



### Description

The S200 Series miniature circuit breaker offers a compact solution for protection requirements. The S200U AND S200UP devices are UL 489 tested current limiting and DIN rail mounted.

The S200U and S200UP is available with application-specific trip characteristics to provide maximum circuit protection.

The breakers offer thermal-magnetic trip protection according to K and Z characteristics.

For the worldwide market, the breakers carry UL, CSA, IEC, CE and many other agency approvals and certifications.

### Features

- UL current limiting
- Fast breaking time (2.3 – 2.5 ms)
- Bus connection system
- Wide range of accessories
- Available with variable depth handle mechanism
- CE certified and marked
- DIN rail mounting
- Finger safe terminals
- Multi-function terminals
- Suitable for reverse feed
- UL 489 Listed - branch circuit protective device. UL File #E212323

	S200U	S200UP	S201DC
<b>Amperage</b>	0.2 – 63	0.2 – 25	1 – 25
<b>Voltage</b>	240 VAC	480Y/277VAC	60 VDC
<b>Poles</b>	1, 2, 3, 4	1, 2, 3, 4	1
<b>Trip characteristics</b>	K, Z	K, Z	K, Z
<b>Interrupting ratings</b>	Up to 25 kA: IEC 60947-2 10 kA: UL 489 10 kA: CSA 22.2 No. 5	Up to 25 kA: IEC 60947-2 10 kA: UL 489 10 kA: CSA 22.2 No. 5	14 kA: UL489
<b>Auxiliary contacts</b>	Yes	Yes	Yes
<b>Bell alarm</b>	Yes	Yes	Yes
<b>Shunt trip</b>	Yes	Yes	Yes
<b>Bus bar</b>	Yes	Yes	Yes

## S200U-K, 240 VAC

### Branch circuit protection

### UL 489, CSA 22.2 No. 5

# K



S201U-K



S202U-K



S203U-K



S204U-K

No. of poles	Rated current	Catalog number	List price	No. of poles	Rated current	Catalog number	List price
1	0.2	S201U-K0.2	\$ 38	3	0.2	S203U-K0.2	\$ 137
	0.3	S201U-K0.3			0.3	S203U-K0.3	
	0.5	S201U-K0.5			0.5	S203U-K0.5	
	0.75	S201U-K0.75			0.75	S203U-K0.75	
	1	S201U-K1			1	S203U-K1	
	1.6	S201U-K1.6			1.6	S203U-K1.6	
	2	S201U-K2			2	S203U-K2	
	3	S201U-K3			3	S203U-K3	
	4	S201U-K4			4	S203U-K4	
	5	S201U-K5			5	S203U-K5	
	6	S201U-K6			6	S203U-K6	
	8	S201U-K8			8	S203U-K8	
	10	S201U-K10			10	S203U-K10	
	15	S201U-K15			15	S203U-K15	
	16	S201U-K16			16	S203U-K16	
	20	S201U-K20			20	S203U-K20	
25	S201U-K25	25	S203U-K25				
30	S201U-K30	41	30	S203U-K30	137		
32	S201U-K32	43	32	S203U-K32	141		
40	S201U-K40	45	40	S203U-K40	146		
50	S201U-K50	50	50	S203U-K50	155		
60	S201U-K60	54	60	S203U-K60	166		
63	S201U-K63	59	63	S203U-K63	171		
2	0.2	S202U-K0.2	91	4	0.2	S204U-K0.2	194
	0.3	S202U-K0.3			0.3	S204U-K0.3	
	0.5	S202U-K0.5			0.5	S204U-K0.5	
	0.75	S202U-K0.75			0.75	S204U-K0.75	
	1	S202U-K1			1	S204U-K1	
	1.6	S202U-K1.6			1.6	S204U-K1.6	
	2	S202U-K2			2	S204U-K2	
	3	S202U-K3			3	S204U-K3	
	4	S202U-K4			4	S204U-K4	
	5	S202U-K5			5	S204U-K5	
	6	S202U-K6			6	S204U-K6	
	8	S202U-K8			8	S204U-K8	
	10	S202U-K10			10	S204U-K10	
	15	S202U-K15			15	S204U-K15	
	16	S202U-K16			16	S204U-K16	
	20	S202U-K20			20	S204U-K20	
25	S202U-K25	25	S204U-K25				
30	S202U-K30	91	30	S204U-K30	194		
32	S202U-K32	93	32	S204U-K32	194		
40	S202U-K40	100	40	S204U-K40	202		
50	S202U-K50	105	50	S204U-K50	205		
60	S202U-K60	114	60	S204U-K60	211		
63	S202U-K63	123	63	S204U-K63	217		

#### Tripping characteristic K

UL 489  
240 VAC  
10 kA

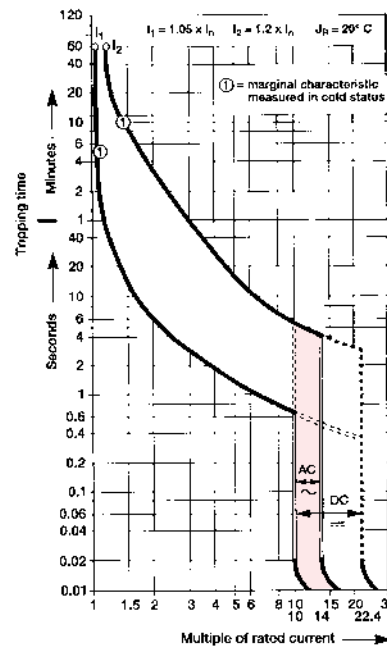
#### Inductive loads

- K Curve
- Designed for allowing higher in-rush currents during system start up
- Example: motors, transformers

#### Accessories & technical data

Accessories – See page 15.7

Technical data – See page 15.76 - 15.82



Note: This breaker for AC use only

# S200U-Z, 240 VAC

## Branch circuit protection

### UL 489, CSA 22.2 No. 5

Miniature  
circuit breakers

# Z



S201U-Z



S202U-Z



S203U-Z



S204U-Z

No. of poles	Rated current	Catalog number	List price	No. of poles	Rated current	Catalog number	List price	
1	0.5	S201U-Z0.5	\$ 54	3	0.5	S203U-Z0.5	\$ 182	
	1	S201U-Z1			1	S203U-Z1		
	1.6	S201U-Z1.6			1.6	S203U-Z1.6		
	2	S201U-Z2			2	S203U-Z2		
	3	S201U-Z3			3	S203U-Z3		
	4	S201U-Z4			4	S203U-Z4		
	5	S201U-Z5			5	S203U-Z5		
	6	S201U-Z6			6	S203U-Z6		
	8	S201U-Z8			8	S203U-Z8		
	10	S201U-Z10			10	S203U-Z10		
	15	S201U-Z15			15	S203U-Z15		
	16	S201U-Z16			16	S203U-Z16		
	20	S201U-Z20			20	S203U-Z20		
	25	S201U-Z25			25	S203U-Z25		
	30	S201U-Z30			30	S203U-Z30		
2	32	S201U-Z32	57	4	32	S203U-Z32	185	
	40	S201U-Z40	61		40	S203U-Z40	189	
	50	S201U-Z50	68		50	S203U-Z50	196	
	60	S201U-Z60	75		60	S203U-Z60	205	
	63	S201U-Z63	80		63	S203U-Z63	212	
	0.5	S202U-Z0.5	121		4	0.5	S204U-Z0.5	274
	1	S202U-Z1				1	S204U-Z1	
	1.6	S202U-Z1.6				1.6	S204U-Z1.6	
	2	S202U-Z2				2	S204U-Z2	
	3	S202U-Z3				3	S204U-Z3	
	4	S202U-Z4				4	S204U-Z4	
	5	S202U-Z5				5	S204U-Z5	
	6	S202U-Z6				6	S204U-Z6	
	8	S202U-Z8				8	S204U-Z8	
	10	S202U-Z10				10	S204U-Z10	
15	S202U-Z15	15		S204U-Z15				
16	S202U-Z16	16		S204U-Z16				
20	S202U-Z20	20		S204U-Z20				
25	S202U-Z25	25		S204U-Z25				
30	S202U-Z30	30		S204U-Z30				
2	32	S202U-Z32	123	4	32	S204U-Z32	276	
	40	S202U-Z40	128		40	S204U-Z40	283	
	50	S202U-Z50	137		50	S204U-Z50	292	
	60	S202U-Z60	146		60	S204U-Z60	304	
	63	S202U-Z63	155		63	S204U-Z63	305	

### Tripping characteristic Z

UL 489  
240 VAC  
10 kA

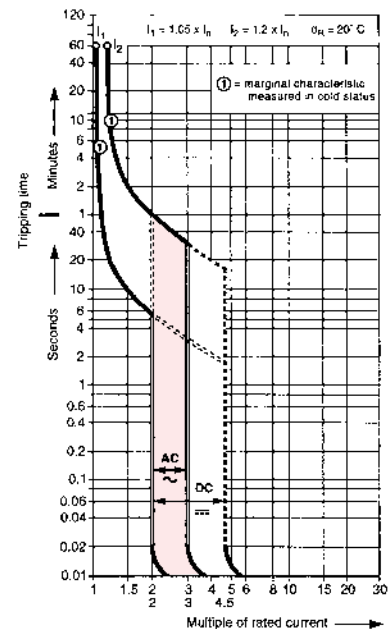
#### Resistive loads

- Z Curve
- Designed to provide maximum protection with a very low short circuit trip setting
- Example: semiconductors, control circuits

#### Accessories & technical data

Accessories – See page 15.7

Technical data – See page 15.76 - 15.82



Note: This breaker for AC use only

## S200UP-K, 480Y/277 VAC

Branch circuit protection  
UL 489, CSA 22.2 No. 5

# K



S201UP-K



S202UP-K



S203UP-K



S204UP-K

No. of poles	Rated current	Catalog number	List prices	No. of poles	Rated current	Catalog number	List price
1	0.2	S201UP-K0.2	\$ 61	3	0.2	S203UP-K0.2	\$ 219
	0.3	S201UP-K0.3			0.3	S203UP-K0.3	
	0.5	S201UP-K0.5			0.5	S203UP-K0.5	
	0.75	S201UP-K0.75			0.75	S203UP-K0.75	
	1	S201UP-K1			1	S203UP-K1	
	1.6	S201UP-K1.6			1.6	S203UP-K1.6	
	2	S201UP-K2			2	S203UP-K2	
	3	S201UP-K3			3	S203UP-K3	
	4	S201UP-K4			4	S203UP-K4	
	5	S201UP-K5			5	S203UP-K5	
	6	S201UP-K6			6	S203UP-K6	
	8	S201UP-K8			8	S203UP-K8	
	10	S201UP-K10			10	S203UP-K10	
	15	S201UP-K15			15	S203UP-K15	
	16	S201UP-K16			16	S203UP-K16	
20	S201UP-K20	20	S203UP-K20				
25	S201UP-K25	25	S203UP-K25				
2	0.2	S202UP-K0.2	162	4	0.2	S204UP-K0.2	301
	0.3	S202UP-K0.3			0.3	S204UP-K0.3	
	0.5	S202UP-K0.5			0.5	S204UP-K0.5	
	0.75	S202UP-K0.75			0.75	S204UP-K0.75	
	1	S202UP-K1			1	S204UP-K1	
	1.6	S202UP-K1.6			1.6	S204UP-K1.6	
	2	S202UP-K2			2	S204UP-K2	
	3	S202UP-K3			3	S204UP-K3	
	4	S202UP-K4			4	S204UP-K4	
	5	S202UP-K5			5	S204UP-K5	
	6	S202UP-K6			6	S204UP-K6	
	8	S202UP-K8			8	S204UP-K8	
	10	S202UP-K10			10	S204UP-K10	
	15	S202UP-K15			15	S204UP-K15	
	16	S202UP-K16			16	S204UP-K16	
20	S202UP-K20	20	S204UP-K20				
25	S202UP-K25	25	S204UP-K25				

### Tripping characteristic K

UL 489  
480Y/277 VAC  
10 kA

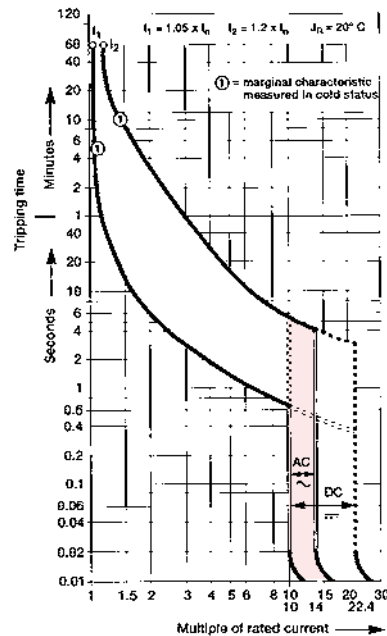
### Inductive loads

- K Curve
- Designed for allowing higher in-rush currents during system start up
- Example: motors, transformers

### Accessories & technical data

Accessories – See page 15.7

Technical data – See page 15.76 - 15.82



Note: This breaker for AC use only

# S200UP-Z, 277/480Y/277 VAC

Branch circuit protection

UL 489, CSA 22.2 No. 5

Miniature  
circuit breakers

# Z



S201UP-Z



S202UP-Z



S203UP-Z



S204UP-Z

No. of poles	Rated current	Catalog number	List price	No. of poles	Rated current	Catalog number	List price
1	0.5	S201UP-Z0.5	\$ 80	3	0.5	S203UP-Z0.5	\$ 285
	1	S201UP-Z1			1	S203UP-Z1	
	1.6	S201UP-Z1.6			1.6	S203UP-Z1.6	
	2	S201UP-Z2			2	S203UP-Z2	
	3	S201UP-Z3			3	S203UP-Z3	
	4	S201UP-Z4			4	S203UP-Z4	
	5	S201UP-Z5			5	S203UP-Z5	
	6	S201UP-Z6			6	S203UP-Z6	
	8	S201UP-Z8			8	S203UP-Z8	
	10	S201UP-Z10			10	S203UP-Z10	
	15	S201UP-Z15			15	S203UP-Z15	
2	0.5	S202UP-Z0.5	212	4	0.5	S204UP-Z0.5	388
	1	S202UP-Z1			1	S204UP-Z1	
	1.6	S202UP-Z1.6			1.6	S204UP-Z1.6	
	2	S202UP-Z2			2	S204UP-Z2	
	3	S202UP-Z3			3	S204UP-Z3	
	4	S202UP-Z4			4	S204UP-Z4	
	5	S202UP-Z5			5	S204UP-Z5	
	6	S202UP-Z6			6	S204UP-Z6	
	8	S202UP-Z8			8	S204UP-Z8	
	10	S202UP-Z10			10	S204UP-Z10	
	15	S202UP-Z15			15	S204UP-Z15	
16	S202UP-Z16	16	S204UP-Z16				
20	S202UP-Z20	20	S204UP-Z20				
25	S202UP-Z25	25	S204UP-Z25				

### Tripping characteristic Z

UL 489

480Y/277 VAC

10 kA

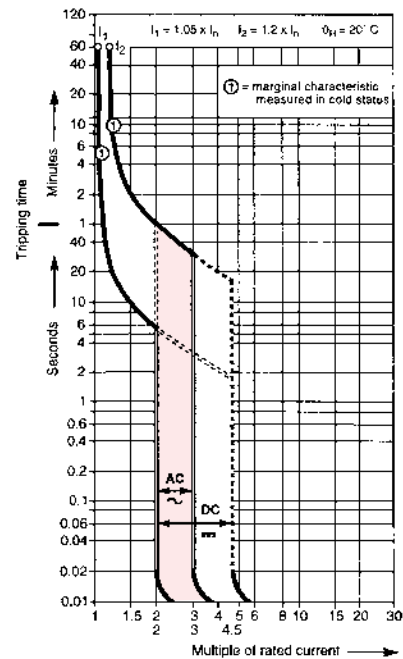
### Resistive loads

- Z Curve
- Designed to provide maximum protection with a very low short circuit trip setting
- Example: semiconductors, control circuits

### Accessories & technical data

Accessories – See page 15.7

Technical data – See page 15.76 - 15.82



Note: This breaker for AC use only

# S201DC, 60 VDC

Branch circuit protection  
UL 489, CSA 22.2 No. 5

# K, Z



S201DC-K



S201DC-Z

No. of poles	Rated current	Catalog number	List price
1	1	S201DC-K1	\$ 36
	1.6	S201DC-K1.6	
	2	S201DC-K2	
	3	S201DC-K3	
	4	S201DC-K4	
	6	S201DC-K6	
	8	S201DC-K8	
	10	S201DC-K10	
	13	S201DC-K13	
	16	S201DC-K16	
1	1	S201DC-Z1	38
	1.6	S201DC-Z1.6	
	2	S201DC-Z2	
	3	S201DC-Z3	
	4	S201DC-Z4	
	6	S201DC-Z6	
	8	S201DC-Z8	
	10	S201DC-Z10	
	16	S201DC-Z16	
	20	S201DC-Z20	
25	S201DC-Z25		

### Tripping characteristic K

UL 489  
60 VDC  
14 kA

#### Inductive loads

- K Curve
- Designed for allowing higher in-rush currents during system start up
- Example: motors, transformers

#### Accessories & technical data

Accessories – See page 15.7

Technical data – See page 15.76 - 15.82

### Tripping characteristic Z

UL 489  
60 VDC  
14 kA

#### Resistive loads

- Z Curve
- Designed to provide maximum protection with a very low short circuit trip setting

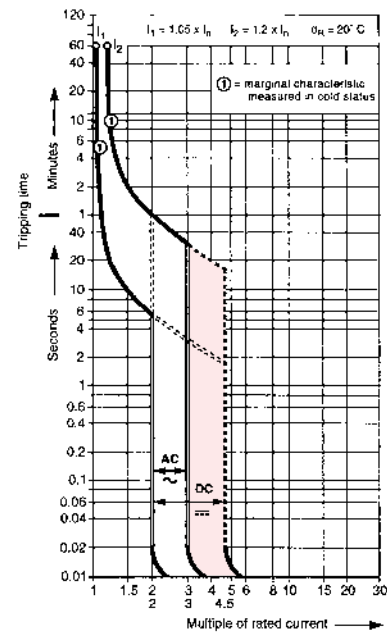
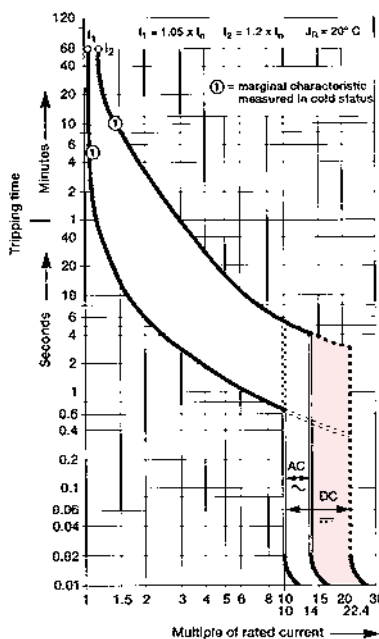
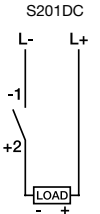
#### Accessories & technical data

Accessories – See page 15.7

Technical data – See page 15.76 - 15.82

60 VDC

Single Pole  
S201DC



Note: This breaker for DC use only.

# Accessories

## S200U & S200UP

### UL 489, CSA 22.2 No. 5

Miniature  
circuit breakers



S2C-H6RU



S2C-S6RU



S2C-DH



S2C-A1U

### Auxiliary contacts

The auxiliary contacts will signal whether the breaker is in the ON or OFF position.

Description	Catalog number	List price
For field mounting: right side	<b>S2C-H6RU</b>	<b>\$ 21</b>

### Bell alarm

The bell alarm includes a set of contacts that will only signal when the breaker has tripped. Typically the contacts would be connected to an alarm or bell to signal the operator that an overcurrent trip has occurred. The bell alarm also includes a test button for testing the alarm contacts without opening the breaker.

Description	Catalog number	List price
For field mounting: right side	<b>S2C-S6RU</b>	<b>\$ 31</b>

### Rotary operating mechanism

Allows "through the door" operation.

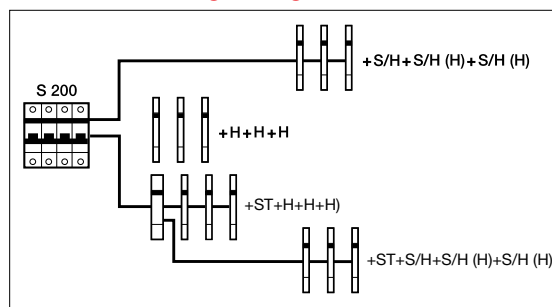
Description	Catalog number	List price
Handle mechanism	<b>S2C-DH</b>	<b>\$ 71</b>

### Shunt trip

For remote tripping of breaker, a shunt trip device can be added to the MCB. The solenoid device opens the breaker after control voltage is applied.

Description	Catalog number	List price
For field mounting: right side 12...60 VAC/DC	<b>S2C-A1U</b>	<b>\$ 89</b>
For field mounting: right side 110...415 VAC 110...250 VDC	<b>S2C-A2U</b>	<b>89</b>

### Possible mounting arrangements of MCB accessories



Legend	
Auxiliary contact	H
Bell alarm/Auxiliary contact	S/H
Bell alarm/Auxiliary contact used as auxiliary contact	S/H (H)
Shunt trip	ST

## Accessories

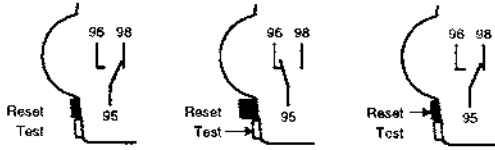
### S200U, S200UP & S201DC

UL 489, CSA 22.2 No. 5

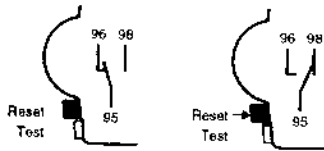
#### Connection drawings

##### Bell alarm S2C-S6RU

In ON and OFF position after hand operation

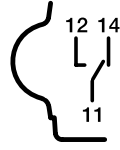


In OFF position after tripping

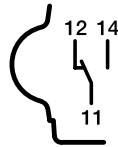


##### Auxiliary contact S2C-H6RU

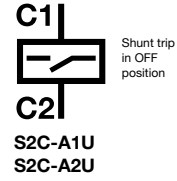
Auxiliary contact in ON position



Auxiliary contact in OFF position

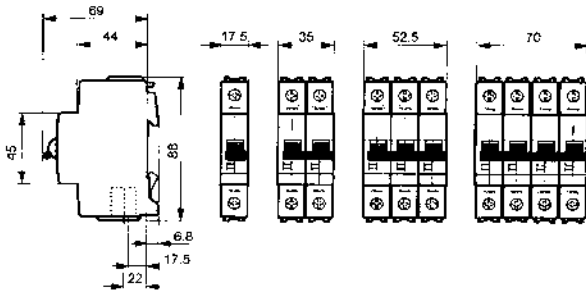


##### Shunt trip S2C-A...U

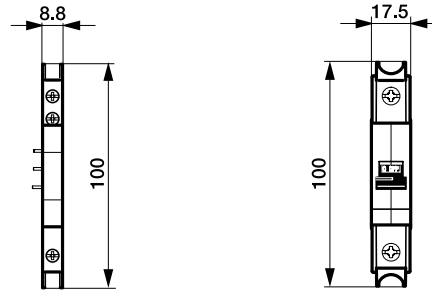


#### Approximate dimensions in mm

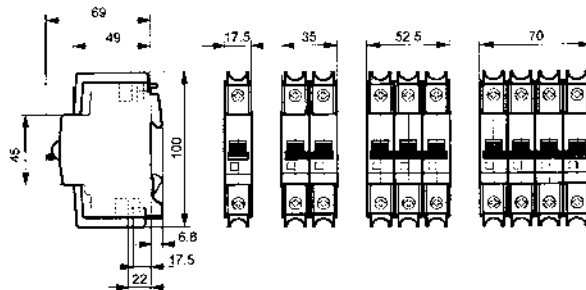
##### S200U



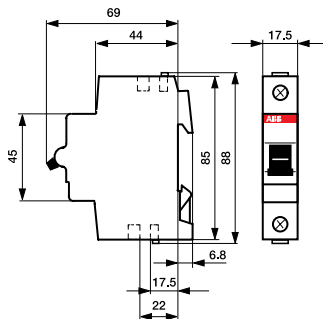
##### S2C-H6RU, S2C-S6RU S2C-A..U



##### S200UP



##### S201DC





# Accessories

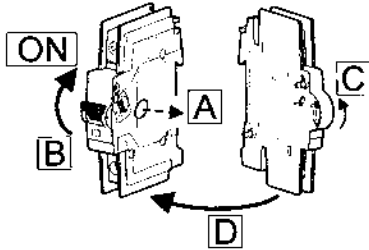
## S200U & S200UP

### UL 489, CSA 22.2 No. 5

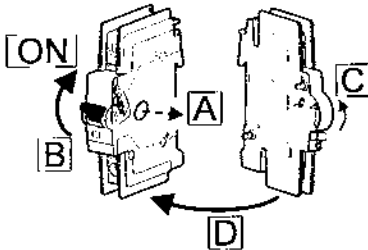
Miniature  
circuit breakers

#### Mounting

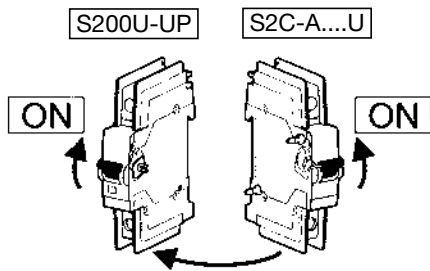
Addition of a S2C-H6RU auxiliary contact



Addition of a S2C-S6RU bell alarm contact



Addition of a S2C-A..U shunt trip



## Accessories

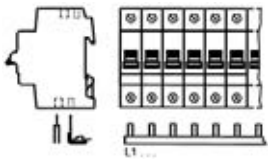
### S200U & S200UP

### UL 489, CSA 22.2 No. 5

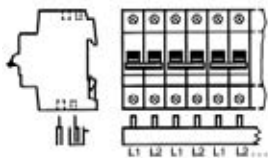
#### UL approved busbars UL file # E250145

UL 489 busbar cannot be cut.

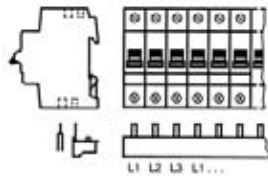
1 Phase



2 Phase



3 Phase



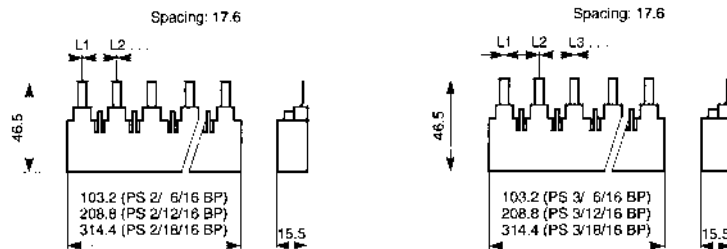
SZ-BSK

For use on:	Amp rating	Number of poles	Phases	Busbar length (mm)	Catalog number	List price
S200U	80	6	1	103.2	<b>PS 1/6/16BP</b>	<b>\$ 19</b>
S200UP		12	1	208.8	<b>PS 1/12/16BP</b>	<b>30</b>
S201DC		18	1	314.4	<b>PS 1/18/16BP</b>	<b>40</b>
S200U	80	6	2	103.2	<b>PS 2/6/16BP</b>	<b>22</b>
S200UP		12	2	208.8	<b>PS 2/12/16BP</b>	<b>35</b>
S201DC		18	2	314.4	<b>PS 2/18/16BP</b>	<b>50</b>
S200U	80	6	3	103.2	<b>PS 3/6/16BP</b>	<b>25</b>
S200UP		12	3	208.8	<b>PS 3/12/16BP</b>	<b>40</b>
S201DC		18	3	314.4	<b>PS 3/18/16BP</b>	<b>60</b>

#### Busbar tooth covers

Description	Catalog number	List price
Covers five unused poles of Busbar	<b>SZ-BSK</b>	<b>\$ 4</b>

#### Dimension drawings in mm



BUSBARS MAY BE USED ON BOTH SIDES OF MCBS

BUSBARS MAY BE CENTER FED IN ORDER TO INCREASE AMPACITY TO 130 AMPS

# Technical data

## S200U, S200UP & S201DC

### UL 489, CSA 22.2 No. 5

Miniature  
circuit breakers

Technical data	S200U	S200UP	S201DC
Specifications:	UL 489, CSA C 22.2 No. 5, IEC 60 947-2		UL 489, VDE 0660
UL File-Number:	E 212323, UL, Current limiting series ratings		E212323, UL
No. of poles:	1, 2, 3 & 4		1
Tripping characteristics:	K, Z		K, Z
Rated current:	0.2 (K) 0.5 (Z) ... 63 A	0.2 (K) 0.5 (Z) ... 25 A	1 - 25 A
Rated voltage:	Single pole: 240VAC Multi pole: 240VAC	Single pole: 277VAC Multi pole: 480Y/277VAC	
Short circuit capacity:	10 kA		14 kA
Frequency:	50/60 Hz		50/60 Hz
Degree of protection:	IP 20		IP 20
Mounting position:	Vertical and horizontal		Vertical and horizontal
Fixing:	35 mm DIN rail		35 mm DIN rail
Clamps only for Cu:	18-4 AWG (0.75 ... 25 mm <sup>2</sup> )		18-4 AWG (0.75 ... 25 mm <sup>2</sup> )
Service life, mech. and at rated load:	20,000 operations		10,000 operations
Tightening torque:	25 in. lbs (2.8 Nm)		25 in. lbs (2.8 Nm)
Ambient temperature:	- 25 °C ... + 55 °C / - 13 °F ... + 131 °F		- 25 °C ... + 55 °C / - 13 °F ... + 131 °F
Shock resistance:	30 g at least 2 impacts shock, duration 13 ms		30 g at least 2 impacts shock, duration 13 ms

### Auxiliary contact S2C-H6RU and S2C-S6RU

Rated current:	10
Rated voltage AC / DC:	24
Contact:	1 pole double throw
Connection capacity mm <sup>2</sup>	18 - 14 AWG (0.75...2.5 mm <sup>2</sup> )
Tightening torque:	11 in.lbs (1.2 Nm)
Shock resistance acc. to DIN IEC 68-2-6:	5 g, 20 frequency cycles 5...150...5 Hz at 24 VAC/DC, 5 mA auto-reclosing < 10 ms
Mechanical service life:	10,000 operations

Shunt trip			S2C-A1U	S2C-A2U
Rated voltage	AC	V	12 ... 60	110 ... 415
	DC	V	12 ... 60	110 ... 250
Max. release duration		ms	< 10	< 10
Min. release voltage	AC	V	7	55
	DC	V	10	80
Consumption on release	AC	VA	40 ... 200	55 ... 210
	DC	VA	40 ... 200	55 ... 110
Coil resistance		Ω	3.7	225
Terminals		AWG/mm <sup>2</sup>	18...6 / 0.75 - 16	18...6 / 0.75 - 16
Tightening torque		in.lbs/Nm	18 / 2	18 / 2

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## Technical data

### S200U & S200UP

### UL 489, CSA 22.2 No. 5

#### Internal resistance and power loss

Internal resistance per pole in mΩ, power loss per pole in W.

Type	Rated current A	Device series <b>K</b>		Device series <b>Z</b>	
		mΩ	W	mΩ	W
<b>S200U S200UP</b>	0.2	42500	1.7	–	–
	0.3	20000	1.8	–	–
	0.5	6340	1.6	10100	2.5
	0.75	2500	1.4	–	–
	1	1400	1.4	2270	2.3
	1.6	625	1.6	1100	2.8
	2	460	1.8	619	2.5
	3	211	1.9	211	1.9
	4	163	2.6	163	2.6
	6	67	2.4	104	3.7
	8	45	2.9	55	3.5
	10	19	1.9	21	2.1
	13	–	–	–	–
	16	8.2	2.1	10.9	2.8
	20	7.3	2.9	7.3	2.9
	25	5.6	3.5	5.6	3.5
	32	4.1	4.2	4.1	4.2
	40	4.0	6.4	4.0	6.4
50	1.2	3.0	1.8	4.4	
63	1.3	5.2	1.3	5.2	

# Technical data

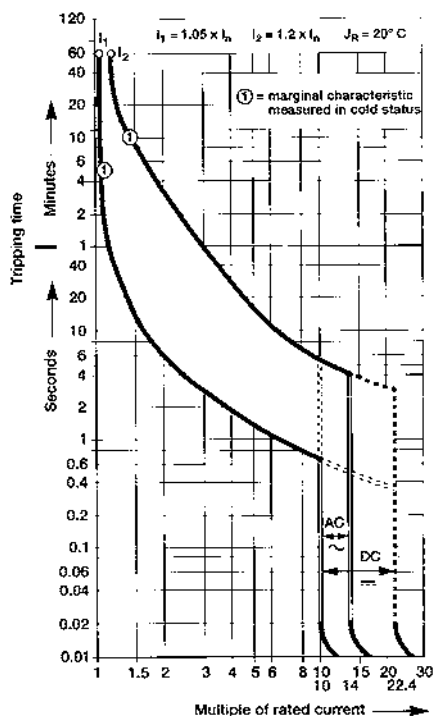
## S200U & S200UP

### UL 489, CSA 22.2 No. 5

Miniature  
circuit breakers

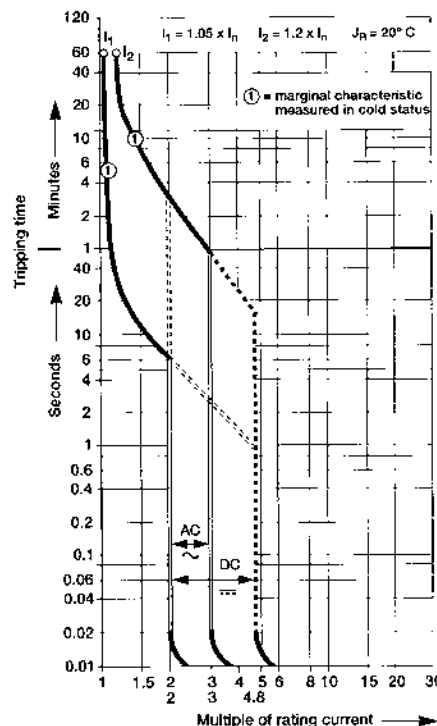
#### Tripping characteristic K (68 °F)

Breaker calibration temperature 68°F  
See chart below for temperature DeRating



#### Tripping characteristic Z (68 °F)

Breaker calibration temperature 68°F  
See chart below for temperature DeRating



#### Temperature derating

Max. operating current values depending on the ambient temperature for a circuit-breaker of characteristics type K and Z

K and Z I <sub>n</sub> (A)	Ambient temperature T (°C/°F)												
	-40/-40	-30/-22	-20/-4	-10/14	0/32	10/50	20/68	30/86	40/104	50/122	60/140	70/158	
0.5	0.66	0.64	0.61	0.59	0.56	0.53	0.50	0.47	0.43	0.40	0.35	0.31	
1.0	1.32	1.27	1.22	1.17	1.12	1.06	1.00	0.94	0.87	0.79	0.71	0.61	
1.6	2.12	2.04	1.96	1.88	1.79	1.70	1.60	1.50	1.39	1.26	1.13	0.98	
2.0	2.65	2.55	2.45	2.35	2.24	2.12	2.00	1.87	1.73	1.58	1.41	1.22	
3.0	4.0	3.8	3.7	3.5	3.4	3.2	3.0	2.8	2.6	2.4	2.1	1.8	
4.0	5.3	5.1	4.9	4.7	4.5	4.2	4.0	3.7	3.5	3.2	2.8	2.4	
6.0	7.9	7.6	7.3	7.0	6.7	6.4	6.0	5.6	5.2	4.7	4.2	3.7	
8.0	10.8	10.2	9.8	9.4	8.9	8.5	8.0	7.5	6.9	6.3	5.7	4.9	
10.0	13.2	12.7	12.2	11.7	11.2	10.6	10.0	9.4	8.7	7.9	7.1	6.1	
13.0	17.2	16.6	15.9	15.2	14.5	13.8	13.0	12.2	11.3	10.3	9.2	8.0	
16.0	21.2	20.4	19.6	18.8	17.9	17.0	16.0	15.0	13.9	12.6	11.3	9.8	
20.0	26.5	25.5	24.5	23.5	22.4	21.2	20.0	18.7	17.3	15.8	14.1	12.2	
25.0	33.1	31.9	30.6	29.3	28.0	26.5	25.0	23.4	21.7	19.8	17.7	15.3	
32.0	42.3	40.8	39.2	37.5	35.8	33.9	32.0	29.9	27.7	25.3	22.6	19.6	
40.0	52.9	51.0	49.0	46.9	44.7	42.4	40.0	37.4	34.6	31.6	28.3	24.5	
50.0	66.1	63.7	61.2	58.6	55.9	53.0	50.0	46.8	43.3	39.5	35.4	30.6	
63.0	83.3	80.3	77.2	73.9	70.4	66.8	63.0	58.9	54.6	49.8	44.5	38.6	



# S200 Series Supplementary protective devices



## S200 Supplementary protective devices UL 1077 Series



### Description

The S200 UL 1077 Series miniature supplementary protector offers a compact solution for protection requirements. The S200 devices are DIN rail mounted.

The S200 is available with application-specific trip characteristics to provide maximum circuit protection.

The supplementary protectors offer thermal-magnetic trip protection according to B, C, D, K and Z characteristics.

For the worldwide market, the breakers carry UL, CSA, IEC, CE and many other agency approvals and certifications.

### Features

- Energy limiting
- Fast breaking time (2.3 – 2.5 ms)
- Bus connection system
- Wide range of accessories
- Available with variable depth handle mechanism
- CE certified and marked
- DIN rail mounting
- Finger safe terminals
- Multi-function terminals
- Suitable for reverse feed
- UL1077 Recognized supplemental protective device. UL file # E76126

	S200	S200P	S280UC	S290
<b>Amperage</b>	0.5 – 63 A	0.2 – 63 A	0.2 – 63 A	80 - 125 A
<b>Voltage</b>	480Y/277 VAC	480Y/277 VAC	250/500 VDC	480Y/277 VAC
<b>Poles</b>	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4	1, 2, 3, 4
<b>Trip characteristics</b>	B, C, D, K	K, Z	K, Z	C
<b>Interrupting ratings</b>	6 kA: IEC 60898 6 kA: UL 1077 6 kA: CSA 22.2 No. 235	Up to 25kA: IEC 60947-2 10kA: UL 1077	Up to 6kA: IEC 60947-2 10kA: UL 1077 6 kA: CSA 22.2 No. 235	Up to 10 kA: IEC 60947-2 5 kA: UL 1077 6 kA: CSA 22.2 No. 235
<b>Auxiliary contacts</b>	Yes	Yes	Yes	Yes
<b>Bell alarm</b>	Yes	Yes	Yes	Yes
<b>Shunt trip</b>	Yes	Yes	Yes	Yes
<b>Undervoltage release</b>	Yes	Yes	Yes	No
<b>Bus bar</b>	Yes	Yes	Yes	No

## S200-B, 480Y/277 VAC

### Supplemental protectors

### UL 1077, CSA 22.2, No. 235

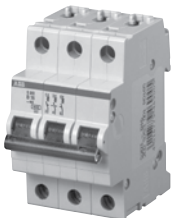
# B



S201-B



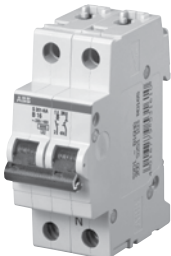
S202-B



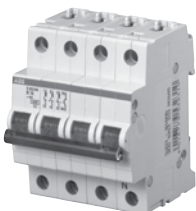
S203-B



S204-B



S201-BNA



S203-BNA

No. of poles	Rated current	Catalog number	List price	No. of poles	Rated current	Catalog number	List price	
1	6	S201-B6	\$ 20	3	6	S203-B6	\$ 77	
	10	S201-B10			10	S203-B10		
	13	S201-B13			13	S203-B13		
	16	S201-B16			16	S203-B16		
	20	S201-B20			20	S203-B20		
	25	S201-B25			25	S203-B25		
	32	S201-B32			25	S203-B32		82
	40	S201-B40			27	S203-B40		86
	50	S201-B50			34	S203-B50		93
	63	S201-B63			45	S203-B63		100
1 + NA	6	S201-B6NA	38	3 + NA	6	S203-B6NA	96	
	10	S201-B10NA			10	S203-B10NA		
	13	S201-B13NA			13	S203-B13NA		
	16	S201-B16NA			16	S203-B16NA		
	20	S201-B20NA			20	S203-B20NA		
	25	S201-B25NA			25	S203-B25NA		
	32	S201-B32NA			45	S203-B32NA		100
	40	S201-B40NA			52	S203-B40NA		107
	50	S201-B50NA			57	S203-B50NA		114
	63	S201-B63NA			64	S203-B63NA		121
2	6	S202-B6	52	4	6	S204-B6	105	
	10	S202-B10			10	S204-B10		
	13	S202-B13			13	S204-B13		
	16	S202-B16			16	S204-B16		
	20	S202-B20			20	S204-B20		
	25	S202-B25			25	S204-B25		
	32	S202-B32			57	S204-B32		82
	40	S202-B40			61	S204-B40		86
	50	S202-B50			66	S204-B50		83
	63	S202-B63			70	S204-B63		100

#### Tripping characteristic B

UL 1077  
480Y/277VAC  
6 kA

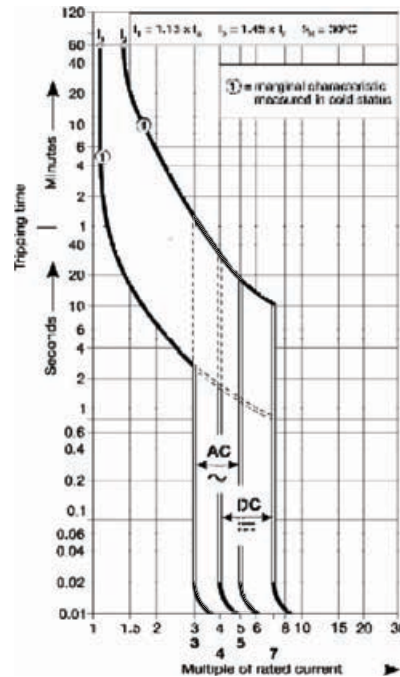
#### Resistive loads

- B Curve
- Designed for use in cable protection applications
- Example: control circuits, lighting

#### Accessories & technical data

Accessories – See page 15.26

Technical data – See page 15.76 - 15.82



Note: Switching neutral is noted by "NA" in the catalog number.



# S200-C, 480Y/277 VAC

## Supplemental protectors

### UL 1077, CSA 22.2, No. 235

Miniature  
circuit breakers

# C



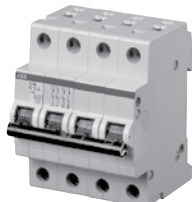
S201-C



S202-C



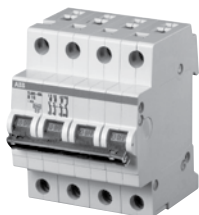
S203-C



S204-C



S201-CNA



S203-CNA

No. of poles	Rated current	Catalog number	List price	No. of poles	Rated current	Catalog number	List price
1	0.5	S201-C0.5	\$ 22	3	0.5	S203-C0.5	\$ 80
	1	S201-C1			1	S203-C1	
	1.6	S201-C1.6			1.6	S203-C1.6	
	2	S201-C2			2	S203-C2	
	3	S201-C3			3	S203-C3	
	4	S201-C4			4	S203-C4	
	6	S201-C6			6	S203-C6	
	8	S201-C8			8	S203-C8	
	10	S201-C10			10	S203-C10	
	13	S201-C13			13	S203-C13	
	16	S201-C16			16	S203-C16	
	20	S201-C20			20	S203-C20	
	25	S201-C25			25	S203-C25	
	32	S201-C32			25	S203-C32	
40	S201-C40	27	S203-C40	89			
50	S201-C50	29	S203-C50	100			
63	S201-C63	34	S203-C63	109			
1 + NA	0.5	S201-C0.5NA	43	3 + NA	0.5	S203-C0.5NA	100
	1	S201-C1NA			1	S203-C1NA	
	1.6	S201-C1.6NA			1.6	S203-C1.6NA	
	2	S201-C2NA			2	S203-C2NA	
	3	S201-C3NA			3	S203-C3NA	
	4	S201-C4NA			4	S203-C4NA	
	6	S201-C6NA			6	S203-C6NA	
	8	S201-C8NA			8	S203-C8NA	
	10	S201-C10NA			10	S203-C10NA	
	13	S201-C13NA			13	S203-C13NA	
	16	S201-C16NA			16	S203-C16NA	
	20	S201-C20NA			20	S203-C20NA	
	25	S201-C25NA			25	S203-C25NA	
	32	S201-C32NA			25	S203-C32NA	
40	S201-C40NA	48	S203-C40NA	121			
50	S201-C50NA	54	S203-C50NA	125			
63	S201-C63NA	59	S203-C63NA	144			
2	0.5	S202-C0.5	52	4	0.5	S204-C0.5	116
	1	S202-C1			1	S204-C1	
	1.6	S202-C1.6			1.6	S204-C1.6	
	2	S202-C2			2	S204-C2	
	3	S202-C3			3	S204-C3	
	4	S202-C4			4	S204-C4	
	6	S202-C6			6	S204-C6	
	8	S202-C8			8	S204-C8	
	10	S202-C10			10	S204-C10	
	13	S202-C13			13	S204-C13	
	16	S202-C16			16	S204-C16	
	20	S202-C20			20	S204-C20	
	25	S202-C25			25	S204-C25	
	32	S202-C32			57	S204-C32	
40	S202-C40	61	S204-C40	125			
50	S202-C50	66	S204-C50	144			
63	S202-C63	73	S204-C63	160			

### Tripping characteristic C

UL 1077  
480Y/277 VAC  
6 kA

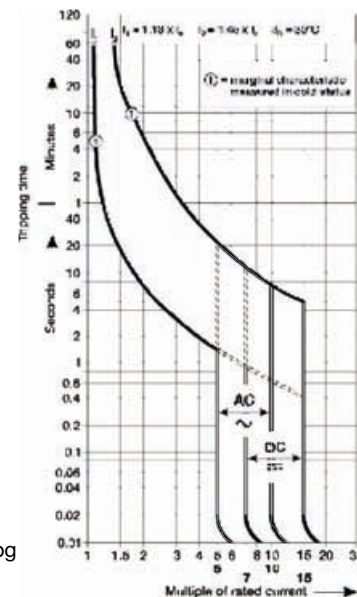
#### Resistive loads

- C Curve
- Designed for use with medium magnetic start up currents
- Example: lighting, control panels

#### Accessories & technical data

Accessories – See page 15.26

Technical data – See page 15.76 - 15.82



Note: Switching neutral is noted by "NA" in the catalog number.

# S200-D, 480Y/277 VAC

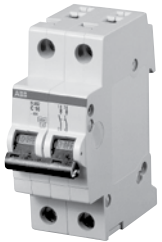
## Supplemental protectors

### UL 1077, CSA 22.2, No. 235

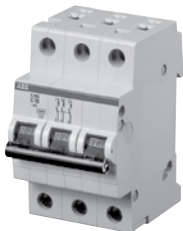
# D



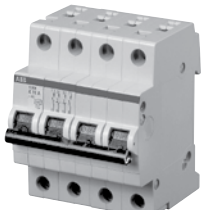
S201-D



S202-D



S203-D



S204-D



S201-DNA



S203-DNA

No. of poles	Rated current	Catalog number	List price	No. of poles	Rated current	Catalog number	List price		
1	0.5	S201-D0.5	\$ 27	3	0.5	S203-D0.5	\$ 98		
	1	S201-D1			1	S203-D1			
	1.6	S201-D1.6			1.6	S203-D1.6			
	2	S201-D2			2	S203-D2			
	3	S201-D3			3	S203-D3			
	4	S201-D4			4	S203-D4			
	6	S201-D6			6	S203-D6			
	8	S201-D8			8	S203-D8			
	10	S201-D10			10	S203-D10			
	13	S201-D13			13	S203-D13			
	16	S201-D16			16	S203-D16			
	20	S201-D20			20	S203-D20			
	25	S201-D25			25	S203-D25			
	32	S201-D32			29	32		S203-D32	98
	40	S201-D40			34	40		S203-D40	105
50	S201-D50	38	50	S203-D50	114				
63	S201-D63	50	63	S203-D63	130				
1 + NA	0.5	S201-D0.5NA	57	3 + NA	0.5	S203-D0.5NA	139		
	1	S201-D1NA			1	S203-D1NA			
	1.6	S201-D1.6NA			1.6	S203-D1.6NA			
	2	S201-D2NA			2	S203-D2NA			
	3	S201-D3NA			3	S203-D3NA			
	4	S201-D4NA			4	S203-D4NA			
	6	S201-D6NA			6	S203-D6NA			
	8	S201-D8NA			8	S203-D8NA			
	10	S201-D10NA			10	S203-D10NA			
	13	S201-D13NA			13	S203-D13NA			
	16	S201-D16NA			16	S203-D16NA			
	20	S201-D20NA			20	S203-D20NA			
	25	S201-D25NA			25	S203-D25NA			
	32	S201-D32NA			61	32		S203-D32NA	139
	40	S201-D40NA			66	40		S203-D40NA	139
50	S201-D50NA	70	50	S203-D50NA	145				
63	S201-D63NA	77	63	S203-D63NA	155				
2	0.5	S202-D0.5	64	4	0.5	S204-D0.5	158		
	1	S202-D1			1	S204-D1			
	1.6	S202-D1.6			1.6	S204-D1.6			
	2	S202-D2			2	S204-D2			
	3	S202-D3			3	S204-D3			
	4	S202-D4			4	S204-D4			
	6	S202-D6			6	S204-D6			
	8	S202-D8			8	S204-D8			
	10	S202-D10			10	S204-D10			
	13	S202-D13			13	S204-D13			
	16	S202-D16			16	S204-D16			
	20	S202-D20			20	S204-D20			
	25	S202-D25			25	S204-D25			
	32	S202-D32			70	32		S204-D32	155
	40	S202-D40			105	40		S204-D40	168
50	S202-D50	114	50	S204-D50	178				
63	S202-D63	130	63	S204-D63	188				

### Tripping characteristic D

UL 1077  
480Y/277 VAC  
6 kA

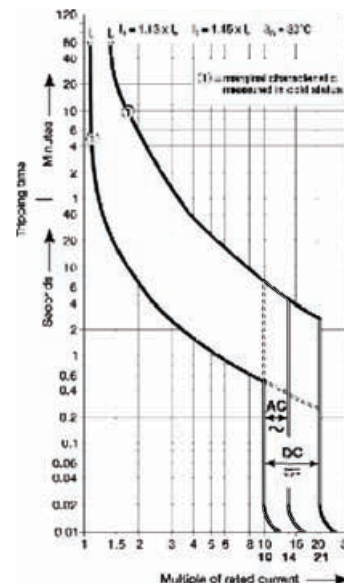
### Inductive loads

- D Curve
- Designed for allowing higher in-rush currents during system start up
- Example: motors, transformers

### Accessories & technical data

Accessories – See page 15.26

Technical data – See page 15.76 - 15.82



Note: Switching neutral is noted by "NA" in the catalog number.

