A higher level of performance

Data Sheet

Sultan 234 - Acoustic Wave Technology

Solids / Liquids level and position measurements to 182m (597ft)

Principle of Operations

The SULTAN 234 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 measuring level of liquids, slurries and solids.

Universal Supply

2 Wire Loop Powered
3 Wire DC
4 Wire AC/DC

Certifications

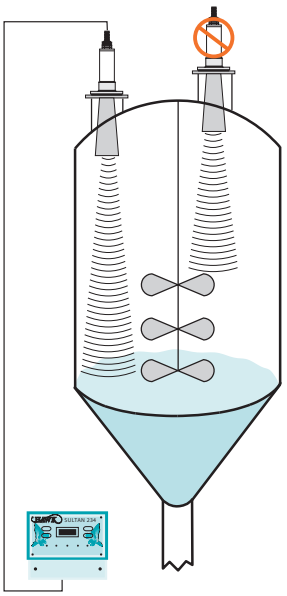
ATEX, SAA/IECEx, CE, (CSA, FM pending)

Features:

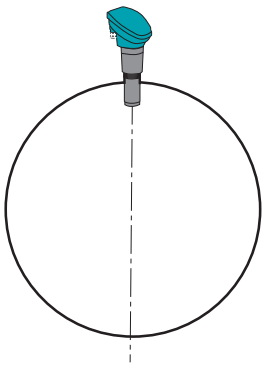
- Non contact measurement
- High Power even with two wire loop supply
- Low cost per point
- Wide range of communications: Devicenet, Goshawk, HART, Modbus, Profibus (Fieldbus & Profibus PA pending)
- Pump Control x5 pumps
- Auto compensation for dust, steam and losses
- Protection class IP67, NEMA 4x (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

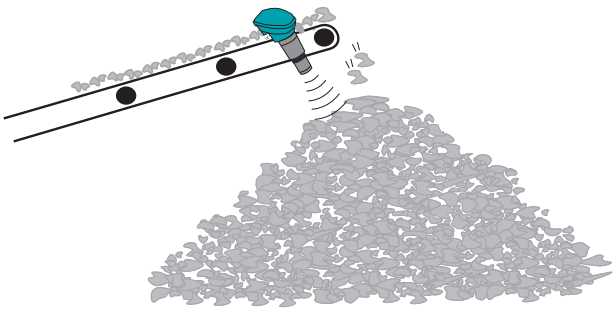


Horizontal Cylindrical/Ball Tanks



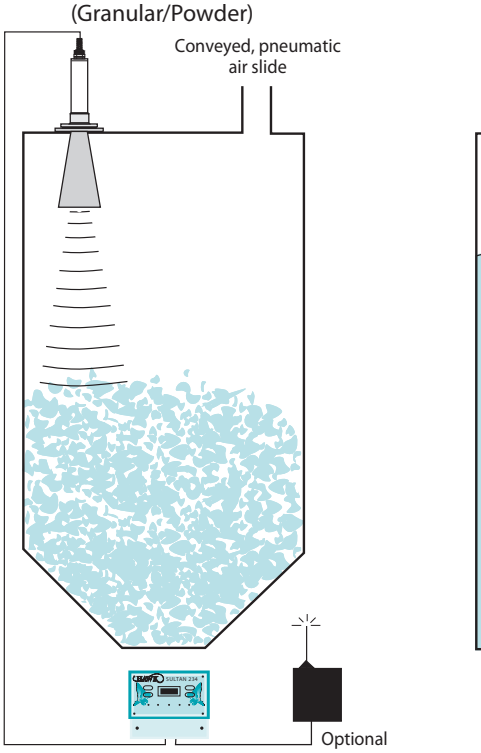
Sultan Acoustic Wave Transmitter

Stockpiles, Stackers, Reclaimers



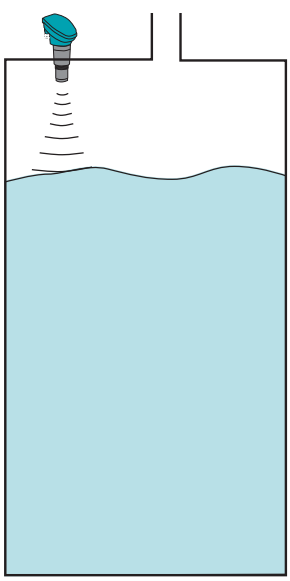
Solids Vessels

High/Low/Continous level (Granular/Powder)



