Level & Flow Analyzer (FLA) for Flotation Cells Datasheet

Principle of Operation

The FloLevel™ Array transducers emit extremely high powered acoustic sound pulses independently, into the Flotation Cell at low audible levels. The pulse amplitude power is great enough to cause a phenomenon called "rarefaction", which causes cavitation to be produced from the Array transducers diaphragms as they pulse. The cavitation bubbles oscillate in front of the diaphragm, which cause implosions that generate high energy levels. This energy level (ultrasonic cleaning) is sufficient to DISSOLVE soluble material, such as soluble soil, salts, calcium and DISPLACE non-soluble particles, such as scale, grease from the Arrays transducer diaphragms.

Ultrasonic signal transmission in a liquid is not affected by density change, or by conductivity change. Ultrasonic signals are attenuated by Froth, which reduce the signal amplitude. Pulsing each transducer in the Array independently enables the system to determine the Liquid presence because of the high amplitude signals resonating in the liquid Pulp/Slurry. Froth is a very poor medium for sound transmission and attenuates the signal, so detecting the interface between the liquid Pulp/Slurry and the Froth interface is very simple, because of the huge variation in signal amplitude size.

FloLevel Technologies™

Features

- Self-Cleaning capability
- Not affected by density change in the Pulp/Slurry
- Not affected by conductivity change in the Pulp/Slurry or Froth
- Color display on controller, showing the four process outputs and diagnostics
- Simple installation from the top of the Flotation Cell without taking the Cell out of service
- Simple calibration and commissioning
- Resolution accuracy options available, 2mm,(0.08”),15mm,(0.6”) 25mm,(1.00”)
- Can measure Flotation Cell depths greater than 6000mm (236”)
- Various output capability options, 4 x 4-20Ma, Modbus, ProfiBus, Foundation FieldBus, DeviceNet, Ethernet.
- Adjustable 316SS bracket, with Flange mounting options.

Primary Application Uses

All Froth Flotation Cells that require high levels of operator manual control to compensate for **Ore Body Variability Changes,** which **affect mineral recovery rates, lower production efficiencies, increase chemical and energy usage.** The FloLevel™ Array is suitable for all mineral recovery, eg: Copper, Molybdenum, Gold, Silver, Lead, Nickel, Iron Ore, Coal, Potash, Oil Sands, Zinc, Gypsum, etc

The FloLevel™ Array will provide, process feedback to enhance automation control by,

1. Providing a reliable Pulp/Slurry level to Froth interface, with “high” resolution to 2mm (0.08”) with no build-up and density change issues.
2. Provide a Froth height level above the launder carry over point to indicate froth recovery levels.
3. Provide a Froth density analog output at the launder position to indicate recovery efficiency.
4. Provide a Froth Flow Rate analog output at the launder position to indicate Froth movement rate.

The above four analog outputs will enable the control system to detect the following process operation characteristics.

1. Pulp/Slurry to Froth Interface:

The acoustic system will provide a repeatable Pulp/Froth interface level, because the signal amplitude in liquid is so many times greater than in Froth. The level position will not drift as the aeration volume increases or decreases, like the probe or float system would. The highest resolution, using the “High Resolution Array” is 2mm (0.08”) and so measuring small Froth depths near the launder is possible and stable, even with density and conductivity changes to the Pulp/Slurry.

2. Froth Height above the Launder Carryover Point:

Froth Height measurement is very important for a number of reasons.
(A) If the Froth height is below the launder carryover point, the Flotation Cell is not producing.
(B) By using the “**High Resolution Array”** and mounting the top transducer of the Array above the launder carryover point, we can provide an accurate Froth height above the launder position, indicating Froth height recovery. The Array transducers can distinguish between Froth and Air because of different amplitude signal sizes.

