

# 3VF2 Circuit-Breakers

## 3- and 4-pole, up to 100 A

For other circuit-breakers  
(complete program)  
see Catalog NS PS

### Technical data

Specifications		IEC 60 947, EN 60 947	
<b>Max. rated current <math>I_n</math></b>	A	16 to 100	
<b>Rated insulation voltage <math>U_i</math></b>			
Main current paths	AC V	690	
Auxiliary circuits	AC V	415	
<b>Rated impulse withstand voltage <math>U_{imp}</math></b>			
Main current paths	kV	6	
Auxiliary circuits	kV	4	
<b>Rated operational voltage <math>U_o</math></b>			
IEC	AC V	up to 415	
<b>Permissible ambient temperature</b>	°C	-20 to +70	
<b>Permissible load</b>			
at various ambient temperatures close to the circuit-breaker, related to the rated current of the circuit-breaker			
- circuit-breaker	at 40 °C %	100	
- for line protection	50 °C %	92	
	55 °C %	87	
	60 °C %	83	
	70 °C %	73	
<b>Rated short-circuit making and breaking capacity</b>			
Rated ultimate short-circuit breaking capacity $I_{cu}^{(1)}$	up to 240 V kA	65	
	up to 415 V kA	18	
Rated service short-circuit breaking capacity $I_{cs}$	up to 240 V kA	33	
	up to 415 V kA	9	
Rated short-circuit making capacity $I_{cm}$	up to 240 V kA	143	
	up to 415 V kA	36	
<b>Main switch characteristics</b> to IEC 60 947-2		yes	
with lockable rotary drives fitted			
<b>EMERGENCY STOP switch characteristic</b> to DIN VDE 0113		yes	
<b>Mechanical endurance</b>	operations	10000	
<b>Max. frequency of operation</b>	1/h	120	
<b>Conductor cross-sections and types of connection for main conductors</b>			
Connection type			
Solid or stranded	up to 40 A	mm <sup>2</sup>	2.5 to 10
	50 to 100 A	mm <sup>2</sup>	16 to 50
Tightening torque for box terminals	Nm	4.0/5.7	
<b>Conductor cross-section for auxiliary circuits</b>			
with terminal connection or terminal strip			
Solid	mm <sup>2</sup>	0.5 to 2.5	
Tightening torque for terminal screws	Nm	0.9	
<b>Power loss per circuit-breaker</b>			
at max. rated current $I_n$ with symmetrical 3-phase load			
- for line protection	W	16	
<b>Permissible mounting position</b>			
<b>Auxiliary switches</b>			
<b>Rated continuous thermal current <math>I_{th}</math></b>	A	6	
<b>Rated making capacity</b>	A	15	
<b>AC (AC-15)</b>			
- Rated operational voltage	V	240	
- Rated operational current	A	6	
<b>DC (DC-13)</b>			
- Rated operational voltage	V	125	
- Rated operational current	A	0.5	
<b>Back-up fuse</b>	A	4	
<b>Releases</b>			
<b>Shunt release (f-release)</b>			
Response voltage		0.7 to 1.1 $U_s$	
- pick-up (breaker trips)			
Power consumption (short time) at:			
12-24 V AC 50/60 Hz	VA	108	
48-60 V AC 50/60 Hz	VA	120	
48-127 V AC 50/60 Hz	VA	162	
12-24 V DC	W	14.4	
48-60 V DC	W	19.2	
110-125 V DC	W	38.4	
220-250 V DC	W	44	
Max. ON period		interrupts automatically	
Max. opening time	ms	50	

# 3VF3 to 3VF8 Circuit-Breakers

## 3- and 4-pole, up to 2500 A

For other circuit-breakers  
(complete program)  
see Catalog NS PS

Technical data

Type		3VF3	3VF4	3VF5	3VF6	3VF7	3VF8	
<b>Max. rated current <math>I_n</math></b> depending on version	A	160/205	200/250	315/400	500/630/800	800/1250	1600/2000	2500
<b>Rated insulation voltage <math>U_i</math></b> to IEC 60 947-2								
Main current paths		750	750	750	750	750	750	750
Auxiliary circuits	AC V	690	690	690	690	690	690	690
<b>Rated impulse withstand voltage <math>U_{imp}</math></b>								
Main current paths	kV	8	8	8	8	8	8	8
Auxiliary circuits	kV	4	4	4	4	4	4	4
<b>Rated operational voltage <math>U_e</math></b> (DC see below)								
IEC	AC V	690 <sup>1)</sup>	690	690	690	690	690	690
NEMA	AC V	600 <sup>1)</sup>	600	600	600	600	600	600
<b>Permissible ambient temperature</b>	°C	-20 to +70	-20 to +70	-20 to +70	-20 to +70	-5 to +60	-5 to +60	-5 to +60
<b>Permissible load</b> at various ambient temperatures close to the circuit-breaker, related to the rated current of the circuit-breaker								
		①	②	①	②	①	②	③
- circuit-breaker	at 40 °C %	100	100	100	100	100	100	100
for line protection	50 °C %	96	92	96	94	96	92	96
	55 °C %	93	87	94	90	93	87	85
	60 °C %	91	83	92	87	90	84	82
	70 °C %	86	73	88	80	85	75	84
- circuit-breaker	at 40 °C %	100/100	-	100	100	100	-	-
for motor protection	50 °C %	100/96	-	100	100	100	-	-
	55 °C %	100/90	-	100	100	100	-	-
	60 °C %	100/86	-	100	100	100	-	-
	70 °C %	100/77	-	87	90	90	-	-
- circuit-breaker	at 40 °C %	100	100	100	100	100	100	100
for starter combinations	50 °C %	100	100	100	100	100	91	100
and non-automatic circuit breakers	55 °C %	96	96	95	95	95	85	100
	60 °C %	91	92	90	90	90	81	100
	70 °C %	86	88	85	84	84	-	92
<b>Rated short-circuit breaking capacity (DC)</b> Not for 3VF motor protection circuit-breakers Time constant $\tau = 10$ ms								
1 current path	2 current paths in series	3 current paths in series	4 current paths in series					
for 3VF3 to 3VF6 to 250 V DC	440 V DC	600 V DC	750 V DC	kA	20	10 <sup>2)</sup>	20	20
NEMA								
Time constant $\tau = 8$ ms								
1 path	2 current paths in series							
DC 250 V	-			kA	10	10 <sup>2)</sup>	10	10
-	DC 250 V			kA	22	10 <sup>2)</sup>	22	22
<b>Main switch characteristics</b> to IEC 60 947-2 with lockable rotary drives fitted		yes	yes	yes	yes	yes	yes	yes
<b>EMERGENCY STOP switch characteristics</b> to DIN VDE 0113		yes	yes	yes	yes	yes	yes	yes
<b>Rated short-circuit breaking capacity</b> to IEC 60 947-2 (AC 50/60 Hz) <sup>4)</sup>		See page 11/9 for rated short-circuit breaking capacity.						

- ① Thermal overload release set to the upper value or fixed-setting thermal overload release.  
② Thermal overload release set to the lower value.  
③ Electronic release.

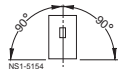
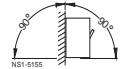
- 1) For circuit-breakers with rated currents  $\leq 40$  A:  $U_e$  maximum 415 V.  
2) 10 kA for 3VF...-0...-...  
3) Circuit-breaker not suitable for DC.  
4) Also suitable for 400 Hz systems, technical data on request.

# 3VF3 to 3VF8 Circuit-Breakers

## 3 and 4-pole, up to 2500 A

For other circuit-breakers  
(complete program)  
see Catalog NS PS

### Technical data

Type		3VF3	3VF4	3VF5	3VF6	3VF7	3VF8		
<b>Max. rated current <math>I_n</math></b> depending on version	A	160/205	200/250	315/400	500/630/800	800/1250	1600/2000	2500	
<b>Endurance</b>	operations	10000	10000	8000	8000	3000	3000	3000	
<b>Max. frequency of operation</b>	1/h	300	240	240	240	60	20	20	
<b>Conductor cross-section and type of connection for main conductors<sup>1)</sup></b>		Box terminals	Box terminals	Box terminals	Flat bar terminals	Flat bar terminals	Flat bar terminals	Vertical busbars	
Connection type									
Solid or stranded	mm <sup>2</sup>	2.5 to 70; 95 <sup>2)</sup>	50 to 150	95 to 240 <sup>6)</sup>	–	–	–	–	
Finely stranded with end sleeve	mm <sup>2</sup>	2.5 to 50; 70 <sup>2)</sup>	35 to 120	70 to 150	–	–	–	–	
Busbars	mm	–	–	–	1 × 40 × 10 <sup>3)</sup>	2 × 40 × 10 <sup>4)</sup>	2 × 60 × 10 <sup>4)</sup>	3 × 80 × 10	
Multiple feed-in terminal (accessory) Cu or Al, stranded	mm <sup>2</sup>	–	–	–	2 × (185–240)	4 × (95–185)	–	–	
Tightening torque for box terminals	Nm	5/9	20	42	31	31	–	–	
Tightening torque for busbar connection pieces	Nm	4.5/4.5	15	30	6	50	37	20	
<b>Conductor cross-sections for auxiliary circuits<sup>5)</sup></b> with terminal connection or terminal strip									
Solid	mm <sup>2</sup>	0.75 to 2.5	0.75 to 2.5	0.75 to 2.5	0.75 to 2.5	0.75 to 2.5	up to 2 × 4	up to 2 × 4	
Finely stranded with end sleeve	mm <sup>2</sup>	0.75 to 1.5	0.75 to 1.5	0.75 to 1.5	0.75 to 1.5	up to 2 × 1.5	up to 2 × 2.5	up to 2 × 2.5	
With brought out cable ends	mm <sup>2</sup>	0.82 (AWG 18)	0.82 (AWG 18)	0.82 (AWG 18)	0.82 (AWG 18)	0.82 (AWG 18)	0.82 (AWG 18)	0.82 (AWG 18)	
Tightening torque for terminal screws	Nm	0.8 to 1.4	0.8 to 1.4	0.8 to 1.4	0.8 to 1.4	0.8 to 1.4	0.8 to 1.4	0.8 to 1.4	
<b>Conductor cross-section for motor operating mechanism</b>									
Solid and stranded	mm <sup>2</sup>	0.75 to 1.5	0.75 to 1.5	0.75 to 1.5	0.75 to 1.5	0.75 to 2.5	0.75 to 2.5	0.75 to 2.5	
<b>Power loss per circuit-breaker</b> at max. rated current $I_n$ with symmetrical 3-phase load		(The power loss of the undervoltage release (r release) must also be taken into account where applicable)							
– line protection	W	60	75	175	255	87/210	135/240	400	
– non-automatic circuit breaker	W	45	75	107	160	87/210	135/240	400	
– for starter combinations	W	45	45	107	160	–	–	–	
– motor protection	W	60	–	75	120	–	–	–	
<b>Permissible mounting position</b>									

- 1) Max. cross-section for one conductor only. For smaller cross-sections: sum up to max. cross-section permissible. CupAl sleeves/cable lugs or CupAl shims are recommended for connecting aluminium conductors.
- 2) For 3VF33.
- 3) 800 A: 3 × 40 × 5.
- 4) Busbar connection pieces (see accessories).
- 5) 2 conductors can be connected.
- 6) 240 mm<sup>2</sup> not suitable for segmented conductors as the terminal has an oval aperture.