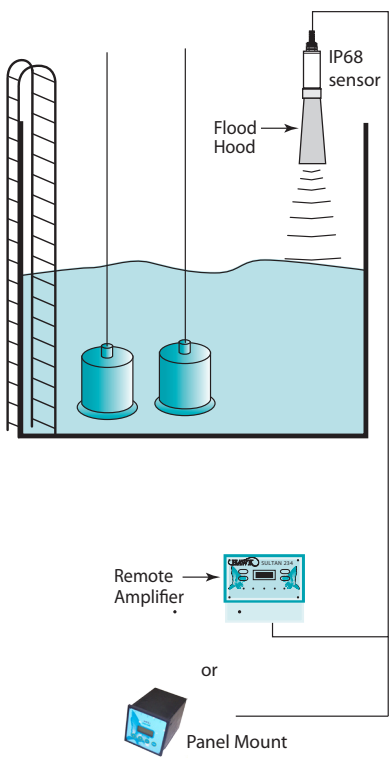
Storage Tanks

High/Low/Continous level (Liquid/Chemical)

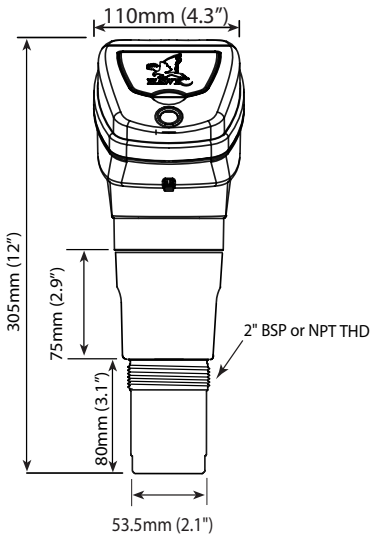


Sewage Wet Well

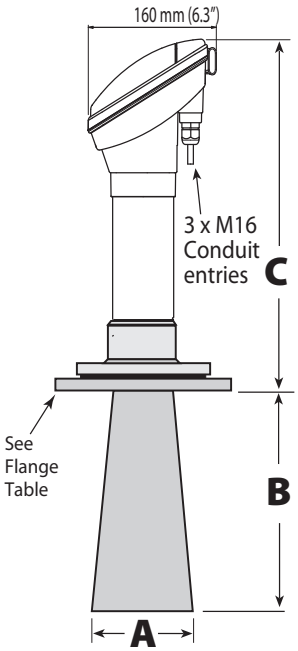
High/Low/Continous level Up to 5 Pumps



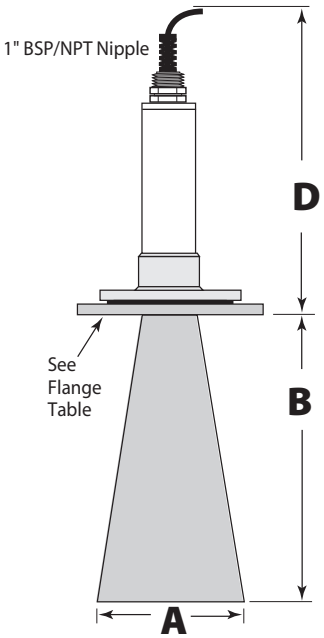
Integral Unit
AWI2SX30/40/50
AWI234SX30/40/50