# S200-K, 480Y/277 VAC

## Supplemental protectors

### UL 1077, CSA 22.2, No. 235

Miniature  
circuit breakers

# K



S201-K



S202-K



S203-K



S204-K



S201-KNA



S203-KNA

No. of poles	Rated current	Catalog number	List price	No. of poles	Rated current	Catalog number	List price		
1	0.5	S201-K0.5	\$ 27	3	0.5	S203-K0.5	\$ 96		
	1	S201-K1			1	S203-K1			
	1.6	S201-K1.6			1.6	S203-K1.6			
	2	S201-K2			2	S203-K2			
	3	S201-K3			3	S203-K3			
	4	S201-K4			4	S203-K4			
	5	S201-K5			5	S203-K5			
	6	S201-K6			6	S203-K6			
	8	S201-K8			8	S203-K8			
	10	S201-K10			10	S203-K10			
	13	S201-K13			13	S203-K13			
	15	S201-K15			15	S203-K15			
	16	S201-K16			16	S203-K16			
	20	S201-K20			20	S203-K20			
	25	S201-K25			25	S203-K25			
	30	S201-K30			30	S203-K30			
1 + NA	32	S201-K32	32	32	S203-K32	107			
	40	S201-K40	36	40	S203-K40	109			
	50	S201-K50	41	50	S203-K50	125			
	60	S201-K60	45	60	S203-K60	137			
	63	S201-K63	50	63	S203-K63	144			
	1 + NA	0.5	S201-K0.5NA	59	3 + NA	0.5	S203-K0.5NA	139	
		1	S201-K1NA			1	S203-K1NA		
		1.6	S201-K1.6NA			1.6	S203-K1.6NA		
2		S201-K2NA	2			S203-K2NA			
3		S201-K3NA	3			S203-K3NA			
4		S201-K4NA	4			S203-K4NA			
6		S201-K6NA	6			S203-K6NA			
8		S201-K8NA	8			S203-K8NA			
10		S201-K10NA	10			S203-K10NA			
13		S201-K13NA	13			S203-K13NA			
16		S201-K16NA	16			S203-K16NA			
20		S201-K20NA	20			S203-K20NA			
25		S201-K25NA	25			S203-K25NA			
32		S201-K32NA	62			32	S203-K32NA		144
40		S201-K40NA	68			40	S203-K40NA		150
50		S201-K50NA	77			50	S203-K50NA		169
63	S201-K63NA	88	63	S203-K63NA	178				
2	0.5	S202-K0.5	61	4	0.5	S204-K0.5	132		
	1	S202-K1			1	S204-K1			
	1.6	S202-K1.6			1.6	S204-K1.6			
	2	S202-K2			2	S204-K2			
	3	S202-K3			3	S204-K3			
	4	S202-K4			4	S204-K4			
	5	S202-K5			5	S204-K5			
	6	S202-K6			6	S204-K6			
	8	S202-K8			8	S204-K8			
	10	S202-K10			10	S204-K10			
	13	S202-K13			13	S204-K13			
	15	S202-K15			15	S204-K15			
	16	S202-K16			16	S204-K16			
	20	S202-K20			20	S204-K20			
	25	S202-K25			25	S204-K25			
	30	S202-K30			30	S204-K30			
2	32	S202-K32	70	32	S204-K32	137			
	40	S202-K40	73	40	S204-K40	146			
	50	S202-K50	80	50	S204-K50	155			
	60	S202-K60	98	60	S204-K60	165			
	63	S202-K63	102	63	S204-K63	171			

### Tripping characteristic K

UL 1077  
480Y/277 VAC  
6 kA

### Inductive loads

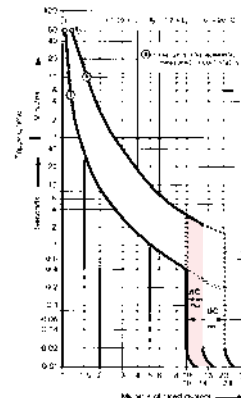
- K Curve
- Designed for allowing higher in-rush currents during system start up
- Example: motors, transformers

### Accessories & technical data

Accessories – See page 15.26

Technical data – See page 15.76 - 15.82

Note: Switching neutral is noted by “NA” in the catalog number.



## S200P-K, 480Y/277 VAC

### Supplemental protectors

### UL 1077, CSA 22.2, No. 235

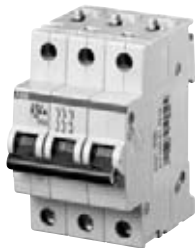
# K



S201P-K



S202P-K



S203P-K

No. of poles	Rated current	Catalog number	List price	No. of poles	Rated current	Catalog number	List price
1	0.2	S201P-K0.2	\$ 54	3	0.2	S203P-K0.2	\$ 146
	0.3	S201P-K0.3			0.3	S203P-K0.3	
	0.5	S201P-K0.5			0.5	S203P-K0.5	
	0.75	S201P-K0.75			0.75	S203P-K0.75	
	1	S201P-K1			1	S203P-K1	
	1.6	S201P-K1.6			1.6	S203P-K1,6	
	2	S201P-K2			2	S203P-K2	
	3	S201P-K3			3	S203P-K3	
	4	S201P-K4			4	S203P-K4	
	6	S201P-K6			6	S203P-K6	
	8	S201P-K8			8	S203P-K8	
	10	S201P-K10			10	S203P-K10	
	13	S201P-K13			13	S203P-K13	
	16	S201P-K16			16	S203P-K16	
20	S201P-K20	20	S203P-K20				
25	S201P-K25	25	S203P-K25				
32	S201P-K32	32	S203P-K32				
	40	S201P-K40	45		40	S203P-K40	157
	50	S201P-K50	54		50	S203P-K50	180
	63	S201P-K63	64		63	S203P-K63	205
2	0.2	S202P-K0.2	96		0.2	S203P-K0.2	
	0.3	S202P-K0.3			0.3	S203P-K0.3	
	0.5	S202P-K0.5			0.5	S203P-K0.5	
	0.75	S202P-K0.75			0.75	S203P-K0.75	
	1	S202P-K1			1	S203P-K1	
	1.6	S202P-K1,6			1.6	S203P-K1,6	
	2	S202P-K2			2	S203P-K2	
	3	S202P-K3			3	S203P-K3	
	4	S202P-K4			4	S203P-K4	
	6	S202P-K6			6	S203P-K6	
	8	S202P-K8			8	S203P-K8	
	10	S202P-K10			10	S203P-K10	
	13	S202P-K13			13	S203P-K13	
	16	S202P-K16			16	S203P-K16	
20	S202P-K20	20	S203P-K20				
25	S202P-K25	25	S203P-K25				
	32	S202P-K32	100				
	40	S202P-K40	107				
	50	S202P-K50	114				
	63	S202P-K63	130				

#### Tripping characteristic K

UL 1077  
480Y/277 VAC  
10 kA

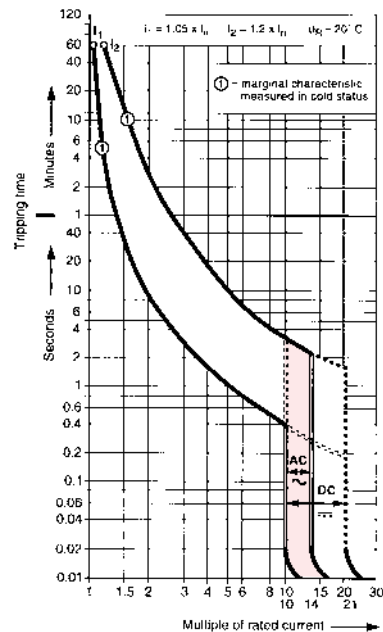
#### Inductive loads

- K Curve
- Designed for allowing higher in-rush currents during system start up
- Example: motors, transformers

#### Accessories & technical data

Accessories – See page 15.26

Technical data – See page 15.76 - 15.82



# S200P-Z, 480Y/277 VAC

## Supplemental protectors

### UL 1077, CSA 22.2, No. 235

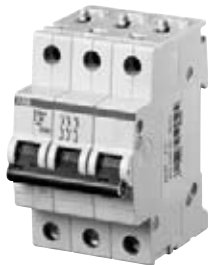
# Z



S201P-Z



S202P-Z



S203P-Z

No. of poles	Rated current	Catalog number	List price	No. of poles	Rated current	Catalog number	List price		
1	0.5	S201P-Z0.5	\$ 54	3	0.5	S203P-Z0.5	\$ 187		
	1	S201P-Z1			1	S203P-Z1			
	1.6	S201P-Z1.6			1.6	S203P-Z1.6			
	2	S201P-Z2			2	S203P-Z2			
	3	S201P-Z3			3	S203P-Z3			
	4	S201P-Z4			4	S203P-Z4			
	6	S201P-Z6			6	S203P-Z6			
	8	S201P-Z8			8	S203P-Z8			
	10	S201P-Z10			10	S203P-Z10			
	16	S201P-Z16			16	S203P-Z16			
	20	S201P-Z20			20	S203P-Z20			
	25	S201P-Z25			25	S203P-Z25			
	32	S201P-Z32			57	32		S203P-Z32	192
	40	S201P-Z40			61	40		S203P-Z40	196
50	S201P-Z50	70	50	S203P-Z50	214				
63	S201P-Z63	80	63	S203P-Z63	228				
2	0.5	S202P-Z0.5	102						
	1	S202P-Z1							
	1.6	S202P-Z1.6							
	2	S202P-Z2							
	3	S202P-Z3							
	4	S202P-Z4							
	6	S202P-Z6							
	8	S202P-Z8							
	10	S202P-Z10							
	16	S202P-Z16							
	20	S202P-Z20							
	25	S202P-Z25							
	32	S202P-Z32		109					
	40	S202P-Z40		114					
50	S202P-Z50	125							
63	S202P-Z63	137							

### Tripping characteristic Z

UL 1077  
480Y/277 VAC  
10 kA

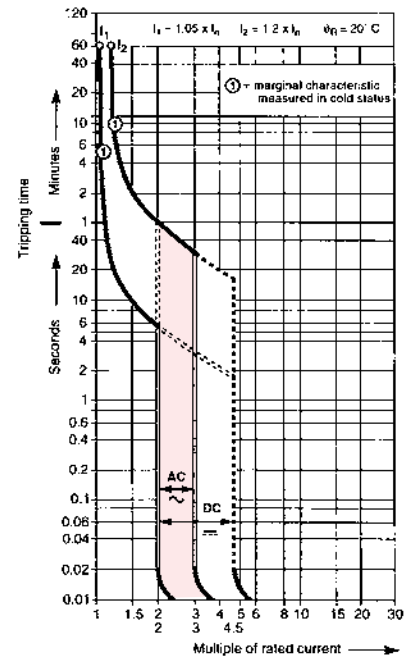
#### Resistive loads

- Z Curve
- Designed to provide maximum protection with a very low short circuit trip setting
- Example: semiconductors

#### Accessories & technical data

Accessories – See page 15.26

Technical data – See page 15.76 - 15.82



## S280W-K 480Y/277 VAC

Supplemental protectors, ring tongue  
UL 1077, CSA 22.2, No. 235

# K



S281-KW



S282-KW

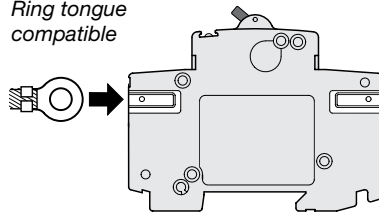


S283-KW

No. of poles	Rated current	Catalog number	List price	No. of poles	Rated current	Catalog number	List price
1	0.2	S281-K0.2W	\$ 50	3	0.2	S283-K0.2W	\$ 215
	0.3	S281-K0.3W			0.3	S283-K0.3W	
	0.5	S281-K0.5W			0.5	S283-K0.5W	
	0.75	S281-K0.75W			0.75	S283-K0.75W	
	1	S281-K1W			1	S283-K1W	
	1.6	S281-K1.6W			1.6	S283-K1.6W	
	2	S281-K2W			2	S283-K2W	
	3	S281-K3W			3	S283-K3W	
	4	S281-K4W			4	S283-K4W	
	6	S281-K6W			6	S283-K6W	
	8	S281-K8W			8	S283-K8W	
	10	S281-K10W			10	S283-K10W	
	13	S281-K13W			13	S283-K13W	
	16	S281-K16W			16	S283-K16W	
	20	S281-K20W			20	S283-K20W	
25	S281-K25W	25	S283-K25W				
2	32	S281-K32W	50	32	S283-K32W	215	
	40	S281-K40W	60	40	S283-K40W	240	
	50	S281-K50W	70	50	S283-K50W	270	
	63	S281-K63W	80	63	S283-K63W	300	
	0.2	S282-K0.2W	145	0.2	S282-K0.2W		
	0.3	S282-K0.3W		0.3	S282-K0.3W		
0.5	S282-K0.5W	0.5		S282-K0.5W			
0.75	S282-K0.75W	0.75		S282-K0.75W			
1	S282-K1W	1		S282-K1W			
1.6	S282-K1.6W	1.6		S282-K1.6W			
2	S282-K2W	2		S282-K2W			
3	S282-K3W	3		S282-K3W			
4	S282-K4W	4		S282-K4W			
6	S282-K6W	6		S282-K6W			
8	S282-K8W	8		S282-K8W			
10	S282-K10W	10		S282-K10W			
13	S282-K13W	13		S282-K13W			
16	S282-K16W	16		S282-K16W			
20	S282-K20W	20		S282-K20W			
25	S282-K25W	25	S282-K25W				
2	32	S282-K32W	150	32	S282-K32W	150	
	40	S282-K40W	160	40	S282-K40W	160	
	50	S282-K50W	170	50	S282-K50W	170	
	63	S282-K63W	190	63	S282-K63W	190	

### Tripping characteristic K

Ring tongue  
compatible



UL 1077  
480Y/277 VAC  
10 kA

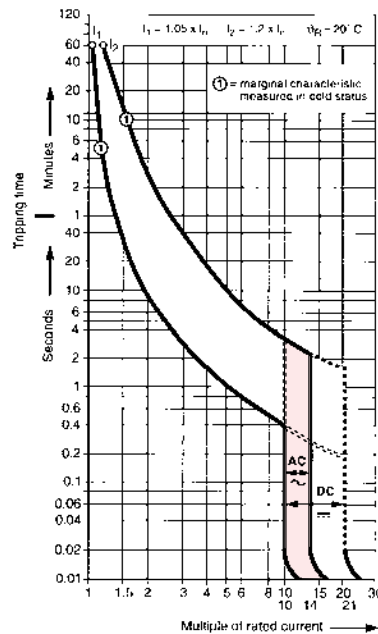
#### Inductive loads

- K Curve
- Designed for allowing higher in-rush currents during system start up
- Example: motors, transformers

#### Accessories & technical data

Accessories – See page 15.26

Technical data – See page 15.76 - 15.82



# S280UC-K, 500 VDC

## Supplemental protectors

### UL 1077, CSA 22.2, No. 235

# K



S281UC-K



S282UC-K



S283UC-K

No. of poles	Rated current	Catalog number	List price	No. of poles	Rated current	Catalog number	List price
1	0,2	S281UC-K0.2	\$ 115	3	0,2	S283UC-K0.2	\$ 420
	0,3	S281UC-K0.3			0,3	S283UC-K0.3	
	0,5	S281UC-K0.5			0,5	S283UC-K0.5	
	0,75	S281UC-K0.75			0,75	S283UC-K0.75	
	1	S281UC-K1			1	S283UC-K1	
	1,6	S281UC-K1.6			1,6	S283UC-K1.6	
	2	S281UC-K2			2	S283UC-K2	
	3	S281UC-K3			3	S283UC-K3	
	4	S281UC-K4			4	S283UC-K4	
	6	S281UC-K6			6	S283UC-K6	
	8	S281UC-K8			8	S283UC-K8	
	10	S281UC-K10			10	S283UC-K10	
	16	S281UC-K16			16	S283UC-K16	
	20	S281UC-K20			20	S283UC-K20	
25	S281UC-K25	25	S283UC-K25				
2	32	S281UC-K32	115	3	32	S283UC-K32	450
	40	S281UC-K40	150		40	S283UC-K40	500
	50	S281UC-K50	150		50	S283UC-K50	520
	63	S281UC-K63	170		63	S283UC-K63	600
	0,2	S282UC-K0.2	270		0,2	S282UC-K0.2	290
	0,3	S282UC-K0.3			0,3	S282UC-K0.3	
	0,5	S282UC-K0.5			0,5	S282UC-K0.5	
	0,75	S282UC-K0.75			0,75	S282UC-K0.75	
	1	S282UC-K1			1	S282UC-K1	
	1,6	S282UC-K1.6			1,6	S282UC-K1.6	
2	S282UC-K2	2		S282UC-K2			
3	S282UC-K3	3		S282UC-K3			
4	S282UC-K4	4		S282UC-K4			
6	S282UC-K6	6		S282UC-K6			
8	S282UC-K8	8		S282UC-K8			
10	S282UC-K10	10		S282UC-K10			
16	S282UC-K16	16		S282UC-K16			
20	S282UC-K20	20		S282UC-K20			
25	S282UC-K25	25	S282UC-K25				
32	S282UC-K32	290	32	S282UC-K32	300		
40	S282UC-K40	300	40	S282UC-K40	350		
50	S282UC-K50	350	50	S282UC-K50	390		
63	S282UC-K63	390	63	S282UC-K63			

### Tripping characteristic K

UL 1077  
250/500 VDC  
10 kA

#### Inductive loads

- K Curve
- Designed for allowing higher in-rush currents during system start up
- Example: motors, transformer

#### Accessories & technical data

Accessories – See page 15.26

Technical data – See page 15.76 - 15.82

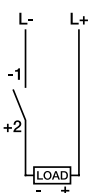
#### Direct current applications

The S280UC differs from standard miniature circuit breakers in that the UC versions include a permanent magnet which aids in the extinguishing of the arc during medium and high level faults. It is necessary to observe the correct polarity and current direction when connecting the UC breakers. Two examples of correct connection are shown.

Termination points are marked on all UC type MCBs, points one (1) and four (4) are negative and points two (2) and three (3) are positive.

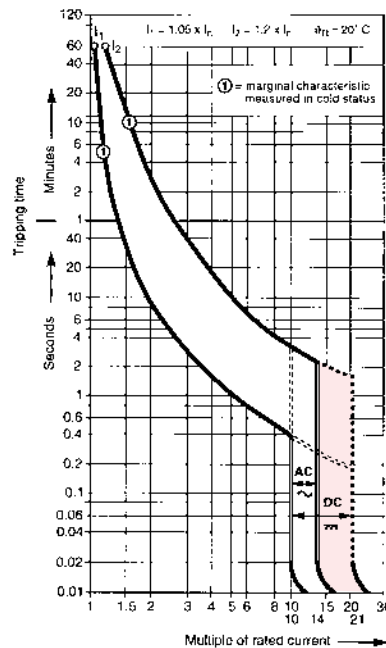
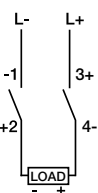
#### 250 V DC

Single Pole  
S201DC



#### 500 VDC

Two Pole  
S282UC



# S280UC-Z, 500 VDC

## Supplemental protectors

### UL 1077, CSA 22.2, No. 235

# Z



S281UC-Z



S282UC-Z



S283UC-Z

No. of poles	Rated current	Catalog number	List price	No. of poles	Rated current	Catalog number	List price		
1	0.5	S281UC-Z0.5	\$ 190	3	0.5	S283UC-Z0.5	\$ 660		
	1	S281UC-Z1			1	S283UC-Z1			
	1.6	S281UC-Z1.6			1.6	S283UC-Z1.6			
	2	S281UC-Z2			2	S283UC-Z2			
	3	S281UC-Z3			3	S283UC-Z3			
	4	S281UC-Z4			4	S283UC-Z4			
	6	S281UC-Z6			6	S283UC-Z6			
	8	S281UC-Z8			8	S283UC-Z8			
	10	S281UC-Z10			10	S283UC-Z10			
	16	S281UC-Z16			16	S283UC-Z16			
	20	S281UC-Z20			20	S283UC-Z20			
	25	S281UC-Z25			25	S283UC-Z25			
	32	S281UC-Z32			190	32		S283UC-Z32	680
	40	S281UC-Z40			210	40		S283UC-Z40	740
50	S281UC-Z50	240	50	S283UC-Z50	850				
63	S281UC-Z63	270	63	S283UC-Z63	950				
2	0.5	S282UC-Z0.5	440	3	0.5	S283UC-Z0.5	\$ 660		
	1	S282UC-Z1			1	S283UC-Z1			
	1.6	S282UC-Z1.6			1.6	S283UC-Z1.6			
	2	S282UC-Z2			2	S283UC-Z2			
	3	S282UC-Z3			3	S283UC-Z3			
	4	S282UC-Z4			4	S283UC-Z4			
	6	S282UC-Z6			6	S283UC-Z6			
	8	S282UC-Z8			8	S283UC-Z8			
	10	S282UC-Z10			10	S283UC-Z10			
	16	S282UC-Z16			16	S283UC-Z16			
	20	S282UC-Z20			20	S283UC-Z20			
	25	S282UC-Z25			25	S283UC-Z25			
	32	S282UC-Z32			460	32		S283UC-Z32	680
	40	S282UC-Z40			480	40		S283UC-Z40	740
50	S282UC-Z50	560	50	S283UC-Z50	850				
63	S282UC-Z63	620	63	S283UC-Z63	950				

### Tripping characteristic Z

UL 1077  
250/500 VDC  
10 kA

#### Resistive loads

- Z Curve
- Designed to provide maximum protection with a very low short circuit trip setting
- Example: semiconductors

#### Accessories & technical data

Accessories – See page 15.26  
Technical data – See page 15.76 - 15.82

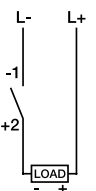
#### Direct current applications

The S280UC differs from standard miniature circuit breakers in that the UC versions include a permanent magnet which aids in the extinguishing of the arc during medium and high level faults. It is necessary to observe the correct polarity and current direction when connecting the UC breakers. Two examples of correct connection are shown.

Termination points are marked on all UC type MCBs, points one (1) and four (4) are negative and points two (2) and three (3) are positive.

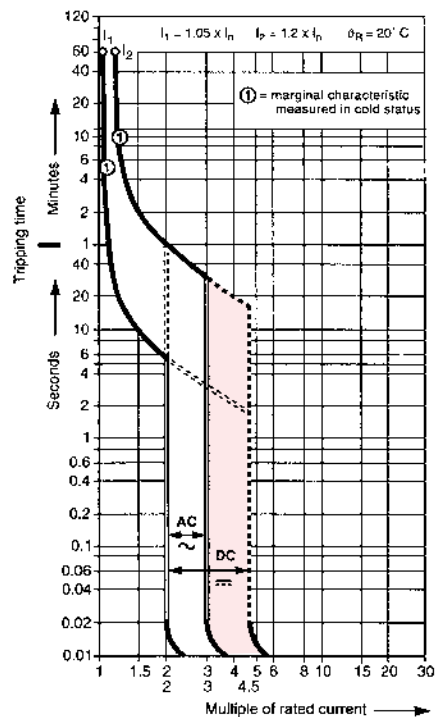
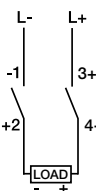
#### 250 V DC

Single Pole  
S201DC



#### 500 VDC

Two Pole  
S282UC





**S290**  
480Y/277 VAC  
UL 1077, CSA 22.2, No. 235

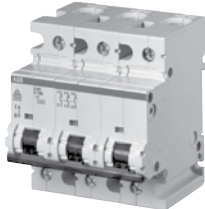
**C**



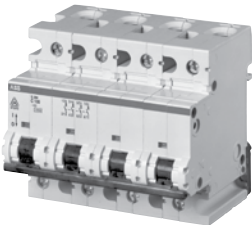
S291-C



S292-C



S293-C



S294-C

No. of poles	Rated current	Catalog number	List price
1	80	S291-C80	\$ 140
	100	S291-C100	168
	125	S291-C125	196
2	80	S292-C80	280
	100	S292-C100	336
	125	S292-C125	392
3	80	S293-C80	420
	100	S293-C100	504
	125	S293-C125	588
4	80	S294-C80	560
	100	S294-C100	672
	125	S294-C125	784

**Tripping characteristic C**

UL 1077

480Y/277 VAC  
5 kA, single pole  
14ka, multi pole

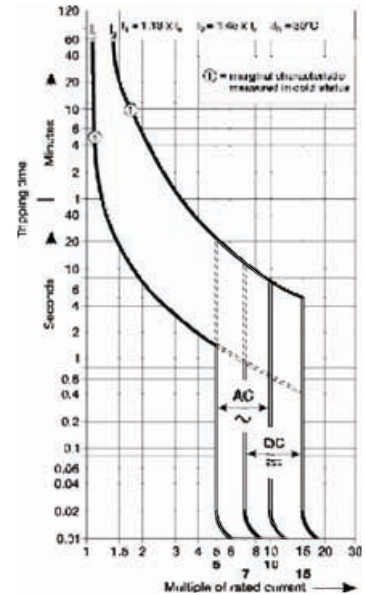
**Resistive loads**

- C Curve
- Designed for use with medium magnetic start up currents
- Example: lighting, control panels

**Accessories & technical data**

**Accessories** – See page 15.27

**Technical data** – See page 15.76 - 15.82



## Accessories

### S200 & S200P

### UL 1077, CSA 22.2, No. 235



S2C-H6R



S2C-A



S2C-UA

#### Auxiliary contacts

The auxiliary contacts will signal whether the breaker is in the ON or OFF position.

Description	Catalog number	List price
For field mounting: right side	<b>S2C-H6R</b>	<b>\$ 21</b>

#### Bell alarm

The bell alarm includes a set of contacts that will only signal when the breaker has tripped. Typically the contacts would be connected to an alarm or bell to signal the operator that an overcurrent trip has occurred. The bell alarm also includes a test button for testing the alarm contacts without opening the breaker.

Description	Catalog number	List price
For field mounting: right side	<b>S2C-S/H6R</b> ①	<b>\$ 48</b>

#### Shunt trip

For remote tripping of breaker, a shunt trip device can be added to the MCB. The solenoid device opens the breaker after control voltage is applied.

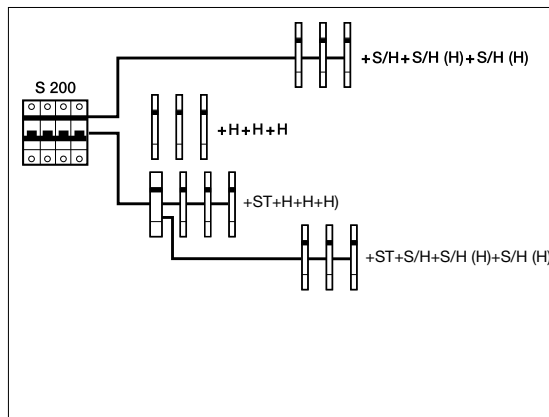
Description	Catalog number	List price
For field mounting: right side		
A1-12-60 VAC (12 – 60 VDC)	<b>S2C-A1</b>	<b>\$ 75</b>
A2-110-415 VAC (110 – 250 VDC)	<b>S2C-A2</b>	<b>70</b>

#### Undervoltage release

When control voltage drops below approximately 50 % of rated voltage, the UVR opens the breaker. The breaker can not be operated unless proper control voltage is first applied to the UVR coil.

Description	Catalog number	List price
For field mounting: right side		
12 VDC	<b>S2C-UA 12</b>	<b>\$ 216</b>
24 VAC/VDC	<b>S2C-UA 24</b>	<b>216</b>
48 VAC/VDC	<b>S2C-UA 48</b>	<b>216</b>
110 VAC/VDC	<b>S2C-UA 110</b>	<b>216</b>
220 VAC/VDC	<b>S2C-UA 230</b>	<b>216</b>
380 VAC	<b>S2C-UA 400</b>	<b>216</b>

#### Possible mounting arrangements of MCB accessories



Legend	
Auxiliary contact	H
Bell alarm/Auxiliary contact	S/H
Bell alarm/Auxiliary contact used as auxiliary contact	S/H (H)
Shunt trip	ST
Undervoltage release	UR

① Combination bell alarm/auxiliary contact.

## Accessories

S290

UL 1077, CSA 22.2, No. 235

Miniature  
circuit breakers



S290-H11

### Auxiliary contacts

The auxiliary contacts will signal whether the breaker is in the ON or OFF position.

Description	Catalog number	List price
Auxiliary contact	<b>S290-H11</b>	<b>\$ 72</b>

### Bell alarm

The bell alarm includes a set of contacts that will only signal when the breaker has tripped.

Typically the contacts would be connected to an alarm or bell to signal the operator that an overcurrent trip has occurred. The bell alarm also includes a test button for testing the alarm contacts without opening the breaker.

Description	Catalog number	List price
Signal contact	<b>S290-S</b>	<b>\$ 112</b>

### Shunt trip

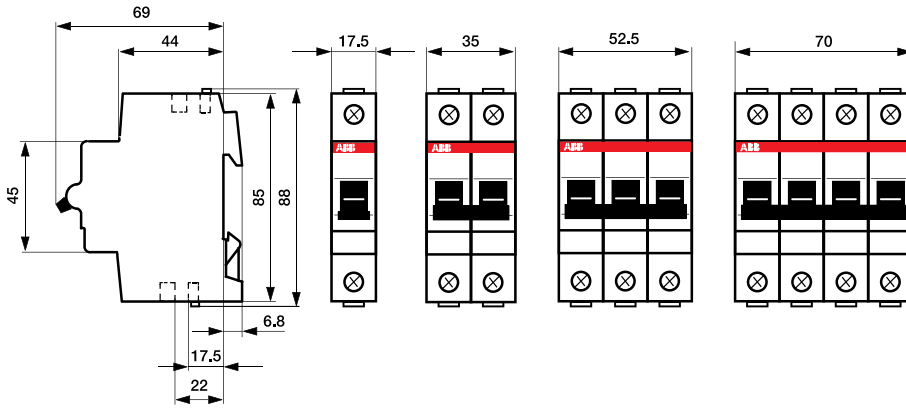
For remote tripping of breaker, a shunt trip device can be added to the MCB. The solenoid device opens the breaker after control voltage is applied.

Description	Catalog number	List price
For field mounting, left side 110V – 415VAC	<b>S290-A1</b>	<b>\$ 43</b>
For field mounting, left side 24 – 48VDC	<b>S290-A2</b>	<b>67</b>

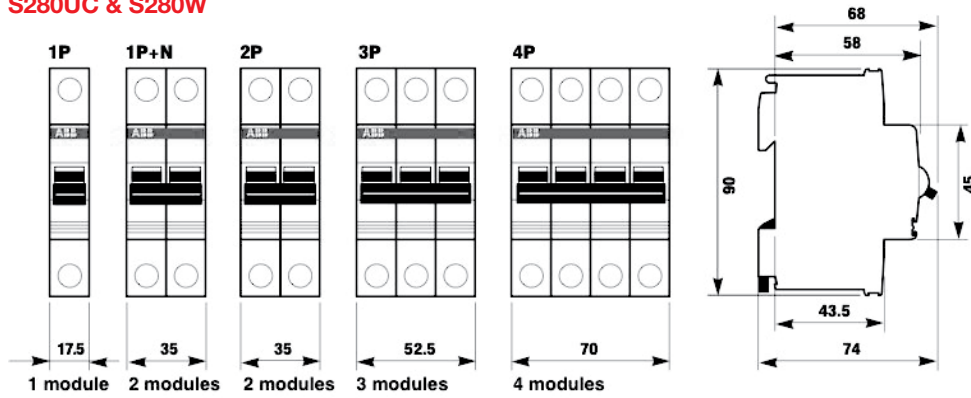
## Approximate dimensions

S200, S200P, S280UC, S280W, S290  
UL 1077, CSA 22.2, No. 235

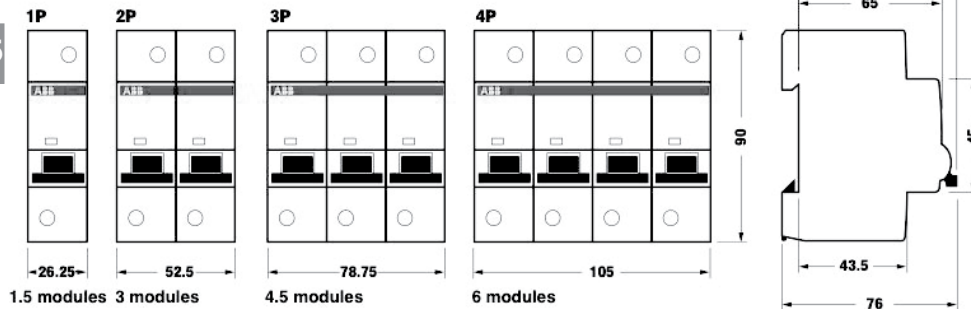
### S200, S200P



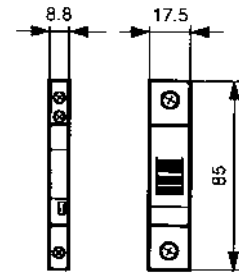
### S280UC & S280W



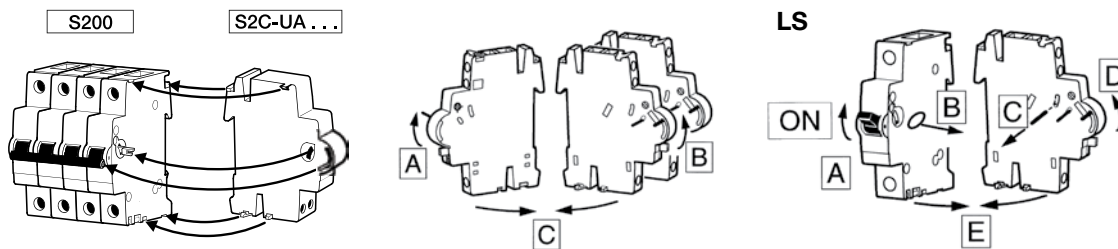
### S290



### S2C-H6R, S2C-A... S2C



### Addition of S2C-A...U

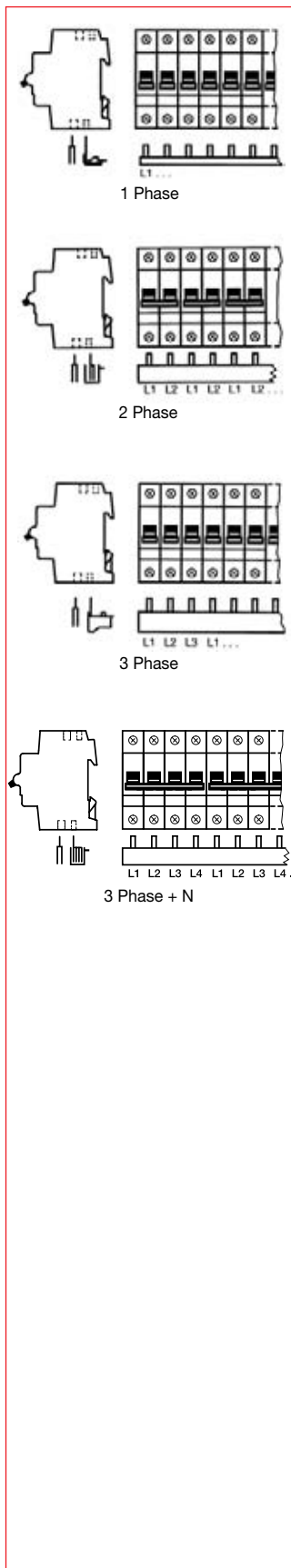


# Accessories

## S200 & S200P

### UL 1077, CSA 22.2, No. 235

Miniature  
circuit breakers



#### 1 Phase

For use on:	Amp rating	Number of poles	Phases	Busbar length (mm)	End cap catalog number	Catalog number	List price
S200	63	60	1	986	-	<b>PS1/60</b>	<b>\$ 51</b>
S200 P	80	60	1	986	-	<b>PS1/60/16</b>	<b>51</b>

#### 2 Phase

For use on:	Amp rating	Number of poles	Phases	Busbar length (mm)	End cap catalog number	Catalog number	List price
S200	63	58	2	1035	PS-END	<b>PS2/58SP</b>	<b>\$ 100</b>
S200 P	80	58	2	1035	PS-END	<b>PS2/58/16SP</b>	<b>119</b>

#### 3 Phase

For use on:	Amp rating	Number of poles	Phases	Busbar length (mm)	End cap catalog number	Catalog number	List price
S200	63	60	3	1065	PSB-ENDSP	<b>PS3/60SP</b>	<b>\$ 135</b>
S200 P	80	60	3	1065	PSB-ENDSP	<b>PS3/60/16SP</b>	<b>180</b>

#### 4 Phase

For use on:	Amp rating	Number of poles	Phases	Busbar length (mm)	End cap catalog number	Catalog number	List price
S200	80	60	4	1056	PS-END1	<b>PS4/60/16SP</b>	<b>\$ 210</b>
S200 P	80	60	4	1056	PS-END1	<b>PS4/60/16SP</b>	<b>210</b>

#### NOTE

ALL BUSBARS MAY BE CENTER FED IN ORDER TO INCREASE AMPACITY UP TO 130 A.

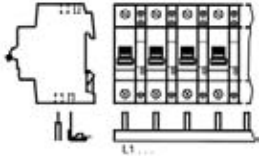
#### NOTE

BUSBARS MAY BE USED ON LINE OR LOAD SIDE OF MCBS

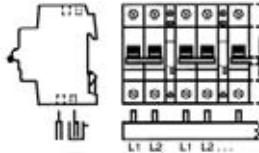
## Accessories

### S200 & S200P

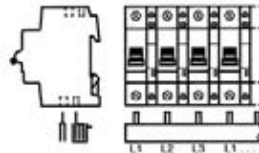
### UL 1077, CSA 22.2, No. 235



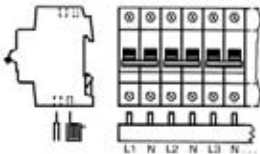
1 Phase + Aux



2 Phase + Aux



3 Phase + Aux



3 Phase + N



SZ-BSK

#### 1 Phase with 1 auxiliary

For use on:	Amp rating	Number of poles	Phases	Busbar length (mm)	End cap catalog number	Catalog number	List price
S200 & S200 P	63	38	1	1044	-	<b>PS1/38H</b>	<b>\$ 45</b>
	80	38	1	1044	-	<b>PS1/38/16H</b>	<b>51</b>

#### 2 Phase with 1 auxiliary

For use on:	Amp rating	Number of poles	Phases	Busbar length (mm)	End cap catalog number	Catalog number	List price
S200 & S200 P	80	48	2	1065	PS-ENDSP	<b>PS2/48/16SP</b>	<b>\$ 168</b>

#### 3 Phase with 1 auxiliary

For use on:	Amp rating	Number of poles	Phases	Busbar length (mm)	End cap catalog number	Catalog number	List price
S200 & S200 P	80	39	3	980	PS-ENDSP	<b>PS3/39/16SP</b>	<b>\$ 127</b>

#### 3 Phase + N, for use with 2 pole-MCBs on 3 phase/4W system

For use on:	Amp rating	Number of poles	Phases	Busbar length (mm)	End cap catalog number	Catalog number	List price
S200 & S200 P	80	58	4	1048	PS-END1SP	<b>PS4/58/16NSP</b>	<b>\$ 255</b>

#### NOTE

ALL BUSBARS MAY BE CENTER FED IN ORDER TO INCREASE AMPACITY UP TO 130 A.

#### NOTE

BUSBARS MAY BE USED ON LINE OR LOAD SIDE OF MCBS

#### Busbar tooth covers

Description	Catalog number	List price
Covers five unused poles of busbar	<b>SZ-BSK</b>	<b>\$ 4</b>

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## Notes

Miniature  
circuit breakers

## Technical data

### S200, S200P & S290

### UL 1077, CSA 22.2, No. 235

Technical data	S200	S200P	S290
Specifications:	UL 1077, CSA C 22.2, VDE 0660, 60898, 60947-2		UL 1077, IEC 898
UL File-Number:	E 76126 UL CL		
No. of poles:	1, 2, 3 & 4		1, 2, 3 & 4
Tripping characteristics:	B,C,D, K & Z	K & Z	C
Rated current:	0.5-63 A	0.2-63 A	80-125 A
Rated voltage:	Multi pole: 480Y/277 VAC		277Y/480 VAC
Short circuit capacity:	S200 6kA; S200P 10 kA		Single pole 5 kA; Multi-pole 14 kA
Frequency:	50/60 Hz		50/60 Hz
Degree of protection:	IP 20		IP 20
Mounting position:	Vertical, horizontal		Vertical, horizontal
Fixing:	35mm DIN rail		35mm DIN rail
Clamps only for Cu:	18-4 AWG		14-1/0 AWG
Service life, mech. and at rated load:	20,000 operations		10,000 operations
Tightening torque:	25 in. lbs (2.8 Nm)		35 in. lbs
Ambient temperature:	- 25°C ... - 13°F / 70°C ... 158°F		-25°C... -13°F / 45°C... 113
Shock resistance:	30 g at least 3 impacts, shock duration of 11 ms		5g min. of 2 impacts, shock duration of 11 ms

#### Auxiliary contact S2C-H6R and Signal contact S2C-S6R for S200 and S200P

Rated current:	10
Rated voltage AC / DC:	24
Contact:	1 pole, single throw
Connection capacity mm <sup>2</sup>	18 – 14 AWG (0.75...2.5)
Tightening torque:	11 in. lbs (1.2 Nm)
Shock resistance acc. to DIN IEC 68-2-6:	5 g, 20 frequency cycles 5...150...5 Hz at 24 VAC/DC, 5 mA auto-reclosing < 10 ms
Mechanical service life:	10,000 operations

#### Shunt trip

		S2C-A1	S2C-A2
Rated voltage	AC	12 ... 60 V	110 ... 415 V
	DC	12 ... 60 V	110 ... 250 V
Max. release duration		< 10 ms	< 10 ms
Min. release voltage	AC	7 V	55 V
	DC	10 V	80 V
Consumption on release	AD	40 ... 200 VA	55 ... 210 VA
	DC	40 ... 200 VA	55 ... 110 VA
Coil resistance		3.7 Ω	225 Ω
Terminals		18...6/0.75 – 16 AWG/mm <sup>2</sup>	18...6/0.75 – 16 AWG/mm <sup>2</sup>
Tightening torque		18/2 in.lbs/Nm	18/2 in.lbs/Nm

#### Undervoltage release

		S2C-UA 12 DC	S2C-UA 24 AC	S2C-UA 24 DC	S2C-UA 48 AC	S2C-UA 48 DC	S2C-UA 110 AC	S2C-UA 110 DC	S2C-UA 230 AC	S2C-UA 230 DC	S2C-UA 400 AC
Standards		IEC/EN 60947-1									
Rated voltage	AC	12 V	24 V	24 V	48 V	48 V	110 V	110 V	230 V	230 V	400 V
	DC										
Frequency		50 ... 60 Hz									
Release trip		0.35 UnOVO 0.7 Un V									
Terminals		2 x 16/2 x 1.5 AWG/mm <sup>2</sup>									
Consumption		0.2 VA	3.6 VA	2 VA	3.6 VA	2.1 VA	3.5 VA	2.2 VA	3.7 VA	2.3 VA	2.4 VA
Resistance to corrosion		constant atmosphere: 23/83 – 40/93 – 55/20; variable atmosphere: 25/95 – 40/93 °C/RH									
Protection degree		IPXXB/IP2X									
Tightening torque		3.5/0.4 in.lbs/Nm									



# Technical data

## S200 & S200P

### UL 1077, CSA 22.2, No. 235

Miniature  
circuit breakers

#### Internal resistance and power loss

Internal resistance per pole in mΩ, power loss per pole in W

Type	Rated current	Device series B, C, D <sup>①</sup>		Device series K		Device series Z	
		A	mΩ	W	mΩ	W	mΩ
S200 & S200P	0.5	5500	1.4	6340	1.6	10100	2.5
	1	1440	1.4	1550	1.6	2270	2.3
	1.6	630	1.6	695	1.8	1100	2.8
	2	460	1.8	460	1.9	619	2.5
	3	150	1.3	165	1.5	202	1.8
	4	110	1.8	120	2.0	149	2.4
	6	55	2.0	52	1.9	104	3.7
	8	15	1.0	38	2.5	53.9	3.45
	10	13.3	1.3	12.6	1.26	17.5	1.7
	13	13.3	2.3	12.6	1.26	-	-
	16	7.0	1.8	7.7	2.0	10.9	2.8
	20	6.25	2.5	6.7	2.7	6.0	2.4
	25	5.0	3.2	4.6	2.9	4.1	2.6
32	3.6	3.7	3.5	3.6	2.8	2.9	
40	3.0	4.8	2.8	4.5	2.5	4.1	
50	1.3	3.25	1.25	2.9	1.8	4.4	
63	1.2	4.8	0.7	5.2	1.3	5.2	

① Current intensities 0.5 - 4 apply exclusively to C-type trip characteristics

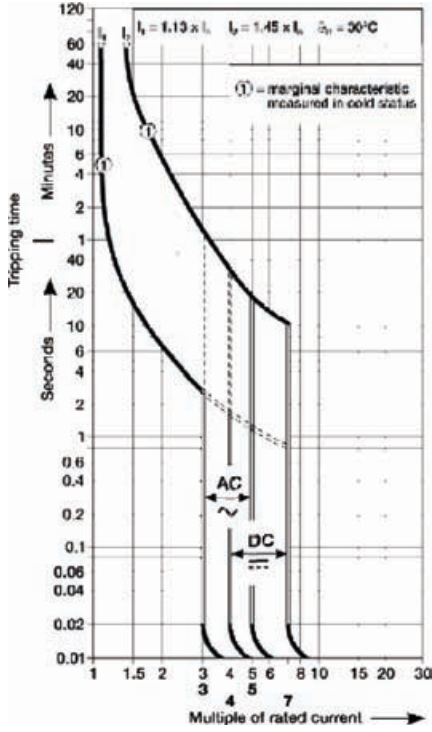
#### Temperature derating

Max operating current depending on the ambient temperature of a circuit breaker characteristics type B, C and D

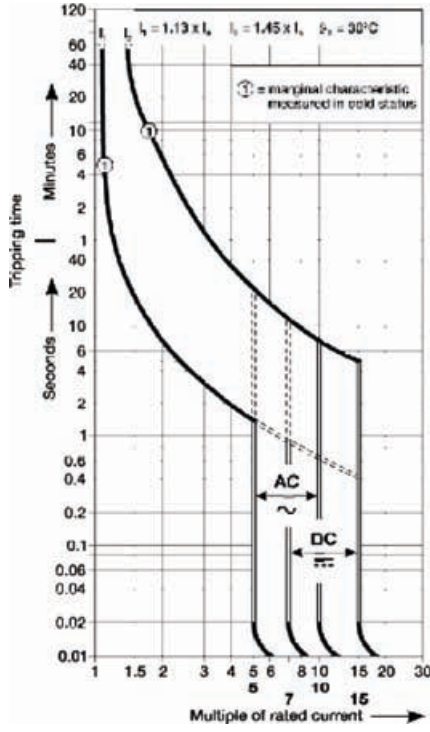
B,C & D	Ambient Temperatures T (C°/F°)											
	-40/-40	-30/-22	-20/-4	-10/14	0/32	10/50	20/68	30/86	40/104	50/122	60/140	70/158
Amps	0.67	0.65	0.62	0.60	0.58	0.55	0.53	0.50	0.47	0.44	0.41	0.37
	1.33	1.29	1.25	1.20	1.15	1.11	1.05	1.00	0.94	0.88	0.82	0.75
	2.13	2.07	2.00	1.92	1.85	1.77	1.69	1.60	1.51	1.41	1.31	1.19
	2.67	2.58	2.49	2.40	2.31	2.21	2.11	2.00	1.89	1.76	1.63	1.49
	4.0	3.9	3.7	3.6	3.5	3.3	3.2	3.0	2.8	2.6	2.4	2.2
	5.3	5.2	5.0	4.8	4.6	4.4	4.2	4.0	3.8	3.5	3.3	3.0
	8.0	7.7	7.5	7.2	6.9	6.6	6.3	6.0	5.7	5.3	4.9	4.5
	10.7	10.3	10.0	9.6	9.2	8.8	8.4	8.0	7.5	7.1	6.5	6.0
	13.3	12.9	12.5	12.0	11.5	11.1	10.5	10.0	9.4	8.8	8.2	7.5
	17.3	16.8	16.2	15.6	15.0	14.4	13.7	13.0	12.3	11.5	10.6	9.7
	21.3	20.7	20.0	19.2	18.5	17.7	16.9	16.0	15.1	14.1	13.1	11.9
	26.7	25.8	24.9	24.0	23.1	22.1	21.1	20.0	18.9	17.6	16.3	14.9
	33.3	32.3	31.2	30.0	28.9	27.6	26.4	25.0	23.6	22.0	20.4	18.6
	42.7	41.3	39.9	38.5	37.0	35.4	33.7	32.0	30.2	28.2	26.1	23.9
	53.3	51.6	49.9	48.1	46.2	44.2	42.2	40.0	37.7	35.3	32.7	29.8
	66.7	64.5	62.4	60.1	57.7	55.3	52.7	50.0	47.1	44.1	40.8	37.3
	84.0	81.3	78.6	75.7	72.7	69.6	66.4	63.0	59.4	55.6	51.4	47.0
	112.6	107.2	102.1	97.2	92.6	88.2	84.0	80.0	76.0	72.2	68.6	65.2
	140.7	134.0	127.6	121.6	115.8	110.3	105.0	100.0	95.0	90.3	85.7	81.5
	175.9	167.5	159.5	151.9	144.7	137.8	131.3	125.0	118.8	112.8	107.2	101.8

**Technical data**  
S200, S200P & S290  
UL 1077, CSA 22.2, No. 235

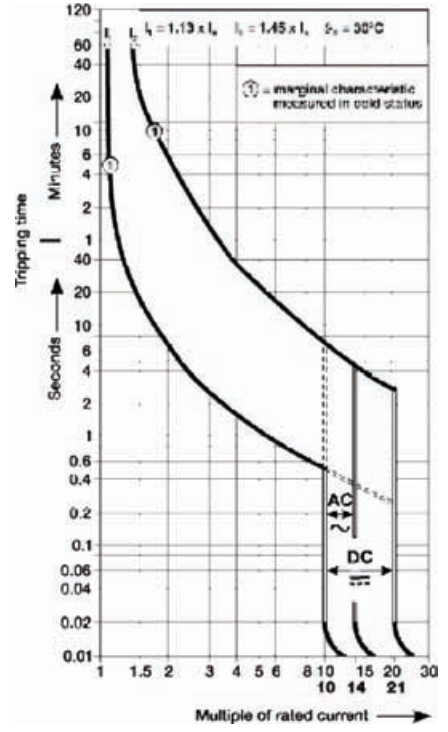
Tripping characteristic B



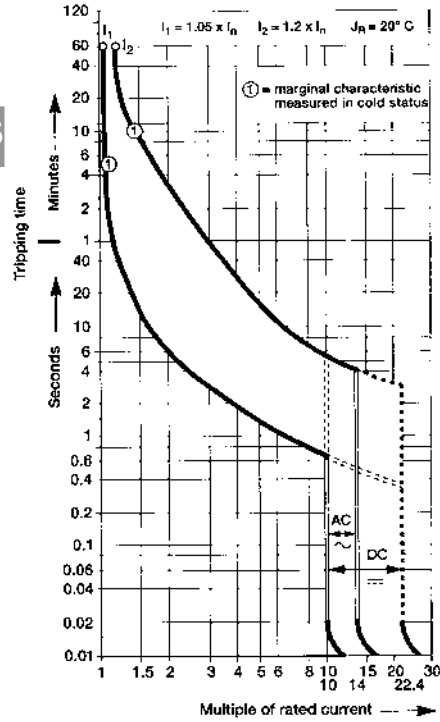
Tripping characteristic C



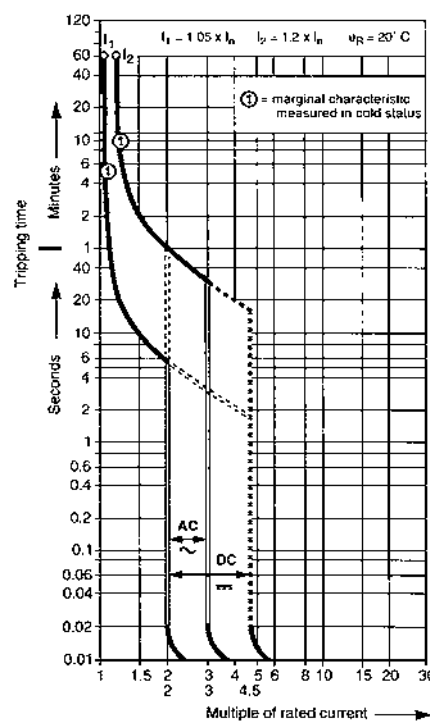
Tripping characteristic D



Tripping characteristic K



Tripping characteristic Z



15

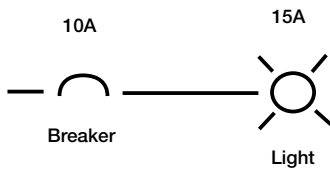
## Introduction

The circuit breaker plays an important role in providing over-current protection and a disconnect means in electrical networks. Recent advancements in circuit breaker technology has increased breaker performance and protection.

## Overload

A slow and small overcurrent situation that causes the ampacity and temperature of the circuit to gradually increase over time. This type of event is characterized by a slight increase in the load (ampacity) on the circuit and is interrupted by the thermal trip unit of the breaker.

### Thermal Example

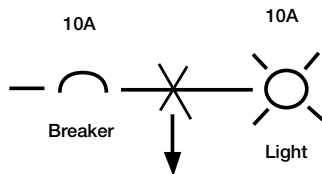


The light draws more than 10 amps for an extended period of time creating a thermal overload.

## Short circuit

A rapid and intense overcurrent situation that causes the ampacity of the circuit to increase. This type of event is characterized by a dramatic increase in the load (ampacity) on the circuit and is interrupted by the magnetic trip unit of the breaker.

### Magnetic Example

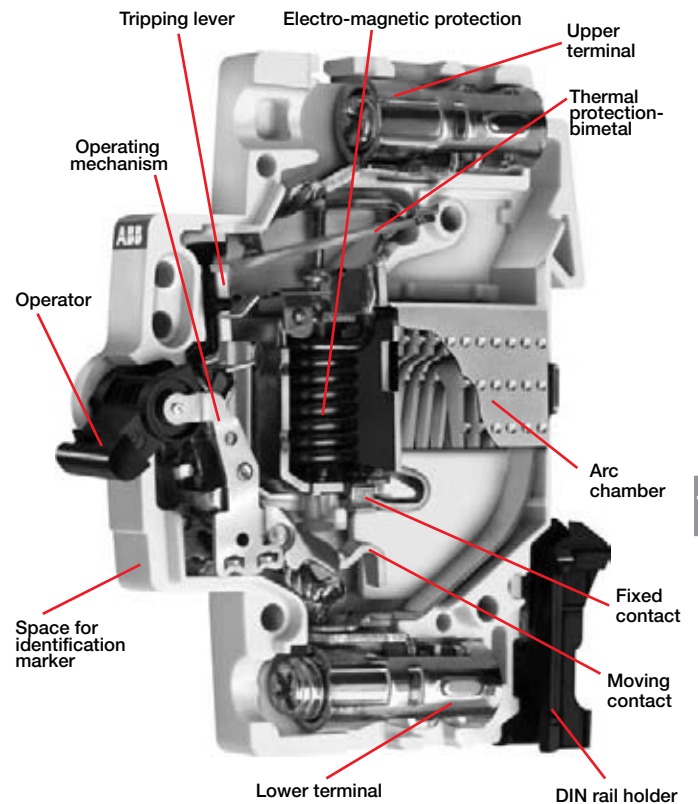


The wire connected between the light and breaker is cut and shorted to ground creating a short circuit.

## Breaker definition

A breaker is a device designed to isolate a circuit during an overcurrent event without the use of a fusible element. A breaker is a resettable protective device that protects against two types of overcurrent situations; Overload and Short Circuit.

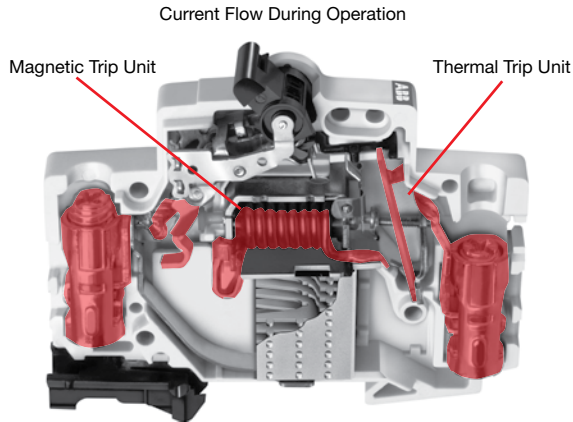
## ABB current limiting breaker



## Circuit breaker construction

### Thermal / Magnetic trip units definition

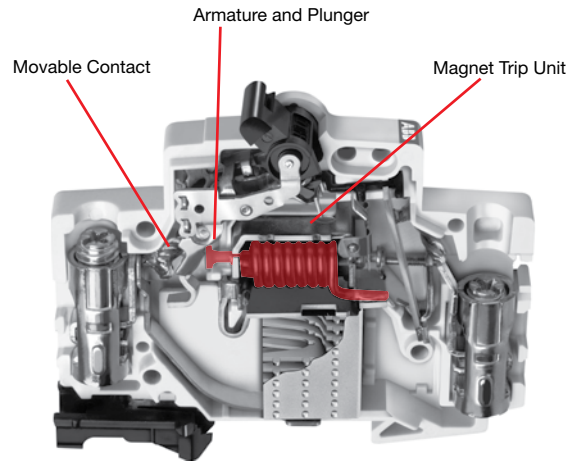
ABB Current Limiting Breakers use an electromechanical (Thermal / Magnetic) trip unit to open the breaker contacts during an overcurrent event. The thermal trip unit is temperature sensitive and the magnetic trip unit is current sensitive. Both units act independently and mechanically with the breaker's trip mechanism to open the breaker's contacts.



All highlighted components are energized during operation

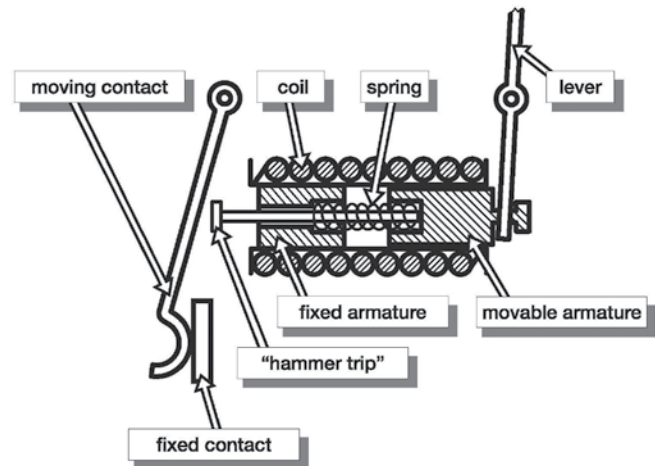
### Magnetic trip units (short circuit protection)

The Magnetic trip unit protects against a short circuit. The magnetic trip unit is comprised of an electromagnet and an armature.



### Components of a magnetic trip unit

When there is a short circuit, a high magnitude of current passes through the coils creating a magnetic field that attracts the movable armature towards the fixed armature. The hammer trip is pushed against the movable contact and the contacts are opened. The opening of the breaker's contacts during a short circuit is complete in .5 milli-seconds.

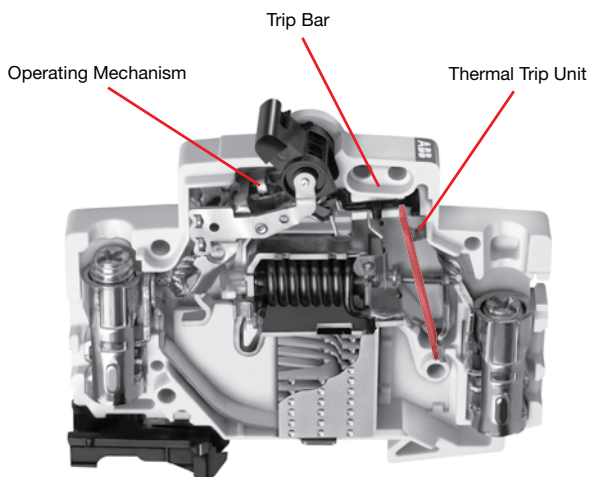


### Overload protection

The thermal trip unit protects against a continuous overload. The thermal unit is comprised of a bimetal element located behind the circuit breaker trip bar and is part of the breaker's current carrying path. When there is an overload, the increased current flow heats the bimetal causing it to bend. As the bimetal bends it pulls the trip bar which opens the breaker's contacts.

The time required for the bimetal to bend and trip the breaker varies inversely with the current. Because of this, the tripping time becomes quicker as current increases in magnitude.

Overload protection is applicable to any installation, conductor, or component which can be subjected to low-magnitude but long-time over-currents. Low-magnitude, long-time over-currents can be dangerous because they reduce the life of the electrical installation, conductor, and components and if left unchecked could result in fire.

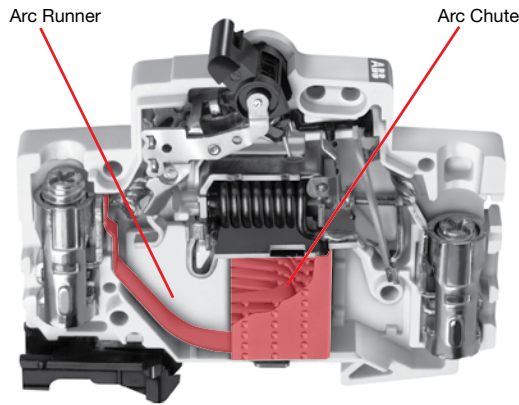


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## Arc runners / Arc chutes

The arc runner and arc chute limit and dissipate the arc energy during the interruption of an overload or short circuit event.

During an overload or short circuit event, the contacts of the breaker separate and an electrical arc is formed between the contacts through air. The arc is moved into the arc chute by “running” the arc down the interior of the breaker along the arc runner. When the arc reaches the arc chute it is broken into small segmented arcs. The segmented arcs split the overall energy level into segments less than 25V. Each 25V segment does not have a high enough energy level to maintain an arc and all energy is naturally dissipated.



## Breaker curves

### Thermal Trip Unit (region one)

The first sloping region of the breaker curve is a graphical representation of the tripping characteristics of the thermal trip unit. This portion of the curve is sloped due to the nature of the thermal trip unit. The trip unit bends to trip the breaker's trip bar in conjunction with a rise in amperage (temperature) over time. As the current on the circuit increases, the temperature rises, the faster the thermal element will trip.

Example using the curve below: If you had a 10A breaker and the circuit was producing 30 amps of current, the breaker would trip between 2 seconds and 1 minute. In this example you would find the circuit current on the bottom of the graph (Multiples of rated current). The first line is 10 amps (10 amp breaker x a multiple of one), the second line is 20 amps (10 amp breaker x multiple of 2), and the third line is 30 amps (10 amp breaker x multiple of 3). Next you would trace the vertical 30A line up until it intersects the red portion of the breaker thermal curve. If you follow the horizontal lines, on both sides of the red curve, to the left you will see that the breaker can trip as fast as 2 seconds and no slower than 1 minute.

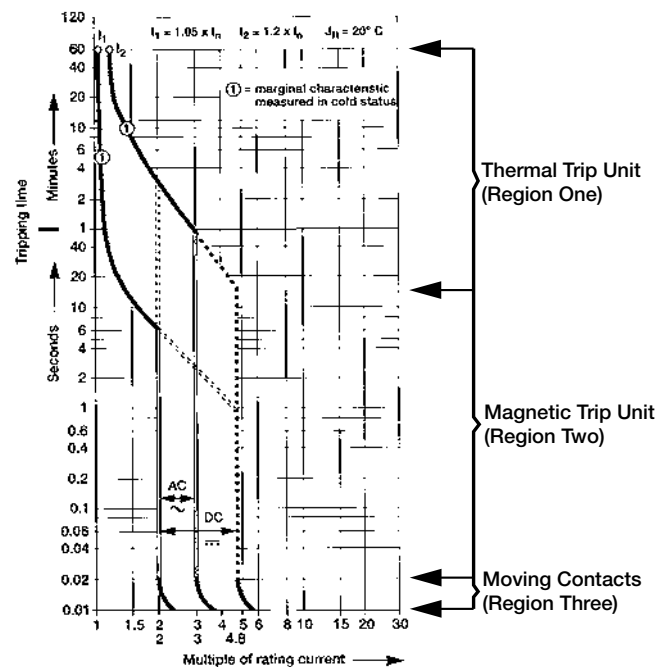
### Magnetic Trip Unit (region two)

This region of the breaker curve is the instantaneous trip unit. ABB's miniature circuit breaker's instantaneous trip unit interrupts a short circuit in 2.3 to 2.5 milliseconds. Because of this the curve has no slope and is graphically represented as a vertical straight line.

Example using the curve above: If you had a 10 amp breaker the magnetic trip element would interrupt a short circuit between 10 and 30 amps (10 amp breaker x multiple of 2 and 3) in 2.3 to 2.5 milliseconds.

### Breaker Contacts (region three)

This region of the curve is the time required for the contacts of the breaker to begin to separate. The contacts will open in less than .5 milliseconds and is graphically represented by the bottom vertical portion of the curve.



## Current limiting definitions

All ABB Miniature Circuit Breakers are UL tested and certified as current limiting protective devices. Current limiting circuit breakers provide a higher level of circuit protection than a typical zero point external breakers.

## UL AC 60Hz cycle

UL defines an AC cycle as the potential energy of the wave form traveling from Zero-to-Positive amplitude, Positive-to-Zero amplitude, Zero-to-Negative amplitude, Negative-to-Zero amplitude 60 times in one second. One cycle is completed every 16.6 milliseconds.

## UL breaker current limiting

UL defines breaker current limitation as a breaker that interrupts and isolates a fault in less than 1/2 of an AC cycle. 1/2 a cycle is completed in 8.3 milliseconds.

## NEC240.2 current limiting

A device that, when interrupting current in its current-limiting range, reduces the current flowing in the faulted circuit to a magnitude substantially less than that obtainable in the same circuit if the device were replaced with a solid conductor having comparable impedance.

## IEC 60947-2 current limiting circuit breaker

A circuit breaker with sufficiently short trip time to prevent the short-circuit current from reaching the peak value which would otherwise be reached.

## ABB current limiting breakers

ABB current limiting breakers can interrupt and isolate a fault in 1/8 of an AC cycle. The breaker fault interruption is completed in 2.3 to 2.5 milliseconds.

## Zero point extinguishing breakers

A typical zero point extinguishing breaker interrupts a fault and does not isolate the energy. The breaker allows an arc to be present between the open contacts until the AC wave form crosses zero. When the wave form crosses zero, the potential energy is zero and the arc (fault) naturally extinguishes. The arc could be present for up to 8.3 milliseconds.

## Current limiting breakers and electrical networks

### Current Limitation

When a short-circuit condition occurs, the “ideal” current limiting circuit breaker opens before the current waveform can reach its full potential magnitude which occurs at 1/4 cycle (4.17ms). ABB’s current limiting breakers can interrupt a fault in about 1/2 cycle or 2.3ms to 2.5ms.

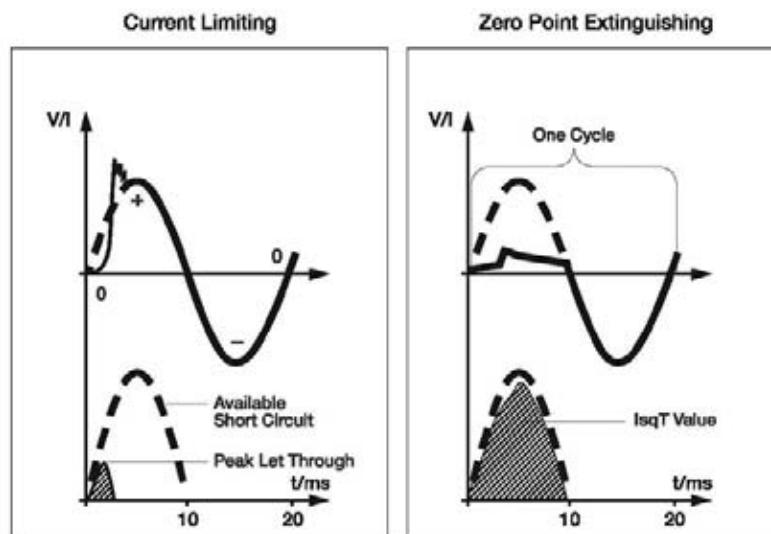
ABB’s current limiting breakers interrupt a short circuit in less than 1/8 cycle and limit the amount of current that can reach a circuit. Limiting the available current on the circuit provides additional protection against network, breaker, or bus damage and prevents the tripping of upstream breakers (selective coordination).

### IsqT

The true destructive nature of a short circuit is measured by the time it is available combined with the peak value of the short circuit. The IsqT (Amps Squared over Time) value represents the amount of energy available on a network during a short circuit and is represented by the shaded area on the graph below.

During a short circuit both magnetic forces and thermal energy combine to damage devices on the electrical network. The level of thermal energy and magnetic forces are directly proportional to the square of the current. The magnetic forces vary as a square of the peak current available and the thermal energy varies as a square of the RMS (root mean square) current available. ABB’s current limiting breakers will limit the let-through energy to a fraction (1/100<sup>th</sup>) of the value which is available from the network. By comparison, a Zero Crossing breaker would let-through approximately 100 times as much destructive energy as the current limiting circuit breaker [(100,000A / 10,000A) squared – 100X].

ABB’s current limiting breakers limit the short circuit current to a relatively small magnitude in an extremely short time, which dramatically limits a short circuit’s destructive energy.



## Current limiting and zero crossing breakers

During the initial stages of a short circuit a breaker's contacts open to interrupt the circuit. After the contacts open an arc forms in the air between the contacts on both the current limiting and zero crossing breaker contacts. What distinguishes a current limiting breaker from a zero crossing breaker is what each breaker does after an arc is formed between the open contacts.

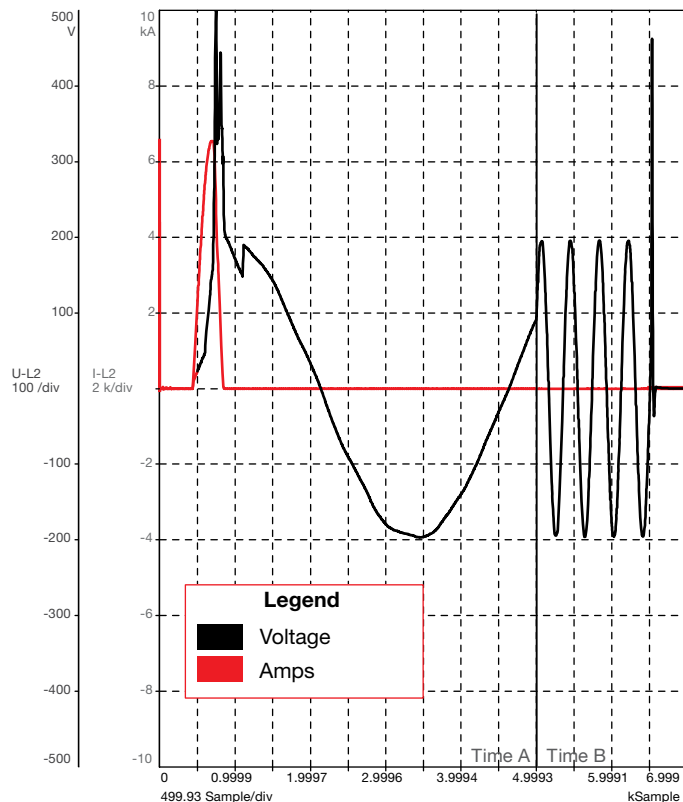
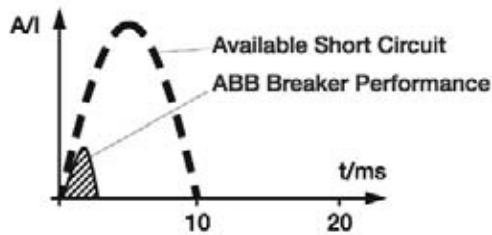
A current limiting breaker "runs" the arc down the breaker arc runner into an arc chute that extinguishes the arc.

A zero crossing breaker does not attempt to extinguish the arc. The breaker is designed to withstand the energy of the arc long enough for the waveform to cross zero. When the wave form crosses zero the potential energy is zero and the arc naturally extinguishes itself.

ABB's current limiting breakers interrupt the arc energy in 2.3ms to 2.5ms (1/8 cycle) and a zero crossing breaker allows the arc to be present for up to 8.3ms (1/2 cycle). A zero crossing breaker will let through 100 times as much energy as an ABB current limiting breaker.

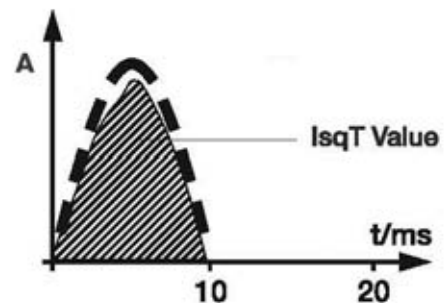
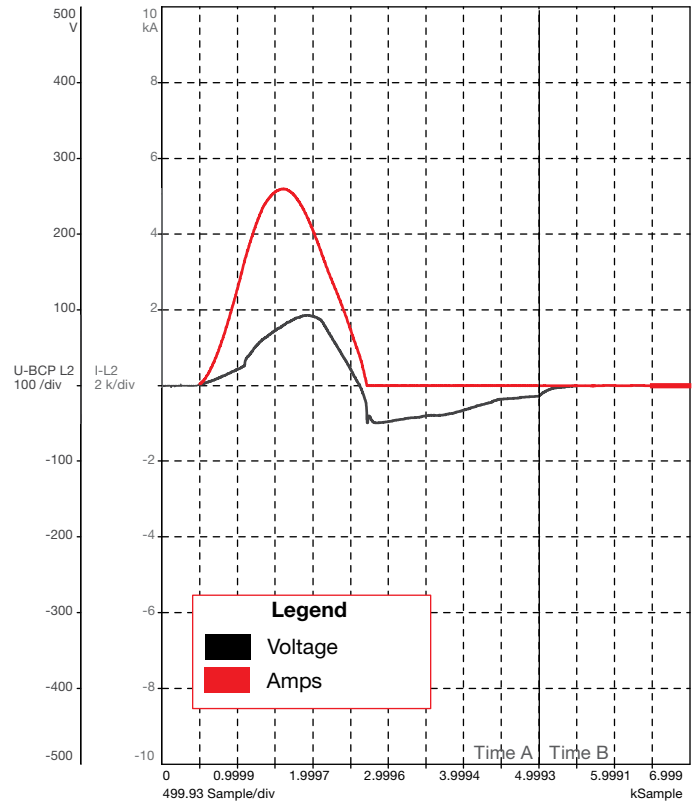
## Current limiting example

The lab test report below details a 20A S200 series current limiting breaker interrupting a 28kA fault in 1.7 milliseconds. The total "I Square T" value is 32.0kA.



## Zero crossing example

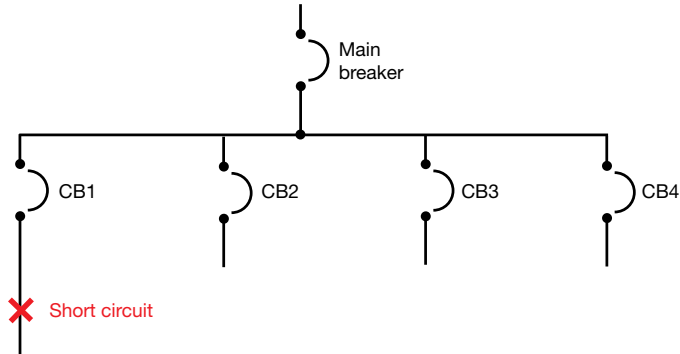
The test report below details a 20A Zero Point Extinguishing breaker interrupting a 9kA fault in 9 milliseconds. The total "I Square T" value is 104.0kA.



## Selective coordination and series ratings

### IEC 60497-1 selective coordination definition

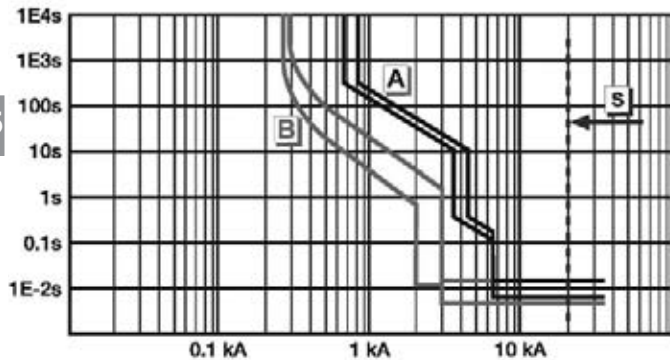
Coordination between the operating characteristics of two or more over-current protection devices, so that when an over-current within established limits occurs, the device designated to operate within those limits trips whereas the other do not trip.



### Example of breaker coordination

When an over-current event occurs at the branch breaker level (CB1), and the event is within the operating characteristics of the breaker, then the branch breaker should interrupt the circuit (open) and the main breaker should remain closed and energized. The chart below gives a graphical representation of a downstream branch breaker (B curve) and a main breaker (A curve) with coordination. The separation between the curves allows the branch breaker to react to the fault and the main breaker remain closed and energized.

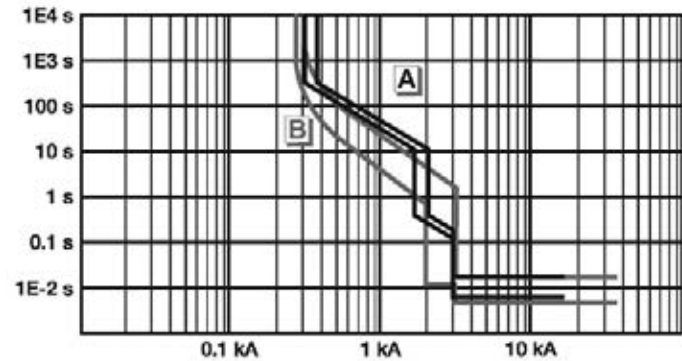
Coordination



### Example of no breaker coordination

Selective breaker coordination is not achieved when there is an overload event at the branch breaker level (MCB1) and both the branch breaker and main breaker interrupt the circuit (open). When there is no breaker coordination several circuits lose power that should remain operational during and after the overload event. The chart below gives a graphical representation of a downstream branch breaker (B curve) and a main breaker (A curve) without coordination. There is no separation between the curves. The branch breaker will react to a fault and the main breaker will open and de-energize all circuits downstream.

No Coordination



Problems in coordination occur when the branch breaker allows the "I Square T" value of the short circuit to rise to a level that is in the operating range of the up-stream main breaker. Proper breaker coordination is easier to achieve with the use of current limiting breakers at the branch level.

### Selective coordination and current limiting breakers

Recent improvements in ABB circuit breaker technology has pushed the performance of breakers to the same level as fuses. The reaction time and tripping characteristics of current limiting breakers are now on par with fuses. This allows ABB to provide a high level of coordination between branch breakers and the main. A current limiting branch breaker will limit the "I Square T" value well below the level of the operating range of the up-stream main breaker.

ABB's current limiting branch breakers can coordinate between the main breaker up to 35kA.

### Selective coordination and zero crossing breakers

Zero crossing breakers do not limit the "I Square T" value. They wait for the wave form to cross zero and allow a high level of let-through energy to pass through the system. The "I Square T" value of a zero crossing breaker is high enough that the main breaker will likely trip during a short circuit. With zero crossing breakers it is extremely difficult to coordinate between branch and main breakers.

A typical zero crossing breaker's coordination level is below 10kA. There are a few manufactures that have achieved coordination between a branch zero crossing breaker and the main by slowing the performance (protection) of the main breaker.



## Series ratings –vs- selective coordination

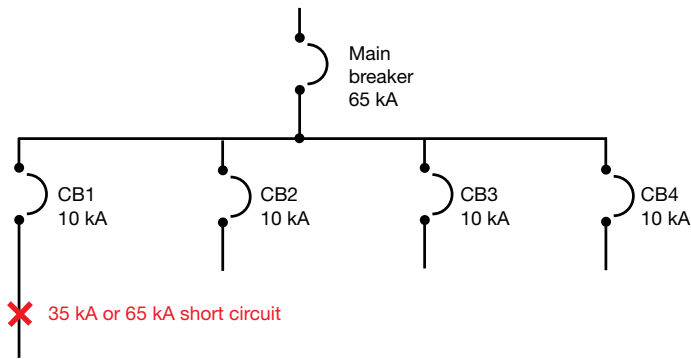
### Selective coordination

Selective coordination is achieved when there is a short circuit on a branch circuit breaker, the branch breaker opens and isolates the fault, and the main breaker remains closed. The rating is usually a value above the “stand alone” interrupting rating of the branch breaker and the “stand alone” rating of the main breaker.

**Example:**

65kA rated main breaker  
10kA rated branch breaker  
Coordination between the two breakers up to 35kA

There can be a short circuit on the branch breaker up to 35kA where the branch will open (CB1) and the main breaker will remain closed. Although the branch has a 10kA “stand alone” rating both the breakers work together to limit the available short circuit to allow the branch (CB1) to isolate the fault.



### Series ratings

Series ratings are different from coordination ratings. Unlike coordination ratings where the branch opens and the main remains closed, a series rated combination is one where both the branch and main breakers open and work together to isolate the fault.

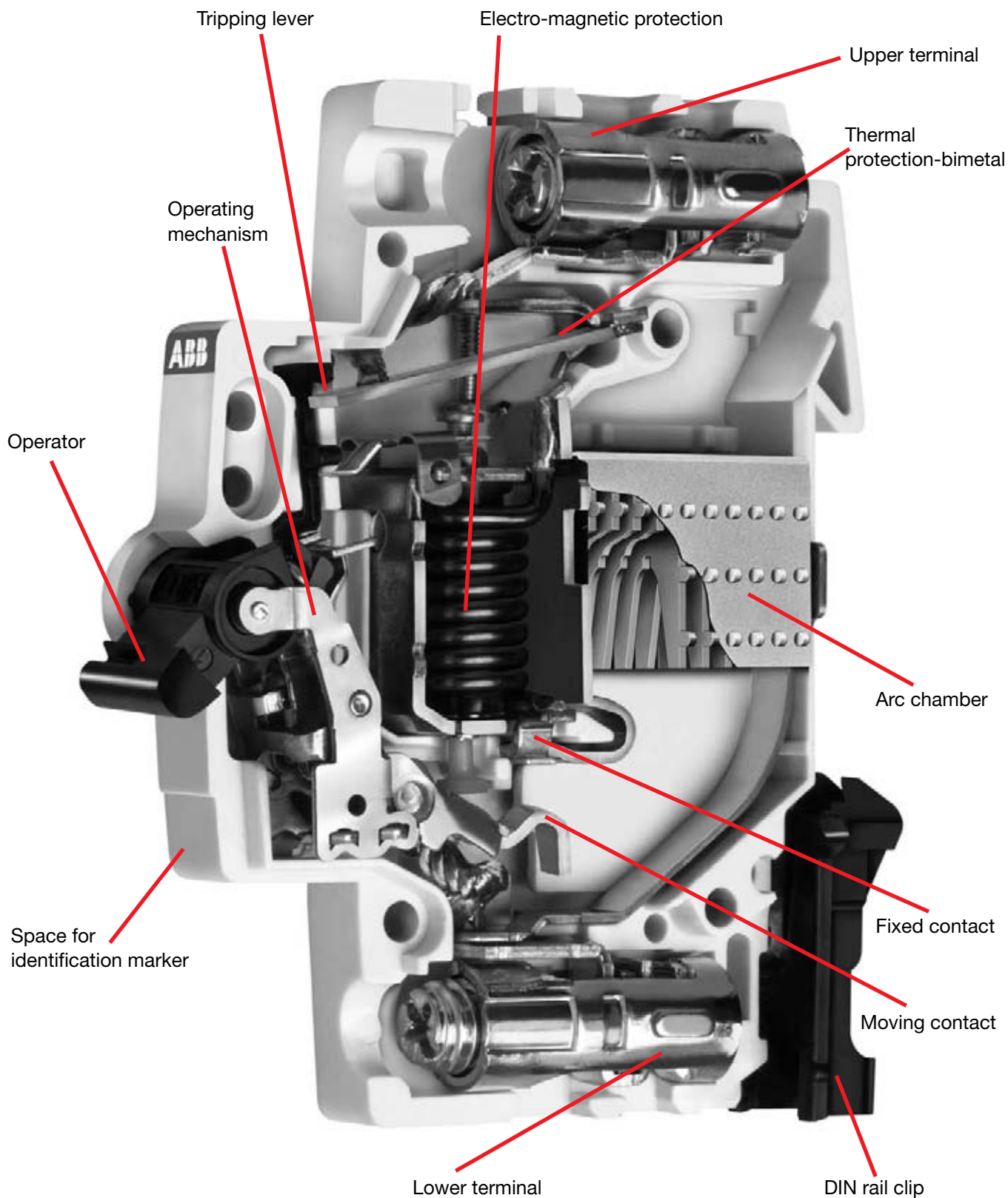
The series rating combination of two breakers is equal to the “stand alone” interrupting value of the main breaker. This is a result of the main breaker let-through value being lower than the “stand alone” interrupting value of the branch breaker. During a short circuit the main breaker will limit the energy to a level that is below the “stand alone” value of the branch breaker.

**Example:**

65kA rated main breaker  
10kA rated branch breaker  
Series combination rating between the two breakers up to 65kA

There can be a short circuit on the branch breaker up to 65kA where the branch will open and the main breaker will open. Although the branch breaker (CB1) has a 10kA “stand alone” rating the main breaker has a let-through value below 10kA. If there is a fault up to 65kA on the network the main breaker will limit the energy to a value less than the rating of the branch breaker (CB1). Both breakers will trip (no coordination) but the network can safely withstand a fault of 65kA.

## Miniature circuit breaker cutaway



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