

Ny utgave 2011

Vg2 elektro

Teori med
praktiske
øvinger

Kunnskaps-
løftet

Frank Fosbæk

Automatiserte anlegg

Vg2 automatisering

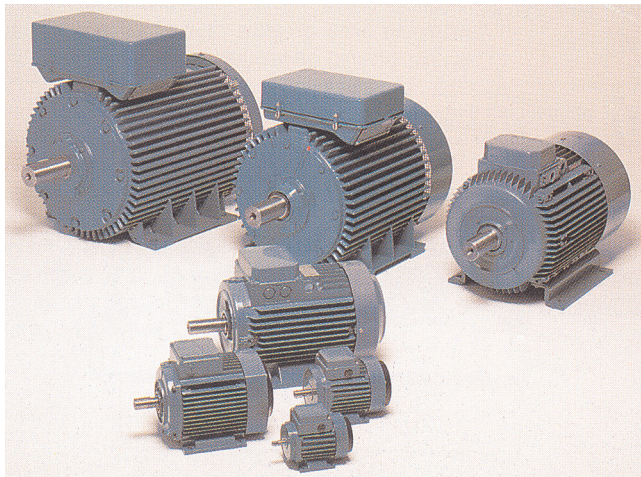
ELFORLAGET

Illustrasjoner til Automatiserte anlegg Vg2 automatisering

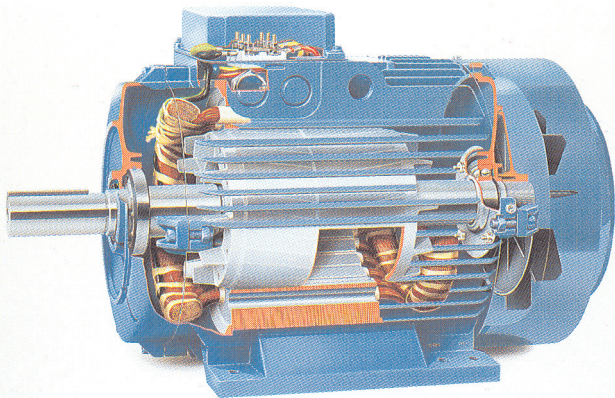
Kapittel 4

Illustrasjonene kan brukes fritt i undervisningen

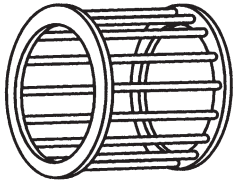
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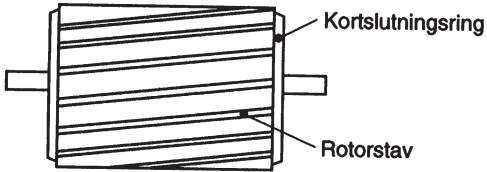
Figur 4.1 Ulike størrelser på asynkrone vekselstrømsmotorer