Integral



Remote



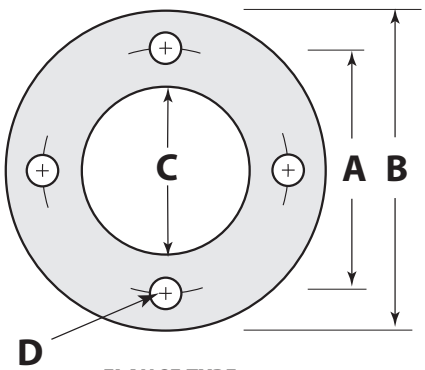
All horns must protrude into the vessel by at least 50 mm (2 inches) past the mounting nozzle.

Integral Transmitter Table

Model	Selected Flange	B mm	B in	C mm	C 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 kHz	4"	280	11.0	350	13.8
*8" is non standard/please consult factory before selecting.					

Remote Transducer Table

Model	Selected Flange	B mm	B in	D mm	D 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 kHz	4"	280	11.0	260	10.2
*8" is non standard/please consult factory before selecting.					



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

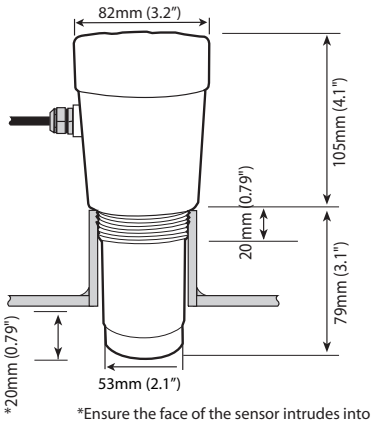
6"	FA6	241	9.5	279.5	11.0	150	6	22	0.85
	FD6	240	9.4	285	11.2	150	6	22	0.85
	FJ6	240	9.4	280	11.0	150	6	19	0.75
8"	FA8	298.5	11.8	343	13.5	200	8	22	0.85
	FD8	295	11.6	340	13.4	200	8	22	0.85
	FJ8	290	11.4	330	13.0	200	8	19	0.75

Note: Other flange sizes available upon request.

Dimensions

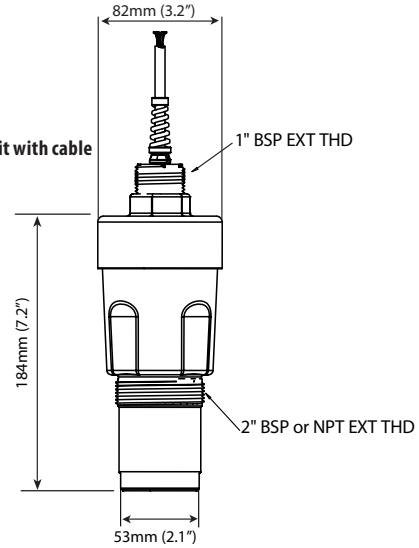
2 inch Remote Mounting Dimensions

Screwtop with integral junction box



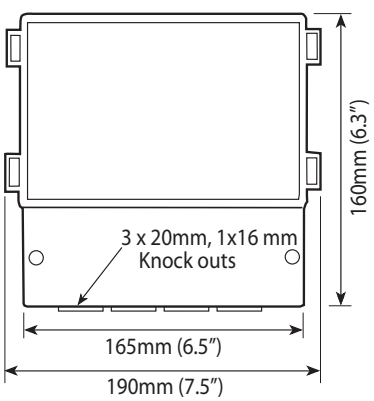
*Ensure the face of the sensor intrudes into the vessel by more than 20mm

