

Level Switch

LS Ex KS Ex RS Ex

Manual



AQ M-Tech AB

ATEX 

Level Switch

LS Ex KS Ex RS Ex

ATEX Certified

AQ M-Tech AB

Manual version 3.3

November 2018

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2. Manufacturer information

AQ M-Tech 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 manual without prior notice.


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

Manufacturer Declaration of Conformity

Manufacturer: AQ M-Tech AB Sweden declares, that the product:

Level Switch Ex marked with CE-label conforms with the following standards:

IEC 60079-0:2011 (Ed. 6), IEC 60079-11:2011 (Ed. 6), EN 60079-0:2012 (Ed. 4), EN 60079-11:2012 (Ed. 2)

Level Switch Ex marked with  conforms to WEEE, directive 2012/19/EU. When the Level Switch Ex is to be discarded it shall be sent back to AQ M-Tech AB for safe disposal. See "Manufacturer Information" for return address.

Level Switch Ex is RoHS Compliant, directive 2011/65/EU.

Limited Warranty

AQ M-Tech AB warrants to the original end user that the Level Switch Ex 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 Level Switch Ex have indications of failure due to faulty workmanship or materials, AQ M-Tech AB will replace it with no charge. This warranty shall not apply if the Level Switch Ex 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 M-Tech AB. AQ M-Tech AB shall in no event be held liable for indirect or consequential damages of any kind or character to the purchaser.

Returning the Level Switch Ex

- If the Level Switch Ex is to be discarded it shall be sent back to AQ M-Tech AB for safe disposal.
- If the Level Switch Ex shall undergo a warranty commission it shall be sent back to AQ M-Tech AB.

Before sending the Level Switch Ex to AQ M-Tech AB it must be clean and without any harmful contaminations.

A certificate shall be attached with the Level Switch Ex that confirms the cleaning and shows following information:

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

See "Manufacturer Information" for return address.

Warning

The Level Switch Ex is intended to be connected to the Ultrasound Controller manufactured by AQ M-Tech AB. AQ M-Tech AB takes no responsibility for any possible damage that could happen if the Level Switch Ex is connected to any other equipment. It is not allowed to repair or modify the Level Switch.

3. Introduction

When the Level Switch Ex is attached to the outside of a container or pipe it can sense liquid level inside. The Level Switch Ex senses through the wall without any need for a hole in the container. The Level Switch Ex is made to be used together with the Ultrasound Controller.

4. Mode

The sensor Mode setting of the Ultrasound Controller determines in which way the Level Switch Ex measures the level.

In Level Switch mode the Level Switch Ex measures a single level from the side.

In Level Sensor mode the Level Switch Ex measures a continuous level from the bottom.

5. Level Switch Mode

In Level Switch Mode each Level Switch Ex measures a single level. It measures the presence or no presence of liquid behind the container wall or pipe wall.

All types of Ex Level Switches can be used in Level Switch Mode but use different measuring techniques.

There are two measuring techniques Echo and WR (see Ultrasound Controller manual).

Level Switch KS Ex and Level Switch LS Ex should be used with the Echo technique and Level Switch RS Ex must be used only with the WR technique.

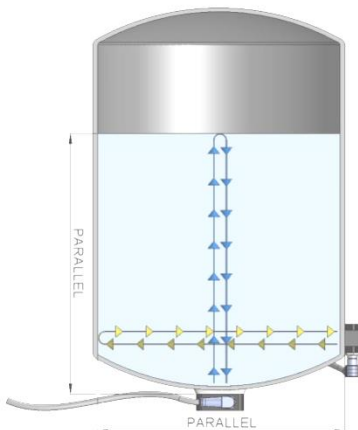
The Level Switch Ex is attached on the wall of the container or pipe. For a cylindrical wall, a Level Switch with a diameter close to the diameter of the container should be chosen. The ultrasound must pass easy into the container or pipe; therefore there must be a tight ultrasound-connection without any air-gap between the Level Switch Ex and the wall.

6. Level Sensor Mode

In Level Sensor mode the Level Switch Ex measures the continuous liquid level. The Level Switch Ex is attached under the container and measures through the bottom.

Level Switch KS Ex or Level Switch LS Ex should be used (Level Switch RS Ex cannot be used).

A Level Switch Ex that fits the shape of the bottom should be chosen. The Level Switch Ex measures the echo that bounces at the liquid surface. It is important the echo goes straight back to the Level Switch Ex. If the Level Switch Ex and the bottom are not horizontal then the echo may bounce in another direction.



If the bottom is not horizontal, methylmetacrylate glue can be used to glue the Level Switch Ex at an angle. In this case the Level Switch should be connected to Ultrasound Controller and be active measuring while being glued so that it can be adjusted for maximum echo.

Sound has to be able to pass through the bottom. Most plastics let sound through well except polypropylene and fiber reinforced plastics. For stainless steel, a bottom thickness of 5,8mm is the maximum recommended.

Stainless steel 5,8mm 2,9mm and 1,45mm works well at 2MHz which is the optimal frequency for the Level Switch Ex. For other thicknesses other frequencies will be chosen by Ultrasound Controller.

Sound velocity varies with liquids and temperatures. A Level Switch Ex placed low on the container wall can be used to measure and compensate for sound velocity changes. More information: Ultrasound Controller manual.

7. Gluing the Level Switch Ex

The Level Switch Ex is glued to the outside of the container and the gap between the Level Switch Ex and the container is filled with glue. If the container is cylindrical choose a Level Switch Ex with a diameter close to the diameter of the container.

Important: Before gluing, make sure the echo will be reflected back to the sensor and that there is nothing inside the container blocking the echo. Also make sure the surface of the container under the Level Switch Ex is even and not a weld joint.

The ultrasound can pass into the container only if there is an air-tight ultrasound-connection between the Level Switch Ex and the container. To make such a connection the Level Switch Ex can be glued with Methylmetacrylate glue or Electrolube HTC compound or Silicone.

Gluing the Level Switch Ex with Methylmetacrylate glue: Put a mix of the two parts of Methylmetacrylate glue on the inner (container-facing) side of the Level Switch Ex and press it on to the container and hold it there until glue has cured (10 minutes). The methylmetacrylate glue should cover the gap. Methylmetacrylate glue is fast and easy to use. The glue thickness should be made as thin as possible.

Temporary installing the Level Switch Ex with Electrolube HTC: Put Electrolube HTC on the inner (container-facing) side of the Level Switch Ex and press it on to the container. Use a clamp or cable ties to hold the Level Switch Ex in place. The Electrolube HTC compound does not get stiff. If the Level Switch Ex is removed it is recommended to wipe off the old compound and use new next time.

NOTE! The connector must not be turned



8. Connecting the Level Switch Ex

The connector on the cable fits the Level Switch Ex and the other end of the cable connects to the barrier (hazardous side). The maximum cable length is 40m. A similar screened cable connects the safe side of the barrier to the Ultrasound Controller. The cable-screen is important because it prevents external noise from entering. Therefore all cables must be screened and the screen must be connected to ground. The screen of the cable connected to the Level Switch Ex should be connected to the ground terminal of the barrier.

NOTE! The unscreened part of the cable should be kept very short (< 30mm) and the screen must be connected to ground.

The diagrams below show how to connect Ex Level Switches and Ex Level Sensors to Ultrasound Controller via intrinsically safe zener barriers. Please look at the correct diagram.

In the diagrams, the cable type between Ultrasound Controller and the barriers is the same type as between the barriers and the sensors.

Choosing a barrier

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

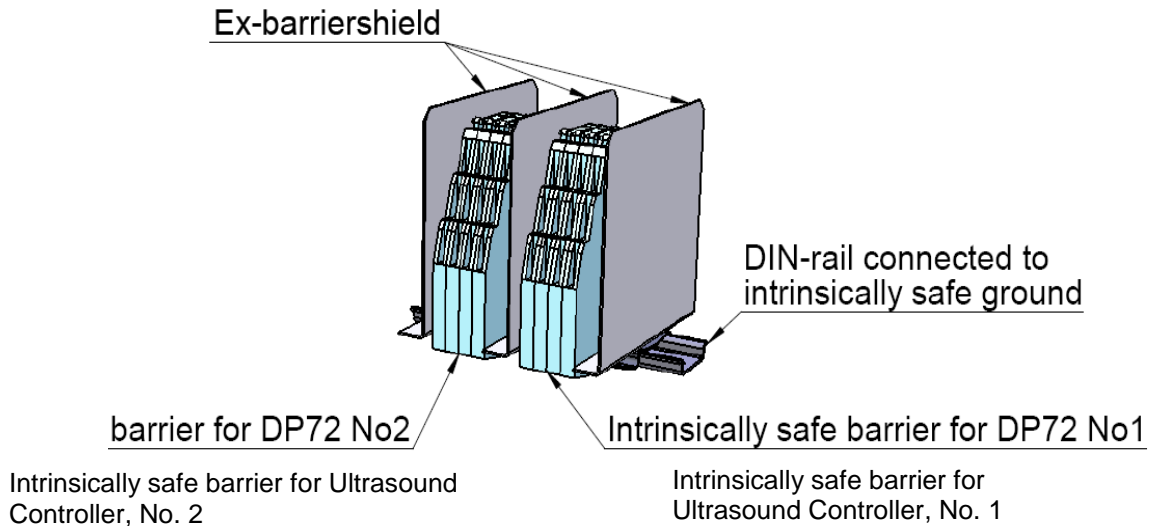
1. The barrier must use resistive current limitation.
2. The barrier must be made for AC current.
3. Zener diodes inside the barrier must not connect directly between channels.
4. The barrier voltage should be as high as can be allowed. (minimum $\pm 8V$ AC)
5. The barrier resistance should be as low as can be allowed. (maximum 110Ω)
6. The barrier must attenuate 2MHz as little as possible.
7. The barrier capacitance to ground should be as low as possible.

Ex-barriershields

The zener barriers are not shielded so noise can interfere when weak signals are being measured. To reduce noise interference, shielding aluminium plates should be placed outside each group of barriers belonging to each Ultrasound Controller, see picture.

Shielding aluminium 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.



Intrinsically Safe Barrier

Notice that Ultrasound Controller is not EX certified and ia-classified barriers must be used to connect the Level Switch Ex to The Ultrasound Controller.

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). Special conditions for use according to certificate SP13ATEX3645X concerning the Level Switch Ex:

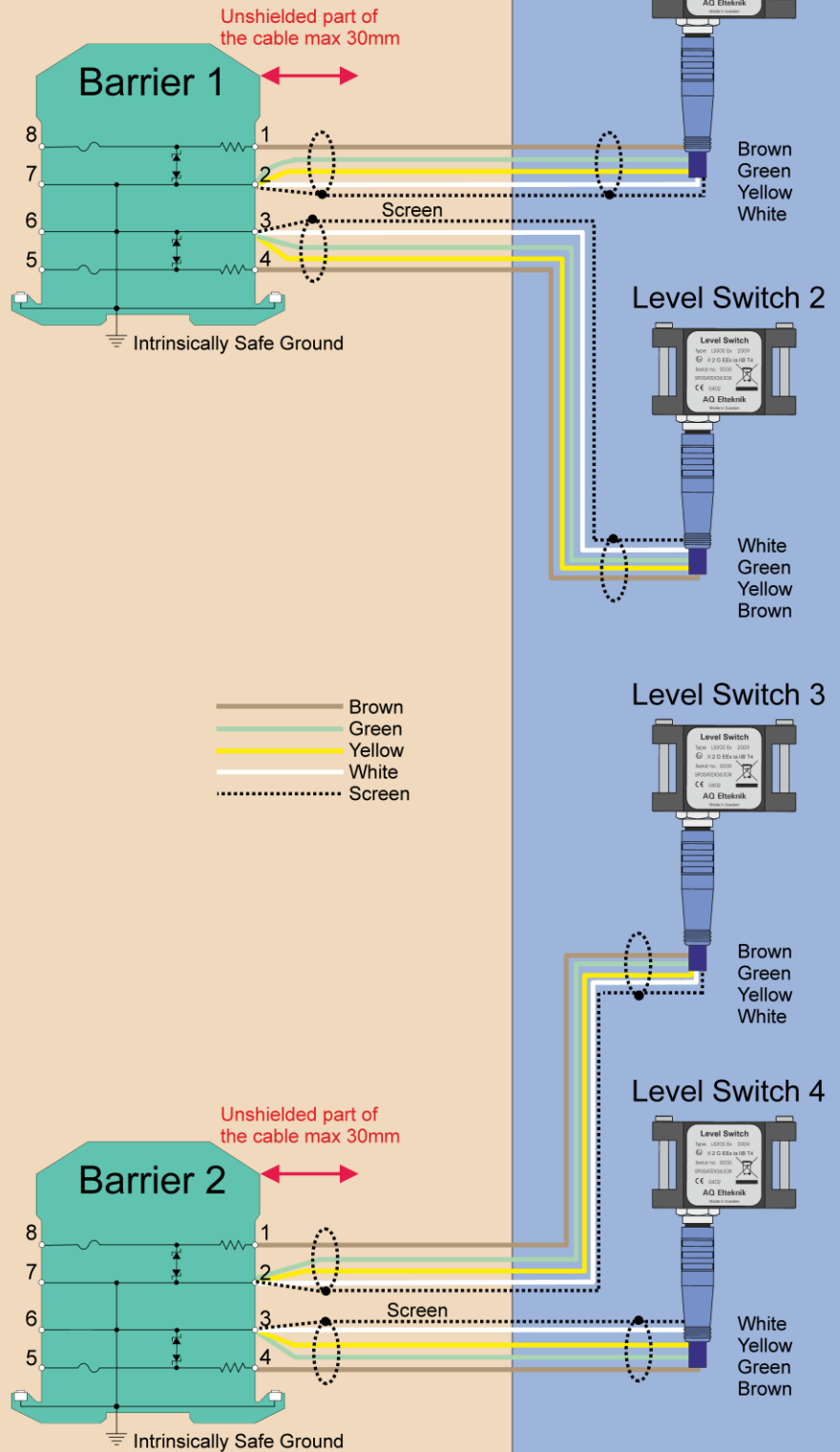
1. The cable from the barrier to the Level Switch Ex shall be permanently installed, mechanically protected and protected from other environmental stress in order to ensure explosion protection. A person with the required knowledge should perform installation.
2. The current limitation of the intrinsically safe barriers connected to the Level Switch Ex must be resistive with linear characteristic.
3. External source of heating and cooling shall be considered so that the ambient temperature is kept in the range -15°C to +60°C.

Connecting Level Switch Ex via barrier to transmitter

Safe Area

For information about connections on the safe area read manual for the transmitter.

Hazardous Area



Technical data

Level Switch LS Ex	Fit container diameter (mm)
LS46 Ex	44 – 47
LS49 Ex	47 – 51
LS53 Ex	51 – 56
LS65 Ex	57 – 70
LS75 Ex	70 – 79
LS85 Ex	79 – 91
LS100 Ex	91 – 106
LS115 Ex	106 – 123
LS135 Ex	123 – 146
LS165 Ex	146 – 180
LS200 Ex	180 – 240
LS300 Ex	240 – 370
LS500 Ex	370 – 700
LS1300 Ex	700 – 2000
LSF EX	Flat container wall

Level Switch KS Ex	Fit container diameter (mm)
KS27 Ex	26-28
KS30 Ex	29-31
KS34 Ex	32-35
KS38 Ex	36-40
KS42 Ex	40-43
KS46 Ex	44-49
KS53 Ex	50-57
KS65 Ex	58-69
KS75 Ex	70-79
KS85 Ex	80-89
KS115 Ex	98-135
KS165 Ex	135-200
KS250 Ex	201-350
KS600 Ex	351-1000
KSF Ex	1000-Flat

Level Switch RS Ex	Fit container diameter (mm)
RS27 Ex	26-28
RS30 Ex	29-31
RS34 Ex	32-35
RS38 Ex	36-40
RS42 Ex	40-43
RS46 Ex	44-49
RS53 Ex	50-57
RS65 Ex	58-69
RS75 Ex	70-79
RS85 Ex	80-89
RS115 Ex	98-135
RS165 Ex	135-200
RS250 Ex	201-350
RS600 Ex	351-1000
RSF Ex	1000-Flat

Mounting screws:

LS Ex – M2,5x20mm. KS Ex – M4x >15mm. RS Ex – M4x>40mm.

Material:

plastic and stainless steel 316L

Operating temperature range:

-15°C to 60°C

Maximum temperature:

60°C

Transport temperature range:

-15 to + 60 °C

Cable with connector

WB-cable-7m 7m blue, 4x0,14mm² + screen, diameter 4,5mm

WB-cable-20m 20m blue, 4x0,14mm² + screen, diameter 4,5mm

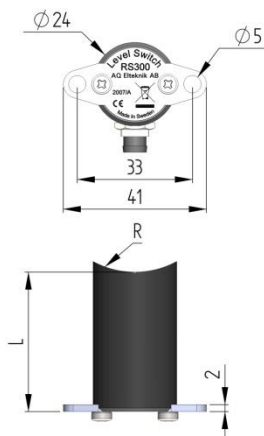
WB-cable-40m 40m blue, 4x0,14mm² + screen, diameter 4,5mm

Maximum cable length

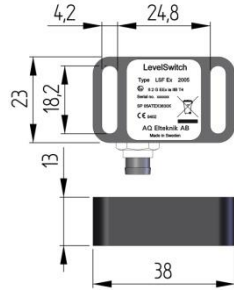
40m

The sensors are intended to be used at normal atmospheric pressure (0,8-1,1 bar), normal oxygen concentration (21 %).

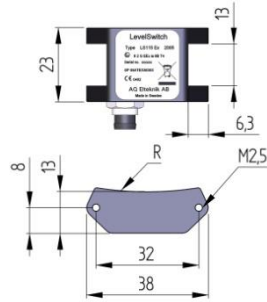
Dimensions



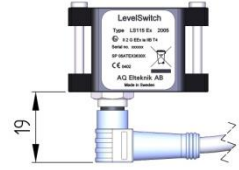
Level Switch RS Ex
 Level Switch RSF Ex
 Level Switch KS Ex
 Level Switch KSF Ex



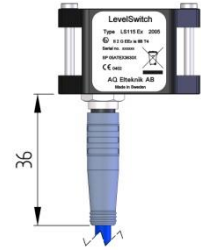
Level Switch LSF EX



Level Switch LS EX



Cable 90°

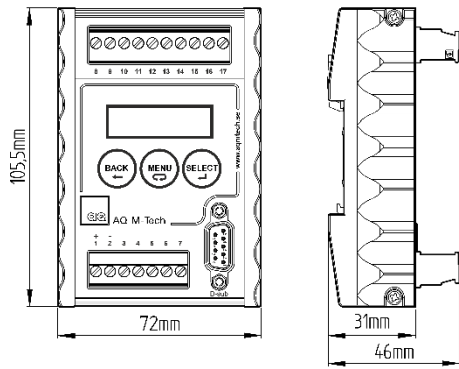


Cable 0°

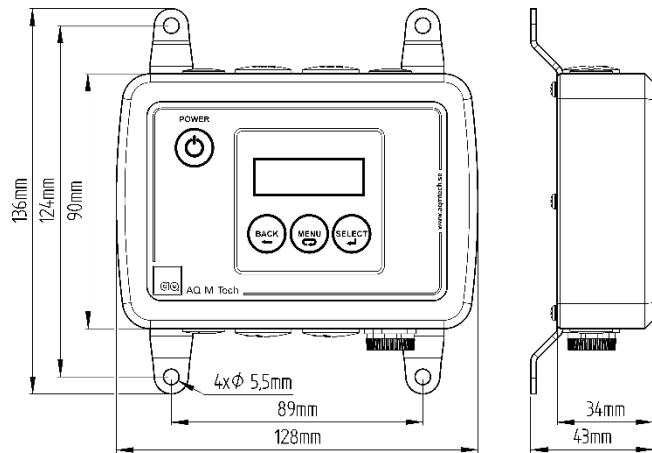
Level Switch	Dimensions	Comment
Level Switch KS Ex	L = 15mm R = fit container diameter	Can fit a depression 8mm deep
Level Switch KSF Ex	L = 20mm R = flat surface	Can fit a depression 8mm deep
Level Switch RS Ex	L = 40mm R = fit container diameter	
Level Switch RSF Ex	L = 40mm R = flat surface	
Level Switch LS Ex	See drawings	Old version, only spare part. For new design use Level Switch KS Ex
Level Switch LSF Ex	See drawings	Old version, only spare part. For new design use Level Switch KS Ex

Transmitter - Ultrasound Controller

D72 / DP72




D128



9. Manufacturer information

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E-mail: info.aqmtech@aqg.se

Label information

AQ M-Tech AB Bolandsgatan 10, SE-753 23 Uppsala
Level Switch Made in Sweden
Type see "Technical data"
Ex Class C_E 0402  II 2G Ex ia IIB T4 Gb
IECEX RISE 18.0002X (Level Switches with IECEX number are only available via GE Healthcare)
SP No. SP13ATEX3645X

Intrinsic parameters

Max input voltage U_i : 10,0V
Max current input I_i : 250mA
Max power input P_i : 1,1W
Inner capacitance C_i : 200nF
Inner inductance L_i : 0,05mH

EX description

The Level Switch Ex is made to be used in Apparatus-group IIB and Equipment-group 2G.
The Level Switch Ex is classified for zone 1. Notice that Ultrasound Controller model D72/DP72/D128 is not EX certified and ia-classified barriers must be used to connect the Level Switch Ex to the Ultrasound Controller.

