SIPROTEC 7VE6
Multifunction Paralleling Device

Fig. 11/83
SIPROTEC 7VE6
multifunction paralleling device

Description

The 7VE61 and 7VE63 paralleling devices of the SIPROTEC 4 family are multifunctional compact units used for paralleling power systems and generators.

Their technical design ensures highly reliable paralleling due to their 1½-channel or 2-channel measurement method and their hardware design. This is supported by numerous monitoring functions.
The units automatically detect the operating conditions. The response to these conditions depends on settings.
In "synchronous network switching" mode, the frequency difference is measured with great accuracy. If the frequency difference is almost zero for a long enough time, the networks are already synchronous and a larger making angle is permissible.

If the conditions are asynchronous, as is the case when synchronizing generators, the generator speed is automatically matched to the system frequency and the generator voltage to the system voltage. The connection is then made at the synchronous point, allowing for circuit-breaker make-time.

The 7VE61 paralleling device is a 1½-channel unit (paralleling function + synchro-check) for use with small to medium-size generators and power systems. It is more reliable than 1-channel paralleling devices. It can also be used for synchro-check, with parallel operation of three synchronization points.

For larger generators and power systems with high reliability requirements, the 2-channel 7VE63 is recommended. Two independent methods decide on the connection conditions. The unit also has the full control functions of the SIPROTEC 4 family.

Voltage and frequency functions (V>, V<, f>, f< df/dt) including voltage vector jump ($\Delta\varphi$) are optionally available for protection or network decoupling applications.

The integrated programmable logic functions (continuous function chart CFC) offer the user a high flexibility so that adjustments can easily be made to the varying requirements on the basis of special system conditions.

The flexible communication interfaces are open to modern communication architectures with control systems.

Function overview

Basic functions

- High reliability with a two-out-of-two design (1 ½ channels in 7VE61 and 2 channels in 7VE63)
- Paralleling of asynchronous voltage sources
- Balancing commands for voltage and speed (frequency)
- Paralleling of synchronous voltage sources
- Synchro-check function for manual synchronization
- Parameter blocks for use on several synchronizing points (7VE61 max. 4 and 7VE63 max. 8)

Additional functions

- Consideration of transformer vector group and tap changer
- Synchronization record (instantaneous or r.m.s. record)
- Commissioning support (CB-time measurement, test synchronization)
- Browser operation
- Full control functionality of SIPROTEC 4
- Analog outputs of operational measured values
- Functions for protection or network decoupling tasks

Protection functions (option)

- Undervoltage protection(27)
- Overvoltage protection (59)
- Frequency protection (81)
- Rate-of-frequency-change protection (81R)
- Jump of voltage vector monitoring

Monitoring functions

- Self-supervision of paralleling function
- Operational measured values
- 8 oscillographic fault records

Communication interfaces

- System interface
  - IEC 60870-5-103
  - IEC 61850 protocol
  - PROFIBUS-DP
  - MODBUS RTU and DNP 3.0
- Service interface for DIGSI 4 (modem)
- Front interface for DIGSI 4
- Time synchronization via IRIG B/ DCF77

Application

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Uniform design

The SIPROTEC 4 units have a uniform design and a degree of functionality which represents a whole new quality in protection and control and automation.
Local operation has been designed according to ergonomic criteria. Large, easy-to-read displays (graphic display for 7VE63) were a major design aim. The DIGSI 4 operating program considerably simplifies planning and engineering and reduces commissioning times.

Highly reliable

The 7VE6 hardware is based on 20 years of Siemens experience with numerical protection equipment. State-of-the-art technology and a high-efficiency, 32-bit microprocessor are employed. Production is subject to exacting quality standards.

Special attention has been paid to electromagnetic compatibility, and the number of electronic modules has been drastically reduced by the use of highly integrated circuits.

The software design incorporates accumulated experience and the latest technical knowledge. Object orientation and high-level language programming, combined with the continuous quality assurance system, ensure maximized software reliability.

Programmable logic

The integrated programmable logic function allows the user to implement his own functions for automation of switchgear (interlocking) via a graphic user interface. The user can also generate user-defined messages.

Adjustments can easily be made to the varying power station requirements.

Measurement method

Powerful and successful algorithms based on years of experience have been incorporated. They ensure both a high level of measurement accuracy and effective noise signal suppression. That makes for reliable paralleling even in networks with harmonics. Complementary measurement methods avoid unwanted operation.

Design

The units are available in two designs: the ½ 19" wide 7VE61 and the ½ 19" wide 7VE63. The 7VE61 features a four-line display. The 7VE63 is equipped with a graphic display for visualization of switching states. It also has a larger number of binary inputs and outputs than the 7VE61.

Communication

Flexible and powerful communication is paramount. That is why the paralleling devices have up to five serial interfaces (for details see chapter 4 "Communication"):

- Front interface for connecting a PC
- Service interface for connecting a PC (e.g. via a modem)
- System interface for connecting to a control system via IEC 60870-5-103, IEC 61850, PROFIBUS-DP, MODBUS RTU or DNP 3.0
- Interface for an analog output module (2 – 20 mA) and an input
- For time synchronization via DCF77 or IRIG B.

Operational measured values

In order to assist system management and for commissioning purposes, relevant measured values are displayed as primary and secondary values with unit and values relating to the object to be protected.

The measured values can also be transferred via the serial interfaces.

In addition, the programmable logic permits limit value scans and status indications derived therefrom.

Metered values are available in the form of energy metered values for the active and reactive energy supplied and are also provided by an elapsed-hour meter.

Application

Indications

The SIPROTEC 4 units provide detailed data for analysis of synchronization (fault events from activated protection functions) and for checking states during operation. All indications are protected against power supply failure.

- **Synchronization indications** (Fault indications)
  The last eight synchronizations (faults) are stored in the unit at all times. A fresh synchronization (fault) will erase the oldest one. The fault indications have a time resolution of 1 ms. They provide detailed information on history. The buffer memory is designed for a total of 600 indications.
- **Operational indications**
  All indications that are not directly associated with the synchronization (fault) (e.g. operating or switching actions) are stored in the status indication buffer. The time resolution is 1 ms, buffer size: 200 indications.

Fault recording at up to 10 or 100 seconds

An instantaneous value or r.m.s. value recorder is provided. The firmware permits storage of 8 fault recordings. Triggering can be effected by the synchronization function (starting or closing command), protection function (pickup or tripping), binary input, the DIGSI 4 operating program or by the control system.

The instantaneous value recording stores the voltage input values ($v_a, v_b, v_c, v_d, v_e, v_f$), voltage differences ($v_a$-$v_d$, v_b-v_e, v_c-v_f), and calculated r.m.s. values ΔV, Δf, $\Delta\alpha$ at 1-ms intervals (or 0.83-ms intervals for 60 Hz). The r.m.s. values are calculated every half cycle. The total duration of the fault recording is 10 seconds. If the time is exceeded, the oldest recording is overwritten.

If you want to record for a longer period for commissioning purposes (for example, to show the effect of balancing commands), r.m.s. value recording is advisable. The relevant calculated values ($V_1, V_2, f_1, f_2, \Delta V, \Delta f, \Delta\alpha$) are recorded at half-cycle intervals. The total duration is 100 seconds.

Time synchronization

A battery-backed clock is a standard component and can be synchronized via a synchronization signal (DCF77; IRIG B via satellite receiver), binary input, system interface or SCADA (e.g. SICAM). A date and time are assigned to every indication.

Freely assignable binary inputs and outputs

Binary inputs, output relays, and LEDs can each be given separate user-specific assignments. Assignment is effected using a software matrix, which greatly simplifies the allocation of individual signals.

To ensure dual-channel redundancy, control of the CLOSE relay (relay R1 and R2) is prioritized and should not be altered. These two relays have a special, highly reliable control and monitoring logic (see Fig. 11/89).

Continuous self-monitoring

The hardware and software are continuously monitored. If abnormal conditions are detected, the unit signals immediately. In this way, a great degree of safety, reliability and availability is achieved.

Reliable battery monitoring

The battery buffers the indications and fault recordings in the event of power supply voltage failure. Its function is checked at regular intervals by the processor. If the capacity of the battery is found to be declining, an alarm indication is generated.

All setting parameters are stored in the Flash-EPROM which are not lost if the power supply or battery fails. The SIPROTEC 4 unit remains fully functional.

Functions

Functional scope of the paralleling function

The units contain numerous individually settable functions for different applications. They cover the following operating modes:

Synchro-check

In this mode, the variables ΔV, Δf, $\Delta\alpha$ are checked. If they reach set values, a release command is issued for as long as all three conditions are met, but at least for a settable time.

Switching synchronous networks

The characteristic of synchronous networks is their identical frequency ($\Delta f \approx 0$). This state is detected, and fulfillment of the ΔV and $\Delta\alpha$ conditions is checked. If the conditions remain met for a set time, the CLOSE command is issued.

Switching asynchronous networks

This state occurs in the power system and generator (open generator circuit-breaker). A check is made for fulfillment of ΔV and Δf conditions and the connection time is calculated, taking account of $\Delta\alpha$, and the circuit-breaker making time. By means of balancing commands (for voltage and frequency), the generator can automatically be put into a synchronous condition.

Switching onto dead busbars

The voltage inputs are checked here. The CLOSE command is issued depending on the set program and the result of measurement. A three-phase connection increases reliability because several voltages must fulfill the conditions (see Fig. 11/84).

The following operating states are possible:

– $V1 <$ $V2 >$
  (connection to dead busbar (side 1))
– $V1 >$ $V2 <$
  (connection to dead line (side 2))
– $V1 <$ $V2 <$
  (forced closing)

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Functions

Voltage and frequency band query

Synchronization is not activated until the set limits are reached. Then the remaining parameters (see above) are checked.

Vector group adaptation

If synchronization is effected using a transformer, the unit will take account of the phase-angle rotation of the voltage phasor in accordance with the vector group entry for the transformer. On transformers with a tap changer, the tap setting can be communicated to the unit, for example, as BCD code (implemented in the 7VE63). When using the IEC 61850 communication standard, it is possible to detect tap position indications with a bay control unit (e.g. 6MD66) and to transmit these indications via GOOSE to the 7VE6 paralleling device. Deviations from the rated transformation ratio result in the appropriate voltage amplitude adaptation.

