



A higher level of performance

Data Sheet

Sultan 234P - Acoustic Wave Technology

Moving Machinery Monitoring to 195m (640ft)

Principle of Operations

The SULTAN 234P Master which is generally mounted on moving machinery, emits a high powered acoustic wave transmit pulse.

The pulse is detected by a Slave transducer mounted on a fixed position which immediately emits a pulse back to the Master on the moving machinery.

The Master transmitter calculates transit times and provides a 4-20mA output proportional to the position of the moving machinery in relation to the Slaves fixed position.

There is NO wiring requirement between the Master and Slave transducers, which allows for easy retro fit to existing shuttle conveyors, cranes, stackers, reclaimers, etc.

Dust, Background noise, wet atmosphere, high winds can be compensated for by proper selection of operating frequency of the transducer.

e.g. Use lower frequency transducers where high dust, high wind conditions prevail.

Primary Areas of Applications

• Mining:

Shuttle conveyor positioning.
Stacker/reclaimer positioning.
Stacker/reclaimer collision protection.
Transfer conveyor positioning.

• Power Stations:

Shuttle conveyor positioning.
Transfer conveyor positioning.
Bunker discharge wagon positioning.

• Smelters:

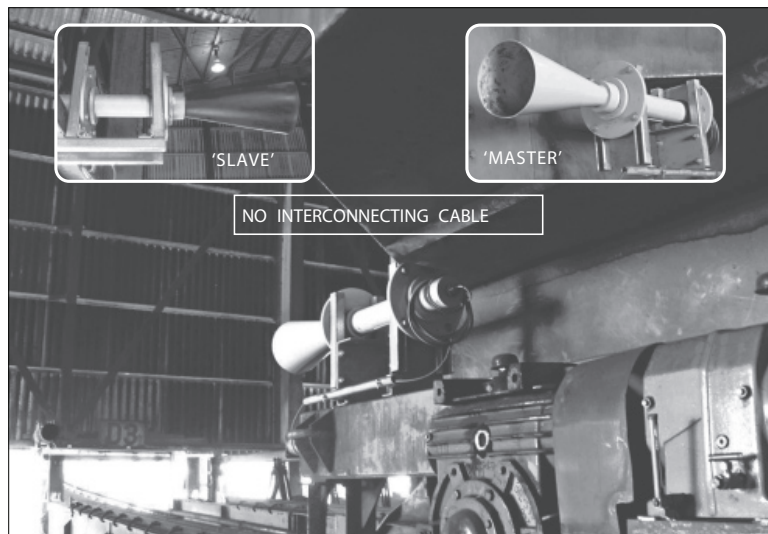
Crane collision control - positioning.

• Container Ports / Port Cranes:

Crane collision control - positioning

Function

The Sultan 234P is a non contact, two piece Master and Slave distancing transmitter for ranges up to 195 metres.



