

CURRENT TRANSFORMERS



SIRIM SIRIM CALIBRATION PROCEDURE
USED : CP - 446 - 355



NATA TYPE TESTED & CERTIFIED
LABORATORY REG. NO. 179

ENCASED CT

EM-1A CTME 1
EM-2A CTME 2
EM-3A CTME 3
EM-4A CTME 4
EM-4G CTME 5
CTME 6

RESIN CT

157 RM1A
167 RM2A
254 RM3A
361 RM4A
541 RM5A
641 RM6A
TCT RP1B
WCT RP2B
SCT RP3B
SCT-45 RP4B
RP5B

TAPE CT

TM-1A
TM-2A
TM-3A
TM-4A
TM-5A
TP-1A
TP-2A
TP-3A
TP-4A
TP-5A



DPI INDUSTRIES SDN BHD

Introduction

The DPI range of current transformers (CTs) incorporate the latest design technology from Australia using the most up to date softwares. Simple in design but comprehensive in range and dimensions, DPI range of current transformers provide the complete solutions to all switchboard manufacturers requirements.

The DPI range of CTs incorporates 3 basic type of design/finishing - encased, resin encapsulated and tape wound for both measurement and protection options. Dual as well as other multiple ratios are available. CTs with special requirements including Class 'X' CTs are also catered for and DPI design specialist are able to offer extensive assistance.

DPI current transformers are design and manufactured to comply with the latest International Standards including BS7626:1993, BS3938:1982, IEC185:1987, AS1675:1986, IEC 60044-1:2003

Other Features include:

- Flexible range of dimensions to cover all busbar sizes.
- Core made from High Grade Oriented Silicon Steel for optimum performance
- Easy termination on secondary terminals
- 1A or 5A secondary currents
- Range of Primary Currents up to 6000A
- Dual Ratio available for all types & range
- Other multiple ratios available on request
- Various mounting arrangements available
- Full routine tested - test results available on request

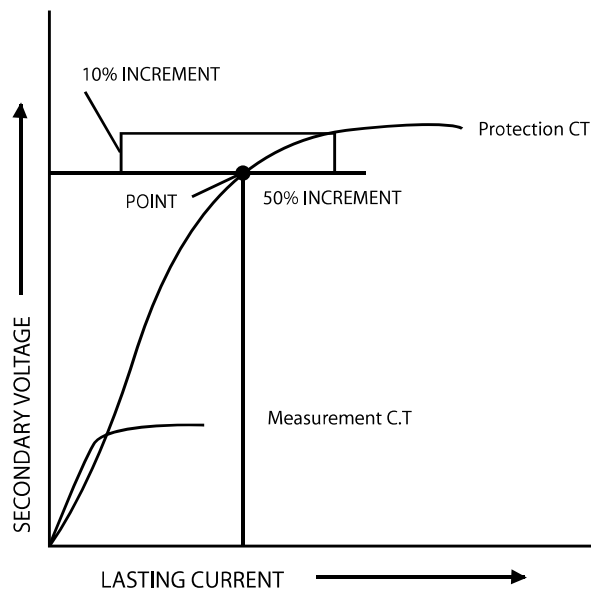


Fig 1
Typical Magnetising Characteristics of Current Transformers indication the comparison between Measurement & Protection Types

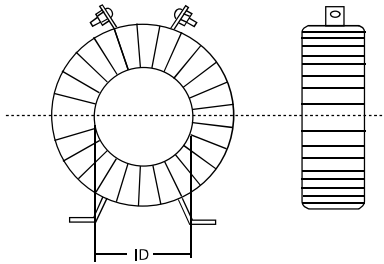
Applications of DPI Current Transformers

Measurement type CTs are required to transform the primary current at various classes of accuracy, as specified by the class designation, over a current range from 5% to 125% of its rated primary current. The design of this type of transformers requires the inclusion of a core and winding which when connected to its rated burden, will perform within the limits of errors specified by the various International Standards. It is an advantage for a Measurement Type CT to saturate above this range of primary currents to provide protection against damage to instruments by limiting the secondary current when surge currents or faults appear in the primary circuit.

