SYNCHROTACT® Datasheet - Edition 03.2016

SYNCHROTACT® Datasheet
Synchronizing devices and systems

Power and productivity
for a better world™

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SYNCHROTACT® Datasheet
Advantages

ABB Switzerland Ltd is a world-leading manufacturer of synchronizing equipment. Application-specific systems are developed, produced and commissioned. In addition, our products are supported throughout the entire lifecycle.

The product portfolio of SYNCHROTACT® offers enormous advantages

+ Optimum reliability
+ Guaranteed availability
+ Lowest project-engineering costs
+ Quick commissioning using PC tool SynView
+ Synchronizes up to seven power circuit breakers with different requirements
+ Advanced technology
+ Universal use
+ Decades of experience with synchronizing systems
+ After-sales service: a 24 hour hotline available 365 days a year and remote servicing via the Internet
+ Training program for commissioning and service personnel

1


ABB
SYNCHROTACT® 5
Pset selected 1
ΔU 5.3 %
α -51 DEG
0.55 %
U+
U-
f+
f-
COMMAND
ΔU < ΔUmax
s < smax
α < αmax
U1/U2=0
CHK RELEASE
READY
OPERATING
BLOCKED
ERROR
DATA

SYNCHROTACT® 5
Synchronizing and paralleling devices

SYNCHROTACT® 5

SYNCHROTACT® 5
Range of applications

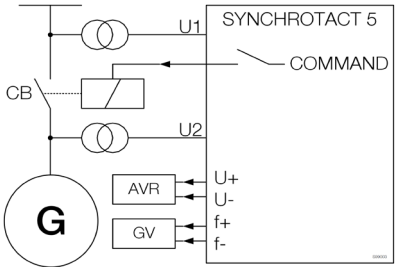
Synchronizing devices are widely used in power stations or industrial installations with their own power generating facilities, where the generators need to be paralleled with an island line or a public line, or in power distribution systems.

1

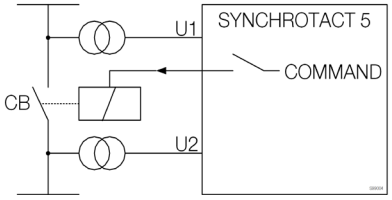
Power circuit breakers may only be closed if both voltages are approximately synchronous (coincident). Otherwise, faults in line operation, loading of the generators and, in extreme cases, damage to the generators can result.

SYNCHROTACT® 5 performs these functions safely and reliably, whether as a monitoring element for manual paralleling or as an independent fully-automatic synchronizing device.

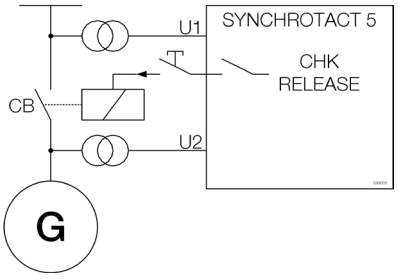
SYNCHROTACT® 5 covers the following areas of applications



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



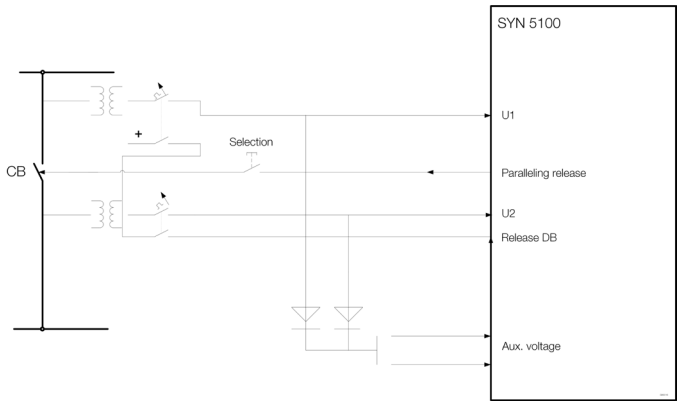
2. Automatic paralleling for synchronous and asynchronous lines, transmission lines and busbars.



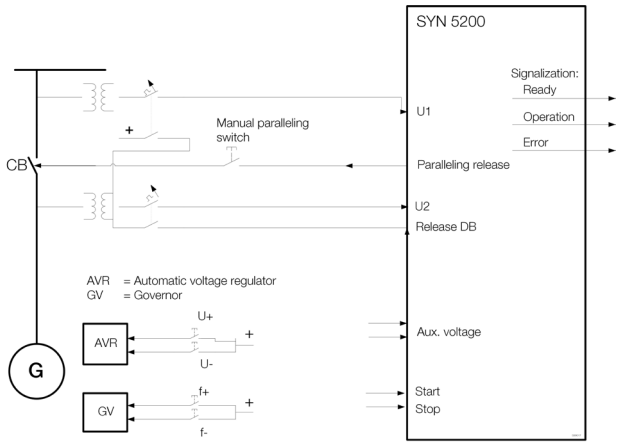
3. Paralleling monitoring (synchrocheck) for the monitoring of automatic or manual paralleling procedures including the connection of voltage-free lines (dead bus).

U1	= Line/bus bar-voltage
U2	= Generator voltage
CB	= Circuit breaker
G	= Generator
AVR	= Automatic voltage regulator
GV	= Governor
COMMAND	= Paralleling command
U+, U-	= Voltage adjusting commands
f+, f-	= Frequency adjusting commands

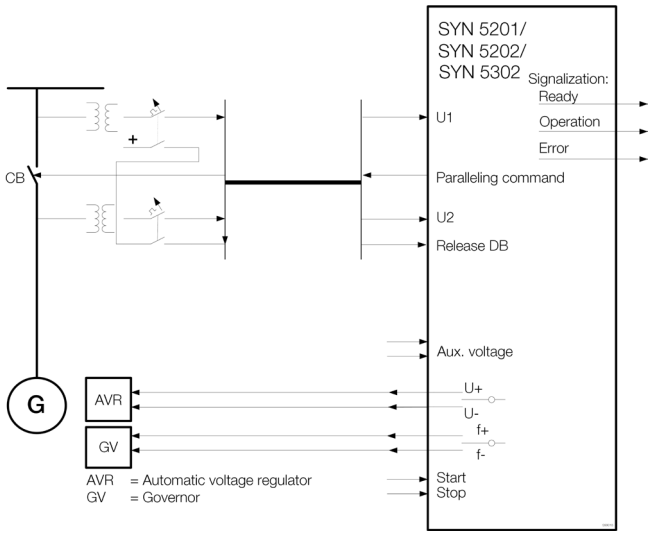
SYNCHROTACT® 5
Typical applications



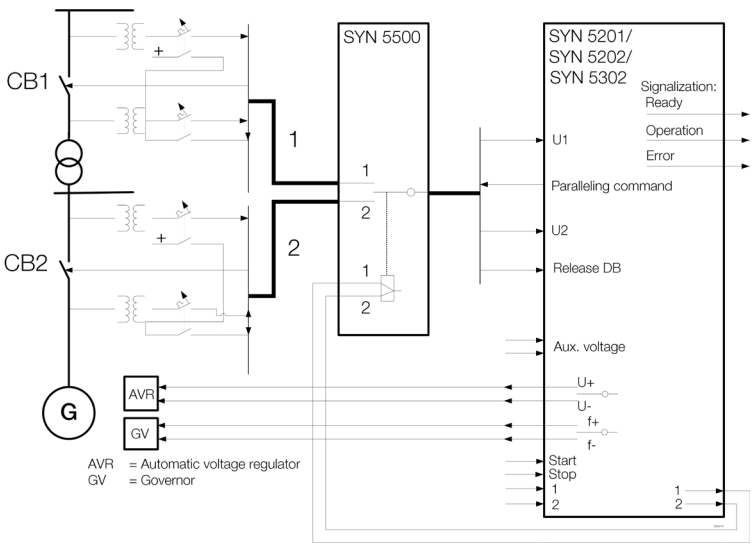
Simple, permanently-operated synchrocheck for paralleling of two lines.



Synchrocheck for monitoring manual paralleling of a generator.



Automatic synchronizing and paralleling of a generator.



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

SYNCHROTACT® 5
Principle of operation

The synchronizing and paralleling process can be divided into the following blocks

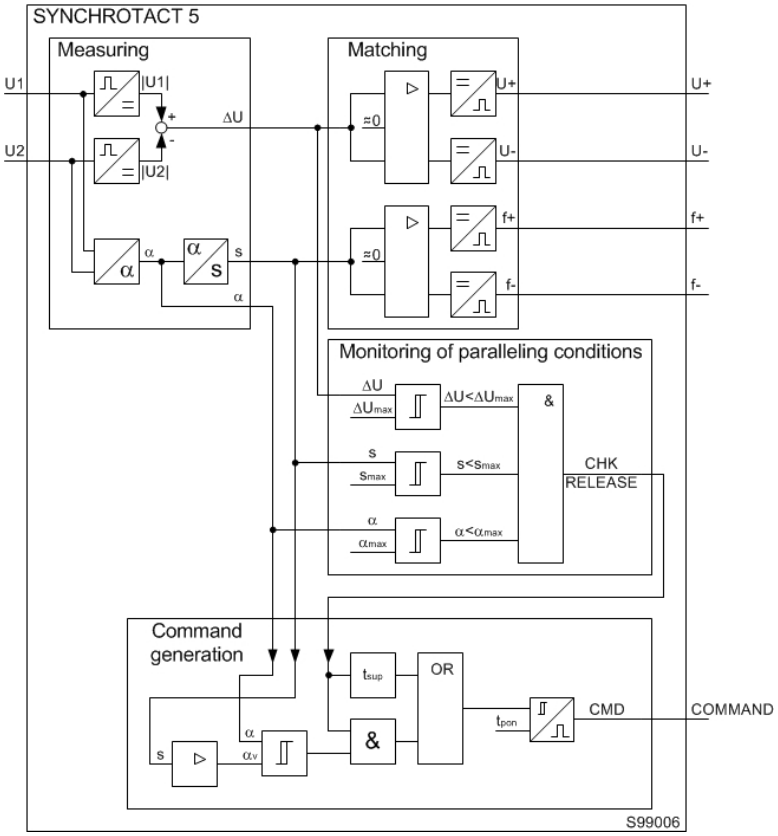
Measuring
Voltage difference **ΔU** (amplitude), slip **s** (frequency difference), and phase-angle α, are all required for paralleling. These values are formed from the two measurement signals **U1** and **U2** (see illustration, left).

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.

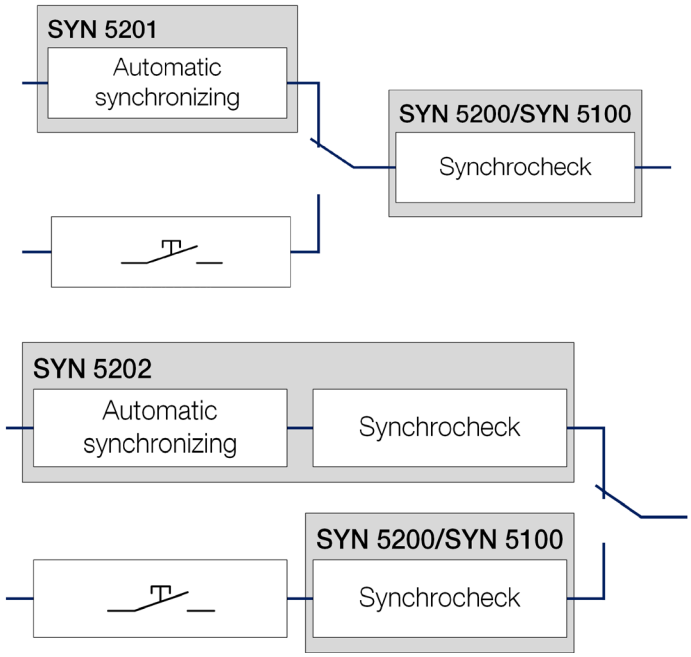
Command generation
The command generation calculates the necessary lead angle **αv**, by which the paralleling command must be advanced due to closing time delay. The action ensures that the main contacts close at precisely the right time. If α reaches **αv** at the same time as paralleling release **(CHK RELEASE)**, the command is issued. Under synchronous conditions, ie, permanent paralleling release during the adjustable monitoring time, **tsup**, the **CMD** 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.

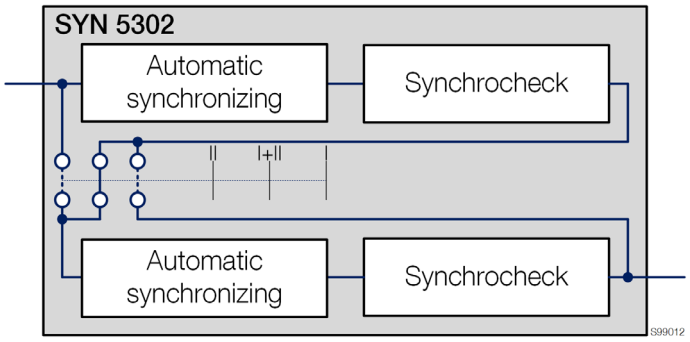


SYNCHROTACT® 5
Optimum reliability

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



High levels of safety and availability can be achieved by using a second, redundant synchronizing system. If system 1 can no longer synchronize, it is possible to do so by switching over to the second system.



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 synchronizing system needs to be structured according to the above pattern. The SYNCHROTACT® 5 single-channel synchronizing devices offer a high degree of security and are often used in practice. However, security can be significantly increased by means of dual-channel systems. It is unlikely that the two channels - of which the hardware and software are structured differently - will have the same malfunction simultaneously. The extra cost of a dual channel system can prove beneficial compared to the damage arising from incorrect paralleling.

Second, redundant synchronizing system?

Often, two redundant synchronizing systems are installed in a single plant so that, in the event of one system failing, the other can be used, thereby increasing availability. The second system is often designed for manual synchronizing with or without synchrocheck.

In addition, with SYNCHROTACT® 5, ABB offers two automatic dual-channel systems in a single casing, thus avoiding manual synchronizing.

Advantages of such a 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 synchronizing where the manual synchronizing system is seldom used.

SYNCHROTACT® 5
The seven-in-one synchronizing device

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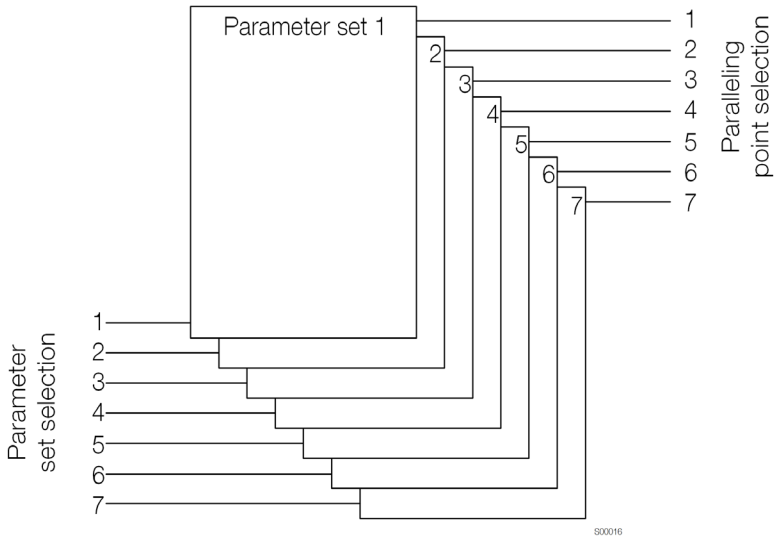
Specific settings for synchronizing and paralleling are stored in a parameter set. Devices with seven parameter sets have seven times the same parameters, with the possibility of individual setting. That way, seven paralleling points with individual settings may be operated. Firstly, the parameter set, or the circuit breaker to be synchronized has to be selected. Then the synchronizing process can be started.

The software-driven link between parameter set and paralleling point guarantees the correct assignment of the setting values to the related plant components.

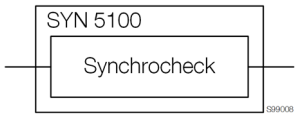
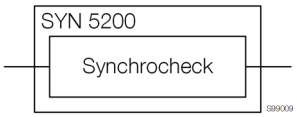
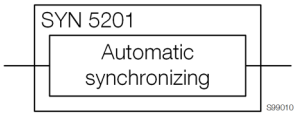
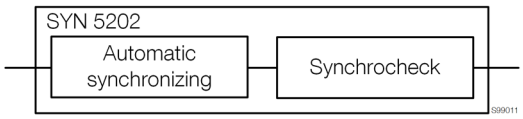
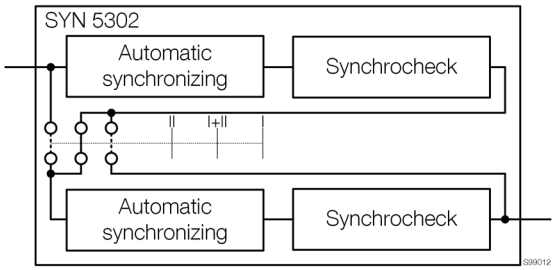


Control options

Service control for commissioning and servicing
- Built-in service controls: keypad and LCD (standard)
- SynView PC tool (accessory) for local control: PC / Ethernet (standard)
- SynView PC tool (accessory) via LAN (standard)

Operating control for normal synchronizing operation
- Digital inputs/outputs: conventional wiring (standard)
- Interface (Modbus, Profibus, LON, IEC 61850): remote-controlled synchronizing operation (option)

SYNCHROTACT® 5
Device types

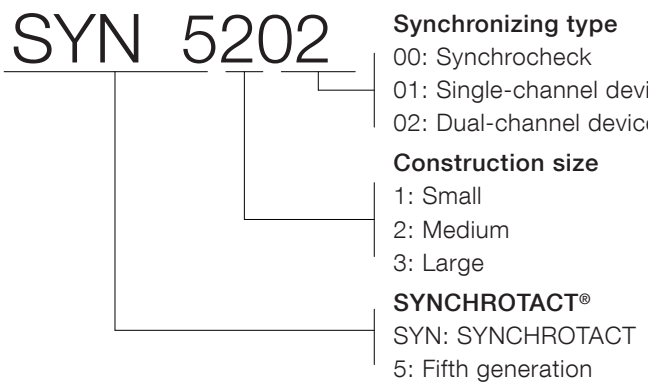
Type	Function	Symbol
SYN 5100	Synchrocheck	
SYN 5200	Synchrocheck or automatic paralleling unit without unit matcher	
SYN 5201	Automatic single-channel synchronizing device	
SYN 5202	Automatic dual-channel synchronizing device	
SYN 5302	Redundant automatic dual-channel synchronizing device	

Differences between SYN 5100 and SYN 5200

SYN 5100 offers a parameter set with five 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. Additionally, because of its command generation, SYN 5200 can be used as an automatic paralleling unit.

