Air Sensor

SAC Ex

Manual

AQ Elteknik AB

ATEX

Air Sensor

SAC Ex

ATEX Certified model

Manual version 2.1

April 2014

AQ Elteknik AB

Table of contents

1. Manufacturer information

AQ Elteknik AB operates a policy of on-going development and reserves the right to make changes and improvements to any of the products described in this users guide without prior notice. Any changes on the products will take place only after consulting the certifying body to ensure that the changes will not effect the Ex safety.

Under no circumstances shall AQ Elteknik be held responsible for any loss or indirect damage howsoever caused. The contents of this document are provided as it is. AQ Elteknik AB reserves the right to revise this document or withdraw it at any time without prior notice.

Manufacture Declaration of Conformity

Manufacturer: AQ Elteknik AB Sweden declares, that the product:

Air Sensor marked with CE-label conforms with the following standards: EN 61000-6-2:2001, EN 61000-6-4:2001, EN55011 (Group 1, Class B).

The Air Sensor is RoHS Compliant, directive 2002/95/EC. Air Sensor marked with  conforms to WEEE.

Limited Warranty

AQ Elteknik AB warrants to the original end user that the Air Sensor is free from any defects in materials or workmanship for a period of one year from the date of purchase. During the warranty period, should the Air Sensor have indications of failure due to faulty workmanship or materials,
AQ Elteknik AB will replace it with no charge. This warranty shall not apply if the Air Sensor is modified, misused or subjected to abnormal working conditions.

Replacement as provided under this warranty is the only remedy of the purchaser. The purchaser pays freight to AQ Elteknik AB. AQ Elteknik AB shall in no event be held liable for indirect or consequential damages of any kind or character to the purchaser.

Returning the Air Sensor

- If the Air Sensor is to be discarded it shall be sent back to AQ Elteknik AB for safe disposal.
- If the Air Sensor shall undergo a warranty commission it shall be sent back to AQ Elteknik AB.

Before sending the Air Sensor to AQ Elteknik AB it must be clean and without any harmful contaminations.
A certificate shall be attached with the Air Sensor that confirms the cleaning and shows following information:

- Who has cleaned the Air Sensor (company if other than sender)
- Who has checked and confirmed that the Air Sensor is clean (company and person)
- Who is sending back the Air Sensor (company)

See “Manufacturer Information” for return address.

Warning

The Air Sensor is intended to be used with the Ultrasound Controller manufactured by AQ Elteknik AB.
AQ Elteknik AB takes no responsibility for any possible damage that could happen if the Air Sensor is connected to any equipment not manufactured by AQ Elteknik AB.

Manufacturer information

Manufacturer:	**AQ Elteknik AB**		
address:	Alsikegatan 4	phone:	+46 (0)18-18 34 30
	SE-753 23 Uppsala	fax:	+46 (0)18-10 50 04
	Sweden		
web:	**www.aqelteknik.com**	e-mail:	aqelteknik@aqg.se

2. Introduction

Air Sensor

Liquid flowing through the Air Sensor is monitored with ultrasound and the presence of gas or particles is detected by the connected Ultrasound Controller. The Air Sensor is reliable and easy to use. It is turned from one piece and the inside is completely smooth with low Ra-value

Ultrasound Controller D72 / DP72

Ultrasound Controller D72 or DP72 is recommended for use with the Air Sensors. It mounts on a DIN-rail and can be connected to two Air Sensors.

3. Functional Description

Principle of Bubble Detection

Bubbles in the liquid flowing through the Air Sensor are monitored by the use of ultrasound.

Inside the Air Sensor two low intensity beams of ultrasound are transmitted across the liquid-path in directions perpendicular to the liquid flow.

If a bubble moves into one of the ultrasound-beams the ultrasound will be partially deflected and the intensity of the ultrasound decreases. The controller constantly measures the intensity of the ultrasound and if it becomes lower than a threshold it detects a bubble. Dense particles in the liquid also deflect the ultrasound and can therefore be detected. To achieve very low sensitivity for bubbles a different technique is used, measuring the damping effect liquid has on vibrations in the air sensor wall.

Sensitivity

The sensitivity for bubbles can be set to high, medium, low, very low and very very low. (How to set it, see ultrasound controller manual.)

With sensitivity set to high a single bubble of approximately 2mm diameter or larger can be detected passing trough the Air Sensor.

