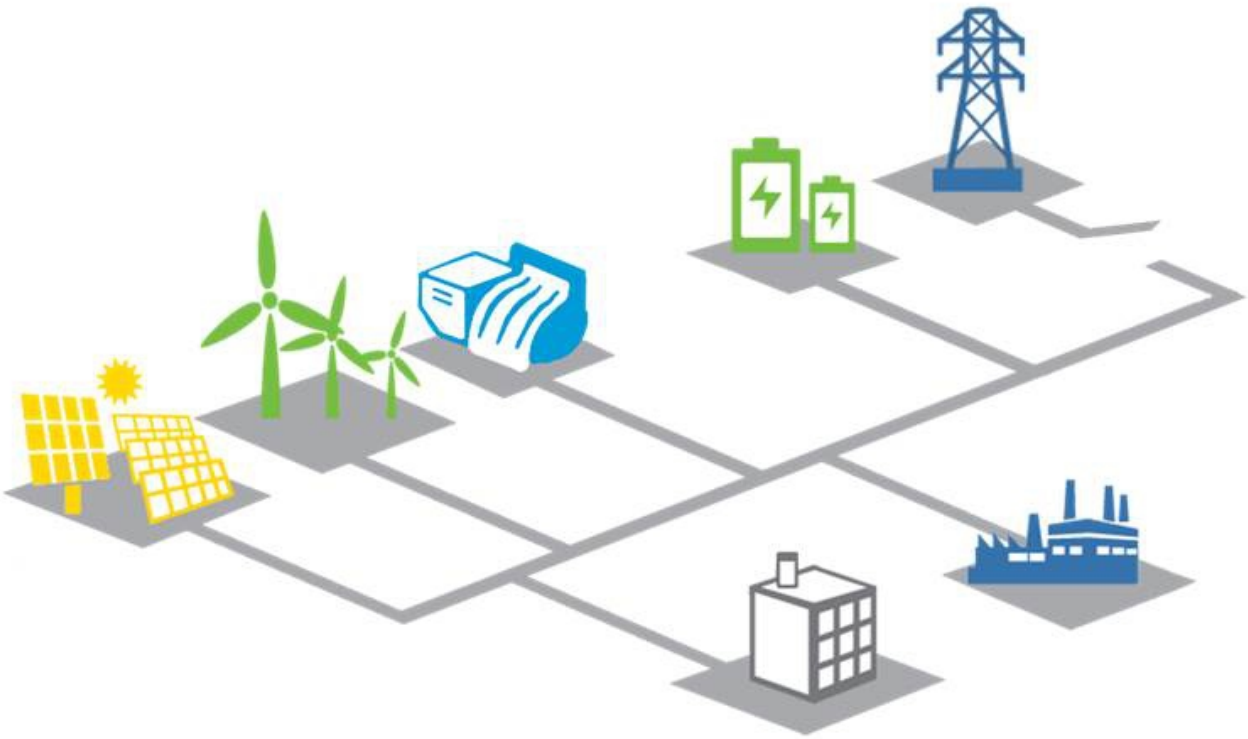
Firmware Tde Macno

User's manual

# AFE ENERGY - Micro Grid



Cod. MW01101E00 V_1.3

# INDEX

# 1 MICRO-GRID

## 1.1 STORAGE / ISLAND FUNCTION MODE

OPDE-AFE converters (fw 40.75-) implement the procedures for the operation as Storage and Island Function Mode for the management of Micro-Grids.

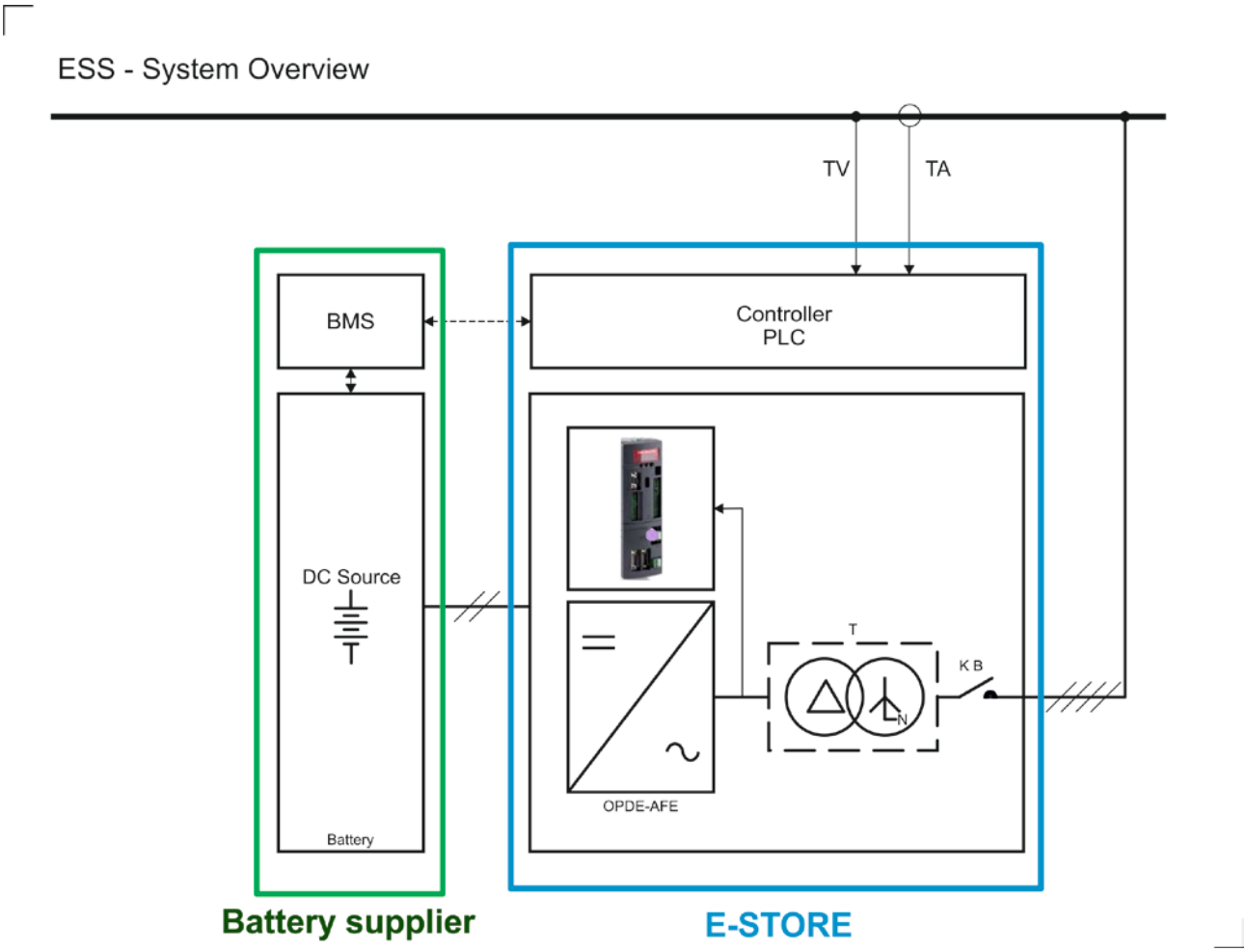



**FIG. 1**

OPDE-AFE converter is capable of managing a micro-grid both connected to the grid (Grid Connected), both in Island Operation Mode depending on the conditions and status of available energy sources.

