: **Nivus GmbH,**

6 Address: **Im Täle 2, 75031 Eppingen, Germany**

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   EN60079-0:2009   EN60079-11:2012   EN60079-26:2007

10 If the sign "X" is placed after the certificate number then this indicates that the equipment or protective system is subject to special conditions of safe use specified in the schedule to this certificate.

11 This EC-Type Examination certificate relates only to the design and construction of the specified equipment in accordance with Directive 94/9/EC. Further requirements of this Directive apply to the manufacture and supply of this equipment.

12 The marking of this equipment or protective system shall include the following:

   ⟨Ex⟩ II 1 G Ex ia IIC T4 Ga T_{amb} -40°C to +80°C

   II 1 D Ex ia IIIC T130°C Da

This certificate and its schedules may only be reproduced in its entirety and without change. This certificate is issued in accordance with the TRaC Ex Certification Scheme.

S.P. Winsor

S P Winsor, Certification Officer

Issue date: 2012-09-06

Copy No.

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STOP

The approval is only valid in connection with the respective indication on the sensor nameplate.
The complete EC-type examination certificate (incl. supplements) can be downloaded from www.nivus.com.

2 Overview and use in accordance with the requirements

2.1 Overview

1 Sensor
2 Sensor surface
3 cable

Fig. 2-1 **Overview**

2.2 Use in accordance with the requirements

The i-Series Intelligent Sensor is a highly developed ultrasonic level measurement system which provides non-contacting level measurement for a wide variety of applications in both liquids and solids. Its unique design gives unrivalled performance in echo discrimination and accuracy in a loop powered device.

The device is exclusively intended to be used for purposes as described above. Modifying or using the devices for other purposes without the written consent of the manufacturer will not be considered as use in accordance with the requirements.

Damages resulting from this are left at user's risk.

The device is designed for a lifetime of approx. 10 years. After that period an inspection in addition with a general overhaul shall be made.

Ex-Protection

The Ex-version of the sensor is designed to be used in areas with explosive atmospheres (zone 1 or zone 0).

The transmitter always has to be installed outside of Ex-zones!

Approval (option)

Sensor:
$\langle\!\varepsilon x\!\rangle$ II 2 G Ex mb IIC T4 GB

$\langle\!\varepsilon x\!\rangle$ II 2 D Ex mb IIIC T130 °C Db

$\langle\!\varepsilon x\!\rangle$ II 1 G Ex ia IIC T4 Ga

$\langle\!\varepsilon x\!\rangle$ II 1 D Ex ia IIIC T103 °C Da

The approval is only valid in connection with the respective indication on the transmitter or the sensor nameplate.

For installation and initial start-up the conformity certificates and test certificates of the respective authorities must be followed.

2.3   Specifications

Power Supply	10 - 28 V DC			
Outputs	HART – loop powered (2-wire) or 4-20 mA (3.8 – 22 mA) Profibus PA			
Operating temperature	-40 to 80 °C			
Material sensor body	Valox 357 PBT optional: PVDF			
Ex Approval	II 2 G Ex mb IIC T4 GB II 2 D Ex mb IIIC T130°C Db II 1 G Ex ia IIC T4 Ga II 1 D Ex ia IIIC T103°C Da			
Protection	IP68			
Startup time	Typically 4 seconds (after 12h non- activity 9 seconds)			
Parameter Access	Signal via cable, for setup and data collection using HART protocol (version 7)			
Configuration	Incl. programming software for parameter setting, echo evaluation, linearization and agitator avoidance			
Sensor type	i-3	i-6	i-10	i-15
Measurement range	0.125 m – 3 m	0.3 m – 6 m	0.3 m – 10 m	0.5 m – 15 m
Sensor Frequency	125 KHz, <10° beam angle	75 KHz, <10° beam angle	50 KHz, <10° beam angle	41 KHz, <8° beam angle
Weight	1 kg	1,2 kg	1,3 kg	1,4 kg
Resolution	0,1 % or 2 mm (0.7 inch) whichever is greater			
Measurement uncertainty	0.25 % or 6 mm (whichever is greater)			
Mounting Standard Mounting Option	1” NPT i-3 and i-6 via 1.5" front thread i-10 via 2" front thread			
Options				
Flood protection head	for all types without front thread			
Flange version				

PC interface

All parameters can be accessed and changed via Hart Modem and i-Sensor Hart Lite Communicator.
Trace viewing ability and parameter upload/download capability via Hart Modem and i-Sensor Hart PC.

NIVUS GmbH operates a policy of constant development and improvement and reserve the right to amend technical details as necessary.

3   General Notes on Safety and Danger

3.1   Danger Notes

3.1.1 General Danger Signs

Cautions
are framed and labelled with a warning triangle.

Notes
are framed and labelled with a "hand".

Danger by electric voltage
is framed and labelled with the Symbol on the left.

Warnings
are framed and labelled with a "STOP"-sign.

For connection, initial start-up and operation of the NivuMaster Ultrasonic-Sensors the following information and higher legal regulations (e.g. in Germany VDE), such as Ex-regulations as well as safety requirements and regulations in order to avoid accidents, must be observed.
All operations, which go beyond steps to install, to connect or to program the device, must be carried out by NIVUS staff only due to reasons of safety and guarantee.

3.1.2 Special Danger Notes

Please note that due to the operation in the waste water field, transmitter, sensors and cables may be loaded with dangerous disease germs. Respective precautionary measures must be taken to avoid damage to one's health.

3.2 Device Identification

The instructions in this manual are valid only for the type of device indicated on the title page.

The type ID label is wrapped around the sensor and contains the following specifications:

- Name and phone number of manufacturer

- CE label

- Type and serial number

- Year of manufacture

- Ex-label (on Ex-version devices only) as mentioned in chapter 2.2.

It is important for enquiries and replacement part orders to specify article number as well as serial number of the respective transmitter or sensor. This ensures correct and quick processing.
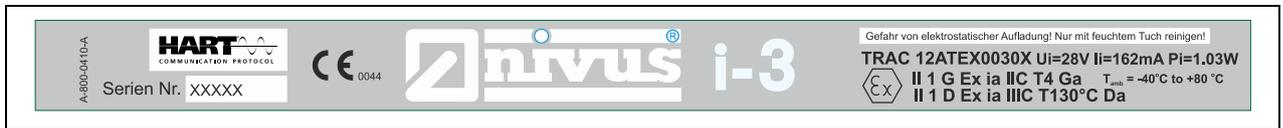
Fig. 3-1   Ex-label zone 0 i-sensors

Fig. 3-2   Ex-label zone 1 i-sensors

This instruction manual is a part of the device and must be available for the user at any time.

The safety instructions contained within must be followed.

It is strictly prohibited to disable the safety contrivances or to change the way they work.

3.3 Installation of Spare Parts and Parts subject to wear and tear

We herewith particularly emphasize that replacement parts or accessories, which are not supplied by us, are not certified by us, too. Hence, the installation and/or the use of such products may possibly be detrimental to the device's ability to work.

Damages caused by using non-original parts and non-original accessories are left at user's risk.

3.3.1 List of Spare Parts

1. sensor complete

2. counter nut

3. holder bracket

3.4 Turn-off procedure

For maintenance, cleaning and repairs (authorised staff personnel only) the device shall be disconnected from mains and shall be prevented from being turned on again unintentionally.

3.5 User's Responsibilities

In the EEA (European Economic Area) national implementation of the framework directive 89/391/EEC and corresponding individual directives, in particular the directive 89/655/EEC concerning the minimum safety and health requirements for the use of work equipment by workers at work, as amended, are to be observed and adhered to.
In Germany the Industrial Safety Ordinance must be observed.

The customer must (where necessary) obtain any local **operating permits** required and observe the provisions contained therein.
In addition to this, he must observe local laws and regulations on

- personnel safety (regulations on safety at work)

- safety of work materials and tools (safety equipment and maintenance)

- disposal of products (laws on wastes)

- disposal of materials (laws on wastes)

- cleaning (cleansing agents and disposal)

- environmental protection

Connections:

Before operating the device the user has to ensure, that the local regulations (e.g. for operation in channels) on installation and initial start-up are taken into account, if this is both carried out by the user.

4 Functional Principle

4.1 General

Easy calibration and maintenance free "fit and forget" performance mean that you can install the i-Series Intelligent Sensor Level Monitoring System rapidly and with confidence, with calibration being achieved either by the use of a HART programmer/calibrator or via a PC utilising the NIVUS interface and software.

The i-Series Intelligent Sensor operates on the principle of timing the echo received from a measured pulse of sound transmitted in air and utilises "state of the art" echo extraction technology.

4.2 Sensor Versions

i-Series Intelligent Sensor comes in four models:

NMI-	Type	Measurement range							
	03	0.125 to 3 m							
	06	0.3 to 6 m							
	10	0.3 to 10 m							
	15	0.5 to 15 m							
		Sensor cable length							
	05	5 m							
	10	10 m							
	20	20 m							
	30	30 m							
	50	50 m							
	99	100 m							
	xx	Special cable length upon request							
		Construction							
		0	**Standard**						
			000	Standard					
		1	**SUB flood protection head**	(not coated only)					
			000	Standard					
		2	**Flange**	(PTFE coating 0.25 mm)					
			002	2" ANSI					
			003	3" ANSI					
			004	4" ANSI					
			006	6" ANSI					
			008	8" ANSI					
			050	DN50					
			080	DN80					
			100	DN100					
			150	DN150					
			200	DN200					
		5	**Front thread mount**						
			015	Front thread 1,5"	only for i-3 and i-6				
			020	Front thread 2"	only for i-10				
				Sensor Body					
				0	not coated				
				1	foamed material	only for standard construction; i-6, i-10 and i-15			
				2	PTFE 0.25mm	only for flange construction			
				4	PVDF-enclosure	not for SUB and flange construction, as well as i-3 standard construction			
					ATEX Approvals				
					0	Ex "m" Zone 1			
					1	Ex "ia" Zone 0			
						Connection			
						H	HART / 4-20 mA		
						P	Profibus		
NMI-									

Fig. 4-1   Type key for i-Series Intelligent Sensors

All models can be mounted via a rear, 1" BSP/NPT, thread (Standard) with a model with alternative front thread mounting being available, in addition flange mount and PVDF options are also available. See Chapter 6 Installation for further details.

All model types are available for use in hazardous area installations with either Ex mb (zone 1) or Ex ia (zone 0) ATEX certification.

The i-Series Intelligent Sensor has a 4 to 20 mA output which can be programmed to give an output proportional to level, space, distance or volume, dependant on the measurement mode selected and provides a 'fault condition' alarm of either 3.8 mA or 22 mA.

5 Storing, Delivery and Transport

5.1 Receipt

Please check your delivery according to the delivery note for completeness and intactness immediately after receipt. Any damage in transit must be instantly reported to the carrier. An immediate, written report must be sent to NIVUS GmbH Eppingen as well.

Please report any delivery incompleteness in writing to your representative or directly to NIVUS Eppingen within two weeks.

Mistakes cannot be rectified later!

5.1.1 Delivery

The standard delivery of the i-Series Intelligent Sensor contains:

- the instruction manual with the certificate of conformity. Here, all necessary steps to correctly install and to operate the measurement system are listed.

- 1 Ultrasonic-Sensor

- 2 x screw nuts (G1" PVC)

Additional accessories depending on order. Please check by using the delivery note.

5.2 Storing

The following storing conditions must be strictly adhered to:

i-Series Intelligent Sensor: max. temperature: + 80 °C (176 °F)
                                min. temperature: - 40 °C (-40 °F)

The devices must be protected from corrosive or organic solvent vapours, radioactive radiation as well as strong electromagnetic radiation.

5.3 Transport

The Sensors are conceived for harsh industrial conditions. Despite this do not expose them to heavy shocks or vibrations.
Transportation must be carried out in the original packaging.

5.4 Return

The units must be returned at customer cost to NIVUS Eppingen in the original packaging.
Otherwise the return cannot be accepted!

6 Installation

6.1 Power Supply Requirements

For electric installation the local regulations in the respective countries
(e.g. VDE 0100 in Germany) must be referred to.

The i-Series Intelligent Sensor operates from a DC supply of 10 to 28V and will
typically draw less than 22mA.

*All electronic products are susceptible to electrostatic shock, so follow proper
grounding procedures during installation.*

The compact one-piece construction of the i-Series Intelligent Sensor can be
mounted easily using either the 1″BSP/NPT rear mounting thread or the integral
1.5" or 2" BSP/ NPT, front thread, dependent on model.
When choosing a location to mount the i-Series Intelligent Sensor, bear in mind
the following:

- The ultrasonic signal path should be free of falling material and obstructions
  such as pipes, beams etc.

- The i-3 should be mounted at least 12.5 cm (0.41 feet) above the maximum
  level of the material and be perpendicular to the surface. While the i-6 and
  10 should be mounted at least 30cm (0.98 feet) above the maximum level of
  the material and be perpendicular to the surface. And the i-15 should be
  mounted at least 50cm (1.64 feet) above the maximum level of the material
  and again should be perpendicular to the surface

- The ambient temperature is between -40 ºC and 80 ºC.

