



PHASE
TO
PHASE



cigre
Nederland

15 april 2025

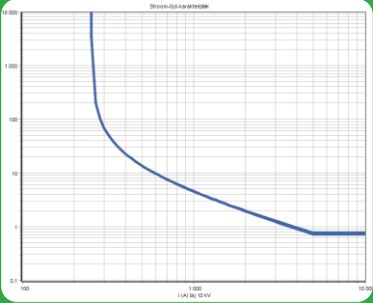


Beveiliging ontrafeld

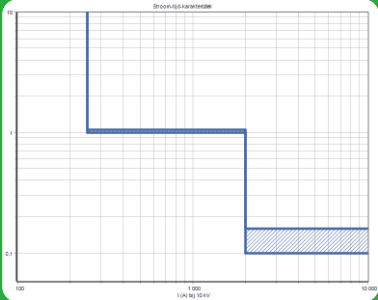
Uitgelegd wat je altijd al wilde weten

Overstroombeveiliging: Het belang van de basis
Colin Willemsen, Phase to Phase

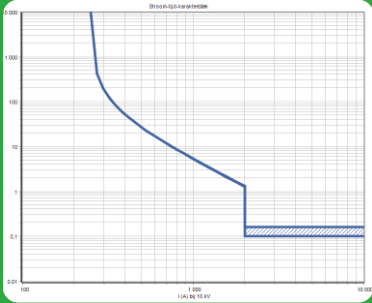
AMT-relais



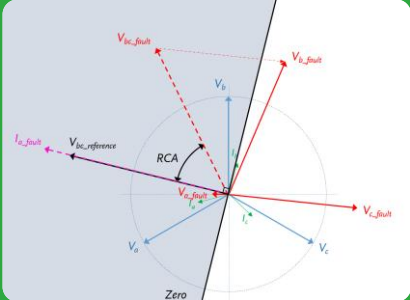
OMT-relais



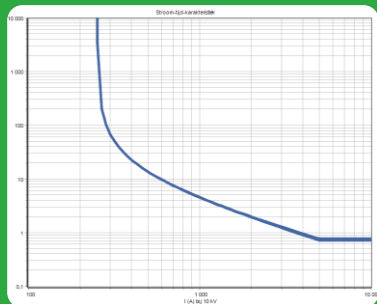
Combinatie



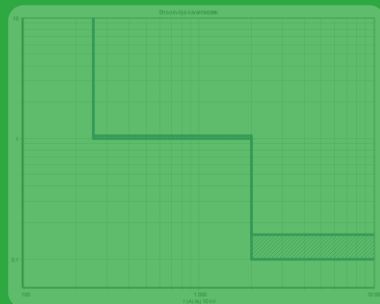
Richting



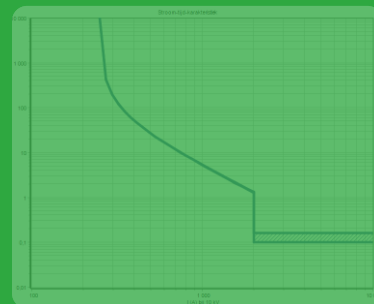
AMT-relais



OMT-relais



Combinatie



Richting



Type Siprotec 7SJ82

Kort 7SJ82

Inom 300 A

t,input 0 s

t,output 0 s

Karakteristiek

- ☐ Curve
- ☐ Vaste tijd
- ☒ Inverse
- ☐ Speciaal
- ☐ Specifiek
- ☐ LSI

Inverse

Soort

- ☐ normal inverse
- ☒ very inverse
- ☐ extremely inverse
- ☐ long time inverse
- ☐ PI inverse

