



# **Low Voltage Current Transformer Metering Installation Mandatory Requirements (NSW)**

<b>Title</b>			
<b>Low Voltage Current Transformer Metering Installation Mandatory Requirements (NSW)</b>			
<b>Document Number:</b>	PMPP 13	<b>Author:</b>	Metering Assets & Compliance Lead
<b>Document Version:</b>	2	<b>Approved by:</b>	Head of Metering
<b>Document Owner:</b>	Engineering	<b>Issue date:</b>	7/05/2020

## Contents

1	DISCLAIMER .....	3
2	SCOPE .....	4
3	INTRODUCTION .....	4
4	LOW VOLTAGE CURRENT TRANSFORMER REQUIREMENTS .....	4
	4.1 Principles of LVCT Selection and Installation.....	5
	4.2 Rating of LVCT for the Switchboard .....	5
	4.3 PLUS ES Supplied LVCT's.....	5
	4.4 Specification for LVCT's not supplied by PLUS ES.....	5
	4.5 Current Transformer Test Results .....	6
5	INSTALLATION DETAILS .....	6
	5.1 CT metering Test Block requirements.....	6
	5.2 LVCT Secondary Conductors.....	7
	5.3 CT Chamber .....	7
6	PLUS ES SUPPLIED CURRENT TRANSFORMERS.....	9
	6.1 Dimensions .....	9
	6.2 Sales .....	9
7	REFERENCES .....	9
8	DOCUMENT HISTORY .....	10

## 1 DISCLAIMER

***By receiving these requirements, you agree to be bound by the terms set out below.***

*This policy contains information which may be subject to copyright and may not be published in whole or in part for any purpose without prior written consent from PLUS ES.*

*No representation, warranty or undertaking, express or implied, is made as to, and no reliance should be placed on, the accuracy, completeness or correctness of the information contained in this policy or any further information supplied by PLUS ES in connection with these matters. To the maximum extent permitted by law, neither: PLUS ES; nor (a) any entity which (i) directly or indirectly controls PLUS ES, (ii) is directly or indirectly controlled by PLUS ES, or (iii) is under common control with PLUS ES; nor (b) the respective members, directors, officers, employees, agents, affiliates, advisers or representatives of the entities in paragraphs (a) and (b), ("Group Members") nor any other person accepts any liability for any loss arising from or in connection with this policy including, without limitation, any liability arising from fault or negligence.*

*The information and opinions contained in this policy in relation to the business and operations of PLUS ES constitutes the sole judgment of PLUS ES as at the date of this policy and are subject to change without notice. No Group Member has independently verified the information contained in this policy. There is no obligation on PLUS ES or any other person to update, modify or amend this policy or otherwise to notify you if any information, opinion, projection, forecasts or estimate set forth herein, changes or subsequently becomes inaccurate. Certain of the information contained herein is or may be based upon or derived from information provided by third-parties. No Group Member guarantees the accuracy of such information. To the maximum extent permitted by law, each Group Member: (i) limits its liability for any loss arising out of or in connection with this policy (including liability for breach of contract, for tort including negligence or on any other legal basis) to \$100 in aggregate, and (ii) excludes liability for any and all indirect, consequential, special, exemplary or special losses, or for any loss of profits, loss of data, loss of use, or loss of business opportunity.*

## 2 SCOPE

This publication provides technical information describing PLUS ES mandatory requirements for the configuration of customer switchboards employing Low Voltage Current Transformer (LVCT) metering.

## 3 INTRODUCTION

Since the introduction of the Power of Choice reforms and associated National Electricity Rules (NER) changes of December 2017, the role of the electricity distributor has retracted from defining metering obligations and, instead, handing this obligation to other market participants. In some jurisdictions, such as NSW, the metering installation is defined as being part of the customer's electrical installations where Type 4 contestable metering is installed. As such, the definition of metering requirements is no longer the role of the Network.