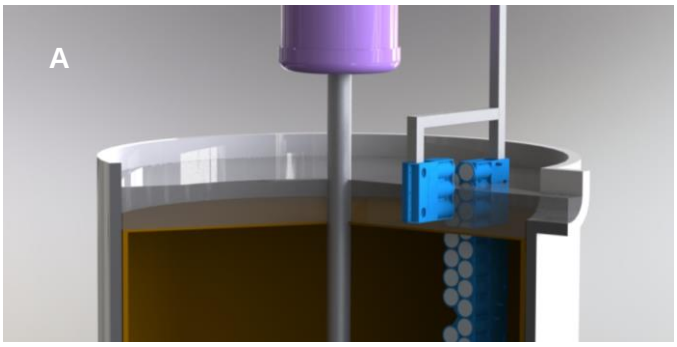
3. Froth Density:

By using the Analyzer Array, we can provide a variable analog output, based on signal penetration variations, caused by density changes (mineral recovery) in the Froth. The Froth flows between the two sets of Arrays and as the density of the Froth varies, a change in signal amplitude size is seen. If the density increases too high, it provides feedback that the Froth has become too viscous and mineral recovery is too high, which could also cause Froth collapse. If the Froth density is too low, it provides feedback that the Froth mineral recovery is low. Column Cells with drip pans will not affect Density measurement.

4. Froth Flow/Movement:

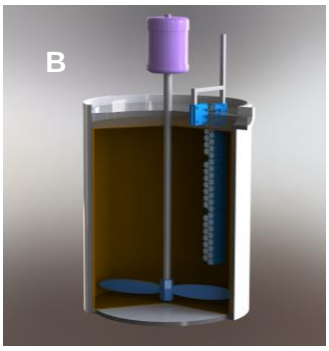
By using the Analyzer Array as above, we can also derive an additional analog output, which will provide a Froth Flow rate (Time of Flight) past the transducers. This will identify if the Froth flow rate is too high, possibly producing low mineral(low density) recovery Froth, which can be confirmed with the Density output (3) and Froth flow rate too low, possibly producing viscous, high mineral recovery, which also can be confirmed by the Density output (3). This output also confirms that the Flotation Cell is producing.

By using combinations of all four outputs, it is possible to check a number of process conditions, which could be affecting performance of the Flotation Cell and provide alarm status.
We can provide continuous feedback information to the control system for each Flotation Cell, which will provide the necessary data to react faster to ore body variation, which affect Flotation Cell recovery performance. This will improve individual Cell efficiencies, by continuously monitoring these four process variables and relying less on operators, manually observing each Flotation Cell, for process changes.



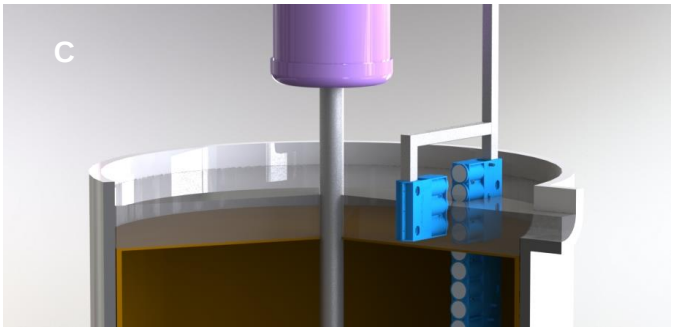
Drawing A shows the FloLevel™ high resolution Array Transducers used for Flotation Cells that have small Froth depths below the bottom of the launder of 25mm (1.00”) and require high resolution accuracy (15mm) (0.6”) for maintaining the Pulp/Slurry height close to the launder carry over position.

The high resolution Array is also used to provide a high resolution level of the Froth height above the launder carry over point to identify Froth recovery levels. It also shows the Analyzer Array used in conjunction with the larger Array to provide Froth Density and Froth Flow rate at the launder level.



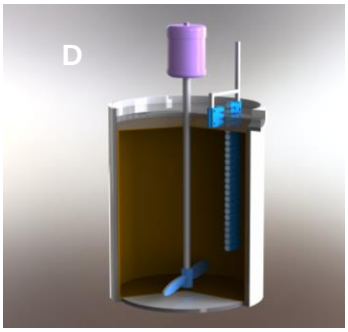
Drawing B shows the FloLevel™ high resolution Arrays used in Column Flotation Cells, for monitoring Flotation Cells where greater accuracy is required.

