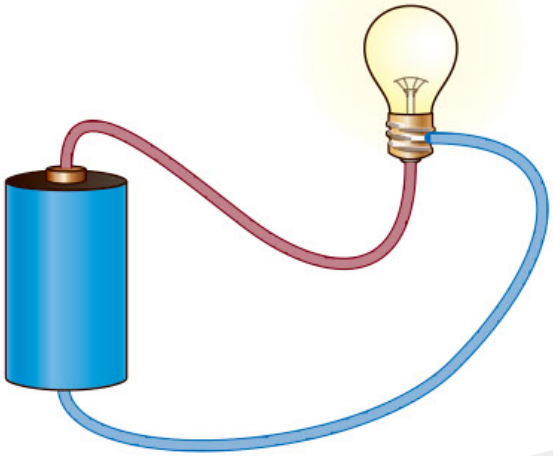
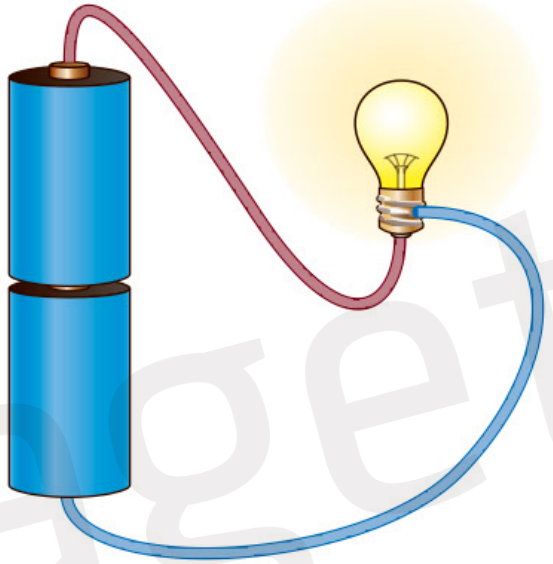
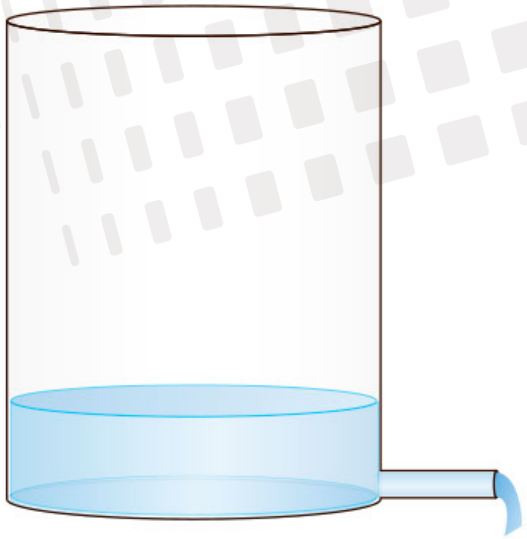
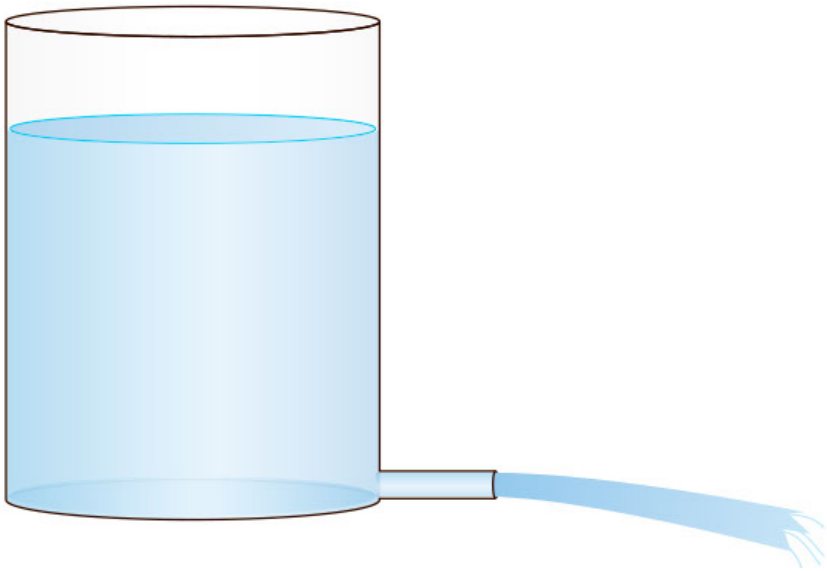
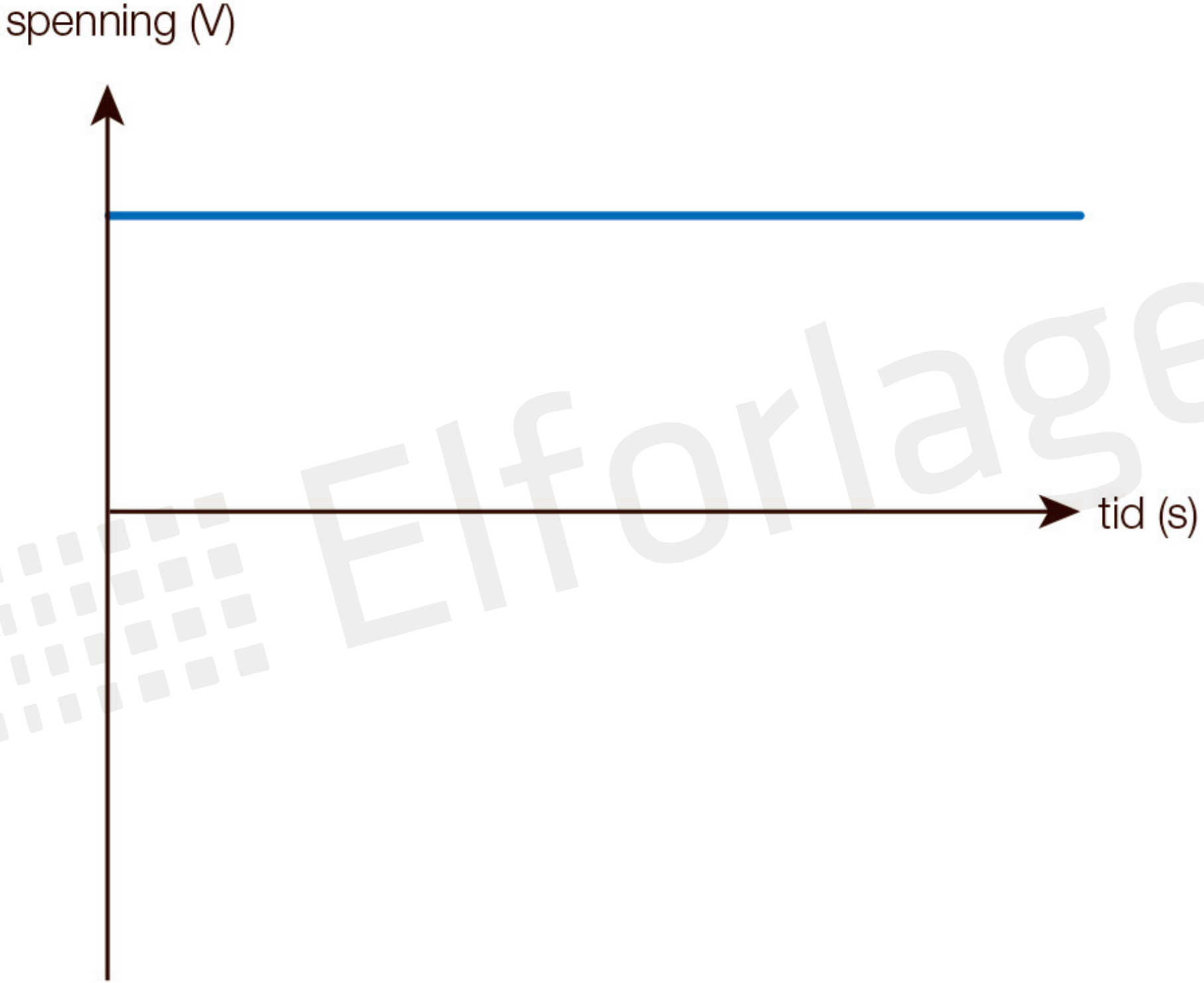


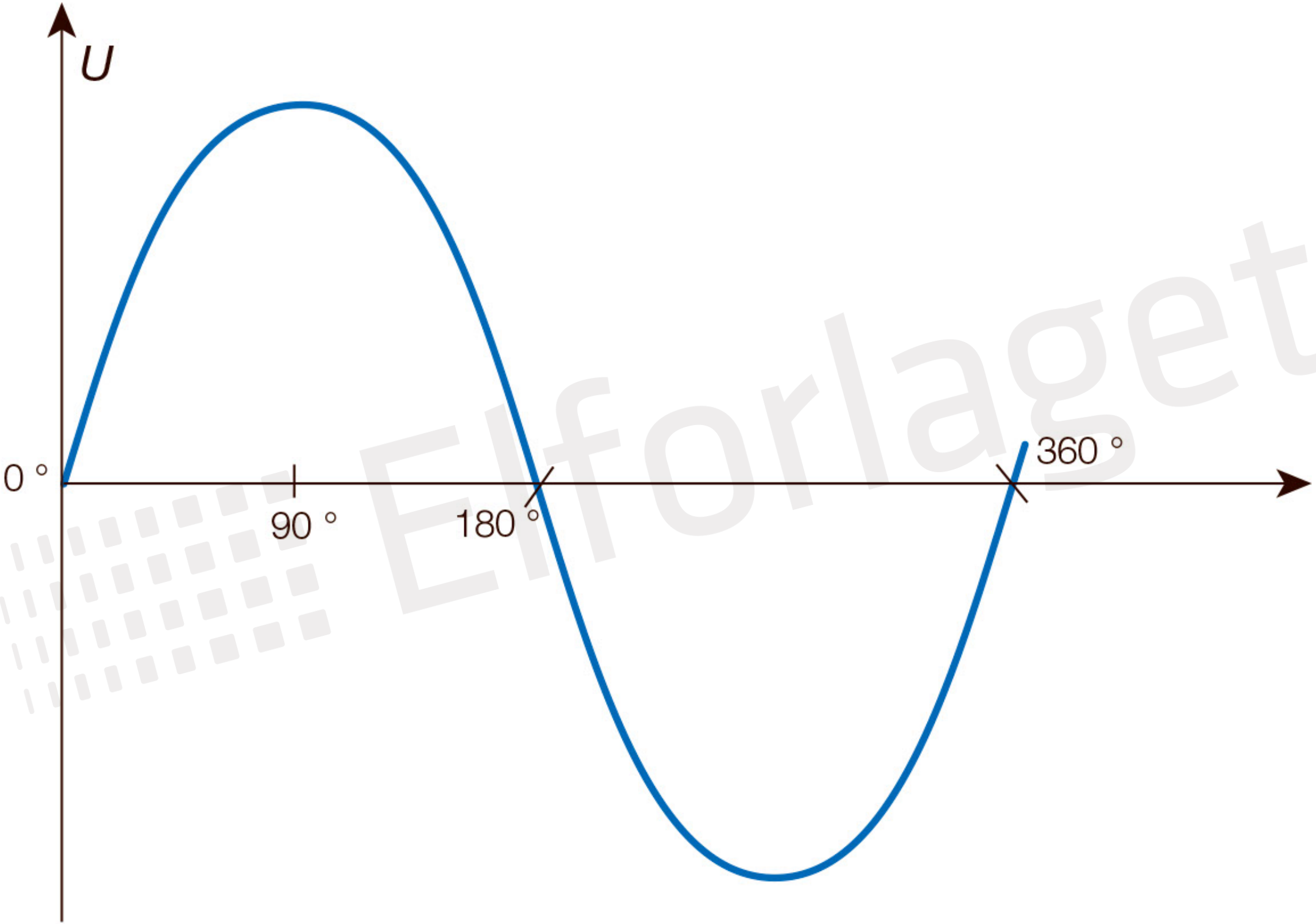


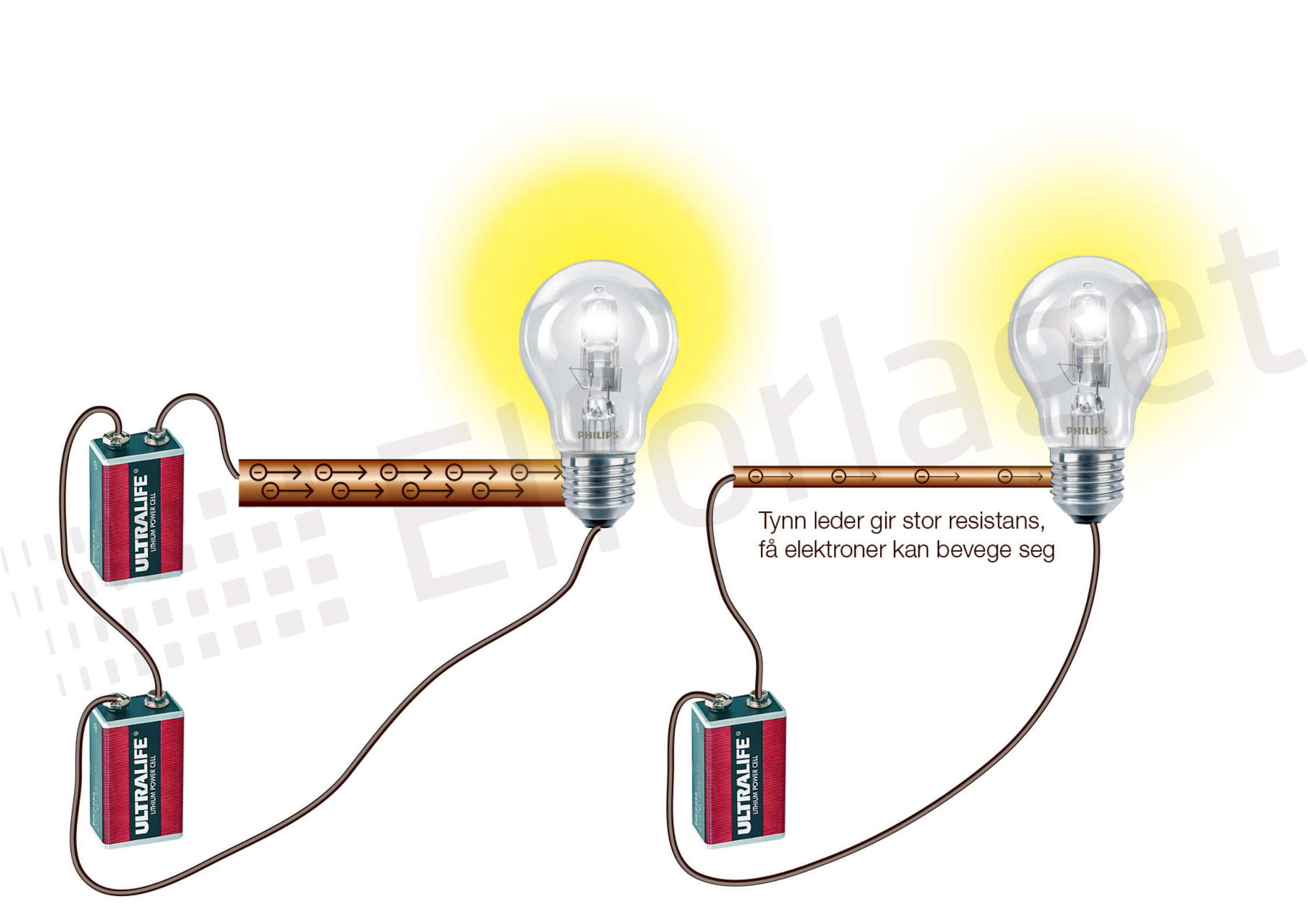


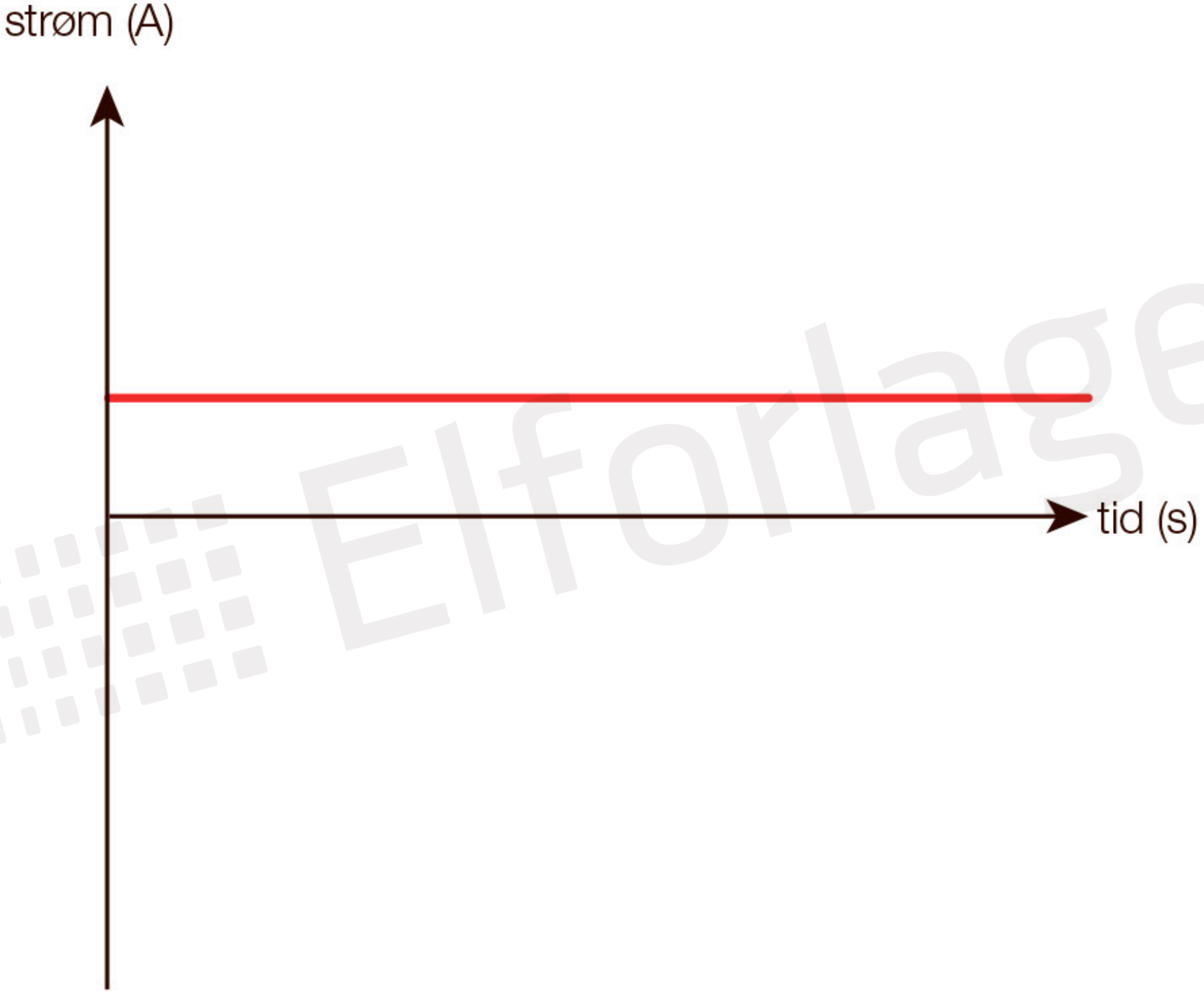


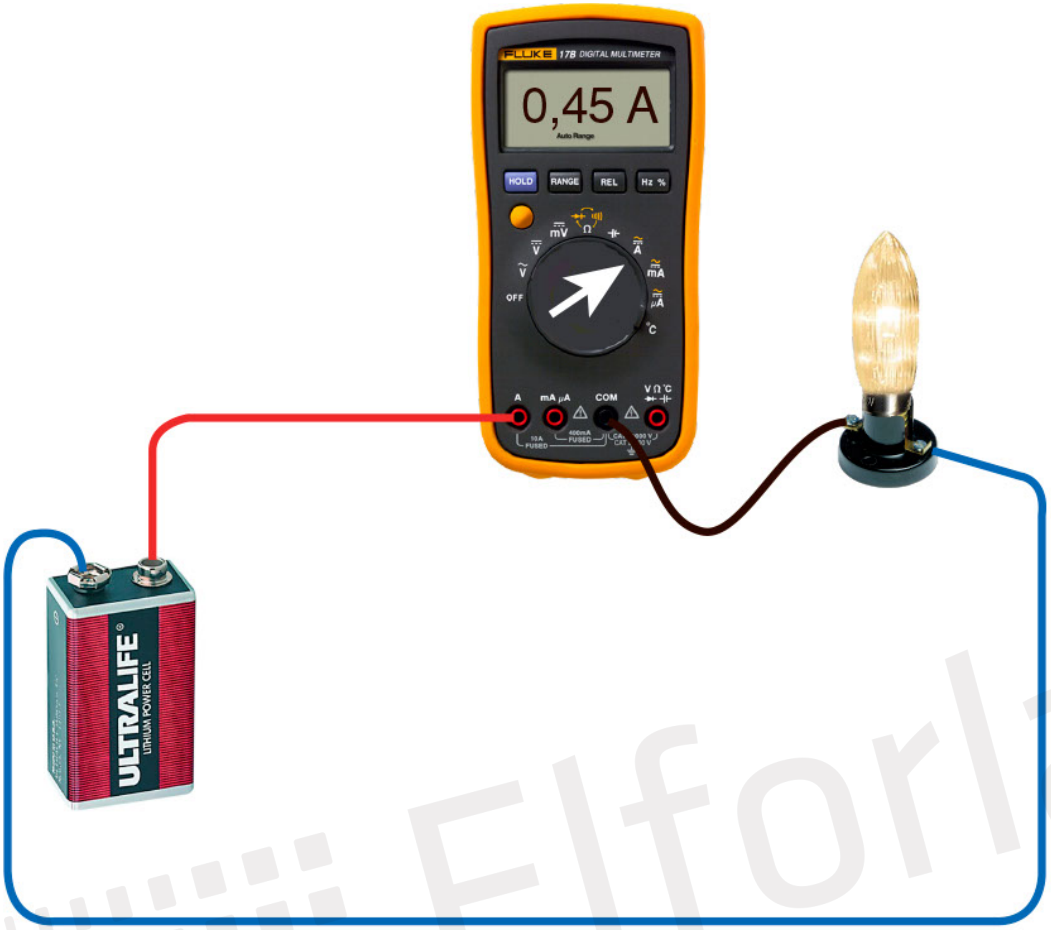



FLUKE 17B DIGITAL MULTIMETER
9,0
Auto Range
HOLD
RANGE
REL
Hz %
mV
Ω
V
A
V
mA
OFF
µA
°C
A
mA µA
COM
V Ω °C
10A FUSED
400mA FUSED
CAT I 1000 V
CAT II 600 V
ULTRALIFE
LITHIUM POWER CELL

