



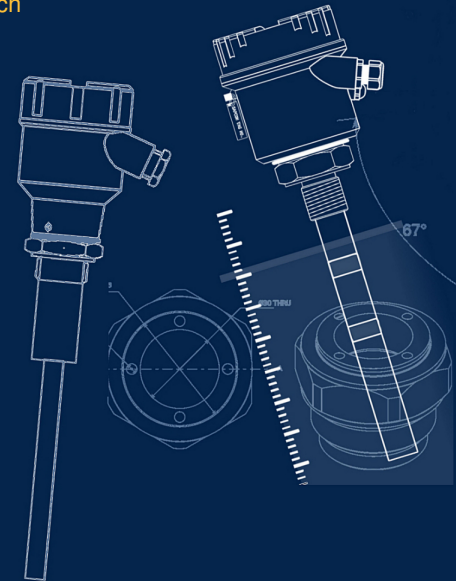
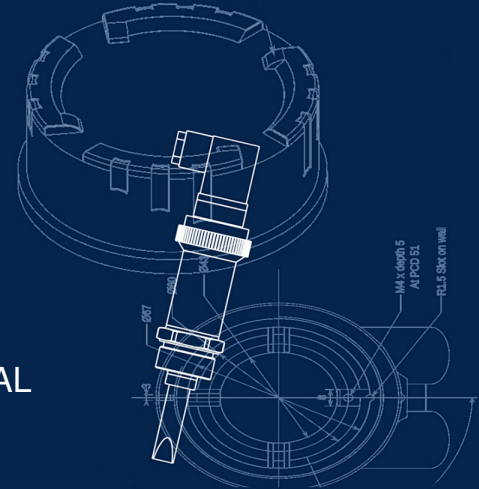
Grown...to meet challenges

INSTRUCTION MANUAL

ORBIT PADDLE

Stepmatic Rotary Paddle Level Switch

Version 3.2



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Revision History

Revision	Date	Author(s)	Description
1.0	15 Jan 2014	RND	First Version Editing
1.1	25 Sep 2014	MRK	Applications Revision
1.2	20 Apr 2015	RND	Features Revision
1.3	23 Dec 2015	RND	Specs Revision
1.4	10 Aug 2016	RND	Specs Revision
2.0	08 Jan 2017	BRND	Revised Format
2.1	17 Sep 2017	BRND	Branding Revisions
3.0	5 Feb 2020	BRND	Model Updation
3.1	10 May 2021	BRND	Section Updation
3.2	12 Apr 2020	BRND	Model Updation

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- The images shown in this manual may differ from the actual instrument / housing in terms of dimensions, color and design. Please refer to GA drawings for dimensional details.
- Values (of performance) described in this manual were obtained under ideal testing conditions. Hence, they may differ under industrial environment and settings.

General Instructions

- Instrument shouldn't block the material filling inlet.
- Secure the cover of housing tightly. Tighten the cable glands. For side mounting, the cable glands should point downwards.
- For side mounting, provide a baffle to prevent the material from falling on the probe.
- When handling forks, do not lift them using their tines. While using them with solids, ensure that material size is less than 10mm.
- Deforming the shape of the tines may interfere with the fork's operating frequency.
- Make all electrical connections as instructed in the manual. Don't power on the device before verifying the connections.

1 Introduction

Orbit is a rotating paddle level limit switch that uses a unique stepper gear motor drive resulting in highly reliable operation in most of the powders and granular solids. It is suitable for level detection in Storage Tanks, Bin Hoppers, and Containers to avoid overspill and material loss.

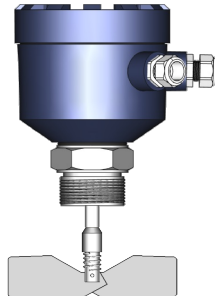


Figure 1: Orbit Product Image

2 Operating Principle

An electric motor drives the shaft connected to the rotating paddle which in-turn is connected to a spring. When rotating freely, the spring is relaxed, as the application media covers the blades of the rotating paddle, the torque requirement increases, which extends spring. The spring extension is detected by position sensors, thus level of application media is detected. The power to the motor turned off. Subsequently, when the rotating paddle is uncovered, the spring ensures the motor is back to the position where motor can be powered on.