# 3VF3 to 3VF8 Circuit-Breakers

## 3 and 4-pole, up to 2500 A

For other circuit-breakers  
(complete program)  
see Catalog NS PS

### Technical data

Type		3VF3			3VF4			3VF5			3VF6			3VF7			3VF8		
Auxiliary switches																			
<b>Conventional thermal current <math>I_{th}</math></b>	A	6			6			6			6			6			6		
<b>Rated making capacity</b>	A	20			20			20			20			20			20		
<b>AC (AC-15)</b>																			
- Rated operational voltage	V	230	415	690	230	415	690	230	415	690	230	415	690	230	415	690	230	415	690
- Rated operational current	A	6	3	0.25	6	3	0.25	6	3	0.25	6	3	0.25	6	3	0.25	6	3	0.25
<b>DC (DC-13)</b>																			
- Rated operational voltage	V	24	125	240	24	125	240	24	125	240	24	125	240	24	125	240	24	125	240
- Rated operational current	A	6	0.5	0.15	6	0.5	0.15	6	0.5	0.15	6	0.5	0.15	6	0.5	0.15	6	0.5	0.15
<b>Back-up fuse</b>																			
<b>Miniature circuit-breaker</b>	A	6	4	4	6	4	4	6	4	4	6	4	4	6	4	4	6	4	4
Leading auxiliary switches (only on combination with rotary drive)																			
<b>Conventional thermal current <math>I_{th}</math></b>	A	2			2			2			2			-			16		
<b>Rated making capacity</b>	A	2 (inductive 0.5)			2 (inductive 0.5)			2 (inductive 0.5)			2 (inductive 0.5)			-			60		
<b>AC</b>																			
	cos $\phi$	0.7			0.7			0.7			0.7			-			0.7		
- Rated operational voltage	V	220			220			220			220			-			380		
- Rated operational current	A	2 (inductive 0.5)			2 (inductive 0.5)			2 (inductive 0.5)			2 (inductive 0.5)			-			6		
- Rated breaking capacity	A	2			2			2			2			-			60		
<b>Back-up fuse (quick-response)</b>	A	2			2			2			2			-			16		
Releases																			
<b>Undervoltage release (r release)</b>																			
Response voltages:																			
- Drop (breaker trips)	V	0.7 to 0.35 $U_s$			0.7 to 0.35 $U_s$			0.7 to 0.35 $U_s$			0.7 to 0.35 $U_s$			0.7 to 0.35 $U_s$			0.7 to 0.35 $U_s$		
- Pick-up (breaker can be closed)	V	0.85 to 1.1 $U_s$			0.85 to 1.1 $U_s$			0.85 to 1.1 $U_s$			0.85 to 1.1 $U_s$			0.85 to 1.1 $U_s$			0.85 to 1.1 $U_s$		
Power consumption (uninterrupted) at:																			
12 V AC 50/60 Hz	VA	2.5			1.6			1.6			1.6			1.9			2.9		
24 V AC 50/60 Hz	VA	1.4			6.0			6.0			6.0			2.4			3.1		
48-60 V AC 50/60 Hz	VA	1.2-1.9			3.2-5.5			3.2-5.5			3.2-5.5			2.3-4.1			3.4-6.0		
110-127 V AC 50/60 Hz	VA	1.3-1.7			2.2-2.9			2.2-2.9			2.2-2.9			3.4-4.2			3.3-3.8		
208-240 V AC 50/60 Hz	VA	2.2-2.9			3.5-4.6			3.5-4.6			3.5-4.6			4.8-6.5			4.2-7.2		
AC 50/60 Hz 380-500 V	VA	2.9-5			3.9-6.9			3.9-6.9			3.9-6.9			6.8-12.0			3.8-10.0		
12 V DC	W	2.8			2.5			2.5			2.5			2.8			3.4		
24 V DC	W	1.6			3.1			3.1			3.1			3.6			4.3		
48-60 V DC	W	1.3-2.0			3.5-5.4			3.5-5.4			3.5-5.4			3.5-6.5			4.8-7.2		
110-125 V DC	W	1.5-1.9			3.2-4.1			3.2-4.1			3.2-4.1			2.9-3.6			3.3-3.8		
220-250 V DC	W	2.6-3.4			5.5-6.9			5.5-6.9			5.5-6.9			4.8-6.3			6.6-7.5		
Max. opening time	ms	50			50			50			50			80			80		
<b>Shunt release (f release)</b>																			
Response voltage																			
- Pick-up (breaker trips)	V	0.7 to 1.1 $U_s$			0.7 to 1.1 $U_s$			0.7 to 1.1 $U_s$			0.7 to 1.1 $U_s$			0.7 to 1.1 $U_s$			0.7 to 1.1 $U_s$		
Power consumption (short time) at:																			
12-24 V AC 50/60 Hz	VA	40-300			87-405			87-405			81-701			86-631			177-1207		
48-60 V AC 50/60 Hz	VA	-			710-1105			710-1105			58-90			48-71			443-731		
48-127 V AC 50/60 Hz	VA	92-640			-			-			-			-			-		
110-240 V AC 50/60 Hz	VA	51-240			66-432			66-432			118-665			81-505			323-1466		
380-440 V AC 50/60 Hz	VA	-			127-188			127-188			125-181			43-68			1193-1641		
380-600 V AC 50/60 Hz	VA	278-700			-			-			-			-			-		
480-600 V AC 50/60 Hz	VA	-			34-60			34-60			43-79			41-69			197-312		
12-24 V DC	W	54-400			164-631			164-631			79-1000			46-405			289-865		
48-60 V DC	W	100-160			830-1580			830-1580			18-31			58-94			468-696		
110-125 V DC	W	55-71			112-150			112-150			112-150			74-98			363-473		
220-250 V DC	W	110-140			40-58			40-58			38-52			38-49			513-665		
Max. ON period	s	interrupts automatically																	
Max. opening time	ms	50			50			50			50			62			62		

# 3VF3 to 3VF8 Circuit-Breakers

## 3 and 4-pole, up to 2500 A

For other circuit-breakers  
(complete program)  
see Catalog NS PS

### Technical data

Type		3VF3	3VF4	3VF5	3VF6	3VF7	3VF8
Motor operating mechanism							
<b>Power consumption</b>	W	200	200	200	300	1000	2000
<b>Rated control supply voltage</b>	AC 50/60 Hz V	–	42	–	110–127	220–240	110–127 220–240
	DC V	24	48	60	110	220	48 – 48 –
<b>Back-up fuse or miniature circuit-breaker</b>	A	10 (for 3VF6: 16 A)	6 (for 3VF6: 10 A)	6	6	6	25 (for 32 A DC) 16
<b>Working range of control supply voltage</b>	V	0.85 to 1.1 $U_s$					
Minimum signal duration at $U_s$	s	1	1	1	1	0.5	0.03
Max. make- or break-time	s	1	1	1	1	0.5	0.5
Reclosing possible after approx.	s	2	2	2	2	2	60
Max. permissible frequency of operation	1/h	120	120	60	60 (4-pole: 20)	60	20
Max. operating signal duration	s	Non-maintained or continuous signal (depends on circuit)					
Motor operating mechanism suitable for synchronizing							
<b>Power consumption</b>	W	–	200	200	300	–	–
<b>Rated control supply voltage</b>	AC 50/60 Hz V	–	–	42	–	110–127	220–240
	DC V	–	24	48	60	110	220
<b>Back-up fuse or miniature circuit breaker</b>	A	–	10	6 (for 3VF6: 10 A)	6	6	–
<b>Working range of control supply voltage</b>	V	–	0.85 to 1.1 $U_s$		0.85 to 1.1 $U_s$		–
Minimum signal duration at $U_s$	ms	–	45	45	45	–	–
Make-time	ms	–	50	50	50	–	–
Break-time	s	–	1	1	1	–	–
Spring rewinding time	s	–	2	2	2	–	–
Reclosing possible after approx.	s	–	3	3	3	–	–
Max. permissible frequency of operation	1/h	–	60	60	30 (4-pole: 20)	–	–
Max. operating signal duration	s	–	Non-maintained or continuous signal (depends on circuit)				
Solenoid operating mechanism							
<b>Making current</b>							
at rated control supply voltage							
110–120 V AC, 110–120 V DC	A	20	–	–	–	–	–
220–240 V AC, 220–240 V DC	A	11	–	–	–	–	–
<b>Back-up fuse</b>							
at rated control supply voltage							
110–120 V AC, 110–120 V DC	A	6	–	–	–	–	–
220–240 V AC, 220–240 V DC	A	4	–	–	–	–	–
<b>Working range of control supply voltage</b>	V	0.85 to 1.1 $U_s$					
Minimum signal duration at $U_s$	ms	30	–	–	–	–	–
Max. make- or break-time	ms	80	–	–	–	–	–
Minimum necessary pause following operation	s	15	–	–	–	–	–

For other circuit-breakers (complete program) see Catalog NS PS

## Specifications

All 3VF circuit-breakers comply with:  
IEC 60 947-1/DIN VDE 0660, Part 100;

IEC 60 947-2/DIN VDE 0660, Part 101.

Isolator characteristics to IEC 60 947-3

In addition, the overload protection for motor protection circuit breakers complies with: IEC 60 947-4-1/DIN VDE 0660, Part 102.

The main switches comply with DIN VDE 0113, see page 11/33.

## Operating conditions

3VF circuit-breakers are climate proof. They are intended for use in enclosed areas where no severe operating conditions (e.g. dust, corrosive vapours, damaging gases) are present.

When installed in dusty and damp areas, suitable enclosures (housings, cubicles) must be provided.

The permissible ambient temperatures and the associated rated currents are listed in the technical data (see page 11/26).

## Degree of protection

Circuit-breaker with front rotary drive	IP 30
with door coupling rotary drive	IP 54
with motor/solenoid operating mechanism	IP 65
with plug-in socket	IP 20
	IP 20

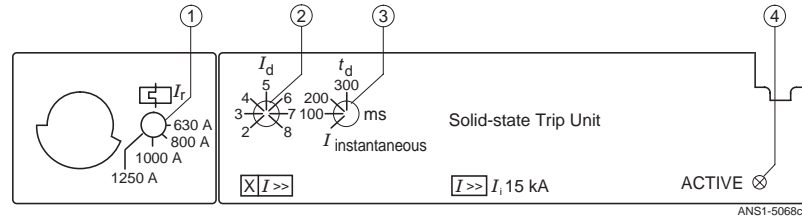
## Design

The basic 3VF circuit-breakers have a toggle lever operator (see "Toggle lever and switching status indicator" ①), which also acts as a switching status indicator. In addition to the "ON" and "OFF" positions, the "Tripped" position is possible.

The lever jumps to the "Tripped" position if the circuit-breaker has been tripped by the operation of its overload, short-circuit, shunt or undervoltage release or by pressing the "TEST"-button. To be able to reclose the circuit-breaker after tripping, the toggle lever must be moved beyond the "OFF" position ("RESET"). It is then ready to close again (see "Positions of toggle lever").

As additional switching status indication, the 3VF3 to 3VF8 circuit-breakers have 2 windows to the right and left of the toggle lever (see "Toggle lever and switching status indicator" ②).

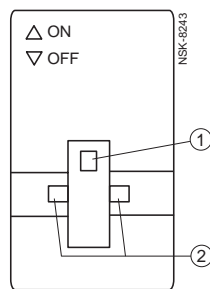
## Electronic overcurrent release for line protection (example 3VF7)



- ① Set current  $I_T$
- ② Tripping current  $I_d$
- ③ Time delay  $t_d$

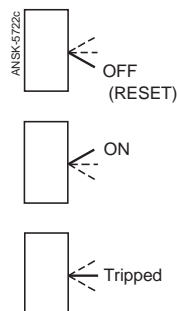
- ④ LED flashes: overcurrent release operating fault-free; LED lights continuously: overload condition

## Toggle lever and switching status indicator



- ① Toggle lever
- ② Switching status window

## Positions of toggle lever

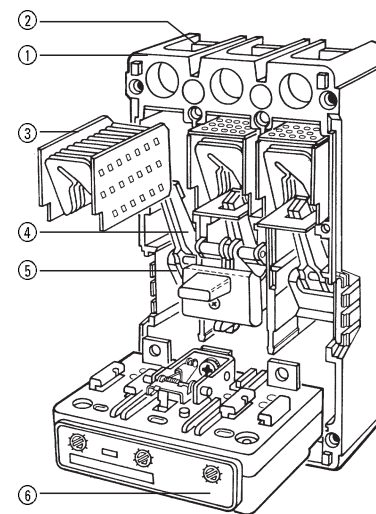


in which the colours red, green and white correspond to the "ON", "OFF" and "Tripped" positions.

## Overcurrent release system

All circuit breakers are supplied complete with an integral overcurrent release (see diagram "3VF5 circuit-breaker, internal construction" ⑥).

## 3VF5 circuit-breaker, internal construction



- ① Case
- ② Main connections
- ③ Arc chamber
- ④ Moving contacts
- ⑤ Breaker mechanism
- ⑥ Overcurrent release module

## 3VF2 to 3VF6 circuit-breakers for line protection with mechanical overcurrent releases, i.e. overcurrent release version "an"

The overload and short-circuit releases function with bimetallic or magnetic elements. The overload and short-circuit releases can be supplied with a fixed or adjustable setting.

Four pole circuit-breakers for line protection can be supplied optionally with overcurrent releases in all 4 poles or without overcurrent release in the 4th pole (N). Above 100 A rated

current, the releases in the 4th pole (N) are designed for 60% of the current of the 3 main conductors to ensure safe protection for cables with reduced cross-section neutral conductors.

# 3VF Circuit-Breakers

## Description

### 3VF5 to 3VF8 circuit-breakers for line protection with electronic overcurrent releases

All 3VF7 to 3VF8 circuit breakers are equipped with "azn" electronic overcurrent releases for short-delay short-circuit tripping. 3VF5 and 3VF6 circuit breakers can be equipped with "azn" electronic overcurrent releases.

The electronic overcurrent release system consists of:

- 3 current transformers
- Evaluation electronics with microprocessor
- Tripping magnet.

No auxiliary voltage supply is required for the release system.

A minimum load current of approximately 20% of the corresponding rated current  $I_n$  of the circuit-breaker is required to activate the overcurrent release.

Fault-free operation of the overcurrent release is shown by the regular flashing of the "ACTIVE" LED ④ (see page 11/31, "Electronic overcurrent release" ④). A steady light indicates an overload condition ( $I > 100\% I_n$ ).

#### • Current-dependent delayed overcurrent tripping "a"

The set current  $I_r$  can be set from 0.5 to 1 times the value of the rated current  $I_n$  of the circuit-breaker in 4 steps.

The time-current characteristic of the current-dependent tripping corresponds to 10 s at  $7.2 \times I_r$  (see page 11/31, "Electronic overcurrent release" ①).

#### • Short time-delayed short-circuit tripping "z"

The response value  $I_d$  can be set in 7 steps between 2 and 8 times the value of  $I_r$ .

The delay time  $t_d$  can be set from 0 (instantaneous) to 300 ms in 4 steps.

Time selectivity with the downstream circuit-breakers can thus be achieved up to current values of

- 4.0 kA  $\pm$  15% for 3VF5,
- 5.5 kA  $\pm$  15% for 3VF6,
- 15 kA  $\pm$  15% for 3VF7 and
- 20 kA  $\pm$  15% for 3VF8.

#### • Instantaneous short-circuit tripping "n"

The response value  $I_i$  of the instantaneous short-circuit release is set to a fixed value of 4 kA for 3VF5, 5.5 kA for 3VF6, 15 kA for 3VF7 and 20 kA for 3VF8. The electronic circuit of the overcurrent release is inherently safe at high temperatures: if the temperature of the printed circuit board rises to 90 °C the circuit-breaker trips.

### Circuit-breakers for motor protection

All circuit-breakers for motor protection are equipped with electronic overcurrent releases. These work on the same principle as the electronic overcurrent releases fitted to the line protection circuit-breakers.

The characteristic curve of the current-dependent delayed overload release is matched optimally to the overload behaviour of three-phase motors. Depending on the version, the time-current characteristic of the overload release can be set in steps between "Class 5" and "Class 30".

Phase failure sensitivity is also integrated into this design variant, so that the motor is provided with reliable protection even in the event of phase failure or asymmetry.

All 3VF3 to 3VF6 circuit-breakers for motor protection have a so-called "thermal memory" that stores the pre-load of the breaker and tripping due to overload and takes account of the heating of the motor by reducing the tripping time (see characteristics in Catalog NS PS). A cooling period of a few minutes may therefore be required following tripping on overload before the motor can be re-started.

The same applies to too many starts within a short period that cause inadmissible heating of the motor. A reclosing lockout remains in force for one minute following a trip on overload.

In circuits with very high harmonic content caused by frequency converters or soft starters, 3VF2 to 3VF6 circuit-breakers with "an" bimetal releases are recommended.

### Circuit-breakers for starter combinations

Circuit-breakers for **starter combinations** are in practice used together with a motor contactor and a suitable overload relay.

### Non-automatic circuit-breakers

**Non-automatic circuit-breakers** have integral short-circuit protection so that back-up fuses are not required. Four-pole non-automatic circuit-breakers do not have a short-circuit release in the 4th pole (N).

### Installation

Mounting the circuit-breakers in line without intermediate spacing is, in fact, possible but is not recommended because of the reduced heat dissipation (and possible reduction of current rating).

### Connection

(see accessories, page 11/22)

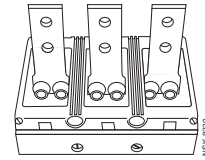
The basic circuit-breaker is supplied as follows:

**With box terminals**  
3VF2 to 3VF5 circuit-breakers for the direct connection of stranded cables or finely-stranded cables with sleeves (see diagram "box terminals for 3VF3 and 3VF4" and Technical Data).

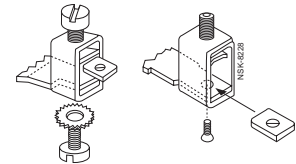
**Busbar connection pieces**  
3VF6 to 3VF8 circuit-breakers are connected using busbar connection pieces. These are designed for the connection of standard busbars and are available for front or rear connection. 3VF6 circuit-breakers are supplied with front connection pieces.

For other circuit-breakers (complete program) see Catalog NS PS

#### Front busbar connection pieces for 3VF7



#### Box terminals for 3VF3 (left) and 3VF4 (right)



The connection of laminated copper bars using clamp terminations is possible with breaker types 3VF3 (up to 160 A), 3VF4, 3VF5, 3VF6 and 3VF7 (up to 800 A).

The **incoming and outgoing side** can be chosen as desired for all circuit-breakers. The electrical data remains unchanged. An exception to this is circuit-breakers fitted with DI modules: these breakers must be fed from the top.

Bare cables and bars used as top connections must be insulated in the area of the arc blowout (see dimension drawings on pages 11/44 and 11/45). Phase separation barriers (see accessories, pages 11/22 and 11/23) can also be used for this purpose.



## Description

For other circuit-breakers (complete program) see Catalog NS PS

### Method of installation

#### Fixed mounting

Using the standard design

#### Plug-in circuit breakers

instead of box terminals, the circuit-breakers have 6 knife contacts and also a safety trip pin. This causes the breaker to be tripped if an attempt is made to unplug it while it is closed and prevents the breaker from being switched on before it is replaced in its socket.

**Withdrawable circuit-breaker** 3VF6 and 3VF7 circuit-breakers are available in a withdrawable design. Withdrawable circuit-breakers cannot be fitted with motor operating mechanisms.

### Connection of accessories

Two types of connection are possible for internally-fitted accessories (auxiliary releases, auxiliary switches) (see illustration):

- With terminal strip (on the side of the breaker)
- With connection cables (finely stranded)

Motor operating mechanisms always have connection terminals.

### Accessories

All circuit-breakers are supplied complete with internally-fitted accessories according to order (e.g. auxiliary or alarm switches, undervoltage or shunt releases). The equipment options can be seen from the ordering table on page 11/16. Externally-fitted accessories, such as rotary drives, motor operating mechanisms, connection accessories etc. are always supplied separately.

### Drives

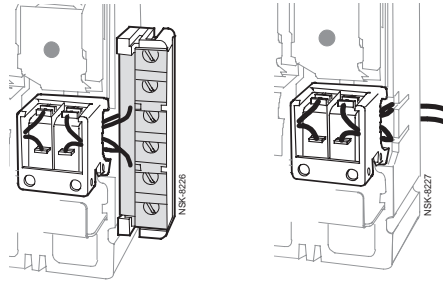
(see page 11/20)

Front rotary drives (see illustration)

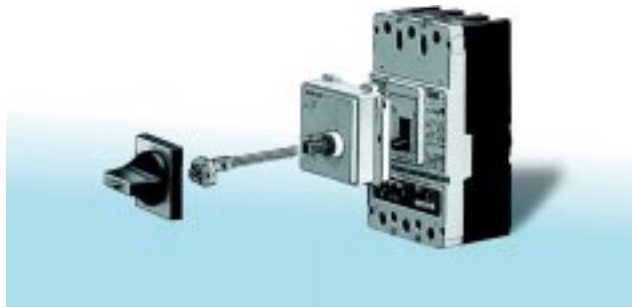
#### Leading auxiliary switch S4 in front rotary drive



Auxiliary release, auxiliary switch – connection with terminal strip (left) connection with cables (right)



Rotary drive with door coupling for 3VF4



tion). These are designed for fitting direct on the circuit-breaker and convert the vertical toggle lever movement into a rotary motion (rotary drive with knob).

#### Leading auxiliary switch in front rotary drive (see illustration)

If a circuit-breaker has a leading auxiliary switch, it is possible to energize the undervoltage release early and thus make the circuit-breaker ready to close.

#### Rotary drive with door coupling (see illustration) (complete drive)

Door coupling drives in the 8UC6 range are available for fitting to circuit breakers in control cubicles and distribution boards with doors and detachable covers. These are supplied as a complete kit including articulated coupling, see Part 13.

In respect of the switching status indication and the "RESET" operation, the same applies to the rotary drives as to the toggle lever. Indication is by the position of the knob (see Construction, page 11/31).

#### Front rotary drives with and without door coupling

All rotary drives can be locked in the "OFF" position using padlocks. All 3VF circuit-breakers equipped with these drives and with suitable terminal covers can therefore be used as main switches in accordance with DIN VDE 0113.

#### Motorized operating mechanisms

3VF3 to 3VF8 circuit breakers can be equipped with motor operating mechanisms to permit remotely-controlled opening and closing.

Front rotary drive for 3VF6



Motor operating mechanism for 3VF4



#### Motorized operating mechanisms suitable for synchronizing (motor-wound stored energy mechanism)

For rapid closing suitable for synchronising ( $t_E < 80$  ms) or for normal remote tripping, solenoid mechanisms or motor-wound stored energy mechanisms are available.

Locking devices to accept padlocks are available as an option for motor operating mechanisms and are generally fitted to stored-energy and solenoid mechanisms. These provide electrical and mechanical lock-out of the drive. All remotely-controlled mechanisms are provided with a manual operation device that permit all switching operations to be performed locally.



# 3VF Circuit-Breakers

For other circuit-breakers (complete program) see Catalog NS PS

## Description

### Auxiliary releases and auxiliary switches

#### Undervoltage release, leading auxiliary switch

The circuit-breaker can only be closed if voltage is applied to the undervoltage release. If there is no voltage present, operation of the breaker results in re-tripping.

Frequent re-tripping should be avoided because of its effect on the service life of the circuit-breaker.

If the circuit-breaker has a leading auxiliary switch, it is possible to apply voltage early to the undervoltage release and thus prepare the breaker for closing.

For 3VF circuit-breakers, the leading auxiliary switch can be supplied with the front rotary drives or complete drives. See "Accessories" for more information.

#### Delay device for undervoltage release

To avoid tripping of the circuit-breaker during brief interruptions or drops in the voltage, delay devices can be fitted in the undervoltage release circuit. When selecting a circuit-breaker with delayed undervoltage release, it must be noted that the voltage of the undervoltage release must be selected for DC.

#### Shunt release

The shunt release (f release) is used for remote tripping.

The coil of the shunt release is designed for short-time operation only.

It is not permissible to apply a continuous trip command to a shunt release to prevent closing when the circuit-breaker is tripped, i.e. interlocking circuits with a continuous command must not be designed to operate a shunt release.

#### Auxiliary switches

Auxiliary switches are used for indication and control. The various functions of the auxiliary switch (1 changeover) can be seen from the table.

### Options for equipping 3VF3 to 3VF8 circuit-breakers with auxiliary and alarm switches

3-pole circuit-breakers		4-pole circuit-breakers	
left	right	left	right
2 AS	1 HS	2 AS	1 HS
1 AS	2 HS	1 AS	2 HS
2 AS	2 HS	2 AS	2 HS
—	4 HS	—	4 HS
—		—	
3VF3 for motor protection			
1 HS	—	1 HS	—
2 HS	—	2 HS	—
1 AS	—	1 AS	—
1 AS + 1 HS	—	1 AS + 1 HS	—
2 AS	—	2 AS	—

/ / DI Shunt release or undervoltage release or DI module (if built in)  
 HS Auxiliary switch  
 AS Alarm switch  
 ● For 3VF8 circuit-breaker only

### Operation of contacts of auxiliary and alarm switches depending on the switching status of the circuit-breaker

Position of toggle lever (applies also in the same sense to rotary drive)	Position of auxiliary switch <sup>2)3)</sup>	Position of alarm switch	Position of auxiliary switch <sup>2)3)</sup>	Position of alarm switch	Position of leading auxiliary switch <sup>4)</sup> 3VF3 to 3VF8
	3VF2 	3VF2 	3VF3 to 3VF8 	3VF3 to 3VF8 	3VF3 to 3VF8 

#### Alarm switch

The alarm switch operates when the circuit-breaker is tripped by short-circuit or over-current and also when tripped by the shunt release or undervoltage release.

#### Fitting auxiliary switches and alarm switches

(see accessories, page 11/16)

The equipping of a circuit-breaker with auxiliary switches and alarm switches depends on the position in which these switches are fitted in the circuit-breaker and on the size of the circuit breaker. The fitting position of the auxiliary switches

and alarm switches differs according to the design of the circuit-breaker (see pages 11/14 to 11/17).

#### PLC interface

Coupling units or relays should be use to interface with a PLC.

For characteristics of 3VF circuit breakers, see Catalog NS PS, "Products and systems for power distribution".

- 1) only provided on 3VF3. ...F1.
- 2) Values in brackets apply to second switch block.
- 3) The connection markings for the 3rd and 4th auxiliary switches can be seen from the circuit diagram on page 11/35.
- 4) Built into the rotary drive.

# 3VF3 to 3VF8 Circuit-Breakers

## 3- and 4-pole

### Circuit diagrams

For other circuit-breakers (complete program) see Catalog NS PS

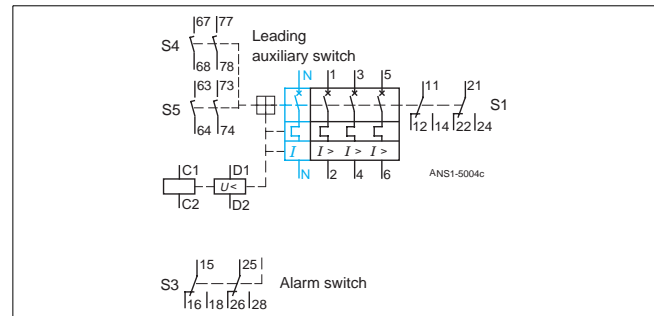
The circuit symbols used in the equipment circuit diagrams only provide information about the type, circuit and method of operation of the equipment within the meaning of DIN 40 713 but not about its design.

As all possible combinations cannot be shown here, the cir-

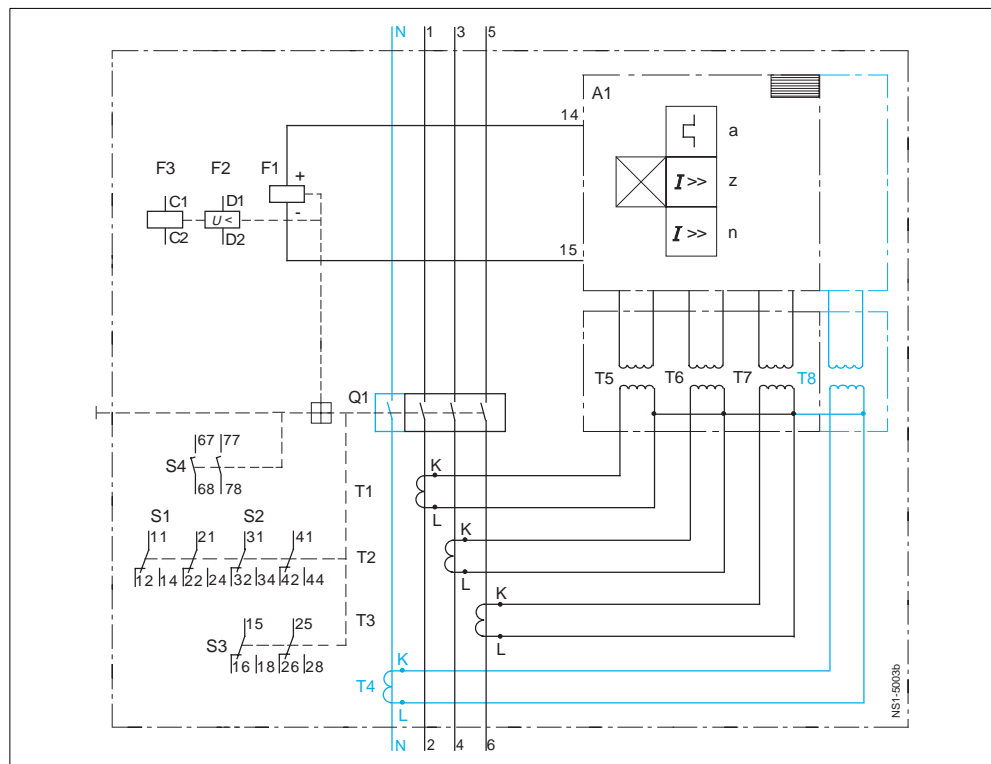
cuit diagrams should be modified as appropriate for different versions.

Circuit diagrams are only provided as may be necessary to give a better understanding of the functioning of the equipment.

Connection diagram for 3- and 4-pole 3VF3 to 3VF6 circuit-breakers for line protection

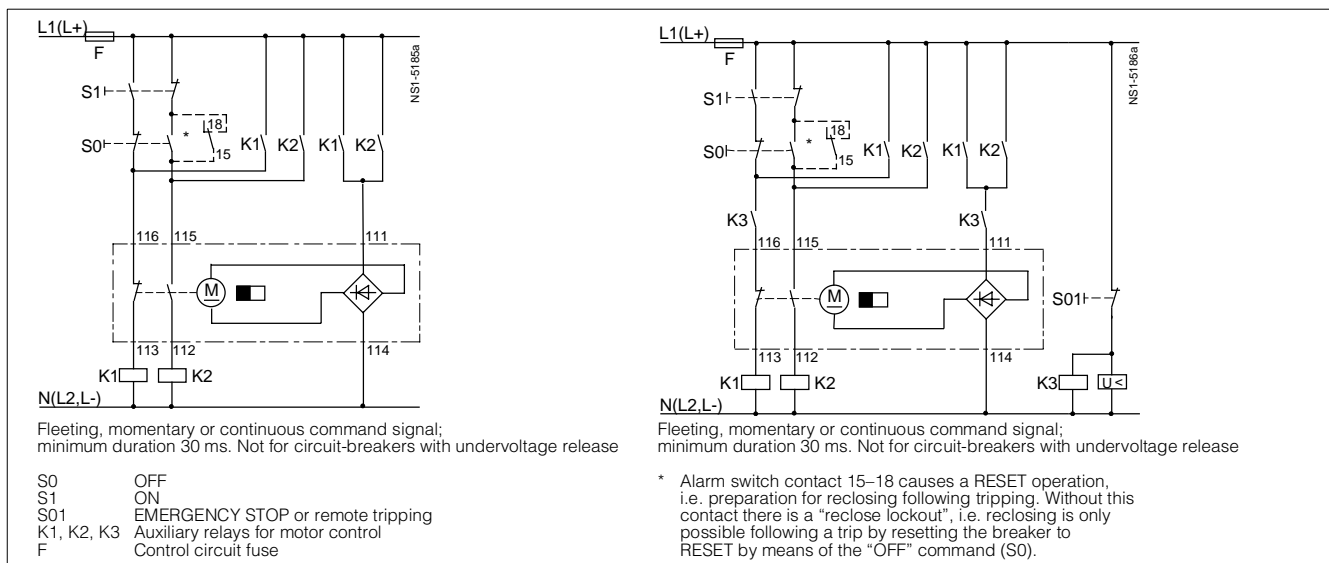


Connection diagram for 3VF3, 3VF5 and 3VF6 circuit-breakers for motor protection and for 3 and 4-pole 3VF7 and 3VF8 circuit-breakers (3VF7 without S2)



- Q1 Main contacts
  - A1 Electronic overcurrent release
  - F1 Trip magnet for A1
  - F2 Undervoltage release
  - F3 Shunt release
  - S1 1st + 2nd aux. switch
  - S2 3rd + 4th aux. switch
  - S3 Alarm switch
  - S4 Leading aux. switch (fitted in rotary drive)
  - T1...T4 Current transformer
  - T5...T8 Intermediate transformer
  - V1-V3 Power supply
  - G Output stage
  - D Thermal memory
  - R1 Current setting
  - R2 Setting for time-current characteristic
- four pole version

Motorized operating mechanism for 3VF3 to 3VF8



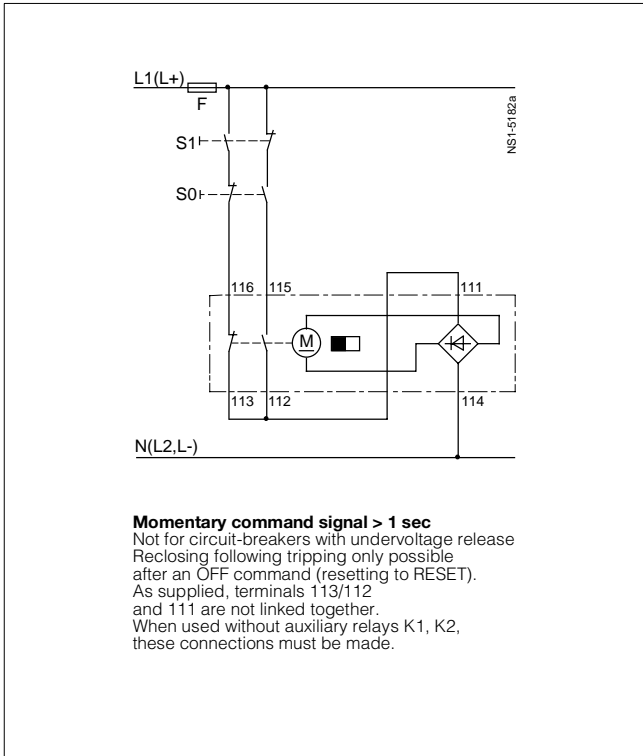
# 3VF3 to 3VF8 Circuit-Breakers

## 3- and 4-pole

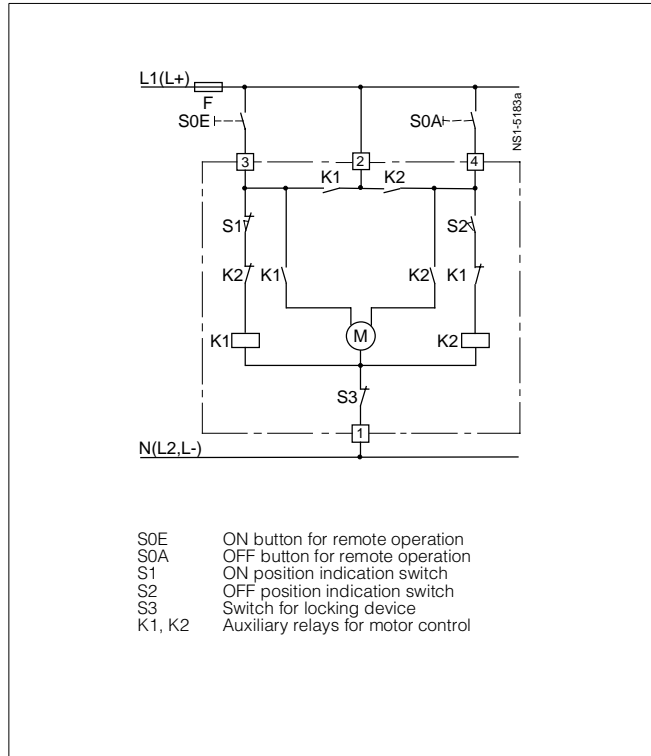
### Circuit diagrams

For other circuit-breakers  
(complete program)  
see Catalog NS PS

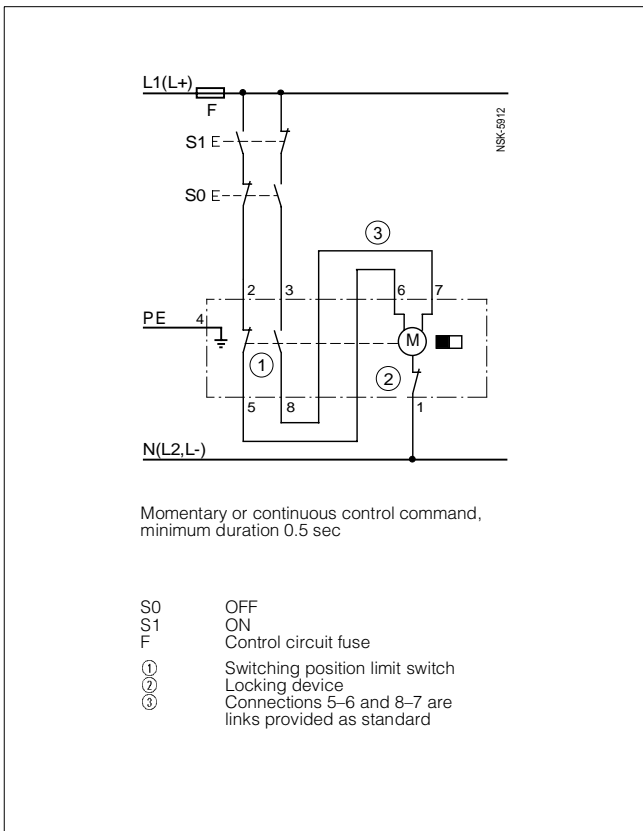
**Motorized operating mechanism for 3VF3 to 3VF6**



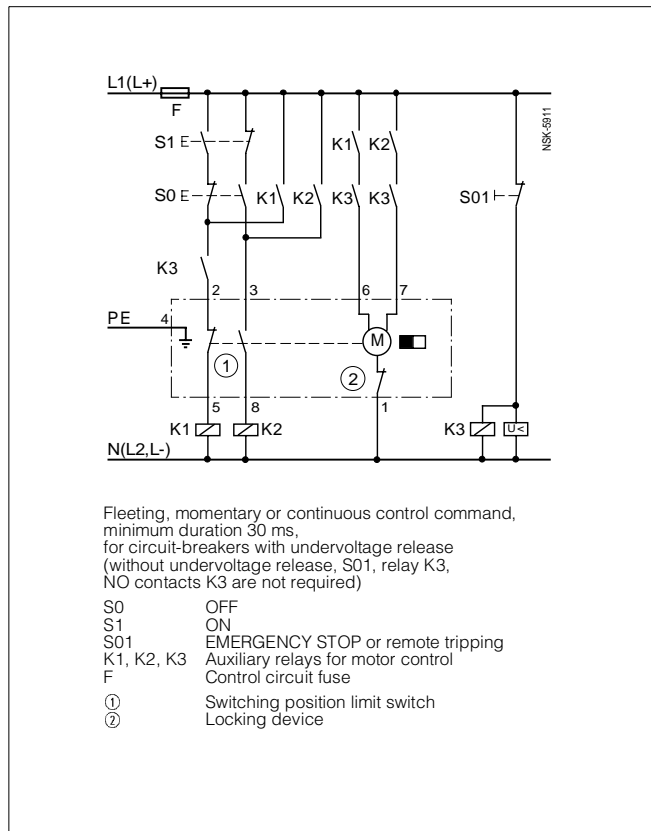
**Motorized operating mechanism for 3VF8**



**Motorized operating mechanism for 3VF7**



**Motor izedoperating mechanism for 3VF7 with undervoltage release**



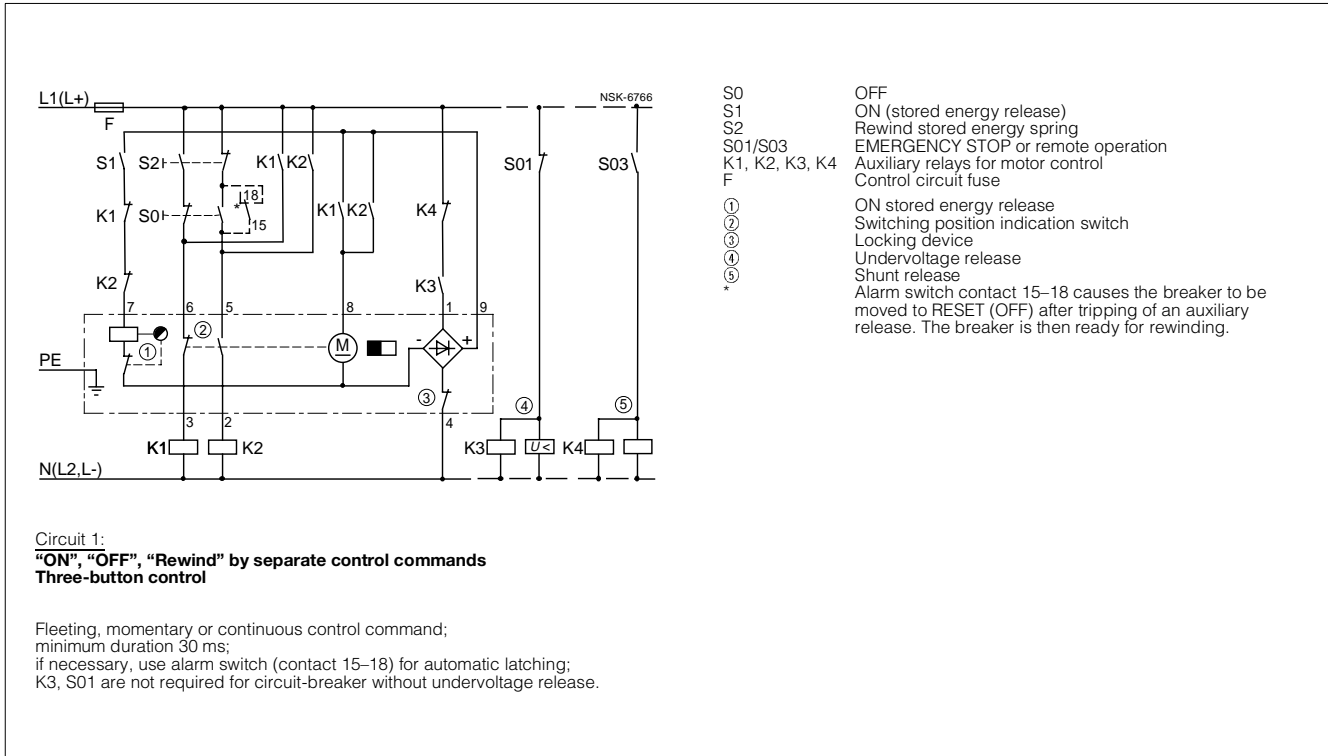
# 3VF3 to 3VF8 Circuit-Breakers

## 3- and 4-pole

### Circuit diagrams

For other circuit-breakers  
(complete program)  
see Catalog NS PS

#### Motorized operating mechanism for 3VF4, 3VF5, 3VF6 suitable for synchronizing



#### Motorized operating mechanism for 3VF4, 3VF5, 3VF6 suitable for synchronizing