m 1

I> 250 A

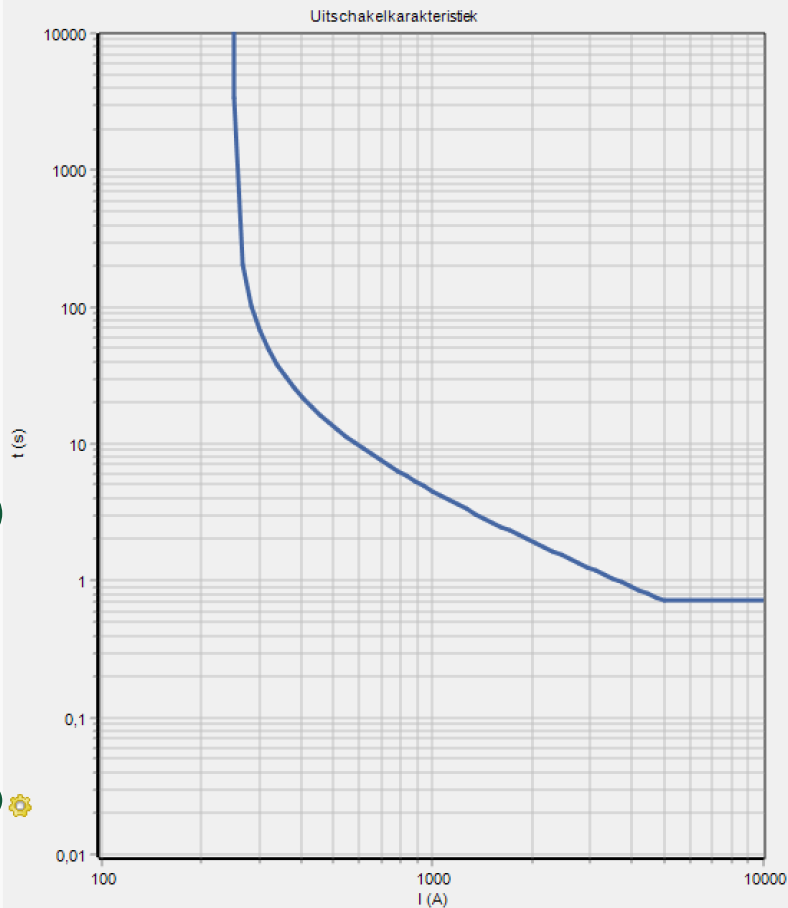
I>> ☐

I>>> ☐

Spannings-
proportioneel ☐

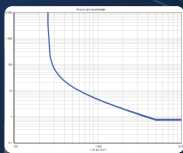
Id 20

Reset schijfemulatie t 0 s



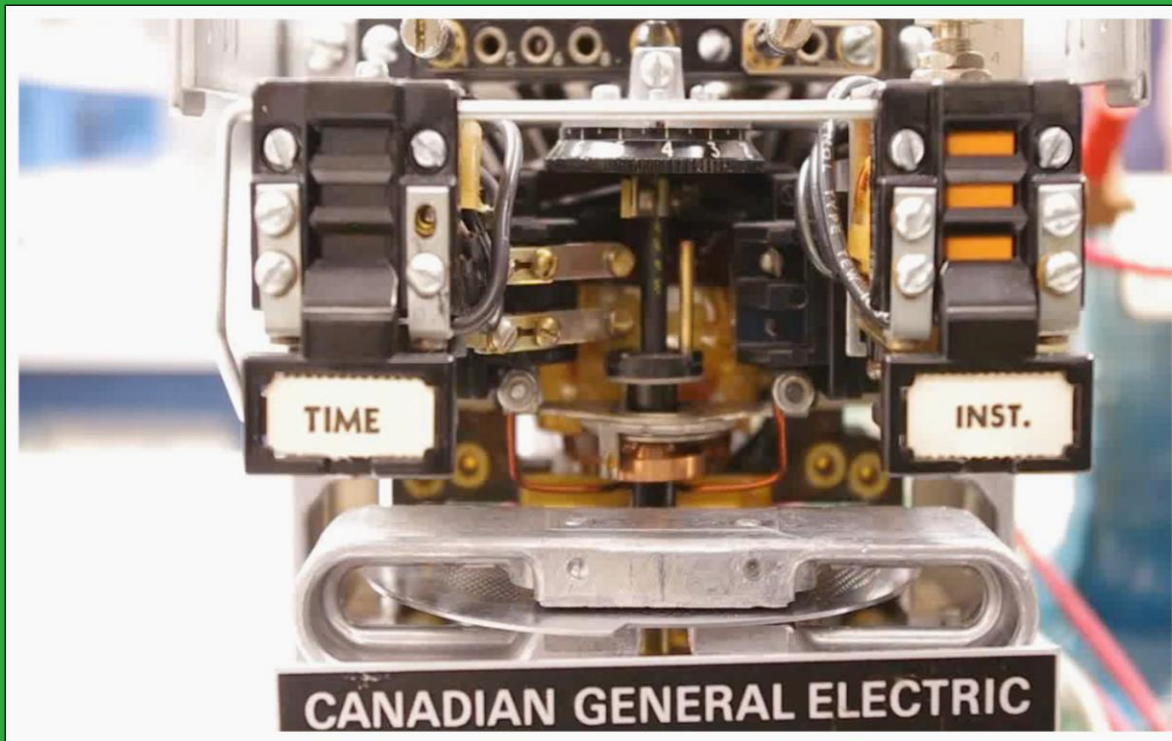
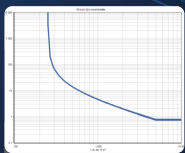
OK

Annuleren



$$t_{trip}(G) = TMS \left(\frac{\beta}{\left(\frac{G}{G_{>}}\right)^{\alpha} - 1} + c \right)$$

Type	Veelgebruikte naam	Tripkarakteristiek			Resetkarakteristiek	
		β (s)	c (s)	α	t_{reset} (s)	α
A	Inverse	0,14	0	0,02	*	*
B	Very inverse	13,5	0	1	*	*
C	Extremely inverse	80	0	2	*	*
D	IEEE Moderately inverse	0,0515	0,114	0,02	4,85	2
E	IEEE Very inverse	19,61	0,491	2	21,6	2
F	IEEE Extremely inverse	28,2	0,1217	2	29,1	2



Kortsluiting:

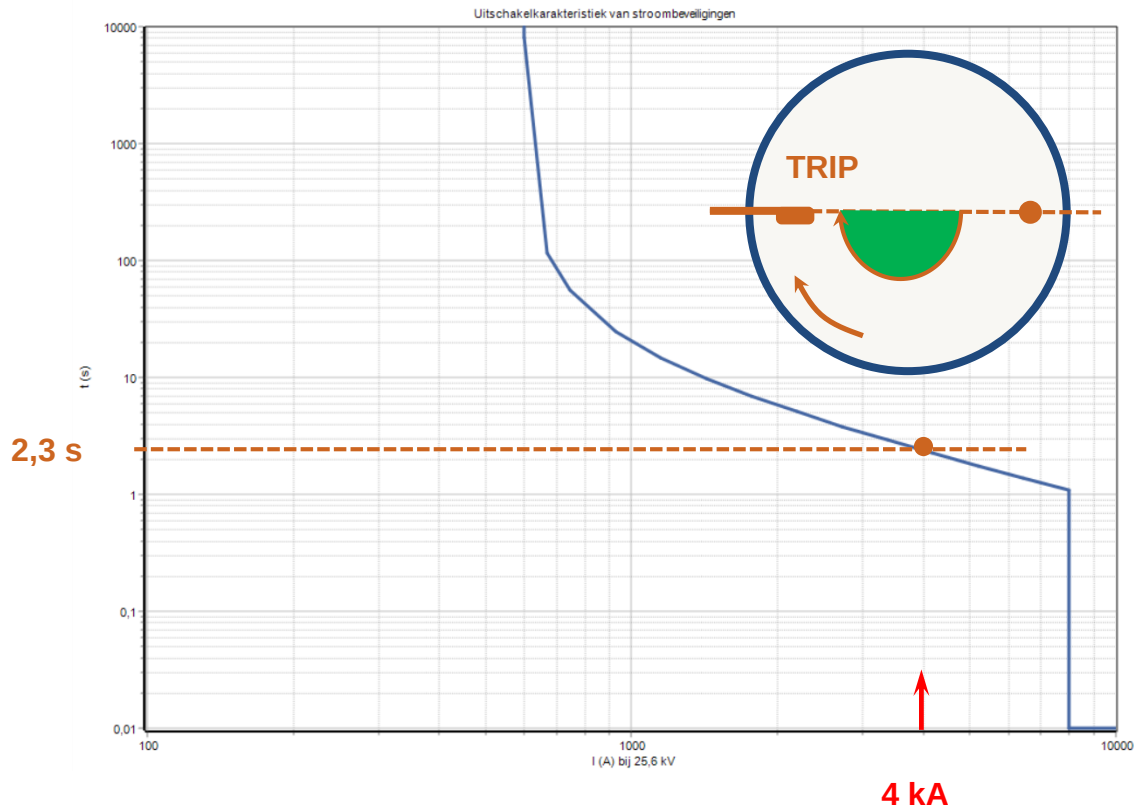
4 kA

very inverse

$I > = 600 \text{ A}$

$I >> = 8 \text{ kA}$

$t >> = 10 \text{ ms}$



Totale triptijd 2,3 seconden

Sequentities:

1) 4 kA, 700 ms

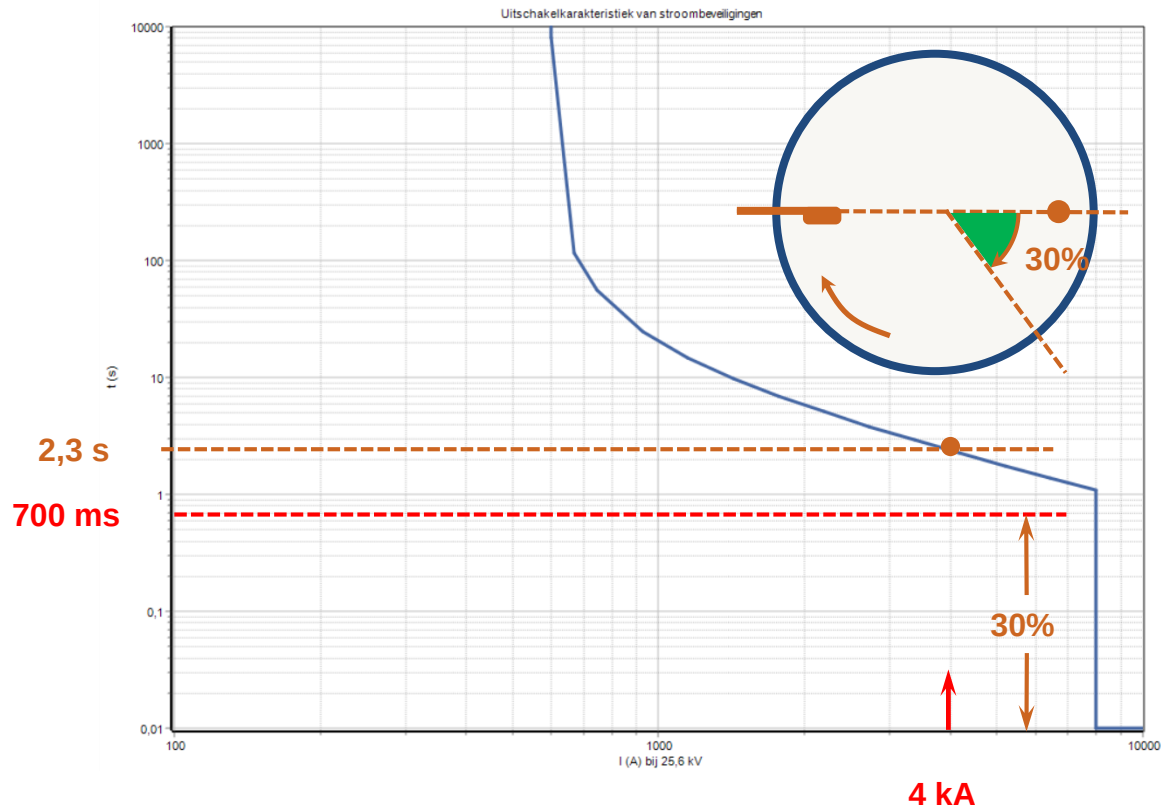
2) 1 kA, ?

very inverse

$I > = 600 \text{ A}$

$I >> = 8 \text{ kA}$

$t >> = 10 \text{ ms}$



2) 1 kA, ?

 $t_{gg} = 10 \text{ ms}$

20 s



Type Siprotec 7SJ82

Kort 7SJ82

Inom 300 A

t,input 0 s

t,output 0 s

Karakteristiek

- ☐ Curve
☐ Vaste tijd
☒ Inverse
☐ Speciaal
☐ Specifiek
☐ LSI

Inverse

Soort

- ☐ normal inverse
☒ very inverse
☐ extremely inverse
☐ long time inverse
☐ PI inverse

