Acoustic Wave Level Transmitter

SULTAN Series Smart Universal Level Transmitter and Network

HAWK
DATA SHEET

SULTAN 234 Series

Solids / Liquids Level to 60 metres

- Universal Supply: 2 Wire Loop Powered.
  3 Wire DC.
  4 Wire AC/DC.
- Universal Transducer Inputs:
  50kHz, 40kHz, 30kHz, 20kHz, 15kHz, 10kHz, 5kHz.
- GSM/CDMA Capability
- Communications:
  GOSHAWK, HART, MODBUS
  FOUNDATION FIELDBUS, PROFIBUS & DEVICENET (pending)
- Certification:
  CE, ATEX, SAA, FM, CSA, (pending)
- Multiple Head Configuration:
  1 to 128 Transducer Locations.

CE Approved

AUSTRALIAN DESIGNED & MANUFACTURED

FUNCTION

The SULTAN 234, is a non intrusive acoustic wave transmitter with flexibility , used for measuring liquids and solids.

PRIMARY AREAS OF APPLICATION

- Waste water/water:
  Open channel flow, inlet screens, sumps, pump stations, water towers, dam level, chemical, etc.
- Mining:
  Crushers, surge bins, ore passes, conveyor profile, blocked chute, stockpile, stackers, r eclaimers, storage silos etc.
- Power Stations:
  Boiler bunkers, raw coal bunkers, ash pits, fly ash silos, etc.

FOOD	CEMENT
PLASTICS	GRAIN
CHEMICALS	PAPER
IRRIGATION	QUARRIES

Acoustic Wave Level Transmitter

SULTAN Series Smart Universal Level Transmitter and Network

GENERAL DESCRIPTION

- **The SULTAN 234 Series Acoustic Wave Range offers a wide and comprehensive range of advantages.**
- **Large selection of transducers.**
- **No contact between the tranducer and the material.**
- **Suitable for measuring rocks, powders, viscous and aggressive media.**
- **Power supply flexibility allows for 2 wire loop power, AC and DC supplies all within a single amplifier.**
- **Easy to calibrate and commission.**
- **Wide spectrum of applications.**
- **Multiple head capability to reduce cost per unit (max 128 points).**
- **Open channel.flow**

FEATURES

- **Non contact measurement.**
- **Low installation costs**
- **High Power even with two wire loop power.**
- **Low cost per point.**
- **Wide range of communications:**
  HART, GOSHAWK, MODBUS.
  PROFIBUS & FIELDBUS (pending).
- **Ex Certification. SAA, CSA, FM, ATEX (pending).**
- **Pump Control.** (X5 pumps)
- **Auto compensation** (dust, steam)
- **Impact resistant.** (IP67, NEMA 4x)
- **Programmable fail safe mode.**
- **High Temp Applications: 175°C**
- **Sanitary fittings for food applications.**
- **GSM/CMDA remote setup options/config.**
- **Differential level control (2 Transducers).**

PRINCIPLE OF OPERATION

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 these high powered waves ensures minimal losses through the enviroment where the sensor is located. Due to the high powered emitted pulse, any losses have a far less effect than traditional ultrasonic devices. More energy is transmitted hence more energy is returned. The receiver circuitry is designed to indentify and monitor low level return signals even when noise levels are quite high.The measured signal is temperature compensated to provide maximum accuracy to the outputs and display.

