Data Sheet

# Sultan 2 - Acoustic Wave Technology

*2 Wire Solids / Liquids level measurements to 60m (196ft)*


## Principle of Operations

The SULTAN 2 emits a high powered **acoustic wave** transmit pulse which is reflected from the surface of the material being measured. The reflected signal is processed using specially developed software to enhance the correct signal and reject false or spurious echoes.

The transmission of high powered acoustic waves ensures minimal losses through the environment where the sensor is located. Due to the high powered emitted pulse, any losses have far less effect than would be experienced by traditional ultrasonic devices. More energy is transmitted hence more energy is returned. Advanced receiver circuitry is designed to identify and monitor low level return signals even when noise levels are high. The measured signal is temperature compensated to provide maximum accuracy to the outputs and display.

## Primary Areas of Applications

- **Waste water/water:**

River level, wet wells, inlet screens, tanks, sumps, pump stations, water towers, dams, basin levels, chemical storage, etc.

- **Mining:**

Crushers, surge bins, ore passes, conveyor profile, blocked chute, stockpile, stackers, reclaimers, storage silos etc.

- **Power Stations:**

Boiler bunkers, raw coal bunkers, ash pits, fly ash silos, etc.

- **Others:**

Food, Cement, Plastics, Grain, Chemicals, Paper, Irrigation, Quarries

## Function

The Sultan 234, is a non intrusive acoustic wave transmitter with flexibility, used for level measuring of liquids, slurries and solids.

## Power Supply

2 Wire Loop Powered

## Certifications

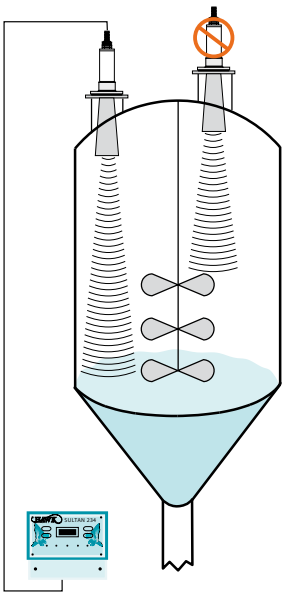
ATEX, SAA/IECEx, CE, (CSA, FM pending)

## Features:

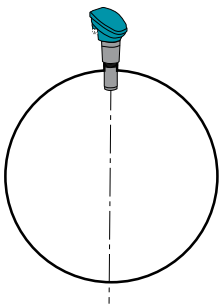
- Non contact measurement.
- Self cleaning sensors
- Power supply flexibility allows for 2 wire loop power.
- Low cost per point.
- Wide range of communications: Devicenet, Goshawk, HART, Modbus, Profibus (Fieldbus & Profibus PA pending)
- Pump Control x5 pumps
- Auto compensation for dust, steam and losses.
- Protection class. IP67, NEMA 4x (IP68 Transducer)
- Programmable fail safe mode.
- High temp applications on request
- GSM/CMDA remote setup options/config.
- Differential and average level control (2 transducers).

