

Topic: Typical Thumb rule

wire Capacity:

- A. For Cu Wire Current Capacity (Up to 30 Sq.mm) = 6X Size of Wire in Sq.mm
Ex. For 2.5 Sq.mm = $6 \times 2.5 = 15$ Amp, For 1 Sq.mm = $6 \times 1 = 6$ Amp, For 1.5 Sq.mm = $6 \times 1.5 = 9$ Amp
- B. For Cable Current Capacity = 4X Size of Cable in Sq.mm ,Ex. For 2.5 Sq.mm = $4 \times 2.5 = 10$ Amp.
- C. Nomenclature for cable Rating = U_o/U
where U_o =Phase-Ground Voltage, U =Phase-Phase Voltage, U_m =Highest Permissible Voltage



Earthing Resistance:

- A. Earthing Resistance for Single Pit = 5Ω , Earthing Grid = 0.5Ω
- B. As per NEC 1985 Earthing Resistance should be $< 5\Omega$.
- C. Voltage between Neutral and Earth ≤ 5 Volts
- D. Resistance between Neutral and Earth $\leq 1\Omega$
- E. Creepage Distance = 18 to 22mm/KV (Moderate Polluted Air) or
- F. Creepage Distance = 25 to 33mm/KV (Highly Polluted Air)

Minimum Bending Radius:

- A. Minimum Bending Radius for LT Power Cable = $12 \times \text{Dia of Cable}$.
- B. Minimum Bending Radius for HT Power Cable = $20 \times \text{Dia of Cable}$.
- C. Minimum Bending Radius for Control Cable = $10 \times \text{Dia of Cable}$.

Insulation Resistance:

- A. Insulation Resistance Value for Rotating Machine = $(KV+1) M\Omega$.
- B. Insulation Resistance Value for Motor (IS 732) = $((20 \times \text{Voltage (L-L)}) / (1000 + (2 \times KW)))$.
- C. Insulation Resistance Value for Equipment ($< 1KV$) = Minimum $1 M\Omega$.
- D. Insulation Resistance Value for Equipment ($> 1KV$) = $KV \ 1 M\Omega$ per $1KV$.



Reference: niman power_safety ki pathshala _necxx/np-01

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- E. Insulation Resistance Value for Panel = 2 x KV rating of the panel.
- F. Min Insulation Resistance Value (Domestic) = 50 MΩ / No of Points. (All Electrical Points with Electrical fitting & Plugs). Should be less than 0.5 MΩ
- G. Min Insulation Resistance Value (Commercial) = 100 MΩ / No of Points. (All Electrical Points without fitting & Plugs). Should be less than 0.5 MΩ.
- H. Test Voltage (A.C) for Meggering = (2X Name Plate Voltage) +1000
- I. Test Voltage (D.C) for Meggering = (2X Name Plate Voltage).
- J. Submersible Pump Take 0.4 KWH of extra Energy at 1 meter drop of Water.

Lighting Arrestor:

Arrestor has Two Rating=

- (1) MCOV=Max. Continuous Line to Ground Operating Voltage.
- (2) Duty Cycle Voltage. (Duty Cycle Voltage>MCOV).

Transformer:

- A. Current Rating of Transformer=KVAX1.4
- B. Short Circuit Current of T.C /Generator= Current Rating / % Impedance
- C. No Load Current of Transformer=<2% of Transformer Rated current
- D. Capacitor Current (Ic)=KVAR / 1.732xVOLT (Phase-Phase)
- E. Typically the local utility provides transformers rated up to 500kVA For maximum connected load of 99kW,
- F. Typically the local utility provides transformers rated up to 1250kVA For maximum connected load of 150kW.
- G. The diversity they would apply to apartments is around 60%
- H. Maximum HT (11kV) connected load will be around 4.5MVA per circuit.
- I. 4No. earth pits per transformer (2No. for body and 2No. for neutral earthing),
- J. Clearances, approx.1000mm around TC allow for transformer movement for replacement.

Diesel Generator:

- A. Diesel Generator Set Produces=3.87 Units (KWH) in 1 Litter of Diesel.
- B. Requirement Area of Diesel Generator = for 25KW to 48KW=56 Sq.meter,
100KW=65 Sq.meter.
- C. DG less than or equal to 1000kVA must be in a canopy.
- D. DG greater 1000kVA can either be in a canopy or skid mounted in an acoustically treated room



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- E. DG noise levels to be less than 75dBA @ 1meter.
- F. DG fuel storage tanks should be a maximum of 990 Litter per unit Storage tanks above this level will trigger more stringent explosion protection provision.

