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# AFS contactors for safety applications

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# AFS 3-pole contactors with front-mounted auxiliary contacts

## Dedicated for safety applications

ABB's complete range of safety components make protection systems easier to build. Designed for machine safety applications, AFS contactors come with fixed front auxiliary contact blocks, making them ideal for monitoring and controlling circuits. Mechanically linked and mirror contacts help make your system safer.



### Safety and protection

#### Safety in all things

ABB's AFS contactors can be easily integrated in machine manufacturer's systems complying with main standards EN ISO 13849 and EN 62061 - guaranteeing the safe use of your machinery and equipment.

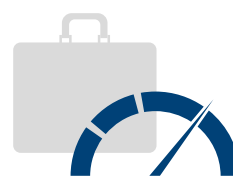
The AFS contactor range is an integral part of ABB's comprehensive range of safety products.



### Continuous operation

#### Secure uptime

The AFS contactor secures system uptime. It allows direct control by safety PLCs or safety relays to ensure the safety performance customers require, for contactors up to 38 A. A low energy auxiliary contact guarantees PLC feedback.



### Speed up your projects

#### Simplify design

Perfect design makes integration easier. ABB's distinctive yellow auxiliary contact block makes identifying the right product quicker.

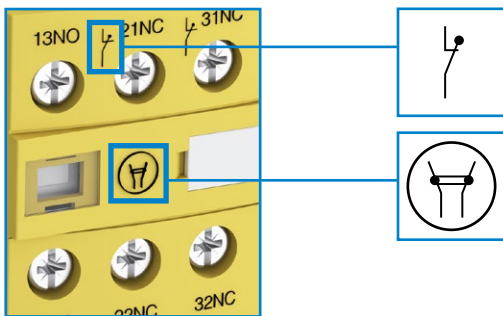
By reducing the contactor coil's power consumption, panels can also be made smaller and transformers more compact. In addition, all the safety data for the contactors are readily available using safety design tools.

# AFS contactors with front-mounted auxiliary contact blocks

## Dedicated for safety applications

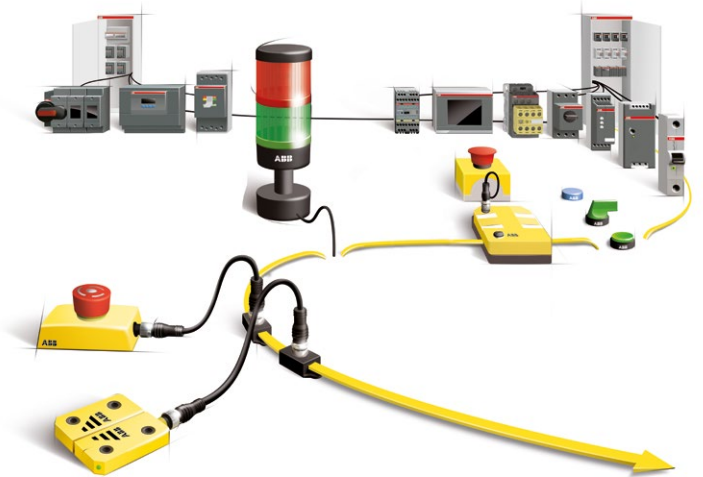
### Contactors status guaranteed

ABB's permanently fixed front-mounted auxiliary contact blocks guarantee the correct contactor status at all times. Mechanically linked and mirror contacts get clearly marked symbols on the front and provide the performance required in feedback circuits. This prevents any unexpected state changes of auxiliary contact if main contacts become welded or stuck and ensures an accurate depiction of the safety system status displayed at all times.



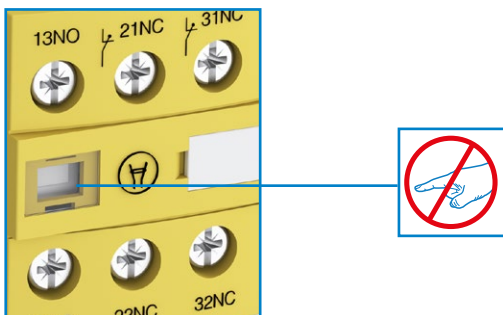
### Easy safety chain identification

The yellow housing of ABB's AFS contactors makes identifying the safety product in your panel quicker. During routine maintenance work, ABB's intuitive design saves valuable time.



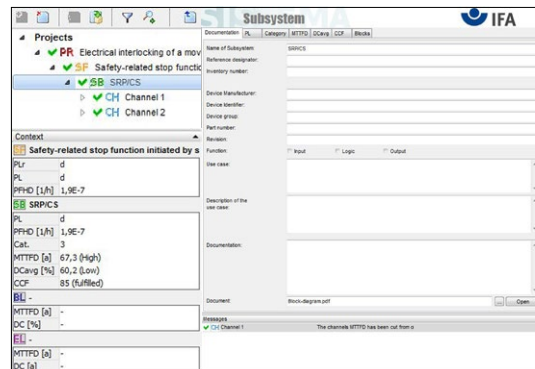
### Prevent unexpected operations

Front-mounted contact blocks are permanently fixed to protect devices against accidental misuse and operation. A factory-fitted transparent cover shields the contactor status indicator, providing additional protection.



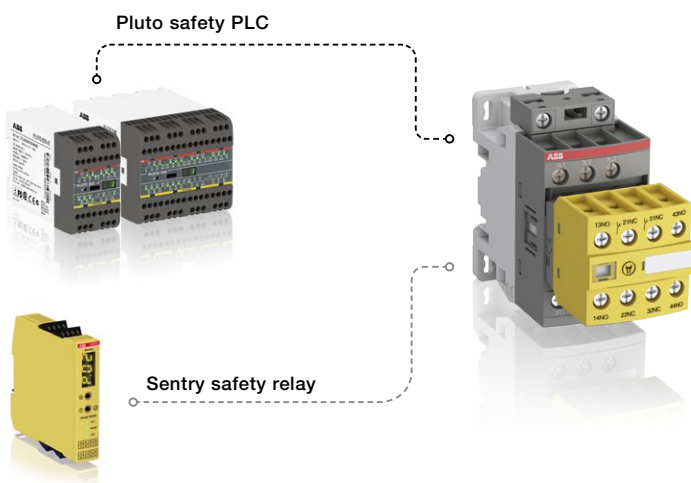
### Simplify calculation of your installation safety level

All safety values are available in safety design tool such as Sistema and FSDT, dedicated software for determining the Performance Level (PL) and Safety Integrity Level (SIL) of safety functions and generating technical documentations.



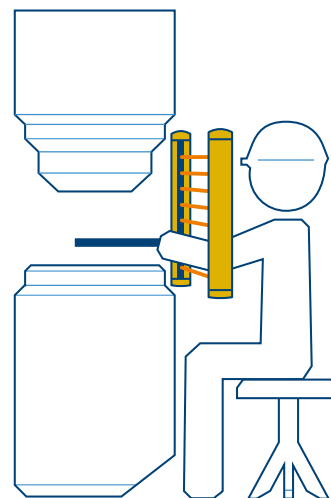
### Control by safety PLCs or safety relays

ABB's AFS contactors can be controlled directly by safety PLCs or safety relays. The low energy auxiliary contacts feature a minimum switching capacity 12 V / 3 mA. They guarantee system status feedback, making the system safe and reliable.



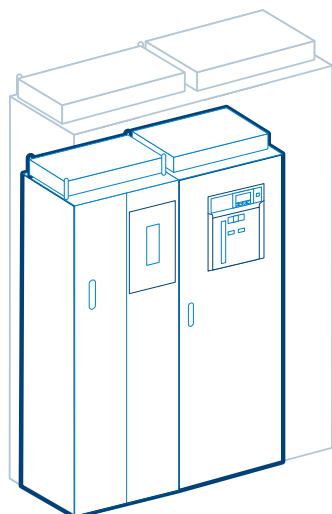
### Fast response for increased safety

With fast opening times less than 30 ms for selected variants, AFS09 ... AFS38 respond quickly when a dangerous failure is detected. Safety is enhanced and the safety distances of installations can be significantly shorter.



### Panel size reduction

By reducing coil energy consumption by up to 60%, panels can be built smaller and transformers can be downsized. With reduced power dissipation in the cabinet, installations also need fewer fans. Using AFS contactors saves money and precious space.



### Built-in surge suppression

Unlike conventional contactors, ABB's AFS contactors have built-in surge suppression, preventing surges from ever reaching the control circuit. With no need for the usual external surge suppressor add-ons, ABB's solution means one less device to install and one less complication to manage.



# AFS09 ... AFS38 3-pole contactors for safety application

## 4 to 18.5 kW

### AC / DC operated with 2 N.O. + 2 N.C. auxiliary contacts



AFS16-30-22

1SBC101538W0014



AFS38-30-22

1SBC101539W0014

#### Description

AFS09 ... AFS38 contactors are designed for machine safety applications. They are delivered with fixed front-mounted auxiliary contact blocks making them ideal for monitoring and controlling circuits. Mechanically linked and mirror contacts make your system safer.

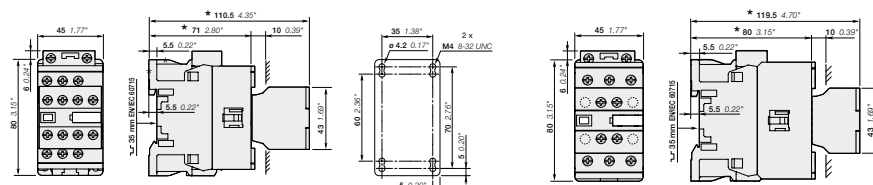
- control circuit with electronic coil interface:
  - dedicated 24 V DC for direct control by PLC-output  $\geq 250$  mA, low holding consumption up to 1.7 W
  - 24...60 V AC, 20...60 V DC and 100...250 V AC / DC operated accepting a wide control voltage range
  - reduced panel energy consumption
- mirror and mechanically linked contacts, with front marked symbol acc. to IEC60947-5-1, always guaranteeing the right contactor status
- front-mounted auxiliary contact block:
  - permanently fixed
  - protective cover to prevent manual operation
  - yellow housing for easy identification
  - minimum switching capacity 12 V / 3 mA, with a failure rate  $10^{-7}$  acc. to IEC 60947-5-4
- built-in surge suppression

#### Ordering details

IEC	UL/CSA		Rated control circuit voltage Uc min. ... Uc max.	Auxiliary contacts fitted	Type (1)	Order code	Weight		
	Rated operational power	3-phase motor rating						General use rating	Pkg (1 pce)
400 V AC-3	AC-1	480 V	600 V AC				kg		
kW	A	hp	A	V 50/60 Hz	V DC				
4	25	5	25	-	24	2 2	AFS09Z-30-22-30	1SBL136082R3022	0.49
				24 ... 60	20 ... 60 (1)	2 2	AFS09-30-22-11	1SBL137082R1122	0.32
				100 ... 250	100 ... 250	2 2	AFS09-30-22-13	1SBL137082R1322	0.32
5.5	28	7-1/2	28	-	24	2 2	AFS12Z-30-22-30	1SBL156082R3022	0.49
				24 ... 60	20 ... 60 (1)	2 2	AFS12-30-22-11	1SBL157082R1122	0.32
				100 ... 250	100 ... 250	2 2	AFS12-30-22-13	1SBL157082R1322	0.32
7.5	30	10	30	-	24	2 2	AFS16Z-30-22-30	1SBL176082R3022	0.49
				24 ... 60	20 ... 60 (1)	2 2	AFS16-30-22-11	1SBL177082R1122	0.32
				100 ... 250	100 ... 250	2 2	AFS16-30-22-13	1SBL177082R1322	0.32
11	45	15	45	-	24	2 2	AFS26Z-30-22-30	1SBL236082R3022	0.54
				24 ... 60	20 ... 60 (1)	2 2	AFS26-30-22-11	1SBL237082R1122	0.36
		100 ... 250	100 ... 250	2 2	AFS26-30-22-13	1SBL237082R1322	0.36		
15	50	20	50	-	24	2 2	AFS30Z-30-22-30	1SBL276082R3022	0.54
				24 ... 60	20 ... 60	2 2	AFS30-30-22-11	1SBL277082R1122	0.36
		100 ... 250	100 ... 250(1)	2 2	AFS30-30-22-13	1SBL277082R1322	0.36		
18.5	50	25	50	-	24	2 2	AFS38Z-30-22-30	1SBL296082R3022	0.54
				24 ... 60	20 ... 60 (1)	2 2	AFS38-30-22-11	1SBL297082R1122	0.36
		100 ... 250	100 ... 250	2 2	AFS38-30-22-13	1SBL297082R1322	0.36		

(1) AFS...-30-...-11 for control by transistor outputs of safety PLCs and safety relays use interface relay RA4 1SBN060100R1000.

#### Main dimensions mm, inches



AFS09, AFS12, AFS16

\* For AFS09Z, AFS12Z, AFS16Z-30-22-30: depth + 20 mm (+ 0.79")

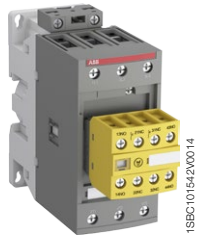
AFS26, AFS30, AFS38

\* For AFS26Z, AFS30Z, AFS38Z-30-22-30: depth + 20 mm (+ 0.79")

# AFS40 ... AFS96 3-pole contactors for safety application

## 18.5 to 45 kW

### AC / DC operated with 2 N.O. + 2 N.C. auxiliary contacts



AFS65-30-22



AFS96-30-22

#### Description

AFS40 ... AFS96 contactors are designed for machine safety applications. They are delivered with fixed front-mounted auxiliary contact blocks making them ideal for monitoring and controlling circuits. Mechanically linked and mirror contacts make your system safer.

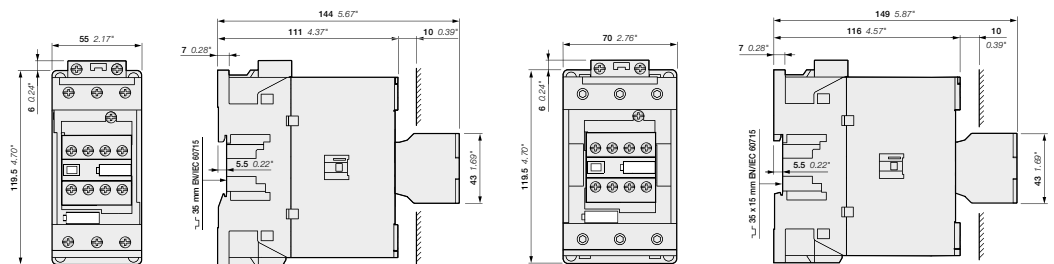
- control circuit with electronic coil interface:
  - 24...60 V AC, 20...60 V DC and 100...250 V AC / DC operated accepting a wide control voltage range
  - reduced panel energy consumption
- mirror and mechanically linked contacts, with front marked symbol acc. to IEC60947-5-1, always guaranteeing the right contactor status
- front-mounted auxiliary contact block:
  - permanently fixed
  - protective cover to prevent manual operation
  - yellow housing for easy identification
  - minimum switching capacity 12 V / 3 mA, with a failure rate  $10^{-7}$  acc. to IEC 60947-5-4
- built-in surge suppression

#### Ordering details

IEC Rated operational power	UL/CSA 3-phase motor rating 480 V	General use rating 600 V AC	Rated control circuit voltage		Auxiliary contacts fitted	Type (1)	Order code	Weight Pkg (1 pce) kg	
			Uc min. ...	Uc max.					
400 V AC-3 kW	AC-1 hp	A	V 50/60 Hz	V DC					
18.5 kW	70 A	30	60 A	24 ... 60	20 ... 60 (1)	2 2	AFS40-30-22-11	1SBL347082R1122	1.02
				100 ... 250	100 ... 250	2 2	AFS40-30-22-13	1SBL347082R1322	1
22 kW	100 A	40	80 A	24 ... 60	20 ... 60 (1)	2 2	AFS52-30-22-11	1SBL367082R1122	1.02
				100 ... 250	100 ... 250	2 2	AFS52-30-22-13	1SBL367082R1322	1
30 kW	105 A	50	90 A	24 ... 60	20 ... 60 (1)	2 2	AFS65-30-22-11	1SBL387082R1122	1.02
				100 ... 250	100 ... 250	2 2	AFS65-30-22-13	1SBL387082R1322	1
37 kW	125 A	60	105 A	24 ... 60	20 ... 60 (1)	2 2	AFS80-30-22-11	1SBL397082R1122	1.27
				100 ... 250	100 ... 250	2 2	AFS80-30-22-13	1SBL397082R1322	1.22
45 kW	130 A	60	115 A	24 ... 60	20 ... 60 (1)	2 2	AFS96-30-22-11	1SBL407082R1122	1.27
				100 ... 250	100 ... 250	2 2	AFS96-30-22-13	1SBL407082R1322	1.22

(1) AFS...-30...-11 for control by transistor outputs of safety PLCs and safety relays use interface relay RA4 1SBN060100R1000.