**CSI**: When connected to the network (Grid Connected, PLL Control active), the inverter can operate as a current generator (CSI). The presence of an AC source (Vg) is managed by operating as Battery Charger (Battery Charger Grid-Connected CSI) in which the exchange of power with the battery can be set by the user. The converter can also provide reactive power for reactive load compensation (cosphi correction).

**VSI**: Feeding the converter with a DC voltage supplied by battery or other source, the converter provides three-phase output voltages to be set in amplitude and frequency. The AC voltage control loop tends to maintain those values of amplitude and frequency set by the user.

The use of a transformer Dyn11 (FIG. 2) enables the provision of single-phase voltage.

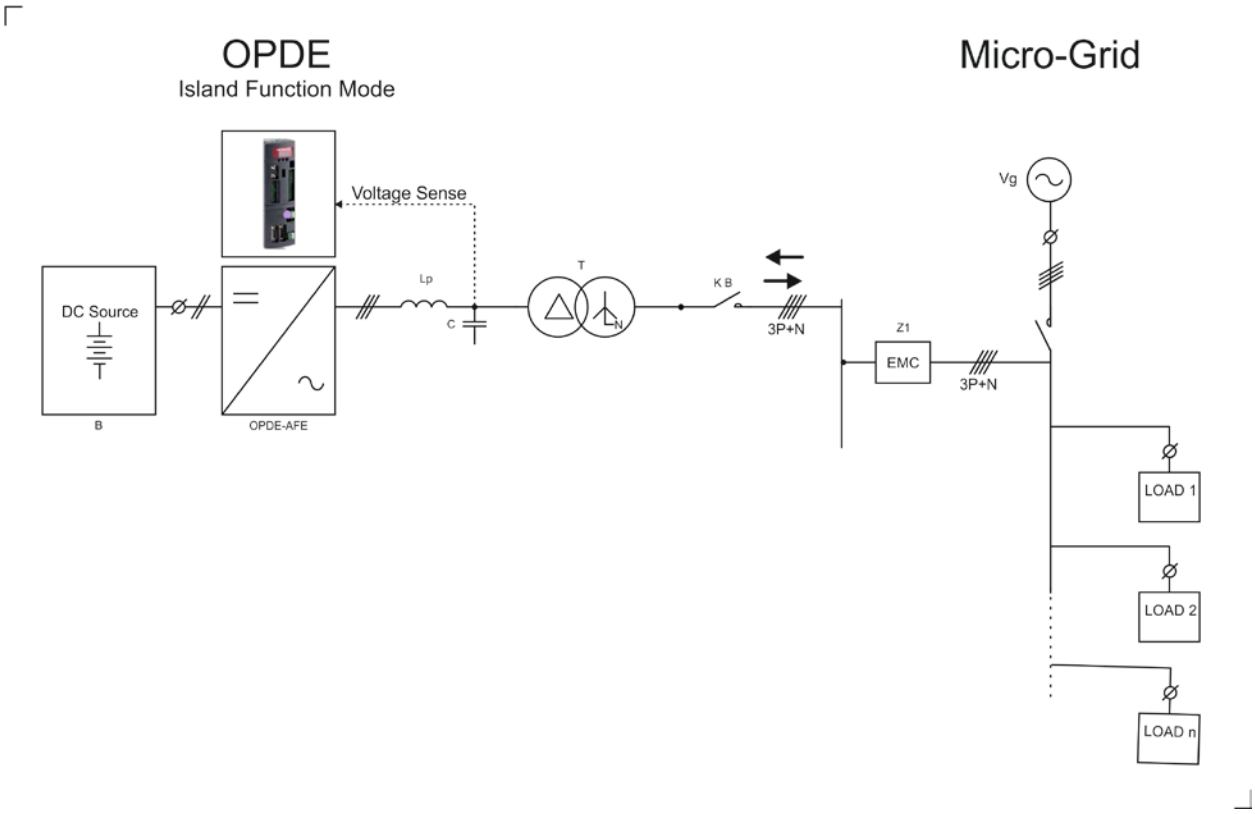



**FIG. 2:** Storage / Micro-Grid schematics

## 1.2 MODE OF OPERATION

STORAGE Operation Mode:
In STORAGE Operation Mode in which both an accumulator battery and a power source AC are always present, the AFE can be handled in two ways:
in current control (**CSI**) or in voltage control with current limit active.
Island Operation Mode (Micro-Grid):
In Island Operation Mode (Micro-Grid) the AC voltage output is adjustable in amplitude and frequency by the user (**VSI**). Power is supplied from the DC side whose voltage value must be appropriate to the output to be obtained.

### 1.2.1 System Set Up (VSI Mode)

VSI Control Mode (Voltage Source Inverer) is performed as described in the control schematic below.
By disabling I20=FALSE, the Voltage AC control is performed. Providing a DC input Voltage adeguate to the purpose (at least the rectified AC Voltage required), the inverter can control the output AC Voltage thus to obtain the setpoint required in amplitude and frequency.

**Attention!** in VSI Mode the only L1,L2,L3 POSITIVE sequence is managed. Make sure the connection to Grid (if required) follows the correct sequence.

It is possible to correct the setpoints P10 (Amplitude) and P63 (frequency) thus to optain a completey settable system with Voltage and Frequency dynamically changeable by the user. This can be obtained by using the values VgridOvd and FgridOvd via FieldBus as described in Par. **1.7**.

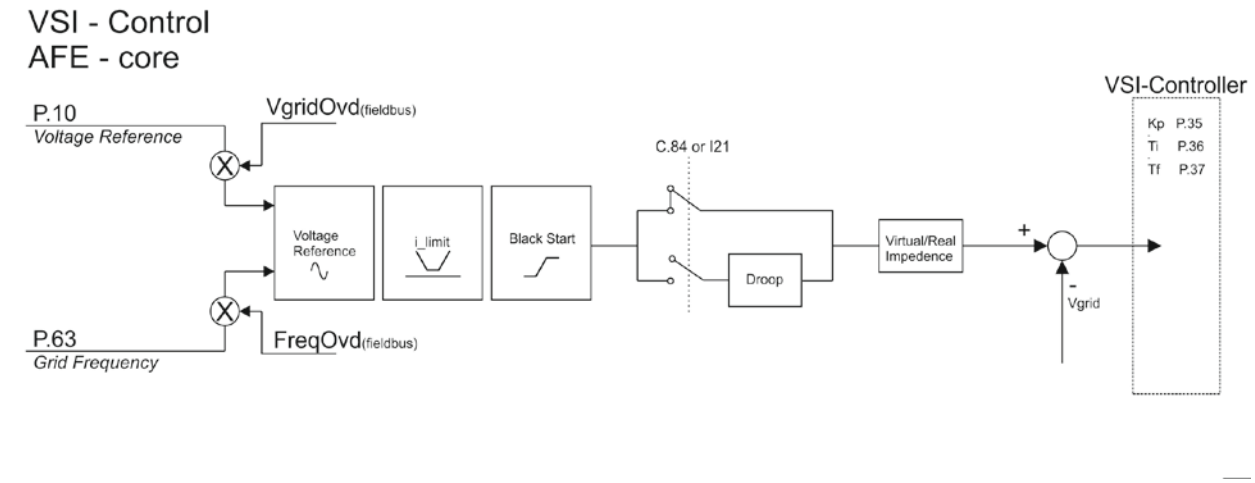



**FIG. 3:** VSI Reference and Control Mode

Table with the main configuration parameters:

