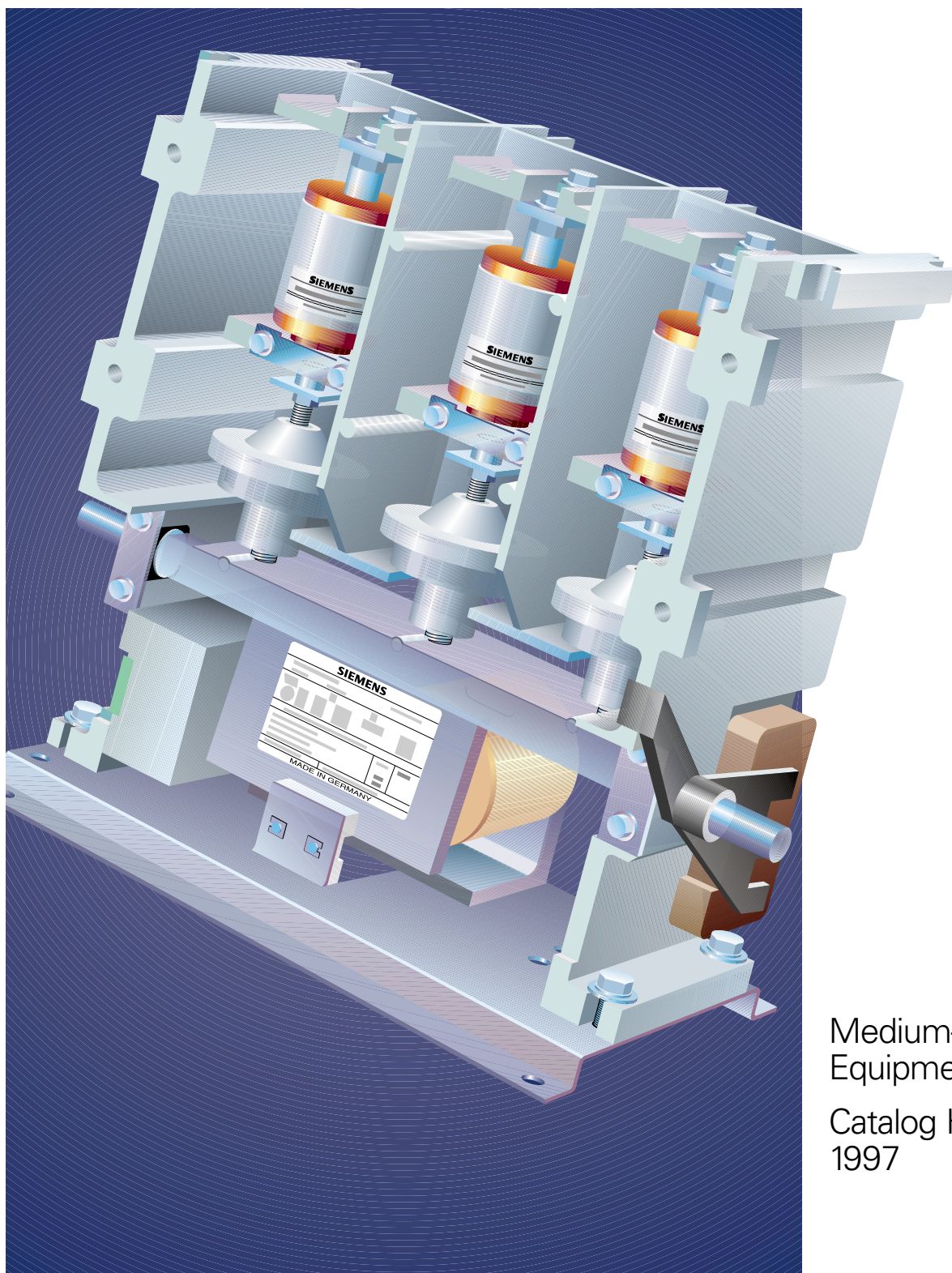


# SIEMENS

## 3TL Vacuum Contactors



Medium-Voltage  
Equipment

Catalog HG 11.21  
1997

# EONet

THE INTERNATIONAL CERTIFICATION NETWORK

This is to state that

**Siemens AG**  
Power Transmission and Distribution Group  
Medium Voltage Division (BV 10)

holds the  
**Quality System Certificate**

for the standard from  
**ISO 9000**

series, and for the scope, specified in the certificate.

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# CERTIFICATE



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Power Transmission and Distribution Group  
Medium Voltage Division (BV 10)

Quality and Environmental Management System  
DIN EN ISO 9001  
DIN EN ISO 14001

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Title: *[Title]*



Siemens AG Power Transmission and Distribution Group  
Medium Voltage Division (BV 10)  
Friedenstraße 100, 40474 Düsseldorf  
DIN EN ISO 9001  
DIN EN ISO 14001

## 3TL Vacuum Contactors

Medium-Voltage  
Equipment

**3TL Vacuum Contactors**  
General Description

1

**3TL8 Vacuum Contactors**  
as Economy Contactors

2

**3TL6 Vacuum Contactors**  
as Universal Contactors

3

**Appendix**  
Catalog Index  
Conditions of Sale and Delivery

A

### 3TL vacuum contactors (selection)

**3TL8 vacuum contactors**  
as economy  
contactors up to  
7.2 kV / 400 A



**3TL6 vacuum contactors**  
as universal  
contactors up to  
12 kV / 450 A



Excavator 292 of Rheinbraun AG

### Features

#### Quality standard

DIN EN ISO 9001

3TL vacuum contactors are routine tested to specifications that go beyond those laid down by the relevant standards:

- Continuous testing during the manufacturing processes
- Several operating cycles per routine test
- Current measured-value acquisition – such as, for example, operating speed and contact travel – compared with the values from the long-term tests

Other features:

- Stable measured values with tight tolerances
- Low power loss
- Constant long-term thermal stability.



# 3TL Vacuum Contactors General Description



### Environmental compatibility

- DIN EN ISO 14001  
3TL vacuum contactors are
- Environmentally compatible with respect to the materials used and manufacturing processes
  - Environment-neutral with respect to how they operate and during switching operations
  - Simple to dispose of at the end of their service life.

### Freedom from maintenance

- 3TL vacuum contactors are maintenance-free
- Under normal ambient conditions in line with IEC 694 and DIN VDE 0670 Part 1000 in the temperature range stated (see page 1/8)
  - Through to the end of the vacuum interrupters' service life.



Siemens 8BK30 medium-voltage withdrawable switchgear with 3TL6 vacuum contactor on central truck

Contents	Page
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# 3TL Vacuum Contactors General Description

1

## Application

3TL vacuum contactors are 3-pole contactors with solenoid-operated mechanism for medium-voltage switchgear systems.

They are load-break switchgear with a limited short-circuit making and short-circuit breaking capacity and are used for high switching frequencies (> 10,000 operating cycles).

The vacuum contactors are suitable for the operational switching of AC loads in indoor systems and can perform, for example, the following switching duties:

- Switching of three-phase motors in AC-3 and AC-4 operation
- Switching of transformers
- Switching of reactors
- Switching of ohmic loads (e. g. arc furnaces)
- Switching of capacitors

With reversing contactor combinations, only one contactor is required for each direction of rotation, if HV HRC fuses are used for short-circuit protection.

## Application examples

- Conveyor and lift systems
- Pump stations
- Ventilation and heating
- Systems for reactive-power compensation

for the following branches of industry:

- Mining
- Steel
- Gas and petrochemicals
- Paper
- Cement

## Versions






### 3TL8 vacuum contactors

- as economy contactors
- Up to 1 mill. mechanical operating cycles
- Up to 7.2 kV

### 3TL6 vacuum contactors

- as universal contactors
- Up to 3 mill. mechanical operating cycles
- Up to 12 kV

## Fields of application

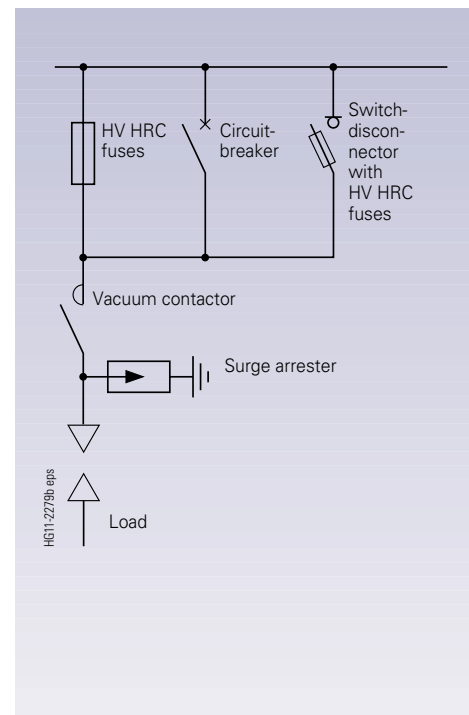
Application, switching of loads	For operating voltage and normal current	Vacuum contactor type	Mechanical operating cycles	Application examples
<b>Medium-voltage three-phase motors</b> 	up to 7.2 kV up to 400 A	3TL8	1 mill.	Conveyor and lift systems, compressors, pump stations, ventilation and heating
	up to 12 kV up to 450 A	3TL6	3 mill.	
<b>Transformers</b> 	up to 7.2 kV up to 400 A	3TL8	1 mill.	Secondary distribution switchgear, industrial network distribution systems
	up to 12 kV up to 450 A	3TL6	3 mill.	
<b>Reactors</b> 	up to 7.2 kV up to 400 A	3TL8	1 mill.	Industrial network distribution systems, DC link reactors, reactive-power compensation systems
	up to 12 kV up to 450 A	3TL6	3 mill.	
<b>Ohmic loads</b> 	up to 7.2 kV up to 400 A	3TL8	1 mill.	Heating resistors
	up to 12 kV up to 450 A	3TL6	3 mill.	Arc furnaces
<b>Capacitors</b> 	up to 7.2 kV up to 250 A	3TL8	1 mill.	Reactive-power compensation systems, capacitor banks
	up to 12 kV up to 250 A	3TL6	3 mill.	

## Switching duties

Cases of switching line and load-side operating states	
Switching inductive circuits	Unloaded transformers (neutral earthing transformers)
	Loaded transformers
	Overloaded transformers
	Transformers in rush
	Furnace transformers
	Motors normally operating
	Motors starting up
Switching capacitive circuits	Capacitors
	Back-to-back switching of capacitors
Switching on short-circuit	Fault making 1)
	Locked motor rotor
Switching under earth-fault conditions	Fault on the line side:
	– unloaded cables, overhead lines
	– loaded cables, overhead lines
	Fault on the load side:
– unloaded cables, overhead lines	
– loaded cables, overhead lines	

1) Limited fault breaking capacity.

## Switchgear used with vacuum contactors



## Switching duties, cases of application

### Switching of motors

3TL vacuum contactors are particularly suitable for the frequent switching of motors. As the chopping current of the contactors is  $\leq 5$  A, no impermissibly high overvoltages occur in the operational switching of started-up motors. If, however, high-voltage motors with a starting current of  $\leq 600$  A are switched off during start-up, overvoltages may occur. The level of these overvoltages can be reduced to safe values by means of special surge limiters (see Catalog HG 21 "Overvoltage Protection", catalog section: Type 3EF Surge Limiters).

The 3EF surge limiters are preferably arranged in the cable termination compartment parallel to the cable sealing end.

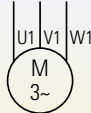
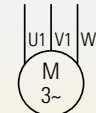
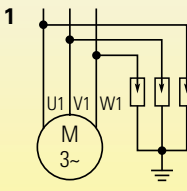
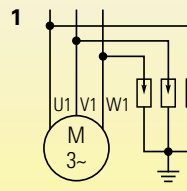
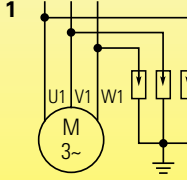
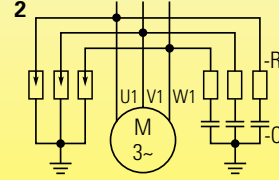
The surge limiters are made up of non-linear discharge resistors (SIOV metal-oxide varistors) and a series-connected spark gap.

Care must be taken during installation that for mechanical reasons the surge limiter is connected flexibly on one side.

### Utilization categories

Utilization categories	Typical applications
AC-3	Squirrel-cage motors: starting, de-energizing while running
AC-4	Squirrel-cage motors: starting, braking by plugging <sup>1)</sup> , reversing <sup>1)</sup> , jogging <sup>2)</sup>

- 1) The terms "braking by plugging" and "reversing" of the motor refer to rapid braking or reversing of the direction of rotation by swapping over two supply wires while the motor is running.
- 2) "Jogging" refers to one-off or repeated brief energizing of a motor in order to actuate small movements of machines.

Motor version (insulation) modern insulation system	Older design or unknown insulation level	Operating mode
		Switching of started-up motors
		Occasional switching of motors just started-up (on fault)
		Frequent switching during AC-4 operation

1 With surge limiter  
2 With surge limiter and additional RC circuit

Circuit examples for overvoltage protection for three-phase motors with starting current  $\leq 600$  A

### Overvoltage protection by means of limiters

Overvoltages can be caused by multiple re-ignition in the first pole to clear or virtual current chopping in the last pole to clear, for example when switching stalled motors or motors in the course of start-up.

Those components endangered are the input windings of squirrel-cage and slip-ring motors with a starting current of  $\leq 600$  A.

Surge limiters assure positive protection against overvoltage; see above for circuit examples.

### Overvoltage protection by means of RC circuit

The following guide values apply to components of the RC circuit:

Capacitor <i>C</i>	0.25 $\mu\text{F}$ per phase, protective capacitor version
Resistor <i>R</i>	30 to 50 $\Omega$ 100 W per phase, low-inductance version

Siemens must be contacted to ensure perfect configuration of the RC circuit to suit the type of attachment and cable length (see above for circuit examples).

If voltage tests are carried out on the motor, the RC circuit and surge limiters must be disconnected to prevent them from becoming damaged.

When used in conjunction with withdrawable-type vacuum contactors, the RC circuit must be constructed separately.

### Switching of transformers

In case of switching of inductive currents, current chopping at the contact gap may give rise to overvoltages. However due to the special contact material used in 3TL contactors, the chopping current is limited to  $\leq 5$  A. This means that no dangerous overvoltages develop when unloaded transformers are switched off.

### Switching of capacitors

3TL vacuum contactors can, at rated voltages of up to 7.2 kV, cut off capacitive currents of up to 250 A without restriking and therefore without overvoltages.

When the rated voltage is 12 kV, 3EF surge limiters must be used (see Catalog HG 21 "Overvoltage Protection", catalog section: Type 3EF Surge Limiters).

# 3TL Vacuum Contactors General Description

## Switching duties, cases of application

### Short-circuit protection

The 3TL vacuum contactors are not designed to switch short-circuit currents. It is therefore absolutely essential to provide short-circuit protection.

The best protection is provided by HV HRC fuses, but circuit-breakers can also be used subject to the conditions described in "short-circuit protection by means of circuit-breakers" on this page.

### Short-circuit protection by means of HV HRC fuses

HV HRC fuses have a current-limiting effect with high short-circuit currents, i.e. the fuse limits the short-circuit current to the cut-off current.

When the fuses are selected, the type of load must be taken into account, for example, motor, transformer or capacitors.

For an example of coordination of an HV HRC fuse with overcurrent-time protection, see the chart on the right.

### Requirements

- The cut-off current  $I_D$  must not exceed 50 kA at 7.2 kV.
- With an LV power supply via a control power transformer, short-circuit currents must be interrupted between the switching capacity limit (5 kA) and  $30 \times I_r$  (12 kA) within 80 ms. This stipulation does not apply if
  - there is mechanical latching or
  - the opening times have been extended so much that in the above-mentioned current range the contactor cannot open until the fuse has interrupted the current.

For further specifications, see Catalog HG 12 "Switch-Disconnectors, Vacuum Switches, High-Voltage HRC Fuses".

- When the motors are energized, the HV HRC fuse is loaded most by the motor starting current that occurs. It must neither blow nor become damaged under these loads.
- Other factors that influence loading of the HV HRC fuses are the starting time and starting frequency of the motors.

### Short-circuit protection for "Class E2 controller" in accordance with UL 347 / CSA C22.2

When using 3TL vacuum contactors as "Class E2 controllers" for 7.2 kV, Siemens fuses of type 3GD1 150-UD (7.2 kV/250 A) or other fuses with a comparable current/time curve must be used to provide short-circuit protection.

If 2 fuse links are connected in parallel, the symmetrical short-circuit current measured is divided by 2 and this value used to determine the cut-off current for one fuse link. This value must then be multiplied by 2 in order to arrive at the total cut-off current, which must not exceed the permissible value for the vacuum contactor.

Parallel connection should be configured such that the resistance in the two branches is, if possible, identical.

When the fuses blow, this must result in the vacuum contactor being opened. An appropriate device that is actuated by the release bolt of the HV HRC fuse link must be installed.

### Fuse monitoring

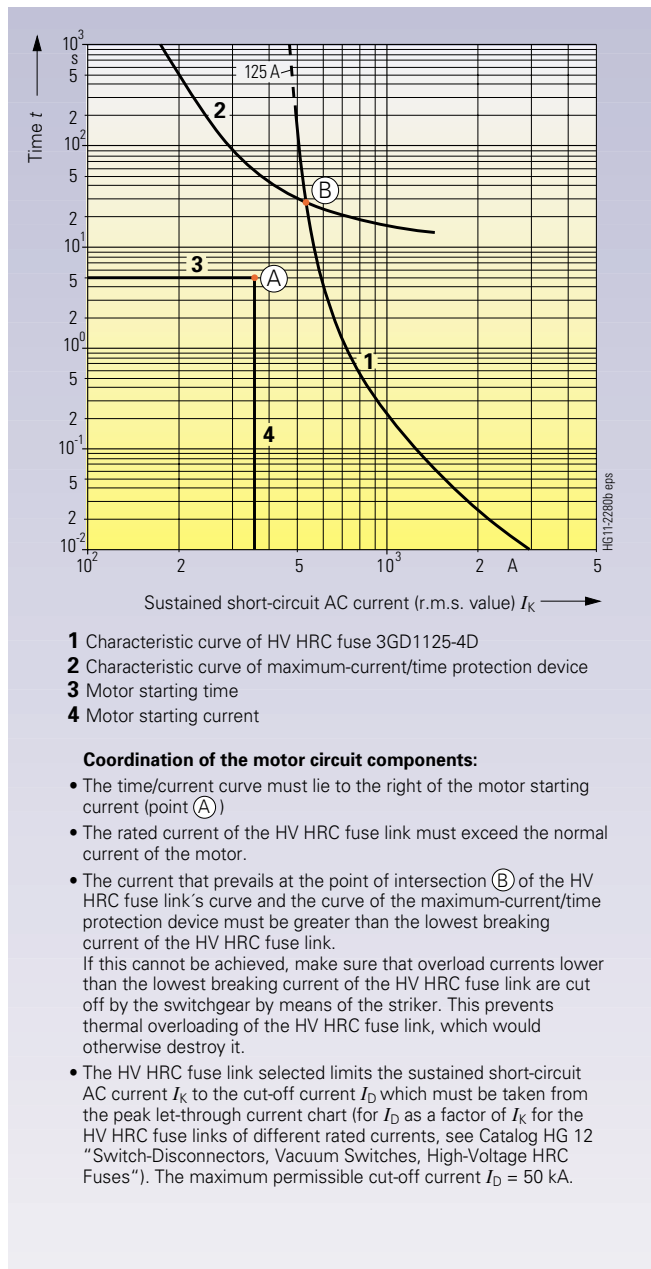
The fuse bases can be supplied with a fuse monitor in order to prevent a three-phase load (e.g. a motor) from being supplied on only two phases when a fuse blows. This fuse monitor can be used either to initiate an alarm signal or to open the vacuum contactor.