Power Supply

2 Wire Loop Powered

Certifications

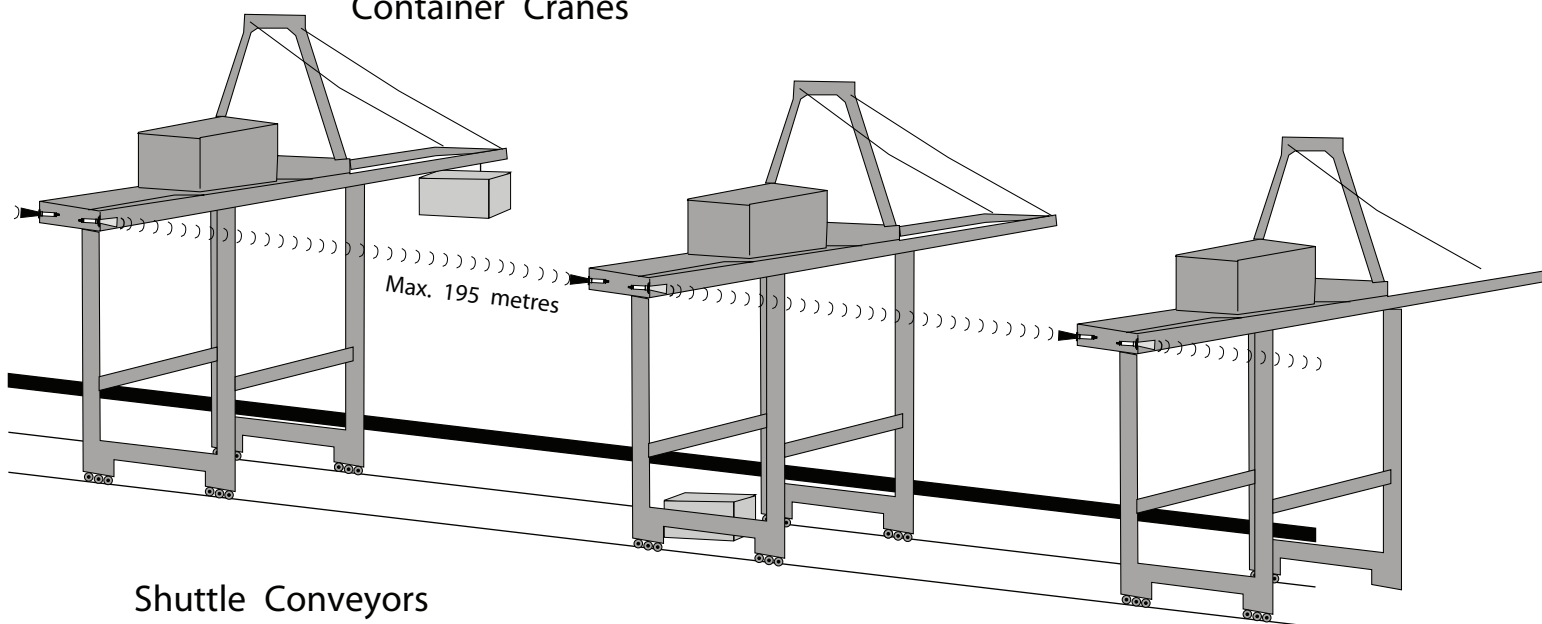
ATEX, SAA/IECEX, CE, (CSA, FM pending)

Features:

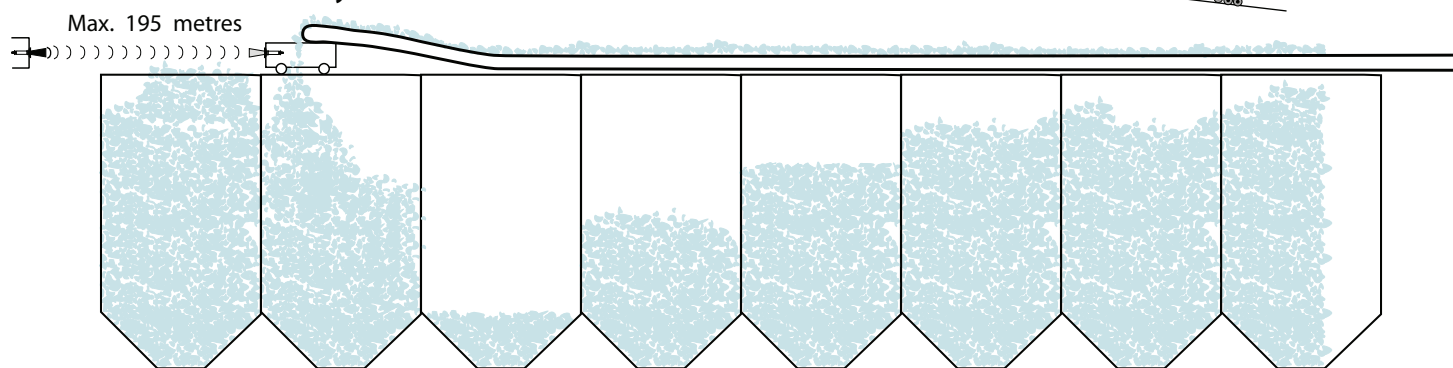
- Non contact position control.
- Low installation costs, low purchase price.
- Ranges from 0-20m (65ft) (30kHz version) to 0-195m (640ft) (5kHz version).
- Does not rely on any mechanical connection that may slip because of the material on the rails (Encoder problems).
- Communications: HART, GOSHAWK, MODBUS (PROFIBUS AND FIELDBUS PENDING).
- On power-up, instantly knows its position.
- No interconnecting cable required between the Master and Slave transducers.
- No wearing parts, no maintenance costs.
- Easy alignment adjustment (not critical like laser instruments)
- Easy to retrofit existing machines
- Not affected by reflecting surfaces eg roof struts, brackets, guard rails, trailing cables.
- Either Master or Slave can be mounted on moving machinery.

