



## (2) Molded Case Circuit Breaker (MCCB)

ليس بالقاطع القوي - يستخدم مع الأحمال الصناعية والأحمال الكبيرة

ليوفر من

(1) 16 : 3200 A

(2) Fixed & adjustable

(3) Short circuit withstand

18KA - 80KA

(4) 3P, 4P فقط



## (3) Air Circuit Breaker

(1) 400 : 6300 A

ليوفر من

(2) adjustable

(3) Short circuit withstand

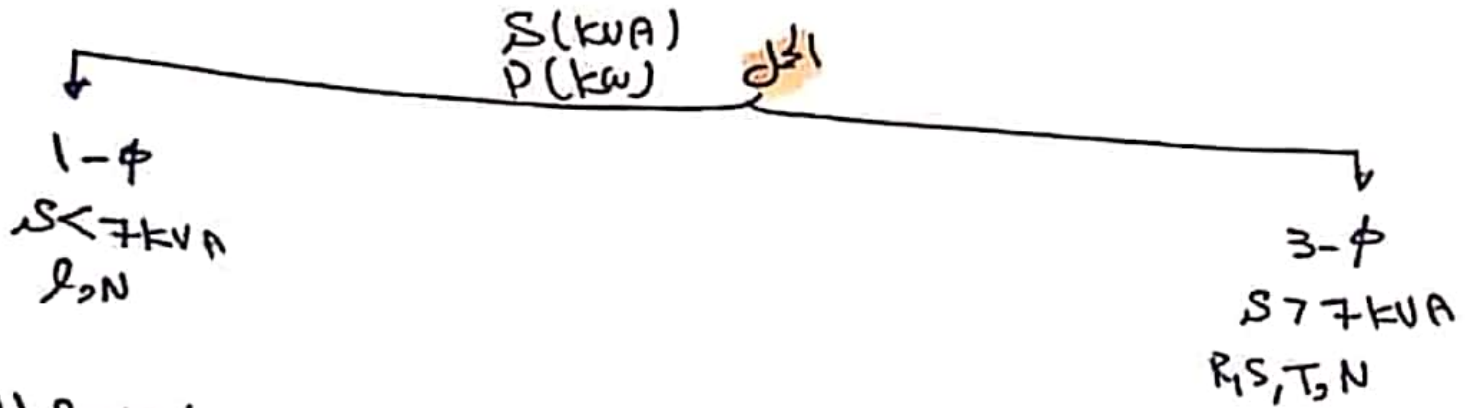
35KA - 120KA



من أهم مميزات القواطع الهوائية  
سهولة نقله وتركيبه وتغيير الأحمال  
المتغيرة وعمل الصيانة

(2)