- There should be no high voltage cables or electrical inverter wiring in close
  proximity to the Sensor cabling.

Before feeding the rated voltage the sensor installation must be correctly com-
pleted. The installation should be carried out by qualified personnel only. Further
statutory standards, regulations and technical rulings have to be taken into ac-
count.
The sensor protection rating is IP68.
Please check if the power supply of the i-Series Intelligent Sensor must be inte-
grated into the facility's emergency shutdown conception.

6.2 Sensor Dimensions

The dimensions of the i-Series Intelligent Sensor are as shown below.
Dimensions in mm (inch)

Rear Thread Mount
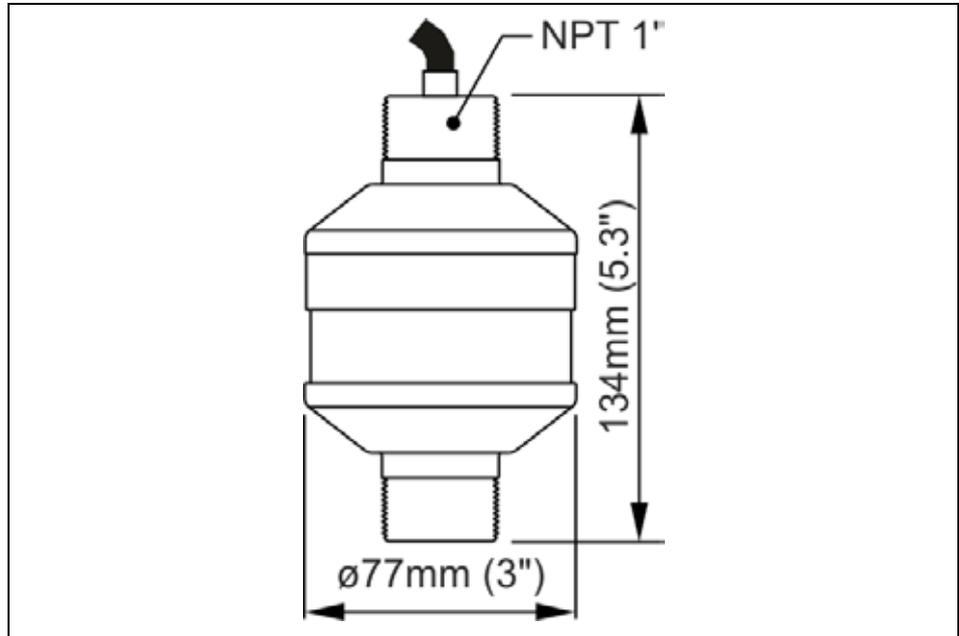
Fig. 6-1   i-03 sensor dimensions
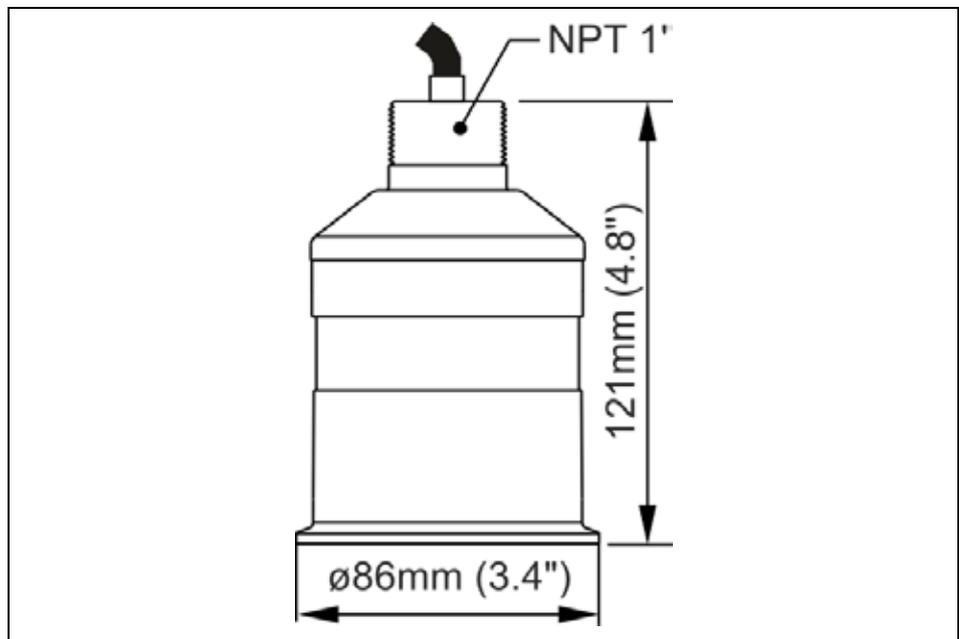
Fig. 6-2   i-06 and i-10 sensor dimensions
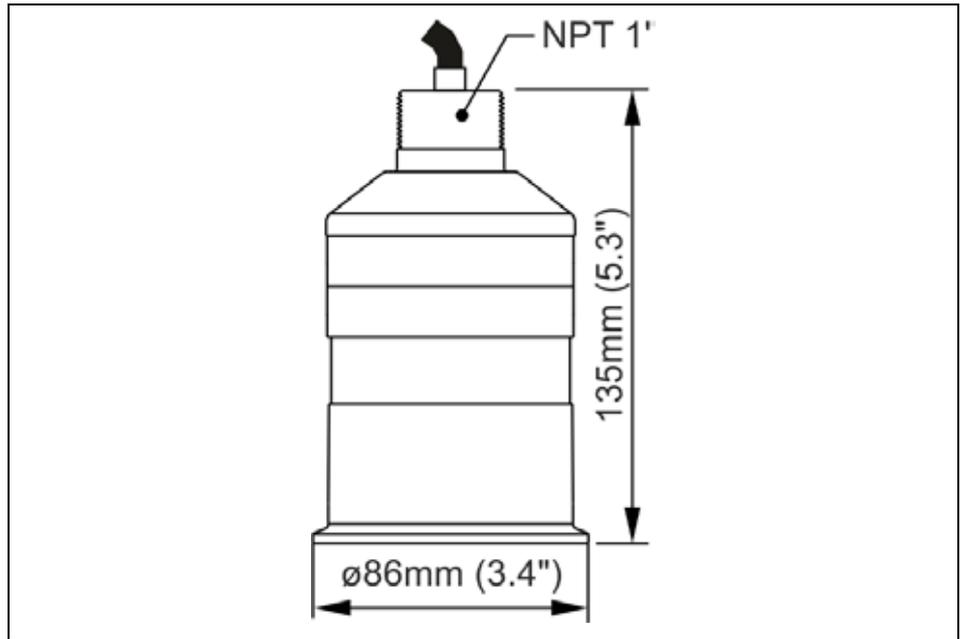
Fig. 6-3   i-15 sensor dimensions

Front Thread Mount
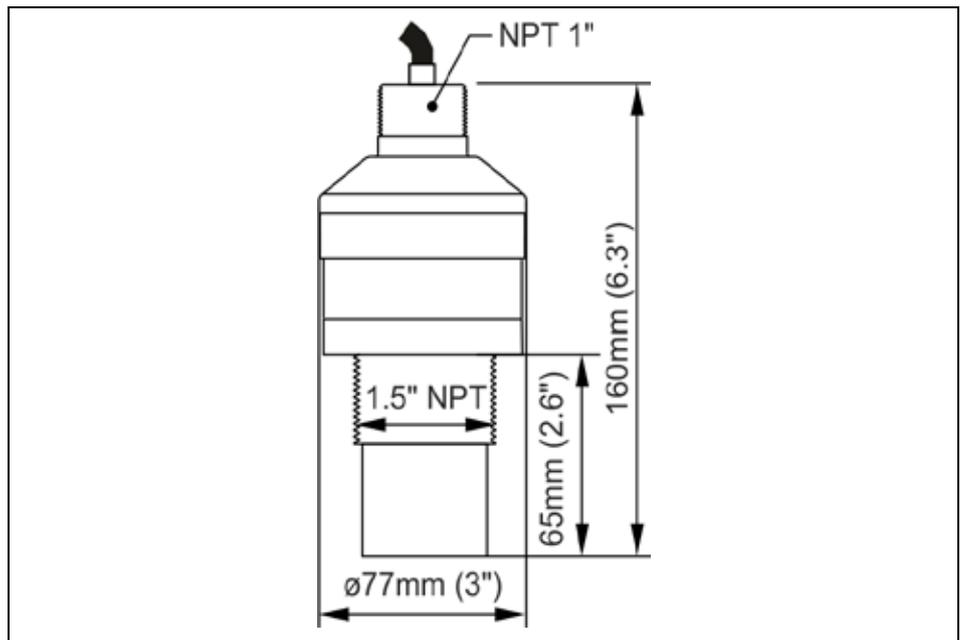
Fig. 6-4   Sensor dimensions i-03 and i-06, front tread mount
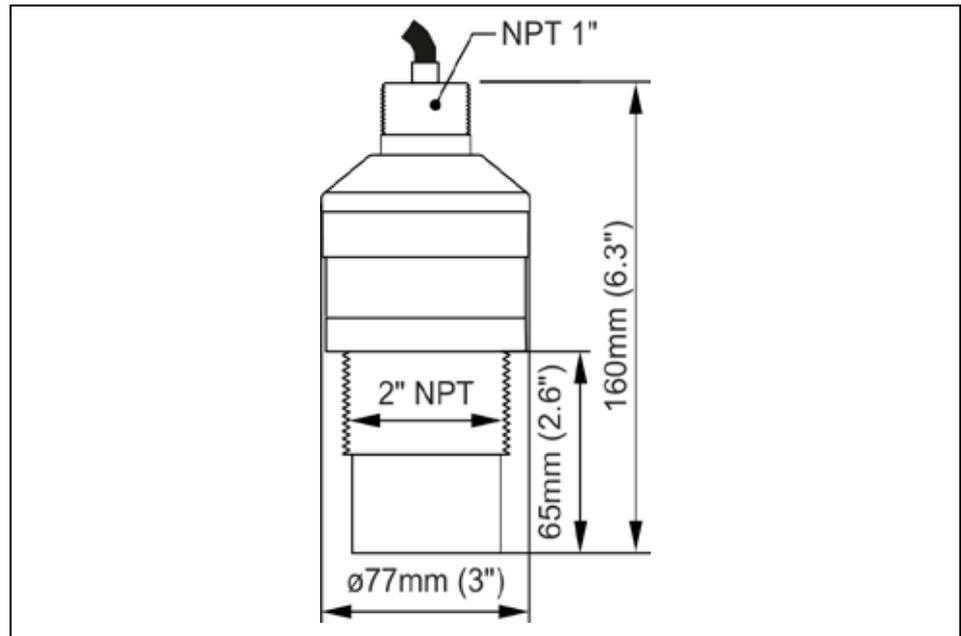
Fig. 6-5   Sensor dimensions i-10, front tread mount

6.3   Installation and Connection of i-Series Sensors

6.3.1   General

The sensors mounting place has to be selected according to certain criteria. Please strictly avoid:

- heat emitting objects (max. ambient temperature: +80 °C (176 °F))

- objects with strong electromagnetic fields (e.g. frequency converters, electric motors with high power consumption or similar)

- corrosive chemicals or gas

- mechanical shocks

- vibrations

- radioactive radiation

- installation close to footpaths or travel ways

Removing or loosening cable glands results in leakage and causes a failure in the measurement / the sensor.

__No__ sensor parts are allowed to be removed on principle!

To avoid disturbances from electrical interferences, the sensor cable must not be laid close to (or parallel to) engine (motor) lines or main power lines.

6.3.2 Outdoor and Open Vessel Installation

The i-Series Intelligent Sensor can be simply mounted on a bracket, suitable for the application and secured using either the 1" NPT rear thread or via the 1½″ or 2″ front thread, dependant on model.

Care should be taken to ensure that the i-Series Intelligent Sensor is not installed in direct sunlight, in order to avoid errors in the measurement of ambient temperature.

Attention should also be taken, when mounting the unit, to ensure that strong windy conditions are avoided, wherever possible, to prevent abnormal operation.

Model	Range	L = Blanking
i-3	3 metres (9.84 feet)	125mm (0.41 feet)
i-6	6 metres (19.69 feet)	300mm (0.98 feet)
i-10	10 metres (32.18 feet)	300mm (0.98 feet)
i-15	15 metres (49.21 feet)	500mm (1.64 feet)

'L' (Blanking) should as a minimum be at least that as detailed in the table above, but can be greater if required.
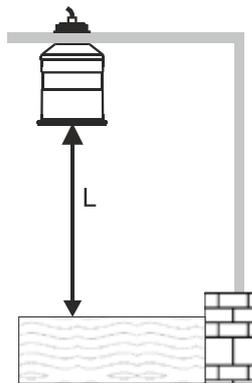
Mounted via Rear 1″ NPT Thread   Mounted via optional Front Thread
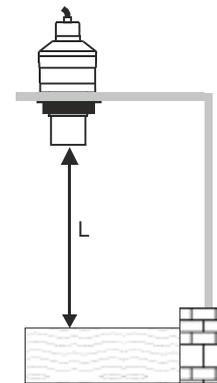
6.3.3 Closed Vessel Installation

"L" should as a minimum be at least that as detailed in the table above, but can be greater if required. The i-Series Intelligent Sensor can be simply screwed into a flange and secured using the rear 1" NPT rear thread or via the 1½″ or 2″ front thread, dependant on model.