Typical Applications

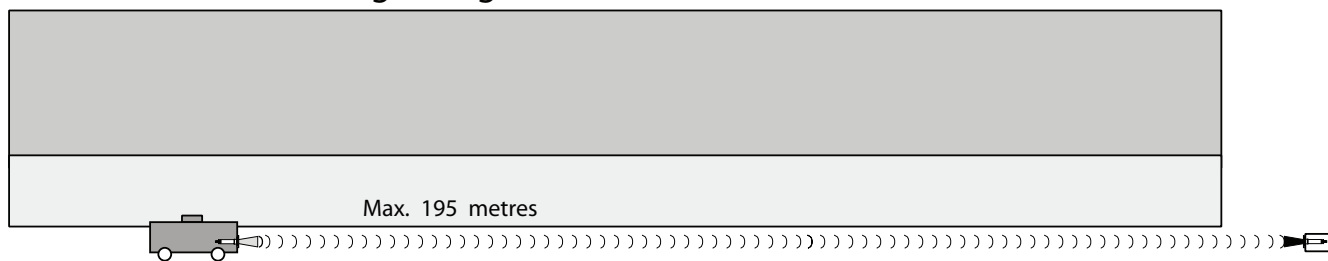
Container Cranes



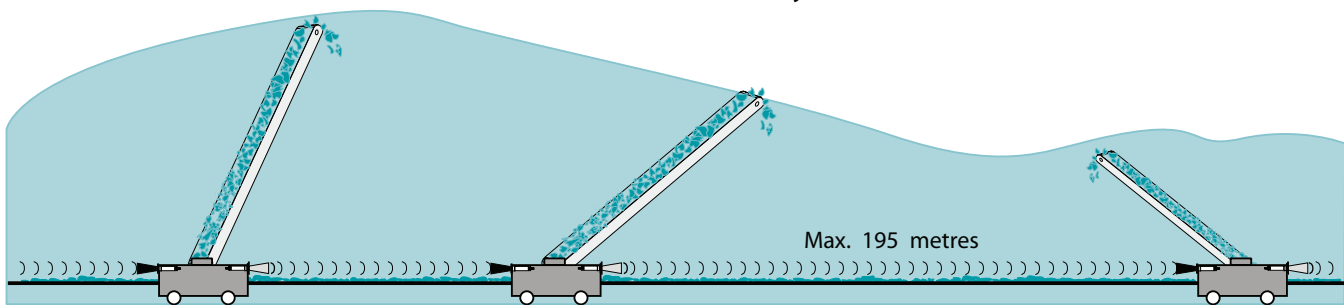
Shuttle Conveyors



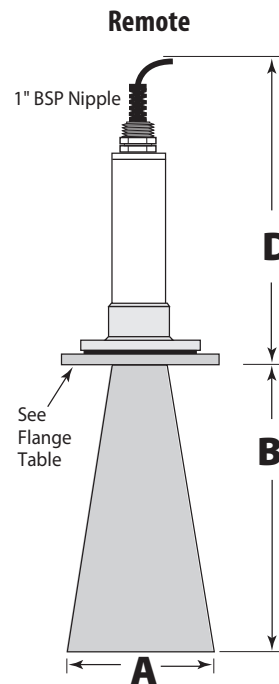
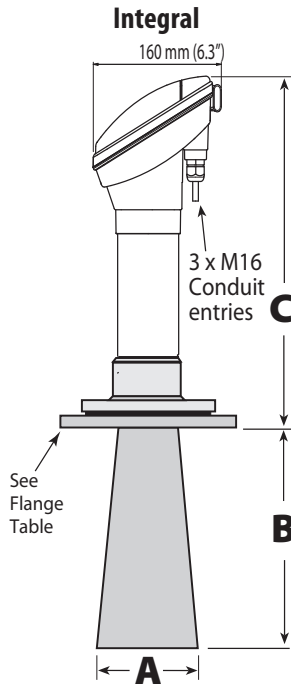
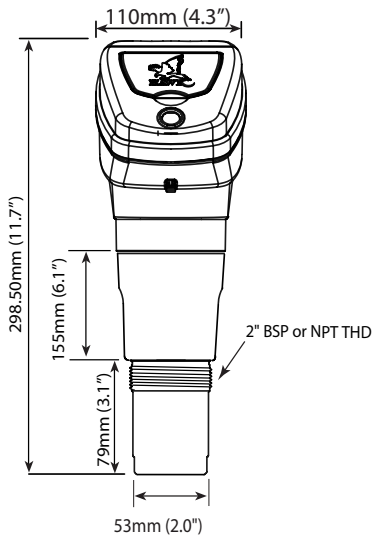
Bunker Discharge Wagons



Reclaimer / Stacker Conveyors



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



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

Integral Transmitter Table

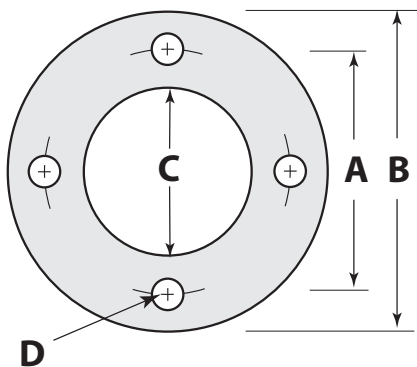
Model	Selected Flange	B		C	
		mm	in	mm	in
AWI 5 kHz	10"	455	17.9	840	33.1
AWI 10 kHz	10"	415	16.3	540	21.3
	* 8"	280	11.0	540	21.3
