Power needs control

Ultra Quick

Fuses for semiconductor protection

2008

ULTRA QUICK

Prepared by: Brane Lebar
product manager assistant

1. Market situation
2. What is Ultra Quick?
3. Reason for useing protection of semiconductors
4. Danger of semiconductor explosion
5. Difference between gG and aR/gR fuse

6. What we can protect with UQ ?
   - -Thyristor, diode protection
   - -IGBT protection
   - -Battery, DC applications

7. Full protection of thyristor
   - -Overload and s.c. protection of thyristor
   - -When aR, when gR characteristics

8. Typical electrical characteristics
   - -Short circuit simulation
   - -I/t characteristics for gR, gG, aM
   - -Selectivity
   - -Thermal dissipation

9. Selecting UQ fuse
   - -Voltage selection
   - -Current selection
   - -Joule integral selection
   - -Ultra Quick select.xls

10. ETI UQ program (catalogue overview)
   - -Type of fuses
   - -Fuse bases and microswitches

11. Bussiness segment
   - -Key words
   - -Producers
   - -Typical plants
   - -Future application
   - -Motor control market

12. Comparison characteristics ETI-competitors

13. World standards

14. Support

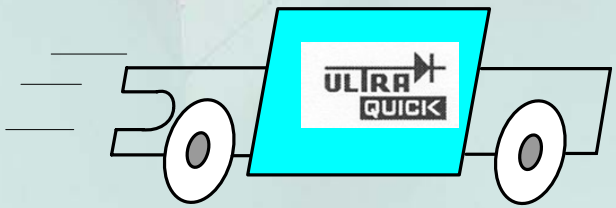
- -UQ application guide
- -UQ industry applications-help for sales
- -Cross-reference
- -OEM references
- -Link to other documents

For presentation you need **Power point 2003**!

Market situation

One of the fastest growing market for fuses is protection of semiconductor devices

!!!



In today's industry avoiding "down-time" can be the same as creating profit !!!

What is ULTRA QUICK?

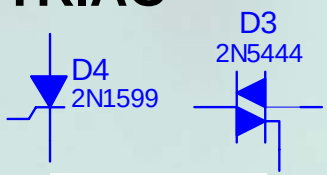
ULTRA QUICK (UQ) is a trade mark™ for the ETI program of fuses for protection of semiconductors and applications with semiconductors

DIODE
(1950)

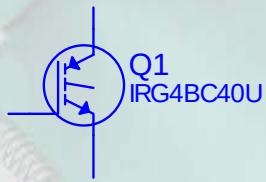
Thyristor (1956),

GTO thyristor,

TRIAC



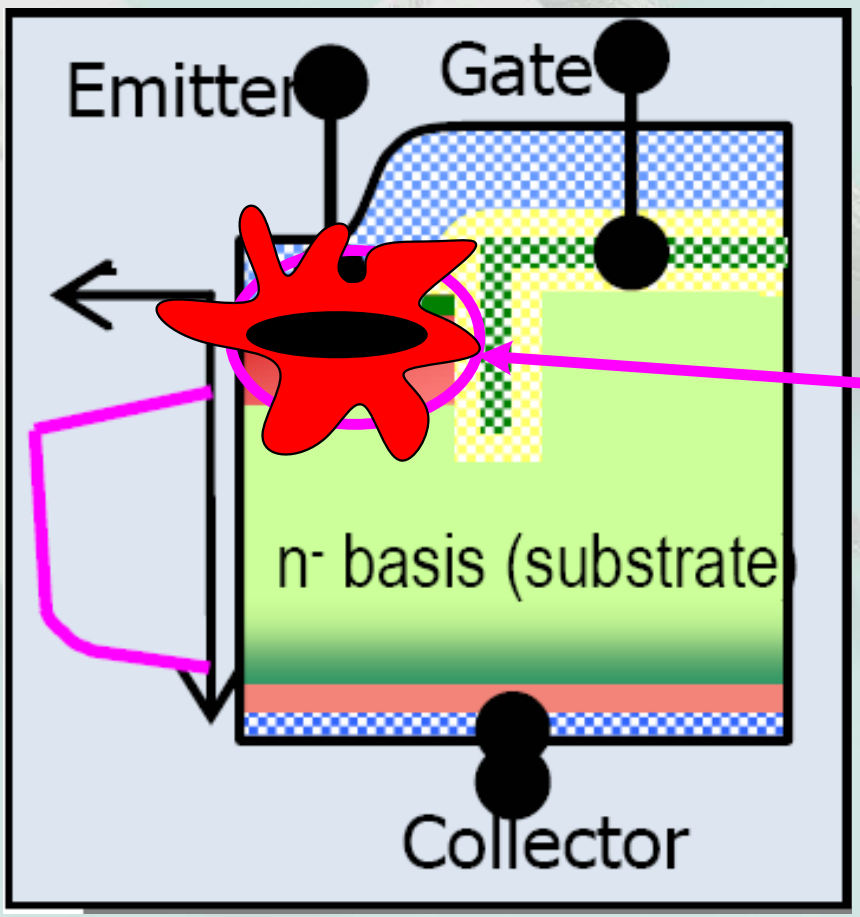
IGBT transistor
(1985)



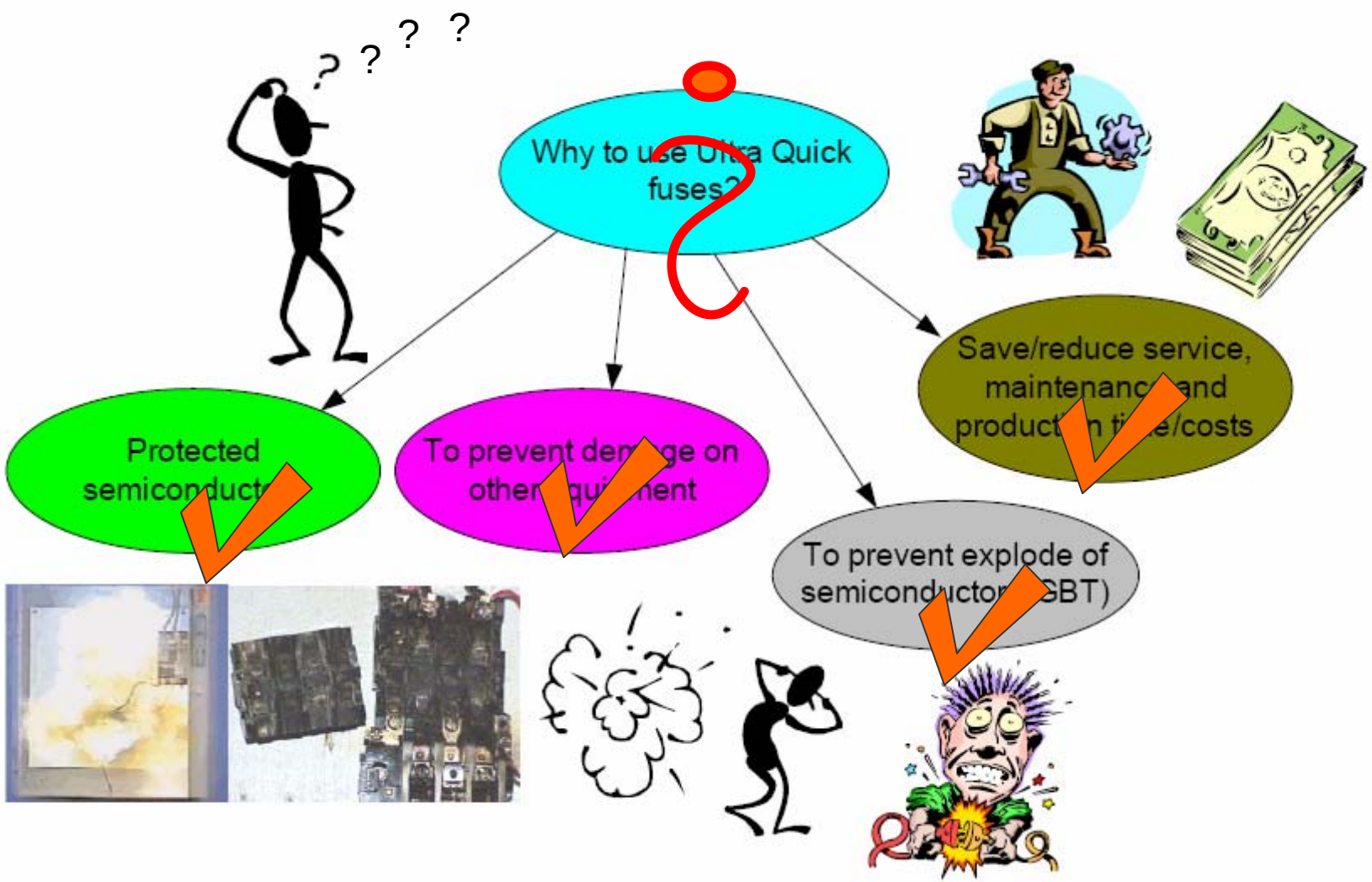
Power needs control

Ultra Quick

Reason for useing protection of semiconductors:



The p-n semiconductor junction can be very easily damaged


Why to use Ultra Quick fuses?
Protected semiconductor
To prevent damage on other equipment
Save/reduce service, maintenance and production time/costs
To prevent explode of semiconductor (IGBT)

Danger of semiconductor explosion :

In (A)

15-30xIn(10ms) -ordinary industrial fuse has blown

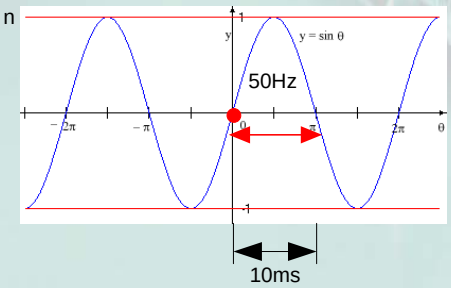
>10xIn (10ms) break down of semiconductors

safety

ULTRA QUICK

5-6xIn(10ms) - UQ fuse has blown

In



Power needs control

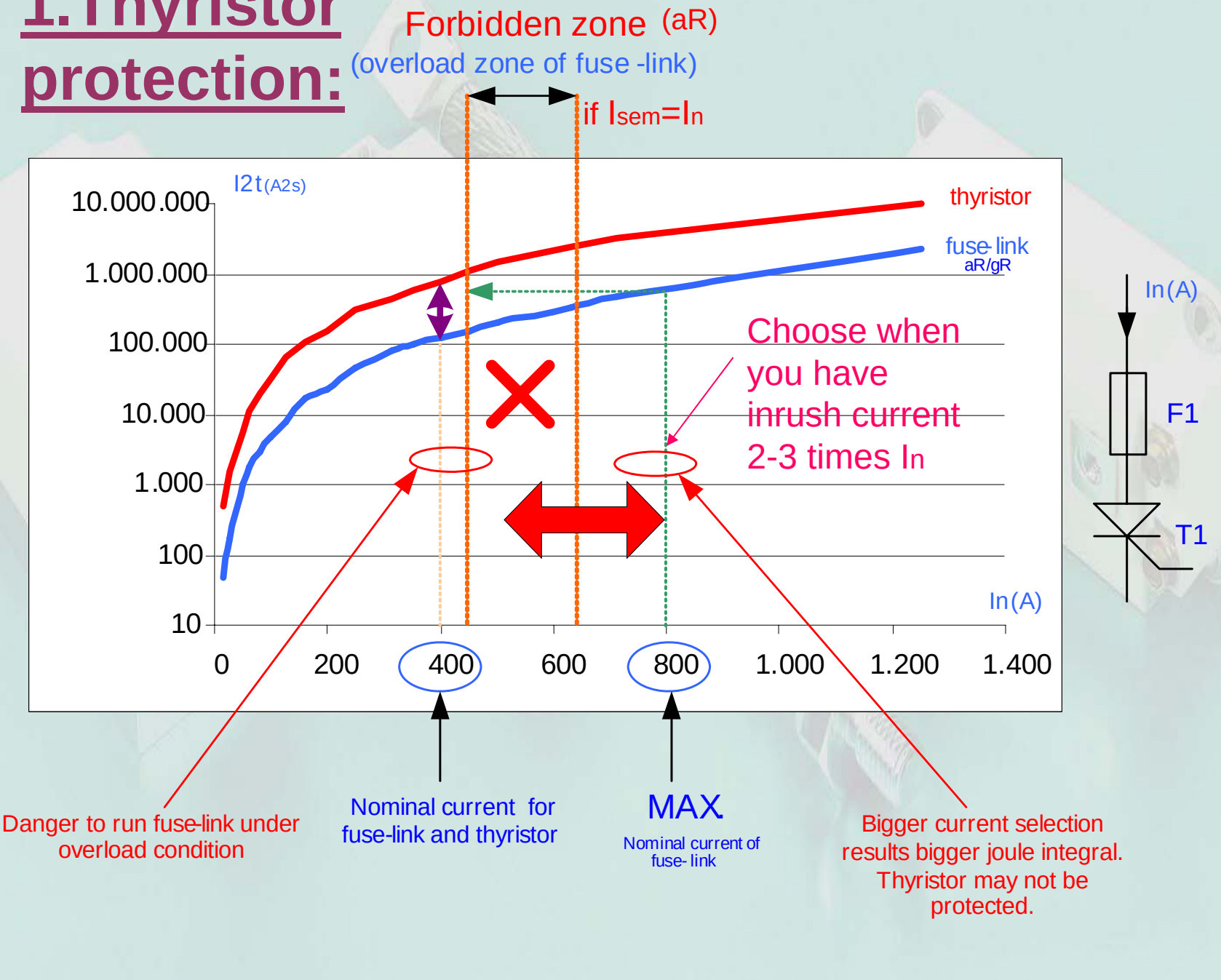
Ultra Quick

Difference between UQ fuse and standard gG industrial fuse?

	Ultra Quick fuse (aR/gR)	Industrial fuse (gG)
Joule integral	**Low**	High
Power dissipation	**Higher**	Low
Material of body	**Steatit (610)**	Ceramics
Melting element	**Pure silver strip (smaller)**	Copper strip
Sand filler	**Quarz + glass water (complicated process)**	Quarz
Type of protection	**Short circuit (aR)**	Full (overload + short circuit)

What we can protect with UQ

1.Thyristor protection:



2.IGBT protection:

•Main purpose is to protect IGBT against explosion-ruptured (I^2t of IGBT is too small to adequate protect by fuse for semiconductor protection !!!

•**Type 1** protection!!!

Sample:

•Ic=200A

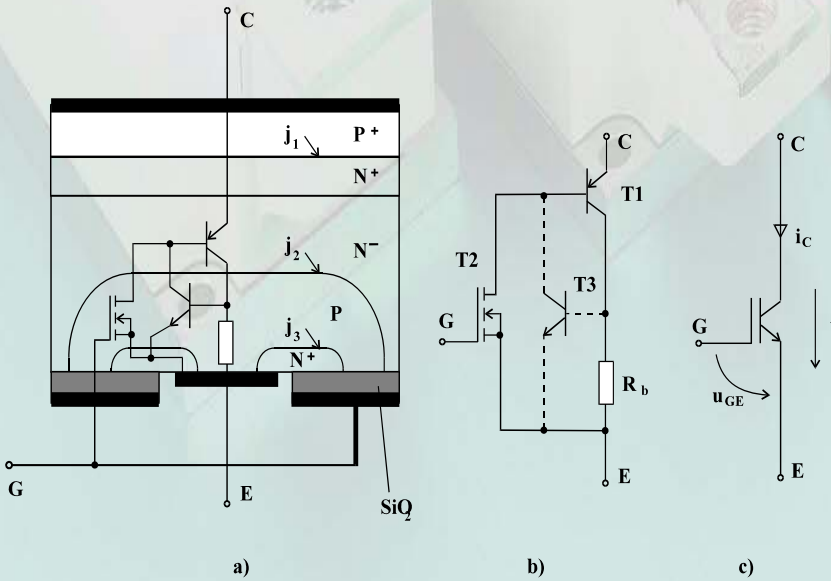
•Icp (1ms)=400A

•I^2t (IGBT)=$(400A)^2$ x 0,001s=160A^2s

•I^2t (fast fuse 200A)=15.000-20.000A^2s

Electronic protection

100% realibility



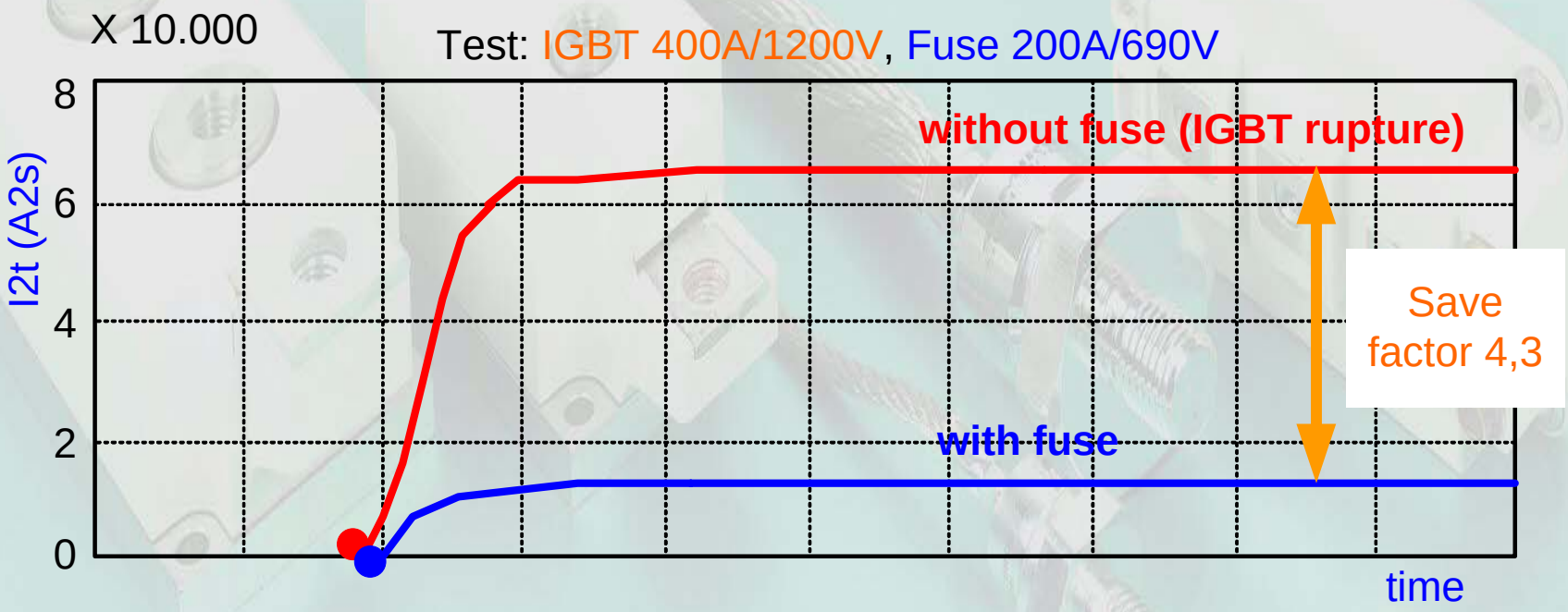
Combination of electronic protection and fuse for semiconductor protection for the middle and high power sistems.

Danger: electronic protection degradated over the time because overvoltage!!!

Power needs control

Ultra Quick

IGBT protection by fuse for semiconductor protection against ruptured (Type 1 protection) :



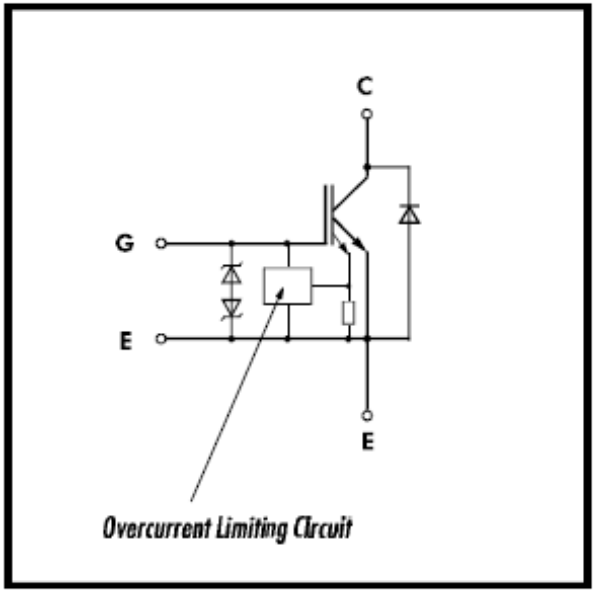
■ Maximum Ratings and Characteristics

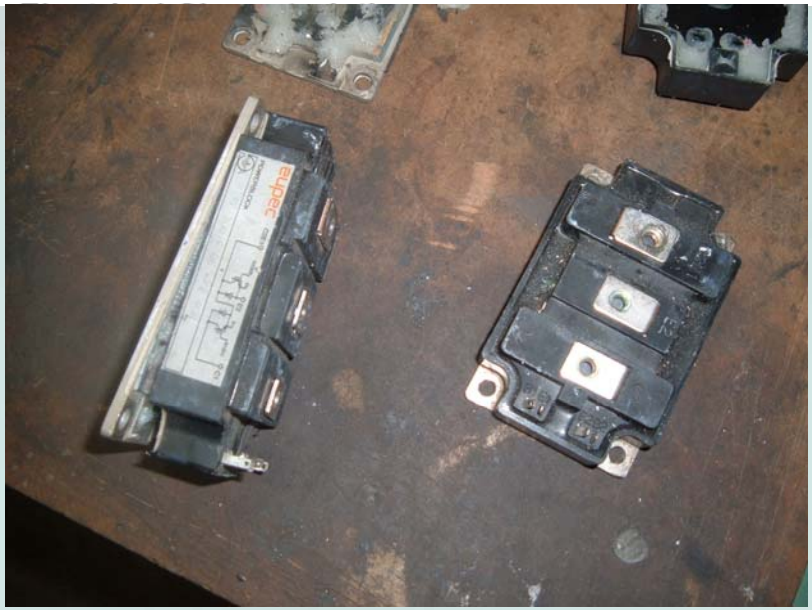
• **Absolute Maximum Ratings** (T_c=25°C)

Items		Symbols	Ratings	Units
Collector-Emitter Voltage		V_{CES}	1200	V
Gate -Emitter Voltage		V_{GES}	± 20	V
Collector Current	Continuous	I_C	200	A
	1ms	$I_{C\ PULSE}$	400	
	Continuous	$-I_C$	200	
	1ms	$-I_{C\ PULSE}$	400	
Max. Power Dissipation		P_C	1500	W
Operating Temperature		T_j	+150	°C
Storage Temperature		T_{stg}	-40 ~ +125	°C
Isolation Voltage	A.C. 1min.	V_{is}	2500	V
Screw Torque		Mounting *1	3.5	Nm
		Terminals *2	4.5	
		Terminals *3	1.7	

Note: *1:Recommendable Value; 2.5 ~ 3.5 Nm (M5) or (M6)
*2:Recommendable Value; 3.5 ~ 4.5 Nm (M6)
*3:Recommendable Value; 1.3 ~ 1.7 Nm (M4)

■ Equivalent Circuit





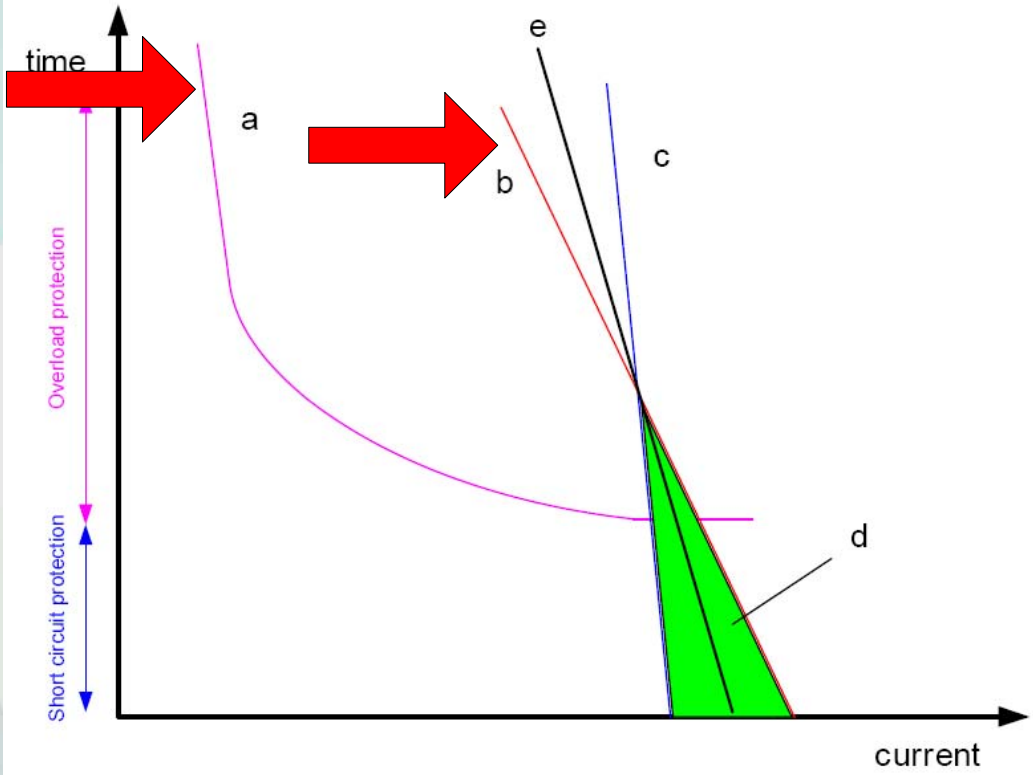
3.Battery protection (U_n >60V d.c.):

Fault currents are usually only limited by the internal impendance of the battery. The internal impendance of the battery will vary with the state of charge of the battery. If the battery is in a part discharged condition there will not be sufficient current available to operate a fuse link. Ultra Quick fuse – links are often used to protect batteries, as they limit the peak current to lower values than other fuse type and this will better protect the battery from damage.

Reason for useing ultra quick for battery protection are:

-phisicaly smaller than gG fuses
-faster
-more limit the peak current

Full protection of thyristor



a:Characteristics of the temperature relay on thyristor

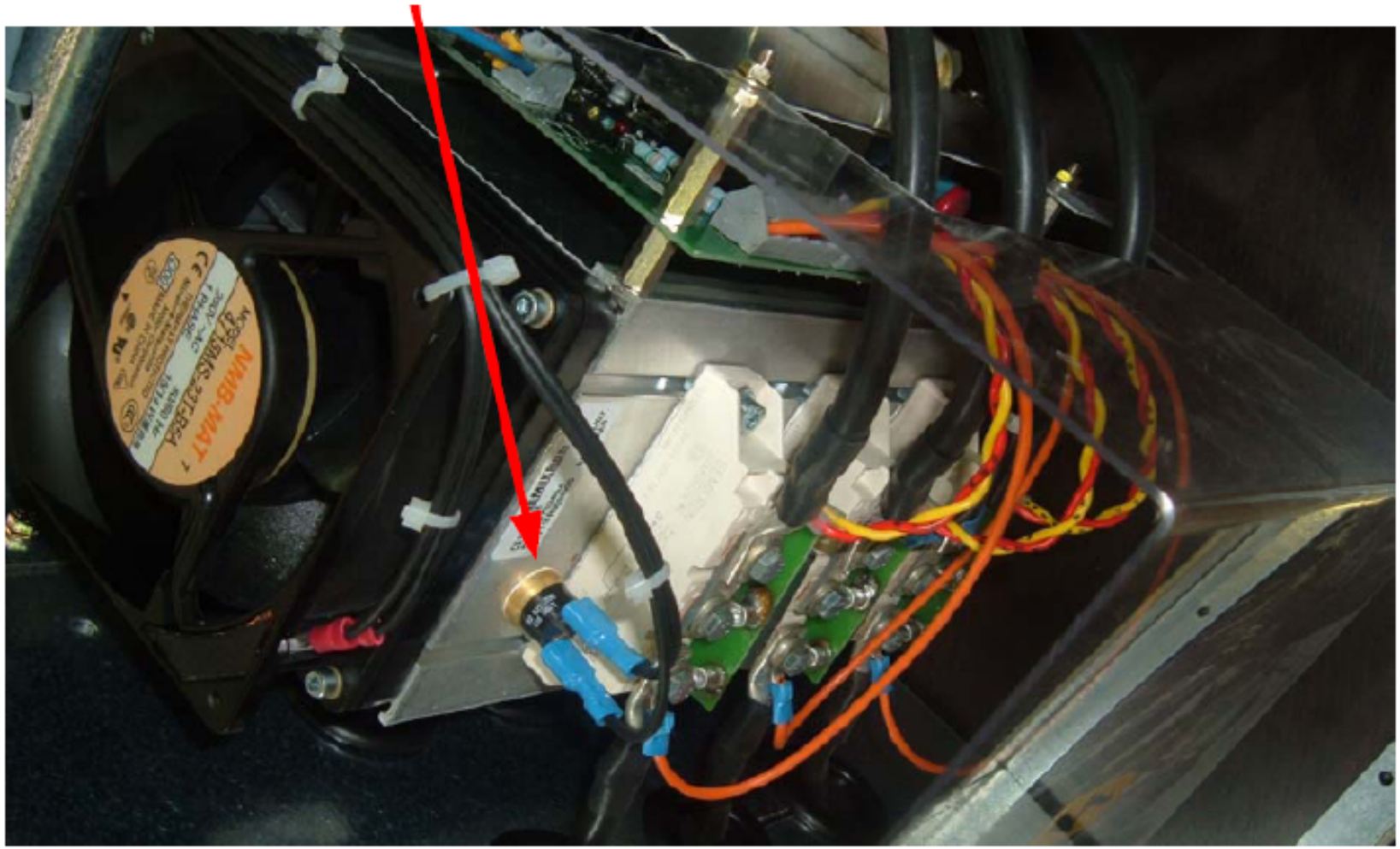
b:Characteristics of gL/gG fuse

c:Characteristics of semiconductor fuse

d: Area where the gL /gG fuse is not fast enough to achieve a type 2 coordination

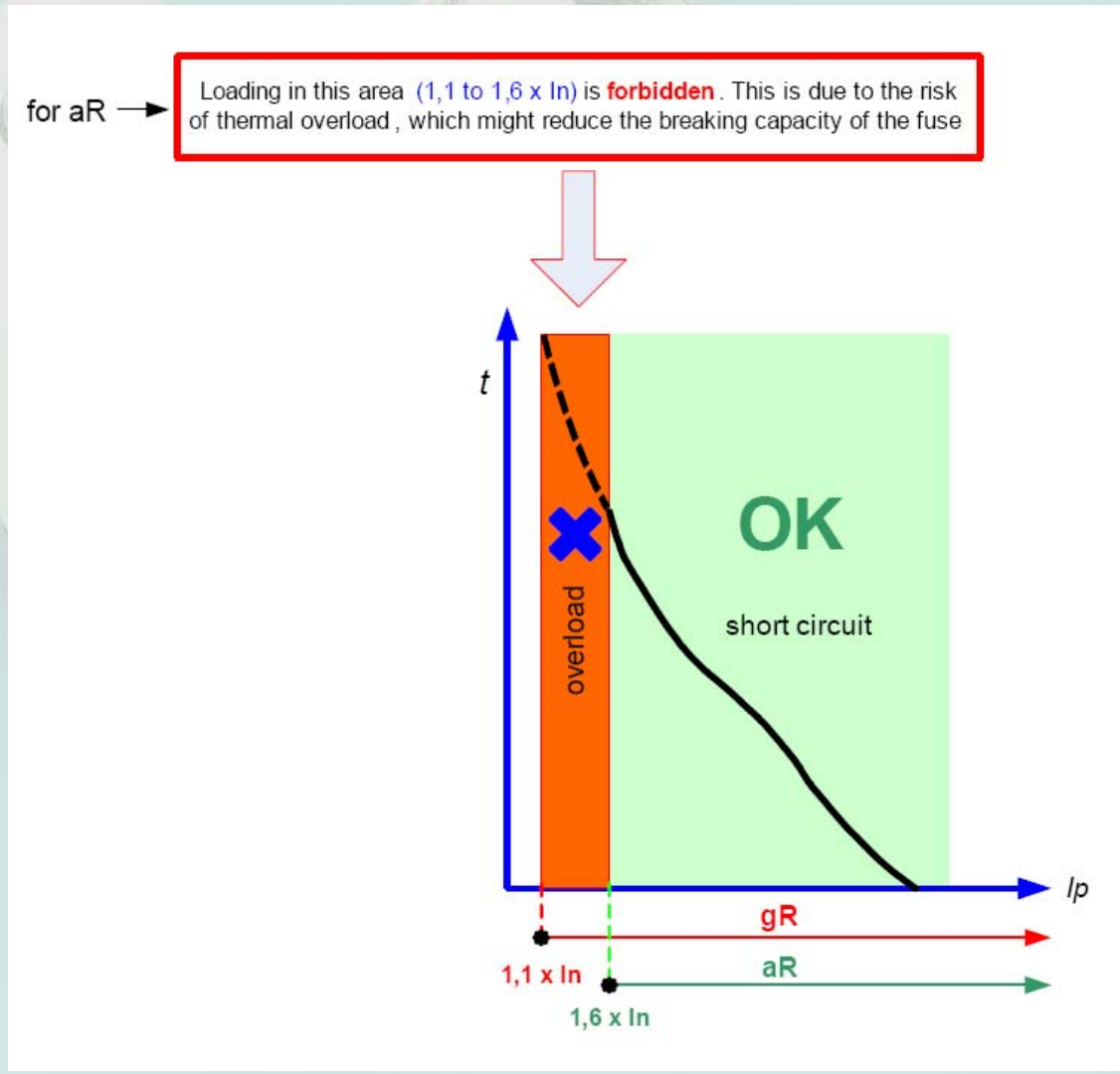
e:thyristor overcurrent characteristics

Over-current protection by bimetal
(temp. sensor)

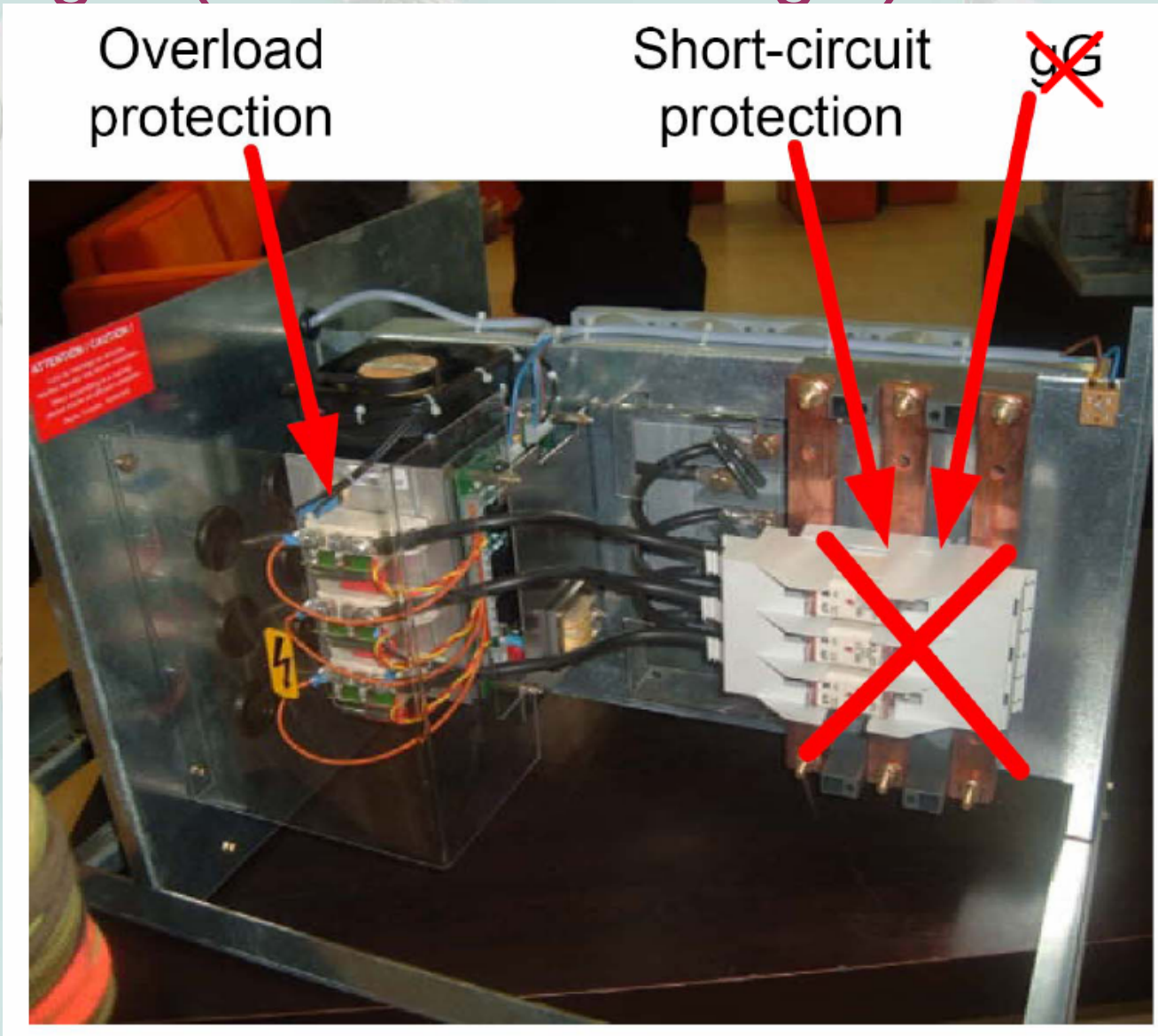


Characteristics - when is gR or aR

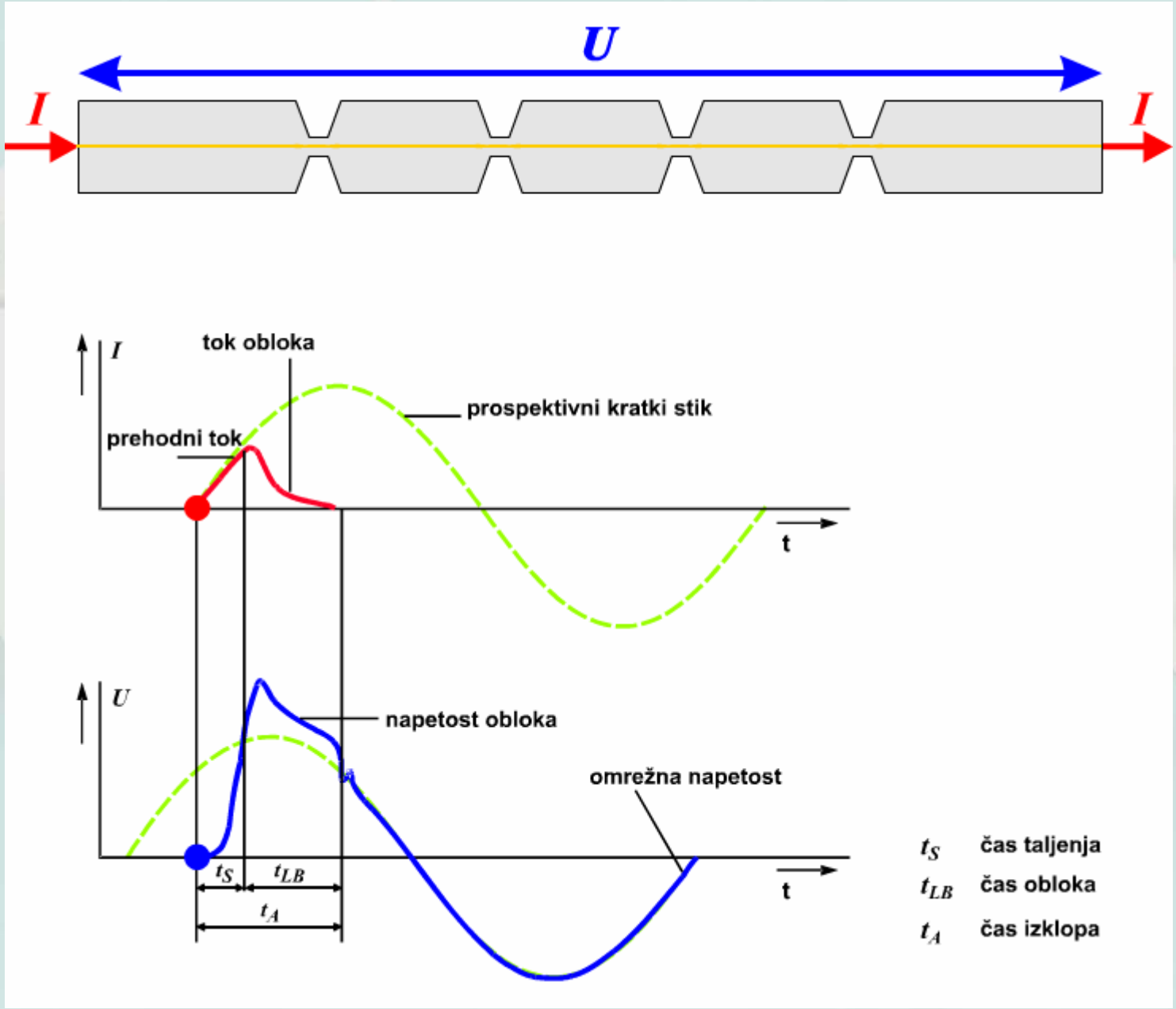
- Overloads + short circuit gR (*1,1 x In* up to breaking capacity)
- Short-circuit aR (*1,6 x In* up to breaking capacity)



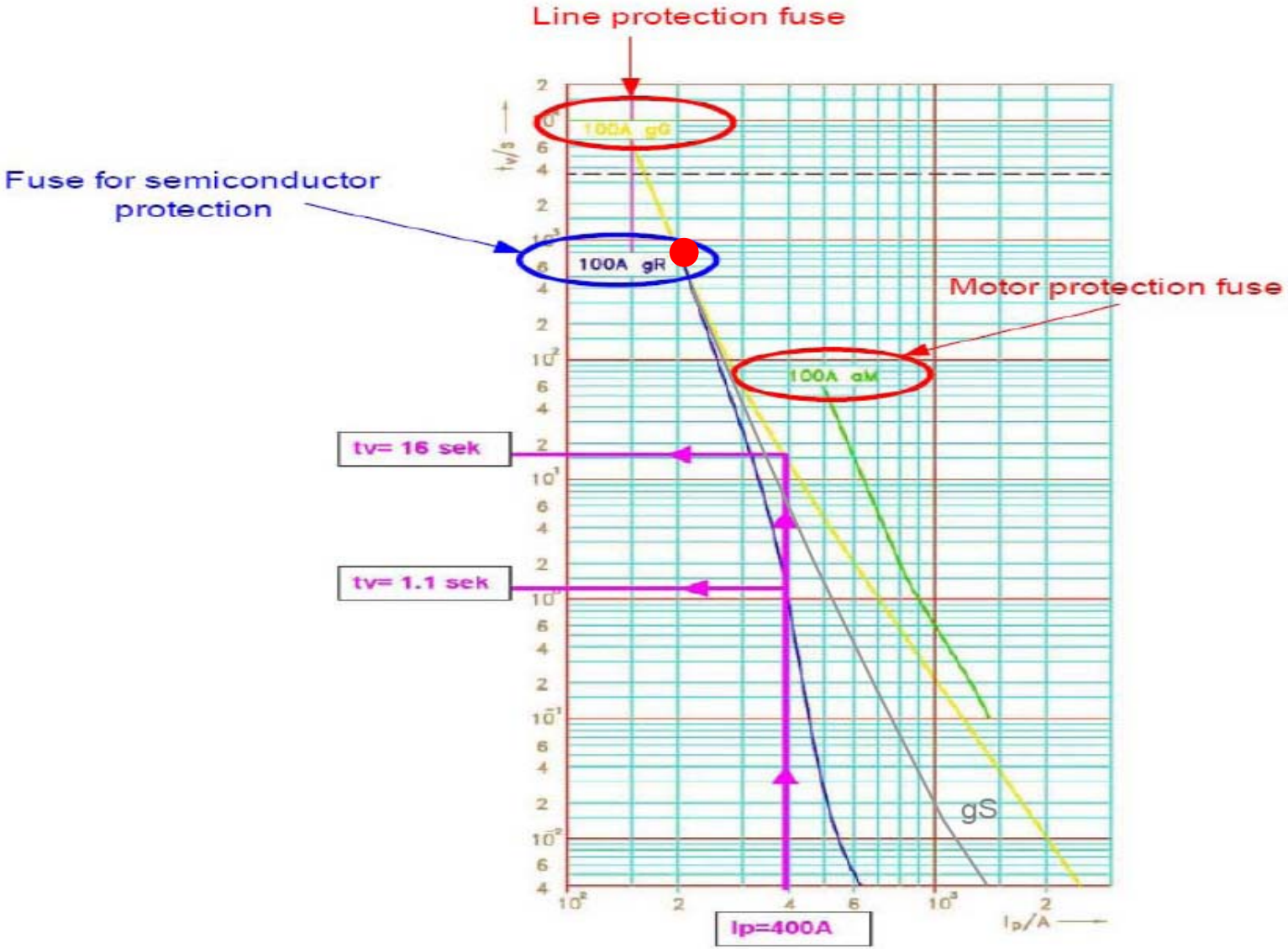
Wrong s.c. protection of thyristors with gG (must be aR or gR):



Typical electrical characteristics



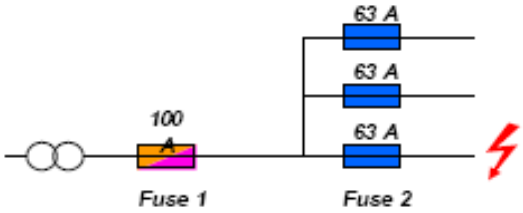
I/t characteristics gR, gG, aM:



SELECTIVITY:

Important: Selectivity is ensured when orange surface is bigger than blue

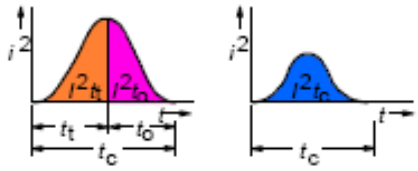
Rules: Fuse-links are selectivity when nominal current are given in the rate 1:1,6



Rules:

Pre-arc integ. $I^2t_s = f(I_p)$

Arc int. $I^2t_L = f(I_p, U_n, \cos\varphi)$



Case :

100 A

$I^2t_t = 24000\ A^2s$

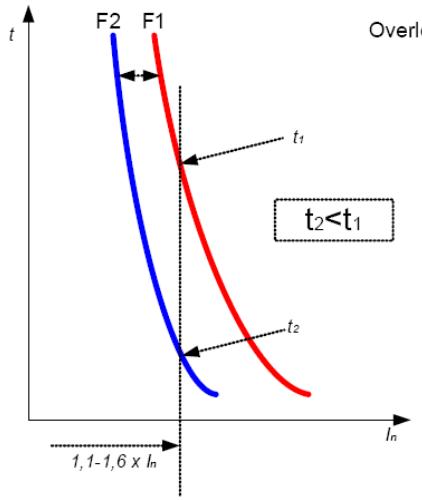
63 A

$I^2t_t = 770\ A^2s$

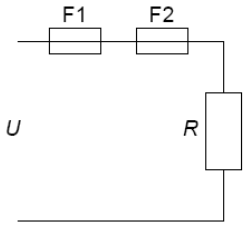
$I^2t_o = 10300\ A^2s$

$I^2t_c = 18000\ A^2s$

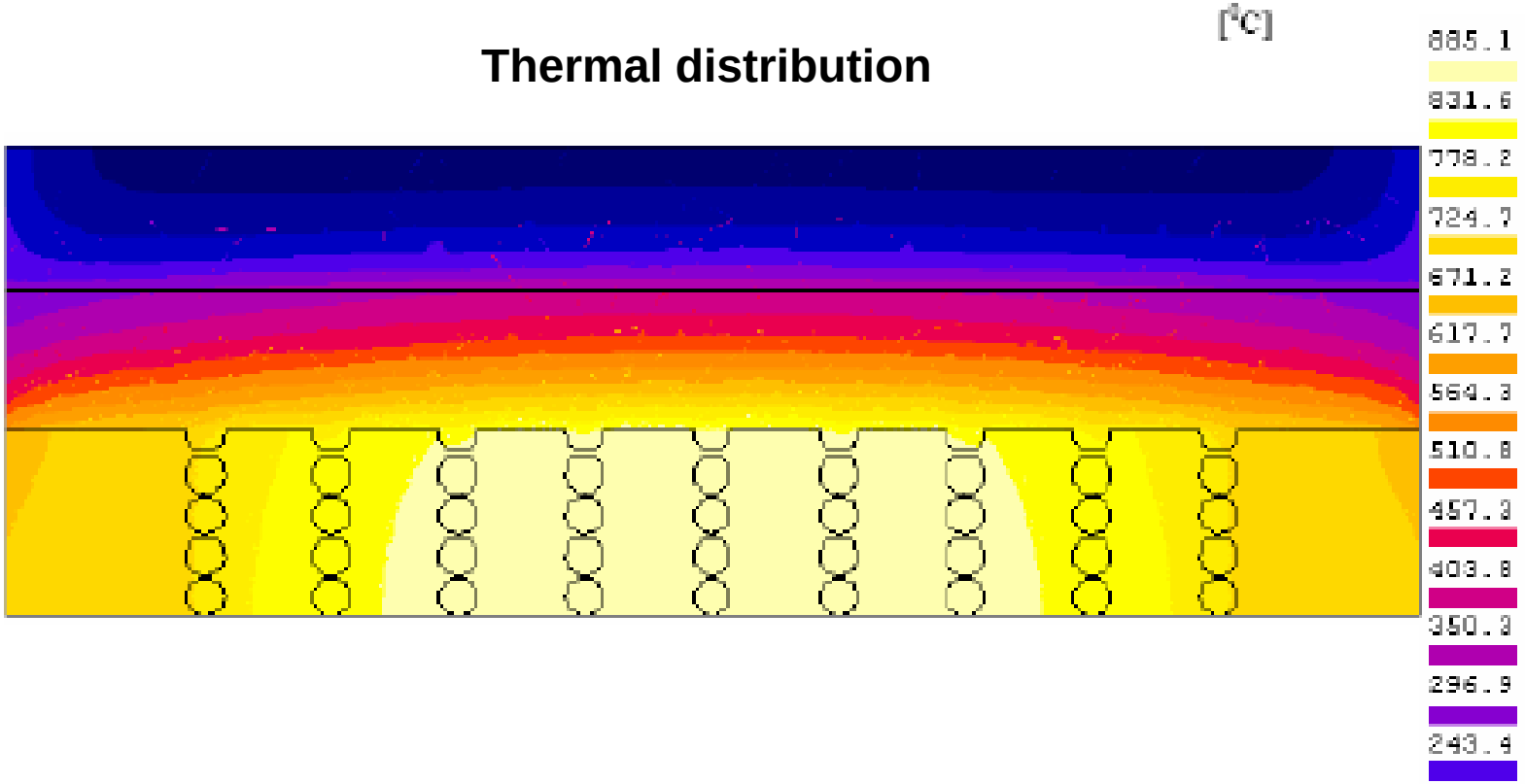
Pre-arcing integral Fuse 1	>	Operating integral Fuse 2
I^2t_t (Fuse 1)	>	I^2t_c (Fuse 2)



Overload (1,1-1,6 x In)



Thermal distribution



$$\iiint \frac{j^2}{\sigma} dV = \iiint \rho c \frac{\partial T}{\partial t} dV - \iiint div(\lambda \cdot gradT) dV$$

(1)

where:

T means the temperature of element [ºC];

j – current density [A/m^2];

σ – electrical conductivity [1/Ωm];

ρ – material density [kg/m^3];

c – specific heat [J/kgºC];

λ – thermal conductivity [W/mºC].

Selecting UQ fuse

What we must know for selecting UQ fuse link?

total joule integral of UQ fuse link

joule integral of semiconductor

In

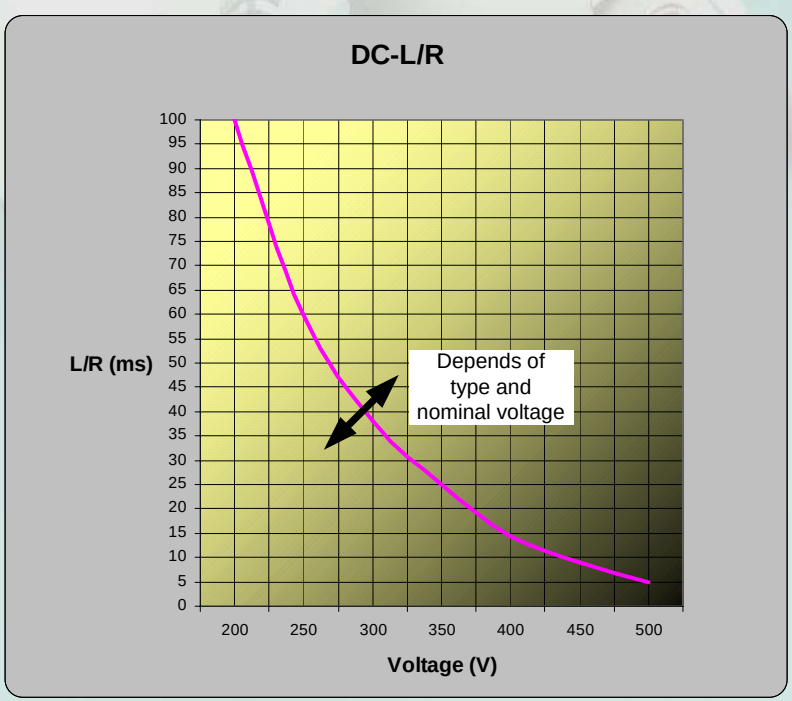
Un

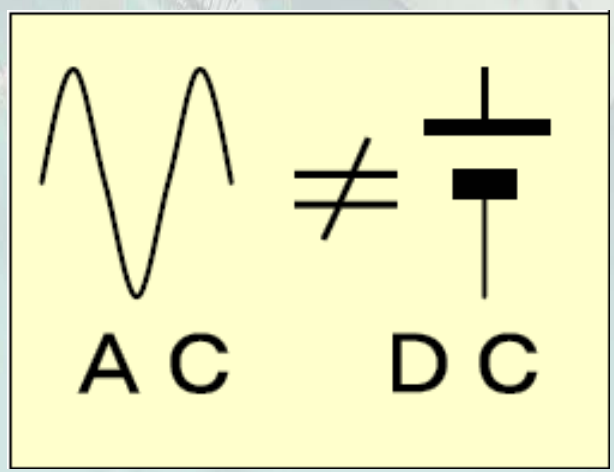
Size

power dissipation of fuse link

Fuse selection criteria (Un)

- Voltage rating:choose the maximum voltage the fuse is likely exposed to
- The operation voltage must not exeed the rated voltage of fuse
- The rated voltage for AC and DC are different



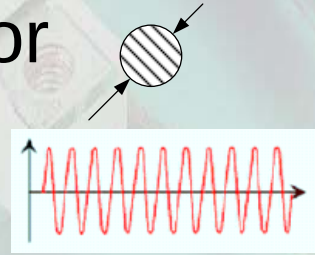


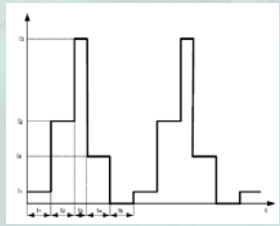
Fuse selection criteria (I_n)

- Smaller current selection –problem to run under overload condition (forbidden dashed section (aR) of the melt curve).
- Bigger current selection - more fault let-through energy (joule integral). The semiconductor may not be protected.

Additional influenced factors (In)

- Ambient temperature
- Forced cooling
- Terminal conductor
- Frequency
- Current variation





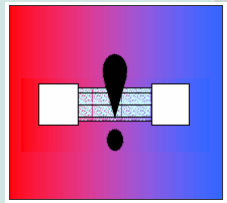
Ambient temperature A_1

$$A_1 = \sqrt{\frac{a - \vartheta}{a - \vartheta_0}}$$

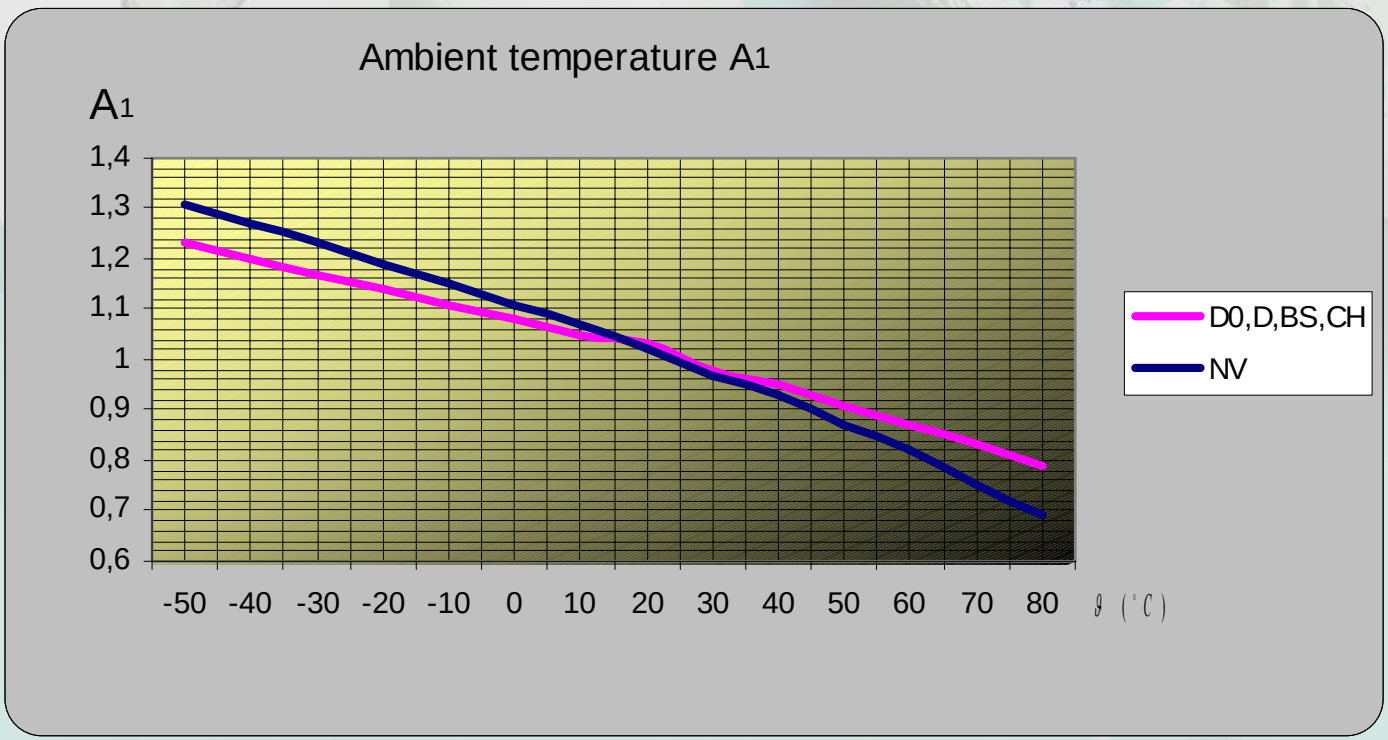
where:

a is the maximum allowable fuse temperature (typically 130-150°C)

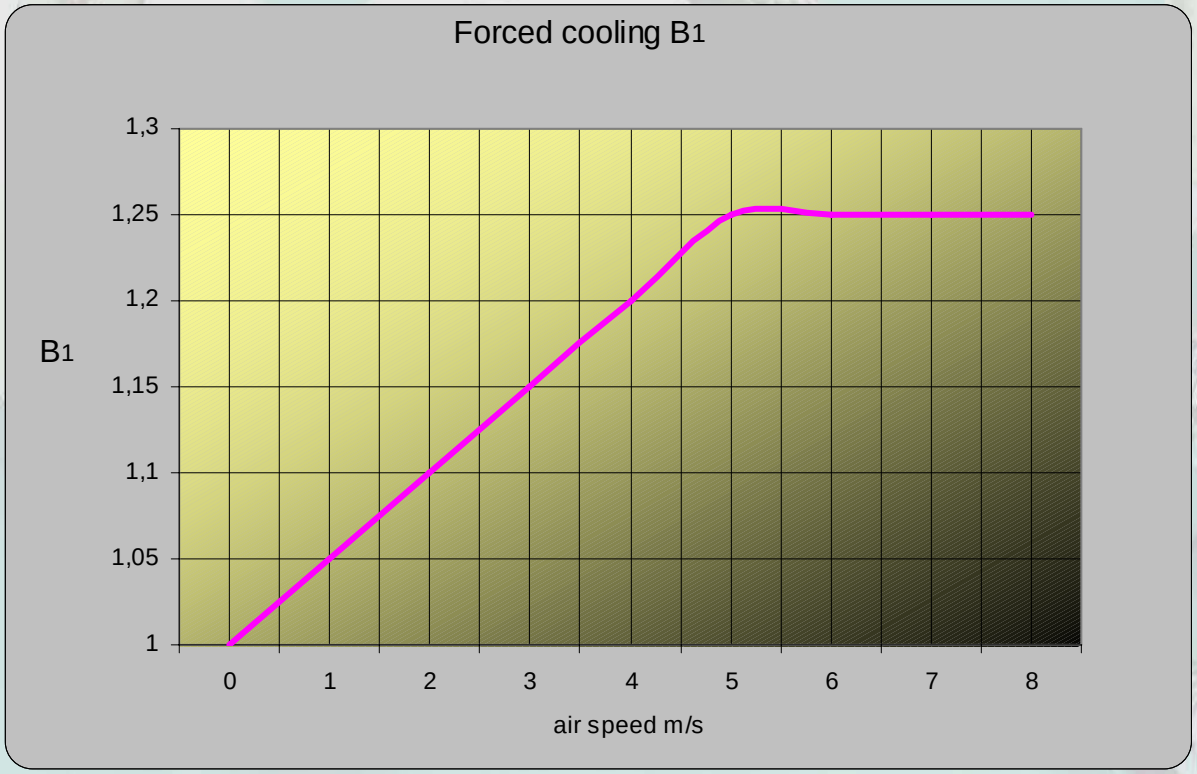
ϑ_0 is reference ambient temperature (25°C)



Consider the effect of the ambient temperature when you use the fuse.
Electrical performance of the fuse may vary depending on the temperatures.



Forced cooling B_1

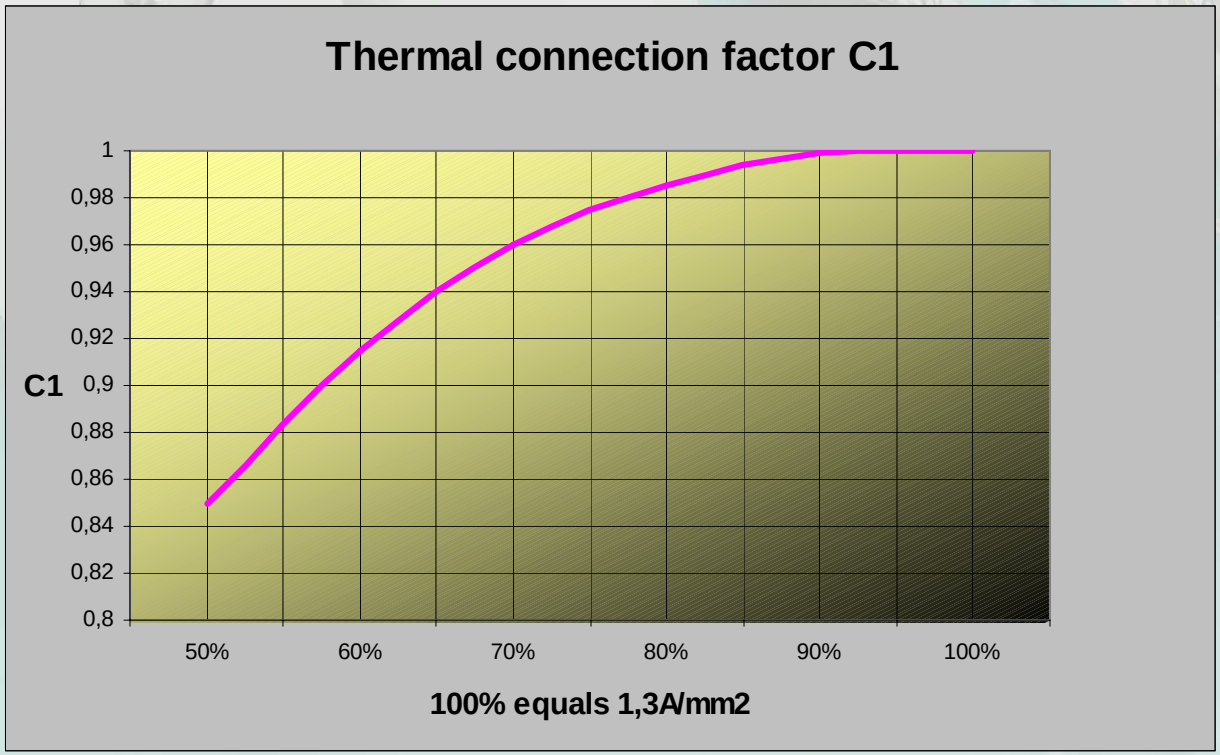


Terminal conductor C_1

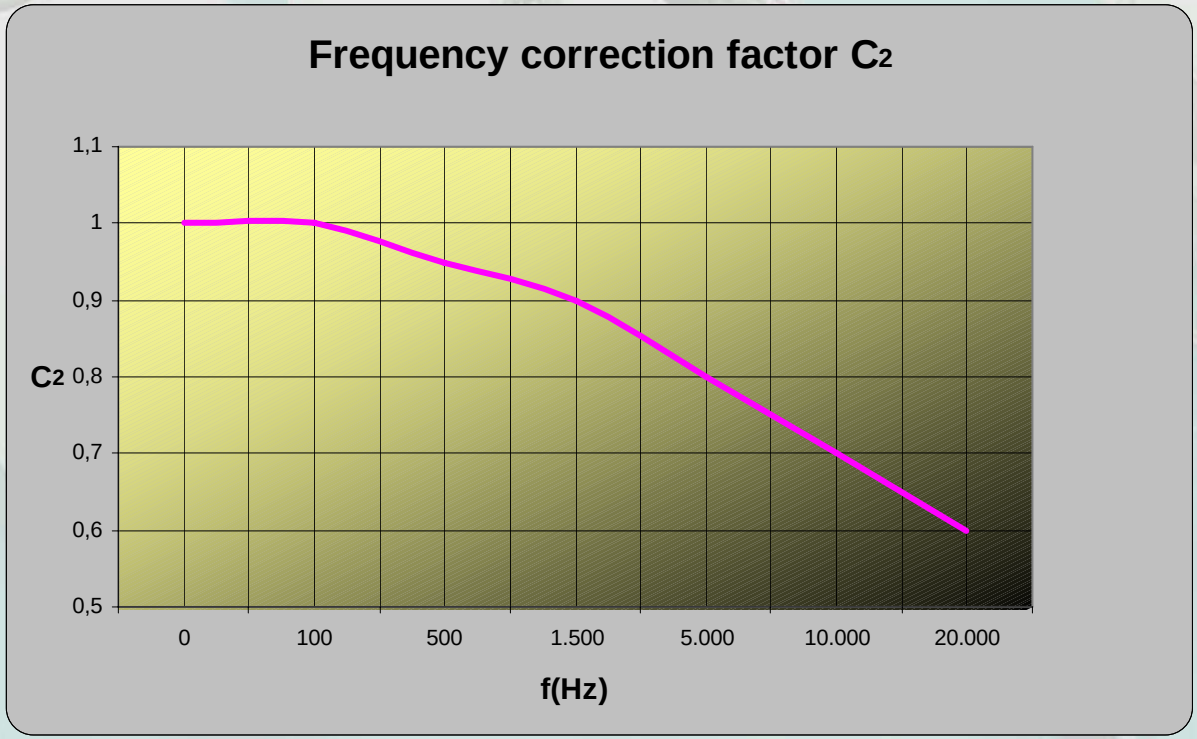
In the real world, the fuse may be used with cable bus sizes which are smaller than those used in the standard type test conducted in the lab.

C_1 varies with fuse design configuration and is;

typically in the range 0,8 to 1



Frequency correction factor C_2



Current variation A_2

Steel production →

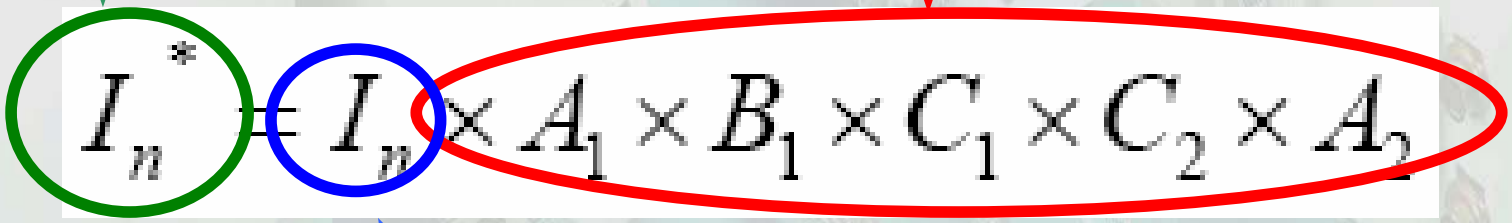
Soft-starter →

Working conditions	A_2
A few stops per year	0,95
One stop per day	0,9
Up to 12 stops per day	0,8

Combining the factors

Circuit current

Influenced factors



Nominal current of fuse - link

Example:

What could be MAX. nominal current in circuit for selected fuse-link?

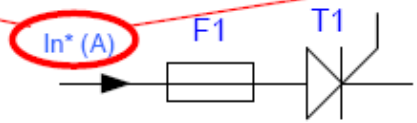
1000A fuse has the following data:

$a = 150°C$ $\quad C_1 = 0{,}95$ $\quad \vartheta_0 = 25°C$ $\quad C_2 = 0{,}9$

$\vartheta = 60°C$ $\quad f = 500Hz$ $\quad$ forced air cooling with v=3m/s… $B_1 = 1{,}15$ $\quad A_2 = 0{,}8$

$$A_1 = \sqrt{\frac{a-\vartheta}{a-\vartheta_0}} = \sqrt{\frac{150-60}{150-25}} = 0{,}84$$

$$I_n^* = I_n \times A_1 \times B_1 \times C_1 \times C_2 \times A_2 = 1000 \times 0{,}84 \times 1{,}15 \times 0{,}95 \times 0{,}9 \times 0{,}8 = 660A$$

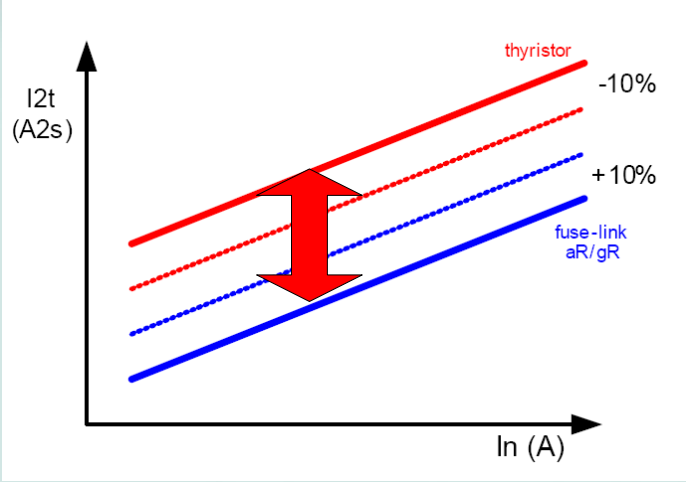


Fuse selection criteria Joule integral

$$I^2t_{\text{fuse}} < I^2t_{\text{sem}}$$

typical 1:1,5

Why? The reason is tolerances in Joules integral of fuse link and semiconductors (-+10%) and additional safety (10%)



Ultra Quick

Power needs control

$$I^2t_{sem} = \int_0^T i^2 dt = \int_0^T (I_{TSM} \sin \omega t)^2 dt = \frac{I^2_{TSM}}{2} T$$

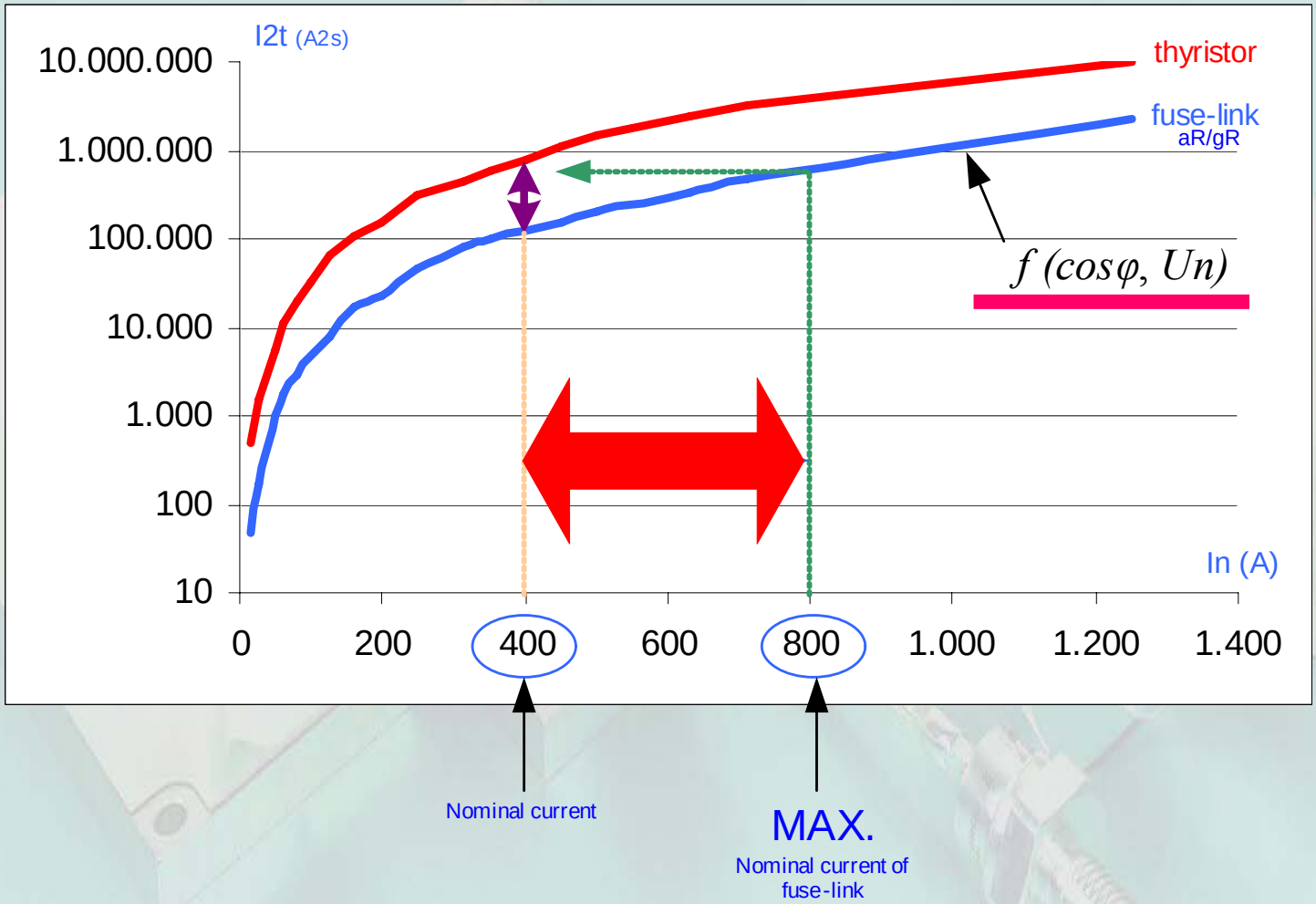
1 : 1,5

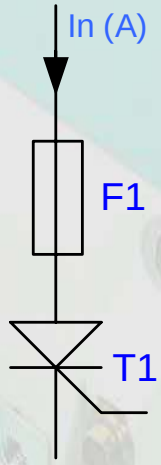
Joule integral

Joule integral

Phase control thyristors

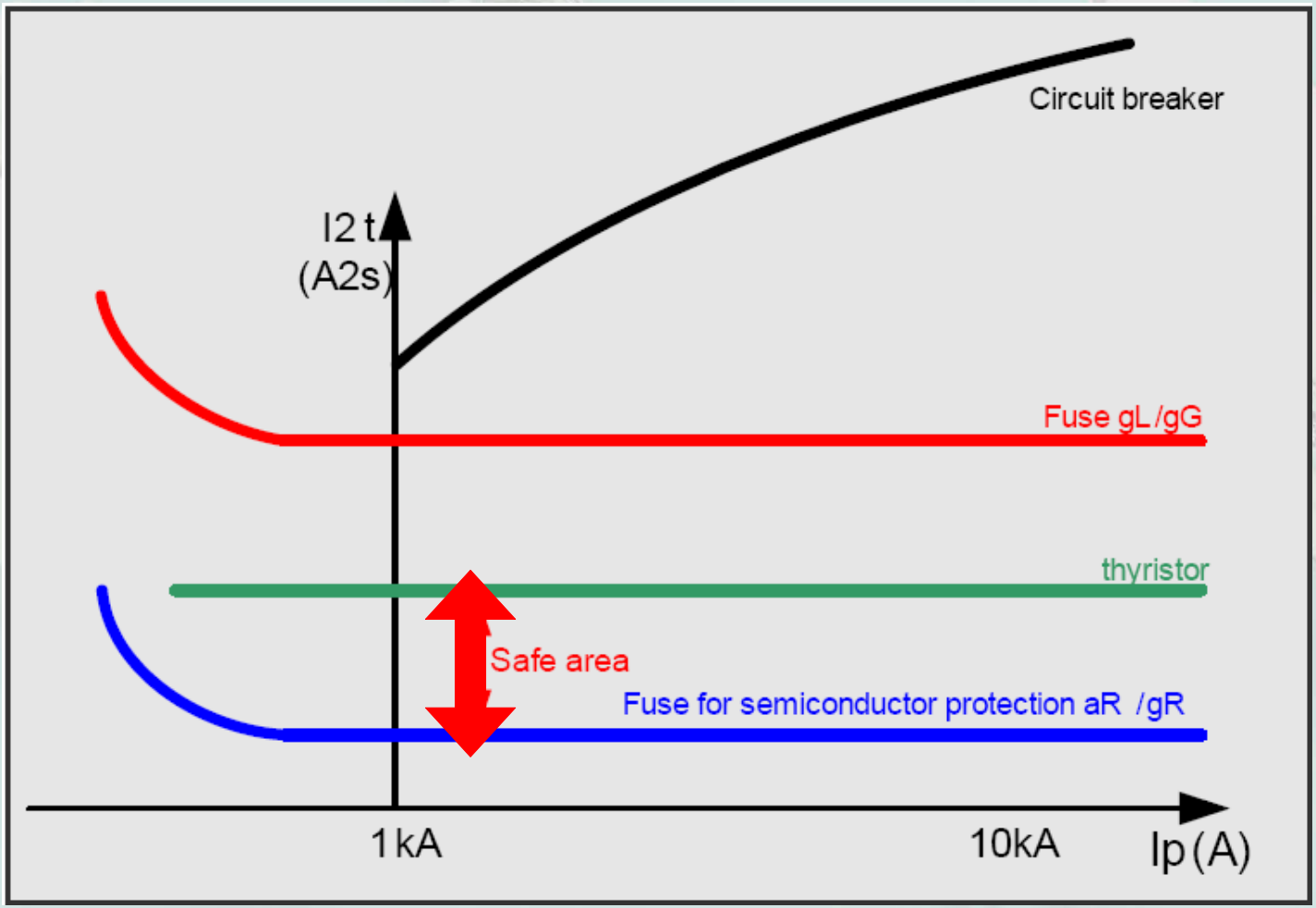
Model	$I_{T(AV)}$	I_{TSM}	dv/dt	di/dt	I_{drm}/I_{rrm}
	55□	10ms			
	A	KA	V/us	A/us	mA
KP200A	200	2.5	300	100	30
KP300A	300	3.8	300	100	30
KP400A	400	5	300	100	40
KP500A	500	6.4	300	100	50
KP600A	600	6.4	300	100	40
KP800A	800	10	300	100	50



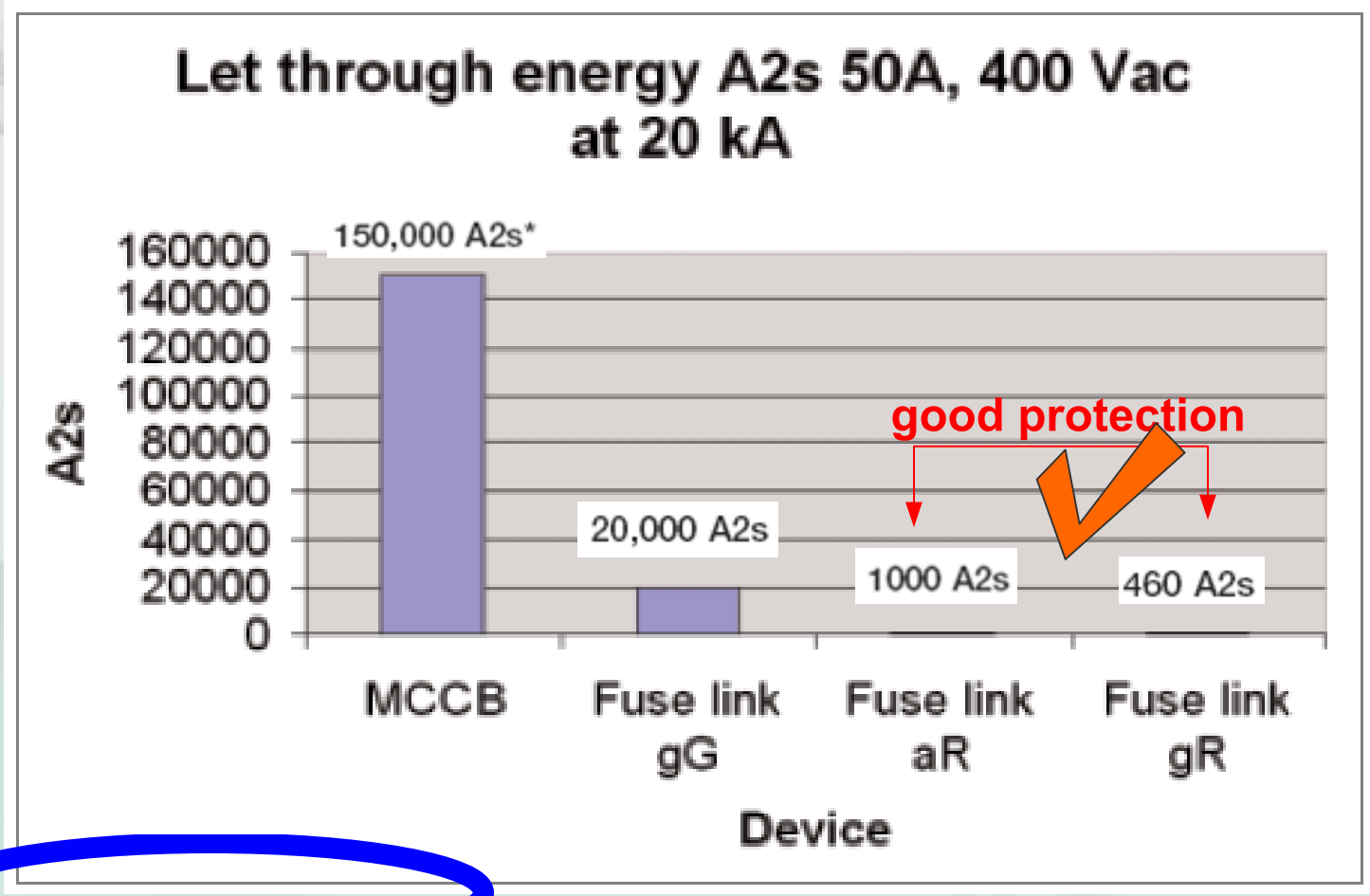


$$\text{Operating } I^2t \text{ at reduced voltage } V_r = \left\{\frac{\text{Operating } I^2t \text{ at test voltage } V_t}{\text{prearcing } I^2t}\right\}^{V_r/V_t} \times \text{prearcing } I^2t$$

Comparison I2t/Ip for fuse aR/gR and gL/gG, circuit breaker and thyristor for the same amp. rating



Let through energy-joule integral:



Don’t worry!!!

solution is

Ultra Quick select.xls

Microsoft Excel - Ultra Quick select V10.xls

Datoteka Urejanje Pogled Vstavljanje Oblika Orodja Podatki Okno Pomoč Adobe PDF

Vnesite vprašanje

Arial CE 26

PDF Transformer

D24 =' Load'!J25/(table!C32*table!F20*table!I26*table!L33*table!J33)

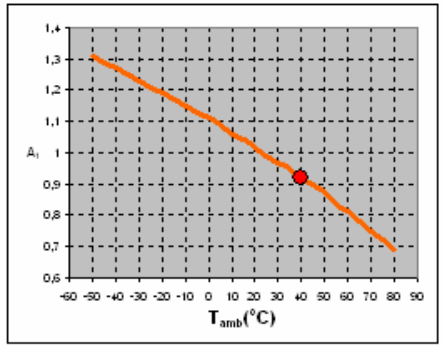
ETI ULTRA QUICK

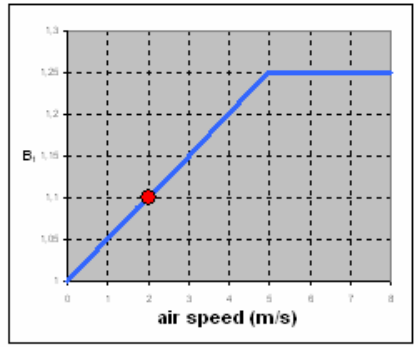
Use 2 fuses in parallel

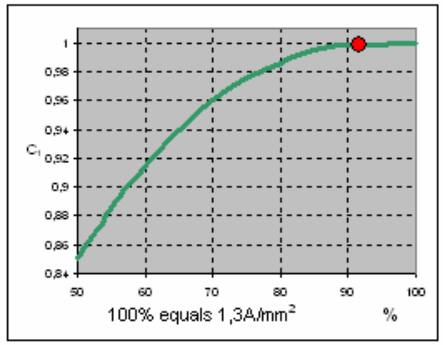
U_R:	157	V
U_s:	111	V
IS:	71	A
cosφ:	0,30	
T_{amb}:	40	°C
Forced cooling:	2	m/s
Cable cross-section:	50	mm^2
f:	50	Hz

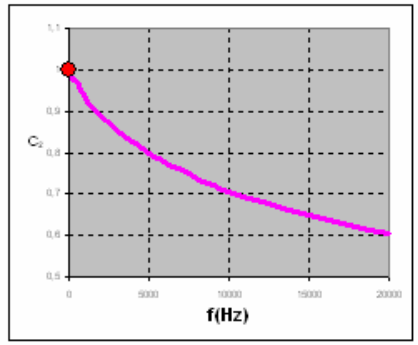
continous load

I_n >= : 88 A ~









Overloads | Load | Type-Size | Charact. | Switch | I2t | In | Select fuse

Pripravljen NUM

start | Osveževanje Grupe.xls | Ultra Quick select V10... | Brane Lebar - Prejeto... | Microsoft PowerPoint ... | SL | 8:16

Microsoft Excel - Ultra Quick select V10.xls

Datoteka Urejanje Pogled Vstavljanje Oblika Orodja Podatki Okno Pomoč Adobe PDF

Vnesite vprašanje

Arial CE 10 K Z P

PDF Transformer

A11

ETI ULTRA QUICK

FUSES FOR PROTECTION OF SEMICONDUCTORS

Select your fuse-link

Show all

Select

Circuit

>=	>=			<=		>=			<=
111	87	A				23	aR	NVS5	700
$V_{\sim}$	~			A^2s		kA~			A^2s

at U_n (cosφ=0,15) $I_s = I_n$ at cosφ= 0,30 at U_s (V)= 111

Filter

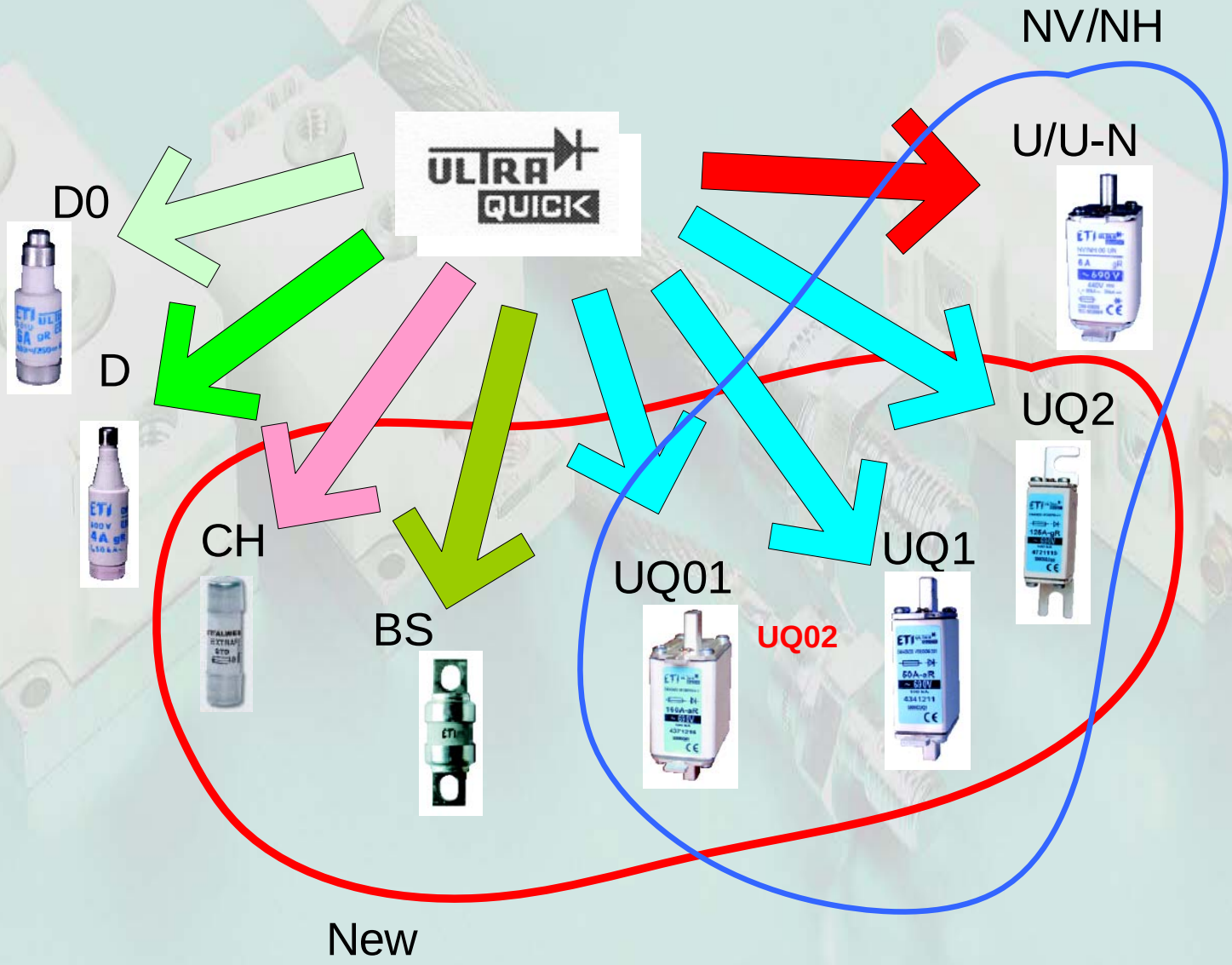
ETI code	ETI type	U_n (V)	I_n (A)	Series	Type	Size	I^2t (A^2s)	$I^2t_{(1ms)}$ (A^2s)	P_d(W)	B.c.(kA)	Char.	Switch	Page	I^2t (A^2s)	P_d(W
004341204	M00CUQ1/10A/690V	690	10	UQ1	M	00C	80	8	5,5	200	aR	NVS5	14	13	
004341205	M00CUQ1/16A/690V	690	16	UQ1	M	00C	140	13	6	200	aR	NVS5	14	23	
004341206	M00CUQ1/20A/690V	690	20	UQ1	M	00C	230	22	7	200	aR	NVS5	14	39	
004341207	M00CUQ1/25A/690V	690	25	UQ1	M	00C	400	38	8	200	aR	NVS5	14	67	
004341208	M00CUQ1/32A/690V	690	32	UQ1	M	00C	650	61	9	200	aR	NVS5	14	109	
004341209	M00CUQ1/35A/690V	690	35	UQ1	M	00C	835	78	10	200	aR	NVS5	14	140	
004341210	M00CUQ1/40A/690V	690	40	UQ1	M	00C	1.030	96	11	200	aR	NVS5	14	172	
004341211	M00CUQ1/50A/690V	690	50	UQ1	M	00C	1.820	170	12	200	aR	NVS5	14	305	
004341212	M00CUQ1/63A/690V	690	63	UQ1	M	00C	2.680	250	14,2	200	aR	NVS5	14	449	
004341213	M00CUQ1/80A/690V	690	80	UQ1	M	00C	5.550	520	20,2	200	aR	NVS5	14	929	
004341214	M00CUQ1/100A/690V	690	100	UQ1	M	00C	8.350	780	23,4	200	aR	NVS5	14	1.398	
004341215	M00CUQ1/125A/690V	690	125	UQ1	M	00C	11.800	1.100	28	200	aR	NVS5	14	1.975	
004341216	M00CUQ1/160A/690V	690	160	UQ1	M	00C	19.300	1.800	35	200	aR	NVS5	14	3.231	
004343208	M1UQ1/32A/690V	690	32	UQ1	M	1	650	61	7,3	200	aR	NVS5	15	109	

Overloads Load Type-Size Charact. Switch I2t In Select fuse

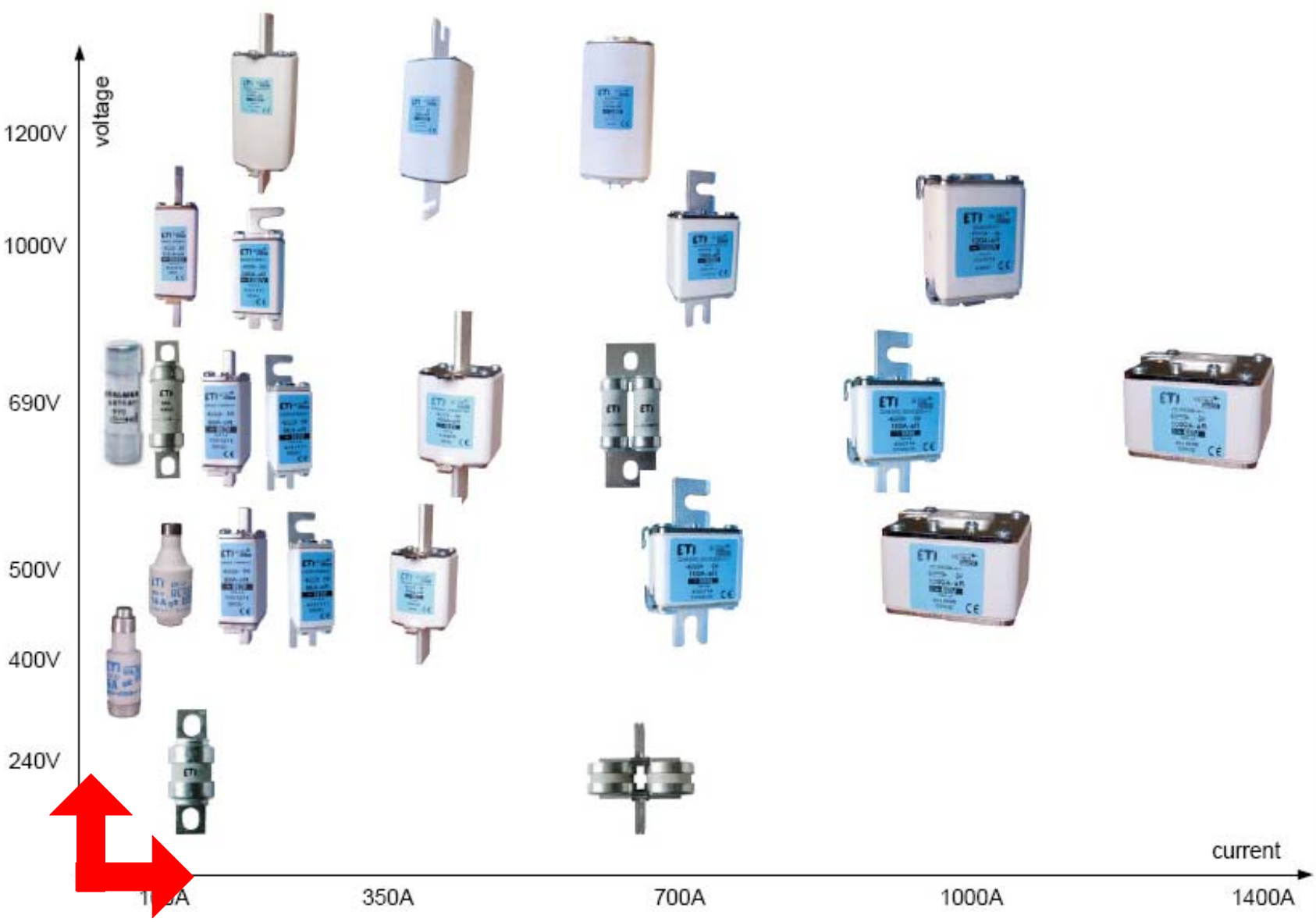
Pripravljen NUM

start Osveževanje Grupe.xls Ultra Quick select V10... Brane Lebar - Prejeto... Microsoft PowerPoint ... SL 8:17

ETI UQ program (catalogue):



ETI UQ program in two dimensions



Ultra Quick

Power needs control

Fuses for semiconductor protection

NH

Type M • Sizes 000, 00, 1, 2, 3 • Knife contacts according to DIN 43620 and VDE 0636-201 • With top flap indicator	**Type S** • Sizes 000, 00 • Bolted (slotted) connections according to DIN 43653 and IEC60269-4-1 • With top flap indicator
Type G • Sizes 1, 2, 3 • Flush end connections (face fixing) according to IEC 60269-4-1 • With top flap indicator	**Type S** • Sizes 1, 2, 3 • Bolted (slotted) connections according to DIN 43653 and IEC60269-4-1 • With top flap indicator
Type G-M • Sizes 1, 2, 3 • Flush end connections (face fixing) according to IEC 60269-4-1 • With centre trip indicator	**Type S-M** • Sizes 1, 2, 3 • Bolted (slotted) connections according to DIN 43653 and IEC60269-4-1 • With centre trip indicator

Fuses for semiconductor protection

NH dimensions

Type M

Sizes 000, 00, 1, 2, 3

Knife contacts according to DIN 43620 and VDE 0636-201 and IEC60269-2-1

With top flap indicator

Fuses for semiconductor protection

NH bolted fuselinks Type IB - Body sizes 000 and 00

Type S

Sizes 000, 00

Bolted (slotted) connections according to DIN 43653 and IEC60269-4-1

With top flap indicator

Ultra Quick

Power needs control

Fuses for semiconductor protection

NH bolted fuselinks

Type IB - Body sizes 1, 2 and 3

Type S

Sizes 1, 2, 3

Bolted (slotted) connections according to DIN 43653 and IEC60269-4-1

With top flap indicator

Ultra Quick

Power needs control

Fuses for semiconductor protection

NH bolted fuselinks

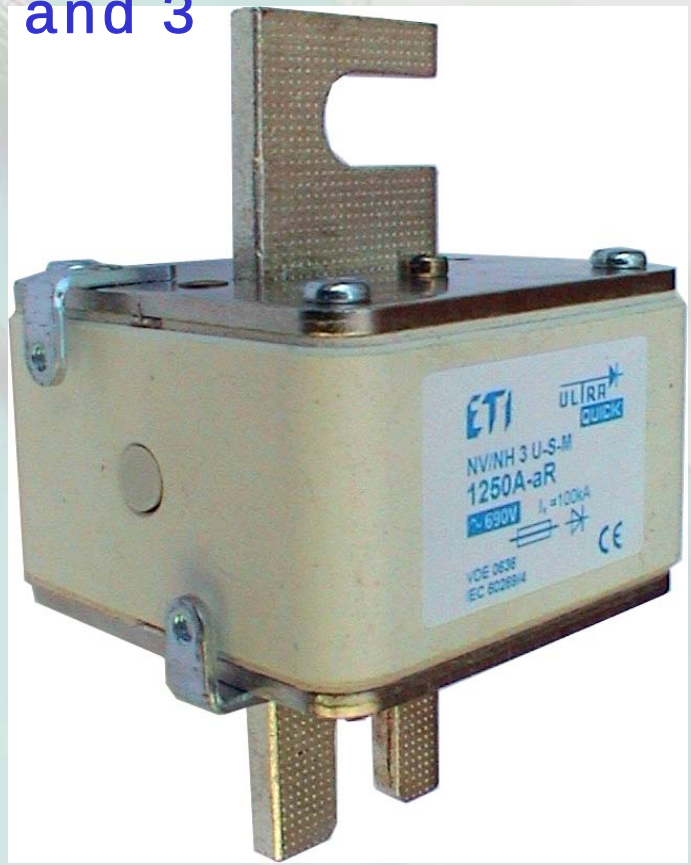
Type IB - Body sizes 1, 2 and 3

Type S-M

Sizes 1, 2, 3

Bolted (slotted) connections according to DIN 43653 and IEC60269-4-1

With centre trip indicator



Ultra Quick

Power needs control

Fuses for semiconductor protection

NH flush-end fuselinks,

Type IIA, up to 1200V up to 1250A

Type G

Sizes 1, 2, 3

Flush end connections (face fixing) according to IEC 60269-4-1

With top flap indicator

Ultra Quick

Power needs control

Fuses for semiconductor protection

NH flush-end fuselinks,

Type IIA, up to 1000V up to 1250A

Type G-M

Sizes 1, 2, 3

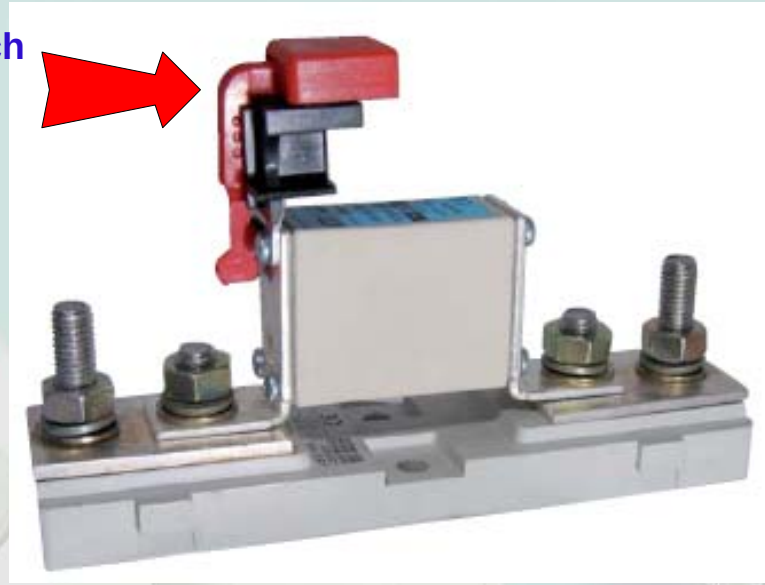
Flush end connections (face fixing) according to IEC 60269-4-1

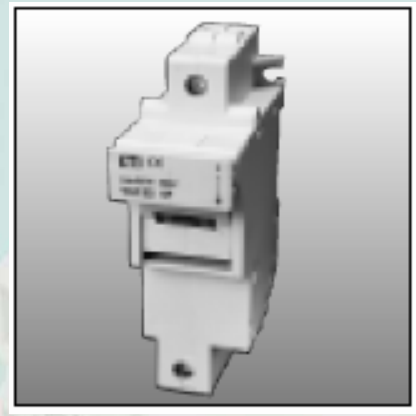
With centre trip indicator

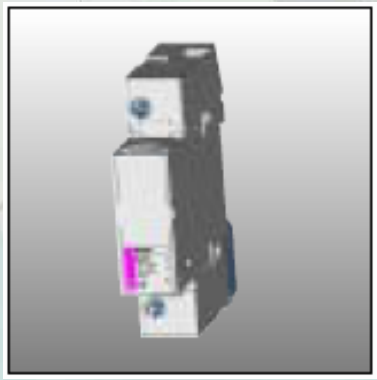
Ultra Quick

Power needs control

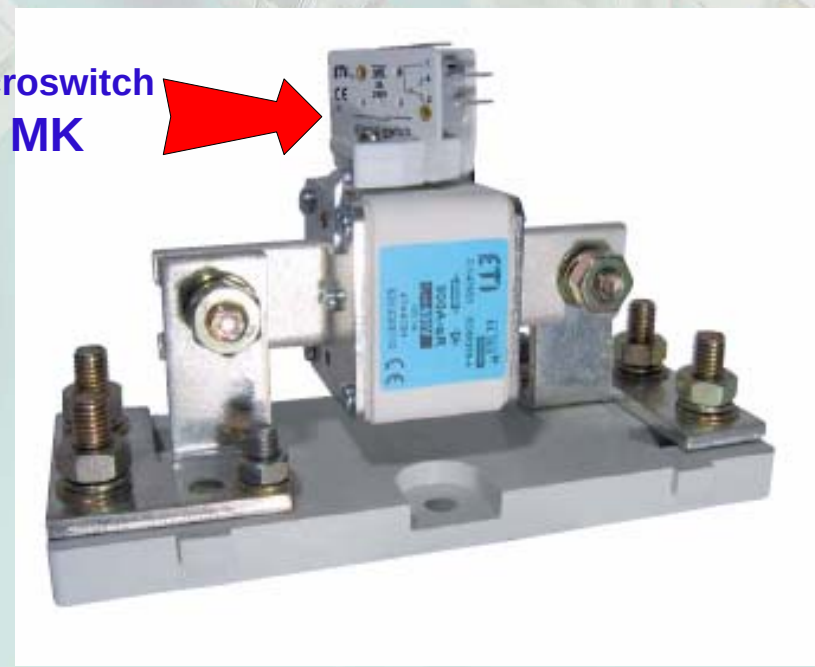
Microswitch
NVS5







Microswitch
MK



Ultra Quick

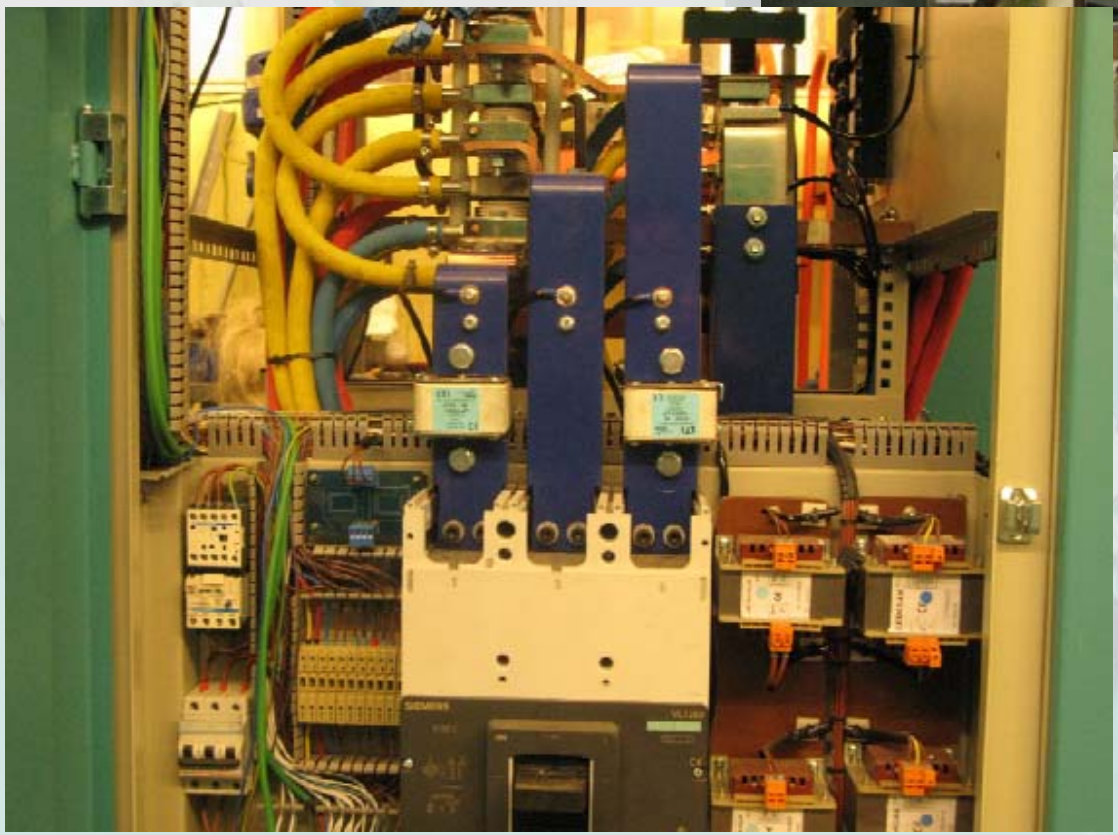
Power needs control

UPS:

Power needs control

Ultra Quick

Induction heater:



Power needs control

Ultra Quick

Business Segments

OEM

- Original Equipment Manufacturers

- **Opportunity for large number of fuses at one-time or on yearly consumption**
- **Price sensitive**
- **Direct contact with design engineers**

MRO

- Maintenance Replacement Operations

- **Cross-reference important**
- **Small number of fuses**
- **Short term delivery important- day to day**

Ultra Quick

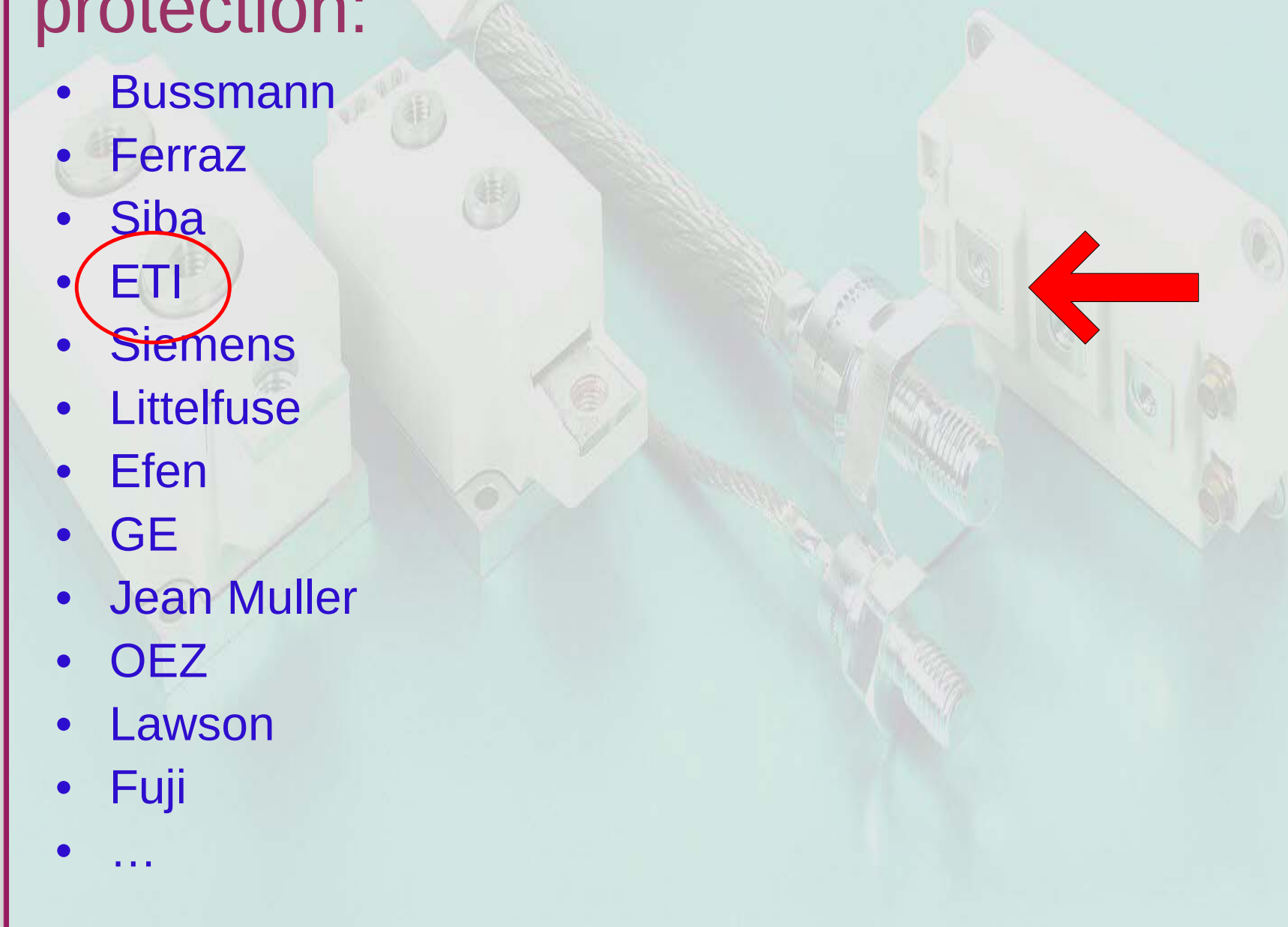
Power needs control

Key words for finding sales opportunities?

- Drives
- Rectifires
- UPS (computer, telecom, ADSL, VDSL, ISDN)
- Power electronics
- Converters, inverters, wind energy
- Motors
- Pumps, fans
- Lift, crane
- Electrolysis
- DC power

Producers of fuses for semiconductor protection:

- Bussmann
- Ferraz
- Siba
- ETI
- Siemens
- Littelfuse
- Efen
- GE
- Jean Muller
- OEZ
- Lawson
- Fuji
- ...



Ultra Quick

Power needs control

Typical industries/plants/equipment protected with ULTRA QUICK

PRODUCER OF FREQUENCY CONVERTER

Food processing

ARMY-SERVICE

ELECTRICAL CAR-

PRODUCER OF MOTOR DRIVER

Pulp and paper

PHARMACEUTICAL

PRODUCER OF UPS SYSTEMS

IRONWORKS

Amusement parks

Sewage treatment plants

ULTRA QUICK

PRODUCER OF DC-DC, AC-DC, DC- AC CONVERTERS

HEAVY INDUSTRY

Petro-Chemical

CABLE RAILWAY (SKI CENTERS..)

TRAMWAY

Printing plants

RAILWAY

Port authorities

Cement plants

Welding machine

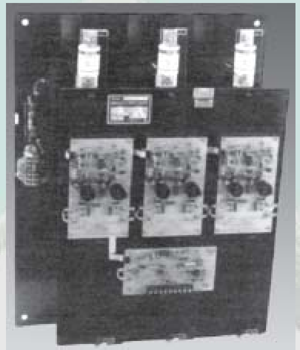
Thermal, hydro, Aluminium POWER PLANT

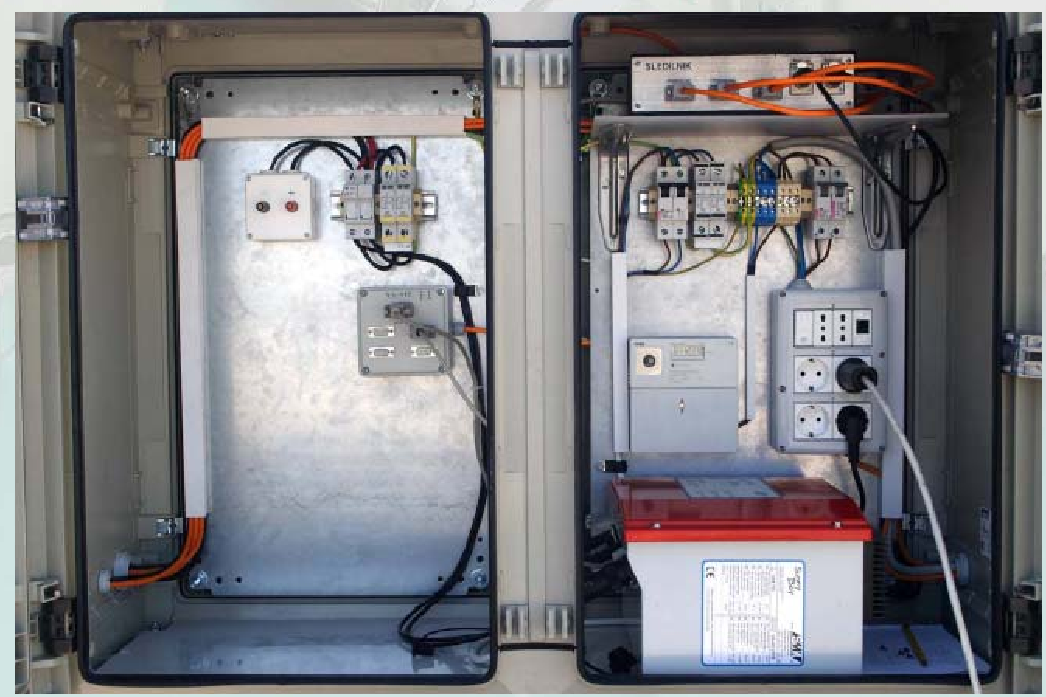
Power needs control

Ultra Quick

Where we can use UQ fuse?

- UPS systems (Computer back up, Telecom, Hospital, Emergency, Controled power shut down)
- DC motor drives
- Servo motors (inverters for brushless servomotors-CNC machine, robot)
- AC motor drivers (Soft starters, Freq. converters)
- Power supplies (Chemical electrolysis, Al-Mg smelters, Electrolytic winning of cadmium, copper, nickel, cobalt and non-ferrous materials, Zinc plants, Graphite electrode plants, DC arc Furnace)
- Inverters (Wind power, Fuel cell supplies equipment, airports-400Hz)





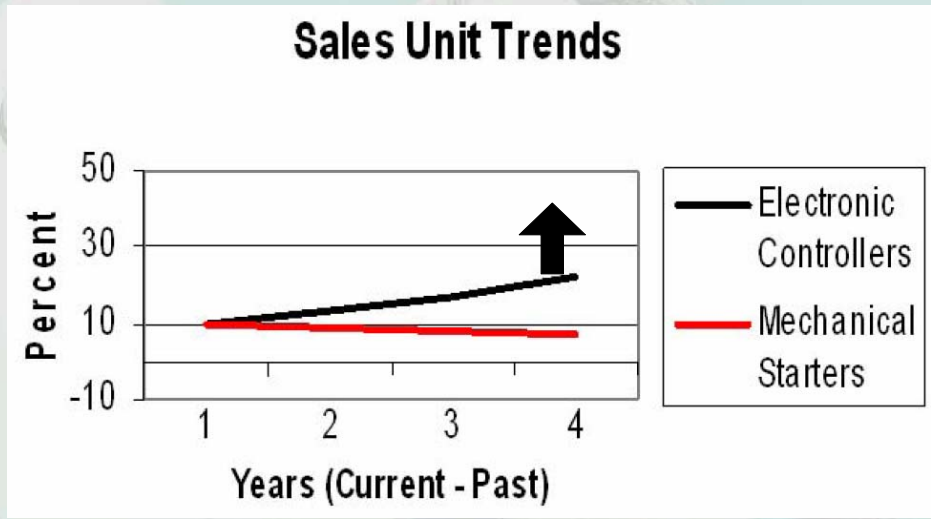
Power needs control

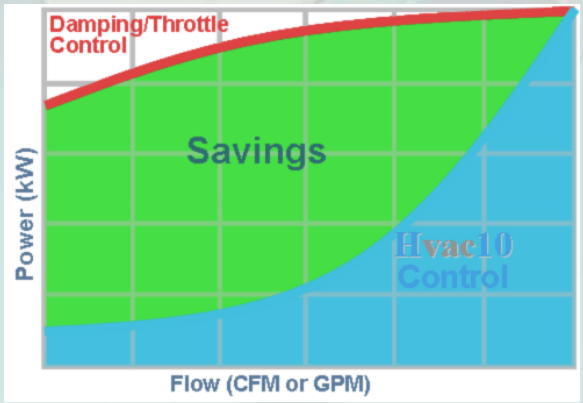
Future application?

Power needs control

Ultra Quick

Electronic motor controler market growing 20-30% per year?



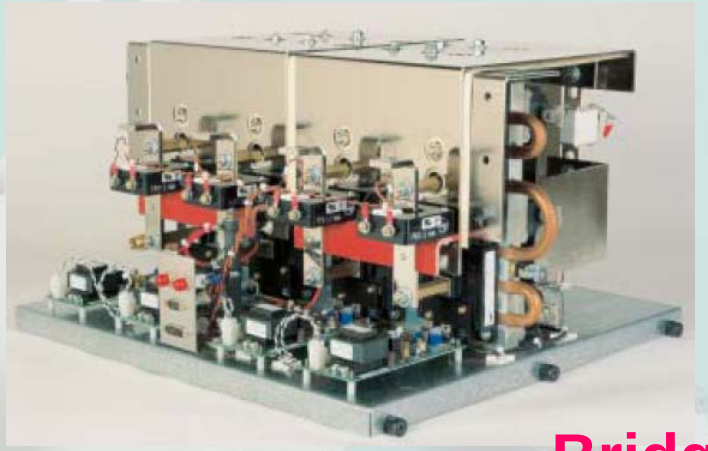


Ultra Quick

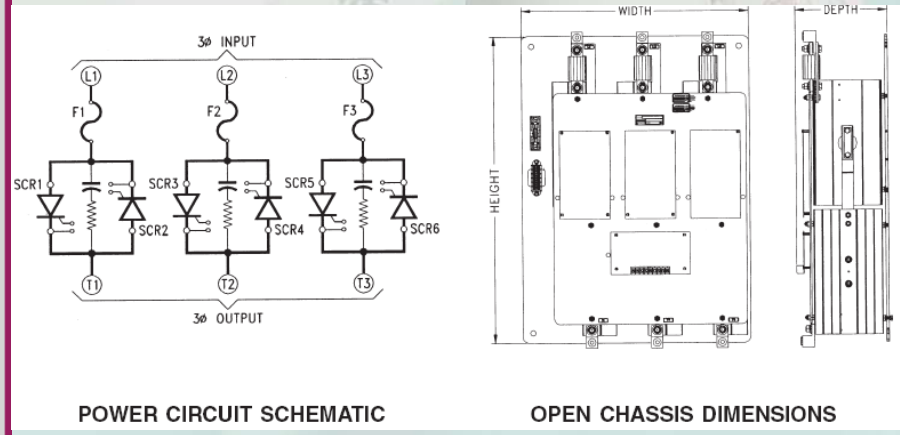
Power needs control

Active Var-compensator-(triac switch) (FACTS) ?

Traction inverter



Power control

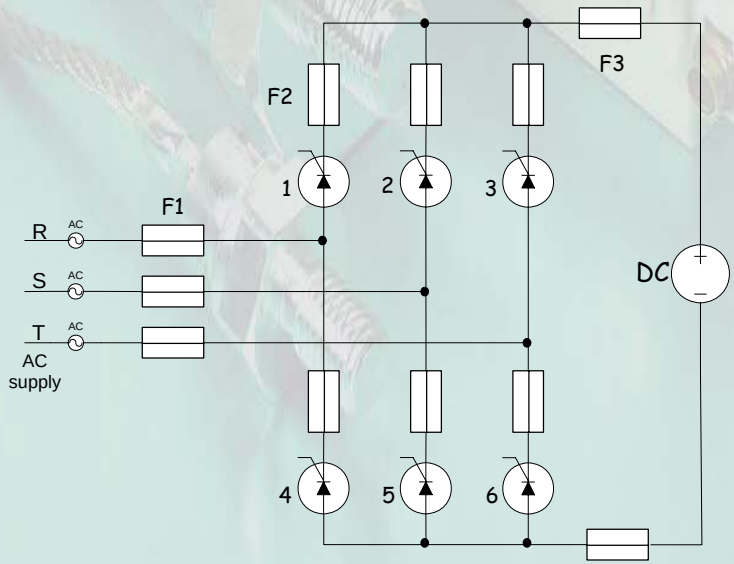


POWER CIRCUIT SCHEMATIC

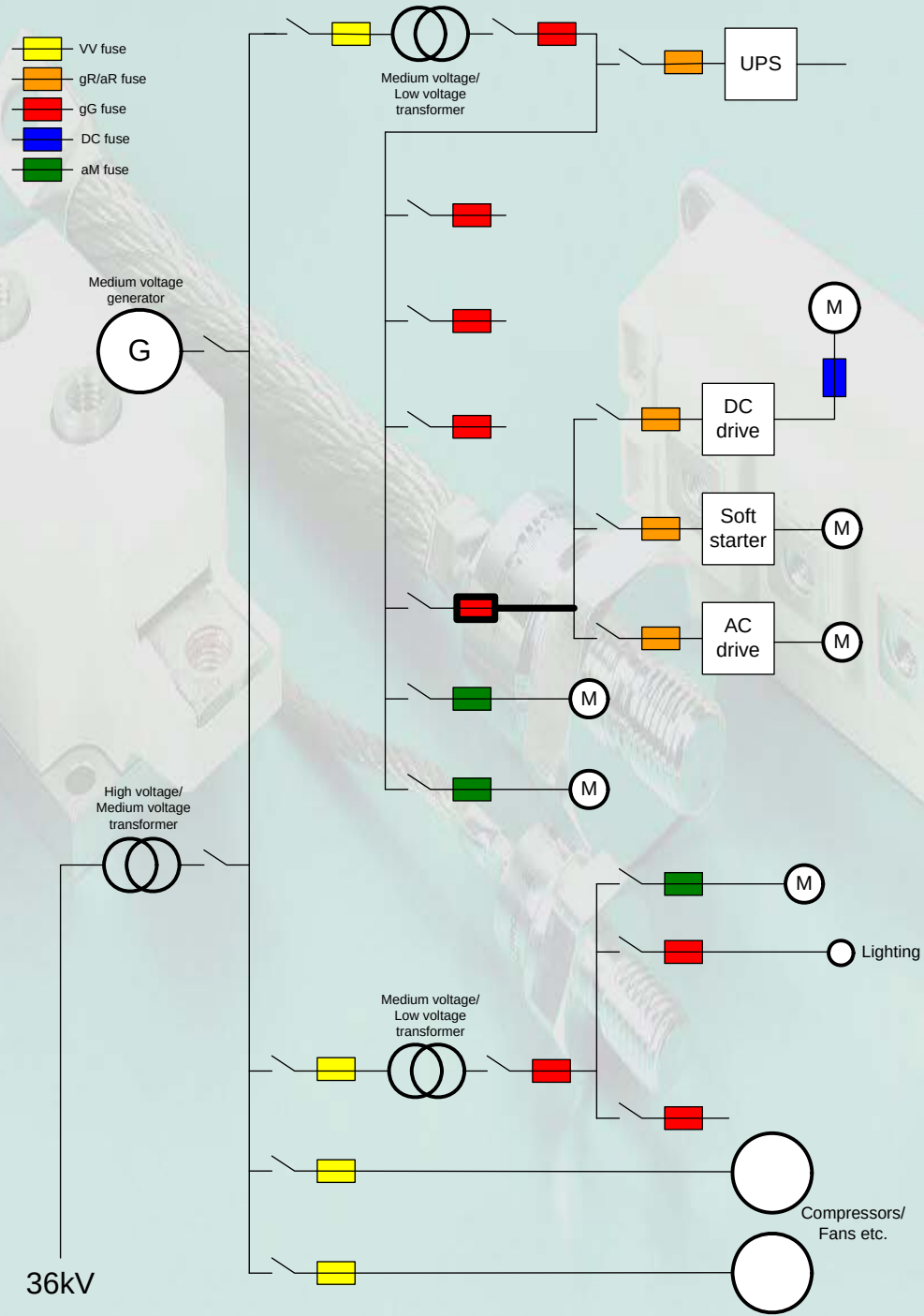
OPEN CHASSIS DIMENSIONS

Bridge converter (DC motor converter)

3-phase controlled bridge converter



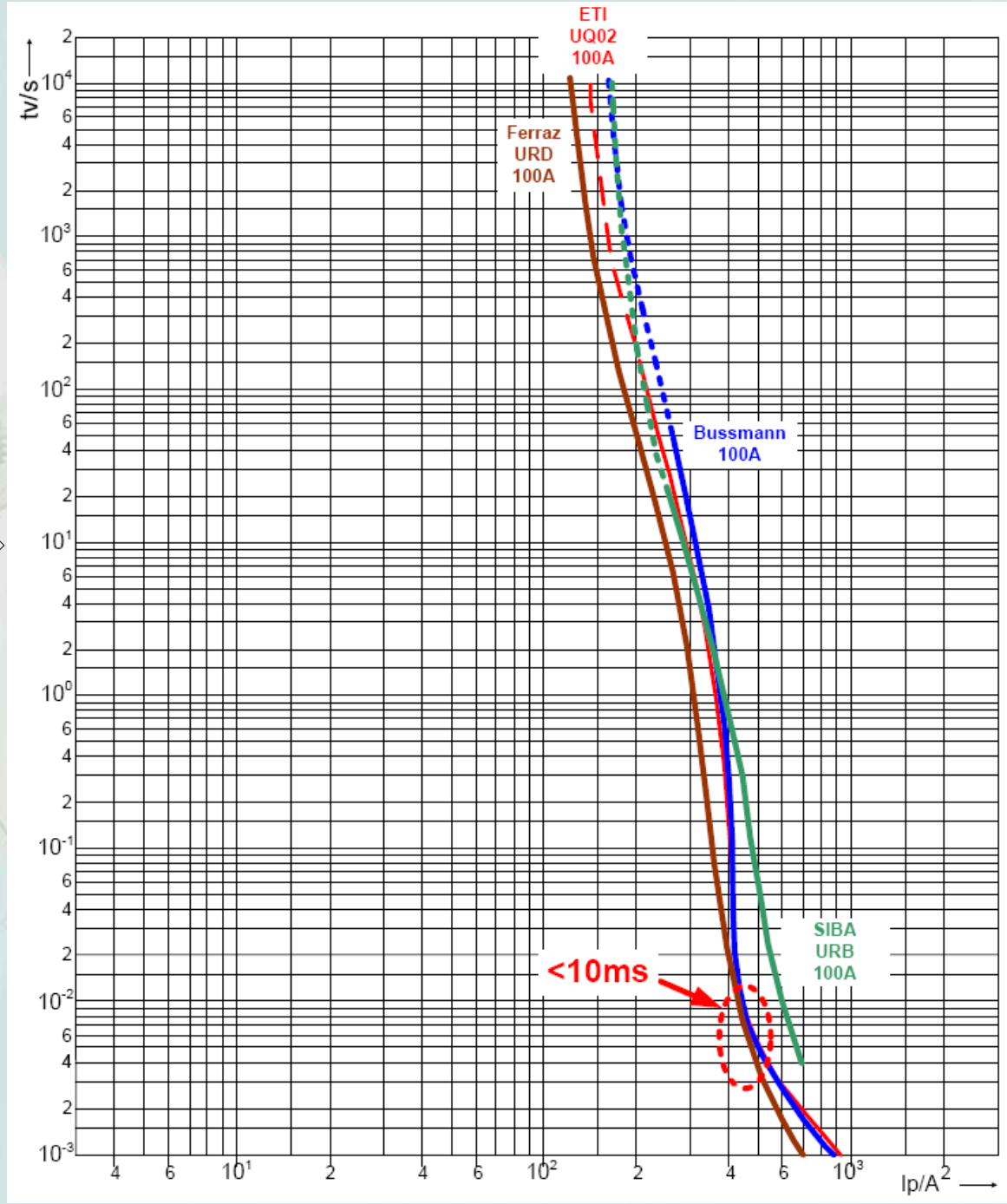
Fuse in factory:



Power needs control

Ultra Quick

Comparison characteristics ETI-Competitors



World Standards:

Power needs control

Ultra Quick

Standards IEC 60947-4-2:

The standard **IEC 60947-4-2** defines two types of co-ordination according to the expected level of service continuity. The standard IEC 60947-1, general rule are applicable to this standard, where specifically called for.

Type 1: Coordination requires that, under short-circuit conditions, the device shall cause no danger to persons or installation and may not be suitable for further service withouth repair and replacement of parts.

Type 2: **Coordination requires that, under short-circuit conditions, the device shall cause no danger to persons or installation and shall be suitable for further use. For hybrid controllers and starters, the risk of contact welding is recognized in which case the manufacturer shall indicate the measures to be taken as regards the maintenance of the equipment.**

Note: When using a softstarter in a type 2 co-ordination, replacing the fuses and restart has to be accepted after a short-circuit. Only semiconductor fuses can be used to achieve a type 2 coordination for softstarters.

Type 2 COORDINATED PROTECTION

Ultra Quick

Support for:

engineers

and

sales people

Power needs control

Ultra Quick industry application (help for sales)

Ultra Quick industry application

Ultra Quick application guide

Power needs control

Ultra Quick

ULTRA QUICK

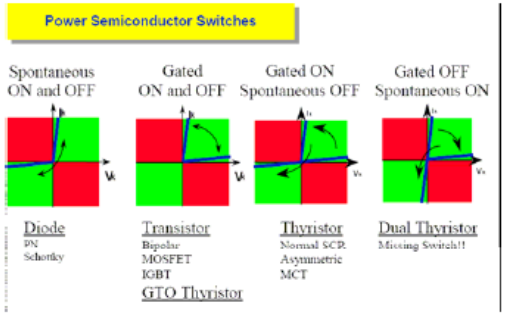
Application guide

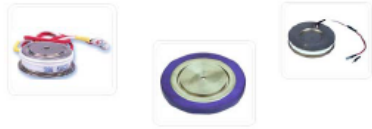
FUSES FOR PROTECTION OF SEMICONDUCTORS

ETI POWER NEEDS CONTROL

Introduction

The fuse links of ULTRA-QUICK type are used for the protection of power semiconductors, such as





diodes, thyristors, triacs...IGBT transistors. These elements are due to their low thermal capacity very sensitive to over-loads, therefore a normal protection with fuse links for installation protection is not enough, because they are too slow. The fuse links for semiconductor protection must fulfill a series of requirements, the most imortant of them are:

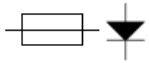
- Fast acting in the overload and short-circuit range

- Extremely low value of the operating Joule integral (I^2t)

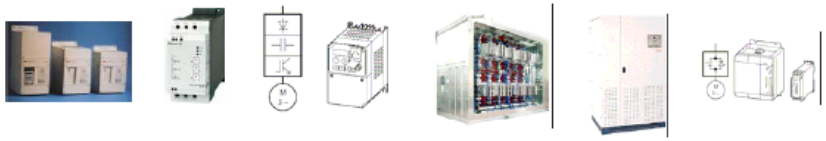
- Low switching overvoltage at circuit opening

- Low power dissipation (P_d)

Some of these requirements are contradictory, therefore are ULTRA – QUICK fuse links the required product. At high inductivities L the overvoltage can destroy a semiconductor. Inter alia, they are distinguished by their low sensitivity to ageing, which was achieved by the use of pure silver for the fuse element. The fuse links ULTRA-QUICK meet all the requirements of DIN 57636/VDE 0636. Dimensionally, they are equal to the fuse links of standard programs D0, D, BS, C in NV-NH. Externally they are differ from them by the mark ULTRA-QUICK, and the fuse symbol for semiconductor protection

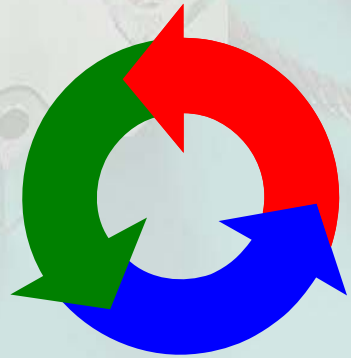


This Technical information is intended to be used as an instruction for the use of the ULTRA-QUICK catalogue program, it is an aid in designing, and represents a basis for dimensioning optimum power semiconductor protection in your converter, soft-starter, UPS, freqency converter, solid state relays, power regulator...



Ultra Quick

Cross-reference



Power needs control

ETI d.d. - Product/Cross Reference Search - Microsoft Internet Explorer

Datoteka Urejanje Pogled Priljubljene Orodja Pomoč

Nazaj Iskanje Priljubljene

Naslov http://uq.eti.si/index.php Pojdi Links

Choose your language:

Multi language version

ULTRA QUICK

PRODUCT/CROSS REFERENCE

SEARCH

Insert competitor code

COMPETITOR part number

170M4810

Search

Search ETI part number

#	ETI part number	ETI type	Competitor part number	Technical data
1.	004301114	S00UQ01/80/100A/1000V	170M4810	(61.3 KB)

Note: This cross-reference tables was prepared from latest published information. Use this cross reference as a guide only for the selection of similar products. Competitor's products may differ in size and performance from ETI products. It is recommended, that each application be checked for suitable electrical and mechanical characteristics before substituting. ETI is not responsible for misapplications of its products.

COMPETITORS and SAMPLE of codes:

BUSSMANN	FERRAZ	SIBA	SIEMENS	JEAN MULLER	EFEN
170M4810	12.5URD71TTF0315 6,9URB00D08L200 Q300555A	2071331.125	3NE3336	R1386740	352000070

Internet 11. april 2007

start Brane Leb... drives prot... Microsoft E... Benchmark... ultra_quick... Microsoft ... ETI d.d. - ... SL 11:21

Power needs control

Ultra Quick

http://uq.eti.si/files/28P.pdf - Microsoft Internet Explorer

File Edit View Favorites Tools Help

Back Search Favorites

Address http://uq.eti.si/files/28P.pdf

Go Links

Save a Copy Select Text 50% Search Adobe PDF files

Bookmarks Signatures Layers Pages

ETI

SYSTEM NV/NH

SERIES UQ01 TYPES 80mm RATED VOLTAGE ~ 1000V

ULTRA QUICK

8,27 x 11,69 in

1 of 1

Done Internet

start Brane Lebar - Prejet... Microsoft Excel Microsoft PowerPoint... Adobe Reader http://uq.eti.si/files/... SL 8:23

ETI d.d. - Product/Cross Reference Search - Microsoft Internet Explorer

Datoteka Urejanje Pogled Priljubljene Orodja Pomoč

Nazaj Iskanje Priljubljene

Naslov http://uq.eti.si/index.php Pojdi Links

Choose your language:

ULTRA QUICK

PRODUCT/CROSS REFERENCE SEARCH

ETI part number

004383115

Search

Search Competitor part number

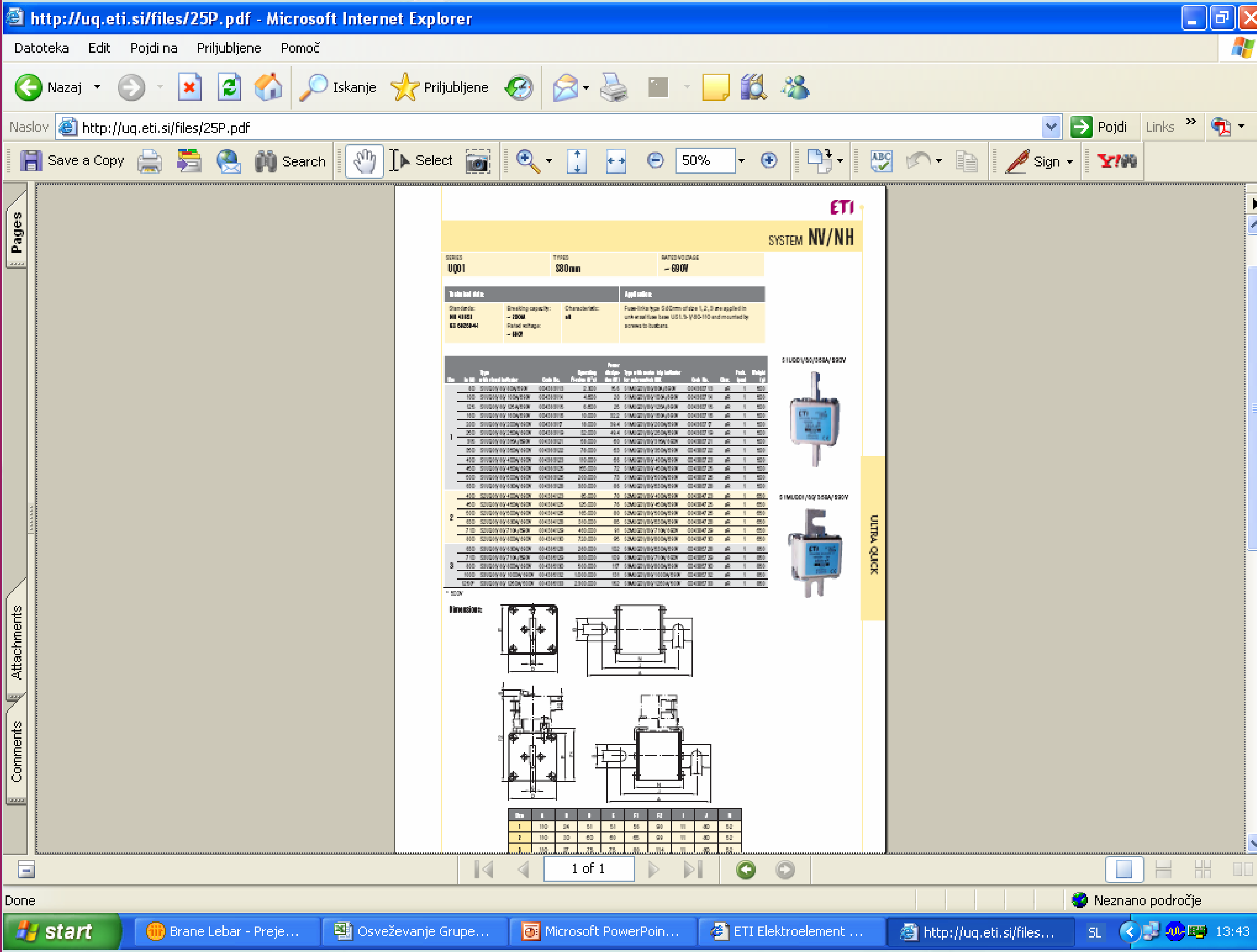
ETI part number	ETI type	Technical data
004383115	S1UQ01/80/125A/690V	(104.4 KB)

Note: This cross-reference tables was prepared from latest published information. Use this cross reference as a guide only for the selection of similar products. Competitor's products may differ in size and performance from ETI products. It is recommended, that each application be checked for suitable electrical and mechanical characteristics before substituting. ETI is not responsible for misapplications of its products.

Dokončano Internet

start Brane Lebar - Preje... Osveževanje Grupe... Microsoft PowerPoin... ETI Elektroelement ... ETI d.d. - Product/C... SL 13:41

Ultra Quick



Power needs control

Ultra Quick Cross-Reference

Cylindrical

	ETI	Bussmann	Ferraz	Siba
	SIZE 10 x 38			
	CH10UQ/6A/690V	FWC-6A10F	E330008	60 03205
	CH10UQ/8A/690V	FWC-8A10F	F330009	60 03205
	CH10UQ/10A/690V	FWC-10A10F	G330010	60 03205
	CH10UQ/12A/690V	FWC-12A10F	H330011	60 06306
	CH10UQ/16A/690V	FWC-16A10F	J330012	60 06306
	CH10UQ/20A/690V	FWC-20A10F	K330013	60 06306
	CH10UQ/25A/690V	FWC-25A10F	L330014	60 03305
	CH10UQ/32A/690V	FWC-32A10F	Y330278	-
	SIZE 14 x 51			
	CH14UQ/10A/690V	FWP-10A14F	T093903	50 12406
	CH14UQ/12A/690V	-	-	-
	CH14UQ/16A/690V	FWP-15A14F	W093905	50 12406
	CH14UQ/20A/690V	FWP-20A14F	X093906	50 12406
	CH14UQ/25A/690V	FWP-25A14F	Y093907	50 12406
	CH14UQ/32A/690V	FWP-32A14F	Z093908	50 12406
	CH14UQ/40A/690V	FWP-40A14F	A093909	5012406
	CH14UQ/50A/690V	FWP-50A14F	B093910	50 05806
	SIZE 22 x 58			
	CH22UQ/20A/690V	FWP-20A22F	-	50 14006
	CH22UQ/25A/690V	FWP-25A22F	B093956	50 14006
	CH22UQ/32A/690V	FWP-32A22F	Z094828	50 14006
	CH22UQ/40A/690V	FWP-40A22F	S094822	50 14006
	CH22UQ/50A/690V	FWP-50A22F	W094779	50 14006
	CH22UQ/63A/690V	FWP-63A22F	T094823	50 14006
	CH22UQ/80A/690V	FWP-80A22F	A094829	50 14006
	CH22UQ/100A/690V	FWP-100A22F	Y094827	50 14006

BS88 part 4 – 690V

	ETI	Bussmann	Ferraz	GE
	BS17			
	BS17UQ/63/25A/690V	ET25	J075895	GSB25
	BS17UQ/63/32A/690V	ET32	K075896	GSGB30
	BS17UQ/63/35A/690V	FE35	-	GSGB35
	BS17UQ/63/40A/690V	FE40	-	GSGB40
	BS17UQ/63/45A/690V	FE45	-	GSGB45
	BS17UQ/63/50A/690V	FE50	-	GSGB55
	BS17UQ/63/56A/690V	ET56	-	GSGB55
	BS17UQ/63/63A/690V	FE63	-	GSGB55
	BS17UQ/63/71A/690V	FE71	-	-
	BS17UQ/63/80A/690V	FE80	-	GSGB80
	BS17UQ/63/90A/690V	FE90	-	GSGB95
	BS17UQ/63/100A/690V	FE100	-	-
	BS17D			
	BS17DUQ/70/90A/690V	EET90	A099959	GSGB85
	BS17DUQ/70/110A/690V	EET110	B099959	GSGB110
	BS17DUQ/70/120A/690V	FEE120	B099959	GSGB125
	BS17DUQ/70/140A/690V	FEE140	J075908	-
	BS17DUQ/70/160A/690V	FEE160	K075909	GSGB160
	BS38			
	BS38UQ/83/160A/690V	MT160	Q097166	GSB160
	BS38UQ/83/180A/690V	FM180	-	GSGB170
	BS38UQ/83/200A/690V	FM200	-	GSGB190
	BS38UQ/83/250A/690V	FM250	-	GSGB235
	BS38UQ/83/315A/690V	FM315	-	GSGB300
	BS38UQ/83/350A/690V	FM350	-	GSGB325
	BS38T			
	BS38TUQ/83/200A/690V	MMT200	F097272	-
	BS38TUQ/83/225A/690V	MMT225	J097275	-
	BS38TUQ/83/315A/690V	MMT315	K097276	-
	BS38TUQ/83/355A/690V	MMT355	S0972763	-
	BS38TUQ/83/400A/690V	FMM400	-	-
	BS38TUQ/83/450A/690V	FMM450	-	GSGB400
	BS38TUQ/83/500A/690V	FMM500	-	GSGB500
	BS38TUQ/83/630A/690V	FMM630	-	-
	BS38TUQ/83/700A/690V	FMM700	-	-

Square body type M: DIN 43620 – 690V

	ETI	Bussmann	Ferraz	Siba
	SIZE 00C			
	M00UQ02/35A/690V	170M1562	X322043	-
	M00UQ02/40A/690V	170M1563	B322047	-
	M00UQ02/50A/690V	170M1564	F322051	-
	M00UQ02/63A/690V	170M1565	K322055	-
	M00UQ02/80A/690V	170M1566	Q320059	-
	M00UQ02/100A/690V	170M1567	V320063	-
	M00UQ02/125A/690V	170M1568	X320065	-
	M00UQ02/160A/690V	170M1569	N320069	-
	M00UQ02/200A/690V	170M1570	D320071	-
	M00UQ02/250A/690V	170M1571	H320075	-
	SIZE 1			
	M1UQ02/63A/690V	170M3810	M320355	20 003 04
	M1UQ02/80A/690V	170M3811	K320399	20 003 04
	M1UQ02/100A/690V	170M3812	W320363	20 003 04
	M1UQ02/125A/690V	170M3813	Y320365	20 003 04
	M1UQ02/160A/690V	170M3814	C320369	20 003 04
	M1UQ02/200A/690V	170M3815	E320371	20 003 04
	M1UQ02/250A/690V	170M3816	J320375	20 003 04
	M1UQ02/315A/690V	170M3817	N320379	20 003 04
	M1UQ02/350A/690V	170M3818	P320380	20 003 04
	M1UQ02/400A/690V	170M3819	S320383	20 003 04
	SIZE 2			
	M2UQ02/400A/690V	170M5808	B320483	20 004 04
	M2UQ02/450A/690V	170M5809	D320485	20 004 04
	M2UQ02/500A/690V	170M5810	F320487	20 004 04
	M2UQ02/630A/690V	170M5812	H320489	20 004 04
	SIZE 3			
	M3UQ02/500A/690V	170M6808	P320587	20 005 04
	M3UQ02/630A/690V	170M6810	R320589	20 005 04
	M3UQ02/710A/690V	170M6811	S320590	20 005 04
	M3UQ02/800A/690V	170M6812	T320591	20 005 04

Square body type G: DIN 43653 – 690V

	ETI	Bussmann	Ferraz	Siba
	SIZE 1			
	G1MUQ02/250A/690V	170M4459	Y300056C	20 325 20
	G1MUQ02/315A/690V	170M4460	M302162C	20 325 20
	G1MUQ02/350A/690V	170M4461	A300058C	20 325 20
	G1MUQ02/400A/690V	170M4462	B300059C	20 325 20
	G1MUQ02/450A/690V	170M4463	S300005C	20 325 20
	G1MUQ02/500A/690V	170M4464	T300006C	20 325 20
	G1MUQ02/550A/690V	170M4465	H300479	20 325 20
	G1MUQ02/630A/690V	170M4466	W300008C	20 325 20
	G1MUQ02/710A/690V	170M4467	K300481	20 325 20
	SIZE 2			
	G2MUQ02/500A/690V	170M5460	K300057C	20 334 22
	G2MUQ02/550A/690V	170M5461	R300464	20 334 22
	G2MUQ02/630A/690V	170M5462	L300068C	20 334 22
	G2MUQ02/710A/690V	170M5463	N300070C	20 334 22
	G2MUQ02/800A/690V	170M5464	P300071C	20 334 22
	G2MUQ02/900A/690V	170M5465	W300468	20 334 22
	G2MUQ02/1000A/690V	170M5466	X300469	20 334 22
	SIZE 3			
	G3MUQ02/630A/690V	170M6460	X300078	20 343 22
	G3MUQ02/710A/690V	170M6461	Y300079C	20 343 22
	G3MUQ02/800A/690V	170M6462	Z300080C	20 343 22
	G3MUQ02/900A/690V	170M6463	B300450	20 343 22
	G3MUQ02/1000A/690V	170M6464	B300082C	20 343 22
	G3MUQ02/1250A/690V	170M6466	D300084C	20 343 22
	G3MUQ02/1400A/690V	170M6467	F300454	20 343 22

Square body type S: DIN 43653 – 690V

	ETI	Bussmann	Ferraz	Siba
	SIZE 00C			
	S00CUQ01/80/63A/690V	170M2662	R330272C	20 282 04
	S00CUQ01/80/80A/690V	170M2663	A330073	20 282 04
	S00CUQ01/80/100A/690V	170M2664	L330057	20 282 04
	S00CUQ01/80/125A/690V	170M2665	K330038	20 282 04
	S00CUQ01/80/160A/690V	170M2666	N330059	20 282 04
	S00CUQ01/80/200A/690V	170M2667	P330040	20 282 04
	S00CUQ01/80/250A/690V	170M2668	B330028	20 282 04
	S00CUQ01/80/315A/690V	170M2669	A330188	20 282 04
	S00UQ01/80/350A/690V	170M2670	B330189	20 282 04
	S00UQ01/80/400A/690V	170M2671	E330192	20 282 04
	SIZE 1			
	S1MUQ02/110/250A/690V	170M4209	J300020C	20 271 34
	S1MUQ02/110/315A/690V	170M4210	K300021C	20 271 34
	S1MUQ02/110/350A/690V	170M4211	L301161C	20 271 34
	S1MUQ02/110/400A/690V	170M4212	A300127C	20 271 34
	S1MUQ02/110/450A/690V	170M4213	M300231C	20 271 34
	S1MUQ02/110/500A/690V	170M4214	N300024C	20 271 34
	S1MUQ02/110/550A/690V	170M4215	P300025C	20 271 34
	S1MUQ02/110/630A/690V	170M4216	Q300026C	20 271 34
	S1MUQ02/110/710A/690V	170M4217	R300027C	20 271 34
	SIZE 2			
	S2MUQ02/110/500A/690V	170M5210	S300258C	20 274 34
	S2MUQ02/110/550A/690V	170M5211	S300189C	20 274 34
	S2MUQ02/110/630A/690V	170M5212	T300190C	20 274 34
	S2MUQ02/110/710A/690V	170M5213	R300027C	20 274 34
	S2MUQ02/110/800A/690V	170M5214	H3607096	20 274 34
	S2MUQ02/110/900A/690V	170M5215	X300193C	20 274 34
	S2MUQ02/110/1000A/690V	170M5216	Y300194C	20 274 34
	SIZE 3			
	S3MUQ02/110/630A/690V	170M6210	V300260C	20 277 34
	S3MUQ02/110/710A/690V	170M6211	W300261C	20 277 34
	S3MUQ02/110/800A/690V	170M6212	X300262C	20 277 34
	S3MUQ02/110/900A/690V	170M6213	Y300194C	20 277 34
	S3MUQ02/110/1000A/690V	170M6214	Y300194	20 277 34
	S3MUQ02/110/1250A/690V	170M6216	B300266C	20 277 34
	S3MUQ02/110/1400A/690V	170M6217	C300267C	20 277 34

ETI d.d.
Obrezija 5, 1411 Izlake, Slovenia
Phone: +386 3 5657 570
E-mail: eti@eti.si
http://www.eti.si

The products on this cross-reference table are some of the most commonly used fuses for semiconductor protection.

Ultra Quick

Power needs control

References Ultra Quick

(Siemens, GE, Bosch-Rexroth, Solcon, Siei…)

Produced in ETI under Siemens brand name

6.6.2.1 Recommended fuses for field circuit

Converter unit Rated DC current A	Max. permissible field current A	Fuse Order No.	Rated current of fuse A
15	3	5SD420	16
30	5	5SD420	16
60 to 125	10	5SD420	16
210 to 280	15	5SD440	25
400 to 600	25	5SD440	25
710 to 1200	30	5SD480	30
1500 to 2000	40	3NE1802-0	40

Fuses aR (F1) A	Fuses ETI (Ultra quick) or Jean Muller (Ultra flink) Type	Jean Muller-ETI reference number
12	S00CUQ01/32A/690V	R5082953 - 4371108
16	S00CUQ01/32A/690V	R5082953 - 4371108
20	S00CUQ01/40A/690V	R5083453 - 4371110
25	S00CUQ01/50A/690V	R5083553 - 4371111
32	S00CUQ01/80A/690V	R5084153 - 4371113
63	S00CUQ01/100A/690V	R5084353- 4371114

ata power circuit

ASTAT SD	Total losses W	Contactor DC1 Type	aM Fuses A	Semiconductor fuses Jean Müller Type	Jean Müller Ref. No.	Typower Silco 690V – Bussmann Type
QS_ 6NA	17	CL00	12	S00C4/UF01/32A/690V	R5082953	Size = 00, In = 32A
QS_ 0NA	31	CL00	16	S00C4/UF01/32A/690V	R5082953	Size = 00, In = 32A
QS_ FNA	37	CL01	20	S00C4/UF01/40A/690V	R5083453	Size = 00, In = 40A
QS_ GNA	49	CL02	25	S00C4/UF01/50A/690V	R5083553	Size = 00, In = 50A
QS_ HNA	75	CL04	32	S00C4/UF01/80A/690V	R5084153	Size = 00, In = 80A
QS_ INA	86	CL45	63	S1U01/110/100A/690V	R10843??	Size = 00, In = 100A

Coordination type 1

5–10 Spannungsversorgung BOSCH

Modultyp	Einheit	NAA 21	NAA 35	NAA 70	NAA 90	NAA 180
für Versorgungsmodul		VMA 21KR	VMA 35P	VMA 70C	VMA 90D	VMA 180E
Anschlussspannung	VAC	3 x 400...460 ± 10%				
Bemessungsspannung	VAC	400				
Netzfrequenz	Hz	48...62				
Bemessungsleistung bei ϑ_U = 45°C	kVA	16	24	47	62	124
Sicherung	Typ	FERRAZ Kapselsicherung, überflink 63 A/690 V	Jean Müller M00üf1, superflink 63 A/660 V	100 A/660 V	125 A/660 V	Jean Müller M1üf1, superflink 250 A/660 V
	Bestellnummer	3 x 1070 921 621	3 x 1070 917 648	3 x 1070 917 649	3 x 1070 918 481	3 x 1070 919 804
Leistungsschütz		Integriert				
Ladeschaltung		Integriert				
Elektronikfunktion		Transformieren der Synchronisationsspannung, Codierung				
Netzfilter		Je nach Ausführung integriert, vgl. Seite 5–13				
Kühlung		Natürliche Konvektion				
Masse	kg	8,5	8,4	8,4	8,4	13

ϑ_U = Umgebungstemperatur

e Selection Table (400V)

FUSE SELECTION (recommended values for mains supply of 400V)

SMB fuse value Title numbers in Amp's	Max. Thyristor I^2t allowed	ALSTOM Ultra Fast Acting fuse	JEAN MULLER Semicon fuse links	FERRAZ / SHAUMAT Carbone Lorraine Protistor series	FERRAZ Specific Reference /Publication
Solbrake / SMB 8	400	GSGB30	500V - 40A	6,9 gRB17.63	G220967 / A600070
Solbrake / SMB 17	5000	GSGB55	500V - 50A	6,9 gRB17.63	G220967 / A600070
Solbrake / SMB 31					
Solbrake / SMB 58	18000	GSGB170	500V - 250A	6,6 URC 000 BS 88 180	C330144 / H600399
Solbrake / SMB 105	100000	GSGB350	500V - 350A	6,6 URD 2x000 BS 88 355	V330160 / H600399
Solbrake / SMB 210	600000	GSGB580	500V - 710A	6,6 URD 31 D 11 0630	Q300026 / D600188
Solbrake / SMB 310					
Solbrake / SMB 390	800000	GSGB800	500V - 1000A	6,6 URD 32 D 11 0800	W300192 / D600188

AVy4220-...	S00uF1/80/80A/660V	F4M19	A70P80	FWP80	S7G54
AVy4300-...	S00uF1/80/100A/660V	F4G18	A70P100	FWP100	S7G55
AVy4370-...	S00uF1/80/125A/660V	F4G20	A70P150	FWP150	S7G56
AVy5450-...	S00uF1/80/160A/660V	F4E15	A70P175	FWP175	S7G57
AVy5550-...	S00uF1/80/200A/660V	F4G23	A70P200	FWP200	S7G58
AVy6750-...	S1uF1/110/250A/660V	F4G28	A70P250	FWP250	S7G59
AVy7990-...	S1uF1/110/315A/660V	F4G30	A70P350	FWP350	S7G61
AVy71100-...	S2uF1/110/400A/660V	F4G34	A70P400	FWP400	S7G62
AVy71320-...	S2uF1/110/500A/660V	F4E30	A70P500	FWP500	S7G63
AVy81600-...	S2uF1/110/500A/660V	F4E30	A70P500	FWP500	S7G63
AVy92500-...	S2uF1/110/630A/660V	F4E31	A70P600	–	S7G65
AVy93150-...	S2uF1/110/630A/660V	F4E31	A70P600	–	S7G65

The fuse technical data, such as dimensions, weights, dissipated power, fuse blocks etc. can be found in the fuse manufacturer catalogues.
Fuse producer: Jean Müller, Eltville = Type Z14..., Z22, S00..., S1..., S2...
Gould Shawmut = A70P...
Bussmann = FWP...

D.75

Ultra Quick

Power needs control

Link to other documents:

- Catalogue Semiconductor protection
- Ultra Quick application guide
- Ultra Quick in world industry
- Cross-reference on internet
- Ultra Quick select
- References for Ultra Quick
- Motor starter tables
- Frequently asked questions
- www.eti.si (semiconductor protection)

remember

»Only fuses for semiconductor protection give us reliable protection for motor drives« said projectant with more than 20 years work experience!

Thanks