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Siemens Vacuum Recloser 3AD

Medium-Voltage Equipment

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Medium-Voltage Equipment Catalog HG 11.42 · 2018

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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).



Description Contents



Vacuum recloser with control cubicle and controller 7SR224



Vacuum recloser with control cubicle and controller 7SC80

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Siemens vacuum recloser 3AD

3AD vacuum reclosers combine the latest technology in vacuum switching and electronic control. They are based on decades of experience in circuit-breaker design, protection relay development and network planning. Siemens reclosers meet all the requirements for outdoor use in accordance with the recloser standards IEEE C37.60 and IEC 62271-111.

Three-phase switch unit design 38



Control cubicle with controller 7SR224



The switch unit is the primary part of the recloser. It is located on top of the pole to switch the overhead line. Alternatively, it can be mounted on a frame inside a substation. It is designed to permanently withstand weather, dust and animals.

The recloser consists of two main components: The switch unit, where Siemens offers its customers two designs – 27 kV or 38 kV – and the controller as protection and control unit. The latter is located inside the control cubicle (CC), which also contains the electronics and auxiliary circuits.

Single-phase switch unit design 27



Control cubicle with controller 7SC80

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As the brain of the recloser, the controller is located inside the control cubicle which is mounted at the bottom of the pole or inside a substation.

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Recloser principle

Reclosers are used in overhead lines and in substations. Like circuit-breakers they are capable of switching normal and fault currents. They are equipped with sensors and a controller being the protection and control device. In case of a temporary line fault, they can trip and reclose up to four times, thus avoiding longer network interruptions.

As outdoor devices they are pole or structure-mounted and exposed to environment and weather. Extensive testing beyond the recloser standard has proven the suitability for application in various climates to ensure long service life.

Recloser switching cycle

In case of a network fault, the recloser opens and recloses several times. In case of temporary faults, the automatic reclosing significantly reduces the outage times.

While the trip settings for each operation can be set individually, the optimal recloser cycle is:

- The first two interruptions of a fault are set to instantaneous protection, so that downstream fuses in the system do not operate. After a few cycles it recloses back on.
- The subsequent interruptions have a delayed protection setting. Thus, downstream fuses on network spurs have the chance to operate and isolate the affected network section, restoring normal operation in the main feeder.

The controller for the 3AD recloser is based on the Siemens protection relay family. It allows full flexibility for the user to set up to five trips and up to nine recloses, each of them with individual protection settings for phase, earth and highimpedance faults.

Design of the switch unit

Vacuum interrupter

Siemens vacuum reclosers rely on a well-established technology Siemens has developed and introduced into series production some 40 years ago: the Siemens vacuum interrupter.

It offers high performance and reliability and is being continuously improved.

Pole assemblies

Each vacuum interrupter is embedded in a solid-insulated pole made of weather-proof cycloaliphatic epoxy-resin. This enables a small design as well as resistance against environmental effects. The vacuum interrupter is vertically mounted inside the pole, providing a long service life. Each recloser is equipped with an integrated current transformer. For directional protection or metering purposes, a resistive voltage sensor can also be incorporated in the pole. The accuracy achieved in this way is much higher than that of capacitive dividers.



Switch unit design 27 – front view



Switch unit design 27 - rear view



38 kV pole design

Mechanical lockout



Lockout handle – pushed in (operational position)



Lockout handle – pulled (open position)

Operating mechanism

Magnetic actuator

The recloser is operated by a magnetic actuator enabling the recloser cycle, i.e. the high number of switching operations within a short period of time. The actuator is a bi-stable system, locked in the end positions by permanent magnets. If not in operation, the magnet coils do not consume any power.

The operating mechanism housing is made of galvanized mild steel with a special coating for outdoor applications. Optionally, a stainless-steel housing is available. Apart from the complete kinematics, it also accommodates the position indicator and a mechanical operations counter.

The recloser is installed on the pole by means of a pole mounting frame. Alternatively, the recloser can be mounted on a frame in substations.

A three-phase recloser has gang-operated poles on a common actuator housing.

A single-phase recloser follows the same constructional principle, but it is designed according to the forces required for the operation of only one pole.

Mechanical lockout

The recloser can be tripped manually. If the handle is pulled, the recloser opens and is simultaneously locked out electrically and mechanically. The handle stays extended, thus indicating the interlocked state.

To close the recloser again, the handle must first be pushed back to the operation position in order to release the lockout. Then the recloser can be closed electrically via the controller.

Data on the nameplate

	_	
Vacuum Recloser		
Serial No.: S 3AD/	Date of prod. 2018	
<i>U</i> _r kV 50/60 Hz	I _r A	
Up kV	I _{sc} kA	
U _d kV	m kg	
according to IEC 62271-1	11 ve IEEE Std. C37.60	1
Order code 3AD3222-1AA	A61–2AA2	
Auxiliary Voltage V.		

Note:

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

- Order code
- Serial No.
- Date of prod.

Controller general description

A controller is the heart of the recloser and responsible for the switching process. Furthermore, all protection functions make sure that a safe and controlled switching process is executed. Siemens offers for recloser application two different variants of controllers, the Siemens Reyrolle 7SR224 and the SIPROTEC 7SC80 which are defined in the following pages. All main differences are described in the table below.

Differences between SIPROTEC 7SC80 & Reyrolle 7SR224

Main differences	7SC80	7SR224
Main applications	Fast Fault Location, Isola- tion and Service Restoration (FLISR), Source Transfer, Load Balancing, ATS	Traditional recloser applications
	For AR standard applications and Smart Grid Ready Fixed BI/BO	For AR standard applications Variable BI/BO
Others	Variable powerful Ethernet based protocols	Serial protocols for IEC and ANSI standard
	Powerful and flexible logic	Base logic
	16 setting groups	8 setting groups

Controller 7SR224

The controller is based on the Siemens Reyrolle 7SR224 directional overcurrent protection relay family. It provides protection, control, monitoring, measuring and metering with integrated input and output logic, data logging & fault reports.

Communication access to relay functionality is via a front USB port for local PC connection or a rear electrical RS485 port for remote connection. Additional rear port options including RS232, Ethernet and optical ports are available.

The controller is mounted in the control cubicle. Along with the controller, this cubicle also contains the auxiliary power supply with batteries for uninterruptible power supply, electronic boards, fuses, and a general-purpose outlet to power a laptop.

The controller contains a large number of protection functions (elements) which can be selected or deselected through the menu driven display or a laptop. These functions can be customized to the utilities' needs by parameters (settings) as described below.

User interface

- 20-character x 4-line backlight LCD
- 5 menu navigation keys
- 3 fixed LEDs
- 12 freely programmable function keys each with tri-color LED
- 8 or 16 programmable LEDs. Each LED is tri-colored (red, green or yellow) allowing for clear indication of the associated function state.

Control cubicle

The cubicle includes the complete electronics, the protection relay and the UPS system of the recloser. Additional components and features can be selected via order number (MLFB).





Tri-color LEDs and pushbuttons of the controller



Protection functions

(in order of ANSI numbering)

21 Fault locator (Distance relay)

The fault locator is a stand-alone and independent function which uses the line and power system parameters set in other functions. In the event of a fault, it is addressed by the protection functions.

25 Synchronizing

Synchronizing is used with three-pole manual closing and auto-reclose operations to ensure that voltages are within safe limits before allowing the close operation to proceed. The ARGUS-M controller provides settings for voltages, phase and frequency difference for check synchronizing as well as system synchronizing and close on zero phase difference for automatic selection following detection of a split system. Automatic synchronizing bypass is also available to allow closure to energize a dead feeder or busbar.

27/59 Under / overvoltage

Four elements which can be set independently as under or overvoltage. Each element has settings for pickup level and Definite Time Lag (DTL) delays, operates if voltage 'exceeds' setting for duration of delay. Typically applied in load shedding schemes.

37 Undercurrent monitoring

Two elements with settings for pickup level and Definite Time Lag (DTL) delays. Each operates if current falls below its setting for duration of its delay.

46BC Broken conductor

Each element has settings for pickup level and DTL delay. With the circuit-breaker closed, if the NPS/PPS current ratio is above setting, this could be due to a broken conductor.

46NPS Negative phase-sequence overcurrent

Two elements, one DTL and one IDMT, with user settings for pickup levels and delays. NPS current elements can be used to detect unbalances on the system. The negative phasesequence component of current is derived from the three phase currents. It is a measure of the quantity of unbalanced current on the system.

47NPS Negative phase-sequence overvoltage

Two DTL elements with independent user settings for NPS overvoltage pickup level and delays. NPS voltage elements can be used to detect unbalances on the system. The negative phase sequence component of voltage is derived from the three phase voltages. It is a measure of the quantity of unbalanced voltage on the system.

49 Thermal overload

The thermal algorithm calculates the thermal state of each pole from the measured currents and can be applied to lines, cables and transformers; operates if the user set thermal overload is exceeded. Capacity alarm operates if a user set percentage of overload is reached.

50BF Circuit-breaker fail

The circuit-breaker fail function may be triggered from an internal trip signal or from a binary input. All measured currents can be monitored following a trip signal and an output is issued if any current is still detected after a specified time interval. This can be used to re-trip the CB or to back-trip an upstream CB. A second back-trip time delay is provided to enable another stage to be utilized if required.

51V Voltage-dependent overcurrent protection

Element has settings for undervoltage pickup level and operates if voltage falls below setting. On pickup this element applies the set 51V Multiplier to the pickup setting of the 67/51 phase fault elements.

59N Neutral overvoltage

Two elements, one DTL and one IDMTL, have user settings for pickup level and delays. These will operate if the neutral voltage exceeds the setting for duration of delay. Neutral overvoltage can be used to detect earth faults in high impedance earthed or isolated systems.

67/50 Phase-fault elements

Provide Directional Instantaneous or Definite Time (DTL) overcurrent protection, with independent settings for pickup current and time delay. Four elements are provided. Elements can be inrush-inhibited.

67/51 Phase-fault elements

Provide Directional Inverse Definite Time overcurrent protection, TCC/DTL with independent settings for pickup current, TCC and minimum/follower time delay. Four elements are provided.

The user can select the TCC from standard IEC/ANSI or legacy characteristics e.g. 101 (A) etc. Reset TCC can be user set to either DTL or shaped, to integrate grading with electrome-chanical or other protection devices.

Earth-fault/Sensitive earth-fault

The earth-fault current is measured directly via a dedicated current analog input. This input is used for both earth-fault and sensitive earth-fault elements.

67/50G Earth-fault

Provide Directional Instantaneous or Definite Time (DTL) earth-fault protection, with independent settings for pickup current and time delay. Four elements are provided. Elements can be inrush-inhibited.

67/51G Earth-fault

Provide Directional Inverse Definite Time earth-fault protection, TCC/DTL with independent settings for pickup current, TCC and minimum/follower time delay. Four elements are provided.

The user can select the TCC from standard IEC/ANSI or legacy characteristics e.g. 101 (A) etc. Reset TCC can be user set to either DTL or shaped, to integrate grading with electrome-chanical or other protection devices.

Protection functions (contin.) (in order of ANSI numbering)

67/50SEF Sensitive earth-fault

Provide Directional Instantaneous or Definite Time (DTL) earth-fault protection, with independent settings for pickup current and time delay. Four elements are provided. Elements can be inrush-inhibited.

67/51SEF Sensitive earth-fault

Provide Directional Instantaneous or Definite Time (DTL) earth-fault protection, with independent settings for pickup current and time delay. Four elements are provided. Elements can be inrush-inhibited.

The user can select the TCC from standard IEC/ANSI or legacy characteristics e.g. 101 (A) etc. Reset TCC can be user set to either DTL or shaped, to integrate grading with electrome-chanical or other protection devices.

67 Directional control

Phase-fault, earth-fault and sensitive earth-fault elements can be directionalized. Each element can be user set to forward, reverse, or non-directional.

Where multiple elements are provided two could be set for forward and two for reverse, thus providing bi-directional tri-state protection is a single device.

Phase-fault elements are extrapolated from the calculated quadrature voltage, i.e. Ia~Vbc, Ib~Vca & Ic~Vab.

Earth-fault/SEF elements are extrapolated from internally calculated zero sequence voltage, i.e. Io~Vo.

51C Cold load pickup

When a circuit-breaker is closed onto a 'cold' load, i.e. one that has not been powered for a prolonged period, this can impose a higher than normal load-current demand on the system which could exceed 'normal settings'. These conditions can exist for an extended period and must not be interpreted as a fault. To allow optimum setting levels to be applied for normal operation, cold load causes the 67/51 elements to change to 67/51C settings, i.e. setting/TCC/time multiplier/follower delay times, for a limited period. Cold load resets and returns to 'normal settings' when either the circuit-breaker has been closed for a user set period, or if the current has fallen to below a set level for a set time and it is safe to return.

51V Voltage dependent overcurrent

Element has settings for undervoltage pickup level and operates if voltage falls below setting. On pickup this element applies the set 51V multiplier to the pickup setting of the 67/51 phase-fault elements.

60CTS CT supervision

The CT supervision considers the presence of negative phase-sequence current, without an equivalent level of negative phase-sequence voltage, for a user set time as a CT failure. Element has user operate and delay settings.

60VTS VT supervision

The VT supervision uses a combination of negative phasesequence voltage and negative phase-sequence current to detect a VT fuse failure. This condition may be alarmed or used to inhibit voltage dependent functions. Element has user operate and delay settings.

64H Restricted earth-fault scheme

The measured earth-fault input may be used in a 64H highimpedance, restricted earth-fault scheme. The required external series stabilizing resistor and shunt non-linear varistor can be supplied.

74TC Trip-circuit supervision

Up to three trip circuits can be monitored using binary inputs connected in H4/H5/H6 or H7 schemes. Trip-circuit failure raises an HMI alarm and output(s).