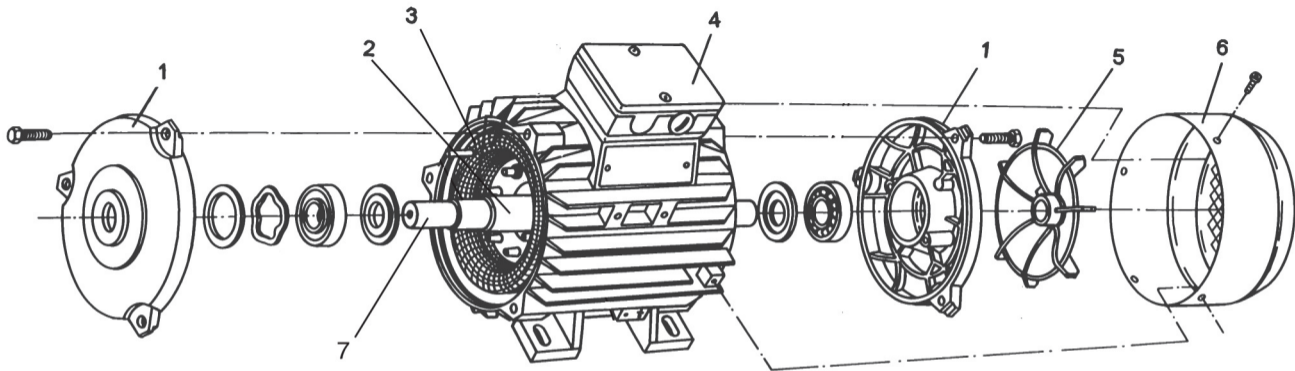


Figur 4.2 Gjennomskåret trefase asynkronmotor



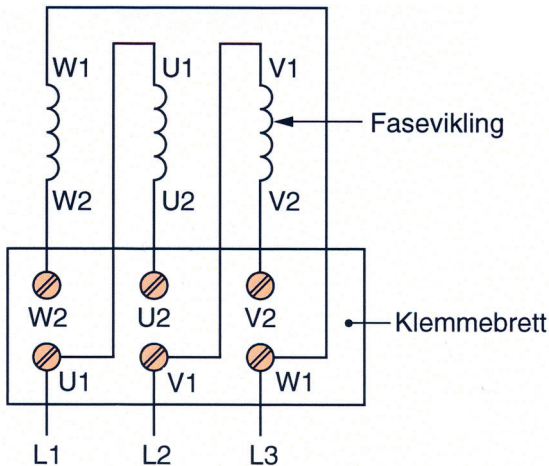
Figur 4.3 Burvikling



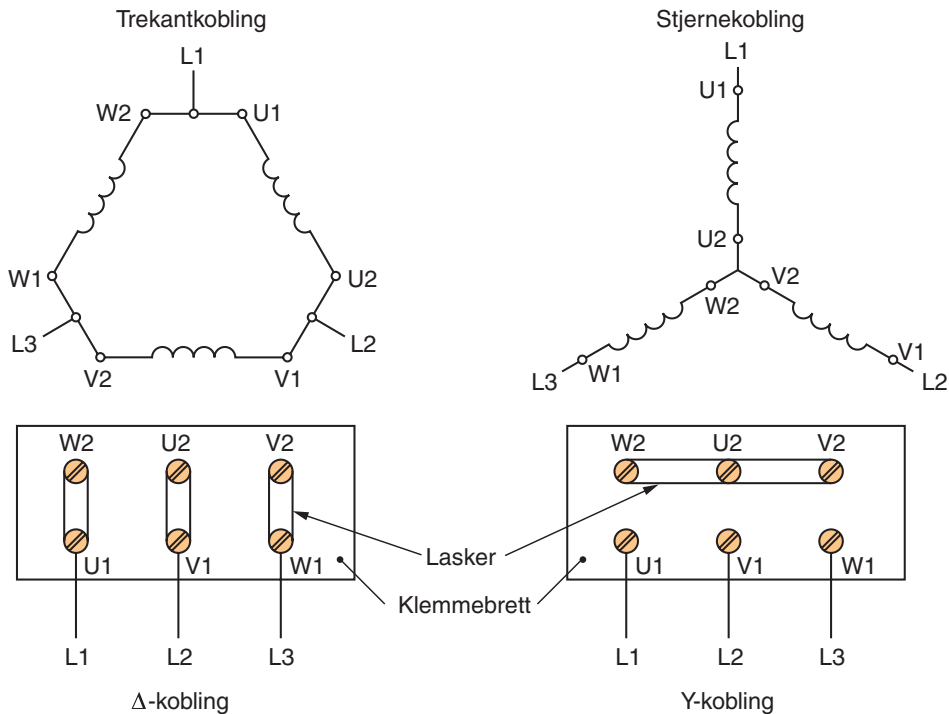


- | | | | |
|---|------------------------------|---|-------------------------|
| 1 | Lagerskjold | 5 | Kjølevifte |
| 2 | Kortslutningsrotor | 6 | Viftedeksel |
| 3 | Stator med faseviklinger | 7 | Motoraksel (rotoraksel) |
| 4 | Koblingsboks med klemmebrett | | |

