



ABB Industrie AG is a world-leading manufacture of synchronization equipment. Application-oriented solutions are developed, produced, commissioned and serviced.

Advantages

- Maximum reliability
- Guaranteed availability
- Lowest project-engineering costs
- Quick commissioning using convenient PC tool SynView
- Synchronizes up to 7 power circuit breakers with different requirements
- Design 100 % compliant with CE guidelines
- Advanced technology
- Universal use
- Decades of experience with synchronization systems
- After-sales service: 24 h hotline 365 days a year & remote servicing via the internet
- Training program for commissioning and service personnel

An optimum, profit-bringing solution from the very beginning!

New! Communications interfaces for
remote servicing via the internet



Variety of applications

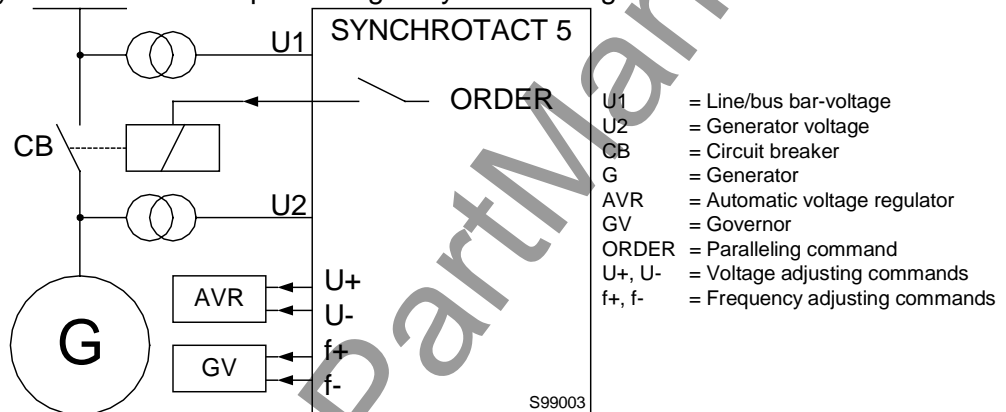
Synchronization units are widely used in power stations or industrial installations with their own power generating facilities, where the generators need to be paralleled with an island line or a public line, or in power distribution systems.

Power circuit breakers may only be closed if both voltages are at least approximately synchronous (coincident). Otherwise, faults in line operation, loading of the generators and, in extreme cases, damage to the generators can result.

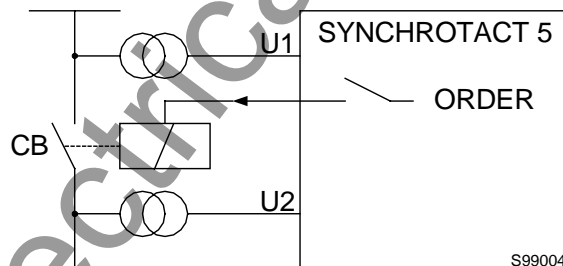
SYNCHROTECT[®] 5 performs these functions safely and reliably, whether as a monitoring element for manual paralleling or as an independent fully-automatic synchronization unit.

SYNCHROTECT[®] 5 covers the following areas of application:

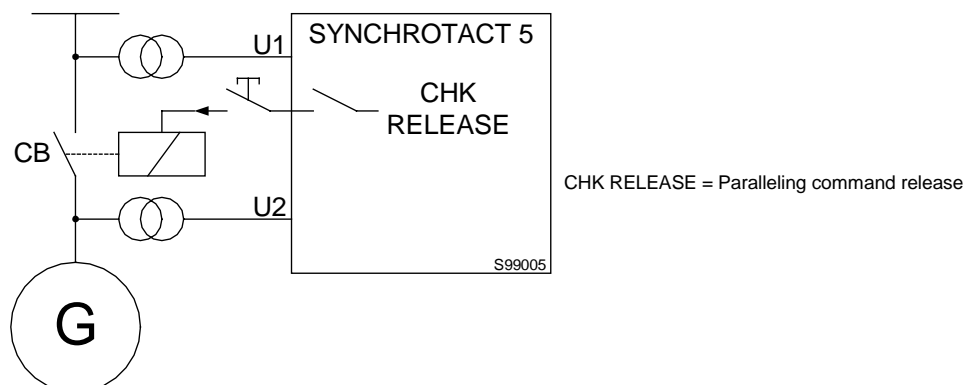
1. Automatic synchronization and paralleling of synchronous generators with line.



2. Automatic paralleling for synchronous and asynchronous lines, transmission lines and busbars.



3. Paralleling monitoring (synchrocheck) for the monitoring of automatic or manual paralleling procedures including the connection of voltage-free lines (dead bus).



Clearly-structured principle of operation

The synchronization and paralleling process can be divided into the following blocks:

Measuring

The values voltage difference (amplitude) ΔU , slip (frequency difference) s and phase-angle difference α , which are required for paralleling, are formed from the two measurement signals U_1 and U_2 (see illustration below).

Matching

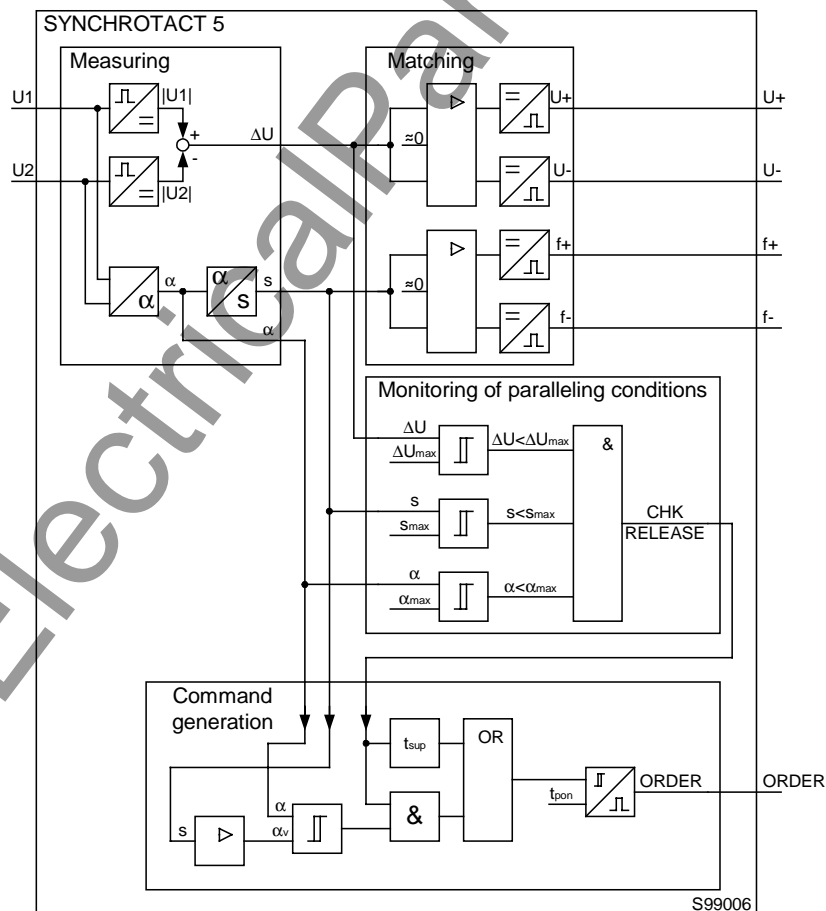
Voltage and frequency matching functions reduce the voltage difference ΔU and slip s by sending adjusting pulses to the voltage or turbine regulators.

