

# HighPROTEC

## MRA4

### FEEDER PROTECTION AND INTERCONNECTION OF DECENTRALIZED ENERGY RESOURCES

The MRA4 is a high precision and reliable protection and control relay. The intuitive setting concept with plausibility test enables reliable and time optimized configuration of the extensive protection function to a variety of applications such as incoming or outgoing feeder protection, network protection and generator protection.

The implemented switchgear management guarantees an efficient and safe control and supervision.

The device is a bench mark in flexibility and usability and offers various communication options. The hardware is designed for all nominal values in combination with protection and control functionality.

The parameterizing and analyzing software Smart view SE is usable for each HighPROTEC device and free of charge.

### Comprehensive Protection Package <sup>(1)</sup>

- ▶ 6 elements phase overcurrent protection directional and non-directional (ANSI/IEC/51C/51V)
- ▶ Frequency measurement and ROCOF (df/dt) measurement is now user-adjustable. Furthermore, measurement precision has been improved: 5mHz from 45-55 Hz
- ▶ 4 elements earth fault protection <sup>(2)</sup>, non-directional or directional (multi-polarising)
- ▶ Wattmetric Ground Fault Protection
- ▶ 2 elements unbalanced load protection
- ▶ Voltage protection <sup>(2)</sup>  
6 elements selectable: V<, V>, V<(t)
- ▶ 6 elements unbalanced voltage supervision
- ▶ Fourth Voltage measuring input <sup>(2)</sup>  
2 elements VE> or VX (for synchro-check)
- ▶ Synchro-check options:  
Generator-to-System or System-to-System
- ▶ 6 elements frequency protection; each can be used as:  
f>, f<, df/dt (ROCOF), vector surge
- ▶ 6 elements power protection; each can be used as:  
P>, P<, Pr, Q>, Q<, Qr, S>, S<
- ▶ Two elements power factor (PF)

### Power Quality

- ▶ THD protection

### Demand Management/ Peak Values

- ▶ Peak values of current and power, average current and energy demand

### Interconnection Package

The comprehensive interconnection package is summarized within one menu:

- ▶ Non-discriminating active power direction depending load shedding
- ▶ HVRT (High Voltage Ride Through)
- ▶ FRT (LVRT): Settable FRT-Profiles, optional AR coordinated
- ▶ QV-Protection: Undervoltage-Reactive
- ▶ Power protection
- ▶ Automatic Reconnection
- ▶ Frequency protection:  
6 elements configurable as  
f<, f>, df/dt (ROCOF), vector surge
- ▶ CB-Intertripping
- ▶ Synchro-check (Generator to mains, mains-to-mains), options e.g. to switch onto dead bus

### 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 Control pages
- ▶ SCADApter to re-assign datapoints for Retrofit projects: Modbus, Profibus, IEC 60870-5-103/ -104

### Control

- ▶ 1 breaker
- ▶ Breaker wear



### New Features - Release 3.7

- ▶ Component certificate VDE-AR-N 4110
- ▶ G99 Issue 1 Amendment 6
- ▶ Improved frequency and ROCOF precision
- ▶ Improved design of the PC tools
- ▶ Configurable SCADA protocols:  
Modbus, Profibus, IEC 60870-5-103/-104, DNP3

*All HighPROTEC devices have been type tested and fully certified by KEMA Laboratories (IEC 60255-1:2009).*

### 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: current, voltage
- ▶ Graphical display of tripping characteristics
- ▶ 8 languages selectable within the relay

### Communication Options

- ▶ IEC 61850
- ▶ Profibus DP
- ▶ Modbus RTU and/or Modbus TCP
- ▶ IEC 60870-5-103
- ▶ IEC 60870-5-104
- ▶ DNP 3.0 (RTU, TCP, UDP)
- ▶ SCADApter

### Cyber Security

- ▶ Menu for the activation of BDEW-White-paper-compliant security settings (e.g. hardening of interfaces)
- ▶ Security Logger
- ▶ Centralized Security Logs (Syslog)
- ▶ Encrypted Connection Smart view - Device
- ▶ Device specific certificates (No man in the middle attacks)

### Logic

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

### Time Synchronisation

- ▶ SNTP, IRIG-B00X, Modbus, DNP 3.0, IEC 60870-5-103/-104

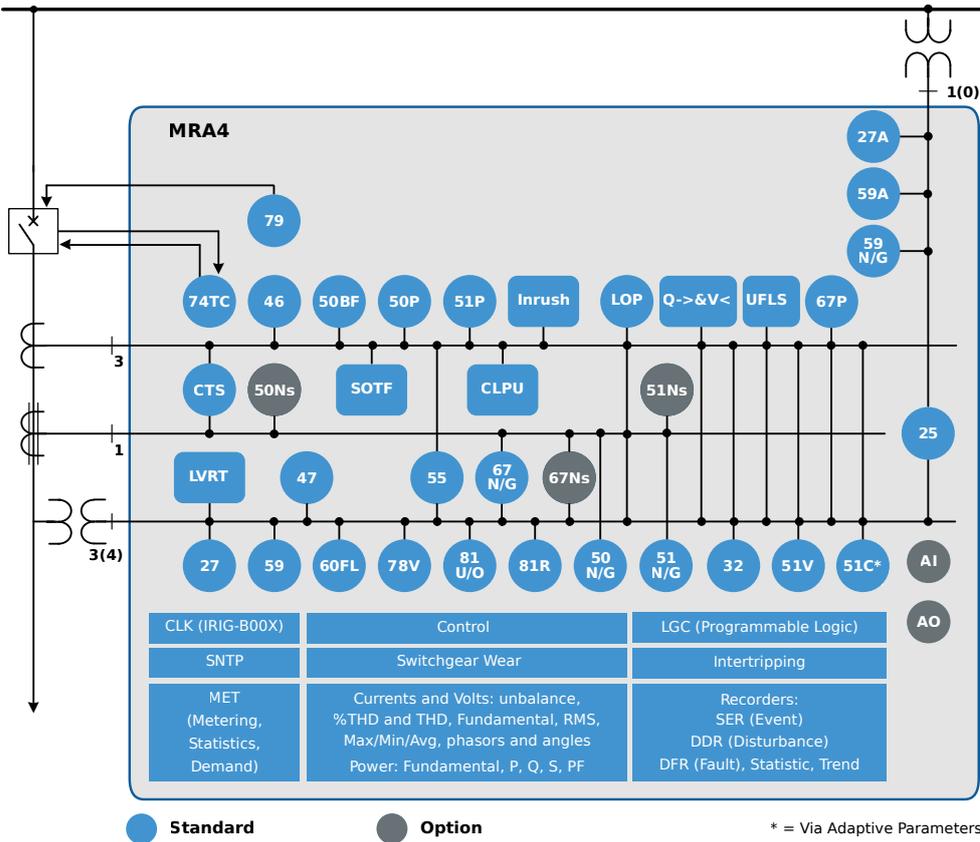
<sup>(1)</sup> DFT, True RMS or I2 based

<sup>(2)</sup> DFT or True RMS based

**Functional Overview**

Protective Functions		ANSI	IEC 61850
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	6	50P, 51P, 67P  51C 51V 51Q	PTOC
I2>, unbalanced load protection with evaluation of the negative phase sequence currents	2	46	PTOC
IB, overload protection with thermal replica and separate pick-up values for alarm and trip functions	1	49	PTTR
IH2/In, inrush detection with evaluation of the 2nd harmonic	1	Inrush	PHAR
IG, earth overcurrent and short circuit protection, all elements can be configured for directional (multi-polarising) or non-directional supervision. Various reset options (instantaneous, definite time, reset characteristics according to IEC and ANSI).	4	50N/G, 51N/G, 67N/G	PTOC
V<, V>, V(t)<, under- and overvoltage protection, time dependent undervoltage protection Voltage asymmetry supervision (V012)	6	27, 59	PTOV, PTUV
V1, under and overvoltage in positive phase sequence system V2, overvoltage in negative phase sequence system	6	47	PTOV, PTUV
Each of the six frequency protection elements can be used as: f< fs, df, dt, ROCOF, DF/DT, vector surge, ...	6	81U/O, 81R, 78	PTOF, PTUF, PFRC, PPAM
VX, residual voltage protection or bus bar voltage for Synch Check	2	27A/N, 59A/N	PTOV, PTUV
AR, automatic reclosing	1	79	RREC
ExP, External alarm and trip functions	4		GAPC
PQS, Power protection	6	32, 37	PDOP, PDUP
PF, Power factor	2	55	PUPF
FRT (optional coordination with AR-feature)	27 (t)	27 (t, AR)	
HVRT (OVRT) High Voltage Ride Through	1	59	PTOV
Q(V) Protection (undervolt. dep. directional reactive power protection with reclosing disengaging)			PTUV
UFLS (non-discriminating active power direction depending load shedding)			PFRC
10-Minutes-Mean-Square-Sliding Supervision: adjustable according to VDE-AR 4105 Synch Check		25	RSYN
<b>Control and Logic</b>			
Control: Position indication, supervision time management and interlockings for 1 breaker			CILO, CSWI, XCBR, XSWI
Logic: Up to 80 logic equations, each with 4 inputs, selectable logical gates, timers and memory function			
<b>Supervision Functions</b>			
CBF, circuit breaker failure protection	1	50BF	RBRF
TCS, trip circuit supervision	1	74TC	SCBR
LOP, loss of potential	1	60FL	
FF, fuse failure protection via digital input	1	60FL	
CTS, current transformer supervision	1	60L	
CLPU, cold load pickup	1		
SOTF, switch onto fault	1		PSOF
Demand management and peak value supervision (current and power) THD supervision Breaker wear with programmable wear curves			
Recorders: Disturbance recorder, fault recorder, event recorder, trend recorder			RDRE

## Functional Overview in ANSI / IEEE C37.2 Form



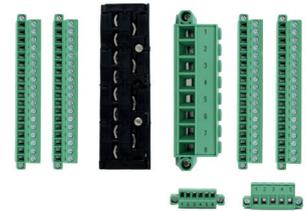
### 19 " Variants Available!

See Order Form on page 4,  
housing type "rack mounting"



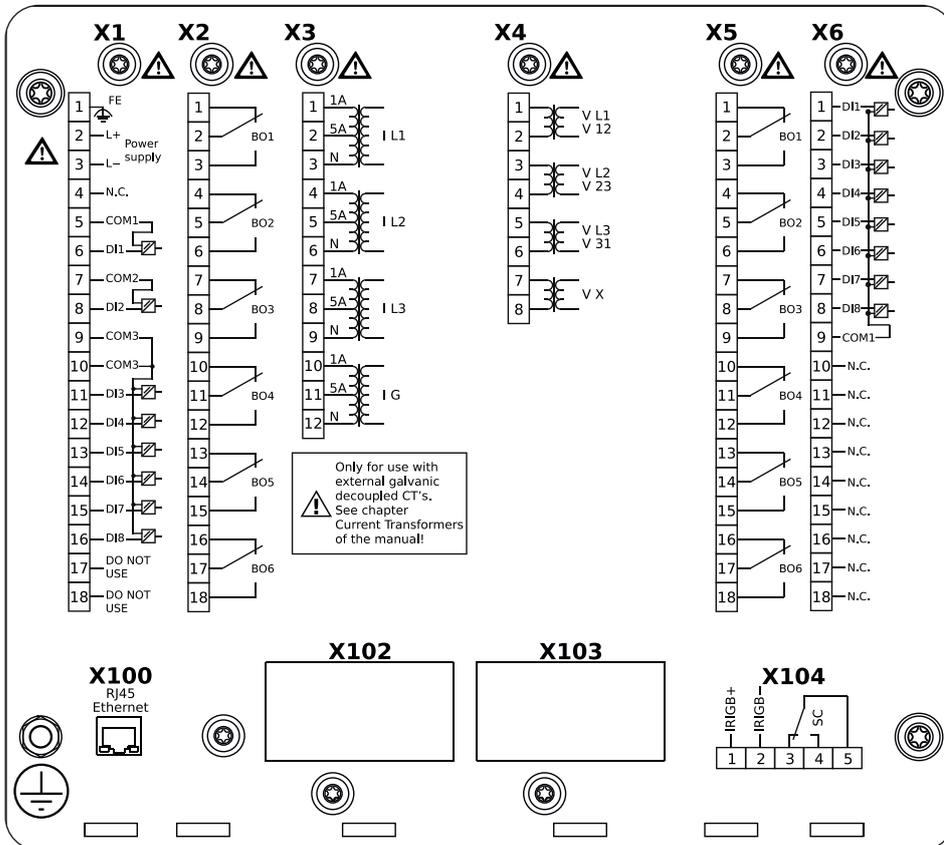
<https://docs.SEGelectronics.de/hpt-2>

### Terminals Available Separately!



Order codes HPTTERMKIT-1 ... -5  
For MRA4: HPTTERMKIT-3  
The terminal kits allow for making  
all required wirings in advance,  
thus speeding up the installation  
and commissioning work.

## Connections (Example)



## Approvals / Standards



certified regarding UL508  
(Industrial Controls)

certified regarding  
CSA-C22.2 No. 14  
(Industrial Controls)

certified by EAC  
(Eurasian Conformity)

Type tested and certified by KEMA  
Laboratories in accordance with the  
complete type test requirements of  
IEC 60255-1:2009.

Component certificate regarding the  
German grid code standard  
VDE-AR-N 4110 (2018-11)

Complies with G99 Issue 1 Am. 6.  
Complies with IEEE 1547-2003.  
Amended by IEEE 1547a-2014.  
Complies with ANSI C37.90-2005.

**PROTECTION MADE SIMPLE.**

**Order Form MRA4**

Directional Feeder Protection					MRA4	-2				
Version 2 with USB, enhanced communication and user options										
Analog In / Out	Digital Inputs	Binary output relays	Housing	Large display						
—	8	7	B2	—	A					
—	16	13	B2	—	D					
—	24	20	B2	—	E					
2+2	16	15	B2	—	F					
<b>Hardware variant 2</b>										
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				
<b>Housing and mounting</b>										
Housing suitable for door mounting									A	
Housing suitable for 19" rack mounting									B	
<b>Communication protocol</b>										
Without protocol										A*
Modbus RTU, IEC60870-5-103, DNP3.0 RTU   RS485/terminals										B*
Modbus TCP, DNP3.0 TCP/UDP, IEC 60870-5-104   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, IEC 60870-5-104   Ethernet 100MB/RJ45										H*
IEC60870-5-103, Modbus RTU, DNP3.0 RTU   RS485/terminals										I*
Modbus TCP, DNP3.0 TCP/UDP, IEC60870-5-104   Ethernet 100 MB/RJ45										J*
IEC61850, Modb. TCP, DNP3.0 TCP/UDP, IEC 60870-5-104   Opt. Eth. 100MB/LC duplex conn.										K*
Modbus TCP, DNP3.0 TCP/UDP, IEC 60870-5-104   Opt. Ethernet 100MB/LC duplex connector										L*
IEC60870-5-103, Modbus RTU, DNP3.0 RTU   RS485/terminals										T*
IEC61850, Modbus TCP, DNP3.0 TCP/UDP, IEC60870-5-104   Ethernet 100 MB/RJ45										
<b>Harsh Environment Option</b>										
None										A
Conformal Coating										B
<b>Special Standards-Related Packages</b>										
None										
G99 Type-Tested Variant (based on a special EREC-G99-adapted Release 3.6)										+G
<b>Available menu languages (in every device)</b>										
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 can be used without extra costs.

<b>Current inputs</b>	4 (1 A and 5 A) with automatic CT Disconnect
<b>Voltage inputs</b>	4 (0 ... 800 V, for variants MRA4-2 <b>A</b> , MRA4-2 <b>D</b> , and MRA4-2 <b>F</b> ) or 4 (0 ... 300 V, for variant MRA4-2 <b>E</b> )
<b>Digital Inputs</b>	Switching thresholds adjustable via software
<b>Analog Inputs (Type F)</b>	0 ... 20mA / 4 ... 20mA / 0 ... 10V
<b>Analog outputs (Type F)</b>	0 ... 20mA / 4 ... 20mA / 0 ... 10V
<b>Power supply</b>	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%)
<b>Terminals</b>	All terminals plug type
<b>Type of enclosure</b>	IP54
<b>Dimensions of housing (W x H x D)</b>	19" flush mounting: 212.7 mm x 173 mm x 208 mm 8.374 in. x 6.811 in. x 8.189 in. Door mounting: 212.7 mm x 183 mm x 208 mm 8.374 in. x 7.205 in. x 8.189 in.
<b>Weight (max. components)</b>	approx. 4.7 kg / 10.36 lb

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**Find Your Local Distributor on**

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**Technical Documents:**

<https://docs.SEGelectronics.de/mra4-2>



For more information please contact: