



A higher level of performance

Data Sheet

ORCA - Sonar Sludge Level System



Sonar Interface

Sludge Level Monitoring

Principle of Operations

The ORCA Sonar Series transducer emits a high powered acoustic pulse, which is reflected from the interface density selected. The reflected signal is processed using specially developed software algorithms, that eliminate lighter floating densities and stratified layers, allowing measurement of "RAS" or "BED" levels. It can be calibrated to measure lighter densities like "FLOC" or one of the outputs could be used for a "CLARITY" output, similar to a basic turbidity transmitter measuring solids in suspension.

By choosing the correct sonar transducer frequency, the Orca sonar guarantees the optimized performance when measuring both light and heavy density interfaces.

Primary Areas of Applications

Sewage & Wastewater

- Primary Sedimentation – Blanket level.
- Secondary and final Clarifiers – RAS Blanket and fluff/ pin floc layer.
- Thickeners and DAF – Bed level and clarity of water.
- Sequential Batch Reactors – Blanket monitoring (floating sonar).
- Lagoons – Bed sludge level.
- Lamella Clarifier – Bed level and floc level.

Mining / Process

- Clarifiers, thickeners, CCD's, settling ponds/lagoons, water treatment, carbon columns.

Function

The ORCA Series Sonar, sludge blanket and interface controller, consists of a microprocessor based transmitter, with easy menu driven programming via keypad, PC combinations or GSM modem, COMMS, GSM interface. The Orca controller works together with appropriate sonar transducer and transducer cleaning mechanism.



Features:

- Dual independent analogue outputs to track two different interfaces, or clarity simultaneously, with the one sonar sensor.
- Full range of sonar transducers to optimize detection of heavy and light density interfaces.
- Widest range of sonar frequencies to optimize performance.
- Easy calibration to track specific density interfaces. eg: RAS blanket - 4g/l, floc/fluff layer - 1g/l.
- Industrial scum cleaning mechanisms, that do not require maintenance.
- No wiper blade assemblies.
- Control room graphics of tanks and interfaces.
- Wide range of communications:
Devicenet, GosHawk, HART, Modbus, Profibus DP Foundation Fieldbus and Profibus PA
- CDMA/GSM remote support capability for calibration, commissioning or technical back-up.
- Relay alarms

Cutting Edge Sonar Technology

Comparison between First Generation and Third Generation Sonar Technology

There are two major innovative changes between the First Generation instruments and the current Third Generation "ORCA" Hawk sonar range.

1. Sonar Transducer Frequencies

All other existing sonar transmitters are described as being First Generation technology. They utilize only one sonar transducer frequency and therefore have severe limitations in where they can be used successfully. An understanding of the Basic Physics of Sound Transmission, indicates that sound transmission through a liquid or gas, varies, based on the wavelength of the frequency transmitted.

When transmitting sound pulses through air, that may contain steam, condensation, dust etc the rule is to use a lower frequency, longer wavelength transducer to diffract the signal around particles in suspension. Its called the fog horn principle.

The same principle applies to transmitting sound through a liquid. When monitoring an interface in a process tank, like a secondary clarifier, the interface for controlling the RAS pumps, resides lower in the tank than the grey interface Fluff Layer. The First Generation sonar tries to stay on this heavier density RAS blanket by utilizing software algorithms. The problem is that as soon as the secondary tank has settling and bulking problems, the First Generation sonar monitors the interface going to the surface, so using software algorithms is not the total answer.

In our Third Generation Sonar range, the ORCA has "seven" different sonar transducer frequencies to choose from. Depending on the application at the Waste Treatment Plant, we select the appropriate sonar transducer frequency, according to the density of the interface we want to control and monitor off.

This means that instead of having small signals (300milli-volts) reflecting off the desired density interface, the ORCA range has signals as large as 2500millivolts, almost 10 times greater, because of optimizing the sonar transducer frequency. It also means, that when the secondary clarifier has bulking and settling problems, the instrument continues to control off the RAS Blanket density, which still is at the bottom of the tank. It is only the lighter densities that are hydraulically lifted towards the launders at the top of the tank.

So we use a different sonar transducer frequency for each of the main applications at the Wastewater Treatment plant, Primary Sedimentation Tanks, Secondary/Final Clarifiers, Thickeners, and DAF Tanks.

