APPLYATION

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 SYSTEM

- 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 (non-directional or directional (multi-polarising)
- Two elements unbalanced load protection
- Voltage protection: six elements selectable: V<, V>
- Six elements unbalanced voltage supervision
- Flexible Fourth Voltage measuring input: two elements VE> or VX (for synch-check)
- Synchro-check options
- Generator-to-System or System-to-System
- 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)

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-Intertripping
- 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.

RECORDERS

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

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
- 7 languages selectable within the relay

COMMUNICATION OPTIONS

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

LOGIC

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

TIME SYNCHRONISATION

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

PC TOOLS

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

NEW FEATURES

- Line differential
- In-zone transformer differential
- Remote parameter setting
- Remote monitoring
- Transfer signals
- Transfer trips
### Functional Overview

<table>
<thead>
<tr>
<th>Protective Functions</th>
<th>Elements</th>
<th>ANSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cable and Line differential protection</td>
<td>1</td>
<td>87L</td>
</tr>
<tr>
<td>In-Zone Transformer differential protection</td>
<td>1</td>
<td>87T</td>
</tr>
<tr>
<td>I, time overcurrent and short circuit protection, all elements can be configured for direction or non-directional supervision. Multiple reset options (instantaneous, definite time, reset characteristics according to IEC and ANSI).</td>
<td>6</td>
<td>50P, 51P, 67P</td>
</tr>
<tr>
<td>Voltage controlled overcurrent protection by means of adaptive parameters</td>
<td></td>
<td>51C</td>
</tr>
<tr>
<td>Voltage dependent overcurrent protection</td>
<td></td>
<td>51V</td>
</tr>
<tr>
<td>Negative phase sequence overcurrent protection</td>
<td></td>
<td>51Q</td>
</tr>
<tr>
<td>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).</td>
<td>4</td>
<td>50N, 51N, 67N</td>
</tr>
<tr>
<td>V&lt;, V&gt;, V(t)&lt;, under- and overvoltage protection, time dependent undervoltage protection</td>
<td>6</td>
<td>27, 59</td>
</tr>
<tr>
<td>Voltage asymmetry supervision (V012)</td>
<td></td>
<td>81U/O, 81R, 78</td>
</tr>
<tr>
<td>V1, under and overvoltage in positive phase sequence system</td>
<td>6</td>
<td>47</td>
</tr>
<tr>
<td>V2, overvoltage in negative phase sequence system</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Each of the six frequency protection elements can be used as: f&lt;, f&gt;, df, dt, ROCOF, DF/DT, vector surge, ...</td>
<td>6</td>
<td>81U/O, 81R, 78</td>
</tr>
<tr>
<td>VX, residual voltage protection or bus bar voltage for Synch Check</td>
<td>2</td>
<td>25 or 59N</td>
</tr>
<tr>
<td>AR, automatic reclosing</td>
<td>1</td>
<td>79</td>
</tr>
<tr>
<td>Exp, External alarm and trip functions</td>
<td>4</td>
<td></td>
</tr>
<tr>
<td>PQS, Power protection</td>
<td>6</td>
<td>32, 37</td>
</tr>
<tr>
<td>PF, Power factor</td>
<td>2</td>
<td>55</td>
</tr>
<tr>
<td>FRT (optional coordination with AR-feature)</td>
<td>27 (t)</td>
<td>27 (t, AR)</td>
</tr>
<tr>
<td>Q(V) Protection (undervolt. dep. directional reactive power protection)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Reconnection Module</td>
<td>2</td>
<td></td>
</tr>
<tr>
<td>UFLS (non-discriminating active power direction depending load shedding)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>10-Minutes-Mean-Square-Sliding Supervision: adjustable according to VDE-AR 4105</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Synch Check</td>
<td>1</td>
<td>25</td>
</tr>
<tr>
<td>V/f (Overexitation)</td>
<td>2</td>
<td>24</td>
</tr>
</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

<table>
<thead>
<tr>
<th>Supervision Functions</th>
<th>Elements</th>
<th>ANSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>CBF, circuit breaker failure protection</td>
<td>1</td>
<td>50BF</td>
</tr>
<tr>
<td>TCS, trip circuit supervision</td>
<td>1</td>
<td>74TC</td>
</tr>
<tr>
<td>LOP, loss of potential</td>
<td>1</td>
<td>60FL</td>
</tr>
<tr>
<td>FF, fuse failure protection via digital input</td>
<td>1</td>
<td>60FL</td>
</tr>
<tr>
<td>CTS, current transformer supervision</td>
<td>1</td>
<td>60L</td>
</tr>
<tr>
<td>CLPU, cold load pickup</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>SOTF, switch onto fault</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Demand management and peak value supervision (current and power)</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>THD supervision</td>
<td>1</td>
<td></td>
</tr>
<tr>
<td>Breaker wear with programmable wear curves</td>
<td>1 / Bkr</td>
<td></td>
</tr>
<tr>
<td>Recorders: Disturbance recorder, fault recorder, event recorder, trend recorder</td>
<td>1</td>
<td></td>
</tr>
</tbody>
</table>
certified regarding UL508
(Industrial Controls)
certified regarding CSA-C22.2 No. 14
(Industrial Controls)
certified by EAC
(Eurasian Conformity)
Type tested
regarding IEC60255-1 and
regarding IEC61850
certified regarding “BDEW-Richtlinie für Erzeugungsanlagen am Mittelspannungssnetz, Ausgabe Juni 2008”
complies with IEEE 1547-2003
amended by IEEE 1547a-2014
(German grid code standard)
complies with ANSI C37.90-2005

APPROVALS

CONNECTIONS (EXAMPLE)
## ORDER FORM MCDLV4-2

<table>
<thead>
<tr>
<th>Line differential protection</th>
<th>MCDLV4-2</th>
</tr>
</thead>
<tbody>
<tr>
<td>Version 2 with USB, enhanced communication and user options.</td>
<td></td>
</tr>
</tbody>
</table>

### Voltage measuring
- X: 8
- X: 16
- X: 24

### Digital Inputs
- 7
- 13
- 20

### Binary output relays
- B2
- B2
- B2

### Housing
- X
- X
- X

### Large display
- A
- D
- E

### 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
- 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 100MB/RJ45: H*
- Modbus TCP, DNP3.0 TCP/UDP | Ethernet 100MB/RJ45: I*
- IEC61850, Modbus TCP, DNP3.0 TCP/UDP | Optical Ethernet 100MB/LC duplex connector: K*
- Modbus TCP, DNP3.0 TCP/UDP | Optical Ethernet 100MB/LC duplex connector: L*

### Harsh Environment Option
- None: A
- Conformal Coating: B

### 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.

### Current inputs
- 4 (1 A and 5 A) with automatic CT Disconnect

### Voltage inputs
- 4 (0–800 V, or 0–300 V for Type “E” with enhanced digital inputs and outputs)

### 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>dc</sub> - 230 V<sub>dc</sub> (-20/+10%)

### Terminals
- All terminals plug type

### Type of enclosure
- IP54

### Dimensions of housing (W x H x D)
- 19" flush mounting: 212.7 mm x 173 mm x 208 mm
- Door mounting: 212.7 mm x 183 mm x 208 mm

### Weight (max. components)
- Approx. 4.2 kg / 9.259 lb

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