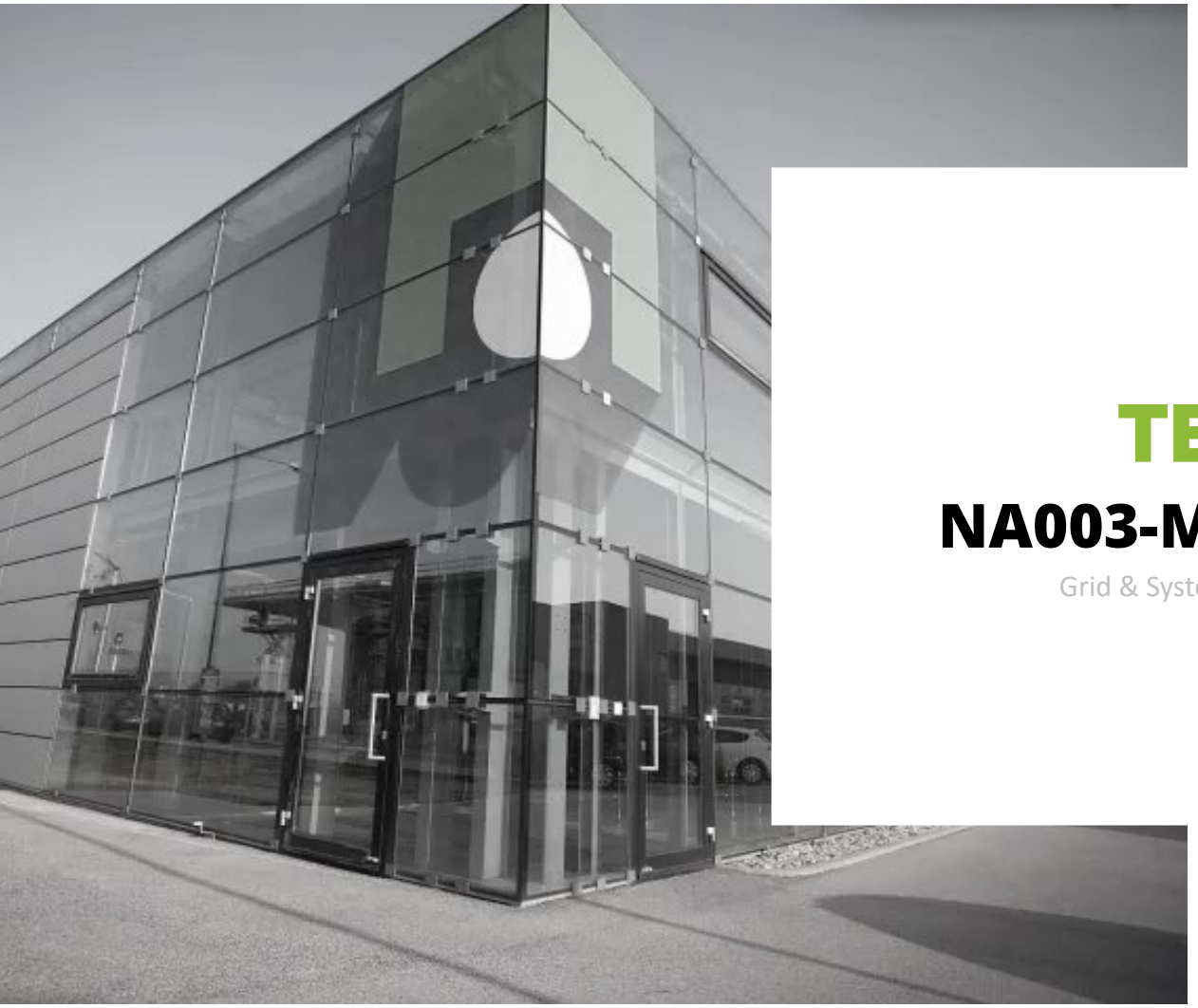


WE MAKE THE WORLD A BETTER PLACE



TELE

NA003-M64(.COM)

Grid & System Protection



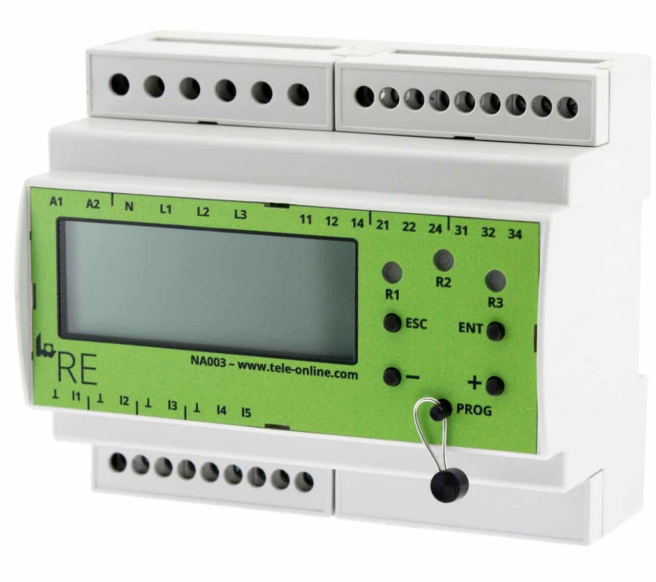
NA003-M64(.COM)

WHY – GRID & SYSTEM PROTECTION?



- Autonomously working isolation unit for electrical energy producers (EEG)
- Mandatory legal requirements – external grid & system protection for systems >30kVA or depending on country-specific specifications
- Feeding into the public grid
- Immediate switch-off in case of grid shutdown or disconnection
- Protects people and equipment
- Network stability

ABOUT ME



- Type code **NA003-M64 / NA003-M64.COM**

  NA003 grid and system protection device, 3. generation

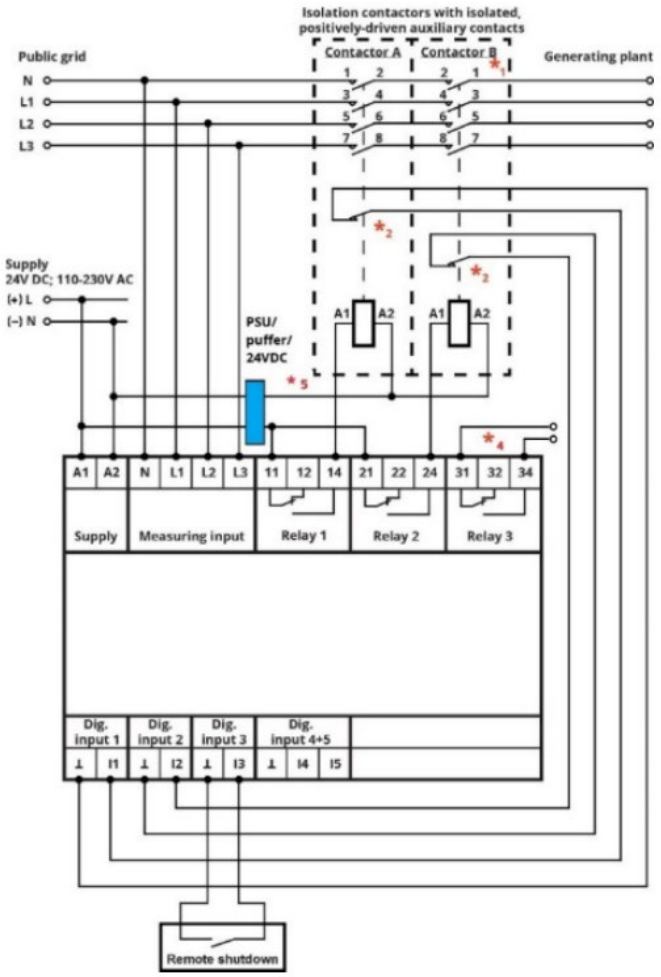
  M64 memory, describes hold of differnent parameter sets