### Short-circuit protection by means of circuit-breakers

Loads for which no suitable fuses are available can also be protected by means of circuit-breakers.

Due to the longer break time of the circuit-breakers (maximum permissible 120 ms), the short-circuit current must not exceed the maximum permissible value for the vacuum contactor (20 kA at 7.2 kV).

As a result of the longer break time, the interrupters must be replaced immediately in the case where the maximum permissible short-circuit current value has been reached, since this causes a severe reduction in their service life.



Example for coordination of a 125 A HV HRC fuse curve with a motor curve

### Overload protection

It is possible to use thermally delayed overload relays in conjunction with suitable current transformers for protecting high-voltage motors against overload.

### Trip-free mechanism

All the switching contacts of the vacuum contactors operate trip-free.

The "OPEN" command interrupts the "CLOSE" command, i.e. the moment of the "OPEN" command determines whether the contacts close or not.

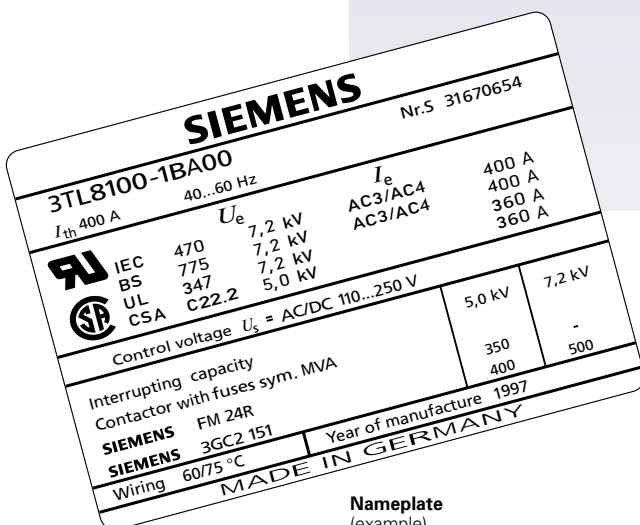


# 3TL Vacuum Contactors General Description

## Technical specifications in comparison

### Overview

	3TL8 vacuum contactor	3TL6 vacuum contactor
Rated voltage	• up to 7.2 kV	• up to 12 kV
Rated normal current	• 400 A	• 450 A
Switching frequency	• up to 1200 operating cycles/h	• up to 1200 operating cycles/h
Service life	operating cycles	
– Contactor	• mech. service life: 1 mill.	• mech. service life: 3 mill.
– Vacuum interrupter	• mech. service life: 0.25 mill. • electr. service life: 0.25 mill.	• mech. service life: 2 mill. • electr. service life: 1 mill.
Chopping current	• ≤ 0.6 A	• < 5 A
Electronic economy circuit	• classification into voltage ranges 24 V to 60 V 110 V to 250 V irrespective of DC or AC actuation	• none
Auxiliary contacts	• positively driven auxiliary switch; 4NO, 4NC	• positively driven auxiliary switch; 6NO, 5NC
Operating mechanism	• underneath to the vacuum interrupters	• at rear to the vacuum interrupters
Type of construction	• slim-line	• compact
Main conductor terminals	• at rear on the vacuum interrupters	• at front on the vacuum interrupters
Auxiliary conductor terminals	• direct tapping at the terminals (optional: wiring of the auxiliary contacts on the central terminal block)	• terminal block with testing options in installed state (optional: withdrawable terminal block)
Additional modules	• mechanical closing latching • long operating mechanism shaft for powerless, external built-on accessories	• mechanical closing latching • mechanical closing lock-out • extension or reduction of the break time



Nameplate  
(example)

# 3TL Vacuum Contactors General Description

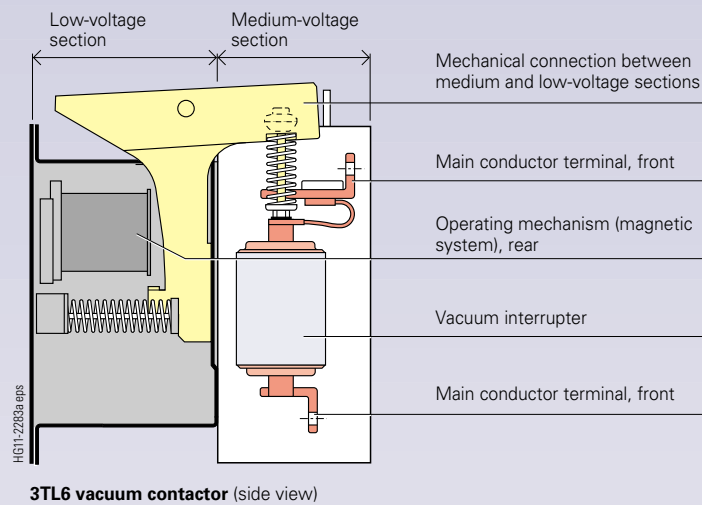
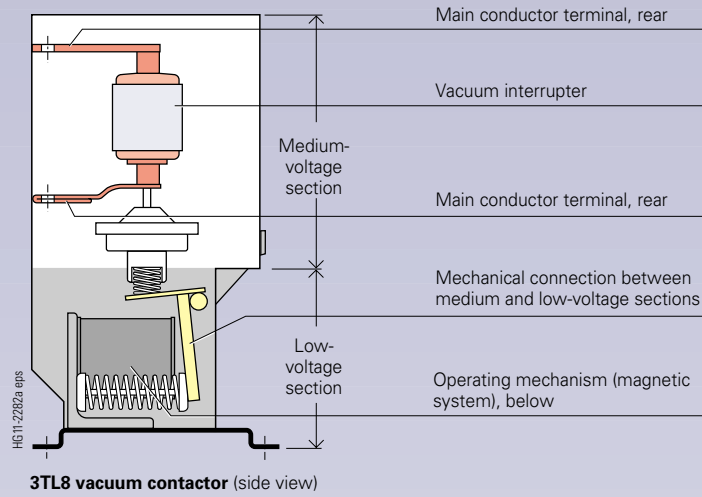
## Construction principle in comparison

The 3TL vacuum contactors are made up of the following assemblies:

- Medium-voltage section with
  - Vacuum interrupters
  - Main conductor terminals
- Low-voltage section with
  - Operating mechanism (magnetic system)
  - Electronic module (electronic economy circuit)
  - Mechanical closing latching
  - Auxiliary contact block.

For further details about the construction of the vacuum contactors, see catalog sections 2 and 3.

1



## Vacuum interrupter

### Arc-quenching system

As the contacts open, the current that is to be interrupted initiates a metal-vapour arc discharge. Current continues flowing through the metal vapour plasma until the next current zero. The arc extinguishes at approximately current zero. The metal vapour loses its conductivity within a few microseconds, which very quickly reestablishes the dielectric strength of the contact gap.

A certain minimum current is needed in order to maintain the metal-vapor arc discharge. The arc will be chopped before the natural current zero if the current falls below this value.

In order to prevent impermissible overvoltages when performing switching operations in inductive circuits, the chopping current must be limited to the lowest possible value. Due to the use of a special contact material, the chopping current in the 3TL vacuum contactor is only  $\leq 5$  A.

Due to the rapid recovery of the dielectric strength of the contact gap, the arc is safely quenched even in cases where contact separation occurs immediately before a current zero. Consequently, the arcing time of the last poles to clear is no more than 15 ms.

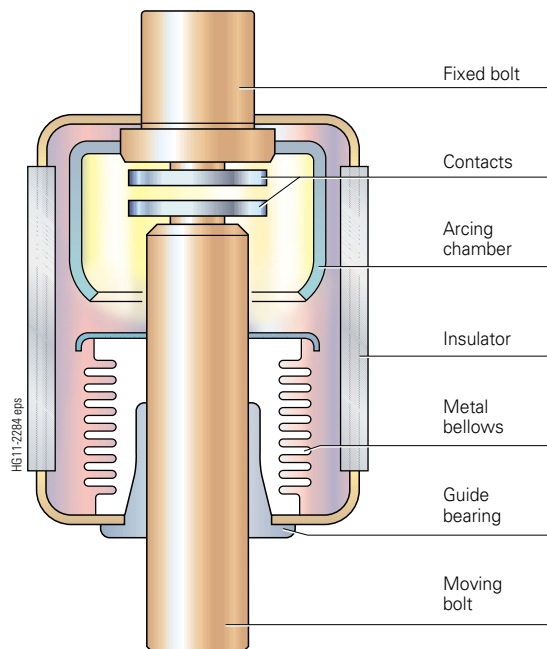
With AC circuit-breakers, the actual task of the arc-quenching system is to deionize the contact gap immediately after current zero.

In the case of all the conventional methods of arc-quenching this means that the arc is being cooled even before the minimum quenching gap and the subsequent current zero are reached. As a result, the arc power is unintentionally increased to a considerable degree.

With the vacuum contactor, on the other hand, the arc is not cooled. The metal-vapour plasma has a high conductivity which results in an extremely low arc voltage with values from only 20 to 50 V.

For this reason, and due to the short arcing times, the amount of energy conversion in the contact gap is very low. This relatively low stress level means that the quenching system is maintenance-free and allows up to 1 million electrical operating cycles.

Due to the very low pressures of less than  $10^{-9}$  bar in the interrupter under steady-state conditions, contact gaps of only 5 to 7 mm are required to achieve a high dielectric strength in 3TL vacuum contactors.



**Vacuum interrupter**  
(example)

# 3TL Vacuum Contactors General Description

1

## Standards

### Design

3TL vacuum contactors are of an open design, degree of protection IP00 according to DIN VDE 0470 Part 1 and IEC 144.

They comply with the standards for high-voltage AC contactors of between 1 kV and 12 kV:

- IEC Publication 470 – 1974
- DIN VDE 0660 Part 103 – 3.84
- UL Standard 347
- CSA C22.2

### Tests

We have our own accredited test bays which we can use to develop and type-test high-capacity switchgear in accordance with the relevant standards:

- High power electrical testing
- Testing of:
  - Mechanical operation
  - Reliability
  - Insulating capacity
  - Temperature rise
  - Climatic withstand capability

Extensive series of tests are carried out for the type-tests specified in the relevant standards in order to achieve reliable results.

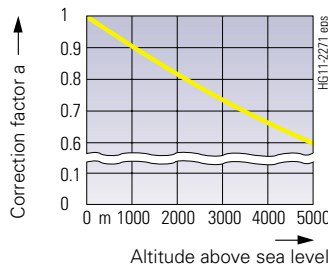
If a customer requests tests that are to be conducted in test bays not owned by Siemens, there are other accredited testing institutes who can be engaged.

The tests encompass switching capacity, current-carrying capacity and, where applicable, insulating capacity. The fees for these tests are charged by PEHLA according to their current price schedule.

### Insulating capacity

3TL vacuum contactors are suitable for site altitudes between 1250 m below sea level and 2500 m above sea level.

The specified values are referred to sea level. When installed at altitudes above 1000 m, an allowance must be made for the resulting decrease in insulating capacity (see correction factor a in the diagram below)



The following expression thus applies for the selection of the devices and equipment:

$$\text{Rated withstand voltage to be selected } ^1) \geq \frac{\text{Required rated withstand voltage } ^1)}{1.1 \cdot a}$$

If, however, the actual insulating capacity must be determined at the installation site – the withstand voltage – the reduction of the insulating capacity from that for an altitude of 0 m (sea level) must be calculated as follows:

$$\text{Withstand voltage } ^2) = a \cdot \text{rated withstand voltage } ^1) \text{ of the selected switching device.}$$

Definitions:

Rated.....withstand voltage <sup>1)</sup> = target value according to VDE, IEC etc. referred to sea level.

.....withstand voltage <sup>2)</sup> = actual value at the respective height.

1) Rated lightning impulse withstand voltage, rated power-frequency withstand voltage

2) Lightning impulse withstand voltage, power-frequency withstand voltage

### Ambient conditions

Vacuum contactors can be used in buildings with low thermal insulation or low heat storage capacity, heated or cooled, without temperature monitoring. The heating or cooling may fail for a period of several days.

The vacuum contactors fulfill the following ambient conditions in accordance with IEC 721, Part 3.3, 1990:

- Climatic:
  - Class 3K4 (minimum temperature limit – 25 °C)
  - Class 3K6 (without ice formation and wind-driven precipitation)
  - Class 3Z2
  - Class 3Z5
- Biological:
  - Class 3B1
- Chemically active materials:
  - Class 3C2 (without occurrence of saline fog with simultaneous moisture condensation)
- Mechanically active materials:
  - Class 3S2 (restriction acc. to operating instructions: clean insulating components)
- Mechanical:
  - Class SM2.

### Ambient temperature <sup>3)</sup>

Temperature value	for vacuum contactor	
	3TL8	3TL6
Maximum value	+65 °C	+80 °C
Maximum value of 24-hour mean	+60 °C	+75 °C
Minimum value	–25 °C	–25 °C

### Relative humidity (measured averages):

- Over 24 hours: max. 95 %
- Over 1 month: max. 90 %

Condensation may occasionally occur under these conditions.

Occasional exposure to condensation once per month for approximately 2 hours is permitted (tested according to DIN 50016, FW24).

3) For permissible mechanical service life, see "Technical specifications", pages 2/4 and 3/4.

The ambient air must not be contaminated with excessive amounts of dust, smoke, corrosive or flammable gases, vapors or salt.

For further specifications about the ambient conditions, refer to the technical specifications in catalog sections 2 and 3.



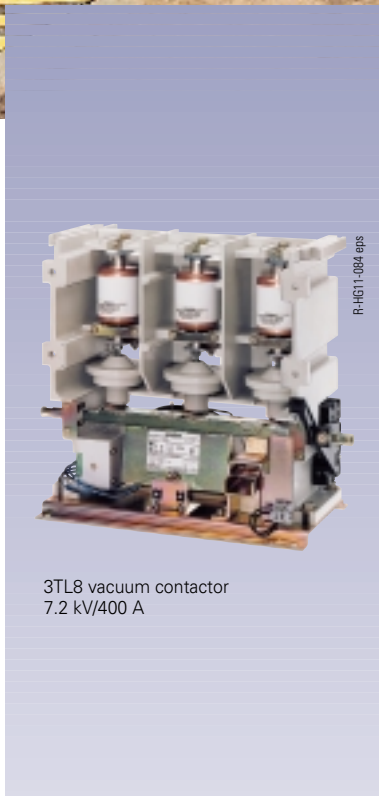
# 3TL8 Vacuum Contactors as Economy Contactors



Rolling mill, Hylsa in Mexico

## Features

- 7.2 kV rated voltage
- Maintenance-free through to the end of the vacuum interrupters' service life
- Mechanical service life of the contactor: 1 mill. operating cycles
- Suitable for switching, for example,
  - Transformers
  - Capacitors
  - Filter circuits
  - Motors
  - Reactors
  - Ohmic loads



3TL8 vacuum contactor  
7.2 kV/400 A

R-HG11-024 eps

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Selection and ordering data	2/5
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Internal connection diagrams	2/7
Circuit diagrams	2/8, 2/9
Dimensions and weights	2/10
Shipping	2/11
Enquiry form	2/12

# 3TL8 Vacuum Contactors as Economy Contactors

## Construction and mode of operation

### Construction

The 3TL8 vacuum contactor consists of:

- Medium-voltage section with
  - Insulating plastic housing (1)
  - Vacuum interrupters (2)
  - Main conductor terminals (8 and 9)
- Low-voltage section with
  - Magnetic system (11)
  - Electronic economy circuit (14)
  - Auxiliary contact blocks (12 and 13)
  - Mechanical closing latching (6) as an additional module

### Mode of operation

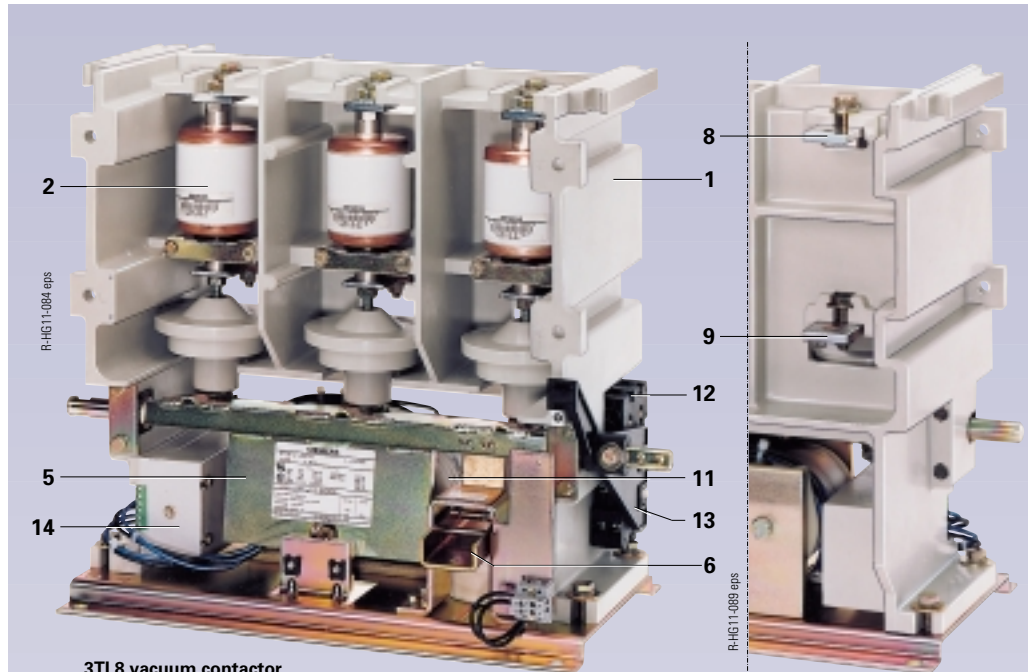
The magnetic system (11) of the 3TL8 vacuum contactor opens and closes the contacts of the vacuum interrupters (2). Due to the use of the electronic economy circuit (14), the magnetic system (11) is independent of the voltage type and level across a wide range.

### Mechanical closing latching

The mechanical closing latching (6) holds the vacuum contactor in the closed state even without excitation of the magnetic system (11).

The latching module of the mechanical closing latching (6) is fitted inside the mechanism housing (5). When the magnetic system (11) is excited, the vacuum interrupter (2) is latched mechanically by means of a lever and roller system into the "CLOSED" position. The contactor is unlatched electrically by means of an unlatching solenoid or mechanically by means of a release bolt (the coupling must be provided by the customer).

The command duration for the unlatching solenoid must be between 100 ms and 1 s. An external command ending unit must be provided.



**3TL8 vacuum contactor**  
7.2 kV/400 A

Main conductor terminals located at rear (1 pole shown)



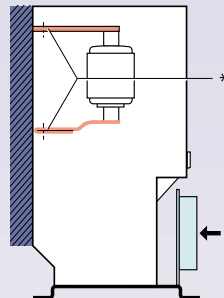
Electronic module (14)



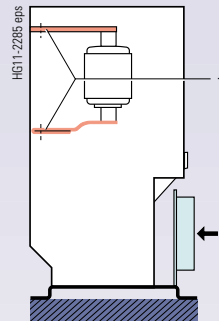
Mechanical closing latching (6)

**Legend**  
(see page 2/3)

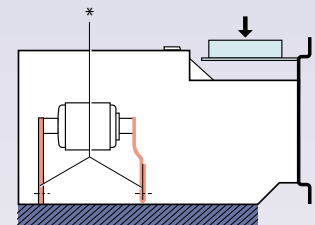
### Permissible installation positions



**Wall assembly**  
vertical layout



**Floor assembly**  
vertical layout

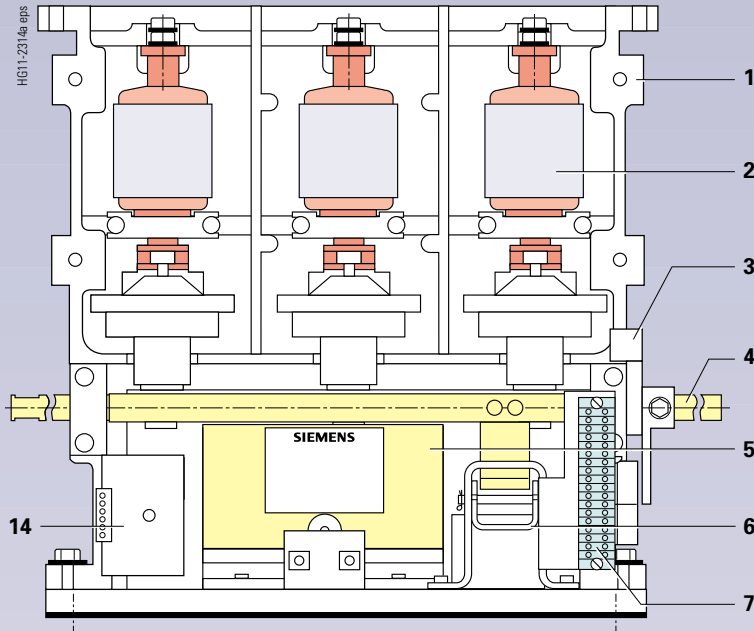


horizontal layout

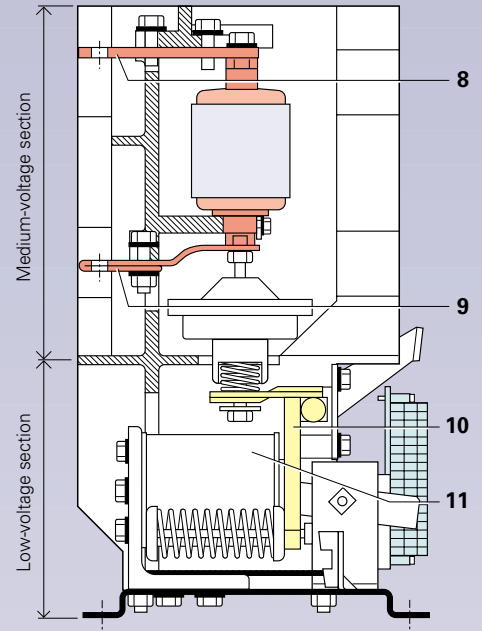
- \* Position of the main conductor terminals
- ➔ Position of the terminal block



Continued



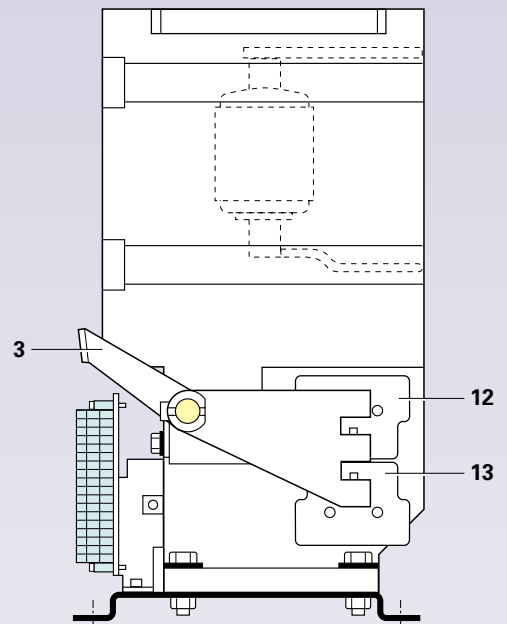
Structure of the 3TL8 vacuum contactor (front view)



Side view from left (sectional view)

### Legend

- 1 Insulating plastic housing
- 2 Vacuum interrupter \*
- 3 Position indicator O - I
- 4 Operating shaft (short or long version)
- 5 Mechanism housing
- 6 Mechanical closing latching \*  
(optional) with rectifier module \*  
for AC operation
- 7 Terminal block (optional)
- 8 Top main conductor terminal
- 9 Bottom main conductor terminal
- 10 Mechanical connection between medium  
and low-voltage sections
- 11 Magnetic system (solenoid \*)
- 12 Top auxiliary contact block \*
- 13 Bottom auxiliary contact block \*
- 14 Electronic module \* (electronic economy  
circuit) with terminals



Side view from right

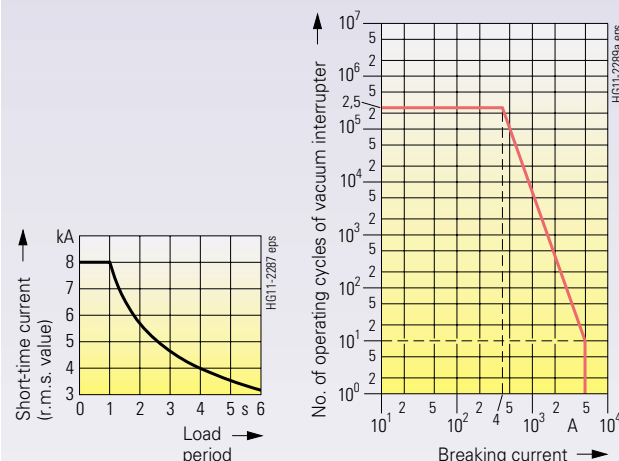
\* Also available as a spare part.

# 3TL8 Vacuum Contactors as Economy Contactors

## Technical specifications

### Medium-voltage section

<b>Rated operational voltage <math>U_e</math></b>	7.2 kV
<b>Rated frequency</b>	50 to 60 Hz
<b>Rated continuous current <math>I_u</math> to DIN VDE 0660</b>	400 A
<b>Rated normal current <math>I_e</math></b> according to utilization categories AC-1, AC-2, AC-3 and AC-4 at ambient temperatures up to +55 °C	400 A
	+65 °C 360 A
<b>Switching capacity</b> according to utilization category AC-4 (p. f. = 0.35)	
Rated making current	4000 A
Rated breaking current	3200 A
<b>Max. permissible switching capacity</b>	5 kA
<b>Rated short-time current 1 s</b> (r.m.s. value) (For short-time current for longer periods, see short-time current load-period curve)	8 kA
<b>Switching of capacitors</b>	
Rated capacitor current	250 A
Maximum permissible making current peak	10 kA
<b>Switching frequency</b> (AC and DC operation) without mechanical closing latching	1200 operating cycles/h
<b>Mechanical service life of the contactor</b> according to class D3 as defined in DIN VDE 0660	1 mill. operating cycles
<b>Mechanical service life of the vacuum interrupter</b>	0.25 mill. operating cycles
<b>Electrical service life of the vacuum interrupter</b> at rated normal current	0.25 mill. operating cycles
<b>Insulation level</b>	
Rated lightning impulse withstand voltage (to DIN VDE 0670, IEC 56): to earthed parts and between poles across the open contact gap	60 kV 40 kV
Rated power-frequency withstand voltage 50 Hz (r.m.s.) to earthed parts and between poles across the open contact gap	20 kV 20 kV
<b>Cross-sections of the main conductor terminals</b>	
Terminal screw	M10
Stranded conductors with cable lug	50 to 240 mm <sup>2</sup>
Copper rail to DIN 43 671	30 x 5 mm
Aluminium rail to DIN 43 670	20 x 10 mm

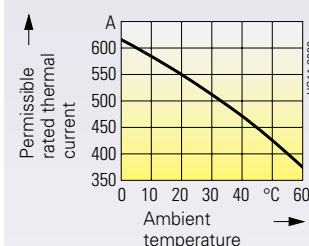


### Low-voltage section

<b>Power consumption of the solenoid</b> (AC and DC operation)	
Pickup power	600 W
Holding power	90 W
<b>Voltage range of the solenoid</b>	
Operating voltage (AC and DC operation)	0.85 to 1.1 $U_c$
<b>Minimum closing command</b> for the solenoid	300 ms
<b>Make time <sup>1)</sup></b> (AC and DC operation 110 V to 250 V)	200 ms at 0.85 x 110 V 150 ms at 1.0 x 110 V 50 ms at 1.1 x 250 V
<b>Break time <sup>2)</sup></b> (AC and DC operation 110 V to 250 V) depending on the electronic economy circuit	325 ± 75 ms or ≤ 50 ms <sup>3)</sup>
<b>Mechanical closing latching</b> (optional) (AC and DC operation)	
Service life	100,000 operating cycles
Switching frequency	60 operating cycles/h
Power consumption of unlatching solenoid	900 W
Voltage range of unlatching solenoid	0.85 to 1.1 $U_c$
Tripping pulse (by external circuit provided by customer)	0.2 to max. 1 s
Break time	< 45 ms
<b>Auxiliary contacts</b>	
<b>Number of auxiliary contacts</b>	2NO + 2NC or 4NO + 4NC
<b>Rated continuous current <math>I_u</math></b>	10 A
<b>Rated normal current <math>I_e</math></b>	
Utilization category for AC-11 at rated voltage	125 V AC, 10 A 230 V AC, 10 A 500 V AC, 4 A 600 V AC, 2 A
Utilization category for DC-11 at rated voltage	24 V DC, 10 A 110 V DC, 5 A 125 V DC, 0.9 A 220 V DC, 0.45 A 440 V DC, 0.25 A 600 V DC, 0.2 A
<b>Cross-sections of the auxiliary contacts</b> to EN 60 947 Part 1 (screw terminal, two-wire connection possible)	
– solid	0.6 to 4 mm <sup>2</sup>
– finely stranded with end sleeve	0.5 to 2.5 mm <sup>2</sup>

### Ambient conditions

<b>Ambient temperature</b>	
Storage	at – 40 to + 65 °C 20 years
Operation	at – 5 to + 65 °C at – 25 to – 5 °C 1 mill. operating cycles 0.5 mill. operating cycles
<b>Site altitude</b>	200 m below sea level to 1250 m above sea level
<b>Shock resistance</b> (square impact)	5 x g, 10 ms or 10 x g, 5 ms



- 1) Make time = Time from the instant of application of a control pulse (command) to the instant when the contacts touch.
- 2) Break time = Time from the instant of application of the "OPEN" control pulse to the instant of contact separation.
- 3) Possible by means of external circuit.





# 3TL Vacuum Contactors as Economy Contactors

3TL  
Vacuum Contactors

2

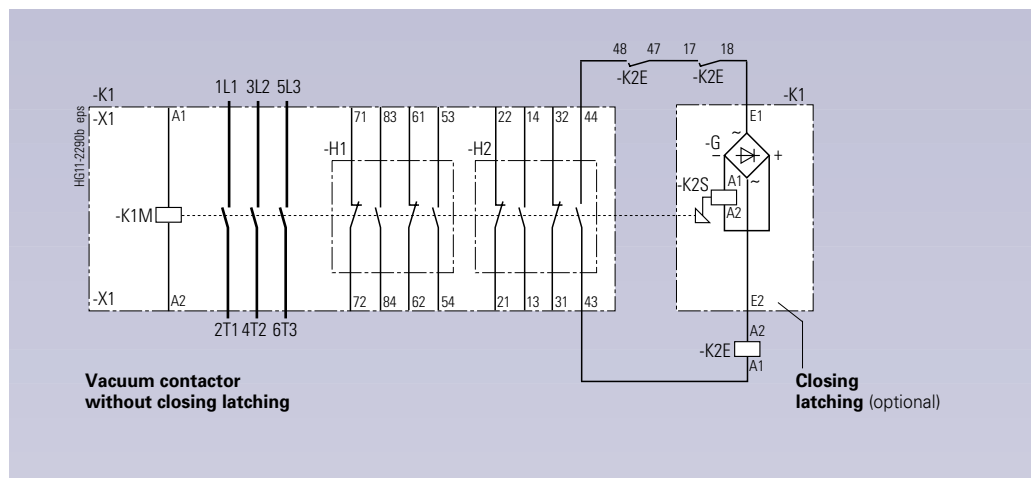
**Spare parts and accessories** (when placing an order, please also state the type and serial number of the vacuum contactor)

	Scope of delivery	Operating voltage or contacts	Order No.
<b>Vacuum interrupter</b>	 RH611-107 eps	–	<b>3TY5 810-0AA0</b> (up to serial no. 31 670 935)  <b>3TY5 810-1AA0</b> (as of serial no. 31 670 936)
<b>Auxiliary contact block</b>	 RH611-088 eps	top 2NO + 2NC  bottom 2NO + 2NC	<b>3TY7 561-1SA0</b>  <b>3TY7 561-1NA0</b>
<b>Solenoid</b>	 RH611-108 eps	24 V – 60 V AC/DC  110 V – 250 V AC/DC	<b>3TY5 811-0AA0</b>  <b>3TY5 811-0BA0</b>
<b>Electronic module</b>	 RH611-093 eps	24 V – 60 V AC/DC  110 V – 250 V AC/DC	<b>3TY5 812-0AA0</b>  <b>3TY5 812-0BA0</b>
<b>Contactor relay (accessory)</b>	 RH611-102 eps	110 V AC 50/60 Hz 115 V AC 50/60 Hz 120 V AC 50/60 Hz 125/127 V AC 50 Hz  220 V AC 50/60 Hz 230 V AC 50/60 Hz 240 V AC 50/60 Hz 400 V AC 50 Hz  24 V DC 60 V DC 110 V DC 125 V DC 220 V DC	<b>3TH40 92-0AG1</b> <b>3TH40 92-0AJ1</b> <b>3TH40 92-0AK1</b> <b>3TH40 92-0AL0</b>  <b>3TH40 92-0AN1</b> <b>3TH40 92-0AL1</b> <b>3TH40 92-0AP1</b> <b>3TH40 92-0AV0</b>  <b>3TH40 92-0BB4</b> <b>3TH40 92-0BE4</b> <b>3TH40 92-0BF4</b> <b>3TH40 92-0BG4</b> <b>3TH40 92-0BM4</b>
<b>Mechanical closing latching (accessory)</b>	 RH611-109 eps	110 V – 115 V AC 50/60 Hz 120 V – 127 V AC 50/60 Hz 220 V – 240 V AC 50/60 Hz 380 V AC 50/60 Hz  24 V DC 30 V DC 48 V DC 60 V DC  110 V DC 125 V DC 220 V – 250 V DC	<b>3TY5 892-0AG7</b> <b>3TY5 892-0AL7</b> <b>3TY5 892-0AN7</b> <b>3TY5 892-0AQ2</b>  <b>3TY5 892-0BB4</b> <b>3TY5 892-0BC4</b> <b>3TY5 892-0BD4</b> <b>3TY5 892-0BE4</b>  <b>3TY5 892-0BF4</b> <b>3TY5 892-0BG4</b> <b>3TY5 892-0BM4</b>
<b>Rectifier module (accessory) for mechanical closing latching</b>	 RH611-106 eps	–	<b>3AX15 25-1F</b>

## Internal connection diagrams

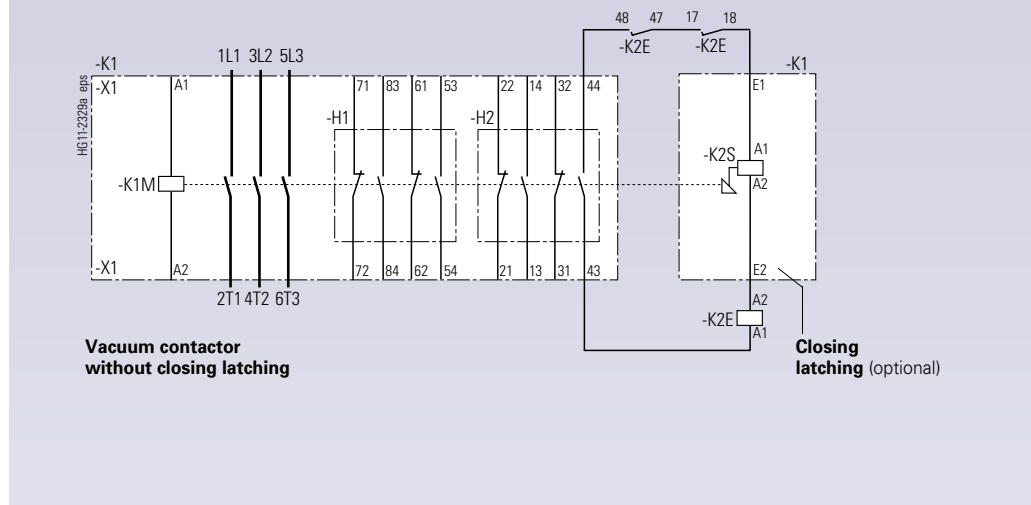
### AC operation

- Voltage ranges
  - 24 V to 60 V AC
  - 110 V to 250 V AC
- Without mechanical closing latching:
  - Opening delay  $\leq 50$  ms by means of external circuit
  - Opening delay  $325 \pm 75$  ms
- Auxiliary contact block
  - 2NO + 2NC
  - Optional: 4NO + 4NC
- Optional: with mechanical closing latching (-K2S) (only in conjunction with auxiliary contact block 4NO + 4NC) and with rectifier



### DC operation

- Voltage ranges
  - 24 V to 60 V DC
  - 110 V to 250 V DC
- Without mechanical closing latching:
  - Opening delay  $\leq 50$  ms by means of external circuit
  - Opening delay  $325 \pm 75$  ms
- Auxiliary contact block
  - 2NO + 2NC
  - Optional: 4NO + 4NC
- Optional: with mechanical closing latching (-K2S) (only in conjunction with auxiliary contact block 4NO + 4NC)



### Legend

- G Rectifier module
- H1 Bottom auxiliary contact block
- H2 Top auxiliary contact block (optional)
- K1 Vacuum contactor
- K1M Solenoid-operated mechanism for vacuum contactor
- K2E External contactor relay (e.g. Siemens type 3TH4)
- K2S Unlatching solenoid (optional)
- X1 Terminal block for auxiliary conductor connection

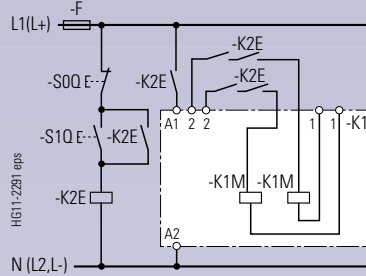
# 3TL8 Vacuum Contactors as Economy Contactors

## Circuit diagrams (examples)

### AC and DC operation

- Without mechanical closing latching
- Opening delay  
–  $\leq 50$  ms by means of external circuits  
–  $325 \pm 75$  ms

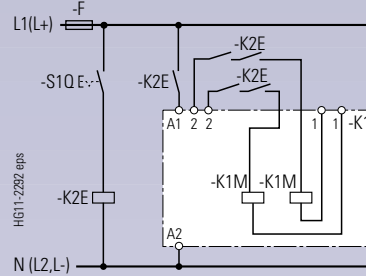
#### Momentary-contact control



Without time-delay relay for minimum motor starting time, opening delay  $\leq 50$  ms

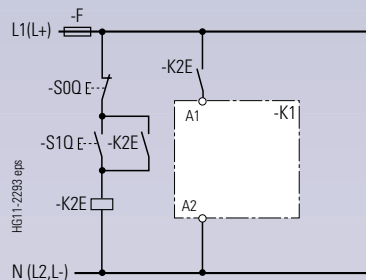
Fig. 1

#### Maintained-contact control



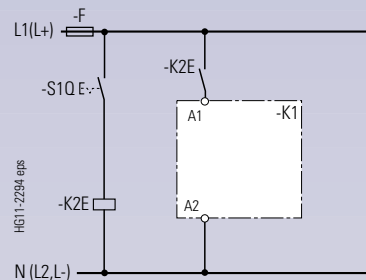
Without time-delay relay for minimum motor starting time, opening delay  $\leq 50$  ms

Fig. 3



Without time-delay relay for minimum motor starting time, opening delay  $325 \pm 75$  ms

Fig. 2



Without time-delay relay for minimum motor starting time, opening delay  $325 \pm 75$  ms

Fig. 4

#### Legend

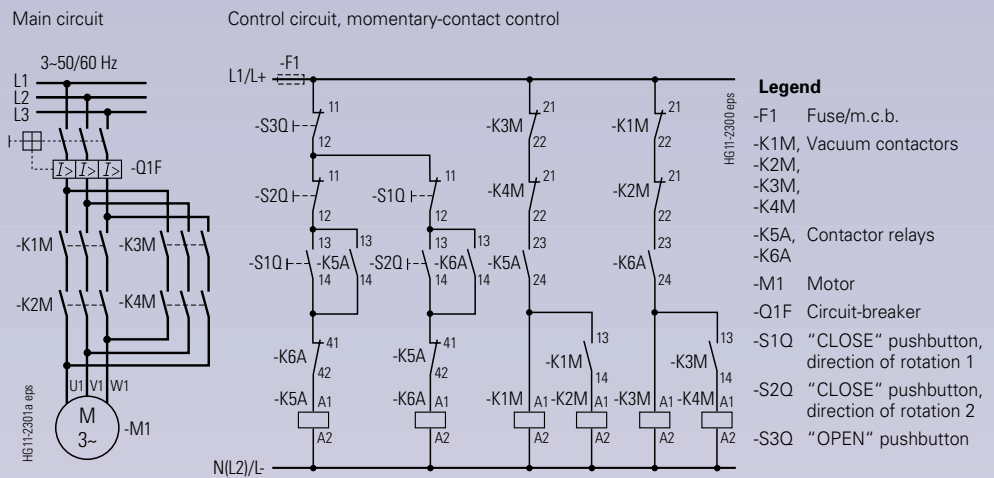
- F Fuse
- K1 Vacuum contactor
- K2E External contactor relay (e.g. Siemens type 3TH4)
- K1M Solenoid-operated mechanism
- S0Q External "OPEN" pushbutton
- S1Q External "CLOSED" pushbutton



## Circuit diagrams (examples for motor start-up)

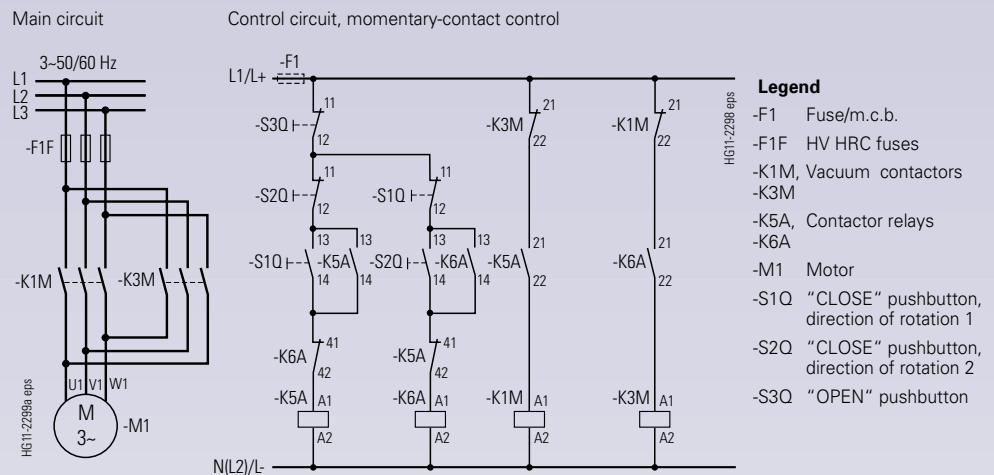
### Short-circuit protection by means of circuit-breaker

- Control of a high-voltage motor with reversing contactor combination
- for 2 directions of rotation
- with four 3TL8 contactors



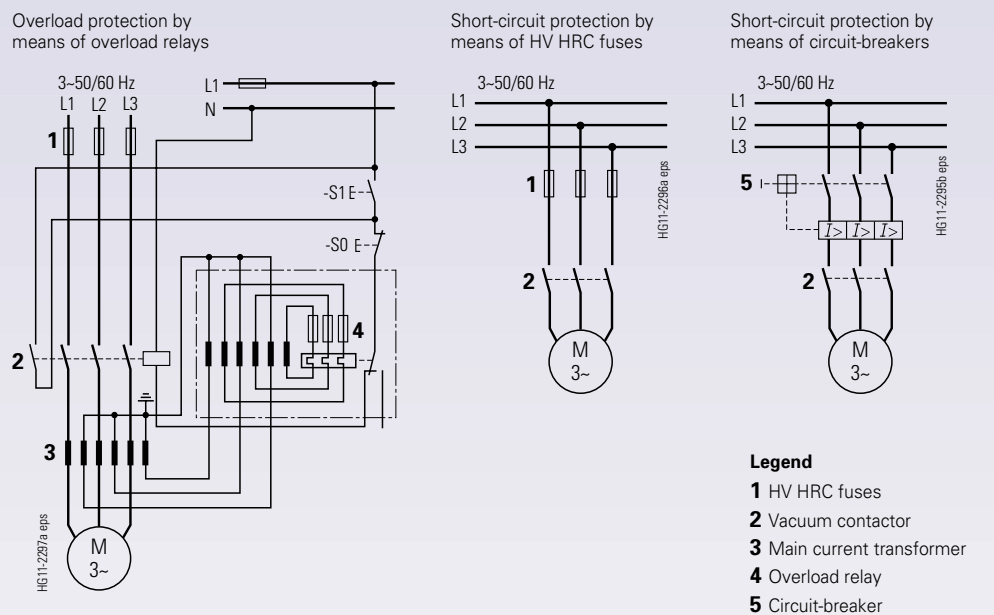
### Short-circuit protection by means of HV HRC fuses

- Control of a high-voltage motor with reversing contactor combination
- for 2 directions of rotation
- with two 3TL8 contactors



### Overload and short-circuit protection

- for 1 direction of rotation
- with one 3TL8 contactor



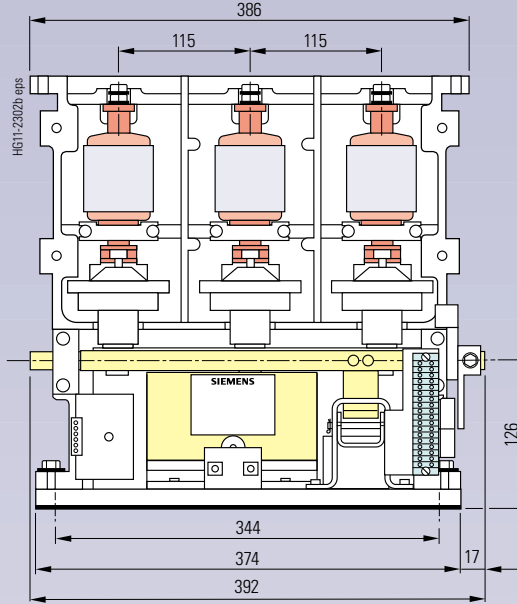
# 3TL8 Vacuum Contactors as Economy Contactors

## Dimensions and weights

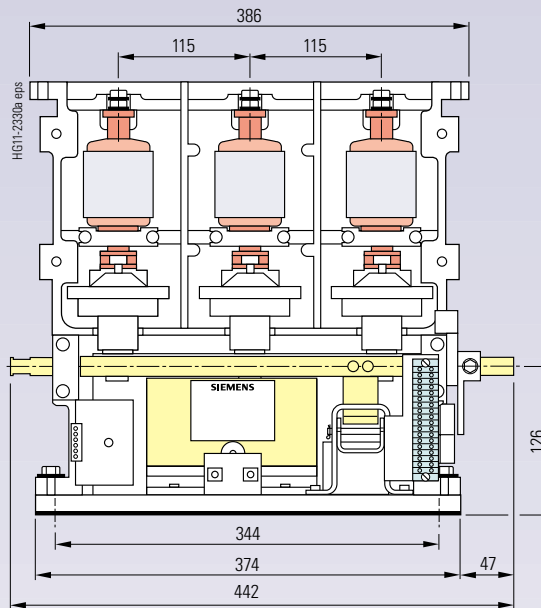
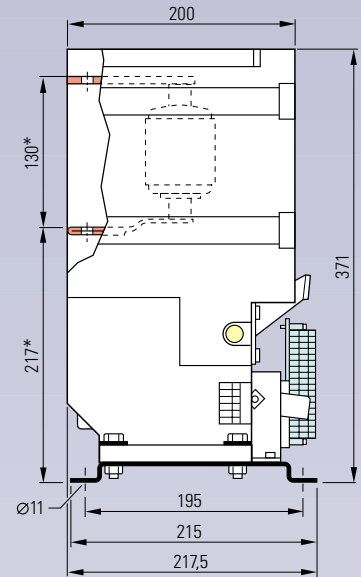
### 3TL8 vacuum contactor

- For AC and DC operation
- Weight 32 kg.

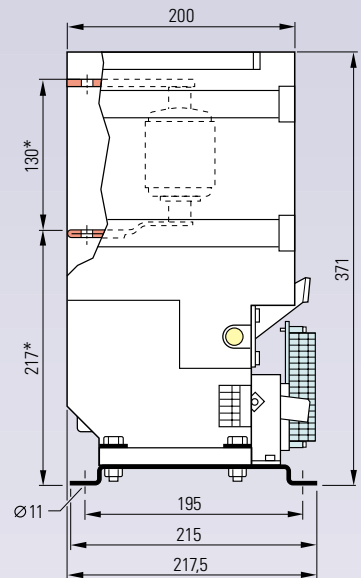
2



3TL8 100 vacuum contactor with short operating shaft



3TL8 101 vacuum contactor with long operating shaft



\* Fixing dimensions

## Shipping

### Packaging

The 3TL8 vacuum contactors are packed in accordance with the customer's order specifications and shipped anywhere in the world in the mode determined by the customer.

If the customer has not specified the manner of packaging and mode of shipping, the most economic option is chosen depending on the size of the lot ordered.

Package type	Destination					
	Germany		Europe		Overseas	Overseas/Europe
	Shipping by means of truck rail		Shipping by means of truck rail		Shipping by means of ship	Shipping by means of air freight
Individual package	•		•		•	•
Lot-size package		•		•	•	•
Cardboard box with inner box to suit unit	•	•	•	•		•
Cardboard box with sealed packaging and inner box to suit unit			•	•	•	•
Skeleton container with cardboard boxes and inner box to suit unit		•				
Plywood box + cardboard boxes with sealed packaging and inner box to suit unit			•	•	•	•

• Preferred package type

### Shipping dimensions and weights

Shipping by truck or rail

Package type	for no. of vacuum contactors	Length mm	Width mm	Height mm	Volume m <sup>3</sup>	Gross weight kg
Cardboard with inner box to suit unit	1	490	300	400	0.059	23
	2	800	780	670	0.42	62
	3 – 4	1020	620	670	0.42	100 – 130
Cardboard box with sealed packaging and inner box to suit unit	1 – 2	800	780	670	0.42	45 – 70
	3 – 4	1020	620	670	0.42	105 – 135
Skeleton container with cardboard boxes and inner box to suit unit	3 – 12	1200	800	800	0.77	125 – 360
Plywood box + cardboard boxes with sealed packaging and inner box to suit unit	1 – 3	920	620	720	0.41	50 – 100
	7 – 10	1020	1020	1020	1.06	240 – 310

Shipping by ship

Package type	for no. of vacuum contactors	Length mm	Width mm	Height mm	Volume m <sup>3</sup>	Gross weight kg
Cardboard box with inner box to suit unit	–	–	–	–	–	–
Cardboard box with sealed packaging and inner box to suit unit	1 – 2	800	780	670	0.42	45 – 70
	3 – 4	1020	620	670	0.42	105 – 135
Skeleton container with cardboard boxes and inner box to suit unit	–	–	–	–	–	–
Plywood box + cardboard boxes with sealed packaging and inner box to suit unit	1 – 3	920	620	720	0.41	50 – 100
	7 – 10	1020	1020	1020	1.06	240 – 310

Shipping by air freight

Package type	for no. of vacuum contactors	Length mm	Width mm	Height mm	Volume m <sup>3</sup>	Gross weight kg
Cardboard box with inner box to suit unit	1	490	300	400	0.059	23
	2	800	780	670	0.42	62
	3 – 4	1020	620	670	0.42	100 – 130
Cardboard box with sealed packaging and inner box to suit unit	1 – 2	800	780	670	0.42	45 – 70
	3 – 4	1020	620	670	0.42	105 – 135
Skeleton container with cardboard boxes and inner box to suit unit	–	–	–	–	–	–
Plywood box + cardboard boxes with sealed packaging and inner box to suit unit	1 – 3	920	620	720	0.41	50 – 100
	7 – 10	1020	1020	1020	1.06	240 – 310

# 3TL8 Vacuum Contactors as Economy Contactors

## Enquiry form

Please  
- copy this form  
- complete it according  
to your requirements  
- return it to your  
Siemens office

### To your Siemens office

Company Siemens AG  
 Department \_\_\_\_\_  
 Name \_\_\_\_\_  
 Street \_\_\_\_\_  
 City, postal code \_\_\_\_\_  
 Fax \_\_\_\_\_

### Your personal details

Company \_\_\_\_\_  
 Department \_\_\_\_\_  
 Name \_\_\_\_\_  
 Street \_\_\_\_\_  
 City, postal code \_\_\_\_\_  
 Tel. \_\_\_\_\_  
 Fax \_\_\_\_\_

**We request the following:**  Quotation  Call  Visit  Order/Delivery

### Technical specifications

See page 2/4.

Other requirements \_\_\_\_\_

7.2 kV rated operational voltage

50/60 Hz rated frequency

400 A rated normal current

8 kA rated short-time current

250 A rated capacitor current (switching of capacitors)

Switching frequency 1200/h

Other requirements \_\_\_\_\_

Mechanical service life of the vacuum contactor, 1 mill.

Mechanical service life of the vacuum interrupter, 0.25 mill.

Electrical service life of the vacuum interrupter, 0.25 mill.

Chopping current  $\leq 0.6$  A

Max. permissible switching capacity 5 kA

### Additional/secondary equipment

See page 2/5.

**Version**

With short operating shaft

With long operating shaft

**Auxiliary switches, additional modules**

2NO+2NC  4NO+4NC

4NO+4NC + closing latching

**Operating voltage of the solenoid**

24 V to 60 V AC/DC

110 V to 250 V AC/DC

**Break time**

325  $\pm$  75 ms

**Wiring**

Auxiliary switches on terminal block

Conductors, halogen-free and flame-resistant

### Operating voltage for releasing the mechanical closing latching

Without closing latching

24 V DC  30 V DC

48 V DC  60 V DC

110 V DC  125 V DC

220 to 250 V DC

110/115 V AC 50/60 Hz

120/127 V AC 50/60 Hz

220/240 V AC 50/60 Hz

380 V AC 50/60 Hz

### Operating instructions

Without routine test report  German/English

French/Spanish

With routine test report  German/English

French/Spanish

**Order No.**

-      -

**Quantity**

\_\_\_\_\_

### Field of application and other requirements

Motors \_\_\_\_\_

Transformers \_\_\_\_\_

Reactors \_\_\_\_\_

Ohmic loads \_\_\_\_\_

Capacitors \_\_\_\_\_

Filter circuits \_\_\_\_\_

2

# 3TL6 Vacuum Contactors as Universal Contactors



Transrapid MAGLEV vehicle, test track at Lathen, Germany

## Features

- Rated voltages up to 12 kV
- Maintenance-free through to the end of the vacuum interrupters' service life
- Mechanical service life of the contactor up to 3 mill. operating cycles
- Suitable for switching, for example:
  - Transformers
  - Capacitors
  - Filter circuits
  - Motors
  - Reactors
  - Ohmic loads



## Contents

Page

Construction and mode of operation	3/2, 3/3
Technical specifications	3/4
Selection and ordering data	3/5
Spare parts and accessories	3/6
Internal connection diagrams	3/7
Circuit diagrams	3/8, 3/9
Dimensions and weights	3/10
Shipping	3/11
Enquiry form	3/12



# 3TL6 Vacuum Contactors as Universal Contactors

## Construction and mode of operation

### Construction

The 3TL6 vacuum contactor consists of:

- Medium-voltage section with
  - Insulating plastic housing (15)
  - Vacuum interrupters (13)
  - Main conductor terminals (12 and 14)
- Low-voltage section with
  - Mechanism housing (1) made of sheet steel
  - Magnetic system (2)
  - Central terminal block (3) for auxiliary and control circuits
  - Contactor relay (external)
  - Auxiliary contact blocks
  - Mechanical closing latching (7 to 9) and mechanical closing lock-out (5) as additional modules
- Integral rocker (10) as connection between the magnetic system and the vacuum interrupters.

### Mode of operation

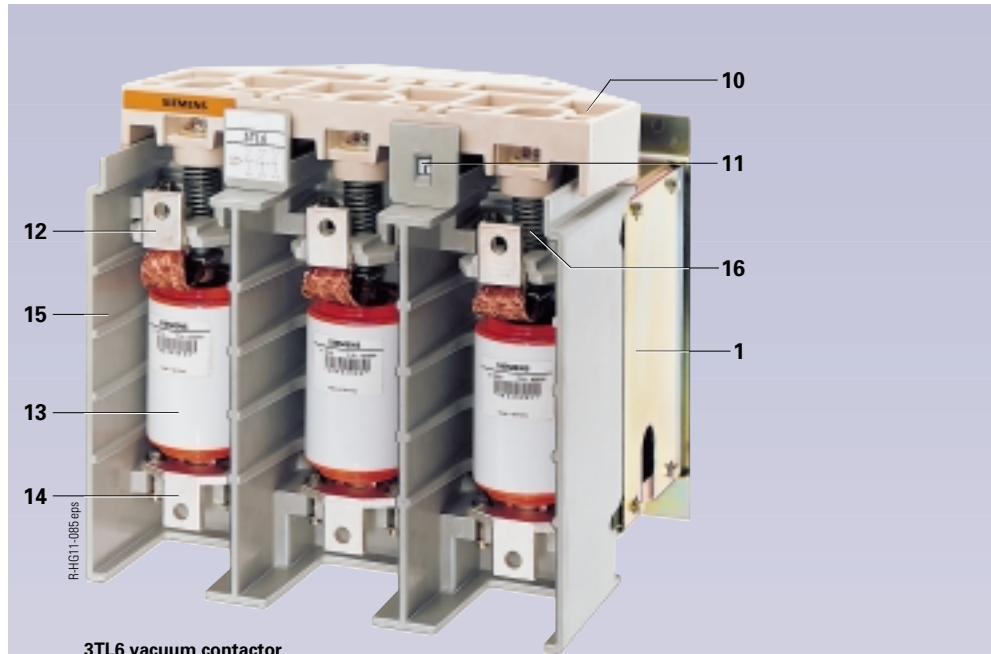
(see figure on page 3/3)

The atmospheric pressure exerts a force on the metal bellows of the vacuum interrupter. Without the influence of the operating mechanism, the contact gap would close. The opening springs (6) keep the moving contact piece in the open position by means of the integral rocker (10).

To close the vacuum contactor, the pressure force of the opening springs (6) is overcome by the magnetic system (2). The solenoid armature (4) is attracted and thereby moves the integral rocker (10) which releases the moving interrupter contact piece from the open position. The atmospheric pressure closes the contact pieces. The integral rocker (10) then presses the contact pressure springs (16) together and thereby produces the necessary contact force.

After de-energization of the electromagnetic excitation, the opening springs (6) open the contact gap by means of the integral rocker (10) and the moving interrupter contact piece.

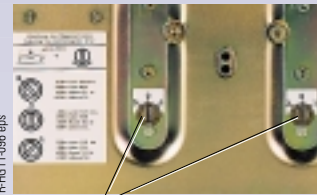
The DC magnetic system functions as an economy circuit. This leads to a longer mechanical service life and reduces both pick-up and holding power.



**3TL6 vacuum contactor**  
7.2 kV/450 A



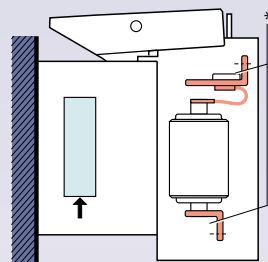
Terminal block (3)  
(Optional: withdrawable from side)



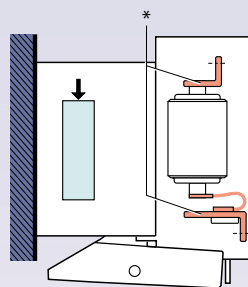
Adjusting controls (at rear of unit) for adapting to a site altitude between 1250 m below and 2500 m above sea level

**Legend**  
See page 3/3

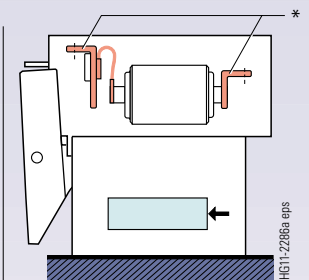
### Permissible installation positions



**Wall assembly**  
vertical layout



vertical layout  
(rotated through 180°)



**Floor assembly**  
horizontal layout

- \* Position of the main conductor terminals
- ➔ Position of the terminal block

Continued

## Adapting to the site altitude

The vacuum contactor is factory-set for a site altitude between 200 m below and 1250 m above sea level. If it is to be used at altitudes not within this range, the altitude range must be adapted by means of adjusting controls (see figure on page 3/2) at the rear of the end unit.

Adjusting ranges above sea level:

- + 1250 m to + 2500 m
- – 200 m to + 1250 m
- – 1250 m to + 200 m.

## Mechanical closing latching

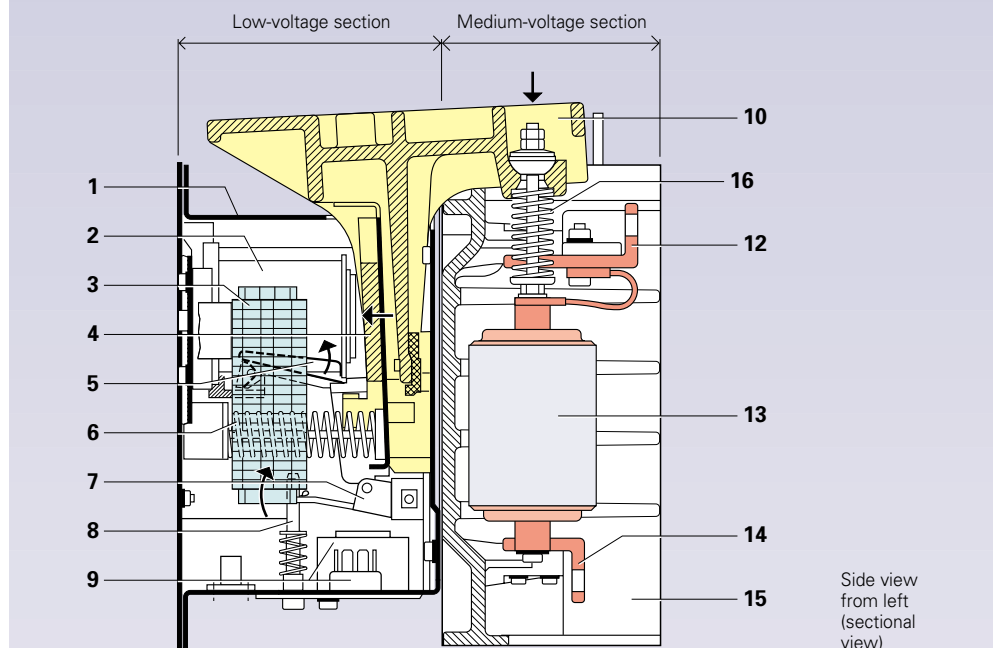
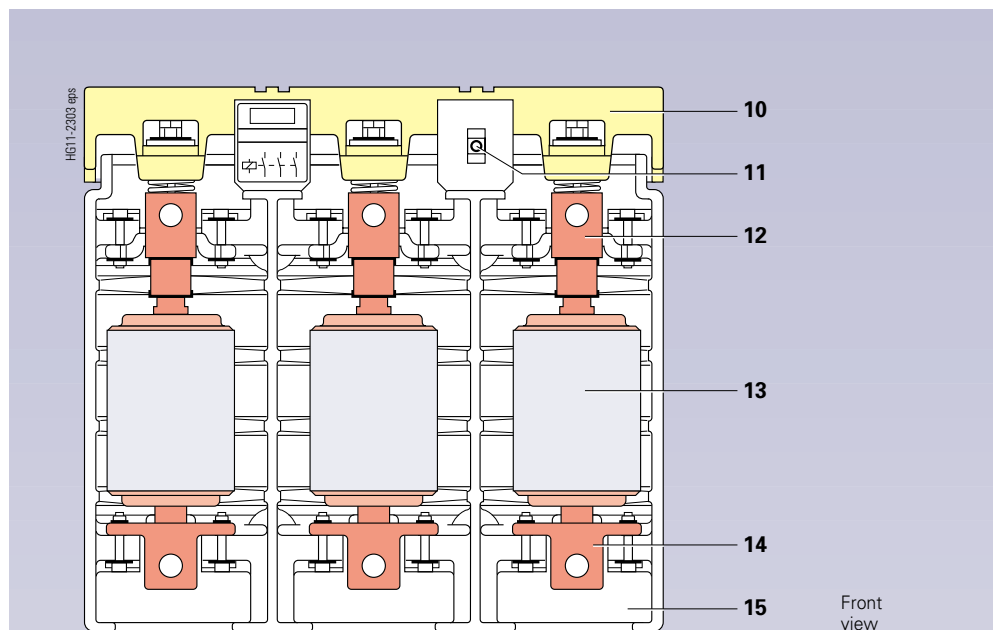
The latching lever (7) holds the vacuum contactor in the closed state even without excitation of the magnetic system. When the magnetic system is excited, the integral rocker is latched mechanically by means of a lever and roller system into the "CLOSED" position. The contactor is unlatched electrically by means of an unlatching solenoid (9) or mechanically by means of the release bolt (8).

## Mechanical closing lock-out

The mechanical closing lock-out (5) prevents unintentional closing of the vacuum contactor, for example, due to vibrations or when the withdrawable unit is moved. This lock remains inoperative during operational switching.

## Blocking element for interlocking of two contactors

A mechanically functioning blocking element is available on request (for rated voltages up to 7.2 kV only) for mutual interlocking of two contactors in reversing operation. The blocking element is fixed between the two contactors and intervenes in a mutually controlling and blocking manner in the movement of the integral rocker of both contactors. This rules out a phase short-circuit as a result of simultaneous activation of both directions of rotation in the event of mechanical impact and electrical maloperations.



**Design of a 3TL6 vacuum contactor in the "OPEN" state**  
(the arrows show the "CLOSED" direction of movement)

### Legend

- |   |  |  |
|---|--|--|
| <p><b>1</b> Mechanism housing</p> <p><b>2</b> Magnetic system (solenoid *) with rectifier * (optional) and economy resistor *</p> <p><b>3</b> Terminal block (optional: withdrawable from side)</p> <p><b>4</b> Solenoid armature</p> <p><b>5</b> Mechanical closing lock-out *</p> | <p><b>6</b> Opening spring</p> <p><u>Mechanical closing latching (7 to 9)</u></p> <p><b>7</b> Latching lever</p> <p><b>8</b> Release bolt</p> <p><b>9</b> Unlatching solenoid * with rectifier and varistor modules * (optional)</p> | <p><b>10</b> Integral rocker</p> <p><b>11</b> Position indicator O – I</p> <p><b>12</b> Top main conductor terminal</p> <p><b>13</b> Vacuum interrupter *</p> <p><b>14</b> Bottom main conductor terminal</p> <p><b>15</b> Insulating plastic housing</p> <p><b>16</b> Contact pressure spring</p> |
|---|--|--|

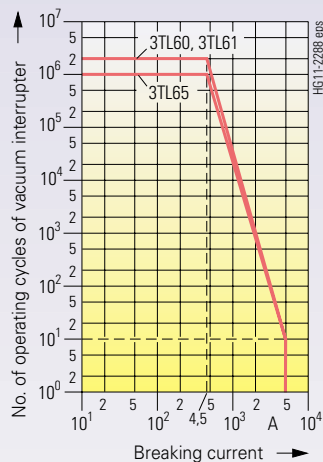
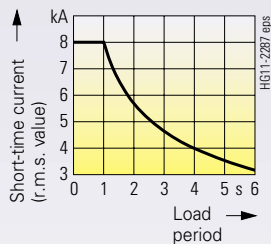
\* Also available as a spare part.

# 3TL6 Vacuum Contactors as Universal Contactors

## Technical specifications

### Medium-voltage section

	Vacuum contactor type 3TL61	3TL65
<b>Rated operational voltage <math>U_e</math></b>	7.2 kV	12 kV
<b>Rated frequency</b>	50 to 60 Hz	
<b>Rated continuous current <math>I_u</math> to DIN VDE 0660</b>	450 A	
<b>Rated normal current <math>I_e</math></b> according to utilization categories AC-1, AC-2, AC-3 and AC-4 at ambient temperatures up to + 55 °C + 80 °C	450 A 315 A	
<b>Switching capacity</b> according to utilization category AC-4 (p. f. = 0.35)		
Rated making current	4500 A	
Rated breaking current	3600 A	
<b>Max. permissible switching capacity</b>	5 kA	
<b>Rated short-time current 1 s</b> (r.m.s. value) (For short-time current for longer periods, see short-time current load-period curve)	8 kA	
<b>Switching of capacitors</b>		
Rated capacitor current	250 A	250 A <sup>3)</sup>
Maximum permissible making current peak	10 kA	10 kA
<b>Switching frequency</b> (AC and DC operation) without mechanical closing latching	1200 operating cycles/h	600 operating cycles/h
<b>Mechanical service life of the contactor</b> according to class D3 as defined in DIN VDE 0660	3 mill. operating cycles	1 mill. operating cycles
<b>Mechanical service life of the vacuum interrupter</b>	2 mill. operating cycles	1 mill. operating cycles
<b>Electrical service life of the vacuum interrupter</b> at rated normal current	1 mill. operating cycles	0.5 mill. operating cycles
<b>Insulation level</b>		
Rated lightning impulse withstand voltage (to DIN VDE 0670, IEC 56): to earthed parts and between poles across the open contact gap	60 kV 40 kV	75 kV 60 kV
Rated power-frequency withstand voltage 50 Hz (r.m.s.) to earthed parts and between poles across the open contact gap	20 kV 20 kV	28 kV 28 kV
<b>Cross-sections of the main conductor terminals</b>		
Terminal screw	M10	M10
Stranded conductors with cable lug	50 to 240 mm <sup>2</sup>	50 to 185 mm <sup>2</sup>
Copper rail to DIN 43 671	30 x 5 mm	30 x 5 mm
Aluminium rail to DIN 43 670	20 x 10 mm	20 x 10 mm



### Low-voltage section

	Vacuum contactor type 3TL61	3TL65
<b>Power consumption of the solenoid</b> (AC and DC operation)		
Pickup power	650 W	
Holding power	90 W	
<b>Voltage range of the solenoid</b> Operating voltage (AC and DC operation)	0.8 to 1.1 $U_c$	
<b>Minimum closing command</b> for the solenoid	100 ms	
<b>Make time <sup>1)</sup></b> (AC and DC operation)	100 ms at 0.85 x $U_c$ 80 ms at 1.0 x $U_c$ 60 ms at 1.1 x $U_c$	
<b>Break time <sup>2)</sup></b> (AC and DC operation) Other opening delay times possible as special version: see page 3/5	30 ms at 0.8 x $U_c$ 50 ms at 1.0 x $U_c$ 50 ms at 1.1 x $U_c$	
<b>Mechanical closing latching</b> (optional) (AC and DC operation)		
Service life	100,000 operating cycles	
Switching frequency	60 operating cycles/h	
Power consumption of unlatching solenoid	900 W	
Voltage range of unlatching solenoid	0.85 to 1.1 $U_c$	
Tripping pulse (by external circuit provided by customer)	0.2 to max. 1 s	
Break time	< 45 ms	
<b>Auxiliary contacts</b>		
<b>Number of auxiliary contacts</b>	4NO + 3NC (optional: 6NO + 5NC)	
<b>Rated continuous current <math>I_u</math></b>	10 A	
<b>Rated normal current <math>I_e</math></b> Utilization category for AC-11 at rated voltage	125 V AC, 10 A 230 V AC, 10 A 500 V AC, 4 A 600 V AC, 2 A	
Utilization category for DC-11 at rated voltage	24 V DC, 10 A 110 V DC, 5 A 125 V DC, 0.9 A 220 V DC, 0.45 A 440 V DC, 0.25 A 600 V DC, 0.2 A	
<b>Cross-sections of the auxiliary contacts</b> to EN 60 947 Part 1 (screw terminal, two wire connection possible)		
- solid	0.6 to 4 mm <sup>2</sup>	
- finely stranded with end sleeve	0.5 to 2.5 mm <sup>2</sup>	

### Ambient conditions

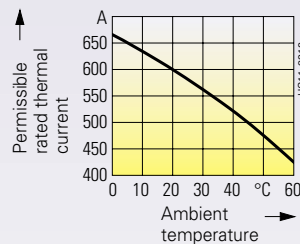
#### Ambient temperature

Storage	at - 40 to + 65 °C	20 years	20 years
Operation	at - 5 to + 55 °C	Operating cycles	2 mill.
	at + 55 to + 80 °C	Operating cycles	1 mill.
	at - 25 to - 5 °C	Operating cycles	0.5 mill.

<b>Site altitude</b> (adjustable)	1250 m below sea level to 2500 m above sea level
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#### Shock resistance (square impact)

	5 x g, 10 ms or 10 x g, 5 ms
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- 1) Make time = Time from the instant of application of a control pulse (command) to the instant when the contacts touch.
- 2) Break time = Time from the instant of application of the "OPEN" control pulse to the instant of contact separation.
- 3) 3EF3 surge limiter required.

# 3TL6 Vacuum Contactors as Universal Contactors

3TL  
Vacuum Contactors

## Selection and ordering data

# up to 12 kV



R-HG11-085 eps

Rated operational voltage $U_e$	Rated lightning impulse withstand voltage		Rated power-frequency withstand voltage	Rated normal current $I_e$	Order No.	Order code
kV	kV to earth	kV across open contact gap	kV	A		
7.2	60	40	20	450	<b>3TL6 1</b> □ 3 - □ □ □ □ - □ □ □ □	
12	75	60	28	450	<b>3TL6 5</b> □ 0 - □ □ □ □ - □ □ □ □	
<b>Terminal block</b>					<b>Auxiliary contacts</b>	
Central					4NO + 3NC	1
Central					6NO + 5NC	2
Withdrawable					6NO + 5NC	3
<b>Additional modules</b>					<b>Auxiliary contacts</b>	
Without additional modules						0
Mechanical closing latching					1NO assigned	1
Mechanical closing lock-out						2
Mechanical closing latching and closing lock-out					1NO assigned	3
f-release with closing latching, without closing lock-out					1NO assigned	4
f-release with closing latching, with closing lock-out					1NO assigned	5
<b>Type of operation for solenoid and mechanical closing latching</b>						
AC operation for air-insulated systems						A
DC operation for air-insulated systems						B
<b>Operating voltage for solenoid and mechanical closing latching</b>						
110 V AC 50/60 Hz						G 2
115 V AC 50/60 Hz						J 2
120 V AC 50/60 Hz						K 2
125/127 V AC 50 Hz						L 0
220 V AC 50/60 Hz						N 2
230 V AC 50/60 Hz						L 2
240 V AC 50/60 Hz						P 2
380 V AC 50 Hz						Q 0
400 V AC 50 Hz						V 0
415 V AC 50 Hz						R 0
440 V AC 50/60 Hz						R 2
500 V AC 50 Hz						S 0
24 V DC						B 4
60 V DC						E 4
110 V DC						F 4
125 V DC						G 4
220 V DC						M 4
Operating voltage of solenoid different from that of mechanical closing latching <sup>1)</sup>						Z 0
						K 1 Y
<b>Operating instructions</b>						
German / English (standard)						
French / Spanish						Z L 0 1
<b>Routine test report</b>						
German / English <sup>2)</sup>						Z F 2 0
<b>Special versions</b>						
<b>Break times</b>						
$\leq 35$ ms						Z G 0 1
$\leq 120$ ms						Z G 0 2
$250 \pm 70$ ms						Z G 0 3
120/50 ms						Z G 0 8
<b>Overvoltage protection circuitry in secondary circuit</b>						
Varistor module						Z A 0 0
Rectifier module						Z A 0 1
<b>Wiring</b>						
Conductors, halogen-free and flame-resistant						Z A 1 0

1) Ordering data: in addition to the Order No., state the required operating voltage from the above table in plain text (please make inquiry).











2) Other languages on request.

**Note:**

Due to a lack of space, the internal command ending unit cannot be installed in 3TL6 vacuum contactors with withdrawable terminal block. Order No. 3TL6 133 and 3TL6 530.

# 3TL6 Vacuum Contactors as Universal Contactors

**Spare parts and accessories** (when placing an order, please also state the type and serial number of the vacuum contactor)

	Scope of delivery	Operating voltage or contacts	Order No.	Operating voltage	Order No.
<b>Vacuum interrupter</b>	 R-HG11-097 eps	–	<b>3TY5 610-2AA0</b> <b>3TY5 650-0AA0</b>		
<b>Auxiliary contact block</b>	 R-HG11-098 eps	left 2NO + 2NC 3NO + 3NC right 2NO + 2NC 3NO + 3NC	<b>3TY7 561-1NA0</b> <b>3TY7 561-1QA0</b> <b>3TY7 561-1PA0</b> <b>3TY7 561-1RA0</b>		
<b>Solenoid</b> from year of manufacture 10.90, from serial no. 31 375 035	 R-HG11-101 eps	110/115 V AC 50/60 Hz 120 V AC 50/60 Hz 125/127 V AC 50 Hz 220 V AC 50/60 Hz 230/240 V AC 50/60 Hz 380 V AC 50 Hz 400/415 V AC 50 Hz 440 V AC 50/60 Hz	<b>3TY5 651-0AG7</b> <b>3TY5 651-0AL7</b> <b>3TY5 651-0AL7</b> <b>3TY5 651-0AN2</b> <b>3TY5 651-0AN7</b> <b>3TY5 651-0AQ2</b> <b>3TY5 651-0AR7</b> <b>3TY5 651-0AR7</b>	500 V AC 50 Hz 24 V DC 60 V DC 110 V DC 125 V DC 220 V DC	<b>3TY5 651-0AU7</b> <b>3TY5 651-0BB4</b> <b>3TY5 651-0BE4</b> <b>3TY5 651-0BF4</b> <b>3TY5 651-0BG4</b> <b>3TY5 651-0BM4</b>
<b>Solenoids with resistor</b> (complete kit only) up to year of manufacture 09.90, up to serial no. 31 375 034	 R-HG11-101 eps R-HG11-100 eps	110/115 V AC 50/60 Hz 120 V AC 50/60 Hz 125/127 V AC 50 Hz 220 V AC 50/60 Hz 230/240 V AC 50/60 Hz 380 V AC 50 Hz 400/415 V AC 50 Hz 440 V AC 50/60 Hz	<b>3TY5 656-0AG7</b> <b>3TY5 656-0AL7</b> <b>3TY5 656-0AL7</b> <b>3TY5 656-0AN2</b> <b>3TY5 656-0AN7</b> <b>3TY5 656-0AQ2</b> <b>3TY5 656-0AR7</b> <b>3TY5 656-0AR7</b>	500 V AC 50 Hz 24 V DC 60 V DC 110 V DC 125 V DC 220 V DC	<b>3TY5 656-0AU7</b> <b>3TY5 656-0BB4</b> <b>3TY5 656-0BE4</b> <b>3TY5 656-0BF4</b> <b>3TY5 656-0BG4</b> <b>3TY5 656-0BM4</b>
<b>Resistor</b> (accessory) <b>for economy circuit</b> from year of manufacture 10.90, from serial no. 31 375 035	 R-HG11-100 eps	110/115 V AC 120/125/127 V AC 220 V AC 230/240 V AC 380 V AC 400/415/440 V AC	<b>3TY5 664-1DA0</b> <b>3TY5 664-1EA0</b> <b>3TY5 664-1FA0</b> <b>3TY5 664-1GA0</b> <b>3TY5 664-1HA0</b> <b>3TY5 664-1JA0</b>	500 V AC 24 V DC 60 V DC 110 V DC 125 V DC 220 V DC	<b>3TY5 664-1KA0</b> <b>3TY5 664-0AA0</b> <b>3TY5 664-0CA0</b> <b>3TY5 664-0DA0</b> <b>3TY5 664-0EA0</b> <b>3TY5 664-0FA0</b>
<b>Contactor relay</b>	 R-HG11-102 eps	110 V AC 50/60 Hz 115 V AC 50/60 Hz 120 V AC 50/60 Hz 125/127 V AC 50 Hz 220 V AC 50/60 Hz 230 V AC 50/60 Hz 240 V AC 50/60 Hz 400 V AC 50 Hz 415 V AC 50 Hz 440 V AC 50/60 Hz	<b>3TH40 92-0AG1</b> <b>3TH40 92-0AJ1</b> <b>3TH40 92-0AK1</b> <b>3TH40 92-0AL0</b> <b>3TH40 92-0AN1</b> <b>3TH40 92-0AL1</b> <b>3TH40 92-0AP1</b> <b>3TH40 92-0AV0</b> <b>3TH40 92-0AR0</b> <b>3TH40 92-0AR1</b>	500 V AC 50 Hz 24 V DC 60 V DC 110 V DC 125 V DC 220 V DC	<b>3TH40 92-0AS0</b> <b>3TH40 92-0BB4</b> <b>3TH40 92-0BE4</b> <b>3TH40 92-0BF4</b> <b>3TH40 92-0BG4</b> <b>3TH40 92-0BM4</b>
<b>Mechanical closing latching</b> (accessory)	 R-HG11-103 eps	110/115 V AC 50/60 Hz 120 V AC 50/60 Hz 125/127 V AC 50 Hz 220 V AC 50/60 Hz 230/240 V AC 50/60 Hz 380 V AC 50 Hz 400/415 V AC 50 Hz 440 V AC 50/60 Hz	<b>3TY5 692-0AG7</b> <b>3TY5 692-0AL7</b> <b>3TY5 692-0AL7</b> <b>3TY5 692-0AN2</b> <b>3TY5 692-0AN7</b> <b>3TY5 692-0AQ2</b> <b>3TY5 692-0AR7</b> <b>3TY5 692-0AR7</b>	500 V AC 50 Hz 24 V DC 60 V DC 110 V DC 125 V DC 220 V DC	<b>3TY5 692-0AU7</b> <b>3TY5 692-0BB4</b> <b>3TY5 692-0BE4</b> <b>3TY5 692-0BF4</b> <b>3TY5 692-0BG4</b> <b>3TY5 692-0BM4</b>
<b>Mechanical closing lock-out</b> (accessory)	 R-HG11-104 eps	–	<b>3TY5 693-0AA0</b>		
<b>Blocking element</b> (acc. for mechanical interlocking of two 3TL6 contactors up to 7.2 kV)	 R-HG11-105 eps	–	<b>3TX5 111-0AA0</b>		
<b>Rectifier module</b> (accessory) with varistor	 R-HG11-106 eps	–	<b>3AX15 25-1F</b>		
<b>Varistor module</b> (accessory)		–	<b>3AX15 26-0F</b>		
<b>Rectifier</b>		–	<b>3TY5 694-2AA0</b>		
<b>Adapting parts</b> (accessories), 1 set	for main conductor connection when substituting 3TL50 and 3TL51 contactors with 3TL61	–	<b>3TY5 610-1AA0</b>		



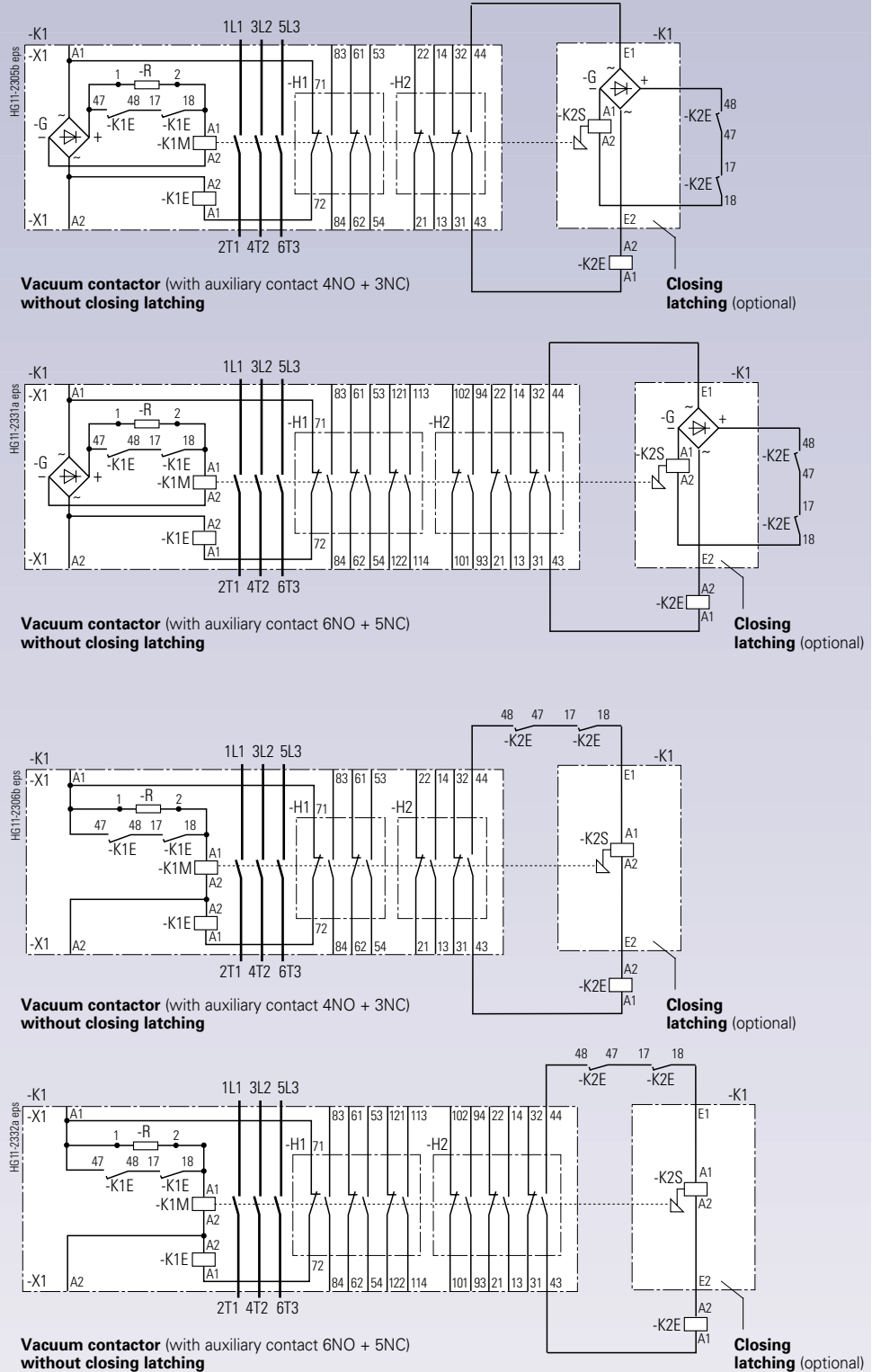
## Internal connection diagrams

### AC operation

- Voltage range  
110 V to 500 V AC  
50/60 Hz
- Opening delay  
– ≤ 35 ms  
– approximately 50 ms  
– 250 ± 70 ms
- Rectifier  
for economy circuit
- Resistor  
for economy circuit
- Auxiliary contact block  
– 4NO + 3NC or  
– 6NO + 5NC
- Optional: rectifier module  
or varistor module
- Optional: with mechanical  
closing latching

### DC operation

- Voltage range  
24 V to 220 V DC
- Opening delay  
– ≤ 35 ms  
– approximately 50 ms  
– 250 ± 70 ms
- Resistor  
for economy circuit
- Auxiliary contact block  
– 4NO + 3NC or  
– 6NO + 5NC
- Optional: with mechanical  
closing latching



<b>Legend</b>	-G Rectifier	-K1M Solenoid-operated mechanism for vacuum contactor
	-H1 Right-hand auxiliary contact block	-K2S Unlatching solenoid (optional)
	-H2 Left-hand auxiliary contact block	-R Economy resistor
	-K1 Vacuum contactor	-X1 Terminal block for auxiliary conductor connection
	-K1E Contactor relay for economy circuit	

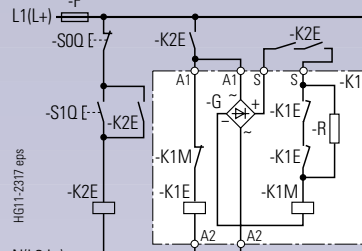
# 3TL Vacuum Contactors as Universal Contactors

## Circuit diagrams (examples)

### AC operation

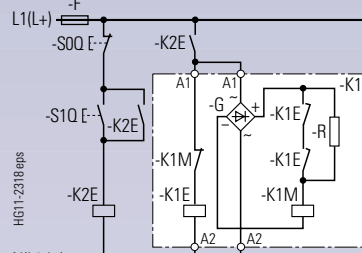
- Without mechanical closing latching
- Opening delay
  - ≤ 35 ms
  - approximately 50 ms
  - 250 ± 70 ms
- Rectifier
- Resistor for economy circuit

### Momentary-contact control



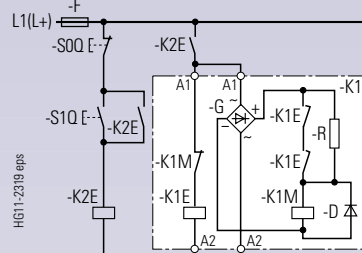
Without time-delay relay for minimum motor starting time; opening delay **≤ 35 ms**

Fig. 1



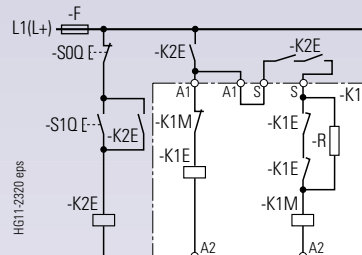
Without time-delay relay for minimum motor starting time; opening delay **approx. 50 ms**

Fig. 2



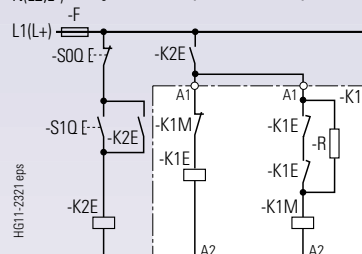
Without time-delay relay for minimum motor starting time; opening delay **250 ± 70 ms**

Fig. 3



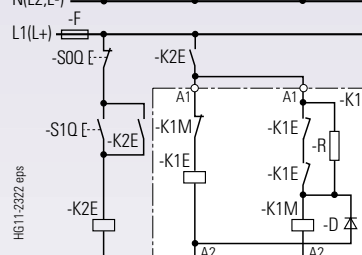
Without time-delay relay for minimum motor starting time; opening delay **≤ 35 ms**

Fig. 7



Without time-delay relay for minimum motor starting time; opening delay **approx. 50 ms**

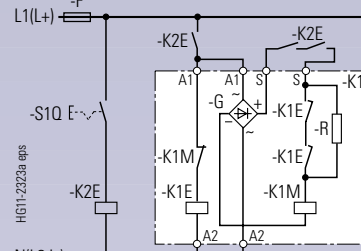
Fig. 8



Without time-delay relay for minimum motor starting time; opening delay **250 ± 70 ms**

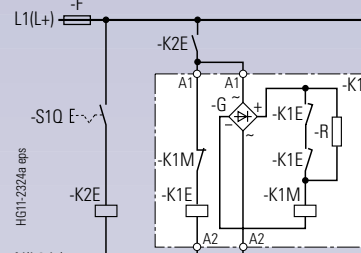
Fig. 9

### Maintained-contact control



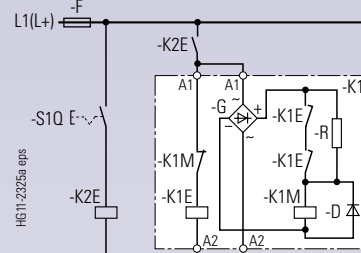
Without time-delay relay for minimum motor starting time; opening delay **≤ 35 ms**

Fig. 4



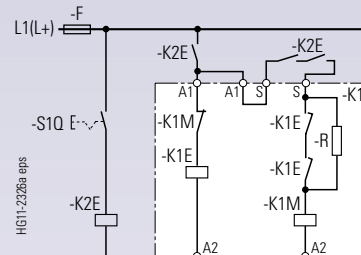
Without time-delay relay for minimum motor starting time; opening delay **approx. 50 ms**

Fig. 5



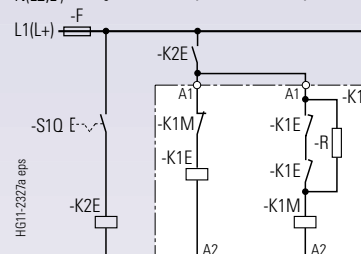
Without time-delay relay for minimum motor starting time; opening delay **250 ± 70 ms**

Fig. 6



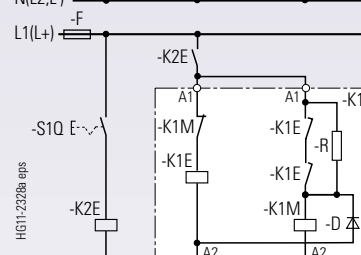
Without time-delay relay for minimum motor starting time; opening delay **≤ 35 ms**

Fig. 10



Without time-delay relay for minimum motor starting time; opening delay **approx. 50 ms**

Fig. 11



Without time-delay relay for minimum motor starting time; opening delay **250 ± 70 ms**

Fig. 12

### DC operation

- Without mechanical closing latching
- Opening delay
  - ≤ 35 ms
  - approximately 50 ms
  - 250 ± 70 ms
- Resistor for economy circuit

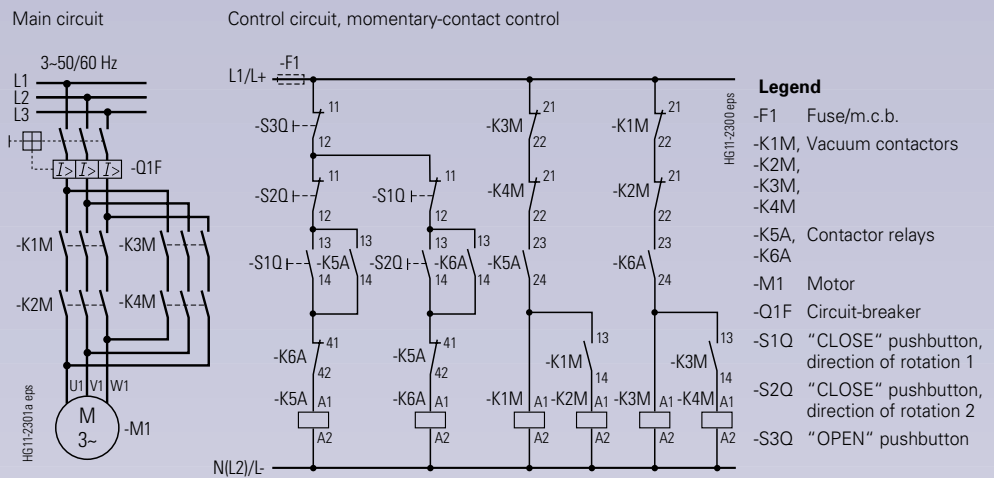
### Legend

- F Fuse
- K1 Vacuum contactor
- K2E External contactor relay (e.g. Siemens type 3TH4)
- K1E Internal contactor relay
- K1M Solenoid-operated mechanism
- R Economy resistor
- G Rectifier
- D Free-wheeling diode
- S0Q External "OPEN" pushbutton
- S1Q External "CLOSED" pushbutton

## Circuit diagrams (examples for motor start-up)

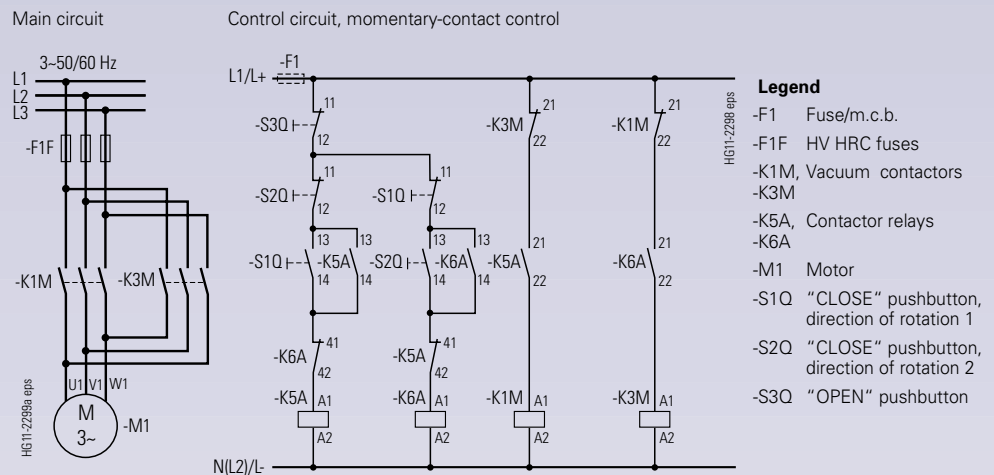
### Short-circuit protection by means of circuit-breaker

- Control of a high-voltage motor with reversing contactor combination
- for 2 directions of rotation
- with four 3TL6 contactors



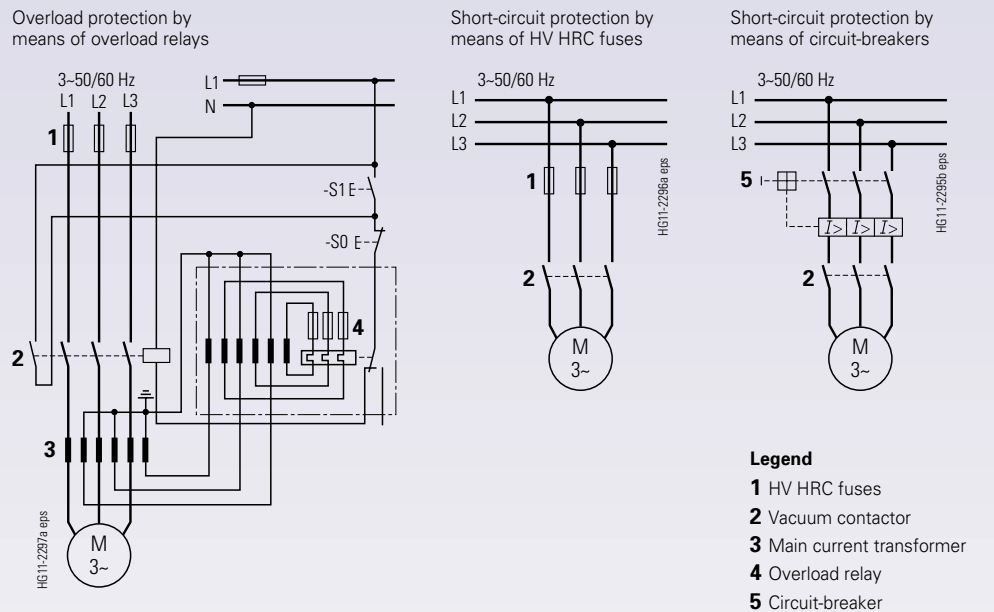
### Short-circuit protection by means of HV HRC fuses

- Control of a high-voltage motor with reversing contactor combination
- for 2 directions of rotation
- with two 3TL6 contactors



### Overload and short-circuit protection

- for 1 direction of rotation
- with one 3TL6 contactor



# 3TL6 Vacuum Contactors as Universal Contactors

## Dimensions and weights

### 3TL6 vacuum contactors

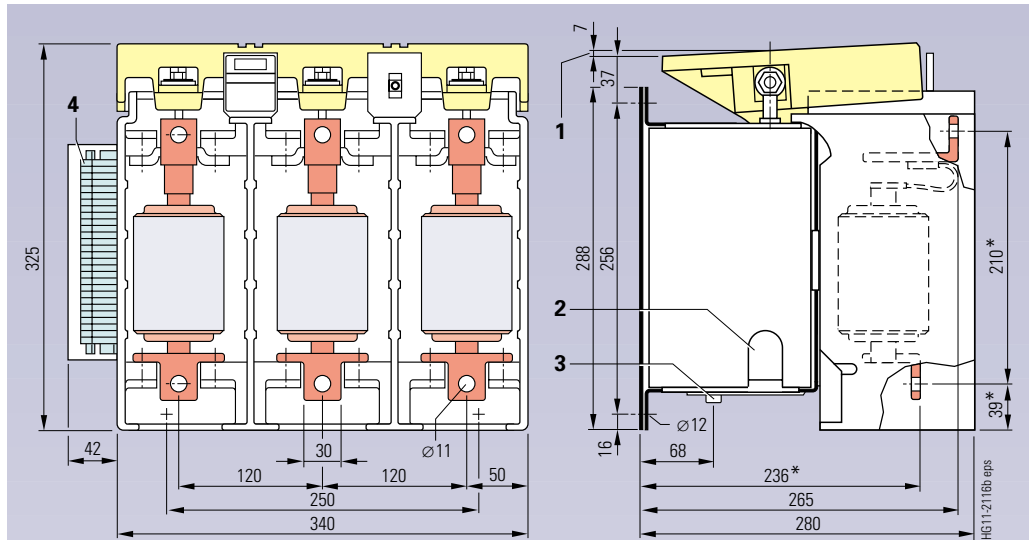
for AC and DC operation

#### Weights

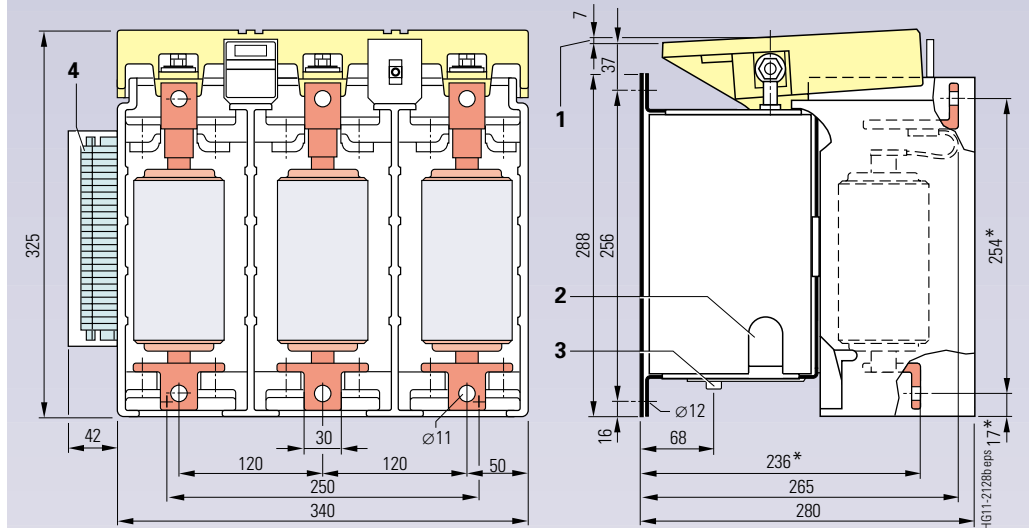
Rated voltage kV	Vacuum contactor type	Weight approx. kg
7.2	3TL61	28
12	3TL65	30

#### Legend

- 1 Travel of the integral rocker during switching operation for external interlock and position indicator; max. permissible counterforce 10 N
- 2 Opening for insertion of auxiliary wires into central terminal block
- 3 Mechanical unlatching, bolt with internal thread M5 x 10
- 4 Terminal block withdrawn (only possible with 3TL6□3□-... contactor)



3TL61 vacuum contactor



3TL65 vacuum contactor

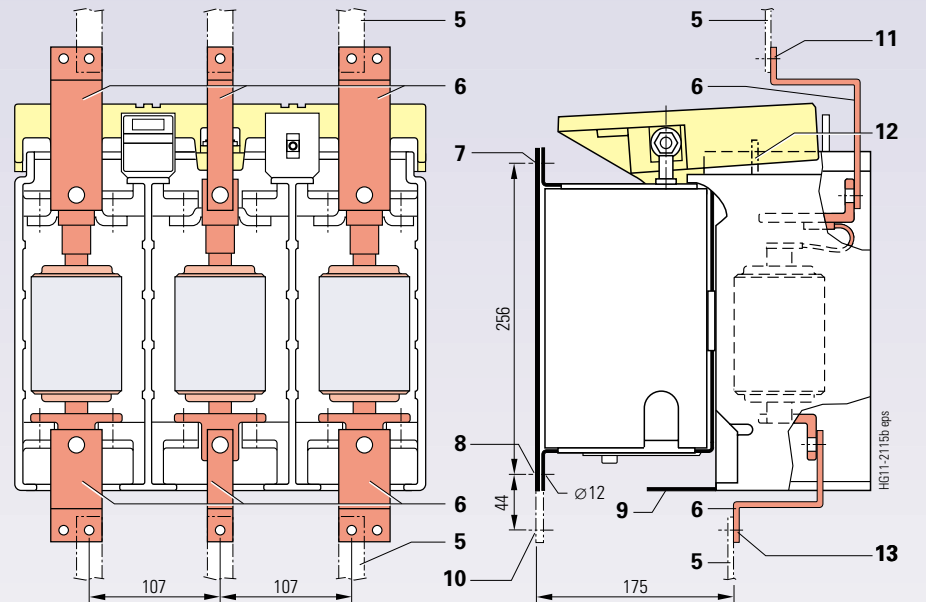
\* Fixing dimensions

#### Adapter parts

for 3TL61 vacuum contactor (replacement for 3TL50 and 3TL51 contactors)

#### Legend

- 5 System-internal conductor rails
- 6 Set of adapter parts 3TY5 618-0
- 7 Mounting 3TL5 and 3TL6
- 8 New mounting 3TL6
- 9 Insulating plate
- 10 Previous mounting 3TL5
- 11 New terminal 3TL6
- 12 Previous terminal 3TL5
- 13 Terminal 3TL5 and new terminal 3TL6



## Shipping

### Packaging

The 3TL6 vacuum contactors are packed in accordance with the customer's order specifications and shipped anywhere in the world in the mode determined by the customer.

If the customer has not specified the manner of packaging and mode of shipping, the most economic option is chosen depending on the size of the lot ordered.

Package type	Destination					
	Germany		Europe		Overseas	Overseas/Europe
	Shipping by means of truck		Shipping by means of rail		Shipping by means of ship	Shipping by means of air freight
Individual package	•		•		•	•
Lot-size package		•		•	•	•
Cardboard box with inner box to suit unit	•	•	•	•		•
Cardboard box with sealed packaging and inner box to suit unit			•	•	•	•
Skeleton container with cardboard boxes and inner box to suit unit		•				
Plywood box + cardboard boxes with sealed packaging and inner box to suit unit			•	•	•	•

• Preferred package type

### Shipping dimensions and weights

Shipping by truck or rail

Package type	for no. of vacuum contactors	Length mm	Width mm	Height mm	Volume m <sup>3</sup>	Gross weight kg
Cardboard box with inner box to suit unit	1	500	400	400	0.08	32
	2	840	570	640	0.3	87
	3 – 4	920	820	930	0.7	137 – 170
	5 – 8	1120	820	950	0.87	197 – 293
Cardboard box with sealed packaging and inner box to suit unit	1 – 2	840	570	640	0.3	92
	3 – 4	920	820	930	0.7	142 – 175
	5 – 8	1120	820	950	0.87	202 – 298
Skeleton container with cardboard boxes and inner box to suit unit	3 – 8	1200	800	800	0.77	176 – 333
Plywood box + cardboard boxes with sealed packaging and inner box to suit unit	1 – 2	920	620	670	0.38	59 – 91
	3 – 4	920	820	930	0.7	141 – 173
	5 – 8	1220	860	960	1.0	205 – 305

Shipping by ship

Package type	for no. of vacuum contactors	Length mm	Width mm	Height mm	Volume m <sup>3</sup>	Gross weight kg
Cardboard box with inner box to suit unit	–	–	–	–	–	–
Cardboard box with sealed packaging and inner box to suit unit	1 – 2	840	570	640	0.3	92
	3 – 4	920	820	930	0.7	142 – 175
	5 – 8	1120	820	950	0.87	202 – 298
Skeleton container with cardboard boxes and inner box to suit unit	–	–	–	–	–	–
Plywood box + cardboard boxes with sealed packaging and inner box to suit unit	1 – 2	920	620	670	0.38	59 – 91
	3 – 4	920	820	930	0.7	141 – 173
	5 – 8	1220	860	960	1.0	205 – 305

Shipping by air freight

Package type	for no. of vacuum contactors	Length mm	Width mm	Height mm	Volume m <sup>3</sup>	Gross weight kg
Cardboard box with inner box to suit unit	1	500	400	400	0.08	32
	2	840	570	640	0.3	87
	3 – 4	920	820	930	0.7	137 – 170
	5 – 8	1120	820	950	0.87	197 – 293
Cardboard box with sealed packaging and inner box to suit unit	1 – 2	840	570	640	0.3	92
	3 – 4	920	820	930	0.7	142 – 175
	5 – 8	1120	820	950	0.87	202 – 298
Skeleton container with cardboard boxes and inner box to suit unit	–	–	–	–	–	–
Plywood box + cardboard boxes with sealed packaging and inner box to suit unit	1 – 2	920	620	670	0.38	59 – 91
	3 – 4	920	820	930	0.7	141 – 173
	5 – 8	1220	860	960	1.0	205 – 305



# 3TL6 Vacuum Contactors as Universal Contactors

## Enquiry form

Please  
- copy this form  
- complete it according to  
your requirements  
- return it to your Siemens  
office

### To your Siemens office

Company Siemens AG  
 Department \_\_\_\_\_  
 Name \_\_\_\_\_  
 Street \_\_\_\_\_  
 City, postal code \_\_\_\_\_  
 Fax \_\_\_\_\_

### Your personal details

Company \_\_\_\_\_  
 Department \_\_\_\_\_  
 Name \_\_\_\_\_  
 Street \_\_\_\_\_  
 City, postal code \_\_\_\_\_  
 Tel. \_\_\_\_\_  
 Fax \_\_\_\_\_

### We request the following:

Quotation     Call     Visit     Order/Delivery

### Technical specifications

See page 3/4.

			Other requirements
Vacuum contactor type	<input type="checkbox"/> 3TL61	<input type="checkbox"/> 3TL65	<input type="checkbox"/>
Rated operational voltage	<input type="checkbox"/> 7.2 kV	<input type="checkbox"/> 12 kV	<input type="checkbox"/>
Rated frequency	<input type="checkbox"/> 50/60 Hz	<input type="checkbox"/> 50/60 Hz	<input type="checkbox"/>
Rated normal current	<input type="checkbox"/> 450 A	<input type="checkbox"/> 450 A	<input type="checkbox"/>
Rated short-time current	<input type="checkbox"/> 8 kA	<input type="checkbox"/> 8 kA	<input type="checkbox"/>
Rated capacitor current	<input type="checkbox"/> 250 A	<input type="checkbox"/> 250 A	<input type="checkbox"/>
Switching frequency	<input type="checkbox"/> 1200/h	<input type="checkbox"/> 600/h	<input type="checkbox"/>
Mechanical service life of the contactor	<input type="checkbox"/> 3 mill.	<input type="checkbox"/> 1 mill.	<input type="checkbox"/>
Mechanical service life of the vacuum interrupter	<input type="checkbox"/> 2 mill.	<input type="checkbox"/> 1 mill.	<input type="checkbox"/>
Electrical service life of the vacuum interrupter	<input type="checkbox"/> 1 mill.	<input type="checkbox"/> 0.5 mill.	<input type="checkbox"/>
Chopping current	<input type="checkbox"/> ≤ 5 A	<input type="checkbox"/> ≤ 5 A	<input type="checkbox"/>
Max. permissible switching capacity	<input type="checkbox"/> 5 kA	<input type="checkbox"/> 5 kA	<input type="checkbox"/>

### Additional/secondary equipment

See page 3/5.

Central terminal block, auxiliary contacts	<input type="checkbox"/> 4NO+3NC	<input type="checkbox"/> 6NO+5NC	<input type="checkbox"/>
Withdrawable terminal block, auxiliary contacts	<input type="checkbox"/> 6NO+5NC		<input type="checkbox"/>
Without additional modules	<input type="checkbox"/>		<input type="checkbox"/>
Mechanical closing latching	<input type="checkbox"/> with	<input type="checkbox"/> without	
Mechanical closing lock-out	<input type="checkbox"/> with	<input type="checkbox"/> without	
f-release	<input type="checkbox"/> with	<input type="checkbox"/> without	
Operating voltage of the solenoid	<input type="checkbox"/> ____ V AC ____ Hz	<input type="checkbox"/> ____ V DC	<input type="checkbox"/>
Operating voltage for releasing the mechanical closing latching	<input type="checkbox"/> ____ V AC ____ Hz	<input type="checkbox"/> ____ V DC	<input type="checkbox"/>
Operating instructions	<input type="checkbox"/> German / English <input type="checkbox"/> French / Spanish		<input type="checkbox"/>
Routine test report	<input type="checkbox"/> German / English		<input type="checkbox"/>
Break times	Standard: <input type="checkbox"/> 50 ms		<input type="checkbox"/>
Special versions:	<input type="checkbox"/> 35 ms <input type="checkbox"/> 120 ms <input type="checkbox"/> 250 ms <input type="checkbox"/> 120/50 ms		<input type="checkbox"/>

### Order No.

-     -

### Quantity

\_\_\_\_\_

### Field of application and other requirements

Motors \_\_\_\_\_  
 Transformers \_\_\_\_\_  
 Reactors \_\_\_\_\_  
 Ohmic loads \_\_\_\_\_  
 Capacitors \_\_\_\_\_  
 Filter circuits \_\_\_\_\_

<b>Contents</b>	<b>Page</b>
Catalog Index	A/2 – A/4
Conditions of Sale and Delivery, Export Regulations, Trademarks, Dimensions	A/6
Customer Training Program	

## Catalog Index of the Power Transmission and Distribution Group

	Title	Designation	Order No.	
High Voltage	<b>High-Voltage Equipment (Above 52 kV)</b>			
	Type 3EM2 Surge Arresters with Current-Limiting Series Spark Gap for HV System Voltages up to 245 kV	HG 21.3.1	E86010-K1521-A311-A1-7600	
	Type 3EM3 Surge Arresters with Current-Limiting Series Spark Gap for HV System Voltages up to 525 kV	HG 21.3.2	E86010-K1521-A321-A1-7600	
	Type 3EP2 Surge Arresters without Gaps for HV System Voltages up to 362 kV	HG 21.3.4	E50001-K1521-A341-A1-7600	
	Type 3EP3 Surge Arresters without Gaps for HV System Voltages up to 525 kV	HG 21.3.5	E86010-K1521-A351-A1-7600	
	Surge Counting Devices for Surge Arresters	HG 21.4	E50001-K1521-A401-A1-7600	
	High-Voltage Porcelain Insulators	HG 23	E50001-K1523-A101-A2-7600	
Medium Voltage	<b>Medium-Voltage Switchgear (High-Voltage Indoor Distribution Switchgear)</b>			
	Metal-Enclosed Truck-Type Switchboards for Indoor Installation 8BC1, 8BD1	HA 21	E86010-K1421-A101-A3-7600	
	Type 8BK20 Switchgear up to 24 kV with Withdrawable Circuit-Breakers (Metal-Clad)	HA 25.21	E50001-K1425-A311-A5-7600	
	Type 8BK40 Switchgear up to 17.5 kV/63 kA with Withdrawable Circuit-Breakers	HA 25.31	E50001-K1425-A411-A2-7600	
	Generator Circuit-Breaker Units up to 17.5 kV/80 kA, Type 8BK41	HA 25.41	E50001-K1425-A511-A1-7600	
	Type 8BJ50 Switchgear up to 24 kV with Withdrawable Circuit-Breakers*	HA 25.61	E50001-K1425-A711-A2-7600	
	36/38 kV Switchgear with Withdrawable Vacuum Circuit-Breakers, Type 8BK20	HA 26.1	Siemens Den Haag, Dept.CMS DMS	
	Type 8BK30 Switchgear up to 12 kV with Draw-Out Vacuum Contactors	HA 27.11	E50001-K1427-A111-A2-7600	
	Panels up to 36 kV with Fixed-Mounted Circuit-Breakers, SF <sub>6</sub> -Insulated, Types 8DA10 and 8DB10			
	Single-Pole, Metal-Enclosed, Metal-Clad Single-Busbar Switchgear			
	Duplicate-Busbar Switchgear	HA 35.11	E50001-K1535-A101-A6-7600	
	Type 8DC11 Panels up to 24 kV, Fixed-Mounted Vacuum Circuit-Breaker Switchgear, SF <sub>6</sub> -Insulated	HA 35.41	E50001-K1435-A401-A3-7600	
	Spline-Shaft Drive 8UG for Torque Transmission up to 200 Nm	HA 39.1	E86010-K1439-A111-A2-7600	
	Motor Drive 8UH for Torque Requirements up to 250 Nm	HA 39.3	E86010-K1439-A131-A1-7600	
	Fixed-Mounted Ring-Main Units up to 24 kV, SF <sub>6</sub> -Insulated, Type 8DH10	HA 41.11	E50001-K1441-A101-A2-7600	
	Fixed-Mounted Ring-Main Units up to 24 kV, SF <sub>6</sub> -Insulated, Type 8DJ10	HA 45.11	E50001-K1445-A111-A6-7600	
	Type 8FB1 Compact Transformer Substations up to 24 kV	HA 51.1	E50001-K1451-A111-A2-7600	
	Factory-Built Container Stations, Type 8FF1	HA 52.1	E50001-K1452-A111-A1-7600	
	Medium-Voltage Equipment (High-Voltage Equipment up to 52 kV)			
	3AH Vacuum Circuit-Breakers	HG 11.11	E50001-K1511-A111-A3-7600	
	3TL Vacuum Contactors	HG 11.21	E50001-K1511-A211-A1-7600	
	Disconnectors and Earthing Switches	HG 11.31	E50001-K1511-A311-A1-7600	
	Vacuum Switches, Switch-Disconnectors, HV HRC Fuse	HG 12	E50001-K1512-A101-A4-7600	
	Switchgear Interlock Units, Control Valves, Compressed Air Systems	HG 13	E86010-K1513-A101-A1-7600	
	Overvoltage Protection	HG 21	E50001-K1521-A101-A1-7600	
	Insulators of Cast Resin (Excerpt)	HG 22	E50001-K1522-A111-A1-7600	
	Current and Voltage Transformers	HG 24	E50001-K1524-A101-A2-7600	
	Air-Cored Reactors, High-Voltage Capacitors	HG 25	E86010-K1525-A101-A4-7600	
	Low Voltage	<b>Power Factor Correction</b>		
	Low-Voltage Power Capacitors and Power Factor Correction Units Selection and Ordering Data	K1.2	E50001-K1600-A121-A5-7600	
Power Cables	<b>Power Cables</b>			
	Flexible Electric Cables for Cranes and Material Handling Equipment	SK 1.12	E50001-K8112-A101-A1-7600	
	SIENOPYR Power Cables	SK 3.30	E50001-K8133-A101-A1-7600	
	Installation Cables, Power Cables	SK 3.40	E50001-K8134-A101-A1-7600	
	Special-Purpose Cables for Industrial Applications	SK 4.20	E50001-K8142-A101-A1-7600	

Stand 07.10.1997 (VO)

Protection and  
Substation  
Control Systems

Title	Designation	Order No.
<b>Numerical Protective Relaying</b>		
Numerical Protection Devices	LSA 2.0.1	E50001-K5702-A011-A1-7600
Operation and Evaluation Software for Numerical Protection Devices	LSA 2.0.2	E50001-K5702-A121-A1-7600
Relay Selection Guide	LSA 2.0.3	E50001-K5702-A031-A1-7600
SIPROTEC 7SJ600 Overcurrent, Motor and Overload Protection	LSA 2.1.15	E50001-K5712-A251-A2-7600
SIPROTEC 7SJ601 Overcurrent Protection	LSA 2.1.16	E50001-K5712-A261-A1-7600
7SJ41 Definite-Time Overcurrent Protection Relay	LSA 2.1.10	E50001-K5712-A201-A2-7600
7SJ511 Numerical Overcurrent-Time Protection (Version V3)	LSA 2.1.3	E50001-K5712-A131-A3-7600
7SJ512 Numerical Overcurrent-Time Protection (Version V3)	LSA 2.1.4	E50001-K5712-A141-A3-7600
7SJ512 Numerical Feeder Protection	LSA 2.1.30	E50001-K5712-A411-A1-7600
SIPROTEC 7SJ531 Numerical Line and Motor Protection with Control Function	LSA 2.1.9	E50001-K5712-A191-A3-7600
7SJ551 Multi-Function Protection Relay	LSA 2.4.2	E50001-K5742-A121-A3-7600
SIPROTEC 7SA510 Distance Protection Relay (Version V3)	LSA 2.1.17	E50001-K5712-A271-A1-7600
SIPROTEC 7SA511 Distance Protection Relay (Version V3)	LSA 2.1.11	E50001-K5712-A211-A2-7600
7SA513 Line Protection Relay (Version V3)	LSA 2.1.12	E50001-K5712-A221-A1-7600
7SA518/519 Overhead Control-Line Protection Relay (Version V3)	LSA 2.1.14	E50001-K5712-A241-A1-7600
3VU13 Miniature Circuit-Breaker	LSA 2.1.8	E50001-K5712-A181-A2-7600
7SD502 Line Differential Protection with Two Pilot Wires	LSA 2.2.1	E50001-K5722-A111-A2-7600
7SD503 Line Differential Protection with Three Pilot Wires	LSA 2.2.2	E50001-K5722-A121-A2-7600
7SD511/512 Current Comparison Protection Relay (Version V3) for Overhead Lines and Cables	LSA 2.2.3	E50001-K5722-A131-A2-7600
7UT512/513 Differential Protection Relay (Version V3) for Transformers, Generators and Motors	LSA 2.2.4	E50001-K5722-A141-A2-7600
7SS5 Station Protection	LSA 2.2.5	E50001-K5722-A151-A2-7600
Auxiliary Current Transformers 4AM50, 4AM51, 4AM52 and Isolating Transformers 7XR95	LSA 2.2.6	E50001-K5722-A161-A1-7600
Introduction to Earth-Fault Detection	LSA 2.3.1	E50001-K5732-A111-A1-7600
7SN71 Transient Earth-Fault Relay	LSA 2.3.2	E50001-K5732-A121-A1-7600
7XR96 Toroidal Current Transformer	LSA 2.3.3	E50001-K5732-A131-A1-7600
7VC1637 Earth-Leakage Monitor	LSA 2.3.4	E50001-K5732-A141-A1-7600
Introduction to Generator Protection	LSA 2.5.1	E50001-K5752-A111-A1-7600
7UM511 Generator Protection Relay (Version V3)	LSA 2.5.2	E50001-K5752-A121-A2-7600
7UM512 Generator Protection Relay (Version V3)	LSA 2.5.3	E50001-K5752-A131-A2-7600
7UM515 Generator Protection Relay (Version V3)	LSA 2.5.4	E50001-K5752-A141-A2-7600
7UM516 Generator Protection Relay (Version V3)	LSA 2.5.5	E50001-K5752-A151-A1-7600
7UW50 Tripping Matrix	LSA 2.5.6	E50001-K5752-A161-A1-7600
7VE51 Synchronizing Unit	LSA 2.5.7	E50001-K5752-A171-A1-7600
7VP151 Three-Phase Portable Test Set (Omicron CMC56)	LSA 2.6.1	E50001-K5762-A111-A2-7600
7XV72 Test Switch	LSA 2.6.2	E50001-K5762-A121-A1-7600
7SV50 Numerical Circuit-Breaker Failure Protection Relay	LSA 2.7.1	E50001-K5772-A111-A1-7600
7SV512 Numerical Circuit-Breaker Failure Protection Relay	LSA 2.7.2	E50001-K5772-A121-A1-7600
7VK512 Numerical Auto-Reclose/Check-Synchronism Relay	LSA 2.7.3	E50001-K5772-A131-A1-7600
7SM70 Analog Output Unit	LSA 2.7.5	E50001-K5772-A151-A1-7600
7SM71 Analog Output Unit	LSA 2.7.6	E50001-K5772-A161-A1-7600
7VR50 Protection Signalling Equipment for Digital Communication Links	LSA 2.7.7	E50001-K5772-A171-A1-7600
7SV7220 Power Supply Unit	LSA 2.7.9	E50001-K5772-A191-A1-7600
SIPROTEC 7RW600 Numerical Voltage, Frequency and Overexcitation Relay	LSA 2.7.10	E50001-K5772-A201-A1-7600
Centralized and Remote Control of Siemens Protection Relays (Overview)	LSA 2.8.1	E50001-K5782-A111-A1-7600
Operating and Analysis Software DIGSI V3	LSA 2.8.2	E50001-K5782-A121-A1-7600

Transformers  
GEAFOL®

<b>Distribution Transformers</b>		
Buchholz Relays to DIN 42 566 with Change-over Contacts	—	A19100-T5101-A9A-7600
Cast-Resin Transformers 100 to 2500 kVA	TV 1	E50001-K7101-A101-A2-7600
TUMETIC and TUNORMA Oil-Immersed Distribution Transformers 50 to 2500 kVA	TV 2	E50001-K7102-A101-A1-7600

Stand 07.10.1997 (VO)

## Catalog Index of the Power Transmission and Distribution Group

	Title	Designation	Order No.
Protection and Substation Control Systems	<b>Measurement and Recording Systems</b>		
	Fault Recorder OSCILLOSTORE	SR 10.1	E50001-K4010-A101-A1-7600
	Power System Quality Analysis OSCILLOSTORE	SR 10.2	E50001-K4020-A101-A1-7600
	<b>Analog Protective Relaying</b>		
	Static Analog Network Protection Relays	R 1.1	E50001-K4501-A111-A1-7600
	Static Analog Machine Protection Relays	R 1.2	E50001-K4501-A121-A1-7600
	Static Analog Ancillary Protection Equipment	R 1.3	E50001-K4501-A131-A1-7600
	Hand and Electrical Reset Tripping Relay 7PA20	R (Extract)	E86010-K4500-A151-A1-7600
	Trip Circuit Supervision Relay 7PA21	R (Extract)	E86010-K4500-A161-A1-7600
	Pilot-Wire Differential Relay 7SD24	R (Extract)	E86010-K4500-A131-A1-7600
	Microprocessor Based Overcurrent Relay 7SJ55	R (Extract)	E50001-K4500-A361-A2-7600
	High-Speed Busbar Differential Relay 7SS10	R (Extract)	E50001-K4500-A241-A2-7600
	High Impedance Differential Relay 7VH80	R (Extract)	E86010-K4500-A321-A1-7600
	Auto-Reclose Relay 7VK14	R (Extract)	E86010-K4500-A141-A1-7600
	<b>Substation Control and Protection</b>		
	Input/Output Unit 6MB522	LSA 1.1.1	E50001-K5701-A111-A4-7600
	Input/Output Unit 6MB523	LSA 1.1.2	E50001-K5701-A121-A2-7600
	6MB511/6MB512 Substation Control Master Unit and 7SW511/7SW512 Relay Data Concentrator	LSA 1.1.3	E50001-K5701-A131-A2-7600
	6MB520/6MB521 Input/Output Units	LSA 1.1.4	E50001-K5701-A141-A1-7600
	6MB513/514 Compact Control Master Unit and Relay Data Concentrator	LSA 1.1.6	E50001-K5701-A161-A1-7600
	6MB524 Bay Control Unit	LSA 1.1.7	E50001-K5701-A171-A1-7600
	6MB525 Mini Bay Unit (MBU)	LSA 1.1.8	E50001-K5701-A181-A1-7600
	6MB5510 Station Control Unit	LSA 1.2.1	E50001-K5701-A211-A2-7600
	6MB552 Compact Remote Terminal Unit	LSA 1.2.2	E50001-K5701-A221-A1-7600
	6MB5530-0 Minicomcompact Remote Terminal Unit	LSA 1.2.3	E50001-K5701-A231-A1-7600
	6MB5530-1 Minicomcompact Remote Terminal Unit for Cable Shield Communication	LSA 1.2.4	E50001-K5701-A241-A1-7600
	6MB5540 SINAUT LSA COMPACT Remote Terminal Unit	LSA 1.2.5	E50001-K5701-A251-A1-7600
6MB5515 Station Control Unit	LSA 1.2.6	E50001-K5701-A261-A1-7600	
Control in SINAUT LSA Substation Control and Protection	LSA 1.4.1	E50001-K5701-A411-A1-7600	
Status Indications in SINAUT LSA Substation Control and Protection	LSA 1.4.2	E50001-K5701-A421-A1-7600	
Analog Values in SINAUT LSA Substation Control and Protection	LSA 1.4.3	E50001-K5701-A431-A1-7600	
Metering in SINAUT LSA Substation Control and Protection	LSA 1.4.4	E50001-K5701-A441-A1-7600	
Voltage Control with Input/Output Units 6MB520/6MB521	LSA 1.4.5	E50001-K5701-A451-A1-7600	
Network Synchronization with Input/Output Units 6MB520/521	LSA 1.4.6	E50001-K5701-A461-A1-7600	
Operation with Two Control Master Units	LSA 1.4.7	E50001-K5701-A471-A1-7600	
Node Functions in SINAUT LSA Substation Control and Protection	LSA 1.4.8	E50001-K5701-A481-A1-7600	
System Management with the SINAUT LSA Substation Control and Protection System	LSA 1.4.9	E50001-K5701-A491-A1-7600	
LSADIAG - Testing and Diagnostics System for SINAUT LSA Substation Control and Protection	LSA 1.5.2	E50001-K5701-A521-A1-7600	
LSACONTROL - Control and Monitoring	LSA 1.5.3	E50001-K5701-A531-A1-7600	
LSAPROCESS - Process Information Analysis	LSA 1.5.5	E50001-K5701-A551-A1-7600	
LSA 678 Standard Cubicle	LSA 1.6.1	E50001-K5701-A611-A1-7600	
Energy Meters	<b>Energy Meters</b>		
	7EC48 Solid-State 3-Phase Meter with Drum-Type Registers	Z 9.1.1	E50001-K8991-A101-A1-7600
	7E.62/63 Static Multifunction Meters	Z 9.1.2	E50001-K8991-A111-A2-7600
	7EC49 Electronic 3-Phase Meter with Drum-Type Registers	Z 9.1.3	E50001-K8991-A121-A1-7600
	7EC60/61 Multi-Tariff Maximum Demand Meter	Z 9.1.4	E50001-K8991-A131-A1-7600
	7E.64/65 Electronic Precision Meters	Z 9.1.5	E50001-K8991-A141-A1-7600
	DATAREG 48 Data Recording and Transmission Unit	Z 9.2.2	E50001-K8992-A111-A1-7600
	7FM803/804 Universal Tariff Unit	Z 9.2.3	E50001-K8992-A121-A1-7600

Stand 07.10.1997 (VO)





# Conditions of Sale and Delivery

## Conditions of Sale and Delivery

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Subject to the General Conditions of Supply and Delivery for Products and Services of the Electrical and Electronic Industry and to any other conditions agreed upon with the recipients of catalogs.

■ The technical data, dimensions and weights are subject to change unless otherwise stated on the individual pages of this catalog.

The illustrations are for reference only.

We reserve the right to adjust the prices and shall charge the prices applying on the date of delivery.

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## Export Regulations

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In accordance with the present provisions of the German Export List and the US Commercial Control List, export licences are not required for the products listed in this catalog.

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Relevant are the export criteria stated in the delivery note and the invoice regarding a possible export and reexport licence.

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All product designations used are trademarks or product names of Siemens AG or of other suppliers.

## Dimensions

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All dimensions in this catalog are given in mm.

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# Our Customer Training Program

It is worthwhile and important for every user to be knowledgeable about switchgear used.

Besides our products, we therefore offer training courses on all application and functional aspects of our vacuum circuit-breakers.

Engineers and technicians will receive extensive information on planning and selection of switching devices and switchgear, while operating and maintenance personnel will learn all about the technology, design, layout and functions.

Are you interested? **Yes.**

Then copy this page, enter the information requested and send it to your Siemens office.

We will then send you further information.

## To your Siemens office

Company Siemens AG  
Department \_\_\_\_\_  
Name \_\_\_\_\_  
Street \_\_\_\_\_  
City \_\_\_\_\_  
Fax \_\_\_\_\_

## Medium-voltage technology Switching devices and switchgear

The course provides planning and selection criteria for switching devices and switchgear in medium-voltage systems.

It is intended for engineers and technicians working for the power supply in industry and public utilities.

### Focal points

- Principles of switching devices
- Types of switching devices
- Planning of switchgear
- Types of switchgear
- Switchgear accessories

### Organization

Siemens AG  
Dept. SQT FSK, Mrs. Gulden  
P.O.Box 3240  
  
D-91050 Erlangen  
Germany  
  
Tel.: (+49) 91 31/7-4 38 05  
Fax: (+49) 91 31/7-4 35 09

### Duration

2 days

### Location

In the Erlangen area

### Your data

Company \_\_\_\_\_  
Department \_\_\_\_\_  
Name \_\_\_\_\_  
Street \_\_\_\_\_  
City \_\_\_\_\_  
Fax \_\_\_\_\_

## Technical information course – Medium-voltage circuit-breakers

The course provides information on medium-voltage vacuum circuit-breakers, covering the salient technical aspects.

It is intended for operating and maintenance personnel, field service staff and engineers.

### Focal points

- Modules
- Function and operating mechanism principles
- Control and monitoring
- Maintenance and service
- Environmental protection

### Organization

Siemens AG  
Dept. EV HWS, Mrs. Bäuerlein  
P.O.Box 3220  
  
D-91050 Erlangen  
Germany  
  
Tel.: (+49) 91 31/7-3 36 04  
Fax: (+49) 91 31/7-3 44 49

### Duration

1 week

### Location

Berlin, Training centre  
or locally

### Your data

Company \_\_\_\_\_  
Department \_\_\_\_\_  
Name \_\_\_\_\_  
Street \_\_\_\_\_  
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