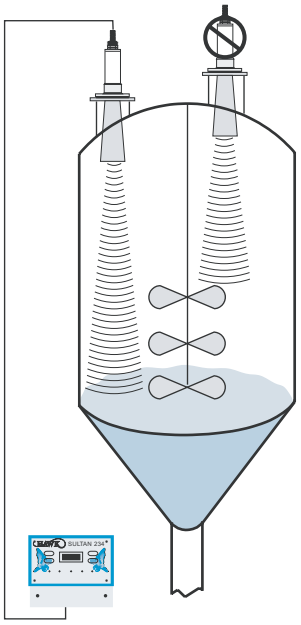
Acoustic Wave Level Transmitter

SULTAN Series Smart Universal Level Transmitter and Network

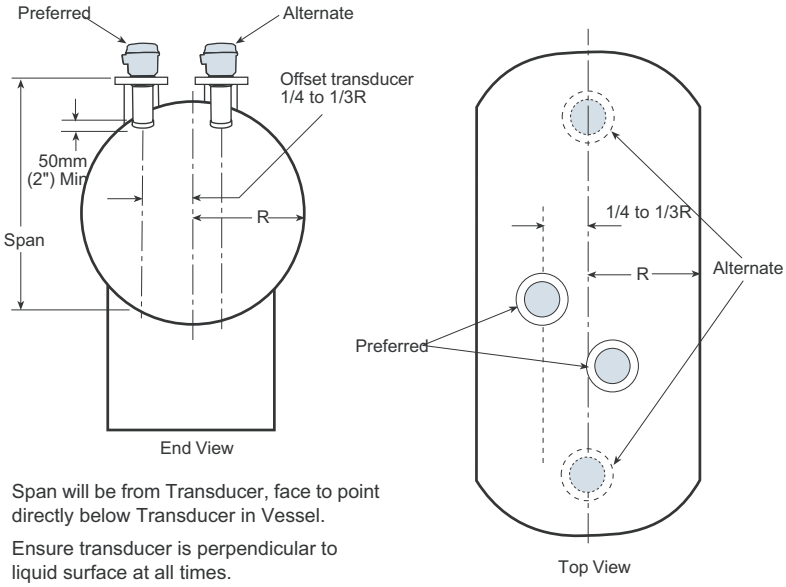
HAWK DATA SHEET

TYPICAL APPLICATIONS

Conical Shape Vessels



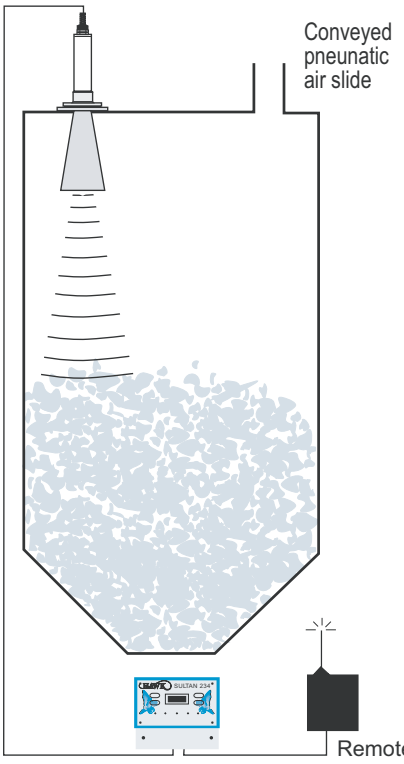
Horizontal Liquid Tanks



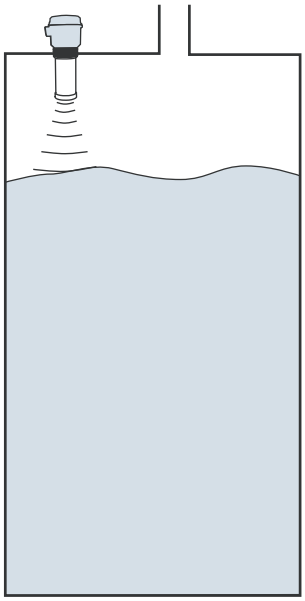
Span will be from Transducer, face to point directly below Transducer in Vessel.

Ensure transducer is perpendicular to liquid surface at all times.

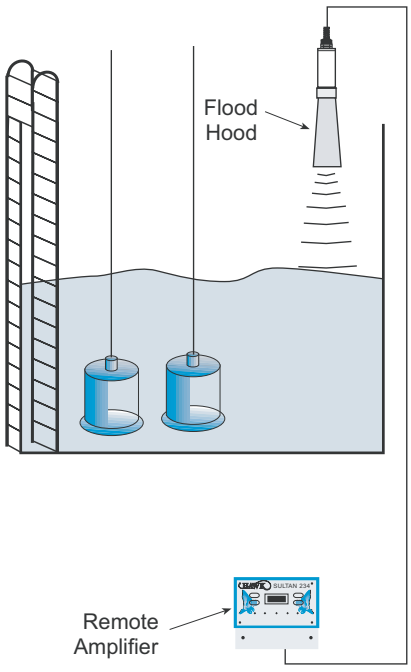
High/Low Solid (Granular/Powder)