  .COM with Modbus RTU interface

- Developed and manufactured from TELE
- MADE IN AUSTRIA
- Universally usable
- Part number NA003-M64: 2700100x
- Part number NA003-M64.COM: 2700200x
- Quarterly launch of a new version – index change by integrating new parameter sets

NA003-M64(.COM)

WHAT CAN I DO?



- Monitoring relays for voltage (1ph, 3ph) & frequency
- Safe measurement with 2 redundant fast measuring systems (safety concept)
- Predefined "country-specific" measuring & monitoring parameters
- Can hold more than 64 different parameter sets
- Adjust these parameters within allowed limits to comply with local regulations
- Parameter setting can be secured with a seal or password on request
- Optimised for mounting in control cabinets and on top-hat rails

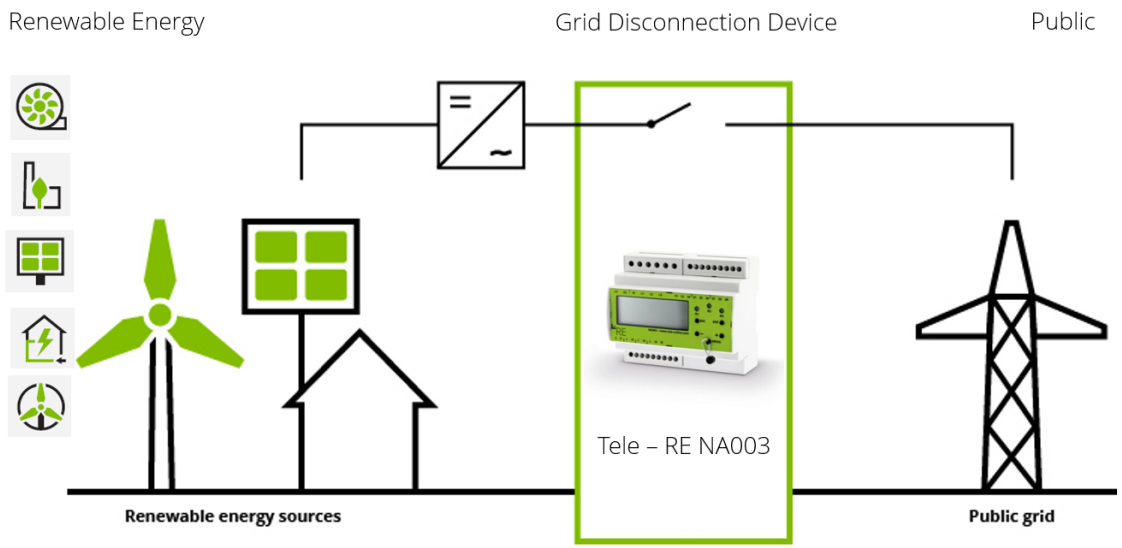
MY BENEFITS FOR YOU

- Best price/performance ratio on the market
- Meet all local monitoring criteria for a grid & system protection relay
- Perfectly suitable for worldwide export and use, as all international standards are implemented
- Work universally with 24V DC & 110-230V AC
- Clear and concise operation and readability thanks to digital display
- Settings can be done manually or via interface – MB/RTU
- Read and Write functionality
- Value transmission to MB-Master via MB/RTU
- 24/7 adjustment via MB interface
- Top TELE quality and highest availability for a very long time
- Downward compatible for former standards/devices

NA003-M64(.COM)

