

# Digital On-Load Tap-Changer Voltage Controller

## Information Sheet





## Base Model

### TAPCON® 250 at a glance

- Clear and well-arranged 128 x 128 dot multi-graphic display

At a single glance multiple lines of continuous information is displayed:

- Actual voltage measured
- Set reference voltage level
- Variance between the actually measured and set voltage for comparison
- Actual tap position
- Status line showing certain events
- Visible bar graph during timing events
- Visible graphic of actual voltage in relation to set reference voltage and its bandwidth
- Several LED's for indication of events/mode/status and for random assignment

⇒ **No need for additional displays in the switching cabinet.**



- Four (4) independent and adjustable voltage levels are available to regulate during either voltage reduction or increase events as needed for the power system. These are selectable simply by a DC signal to the TAPCON®.
- Regulation settings such as bandwidth, undervoltage and overvoltage can be set in either a percentage or an absolute value.
- Plug-and-play with NORMset  
Thanks to the MR standard function called NORMset, a reference voltage level and the potential transformer ratio are the only two parameters required. The software takes care of all the rest.
- Simple and straightforward menus to navigate
- Measured value memory, peak value memory, record function  
The time characteristic of a measuring-circuit voltage is recorded in a separate measured value memory and can be recalled either via display or PC using the visualization software.



*Measured value memory (optional)*

- Line Drop Compensation with R & X compensation or Z compensation
- Status-Alarm output and programmable alarm output
- Programmable Switch Status Input
- Several status inputs, e.g. auto inhibit or counter contact
- RS232 DB9 communications port on the front panel
- Windows based PC visualization software TAPCON®-trol System is provided with every controller to recall measured and calculated data as well as set parameters
- *Standard alternative external 12VDC power supply input* for continuous operation during an AC power outage



## Technical Details

	Range
Power supply	AC 85...140 V (45 ... 65 Hz)
	DC 12 V
	Power consumption 6 VA ... 12 VA (depending on extensions)
Protective housing	5.81 x 8.5 x 3.08 " (W x H x D) (147.6 x 216 x 78.2 mm) Weight approx. 6.2 lbs (2.8 kgs)
Operating temperature*	- 13° F...+158° F (- 25° C...+70° C)
Storage temperature	- 40° F...+185° F (- 40° C ...+85° C)
Reference voltage level	100...135 V
Bandwidth	±0.5...±9%
Delay time T1	1...600 s
Delay time T2	1...60 s
Switching pulse duration	0...10 s
LDC	Ur = 0...±25 V
	Ux = 0...±25 V
Z compensation selection	Voltage rise 0...15 % of reference voltage level Limitation 0...15 % of reference voltage level
Undervoltage blocking	95...135 V
Overvoltage detection with high speed return control (interruptible)	100...140 V
Overcurrent blocking	50...210%
Voltage transformer	0.1...999.0 kV / 120 V
Current transformer	1 ... 10,000 A / 0.2 A
* extended temperature range on demand	

Pushbuttons	Raise / Lower
	5 Menu keys
	5 Function keys
Display	Monochromatic display with graphics capabilities, 128 x 128 dot
	1 LED lamp (green) for operating status
	1 LED lamp (yellow) for signalling, "parallel operation active" status
	1 LED lamp (red) each for signalling U<, U>, I>
	1 LED lamp (green) for signalling "NORMset active" status
	3 LED lamps (yellow) for random assignment
	1 LED lamp (yellow / green / red) for random assignment
	RAISE command with green LED indication
	LOWER command with green LED indication
	REMOTE mode with green LED indication
MANUAL mode with green LED indication	
AUTO mode with green LED indication	

## Communications

The communication interface module (CI-module) of the TAPCON®250 enables the controller to communicate via different SCADA protocols. You can also set the CI-module to "no protocol" so that the controller settings can be managed via the TAPCON-trol System visualization software and the CI-module interfaces.

For better flexibility the CI-module was designed as a plug-in module with the possibility of a future upgrade of the controller even in the field.

The following interfaces are available:

- RS232 (DB-9 connector)
- RS485 (3-pin Phoenix connector)
- Ethernet or Modem (optional, RJ45 connector)
- Optical fiber (optional, FH-ST connector)

Per default the CI-module is equipped with two different SCADA protocols

- DNP3.0
- MODBUS RTU & ASCII

Communication protocols to all renowned manufacturers of operation control systems can be supported on demand.



*Communication Interface (optional)*

## Analog Interface

The TAPCON®250 can be equipped with an analog interface module (AI-module) for the purpose of a positive tap-changer position input information. Furthermore an answer to many utilities needs today is now available in the TAPCON®250: a selectable milliamp current signal output (0...1mA or 4...20mA) of tap-changer position for the utility's use with the substation conditions.

The tap-changer position can be an input of either a potentiometer from the motor drive or a generated milliamp current signal directly into the TAPCON®250 controller.

For a failure indication the AI-module has a built-in sensor break detection when set to 4...20 mA current loop output.

Available *tap position input* selections (set by MR):

- Potentiometer (100 Ohms ... 2 kOhms)
- 0...1 mA current loop
- 0...20 mA current loop

Available *tap position output* selection (user-selectable):

- 0...1 mA current loop
- 4...20 mA current loop



*Analog Interface (optional)*



## Paralleling

The TAPCON®250 is the **perfect solution** for upgrading both today's and past control schemes:

- Paralleling of power transformers - these schemes can be simplified and finally understood straightforwardly with the TAPCON® series of controllers.
- The past difficult CT wiring schemes between transformers for minimum circulating current method of paralleling is no longer required. Major cost savings during installation and operation are available to the end-user when paralleling the TAPCON® 250 controllers directly via CAN bus.
- A choice of paralleling methods is available in the TAPCON®250 as either "minimum circulating reactive current" or "master/follower" simply via menu selection.
- One of the options available is system topology detection in a multiple bus bar system. In that case, the regulators will detect automatically which of the transformers are engaged in parallel operation.
- The implementation of a CAN-bus paralleling system allows parallel control without an additional control device.
- TAPCON® 250 can parallel multiple transformers in several combinations:
  - TAPCON®250 to TAPCON®250 directly via CAN-bus communication (MR technology)
  - TAPCON®250 to TAPCON® series controllers directly via CAN-bus communication (MR technology)
  - TAPCON®250 with TAPCON®-XPA to TAPCON®250 with TAPCON®-XPA (ANSI scheme)
  - TAPCON®250 with TAPCON®-XPA to other manufacturers' ANSI scheme controllers with parallel balancing modules and AC relays.
- TAPCON®-XPA is an eXternal Paralleling Assistant allowing the CT circuits from other AVRs driven by ANSI to be properly connected and measured in the ANSI scheme. A CAN-bus connection is made from the XPA to the TC250. The TAPCON®-XPA offers the combined features of both parallel balancing module and AC relay found in other control schemes.
- Available paralleling selections:
  - Master = Master/Follower principle: the controller assumes Master function
  - Follower = Master/Follower principle: the controller assumes Follower function
  - Auto-Synchronisation = Master/Follower principle: with this setting, the controller with lowest CAN address of all other regulators is automatically selected as Master.
  - Circulating reactive current = parallel operation following the current principle of minimum circulating reactive current with controllers directly connected via CAN bus
  - XPA = parallel operation with the TAPCON®-XPA, eXternal Paralleling Assistant, following the principle of minimum circulating reactive current with CT circuits connected between power transformers





## Adapter Panels

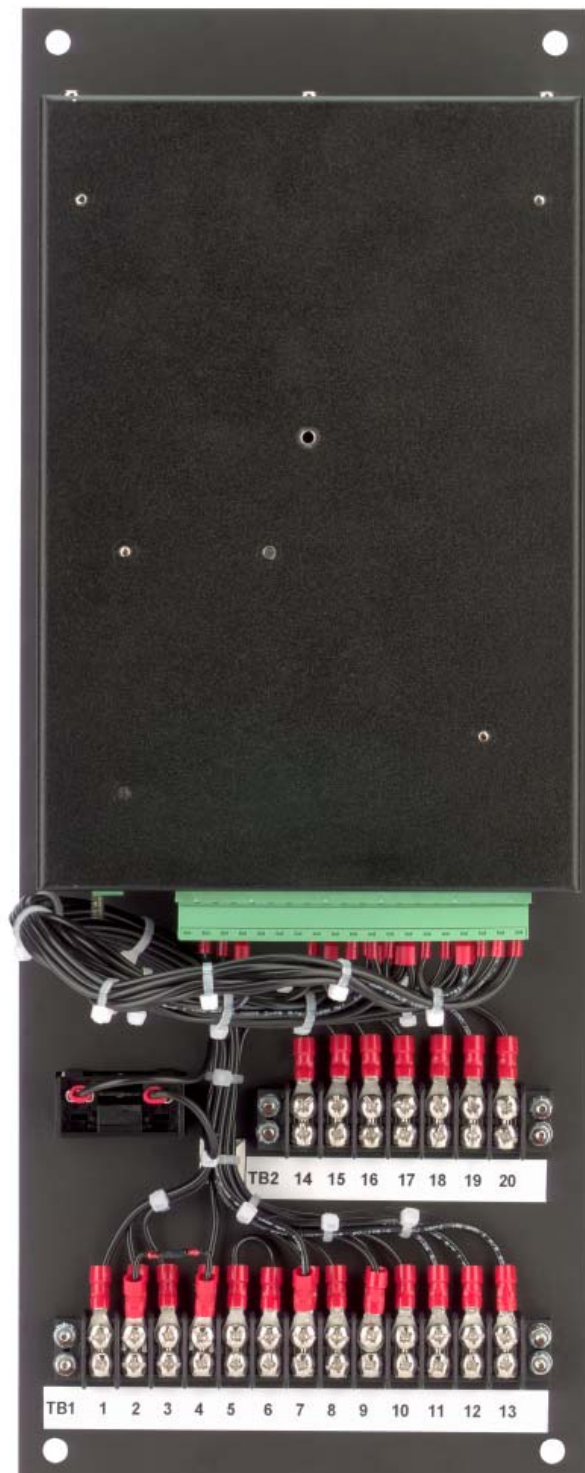
### Adapter Panel TC250-67

The first available adapter panel for the TAPCON®250 allows the controller to easily retrofit other manufacturers' controls. It is also a perfect choice for new general-purpose transformer applications.

The TC250-67 can quickly be connected to the TAPCON®250 with two 19-pin connectors and four mounting screws.



Adapter Panel (front view)



Adapter Panel (back view)



TC250-67



