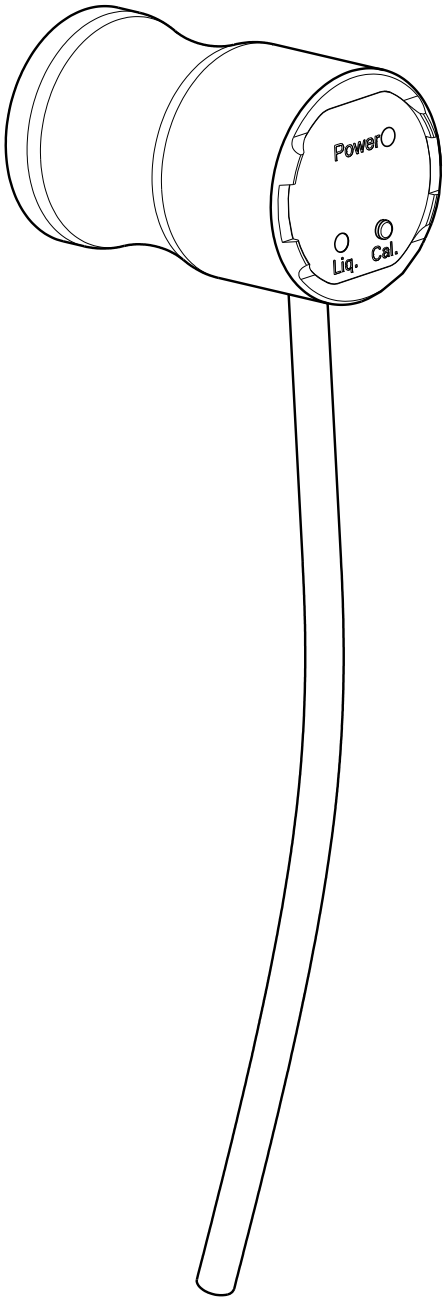
Level Switch FX

Manual



AQ Elteknik

AROS QUALITY GROUP AB

Level Switch FX

Version 1.5

March 2012

AQ Elteknik AB

Table of contents

1. Manufacturer information 4

CE Declaration of Conformity 4

Limited Warranty 4

Manufacturer information 4

Certificate of Quality and Function 4

2. Introduction 5

3. Electric installation 5

4. Installation 5

5. Calibration 6

6. Settings 7

7. Indications 7

8. Technical specifications Level Switch FX 8

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 manual without prior notice.

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.

CE Declaration of Conformity

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

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

Level Switch FX marked with  conforms to WEEE directive 2002/96/EC. The Level Switch FX also conforms to RoHS directive 2002/95/EC. When the Level Switch FX is to be discarded, send it back to AQ Elteknik AB for safe disposal.

Limited Warranty

AQ Elteknik AB warrants to the original end user that the Level Switch FX 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 FX 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 Level Switch FX 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.

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			
	www.aqelteknik.com	E-mail:	aqelteknik@aqg.se	

Certificate of Quality and Function

AQ Elteknik AB guaranties that the Level Switch FX has passed function tests and quality tests

2. Introduction

The Level Switch FX attaches to the outside of a container and senses the presence of liquid inside through the container wall.

The measuring technique of Level Switch FX sends ultrasound into the container wall and measures the damping the liquid has on the ultrasound vibrations in the container wall. This technique depends on the properties of the container wall. It works very well for plastic walls and for metal and glass walls there is some temperature-dependence. The minimum wall thickness is 1,3mm and the maximum wall thickness is 15mm (except PP max 10mm). Double walls cannot be measured. Plastic with fiber could be difficult to measure.

The temperature-dependence for metal and glass walls can cause errors if container wall temperature changes more than 15ºC from the temperature at calibration.

The Level Switch FX is very sensitive to small movements of the Level Switch FX. Gluing the Level Switch FX is the best way to ensure stability.

Level Switch FX can also be sensitive to liquid drops remaining on the inside of the wall. Always thorough testing before use is recommended.

3. Electric installation

White: Power supply +

Brown: Power supply -

Green: Output NPN

Screen: can be connected to ground or supply –

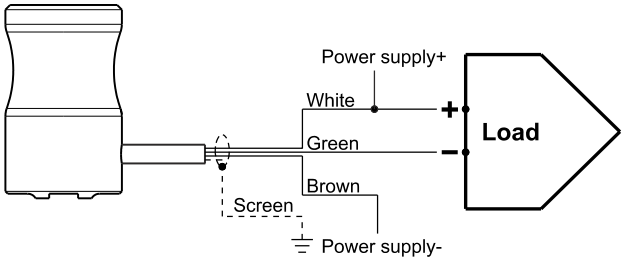


Fig 1

Green is an NPN-output which makes connection to brown when active. Maximum current is 250mA.

A load should be connected between white and green (Fig1)

A relay should be connected between white and green (Fig2).

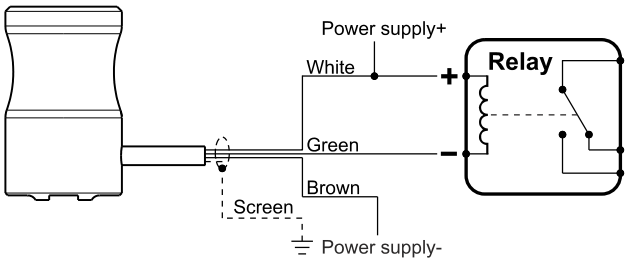


Fig 2

4. Installation

The Level Switch FX measures if there is liquid or not behind the container wall. Ultrasound passes into the container through an area approximately 6mm diameter at the center of the Level Switch FX. The ultrasound must be able to pass easy into the container; therefore there must be a tight ultrasound-connection without any air-gap between the Level Switch FX and the wall. This can be achieved by gluing it. We recommend **“Loctite Repair Extreme”.** However for PP, PE we recommend **“Loctite 422”** and primer **“Loctite 770”** or similar.

Check that the Level Switch FX fits the container (Fig 3), then put cable-ties or a string tight around the container and the Level Switch FX (Fig 5). Bend the Level Switch FX loose and put some glue on the container-facing side of the Level Switch FX (Fig 4). Put a round drop of glue, not a circle, so that when the Level Switch FX is pressed against the container wall, air should not be trapped inside the glue. Put the cable-tie or string on the Level Switch FX and bend it up on the container (Fig 5). The glue should cover the gap between the Level Switch FX and the container. Leave the Level Switch FX steady for 24 hours then the glue has partly cured. The Level Switch FX can be calibrated and tested immediately but a final calibration should be done a few weeks later when the glue is completely cured. For testing purposes or if for some reason the Level Switch FX cannot be glued, Electrolube HTC Heat Transfer Compound can be used. It does not cure so the Level Switch FX must be held very steady in place by other means.

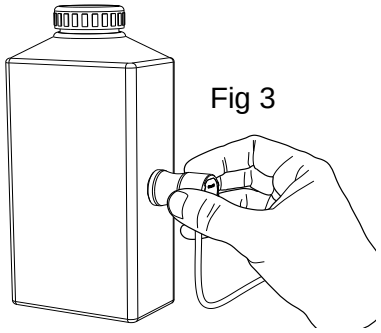


Fig 3

When the container wall is not flat, the gap between the container and Level Switch FX must be filled with glue.

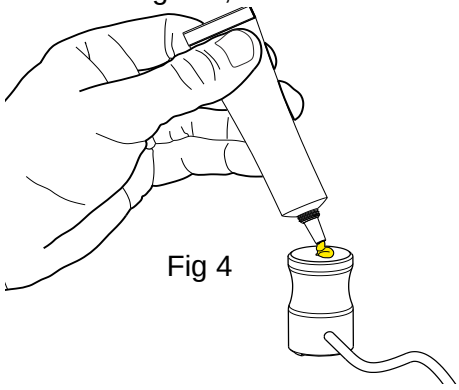


Fig 4

To facilitate gluing on a round container, Level Switch FX-COLLET can be used (Fig 12). First install Level Switch FX-COLLET on the container using cable-ties or wire. Then put a big round drop of glue on the Level Switch FX and insert it into Level Switch FX-COLLET. The glue will then fill the space between Level Switch FX and the container wall (Fig 6).
Level Switch FX-COLLET must remain attached.

If better IP-protection is needed, Level Switch FX-CAP can be attached on top of the Level Switch FX. (Fig 11)

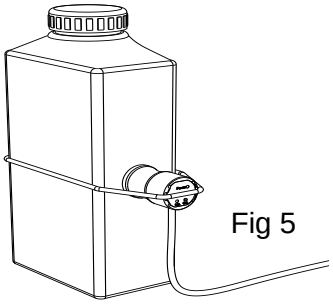


Fig 5

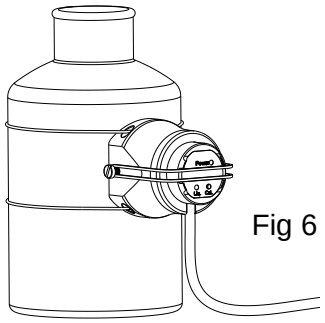


Fig 6

5. Calibration

Before Level Switch FX can be used it must be calibrated both for liquid and for air. The two calibrations should be done one after the other although the time span between is not limited. Press the CalButton on the Level Switch FX to start calibration.

Calibration sequence starting with liquid:

1. Fill the container with liquid. (Fig8)
2. Press the CalButton 1s. (Fig7)
3. LiqLED blinks fast green for 5 seconds while it calibrates liquid.
4. Level Switch FX is waiting for calibrating air. LiqLED blinks slow green.
5. Empty the container.
6. Press the CalButton 0,1s. (Fig7)
7. LiqLED blinks fast red for 5 seconds while it calibrates air.

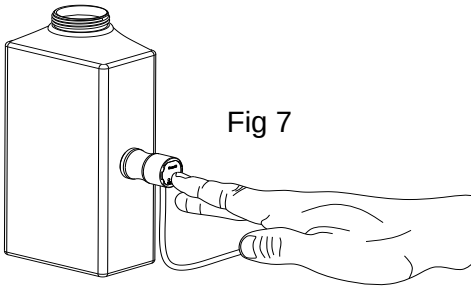


Fig 7

Alternative calibration sequence starting with air:

1. Empty the container.
2. Hold the CalButton until it starts blinking fast red. (Fig7)
3. LiqLED blinks fast red for 5 seconds while it calibrates air.
4. Level Switch FX is waiting for calibrating liquid. LiqLED blinks slow red.
5. Fill the container with liquid. (Fig8)
6. Press the CalButton. (Fig7)
7. LiqLED blinks fast green for 5 seconds while it calibrates liquid.

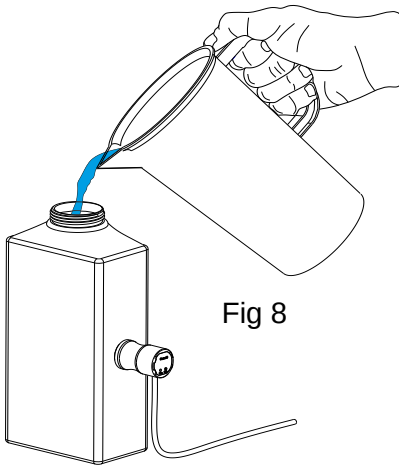


Fig 8

If after calibration LiqLED blinks red continuously, signal difference between liquid and air is too small for reliable measurement.

To check the signal strength, press the CalButton very short. Red starts blinking slow a number of times, the number of blinks indicates the signal strength. Less than 3 blinks is unreliable, more than 6 blinks is good.

6. Settings

To enter settings mode, hold the CalButton while supply is switched on. The LiqLED blinks every 2 second indicating settings mode has been entered. Double blink indicates setting the output parameter: Double blink green = output is active with liquid (default), Double blink red = output is active with air. Press the CalButton short to toggle.

Holding the CalButton long selects next parameter: Triple-blink indicates setting the detection delay parameter: Triple-blink green = detection delay 0,1s (default), Triple-blink red = detection delay 2s. Press the CalButton short to toggle. (Long detection delay is used to avoid rapid changes of the output)

Switch off the supply (or hold the CalButton long) to exit settings mode.

7. Indications

PowerLED: Lights when supply is connected to Level Switch FX

LiqLED off = Air, low level

LiqLED green = Liquid, high level

LiqLED blinking red = error

LiqLED blinking red and green = error

LiqLED blinking slow red = waiting for calibration of liquid

LiqLED blinking slow green = waiting for calibration of air

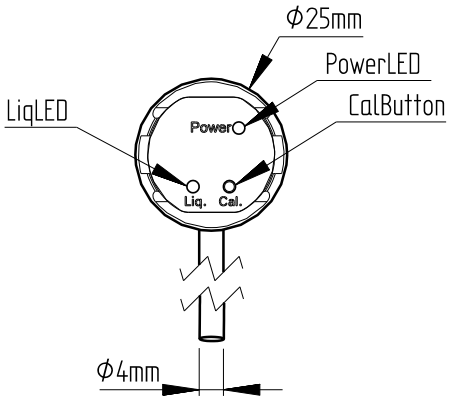
LiqLED double blink red or green every 2 second = Settings mode (output)

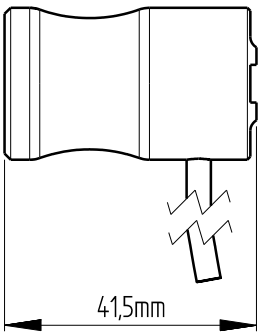
LiqLED triple blink red or green every 2 second = Settings mode (delay)

LiqLED blinking red at medium speed a limited number of blinks = indicating signal difference between air and liquid measured during calibration

8. Technical specifications Level Switch FX

Weight with cable	80g
Cable	2m ø 4mm (White plus+ Brown minus- Green output)
Operating voltage	+12 to +24V DC power supply (max +28V DC)
Current consumption	30mA (not including relay current)
Protection class	IP60, or IP65 with option: Level Switch FX-CAP
Media and ambient temperature	-10°C to 60°C
Approximate maximum metal container temperature deviation from temperature during calibration	±15°C
Ambient Humidity	max 90%
Material	PEI
Measurement frequency	approx. 2 MHz
Green (output)	NPN-transistor (makes connection between green and brown when active)
Selectable active with liquid or with air.	
Level change detection delay	Selectable 0,1s or 2s
Voltage applied at green (output)	Must not exceed voltage at white or brown
Max current at green (output)	250mA (no short circuit protection)
Container wall	1,3mm to 15mm thickness (PP max 10mm)
Glue	Loctite repair extreme
Order number:	FX
Minimum container diameter:	approx. 70mm





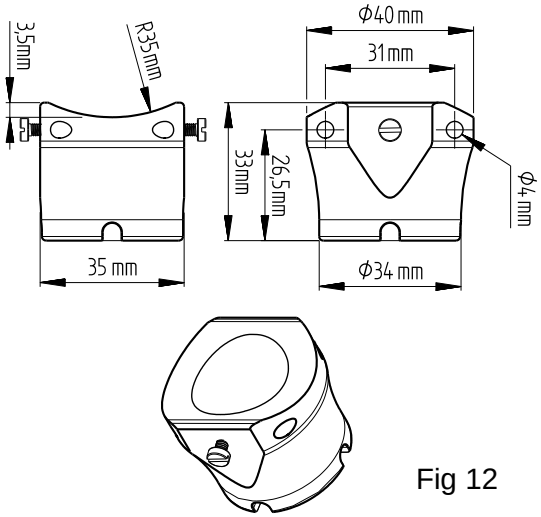


Fig 12

To facilitate gluing on a round container (Fig 6), Level Switch FX-COLLET can be used.
Level Switch FX-COLLET is ordered separately. Order number: Level Switch FX-COLLET (Fig 12).

The IP protection can be improved to IP65 with Level Switch FX-CAP (Fig 11)
Level Switch FX-CAP is ordered separately. Order number: Level Switch FX-CAP

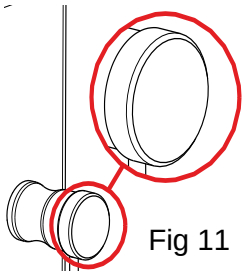


Fig 11