Instead, the NER places the responsibility for the installation, maintenance and correct and accurate operation of the Metering Installation, on to the Metering Coordinator and Metering Provider roles.

The NER defines the Metering Installation to include current transformers, testing facilities and secondary wiring, security and protection - in addition to the meter and communications equipment.

Because current transformers are incorporated into the customer's electricity infrastructure – and are typically owned by the customer – it is important to specify a metering design arrangement that can be prepared and built by the customer's electrical contractor and can comply with the obligations of the NER, in anticipation of the Metering Provider's involvement in the customer's electrical installation.

This document serves the purpose to define such requirements to the customer's electrical contractor to ensure that the metering installation is suitable for NER compliance.

All correspondence should be directed to:

Manager Metering Assets & Technology - PLUS ES  
48-50 Holker Street Silverwater NSW 2128 AUSTRALIA  
MP@pluses.com.au

## 4 LOW VOLTAGE CURRENT TRANSFORMER REQUIREMENTS

This document is written in response to Clause 2.12 of the Metering Equipment Annexure of the Service & Installation Rules of New South Wales July 2018. The Annexure states that “...*the customer must provide...current transformers...in accordance with the requirements of these rules and the MP...*”.

The Metering Provider (MP) requirements include maintaining compliance with the National Electricity Rules Clause S7.2.1(d) of the NER states that “A Metering Provider must ensure that any metering equipment it installs is suitable for the range of operating conditions to which it will be exposed (e.g. temperature; impulse levels), and operates within the defined limits for that equipment”

The following information describes PLUS ES Metering Provision (MP) specifications for low voltage current transformers. The scope of this document presently details three phase, low voltage (230/400V) metered connections with maximum current between 80A and 4000A.

In conjunction with this, low voltage current transformer metering installations should also be built in accordance with the full requirements of the Service & Installation Rules of New South Wales July 2018, the referenced Metering Equipment Annexure and where applicable, AS3000 Wiring Rules

PLUS ES reserves the right to decline the metering of electrical installations that do not comply with these requirements.

## 4.1 Principles of LVCT Selection and Installation

Low Voltage Current Transformers (LVCT's) are selected and installed such that:

- (1) The CT's are rated to accommodate the maximum current capacity of the switchboard, and robustly built, to better ensure they are suitable for the life of the switchboard;
- (2) The CT's with secondary circuits, will comply with the accuracy requirements of the National Electricity Rules up to the maximum current capacity of the switchboard;
- (3) The CT's are installed to facilitate safe in-service testing, and
- (4) Are chosen from National Electricity Market (NEM) recognised standard ratio families to satisfy long term asset management obligations.

## 4.2 Rating of LVCT for the Switchboard

The correct CT ratio must be selected to ensure correct operation for the life of the switchboard in which they are installation. For three phase low voltage (230/400V) circuit metered with CT, that:

- The maximum current is no greater than the maximum of the accuracy range of the CT; and
- The associated submain protection is no greater than the maximum of the accuracy range of the CT.

## 4.3 PLUS ES Supplied LVCT's

PLUS ES makes available for sale LVCT's of standard NEM LVCT family categories which comply with, are type tested and have available individual routine tests result compliant with AS60044.1–2007 class 0.5S. The following table details the available LVCT's and PLUS ES approved method of application:

CT Selection	Acceptable Range for Maximum Load Current	Applicable Maximum Submain Protection Setting
S type 200/5 Extended 200% & 5VA burden rating	>80 to 400A	400A
T Type 800/5 Extended 200% & 15VA burden rating	> 200 to 1600A	1600A
W Type 1500/5 Extended 200% & 15VA burden rating	>800 to 3000A	3000A
U Type 2000/5 Extended 200% & 15VA burden rating	>1500 to 4000A	4000A

**Table 1 Current Transformer Selection**

**Warning** – the application of LVCT's at their maximum 200% extended range eliminates any scope for load growth. If the customer's future load exceeds the maximum acceptable load current for the CT, the metering installation becomes non-compliant with the NER, and the LVCT's will require upgrade. Therefore, it is strongly recommended to select the higher LVCT ratio which offers a margin for future load growth.