Voltage and frequency balancing

If the synchronization conditions are not fulfilled, the unit will automatically issue balancing signals. These are the appropriate up or down commands to the voltage or speed controller (frequency controller). The balancing signals are proportional to the voltage or frequency difference, which means that if the voltage or frequency difference is substantial, longer balancing commands will be output. A set pause is allowed to elapse between balancing commands to allow the state change to settle. This method ensures rapid balancing of the generator voltage or frequency to the target conditions.

If identical frequency is detected during generator-network synchronization ("motionless synchronization phasor"), a kick pulse will put the generator out of this state.

For example, if the voltage is to be adjusted using the transformer tap changer, a defined control pulse will be issued.

Several synchronizing points

Depending on the ordered scope, several synchronization points can be operated. The data for synchronization of each circuit-breaker (synchronization function group) are stored individually. In the maximum version, the 7VE63 operates up to 8 synchronization points. Selection is made either via the binary input or the serial interface. With the CFC, it is also possible to control the connection of the measured variables or commands via a master relay.

Commissioning aids

The paralleling device is designed to be commissioned without an external tester/ recorder (see Fig. 11/84). For that purpose, it contains a codeword-protected commissioning section. This can be used to measure the make time automatically with the unit (internal command issue until the CB poles are closed). This process is logged by the fault recording function.

The operational measured values also include all measured values required for commissioning. The behavior of the paralleling function or the unit is also documented in detail in the operational annunciation and synchronization annunciation buffer. The connection conditions are documented in the synchronization record. Test synchronization is also permitted. All actions inside the synchronizer are taken but the two CLOSE relays are not operated (R1 and R2). This state can also be initiated via a binary input.

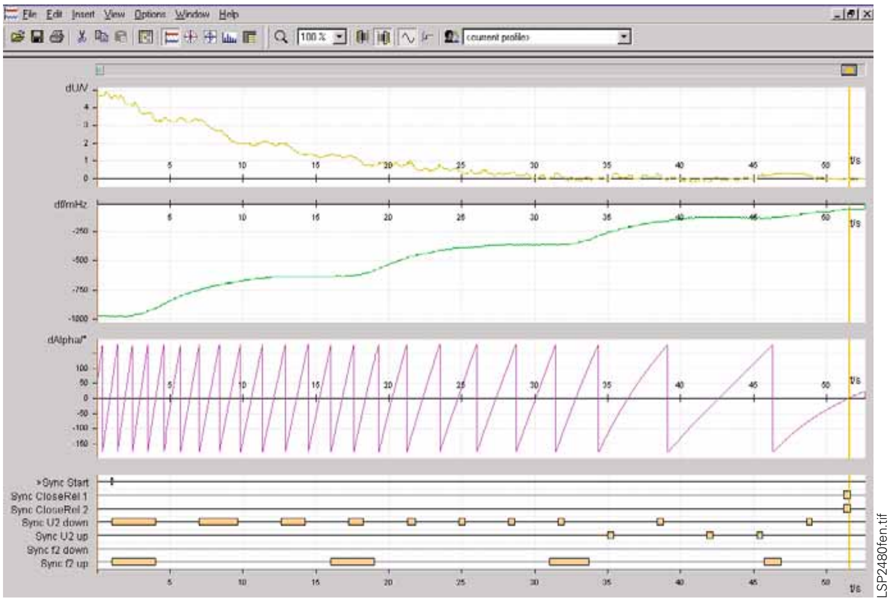

Fig. 11/84
SIGRA 4, synchronization record with balancing commands

Functions

Great safety and reliability due to multi-channel redundancy

Generator synchronization especially requires units in which unwanted operation can be ruled out. The paralleling device achieves this multi-channel redundancy with a two-out-of-two decision. That means that two conditions for the CLOSE command must be fulfilled. Fig. 11/85 shows the structure of the two designs.

In the 1½-channel version (7VE61), the paralleling function is the function that gives the CLOSE command. The synchro-check function acts as a release criterion with rougher monitoring limit settings. Other monitoring functions are also active at the same time (see below).

In the two-channel version (7VE63), two independent methods work in parallel. The CLOSE command is given when the two methods simultaneously decide on CLOSE. Fig. 11/86 shows the consistent implementation of dual-channel redundancy.

The measured quantities are fed to two ADCs. The second ADC processes the values rotated through 180° (e.g. $\overline{V1}$). The monitoring methods test all the transformer circuits including internal data acquisition for plausibility and they block measurement if deviations are found. The phase-sequence test detects connection errors. The measuring methods 1 and 2 include the measurement algorithms and logic functions.

In keeping with the two-channel redundancy principle, differing measurement methods are used to prevent unwanted operation due to systematic errors.

In addition, numerous methods are also active, such as closure monitoring (synchronism monitoring of both methods). Unwanted relay operation is avoided by two-channel operation of both CLOSE relays. The two measurement methods operate the transistors crossed over.

Moreover, coil operation is monitored in the background. For this purpose, transistors are activated individually and the response is fed back. Both interruptions and transistor breakdown are detected. When faults are found, the unit is blocked immediately.

The plausibility monitoring of set values (valid limits) and selection of the synchronization function groups (only one can be selected) are also supported. In the event of any deviations, messages are output and the paralleling function is blocked.

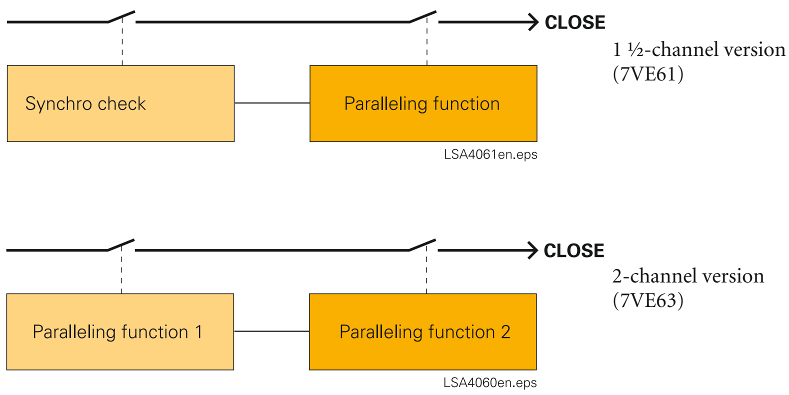

Fig. 11/86
Design of multi-channel redundancy

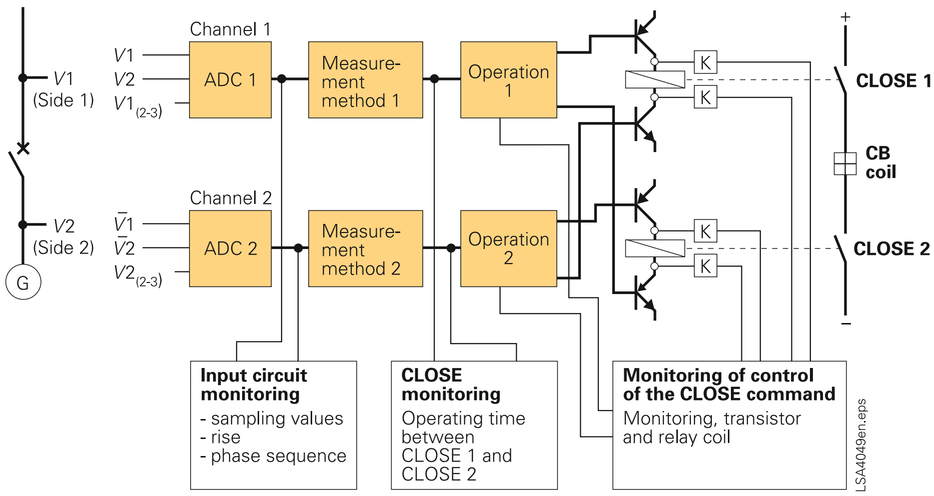

Fig. 11/85
Two-channel redundancy

Functions

Internet technology simplifies commissioning

In addition to the universal DIGSI 4 operating program, the synchronizer contains a Web server that can be accessed via a telecommunications link using a browser (e.g. Internet Explorer). The advantage of this solution is that it is both possible to operate the unit with standard software tools and to make use of the Intranet/ Internet infrastructure. Moreover, information can be stored in the unit without any problems. In addition to numeric values, visualizations facilitate work with the unit. In particular, graphical displays provide clear information and a high degree of operating reliability. Fig. 11/88 shows an example of an overview that is familiar from conventional synchronizers. The current status of synchronization conditions is clearly visible. Of course, it is possible to call up further measured value displays and annunciation buffers. By emulation of integrated unit operation, it is also possible to adjust selected settings for commissioning purposes, (see Fig. 11/87).

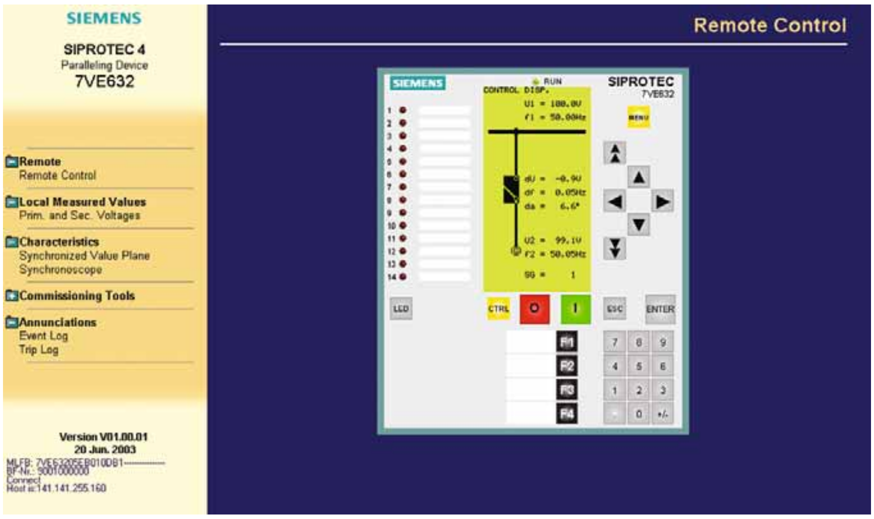

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Fig. 11/87
Browser-based operation