Type Code



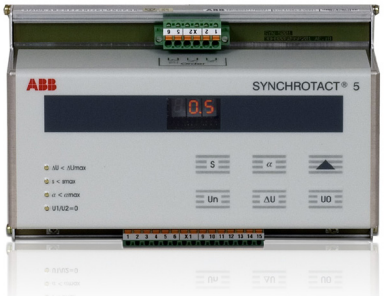
Differences between SYN 5302 and SYN 5202

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. Both systems are normally all wired in series (four channels!). Should one system fail, 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 synchronizing system are saved.

SYNCHROTACT® 5
Device types

Front view of
SYN 5100

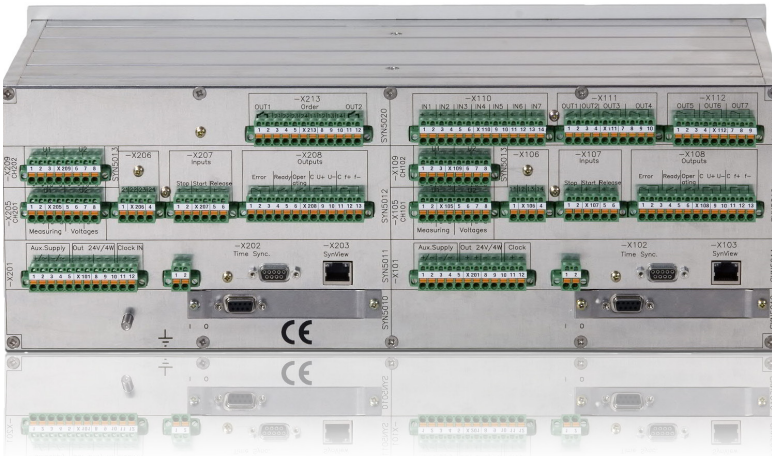


Front view of
SYN 5200
SYN 5201
SYN 5202

Rear view of
SYN 5202 with 7
parameter sets

Front view of
SYN 5302

Rear view of
SYN 5302 with 7
parameter sets



SYNCHROTACT® 5
Functions, options and ordering details

Functions at a glance

Function	Type				
Product					
	SYN 5100	SYN 5200	SYN 5201	SYN 5202	SYN 5302
Automatic synchronizing	No	Yes	Yes	Yes	Yes
Paralleling of two lines	Yes	Yes	Yes	Yes	Yes
Synchrocheck mode	Yes	Yes	Yes	Yes	Yes
Voltage matching	No	No	Yes	Yes	Yes
Frequency matching	No	No	Yes	Yes	Yes
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
Signaling	No	Yes	Yes	Yes	Yes
Parameter setting by PC Tool SynView	No	Yes	Yes	Yes	Yes
Parameter setting without PC	Yes	Yes	Yes	Yes	Yes
Semi-flush mounting	No	Yes	Yes	Yes	Yes
Surface mounting	No	on request	on request	on request	on request
Hat rail mounting (DIN)	Yes	No	No	No	No

Options

	Option	SYN 5100	SYN 5200, SYN 5201, SYN 5202, SYN 5302
w	Communication	0: none	0: none 2: Modbus 3: Profibus 4: Lon-Bus 5: IEC 61850
x	Code for internal use	2: internal code	2: internal use
y	Auxiliary voltage / nominal frequency	Un = 50 to 130 VAC and 100 to 125 VDC 2: fn = 50/60 Hz 5: fn = 16⅔ Hz	Un = 100 to 230 VAC and 24 to 250 VDC: 7: fn = 50/60 Hz 8: fn = 16⅔ Hz
z	Parameter sets	1: 1 parameter set	1: 1 parameter set 7: 7 parameter sets

Ordering details

Device type	Options
SYN 5u0v	- wxyz

Examples	
SYN 5100 - 0221	Synchrocheck with nominal frequency 50 or 60 Hz and one parameter set
SYN 5200 - 0271	Synchrocheck with nominal frequency 50 or 60 Hz and one parameter set
SYN 5201 - 0287	Automatic single-channel synchronizing device with nominal frequency 16⅔ Hz and seven parameter sets
SYN 5202 - 2277	Automatic dual-channel synchronizing device with communication (Modbus), nominal frequency 50 or 60 Hz and seven parameter sets
SYN 5302 - 5277	Redundant automatic dual-channel synchronizing device with communication (IEC 61850), nominal frequency 50 or 60 Hz and seven parameter sets

SYNCHROTACT® 5
Option Details

Option w: Communication interface

Characteristics of the field bus protocols	
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 (analog); new event
Addressing	Slave address, depending on fieldbus

Characteristics of the IEC 61850 interface	
Interface type	Ethernet
Connector type	RJ45
Transmitted signals	Digital I/Os (status information/controls); actual values (measured values)

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.

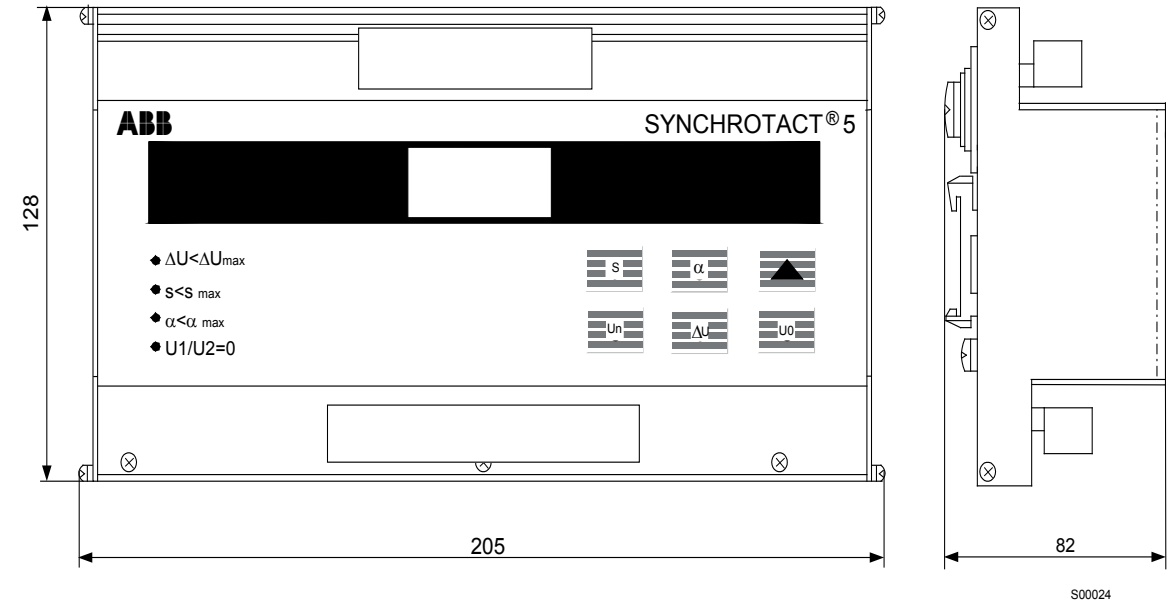
Option z: Parameter sets

SYNCHROTACT® 5 - devices with seven parameter sets include additional hardware with seven digital inputs and seven relay outputs. They are normally used for the selection of both parameter set and paralleling point. The inputs and outputs that are not used can be configured for other functions. The possible functions are shown in the table on the right.

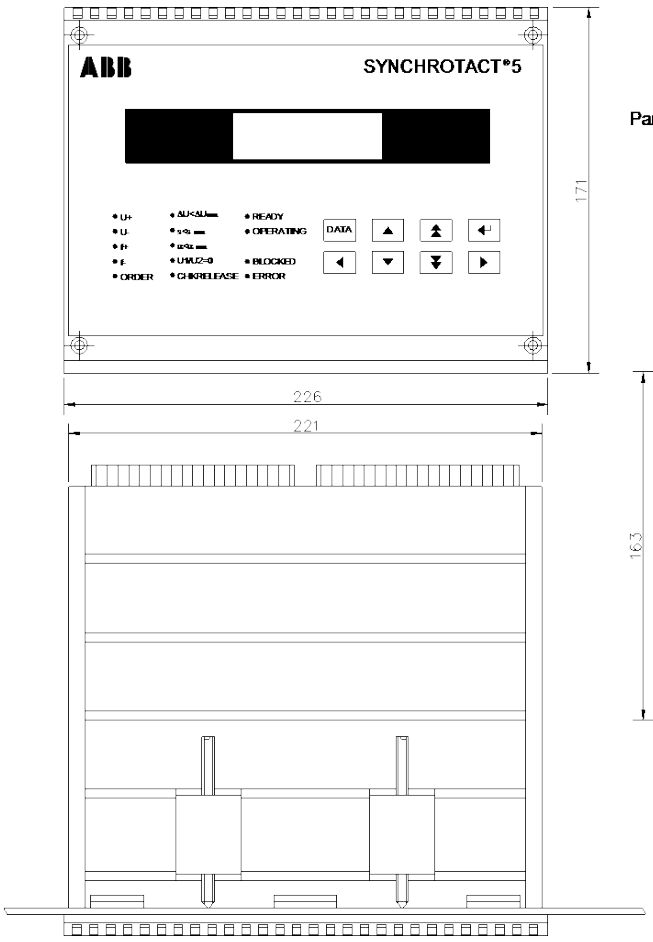
Configurable functions of digital inputs
Selection of parameter set or paralleling point
Selection of TEST mode
Starting, stopping and blocking of synchronizing process
Device Reset
Configurable functions of digital outputs
Selection or acknowledgment of paralleling point / parameter set
Switchover contact for the command circuit which must be connected in series with the manual paralleling circuit in synchrocheck mode
Signaling of the following variables: – Paralleling command in TEST mode – Dead bus released – Synchronizing 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 that have tripped – Single-system operation (only SYN 5302)