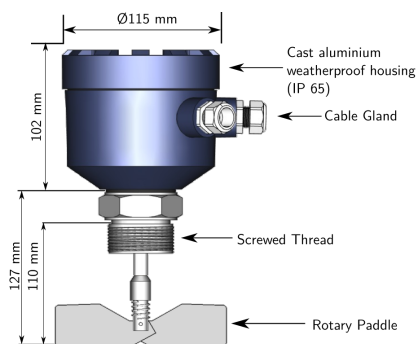


Figure 2: Description of Parts

3 Features

- Universal power supply: 90-265 V AC and 24-55 V DC.
- Adjustable RPM and adjustable switching sensitivity.
- Motor fault indication.
- Direct stepper gear motor design, maintenance-free.
- Variable sensitivity control, wide application range.

- Selectable failsafe operation.
- Foldable paddle mechanism for ease of installation.
- 2 potential free contacts with adjustable time delay.
- Rope probe available for longer lengths.

4 Applications

- Plastic Pipes
- Plastic Chips
- Grain Handling
- Cement Industry
- Food Processing
- Pharmaceuticals

5 Application Specifications

Please refer to Table 1 for Application Specifications.

PARAMETER	VALUE
RPM	2 - 8
Density	Minimum 0.5 gm/cm^3
Material Size	A maximum of 35 mm
Response Time	2-3 sec (For both, Covered and Uncovered Delays)

Table 1: Application Specifications

6 Electrical Specifications

Please refer to Table 2 for Electrical Specifications.

PARAMETER	VALUE
Input Power Supply	24 - 55 V DC and 90 - 265 V AC
Output	DPDT Relay output
Power Consumption	4.5W at 24 V
Switching	Single-point switching
Switching Indication	Green LED - Motor Status Bi-Color LED for Alarm Status <ul style="list-style-type: none"> • Green-Normal • Red-Alarm
Fail-safe	Field Selectable <ul style="list-style-type: none"> • Open - Fail-safe High (For High Level) • Close - Fail-safe Low (For Low Level)
Time Delay Settings	1 - 25 seconds (For both, Covered and Uncovered Delays)
Relay Rating	10 Amp at 275 V AC

Table 2: Electrical Specifications

7 Mechanical Specifications

Please refer to Table 3 for Mechanical Specifications.

PARAMETER	VALUE
Housing	RB: Cast Aluminium weatherproof powder coated paint (Rating IP-65) FP2A: Cast aluminium weather & flameproof powder coated paint suitable for Gas Group IIA & IIB as per IS 2148
Cable Entry	PG 13.5 (Polyamide), 1/2" BSP/NPT DC Gland
Mounting	Screwed - 1 - 1-1/2" BSP/NPT
Operating Temperature	<ul style="list-style-type: none"> • Ambient Temperature - 0°C - 65°C • Process Temperature - Up to 200°C
Probe Length	<ul style="list-style-type: none"> • Horizontal Mounting: 110mm - 500mm • Vertical Mounting: 110mm - 1000mm
Motor	Stepper motor with reduction gear head
Paddle	SS 316 foldable paddle

Table 3: Mechanical Specifications

8 Installation Guidelines

Note: For probe length greater than 500mm only top mounting is available.

Important - For vertically installed probes with wire extensions, ensure that the fitting is vertical within plus minus 5 deg. For side entry probes without wire extensions, mounting angle is unimportant.

While installing the instrument, please take care of the following points:

1. Please ensure that the bore dimensions must match the width of Orbit's blade. Refer the dimensions given below as per mounting specifications.

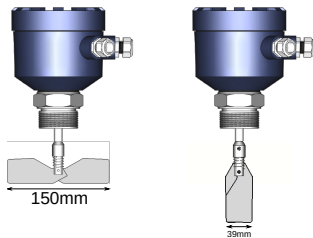


Figure 3: Dimensions for 1 1/2" Mounting

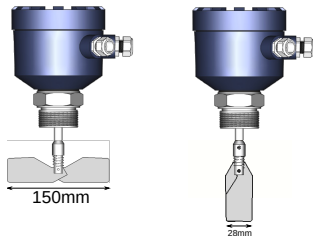


Figure 4: Dimensions for 1" Mounting

2. The instrument should be installed horizontally or vertically by bringing the twin vanes together and push them through the threaded female connection. Due to spring action, the paddle will flare out after entering the tank. No access from inside the vessel is required to install or uninstall the unit.