Monitoring of paralleling conditions

This function compares the actual values with their set maximum values and releases paralleling (CHK RELEASE) if all conditions are fulfilled simultaneously.

Command generation

The command generation calculates the necessary lead angle α_v by which the paralleling command (ORDER) must be advanced due to the delay through the closing times in order that the main contacts close exactly at the precise instant of coincidence. If α reaches α_v at the same time as paralleling release (CHK RELEASE), the command is issued. Under synchronous conditions, i.e. permanent paralleling release during the adjustable monitoring time t_{sup} , the command is also issued without taking the lead angle into consideration.

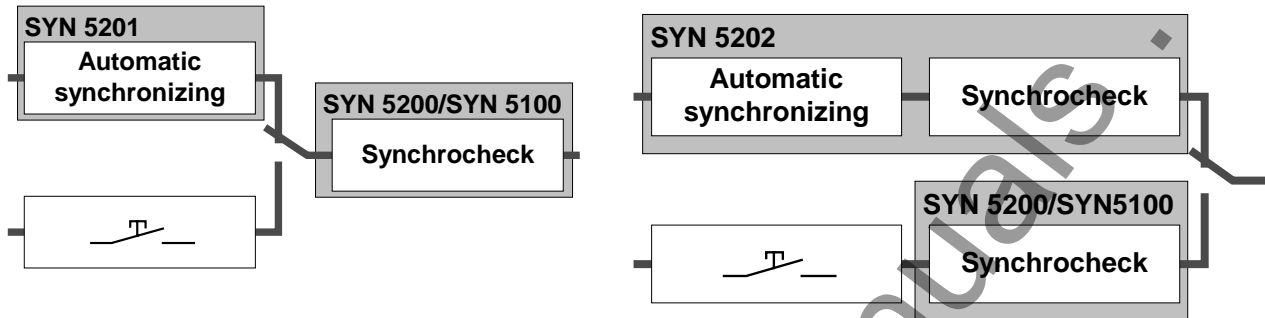


Synchrocheck mode (paralleling monitoring):

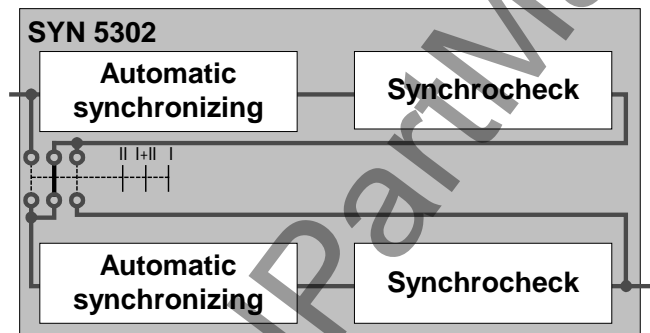
In Synchrocheck mode, only the measuring and monitoring function blocks are active. The output relay is closed during paralleling release.

Optimum reliability

From a synchronization unit, it is expected to close the power circuit breaker at the correct time but also that, if required, paralleling can also take place whenever permissible. Although the series connection of the output contacts of two independently-functioning channels (dual-channel system) which is usual in synchronization systems greatly increases security against incorrect paralleling, it necessarily leads to an reduction in availability.



High levels of safety and reliability can be achieved through the use of a second, redundant synchronizing system. If system 1 is no longer able to synchronize, it is possible to switch over to the second system and synchronize with this.



In this configuration, two automatic dual-channel systems are housed in one unit. Normally, the output contacts of both systems are connected in series (4 channels!). One of the two systems can be bridged by means of a system selector switch.

Advice:

Single or dual-channel?

Not every synchronization system necessarily needs to be structured according to the above pattern. The SYNCHROTECT single-channel synchronization units offer a high degree of security and are often used in practice. However, security can be further increased to a **significant** degree by means of dual-channel systems. It is unlikely that the two channels, which are structured differently in both hardware and software terms, will have the same malfunction simultaneously. The extra cost of a dual-channel system frequently bears a profitable relationship to the possible consequential costs arising from incorrect paralleling.

Second, redundant synchronizing system?

Often, two redundant synchronizing systems are installed in a plant so that, in the event of failure of one system, it is possible to switch over to the other and thus increase availability. The second system is often designed for manual synchronizing with or without synchrocheck.

In addition to this solution, with SYNCHROTECT® 5 ABB offers two automatic dual-channel systems in a single casing, thus allowing manual synchronization to be dispensed with. The advantages of this solution:

- No engineering and wiring costs for the second system
- Further increased security since all four output contacts are normally operated in series
- No problems with synchronization in cases where the manual synchronizing system is very seldom used.

Possible means of control

Service control for commissioning and servicing:

1. Built-in service controls: keypad & LCD (standard)
2. SynView PC tool for local control: PC/RS 232 (accessory)
3. Ethernet interface: remote servicing via Internet (option)

Operating control for normal synchronizing operation:

1. Digital inputs/outputs: conventional wiring (standard)
2. Interface (modbus, profibus, LON): remote-controlled synchronizing operation (option)

Fast commissioning with SynView

SynView is the appropriate aid for simple and fast commissioning of SYNCHROTECT[®] 5 devices. The PC software runs under MS[®] Windows[™] NT, 95 and 98 in the standard languages German, English or French. Versions in other languages are possible. SynView consists of 5 functions which are explained in greater detail in the following.

Parameter tool

All parameter settings are carried out with this. The files can be stored on the PC and copied to other units. Helpful functions such as comparing parameter files with device settings or the display of recommended setting values greatly simplify commissioning and servicing work.

Transient recorder tool

The voltage difference and paralleling command from the last three synchronizing processes are displayed. The tool makes the use of a separate recorder unnecessary.

Actual values tool

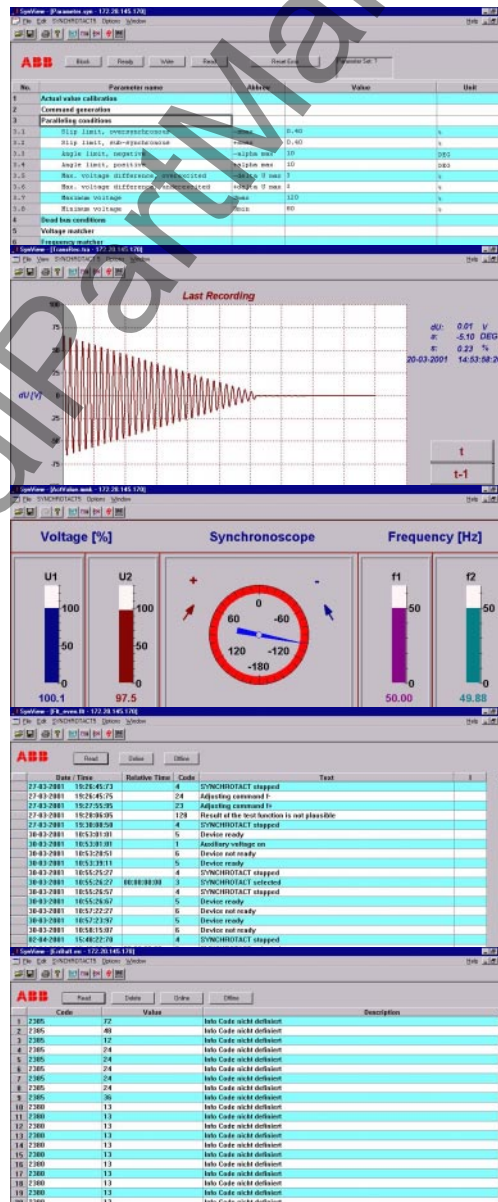
A synchroscope, together with all the values important for paralleling, is displayed on the user interface. These simplify function-testing of the synchronizing process if no instruments are available.

