

Level Below

Non-contact level sensing with high accuracy for demanding environments.

Technical data

Product no	FB-L-R-I2C-2-2
Sensing element	60 GHz radar
Algorithm	Optimized for water surface level detection
Default range	200-6000 mm
Accuracy	+/- 3 mm
Half power beam width	~8°
Protection rating	IP68, IP69K
Ambient temperature	-40 °C to +60 °C
Output signal	Serial I2C
Operating voltage	3.3V DC
Power consumption	52 mA average current at 3.3 V
Peak current	90 mA peak current at 3.3 V
First sample timing	~415 ms
Sample refresh rate	~180 ms
Dimensions	Body height 40.0 mm Thread G1, BSPP Hex Nut flat width 36.0 mm
Connector	Ø4,2 mm x 1.5 m cable, circular M12, Class A, 4 poles
Exposed material	Polypropylene, Polyurethane

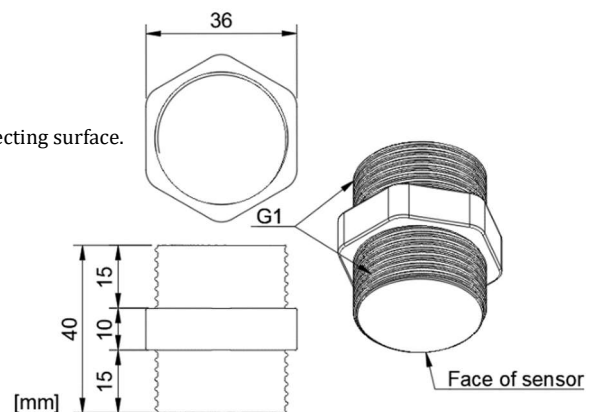


Surface distance

The face of the sensor is to be facing towards the target surface.
On command the sensor will sample and report a distance to the strongest reflecting surface.

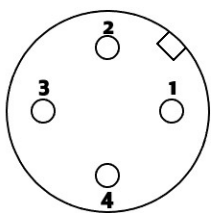
Factory settings

Origin, zero distance	Face of sensor
Max distance	6000 mm
Min distance	200 mm
No target detected	Reports 65535 mm



Wiring

Pin connections as shown below.



Pin 1: B+ Brown
Supply operating voltage from 3.3 V DC.

Pin 2: SCL White

Pin 3: SDA Blue

Pin 4: GND Black
Common ground, DC return

Timings

1. Required power-up timing before sampling is ~235 ms.
2. After power-up sequence is complete, the sensor will wait for a range reading command via the I2C-bus.
3. Refresh rate of sampling is ~180 ms.
4. First available value from the sensor is powered on is ~415 ms.

Use cases

- Wastewater monitoring
- Tank level measurements
- Flood warnings

Successful ranging of objects is influenced by the material properties of the target and its surroundings. Users are encouraged to evaluate the sensor performance in their application. Flow Below AB insists that users should only use the product within its intended parameters.

Default Address

Scheme	Default address (decimal)	Default address (binary)	Notes
8-bit addressing	224	1110 000X	8-bit addressing inserts the R/W bit and only allows for even number addresses
8-bit read/write addressing	Write: 224 Read: 225	1110 0000 1110 0001	8-bit R/W addressing schemes require the user to set the R/W bit directly.

Commands

Command	Sequence of events	Value used	Notes
Start reading	1. Initiate a write at the sensor address	224 (default)	Commands the sensor to initiate reading of surface distance.
	2. Write the start reading command byte	81	Sampling will continue until a report reading command is sent. Minimum ~180 ms between reading and report to allow for 1 full measurement cycle at factory settings.
Report reading	1. Initiate a read at the sensor address	225 (default)	The sensor will report the latest surface distance value in mm.
	2. Read 2 bytes representing the distance.	(Sent by sensor)	If the sensor has not yet completed at least 1 full measurement cycle the sensor will respond with 0.
Change parameters	1. Initiate a write at the sensor address	224 (default)	Commands the sensor to change a parameter.
	2. Write 1 byte to initiate change parameters command.	105	See explanation of parameters in "List of parameters".
	3. Write 1 byte to select which parameter to change.	(See list of parameters)	To save the changes, please see Save parameters to memory command.
	4. Write 2 bytes representing the value.	(See list of parameters)	
Save parameters to memory	1. Initiate a write at the sensor address	224 (default)	Commands the sensor to save all parameters with new values to memory.
	2. Write the save parameters to memory command.	125	Run command before turning the sensor off to save the new parameter settings to memory for use in future sampling.
	3. Confirm the save parameters to memory command.	120	
Factory reset	1. Initiate a write at the sensor address	224 (default)	Commands the sensor to reset all parameters to factory settings.
	1. Write 1 byte to initiate the factory reset command.	185	
	2. Write 1 byte to confirm the factory reset command.	180	

List of parameters

Changing parameters are intended to allow users flexibility to adjust the measurements to their needs in case factory settings are not suitable for the user application. Changing these parameters will affect technical data and timings specified within this datasheet.

Parameter name	Parameter number	Default value	Suggested values	Notes
Start distance	0	200	200-6000	Change minimum distance from sensor face to surface in mm.
End distance	1	6000	200-6000	Change maximum distance from sensor face to surface in mm.
Sensor address	10	224	1-224	Change sensor address.
			Invalid Address Values: 0, 80, 115, 120, 124, 130, 134, 140, 144, 150, 164, 170	The sensor will only accept even address values. If an odd numbered address is sent the sensor will be set to the next lowest even number. If the sensor is told to change to one of the invalid addresses below the sensor will ignore this command and stay at its current address.