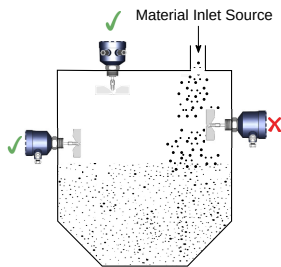


Figure 5: Proper Mounting Arrangement

3. Observe that when installed directly under the material inlet source, a canopy called baffle of appropriate strength and size should be welded right above the instrument as shown.

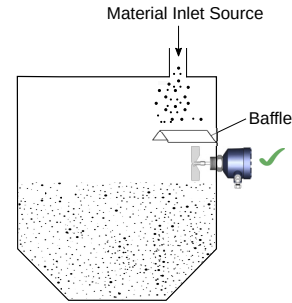


Figure 6: Orbit with Baffle

4. To prevent the ingress of moisture and water seepage in side mounting position, the cable entries should always point downwards.

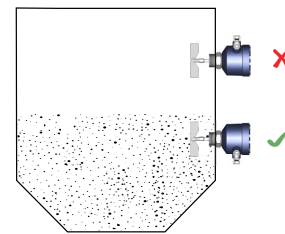


Figure 7: Cable Gland Arrangement

5. Secure the cover of housing tightly. Tighten the cable glands.
6. When handling Orbit, do not lift them using their paddle as shown in Figure 8.

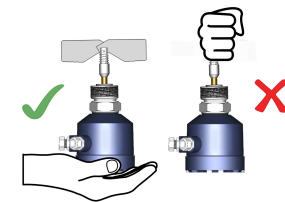


Figure 8: Correct Handling

7. While screwing the instrument, the hexagonal mounting bush should be turned and not the housing.
8. Make all electrical connections as instructed in the manual. Don't power on the device before verifying the connections.
9. Weatherproofness of enclosure is guaranteed only if the cover is in place glands adequately tightened. Damage due to accidental entry of water can be avoided if the instrument is installed in a rain shade.
10. If the ambient temperature is high, the instrument should not be installed to receive direct sunlight. In case such a position of shade is not available, a heat shield should be fitted above the instrument especially if the operating temperature lies between 60°C and 80°C.

9 Electrical Connections

Electrical connections for the instrument will change with the model. Please refer to figure 9 and the precautions mentioned below before connecting the device:

- Power Supply Rating**
 Make sure the power supplied to the instrument is within the specified range mentioned in Table 2.
- Connect Earth**
 When supplying AC power, please make sure that the grounding screw on the housing and the earth terminal are all connected to the plant's earth.
- Power Supply Fluctuations & Noise**
 External noise or fluctuating power supplies could affect performance and shorten the life of the instrument. Use external line suppressors and fuse wires to contain the risk of damage to the circuit.

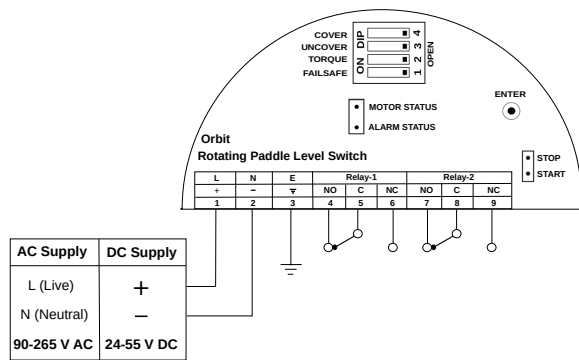


Figure 9: Electrical Connections of Universal Model (-D-U2-)

10 Cover Delay

When the application material covers the paddle, the changeover of the output can be delayed by a pre-determined time. This time is called COVER Delay. For a different value of cover delay, the number of blinks can be adjusted as per requirement. The ALARM STATUS LED will start blinking RED if the switch point is reached. It will blink for the number of seconds for which the cover delay is set. 1 blink is equal to 1 second during switching.

Note: Set the value of COVER DELAY between 1-25 secs.

Follow the below procedure for setting Cover Delay:

- Unscrew the cover and ensure that all DIP switches are in OPEN position as shown in Figure 10. Make sure that ALARM STATUS LED is not blinking for error.
- Set the COVER switch to CLOSE (Opposite of OPEN for DIP switch) position as shown in Figure 11.

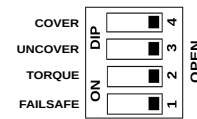


Figure 10: DIP-Switch

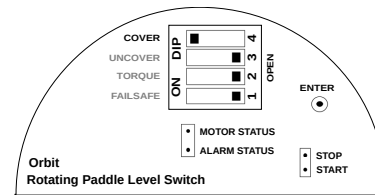


Figure 11: Cover Delay Switch Position

- Press and hold ENTER key as shown in Figure 12. The ALARM STATUS LED starts blinking. Blink the LED according to value of cover delay.

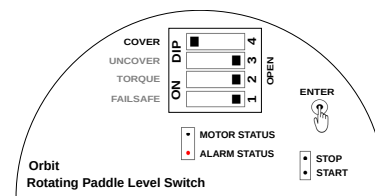


Figure 12: Setting Cover Delay

- Delay is entered, but not saved. To save and test the cover delay, set the COVER switch back to OPEN position as shown in Figure 13.

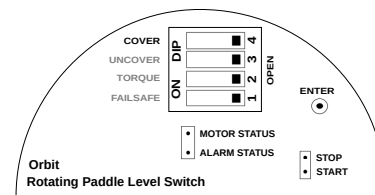


Figure 13: Saving Cover Delay

- To test, dip Orbit into the application material until the switching point is reached.

11 Uncover Delay

When the application material uncovers Orbit's blades, the changeover of the output can be delayed by a pre-determined time. This time is called UNCOVER Delay. For a different value of uncover delay, the number of blinks can be adjusted as per requirement. The ALARM STATUS LED will start blinking RED if the switch point is achieved. It will blink for the number of seconds for which the uncover delay is set.

Note: Set the value of UNCOVER DELAY between 1-25 secs.

Follow the below procedure for setting Uncover Delay:

1. Unscrew the cover and ensure that all DIP switches are in OPEN position as shown in Figure 10. Make sure that ALARM STATUS LED is not blinking for error.
2. Set the UNCOVER switch to CLOSE (Opposite of OPEN for DIP switch) position as shown in Figure 14.

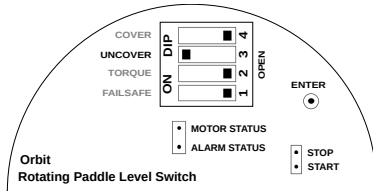


Figure 14: Uncover Delay Switch Position

3. Press and hold ENTER key as shown in Figure 15. The ALARM STATUS LED starts blinking. Blink the LED according to value of uncover delay.

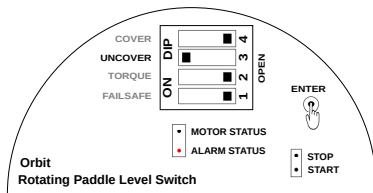


Figure 15: Setting Uncover Delay

4. Uncover delay is entered, but not saved. To save and test the uncover delay, set the UNCOVER switch back to OPEN position as shown in figure 16.

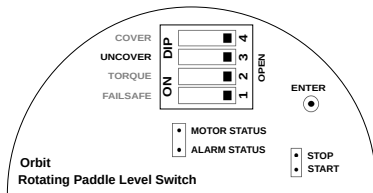


Figure 16: Saving Uncover Delay

5. To test, dip Orbit into the application material until the switching point is achieved.

12 Fail-Safe Settings

In a condition of device failure, known errors and input power failure the outputs of the device resemble the ALARM condition. This is meant to prevent overflow or dry run conditions in case of failures.

Prevent Overflow - High Level Switch Failsafe High (default) is set by moving the Failsafe switch to OPEN position as shown in Figure 17.

Note: HI in top cover indicates failsafe high.

- When not in contact with the material, LED turns GREEN.