Fault-/Event log tool

The 256 events stored in SYNCHROTECT[®] 5 are displayed in plain text with date and timestamp. This greatly simplifies the localization of faults, e.g. wiring or control faults which sometimes occur during commissioning.

Diagnostic tool

In difficult cases which cannot be solved on site, this tool helps the manufacturer to identify the causes of the problem from the data stored here.



Device types

The SYNCHROTECT® 5 family of devices consists of 5 device types:

Type	Function	Symbol
SYN 5100	Synchrocheck	
SYN 5200	Synchrocheck or automatic paralleling unit without matcher	
SYN 5201	Automatic single-channel synchronization unit	
SYN 5202	Automatic dual-channel synchronization unit	
SYN 5302	Redundant automatic dual-channel synchronization unit	

Difference between SYN 5302 and SYN 5202:

The SYN 5202 is a dual-channel system with two differently-structured independent channels in the same casing. SYN 5302 consists of two SYN 5202 dual-channel devices in one casing. The two systems are normally all wired in series (4 channels!). In the event of failure of one system, it is possible to switch over without danger to the other dual-channel automatic system. This allows paralleling to be carried out fully automatically and with maximum security at all times. Additional costs for a redundant synchronization system are saved.

Difference between SYN 5100 and SYN 5200:

SYN 5100 offers a parameter set with 5 parameters, the auxiliary voltage range is 50 to 130 VAC or 100 to 125 VDC.

SYN 5200 features communications interfaces, seven parameter sets, a wider auxiliary voltage range and the convenient PC tool SynView with all its functions. In addition, because of its command generation, SYN 5200 can also be used as an automatic paralleling unit.

Type code

SYN 5202

Synchronization type

- 00: Synchrocheck
- 01: Single-channel device
- 02: Dual-channel device

Construction size

- 1: Small size
- 2: Medium size
- 3: Large size

SYNCHROTECT

- SYN = SYNCHROTECT
- 5: Fifth generation

Device types

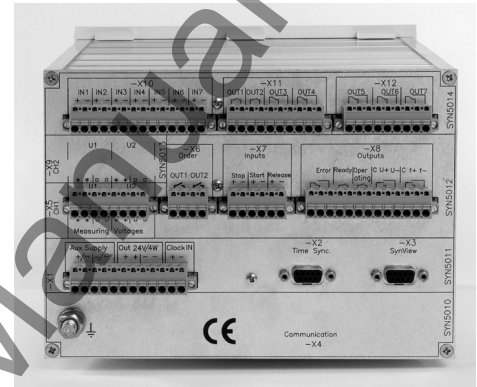
SYN 5100:



Front view of SYN 5200, SYN 5201, SYN 5202:



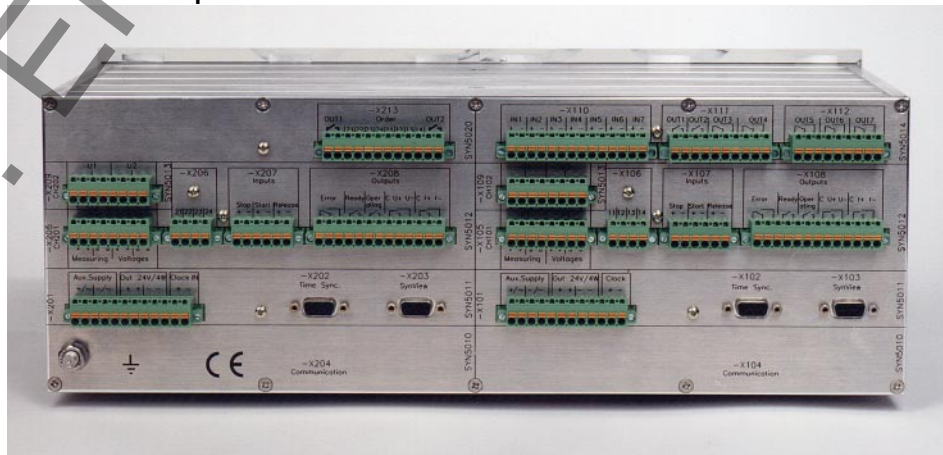
Rear view of SYN 5200, SYN 5201 with 7 parameter sets:



Front view of SYN 5302:



Rear view of SYN 5302 with 7 parameter sets:



Scope of functions at a glance

Function	SYN 5100	SYN 5200	SYN 5201	SYN 5202	SYN 5302
Automatic synchronization with U- and f- matching	No	No	Yes	Yes	Yes
Automatic synchronization without U- and f- matching	No	Yes	Yes	Yes	Yes
Synchrocheck mode	Yes	Yes	Possible	Possible	Possible
Dual-channel system	No	No	No	Yes	Yes
Integrated, redundant system (bypass)	No	No	No	No	Yes
Number of parameter sets	1	either 1 or 7	either 1 or 7	either 1 or 7	either 1 or 7
Paralleling of synchronous lines	Yes	Yes	Yes	Yes	Yes
Paralleling of asynchronous lines	Yes	Yes	Yes	Yes	Yes
Paralleling of voltage-free lines	Yes	Yes	Yes	Yes	Yes
Signalling	No	Yes	Yes	Yes	Yes
Built-in control unit for servicing	Yes	Optional	Optional	Optional	Yes
PC tool 'SynView'	No	Optional	Optional	Optional	Optional

Options

	Option	SYN 5100	SYN 5200, SYN 5201, SYN 5202, SYN 5302
w	Communication	0 none	0 none 1 Ethernet 2 Modbus 3 Profibus 4 Lon-Bus B Ethernet & Modbus C Ethernet & Profibus D Ethernet & Lon-Bus
x	Code for internal use	2 internal code	2 internal code
y	Auxiliary voltage / nominal frequency	fn = 50/60 Hz: 2 50 to 130 VAC & 100 to 125 VDC fn = 16 ² / ₃ Hz: 5 50 to 130 VAC & 100 to 125 VDC	fn = 50/60 Hz: 1 24/48 VDC 2 100 to 125 VAC/VDC 3 220 to 250 VDC fn = 16 ² / ₃ Hz: 4 24/48 VDC 5 100 to 125 VAC/VDC 6 220 to 250 VDC
z	Parameter sets / configurable inputs/outputs (I/O)	1 1 Parameter set	1 1 Parameter set 7 7 Parameter sets

Ordering information

Device type	Options
SYN 5u0v	- wxyz

Examples:

SYN 5100 – 0221	Synchrocheck with nominal frequency 50 or 60 Hz, auxiliary voltage 50 to 130 VAC or 100 to 125 VDC and 1 parameter set
SYN 5200 – 0221	Synchrocheck with nominal frequency 50 or 60 Hz, auxiliary voltage 100 to 125 VAC/VDC and 1 parameter set
SYN 5201 – 0247	Automatic single-channel synchronization unit with nominal frequency 16 ² / ₃ Hz, auxiliary voltage 24/48 VDC and 7 parameter sets.
SYN 5202 – B217	Automatic dual-channel synchronization unit with communication (Ethernet und Modbus), nominal frequency 50 or 60 Hz, auxiliary voltage 24/48 VDC and 7 parameter sets.
SYN 5302 – 4237	Redundant automatic dual-channel synchronization unit with communication (Lon), nominal frequency 50 or 60 Hz, auxiliary voltage 220 to 250 VDC and 7 parameter sets.

