CURRENT TRANSFORMER (CT) INSTALLATION INSTRUCTIONS

SAFETY

CTs are installed in systems were lethal voltages are present. CTs should only be installed or maintained by competent individuals. After reviewing the risk for any particular installation all required precautions should be taken.

CTs can produce high voltages on the secondary terminals if power is applied to the primary whilst they are in an open circuit condition. This may pose a hazard and can even damage the CT itself. If a CT must be installed without the secondary wiring connections made, a shorting link should be installed between the secondary connections.

(even small CTs can develop >1kV, large windings with lots of turns can develop >10kV)

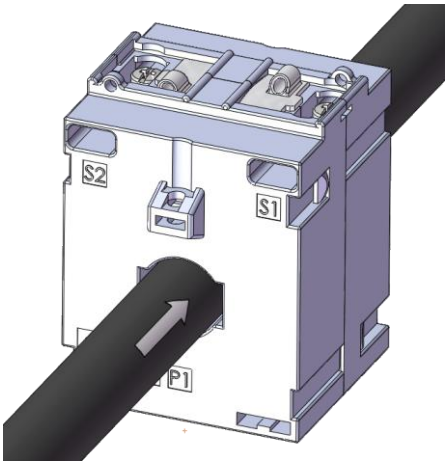
CTs should never be left with an open circuit secondary winding.

Where connections are made to a wound primary, these should be insulated correctly as they carry the full system voltage and current.

Work with caution and apply common sense, there may be risks other than those detailed above, for instance large CTs can be heavy, high ratio CTs may get uncomfortably hot during operation.

GENERAL INSTALLATION INSTRUCTIONS

1) Install the CT to the primary connection, on most CTs this means passing the primary conductor through the aperture in the CT. If the CT is installed onto a system that is powered, or there will be a delay before making the secondary connections, install a link of wire to short out the secondary terminals, only remove it when final secondary connections are made. Never allow the CT secondary to become open circuit when current is flowing though the primary,
    a. Occasionally some CTs require multiple turns of the primary conductor to give the correct ratio, this will be indicated by a label on the side of the CT. If the number of turns of the primary conductor is incorrect then the final ratio will be incorrect.
    b. Some CTs have wound primary connections in this case the primary connections must be connected directly in circuit with the current to be measured.
    c. Multi-Ratio CTs have several secondary connections. If some of these connections are unused they must be left open circuit during normal operation.
2) Ensure the CT is installed such that the P1 primary connection faces the power source
3) For measurement, and most protection applications ensure, that the CT is installed around a single conductor. If a CT is installed with both live and neutral conductors passing through the aperture, then no current will be measured under normal working conditions.
    a. For protection applications where the CT is connected to an Earth leakage relay the neutral conductor and ALL of the live conductors must be passed through the CT aperture, the Earth connection must NOT be passed through the CT.
4) Use a suitable fixing method to secure the CT in the correct position around the primary conductor
5) Do not force the CT over the primary conductor as this could damage the insulation on the CT
6) Allow for a reasonable clearance on the outside of the CT, do not force between adjacent conductors
7) Make the secondary connections using the shortest usable length of a suitable sized cable. Select the cable diameter in accordance with the required length so as not to over burden the CT
8) Observe the wiring polarities for the specific installation.



POWER COMING FROM THE SOURCE MUST GO THROUGH THE P1 SIDE FIRST, IN ORDER MAINTAIN CORRECT POLARITY

SPLIT CORE CTS

Ensure that the mating faces of the CT core are clean and free from damage and debris before mating the two halves of the CT together. To ensure stated performance the sections of core must be properly aligned, and the clamping mechanism is done up tightly.

PROTECTIVE CTS

It is essential that adequately sized cable is used and that the CT is not overburdened, the cable used for the secondary connections must be capable of supporting the secondary fault current for at least the duration of the fault.