Each ORCA sonar transducer has "smart" capability. They can be driven to output two different frequencies.

a. The Secondary Clarifier has two interfaces that are needed for optimizing the efficiency of the tank. The first is the RAS Blanket, that we generally monitor at a density of 4g/L, which guarantees a quality biomass return to the aeration lanes and

to the Thickening area. This ensures that the RAS Blanket is not over pumped (over scavenged) and that we do not reduce the retention time in aeration by pumping in lower density biomass.

b. The second interface that we need to monitor is the Fluff Layer and we calibrate this density at 600 milligram/L. Under normal operating conditions in the Secondary Clarifier, the Fluff Layer at 600 milligrams/L sits about 1500mm above the RAS Density of 4g/L. By monitoring the two analogue outputs in the PLC we can identify how well the Secondary Clarifier is operating, because the two signals should rise and fall on the trend simultaneously if the tank is settling well. When a process problems occurs, perhaps caused by changing industrial effluent entering the plant, causing a biological instability, bulking and settling problems occur. The RAS Blanket density is heavy enough not to rise, but the lighter Fluff Layer interface will be hydraulically lifted in the tank. The second analogue will indicate a change in settling patterns and an alarm can be raised in the PLC that the tank is experiencing settling problems.

c. This ensures that we not only control and optimize the RAS and the WAS densities, but we also provide early feedback to the process engineers and operators that one or more tanks have a process problem.



2. Special algorithms for controlling sonar interfaces, special scum cleaning capabilities

- a. Secondary Clarifiers can suffer with stratified interfaces, when process stability is lost. These stratified interfaces can confuse First Generation sonar transmitters into believing that the interface is higher in the tank than it really is. Our algorithms delete the stratified interface from being detected.
- b. Some Secondary Clarifier tanks suffer from hydraulic imbalance to their inflow, when compared to other tanks close by. This causes a change in settling and monitoring of the interfaces, which the ORCA can handle with the minimum of calibration change. This is all the more reason that each Secondary Clarifier Tank should be treated as a sole stand alone process tank.
- c. We have also developed a range of scum cleaners that are totally controlled by the ORCA transmitter. These cleaning mechanisms are an absolute necessity to our performance warranty. There is no known instrument that can survive, immersed in sewage media, that will work reliably without cleaning.



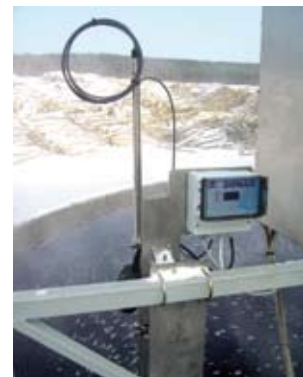
Glossery of Terms

RAS	Return Activated Sludge
WAS	Waste Activated Sludge
DAF	Dissolved Air Floatation
Lamella	Type of clarifier design
Fluff Layer	Light density interface secondary clarifier
SBR	Sequential Batch Reactor
Pinfloc	Particles in suspension
Clarity	Cleanness of liquid
CCD	Type of thickener-mining
Floc Dosing	Chemical dosing to improve settling



Typical Applications

Area	Functions
Water Treatment Plant	
Primary Sedimentation Tank	Floc level / sludge blanket level
Sludge Thickener Tank	Sludge bed level / clarity suspended solids / floc level
Calcium Hydroxide Reactor	Sand/pellet bed level
Sodium Hydroxide Reactor	Sand/pellet bed level
Sewage Treatment Plant	
Primary Sedimentation Tank	Sludge blanket level
Secondary / Final Clarifier	RAS blanket level / rag/pinfloc layer / clarity suspended solids
Sludge Thickener Tank	Sludge bed level / clarity suspended solids
“DAF” Tank	Sludge bed level / floating sludge level
Sequential Batch Reactor (SBR)	Settling bed level / RAS blanket level
Industrial (food, paper etc.)	
Primary Sedimentation Tank	Sludge blanket level
Secondary Clarifier Tank	RAS blanket level / clarity suspended solids / rag/pinfloc layer
Thickener Tank	Sludge bed level / clarity suspended solids / floc level
“DAF” Tank	Sludge bed level / floating sludge level
Sequential Batch Reactor (SBR)	Settling blanket level / RAS bed level
Carbon Column	Carbon bed level
Mining/Mineral processing	
Clarifier Tank	Blanket level / clarity suspended solids / stratified floc layers
Thickener Tank	Sludge bed level / clarity suspended solids / stratified floc layers
CCD's Tank	Sludge bed level / clarity suspended solids / stratified floc layers
Settling Ponds	Sludge bed level



Transducer Selection Guidelines

Typically, the most difficult task when wanting to determine the level of an interface, lies in the correct selection of the transducer frequency.