IP68 Sealed unit with cable



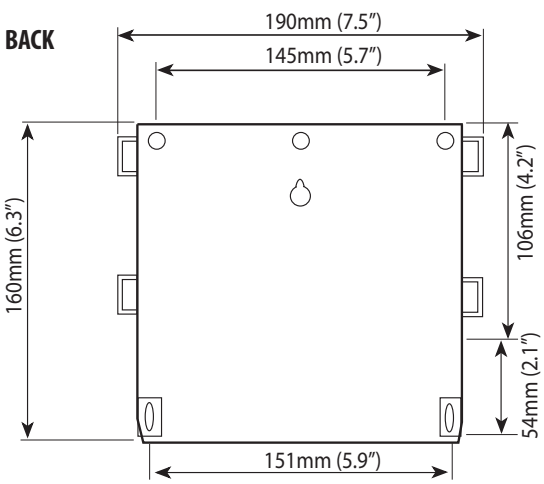
REMOTE ENCLOSURES - Field Mount
AWR2, AWR234

FRONT

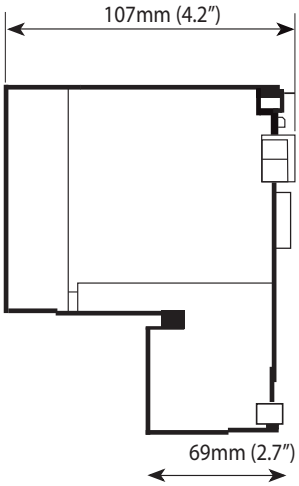


DIN Rail or screw mountable

BACK

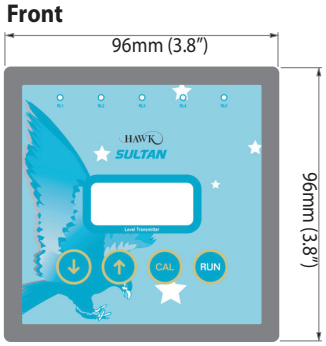


SIDE

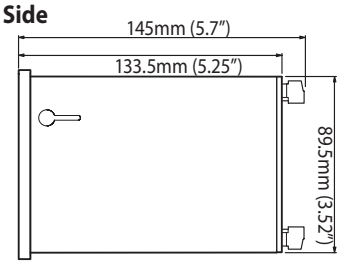


