UL248 North American Low Voltage Fuses

UL standards

- UL198 : Old low voltage fuse standards
- UL248 : New old voltage fuse standards
- UL512 : Fuse block standards

UL standards

They establish :

- The dimensional characteristics of fuses
- The electrical characteristics
- The acceptance criteria at overload and short circuit levels
- Marking requirements of the fuse

UL Listed vs UL Recognized

Listed fuses must comply with all requirements of a UL standard. They are suitable for general use and are applied per NEC. They can be stamped with the UL logo.

Recognized components are suitable for limited applications. They do not meet all requirements of a standard. But the UL describes the type of tests the fuses must perform.

Semiconductor fuses are Recognized Component and can be marked with the special logo.

UL248 standard

- Former UL198 updated and rewritten
- Done by industry in 1996
- Harmonized by the CSA – all documents are the same
- Consists of a general requirements part and 15 additional sections
- Product meeting UL198 is « grandfathered » into 248 without additional testing

Fuse class to UL248 standard

Part 01 General requirements

Part 02 Class C

Part 03 Class CA & CB

Part 04 Class CC

Part 05 Class G

Part 06 Class H non renewable

Part 07 Class H renewable

Part 08 Class J

Part 09 Class K

Part 10 Class L

Part 11 Class PLUG FUSE

Part 12 Class RK1 & RK5

Part 13 Class SEMICONDUCTOR FUSE

Part 14 Class SUPPLEMENTAL FUSE

Part 15 Class T

Part 16 Test limiters

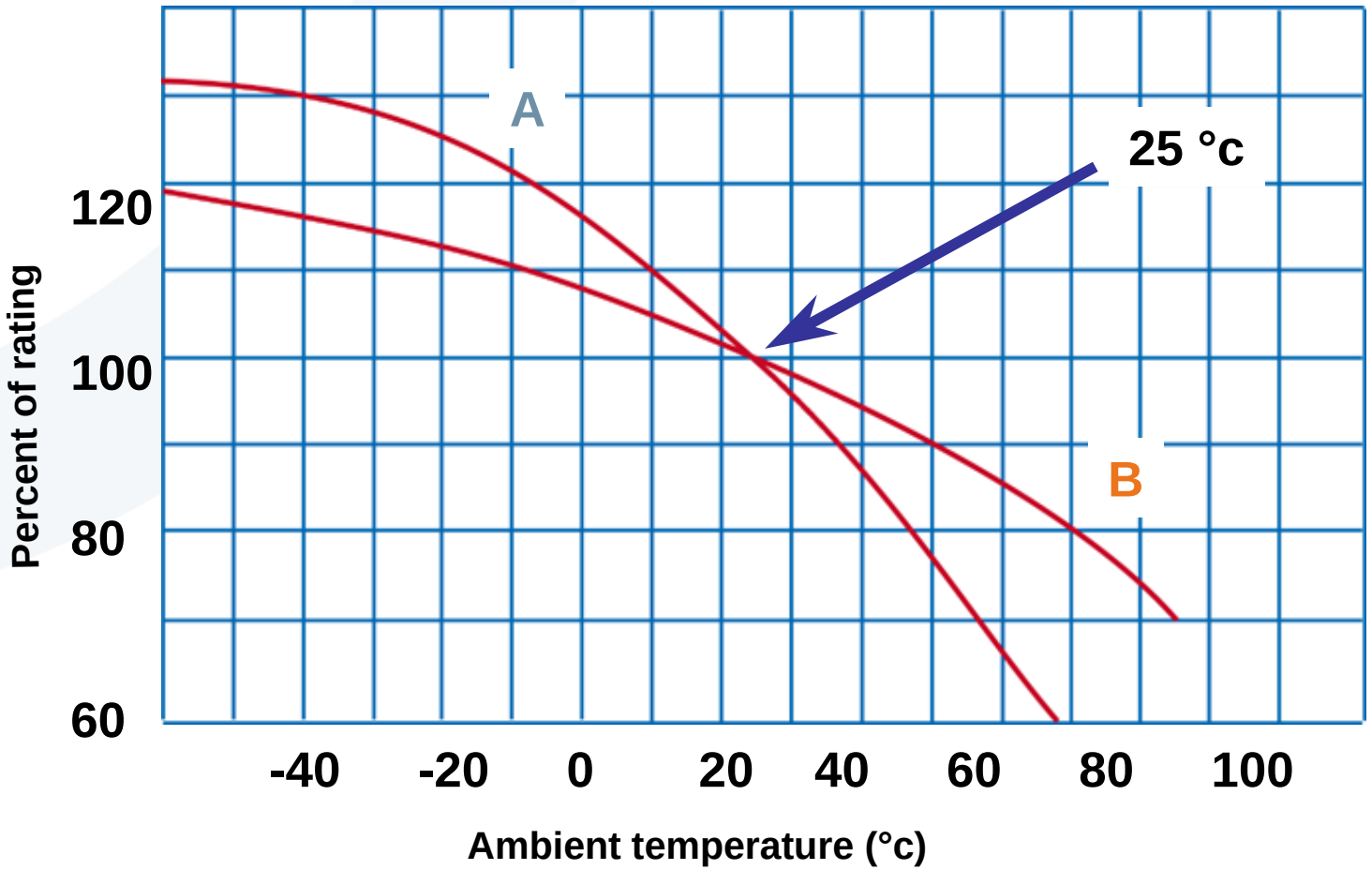
North American fuse standards

- Case sizes: 30A, 60A, 100A, 200A, 400A & 600A
- Temperature rise: 100% (1.0 In)
- Current carry: 110%, temperature stabilization
(non melting at 125% for IEC class gG)
- Fusing factor: 135%, specified maximum time (160% for gG)
- Overload: 200%, specified maximum time
- Time-delay (optional): generally 500% at minimum time 10s
For class CC it becomes 200% at minimum time 12 s
- Short-circuit: I^2t & I_p (peak current) limits specified by class
- Interrupting rating: 200kA, optional 300kA

Things to remember

- UL Listed fuses are General purpose
- Voltage ratings are **maximum**
- Fuse have “rejection” to prevent installing the wrong fuse
- Fuses are not loaded beyond 80% expect Class L & High voltage

Ambient compensation chart



A : effect on blowing time **B :** effect on current carry

Standard voltage system in North America (60Hz)

- 120/240V, 1-phase (USA & Canada)
- 120/208V, 3-phase (USA & Canada)
- 240/416V, 3-phase (Canada)
- 277/480V, 3-phase (mainly USA)
- 347/600V, 3-phase (mainly Canada)

- Higher industrial voltages: 2400V, 4160V, 4800V and 7200V
- Distribution voltages:15kV, 25kV & 35kV

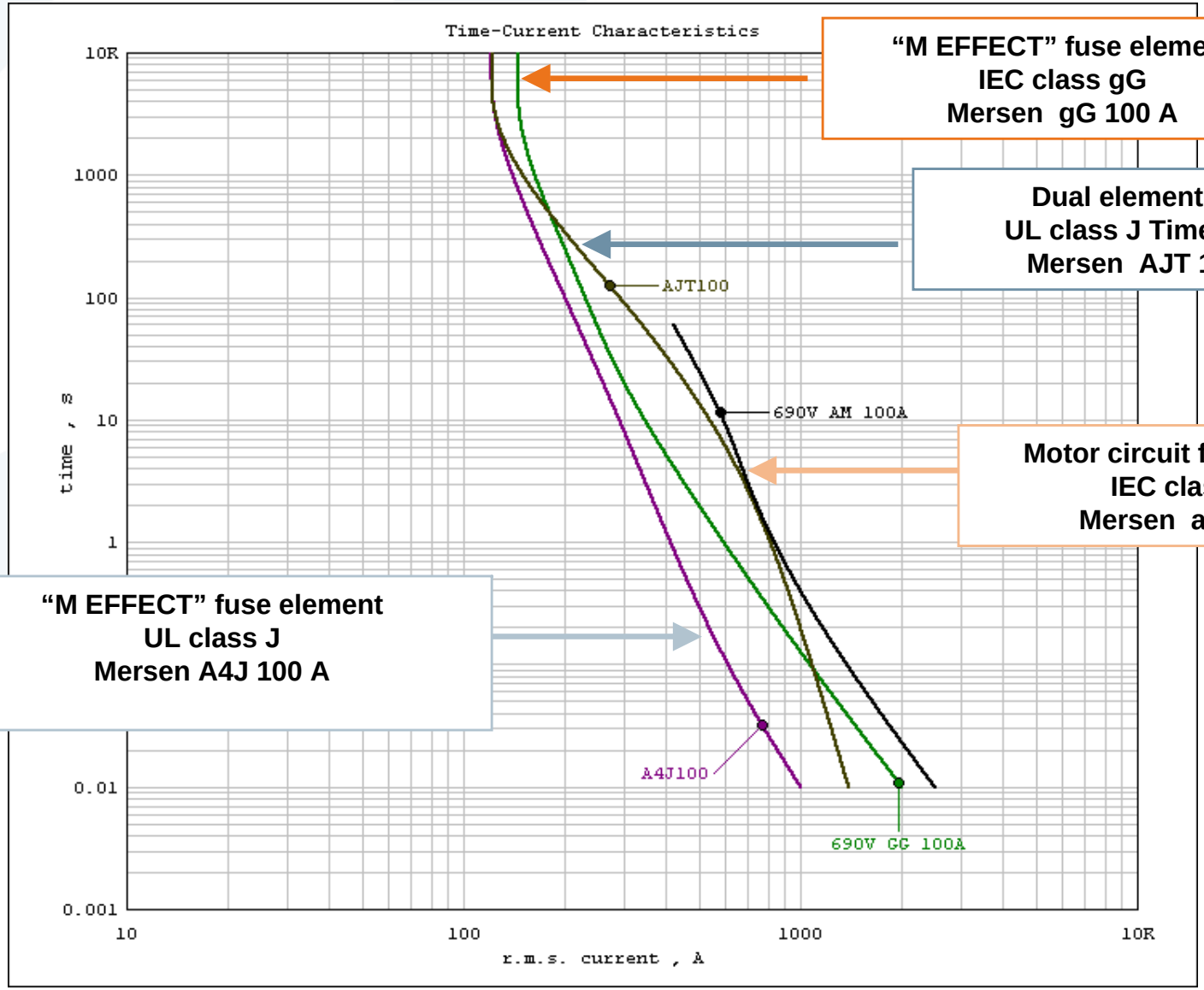
Advantages of « Dual-element » construction Vs Single-element

- Thermal sensitivity - reduce equipment damage from heat
- Superior long-term cycling capabilities
- Performance characteristics remain unchanged over time (eutectic solder)
- Lower watts loss, therefore lower temperature
- Good coordination with downstream devices
- Ability to size closer to normal running current
- Greater short-term overload capacity

Amp-Trap 2000® Fuses

Catalog Number	UL Class	Voltage (V)	Rating (A)	I. R. (KA)	Cut off current of the max rating at 200 KA (KA)	New I.R. (KA)
AJT	J Time Delay	600 max	1- 600	200	55	300
A4BQ	L Time Delay	600 max	601 - 6000	200	240	300
A2D	RK1 Time Delay	250 max	1/10 - 600	200	51	
A6D	RK1 Time Delay	600 max	1/10 - 600	200	62	
ATDR	CC Time Delay	600 max	1/4 - 30	200	32	
ATQR	CC Time Delay	600 max	1/4 - 30	200	45	

Comparison of the Time current curves of IEC and UL fuses



“M EFFECT” fuse element
IEC class gG
Mersen gG 100 A

Dual element fuse
UL class J Time Delay
Mersen AJT 100 A

Motor circuit fuse element
IEC class aM
Mersen aM 100 A

“M EFFECT” fuse element
UL class J
Mersen A4J 100 A

Class J

- Available types:
  Time-delay AJT (preferred): melts at 500% @ 10s
  Fast-acting A4J: melts between 200% and 330% @ 10s
- Current limitation (similar to RK1)
  AJT 600A cut off current = 55kA at 200kA fault
  A4J 600A cut off current = 53kA at 200kA fault
- DC capability:
  AJT tested at 500VDC 100kA
  A4J tested at 300VDC 20kA
- Dimensions approximately same as European sizes
- Ampere range: 0-600A @ 600V
- Interrupting rating: 300kA for the AJT range
  200kA for the A4J range
- Main, feeder & branch circuit applications

Ideal global product …it is an IEC gD & UL-listed

Class L

- Available types:
  - Time-delay A4BQ (preferred) melts at 500% & 4s
  - Fast-acting A4BY
- Current limitation
  - A4BQ 6000A cut off current = 240kA at 200kA fault
  - A4BY 6000A cut off current = 220kA at 200kA fault
- DC capability:
  - A4BQ 601 to 6000A tested at 500VDC 100kA
  - A4BY 200 to 2500 3000A tested at 300VDC 100kA
- Main or feeder fuse applications
- Seldom used by OEM's ... little European use
- Ampere range: 601-6000A @ 600V~
- Interrupting rating: 300kA for the A4BQ range
  200kA for the A4BY range

Note : Fusing factor 150% (unique)

Class RK1

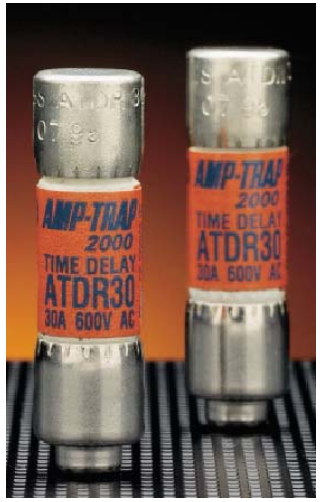
- Ampere range: 0-600A @ 250V & 600V
- Available types:
  - Time-delay A2D (250V)& A6D (600V) preferred
    melt at 500% & 10s
  - Fast-acting A2K (250V) & A6K(600V)
- Current limitation
  - A6D 600A cut off current = 62kA at 200kA fault
  - A6K 600A cut off current = 48kA at 200kA fault
- Interrupting rating: 300kA for A2D & A6D
  200kA for A2K & A6K
- Main, feeder & branch circuit applications
- Seldom used by OEM's - replacement

Class T

- Main, feeder & branch circuit applications
- Very compact dimensions
- Specialized applications ... little European use
- Ampere range: 0-1200A @ 300VAC and 600VAC
  > 600A ... unique fusing factor 150% (like L's)
- Interrupting rating: 200kA (optional 300kA)
- Current limitation: T (300V < J, 600V = J)
- Available types: fast-acting only!

North American control fuses

- Class CC ... ideal



- Class CB (BS88)
- Class CA (BS88)

- Class G (4 sizes)
- Type M («Midgets»)
- Supplemental (Miniatures)

Control fuses
(classes CA, CB, CC)

- Control & branch circuit applications
- CA & CB are variants of British BS88
- CC is variant of NF 10x38mm fuses (French)
- Ampere range: 0-30A @ 600VAC
- Interrupting rating: 200kA
- Current limitation: defined by Standards
- Available types: fast-acting and time-delay

How to solve problems

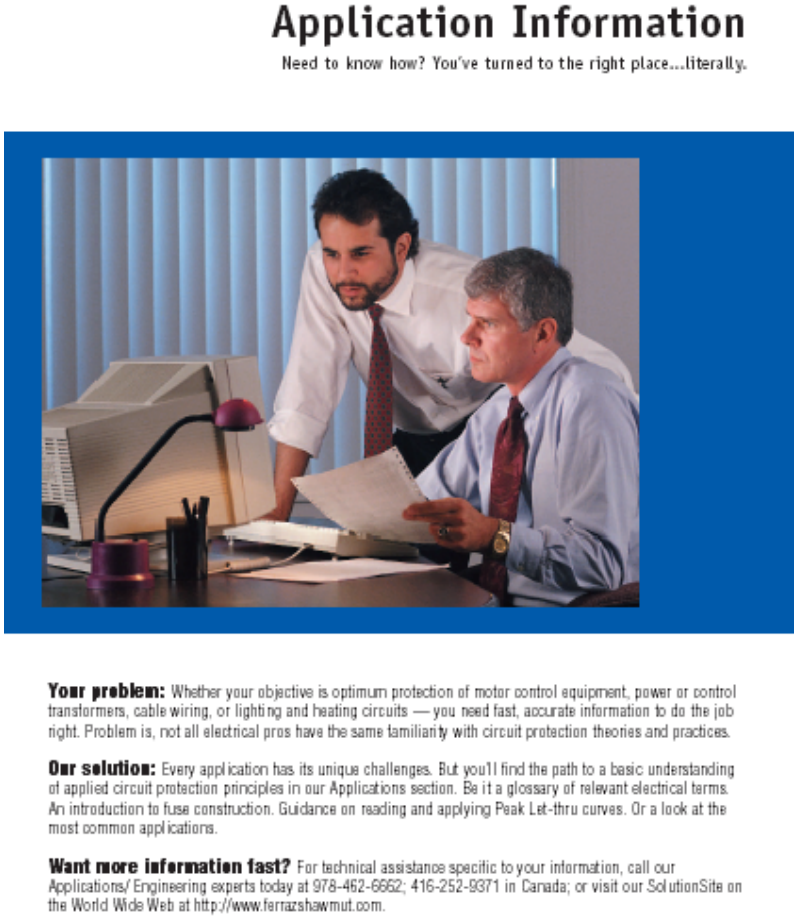
2 methodes:

1. Use tables in “Application information”

or

Individual tables for each fuse range

2. Use software SAF : Select-A-Fuse



Application Information

Need to know how? You've turned to the right place...literally.

Your problem: Whether your objective is optimum protection of motor control equipment, power or control transformers, cable wiring, or lighting and heating circuits — you need fast, accurate information to do the job right. Problem is, not all electrical pros have the same familiarity with circuit protection theories and practices.

Our solution: Every application has its unique challenges. But you'll find the path to a basic understanding of applied circuit protection principles in our Applications section. Be it a glossary of relevant electrical terms. An introduction to fuse construction. Guidance on reading and applying Peak Let-thru curves. Or a look at the most common applications.

Want more information fast? For technical assistance specific to your information, call our Applications/ Engineering experts today at 978-462-6662; 416-252-9371 in Canada; or visit our SolutionSite on the World Wide Web at http://www.ferrazshawmut.com.

How to solve problems

Application example: Motor circuit protection

Selection from tables in the “Application Information”

Voltage: 460V

Power: 250Ch

Start time: 8s

Results are:

AJT600

A6D600

TRS600

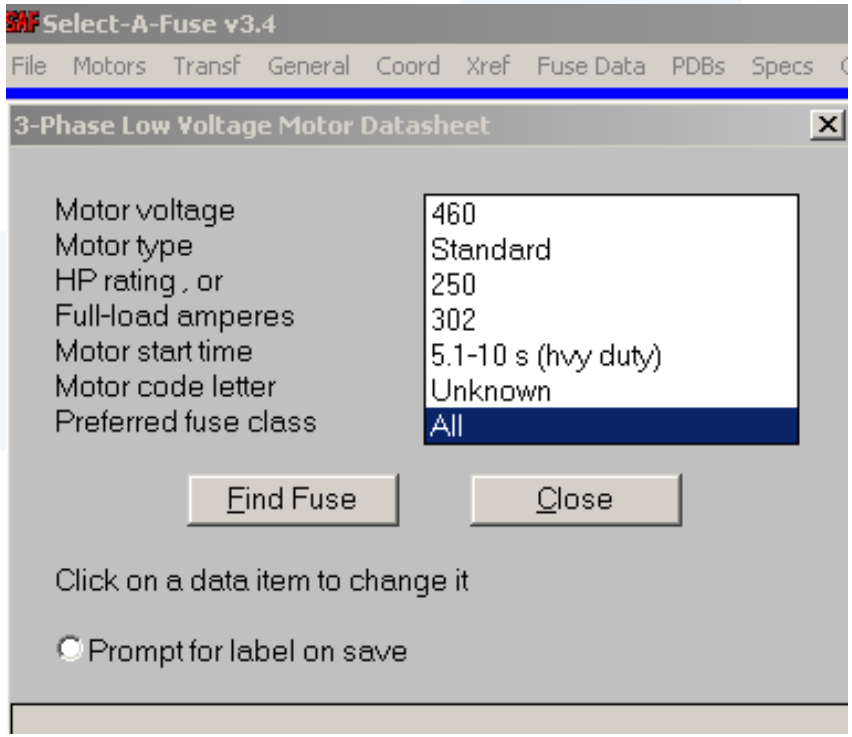
See differences in the next slide

MOTOR HP	FULL LOAD AMPERES	RECOMMENDED FUSE AMPERE RATING								
		MOTOR ACCELERATION TIMES								
		MINIMUM 2 SECS.	TYPICAL 5 SECS.	HEAVY LOAD OVER 5 SECS.	MINIMUM 2 SECS.	TYPICAL 5 SECS.	HEAVY LOAD OVER 5 SECS.	MINIMUM 2 SECS.	TYPICAL 5 SECS.	HEAVY LOAD OVER 5 SECS.
460V		RK5–TRS (Tri-onic®)/RK1–A6D			J–AJT			UL CLASS CC ATDR		
1/2	1.1	1-4/10	1-6/10	2	1-1/2	1-6/10	2	3	3-1/2	4-1/2
3/4	1.6	2	2-1/4	2-8/10	2	2-1/4	2-8/10	3-1/2	5	6-1/4
1	2.1	2-1/2	3-2/10	4	2-1/2	3-2/10	4	5	6-1/4	9
1-1/2	3	3-1/2	4-1/2	5-6/10	3-1/2	4-1/2	5-6/10	6	9	12
2	3.4	4	5	6	4	5	6	8	10	15
3	4.8	5-6/10	7	9	6	8	9	12	15	17-1/2
5	7.6	10	12	15	10	12	15	15	25	30
7-1/2	11	15	17-1/2	20	15	17-1/2	20	25	30	-
10	14	17-1/2	20	25	17-1/2	20	25	30	-	-
15	21	25	30	40	25	30	40	-	-	-
20	27	35	40	50	35	40	50	-	-	-
25	34	40	50	60	40	50	60	-	-	-
30	40	50	60	70	50	60	70	-	-	-
40	52	70	80	100	70	80	100	-	-	-
50	65	80	100	125	80	100	125	-	-	-
60	77	100	125	150	100	125	150	-	-	-
75	96	125	150	175	125	150	175	-	-	-
100	124	175	200	225	175	200	225	-	-	-
125	156	200	225	300	200	225	300	-	-	-
150	180	225	250	350	225	250	350	-	-	-
200	240	300	350	450	300	350	450	-	-	-
250	302	400	450	600	400	450	600	-	-	-
300	361	450	600	-	450	600	-	-	-	-

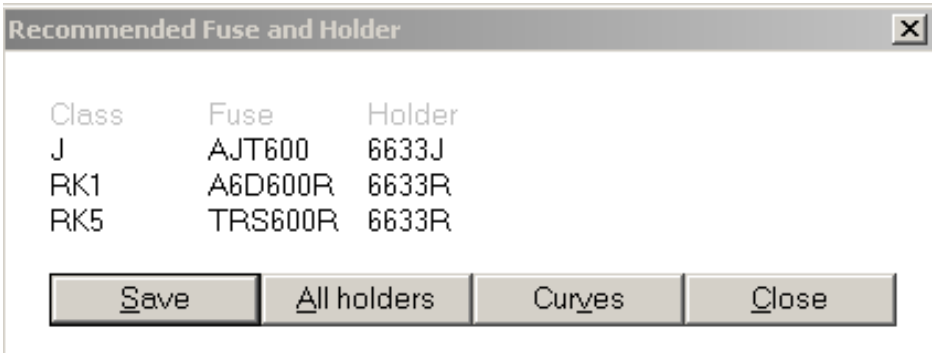
How to solve problems

Application example: Motor circuit protection

Selection frime the Select-A-Fuse software



Voltage: 460V
Power: 250ch
Start time: 8s



How to solve problems

Application example: Motor circuit protection

Comparison of the results

	Dimensions	Cut off under 100kA fault	Melt current at 10s	Comment
AJT600	64x203	42kA	3200A	Faster and most compact
A6D600R	66x264	50kA	3000A	
TRS600R	66x264	72kA	3300A	Cheapest