There are many other variables to consider. They include particle size, flow, velocity, material, air bubble retention etc.

In general, the following should be undertaken:

It is recommended always to use an automated cleaner.

1. Identify a position away from direct inflow, where turbulence is minimized.
2. If air bubbles are present within heavy suspended solids, use the scum cleaner.
3. Position sonar transducer 1/3 radius from circumference of the tank away from the influence of the feed well.
4. Submerge the face of the selected transducer by a minimum of 20mm (0.79”).

The higher the transducer frequency, the easier it becomes to see smaller particle sizes. The disadvantage, is the lack of penetration and a higher likelihood of air bubbles forming on the sensor face, creating impedance to the transmit and received signals.

Lower transducer frequencies will not see such small particles, but will see a more clearly defined interface.

The frequency selection should be based upon the % solids, plus a logical position for the placement of the sensor. Please consult your local distributor for correct transducer selection.

All sonar transducers will be affected by air bubble accumulation on the sensor face. If the auto cleaner is used, the system will operate to ensure accumulation of air bubble interface does not cause operational problems.



Monitoring Settling Blanket in a SBR (Sequent Batch Reactor)

Application problem

The client had blanket carry-over problems, which affected his EPA licence. The decant range was 0-1500 mm (0-60")

Wastewater treatment plant

250 megalitre/day (65 million gallons/day)

Comments

We installed our floating sonar transmitter, with auto scum cleaner, close to one of seven launders in the tank. During aeration the sonar transmitter detected a high level blanket in suspension. Once the aeration period had stopped, the blanket settling was detected. Once the blanket had settled 1 m (3.2 ft) below the liquid height, the launders were introduced and decanting started.

Solution

Using the ORCA floating sonar stopped carry-over into the launders. Automating the decant phase, based on the blanket settling, increased efficiency and saved time during the settling phase.

Ordering information

Part numbers

OSIRDYX - Transmitter

OSIRT003S4XC6 - Sonar transducer

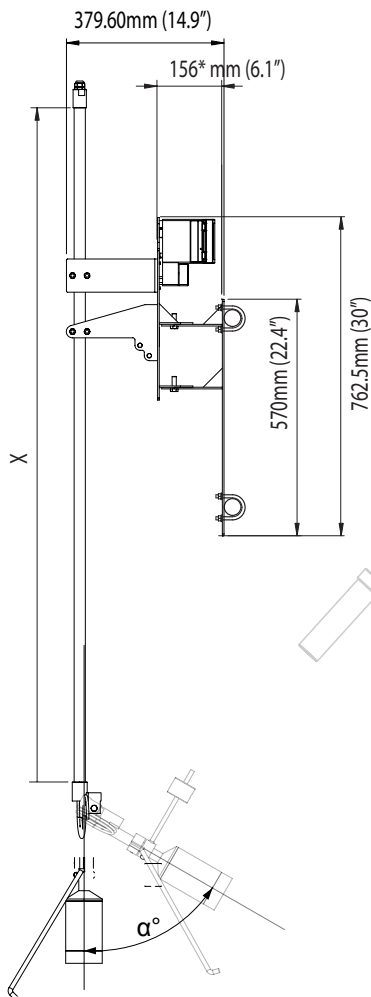
OSIRSCD - Sonar Cleanser/Float/Brackets

OSIRME - L5 - Sonar Transducer SS Pole 5 m (16.5 ft)