دک ۱ → pole C.B → دیم افکتی ۲



(1) Rated Current

$$S = VI \quad \text{or} \quad P = VI \cos \phi$$

$$I = \frac{S}{V}$$

$$I = \frac{S \times 1000}{220}$$

$$I_r = 4.5 * S$$

$$P = \sqrt{3} V I * \cos \phi$$

$$\text{or}$$

$$S = \sqrt{3} V I$$

$$I_r = \frac{S}{\sqrt{3} V}$$

$$I_r = \frac{S * 1000}{\sqrt{3} * 380}$$

$$I_r = 1.5 * S$$

(2) Circuit Breaker Current

$$I_{CB} = 1.25 * I_r$$

Circuit Breaker Rating

1 - 3 - 6 - 10 - 16 - 20 - 25 - 32 - 40 - 50 - 63 A

80 - 100 - 125 - 160 - 200 - 250 - 320 - 400 - 500 - 630 A

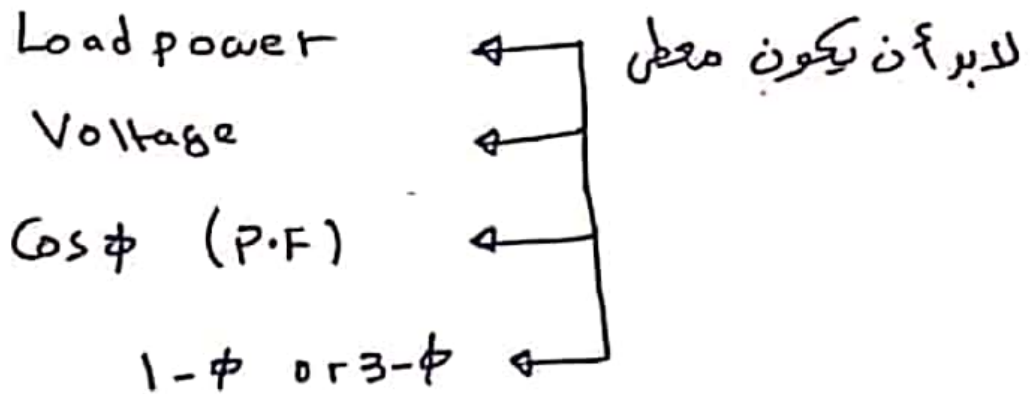
800 - 1000 - 1250 - 1600 - 2000 - 2500 - 3200 - 4000 - 5000

6300 A - 7200A

(2)

## Selection C.B and cable For Given load

خطوات اختيار المقاطع والكابلات المناسبة



(1) Load current  $I_L$  هتقوم بحساب  $I_L$

Full load current او بعتن آخر

من المعادلات الآتية

1- $\phi$  لو كان الحمل  $R, N$

3- $\phi$  لو كان الحمل  $R, S, T, N$

$$S = VI \quad \text{or} \quad P = VI \cos \phi$$

$$I = \frac{S}{V} \quad \text{or} \quad I = \frac{P}{V \cos \phi}$$

$$S = \sqrt{3} V I \quad \text{or} \quad P = \sqrt{3} V I \cos \phi$$

$$I = \frac{S}{\sqrt{3} V} \quad \text{or} \quad I = \frac{P}{\sqrt{3} V \cos \phi}$$

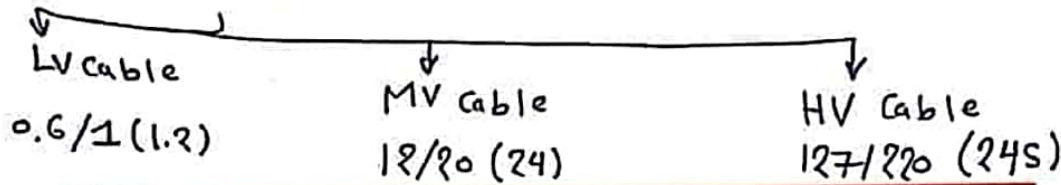
$$(2) I_{C.B} = 1.25 * I_r$$

(9)



What are the factors affecting the selection of cable

(1) Voltage



**Voltage**  
The standard rated voltage of a cable is denoted by  $U_0/U$  ( $U_m$ ), where

- $U_0$  : is the rated power-frequency voltage between conductor and earth or metallic screen.
- $U$  : is the rated power-frequency voltage between conductors.
- $U_m$  : is the maximum continuously permissible operating voltage of a cable at time or in any part of the network.

$U_0/U$ (kV)	0.6/1	1.8/3	3.6/6	6/10	8.7/15	12/20	18/30	38/66	76/132	127/220
$U_m$ (kV)	1.2	3.6	7.2	12	17.5	24	36	72.5	145	245

Note: Cable design for 6/10, 12/20 and 18/30 kV is applicable for 6.35/11, 12.7/22 and 19/33 kV respectively.