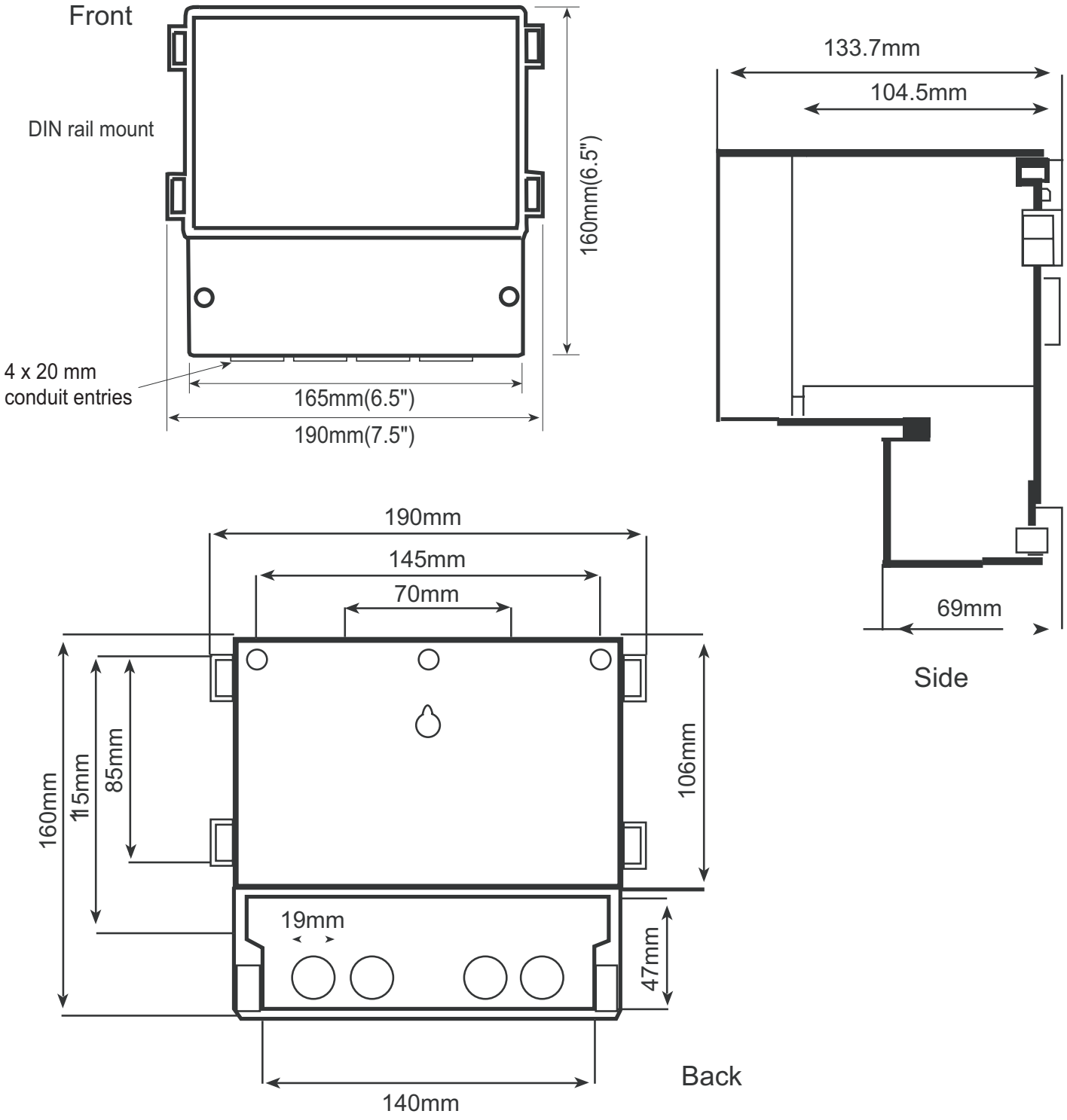
Feeder Pipe High/Low Liquid/Chemical



Sewage Wet Well Up to 5 Pumps

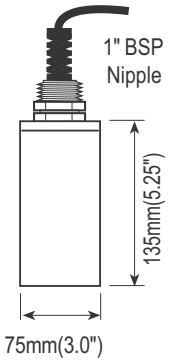


Remote Enclosure

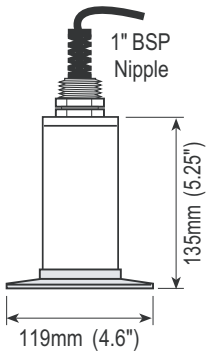


DIMENSIONS

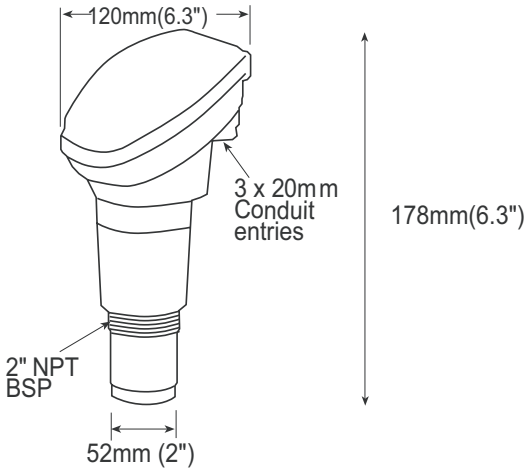
RemoteTransducer
AWRT30/40/50



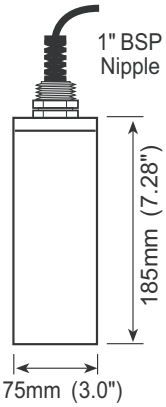
Remote Transducer
TriClover
3-A Sanitary Flange
AWRT30/40/50



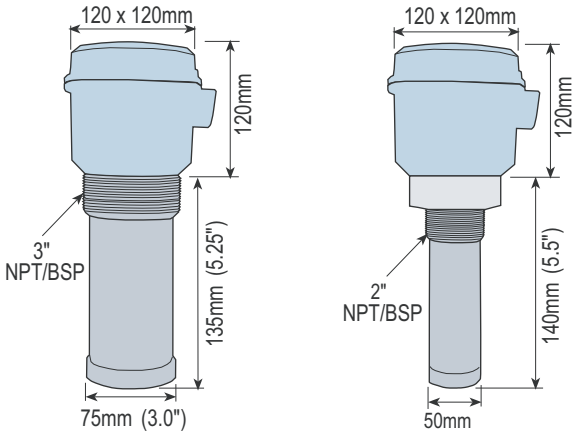
Integral Unit
AWI2SX30/40/50
AWI234SX30/40/50



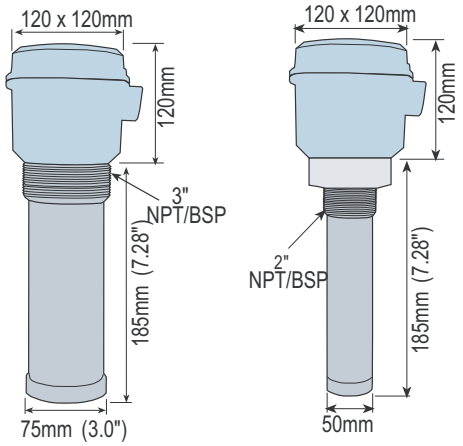
Remote
Transducer
AWRT20



Integral Version (2relays)
AWIMX30/40/50
AWI234MX30/40/50

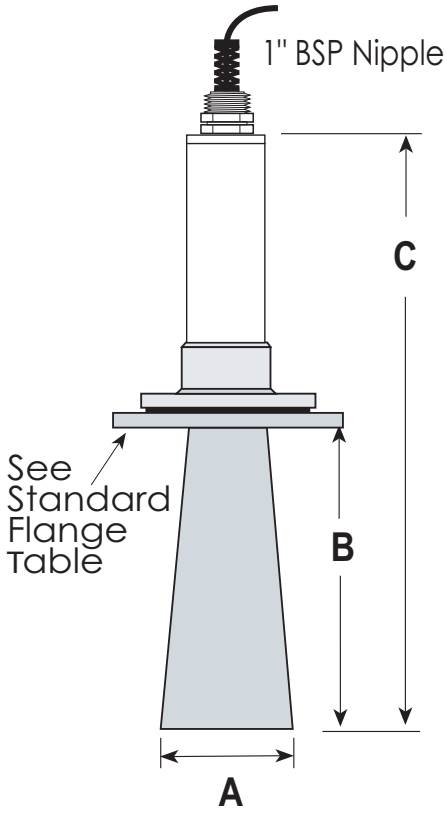


Integral Version(2relays)
AWIMX20AWI234MX20



DIMENSIONS

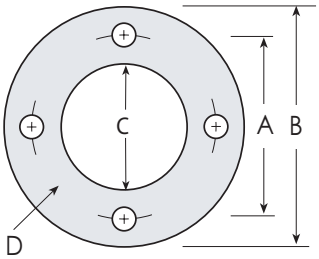
Remote Transducer



STANDARD REMOTE TRANSDUCER TABLE

Model	A		B		C	
	mm	In	mm	In	mm	In
AWRT5	236	9.2	413	16.2	1085	42.71
AWRT10	236	9.2	413	16.2	772.8	30.3
AWRT15	120	4.75	375	14.7	580	22.8
AWRT20	98.5	3.9	258.4	10.2	516	20.3
AWRT30/40/50	98.5	3.9	258.4	10.2	466	18.4

For other cone sizes consult factory



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

STANDARD ANSI/DIN/JIS FLANGE TABLE

FLANGE TYPE	A (PCD)		B (OD)		C (ID)		D (Hole)	
	mm	in.	mm	in.	mm	in.	mm	in.
FCA4	190.5	7.5	228	9.0	100	4	19	0.75
FCD4	180	7.0	220	8.7	100	4	18	0.7
FCJ4	175	6.9	210	8.4	100	4	15	0.6
FCA6	241	9.5	279.5	11.0	150	6	22	0.85
FCD6	240	9.4	285	11.2	150	6	22	0.85
FCJ6	240	9.4	280	11.0	150	6	19	0.75
FCA8	298.5	11.8	343	13.5	200	8	22	0.85
FCD8	295	11.6	340	13.4	200	8	22	0.85
FCJ8	290	11.4	330	13.0	200	8	19	0.75
FCA10	362	14.3	406	16.0	250	10	25	1.0
FCD10	350	13.8	395	15.6	250	10	22	0.85
FCJ10	355	14.0	400	15.7	250	10	23	0.9

