DOPPLER

Phased Array Probe Catalogue

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Doppler Electronic Technologies Co.,Ltd

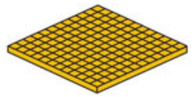
NDT

Phased Array Probe

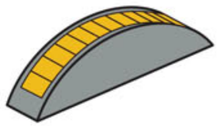
Linear (L)

Internal focused (S)

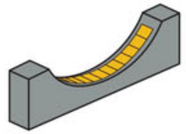
1.5D Array (M)



2D Array (M)

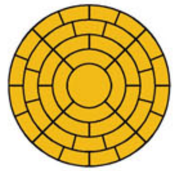


Convex (V)

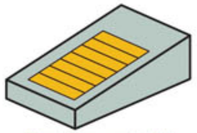


Concave (C)

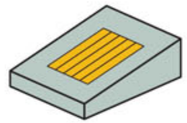
Annular (A)



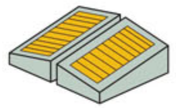
Annular sectorial (S)



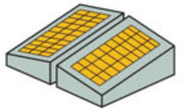
Variable angle (L)



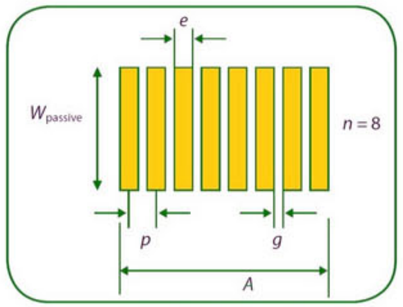
Skew (S)



Dual linear(S)



Dual 1.5D(S)



- A : Active aperture
- g : Inter element spacing
- e : Element width
- p : Elementary pitch
- w : elevation
- n : number of elements in the PA probe
- Active aperture : A = n • p
- Precise active aperture : A = (– 1) • p + e
- Near–field : N =D2•f/4c
- To calculate the near–field value in the active (primary) • axis of a phased array probe ,D = n ' • p
- To calculate the near–field value in the passive • (secondary) axis of a hased array probe ,D = Wpassive (elevation)

Ordering Information

General frequency is 1MHz – 15MHz, elements quantity is 8 to 128, special custom can achieve 1024. In this manual mainly detail introduce the linear, matrix multi–ring, concave, integration wedge probe. Other type probes can customize according to the demand of customer. The wedge, connector conversion box, cable also can customize.

Probe Model Illustrate

5	L	64	–	0.8	×	10	–	B	6	–	P	–	110	–	2.0	–	H1
Frequency	Array type	No. elements		Pitch		Elevation		Probe type	Casing type		Cable jacket type		Cable capacitance		Cable length		Connector type

Frequency : 1=1MHz 2=2MHz 3.5=3.5 MHz 5=5 MHz 7.5=7.5 MHz 10=10 MHz 15=15MHz
Array type : L(linear) V(convex) C(concave) M (matrix) A(Annular) S(special)
No. elements : 64=64 elements
Pitch : 0.8=0.8mm
Elevation : 10=10mm
Probe type : A : wedge integrated （A45 integration 45° wedge, A0 integration 0° wedge）
B : wedge un–integrated contact probe (B1,B2···.)
R : radius of concave or convex probe （R29 : Radius 29 ）
I : Immersion probe
Casing type : according probe serial
Cable jacket type : P : PVC U:PU (required by nuclear industry)
Cable capacitance : 50=50PF 60=60PF 75=75PF 90=90PF 110=110PF
Cable length : 2.0=2.0m
Connector typeTube diameter H1:Hypetronics P1 :OmniScan 160PIN D1:DL–156P
D2:DL–260P D3:DL–96P J1:D38999/26FF35SN
M1: MOLEX 36PIN M2:MOLEX 160PIN
C1: CONEC 78PIN T1 ITT–cannon 127050

Wedge Model Illustrate

Sb6	–	N	55	S	–	I	H	C	–	AOD	50
Wedge type		Mounting method	Refraction angle	Wave type		irrigation	scanner yoke attachment points	adjustable carbide wear pins		Radius type	Tube diameter

Wedge type : s × × : casing type matched to the wedge × ×
Mounting method : n= normal
L = lateral
Refraction angle : 0=0° 45=45° 55=55°
Wave type : s=shear l=longitudal
IHC : I= irrigation H= scanner yoke attachment points C= adjustable carbide wear pins
Radius type : aod=axial outside diameter (circumferential scan)
cod=circumferential outside diameter (axial scan)
Tube diameter : 50=50mm

Linear SAMLL

B1 Housing

B12 Housing

B38 Housing

Features & Benefits

- Small footprint
- Optimized for thin welded parts
- Wave layers with acoustic adaptation to Rexolite

Applications

- Surfaces with complex geometry where good coupling is not possible
- Inspection of turbines, blade roots and fine welds

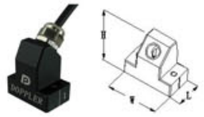
Probe specifications and dimensions

Type	Frequency (MHz)	Elements	Pitch (mm)	Active aperture (mm)	Elevation (mm)	Casing dimensions						Case type
						Long （L）		Width （W）		Height （H）		
						mm	in	mm	in	mm	in	
5L10–0.5*5	5	10	0.5	5	5	9	0.35	8	0.31	20	0.79	B1
7.5L8–0.5*5	7.5	8	0.5	5	5	9	0.35	8	0.31	20	0.79	
10L16–0.3*5	10	16	0.3	4.8	5	9	0.35	8	0.31	20	0.79	
5L12–0.6*7.2	5	12	0.6	7.2	7.2	11	0.43	30	1.18	25	0.98	B38
7.5L12–0.6*7.2	7.5	12	0.6	7.2	7.2	11	0.43	30	1.18	25	0.98	
4L16–0.5*9	4	16	0.5	8	9	15	0.59	28	1.10	27	1.06	B12
5L16–0.6*10	5	16	0.6	9.6	10	15	0.59	28	1.10	27	1.06	
7.5L16–0.6*10	7.5	16	0.6	9.6	10	15	0.59	28	1.10	27	1.06	
10L32–0.31*10	10	32	0.31	9.92	10	15	0.59	28	1.10	27	1.06	

Linear MEDIUM

B5 Housing

B30 Housing



B10 Housing

Features & Benefits

- Wave layers with acoustic adaptation to Rexolite
- Captive anchoring screws are provided with the probe
- Awide selection of wedges is available to suit any angle beam application

Applications

- Manual or automated inspection of 6.35 mm to 38 mm thick welds
- Detection of flaws and sizing
- Inspections of castings, forgings, pipes, tubes, and machined and structural components for cracks and welding defects

Probe Specifications And Dimensions

Type	Frequency (MHz)	Elements	Pitch (mm)	Active aperture (mm)	Elevation (mm)	Casing dimensions						Case type
						Long (L)		Width (W)		Height (H)		
						mm	in	mm	in	mm	in	
2.5L16-1.0*12	2.5	16	1	16	12	21	0.83	33.5	1.32	38.5	1.52	B10
4L16-1.0*10	4	16	1	16	10	21	0.83	33.5	1.32	38.5	1.52	
5L32-0.5*10	5	32	0.5	16	10	21	0.83	33.5	1.32	38.5	1.52	
5L16-1.0*10	5	16	1	16	10	21	0.83	33.5	1.32	38.5	1.52	
7.5L32-0.5*10	7.5	32	0.5	16	10	21	0.83	33.5	1.32	38.5	1.52	
10L16-1.0*10	10	16	1	16	10	21	0.83	33.5	1.32	38.5	1.52	
5L32-0.6*15	5	32	0.6	19.2	15	24	0.94	33	1.30	25	0.98	
3.5L16-1.6*16	3.5	16	1.6	25.6	16	36	1.42	34	1.34	25	0.98	B5
2L16-1.8*20	2	16	1.8	28.8	20	35	1.38	28	1.10	29.9	1.18	B30

Linear LARGE

B7/9/25 Housing

B26 Housing

B6/B9/B23/B40 Housing

Features & Benefits

- Large active aperture for high acoustic energy
- Wave layers with acoustic adaptation to Rexolite

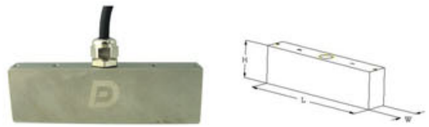
Applications

- Inspection of girth welds with automatic inspection system
- Manual or automated inspection of thick welds
- Adapted for inspection of thick stainless steel specimens
- Detection of flaws and sizing
- Inspection of castings, forgings, pipes, tubes, and machined and structural components for cracks and welding defects

Probe Specifications And Dimensions

Type	Frequency (MHz)	Elements	Pitch (mm)	Active aperture (mm)	Elevation (mm)	Casing dimensions						Case type
						Long (L)		Width (W)		Height (H)		
						mm	in	mm	in	mm	in	
5L32-1.0*10	5	32	1	32	10	38	1.50	29	1.14	30	1.18	B40
5L64-0.6*10	5	64	0.6	38.4	10	44	1.73	28	1.10	34	1.34	B7
2.25I64-0.75*10	2.25	64	0.75	48	10	57	2.24	29	1.14	35	1.38	B6
5L64-0.8*10	5	64	0.8	51.2	10	57	2.24	29	1.14	35	1.38	
7.5L64-0.8*10	7.5	64	0.8	51.2	10	57	2.24	29	1.14	35	1.38	
7.5L60-1.0*10	7.5	60	1	60	10	68	2.68	26.8	1.06	40	1.57	B23
3.5L128-0.5*10	3.5	128	0.5	64	10	70	2.76	29	1.14	35	1.38	B9
5L64-1.0*10	5	64	1	64	10	84	3.31	35.5	1.40	32	1.26	B26
2L16-3.5*20	2	16	3.5	56	20	64	2.52	40	1.57	40	1.57	B25