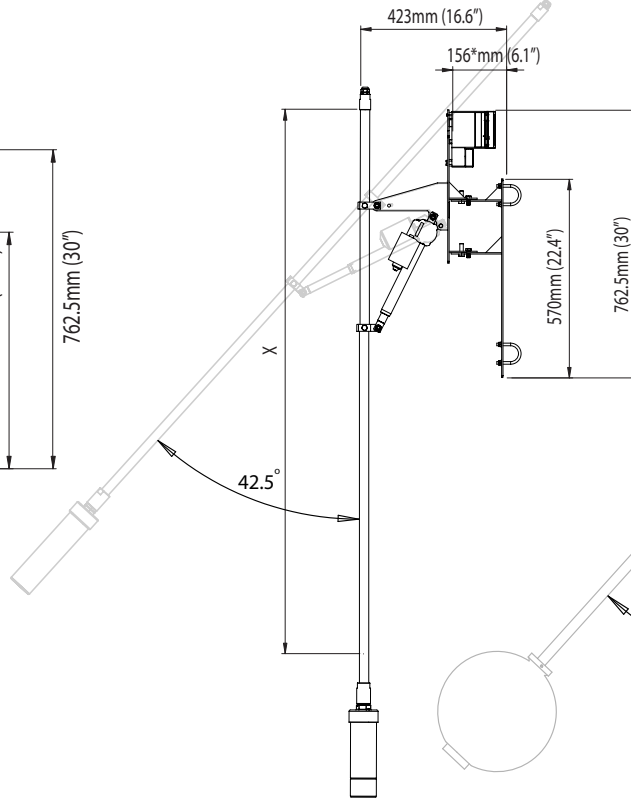


Dimensions

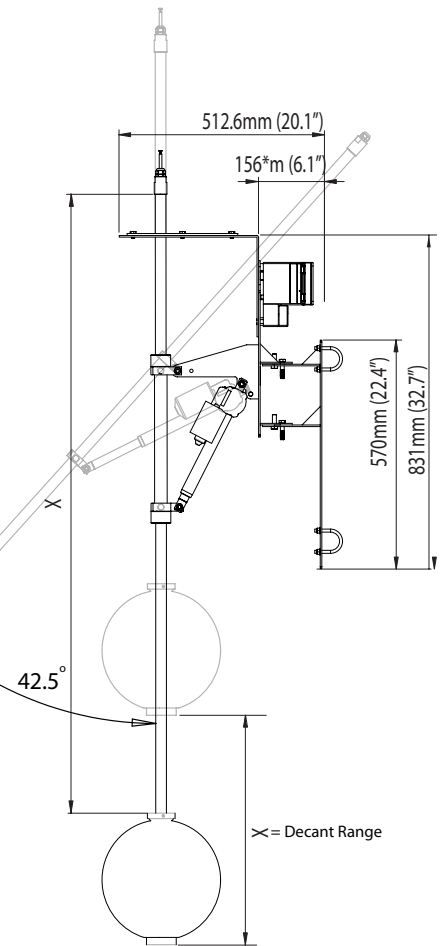
SONAR IMPACT PLATE



SONAR ACTUATOR CLEANER



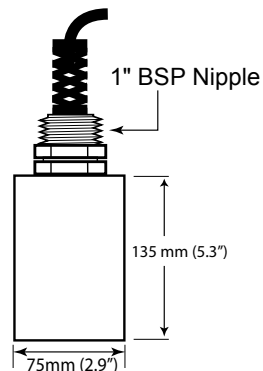
FLOATING SONAR SENSOR



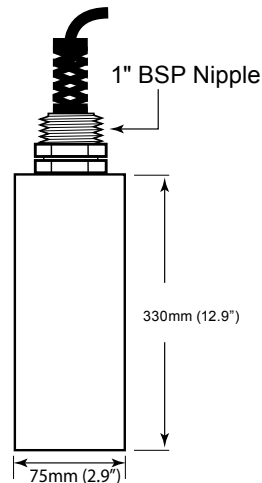
X - Pipe length to suit
* distance from safety rail or Bridge
may be varied

Note: Advise physical dimension of surface
scum rake.