Current Capacity of Equipment:

- A. 1 Phase Motor draws Current=6Amp per HP.
- B. 3 Phase Motor draws Current=1.25Amp per HP.
- C. Full Load Current of 3 Phase Motor=HPx1.5
- D. Full Load Current of 1 Phase Motor=HPx6
- E. No Load Current of 3 Phase Motor =25-30% of FLC
- F. KW Rating of Motor=HPx0.75
- G. Full Load Current of equipment =1.39xKVA (for 3 Phase 415Volt)
- H. Full Load Current of equipment =1.74xKw (for 3 Phase 415Volt)

Current Transformer:

- A. Nomenclature of CT:
- B. Ratio: input / output current ratio
- C. Burden (VA): total burden including pilot wires. (2.5, 5, 10, 15 and 30VA.)
- D. Class: Accuracy required for operation (Metering: 0.2, 0.5, 1 or 3, Protection: 5, 10, 15, 20, 30).
- E. Accuracy Limit Factor:
- F. Nomenclature of CT: Ratio, VA Burden, Accuracy Class, Accuracy Limit Factor.Example: 1600/5, 15VA 5P10 (Ratio: 1600/5, Burden: 15VA, Accuracy Class: 5P, ALF: 10)
- G. As per IEEE Metering CT: 0.3B0.1 rated Metering CT is accurate to 0.3 percent if the connected secondary burden if impedance does not exceed 0.1 ohms.
- H. As per IEEE Relaying (Protection) CT: 2.5C100 Relaying CT is accurate within 2.5 percent if the secondary burden is less than 1.0 ohm (100 volts/100A).

Rules to follow:

1. Standard Size of Transformer ()
2. Standard Size of Motor (HP)
3. Approximate RPM of Motor
4. Motor Line Voltage
5. Motor Starting Current
6. Motor Starter
7. Impedance of Transformer (As per IS 2026)



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Standard Size of Transformer

1. Standard Size of Transformer

Single Phase Transformer

5KVA, 10KVA, 15KVA, 25KVA, 37.5KVA, 50KVA, 75KVA, 100KVA, 167KVA, 250KVA, 333KVA, 500KVA, 833KVA, 1.25KVA, 1.66KVA, 2.5KVA, 3.33KVA, 5.0KVA, 6.6KVA, 8.3KVA, 10.0KVA, 12.5KVA, 16.6KVA, 20.8KVA, 25.0KVA, 33.33KVA

Three Phase Transformer

3KVA, 5KVA, 9KVA, 15KVA, 16KVA, 25KVA, 30KVA, 45KVA, 63 KVA, 75KVA, 100KVA, 112.5KVA, 150KVA, 160KVA, 200KVA, 225KVA, 250KVA, 300KVA, 315KVA, 400KVA, 500KVA, 630KVA, 750KVA, 1MVA, 1.5MVA, 2MVA, 1.6MVA, 2.0MVA, 2.5MVA, 3.7MVA, 5MVA, 7.5MVA, 10MVA, 12MVA, 15MVA, 20MVA, 25MVA, 30MVA, 37.5MVA, 50MVA, 60MVA, 75MVA, 100MVA

Standard Size of Motor (HP)

Electrical Motor (HP)

1, 1.5, 2, 3, 5, 7.5, 10, 15, 20, 30, 40, 50, 60, 75, 100, 125, 150, 200, 250, 300, 400, 450, 500, 600, 700, 800, 900, 1000, 1250, 1500, 1750, 2000, 2250, 3000, 3500 and 4000

Motor Line Voltage

Motor (KW)	Line Voltage
< 250 KW	>440 V (LV)
150 KW to 3000KW	2.5 KV to 4.1 KV (HV)
200 KW to 3000KW	3.3 KV to 7.2 KV (HV)
1000 KW to 1500KW	6.6 KV to 13.8 KV (HV)

Motor Starting Current

Supply Size of Motor	Max. Starting Current
1 Phase < 1 HP	6 X Motor Full Load Current
1 Phase 1 HP to 10 HP	3 X Motor Full Load Current
3 Phase 10 HP	2 X Motor Full Load Current
3 Phase 10 HP to 15 HP	2 X Motor Full Load Current
3Phase > 15 HP	1.5 X Motor Full Load Current



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Motor Starter

Starter	HP or KW	Starting Current	Torque
DOL	<13 HP (11KW)	7 X Full Load Current	Good
Star-Delta	13 HP to 48 HP	3 X Full Load Current	Poor
Auto TC	> 48 HP (37 KW)	4 X Full Load Current	Good/ Average
VSD		0.5 to 1.5 X Full Load Current	Excellent

Motor > 2.2KW should not connect direct to supply voltage if it is in Delta winding

Impedance of Transformer (As per IS 2026)

>MVA	% Impedance
< 1 MVA	5%
1 MVA to 2.5 MVA	6%
2.5 MVA to 5 MVA	7%
5 MVA to 7 MVA	8%
7 MVA to 12 MVA	9%
12 MVA to 30 MVA	10%
> 30 MVA	12.5%

Typical rating

SS NO	KVA	Voltage (KV)	Oil Qty.	Make	Impedance	Type	Vector group	Cooling
1	1250	6.6/0.433	875	Alstom	4.89	Delta/Star	DYN-11	ONAN
2	1600	6.6/0.433	875	TR & Rectifier	6.26	Delta/Star	DYN-11	ONAN
3	750	11/0.433	700	Kirloskar	5.14	Delta/Star	DYN-11	ONAN
4	1000	11/0.433	1050	Vishwakarma electrical	5.00	Delta/Star	DYN-11	ONAN
5	1500	11/0.433	1500	Crompton	5.18	Delta/Star	DYN-11	ONAN
6	1600	11/0.433	1520	Kirloskar	6.31	Delta/Star	DYN-11	ONAN
7	25000	33/6.9	12000	Voltamp	7.90	Delta/star	DYN11	ONAN
8	2000	6.6/0.433	1798	Voltamp	6.34	Delta/star	DYN11	ONAN
9	2500	6.6/0.433	1775	Voltamp	8.05	Delta/star	DYN11	AN
10	2500	6.6/0.433	1775	Voltamp	8.16	Delta/star	DYN11	AN
11	2000	6.6/0.433	1798	Voltamp	6.40	Delta/star	DYN11	ONAN
12	1600	6.6/0.433	1250	Voltamp	6.33	Delta/star	DYN11	ONAN
13	2000	6.6/0.433	1798	Voltamp	6.36	Delta/star	DYN11	ONAN
14	1250	6.6/0.433	1085	HPS	5.40	Delta/star	DYN11	ONAN



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15	2500	6.6/0.433	1775	Voltamp	8.35	Delta/star	DYN11	ONAN
16	1600	6.6/0.433	1250	HPS	8.54	Delta/star	DYN11	ONAN
17	2500	6.6/0.433	1775	Voltamp	8.13	Delta/star	DYN11	AN

Standard Size of MCB, MCCB, ELCB, RCCB, SFU and Fuse

1. MCB Up to 63 Amp (80Amp and 100 Amp as per Request)
2. MCCB Up to 1600 Amp (2000 Amp as per Request)
3. ACB Above 1000 Amp
4. MCB Rating 2A, 6A, 10A, 16A, 20A, 32A, 40A, 50A, 63A
5. MCCB Rating 0.5A, 1A, 2A, 4A, 6A, 10A, 16A, 20A, 32A, 40A, 50A, 63A, 80A, 100A
(Domestic Max 6A)
6. RCCB/ELCB 6A, 10A, 16A, 20A, 32A, 40A, 50A, 63A, 80A, 100A
7. Sen. of ELCB 30ma (Domestic), 100ma (Industrial), 300ma
8. DPIC (Double Pole Iron Clad) main switch 5A, 15A, 30 A for 250V
9. TPIC (Triple Pole Iron Clad) main switch 30A, 60A, 100A, 200 A For 500 V
10. DPMCB 5A, 10A, 16A, 32A and 63 A for 250V
11. TPMCCB 100A, 200A, 300A and 500 A For 660 V
12. TPN main switch 30A, 60A, 100A, 200A, 300 A For 500 V
13. TPNMCB 16A, 32A, 63A For 500 V, beyond this TPNMCCB: 100A, 200A, 300A, 500 A For 660 V
14. TPN Fuse Unit (Rewirable) 16A, 32A, 63A, 100A, 200A
15. Change over switch (Off Load) 32A, 63A, 100A, 200A, 300A, 400A, 630A, 800A
16. SFU (Switch Fuse Unit) : 32A, 63A, 100A, 125A, 160A, 200A, 250A, 315A, 400A, 630A
17. HRC Fuse TPN (Bakelite) 125A, 160A, 200A, 250A, 400A, 630A
18. HRC Fuse DPN (Bakelite) 16A, 32A, 63A

Restricted limited approach boundary (Compliance: NFPA-70E)



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