## 4.4 Specification for LVCT's not supplied by PLUS ES

- CT burden rating for 5A secondary CT's is 15VA and minimum acceptable burden rating is 5VA.
- The CT must be a Class 0.5S and built to and design type tested to full compliance with AS60044.1–2007, with evidence of such compliance through the availability of type test certificates supplied from a laboratory accredited by NATA or other Accreditation Body that is a signatory of the ILAC MRA.

- The CT must not be of split-core construction.
- Individual phase and amplitude accuracy test results must be supplied, with the testing (a) carried out in accordance with AS60044.1-2007 (b) with the results traceable and sourced from a laboratory that is qualified under ISO/IEC 17025 General requirements for the competence of testing and calibration laboratories and is accredited for that qualification by NATA or another accreditation body that is a signatory of the ILAC MRA and (c) to a measurement uncertainty of  $\pm 0.1\%$  for the amplitude error and  $\pm 0.1$  crad for the phase error, based on a 95% confidence level.
- Each CT's Certificate of Compliance must detail the individual test results, references to the laboratory qualifications and a report number to uniquely identify the Certificate.
- The individual CT test results must include test points of: 1%, 5%, 20%, 100%, 120% and maximum extended range, of rated current and tested at both 25% rated burden and 100% rated burden (Power Factor of burden 0.8).
- The terminals have double-ended tunnel types with two (2) screws at each end and capable of accepting 2.5mm<sup>2</sup> to 10mm<sup>2</sup> stranded cable, have a transparent, sealable cover, with terminal assemblies manufactured from either copper or brass

## 4.5 Current Transformer Test Results

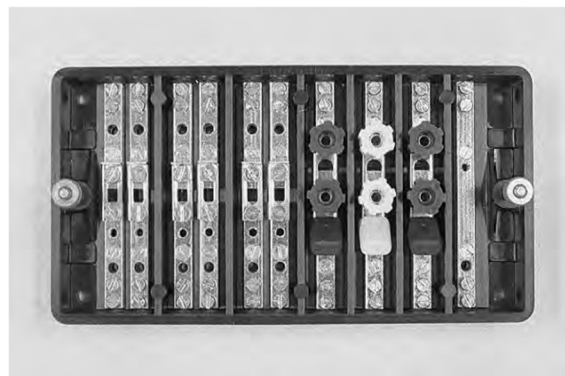
Prior to PLUS ES commissioning metering on the site, forward CT details including type test certificates and individual CT routine test results and installation details, where available, to [mp@pluses.com.au](mailto:mp@pluses.com.au) for review and approval.

## 5 INSTALLATION DETAILS

### 5.1 CT metering Test Block requirements

In addition to the requirements detailed in the clause 2.14.4 of the Annexure to Service and Installation Rules of New South Wales July 2018, the meter test block shall be:

- ESAA pattern or otherwise PLUS ES approved equivalent;
- Located on the front of the metering panel;
- Covered with transparent, sealable cover;
- Installed such that: (a) the voltage slide link will fall to the open position if released; and (b) the current slide link will fall to the closed position if released; and (c) current and voltage conductors that route from the CT chamber, enter the bottom of the test block.



PLUS ES makes available for sale Test Blocks compliant with this document.



## 5.2 LVCT Secondary Conductors

- Individual cables must be individually identifiable along entire length (i.e. numbered or coloured)
- The maximum route length of secondary conductors of 5A secondary rated LVCT's shall be as follows:

Conductor csa (mm <sup>2</sup> )	CT with 5VA Rated secondary circuit (m)	CT with 15VA rated secondary circuit (m)
2.5	10	20
4	16	32
6	25	55
10	40	90

**Table 2 LVCT Secondary Route Lengths**

## 5.3 CT Chamber

Chamber must be so designed as to allow adequate and safe access without exposure to live parts. Critical requirements include, but are not limited to the following:

- CT chamber must be segregated from other equipment. No other part of the electrical installation, including other measuring instruments, control devices or MEN connections, are permitted within the CT enclosure;
- CT's and their associated potential fuses located are located within the CT chamber;
- Labelling "Revenue Metering Current Transformers" located on the outside of the CT chamber;
- Access to CT chamber is via doors or access covers that are easily and safely opened or removed. If hinged, they must be capable of opening to 90 degrees. If removable, they must be fitted with two handles for safe removal;
- Doors and access panels must have provision for sealing;
- Access to current transformers or voltage circuit fuses must be possible without interruption to supply;
- CT secondary terminals and potential fuses must be positioned:
  - no lower than 500 from ground or floor; and
  - no higher than 1800 from ground or floor.
- CT's must be fitted over removable sections of busbar;
- Chamber dimensions achieving at least:
  - 100mm clearance between removable busbar and chamber opening;
  - 100mm clearance between outer CT's and chamber opening;
  - 50mm clearance between individual CT's (in-line and staggered mounting);
  - 50mm clearance between individual CT and adjacent busbar (staggered mounting);

- All live low voltage parts within the chamber must be individually insulated, with bolted busbar or cable connections covered with non-adhesive insulation that can be temporarily removed for access to connections;
- Current transformers must be installed with bolts, washers and nuts to facilitate removal and installation;
- Voltage circuit fuse block must be:
  - located within CT chamber, in an area between primary conductors and chamber opening with at least 75mm clearance between rear of fuse block and primary conductors;
  - positioned so as not to obstruct access to the CT secondary terminals;
  - positioned enable the fuse wedge to be withdrawn towards the operator; and
  - fixed into position such as to prevent fuse movement of the fuse bases;
- Voltage circuit supply conductors on the line side of fuse block must be:
  - as short as practicable, in no case exceed 500mm in length; and
  - double insulated, 7 stranded, minimum of 4mm<sup>2</sup> cross section, without joints, colour coded, sleeved and terminated at sealable 10A HRC fuses.
- LVCT secondary conductors must be insulated and sleeved



## 6 PLUS ES SUPPLIED CURRENT TRANSFORMERS

### 6.1 Dimensions

PLUS ES supplied, for sale, LVCT's comply with the requirements specified in this document and have the following overall dimensions:

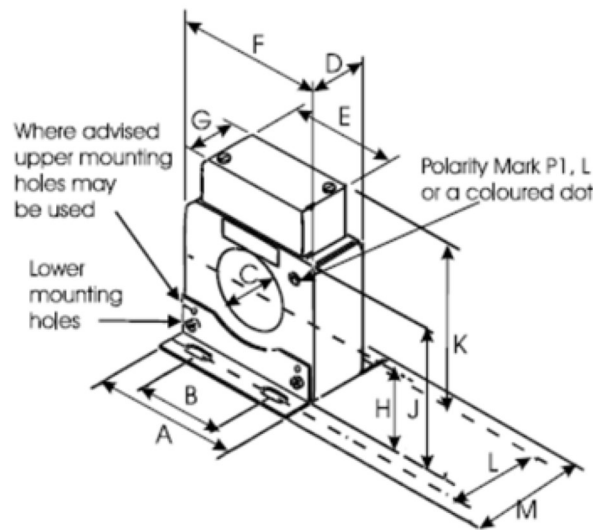


diagram c/o NSW SIR

Dimensions (mm)	A	B	C	D	F	H	K	L	M
S Type	114	75	45	58	114	65	169	80	105
T Type	165	75	85	60	165	85	214	80	107
W Type	165	75	112	65	165	85	218	80	107
U Type	240	190	170	57	248	134	311	123	159

### 6.2 Sales

PLUS ES supplied LVCTs and test blocks can be purchased through the PLUS ES web site

## 7 REFERENCES

- National Electricity Rules
- Metering Equipment Annexure of the Service & Installation Rules of New South Wales July 2018
- AS3000