Panel Mount

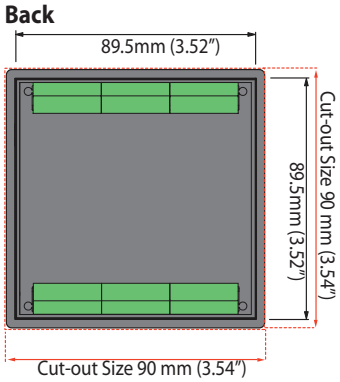
Front



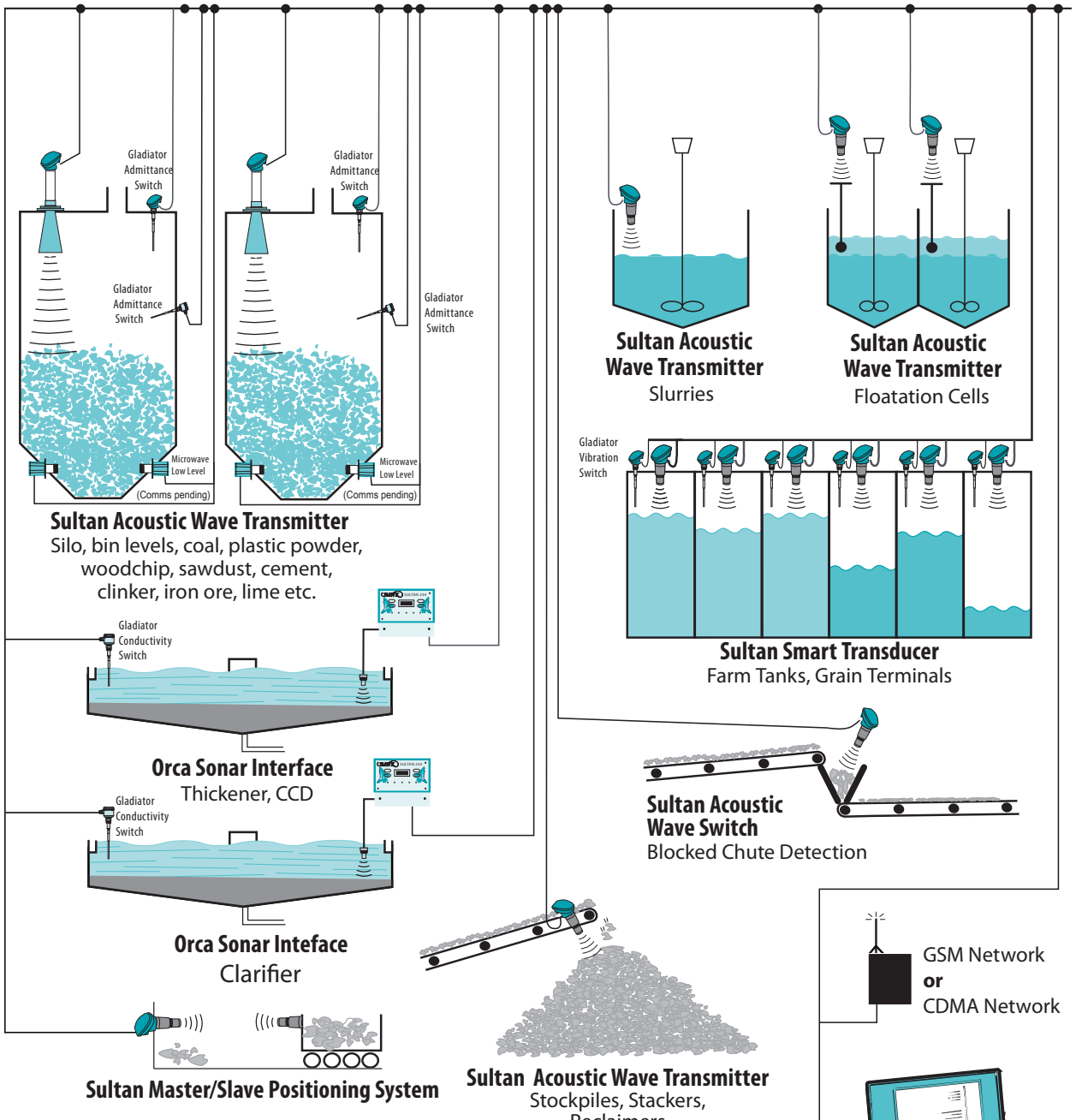
Side



Back



Modbus and Profibus



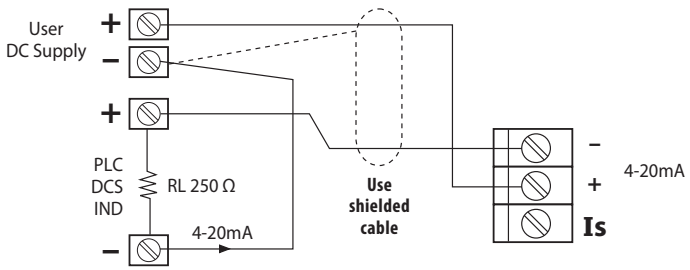
(Limited Modbus query rate for Switches only)

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.

