SYNCHROTEQ PLUS

DESCRIPTION

The SynchroTeq™ Plus is the most advanced Point on Wave controllers – Controlled Switching Device – CSD - available on the market for medium to high-voltage Independent Pole Operated (IPO) and gang-operated circuit breakers (C/Bs). The SynchroTeq Plus not only controls C/B switching; it also monitors and reports C/B performance problems and alarms.

Using patented operating algorithms, the SynchroTeq Plus unit automatically adjusts C/B operations according to the supply voltage, air temperature, pressure of the drive mechanism and so on. In addition, the unit intelligently adjusts the next operation based on calculations from previous C/B performance.

SynchroTeq Plus supports different types of applications including:

- Shunt reactors
- Capacitor banks while taking into account residual charge (fully charged, partially discharged and completely discharged)
- Transmission lines
- Power transformers while taking into account the residual flux

Also, it can control different live tank/dead tank C/B technologies using hydraulic, pneumatic, spring or motor drive mechanisms.

VIZIMAX SynchroTeq™ products is a manufacturer agnostic solution and has been successfully used on modern and legacy C/B models from different manufacturers such as ABB, Siemens, Alstom, BHEL, and CG. It can be installed on brand new or existing C/Bs.

The SynchroTeq Plus can be controlled locally or remotely. The unit includes a graphical web operating interface and SynchroTeq Configuration Suite™ configuration and data analysis software designed for the MS Windows™ environment.

BENEFITS

The benefits of installing a SynchroTeq Plus controller are the following:

- Mitigate disturbances, providing utilities, independent power producers (IPPs) and industrial customers with better waveforms and more reliable transmission networks.
- Suitable for new or existing HV equipment, allowing you to make the most of your previous investments.
- Manufacturer-agnostic solution, compatible with any brand of C/B.
- Complies with all substation protocols including DNP3, IEC 61850, IEC 60870 and Modbus using the optional SynchroTeq communication module.
- Eliminates the need for pre-insertion resistors, which are a major cause of C/B failure.
- Modular and expandable platform can be sized to fit any C/B switching application, with dedicated hardware modules and custom configuration to serve shunt capacitor banks, shunt reactors, power transformers (3-phase and single phase) and uncompensated transmission lines, among others.
- Residual flux management modules produce seamless power transformer energization, dramatically reducing the possibility of inrush current. The result? Guaranteed availability across your entire infrastructure, at all times.

CONTROLLED SWITCHING PRINCIPLES

The goal of the SynchroTeq Plus unit is to perform the controlled switching of circuit breaker for opening and/or closing operations. By optimizing the switching of each circuit breaker pole individually, inrush current and voltage transients are virtually eliminated, thus improving grid power quality.

When the SynchroTeq MV receives a CLOSE command, it waits for the first zero-crossing of the source voltage for synchronization of the C/B mechanical operation. It waits for a synchronization delay to send a controlled CLOSE command to each C/B pole at a very precise point on the wave for switching to occur. The OPEN operation is the same as that for CLOSE operation except that a current or a voltage zero-crossing can be used as the reference signal to control the C/B contacts arcing and avoid re-ignition.

The computed time delay is measured from the reference zero-crossing and, using adaptive control, adjusts to account for environmental factors, idle time, and other measurements and variations in the C/B characteristics of each phase.

FEATURES

C/B OPERATION TIMING PREDICTION

Using patented operating algorithms, SynchroTeq Plus automatically adjusts C/B operation timing based on measured operating variables, including C/B control voltage, ambient temperature and, for each pole, the pressure of the insulating gas or the drive mechanism. In addition, SynchroTeq Plus intelligently adjusts the next operation based on the elapsed time since the last operation (idle time compensation) and the past history of the C/B timing performance (adaptive control).

EVENTS AND WAVEFORM RECORDING

At each switching operation, SynchroTeq Plus records current and voltage waveforms including the C/B interface signals (52a/52b/Trip/Close/inputs/commands) over a period of 1250 ms (250 ms pre-trigger). These waveforms are part of the sequence of events list which includes the alarms and the operations performed on the unit (for example, alarm reset, in/out of service). Each event includes the SynchroTeq Plus's complete status and operating environment to allow for detailed analysis. The SynchroTeq Plus has a memory capacity of 2000 events, including the waveforms.

WEB OPERATION INTERFACE

The current status, alarms, readings values and the event list can be displayed on any PC using a Web browser such as Internet Explorer™ or Firefox™. The SynchroTeq Plus Web interface is secured (https://) and access is only granted to authenticated users. This interface provides information about the current status or the status of the unit when an event occurred.

The event details interface is organized into five different views: Unit status, alarms, calculated values for opening, calculated values for closing and measured values. COMTRADE compatible waveforms can be downloaded on request from the Web interface.