# Typical Applications

### Conical Shape Vessels

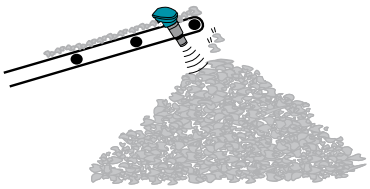


### Horizontal Cylindrical Tanks



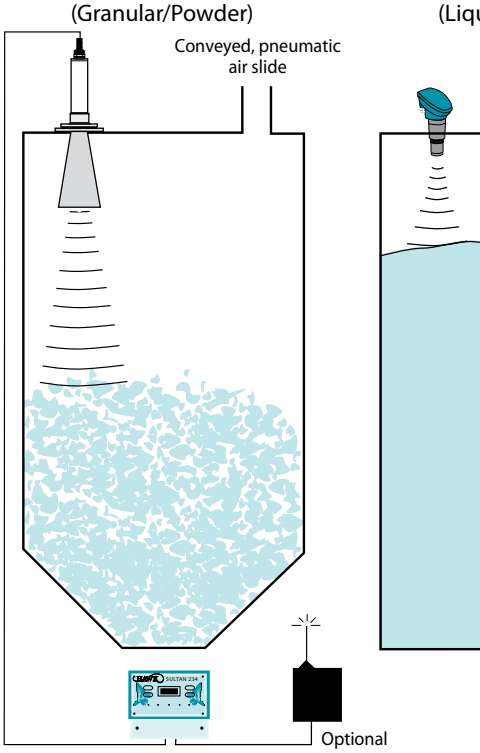
### Sultan Acoustic Wave Transmitter

Stockpiles, Stackers,
Reclaimers



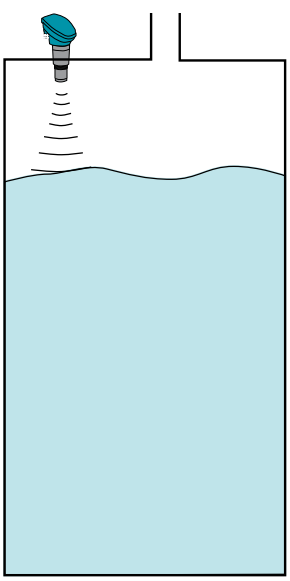
### Solids Vessels

High/Low/Continous level
(Granular/Powder)



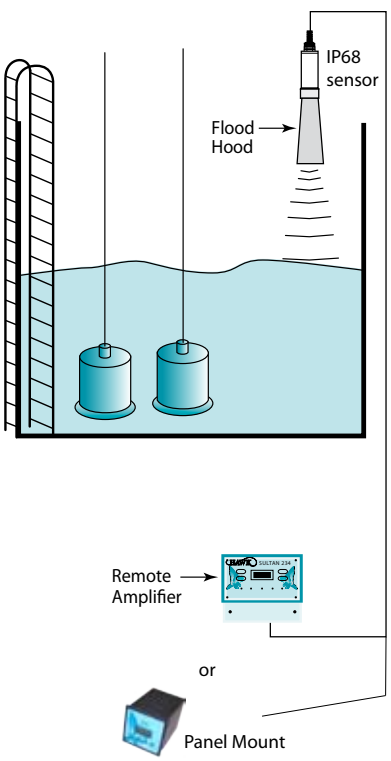

### Storage Tanks

High/Low/Continous level
(Liquid/Chemical)

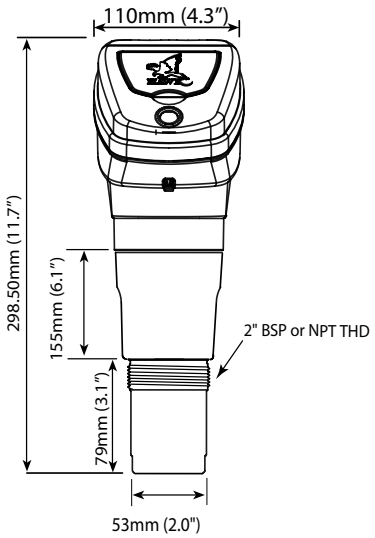


### Sewage Wet Well

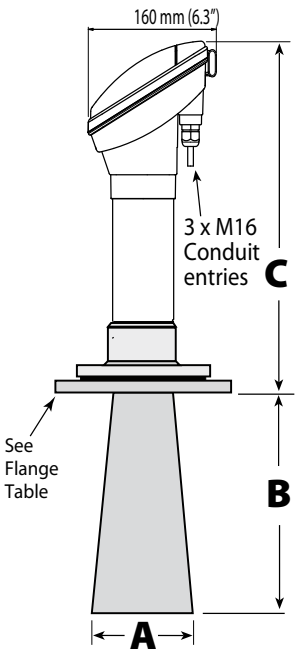
High/Low/Continous level
Up to 5 Pumps



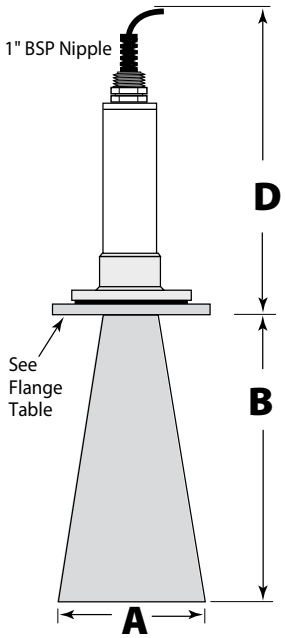
**Integral Unit**
**AWI2SX30/40/50**
**AWI234SX30/40/50**




**Integral**



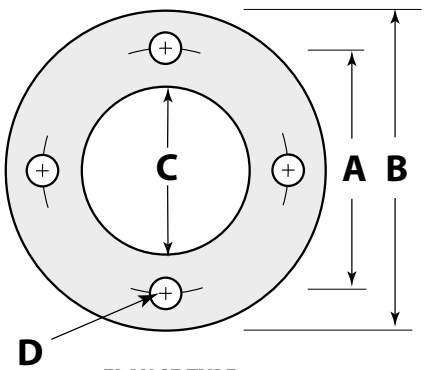

**Remote**




All horns must protrude into the vessel by at least 50 mm (2 inches) past the mounting nozzle

| Integral Transmitter Table | | | | | |
|---|---|---|---|---|---|
| Model | Selected Flange | B | | C | |
| | | mm | in | mm | in |
| AWI 5 kHz | 10" | 455 | 17.9 | 840 | 33.1 |
| AWI 10 kHz | 10" | 415 | 16.3 | 540 | 21.3 |
| * | 8" | 280 | 11.0 | 540 | 21.3 |
| AWI 15 kHz | 10" | 455 | 17.9 | 440 | 17.3 |
| * | 8" | 280 | 11.0 | 440 | 17.3 |
| AWI 20 kHz | 4" | 280 | 11.0 | 390 | 15.4 |
| AWI 30/40/50 kHz | 4" | 280 | 11.0 | 350 | 13.8 |
| *8" is non standard/please consult factory before selecting. | | | | | |

| Remote Transducer Table | | | | | |
|---|---|---|---|---|---|
| Model | Selected Flange | B | | D | |
| | | mm | in | mm | in |
| AWRT 5 kHz | 10" | 455 | 17.9 | 750 | 29.5 |
| AWRT 10 kHz | 10" | 415 | 16.3 | 450 | 17.7 |
| * | 8" | 280 | 11.0 | 450 | 17.7 |
| AWRT 15 kHz | 10" | 455 | 17.9 | 350 | 13.8 |
| * | 8" | 280 | 11.0 | 350 | 13.8 |
| AWRT 20 kHz | 4" | 280 | 11.0 | 300 | 11.8 |
| AWRT 30/40/50 kHz | 4" | 280 | 11.0 | 260 | 10.2 |




**FLANGE TYPE:**
A = ANSI Flange
J = JIS Flange
D = DIN Flange
**Others Available**

**STANDARD ANSI/DIN/JIS FLANGE DIMENSIONS**

| SIZE | FLANGE TYPE | A (PCD) mm | A (PCD) in. | B (OD) mm | B (OD) in. | C (ID) mm | C (ID) in. | D (Hole) mm | D (Hole) in. |
|---|---|---|---|---|---|---|---|---|---|
| 4" | FA4 | 190.5 | 7.5 | 228 | 9.0 | 100 | 4 | 19 | 0.75 |
| | FD4 | 180 | 7.0 | 220 | 8.7 | 100 | 4 | 18 | 0.7 |
| | FJ4 | 175 | 6.9 | 210 | 8.4 | 100 | 4 | 15 | 0.6 |
| 10" | FA10 | 362 | 14.3 | 406 | 16.0 | 250 | 10 | 25 | 1.0 |
| | FD10 | 350 | 13.8 | 395 | 15.6 | 250 | 10 | 22 | 0.85 |
| | FJ10 | 355 | 14.0 | 400 | 15.7 | 250 | 10 | 23 | 0.9 |

**NON STANDARD ANSI/DIN/JIS FLANGE DIMENSIONS**

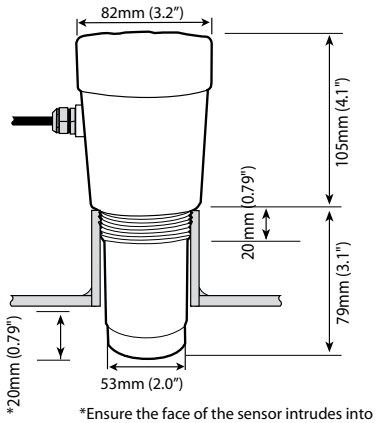
| | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| 8" | FA8 | 298.5 | 11.8 | 343 | 13.5 | 200 | 8 | 22 | 0.85 |
| | FD8 | 295 | 11.6 | 340 | 13.4 | 200 | 8 | 22 | 0.85 |
| | FJ8 | 290 | 11.4 | 330 | 13.0 | 200 | 8 | 19 | 0.75 |

**Note:** Other flange sizes available upon request.

# Dimensions

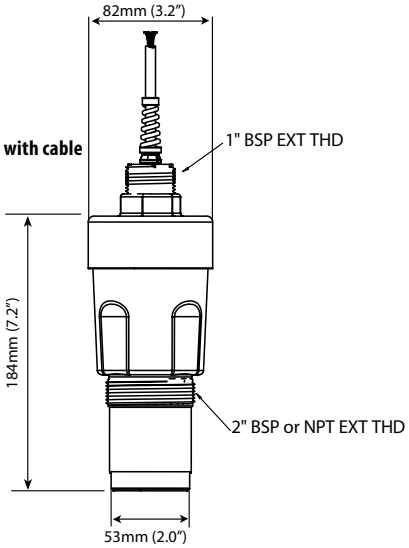
## 2 inch Remote Mounting Dimensions

**Screwtop with integral junction box**




*Ensure the face of the sensor intrudes into the vessel by more than 20mm

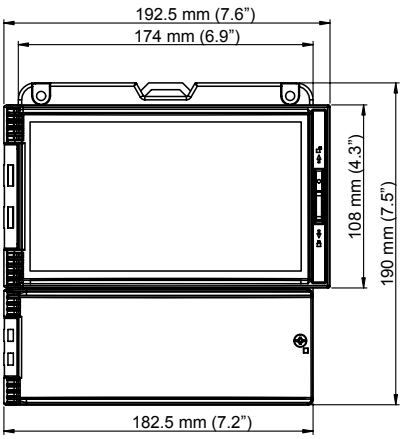
**IP68 Sealed unit with cable**



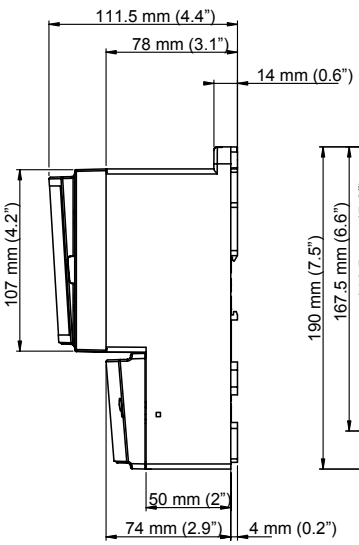

## REMOTE ENCLOSURES

### Field Mount

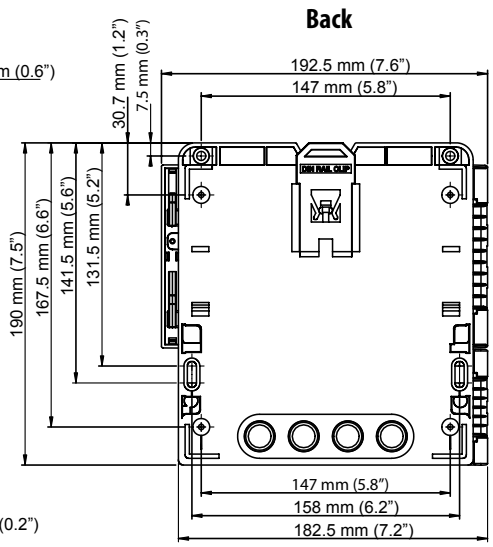
**Front**




**Side**

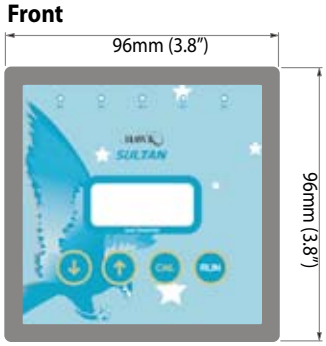



