

UNITROL® 1000

Compact Automatic Voltage Regulator for
small synchronous machines

UNITROL® 1000-15 and UNITROL® 1000-40



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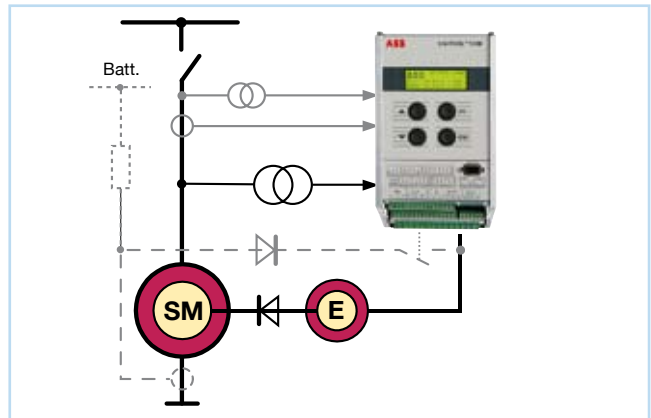
The ABB logo, consisting of the letters "ABB" in a bold, red, sans-serif font.

UNITROL® 1000-15 Covers a wide application range

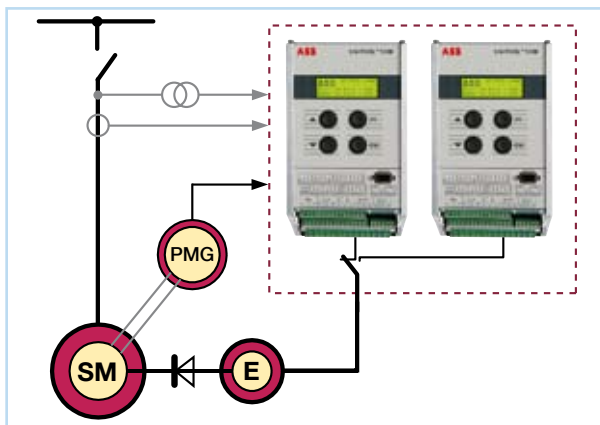
The UNITROL® 1000-15 is an Automatic Voltage Regulator of the latest design for synchronous generators and synchronous motors. The implementation of the most advanced microprocessor technology together with IGBT semiconductors enables it to be used in a wide range of applications. The maximum output current is 15 A and the power input can be from an AC or DC source.

Compact design

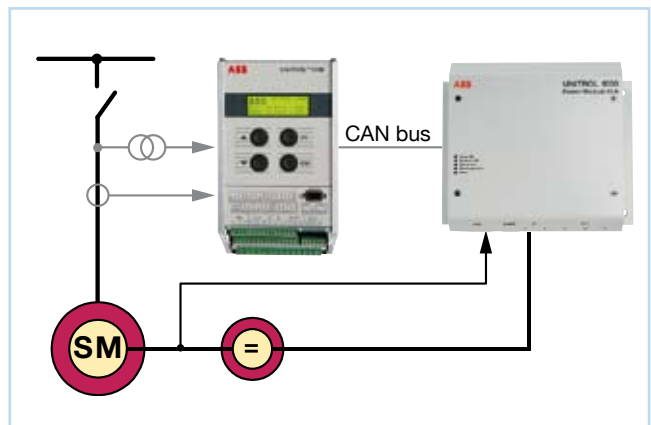
The UNITROL 1000-15 has all the elements of excitation control built inside. A powerful signal processor running extensive control software guarantees excellent performance under all conditions. The chopper type power stage, which can be supplied from an AC or DC power source, enables the use in varied applications. The front panel serves for easy monitoring and configuring. The robust mechanical design guarantees a high reliability. The applications shown here are typical examples.



Shunt excitation with optional short circuit support



Redundant voltage regulator with Permanent Magnet Generator (PMG) supply



Replacement of voltage regulators for generators with direct-current exciter machines with UNITROL 1000-40. A suitable solution for modernization of older mechanical or analog voltage regulators.

UNITROL 1000-PM40

The UNITROL 1000-PM40 is a microprocessor controlled chopper type power stage with IGBT semiconductors. It is connected to a UNITROL 1000-15 AVR by a CAN bus. This combination called **UNITROL 1000-40** covers a field current range up to 40 A.

LEDs (Light Emitting Diodes) on the front plate of the UNITROL 1000-PM40 provide the most important status information

Additional settings or commissioning are not required since the power stage is automatically configured by the UNITROL 1000-15.

UNITROL 1000-40 is a perfect solution for retrofit applications where field current between 15 A and 40 A is needed.



UNITROL® 1000-15 Performance features

The highly efficient software of the UNITROL 1000 fulfills all requirements for the stable and reliable operation of your synchronous machine.

Standard functions (BASIC)

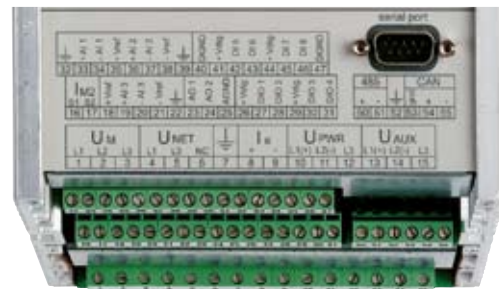
- Voltage regulator with PID control algorithm
- Cos φ regulator with PID control algorithm
- Reactive power regulator with PID control algorithm
- Excitation current regulator (manual control) with PI control algorithm
- Open loop control of output voltage for test purpose
- Internal digital reference values
- Bumpless changeover for all modes of operation
- Soft-start function
- Reactive current droop for network operation
- Volts-per-Hertz limiter
- Minimum excitation current limiter
- Three-step delayed maximum excitation current limiter (temperature dependent)
- Reactive current limiter as a function of active power (P/Q)
- Stator voltage limiter
- Stator current limiter (temperature dependent)
- Reactive power sharing between parallel machines by RS 485 bus
- Voltage matching prior to synchronizing
- Standard Modbus RTU interface on RS 232 and RS 485
- Undervoltage detection to activate external current boost for short circuit support (compounding)
- Built-in step test function
- Alarm and Trip signals



UNITROL 1000-15

Optional functions

- Automatic synchronizing
- Synchrocheck function
- Monitoring of rotating diodes
- Power System Stabilizer, according to IEEE PSS 2A/2B
- Enhanced monitoring functions for redundant system, like PT monitoring
- Set point following based on CAN for redundant systems
- Stand-by mode for redundant backup channel system



The inputs and outputs are all located at the bottom of the unit

Inputs and outputs

The UNITROL 1000-15 is equipped with flexible interfaces:

- 4 digital inputs
- 4 digital outputs (or inputs)
- 3 analog inputs
- 2 analog outputs

The four digital outputs can be individually redefined as digital inputs.

An RS 232 serial interface is used for PC connection (CMT 1000).

An optional RS 485 link can be used for Modbus serial communication or for reactive power sharing (up to 32 parallel units).

UNITROL® 1000-15 Human Machine Interface

A practical and simple-to-operate panel on the unit enables easy access without a Laptop. A user-friendly software tool “CMT 1000” simplifies the commissioning.



Full operation is possible using only four keys and an illuminated display

Local operation panel

All parameters can be set directly on the device, without any additional equipment being necessary, for example:

- Configuration of inputs and outputs
- Selection of the measuring values which are shown on the display
- Setting and alteration of parameters
- Monitoring of the operation

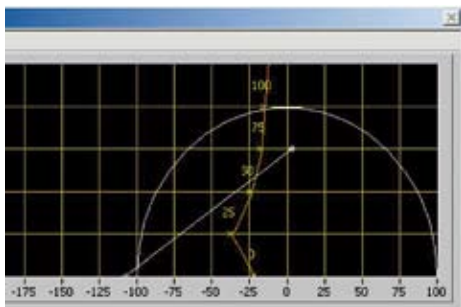


Example of parameter settings on the display

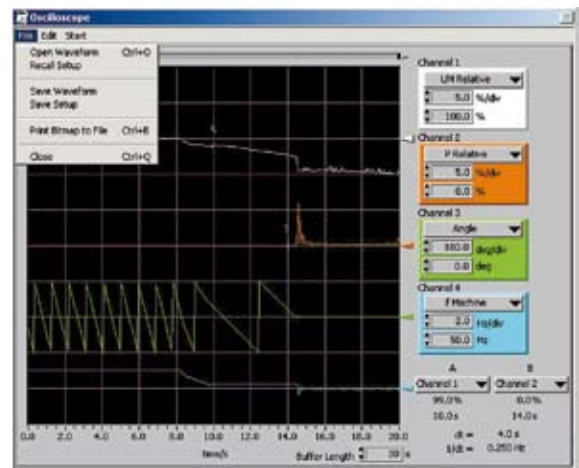
User-friendly configuration and optimization with CMT 1000

All of the parameter settings for the UNITROL 1000 Family can be performed using “CMT 1000” – Commissioning and Maintenance Tool – for Microsoft® Windows™.

It is easy to follow how the changing of a parameter affects the overall behavior of the regulator by referring to the power chart and the oscilloscope function. This means that the optimum settings are quickly identified.



The power chart shows the actual operating point and the setting curves of the P/Q limiter



Screenshot of CMT 1000 Oscilloscope

CMT 1000 Oscilloscope

- Four signals can be selected for graphic display
- Parameter files and graphs can be saved in numerical form for later analysis
- The resolution of the oscilloscope is 50 ms, and a total of 20 channels are recorded

UNITROL® 1000 Systems

For customers who prefer engineered and ready-to-operate solutions, we offer standard or custom-built systems. Every system leaves our factory fully tested.



Plate with single-channel system

Single-channel system

The single-channel solution, with all the necessary components installed on a mounting plate, is frequently used for the excitation of smaller synchronous machines, e.g. generators that are driven by hydro turbine or by a diesel engine. This is also a commonly used solution for motor excitation.

Dual-channel system

A dual-channel system with its 100 % redundancy is used when there are higher requirements in terms of reliability and security against failure.



Compact dual-channel system on a mounting plate



AVR system in a small cabinet

System installed in switchgear cabinet

A UNITROL 1000 voltage regulating system installed in a switchgear cabinet is the best solution if no cabinet is available for the installation of a mounting plate. System includes necessary peripheral components, like excitation breaker, interface relays, transducers, MCBs, etc.

UNITROL® 1000 E-Learning

UNITROL 1000 E-Learning is an interactive training program. With it you will learn excitation basics and how to operate a UNITROL 1000 device.

Learn to operate UNITROL 1000 via E-Learning

The interactive E-Learning training program provides a comprehensive guide to installing and operating the UNITROL 1000 voltage regulator. You will learn:

- Basic theory of a synchronous machine and excitation
- How to operate UNITROL 1000 using the front panel push-buttons
- To control and operate UNITROL 1000 using CMT 1000 on your PC
- How to determine and set parameters
- How to commission a UNITROL 1000

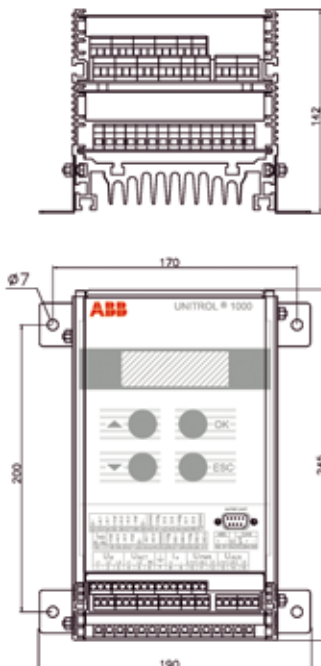
More information about this program can be found on our Website www.abb.com/unitrol in the product's "Downloads" section.

Please use the "Contact us" section to order the UNITROL 1000 E-Learning program on CD.

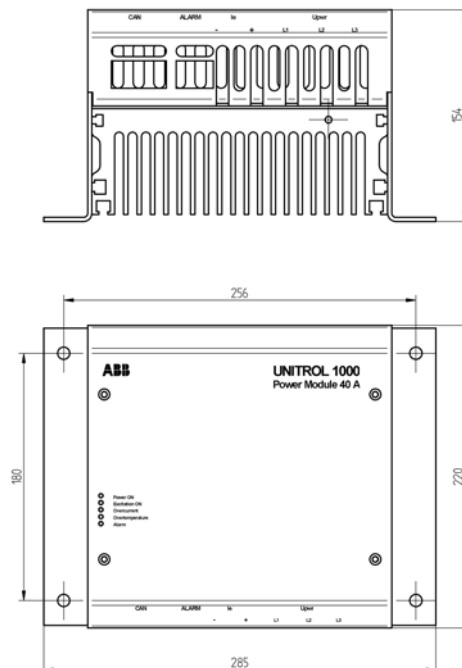


Screenshot of UNITROL 1000 E-Learning program

Mechanical dimensions of the devices



Dimensions of the UNITROL 1000-15 (mm)



Dimensions of the UNITROL 1000-PM40 (mm)

Technical Data of UNITROL® 1000-15 & UNITROL® 1000-PM40

UNITROL 1000-15

Auxiliary supply

AC input voltage, 3-ph min/max	9 to 250 V _{AC}
AC input voltage, 1-ph min/max	50 to 250 V _{AC}
DC input voltage min/max	18 to 300 V _{DC}
Maximum power consumption	25 W
Test voltage	2 kV

Power electronics supply

AC input voltage, 1-/3-ph min/max	0 to 250 V _{AC}
DC input voltage min/max	0 to 300 V _{DC}
Frequency range	40 to 600 Hz
Test voltage	2 kV

Measurement inputs

Generator voltage, 3-ph max.	250 V
Generator current, 1-ph	1 A
Network voltage, 1-ph max.	150 V
Frequency range	10 to 100 Hz

Excitation output

Continuous output current	15 A _{DC}
Current de-rating for ambient temperature > 50 °C	1 A/Kelvin
Overload (10 s maximum)	30 A _{DC}
Overload (4 min maximum)	20 A _{DC}

Internal voltage source

Auxiliary voltage source	24 V _{DC}
Maximum output current	300 mA

Analog inputs/outputs

Voltage range	± 10 V
Impedance	100 kOhm
Reference source for external potentiometer	± 10 V

Serial interface

For PC connection	RS 232
For paralleling of several devices	RS 485
For local extension devices	CAN bus

Accuracy

Voltage regulation	< 0.1%
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Ambient values

Operating temperature range	0 to 60 °C
Storage temperature range	- 20 to +75 °C
Vibration	2 mm f < 15 Hz 0.7 g f > 15 Hz
Shock	5g, 11 ms impulse

EMC withstand

Immunity	EN 61000-6-2
Emission	EN 61000-6-4

Mechanical data

Weight	5 kg
Protection class	IP 20

UNITROL 1000-PM40

Power electronics supply

AC input voltage, 3-ph min/max	9 to 250 V _{AC}
AC input voltage, 1-ph min/max	50 to 250 V _{AC}
DC input voltage min/max	18 to 300 V _{DC}

Excitation output

with 3-phase AC or DC supply

Continuous output current	40 A _{DC}
Overload (10 s maximum)	80 A _{DC}
Overload (4 min maximum)	50 A _{DC}

with 1-phase AC supply

Continuous output current	30 A _{DC}
Overload (10 s maximum)	60 A _{DC}
Overload (4 min maximum)	40 A _{DC}

Serial interface

CAN bus

Mechanical data

Weight	6.7 kg
Protection class	IP 20

For ambient and AVR related technical data please refer to the UNITROL 1000-15 data to the left.

Products of the UNITROL® 1000 Family

UNITROL® 1000 Family is a series of digital Automatic Voltage Regulators. A modern controller design together with IGBT chopper power stage enables them to be used in a large variety of applications.



UNITROL 1000-7

UNITROL 1000-7 is an AVR for maximum 7 A continuous field current. It is targeted at synchronous machine manufacturers and system integrators who look for a straight-forward and cost-effective solution.

UNITROL 1000-15

UNITROL 1000-15 is an AVR with field current up to 15 A. A local operation panel serves for easy monitoring and parameter settings. This compact and easily operated unit covers a wide range of applications.

UNITROL 1000-PM40

UNITROL 1000-PM40 is the power module extending the output current of the UNITROL 1000-15 up to 40 A. A CAN bus interface between the two units is used for this plug&play combination, **UNITROL 1000-40**.

ABB Switzerland Ltd in Turgi, Switzerland, is the worldwide Center of Excellence for Excitation and Synchronizing Systems



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