Linear X-LARGE



Features & Benefits

- Large active aperture for high acoustic energy
- Wave layers with acoustic adaptation to Rexolite
- Cable connector can come out from either the side or the top

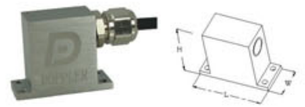
Applications

- Used for C-scan inspections of composites (delamination, disbonding, and porosity)
- Adapted for inspection of thick stainless steel specimens

Probe Specifications And Dimensions

Type	Frequency (MHz)	Elements	Pitch (mm)	Active aperture (mm)	Elevation (mm)	Casing dimensions						Case type
						Long (L)		Width (W)		Height (H)		
						mm	in	mm	in	mm	in	
5L128-0.8*12	5	128	0.8	102.4	12	106	4.17	17	0.16	32	1.26	B39

Matrix 2 D/1.5D



B 21 Housing

B13/15/16/19 Housing

Features & Benefits

- Matrix or 2D array transducers allow 3D beam focusing and scanning, thus opening up new possibilities
- Control of the focal zone diameter in 3D, cylindrical beam
- Inspection of volumes from limited points of access
- Detection of defects that may have multiple, un-predetermined orientations

Applications

- Weld inspection
- Inspection of parts with complex geometry
- General NDT

Probe Specifications And Dimensions

Type	Frequency (MHz)	Elements	Pitch	Active aperture (mm)	Elevation (mm)	Casing dimensions (mm)	Case type						Case type
							Long (L)		Width (W)		Height (H)		
							mm	in	mm	in	mm	in	
1.5M5*3-3.5*3	1.5	15	3.5	3	17.5	9	31.5	1.24	13	0.51	25	0.98	B21
5M8*8-1.0*1.0	5	64	1	1	8	8	35	1.38	19	0.75	45	1.77	B15
5M8*8-1.5*1.5	5	64	1.5	1.5	12	12	34	1.34	20	0.79	47	1.85	B19
5M16*16-1.0*10	5	256	1	1	16	16	40	1.57	27	1.06	55	2.17	B16
10M4*4-2.0*2.0	10	16	2	2	8	8	35	1.38	19	0.75	45	1.77	B15
10M8*8-0.6*0.6	10	64	0.6	0.6	4.8	4.8	25	0.98	12.5	0.49	47	1.85	B13

Concave

R1/5/7/8 Housing

Features & Benefits

- Acoustic impedance matches water.
- High circumferential resolution around the radius
- Corrosion–resistant stainless steel case
- Waterproof guaranteed up to 1 m underwater
- Compatible with adjustable immersion wedges

Applications

- Inspection of carbon fiber reinforced polymers (CFRP) corners
- Composite inspection for delamination

Probe Specifications And Dimensions

Type	Frequency (MHz)	Elements	Pitch X(mm)	Pitch Y(mm)	Active aperture X(mm)	Active aperture Y(mm)	Casing dimensions						Case type
							Long (L)		Width (W)		Height (H)		
							mm	in	mm	in	mm	in	
3.5C128-0.625*13-R32	3.5	128	0.625	R32	80	13	111	4.37	19	0.75	56	2.20	R8
3.5C96-0.6*12-R22.9	3.5	96	0.6	R22.9	57.6	12	95.1	3.74	19	0.75	52	2.05	R7
4C64-1.0*10-R50	4	64	1	R50	64	10	124	4.88	18	0.71	60	2.36	R1
10C64-1.0*10-R29	10	64	1	R29	64	10	106	4.17	18	0.71	47	1.85	R5

Wedge Integrated

A25/40 Housing

A35 Housing

Features & Benefits

- Probe and wedge in the same housing
- The lowest profile probe and wedge combination for contact angle beam inspection
- Coupling always good between probe and wedge interfaces, no need for couplant between the probe and wedge
- Very small assembly for easy access in restricted areas
- Inspections of 30° to 70° in steel, SW or LW
- Probes with an internal wedge can be specially ordered to fit a specific curvature radius

Applications

- Manual weld inspection of 6.35 mm to 19 mm thick surfaces (butt joints, corner joints, tee joints), using 40° to 70° simultaneously
- Manual inspection of stress–corrosion cracking
- AWS and DGS code compliant applications

Probe Specifications And Dimensions

Type	Frequency (MHz)	Elements	Pitch X(mm)	Pitch Y(mm)	Active aperture X(mm)	Active aperture Y(mm)	Casing dimensions						Case type
							Long (L)		Width (W)		Height (H)		
							mm	in	mm	in	mm	in	
4L16-0.5*9-A35	4	16	0.5	35	8	9	27	1.06	16.5	0.65	22	0.87	A35
5L10-0.5*5-A25	5	10	0.5	25	5	5	20	0.79	16	0.63	9	0.35	A25
5L12-0.5*6A40	5	12	0.5	40	6	6	25	0.98	15	0.59	9	0.35	A40

Connector

DOPPLER provide plenty of connector types to adopted of all kinds of phased array system in the market.

C1：CONEC（TD）

M1：MOLEX

QLC260P

P1：Omni Connector 30056

H1：Hypertronic

J1：D38999

D2：DL-260P

D2：DL-260P（C）

R1：HIROSE

Cable Type

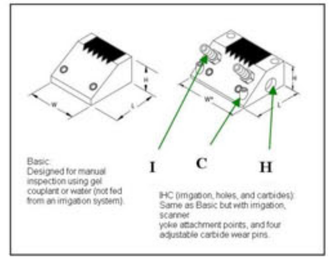
- Doppler use long-tested cable for phased array probe
- Low signal attenuation
- Flexible
- Good mechanical characteristic
- Compatible to industrial environment

Cable type	50 Ohm coaxial cable with dual shield			
Probe elements	16	64	128	192
Diameter of cable	4.0 mm	5.9 mm	6.8 mm	8.0 mm
color	Black/Ivory			
Jacket material	PVC OR PU			

Wedge

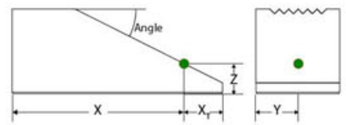
Features

- Custom refraction angle
- Custom design of wedge geometry, material and angle, etc

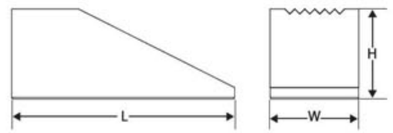


Wedge Parameters Format

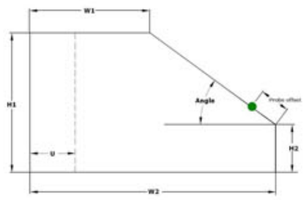
Wedge parameters with OmniScan®	
X	Primary offset
Y	Secondary offset (0 when probe is centered)
Z	Height



Wedge parameters with TomoView™	
XT	Primary axis offset of the middle of the first element (mm)
Y	Secondary axis offset of the middle of the first element
Z	Height at the middle of the first element (mm)

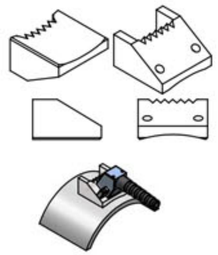


Wedge parameters with ISONIC	
W2	The length of wedge
Probe offset	The center of the first element
H2	The minimum height of wedge

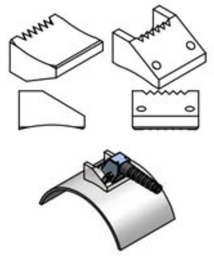


Wedge Specifications And Dimensions

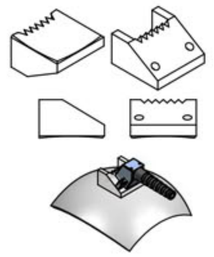
Model	Case	Refraction Angle in Steel	Scan Angle	Dimension mm			Angle
				L	H	W	
SB5-N0L	B5	0° LW	N/A	37.60	20.00	36.60	0°
SB5-N45L	B5	45° LW	30to60	55.50	49.00	36.60	16.5°
SB6-N0L*	B6"	0° LW	N/A	70.00	20.00	35.00	0°
SB6-N45S	B6	45° SW	30to60	79.50	37.28	38.00	30°
SB6-N55S*	B6"	55° SW	30to70	79.50	40.57	38.00	36°
SB6-N60S*	B6"	60° SW	45to70	79.50	42.20	38.00	38°
SB6-N45L*	B6"	45° LW	30to60	79.50	22.30	38.00	16.5°
SB6-N60L*	B6"	60° LW	45to70	79.50	25.80	38.00	20°
SB7-N0L*	B7"	0° LW	N/A	54.00	20.00	32.00	0°
SB7-N55S	B7	55° SW	30to70	68.50	43.00	30.00	36°
SB7-N55S-IHC *	B7"	55° SW	30to70	68.50	43.00	40.00	36°
SB8-N0L*	B8"	0° LW	N/A	24.00	20.00	33.00	0°
SB8-N45S	B8	45° SW	30to60	31.90	17.80	28.00	30°
SB8-N60S*	B8"	60° SW	45to70	31.90	20.70	28.00	38°
SB8-N45L*	B8"	45° LW	30to60	31.90	12.40	28.00	16.5°
SB8-N60L*	B8"	60° LW	45to70	31.90	13.85	28.00	20°
SB9-N0L*	B9"	0° LW	N/A	80.00	20.00	32.00	0°
SB9-N55S	B9	55° SW	30to70	124.50	60.00	35.50	36°
SB10-N0L*	B10"	0° LW	N/A	33.50	20.00	31.00	0°
SB10-N45S	B10	45° SW	30to60	32.60	16.85	33.50	30°