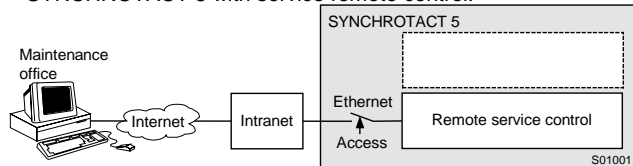
Captions to the options

Option w: Communication

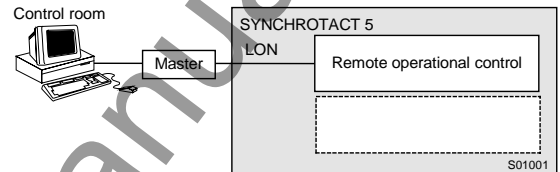
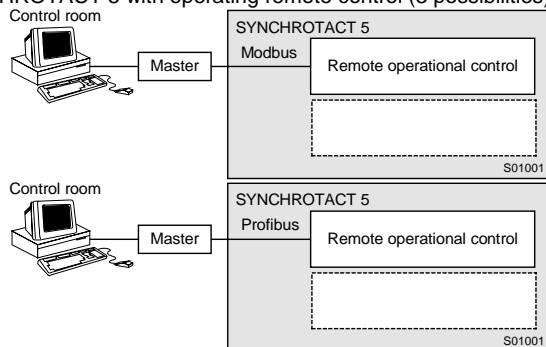
The Communications option features two interfaces:

- Service remote control (remote servicing): SynView operation via Ethernet
- Operating remote control

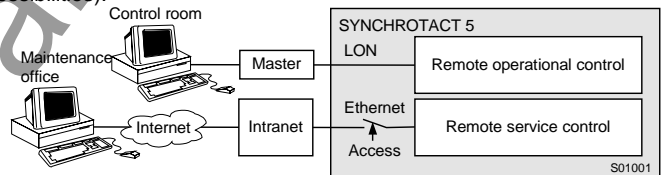
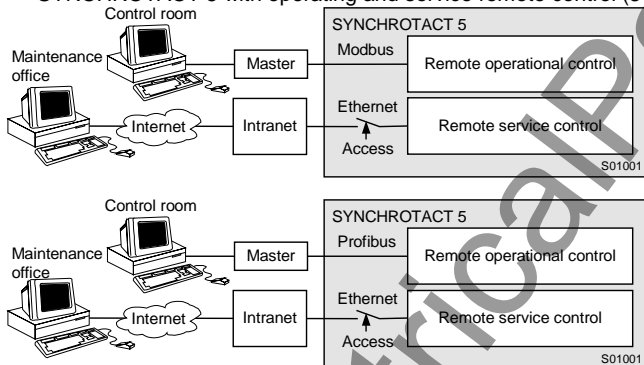
SYNCHROTACT 5 with service remote control:



SYNCHROTACT 5 with operating remote control (3 possibilities):



SYNCHROTACT 5 with operating and service remote control (3 possibilities):



Characteristics of service remote control:

Supported protocols:	TCP/IP
Interface type:	Ethernet
Connector type:	RJ45
Transmitted signals:	SynView is used as the user interface
Addressing:	IP-address
Access security	Access can be blocked by means of a switch on the unit

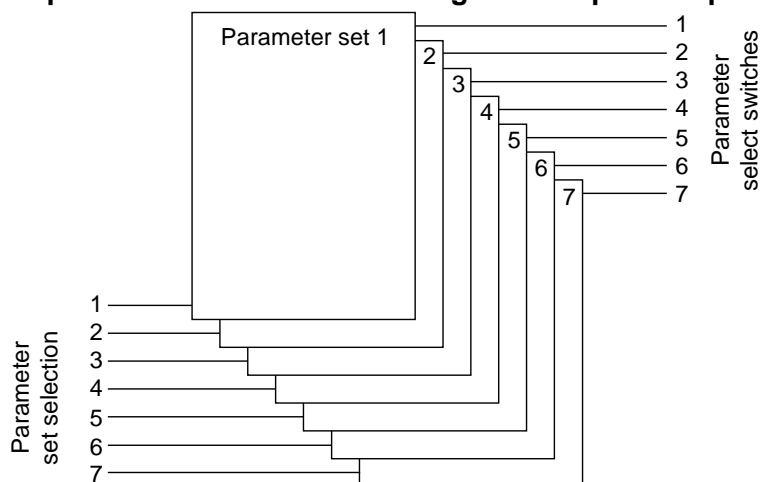
Characteristics of the operating remote control:

Supported protocols:	Modbus RTU; Profibus; Lon
Interface type:	Modbus and Profibus: RS 485 Lon: optical
Connector type:	Modbus and Profibus: D-Sub9 (female) Lon: HP BFOC/2,5 (optical)
Transmitted signals:	Digital inputs/outputs; status indicators (LEDs); actual values (analogue); new event
Addressing:	Slave address, depending on fieldbus

SYN 5302: the interfaces are duplicated, i.e. each system can be controlled individually. Commands, for example starting synchronizing, have to be given separately for each system.

Captions to the options

Option z: Parameter sets/configurable inputs/outputs (I/O)



The specific settings for the synchronization and paralleling are stored in a parameter set. If a device is to synchronize with different settings, e.g. several paralleling points, the option with 7 parameter sets should be chosen, which includes additional hardware with seven inputs and outputs for this purpose. The inputs and outputs not used can be configured for other functions. The possible functions are shown in the table below:

S00016

Configurable functions of digital inputs
Selection of parameter set or paralleling point
Selection of TEST mode
Starting, stopping and blocking of synchronization process

Configurable functions of digital outputs
Selection or acknowledgement of paralleling point/ parameter set
Switchover contact for the command circuit which must be connected in series with the manual paralleling circuit in synchrocheck mode
Signalling of the following variables: Paralleling command in TEST mode Dead bus released Synchronization process stopped Phase-angle difference within tolerance band Slip within tolerance band Voltage difference within tolerance band Paralleling command released U1 leading or lagging $f1 > f2$; $f1 < f2$ $U2 > U1$; $U2 < U1$ U1 or U2 outside of permissible range Monitoring of paralleling contacts tripped Single-system operation (only SYN 5302)

Accessories

PC-Tool for commissioning and servicing purposes	SynView	3BHB 008 219 R0001
Auxiliary device for switching several paralleling points	SYN 5500	3BHB 006 500 R0001
Synchronization instruments	Double voltage measurement Double frequency measurement Synchroscope	Separate ordering details
Auxiliary/compensation transformers for the measurement voltages		Separate ordering details

Synchronization instruments: Conventional instruments are usually built into a synchronization system if the system includes a manual synchronization option. However, in some cases they are also used for information purposes, e.g. for service work, on fully-automatic synchronization systems. The latter case can also be covered with the SYNCHROTECT® 5 PC tool "SynView".