Protection type CTs are required to transform the primary current to a secondary current up to a specified Accuracy Limit Factor according to the particular classification as set out in the various International Standards specifications. A protection CT is thus required to supply the transformed primary current to the external burden without saturating, even in the presence of large line faults. Typically a protection CT is able to deliver 20 times its rated current (i.e. accuracy limit factor of 20) before beginning to saturate, within limits of the composite errors. Because of this wide operating range, protection CTs tend to have larger cross sections and heavier cores in comparison to the measurement CTs. For space and economic reasons, one should avoid over specifying protection CTs. It is always absolutely critical that the protection CTs installed are able to withstand the fault currents otherwise the CTs may be damaged during a fault occurrence and the performance of the protection relays compromised. DPI protection CTs are designed taking this into consideration.

Certain applications may require Measurement type CTs with extended performance range (1% to 125%) and Protection CTs complying with certain parameters (exciting current, knee point voltage) e.g. Class 'X' CT. All these type of CTs are available from DPI on request.

Tape Wound Type Current Transformers



TAPE WOUND CURRENT TRANSFORMERS

Main features include:-

- Option of Tag terminals or insulated wire leads.
- Tough non-adhesive vulcanised PVC tape for excellent protection.
- Option for busbar or foot mounting.
- Excellent flexibility in terms of dimensional and performance requirements.

Dimensional Details (in mm)

Frame Size	ID
TM1A/TP1B	22 - 26
TM1B/TP1B	27 - 31
TM1C/TP1C	32 - 33
TM2A/TP2A	34 - 39
TM2B/TP2B	40 - 44
TM2C/TP2C	45 - 50
TM2D/TP2D	51 - 53
TM3A/TP3A	54 - 63
TM3B/TP3B	64 - 73
TM3C/TP3C	74 - 84
TM4A/TP4A	85 - 89
TM4B/TP4B	90 - 94
TM4C/TP4C	95 - 99
TM4D/TP4D	100 - 102
TM5A/TP5A	103 - 112
TM5B/TP5B	113 - 122
TM5C/TP5C	123 - 132
TM5D/TP5D	133 - 143
TM6A/TP6A	144 - 153

Tape Wound Measurement Current Transformers

5 standard sizes (TM1A to TM5A) for primary currents from 50A to 6000A. Accuracy classes from 0.2, 0.5, 1, 3, 5 & Specials.

Frame Size	Ratio	VA	Class 5					Class 3					Class 1					Class 0.5									
			2.5	3	4	5	7.5	2	3	4	5	7.5	2	3	4	5	7.5	2	3	4	5	7.5	2	3	4	5	7.5
TM1A	50/5A																										
	60/5A																										
	75/5A																										
	100/5A																										
	150/5A																										
TM2A	75/5A																										
	100/5A																										
	150/5A																										
	200/5A																										
	300/5A																										
	500/5A																										
TM3A	300/5A																										
	400/5A																										
	500/5A																										
	600/5A																										
	800/5A																										
	1200/5A																										
TM4A	600/5A																										
	800/5A																										
	1000/5A																										
	1200/5A																										
	1600/5A																										
	2500/5A																										
TM5A	1600/5A																										
	2000/5A																										
	2500/5A																										
	3000/5A																										
	4000/5A																										
	6000/5A																										

Performance chart determined in accordance to IEC60044-1:2003 based on 5A secondary.

- Indicates the performance specifications which can be achieved by the particular frame size at that particular ratio.
- Indicates standard stock CT for that particular frame size & ratio.

Tape Wound Protection Current Transformers

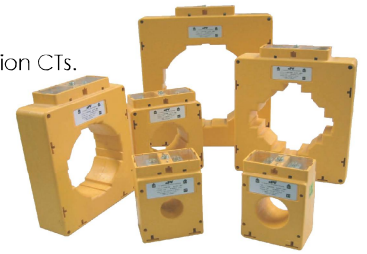
5 standard sizes (TP1A to TP5A) for primary currents from 50A to 6000A. Accuracy classes from 5P, 10P & Specials.