**Back**

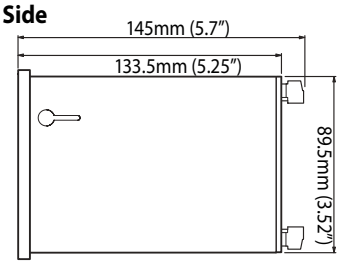



### Panel Mount

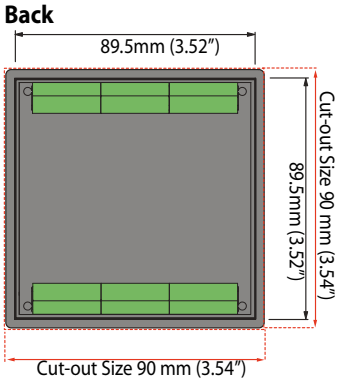
**Front**



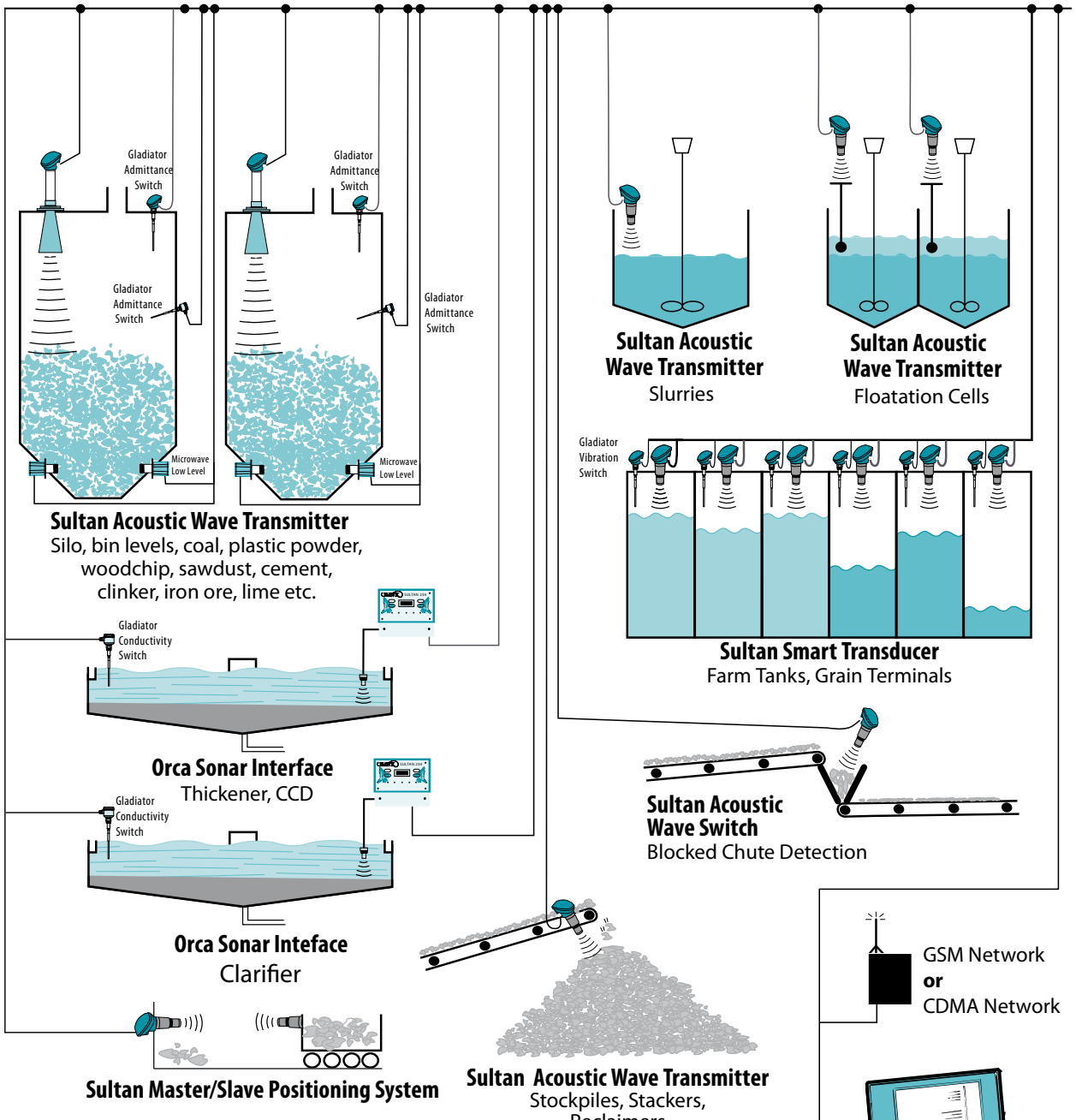

**Side**




**Back**



## Modbus and Profibus

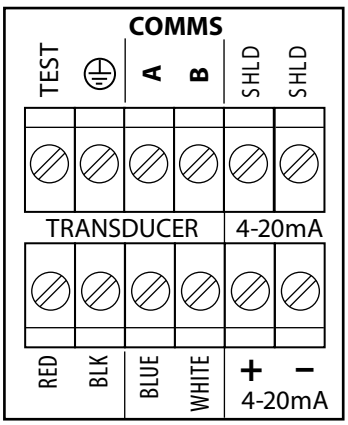



(Limited Modbus query rate for Switches only)

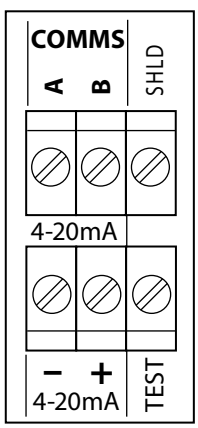
### GSM or CDMA Network

- 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.
- Specifications for all other communication systems, eg HART, Profibus, Modbus etc check instruction manual.

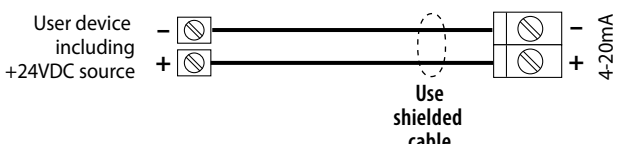
## AWR2 Series — Remote Loop Power Transmitter




## AWI2 Series — Integral Loop Power Transmitter




### 4-20mA Output




NOTE:
RL Max = 750Ω
if user DC Supply 24V

Sultan output is sinking current. Voltage to drive current loop must be provided by PLC, indicator, other user device or external DC supply.

**Sultan AW Remote Electronics**

**Model**

AWR2 Remote 2 Wire, Housing / Facia Display Connection Board/Process Module, No relays

**Housing**

S Standard polycarbonate electronics housing

P Panel Mount Housing

**Power Supply**

B 24 VDC standard

**Output Configuration (PC comms Goshawk standard)**

X 4-20mA analogue output module, 2/3/4 includes Modbus comms

H HART 2 wire only

P Profibus DP

A Profibus PA

E Ethernet

D Devicenet

Z Special Request

**Internal HawkLink Modem (not available)**

X Not Required

**Approval Standard**

X Not Required

A0 Intrinsic Safe (AWR2 only): IECEx Zone 0 (Ex ia IIA T4) / ATEX (Grp II Cat 1 GD IP67 EEx ia IIA T4)

A22 ATEX Dust (Grp II Cat 3 D T85C IP67)

GP CSA Equip Class 2; Pollution deg 2; measurement II (ordinary locations)

RN CSA Class I; Div 1/2; Group D; Zone 0; AEx/Ex ia IIA; T4

KN CSA Class Ii; Div 2; Group F & G; Class III

**AWR2 S B X X X**

## Sultan AW Remote Transducer

**Model**

AWRT Acoustic Wave Remote Transducer

**Transducer Frequency**

- 50 50kHz for applications up to 5m, available in 2” only
- 40 40kHz for applications up to 7m, available in 2” only
- 30 30kHz for applications up to 11m for 2” and 15m for 3” (4” cone is required for 3” units)
- 20 20kHz for applications up to 20m, available in 3” only (4” cone is required)
- 15 15kHz for applications up to 30m, available in 3” only (10” cone is required)
- 10 10kHz for applications up to 40m, available in 3.5” only (10” cone is required)
- 09 9kHz for high power extended range applications up to 170m (10” cone is required)
- 05 5kHz for applications up to 60m maximum, available in 3.5” only (10” cone is required)
- 04 4kHz for high power extended range applications up to 170m (10” cone is required)

**Process Temperature - Facing material selection**

- S Standard Temperature Dry Atmosphere only, (Polyolfin face) for 4, 5, 9, 10 and 15kHz only
- T Standard Temperature Wet Atmosphere, (Teflon 3” & larger transducers, Tefzel for 2”)
- Y High Temperature Wet and Dry Atmosphere, 150C, (Titanium face) for 15kHz only
- Z Special Request

**Transducer Housing Material**

- 4 Polypropylene (3” transducer version)
- 6 Tefzel (2” transducer version)

**Thread Standards**

- X Not Required (Standard Flange Mount, see flange & cone selection)
- TB BSP
- TN NPT

**Mounting Thread Sizes**

- X Not Required (Standard Flange Mount, see flange & cone selection)
- 20 2” thread for 50,40,30 kHz in Tefzel housing only
- 30 3” thread on the back cap for 30,20,15 kHz only. For 15kHz use “B” type flange.
- 50 3.5” thread on the end cap for 10 and 5kHz only

