SEG electronics

HighPROTEC | PROTECTION TECHNOLOGY MADE SIMPLE

MRA4 | FEEDER PROTECTION AND INTER-CONNECTION OF DECENTRALIZED ENERGY RESOURCES

APPLICATION

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 guaranties 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 [1]

‣ 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 (2), non-directional or directional (multi-polarising)
‣ Wattmetric Ground Fault Protection
‣ 2 elements unbalanced load protection
‣ Voltage protection (2) 6 elements selectable: V<, V>, V<(t)
‣ 6 elements unbalanced voltage supervision
‣ Fourth Voltage measuring input (2) 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

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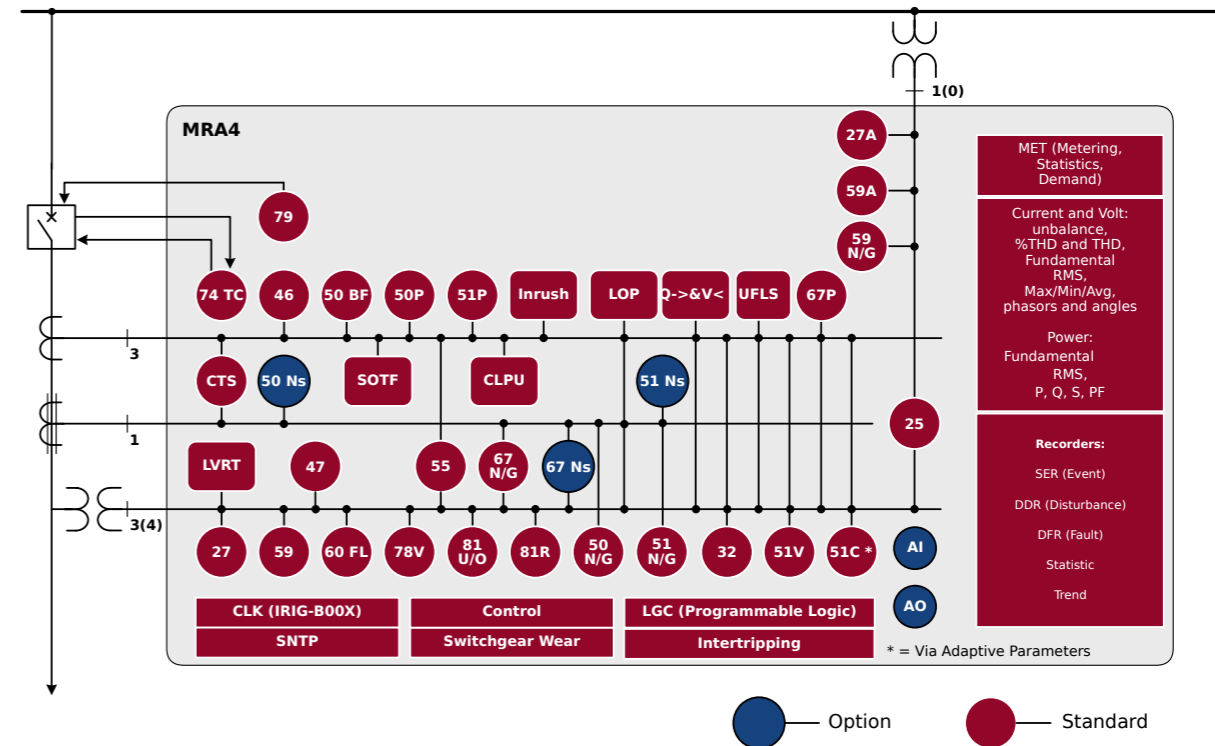
‣ SNTP, IRIG-B00X, Modbus, DNP 3.0, IEC 60870-5-103/-104

(1) DFT, True RMS or I2 based

(2) DFT or True RMS based

FUNCTIONAL OVERVIEW

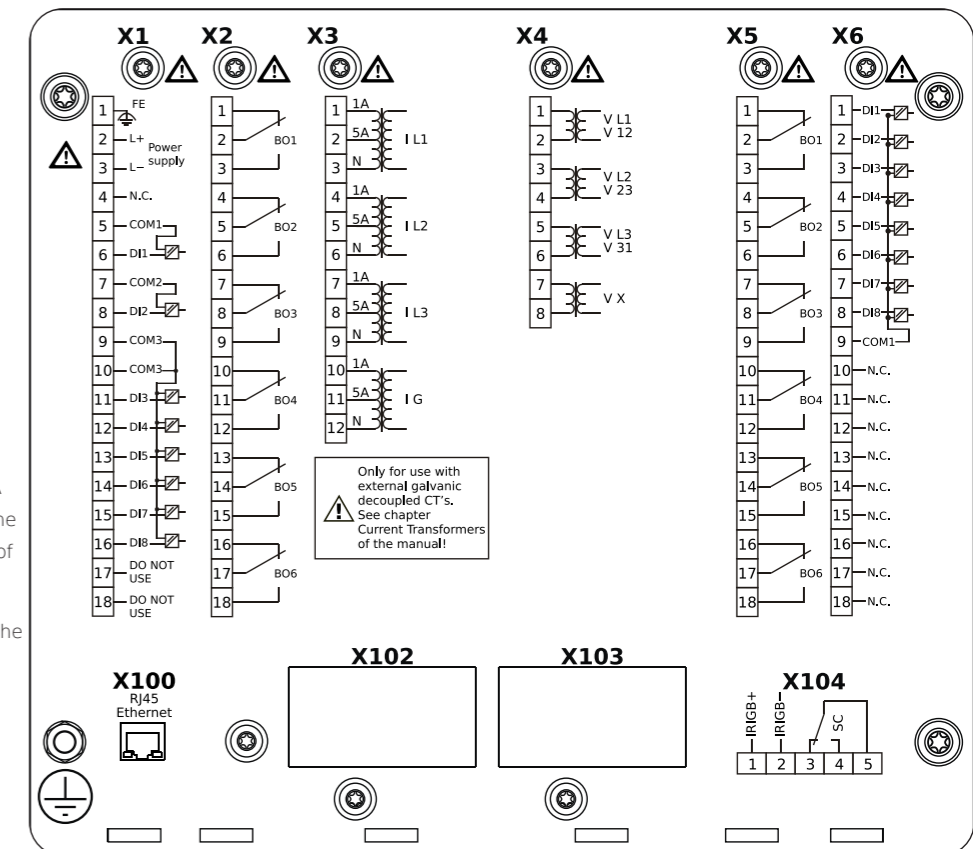|	Elements	ANSI
Protective Functions		
I, time overcurrent and short circuit protection, all elements can be configured for directional or non-directional supervision. Multiple reset options (instantaneous, definite time, reset characteristics according to IEC and ANSI).	6	50P, 51P, 67P
Voltage controlled overcurrent protection by means of adaptive parameters		51C
Voltage dependent overcurrent protection		51V
Negative phase sequence overcurrent protection		51Q
I2>, unbalanced load protection with evaluation of the negative phase sequence currents	2	46
IB, overload protection with thermal replica and separate pick-up values for alarm and trip functions	1	49
IH2/In, inrush detection with evaluation of the 2nd harmonic	1	Inrush
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).	4	50N/G, 51N/G, 67N/G
V<, V>, V(t)<, under- and overvoltage protection, time dependent undervoltage protection	6	27, 59
Voltage asymmetry supervision (V012)		
V1, under and overvoltage in positive phase sequence system	6	47
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, …	6	81U/O, 81R, 78
VX, residual voltage protection or bus bar voltage for Synch Check	2	25 or 59N/G
AR, automatic reclosing	1	79
ExP, External alarm and trip functions	4	
PQS, Power protection	6	32, 37
PF, Power factor	2	55
FRT (optional coordination with AR-feature)	27 (t)	27 (t, AR)
HVRT (OVRT) High Voltage Ride Through	1	59
Q(V) Protection (undervolt. dep. directional reactive power protection with reclosing disengaging)		
UFLS (non-discriminating active power direction depending load shedding)		
10-Minutes-Mean-Square-Sliding Supervision: adjustable according to VDE-AR 4105		
Synch Check		25
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		
CBF, circuit breaker failure protection	1	50BF
TCS, trip circuit supervision	1	74TC
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	
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		

FUNCTIONAL OVERVIEW IN ANSI / IEEE C37.2 FORM

APPROVALS / STANDARDS

CE

UL
certified regarding UL508
(Industrial Controls)

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

EAC
certified by EAC
(Eurasian Conformity)

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

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

KESCO
동일성 선언서
(Declaration of Identity)

CONNECTIONS (EXAMPLE)

Complies with "Engineering Recommendation G99 Issue 1 Amendment 6 - March 2020".
Complies with IEEE 1547-2003.
Amended by IEEE 1547a-2014.
Complies with ANSI C37.90-2005.

ORDER FORM MRA4

Directional Feeder Protection					MRA4	-2				

Version 2 with USB, enhanced communication and user options

Analog In Analog 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

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

Housing suitable for door mounting	A
Housing suitable for 19" rack mounting **	B

Communication protocol

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* Modbus TCP, DNP3.0 TCP/UDP, IEC60870-5-104 | *Ethernet 100 MB/RJ45*	I*
IEC61850, Modbus TCP, DNP3.0 TCP/UDP, IEC 60870-5-104 | *Optical Eth. 100MB/LC duplex connector*	K*
Modbus TCP, DNP3.0 TCP/UDP, IEC 60870-5-104 | *Optical Ethernet 100MB/LC duplex connector*	L*
IEC60870-5-103, Modbus RTU, DNP3.0 RTU | *RS485/terminals* IEC61850, Modbus TCP, DNP3.0 TCP/UDP, IEC60870-5-104 | *Ethernet 100 MB/RJ45*	T*

Harsh Environment Option

None	A
Conformal Coating	B

Special Standards-Related Packages

None	
G99 Type-Tested Variant (based on a special EREC-G99-adapted Release 3.6)	+G

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.

Current inputs	4 (1 A and 5 A) with automatic CT Disconnect
Voltage inputs	4 (0 … 800 V, for variants MRA4-2**A**, MRA4-2**D**, and MRA4-2**F**)
	or 4 (0 … 300 V, for variant MRA4-2**E**)
Digital Inputs	Switching thresholds adjustable via software
Analog Inputs (Type F)	0 … 20mA / 4 … 20mA / 0 … 10V
Analog outputs (Type F)	0 … 20mA / 4 … 20mA / 0 … 10V
Power supply	Wide range power supply
	24 V_{DC} – 270 V_{DC} / 48 V_{AC} – 230 V_{AC} (−20/+10%)
Terminals	All terminals plug type
Type of enclosure	IP54
Dimensions of housing	19" flush mounting: 212.7 mm × 173 mm × 208 mm
(W x H x D)	8.374 in. × 6.811 in. × 8.189 in.
	Door mounting: 212.7 mm × 183 mm × 208 mm
	8.374 in. × 7.205 in. × 8.189 in.
Weight (max. components)	approx. 4.7 kg / 10.36 lb

**19 " Variants Available! **

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

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