(2) Type of conductor



← حسباً توجيهاً لكاتب افضل من اللومنيوم  
 ← لكاتب اقل سعراً من اللومنيوم.  
 ← اللومنيوم لا يتم كثيراً ومضوضها من MV, HV  
 ← اقل من الوزن  
 ← ارخص من النحاس



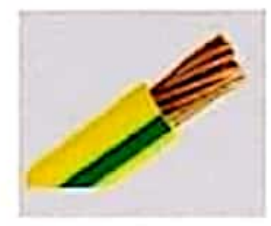
(3) according to insulation نوع العزل

	XIPE	PVC
max operating Temp	90°C	70° or 85°C
Damage Temp	250°C	160°C
Short Circuit withstand s.c	LV & MV	LV
	High	Low

(4) according core number

(1) single core cable

(Riser) Earthing



(2) Multi core cable

2 core

1-φ (R, N)



3 core

LV (R, N, E)



MV (R, S, T)



4 core

(3-φ, N)



- (5) Derating Factor, or C.F.
  - Air Temp (Air Temp D.F)
  - Ground Temp (G.T D.F)
  - depth (0.8, 1, 1.5) m
  - Grouping Factor
- (6) Voltage drop
- (7) Short Circuit with Stand
- (8) Method of laying (laid Free air, Ground, Duct)
- (9) Armored or Not

یا علی

### CABLES

Single Core Cables, with Stranded Circular Copper Conductors, PVC Insulated and PVC Sheathed



### CABLES

Multicore Cables, with Stranded Copper Conductors PVC Insulated and PVC Sheathed



### CABLES

Multicore Cables, with Stranded Aluminium Conductors, PVC Insulated and PVC Sheathed



### CABLES

Multicore Cables, with Stranded, Copper Conductors, XLPE Insulated and PVC Sheathed



# Basic Calculations:

## Selection of CB and Cable for Given Load

Multicore Cables with Stranded, Copper Conductors, XLPE Insulated and PVC Sheathed

Egytech - code	Nominal cross sectional area	Max. conductor resistance		Current rating			Approx. overall diameter	Approx. weight
		DC at 20 °C	AC at 90 °C	Laid direct in ground	Laid in ducts	Laid in free air		
	mm <sup>2</sup>	Ω/km	Ω/km	A	A	A	mm	kg/km

### Four core cables

CX1-T104-U04	1.5 mm	12.1000	15.400	26	23	22	10.6	150
CX1-T104-U06	2.5 mm	7.4100	9.450	35	29	32	11.9	205
CX1-T104-U08	4 mm	4.6100	5.880	45	36	41	13.4	280
CX1-T104-U09	6 mm	3.0800	3.930	57	45	50	14.6	365
CX1-T104-U10	10 mm	1.8300	2.330	75	60	68	17.0	572
CX1-T104-U11	16 mm	1.1500	1.470	97	75	89	19.4	825
CX1-T104-U12	25 mm	0.7270	0.927	128	102	120	23.5	1245
CX1-T104-U13	35 mm	0.5240	0.669	155	120	145	23.6	1530
CX1-T104-U14	50 mm	0.3870	0.494	185	145	179	27.1	2060
CX1-T104-U15	70 mm	0.2680	0.343	220	180	225	31.4	2905
CX1-T104-U16	95 mm	0.1930	0.248	265	210	268	35.1	3910
CX1-T104-U17	120 mm	0.1530	0.197	305	245	310	39.2	4915
CX1-T104-U18	150 mm	0.1240	0.160	335	275	352	43.7	6035
CX1-T104-U19	185 mm	0.0991	0.129	375	310	404	48.7	7540
CX1-T104-U20	240 mm	0.0754	0.099	435	365	483	54.5	9785

Cable cross sectional area (C.S.A)

(4 x 25) mm<sup>2</sup> Cu / XLPE / PVC , Free air



# CABLES

## Ground temperature derating factor

Ground temperature °C	25	30	35	40	45	50	55
PVC cables rated 70 °C	1.13	1.07	1.00	0.93	0.85	0.76	0.65
XLPE cables rated 90 °C	1.09	1.04	1.00	0.95	0.90	0.85	0.80

Table 3

## Air temperature derating factor

Air temperature °C	25	30	35	40	45	50	55
PVC cables rated 70 °C	1.22	1.15	1.08	1.00	0.95	0.82	0.71
XLPE cables rated 90 °C	1.14	1.10	1.05	1.00	0.90	0.89	0.84