AWI 15 kHz	10"	455	17.9	440	17.3
	* 8"	280	11.0	440	17.3
AWI 20 kHz	4"	280	11.0	390	15.4
AWI 30 kHz	4"	280	11.0	350	13.8

*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 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)		B (OD)		C (ID)		D (Hole)	
		mm	in.	mm	in.	mm	in.	mm	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

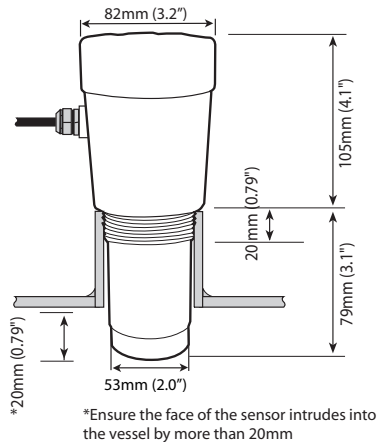
6"	FA6	241	9.5	279.5	11.0	150	6	22	0.85
	FD6	240	9.4	285	11.2	150	6	22	0.85
	FJ6	240	9.4	280	11.0	150	6	19	0.75
8"	FA8	298.5	11.8	343	13.5	200	8	22	0.85
	FD8	295	11.6	340	13.4	200	8	22	0.85
	FJ8	290	11.4	330	13.0	200	8	19	0.75

Note: Other flange sizes available upon request.