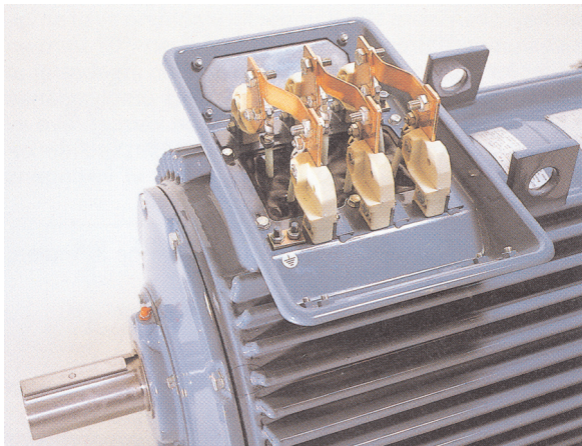
Figur 4.4 Oppbygningen av en asynkronmotor



Figur 4.5 Statorviklinger koblet til motorens klemmebrett



Figur 4.6 Trekant- og stjernekobling



Figur 4.7 Klemmebrett på en middelsstor motor med statorviklingene trekantkoblet

Motor 3 ~ 50 Hz	IEC 34-6-IC01
15 kW	2910 r/min
	cos φ 0,88
Y 400 V 27,5 A	Δ 230 V 48,7 A
	IP 34

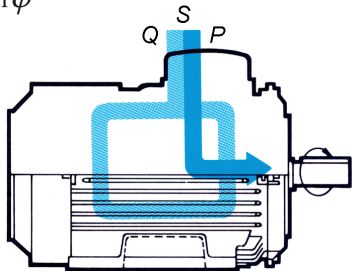
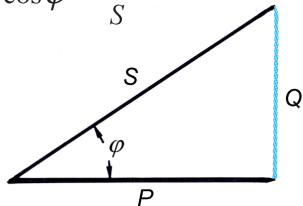
Figur 4.8 Merkeskilt for trefase asynkronmotor

$$S = U \cdot I \cdot \sqrt{3}$$

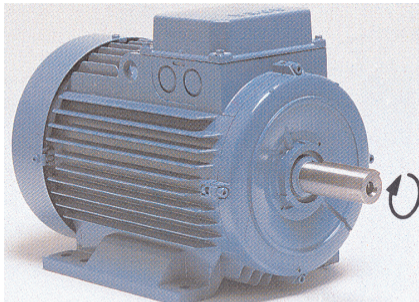
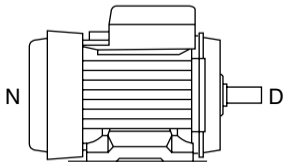
$$P = S \cdot \cos \varphi = U \cdot I \cdot \sqrt{3} \cdot \cos \varphi$$