## Example

Given 50HP Motor 3Ph, 380V, 0.85 lag P.F,  $\eta = 1$

$$(1) P = \sqrt{3} S * \cos \phi$$

$$P = \sqrt{3} V I_L * P.F$$

$$I_L = \frac{P (kW)}{\sqrt{3} * V * P.F} = \frac{50 * 746}{\sqrt{3} * 380 * 0.85} = 66.67 A$$

$$(2) I_{C.B} = 1.25 * I_L$$

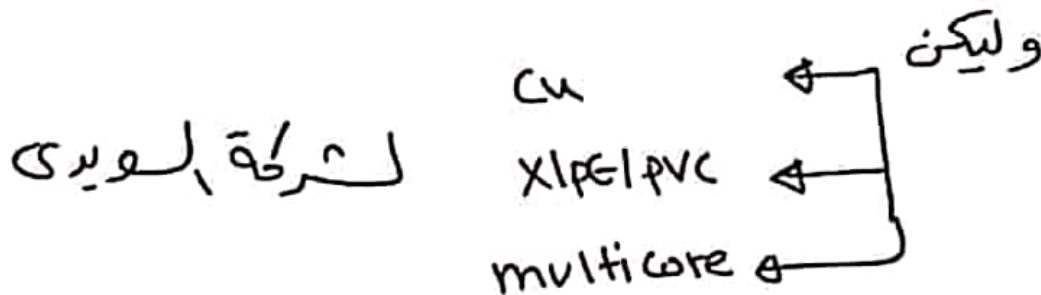
$$I_{C.B} = 1.25 * 66.67 = 83.34 A$$

C.B Rated From Table (100 A)

(3) اختيار الكابل

$$I_{Cable} = 1.2 * I_{C.B \text{ Rated}} = 1.2 * 100 = \underline{120 A}$$

لهذا نجد جدول الكابلات ونختار الكابل المناسب



# Specification of Cables

توصیف کابل

لو (C.S.A)



$$C.S.A (\text{phase}) = C.S.A (N) = C.S.A (E)$$

1- $\phi$   
R, N, E

3- $\phi$   
R, S, T, N, E  
5x3 mm<sup>2</sup>  
5x4 mm<sup>2</sup>  
5x6 mm<sup>2</sup>  
5x10 mm<sup>2</sup>  
5x16 mm<sup>2</sup>

3x3 mm<sup>2</sup>  
3x4 mm<sup>2</sup>  
3x6 mm<sup>2</sup>  
3x10 mm<sup>2</sup>  
3x16 mm<sup>2</sup>  
R, N, E