Terminal Connections for DC Supply – Model dependant

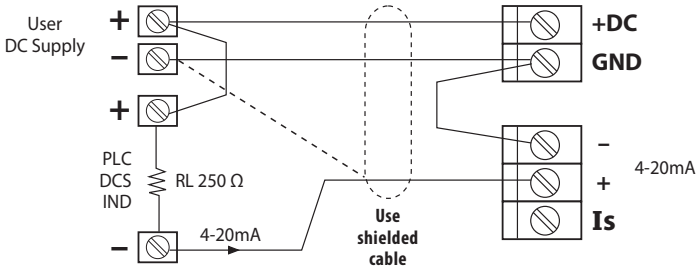
a) 2 Wire DC Loop Powered



Note: RL Max = 600Ω
if user DC Supply 24V

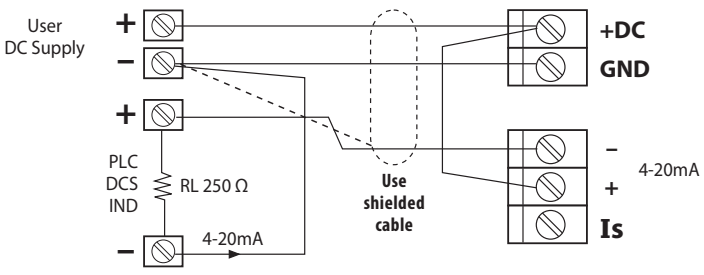
Terminal Connections for DC Supply – Model dependant

b) 3 Wire DC – Modulating from Common User Supply (RL to +DC)



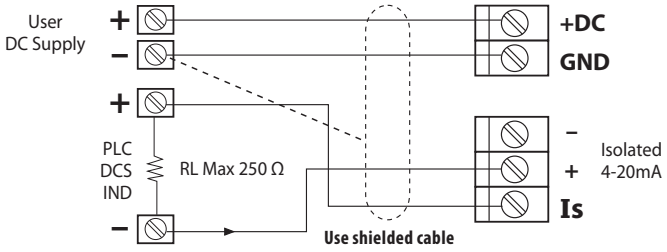
Note: RL Max = 750Ω
if user DC Supply 24V

c) 3 Wire DC – Modulating from Common User Supply (RL to GND)



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

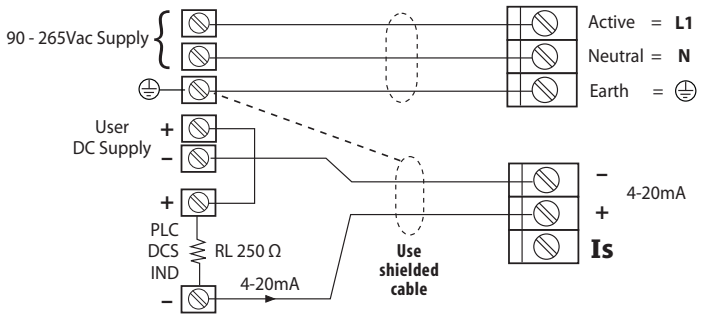
d) 4 Wire DC – Driving from Internal Isolated Supply (Is)



Note: Isolated current output can be made common with +DC or GND if required. (e.g. RL – connected to GND)

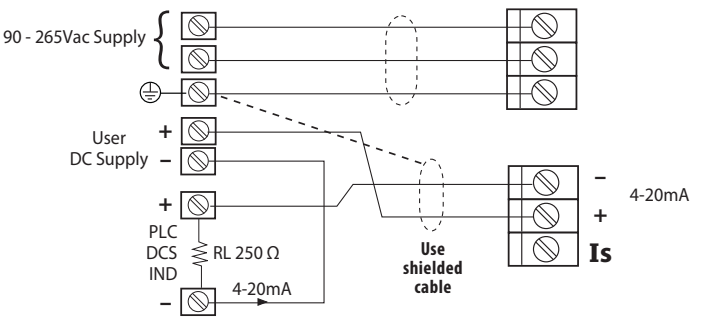
Terminal Connections for AC Supply – Model dependant

e) Modulating from User's External DC Supply (RL to Pos.)