74BF Circuit-breaker close command monitoring

79 Auto-reclose

The controller provides independent phase-fault, earth-fault and sensitive earth-fault sequences. They can be set for up to 4 shots, i.e. 5 trips + 4 reclose attempts to lockout. These sequences can be user set to any configuration of instantaneous (fast TCC) or delayed TCC protection, with independent reclose (Dead) times.

As the user defines which elements are instantaneous, the combination of TCC1 plus 50 high-set elements & TCC2 plus 50 high-set elements, provides the user with full flexibility. It enables the optimization of the protection characteristics, which will be applied at each point in the protection sequence. Limits can be set by the user on the number of delayed trips to lockout or high-set trips to lockout.

The external protection auto-reclose sequence allows autoreclose to be provided for a separate high-speed protection device with options for blocking external trips to allow overcurrent grading to take place.

Single / triple auto-reclose

Additional optional functionality is available to provide tripping, auto-reclose and control of three single-pole reclosers located together and controlled by a single ARGUS-M controller device. The facility to operate each of the three phases independently for systems where single-phase loads are connected is common in some countries. The ARGUS-M provides flexible schemes which are used to provide single and threepole trip and reclose operations depending on the fault type detected.

Protection functions (contin.) (in order of ANSI numbering)

Loss of voltage LOV automation

Additional optional functionality is available to provide control of Normally Open Points (NOP) and other reclosers in the distribution network to provide an automation sequence of load restoration following a persistent fault. The sequence is started by the loss of voltage detection, for an extended period of time, following a complete but unsuccessful autoreclose sequence, which has caused lockout of a recloser at any point in the network.

81 Under / overfrequency

Each of the 4 elements has settings for pickup level, drop-off level and Definite Time Lag (DTL) delays. This function operates if frequency 'exceeds' setting for duration of delay. Typically applied in load shedding schemes.

81HBL2 Second harmonic block

Where second harmonic current is detected, i.e. during transformer energization, the user selected elements can be blocked.

27 Sag/59 Swell

Power system utilities use SARFI (System Average RMS Variation Frequency Index), indices of voltage sag and swell, which express the magnitude and duration of sag and swell variations occurring on their systems. These indices are based on the 'ride-through' capability of the customer's plant and are usually expressed in terms of the number of a specific class (index) of r.m.s. variation per customer per specified period.

These elements provide the raw data in the form of counters that display the total count of each type of index value. Sags have a greater impact on plant performance than swells. Disturbances are classified according to their magnitude and duration, the limits can be user set for SIARFI (System Instantaneous Average RMS Variation Frequency Index), SMARFI (System Momentary Average RMS Variation Frequency Index) & STARFI (System Temporary Average RMS Variation Frequency Index). Breaks above 60 s duration are interruptions. Counters for each are provided per pole.

86 Lockout

All binary output statuses can be memorized. The LED reset key is used to reset the lockout state. The lockout state is also stored in the event of supply voltage failure. Reclosure can only occur after the lockout state is reset.

Optional protection functions

The optional protection functions are depending on specific types of controller and may not be available in combination. For a detailed overview of options please refer to the order overview (MLFB).

- Single/triple-pole autoreclose
- Fault locator
- Loop automation
- Synchronizing.

Communication interface

- Front USB port
- Rear RS485 port
- Rear RS232 port
- IRIG-B ports
- Rear fiber optic ports
- Rear fibre optic Ethernet ST-type
- RJ45.

Communication protocol options

- IEC 60870-5-103
- MODBUS RTU
- DNP 3.0
- IEC 60870-5-101
- IEC 61850.

Monitoring functions

- Fault data mode displays date and time, type of fault and currents and voltages for each of the last 10 faults
- Favorite (default) meters User selectable from:
 - Currents primary, secondary, xIn, earth/SEF, sequence components and 2nd harmonic
 - Voltages primary, secondary, xVn, Ph-Ph and Ph-n, sequence components, calculated earth voltage, neutral voltage displacement (Vx) voltage
 - Frequency
 - Power MW, MVar, MVA, power factor
 - Energy export and import MWh, MVarh
 - Direction load flow indication
 - Thermal capacity %
 - Auto-reclose status and shot number
- CB maintenance:
 - 4 independent trip counters
 - Frequent operations counter
 - Lockout handle operations counter
 - I²t summation for contact wear
- General alarms
- Battery condition monitoring and automatic cyclical test
- Power quality 27 sag and 59 swell (per pole counters for SIARFIx, SMARFIx, STARFIx and interruption events)
- Binary input status indication
- Binary output status indication
- Virtual internal status indication
- Communications meters
- Miscellaneous meters, date, time, waveform, fault, event and data log record counters
- Demand monitoring.

Data acquisition via communication interface

Sequence of event records

Up to 5000 events are stored and time tagged to 1 ms resolution.

Fault records

The last 10 fault records are displayed on the relay fascia and are also available through the communication interface, with time and date of trip, measured quantities and type of fault.

Waveform recorder

The waveform recorder stores analog data for all poles and the states of protection functions, binary inputs, LEDs and binary outputs with user settable pre and post-trigger data. A record can be triggered from protection functions, binary inputs or via data communications. 10 records of 1 second duration are stored.



Demand monitoring

A rolling record of demand over the last 24 h is stored. The demand is averaged over a user selectable period of time. A rolling record of such demand averages is stored and provides the demand history. A typical application is to record 15 min. averages for the last 7 days.

Real-time clock

The time and date can be set and are maintained while the relay is de-energized by a back-up storage capacitor. The time can be synchronized from a binary input pulse or the data communication channel.

<u>Data log</u>

The average values of voltage, current as well as real and reactive power are recorded at a user selectable interval and stored to provide data in the form of a data log which can be downloaded for further analysis. A typical application is to record 15 min. intervals over the last 7 days.

Software

<u>Reydisp</u> Evolution

For communication with the relay via a PC (personal computer) a user-friendly software package, Reydisp Evolution, is available to allow transfer of relay settings, waveform records, event records, fault data records, instruments/meters and control functions. Reydisp Evolution is compatible with IEC 60870-5-103.

Further information

- Software free of charge
- Download link:

For further information, product news and software download please visit: www.energy.siemens.com

Quicklogic – basic logic applications

The user can map binary inputs (the number of binary inputs and outputs depends on the controller type. For detailed information please see the scope of delivery description) and protection operated outputs to function inhibits, logic inputs, LEDs and / or binary outputs. The user can also enter up to 16 equations defining scheme logic using standard functions e.g. timers and / or gates, inverters and counters. Each protection element output can be used for alarm and indication and / or tripping.

Reydisp Manager Logic Editor

For extended applications like selfhealing or bay communication using IEC 61850 the powerful logic tool Reydisp Manager is available.

Reydisp Manager allows multiple Siemens Reyrolle devices to be configured in a single project.

It provides the following features:

- A task based approach for configuring devices
- Easy synchronization of device configuration
- User configurable logic diagrams
- IEC 61850 specific configuration options
- System configurator (optional) to configure stations
- Time zone configuration
- IEC 61850 interface configuration
- Easy to use single file SCD/CID import.



Controller 7SC80



Web HMI, controller 7SC80



Control cubicle with controller 7SC80

Controller 7SC80

The universal feeder protection controller SIPROTEC 7SC80 is a device that can perform control and monitoring functions and therefore provides the user with a cost effective platform for power system management and ensures reliable supply of electrical power to the customers. It can be used for protection and automation of medium-voltage distribution networks with earthed, low-resistance earthed, isolated or compensated neutral point.

The 7SC80 provides circuit-breaker control, protection and automation functions. The integrated programmable logic (CFC) allows the user to add own functions, e.g. for the automation of medium-voltage grids (including: interlocking, transfer and load shedding schemes).

Local communication with a PC is possible via the USB-DIGSI interface at the front and also via network communication protocols. The DIGSI 4 operating software enables to perform all operational and evaluation tasks, for example entering and modifying configuration and setting parameters or configuring user-specific logic functions. This is possible via a USB connection directly at the controller or via remote parameterization from the control center. In addition, the 7SC80 is equipped with a powerful 100Mbit Ethernet module.

The 7SC80 is mounted inside the control cubicle. Along with the controller, this cubicle also contains the auxiliary power supply with batteries for uninterruptible power supply, electronic boards and a power outlet to power a laptop (optional).

User interface

- 6 rows with 20 characters each backlight LC display
- 14 function keys plus arrow keys, 9 of them freely programmable
- 32 configurable LEDs plus operating LEDs
- Automatic LED and pushbutton labeling (for web-HMI).

Web-HMI

The 7SC80 controller offers a Web-based HMI for local and remote access to the recloser in order to monitor measures and indications as well as perform switching actions. This software consists of HTML pages and a Java web start application and can be easily run by a browser application from a PC without further installation.

Control cubicle

For the 7SC80 one well-defined universal cubicle design is selectable. It includes the complete electronics, the protection relay and the UPS system of the recloser.

Protection functions

(in order of ANSI numbering)

21 Fault locator

The fault locator is a stand-alone and independent function which uses the line and power system parameters set in other functions. In the event of a fault, it is addressed by the protection functions provided in the 7SC80 device.

25 Synchrocheck

When connecting two sections of a power system, the synchrocheck function verifies that the switching does not endanger the stability of the power system.

27/59 Under / overvoltage

Voltage protection has the task to protect electrical equipment against undervoltage and overvoltage. Both operational states are abnormal as overvoltage may cause, for example, insulation problems or undervoltage may cause stability problems.

37 Undercurrent monitoring

Two elements with settings for pickup level and Definite Time Lag (DTL) delays. Each operates if current falls below its setting for duration of its delay.

46 Unbalanced load protection

Detects unbalanced loads on the system. This protection function can be used to detect interruptions, short-circuits and polarity problems in the connections to the current transformers.

47NPS Negative-sequence overvoltage protection

Two DTL elements with independent user settings for NPS overvoltage pickup level and delays. NPS voltage elements can be used to detect unbalances on the system. The negative phase-sequence component of voltage is derived from the three phase voltages. It is a measure of the quantity of unbalanced voltage on the system.

49 Thermal overload protection

The thermal overload protection is designed to prevent thermal overloads from damaging the protected equipment. The protection function represents a thermal replica of the equipment to be protected (overload protection with memory capability). Both the previous history of an overload and the heat loss to the environment are taken into account.

50BF Breaker failure protection

The breaker failure protection function monitors proper tripping of the relevant circuit-breaker. If after a programmable time delay the circuit-breaker has not opened, breaker failure protection issues a trip signal to isolate the failure breaker by tripping other surrounding backup circuit-breaker.

51V Voltage-controlled inverse time overcurrent protection

The inverse-time overcurrent protection is provided with an undervoltage detection that can be disabled.

50, 51, 50N, 51N Overcurrent protection

Overcurrent protection is the main protection function of the 7SC80 relay. Each phase current and the ground current is provided with four elements. All elements are independent from each other and can be combined as desired. Nondirectional overcurrent protection is suitable for networks that are radial and supplied from a single source, or open looped networks, and for backup protection of differential protective schemes of all kinds.

51C Dynamic cold load pickup

With the cold load pickup function, pickup and delay settings of directional and non-directional time overcurrent protection can be changed over dynamically. It can be necessary to dynamically increase the pickup values if system components temporarily consume more power when they are re-energized after a prolonged dead time. A general increase of pickup thresholds can thus be avoided that takes into consideration such starting conditions.

60CTS Current transformer supervision

The CT supervision considers the presence of negative phase-sequence current, without an equivalent level of negative phase-sequence voltage, for a user set time as a CT failure. Element has user operate and delay settings.

60VTS Voltage transformer supervision

The 60VTS component setting selects the method used for the detection of loss of 1 or 2 VT phases, i.e. ZPS or NPS components. The sequence component voltage is derived from the line voltages; suitable VT connections must be available. The relay utilizes fundamental voltage measurement values for this function.

64H Overcurrent protection, 1-phase

The measured earth-fault input may be used in a 64H high impedance, restricted earth-fault scheme. The required external series stabilizing resistor and shunt non-linear varistor can be supplied.

64/59N Displacement voltage

The displacement voltage protection has 3 elements. The elements VO> and VO>> work independently. The VOp element allows you to implement a dependent displacement voltage protection.

64, 67N(s), 50N(s), 51N(s) Ground fault protection

Sensitive ground fault detection may be used in isolated or compensated systems to detect ground faults, to determine phases affected by ground faults and to specify the direction of ground faults. In solidly or low-resistance grounded systems, sensitive ground fault detection is used to detect high impedance ground faults. **Protection functions** (contin.) (in order of ANSI numbering)

67, 67N Directional overcurrent protection

The directional overcurrent protection allows the 7SC80 feeder protection to be used also in power systems where protection coordination depends on knowing both the magnitude of the fault current and the direction of power flow to the fault location. For parallel lines or transformers supplied from a single source, only directional overcurrent protection allows selective fault detection. For line sections supplied from two sources or in ring-operated lines, the overcurrent protection has to be supplemented by the element-specific directional criterion.

74TC Trip circuit supervision

One or two binary inputs can be used for monitoring the circuit-breaker trip coil including its incoming cables. An alarm signal is generated whenever the circuit is interrupted.

79 Automatic reclosing system

From experience, about 85% of insulation faults associated with overhead lines are arc short circuits which are temporary in nature and disappear when protection takes effect. This means that the line can be connected again. The reconnection is accomplished after a dead time via the automatic reclosure function. If the fault still exists after automatic reclosure (arc has not disappeared, there is a metallic fault), then the protective elements will re-trip the circuit-breaker. In some systems, several reclosing attempts are performed.

81HBL2 Inrush current detection

Where second harmonic current is detected, i.e. during transformer energization, the user selected elements can be blocked.

810/U Frequency protection

The frequency protection function detects overfrequencies and underfrequencies in the power system. If the frequency lies outside the permissible range, appropriate switching actions are initiated.