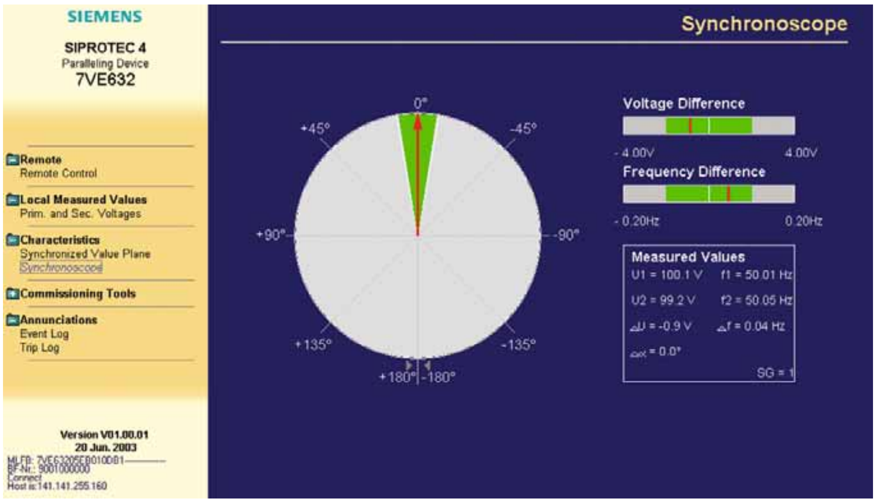

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Fig. 11/88
Overview display of the synchronization function

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Functions

Protection and automation functions

Basic concept

The paralleling function is not performed constantly. Therefore the measured quantities provided at the analog inputs are available for other functions. Voltage and frequency protection or limit value monitoring of these quantities are typical applications. Another possible application is network decoupling. After network disconnection, automatic resynchronization using the CFC is possible on request.
To allow for great flexibility, these functions can be assigned to the analog inputs. This is defined for the specific application.

Undervoltage protection (ANSI 27)

The protection function is implemented on two stages and evaluates the voltage at an input assigned to it. Analysis of a phase-to-phase voltage is beneficial as it avoids starting in the event of earth faults. The protection function can be used for monitoring and decoupling purposes or to prevent voltage-induced instability of generators by disconnection.

Overvoltage protection (ANSI 59)

The protection function is implemented on two stages and evaluates the voltage at an input assigned to it.
The overvoltage protection prevents impermissible stress on equipment due to excessive voltages.

Frequency protection (ANSI 81)

The protection function is implemented on four stages and evaluates the frequency of an input assigned to it. Depending on the frequency threshold setting, the function can provide overfrequency protection (setting $> f_n$) or underfrequency protection (setting $< f_n$. Each stage can be delayed separately. Stage 4 can be configured either as an overfrequency or underfrequency stage.

The application consists of frequency monitoring usually causing network disconnection in the event of any deviations. The function is suitable as a load shedding criterion.

Rate-of-frequency-change protection (ANSI 81R)

This function can also be assigned to an input. The frequency difference is determined on the basis of the calculated frequency over a time interval. It corresponds to the momentary rate-of-frequency change. The function is designed to react to both positive and negative rate-of-frequency changes. Exceeding of the permissible rate-of-frequency change is monitored constantly. Release of the relevant direction depends on whether the actual frequency is above or below the rated frequency. In total, four stages are available, and can be used optionally.

This function is used for fast load shedding or for network decoupling.

Jump of voltage vector monitoring

Smaller generating plants frequently require the vector jump function. With this criterion it is possible to detect a disconnected supply (e.g. due to the dead time during an automatic reclosure) and initiate generator disconnection. This avoids impermissible loads on the generating plant, especially the drive gearing, if reconnection to the network is asynchronous.

The vector jump function monitors the phase angle change in the voltage.

If the incoming line should fail, the abrupt current discontinuity leads to a phase angle jump in the voltage. This is measured by means of a delta process. The command for opening the generator or coupler circuit-breaker is issued if the set threshold is exceeded.

Vector jump monitoring is performed again for the assigned voltage input. This function is blocked during synchronization.

Threshold monitoring

The threshold function is provided for fast monitoring and further processing in the CFC. Optional monitoring of the calculated voltage (for violation of an upper or lower threshold) at the six voltage inputs is possible. A total of three greater-than and three less-than thresholds are available.
The check is made once per cycle, resulting in a minimum operating time of about 30 ms for the voltage. The times can be extended by the internal check time, if necessary (about 1 cycle).

Typical applications

Connection to three-phase voltage transformer

If three-phase voltage transformers are available, connection as shown in Fig. 11/89 is recommended. This is the standard circuit because it provides a high level of reliability for the paralleling function. The phase-sequence test is additionally active, and several voltages are checked on connection to a dead busbar. Interruption in the voltage connection does not lead to unwanted operation. Please note that side 1 (that is, V_1) is always the feed side. That is important for the direction of balancing commands.

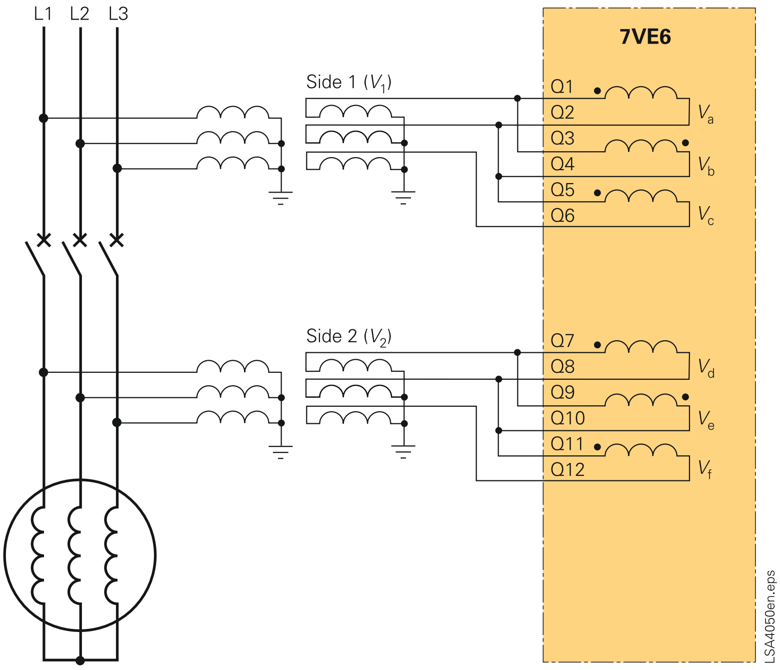

Fig. 11/89

Connection to open delta connection (V-connection) voltage transformer

Fig. 11/90 shows an alternative to Fig. 11/89 for substations in which the voltage transformers have to be V-connected. For the paralleling device, this connection is the electrical equivalent of the connection described above. It is also possible to combine the two: three one-pole isolated voltage transformers on one side and the V-connection on the other. If, additionally, a synchroscope is connected, it must be electrically isolated by means of an interposing transformer.

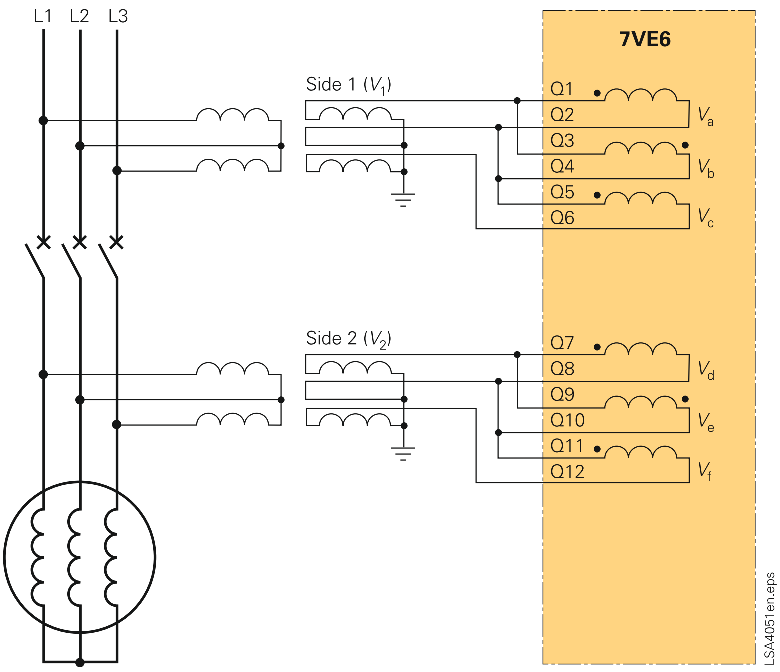

Fig. 11/90

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Typical applications

Connection to unearthed voltage transformer

To save costs for the voltage transformer, two-phase isolated voltage transformers are used that are connected to the phase-to-phase voltage (see Fig. 11/91). In that case, the phase-rotation supervision is inactive and reliability restrictions when connecting to the dead busbar must be accepted.

Full two-channel redundancy is ensured.

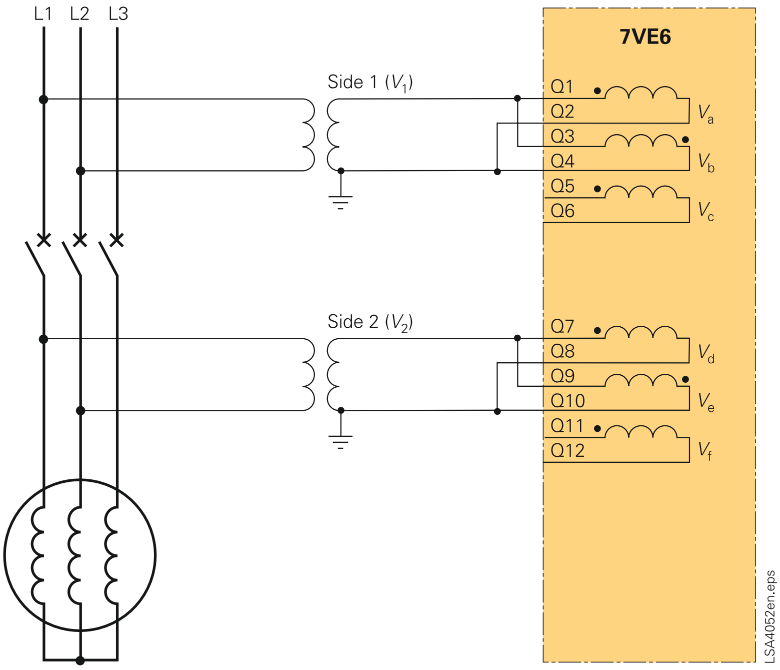

Fig. 11/91

Connection to single-phase isolated voltage transformer

As an alternative to Fig. 11/91, some substations use single-phase isolated voltage transformers (see Fig. 11/92). In this case, only a phase-to-earth voltage is available. This connection should be avoided if possible. Especially in isolated or resonant-(star point) neutral-earthed networks, an earth fault would lead to a voltage value of zero. That does not permit synchronization and the busbar is detected as dead.
If V_1 < and V_2 > connection is permitted, there is a high risk of incorrect synchronization. Furthermore, an earth fault in phase L2 leads to an angle rotation of – for instance – 30° in phase L1. This means that the device switches at a large fault angle.

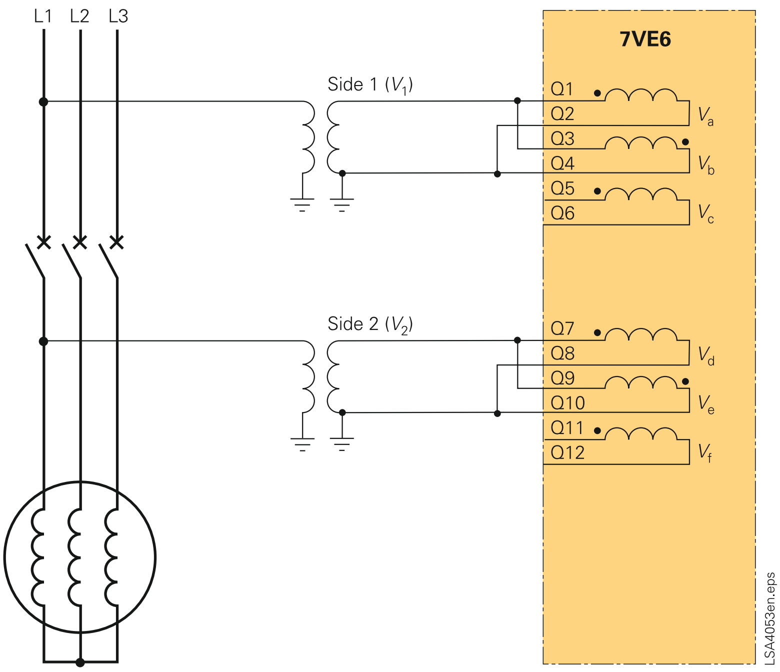

Fig. 11/92

Typical applications

Switching in 16.7 Hz networks for application in traction systems

The unit can also be used for synchronizing railway networks or generators. The connection has to be executed according to Fig. 11/93. No phase sequence test is available here. Two-channel redundancy is ensured.

The voltage inputs permit the application of the 16.7 Hz frequency without any difficulties.

On connection to a dead busbar, a broken wire in the external voltage transformer circuit is not detected. It is recommended to make another interrogation of a second voltage transformer.

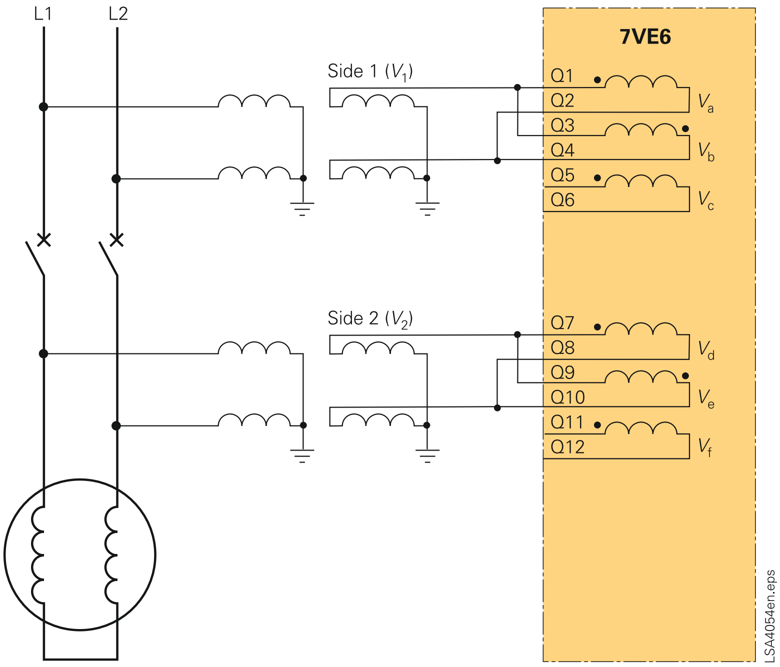

Fig. 11/93

Typical applications

Synchro-check for several synchronizing points

To avoid unwanted operation during manual synchronization or during connection of circuit-breakers in the network, the synchro-check function is used as an enabling criterion. It is fully compatible with all of the connections described above (see Figs. 11/89 to 11/93). With the "synchro-check" ordering option, the paralleling device also allows up to three circuit-breakers to be monitored in parallel. That saves wiring, switching and testing. In particular, that is an application for the 1½ circuit-breaker method. Moreover, on smaller generating plants one unit can be used for up to three generators, which helps reduce costs.

The connection shown in Fig. 11/94 is a single-pole version, which is acceptable for the synchro-check function.

An alternative is the connection for two switching devices (see Fig. 11/95).

The two free voltage inputs can be used for monitoring purposes.