COMMUNICATIONS AND HARDWARE OPTIONS

SynchroTeq Plus is equipped with two Ethernet ports for direct connection to a maintenance PC (front panel) or a LAN (back panel), which provides access to the unit. The following options are also offered at extra cost:

- Additional Ethernet communication plug-In (fiber optic and/or copper) for remote data analysis and maintenance
- Integrated bypass modules (STP 030302) that allows the C/B to be switched when the controlled switching functions are not available (unit unpowered, defective or out of service)
- A dual supply SPSBO (STP030303) option can be added to the unit to have the trip/close circuits powered from different supplies.

RESIDUAL FLUX MANAGEMENT OPTION

SynchroTeq Plus offers additional three phase voltage measurement required for Power Transformer application algorithm to calculate residual Flux (option STP 030101 or STP 030103). The extra analog inputs are used to calculate the residual flux in each phase when a power transformer is de-energized. SynchroTeq Plus uses these residual flux calculations to optimize CLOSE operation timing, resulting in a drastic reduction or in some cases the complete elimination of the inrush current normally resulting from uncontrolled energizing of the power transformer.

ENCLOSURE AND CABLING

The SynchroTeq Plus cabling is done from the back using screw type removable terminal blocks. AC current connections are made on shorting plugs to prevent CT damage in case a connector is accidentally removed. SynchroTeq Plus is available as a standard Rackmount (RM) enclosure to be installed in the control building. It is also available as a Standalone (SA) unit which can be installed in the C/B control enclosure in the switchyard.

FRONT PANEL OR REMOTE CONTROL

SynchroTeq Plus can be controlled locally from the front panel or remotely with the Web operation interface or by substation protocols using the SynchroTeq Communication Module (RWK 000016).

The SynchroTeq Communication Module allows device to communicate with or operate SynchroTeq Plus using major substation communication protocols including DNP3, Modbus, IEC 60870-5-101 & -104 and IEC 61850 protocols on Ethernet Copper or FO links and is configured using a XML customization file.

SOFTWARE

SynchroTeq Plus system includes Windows-based SynchroTeq Configuration Suite™ software comprising the SynchroTeq Configurator and the Event Analyzer.

The SynchroTeq Configurator is used to customize the operation of the SynchroTeq Plus and its Web interface using system and application configuration files. It supports both offline and online modes of operation and provides features to exchange these configuration files with the SynchroTeq Plus unit. Typically, the configuration files are designed and managed offline on a maintenance PC and are uploaded to the SynchroTeq Plus as part of the system commissioning.

The Event Analyzer is a COMTRADE compatible enhanced waveform viewer that displays the waveforms and the C/B operation simultaneously

MOUNTING

DIMENSIONS

Specifications	Value
Width	444 mm/17.5 inch for standard; 483 mm/19 inch for Rackmount installation
Height	4 UM (modular units: 177 mm/7 inch)
Depth	299 mm (12 inch)
Weight	7.5 kg (16.5 lbs.) with optional Residual flux and Bypass options

Leave at least 101.6 mm (4 in) clearance at the back of the unit for the cable connections.
Leave at least 44,45 mm (1U, 1.75 in) on the top for heat

NOTES: SA version should be installed in a water protected shelter together with the C/B. The SA option provides conformal coating of the electronic circuit boards plus an additional environmental protective cover. For RM installation, the mounting ears can be installed in the front of the unit, but they can be moved to the back or bottom of the unit for panel mount installations.

