APPLICATION

The various protective functions of the MRDT4 are specifically tailored to the protection of two winding transformers. The device offers in addition to the differential protection various communication and backup protection functions. Furthermore the MRDT4 can be used for generator differential protection.

ALL INCLUSIVE:
- All protection features without extra charge
- Parameter setting and evaluation software
- Disturbance record analysis software

TRANSFORMER PHASE DIFFERENTIAL PROTECTION
- Stabilized phase differential protection with transients and C.T. saturation detection
- Various selectable transformer groups
- Zero sequence removal
- Three point slope characteristic
- High set element (non-restraint)

TWO ELEMENTS GROUND DIFFERENTIAL PROTECTION
- Three point slope characteristic
- High set element (non-restraint)

BACKUP PROTECTION
- 4 Elements Overcurrent/short-circuit protection (non-directional)
- 4 Elements Earth fault protection (non-directional)
- Tripping characteristics: DEFT
  ANSI: NINV, VINV, EINV,
  IEC: NINV, VINV, LINV, EINV, RXiDG
  Thermal Flat, IT, I2T, I4T

TWO ELEMENTS UNBALANCED LOAD PROTECTION
- Supervision by definite time or tripping characteristic

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

ADDITIONAL HIGHLIGHTS
- Inrush
- Thermal replica
- Four elements external protection
- Plausibility checks
- Adaptive parameter sets
- Status display
- Masking of unused functions
- Breaker Manager and Breaker wear

COMPREHENSIVE MEASURED VALUES AND STATISTICS
- THD (total harmonic distortion)
- Current phasors and angles
- RMS and fundamental
- Sequence currents
- Differential currents

TEMPERATURE PROTECTION
- Buchholz (sudden pressure), ext. oil temperature, and aux. temperature protection via digital input
- Temperature measurement via external RTD-box (option)

SUPERVISION
- Current transformer supervision
- Circuit breaker failure protection
- Trip circuit supervision
- Cold load pickup
- Switch onto fault

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)

CONTROL
- Two breakers (or isolators/grounding switches)
- Breaker wear

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

TIME SYNCHRONISATION
- SNTP or IRIG-B00X

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

#### Protective Functions

<table>
<thead>
<tr>
<th>Description</th>
<th>Elements</th>
<th>ANSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Transformer differential protection (2 windings), ( \text{Id} )</td>
<td>1</td>
<td>87T</td>
</tr>
<tr>
<td>Curve with zero point and three settable slopes and highest element ( \text{Id}&gt;&gt; ),</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Inrush stabilisation / detection of 2nd, 4th and 5th harmonics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Restricted earth fault ( \text{idg}, \text{idg}&gt;&gt; ), characteristics similar to 87T</td>
<td>2</td>
<td>87TN</td>
</tr>
<tr>
<td>1, time overcurrent and short circuit protection (non-directional)</td>
<td>4</td>
<td>50P</td>
</tr>
<tr>
<td>Multiple reset options (instantaneous, definite time, reset characteristics according to IEC and ANSI)</td>
<td>4</td>
<td>51P</td>
</tr>
<tr>
<td>( \text{Id}&gt;&gt; ), unbalanced load protection with evaluation of the negative phase sequence currents</td>
<td>2</td>
<td>46</td>
</tr>
<tr>
<td>( \text{TH}2/\text{In} ), inrush detection with evaluation of the 2nd harmonic</td>
<td>2</td>
<td>Inrush</td>
</tr>
<tr>
<td>( \text{TH} ), overload protection with thermal replica for transformers IEC60255-8, alarm and trip threshold</td>
<td>1</td>
<td>49T</td>
</tr>
<tr>
<td>( \text{TH} ), earth overcurrent and short circuit protection (non-directional)</td>
<td>4</td>
<td>50N</td>
</tr>
<tr>
<td>Tremendous reset options (instantaneous, definite time, reset characteristics according to IEC and ANSI)</td>
<td>4</td>
<td>51N</td>
</tr>
<tr>
<td>( \text{I} ), inrush protection and trip functions</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>RTD temperature supervision via optional RTD-Box with 12 sensors</td>
<td>26</td>
<td></td>
</tr>
</tbody>
</table>

#### Control and Logic

Control: Position indication, supervision time management and interlockings for 2 breakers

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

#### Supervision Functions

<table>
<thead>
<tr>
<th>Description</th>
<th>Elements</th>
<th>ANSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \text{CBF} ), circuit breaker failure protection for both circuit breakers</td>
<td>2</td>
<td>50BF</td>
</tr>
<tr>
<td>( \text{TC} ), trip circuit supervision</td>
<td>2</td>
<td>50TC</td>
</tr>
<tr>
<td>( \text{CT} ), current transformer supervision</td>
<td>2</td>
<td>60L</td>
</tr>
<tr>
<td>( \text{CLPU} ), cold load pickup</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>( \text{SOTF} ), switch onto fault</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>( \text{BW} ), breaker wear</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>Non volatile event recorder up to 120 s with 32 samples per cycles</td>
<td></td>
<td></td>
</tr>
<tr>
<td>THD supervision</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### APPROVALS

- Type Approval
- Certified regarding UL508 (Industrial Controls)
- Certified regarding CSA-C22.2 No. 14 (Industrial Controls)
- Certified by EAC (Eurasian Conformity)
- Type tested (and certified) regarding IEC60255-1

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

Complies with ANSI C37.90-2005
FUNCTIONAL OVERVIEW IN ANSI FORM

MRDT4

Typical Configuration

Winding Side 1  Winding Side 2

W1 74TC

W1 50N  W1 50N  W2 50N  W2 74TC

W1 51N  W1 51N  W2 51N

W1 87N  W1 87N  W2 87N

W1 Inrush  W2 Inrush

W1 50  W2 50

W1 51  W2 51

W1 46  W2 46

W1 50BF

49

W2 50BF

Typical Configuration

Switchgear Wear (2 elements)

Fault recorder

Event recorder

Disturbance recorder

Trend recorder

W1 or W2 CLPU

W1 or W2 SOTF

87T

Control

Programmable Logic

Comm Interface(s)

SNTP

IRIG

Current Max/Min/Avg, THD Current, Current Phasors, Sequence Currents, Diff Currents, Harmonic Currents

Metering

49

Inrush

50

50BF

50N

51N

51N

87N

87T

87N

86

Typical Configuration

FunctionAl overview in ANSI form
**ORDER FORM MRDT4-2**

<table>
<thead>
<tr>
<th>Non-directional Transformer Differential Protection</th>
<th>MRDT4 -2</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Version 2 with USB, enhanced communication and user options</strong></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Digital Inputs</th>
<th>Binary output relays</th>
<th>Housing</th>
<th>Large display</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td>7</td>
<td>B2</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>13</td>
<td>B2</td>
<td></td>
</tr>
</tbody>
</table>

**Hardware variants**

- Phase Current 5 A/1 A, W1/W2 Ground Current 5 A/1 A
- Phase Current 5 A/1 A, W1 Sen. Gr. Curr. 5 A/1 A, W2 Gr. Curr. 5 A/1 A
- Phase Current 5 A/1 A, W1 Gr. Curr. 5 A/1 A, W2 Sen. Gr. Curr. 5 A/1 A
- Phase Current 5 A/1 A, W1/W2 Sen. Gr. Curr. 5 A/1 A

**Housing and mounting**

- Door mounting
- Door mounting 19" (flush mounting)

**Communication protocol**

- Without protocol
- Modbus RTU, IEC60870-5-103, DNP3.0 RTU | RS485/terminals
- Modbus TCP, DNP3.0 TCP/UDP | Ethernet 100 MB/RIJ5
- Profibus-DP | optic fiber/ST-connector
- Profibus-DP | RS485/D-SUB
- Modbus RTU, IEC60870-5-103, DNP3.0 RTU | optic fiber/ST-connector
- Modbus RTU, IEC60870-5-103, DNP3.0 RTU | RS485/D-SUB
- IEC61850, Modbus TCP, DNP3.0 TCP/UDP | Ethernet 100 MB/RIJ5
- IEC60870-5-103, Modbus RTU, DNP3.0 RTU | RS485/terminals
- Modbus TCP, DNP3.0 TCP/UDP | Ethernet 100 MB/RIJ5
- Modbus TCP, DNP3.0 TCP/UDP | Optical Ethernet 100MB/LC duplex connector
- Modbus TCP, DNP3.0 TCP/UDP | Optical Ethernet 100MB/LC duplex connector

**Harsh Environment Option**

- None
- Conformal Coating

**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 (RIJ5).

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

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www.woodwardseg.cz

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**Current inputs**

- 8 (1 A and 5 A) with automatic CT Disconnect
- Switching thresholds adjustable via software

**Digital Inputs**

- Wide range power supply
- 24 Vdc - 270 Vdc / 48 Vdc - 230 Vdc (-20/+10%)
- All terminals plug type

**Power supply**

- IP54

**Dimensions of housing**

- (W x H x D):
  - 19" flush mounting: 212.7 mm x 173 mm x 208 mm
  - 8.374 in. x 6.810 in. x 8.189 in.
  - Door mounting: 212.7 mm x 183 mm x 208 mm
  - 8.374 in. x 7.200 in. x 8.189 in.

**Weight (max. components)**

- approx. 4 kg