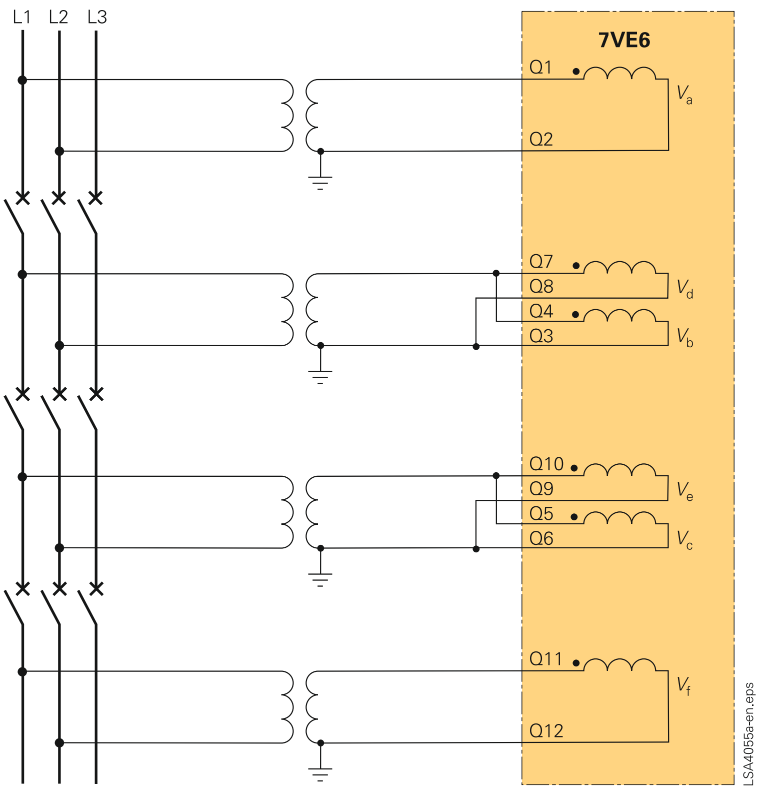

Fig. 11/94

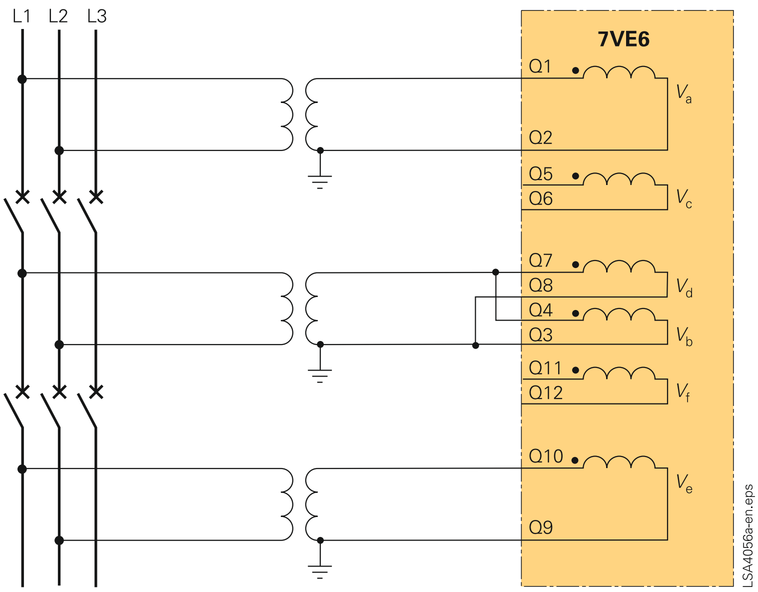

Fig. 11/95

Typical applications

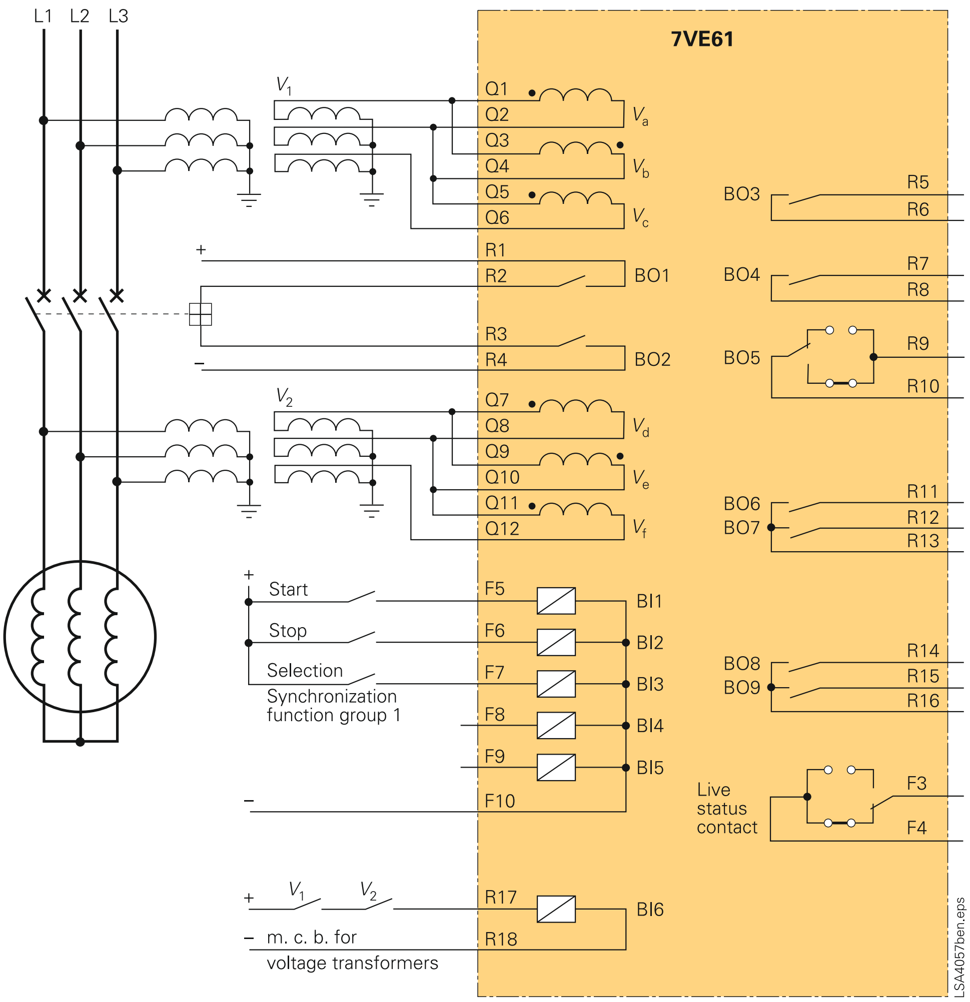

Fig. 11/96

Synchronization of a generator

Fig. 11/96 shows an example of the 7VE61 paralleling device connected to a medium-power generator. Where three-phase voltage transformers are available, direct connection is recommended. The synchronization point and start of synchronization is selected via the binary inputs. If cancellation is necessary, the stop input must be used.

If synchronization onto a dead busbar is permitted, the alarm contact of the voltage transformer miniature circuit-breakers (m.c.b.) must be connected to the unit.

Relays R1 and R2 are used for a CLOSE command. The other relays are used for selected indications and for the balancing commands.

The live status contact operated by the unit self-supervision function must also be wired.

Technical data

Hardware	
Analog inputs	
Rated frequency	50, 60 or 16.7 Hz
Rated voltage V_N	100 to 125 V
Power consumption Voltage inputs (at 100 V)	 Approx. 0.3 VA
Capability in voltage paths	230 V continuous
Auxiliary voltage	
Rated auxiliary voltage	24 to 48 V DC 60 to 125 V DC 110 to 250 V DC 220 to 250 V DC 115 and 230 V AC (50/60 Hz)
Permitted tolerance	-20 to +20 %
Superimposed AC voltage (peak-to-peak)	≤ 15 %
Power consumption Quiescent 7VE61 7VE63	 Approx. 4 W Approx. 5.5 W
Energized 7VE61 7VE63	 Approx. 9.5 W Approx. 12 W
Bridging time during auxiliary voltage failure at V_{aux} = 48 V and V_{aux} ≥ 110 V at V_{aux} = 24 V and V_{aux} = 60 V	 ≥ 50 ms ≥ 20 ms
Binary inputs	
Quantity 7VE61 7VE63	 6 14
3 pickup thresholds Range is settable with jumpers	14 to 19 V DC, 66 to 88 V DC; 117 to 176 V DC
Maximum permissible voltage	300 V DC
Current consumption, energized	Approx. 1.8 mA
Output relays	
Quantity 7VE61	 9 (each with 1 NO; 1 optional as NC, via jumper)
7VE62	17 (each with 1 NO; 2 optional as NC, via jumper)
7VE61+7VE63	1 live status contact (NC, NO via jumper)
Switching capacity Make Break Break (for resistive load) Break (for L/R ≤ 50 ms)	 1000 W / VA 30 VA 40 W 25 W
Switching voltage	250 V
Permissible current	5 A continuous 30 A for 0.5 seconds
LEDs	
Quantity RUN (green) ERROR (red) Assignable LED (red) 7VE61 7VE63	 1 1 7 14

Unit design	
7XP20 housing	For dimensions see dimension drawings part 15
Degree of protection acc. to EN 60529 For surface-mounting housing For flush-mounting housing Front Rear For the terminals	 IP 51 IP 51 IP 50 IP 2x with terminal cover put on
Weight Flush-mounting housing 7VE61 (½ x 19“) 7VE63 (½ x 19“)	 Approx. 5.2 kg Approx. 7 kg
Surface-mounting housing 7VE61 (½ x 19”) 7VE63 (½ x 19”)	 Approx. 9.2 kg Approx. 12 kg

Serial interfaces	
Operating interface for DIGSI 4	
Connection	Non-isolated, RS232, front panel; 9-pin subminiature connector (SUB-D)
Baud rate	4800 to 115,200 baud
Time synchronization IRIG-B / DCF77 signal (Format: IRIG B000)	
Connection	9-pin subminiature connector, (SUB-D), terminal with surface-mounting case
Voltage levels	Selectable 5, 12 or 24 V
Service / modem interface (Port C) for DIGSI 4 / modem / service	
Isolated RS232/RS485	9-pin subminiature connector (SUB-D)
Test voltage Distance for RS232 Distance for RS485	500 V / 50 Hz Max. 15 m Max. 1000 m
System interface (Port B) *IEC 60870-5-103 protocol, PROFIBUS-DP, MODBUS RTU, DNP 3.0)* ***and interface (Port D)***	
Isolated RS232/RS485 Baud rate Test voltage Distance for RS232 Distance for RS485	9-pin subminiature connector (SUB-D) 4800 to 115200 Baud 500 V / 50 Hz Max. 15 m Max. 1000 m
RS485: PROFIBUS-DP, MODBUS RTU, DNP 3.0 Test voltage	9-pin subminiature connector (SUB-D) 500 V / 50 Hz
Baud rate PROFIBUS-DP MODBUS RTU, DNP 3.0	 Max. 12 MBaud Max. 19200 Baud
Distance PROFIBUS-DP MODBUS RTU, DNP 3.0	 Max. 1000 m with 93.75 kBaud; Max. 100 m with 12 MBaud 1000 m
Fiber optic: IEC, PROFIBUS-DP, MODBUS RTU, DNP 3.0 PROFIBUS-DP IEC, MODBUS RTU, DNP 3.0	ST connector Double ring Point-to-point
Baud rate PROFIBUS-DP MODBUS RTU, DNP 3.0	 Max. 1.5 MBaud Max. 19200 Baud
Optical wavelength	λ = 820 nm
Permissible path attenuation	Max. 8 dB, for glass-fiber 62.5/125 µm
Distance	Max. 1.5 km
Analog output module (electrical)	2 ports with 0 to +20 mA

Technical data

System interface (Port B) IEC 61850	
Ethernet, electrical (EN 100) for IEC 61850 and DIGSI	
Connection	
for flush-mounting case	Rear panel, mounting location "B", two RJ45 connector, 100 Mbit/s acc. to IEEE802.3
for surface-mounting case	At bottom part of the housing
Test voltage	500 V; 50 Hz
Transmission speed	100 Mbits/s
Distance	20 m/66 ft
Ethernet, optical (EN 100) for IEC 61850 and DIGSI	
Connection	
for flush-mounting case	Rear panel, mounting location "B", LC connector receiver/transmitter
for panel surface-mounting case	Not available
Optical wavelength	λ = 1350 nm
Transmission speed	100 Mbits/s
Laser class 1 acc. to EN 60825-1/-2	Glass fiber 50/125 µm or glass fiber 62/125 µm
Permissible path attenuation	Max. 5 dB for glass fiber 62.5/125µm
Distance	Max. 800 m/0.5 mile

Electrical tests	
Specifications	
Standards	IEC 60255 (product standards) ANSI/IEEE C37.90.0/.1/.2 UL 508 DIN 57435, part 303 For further standards see below
Insulating tests	
Standards	IEC 60255-5
Voltage test (100 % test) All circuits except for auxiliary supply, binary inputs, communication and time synchronization interfaces	2.5 kV (r.m.s.), 50/60 Hz
Voltage test (100 % test) Auxiliary voltage and binary inputs	3.5 kV DC
Voltage test (100 % test) only isolated communication interfaces and time synchronization interface	500 V (r.m.s. value), 50/60 Hz
Impulse voltage test (type test) All circuits except for communication interfaces and time synchronization interface, class III	5 kV (peak); 1.2/50 µs; 0.5 J; 3 positive and 3 negative impulses at intervals of 5 s
EMC tests for noise immunity (type test)	
Standards	IEC 60255-6, IEC 60255-22 (product standards) EN 50082-2 (generic standard) DIN 57435 part 303
High frequency test IEC 60255-22-1, class III and DIN 57435 part 303, class III	2.5 kV (peak value), 1 MHz; τ = 15 ms 400 pulses per s; duration 2 s
Electrostatic discharge IEC 60255-22-2, class IV EN 61000-4-2, class IV	8 kV contact discharge; 15 kV air discharge; both polarities; 150 pF; R_i = 330 Ω
Irradiation with RF field, non-modulated IEC 60255-22-3 (report), class III	10 V/m; 27 to 500 MHz
Irradiation with RF field, amplitude-modulated, IEC 61000-4-3, class III	10 V/m; 80 to 1000 MHz; 80 % AM; 1 kHz
Irradiation with RF field, pulse-modulated IEC 61000-4-3/ ENV 50204, class III	10 V/m; 900 MHz; repetition frequency 200 Hz; duty cycle 50 %
Fast transient interference bursts IEC 60255-22-4, IEC 61000-4-4, class IV	4 kV; 5/50 ns; 5 kHz; burst length = 15 ms; repetition rate 300 ms; both polarities; R_i = 50 Ω; test duration 1 min
High-energy surge voltages (SURGE), IEC 61000-4-5 installation, class III	Impulse: 1.2/50 µs
Auxiliary supply	Common (longitudinal) mode: 2 kV; 12 Ω, 9 µF Differential (transversal) mode: 1 kV; 2 Ω, 18 µF
Measurement inputs, binary inputs and relay outputs	Common (longitudinal) mode: 2 kV; 42 Ω, 0.5 µF Differential (transversal) mode: 1 kV; 42 Ω, 0.5 µF
Line-conducted HF, amplitude-modulated IEC 61000-4-6, class III	10 V; 150 kHz to 80 MHz; 80 % AM; 1 kHz
Magnetic field with power frequency IEC 61000-4-8, class IV; IEC 60255-6	30 A/m continuous; 300 A/m for 3 s; 50 Hz 0.5 mT; 50 Hz
Oscillatory surge withstand capability ANSI/IEEE C37.90.1	2.5 to 3 kV (peak); 1 to 1.5 MHz damped wave; 50 surges per second; Duration 2 s; R_i = 150 to 200 Ω
Fast transient surge withstand capability ANSI/IEEE C37.90.1	4 to 5 kV; 10/150 ns; 50 surges per second; both polarities; duration 2 s ; R_i = 80 Ω
Radiated electromagnetic interference ANSI/IEEE C37.90.2	35 V/m; 25 to 1000 MHz
Damped oscillations IEC 60894, IEC 61000-4-12	2.5 kV (peak value), polarity alternating 100 kHz, 1 MHz, 10 and 50 MHz, R_i = 200 Ω
EMC tests for interference emission (type test)	
Standard	EN 50081-1 (generic standard)
Conducted interference voltage on lines only auxiliary supply IEC-CISPR 22	150 kHz to 30 MHz Limit class B
Interference field strength IEC-CISPR 22	30 to 1000 MHz Limit class B