**Configuration Parameters:**

| Name | Description | Min | Max | Default | UM | Scale |
|---|---|---|---|---|---|---|
| GRID_ISL_V_REF | P10 - AC GRID_ISL Voltage Reference | 30.0 | 780.0 | 230 | V | 10 |
| BLK_START_TM | P21 - Black Start Time | 0.01 | 199.99 | 10.00 | s | 100 |
| FREQ_DROOP | P22 - % Frequency Droop | -100.00 | 100.00 | 2.00 | % | 81.92 |
| VOLT_DROOP | P23 - % Voltage Droop | -100.00 | 100.00 | 5.00 | % | 81.92 |
| GRID_ISL_KP | P35 - KpV GRID_ISL V Prop Gain | 0.1 | 400.0 | 0.3 | | 10 |
| GRID_ISL_TI | P36 - TiV GRID_ISL V lead time constant | 0.1 | 3000.0 | 5.0 | ms | 10 |
| GRID_ISL_TF | P37 - TfV GRID_ISL filter time constant | 0.0 | 25.0 | 0.0 | ms | 10 |
| PRC_DIS_REG_GRID_ISL | P38 - Cross Coupling multiplier for GRID_ISL V ac Control | 0.0 | 200.0 | 80.0 | % | 10 |
| F_GRID_NOM | P63 - Rated grid frequency | 50.0 | 60.0 | 50.0 | Hz | 10 |
| PRC_REAL_VRS | P69 - Voltage drop due to real resistor | 0.00 | 25.00 | 0.1 | $\%_{V\_GRID\_NOM}$ | 327.67 |
| PRC_REAL_VLS | P70 - Voltage drop due to real inductance | 0.00 | 50.00 | 3.0 | $\%_{V\_GRID\_NOM}$ | 327.67 |
| PRC_VIRTL_VRS | P72 - Voltage drop due to real+virtual resistor | -25.00 | 25.00 | 0.1 | $\%_{V\_GRID\_NOM}$ | 327.67 |
| PRC_VIRTL_VLS | P73 - Voltage drop due to real+virtual inductance | -50.00 | 50.00 | 3.0 | $\%_{V\_GRID\_NOM}$ | 327.67 |
| CAPAC_LINE_CURR | P74 - Capacitors Line Current | 0.00 | 20.00 | 0.0 | $\%_{I\_CONV\_NOM}$ | 327.67 |
| DY11_AN | P80 - Dy11 angle Phase Shift | -180.0 | 180.0 | 0.0 | deg | 10 |
| CONTROL_SEL | C00 -Control Selection | Range<br>0 AFE standard control<br>1 FFE control<br>2 Micro-Grid control | | 0 | | 1 |
| I_CTRL_SEL | C80 - Current control type selection | Range<br>0 dq control<br>1 ac control | | 1 | | 1 |
| V_CTRL_SEL | C81 -Voltage control type (GRID-ISLAND) | Range<br>0 dq control<br>1 ac control | | 0 | | 1 |
| SYNC_CARD_SEL | C82 - Type of Sync Card mounted | Range<br>0 old<br>1 new | | 0 | | 1 |
| SWAP_ISL_EN | C83 -Swap to Island function Enable | 0 | 1 | 0 | | 1 |

**TAB. 1:** Parameters and Connections for MicroGrid Application

| | | | |
|---|---|---|---|
| I20 | | 0 | **VSI**, AC Grid Voltage Control Active. |
| | | 1 | **CSI**, PLL Active |
| I21 | | 0 / 1 | Enable droop control |
| | | | |
| O44 | | 0 (False) / 1 (true) | V Bus into the range VB_MAX VB_MIN |
| | | | |

**TAB. 2:** Logic Input /Output specific for MicroGrid Application

For Island Operation Mode the following configuration parameters must be set.

| | | | | | | |
|---|---|---|---|---|---|---|
| CONTROL_SEL | C00 -Control Selection | 0 | 2 | 0 | | 1 |

C.00 defines the type of control used. The control modes available are shown in

| C.00 | Control |
|---|---|
| 0 | A.F.E. standard control |
| 1 | F.F.E. control |
| **2** | **Micro-Grid control** |

**TAB. 3**

| | | | | | | |
|---|---|---|---|---|---|---|
| GRID_ISL_V_REF | P10 - AC GRID_ISL Voltage Reference | 30.0 | 780.0 | 230 | V | 10 |

P10 [V rms] should be set to the value of the AC voltage to be obtained. This value must be consistent with the DC supply voltage of the converter.
Setting the working voltage [V] affects the size of the magnetic components of the framework that contains the converter (transformer, LCL filter). Therefore, it is necessary to specify the working voltage when issuing the order for the correct sizing of the converter and auxiliary components.

| | | | | | | |
|---|---|---|---|---|---|---|
| F_GRID_NOM | P63 - Rated grid frequency | 50.0 | 60.0 | 50.0 | Hz | 10 |

P63 is the frequency [Hz] of the desired AC voltage.
Setting the working frequency affects the size of the magnetic components of the framework that contains the converter (transformer, LCL filter). Therefore, it is necessary to specify the working frequency (50-60Hz) when issuing the order for the correct sizing of the converter and auxiliary components.

| | | | | | | |
|---|---|---|---|---|---|---|
| BLK_START_TM | P21 - Black Start Time | 0.01 | 199.99 | 10.00 | s | 100 |

P21 refers to the Black Start function. It is the ramp time in which the voltage is brought from the value 0 to the one set on P.10. This time should be set taking into account the possible currents of electrical machines in the network (transformers, motors ...) while starting. During the Black start the output frequency is fixed and equal to the value set on P63.

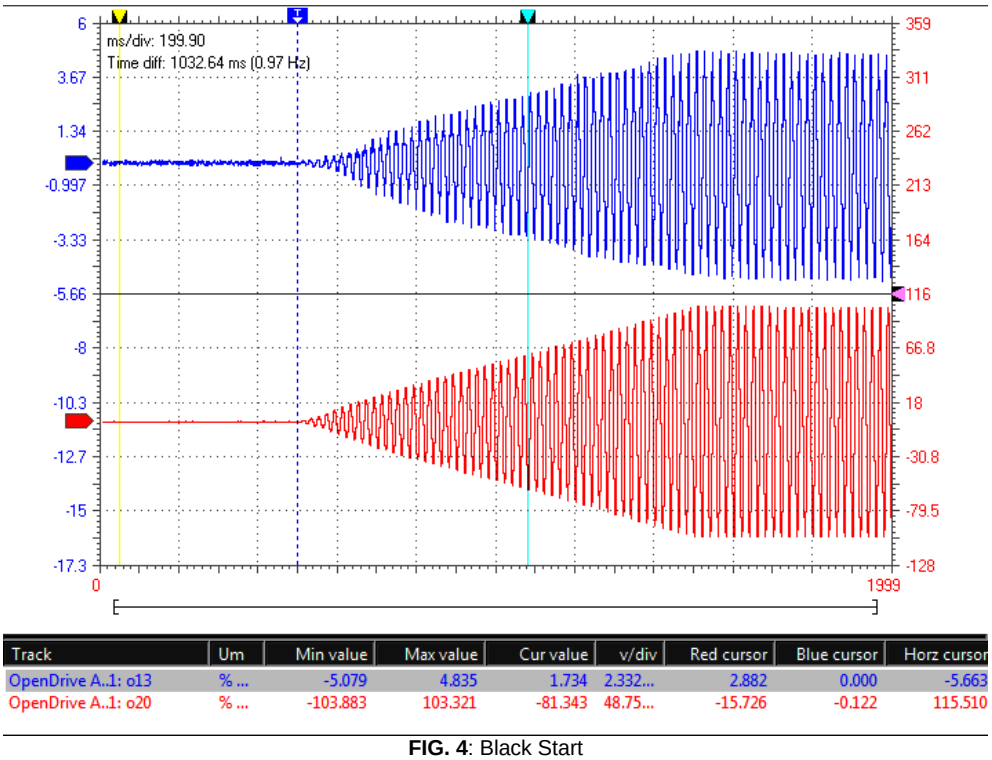



**FIG. 4**: Black Start

| | | | | | | |
|---|---|---|---|---|---|---|
| GRID_ISL_KP | P35 - KpV GRID_ISL V Prop Gain | 0.1 | 400.0 | 0.3 | | 10 |
| GRID_ISL_TI | P36 - TiV GRID_ISL V lead time constant | 0.1 | 3000.0 | 5.0 | ms | 10 |
| GRID_ISL_TF | P37 - TfV GRID_ISL filter time constant | 0.0 | 25.0 | 0.0 | ms | 10 |

| | | | | | | |
|---|---|---|---|---|---|---|
| PRC_DIS_REG _GRID_ISL | P38 - Cross Coupling multiplier for GRID_ISL V ac Control | 0.0 | 200.0 | 80.0 | % | 10 |

P35, P36, P37 refers respectively to Kp, Ti, Tf of the PI of the AC Voltage Loop.
percDisGRID_ISL is a quantity that can enable the de-coupling term between the axes (dq control). In general, this feature is enabled with a default value equal to 80%.

| | | | | | | |
|---|---|---|---|---|---|---|
| PRC_REAL_VRS | P69 - Voltage drop due to real resistor | 0.00 | 25.00 | 0.1 | $\%_{V\_GRID\_NOM}$ | 327.67 |
| PRC_REAL_VLS | P70 - Voltage drop due to real inductance | 0.00 | 50.00 | 3.0 | $\%_{V\_GRID\_NOM}$ | 327.67 |
| PRC_VIRTL_VRS | P72 - Voltage drop due to real+virtual resistor | -25.00 | 25.00 | 0.1 | $\%_{V\_GRID\_NOM}$ | 327.67 |
| PRC_VIRTL_VLS | P73 - Voltage drop due to real+virtual inductance | -50.00 | 50.00 | 3.0 | $\%_{V\_GRID\_NOM}$ | 327.67 |

| | | | | | | |
|---|---|---|---|---|---|---|
| CAPAC_LINE_CURR | P74 - Capacitors Line Current | 0.00 | 20.00 | 0.0 | $\%_{I\_CONV\_NOM}$ | 327.67 |

P72 and P73 refer to Virtual+Real Impedence. They allow to configure the total Resistive and Inductance impedence due to Real + Virtual components during VSI working mode.
Setting P72 and P73 to the same values of P.69 ( Voltage Drop due to real resistor) and P70 (voltage Drop due to real inductance) the Virtual Impedence function is automatically excluded.

P74 is the amount of current (% I_CONV_NOM) in the line (L1, L2, L3) due to the Capacitor Filter (LC). Setting the value to 0.0, the amount of Capacitor current is excluded into the Virtual impedence calculations.

| | | | | | | |
|---|---|---|---|---|---|---|
| DY11_AN | P80 - Dy11 angle Phase Shift | -180.0 | 180.0 | 0.0 | deg | 10 |

P80 defines the angle between the control point and capture of synchronization signals (Voltage Sense). In particular, with the use of Dyn11 transformer type, the angle should be set to the value of 30.0 degrees. (This only in the case in which the signals are acquired on the λ-side of the transformer). In the case where, as suggested in Figure 1, the sync signals (Voltage Sense) are acquired from the Δ side of the transformer, the phase shift to be set remains null (P80 = 0.0).

| | | Range | | | | |
|---|---|---|---|---|---|---|
| I_CTRL_SEL | C80 - Current control type selection | 0 | dq control | 1 | | 1 |
| | | 1 | ac control | | | |

Type of Current Control Loop. By setting C80 = 1, AC current control is selected (recommended for all Micro-Grid applications).

| | | Range | | | | |
|---|---|---|---|---|---|---|
| V_CTRL_SEL | C81 -Voltage control type (GRID-ISLAND) | 0 | dq control | 0 | | 1 |
| | | 1 | ac control | | | |

Type of Voltage Control Loop. By setting C81 = 1, AC voltage control is selected.

| | | Range | | | | |
|---|---|---|---|---|---|---|
| SYNC_CARD_SEL | C82 - Type of Sync Card mounted | 0 | old | 0 | | 1 |
| | | 1 | new | | | |

Indicates the type of Sync card mounted. C82 = 0 indicates that the card mounted is the Standard (commonly used in applications AFE and FFE), with C82 = 1 indicates the mounting of the sync card to improve performance. Please contact TDEMacno for more details.

### 1.2.2 Exchange Mode: CSI Management / VSI Management

For the exchange of a management VSI / CSI or vice versa by CSI / VSI, a digital input is configurable to the function I.20.

| | | | |
|---|---|---|---|
| I20 | | 0 | **VSI**, AC Grid Voltage Control Active. |
| | | 1 | **CSI**, PLL Active |

Warning: during the VSI operation mode, the function Precharge Bus Capacitors is managed only on the value of the voltage of the bus itself. Power failure alarm (A.02) is not reported at start in VSI.
The function ALL_RST_ON_GRID (C35=1) that acts as Automatic Alarm Reset When Grid Back On, in VSI Mode is managed only on the presence of the DC Bus Voltage. In CSI Operation, function Precharge is managed both on the value of the Bus Voltage that on the value of the line AC.