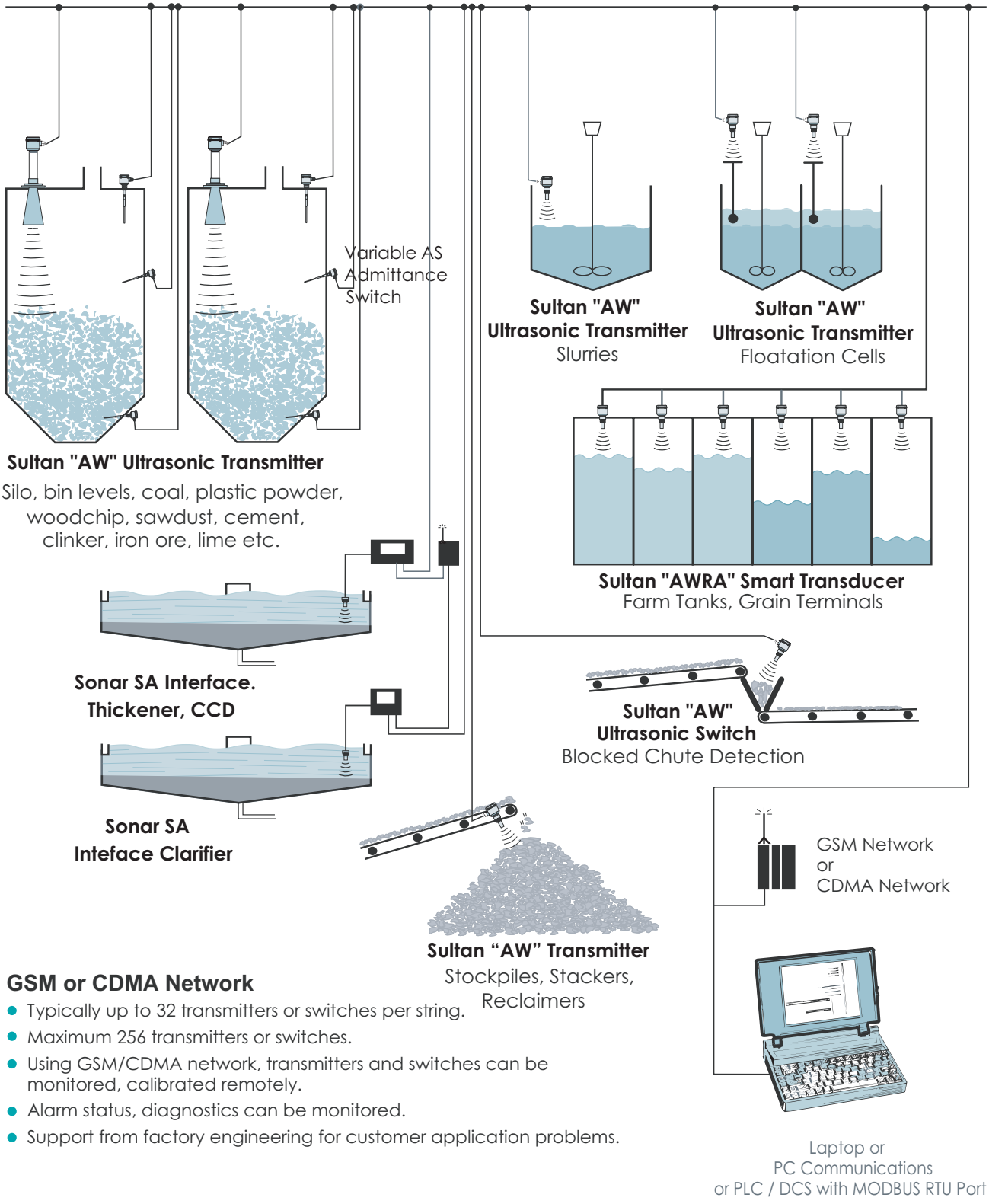
For other flange sizes consult factory

Acoustic Wave Level Transmitter

SULTAN Series Smart Universal Level Transmitter and Network

COMMUNICATION NETWORK OVERVIEW - Modbus, Profibus

Multidrop connection of Sultan "AW" Ultrasonics, Variable "AS" Admittance Probes, Sonar "SA" interface transmitter

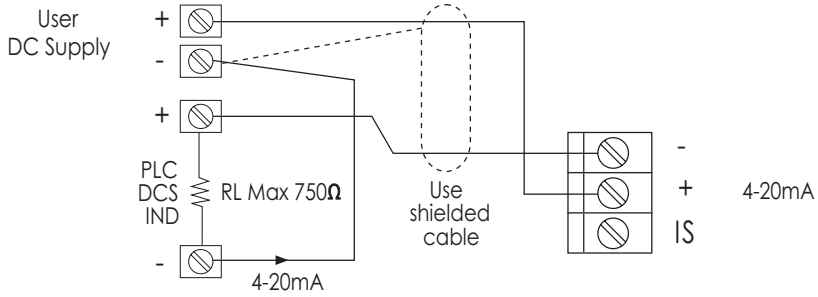


GSM or CDMA Network

- Typically up to 32 transmitters or switches per string.
- Maximum 256 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.

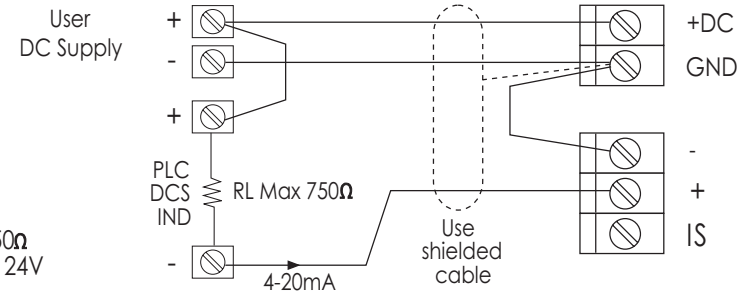
Terminal Connections for DC Supply - Model dependant

a) 2 Wire DC Loop Powered



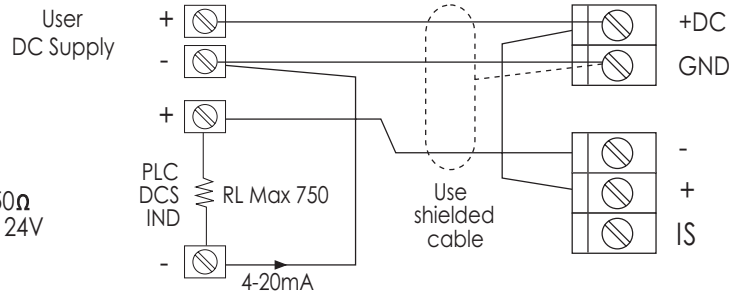
Terminal Connections for DC Supply - Model dependant

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



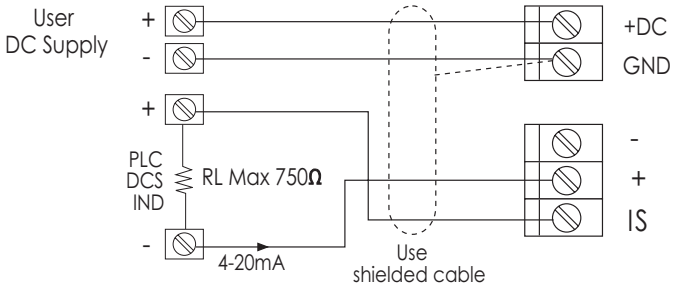
Note: RL Max = 750Ω
if user DC Supply 24V

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 (I+)

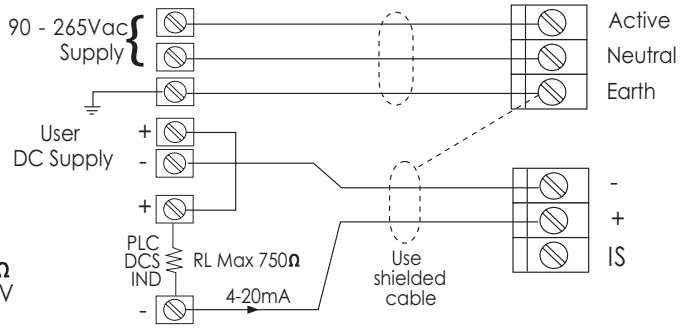


Note: Isolated current output can be made common with +DC or GND if required. (e.g. RL - connected to GND)

WIRING DIAGRAMS

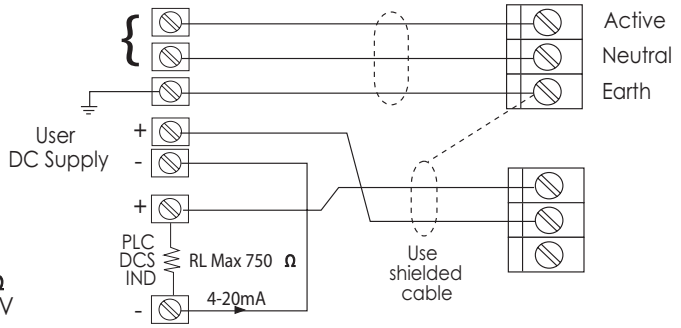
Terminal Connections for AC Supply - Model dependant

e) Modulating from Users External DC Supply (RL to Pos.)



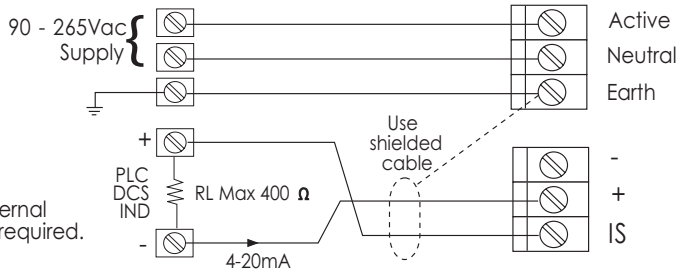
Note: RL Max = 750 Ω if user DC Supply 24V

f) Modulating from Users External DC Supply (RL to Neg.)



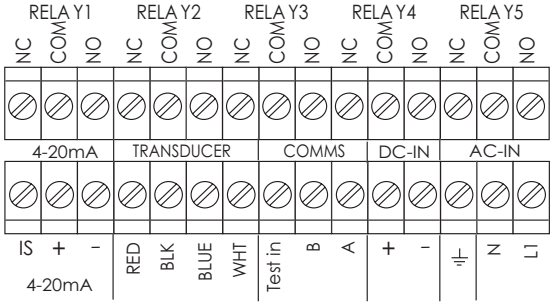
Note: RL Max = 750 Ω if user DC Supply 24V

g) 4 Wire DC - Driving from Internal Isolated Supply (I+)

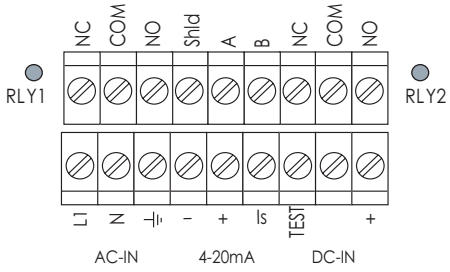


Note: Isolated current output can be made common with external DC Supply Positive or Negitive if required. (e.g. RL - connected to GND)

AW Series Transmitter Remote Version (4 OR 5 Relays)



AW Series Transmitter Integral Version (2 Relays)



Acoustic Wave Level Transmitter

SULTAN Series Smart Universal Level Transmitter and Network

HAWK DATA SHEET

SPECIFICATIONS

Frequency
- 5kHz, 10kHz, 15kHz, 20kHz, 30kHz, 40kHz, 50kHz,

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

Power Consumption
- <10w @ 24Vdc
- <10VA @ 240Vac
- <21VA @ 24Vdc

Analog Output
- 4 -20mA (750ohms User supply 24Vdc) (400ohms Internal)

Communications
- GOSHAWK, HART, MODBUS
  FOUNDATION FIELDBUS & PROFIBUS (pending)

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 = 0.25m (10")
- 40kHz = 0.22m (12")
- 30kHz = 0.35 m (14")
- 20kHz = 0.45m (17")
- 15kHz = 0.60m (24")
- 10kHz = 1.0m (39")
- 05kHz = 1.5m (59")