$$Q = S \cdot \sin \varphi = U \cdot I \cdot \sqrt{3} \cdot \sin \varphi$$

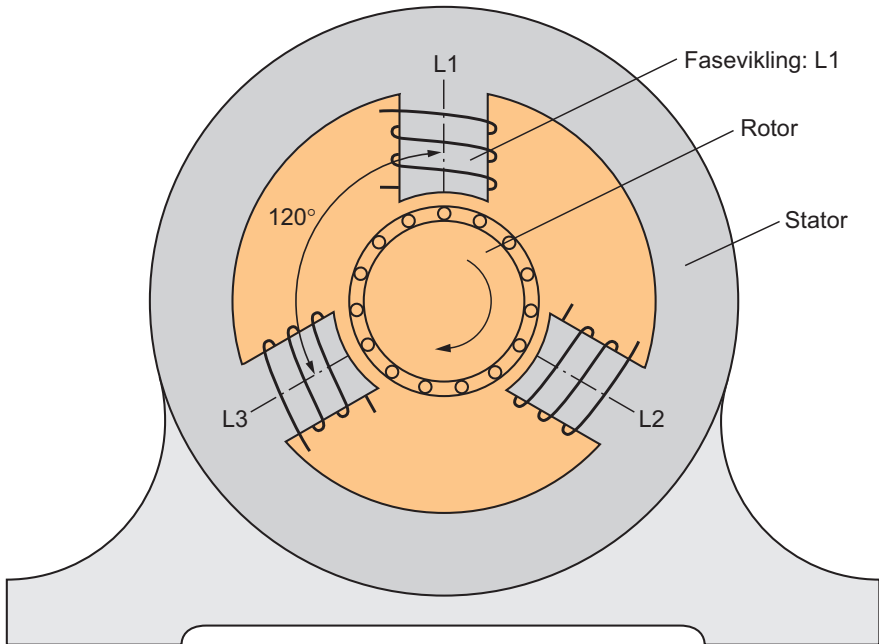
$$\cos \varphi = \frac{P}{S}$$



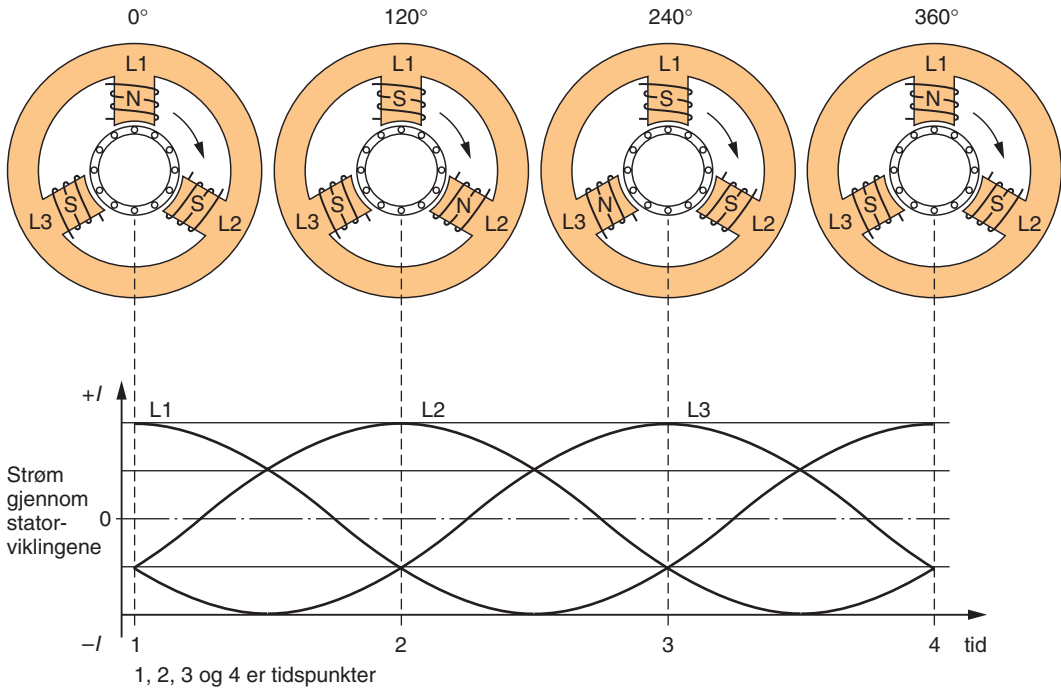
Figur 4.9 Motorens effektfaktor



Figur 4.10 Rotasjonsretning med urviseren sett mot D-enden

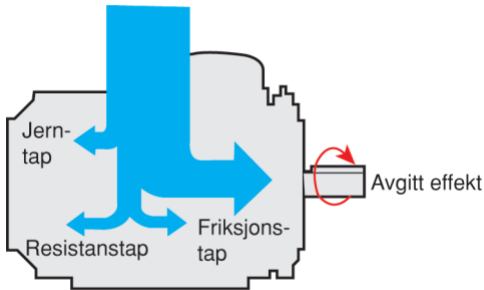


Figur 4.11 Prinsipiell oppbygning av trefase asynkronmotor

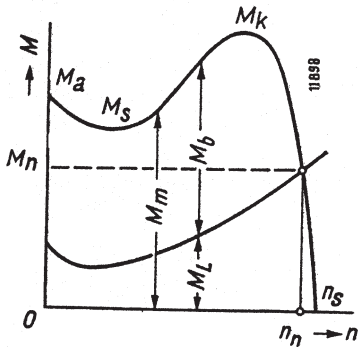


Figur 4.12 Magnetisk rotasjonsfelt