Mechanical stress tests	
Vibration, shock stress and seismic vibration	
During operation	
Standards	IEC 60255-21 and IEC 60068
Vibration IEC 60255-21-1, class II IEC 60068-2-6	Sinusoidal 10 to 60 Hz: ± 0.075 mm amplitude; 60 to 150 Hz: 1 *g* acceleration Frequency sweep 1 octave/min 20 cycles in 3 orthogonal axes
Shock IEC 60255-21-2, class I IEC 60068-2-27	Half-sinusoidal Acceleration 5 *g*, duration 11 ms, 3 shocks each in both directions of the 3 axes

Technical data

Seismic vibration IEC 60255-21-2, class I IEC 60068-3-3	Sinusoidal 1 to 8 Hz: ± 3.5 mm amplitude (horizontal axis) 1 to 8 Hz: ± 1.5 mm amplitude (vertical axis) 8 to 35 Hz: 1 *g* acceleration (horizontal axis) 8 to 35 Hz: 0.5 *g* acceleration (vertical axis) Frequency sweep 1 octave/min 1 cycle in 3 orthogonal axes
During transport	
Standards	IEC 60255-21 and IEC 60068-2
Vibration IEC 60255-21-1, class II IEC 60068-2-6	Sinusoidal 5 to 8 Hz: ±7.5 mm amplitude; 8 to 150 Hz: 2 *g* acceleration Frequency sweep 1 octave/min 20 cycles in 3 orthogonal axes
Shock IEC 60255-21-2, class I IEC 60068-2-27	Half-sinusoidal Acceleration 15 *g*, duration 11 ms, 3 shocks each in both directions 3 axes
Continuous shock IEC 60255-21-2, class I IEC 60068-2-29	Half-sinusoidal Acceleration 10 *g*, duration 16 ms, 1000 shocks in both directions of the 3 axes

Climatic stress test

Temperatures	
Standards	IEC 60068-2-1, IEC 60068-2-2
Recommended operating limiting temperature	–5 °C to +55 °C / +25 °F to +131 °F
Temporarily permissible operating temperature	-20 to +70 °C (Legibility of display may be impaired above +55 °C / +131 °F)
Limiting temperature during permanent storage (with supplied packing)	–25 °C to +55 °C / –13 °F to +131 °F
Limiting temperature during transport (with supplied packing)	–25 °C to +70 °C / –13 °F to +158 °F
Humidity	
Standards	IEC 60068-2-3
Permissible humidity stress It is recommended to arrange the units in such a way that they are not exposed to direct sunlight or pronounced temperature changes that could cause condensation	Annual average ≤ 75 % relative humidity; on 56 days a year up to 93 % relative humidity; condensation is not permitted

Functions

General

Frequency range	25 to 75 Hz (f_N = 50 Hz) 30 to 90 Hz (f_N = 60 Hz) 8.35 to 25 Hz (f_N = 16.7 Hz)

Paralleling function (ANSI 25)

Setting ranges	
Upper voltage limit V_{max}	20 to 140 V (steps 1 V)
Lower voltage limit V_{min}	20 to 125 V (steps 1 V)
V < for de-eergized status	1 to 60 V (steps 1 V)
V > for energized status	20 to 140 V (steps 1 V)
Voltage difference ΔV	0 to 40 V (steps 1 V)
Frequency difference Δf	0 to 2 Hz (steps 0.01 Hz)
Angle difference $\Delta\alpha$	2 to 80° (steps 1°)
Changeover threshold asynchronous – synchronous	0.01 to 0.04 Hz (steps 0.01 Hz)
Angle correction of vector group	0 to 359° (steps 1°)
Matching voltage transformer V_1/V_2	0.5 to 2 (steps 0.01)
Circuit-breaker making time	10 to 1000 ms (steps 1 ms)
Operating time of circuit-breaker	0.01 to 10 s (steps 0.01 s)
Max. operating time after start	0.01 to 1200 s (steps 0.01 s)
Monitoring time of voltage	0 to 60 s (steps 0.1 s)
Release delay	0 to 60 s (steps 0.01 s)
Synchronous switching	0 to 60 s (steps 0.01 s)
Times	
Minimum measuring time	Approx. 80 ms (50/60 Hz) Approx. 240 ms (16.7 Hz)
Drop-off	
Drop-off ratio voltage	Approx. 0.9 (V >) or 1 (V <)
Drop-off difference frequency	20 mHz
Drop-off difference phase angle	1 °
Tolerance	
Voltage measurement	1 % of pickup value or 0.5 V
Voltage difference ΔV	1 % of pickup value or max. 0.5 V (typical < 0.2 V)
Frequency difference Δf	< 10 mHz (synchronous network) < 15 mHz (asynchronous network)
Angle difference $\Delta\alpha$	0.5° with minor slip and approx. rated frequency 3° for Δf < 1 Hz, 5° for Δf > 1 Hz
Delay times	1 % or 10 ms

Readjustment commands for synchronization

Frequency balancing	
Minimum control pulse	10 to 1000 ms (steps 1 ms)
Maximum control pulse	1 to 32 s (steps 0.01 s)
Frequency change of controller	0.05 to 5 Hz/s (steps 0.01 Hz/s)
Setting time of controller	0 to 32 s (steps 0.01 s)
Target value for frequency balancing	-1 to 1 Hz (steps 0.01 Hz)
Kick pulse	Available
Voltage balancing	
Minimum control pulse	10 to 1000 ms (steps 1 ms)
Maximum control pulse	1 to 32 s (steps 0.01 s)
Voltage change of controller	0.1 to 50 V/s (steps 0.1 V/s)
Setting time of controller	0 to 32 s (steps 0.01 s)
Permissible overexcitation $(V/V_N)/(f/f_N)$	1 to 1.4 (steps 0.01)
Tolerances	
Minimum control pulse	1 %
Control times	Approx. 5 % or ± 20 ms

Undervoltage protection (ANSI 27)

Setting range	
Undervoltage pickup V<, V<<	10 to 125 V (steps 0.1 V)
Time delays T	0 to 60 s (steps 0.01 s) or indefinite
Times	
Pickup times V<, V<<	Approx. 50 ms (150 ms at 16.7 Hz)
Drop-off times V<, V<<	Approx. 50 ms (150 ms at 16.7 Hz)
Drop-off ratio V<, V<<	1.01 to 1.10 (steps 0.01)
Tolerances	
Voltage limit values	1 % of set value or 0.5 V
Time delays T	1 % or 10 ms

Technical data

Overvoltage protection (ANSI 59)	
Setting ranges	
Overvoltage pickup $V>$, $V>>$	30 to 170 V (steps 0.1 V)
Time delays T	0 to 60 s (steps 0.01 s) or indefinite
Time	
Pickup times $V>$, $V>>$	Approx. 50 ms (150 ms at 16.7 Hz)
Drop-off times $V>$, $V>>$	Approx. 50 ms (150 ms at 16.7 Hz)
Drop-off ratio $V>$, $V>>$	0.90 to 0.99 (steps 0.01)
Tolerances	
Voltage limit values	1 % of set value or 0.5 V
Time delays T	1 % or 10 ms
Frequency protection (ANSI 81)	
Setting ranges	
Steps; selectable $f>$, $f<$	4
Pickup values $f>$, $f<$	40 to 65 Hz (steps 0.01 Hz)
Time delays T	0 to 60 s (steps 0.01 s) or indefinite
Undervoltage blocking $V<$	10 to 125 V (steps 0.1 V)
Times	
Pickup times $f>$, $f<$	Approx. 100 ms (300 ms at 16.7 Hz)
Drop-off times $f>$, $f<$	Approx. 100 ms (300 ms at 16.7 Hz)
Drop-off difference Δf	Approx. 20 mHz
Drop-off ratio $V<$	Approx. 1.05
Tolerances	
Frequencies	10 mHz at $f = f_N$
Undervoltage blocking	1 % of set value or 0.5 V
Time delays T	1 % or 10 ms
Rate-of-frequency-change protection (ANSI 81R)	
Setting ranges	
Steps, selectable $+df/dt>$; $-df/dt$	4
Pickup value df/dt	0.1 to 10 Hz/s (steps 0.1 Hz/s);
Time delays T	0 to 60 s (steps 0.01 s) or indefinite
Undervoltage blocking $V<$	10 to 125 V (steps 0.1 V)
Times	
Pickup times df/dt at 16.7 Hz: times x 3	Approx. 200 to 700 ms (depending on measuring duration)
Drop-off times df/dt at 16.7 Hz: times x 3	Approx. 200 to 700 ms (depending on measuring duration)
Drop-off ratio df/dt	0.02 at 0.99 Hz/s (settable)
Drop-off ratio $V<$	Approx. 1.05
Tolerances	
Rate-of-frequency change	Approx. 0.1 Hz/s at $V > 0.5\ V_N$
Measuring duration < 5	Approx. 5 % or 0.15 Hz/s at $V > 0.5\ V_N$
Measuring duration > 5	Approx. 3 % or 0.15 Hz/s at $V > 0.5\ V_N$
Undervoltage blocking	1 % of set value or 0.5 V
Time delays T	1 % or 10 ms
Jump of voltage vector monitoring	
Setting ranges	
Stage $\Delta\varphi$	2° to 30° (steps 0.1°)
Time delay T	0 to 60 s (steps 0.01 s) or indefinite
Undervoltage blocking $V<$	10 to 125 V (steps 0.1 V)
Maximum voltage	10 to 170 V (steps 0.1 V)
Times	
Pickup times $\Delta\varphi$	Approx. 75 ms (225 ms at 16.7 Hz)
Drop-off times $\Delta\varphi$	Approx. 75 ms (225 ms at 16.7 Hz)
Tolerances	
Vector jump	0.5° at $V > 0.5\ V_N$
Undervoltage blocking	1 % of set value or 0.5 V
Time delay T	1 % or 10 ms
External trip coupling	
Number of external trip couplings	4

