APPLICATION

The MCDLV4 protection system protects cables and lines up to 24 km. The system is able to replace up to six protection devices.

- 2 Cable and Line Differential Devices
- 2 Directional Feeder Backup Devices
- 1 In-Zone Transformer Differential Device
- 1 Mains Decoupling Device

= 6 devices combined in one system

CABLE AND LINE DIFFERENTIAL

- Protection for cables and lines up to 24 km

DIRECTIONAL FEEDER BACKUP

- Six elements phase overcurrent protection directional and non-directional (ANSI/IEC/51C/51V)
- Four elements earth fault protection (2) non-directional or directional (multi-polaring)
- Two elements unbalanced load protection
- Voltage protection: six elements selectable: V<, V>
- Six elements unbalanced voltage supervision
- Flexible Fourth Voltage measuring input: 2 elements VE> or VX (for synch-check)
- Each of the six elements frequency protection can be used as: f<, f>, ROCOF, vector surge...
- Six elements power protection each can be used as: P>, P<, Pr, Q>, Q<, Qr, S>, S<
- Two elements power factor (PF)

IN-ZONE TRANSFORMER DIFFERENTIAL

- Full Differential Protection for Transformers within the line/cable

INTERCONNECTION/MAINS DECOUPLING

The comprehensive interconnection package is summarized within one menu:
- Non-discriminating active power direction depending load shedding
- FRT (LVRT): Settable FRT-Profiles, optional AR coordinated
- QV-Protection: Undervoltage-Reactive Power protection
- Automatic Reconnection
- Frequency protection:
  - Six elements configurable as f<, f>, df/dt (ROCOF), Vector Surge
  - CB-Intertipping
  - Synch Check (Generator to mains, mains-to-mains), options e.g. to switch onto dead bus
- Transfer Signals and Transfer Trips
  - Up to 16 digital signals and 4 trips can be transferred via the inter-device communication. Copper wiring is not longer required this way.

LOCAl AND REMOTE COMMISSIONING SUPPORT

- USB connection
- Unmanned remote end parameter setting
- Unmanned remote end monitoring
- Unmanned remote end failure analysis
- Customizable Display (Single-Line, ...)
- Customizable Inserts
- Copy and compare parameter sets
- Configuration files are convertible
- Forcing and disarming of output relays
- Fault simulator: current and voltage
- Graphical display of tripping characteristics
- 8 languages selectable within the relay

COMMUNICATION OPTIONS

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

LOGIC

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

RECORDERS

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

IT SECURITY

- Menu for the activation of BDEW-Whitepaper-compliant security settings (e.g. hardening of interfaces)

TIME SYNCHRONISATION

- SNTP, IRIG-800X, Modbus, DNP 3.0, IEC60870-5-103
- Protection Communication

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>Elements</th>
<th>ANSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>87L</td>
</tr>
<tr>
<td>1</td>
<td>87T</td>
</tr>
<tr>
<td>6</td>
<td>50P, 51P, 67P</td>
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<tr>
<td>51C</td>
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<td>51V</td>
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<td>51Q</td>
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<tr>
<td>2</td>
<td>46</td>
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<td>1</td>
<td>49</td>
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<tr>
<td>1</td>
<td>Inrush</td>
</tr>
<tr>
<td>4</td>
<td>50N, 51N, 67N</td>
</tr>
<tr>
<td>6</td>
<td>27, 59</td>
</tr>
<tr>
<td>6</td>
<td>81U/O, 81R, 78</td>
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<tr>
<td>2</td>
<td>25 or 59N</td>
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<tr>
<td>1</td>
<td>79</td>
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<tr>
<td>4</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>32, 37</td>
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<tr>
<td>2</td>
<td>55</td>
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<tr>
<td>27 (t)</td>
<td>27 (t, AR)</td>
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<tr>
<td>1</td>
<td>81U/O, 81R, 78</td>
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<tr>
<td>1</td>
<td>74TC</td>
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<tr>
<td>1</td>
<td>60FL</td>
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<td>60FL</td>
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<td>50BF</td>
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</tbody>
</table>

### Control and Logic

**Control**: Position indication, supervision time management and interlockings for up to 6 breakers

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

### Supervision Functions

<table>
<thead>
<tr>
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<th>ANSI</th>
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<tbody>
<tr>
<td>1</td>
<td>50BF</td>
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<tr>
<td>1</td>
<td>74TC</td>
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<td>8kr</td>
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</table>

### Elements

- Cable and Line differential protection
- In-Zone Transformer differential protection
- I, time overcurrent and short circuit protection, all elements can be configured for directional or non-directional supervision. Multiple reset options (instantaneous, definite time, reset characteristics according to IEC and ANSI).
- Voltage controlled overcurrent protection by means of adaptive parameters
- Voltage dependent overcurrent protection
- Negative phase sequence overcurrent protection
- I2>, unbalanced load protection with evaluation of the negative phase sequence currents
- IB, overload protection with thermal replica and separate pick-up values for alarm and trip functions
- IHZ/In, inrush detection with evaluation of the 2nd harmonic
- IG, earth overcurrent and short circuit protection, all elements can be configured for directional (multi-polarising) or non-directional supervision. Tremendous reset options (instantaneous, definite time, reset characteristics according to IEC and ANSI)
- 6, 50N, 51N, 67N, 51C, 51V, 51Q
- I<, I>, I(t)<, under- and overvoltage protection, time dependent undervoltage protection
- Voltage asymmetry supervision (V012)
- V1, under and overvoltage in positive phase sequence system
- V2, overvoltage in negative phase sequence system
- Each of the six frequency protection elements can be used as: f<, fs, df, dt, ROCOF, DF/DT, vector surge, ...
- VX, residual voltage protection or bus bar voltage for Synch Check
- AR, automatic reclosing
- FRT (optional coordination with AR-feature)
- Q(V) Protection (undervolt. dep. directional reactive power protection)
- Reconnection Module
- LFLS (non-discriminating active power direction depending load shedding)
- 10-Minutes-Mean-Square-Sliding Supervision: adjustable according to VDE-AR 4105
- Synch Check
- V/F (Overexitation)
- Breaker wear with programmable wear curves
- Recorders: Disturbance recorder, fault recorder, event recorder, trend recorder

### ANSI

- 87L
- 87T
- 50P, 51P, 67P
- 51C
- 51V
- 51Q
- 27, 59
- 81U/O, 81R, 78
- 25 or 59N
- 79
- 55
- 27 (t, AR)
- 81U/O, 81R, 78
- 74TC
- 60FL
- 60FL
- 60L
- |
- |
- |
- |
- 8kr
- |

### Released

[www.woodward.com](http://www.woodward.com)
**FUNCTIONAL OVERVIEW IN ANSI FORM**

- Current and Volt: unbalance, %THD and THD, Fund. and RMS, Max/Min/Avg, phasors and angles
- Power: Fund. and RMS, P, Q, S, PF
- Metering, Statistics and Demand
- Fault recorder
- Event recorder
- Disturbance recorder
- Slip-Trans
- Trip-Trans
- Data from/to Remote End (via dedicated Communication)

**APPROVALS**
- certified regarding UL508 (Industrial Controls)
- certified regarding CSA-C22.2 No. 14 (Industrial Controls)
- certified by EAC (Eurasian Conformity)
- Type tested regarding IEC 60255-1 and IEC 61850
- certified regarding BDEW-Richtlinie für Erzeugungsanlagen am Mittelspannungsnetz, Ausgabe Juni 2008 (German grid code standard)
- complies with IEEE 1547-2003 amended by IEEE 1547a-2014
- complies with ANSI C37.90-2005

**CONNECTIONS (EXAMPLE)**

- X1
- X2
- X3
- X4
- X5
- X6
- X100
- X102
- X103
- X104
### Line differential protection MCDLV4-2

**Version 2 with USB, enhanced communication and user options**

<table>
<thead>
<tr>
<th>Voltage measuring</th>
<th>Digital Inputs</th>
<th>Binary output relays</th>
<th>Housing</th>
<th>Large display</th>
</tr>
</thead>
<tbody>
<tr>
<td>X</td>
<td>8</td>
<td>7</td>
<td>B2</td>
<td>A</td>
</tr>
<tr>
<td>X</td>
<td>16</td>
<td>13</td>
<td>B2</td>
<td>X</td>
</tr>
<tr>
<td>X</td>
<td>24</td>
<td>20</td>
<td>B2</td>
<td>E</td>
</tr>
</tbody>
</table>

**Hardware variant 2**

- Phase Current 5 A/1 A, Ground Current 5 A/1 A: 0
- Phase Current 5 A/1 A, Sensitive Ground Current 5 A/1 A: 1

**Housing and mounting**

- Door mounting: A
- Door mounting 19” (flush mounting): B

**Interdevice Communication**

- LC duplex connector, mono mode (up to 24 km), multi mode (up to 4 km): 0
- ST connector, BFOC2.5, multi mode (up to 2 km): 1

**Communication protocol**

<table>
<thead>
<tr>
<th>Without protocol</th>
<th>Modbus RTU, IEC60870-S-103, DNP3.0 RTU</th>
<th>RS485/terminals</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modbus TCP, DNP3.0 TCP/UDP</td>
<td>Ethernet 100 MB/RJ45</td>
<td></td>
</tr>
<tr>
<td>Profibus-DP</td>
<td>optic fiber/ST-connector</td>
<td></td>
</tr>
<tr>
<td>Profibus-DP</td>
<td>RS485/D-SUB</td>
<td></td>
</tr>
<tr>
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<td></td>
</tr>
<tr>
<td>IEC61850, Modbus TCP, DNP3.0 TCP/UDP</td>
<td>Optical Ethernet 100MB/LC duplex connector</td>
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<td></td>
</tr>
</tbody>
</table>

**Harsh Environment Option**

- None: A
- Conformal Coating: B

**Available menu languages (in every device)**

- English / German / Spanish / Russian / Polish / Portuguese / French / Romanian

*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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