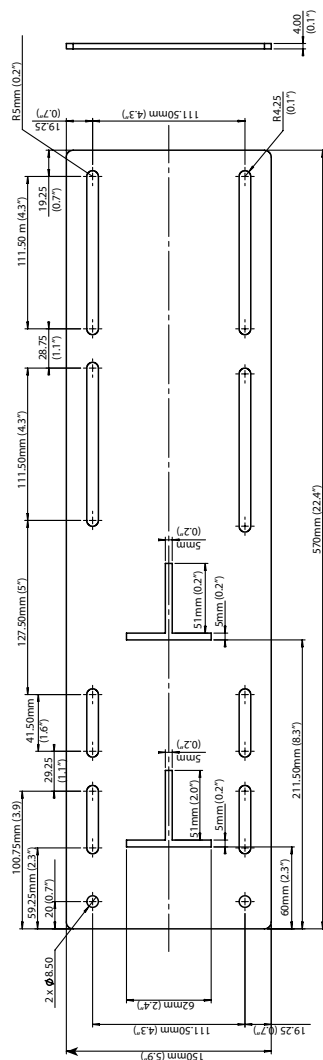
OSIRT Transducer



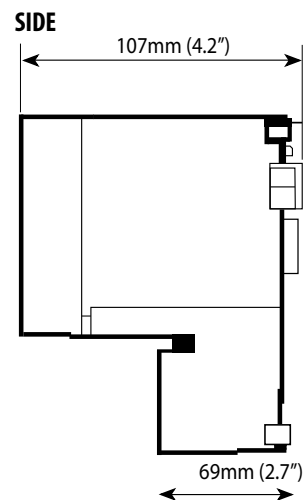
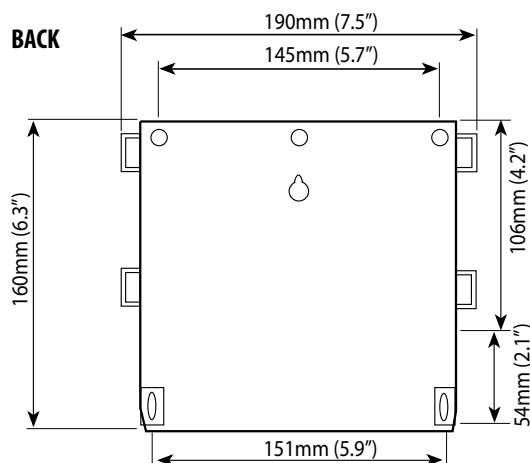
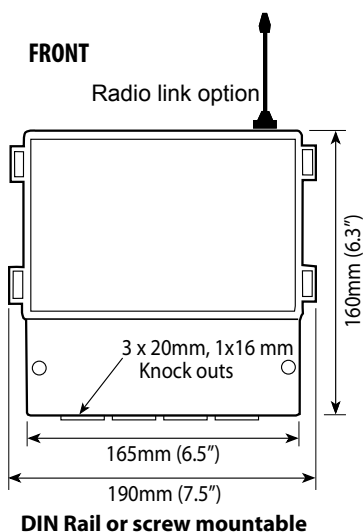
OSIRT Fibreglass Transducer