SYNCHROTACT® 5
Dimension diagrams

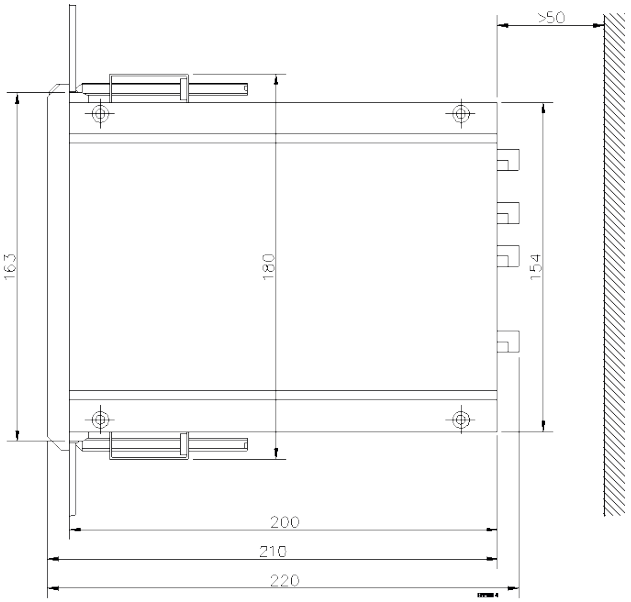
SYN 5100



SYN 5200, SYN 5201, SYN 5202

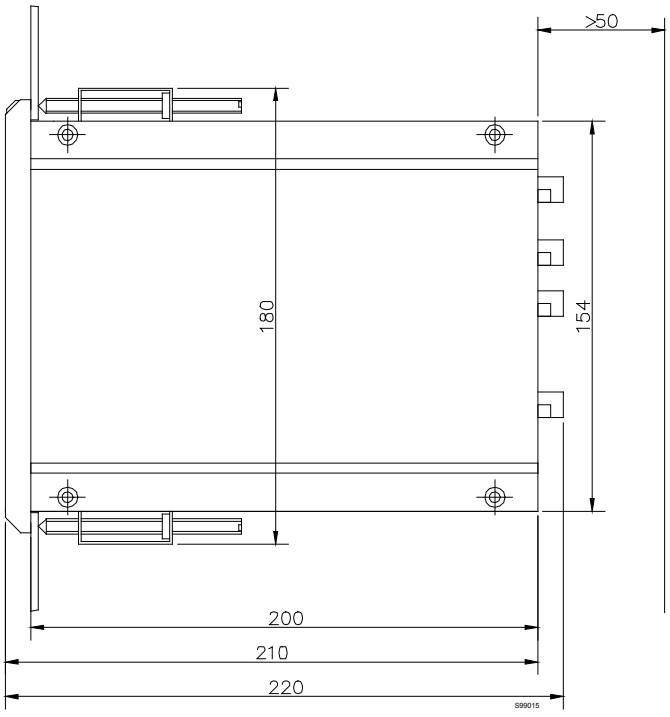


Panel cut-out w*h = 222*164 mm



SYN 5302

Panel cut-out W x H = 443 mm x 155 mm



SYNCHROTACT® 5
Technical Data

Inputs

Auxiliary voltage		
Nominal voltage range		24 to 250 VDC 100 to 230 VAC
Permissible voltage range		18 to 300 VDC 75 to 300 VAC
SYN 520v/SYN 5302 Maximum power consumption	READY	25 W/35 VA
	OPERATING	25 W/35 VA
SYN 5100 Maximum power consumption		2 W/4 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 contact voltage	250 VAC/VDC
Limiting continuous current	10 A
Maximum switching power ON AC/DC	1500 VA/W
Maximum switching power OFF AC/DC (resistive)	1500/150 VA/W
Adjusting command and signaling relays	
Maximum contact voltage	250 VAC/VDC
Limiting continuous current	1,5 AAC/ADC
Maximum switching power ON/OFF AC/DC	50 VA/W

Interface

PC Tool 'SynView' Ethernet	
Bridgeable distance	100 m

Parameter setting ranges

SYN 5200, SYN 5201, SYN 5202 (channel 1), SYN 5302 (channels 1)	Step	Setting range
Actual value calibration		
Nominal voltage	1 V	50 to 130 VAC
Voltage matching (between U1 and U2)	0,1 %	± 12 %
Angle matching (SYN 5200 and SYN 5201 only)	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 %
Note: *Positive and negative limit values can be set separately		
Dead bus conditions		
Maximum zero voltage for dead bus	1 %	0 to 49 %
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 is 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 is 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)	Step	Setting range
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 60255-5	2 kV
Impulse voltage test	IEC 60255-5	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 IEEE STD 344-1987	Method A 5 g in each axis

Environmental values

Emission / immunity (EMC)		
Emission AC mains conducted disturbance	CISPR 22	Class B 0,15 to 0,5 MHz: 66...56dB / 56...46dB 0,5 to 5 MHz: 56...46dB 5 to 30 MHz: 60dB / 50dB
Emission, enclosure radiation disturbance	CISPR 11	Class A 30 to 230 MHz: 30dB 230 to 1000 MHz: 37dB
Electrostatic discharges	IEC 60255-22-2 IEC 61000-4-2 IEEE C37.90.3-2001	Class IV Contact: 8 kV Air: 15 kV
Electromagnetic fields	IEC 61000-4-16	0 to 150 kHz: 30 V continuous; 300 V for 1 s
	IEC 61000-4-6	0,15 to 80 MHz 10 V; 80 % AM
	IEC 60255-22-3 IEC 61000-4-3	Frequency sweep: 80 to 1000 MHz: 10 V/m; 80 % AM 1,4...2 GHz: 20 V/m; 80 % AM Spot frequencies: 80/160/450/900 MHz: 80 % AM; Testing time >10 s
	IEEE C37.90.2-2004	25 to 1000 MHz: 20 V/m; 80% AM (max. result. field strength: 35 V/m)
Fast transient	IEC 60255-22-4 IEC61000-4-4	Class IV; 4 kV
	IEEE C37.90.1-2002 (fast transient)	4 kV common and transverse mode
	IEC 61000-4-12	2,5 kV
Surge voltage	IEC 61000-4-5	Installation classification: class 3 ± 1 / ± 2 kV
Voltage dips	IEC 61000-4-11	AC: 30%: 10 ms 60%: 100 ms >95%: 5000 ms
1 MHz burst disturbance	IEC 60255-22-1	Class III 2,5 kV common and transverse
	IEEE C37.90.1-2002 (oscillatory)	2,5 kV common and transverse

SYNCHROTACT® 5
Technical Data

Relevant standards

CE-conformity		
EMC-directive	2014/30/EU	
Generic standard	EN 61000-6-4 EN 61000-6-2	Emission Immunity
Low voltage directive	2014/35/EU	
Safety of information technology equipment	EN 60950	
Product standards		
Measuring relays and protection equipment	IEC 60255-6	
Product standard for measuring relays and protection equipment	EN 50263	
Hydro Québéc standard for electronic equipment and relays	SN-62.1008d	
IEEE standard for relays	IEEE C37.90-1989	

Construction data

Degrees of protection in accordance with IEC 60529	
Front	IP 54
Rear	IP 50
Dimensions	
SYN 5100 Hat rail mounting (DIN)	See illustration of dimensions
SYN 5200, SYN 5201, SYN 5202	
SYN 5302	
Weight	
SYN 5100	0,3 kg
SYN 5200, SYN 5201, SYN 5202	4 kg
SYN 5302	8 kg

SYNCHROTACT® 5
Spare Parts

Spare parts

PCB designation	Type
Communications board IEC 61850	SYN 5009
Communications board	SYN 5010
Processor and power supply board (Indication of device type required, e.g. SYN 5201)	SYN 5011
Basic I/O unit	SYN 5012
Processor for channel 2 (synchrocheck)	SYN 5013
Extended I/O / seven 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

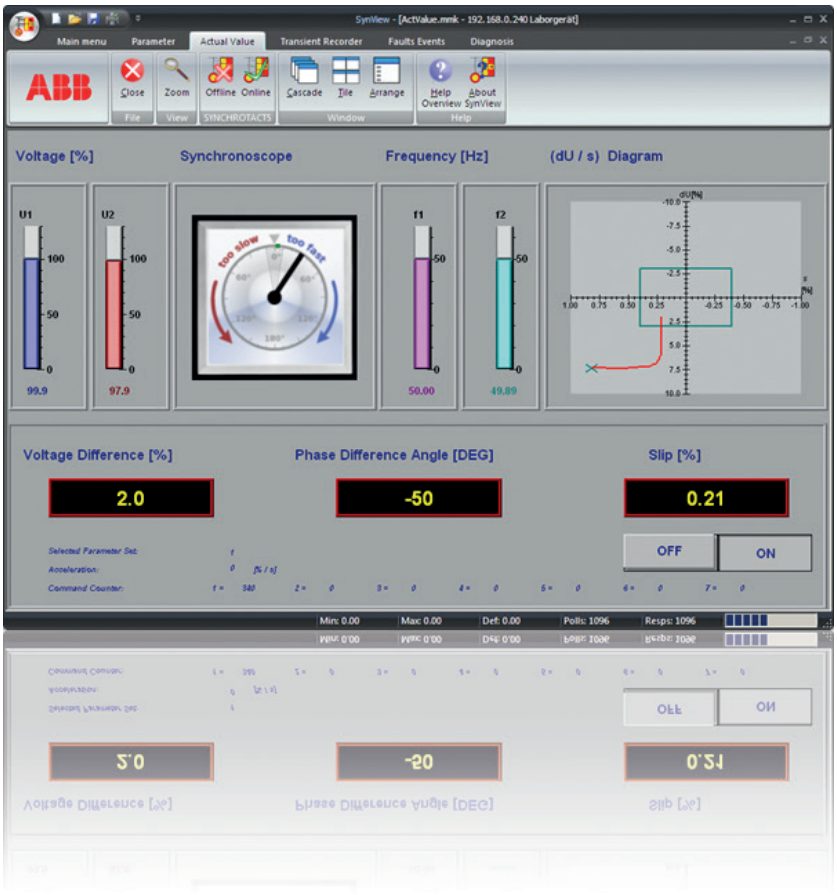
When ordering, please state the complete type designation of the synchronizing unit.