### 1.2.3 System Set Up (CSI Mode)

CSI Control Mode is performed by setting the Iq (sysIqref) and Id (sysIdRef) references to the AFE to provide the required power to Batteries and Grid.
**V Bus max LIM** and **V Bus min LIM** are voltage limits to preserve the Batteries. If the value of V Bus max Lim = V Bus min Lim, the limit function is automatically excluded.
VBus Limits are selected by setting E25=1, in this way the DC Bus Voltage control is automatically excluded, thus the value of *VBusOvdFieldbus* is not managed.
VBusmaxLIM and VBus minLIM values are set in E55 and E56 and moltiplied by a factor settable ion VBMaxLimFieldbus and VBMinLimFieldbus [16384] writtable by fieldbus.

**Application Parameters:**

| Name | Description | Min | Max | Default | UM | Scale |
|---|---|---|---|---|---|---|
| IQ_REF | E00 - Reference for active current Iq | -100.0 | 100.0 | 0.0 | $\%_{I\_CONV\_NOM}$ | 100 |
| ID_REF | E01 - Reference for reactive current Id | -100.0 | 100.0 | 0.0 | $\%_{I\_CONV\_NOM}$ | 100 |
| EN_CURR_REF | E25 - Enable application current reference | 0 | 1 | 0 | | 1 |
| VB_MAX | E55 - V Bus Max Limit in CSI | 0 | 1200 | 0 | [V] | 10 |
| VB_MIN | E56 - V Bus Min Limit in CSI | 0 | 1200 | 0 | [V] | 10 |
| KP_VB_LIM | E57 - Kp V Bus limit in CSI | 0.0 | 300.0 | 1.0 | | 10 |
| TI_VB_LIM | E58 - Ti V Bus Limit in CSI | 0.0 | 3000.0 | 60.0 | [ms] | 10 |
| TF_VB_LIM | E59 - Tf V Bus Limit in CSI | 0.0 | 3000.0 | 0.0 | [ms] | 10 |

| | | | | | | |
|---|---|---|---|---|---|---|
| EN_FLDBUS_REF | E27 - Enable FIELD-BUS reference values | 0 | 1 | 0 | | 1 |

**Optional (Available only if DC Current sensor is mounted)**

| | | | | | | |
|---|---|---|---|---|---|---|
| I_PV_MAX | E30 - Maximum PV input current | 0.0 | 2000.0 | 0.0 | A | 10 |
| Tau_Ipv_filter | E37 - Time constant Ipv filter | 10 | 999 | 10 | ms | 1 |
| Kmult_Ipv | E38 - Kmult_IPV | 0 | 200 | 100 | % | 1 |

| | | | |
|---|---|---|---|
| O44 | | 0 (False) / 1 (true) | V Bus into the range VB_MAX VB_MIN |

### 1.2.4 Pre-Charge in Csi Mode

Working in CSI Mode, at DC Bus discharged, the pre-charge must be carried out with external resistors.
Theoretically, two Pre-charge circuits must be considered: one on the DC side of the AFE (DC source), the other one on the AC Side of the AFE (Grid).
With the care of charging the DC Bus Capacitors always via DC Source, only the DC Pre-charge circuit must be provided.
An external control can verify DC pre-charge being correctly completed by comparing the DC Bus voltage read by the AFE with the actual DC Voltage of the DC source.

**Attention!** Connecting AFE to Grid, before Precharge being completed can be potentially destructive.

In order to verify the DC Bus Voltage being over a minimum level to guarantee safely connection to the Grid, the output O44 can be read.
Connect AFE to Grid only once O44 to a TRUE level.

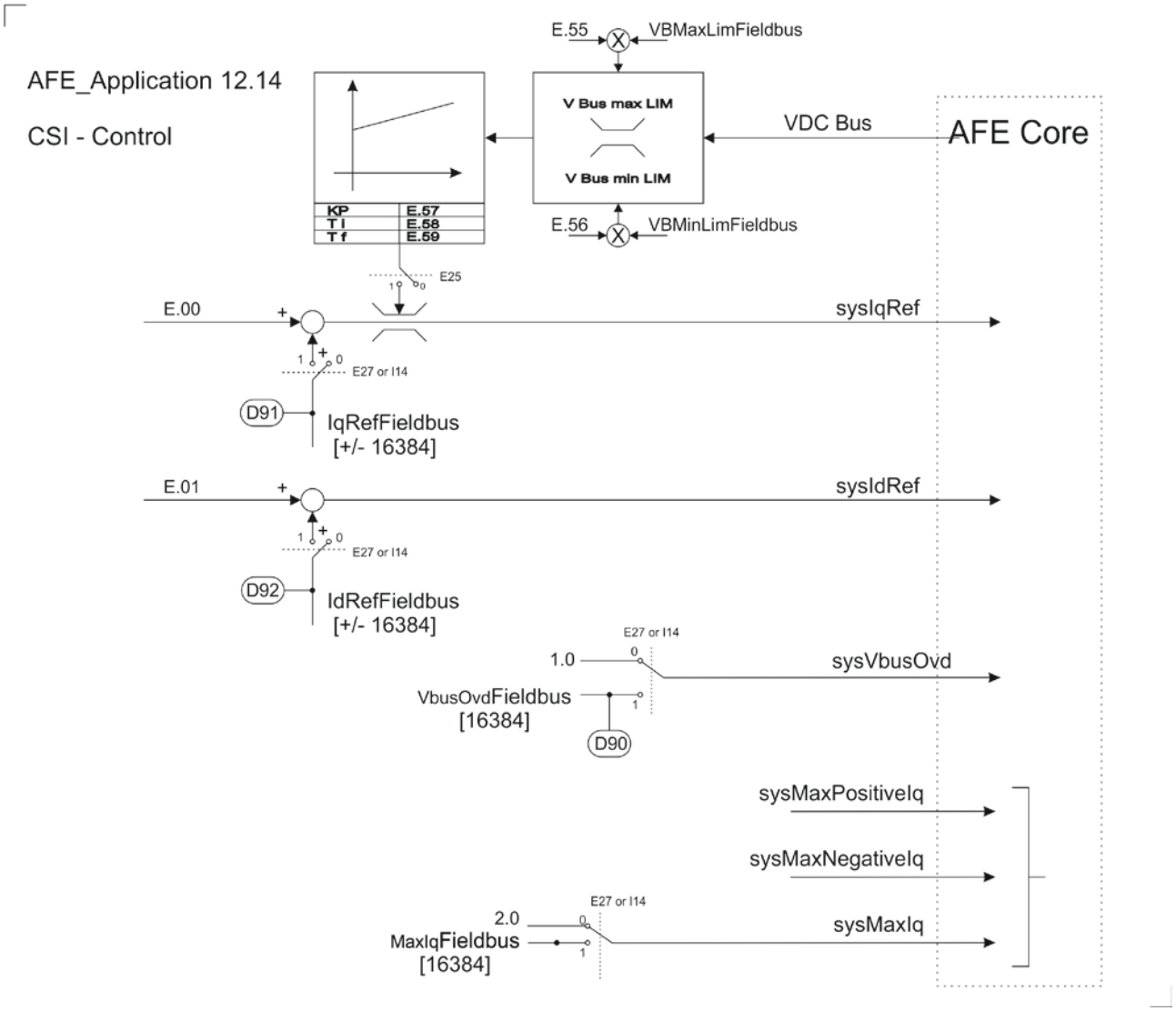



**FIG. 5**: CSI-Mode Control Scheme

## 1.3 SWAP TO ISLAND FUNCTION

Enables the converter while working in CSI mode to swap to Island function (VSI mode) if Grid Voltage goes off or frequency run out of its nominal value. Setting C83=1 enables the automatic swap from CSI to VSI in case of grid off. With C83=0 (default) the converter trips to A.2 Alarm.

| | | | |
|---|---|---|---|
| I03 | | 0 | **Swap enable** 0:not enabled 1:enabled |

| | | | | | | |
|---|---|---|---|---|---|---|
| SWAP_ISL_EN | C83 -Swap to Island function Enable | 0 | 1 | 0 | | 1 |

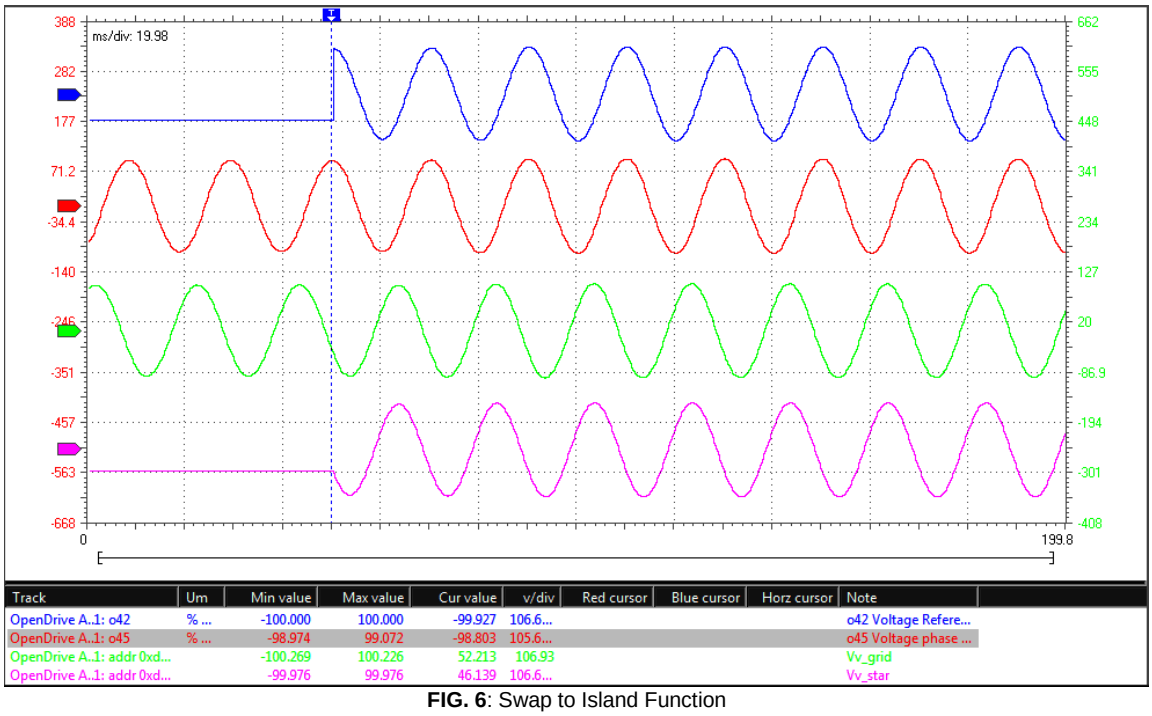



**FIG. 6**: Swap to Island Function

## 1.4 DROOP CONTROL FUNCTION

| | | | |
|---|---|---|---|
| I21 | | 0 | **Droop** 0:no 1:enabled |

Droop control function can be enabled by I21 or C84.

| | | | | | | |
|---|---|---|---|---|---|---|
| FREQ_DROOP | P22 - % Frequency Droop | -100.00 | 100.00 | 2.00 | % | 81.92 |
| VOLT_DROOP | P23 - % Voltage Droop | -100.00 | 100.00 | 5.00 | % | 81.92 |

To allow power sharing when in VSI mode in paralleled with other Voltage sources the Droop Control function is implemented. Both Frequency and Voltage droops are available with values that can be set (in %) between -100% to +100%.

Typical Frequency Droop values for active power sharing are 0÷5%.
Typical Voltage Droop values for reactive power sharing are 0÷20%.

## 1.5 VIRTUAL IMPEDENCE

Real and Virtual Impedences can be set using the parameters:

| | | | | | | |
|---|---|---|---|---|---|---|
| PRC_REAL_VRS | P69 - Voltage drop due to real resistor | 0.00 | 25.00 | 0.1 | $\%_{V\_GRID\_NOM}$ | 327.67 |

| | | | | | | |
|---|---|---|---|---|---|---|
| PRC_REAL_VLS | P70 - Voltage drop due to real inductance | 0.00 | 50.00 | 3.0 | %$V_{GRID\_NOM}$ | 327.67 |
| PRC_VIRTL_VRS | P72 - Voltage drop due to real+virtual resistor | -25.00 | 25.00 | 0.1 | %$V_{GRID\_NOM}$ | 327.67 |
| PRC_VIRTL_VLS | P73 - Voltage drop due to real+virtual inductance | -50.00 | 50.00 | 3.0 | %$V_{GRID\_NOM}$ | 327.67 |
| CAPAC_LINE_CURR | P74 - Capacitors Line Current | 0.00 | 20.00 | 0.0 | %$I_{CONV\_NOM}$ | 327.67 |

Besides the real value of impedence (P69, P70), the virtual value must be set (P72, P73). P74 can be set to consider the current on the line capacitors.