RAIL BASE PLATE

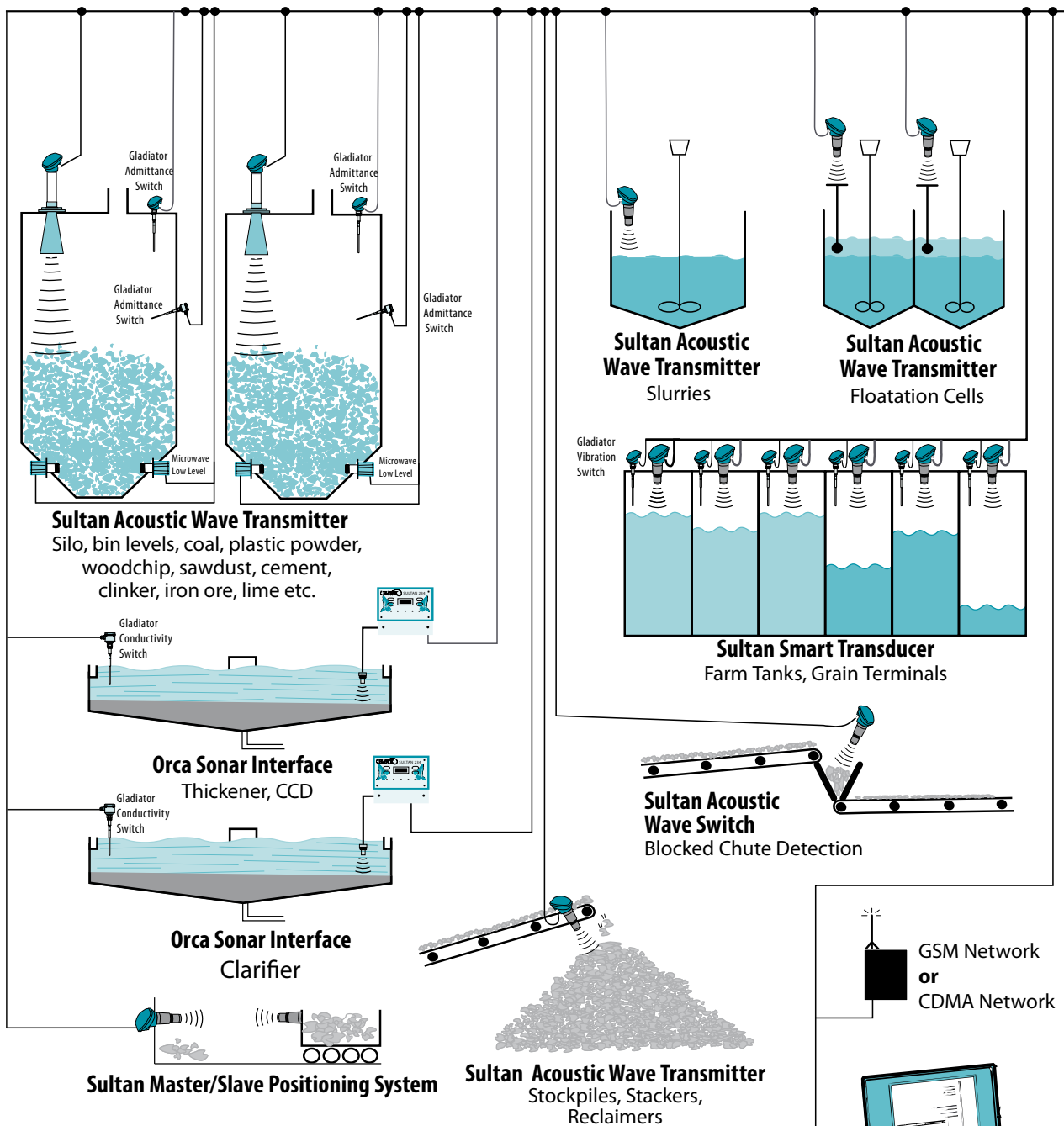


REMOTE ENCLOSURE



Communication Network Overview

Modbus and Profibus



GSM or CDMA Network

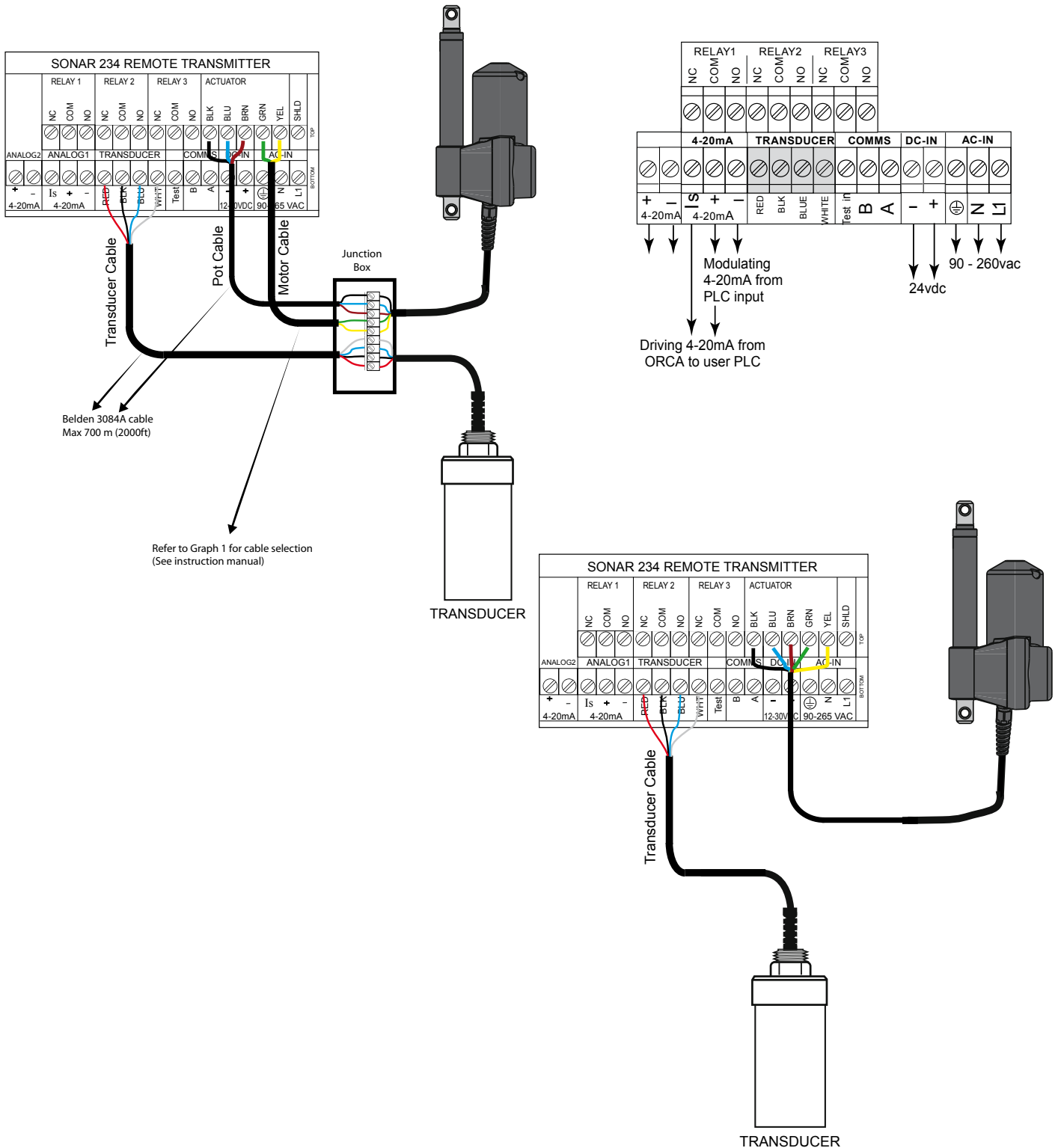
- Typically up to 31 transmitters or switches per string.
- Maximum 250 transmitters or switches.
- Using GSM/CDMA network, transmitters and switches can be monitored, calibrated remotely.
- Alarm status, diagnostics can be monitored.
- Support from factory engineering for customer application problems.

Laptop or PC Communications
or PLC / DCS with
MODBUS RTU Port
GosHawk Software for
inventory monitoring on PC

(Limited Modbus query rate for Switches only)



OSIR SONAR SERIES TRANSMITTER Remote Version (3 Relays) (2 Analogues)



Part Numbering

ORCA Sonar Electronics

Model

OSIR ORCA Sonar Level Transmitter with 1 or 2 analogue outputs and 3 relay alarms

Power Supply

B 24 Vdc

D 90-250Vac and 24Vdc

Output Configuration (PC comms GosHawk standard)

X 1 x 4-20mA analogue output modules with Modbus Comms

Y 2 x 4-20mA analogue output modules with Modbus Comms

I 1 x 4-20mA analogue output modules with Modbus and HART Comms***

J 2 x 4-20mA analogue output modules with Modbus and HART Comms***

W Modbus comms only

P Profibus DP*

A Profibus PA

F Foundation Fieldbus

E Ethernet

D Devicenet

Z Special Request

Internal HawkLink Modem**

X Not Required

G2 GSM Frequency 800/1900 MHz/19200 Baud for USA, Canada

G4 GSM Frequency 900/1800 MHz/192 Baud for Australia, Europe

OSIR D Y X

Notes:

* Can not be used with internal HawkLink. Can be used with remote HawkLink.