AXIAL OUTSIDE DIAMETER
AOD



CIRCUMFERENTIAL OUTSIDE DIAMETER
COD

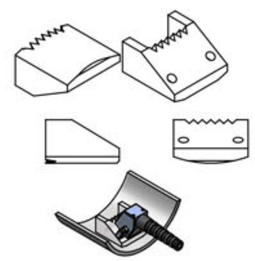


SPHERICAL OUTSIDE DIAMETER
SOD

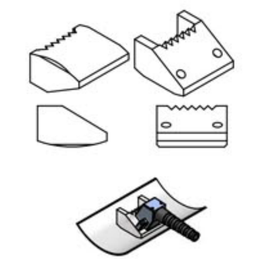
Wedge Specifications

Wedge Specifications And Dimensions

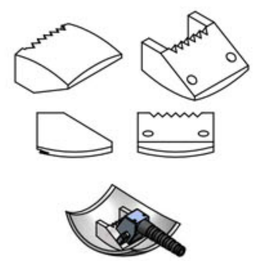
Model	Case	Refraction Angle in Steel	Scan Angle	Dimension mm			Angle
				L	H	W	
SB10-N45S-IH *	B10"	45° SW	30to60	45.00	23.46	40.00	30°
SB10-N55S*	B10"	55° SW	30to70	32.60	18.50	33.50	36°
SB10-N60S*	B10"	60° SW	45to70	32.60	18.93	33.50	38°
SB10-N45L*	B10"	45° LW	30to60	32.60	12.31	33.50	16.5°
SB10-N60L*	B10"	60° LW	45to70	32.60	13.53	33.50	20°
SB12-N0L*	B12"	0° LW	N/A	28.00	20.00	25.00	0°
SB12-N55S	B12	55° SW	30to70	25.50	15.00	28.00	36°
SB15-N0L*	B15"	0° LW	N/A	40.00	20.00	21.00	0°
SB15-N50L	B15	50° LW	30to70	35.00	13.52	40.00	17.5°
SB15-N55S	B15	55° SW	30to70	35.00	18.70	40.00	36°
SB15-N70S*	B15"	70° SW	50to80	40.00	21.05	40.00	43°
SB16-N0L*	B16"	0° LW	N/A	45.00	20.00	30.00	0°
SB16-N55S	B16	55° SW	30to70	45.00	23.63	40.00	36°
SB19-N0L*	B19"	0° LW	N/A	40.00	20.00	38.00	0°
SB19-N55S	B19	55° SW	30to70	54.50	31.17	40.00	36°
SB22-N0L*	B22"	0° LW	N/A	35.00	20.00	31.00	0°
SB23-N50S	B23	50° SW	30to70	82.00	44.00	38.00	33.7°
SB25-N55S*	B25"	55° SW	30to70	88.00	43.62	44.00	36°
SB30-N55S*	B30"	55° SW	30to70	53.00	27.75	44.00	36°



AXIAL INSIDE DIAMETER
AID

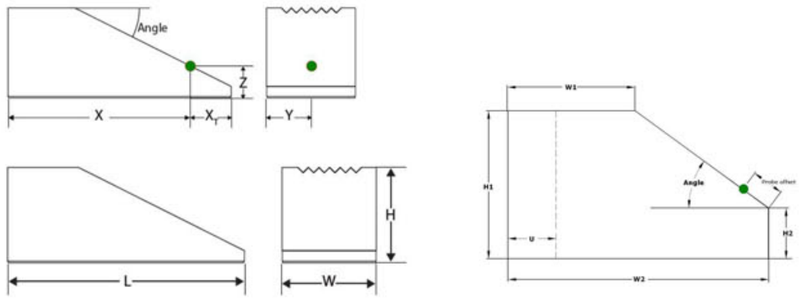


CIRCUMFERENTIAL INSIDE DIAMETER
CID



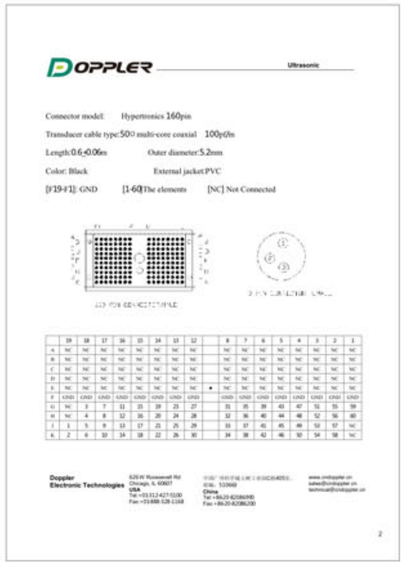
SPHERICAL INSIDE DIAMETER
SID

Wedge Characterization Report Template



Wedge Type	Angle	Number of elements	H1	H2	U	W2	W1	Probe Offset	W	X	XT	Z	Wedge Velocity
SB6-N45S	30	64	37.28	5.3	0	79.5	24.1	2.9	38	77	2.5	6.75	2350m/s
SB6-N55S	36	64	40.57	5.3	0	79.5	30.1	2.9	38	77.1	2.35	7	2350m/s