m 1

Spannings-
proportioneel ☐

I> 250 A

I_d 20

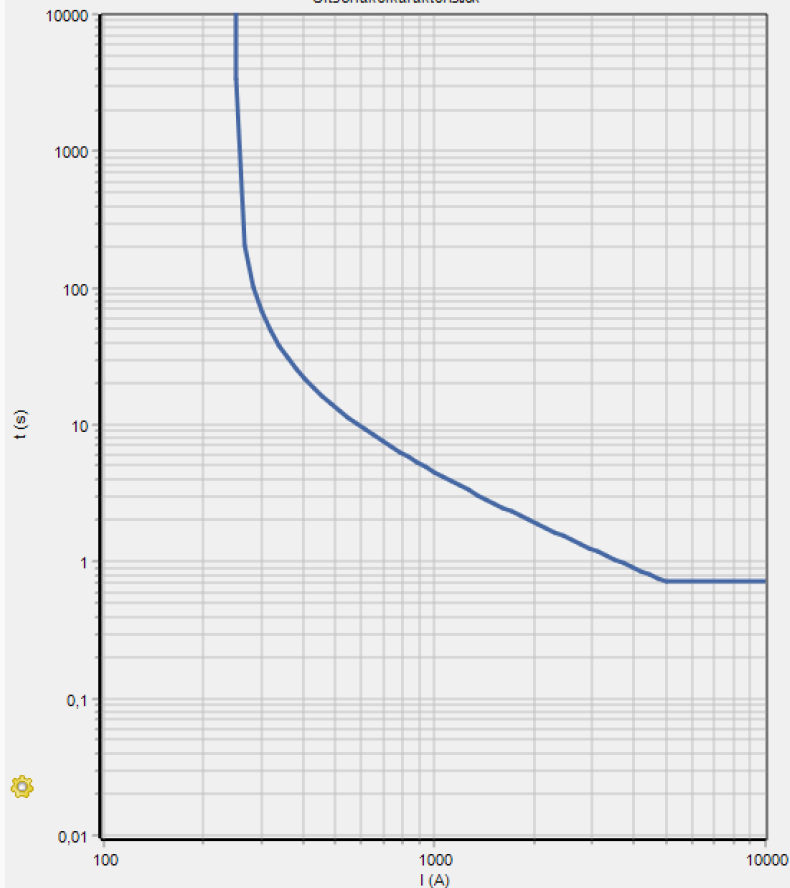
I>> ☐

I>>> ☐

Reset schijfemulatie t 0 s



Uitschakelkarakteristiek



OK

Annuleren

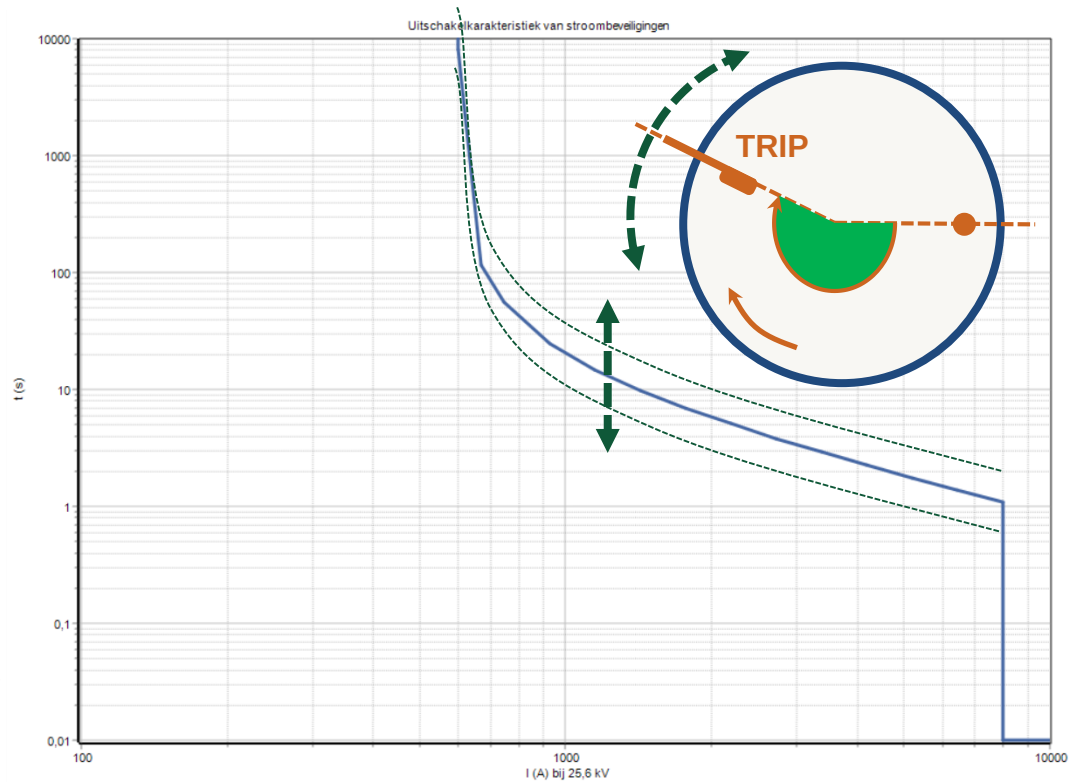
very inverse

$I > = 600 \text{ A}$

$I >> = 8 \text{ kA}$

$t >> = 10 \text{ ms}$

$$t_{trip}(G) = TMS \left(\frac{\beta}{\left(\frac{G}{G_{>}}\right)^{\alpha} - 1} + c \right)$$



Type Siprotec 7SJ82

Kort 7SJ82

Inom 300 A

t,input 0 s

t,output 0 s

- Karakteristiek
- ☐ Curve
 - ☐ Vaste tijd
 - ☒ Inverse
 - ☐ Speciaal
 - ☐ Specifiek
 - ☐ LSI

Inverse

Soort

- ☐ normal inverse
- ☒ very inverse
- ☐ extremely inverse
- ☐ long time inverse
- ☐ RI-inverse