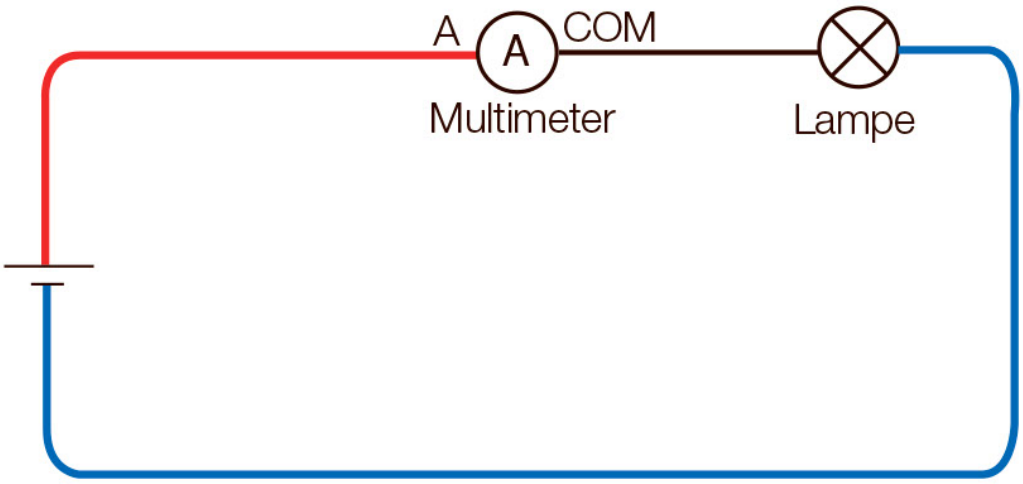



ULTRALIFE
LITHIUM POWER CELL
PHILIPS
Tynn leder gir stor resistans,
få elektroner kan bevege seg

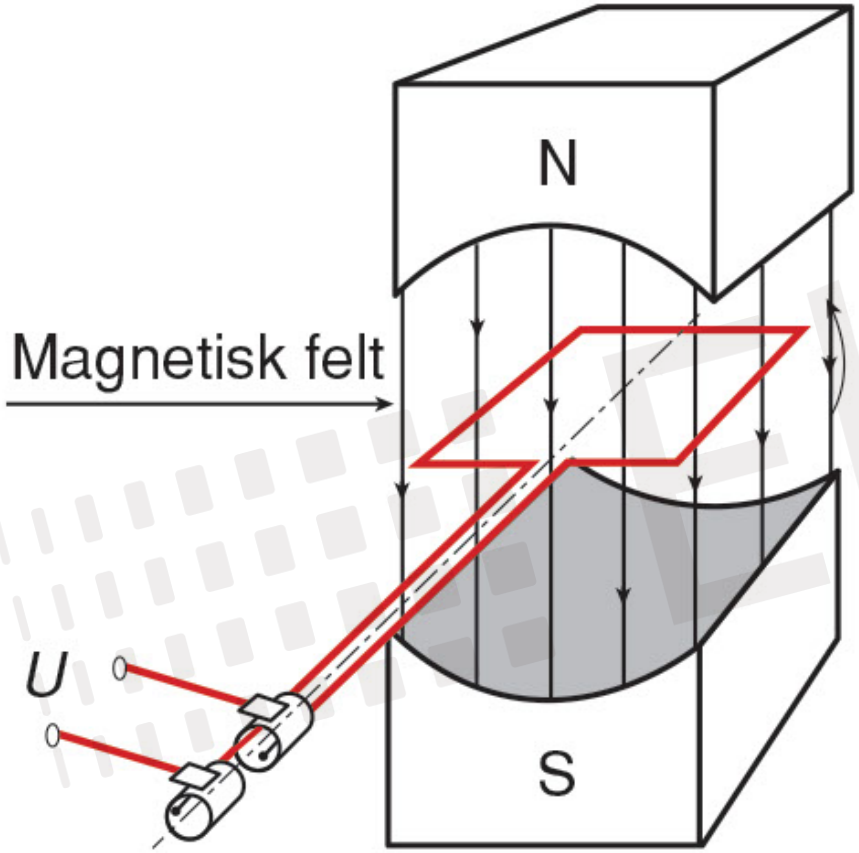


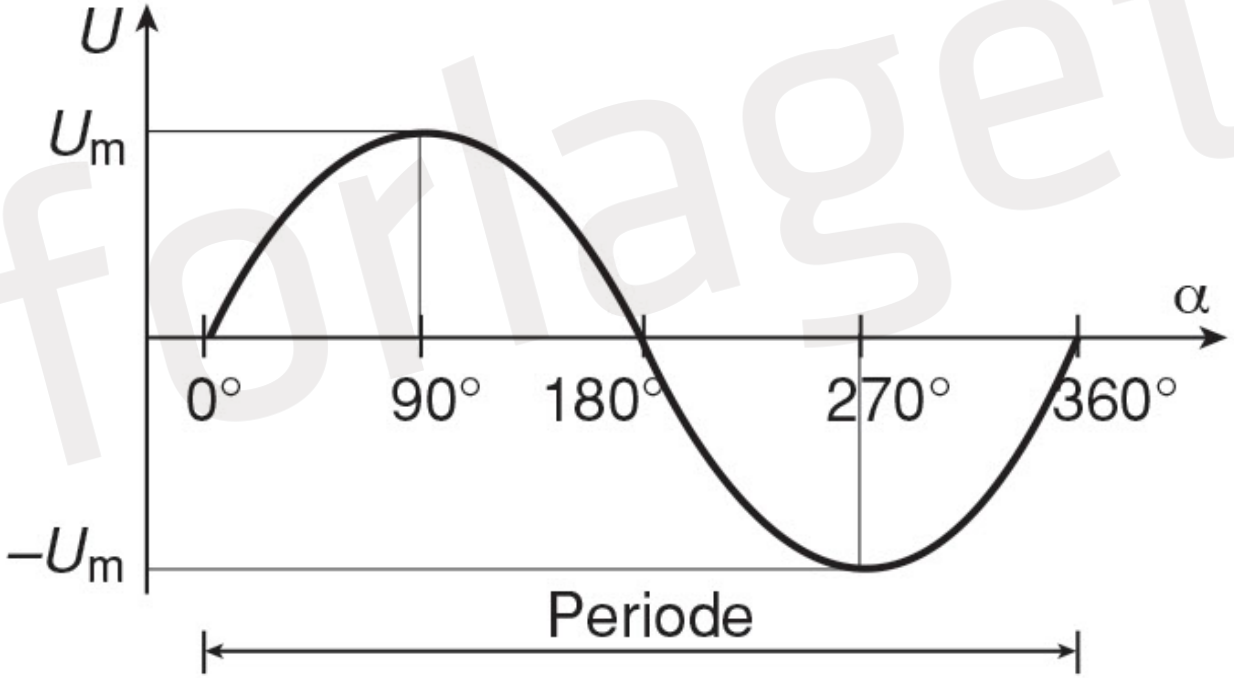


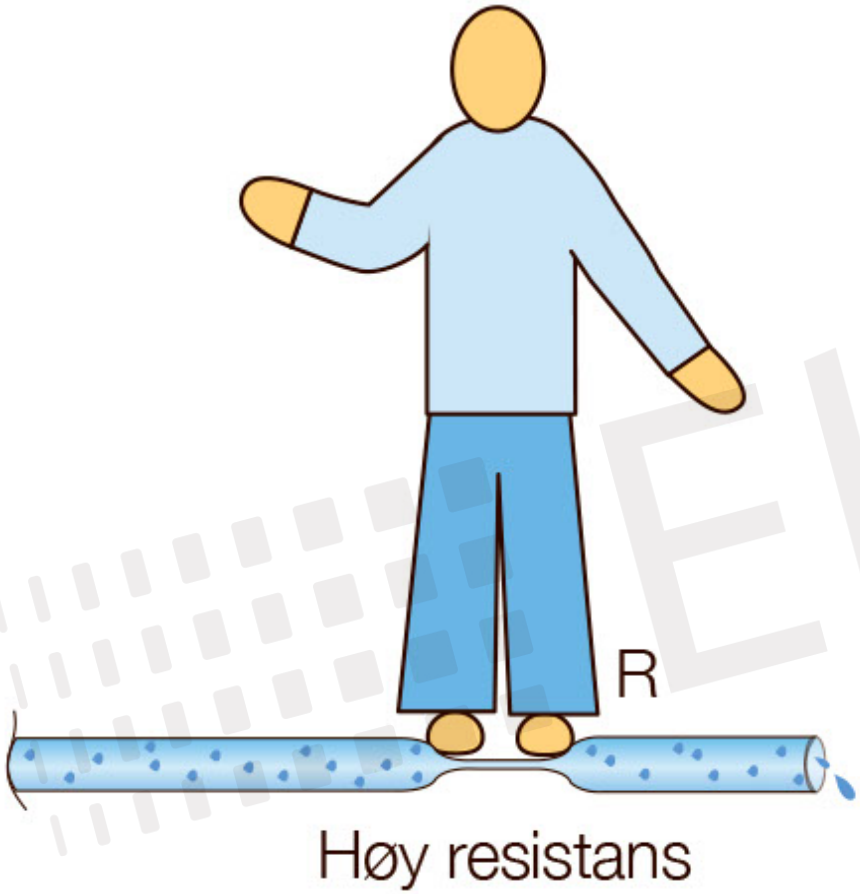
Amperemeter
i serie



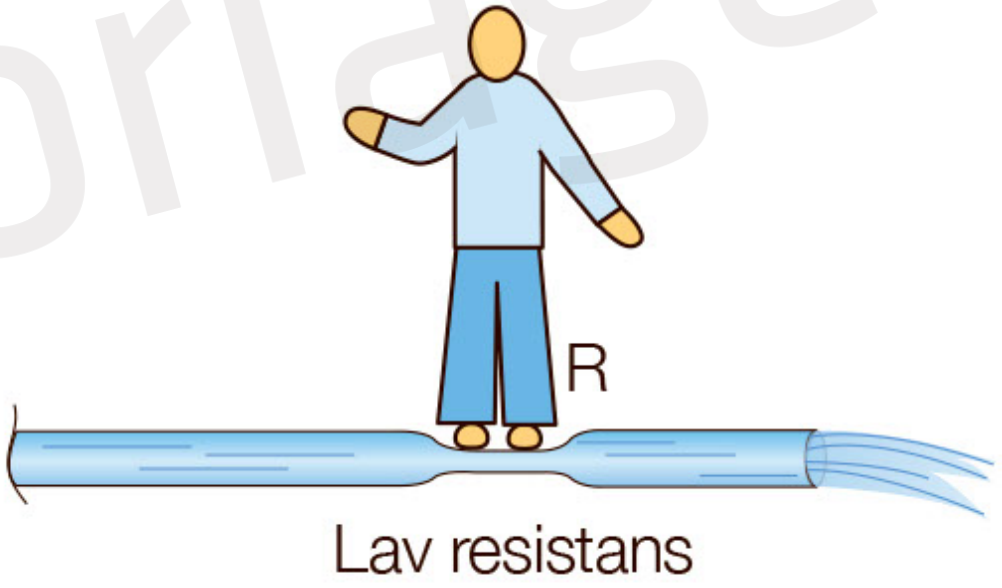

HOLD
OFF
324.0
A AC
°F/°C
AC/DC
FLUKE 324
TRUE RMS CLAMP METER
COM
VΩ


N
Magnetisk felt
U
S

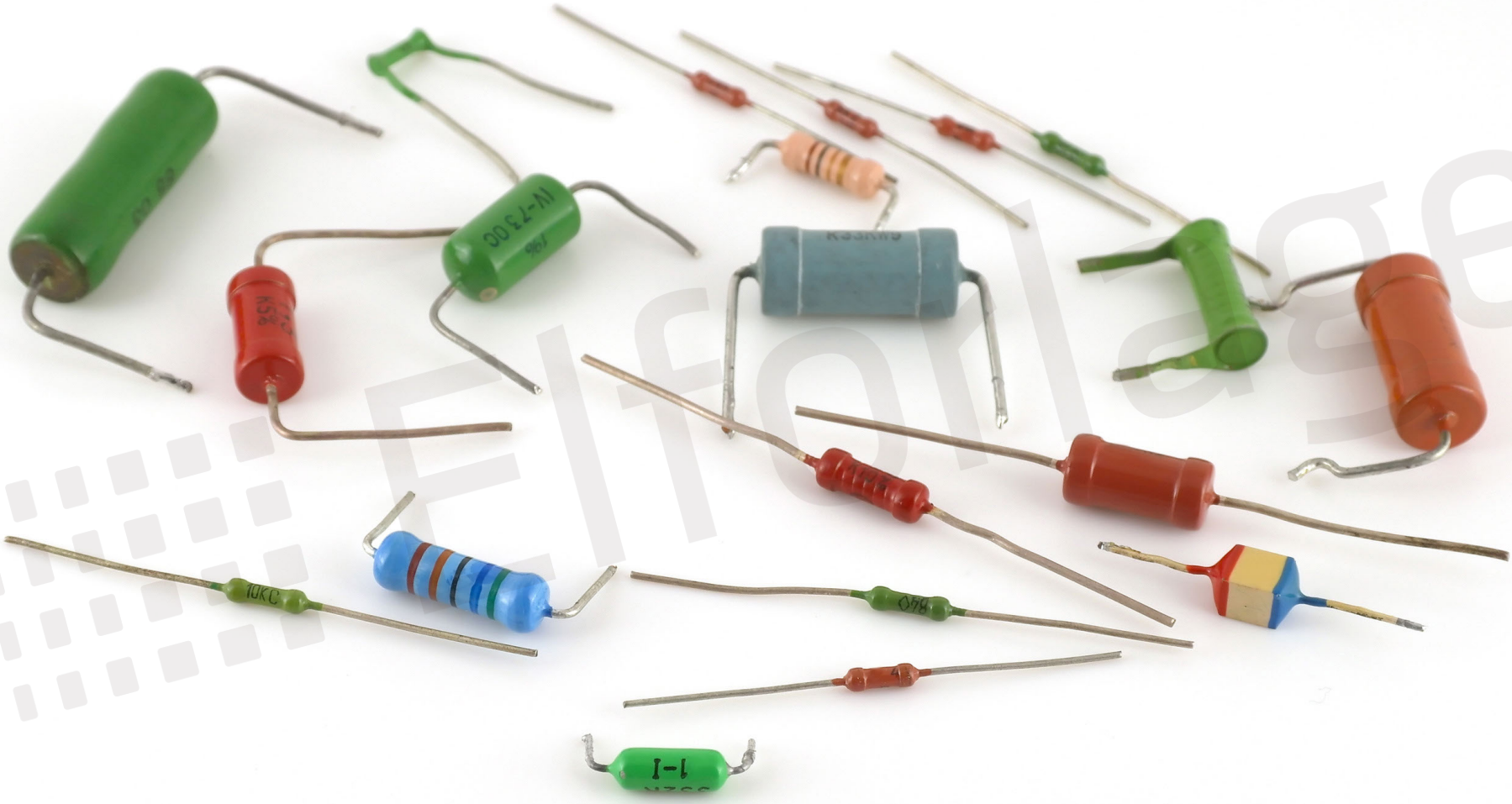

U
U_m
$-U_m$
α
0°
90°
180°
270°
360°
Periode



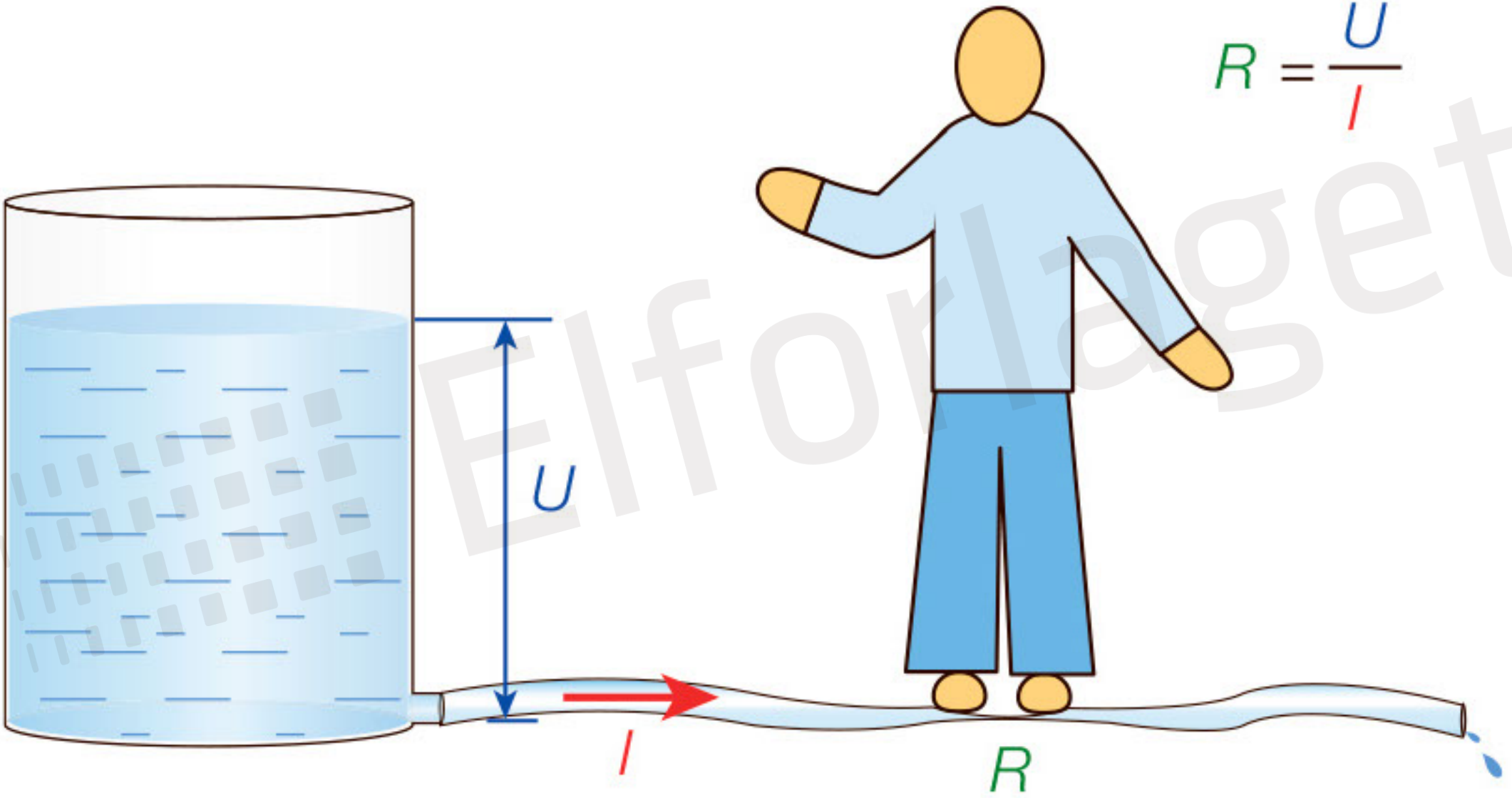
Høy resistans

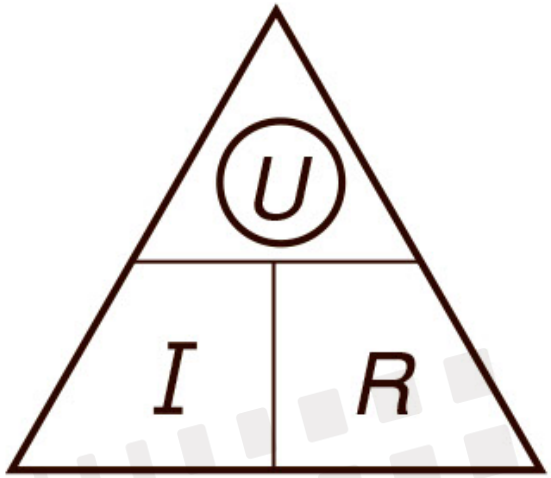


Lav resistans

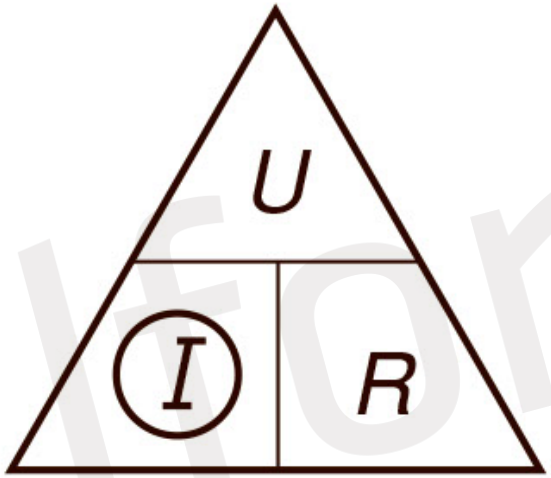

10KC
1-I


FLUKE 17B DIGITAL MULTIMETER
20 Ω
Auto Range
HOLD
RANGE
REL
Hz %
mV
Ω
V
A
V
mA
OFF
µA
°C
A
mA µA
COM
V Ω °C
10A FUSED
400mA FUSED
CAT I 1000 V
CAT II 600 V