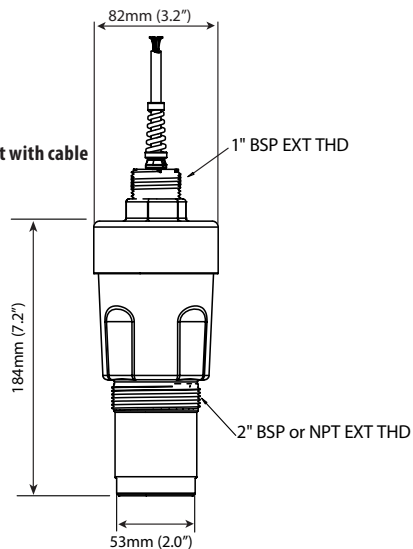
Dimensions

2 inch Remote Mounting Dimensions

Screwtop with integral junction box

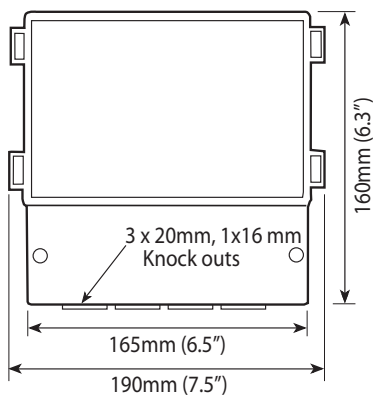


IP68 Sealed unit with cable



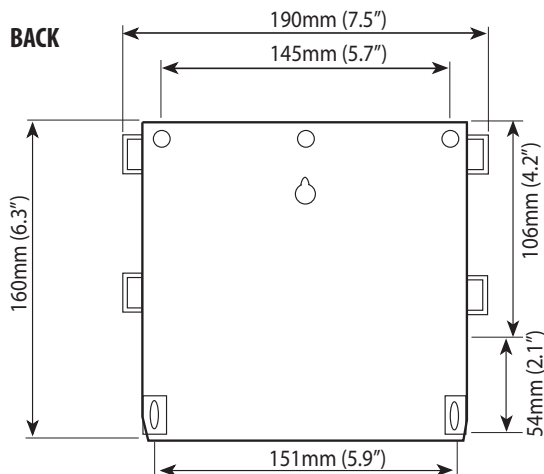
REMOTE ENCLOSURES - Field Mount AWR2, AWR234