## 1.6 APPENDIX - MICROGRID STATUS WORD

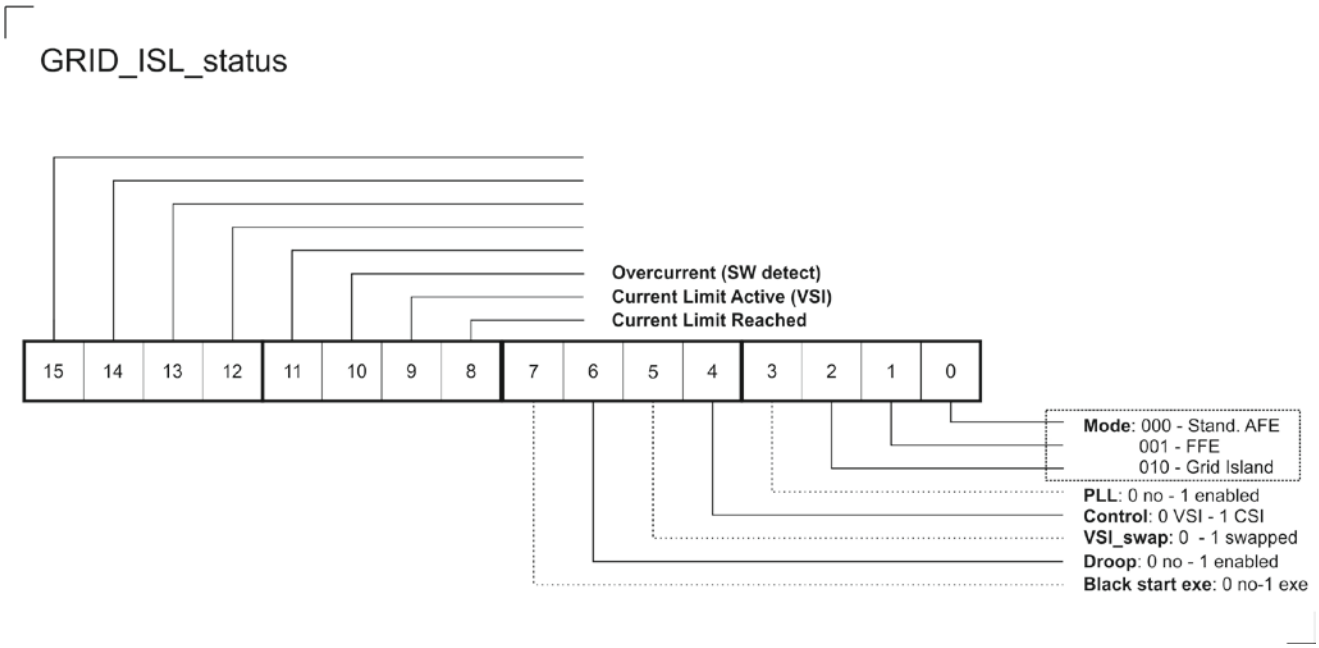



**FIG. 7**: GRID_ISL_status – Micro Grid Status Word (d.09 / o.09)

| | BIT Function | Description |
|---|---|---|
| **b0** | **Mode0** (bit0) | 0: Standard AFE |
| **b1** | **Mode1** (bit1) | |
| **b2** | **Mode2** (bit2) | Mode: 1: FFE<br>2: MicroGrid |
| **b3** | **PLL**- 0:not active 1:active | PLL grid phase control |
| **b4** | **Control** - 0:VSI 1:CSI | VSI/CSI |
| **b5** | **VSI_swap** - 0:no 1:swapped | Swapped to island |
| **b6** | **Droop** - 0:no 1:enabled | Droop Control Enabled |
| **b7** | **Black start exe**: 0 no-1 exe | Black Start in execution |
| **b8** | **Current Limit Reached** | |
| **b9** | **Current Limit Active** (VSI) | |
| **b10** | **Overcurrent** (SW detect) | |
| **b11** | | |
| **b12** | | |
| **b13** | | |
| **b14** | | |
| **b15** | | |

**TAB. 4**: GRID_ISL_status - Micro Grid Status Word (Bit Function)

## 1.7 APPENDIX - MICROGRID: FIELDBUS MANAGEMENT

Exchanging commands and status between Converter and external control is possible by configuring Fieldbus objects.

| Index | Description | Val Def | Val Min | Val Max | Scale | [UM] |
|---|---|---|---|---|---|---|
| 2100 h | VbusOvd (Fieldbus) | 100.0 | | | 16384 | [%P.8] |
| 2101 h | IqRef (Fieldbus) | 0.00 | -100 | 100 | 16384 | [%I_CONV] |
| 2102 h | IdRef (Fieldbus) | 0.00 | -100 | 100 | 16384 | [%I_CONV] |
| 2103 h | MaxIq (Fieldbus) | 200.0 | 0 | 200 | 16384 | [%I_CONV] |
| 2104 h | VgridOvd (Fieldbus) | 100.0 | 0 | 200 | 16384 | [%V_GRID_ISL] |
| 2105 h | FreqOvd (Fieldbus) | 100.0 | 0 | 200 | 16384 | [%F_GRID_NOM] |
| 2106 h | VBLimMaxOvd (Fieldbus) | 100.0 | 0 | 100 | 16384 | [%E.55] |
| 2107 h | VBLimMinOvd (Fieldbus) | 100.0 | 0 | 100 | 16384 | [%E.56] |

**TAB. 5**

To enable reference from Fieldbus, the EN_FLDBUS_REF (**E27**) or ID_EN_FLDBUS_REF (Enable FIELD-BUS reference values **I14**) must be enabled. This can be done using a Digital Input of the converter configured as I14, or using the FieldBus EN_FLDBUS_REF from the field. In case no one of the Enable switch is set to ON, the objects assume the default values.

The following table shows the main mapped objects for all TDE applications. For more information please see the User's manual.

| Index (hex) | Object | Type | Name | Description | PDO Mapping | Access |
|---|---|---|---|---|---|---|
| 200D | ARRAY | INTEGER16 | Tab_par[200] | Current parameter values | No | Reading/ writing |
| 200E | ARRAY | INTEGER16 | Tab_con[100] | Current connections value | No | Reading/ writing |
| 200F | ARRAY | INTEGER16 | Tab_Int[128] | Current internal values | Yes | Reading |
| 2010 | ARRAY | INTEGER16 | Tab_inp_dig[32] | Current values of standard input logic functions | Yes | Reading |
| 2011 | ARRAY | INTEGER16 | Tab_out_dig[32] | Current values of standard output logic functions | Yes | Reading |
| 2012 | ARRAY | INTEGER16 | Tab_osc[100] | Current monitorable size values | Yes | Reading |
| 2016 | ARRAY | UNSIGNED32 | Out_dig_appl | Application output function reading via fieldbus | Yes | Reading |
| 2017 | VAR | UNSIGNED16 | Status | Converter variable status | Yes | Reading |
| 2018 | VAR | UNSIGNED16 | Alarms | Converter alarm status | Yes | Reading |
| 201E | ARRAY | INTEGER16 | Tab_dati_applicazione [100] | Available data area for application | Yes | Reading/ writing |
| 201F | VAR | UNSIGNED32 | Inp_dig_field | Input logic function writing via fieldbus | Yes | Writing |
| 2020 | VAR | UNSIGNED32 | Inp_dig | Input logic function reading via fieldbus | Yes | Reading/ writing |
| 2021 | VAR | UNSIGNED32 | Out_dig | Standard logic output reading via fieldbus | Yes | Reading |

**TAB. 6:** Objects mapping

| Index (hex) | Object | Type | Name | Description | PDO Mapping | Access |
|---|---|---|---|---|---|---|
| 2100 | VAR | INTEGER16 | VbusOvd(Fieldbus) | VbusOvd - DC Bus Voltage override (Fieldbus) | Yes | Reading/ writing |
| 2101 | VAR | INTEGER16 | IqRef(Fieldbus) | IqRef - active current reference (Fieldbus) | Yes | Reading/ writing |
| 2102 | VAR | INTEGER16 | IdRef(Fieldbus) | IdRef - reactive current reference (Fieldbus) | Yes | Reading/ writing |
| 2103 | VAR | INTEGER16 | IqMax(Fieldbus) | IqMax - active current limit (Fieldbus) | Yes | Reading/ writing |
| 2104 | VAR | INTEGER16 | VgridOvd(Fieldbus) | VgridOvd - AC Voltage override (VSI) (Fieldbus) | Yes | Reading/writing |
| 2105 | VAR | INTEGER16 | FreqOvd(Fieldbus) | FreqOvd - Frequency Override (VSI) (Fieldbus) | Yes | Reading/ writing |

**TAB. 7**: Grid Island specific Objects mapping

### 1.7.1 Example

Example of cyclic variables Exchange via Profibus.
The example refers to data exchange in BigEndian mode and suppose to Exchange **6 Word in TX and 6 Word in RX** (one double word + 4 words). Remember the number of words Tx and Rx must be the same.
These objects must be set in the folder *Cyclic Mapping* (Filedbus --> Profibus --> New manage --> Cyclic Mapping.

| Name | Value | Um | Default | Min | Max | |
|---|---|---|---|---|---|---|
| MAP_ERROR_CODE | Ok | | Ok | | | Mapping Error Code |
| MAP_ERROR_OBJ | 0 | Hex | 0 | | | Mapping Error Object |
| RX0_INDEX | 201f | Hex | 0 | | | Receive Object0 Index |
| RX0_SUB_INDEX | 0 | Hex | 0 | | | Receive Object0 Sub-Index |
| RX1_INDEX | 2100 | Hex | 0 | | | Receive Object1 Index |
| RX1_SUB_INDEX | 0 | Hex | 0 | | | Receive Object1 Sub-Index |
| RX2_INDEX | 2101 | Hex | 0 | | | Receive Object2 Index |
| RX2_SUB_INDEX | 0 | Hex | 0 | | | Receive Object2 Sub-Index |
| RX3_INDEX | 2102 | Hex | 0 | | | Receive Object3 Index |
| RX3_SUB_INDEX | 0 | Hex | 0 | | | Receive Object3 Sub-Index |
| RX4_INDEX | 2103 | Hex | 0 | | | Receive Object4 Index |
| RX4_SUB_INDEX | 0 | Hex | 0 | | | Receive Object4 Sub-Index |
| RX5_INDEX | 0 | Hex | 0 | | | Receive Object5 Index |
| RX5_SUB_INDEX | 0 | Hex | 0 | | | Receive Object5 Sub-Index |
| RX6_INDEX | 0 | Hex | 0 | | | Receive Object6 Index |
| RX6_SUB_INDEX | 0 | Hex | 0 | | | Receive Object6 Sub-Index |
| RX7_INDEX | 0 | Hex | 0 | | | Receive Object7 Index |
| RX7_SUB_INDEX | 0 | Hex | 0 | | | Receive Object7 Sub-Index |
| RX8_INDEX | 0 | Hex | 0 | | | Receive Object8 Index |
| RX8_SUB_INDEX | 0 | Hex | 0 | | | Receive Object8 Sub-Index |
| RX9_INDEX | 0 | Hex | 0 | | | Receive Object9 Index |
| RX9_SUB_INDEX | 0 | Hex | 0 | | | Receive Object9 Sub-Index |
| TX0_INDEX | 2021 | Hex | 0 | | | Transmit Object0 Index |
| TX0_SUB_INDEX | 0 | Hex | 0 | | | Transmit Object0 Sub-Index |
| TX1_INDEX | 200f | Hex | 0 | | | Transmit Object1 Index |
| TX1_SUB_INDEX | 1a | Hex | 0 | | | Transmit Object1 Sub-Index |
| TX2_INDEX | 2012 | Hex | 0 | | | Transmit Object2 Index |
| TX2_SUB_INDEX | 18 | Hex | 0 | | | Transmit Object2 Sub-Index |
| TX3_INDEX | 2012 | Hex | 0 | | | Transmit Object3 Index |
| TX3_SUB_INDEX | f | Hex | 0 | | | Transmit Object3 Sub-Index |
| TX4_INDEX | 2018 | Hex | 0 | | | Transmit Object4 Index |
| TX4_SUB_INDEX | 0 | Hex | 0 | | | Transmit Object4 Sub-Index |

The object mapped are:

**RX**

| Index (hex) | Object | Type | Name | Description | PDO Mapping | Access |
|---|---|---|---|---|---|---|
| 201f | VAR | UNSIGNED32 | Inp_dig_field | Input logic functions | Yes | Reading/ writing |
| 2106 | VAR | INTEGER16 | VbusOvd (Fieldbus) | VbusOvd - DC Bus Voltage override (Fieldbus) | Yes | Reading/ writing |
| 2101 | VAR | INTEGER16 | IqRef (Fieldbus) | IqRef - active current reference (Fieldbus) | Yes | Reading/ writing |
| 2102 | VAR | INTEGER16 | IdRef (Fieldbus) | IdRef - reactive current reference (Fieldbus) | Yes | Reading/ writing |
| 2103 | VAR | INTEGER16 | NC | | | |
| 2022 | VAR | INTEGER16 | NC | | | |
| 2022 | VAR | INTEGER16 | NC | | | |

**TX**

| Index-sub (h) | Object | Type | Name | Description | PDO Mapping | Access |
|---|---|---|---|---|---|---|
| 2021-0 | VAR | UNSIGNED32 | Out_dig | Standard logic output reading via fieldbus | Yes | Reading |
| 200f-1a | ARRAY | INTEGER16 | Tab_Int[26] | Reactor temperature | Yes | Reading |
| 2012-f | ARRAY | INTEGER16 | Tab_osc[15] | Iq component of current (reading) | Yes | Reading |
| 2012-18 | ARRAY | INTEGER16 | Tab_osc[24] | Bus Voltage | Yes | Reading |
| 200f-41 | VAR | INTEGER16 | IPV | PV Input Current (DC) | Yes | Reading |
| 200f-9 | VAR | INTEGER16 | Status | Status MicroGrid | Yes | Reading |
| 2018-0 | VAR | UINTEGER16 | Alarms | Allarms | Yes | Reading |



Via dell'Oreficeria, 41
36100 Vicenza - Italy
Tel +39 0444 343555
Fax +39 0444 343509
www.bdfdigital.com