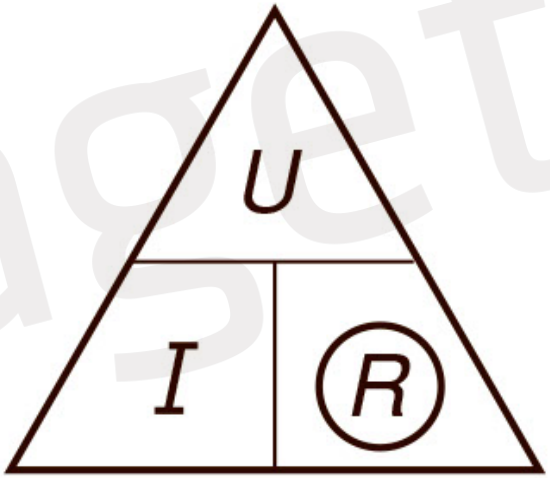

$R = \frac{U}{I}$
U
I
R



$$U = I \cdot R$$

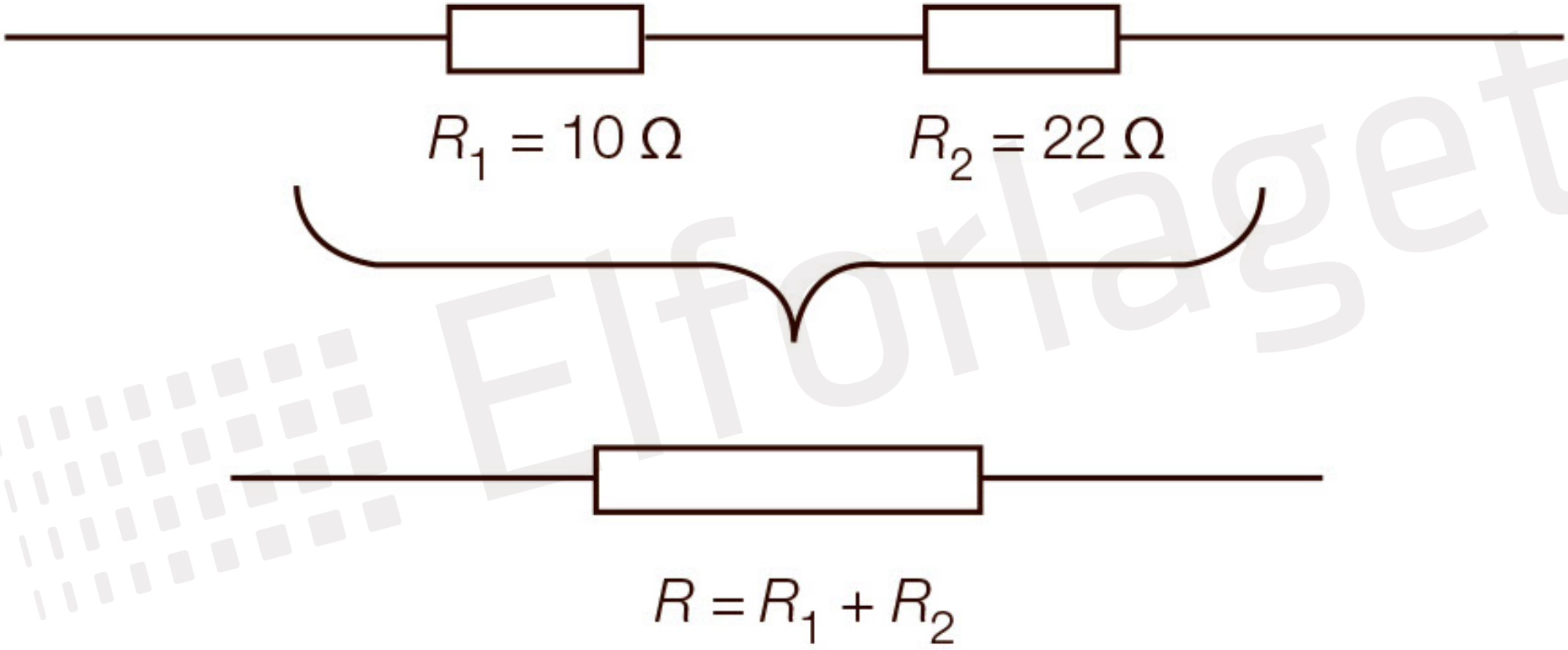


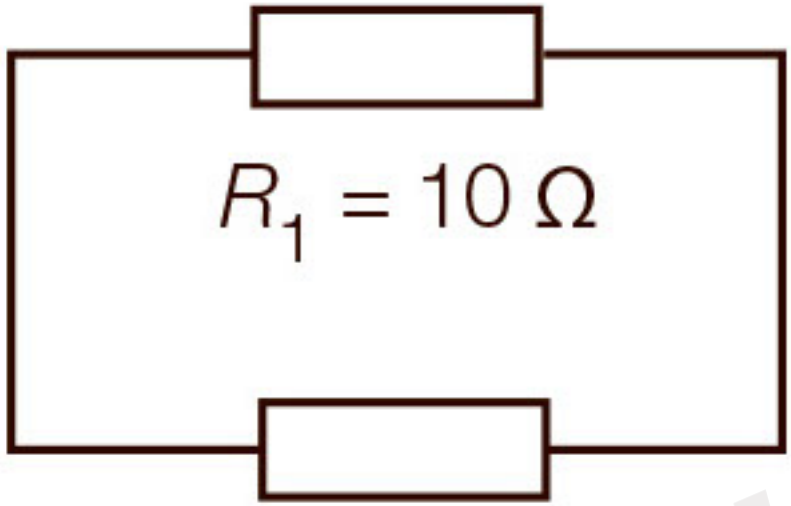
$$I = \frac{U}{R}$$



$$R = \frac{U}{I}$$

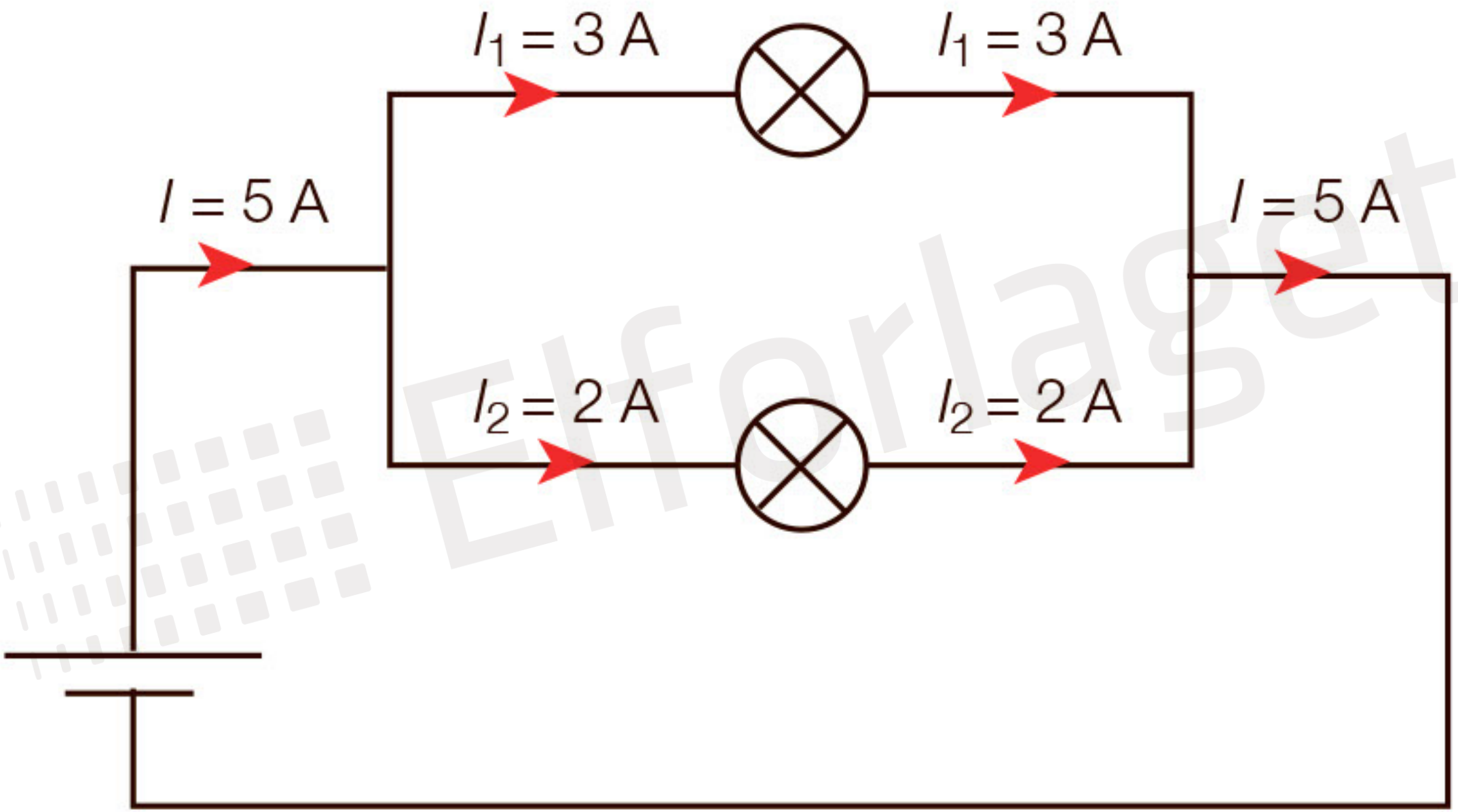

Elforlaget

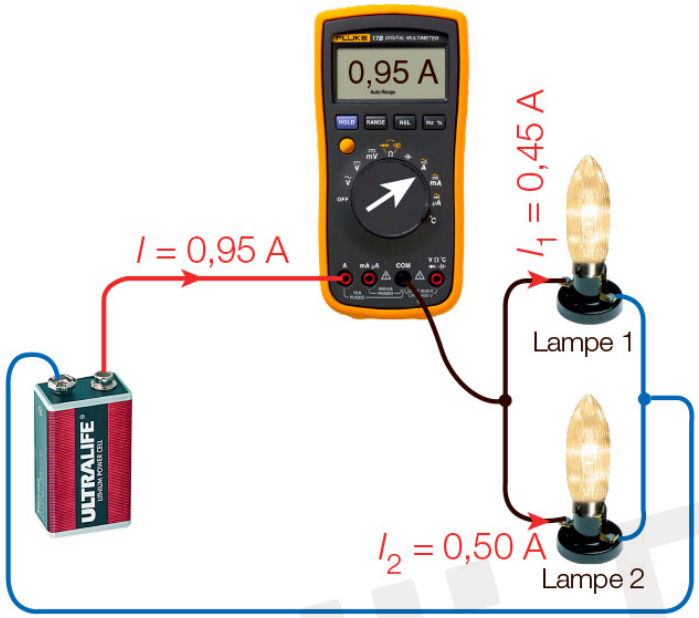


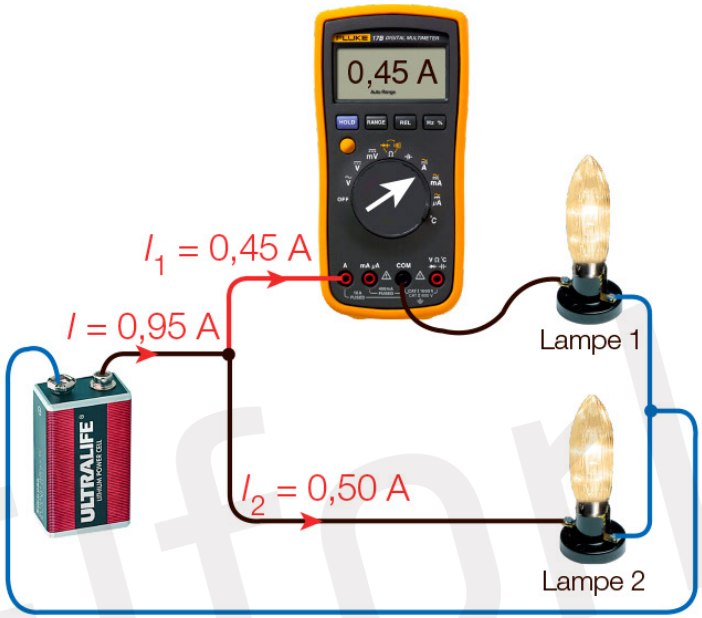


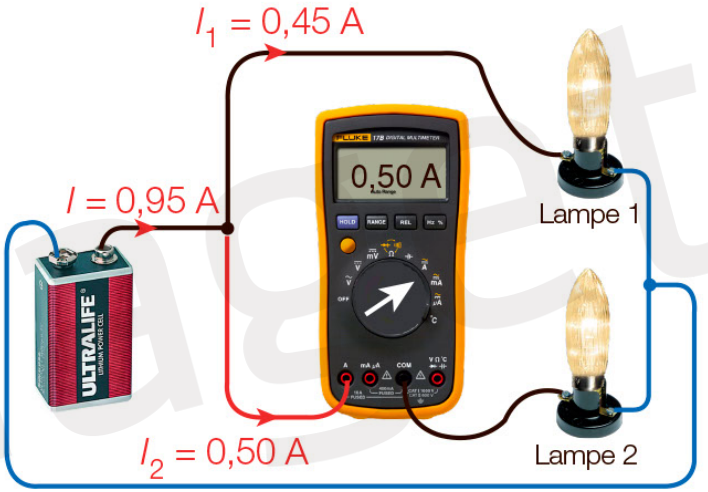
$R_2 = 22\ \Omega$

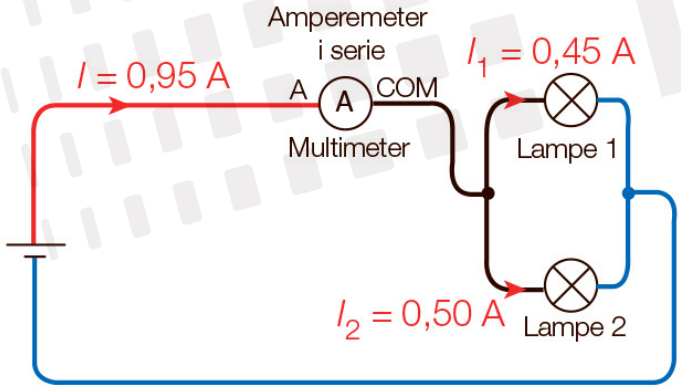
$$R = \frac{R_1 \cdot R_2}{R_1 + R_2} \quad \text{eller } R \Rightarrow \quad \frac{1}{R} = \frac{1}{R_1} + \frac{1}{R_2}$$

