



UNITROL® 1000

Compact and powerful
Automatic voltage regulators

Power and productivity
for a better world™



Product benefits



ABB is the world leading volume supplier of high quality UNITROL automatic voltage regulators (AVR) and static excitation systems (SES) that offers solutions for any type and size of power plant with high return on investment. UNITROL 1000 product family covers low power range applications and sets with respect to functionality, reliability and connectivity a new benchmark for the global industry.

UNITROL 1000 provides compact and reliable solutions. Various built-in control software functions, robust mechanical and electrical design enable a wide range of applications.

Main features

- Compact and robust AVR for excitation current up to 40 A
- Separate communication and control processors
- Wide range of built-in control software functions
- Ethernet-based fieldbus interface
- Wide range of power input voltage, for AC and DC input
- Flexible and freely configurable measurements and inputs/outputs (I/Os)

Wide range of applications

- Land-based power plants based on diesel engines, gas or steam turbines and hydro turbines
- Marine: electrical propulsion and auxiliary supply
- Traction: diesel electric locomotives
- Wind: based on direct connected synchronous machines
- Synchronous motors

Key benefits

+ Stable and reliable control of your machine

Highly integrated and robust AVR for harsh industrial environment. Stable and accurate regulation even with highly disturbed voltages.

+ AVR for various applications

Fully configurable I/Os and measurement inputs and user-specific configurable field bus interface enable easy plant integration.

+ Easy operation, monitoring and maintenance of the system

Intuitive and user-friendly commissioning tool.

+ Full support for grid codes

Built-in Power System Stabilizer (option), simulation models and grid code studies available.

+ Efficient product life cycle management

Extended life time of your assets with minimum costs.

+ Professional technical help always within your reach

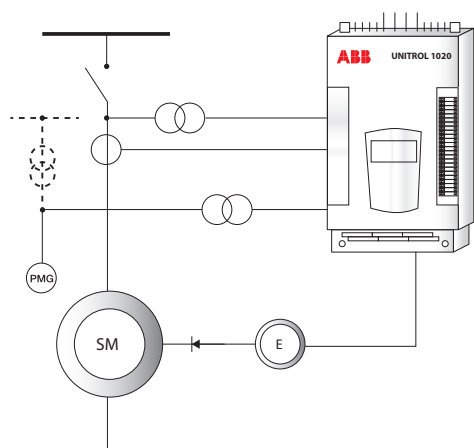
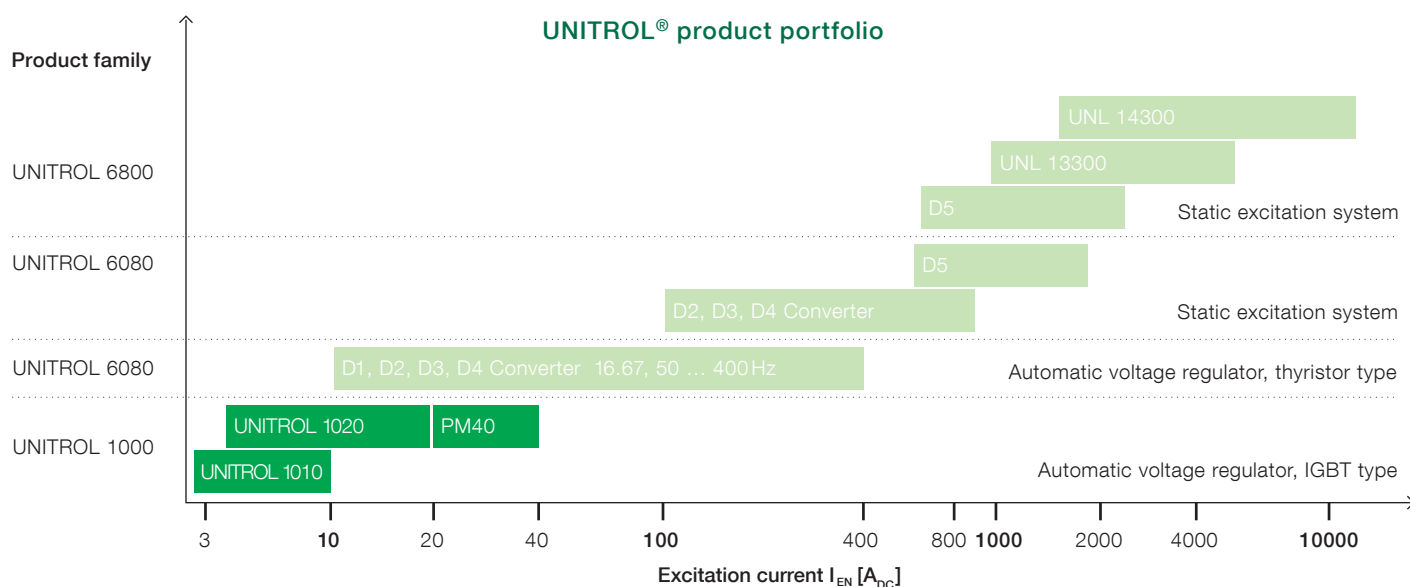
ABB's global excitation service network.

Portfolio

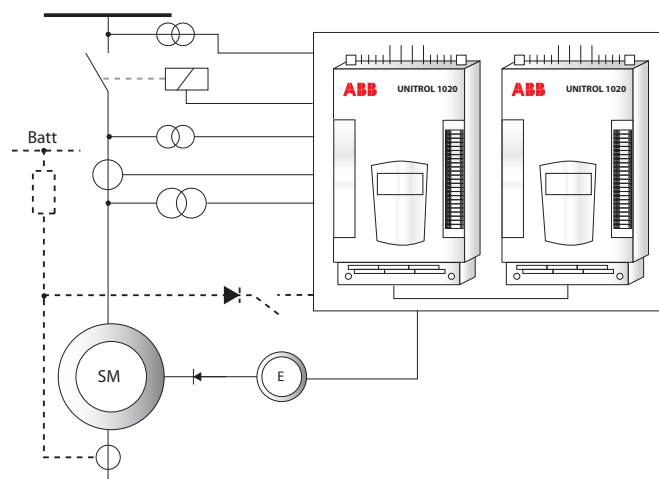
UNITROL 1020 and UNITROL 1010 are the latest products of the UNITROL 1000 family. For most reliable operation, the communication and control tasks are split in separate controllers. The non-volatile flash memory of the AVR stores events and data logs to enable fault analysis and fast trouble shooting. Time synchronization is done over Ethernet communication, and the events and data logs are time-stamped.

UNITROL 1000 is provided with modern communication ports like Ethernet and USB for connection of the PC-based commissioning tool CMT1000. Besides it is possible to power up the controller of the device via USB port. Thus the user can download files or configure the device even when no input power is available. AVR output stage is based on proven IGBT technology, which allows AC and/or DC voltage inputs from different sources.

UNITROL 1020 and UNITROL 1010 are designed for a wide range of ambient temperature and harsh environmental conditions and can be mounted directly on the machine.



Single channel generator or motor excitation with PMG supply.



Dual channel generator or motor excitation with compounding and field flashing.

Overview

UNITROL 1020 combines high performance control and power circuits with a simple mechanical design. The construction provides a platform for a broad range of small applications, including those in highly demanding

environmental conditions. Furthermore, high levels of EMC immunity is achieved through separation of the power and measurement terminals from the I/O connectors.

Polymer housing

Protects all live parts to prevent electric shocks.

USB port

- Connects the CMT1000 (commissioning and maintenance tool)
- Device configuration and event and data upload without any other power supply

Indication LEDs

- Green: Power ON, blinking indicates software is running
- Yellow: Excitation ON, blinking indicates limiter is active
- Red: Alarm, blinking indicates start up error

Ethernet port

- Connects the CMT1000
- Remote access over Modbus TCP

Solid aluminium base plate

- Robust mechanical design allows use in high vibration applications.
- Can be mounted directly within the machine terminal box.

Power and measurement terminals

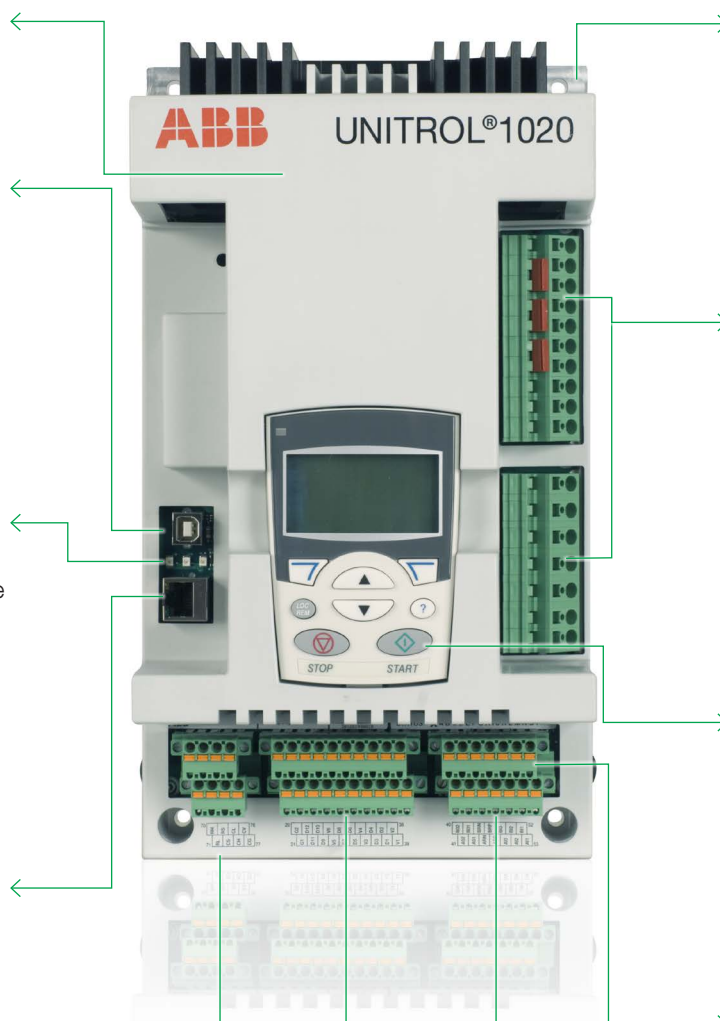
- Specified up to 30 A continuous current and max. cable up to 4 mm² (AWG 24–10)
- Tension spring terminals for reliable connection
- Easy access over test points

Local human interface

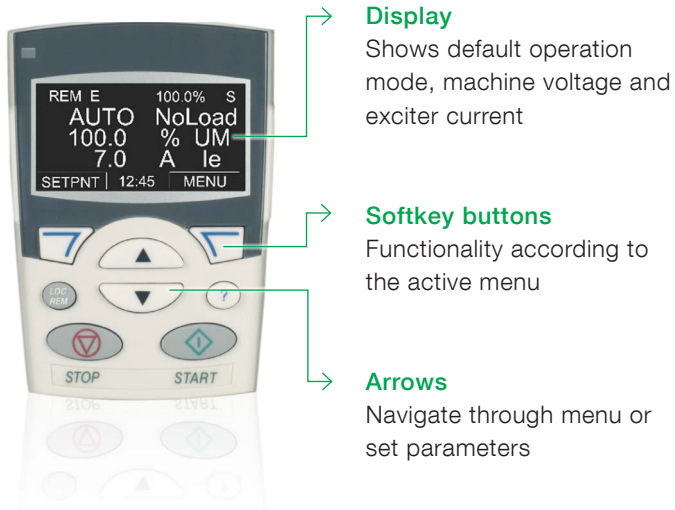
- Intuitive local control panel for indication of AVR status, active limiters and measurements
- Local control can be taken over to change parameters

Analog and digital inputs and outputs, serial fieldbus

Tension spring connectors allow reliable wiring and fast replacement.



Local human-machine interface provides immediate data on AVR status.



The UNITROL 1000 family has freely configurable measurement and analog or digital I/Os. The configuration is done via the local human-machine interface or CMT1000 software.

Power terminals

- 3 phase excitation power input
- 3 phase auxiliary power input (control power supply)
- Excitation output

Measurement terminals

- 3 phase machine voltage
- 1 phase network voltage
- 1 phase machine current

Analog I/O

- 2 outputs / 3 inputs (configurable)
- +10 V / -10 V references output

Digital I/O

- 4 inputs only (configurable)
- 8 inputs / outputs (configurable)
- 24 V output (600 mA) for external relay

Serial fieldbus

- RS485 for Modbus RTU or VDC communication
- CAN for dual channel communication

UNITROL 1010 is a compact device with limited functionality and is designed for excitation currents up to 10 A nominal. It supports the same interfaces and has the same mechanical footprint as UNITROL 1020.



UNITROL 1000-PM40 is the power module that extends the output current of the UNITROL 1020 up to 40 A.



Control software

The UNITROL 1000's software has all the functions necessary for modern excitation systems. ABB offers three software-function packages out of the shelf.

LIGHT

The **LIGHT** version covers essential functionality for cost sensitive applications where limited software functionality is required.

- Regulator control modes: Bumpless transfer between all modes
 - Automatic voltage regulator (AVR)
 - Field current regulator (FCR)
 - Power factor regulator (PF)
 - Reactive power regulator (VAR)
- Limiters: Keeping synchronous machines in a safe and stable operation area
 - Excitation current limiter (min. / max.)
 - PQ minimum limiter
 - Machine current limiter
 - V / Hz limiter
 - Machine voltage limiter
- Soft start
- Voltage matching

BASIC

The **BASIC** version covers all functionality of **LIGHT** in addition to the following:

- Modbus TCP
- Rotating diode monitoring
- Analog input to PID summing point for super imposed regulator.
- VDC mode: Reactive load sharing for up to 31 machines in island operation.
- Dual channel / monitoring: Enables the dual channel operation based on self diagnostics and setpoint follow up over CAN communication.

Available software packages:

	Software function	UNITROL 1010	UNITROL 1020
LIGHT	AVR / FCR / PF / VAR	LIGHT	LIGHT
	Limiters		
	Soft start		
	Voltage matching		
BASIC (Configurable SW)	Modbus TCP	BASIC	BASIC
	Rotating diode monitoring		
	Input for closed loop control		
	VDC mode		
	Dual channel / monitoring		
FULL (Configurable SW)	Synchronization	BASIC + SYNCHRONIZATION	BASIC + SYNCHRONIZATION
	Event logger		
	Data logger		
	Real-time clock		
OPTION	Power system stabilizer (PSS)	FULL + PSS	FULL + PSS

FULL

The **FULL** version covers all functionality of **BASIC** in addition to the following:

- Synchronization: Fast and reliable built-in synchronizer.
- Event logger: Up to 500 events are stored in a non-volatile memory.
- Data logger: A data log of 12 signals is saved automatically in the non-volatile memory.
- Real-time clock: For accurate time stamped events and data logs.

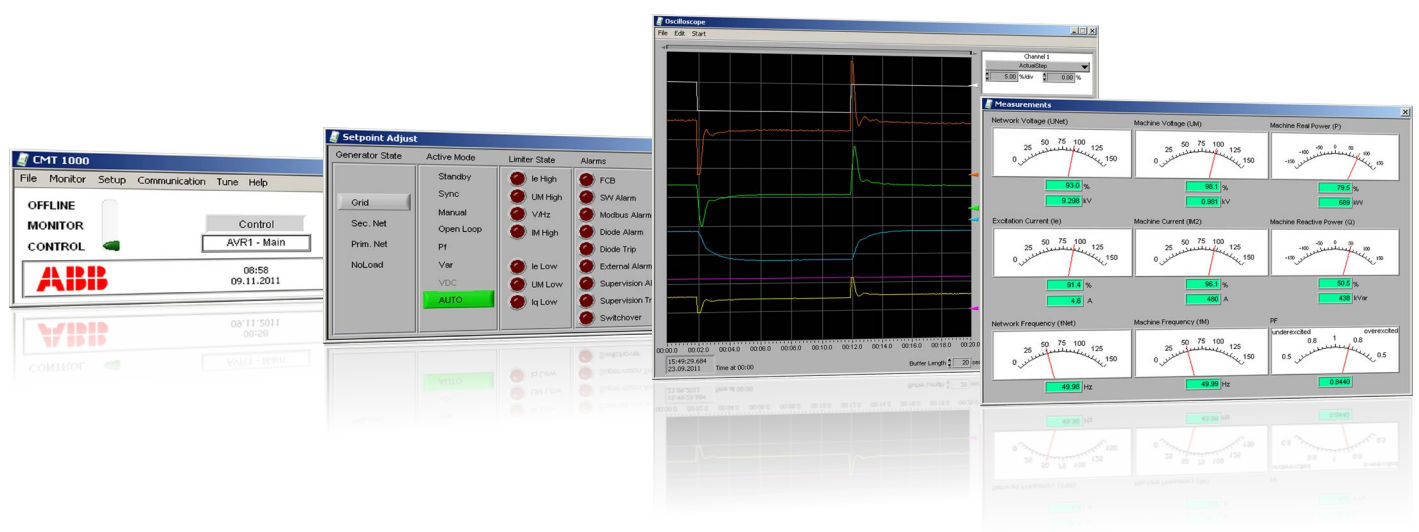
Power system stabilizer (PSS)

The **FULL** software version can be complemented with the power system stabilizer function. Compliant with the standard IEEE 421.5-2005 2A / 2B, the PSS improves the stability of the generator over the highest possible operation range.

Commissioning and maintenance tool CMT1000

CMT1000 is a commissioning and maintenance tool for the UNITROL 1000 product family. The tool is used to setup all parameters and tune the PID to guarantee stable operation. The CMT1000 software allows an extensive supervision of the system, which helps the user to identify and locate problems during on-site commissioning.

The CMT1000 is connected to the UNITROL 1000 via USB or Ethernet port, where Ethernet connection allows remote access over 100 meters.



Main window

- Indication of access mode and device information.
- Change of parameter is only possible in CONTROL access mode.
- LED symbol indicates that all parameters are stored on non-volatile memory.

Setpoint adjust window

- Overview of all control modes, alarms, generator and active limiters status.
- Set point adjustment and application of steps for tuning of the PID.

Oscilloscope

- 6 signals can be selected out of 20 recorded channels.
- The time resolution is 50 ms.
- Files can be saved to PC for further investigation.

Measurement

- All measurements on one screen.

Technical data and order codes

UNITROL 1010/UNITROL 1020

Power electronic input

AC input voltage 3-phase (max., sinusoidal)	0 to 300 V _{AC}
DC input voltage (max.)	0 to 420 V _{DC}
Max. peak input voltage (not sinusoidal)	420 V _p

Voltage regulation

Accuracy at 25 °C	0.2 %
AVR response time (3-phase meas.)	< 20 ms
AVR response time (1-phase meas.)	< 50 ms
PWM limitation	0.5 to 99 %

Excitation output UNITROL 1020

Continuous output current (40 °C)	20 A _{DC}
(55 °C requires an external capacitor)	
Continuous output current (55 °C)	15 A _{DC}
Overload current for 10 sec. (55 °C)	40 A _{DC}

Excitation output UNITROL 1010

Continuous output current (55 °C)	10 A _{DC}
Overload current for 10 sec. (55 °C)	20 A _{DC}

Auxiliary supply (controller) input

AC input voltage 3-phase (max., sinusoidal)	9 to 300 V _{AC}
AC input voltage 1-phase (max., sinusoidal)	16 to 300 V _{AC}
DC input voltage (max.)	18 to 420 V _{DC}
Max. peak input voltage (not sinusoidal)	420 V _p

Exciter current measurements

Full range	0 to 40 A
Accuracy	< 1 %
Resolution	< 100 mA

Measurements

Machine voltage, 1, 2 or 3 phase	up to 500 V _{AC}
Machine current, 1 phase	1 to 5 A _{AX}
Network voltage, 1 phase	up to 500 V _{AC}
Frequency range	10 to 150 Hz
Accuracy	< ± 1 %

24 V digital I/O, 4 inputs, 8 I/Os

Digital input impedance	< 2 kΩ
Digital input threshold (low / high)	5 V / 13 V
Digital output, max. output current	150 mA

±10 V analog I/O, 3 inputs, 2 outputs

Analog inputs impedance	< 240 kΩ
Analog output impedance	100 Ω

Communication interfaces

Ethernet (cable length < 100 m)	10 / 100 MBit/s
USB version (cable length < 3 m)	1.0; 1.1; 2.0
RS485 data rate (cable length < 500 m)	Configurable
CAN (cable length < 3 m)	Only for connections between UNITROL 1000 devices (UNITROL 1000-PM40 or dual channel configuration)

Environmental data

Permissible ambient temperature	-40 to 70 °C
Maximum heat sink temperature	90 °C

Mechanical stability

Vibration, IEC 60068-2-6	DNV class B
Shock and bump, IEC 60255-21-2	Class 2
Seismic, IEC 60255-21-3	Class 2

EMC standards

Generic immunity standard EN 61000-6-2	
Generic emission standard IEC 61000-6-4	

Certifications

CE certification	
cUL certifications according	
UL 508c (compliant with CSA)	
DNV certification according class B	

UNITROL 1000-PM40

Power electronic input

AC input voltage 3-phase (max.)	0 to 250 V _{AC}
DC input voltage (max.)	0 to 300 V _{DC}
Absolute max. peak input voltage	350 V _p

Excitation output UNITROL 1000-PM40

Continuous output current (55° C)	40 A _{DC}
Overload current for 10 sec. (55° C)	80 A

Order codes

UNITROL 1010

UNITROL 1010-0002 LIGHT	3BHE035301R0002
UNITROL 1010-0003 BASIC	3BHE035301R0003
UNITROL 1010-0004 BASIC + SYNC	3BHE035301R0004

UNITROL 1020

UNITROL 1020-0003 BASIC	3BHE030579R0003
UNITROL 1020-0004 BASIC + SYNC	3BHE030579R0004
UNITROL 1020-0006 FULL	3BHE030579R0006
UNITROL 1020-0007 FULL + PSS	3BHE030579R0007

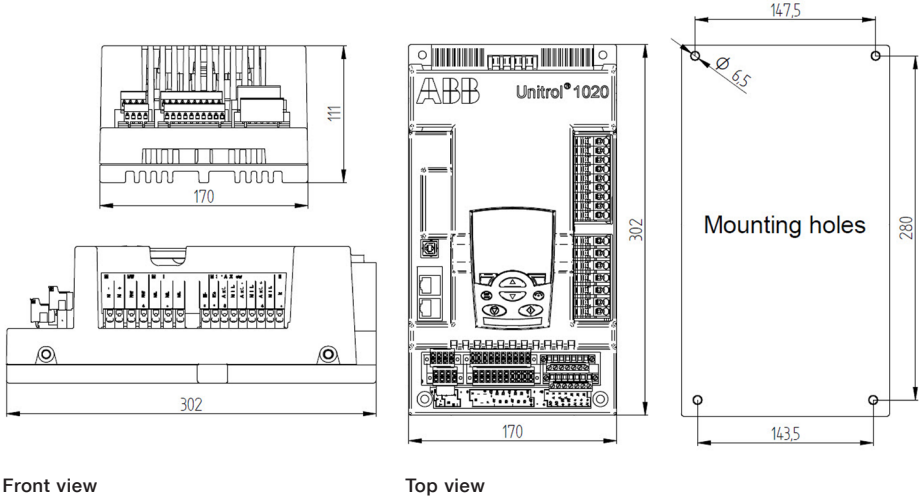
UNITROL 1000-PM40

UNITROL 1000-PM40	3BHE015411R0001
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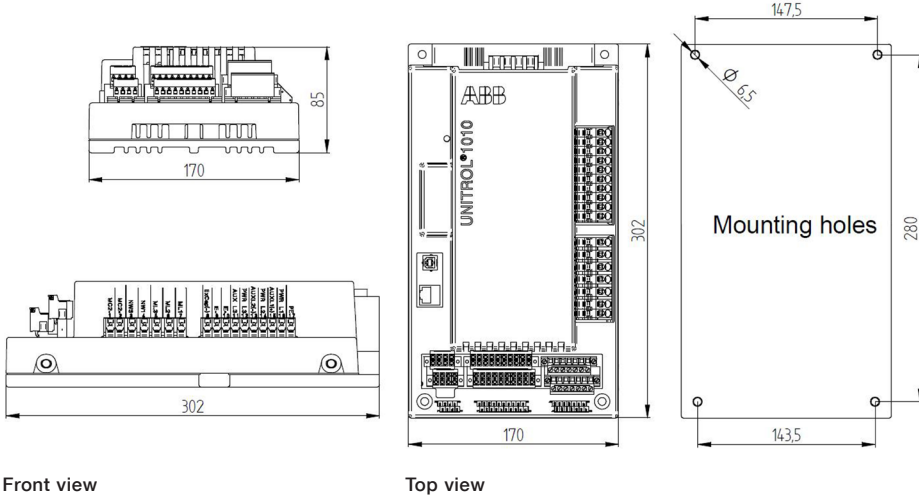
Devices are shipped with a CD containing a CMT1000 commissioning and maintenance tool, a production test certificate and manuals.

Mechanical dimensions

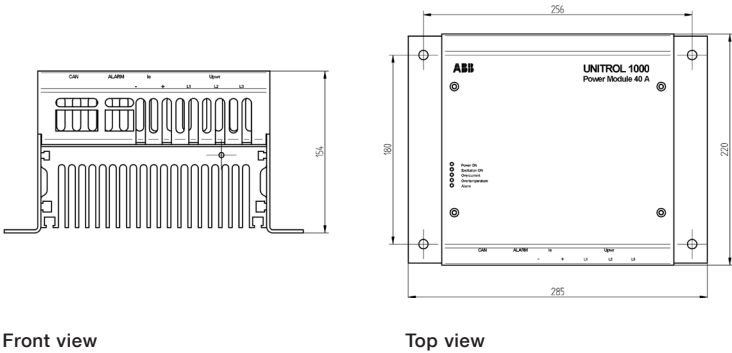
UNITROL 1020



UNITROL 1010



UNITROL 1000-PM40



Grid codes and UNITROL 1000 systems

Grid codes

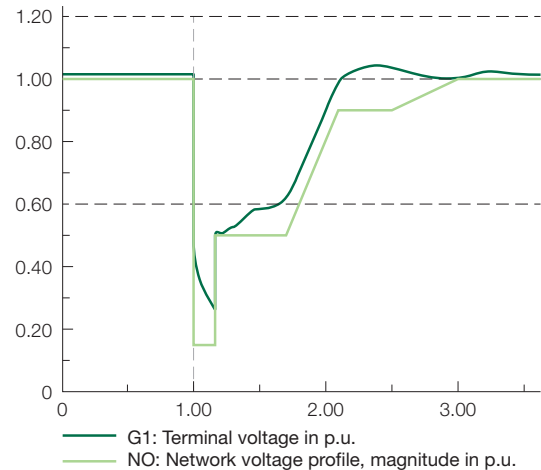
Built-in power system stabilizer and fast detection of voltage dips are prerequisites to meet any grid codes.

ABB provides detailed computer representation of internal control algorithm and IEEE models for system simulations.

In addition, ABB provides several levels of service:

- Calculation of PSS parameter
- Simulations of reference step responses
- Stability simulations for various different network conditions

ABB provides detailed questionnaires and provides results in a report.



Example of fault ride through defined grid code. ABB offers grid code compliant studies in order to prove stability under all circumstances.

UNITROL 1000 systems

ABB provides over 100 years of experience in building project specific engineered systems for any applications.

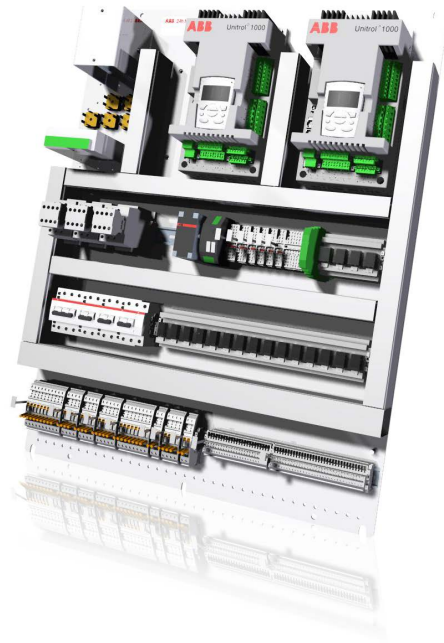
ABB offers various systems depending on the need of the customer:

- Single channel systems
- Dual channel systems
- Mounting on a plate or in a cubicle

Systems include protection breaker and exciter field breaker. They are fully tested in the ABB factory and AVR setting can be ordered preset.

Ask our expert for more information about:

- Variable speed applications
- Multiple power input sources
- Synchronization of your machine
- I/O extension with external programmable logic controller over field bus



3D model of dual-channel system on a mounting plate.

Service and support

For life cycle management or technical support, the worldwide network of UNITROL specialists is at your service.

Installation and commissioning

The professionalism, extensive experience and multilingual skills of ABB's engineers ensure a satisfactory installation and commissioning.

Training

ABB university offers standard and customized training courses for UNITROL excitation systems. On-site training options are also available. For a detailed training program, visit www.abb.com/abbuniversity

e-Learning

With the UNITROL 1000 interactive e-learning program you decide where and when you learn. The program covers general excitation knowledge as well as detailed product handling know-how.

UNITROL 1000 global support organization

A team of qualified engineers located in different ABB organizations worldwide are ready to support you with your most challenging enquiries and application requirements.

Life cycle management

ABB's excitation systems life cycle management model helps the customers to extend and maximize the life cycle of their assets at minimum costs. Depending on the product's life cycle phase, the service specialists recommend necessary actions and approach the clients pro-actively to inform them on all maintenance, service and upgrade necessities.

Examples of life cycle services:

- Technical support for optimized reliability
- Spare parts delivery
- Preventive and corrective maintenance
- Upgrade and modernization



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