m 1

I> 250 A

I>> ☐

I>>> ☐

Spannings-
proportioneel ☐

Id 20

Reset schijfemulatie t 0 s



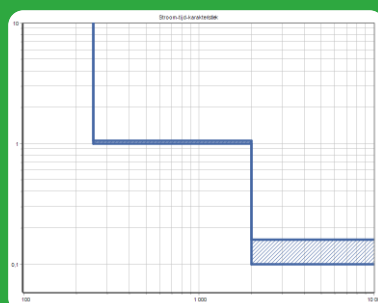
Uitschakelkarakteristiek



OK

Annuleren

OMT-relais



Type Siprotec 7SJ82

Kort 7SJ82

Karakteristiek

- ☐ Curve
☒ Vaste tijd
☐ Inverse
☐ Speciaal
☐ Specifiek
☐ LSI

Inom 300 A

t,input 0 s

t,output 0 s

Vaste tijd

Aantal instelpunten

- ☐ 1
☒ 2
☐ 3

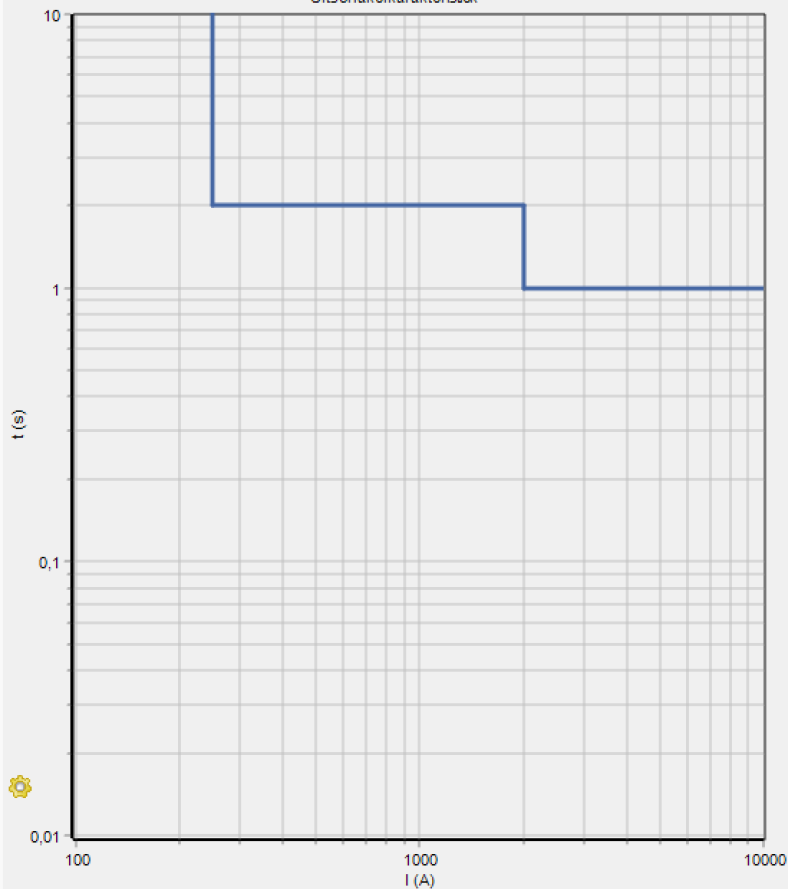
I> 250 A t> 2 s

I>> 2000 A t>> 1 s

Afval-aanspreekverhouding 0,95

t,reset 0 s

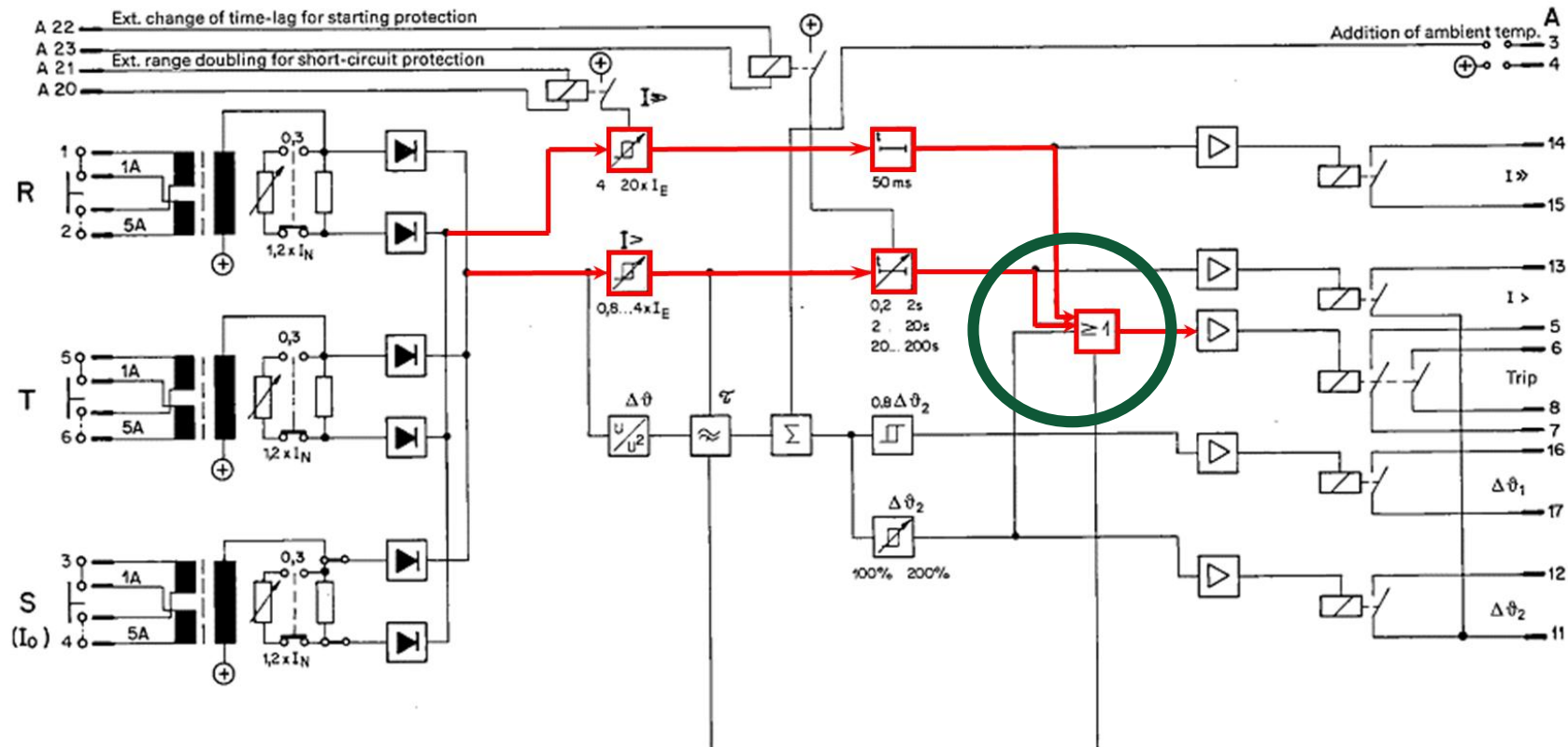
Uitschakelkarakteristiek



OK

Annuleren

Logica OMT-relais



Sequenties:

1) 4 kA, 700 ms

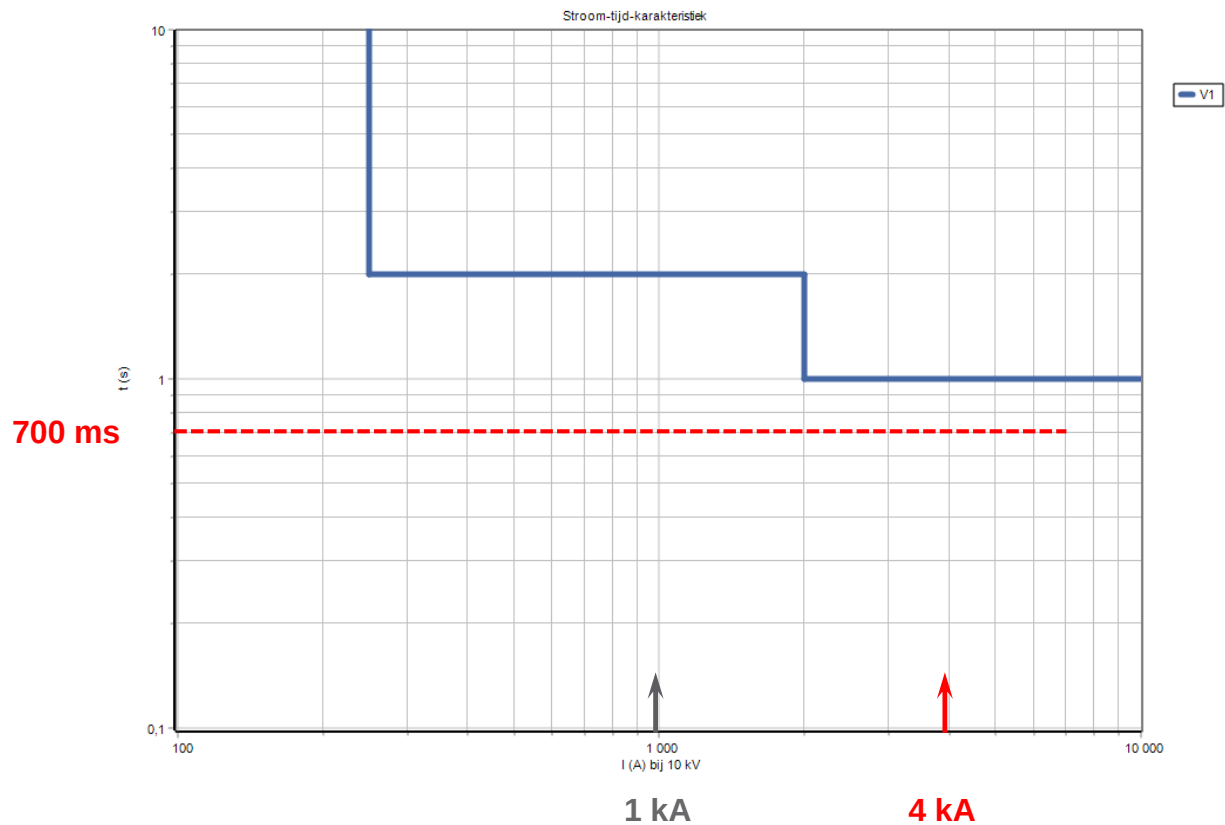
2) 1 kA, ?

$I_{>} = 250 \text{ A}$

$t_{>} = 2 \text{ s}$

$I_{>>} = 2 \text{ kA}$

$t_{>>} = 1 \text{ s}$



Sequenties:

1) 4 kA, 700 ms

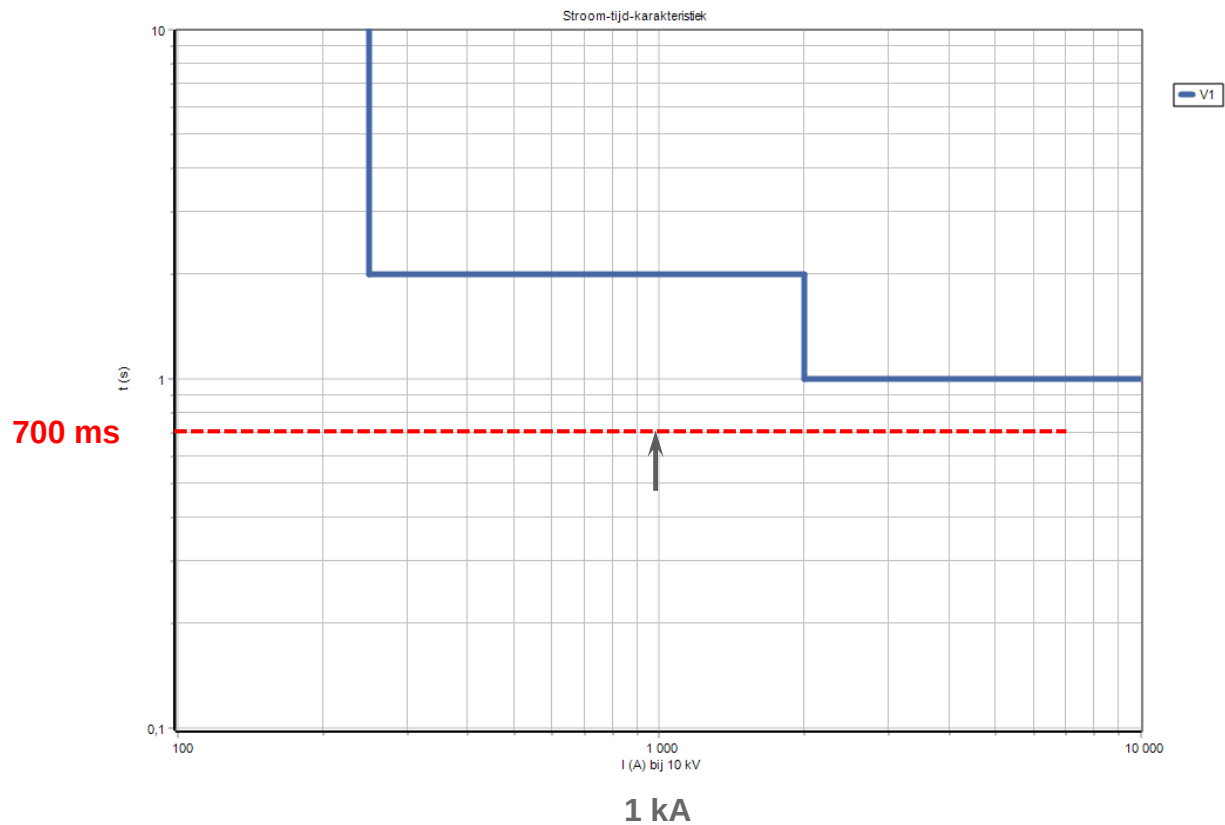
2) 1 kA, ?