SUMMATION CTS

Summation CTs should be used when it is not practical to have a single high ratio CT, summation CTs are typically used with a number of Primary CTs

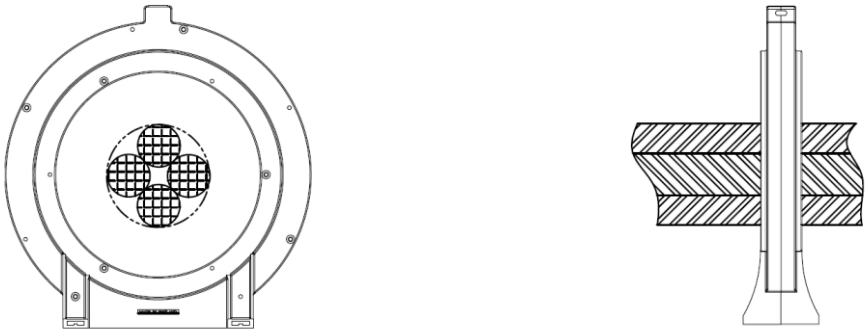
Summation CTs can only be used across a single phase, they cannot sum across multiple phases. If summation needs to be done on multiple phases, then multiple summation CTs are required.

Polarity must be observed, if a primary CT is wired with the wrong polarity to summation CT its current will be subtracted from the total.

If All of the primary CTs do not all have the same ratio, a special summation CT is required. On installation the Primary CTs must be wired to the correct input terminals on the summation CT or the resulting sum will be incorrect.

CORE BALANCE CTS

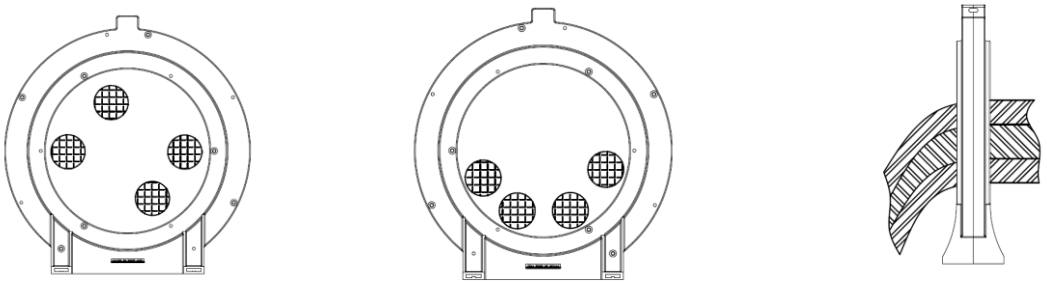
A core balance CT is used with an earth leakage relay to detect earth leakage faults. Ensure that the CT is correctly sized for the relay being used. All Live conductors and the neutral conductor must be passed through the CT, the Earth conductor must remain OUTSIDE the CT.



IDEAL CONDUCTOR PLACEMENT

Best performance will be achieved if the conductors are placed as centrally as possible with an air gap between the conductors and the CT approximately the same width as conductor grouping

Conductors should pass straight through the middle of the CBCT without bends close to the surface of the CBCT



CONDUCTOR PLACEMENT NOT IDEAL

The larger the CBCT aperture the higher phase current can be used (without spurious tripping) but the less sensitive it will be to very low fault currents. The table below gives some guide values for phase current and minimum trip threshold. These values are suggestions but if you deviate from them please test the set up first with your equipment, the current magnitudes listed are based on the trip threshold listed, higher currents may be used be increasing the threshold at which the relay trips.

Model	Recommended Max Phase current	Overload current	Suggested Min Trip Threshold
	A	A	mA
CTB35	65	400	30
CTB50	85	500	30
CTB70	160	1000	30
CTB120	250	1500	100
CTB160	320	2000	100
CTB210	400	2400	300

SPECIFIC INSTALLATION INSTRUCTIONS

POLARITY MARKINGS

Most Hobut CTs are labelled as per IEC61869-2 using the P1 – P2: S1 - S2 nomenclature, the table below gives cross reference to some common alternative terminal marking standards.

Standard	Primary		Secondary	
IEC61869-2	P1	P2	S1	S2
IEEE C57.13	H1	H2	X1	X2
	K	L	k	l

P1 should face towards the power source, P2 should face towards the load.

CTs with multiple secondary ratios will be marked S1,S2,S3….

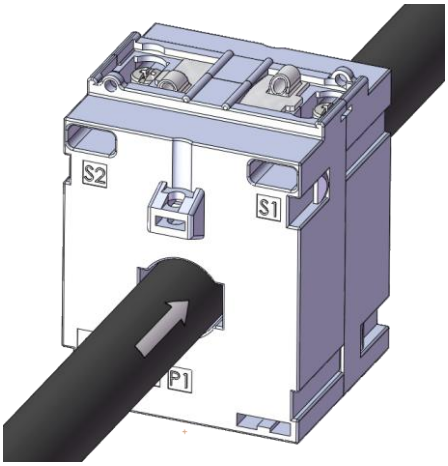
CTs with multiple cores or windings will be marked 1S1,1S2 (first core secondary connections 1 and 2) 2S1, 2S2 (second core secondary connections 1 and 2) and so on

Always follow the polarity markings on the CT, as a standard Hobut CTs are constructed as follows. *Please be aware that this can change for bespoke CTs, CTs with multiple windings and by customer request.*

MOULDED CASE CTS

Polarity markings are moulded into the case. Facing the CT on the P1 side, S2 will be the left hand terminal, S1 will be the right hand terminal.

Ensure 2 – 3mm minimum air gap on outside surfaces of the CT, do not install with zero clearance.

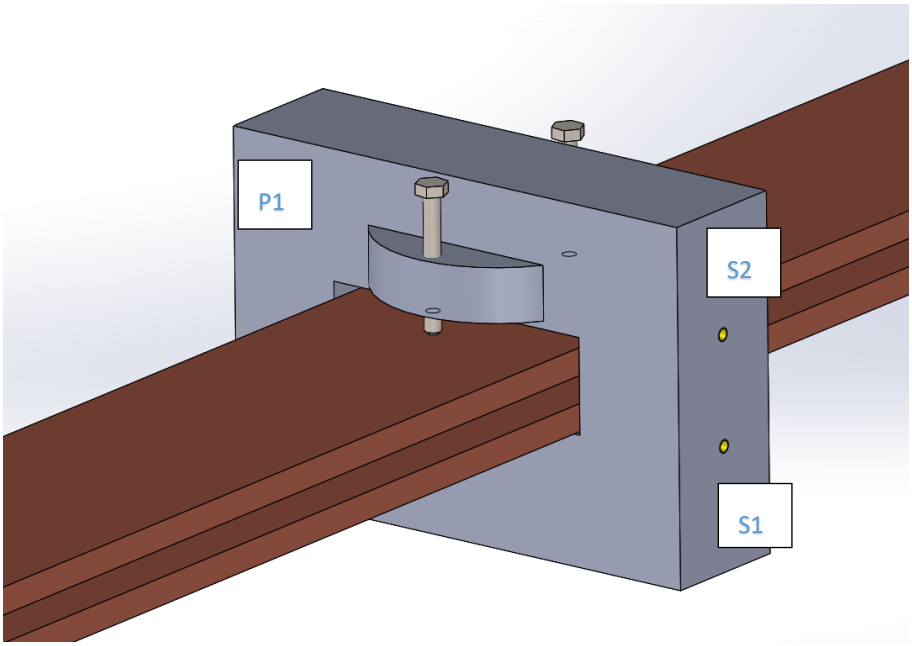


RING TYPE CTS

Polarity markings are applied onto the CT after construction. Unless otherwise specified facing the CT on the P1 side, S2 will be the left-hand terminal, S1 will be the right-hand terminal.

RESIN ENCAPSULATED CTS

Polarity markings are applied onto the CT after construction – due to the bespoke nature of encapsulated resin transformers terminal location and polarity will be as specified when ordering. If no polarity configuration is specified facing the CT on the P1 side, S2 will be the left-hand terminal, S1 will be the right-hand terminal.



CTS WITH CABLE CONNECTION

Some CTs most often ring type CTs and split core CTS come with cabled connections, for CTs with more than 2 wire you must refer to the labels.

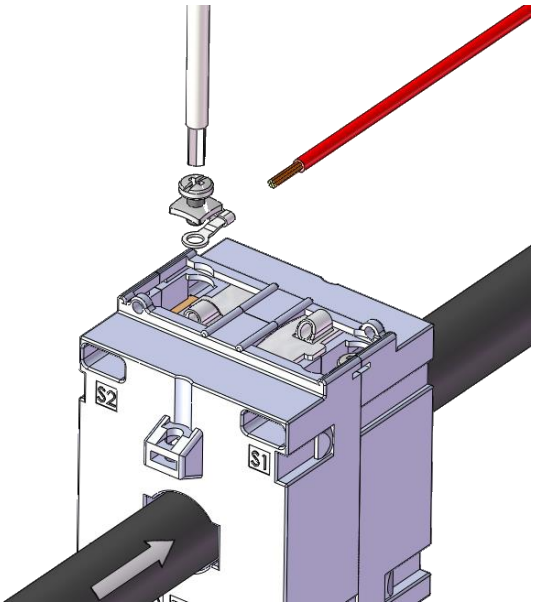
P1 will be marked on the CT label. For CTs with Red and Black wires, Red will be S1, Black will be S2. For CTs with Black and White Cables (most commonly small mV split core CTs) white will be S1 and Black will be S2.

TERMINAL CONNECTIONS

SCREW CLAMP TYPE

For the best electrical connection use a Fork Type crimp terminal, made onto the connection wire following the manufactures instructions. Bare solid or stranded wire may also be used.

1) Loosen the terminal screw, the wire clamp is retained and should move with the screw
2) Seat the terminal end or the bare wire under the wire clamp
3) Tighten the terminal screw, do not exceed a torque of 0.9Nm



USE PROPERLY TERMINATED CABLES WHEREVER POSSIBLE

POST AND NUT TYPE

For the best electrical connection use a ring or spade type crimp terminal, made onto the connection wire following the manufactures instructions.

1) Loosen the top M6 nut using a 10mm wrench
2) Seat the terminal end or bare wire in between the two washers
3) Tighten the top M6 Nut using a 10mm wrench, do not exceed a torque of 1.6Nm, be sure to provide adequate counter torque to the lower nut

Be aware the bottom nut secures the post onto the CT, it is not used to make an electrical connection

Note: Some CTs have M4 posts in this case please in general do not exceed a tightening torque of 1Nm, ask for information if it is not provided in the packaging.

TAG TYPE

For the best electrical connection use a ring type crimp terminal, made onto the connection wire following the manufactures instructions.

The connection is intended to be used with a connection terminal and securing bolt (Max ¼") by others, please follow the manufacturer's instructions for the chosen connection method.

WIRE CONNECTIONS

Some Hobut CT are supplied with flying lead wire connections. These are intended for direct connection to a suitable terminal block, terminate in a suitable terminal to maintain a good electrical connection.

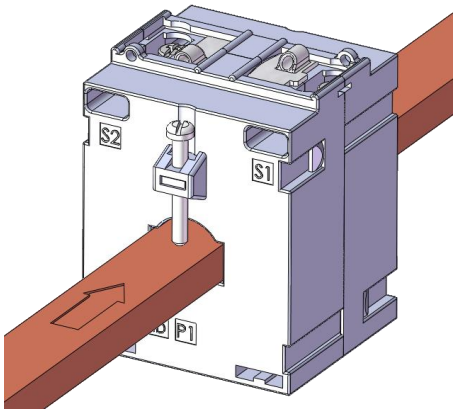
MOUNTING

BUS BAR MOUNTING SCREWS

Used on moulded case CTs – 14, 16, 17, 18, 19, 20, 21, 65, 84, 101, 105, 127, Series

For mounting to rectangular section bus bars

1. Using the supplied fixing kit.
2. Insert the square nut into the mounting hole on the side of the CT, insert the supplied screw into the mounting hole and screw into the nut.
3. Secure the CT using the mounting screw, do up the screws loosely first then tighten each screw in turn a little repeating the process until each screw is secure at the required tightness. Be careful to avoid unevenly tightening the screws or applying to much force to the plastic case.



MOUNTING FEET

Push in type used on moulded case CTs – 13, 14, 16, 17, 18, 19, 20, Series

For mounting CT to base plane or cabinet

1. Using the supplied fixing kit, select the mounting feet
2. Push the mounting feet into the holes on the bottom edge of the CT
3. Use a suitably sized fixing (max 6mm) with a washer

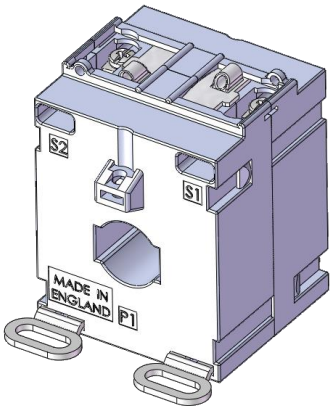


Plate Mounting used on Ring Type CTs – Optional Item, must be specified on order

For mounting CT to base plane or cabinet

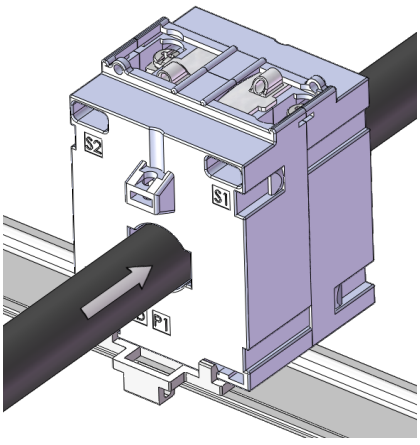
1. Use a suitably sized fixing (max 6mm) with a washer

DIN MOUNTING

Snap on Din Rail Mounting plate for use with moulded case CTs – 13, 14, 16

Each series of CT is supplied with its own DIN mounting clip (where available), they are not interchangeable

1) Fix the DIN mounting clip to the CT using the fixing holes on the bottom of the CT
2) Hook the fixed edge of the mounting clip over the DIN rail
3) Push the CT down so that the Spring loaded catch on the DIN rail mounting clip fully engages

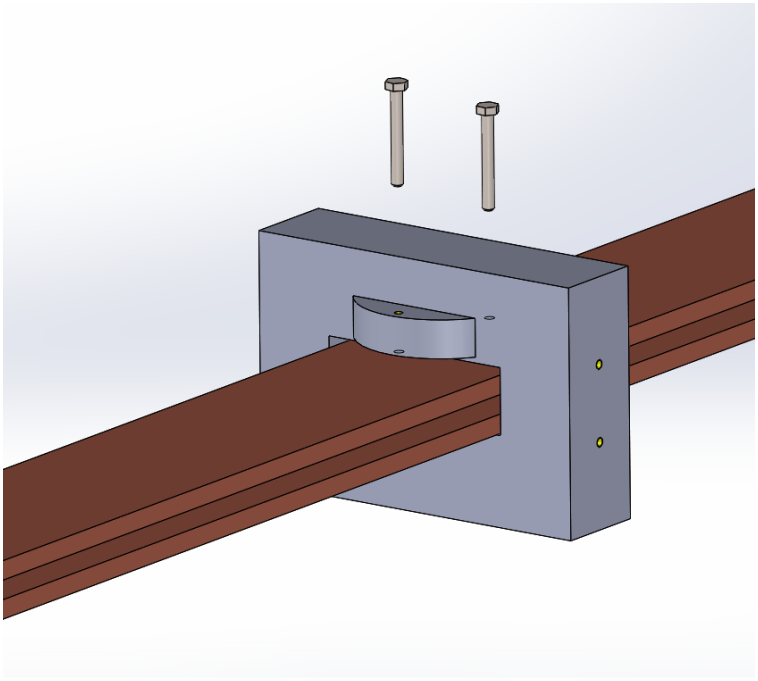


Removal

1) Use a flat bladed screwdriver to release the spring loaded catch and lift the CT away from the DIN Rail.

CAST RESIN BUS BAR MOUNTING

Cast resin encapsulated CTs can be heavy, busbar clamps are provided to secure the CT in position during assembly. The bus bar clamps may be adequate to support smaller CTs, but in the case of large CTs other fixings must be provided to support the weight of the CT.



Ensure the weight of the CT is supported before tightening the screws, install each screw so that it is thumb tight. When tightening screws through the bus bar clamps apply torque to each screw in small increments alternately until the fixing is equalised, when both screws are thumb tight turn each through a further 90° arc.

No more than 1Nm should be applied to the screws in the busbar clamp, less may be adequate for the application. Each application will be different.

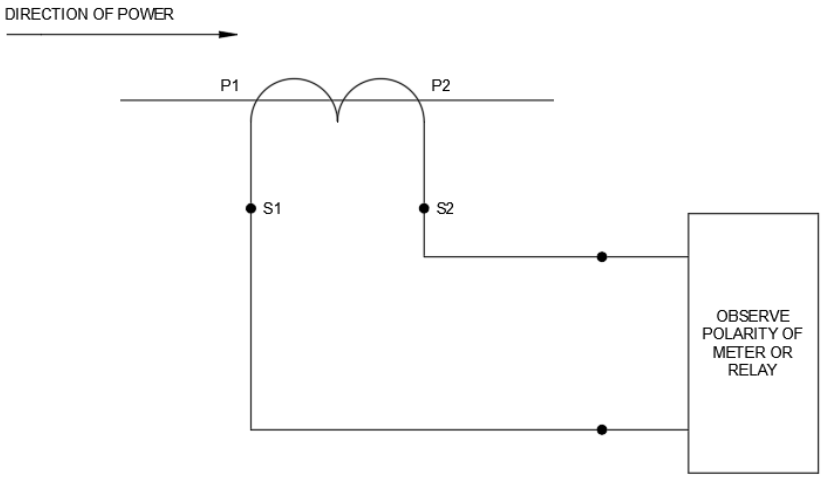
WIRING DIAGRAMS

The diagrams below show the typical wiring schematic for various types of CT,

- Always follow the schematics and drawings issued for your particular installation
- Always observe the polarity of the device that the CT is wired to

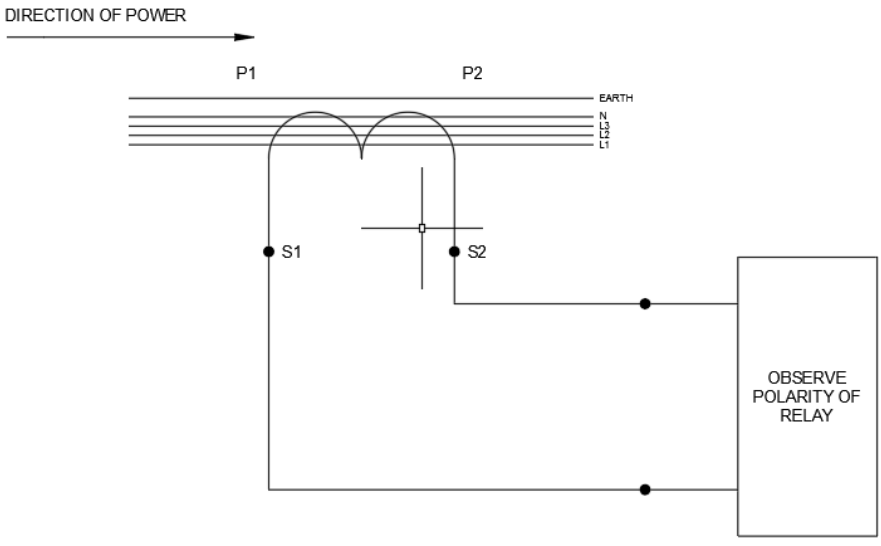
MEASUREMENT OR PROTECTION CT

Only a single phase can be measured by each CT

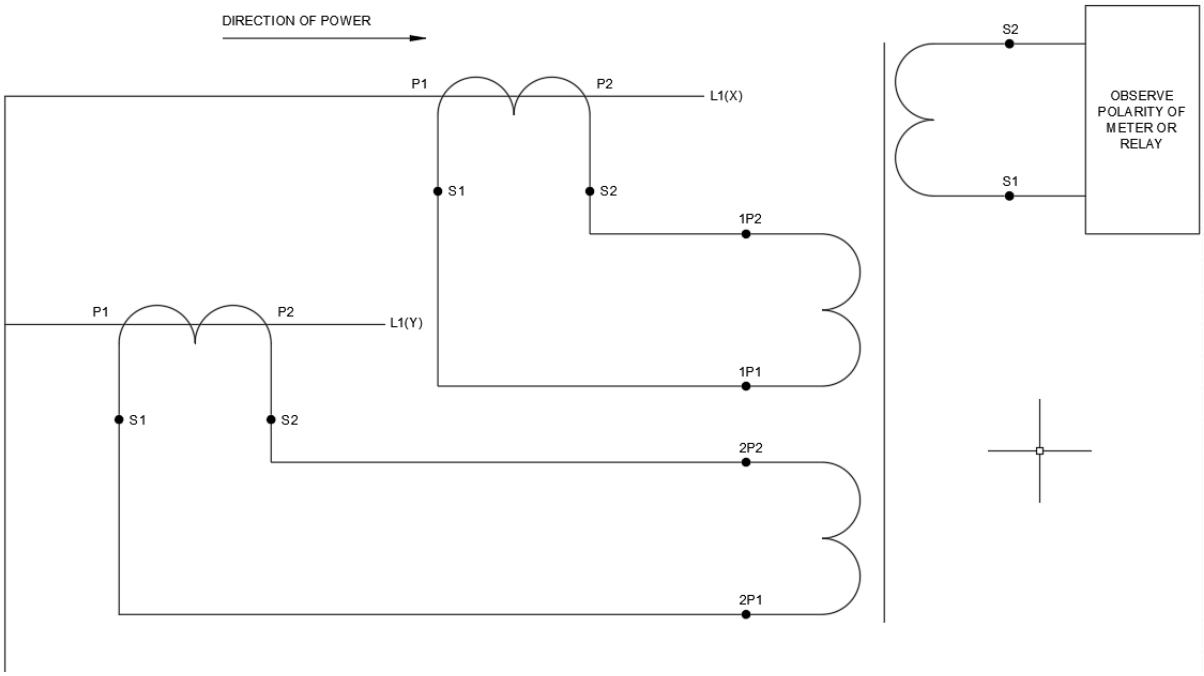


CORE BALANCE OR EARTH LEAKAGE PROTECTION CT

All phases and the neutral should be passed through the CT, the EARTH must not be passed through the CT



SUMMATION CT


DIRECTION OF POWER
P1
P2
L1(X)
S1
S2
1P2
P1
P2
L1(Y)
1P1
S1
S2
2P2
2P1
S2
S1
OBSERVE POLARITY OF METER OR RELAY

APPENDIX A: TIGHTENING TORQUES

Fastening Type	Size	Maximum Recommended Torque
Combi Screw (Moulded Case Terminal)	M4	0.9Nm
CTB Terminal		0.4Nm
Moulded Case Mounting Screw	M4 /M5	Customer to determine torque required. Should be kept to a minimum <0.2Nm.
Binding Post - Brass	M4	1Nm
Binding Post – Brass, RED Plastic Case CTs	M4	1.95Nm
Binding Post – Brass, Plastic Case CTs	M6	1.6Nm
Binding Post – Brass, Resin Cast CTs	M6	4Nm
Binding Post – Brass, Resin Cast CTs	M8	6Nm
Split core CT banding	7mm	3Nm
Resin Cast Terminal	M5/M6	2Nm
Resin Cast Bus Bar Clamp	M5/M6	0.7-1Nm MAX Dependent on Installation. Best practice is to tighten all screws thumb tight then torque equally.

All torque recommendations are based on clean oil free surfaces, check these values on your installation before adopting them.

APPENDIX B: THERMAL RATINGS

AMBIENT TEMPERATURE

The ambient temperature range in which the CT operates may be listed on the name plate. If a temperature range is not mentioned on the name plate then for IEC ratings the range will be -5/40°C and for IEEE ratings the range will be -5/30°C.

BUSBAR TEMPERATURE

The busbar temperature should not generally exceed the insulation rating of the CT. It should not be taken that if a bus bar will fit through the CT aperture that the size of the bus bar is suitable for the rated current without additional cooling.

In general there should be a clearance between the bus bar and the inner surface of the CT to allow for convection to cool the surface.

ICTH: CONTINUOUS THERMAL CURRENT

