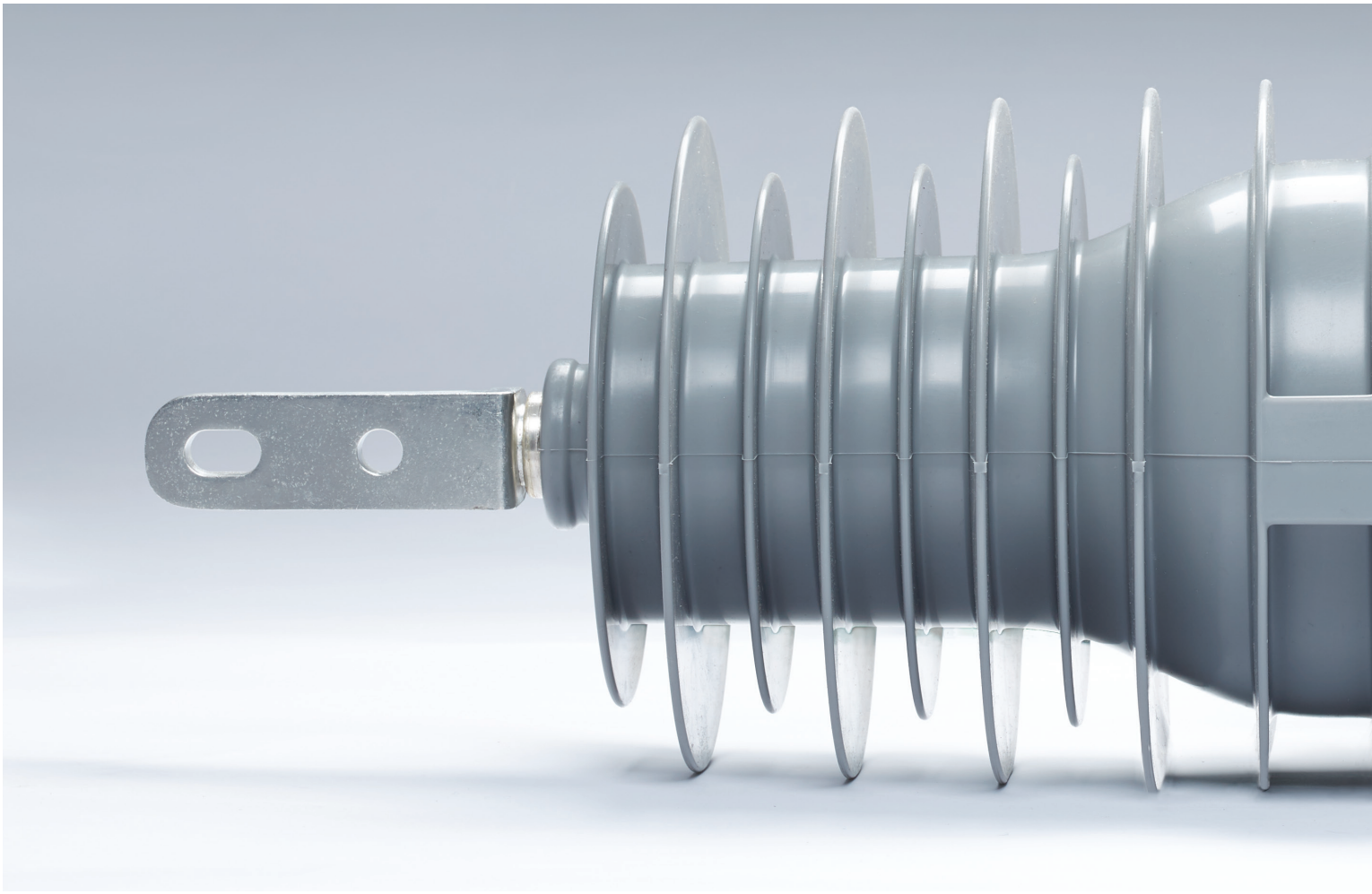
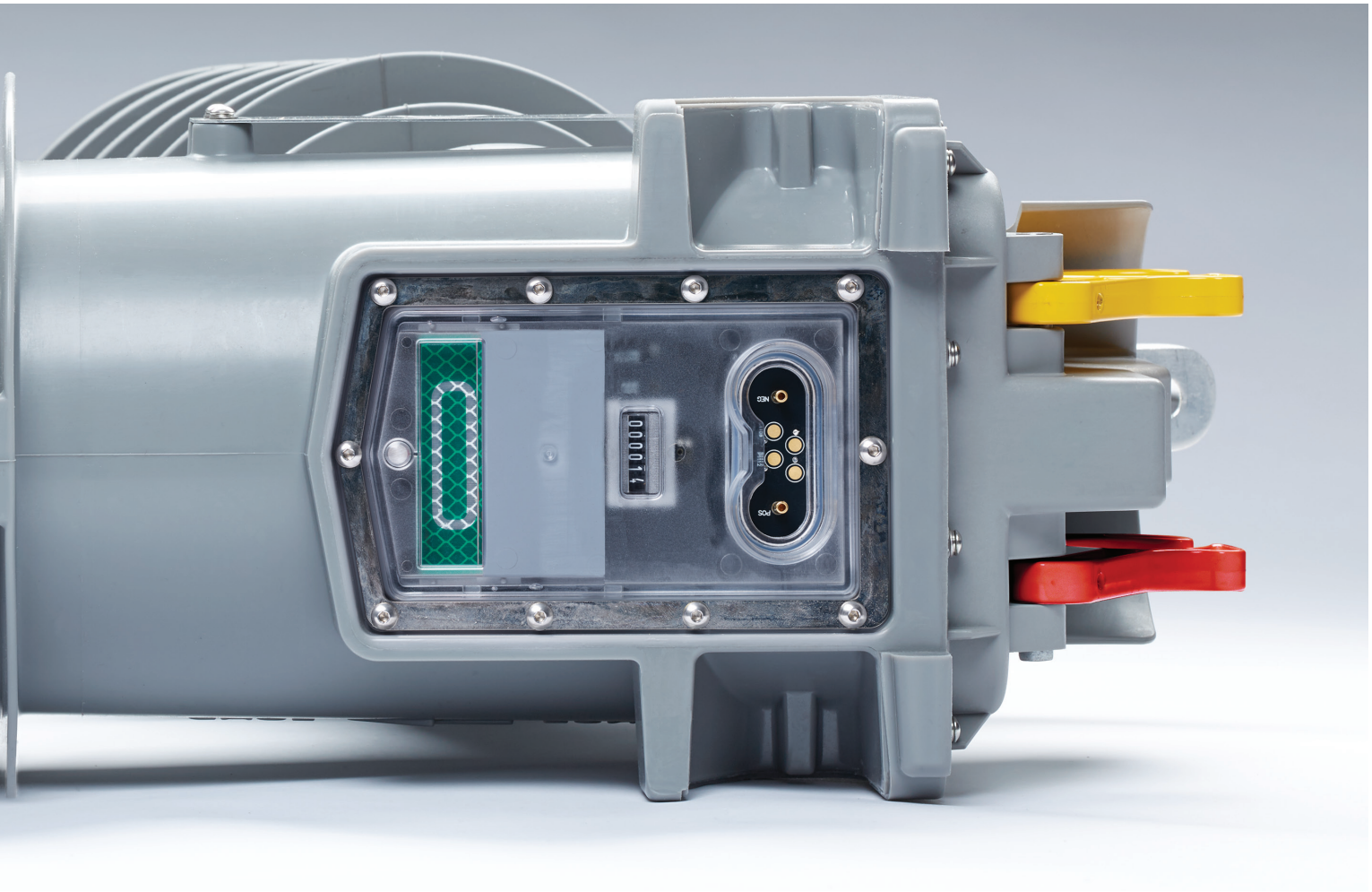
Compact Modular Recloser **CMR**

Single-, two-, and three-phase family of outdoor auto-reclosers

SIEMENS



The Compact Modular Recloser (CMR) is fully rated, lightweight, and configurable.



MANAGEMENT SYSTEM CERTIFICATION
DNV·GL
ISO 9001 = ISO 14001
OHSAS 18001

The products and systems described in this catalog are manufactured and sold according to a certified management system (acc. to ISO 9001, ISO 14001 and BS OHSAS 18001).

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COMPACT MODULAR RECLOSER (CMR)

Introduction

Distribution utilities have been trapped between the high capital cost of modern electronically controlled reclosers and the high operating cost of obsolete hydraulic reclosers.