**Approval Standard**

- X Not Required
- A0 Intrinsic Safe: IECEx Zone 0 (Ex ia IIA T4)/ATEX (GrpII Cat1 GD IP67 EEx ia IIA T4)
- A1 ATEX Encapsulated (Grp II Cat 2 GD EEx m II IP68)
- A20 ATEX Dust (Grp II Cat 1 D T85C IP67)
- A21 ATEX Dust (Grp II Cat 2 D T85C IP67)
- A22 ATEX Dust (Grp II Cat 3 D T85C IP67)

**Connection**

- C IP68 Sealed unit with cable
- S Screwtop with integral junction box (available only for 2” units)

**Cable Length**

- 6 6m cable (Standard)
- 15 15m cable
- 30 30m cable
- 50 50m cable
- X Not Required

**Mounting Accessories**

- X Not Required
- CS Cable Suspension for remote 50/40/30/20kHz only

**AWRT 20 T 4 X X X C 6 X**

## Sultan AW Integral Transmitter

Model

AWI2 Integral 2 Wire, Housing / Facia Display Connection Board/Process Module, No relays

**Housing**

S Standard Valox 357U moulded electronics housing

**Power Supply**

B 12-30 VDC

**Transducer Frequency**

50 50kHz for applications up to 5m, available in 2” only
40 40kHz for applications up to 7m, available in 2” only
30 30kHz for applications up to 11m for 2” and 15m for 3” (4” cone required for 3” units)
20 20kHz for applications up to 20m, available in 3” only (4” cone required)
15 15kHz for applications up to 30m, available in 3” only (10” cone required)
10 10kHz for applications up to 40m, available in 3.5” only (10” cone required)
05 5kHz for applications up to 60m maximum, available in 3.5” only (10” cone required)

**Process Temperature - Facing material selection**

S Standard Temperature Dry Atmosphere only, (Polyolfin face) for 4, 5, 9, 10 and 15kHz only
T Standard Temperature Wet Atmosphere, (Teflon 3” & larger transducers, Tefzel for 2”)
Y High Temperature Wet and Dry Atmosphere, 150C, (Titanium face) for 15kHz only
Z Special Request

**Transducer Housing Material**

4 Polypropylene
6 Tefzel for 2” (standard). For 3” Teflon please contact us

**Thread Standards**

X Not Required (Standard Flange Mount, see flange & cone selection)
TB BSP
TN NPT

**Mounting Thread Sizes**

X Not Required (Standard Flange Mount, see flange & cone selection)
20 2” thread for 50,40,30 kHz in Tefzel housing only
30 3” thread on the back cap for 30, 20, 15 kHz only. For 15kHz use “B” type flange.
50 3.5” thread on the end cap for 10 and 5kHz only

**Output Configuration (PC comms Goshawk standard)**

X 4-20mA analogue output module, 2/3/4 includes Modbus comms
H HART 2 wire only
P Profibus DP
A Profibus PA
E Ethernet
D Devicenet
Z Special Request

**Approval Standard**

X Not Required
A0 Intrinsic Safe: IECEx Zone 0 (Ex ia IIA T4) / ATEX (Grp II Cat 1 GD IP67 EEx ia IIA T4)
A22 ATEX Dust (Grp II Cat 3 D T85C IP67)

**Position / Crane master/Software Options for Sultan 234 Only**

X Not required

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **AWI2** | **S** | **B** | **30** | **T** | **4** | **X** | **X** | **X** | **X** | **X** |

## Flange Selection

F Flange

**Dimension Standard**
A ANSI
D Din
J JIS
Z Special Request

**Flange Sizes**
2N 2” NPT flange
2B 2” BSP flange
4 4” acoustically isolated flange
8 8” acoustically isolated flange
10 10” acoustically isolated flange
Z Special Request

**Flange Mounting Position**
A Cone Mounted
B Transducer Body Mounted
C Angle flange

**Flange Material**
4 Polypropylene
6 Teflon
Z Special Request

**F A 4 A - 4**

## Cone Selection

C Focalizer Cone

**Cone Size**
02N Adaptor for 2” NPT sensor to fit into 4” cone (included)
02B Adaptor for 2” BSP sensor to fit into 4” cone (included)
04 4” cone, 30 and 20kHz 3” transducer
06 6” cone, 30 and 20kHz 3” transducer
08-15 8” cone,15kHz
08-10 8” cone, 10kHz
10-15 10” cone,15kHz
10-10 10” cone, 10kHz
10-05 10” cone, 5kHz

**Cone Material**
4 Polypropylene
6 Teflon
7 Carbon Fibre. Comes attached to Carbon Fibre Flange
8 Polyurethane (flexible cone)
Z Special Request