With sensitivity set to medium a single bubble of approximately 3mm diameter or larger can be detected.

With sensitivity set to low a single bubble of approximately 10mm diameter can be detected. Low sensitivity is achieved in the Air Sensor by requiring both detectors to detect bubbles at the same time.

Many small bubbles together will be detected as if they were a single big bubble.

Even tiny (microscopic) bubbles can be detected if there are very many of them.

When using very low sensitivity the Air Sensor should preferably be installed with vertical liquid flow since otherwise lingering liquid drops inside the Air Sensor can be detected as liquid. Very low and very very low sensitivity does not work for Air Sensors with diameter <16 mm.

4. Installing the Air Sensor

Installing the Air Sensor

One or two Air Sensors can be connected to one Ultrasound Controller D72 or DP72. The Air Sensor has tri-clamp connections (TC or mini-TC) and it is important to install the sensor correctly by connecting the tri-clamp properly to avoid leakage. When installing the Air Sensor it is also necessary to take into consideration external heating and cooling sources for remaining the operating temperature range. The Air Sensor is designed to be used in normal atmospheric pressure (0.8 bar – 1.1 bar) and also normal oxygen content.

The Air Sensor should be installed in accordance with national regulations. A person with the required knowledge should perform installation.

Cable

The cable from the Air Sensor connects to the barriers hazardous side. The maximum cable length is 40m. The cable-shield is important because it prevents external noise from entering. If the cable is extended, use same or similar cable type (4 conductor with common shield).

NOTE! The unshielded part of the cables should be max 40mm.

Vertical or Horizontal Installation

We recommend if possible installing the Air Sensor with vertical liquid flow. The bubbles will then be drawn to the center where bubbles are easily detected.

If the Air Sensor however is installed horizontally, we recommend the Air Sensors to be turned in such a way that the connector is on top. Bubbles floating in the upper part of the Air Sensor will then be easily detected.

5. Connecting the Air Sensor

Connecting the Air Sensor Ex using barriers

The Ultrasound Controller D72 or DP72 is not ex-certified and intrinsically safe barriers must be used to connect the Air Sensor Ex. The diagram below shows how to connect two Air Sensors SAC via two barriers. It is important to install the barriers and the sensors according to EN 60079-14 and to summarize the voltage and current according to appendix B.

One zener barrier is needed for each Air Sensor.

In the diagrams, the cable type between D72 / DP72 and the barriers is the same type as between the barriers and the Air Sensors. If another cable type is used it must be shielded. Unshielded parts of the cable should be short.

Choosing a barrier

The barrier must be chosen according to EN 60079-14, but there are also measurement considerations for choosing the barrier:

1. The barrier must use resistive current limitation.
2. The barrier must be made for unbiased AC current relative ground.
3. The barrier voltage should be minimum ±8V AC
4. The barrier resistance should be maximum 110Ω
5. The barrier attenuation at 2MHz should be maximum 10dB.
6. The barriers capacitance to ground should be maximum 3nF.

Recommended barrier: Pepperl+Fuchs Z960.

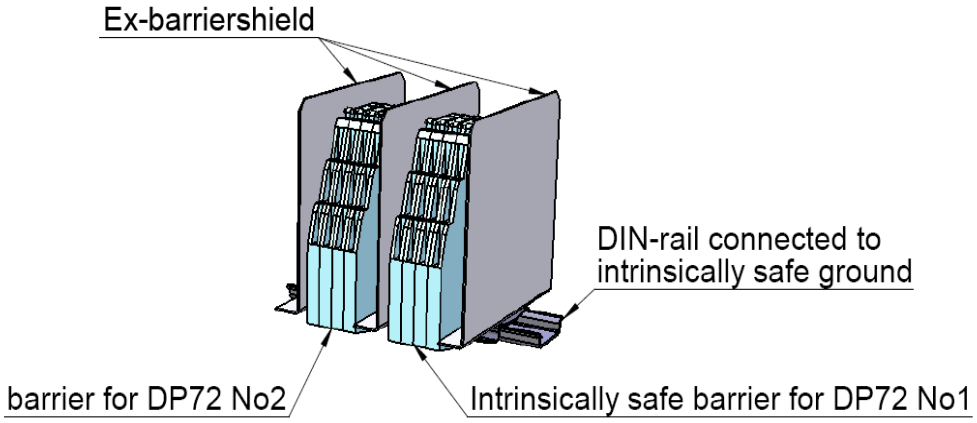
Ex-barriershields

Shielding aluminum plates must be placed outside each group of barriers belonging to each Ultrasound Controller D72 / DP72.