Probe Characterization Report Template


DOPPLER Ultrasonic

Connector model: Hypertronics 160pin

Transducer cable type:50Ω multi-core coaxial 100p/p/n

Length:0.6±0.06m Outer diameter:5.2mm

Color: Black External jacket:PVC

[#19-#1]: GND [1-60]The elements [NC] Not Connected

	19	18	17	16	15	14	13	12		8	7	6	5	4	3	2	1
A	NC	NC	NC	NC	NC	NC	NC	NC		NC	NC	NC	NC	NC	NC	NC	NC
B	NC	NC	NC	NC	NC	NC	NC			NC	NC	NC	NC	NC	NC	NC	NC
C	NC	NC	NC	NC	NC	NC	NC	NC		NC	NC	NC	NC	NC	NC	NC	NC
D	NC	NC	NC	NC	NC	NC	NC	NC		NC	NC	NC	NC	NC	NC	NC	NC
E	NC	NC	NC	NC	NC	NC	NC	NC	★	NC	NC	NC	NC	NC	NC	NC	NC
F	GND	GND	GND	GND	GND	GND	GND	GND		GND	GND	GND	GND	GND	GND	GND	GND
G	NC	1	7	11	15	19	23	27		31	35	39	43	47	51	55	59
H	NC	4	8	12	16	20	24	28		32	36	40	44	48	52	56	60
I	1	5	9	13	17	21	25	29		33	37	41	45	49	53	57	NC
K	2	6	10	14	18	22	26	30		34	38	42	46	50	54	58	NC

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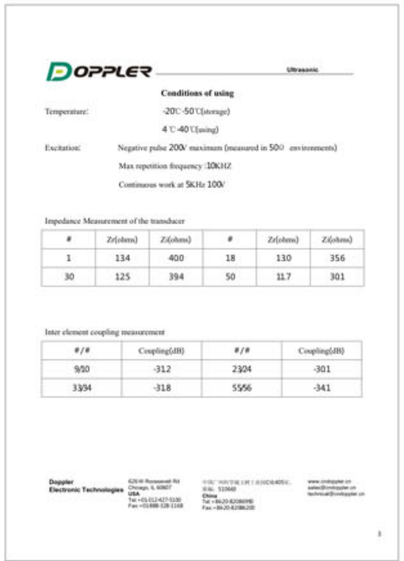
DOPPLER Ultrasonic

Conditions of using

Temperature: -20℃-50℃(storage)

4℃-40℃(using)

Excitation: Negative pulse 200V maximum (measured in 50Ω environments)

Max repetition frequency :10KHZ

Continuous work at 5KHz 100V

Impedance Measurement of the transducer

#	Zr(ohms)	Zi(ohms)	#	Zr(ohms)	Zi(ohms)
1	134	400	18	130	356
30	125	394	50	117	301

Inter element coupling measurement

#/#	Coupling(dB)	#/#	Coupling(dB)
9/10	-312	23/24	-301
33/34	-318	55/56	-341

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Probe Characterization Report Template


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MEASUREMENT REPORT

7.5MHz 60chs Linear Phased Array

Model:7.5L60-1.0×10

SN: 17500108

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DOPPLER Ultrasonic

TECHNICAL SPECIFICATIONS

Acoustical characteristics and acceptance criteria

Center frequency (-6dB)	7.5±0.75MHz
Bandwidth (-6dB)	≥60%
Pulse length(-20dB)	≤0.3us
Sensitivity homogeneity	±3dB
Inter element coupling between neighbor elements	≤-30dB
Backing echo compare with the main signal	≤-60dB
Geometrical shape	inear array
Mechanical focusing	none
Number of channels	60
Elementary Pitch	1.0mm
Elements inter space	0.1mm
Elevation	10mm

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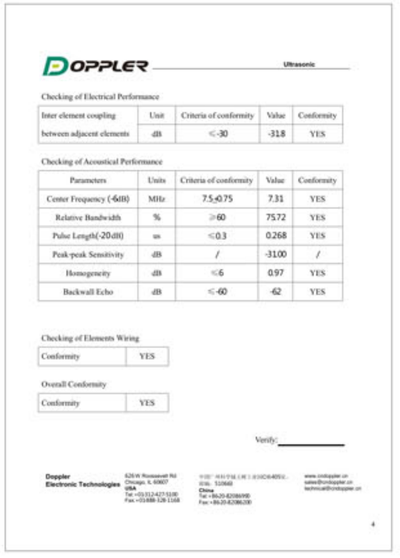
1