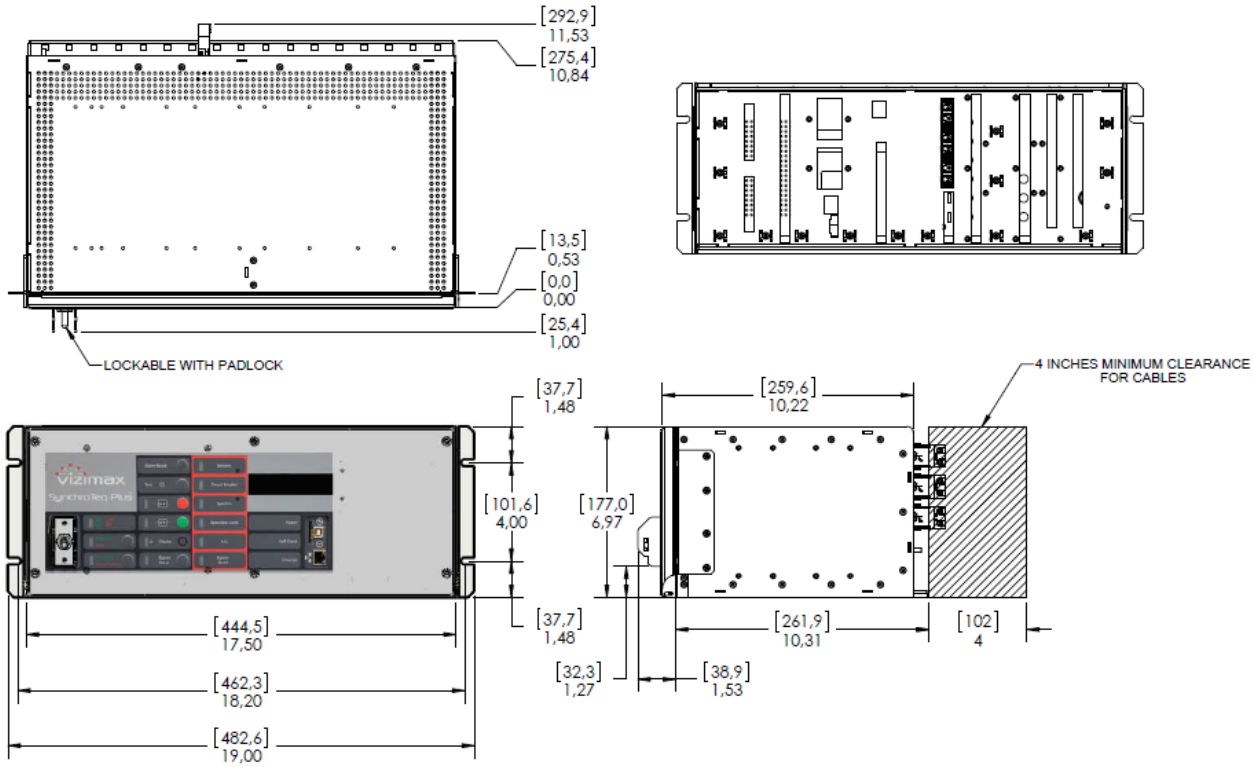

FIGURE 1 SynchroTeq Plus rackmount dimensions

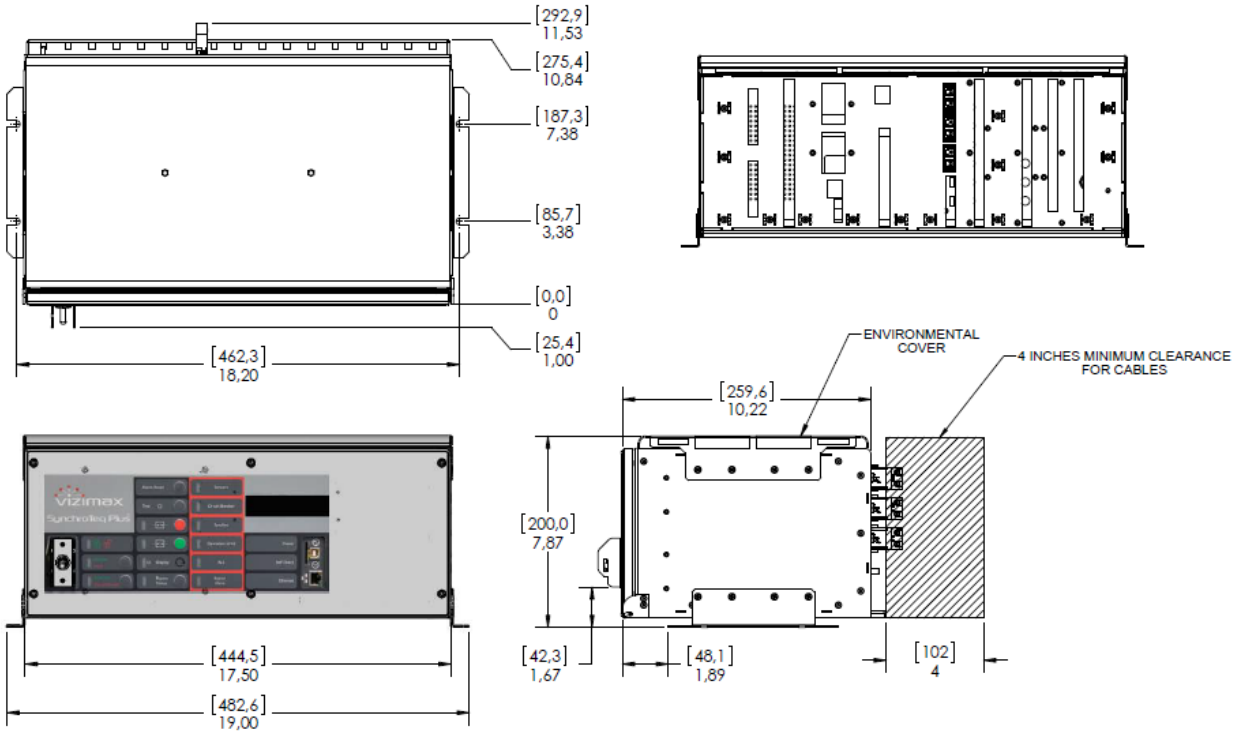

FIGURE 2 SynchroTeq Plus SA dimensions

CERTIFICATION

COMPLIANCE

ENVIRONMENTAL

Climatic	Standard	Level
Cold	IEC 60068-2-1	Tests Ad: -50 C 16hr.*
Dry Heat	IEC 60068-2-2	Tests B: +70 C 16hr. *
Damp Heat	IEC 60068-2-30	Tests Db: +25 to +55C, 93% R.H. 6 cycles 144 hr.
Ingress Protection	IEC 60529	IP30
Maximum Altitude	MEAS CAT III	< 2000 m
Storage temperature		-50 to +85 ºC

* See Temperature Derating Table

Mechanical Stress	Standard	Level
Sinusoidal Vibration	IEC 60068-2-6 IEC60255-21-1	Class2 Tests Fc: 10 to 150 Hz at 1.0G Response 1 sweep/axis Class1 Withstand 20 sweep / axis
Shocks	IEC 60068-2-27 IEC 60255-21-2	Class1 Withstand 5g/11ms (3) Repetitive bump 10g/16ms (1000) Response 15g/11ms (3)
Seismic	IEC 60255-21-3	Method A , class 1
Drop & Topple	IEC 60068-2-31	Drop 100mm Edge/Corner/Face

ELECTROMAGNETIC COMPATIBILITY (EMC)

Emissions	Standard	Level
Radiated Emissions	EN55011,22 CISPR 11, 22 60255-26 FCC	Class A 30MHz-1GHz (FCC part15: 2010 B, up to 2GHz)
Conducted Emissions	EN55011 CISPR 11	Class A 150kHz - 30MHz

Immunity	Standard	Level
Radiated Immunity	IEC 61000-4-3 IEC 61000-6-5 IEC 60255-26	Level 3 10V/m (80MHz - 1GHz) 80%modulated (1 kHz)
Radiated Immunity	IEC 61000-4-3 IEC 61000-6-5 IEC 60255-22-3 IEC 60255-26	Level 3 10V/m (1.4 – 2.7GHz) 3V/m (5.15 - 5.75GHz)
