

Electrical installation solutions for buildings – Technical details

Arc Fault Detection Devices

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AFDD technical details

Functions and classification criteria for AFDD

Functions and classification criteria for AFDD

An AFDD (Arc Fault Detection Device) according to the product standard “IEC 62606 - General requirements for Arc Fault Detection Devices” is a device intended to mitigate the effects of arcing faults by disconnecting the circuit when an arc fault is detected: this product standard is partially derived from the UL 1699 standard.

Three different type of products are described in IEC 62606 standard:

- **AFDD in series with protection device:**

AFDD as one single device, comprising an AFD unit and opening means and intended to be connected in series with a suitable short circuit protective device declared by the manufacturer complying with one or more of the following standards IEC 60898-1, IEC 61009- 1 or IEC 60269 series.

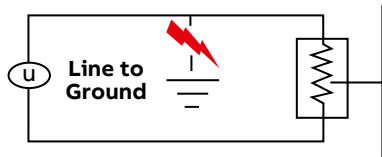
- **Integrated solution:**

AFDD as one single device, comprising an AFD unit integrated in a protective device complying with one or more of the following standards IEC 60898-1, IEC 61008-1, IEC 61009- 1 or IEC 62423.

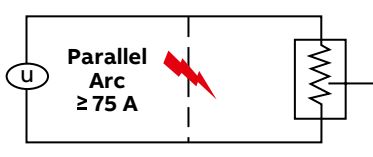
- **AFDD + protection device assembled on site:**

AFDD according to Annex D, comprised of an AFD unit and a declared protective device, intended to be assembled on site.

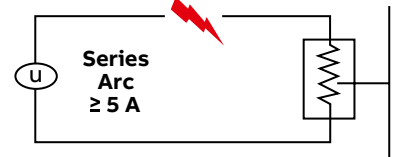
AFDD can guarantee protection against all types of arc faults:



Earth arc fault
current is following from active conductor to the earth



Parallel arc fault
current is following between active conductors in parallel with the load of the circuit



Series arc fault
current is following within one conductor of the final circuit

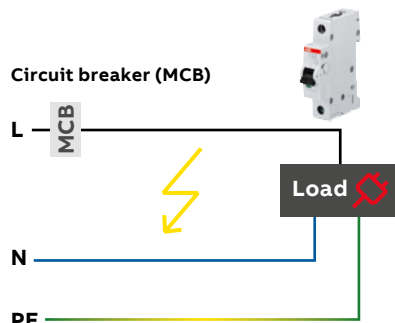
Different levels of protection

RCDs are recognized efficient to reduce the risk of fire by detection of leakage current and arcing to ground as a consequence of tracking currents within an electrical installation. For this reason RCDs can detect only earth arc faults.

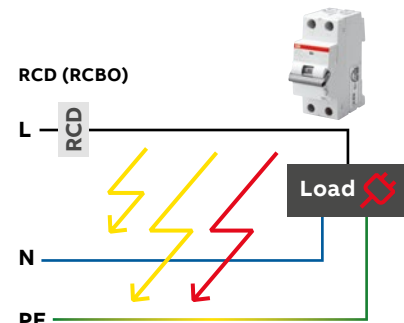
During a series and parallel arc fault, there is no leakage to ground therefore RCDs can't detect such a fault.

RCDs as fuses or circuit-breakers are not able to reduce the risk of electrical fire due to series or parallel arcing between live conductors.

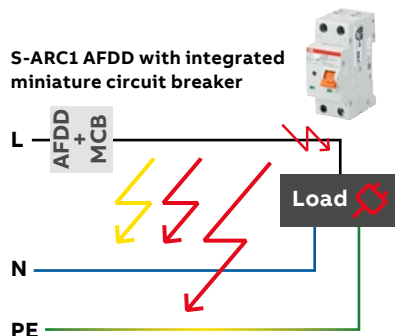
In order to ensure a complete protection against arc faults, it is required the installation of an AFDD.



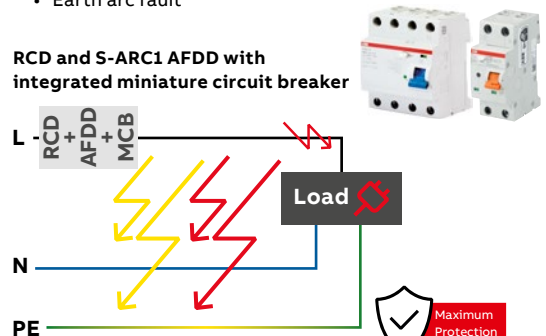
Circuit breaker (MCB)
Protection against:
• Overcurrent (short circuits, overload)



RCD (RCBO)
Protection against:
• Overcurrent (short circuits, overload)
• Earth faults currents
• Earth arc fault



S-ARC1 AFDD with integrated miniature circuit breaker
Protection against:
• Overcurrent (short circuits, overload)
• Serial and parallel arc faults
• Earth arc faults



RCD and S-ARC1 AFDD with integrated miniature circuit breaker
Protection against:
• Overcurrent (short circuits, overload)
• Earth faults currents
• Serial, parallel and earth arc faults

AFDD technical details

Power loss, derating and performance in altitude

Voltage drop, Internal resistance, Power loss and own consumption for S-ARC1 series

In [A]	Voltage drop [mV]	Internal Resistance [mΩ]	Power loss [W]	Own consumption [W]
6	380	63,3	2,3	0,5
10	203	20,3	2	0,5
13	166	12,8	2,2	0,5
16	175	10,9	2,8	0,5
20	182	9,1	3,6	0,5

Derating in temperature for S-ARC1 series

Max operating current depending on the ambient temperature of a circuit breaker in load circuit of characteristics type B and C.

Daily average ambient temperature is intended to be $\leq +35$ °C.

Curve B, C	Temperature [°C]									
	-25	-20	0	10	20	25	30	40	50	55
In (A)										
6	7,2	6,8	6,4	6,3	6,1	6	6	6	5,8	5,8
10	12,2	11,9	10,8	10,7	10,5	10,2	10	10	9,8	9,6
13	15,6	15,2	14,2	13,8	13,4	13,2	13	12,9	12,7	12,6
16	19,5	18,9	17,9	17,3	16,7	16,3	16	15,8	15,5	15,4
20	24,4	24	22,4	21,6	21	20,4	20	19,8	19,5	19,4

Performance in altitude for S-ARC1 series

Elevation	[m]	3000	4000	5000	6000
Rated Current	[A]	0,96 x In	0,94 x In	0,92 x In	0,90 x In
Rated Voltage	[V]	0,877 x Un	0,775 x Un	0,676 x Un	0,588 x Un

For altitude higher than 3.000m the isolating characteristic is no longer available.

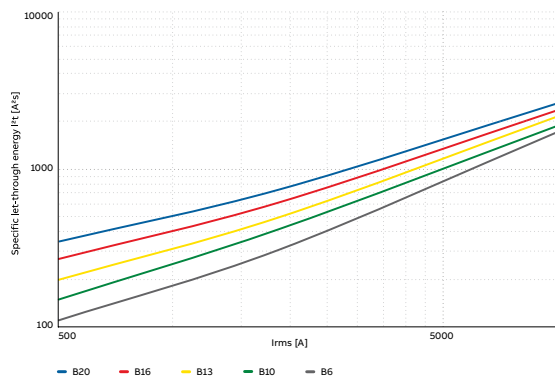
Influence of adjacent devices

Number of devices	Correction factor
1	1
3	0,92
5	0,88
7	0,85
9	0,84

AFDD technical details

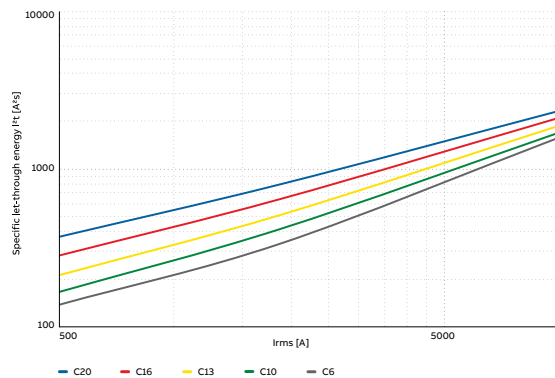
Specific let-through energy I^2t S-ARC1 and S-ARC1 M

01 I^2t
S-ARC1 Tripping
Characteristics B



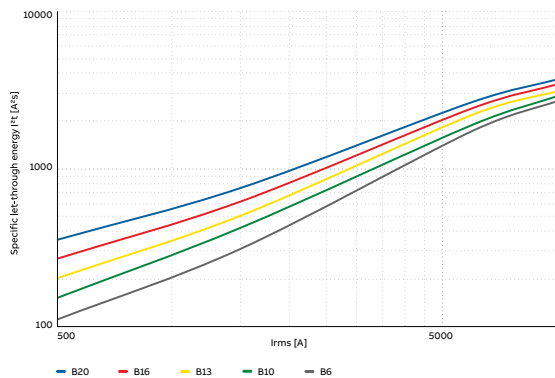
01

02 I^2t
S-ARC1 Tripping
Characteristics C



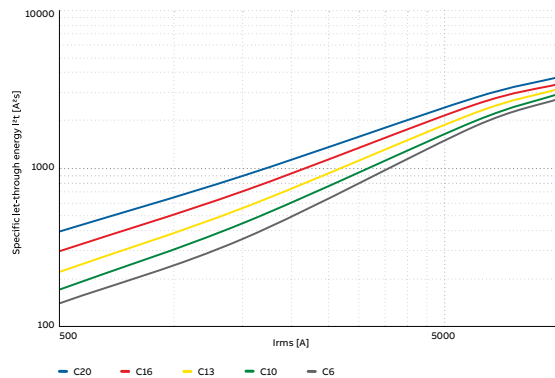
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03 I^2t
S-ARC1 M Tripping
Characteristics B



03

04 I^2t
S-ARC1 M Tripping
Characteristics C

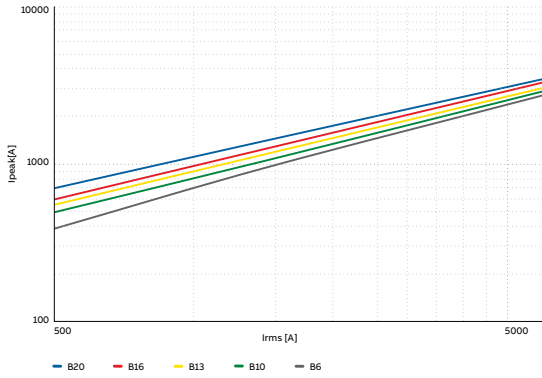


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AFDD technical details

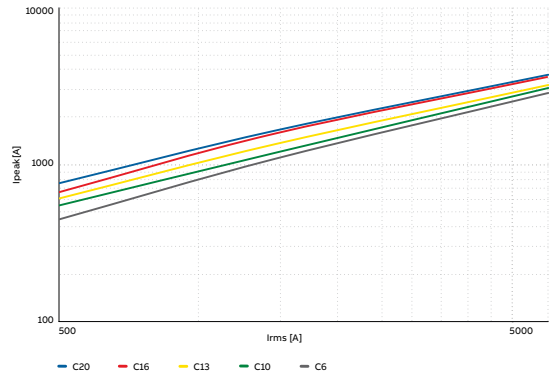
Ipeak S-ARC1 and S-ARC1 M

01 Ipeak
S-ARC1 Tripping
Characteristics B



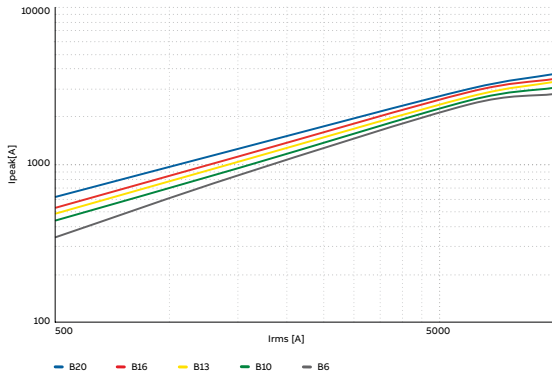
01

02 Ipeak
S-ARC1 Tripping
Characteristics C



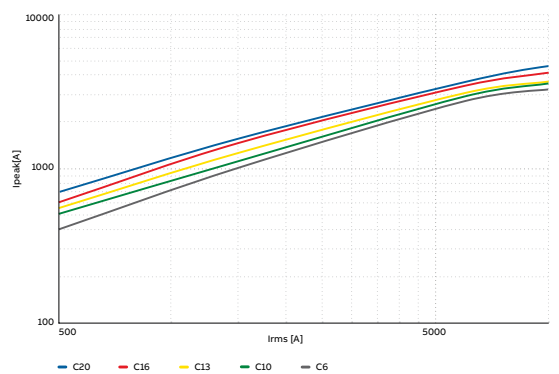
02

03 Ipeak
S-ARC1 M Tripping
Characteristics B



03

04 Ipeak
S-ARC1 M Tripping
Characteristics C



04

AFDD technical details

Coordination tables: S-ARC1, S-ARC1M back-up

Fuses - S-ARC1 @ 230/240V

		Supply S.		gL/gG					
Load S.		Icu [kA]	In[A]	25	40	50	63	80	100
S-ARC1	B,C	7.5	6...20	35	25	20	15	10	10
S-ARC1M	B,C	10	6...20	35	25	20	15	10	10

MCCB@415V - S-ARC1 @230/240V

		Upstream		XT1	XT1	XT1	XT2	XT3	XT4	XT1	XT2	XT3	XT4	XT1	XT2	XT4	XT2	XT4	XT2	XT4
Char				B	C	N	N	N	N	S	S	S	S	H	H	H	L	L	V	V
Down-stream		Icu [kA]	In[A]	18	25	36	36	36	36	50	50	50	50	70	70	70	120	120	150	150
S-ARC1	B,C	7.5	6...20	16	16	16	20	10	10	16	20	10	10	16	20	10	20	10	20	10
S-ARC1M	B,C	10	6...16 20	16	16	16	25	16	25	16	25	16	25	16	25	16	25	25	25	25
							25	16	16	25	16	16	16	25	16	25	16	25	16	25

MCCB @415V - S-ARC1 @230/240V

		Supply S.		T1	T1	T1	T2	T3	T4	T2	T3	T4	T2	T4	T2	T4	T4
Char				B	C	N	N	N	N	S	S	S	H	H	L	L	V
Load S.		Icu [kA]	In[A]	16	25	36	36	36	36	50	50	50	70	70	85	120	200
S-ARC1	B,C	7.5	6...20	16	16	16	20	10	10	20	10	10	20	10	20	10	10
S-ARC1M	B,C	10	6...20	16	16	16	25	16	25	25	16	16	25	16	25	16	16

S800S - S-ARC1 @ 230/240V

		Supply S.		S800S							
Char				B,C,D,K							
Load S.		Icu [kA]	In[A]	50							
S-ARC1	B,C	7.5	6...16	25	32	40	50	63	80	100	125
			20	50	40	25	25	18	15	15	15
			20	-	40	25	25	18	15	15	15
S-ARC1M	B,C	10	6...16	50	50	50	50	50	50	50	50
			20	-	50	50	50	50	50	50	50

S800N - S-ARC1 @ 230/240V

		Supply S.		S800N							
Char				B,C,D							
Load S.		Icu [kA]	In[A]	36							
S-ARC1	B,C	7.5	6...16	25	32	40	50	63	80	100	125
			20	36	36	25	25	18	15	15	15
			20	-	36	25	25	18	15	15	15
S-ARC1M	B,C	10	6...16	36	36	36	36	36	36	36	36
			20	-	36	36	36	36	36	36	36

S800C - S-ARC1 @ 230/240V

Supply S.		S800C											
Char		B,C,D,K											
Load S.	Icu [kA]		25										
S-ARC1	B,C	7.5	In[A]	25	32	40	50	63	80	100	125		
			6...16	25	25	25	25	18	15	15	15		
			20	-	25	25	25	18	15	15	15		
S-ARC1M	B,C	10	6...16	25	25	25	25	25	25	25	25	25	25
			20	-	25	25	25	25	25	25	25	25	25

S800B - S-ARC1 @ 230/240V

Supply S.		S800B											
Char		B,C,D,K											
Load S.	Icu [kA]												
S-ARC1	B,C	7.5	In[A]	32	40	50	63	80	100	125*			
			6...20	16	16	16	16	15	15	15			
S-ARC1M	B,C	10	6...20	16	16	16	16	16	16	16	16		

*Only S800B B,C

S200 - S-ARC1 @230/240V

Supply S.		S200		S200M		S200P		S200P		
Char		B-C		B,C		B,C		B,C		
Load S.	Icu [kA]		20		25		40		25	
S-ARC1	B,C	7.5 and 10	In[A]	0.5..63	0.5...63		0.5...25		32	
			6...20	20	25		40		25	

DS201 - S-ARC1 @230/240V

Supply S.		DS201												
Char		B,C												
Load S.	In[A]		2...40											
S-ARC1	B,C	6...20	Icu [kA]	10										
			7.5 and 10	10										

AFDD technical details

Coordination tables: S-ARC1, S-ARC1M selectivity

Fuse gL/gG- S-ARC1 @ 230/240V

Load S.	Char	Supply S.	Fuse gL/gG									
		Icu [kA]	In[A]	25	32	40	50	63	80	100	125	
S-ARC1	B,C	7,5	6	1	1.5	4	4.5	T	T	T	T	
			10		1.2	3.5	4	T	T	T	T	
			13		1	3	3.5	5	T	T	T	
			16		1	3	3.5	5	T	T	T	
			20		1	3	3.5	5	T	T	T	
S-ARC1M	B,C	10	6	1	1.5	4	4.5	7	T	T	T	
			10		1.2	3.5	4	6	T	T	T	
			13		1	3	3.5	5	T	T	T	
			16		1	3	3.5	5	T	T	T	
			20		1	3	3.5	5	8	T	T	

MCCB@415V - S-ARC1 @230/240V

Load S.	Char	Icu [kA]	In[A]	Supply S.																			
				XT1																			
				Version																			
				Release																			
										B,C,N,S,H				TM									
													16	20	25	32	40	50	63	80	100	125	160
S-ARC1	B,C	7,5	6	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T		
			10			3	3	3	4,5	T	T	T	T	T	T	T	T	T	T	T	T		
			13					3	4,5	5	T	T	T	T	T	T	T	T	T	T	T		
			16					3	4,5	5	T	T	T	T	T	T	T	T	T	T	T		
			20						3	5	T	T	T	T	T	T	T	T	T	T	T		
S-ARC1M	B,C	10	6	6	6	6	6	6	6	6	T	T	T	T	T	T	T	T	T	T			
			10			3	3	3	4,5	7,5	8,5	T	T	T	T	T	T	T	T				
			13					3	4,5	5	7,5	T	T	T	T	T	T	T	T				
			16					3	4,5	5	7,5	T	T	T	T	T	T	T	T				
			20						3	5	6	T	T	T	T	T	T	T	T				

MCCB@415V - S-ARC1 @230/240V

Load S.	Char	Icu [kA]	In[A]	Supply S.																								
				XT2																								
				Version																								
				Release																								
																N,S,H,L,V				TM				EL				
													16	20	25	32	40	50	63	80	100	125	160	10	25	63	100	160
S-ARC1	B,C	7,5	6	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	
			10			3 ¹	3	3	3	4,5	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	
			13				3 ¹	3	3	4,5	5	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	
			16				3 ¹	3	3	4,5	5	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	
			20				3 ¹		3	5	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	
S-ARC1M	B,C	10	6	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T		
			10			3 ¹	3	3	3	4,5	7,5	8,5	T	T	T	T	T	T	T	T	T	T	T	T	T	T		
			13				3 ¹	3	3	4,5	5	7,5	T	T	T	T	T	T	T	T	T	T	T	T	T	T		
			16				3 ¹	3	3	4,5	5	7,5	T	T	T	T	T	T	T	T	T	T	T	T	T	T		
			20				3 ¹		3	5	6	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T		

¹ Value valid in case of Supply S. breaker only magnetic

MCCB@415V - S-ARC1 @230/240V

			Supply S.								XT3
			Version								N,S
			Release								TM
Load S.	Char	Icu [kA]	In[A]	63	80	100	125	160	200	250	
S-ARC1	B,C	7,5	6	T	T	T	T	T	T	T	
			10	T	T	T	T	T	T	T	
			13	5	T	T	T	T	T	T	
			16	5	T	T	T	T	T	T	
			20	5	T	T	T	T	T	T	
S-ARC1M	B,C	10	6	T	T	T	T	T	T	T	
			10	7,5	8,5	T	T	T	T	T	
			13	5	7,5	T	T	T	T	T	
			16	5	7,5	T	T	T	T	T	
			20	5	6	T	T	T	T	T	

MCCB@415V - S-ARC1 @230/240V

			Supply S.													XT4					
			Version													N,S,H,L,V					
			Release													TM	EL				
Load S.	Char	Icu [kA]	In[A]	20	25	32	40	50	63	80	100	125	160	200	225	250	40	63	100	160	250
S-ARC1	B,C	7,5	6	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
			10	3 ¹	3	3	3	4,5	T	T	T	T	T	T	T	T	3	T	T	T	T
			13			3 ¹	3	4,5	5	T	T	T	T	T	T	T	3	T	T	T	T
			16			3 ¹	3	4,5	5	T	T	T	T	T	T	T	3	T	T	T	T
			20			3 ¹		3	5	T	T	T	T	T	T	T		T	T	T	T
S-ARC1M	B,C	10	6	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
			10	3 ¹	3	3	3	4,5	7,5	8,5	T	T	T	T	T	T	3	T	T	T	T
			13			3 ¹	3	4,5	5	7,5	T	T	T	T	T	T	3	T	T	T	T
			16			3 ¹	3	4,5	5	7,5	T	T	T	T	T	T	3	T	T	T	T
			20			3 ¹		3	5	6	T	T	T	T	T	T		T	T	T	T

¹ Value valid in case of Supply S. breaker only magnetic

AFDD technical details

Coordination tables: S-ARC1, S-ARC1M selectivity

MCCB@415V - S-ARC1 @230/240V

			Supply S.							T1						
			Version							B,C,N						
			Release							TMD						
			Iu[A]							160						
Load S.	Char	Icu [kA]	In[A]	16	20	25	32	40	50	63	80	100	125	160		
S-ARC1	B,C	7,5	6	T	T	T	T	T	T	T	T	T	T	T		
			10			3	3	3	4,5	T	T	T	T	T		
			13					3	4,5	5	T	T	T	T		
			16					3	4,5	5	T	T	T	T		
			20						3	5	T	T	T	T		
S-ARC1M	B,C	10	6	6	6	6	6	6	6	T	T	T	T	T		
			10			3	3	3	4,5	7,5	8,5	T	T	T		
			13					3	4,5	5	7,5	T	T	T		
			16					3	4,5	5	7,5	T	T	T		
			20						3	5	6	T	T	T		

MCCB@415V - S-ARC1 @230/240V

			Supply S.							T2								
			Version							N,S,H,L								
			Release							TMD								
			Iu[A]							160								
Load S.	Char	Icu [kA]	In[A]	16	20	25	32	40	50	63	80	100	125	160	25	63	100	160
S-ARC1	B,C	7,5	6	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
			10		3	3	3	3	4,5	T	T	T	T	T	T	T	T	T
			13				3	3	4,5	5	T	T	T	T		T	T	T
			16				3	3	4,5	5	T	T	T	T		T	T	T
			20				3		3	5	T	T	T	T		T	T	T
S-ARC1M	B,C	10	6	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
			10		3	3	3	3	4,5	7,5	8,5	T	T	T	T	T	T	T
			13				3	3	4,5	5	7,5	T	T	T		T	T	T
			16				3	3	4,5	5	7,5	T	T	T		T	T	T
			20				3		3	5	6	T	T	T		T	T	T

MCCB@415V - S-ARC1@230/240V

			Supply S.		T3					
			Version		N,S					
			Release		TMD, MA					
			Iu[A]		250					
Load S.	Char	Icu [kA]	In[A]	63	80	100	125	160	200	250
S-ARC1	B,C	7,5		T	T	T	T	T	T	T
				T	T	T	T	T	T	T
				5	T	T	T	T	T	T
				5	T	T	T	T	T	T
				5	T	T	T	T	T	T
S-ARC1M	B,C	10		T	T	T	T	T	T	T
				7,5	8,5	T	T	T	T	T
				5	7,5	T	T	T	T	T
				5	7,5	T	T	T	T	T
				5	6	T	T	T	T	T

S800N/S - S-ARC1 @230/240V

			Supply S.		S800N-S					
			Char		B					
Load S.		Icu [kA]	36-50							
S-ARC1, S-ARC1M	B,C	7,5 and 10	In[A]	50	63	80	100	125		
			6	0.6	1.2	1.6	2.6	3.8		
			10	0.5	1.1	1.4	2	3		
			13		0.8	1.2	1.7	2.5		
			16		0.8	1.2	1.7	2.5		
			20			1	1.5	2.1		

S800N/S - S-ARC1 @230/240V

			Supply S.		S800N-S					
			Char		C					
Load S.		Icu [kA]	36-50							
S-ARC1, S-ARC1M	B,C	7,5 and 10	In[A]	40	50	63	80	100	125	
			6	0.55	1.1	1.5	2.5	3.6	5.5	
			10	0.45	1	1.3	1.9	2.8	4.2	
			13		0.75	1.1	1.6	2.3	3.6	
			16		0.75	1.1	1.6	2.3	3.6	
			20			0.9	1.4	1.9	3.3	

AFDD technical details

Coordination tables: S-ARC1, S-ARC1M selectivity

S800N/S - S-ARC1 @230/240V

		Supply S.				S800 N-S							
		Char		D									
Load S.		Icu [kA]		36-50									
				In[A]	25	32	40	50	63	80	100	125	
S-ARC1	B,C	7,5	6	0.6	1.3	2	3.2	3.9	T	T	T		
			10	0.5	1.2	1.65	2.6	3.1	T	T	T		
			13		0.9	1.4	1.8	2.6	5	T	T		
			16		0.9	1.4	1.8	2.6	5	T	T		
			20			1.3	1.6	2.2	4.2	5.4	T		
S-ARC1M	B,C	10	6	0.6	1.3	2	3.2	3.9	8	T	T		
			10	0.5	1.2	1.65	2.6	3.1	6.2	8.6	T		
			13		0.9	1.4	1.8	2.6	5	6.3	8.8		
			16		0.9	1.4	1.8	2.6	5	6.3	8.8		
			20			1.3	1.6	2.2	4.2	5.4	7.6		

S700 - S-ARC1 @230/240V

		Supply S.				S700							
		Char		E									
Load S.		Icu [kA]		25									
				In[A]	20	25	35	40	50	63	80	100	
S-ARC1, S-ARC1M	B,C	7,5 and 10	6	T	T	T	T	T	T	T	T	T	
			10	T	T	T	T	T	T	T	T		
			13		T	T	T	T	T	T	T		
			16		T	T	T	T	T	T	T		
			20			T	T	T	T	T	T		