R, S, T, N, E

$$(1) C.S.A (E) = \frac{1}{2} C.S.A (\text{phase})$$

$$(2) C.S.A (N) = C.S.A (\text{phase})$$

لو  $C.S.A > 35 \text{ mm}^2$

$$C.S.A (N) = \frac{1}{2} C.S.A (\text{phase})$$

Reduced

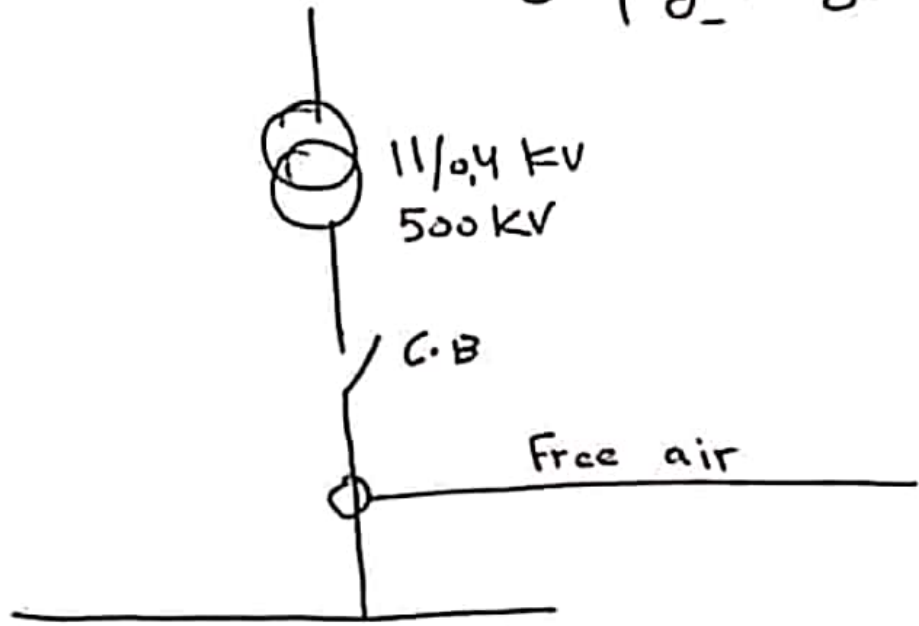
OR

$$C.S.A (N) = C.S.A (\text{phase})$$

Full

دستورچه هام لو  $I_{cable} \gggggg$

لو صیت  $I_{cable}$  ر لقیته کسره برآ  
فمکن رقم  $I_{cable}$  عا کذا کابل سیل لیتا -  
عا سیل لیتا



عاوزا حب ل C.B و اکتا لکابل

$$(1) P = \sqrt{3} V I \cos \phi \quad \text{or} \quad S = \sqrt{3} V I_L$$

$$I_L = \frac{S}{\sqrt{3} \times V} = \frac{S \times 1000}{\sqrt{3} \times 400} = \frac{500 \times 1000}{\sqrt{3} \times 400}$$

$$I_L = 720 \text{ A}$$

C.B next Rating (800 A) MCCB

$$I_{cable} = \frac{800}{0.8} \approx 1250 A$$

Free air  $50^{\circ}C$

هذه جدول لكابلات من هتلاقى كابل  
ليجى لتيار -

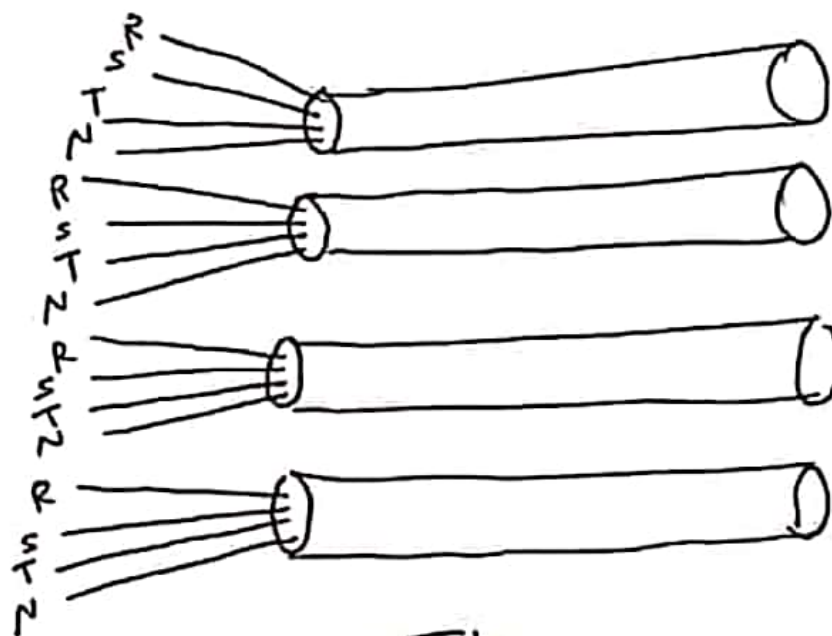
لعموم قاسم  $I_{cable} \div 4$  رقم

$$\frac{I_{cable}}{4} = \frac{1250}{4} \approx 312.5 A$$

هذه جدول لكابلات

4 // (3 \* 120 + 70) mm<sup>2</sup> Cu / XLPE / PVC

multi > معناه انى طالع من الجول كابل



الجول