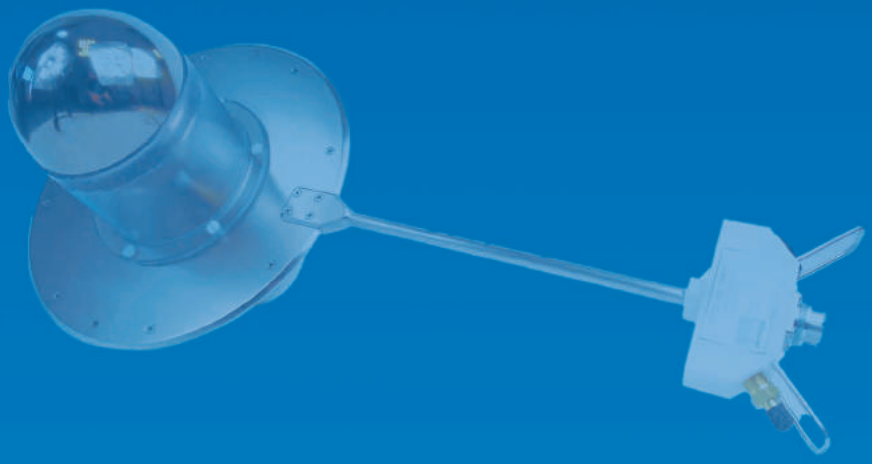
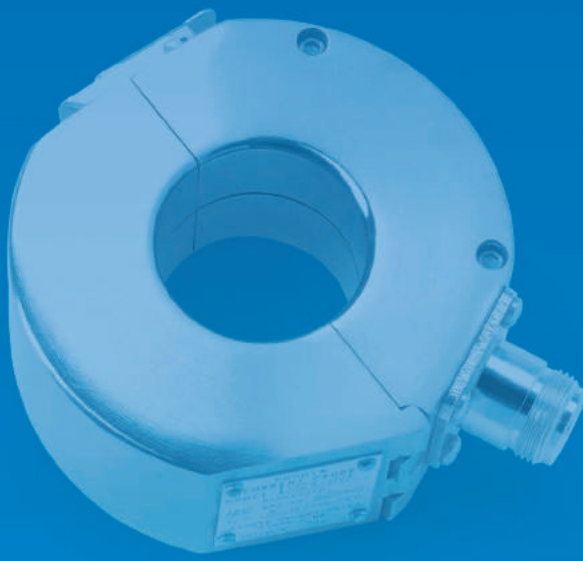
Probes, Baluns and Accessories





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Current Probes

PPM Test supplies a wide portfolio of RF current monitoring probes, also known as current clamps or current transducers. These range from the tiny, high frequency IP series to specialised I-dot sensors for pulsed or high power measurements.

The Prodyn I-125 is the most popular model of current probe, offering a good core capability for EMC measurements. These probes have a split core for easy installation onto cable bundles and typically exhibit a frequency response within +/-1.5 dB (dependent on model) of the specified frequency range.

The products come with a 1 year warranty included as standard.

Current Probes by Series

Series	Aperture dia.	Freq. range (useable)	Z_t (Ω)
CIP Series	N/A *	20 Hz - 800 MHz	1 - 5
IP Series	0.12” (3.1 mm)	20 kHz - 400 MHz	1 - 5
I-075 Series	0.75” (19.1 mm)	40 kHz - 420 MHz	5 - 10
I-125 Series	1.25” (31.8 mm)	1 kHz - 1 GHz	0.005 - 5
I-150 Series	1.50” (38.1 mm)	1 kHz - 1 GHz	5
I-210 Series (Radiation Hardened)	12” (304.8 mm)	70 Hz – 2.5 MHz	0.125 - 0.131
I-262 Series	2.62” (66.5 mm)	10 kHz - 200 MHz	0.06 - 5
I-300 Series	0.22” (5.6 mm	100 kHz - 450 kHz	1 - 5
I-400 Series	0.50” (12.7 mm)	30 kHz - 200 MHz	1 - 5
IP2 HF Series	0.80” (20.3 mm)	100 kHz - 1.3 GHz	1 - 10

* measures current inside a 50 Ω coaxial cable.