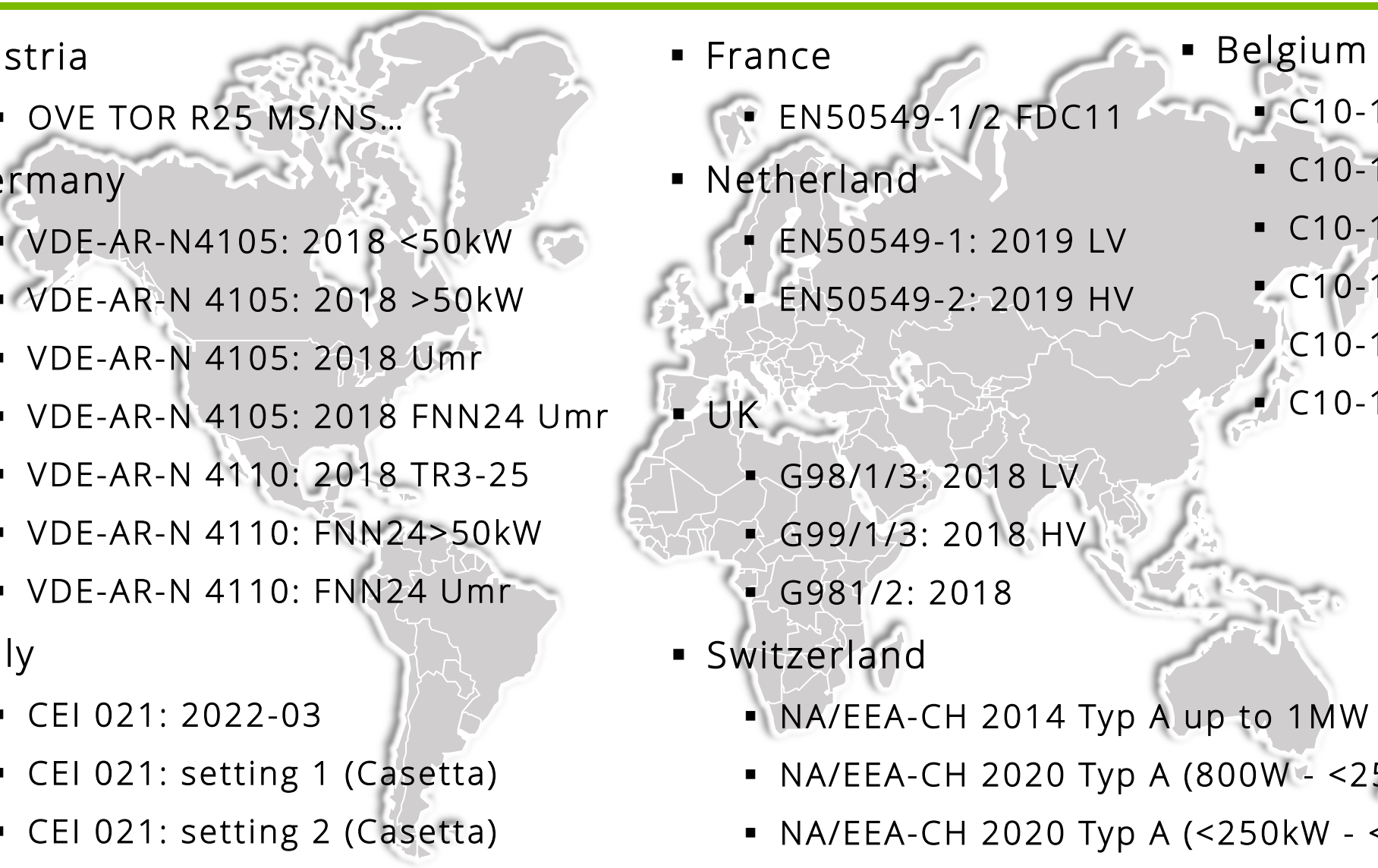
MY BENEFITS FOR YOUR CUSTOMERS

- Control the feed-in of energy into the grid
- Protect the grid, if feeding is not allowed
- Protect the energy generation plant, if the grid does not comply with specified values
- Control the contactor / circuit breaker & monitor them for proper function
- Stabilize the net when short load peaks occur (FRT)
- Generate an error list for later analysis
- Display live measured values
- Suitable for low and medium voltage systems
- Can be modified for special customer requirements



NA003-M64(.COM)

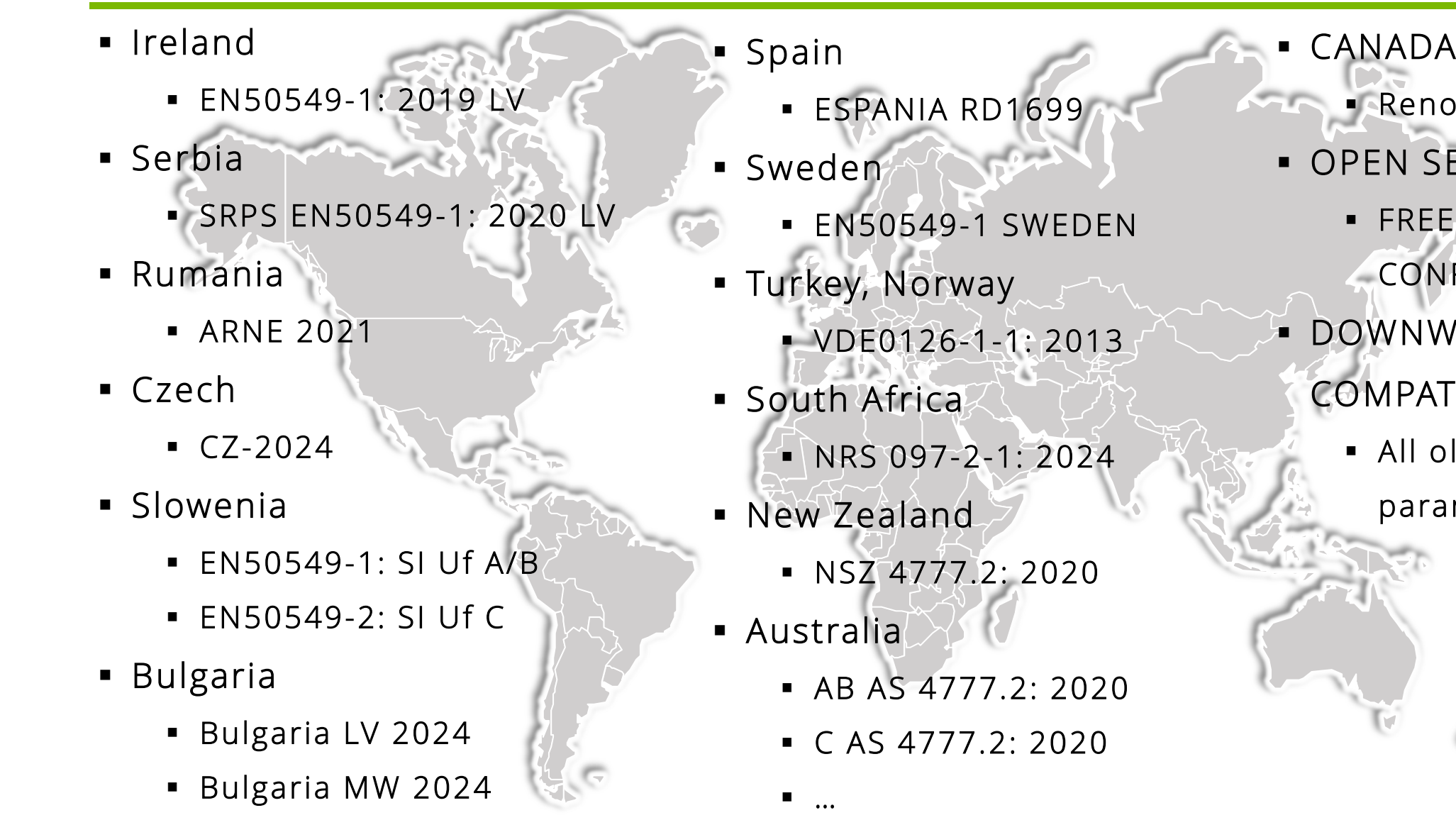
INTEGRATED COUNTRY STANDARDS



- Austria
  - OVE TOR R25 MS/NS…
- Germany
  - VDE-AR-N4105: 2018 <50kW
  - VDE-AR-N 4105: 2018 >50kW
  - VDE-AR-N 4105: 2018 Umr
  - VDE-AR-N 4105: 2018 FNN24 Umr
  - VDE-AR-N 4110: 2018 TR3-25
  - VDE-AR-N 4110: FNN24>50kW
  - VDE-AR-N 4110: FNN24 Umr
- Italy
  - CEI 021: 2022-03
  - CEI 021: setting 1 (Casetta)
  - CEI 021: setting 2 (Casetta)
- France
  - EN50549-1/2 FDC11
- Netherland
  - EN50549-1: 2019 LV
  - EN50549-2: 2019 HV
- UK
  - G98/1/3: 2018 LV
  - G99/1/3: 2018 HV
  - G981/2: 2018
- Switzerland
  - NA/EEA-CH 2014 Typ A up to 1MW
  - NA/EEA-CH 2020 Typ A (800W - <250kW
  - NA/EEA-CH 2020 Typ A (<250kW - <36MW
- Belgium
  - C10-11: 2021 LV-IP
  - C10-11: 2021 LV-FL
  - C10-11: 2021 LV-OR
  - C10-11: 2019-LV-ASS
  - C10-11: 2021 HV-IP
  - C10-11: 2019 HV-ASS

NA003-M64(.COM)

INTEGRATED COUNTRY STANDARDS



- Ireland
  - EN50549-1: 2019 LV
- Serbia
  - SRPS EN50549-1: 2020 LV
- Rumania
  - ARNE 2021
- Czech
  - CZ-2024
- Slowenia
  - EN50549-1: SI Uf A/B
  - EN50549-2: SI Uf C
- Bulgaria
  - Bulgaria LV 2024
  - Bulgaria MW 2024
- Spain
  - ESPANIA RD1699
- Sweden
  - EN50549-1 SWEDEN
- Turkey, Norway
  - VDE0126-1-1: 2013
- South Africa
  - NRS 097-2-1: 2024
- New Zealand
  - NSZ 4777.2: 2020
- Australia
  - AB AS 4777.2: 2020
  - C AS 4777.2: 2020
  - …
- CANADA
  - Renova SRL
- OPEN SETUP
  - FREE CONFIGURABLE
- DOWNWARD COMPATIBLE
  - All older/obsolete parameter sets

WHATS NEW IN VERSION K

- AUSTRIA
  - TIROL
    - New Requirments TiNetz – Switch ON Threshold Undervoltage- >85% instead of >86%
    - Medium Voltage – new requirments Overvoltage thresholds (both sets)
  - Upper Austria
    - MV-Parameter Set = ID 872 & ID 873 according to the requirments of Linz AG – Energie AG don‘t accept TELE device for MV-systems due to missing earth leakage monitoring.
    - Additional adjustment Nominal voltage 10kV grid and 100:1 VT
    - New switch-on times of 300s instead of 60s (ON delay)
    - Digital Input 3 (DI3) = n.c. (normally closed) instead of n.o. (normally open)

WHATS NEW IN VERSION K

- GERMANY
  - VDE-AR-N 4105: 2018 FNN24 Umr
  - VDE-AR-N 4110: FNN24>50kW
  - VDE-AR-N 4110: FNN24 Umr
    - Integration of 3 additional Parameter Sets due to NELEV Verordnung from March 2024 (VDE FNN)
    - Better knowing under Solarpaket 1 (Bundesgesetzgebung/federal legislation DE)
    - Should make it easier to get equipment approved and certified
    - The Solar Package 1 law is not yet in force, but is already being demanded by individual energy providers, and therefore the integration of these three new parameter sets.
    - Limits in the system dimension have changed – application of which directive
    - NEW – additional second frequency threshold at f>> 52.5Hz

WHATS NEW IN VERSION K

- EUROPA
  - EN50549
    - New testing standard– EN50549-10:2022
    - Affects the Netherlands, Ireland, the Czech Republic, Slovenia, France, and Serbia
    - New testing requirments – Range-Tests – Recertification of all parameter sets

- FRANCE
  - EN 50549-1/2 FDC11
    - Due to new testing standard – brand new parameter set = EN50549-1/2 FDC11
    - For LV and MV systems
    - Replaces old VDE 0126-1-1 (ENEDIS) parameter set
    - All certificates available in French language

WHATS NEW IN VERSION K

- SPAIN
  - ESPANIA RD1699
    - New country, including the development of new opportunities
    - Conformity with local network requirements
    - Certificates in Spanish language

- SWEDEN
  - EN50549-1 SWEDEN
    - New country, including the development of new opportunities
    - Adaptation to local network requirements (EFIS = Swedish Energy Agency)
    - Modification of EN50549 to local requirements
    - No external/additional certificate required

WHATS NEW IN VERSION K

- BELGIEN
  - C10-11: 2021
    - Separate new parameter sets for the energy suppliers FLUVIUS and ORES
    - FLUVIUS = FLANDERS and ORES = WALLONIA
    - Alignment with local requirements
    - In accordance with SYNERGRID requirements

- CANADA
  - RENOVA SRL
    - Own customer-specific parameter set according to the application and feed-in conditions in the Canadian grid.

NA003-M64(.COM)

WHERE AND BY WHOM AM I USED?



- Solar & renewable energy generation systems
- Cogeneration plant manufacturers
- Small hydropower plant manufacturers
- Large switchgear manufacturers for power generation plants
- Switchgear manufacturers
- Planning/Design offices
- Manufacturers/ wholesalers of battery storage systems
- Manufacturers/ wholesalers of inverters
- Specialist manufacturers of grid & system protection equipment



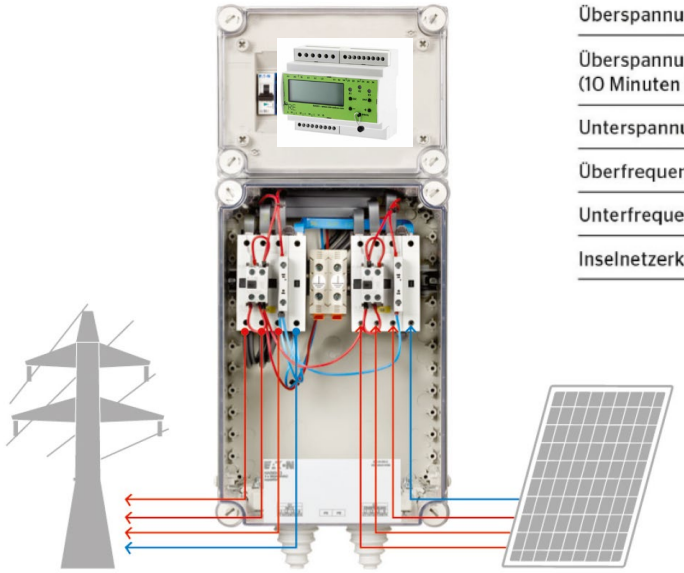
TECHNICAL
TRAINING

Grid & System Protection

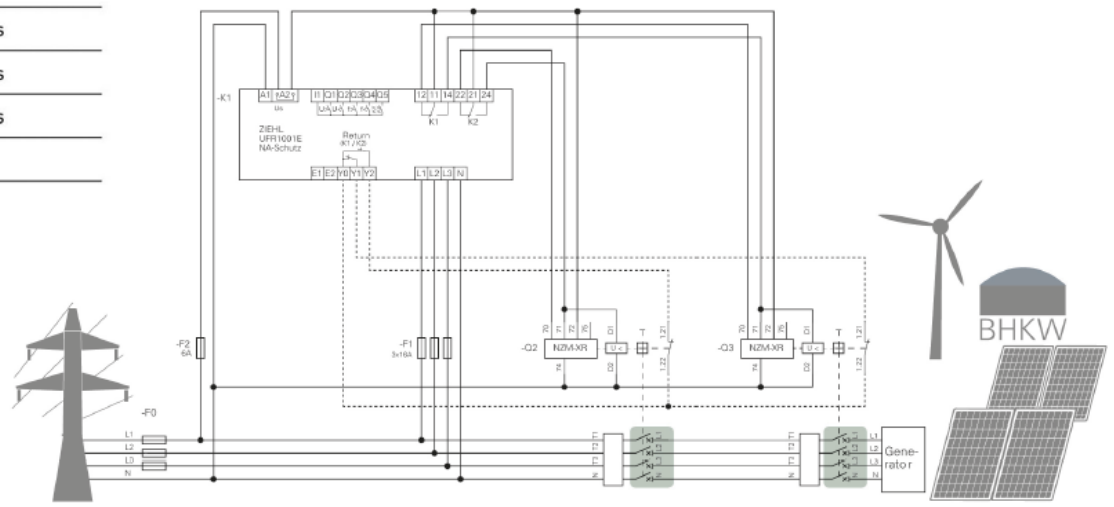


HOW DO I PROTECT?

- NA003-M64 measures voltage and frequency in the so-called PARALLEL MODE. In case of deviations from standard values, it disconnects the power generation system from the grid.
- Criteria for disconnection are voltage ranges, frequency ranges and rates of change (RoCoF) of frequency and voltage.



Schutzfunktion		Einstellwert	Auslösezeit
Überspannungsschutz	1 U >	1,15 U_N	< 200 ms
Überspannungsschutz (10 Minuten Mittelwert)	2 U >>	1,10 U_N	< 200 ms
Unterspannungsschutz	U <	0,8 U_N	< 200 ms
Überfrequenzschutz	f >	51,5 Hz	< 200 ms
Unterfrequenzschutz	f <	47,5 Hz	< 200 ms
Inselnetzerkennung			< 5 s



PARAMETER STRUCTURE

3.5.10 ÖVE TOR R25 NS ASYNC [ID 803] Typ A/B low voltage asynchr. generators

Connection Mode			Conformity Range	Possible Range
ID		Default		
.003	Connection	4-wire (LN)	4-wire (LN)	2-wire, 3-wire, 4-wire (LN), 4-wire (LN+LL)

Nominal Voltage					Conformity Range		Possible Range	
ID				Default	Min	Max	Min	Max
.005	ULN/LL nom	Unom Y	V	230.0	57.5	230.0	28.8	241.4
		Unom Δ	V	400.0	100.0	400.0	50.0	420.0

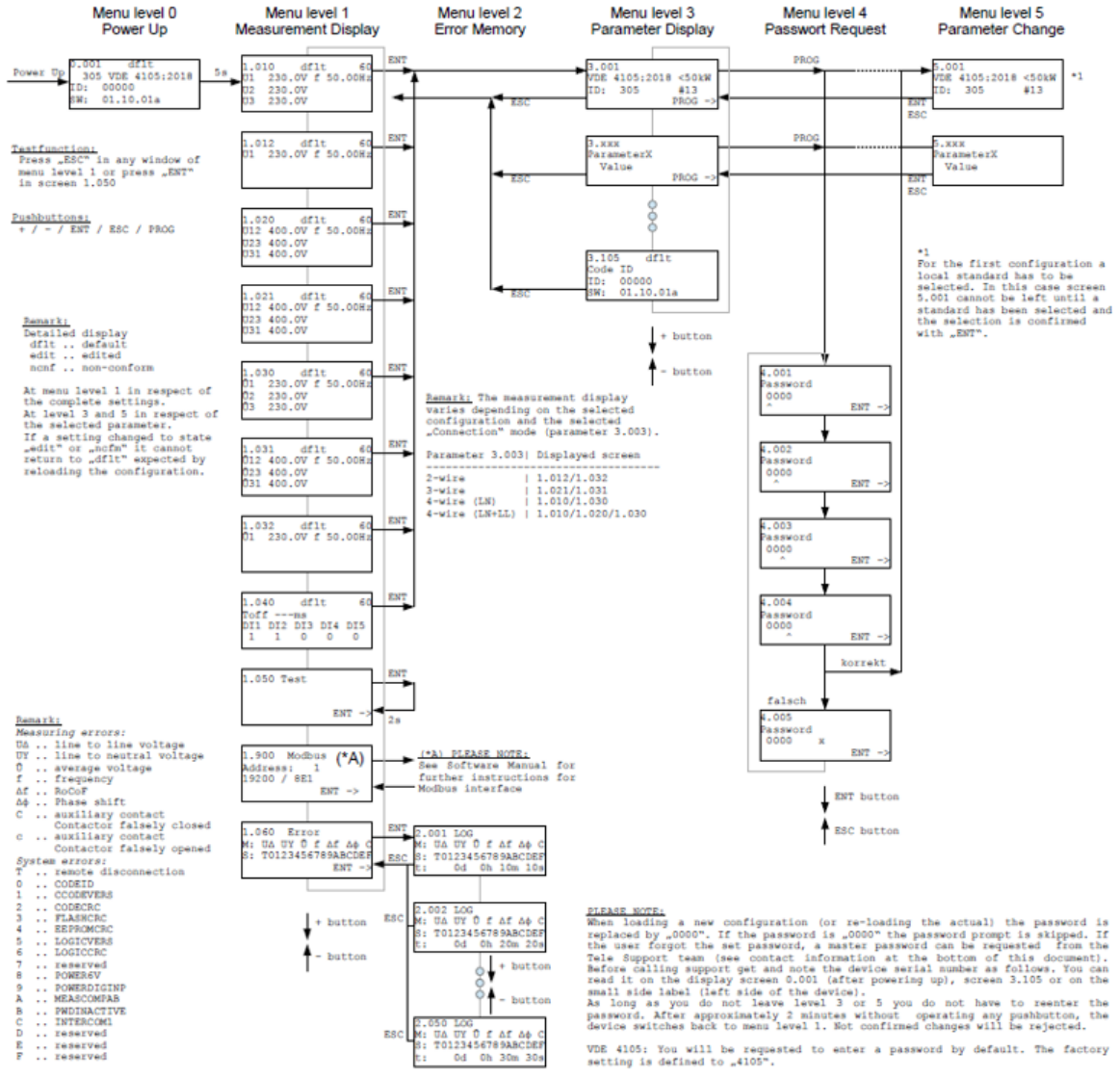
Overvoltage1 Line to Neutral					Conformity Range		Possible Range	
ID				Default	Min	Max	Min	Max
.018	Ueff >	Enable function		on	on / off		on /off	
.019	Ueff > off	U_{THR} OFF	%Unom	111	100	130	100	135
.020	Ueff > on	U_{THR} ON	%Unom	108	100	108	100	135
.021	T Ueff >	Time OFF	ms	60000	50	180000	50	180000
Comment:		Ueff > on has a fixed offset of 0.5% U_{NOM} subtracted from the displayed value						
Only active for:		Connection Modes: 2-wire, 4-wire (LN), 4-wire (LN+LL)						

Undervoltage1 Line to Neutral					Conformity Range		Possible Range	
ID				Default	Min	Max	Min	Max
.023	Ueff < off	U_{THR} OFF	%Unom	80	10	100	10	100
.024	Ueff < on	U_{THR} ON	%Unom	90	86	100	10	100
.025	T Ueff <	Time OFF	ms	1500	50	180000	50	180000
Comment:		Ueff < on has a fixed offset of 0.5% U_{NOM} added to the displayed value						
Only active for:		Connection Modes: 2-wire, 4-wire (LN), 4-wire (LN+LL))						

Overvoltage2 Line to Neutral				Conformity Range		Possible Range	
ID			Default	Min	Max	Min	Max

- For each parameter there‘s always a:
  - Function explanation
  - Standard value (default)
  - Conformity range
  - Possible range
- If the default value is adjusted, but is in the compliant range, the parameter in the display shows "edit".
- If the default value is adjusted, but is outside the conforming range, the display shows "ncnF" (i.e. non conform).
  This means that the device no longer meets the tested specifications.

MENU STRUCTURE

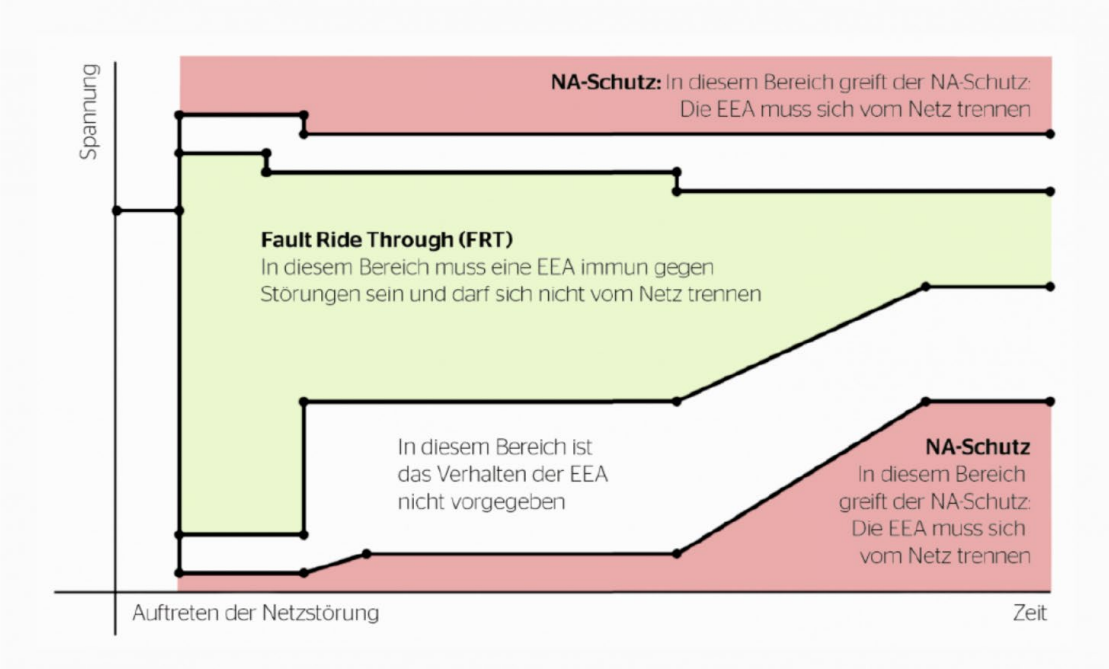


HOW DO I STABILIZE THE GRID?

- In the past, the situation was simpler. Large power plants were responsible for grid stability and power generation plants (EEA) were tolerated but had to subordinate themselves. If the grid frequency changed above 50.2Hz or below 49.5Hz, the EEA had to disconnect from the grid (VDE 0126-1-1 (2002).

- To ensure system stability of the interconnected grid EEA's requirements not to disconnect from the grid during short grid disturbances are even more important than grid & system protection.

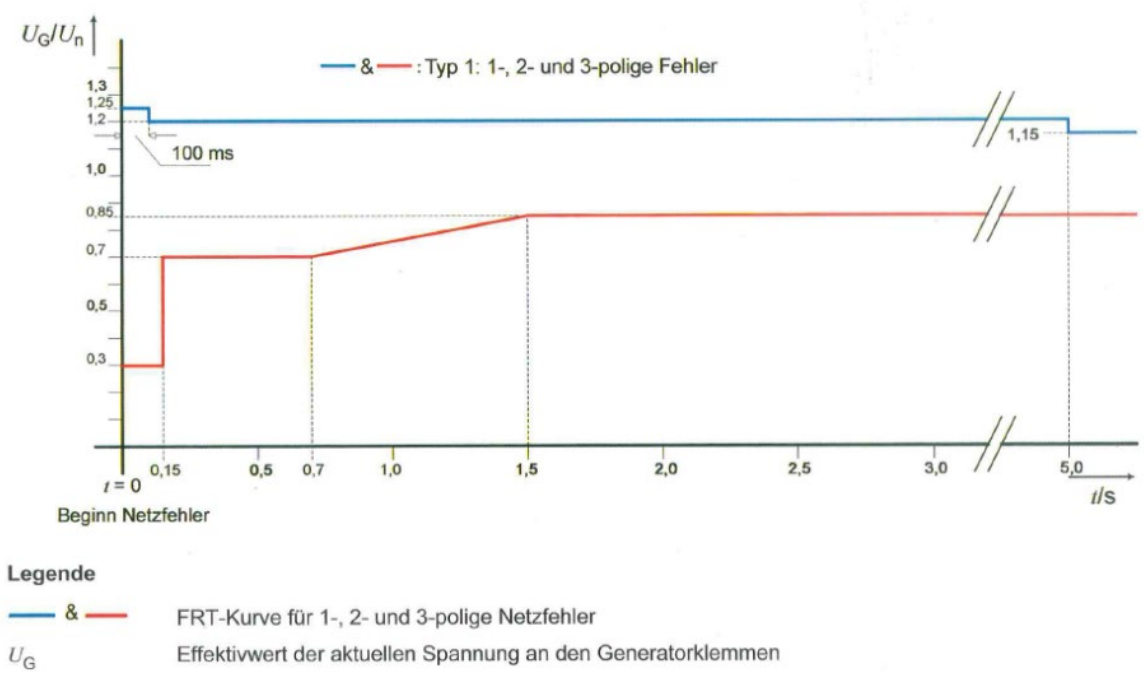
- These requirements are generally referred to as FRT (Fault Ride Through).



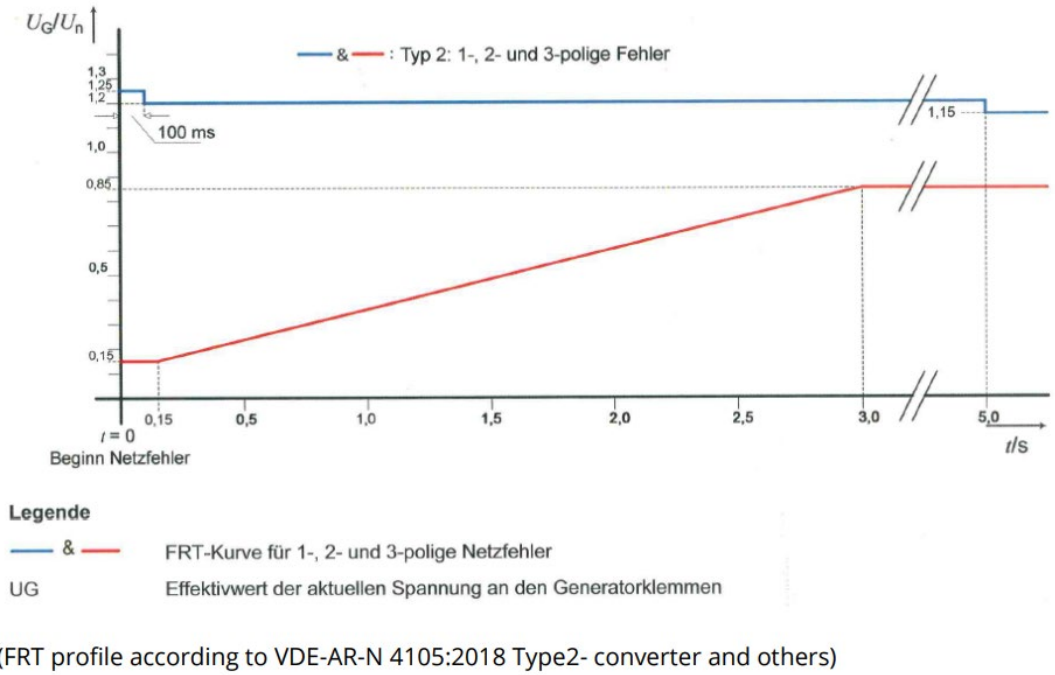
HOW DO I STABILIZE THE GRID?

- FRT requirements from VDE-A-N-4105: 2018

FRT Profile Type 1 – synchronous generators



FRT Profile Type 2 – converters and others



(FRT profile according to VDE-AR-N 4105:2018 Type2- converter and others)

HOW DO I STABILIZE THE GRID?

- FRT capability must be considered separately for the different components of a power generation system.
  - Contactor / Circuit breaker – own buffering
  - Attention, the installer must ensure that the requirements for FRT and undervoltage protection do not influence each other.

- If the NA003 is connected on the supply side (A1/A2) to the main power supply (not supplied separately from the measuring circuit), the NA protection can bridge <580ms at 230V AC and <200ms at 110V AC, i.e. no reset of the NA protection nor do the relays R1/R2 drop off.

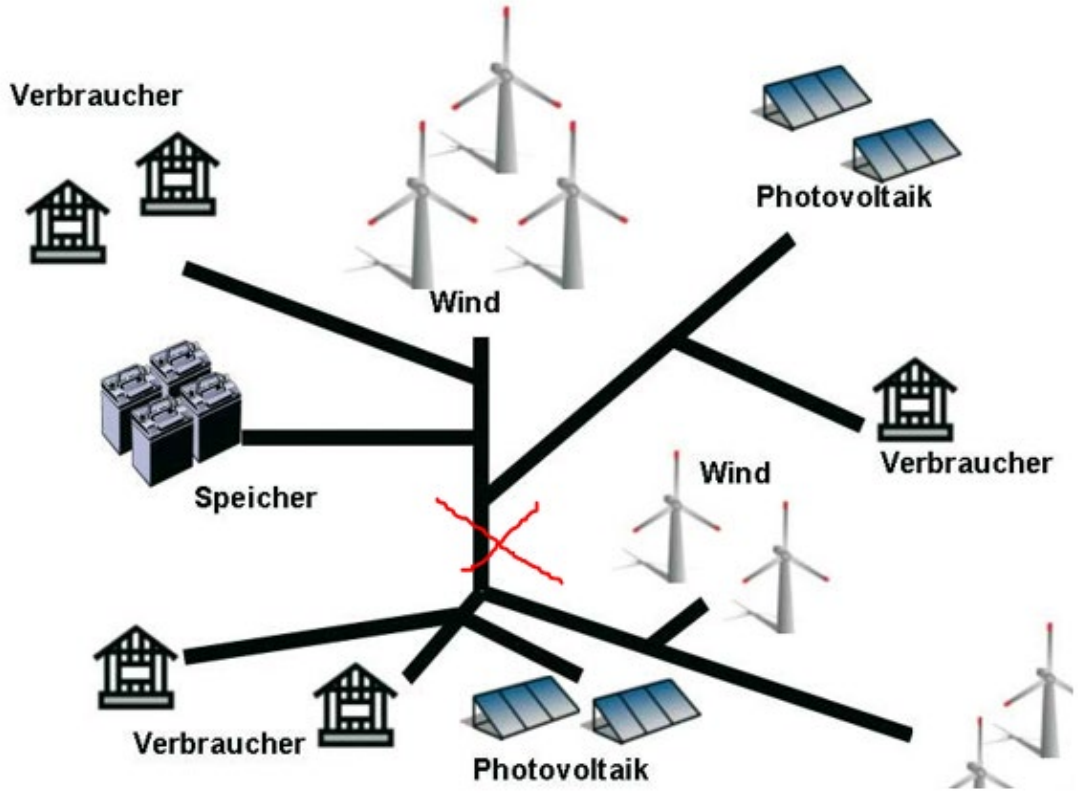
- With 24V DC supply, sufficient buffering must be available, since the internal power supply of the grid & system protection can only bridge 70ms max.

ISLAND DETECTION

- A Microgrid is a locally defined electricity main that consists of only one or a few electric generators, supplying only a small area and is no longer connected to other electric grids

- 2 methods of island detection
  - **Active methods**
  - **Passive methods**

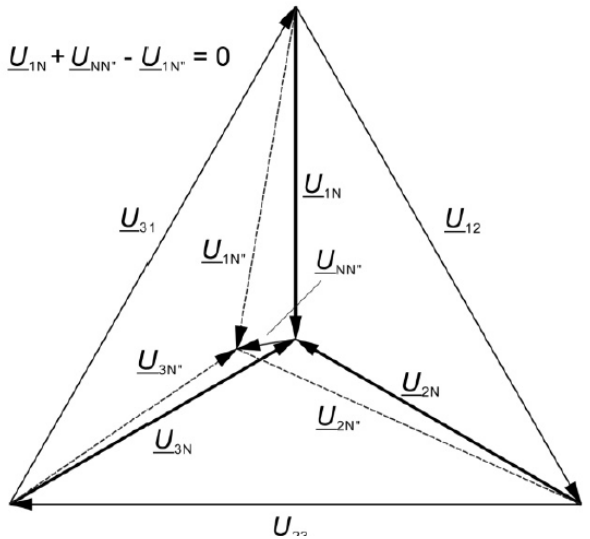
- **Active methods**
  - Only be possible with converters



ISLAND DETECTION

- **Passive method**
  - **Loss Of Mains via voltage measurement**
    - 3-phase voltage monitoring (line to line)
  - **Loss Of Mains via RoCoF**
    - Based on frequency measurement and triggers in the event of lasting frequency changes over multiple periods (df/dt limit is specified and set in mHz/s)
  - **Loss Of Mains via Vector Shift**
    - Detected via time measurements of the half-waves and the comparison with previous measurements. … occur due to a sudden load change or shortcuts in the superordinate mains (specified and set in degrees (0,1 etc.)

ZERO SEQUENCE PROTECTION (UZERO)



- The detection of the zero sequence (Uzero) in the three-phase system forms a further supplement to the protection functions. Zero sequence can be used, for example, to detect short circuits in the superordinate medium power grid. For this purpose, the three line-to-neutral voltages L1, L2 and L3, which are normally shifted by 120°, both the magnitude and the phase position are added to each other. The magnitude of the voltage difference (without angle) to the neutral conductor is determined and divided by three. If all line-to-neutral voltages have the same magnitude and are shifted exactly 120° to each other, the zero sequence is 0VAC.

MODBUS INTERFACE

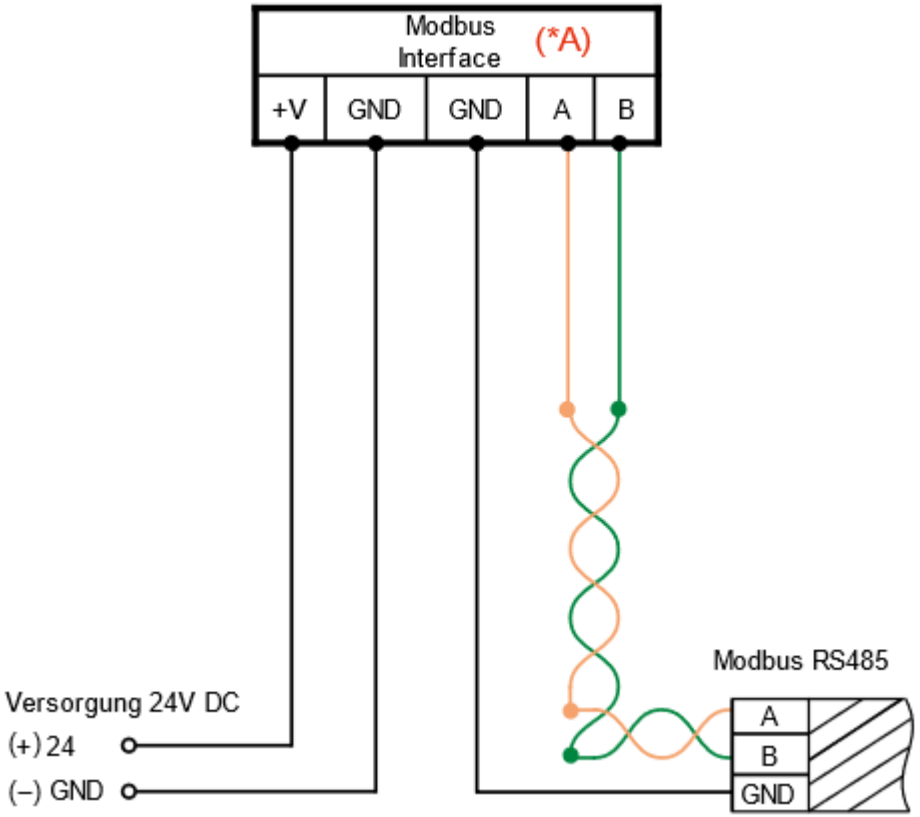
The Add-On NA003.COM implements a Modbus RTU (RS485 standard) interface.
It is possible to read and to overwrite values like voltages, frequencies, parameter sets, etc.

Basic Data Modbus Interface

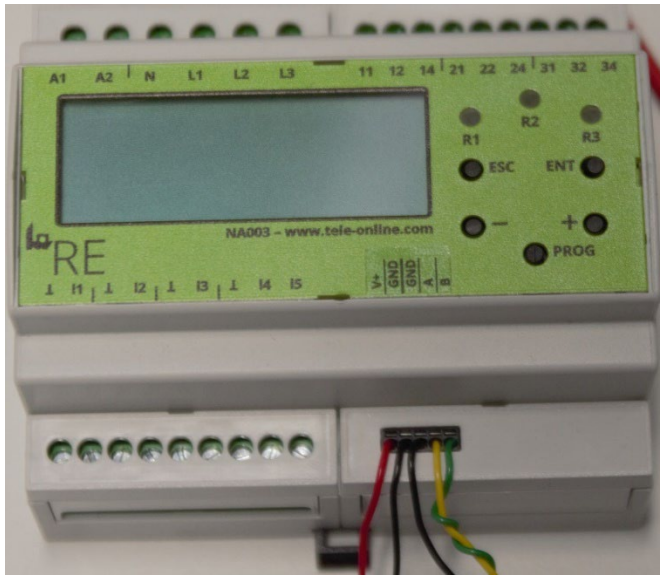
Type	Modbus RTU/RS485, 5V Transceiver
Supply	24V d.c.
Tolerance of the supply voltage	± 15%
Nominal consumption interface (ca.)	0,2W @ 24V d.c.
Terminals	V+, GND, GND, A, B
Baudrate	9k6 = 9600 baud / 19k2 = 19200 baud (Default: 19200 baud)
Startbit	1
Data length	8 bits
Parity bit	E - even / O - odd / N - none (8N1 none conform)
Number of stopbits	1 or 2
Modbus register / configuration	See software manual (website: www.tele.com)
Protection against electrical shock	Protective separation by reinforced insulation across RS485 interface and Sensor Inputs.
Cable management communication:	Must be installed in-building and with no connection to earth. Length of cables <10m.

MODBUS INTERFACE CONNECTION

Modbus RS485 standard including RTU cable and 5V transceiver are necessary. We recommend a USB-to-RS485 adapter at this point to establish a stable serial connection between the slave (NA003.COM) and the master (user PC, etc.).







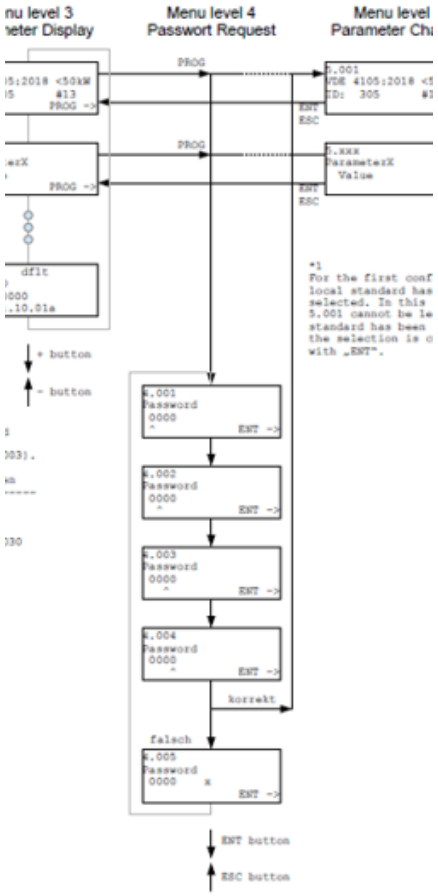
MODBUS POLL ©

All relevant information about software can be found in the document "Software Manual NA003.COM" as an appendix or at www.tele-online.com.

In the document you will find all Modbus register entries, the adapted menu structure, and the handling with "Modbus Poll ©", which we recommend as Modbus configuration software, as Modbus Poll was also used in the use case in the software manual.

The Modbus Poll program is available online and can be downloaded free on: https://www.modbustools.com/

MY PROTECTION FOR PARAMETER SETTINGS



There are 2 ways to protect unintended parameter changes:

- Seal on the PROG button
- Password protection in parameter menu



OPEN SETUP

Open Setup, freely configurable and without restrictions

- A setting option that does not exist otherwise
- Parameter setting - individually and according to customer's wishes/needs
- Free configuration by the user based on all available parameters
- Cross-country use through free configuration even with non-country-specific requirements or different specifications
- Multifunctional monitoring relay and not only for grid & system protection

PRELIMINARY INFORMATION – COMING SOON

NA005

- New Soft- and Hardware-platform
  - Classic NA without interface
  - New version with interface
    - MB-TCP/IP (EtherNet) interface (write und read mode)
- Especially for additional new business areas
  - Storage to Grid
  - Bidirectional charging
- Product launch Q4/2025
- Working Samples end Q3/2025