Conducted Disturbance, HF	IEC 61000-4-6 IEC 61000-6-5 IEC 60255-22-6 IEC 60255-26	Lev.3 10 Vrms (150kHz - 80 MHz) 80% modulated (1 kHz)
Conducted Disturbance, LF	IEC 61000-4-16 IEC 61000-6-5 IEC 60255-26	Level 4 30V & 300V Short term Power Line Freq. 60Hz Only
Surge Immunity	IEC 61000-4-5 IEC 60255-22-5 IEC 61000-6-5 IEC 60255-26	Level 4 LN-PE 4KV , L-N 2Kv I/O: 40Ohm-0,5uF
D.C. Power Ripple	IEC 61000-4-17 IEC 61000-6-5 IEC 60255-11 IEC 60255-26	Level 3 10% UT – 10min.
D.C. Power Voltage Dip & Interrupts	IEC 61000-4-29 IEC 61000-6-5 IEC 60255-11 IEC 60255-26	Level 3 Dips. 0, 40, 70% UT Slow variations 60 sec.
Electrostatic Discharge	IEC 61000-4-2 IEC 60255-22-2 IEC 61000-6-5 IEC 60255-26	Level 4 8KV Contact / 15kV Air Discharge.
Fast Transient	IEC 61000-4-4 IEC 60255-22-4 IEC 61000-6-5 IEC 60255-26	Level 4 4 kV 2.5kHz (Power Supply) 2 kV 5.0kHz (Other) 2kV 100kHz
Power Magnetic Field	IEC 61000-4-8 IEC 61000-6-5 IEC 60255-26	Level 4 30A-m continuous 300A-m short term

SURGE WITHSAND CAPABILITY (SWC)

	Standard	Level
Impulse Voltage	IEC 60255-5 IEC61180-1	OVC CAT IV 5KV 1.2/50 µs - 500Ohm
Insulation Dielectric **Insulation Resistance**	IEC 60255-5 IEC61180-1	2000V_{RMS} – 1 minute 100MΩ@500Vdc
Oscillatory Wave, **High Frequency Disturbance**	IEC 61000-4-18 IEC 60255-22-1 IEC 61000-6-5 IEC 60255-22-6	Level 3 2.5 kV CM/1kV DM (1 MHz/400 Hz) 200 Ω 1min. duration +/- polarity