DOPPLER Ultrasonic

Checking of Electrical Performance

Inter element coupling	Unit	Criteria of conformity	Value	Conformity
between adjacent elements	dB	≤-30	-31.8	YES

Checking of Acoustical Performance

Parameters	Units	Criteria of conformity	Value	Conformity
Center Frequency (-6dB)	MHz	7.5±0.75	7.31	YES
Relative Bandwidth	%	≥60	75.72	YES
Pulse Length(-20dB)	us	≤0.3	0.268	YES
Peak-peak Sensitivity	dB	/	-31.00	/
Homogeneity	dB	≤6	0.97	YES
Backwall Echo	dB	≤-60	-62	YES

Checking of Elements Wiring

Conformity	YES

Overall Conformity

Conformity	YES

Verify:_____

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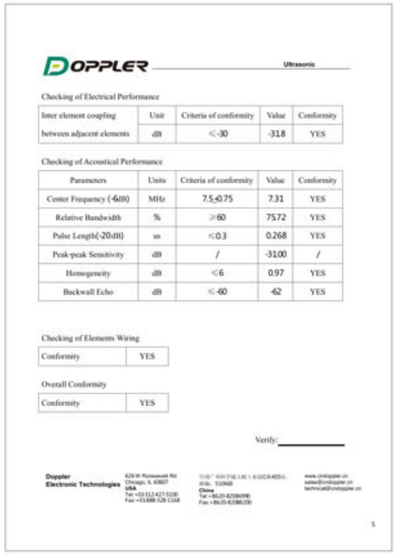
4


DOPPLER Ultrasonic

Checking of Electrical Performance

Inter element coupling	Unit	Criteria of conformity	Value	Conformity
between adjacent elements	dB	≤-30	-31.8	YES

Checking of Acoustical Performance

Parameters	Units	Criteria of conformity	Value	Conformity
Center Frequency (-6dB)	MHz	7.5±0.75	7.31	YES
Relative Bandwidth	%	≥60	75.72	YES
Pulse Length(-20dB)	us	≤0.3	0.268	YES
Peak-peak Sensitivity	dB	/	-31.00	/
Homogeneity	dB	≤6	0.97	YES
Backwall Echo	dB	≤-60	-62	YES

Checking of Elements Wiring

Conformity	YES

Overall Conformity

Conformity	YES

Verify:_____

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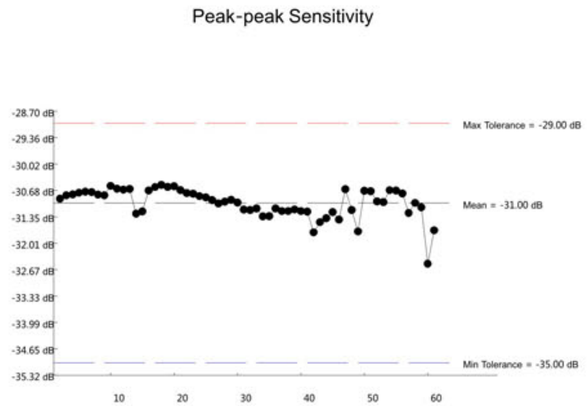
#	Srel (dB)	Fc (MHz)	Bw (%)	T10 (ns)	#	Srel (dB)	Fc (MHz)	Bw (%)	T10 (ns)
1	-30.69	7.40	74.85	252.80	49	-30.69	7.32	76.38	250.80
2	-30.81	7.34	76.71	249.20	50	-30.70	7.29	77.52	250.80
3	-30.78	7.36	77.55	248.40	51	-30.96	7.17	75.43	254.40
4	-30.74	7.34	76.63	248.00	52	-30.98	7.18	75.91	254.40
5	-30.72	7.33	76.84	248.00	53	-30.68	7.30	76.91	250.40
6	-30.72	7.39	77.32	247.20	54	-30.69	7.29	78.58	249.20
7	-30.79	7.40	75.12	248.00	55	-30.76	7.23	76.96	251.20
8	-30.81	7.33	75.82	250.00	56	-31.25	7.22	74.80	290.00
9	-30.57	7.29	75.48	250.00	57	-31.00	7.26	72.96	302.00
10	-30.64	7.31	76.14	250.40	58	-31.11	7.28	74.49	251.20
11	-30.66	7.29	76.30	250.80	59	-32.52	7.29	72.84	297.00
12	-30.65	7.35	76.93	247.60	60	-31.68	7.28	73.53	248.80
13	-31.26	7.18	76.89	282.40	61				
14	-31.21	7.32	75.89	290.80	62				
15	-30.69	7.13	76.04	254.00	63				
16	-30.60	7.29	73.33	296.80	64				
17	-30.55	7.28	74.35	290.40	65				
18	-30.60	7.25	75.57	252.40	66				
19	-30.58	7.33	74.27	291.20	67				
20	-30.67	7.33	75.26	250.00	68				
21	-30.75	7.30	76.54	251.20	69				
22	-30.83	7.35	77.91	248.00	70				
23	-30.85	7.40	76.77	246.40	71				
24	-30.92	7.43	74.45	286.00	73				
25	-31.01	7.33	75.14	288.40	74				
26	-30.97	7.34	75.68	286.40	75				
27	-30.92	7.38	76.41	278.00	76				
28	-30.99	7.36	76.34	248.40	77				
29	-31.16	7.39	74.52	286.80	78				
30	-31.17	7.42	74.96	286.80	79				
31	-31.13	7.41	75.56	287.20	80				
32	-31.33	7.39	76.27	282.80	81				
33	-31.33	7.34	75.42	287.60	82				
34	-31.14	7.37	73.60	294.00	83				
35	-31.20	7.33	74.21	293.60	84				
36	-31.20	7.25	76.85	284.40	85				
37	-31.16	7.14	75.90	253.20	86				
38	-31.20	7.26	73.94	284.80	87				
39	-31.22	7.31	74.02	291.20	88				
40	-31.23	7.31	74.32	293.20	89				
41	-31.48	7.27	74.32	293.20	90				
42	-31.38	7.29	74.67	294.40	91				
43	-31.23	7.32	75.58	295.20	92				
44	-31.41	7.31	74.86	289.20	93				
45	-30.65	7.33	74.91	248.40	94				
46	-31.17	7.33	79.32	246.40	95				
47	-31.71	7.37	76.61	245.60	96				
48									

Summary

Customer :		Serial number:	175-001-003
Probe Model :	7.5L60P1.0	Operator:	0020
Frequency:	7.50 MHz	Date:	2010-9-9
Number of elements:	60	Time:	14:33:55

Parameter	Units	E#17	E#23	E#30	E#36	E#42	Min	Max	Mean	Stdev
Peak-peak Sensitivity	dB	-30.55	-30.83	-31.16	-31.20	-31.20	-32.52	-30.55	-31.00	0.36
-6dB pulse length	ns	107.60	107.20	106.80	107.60	107.60	106.00	145.20	107.83	4.96
-20dB pulse length	ns	290.40	248.00	286.80	293.60	293.20	245.60	302.00	268.85	20.22
-30dB pulse length	ns	480.00	483.20	483.60	485.60	491.20	476.40	493.20	485.82	3.79
-6 dB Low bandedge	MHz	4.57	4.49	4.64	4.61	4.57	4.35	4.66	4.54	0.07
-6 dB High bandedge	MHz	9.98	10.21	10.14	10.05	9.97	9.85	10.24	10.08	0.11
-6 dB Center frequencty	MHz	7.28	7.35	7.39	7.33	7.27	7.13	7.43	7.31	0.07
-6 dB Bandwidth	%	74.35	77.93	74.52	74.21	74.32	72.84	79.32	75.72	1.51
Focal Depth	mm			0.00						



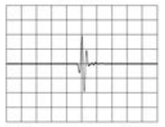
DOPPLER

Ultrasonic

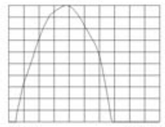
Doppler Electronic Technologies

Probe Type:	7.5L60P1.0	Customer:	
Serial No. :	175-001-003(#6)	Operator:	0020
Test Date:	2010-9-9	Checked by :	_____

Echo Signal



Spectrum



Technical Data

Symbol	Description	Min Tolerance	Actual	Max Tolerance	Units
T10	Echo Pulse Duration @ -20dB	350.00	247.20	800.00	nS
Fc	Test Frequency	6.75	7.39	8.25	MHz
B-6	Relative Bandwidth @ -6dB	70.00	77.32	90.00	%
B	Beam Angle	0.00	0.00	0.00	Grad / deg
ZA	Probe Index	0.00	0.00	0.00	mm
F	Focus	0.00	0.00	0.00	mm
Srel	Relative Pulse-echo Sensitivity	-35.00	-30.73	-29.00	dB

Reference of Calibrated Instruments Used

Manufacturer / Model	Serial No.	Plant No.	Cal Date	Due Date
5800 Pulser / Receiver	070105312	1	2009-12-19	2010-12-19
Tektronix DPO 3012 / Oscilloscope	0054865	1	2010-01-12	2011-01-12
Standard Probe	50001	1	2010-01-12	2011-01-12
Agilent 4294 / Impedance Analyzer	MY43201723	1	2009-01-04	2011-01-04

Instruments Setting	5800PR P/E
Intensity	12.5 uJ
Damping **	100 Ohm
PRF Mode	1KHz
Filter	1 MHz/20 MHz
Test Block	Rexolite thickness:20mm
Sound Velocity	2337m/s
Reflector/Radius	cylinder/100
Connecting Cable	50 Ohm

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