**C 04 - 4**

# Specifications

**Frequency**
• 5kHz, 10kHz, 15kHz, 20kHz, 30kHz, 40kHz, 50kHz

**Operating Voltage**
• 12 - 30Vdc (residual ripple no greater than 100mV)

**Power Consumption**
• <10w @ 24Vdc

**Analog Output**
• 4 -20mA (750 ohms @ 24Vdc User supply
)

**Communications**
• Goshawk, HART, Modbus, Profibus DP, DeviceNet

**Blanking Distance**
• 50kHz = 0.25 m (10”)
• 40kHz = 0.30 m (12”)
• 30kHz = 0.35 m (14”)
• 20kHz = 0.45 m (17”)
• 15kHz = 0.60 m (24”)
• 10Hz = 1.0 m (39”)
• 5kHz = 1.5 m (59”)

**Maximum Range**

| | | |
|---|---|---|
| • 5 m (16ft) | 50kHz | liquids |
| • 7 m (22ft) | 40kHz | liquids |
| • 10 m (33ft) | 30kHz | liquids, 5m (16ft) solids |
| • 20 m (65ft) | 20kHz | liquids/slurries, 10m (33ft) solids |
| • 30 m (98ft) | 15kHz | liquids/slurries, 20m (65ft) solids |
| • 50 m (165ft) | 10kHz | liquids/slurries/powders/solids |
| • 60 m (196ft) | 5kHz | liquids/slurries/powders/solids |
| • 180 m (588ft) | 4/9 kHz for extended range | |

**Resolution**
• 1 mm (0.04”) 50, 40, 30,20, 15, 10, 5kHz
• 4 mm (0.2”) 9, 4kHz

**Sensor Accuracy**
• +/- 0.25% of measured range

**Operating Temperature**
• Integral System -40°C (-40°F) to 80°C (176°F)
• Remote electronics -40°C (-40°F) to 80°C (176°F)
• Remote transducer -40°C (-40°F) to 80°C (176°F)
-40°C (-40°F) to 175°C (Hi-Temp. version)

**Transducer/Amplifier Separation**
• up to 1000m using specified extension cable

**Cable**
• 4 conductor shielded twisted pair instrument cable.
Conductor size dependent on cable length.
BELDEN 3084A, DEKORON or equivalent.
Max: BELDEN 3084A = 500m (1640 ft)
Max: DEKORON IED183AA002 = 350m (980 ft)

IMPORTANT
“USE SPECIFIED CABLE ONLY”

**Maximum Operating Pressure**
• +/- 7.5 PSI (+/- 0.5 Bar)

**Beam Angle**

| | | |
|---|---|---|
| • 7.5° | without focaliser | 50kHz/40kHz/30kHz |
| • 4° | with focaliser | 50kHz/40kHz |
| • 6° | with focaliser | 30kHz/20kHz/15kHz/10kHz/5kHz |

**Display**
• 2 line x 8 digit alphanumeric LCD

**Memory**
• Non-Volatile (No backup battery required)
• >10 years data retention

**Enclosure Sealing**
• Integral System IP67
• Remote Electronics IP65 (Nema 4x)
• Remote Transducer IP68

**Cable Entries**
• Integral: 3 x M16 Glands
• Remote: 3 x 20mm, 1 x 16mm knock outs.

**Mounting**
• ANSI, JIS or DIN Flange
• 4 in/100mm to 10 in/250mm
• 2in BSP Thread / NPT Thread

**Typical Weight**
Sultan AW System with appropriate flange and cone

| Frequency (in kHz) | | kg | lb |
|---|---|---|---|
| 5 | 5kHz Transducer | 13 | 28.6 |
| 10 | 10kHz Transducer | 10 | 22.0 |
| 15 | 15kHz Transducer | 8 | 17.6 |
| 20/30 | 20 or 30kHz (3”) Transducer | 3 | 6.6 |
| 30/40/50 | 30 (2”), 40 or 50kHz Transducer | 1 | 2.2 |

| Configuration | | kg | lb |
|---|---|---|---|
| R6 | Remote system with 6m cable | 1 | 2.2 |
| R15 | Remote system with 15m cable | 3 | 6.6 |
| R30 | Remote system with 30m cable | 6 | 13.2 |
| R50 | Remote system with 50m cable | 10 | 22.0 |

Additional product warranty and application guarantees upon request.

Technical data subject to change without notice.

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