Where possible use a flange made of a synthetic material such as PVC, in cases where a metal flange is used it is advisable to fit a suitable gasket between the flange of the i-Series Intelligent Sensor and the connection to the vessel.
Stand Pipe Installations
When mounting the i-Series Intelligent Sensor to a standpipe care should be taken to ensure that the standpipe is of sufficient diameter with reference to its length, see the table below for details:

Stand Pipe Installations

When mounting the **i-Series Intelligent Sensor** to a standpipe care should be taken to ensure that the standpipe is of sufficient diameter with reference to its length, see the table below for details:

Dia. (D)		Min Length (L)	
mm	inches	mm	inches
80	3	220	8
100	4	300	12
150	6	420	16
200	8	560	22
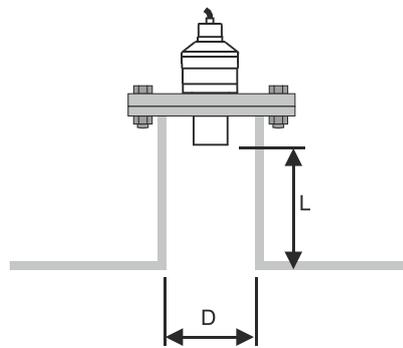
Flange mounted via Front Thread   Optional Flange Mounted
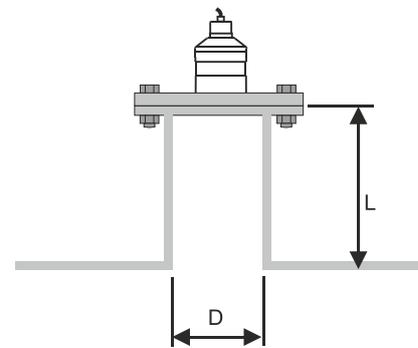
When using a standpipe, fixed to the top of a vessel, ensure that the open end of the standpipe is clear of any obstructions such as weld seams, gaskets etc. in order to avoid unwanted signal returns.

If using standpipes which extend in to the vessel, beyond the blanking distance, but not as far as the empty level, then the open end of the standpipe should be cut to an angle of 45°.
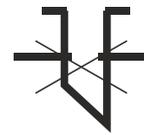
The maximum level (100 % of Span) is inside the Blanking Distance	Pipe should be free of obstructions such as weld seams	Correct standpipe installation

When using the i-Series Intelligent Sensor to measure 'aggressive, materials such as 'alkaline' and 'acids' it is recommended that either a PVDF or an optional PTFE faced Flanged Sensor is used. Please consult NIVUS for full availability of options.

6.3.4 Cable

The i-Series Intelligent Sensor comes with a fitted integral cable; if this cable is extended then the total capacitance must not exceed the limits for the voltage applied.

Important Information

In the case of the Ex mb version the cable is fitted with an over current protection device in the form of a fuse, please note that under no circumstances should this fuse be removed. The fuse must be fitted in the non-hazardous area.

6.3.5 Typical wiring for a Non-Hazardous location
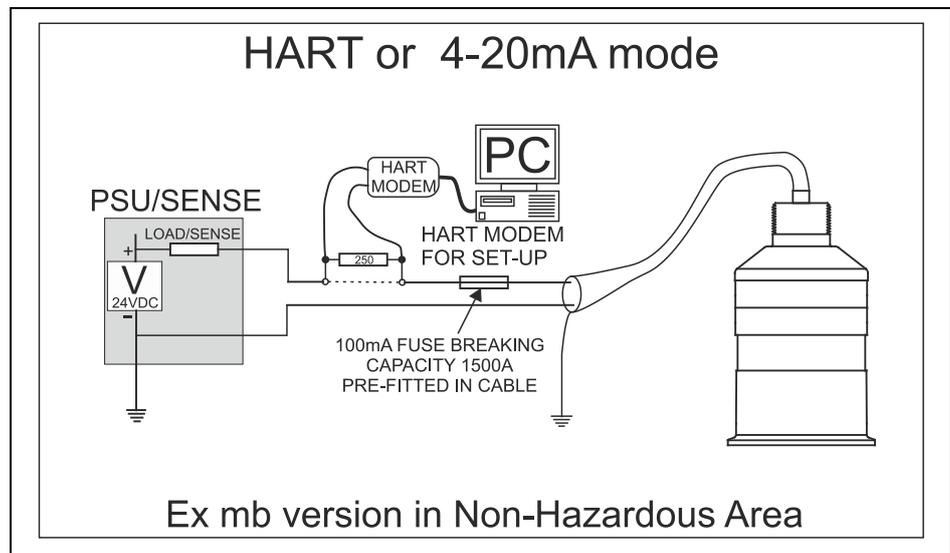
The HART modem and PC or HART programmer are used to set up the operation parameters for the i-Sensor. The output can either be as a 4-20 mA current giving level or distance or as a digital signal via a HART master.
The i-Sensors cable is a twisted pair with overall cable screen. The twisted pair are red and black, connect the red to +V and the black to -V. The screen should go to signal ground.

Loop Resistance
For two wire operation the maximum cable resistance allowable can be calculated from the graph below. For example if an i-Series Intelligent Sensor was supplied from 24 V, the maximum total cable resistance is 600 ohms, for a typical 77 ohm /km cable this would mean a maximum cable length of 600/77 = 7.8 km, remember this total cable resistance, so this figure has to be divided by 2 to give 3.9 km max distance.
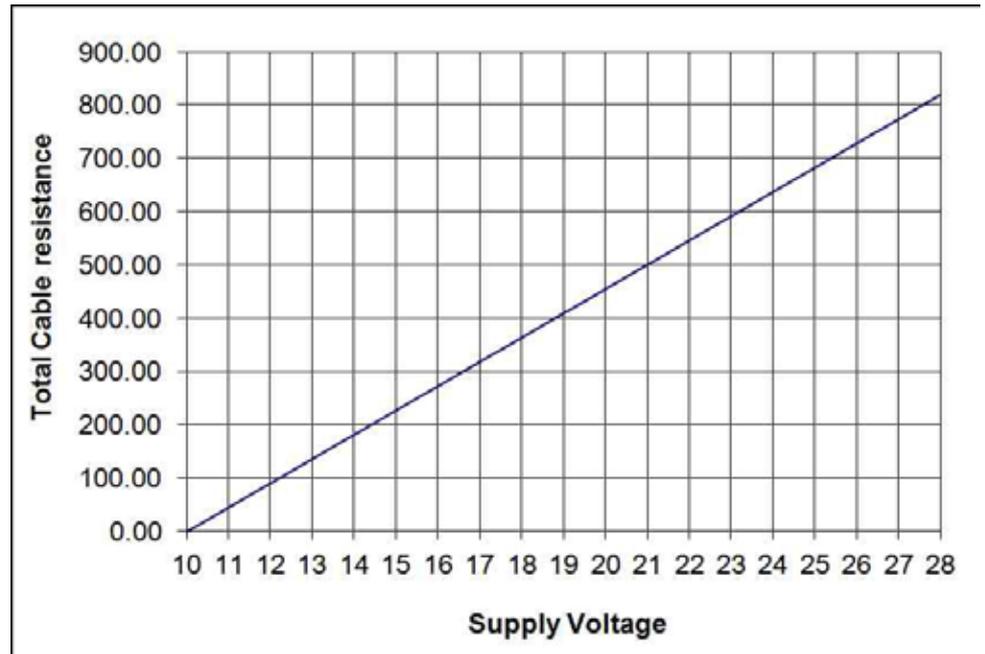
Maximum cable resistance vs supply voltage.

Important Information

If the equipment is installed or used in a manner not specified in this manual, then the protection provided by the equipment may be impaired.

6.3.6 Preparation for Operation

Before switching on, check the following:

- The i-Series Intelligent Sensor is mounted correctly.

- The power supply is correctly installed.

6.4 Maintenance

There is no user serviceable parts inside your i-Series Intelligent Sensor, if you experience any problems with the unit, then please contact NIVUS GmbH for advice.
To clean the equipment, wipe with a damp cloth. Do not use any solvents on the enclosure.

6.5 Hazardous Area Installation

6.5.1 Information specific to Hazardous Area Installation

(Reference European ATEX Directive 94/9/EC, Annex II, 1.0.6.)

The following instructions apply to equipment covered by certificate number SIRA TRAC 12ATEX0030X (Ex ia) & SIRA TRAC 12ATEX0031X (Ex mb)

1. The equipment may be used with flammable gases and vapours with apparatus groups IIC, IIB, and IIA with temperature classes; T1, T2, T3, T4 maximum ambient temperature range -40 °C to +80 °C.

2. The equipment is only certified for use in ambient temperatures in the range -40 °C to +80 °C and should not be used outside this range

3. Installation shall be carried out in accordance with the applicable code of practice by suitably-trained personnel

4. Repair of this equipment shall be carried out in accordance with the applicable code of practice.

5. Certification marking as detailed in drawing number D-804-0964-C (Ex ia) & D-804-0996-B (Ex mb).
   If the equipment is likely to come into contact with aggressive substances, then it is the responsibility of the user to take suitable precautions that prevent it from being adversely affected, thus ensuring that the type of protection is not compromised.
   Aggressive Substances - e.g. acidic liquids or gases that may attack metals or solvents that may affect polymeric materials. Suitable Precautions - e.g. regular checks as part of routine inspections or establishing from the material's data sheet that it is resistant to specific chemicals.

6. The certificate number has an 'X' suffix that indicates that the following special condition of certification applies;
   In the case of i-Sensor range due to the housing and labels being non-conductive plastic care needs to be taken with regards electrostatic charge. The equipment shall not be installed if the conditions are conducive to the build-up of electrostatic charge. Additionally the equipment should only be cleaned with a damp cloth.
   With the i-Series Ex mb version a 100 mA, 1500 A breaking capacity fuse must be fitted in the positive lead of the cable. The product is shipped with this fuse in the cable, visible through the heat shrink at the wire end of the cable

7. The manufacturer should note that, on being put into service, the equipment must be accompanied by a translation of the instructions in the language or languages of the country in which the equipment is to be used and by the instructions in the original language.

6.5.2 Hazardous Area specific Power Supply and barrier Requirements

The i-Sensor operates from a DC supply of 10-28 V and will typically draw less than 22 mA.

In the case of the Ex ia version the unit must be powered from an approved i.s. safety barrier or approved i.s. Power supply with the following limits:

U_o <= 28 V, I_o <=162 mA, P_o <= 1.00 W

In the case of the Ex mb version the unit must be powered from a power supply and 100 mA fuse (1500 A breaking capacity) to give prospective short current of 1500 A. This fuse (100 mA leaded Littlefuse series 242) is fitted in the cable of the Ex mb version of i-sensors. The power supply should have the following rating: U_m = 28 V
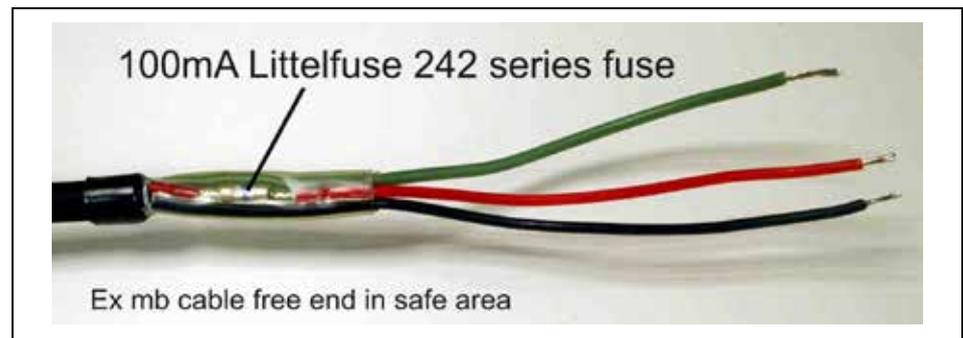
The i-Sensors cable is a twisted pair with overall cable screen. The twisted pair are red and black, connect the red to +V and the black to -V. The screen should go to signal ground.

Typical wiring for the two types of i-Sensors:

Ex ia Version 4-20mA mode

SAFE AREA

HAZARDOUS AREA

PSU/SENSE

+
V
24VDC
-

LOAD/SENSE

I.S. EARTH

DUAL ZENER BARRIER

Ui<=28V
Ii<=162mA
Pi<=1.03W

DOUBLE ZENER BARRIER
CURRENT SENSED IN GROUND

Ex ia Version 4-20mA mode

SAFE AREA

HAZARDOUS AREA

PSU/SENSE

CURRENT SENSE

V +
-

GALVANIC ISOLATOR

Ui<=28V
Ii<=162mA
Pi<=1.03W

GALVANIC ISOLATOR

TYPICAL Ex ia HART MULTIPLEXED SYSTEM

Ex mb Version 4-20mA mode

SAFE AREA

HAZARDOUS AREA

PSU/SENSE

LOAD/SENSE

PC

HART MODEM

HART MODEM FOR SET-UP

250

V
24VDC

100mA FUSE BREAKING
CAPACITY 1500A
PRE-FITTED IN CABLE

Um=28V
PROSPECTIVE
SHORT CIRCUIT
CURRENT 1500A

Ex mb version

Ex mb Version DIGITAL HART (HAZARDOUS)

SAFE AREA

HAZARDOUS AREA

PSU

PC

HART MODEM

HART MASTER

V
24VDC
+
−

250

100mA FUSE BREAKING CAPACITY 1500A PRE-FITTED IN CABLE

UPTO 15 UNITS

Ex mb MULTIDROP (HAZARDOUS AREA)

7 How To Use Your i-Series Intelligent Sensor

7.1 4-20 mA Device

The i-Series Hart Intelligent Sensor can be used as an 'out of the box'
4 – 20 mA device if this is the case then by default, when you switch the
i-Series Intelligent Sensor on, the 4 – 20 mA output will be proportional to the
level being seen, with respect to the maximum range and span of the i-Sensor
model being used as detailed in the table below.

	i-3	i-6	i-10	i-15
4 mA (Empty) 0 % of Span Distance from Sensor Face in metres	3.0	6.0	10.0	15.0
20 mA (Full) 100 % of Span Distance from Sensor Face in metres	0.125	0.300	0.300	0.500

Note

*Customised factory calibration of Span is available; please contact NIVUS
GmbH for further details.*

Important Information

*When the i-Series Intelligent Sensor is operated below 8 mA then the speed of
response will decrease. See the following table for cycle times:*

Type	Loop Current Drawn						
	3.8	4	5	6	7	8	9
i-3	5.6	3.8	1.5	1	1	1	1
i-6	7.5	4.8	2	1.2	1	1	1
i-10	9.8	6.6	2.7	1.7	1.3	1.05	1
i-15	10.9	7.5	3.2	2	1.4	1.1	1

Fig. 7-1   Time in seconds between firing

For example: if using an i-6 and the target is causing a current draw of 5 mA
then the cycle time (the time between measurements) is 2 seconds.
Any Sensor drawing 9 mA or above will have a cycle time of 1 second.

7.2   Accessing Parameters

In order to view or change parameters values one of the following methods must be used.

7.3   Hart Commands

If familiar with the use of HART protocol and the i-Series Intelligent Sensor is connected to a HART modem then it can be programmed following normal HART procedures.
Commands implemented by the i-Series Intelligent Sensor are as follows:

7.3.1 Universal

0, 1, 2, 3, 6, 7, 8, 9, 11, 12, 13, 14, 15, 16, 17, 18, 19, 20, 21, 22, 38 and 48.

7.3.2 Common practice

33, 34, 35, 40, 41, 42, 45, 46, 47, 83, 89, 90, 111, 112 and 122.

7.4   i-Series Hart PC Lite

Your i-Series Intelligent Sensor comes complete with the i-Series HART PC Lite software contained on CD, which, when used with a HART Modem, see Chapter 2 Installation for full details on how to connect the modem, can be used to to carry out the programming of the i-Series Intelligent Sensor.

Insert the CD into the CD drive of the PC intended to be used to carry out the programming of the i-Series Intelligent Sensor and install the software, following the on screen instructions.
Once the software is installed connect the computer via a convenient USB port to the HART Modem. Double click the 'i-Series HART PC Lite' icon, installed on your desktop and the programme will open and you will see the following screen:
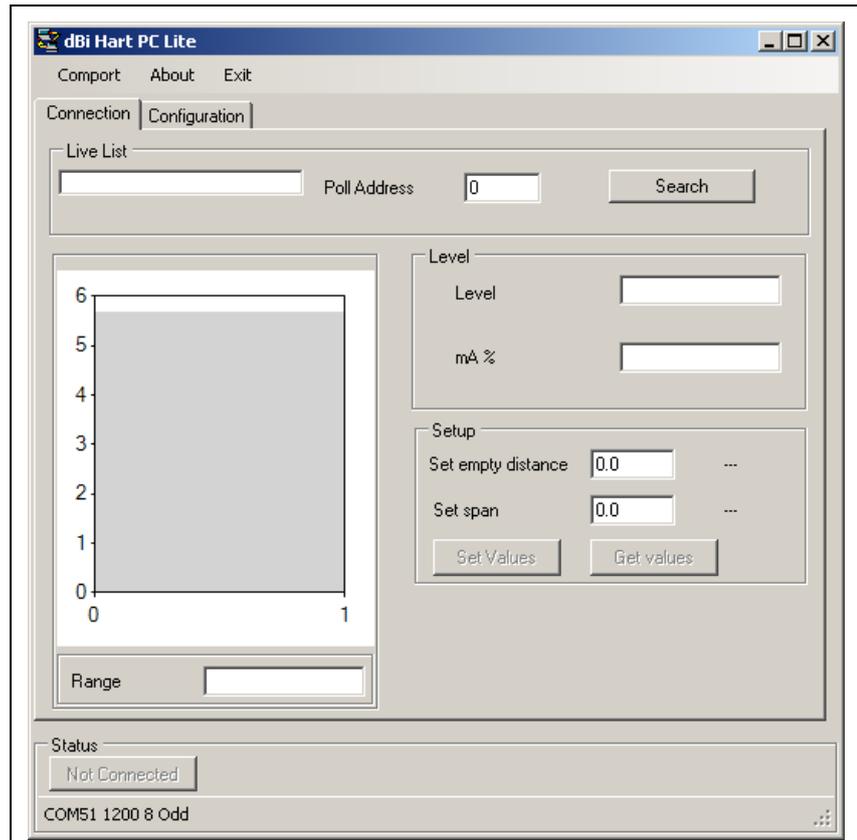
To connect to the i-Series Intelligent Sensor 'click' on the 'Search' button which will then change to 'Scanning' and once a connection with a device has been established it will change to 'Connected' and the 'Status' button will show 'Connected' and flash Green, if the i-Series HART PC Lite fails to connect please check the Comport Configuration as detailed on page 34. When using the i-Series HART PC Lite software, keypad input can be achieved by using a 'mouse' or similar device to place the cursor over the relevant key followed by a 'left' click, with numeric detail being entered directly from the PC keyboard.

Once i-Series HART PC Lite has successfully connected you will see the following display in chapter 7.4.1.

7.4.1 Connection
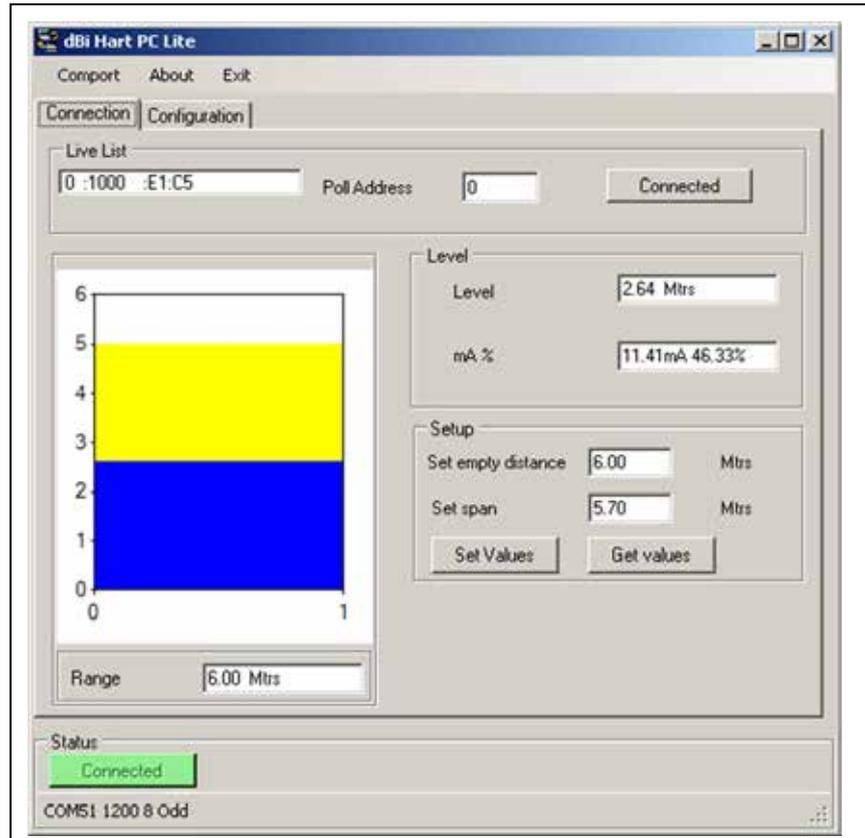
On the opening screen the following Information is available:

Live List

Gives details of all devices connected, if more than one device is present the 'Live List' will become a drop down box and the required device selected.

Poll Address

Gives the Poll Address of the selected Device.

Level

Gives value of the Level in the vessel in Measurement Units (P104)

mA %

Gives current value of the mA Output and how full the vessel is in percentage.

Set Empty Distance

Allows the Empty Distance to be set.

Set Span

Allows the Span to be set which will determine the range of the 4 to 20 mA output, with 4 mA representing 0 % (empty) and 20 mA representing 100 % (full).

Range

Shows the maximum range that can be measured, by the i-Series Intelligent Sensor, that is currently connected.

Bar Graph Display

Gives a graphical indication of the Empty Distance (P105) and Maximum Span (P106) along with current level being measured.

7.4.2 Configuration
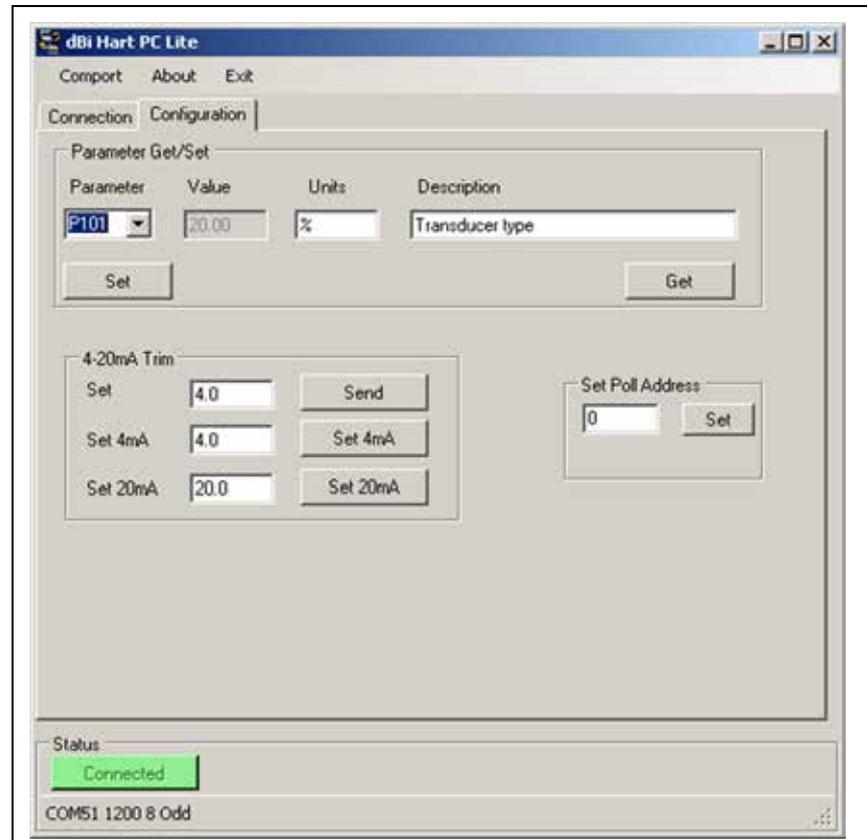
Parameter Get/Set

Get:

Will read and display the current value of the parameter selected along with the 'units' of measurement, where used, and the description of the parameter selected. Select the desired parameter form the drop down 'Parameter' box and 'click' 'Get'

Set:

Allows the value of the selected parameter to be changed. Select the desired parameter form the drop down 'Parameter' box enter required value in the 'Value' box and 'click' 'Set'
For a full list of available parameters see Chapter 5 Parameter Guide.

4 – 20 mA Trim

If the device connected to the mA output is out of calibration, and cannot be calibrated, then the low and high current levels can be trimmed by altering Set 4 mA (P838Low Trim) and Set 20 mA (P839 High Trim). To do this, simply enter the value that ensures that 4 mA or 20 mA respectively are shown on the remote device.

7.4.3 Communication Port Configuration

If the i-series HART PC Lite fails to connect to the i-Series Intelligent Sensor you may need to change the communications port that is being used, to do this 'click' on the 'Comport' menu in the top menu bar and the 'Comm Port Setup' window will appear, select the appropriate communications port and then close the window.
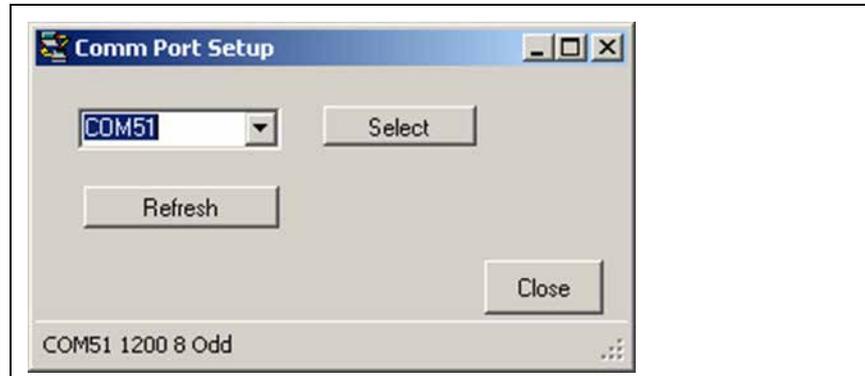
7.5 Parameter Defaults

7.5.1 Factory Defaults

When first installing the i-Series Intelligent Sensor, or subsequently moving or using the unit on a new application, before proceeding to program the unit for its intended application it is recommended that you ensure that all parameters are at their default values by completing a Factory Defaults P930, as described in Chapter 5 Parameter Guide

Once you are satisfied with the installation, and the i-Series Intelligent Sensor is reading what you would expect in terms of distance from the face of the Sensor to the material level, then you can proceed with any programming, required for the intended application. It is sensible to program all of the required parameters at the same time. The system will be then set-up.

8   Getting Results with Your i-Series Intelligent Sensor

This chapter explains how to undertake the various functions of your i-Series Intelligent Sensor. Where specific parameters are used, consult Parameter Guide in Chapter 9.

8.1   Setting up Your Application

8.1.1   Empty Distance

Empty Distance (P105) is the distance from the face of the Sensor to the material at the bottom of the vessel.

8.1.2   Span

Span (P106) is the distance from the empty level (0 % full) to span (100 % full).

8.1.3   Near and Far Blanking

Near blanking (P107) is the distance from the face of the Sensor that the i-Series Intelligent Sensor will not record a level nearer than. A typical reason to increase this from the default value would be if you wish to ignore close in obstructions.

Far blanking (P108) is the distance (as a percentage of empty level) beyond the empty level that the i-Series Intelligent Sensor will read, the default is plus 20% of empty level. If you wish to monitor further than the empty level, then increase this figure, so that the empty level plus the far blanking figure (as % of empty level) is greater than the surface being measured, within the capability of the Sensor being used.

8.2   Using the 4-20 mA Output

The mA output can be used to monitor remotely what the i-Series Intelligent Sensor is measuring, so it can be displayed remotely, integrated into a PLC, or used to generate a record using a chart recorder or similar.

By default, the i-Series Intelligent Sensor will provide a 4-20 mA output that is proportional to level and can be overwritten as follows.

By default, the 4-20 mA will represent the operational span of the i-Series model in use, with empty (0 % full) = 4 mA and full (100 % of the operational span) = 20 mA, but you may wish to only represent a section of the operational span. For example, the application may have an operational span of 6 metres, but you may only wish to represent empty level to 5 metres. If so, change P834 (Low Value) to 0, and P835 (High Value) to 5.0.

If the device connected to the mA output is out of calibration, and cannot be calibrated, then the low and high current levels can be trimmed by altering P838 (Low Trim) and P839 (High Trim). To do this, simply enter the value that ensures that 4 mA or 20 mA respectively are shown on the remote device. You can use the left/right menu keys to alter the value until the correct reading is shown on the remote device, rather than typing in a value.

8.3   Setting Security Passcodes

A passcode is used to protect parameter entries and will be required when accessing parameters with certain PC Software's.
You can set a new passcode to prevent anyone changing any of your settings within your i-Series Intelligent Sensor. The default passcode is 1997, but this may be changed as follows.

Additional Information

The passcode is also used for remote access using certain PC Software's, so if this is being used, be sure to ensure any additional equipment using this feature is changed accordingly.

8.3.1   Changing the Passcode

You can set the passcode to any number from 0000 to 9999. To do this, select P922 which is the passcode parameter which can be changed as required.

8.4   Resetting Factory Defaults

If you need to restore parameters to their original factory settings, then access parameter P930, which is the factory defaults parameter, change the value to 1 and ENTER, all parameters, with the exception of the mA trims, will be restored to the factory settings (including the DATEM trace) and on completion.

8.5   Checking the Information Specific to your i-Series Intelligent Sensor

There are some parameters dedicated to each individual i-Series Intelligent Sensor, such as the software revision and the unit's serial number.

8.5.1   Checking the Software Revision and Serial Number

If you need to identify the serial number of the unit or the current level of software in your i-Series Intelligent Sensor, the following parameters can be used. Select parameter P926 to view the identity of the current software revision or P928 for the serial number of the unit.

9 Parameter Guide

9.1 Parameter Listing

This chapter describes all of the parameters contained within the i-Series (HART) Intelligent Sensor.

9.2 Application

9.2.1 Operation

P100 Mode of Operation

This parameter sets the mode of operation, when in run mode, and can be set to one of the following:

Option	Description
1 = Distance Display	shows the distance from the Sensor face to the surface.
2 = Level (Default)	Display shows how full the vessel is.
3 = Space	Display shows how empty a vessel is.
4 = Volume	Display shows volume of material in the vessel

P102 Material

This parameter should be set to the type of material being monitored.

Option	Description
1 = Liquid (Default)	Use for liquids and flat solid materials
2 = Solid	Solid material that is heaped or at an angle
3 = Closed Tank	Use for closed tanks or domed roofs.

9.2.2 Distances

P104 Measurement Units

This parameter sets the units you want to use for programming and display

Option	Description
1 = metres	All units of measure are METRES
2 = cm	All units of measure are CENTIMETRES
3 = mm	All units of measure are MILLIMETRES
4 = feet	All units of measure are FEET
5 = inches	All units of measure are INCHES

P105 Empty Level

This parameter is to be set to the maximum distance from the face of the Sensor to the empty point, in **P104 Measurement Units**. Note this value affects span as well, so should be set before span. Default: i-3=3.00 m (9.84 feet),
i-6=6.00 m (19.69 feet), i-10=10.00 m (32.81 feet) and i-15=15.00 m (49.21 feet).

P106 Span

This parameter should be set to the maximum distance from the Empty Level (P105) to the maximum material level. It is automatically set to be equal to the Empty Level (P105) less the Near Blanking distance (P107), when you set the empty level. Default i-3 = 2.80 m (9.19 feet), i-6 = 5.70 m (18.70 feet), i-10 = 9.70 m (31.82 feet) and i-15 = 14.5 m (47.57)

P107 Near Blanking Distance

This parameter is the distance from the face of the Sensor that is not measurable, and is pre-set to the minimum value dependant on the version of i-Series Intelligent Sensor being used. It should not be set to less than this figure, but can be increased.

Version	Near Blanking Distance
i-3 metre	Default Blanking Distance = 0.125 m (0.66 feet)
i-6 metre	Default Blanking Distance = 0.3 m (0.98 feet)
i-10 metre	Default Blanking Distance = 0.3 m (0.98 feet)
i-15 metre	Default Blanking Distance = 0.5 m (1.64 feet)

P108 Far Blanking Distance

This is the distance (as a percentage of empty level) beyond the empty point that the unit will be able to measure, and the default is pre-set to 10 % of the empty level.
If the surface being monitored can extend beyond the Empty Level (P105) then the far blanking distance can be increased to a maximum of 100 % of empty level.
This parameter is always entered as a % of empty level.

Data Logs

The data log parameters contains the following information.

9.2.3 Temperature

The following parameters give information on temperature conditions seen by the Temperature source (P852) in ºC. All of these parameters are read only and cannot be changed, though if P852 is changed they will be reset.

P580 Minimum Temperature

This parameter displays the minimum temperature recorded.

P581 Minimum Temperature Date

This parameter displays the date when the minimum temperature was recorded.

P582 Minimum Temperature Time

This parameter displays the time when the minimum temperature was recorded.

P583 Maximum Temperature

This parameter displays the maximum temperature recorded.

P584 Maximum Temperature Date

This parameter displays the date when the maximum temperature was recorded.

P585 Maximum Temperature Time

This parameter displays the time when the maximum temperature was recorded.

P586 Current Temperature

This parameter displays the current temperature.

9.2.4 Sensor Power Information

The following parameters provide information on when the i-Series Intelligent Sensor was last powered down and how long it had run for.

P940 Number of Starts

This parameter displays the number of times that the unit has been powered since leaving the factory.

P941 Last Power Off Date

This parameter displays the last date on which the power was removed from the unit.

P942 Last Power Off Time

This parameter displays the last time on which the power was removed from the unit.

P943 Last Run Time (minutes)

This parameter displays how long the unit had been running, in minutes, prior to the last power down.

P944 Last Run Time (hours)

This parameter displays how long the unit had been running, in hours, prior to the last power down.

P945 Total Runtime (hours)

This parameter displays the accumulated total number of hours that the unit has been in operation (powered up) since leaving the factory.

9.3 Volume

9.3.1 Conversion

P600 Vessel Shape

This parameter determines which vessel shape is used when utilising "Volume Conversion".

The choices are as shown in the table below, along with the dimensions that are required to be entered (P601-P603).
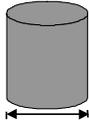
Vessel Shape	P600 Value	Dimensions Required
	P600 = 0 Cylindrical Flat base (Default)	Cylinder diameter
	P600 = 1 Rectangular Flat base	Width and Breadth
	P600 = 2 Cylindrical Cone base	Cylinder diameter and height of bottom
	P600 = 3 Rectangular Pyramid base	Width and Breadth of rectangular section and height of bottom
	P600 = 4 Cylindrical Parabola base	Cylinder diameter and height of bottom
	P600 = 5 Cylindrical Half-sphere base	Cylinder Diameter
	P600 = 6 Cylindrical Flat sloped base	Cylinder diameter and height of bottom
	P600 = 7 Rectangular Flat sloped base	Width and Breadth of rectangular section and height of bottom
	P600 = 8 Horizontal cylinder with flat ends	Cylinder diameter and tank length
	P600 = 9 Horizontal cylinder with parabolic ends	Cylinder diameter, length of one end section, and tank length
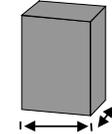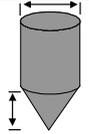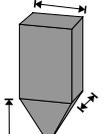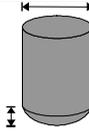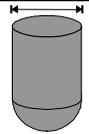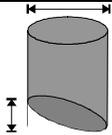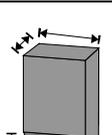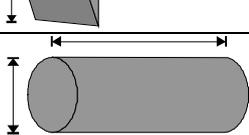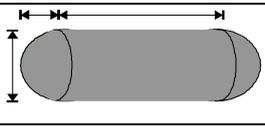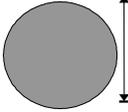
Vessel Shape	P600 Value	Dimensions Required
	P600 = 10 Sphere	Sphere diameter
	P600 = 11 Universal Linear	No dimensions required, level and volume break-points used.
	P600 = 12 Universal Curved	No dimensions required, level and volume break-points used.
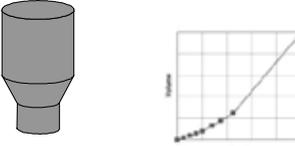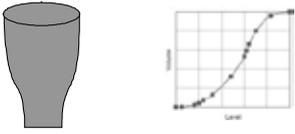
P601-P603 Vessel Dimensions

These three parameters are used to enter the dimension required to calculate the volume. The dimensions required are as shown below.

Vessel Shape	P601	P602	P603
P600 = 0 Cylindrical Flat base	Cylinder Diameter		
P600 = 1 Rectangular Flat base		Width of rectangle	Breadth of rectangle
P600 = 2 Cylindrical Cone base	Height of base	Cylinder Diameter	
P600 = 3 Rectangular Pyramid base	Height of base	Width of rectangle	Breadth of rectangle
P600 = 4 Cylindrical Parabola base	Height of base	Cylinder Diameter	
P600 = 5 Cylindrical Half-sphere base	Cylinder Diameter		
P600 = 6 Cylindrical Flat sloped base	Height of base	Cylinder Diameter	
P600 = 7 Rectangular Flat sloped base	Height of base	Width of rectangle	Breadth of rectangle
P600 = 8 Horizontal cylinder with flat ends	Length of Cylinder	Cylinder Diameter	
P600 = 9 Horizontal cylinder with parabolic ends	Length of Cylinder	Cylinder Diameter	Length of one end section
P600 = 10 Sphere	Sphere Diameter		

P604 Calculated Volume

This parameter displays the maximum volume that has been calculated by the i-Series Intelligent Sensor and is a Read Only parameter. The volume displayed will be shown in cubic meters and is the total volume available between empty level (P105) and 100% of span (P106).

P605 Volume Units

This parameter determines the units that will be used in calculating volume conversion. It is used in conjunction with P607 (maximum volume), please note that there is no provision for the volume units descriptor to be shown on the display. The choices are:

Option	Description
0 = No Units	Volume will be totalised with no units
1 = Tons	Volume will be totalised in Tons
2 = Tonnes	Volume will be totalised in Tonnes
3 = Cubic metres	Volume will be totalised in cubic metres
4 = Litres	Volume will be totalised in litres
5 = UK Gallons	Volume will be totalised in UK Gallons
6 = US Gallons	Volume will be totalised in US Gallons
7 = Cubic feet	Volume will be totalised in cubic feet
8 = Barrels	Volume will be totalised in barrels

P606 Correction Factor

This parameter is used to enter a correction factor, when required, such as the specific gravity of the material so that the volume calculated is relative to the actual amount of material that can be contained between empty level (P105) and 100% of span (P106). Default = 1

P607 Max Volume

This parameter displays the actual maximum volume that has been calculated by the i-Series Intelligent Sensor, i.e. P604 Calculated Volume x P606 Correction Factor, and is a Read Only parameter. The volume displayed will be shown in P605 Volume Units and is the total volume available between empty level (P105) and 100% of span (P106).

9.3.2 Breakpoints

P610-P641 Level/Volume Breakpoints

These parameters are used to create a profile of the vessel when P600 = 11 (universal linear) or P600 = 12 (universal curved). You should enter breakpoints in pairs, a reading for level and its corresponding volume. The more pairs you enter, the more accurate the profile will be. In the case of universal linear, then enter the level/volume at each of the points where the vessel changes shape. In the case of the universal curved, enter values around each arc tangent, as well as at the top and bottom.
You must enter at least two pairs, and you can enter up to 16 pairs.

Universal Linear (P600 = 11)

This volume calculation creates a linear approximation of the level/volume relationship, and works best if the vessel has sharp angles between each section.
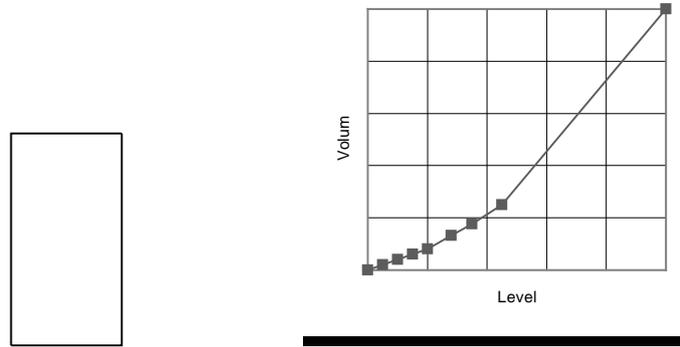
You should enter a level/volume breakpoint for each place where the vessel changes direction, and numerous where the section is slightly curved (mostly linear, but has got a small arc). You can enter any number of pairs between 2 and 16.

Universal Curved (P600 = 12)

This volume calculation creates a curved approximation of the level/volume relationship, and works best if the vessel is non-linear, and there are no sharp angles.
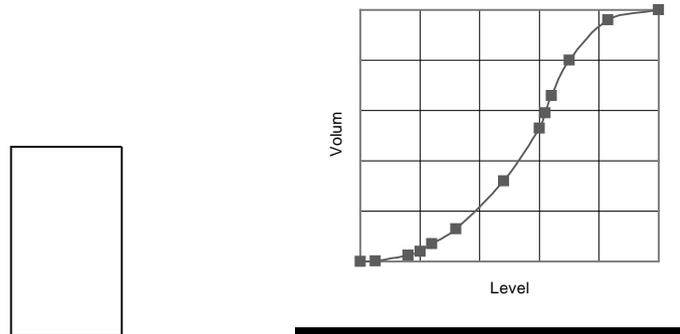
You should enter 2 level/volume breakpoints at the minimum and maximum levels, and several for each place where the vessel has got an arc. You can enter any number of pairs between 2 and 16.

P696 Reset Breakpoints

This parameter allows the resetting, to the default value, of all previously set breakpoints (P610-673), without having to access them individually. When it is necessary to reset or amend particular breakpoints this can be achieved by directly accessing the desired parameter (P610-673) and changing as required.

P697 Number of Breakpoints Set

This parameter allows you to review the number of breakpoints that have been set, without the need to access each individual one in turn, this is a "Read Only " parameter and no values can be entered.

9.4   mA Output

P834 mA Low Level

This parameter sets, in Measurement Units (P104), the value of 'level', 'distance' or 'space', depending on the selected Mode of Operation (P100), at which 4 mA will occur.

P835 mA High Level

This parameter sets, in Measurement Units (P104), the value of 'level', 'distance' or 'space', depending on the selected Mode of Operation (P100), at which 20 mA output will occur.

P838 mA Low Trim

If the device you are connected to is not calibrated, and not showing the low value, then you can trim it using this parameter. You can either type in the offset directly, or use the arrow keys to move the output up and down until you get the expected result on the device that is connected.

P839 mA High Trim

If the device you are connected to is not calibrated, and not showing the high value, then you can trim it using this parameter. You can either type in the offset directly, or use the arrow keys to move the output up and down until you get the expected result on the device that is connected.

P808 Fail-safe Mode

By default, if a fail-safe condition occurs, then the display, relays and the mA output are held at their last known values until a valid reading is obtained.
If required, then you can change this so that the unit goes to high (100% of span), or low (empty) as follows:

Option	Description
1 = Known (Default)	Remain at the last known value
2 = High	Will fail to the high value (100 % of Span)
3 = Low	Will fail to the low value (empty)

P809 Fail-safe Time

In the event of a fail-safe condition occurring the fail safe timer determines the time before fail-safe mode is activated. Default = 2.00 mins
If the timer activates, the unit goes into fail-safe, as determined by P808, (Display and P840 (mA Output). When this happens, you will see the message "LOE!" on the display.
When a valid measurement is obtained then the display, relays and mA output will be restored and the timer is reset.

9.5   Compensation

P851 Measurement Offset

The value of this parameter is added to the measured distance, in Measurement Units (P104).
This Offset will be added to the level, as derived from the Sensor, and will affect everything including the reading on the display, the relay setpoints and the mA output.

P852 Temperature Source

Default = 1

This parameter determines the source of the temperature measurement. By default it is set to internal Sensor (P852 = 1), which will automatically detect the temperature from the Sensor. If for any reason, no temperature input is received, then the Fixed Temp value is used, as set by P854.

The temperature source can be specifically set as follows:

Option	Description
1 = Internal (Default)	Always uses temperature reading from Sensor.
3 = Fixed	Always uses fixed temperature (P854)

P854 Fixed Temperature

This parameter sets the temperature, in degrees centigrade to be used if
P852 Temperature Source = 3 (Default = 20 °C)

P860 Sound Velocity

This option allows for the velocity of sound to be changed according to the atmosphere the Sensor is operating in. By default the velocity is set for 342.72 m/sec which is the speed of sound travelling in air at a temperature of 20°C.
The table below gives details of the velocity of sound in various gaseous atmospheres In all cases the velocity indicated is that in a 100% gaseous atmosphere at 0°C. In atmospheres less than 100 % it may be necessary to check the level indicated at near empty and near full and compare with the actual level, several times, then adjust the Sound Velocity accordingly to obtain an accurately displayed reading.

Gas	Sound Velocity
Chlorine	206 m/sec
Argon	308 m/sec
Oxygen	316 m/sec
Air	331.5 m/sec
Ammonia	415 m/sec
Methane	430 m/sec
Helium	435 m/sec
Neon	965 m/sec

P645 Vapour Temperature Compensation

The sound velocity in air increases or decreases at a uniform rate of
60 cm/sec. per °C, however in atmospheres other than air it will change at a different rate.

This option allows the rate of change in cm/sec. per °C to be set according to the atmosphere and temperature present. The level indicated, should be compared with the actual level, several times, then Vapour Temperature Compensation adjusted accordingly, to obtain an accurately displayed reading.
Default = 60 cm/sec. per °C

9.6   Stability

9.6.1 Damping

Damping is used to damp the display, to enable it to keep up with the process but ignore minor surface fluctuations.

P870 Fill Damping

This parameter determines the maximum rate at which the unit will respond to an increase in level. It should be set slightly higher than the maximum vessel fill rate. Default = 10.000 metres/minute (32.81 feet/minute)

P871 Empty Damping

This parameter determines the maximum rate at which the unit will respond to a decrease in level. It should be set slightly higher than the maximum vessel empty rate. Default = 10.000 metres/minute (32.81 feet/minute)

9.6.2 Filters

P881 Fixed Distance

This parameter determines the width of gate to be used in tracking an echo and under normal circumstances will not require changing, but it can be increased in the cases where the surface is moving extremely fast (in excess of 10 m/min) to ensure smooth processing of the changing level.

P884 Peak Percentage

When P102 = 2 (Solids), this parameter can be used to determine the point at which the measurement is taken, within the established gate of the selected echo, in order to compensate for any error that maybe caused by "angles of repose" presented by the way the material settles. Please consult NIVUS GmbH, for further information and assistance on changing the value of this parameter.

9.7 System

The following three parameters do not affect how the unit performs, but details, contained in them, may be required, by NIVUS GmbH, when making technical enquiries.

9.7.1 Password

P921 Enable Code

Enables the passcode (P922), which means the passcode must be entered to go into program mode. If disabled (set to 0), then no passcode is required, and pressing ESC and ENTER button simultaneously will allow entry into the program mode.

P922 Passcode

This is the passcode that must be used to enter program mode. The default is 1997, but this can be changed to another value.

9.7.2 System Information

P926 Software Revision

This parameter will display the current software revision.

P927 Hardware Revision

This parameter will display the current hardware revision. It is read only, and cannot be changed.

P928 Serial Number

This parameter will display the serial number of the unit.

P930 Factory Defaults

This parameter resets all parameter values to the original Factory Set values that were installed when the unit was tested, before despatch to you.
To reset parameters, Set P930 to 1.

9.7.3 Date & Time

The date and time is used, to control specific relay functions and date stamp certain events that are contained in the Data Logs. It is also used in conjunction with the system watchdog that keeps an eye on the times the unit has started.

P931 Date

This parameter display the current date, in the format as set by P933 (Date Format), and can be reset if required.

P932 Time

This parameter displays the current time and can be reset if required, in the format HH:MM (24-hour format). This is set initially to UTC.

9.7.4 LOE Save Trace

P950 Save DATEM Trace on LOE

When enabled this parameter will ensure that in the event of the unit going into a LOE situation a trace at the time of the LOE occurrence is saved for future reference.

Option	Description
0 = Off	Feature is disabled and in the event of LOE echo trace will NOT be saved.
1 = Enable (Single Trace)	In the event of a LOE situation an echo trace WILL be saved and stored for future reference. Once a LOE trace has been saved no further traces will be taken
2 = Enable Overwrite (Default)	In the event of an LOE event occurring any previous trace will be overwritten and the last LOE trace saved.

9.8 DATEM

P020 Set DATEM

This parameter allows DATEM to be reset to its default value. To reset DATEM to its default value set parameter value to 1, the trace will then be set to its default value and then update as normal.

P021 Set Dist

Allows the user or service personnel to determine which echo is to be displayed. On start-up, if the unit displays an incorrect reading then simply enter the distance from the Sensor to the required level and, if an echo is present at this point, the Gate will establish itself around the chosen echo, DATEM will update in front of the Gate and reference out any other unwanted echoes.
It should be noted that DATEM will reset to default values whilst performing this function, and reform itself once it has selected an echo.
Enter distance from the face of Sensor to the target in units of measurement
P104
Values: Min. 0.000, Max. 99.00 m

P905 Peak Clearance

This parameter is used to set the "height" above which the DATEM trace will "stand off" from around unwanted echoes such as obstructions. Please consult NIVUS GmbH for further information and assistance on changing the value of this parameter.

P906 Side Clearance

This parameter is used to set the "distance" by which the DATEM trace will "stand off" from around unwanted echoes such as obstructions. Please consult NIVUS GmbH for further information and assistance on changing the value of this parameter.

10 Troubleshooting

This section describes many common symptoms, with suggestions as to what to do.

Symptom	What to Do
Sensor not firing.	Check power supply
Unit indicates a "L0E" situation.	No valid echo being received and unit has gone into fault condition. Check material level is not out of range, sensor is perpendicular to material surface.
Incorrect reading being obtained for current level.	Measure actual distance from Sensor face to surface of material. Access P21, via PC Software type in the measured distance, and Set Parameter.
4-20 mA current fixed even though level is changing.	Poll address is above 0, and is in multi drop mode.
Material level is consistently incorrect by the same amount.	Check empty level (P105) correctly entered.

11 Parameter Record

Application

Parameter Details		Entered Values					
No.	Description	Default	1	2	3	4	5
P100	Mode	2 = Level					
P102	Material	1 = Liquid					
P104	Measurement Units	**Model Dependant**					
P105	Empty Level	**Model Dependant**					
P106	Span	**Model Dependant**					
P107	Near Blanking	**Model Dependant**					
P108	Far Blanking	20%					

Data Logs

Temperature

Parameter Details		Entered Values					
No.	Description	Default	1	2	3	4	5
P580 P581	Minimum Temperature	Read Only					
P581	Min Temperature Date	Read Only					
P582	Min Temperature Time	Read Only					
P583	Maximum Temperature	Read Only					
P584	Max Temperature Date	Read Only					
P585	Max Temperature Time	Read Only					
P586	Current Temperature	Read Only					

Sensor Power Information

Parameter Details		Entered Values					
No.	Description	Default	1	2	3	4	5
P940	Number of Starts	Read Only					
P941	Last Power Off	Read Only					
P942	Last Power Off	Read Only					
P943	Last Runtime Minutes	Read Only					
P944	Total Runtime	Read Only					

Volume

Conversion

Parameter Details		Entered Values					
No.	Description	Default	1	2	3	4	5
P600	Vessel Shape	0					
P601	Vessel Dimen-	0.00					
P602	Vessel Dimen-	0.00					
P603	Vessel Dimen-	0.00					
P604	Calculated Vol-	Read Only					
P605	Volume Units	**Model Dependant**					
P606	Correction Fac-	1					
P607	Max Volume	Read Only					

Breakpoints

No.	Description	Default	1	2	3	4	5
Parameter Details		Entered Values					
P610	Level Breakpoint 1	0.00					
P611	Volume Breakpoint 1	0.00					
P612	Level Breakpoint 2	0.00					
P613	Volume Breakpoint 2	0.00					
P614	Level Breakpoint 3	0.00					
P615	Volume Breakpoint 3	0.00					
P616	Level Breakpoint 4	0.00					
P617	Volume Breakpoint 4	0.00					
P618	Level Breakpoint 5	0.00					
P619	Volume Breakpoint 5	0.00					
P620	Level Breakpoint 6	0.00					
P621	Volume Breakpoint 6	0.00					
P622	Level Breakpoint 7	0.00					
P623	Volume Breakpoint 7	0.00					
P624	Level Breakpoint 8	0.00					
P625	Volume Breakpoint 8	0.00					
P626	Level Breakpoint 9	0.00					
P627	Volume Breakpoint 9	0.00					
P628	Level Breakpoint 10	0.00					
P629	Volume Breakpoint	0.00					
P630	Level Breakpoint 11	0.00					
P631	Volume Breakpoint	0.00					
P632	Level Breakpoint 12	0.00					
P633	Volume Breakpoint	0.00					
P634	Level Breakpoint 13	0.00					
P635	Volume Breakpoint	0.00					
P636	Level Breakpoint 14	0.00					
P637	Volume Breakpoint	0.00					
P638	Level Breakpoint 15	0.00					
P639	Volume Breakpoint	0.00					
P640	Level Breakpoint 16	0.00					
P641	Volume Breakpoint	0.00					
P696	Reset Breakpoints	0					
P697	Number of B'points	Read					

mA Output

Output

No.	Description	Default	1	2	3	4	5
Parameter Details		Entered Values					
P834	Low Level	0.000					
P835	High Level	**Model Dependant**					
P838	Low Trim	0.00 mA					
P839	High Trim	0.00 mA					
P808	Fail Mode	1 = Known					
P809	Fail Time	2.0 mins					

Fail Mode

Parameter Details		Entered Values					
P808	Fail Mode	1 = Known					
P809	Fail Time	2.0 mins					

Compensation

No.	Description	Default	1	2	3	4	5
Parameter Details		Entered Values					
P851	Measurement	0.000					
P852	Temperature	1 = Automatic					
P854	Fixed Tempera-	20.00 Deg. C					
P860	Sound Velocity	342.72 m/sec					
P645	Vapour Temp.	60 cm/sec per					

Stability

Damping

No.	Description	Default	1	2	3	4	5
Parameter Details		Entered Values					
P870	Fill Damping	Model De-					
P871	Empty Damping	Model De-					

Filters

No.	Description	Default	1	2	3	4	5
Parameter Details		Entered Values					
P881	Fixed Distance	0.2 metre					
P884	Peak Percentage	50%					

System

No.	Description	Default	1	2	3	4	5
Parameter Details		Entered Values					
P921	Enable Code	1 = Yes					
P922	Passcode	1997					
P926	Software Revi-	Read Only					
P927	Hardware Revi-	Read Only					
P928	Serial Number	Read Only					
P950	Save Trace on	2					

DATEM

No.	Description	Default	1	2	3	4	5
Parameter Details		Entered Values					
P905	Peak Clearance	80 millivolts					
P906	Side Clearance	0.06 metres					

15 Table of Pictures

16   Index

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EU Konformitätserklärung

EU Declaration of Conformity

Déclaration de conformité UE

Für das folgend bezeichnete Erzeugnis:

For the following product:

Le produit désigné ci-dessous:

Bezeichnung:	**"Ex" Ultraschallsensoren i-Serie**
Description:	*"Ex" i series of ultrasonic transducers*
Désignation:	*"Ex" Capteurs ultrasoniques de la série i*
Typ / Type:	**NMI0xxxxxxx1… [1] / NMI0xxxxxxx0… [2]**

erklären wir in alleiniger Verantwortung, dass die auf dem Unionsmarkt ab dem Zeitpunkt der Unterzeichnung bereitgestellten Geräte die folgenden einschlägigen Harmonisierungsvorschriften der Union erfüllen:

we declare under our sole responsibility that the equipment made available on the Union market as of the date of signature of this document meets the standards of the following applicable Union harmonisation legislation:

nous déclarons, sous notre seule responsabilité, à la date de la présente signature, la conformité du produit pour le marché de l'Union, aux directives d'harmonisation de la législation au sein de l'Union:

- 2014/34/EU   • 2014/30/EU   • 2011/65/EU

Bei der Bewertung wurden folgende einschlägige harmonisierte Normen zugrunde gelegt bzw. wird die Konformität erklärt in Bezug auf die nachfolgend genannten anderen technischen Spezifikationen:

The evaluation assessed the following applicable harmonised standards or the conformity is declared in relation to other technical specifications listed below:

L'évaluation est effectuée à partir des normes harmonisées applicable ou la conformité est déclarée en relation aux autres spécifications techniques désignées ci-dessous:

- EN IEC 60079-0:2018   • EN 61326-1:2013
- EN 60079-18:2015 + A1:2017 [2] only   • EN 60079-11:2012 [1] only

Ex-Kennzeichnung / *Ex-designation* / *Marquage Ex* :

⟨Ex⟩ II 1G Ex ia IIC T4 Ga T$_{amb}$ -40°C to +80°C [1]   ⟨Ex⟩ II 1D Ex ia IIIC T130°C Da T$_{amb}$ -40°C to +80°C [1]

⟨Ex⟩ II 2G Ex mb IIC T4 Gb T$_{amb}$ -40°C to +80°C [2]   ⟨Ex⟩ II 2D Ex mb IIIC T130°C Db T$_{amb}$ -40°C to +80°C [2]

EU-Baumusterprüfbescheinigung / *EU-Type Examination Certificate* / *Attestation d'examen «UE» de type:*

TRaC12ATEX0030X (Ex ia) V1 [1]   TRaC12ATEX0031X (Ex mb) V1 [2]

Benannte Stelle (Kennnummer) / *Notified Body (Identif. No.)* / *Organisme notifié (№ d'identification)*

Element Materials Technology Rotterdam B.V., Zekeringstraat 33, Amsterdam, Netherlands   (2812)

Qualitätssicherung ATEX / *Quality assurance ATEX* / *Assurance qualité ATEX:*

TÜV Nord CERT GmbH, Am TÜV 1, 45307 Essen, Germany   (0044)

Diese Erklärung wird verantwortlich für den Hersteller:

This declaration is submitted on behalf of the manufacturer:

Le fabricant assume la responsabilité de cette déclaration:

NIVUS GmbH
Im Taele 2
75031 Eppingen
Germany

abgegeben durch / *represented by* / *faite par:*

Ingrid Steppe (Geschäftsführerin / *Managing Director / Directeur général*)

Eppingen, den 21.10.2022

Gez. *Ingrid Steppe*

NIVUS GmbH
Im Täle 2
75031 Eppingen

Telefon: +49 07262 9191-0
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E-Mail: info@nivus.com
Internet: www.nivus.de

UK Declaration of Conformity

For the following product:

Description:	**"Ex" i series of ultrasonic transducers**
Type:	**NMI0xxxxxxx1…** [1] **/ NMI0xxxxxxx0…** [2]

we declare under our sole responsibility that the equipment made available on the UK market as of the date of signature of this document meets the standards of the following applicable UK harmonisation legislation:

- SI 2016 / 1107 The Equipment and Protective Systems Intended for use in Potentially Explosive Atmospheres Regulations 2016

- SI 2016 / 1091 The Electromagnetic Compatibility Regulations 2016

- SI 2012 / 3032 The Restriction of the Use of Certain Hazardous Substances in Electrical and Electronic Equipment Regulations 2012

The evaluation assessed the following applicable harmonised standards or the conformity is declared in relation to other technical specifications listed below:

- BS EN IEC 60079-0:2018
- BS EN 60079-18:2015 + A1:2017 [2] only
- BS EN 61326-1:2013
- BS EN 60079-11:2012 [1] only

Ex-designation:

⟨Ex⟩ II 1G Ex ia IIC T4 Ga T_{amb} -40°C to +80°C [1]

⟨Ex⟩ II 1D Ex ia IIIC T130°C Da T_{amb} -40°C to +80°C [1]

⟨Ex⟩ II 2G Ex mb IIC T4 Gb T_{amb} -40°C to +80°C [2]

⟨Ex⟩ II 2D Ex mb IIIC T130°C Db T_{amb} -40°C to +80°C [2]

EU-Type Examination Certificate:

TRaC12ATEX0030X (Ex ia) V1 [1]

TRaC12ATEX0031X (Ex mb) V1 [2]

Notified Body (Identif. No.):

Element Materials Technology Rotterdam B.V., Zekeringstraat 33, Amsterdam, Netherlands   (2813)

Quality Assurance Ex:

TÜV Nord CERT GmbH, Am TÜV 1, 45307 Essen, Germany   (0044)

This declaration is submitted on behalf of the manufacturer:

NIVUS GmbH
Im Taele 2
75031 Eppingen
Germany

represented by:
Ingrid Steppe (Managing Director)

Eppingen, 21/10/2022

Signed by *Ingrid Steppe*

1 **EU - TYPE EXAMINATION CERTIFICATE**

2 Product or Protective System Intended for use in Potentially Explosive Atmospheres
Directive 2014/34/EU – Annex III

3 EU - Type Examination   TRAC12ATEX0030X (incorporating variation V1)
Certificate No.:

4 Product: **Ultrasonic Transducers,**
                    i-Series Intelligent Sensors

5 Manufacturer: **Nivus GmbH,**

6 Address: **Im Täle 2, 75031 Eppingen, Germany**

7 This product and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

8 Element Materials Technology, Notified Body number 2812, in accordance with Article 17 of Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014, certifies that this product has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres given in Annex II to the Directive.

     The examination and test results are recorded in the confidential report TRA-008917-33-02A

9 Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

       EN60079-0:2009   EN60079-11:2012   EN60079-26:2007

     Except in respect of those requirements listed at section 18 of the schedule.

10 If the sign "X" is placed after the certificate number, it indicates that the product is subject to specific conditions of use specified in the schedule to this certificate.

11 This EU - TYPE EXAMINATION CERTIFICATE relates only to the design and construction of the specified product. Further requirements of the Directive apply to the manufacturing process and supply of this product. These are not covered by this certificate.

12 The marking of this product shall include the following:

     ⟨Ex⟩ II 1 G Ex ia IIC T4 Ga T_{amb} = -40°C to +80°C

     II 1 D Ex ia IIIC T130°C Da

     This certificate and its schedules may only be reproduced in its entirety and without change. This certificate is issued in accordance with the Element Materials Technology Ex Certification Scheme.

S.P. Winsor

S P Winsor, Certification Manager

Issue date: 2021-01-15   Page 1 of 7   CSF355-NL 4.0

13   SCHEDULE TO EU - TYPE EXAMINATION CERTIFICATE

14   CERTIFICATE NUMBER TRAC12ATEX0030X (incorporating variation V1)

15   Description of Product

The "i-Series Intelligent Sensors" are ultrasonic transducers. They are a range of low power, compact acoustic measurement devices and are intended to be powered, via an ATEX approved galvanic / zener barrier or a specialist ATEX approved PSU, by a control unit which also processes the measurement data received.

The range of transducers consists of slightly different constructions with respect to dimensions but all have a non-metallic enclosure which houses 2 internal electronic PCBs and a piezo crystal. The free space internally is potted with 1 of 2 types of material. Each unit has an integral screened cable for the power supply and some of the models use syntactic foam as a facing material.

Table of entity parameters	
Parameter	Channel 1
U_i	28V
I_i	162mA
P_i	1.03W
C_i	0
L_i	0

16   Test Report No. (as added for this issue of the certificate):   TRA-008917-33-02A.

17   Specific Conditions of Use

1. The "i-Series Intelligent Sensors" must be powered by an ATEX approved barrier that meets the following parameters: U_o = ≤28V, I_o = ≤162mA, P_o = ≤1.03W

2. The equipment must be routinely inspected to avoid the build up of dust layers when installed in a Zone 20, 21 & 22.

3. The power supply cable to the transducers shall meet the relevant installation requirements of clause 9 of EN60079-14:2008.

Attention is drawn to the operating and installation instructions which may contain useful information in relation to conditions of use.

18   Essential Health and Safety Requirements (Directive Annex II)

In addition to the Essential Health and Safety Requirements covered by the standards listed at item 9, all other requirements are demonstrated in the relevant reports.

19   Drawings and Documents

The list of controlled technical documentation is given in Appendix A to this schedule.

20   **Routine Tests**

None.

21   **Specific Conditions for Manufacture**

1. Wiring and potting of the "i-Series Intelligent Sensors" shall be manufactured in accordance with document ref. Special process instruction 9.0, i potting rev 1.0 dated 2012-06-13.

2. Conditions for manufacturing and production control are the same as for equipment detailed within report TRA-008917-33-01A.

22   **Photographs**

23   **Details of Markings**

24   **Certificate History**

Original certificate	2012-09-06	First issue.
Variation V1	2021-01-15	This certificate was originally issued by Notified Body number 0891 under Directive 2014/34/EU. The technical file has been transferred to Element Notified Body number 2812 without further assessment or evaluation.

This certificate is a consolidated certificate and reflects the latest status of the certification, including all variations and amendments.

25   **Notes to CE marking**

In respect of CE Marking, Element Materials Technology accepts no responsibility for the compliance of the product against all applicable Directives in all applications.

26   **Notes to this certificate**

Element Materials Technology certification reference: TRA-008917-33-02A. (NR-NVSQ-0002).

Throughout this certificate, the date format yyyy-mm-dd (year-month-day) is used.

Notified Body number 2812 is the designation for Element Materials Technology Rotterdam BV.

In accordance with Article 41 of Directive 2014/34/EU, EC-Type Examination Certificates referring to 94/9/EC that were in existence prior to the date of application of 2014/34/EU (20 April 2016) may be referenced as if they were issued in accordance with Directive 2014/34/EU. Variation certificates to such EC-Type Examination Certificates, and new issues of such certificates, may continue to bear the original certificate number issued prior to 20 April 2016.

27   Conditions for the validity of this certificate

This certificate remains valid for so long as:

(i)   The equipment listed in section 4 is manufactured in accordance with the documents listed in Appendix A of this certificate.

(ii)   The standards listed in section 9 of this certificate continue to satisfy the Essential Health and Safety Requirements of Annex II of Directive 2014/34/EU and the generally acknowledged state of the art (e.g. as determined by the publishers of those standards).

APPENDIX A - TECHNICAL DOCUMENTS

Title:	Drawing No.:	Rev. Level:	Date:
Intelligent Transducer General Layout	D-804-0948-A	A	2011-12-01
HIPA (Hart, imp, PA) Schematic For ATEX Certification	D-804-0949-A	A	2012-01-03
HIPA PCB (3 pages)	D-804-0950-B	B	2012-01-03
ATEX Certified HIPA Ping BOM (2 pages)	*	1.0	2012-01-17
Hart CPU Schematic For ATEX Certification	D-804-0951-A	A	2012-01-03
Hart CPU PCB (4 pages)	D-804-0952-B	B	2012-04-23
ATEX Certified Hart Transducer Processor BOM (3 pages)	*	1.0	2012-01-17
NIVUS i 3, 6, 10 & 15 HART Transducer Wraparound Labels for Ex ia	D-804-0964-C	C	2012-06-27
i Transducer Potting Thickness	D-804-0969-A	A	2012-03-13
i Transducer Block Diagram For Exia	D-804-0979-A	A	2012-04-23
i Transducer Cap	D-804-0980-A	A	2012-04-23
i 3 Standard Housing	D-804-0981-A	A	2012-04-23
i 6 Standard Housing	D-804-0982-A	A	2012-04-23
i 10 Standard Housing	D-804-0983-A	A	2012-04-23
i 15 Standard Housing	D-804-0984-A	A	2012-04-23
i 3 Threaded Nose Housing	D-804-0985-A	A	2012-04-23
i 6 Threaded Nose Housing	D-804-0986-A	A	2012-04-23
i 10 Threaded Nose Housing	D-804-0987-A	A	2012-04-23
i Housing Extension Ring	D-804-0988-A	A	2012-04-23
Special Process Instruction 9.0 i Potting	*	1.0	2012-06-13
Instruction Manual for i-Series Intelligent Sensors	i-Series Sensors	00	2012-07-20
* No information provided.			

element

1   # EU - TYPE EXAMINATION CERTIFICATE

2   Product or Protective System Intended for use in Potentially Explosive Atmospheres Directive 2014/34/EU – Annex III

3   EU - Type Examination Certificate No.:   **TRAC12ATEX0031X (incorporating variation V1)**

4   Product: **Ultrasonic Transducers,**
                             i-Series Intelligent Sensors

5   Manufacturer: **Nivus GmbH,**

6   Address: **Im Täle 2, 75031 Eppingen, Germany**

7   This product and any acceptable variation thereto is specified in the schedule to this certificate and the documents therein referred to.

8   Element Materials Technology, Notified Body number 2812, in accordance with Article 17 of Directive 2014/34/EU of the European Parliament and of the Council, dated 26 February 2014, certifies that this product has been found to comply with the Essential Health and Safety Requirements relating to the design and construction of products intended for use in potentially explosive atmospheres given in Annex II to the Directive.

The examination and test results are recorded in the confidential report TRA-008917-33-02A

9   Compliance with the Essential Health and Safety Requirements has been assured by compliance with:

         EN60079-0:2009   EN60079-18:2009

Except in respect of those requirements listed at section 18 of the schedule.

10   If the sign "X" is placed after the certificate number, it indicates that the product is subject to specific conditions of use specified in the schedule to this certificate.

11   This EU - TYPE EXAMINATION CERTIFICATE relates only to the design and construction of the specified product. Further requirements of the Directive apply to the manufacturing process and supply of this product. These are not covered by this certificate.

12   The marking of this product shall include the following:

     ⟨Ex⟩ **II 2 G Ex mb IIC T4 Gb** T_{amb} = -40°C to +80°C

        II 2 D Ex mb IIIC T130°C Db

This certificate and its schedules may only be reproduced in its entirety and without change. This certificate is issued in accordance with the Element Materials Technology Ex Certification Scheme.
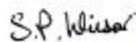
S.P. Winsor

S P Winsor, Certification Manager

Issue date: 2021-01-19 (issue 2)   Page 1 of 6   CSF355-NL 4.0

13   SCHEDULE TO EU - TYPE EXAMINATION CERTIFICATE

14   CERTIFICATE NUMBER TRAC12ATEX0031X (incorporating variation V1)

15   Description of Product

The "i-Series Intelligent Sensors" are ultrasonic transducers. They are a range of 4-20 mA loop-powered, compact acoustic measurement devices and are intended to be powered by a control unit (not part of this certified equipment) which also processes the measurement data received. The transducers are protected by a fuse in line with the power supply.

The range of transducers consists of slightly different constructions with respect to dimensions but all have a non-metallic enclosure which houses 2 internal electronic PCBs and a piezo crystal. The free space internally is potted with 1 of 2 types of material. Each unit has an integral screened cable for the power supply and some of the models use syntactic foam as a facing material.

The equipment is marked with a maximum voltage rating of $Um = 28V$ and is current limited by an internal fuse.

16   Test Report No. (as added for this issue of the certificate):   TRA-008917-33-02A.

17   Specific Conditions of Use

1. The "i-Series Intelligent Sensors" must be routinely inspected to avoid the build up of dust layers when installed in a Zone 21 & 22.

2. The "i-Series Intelligent Sensors" must only be wiped with a damp or antistatic cloth.

3. Only the fuse value listed on drawing D-0804-0978-A is permitted to be used with the Ex approved "i-Series Intelligent Sensors"

Attention is drawn to the operating and installation instructions which may contain useful information in relation to conditions of use.

18   Essential Health and Safety Requirements (Directive Annex II)

In addition to the Essential Health and Safety Requirements covered by the standards listed at item 9, all other requirements are demonstrated in the relevant reports.

19   Drawings and Documents

The list of controlled technical documentation is given in Appendix A to this schedule.

20   Routine Tests

None.

21   Specific Conditions for Manufacture

1. Wiring and potting of the "i-Series Intelligent Sensors" shall be manufactured in accordance with document ref. Special process instruction 9.0, i potting rev 1.0 dated 2012-06-13.

2. Conditions for manufacturing and production control are the same as for equipment detailed within report TRA-008917-33-01A.

22   Photographs

23 Details of Markings

24 Certificate History

Original certificate	2012-09-06	First issue.
Variation V1	2021-01-15	This certificate was originally issued by Notified Body number 0891 under Directive 2014/34/EU. The technical file has been transferred to Element Notified Body number 2812 without further assessment or evaluation.
Variation V1 issue 2	2021-01-19	Correction to error in standards in section 9.

This certificate is a consolidated certificate and reflects the latest status of the certification, including all variations and amendments.

25 Notes to CE marking

In respect of CE Marking, Element Materials Technology accepts no responsibility for the compliance of the product against all applicable Directives in all applications.

26 Notes to this certificate

Element Materials Technology certification reference: TRA-008917-33-02A. (NR-NVSQ-0001).

Throughout this certificate, the date format yyyy-mm-dd (year-month-day) is used.

Notified Body number 2812 is the designation for Element Materials Technology Rotterdam BV.

In accordance with Article 41 of Directive 2014/34/EU, EC-Type Examination Certificates referring to 94/9/EC that were in existence prior to the date of application of 2014/34/EU (20 April 2016) may be referenced as if they were issued in accordance with Directive 2014/34/EU. Variation certificates to such EC-Type Examination Certificates, and new issues of such certificates, may continue to bear the original certificate number issued prior to 20 April 2016.

27   Conditions for the validity of this certificate

This certificate remains valid for so long as:

(i)   The equipment listed in section 4 is manufactured in accordance with the documents listed in Appendix A of this certificate.

(ii)   The standards listed in section 9 of this certificate continue to satisfy the Essential Health and Safety Requirements of Annex II of Directive 2014/34/EU and the generally acknowledged state of the art (e.g. as determined by the publishers of those standards).

APPENDIX A - TECHNICAL DOCUMENTS

Title:	Drawing No.:	Rev. Level:	Date:
Intelligent Transducer General Layout	D-804-0948-A	A	2011-12-01
HIPA (Hart, imp, PA) Schematic For ATEX Certification	D-804-0949-A	A	2012-01-03
HIPA PCB (3 pages)	D-804-0950-B	B	2012-01-03
ATEX Certified HIPA Ping BOM (2 pages)	*	1.1	2012-06-19
Hart CPU Schematic For ATEX Certification	D-804-0951-A	A	2012-01-03
Hart CPU PCB (4 pages)	D-804-0952-B	B	2012-01-03
ATEX Certified Hart Transducer Processor BOM (3 pages)	*	1.1	2012-06-19
NIVUS i 3, 6, 10 & 15 HART Transducer Wraparound Labels for Ex mb	D-804-0996-B	*	2011-09-26
i Transducer Block Diagram For Exm	D-804-0978-A	A	2012-04-23
i Transducer Potting Thickness	D-804-0969-A	A	2012-03-13
i Transducer Cap	D-804-0980-A	A	2012-04-23
i 3 Standard Housing	D-804-0981-A	A	2012-04-23
i 6 Standard Housing	D-804-0982-A	A	2012-04-23
i 10 Standard Housing	D-804-0983-A	A	2012-04-23
i 15 Standard Housing	D-804-0984-A	A	2012-04-23
i 3 Threaded Nose Housing	D-804-0985-A	A	2012-04-23
i 6 Threaded Nose Housing	D-804-0986-A	A	2012-04-23
i 10 Threaded Nose Housing	D-804-0987-A	A	2012-04-23
i Housing Extension Ring	D-804-0988-A	A	2012-04-23
Special Process Instruction 9.0 i Potting	*	1.0	2012-06-13
Instruction Manual for i-Series Intelligent Sensors	i-Series Sensors	00	2012-07-20
* no information provided.			