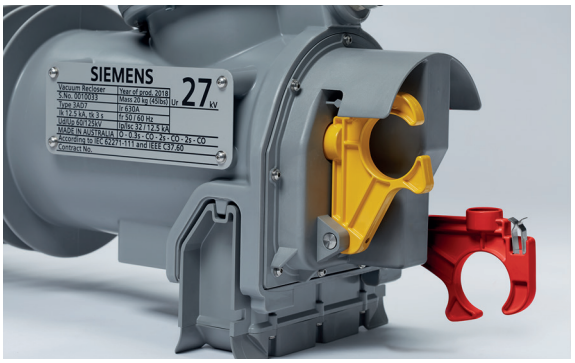
The CMR™ compact modular recloser provides a new approach without the high cost of pole-mounted control cubicles and auxiliary supplies of the modern recloser and without the protection limitations and maintenance costs of hydraulic reclosers.

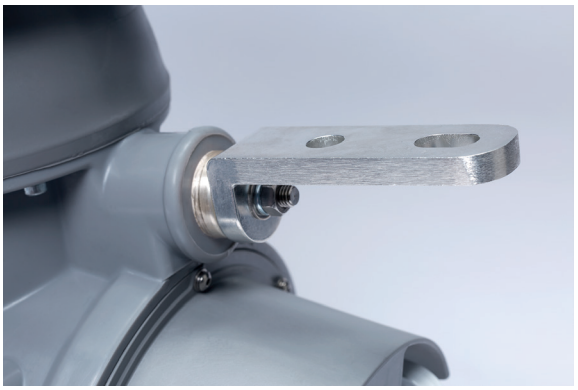
The CMR is a new class of intelligent auto-recloser with unique self-powering from line voltage with a fully-insulated housing. With embedded microprocessor control in the switch unit with wireless connectivity, the CMR has advanced protection and measurement capabilities, event logging, and load profiling.

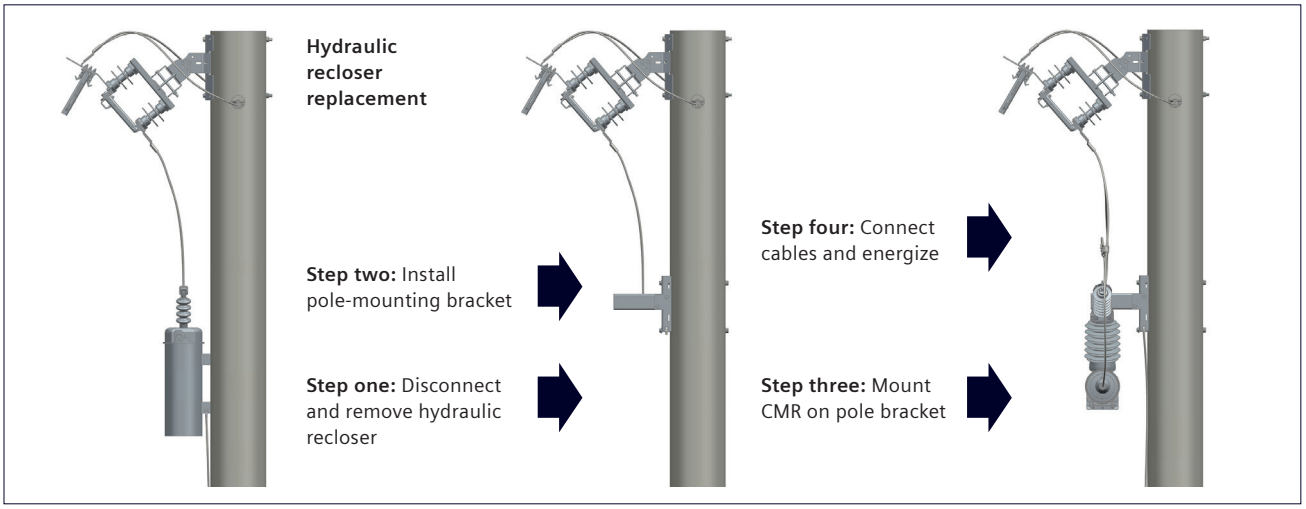
As a world-first innovation, the CMR self-powers using the line-to-ground potential via a fully integrated resistor-capacitor chain power supply. Back-up energy is stored in a detachable battery module with long-life, rechargeable battery cells. This voltage based self-powering ensures reliable operation on all networks. It enables significantly higher load and fault-current ratings to be achieved in a smaller footprint and lower cost.

The fully-insulated design improves safety and network reliability by ensuring no live components of the CMR are contactable by operators or wildlife. Lightweight and simple mounting options mean the CMR is fast and easy to install.

The new CMR represents a quantum step in technology for cost-effectively improving the reliability of overhead medium-voltage networks.







COMPACT MODULAR RECLOSER (CMR)

Application

The CMR approaches overhead distribution protection in a new way. Its unique system design provides fundamental protection and monitoring capabilities for single- and multi-phase recloser applications in urban and rural networks. This clever, completely integrated system is suitable for all sites, even those with inconsistent or no line current.

By eliminating the need for regular maintenance[1] and utilizing line voltage as power supply, this new auto-recloser generation addresses all common problems of obsolete hydraulic reclosers.

For greater flexibility, utilities can choose between pre-configured options as a drop-in alternative to a traditional hydraulic recloser or to self-configure the devices to take advantage of advanced protection, measurement and logging features.

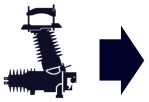
Footnote:

1. Excludes routine battery replacements every eight years.

I want to buy a modern electronically controlled recloser but don't need complicated protection, automation, and SCADA features. I want to avoid the design, construction, and equipment cost of a solution with a separate switch unit, control cubicle, auxiliary supply, and connection cable.

Fully integrated

The recloser is a fully integrated device of switch unit, controller, and power supply.



All the user need do is:
- Mount the recloser on the pole
- Connect the earth lead
- Connect the line- and load-side cable tails.

Simple user interfaces are provided by external handles for linesman operation with hookstick.

Wireless connection enables configuration, operation, and event retrieval via intuitive PC applications.

I want a replacement for my existing hydraulic recloser without having to perform protection studies or train technicians in how to configure a new device. I want to gain the benefit of reduced maintenance, simple installation, and knowing I can access advanced features in the future without needing to change out the recloser physically.

Factory configured

The factory configures the protection settings to mimic any model of legacy single-phase hydraulic recloser.

The user advises Siemens of the model code of the legacy hydraulic recloser, and the factory applies and tests protection settings to generate equivalent performance.

The CMR is flexible for the future as the user can wirelessly change the protection settings or enable other functions as their requirements evolve.

I want to upgrade my network and replace my obsolete hydraulic reclosers with an advanced alternative that immediately gives me access to additional protection options, provides network data, and eliminates the need to remove the recloser from service to perform routine maintenance processes.

User configured

The user configures the recloser wirelessly to access comprehensive protection, measurement, and logging features.

The user immediately has access to:
- Fully configurable protection curves
- Five protection groups
- Current and voltage measurement
- GPS time-stamped event log.

When compared with hydraulic reclosers, CMR's superior ratings allows it to be applied to the majority of overhead line locations where load and fault conditions associated with network growth require higher performances.

COMPACT MODULAR RECLOSER (CMR)

The CMR system

Developed as part of an integrated system of tools and accessories, CMR is an essential element in a system of components that work together to deliver ease of installation, rapid commissioning, and reliable operation in all conditions. A typical CMR installation includes:

- The compact recloser
- Crossarm clamp or pole-mounted assembly
- Wildlife guards
- Battery module
- Ground connection.

Switch unit design

The CMR is a fully integrated unit consisting of a vacuum interrupter driven by a magnetic actuator. Onboard current and voltage sensors provide measurement inputs into the built-in electronic controller and protection modules.

As an insulated system utilising high-grade, silicone insulation, the CMR delivers improved operator safety and superior outdoor life.

Line voltage self-powering

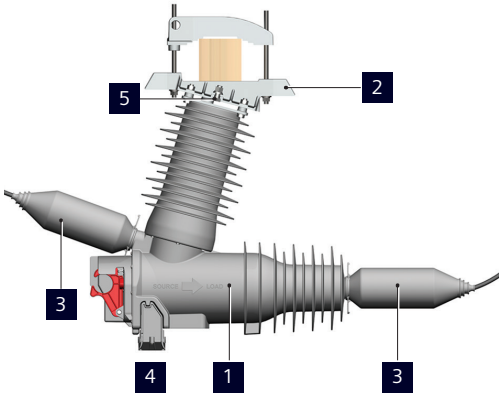
Incorporating a breakthrough innovation in harvesting power from the line voltage, the CMR uses the line-to-ground system voltage to deliver a small leakage current flowing through a resistor-capacitor network to generate power for the electronic controller and to recharge the battery module.

Battery module

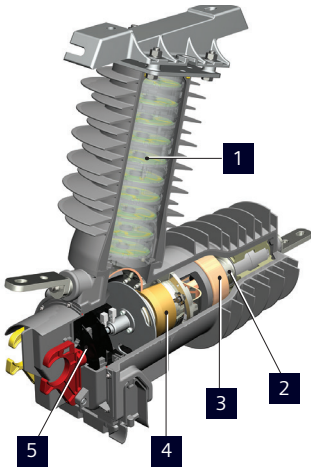
Rechargeable from the line voltage, the battery module plugs into the CMR and provides back-up power in the event the line is dead.

Energy stored in the battery module is used to power the CMR during infrequent periods when no line voltage is available and to recharge the trip and close capacitors during a reclose sequence.

1. The compact recloser
2. Crossarm clamp or pole-mounted assembly
3. Wildlife guards
4. Battery module
5. Ground connection

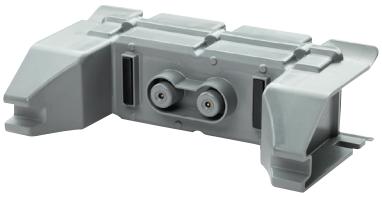


A typical CMR installation

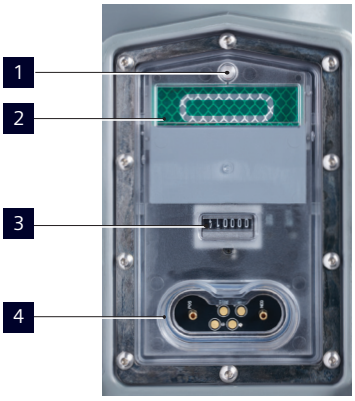


1. Voltage power system
2. Vacuum interrupter
3. Current transformer
4. Magnetic actuator
5. Electronic controller

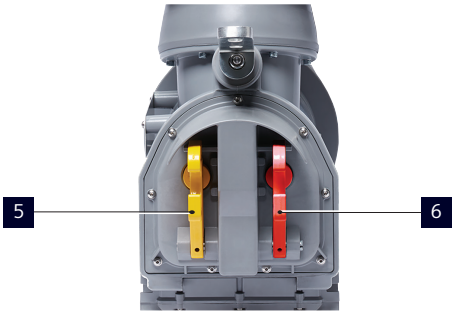
Switch and voltage stack side view



Battery module



1. LED
2. Position indicator
3. Counter
4. Battery module connection
5. Manual operation handle
6. Non-reclose handle



Vacuum interrupter
The CMR relies upon Siemens' well-established vacuum interrupter technology.

Magnetic actuator
The magnetic actuator has been specifically designed for precise control of operation to enable point on-wave switching to optimize arc clearing of the vacuum interrupter.

LED
Adjacent to the position indicator is a high-intensity LED that when illuminated is visible from the ground in daylight.

The LED is used to assist the operator during commissioning and when manually interacting with the recloser.

Position indicator
The magnetic actuator is directly coupled to the position indicator, which is visible from ground level. The indicator has red/green colors with I/O labels to indicate closed/open state. The color assignment can be changed upon customer's request.

Operations counter
On the underside of the device adjacent to the position indicator is an electromechanical operation counter

Non-reclose handle
The red, non-reclosing handle is used by a local operator to change the protection function of the recloser. When pulled down, the recloser changes protection groups; typically to a group configured for a single protection trip to lockout.

Manual operation handle
The recloser is fitted with a yellow, mechanical, manual-operation handle that is directly connected to the magnetic actuator. Pull the handle down to mechanically trip and lockout the recloser. Return the handle to the up position to electrically close the recloser using the energy stored in the battery module.

Mounting

Terminals

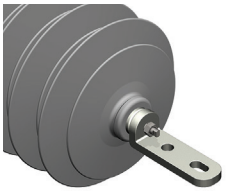
The CMR can be ordered with multiple styles of terminal depending upon current-carrying capacity and preferred installation methods:

- 800 A: two hole NEMA palm
- 630 A: two-hole NEMA palm
- 400 A: cable clamp.

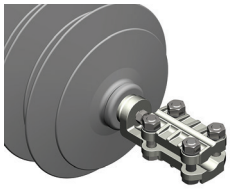
Other options are available by customer's request.

Wildlife guard

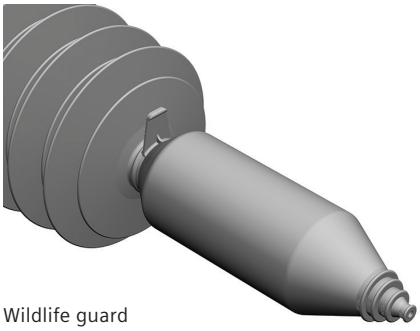
To maintain a fully-insulated system, wildlife guards are available to cover the recloser terminals.



Terminal palm



Cable clamp



Wildlife guard

Single-phase unit

Crossarm mounting

The preferred method of mounting is to a crossarm using the integrated crossarm-clamp assembly.
The design of this clamp facilitates simple lifting, mounting, and securing of the recloser to the crossarm.

Integrated surge arrester mounting

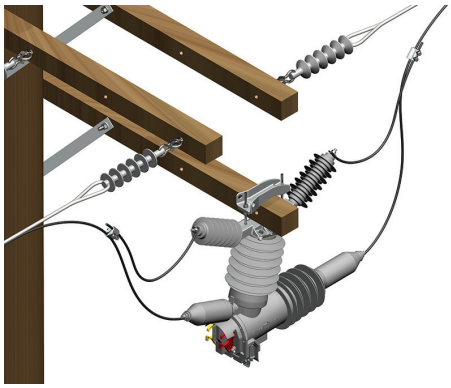
The crossarm-mounting bracket provides integrated locations for installation of surge arresters on both the line and load sides. Siemens recommends the use of distribution class surge arresters. Surge arresters are not provided and must be ordered separately.

Grounding connection

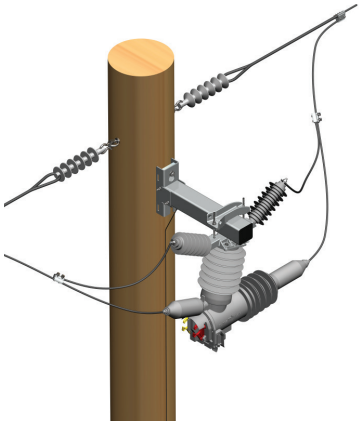
A ground connection is required for the voltage power supply and voltage measurement function to have a 0 V reference point. The crossarm-mounting bracket has an integrated ground wire-connection stud.

Pole-mounting bracket

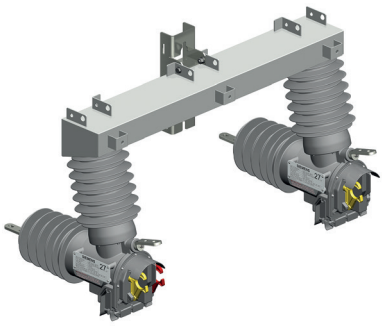
For poles with no pre-existing crossarm, a pole-mounting bracket is available that the crossarm clamp can be fitted to.



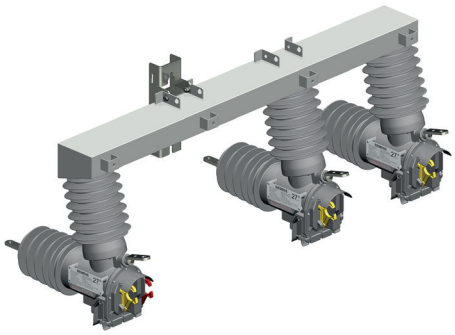
Crossarm-mounting bracket



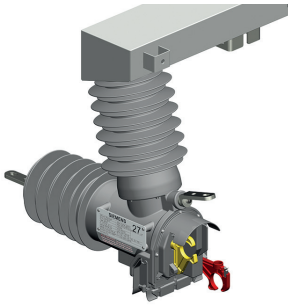
Pole-mounting bracket



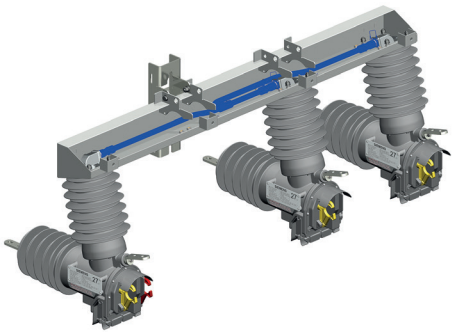
Two-phase CMR



Three-phase CMR



Controller phase has red handle



Three-phase CMR fiberoptic loom

Modular multi-phase system

Multiple CMRs can be connected together via an fiberoptic loom to build an extensible and modular multi-phase recloser system.

Mounting frame

Each CMR is connected to a powder-coated 304 grade stainless steel frame with integrated surge arrester and pole-mounting brackets. Frame options are available for two-phase and three-phase installations.

At time of order, the arrangement of the CMRs on the frame are specified as to the number of phases on the left- and right-hand side of the pole.

Controller phase

In a multi-phase system, the left-hand pole is the controller unit and has the red non-reclose handle, GPS chip, and wireless radio. It processes all signals and makes protection decisions. The other phases are simply providing data to and acting on commands from the controller phase.

Fiberoptic

The CMR units making up each phase of the system are connected via a fiberoptic cable mounted inside of the frame. Current, voltage, and status data is shared over the fiberoptic and consolidated in the controller phase. The controller phase does all protection functions and sends controls to the other phases for when to operate.

Hydraulic recloser protection

A traditional hydraulic recloser requires the correct hydraulic valves and series-trip coils to be fitted at the time of manufacture to deliver specific protection functionality. The hydraulic recloser order code defines all of these manufacturing options.

Recloser model and type

The hydraulic-recloser model type defines the shape of the fundamental time-current curve of the protection and the dead time between operations in the reclose sequence.

The recloser then supports two curves, a “fast” and a “delayed” curve option of the fast curve is the A-curve and select the delayed curve from the B, C, D, or E-curve options.

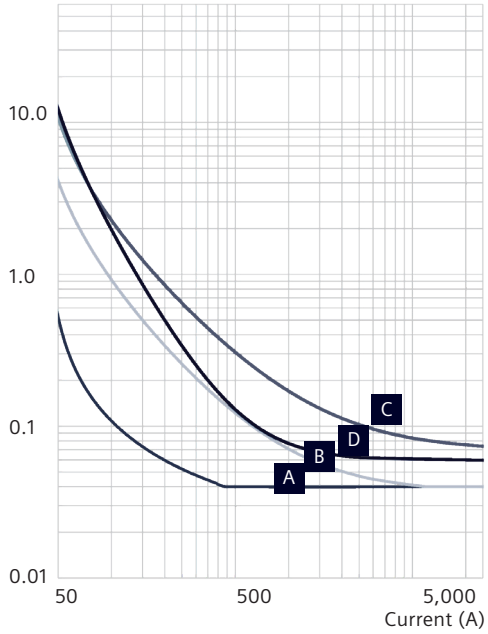
Series trip coil rating

The hydraulic recloser is then fitted with a series coil that sets the protection pickup at x2 the coil continuous-current capability.

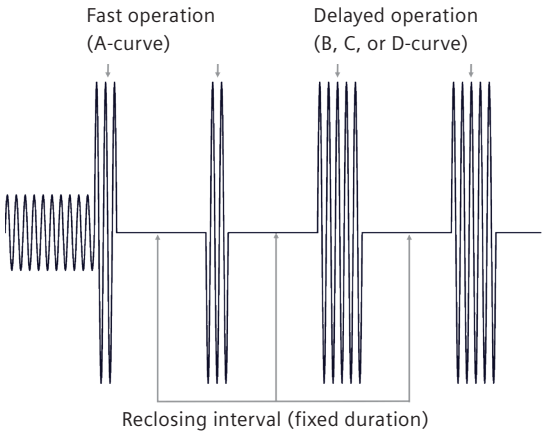
Operating sequence

During the manufacturing process, the hydraulic recloser mechanism is adjusted to determine the operating sequence of the recloser, including the following parameters of number of fast-curve operations (0-4) andn umber of delayed-curve operations (0-4). Note that the total number of operations cannot exceed four and that the fast operations must occur before the delayed operations in the reclose sequence.

To have the Siemens factory pre-configure a CMR to mimic the operating characteristics of the hydraulic recloser to be replaced, please provide the model code of that recloser to Siemens at time of order or complete the Siemens' order code on page 17 of this catalog.



Type L time-current curves 25 A series coil

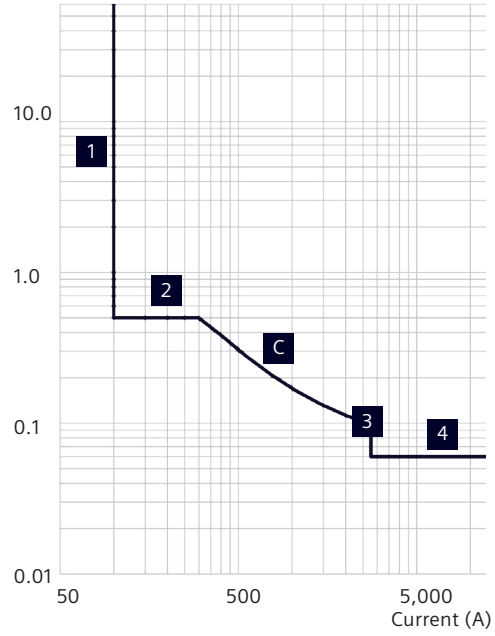


Operating sequence table

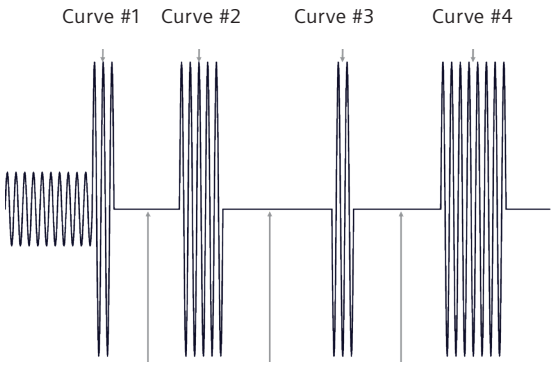
Hydraulic recloser configuration options	Value
Recloser group and type	Type V4L
Continuous current rating of series-trip coil	200
Delayed time-current curve	D
Number of fast A-curve operations	3
Number of delayed operations	1
Hydraulic recloser order code	**KL V4 200 D 3 1**

How to select hydraulic recloser

Ratings	Unit	Description
15.5	kV	Maximum system voltage
110	kV	Impulse withstand
6,000	A	Interrupting current
200	A	Continuous current
Operating sequency	**Unit**	**Description**
A		Trip curve 1
2	s	Recloser interval 1
A		Trip curve 2
2	s	Recloser interval 2
A		Trip curve 3
2	s	Recloser interval 3
D		Trip curve 4



Configurable time-current curve elements



Configurable operating sequence

Configurable protection

The CMR is a microprocessor-controlled vacuum auto-recloser and, therefore, its protection capabilities are not limited by hydraulic valves and series-trip coil selections. A settings file is created offline and then sent to the CMR wirelessly using the CMR Connect PC application.

Time-current curve configuration

The CMR uses a point-mapping approach to curve creation and supports all existing hydraulic-recloser curves, fuse curves, IEC or ANSI curves, and user-definable curves. Each base curve has a range of modifiers that can be applied, including pick-up current, maximum time element, instantaneous element, and minimum time element.

A total of 30 independent curves can be created and used per recloser. The active time-current curve can be modified by the controller to apply to inrush restraint andcold-load restraint.

Earth-fault protection

In multi-phase CMR systems it is possible to calculate a residual earth-fault current and have protection operate upon this input. The same time-current curve options available in overcurrent protection can be applied to earth faults.

Sensitive earth-fault protection

The CMR can also have a definite time-sensitive, earth-fault element for detecting high-impedance faults.

Reclose-sequence configuration

A reclose sequence can be configured by assigning the total number of operations in the sequence, the reclose interval between each operation, and the time-current curve applicable to each operation. A high-current lockout can also be set.

Protection groups

The CMR allows the user to store up to five different protection groups in the device and assign these to certain conditions (i.e., group 0 is normal, group 1 is red handle down, and group 2 is set for extreme fire risk days (via SCADA as a future feature). Each protection group allows the configuration of overcurrent, earth fault and sensitive earth fault elements.

COMPACT MODULAR RECLOSER (CMR)

Remote Control Unit

Communications interface

To communicate with the SCADA system master station, a long-haul radio or modem is required. The RCU electronics provide a serial, asynchronous data interface (RS232) and an Ethernet port (RJ45) for this purpose.

A purpose-built cable connects the radio/modem to the RCU interface. The design and construction of this cable may be carried out by the customer or as a value-added service provided by Siemens.

Communications protocol

The RCU supports DNP 3.0 and IEC60870-5-104 over both serial link and IP protocol. The RCU has over 200 digital points and more than 40 analog points providing status information on the CMRs and RCU. The RCU can also receive a wide variety of controls from the SCADA master.

RCU configuration

The RCU is configured wirelessly over the short-range radio using the RCU Connect PC application.

Standards

The design and testing of the RCU are according to the relevant parts of IEC 60950-1: 2005 Information technology equipment – Safety.

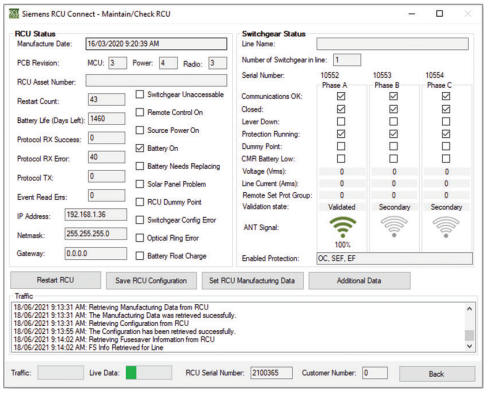
Ambient conditions

The RCU is suitable for use in outdoor environments with ambient temperatures in the range of -22 °F to 113 °F (-30 °C to +45 °C) and relative humidity in the range of five percent to 95 percent. For temperatures below 5 °F (-15 °C), the low-temperature version is required.

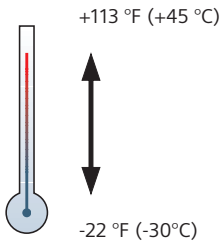
Communications and data

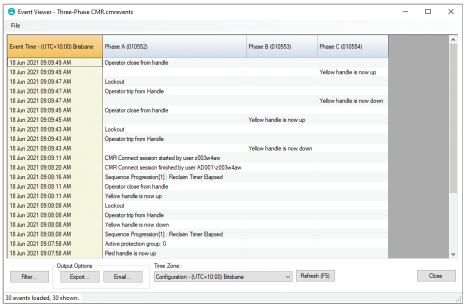
Wireless communications

The CMR includes an intelligent, short-range wireless transceiver, which enables encrypted communications on the public 2.4 GHz band and has an effective range of up to 60 ft (20 m).



RCU for SCADA connectivity





Event log

PC and CMR

GPS chip for event data

For applications requiring accurate time-stamped event data, the CMR is available with a GPS chip. Events include protection operations, fault data, manual operations, and configuration changes. Events can be viewed using the CMR Connect PC application.

Fault-passage indication

The CMR can be configured to flash the LED as a fault beacon when certain protection events occur (i.e., a permanent fault and the recloser has tripped to lockout).

PC communications kit

With the PC communications kit and the CMR Connect software, a local user can use a PC to connect with the CMR over the wireless link to send a new configuration to the recloser, retrieve event data from the recloser, open or close the switch, and update the firmware.

RCU cubicle

The RCU enclosure is mounted to the pole using the pole-mounting bracket and is manufactured from powder-coated stainless steel for long service life. Material options are available at time of ordering including 304 (standard) and 316 grade stainless steel.

The RCU enclosure has a handle with an internal three-point locking mechanism. An external padlock can be fitted to restrict access.

On the top of the RCU enclosure is a high-grade, UV-stabilised plastic shade hood. This shade hood is to reduce solar heating and to provide an aperture for the short-range radio.

At the rear of the RCU enclosure, there is a ground stud and a number of openings fitted with cable glands to allow external wiring to access the internals of the RCU.

Electronics housing

The electronics housing contains the microprocessor, battery, power connection terminals, data connection points, and the user interface for the RCU. The RCU has a simple user interface for operations and maintenance purposes. The RCU front panel has a number of LED indicators. The LEDs are normally off (to reduce power consumption) and turn on automatically while the door is open as controlled by the position of the door switch. The electronics housing also holds the 12 V, 7.2 Ah lead-acid battery. The electronics housing is normally powered by a selectable 115/230 Vac low-voltage supply.

Radio tray

The radio tray is available for the installation of the utility-specific radio, modem, or other means to connect to the utility's SCADA system. The radio tray hinges down and allows access to the radio behind. When in the hinged up position, the tray provides a degree of protection from driving rain.

RCU accessories

Operator panel

The operator control panel is an optional accessory mounted on the front of the radio tray and plugs into the RCU's electronics compartment. The operator control panel allows a local user to trip and close the CMRs or to change the active protection mode in the CMRs and turn auto-reclose on and off. It also provides additional status information.

There are two operator panels available, one panel for use with CMRs installed as independent poles and another for when they are optically ganged.

Low-temperature option

The low-temperature RCU includes a heater mounted behind the radio tray. It has a positive temperature coefficient element which acts as a thermostatic heater keeping the battery and electronic compartment above 5 °F (-15 °C) for ambient temperatures as low as -22 °F (-30 °C).

Solar panel

In environments where good sunlight is available all year, it is possible to power the RCU using a solar power kit option. This includes the solar panel, mounting bracket, and cable. Solar powering of the RCU is also dependent upon power consumption of the utility's radio or modem being less than 100 mW on average. The solar panel is connected into the terminal compartment to a dedicated set of terminals as an alternative to the mains supply.

Solar ratings	Value
Power ratings	65 W
Nominal voltage	18 V
Cell type	Polycrystalline

Voltage transformer

Where low-voltage mains is not available and solar powering is not practical, the RCU should be powered by a voltage transformer connected to the medium-voltage line on which the CMR is installed.

COMPACT MODULAR RECLOSER (CMR)

Ratings

Standards

The CMR conforms to the relevant sections of the following standards: IEC 62271-111 (2012)/IEEE C37.60.

Switch unit parameters	Unit	One-, two- and three-phase	One-phase only
Rated voltage	kV	Up to 27 kV	38
Rated frequency f_r	Hz	50/60	50/60
Rated continuous current I_r at 104 °F (40 °C)	A	800	800
Rated continuous current I_r at 131 °F (55 °C)	A	630	630
Rated short-time withstand current I_k	kA	12.5	6.3
Rated peak-withstand current I_p	kA	32.5	16.4
Rated duration of short circuit t_k	s	3	3
Rated symmetrical interrupting current I_{sc}	kA	12.5	6.3
Rated symmetrical fault-making current	kA	12.5	6.3
Rated operating sequence		O-0.3 s-CO-2 s-CO-2 s-CO	O-0.3 s-CO-2 s-CO-2 s-CO
Opening/closing times	ms	<20 ms	<20 ms
Clearing time	ms	<50 ms	<50 ms
Rated line-charging interrupting current	A	5	5
Rated cable-charging interrupting current	A	25	40
Minimum number of operations at rated short-circuit current		70	240
Minimum number of load-break operations at rated current/mechanical operations		10,000	10,000
IP rating		67	67
Creepage distance	in (mm)	46.7 (>1,185)	46.7 (>1,185)

Model selection for system voltage

The CMR self powers by harvesting energy from the line using an inbuilt, high-impedance chain connected from line voltage to ground (earth) point. Leakage current in the range of 4 mA flows through this chain and provides power to the recloser electronic controller. Successful deployment of the CMR requires that the correct model is selected to match the available line voltage of the network. If the available voltage is too low, then the batteries cannot be recharged.

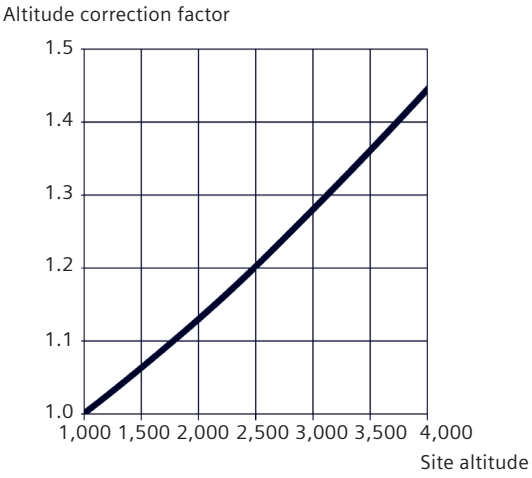
Ratings description	Unit	Model					
Rated maximum voltage (P-P) U_r	kV	4.5	12	17.5	27	27	38
Rated power-frequency withstand - dry U_d	kV	10	28	50	60	60	70
Rated impulse-withstand voltage U_p	kV	110	95	110	125	150	170
Minimum system voltage for operation (P-P)	kV	2.1	7	10	15.5	15.5	20

Altitude correction factor

The dielectric strength of air insulation decreases with increasing altitude due to low air density. The rated withstand voltage values specified in the above apply to a site altitude of 1,000 m above sea level. For altitudes above 1,000 m, the insulation level must be corrected according to IEC 62271-1.

The correction applies to the rated power-frequency withstand voltage and the rated impulse-withstand voltage. To select the devices, the following applies:

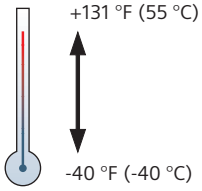
- $U \geq U_o \times K_a$
- U = Rated withstand voltage at reference atmosphere
- U_o = Rated withstand voltage requested for place of installation
- K_a = Altitude correction factor from the diagram.



Ambient conditions

The CMR is suitable for use in outdoor service environments as follows:

Service environment	Rating
Humidty	0 to 100%
Maximum altitude	13,123 ft (4,000 m)
Pollution class	Very heavy (as per IEC 60815-3)



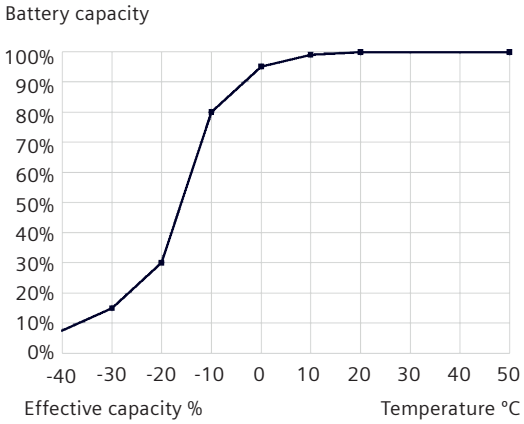
Battery module performance

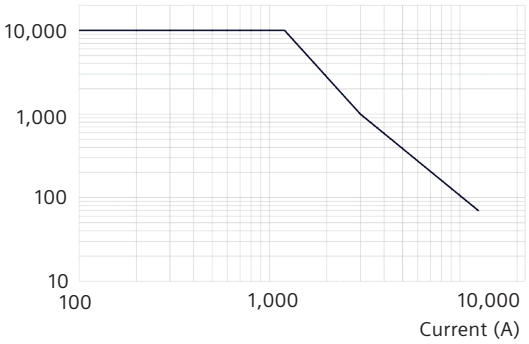
The battery module1 is fitted with four high-grade 3.6 V Li-ion battery cells of the 18650 size and capacity of 2,000 mAh providing the following system performance:

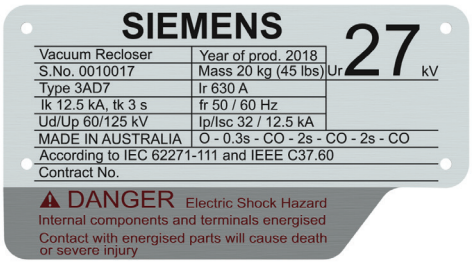
Service environment	Rating
Humidty	0 to 100%
Maximum altitude	13,123 ft (4,000 m)
Pollution class	Very heavy (as per IEC 60815-3)

The battery capacity is reduced at low temperature per the adjacent chart. For expected performance at low temperature, multiply the percentage from the chart by the expected hold-up time or number of trip/close operations in the above table.

As the battery cells age and near end-of-life, the available capacity reduces and the rated performance may not be achieved.







Electrical life

The electrical life of the CMR is limited to the fault-interruption capacity of the vacuum interrupter. The electronic controller tracks the number and magnitude of interruptions and estimates when the vacuum interrupter is worn out.

For example, the vacuum interrupter would be worn out after completing 5,000 load-current interruptions at 630 A using 50 per cent of the available life and 50 fault-current interruptions at 10,000 A using the other 50 per cent of life.

Nameplate

Note: For any request regarding spare parts, subsequent deliveries, etc., the following details are necessary:

- Type designation
- Serial No.
- Year of manufacture.

COMPACT MODULAR RECLOSER (CMR)

Product selection

Order number structure

The 16-digit order number fully configures a CMR. The primary part covers the main electrical data. The second part covers terminals, mounting, and other mechanical options. The third part defines any requirements for factory loading of hydraulic recloser mimicking protection settings.

The CMR can be ordered either unconfigured if the user wants to do their protection settings, or pre-configured if the user wants it configured by the factory to match the performance of a traditional hydraulic recloser. The user can change the configuration as required.

To order an unconfigured CMR, please choose a digit for the first 12 positions of the part number followed by 0AA0 for positions 13-16. Example below.

3	A	D	7	1	5	2	–	2	C	A	1	0	–	0	A	A	0	–	Z	■	■	■
1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16	–	Z			

To order a pre-configured CMR to provide the equivalent protection function of a legacy hydraulic recloser, all of the digits from 13-16 must have a valid selection. Example below. Note: only the digits 13-16 show altered from the previous example.

3	A	D	7	1	5	2	–	2	C	A	1	0	–	1	C	C	1	–	Z	■	■	■
1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16	–	Z			

3	A	D	7	■	■	■	–	■	■	■	■	■	–	■	■	■	■	–	Z	■	■	■
1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16	–	Z			

5th position	**1**	**Phase type:** Single-phase
	2	**Phase type:** Two-phases
	3	**Phase type:** Three-phases
6th position	**1**	**Rating:** 4.5 kV-12.5 kA-630 A (110 kV BIL/2.5-4.5 kV system voltages)
	3	**Rating:** 12 kV-12.5 kA-630/800 A (95 kV BIL/7-12 kV system voltages)
	4	**Rating:** 17.5 kV-12.5 kA-630/800 A (110 kV BIL/10.0-17.5 kV system voltages)
	5	**Rating:** 27 kV-12.5 kA-630/800 A (125 kV BIL/15.5-27 kV system voltages)
	6	**Rating:** 27 kV-12.5 kA-630/800 A (150 kV BIL/15.5-27 kV system voltages)
	7	**Rating:** 27 kV-12.5 kA-630/800 A (170 kV BIL/17.5-23 kV SWER voltages)
	9	**Rating:** 38 kV-6.3 kA-630/800 A (170 kV BIL/20.0-38 kV system voltages) (single-phase only)
7th position	**0**	**Terminal:** Not specified
	1	**Terminal:** 630 A palm (two hole – tin-plated aluminium) – includes wildlife guard
	2	**Terminal:** 400 A cable clamp (imperial) (tin-plated aluminium) – includes wildlife guard
	3	**Terminal:** 400 A cable clamp (metric) (tin-plated aluminium) – includes wildlife guard
	4	**Terminal:** 800 A palm (two hole – tin-plated brass) – includes wildlife guard
Hyphen	**–**	**Space**
8th position	**2**	**Controller:** Single-phase: GPS (events and RCU connectable) (no fiberoptic or SEF resister)
	5	**Controller:** Multi-phase: (controller phase) (secondary phases have no GPS, antenna, mechanical counter or red lever fitted)
9th position	**A**	**Mounting:** No mounting bracket
	B	**Mounting:** Single-phase: crossarm clamp, metric
	C	**Mounting:** Single-phase: crossarm clamp, imperial
	D	**Mounting:** Single-phase: crossarm clamp with pole bracket, metric
	E	**Mounting:** Single-phase: crossarm clamp with pole bracket, imperial
	F	**Mounting:** Two-phases: integrated 1L-1R: metric
	G	**Mounting:** Two-phases: integrated 1L-1R: imperial
	H	**Mounting:** Two-phases: integrated 2L: metric
	J	**Mounting:** Two-phases: integrated 2L: imperial
	K	**Mounting:** Two-phases: integrated 2R: metric
	L	**Mounting:** Two-phases: integrated 2R: imperial
	M	**Mounting:** Three-phases: integrated 2L-1R: metric
	N	**Mounting:** Three-phases: integrated 2L-1R: imperial
	P	**Mounting:** Three-phases: integrated 1L-2R: metric
	Q	**Mounting:** Three-phase: integrated 1L-2R: imperial

3	A	D	7	■	■	■	–	■	■	■	■	■	–	■	■	■	■	–	Z	■	■	■
1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16	–	Z			

10th position	**A**	**Fiberoptic loom configuration:** Single-phase: no selection required
	B	**Fiberoptic loom configuration:** Multi-phase: integrated in mounting bracket
11th position	**0**	**Battery module:** None
	1	**Battery module:** Standard
12th position	**0**	**Language:** English/indicator standard (green = open)
	1	**Language:** English/indicator reversed (green = closed)
Hyphen	**–**	**Space**
13th position	**0**	**Unconfigured**
	1	**Fast-curve:** Cooper type E
	2	**Fast-curve:** Cooper type H
	3	**Fast-curve:** Cooper type L
	4	**Fast-curve:** Cooper type 4H, V4H
	5	**Fast-curve:** Cooper type 4E
	6	**Fast-curve:** Cooper type 6H, V6H
	7	**Fast-curve:** Cooper type V4E
	8	**Fast-curve:** Cooper type V4L
	9	**Fast-curve:** Other combinations
14th position	**A**	**Unconfigured**
	B	**Equivalent series trip coil rating:** 5A
	C	**Equivalent series trip coil rating:** 10A
	D	**Equivalent series trip coil rating:** 15A
	E	**Equivalent series trip coil rating:** 25A
	F	**Equivalent series trip coil rating:** 35A
	G	**Equivalent series trip coil rating:** 50A
	H	**Equivalent series trip coil rating:** 70A
	J	**Equivalent series trip coil rating:** 100A
	K	**Equivalent series trip coil rating:** 140A
	L	**Equivalent series trip coil rating:** 200A
	M	**Equivalent series trip coil rating:** 280A
15th position	**A**	**Unconfigured**
	B	**Number of fast curves and delayed curves:** 4 fast/0 delayed
	C	**Number of fast curves and delayed curves:** 3 fast/0 delayed
	D	**Number of fast curves and delayed curves:** 2 fast/0 delayed
	E	**Number of fast curves and delayed curves:** 1 fast/0 delayed
	F	**Number of fast curves and delayed curves:** 3 fast/1 delayed
	G	**Number of fast curves and delayed curves:** 2 fast/1 delayed
	H	**Number of fast curves and delayed curves:** 1 fast/1 delayed
	J	**Number of fast curves and delayed curves:** 2 fast/2 delayed
	K	**Number of fast curves and delayed curves:** 1 fast/2 delayed
	L	**Number of fast curves and delayed curves:** 1 fast/3 delayed
	M	**Number of fast curves and delayed curves:** 0 fast/4 delayed
	N	**Number of fast curves and delayed curves:** 0 fast/1 delayed
	P	**Number of fast curves and delayed curves:** 0 fast/2 delayed
	Q	**Number of fast curves and delayed curves:** 0 fast/3 delayed
16th position	**0**	**Unconfigured**
	1	**Slow-curve:** Cooper B
	2	**Slow-curve:** Cooper C
	3	**Slow-curve:** Cooper D

Remote Control Unit (RCU) configuration

3	A	D	8	■	■	■	–	■	■	■	■	■	–	■	■	■	■	–	Z	■	■	■
1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16	–	Z			

10th position	**B**	**RCU battery:** 7.2 Ah lead acid
	D	**RCU battery:** 11.4 Ah lithium battery (not for cold climate)
	N	**RCU battery:** No battery
11th position	**2**	**RCU enclosure:** 316 stainless powdercoated
	3	**RCU enclosure:** 304 stainless powdercoated (standard)
12th position	**0**	**RCU mounting assembly:** No RCU mounting assembly
	1	**RCU mounting assembly:** Standard pole-mounting assembly
	2	**RCU mounting assembly:** Side-mounting assembly
	3	**RCU mounting assembly:** Standard pole-mounting assembly (304 grade s/s)
	4	**RCU mounting assembly:** Standard pole-mounting assembly (316 grade s/s)
Hyphen	**–**	**Space**
13th position	**1**	**Firmware application (switchgear protocol):** Fusesaver DNP3 and IEC 104
	2	**Firmware application (switchgear protocol):** CMR DNP3 and IEC 104
14th position	**B**	**RCU isolator and heater:** External isolated mains input
	C	**RCU isolator and heater:** External isolated mains input and heater
15th position	**R**	**RCU operator panel:** CMR independent poles
	U	**RCU operator panel:** CMR optically ganged poles
16th position	■	**Language:** Operation manual, nameplate of Fusesaver or RCU

RCU configuration example RCU battery type: 7.2 Ah lead acid, RCU enclosure: 304 stainless steel powdercoated, standard pole-mounting assembly, RCU protocol: DNP 3.0, without RCU isolator and heater, without operator panel

3	A	D	8	8	0	0	–	0	A	B	3	1	–	1	A	A	1	–	■	■	■	■

RCU accessories/spare parts

■	■	■	■	■	–	■	■	3	A	X	1	3	5	0	–	■	■	–	Z	■	■	■
1	2	3	4	5	–	6	7	8	9	10	11	12	13	14	–	15	16	–	Z			

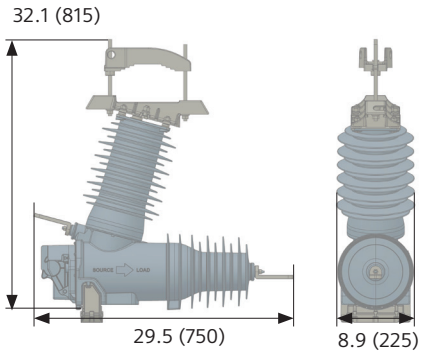
15th and 16th positions	**6**	**A** RCU battery 7.2 Ah lead acid
	6	**B** Solar panel kit 65W
	6	**K** Voltage transformer (VT) mounting kit (excluding VT)
	6	**L** RCU electronic enclosure (excluding battery)
	6	**M** RCU power cable
	6	**N** RCU roof enclosure
	6	**P** Serial cable RS232 plus power
	6	**Q** Serial cable RS232 plus power (bare ends)
	6	**R** RCU radio tray (spare part)
	6	**T** RCU battery 11.4 Ah lithium
	6	**U** Ethernet cable RJ34 plus power
	7	**A** RCU side-mounting assembly
	7	**B** RCU standard pole-mounting assembly
	7	**C** RCU standard pole-mounting assembly (304 grade s/s)
	7	**D** RCU standard pole-mounting assembly (316 grade s/s)
	8	**R** RCU operator panel - CMR indepedent poles
	8	**U** RCU operator panel - CMR optically ganged poles

COMPACT MODULAR RECLOSER (CMR)

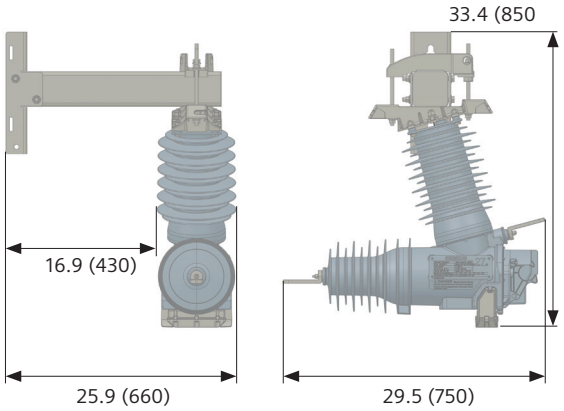
Dimensions

Dimensions in inches (mm)

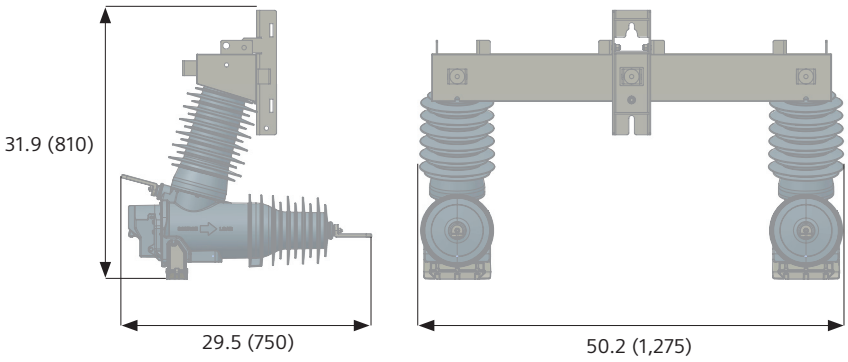
Crossarm-mounted, single-phase assembly
Weight <55.1 lbs (<25 kg)



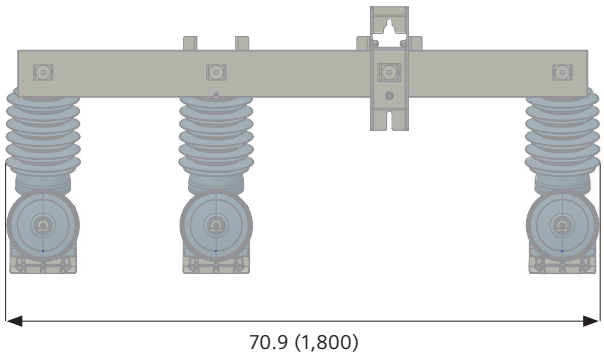
Pole-mounted, single-phase assembly
Weight <66.1 lbs (<30 kg)



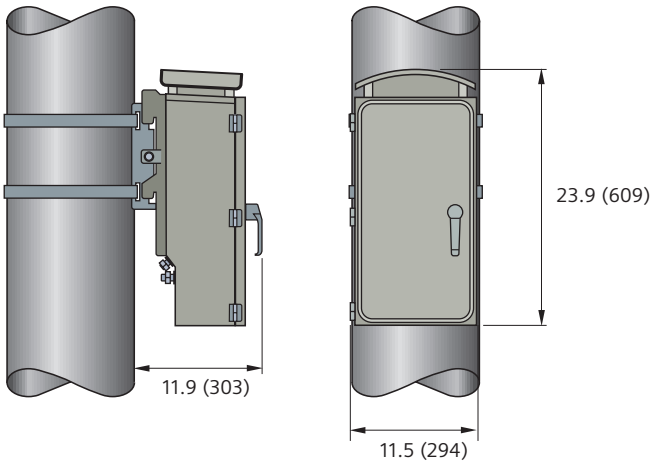
Pole-mounted, two-phase assembly
Weight 121.3 lbs (55 kg)



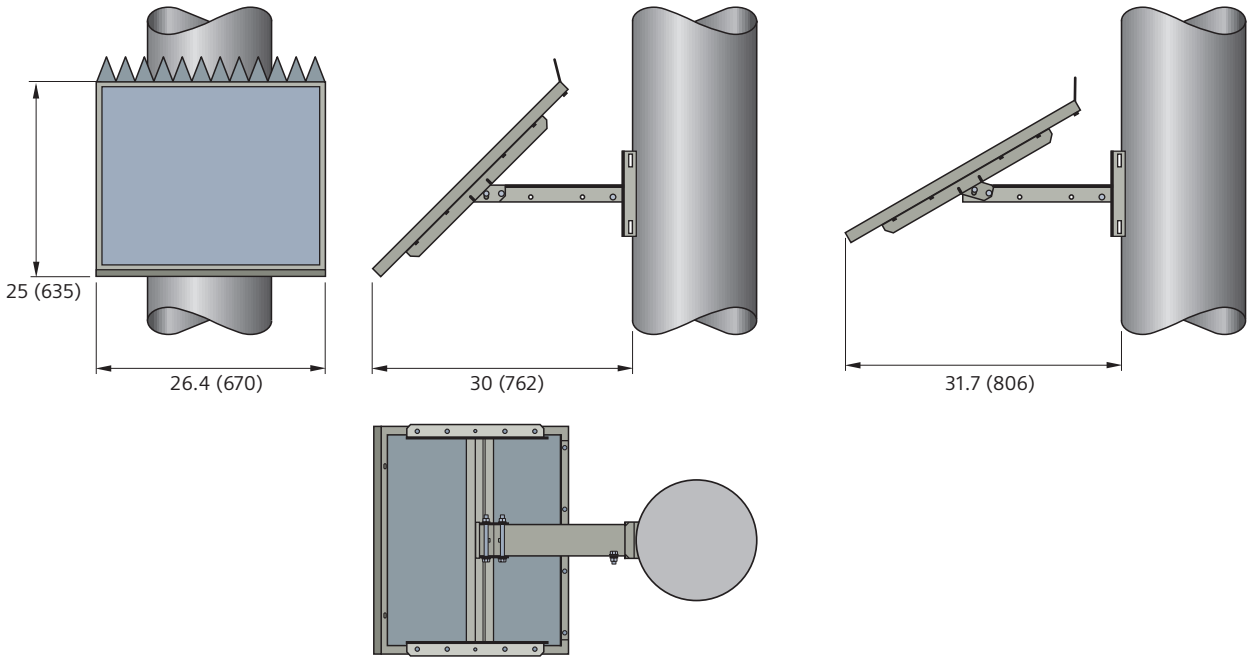
Pole-mounted, three-phase assembly
Weight 187.4 lbs (85 kg)



Dimensions in inches (mm)



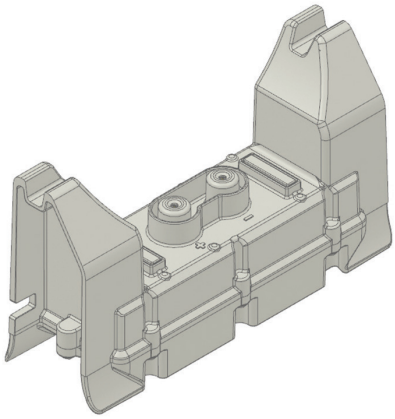
Remote Control Unit (RCU)



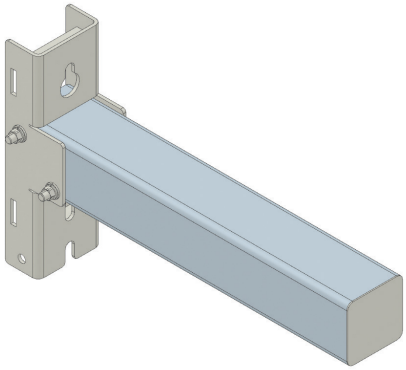
Solar panel (RCU powering option)

COMPACT MODULAR RECLOSER (CMR)

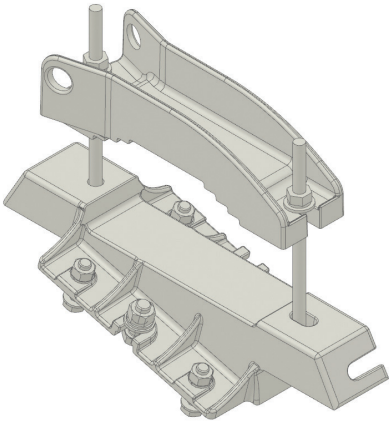
Accessories



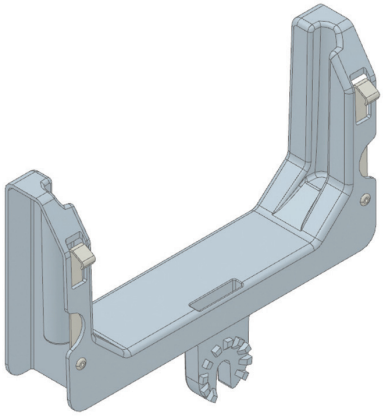
Battery module



Pole-mounting bracket

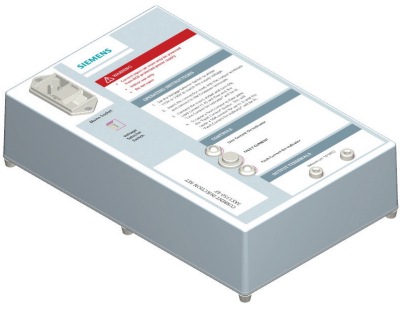


Crossarm clamp kit

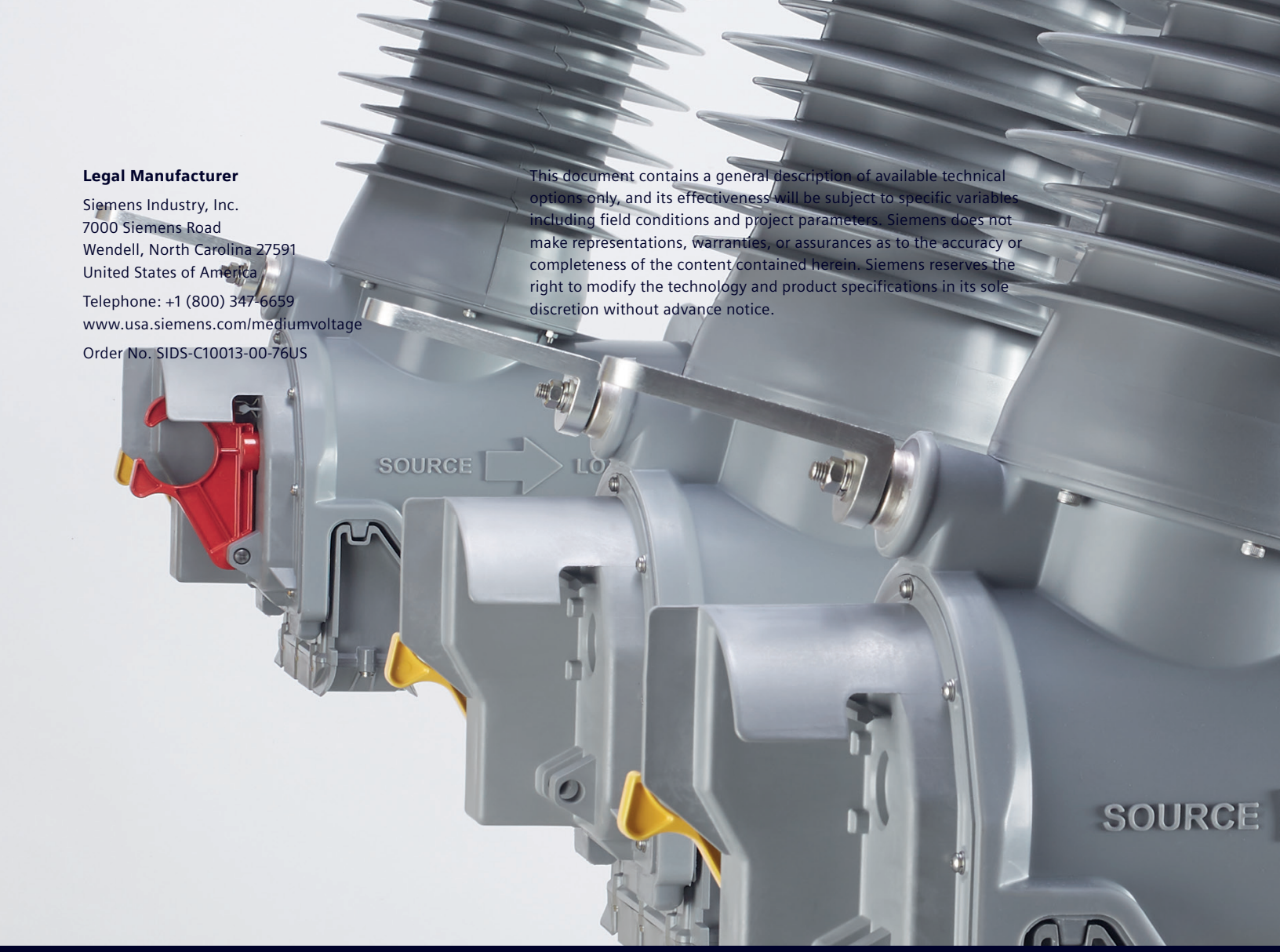


Battery module attachment tool

PC communications kit



Current injection set



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Siemens Industry, Inc.
7000 Siemens Road
Wendell, North Carolina 27591
United States of America

Telephone: +1 (800) 347-6659
www.usa.siemens.com/mediumvoltage

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