Maximum Range
- 5m (16ft) 50kHz liquids
- 7m (22ft) 40kHz liquids
- 10m (33ft) 30kHz liquids, 3.0m (10ft) solids
- 20m (65ft) 20kHz liquids/slurries, 10m (32ft) solids
- 50m (162ft) 15kHz liquids/slurries, 20m (64ft) solids
- 60m (195ft) 10kHz liquids/slurries/powders/solids
- 100m (324ft) 5kHz liquids/slurries/powders/solids

Resolution
- 1mm (0.04 in) 50kHz/40kHz/30kHz/20kHz
- 4mm (0.20 in) 15kHz/10kHz/5kHz

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
- >200m (656ft) Consult factory for greater distances
- Multi Head Version max transducers 1-128*
  *Standard Version maximum 32 transducers

Cable
- 4 conductor shielded twisted pair instrument cable
  Conductor size dependent on cable length. Belden 3084A, Dekron or equivalent

Maximum Operating Pressure
- 30 P.S.I. (2 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 16mm
- Remote: 3 x 20mm, 1x16mm
  Other options available

Mounting
- ANSI, JIS or DIN Flange
- 4 in/100mm or 10 in/250mm
- 2in or 3in BSP Thread / NPT Thread

Typical Weight
- Integral System 4kg (8.8lb) 30kHz/20kHz/15kHz
- Remote Amplifier 1kg (2.2lb)
  40kHz/30kHz/20kHz/15kHz/10kHz/5kHz
- Remote Transducer 2kg (4.4lb) 40kHz/30kHz/20kHz
- Remote Transducer 10kg (21lb) 15kHz/10kHz
- Remote Transducer 15kg (33lb) 5kHz

PART NUMBERING

Sultan AW Remote Electronics

MODEL
AWR2 = Remote 2 Wire 4-20mA Sultan with PC Comms
AWR234 = Remote 2/3/4 Wire 4-20mA Sultan With PC comms and 5 relays

HOUSING
S = Standard Plastic moulded housing

POWER SUPPLY
B = 24 VDC standard
U = Universal AC power supply (80-260 VAC input)
*(AWR234 only)

ADDITIONAL COMMUNICATIONS
X = Not Required
M = Modbus Comms
Z = Special Request
* HART and ProfiBUS DP available soon.

APPROVAL STANDARD
X = Not required
A0 = ATEX Zone 0(pending)
A1 = ATEX Zone 1(pending)
A10 =ATEX Zone 10(pending)
A20 =ATEX Zone 20(pending)

AWR2	S	B	X	X

APPROVAL STANDARDS
CSA, FM, SAA (Pending)

Sultan AW Remote Transducer

MODEL
AWRT = Acoustic Wave Remote Transducer

TRANSDUCER FREQUENCY
50 - 50kHz for applications 0-5m maximum
40 - 40kHz for applications 0-7m maximum
30 - 30kHz for applications 0-10m maximum
20 - 20kHz for applications 0-20m maximum
15 - 15kHz for applications 0-30m maximum (CA req d)
10 - 10kHz for applications 0-50m maximum
5 - 05kHz for applications 0-60m maximum

PROCESS TEMPERATURE
Facing material selection
S = Standard Temp (15-50kHz teflon, 5, 10kHz polyolefin)
T = Standard Temp (wet atmosphere, teflon face)
H = High Temp (microcell face)
W = High Temp (wet atmosphere, microcell + teflon)
Z = Special Request

TRANSDUCER HOUSING MATERIAL
4 = Polypropylene (standard, others by request only)
5 = Kynar
6 = Teflon
0 = UPVC

THREAD STANDARDS
X = Not Required (see flange & cone selection)
TB = BSP
TN = NPT

THREAD SIZES
X = Not Required
20 = 2" thread with PP focalizer
30 = 3" thread with PP focalizer

APPROVAL STANDARD
X = Not required
A0 = ATEX Zone 0(pending)
A1 = ATEX Zone 1(pending)
A10= ATEX Zone 10(pending)
A20= ATEX Zone 20(pending))

CONNECTION
S = Screw top unit with intergral junction box
C = IP68 Sealed unit with 6 metre cable
D = DIN Plug (IP68) NEMA 4x
4 = Terminals in DIN plug
X = Not required

AWRT	50	S	4	X	X	X	S	X

APPROVAL STANDARDS
CSA, FM, SAA (Pending)

PART NUMBERING

Sultan AW Smart Transducer

MODEL

AWSTA = Smart Acoustic Wave Transducer with PC Comms (2 wire 4-20mA)*(late 2003)
AWSTB = Smart Acoustic Wave Transducer (24 VDC, 4-20mA output, 1 relay)
AWSTC = Smart Acoustic Wave Transducer with Modbus (24 VDC, 1 relay)
AWSTD = Smart Acoustic Wave Transducer with Modbus (24 VDC, 4-20mA output, 1 relay)

TRANSDUCER FREQUENCY

50 - 50kHz for applications 0-5m maximum
40 - 40kHz for applications 0-7m maximum
30 - 30kHz for applications 0-10m maximum
20 - 20kHz for applications 0-20m maximum
15 - 15kHz for applications 0-30m maximum (CA req'd)
10 - 10kHz for applications 0-50m maximum
5 - 05kHz for applications 0-60m maximum

PROCESS TEMPERATURE

Facing material selection

S = Standard Temp (15-50kHz teflon, 5, 10kHz polyolefin)
T = Standard Temp (wet atmosphere, teflon face)
H = High Temp (microcell face)
W = High Temp (wet atmosphere, microcell + teflon)
Z = Special Request