** Internal HawkLink cannot be used in Zone 0 / 20

*** Contact factory

ORCA Remote Transducer

Model

OSIRT ORCA Remote Sonar Transducer

Number of Crystals

0 1 Crystal

3 3 Crystals Array

7 7 Crystals Array

Transducer

02 (150kHz)

03 (300kHz)

04 (450kHz)

05 (700kHz)

07 (30kHz)

Blanking

450mm

450mm

450mm

450mm

600mm

Temperature and Facing material selection

S Standard Temperature Version

H Fibreglass High Temperature Version

Transducer Housing Material

4 Polypropylene

H Fibreglass High Temperature Housing, must be used with fibreglass face

Z Special

Approval Standard

A0 ATEX Cat1 EEx_ia (Zone 0)

A1 SAA Ex_m (Zone 1)

X Not Required

Connection

C IP68 Sealed unit with 6 metre cable

Cables

6 6m cable (Standard)

15 15m cable

30 30m cable

50 50m cable

OSIRT 0 02 S 4 X C 6



Orca Accessories

Mounting Extension

Model

OSIRME Mounting Extension Stainless Steel Pipe***

Length

L2 2 Meters (6.6ft)

L3 3 Meters (9.8ft)

*** Pole length must be specified. For example 1m (3.3ft) pole, L1.

OSIRME L2

Automatic Scum Cleaner

Model

OSIRSC Automatic Scum Cleaner

Type

A 24Vdc Electric Actuator with Mounting Accessories

B Pneumatic Actuator (Please consult the factory)

C Rotary Scum Brush Cleaner

D Floating Sonar with 24Vdc Electric Actuator with Mounting Accessories

E Impact Plate plus Mounting Bracket with Mounting Accessories

OSIRSC A

Complete Part Number

Electronics

Transducer

Accessories

OSIR D Y X

+ **OSIRT 002 S 4 X C 6**

+ **OSIRSC A**

Radio Link

Model

OSIRRL Radio Link Region

R1 USA,Canada

R2 Australia, Europe

R3 Japan

R4 China

OSIRRL R1



Specifications

OSIR Transmitter

Measurement Range

- 0 to 30 metres (0-98.4ft)

Minimum Density Range

- <100mg/l

Accuracy

- $\pm 0.25\%$ of span

Temperature

- -20°C to 70°C
(-4°F to 158°F)

Display

- 2 x 8 digit LCD display.

Echo Processing

- Advanced Sparrow Hawk Algorithms

Outputs

- 2 x Analog 4-20mA (Isolated) max. 750 ohms
 - Relays: 3 x SPDT 0.5Amp
 - Power driver for Auto scum cleaner
 - GosHawk, HART, Modbus, Profibus DP, DeviceNet
Foundation Fieldbus & Profibus PA
- Multidrop mode can address 1-250 units over 4 wire

Diagnostics

- Full operational diagnostics display

Sealing

- IP65

Option

- Reduced blanking distances
- Sun hood

Operating Voltage

- 90 - 260Vac 50/60Hz, 24Vdc

Power Consumption

- <18VA @ 240Vac, peak power 180VA during actuator operation
- <12VA @ 115Vac, peak power 170VA during actuator operation
- <3W @ 24Vdc, peak power of 130W during actuator operation

OSIRT Transducer

Transducer Selection

- See sonar transducer selection guidelines. (P2)

OSIRT002	–	150kHz
OSIRT003	–	300kHz
OSIRT004	–	450kHz
OSIRT005	–	700kHz
OSIRT007	–	30kHz

Please consult your local distributor for correct transducer selection.

Housing

- Polypropylene, Fiberglass, PVDF (Kynar), Teflon and PVC

Sealing

- IP68 (Fully encapsulated)

Special Blanking

- 150mm (5.9") minimum

Temperature Sensor

- Internal (max. 70°C (158°F) Standard)
- High temperature 150°C (302°F) with external pre-amp.

Mounting

- 1.00 inch BSP/NPT nipple

Cable

- Belden 3084A

Weight

- 3.5kg (7.7lb)

Approvals

- SAA. Class 1 Zone 1
- ATEX Cat.1 (Intrinsic Safe)

Auto Scum Cleaner

Construction

- Stainless Steel

Mounting

- Base mount x 4 holes. (See drawing)

Actuator

- Electric 24Vdc
- Pneumatic - Contact factory
- Brush Cleaner
- Impact Plate

Weight

- 5Kg (11lb)

Additional product warranty and application guarantees upon request.

Technical data subject to change without notice.

Contact

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