HighPROTEC | PROTECTION TECHNOLOGY MADE SIMPLE
MRM4 | MOTOR PROTECTION DEVICE

FUNCTIONS
The MRM4 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. The MRM4 provides all necessary functions to protect low and medium voltage motors at all power levels. The protection functions are based on current measurement. They supervise the motor start sequence (motor start), they detect a stall or locked rotor condition and they monitor the thermal condition of the motor. Overcurrent and earth overcurrent protection as well as unbalanced load protection are included in the protection package. The status and operation of the motor will also be monitored by means of the statistic and trend recorder. All important events and measuring values will be logged by means of the start, event, failure and disturbance recorder. The protection functions of the MRM4 have been adapted to comply with the requirements of the VDE-AR-N-4110:2018.

APPLICABLE FOR:
- Low and high voltage asynchronous motors. Protection based on current measurement values

MOTOR PROTECTION FUNCTIONS
- Thermal overload protection 49M
- Locked rotor protection 51LRS
- JAM or Stall protection 51LR
- Underload protection 37
- Motor start 48
- Starts per Hour 66
- Negative phase sequence (current unbalance) 46
- Overcurrent/short circuit prot. 50P/51P
- Earth overcurrent and short circuit protection 50N/51N
- Reclosing lockout 86
- RTD supervision via external temperature box 26 (type MRM4-2B, on request)
- Wattmetric Ground Fault Protection

SYSTEM SUPERVISION FUNCTIONS
- CBF, circuit breaker failure 50BF
- TCS, trip circuit supervision via digital inputs 74TC
- CTS, current transformer supervision 60

HISTORY COUNTER
- Motor starts, numbers of alarms and trips of all important protection functions like l, I, thermal supervision, JAM, undercurrent and negative phase sequence

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

TOTAL COUNTER
- Breaker wear values
- Motor run time
- Motor operation counter
- History

MOTOR START RECORDER
- Max. RMS values of phase currents
- Negative phase sequence currents
- Start duration
- Used thermal capacity
- Successful starts
- Temperature profile (optional)

STATISTIC RECORDER
- Number of successful starts
- Average 12T values
- Average max. start current

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

COMMUNICATION OPTIONS
- IEC61850
- Profinbus DP
- Modbus RTU and/or Modbus TCP
- IEC60870-5-103
- IEC60870-5-104
- DNP 3.0 (RTU, TCP, UDP)
- SCADApter for Retrofit

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

COMMISSIONING SUPPORT
- USB connection
- Customizable Display (Single-Line, …)
- Customizable Inserts
- Copy and compare parameter sets
- Forcing and disarming of output relays
- Fault simulator: current and voltage
- Graphical display of tripping characteristics
- 8 languages selectable within the relay

TIME SYNCHRONISATION
- SNTP, IRIG-800X, Modbus, DNP 3.0, IEC60870-5-103/104

IT SECURITY
- Menu for the activation of BDEW-Whitepaper-compliant security settings (e.g. hardening of interfaces)
- IT Security Logger
- Syslog (to centralized server)
- Encrypted connection with Smart view

ADDITIONAL HIGHLIGHTS
- 20 mA output (Type MRM4-2B)
- Long starting time for reduced voltage starts
- Emergency Start
- Incomplete sequence
- Anti-backspin time delay
- Permitted number of cold starts
- Supervision of starts per hour
- Mechanical load shedding
- Zero speed detection (stall) via digital input
- Motor stop inputs
- External alarm and trip inputs
## FUNCTIONAL OVERVIEW

### Protective Functions

<table>
<thead>
<tr>
<th>Element</th>
<th>Function Description</th>
<th>ANSI</th>
</tr>
</thead>
<tbody>
<tr>
<td>IB</td>
<td>Thermal overload protection</td>
<td>49M</td>
</tr>
<tr>
<td>I, I2</td>
<td>Time overcurrent and short circuit protection (non-direction) (instantaneous, definite time, characteristics according to IEC60255, ANSI)</td>
<td>50P, 51P</td>
</tr>
<tr>
<td>IG</td>
<td>Earth time overcurrent and short circuit protection (non-direction) (instantaneous, definite time, characteristics according to IEC60255, ANSI)</td>
<td>50N/G, 51N/G</td>
</tr>
<tr>
<td>I&lt;</td>
<td>Underload protection</td>
<td>37</td>
</tr>
<tr>
<td>49R</td>
<td>Reclosing lockout</td>
<td></td>
</tr>
<tr>
<td>51LR</td>
<td>Incomplete sequence</td>
<td></td>
</tr>
<tr>
<td>51LS</td>
<td>Locked rotor protection</td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>Motor start</td>
<td></td>
</tr>
<tr>
<td>66</td>
<td>Starts per Hour</td>
<td></td>
</tr>
<tr>
<td>50BF/62BF</td>
<td>Circuit breaker failure</td>
<td></td>
</tr>
<tr>
<td>74TC</td>
<td>Trip circuit supervision via digital inputs</td>
<td></td>
</tr>
<tr>
<td>60L</td>
<td>Current transformer supervision</td>
<td></td>
</tr>
<tr>
<td>49M</td>
<td>Unbalanced load protection with evaluation of the negative phase sequence current</td>
<td>46</td>
</tr>
<tr>
<td>49R</td>
<td>Earth time overcurrent and short circuit protection (non-direction) (instantaneous, definite time, characteristics according to IEC60255, ANSI)</td>
<td></td>
</tr>
<tr>
<td>48</td>
<td>Motor start</td>
<td></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

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<tbody>
<tr>
<td>CBF</td>
<td>Circuit breaker failure</td>
<td>50BF/62BF</td>
</tr>
<tr>
<td>TCS</td>
<td>Trip circuit supervision via digital inputs</td>
<td>74TC</td>
</tr>
<tr>
<td>CTS</td>
<td>Current transformer supervision</td>
<td>60L</td>
</tr>
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</table>

### Demand management and peak value supervision (current)

- Breaker wear with programmable wear curves

### Recorders

- Disturbance Recorder
- Fault recorder
- Event recorder
- Trend recorder
- Motor Start recorder
- Statistical recorder

## DIMENSIONS

### Motor Protection Device

![Motor Protection Device Dimensions](dimensions.png)

- **Dimensions**:
  - Height: 182 mm (7.17 inches)
  - Width: 141.50 mm (5.57 inches)
  - Depth: 38 mm (1.49 inches)

- **Max. Size**:
  - Height: 206.50 mm (8.13 inches)
  - Width: 182 mm (7.17 inches)
  - Depth: 9.64 mm (0.38 inches)
FUNCTIONAL OVERVIEW IN ANSI FORM

**Approvals**

- CE certified regarding UL 508 (Industrial Controls)
- UL certified regarding CSA-C22.2 No. 14 (Industrial Controls)
- Type tested according to IEC60255-1
- EAC certified by EAC (Eurasian Conformity)

**Connections (Example)**

- Only for use with external galactic decoupled CT's. See chapter Current Transformers of the manual.

**Device Type:**
- **MRM4-2Bxxx**
- **Standard**
- **RTD (ANSI 26/38/49)**: requires URTD box (separate hardware)

**Connections (Example)**

- **X1, X2, X3**
- **X100, X101, X103**
- **Function Overview in ANSI Form**

**Certifications**

- Complies with IEEE 1547-2003
- Amended by IEEE 1547a-2014
- Complies with ANSI C37.90-2005
ORDER FORM MRM4

Motor Protection

Version 2 with USB, enhanced communication and user options

Motor protection MRM4 -2

Components

Digital Inputs | Analog Inputs | RTD-Box | Housing | Large display
---|---|---|---|---
8 | 6 | 0/0 | B | A
4 | 4 | 0/1 | ✓ | B

Hardware variant 2

Phase Current 5 A/1 A, Ground Current 5 A/1 A

Housing and mounting

Door mounting

Communication protocol

Without protocol

Modbus RTU, IEC60870-5-103, DNP3.0 RTU | RS485/terminals

Modbus TCP, DNP3.0 TCP/UDP, IEC 60870-5-104 | Ethernet 100 MB/RJ45

Profibus-DP | optic fiber/ST-connector

Profibus-DP | RS485/D-SUB

Modbus RTU, IEC60870-5-103, DNP3.0 RTU | optic fiber/ST-connector

Modbus TCP, DNP3.0 TCP/UDP, IEC 60870-5-104 | Ethernet 100 MB/RJ45

IEC61850, Modbus TCP, DNP3.0 TCP/UDP, IEC 60870-5-104 | Optical Ethernet 100MB/LC duplex connector

Modbus TCP, DNP3.0 TCP/UDP, IEC 60870-5-104 | Optical Ethernet 100MB/LC duplex connector

IEC60870-5-103, Modbus RTU, DNP3.0 RTU | RS485/terminals

IEC60870-5-103, Modbus RTU, DNP3.0 RTU | RS485/terminals

IEC61850, Modbus TCP, DNP3.0 TCP/UDP, IEC 60870-5-104 | Ethernet 100 MB/RJ45

IEC60870-5-103, Modbus RTU, DNP3.0 RTU | RS485/terminals

IEC60870-5-103, Modbus RTU, DNP3.0 RTU | RS485/terminals

IEC61850, Modbus TCP, DNP3.0 TCP/UDP, IEC 60870-5-104 | Ethernet 100 MB/RJ45

Harsh Environment Option

None

Conformal Coating

Available menu languages

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

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

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

Digital inputs

Switching thresholds adjustable via software

Power supply

Wide range power supply

24 V<sub>dc</sub> – 270 V<sub>dc</sub> / 48 V<sub>ac</sub> – 230 V<sub>ac</sub> (−20/+10%)

All terminals plug type

Terminals

Type of enclosure (Front)

IP54

Dimensions of housing

(W × H × D)

19" flush mounting: 141.5 mm × 173 mm × 209 mm

5.571 in. × 6.811 in. × 8.228 in.

Door mounting: 141.5 mm × 183 mm × 209 mm

5.571 in. × 7.205 in. × 8.228 in.

Weight (max. components)

approx. 2.9 kg / 6.393 lb

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