Tilført effekt



Figur 4.13 Tapene i trefase asynkronmotorer



M_m = motormoment

M_L = lastmoment

M_b = akselerasjons-
moment

n_n = merke-turtall

M_a = startmoment

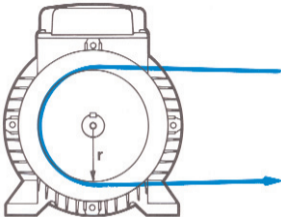
M_k = kippmoment

M_n = merkemoment

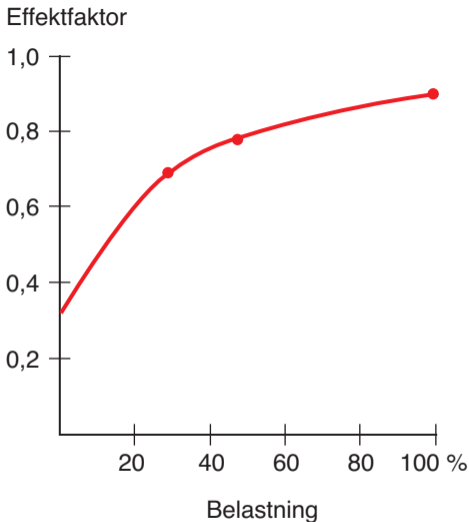
M_s = sadelmoment

n_s = synkrone turtall

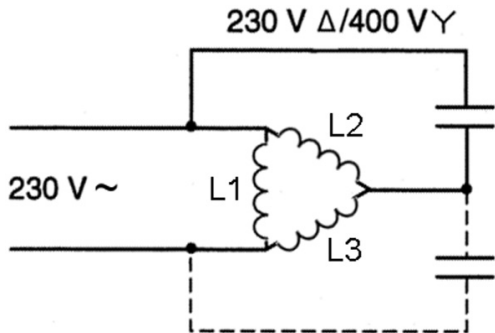
Figur 4.14 Dreiemomentet som funksjon av rotasjonsfrekvensen for en asynkronmotor