SAFETY

	Standard	Level
Safety (Phase1)	IEC 61010-1 (Test & measurement)	Complete evaluation performed by Regulatory Agency: Nemko CB Report TR230362, IEC 61010 2nd edition
Safety (Phase 2) **w/ Bypass card and Active Junction Box options**	IEC 61010-1 (Test & measurement)	Complete evaluation performed by Regulatory Agency: UL IEC Report E362524-A2-IT-1, IEC 61010 2nd edition Equipment marked CE, c-UL-us

SYNCHROTEQ PLUS CHARACTERISTICS

CATEGORIES

Measuring inputs are defined by IEC Standard 61010 (Safety – Equipment for measurement, control, and laboratory use):

- Measurement category 3 is marked as MEAS CAT III (Highest expected transient voltage = 2.5 kV).
- Measurement category 4 is marked as MEAS CAT IV (Highest expected transient voltage = 4 kV)

Overvoltage category 3 is marked as OVC CAT III.

COMMUNICATION PORTS

Port	Characteristics	Value
USB Front panel	Interface compatibility	2.0
	Maximum speed	480 Mbit/sec
	Connector type	Type B
	Voltage isolation level	N/A
SD card Front panel	Interface	2.0 high speed
	Connector Type	SD/SDHC board
	Voltage isolation level	N/A
100Base-T Ethernet Front panel	Interface	10/100 Mbps
	Connector name	Front-Eth
	Connector type	RJ-45
100Base-T Ethernet Rear Panel	Interface	10/100 Mbps
	Connector type	RJ-45
RS-485 serial Rear Panel	Connector family	Phoenix MC 1.5/..-STF 3.81 mm
	Connector type	Pluggable terminal block with screw flange, cage clamp

The SynchroTeq Plus supports up to two (2) communication ports on rear panel, used ONLY for remote data analysis, commissioning and maintenance:

- **RWC 0D0000** : 100BASE-FX Ethernet on Multimode Fiber Optic with ST Connector
- **RWC 0P0000** : 100BASE-LX10 Ethernet on Single mode Fiber Optic with LC connector
- **RWC 0C0000** : Isolated 100BASE-Ethernet with RJ45 connector

TEMPERATURE DERATING

Specifications		Standards	Value
Temperature range	Operating temperature	IEC 61010-1	-40 to +55 ºC (still air)
	Tested operating temperature	IEC 68-2-2	-50 to +70 ºC (natural convection)

MEAN TIME BEFORE FAILURE (MTBF)

Specifications	Value
MTBF	13 years estimated

CIRCUIT BREAKER COILS COMMAND OUTPUTS

The SynchroTeq Plus **SPSBO** module drives the circuit breaker (C/B) coils and has the following characteristics:

Characteristics	Value
Number of outputs	6
Output driver technology	Solid State, Select Before Operate (SBO)
Rated voltage	48 Vdc, 110 Vdc, 125 Vdc, 220-250 Vdc
Overvoltage category	OVC CAT III
DC rated continuous current (tmax= 300 s)	5 A
Maximum making current (tmax=5 ms)	35 A
Maximum breaking current (L/R=0 ms)	20 A
Maximum breaking current when (L/R=40 ms)	20 A
Over current supervision	45 A
Maximum output leakage current	<1 mA
Voltage Burden	5 Vcc
Output activation time	10 ms to 100 ms (Programmable increments of 10 ms) 100 ms to 1000 ms (Programmable increments of 100 ms)
C/B coil supervision	3 mA

NOTES: The dual supply SPSBO (STP030303) option can be added to the unit allowing the separation of the OPEN and CLOSE circuit breaker commands on two different isolated power supply using two separate modules (SPSBO Open, and SPSBO Close). The dual

supply SPSBO option (STP030303) cannot be used with the Bypass module option (STP030302) since both modules are installed in the same slot.

DIGITAL INPUTS

The **SPSEQ** module is a processor circuit board with 12 opto-isolated digital inputs as follows:

- Six inputs for the C/B position (52a/52b contacts)
- Two inputs for the control of the C/B (OPEN/CLOSE commands)
- One input to force the SynchroTeq Plus Out of Service
- Three isolated general purpose contact inputs for C/B monitoring (for example, SF6 lock-out contact, heater contact and low pressure alarm)

Characteristics		Value			
Number of inputs		12			
Number of supervised inputs with opto-coupler tests		9			
Rated voltage		48 Vdc	110 Vdc	125 Vdc	220 -250 Vdc
Input voltage range	For idle state	24 Vdc	69 Vdc	69 Vdc	150 Vdc
	For active state	31 Vdc	87 Vdc	87 Vdc	173 Vdc
Maximum input Voltage		72 Vdc	150 Vdc	150 Vdc	280 Vdc
Overvoltage category		OVC CAT III			
Burden		<1 W			
Typical Input Impedance	48 Vdc, 110 Vdc (min, max)	24 KΩ, 49 KΩ			
	110 Vdc, 220 Vdc (min, max)	70 KΩ, 170 KΩ			
Capacitive coupling rejection (Cx >0.2 µ F)		Cx >0.5 µ F			
Protection against grounding		Yes			
Polarity reversal		no damage			
Activation delay	For OPEN and CLOSE inputs	2 ms			
	Of other inputs	<0.15 ms			

DC ANALOG INPUTS

The SynchroTeq Plus acquisition (**SPACQ**) module performs the following functions:

- Monitor C/Bs using analog measurements (SF6 pressure, hydraulic pressure, temperature) from 4 to 20 mA sensors connected to the apparatus. Each analog input provides features to calibrate and define the operating range for alarming (sensor alarm).
- Predict the C/B operating time influenced by external conditions such as the ambient temperature, isolation gas or drive mechanism pressures. The compensation is done from the analog inputs and can be activated or deactivated through the system configuration

4 to 20 mA analog/compensation inputs

Characteristics	Value
Number of inputs	5
Operating range (4 to 20 mA nominal)	0 to 25 mA
Input impedance (resistive)	220 Ω
Temporary overvoltage for 2 seconds	50 Vac
Measurement category	MEAS CAT III
Frequency response (-3 dB)	0 to 3 Hz
Full scale accuracy at 23 °C	2 %
Full scale rated noise level	1 %
Sensor supply	24 Vdc/60 mA

C/B coil voltage compensation input

Characteristics	Value
Number of inputs	1
Rated voltage	0 Vdc to 300 Vdc
Input impedance (resistive)	166 K Ω
Overvoltage category	OVC CAT III
Frequency response (-3 dB)	0 to 3 Hz
Full scale accuracy at 23°C	0.5 %
Full scale rated noise level	0.05 %
Polarity inversion	no damage

SynchroTeq Plus internal temperature monitoring

Characteristics	Value
Number of sensors	1
Operating range	-55 °C to +85 °C
Frequency response (-3 dB)	0 to 3 Hz
Full scale accuracy	1 %
Full scale rated noise level	0.5 %

AC MEASUREMENTS INPUTS

The SynchroTeq Plus **SPCTPT** module inputs are used to measure the C/B current using current transformers (CTs), and the source (line or bus) voltage using potential transformers (PTs).

CT inputs

Characteristics		Value
Number of inputs		3
Connector type		Auto-shorting pluggable connector, screw clamp
Current	Rated current	1 A or 5 A
	Saturation current	2 x In
	Maximum current for 1 second	20 x In
Measurement category		MEAS CAT III
Burden	At rated current In = 1 A/5 A	< 0.1 VA/1 VA
Asymmetrical current	During 100 ms	100 %
	Reading after 100 ms	80 %
Nominal frequency		50 Hz or 60 Hz
Bandwidth (-3 dB)		0.5 Hz to 4 KHz
Sampling frequency		10,000/s
Conversion resolution		16 bit
Full scale	Accuracy at 23 °C	0.3 %
	Rated noise level	0.15 %
Zero crossing detection	Range (frequency)	10 to 70 Hz
	Range (current)	5 % to 200 % In
	Accuracy	10 µs
Insensitivity to harmonic contents		Up to 7 % In for 2nd to 10th harmonics
Crosstalk isolation between channels		>76 dB

PT inputs

Characteristics		Value
Number of inputs		3
Rated voltage		100 Vac, 110 Vac, 120 Vac, 100/√3 Vac, 110/√3 Vac, 120/√3 Vac
Thermal capacity (1 minute)		167 Vac
Measurement category		MEAS CAT III
Burden		< 1 VA
Nominal frequency		50 Hz or 60 Hz
Bandwidth (-3 dB)		0.5 Hz to 4 KHz
Sampling frequency		10,000/s
Conversion resolution		16 bit
Full scale	Accuracy at 23 °C	0.3 %
	Rated noise level	0.05 %
Zero crossing detection	Range (frequency)	10 to 70 Hz
	Range (voltage)	37.5 % to 150 % Vn
	Accuracy	10 µs
Insensitivity to harmonic contents		Up to 50 % Vn for 2nd to 10th harmonics
Crosstalk isolation between channels		>84 dB

ADDITIONAL THREE PHASE VOLTAGE MEASUREMENT REQUIRED FOR POWER TRANSFORMER AND APPLICATION ALGORITHM TO CALCULATE RESIDUAL FLUX

The function boards (**SPFLUX** module) are used to calculate optimum C/B closing time based on the residual flux in the transformer core after the transformer is de-energized. The residual flux measurement option reduces the inrush current to a magnitude comparable to the magnetization current. SynchroTeq Plus calculates the residual flux from the voltage measurement on the transformer winding using either PTs or from High Voltage bushing sensors installed on the test tap of the bushing.

There are two function boards' versions:

- Acquisition & Residual Flux Calculation Module for PT with 3 x Analog Inputs (STP 030103): Three (3) additional PT inputs, plus three (3) 4 to 20 mA inputs. The 4 to 20 mA inputs can be used for two-wire sensor monitoring.
- Acquisition & Residual Flux Calculation Module for Power Transformer High Voltage Bushing Sensors (STP 030101): Three (3) additional Power Transformer High Voltage Bushing Sensors inputs suitable for VIZIMAX bushing sensors. The residual flux calculation is made using measurements from the bushing sensors.

Acquisition & Residual Flux Calculation Module for PT w/ 3 x Analog Inputs (STP 030103)

PT inputs

Characteristics	Value
Number of inputs	3
Input operating range	57 Vac (or 100/√3 Vac) to 120 Vac
Measurement category	MEAS CAT III
Thermal capacity (1 minute)	167 Vac
Burden	< 3 VA
Rated frequency	50 Hz or 60 Hz
Bandwidth (dc component included)	0 to 3.6 KHz
Sampling frequency	10,000/s
Conversion resolution	16 bit
Full scale accuracy at 23°C	0.5 %
Full scale rated noise level	0.1 %

4 to 20 mA inputs

Characteristics	Value
Number of inputs	3
Input operating range (4 to 20 mA nominal)	0 to 25 mA
Temperature measurement range	-50ºC to +80 ºC
Sensor supply	24 Vdc / 60 mA provided by the SPFLUX card
Measurement category	MEAS CAT III
Temporary overvoltage for 2 seconds	50 Vac
Input impedance	220 Ω
Independent power supply loop numbers	3
Bandwidth (dc component included)	0 to 3.6 KHz
Sampling frequency	10,000/s
Conversion resolution	16 bit
Full scale accuracy at 23°C	0.5 %
Full scale rated noise level	0.2 %

Acquisition & Residual Flux Calculation Module for VIZIMAX bushing sensors (STP 030101)

Bushing sensor inputs

Characteristics	Value
Number of inputs	3
Voltage operating sensor range	4 to 20 mA
Transformer bushing sensor supply	24 Vdc provided by the SPLUX card
Measurement category	MEAS CAT III
Temporary overvoltage for 2 seconds	50 Vac
Input impedance	220 Ω
Independent power supply loop numbers	3
Bandwidth (dc component included)	0 to 3.6 KHz
Sampling frequency	10,000/s
Conversion resolution	16 bit
Full scale accuracy at 23°C	0.5 %
Full scale rated noise level	0.2 %

4 to 20 mA inputs

Characteristics	Value
Number of inputs	3
Input operating range (4 to 20 mA nominal)	0 to 25 mA
Temperature measurement range	-50ºC to +80 ºC
Sensor supply	24 Vdc / 60 mA provided by the SPLUX card
Measurement category	MEAS CAT III
Temporary overvoltage for 2 seconds	50 Vac
Input impedance	220 Ω
Independent power supply loop numbers	3
Bandwidth (dc component included)	0 to 3.6 KHz
Sampling frequency	10,000/s
Conversion resolution	16 bit
Full scale accuracy at 23°C	0.5 %
Full scale rated noise level	0.2 %

POWER SUPPLY AND SIGNALING OUTPUTS

The SynchroTeq Plus power supply (**SPALIM**) module input is set according to the ordering four options are available: 48, 110, 125 or 220-250 Vdc.

Up to 11 electromechanical relays are provided to signal alarm conditions to external devices such as RTUs and annunciators. They can also drive the external bypass logic when the SynchroTeq Plus is defective or out of service.

Characteristics	Value
Overvoltage category	OVC CAT III
Maximum power consumption	45 W
Polarity inversion	No damage

48 Vdc

Characteristics		Value
Voltage range		36 Vdc to 72 Vdc
Tolerance to power interruption (IEC 61000-4-29)	Short voltage interruption and voltage variation of 30 %, 60 % and 100 %	100 ms

110 Vdc

Characteristics		Value
Voltage range		88 Vdc to 140 Vdc
Tolerance to power interruption (IEC 61000-4-29)	Voltage dip 30%	No impact
	Short voltage interruption and voltage variation of 60 % and 100 %	100 ms

125 Vdc

Characteristics		Value
Voltage range		104 Vdc to 140 Vdc
Tolerance to power interruption (IEC 61000-4-29)	Voltage dip 30%	No impact
	Short voltage interruption and voltage variation of 60 % and 100 %	100 ms

220-250 Vdc

Characteristics		Value
Voltage range		180 Vdc to 280 Vdc
Tolerance to power interruption (IEC 61000-4-29)	Short voltage interruption and voltage variation of 30 %, 60 % and 100 %	100 ms