$I > = 250 \text{ A}$

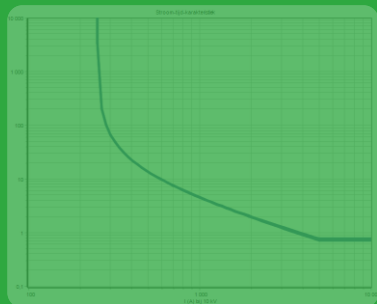
$t > = 2 \text{ s}$

$I >> = 2 \text{ kA}$

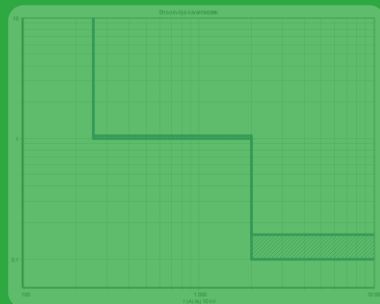
$t >> = 1 \text{ s}$



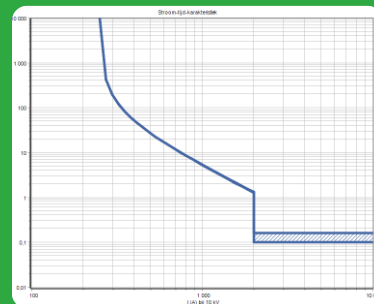
AMT-relais



OMT-relais



Combinatie



Richting



Kortsluiting:

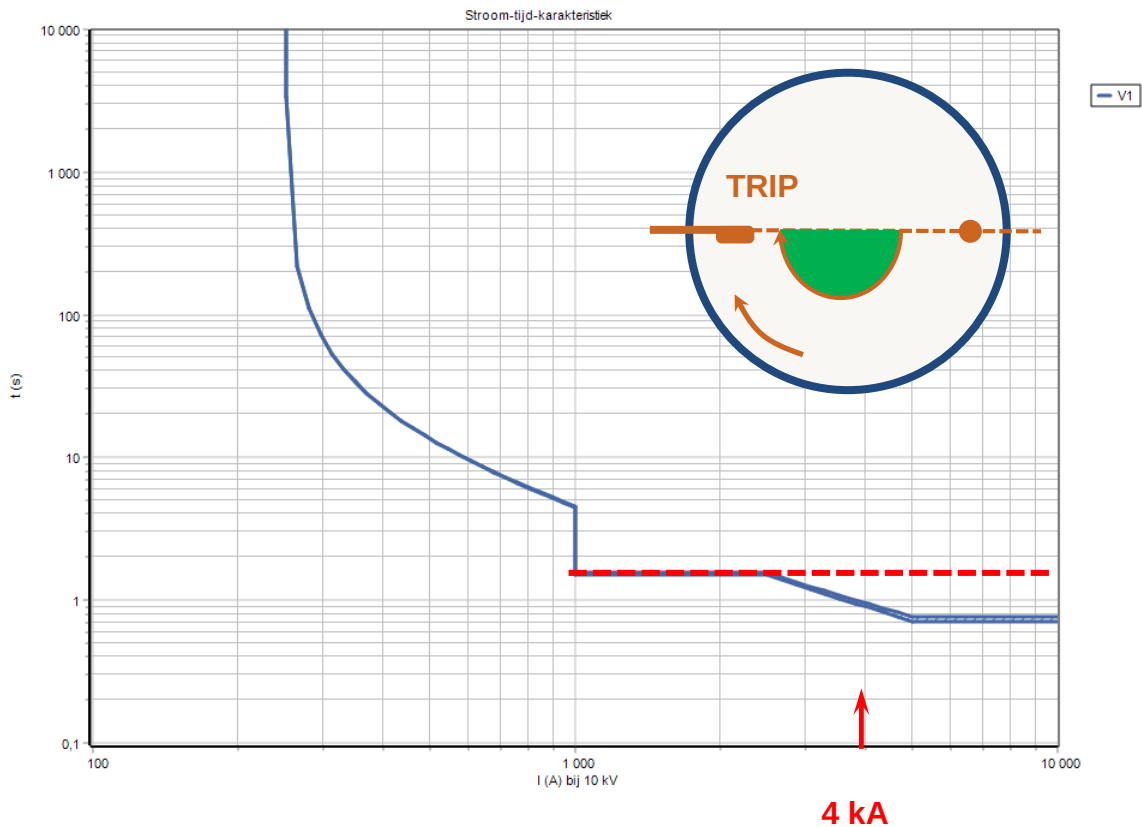
4 kA

$I > = 250 \text{ A}$

$t > = 2 \text{ s}$

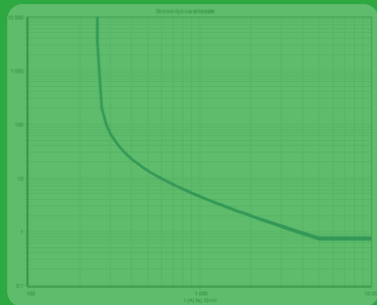
$I >> = 2 \text{ kA}$

$t >> = 1 \text{ s}$

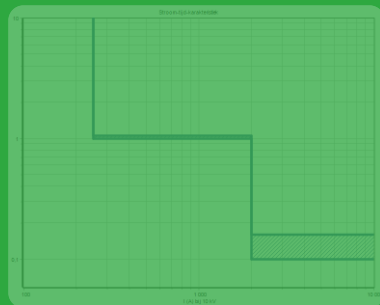


Totale triptijd 0,9 seconden

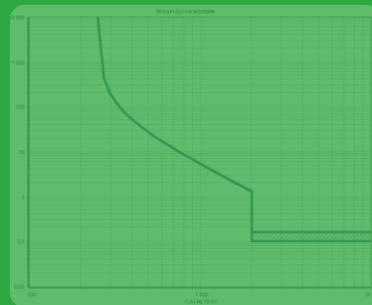
AMT-relais



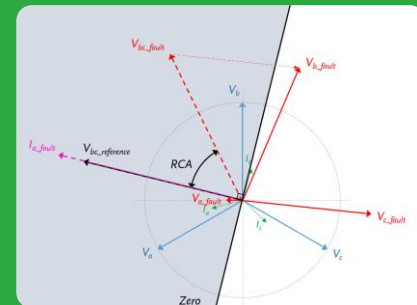
OMT-relais



Combinatie



Richting



Vermogenschakelaar

Algemeen Vermogenschakelaar Eerste stroombeveiliging Betrouwbaarheid Bijzonderheden Notitie Presentatie Selectie Variaties

KP1

10 kV



Kabel 1

Naam

V1

Beveiligingen

	Aanwezig	Actief	Richting	RCA	Info
Stroom 1	☒	☒	☐ < ☐ <> ☒ >	RCA 50	Info
Stroom 2	☐	☐	☐ < ☒ <> ☐ >	RCA 45	Info
Aardfout 1	☐	☐	☐ < ☒ <> ☐ >	RCA 0	Info
Aardfout 2	☐	☐	☐ < ☒ <> ☐ >	RCA 0	Info
Spanning	☐	☐	☐ < ☒ <> ☐ >	RCA 45	Info
Differentiaal	☐	☐			Info
Distantie	☐	☐			Info
Onbalans	☐	☐			Info
Thermisch	☐	☐			Info
Aardfoutdiff.	☐	☐			Info
Vectorsprong	☐	☐			Info
Frequentie	☐	☐			Info

☐ Meeneenschakeling

☐ Reserveschakeling

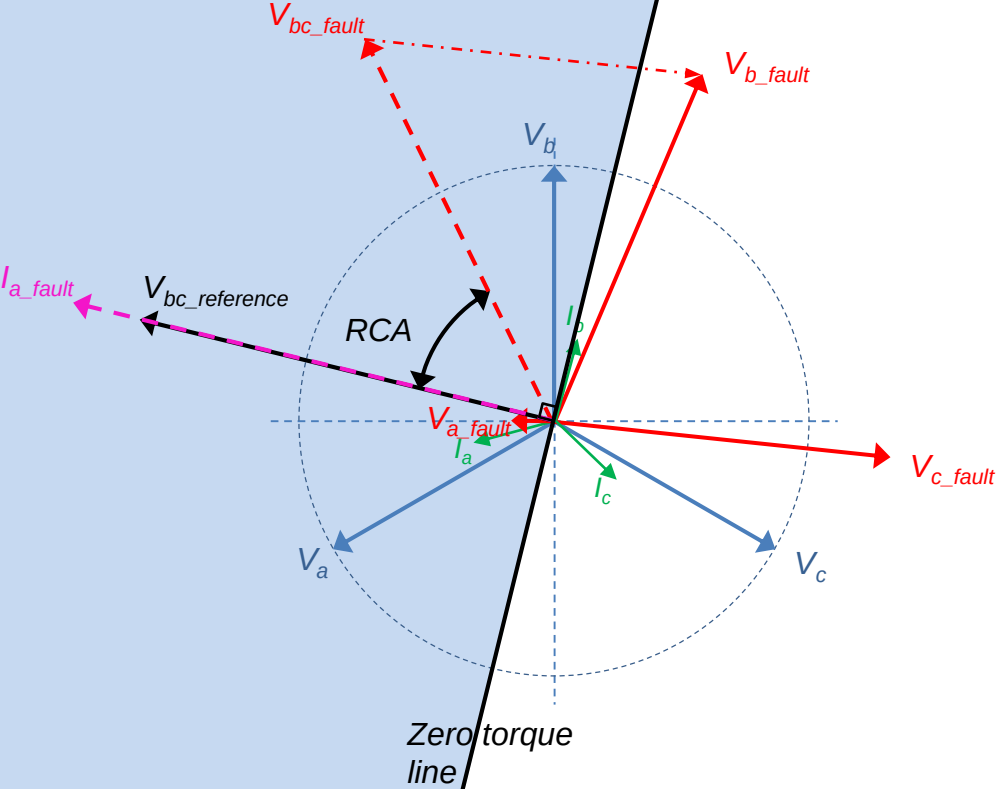
☐ Blokkeerschakeling

OK

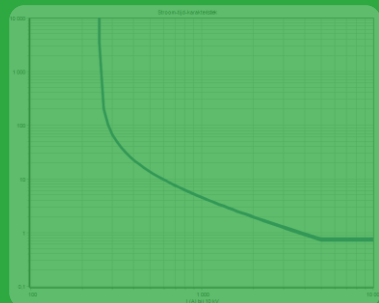
Annuleren

Operate zone

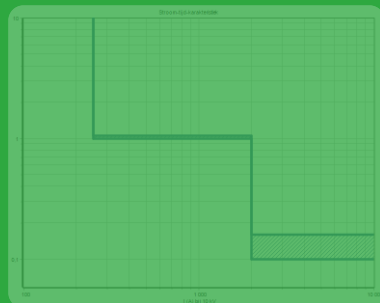
Nonoperate zone



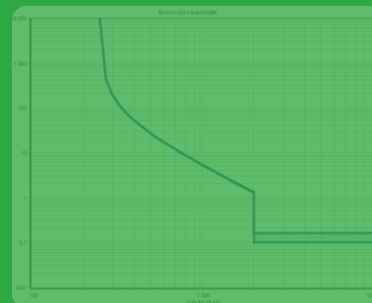
AMT-relais



OMT-relais



Combinatie



Richting



<https://www.phasetophase.nl/wp-content/uploads/2024/04/19-047-Modellerings-beveiligingscomponenten-in-Vision.pdf>

**BEDANKT
VOOR UW
AANDACHT**