Figur 4.15 Motor med reimskive og reim

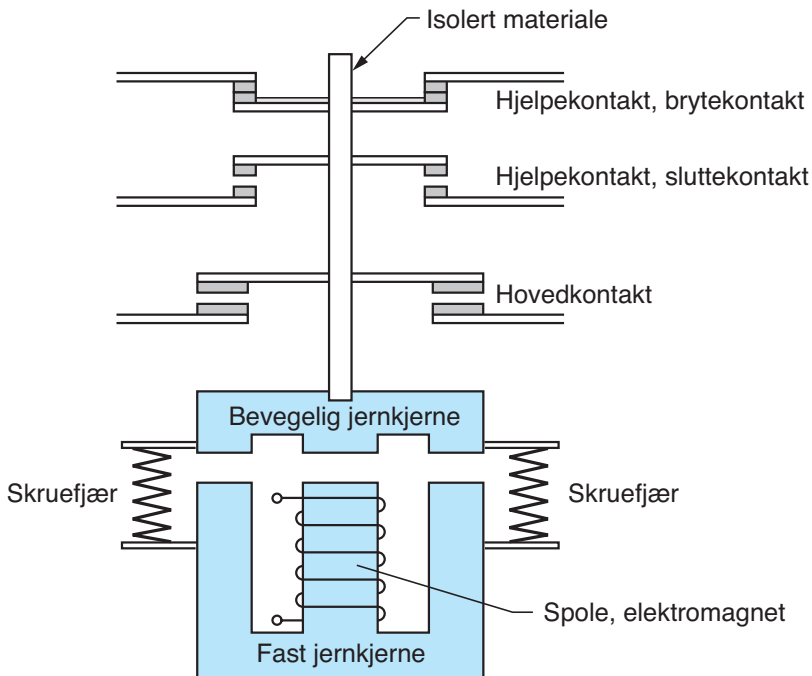


Figur 4.16 Effektfaktoren fra tomgang til merkebelastningen

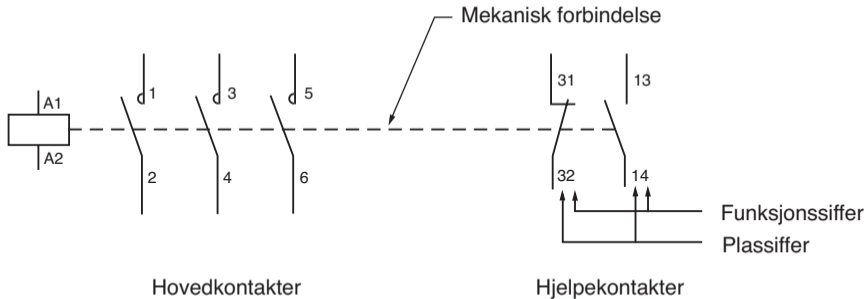


Stiplet kobling for motsatt rotasjonsretning

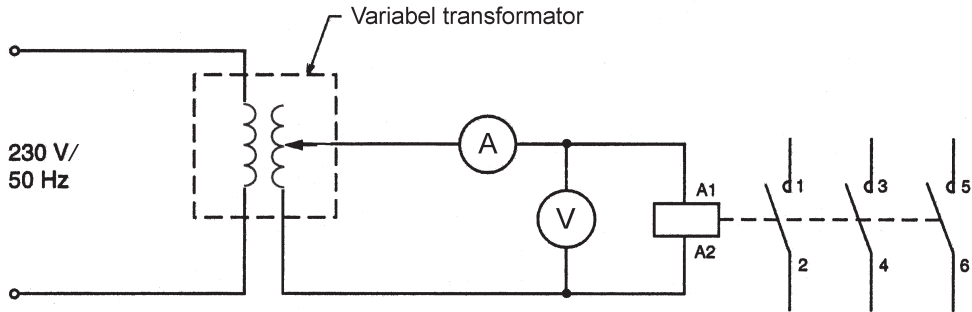
Figur 4.17 Koblingen av kondensatoren til statorviklingene