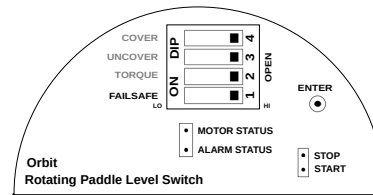


Figure 17: Failsafe High

- When in contact with the material, LED turns RED.

Prevent Dry run - Low Level Switch Failsafe Low is set by moving the Failsafe switch to CLOSE position as shown in Figure 18.

Note: LO in top cover indicates failsafe low.

- When in contact with the material, LED turns GREEN.
- When not in contact with the material, LED turns RED.

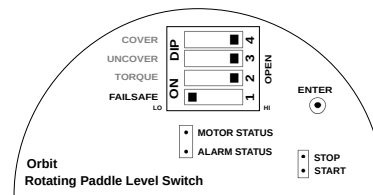


Figure 18: Failsafe Low

13 Sensitivity

Note: Do not use plier or any other tool as it could permanently damage the spring.

Sensitivity adjustment may be required to sense low density application media. This is typically done by adjusting the spring. The position of spring can be changed manually using the hand only as shown in Figure 19 in different holes as per requirement. The values should be selected according to the density of the material to be sensed.

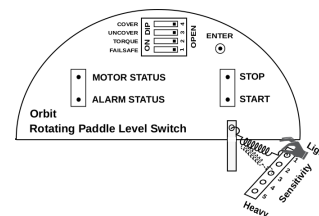


Figure 19: Sensitivity Setting

13.1 For Low Density Media

The selection of higher sensitivity value for low-density media doesn't trigger an alarm as it exerts minimum pressure across the spring which does not stop the paddle. For lighter or low-density media, prefer a sensitivity range between 1-3 as highlighted in Figure 20.

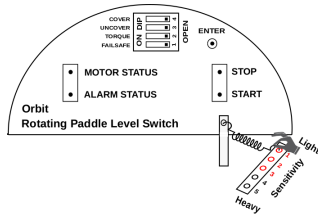


Figure 20: Sensitivity for Low Density Media

13.2 For High Density Media

Highly dense material can be sensed with higher sensitivity value as it exerts maximum pressure across the spring which stops the paddle easily. For high-density media, prefer a sensitivity range between 4-5 as highlighted in Figure 21.

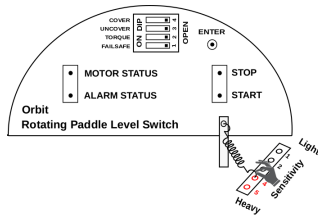


Figure 21: Sensitivity for High Density Media

14 RPM Control

Note: Set RPM value between 2-8

Stepper motors can make adjustable RPM possible. Control the RPM value using DIP Switch. The blinking of MOTOR STATUS LED becomes fast as the rotation speed increases and if MOTOR STATUS LED becomes stable it means motor stops. Please refer to Table 4 and below procedure to setting value of RPM.

VALUE	RPM
1	2
2	3
3	4 (Factory set)
4	5
5	8

Table 4: RPM Control

- Unscrew the cover and ensure that all DIP switches are in OPEN position as shown in Figure 10. Make sure that ALARM STATUS LED is not blinking for error.
- Set the COVER and UNCOVER switch to CLOSE (Opposite of OPEN for a DIP switch) position as shown in Figure 22.
- Press and hold ENTER key as shown in Figure 23. Blink the LED according to value of RPM.

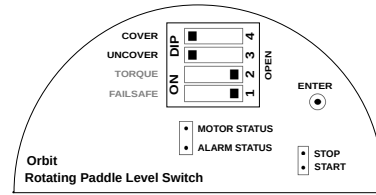


Figure 22: RPM Control Switch Position

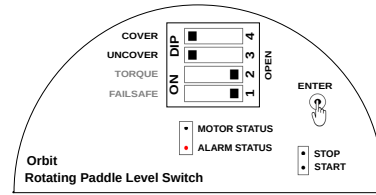


Figure 23: Setting RPM

- RPM is entered, but not saved. To save and test the RPM, set the COVER and UNCOVER switch back to OPEN position as shown in Figure 24.