Multiple Arrays can be attached to provide a control range depth to a maximum of 6000mm (236”) below the launder.



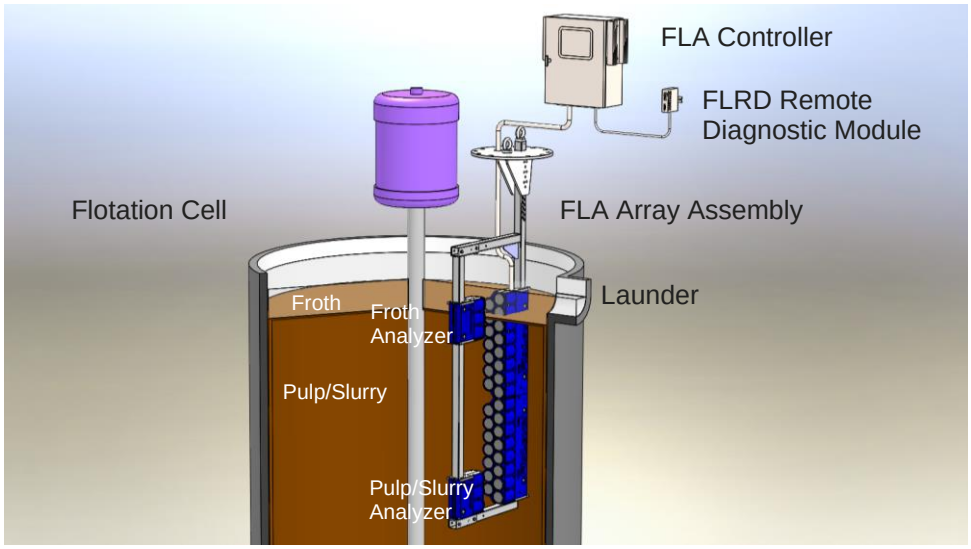
Drawing C shows the FloLevel™ standard resolution Array (25mm,1.00”) used for Flotation Cells that have Froth depths of greater than >100mm (>4”) below the launder carry over point and do not require a resolution accuracy greater than 25mm for controlling the Pulp/Slurry height. The standard resolution Array is also used to measure the level of Froth recovery above the launder carry over position.

It also shows the Analyzer Array that is used in conjunction with the larger Array to provide Froth Density and Froth Flow rate at the launder level.



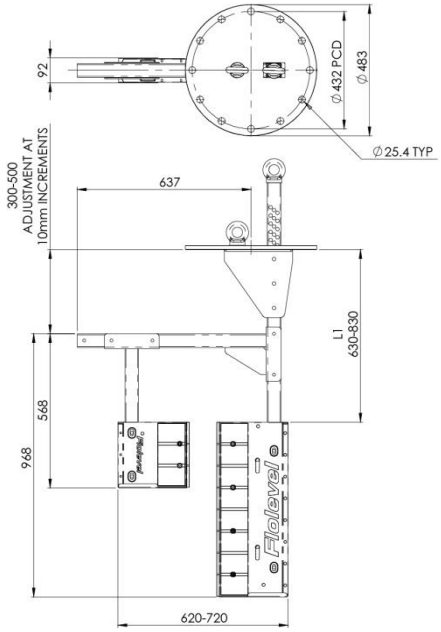
Drawing D shows multiple standard resolution Arrays used where the Flotation Cells have greater Froth depths than >100mm (4”) in Column Cells.

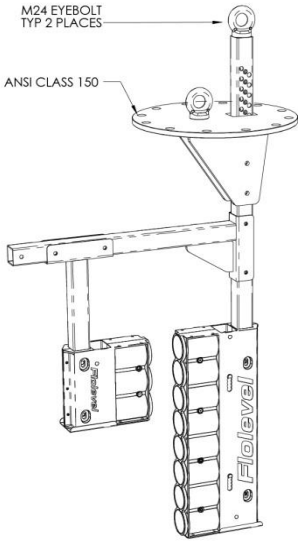
The maximum Pulp/Slurry liquid depth that can be measured using multiple standard Arrays is 6000mm (236”) below the launder level. Froth Flow rate and Froth Density is also standard with the standard resolution FloLevel™ Array.



