

General ratings information and catalog guide for single-phase and three-phase reclosers



Contents

Description	Page	Description	Page
Description	2	Interrupting medium: oil or vacuum	5
Temporary faults	2	Oil interrupters	5
Recloser classifying features	2	Vacuum interrupters	5
Recloser: single-phase or three-phase	2	Recloser application	5
Single-phase reclosers	2	Application criteria	5
Three-phase reclosers	2	Coordination with other devices	6
Recloser ratings summary	3	Dual timing	6
Single-phase tripping	4	Distribution circuit with reclosers diagram	6
Three-phase tripping	4	Recloser operating sequence of fault	7
Controls: hydraulic or electronic	4	Ratings Tables	
Hydraulic controls	4	Ratings for single-phase, hydraulically controlled reclosers	7
Electronic controls	4	Ratings for single-phase, electronically controlled reclosers	9
Current sensing	4	Ratings for three-phase, hydraulically controlled reclosers	10
Microprocessor-based controls	4	Ratings three-phase, electronically controlled reclosers	13



Powering Business Worldwide

Description

Automatic circuit reclosers are recognized by electric utilities throughout the world as an essential device for achieving their prime goal: providing maximum continuity of electric service to their customers simply and economically.

Reclosers sense and interrupt fault currents and automatically restore service after momentary outage.

The automatic circuit recloser is essentially a self-contained device with the necessary intelligence to sense overcurrents to time and interrupt fault currents and to re-energize the line by reclosing automatically. If a fault is permanent, the recloser locks open after a preset number of operations (usually three or four), isolating the faulted section from the main part of the system.

Temporary faults

Extensive studies of overhead distribution systems have established that approximately 80 to 95 percent of all system faults are temporary in nature and, at most, last from only a few cycles to a few seconds.

Typical causes of these temporary faults are:

- Windblown conductors touching one another.
- Lightning surges flashing over an insulator.
- Birds, reptiles, or small animals bridging between an energized line and a grounded surface.
- Tree branches touching energized lines.
- Switching surges that flash over an insulator.

Based on statistics and observations, the need for a trip-and-reclose function was readily recognized; that is, if the line could be tripped open momentarily, a subsequent reclosure very likely would be successful because, by then, the cause of the fault would be gone. Thus, the automatic circuit recloser, in providing this trip-and-reclose function, virtually eliminates prolonged outages on distribution systems due to temporary faults or transient overcurrent conditions.

Recloser classifying features

Major classifying features of automatic circuit reclosers are:

- Single-phase or three-phase
- Control: hydraulic or electronic
- Interrupters: oil or vacuum
- Insulation: oil, air, or epoxy

Table 1 contains a detailed listing of reclosers currently manufactured by Eaton's Cooper Power Systems Division.



Figure 1. Type H single-phase, hydraulically controlled recloser.

Recloser: single-phase or three-phase

Both single- and three-phase reclosers are available to satisfy application requirements.

Single-phase reclosers

Single-phase reclosers, as shown in Figure 1 and 2, are used to protect single-phase lines such as branches or taps of a three-phase feeder. They can also be used on three-phase circuits where the load is predominantly single-phase. Thus, when a permanent phase-to-ground fault occurs, one phase can be locked-out while service is maintained to the remaining two-thirds of the system.

Three-phase reclosers

Two types of three-phase reclosers are available:

- Single-Phase tripping
- Three-Phase tripping



Figure 2. SPEAR™ single-phase, electronically controlled recloser.



Figure 3. NOVA™ triple-single, electronically controlled recloser.

Table 1. Recloser Ratings Summary (See Tables 2–5 for more detailed ratings data)

Voltage Rating (kV)	Max. Cont. Current Rating (A)	Interrupting Rating (sym A at max. voltage)	Interrupting Medium	Control	Recloser Type
Single-Phase					
2.4 - 14.4	50	1250	Oil	Hydraulic	H
	100	2000*	Oil	Hydraulic	4H
	200	2000*	Vacuum	Hydraulic	V4H
	280	4000*	Oil	Hydraulic	L
	280	6000	Vacuum	Hydraulic	V4L
	560	10000*	Oil	Hydraulic	D
	400	8000	Vacuum	Electronic	SPEAR15-8
	630	12500	Vacuum	Electronic	SPEAR15-12
	800	12500	Vacuum	Electronic	SPEAR15-12
24.9	100	2500	Oil	Hydraulic	E
	280	4000	Oil	Hydraulic	4E
	280	6000	Vacuum	Hydraulic	V4E
	400	8000	Vacuum	Electronic	SPEAR27-8
	630	12500	Vacuum	Electronic	SPEAR27-12
	800	12500	Vacuum	Electronic	SPEAR27-12
24.9 - 34.5	560	8000	Oil	Hydraulic	DV
	400	8000	Vacuum	Electronic	SPEAR38-8
	630	12500	Vacuum	Electronic	SPEAR38-12
800	12500	Vacuum	Electronic	SPEAR38-12	
Three-Phase					
2.4 - 14.4	100	2000*	Oil	Hydraulic	6H
	200	2000*	Oil	Hydraulic	V6H
	400	8000	Vacuum	Electronic	NOVA-TS-15-8
	560	10000*	Oil	Hydraulic	W
	560**	10000*	Oil	Electronic	WE
	560	12000	Vacuum	Hydraulic	VW
	560	12000	Vacuum	Electronic	PWE***
	560**	12000	Vacuum	Electronic	VWE
	600	12000	Vacuum	Electronic	VSA12B
	630**	12500†	Vacuum	Electronic	NOVA™ 15
	800	12000	Vacuum	Electronic	VSA12
	800	16000	Vacuum	Electronic	VSA16
	800	20000	Vacuum	Electronic	VSA20
	630**	12500†	Vacuum	Electronic	NOVA-TS-15-12
	630**	12500†	Vacuum	Electronic	NOVA STS-15
	1200	20000	Vacuum	Electronic	VSA20A
24.9	400	8000	Vacuum	Electronic	NOVA-TS-27-8
	560	8000	Oil	Hydraulic	WV27
	560**	8000	Oil	Electronic	WVE27
	560	12000	Vacuum	Hydraulic	VWV27
	560**	12000	Vacuum	Electronic	VWVE27
	560	12000	Vacuum	Electronic	PWVE***
	630**	12500†	Vacuum	Electronic	NOVA 27
	630**	12500†	Vacuum	Electronic	NOVA-TS-27-12
	630**	12500†	Vacuum	Electronic	NOVA STS-27
34.5	400	8000	Vacuum	Electronic	NOVA-TS-38-8
	560	8000	Oil	Hydraulic	WV38X
	560**	8000	Oil	Electronic	WVE38X
	560	12000	Vacuum	Hydraulic	VWV38X
	560**	12000	Vacuum	Electronic	VWVE38X
	560**	12000	Vacuum	Electronic	VS012
	560**	16000	Vacuum	Electronic	VS016
	630**	12500	Vacuum	Electronic	NOVA 38
	630**	12500	Vacuum	Electronic	NOVA-TS-38-12
	630**	12500	Vacuum	Electronic	NOVA STS-38

* Interrupting rating will be higher at lower voltage as shown in expanded tables.

** Continuous current rating can be extended to 800 A with an accessory.

*** For pad-mounted installation.

† 16.0 kA option is also available.



Figure 4. NOVA™ STS single-tank, triple-single electronically controlled recloser

Single-phase tripping

The triple-single reclosers, shown in Figures 3 and 4, have three modes of operation:

- Three-phase trip and three-phase lockout. All three phases simultaneously trip on an overcurrent, reclose and sequence together.
- Single-phase trip and three-phase lockout. Each phase operates independently for overcurrent tripping and reclosing. If any phase sequences to lockout condition (due to permanent fault), or if “lockout” is locally or remotely asserted, the other two phases trip open and lock out. Thus, extended single-phase energization of three-phase loads is prevented.
- Single-phase trip and single-phase lockout. Each individual phase trips and sequences to lockout independent of each other. This is primarily for residential loads and/or where single-phasing of three-phase loads is protected by other means.

Another configurable option is also available to trip and lockout all three phases in the event of a phase-to-phase or three-phase fault. Should a phase-to-phase or three-phase fault be detected on the system, all three reclosers will trip and lockout whenever any one phase sequences to lockout. Three-phase lockout occurs if a multiple phase fault is present as the recloser advances to lockout.

Three-phase tripping

There are various types of three-phase tripping reclosers available to improve system reliability. The recloser selection is based upon electrical ratings required, interrupting and insulation medium, and the selection of hydraulic or electronic control.

- Three-phase trip and three-phase lockout. Larger reclosers such as the units shown in Figures 5 and 6, use this mode. For any fault—single-phase-to-ground, phase-to-phase, or three-phase—all contacts open simultaneously for each trip operation. The three phases, mechanically linked together for tripping and reclosing, are operated by a common mechanism.

Controls: hydraulic or electronic

The intelligence that enables a recloser to sense overcurrents, select timing operation, time the tripping and reclosing functions, and finally lockout is provided by its control. There are two basic types of control schemes used: an integral hydraulic control or an electronic control located in a separate cabinet.

Hydraulic controls

Hydraulic recloser control is used in most single-phase reclosers and in three-phase recloser types 6H, V6H, W, VW, VV27, VVV27, VV38X, and VVV38X. It is built as an integral part of the recloser. With this type of control, an overcurrent is sensed by a trip coil



Figure 5. NOVA™ three-phase, electronically controlled recloser.

Figure 6. Type VSA20A vacuum, three-phase, air-insulated, electronically controlled recloser.

that is connected in series with the line.

When the overcurrent flows through the coil, a plunger is drawn into the coil to trip open the recloser contacts. Timing and sequencing are accomplished by pumping oil through separate hydraulic chambers or ducts.

For smaller reclosers, the reclosing energy is provided by springs that are charged by the series trip-coil plunger during overcurrent operation.

Larger reclosers are closed from a separate closing solenoid that is energized by line potential from the source side of the recloser.

Electronic controls

Eaton's Cooper Power series electronic recloser controls are used in most three-phase reclosers and in the single-phase SPEAR recloser control. Compared with the hydraulic control, they are more flexible, more easily customized and programmed, and many have advanced protection, metering, and automation functionality.

The electronic control is housed in a cabinet separate from the recloser and conveniently permits changes to operational settings. A wide range of accessories is available to customize the basic operation, solving many application problems.

Current sensing

Line current is sensed by special sensing current transformers in the recloser. The recloser and control are connected by a multi-conductor control cable that carries sensing transformer secondary currents to the control and the necessary trip and close signals from the control to the recloser.

Microprocessor-based controls

Eaton offers numerous Cooper Power series electronic controls that can be used in conjunction with its broad line of electronically controlled reclosers.

The Form 6 control, see Figures 7 and 8, provides maximum protective hardware design and simple interactive graphical interfaces for complete user customization. All standard control operating parameters, including minimum trip levels, time-current curve selection, and sequences of recloser operation, are keyboard programmable.

This control utilizes a powerful PC-based interface software to configure control settings, record metering information, and establish communication parameters. It also provides analysis tools that include fault locating, event recording, and oscillography functions.



Figure 7. Form 6-TS pole-mount recloser control (left). Form 6 pole-mount recloser control (right).



Figure 8. Form 6 rack-mount recloser control.



Figure 9. SPEAR recloser control.

For more information on the Form 6 control, refer to *Bulletin B280-08010, Maximum Functionality and Ultimate User Configurability* and for the SPEAR recloser control, refer to *Product Aid, PA280003EN, Smart Single-Phase Automation and Protection Solutions*.



Figure 10. Eaton's Cooper Power series vacuum interrupter.

Interrupting medium: oil or vacuum

Reclosers use either oil or vacuum as the interrupting medium.

Oil interrupters

Reclosers using oil for current interruption use the same oil for basic insulation. Most reclosers with hydraulic control (except the W-group reclosers) also use the same oil for timing and counting functions.

Vacuum interrupters

Vacuum interrupters provide fast, low-energy arc interruption with long contact and interrupter life, low mechanical stress, and maximum operating safety. With arc interruption taking place in a vacuum, contact and interrupter life far exceeds other interrupting media.

Eaton's Cooper Power series vacuum interrupters (Figure 10) are designed with a metal and ceramic housing for maximum strength and long-term vacuum integrity. The high-alumina ceramic has more than five times the strength of glass, which permits a higher processing temperature to develop maximum purity of the assembly, and is impervious even to helium penetration to sustain the vacuum level.

Eaton has over 40 years of experience as a world leader in the design and manufacture of vacuum interrupters for use in its Cooper Power series distribution switchgear. A state-of-the-art vacuum interrupter clean room manufacturing facility ensures the production of very high quality interrupters that provide long and trouble-free operating life.

Depending on type, a vacuum recloser may use either oil, air, or epoxy as the insulating medium.

Recloser application

Reclosers can be used anywhere on a distribution system where recloser ratings are adequate for system requirements. Locations for reclosers are:

- In substations as the primary feeder protective device.
- On distribution lines at a distance from a substation, to sectionalize long feeders and thus prevent outages of the entire feeder when a permanent fault occurs near the end of the feeder.
- On important taps of main feeders to protect the main feeder from interruptions and outages due to faults on the taps.

Application criteria

To properly apply automatic circuit reclosers, five major factors must be considered:

1. System voltage. System voltage will be known. The recloser must have a voltage rating equal to – or greater than – system voltage.
2. Maximum fault current available at the recloser location. Maximum fault current will be known or can be calculated. The recloser interrupting must be equal to – or greater than – the maximum available fault current at the recloser location.
3. Maximum load current. The recloser continuous current rating must be equal to – or greater than – anticipated circuit load. For series-coil-type reclosers, the coil size can be selected to match the present load current, the anticipated future load current, or the substation transformer capacity. Minimum-trip current is nominally twice the coil continuous-current rating.
4. For electronically controlled reclosers, minimum-trip current must be greater than any anticipated peak load. Generally, a trip-current value of at least twice the expected load current is used.
5. Minimum-fault current within the zone to be protected. Minimum fault current that might occur at the end of the line section must be checked to confirm that the recloser will sense and interrupt this current.
6. Coordination with other protective devices on both the source and the load sides of the recloser.

Coordination with other devices

After the first four application factors have been satisfied, coordination of the recloser with both the source- and the load-side devices must be determined. Proper selection of time delays and sequences is vital to assure that any momentary interruption or longer-term outage due to faults is restricted to the smallest possible section of the system.

Generally, recloser timing and sequences are selected to coordinate with the source-side devices. After the size and sequence of the required recloser has been determined, the protective equipment farther down the line is selected to coordinate with it as shown in Figure 11.

Dual timing

Automatic circuit reclosers have dual-timing capabilities; that is, the first fault-current interruptions (one or more) are performed in accordance with a fast or instantaneous timing characteristic (no intentional time delay) and the remaining interruptions are performed in accordance with a predetermined time delay.

The first operations are as fast as possible in order to clear temporary faults before any line damage can occur. If the fault is permanent, the time-delay operation allows the down-line device – either another recloser or a fuse – to clear first.

Recloser-to-recloser coordination is achieved primarily by selecting different coil sizes or trip values with further coordination possible by different time delays or sequences. To coordinate a recloser with a downline fuse, the fuse link size should be selected to coordinate with the recloser fast and time-delay curves.

Figure 12 shows a typical recloser operating sequence-to-lockout for a permanent fault.

A recloser operating on its fast curve should clear a temporary fault before the fuse link can be damaged. When on its time-delay curve, a recloser operation should be more delayed than the fuse-link clearing time, allowing the fuse to clear permanent faults without tripping the recloser.

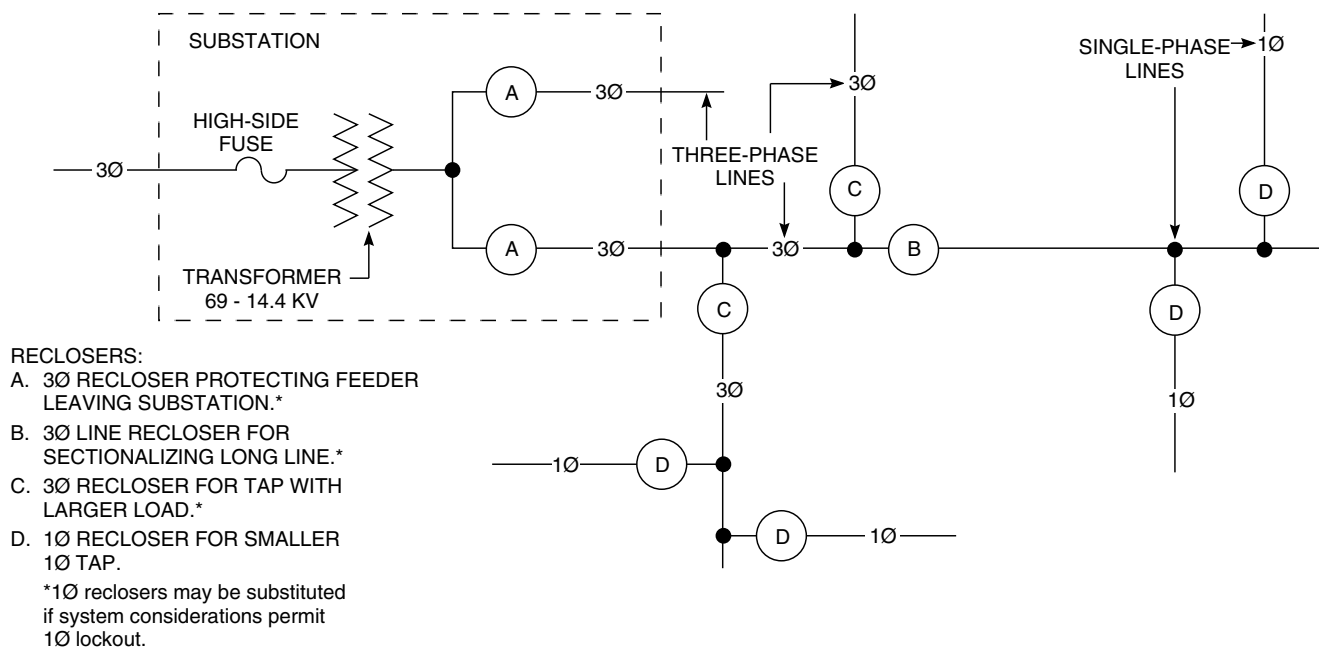


Figure 11. Typical line diagram of distribution circuit showing application of reclosers.

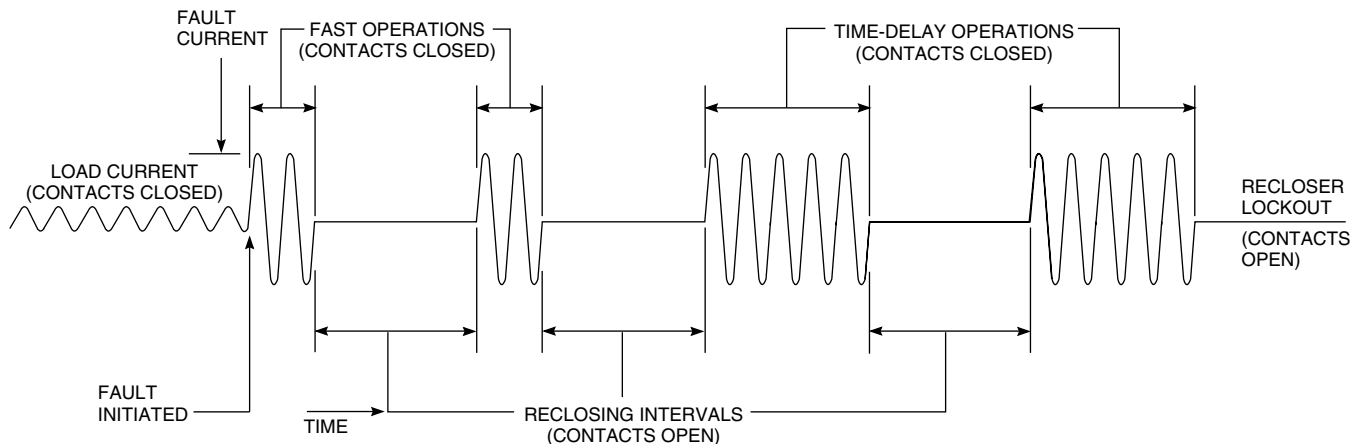


Figure 12. Recloser operating sequence when a permanent fault occurs.

Table 2. Single-Phase, Hydraulically Controlled Reclosers

Recloser Type	Nominal Voltage (kV)	BIL (kV)	Max. Cont. Current Rating (A)	Interrupting Medium	Trip-Coil Rating (cont. A)	Min. Trip Rating (A)	Interrupting Rating (rms sym A)			For Detailed Description and Ordering Information See Catalog Section	
							2.4 kV thru 14.4 kV	Recloser	Mountings		
H	24.4-14.4	95	50	Oil	5	10	2.4 kV thru 14.4 kV			CA280004EN	CA280004EN
					10	20	125				
					15	30	250				
					25	50	375				
					35	70	625				
					50	100	875				
4H	2.4-14.4	110	100	Oil	5	10	200	200	200	CA280004EN	CA280004EN
					10	20	400	400	400		
					15	30	600	600	600		
					25	50	1000	1000	1000		
					35	70	1400	1400	1400		
					50	100	2000	2000	2000		
					70	140	2800	2500	2000		
					100	200	3000	2500	2000		
V4H	2.4-14.4	110	200	Vacuum	5	10	200	200	200	CA280004EN	CA280004EN
					10	20	400	400	400		
					15	30	600	600	600		
					25	50	1000	1000	1000		
					35	70	1400	1400	1400		
					50	100	2000	2000	2000		
					70	140	2800	2500	2000		
					100	200	3000	2500	2000		
					140	280	3000	2500	2000		
					200	400	3000	2500	2000		

* Trip rating is 140% of X coil ratings, all others are 200%.

Table 2. Single-Phase, Hydraulically Controlled Reclosers (continued)

Recloser Type	Nominal Voltage (kV)	BIL (kV)	Max. Cont. Current Rating (A)	Interrupting Medium	Trip-Coil Rating (cont. A)	Min. Trip Rating (A)	Interrupting Rating (rms sym A)			For Detailed Description and Ordering Information See Catalog Section		
							4.8 kV	8.32 kV	14.4 kV	Recloser	Mountings	
L	2.4 - 14.4	110	280	Oil	25	50	1500	1500	1500	CA280004EN	CA280004EN	
					35	70	2100	2100	2100			
					50	100	3000	3000	3000			
					70	140	4200	4200	4000			
					100	200	6000	5000	4000			
					140	280	6000	5000	4000			
					200	400	6000	5000	4000			
					280	560	6000	5000	4000			
							2.4 thru 14.4 kV					
V4L	2.4 - 14.4	110	280	Vacuum	25	50	1500				CA280004EN and Bulletin 89007	CA280004EN
					35	70	2100					
					50	100	3000					
					70	140	4200					
					100	200	6000					
					140	280	6000					
					170	340	6000					
					200	400	6000					
280	560	6000										
							4.8 kV	8.32 kV	14.4 kV			
D	2.4 - 14.4	110	560	Oil	70X	100*	3000	3000	3000	CA280007EN	CA280007EN	
					100	200	6000	6000	6000			
					100X	140*	4200	4200	4200			
					140	280	8400	8400	8400			
					140X	200*	6000	6000	6000			
					160	320	9600	9600	9600			
					185	370	11100	10000	10000			
					225	450	12000	10000	10000			
					280	560	12000	10000	10000			
					280X	400*	12000	10000	10000			
					400	800	12000	10000	10000			
					400X	560*	12000	10000	10000			
					560	1120	12000	10000	10000			
560X	750*	12000	10000	10000								
							24.9 kV					
E	24.9	150	100	Oil	5	10	300				CA280004EN	CA280004EN
					10	20	600					
					15	30	900					
					25	50	1500					
					35	70	2100					
					50	100	2500					
					70	140	2500					
					100	200	2500					
4E	24.9	150	280	Oil	50	100	3000				CA280004EN	CA280004EN
					70	140	4000					
					100	200	4000					
					140	280	4000					
					170	340	4000					
					200	400	4000					
					280	560	4000					

* Trip rating is 140% of X coil ratings, all others are 200%.

Table 2. Single-Phase, Hydraulically Controlled Reclosers (continued)

Recloser Type	Nominal Voltage (kV)	BIL (kV)	Max. Cont. Current Rating (A)	Interrupting Medium	Trip-Coil Rating (cont. A)	Min. Trip Rating (A)	Interrupting Rating (rms sym A)	For Detailed Description and Ordering Information See Catalog Section	
								Recloser	Mountings
24.9 kV									
V4E	24.9	150	280	Vacuum	15	30	900	CA280004EN and Bulletin 91036	CA280004EN
					25	50	1500		
					35	70	2100		
					50	100	3000		
					70	1410	4200		
					100	200	6000		
					140	280	6000		
					170	340	6000		
					200	400	6000		
					280	560	6000		
24.9 thru 34.5 kV									
DV	24.9-34.5	150	560	Oil	70X	100*	3000	CA280004EN	CA280004EN
					100	200	6000		
					100X	140*	4200		
					140	280	8000		
					140X	200*	6000		
					160	320	8000		
					185	370	8000		
					225	450	8000		
					280	560	8000		
					280X	400*	8000		
					400	800	8000		
					400X	560*	8000		
					560	1120	8000		
560X	750*	8000							

* Trip rating is 140% of X coil ratings, all others are 200%.

Table 3. Single-Phase, Electronically Controlled Reclosers

Recloser Type	Nominal Voltage (kV)	BIL (kV)	Max. Cont. Current Rating (A)	Interrupting Medium	Interrupting Rating (rms sym A)	For Detailed Description and Ordering Information See Catalog Section		
						Recloser	Electronic Control	Mountings
2.4 thru 14.4 kV								
SPEAR15-8	2.44-14.4	110*	400	Vacuum	8000	CA280001EN	CA280001EN	S280-101-1
SPEAR15-12			630		12500			
SPEAR15-12			800		12500			
24.9 kV								
SPEAR27-8	24.9	125**	400	Vacuum	8000	CA280001EN	CA280001EN	S280-101-1
SPEAR27-12			630		12500			
SPEAR27-12			800		12500			
34.5 kV								
SPEAR38-8	34.5	170	400	Vacuum	8000	CA280001EN	CA280001EN	S280-101-1
SPEAR38-12			630		12500			
SPEAR38-12			800		12500			

* 125 kV BIL accessory option available

** 150 kV BIL accessory option available

Table 4. Three-Phase, Hydraulically Controlled Reclosers

Recloser Type	Nominal Voltage (kV)	BIL (kV)	Max. Cont. Current Rating (A)	Interrupting Medium	Trip-Coil Rating (cont. A)	Min. Trip Rating (A)	Interrupting Rating (rms sym A)			For Detailed Description and Ordering Information See Catalog Section	
							4.8 kV	8.32 kV	14.4 kV	Recloser	Mountings
6H*	2.4-14.4	110	100	Oil	5	10	200	200	200	CA280004EN	MN280044EN
					10	20	400	400	400		
					15	30	600	600	600		
					25	50	1000	1000	1000		
					35	70	1400	1400	1400		
					50	100	2000	2000	2000		
					70	140	2800	2500	2000		
					100	200	3000	2500	2000		
V6H*	2.4-14.4	110	200	Vacuum	5	10	200	200	200	CA280004EN	S280-85-11
					10	20	400	400	400		
					15	30	600	600	600		
					25	50	1000	1000	1000		
					35	70	1400	1400	1400		
					50	100	2000	2000	2000		
					70	140	2800	2500	2000		
					100	200	3000	2500	2000		
W	2.4-14.4	110	560	Oil	5	10	300	300	300	CA280005EN	MN280044EN MN280039EN
					10	20	600	600	600		
					15	30	900	900	900		
					25	50	1500	1500	1500		
					35	70	2100	2100	2100		
					50	100	3000	3000	3000		
					70	140	4200	4200	4200		
					70X	100**	3000	3000	3000		
					100	200	6000	6000	6000		
					100X	140**	4200	4200	4200		
					140	280	8400	8400	8400		
					140X	200**	6000	6000	6000		
					160	320	9600	9600	9600		
					160X	225**	6750	6750	6750		
					185	370	11100	10000	10000		
					185X	260**	7800	7800	7800		
					200	400	12000	10000	10000		
					225	450	12000	10000	10000		
225X	315**	9450	9450	9450							
280	560	12000	10000	10000							
280X	400**	12000	10000	10000							
400	800	12000	10000	10000							
400X	560**	12000	10000	10000							
560	1120	12000	10000	10000							
560X	750**	12000	10000	10000							

* Phases trip individually on overcurrent, but trip and lock out all three phases at the final step in sequence. Other reclosers operate all three phases simultaneously under all conditions.

** Trip rating is 140% of X coil ratings, all others are 200%.

Table 4. Three-Phase, Hydraulically Controlled Reclosers (continued)

Recloser Type	Nominal Voltage (kV)	BIL (kV)	Max. Cont. Current Rating (A)	Interrupting Medium	Trip-Coil Rating (cont. A)	Min. Trip Rating (A)	Interrupting Rating (rms sym A)	For Detailed Description and Ordering Information See Catalog Section	
								Recloser	Mountings
14.4 kV									
VW	2.4-14.4	110	560	Vacuum	5	10	300	CA280005EN	MN280044EN MN280039EN
					10	20	600		
					15	30	900		
					25	50	1500		
					35	70	2100		
					50	100	3000		
					70	140	4200		
					70X	100**	3000		
					100	200	6000		
					100X	140**	4200		
					140	280	8400		
					140X	200**	6000		
					160	320	9600		
					160X	225**	6750		
					185	370	11100		
					185X	260**	7800		
					200	400	12000		
					225	450	12000		
					225X	315**	9450		
					280	560	12000		
280X	400**	12000							
400	800	12000							
400X	560**	12000							
560	1120	12000							
560X	750**	12000							
24.9 kV									
VW27	24.9	150	560	Oil	5	10	300	CA280005EN	MN280044EN MN280039EN
					10	20	600		
					15	30	900		
					25	50	1500		
					35	70	2100		
					50	100	3000		
					70	140	4200		
					70X	100**	3000		
					100	200	6000		
					100X	140**	4200		
					140	280	8000		
					140X	200**	6000		
					160	320	8000		
					160X	225**	6750		
					185	370	8000		
					185X	260**	7800		
					225	450	8000		
					225X	315**	8000		
					280	560	8000		
					280X	400**	8000		
400	800	8000							
400X	560**	8000							
560	1120	8000							
560X	750**	8000							

* Phases trip individually on overcurrent, but trip and lock out all three phases at the final step in sequence. Other reclosers operate all three phases simultaneously under all conditions.

** Trip rating is 140% of X coil ratings, all others are 200%.

Table 4. Three-Phase, Hydraulically Controlled Reclosers (continued)

Recloser Type	Nominal Voltage (kV)	BIL (kV)	Max. Cont. Current Rating (A)	Interrupting Medium	Trip-Coil Rating (cont. A)	Min. Trip Rating (A)	Interrupting Rating (rms sym A)	For Detailed Description and Ordering Information See Catalog Section	
								Recloser	Mountings
								24.9 kV	
VWV27	24.9	125	560	Vacuum	5	10	300	CA280005EN	MN280044EN MN280039EN
					10	20	600		
					15	30	900		
					25	50	1500		
					35	70	2100		
					50	100	3000		
					70	140	4200		
					70X	100**	3000		
					100	200	6000		
					100X	140**	4200		
					140	280	8400		
					140X	200**	6000		
					160	320	9600		
					160X	225**	6750		
					185	370	11100		
					185X	260**	7800		
					200	400	12000		
					225	450	12000		
225X	315**	9450							
280	560	12000							
280X	400**	12000							
400	800	12000							
400X	560**	12000							
560	1120	12000							
560X	750**	12000							
								34.5 kV	
VWV38X	34.5	150	560	Vacuum	5	10	300	CA280005EN	MN280044EN MN280039EN
					10	20	600		
					15	30	900		
					25	50	1500		
					35	70	2100		
					50	100	3000		
					70	140	4200		
					70X	100**	3000		
					100	200	6000		
					100X	140**	4200		
					140	280	8400		
					140X	200**	6000		
					160	320	9600		
					160X	225**	6750		
					185	370	11100		
					185X	260**	7800		
					200	400	12000		
					225	450	12000		
225X	315**	9450							
280	560	12000							
280X	400**	12000							
400	800	12000							
400X	560**	12000							
560	1120	12000							
560X	750**	12000							

* Phases trip individually on overcurrent, but trip and lock out all three phases at the final step in sequence. Other reclosers operate all three phases simultaneously under all conditions.

** Trip rating is 140% of X coil ratings, all others are 200%.

Table 4. Three-Phase, Hydraulically Controlled Reclosers (continued)

Recloser Type	Nominal Voltage (kV)	BIL (kV)	Max. Cont. Current Rating (A)	Interrupting Medium	Trip-Coil Rating (cont. A)	Min. Trip Rating (A)	Interrupting Rating (rms sym A)	For Detailed Description and Ordering Information See Catalog Section	
								Recloser	Mountings
34.5 kV									
VWV38X	34.5	170	560	Oil	5	10	300	CA280005EN	MN280044EN MN280039EN
					10	20	600		
					15	30	900		
					25	50	1500		
					35	70	2100		
					50	100	3000		
					70	140	4200		
					70X	100**	3000		
					100	200	6000		
					100X	140**	4200		
					140	280	8400		
					140X	200**	6000		
					160	320	8000		
					160X	225**	6750		
					185	370	8000		
					185X	260**	7800		
					225	450	8000		
					225X	315**	8000		
280	560	8000							
280X	400**	8000							
400	800	8000							
400X	560**	8000							
560	1120	8000							
560X	750**	8000							

* Phases trip individually on overcurrent, but trip and lock out all three phases at the final step in sequence. Other reclosers operate all three phases simultaneously under all conditions.

** Trip rating is 140% of X coil ratings, all others are 200%.

Table 5. Three-Phase, Electronically Controlled Reclosers

Recloser Type	Nominal Voltage (kV)	BIL (kV)	Max. Cont. Current Rating (A)	Interrupting Medium	Interrupting Rating (rms sym A)			For Detailed Description and Ordering Information See Catalog Section		
					4.8 kV	8.32 kV	14.4 kV	Reclosers	Electronic Control	Mountings
WE	2.4 - 14.4	110	560**	Oil	12000	10000	10000	280-40	Bulletin B280-08010	MN280044EN MN280039EN
2.4 thru 14.4 kV										
PWE*	2.4 - 14.4	95	560	Vacuum	12000			285-71	Bulletin B280-08010	Not Applicable
VWE	2.4 - 14.4	110	560**	Vacuum	12000			280-40	Bulletin B280-08010	MN280044EN MN280039EN
VSA12B	2.4 - 14.4	110	600	Vacuum	12000			CA280008EN	Bulletin B280-08010	CA280008EN
VSA12	2.4 - 14.4	110	800	Vacuum	12000			CA280008EN	Bulletin B280-08010	CA280008EN
VSA16	2.4 - 14.4	110	800	Vacuum	16000			CA280008EN	Bulletin B280-08010	CA280008EN
VSA20	2.4 - 14.4	110	800	Vacuum	20000			CA280008EN	Bulletin B280-08010	CA280008EN
VSA20A	2.4 - 14.4	110	1200	Vacuum	20000			CA280008EN	Bulletin B280-08010	CA280008EN
NOVA-TS-15-8	2.4 - 14.4	110	400	Vacuum	8000			S280-42-2	Bulletin B280-08012	S280-42-2
NOVA15	2.4 - 14.4	110	630**	Vacuum	12500***			CA280003EN	Bulletin B280-08010	MN280042EN MN280043EN
NOVA-TS-15-12	2.4 - 14.4	110	630**	Vacuum	12500***			S280-42-2	Bulletin B280-08012	S280-42-2
NOVA STS-15	2.4 - 14.4	110	630**	Vacuum	12500***			S280-44-1	Bulletin B280-08012	S280-44-1
24.9 kV										
NOVA-TS-27-8	24.9	125	400	Vacuum	8000			S280-42-2	Bulletin B280-08012	S280-42-2
NOVA 27	24.9	125	630**	Vacuum	12500***			CA280003EN	Bulletin B280-08010	MN280042EN MN280043EN
PWVE*	24.9	125	560	Vacuum	12000			285-71	Bulletin B280-08010	Not Applicable
WVE27	24.9	150	560**	Oil	8000			280-40	Bulletin B280-08010	MN280044EN MN280039EN
VWVE27	24.9	125	560**	Vacuum	12000			280-40	Bulletin B280-08010	MN280044EN MN280039EN
NOVA-TS-27-12	24.9	125	630**	Vacuum	12500***			S280-42-2	Bulletin B280-08012	S280-42-2
NOVA STS-27	24.9	125	630**	Vacuum	12500***			S280-44-1	Bulletin B280-08012	S280-44-1
34.5 kV										
NOVA-TS-38-8	34.5	170	400	Vacuum	8000			S280-42-2	Bulletin B280-08012	S280-42-2
WVE38X	34.5	170	560**	Oil	8000			280-40	Bulletin B280-08010	MN280044EN MN280039EN
VWVE38X	34.5	150	560**	Vacuum	12000			280-40	Bulletin B280-08010	MN280044EN MN280039EN
VS012	34.5	150	560**	Vacuum	12000			280-57	Bulletin B280-08010	280-57
VS016	34.5	150	560**	Vacuum	16000			280-57	Bulletin B280-08010	280-57
NOVA38	34.5	170	630**	Vacuum	12500			CA280003EN	Bulletin B280-08010	MN280042EN MN280043EN
NOVA-TS-38-12	34.5	170	630**	Vacuum	12500			S280-42-2	Bulletin B280-08012	S280-42-2
NOVA STS-38	34.5	170	630**	Vacuum	12500			S280-44-1	Bulletin B280-08012	S280-44-1

* For pad-mounted installation.

** Continuous current rating can be extended to 800 A with an accessory.

*** 16.0 kA option is also available.

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