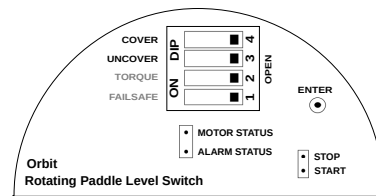


Figure 24: Saving RPM

15 Display Indications

As seen in Fig.25, Universal model has ALARM STATUS LED and a MOTOR LED.

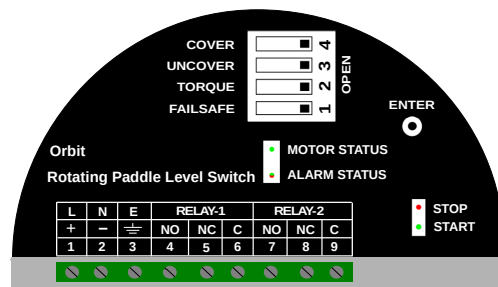


Figure 25: LED Indication on Top Cover

15.1 ALARM STATUS LED

The Bi-color ALARM STATUS LED indicate switching status of instrument.

- **RED** LED: Alarm Condition
- **GREEN** LED: Normal Condition

Continuous blinking of Red or Green LED could indicate an error, refer to Error Indications

15.2 MOTOR STATUS

GREEN LED shows the motor status and the operation shows through START and STOP.

16 Error Indications

On Error, the ALARM STATUS LED starts blinking RED and GREEN alternately at a faster rate. Normal LED blinks are always at the rate of 1 blink per second, in either RED or GREEN color. This error occurs due to loose connection of motor. To resolve this error connect the motor properly.

17 Customer Support

Thank you for going through the instructions given in this manual. To further ease the process of installation and use, we have developed special demo videos which are hosted on YouTube.

Sapcon's YouTube channel, SAPCON INSTRUMENTS, lists all these videos: <https://goo.gl/dnxfcz>

Should you require further information regarding installation, use or working of the instrument, please don't hesitate to contact us. Kindly provide the following information at the time of contacting:

- Instrument Model and Serial Number
- Purchase Order Number and Date of Purchase
- Description of the query
- Your contact details

In an attempt to serve you better, we are open seven days a week (9:30am to 7:30pm). We are available at:

- www.sapconinstruments.com
- sales@sapcon.in
- +91-731-4757575

18 Product Selection Order Code

Product

RP : Orbit - Rotary Paddle Level Switch (Use in Chemical, PVC Powders, Plastic Chips, Cement etc.)

Type

I : Integral (sensor in same unit)

Housing

RB : Cast aluminium weatherproof powder coated paint (IP65)

FP2A : Cast aluminium weather & flameproof powder coated paint suitable for Gas Group IIA & IIB as per IS 2148

Probe Housing Cable Entry

PCPG13 : PG 13.5, Polyamide

PCB5D : 1/2" BSP, DC Gland, Brass

PCN5D : 1/2" NPT, DC Gland, Brass

Output

D : 2NO, 2NC DPDT Relay Output (rated at 6 A, 230 V AC for non-inductive load)

Power Supply

U2 : Universal (90 To 265 V AC, 50Hz) and 24V DC on same terminals

Probe Type

RDP : Rod Probe

ROP : Rope Probe (Probe Length \geq 1001 mm)

Mounting

MB10S6 : Screwed Thread, BSP 1", SS 316

MN10S6 : Screwed Thread, NPT 1", SS 316

MB15S6 : Screwed Thread, BSP 1-1/2", SS 316

MN15S6 : Screwed Thread, NPT 1-1/2", SS 316

Orientation

TM : Top Mount (Probe Length \geq 501 mm)

AM : Agnostic Mount (Probe Length \leq 500 mm)

Extension Material (Probe Length \geq 175 mm)

ES4 : SS 304 (Only with "RDP")

R6S6 : ϕ 6 Wire Rope, SS 316 (Only with "ROP")

Rope Weight (Only with "ROP")

RWS4 : Rope Weight, SS 304

Operating Temperature

10T : Up to 100°C

20T : Up to 200°C

Standoff Material (Except "10T")

STS6 : SS 316

Probe Length

1.1H : 110 mm

1.5H : 150 mm

1.75H5H : 175 to 500 mm (Only with "AM")

5H10H : 501 to 1000 mm (Only with "TM")

10H30H : 1001 to 3000 mm (Only with "ROP" & "TM")