Current Probes by Model

Model	Freq. range (useable)	Z_t (Ω)	Max Output Voltage (Vom)	Saturation current (A)	CW max average current (A)	Peak current (A)	Max pulse width (µs)	Rep rate (kHz)
IP-2-1	100 kHz - 1.3 GHz	1	400	2.94	2.87	284	0.2	6.36
IP-2-5	125 kHz - 800 MHz	5	1000	1.68	13.23	180	0.02	56963
IP-2-10	500 kHz - 1 GHz	10	1000	2.07	7.35	100	0.01	56963
I-075-1B	40 kHz - 150 MHz	5	2000	27.74	35.15	360	0.22	3995
I-075-1C	120 kHz - 420 MHz	5	400	27.51	1.24	64	0.31	1.21
I-075N-10	120 kHz - 350 MHz	10	2000	9.87	9.26	120	0.04	5376
I-125-1A	10 kHz - 100 MHz	5	2000	1259	39.4	320	2.06	478
I-125-1B	50 kHz - 130 MHz	5	2000	39.45	35.15	360	0.37	2389
I-125-1HF	50 kHz - 1 GHz	5	400	29.93	1.29	76	0.5	0.58
I-125-1D	1 kHz - 110 MHz	5	2000	57.33	27.87	360	1	697
I-125-1E	850 Hz - 120 MHz	5	2000	9.82	44.1	360	0.52	2103
I-125-2A	10 kHz - 150 MHz	1	400	1125	4.27	456	9.01	0.01
I-125-2C	300 Hz - 25 MHz	1	2000	50.03	146	1880	5.22	697
I-125-2E	1 kHz - 200 MHz	1	400	9.01	2.95	400	1.14	0.048
I-125-2HF	50 kHz - 1 GHz	1	400	42.66	4.43	400	1.66	0.15
I-125-3A	1 kHz - 250 MHz	0.03	400	878.84	23.2	13397	10.3	0.01
I-125-4A	1 kHz - 150 MHz	0.1	400	879.75	12.85	4064	10.3	0.01
I-125-6A	20 Hz - 30 MHz	0.5	2000	9.82	258	4200	6.12	1055
I-125-7A	400 Hz - 100 MHz	1	400	20.8	11.33	389	15.55	0.06
I-125-9A	1 kHz - 270 MHz	0.005	400	25502	60.05	80072	5	0.01
I-150-1HF	1 kHz - 1 GHz	5	400	15.39	1.27	72	0.42	0.74
I-262-2A	10 kHz - 50 MHz	5	2000	1865	99.61	320	4.6	542
I-262-3A	10 kHz - 140 MHz	2	400	1690	2.32	232	11.5	0.01
I-262-4A	10 kHz - 100 MHz	0.06	400	1832	12.99	6707	14.36	0.01
I-262-5A	10 kHz - 200 MHz	1	400	1158	2.6	424	8.61	0.01
I-262-6A	10 kHz - 150 MHz	0.1	400	1468	9.02	4032	11.5	0.01
I-300B	180 kHz - 300 MHz	5	2000	3.86	30.97	400	0.02	35556
I-310B	50 kHz - 200 MHz	1	400	2.64	4.98	395	0.16	0.97
I-320B	200 kHz - 500 MHZ	1	400	0.94	2.78	352	0.05	1.35
I-400A	50 kHz - 450 MHz	5	2000	13.19	30.97	400	0.15	5338
I-410A	15 kHz - 450 MHz	1	400	22.33	4.98	395	0.73	0.22
I-415C	1 kHz - 350 MHz	1	2000	297.84	154.35	2800	1.36	2829

Please contact PPM Test for detailed specifications of the CIP, IP and I-210 series current probes.

Inductive Current Probes (I-dots) - Electrical Specifications

Model	Mutual Inductance (nH)	Freq. Resp (3 dB MHz)	Risetime (ns)	Max Output (kV)	Output Imp (Ω)	Output	Output Connector
RID-210	2	> 700	< 0.5	5	100	Diff	TCC
RID-220	2.5	> 350	< 1	5	100	Diff	TCC
RID-230	10	> 700	< 0.5	5	100	Diff	TCC
RID-240	0.5	> 1400	< 0.25	5	50	Sgl Eng	Type N
RID-250	10	> 300	< 0.3	5	100	Diff	TCC
RID-260	10	> 1400	< 0.25	5	100	Diff	TCC
RID-265	5	> 1000	< 0.20	2	100	Diff	SMA
RID-270	10	> 1400	< 0.25	5	100	Diff	TCC
RID-290	10	> 280	< 1.25	5	100	Diff	TCC

Inductive Current Probes (I-dots) - Physical Specifications

Model	Aperture Diameter (cm)	Overall Diameter (cm)	Height (cm)	Stem Projection (cm)	Mass (kg)
RID-210	9.7	15.24	3	5.72	1.55
RID-220	19.1	34.93	6.53	5.72	12.49
RID-230	10.01	17.78	7.62	5.72	1.63
RID-240	9.83	15.24	3.18	3.18	5.5
RID-250	19.1	34.93	6.53	5.72	12.49
RID-260	3.81	8.26	5.08	5.72	1
RID-265	3.18	6.99	3.18	N/A	0.12
RID-270	1.91	6.35	3.81	5.72	0.75
RID-290	49.99	66.04	12.07	5.72	5.45

Bulk Current Injection Probes

Model	Freq. range (useable)	Z_t (Ω)	Max Output Voltage (Vom)	Saturation current (A)	CW max average current (A)	Peak current (A)	Max pulse width (µs)	Rep rate (kHz)
IT-050-1	100 kHz - 100 MHz	500	2000	38.7	30.97	4	0.79	975
IT-075-1	100 kHz - 100 MHz	500	2000	44.65	30.97	4	0.79	975
IT-125-1	100 kHz - 100 MHz	500	2000	53.58	30.97	4	0.64	1219
IT-125-2	50 kHz - 700 MHz	50	2000	53.58	8.6	40	0.45	4747

Electric Field Sensors

Electric field (D-dot) sensors are high frequency electric field devices designed to measure the rate of change over time in electric displacement over a wide frequency spectrum. They can also be used to measure the rate of change over time in surface current density. Both free-field and ground plane sensors are available, as well as surface or through-the-ground plane output configurations. The sensors are ideal for immunity testing in standards such as MIL STD-461, RS105.

The products include a 1 year warranty as standard.

Free-Field Electric Field Sensors (D-dots)

Model	Equivalent Area (Aeq)	Freq. Resp. (3 dB pt.)	Risetime (tr 10-90)	Maximum Output (peak)	Output Connector(s)	Mass
AD-20	1 x 10^{-4} m²	> 10 GHz	< 0.029 ns	+ 150 V	SMA Male	40 g
AD-40	1 x 10^{-2} m²	> 1 GHz	< 0.29 ns	+ 4 kV	GR-TCC	782 g
AD-55	3 x 10^{-3} m²	> 2 GHz	< 0.17 ns	+ 1.5 kV	SMA Male	448 g
AD-70	1 x 10^{-3} m²	> 3.5 GHz	< 0.11 ns	+ 1 kV	SMA Male	340 g
AD-80	3 x 10^{-4} m²	> 5.5 GHz	< 0.064 ns	+ 1 kV	SMA Male	260 g
AD-100	1 x 10^{-1} m²	> 350 MHz	<1.1 ns	+ 5 kV	GR-TCC	2.8 kg
AD65(R)	1 m²	> 51 MHz	6.8 ns	+/- 5 kV	Twinax GR standard	-

Ground Plane Electric Field Sensors (D-dots)

Model	Equivalent Area (Aeq)	Freq. Resp. (3 dB pt.)	Risetime (tr 10-90)	Maximum Output (peak)	Output Connector(s)	Mass
AD-S(10)	1 × 10^{-4} m²	> 10 GHz	< 0.03 ns	+150 V	SMA	16 g
AD-(10)	1 × 10^{-4} m²	> 10 GHz	< 0.03 ns	+150 V	SMA	13 g
AD-S(110)	1 × 10^{-3} m²	> 3.5 GHz	< 0.10 ns	+1 kV	SMA	70 g
AD-110	1 × 10^{-3} m²	> 3.5 GHz	< 0.10 ns	+1 kV	SMA	60 g
AD-S(30)	1 × 10^{-2} m²	> 1 GHz	< 0.35 ns	+4 kV	SMA	546 g
AD-30(A)	1 × 10^{-2} m²	> 1 GHz	< 0.35 ns	+4 kV	SMA	324 g
AD-S(60)	1 × 10^{-1} m²	> 400 MHz	< 1.0 ns	+5 kV	Type N	1.5 kg
AD-60(A)	1 × 10^{-1} m²	> 400 MHz	< 1.0 ns	+5 kV	Type N	1.3 kg

Surface Current Density Electric Field Sensors (D-dots)

Model	Equivalent Area (Aeq)	Freq. Resp. (3 dB pt.)	Risetime (tr 10-90)	Maximum Output (peak)	Output Connector(s)	Mass
SD-S10	1 × 10^{-1} m²	>130 MHz	> 2.7 ns	+ 4 kV	GR 874-L-50	1.6 kg
SD-S30	1 × 10^{-2} m²	>350 MHz	< 1.0 ns	+ 4 kV	GR 874-L-50	1.4 kg

Magnetic Field Sensors

The Prodyn magnetic field B-dot sensors are small to medium-sized high frequency sensors that measure the rate of change over time in magnetic fields. They are available in free-field, surface type and radiation hardened formats with sensitive areas of up to 0.1 m^2 or upper 3 dB points of 11 GHz. The voltage output from the probe is proportional to the rate of change of the incident magnetic field.

The products come with a 1 year warranty included.

Free-Field Magnetic Field Sensors (B-dots)

Model	Equivalent Area (Aeq)	Freq. Resp. (3 dB pt.)	Risetime (tr 10-90)	Maximum Output (peak)	Output Connector(s)
B10	1×10^{-1} m²	> 120 MHz	< 3.0 ns	± 5 kV	100 Ω Twinax (modified GR-874)
B20	1×10^{-2} m²	> 300 MHz	< 1.2 ns	± 5 kV	100 Ω Twinax (modified GR-874)
B24	9×10^{-6} m²	~ 8.5 GHz	< 0.041 ns	± 500 V	SMA Male
B60	1×10^{-3} m²	> 840 MHz	< 0.42 ns	± 2 kV	2 SMA Male
B90	2×10^{-5} m²	~ 10 GHz	< 0.35 ns	± 150 V	2 SMA Male
B100	1×10^{-4} m²	> 2.6 GHz	< 0.13 ns	± 1.5 kV	2 SMA Male
MTB-2	1×10^{-2} m²	>12.7 MHz	< 0.28 ns	± 5 kV	GR TCC Twinax

Ground Plane Magnetic Field Sensors (B-dots)

Model	Equivalent Area (Aeq)	Freq. Resp. (3 dB pt.)	Risetime (tr 10-90)	Maximum Output (peak)	Output Connector(s)
B15	1.7×10^{-6} m²	> 500 MHz	Contact us	> 400 V	100 Ω Twinax (modified GR-874)
BS25	4.5×10^{-6} m²	11 GHz	<0.032 ns	± 500 V RMS	SMA Male
BS40	1×10^{-2} m²	> 230 MHz	< 1.5 ns	± 5 kV	Type N Female
BS50	1×10^{-3} m²	> 700 MHz	< 0.5 ns	± 5 kV	Type N Female
BS70	1×10^{-4} m²	> 1.8 GHz	< 0.2 ns	± 1.5 kV	SMA Female
BS80	1×10^{-5} m²	> 5 GHz	< 0.07 ns	± 100 V	SMA Female

Model	Equivalent Area (Aeq)	Freq. Resp. (3 dB pt.)	Risetime (tr 10-90)	Maximum Output (peak)	Output Connector(s)
B30	1×10^{-1} m²	> 78 MHz	< 4.5 ns	± 5 kV	50 Ω GR-874
B40	1×10^{-2} m²	> 230 MHz	< 1.5 ns	± 5 kV	Type N Female
B50	1×10^{-3} m²	> 700 MHz	< 0.5 ns	± 5 kV	Type N female
B70(R)	1×10^{-4} m²	> 1.8 GHz	< 0.2 ns	± 1 kV	Female SMA
B80(R)	1×10^{-5} m²	7.5 GHz	< 0.045 ns	± 250 V	Female SMA

Radiation Hardened Magnetic Field Sensors (B-dots)

Model	Equivalent Area (Aeq)	Freq. Resp. (3 dB pt.)	Risetime (tr 10-90)	Maximum Output (peak)	Output Connector(s)
RB40	1×10^{-3} m²	> 300 MHz	< 1.1 ns	1.5 kV	SMA Male
RB100	2×10^{-5} m²	> 3 GHz	< 0.12 ns	1 kV	SMA Male
RB130	4×10^{-5} m²	2 GHz	< 0.5 ns	1 kV	SMA Male

Baluns and Transformers

PPM Test supplies high voltage, wide-band baluns manufactured by Prodyn. These high performance baluns are designed to convert differential outputs from free-field sensors to a single ended 50 Ω output for capture on a recording or measuring device.

The baluns are particularly well suited for use with unmatched sources such as a D-dot (open circuit) or B-dot (short circuit) where maximum clear time is required. Radiation hardened versions are also available.

Prodyn transformers are bilateral, high performance broadband transformers with coaxially shielded windings on high permeability toroidal cores. They exhibit low insertion loss and high common mode rejection and are suitable for isolation, DC blocking, balanced/unbalanced conversion and other applications, depending on the configuration.

Both products include a 1 year warranty as standard.

Balun Models by Connector

Model	Input	Output
BIB-100	SMA (Female)	SMA (Female)
BIB-101	SMA (Male)	SMA (Male)
BIB-110	GR (Twinax, TCC type)	GR (Locking)
BIB-120	Type 'N' (Female)	Type 'N' (Female)
BIB-125	Type 'N' (Female)	SMA (Female)
BIB-130	Twinax (Amphenol)	Type 'N' (Female)
BIB-135	GR (Twinax, TCC type)	Type 'N' (Female)
BIB-140	Type 'N' (Female)	Type 'N' (Male)
BIB-150	GR (Twinax, TCC type)	GR (Locking)
BIB-160	GR (Twinax, TCC type)	SMA (Female)
BIB-170	SMA (Female)	Type 'N' (Female)
BIB-180	BNC (Female)	BNC (Female)
BIB-190	TNC (Female)	Type 'N' (Female)
BIB-200	HN (Female)	HN (Female)

Balun Models by Bandwidth

Model	Bandwidth (3 db)	Insertion Loss (nominal)	Propagation Delay (nominal)	Max Input Voltage (50 ns duration)	Common Mode Rejection Ratio (dB)	Port Impedance (3 Ports)
A	10 kHz - 250 MHz	6 dB	3.2 ns	1000 V	32	50 Ω
B	15 kHz - 400 MHz	6 dB	2.2 ns	1000 V	32	50 Ω
C	20 kHz - 600 MHz	6 dB	1.9 ns	1000 V	30	50 Ω
D	22 kHz - 1.4 GHz	6 dB	1.4 ns	1000 V	30	50 Ω
E	50 Hz - 150 MHz	6 dB	5.3 ns	1000 V	36	50 Ω
F	200 kHz - 3.5 GHz	8 dB	0.6 ns	1000 V	28	50 Ω
G	250 kHz - 10 GHz	8 dB	0.6 ns	1000 V	20	50 Ω
HV	200 kHz - 3 GHz	8 dB	0.6 ns	5000 V	28	50 Ω

Isolation Transformers

Model	Configuration	Bandwidth f_t , f_3	Insertion Loss	Common Mode Rejection @ f_3	Max Voltage (50 ns pulse)	DC Isolation	Port Impedance
IT1-2A	FBGU	14 KHz, 500 MHz	10 dB	>38 dB	3 kV	3 kV	50 Ω
IT2-2A	GBFU	26 KHz, 500 MHz	10 dB	>38 dB	3 kV	3 kV	50 Ω
IT3-2A	GUFU	26 KHz, 600 MHz	10 dB	N/A	3 kV	3 kV	50 Ω
IT4-2A	GBFB	26 KHz, 600 MHz	10 dB	>38 dB	3 kV	3 kV	50 Ω

Accessories

Passive Integrators

Passive resistor-capacitor integrators are available with standard RC time constants of 0.05, 1, 5, 10 or 100 microseconds. They are available with standard connector types such as N-type, or other styles can be specified. 1 year warranty included.

Model	Input Impedance	Load Impedance	Maximum CW Pin	RC (Time Constant)	CW Accuracy (5%)	CW Accuracy (3 dB)	Mass
PI-.05	50 Ω	>1 M Ω, < 10 pF	1 W	.05 µs	150 MHz	300 MHz	100 g
PI-1	50 Ω	>1 M Ω, < 10 pF	1 W	1 µs	100 MHz	200 MHz	100 g
PI-5	50 Ω	>1 M Ω, < 10 pF	1 W	5 µs	75 MHz	150 MHz	100 g
PI-10	50 Ω	>1 M Ω, < 10 pF	1 W	10 µs	75 MHz	150 MHz	100 g
PI-100	50 Ω	>1 M Ω, < 10 pF	1 W	100 µs	20 MHz	40 MHz	100 g

Current Probe Test Devices

Probe Test Devices (PTDs) are easy to use two-piece devices designed to test and calibrate current probes larger than the spring clamp-on probes. Current is driven through the probe from one connection and is terminated on the other with a matching impedance across bandwidth of generator used, thereby drawing full load current through the probe. 1 year warranty included.

Model	Probe Aperture Diameter (in)	Connectors	VSWR with probe	Dimensions L x W x H (in)
PTD-1	0.22	Type N	-	1.25 x 2.75 x 1.5
PTD-2	0.75, 1.25	Type N	1.2:1. 0-250 MHz	4.5 x 2.5 x 4.5
PTD-3	2.62, 4.00	Type N	1.5:1, 0-150 MHz	8 x 3.2 x 8
PTD-4	0.50	Type N	-	2.25 x 2.8 x 2

Selecting a Probe

The basic parameters below will determine which product is best for any application.

- **B-dot and D-dot sensors** - frequency response (proportional to rise time) and effective area
- **Current probes** - frequency response, current handling and clamp requirement
- **Baluns** - frequency response and connector type

Useful Equations

The following equations determine voltage outputs of the sensors and current probes.

Current probe output:

$$V_{out} = Z_t \times I_{sensed}$$

where Zt = transfer impedance

D-dot output:

$$V_{out} = R\, A_{eq}\, dD/Dt$$

B-dot output:

$$V_{out} = A_{eq}\, dB/Dt$$

The equation below is used to determine frequency inversely proportional to rise time.

$$f_3 = 1/T = .35/t_r$$

Specialist Test & Instrumentation

PPM Test has been manufacturing and distributing test and measurement equipment since 1995 to support testing in:

- EMC Aircraft, including certifications
- EMP & NEMP
- HV & Utilities
- Harsh Environment.

A wide range of industries use PPM Test products, including:

- Internationally recognised UK aircraft testing organisations, such as QinetiQ and BAE Systems
- Military/Defence and Government
- National EMP test laboratories, such as RINA Consulting Defence Ltd
- The UK's Science and Technology Facilities Council.

PPM Test products support standards testing for EMC, EMP, HIRF, NEMP etc., including key standards such as:

- MIL-STD-188-125
- MIL-STD-461G
- DEF STAN 59-188
- DEF STAN 59-411.

Pulse Power & Measurement Ltd is certified to the latest ISO Standard: ISO 9001:2015.

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