Frame Size	Ratio	VA	Class 10P10					Class 5P10					Class 10P15					Class 5P15					Class 10P20					Class 5P20				
			2.5	3	4	5	7.5	2.5	3	4	5	7.5	2.5	3	4	5	7.5	2.5	3	4	5	7.5	2.5	3	4	5	7.5	2.5	3	4	5	7.5
TP1A	50/5A																															
	60/5A																															
	75/5A																															
	100/5A																															
	150/5A																															
TP2A	75/5A																															
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	150/5A																															
	200/5A																															
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	1200/5A																															
TP4A	600/5A																															
	800/5A																															
	1000/5A																															
	1200/5A																															
	1600/5A																															
	2500/5A																															
TP5A	1600/5A																															
	2000/5A																															
	2500/5A																															
	3000/5A																															
	4000/5A																															
	6500/5A																															



ENCASED MEASUREMENT CURRENT TRANSFORMERS (CTME Series)

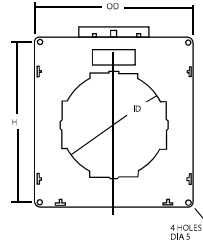
Both measurement and protection CTs are available with the encased range. They are the EM_CT range of encased measurement CTs and the EP_CT range of encased protection CTs.



Main features include:-

- Tough & robust being made from high impact flame retardant materials and can be mounted directly on busbars operating at temperature of 105°C
- Clear terminal cover with sealing facility as standard for all frame sizes.
- Choice of mounting arrangements - foot or busbar.
- Choice of terminations - direct clamp of cable or cable lug
- Choice of cable direction with knockouts provided in terminal shrouds.
- Clip-on mounting feet and busbar clamps available on request at no extra charge

Dimensional Details (in mm)



Frame Size	OD	ID	H
CTME1	65	22	87
CTME2	65	33	87
CTME3	97	51	115
CTME4	128	82	157
CTME5	147	102	175
CTME6	192	126	220

☐ Indicates the performance specifications which can be archived by the particular frame size at that particular ratio.

■ Indicates standard stock CT for that particular frame size & ratio.

Frame Size	Ratio	Class 5					Class 3					Class 2					Class 1					Class 0.5								
		VA	2	2.5	3	5	7.5	2	2.5	3	5	7.5	2	2.5	3	5	7.5	2	2.5	3	5	7.5	2	2.5	3	5	7.5	10	15	
CTME1	50/5A																													
	60/5A																													
	75/5A																													
	100/5A																													
CTME2	75/5A																													
	100/5A																													
	150/5A																													
	200/5A																													
	250/5A																													
	300/5A																													
CTME3	150/5A																													
	200/5A																													
	300/5A																													
	400/5A																													
	500/5A																													
	600/5A																													
	750/5A																													
	800/5A																													
CTME4	300/5A																													
	400/5A																													
	600/5A																													
	630/5A																													
	750/5A																													
	800/5A																													
	1000/5A																													
	1200/5A																													
	1250/5A																													
	1500/5A																													
	1600/5A																													
	2000/5A																													
CTME5	1000/1A																													
	1250/1A																													
	1600/1A																													
	2000/1A																													
	2500/1A																													
	2500/5A																													
CTME6	1500/5A																													
	1600/5A																													
	2000/5A																													
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	3200/5A																													
	4000/5A																													
	2000/1A																													

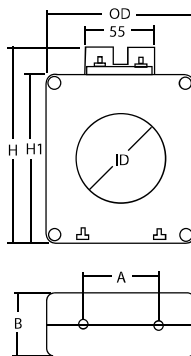


ENCASED MEASUREMENT CURRENT TRANSFORMERS (EM Series)

Both measurement and protection CTs are available with the encased range. They are the EM_CT range of encased measurement CTs and the EP_CT range of encased protection CTs.

Main features include:-

- Tough & robust being made from high impact flame retardant materials and can be mounted directly on busbars operating at temperature of 105°C
- Clear terminal cover with sealing facility as standard for all frame sizes.
- Choice of mounting arrangements - foot or busbar.
- Choice of terminations - direct clamp of cable or cable lug
- Choice of cable direction with knockouts provided in terminal shrouds.
- Clip-on mounting feet and busbar clamps available on request at no extra charge



Dimensional Details (in mm)

Frame Size	OD	ID	H	H1	A	B
EM-1A	73	22	117	87	33	44
EM-2A	73	34	117	87	33	44
EM-3A	104	62	148	118	54	44
EM-4A	134	84	178	148	84	44
EM-4C	140	101	181	156	84	44
EM-4G	155	110	195	170	104	44
EM-5A	197	134	238	211	147	74



Indicates the performance specifications which can be archived by the particular frame size at that particular ratio.

 Indicates standard stock CT for that particular frame size & ratio.

 Indicates performance of the encased CTs achieved by using Spacers.

Frame Size	Ratio	VA	Class 5					Class 3					Class 1					Class 0.5				
			2.5	3	4	5	7.5	2	3	4	5	7.5	2	3	4	5	7.5	2	3	4	5	7.5
EM1A	50/5A																					
	60/5A																					
	75/5A																					
	100/5A																					
	150/5A																					
			2.5	5	7.5	10	15	2.5	5	7.5	10	15	2.5	5	7.5	10	15	2.5	5	7.5	10	15
EM2A	75/5A																					
	100/5A																					
	150/5A																					
	200/5A																					
	300/5A																					
	400/5A																					
500/5A																						
			2.5	5	7.5	10	15	2.5	5	7.5	10	15	2.5	5	7.5	10	15	2.5	5	7.5	10	15
EM3A	300/5A																					
	400/5A																					
	500/5A																					
	600/5A																					
	800/5A																					
	1000/5A																					
1200/5A																						
			2.5	5	7.5	10	15	2.5	5	7.5	10	15	2.5	5	7.5	10	15	2.5	5	7.5	10	15
EM4A	600/5A																					
	800/5A																					
	1000/5A																					
	1200/5A																					
	1600/5A																					
	2000/5A																					
2500/5A																						
			2.5	5	7.5	10	15	2.5	5	7.5	10	15	2.5	5	7.5	10	15	2.5	5	7.5	10	15
EM5A	1600/5A																					
	2000/5A																					
	2500/5A																					
	3000/5A																					
	4000/5A																					
	5000/5A																					
6500/5A																						
			2.5	5	7.5	10	15	2.5	5	7.5	10	15	2.5	5	7.5	10	15	2.5	5	7.5	10	15

Encased Protection Current Transformers

Frame Size	Ratio	VA	Class 10P10					Class 5P10					Class 10P15					Class 10P20					Class 5P20				
			2.5	5	7.5	10	15	2.5	5	7.5	10	15	2.5	5	7.5	10	15	2.5	5	7.5	10	15	2.5	5	7.5	10	15
EP3A	300/5A																										
	400/5A																										
	500/5A																										
	600/5A																										
	800/5A																										
	1000/5A																										
1200/5A																											
			2.5	5	7.5	10	15	2.5	5	7.5	10	15	2.5	5	7.5	10	15	2.5	5	7.5	10	15					
EP4A	600/5A																										
	800/5A																										
	1000/5A																										
	1200/5A																										
	1600/5A																										
	2000/5A																										
2500/5A																											
			2.5	5	7.5	10	15	2.5	5	7.5	10	15	2.5	5	7.5	10	15	2.5	5	7.5	10	15					
EP5A	1600/5A																										
	2000/5A																										
	2500/5A																										
	3000/5A																										
	4000/5A																										
	5000/5A																										
6000/5A																											
			2.5	5	7.5	10	15	2.5	5	7.5	10	15	2.5	5	7.5	10	15	2.5	5	7.5	10	15					

Specifications Current Transformers Selection Guide



Guide to Selection of protection systems, of which the current transformers constitute a vital part, can be complex. Our suggested rating for these applications should be treated with caution as they may be subjected to variations due to relay characteristics or to components of the scheme. Relay manufacturer's recommendation should be followed.

General Type of Relay	Protection System	Typical C.T. Requirement		
		Burden (VA)	Class	Accuracy Limit Factor (ALF)
Magnetic Trips	Overcurrent	2.5 - 5	10P	5
Magnetic O/L with dashspot	Motor overcurrent with time relay	5	10P	5 - 10
Some low consumption thermal types	Motor overcurrent with time relay	2.5	10P	10 to 15
Thermal	Motor overcurrent with time delay	7.5	10P	10 to 15
Inverse Definite Min. Time relays (I.D.M.T)	Overcurrent	15	10P	10 to 15
I.D.M.T Earth Fault Relay	Unrestricted earth fault with approx. time grading	15	10P	10
I.D.M.T Earth Fault Relays	Unrestricted earth fault where phase fault stability or accurate time grading required	15	5P	10

Burden Guide for Measuring Instrument

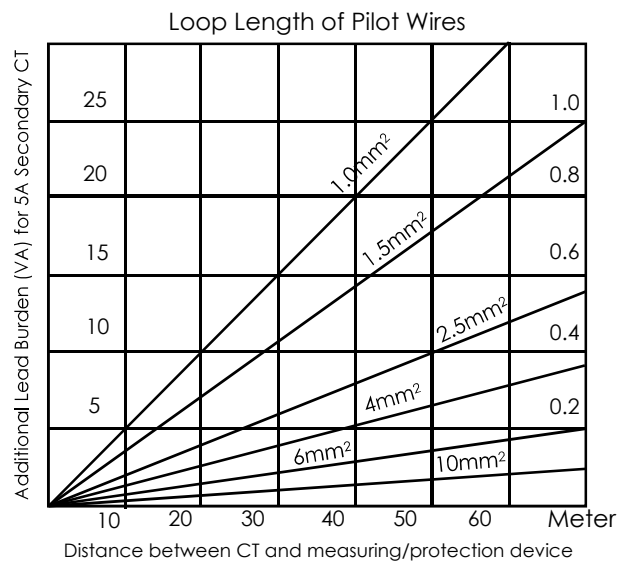
VA	Instrument
0.5	Short scale moving iron ammeters
0.75 to 1.5	240o scale moving iron ammeters
0.1 to 1	Rectified moving iron ammeters
1 to 1.25	Watt/VAr/phase angle meters
2 to 4	Recording ammeters
2 to 3.5	Maximum Demand Indicators
3 to 3.5	Combined MDI & MI ammeters
0.5 to 4	Paladin transducer
0.5 to 4	Protector modules
5 to 10	Electronic control system

Burden Guide for Measuring Instrument

Application	Class of Accuracy
As a standard for testing other current transformers	Better than 0.1
Precision testing	0.1
Precision metering	0.1 or 0.2
Tarif metering (bulk supplies)	0.2
Tarif metering (general), transducers, test equipment, control systems	0.5
Watt/VAr/Phase Angle meters, recording meters, protection devices	1
Industrial ammeters, maximum demand indicators	1 to 3
Approximate measurements	5

Secondary Lead Burden

The impedance of the pilot wire between the CT and Relay/Instrument will add to the total burden of the measurement of protection circuit. The impedance and hence burden can be significant for long pilot wire run and must be taken into account. This is particularly critical for class 'X' CTs. It may be advisable to use 1A secondary for extremely long pilot wire run. The chart below shows the approximate additional burden that must be added to the total CT burden for various sizes of pilot wires at varying distances.



Performance Data (to BS7626:1993, BS3938:1982, IEC185:1987 & AS1675:1986)

	Encased	Resin Encapsulted	Tape Wound
Temperature Range 0C	-20 to +70	-20 to +80	-40 to +75
Insulation Class	B	E	B
Dielectric Strength kV/min	2.5	2.5	2.5
Nominal Frequency Hz	50/60	50/60	50/60
Nominal Strenght (A.C primary) V	660	660	660
Degree of Protection	IP40	IP40/IP00	IP00
Rated Short Circuit Thermal Current (Ith)	60 X rated primary current for 1 second		
Rated Dynamic Current (Idyn)	2.55 X Ith		

Ordering Information

General information required when ordering DPI CTs:

- Current Ratio/Ratios (Primary/Secondary currents)
- Accuracy Class & Burden at each ratios
- Dimensional Restrictions
- Voltage of System
- Preferred Finish (Encased, Tape Wound or Resin Encapsulted)
- Required Short Time and Short Time Current
- Relevant International Standards
- Mounting Accessories
- Any other special requirement

Special CTs (Class 'X')

The selection charts show the standard range of DPI CTs. However Special CTs are available due to the highly flexible manufacturing facilities at DPI. These CTs can be designed and manufactured to meet individual requirements.

Additional information required for Special CTs:

- Knee Point Voltage
- Exciting Current at knee point voltage
- Resistance of CT secondary windings at 75oC
- Burden of pilot wire loop resistance (from CT to device)
- Any other special requirement

Safety Precautions

It is important to ensure that the secondary terminal of the current transformer is not open circuited while the primary supply is energised. Otherwise a high voltage will be developed between the secondary terminals. The secondary terminals should be shorted if the CT is not in use.



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