Drawings and Specifications

FloLevel™ Standard Resolution (Froth Depth <=400mm/15.75”)





Specifications

Operating Supply Voltage
24VDC, 115VAC, 240VAC 50/60Hz

Current consumption
700mA @ 24VDC
500mA @ 115VAC
350mA @ 240VAC

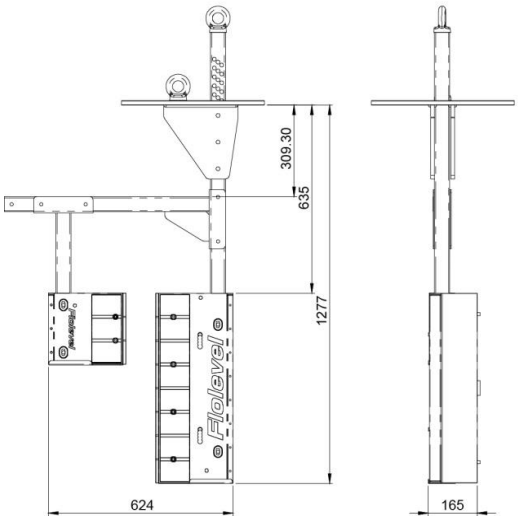
Outputs
4 x 4-20mA isol analog outputs 500 ohm max. @ 24VDC (Relays x 6 SPDT 5A@ 24VDC/240VAC

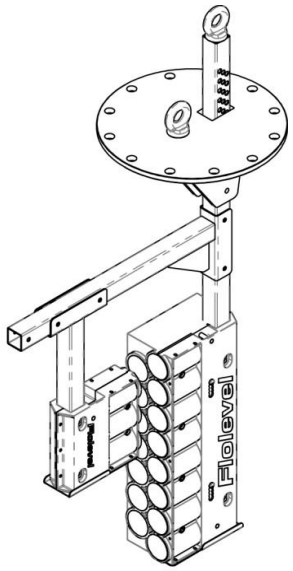
Communication Protocols
Modbus
ProfiBus
Foundation FieldBus
DeviceNet
CanBus
Ethernet

Maximum Depth of Level Range
6000mm (236”)

Resolution Options Available
2mm (0.08”), 15mm (0.6”), 25mm (1.00”)

FloLevel™ High Resolution (Froth Depth <=400mm/15.75”)





Accuracy
+ - 0.5% of range

Operating Temperature
-20 deg C to 80 deg C. (-4 deg F to 176 deg F)

Separation Cable Distance Array/Controller
500m (1640 feet)

Cable required for Array/Controller connection
4 conductors shielded twisted pair
Belden 3084A
Dekoren IED183AA002 (MAX 350m - 900 feet)

Controller Display
3.5” colour display

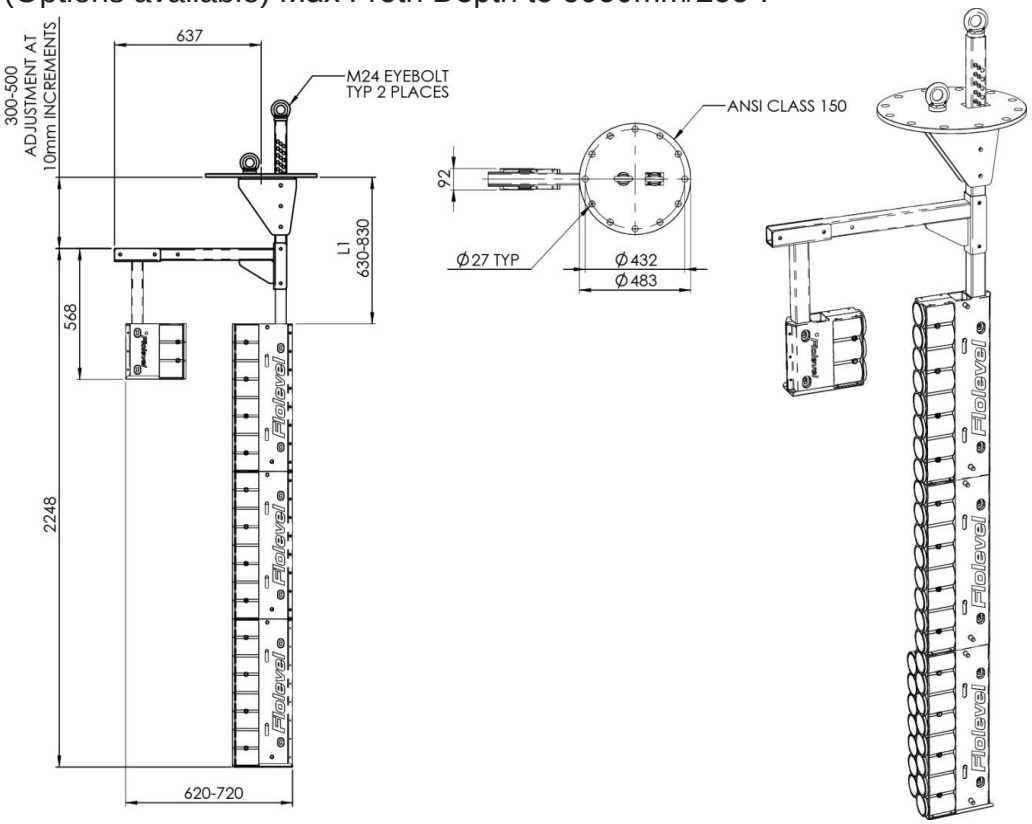
Controller Enclosure
316 Stainless Steel 400 x 400 x 200mm

Controller Sealing
IP65 (Nema 4X)

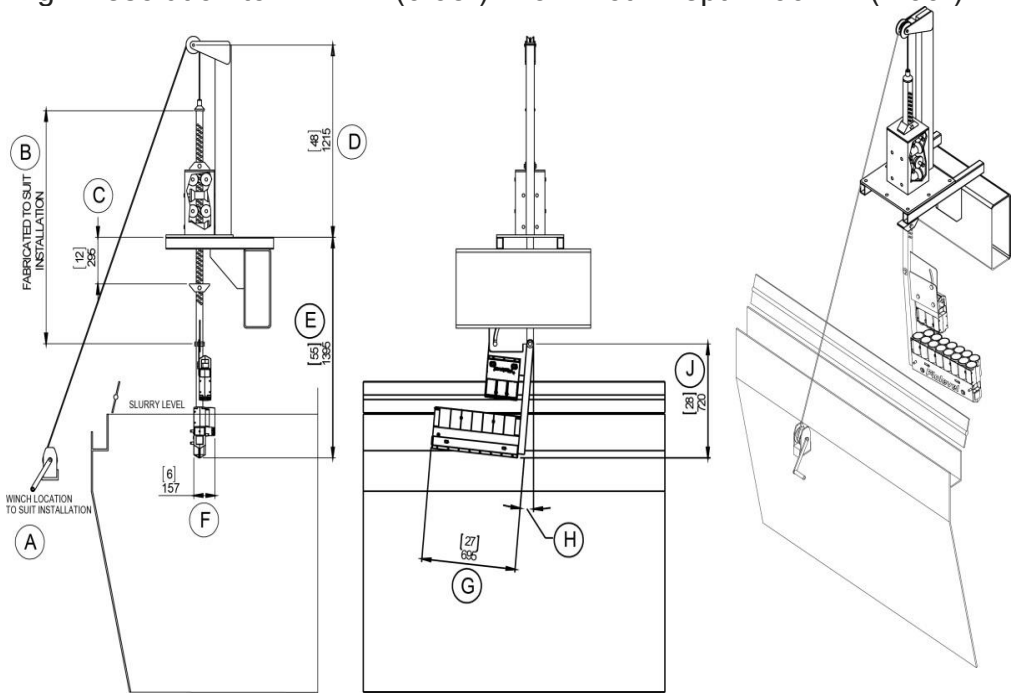
Controller Enclosure Entries
6 x 20mm (6 x 0.75”)

Typical Weight for system including bracket
30 kg (66 lbs.)

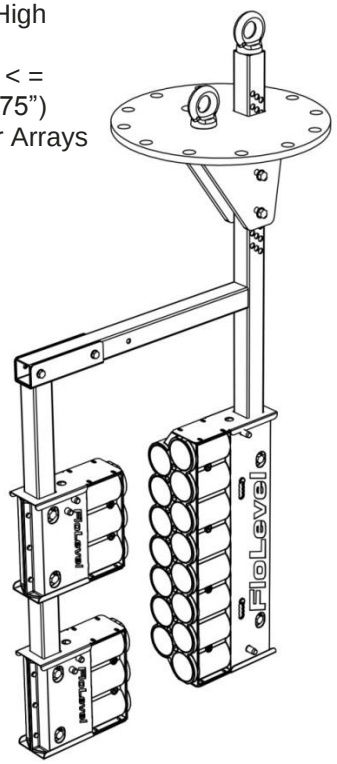
FloLevel™ Multiple Arrays Standard & High Resolution for Column Cells (Options available) Max Froth Depth to 5930mm/233”.



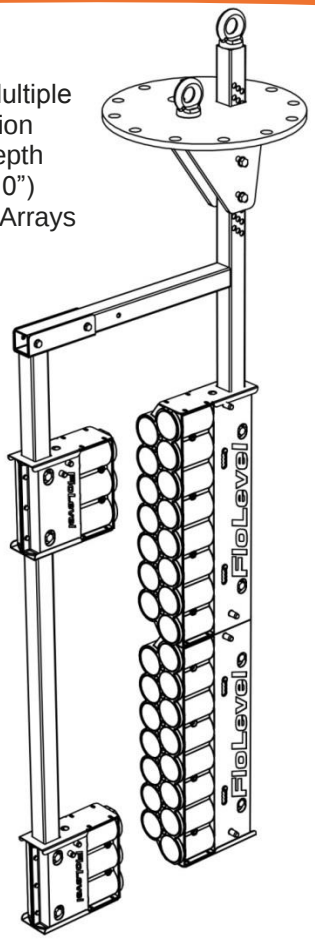
FloLevel™ Adjustable Horizontal Array Assembly with Manual Winch option. High Resolution to =>2mm (0.08”). Max Froth Depth 100mm (4.00”).



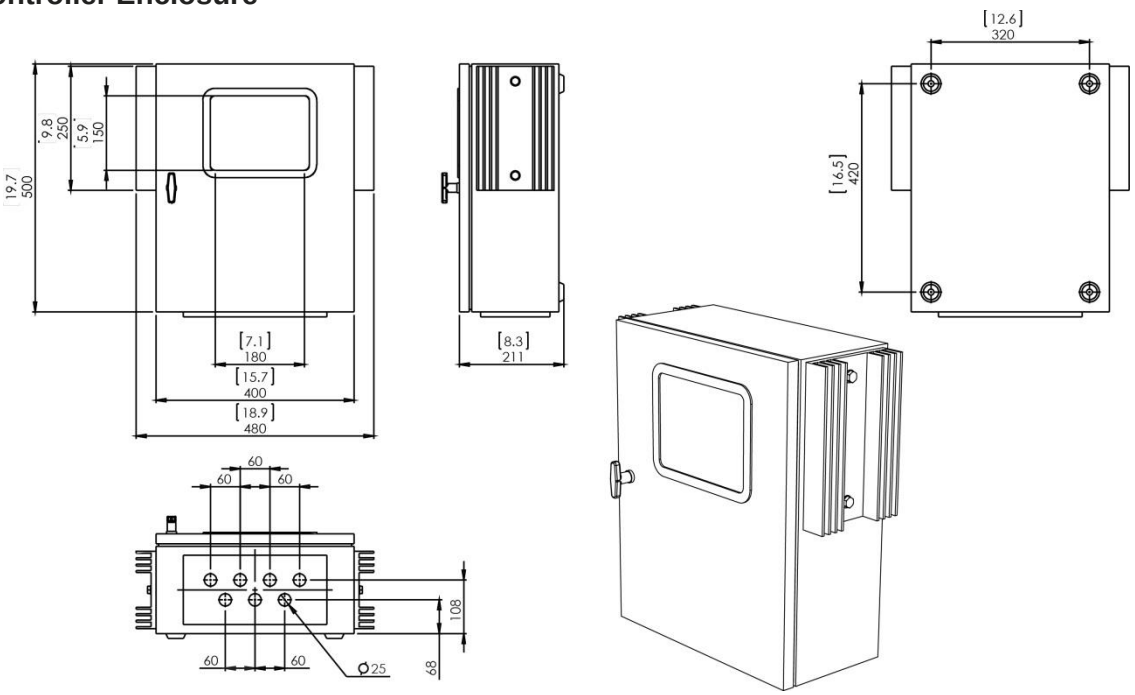
FloLevel™ High
Resolution
Froth Depth < =
400mm (15.75”)
2 x Analyzer Arrays