86 Lockout

All binary output statuses can be memorized. The LED reset key is used to reset the lockout state. The lockout state is also stored in the event of supply voltage failure. Reclosure can only occur after the lockout state is reset.

87N High-impedance ground fault differential protection

With 7SC80, the sensitive measuring input Ins is used for high-impedance protection. As this is a current input, the protection detects current through the resistor instead of the voltage across the resistor R.

Monitoring functions

The device features comprehensive monitoring functions which cover both device hardware and software. The measured values, too, are continuously checked for plausibility so that the current and voltage transformer circuits are largely included into the monitoring system.

Flexible protection functions

The flexible protection functions are applicable for a variety of protection principles. The user can create up to 20 flexible protection functions and configure them according to their function. Each function can be used either as an autonomous protection function, as an additional protective element of an existing protection function or as a universal logic, e.g. for monitoring tasks.

Single-phase overcurrent protection

The single-phase overcurrent protection evaluates the current that is measured by the sensitive INS transformer.

32/55/81R Flexible protection functions

(parameters from current and voltage):

Voltage, power, power factor, frequency change protection.

Self-healing solution

As a self-healing solution, it ensures effective fault detection and fast reaction to specific events within the distribution network. It can be implemented directly at the feeder level using the decentralized logic approach inside the recloser control package with the SIPROTEC 7SC80. Furthermore, the system is designed to work with independent, automated devices. The self-healing logic residing in individual SIPROTEC 7SC80 feeder automation controllers is located at the feeder level.

System interface

- Front USB port
- 100 Mbit Ethernet, electrical, 2 x RJ45 connector
- 100 Mbit Ethernet, with integrated switch, optical, 2 x LC connector multimode 4 km
- 100 Mbit Ethernet, with integrated switch, optical, 2 x LC connector singlemode 24 km.

Communication protocol options

- Without
- IEC 61850
- DNP3 TCP
- DNP3 serial RS485
- Profinet
- IEC 60870-5-104

Monitoring functions

- Operational measured values V, A, f
- Energy metering values Wp, Wq
- Minimum and maximum values
- Circuit-breaker wear monitoring
- Fuse failure monitor
- 8 oscillographic fault records
- Trip circuit supervision (74TC).

Data acquisition and monitoring

Sequence of event records

Operational messages contain information that the device generates during operation and about operational conditions. Up to 1000 operational messages are stored in chronological order in the device, the time stamp resolution is 1 ms. When the maximum capacity of the memory is exhausted, the oldest message is lost. With two indications the user can publish the loading state (in %) of the memory via the communication protocol.

Messages (Buffer: Trip log)

Important information about the progression of a fault can be retrieved, such as the pickup of a protective element or the initiation of a trip signal. The start of the fault is time stamped with the absolute time of the internal system clock. The progress of the disturbance is output with a relative time referred to the instant of fault detection, so that the duration of the fault until tripping and up to reset of the trip command can be ascertained. The resolution of the time information is 1 ms.

Retrievable messages

The indications of the last 8 system incidents can be retrieved and read out. The definition of a system incident is the time period from fault detection until final clearing. If automatic reclosing is performed, the system incident ends after the last reclaim time has expired; that is after successful or unsuccessful reclosing. Therefore, the entire clearing process, including all reclosing cycles, occupies only one fault log. Within a system incident, several faults can occur (from the first pickup of a protection function to the last dropout of a protection function). Without automatic reclosing, each fault is a system incident.

Oscillographic fault records

The SIPROTEC 7SC80 features a fault memory. The instantaneous values of the measurands iA, iB, iC, iN and vA, vB, vC, vAB, vBC, vCA, vN, vX (voltages depending on connection) are sampled at intervals of 1.0 ms (at 50 Hz) and stored in a revolving buffer (20 samples per cycle). In case of a fault, the data is stored for a set period of time, but not for more than 6 seconds. Up to 8 fault events can be recorded in this buffer. The fault record memory is automatically updated with every new fault so that there is no acknowledgment for previously recorded faults required. In addition to protection pickup, the recording of the fault event data can also be started via a binary input or via the serial interface.

Demand monitoring

A high variety of different measurement and calculated values are available, which can be monitored as min/max values and/or average values for different time periods.

Real-time clock

The time and date can be set and is maintained while the relay is de-energized by a back-up battery. The time can be synchronized from a binary input pulse, via GPS / IRIG-B, the data communication channel or SNTP server.

Construction Construction<

DIGSI 4 screenshot



SIGRA screenshot

Software

DIGSI 4

Local communication with a PC is possible via the USB-DIGSI interface at the front. The DIGSI 4 operating software enables to perform all operational and evaluation tasks, for example entering and modifying configuration and setting parameters, configuring user-specific logic functions, reading out operational indications, fault indications and measured values, reading out and displaying fault records, retrieving device conditions and measured values, issuing control commands.

Siemens SIGRA (optional)

In addition to the DIGSI 4 operating software, Siemens offers the SIGRA software package for enhanced data analysis. It is possible with SIGRA 4 to display records from digital protection units and fault recorders in various views and measure them, as required, depending on the relevant task. SIGRA 4 offers the possibility to display signals from various fault records in one diagram and fully automatically synchronize these signals to a common time base. The SIGRA software is web-based available.

Special functions and applications

Application on long rural lines and their specific characteristics

Long rural feeders have a high line impedance due to their length, which results in low-fault levels in case of network failure. This makes it diffcult to distinguish faults from overload situations with a similar current level. The 51V Voltage dependent overcurrent function ensures tripping in fault situations only.

On the other side hand, overload situations are common for long rural feeders. They vary in current and length so that it is difficult to set a trip level: If the level is chosen too low it will often trip. If the level is high it might damage overhead lines or other equipment when the situation lasts too long. The real issue during overload is the thermal stress on lines and transformers. This can be optimized by using 49 Thermal overload in reclosers which calculates the integral heating of line. This allows the maximum utilization without unnecessary tripping.

Load shedding in case the demand deviates from the supply and outages shall be prevented

Siemens reclosers allow smart load shedding schemes. Whenever the network becomes weak, i.e. the demand is higher than the available supply, the voltage and frequency in the network will start to drop. A fast reaction within seconds is required to switch off certain parts of the line in order to reduce the load, keeping the main part network running and stable in total. The decision about dropping parts of the feeder will be made on 81 Under/overfrequency. They have certain settings for which frequency or voltage the network section shall be dropped.

Zero voltage closing for capacitor banks (single-triple recloser)

Capacitor banks are used in substations to compensate for voltage fluctuations. They have to be switched frequently and during voltage zero in order to eliminate stress on the equipment. A special zero voltage closing (ZVC) control in combination with single-triple recloser provides this function.

Broken conductor detection with focus on safety

Broken lines do always inherit the risk of someone getting hurt by touching a wire sitting isolated on the ground. A broken wire can be detected by comparing negative and positive phase sequences in the feeder. Whenever there is a NPS above a certain level it indicates broken wire, regardless of the location upstream or downstream.

<u>Ring-core CT supplement for accurate SEF protection</u> in compensated networks

In compensated networks the current level in case of earth faults is very low. Ring-core CTs are used in switchgear on cable feeders to determine the earth-fault current accurately. 3AD reclosers can be equipped with a ring-core CT even when connected to overhead lines. A fourth current input stage at the controller is used to accurately measure sensitive earth-fault currents down to 0.1 A primary current. This is independent of the phase currents and provides a very accurate protection.

Triple single

The 3-/1-pole operation function allows opening and closing each single phase individually in systems in which the three phases are used independently of one another. Thus, interruptions on the other, unfaulted phases are reduced. This function allows asynchronous reclosing cycles in the three phases with one single controller at the point of infeed. The protection functions time-overcurrent protection and directional time-overcurrent protection supply information about the faulty phases.

Standards

The recloser conforms to the following standards:

- IEC 62271-111 and IEEE C37.60
- IEC 60255
- IEC 62271-1.

Ambient conditions

The recloser is designed for the normal operating conditions defined in IEC 62271-111/IEEE C37.60. This comprises an ambient temperature from -30 °C to +55 °C plus solar radiation.

The Siemens vacuum recloser is designed for environments with very heavy pollution level (level 4) according to the IEC 60071-2.

The 3AD design successfully passed the environmental test in KIPTS*.

Altitude correction factor

The dielectric strength of air insulation decreases with increasing altitude due to low air density. The rated lightning impulse withstand voltage values specified in the chapter "Technical Data" apply to a site altitude of 1000 m above sea level. For an altitude above 1000 m, the insulation level must be corrected according to the drawing as per IEC 62271-1.

The characteristic shown applies to the rated short-duration power-frequency withstand voltage and the rated lightning impulse withstand voltage.

To select the devices, the following applies:

- $U \ge U_0 \ge K_a$
- U Rated withstand voltage under standard reference atmosphere
- $U_0 \, \, {\rm Rated}$ with stand voltage requested for the place of installation
- $\rm K_{a}$ ~~ Altitude correction factor according to the opposite diagram

<u>Example</u>

For a requested rated lightning impulse withstand voltage of 75 kV at an altitude of 2500 m, an insulation level of 90 kV under standard reference atmosphere is required as a minimum:

90 kV \geq 75 kV x 1.2

Number of operating cycles

The switch unit of the 3AD vacuum recloser is maintenancefree for 10,000 C-O operating cycles.

According to the standard IEC 62271-111/IEEE C37.60, the recloser has been type-tested for short-circuit breaking operations.

Ambient conditions



The vacuum recloser 3AD is suitable for use in climate classes according to IEC 721, Part 3.4, as listed below:

Class	Climatic conditions
4K4H	Climatic environmental conditions
4Z5 and 4Z7	Other climatic environmental conditions
4B2	Biological environmental conditions
4C1	Chemically active substances
452	Mechanically active substances
4M2	Mechanically environmental conditions



^{*)} Koeberg Insulator Pollution Test Station (KIPTS)

Product range

3- phase			Rated normal current			
Rated voltage	Rated short-circuit breaking current	Rated lightning impulse withstand voltage				
kV	kA	kV	200 A	400 A	630 A	800 A
12	12.5	75	•		•	•
	16	75			•	 • • • • • • • • • • • • • • • • • • •
15.5	12.5	110				•
	16	110			•	•
24	12.5	125			-	•
	16	125		•	•	 • • • • • •
27	12.5	125				•
	12.5	150		•	•	•
	16	125				
	16	150				
38	12.5	170				
	16	170				
	16	200				
1-phase						
12	12.5	75			•	•
	16	75		• • • • • • •		 •
15.5	12.5	110		•		•
	16	110				
24	12.5	125				
	16	125		•	•	•
27	12.5	125				
	16	125		•		•
	16	150			-	
38	12.5	170		•	•	•
	16	170			-	
	16	200			-	

= Design 27
= Design 38
= Single phase 27
= Single phase 38

Scope of delivery

	Standard equipment	Optionally available	Remarks
Switch unit			
Operating mechanism	Electrical operating mechanism (magnetic actuator)		
Operating mechanism housing	Mild steel with outdoor protection coating, IP 66	Stainless steel, IP 66	
Switching medium	Vacuum interrupters		
Insulation	Solid insulation – Cyclo aliphatic epoxy resin		
Auxiliary power supply voltage	Auxiliary power input 110 V $-$ 240 V AC or DC. Only in combination with a control cubicle		Auxiliary transformer for supply from HV line optionally available according to order
Position indicator	OPEN: green/CLOSED: red	Color vice versa, OPEN: red/CLOSED: green	
Operations counter	Mechanical operations counter in the switch unit		Electronical operations and trip counters in the controller inside the control cubicle
Interlocking	Electrical; mechanical lockout		
Sensors	Integrated current transformers	Additional integrated and/or external voltage sensors	
Connection	Threaded stud 3/4"-10UNC-2B to connect the terminal connectors	Option 1: 2 hole Nema Pad Option 2: Stud to cable connector	
Control cubicle overall equipment			
Socket outlet	None	American, Brazilian, German, British or Australian / New Zealand standard	Voltage as per auxiliary power input
Enclosure	Mild steel with outdoor protection coating IP 66	Stainless steel	
LV terminal blocks and wiring	Wired for operation	CT-test disconnector terminal blocks	
Temperature range	-30 °C to +55 °C	-40 °C to +50 °C	
Power output	48 V power output	12 V/24 V power output	

1

Scope of delivery (cont.)

	Standard equipment		Optionally available	Remarks
Control cubicle with 7SR224				
Programmable LEDs	8 user-definable LEDs		16 LEDs	
Controller size	E10 (= 10" wide)		E12 (= 12" wide)	
Number of inputs/ outputs for customer use	4 x BI, 7 x B0		Additional BI/BO	BI: E10 case: 4, 14, 24 E12 case: 24, 34 BO:E10 case: 7, 15 E12 case: 7, 15, 23
Operator panel	5 navigation	keys, 12 function keys, 2 pushbuttons	Customer-specific pushbuttons or rotary CLOSE/OPEN switches, key switch for local and remote	
Controller interfaces	USB (front),	RS485 (rear)	RS232, fiber optic, IRIG-B (rear), additional RS485 (rear), RS232 type:DB9, fiber optic ST-type, electrical Ethernet RJ45 (rear), fiber optic Ethernet ST-type	
Protection and monitoring functions	ANSI 21 25 27/59 27/59 37 46BC 46NPS 47NPS 49 50BF 51V 59N 60CTS 60VTS 64H 67/50 67/51 67/516 67/50FE 67/51FE 67/50HI2 74TC 74BF 79 81U/O 81HBL2 86	FunctionsFault LocatorSynchronizingUnder/overvoltageSag/SwellUndercurrentBroken conductor / phase unbalanceNegative phase-sequence overcurrentNegative phase-sequence overvoltageThermal overloadCircuit-breaker failVoltage dependent overcurrentNeutral voltage displacementCT supervisionVT supervisionDirectional instantaneous phase fault overcurrentDirectional instantaneous earth faultDirectional time delayed phase fault overcurrentDirectional instantaneous sensitive earth faultDirectional instantaneous sensitive earth faultDirectional instantaneous sensitive earth-fault protectionDirectional time delayed sensitive earth-fault protectionDirectional instantaneous sensitive earth-fault protectionDirectional time delayed sensitive earth-fault protectionDirectional time-delayed sensitive earth-fault protectionDirectional time-	Loop automation, Single/triple pole Fault Locator (on request), 25 Synchronising	
Communication protocols	IEC 60870-5	-103, MODBUS RTU, DNP 3-serial	IEC 60870-5-101 IEC 61850	Others on request, typically by using additional protocol converters like Siemens SICAM A8000

Scope of delivery (cont.)

	Standard ec	quipment	Optionally available	Remarks
Control cubicle with 7SC80				
Programmable LEDs	32 user-def	inable LEDs		
Controller size	E13.5 = (13	3.5" wide)		
Number of inputs/out- puts for customer use	12 x BI, 8 x	BO	20 x BI, 15 x BO (with extension board for 6 VSs)	
Operator panel	14 function	n keys, 9 of them programmable, 2 arrow keys		
Controller interfaces	USB (front)		100 Mbit Ethernet, 2 x RJ45; 100 Mbit Ethernet optical, 2 x LC	
Communication interfaces	1x RS485 (r	rear)	1x additional RS485 (rear)	
Protection and monitoring functions	ANSI 50/51 50-1, 50-2, 50-3, 51, 50N,51N 50N-1, 50N-2, 50N-3, 51N, 50N(s)/ 51N(s)	Functions Time overcurrent protection phase Ground fault protection Sensitive ground fault protection	Basic version + direction determination overcurrent, phase and ground + voltage protection, SNTP server functionality (no protection), RTU functionality, Faul Locator, Automatic reclosing; 81U/O Under/Overfrequency	
	50BF	Breaker failure protection		
	46	Unbalanced load protection		
	87N	High-impedance ground fault differential protection		
	74TC	Trip circuit supervision		
	37	Undercurrent monitoring		
	60CTS	Current transformer supervision		
	60VTS	Voltage transformer supervision		
	86	OFF interlocked/lockout		
	49	Thermal overload protection		
	51C	Dynamic cold load pickup function		
	81HBL2	Inrush current detection		
	64H	Overcurrent protection		
	79	Auto-reclose 1-phase		
		Monitoring functions		
		Circuit-breaker control		
		Inrush current detection		
		Fault recording		
		Average calculation.min/max values		
		Jump detection		
		Flexible protection functions		
Communication protocols for 75C80 controller	IEC 61850 -	+ DNP3 TCP	IEC 61850 + IEC 60870-5-104 + DNP-serial	

Product Selection Contents

2



Control cubicle with controller 7SC80



Switch unit design 27

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Siemens Vacuum Recloser 3AD · Siemens HG 11.42 · 2018 25

Order number structure

The vacuum reclosers consist of a primary part as well as of a controller or secondary part. The relevant data make up the 16-digit order number. The primary part covers the main electrical data of the circuit-breaker poles. The controller and secondary part covers all auxiliary devices and the controller, which are necessary for operating and controlling the recloser.

Order codes

Individual equipment versions, marked with 9 or Z in the 8th to 16th position, are explained more in detail by a 3-digit order code. Several order codes can be added to the order number in succession and in any sequence.

Special versions

In case of special versions, "-Z" is added to the order number and a descriptive order code follows. If several special versions are required, the suffix "-Z" is listed only once. If a requested special version is not in the catalog and can therefore not be ordered via order code, it has to be identified with Y 9 9 after consultation. The agreement hereto is made between your responsible sales partner and the order processing department in our Switchgear Factory in Berlin.



Configuration example

In order to simplify the selection of the correct order number for the requested recloser type, you will find a configuration example on each page of the chapter "Product Selection". For the selection of the auxiliary voltages, the fixing options, the controller, etc. always the last example of the primary part was taken over and continued, so that at the end of the equipment selection (page 34) a completely configured recloser results as an example.

On the foldout page we offer a configuring aid. Here you can fill in the order number you have determined for your recloser.

Example for Order No.: 3 A Order codes:



Selection of primary ratings

					4		the state		人手に開いる	alle									- Internet			N				
12 kV					0	Position:	1	2	3	4	5	6	7	- 8	89	9 10	0 11	12	-	13	14	15	16		Order	codes
주 고 Rated voltage	$\gtrsim \frac{1}{2}$ Rated lightning impulse withstand voltage	₹ ared short-duration ₹ a power-frequency withstand voltage	∀y Rated short-circuit ⁵⁵ breaking current	 A rated normal current 	Three-phase	Single-phase	-	A							See page 30	See hade 31	See Dade 31	See page 31		See page 32	See page 32	See page 33	See page 33	 See page 34		
12	75	28	12.5	200			3	A	D	3	1	2	6													
				400 630			3	A	D	3	1	2	1													
				800			3	Α	D	3	1	2	3													
			16	630			3	A	D	3	1	3	2													
12			12.5	200	-		3	A	D	5 1	י 1	2	6													
				400			3	А	D	1	1	2	1													
				630			3	A	D	1	1	2	2													
			16	200			3	A	D	1	י 1	2	6													
				400			3	Α	D	1	1	3	1													
				630			3	A	D	1	1	3	2													
15 5 k	·\/			800			3	A	D	1	1	3	3													
	V U	U.	I	I																						
kV	kV	kV	-sc kA	A A																						
15.5	110	50	12.5	200	•		3	А	D	3	2	2	6													
				400			3	Α	D	3	2	2	1													
				630 800			3	A	D	3	2	2	2													
			16	630			3	A	D	3	2	3	2													
				800	•		3	Α	D	3	2	3	3													
15.5			12.5	200		-	3	A	D	1	2	2	6													
				630			3	A	D	1	2	2	2													
				800			3	Α	D	1	2	2	3													
			16	400			3	A	D	1	2	3	1													
				800			3	A	D	1	2	3	3													
Configura Siemens va Rated volta Rated light Rated shor Rated shor Rated norr Type: Thre	tion examp acuum reclo age U _r = 15 . tning impul rt-duration p rt-circuit bre nal current e-phase	ble oser 3AD 5 kV se withstan oower-frequ eaking curre I _r = 630 A	d voltage l uency with ent $I_{\rm sc} = 16$	U _p = 110 k stand volta kA Exa	V age U _d = 50 ample for C	kV 9rder No.:	3	A	D	3	2	3	2	- 1												

Selection of primary ratings



	24 kV						Position:	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16			Orde	er coo	des
						(Order No.:	3	А	D					-						-					-	\star			
	전 고 Rated voltage	 	Rated short-duration ₹ □ Dower-frequency withstand voltage	 ⁵⁵ Rated short-circuit ⁵⁶ breaking current 	 Y Rated normal current 	Three-phase	Single-phase									See page 30	See page 30	See page 31	See page 31	See page 31		See page 32	See page 32	See page 33	See page 33		See page 34			
1	24	125	50	12.5	200			3	А	D	3	6	2	6																
					400			3	Α	D	3	6	2	1																
					630	-		3	Α	D	3	6	2	2																
					800			3	Α	D	3	6	2	3																
				16	630	•		3	А	D	3	6	3	2																
					800	•		3	Α	D	3	6	3	3																
	24			12.5	200			3	Α	D	1	6	2	6																
					400			3	Α	D	1	6	2	1																
					630			3	Α	D	1	6	2	2																
					800		•	3	Α	D	1	6	2	3																
				16	400			3	Α	D	1	6	3	1																
					630		•	3	Α	D	1	6	3	2																
					800			3	Α	D	1	6	3	3																



Selection of primary ratings



Selection of primary ratings, selection of controller



38 kV						Position:	1	2	3	4	5	6	7	-	8	9	10	11	12	-	13	14	15	16			Orde	er coo	les
					C	Order No.:	3	Α	D					-						-					-	\star			
전 고 Rated voltage	Rated lightning 주 ^a C impulse withstand voltage	$\underset{\sim}{Rated short-duration} \\ \underset{\sim}{withstand voltage} \\$	メ パ Rated short-circuit ど が breaking current	> ¹ Rated normal current	Three-phase	Single-phase									See page 30	See page 30	See page 31	See page 31	See page 31		See page 32	See page 32	See page 33	See page 33		See page 34			
38	170	70	12.5	400			3	А	D	3	5	2	1																
				630			3	Α	D	3	5	2	2																
				800			3	А	D	3	5	2	3																
			16	400			3	А	D	3	5	3	1																
				630			3	А	D	3	5	3	2																
				800	•		3	Α	D	3	5	3	3																
	200*	95*	16	400			3	А	D	3	7	3	1																
				630	•		3	Α	D	3	7	3	2																
				800	•		3	А	D	3	7	3	3																
	170	70	12.5	400		•	3	Α	D	1	5	2	1																
				630			3	Α	D	1	5	2	2																
				800		•	3	Α	D	1	5	2	3																
			16	400		•	3	Α	D	1	5	3	1																
				630			3	Α	D	1	5	3	2																
				800			3	Α	D	1	5	3	3																
	200 *	95*	16	400			3	Α	D	1	7	3	1																
				630			3	Α	D	1	7	3	2																
				800			3	A	D	1	7	3	3																

* Values for $U_p = 200$ kV and $U_d = 95$ kV on request

Selection of controller

8 th position		Position:	1	2	3	4 5	56	7	_	8	9	10	1	12	- 1	3 ′	14	15	16		(Orde	r cor	des
Recloser configuration	n	Order No.:	3	Α	D				-						- 1					- \star	r			
Options												See page 31	See page 31	See page 31		see page 32	See page 32	See page 33	See page 33	See nade 34	ace hade at			
Recloser for pole mount	ng ¹⁾ incl. control cubicle	and controller							_	1	_													
Recloser for substation a	pplication incl. control cu	ibicle and controller 1)								2														
Switch unit only for use control cable)	with 7SR224 (w/o cubicle	e, controller and								3		Y		0	()	Y	Y						
Switch unit only for use v	/ith 7SC80 (w/o cubicle, co	ontroller and control cable)								3		Υ		0	()	Y	Υ				Т	4	7
Control cubicle only (no	cables included)									4				0										
1) Mounting according to	list of accessories																							
9 th position Current and voltage	measuring																							
Current transformers 1 integrated CT per pole	Voltage sensors 1 integrated sensor per pole (including sensor cable)	Voltage sensors 2 integrated sensors per pole (including sensor cable)																						
											А													
•											В													
•		•									C**	F G N Y												
** Version with 2 integra	ted voltage sensors per p	ole on request										-												_
Configuration example																								
Siemens vacuum recloser	3AD		3	Α	D																			
$(U_{\rm r} = 27 \text{ kV}, U_{\rm p} = 125 \text{ kV},$	$U_{\rm d} = 60 \text{ kV}, I_{\rm sc} = 12.5 \text{ kA}$, I _r = 400 A)																						
Type: Three-phase						3 3	3 2	1	-															
Recloser for pole mountin	ng incl. control cubicle an	d controller								1														
Current and voltage meas	uring: Current transforme	rs, 1 integrated CT per pol	le								Α													
-	-	Example for Order No.:	3	Α	D	3 3	3 2	1	-	1	A				- 1					ĺ.				
		Order codes:																			Ì			

Selection of controller

				-		
10th position Controller size		Position: 1	2 3 4 5 6 7	- 8 9 10 11 12	- 13 14 15 16	Order codes
Controller size Function keys Function keys Func	1 2 0 Number of binary 0 inputs (partly for 0 customer use) 0 2	A line use of the line use of			See page 32 See page 32 See page 33 See page 33	See page 34
• • •				A		
				C		
	•			D		
				H		
For loop automation	_	-		E***	D	
				G ^{***}	D	
75C80				M		
				N***		
* 10" (inches) ** 12" (inches) Without controller	*** Usable for a	applications with 6 v	voltage sensors	3 Y 0	0 7 7	
				5 1 0		
11 th position Auxiliary voltage for heaters an	d control					
DC voltage (DC option, without internal batteries)	AC voltage					
110 V 220 V				3		
220 V	110 V/120 V			5		
	220 V/240 V			6		
12 th position Control and sensor cables						
Options						
Without				0		
Cable length 6 m				1		
Cable length 9 m				2		
Cable length 3 m				4		
Cable length 15 m				5		
Cable length 20 m				6		
Cable length 25 m	N 43			7		
1) On request	ed) ⁽⁾			9		M 1 Y
Configuration example Siemens vacuum recloser 3AD		3	A D			
$(U_r = 27 \text{ kV}, U_p = 125 \text{ kV}, U_d = 60 \text{ kV}, I$ Type: Three-phase Controller size: E12, 12 function keys, Auxiliary voltage for heaters and control	r _{sc} = 12.5 kA , <i>I</i> _r = 400 A 16 tri-color LEDs, 33 b bl 110 V/120 V AC	() inary inputs, 30 bin	3 3 2 1 ary outputs	- 1 A D 5		

Selection of controller

2

	本社会	ľ				V				-															
13 th po	osition							F	osition:	1	23	45	6	7 -	- 8	9 10) 11	12 -	13	14	15 16		0	rder coo	les
Comm	unicat	ion pr	otocol	s				Ord	er No.:	3	A D	•		-	•	• •		• -	•	•	• •	- *			-
Oŗ	otions																				See page 33 See page 33	See nade 34			
7SR22	4 contr	oller				d (1 out	$(12)^{2}$												2	Δ					
IEC 608	870-5-1	03, MC	DBUS R	TU, DNF	9 3-seria	ll (2 out	of 3) ³⁾												2	BC					
IEC 608	870-5-1	03, IEC	60870-	5-101,	MODBU	S RTU (2 out of	3) ³⁾											3	D					
IEC 608 (Includ	870-5-1 led pow	04 (wit er supp	h additi bly 24 V,	onal pro 5 W ava	otocol c ailable f	onverte or othe	r SICAM r purpos	A8000 es))										4	A					
IEC 608 and IEC (includ	870-5-1 C 60870 led pow	04 (wit)-5-101 er supp	h additi or IEC 6 ly 24 V,	onal pro 50870-5 5 W ava	otocol c -103 ailable f	onverte [:] or othe	r SICAM r purpos	A8000 es))										4	C D					
IEC 608 (1 out	870-5-1 of 4) ar	01, IEC d IEC 6	60870- 1850 (i	5-103, ncl. Ethe	MODBU ernet in	S RTU, I terface)	ONP 3.0												8	F G					
7SC80	contro	ller				,														-					
DNP 3.	0 Serial															M			5	Ρ					
IEC 61	850 + D	NP3 TC	Р													M	1		6	M					
IEC 618	850 + IE	C 6087	0-5-104	ļ												M	1		7	M					
1) 1 out 2) 1 out 3) 2 out 14 th pc Comm	of 4 can of 3 co of 3 co osition unicat	n be act mmunio mmunio : ion in	ivated a cation pr cation pr terface	t the sar otocols otocols	ne time can be a can be a	activateo activateo	d at the s d at the s	ame tir ame tir	ne ne																
1 × USB (front)	1 x RS485 (rear)	1 additional RS485 (rear)	1 x RS232 type: DB9 (rear)	1 x IRIG-B (for time synch.)	2 x fiber optic ST-type (rear)	2 x electrical Ether- net RJ45 (rear)	2 x fibre optical Ethernet Duplex connector (rear)	100 Mbit Ethernet, 2 x RJ45 connector	100 Mbit Ethernet, optical 2 x LC con- nectors																
7SR224	contro	ller				_				_															
- 21																				A R					
																				C					
	•		•	•						_						٨				D					
•	•					•										G			8	F					
							•									C			8	G					
7SC80 (control	ler														G									
																M	1		5	Р					
																M			6	м					
1.1																M			6	N					
										-						N			7						—
Configu Siemen: (U _r = 27 Type: Th Commu Commu	uration s vacuu 7 kV, U _p hree-ph nication	examp m reclo = 125 ase i protoc n interf	le ser 3AD k V , U _d = ol IEC 60 aces 1 x	60 kV , 0870-5-1 USB, 2	I _{sc} = 12 103, MO x RS485	.5 kA , I DBUS R 5, 1 x IR	, = 400 A TU, DNP IG-B	4) 3-serial	(2 out o	3 f 3)	A D	3 3	2	1 -	• 1	A D	5	1 -	2	С					
						E	xample	for Ord Order	er No.: codes:	3	A D	3 3	2	1 -	• 1	A D	5	1 -	2	C	•				

Selection of controller

		食人間							
15 th position Protection and monitoring functions	Position: Order No :	1 2 3 4	5 6 7	- 8 9	10 11	12 - 13 14	4 15 16	0	rder codes
Controller functions	order No							See page 34	
75R224 Standard protection and monitoring functions							Δ		
Standard protection and monitoring functions for loop auton	nation			B			D		
Standard protection and monitoring functions for synchronou	us connection			B			E		
Standard protection and monitoring functions plus: Single-phase/three-phase automatic reclosing with synchroni 75C80	izing function						F		
Standard protection and monitoring functions with automati	c reclosing				M		м		
Standard protection and monitoring functions + direction determination overcurrent, phase and ground + voltage protection + automatic reclosing				B	M		N		
Standard protection and monitoring functions + direction der overcurrent phase and ground + voltage protection + automatic reclosing (AR) + fault locator	termination			B	M N		Q		
16 th position Languages									I
Languages of operating instructions and nameplate									
English Spanish							2		
Portuguese					2)		4		
German					Μ		6		8 1 Y
 On request Not in combination with 10th position = "M" 									
Configuration example Siemens vacuum recloser 3AD $(U_r = 27 \text{ kV}, U_p = 125 \text{ kV}, U_d = 60 \text{ kV}, I_{sc} = 12.5 \text{ kA}, I_r = 400 \text{ A})$ Type: Three-phase Controller 7SR224 with standard protection and monitoring fur Language of operating instructions and nameplate: English Example for) nctions or Order No.: Order codes:	3 A D 3 3 A D 3	3 2 1 3 2 1	- 1 A	D 5	1 – 2 C 1 – 2 C	A 2 A 2		

2

Selection of additional equipment

Selection of additional equipment	Position:	1234	567-	8 9 10	11 12 - 13	14 15 16		Orde	er co	des
	Order No.:	3 A D 🔳					*			•
Switch unit options							-	-	0	0
Cable connector (2-noie Nema pad)						_	2	Т	0	1
Position indicators with interchanged colors						_	7	т	0	7
Capacitor bank switching						-	7	т	6	3
Switch unit for use with 7SC80						-	Z	Т	4	7
Conservations for control subjets (750224 and 75502)										_
General options for control cubicles ($75R224$ and $75C80$) Ambient air temperature up to -40 °C						_	7	Δ	3	8
Protective cover for cubicle connectors (vandalism protection)					_	7	т	0	8
"Door open" contact and cubicle lighting	1)					-	7	т	1	0
Stainless-steel design						_	z	T	0	1
24 V power output (max. 15 W) for additional devices						-	z	Т	5	3
12 V power output (max. 15 W) for additional devices						-	z	Т	5	4
48 V power output (max. 15 W); if T53/T54 is not chosen, the power output is mounted	en 48 V									
Power outlet German SCHUKO standard						-	z	Т	1	1
Power outlet British standard						-	z	Т	1	2
Power outlet Australian/New Zealand standard						-	Ζ	Т	1	3
Power outlet Brazilian standard						-	z	т	1	4
Customer-specific wiring inside the cubicle						-	Ζ	Т	9	8
Options for control cubicle (7SR224 controller)										
Power outlet standard (US style);										
if T11/T12/T13 is not chosen, then US style power outlet is n	nounted					_			-	
Serial to Ethernet converter						-	2	T	0	3
Bluetooth modem						-	2	T	4	3
Quaddatid GPRS/GSM modern	iqoq)					-	2	T	4	4
Key-operated switch in control cubicle, programmable function	on					_	7	т	5	1
CT test disconnect terminals (6 nos.)	011					-	Z	т	5	6
Configuration example Siemens vacuum recloser 3AD Rated voltage $U_r = 27 \text{ kV}$ Rated lightning impulse withstand voltage $U_p = 125 \text{ kV}$ Rated short-duration power-frequency withstand voltage $U_d = 0$ Rated short-circuit breaking current $I_{sc} = 12.5 \text{ kA}$ Rated normal current $I_r = 400 \text{ A}$ Type: Three-phase	60 kV	3 A D	3 2 1 -	L						
Recloser for pole mounting incl. control cubicle and controller Current and voltage measuring: Current transformers, 1 CT integ Controller size: E12, 12 function keys, 16 tri-color LEDs, 33 binar Auxiliary voltage for heaters and control 110 V/120 V AC Length of control and sensor cable 6 m Communication protocol IEC 60870-5-103, MODBUS RTU, DNP Communication interfaces 1 x USB, 2 x RS485, 1 x IRIG-B Controller with standard protection and monitoring functions Language of operating instructions and nameplate: English "Door open" contact and cubicle lighting Stainless steel for switch unit and control cubicle Example fo	grated per pole ry inputs, 30 bi 3-serial (2 out r Order No.:	e inary outputs t of 3) 3 A D 3	3 2 1 –		5 1 – 2 5 1 – 2	C A	ZZZ	T	1 0	0 1
C	Order codes:	T 1 0 +	T 0 1							

Selection of accessories and spare parts Position:	1	2	3	4	5	6	7	-	8	9	10 1	1 1	2 -	13	14	15	16		_	Order code	5
Order No.:	3							-					• -					- *			
Cables SU/CC																					
Control cable 3 m (black) – for control cubicle with 7SR224 controller	3	А	х	1	3	0	0	-	3	н											
Control cable 6 m (black) – for control cubicle with 7SR224 controller	3	А	х	1	3	0	0	-	3	G											
Control cable 9 m (black) – for control cubicle with 7SR224 controller	3	А	х	1	3	0	0	-	3	F											
Control cable 12 m (black) – for control cubicle with 7SR224 controller	3	А	х	1	3	0	0	-	3	J											
Control cable 15 m (black) – for control cubicle with 7SR224 controller	3	Α	х	1	3	0	0	-	3	к											
Control cable 20 m (black) – for control cubicle with 7SR224 controller	3	А	х	1	3	0	0	-	3	L											
Control cable 25 m (black) – for control cubicle with 7SR224 controller	3	А	х	1	3	0	0	-	3	М											
Control cable 6 m (black) – for control cubicle with 7SC80 controller	3	А	х	1	3	0	0	-	3	т											
Control cable 9 m (black) – for control cubicle with 7SC80 controller	3	А	х	1	3	0	0	-	3	S											
Sensor cable 3 m (black) – for control cubicles with 7SC80 controller or 7SR224 controller	3	A	x	1	3	0	0	-	3	E											
Sensor cable 6 m (black) – for control cubicles with 7SC80 controller or 7SR224 controller	3	A	х	1	3	0	0	-	3	D											
Sensor cable 9 m (black) – for control cubicles with 7SC80 controller or 7SR224 controller	3	A	x	1	3	0	0	-	3	с											
Sensor cable 12 m (black) – for control cubicles with 7SC80 controller or 7SR224 controller	3	A	х	1	3	0	0	-	3	N											
Sensor cable 15 m (black) – for control cubicles with 7SC80 controller or 7SR224 controller	3	A	x	1	3	0	0	-	3	Р											
Sensor cable 20 m (black) – for control cubicles with 7SC80 controller or 7SR224 controller	3	A	х	1	3	0	0	-	3	Q											
Sensor cable 25 m (black) – for control cubicles with 7SC80 controller or 7SR224 controller	3	A	x	1	3	0	0	-	3	R											
CC related equipment																					
Capacitor board (recloser design 27)	3	А	х	1	3	0	0	-	4	с											
Capacitor board (recloser design 38)	3	Α	Х	1	3	0	0	-	4	J											
Switch unit driver SUD-V3 with modem supply 48 V	3	А	х	1	3	0	0	-	4	к											
Switch unit driver SUD-V3 with modem supply 24 V	3	А	Х	1	3	0	0	-	4	L											
Switch unit driver SUD-V3 with modem supply 12 V	3	А	х	1	3	0	0	-	4	М											
One set of batteries (4 batteries at each 12 V, 12 h)	3	А	Х	1	3	0	0	-	4	Е											
Power supply (battery charger) type Power One LOK4740-2RLD	3	А	Х	1	3	0	0	-	4	н											
USB cable for parametrizing controller 7SR224 or 7SC80	3	А	х	1	3	0	0	-	4	L											
SICAM A8000 CP-8021 MASTER MODULE incl. SD-card 2 x RJ45 Ethernet, 1 x RJ45 RS-232, 1 x terminal RS-485, operating temperature: –40 to +70 $^\circ\text{C}$	6	М	F	2	8	0	2	-	1	A	A () ()								
SICAM A8000 CP-8022 MASTER MODULE with GPRS incl. SD-card 2 x RJ45 Ethernet, 1 x RJ45 RS-232, 1 x terminal RS-485, 1 x terminal RS-232 or 485, operating temperature: -40 to +70 $^\circ\text{C}$	6	м	F	2	8	0	2	-	2	A	A) (C								
SICAM A8000 PS-8620 power supply 24–60 V DC 12 W	6	М	F	2	8	6	2	-	0	А	A () ()								
SICAM A8000 PS-8622 power supply 110–220 V DC 12 W	6	Μ	F	2	8	6	2	-	2	А	A () (C								
Light bulb for cubicle lighting 110 V	3	А	х	1	3	0	0	-	4	Ρ											
Light bulb for cubicle lighting 240 V	3	Α	Х	1	3	0	0	-	4	Q											
Connection material																					
Assembly kit for pole mounting frame (threaded bolt + nuts)	3	Α	х	1	3	0	0	-	5	С											
One set (2 pcs) of terminal connectors (2-hole NEMA)	3	А	х	1	3	0	0	-	5	Е											
One piece of terminal connectors (4-hole NEMA)	3	А	Х	1	3	0	0	-	5	U											_
Mounting accessories																					
Bird protection set (per phase for upper and lower terminal, recloser design 27)	3	А	х	1	3	0	1	-	5	N											
Bird protection set (per phase for upper and lower terminal, recloser design 38)	3	A	x	1	3	0	1	-	5	Р											
Pole holder for control cubicle	3	А	Х	1	3	0	0	-	5	Х											

(continued) Order No.: 3 •	
Pole mounting frame type J for three-phase recloser with provision for surge arrester (design 27 and design 38)3AX1301-5JPole mounting frame type G for three-phase recloser with provision for surge arresters and for external voltage sensors T82 (design 27 and design 38)3AX1301-5GPole mounting frame for single-pole recloser (design 27 and design 38)3AX1301-5AMounting frame for upright installation (de.g. H-pole cross arms)3AX1301-5KMounting frame for upright installation (e.g. H-pole cross arms)3AX1301-5KPole mounting frame for upright installation (e.g. H-pole cross arms)3AX1301-5KPole mounting frame for one voltage transformer up to 27 kV (internal supply of recloser)3AX1300-5KPole mounting frame for three voltage transformers up to 38 kV (internal supply of recloser)3AX1300-5KPole mounting frame for three voltage transformers up to 38 kV (internal supply of recloser)3AX1300-5KPole mounting frame for three voltage transformers up to 38 kV (internal supply of recloser)3AX	
Pole mounting frame type J for three-phase recloser 3 A X 1 3 0 1 - 5 J Pole mounting frame type G for three-phase recloser 3 A X 1 3 0 1 - 5 G Pole mounting frame type G for three-phase recloser 3 A X 1 3 0 0 - 5 A Pole mounting frame for single-pole recloser (design 27 and design 38) 3 A X 1 3 0 0 - 5 A Mounting frame for upright installation (design 27 and design 38) 3 A X 1 3 0 1 - 5 K Mounting frame for upright installation (e.g. H-pole cross arms) 3 A X 1 3 0 0 - 5 K Pole mounting frame for one voltage transformer up to 27 kV 3 A X 1 3 0 0 - 5 K Pole mounting frame for one voltage transformer up to 38 kV 3 A X 1 3 0	
Pole mounting frame type G for three-phase recloser 3 A X 1 3 0 1 - 5 G Pole mounting frame for single-pole recloser (design 27 and design 38) 3 A X 1 3 0 1 - 5 A Mounting frame for upright installation (de.gn 27 and design 38) 3 A X 1 3 0 1 - 5 L Mounting frame for upright installation (e.g. H-pole cross arms) 3 A X 1 3 0 1 - 5 K Mounting frame for upright installation (e.g. H-pole cross arms) 3 A X 1 3 0 1 - 5 K Pole mounting frame for one voltage transformer up to 27 kV (internal supply of recloser) 3 A X 1 3 0 0 - 5 K Pole mounting frame for three voltage transformers up to 27 kV (internal supply of recloser) 3 A X 1 3 0 0 - 5 M Pole mounting frame for three voltage transformers up to 38 kV (internal supply of rec	
Pole mounting frame for single-pole recloser (design 27 and design 38)3AX1300-5AMounting frame - alley arm installation (design 27 and design 38)3AX1301-5LMounting frame for upright installation (e.g. H-pole cross arms)3AX1301-5KMounting frame for upright installation (e.g. H-pole cross arms)3AX1301-5KPole mounting frame for one voltage transformer up to 27 kV3AX1300-5KPole mounting frame for one voltage transformer up to 38 kV3AX1300-5SPole mounting frame for three voltage transformer up to 38 kV3AX1300-5SPole mounting frame for three voltage transformer up to 38 kV3AX1300-5SPole mounting frame for three voltage transformers up to 38 kV3AX1300-5MPole mounting frame for three voltage transformers up to 38 kV3AX1300-5MPole mounting frame for three voltage transformers up to 38 kV3AX1300-5MPole mounting frame for three-phase reclos	
Mounting frame - alley arm installation (design 27 and design 38)3AX1301-5LMounting frame for upright installation (e.g. H-pole cross arms)3AX1301-5KMounting frame for upright installation (e.g. H-pole cross arms)3AX1301-5Hfor reclosers with older design *Pole mounting frame for upright installation (e.g. H-pole cross arms)3AX1300-5KPole mounting frame for one voltage transformer up to 27 kV3AX1300-5LPole mounting frame for three voltage transformer up to 38 kV3AX1300-5KPole mounting frame for three voltage transformer up to 27 kV3AX1300-5KPole mounting frame for three voltage transformer up to 38 kV3AX1300-5KPole mounting frame for three voltage transformers up to 27 kV3AX1300-5KPole mounting frame for three voltage transformers up to 38 kV3AX1300-5KPole mounting frame type B for three-phase recloser3AX1301-5Efor reclosers with o	
Mounting frame for upright installation (e.g. H-pole cross arms) (design 27 and design 38)3AX1301-5KMounting frame for upright installation (e.g. H-pole cross arms) Pole mounting frame for one voltage transformer3AX1301-5Hfor reclosers with older design*Pole mounting frame for one voltage transformer up to 27 kV (internal supply of recloser)3AX1300-5SPole mounting frame for one voltage transformer up to 38 kV (internal supply of recloser)3AX1300-5SPole mounting frame for three voltage transformers up to 27 kV (internal supply of recloser)3AX1300-5SPole mounting frame for three voltage transformers up to 27 kV (internal supply of recloser)3AX1300-5SPole mounting frame for three voltage transformers up to 38 kV (internal supply of recloser)3AX1300-5MPole mounting frame type B for three-phase recloser with provision for surge arresters (design 38)3AX1301-5Bfor reclosers with older design*Pole mounting frame type F for three-phase recloser with provision for surge arresters (design 27)3AX1301-5Ffor rec	
Mounting frame for upright installation (e.g. H-pole cross arms)3AX1301-5Hfor reclosers with older design *Pole mounting frame for one voltage transformer up to 27 kV (internal supply of recloser)3AX1300-5KPole mounting frame for one voltage transformer up to 38 kV (internal supply of recloser)3AX1300-5SPole mounting frame for three voltage transformer up to 38 kV (internal supply of recloser)3AX1300-5SPole mounting frame for three voltage transformers up to 27 kV (internal supply of recloser)3AX1300-5SPole mounting frame for three voltage transformers up to 38 kV (internal supply of recloser)3AX1300-5MPole mounting frame type B for three-phase recloser with provision for surge arresters (design 38)3AX1301-5Bfor reclosers with older design *Pole mounting frame type E for three-phase recloser with provision for surge arresters (design 27)3AX1301-5Ffor reclosers with older design *Pole mounting frame for substation application3AX1301-5Ffor reclosers with older design *Pole mounting	
Pole mounting kit for ring-core current transformer 3 A X 1 3 0 0 - 5 K Pole mounting frame for one voltage transformer up to 27 kV (internal supply of recloser) 3 A X 1 3 0 0 - 5 L Pole mounting frame for one voltage transformer up to 38 kV (internal supply of recloser) 3 A X 1 3 0 0 - 5 S Pole mounting frame for three voltage transformers up to 27 kV (internal supply of recloser) 3 A X 1 3 0 0 - 5 M Pole mounting frame for three voltage transformers up to 38 kV (internal supply of recloser) 3 A X 1 3 0 0 - 5 M Pole mounting frame type B for three-phase recloser with provision for surge arresters (design 38) 3 A X 1 3 0 1 - 5 B for reclosers with older design * Pole mounting frame type E for three-phase recloser with provision for surge arresters (design 27) 3 A X 1 3 0 1	
Pole mounting frame for one voltage transformer up to 27 kV (internal supply of recloser) 3 A X 1 3 0 0 - 5 L Pole mounting frame for one voltage transformer up to 38 kV (internal supply of recloser) 3 A X 1 3 0 0 - 5 L Pole mounting frame for three voltage transformers up to 27 kV (internal supply of recloser) 3 A X 1 3 0 0 - 5 M Pole mounting frame for three voltage transformers up to 38 kV (internal supply of recloser) 3 A X 1 3 0 0 - 5 M Pole mounting frame for three voltage transformers up to 38 kV (internal supply of recloser) 3 A X 1 3 0 0 - 5 M Pole mounting frame type B for three-phase recloser with other design 38 3 A X 1 3 0 1 - 5 E for reclosers with older design * Pole mounting frame type E for three-phase recloser with provision for surge arresters (design 27) 3 A X 1 3 0	
Pole mounting frame for one voltage transformer up to 38 kV (internal supply of recloser)3AX1300-55Pole mounting frame for three voltage transformers up to 27 kV (internal supply of recloser)3AX1300-5MPole mounting frame for three voltage transformers up to 38 kV (internal supply of recloser)3AX1300-5MPole mounting frame type B for three-phase recloser with provision for surge arresters (design 38)3AX1301-5Bfor reclosers with older design*Pole mounting frame type E for three-phase recloser with provision for surge arresters (design 27)3AX1301-5Efor reclosers with older design*Pole mounting frame type F for three-phase recloser with provision for surge arresters (design 27)3AX1301-5Ffor reclosers with older design*Pole mounting frame type F for three-phase recloser with provision for surge arresters (design 27)3AX1301-5Ffor reclosers with older design*Mounting frame for substation application for switch unit, control cubicle and surge arresters (recloser design 27 and design 38)3AX1300-5WMounting frame for substation application for switch unit, control cubicle and surge arreste	
Pole mounting frame for three voltage transformers up to 27 kV (internal supply of recloser) 3 A X 1 3 0 0 - 5 M Pole mounting frame for three voltage transformers up to 38 kV (internal supply of recloser) 3 A X 1 3 0 0 - 5 M Pole mounting frame tor three voltage transformers up to 38 kV (internal supply of recloser) 3 A X 1 3 0 0 - 5 T Pole mounting frame type B for three-phase recloser with provision for surge arresters (design 38) 3 A X 1 3 0 1 - 5 B for reclosers with older design * Pole mounting frame type E for three-phase recloser with provision for surge arresters (design 27) 3 A X 1 3 0 1 - 5 F for reclosers with older design * Pole mounting frame type F for three-phase recloser with provision for surge arresters (design 27) 3 A X 1 3 0 1 - 5 F for reclosers with older design * Mounting frame for substation application for switch unit, control c	
Pole mounting frame for three voltage transformers up to 38 kV (internal supply of recloser) 3 A X 1 3 0 0 - 5 T Pole mounting frame type B for three-phase recloser with provision for surge arresters (design 38) 3 A X 1 3 0 1 - 5 B for reclosers with older design * Image: constraint of the constraint	
Pole mounting frame type B for three-phase recloser with provision for surge arresters (design 38) 3 A X 1 3 0 1 - 5 B for reclosers with older design * Pole mounting frame type E for three-phase recloser with provision for surge arresters (design 27) 3 A X 1 3 0 1 - 5 B for reclosers with older design * Pole mounting frame type E for three-phase recloser with provision for surge arresters (design 27) 3 A X 1 3 0 1 - 5 E for reclosers with older design * Pole mounting frame type F for three-phase recloser with provision for surge arresters (design 27) 3 A X 1 3 0 1 - 5 F for reclosers with older design * Mounting frames for substation application 3 A X 1 3 0 0 - 5 W Mounting frame for substation application for switch unit, control cubicle and surge arresters (recloser design 27 and design 38) 3 A X 1 3 0 0 - 5 W Mounting frame for substat	
Pole mounting frame type E for three-phase recloser with provision for surge arresters (design 27) 3 A X 1 3 0 1 - 5 E for reclosers with older design * Pole mounting frame type F for three-phase recloser with provision for surge arresters (design 27) 3 A X 1 3 0 1 - 5 F for reclosers with older design * Mounting frames for substation application 3 A X 1 3 0 1 - 5 F for reclosers with older design * Mounting frame for substation application for switch unit, control cubicle and surge arresters (recloser design 27 and design 38) 3 A X 1 3 0 0 - 5 W Mounting frame for substation application for switch unit, control cubicle and surge arresters (recloser design 27 and design 38) 3 A X 1 3 0 0 - 5 W	
Pole mounting frame type F for three-phase recloser with provision for surge arresters (design 27) 3 A X 1 3 0 1 - 5 F for reclosers with older design * Mounting frames for substation application for switch unit, control cubicle and surge arresters (recloser design 27 and design 38) 3 A X 1 3 0 0 - 5 W Mounting frame for substation application for switch unit, control cubicle and surge arresters (recloser design 27 and design 38) 3 A X 1 3 0 0 - 5 W	
Mounting frames for substation application 3 A X 1 3 0 0 - 5 W Mounting frame for substation application for switch unit, control cubicle and surge arresters (recloser design 27 and design 38) 3 A X 1 3 0 0 - 5 W	
Mounting frame for substation application for switch unit, control cubicle and surge arresters (recloser design 27 and design 38)3AX1300-5WMounting frame for substation application for switch unit and control cubicle design 38)3AX1300-5W	
Mounting frame for substation application for switch unit and 3 A X 1 3 0 0 - 5 Q for reclosers with older design *	
Mounting frame for substation application for switch unit, control cubicle and surge arresters (recloser design 38) 3 A X 1 3 0 0 - 5 R for reclosers with older design *	
Mounting frame for substation application for switch unit, control cubicle and surge arresters (recloser design 27) 3 A X 1 3 0 0 - 5 V for reclosers with older design *	
External voltage sensors **	
Set of external voltage sensors (VS) for 27 kV, installation on pole mounting frame, consists of 3 VS, junction box and connection cables 3 A X 1 3 0 0 – 0 C	
Set of external voltage sensors (VS) for 38 kV, installation on pole mounting frame, consists of 3 VS, junction box and connection cables 3 A X 1 3 0 0 - 0 D	
Set of external voltage sensors (VS) for 27 kV, installation directly at switch unit, consists of 3 VS, mounting plate and connection cables 3 A X 1 3 0 0 - 0 E	
Set of external voltage sensors (VS) for 38 kV, installation directly at switch unit, consists of 3 VS, mounting plate and connection cables	
Other accessories for recloser	
3 A X 1 3 0 0 - 8 A	

* For deliveries up to 01/2017
 ** Requires a controller with 6 inputs for voltage

Instrument transformers

Instrument transformers are a prerequisite for measuring high voltages or currents, and provide auxiliary supply. This equipment is available on request.

Surge arresters

Surge arresters protect operational equipment from overvoltages caused by lightning strikes in overhead lines and switching operations. The arresters are mounted between phase and earth. We strongly suggest to install surge arresters on both load and source side of the recloser. This equipment is available on request.

Typical rated voltages U_r for highest voltages of the system U_s according to IEC 60099-4.

Highest voltage of system	Solidly earthed neutral system	lsolated neutral system; Delta winding	Impedance earthed neutral system	Resonant earthed neutral system
U _s kV	U _r kV	U _r kV	U _r kV	U _r kV
		÷	ļ.	Į.
3.6	3	6	3	6
7.2	6	9	9	9
12	9	15	12	15
17.5	15	24	15	24
24	18	30	21	30
36	27	45	33	45

Typical duty cycle voltages U_r for highest voltages of the system U_s according to IEEE C62.11.

System L-L voltage	Four-wire multi-grounded neutral wye	Three-wire low impedance neutral circuit	Three-wire high impedance neutral circuit
Us	U _r	U _r	U _r
kV	kV	kV	kV
		Ţ	Ţ
4.16	3	6	6
6.9			9
8.3	6	9	
12	9	12	
12.47	9 or 10	15	
13.8	10 or 12	15	18
22.86	15	21	
23			30
34.5	27	36	







Medium-voltage surge arresters

Product Selection 3EK7 specifications according to IEC

IEC

Electrical characteristics

Rated voltage	Continuous operating voltage	Arrester type	Designation	Nominal discharge current	Charge transfer ratin	Thermal charge transfer rating	Maximum values of the residual voltages at discharge currents of the following impulses								
							30/60 µs	30/60 µs	8/20 µs						
Ur	Uc			I _n	Q _{rs}	Q _{th}	125 A	500 A	1 kA	3 kA	5 kA	10 kA	20 kA		
kV	kV			kA	С	С	kV	kV	kV	kV	kV	kV	kV		
3.0	2.4	3EK7 030 - 4 C B 4	DH	10	0.4	1.1	5.8	6.1	6.5	7.1	7.4	8.0	9.1		
6.0	4.8	3EK7 060 - 4 C B 4	DH	10	0.4	1.1	11.6	12.2	13.0	14.2	14.8	15.9	18.3		
9.0	7.2	3EK7 090 - 4 C B 4	DH	10	0.4	1.1	17.4	18.4	19.6	21.2	22.2	23.9	27.4		
12	9.6	3EK7 120 - 4 C C 4	DH	10	0.4	1.1	23.2	24.5	26.1	28.3	29.6	31.8	36.6		
15	12.0	3EK7 150 - 4 C C 4	DH	10	0.4	1.1	29.0	30.6	32.6	35.4	37.0	39.8	45.7		
18	14.4	3EK7 180 - 4 C D 4	DH	10	0.4	1.1	34.8	36.7	39.1	42.5	44.4	47.7	54.9		
21	16.8	3EK7 210 - 4 C D 4	DH	10	0.4	1.1	40.6	42.9	45.6	49.5	51.8	55.7	64.0		
24	19.2	3EK7 240 - 4 C E 4	DH	10	0.4	1.1	46.4	49.0	52.2	56.6	59.1	63.6	73.1		
27	21.6	3EK7 270 - 4 C E 4	DH	10	0.4	1.1	52.2	55.1	58.7	63.7	66.5	71.6	82.3		
30	24.0	3EK7 300 - 4 C F 4	DH	10	0.4	1.1	58.0	61.2	65.2	70.8	73.9	79.5	91.4		
33	26.4	3EK7 330 - 4 C H 4	DH	10	0.4	1.1	63.8	67.3	71.7	77.8	81.3	87.5	101		
36	28.8	3EK7 360 - 4 C H 4	DH	10	0.4	1.1	69.6	73.5	78.2	84.9	88.7	95.4	110		
39	31.2	3EK7 390 - 4 C H 4	DH	10	0.4	1.1	75.4	79.6	84.7	92.0	96.1	103	119		
42	33.6	3EK7 420 - 4 C H 4	DH	10	0.4	1.1	81.2	85.7	91.3	99.1	104	111	128		
45	36.0	3EK7 450 - 4 C H 4	DH	10	0.4	1.1	87.1	91.8	97.8	106	111	119	137		
48	38.4	3EK7 480 - 4 C H 4	DH	10	0.4	1.1	92.9	97.9	104	113	118	127	146		
51	40.8	3EK7 510 - 4 C J 4	DH	10	0.4	1.1	98.7	104	111	120	126	135	155		
54	43.2	3EK7 540 - 4 C J 4	DH	10	0.4	1.1	104	110	117	127	133	143	165		
60	48	3EK7 600 - 4 C J 4	DH	10	0.4	1.1	116	122	130	142	148	159	183		

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Mechanical characteristics

Rated voltage	Continuous operating voltage	Arrester type	Height [H]	Creepage distance	Rated short-circuit current	Lightning impulse withstand voltage	Power frequency withstand voltage, wet	Specified short-term load SSL	Specified long-term load SLL	Maximum weight of arrester	Flashover distance
U,	U _c				I _s	1.2/50µs	1 min.				
kV	kV		mm	mm	kA	kV	kV	N	N	kg	mm
3.0	2.4	3EK7 030 - 4 C B 4	170	372	20	104	49	2940	2050	1.5	180
6.0	4.8	3EK7 060 - 4 C B 4	170	372	20	104	49	2940	2050	1.6	180
9.0	7.2	3EK7 090 - 4 C B 4	170	372	20	104	49	2940	2050	1.6	180
12	9.6	3EK7 120 - 4 C C 4	200	485	20	122	57	2500	1750	1.9	210
15	12.0	3EK7 150 - 4 C C 4	200	485	20	122	57	2500	1750	2.0	210
18	14.4	3EK7 180 - 4 C D 4	240	605	20	144	67	2080	1450	2.3	248
21	16.8	3EK7 210 - 4 C D 4	240	605	20	144	67	2080	1450	2.4	248
24	19.2	3EK7 240 - 4 C E 4	270	775	20	166	77	1850	1290	2.7	286
27	21.6	3EK7 270 - 4 C E 4	270	775	20	166	77	1850	1290	2.8	286
30	24.0	3EK7 300 - 4 C F 4	300	900	20	184	86	1660	1160	3.1	318
33	26.4	3EK7 330 - 4 C H 4	400	1230	20	242	113	1250	870	3.9	418
36	28.8	3EK7 360 - 4 C H 4	400	1230	20	242	113	1250	870	4.0	418
39	31.2	3EK7 390 - 4 C H 4	400	1230	20	242	113	1250	870	4.1	418
42	33.6	3EK7 420 - 4 C H 4	400	1230	20	242	113	1250	870	4.1	418
45	36.0	3EK7 450 - 4 C H 4	400	1230	20	242	113	1250	870	4.2	418
48	38.4	3EK7 480 - 4 C H 4	400	1230	20	242	113	1250	870	4.3	418
51	40.8	3EK7 510 - 4 C J 4	470	1420	20	281	131	1060	740	4.9	484
54	43.2	3EK7 540 - 4 C J 4	470	1420	20	281	131	1060	740	5.0	484
60	48	3EK7 600 - 4 C J 4	470	1420	20	281	131	1060	740	5.1	484

IEEE

Electrical characteristics

Duty cycle voltage	MCOV	Arrester order number	Energy class	Lightning impulse classifying current	Single impulse withstand rating	Switching surge energy rating	Protective level Maximum discharge voltage							
	-			I.			45/90 μs 125 A	45/90 μs 500 A	8/20 μs 1.5 kA	8/20 μs 3 kA	8/20 μs 5 kA	8/20 μs 10 kA	8/20 μs 20 kA	
kV	kV			kA	С	kJ/kVmcov	kV cr	kV cr	kV cr	kV cr	kV cr	kV cr	kV cr	
3.0	2.55	3EK8 030 - 3 B A 2	А	10	0.4	3.0	6.7	7.0	7.7	8.0	8.4	9.0	10.1	
6.0	5.10	3EK8 060 - 3 C A 2	А	10	0.4	3.0	13.3	14.0	15.3	16.0	16.7	18.0	20.2	
9.0	7.65	3EK8 090 - 3 C A 2	А	10	0.4	3.0	20.0	21.1	23.0	24.0	25.1	27.0	30.2	
10	8.40	3EK8 100 - 3 C A 2	А	10	0.4	3.0	22.2	23.4	25.5	26.7	27.9	30.0	33.6	
12	10.2	3EK8 120 - 3 E A 2	А	10	0.4	3.0	26.6	28.1	30.6	32.0	33.5	36.0	40.3	
15	12.7	3EK8 150 - 3 E A 2	А	10	0.4	3.0	33.3	35.1	38.3	40.1	41.9	45.0	50.4	
18	15.3	3EK8 180 - 3 E A 2	А	10	0.4	3.0	40.0	42.1	45.9	48.1	50.2	54.0	60.5	
21	17.0	3EK8 210 - 3 G A 2	А	10	0.4	3.0	46.6	49.1	53.6	56.1	58.6	63.0	70.6	
24	19.5	3EK8 240 - 3 G A 2	А	10	0.4	3.0	53.3	56.2	61.2	64.1	67.0	72.0	80.6	
27	22.0	3EK8 270 - 3 G A 2	А	10	0.4	3.0	59.9	63.2	68.9	72.1	75.3	81.0	90.7	
30	24.4	3EK8 300 - 3 J A 2	А	10	0.4	3.0	66.6	70.2	76.5	80.1	83.7	90.0	101	
36	29.0	3EK8 360 - 3 J A 2	А	10	0.4	3.0	79.9	84.2	91.8	96.1	100.4	108.0	121	

Mechanical characteristics

Duty cycle voltage	MCOV	Arrester order number	Height [H]	Leakage distance	Rated short-circuit current voltage	Recomi minimum	Recommended minimum clearances		Dynamic cantilever load	Weight
					Is	To ground (ph-gnd)	Between phases			
kV	kV		inch	inch	kA	inch	(ph-ph) inch	lbf	lbf	lbs
3.0	2.55	3EK8 030 - 3 B A 2	3.2	7.1	20	3.0	4.3	156	219	2.3
6.0	5.10	3EK8 060 - 3 C A 2	5.2	13.0	20	3.4	5.4	96	135	3.0
9.0	7.65	3EK8 090 - 3 C A 2	5.2	13.0	20	4.0	6.0	96	135	3.1
10.0	8.40	3EK8 100 - 3 C A 2	5.2	13.0	20	4.2	6.2	96	135	3.2
12	10.20	3EK8 120 - 3 E A 2	7.5	20.5	20	5.5	7.5	67	94	4.2
15	12.7	3EK8 150 - 3 E A 2	7.5	20.5	20	6.5	8.5	67	94	4.4
18	15.3	3EK8 180 - 3 E A 2	7.5	20.5	20	7.5	9.5	67	94	4.5
21	17.0	3EK8 210 - 3 G A 2	10.2	28.7	20	8.0	10.0	49	69	5.5
24	19.5	3EK8 240 - 3 G A 2	10.2	28.7	20	10.0	12.0	49	69	5.6
27	22	3EK8 270 - 3 G A 2	10.2	28.7	20	10.8	13.0	49	69	5.7
30	24.4	3EK8 300 - 3 J A 2	12.7	36.6	20	10.8	13.3	40	56	6.6
36	29	3EK8 360 - 3 J A 2	12.7	36.6	20	12.8	16.3	40	56	6.9

Product Selection 3EK7/3EK8 surge arresters

Dimension drawings



Dimensions 3EK7, IEC





Dimensions 3EK8, IEEE

For more information on medium-voltage surge arresters, please refer to Catalogue HG 31.1 "Medium-voltage surge arresters".



Switch unit driver – discharge switch for the capacitor



Controller 7SR224



R-HG11-383.tif

Controller 7SC80

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12 kV	¹ ¹ Rated normal current	Rated operating sequence: 0 - 0.2s - CO - 2s - CO - 2s - CO (-30s - CO) - Lockout **	π^{*} Rated duration of short-circuit	⁸¹ Rated short-circuit breaking current	Bar Rated short-circuit making current	$^{\circ}_{\circ}$ C Rated lightning impulse withstand voltage *	\sim Rated short-duration power-frequency withstand voltage *) Impedance μΩ between connections	Creepage distance, phase-to-earth	Clearance, phase-to-phase	Minimum clearance, phase-to-earth	- Weight	Line charging current	Cable charging current	Max. interrupting time / max.closing time
	200	-	5	12 F			- KV	μΩ	010	212		120	A	10	
3AD3 126	200		3	12.5	31.5	75	28	40	810	312	265	120	2	10	50/60
3AU3 121	400		3	12.5	31.5	75	28	40	810	312	265	120	2	10	50/60
3AD3 122	800	-	3	12.5	31.5	75	28	40	810	312	205	120	2	10	50/60
24D2 122	620	-	2	12.5	40	75	20	40	010 010	212	205	120	2	10	50/60
2402 122	800	-	2	16	40	75	20	40	810 810	212	205	120	2	10	50/60
34D1 126	200		2	12.5	31.5	75	20	40	840	51Z	205	65	2	10	50/60
34D1 120	400	-	3	12.5	31.5	75	28	40	840	n a	265	65	2	10	50/60
3AD1 122	630		3	12.5	31.5	75	28	40	840	n a	265	65	2	10	50/60
3AD1 123	800	-	3	12.5	31.5	75	28	40	840	n a	265	65	2	10	50/60
3AD1 136	200		3	16	40	75	28	40	840	na	265	65	2	10	50/60
3AD1 131	400	-	3	16	40	75	28	40	840	n a	265	65	2	10	50/60
3AD1 132	630		3	16	40	75	28	40	840	n.a.	265	65	2	10	50/60
3AD1 133	800		3	16	40	75	28	40	840	n.a.	265	65	2	10	50/60
15.5 kV	I _r A		t _k s	I _{sc} kA	I _{ma} kA	U _p kV	U _d kV	μΩ	mm	mm	mm	kg	A	A	ms
3AD3 226	200	-	3	12.5	31.5	110	50	40	810	312	265	120	2	10	50/60
3AD3 221	400		3	12.5	31.5	110	50	40	810	312	265	120	2	10	50/60
3AD3 222	630	-	3	12.5	31.5	110	50	40	810	312	265	120	2	10	50/60
3AD3 223	800		3	12.5	31.5	110	50	40	810	312	265	120	2	10	50/60
3AD3 232	630	-	3	16	40	110	50	40	810	312	265	120	2	10	50/60
3AD3 233	800		3	16	40	110	50	40	810	312	265	120	2	10	50/60
3AD1 226	200		3	12.5	31.5	110	50	40	840	n.a.	265	65	2	10	50/60
3AD1 221	400		3	12.5	31.5	110	50	40	840	n.a.	265	65	2	10	50/60
3AD1 222	630		3	12.5	31.5	110	50	40	840	n.a.	265	65	2	10	50/60
3AD1 223	800		3	12.5	31.5	110	50	40	840	n.a.	265	65	2	10	50/60
3AD1 231	400		3	16	40	110	50	40	840	n.a.	265	65	2	10	50/60
3ADT 232	630	-	3	16	40	110	50	40	840	n.a.	265	65	2	10	50/60
233	800	-	3	16	40	110	50	40	840	n.a.	265	65	2	10	50/60

Standards according to IEC 62271-100 and IEEE C37.60
 * Partial-discharge free

** Other operating sequences on request

24 kV	¹ Rated normal current	Rated operating sequence: 0 - 0.2s - C0 - 2s - C0 - 2s - C0 (-30s - C0) - Lockout **	م Rated duration of short-circuit	57 Rated short-circuit breaking current	^m Rated short-circuit making current	$^{ m d}$ C Rated lightning impulse withstand voltage *	$_{ m C}$ Rated short-duration power-frequency withstand voltage *	lmpedance μΩ between connections	Creepage distance, phase-to-earth	Clearance, phase-to-phase	Minimum clearance, phase-to-earth	Weight	Line charging current	Cable charging current	Max. interrupting time / max.closing time
Order No.	А		S	kA	kA	kV	kV	μΩ	mm	mm	mm	kg	A	A	ms
3AD3 626	200		3	12.5	31.5	125	50	40	810	312	265	120	5	25	50/60
3AD3 621	400		3	12.5	31.5	125	50	40	810	312	265	120	5	25	50/60
3AD3 622	630		3	12.5	31.5	125	50	40	810	312	265	120	5	25	50/60
3AD3 623	800		3	12.5	31.5	125	50	40	810	312	265	120	5	25	50/60
3AD3 632	630		3	16	40	125	50	40	810	312	265	120	5	25	50/60
3AD3 633	800		3	16	40	125	50	40	810	312	265	120	5	25	50/60
3AD1 626	200		3	12.5	31.5	125	50	40	840	n.a.	265	65	2	25	50/60
3AD1 621	400		3	12.5	31.5	125	50	40	840	n.a.	265	65	2	25	50/60
3AD1 622	630		3	12.5	31.5	125	50	40	840	n.a.	265	65	2	25	50/60
3AD1 623	800		3	12.5	31.5	125	50	40	840	n.a.	265	65	2	25	50/60
3AD1 636	200		3	16	40	125	50	40	840	n.a.	265	65	2	25	50/60
3AD1 631	400		3	16	40	125	50	40	1290	n.a.	265	65	2	25	50/60
3AD1 632	630		3	16	40	125	50	40	840	n.a.	265	65	2	25	50/60
3AD1 633	800		3	16	40	125	50	40	1290	n.a.	265	65	2	25	50/60

Standards according to IEC 62271-100 and IEEE C37.60
 * Partial-discharge free
 ** Other operating sequences on request

27 kV	¹ Rated normal current	Rated operating sequence: O - 0.2s - CO - 2s - CO - 2s - CO (-30s - CO) - Lockout **	\star^{t} Rated duration of short-circuit	$^{ m sr}$ Rated short-circuit breaking current	\mathbf{r}_{max}^{L} Rated short-circuit making current	$^{\rm aC}_{\rm a}$ Rated lightning impulse withstand voltage	د Rated short-duration م power-frequency withstand voltage	Impedance $\mu\Omega$ between connections	Creepage distance, phase-to-earth	Clearance, phase-to-phase	Minimum clearance, phase-to-earth	Weight	Line charging current	Cable charging current	Max. interrupting time/max.closing time
Order No.	А		s	kA	kA	kV	kV	μΩ	mm	mm	mm	kg	А	А	ms
3AD3 326	200		3	12.5	31.5	125	60	40	810	312	265	120	5	25	50/60
3AD3 321	400		3	12.5	31.5	125	60	40	810	312	265	120	5	25	50/60
3AD3 322	630		3	12.5	31.5	125	60	40	810	312	265	120	5	25	50/60
3AD3 323	800		3	12.5	31.5	125	60	40	810	312	265	120	5	25	50/60
3AD3 331	400		3	16	40	125	60	50	1290	312	340	160	5	25	50/60
3AD3 332	630		3	16	40	125	60	50	1290	312	340	160	5	25	50/60
3AD3 333	800		3	16	40	125	60	50	1290	312	340	160	5	25	50/60
3AD3 431	400		3	16	40	150	70	50	1290	312	340	160	5	25	50/60
3AD3 432	630		3	16	40	150	70	50	1290	312	340	160	5	25	50/60
3AD3 433	800		3	16	40	150	70	50	1290	312	340	160	5	25	50/60
3AD1 326	200		3	12.5	31.5	125	60	40	840	n.a.	265	65	5	25	50/60
3AD1 321	400		3	12.5	31.5	125	60	40	840	n.a.	265	65	5	25	50/60
3AD1 322	630		3	12.5	31.5	125	60	40	840	n.a.	265	65	5	25	50/60
3AD1 323	800		3	12.5	31.5	125	60	40	840	n.a.	265	65	5	25	50/60
3AD1 331	400		3	16	40	125	60	50	1290	n.a.	340	86	5	25	50/60
3AD1 332	630		3	16	40	125	60	50	1290	n.a.	340	86	5	25	50/60
3AD1 333	800		3	16	40	125	60	50	1290	n.a.	340	86	5	25	50/60
3AD1 431	400		3	16	40	150	70	50	1290	n.a.	340	86	5	25	50/60
3AD1 432	630		3	16	40	150	70	50	1290	n.a.	340	86	5	25	50/60
3AD1 433	800	-	3	16	40	150	70	50	1290	n.a.	340	86	5	25	50/60

Standards according to IEC 62271-100 and IEEE C37.60
 ** Other operating sequences on request

38 kV	¹ Rated normal current	Rated operating sequence: O - 0.2s - CO - 2s - CO - 2s - CO (-30s - CO) - Lockout **	π^{*} Rated duration of short-circuit	$^{\varkappa}$ Rated short-circuit breaking current	Bated short-circuit making current	$_{\mathrm{e}}^{\mathrm{c}}$ Rated lightning impulse withstand voltage	 Rated short-duration power-frequency withstand voltage 	Impedance μΩ between connections	Creepage distance, phase-to-earth	Clearance, phase-to-phase	Minimum clearance, phase-to-earth	Weight	Line charging current	Cable charging current	Max. interrupting time/max.closing time
Order No.	А		S	kA	kA	kV	kV	μΩ	mm	mm	mm	kg	А	А	ms
3AD3 521	400	•	3	12.5	31.5	170	70	50	1290	312	340	160	5	40	50/60
3AD3 522	630		3	12.5	31.5	170	70	50	1290	312	340	160	5	40	50/60
3AD3 523	800		3	12.5	31.5	170	70	50	1290	312	340	160	5	40	50/60
3AD3 531	400		3	16	40	170	70	50	1290	312	340	160	5	40	50/60
3AD3 532	630		3	16	40	170	70	50	1290	312	340	160	5	40	50/60
3AD3 533	800		3	16	40	170	70	50	1290	312	340	160	5	40	50/60
3AD3 731	400		3	16	40	200	95	50	1290	312	340	160	5	40	50/60
3AD3 732	630		3	16	40	200	95	50	1290	312	340	160	5	40	50/60
3AD3 733	800		3	16	40	200	95	50	1290	312	340	160	5	40	50/60
3AD1 521	400		3	12.5	31.5	170	70	50	1290	n.a.	340	86	5	40	50/60
3AD1 522	630		3	12.5	31.5	170	70	50	1290	n.a.	340	86	5	40	50/60
3AD1 523	800		3	12.5	31.5	170	70	50	1290	n.a.	340	86	5	40	50/60
3AD1 531	400		3	16	40	170	70	50	1290	n.a.	340	86	5	40	50/60
3AD1 532	630		3	16	40	170	70	50	1290	n.a.	340	86	5	40	50/60
3AD1 533	800		3	16	40	170	70	50	1290	n.a.	340	86	5	40	50/60
3AD1 731	400		3	16	40	200	95	50	1290	n.a.	340	86	5	40	50/60
3AD1 732	630		3	16	40	200	95	50	1290	n.a.	340	86	5	40	50/60
3AD1 733	800		3	16	40	200	95	50	1290	n.a.	340	86	5	40	50/60

Standards according to IEC 62271-100 and IEEE C37.60
 ** Other operating sequences on request

Dimension drawings



Dimensions of three-phase switch unit, design 38



Dimensions of three-phase switch unit, design 27



Dimensions of single-phase switch unit, design 27



Dimensions of single-phase switch unit, design 38



Pole mounting frame type J (example for design 27)



Pole mounting frame type G (example for design 38)

Dimension drawings







Mounting frame for substation application (design 27)







Mounting frame for substation application (design 38)

Dimension drawings



Dimensions of control cubicle





Switchgear Factory in Berlin, Germany

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Configuration aid	Foldout page

Annex

Inquiry form

Please copy, fill in and return to your Siemens partner

Inquiry concerning

□ Siemens vacuum recloser 3AD

Please

Submit an offerCall usVisit us

Your address

Company

Dept.

Name

Street

Country

Phone

E-mail

Dept.

Name

Street

Fax

Postal code/city

Technical data

				Other values
Switch unit option:	🗆 Single-phase	🗆 Three-phase		
Rated voltage	□ 12 kV □ 27 kV	□ 15.5 kV □ 38 kV	□ 24 kV	
Rated lightning impulse withstand voltage	□ 75 kV □ 150 kV	□ 110 kV □ 170 kV	□ 125 kV □ 200 kV	□ kV
Rated short-duration power-frequency withstand voltage (dry)	□ 28 kV □ 70 kV	□ 50 kV □ 95 kV	□ 60 kV	□ kV
Rated short-circuit breaking current	🗆 12.5 kA	□ 16 kA		
Rated normal current	□ 200 A □ 800 A	□ 400 A	□ 630 A	

Secondary equipment and communication protocols

For possible combinations see pages 30 to 32

Type of controller	□ 7SC80	□ 7SR224	
Recloser configuration	□ Recloser for pole mounting	Control cubicle and switch unit made of stainless steel	□ Application in substation
	Without control cubicle (switch unit)	\Box Control cubicle only only)	□ Others
Current and voltage measuring	Integrated current transformers	Integrated voltage sensors	
Auxiliary voltage	□ V DC		□ V AC, Hz
Control and sensor cables	□ Without □ 3 m □ 15 m	□ 6 m □ 9 m □ 12 □ 20 m □ 25 m	m □ m
Communication interfaces	USB ST-type	e 🗆 Ethernet ST-type 00 Mbit 🗆 LC 100 Mbit	□ RS485 □ RS232 □ IRIG-B □ RJ45
Protection and monitoring functions additional to standard functions	Synchronizing, synchronizing check	□ Fault locator k	□ Loop automation
Languages of operating instructions and nameplate	□ English (USA) □ German	🗆 Spanish	Portuguese

Application and other requirements

4

Postal code/city

Siemens AG

Fax

Please check off

____ Please fill in

Instruction for configuration of the Siemens vacuum recloser 3AD

1st step: Definition of the primary part (see pages 27 to 30)

Please specify the following ratings:	Possible options:
Rated voltage (U_r)	U _r : 12 kV to 38 kV
Rated lightning impulse withstand voltage (U_p)	U _p : 75 kV to 200 kV
Rated short-duration power-frequency withstand voltage (U_d)	U _d : 28 kV to 95 kV
Rated short-circuit breaking current (I _{SC})	I _{sc} : 12.5 kA and 16 kA
Rated normal current (I _r)	<i>I</i> _r : 200 A to 800 A

These ratings define the positions 4 to 7 of the order number.

2nd step: Definition of the secondary equipment (see pages 30 to 33)

Please specify the following equipment features:	Possible options:
Recloser configuration (position 8)	Recloser incl. control cubicle and cables, recloser without control cubicle and cables, control cubicle only
Current and voltage measuring (position 9)	Integrated current transformers, integrated voltage sensors
Controller size (position 10)	Controller selection, housing size, number of function keys and tri-color LEDs, number of available binary inputs and outputs
Auxiliary voltage (position 11)	Voltages from 110 V DC to 240 V AC
Cable length of control and sensor cables (position 12)	Standard length 3 m, 6 m, 9 m, 12 m, 15 m, 20 m and 25 m special lengths possible, without cable
Communication protocols (position 13)	IEC 60870-5-101, IEC 60870-5-103, IEC 60870-5-104, IEC 61850, MODBUS RTU and DNP 3.0
Communication interfaces (position 14)	USB, RS485, RJ45, RS232, IRIG-B, optical ST, optical LC
Functions of the controller (position 15)	Standard protection and monitoring functions, synchronizing, fault locator (on request), loop automation
Language of operating instructions and nameplate (position 16)	English, Spanish, Portuguese or German

These equipment features define the positions 8 to 16 of the order number.

3rd step: Do you have any further requirements concerning the equipment? (Please refer to page 34)

Should you still need more options than the possible special equipment like country-specific power sockets, weather resistance down to -40 °C, stainless-steel design, etc. please contact your responsible sales partner.





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Energy Management Division Medium Voltage & Systems Postfach 3240 91050 Erlangen, Germany

For more information, please contact our Customer Support Center. Phone: +49 180 524 70 00 Fax: +49 180 524 24 71 (Charges depending on provider) E-mail: support.energy@siemens.com

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