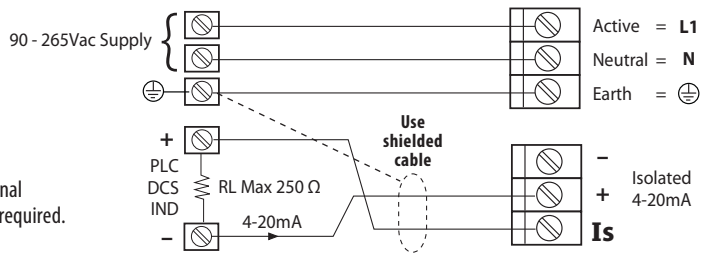
Note: RL Max = 750Ω
if user DC Supply 24V

f) Modulating from User's External DC Supply (RL to Neg.)



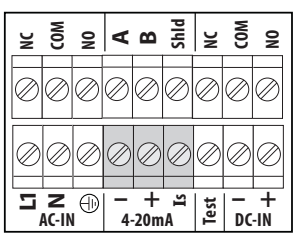
Note: RL Max = 750Ω
if user DC Supply 24V

g) 4 Wire AC – Driving from Internal Isolated Supply (Is)

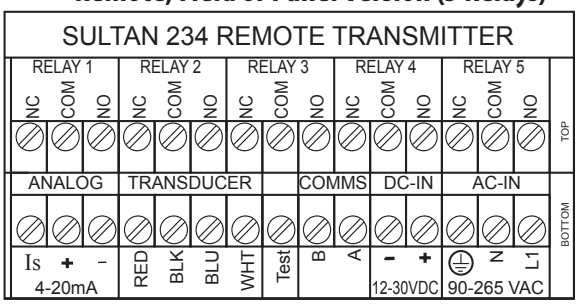


Note: Isolated current output can be made common with external DC Supply Positive or Negative if required. (e.g. RL – connected to GND)

AW Series Transmitter Integral Version (2 Relays)



AW Series Transmitter Remote, Field or Panel Version (5 Relays)



Sultan AW Remote Electronics

Model

AWR2 Remote 2 Wire, Housing / Facia Display Connection Board/Process Module, No relays
AWR234 Remote 2/3/4 Wire 5 relays, Housing / Facia Display Connection Board/Process Module, 5 relays
AWFR234 Remote 2/3/4 Wire 5 relays, Housing / Facia Display Connection Board/Process Module, 5 relays for Flow

Housing

S Standard polycarbonate electronics housing
P Panel Mount Housing

Power Supply

B 24 VDC standard
C 48 VDC for 2/3/4 units only
U Universal AC power supply (90-260 VAC input) for 2/3/4 units only

Output Configuration (PC comms Goshawk standard)

S Switch only. 5 relays for AWR234 only
X 4-20mA analogue output module, includes Modbus comms
H HART 2 wire only
I HART Isolated 4 wire 2/3/4 only
W Modbus Comms only (not available for 2 wire Sultan)
P Profibus DP***
E Ethernet
D Devicenet
Z Special Request

Internal HawkLink Modem (not available with ATEX 0/20 approval)

X Not Required
G2 GSM Frequency 800/1900 MHz/19200 Baud for USA,Canada,Argentina,Chile for Sultan 234 only
G4 GSM Frequency 900/1800 MHz/19200 Baud for Australia,Europe,Chile for Sultan 234 only

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)

Position Unit / Crane Master Options for Sultan 234 Only

PS Position Slave
CM Crane Master
X Not required

AWR2 S B X G4 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 recommended for 3" units)
20 20kHz for applications up to 20m, available in 3" only (4" cone is recommended)
15 15kHz for applications up to 30m, available in 3" only (10" cone is recommended)
10 10kHz for applications up to 40m, available in 3.5" only (10" cone is recommended)
09 9kHz for high power extended range applications up to 170m (10" cone is recommended)
05 5kHz for applications up to 60m maximum, available in 3.5" only (10" cone is recommended)
04 4kHz for high power extended range applications up to 170m (10" cone is recommended)

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 face)
Y High Temperature Wet and Dry Atmosphere, 150C, (Titanium face) for 10kHz only
Z Special Request

