# SEG electronics

# HighPROTEC | PROTECTION TECHNOLOGY MADE SIMPLE

## MCA4 | FEEDER PROTECTION AND INTER-CONNECTION OF DECENTRALIZED ENERGY RESOURCES

## APPLICATION

The MCA4 is a complete solution for the connection of decentralized power generation systems, e. g. wind power, photovoltaic, biogas, to the grid. The MCA4 protects your systems and guarantees the grid compliance of the connected power generation system. It offers high measurement precision and high reliability, and all functions for protection, control and monitoring are included in the price of the device ("all-inclusive concept").

The quality of our HighPROTEC devices, has been certified by the KEMA after passing all tests specified by the IEC 60255-1:2009.

In addition, another independent institute certified the grid-compliant features of the MCA4 (full compliance with VDE-AR-N 4110, certified by the TÜV Nord). Besides, the MCA4 can be perfectly used for feeder protection, grid decoupling and as a generator backup protection.

## 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

‣ up to six breakers (or isolators/ grounding switches)
‣ 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-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
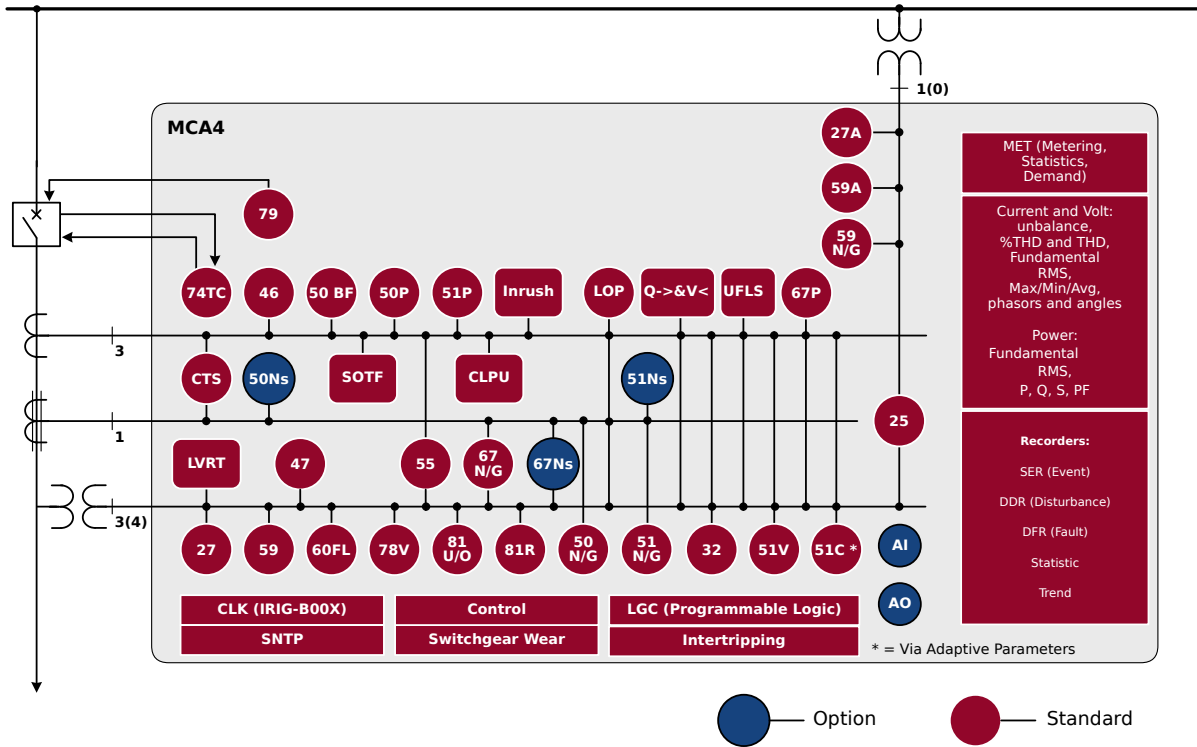
‣ SNTP, IRIG-B00X, Modbus, DNP 3.0, IEC 60870-5-103/-104

*(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 V2, overvoltage in negative phase sequence system | 6 | 47 |
| 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 up to 6 breakers | | |
| 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



MCA4

1(0)

27A
59A
59 N/G

79

74TC · 46 · 50 BF · 50P · 51P · Inrush · LOP · Q->&V< · UFLS · 67P

CTS · 50Ns · SOTF · CLPU · 51Ns

LVRT · 47 · 55 · 67 N/G · 67Ns

25

27 · 59 · 60FL · 78V · 81 U/O · 81R · 50 N/G · 51 N/G · 32 · 51V · 51C *

AI
AO

CLK (IRIG-B00X)
SNTP
Control
Switchgear Wear
LGC (Programmable Logic)
Intertripping

MET (Metering, Statistics, Demand)

Current and Volt: unbalance, %THD and THD, Fundamental RMS, Max/Min/Avg, phasors and angles

Power: Fundamental RMS, P, Q, S, PF

Recorders:
SER (Event)
DDR (Disturbance)
DFR (Fault)
Statistic
Trend

* = Via Adaptive Parameters

⬤ Option     ⬤ Standard

## 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.
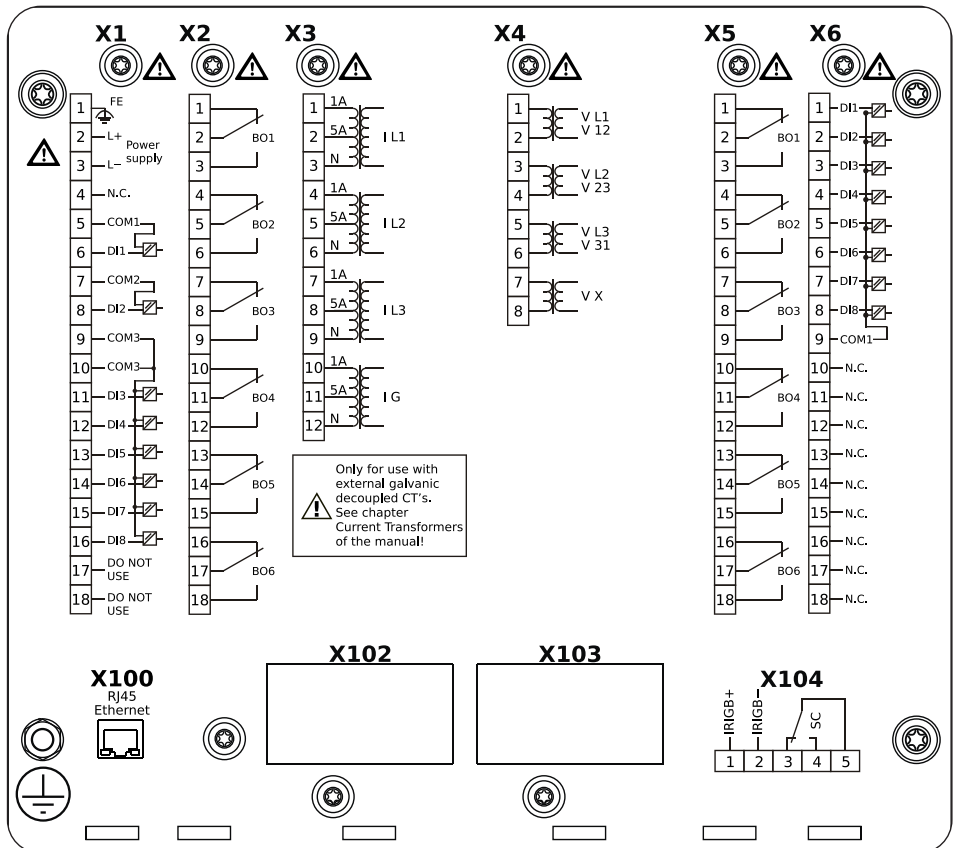
Component certificate regarding the German grid code standard VDE-AR-N 4110 (2018-11)
Component certificate regarding the German grid code standard VDE-AR-N 4120 (2018-11)

KESCO
동일성 선언서
(Declaration of Identity)

## CONNECTIONS (EXAMPLE)



X1  X2  X3      X4      X5  X6

**X1**
1 FE
2 L+ Power supply
3 L-
4 N.C.
5 COM1
6 DI1
7 COM2
8 DI2
9 COM3
10 COM3
11 DI3
12 DI4
13 DI5
14 DI6
15 DI7
16 DI8
17 DO NOT USE
18 DO NOT USE

**X2**
1
2 BO1
3
4
5 BO2
6
7
8 BO3
9
10
11 BO4
12
13
14 BO5
15
16
17 BO6
18

**X3**
1 1A
2 5A · I L1
3 N
4 1A
5 5A · I L2
6 N
7 1A
8 5A · I L3
9 N
10 1A
11 5A · I G
12 N

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

**X4**
1 V L1
2 V 12
3 V L2
4 V 23
5 V L3
6 V 31
7 V X
8

**X5**
1
2 BO1
3
4
5 BO2
6
7
8 BO3
9
10
11 BO4
12
13
14 BO5
15
16
17 BO6
18

**X6**
1 DI1
2 DI2
3 DI3
4 DI4
5 DI5
6 DI6
7 DI7
8 DI8
9 COM1
10 N.C.
11 N.C.
12 N.C.
13 N.C.
14 N.C.
15 N.C.
16 N.C.
17 N.C.
18 N.C.

**X100**
RJ45 Ethernet

**X102**

**X103**

**X104**
IRIGB+
IRIGB-
SC
1 2 3 4 5

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 MCA4

| Directional Feeder Protection | | | | | MCA4 | -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 | X | A |
| - | 16 | 13 | B2 | X | D |
| - | 24 | 20 | B2 | X | E |
| 2+2 | 16 | 15 | B2 | X | 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 ** 19 inch rack | B |

**Communication protocol**

| | |
|---|---|
| Without protocol | A* |
| Modbus RTU, IEC 60870-5-103, DNP 3.0 RTU | RS485/terminals | B* |
| Modbus TCP, DNP 3.0 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, IEC 60870-5-103, DNP 3.0 RTU | optic fiber/ST-connector | F* |
| Modbus RTU, IEC 60870-5-103, DNP 3.0 RTU | RS485/D-SUB | G* |
| IEC 61850, Modbus TCP, DNP 3.0 TCP/UDP, IEC 60870-5-104 | Ethernet 100MB/RJ45 | H* |
| IEC 60870-5-103, Modbus RTU, DNP 3.0 RTU | RS485/terminals | I* |
| Modbus TCP, DNP 3.0 TCP/UDP, IEC 60870-5-104 | Ethernet 100 MB/RJ45 | |
| IEC 61850, Modbus TCP, DNP 3.0 TCP/UDP, IEC 60870-5-104 | Optical Ethernet 100MB/LC duplex connector | K* |
| Modbus TCP, DNP 3.0 TCP/UDP, IEC 60870-5-104 | Optical Ethernet 100MB/LC duplex connector | L* |
| IEC 60870-5-103, Modbus RTU, DNP 3.0 RTU | RS485/terminals | T* |
| IEC 61850, Modbus TCP, DNP 3.0 TCP/UDP, IEC 60870-5-104 | Ethernet 100 MB/RJ45 | |

**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.

| | |
|---|---|
| **Current inputs** | 4 (1 A and 5 A) with automatic CT Disconnect |
| **Voltage inputs** | 4 (0 … 800 V, for variants MCA4-2**A**, MCA4-2**D**, and MCA4-2**F**) or 4 (0 … 300 V, for variant MCA4-2**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 VDC – 270 VDC / 48 VAC – 230 VAC (−20/+10%) |
| **Terminals** | All terminals plug type |
| **Type of enclosure (Front)** | IP54 |
| **Dimensions of housing (W x H x D)** | 19" flush mounting: 212.7 mm × 173 mm × 208 mm 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. 4.2 kg / 9.259 lb |

**19 " Variants Available! \*\***



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

## CONTACT:

**SEG Electronics GmbH**
Krefelder Weg 47
D–47906 Kempen (Germany)

**Sales**
Telephone
+49 (0) 21 52 145 331
Telefax
+49 (0) 21 52 145 354
E-Mail
sales@SEGelectronics.de

**Service & Support**
Telephone
+49 (0) 21 52 145 614
Telefax
+49 (0) 21 52 145 354
E-Mail
support@SEGelectronics.de

**For distributor information, visit**
http://www.SEGelectronics.de

For more information please contact: