APPLICATION

The MRU4 is a protection relay which uses the latest Dual-Core-Processor Technology to provide precise and reliable protective functions and is very easy to operate. It is designed to protect electrical equipment from dangerous voltage fluctuations. For example protection against under voltages caused by mains shortcircuits, or overvoltages due to load shedding or failure of a generator voltage controller. Its compact design makes the MRU4 ideal for installation within the LV terminal compartments of compact SF6-insulated MV systems.

ALL INCLUSIVE:
- All protection features inclusive
- Parameter setting software
- Disturbance analysis software

COMPREHENSIVE FREQUENCY PROTECTION PACKAGE
Each of the six elements can be used as:
- \( f_\mathrm{<} \) or \( f_\mathrm{>} \) (over- and underfrequency supervision)
- \( df/dt \) (ROCOF)
- Rate of change of frequency
- \( (f_\mathrm{<} \text{ and } df/dt) \) or \( (f_\mathrm{>} \text{ and } df/dt) \)
- Combination of over-, under- and rate of change of frequency (ROCOF)
- \( (f_\mathrm{<} \text{ and } DF/DT) \) or \( (f_\mathrm{>} \text{ and } DF/DT) \)
- Combination of over-, under- and increase of frequency
- Delta Phi (Vector surge)

SIX ELEMENTS VOLTAGE PROTECTION
- Under- and overvoltage
- Programmable time dependent undervoltage tripping characteristic

SLIDING-MEAN-SQUARE SUPERVISION
- Adjustable (VDE-AR 4105)

FRT (LRVT)
- Adjustable LVRT-profiles
- Optionally AR-controlled

FLEXIBLE FOURTH VOLTAGE MEASURING INPUT
- 2 elements VE> or VX (for Synch Check)

SYNCH CHECK
- Generator-to-System, System-to-System
- Options to switch onto dead bus bars

TWO ELEMENTS RESIDUAL VOLTAGE PROTECTION
- VE>

SIX ELEMENTS VOLTAGE ASYMMETRY SUPERVISION
- Under- and overvoltage in positive phase sequence system, overvoltage in negative phase sequence system

POWER QUALITY
- THD-protection

SUPERVISION
- Voltage transformer supervision
- Trip circuit supervision
- CBF via position indicators

RECORDERS
- Disturbance recorder: 120 s non volatile
- Fault recorder: 20 faults
- Event recorder: 300 events
- Trend recorder: 4000 non volatile entries

PC TOOLS
- Setting and analyzing software
- Smart view for free
- Including page editor to design own pages

COMMISSIONING SUPPORT
- USB connection
- Customizable Display (Single-Line, ...)
- Customizable Inserts
- Copy and compare parameter sets
- Configuration files are convertible
- Forcing and disarming of output relays
- Fault simulator
- Graphical display of tripping characteristics
- 7 languages selectable within the relay

COMMUNICATION OPTIONS
- IEC61850
- Profibus DP
- Modbus RTU or Modbus TCP
- IEC60870-5-103
- DNP 3.0 (RTU, TCP, UDP)

ADDITIONAL HIGHLIGHTS
- Plausibility checks
- Status display
- Comprehensive measured values and statistics
- Masking of unused functions
- Multi-Password-Level

CONTROL
- one breaker
- Breaker wear

LOGIC
- Up to 80 logic equations for protection, control and monitoring

TIME SYNCHRONISATION
- SNTP or IRIG-B00X
# Functional Overview

### Protective Functions

<table>
<thead>
<tr>
<th>Elements</th>
<th>ANSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>V&gt;, V&lt;, V(t) under- and overvoltage protection, programmable time dependent undervoltage tripping characteristic</td>
<td>6</td>
</tr>
<tr>
<td>FRT (optional coordination with AR-feature)</td>
<td>1</td>
</tr>
<tr>
<td>Synchronism check</td>
<td>1</td>
</tr>
</tbody>
</table>

Each of the six frequency protection elements can be used as:

- f< or f> (over- and under frequency supervision)
- df/dt rate of change of frequency (ROCOF)
- (f< and df/dt) or (f> and df/dt) combination of over-, under- and rate of change of frequency (ROCOF)
- (f< and DF/DT) or (f> and DF/DT) combination of over-, under- and increase of frequency
- Delta Phi (Vector surge)

### Protective Functions

<table>
<thead>
<tr>
<th>Elements</th>
<th>ANSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>VE, residual voltage protection</td>
<td>2</td>
</tr>
<tr>
<td>Voltage asymmetry supervision (V012)</td>
<td>6</td>
</tr>
<tr>
<td>V1, under and overvoltage in positive phase sequence system</td>
<td>6</td>
</tr>
<tr>
<td>V2, overvoltage in negative phase sequence system</td>
<td>47</td>
</tr>
</tbody>
</table>

### ExP, External alarm and trip functions

<table>
<thead>
<tr>
<th>Elements</th>
<th>ANSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>10-Minutes-Mean-Square-Sliding Supervision: adjustable according to VDE-AR 4105</td>
<td>4</td>
</tr>
</tbody>
</table>

### Control and Logic

**Control**: Position indication, supervision time management and interlockings for 1 breaker.

**Logic**: Up to 80 logic equations, each with 4 inputs, selectable logical gates, timers and memory function.

### Supervision Functions

<table>
<thead>
<tr>
<th>Elements</th>
<th>ANSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBF, circuit breaker failure protection (via position indicators)</td>
<td>1</td>
</tr>
<tr>
<td>TCS, trip circuit supervision</td>
<td>1</td>
</tr>
<tr>
<td>VTS, voltage transformer supervision by comparing phase and residual voltages</td>
<td>1</td>
</tr>
<tr>
<td>VTS, fuse failure protection via digital input</td>
<td>1</td>
</tr>
</tbody>
</table>

### THD supervision
FUNCTIONAL OVERVIEW IN ANSI FORM

MRU4

<table>
<thead>
<tr>
<th>Option</th>
<th>Standard</th>
</tr>
</thead>
<tbody>
<tr>
<td>74 TC</td>
<td>27(t)</td>
</tr>
<tr>
<td>LVRT</td>
<td>25</td>
</tr>
<tr>
<td>62 BF</td>
<td></td>
</tr>
<tr>
<td>47</td>
<td>27</td>
</tr>
<tr>
<td>59</td>
<td>59N</td>
</tr>
<tr>
<td>60 FL</td>
<td>78</td>
</tr>
<tr>
<td>81 U/O</td>
<td>81R</td>
</tr>
</tbody>
</table>

- **Fault recorder**
- **Event recorder**
- **Disturbance recorder**
- **Trend recorder**

**Measured and calculated values**
- f, delta phi, V, VE, V1, V2

**APPROVALS**

- Certified regarding UL508 (Industrial Controls)
- Certified regarding CSA-C22.2 No. 14 (Industrial Controls)
- Certified by EAC (Eurasian Conformity)

**CONNECTIONS (EXAMPLE)**

- **COM2**
- **N.C.**
- **COM1**
- **COM3**
- **COM4**
- **COM5**
- **COM6**
- **DO**
- **DO NOT USE**
- **DO NOT USE**

**Type tested (and certified)** regarding IEC60255-1

- Complies with IEEE 1547-2003
- Amended by IEEE 1547a-2014

- Complies with ANSI C37.90-2005
**ORDER FORM MRU4-2**

<table>
<thead>
<tr>
<th>Voltage and Frequency supervision</th>
<th>MRU4</th>
<th>A</th>
<th>0</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version 2 with USB, enhanced communication and user options</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Digital Inputs</strong></td>
<td><strong>Binary output relays</strong></td>
<td><strong>Housing</strong></td>
<td><strong>Large display</strong></td>
</tr>
<tr>
<td>8</td>
<td>6</td>
<td>B1</td>
<td>-</td>
</tr>
</tbody>
</table>

**Hardware variant**  
Standard

**Housing and mounting**  
Door mounting
Door mounting 19” (flush mounting)

**Communication protocol**  

- **Without protocol**: A
- **Modbus RTU, IEC60870-5-103, DNP3.0 RTU | RS485/terminals**: B
- **Modbus TCP, DNP3.0 TCP/UDP | Ethernet 100 MB/RJ45**: C
- **Profibus-DP | optic fiber/ST-connector**: D
- **Profibus-DP | RS485/D-SUB**: E
- **Modbus RTU, IEC60870-5-103, DNP3.0 RTU | optic fiber/ST-connector**: F
- **Modbus RTU, IEC60870-5-103, DNP3.0 RTU | RS485/D-SUB**: G
- **IEC61850, Modbus TCP, DNP3.0 TCP/UDP | Ethernet 100 MB/RJ45**: H
- **IEC60870-5-103, Modbus RTU, DNP3.0 RTU | RS485/terminals**: I
- **Modbus TCP, DNP3.0 TCP/UDP | Optical Ethernet 100 MB/LC duplex connector**: K
- **Modbus TCP, DNP3.0 TCP/UDP | Optical Ethernet 100 MB/LC duplex connector**: L

**Harsh Environment option**  
None

- **Conformal Coating**: A

**Available menu languages (in every device)**  
Standard English/German/Spanish/Russian/Polish/Portuguese/French

*Within every communication option only one communication protocol is usable.

Smart view can be used in parallel via the Ethernet interface (RJ45).

The parameterizing- and disturbance analyzing software Smart view is included in the delivery of HighPROTEC devices.

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**VOLTAGE AND FREQUENCY RELAY**

**Voltage inputs**  
4 (0 – 800 V) with automatic CT Disconnect

**Digital inputs**  
Switching thresholds adjustable via software

**Power supply**  
Wide range power supply  
24 V<sub>AC</sub> - 270 V<sub>AC</sub> / 48 V<sub>AC</sub> - 230 V<sub>AC</sub> (-20/+10%)

**Terminals**  
All terminals plug type

**Mounting**  
Door mounting

**Type of enclosure (Front)**  
IP54

**Dimensions of housing** (W x H x D)  
19” flush mounting: 141.5 mm x 173 mm x 209 mm  
5.571 in. x 6.811 in. x 8.228 in.

Door mounting: 141.5 mm x 183 mm x 209 mm  
5.571 in. x 7.205 in. x 8.228 in.

**Weight (max. components)**  
approx. 2.4 kg

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