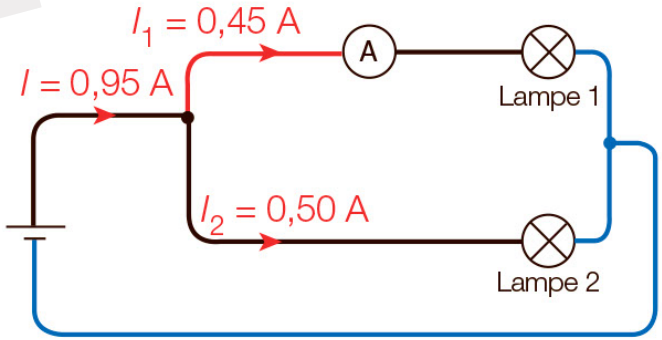

$I_1 = 3\ A$
$I_1 = 3\ A$
$I = 5\ A$
$I = 5\ A$
$I_2 = 2\ A$
$I_2 = 2\ A$

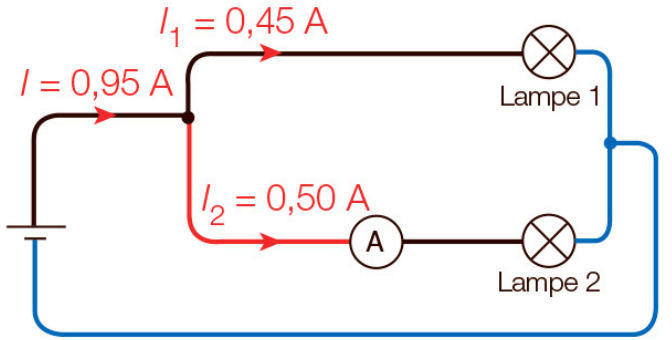

0,95 A
I = 0,95 A
I_1 = 0,45 A
Lampe 1
I_2 = 0,50 A
Lampe 2

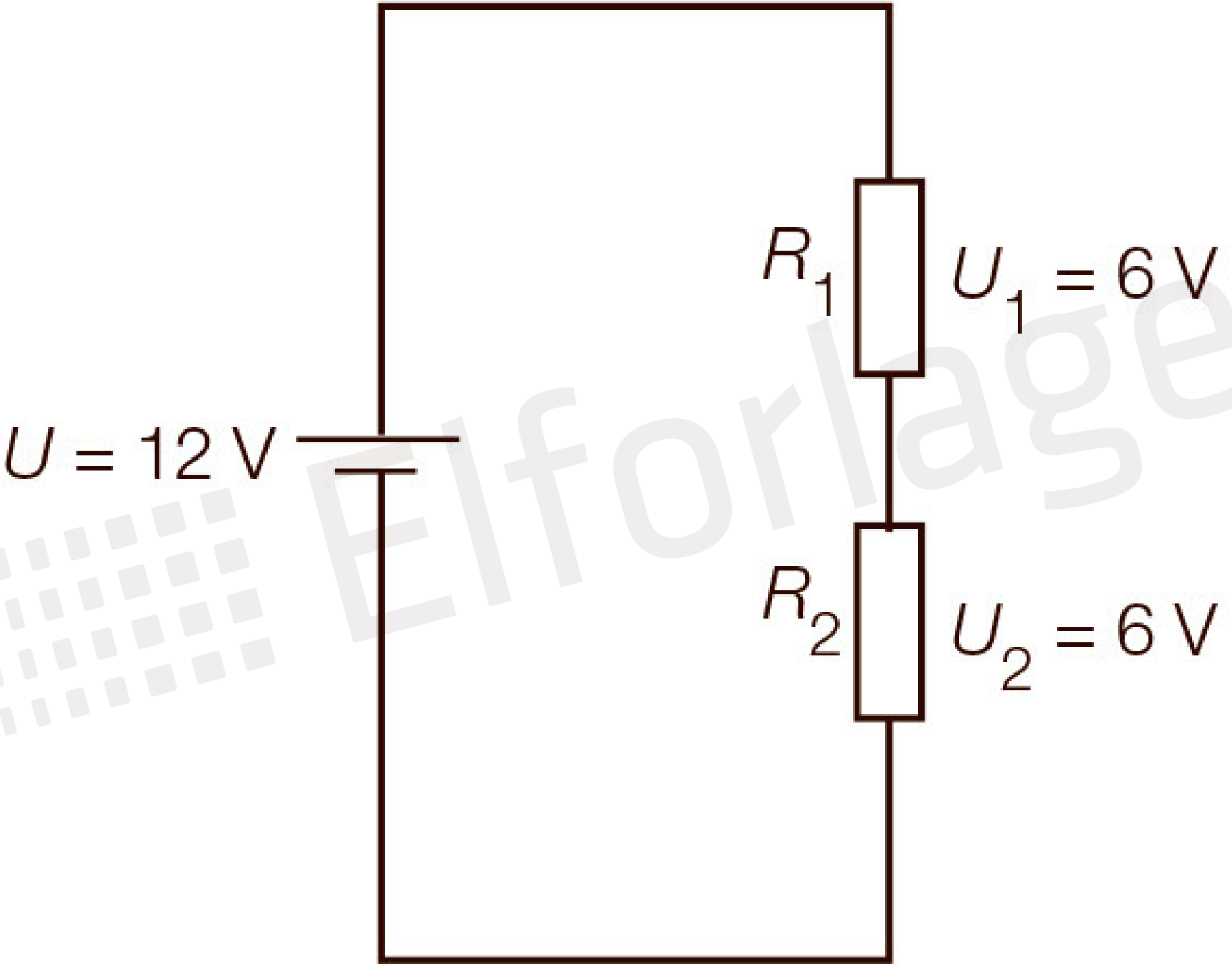

0,45 A
I_1 = 0,45 A
I = 0,95 A
Lampe 1
I_2 = 0,50 A
Lampe 2

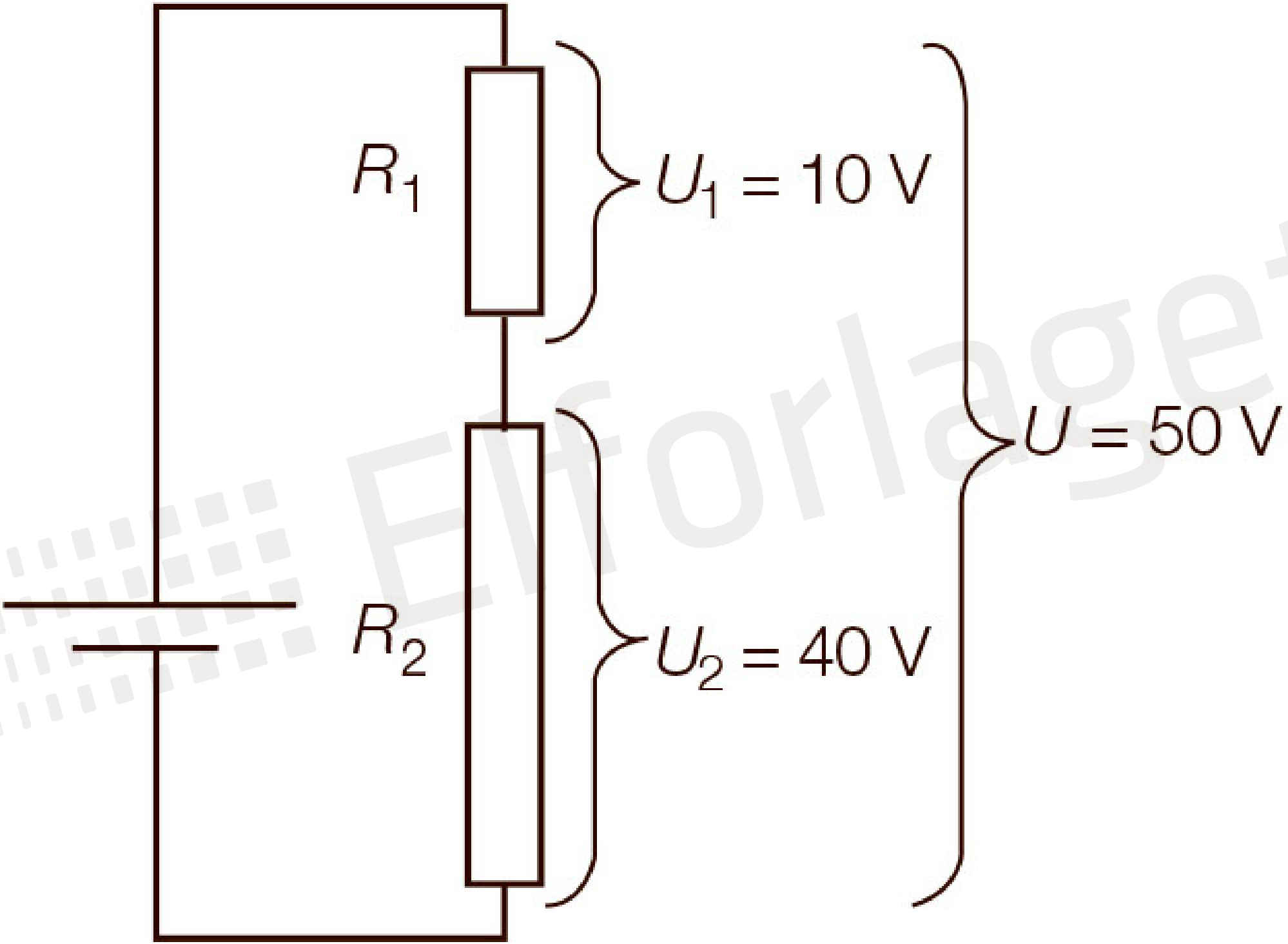

I_1 = 0,45 A
0,50 A
I = 0,95 A
Lampe 1
I_2 = 0,50 A
Lampe 2

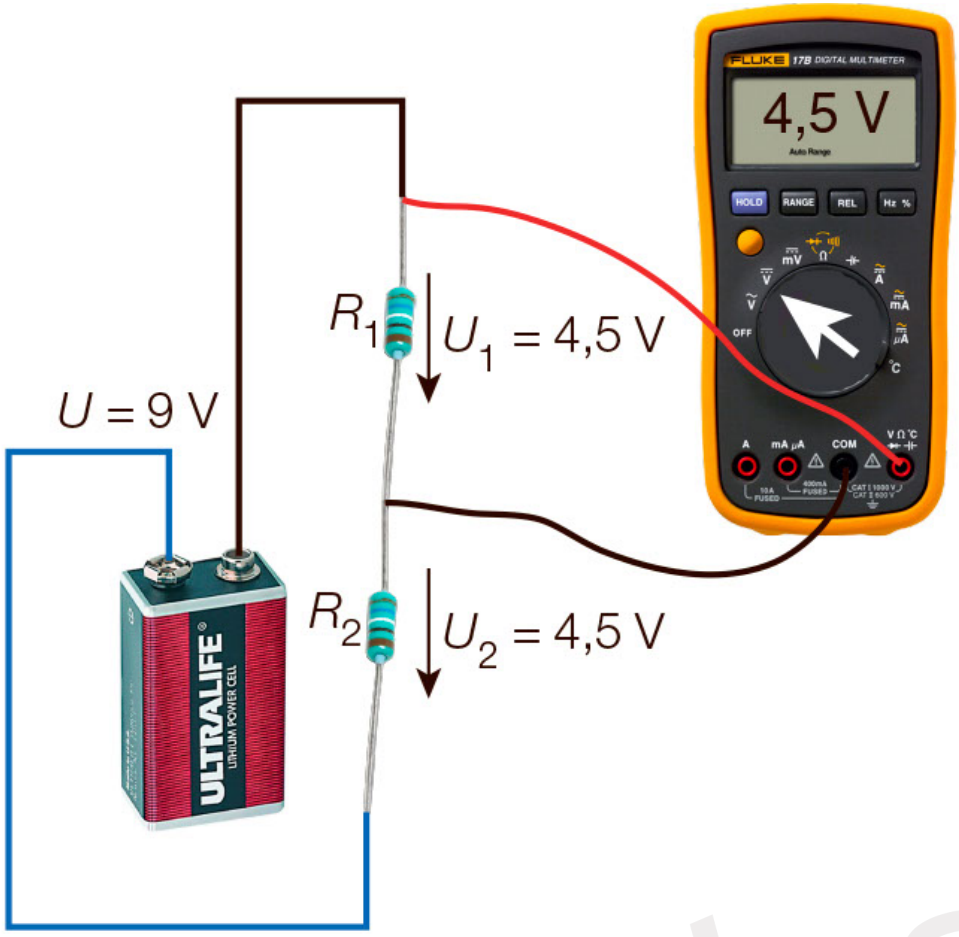

Amperemeter
i serie
I = 0,95 A
A
A
COM
Multimeter
I_1 = 0,45 A
Lampe 1
I_2 = 0,50 A
Lampe 2

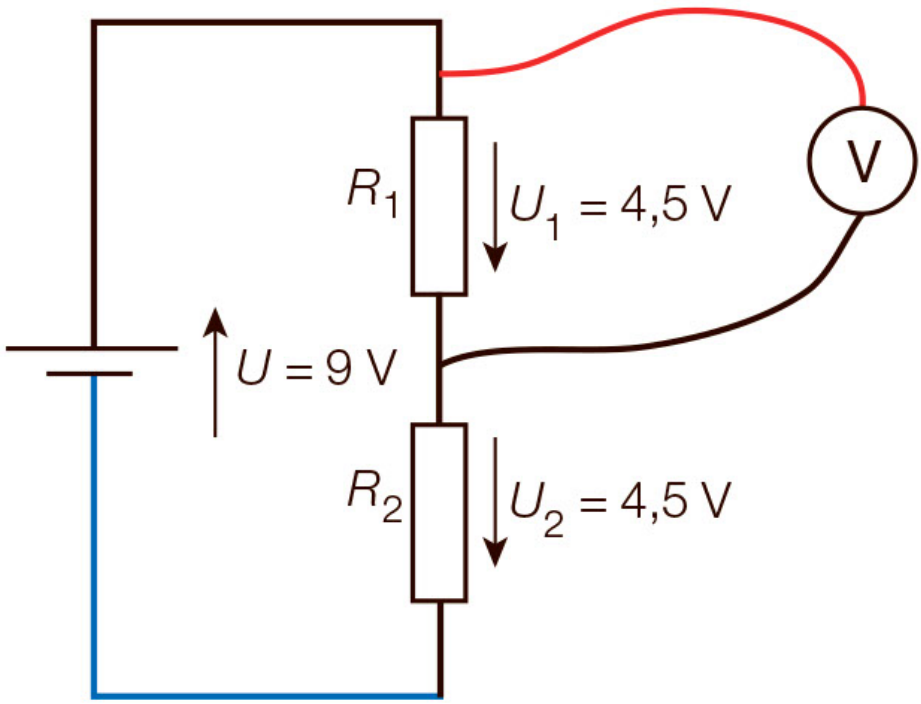

I_1 = 0,45 A
I = 0,95 A
A
Lampe 1
I_2 = 0,50 A
Lampe 2

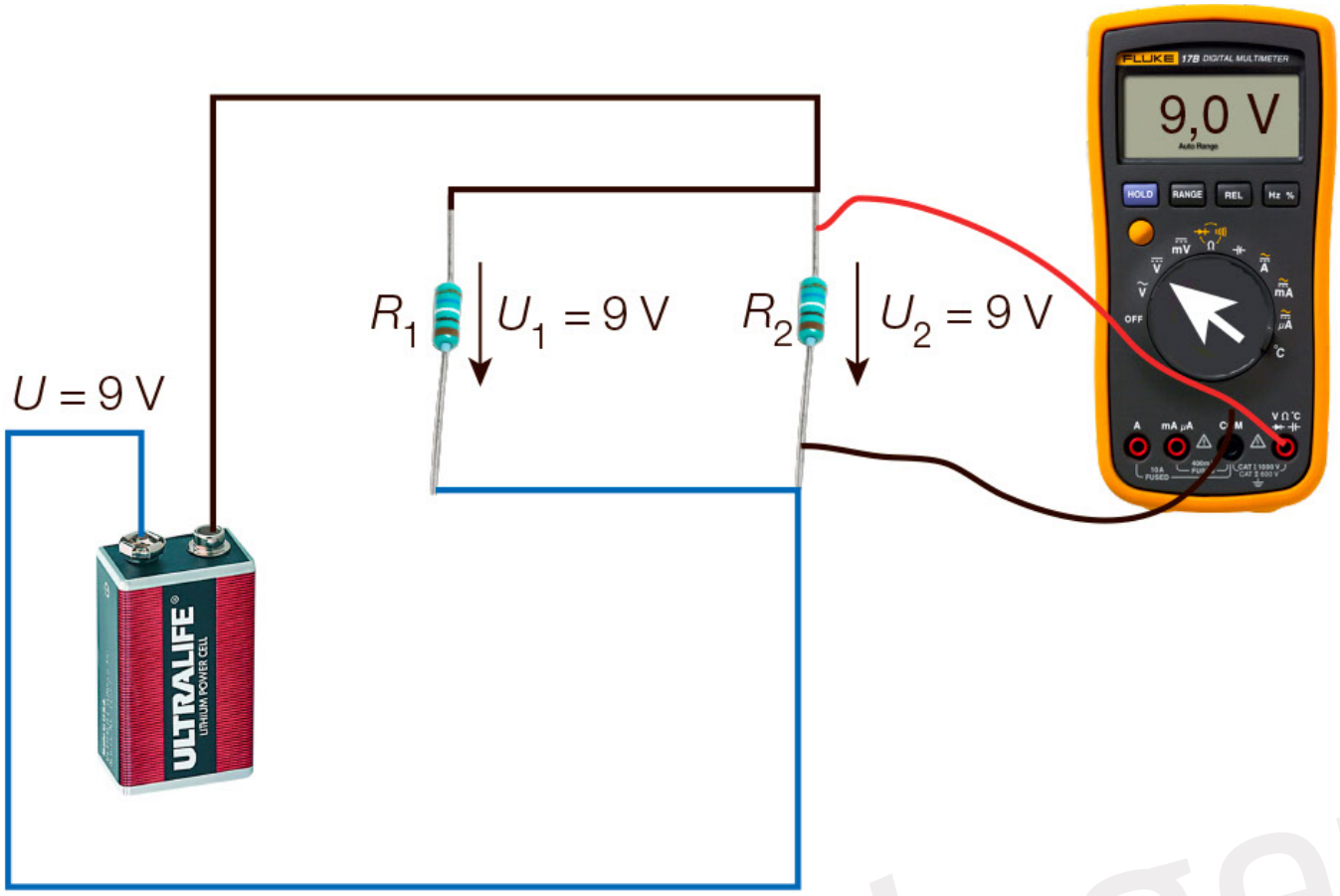

I_1 = 0,45 A
I = 0,95 A
Lampe 1
I_2 = 0,50 A
A
Lampe 2

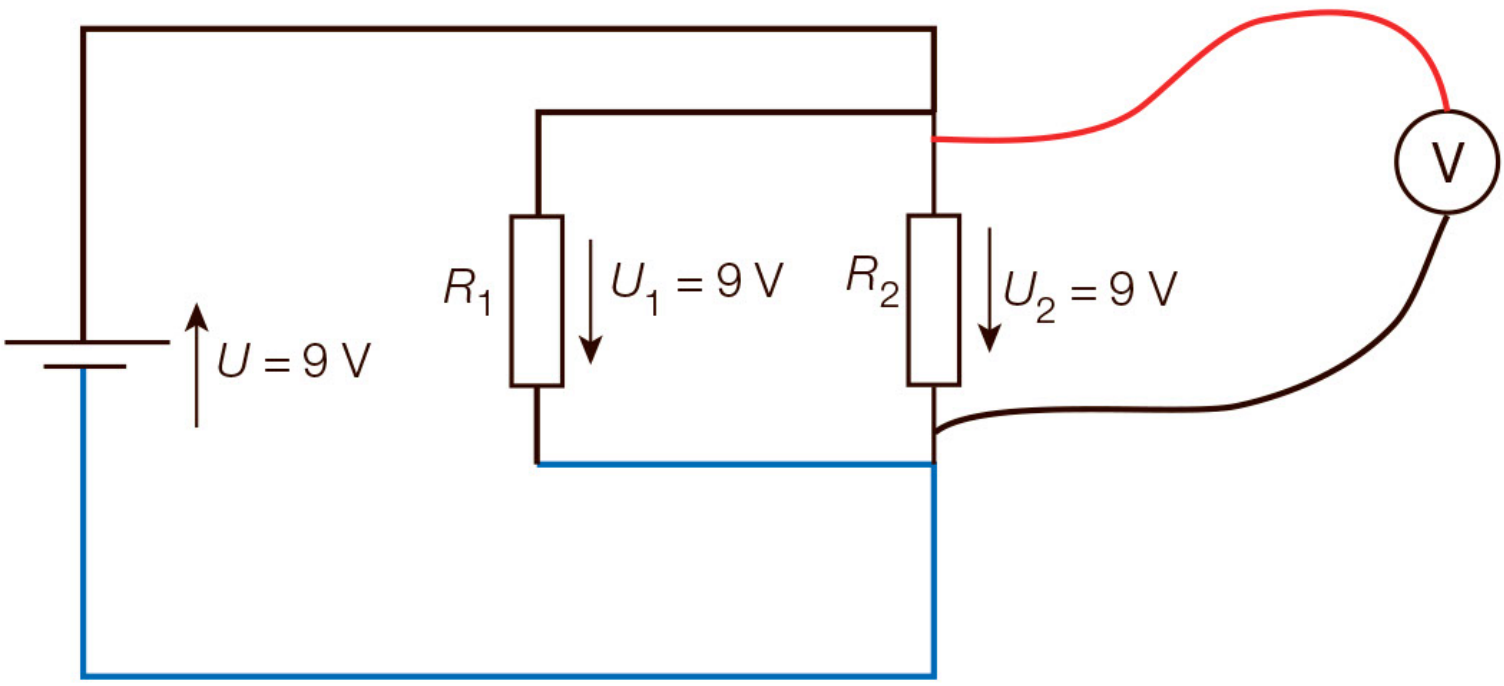


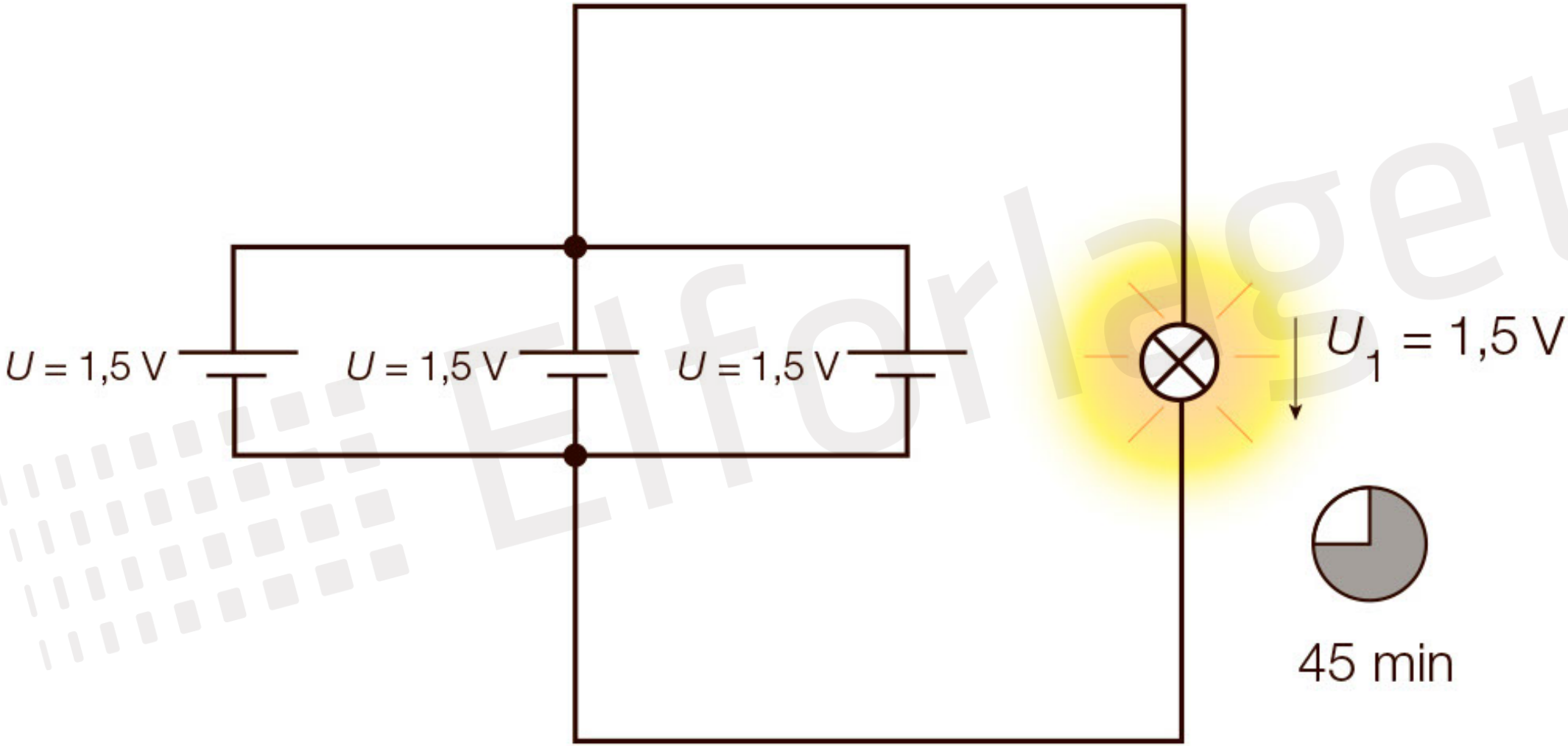

R_1
$U_1 = 10\ \mathrm{V}$
R_2
$U_2 = 40\ \mathrm{V}$
$U = 50\ \mathrm{V}$

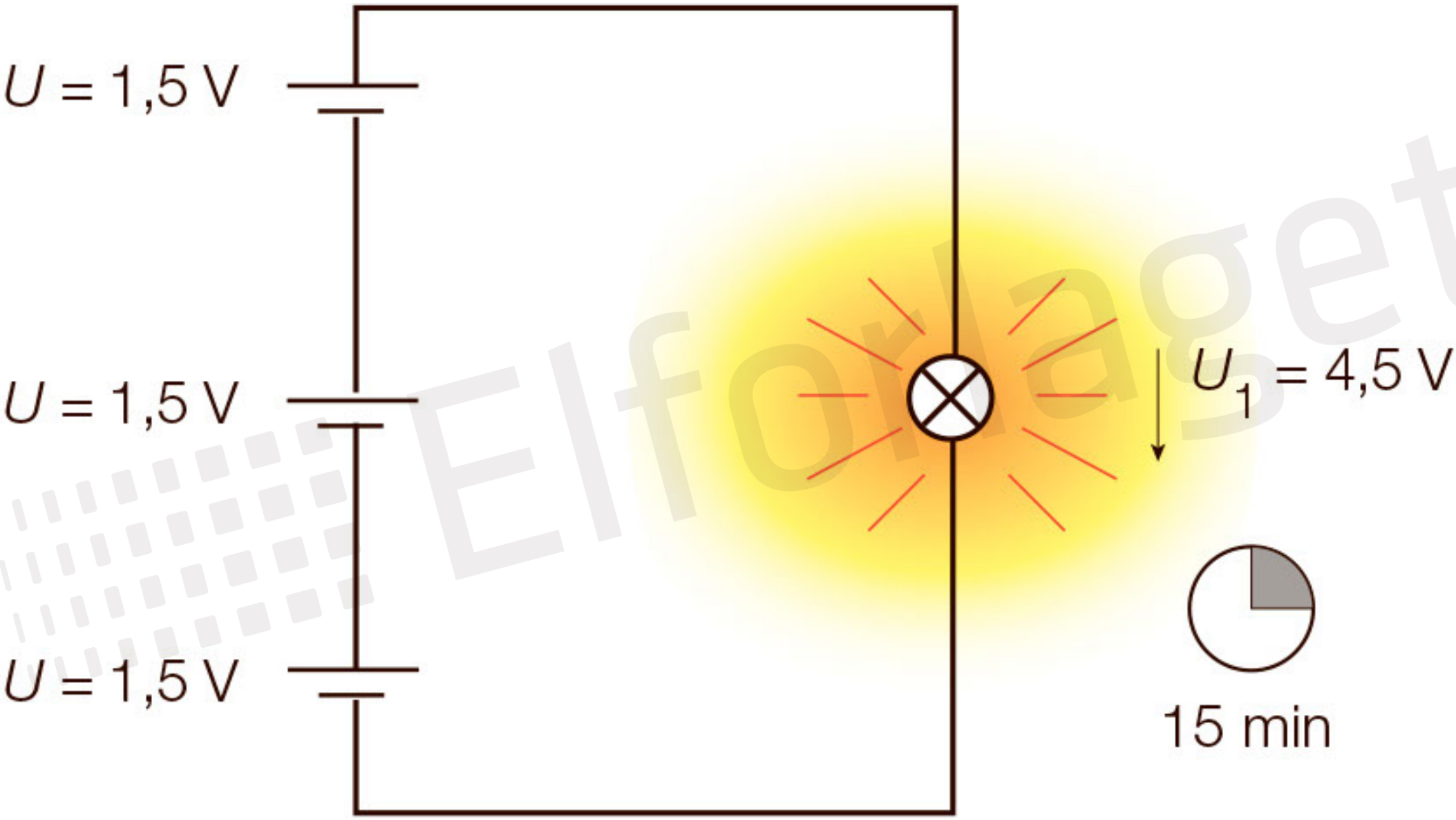

FLUKE 17B DIGITAL MULTIMETER
4,5 V
HOLD
RANGE
REL
Hz %
OFF
A
mA µA
COM
V Ω °C
ULTRALIFE
LITHIUM POWER CELL
R_1
$U_1 = 4{,}5$ V
$U = 9$ V
R_2
$U_2 = 4{,}5$ V

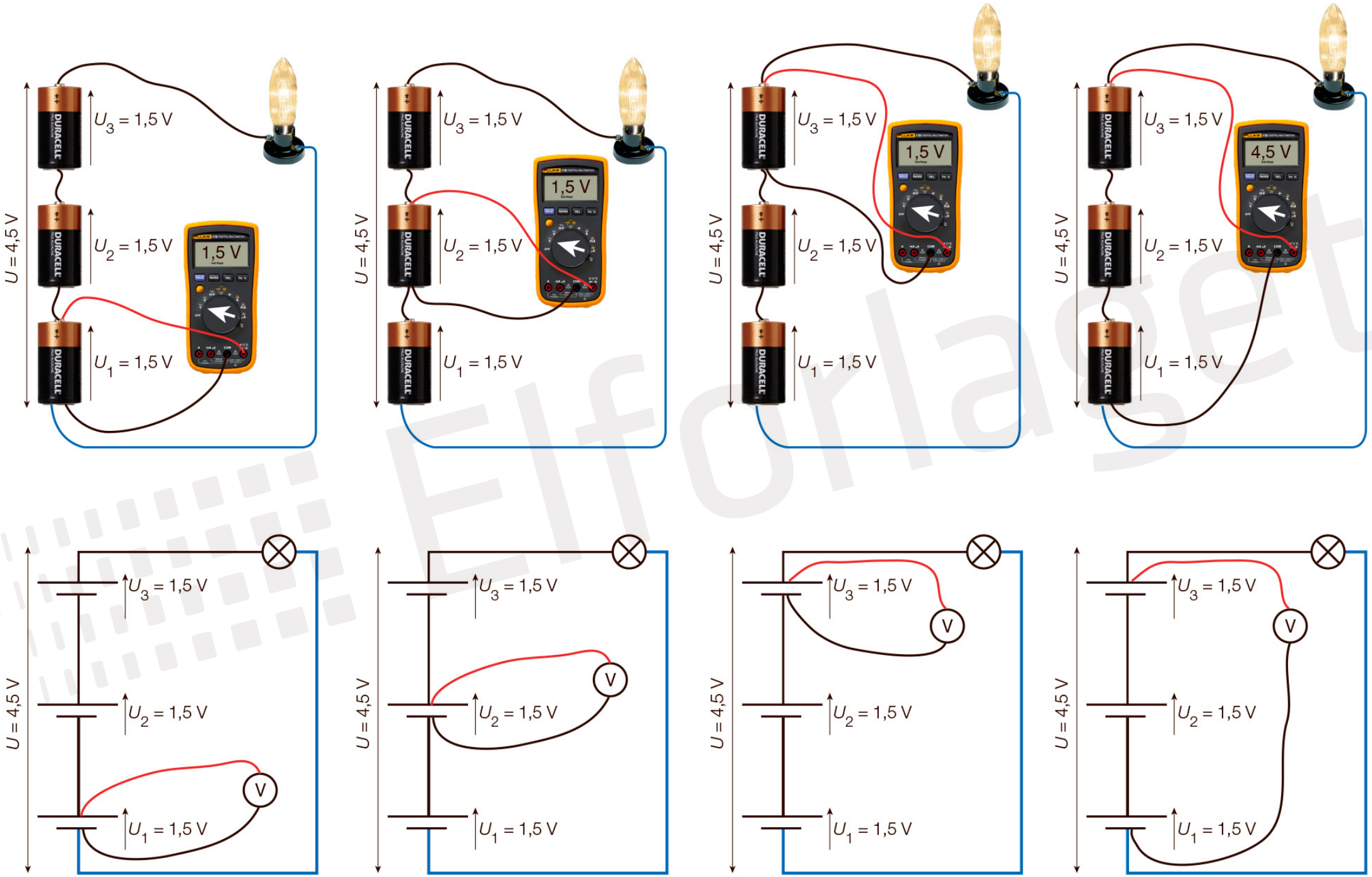

V
R_1
$U_1 = 4{,}5$ V
$U = 9$ V
R_2
$U_2 = 4{,}5$ V


$U = 9\,\text{V}$
R_1
$U_1 = 9\,\text{V}$
R_2
$U_2 = 9\,\text{V}$
ULTRALIFE
LITHIUM POWER CELL
FLUKE 17B DIGITAL MULTIMETER
9,0 V
HOLD
RANGE
REL
Hz %
OFF

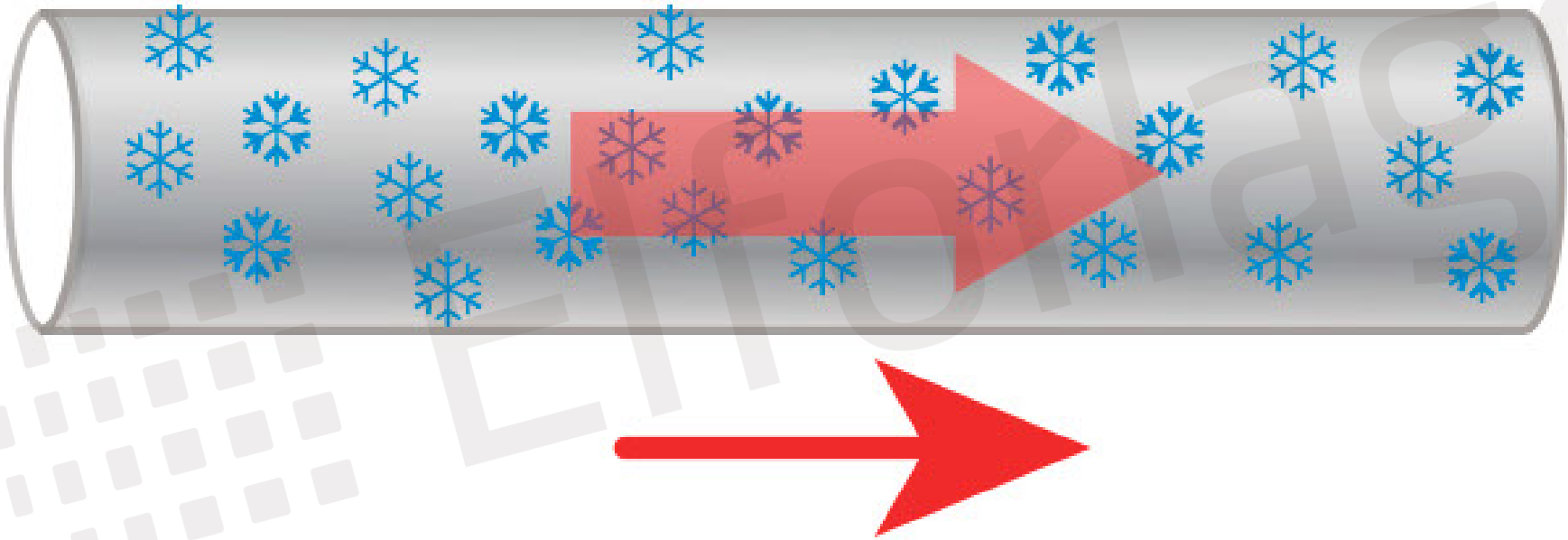

$U = 9\,\text{V}$
R_1
$U_1 = 9\,\text{V}$
R_2
$U_2 = 9\,\text{V}$
V


U = 1,5 V
U = 1,5 V
U = 1,5 V
U1 = 1,5 V
45 min


U = 1,5 V
U = 1,5 V
U = 1,5 V
U1 = 4,5 V
15 min

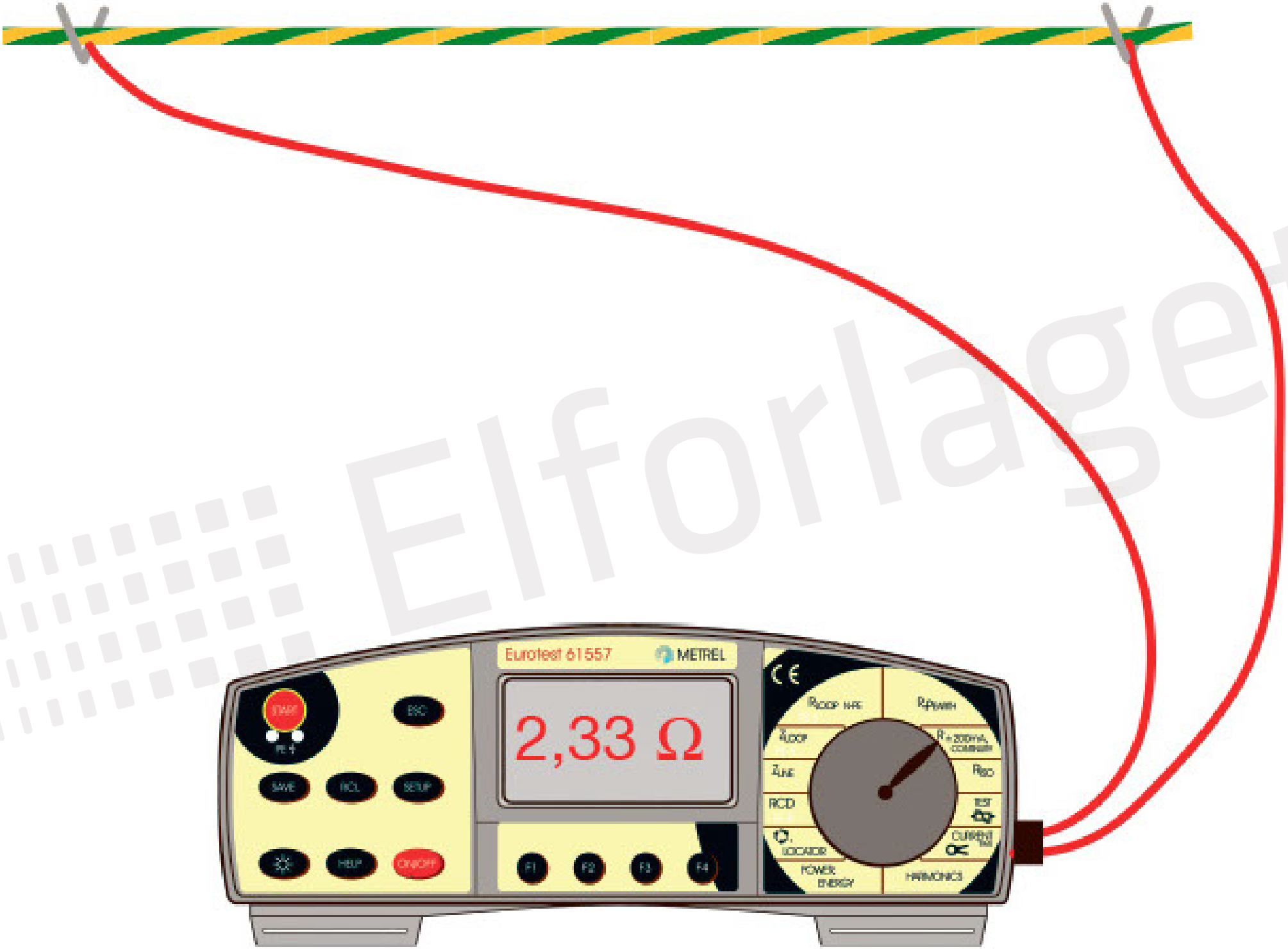

U = 4,5 V
U3 = 1,5 V
U2 = 1,5 V
U1 = 1,5 V
1,5 V
4,5 V
V

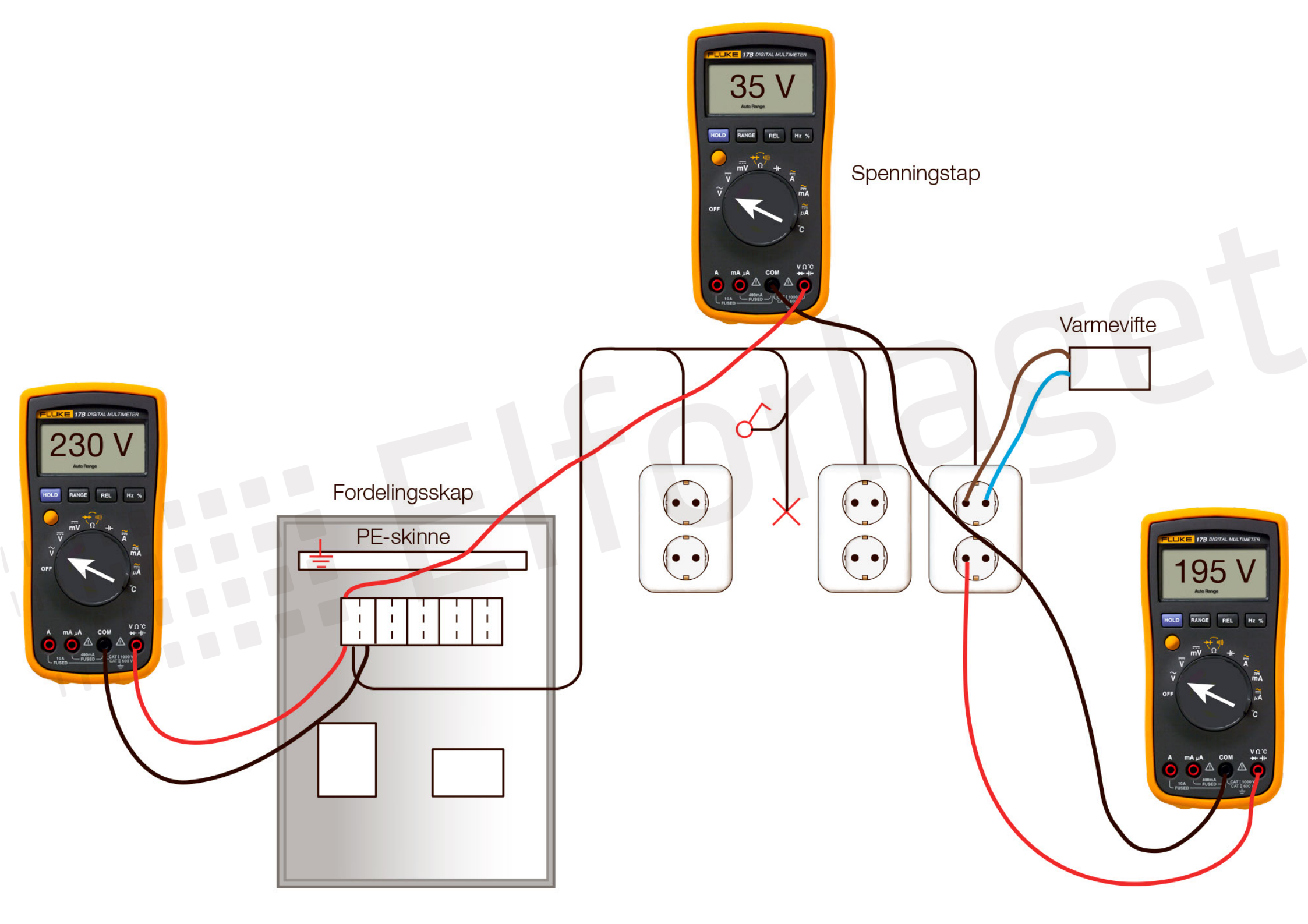
Kald leder – lav resistans



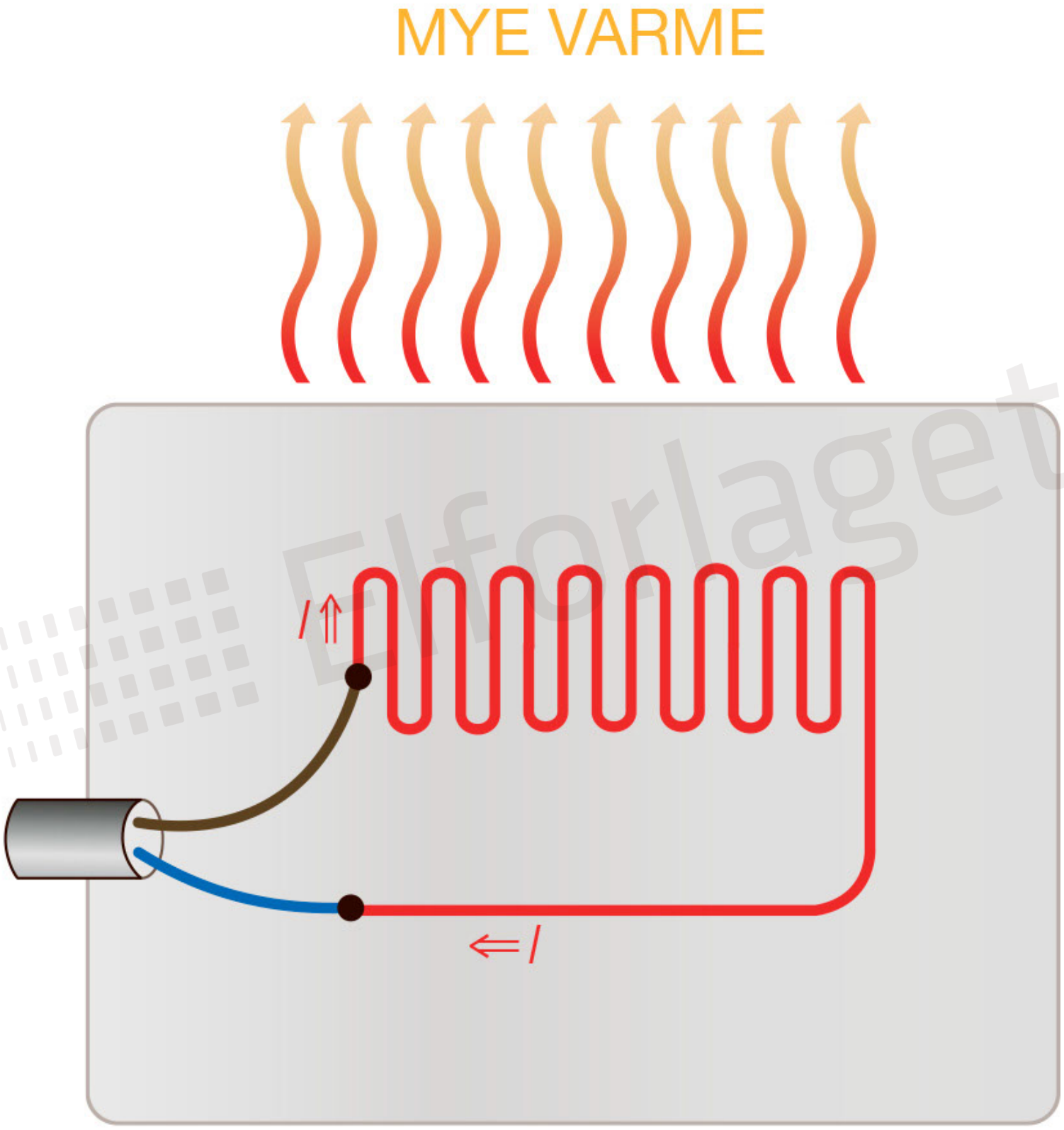
Lett for strømmen å gå i lederen

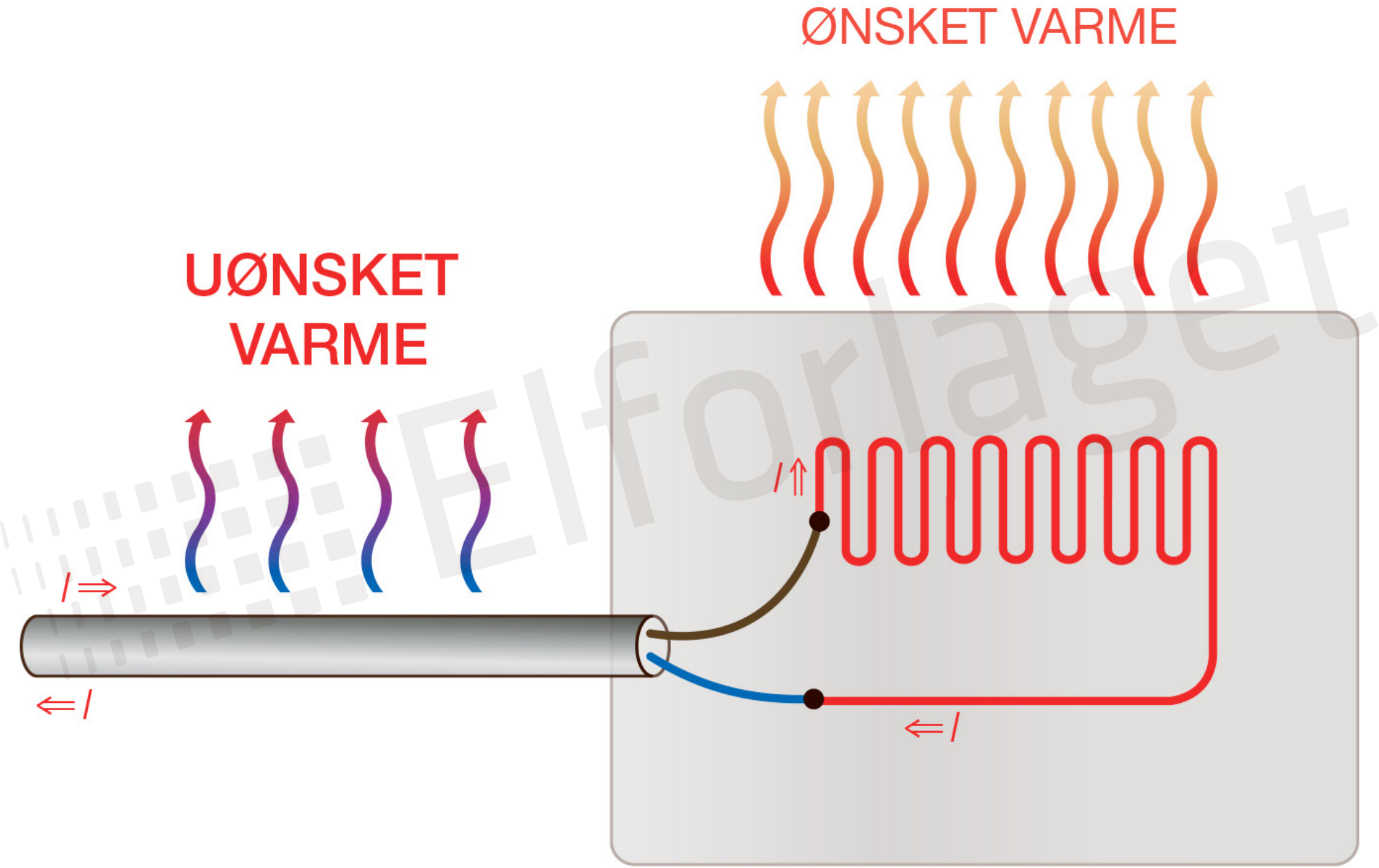

FLUKE 17B DIGITAL MULTIMETER
2,33 Ω
Auto Range
HOLD
RANGE
REL
Hz %
mV
Ω
V
A
V
mA
OFF
µA
°C
A
mA µA
COM
V Ω °C
10A FUSED
400mA FUSED
CAT I 1000 V
CAT II 600 V


Eurotest 61557
METREL
2,33 Ω
START
ESC
SAVE
RCL
SETUP
HELP
ON/OFF
F1
F2
F3
F4
RCD
LOCATOR
POWER
ENERGY
HARMONICS

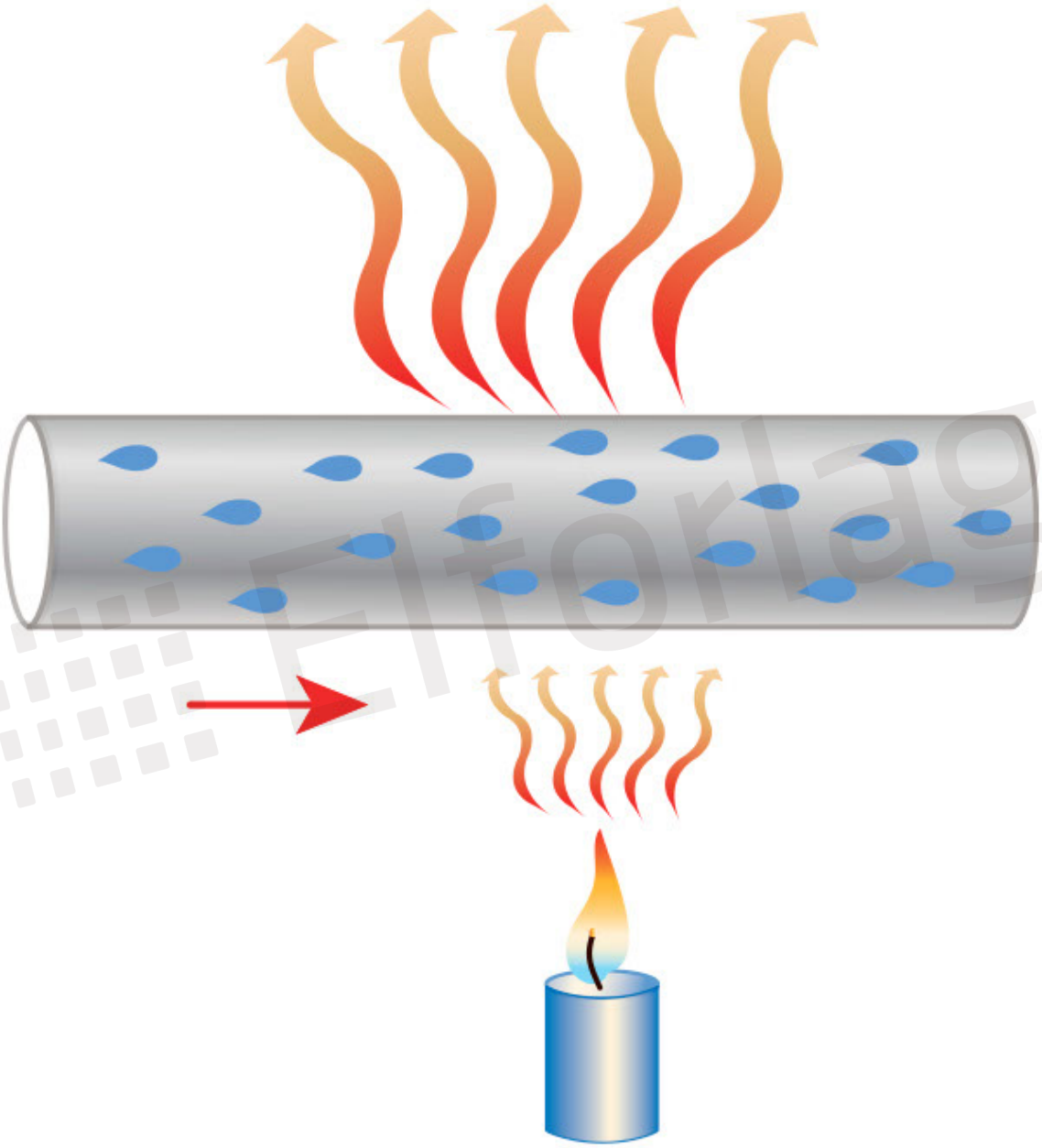

35 V
Spenningstap
Varmevifte
230 V
Fordelingsskap
PE-skinne
195 V


FLUKE 17B DIGITAL MULTIMETER
0,7 Ω
Auto Range
HOLD
RANGE
REL
Hz %
OFF
A
mA µA
COM
V Ω °C
10A FUSED
400mA FUSED


MYE VARME
I
I

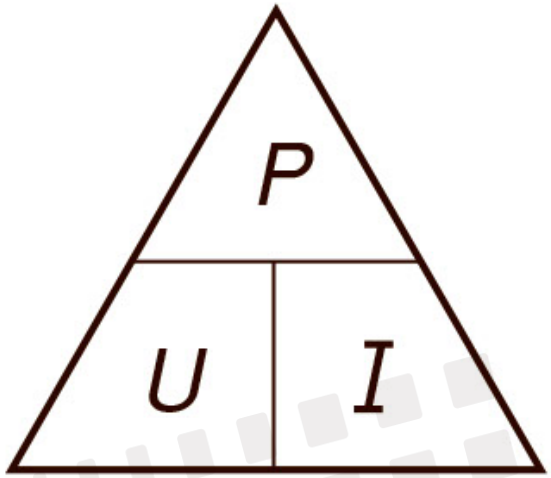

ØNSKET VARME
UØNSKET VARME
I⇒
⇐I
I⇑
⇐I

Varm leder - høy resistans

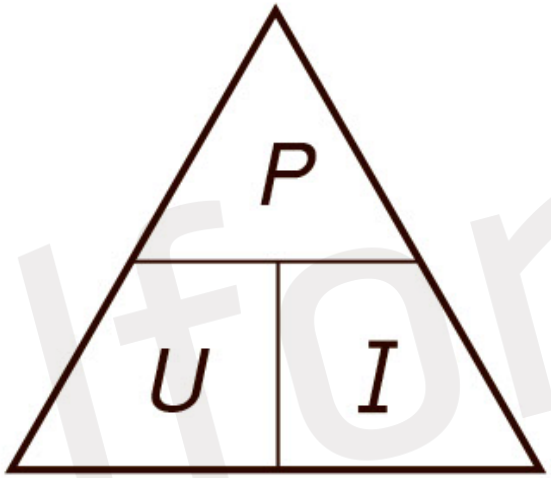


Tregt for strømmen å gå i kabelen

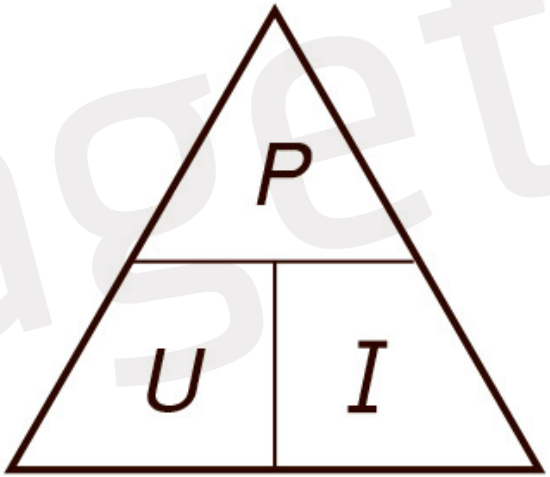

BRUK ALLTID
ISOLERENDE HANSKER
OG
BESKYTTELSESHANSKER
ENSTO
MAKS 1000 V
UTKOBLE
ARBEID PÅ
MÅ IKKE INNKOBL
0 /RC
10
CG/10 C



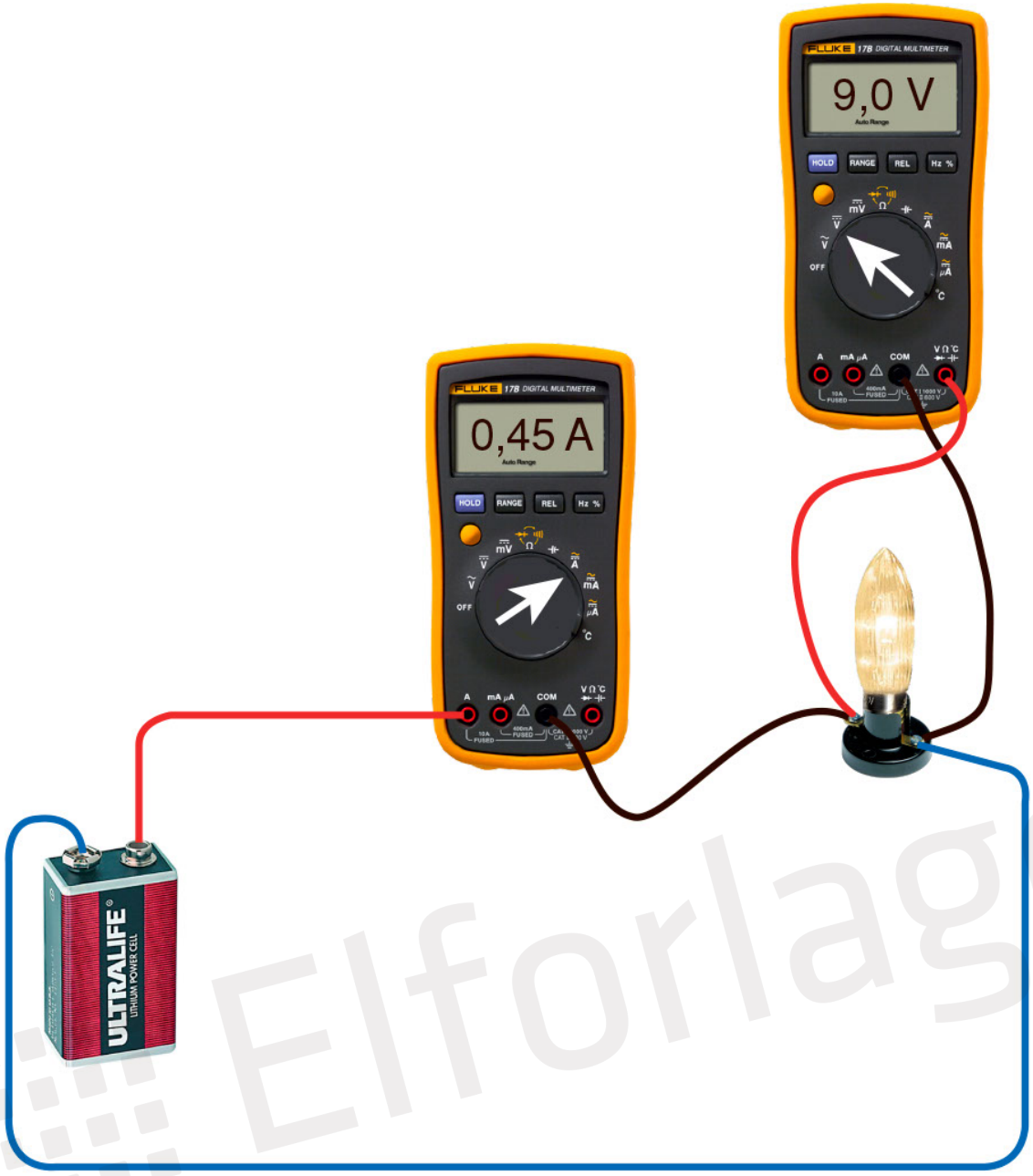
$$P = U \cdot I$$

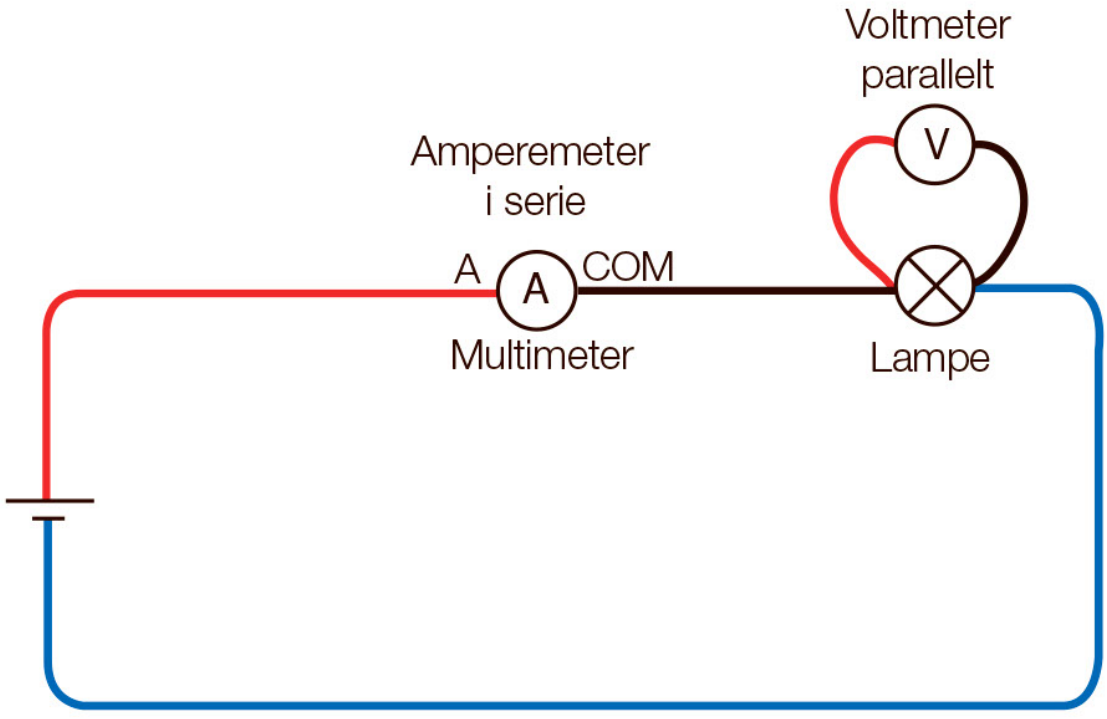


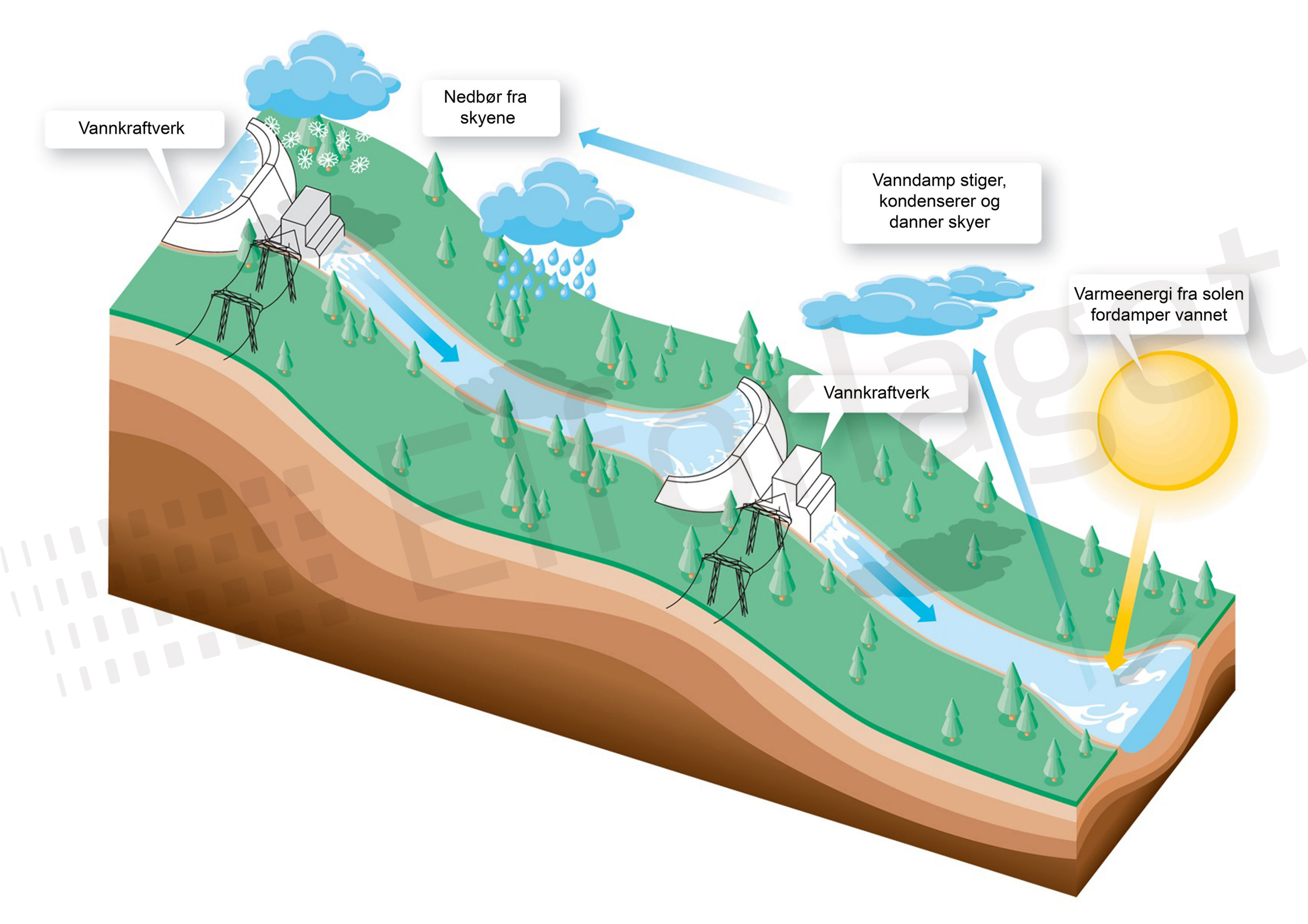
$$U = \frac{P}{I}$$

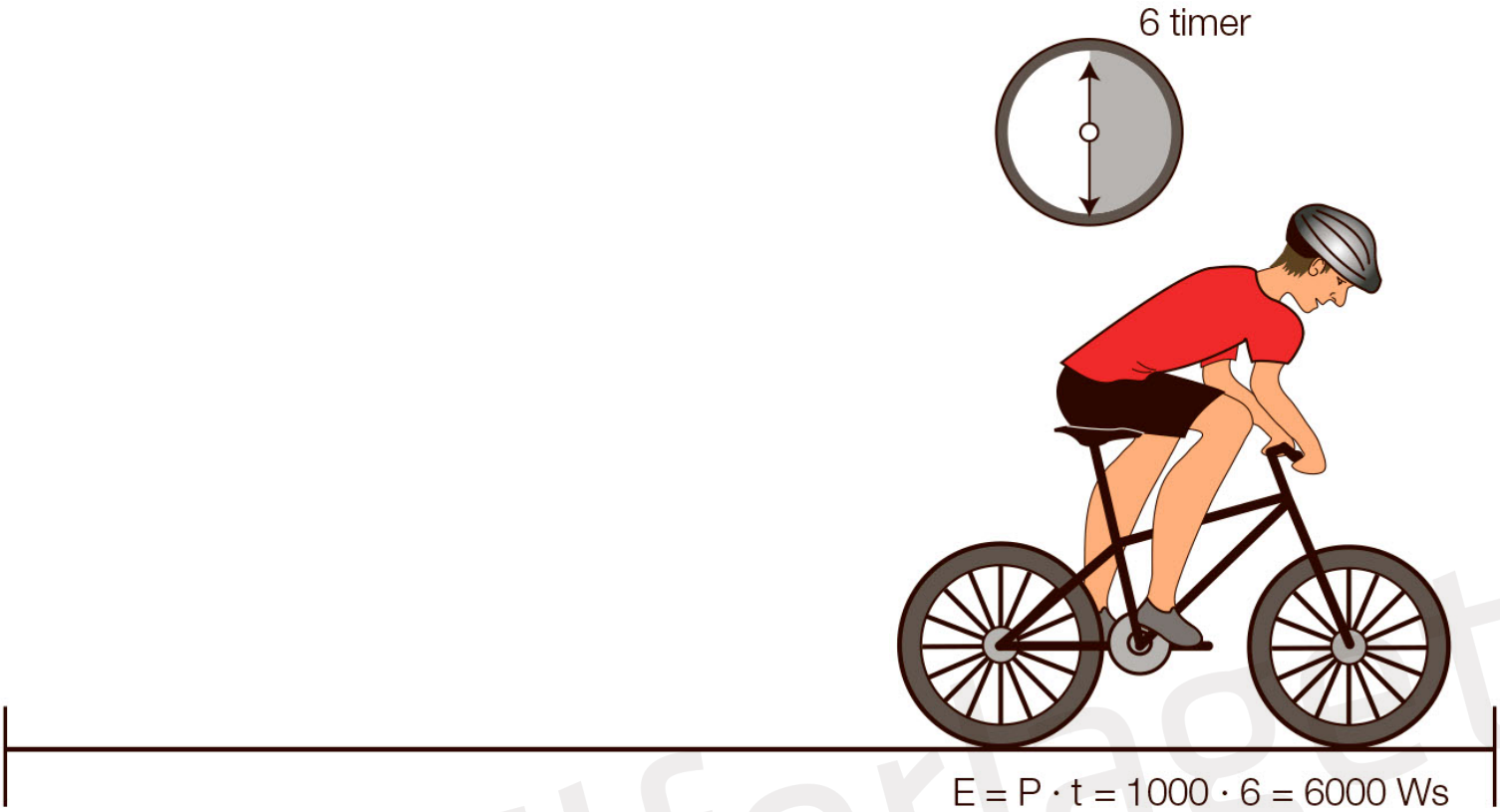


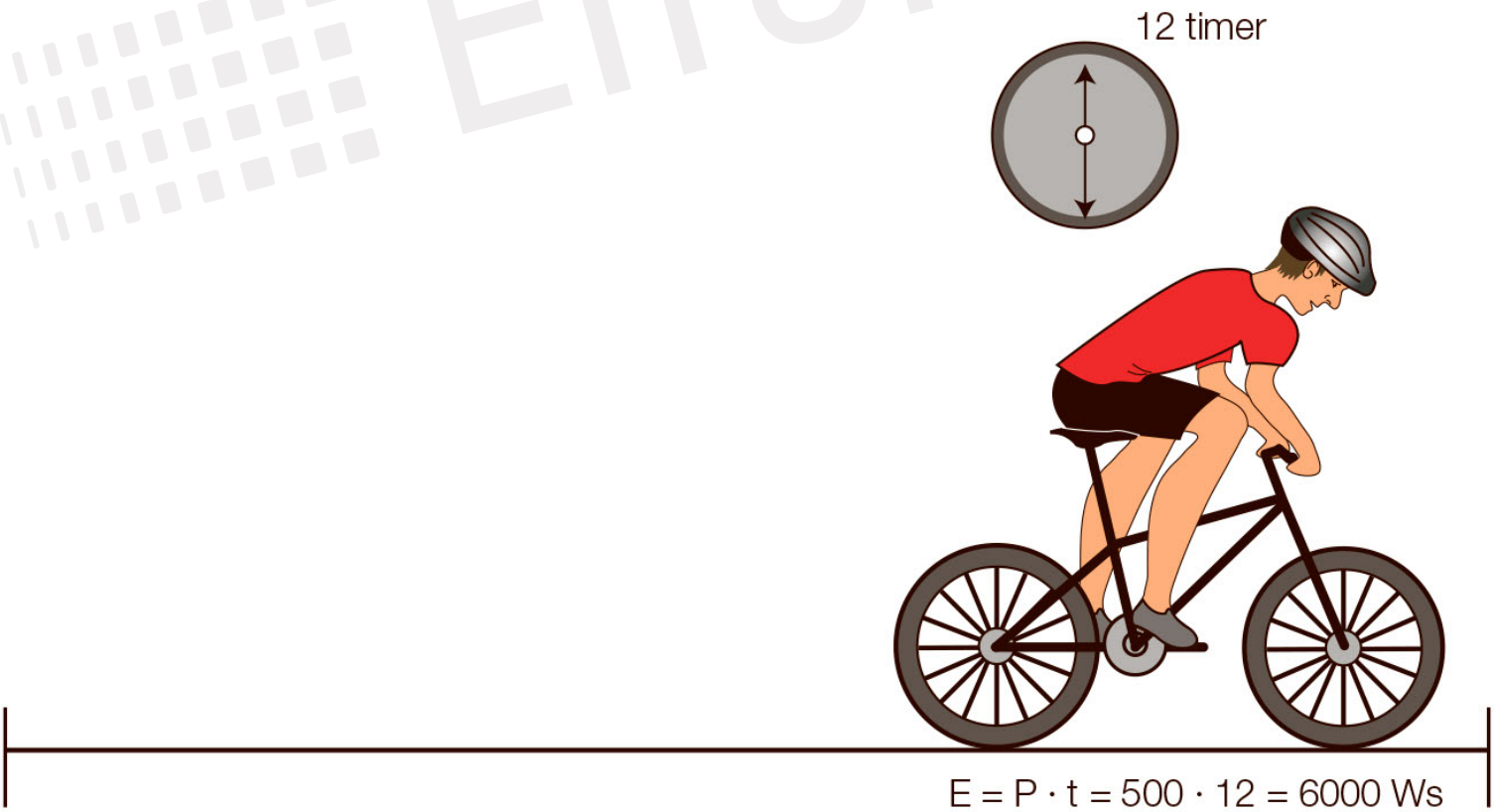
$$I = \frac{P}{U}$$

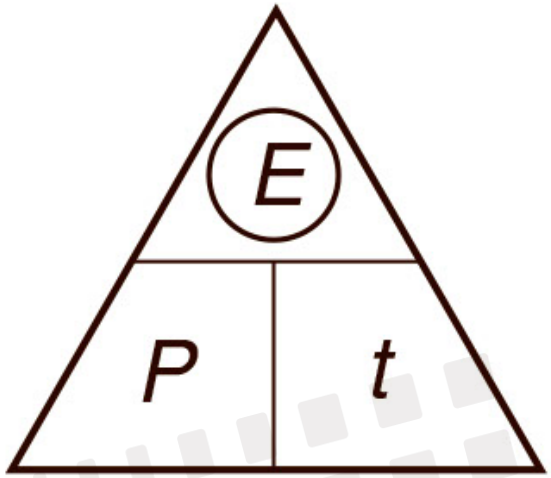

FLUKE 178 DIGITAL MULTIMETER
9,0 V
HOLD
RANGE
REL
Hz %
OFF
A
mA µA
COM
V Ω °C
FLUKE 178 DIGITAL MULTIMETER
0,45 A
HOLD
RANGE
REL
Hz %
OFF
A
mA µA
COM
V Ω °C
ULTRALIFE
LITHIUM POWER CELL


Voltmeter
parallelt
V
Amperemeter
i serie
A
A
COM
Multimeter
Lampe

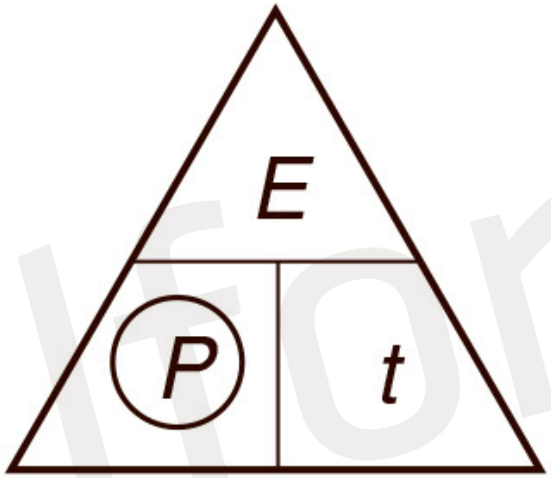

Vannkraftverk
Nedbør fra skyene
Vanndamp stiger, kondenserer og danner skyer
Varmeenergi fra solen fordamper vannet
Vannkraftverk


6 timer
E = P · t = 1000 · 6 = 6000 Ws

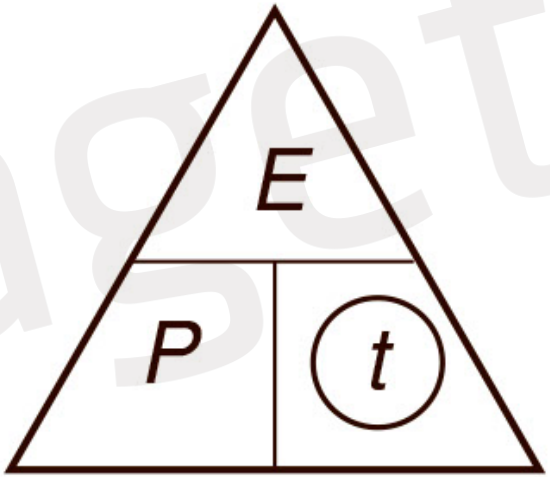

12 timer
E = P · t = 500 · 12 = 6000 Ws



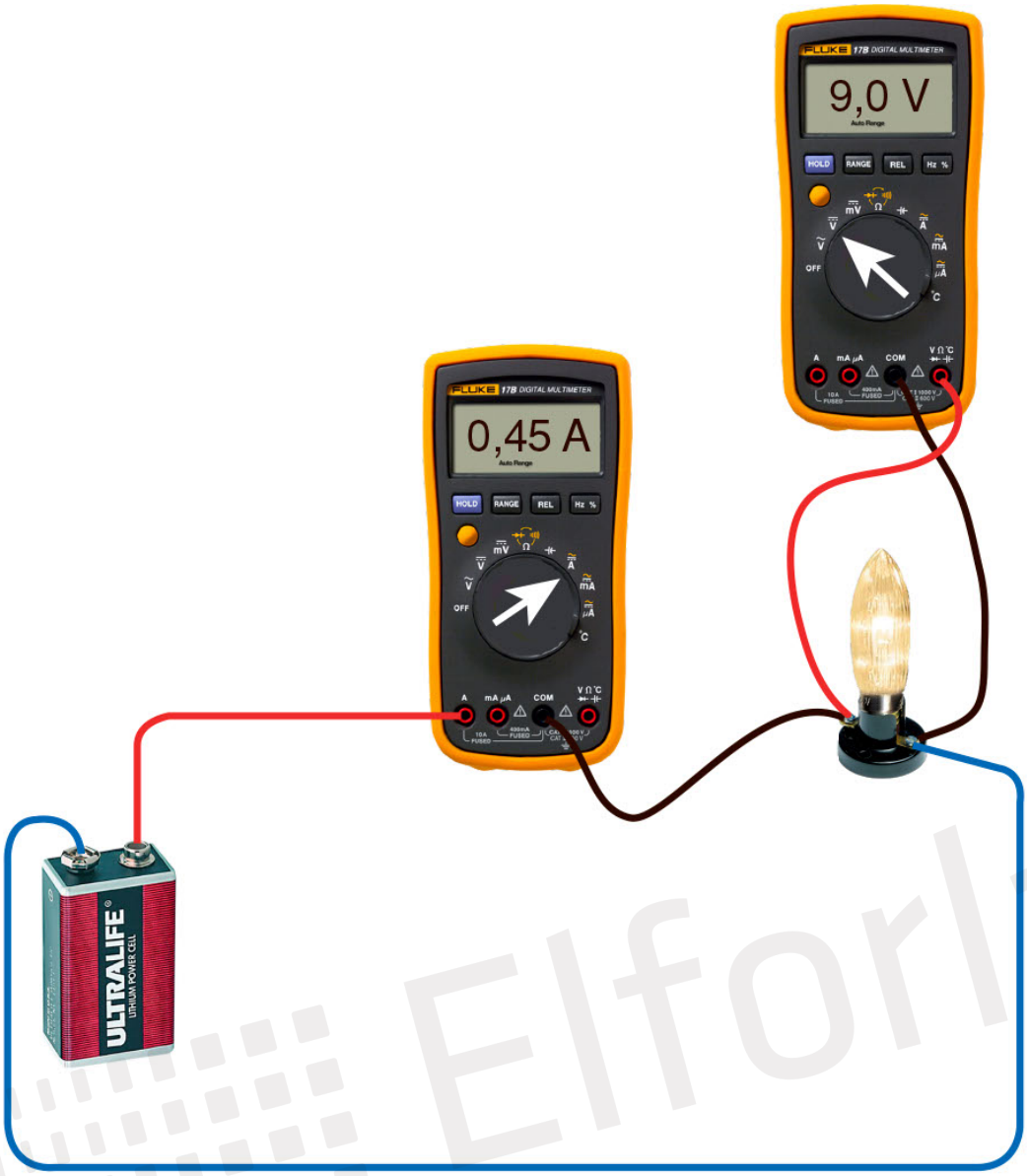
$$E = P \cdot t$$



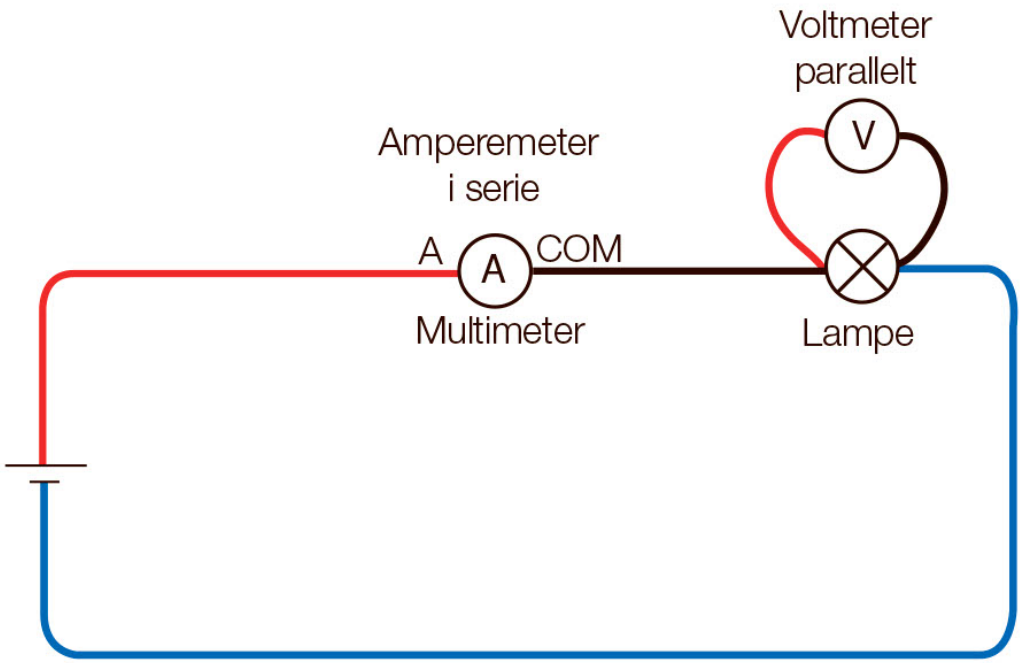
$$P = \frac{E}{t}$$

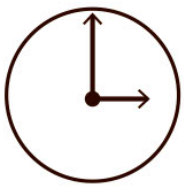


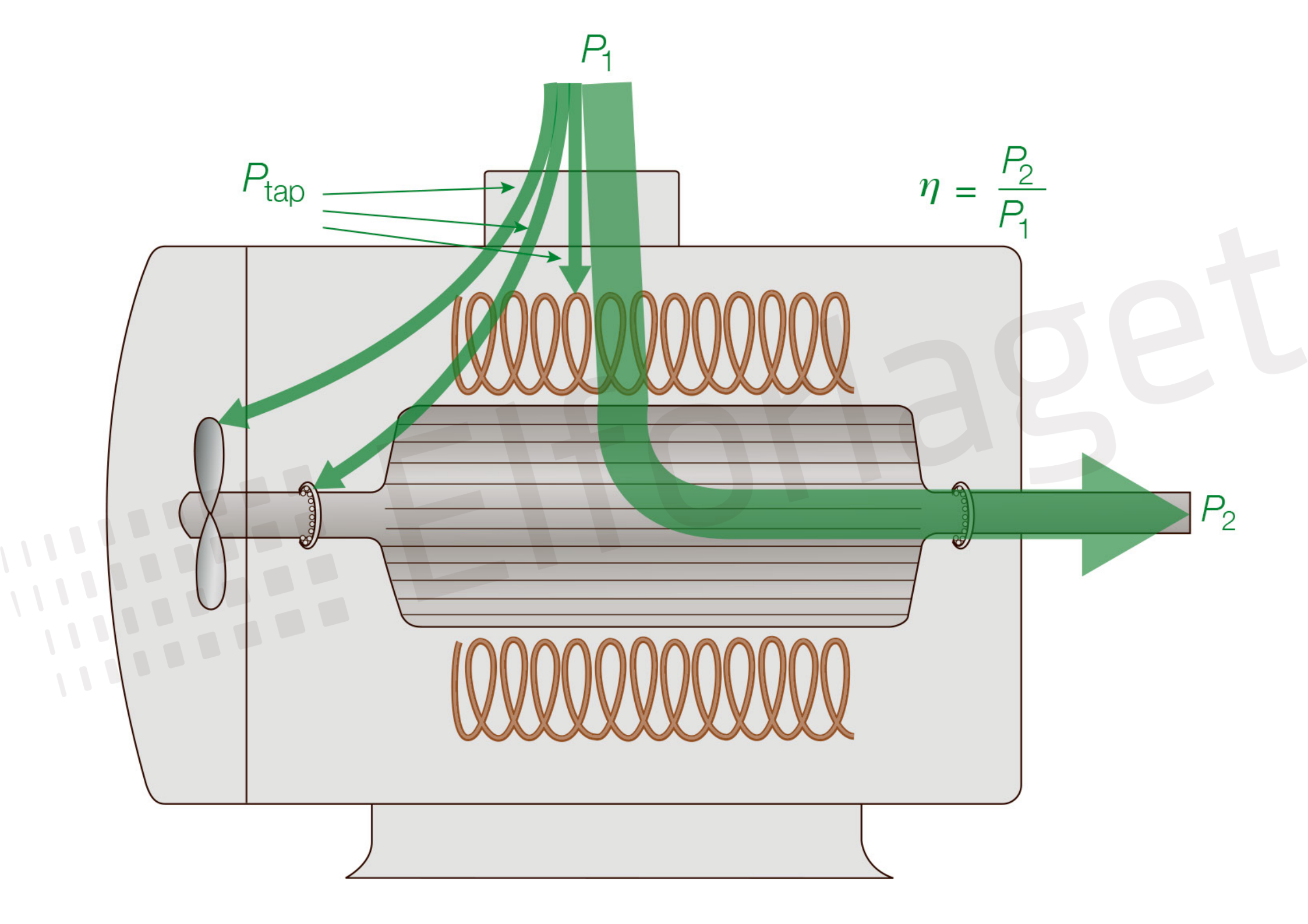
$$t = \frac{E}{P}$$

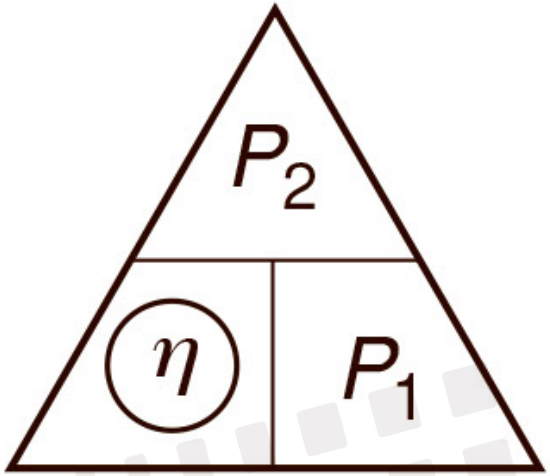

FLUKE 17B DIGITAL MULTIMETER
9,0 V
HOLD
RANGE
REL
Hz %
OFF
A
mA μA
COM
V Ω °C
FLUKE 17B DIGITAL MULTIMETER
0,45 A
HOLD
RANGE
REL
Hz %
OFF
A
mA μA
COM
V Ω °C
ULTRALIFE
LITHIUM POWER CELL


10
35

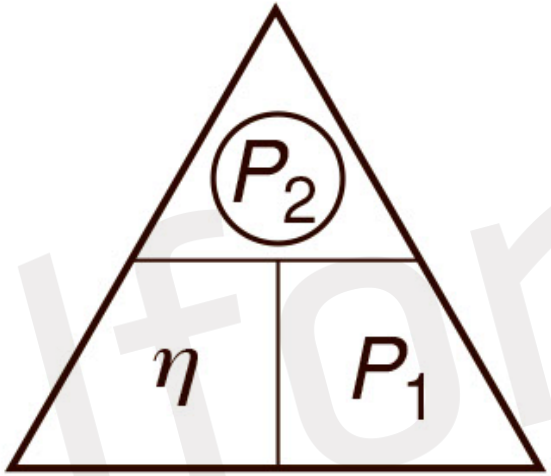

Voltmeter
parallelt
V
Amperemeter
i serie
A
A
COM
Multimeter
Lampe



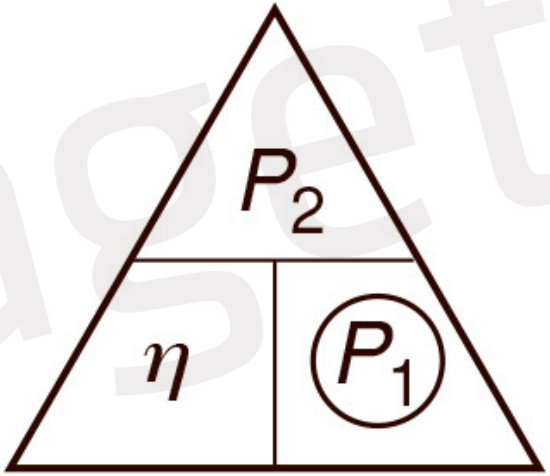

P_1
P_{tap}
$\eta = \frac{P_2}{P_1}$
P_2



$$\eta = \frac{P_2}{P_1}$$

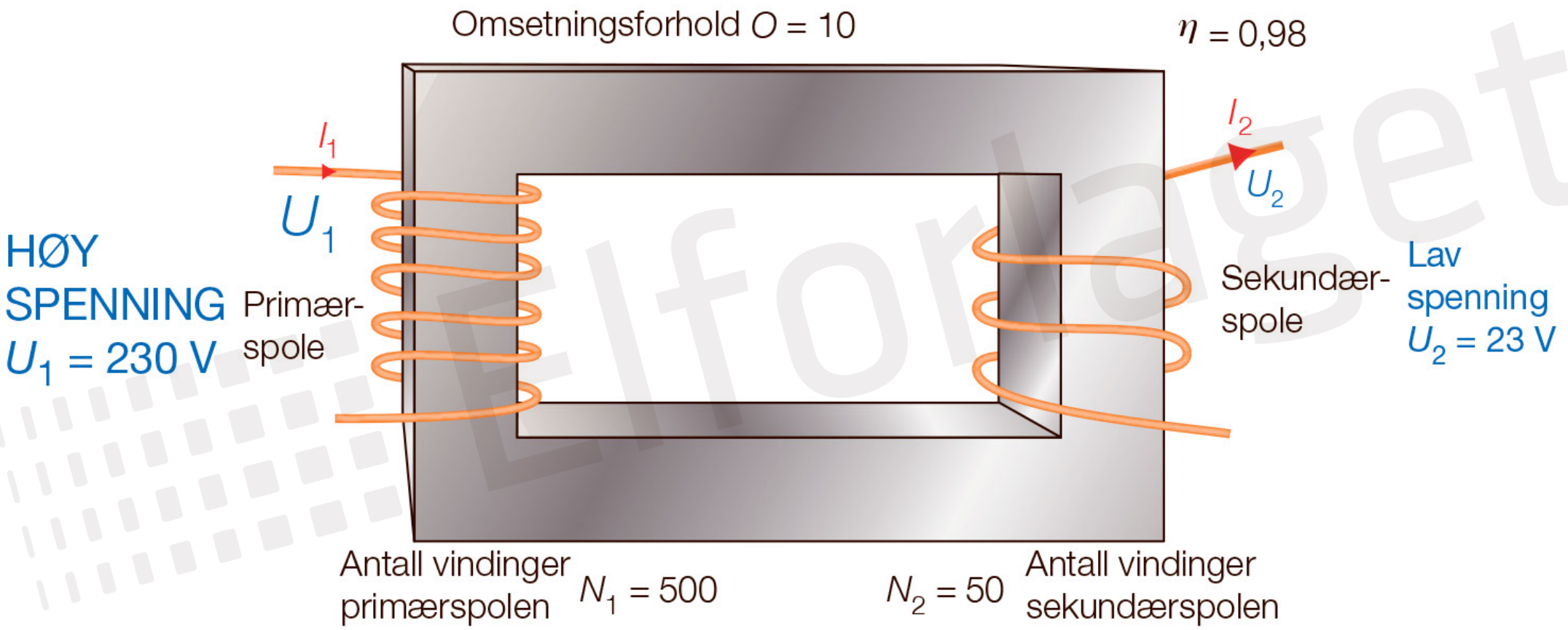


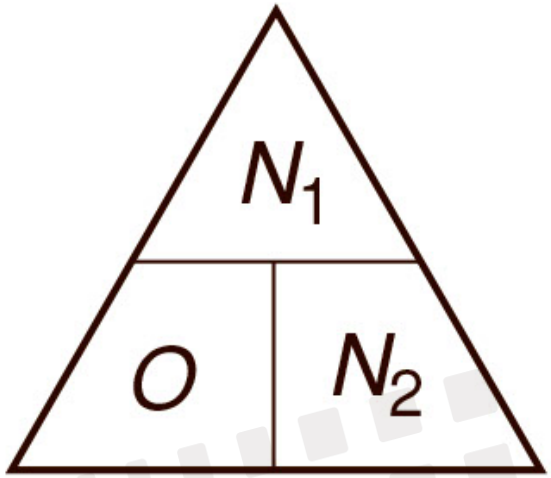
$$P_2 = \eta \cdot P_1$$



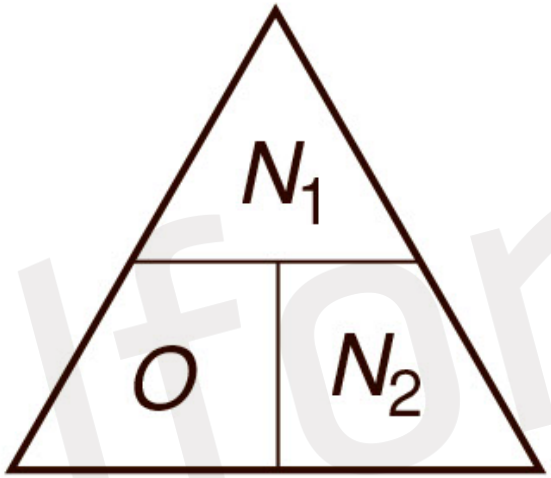
$$P_1 = \frac{P_2}{\eta}$$


ELKO
SEC AC 12V-
DTR 200
Electronic dimmer-
transformer 3185
prim. AC 230V~ 50/60Hz
0.91A λ =0.95
sek. 11.7V~ eff. 5U 300VA
max. 16.6A ta ≤ 45°C
SELV
IP20
T7[06
PRI AC 230V~
NL
tc
70°C

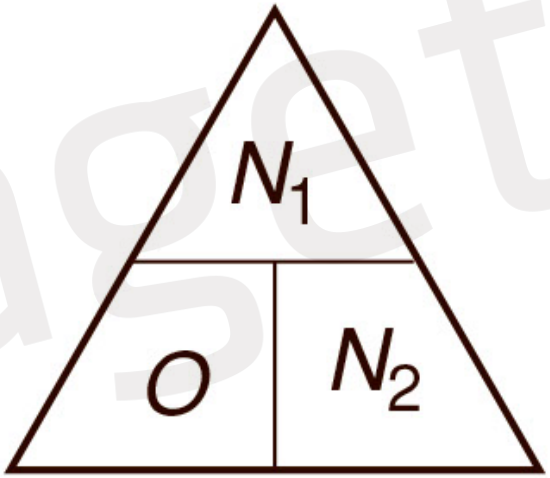

Omsetningsforhold $O = 10$
$\eta = 0{,}98$
I_1
U_1
I_2
U_2
HØY SPENNING
$U_1 = 230$ V
Primær-spole
Sekundær-spole
Lav spenning
$U_2 = 23$ V
Antall vindinger primærspolen
$N_1 = 500$
$N_2 = 50$
Antall vindinger sekundærspolen



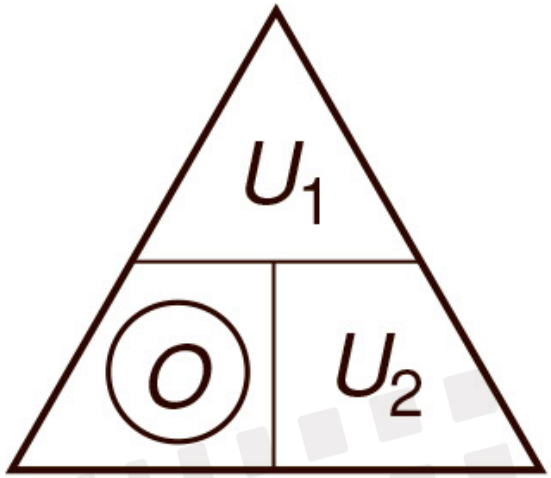
$$O = \frac{N_1}{N_2}$$



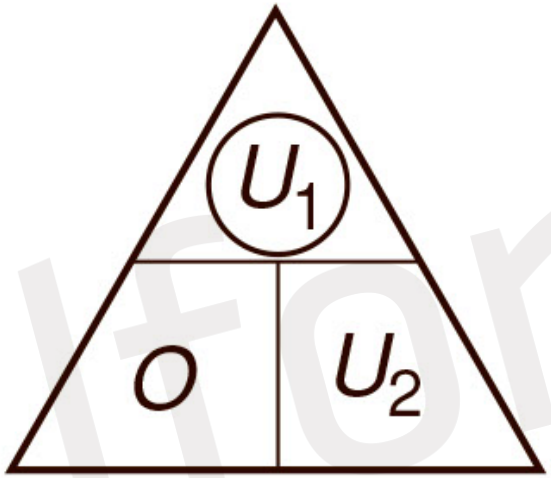
$$N_1 = O \cdot N_2$$



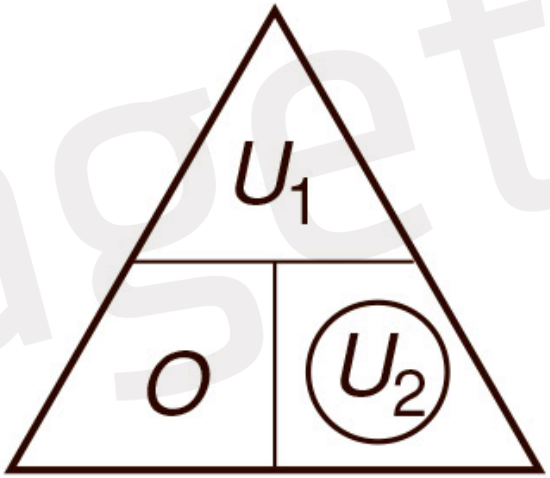
$$N_2 = \frac{N_1}{O}$$



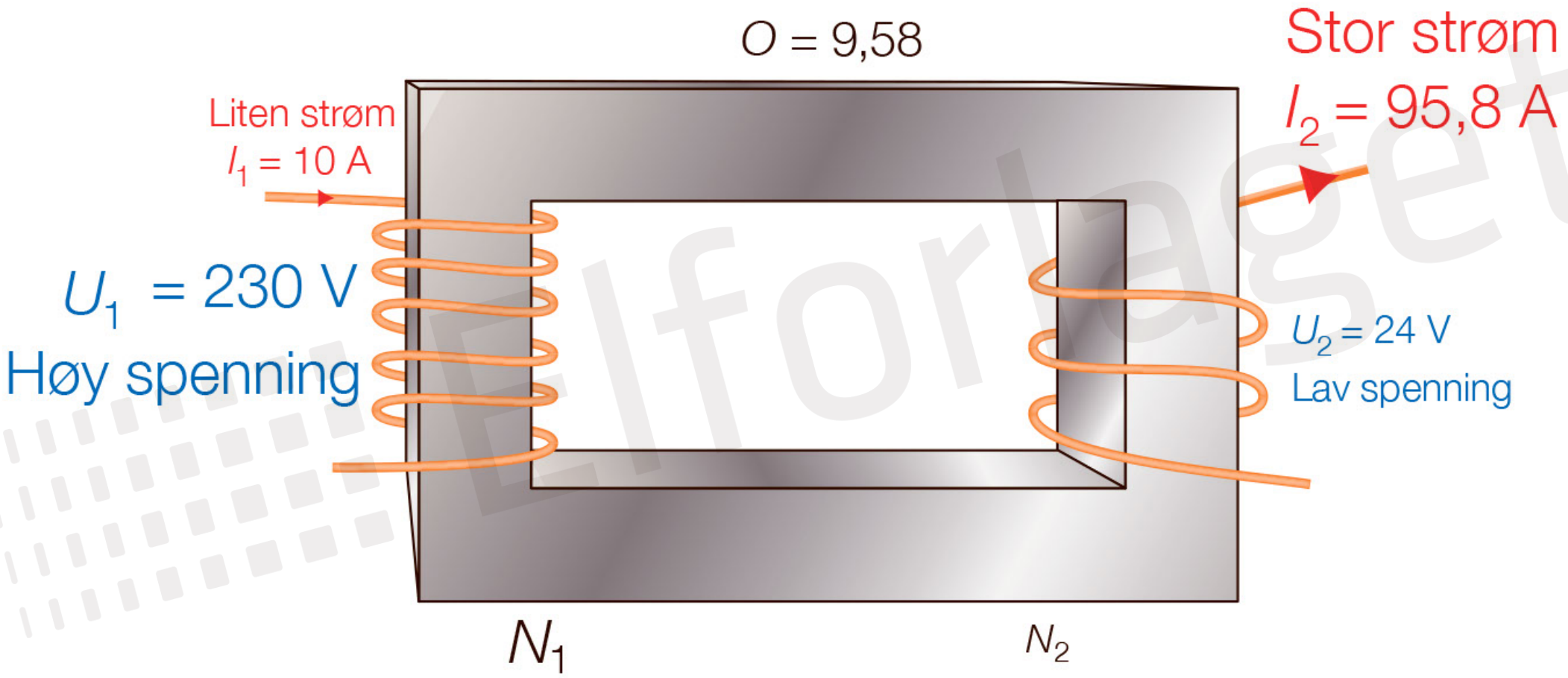
$$O = \frac{U_1}{U_2}$$

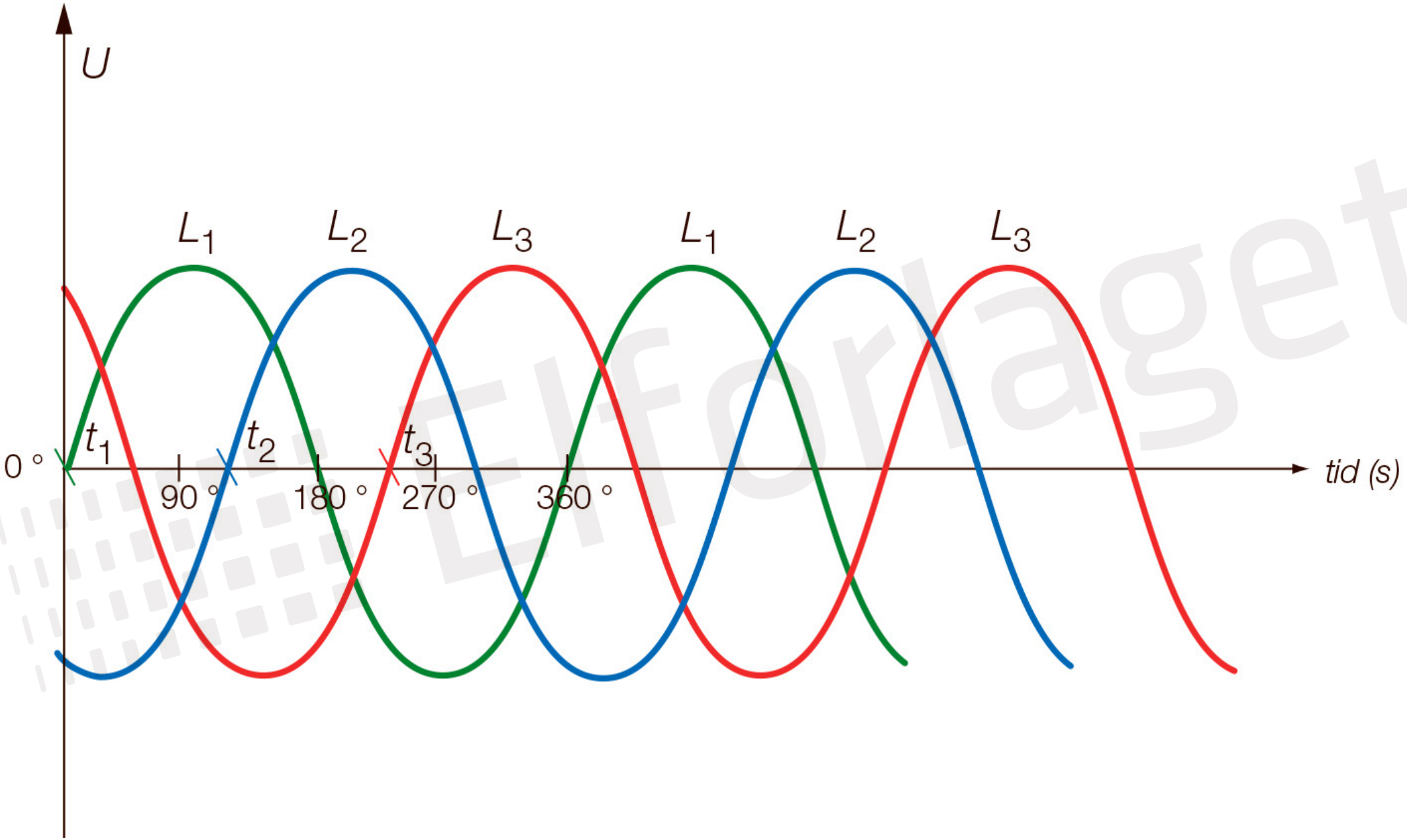


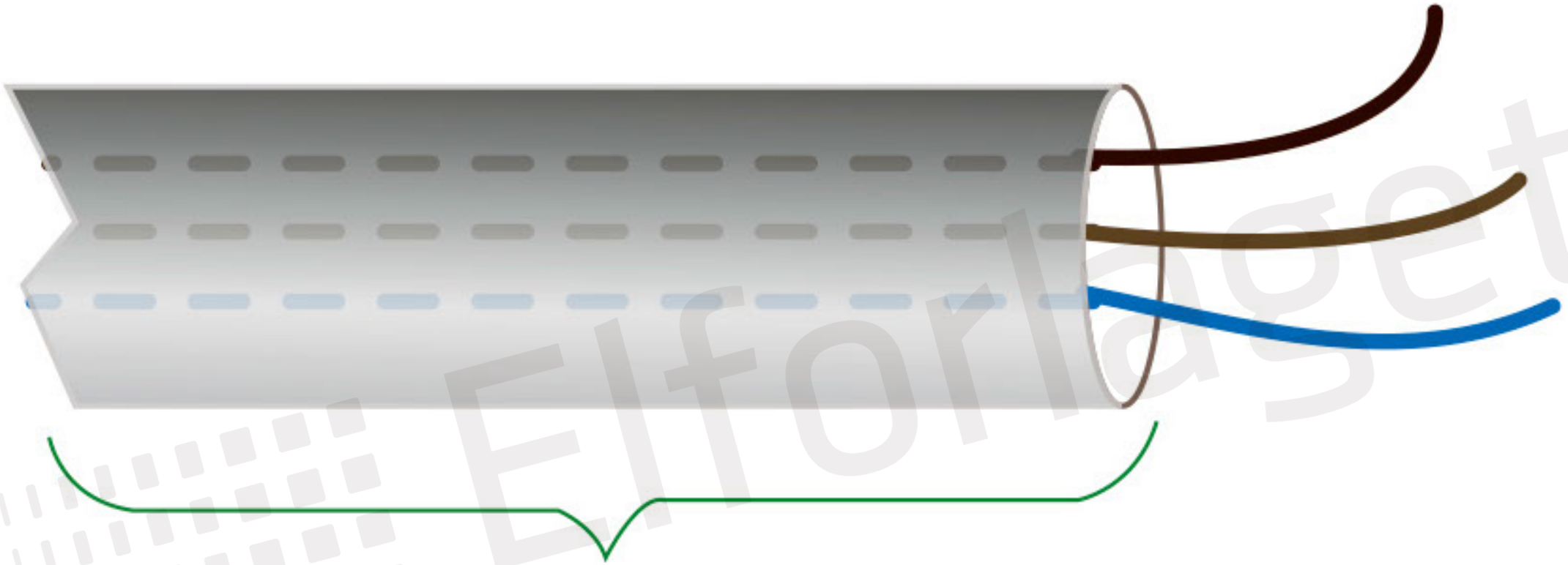
$$U_1 = O \cdot U_2$$



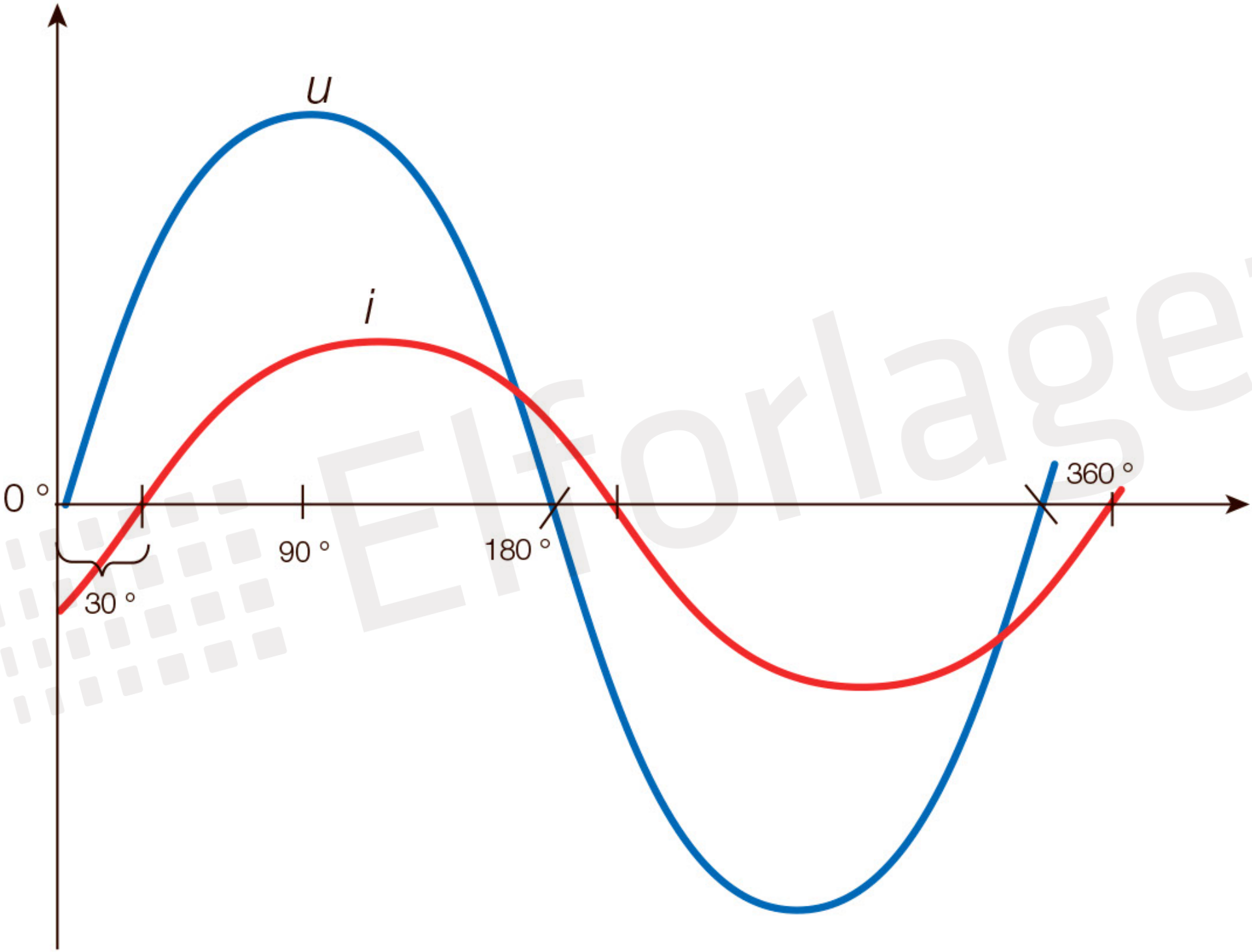
$$U_2 = \frac{U_1}{O}$$


O = 9,58
Stor strøm
I_2 = 95,8 A
Liten strøm
I_1 = 10 A
U_1 = 230 V
Høy spenning
U_2 = 24 V
Lav spenning
N_1
N_2


U
L1
L2
L3
L1
L2
L3
t1
t2
t3
0 °
90 °
180 °
270 °
360 °
tid (s)



$$R_l = \frac{\rho \cdot l \cdot \sqrt{3}}{A}$$


u
i
0 °
30 °
90 °
180 °
360 °