FRONT

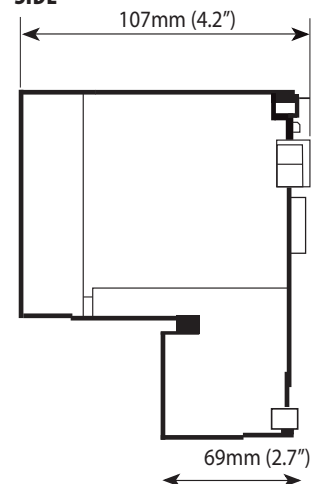


DIN Rail or screw mountable

BACK

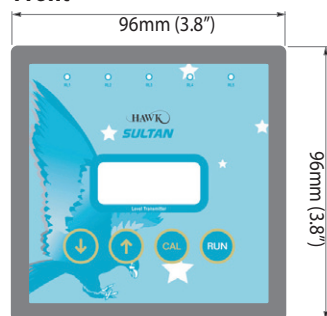


SIDE

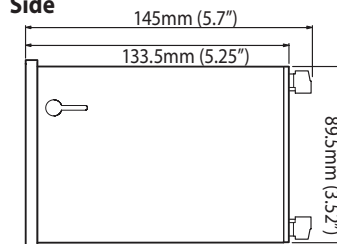


Panel Mount

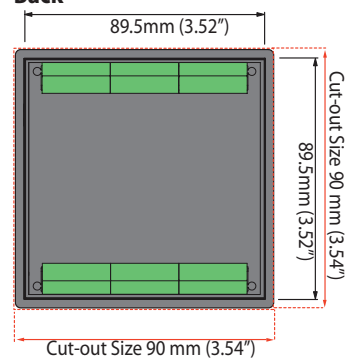
Front



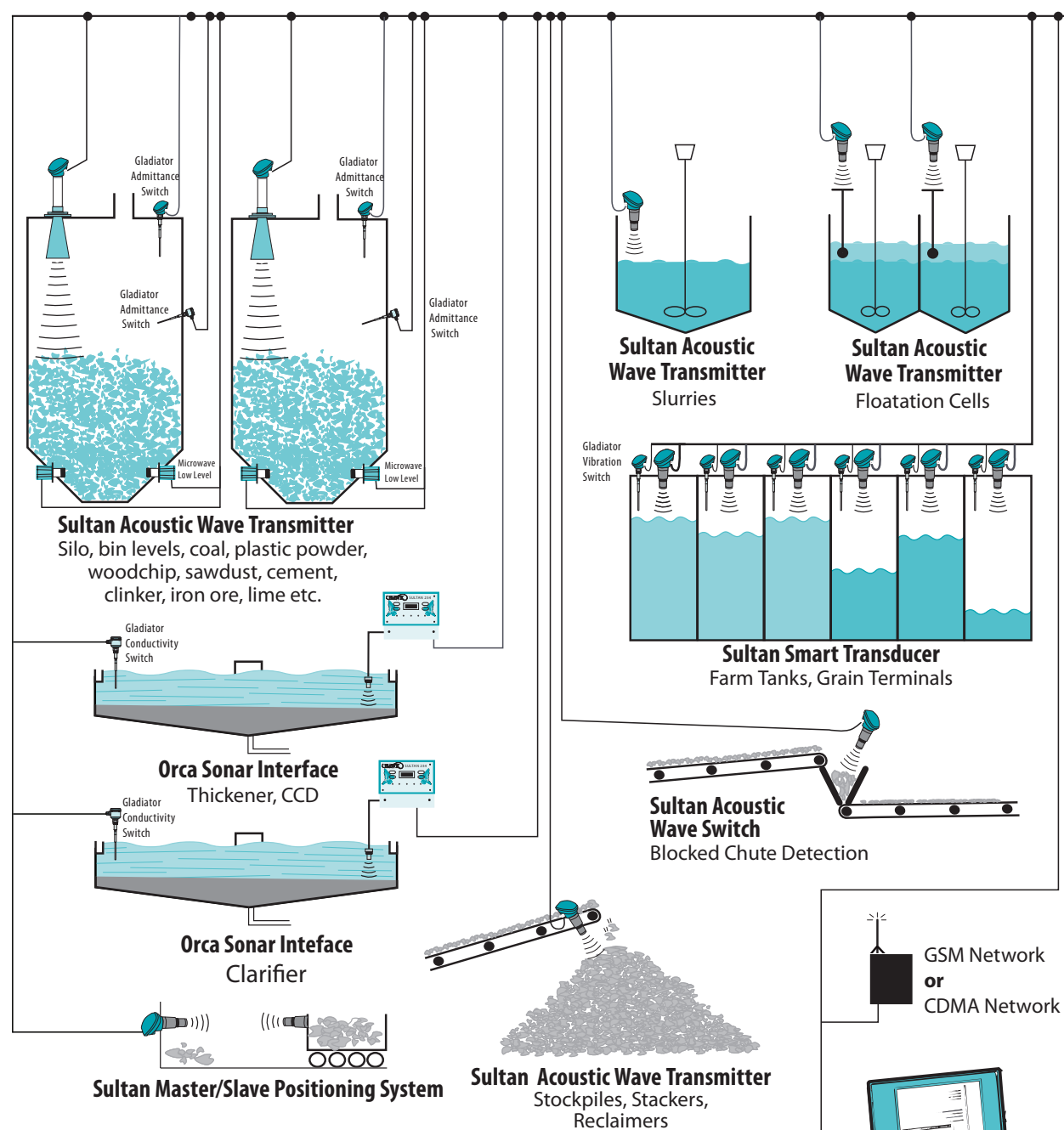
Side



Back



Modbus and Profibus



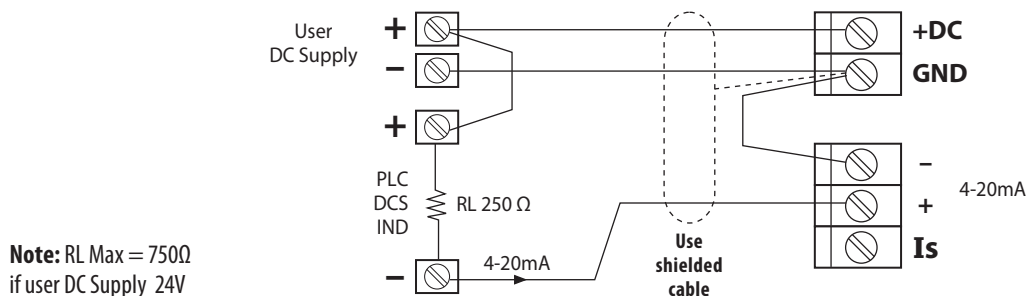
GSM or CDMA Network

- 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.

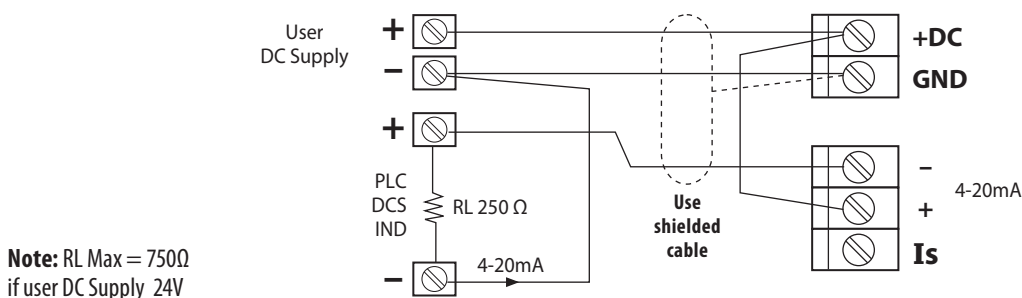
(Limited Modbus query rate for Switches only)

Terminal Connections for DC Supply – Model dependant

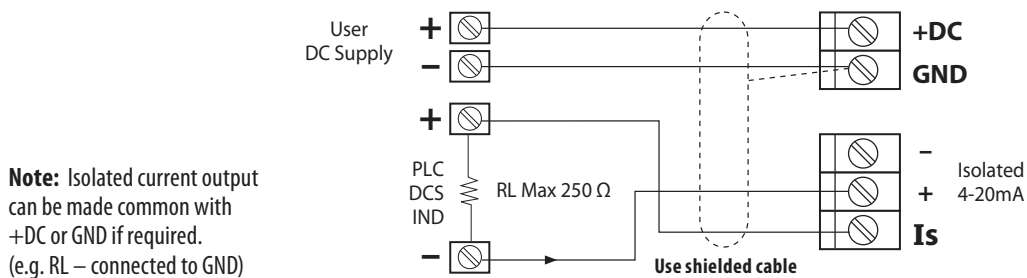
b) 3 Wire DC – Modulating from Common User Supply (RL to +DC)



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



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



Part Numbering

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
 AWR234 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
- FP
- X

AWRT 30 T 4 X X X C 6 X X

Part Numbering

Sultan AW Integral Transmitter

Model	Integral 2 Wire, Housing / Facia Display Connection Board/Process Module, No relays											
AWI2	Integral 2/3/4 Wire, Housing / Facia Display Connection Board/Process Module, 2 relays											
AWI234	Integral 2/3/4 Wire, Housing / Facia Display Connection Board/Process Module, 2 relays for Flow											
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	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				
	7 Carbon Fibre. Comes attached to 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

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)
- Multi Drop mode can address 1 -250 units over 4 wire

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. 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.

Contact

Hawk Measurement Systems (Head Office)

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