Auxiliary/compensation transformers: If the two nominal measurement voltages are outside of the permissible range (50 to 130 VAC) or deviate from one another by more than 10 %, matching transformers must be used. If a step-up transformer is installed between the measuring point and the power circuit breaker which turns the phase of a voltage by a fixed amount, this can be compensated for with the single-channel devices SYN 5200 and SYN 5201. With the devices SYN 5100, SYN 5302, SYN 5302, or where conventional synchronization instruments are used, compensation transformers must be used which turn the phase back again.

Spare parts

PCB designation	Type
Communications board	SYN 5010
Processor and power supply board	SYN 5011
Basic I/O unit	SYN 5012
Processor for channel 2 (synchrocheck)	SYN 5013
Extended I/O / 7 parameter sets (option)	SYN 5014
Bus board for SYN 520x	SYN 5015
System control	SYN 5020
Bus board for SYN 5302	SYN 5025

Ordering information:

When ordering, please state the complete type designation of the synchronizing unit.

Recommendation:

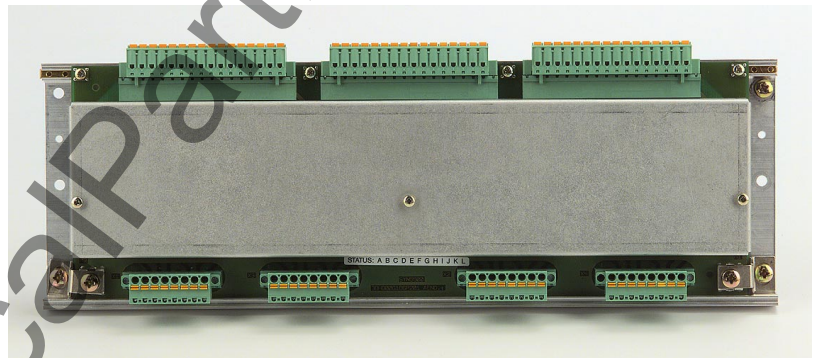
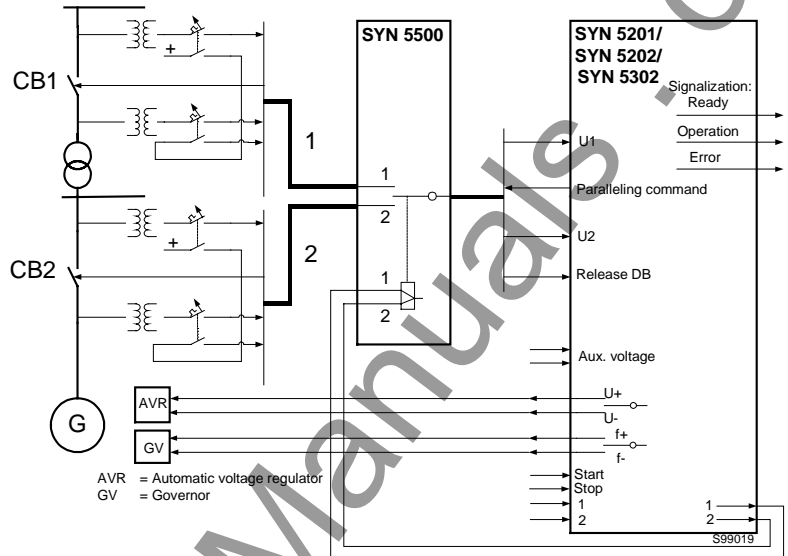
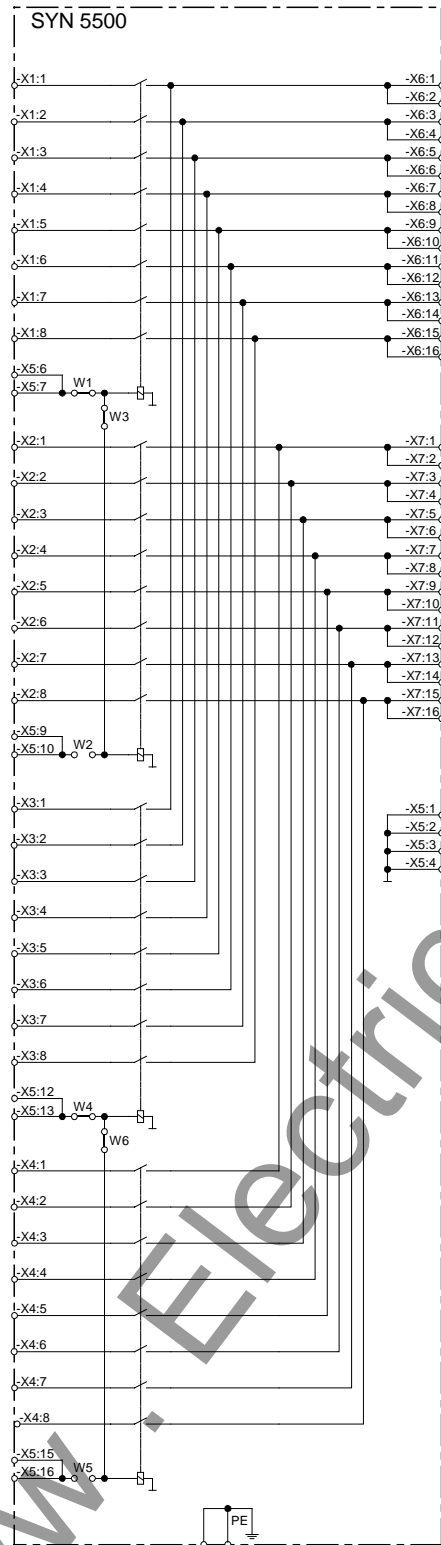
No individual parts are available for the SYN 5100 unit. It is therefore recommended that an identical, pre-set replacement unit be kept in store.

In the case of SYN 520x units, it is recommended that an identical, pre-set replacement unit be kept in store.

In the case of the SYN 5302, the following PCB modules are recommended as spare parts: SYN 5020 system control and SYN 5014 extended I/O card, if the latter is installed.

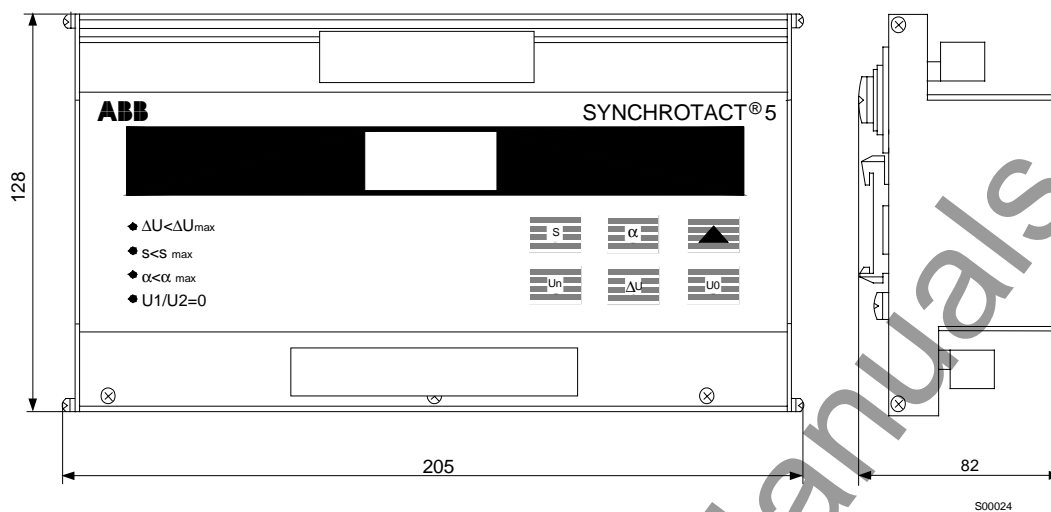
Auxiliary device SYN 5500

The auxiliary device SYN 5500 performs the connection of the measuring and command circuits where several paralleling points need to be switched. An SYN 5500 device can switch 2 paralleling points, each with a maximum of 16 contact pairs, or alternatively, 4 paralleling points, each with 8 contact pairs. Several devices can be used in combination.

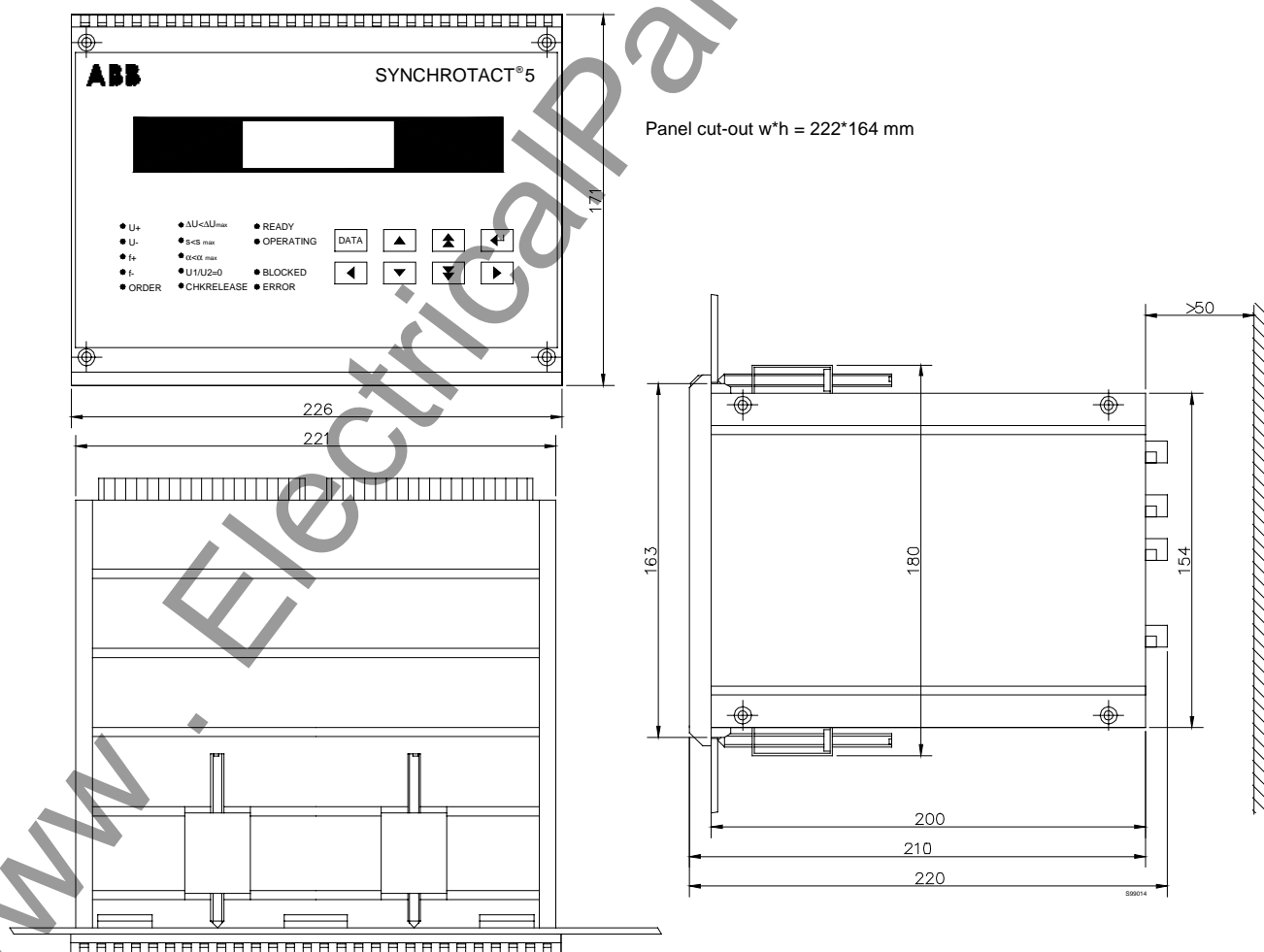


Construction

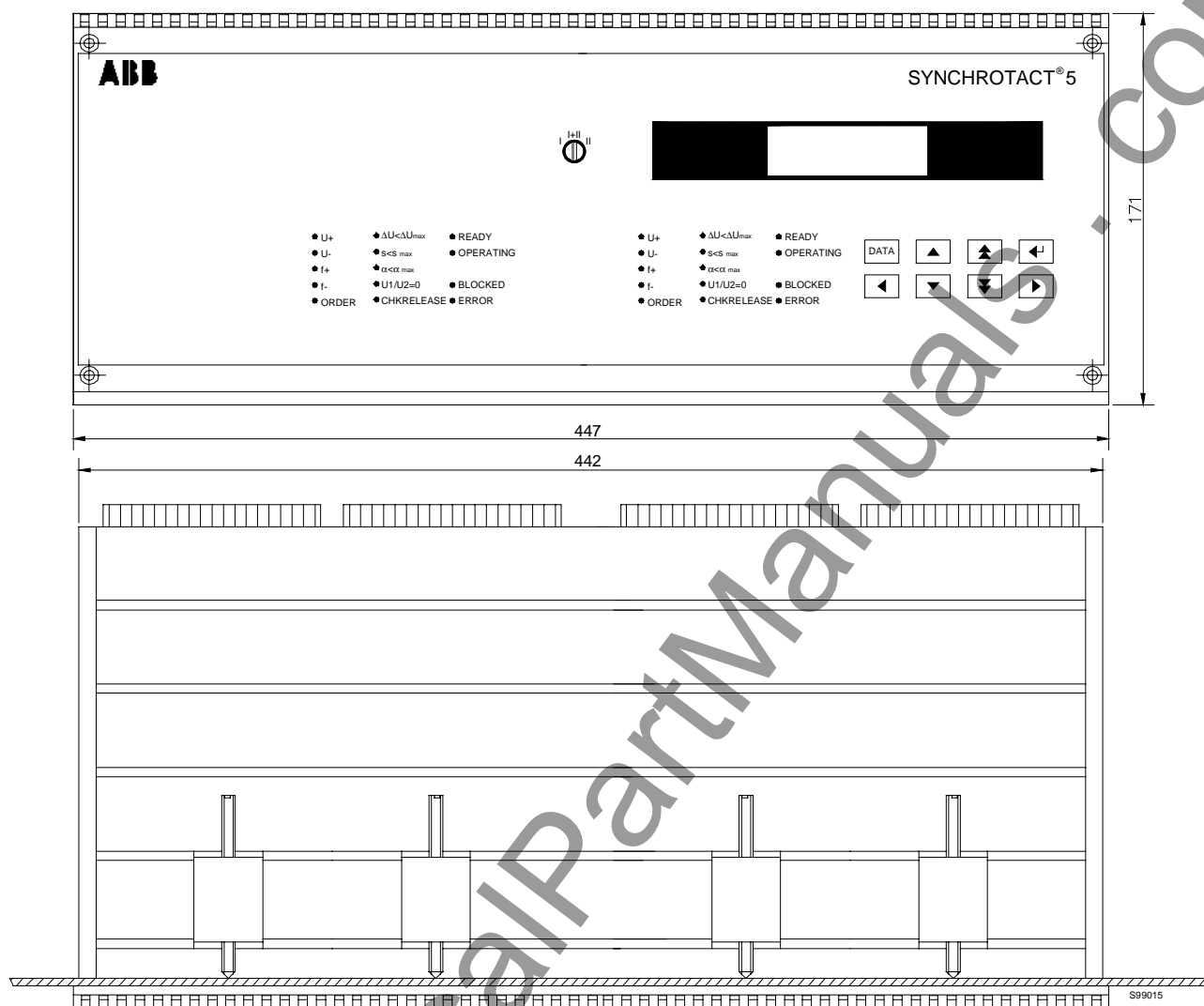
SYN 5100:



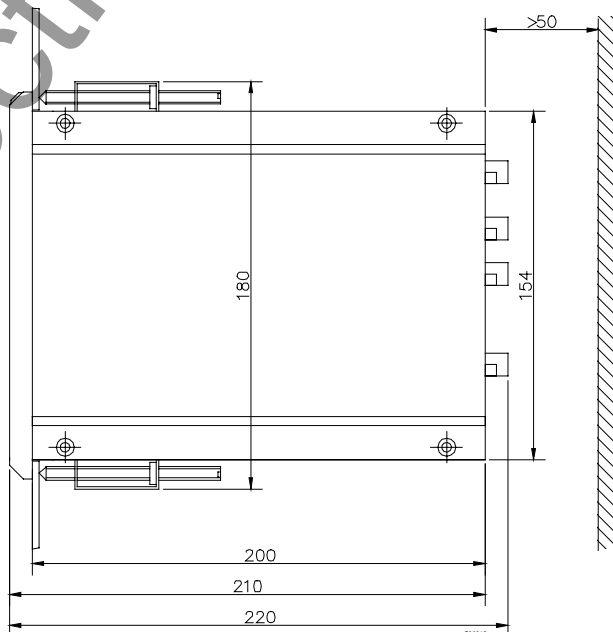
SYN 520x:



SYN 5302:

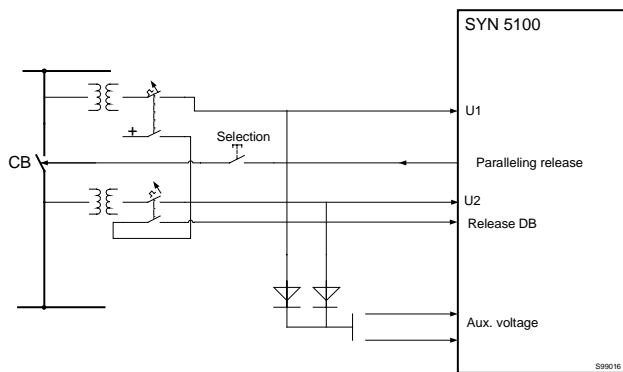


Panel cut-out w*h = 443 x 155 mm

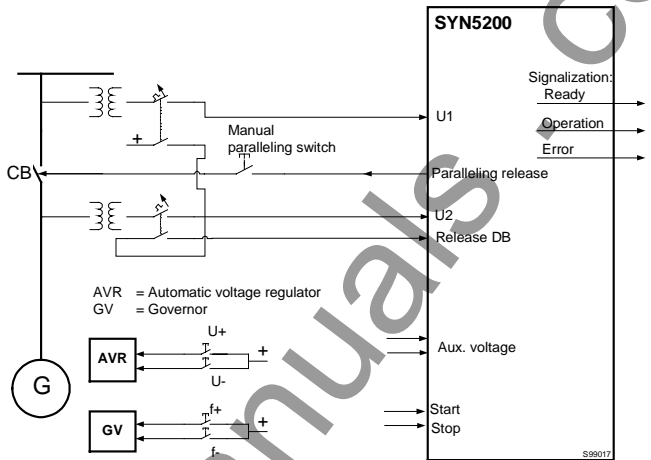


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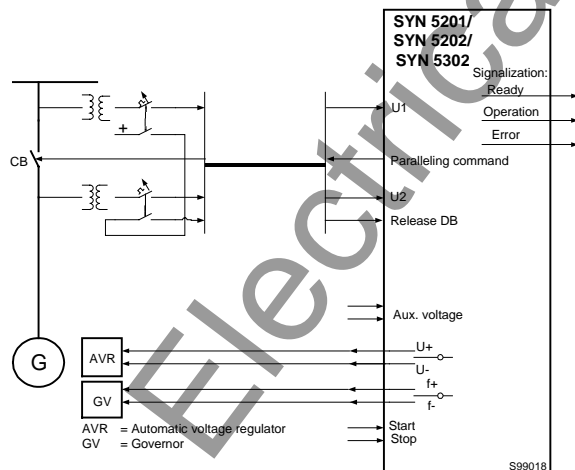
Typical applications



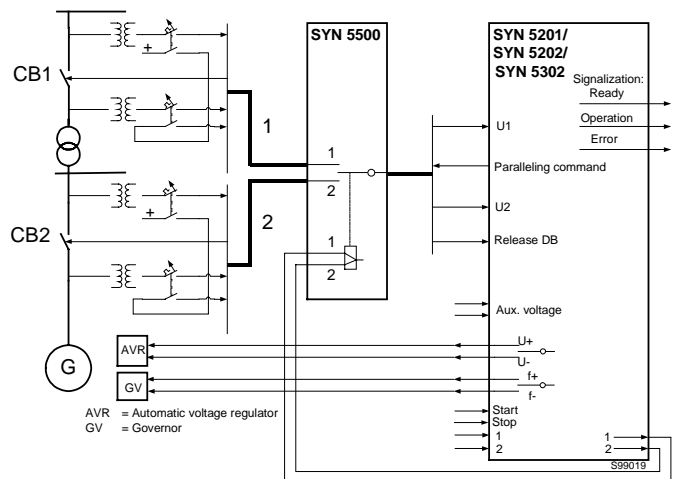
Simple, permanently-operated synchrocheck for paralleling of two lines



Synchrocheck for monitoring manual paralleling of a generator.



Automatic synchronization and paralleling of a generator.



Automatic synchronization and paralleling of two power circuit breakers with the same synchronization unit. The switching can be carried out by means of the auxiliary device SYN 5500.

Technical data

INPUTS

Auxiliary voltage

Nominal voltage ranges	24/48 VDC 100 to 125 VAC/VDC 220 to 250 VDC
Permissible voltage range	0,75 to 1,25*Un
Maximum power consumption (SYN 5302)	25 W/35 VA

Measuring inputs U1, U2

Nominal voltage range	50 to 130 VAC
Voltage range	0 to 130 % Un
Nominal frequency	16 ² / ₃ , 50, 60 Hz
Frequency range	10 to 100 Hz

Digital inputs

Nominal voltages	24/48 VDC
Current consumption	6 to 8 mA

OUTPUTS

Paralleling relays

Maximum switching voltage	250 VAC/DC
Maximum switching current, continuous	5 AAC/ADC
Maximum switching power ON AC/DC	1000 VA/W
Maximum switching power OFF AC/DC	30 VA/W

Adjusting command and signalling relays

Maximum switching voltage	250 VAC/DC
Maximum switching current, continuous	1,5 AAC/ADC
Maximum switching power ON/OFF AC/DC	50 VA/W

INTERFACE

PC-Tool 'SynView' RS232

Bridgeable distance	15 m
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PARAMETER SETTING RANGES

SYN 5200, SYN 5201, SYN 5202 (channel 1), SYN 5302 (channels 1)

Actual value calibration	Step	Setting range
Nominal voltage	1 V	50 to 130 VAC
Voltage matching (between U1 & U2)	0,1 %	±12 %
Angle matching	1 DEG	±180 DEG

Command generation

Paralleling time	10 ms	0 to 990 ms
Duration of paralleling command	10 ms	50 to 990 ms
Monitoring time	1 s	0 to 99 s

Paralleling conditions

Slip limit*	0,01 %	0 to 6 %
Angle limit (angle window)*	1 DEG	1 to 99 DEG
Maximum voltage difference*	1 %	0 to 40 %
Maximum voltage	1 %	100 to 130 %
Minimum voltage	1 %	50 to 95 %

* Positive and negative limit values can be set separately.

Dead bus conditions

Maximum zero voltage for dead bus	1 %	0 to 49 %
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Note: The following possibilities - and all combinations thereof - can be allowed or ruled out for paralleling by means of programming: U1 = dead bus; U2 = dead bus; both sides dead bus

Voltage matcher

Voltage adjustment characteristic	0.01 %/s	0 to 5 %/s
Interval between pulses	1 s	1 to 20 s
Minimum pulse duration	0,01 s	0,05 to 2 s

Note: The length of adjusting pulses are proportional to the voltage difference. The proportionality factor (0.01 to 5 %/s) is adjustable. Alternatively, it is possible to work with fixed pulse lengths (0.05 to 2 s), in which case the interval times are inversely proportional to the voltage difference.

Frequency matcher

Frequency adjustment characteristic	0.01 %/s	0 to 5 %/s
Interval between pulses	1 s	1 to 120 s
Minimum pulse duration	0,01 s	0,05 to 2 s

Note: The length of adjusting pulses are proportional to the slip. The proportionality factor (0.01 to 5 %/s) is adjustable. Alternatively, it is possible to work with fixed pulse lengths (0.05 to 2 s), in which case the interval times are inversely proportional to the slip.

General parameters

Blocking time following start signal	1 s	1 to 10 s
Total paralleling time	0,5 min	0,5 to 15 min; OFF

SYN 5100, SYN 5202 (channel 2), SYN 5302 (channels 2)

Slip limit	0,1 %	0,1 to 2 %
Angle limit	5 DEG	5 to 40 DEG
Maximum voltage difference	5 %	5 to 40 %
Maximum zero voltage for dead bus	5 %	0 to 50 %
Nominal voltage	5 V	50 to 130 VAC

Note: The percentages refer to the nominal values

ENVIRONMENTAL VALUES**Isolation**

Dielectric test	IEC 255-5	2 kV
Impulse voltage test	IEC 255-5	5 kV

Temperature ranges for devices without communication

Transport/storage	-40 to +85 °C
Functionable	-25 to +70 °C
Operation (compliance with technical data)	-10 to +55 °C

Temperature ranges for devices including communication

Transport/storage	-10 to +85 °C
Functionable	+5 to +70 °C
Operation (compliance with technical data)	+5 to +55 °C

Mechanical stability

Vibration	IEC 60255-21-1	10 to 150 Hz; cl. 2
Vibration response		1 g
Endurance		2 g
Shocks and Bumps	IEC 60255-21-2	class 2
Shock response		10 g
Withstand		30 g
Bump		20 g
Earthquake		
Single axis sine sweep seismic test	IEC 60255-21-3	Method A
	IEEE STD 344-1987	5g in each axis

Emission/immunity (EMC)

Emission, terminal disturbance	EN 55011/ CISPR 11	0,15 to 0,5 MHz: 79 dB 0,5 to 30 MHz: 73 dB
Emission, radiation disturbance	EN 55011/ CISPR 11	30 to 230 MHz: 30 dB 230 to 1000MHz: 37 dB
Electrostatic discharges	IEC 61000-4-2	Contact: 6 kV Air: 8 kV
Electromagnetic fields	IEC 61000-4-6	0,15 to 80 MHz 10 V; 80 % AM
	IEC 61000-4-3	80 to 1000 MHz 10 V/m; 80 % AM and PM (900 MHz)
Fast transients/Bursts	IEC 61000-4-4	±1 kV / ±2 kV
Surge voltage	IEC 61000-4-5	±0,5 / ±1 / ±2 / ±4 kV
Voltage dips	IEC 61000-4-11	AC: 30 %: 10 ms 60 %: 100 ms >95 %: 5000 ms
1 MHz Burst disturbance common mode differential mode	IEC 60255-22-1	2,5 kV 1 kV

RELEVANT STANDARDS

CE-conformity

EMC-Directive:	89/336/EEC	
Generic standard	EN 50081-2	Emission
	EN 50082-2	Immunity

LV-Directive:	73/23/EEC	
Safety of information technology equipment	EN 60950	

Product standards

Measuring relays and protection equipment	IEC 60255-6	Emission
Product standard for measuring relays and protection equipment	EN 50263	Immunity
Hydro Québec standard for electronic equipment and relays	SN-62.1008d	

CONSTRUCTION DATA

Degrees of protection in accordance to IEC 60529

Front	IP 54
Rear	IP 50

Dimensions

SYN 5100		see illustration of dimensions
SYN 520x	Modular casing designed to snap onto rail	see illustration of dimensions
SYN 5302		see illustration of dimensions
SYN 5500		see illustration of dimensions
	Casing size (WxHxD)	381*128*50 mm
	Modular casing designed to snap onto rail	

Weight

SYN 5100	0.3 kg
SYN 5200 (maximum variant)	4 kg
SYN 5302	8 kg

Our services - your benefit!

- Product training courses
- Complete advisory and engineering services for system deliveries
- Installation
- Commissioning, maintenance and servicing
- Repair and spare parts service
- Disposal service

You can obtain information on individual solutions from your local ABB representative or directly from the manufacturer!



We reserve the right to change in the interest of technical development

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