Icth or RF (Rating Factor) is the maximum primary current that the CT can be run at continuously at the temperature on the rating plate unless a temperature is stated as part of the Icth or RF rating.

If the CT is installed in a location where the ambient temperature is higher than the rating plate then the maximum primary current must be derated.

Unless explicitly stated on the nameplate the continuous thermal current of our CTs is 100% of nominal primary current. Customers may request alternative ratings of Icth when ordering.

If conditions vary from the name plate or in the case of high current installations with compact spacing where there may be additional magnetic effects, factory acceptance tests should be performed.

INSULATION THERMAL RATING

The insulation thermal rating will be denoted by a letter on the nameplate. If no letter is present on the nameplate then the insulation thermal rating should be considered to be A or 105°C.

Y = 90°C, A (or no letter) = 105°C, E = 120°C, B = 130°C, F = 155°C, H=180°C

The thermal rating is inclusive of the ambient temperature and the temperature rise of the CT during operation.

ITH: SHORT TIME THERMAL CURRENT

Ith is the maximum short circuit current the CT is rated to withstand for a specified time.

Ith is usually stated as 50 x Nominal current / for a duration of 1s (except for CT160 where we state In x10 / 1s) , this is the default but the customer can specify what they require at time of order if it needs to be different and we will design accordingly, this would be quite common on protective class CTs to have a specified fault current.

Ith should be considered on a single fault basis, in such as repeated consecutive faults may cause overheating without due time for cooldown. For applications where repeated overloads are part of the application – such as motor starting then this should be considered at order time – it may be necessary to specify a restriction to time between overloads and number of overloads in a specified time period.