Signaling outputs

Parameter		Value
Number of outputs		11
Rated voltage		24 Vdc to 300 Vdc
Minimum operation voltage		24 Vdc
Overvoltage category		OVC CAT III
Rated current	At 125 Vdc	0.3 A
	At 300 Vdc	0.2 A
Current	Maximum making (tmax. = 200 ms)	1 A
	Maximum breaking (L/R = 40 ms) at 125 Vdc	0.3 A
	Maximum leakage	<0.02 mA

FUNCTIONAL SPECIFICATIONS

WAVEFORM CAPTURE

Parameter	Value
Memory capacity	Up to 2000 events (waveforms are stored in events)
Capture trigger	C/B commands from SynchroTeq Plus (OPEN and CLOSE) Voltage changes on switched side of C/B (for residual flux calculation on power transformer applications) Manual trigger using snapshot capture
Sampling rate	167 samples/cycle at 50 Hz and 60 Hz
Recording time	1250 ms with 250 ms pre-trigger
Recorded signals	Voltages from PTs on unswitched side of C/B (3) Load current (3) Option: Voltages on switched side of C/B (3) Option: Residual flux calculation (3) C/B control commands (3 x Open, 3 x close) C/B position contacts (3 x 52a, 3 x 52b) SynchroTeq Plus command inputs (OPEN and CLOSE) Phase A synchronization (1 x I, 1 x V)

EVENT MEMORY

Parameter	Value
Memory capacity	2000 events, including waveforms when applicable
Recording trigger sources	C/B commands from SynchroTeq Plus Voltage changes on switched side of C/B (for residual flux calculation on power transformer applications) Status change (local/remote, in/out of service, cold start, reset, etc.) Alarms (self-check, sensors, C/B timing problems, C/B interface problem, loss of synchronization signal, etc.) Configuration changes (new parameters) Operation failure (rejected commands) Manual waveform capture Operation commands to SynchroTeq Plus (alarm reset, operation counters reset, set residual flux, etc.)
Search and display filtering capabilities	The event display can be filtered using one or the combination the following criteria: By event sequential number By date By type (open command, close command, residual flux calculation, sensor problem, etc.) By alarm type (sensor out of range, excessive inrush current, synchronization loss, etc.)

Time tagging display resolution	1 millisecond with time zone management
Time tagging synchronization	NTP time server on Ethernet IEEE PTP 1588 clock source on Ethernet Manual synchronization from PC computer
Real time clock autonomy	Approximately 1 week without power (protected with maintenance free super capacitor)

ORDERING INFORMATION

STP 030000 SynchroTeq Plus base unit (Smart Coding to be confirmed) - Compatible w/ either Rackmount or standalone mounting, -40 ºC to 75 ºC (-40 ºF to 165 ºF)

Download the SynchroTeq Plus smart coding on our website: http://www.vizimax.com/support/download

Options:

RWK 000016 Standard SynchroTeq Communication Module for the STU 0x5000 or STP 030000 (2 x Ethernet 100BASE-T + 1 x Ethernet 100BASE-FX multimode + 2 x serial ports) – Protocols DNP3 client and IEC 61850 server + GOOSE – integrated XCBR LN, -40 ºC to 75 ºC (-40 ºF to 165 ºF)

STP 030101 Acquisition & Residual Flux Calculation Module for VIZIMAX Bushing Sensors

STP 030103 Acquisition & Residual Flux Calculation Module for PT w/ 3 x Analog Inputs

STP 030302 SHL-1 - DCO Type - Bypass module

STP 030303 Dual supply circuit breaker coils command (Dual SPSBO option)

STP 030200 Active Junction Box

STP 03040X Bushing Sensors for HV Power Transformer

Factory Acceptance Test, Site Acceptance Test, Configuration services and training Module are also available, please inquire.

Support contact: st.support@vizimax.com
www.vizimax.com/support

North America
2284, de la Province Street
Longueuil (Qc) Canada J4G 1G1

T : **+1 450 679-0003**
F : +1 450 679-9051
sales@vizimax.com
www.vizimax.com

Europe, Middle East, Russia
475 Louise Avenue
1050 Brussels

T : **+32 2 669 0735**
F : +32 2 669 0739
sales@vizimax.com
www.vizimax.com

India
HIG-408, Street no.12
Madhavanagar, Ramachandrapuram
Hyderabad-502032, India

Mob : **+91 9848822724**
sales@vizimax.com
www.vizimax.com

Latin America
Alameda Itù # 1267, Conj. 122
Jardins, CEP 01421-001
São Paulo • SP • Brazil

T: **55-11-96307-6174**
F: 55-11-3081-9077
sales@vizimax.com

ENERGY 3.0

V-FOPR03-011en (2014-05-22)