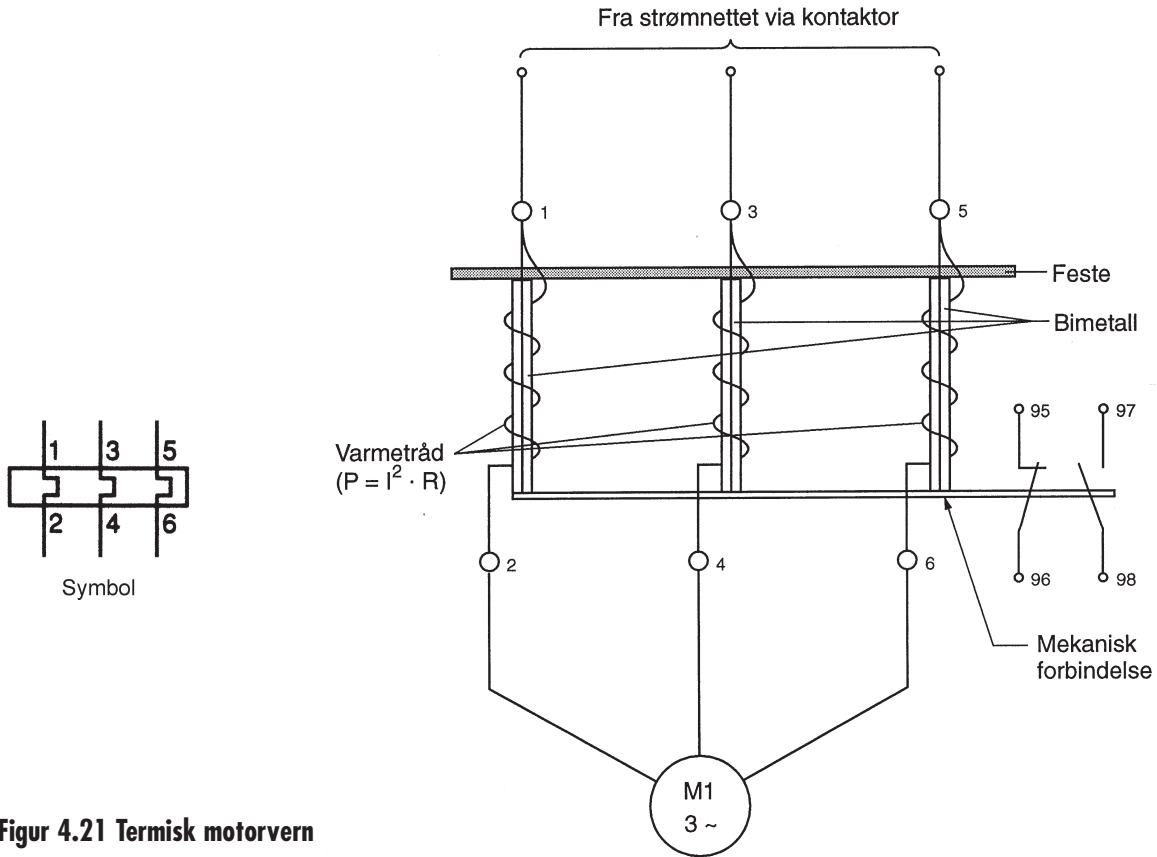
Figur 4.18 Prinsippskisse av en kontaktor