#### Main dimensions mm, inches



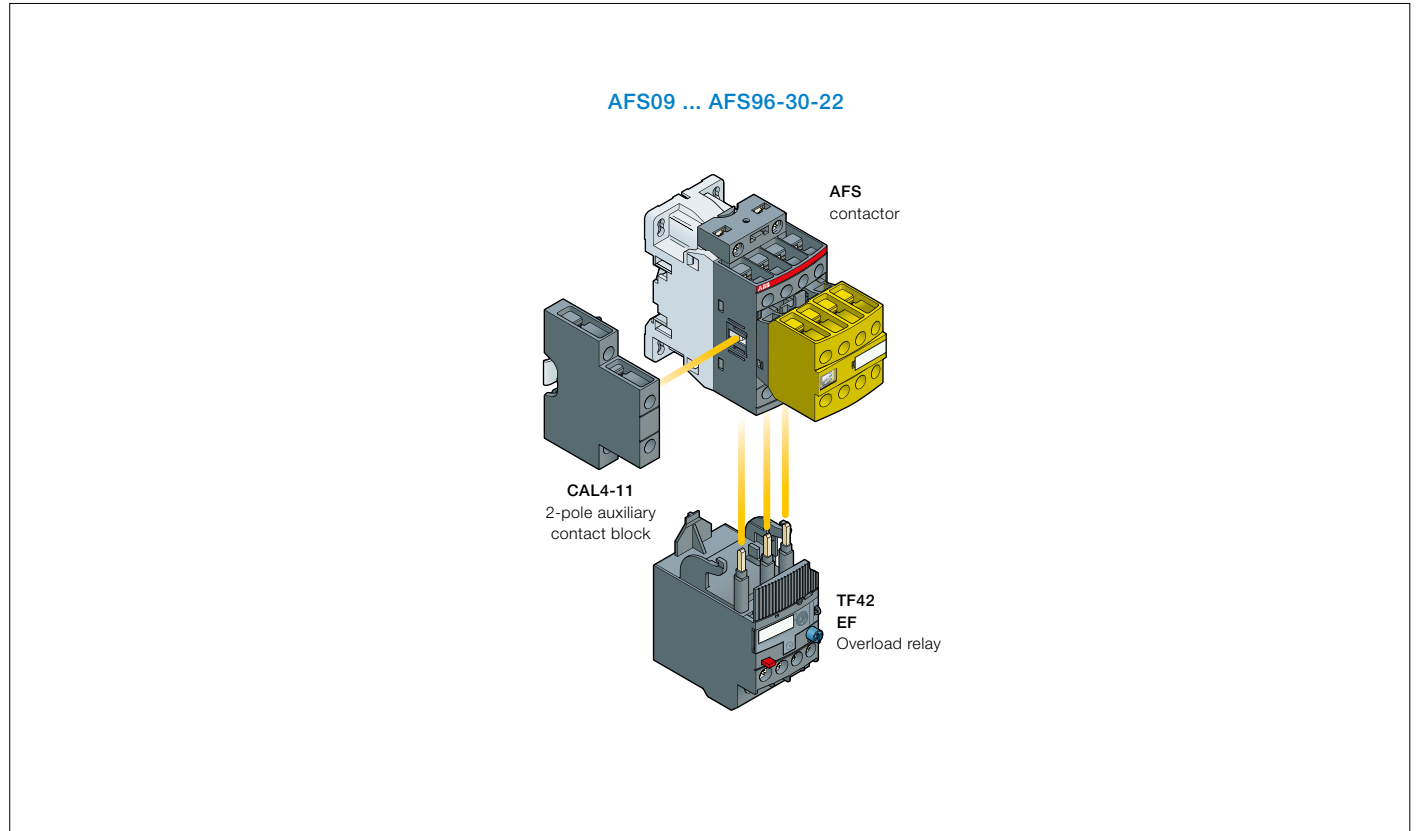
AFS40, AFS52, AFS65

AFS80, AFS96

# AFS09 ... AFS96 3-pole contactors for safety applications

## Main accessories

### Contactor and main accessories (other accessories available)



### Main accessory fitting details

Many configurations of accessories are possible depending on whether these are front-mounted or side-mounted.

Contactor types	Main poles		Built-in auxiliary contacts		Front-mounted accessories				Mechanical interlock unit (between 2 contactors)		Side-mounted accessories		
					Auxiliary contact blocks			Electronic timer		Auxiliary contact blocks			
	I	Y	I	Y	1-pole CA4	1-pole CC4	2-pole CAT4-11	4-pole CA4	TEF4	VM	Left side	Right side	
AFS09 ... AFS96	3	0	2	2	-	-	-	-	-	1	+	1	-
AFS09Z ... AFS38Z	3	0	2	2	-	-	-	-	-	-	-	-	-
AFS40 ... AFS96	3	0	2	2	-	-	-	-	-	1	+	1	+

### Overload relays fitting details (1)

Contactor types	Thermal overload relays	Electronic overload relays
AFS09 ... AFS38	TF42 (0.10...38 A)	EF19 (0.10...19 A)
AFS26 ... AFS38	TF42 (0.10...38 A)	EF45 (9...45 A)
AFS40 ... AFS65	TF65 (22...67 A)	EF65 (20...70 A)
AFS80, AFS96	TF96 (40...96 A)	EF96 (36...100 A)

The addition of an overload relay on the contactor does not prevent fitting of many other accessories as shown above.

(1) Direct mounting - No kit required.



# AFS09 ... AFS96 3-pole contactors for safety applications

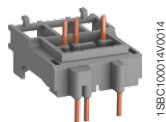
## Main accessories



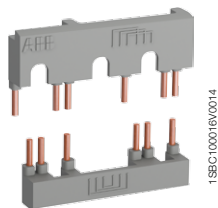
CAL4-11



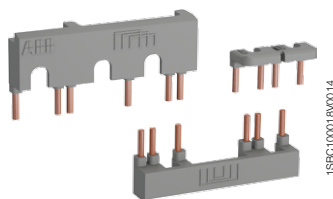
VM4



BEA16-4



BER16-4



BEY16-4

### Ordering Details (1)

For contactors	Auxiliary contacts	Type	Order code	Pkg qty	Weight (1 pce)
					kg

### Side-mounted instantaneous auxiliary contact blocks

AFS09 ... AFS96	1 1	- -	CAL4-11	1SBN010120R1011	1	0.040
	1 1	- -	CAL4-11-T	1SBN010120T1011	10	0.040

### Mechanical interlock unit

AFS09 ... AFS38			VM4	1SBN030105T1000	10	0.005
AFS40 ... AFS96			VM96-4	1SBN033405T1000	10	0.006

Note: VM4 and VM96-4 include 2 fixing clips (BB4) to maintain together both contactors.

For contactors	Time delay range selected by switch	Delay type	Auxiliary contacts	Type	Order code	Pkg qty	Weight (1 pce)
							kg

### Connecting links with manual motor starters

AFS09 ... AFS16	with	MS116-0.16 ... MS116-25, MS132-0.16 ... MS132-25		BEA16-4	1SBN081306T1000	10	0.025
AFS26 ... AFS38	with	MS116-0.16 ... MS116-16, MS132-0.16 ... MS132-10		BEA26-4	1SBN082306T1000	10	0.025
	with	MS116-20 ... MS116-32, MS132-12 ... MS132-32		BEA38-4	1SBN082306T2000	10	0.030
AFS40 ... AFS65	with	MS165-16 ... MS165-65		BEA65-4	1SBN083406R1000	1	0.090
		MS165-16 ... MS165-65 (2)		BPR65-4	1SBN113405R1000	1	0.014

### Connection sets for reversing contactors

AFS09 ... AFS16				BER16-4	1SBN081311R1000	1	0.045
AFS26 ... AFS38				BER38-4	1SBN082311R1000	1	0.100
AFS40 ... AFS65				BER65-4	1SBN083411R1000	1	0.175
AFS80 ... AFS96				BER96-4	1SBN083911R1000	1	0.250

### Connection sets for star-delta starting

AFS09 ... AFS16	with or without VM4			BEY16-4	1SBN081313R2000	1	0.050
AFS26 ... AFS38	with or without VM4			BEY38-4	1SBN082713R2000	1	0.110
AFS40 ... AFS65	with or without VM96-4			BEY65-4	1SBN083413R2000	1	0.200
AFS80 ... AFS96	with or without VM96-4			BEY96-4	1SBN083913R2000	1	0.250

(1) For more information, refer to "Accessories" section.

(2) Use one BPR65-4 for each contactor AF540 ... AF565.

# AFS09 ... AFS96 3-pole contactors for safety application

## Technical data

### Main pole - Utilization characteristics according to IEC

Contractor types	AC / DC operated	AFS09	AFS12	AFS16	AFS26	AFS30	AFS38	AFS40	AFS52	AFS65	AFS80	AFS96
Standards		IEC 60947-1 / 60947-4-1 and EN 60947-1 / 60947-4-1										
Rated operational voltage $U_e$ max.		690 V										1000 V
Rated frequency (without derating)		50 / 60 Hz										
Conventional free-air thermal current $I_{th}$		35 A	35 A	35 A	50 A	50 A	50 A	105 A	105 A	105 A	130 A	130 A
acc. to IEC 60947-4-1, open contactors, $\theta \leq 40^\circ\text{C}$		6 mm <sup>2</sup>	6 mm <sup>2</sup>	6 mm <sup>2</sup>	10 mm <sup>2</sup>	10 mm <sup>2</sup>	10 mm <sup>2</sup>	35 mm <sup>2</sup>	35 mm <sup>2</sup>	35 mm <sup>2</sup>	50 mm <sup>2</sup>	50 mm <sup>2</sup>
With conductor cross-sectional area												
<b>AC-1 Utilization category</b>												
For air temperature close to contactor												
<b><math>I_e</math> / Rated operational current AC-1</b>	$\theta \leq 40^\circ\text{C}$	25 A	28 A	30 A	45 A	50 A	50 A	70 A	100 A	105 A	125 A	130 A
$U_e$ max. $\leq 690$ V, 50/60 Hz	$\theta \leq 60^\circ\text{C}$	25 A	28 A	30 A	40 A	42 A	42 A	60 A	80 A	90 A	100 A	105 A
	$\theta \leq 70^\circ\text{C}$	22 A	24 A	26 A	32 A	37 A	37 A	50 A	70 A	80 A	85 A	90 A
With conductor cross-sectional area		4 mm <sup>2</sup>	6 mm <sup>2</sup>	6 mm <sup>2</sup>	10 mm <sup>2</sup>	10 mm <sup>2</sup>	10 mm <sup>2</sup>	25 mm <sup>2</sup>	35 mm <sup>2</sup>	35 mm <sup>2</sup>	50 mm <sup>2</sup>	50 mm <sup>2</sup>
<b>AC-3 Utilization category</b>												
For air temperature close to contactor $\theta \leq 60^\circ\text{C}$												
<b><math>I_e</math> / Max. rated operational current AC-3 (1)</b>												
	220-230-240 V	9 A	12 A	18 A	26 A	33 A	40 A	40 A	53 A	65 A	80 A	96 A
	380-400 V	9 A	12 A	18 A	26 A	32 A	38 A	40 A	53 A	65 A	80 A	96 A
	415 V	9 A	12 A	18 A	26 A	32 A	38 A	40 A	53 A	65 A	80 A	96 A
	440 V	9 A	12 A	18 A	26 A	32 A	38 A	40 A	53 A	65 A	80 A	96 A
	500 V	9.5 A	12.5 A	15 A	23 A	28 A	33 A	35 A	45 A	55 A	65 A	80 A
	690 V	7 A	9 A	10.5 A	17 A	21 A	24 A	25 A	35 A	39 A	49 A	57 A
	1000 V										25 A	30 A
<b>Rated operational power AC-3 (1)</b>												
	220-230-240 V	2.2 kW	3 kW	4 kW	6.5 kW	9 kW	11 kW	11 kW	15 kW	18.5 kW	22 kW	25 kW
	380-400 V	4 kW	5.5 kW	7.5 kW	11 kW	15 kW	18.5 kW	18.5 kW	22 kW	30 kW	37 kW	45 kW
	415 V	4 kW	5.5 kW	9 kW	11 kW	15 kW	18.5 kW	22 kW	30 kW	37 kW	45 kW	55 kW
	440 V	4 kW	5.5 kW	9 kW	15 kW	18.5 kW	22 kW	22 kW	30 kW	37 kW	45 kW	55 kW
	500 V	5.5 kW	7.5 kW	9 kW	15 kW	18.5 kW	22 kW	22 kW	30 kW	37 kW	45 kW	55 kW
	690 V	5.5 kW	7.5 kW	9 kW	15 kW	18.5 kW	22 kW	22 kW	30 kW	37 kW	45 kW	55 kW
	1000 V										35 kW	40 kW
<b>Rated making capacity AC-3</b>		10 x $I_e$ AC-3 acc. to IEC 60947-4-1										
<b>Rated breaking capacity AC-3</b>		8 x $I_e$ AC-3 acc. to IEC 60947-4-1										
<b>AC-8a Utilization category</b>												
(without thermal overload relay - $U_e$ 400 V 50/60 Hz - $\theta \leq 40^\circ\text{C}$ )												
<b><math>I_e</math> / Rated operational current AC-8a</b>		12 A	16 A	22 A	30 A	40 A	50 A	53 A	70 A	85 A	105 A	120 A
<b>Rated operational power AC-8a</b>		5.5 kW	7.5 kW	11 kW	15 kW	20 kW	25 kW	25 kW	37 kW	45 kW	55 kW	65 kW
<b>Short-circuit protection device for contactors</b>												
without thermal overload relay - Motor protection excluded (2)												
$U_e \leq 500$ V AC - gG type fuse		25 A	32 A	32 A	50 A	63 A	63 A	80 A	110 A	125 A	160 A	160 A
<b>Rated short-time withstand current <math>I_{cw}</math></b>												
at $40^\circ\text{C}$ ambient temperature, in free air from a cold state												
	1 s	300 A	300 A	300 A	700 A	700 A	700 A	1000 A	1000 A	1000 A	1200 A	1200 A
	10 s	150 A	150 A	150 A	350 A	350 A	350 A	600 A	600 A	600 A	780 A	780 A
	30 s	80 A	80 A	80 A	225 A	225 A	225 A	350 A	350 A	350 A	450 A	450 A
	1 min	60 A	60 A	60 A	150 A	150 A	150 A	250 A	250 A	250 A	300 A	300 A
	15 min	35 A	35 A	35 A	50 A	50 A	50 A	110 A	110 A	110 A	140 A	140 A
<b>Maximum breaking capacity</b>												
$\cos \varphi = 0.45$												
	at 440 V	250 A	250 A	250 A	500 A	500 A	500 A	950 A	950 A	950 A	1150 A	1150 A
	at 690 V	106 A	106 A	106 A	200 A	200 A	200 A	600 A	600 A	600 A	750 A	750 A
<b>Power dissipation per pole</b>												
	$I_e$ / AC-1	0.8 W	1 W	1.2 W	1.8 W	2.4 W	2.4 W	3 W	6.3 W	7 W	7.6 W	8.2 W
	$I_e$ / AC-3	0.1 W	0.2 W	0.35 W	0.6 W	0.9 W	1.3 W	1 W	1.7 W	2.7 W	3 W	4.5 W
<b>Max. electrical switching frequency</b>												
	AC-1	600 cycles/h										
	AC-3	1200 cycles/h										
	AC-2, AC-4	300 cycles/h					150 cycles/h					
<b>B10d</b>												
Calculated for 50% of the rated current value $I_e$ at AC-3 / 400 V		1.3 million operating cycles										

(1) For the corresponding kW/A or hp/A values of 1500 r.p.m. 50 Hz or 1800 r.p.m. 60 Hz, 3-phase motors, see "Motor rated operational powers and currents".  
(2) For the protection of motor starters against short circuits, see "Coordination with short-circuit protection devices".

# AFS09 ... AFS96 3-pole contactors for safety application

## Technical data

### Main pole - Utilization characteristics according to UL / NEMA / CSA

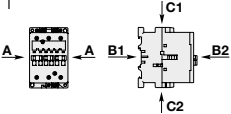
Contactor types	AC / DC operated	AFS09	AFS12	AFS16	AFS26	AFS30	AFS38	AFS40	AFS52	AFS65	AFS80	AFS96
Standards		UL 60947-4-1, CSA-C22.2 No. 60947-4-1										
Maximum operational voltage		600 V										
NEMA size		00	0	-	1	-	-	2	-	-	3	-
NEMA continuous amp rating	Thermal current	9 A	18 A	-	27 A	-	-	45 A	-	-	90 A	-
NEMA maximum horse power ratings												
1-phase, 60 Hz	115 V AC	1/3 hp	1 hp	-	2 hp	-	-	3 hp	-	-	-	-
	230 V AC	1 hp	2 hp	-	3 hp	-	-	7.5 hp	-	-	-	-
NEMA maximum horse power ratings												
3-phase, 60 Hz	200 V AC	1-1/2 hp	3 hp	-	7-1/2 hp	-	-	10 hp	-	-	25 hp	-
	230 V AC	1-1/2 hp	3 hp	-	7-1/2 hp	-	-	15 hp	-	-	30 hp	-
	460 V AC	2 hp	5 hp	-	10 hp	-	-	25 hp	-	-	50 hp	-
	575 V AC	2 hp	5 hp	-	10 hp	-	-	25 hp	-	-	50 hp	-
UL / CSA general use rating												
600 V AC		25 A	28 A	30 A	45 A	50 A	50 A	60 A	80 A	90 A	105 A	115 A
With conductor cross-sectional area		AWG 10	AWG 10	AWG 10	AWG 8	AWG 8	AWG 8	AWG 6	AWG 4		AWG 2	
1 pole	80 V DC	25 A	28 A	30 A	45 A	50 A	50 A	60 A	80 A	90 A	105 A	115 A
2 poles in serie	160 V DC	25 A	28 A	30 A	45 A	50 A	50 A	60 A	80 A	90 A	105 A	115 A
3 poles in serie	240 V DC	25 A	28 A	30 A	45 A	50 A	50 A	60 A	80 A	90 A	105 A	115 A
With conductor cross-sectional area		AWG 10	AWG 10	AWG 10	AWG 8	AWG 8	AWG 8					
UL / CSA maximum 1-phase motor rating												
Full load current	120 V AC	13.8 A	16 A	20 A	24 A	24 A	24 A	34 A	34 A	56 A	80 A	80 A
	240 V AC	10 A	12 A	17 A	17 A	28 A	28 A	40 A	50 A	68 A	68 A	88 A
Horse power rating	120 V AC	3/4 hp	1 hp	1-1/2 hp	2 hp	2 hp	2 hp	3 hp	3 hp	5 hp	7-1/2 hp	7-1/2 hp
	240 V AC	1-1/2 hp	2 hp	3 hp	3 hp	5 hp	5 hp	7-1/2 hp	10 hp	15 hp	15 hp	20 hp
UL / CSA maximum 3-phase motor rating												
Full load current (1)	200-208 V AC	7.8 A	11 A	17.5 A	25.3 A	32.2 A	32.2 A	32.2 A	48.3 A	62.1 A	78.2 A	92 A
	220-240 V AC	6.8 A	9.6 A	15.2 A	22 A	28 A	28 A	42 A	54 A	68 A	80 A	80 A
	440-480 V AC	7.6 A	11 A	14 A	21 A	27 A	34 A	40 A	52 A	65 A	77 A	77 A
	550-600 V AC	9 A	11 A	17 A	22 A	27 A	32 A	41 A	52 A	62 A	77 A	77 A
Horse power rating (1)	200-208 V AC	2 hp	3 hp	5 hp	7-1/2 hp	10 hp	10 hp	10 hp	15 hp	20 hp	25 hp	30 hp
	220-240 V AC	2 hp	3 hp	5 hp	7-1/2 hp	10 hp	10 hp	15 hp	20 hp	25 hp	30 hp	30 hp
	440-480 V AC	5 hp	7-1/2 hp	10 hp	15 hp	20 hp	25 hp	30 hp	40 hp	50 hp	60 hp	60 hp
	550-600 V AC	7-1/2 hp	10 hp	15 hp	20 hp	25 hp	30 hp	40 hp	50 hp	60 hp	75 hp	75 hp
UL / CSA - DC motor starting - 3 poles in series												
Full Load Amps	125 V DC	9.5 A	13.2 A	17 A	25 A	25 A	25 A	40 A	58 A	76 A	76 A	110 A
	250 V DC	8.5 A	12.2 A	12.2 A	20 A	29 A	29 A	38 A	55 A	72 A	89 A	106 A
Horse power rating	125 V DC	1 hp	1-1/2 hp	2 hp	3 hp	3 hp	3 hp	5 hp	7-1/2 hp	10 hp	10 hp	15 hp
	250 V DC	2 hp	3 hp	3 hp	5 hp	7-1/2 hp	7-1/2 hp	10 hp	15 hp	20 hp	25 hp	30 hp
Short-circuit protection device for contactors												
without thermal overload relay - Motor protection excluded												
High fault current		100 kA										
Fuse rating		30 A	60 A		100 A		150 A				200 A	
Fuse type, 600 V		J										
Maximum electrical switching frequency												
For general use		600 cycles/h										
For motor use		1200 cycles/h										

(1) For the corresponding kW/A or hp/A values of 1500 r.p.m, 50 Hz or 1800 r.p.m, 60 Hz, 3-phase motors, see "Motor rated operational powers and currents".

# AFS09 ... AFS96 3-pole contactors for safety application

## Technical data

### General technical data

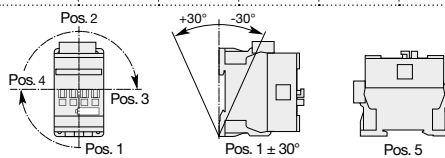
Contactor types	AC / DC operated	AFS09	AFS12	AFS16	AFS26	AFS30	AFS38	AFS40	AFS52	AFS65	AFS80	AFS96	
<b>Rated insulation voltage Ui</b>													
acc. to IEC 60947-4-1		690 V											
acc. to UL / CSA		600 V											
<b>Rated impulse withstand voltage Uimp.</b>		6 kV											
<b>Electromagnetic compatibility</b>		Devices complying with IEC 60947-1 / EN 60947-1 - Environments A and B											
<b>Ambient air temperature close to contactor</b>													
Operation	Fitted with thermal overload relay	-25 ... +60 °C											
	Without thermal overload relay	-40 ... +70 °C											
Storage		-60 ... +80 °C											
<b>Climatic withstand</b>		Category B according to IEC 60947-1 Annex Q											
<b>Maximum operating altitude (without derating)</b>		3000 m											
<b>Mechanical durability</b>													
Number of operating cycles		10 million operating cycles											
Maximum switching frequency		3600 cycles/h											
<b>Shock withstand</b>													
acc. to IEC 60068-2-27 and EN 60068-2-27	<b>Shock direction</b>	1/2 sinusoidal shock for 11 ms: no change in contact position, closed or open position											
Mounting position 1 	A	30 g								25 g			
	B1	25 g closed position / 5 g open position											
	B2	15 g											
	C1	25 g											
	C2	25 g											
Vibration withstand		5 ... 300 Hz						5 ... 300 Hz					
acc. to IEC 60068-2-6		4 g Closed position / 2 g Open position						3 g Closed position / 3 g Open position					

### Magnet system characteristics

Contactor types	AC / DC operated	AFS09	AFS12	AFS16	AFS26	AFS30	AFS38	AFS40	AFS52	AFS65	AFS80	AFS96	
<b>Coil operating limits</b>	<b>AC supply</b>	At $\theta \leq 60$ °C $0.85 \times U_c \text{ min} \dots 1.1 \times U_c \text{ max}$ . At $\theta \leq 70$ °C $0.85 \times U_c \text{ min} \dots U_c \text{ max}$ .						At $\theta \leq 70$ °C $0.85 \times U_c \text{ min} \dots 1.1 \times U_c \text{ max}$ .					
acc. to IEC 60947-4-1	<b>DC supply</b>	at $\theta \leq 60$ °C $0.85 \times U_c \text{ min} \dots 1.1 \times U_c \text{ max}$ at $\theta \leq 70$ °C (AFS) $0.85 \times U_c \text{ min} \dots U_c \text{ max}$ (AFS..Z coil 30) $U_c$						at $\theta \leq 70$ °C $0.85 \times U_c \text{ min} \dots 1.1 \times U_c \text{ max}$					
<b>AC control voltage 50/60 Hz</b>													
Rated control circuit voltage $U_c$		24 ... 250 V AC											
Coil consumption	<b>Average pull-in value</b>	50 VA						25 VA			40 VA		
	<b>Average holding value</b>	2.2 VA / 2 W						4 VA / 2 W					
<b>DC control voltage</b>													
Rated control circuit voltage $U_c$		20 ... 250 V DC											
Coil consumption	<b>Average pull-in value</b>	(AFS) 50 W - (AFS..Z coil 30) 6 W						25 W			40 W		
	<b>Average holding value</b>	(AFS) 2 W - (AFS..Z coil 30) 1.7 W						2 W					
<b>PLC-output control</b>		(AFS..Z coil 30) $\geq 250$ mA 24 V DC for PLCs and safety PLCs using broken wire detection											
<b>Drop-out voltage</b>		$\leq 60$ % $U_c \text{ min}$ .											
<b>Operating time</b>													
Between coil energization and:	<b>N.O. contact closing</b>	40 ... 95 ms						42 ... 100 ms					
	<b>N.C. contact opening</b>	38 ... 90 ms						38 ... 95 ms					
Between coil de-energization and:	<b>N.O. contact opening</b>	11 ... 95 ms (1)						17 ... 100 ms					
	<b>N.C. contact closing</b>	13 ... 98 ms						19 ... 105 ms					
<b>Operating time AFS..Z coil 30 - 24 V DC</b>													
Between coil energization and:	<b>N.O. contact closing</b>	27 ... 53 ms						-					
	<b>N.C. contact opening</b>	20 ... 35 ms						-					
Between coil de-energization and:	<b>N.O. contact opening</b>	17 ... 29 ms						-					
	<b>N.C. contact closing</b>	22 ... 57 ms						-					

(1) AFS09 ... ASF38  $\leq 35$  ms for  $20$  °C  $\leq \theta \leq 70$  °C




### Mounting characteristics and conditions for use

Contactor types	AC / DC operated	AFS09	AFS12	AFS16	AFS26	AFS30	AFS38	AFS40	AFS52	AFS65	AFS80	AFS96	
<b>Mounting positions</b>													
<b>Mounting distances</b>		The contactors can be assembled side by side											
<b>Fixing</b>													
On rail according to IEC 60715, EN 60715		35 x 7.5 mm or 35 x 15 mm											
By screws (not supplied)		2 x M4 screws placed diagonally						2 x M4 or 2 x M6 screws placed diagonally					

# AFS09 ... AFS96 3-pole contactors for safety application

## Technical data

### Connecting characteristics

Contactor types	AC / DC operated	AFS09	AFS12	AFS16	AFS26	AFS30	AFS38	AFS40	AFS52	AFS65	AFS80	AFS96	
<b>Main terminals</b>		 Screw terminals with cable clamp						 Screw terminals with double connector 2 x (9.3 width x 7.9/10.3 depth)		 Screw terminals with double connector 2 x (12.4 width x 9.3/11.1 depth)			
<b>Connection capacity (min. ... max.)</b>													
<b>Main conductors (poles)</b>													
Rigid Solid ( $\leq 4 \text{ mm}^2$ )		1 x	1 ... 6 mm <sup>2</sup>			2.5 ... 10 mm <sup>2</sup>		6 ... 35 mm <sup>2</sup>		6 ... 70 mm <sup>2</sup>			
		2 x	1 ... 6 mm <sup>2</sup>			2.5 ... 10 mm <sup>2</sup>		6 ... 35 mm <sup>2</sup>		6 ... 50 mm <sup>2</sup>			
Flexible with non insulated ferrule		1 x	0.75 ... 6 mm <sup>2</sup>			1.5 ... 10 mm <sup>2</sup>		4 ... 35 mm <sup>2</sup>		6 ... 50 mm <sup>2</sup>			
		2 x	0.75 ... 6 mm <sup>2</sup>			1.5 ... 10 mm <sup>2</sup>		4 ... 35 mm <sup>2</sup>		6 ... 50 mm <sup>2</sup>			
Flexible with insulated ferrule		1 x	0.75 ... 4 mm <sup>2</sup>			1.5 ... 10 mm <sup>2</sup>		4 ... 35 mm <sup>2</sup>		6 ... 50 mm <sup>2</sup>			
		2 x	0.75 ... 4 mm <sup>2</sup>			1.5 ... 4 mm <sup>2</sup>		4 ... 35 mm <sup>2</sup>		6 ... 50 mm <sup>2</sup>			
Bars or lugs		L <	9.6 mm			12.5 mm		9.2 mm		12.2 mm			
Connection capacity acc. to UL/CSA		1 or 2 x	AWG 16 ... 10			AWG 14 ... 8		AWG 10 ... 2		AWG 6 ... 1			
Stripping length			10 mm			14 mm		16 mm		17 mm			
Tightening torque recommended			1.5 Nm / 13 lb.in			2.5 Nm / 22 lb.in		4 Nm / 35 lb.in		6 Nm / 53 lb.in			
<b>Auxiliary conductors (built-in auxiliary terminals + coil terminals)</b>													
Rigid solid		1 x	1 ... 2.5 mm <sup>2</sup>										
		2 x	1 ... 2.5 mm <sup>2</sup>										
Flexible with non insulated ferrule		1 x	0.75 ... 2.5 mm <sup>2</sup>										
		2 x	0.75 ... 2.5 mm <sup>2</sup>										
Flexible with insulated ferrule		1 x	0.75 ... 2.5 mm <sup>2</sup>										
		2 x	0.75 ... 1.5 mm <sup>2</sup>										
Bars or lugs		L <	8 mm										
Connection capacity acc. to UL/CSA		1 or 2 x	AWG 18 ... 14										
Stripping length			10 mm										
Tightening torque													
Coil terminals recommended			1.2 Nm / 11 lb.in										
Built-in auxiliary terminals recommended			1.2 Nm / 11 lb.in										
<b>Degree of protection</b>													
acc. to IEC 60947-1 / EN 60947-1 and IEC 60529 / EN 60529													
Main terminals			IP20					IP10					
Coil terminals			IP20										
Built-in auxiliary terminals			IP20										
<b>Screw terminals</b>													
Delivered in open position, screws of unused terminals must be tightened													
Main terminals			M3.5			M4		M6		M8			
		Screwdriver type	Flat Ø 5.5 / Pozidriv 2			Flat Ø 6.5 / Pozidriv 2					hexagon socket (s = 4 mm)		
Coil terminals			M3.5										
		Screwdriver type	Flat Ø 5.5 / Pozidriv 2										
Built-in auxiliary terminals			M3.5										
		Screwdriver type	Flat Ø 5.5 / Pozidriv 2										

# AFS09 ... AFS96 3-pole contactors for safety applications

## Technical data

### Built-in auxiliary contacts according to IEC

Contactor types	AC / DC operated	AFS09	AFS12	AFS16	AFS26	AFS30	AFS38	AFS40	AFS52	AFS65	AFS80	AFS96
Rated operational voltage U <sub>e</sub> max.		690 V										
Rated frequency (without derating)		50 / 60 Hz										
Conventional free air thermal current I <sub>th</sub> - θ ≤ 40 °C		16 A										
le / Rated operational current AC-15 acc. to IEC 60947-5-1	24-127 V 50/60 Hz	6 A										
	220-240 V 50/60 Hz	4 A										
	400-440 V 50/60 Hz	3 A										
	500 V 50/60 Hz	2 A										
	690 V 50/60 Hz	2 A										
Making capacity AC-15		10 x I <sub>e</sub> AC-15 acc. to IEC 60947-5-1										
Breaking capacity AC-15		10 x I <sub>e</sub> AC-15 acc. to IEC 60947-5-1										
I <sub>e</sub> / Rated operational current DC-13 acc. to IEC 60947-5-1	24 V DC	6 A / 144 W										
	48 V DC	2.8 A / 134 W										
	72 V DC	1 A / 72 W										
	110 V DC	0.55 A / 60 W										
	125 V DC	0.55 A / 69 W										
	220 V DC	0.27 A / 60 W										
	250 V DC	0.27 A / 68 W										
	400 V DC	0.15 A / 60 W										
	500 V DC	0.13 A / 65 W										
	600 V DC	0.1 A / 60 W										
Short-circuit protection device gG type fuse		10 A										
Rated short-time withstand current I <sub>cw</sub>	for 1.0 s	100 A										
	for 0.1 s	140 A										
Minimum switching capacity with failure rate acc. to IEC 60947-5-4		12 V / 3 mA										
Non-overlapping time between N.O. and N.C. contacts		≥ 2 ms										
Power dissipation per pole at 6 A		0.1 W										
Maximum electrical switching frequency	AC-15	1200 cycles/h										
	DC-13	900 cycles/h										
Mechanically linked contacts acc. to annex L of IEC 60947-5-1		Built-in N.O. or N.C. auxiliary contacts and additional N.O. or N.C. auxiliary contacts (CAL4 aux. contact blocks) are mechanically linked contacts.										
Mirror contacts acc. to annex F of IEC 60947-4-1		Built-in N.C. auxiliary contacts or additional N.C. auxiliary contacts (CAL4 aux. contact blocks) are mirror contacts.										

### Built-in auxiliary contacts according to UL / CSA

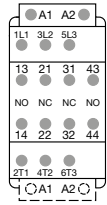
Contactor types	DC operated	AFS09	AFS12	AFS16	AFS26	AFS30	AFS38	AFS40	AFS52	AFS65	AFS80	AFS96
Maximum operational voltage		600_VACPDC, 600_VDCPDC										
Pilot duty		A600, Q600										
AC thermal rated current		10 A										
AC maximum volt-ampere making		7200 VA										
AC maximum volt-ampere breaking		720 VA										
DC thermal rated current		2.5 A										
DC maximum volt-ampere making-breaking		69 VA										

# AFS09 ... AFS96 3-pole contactors for safety applications

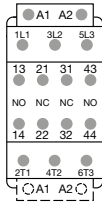
## Terminal marking and positioning

### AFS09 ... AFS96 contactors - AC / DC operated

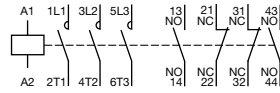
Standard devices



AFS09 ... AFS16..-30-22



AFS26 ... AFS96..-30-22



AFS09 ... AFS96..-30-22

# 3-pole contactors

## Electrical durability and utilization categories

### General

Utilization categories determine the current making and breaking conditions relating to the characteristics of the loads to be controlled by the contactors. International standard IEC 60947-4-1 and European standard EN 60947-4-1 are the standards to be referred to.

If  $I_c$  is the current to be broken by the contactor and  $I_e$  the rated operational current normally drawn by the load, then:

- Categories AC-1 and AC-3:  $I_c = I_e$
- Category AC-2:  $I_c = 2.5 \times I_e$
- Category AC-4:  $I_c = 6 \times I_e$

Generally speaking  $I_c = m \times I_e$  where  $m$  is a multiple of the load operational current.

On next pages, the curves corresponding to categories AC-1, AC-3 and AC-4 represent the electrical durability variation of standard contactors in relation to the breaking current  $I_c$ .

Electrical durability is expressed in millions of operating cycles.

### Curve utilization mode

#### Electrical durability forecast and contactor selection for categories AC-1, AC-2, AC-3 or AC-4

- Note the characteristics of the load to be controlled:
  - Operational voltage .....  $U_e$
  - Current normally drawn .....  $I_e$  ( $U_e / I_e / kW$  relation for motors, see "Motor rated operational powers and currents").
  - Utilization category ..... AC-1, AC-2, AC-3 or AC-4
  - Breaking current .....  $I_c = I_e$  for AC-1 and for AC-3 ;  $I_c = 2.5 \times I_e$  for AC-2 ;  $I_c = 6 \times I_e$  for AC-4
- Define the number of operating cycles  $N$  required.
- On the diagram corresponding to the operational category, select the contactor with the curve immediately above the intersection point ( $I_c ; N$ ).

#### Electrical durability forecast and contactor selection for mixed duty motor control: AC-3 ( $I_c = I_e$ ) type switching off while "motor running" and, occasionally, AC-4 ( $I_c = 6 \times I_e$ ) type switching off while "motor accelerating"

- Note the characteristics of the motor to be controlled:
  - Operational voltage .....  $U_e$
  - Current normally drawn while "motor running" .....  $I_e$  ( $U_e / I_e / kW$  relation for motors, see "Motor rated operational powers and currents")
  - Breaking current for AC-3 .....  $I_c = I_e$
  - Breaking current for AC-4 while "motor accelerating" .....  $I_c = 6 \times I_e$
  - Percentage of AC-4 operating cycles .....  $K$  (on the basis of the total number of operating cycles)
- Define the total number of operating cycles  $N$  required.
- Note the smallest contactor rating compatible for AC-3 ( $U_e / I_e$ ) on Main pole utilization characteristic table (see "Technical data").
- For the selected contactor make a note of the following in relation to the voltage using diagram AC-3 in next pages:
  - The number of operating cycles  $A$  for  $I_c = I_e$  (AC-3)
  - The number of operating cycles  $B$  for  $I_c = 6 \times I_e$  (AC-4)
- Calculate the estimated number of cycles  $N'$  ( $N'$  is always below  $A$ )

$$N' = \frac{A}{1 + 0.01 K (A/B - 1)}$$

- If  $N'$  is too low in relation to the target  $N$ , calculate the estimated number of cycles for a higher contactor rating.

#### Case of uninterrupted duty

For uninterrupted duty, some verifications of preventing maintenance are necessary to check the functionality of the concerned product (consult us).

The combined effect of environmental conditions and the proper temperature of the product may require some disposals. As a matter of fact, for this duty, the use duration prevails over the number of operating cycles.



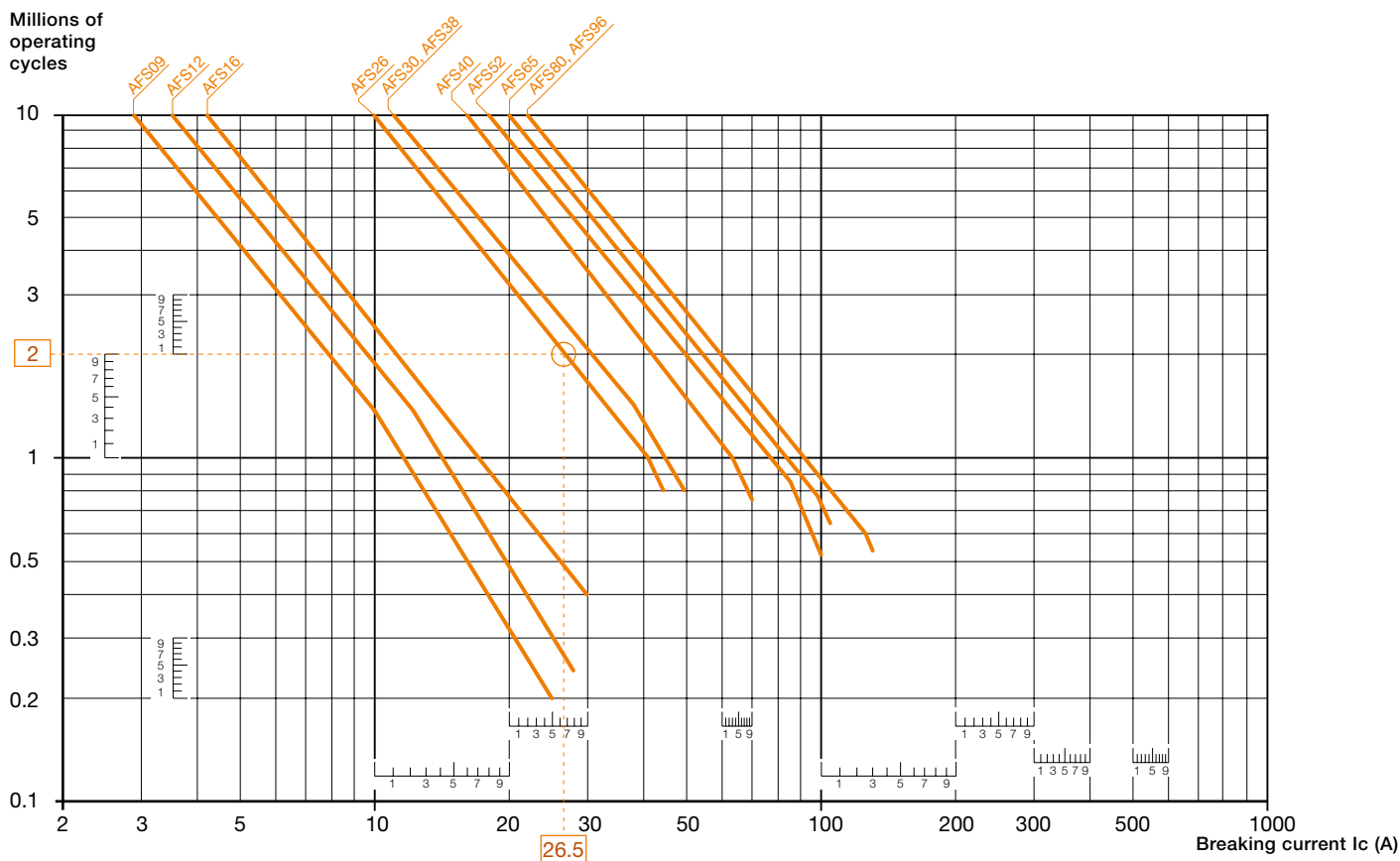
# 3-pole contactors

## Electrical durability

### Electrical durability for AC-1 utilization category - $U_e \leq 690$ V

Switching non-inductive or slightly inductive loads. The breaking current  $I_c$  for AC-1 is equal to the rated operational current of the load.

Ambient temperature and maximum electrical switching frequency: see "Technical data".



#### Example:

$I_c / AC-1 = 26.5$  A – Electrical durability required = 2 millions operating cycles.

Using the AC-1 curves above select the AFS26 contactor at intersection "O" (26.5 A / 2 millions operating cycles).

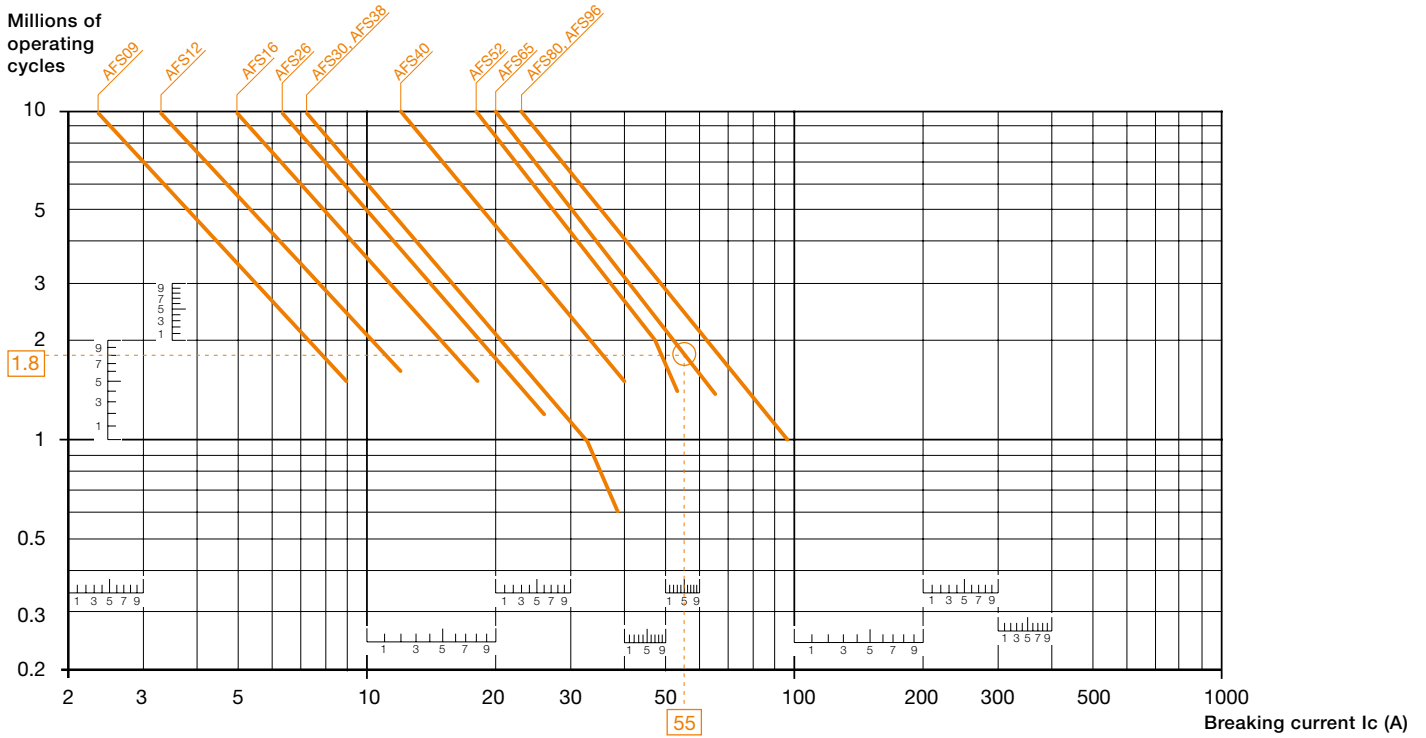
# 3-pole contactors

## Electrical durability

### Electrical durability for AC-3 utilization category - $U_e \leq 440$ V.

Switching cage motors: starting and switching off running motors. The breaking current  $I_c$  for AC-3 is equal to the rated operational current  $I_e$  ( $I_e$  = motor full load current).

Ambient temperature and maximum electrical switching frequency: see "Technical data".



### Example:

Motor power 30 kW for AC-3 -  $U_e = 400$  V and  $I_e = 55$  A utilization – Electrical durability required = 1.8 million operating cycles. For AC-3:  $I_c = I_e$ . Select the AFS65 contactor at intersection "○" (55 A / 1.8 million operating cycles) on the curves (AC-3 -  $U_e \leq 440$  V).

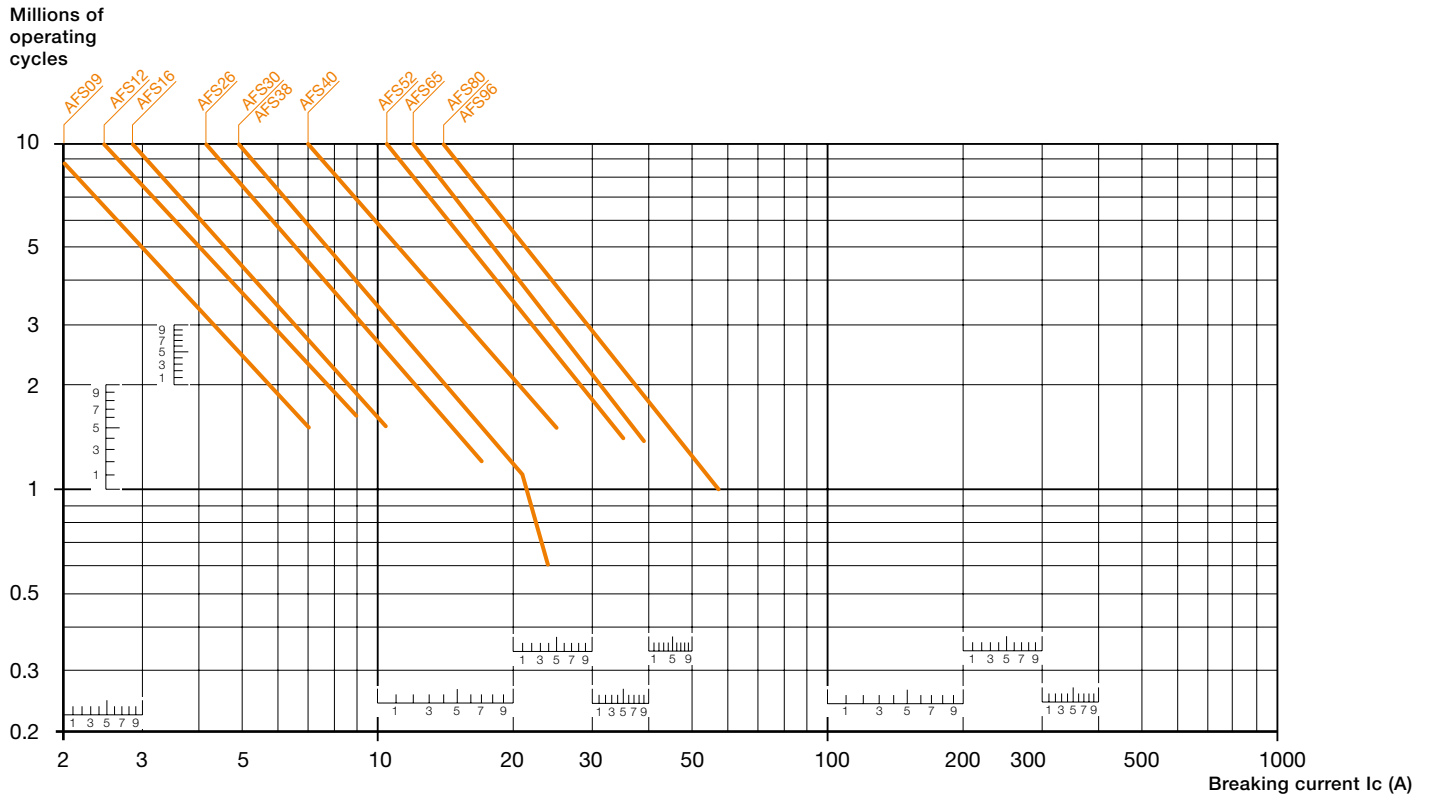
# 3-pole contactors

## Electrical durability

### Electrical durability for AC-3 utilization category - $440\text{ V} < U_e \leq 690\text{ V}$ .

Switching cage motors: starting and switching off running motors. The breaking current  $I_c$  for AC-3 is equal to the rated operational current  $I_e$  ( $I_e$  = motor full load current).

Ambient temperature and maximum electrical switching frequency: see "Technical data".



# 3-pole contactors

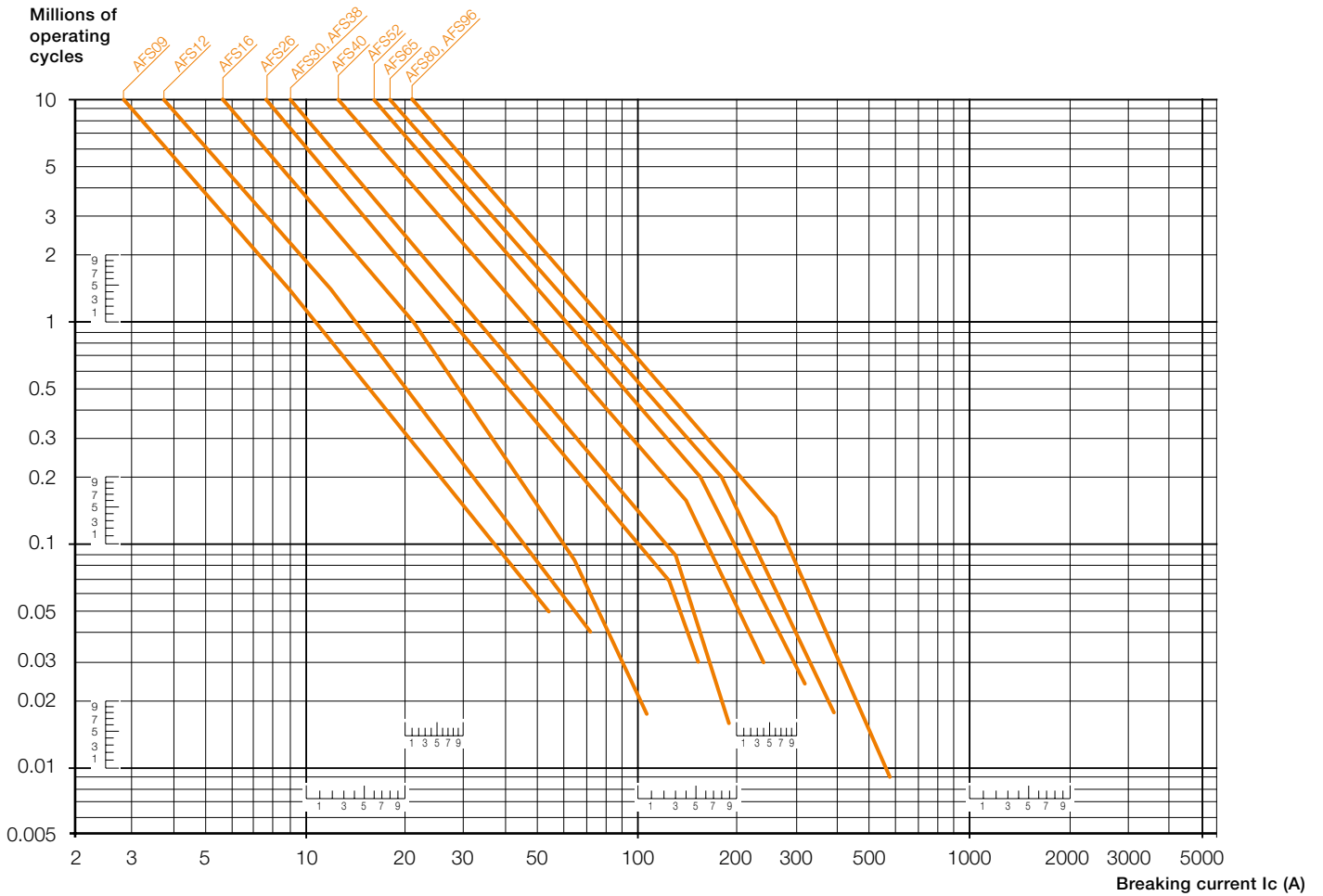
## Electrical durability

Electrical durability for AC-2 or AC-4 utilization category -  $U_e \leq 440\text{ V}$

Ambient temperature  $\leq 60\text{ }^\circ\text{C}$  for AFS09 ... AFS96

Switching cage motors: starting, reverse operation and step-by-step operation. The breaking current  $I_c$  is equal to  $2.5 \times I_e$  for AC-2 and  $6 \times I_e$  for AC-4, keeping in mind that  $I_e$  is the motor rated operational current ( $I_e$  = motor full-load current).

Maximum electrical switching frequency: see "Technical data".



# 3-pole contactors

## Electrical durability

Electrical durability for AC-2 or AC-4 utilization category -  $440\text{ V} < U_e \leq 690\text{ V}$

Ambient temperature  $\leq 60\text{ }^\circ\text{C}$  for AFS09 ... AFS96

Switching cage motors: starting, reverse operation and step-by-step operation. The breaking current  $I_c$  is equal to  $2.5 \times I_e$  for AC-2 and  $6 \times I_e$  for AC-4, keeping in mind that  $I_e$  is the motor rated operational current ( $I_e$  = motor full load current). Maximum electrical switching frequency: see "Technical data".

