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1 Safety

1.1 Safety labels
The following safety labels relating to the operation of the TAP-CON® 250 are used in these operating instructions. These labels must be observed at all times!

<table>
<thead>
<tr>
<th><img src="image1" alt="Danger!" /></th>
<th><strong>DANGER!</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Refers to an <em>imminent danger</em> that may result in death or severe injury.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><img src="image2" alt="Warning!" /></th>
<th><strong>WARNING!</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Refers to a <em>potentially hazardous situation</em> that may result in death or severe injury.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><img src="image3" alt="Caution!" /></th>
<th><strong>CAUTION!</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Refers to a <em>potentially hazardous situation</em> that may result in slight injury or material damage.</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th><img src="image4" alt="Note!" /></th>
<th><strong>NOTE!</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Contains important information and special notes.</td>
</tr>
</tbody>
</table>

The following specific safety warnings are used in these operating instructions:

- **Risk of electric shock!**
- **Fire hazard!**

1.2 Safety instructions
- **All warnings and safety instructions must be observed at all times!**
  Danger of death and risk of injury! Not following the safety instructions may lead to accidents and severe personal injury.
- **Please read these operating instructions before commissioning the equipment!**
  Read the operating instructions before commissioning the TAPCON® 250.
  As operator, you are responsible for ensuring that users of the equipment have fully understood the operating and safety instructions.
- **Always connect the TAPCON® 250 to an electrical ground!**
  To avoid shock hazard, the chassis must be connected to an electrical ground. When servicing the TAPCON® 250 in a test area, the protective earth terminal must be attached to a separate ground securely by use of a tool since it is not grounded by external connectors.
• Only suitably qualified personnel should work at the TAPCON® 250!

The TAPCON® 250 contains high voltages which can cause serious injury or death! It is designed exclusively for application in electrical or energy systems and facilities operated by appropriately trained staff who are familiar with the installation, operation and maintenance of such products.

Exercise due care when operating or servicing alone.

• Do not operate the TAPCON® 250 in an explosive environment!

Do not operate this equipment in the presence of flammable or explosive gases or fumes. To do so would risk a possible fire or explosion.

• Keep away from live circuits!

Operating personnel must not remove the cover or expose the printed circuit board while power is applied. Dangerous voltages may exist even when power is disconnected. To avoid electrical shock, always disconnect power and discharge circuits before working on the unit.

• Do not modify the TAPCON® 250!

Do not perform any unauthorized changes on the TAPCON® 250. Contact Reinhausen Manufacturing regarding any modification. If authorized modifications are to be attempted, be sure to follow replacement procedures carefully to assure that safety features are maintained.

• Avoid static charge!

The TAPCON® 250 contains MOS circuitry which can be damaged by improper test or rework procedures. Avoid static charge on work surfaces and service personnel.

• Use extreme caution during any diagnostic work!

Any attempt to perform any diagnostic work or connection between points on the printed circuit board, unless services noted in the Operating Instructions is likely to cause damage or permanent failure to the TAPCON® 250.
2 General

2.1 Foreword
These operating instructions relate to the TC250-ME adapter panel for Reinhausen’s voltage controller TAPCON® 250. They describe the necessary connections for electronic voltage regulation of tap changers in power transformers. Please read these instructions before commissioning the TC250-ME adapter panel together with the TAPCON® 250. The operator is responsible for ensuring that users of the device have fully understood the operating and safety instructions. More comprehensive information about the configuration and operating principle of the voltage controller along with settings for special applications can be found in the following document: Operating instructions BA297 “Digital On-Load Tap-Changer Voltage Controller TAPCON® 250”.

2.2 Manufacturer
The voltage controller TAPCON® 250 is manufactured by:
Reinhausen Manufacturing Inc.
2549 North 9th Avenue
Humboldt, Tennessee 38343, USA

Phone: (+1)731/784-7681
Fax: (+1)731/784-7682
Email: reinhausen@bestltc.com

Further copies of these operating instructions are available from the above address, if required.

2.3 Warranty and Liability
Warranty and liability claims for personal injury or damage to property are excluded, if they were caused by one or more of the following:
- Inappropriate use of the TC250-ME.
- Improper commissioning and operation of the TC250-ME.
- Operation of the TC250-ME with safety equipment that is faulty, or with safety or protection equipment that is installed incorrectly or non-functioning.
- Non-adherence to the notes in the operating instructions with regard to installation, commissioning and operation of the TC250-ME.
- Unauthorized modification of the TC250-ME.

The adapter panel TC250-ME is offered with an extended warranty.

2.4 Specified Application
An adapter panel or a surface mounting kit must be used with the TAPCON® 250. Each panel adapts the TAPCON® 250 as a transformer control replacement and provides the external connections necessary for operation via terminal blocks on the rear of the adapter panel. The adapter panel TC250-ME in combination with the TAPCON® 250 voltage controller is used for automatic control of transformers with motor-driven tap-changers. The motordrive mechanism receives the corresponding control signals from the voltage controller. With these signals, the tap-changer moves to the next position and the transformer's voltage value is adapted to the preset reference voltage level.
The TC250-ME is a special purpose adapter panel designed for mounting on an existing Pennsylvania McGraw Edison tap-changer controller chassis manufactured after 1978. The 10.125" x 15.0" x .6875" panel mounts via the pre-existing hinge hardware with the four slotted screw holes provided.

Figure 1 McGraw Edison Controller

For further information on
- TAPCON®250
- Analog Input/Output Module
- Communication interface card
- Adapter Panels
please contact Reinhausen Manufacturing or www.tapcon250.com.
2.5 Features of the TC250-ME adapter panel

The TC250-ME adapter panel comes equipped with the following standard features:

- A voltage input fuse block with a 300 mA fuse (and a spare fuse in the fuseholder) to protect the controller's input.
- Voltage Test Terminal (VTT) binding posts. NOTE**Do not input voltage at these terminals unless an EXTERNAL switch has isolated the VTT from the potential transformer connections.

Optional/Application Specific Features:

- INTERNAL/EXTERNAL selector switch for selecting the panel's VTT functionality. If the switch is in the EXTERNAL position, the VTT point is isolated from the potential transformer input and can be used to input an 85 to 140 VAC (45...65 Hz) test voltage.
- LOCAL/REMOTE selector switch for indicating to the controller whether the controller is in local or remote mode (communications control active).
- AUTO/MANUAL selector switch for indicating to the controller whether the controller should be in automatic (controller active) or manual (controller doesn’t perform raise or lower commands) operation mode.
- MANUAL LOWER-OFF-RAISE momentary selector switch used to give manual lower or raise signals.
- PARALLEL/INDEPENDENT selector switch for activating parallel with a compatible device.
- DRAG HANDS RESET switch
3 Commissioning

3.1 Removal of existing assembly
1) Begin by removing voltage from the transformer or terminals 10 and 29 on the existing chassis.
2) Remove the wingnut or screw on the sliding hinge.
3) Remove and save the knob from the door and swing the door open.
4) **VERY IMPORTANT!!**
   Short the LDC CT before the current reaches the control. Failure to do so may result in severe injury or death.
5) Remove all wire connections on the outsides of the terminal blocks. If a parallel balancing module was previously used, remove the module and any wires connected to the regulator chassis. These terminal points are normally 284, 285, and 287. All other connections on the inside of the terminal blocks should remain undisturbed.
6) Remove all connections to RCT-1, RCT-2, and APT.
7) Remove the six-point terminal block location on the right side wall of the existing chassis.
8) Swing the existing panel open and remove the panel from the chassis by detaching the hinges from the panel. Be sure to save the hinges for installation of the TC250-ME panel.

3.2 Installation of TC250-ME Adapter Panel
1) Begin by using the hinges that were saved from the existing panel to mount the TC250-ME panel to the existing chassis. Please note that if a REMOTE/LOCAL Switch is present, its contact block may need to be removed to easily mount the upper hinge.
2) Using the supplied hardware in conjunction with the screws saved earlier, mount the new 8.66/5A:0.2A ACT in place of RCT-2 and RCT-1.
3) Replace the wingnut on the sliding hinge.
4) Mount the TAPCON®250 to the TC250-ME adapter panel with the hardware provided.
5) Make the electrical connections as described in the following sections.
6) Restore voltage to terminal block points 10 and 29.
7) Remove the short from the LDC CT to allow for current flow into the ACT and TAPCON®250.
8) If paralleling is desired, connect the CAN bus of the TAPCON®250 as described in the operating instructions BA 297.
9) Fasten the new panel closed by using the knob saved during the removal of the old panel.

3.3 Connection
Connect the voltage controller in accordance with the wiring diagram (see Figure 2) and according to the wiring diagram of the respective motor drive. Please note that Figure 2 shows the general connection of the TC250-ME adapter panel. If you have acquired a TC250-ME adapter panel that does not contain all of the shown features, your TC250-ME connections may be different. In general, the voltage controller is operated by the measurement voltage of 85...140 VAC on pin P2.1 (Line) and pin P2.3 (Neutral). The terminal connections to P1, P2 and P3 should be made with a #12 - #24 AWG Copper wire preferably in a TYCO/AMP #131331 type (or equivalent) ferrule and 4.5 lb.-in. (0.5 N-m) tightening torque.

The voltage controller alternatively accepts an external +12 VDC/1A power supply on terminal P3 (P3.1 = polarity, P3.2 = return) for continuous operation during an AC power outage.

The TAPCON® 250 was developed in compliance with the relevant EMC standards. The following instructions must be observed to ensure preservation of the EMC properties:

- Ensure proper grounding of the TAPCON® 250 by means of the chassis ground screw attached to the housing.
- Be sure to use only shielded cables for the data links from the TAPCON® 250 to other equipment.
- Refer to the Operating Instructions BA 297 provided separately for wiring details if needed.

**WARNING!**
Risk of electric shock!
Ensure that the voltage controller is connected and the housing grounded with due care.

**NOTE!**
Pay attention to the correct phase angle of the secondary terminals of current transformer and voltage transformer. Ensure correct connection of the output relays to the motor drive unit.
Figure 2  TC250–ME wiring diagram