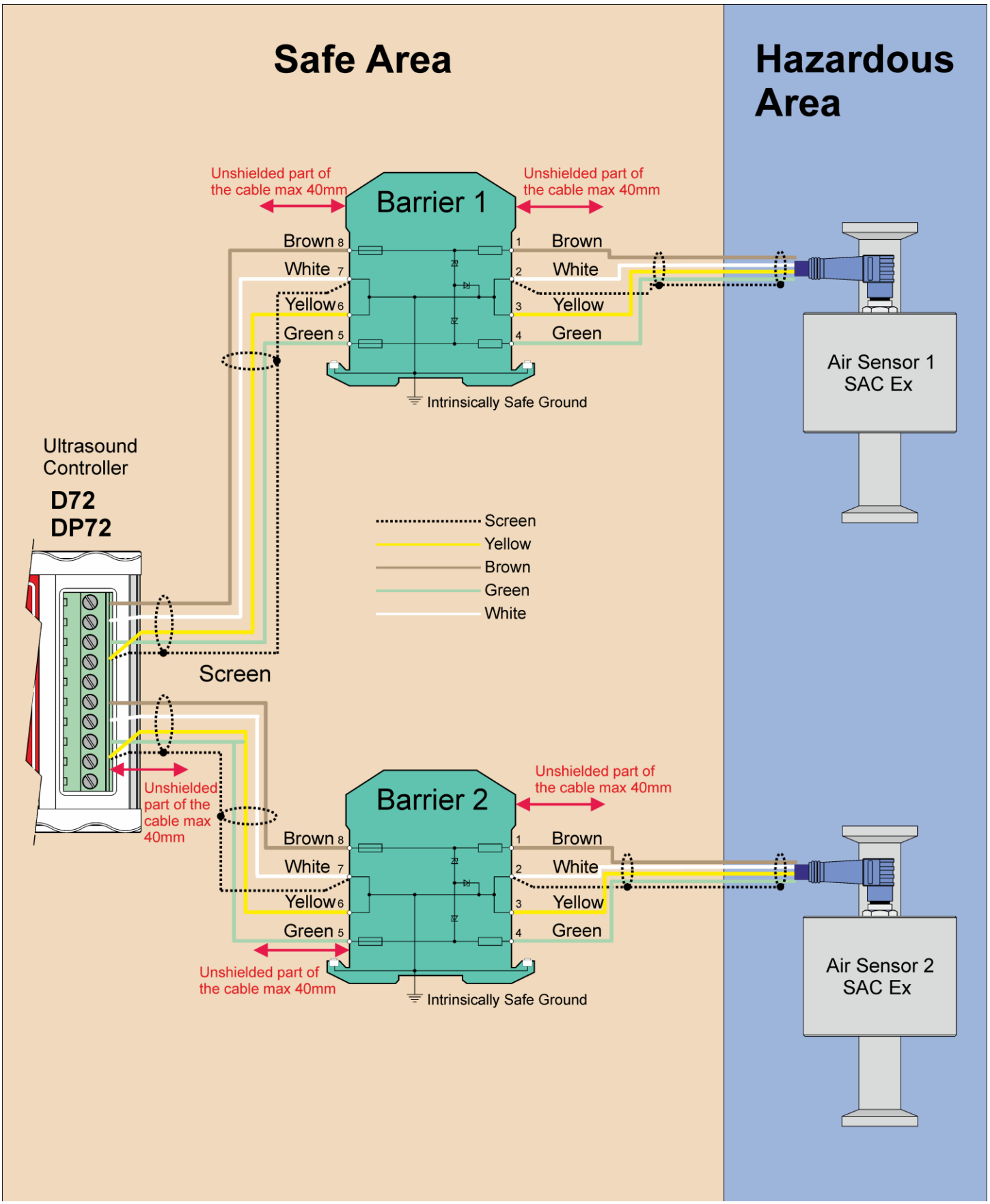
The zener barriers are not shielded, so if there are no shielding aluminum plates, noise can be transferred between barriers belonging to different D72 / DP72. Also unshielded parts of the cables should be short to prevent noise being transferred between different D72 / DP72.