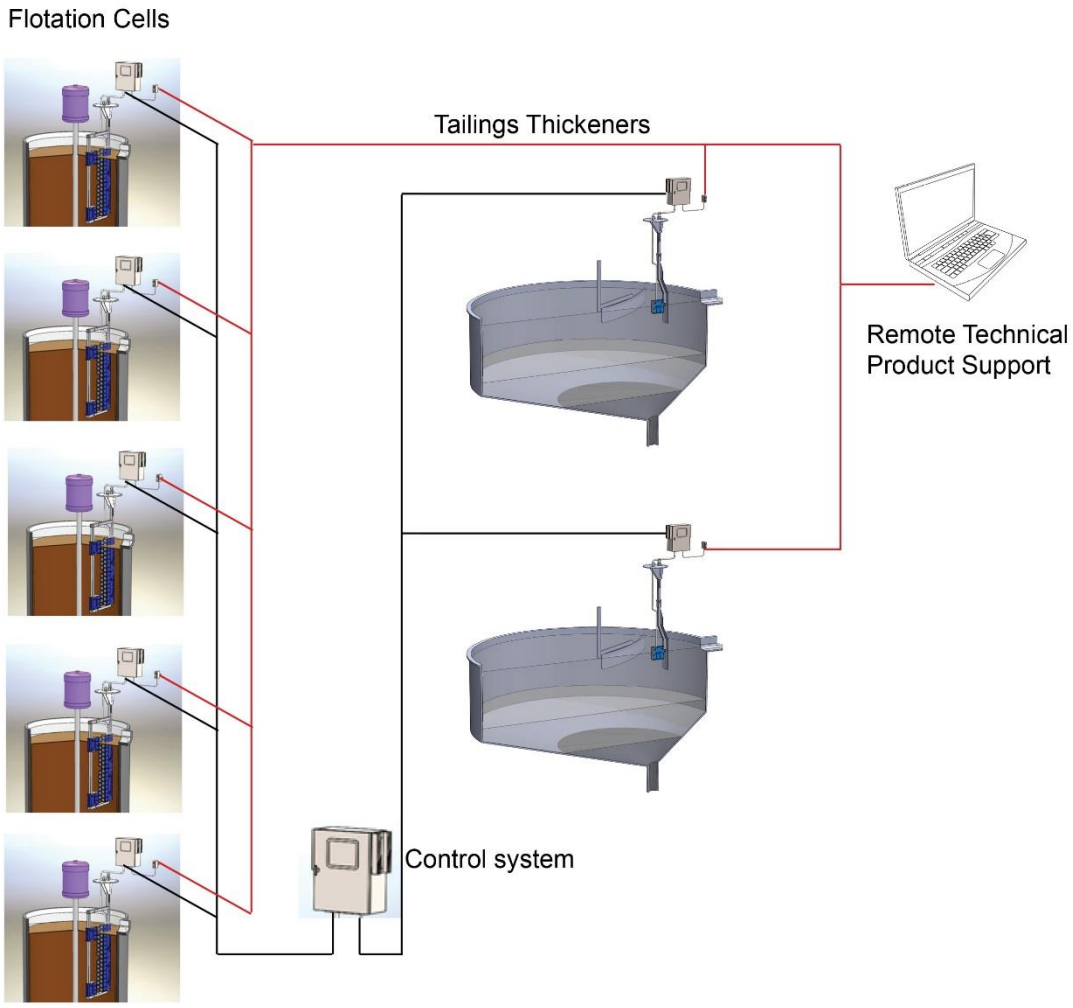
FloLevel™ Multiple
High Resolution
Max Froth Depth
1200mm (51.0”)
2 x Analyzer Arrays



FLA Controller Enclosure



Remote Diagnostics

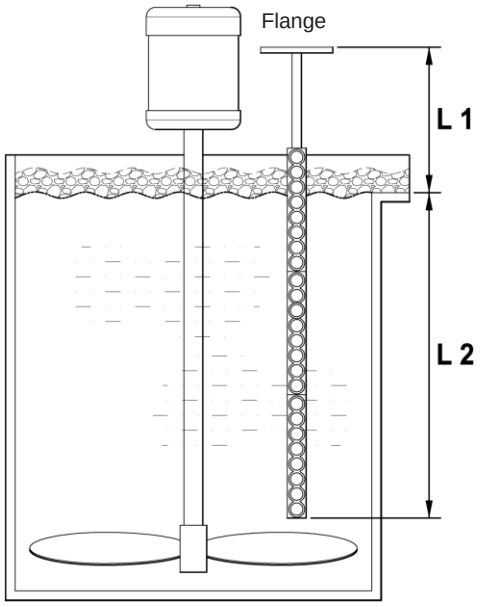


All FloLevel acoustic systems come with a remote diagnostics support module, which provide remote technical support anywhere in the world from factory trained specialists.

Applications that include flotation cells, reagent dosing tanks, mining thickeners that operate 24/7 can be supported remotely through all time zones.

Part Numbers FloLevel™ Array System:

A Product	Mineral	Level Depth below "L2"	Flange Position above "L1"	Resolution	Housing Material	Power Supply	Outputs	Cable Length	Flange Type for Mounting Bracket
FL		Level below launder	Height above launder					Array to Controller	
FL	Coal = 1	0.5m = 1	1.0m = 1	25mm = 1	Polypropy-lene = 1	24vdc = 1	4X4-20Ma =1	5m = 1	
	Copper = 2	1.0m = 2	1.5m = 2	15mm = 2	Urethane = 2	115vac= 2	4x4-20Ma+ relays =2	15m = 2	
	Molybdenum = 3	1.5m = 3	2.0m = 3	2mm = 3	Rubber = 3	240vac =3	ModBus =3	30m = 3	12" ANSI = 1
	Gold = 4	2.0m = 4	2.5m = 4		Other = 4		ProfiBus =4	50m = 4	Other = 4
	Nickel = 5	2.5m = 5	3.0m = 5				Ethernet =5		
	Zinc = 6	3.0m = 6	4.0m = 6				FF Foundation Fieldbus =6		
	Potash = 7	3.5m = 7					Other =7		
	Iron Ore = 8	4.0m = 8							
	Gypsum = 9	4.5m = 9							
	Silver =10	5.0m = 10							
	Lead =11	5.5m = 11							
	Oil Sands =12	6.0m = 12							
		Inches	Inches	Inches				Feet	
		20.0" = 1	40.0" = 1	1.00" = 1				16ft = 1	
		40.0" = 2	60.0" = 2	0.6" = 2				50ft = 2	
		60.0" = 3	80.0" = 3	0.08" = 3				100ft = 3	
		80.0" = 4	100.0"= 4					165ft = 4	
		100.0" = 5	120.0"= 5						
		120.0" = 6	160.0"= 6						
		140.0" = 7							
		160.0" = 8							
		180.0" = 9							
		200.0" = 10							
		220.0" = 11							
		236.0" = 12							



FloLevel Technologies Pty Ltd
Factory 50, 41-49 Norcal Road
Nunawading 3131 VIC
Australia
Phone: +61 (0)3 9872 3096
info@flo-level.com.au www.flo-level.com

FloLevel Technologies™