TRANSDUCER HOUSING MATERIAL

4 = Polypropylene (standar, others by request only)
5 = Kynar
6 = Teflon
0 = UPVC

THREAD STANDARDS

X = Not Required (see flange & cone selection)
TB = BSP (Viton O ring supplied)
TN = NPT

THREAD SIZES

X = Not Required
20 = 2" thread with PP focalizer
30 = 3" thread with PP focalizer

APPROVAL STANDARD

X = Not required
A0 = ATEX Zone 0(pending)
A1 = ATEX Zone 1(pending)
A10 = ATEX Zone 10(pending)
A20 = ATEX Zone 20(pending)

CONNECTION

S = Screw top unit with intergral junction box
C = IP68 Sealed unit with 6 metre cable
D = DIN Plug (pending)
9 = Terminals in DIN plug
X = Not required

AWSTA	50	S	4	X	X	X	C	X

APPROVAL STANDARDS

CSA, FM, SAA (Pending)

Sultan AW Integral Transmitter

MODEL

AWI2 = Integral 2 Wire 4-20mA Sultan with PC Comms
AWI234 = Integral 2/3/4 Wire 4-20mA Sultan with PC Comms and 2 relays

HOUSING

S = Standard Plastic moulded housing (available late 2003)
M = Powder coated Aluminium (integral version only)

POWER SUPPLY

B = 24 VDC Standard
U = Universal AC power supply (80-260 VAC input)

TRANSDUCER FREQUENCY

50 - 50kHz for applications 0-5m maximum
40 - 40kHz for applications 0-7m maximum
30 - 30kHz for applications 0-10m maximum
20 - 20kHz for applications 0-20m maximum
15 - 15kHz for applications 0-30m maximum (CA req'd)
10 - 10kHz for applications 0-50m maximum
5 - 05kHz for applications 0-60m maximum

PROCESS TEMPERATURE

Facing material selection

S = Standard Temp (15-50kHz teflon, 5, 10kHz polyolefin)
T = Standard Temp (wet atmosphere, teflon face)
(use remote or AWT Series for high tempature)

TRANSDUCER HOUSING MATERIAL

4 = Polypropylene (standar, others by request only)
5 = Kynar
6 = Teflon
0 = UPVC

THREAD STANDARDS

X = Not Required (see flange & cone selection)
TB = BSP (Viton O ring supplied)
TN = NPT

THREAD SIZES

X = Not Required
20 = 2" thread with PP focalizer
30 = 3" thread with PP focalizer

ADDITIONAL COMMUNICATIONS

(PC COMMS STANDARD)
X = Not Required
M = Modbus Comms
Z = Special Request

APPROVAL STANDARD

X = Not required
A0 = ATEX Zone 0(pending)
A1 = ATEX Zone 1(pending)
A10 = ATEX Zone 10(pending)
A20 = ATEX Zone 20(pending)

AWI2	M	B	50	S	4	X	X	X	X

APPROVAL STANDARDS

CSA, FM, SAA (Pending)

Acoustic Wave Level Transmitter

SULTAN Series Smart Universal Level Transmitter and Network

PART NUMBERING

Flange Selection

FLANGE
F = Flange Selection

DIMENSION STANDARD
A = ANSI
D = DIN
J = JIS

FLANGE SIZES
2 = 2" flange
4 = 4" flange
6 = 6" flange
8 = 8" flange
10 = 10" flange

FLANGE MOUNTING POSITION
A = Cone mounted
B = Transducer body mounted

FLANGE MATERIAL
4 = Polypropylene
6 = Telfon
7 = Carbon Fibre
8 = Polyurethane
X = Not required
Z = Special Request

F | A | 4 | A | - | 4

Cone Selection

CONE
C = Focalizer Cone

CONE SIZE
02 = 2" cone
04 = 4" cone
06 = 6" cone
08 = 8" cone
10 = 10" cone (10kHz)
11 = 10" cone (15-5kHz)

CONE STYLE
A = Standard (50, 40, 30, 20, 15, 5kHz)
B = Large throat (10kHz)

CONE MATERIAL
4 = Polypropylene
6 = Telfon
7 = Carbon Fibre
8 = Polyurethane ("B" type flange req'd)
Z = Special Request

C | 02 | A | - | 4

Extras

ACCESSORIES
CS= Cable suspension socket
Z = Special Request
CA = Cone Adaptor (10Ž cone + 15kHz)

CS

Full AW Integral Electronics

Part Number Consists of:

Electronics	+	Flange	+	Cone	+	Extras
AWI2MB30SXXXX		FA4A-4		C04A-4		X

Full AW Remote Transducer

Part Number Consists of:

Electronics	+	Flange	+	Cone	+	Extras
AWRT30SXXXCX		FA4A-4		C04A-4		X

Full AW Series Smart Transducer Unit

Part Number Consists of:

Electronics	+	Flange	+	Cone	+	Extras
AWSTA30SXXXSX		FA4A-4		C04A-4		X

Full AW Remote Electronics

Part Number Consists of:
(to be used with AW series remote transducer, see below)

Electronics	+	Extras
AWR234SUMX		X

HAWK Measurement Systems

Represented by: