SIEMENS

Siemens Vacuum Recloser 3AD

Medium-Voltage Equipment

Totally Integrated Power – Vacuum Recloser 3AD

Catalog
HG 11.42

Edition
2016

siemens.com/recloser

R-HG11-172.tif

Siemens Vacuum Recloser 3AD

Medium-Voltage Equipment
Catalog HG 11.42 · 2016

Invalid: Catalog HG 11.42 · 2011
Catalog HG 11.42 · 2015 (PDF version)

siemens.com/recloser

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).

Contents Page

Description 5
General 6
Switch unit 7
Controller 7SR224 9
Controller 7SC80 14
Special functions and applications 19
Standards, ambient conditions, altitude correction factor and number of operating cycles 20
Product range overview and scope of delivery 21

1

Product Selection 23
Ordering data and configuration example 24
Selection of primary ratings 25
Selection of controller 27
Selection of additional equipment 31
Additional components for increased performance 33

2

Technical Data 35
Electrical data, dimensions and weights:
Voltage level 12 kV 36
Voltage level 15.5 kV 36
Voltage level 24 kV 37
Voltage level 27 kV 38
Voltage level 38 kV 39
Dimension drawings 40

3

Annex 45
Inquiry form 46
Configuration instructions 47
Configuration aid Foldout page

4

R-HG11-300.tif

R-HG11-377.tif

Vacuum recloser with control cubicle T97 and controller 7SR224

R-HG11-380.tif

Vacuum recloser with control cubicle T96 and controller 7SC80

Contents Page

Description 5

General 6

Switch unit:
Recloser principle 7
Recloser cycle 7
Design of the switch unit 7
Pole assemblies 7
Operating mechanism 8
Mechanical lockout 8
Nameplate 8

Controller:
General description 9
Controller 7SR224 9
– User interface 9
– Control cubicle 9
– Protection functions 10
– Protection functions and protocols 12
– Data acquisition via communication interface 13
– Software 13
Controller 7SC80 14
– User interface 14
– Web-HMI 14
– Control cubicle 14
– Protection functions 15
– Protection functions and protocols 16
– Data acquisition and monitoring 17
– Software 18
Special functions and applications 19
Standards 20
Ambient conditions 20
Altitude correction factor 20
Number of operating cycles 20
Product range overview 21
Scope of delivery 21

1

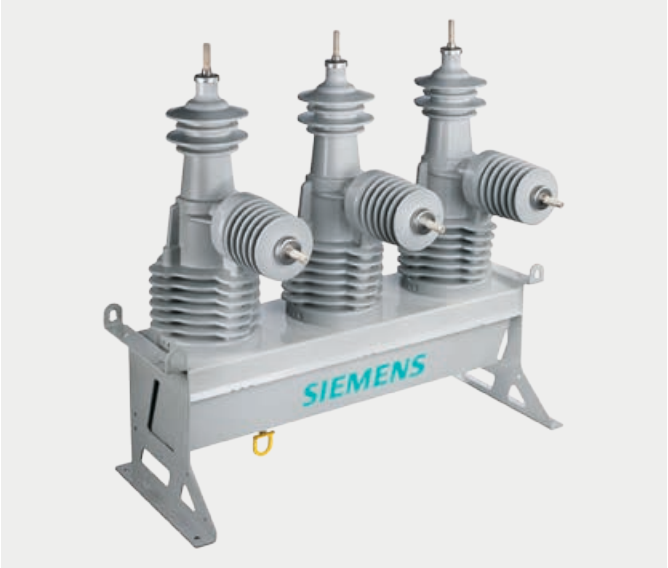
Siemens vacuum recloser 3AD

1

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.

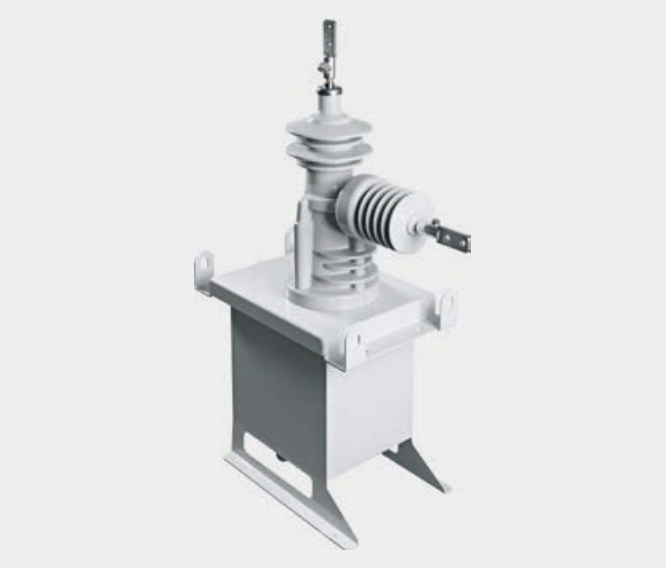
The recloser consists of two main components: The switch unit, where Siemens offers its customers two designs – 27 kV or 38 kV – and the controller as protection and control unit. The latter is located inside the control cubicle (CC), which also contains the electronics and auxiliary circuits.

Three-phase switch unit design 38



R-HG11-378.tif

Single-phase switch unit



R-HG11-319.tif

Control cubicle T97 with controller 7SR224

R-HG11-318.tif

Control cubicle T96 with controller 7SC80

R-HG11-381.tif

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.

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.

1

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 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 four recloses, each of them with individual protection settings for phase, earth and high-impedance faults.

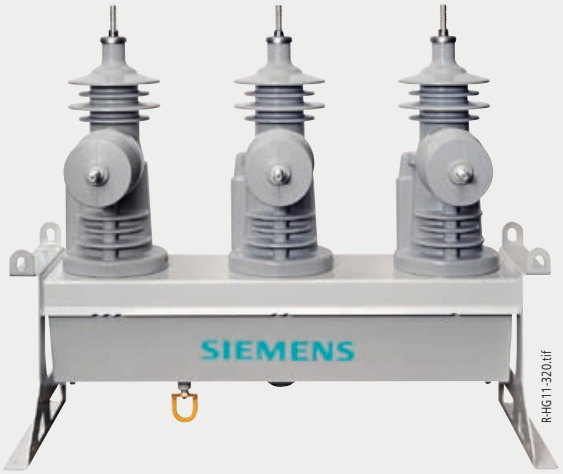
Design of the switch unit

Vacuum interrupter

Our 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

1

Mechanical lockout

R-HG11-306.tif

Lockout handle – pushed in
(operational position)

R-HG11-307.tif

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 directly 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

SIEMENS Q 600673

Vacuum Recloser	Design code 2A
Serial No.: S 3AD/	Date of prod. 2015
U_r 15.5 kV 50 Hz/60 Hz	I_r 630 A
U_p 110 kV	I_{sc} 12.5 kA
U_d 50 kV	m 140 kg
according to IEC 62271-111 and IEEE Std. C37.60	
Order Code 3AD3222–1AA61–2AA2	
Auxiliary Voltage 230 V AC	
MADE IN GERMANY	

HG11-27321_en eps

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, Isolation and Service Restoration (FLISR), Source Transfer, Load Balancing, ATS	Traditional recloser applications
Others	For AR standard applications and Smart Grid Ready	For AR standard applications
	Fixed BI/BO	Variable BI/BO
	Interposing relay to switch between 6VTs	6VT available
	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 Reyrolle 7SR224 directional over-current 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 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

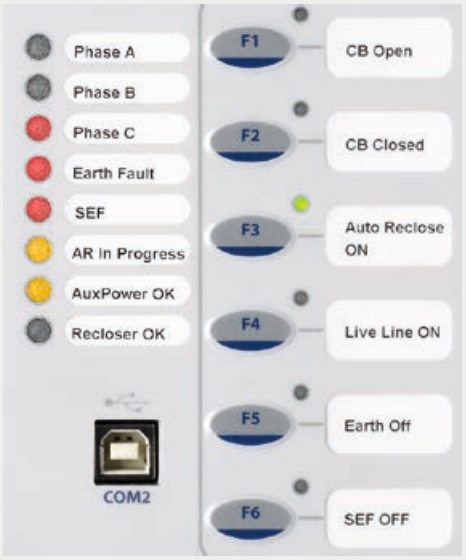
- 20-character x 4-line backlight LCD
- 5 menu navigation keys
- 3 fixed LEDs
- 12 freely programmable function keys each with tri-color LED
- 8 or 16 programmable LEDs. Each LED is tri-colored (red, green or yellow) allowing for clear indication of the associated function state.

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).

R-HG11-308.tif

7SR224 controller



R-HG11-309.tif

Tri-color LEDs and pushbuttons of the controller

R-HG11-331.eps

Cubicle

1

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 phase-sequence 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 electromechanical 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 electromechanical 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 electromechanical 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 phase-sequence 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 high-impedance, 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 auto-reclose 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 three-pole trip and reclose operations depending on the fault type detected.

1

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 auto-reclose 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:
  - 2 independent trip counters
  - Frequent operations counter
  - Lockout handle operations counter
  - I^2t 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.

Data log

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

Reydisp 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.

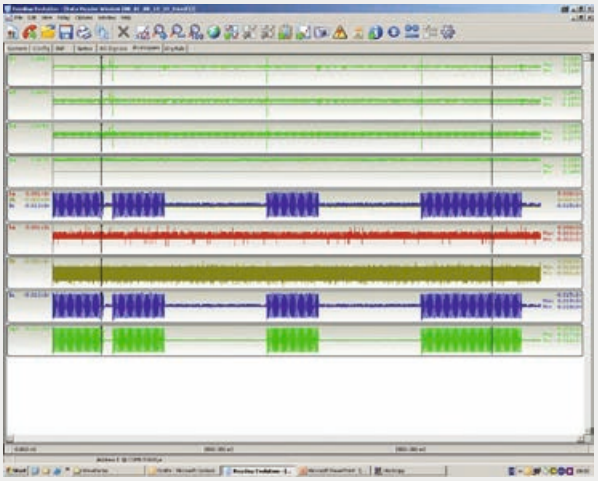
Further information

- Software free of charge
- Download link:

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

Programmable logic

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.

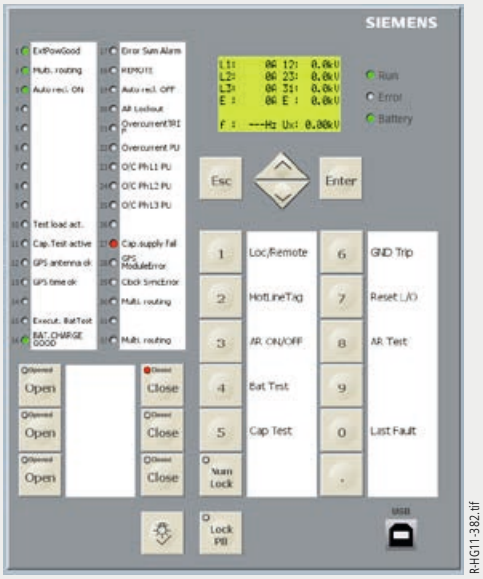


R-HG11-310.tif

Typical Reydisp Evolution screenshot

1

Controller 7SC80



Web HMI, controller 7SC80

Control cubicle T96 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. Non-directional 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 V0> and V0>> work independently. The V0p 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.

1

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.

81O/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.

Communication interface

- Front USB port
- 100Mbit Ethernet, electrical, 2x RJ45 connectors
- 100Mbit Ethernet, optical, 2x LC connectors.

Communication protocol options

- Without
- IEC 61850
- DNP3 TCP
- Profinet Ethernet (EN100)
- 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.

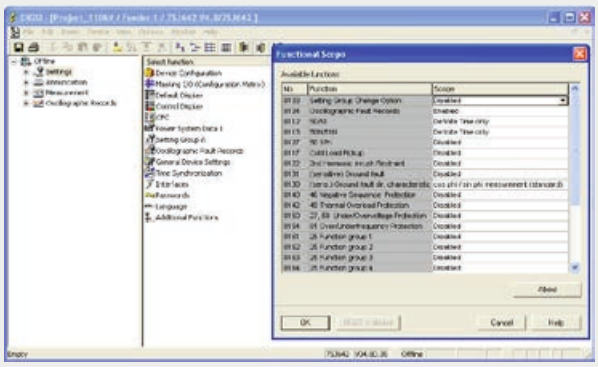
Demand monitoring

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

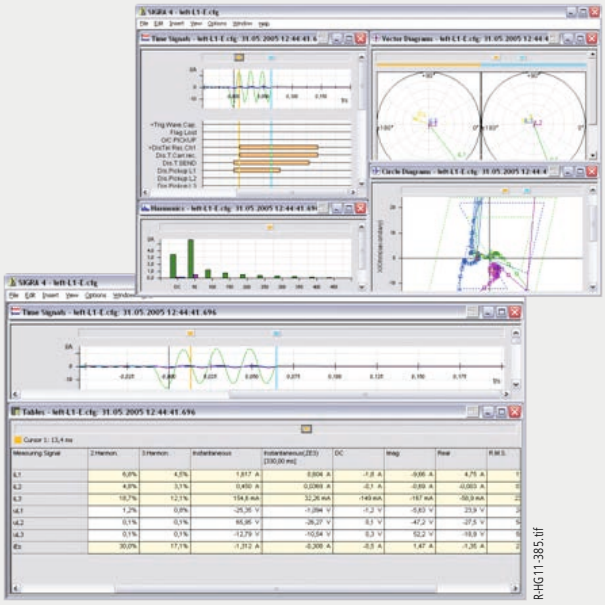
The time and date can be set and is maintained while the relay is de-energized by a back-up battery. The time can be synchronized from a binary input pulse, via GPS/IRIG-B or the data communication channel.

1



R-HG11-384.tif

DIGSI 4 screenshot



R-HG11-385.tif

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.

Ring-core CT supplement for accurate SEF protection 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.

1

Standards

The recloser conforms to the following standards:

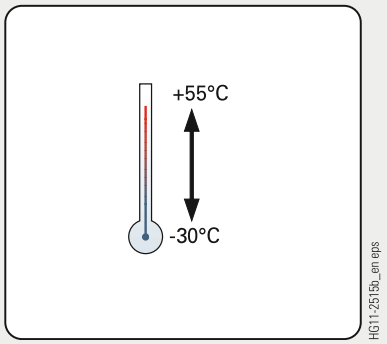
- IEC 62271-111 and IEEE C37.60
- IEC 60255
- IEC 62271-1.

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 extremely high pollution according to the IEC Level 4.

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



Altitude correction factor

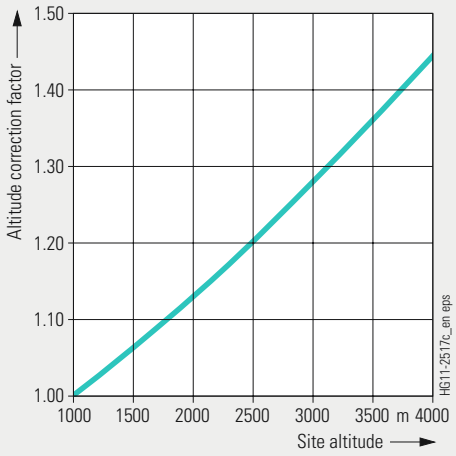
The dielectric strength of air insulation decreases with increasing altitude due to low air density. The rated lightning impulse withstand voltage values specified in the chapter "Technical Data" apply to a site altitude of 1000 m above sea level. For an altitude above 1000 m, the insulation level must 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:

$U \geq U_0 \times K_a$

U Rated withstand voltage under standard reference atmosphere
U_0 Rated withstand voltage requested for the place of installation
K_a Altitude correction factor according to the opposite diagram



Example

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 ≥ 75 kV x 1.2

Number of operating cycles

The switch unit of the 3AD vacuum recloser is maintenance-free for 10,000 operating cycles.

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

*) Koeberg Insulator Pollution Test Station (KIPTS)

1

Product range

3- phase Rated voltage kV	Rated short-circuit breaking current kA	Rated lightning impulse withstand voltage kV	Rated normal current 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 *	195 *			■	■
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			■	■

* On request
■ = Design 27
■ = Design 38
■ = Single phase

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 55	Stainless steel	
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 trip counters in the controller inside the control cubicle
Interlocking	Electrical; mechanical lockout		
Sensors	Integrated current transformers	Additional integrated 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	

1

Scope of delivery (cont.)

	Standard equipment	Optionally available	Remarks
Control cubicle overall equipment			
Socket outlet	American / Brazilian Standard for AC, voltage as per auxiliary power input	Other options are German, British or Australian/ New Zealand standard	
Enclosure	Mild steel with outdoor protection coating IP 56	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 (max. 15 W)	12 V/24 V power output (max 15 W)	
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 BO	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	21 Fault Locator, 25 Synchronizing, 27/59 Under/overvoltage, 27 Sag/ 59 Swell, 37 Undercurrent, 46BC Broken conductor/phase unbalance, 46NPS Negative phase-sequence overcurrent, 47NPS Negative phase-sequence overvoltage, 49 Thermal overload, 50BF Circuit-breaker fail, 51V Voltage dependent overcurrent, 59N Neutral voltage displacement, 60CTS CT supervision, 60VTS VT supervision, 64H Restricted earth fault scheme, 67/50 Directional instantaneous phase fault overcurrent, 67/50G Directional instantaneous earth fault, 67/51 Directional time delayed phase fault overcurrent, 67/51G Directional time delayed earth fault, 67/50SEF Directional instantaneous sensitive earth fault, 67/51SEF Directional time delayed sensitive earth fault, 67/50HI2 Directional instantaneous sensitive earth-fault protection, 67/51HI2 Directional time-delayed sensitive earth-fault protection, 74TC Trip-circuit supervision, 74BF Circuit-breaker close command monitoring, 79 Auto-reclose, 81 Under/ overfrequency, 81HBL2 Inrush restraint, 86 Lockout, Battery and capacitor test, Cold load pickup, Programmable logic, Single/triple auto-reclose, Loss of voltage LOV automation	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	
Control cubicle with 7SC80			
Programmable LEDs	32 user-definable LEDs		
Controller size	E13.5 = (13.5" wide)		
Number of inputs/outputs for customer use	12 x BI, 8 x BO		
Operator panel	14 function keys, 9 of them programmable, 2 arrow keys		
Controller interfaces	USB (front)	100 Mbit Ethernet 2x RJ45; 100 Mbit Ethernet optical 2x LC	
Protection and monitoring functions	50/51 Time overcurrent protection phase 50-1, 50-2, 50-3, 51, 50N/51N Ground fault protection 50N-1, 50N-2, 50N-3, 51N, 50N(s)/51N(s) Sensitive ground fault protection, 50BF Breaker failure protection, 46 Unbalanced load protection, 87N High-impedance ground fault differential protection, 74 TC 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, 81 U/O Flexible protection functions, 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	Basic version + direction determination overcurrent, phase and ground + voltage protection, SNTP server functionality (no protection), RTU functionality, Faul Locator, Automatic reclosing	
Communication protocols for 7SC80 controller	IEC 61850 + DNP3 TCP	IEC 61850 + IEC 60870-5-104	

R-HG11-385.tif

Control cubicle with controller 7SC80

R-HG11-317.eps

Switch unit design 27

R-HG11-326.eps

Pole mounting frame (different designs available)

Contents Page

Product Selection **23**

Ordering data and configuration example 24

Selection of primary ratings:
Voltage level 12 kV 25
Voltage level 15.5 kV 25
Voltage level 24 kV 25
Voltage level 27 kV 26
Voltage level 38 kV 26

Selection of controller:
Recloser configuration 27
Current and voltage measuring 27
Controller size 28
Auxiliary voltage for heaters and control 28
Control and sensor cables 28
Communication protocols 29
Communication interfaces 29
Protection and monitoring functions 30
Languages 30

Selection of additional equipment 31

Additional components for increased performance 33

2

Order number structure

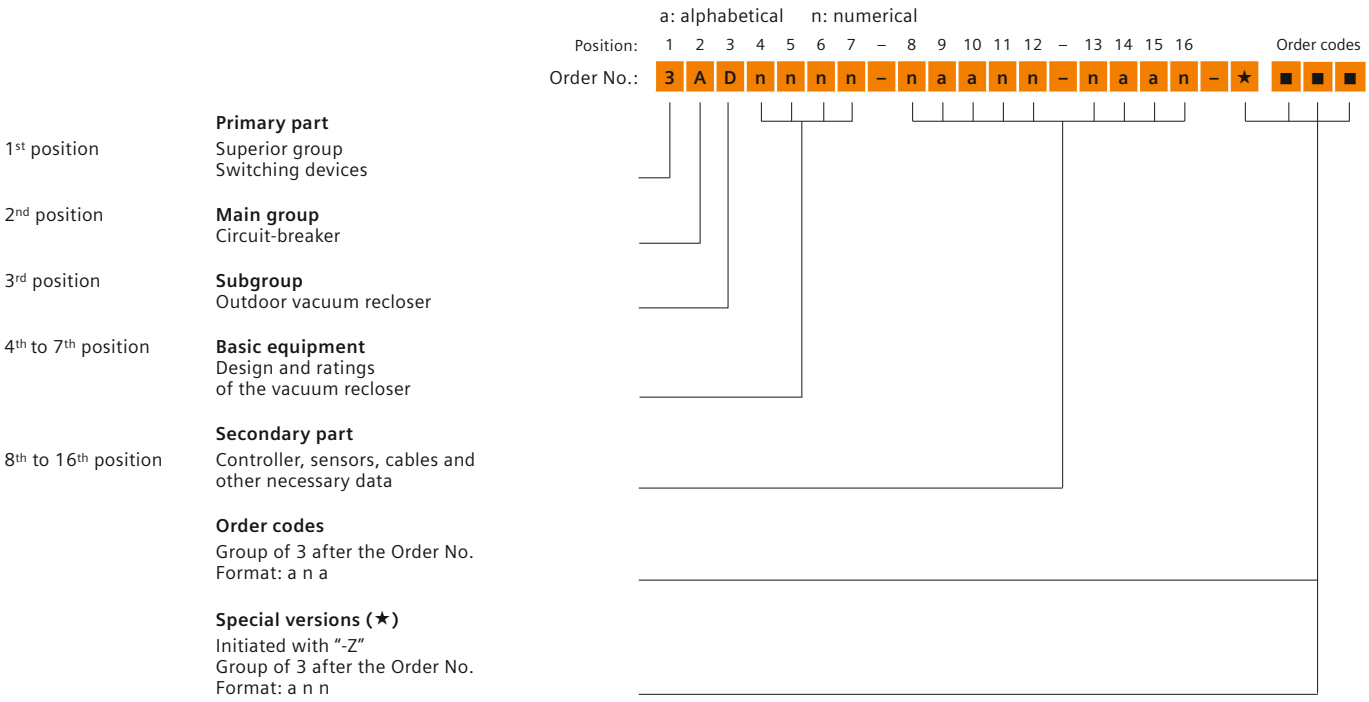
The vacuum reclosers consist of a primary part as well as of a controller or secondary part. The relevant data make up the 16-digit order number. The primary part covers the main electrical data of the circuit-breaker poles. The controller and secondary part covers all auxiliary devices and the controller, 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 31) 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 D 3 2 3 2 – ■ ■ ■ ■ ■ – ■ ■ ■ ■
Order codes:





12 kV

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16		Order codes
Order No.:	3	A	D	■	■	■	■	–	■	■	■	■	■	–	■	■	■	■	–	★	■ ■ ■

Rated voltage U_r kV	Rated lightning impulse withstand voltage U_p kV	Rated short-duration power-frequency withstand voltage U_d kV	Rated short-circuit breaking current I_{sc} kA	Rated normal current I_r A	Three-phase	Single-phase																
															See page 27	See page 27	See page 28	See page 28	See page 28	See page 29	See page 29	See page 30	See page 30	See page 31
12	75	28	12.5	**200**	■		3	A	D	3	1	2	6											
				400	■		3	A	D	3	1	2	1											
				630	■		3	A	D	3	1	2	2											
				800	■		3	A	D	3	1	2	3											
			16	**630**	■		3	A	D	3	1	3	2											
				800	■		3	A	D	3	1	3	3											
12			12.5	**400**		■	3	A	D	1	1	2	1											
				630		■	3	A	D	1	1	2	2											
				800		■	3	A	D	1	1	2	3											
			16	**630**		■	3	A	D	1	1	3	2											
				800		■	3	A	D	1	1	3	3											

15.5 kV

U_r kV	U_p kV	U_d kV	I_{sc} kA	I_r A																				
15.5	110	50	12.5	**200**	■		3	A	D	3	2	2	6											
				400	■		3	A	D	3	2	2	1											
				630	■		3	A	D	3	2	2	2											
				800	■		3	A	D	3	2	2	3											
			16	**630**	■		3	A	D	3	2	3	2											
				800	■		3	A	D	3	2	3	3											
15.5			12.5	**400**		■	3	A	D	1	2	2	1											
				630		■	3	A	D	1	2	2	2											
				800		■	3	A	D	1	2	2	3											
			16	**630**		■	3	A	D	1	2	3	2											
				800		■	3	A	D	1	2	3	3											

24 kV

U_r kV	U_p kV	U_d kV	I_{sc} kA	I_r A																				
24	125	50	12.5	**200**	■		3	A	D	3	6	2	6											
				400	■		3	A	D	3	6	2	1											
				630	■		3	A	D	3	6	2	2											
				800	■		3	A	D	3	6	2	3											
			16	**630**	■		3	A	D	3	6	3	2											
				800	■		3	A	D	3	6	3	3											
24			12.5	**200**		■	3	A	D	1	6	2	6											
				400		■	3	A	D	1	6	2	1											
				630		■	3	A	D	1	6	2	2											
				800		■	3	A	D	1	6	2	3											
			16	**630**		■	3	A	D	1	6	3	2											
				800		■	3	A	D	1	6	3	3											

Configuration example
Siemens vacuum recloser 3AD
Rated voltage U_r = **15.5 kV**
Rated lightning impulse withstand voltage U_p = **110 kV**
Rated short-duration power-frequency withstand voltage U_d = **50 kV**
Rated short-circuit breaking current I_{sc} = **16 kA**
Rated normal current I_r = **630 A**
Type: Three-phase

	3	A	D																					
				3	2	3	2																	
Example for Order No.:	3	A	D	3	2	3	2	–	■	■	■	■	■	–	■	■	■	■			■	■	■
Order codes:																								

Product Selection

Selection of primary ratings





27 kV

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16		Order codes		
Order No.:	3	A	D	■	■	■	■	–	■	■	■	■	■	–	■	■	■	■	–	★	■	■	■

Rated voltage U_r kV	Rated lightning impulse withstand voltage U_p kV	Rated short-duration power-frequency withstand voltage U_d kV	Rated short-circuit breaking current I_{sc} kA	Rated normal current I_r A	Three-phase	Single-phase																		
									See page 27	See page 27	See page 28	See page 28	See page 28		See page 29	See page 29	See page 30	See page 30		See page 31				
27	125	60	12.5	**200**	■		3	A	D	3	3	2	6											
				400	■		3	A	D	3	3	2	1											
				630	■		3	A	D	3	3	2	2											
				800	■		3	A	D	3	3	2	3											
			16	**630**	■		3	A	D	3	3	3	2											
				800	■		3	A	D	3	3	3	3											
	150	70	12.5	**630**	■		3	A	D	3	4	2	2											
				800	■		3	A	D	3	4	2	3											
			16	**630**	■		3	A	D	3	4	3	2											
				800	■		3	A	D	3	4	3	3											
	125	60	12.5	**200**		■	3	A	D	1	3	2	6											
				400		■	3	A	D	1	3	2	1											
				630		■	3	A	D	1	3	2	2											
				800		■	3	A	D	1	3	2	3											
			16	**630**		■	3	A	D	1	3	3	2											
				800		■	3	A	D	1	3	3	3											

38 kV

U_r kV	U_p* kV	U_d* kV	I_{sc} kA	I_r A																				
38	170	70	12.5	**630**	■		3	A	D	3	5	2	2											
				800	■		3	A	D	3	5	2	3											
			16	**630**	■		3	A	D	3	5	3	2											
				800	■		3	A	D	3	5	3	3											

* Values for up to U_p = 195 kV and U_d = 95 kV on request

Configuration example

Siemens vacuum recloser 3AD

Rated voltage U_r = **27 kV**

Rated lightning impulse withstand voltage U_p = **125 kV**

Rated short-duration power-frequency withstand voltage U_d = **60 kV**

Rated short-circuit breaking current I_{sc} = **12.5 kA**

Rated normal current I_r = **400 A**

Type: Three-phase

	3	A	D																					
				3	3	2	1																	
Example for Order No.:	3	A	D	3	3	2	1	–	■	■	■	■	■	–	■	■	■	■						
Order codes:																								





8th position
Recloser configuration

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16		Order codes		
Order No.:	3	A	D	■	■	■	■	–	■	■	■	■	■	–	■	■	■	■	–	★	■	■	■
Options											See page 28	See page 28	See page 28		See page 29	See page 29	See page 30	See page 30		See page 31			
Recloser for pole mounting [1] incl. control cubicle and controller									1														
Recloser for substation application incl. control cubicle and controller [1]									2														
Switch unit only (w/o cubicle, controller and control cable) [2]									3		Y		0		0	Y	Y						
Control cubicle only (no cables included)						0	0		4				0										

1) Mounting according to list of accessories
2) Configuration via 4th to 7th position

9th position
Current and voltage measuring

Current transformers 1 integrated CT per pole	Voltage sensors 1 integrated sensor per pole (including sensor cables)																					
■										A												
■	■									B												

2

Configuration example

Siemens vacuum recloser 3AD
(**U_r = 27 kV**, **U_p = 125 kV**, **U_d = 60 kV**, **I_{sc} = 12.5 kA**, **I_r = 400 A**)
Type: Three-phase
Recloser for pole mounting incl. control cubicle and controller
Current and voltage measuring: Current transformers, 1 integrated CT per pole

Example for Order No.:	3	A	D	3	3	2	1	–	1	A	■	■	■	–	■	■	■	■				
Order codes:																						

Product Selection

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		
Order No.:	3	A	D	■	■	■	■	–	■	■	■	■	■	–	■	■	■	■	–	★	■	■	■

Controller size		Function keys		Number of tri-color LEDs	Number of two-color LEDs	Number of binary inputs (partly for customer use)					Number of binary outputs (partly for customer use)				See page 29	See page 29	See page 30	See page 30	See page 31			
E10*	E12**	10	12	8	16	32	12	13	23	33	43	8	14	22	30								
7SR224																							
■			■	■				■					■								A			T 9 7
■			■	■					■					■							B			T 9 7
■			■	■						■			■								C			T 9 7
	■		■		■					■					■						D			T 9 7
	■		■		■						■			■							E			T 9 7
	■		■		■					■			■								H			T 9 7
For loop automation																								
■			■	■					■					■				■			F			T 9 7
■			■	■				■					■					■			G			T 9 7
Without controller																					Y		0	0 Y Y T 9 7
7SC80																								
		■				■	■					■									M			

* 10″ (inches) ** 12″ (inches)

11th position
Auxiliary voltage for heaters and control

DC voltage (DC option, without internal batteries)	AC voltage	
110 V		3
220 V		4
	110 V/120 V	5
	220 V/240 V	6

12th position
Control and sensor cables

Options	
Without	0
Cable length 6 m	1
Cable length 9 m	2
Cable length 3 m	3
Cable length 12 m	4
Cable length 15 m	5
Cable length 20 m	6
Cable length 25 m	7
Other length (specified text needed) [1]	9 M 1 Y

1) On request

Configuration example

Siemens vacuum recloser 3AD
(U_r = **27 kV**, U_p = **125 kV**, U_d = **60 kV**, I_{sc} = **12.5 kA**, I_r = **400 A**)
Type: Three-phase
Controller size: E12, 12 function keys, 16 tri-color LEDs, 33 binary inputs, 30 binary outputs
Auxiliary voltage for heaters and control 110 V/120 V AC
Length of control and sensor cable 6 m

Example for Order No.:	3	A	D	3	3	2	1	–	1	A	D	5	1	–	■	■	■	■						
Order codes:																								

Product Selection
Selection of controller





13th position
Communication protocols

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16	–		Order codes		
Order No.:	3	A	D	■	■	■	■	–	■	■	■	■	■	–	■	■	■	■	–	★	■	■	■
Options																	See page 30	See page 30		See page 31			
7SR224 controller																							
IEC 60870-5-103, MODBUS RTU, DNP 3-serial (1 out of 3)															2	A							
IEC 60870-5-103, MODBUS RTU, DNP 3-serial (2 out of 3)															2	B C D							
IEC 60870-5-103, IEC 60870-5-101, MODBUS RTU (2 out of 3)															3	D							
IEC 60870-5-104 (with additional protocol converter 1703eMic) (Included power supply 24 V, 5 W available for other purposes)															4	A							
IEC 60870-5-104 (with additional protocol converter 1703eMic) and IEC 60870-5-101 or IEC 60870-5-103 (included power supply 24 V, 5 W available for other purposes)															4	C D							
IEC 60870-5-101, IEC 60870-5-103, MODBUS RTU, DNP 3.0 (1 out of 4) and IEC 61850 (incl. Ethernet interface) [1]															8	F G							
7SC80 controller																							
IEC 61850 + DNP3 TCP											M				6								
IEC 61850 + IEC 60870-5-104											M				7								

1) Additional configuration tool needed (DIGSI upgrade 7XS5460-0AA00 or new license DIGSI: 7XS5461-0AA00) for IEC 61850 communication REYDISP remains for base engineering

14th position
Communication interfaces

	1 x 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 Ethernet RJ45 (rear)	2 x fibre optical Ethernet ST-type (rear)	100 Mbit Ethernet, 2 x RJ45 connector	100 Mbit Ethernet, optical 2 x LC connectors													
7SR224 controller																							
	■	■														A							
	■	■			■	■										B							
	■	■	■		■											C							
	■	■		■	■											D							
	■	■					■				A C G				8	F							
	■	■						■			A C G				8	G							
7SC80 controller																							
	■								■		M					M							
	■									■	M					N							

Configuration example

Siemens vacuum recloser 3AD
(U_r = **27 kV**, U_p = **125 kV**, U_d = **60 kV**, I_{sc} = **12.5 kA**, I_r = **400 A**)
Type: Three-phase
Communication protocol IEC 60870-5-103, MODBUS RTU, DNP 3-serial (2 out of 3)
Communication interfaces 1 x USB, 2 x RS485, 1 x IRIG-B

	3	A	D																				
				3	3	2	1	–	1	A	D	5	1	–									
															2								
																C							
Example for Order No.:	3	A	D	3	3	2	1	–	1	A	D	5	1	–	2	C	■	■					
Order codes:																							

2

Product Selection

Selection of controller





15th position

Protection and monitoring functions

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16		Order codes		
Order No.:	3	A	D	■	■	■	■	–	■	■	■	■	■	–	■	■	■	■	–	★	■	■	■
Controller functions																				See page 31			
7SR224																							
Standard protection and monitoring functions																	A						
Standard protection and monitoring functions for loop automation										B							D						
Standard protection and monitoring functions for synchronous connection										B							E						
Standard protection and monitoring functions plus: Single-phase/three-phase automatic reclosing with synchronizing function																	F						
7SC80																							
Standard protection and monitoring functions with automatic reclosing											M						M						
Standard protection and monitoring functions + direction determination overcurrent, phase and ground + voltage protection + automatic reclosing										B	M						N						
Standard protection and monitoring functions + direction determination overcurrent phase and ground + voltage protection + automatic reclosing (AR) + fault locator										B	M						Q						

16th position

Languages

Languages of operating instructions and nameplate																							
English																		2					
Spanish																		3					
Portuguese											2)							4					
German											M							6					
Other languages (specified text needed) 1)																		9			R	1	Y

1) On request

2) Not in combination with 10th position = "M"

Configuration example

Siemens vacuum recloser 3AD	3	A	D																				
(U_r = **27 kV**, U_p = **125 kV**, U_d = **60 kV**, I_{sc} = **12.5 kA**, I_r = **400 A**)																							
Type: Three-phase				3	3	2	1	–	1	A	D	5	1	–	2	C							
Controller 7SR224 with standard protection and monitoring functions																	A						
Language of operating instructions and nameplate: English																		2					
Example for Order No.:	3	A	D	3	3	2	1	–	1	A	D	5	1	–	2	C	A	2					
Order codes:																							

Selection of additional equipment

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16			Order codes		
Order No.:	3	A	D	■	■	■	■	–	■	■	■	■	■	–	■	■	■	■	–	★	■	■	■
Switch unit options																							
Cable connector (2-hole Nema pad)																			–	Z	T	8	0
Stainless-steel design																			–	Z	T	0	1
Position indicators with interchanged colors																			–	Z	T	0	7
Capacitor bank switching																			–	Z	T	6	3
General options for control cubicles (7SR224 and 7SC80)																							
Ambient air temperature up to –40 °C																			–	Z	A	3	8
Protective cover for cubicle connectors (vandalism protection)																			–	Z	T	0	8
"Door open" contact and cubicle lighting																			–	Z	T	1	0
Stainless-steel design																			–	Z	T	0	1
24 V power output (max. 15 W) for additional devices																			–	Z	T	5	3
12 V power output (max. 15 W) for additional devices																			–	Z	T	5	4
48 V power output (max. 15 W); if T53/T54 is not chosen, then 48 V power output is mounted																							
Power outlet German SCHUKO standard																			–	Z	T	1	1
Power outlet British standard																			–	Z	T	1	2
Power outlet Australian/New Zealand standard																			–	Z	T	1	3
Customer-specific wiring inside the cubicle																			–	Z	T	9	8
Options for control cubicle T97 (7SR224 controller)																							
Power outlet standard (US style); if T11/T12/T13 is not chosen, then US style power outlet is mounted																							
Serial to Ethernet converter																			–	Z	T	0	3
Bluetooth modem																			–	Z	T	4	3
Quadband GPRS/GSM modem																			–	Z	T	4	4
Preparation for installing customer modem (modem not included)																			–	Z	T	4	5
Key-operated switch in control cubicle, programmable function																			–	Z	T	5	1
CT test disconnect terminals (6 nos.)																			–	Z	T	5	6

Configuration example

Siemens vacuum recloser 3AD	3	A	D																				
Rated voltage U_r = **27 kV**																							
Rated lightning impulse withstand voltage U_p = **125 kV**																							
Rated short-duration power-frequency withstand voltage U_d = **60 kV**																							
Rated short-circuit breaking current I_{sc} = **12.5 kA**																							
Rated normal current I_r = **400 A**																							
Type: Three-phase				3	3	2	1	–															
Recloser for pole mounting incl. control cubicle and controller									1														
Current and voltage measuring: Current transformers, 1 CT integrated per pole										A													
Controller size: E12, 12 function keys, 16 tri-color LEDs, 33 binary inputs, 30 binary outputs											D												
Auxiliary voltage for heaters and control 110 V/120 V AC												5											
Length of control and sensor cable 6 m													1	–									
Communication protocol IEC 60870-5-103, MODBUS RTU, DNP 3-serial (2 out of 3)															2								
Communication interfaces 1 x USB, 2 x RS485, 1 x IRIG-B																C							
Controller with standard protection and monitoring functions																	A						
Language of operating instructions and nameplate: English																		2					
"Door open" contact and cubicle lighting																			–	Z	T	1	0
Stainless steel for switch unit and control cubicle																			–	Z	T	0	1
Example for Order No.:	3	A	D	3	3	2	1	–	1	A	D	5	1	–	2	C	A	2	–	Z			
Order codes:	T	1	0	+	T	0	1																

Selection of additional equipment

Position:	1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16			Order codes		
Order No.:	3	■	■	■	■	■	■	–	■	■	■	■	■	–	■	■	■	■	–	★	■	■	■
CC related equipment																							
One set of batteries, 4 nos. for control cubicle	3	A	X	1	3	0	0	–	4	E													
Capacitor board (Recloser Design 27)	3	A	X	1	3	0	0	–	4	C													
Capacitor board (Recloser Design 38)	3	A	X	1	3	0	0	–	4	J													
Switch Unit Driver SUD-V2/3 with modem supply 48 V (Recloser Design 27+38)	3	A	X	1	3	0	0	–	4	K													
Switch Unit Driver SUD-V2/3 with modem supply 24 V (Recloser Design 27+38)	3	A	X	1	3	0	0	–	4	L													
Switch Unit Driver SUD-V2/3 with modem supply 12 V (Recloser Design 27+38)	3	A	X	1	3	0	0	–	4	M													
Power supply (battery charger) Power One	3	A	X	1	3	0	0	–	4	H													
USB cable for parametrizing controller 7SR224 or 7SC80	3	A	X	1	3	0	1	–	4	L													
Mounting accessories																							
Preparation for ring-core CT supplement	3	A	D																–	Z	T	6	0
Voltage transformer for internal supply of recloser (as required)																							
Bird protection set (per phase for upper and lower terminal, recloser design 27)	3	A	X	1	3	0	0	–	5	N													
Bird protection set (per phase for upper and lower terminal, recloser design 38)	3	A	X	1	3	0	0	–	5	P													
Surge arrester	3	E	K	4/7																			
Connection material																							
Cable connector: Nema Pad (1 no.)	3	A	X	1	3	0	0	–	5	U													
Cable connector: 2-hole Nema pad (2 nos.)	3	A	X	1	3	0	0	–	5	E													
Assembly kit for pole mounting frame (threaded rod + nuts)	3	A	X	1	3	0	0	–	5	C													
Pole mounting frames																							
Pole mounting frame type F with provision for surge arresters (Design 27)	3	A	X	1	3	0	1	–	5	F													
Pole mounting frame type B with provision for surge arresters (Design 38)	3	A	X	1	3	0	1	–	5	B													
Pole mounting frame for 1 no. voltage transformer (internal supply of recloser)	3	A	X	1	3	0	0	–	5	L													
Pole mounting frame for 3 nos. voltage transformers	3	A	X	1	3	0	0	–	5	M													
Mounting frame for upright installation up to 27 kV	3	A	X	1	3	0	1	–	5	H													
Pole mounting kit for ring-core CT	3	A	X	1	3	0	0	–	5	K													
Mounting frames for substation application																							
Mounting frame for substation application up to 27 kV for switch unit, control cubicle and surge arresters	3	A	X	1	3	0	0	–	5	V													
Mounting frame for substation application up to 38 kV for switch unit and control cubicle	3	A	X	1	3	0	0	–	5	Q													
Mounting frame for substation application up to 38 kV for switch unit, control cubicle and surge arresters	3	A	X	1	3	0	0	–	5	R													
Equipment for external signal connection																							
KEG238 terminal lug for outdoor current transformer VZF/VZE	3	A	X	1	3	0	0	–	2	A													
Ring-core CT for SEF (Sensitive Earth Fault) 1A (in combination with T60)	3	A	X	1	3	0	0	–	2	B													

Configuration example

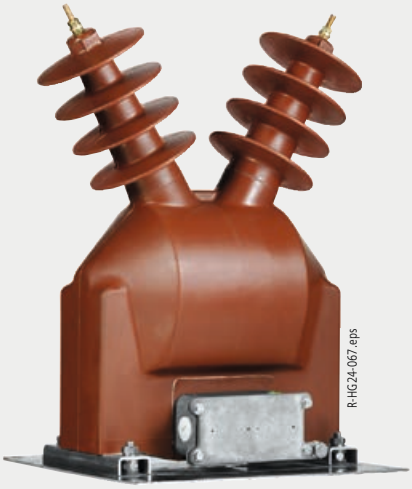
Siemens vacuum recloser 3AD	3	A	D																				
Rated voltage U_r = **27 kV**																							
Rated lightning impulse withstand voltage U_p = **125 kV**																							
Rated short-duration power-frequency withstand voltage U_d = **60 kV**																							
Rated short-circuit breaking current I_{sc} = **12.5 kA**																							
Rated normal current I_r = **400 A**																							
Type: Three-phase				3	3	2	1	–															
Recloser for pole mounting incl. control cubicle and controller									1														
Current and voltage measuring: Current transformers, 1 CT integrated per pole										A													
Controller size: E12, 12 function keys, 16 tri-color LEDs, 33 binary inputs, 30 binary outputs											D												
Auxiliary voltage for heaters and control 110 V/120 V AC												5											
Length of control and sensor cable 6 m													1	–									
Communication protocol IEC 60870-5-103, MODBUS RTU, DNP 3-serial (2 out of 3)															2								
Communication interfaces 1 x USB, 2 x RS485, 1 x IRIG-B																C							
Controller with standard protection and monitoring functions																	A						
Language of operating instructions and nameplate: English																		2					
"Door open" contact and cubicle lighting																			–	Z	T	1	0
Stainless steel for switch unit and control cubicle																			–	Z	T	0	1
Example for Order No.:	3	A	D	3	3	2	1	–	1	A	D	5	1	–	2	C	A	2	–	Z			
Order codes:	T	1	0	+	T	0	1																

Instrument transformers

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

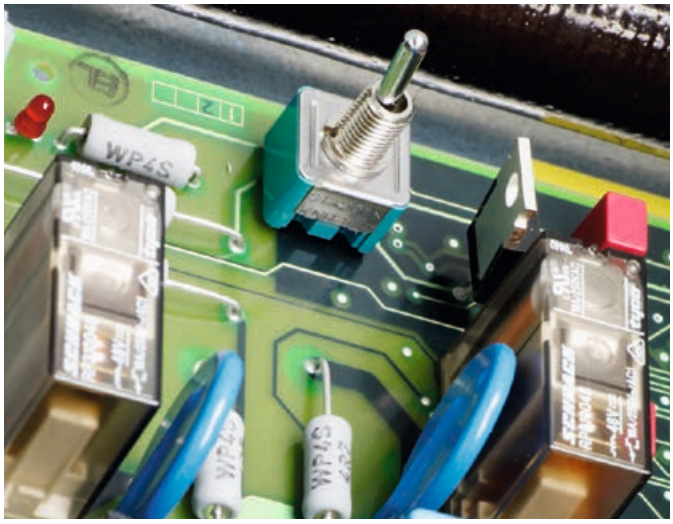
Surge arresters and limiters

Surge arresters and limiters 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.



2

R-HG11-339.tif



R-HG11-314.tif

Switch unit driver – discharge switch for the capacitor

R-HG11-328.tif

Controller 7SR224

R-HG11-383.tif

Controller 7SC80

Contents | Page

Technical Data **35**

Electrical data, dimensions and weights:
Voltage level 12 kV 36
Voltage level 15.5 kV 36
Voltage level 24 kV 37
Voltage level 27 kV 38
Voltage level 38 kV 39

Dimension drawings 40

3

12 kV Order No.	Rated normal current I_r A	Rated operating sequence: O - 0.2s - CO - 2s - CO - 2s - CO (-30s - CO) - Lockout ** 	Rated duration of short-circuit t_k s	Rated short-circuit breaking current I_{sc} kA	Rated short-circuit making current I_{ma} kA	Rated lightning impulse withstand voltage * U_p kV	Rated short-duration power-frequency withstand voltage * U_d kV	Impedance µΩ between connections µΩ	Creepage distance, phase-to-earth mm	Clearance, phase-to-phase mm	Minimum clearance, phase-to-earth mm	Weight kg	Line charging current A	Cable charging current A	Max. interrupting time / max.closing time ms
3AD3 126 ...	200	■	3	12.5	31.5	75	28	40	810	312	265	120	2	10	50/60
3AD3 121 ...	400	■	3	12.5	31.5	75	28	40	810	312	265	120	2	10	50/60
3AD3 122 ...	630	■	3	12.5	31.5	75	28	40	810	312	265	120	2	10	50/60
3AD3 123 ...	800	■	3	12.5	31.5	75	28	40	810	312	265	120	2	10	50/60
3AD3 132 ...	630	■	3	16	40	75	28	40	810	312	265	120	2	10	50/60
3AD3 133 ...	800	■	3	16	40	75	28	40	810	312	265	120	2	10	50/60
3AD1 121 ...	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 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 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 232 ...	630	■	3	16	40	110	50	40	840	n.a.	265	65	2	10	50/60
3AD1 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

n.a. = not applicable

24 kV Order No.	Rated normal current I_r A	Rated operating sequence: O - 0.2s - CO - 2s - CO - 2s - CO (-30s - CO) - Lockout ** 	Rated duration of short-circuit t_k s	Rated short-circuit breaking current I_{sc} kA	Rated short-circuit making current I_{ma} kA	Rated lightning impulse withstand voltage * U_p kV	Rated short-duration power-frequency withstand voltage * U_d kV	Impedance µΩ between connections µΩ	Creepage distance, phase-to-earth mm	Clearance, phase-to-phase mm	Minimum clearance, phase-to-earth mm	Weight kg	Line charging current A	Cable charging current A	Max. interrupting time / max.closing time 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 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

n.a. = not applicable

3

27 kV Order No.	Rated normal current I_r A	Rated operating sequence: O - 0.2s - CO - 2s - CO - 2s - CO (-30s - CO) - Lockout ** 	Rated duration of short-circuit t_k s	Rated short-circuit breaking current I_{sc} kA	Rated short-circuit making current I_{ma} kA	Rated lightning impulse withstand voltage U_p kV	Rated short-duration power-frequency withstand voltage U_d kV	Impedance µΩ between connections µΩ	Creepage distance, phase-to-earth mm	Clearance, phase-to-phase mm	Minimum clearance, phase-to-earth mm	Weight kg	Line charging current A	Cable charging current A	Max. interrupting time/max.closing time 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 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 422 ...	630	■	3	12.5	31.5	150	70	50	1290	312	340	160	5	25	50/60
3AD3 423 ...	800	■	3	12.5	31.5	150	70	50	1290	312	340	160	5	25	50/60
3AD3 432 ...	630	■	3	16	40	150	70	40	1290	312	340	160	5	25	50/60
3AD3 433 ...	800	■	3	16	40	150	70	40	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 332 ...	630	■	3	16	40	125	60	40	840	n.a.	265	65	5	25	50/60
3AD1 333 ...	800	■	3	16	40	125	60	40	840	n.a.	265	65	5	25	50/60

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

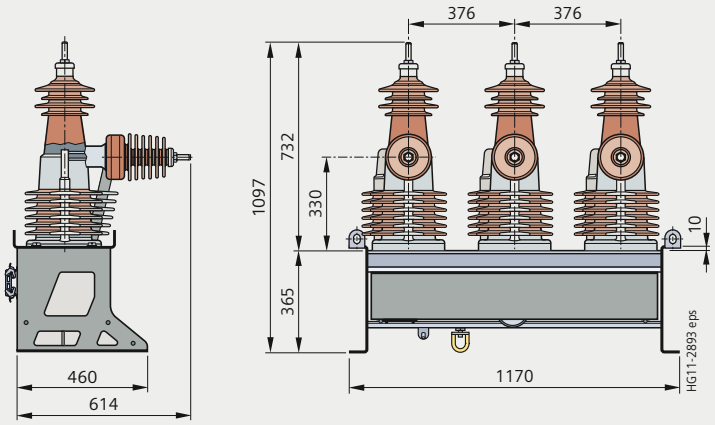
n.a. = not applicable

3

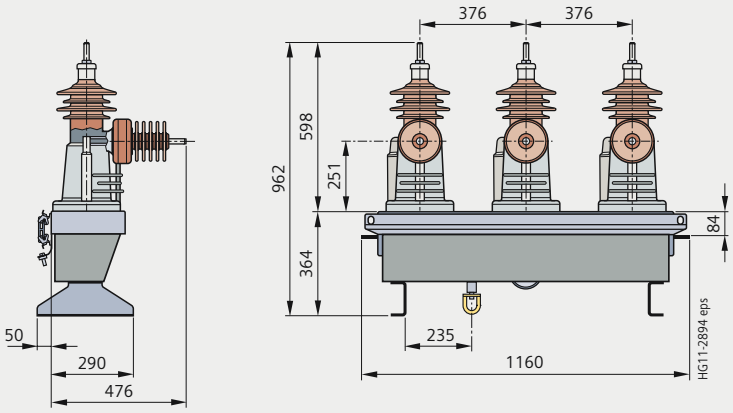
38 kV*	Rated normal current	Rated operating sequence: O - 0.2s - CO - 2s - CO - 2s - CO (-30s - CO) - Lockout **	Rated duration of short-circuit	Rated short-circuit breaking current	Rated short-circuit making current	Rated lightning impulse withstand voltage	Rated short-duration power-frequency withstand 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
	I_r		t_k	I_{sc}	I_{ma}	U_p	U_d								
Order No.	A		s	kA	kA	kV	kV	µΩ	mm	mm	mm	kg	A	A	ms
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 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

■ Standards according to IEC 62271-100 and IEEE C37.60
* Values for up to U_p = 195 kV and U_d = 95 kV on request
** Other operating sequences on request

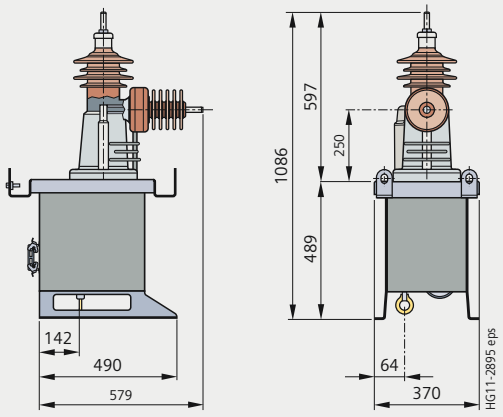
Dimension drawings



Dimensions of three-phase switch unit, design 38



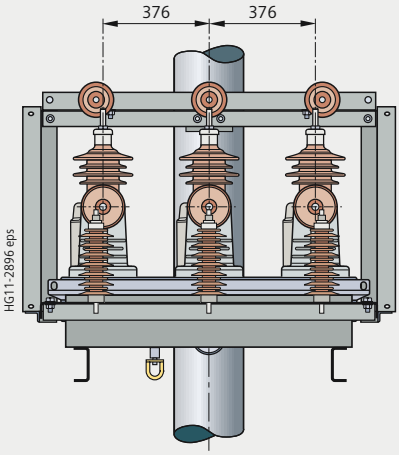
Dimensions of three-phase switch unit, design 27

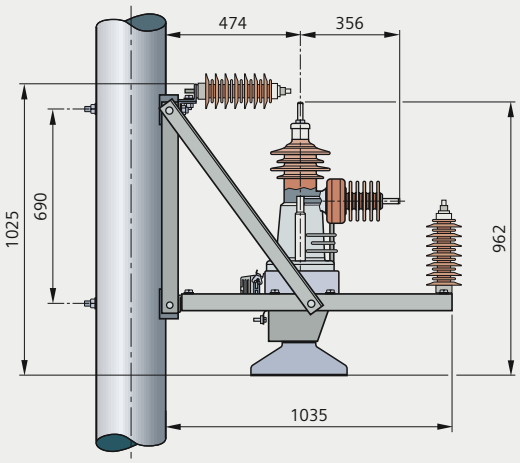


Dimensions of single-phase switch unit

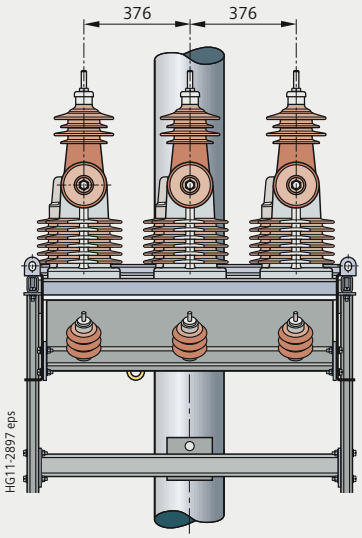
3

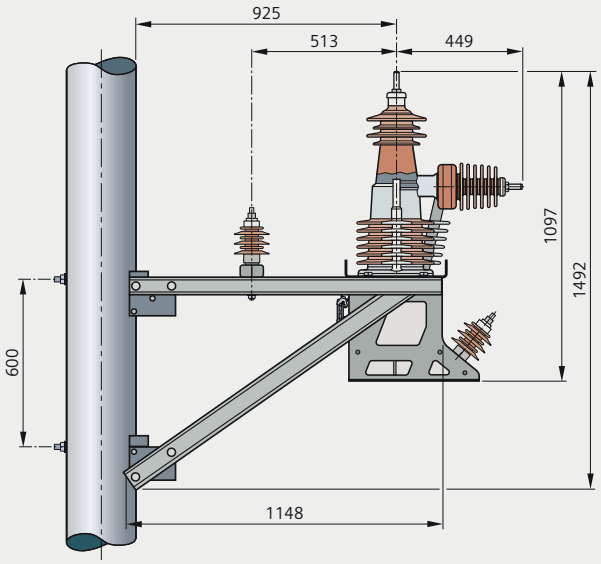
Dimension drawings



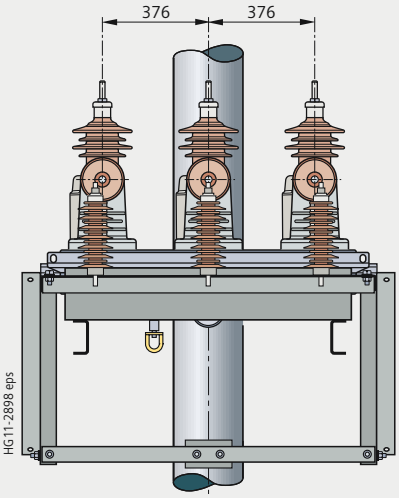


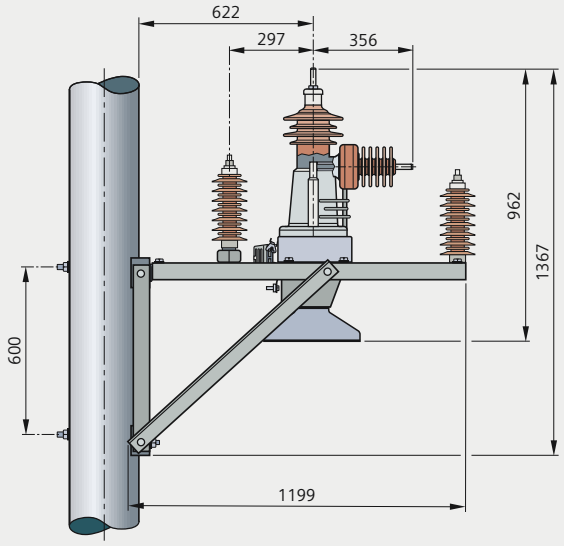
Mounting frame type F (design 27)





Mounting frame type B (design 38)

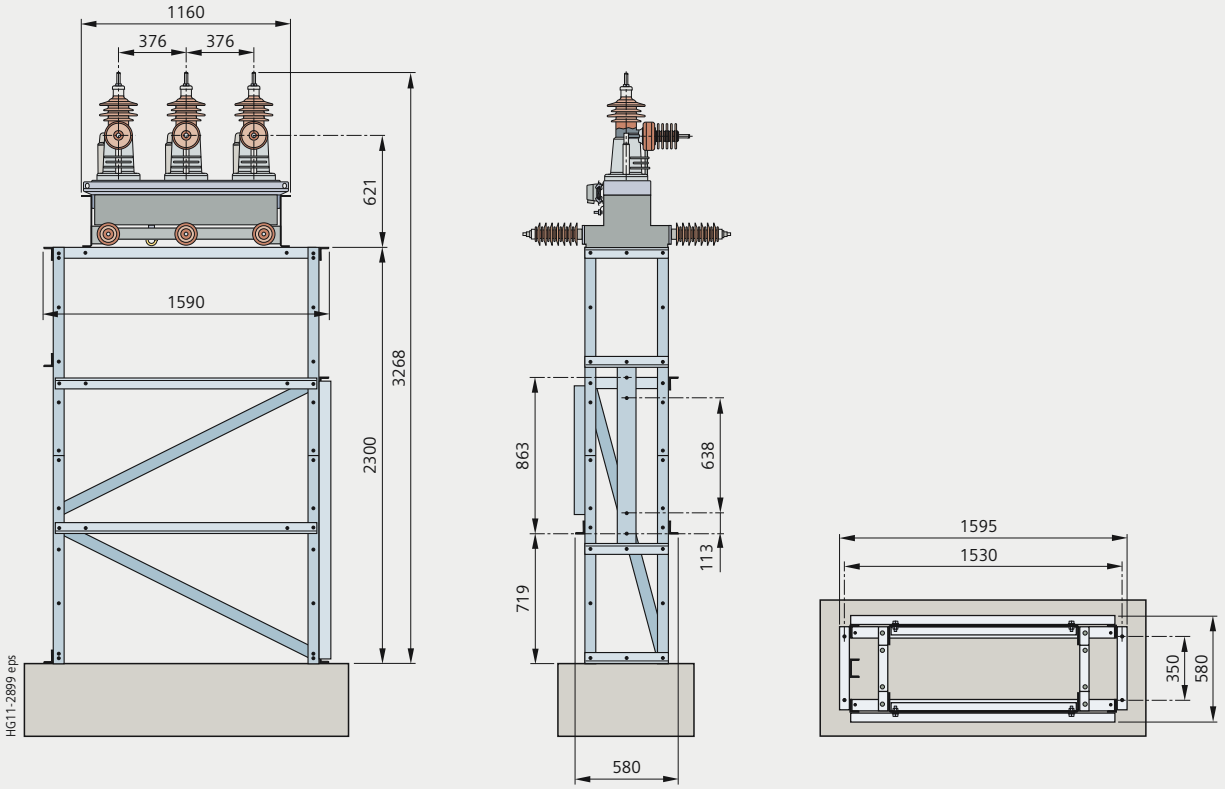




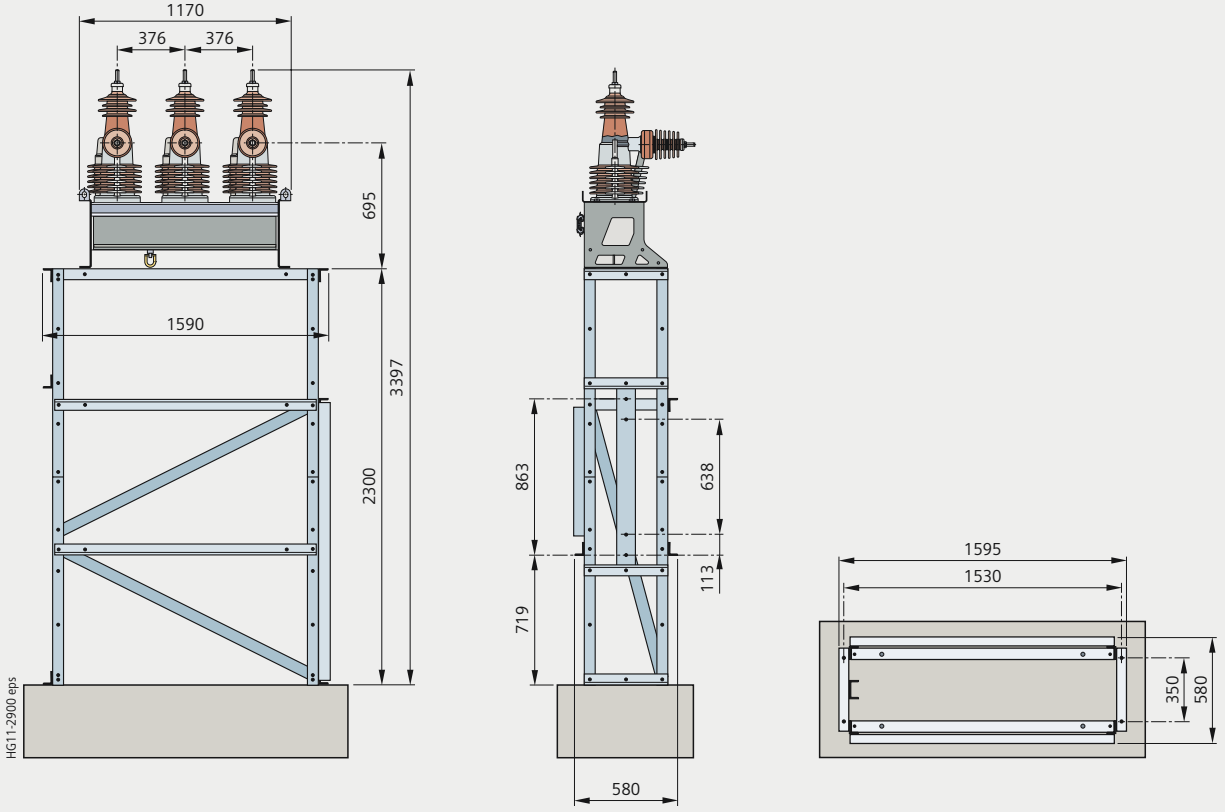
Mounting frame type E (design 27)

3

Dimension drawings

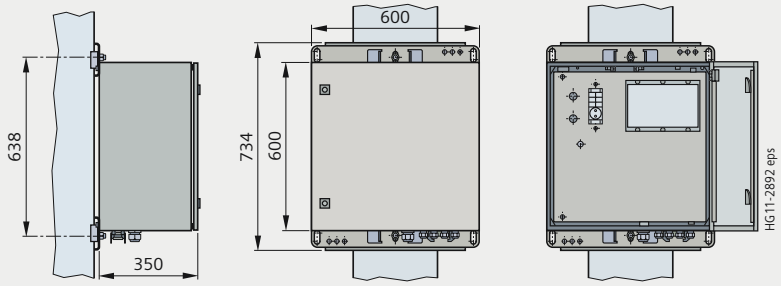


Mounting frame for substation application (design 27)



Mounting frame for substation application (design 38)

Dimension drawings



Dimensions of control cubicle (T96 and T97)

R-HG11-181.tif

R-HG11-180.eps

Switchgear Factory in Berlin, Germany

Contents | Page

Annex 45

Inquiry form 46
Configuration instructions 47
Configuration aid Foldout page

4

Annex
Inquiry form

Please copy, fill in and return to your Siemens partner

Inquiry concerning

☐ Siemens vacuum recloser 3AD

Please

☐ Submit an offer
☐ Call us
☐ Visit us

Your address

Company

Dept.

Name

Street

Postal code / city

Country

Phone

Fax

E-mail

Siemens AG

Dept.

Name

Street

Postal code / city

Fax

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 ☐ 195 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 27 to 29

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 only)	☐ Control cubicle 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 ☐ 20 m	☐ 9 m ☐ 25 m	☐ 12 m ☐ ___ m
Communication interfaces	☐ USB	☐ ST-type	☐ Ethernet ST-type	☐ RS485	☐ RS232
	☐ Optical	☐ RJ45 100 Mbit	☐ LC 100 Mbit	☐ IRIG-B	☐ RJ45
Protection and monitoring functions additional to standard functions	☐ Synchronizing, synchronizing check	☐ Fault locator	☐ Loop automation		
Languages of operating instructions and nameplate	☐ English (USA) ☐ German	☐ Spanish	☐ Portuguese		

Application and other requirements

☐ Please check off ___ Please fill in

You prefer to configure your Siemens vacuum recloser 3AD on your own?

Please follow the steps for configuration and enter the order number in the configuration aid.

Instruction for configuration of the Siemens vacuum recloser 3AD

1st step: Definition of the primary part (see pages 25 and 26)

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 195 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_r: 200 A to 800 A

* On request

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

2nd step: Definition of the secondary equipment (see pages 27 to 30)

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 31)

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.

For configuration of your
Siemens vacuum recloser 3AD

1	2	3	4	5	6	7	–	8	9	10	11	12	–	13	14	15	16		
3	A	D	■	■	■	■	–	■	■	■	■	■	–	■	■	■	■	–	Z
			See page 25	to		See page 27		See page 27	See page 27	See page 28	See page 28	See page 28		See page 29	See page 29	See page 30	See page 30		See page 31
3	A	D					–						–						
				+				+				+				+			
				+				+				+				+			
3	A	D					–						–						
				+				+				+				+			
				+				+				+				+			
3	A	D					–						–						
				+				+				+				+			
				+				+				+				+			
3	A	D					–						–						
				+				+				+				+			
				+				+				+				+			
3	A	D					–						–						
				+				+				+				+			
				+				+				+				+			
3	A	D					–						–						
				+				+				+				+			
				+				+				+				+			
3	A	D					–						–						
				+				+				+				+			
				+				+				+				+			
3	A	D					–						–						
				+				+				+				+			
				+				+				+				+			

R-HG11-182.tif

Published by
Siemens AG

Energy Management
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

Article No. EMMS-K1511-A421-A4-7600
Printed in Germany
Dispo 30405
PU 14/71889 KG 01163.0

www.siemens.com/recloser