Transducer Housing Material

4 Polypropylene, not available for 2"
6 Tefzel for 2" (standard). For 3" Teflon please contact factory

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

Position Unit /Crane Master/Software Options

PS Position Slave
FP Fast Pulsing
X Not Required

AWRT	30	T	4	X	X	X	C	6	X	X

Sultan AW Integral Transmitter

Model

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

AWI234 Integral 2/3/4 Wire, Housing / Facia Display Connection Board/Process Module,2 relays

AWFI234 Integral 2/3/4 Wire, Housing / Facia Display Connection Board/Process Module,2 relays for Flow

Housing

S Standard Valox 357U moulded electronics housing

Power Supply

B 24 VDC standard

C 48VDC for 2/3/4 only

U Universal AC power supply (90-260 VAC input) and 12-30VDC, For 2/3/4 only

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)

09 9kHz for high power extended range applications up to 170m (10" cone required)

05 5kHz for applications up to 60m maximum, available in 3.5" only (10" cone required)

04 4kHz for high power extended range applications up to 170m (10" cone required)

Process Temperature - Facing material selection

S Standard Temperature Dry Atmosphere only, (Polyolfin face)

T Standard Temperature Wet Atmosphere,(Teflon face)

Y High Temperature Wet and Dry Atmosphere,150C, (Titanium face) for 10kHz only

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)

S Switch only. 5 relays for AWR234 only

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

H HART 2 wire only

I HART Isolated 4 wire 2/3/4 only

W Modbus Comms only (not available for 2 wire Sultan)

P Profibus DP

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

PS Position Slave

CM Crane Master

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
- 3 3" acoustically isolated flange
- 4 4" acoustically isolated flange
- 6 6" 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 for polyurethane cone
- 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)
- 03 3" cone for 30,20 and 15kHz transducers with TB30 or TN30 threads
- 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
- 10-09 10" cone, 9kHz
- 10-10 10" cone, 10kHz
- 10-04 10" cone, 4kHz
- 10-05 10" cone, 5kHz

Cone Material
- 4 Polypropylene
- 6 Teflon
- 7A Carbon Fibre. Comes attached to ANSI Carbon Fibre Flange
- 7D Carbon Fibre. Comes attached to DIN Carbon Fibre Flange
- 7J Carbon Fibre. Comes attached to JIS Carbon Fibre Flange
- 8 Polyurethane. Flange needs to be transducer Body Mounted
- Z Special Request

C 04 - 4

Specifications

Frequency
• 5kHz, 10kHz, 15kHz, 20kHz, 30kHz, 40kHz, 50kHz
(4/9 are long range versions of 5/10)

Operating Voltage
• 12 - 30Vdc (residual ripple no greater than 100mV)
• 90 - 265Vac 50/60Hz
• 48Vdc,48Vac-90Vac 50/60Hz

Power Consumption
• <3W @ 24Vdc
• <10VA @ 240Vac
• <4W @ 48Vdc, <7VA @ 48Vac – 90Vac.

Analog Output
• 4 -20mA (750 ohms @ 24Vdc User supply, 250 ohms internally driven)

Communications
• Goshawk, HART, Modbus, Profibus DP, DeviceNet
(Foundation Fieldbus & Profibus PA pending)
Muliti Drop mode can address 1 -250 units over 4 wires

Relay Output: (2) Integral (5) Remote
• Form 'C' (SPDT) contacts, rated 0.5A at 240Vac non-inductive.
• All relays have independently adjustable dead bands.
• Remote failsafe test facility for one relay.

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")
• 10/9kHz = 1.0 m (39")
• 5/4kHz = 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

Electronic Accuracy
• +/- 0.25% of maximum 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. 10kHz 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
• 10°	with focaliser	9kHz/4kHz

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
4/5	4 or 5kHz Transducer	13	28.6
9/10	9 or 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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