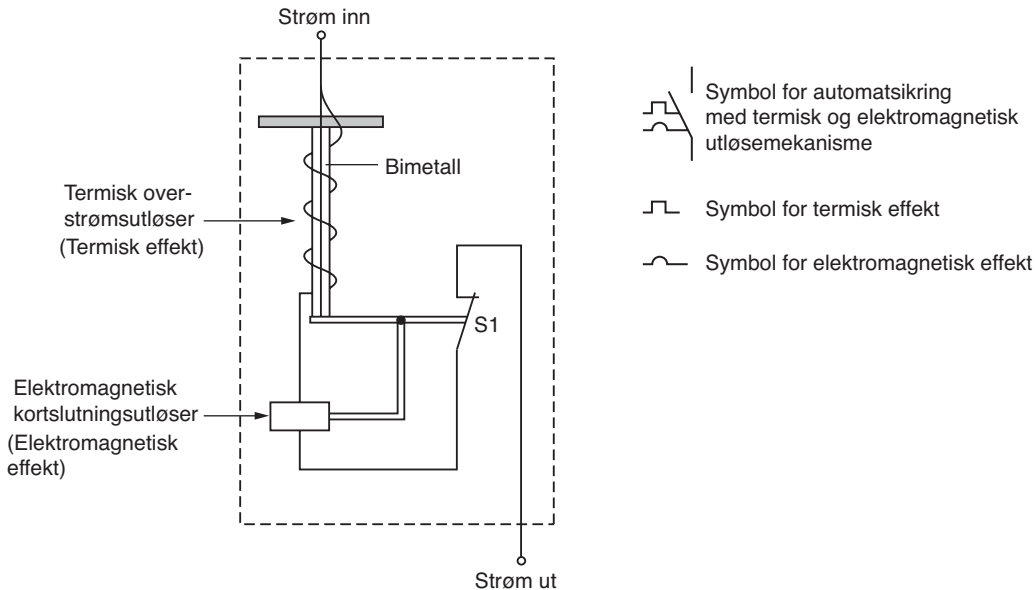
Figur 4.19 Kontaktorens klemmemerking



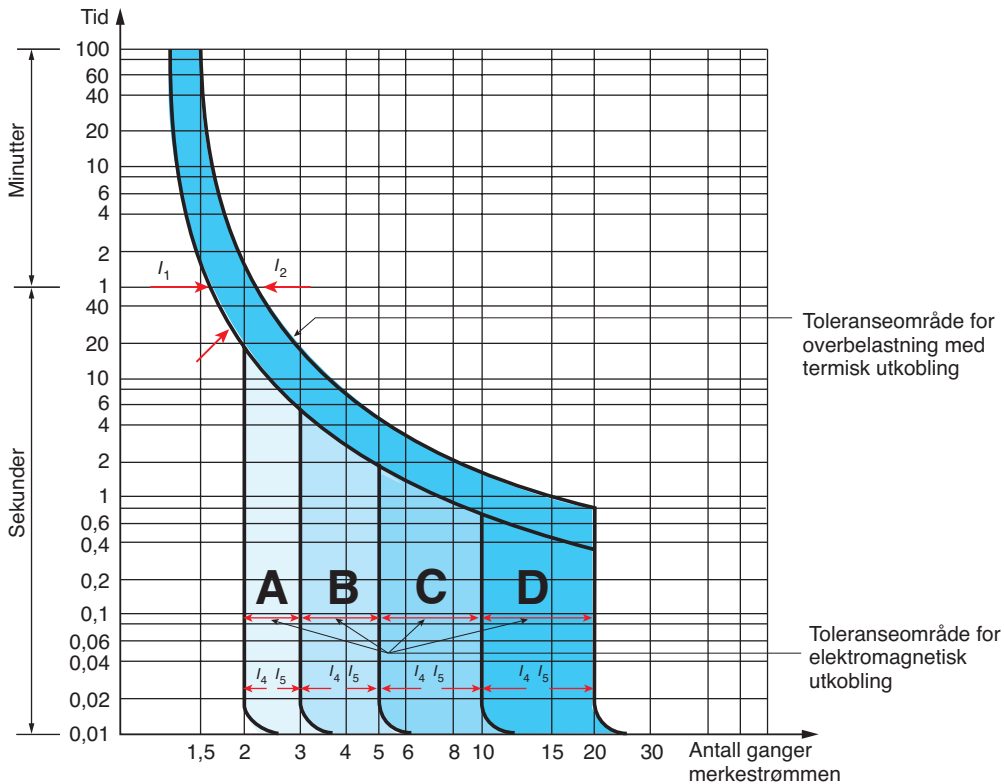
Figur 4.20



Figur 4.21 Termisk motorvern



Figur 4.22 Prinsippskisse av en automatsikring og symbolet for automatsikring



Figur 4.23 Utlosekaraktistikker

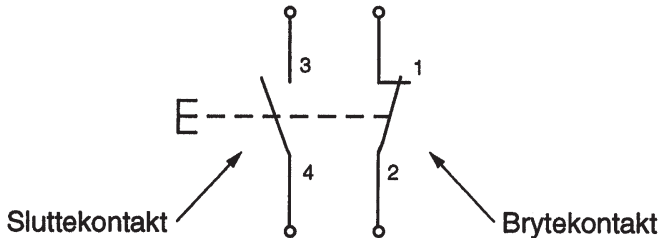


Symbol for
jordfeilbryter

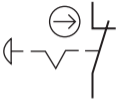


Symbol for automatsikring
med jordfeilbryter

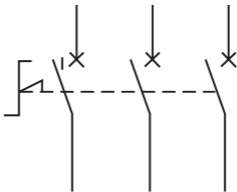
Figur 4.24 Jordfeilbryter og jordfeilautomat



Figur 4.25 Symbolet for betjeningsbryter med slutte- og brytekontakt



Figur 4.26 Symbolet for nødstopbryter



Figur 4.27 Symbolet for en sikkerhetsbryter plassert i en hovedstrømskrets