Threshold value supervision	
Number of steps	6 (3 larger and 3 smaller)
Measured quantity	V_a, V_b, V_c, V_d, V_e, V_f
Setting ranges	2 to + 200 % (steps 1 %)
Times	
Pickup times	Approx. 50 ms (150 ms at 16.7 Hz)
Drop-off times	Approx. 50 ms (150 ms at 16.7 Hz)
Drop-off ratio	0.95
Voltage tolerance	1 % of set value or 0.5 V
Typical operational measured values	
Description	Secondary
Voltages	V_a; V_b; V_c; V_d; V_e; V_f; V_1, V_2, ΔV
Tolerance	0.2 % of measured value or ± 0.2 V ± 1 digit
Phase angle	$\Delta\alpha$
Tolerance	< 0.5°
Frequency	f_1, f_2, Δf
Tolerance	10 mHz at $f = f_N$ 15 mHz at $f = f_N \pm 10$ %
Fault records	
Number of fault records	Max. 8 fault records
Instantaneous values	
Storage time	Max. 10 s
Sampling interval	Depending on the actual frequency (e. g. 1 ms at 50 Hz; 0.83 ms at 60 Hz)
Channels	V_a, V_b, V_c, V_d, V_e, V_f, V_d-V_a, V_e-V_b, V_f-V_c, ΔV, Δf, $\Delta\alpha$
R.m.s. values	
Storage period	Max. 100 s
Sampling interval	Fixed (10 ms at 50 Hz, 8.33 ms at 60 Hz)
Channels	V_1, V_2, f_1, f_2, ΔV, Δf, $\Delta\alpha$
Additional functions	
Fault event logging	Storage of events of the last 8 faults Puffer length max. 600 indications Time solution 1 ms
Operational indications	Max. 200 indications Time solution 1 ms
Elapsed-hour meter	Up to 6 decimal digits
Switching statistics	Number of break operations Number of make operations

CE conformity

This product is in conformity with the Directives of the European Communities on the harmonization of the laws of the Member States relating to electromagnetic compatibility (EMC Council Directive 89/336/EEC) and electrical equipment designed for use within certain voltage limits (Council Directive 73/23/EEC).

This unit conforms to the international standard IEC 60255, and the German standard DIN 57435/ Part 303 (corresponding to VDE 0435/Part 303).

The unit has been developed and manufactured for application in an industrial environment according to the EMC standards.

This conformity is the result of a test that was performed by Siemens AG in accordance with Article 10 of the Council Directive complying with the generic standards EN 50081-2 and EN 50082-2 for the EMC Directive and standard EN 60255-6 for the “low-voltage Directive”.

Selection and ordering data

Description	Order No.	Order code
7VE61 multifunction paralleling unit *Housing 1/3 19", 6 BI, 9 BO, 1 live status contact*	*7VE6110-□□□□□-0□□□*	*□□□*

Auxiliary voltage (power supply, indication voltage)		
24 to 48 V DC , threshold binary input 19 V	*2*	
60 to 125 V DC, threshold binary input 19 V	*4*	
110 to 250 V DC, 115 to 230 V AC, threshold binary input 88 V DC	*5*	
220 to 250 V DC, 115 to 230 V AC, threshold binary input 176 V DC	*6*	

Unit design		
Surface-mounting housing, 2-tier screw-type terminals at top/bottom	*B*	
Flush-mounting housing, screw-type terminals (direct connection/ring-type cable lugs)	*E*	

Region-specific default setting/function and language settings		
Region DE, 50 Hz, language German (language selectable)	*A*	
Region World, 50/60 Hz, language English (GB) (language selectable)	*B*	
Region US, 60 Hz, language English (US) (language selectable)	*C*	
Region World, 50/60 Hz, language Spanish (language selectable)	*E*	

Port B (system interface)		
No system interface	*0*	
IEC 60870-5-103-protocol, electrical RS232	*1*	
IEC 60870-5-103-protocol, electrical RS485	*2*	
IEC 60870-5-103-protocol, optical 820 nm, ST connector	*3*	
Analog outputs 2 x 0 to 20 mA or 4 to 20 mA	*7*	
PROFIBUS-DP Slave, electrical RS485	*9*	*L 0 A*
PROFIBUS-DP Slave, optical 820 nm, double ring, ST connector 1)	*9*	*L 0 B*
MODBUS RTU, electrical RS485	*9*	*L 0 D*
MODBUS RTU, optical 820 nm, ST connector 1)	*9*	*L 0 E*
DNP 3.0, electrical RS485	*9*	*L 0 G*
DNP 3.0, optical 820 nm, ST connector 1)	*9*	*L 0 H*
IEC 61850, 100 Mbit Ethernet, electrical, double, RJ45 connectors	*9*	*L 0 R*
IEC 61850, 100 Mbit Ethernet, optical, double, LC connector 2)	*9*	*L 0 S*

Port C (service interface)		
DIGSI 4/modem, electrical RS232	*1*	
DIGSI 4/modem, electrical RS485	*2*	

Port C (service interface) and Port D (additional interface) *Port C (service interface)*		
DIGSI 4/modem, electrical RS232	*9*	*M 1 □*
DIGSI 4/modem, electrical RS485	*9*	*M 2 □*

Port D (additional interface)		
Analog outputs 2 x 0 to 20 mA or 4 to20 mA		*K*

Scope of functions of the unit		
Synchro-check for up to 3 synchronizing points (with dead bus/line monitoring)	*A*	
Paralleling function for 2 synchronizing points without balancing commands, 1½-channel, synchro-check in 2nd channel	*B*	
Paralleling function for 2 synchronizing points with balancing commands, 1½-channel, synchro-check in 2nd channel	*C*	
Paralleling function for 4 synchronizing points with balancing commands, 1½-channel, synchro-check in 2nd channel	*D*	

Additional functions		
Without	*A*	
Protection and network decoupling function (voltage, frequency and rate-of-frequency-change protection, vector jump)	*B*	

Additional applications		
Without	*0*	
Application for traction systems (f_n = 16.7 Hz)	*1*	

1) With position 9 = *B* (surface-mounting housing) the unit must be ordered with RS485 interface and a separate FO converter.

2) Not available with position 9 = "*B*"

Selection and ordering data

Description	Order No.	Order code
7VE63 multifunction paralleling unit *Housing 1/2 19", 14 BI, 17 BO,1 live status contact*	*7VE6320-□□□□□-0□□□*	*□□□*
Auxiliary voltage (power supply, indication voltage)		
24 to 48 V DC , threshold binary input 19 V DC	2	
60 to 125 V DC, threshold binary input 19 V DC	4	
110 to 250 V DC, 115 to 230 V AC, threshold binary input 88 V DC	5	
220 to 250 V DC, 115 to 230 V AC, threshold binary input 176 V DC	6	
Unit design		
Surface-mounting housing, 2-tier screw-type terminals at top/bottom	B	
Flush-mounting housing, screw-type terminals (direct connection/ring-type cable lugs)	E	
Region-specific default setting/function and language settings		
Region DE, 50 Hz, language German (language selectable)	A	
Region World, 50/60 Hz, language English (GB) (language selectable)	B	
Region US, 60 Hz, language English (US) (language selectable)	C	
Region World, 50/60 Hz, language Spanish (language selectable)	E	
Port B (system interface)		
No system interface	0	
IEC 60870-5-103-protocol, electrical RS232	1	
IEC 60870-5-103-protocol, electrical RS485	2	
IEC 60870-5-103-protocol, optical 820 nm, ST connector	3	
Analog outputs 2 x 0 to 20 mA or 4 to 20 mA	7	
PROFIBUS-DP Slave, electrical RS485	9	L 0 A
PROFIBUS-DP Slave, optical 820 nm, double ring, ST connector 1)	9	L 0 B
MODBUS RTU, electrical RS485	9	L 0 D
MODBUS RTU, optical 820 nm, ST connector 1)	9	L 0 E
DNP 3.0, electrical RS485	9	L 0 G
DNP 3.0, optical 820 nm, ST connector 1)	9	L 0 H
IEC 61850, 100 Mbit Ethernet, electrical, double, RJ45 connectors	9	L 0 R
IEC 61850, 100 Mbit Ethernet, optical, double, LC connector 2)	9	L 0 S
Port C (service interface)		
DIGSI 4/modem, electrical RS232	1	
DIGSI 4/modem, electrical RS485	2	
Port C (service interface) and Port D (additional interface)		
Port C (service interface)		
DIGSI 4/modem, electrical RS232	9	M 1 □
DIGSI 4/modem, electrical RS485	9	M 2 □
Port D (additional interface)		
Analog outputs 2 x 0 to 20 mA or 4 to 20 mA		K
Scope of functions of the unit		
Synchro-check for up to 3 synchronizing points (with dead bus/line monitoring)	A	
Paralleling function for 2 synchronizing points without balancing commands, 2-channel, independent measuring procedures	B	
Paralleling function for 2 synchronizing points with balancing commands, 2-channel , independent measuring procedures	C	
Paralleling function for 8 synchronizing points with balancing commands, 2-channel, independent measuring procedures	D	
Additional functions		
Without	A	
Protection and network decoupling function (voltage, frequency and rate-of-frequency-change protection, vector jump)	B	
Additional applications		
Without	0	
Application for traction systems (f_n = 16.7 Hz)	1	

1) With position 9 = B (surface-mounting housing) the unit must be ordered with RS485 interface and a separate FO converter.

2) Not available with position 9 = "B"

Accessories

Description	Order No.
DIGSI 4 Software for configuration and operation of Siemens protection units running under MS Windows 2000/XP Professional Edition, device templates, Comtrade Viewer, electronic manual included as well as "Getting started" manual on paper, connecting cables (copper)	
Basis Full version with license for 10 computers, on CD-ROM (authorization by serial number)	7XS5400-0AA00
Professional Basis and all optional packages on CD-ROM, DIGSI 4 and DIGSI 3	7XS5402-0AA00
Copper connecting cable Cable between PC/notebook (9-pin connector) and protection unit (9-pin connector) (contained in DIGSI 4, but can be ordered additionally)	7XV5100-4
Manual 7VE61 and 7VE63 Multifunction Paralleling Device	C53000-G1176-C163-1

Fig. 11/97
Short-circuit links for voltage contacts

Fig. 11/98
Mounting rail for 19" rack

Description		Order No.	Size of package	Supplier
Crimp connector	CI2 0.5 to 1 mm^2	0-827039-1	4000	AMP [1]
		0-827396-1	1	AMP [1]
	CI2 1 to 2.5 mm^2	0-827040-1	4000	AMP [1]
		0-827397-1	1	AMP [1]
	Type III+ 0.75 to 1.5 mm^2	0-163083-7	4000	AMP [1]
		0-163084-2	1	AMP [1]
Crimping tool	for type III+	0-539635-1	1	AMP [1]
	and matching female	0-539668-2		AMP [1]
	for CI2	0-734372-1	1	AMP [1]
	and matching female	1-734387-1		AMP [1]
19"-mounting rail		C73165-A63-D200-1	1	Siemens
Short-circuit links	For voltage terminals	C73334-A1-C34-1	1	Siemens
Safety cover for terminals	large	C73334-A1-C31-1	1	Siemens
	small	C73334-A1-C32-1	1	Siemens

1) Your local Siemens representative can inform you on local suppliers.

Connection diagram

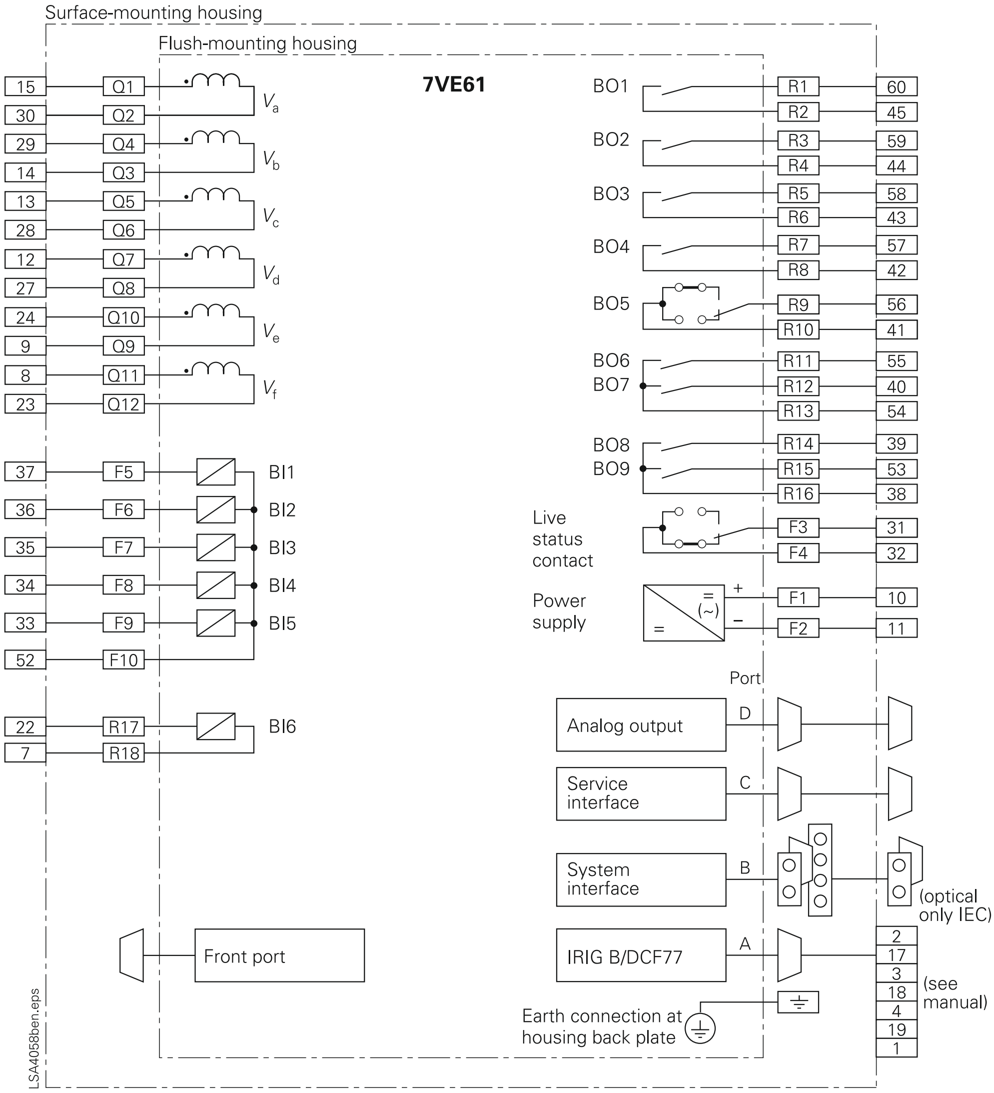

Fig. 11/99
Connection diagram

Connection diagram

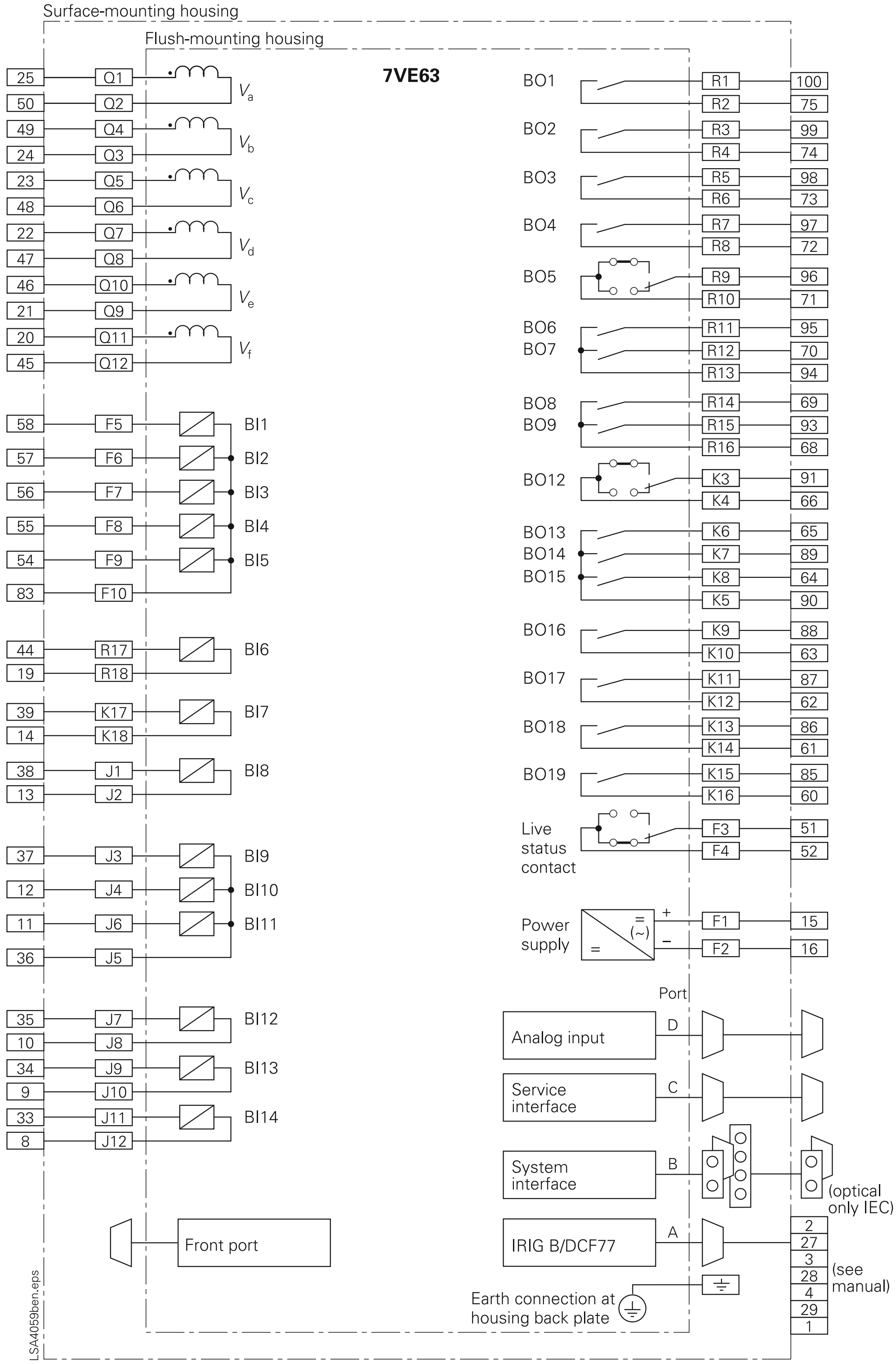

Fig. 11/100
Connection diagram