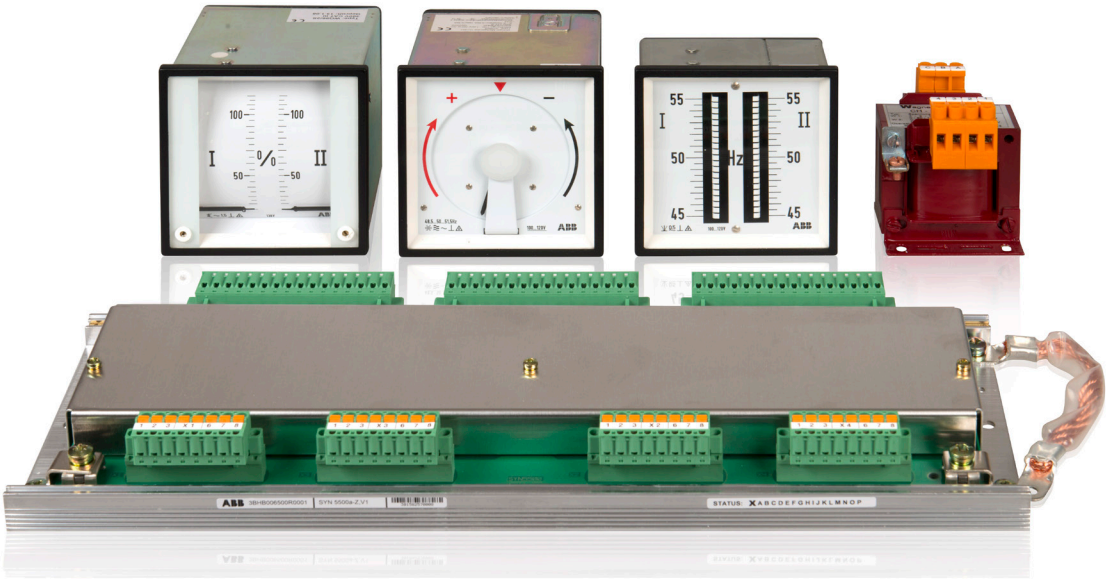
Recommendation

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

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

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.


SynView - [ActValue.mmk - 192.168.0.240 Laborgerät]
Main menu
Parameter
Actual Value
Transient Recorder
Faults Events
Diagnosis
ABB
Close
Zoom
Offline
Online
Cascade
Tile
Arrange
Help Overview
About SynView
File
View
SYNCHROTACTS
Window
Help
Voltage [%]
Synchronoscope
Frequency [Hz]
(dU / s) Diagram
U1
U2
f1
f2
too slow
too fast
99.9
97.9
50.00
49.89
Voltage Difference [%]
Phase Difference Angle [DEG]
Slip [%]
2.0
-50
0.21
OFF
ON
Min: 0.00
Max: 0.00
Def: 0.00
Polls: 1096
Resps: 1096


I
II
%
Hz
ABB

SYNCHROTACT®
Accessories

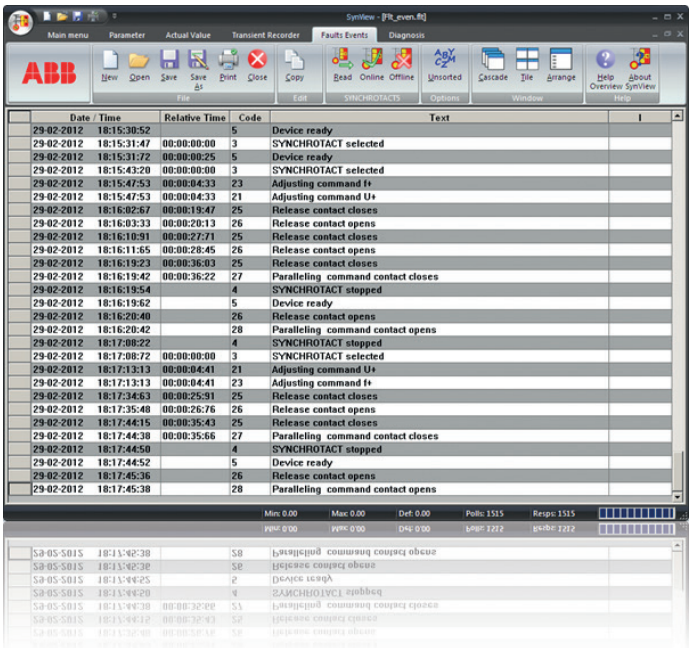
SYNCHROTACT® Accessories

SYNCHROTACT® Accessories
Fast commissioning with SynView

SynView is a tool for simple and fast commissioning of SYNCHROTACT® 5 devices. The PC software runs under MS® Windows™ NT, 95, 98, 2000, XP and Windows 7 in the standard languages German, English or French. SynView consists of five functions explained below:

Parameter tool

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



Transient recorder tool

The voltage difference and paralleling command from the last three synchronizing processes are displayed. As such a separate recorder is 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.

Event recorder tool

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

Diagnostic tool

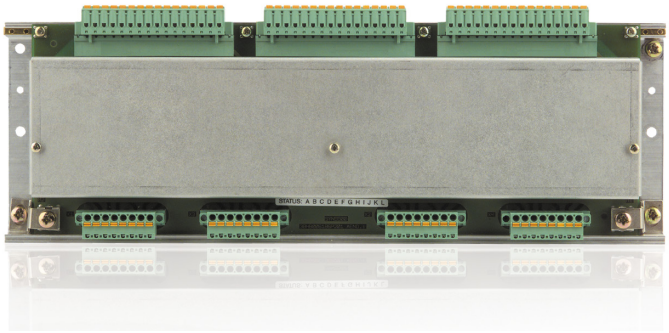
In difficult cases where problems cannot be solved on site, this tool helps the manufacturer to identify the causes of the problem from the data stored in this tool.

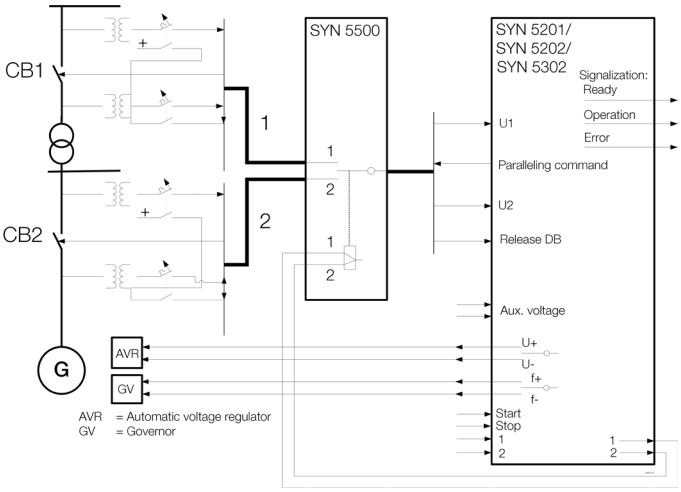
Ordering details

Designation	Type	Part no
PC-Tool for commissioning and maintenance	SynView	–
– with Ethernet cable	RJ45	3BHE 021 768 R0002
– with RS232-cable	D-Sub9	3BHE 021 768 R0001

SYNCHROTACT® Accessories
Auxiliary device SYN 5500

The auxiliary device SYN 5500 connects the measuring and command circuits where several paralleling points need to be switched. An SYN 5500 device can switch two paralleling points, each with a maximum of 16 contact pairs, or alternatively, four paralleling points, each with eight contact pairs. Several devices can be used at the same time.





Ordering details

Designation	Type	Part no
Auxiliary device for switching several paralleling points	SYN 5500	3BHB 006 500 R0001

Technical data	
Maximum contact voltage	250 VAC/VDC
Limiting continuous current	10 A
Maximum switching power ON AC/DC	1500 VA/W
Maximum switching power OFF AC/DC (resistive)	1500/150 VA/W
Coil nominal voltage	24 VDC
Operate voltage	≥ 18 VDC
Release voltage	≤ 3,6 VDC
Coil resistance	1152 Ω
Coil inductivity	1000 mH
Casing size (W x H x D)	381 x 128 x 50 mm
Hat rail mounting (DIN)	

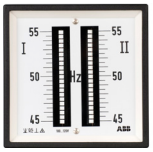
SYNCHROTACT® Accessories
Synchronizing instruments

Electromechanical instruments are commonly used if the synchronizing system provides a manual synchronizing feature. Sometimes the instruments are used in automatic synchronizing systems for information only, eg, for servicing purposes. This requirement can also be covered by the SYNCHROTACT® 5 PC-tool SynView.

Options

Designation		
	Option	Code
w	Nominal voltage	1 100/√3 = 57,7 V 2 110/√3 = 63,5 V 3 115/√3 = 66,4 V 4 120/√3 = 69.3 V 5 100 V 6 110 V 7 115 V 8 120 V
x	Nominal frequency	5 50 Hz 6 60 Hz
y	Labeling	1 Standard labeling 2 Labeling according to separate specification
z	Size	0 96 x 96 mm 1 14 x 144 mm

Ordering details

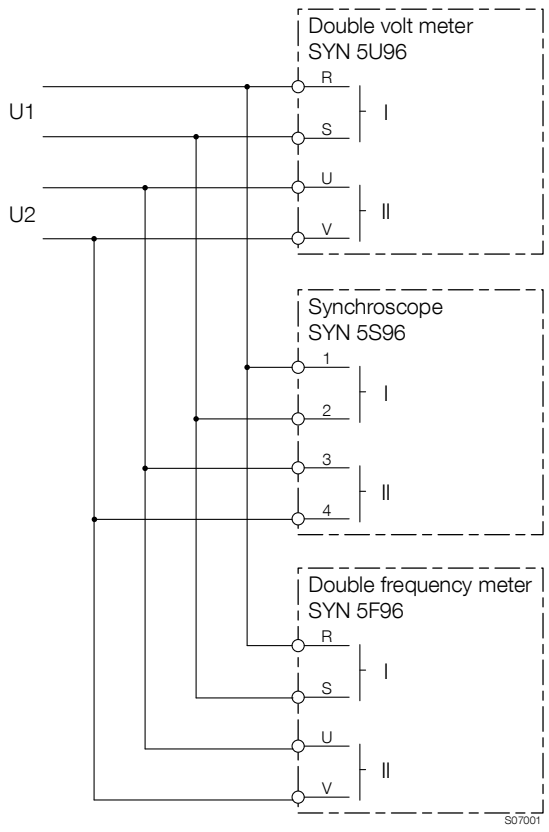
Designation		Type	Part no
Double volt meter		SYN 5U96-wxy0 SYN 5U144-wxy1	3BHE022'313Rwxy0 3BHE022'313Rwxy1
Double frequency meter		SYN 5F96-wxy0 SYN 5F144-wxy1	3BHE022'314Rwxy0 3BHE022'314Rwxy1
Synchroscope		SYN 5S96-wxy0 SYN 5S144-wxy1	3BHE022'315Rwxy0 3BHE022'315Rwxy1

General technical data			
Isolation		IEC 60255-5	2 kV
Temperature range		Operation Storage	-25 °C to +40 °C -25 °C to +65 °C
Relative humidity			≤75 % annual average, no condensation
Shock			15 g, 11 ms
Vibration			2,5 g, 5 to 55 Hz
Protection degree	– casing – connections	IEC 60529 IEC 60529	IP 54 IP 00
Dimensions width x height x installation depth		Size 96 Size 144	96 x 96 x 115 mm 144 x 144 x 164 mm
Front frame		96 / 144	96 mm / 144 mm
Casing		96 / 144	90 mm / 136 mm
Panel cut-out		96 / 144	$92^{+0.8}$ mm / 138^{+1} mm
Fixing			Screw clamps
Electrical connection			Screw- type terminals

SYNCHROTACT® Accessories
Synchronizing instruments

General Technical data		
Fixing		Screw clamps
Electrical connections		Screw-type terminals
Technical data double volt meter		
Measuring range voltage		0 to 120 % Un
Scale arrangement		vertical
Power consumption	with Un ≤ 110 V	96: 2 x <2 VA / 144: 2 x <2,3 VA
Accuracy		Class 1,5
Weight	96 / 144	1,2 kg / 1,5 kg
Technical data double frequency meter		
Measuring range frequency		fn ±5 Hz
Number of reeds		2 x 21
Measuring range voltage		0 to 120 % Un
Scale arrangement		vertical
Power consumption per measuring unit	with Un ≤ 110 V	2 x <1,1 VA
Accuracy		Class 0,5
Weight	96 / 144	0,65 kg / 1 kg
Technical data synchroscope		
Voltage range		0,9 x Un to 1,1 x Un
Overload limit		1,2 x Un
Power consumption	with Un ≤ 110 V	<4,0 VA (line side) <0,7 VA (generator side)
Weight	96 / 144	1,0 kg / 1,8 kg

Connection diagram

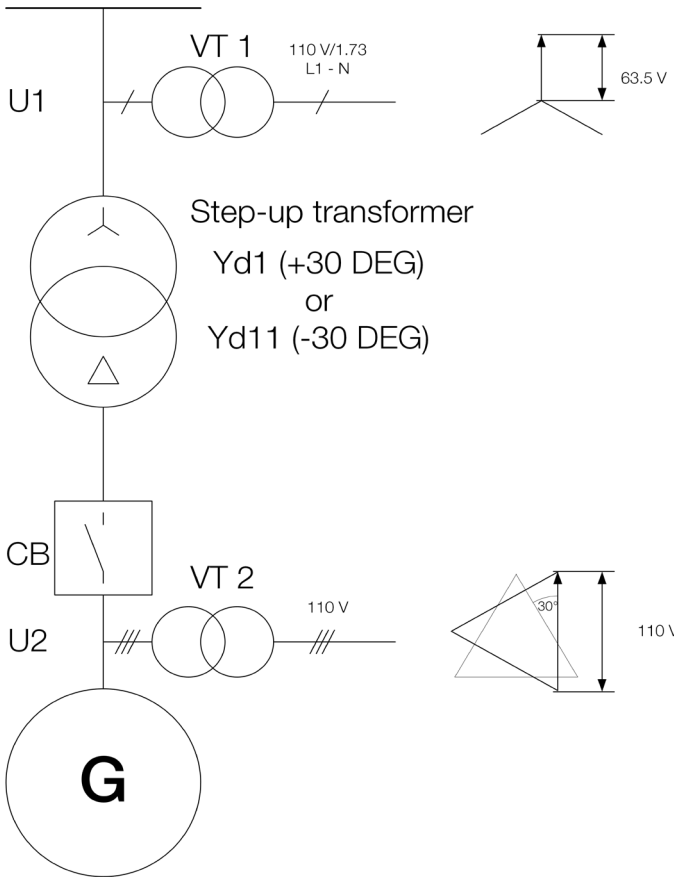


SYNCHROTACT® Accessories
Adaptation and compensation voltage transformers (VTs)

When are adaptation or compensation VTs needed?

– If the two nominal measuring voltages are out of admissible range (50 to 130 VAC).
– If the two nominal measuring voltages are different. With the types SYN 5200 and SYN 5201, differences between the nominal values up to 10 % can be tuned by parameter setting.
– If there is a step-up transformer between measuring VT and circuit breaker, which shifts the phase by a fixed value, it can be compensated with types SYN 5200 and SYN 5201. With the types SYN 5100, SYN 5202, SYN 5302, or with the use of electromechanical synchronizing instruments, compensation VTs shall be used in order to compensate for the phase shift.

Hints to select compensation VTs



If possible, the compensation should be done in a way that a single phase compensation VT is required only

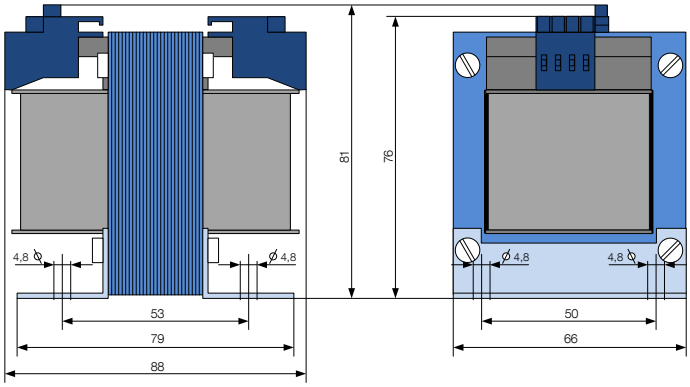
If there is a step-up transformer between measuring VT and circuit breaker, the connection group is usually Yd1 (+30 DEG) or Yd11 (-30 DEG).

With the appropriate selection of the phases, the phase shift can be compensated without any additional components. In this example the compensation of the amplitude by factor √3 remains. This can be done by a single phase compensation VT.

In order to achieve higher accuracy, especially if higher load (synchronizing instruments) is connected, the compensation should be carried out on the generator side.

If a three-phase compensation is inevitable, 3 single-phase VTs have to be selected which will then be connected according to the needs. Be aware that the single phase ratio has to be calculated.

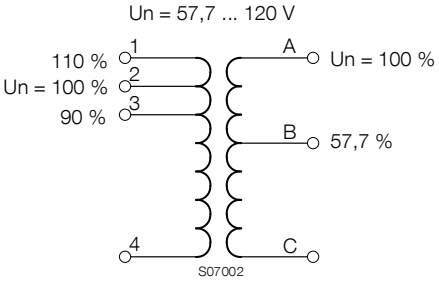
SYNCHROTACT® Accessories
Adaptation and compensation voltage transformers (VTs)



Dimensional drawing

Ordering details

Designation	Type	Part no
Single phase VT	SYN 5T66-0001	3BHE024'870R0001



Connection diagram

Examples

Example	Ratio	Connection	Example	Ratio	Connection
100 V -> 100 V 110 V -> 110 V 120 V -> 120 V 63,5 V -> 63,5 V 57,7 V -> 57,7 V	1	2-4 A-C			
110 V -> 100 V	0,909	1-4 A-C	100 V -> 110 V	1,1	A-C 1-4
100 V -> 57,7 V 110 V -> 63,5 V 120 V -> 69,3 V	1/√3 = 0,577	2-4 B-C	57,7 V -> 100 V 63,5 V -> 110 V 69,3 V -> 120 V	√3 = 1,73	B-C 2-4
100 V -> 63,5 V	1,1/√3 = 0,635	3-4 B-C	63,5 V -> 100 V	√3/1,1 = 1,57	B-C 3-4
110 V -> 57,7 V	1/(1,1 x √3) = 0,525	1-4 B-C	57,7 V -> 110 V	1,1 x √3 = 1,91	B-C 1-4