Shielding aluminum plate must be ordered separately, item no: Ex-barriershield.

The Ex-barriershield snaps on to the DIN-rail next to the intrinsically safe zener barriers, see picture.



Connecting Air Sensor SAC via barriers to Ultrasound Controller D72 or DP72



6. Settings, Calibration and Troubleshooting

See D72 or DP72 manual.

7. Ex description

The Air Sensor is made to be used in Apparatus-group IIB and Equipment-group 1/2G.
The inside of the conduit of the sensor is designed to be exposed to zone 0 and the remaining parts to zone 1. The sensor is transmitting ultrasound into zone 0. Notice that Ultrasound Controller D72 is not Ex certified and barriers must be used to connect the Air Sensors. The intrinsically safe circuit inside the sensor is isolated from earth.

Common regulations for installation and maintenance of explosive protected electrical equipment shall be observed. (EN 60079-14 and EN 60079-17 in European countries connected to CENELEC). A person with the required knowledge should perform installation.

Special conditions for use:

1) The enclosure of the Air sensor must be connected to earth via the mounting in the conduit system.

2) Any external sources of heating must be considered at installation to not exceed the maximum ambient temperature +60 °C for the sensors.

Label information written on Air Sensor Ex

Air Sensor Made in Sweden

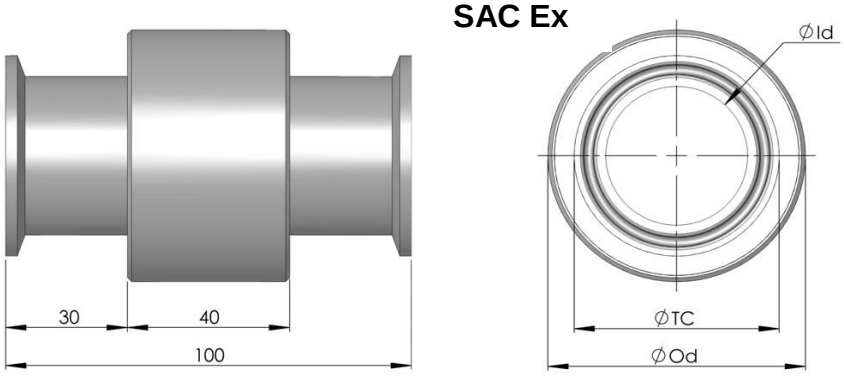
Type	see Technical specifications	
Inner diameter	see Technical Specifications	
Ex Class	CE Ex II 1/2 G Ex ib IIB T4	
SP No.	SP08ATEX3637X	
Transport temp.	Tamb:	-20 to +60 °C
Max input voltage	Ui:	13,0 V
Max current input	Ii:	0,70 A
Max power input	Pi:	1,20 W
Inner capacitance	Ci:	50 nF
Inner inductance	Li:	50 µH

8. Technical specifications

Operating temperature range	0°C to 60°C
Maximum temperature range*	-20°C to 60°C
Maximum pressure	SAC: 1Mpa / 10 bar g at operating temperature range
Protection class	IP67
Finish in pipe (Ra-value)	<0,375 µm / <15 micro inch

*Proper indication of bubbles is not guaranteed at temperatures outside operating temperature range

SAC Ex



Air Sensor SAC Ex dimensions

Model number	Inner diameter (mm)	Outer diameter (mm)	Tri Clamp diameter (mm)	Material
SAC10-25 Ex	10	51	25	Stainless steel 316L
SAC16-25 Ex	16	51	25	Stainless steel 316L
SAC16-50 Ex	16	64	50	Stainless steel 316L
SAC22-50 Ex	22	64	50	Stainless steel 316L
SAC35-50 Ex	35	64	50	Stainless steel 316L
SAC46-64 Ex	46	76	64	Stainless steel 316L
SAC60-77 Ex	60	102	77,5	Stainless steel 316L

Cable for Air Sensor

Cable order-number	Color	Length
WB – Cable – 7m	Blue	7m
WB – Cable – 20m	Blue	20m
WB – Cable – 40m	Blue	40m
WG – Cable – 7m	Grey	7m
WG – Cable – 20m	Grey	20m
WG – Cable – 40m	Grey	40m