Technical data

Nominal voltage range primary and secondary	57,7 to 120 VAC
Accuracy / power without synchronizing instruments	Class 1 / 0,05 VA
Accuracy / power with synchronizing instruments	Class 2 / 4 VA
	Class 5 / 7,5 VA
Dimensions (W x H x D)	66 x 81 x 88 mm
Weight	1,0 kg

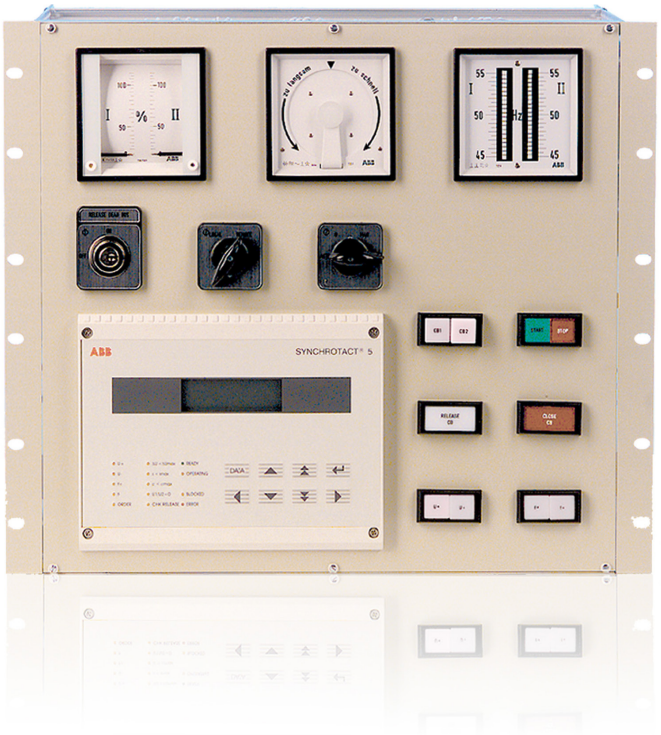


ABB
SYNCHROTACT® 5
DATA
Hz
55
50
45

SYNCHROTACT® CSS
Synchronizing systems

SYNCHROTACT® CSS

SYNCHROTACT® CSS
Application and functionality

SYNCHROTACT® CSS (Compact Synchronizing System) is a pre-engineered synchronizing system, sold as a product.

Application

The use of the already planned and tested synchronizing system saves all engineering costs and inreases safety. SYNCHROTACT® CSS only needs to be installed, connected and commissioned.

The system uses the proven and reliable SYNCHROTACT® 5 components and can be built into a 19" frame.
To ensure high availability of the plant, SYNCHROTACT® CSS consists of a fully automatic and independent manual synchronizing unit.

Different versions are available, either for one or for two circuit breakers, and both either in single- or dual-channel configuration.

The PC software, SynView, which is included in the delivery, provides quick and simple commissioning.

Functionality

SYNCHROTACT® CSS supports the following operating modes, which can be selected by means of a switch.

- **Operating mode AUTO:** generator voltage and frequency are automatically matched by the synchronizing equipment. The circuit breaker will be closed subsequently and exactly with phase-coincidence, taking the breaker closing time into consideration.

- **Operating mode MAN:** the functions are carried out manually by means of push buttons on the front panel. The necessary values are displayed on the synchronizing instruments. The paralleling command is issued by holding down the release button and pushing the command button if phase-coincidence is reached.

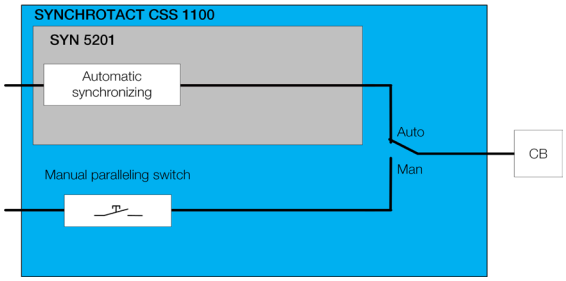
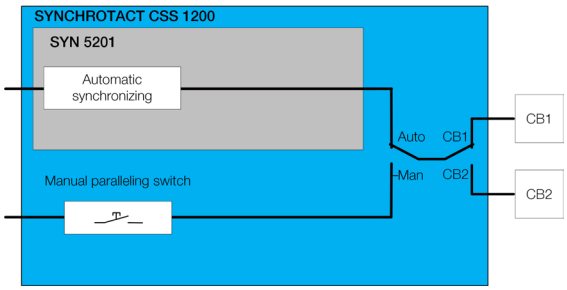
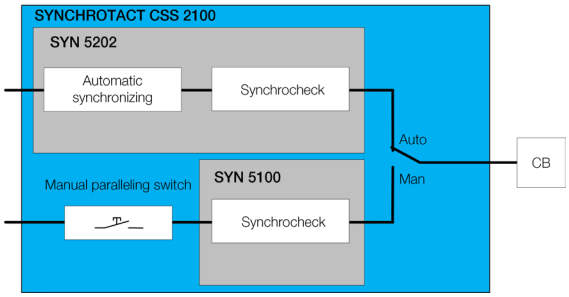
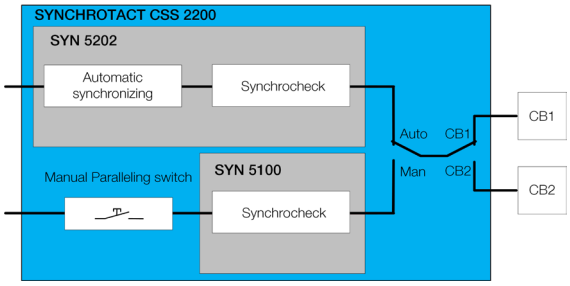
- **Operating mode TEST:** this is identical to the AUTO-mode, except for the paralleling command which is not sent to the circuit breaker but displayed by the system only.

With models for two circuit breakers the paralleling point has to be selected by means of the appropriate selector switch before the synchronizing process is started.

Releasing by means of a key switch, the circuit breaker can be closed even if one or both measuring voltages are dead (dead bus).

Changing the control mode selection from «local» to «remote» allows the use of automatic synchronizing from a remote location.

SYNCHROTACT® CSS
Types and ordering details

Type	Function	Symbol
CSS-1100	Single channel system for one circuit breaker	
CSS-1200	Single channel system for two circuit breakers	
CSS-2100	Dual channel system for one circuit breaker	
CSS-2200	Dual channel system for two circuit breakers	

Ordering details

CSS - type:	Single/dual channel system and 1/2 circuit breaker(s)
Auxiliary voltage:	Nominal value
Measuring voltage:	Primary/secondary nominal values and nominal frequency
Synchronizing instruments:	Labeling primary, secondary or percentage values

Example	
SYNCHROTACT® CSS-2100	– Dual channel synchronizing system for one circuit breakers
Auxiliary voltage: 110 VDC	– Auxiliary voltage: 110 VDC
Measuring voltage: 11kV/110 VAC, 50 Hz	– Measuring voltage primary 11 kV, secondary 110 V and 50 Hz nominal – frequency
Synchronizing instruments: primary values	– Double volt meter labeled with primary values

SYNCHROTACT® CSS
Technical data

Inputs

Auxiliary voltage		
Nominal voltage range	110 to 220 VAC / VDC	
Permissible voltage range	85 to 265 VAC	
	85 to 375 VDC	
Maximum power consumption	25 W / 35 VA	
Measuring inputs		
Nominal voltage range	50 to 130 VAC	
Voltage range	0 to 110 % Un	
Nominal frequency	16 $^{2}/_{3}$, 50 / 60 Hz	
Frequency range	10 to 100 Hz	

3

Outputs and parameter setting ranges

Refer to SYNCHROTACT® 5

Environmental values

Isolation		
Dielectric test	IEC 60255-5	2 kV
Impulse voltage withstand test	IEC 60255-5	5 kV
Temperature ranges		
Transport/storage		-25 to +65 °C
Operation		-25 to +40 °C
Interference immunity/transmission (EMC)		
Refer to SYNCHROTACT® 5		

Relevant standards

CE conformity		
EMC directive	2014/30/EU	
Generic standard	EN 61000-6-2	Emission
	EN 61000-6-4	Immunity
Low voltage directive	2014/35/EU	
Safety of information technology equipment	EN 60950	
Product standards		
Measuring relays and protection equipment	IEC 60255-6	

Construction data

Protection type according to IEC 60529	
Front	IP 50
Rear	IP 00
Dimensions	
width x height x depth	482 x 399 x 297 mm
Weight	
Depending on the version	15 to 16 kg

SYNCHROTACT® Systems
Project-specific synchronizing systems

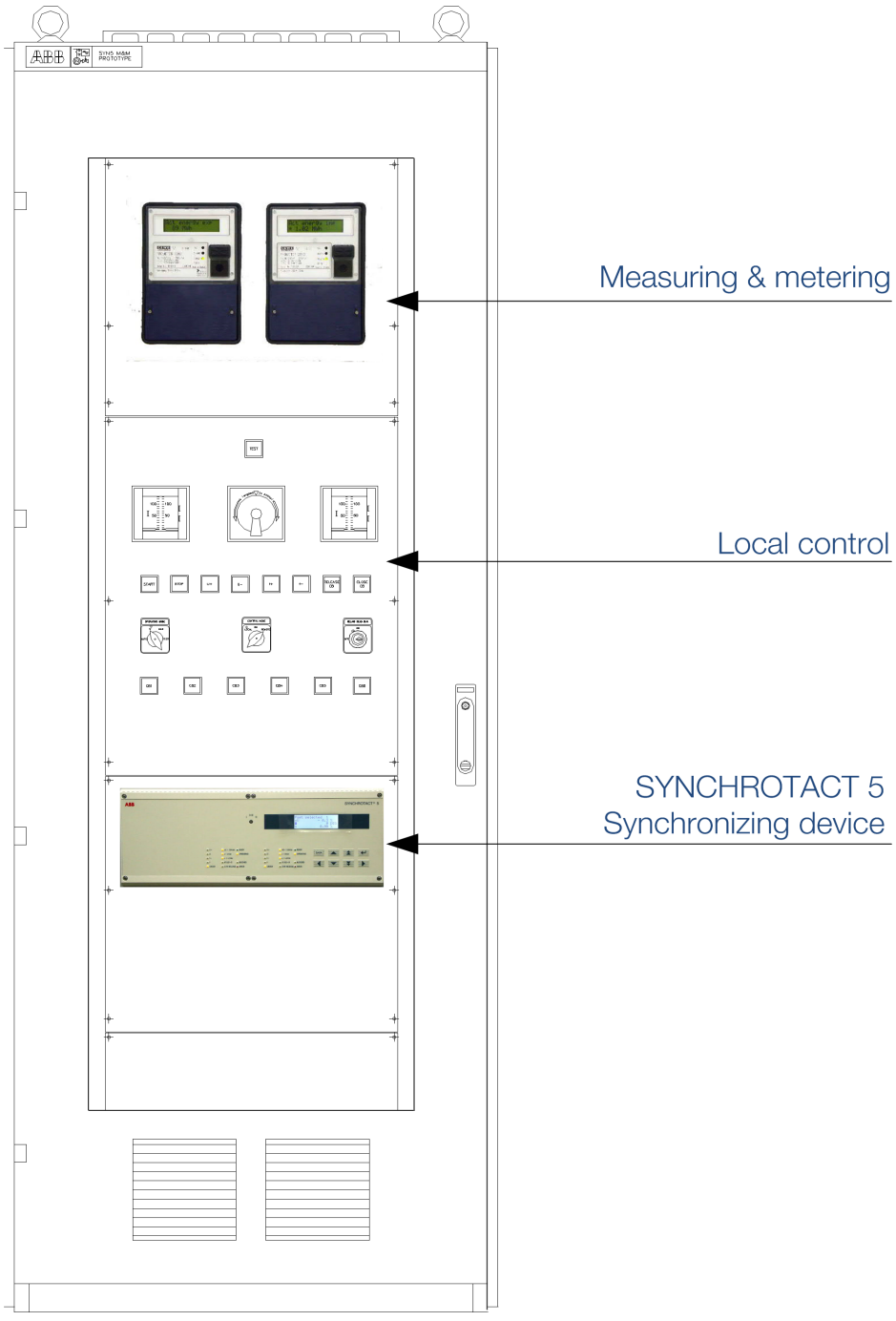
SYNCHROTACT® Systems

4

SYNCHROTACT® Systems
Application

SYNCHROTACT® synchronizing cabinets can be designed specifically for customer requirements and are used to synchronize generators and to parallel lines.

Depending on available space, other systems, as for example measuring and metering functions, may be used in the same cabinet, in addition to the synchronizing system.



Example: Synchronizing cabinet with local control and 2 counters

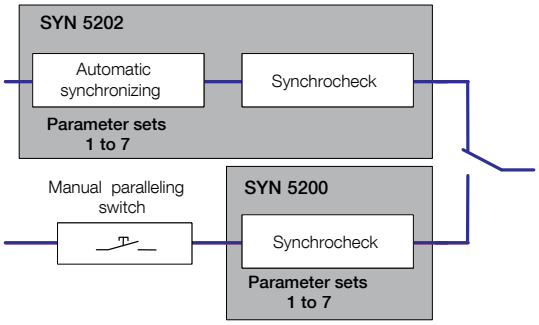
SYNCHROTACT® Systems
Typical configurations of a synchronizing system

The system uses proven SYNCHROTACT® 5-components and may be individually adapted. Typical configurations are as follows:

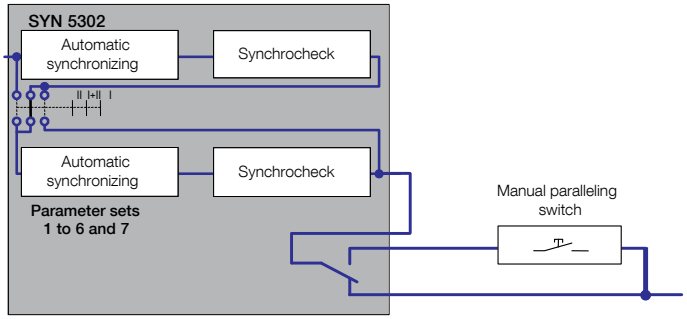
1. Safety: Single- or dual-channel solutions
2. Availability: Redundant manual synchronizing or redundant automatic synchronizing or both
3. Number of circuit breakers to be synchronized: up to four circuit breakers, one or more of which may be generator breakers
4. Power supply: In case of redundant synchronizing, the power supply on the cubicle entrance can be redundant too.
5. Synchronizing control: Remote, local or both
6. Adaptation of the measuring voltages: Especially with synchronizing of several circuit breakers it may occur that the two secondary voltages have different amplitudes and phase angles with closed circuit breaker.

Examples of synchronizing concepts

Automatic synchronizing (sketch shows dual channel version) including separate synchrocheck for redundant manual synchronizing (with its own hardware and power supply).



Redundant, automatic dual channel synchronizing with the additional possibility of a manual synchronizing (using parameter set 7).



SYNCHROTACT®
Service and support

SYNCHROTACT® Service and support

5

SYNCHROTACT®
Service and support

ABB, your expert for all services on SYNCHROTACT®-sychronizing equipment. As your service partner ABB assures comprehensive support for the product range of our synchronizing epuipment and excitation systems over the entire lifecycle.

Installation and commissioning

ABB Services - reliable, fast and customer-oriented.

Our global service network with more than 100 experienced and trained engineers worldwide are the key element for the smooth and fast commissioning as well as for correct setting of the synchronizer. A professional project documentation enables the best possible support on long term.

Key benefits
- Availability of competent professionals on short notice
- Increased availability and safety of the plant

Service Agreement - ABB Excitation Care

Increased efficiency and controlled costs, focusing on the core business.

The ABB Excitation Care - Service Agreement covers not only our excitation systems, but also our synchronizing equipment. In addition to customer telephone support, 24/7-emergency support and periodic maintenance, ABB additionally offers guaranteed response times and on site troubleshooting.

Key benefits
- Support by certified and experienced engineers
- Unlimited 24/7 telephone support, 365 days a year
- Minimizing the outage risk

Training

Your knowledge is your future - the mission of ABB University for Power Electionics.

ABB offers outstanding expertise for maintenance and operating personnel. The SYNCHROTACT®-courses deepen the basic knowledge about synchronization, provide product expertise and enable the participants to work on the synchronization equipment independently and confidently.

Key benefits
- Trained personnel reduces downtime of the plant
- Increased workplace safety through improved knowledge of the users

SYNCHROTACT®
Service and support

Product Life Cycle Management
Entirely service and support.
Our life cycle approach is based on the four-phase model shown below. By means of proactive communication, the customer will be informed by an official "Life Cycle transfer notice" before the product enters a critical phase. Thus, necessary measures for a seamless operation of the plant can be taken in time. (*)

Key benefit
- Higher operating reliability
- Reduced life cycle costs

Spare Parts Management
Maintenance for a reliable spare parts warehouse.
All components are suffering from continuous aging. So also components for excitation systems and synchronizing. This concerns not only the installed systems, but also the components in the spare parts warehouse. ABB has original spare parts and provides a review of spare parts at the customer's warehouse.

Key benefits
- Ensuring the reliability of spare parts
- Availability of spare parts at the lowest cost

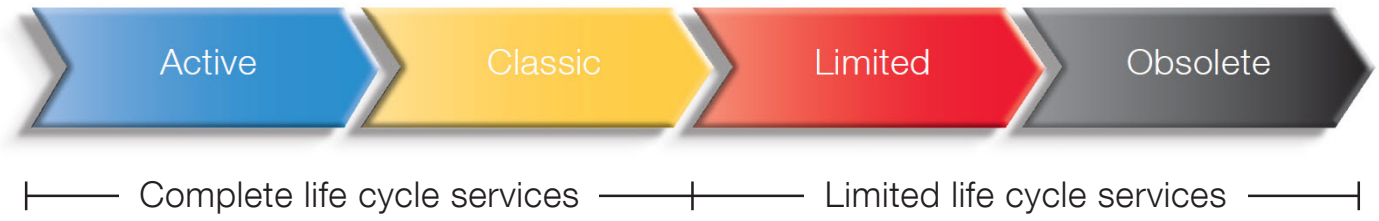
Repairs
Fast and easy product support.
If one unit fails, it can be quickly and easily sent back for inspection and repair at the ABB Return Center.

Key benefits
– Simple return process
– Troubleshooting at ABB manufacturing site

Replacement solutions
Migration to the latest product, or replacement of the entire synchronizing?
As a leader in synchronizing business ABB offers the expertise and experience of alternative solutions for synchronizing equipment, regardless of manufacturer.
The replacement of an old synchronizing device by one of the active life-cycle phase is a time and cost efficient solution.
When a complete synchronization must be replaced, ABB offers its customers a tailor-made solution.

Key benefits
- Improved system availability through reduced downtime
- Seamless operation of the plant

ABB Life cycle model (*)



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